



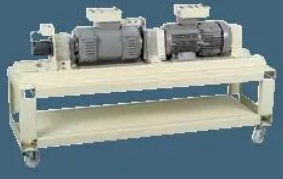




ELECTRICAL LABORATORY EQUIPMENT

Educational Equipment & solutions for Technical Training Institutes & Universities







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Technical Furniture



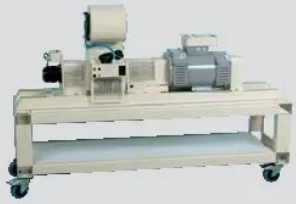
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Motors & Electrotech.



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Renewable Energy



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Training systems & Models



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Measuring Apparatus



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Accessories



TECHNICAL FURNITURE

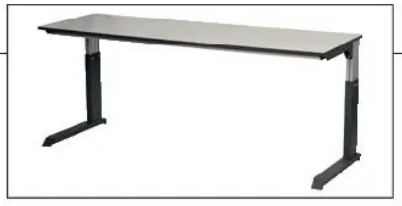
Heavy-duty workbenches

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Light benches and trolleys

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Multi-purpose benches

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Electrotechnical benches

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Wiring benches

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Storage units

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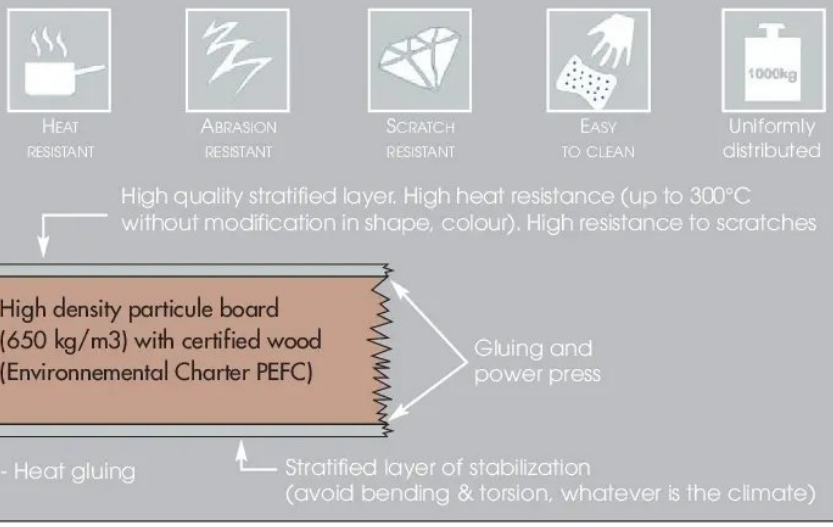



EQUILIBRIUM RANGE

New generation of technical furniture

Quality of stratified top





Quality of steel & finishes



All parts of the metal frame are manufactured from electrogalvanised steel sheet, which is widely used in the car manufacturing industry and makes the sheet extremely resistant to corrosion. The iron/zinc combination forms a natural cell with moisture in the air that prevents the iron from corroding, even if shearing or scratching occurs. This protection is strengthened further by two layers of furnace-baked epoxy paint, which means that it is suitable for use even in tropical or coastal areas.

5 EPOXY PAINT LAYER 2
4 EPOXY PAINT LAYER 1
3 ELECTROGALVANIZED LAYER
2 UNOXYDISED STEEL
1 PVC BASE

Colors

RAL 7016 + RAL 2008
RAL 7016 + RAL 6018

In standard, metal parts of the Equilibrium range are available in one of the two color combinations above.



Other RAL colors are possible on request (additional lead time). More than 300 colors are available.

Power sockets available for technical furniture



F TYPE SCHUKO GERMANY



E TYPE FRANCE



J TYPE SWITZERLAND



G TYPE UNITED KINGDOM



B TYPE USA

STANDARD HEAVY-DUTY BENCHES

Basic benches

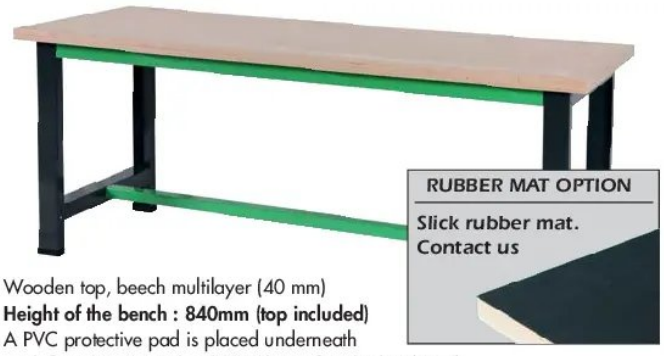
STRATIFIED TOP



High temperature stratified top (40 mm)
Height of the bench : 840mm (top included)
A PVC protective pad is placed underneath each foot.
Maximum load 1000kg uniformly distributed.

Dim. (mm)	Reference ●	Reference ●
1200 x 750	**ASV-127**	**ASO-127**
1200 x 1000	**ASV-1210**	**ASO-1210**
1500 x 750	**ASV-157**	**ASO-157**
1500 x 1000	**ASV-1510**	**ASO-1510**
1800 x 750	**ASV-187**	**ASO-187**
1800 x 1000	**ASV-1810**	**ASO-1810**
2000 x 750	**ASV-207**	**ASO-207**
2000 x 1000	**ASV-2010**	**ASO-2010**
2500 x 750	**ASV-257**	**ASO-257**

WOODEN TOP



Wooden top, beech multilayer (40 mm)
Height of the bench : 840mm (top included)
A PVC protective pad is placed underneath each foot. Maximum load 1000kg uniformly distributed.

Dim. (mm)	Reference ●	Reference ●
1200 x 750	**ABV-127**	**ABO-127**
1200 x 1000	**ABV-1210**	**ABO-1210**
1500 x 750	**ABV-157**	**ABO-157**
1500 x 1000	**ABV-1510**	**ABO-1510**
1800 x 750	**ABV-187**	**ABO-187**
1800 x 1000	**ABV-1810**	**ABO-1810**
2000 x 750	**ABV-207**	**ABO-207**
2000 x 1000	**ABV-2010**	**ABO-2010**

ADJUSTABLE HEIGHT BENCHES



High temperature stratified top (40 mm)
Adjustable height: 700 ~ 960mm (top included)
System with sliding foot components, adjustable continuously, tightened by screws and bolts. Each foot can be adjusted separately (if the floor is not completely flat).
The strength of these adjustable benches is equal to standard benches.
A PVC protective pad is placed underneath each foot.
Maximum load 1000kg uniformly distributed.

Dim. (mm)	Reference ●	Reference ●
1200 x 750	**LSV-127**	**LSO-127**
1200 x 1000	**LSV-1210**	**LSO-1210**
1500 x 750	**LSV-157**	**LSO-157**
1500 x 1000	**LSV-1510**	**LSO-1510**
1800 x 750	**LSV-187**	**LSO-187**
1800 x 1000	**LSV-1810**	**LSO-1810**
2000 x 750	**LSV-207**	**LSO-207**
2000 x 1000	**LSV-2010**	**LSO-2010**

BENCHES WITH WHEELS



High temperature stratified top (40 mm)
Height of the bench: 965mm (top and wheels included)
4 wheels 100 mm diameter with rubber rolling band.
2 wheels have a brake.
Maximum load 500kg uniformly distributed.
Other heights on request.

Dim. (mm)	Reference ●	Reference ●
1200 x 750	**RSV-127**	**RSO-127**
1200 x 1000	**RSV-1210**	**RSO-1210**
1500 x 750	**RSV-157**	**RSO-157**
1500 x 1000	**RSV-1510**	**RSO-1510**
1800 x 750	**RSV-187**	**RSO-187**
1800 x 1000	**RSV-1810**	**RSO-1810**
2000 x 750	**RSV-207**	**RSO-207**
2000 x 1000	**RSV-2010**	**RSO-2010**

BENCHES WITH STRATIFIED TOP AND SHELF



High temperature stratified top (40mm). Stratified shelf depth 340mm.
Height of the bench : 840mm (top included)
A PVC protective pad is placed underneath each foot.
Max load 1000kg uniformly distributed

Dim. (mm)	Reference ●	Reference ●
1500 x 750	**DSV-157**	**DSO-157**
1500 x 1000	**DSV-1510**	**DSO-1510**
1800 x 750	**DSV-187**	**DSO-187**
1800 x 1000	**DSV-1810**	**DSO-1810**
2000 x 750	**DSV-207**	**DSO-207**
2000 x 1000	**DSV-2010**	**DSO-2010**

BENCH WITH SINK (TOP DAMP-PROOF)



HIGH-TEMPERATURE LAMINATED BENCH-TOP 40mm
Workbench height: 840 mm (top included)
PVC protective pads under each foot
Maximum load 1000 kg uniformly distributed.

- 1 bench-top 1500 x 750 mm
- 1 sink 400 x 500 mm, depth 325 mm, single piece injection-moulded corrosion-resistant polypropylene.
- 1 double cold water outlet with two taps.
- With connection accessories for waste water and cold water inlet.

The sink is built-in and fully protected by a front opening cabinet.
100% watertight assembly.

ref. PEG-157

BENCHES WITH POWER CONSOLE & EMERGENCY STOP

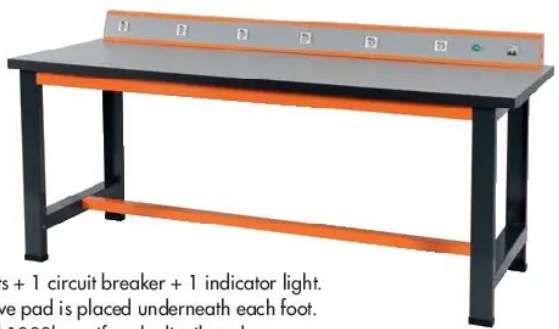


High temperature stratified top (40mm). Stratified shelf depth 340mm.
Height of the bench : 840mm (top included)
A PVC protective pad is placed underneath each foot.
Max load 1000kg uniformly distributed

Dim. (mm)	Thermal magnetic circuit breaker	
	Reference ●	Reference ●
1800x750	**ESV-187**	**ESO-187**
1800x1000	**ESV-1810**	**ESO-1810**
2000x750	**ESV-207**	**ESO-207**
2000x1000	**ESV-2010**	**ESO-2010**

Dim. (mm)	30mA residual current circuit breaker	
	Reference ●	Reference ●
1800x750	**ESV-187D**	**ESO-187D**
1800x1000	**ESV-1810D**	**ESO-1810D**
2000x750	**ESV-207D**	**ESO-207D**
2000x1000	**ESV-2010D**	**ESO-2010D**

BENCHES WITH POWER CONSOLE



6 power sockets + 1 circuit breaker + 1 indicator light.
A PVC protective pad is placed underneath each foot.
Maximum load 1000kg uniformly distributed.

Dim. (cm)	Thermal magnetic circuit breaker	
	Reference ●	Reference ●
180x75	**FSV-187**	**FSO-187**
180x100	**FSV-1810**	**FSO-1810**
200x75	**FSV-207**	**FSO-207**
200x100	**FSV-2010**	**FSO-2010**

Dim. (cm)	30mA residual current circuit breaker	
	Reference ●	Reference ●
180x75	**FSV-187D**	**FSO-187D**
180x100	**FSV-1810D**	**FSO-1810D**
200x75	**FSV-207D**	**FSO-207D**
200x100	**FSV-2010D**	**FSO-2010D**

Information : All power sockets are wired.
(Power cable of the console notre supplied)

Benches with a shelf

BENCHES WITH A SIMPLE SHELF

- High temperature stratified top
- Shelf with: 4x power sockets + 1x circuit breaker + 1x indicator light
- Shelf adjustable in height: maximum 400mm (depth: 400mm)
- Height of the bench: 1240mm (shelf included). Maximum load 1000kg uniformly distributed



	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
Dims. (mm)	Reference ●	Reference ●	Reference ●	Reference ●
1800 x 750	**GSV-187**	**GSO-187**	**GSV-187D**	**GSO-187D**
1800 x 1000	**GSV-1810**	**GSO-1810**	**GSV-1810D**	**GSO-1810D**
2000 x 750	**GSV-207**	**GSO-207**	**GSV-207D**	**GSO-207D**
2000 x 1000	**GSV-2010**	**GSO-2010**	**GSV-2010D**	**GSO-2010D**

BENCH WITH A SHELF & A POWER CONSOLE

- Stratified top. Power console with: 6x power sockets + 1x circuit breaker + 1x indicator light
- Shelf with: 4x power sockets + 1x circuit breaker + 1x indicator light
- Shelf adjustable in height: maximum 400mm (depth: 400mm)
- Height of the bench: 1240 mm (shelf included). Maximum load 1000kg uniformly distributed

(*) for these references, only the circuit breaker of the console is a 30mA residual current type. The circuit breaker of the shelf remains a thermal magnetic one.



	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
Dims. (mm)	Reference ●	Reference ●	Reference ●	Reference ●
1800 x 750	**JSV-187**	**JSO-187**	**JSV-187D**	**JSO-187D**
1800 x 1000	**JSV-1810**	**JSO-1810**	**JSV-1810D**	**JSO-1810D**
2000 x 750	**JSV-207**	**JSO-207**	**JSV-207D**	**JSO-207D**
2000 x 1000	**JSV-2010**	**JSO-2010**	**JSV-2010D**	**JSO-2010D**

BENCH WITH A HIGH SHELF & A POWER CONSOLE

- Stratified top. Power console with: 6x power sockets + 1x circuit breaker + 1x indicator light
- Shelf with: 4x power sockets + 1x circuit breaker + 1x indicator light
- Shelf adjustable in height: maximum 400mm (depth: 400mm)
- Height of the bench: 1240 mm (shelf included). Maximum load 1000kg uniformly distributed

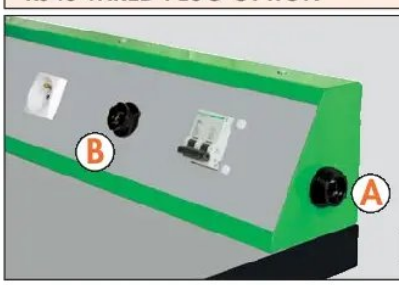
(*) for these references, only the circuit breaker of the console is a 30mA residual current type. The circuit breaker of the shelf remains a thermal magnetic one.



	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
Dims. (mm)	Reference ●	Reference ●	Reference ●	Reference ●
1800 x 750	**KSV-187**	**KSO-187**	**KSV-187D**	**KSO-187D**
1800 x 1000	**KSV-1810**	**KSO-1810**	**KSV-1810D**	**KSO-1810D**
2000 x 750	**KSV-207**	**KSO-207**	**KSV-207D**	**KSO-207D**
2000 x 1000	**KSV-2010**	**KSO-2010**	**KSV-2010D**	**KSO-2010D**

Information : All power sockets are wired. (Power cable of the console not supplied)

RJ45 WIRED PLUG OPTION



Combination of 2 RJ45 connectors connected together in the console.The side connector **A** is used to connect the network input, the front connector **B** is for the user's connection.

ref. CARJ45

RJ45 PLUG (NOT WIRED)

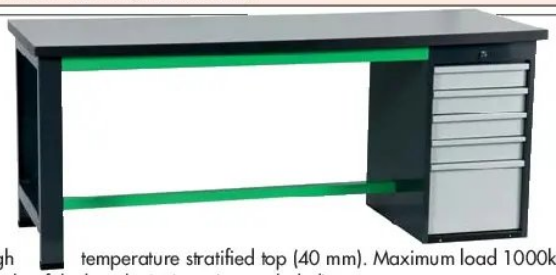
For a cable coming from your patch panel.

ref. SERJ45



Benches with leg-mounted cabinet and drawers

CABINET WITH 5 DRAWERS



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 5 drawers (4 drawers H100mm + 1 drawer H300mm)

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**50TV-187S**	**50TO-187S**
1800 x 1000	**50TV-1810S**	**50TO-1810S**
2000 x 750	**50TV-207S**	**50TO-207S**
2000 x 1000	**50TV-2010S**	**50TO-2010S**

CABINET WITH 4 DRAWERS



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 4 drawers (1 drawer H100mm + 3 drawers H200mm)

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**43TV-187S**	**43TO-187S**
1800 x 1000	**43TV-1810S**	**43TO-1810S**
2000 x 750	**43TV-207S**	**43TO-207S**
2000 x 1000	**43TV-2010S**	**43TO-2010S**

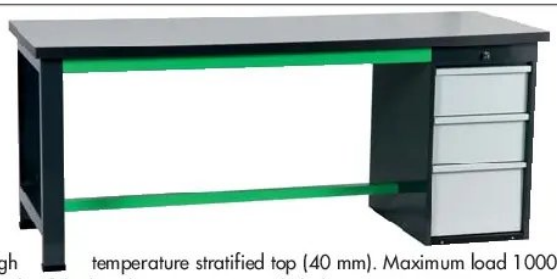
CABINET WITH LOCKING SWING DOOR



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with locking swing door and 2 shelves

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**80TV-187S**	**80TO-187S**
1800 x 1000	**80TV-1810S**	**80TO-1810S**
2000 x 750	**80TV-207S**	**80TO-207S**
2000 x 1000	**80TV-2010S**	**80TO-2010S**

CABINET WITH 3 DRAWERS



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 3 drawers (2 drawers H200mm + 1 drawer H300mm)

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**31TV-187S**	**31TO-187S**
1800 x 1000	**31TV-1810S**	**31TO-1810S**
2000 x 750	**31TV-207S**	**31TO-207S**
2000 x 1000	**31TV-2010S**	**31TO-2010S**

BENCHES WITH 3 HANGING DRAWERS



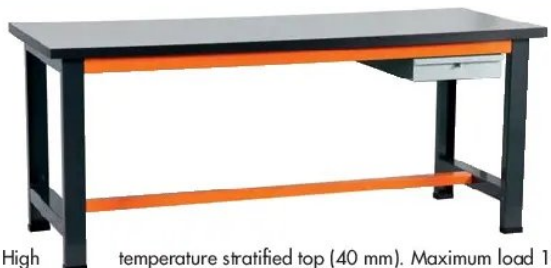
- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 2 drawers H100mm / 1 drawer H200mm

Hanging drawers with lock (can be placed anywhere under the bench top)

For adjustable height bench with hanging drawers, contact us

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**YSV-187**	**YSO-187**
1800 x 1000	**YSV-1810**	**YSO-1810**
2000 x 750	**YSV-207**	**YSO-207**
2000 x 1000	**YSV-2010**	**YSO-2010**

BENCHES WITH 1 HANGING DRAWER



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 1 drawer H100mm

Hanging drawers with lock (can be placed anywhere under the bench top)

For adjustable height bench with hanging drawers, contact us

Dim. (mm)	Reference ●	Reference ●
1800 x 750	**XSV-187**	**XSO-187**
1800 x 1000	**XSV-1810**	**XSO-1810**
2000 x 750	**XSV-207**	**XSO-207**
2000 x 1000	**XSV-2010**	**XSO-2010**

Tool holder benches



Reference ● BPV-1522

Reference ● BPO-1522

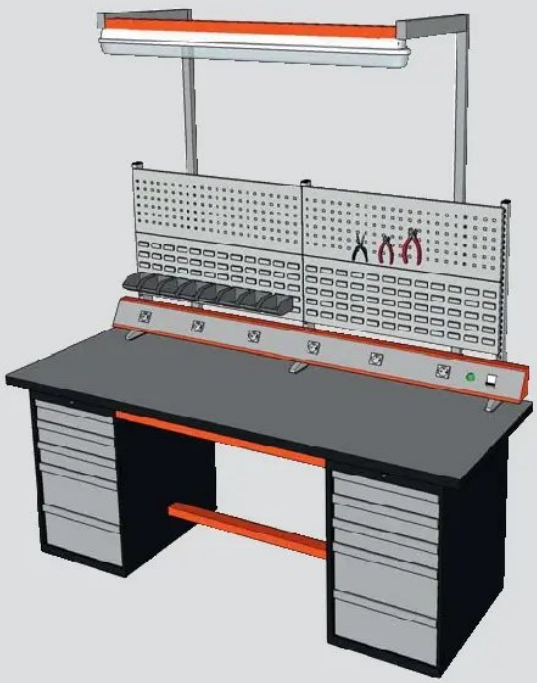
Bench with tool holder vertical panels and tray rests.
High temperature stratified top (40mm).
Height of the bench : 840mm (top included).
Top : 1500 x 750mm
Height of the vertical panels : 830mm
Total height of the bench : 1670mm
A PVC protective pad is placed underneath each foot

Description of the delivered components	Qty
1500x750mm stratified bench 1	1
Perforated panel	2
Tool holder hook	24
Screwdriver holder	1
Trays panels	2
125 x 105mm trays	6
125 x 175mm trays	6
Adjustable shelf (in height)	1

Others configurations available upon request. Contact us.

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs



Accesories sold separately

TRAYS



ref. BAB-2 (125x105mm)

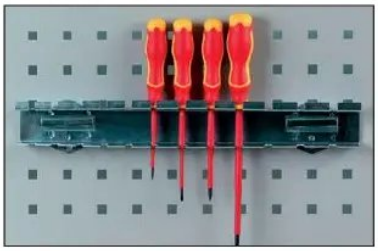
ref. BAB-3 (125x175mm)

TOOL HOLDER HOOK



ref. CPT lenght 75mm

SCREWDRIVERS HOLDER



ref. PTVIS screwdrivers not supplied

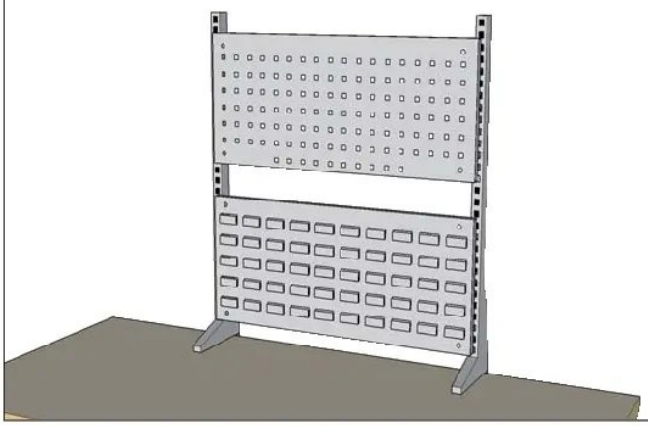
Vertical panels for workbenches

These panels are fixed to the rear of any bench-top with a thickness between 20 and 60mm. The bench-top most overhang by at least 45mm to offer good grip. The bench-top attachment requires no tools, each vertical post is fitted with a screw tightening knob. The vertical panels for tool and tray holders can be easily and quickly hooked onto the posts using hooks in steps of 25mm. Total height with respect to the bench-top: 830mm. The shelves and overhang shelves hook-on in the same way and can be attached between or in front of the panels as an additional thickness.



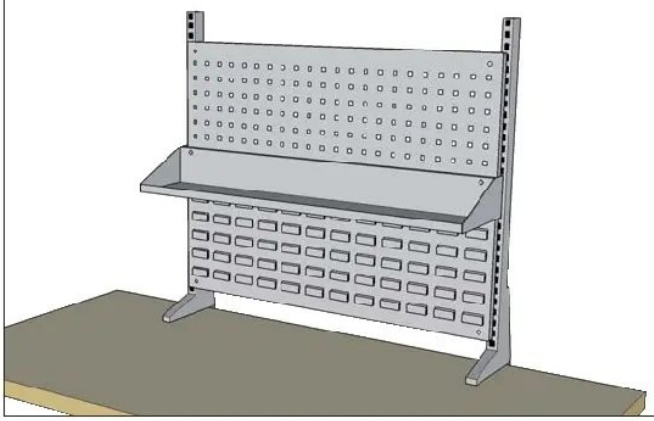
SET N°1 : LENGTH 750MM

Ref.	Panels	Post
PP01-11	1 tool holder + 1 trays holder	2
PP01-20	2 tool holders	2
PP01-02	2 trays holders	2



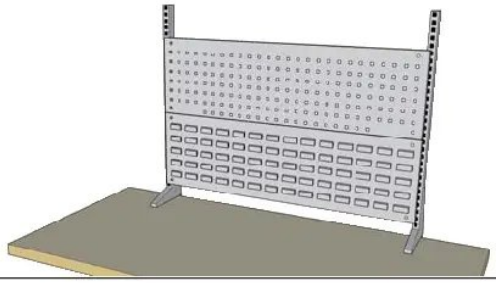
SET N°2 : LENGTH 890MM

Ref.	Panels	Post
PP02-11	1 tool holder + 1 trays holder	2
PP02-20	2 tool holders	2
PP02-02	2 trays holders	2
ETS-800	Optional shelf	



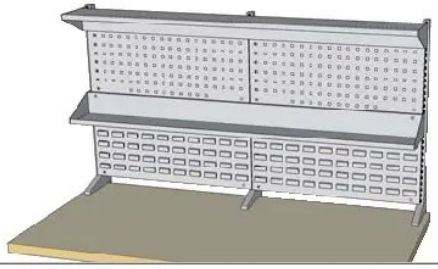
SET N°3 : LENGTH 1050MM

Ref.	Panels	Post
PP03-11	1 tool holder + 1 trays holder	2
PP03-20	2 tool holders	2
PP03-02	2 trays holders	2



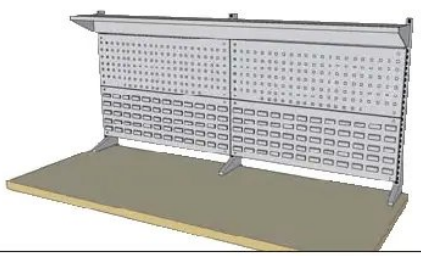
SET N°4 : LENGTH 1470MM

Ref.	Panels	Post
PP04-22	2 tool holder + 1 trays holder	3
PP04-40	4 tool holders	3
PP04-04	4 trays holders	3
ETS-1400	Optional shelf	
ETD-1400	Optional cap	
CONTACT US	Optional light	



SET N°5 : LENGTH 1750MM

Ref.	Panels	Post
PP05-22	2 tool holder + 1 trays holder	3
PP05-40	4 tool holders	3
PP05-04	4 trays holders	3
ETD-1700	Optional shelf	
CONTACT US	Optional light	



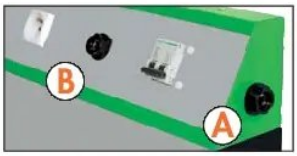
Choose and configure your own workbench

ADDITIONAL ITEMS



RJ45 socket not wired

ref. SERJ45



Combination of 2 RJ45 connectors connected together in the console. The side connector **A** is used to connect the network input, the front connector **B** is for the user's connection.

ref. CARJ45



Power socket 230V (E type). Other models upon request.

ref. PRISE+

COMPUTER ITEMS

SEE PAGES 16-17



SHELVES

Thickness of uprights: 35 mm
Depth of shelves: 400 mm
Available in length: 1200, 1500, 1800, 2000 mm
Height adjustable level



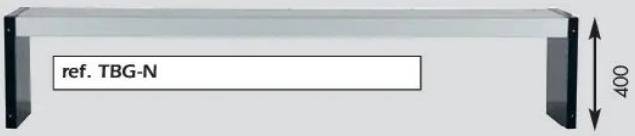
ref. L1G Thermal magnetic circuit breaker
ref. L1G-D 30mA residual current circuit breaker
Without sockets - Please contact us.



ref. L2G Thermal magnetic circuit breaker
ref. L2G-D 30mA residual current circuit breaker
Without sockets - Please contact us.



ref. TBG Thermal magnetic circuit breaker
ref. TBG-D 30mA residual current circuit breaker
Without sockets - Please contact us.



ref. TBG-N

LIGHTING OPTION

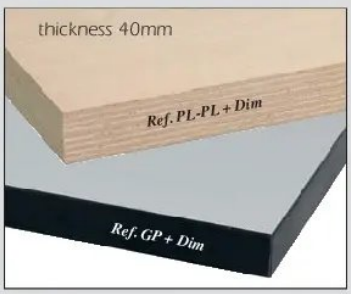
- Fluorescent light 18W with On/Off button
- Underneath the lowest level, when 2 levels



ref. ET-ECL



HIGH TEMPERATURE STRATIFIED* TOP AND WOODEN TOP



WIDTH (mm)	DEPTH 750mm	DEPTH 1000mm
1200 STRAT	Ref. GP127	Ref. GP1210
1200 WOOD	Ref. PL-PL-120x75	Ref. PL-PL-120x100
1500 STRAT	Ref. GP157	Ref. GP1510
1500 WOOD	Ref. PL-PL-150x75	Ref. PL-PL-150x100
1800 STRAT	Ref. GP187	Ref. GP1810
1800 WOOD	Ref. PL-PL-180x75	Ref. PL-PL-180x100
2000 STRAT	Ref. GP207	Ref. GP2010
2000 WOOD	Ref. PL-PL-200x75	Ref. PL-PL-200x100

MAIN FEATURES OF HIGH TEMPERATURE STRATIFIED TOP



Uniformly distributed | Heat resistant | Abrasion resistant | Scratch resistant | Easy to clean

MAIN FEATURES OF WOODEN TOP



Uniformly distributed | Shock resistant

CE PRODUCTS 2 YEARS GUARANTEE

VERTICAL CABLE RACEWAY & 360° LAMP

For the wiring of the power cable from the aerial wiring system to the base of the power supply

ref. DEG-1

Model for power cable and network cable

ref. DEG-2

Beacon with 3 light indicators

ref. VOY181

Beacon with 2 light indicators

ref. VOY121

Beacon with 1 light indicator

ref. VOY61

POWER CONSOLES

Available in length: 1120 – 1430 – 1730 -1920 mm
PVC front panel can be fitted with electrical components and outputs of your choice
See page 14 for standard models available





LEG-MOUNTED CABINETS WITH LOCK

- Available with drawers or swing door
- For top in depth 750 mm or 1000 mm

SEE PAGE 12 FOR MORE INFORMATION



HANGING DRAWERS

- Hanging drawers, 1 to 4 drawers
- For top in depth 750 mm or 1000 mm

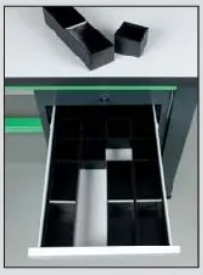
SEE PAGE 13 FOR MORE INFORMATION



LAYOUT OF DRAWERS

- 3 different types of compartments
- Suitable for drawers of leg-mounted cabinets or hanging drawers

SEE PAGE 13 FOR MORE INFORMATION



SINGLE LEGS

Model for top in 750mm depth

ref. PHG-75

Model for top in 1000mm depth

ref. PHG-100



Special angle model to join 2 tops at 90°. Consult us.

Leg mounted cabinet for benches (with lock)



There are two depths available for cabinets with swing doors and drawers: 750 and 1000mm
For this latter, the reference is followed by the extension 100.
Example: 30G-100

- The drawers are mounted on ball bearings so they slide easily and silently. They are removable so drawers can be switched around or sorted.
- The lock secures all the drawers at the same time. In standard, all keys are identical. Different keys can be available upon request.
- Drawers with a height of 300 mm are suitable for standard hanging folders.



ref. 30G-75
ref. 30G-100



ref. 31G-75
ref. 31G-100



ref. 40G-75
ref. 40G-100



ref. 41G-75
ref. 41G-100



ref. 42G-75
ref. 42G-100



ref. 43G-75
ref. 43G-100



ref. 50G-75
ref. 50G-100



ref. 51G-75
ref. 51G-100



ref. 52G-75
ref. 52G-100



ref. 53G-75
ref. 53G-100



ref. 60G-75
ref. 60G-100



ref. 61G-75
ref. 61G-100



ref. 70G-75
ref. 70G-100

Cabinet with lockable swing door. Can be opened from the left or the right (through reversal)

l = 450mm
H = 800mm
P = 665 or 890mm

2 shelves / 3 levels



ref. PTG-75
ref. PTG-100

Hanging drawers

HANGING DRAWERS (300 SERIES) WITH LOCK AND KEY

For top in depth 750 mm or 1000 mm -
Height: 400 mm - Width: 450 mm.
As standard, all keys are identical.
Different keys are available upon request.



3 drawers H100mm

ref. TIG-30



1 drawer H100mm
1 drawer H200mm

ref. TIG-32



1 drawer H300mm.
Drawers with a height of 300 mm are suitable for standard hanging folders.

ref. TIG-33



For top in depth 750 and 1000mm.
Height: 100mm / Width: 400mm.
With lock and key.

ref. TIG-10

HANGING DRAWERS (400 SERIES) WITH LOCK AND KEY

For top in depth 750 mm or 1000 mm -
Height: 490 mm - Width: 450 mm.
As standard, all keys are identical.
Different keys are available upon request.



4 drawers H100mm

ref. TIG-40



2 drawers H100mm
1 drawer H200mm

ref. TIG-41



2 drawers H200mm

ref. TIG-42



1 drawer H100mm
1 drawer H300mm
Drawers with a height of 300 mm are suitable for standard hanging folders.

ref. TIG-43

Layout of drawers in cabinet or hanging drawers

The drawers can be removed easily by lifting them out, so you can take parts to a construction site, sort the drawers without having to bend over, or simply reverse two drawers. The drawers are mounted on ball bearings.
They slide easily and silently.
You can place moulded drawer tidies in these drawers.
3 types of compartment are available:
- **Small : 75x75 H55mm**
- **Medium : 285x75 H55mm**

fitted with a removable divider
- **Large : 415x75 H55mm**

fitted with three removable dividers



REF. AMN-08

4 fixed & 16 modular spaces
4 small
4 large (4 to 16 compartments)



REF. AMN-16

12 fixed & 8 modular spaces
12 small
4 medium (4 to 8 compartiments)



REF. AMN-20

18 fixed & 4 modular spaces
18 small
2 medium (2 to 4 compartiments)



REF. AMN-24

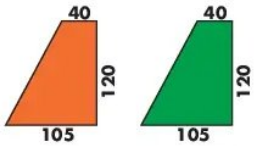
24 fixed spaces
24 small

Power consoles on the bench top

HARD-WEARING LAMP (without maintenance)

Power console with a PVC front panel. Available in a range of lengths 1120 – 1430 – 1730 – 1920 mm. 1920mm in standard. Please confirm the length at order.

Information : All power sockets are wired. (Power cable of the console not supplied)





Reference ●	Reference ●	Protection type
RAV-20	RAO-20	Thermal magnetic circuit breaker
RAV-20D	RAO-20D	30mA Residual current circuit breaker

- 6 power sockets 230V (2P+E)
- A circuit breaker (two possible choices)
- A hardwearing Ø30 LED lamp indicating that sockets are switched on



Reference ●	Reference ●	Protection type
PAV-20	PAO-20	Thermal magnetic circuit breaker
PAV-20D	PAO-20D	30mA Residual current circuit breaker

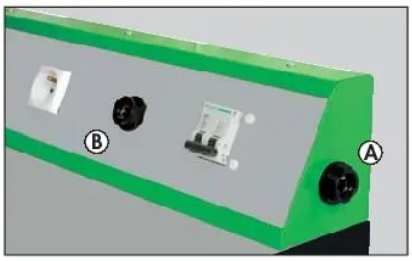
- 6 power sockets 230V (2P+E)
- A circuit breaker (two possible choices)
- A hardwearing Ø30 LED lamp indicating that sockets are switched on
- A key-operated emergency stop button which activates an undervoltage trigger, thereby ensuring positive safety



Reference ●	Reference ●	Protection type
MAV-20	MAO-20	Thermal magnetic circuit breaker
MAV-20D	MAO-20D	30mA Residual current circuit breaker

- 6 power sockets 230V (2P+E)
- A circuit breaker (two possible choices)
- A hardwearing Ø30 LED lamp indicating that sockets are switched on
- A key-operated emergency stop button which activates an undervoltage trigger, thereby ensuring positive safety
- An On/Off button (positive safety)

RJ45 wired plug



Combination of 2 RJ45 connectors connected together in the console.The side connector **A** is used to connect the network input, the front connector **B** is for the user's connection.

ref. CARJ45

MADE TO MEASURE



All these elements can be added to the power consoles.

SATELLITE PLUG



Réf. SE-SAT

«F» type, not wired.

TV PLUG



Réf. SE-TEL

Ø9,52mm male, not wired.

INVERTER PLUG



Réf. SE-UPS

Not wired.

RJ45 PLUG (NOT WIRED)



ref. SERJ45

230V PLUG (2P + E)



ref. PRISE+

Additional power socket.

DC POWER SUPPLY



ref. AD15I

Unit of 2 fixed DC power supplies
+15V/3.4A - 15V/3.4A

230V multi sockets unit



Can only be fixed with plastic screws
(plastic housing)

ref. LGS-8

Unit of 8 power sockets
230V (2P+E) - 3860W.
Dim: 495 x 85 x 55mm

ref. LGS-41

Unit of 4 power sockets
230V (2P+E) - 3860W.
Dim: 295 x 85 x 55mm

Short power console 500mm



Reference ● VXV-1
Reference ● VXO-1
Thermal magnetic circuit breaker

Reference ● VXV-2
Reference ● VXO-2
30mA residual current circuit breaker

- 4 power sockets 230V
- 1 circuit breaker
- Power gland (in standby)
- Sockets are wired but the power cable is not supplied.
  Recommendation: use a supple power cable in 3 strands of 2.5mm²

Computer items for workbenches



Make your own computer workbench by choosing additional items in this page.
Computer hardware not supplied.



SLIDING KEYBOARD/MOUSE SHELF UNDER THE BENCH-TOP



ref. IFG-TAB

The sliding shelf can be locked in the extended position.
Dim: 620 x 320mm. Stratified top. Supplied pre-assembled.

SUPPORT KEYBOARD/MOUSE



Instantly clings to the side of our CPU holders references IFG and IFG-ECO-MINI.
Installation without tools or screws.

ref. IFG-CLA

SHELF



Short shelf fixed on the bench-top
Width: 500mm,
Height & depth: 400 mm
The bench top positioning can be selected during the assembly.

ref. IFG-ETG

CPU TOWER HOLDER



Holder is screwed under the bench. Users have easy access to cable connections and drives. Sturdy and economical, this device ensures that the CPU tower is stored tidily and protected against theft.

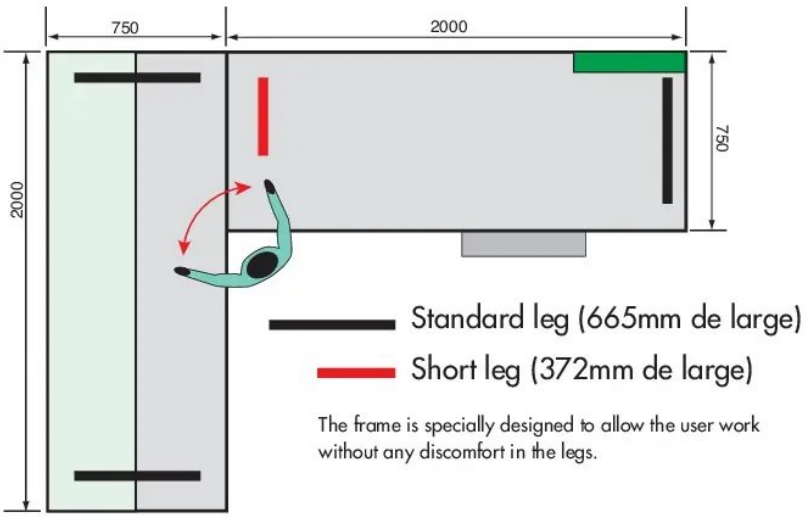
- 45 x 45mm wire mesh
- 50mm front locking bar
- Attached with lag screws (supplied)
- EPOXY paintwork. Steel sheet base plate.



Ref.	Total height interior	Width interior	Depth interior
IFG-ECO	500mm	245mm	500mm
IFG-MINI	400mm	195mm	400mm

Workstation for practical work





The frame is specially designed to allow the user work without any discomfort in the legs.

This bench is a comfortable and spacious unit for tutorials which require the use of computers and measuring equipment.
With a side shelf, a mini-console and special equipment to accomodate all the computer elements.
The TXL40 is very convenient to use.

Reference ●	ref. TXV-40
Reference ●	ref. TXO-40

Computer hardware not supplied

COMPONENTS AND FEATURES OF THE STATION

- Two 40mm high-temperature stratified tops with PVC edges
- 1 "cage"-type CPU tower holder with anti-theft bar at the front.
- 1 sliding keyboard/mouse holder
- 1 base with furnace-baked epoxy paint, vertical support leg and footrest bar. **Base suitable for rotation.**
- 1 mini-console fitted with 4 power sockets 230V + circuit breaker + LED lamp
- 1 shelf fitted with 4 power sockets 230V + circuit breaker at the back + LED lamp
- Height of the working surface: 840mm (top included)
- A very large work surface

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs







Work tables, seated standing





Grey melamine worktop 19mm thick, depth 670mm.
Bench height: Adjustable. Maximum height 1050mm (worktop included).
Separate adjustment of each worktop (double sided).
Matt anodized aluminium stand.
Lasting protection against corrosion.
Load 200kg distributed on the surface.

SINGLE VERSION

Dimensions (mm)	Ref.
1000 x 670	**TLG1-1000**
1400 x 670	**TLG1-1400**
1800 x 670	**TLG1-1800**
2000 x 670	**TLG1-2000**

TWO-SIDED VERSION

Dimensions (mm)	Ref.
1000 x 1380	**TLG2-1000**
1400 x 1380	**TLG2-1400**
1800 x 1380	**TLG2-1800**
2000 x 1380	**TLG2-2000**

Work tables



PLAIN ALUMINIUM VERSION

Dimensions (mm)	Réf.
1000 x 670	**TTG-1067**
1400 x 670	**TTG-1467**
1800 x 670	**TTG-1867**
2000 x 670	**TTG-2067**

Great stability, no side movement thanks to horizontal aluminium profiles with cross-section 80 x 40 mm (40 x 40 mm for TT*-1067) and four feet 40 x 40 mm with plastic pads. Supplied with assembly instructions.
Very simple and quick to assembly by one person.

- Grey melamine worktop 19mm thick.
- Bench height 760mm (worktop included).
- Matt anodized aluminium stand.
- Lasting protection against corrosion.
- Load 300kg distributed on the surface. (200kg for TTG-1067)

PAINTED ALUMINIUM VERSION:

ANTHRACITE + GREEN OR ORANGE

Dimensions (mm)	Ref. Green	Ref. Orange
1000 x 670	**TTV-1067**	**TTO-1067**
1400 x 670	**TTV-1467**	**TTO-1467**
1800 x 670	**TTV-1867**	**TTO-1867**
2000 x 670	**TTV-2067**	**TTO-2067**



Units identical to models TLG1 and TLG2 but with top shelf:
Shelf of grey melamine 19mm, depth 400mm.

VERSION WITH SHELF

Version	Dimensions (mm)	Ref.
Simple	1000 x 810	**TLG3-1000**
Simple	1400 x 810	**TLG3-1400**
Simple	1800 x 810	**TLG3-1800**
Simple	2000 x 810	**TLG3-2000**
Double	1000 x 1380	**TLG4-1000**
Double	1400 x 1380	**TLG4-1400**
Double	1800 x 1380	**TLG4-1800**
Double	2000 x 1380	**TLG4-2000**

Isolated work tables



Innovative composite material stand (70% wood fibre).
It is neutral to magnetic fields and electrically insulating.
High-temperature laminated top, 22mm thick.
Overall height (top included): 742mm.
Colour: 2 shades of grey.
Max load: 200kg.

Dimensions (mm)	Ref.
1500 x 750	**TLG-1500**
1800 x 750	**TLG-1800**
2000 x 750	**TLG-2000**

Tool-holder workstations

Laminated top 22mm thick.
Top position adjustable.
Max height 920mm (top included)
Independent adjustment of each top in the two-sided versions.
Max load 200kg uniformly distributed.
Matt anodized aluminium stand and structure. Lasting protection against scratching and corrosion.

Tool-holder frame equipped with:
- 20 plastic hooks for screwdrivers
- 2 tool-holder hooks
- 1 tool-holder support 240 x 80mm
- 1 magnetic support
- 1 universal support Ø80mm
- 1 document holder (A4 size) 8 double-sided places
- 1 strip with 5 2P+E outlets and switch





SINGLE VERSION

Width / Depth / Height	Ref.
1200 x 910 x 2000mm	**PTE1-1200**
1500 x 910 x 2000mm	**PTE1-1500**
2000 x 910 x 2000mm	**PTE1-1800**

TWO-SIDED VERSION

Width / Depth / Height	Ref.
1200 x 1660 x 2000mm	**PTE2-1200**
1500 x 1660 x 2000mm	**PTE2-1500**
2000 x 1660 x 2000mm	**PTE2-1800**

Technical trolleys

SINGLE TROLLEY 3 LEVELS



- Frame made of matt aluminium sections on casters, two with brakes.
- Three shelves of grey melamine 19mm, depth 400mm.
  Height of each shelf is adjustable. Max. load per shelf 60kg.
- Height 1550mm
- Depth 500mm
- Width according to version: 600 / 850 / 1100 mm.

Width	600mm	850mm	1100mm
Ref.	DEST1	DEST2	DEST3

DOUBLE TROLLEY 3 LEVELS



- Frame made of matt aluminium sections on casters, two with brakes.
- Six shelves of grey melamine 19mm, depth 400mm.
  Height of each shelf is adjustable. Max. load per shelf 60kg.
- Height 1550mm
- Depth 900mm
- Width according to version: 600 / 850 / 1100 mm.

Width	600mm	850mm	1100mm
Ref.	DEST11	DEST22	DEST33

COMPUTER TROLLEYS

Computer trolley with casters equipped with three shelves of grey melamine 19mm and one screen support arm. All the parts are height adjustable.

- Frame made of matt aluminium sections.
- 1 shelf of grey melamine 750 x 400 mm.
- 2 shelves of grey melamine 500 x 400 mm.
- 1 microprocessor unit support.
- 1 flat screen articulated arm.
- Frame dimensions (without arm):
  H1150 – W750 – D500 mm

ref. DES-INF2

Computer hardware not supplied



Computer trolley with casters equipped with three shelves of grey melamine 19mm and one magnetic plate for easy attachment of your work documents. All the parts are height adjustable.

- Frame made of matt aluminium sections.
- 1 shelf of grey melamine 750 x 400 mm.
- 2 shelves of grey melamine 500 x 400 mm.
- 1 magnetic plate.
- 1 support for flat screen.
- 1 microprocessor unit support.
- Dimensions hors tout :
  H1840mm - L750mm - P500mm

ref. DES-INF1

Computer hardware not supplied



ADJUSTABLE TROLLEY



- Frame made of matt aluminium sections on casters, two with brakes.
- One shelf of grey melamine 19mm, depth 400mm.
  Height of each shelf is adjustable. Max. load per shelf 60kg.
- Adjustable height from 850 to 1220mm.
- Depth 510mm.
- Width according to version: 600 / 850 / 1100 mm.

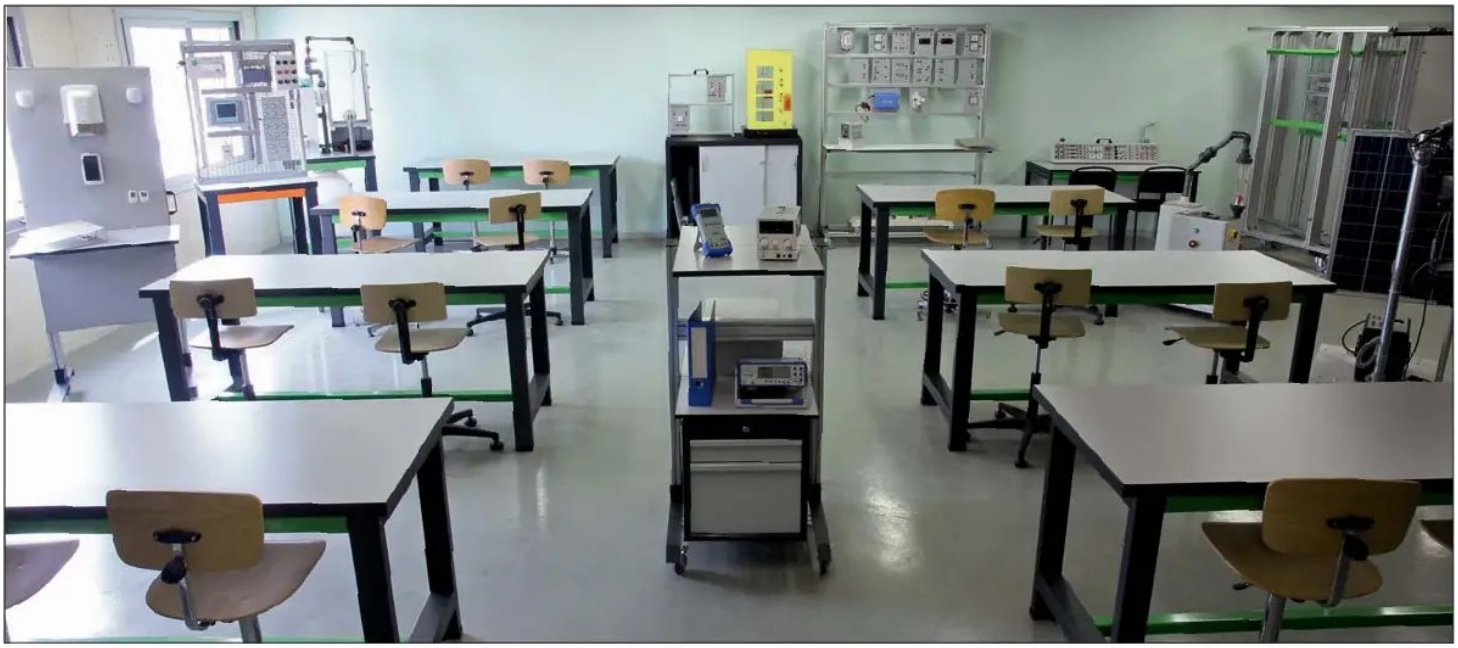
Width	600mm	850mm	1100mm
Ref.	**DESTR1**	**DESTR2**	**DESTR3**

TROLLEY WITH CABINET



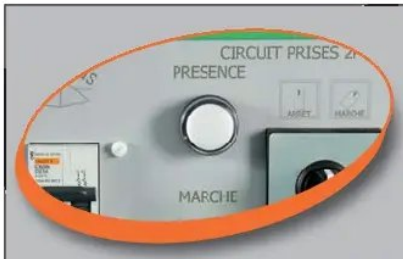
- Frame made of matt aluminium sections on casters, two with brakes.
- Four shelves of grey melamine 19mm, depth 400mm.
  Height of each shelf is adjustable. Max. load per shelf 60kg.
- 1 cabinet. Dimensions 490 x 450 x 550mm.
- 2 handles for easy mobility.
- Dimensions: 1200 x 670 x 900mm.

Width	4 x 100mm	2 x 200mm	100mm + 300mm
Ref.	**DEST44**	**DEST42**	**DEST40**

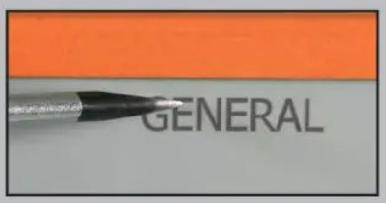




Electrotechnical workstations our quality commitment

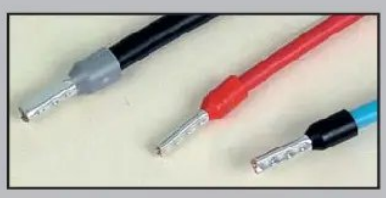


Engraving on the front in the part
Potential for symbols, icons, logos or personalisations engraved on the front. The engraving in the part is impervious to abrasion and cannot be removed.





Crimped cable conduit sleeves for optimal contact
The crimped sleeves limit risk of fire or electrocution during maintenance.





Resistant LED indicator lights
Cannot be removed by the student (no ability to unscrew the front cap)
No risk of accidental contact for the maintenance operator

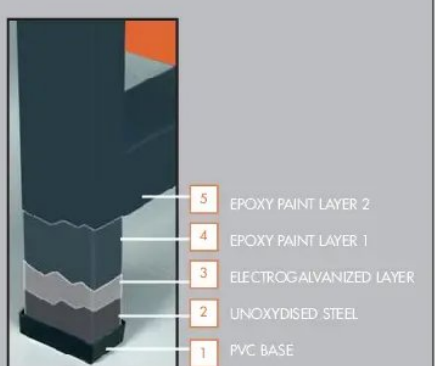




Control console free of metal components
All our components are free of accessible metal pieces (except for the ground). The PVC front face is entirely free of metal elements, even of screws, which provides a high degree of safety against indirect contact.



Epoxy paint & electrogalvanized steel
All of our leg assemblies are manufactured from electrogalvanised steel sheet, and makes the sheet extremely resistant to corrosion. This protection is strengthened further by two layers of furnace-baked epoxy paint, which means that it is suitable for use even in tropical settings.



Standards multi purpose workstations

hard-wearing led indicator light



ref. SYV-3



ref. SYO-1

It is a single, fully-equipped electric-powered station which complies with current standards and is ready to be connected to the electric network. The start-up systems and connection terminals are installed on an electrotechnical console. There are many standard configurations, and these can be modified easily on simple application. All workbenches have a key-operated "EMERGENCY STOP" button for autonomous positive safety and an On/Off push-button with a lamp and "memory" function.

LOCKABLE COVER FOR CIRCUIT BREAKERS
Circuit breakers are placed behind a lockable transparent cover
Restricted access
IP2X protection



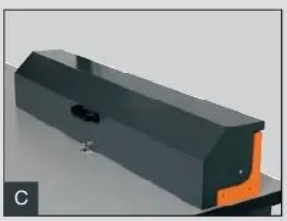
Ref. ●	Ref. ●	Thermal magnetic circuit breaker (D type) ■	3-phase mains on 4 safety terminals ■	4 power sockets 230V 2P+E ■	3-phase 0-430V 3.5kVA variable ■	Fixed 240VDC/2A insulated ■	Fixed 24VAC/5A with circuit breaker ■	Stratified bench-top 2000x750	Stratified bench-top 2000x1000	Technical leg
SYO-1	SYV-1	x	x	x	x	x	x	x		x
SYO-2	SYV-2	x	x	x	x	x	x		x	x
SYO-3	SYV-3	x	x	x		x	x	x		
SYO-4	SYV-4	x	x	x		x	x		x	
SYO-5	SYV-5	x	x	x			x	x		
SYO-6	SYV-6	x	x	x			x		x	
SYO-7	SYV-7	x	x	x				x		
SYO-8	SYV-8	x	x	x					x	

■ **HARD-WEARING LAMP WITHOUT MAINTENANCE**

ANTI-VANDALISM COVER WITH KEY







This pull-down cover in front of the electrical equipment in the console prevents students from scribbling on or vandalising the front and its equipment. Standard dimensions: 1200mm.
Other dimensions upon request.



System of lock with hook taken in the plate.
Compatibility with a shelf, contact us.

ref. VSG-12

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs



Configure your own power console

Select first the bare power console, then select the obligatory main module (see opposite) and finally select the electrical modules and options.
Dimensions available: 1200 - 1500 - 1800 - 2000mm.

Ref. ● PUV-32

Ref. ● PUO-32



3-PHASE MODULE ON TERMINALS



3-phase supply module 11kW – fixed 3x400V+N
On-Off key control

ref. SE5TR

3-PHASE MODULE ON SOCKET



3-phase supply module on hypra socket 16A 3P+N+T.
On-Off key control

ref. SE5PCTR

3-PHASE HYPRA SOCKET MODULE



Mounted in parallel on 3-phase supply with output terminals or socket (only available with option SE5TR & SE5PCTR)

ref. HP4

DC MODULE -15VDC +15VDC 3A



DC fixed supply with 2 outputs
+15V/3.4A -15V/3.4A

ref. AD15I

3-PHASE MODULE 0-430V



3-phase 0-430 VAC variable – 3.5kVA
Module with technical leg.
On-Off key control.

ref. SE6VA

AC SUPPLY MODULE 24V / 5A



Module 24V/5A insulated from mains

ref. SE3BT

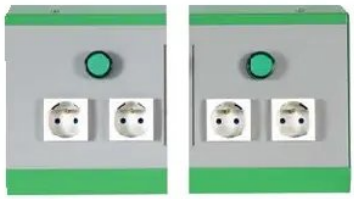
DC VARIABLE SUPPLY



DC power supply with adjustable voltage
0-30V DC/3A

ref. R3030I

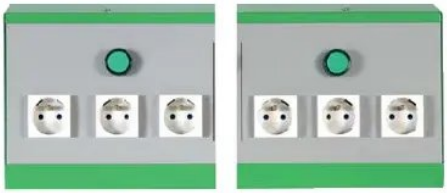
MAINS SOCKETS MODULE (2 X 2)



ref. SE4PC

Module with 2 x 2 power sockets 230V + lamp.

MAINS SOCKETS MODULE (2 X 3)



ref. SE6PC

Module with 2 x 3 power sockets 230V + lamp.

MEASURED POWER SOCKET MODULE



Output on power socket 2P+E with wattmeter direct display of consumed power.
Measuring apparatus: 10000 pts
Maximum power: 3500W
Protection by circuit breaker on the front panel

ref. SEPCW

INVERTER SOCKET



Not wired.
For U.P.S.

Réf. SE-UPS



OBLIGATORY MAIN MODULES

Choose one of these main modules with or without on/off key control.

SE1MA without on/off key control

ref. SE1MA
for 3-phase mains supply

ref. SE1MA-MONO
for single-phase mains supply

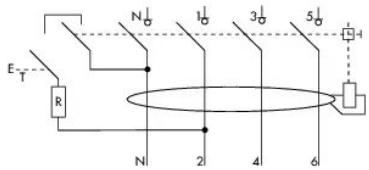
SEMC with on/off key control

ref. SEMC
for 3-phase mains supply

ref. SEMC-MONO
for single-phase mains supply



RESIDUAL CURRENT CIRCUIT BREAKER



ref. DIF30-4S A type (3-phase workstation)

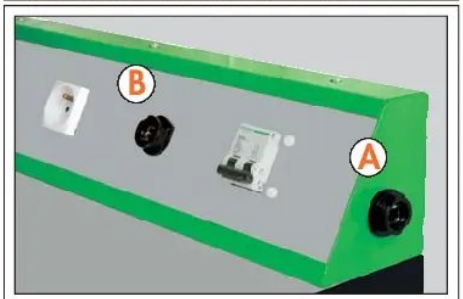
ref. DIF30-2C A type (single-phase workstation)

ref. DIF30-2SAC AC type (3-phase workstation)

ref. DIF30-4SAC AC type (single-phase workstation)

30mA protection at the front. Useful only if the room is not equipped with this device.

WIRED SOCKET RJ45 MODULE



ref. CARJ45

Combination of 2 RJ45 connectors connected together in the console.The side connector **A** is used to connect the network input, the front connector **B** is for the user's connection.

RJ45 SOCKET MODULE



ref. SERJ45

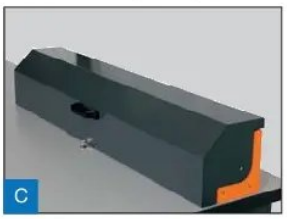
RJ45 socket installed but not connected.

ANTI-VANDALISM COVER WITH KEY

This pull-down cover in front of the electrical equipment in the console prevents students from scribbling on or vandalising the front and its equipment. Standard dimensions:1200mm. **Other dimensions upon request.**







ref. VSG-12
(1200mm)

ref. VSG-20
(2000mm)





System of lock with hook taken in the plate. Compatibility with a shelf, contact us.

360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green Ø60mm

ref. VOY181



Beacon with 2 light indicators: red and green Ø60mm

ref. VOY121



Beacon with a red light indicator (voltage presence) Ø60mm

ref. VOY61

COLOURS AVAILABLE UPON REQUEST

white - orange - red - green - blue

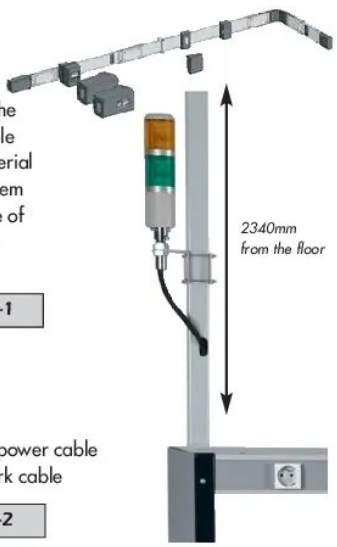


HARD-WEARING LED LAMPS

VERTICAL CABLE RACEWAY

For the wiring of the power cable from the aerial wiring system to the base of the power supply

ref. DEG-1



Model for power cable and network cable

ref. DEG-2

Stand alone DC & AC power supply

hard-wearing led indicator light





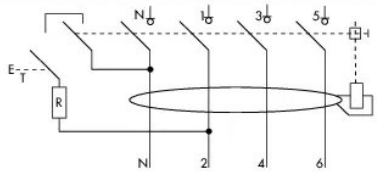
LOCKABLE COVER FOR CIRCUIT BREAKERS ON THE REAR DOOR
Circuit breakers are placed behind a lockable transparent cover. Restricted access IP2X protection.



Ref	AXG-40	AXG-20	AXG-10
Rating	4000VA	2000VA	1000VA
■ ■ DC SUPPLY 0-270V	16A	8A	7A
■ 3-PHASE variable	0-450V/8A	0-430V/5A	0-430V/5A
■ ■ AUXILIARY 0-250VDC	2.5A	2.5A	2.5A
■ AUXILIARY 0-250VAC	2.5A	2.5A	2.5A
■ 3-PHASE MAINS	4 terminals 3x400VAC	4 terminals 3x400VAC	4 terminals 3x400VAC
■ 4 SOCKETS MAINS	230V 2P+E	230V 2P+E	230V 2P+E

■ **with hard-wearing lamp without maintenance** ■ **insulated from mains**

OPTION RESIDUAL CURRENT CIRCUIT BREAKER



30mA protection at the front. Useful only if the room is not equipped with this device.

ref. DIF30-4L A Type

ref. DIF30-4LAC AC Type

This new technical leg design offers you the option to create a new station or to renovate existing tables. Thanks to its compactness it can act both as a table leg and as an item next to a table. This AXG** (* represents power) product is completely autonomous. With a simple three-phase mains input + neutral + earth, it can provide all the power supply combinations provided in the table below. Supplied assembled and ready to be connected to 3-phase 400V from mains.
Height of attachment under bench-top: 720 to 830mm
Length: 665mm
Total height: 1050mm (including console).
Maximum width: 250mm

1 MAIN DC SUPPLY

0 - 270V variable and insulated from the mains by insulated transformer as specified by safety standards for the use of direct currents. The whole unit is protected against overloads and short circuits. Rectification is provided by a generously over-specified Graetz bridge (ripple rate 4%). Voltmeter and ammeter displays.
A magneto-thermal circuit breaker protects this output. A contactor with a control button gives start/stop functions command, on condition that this the autotransformer output is at 0V. An indicator light shows that the unit is powered up.

2 VARIABLE 3-PHASE SUPPLY

Variable by autotransformer and protected against overloading and short circuits. The voltage range on offer is 0-430V between phases (450V for the 4000VA model). A thermal magnetic circuit breaker protects this output. A push button contact performs start/stop switching as long as the autotransformer is at 0 voltage. An indicator light shows that the unit is powered up

Main supplies 1 & 2 can't work simultaneously

3 DC AUXILIARY SUPPLY

0-250V variable by single phase autotransformer protected against overloading and short circuits. Voltmeter and ammeter displays. An On/Off button control. An indicator light shows that the unit is powered up.

4 SINGLE-PHASE AUXILIARY SUPPLY

0-250V variable by single phase autotransformer protected against overloading and short circuits. Voltmeter and ammeter displays. An On/Off button control.

Auxillary supplies 3 & 4 can't work simultaneously

5 3-PHASE SUPPLY (3X400VAC FIXED)

On four terminals, protected, with switch and On/Off button control.
An indicator light shows that the unit is powered up

6 4 POWER SOCKETS 230V (2P + E)

230V sockets (2 on either side), protected, with indicator loghts.

7 EMERGENCY STOP BUTTON

Key controlled in the centre of the console (can be mounted in alternative positions on request). It cuts out a single bank without affecting the others. Positive security stop.

8 PUSH BUTTON

Start/Stop with indicator providing start-up with "memory" function.
An indicator light shows that the unit is powered up

Complete resistive load unit



This new design enables you to create a new station or to renovate existing benches. Thanks to its compactness it can act both as a table leg and as an item next to a table. This ARG** (**represents power) reference product requires no power supply. Thanks to its smart design, this charging unit does not require forced ventilation. It contains resistors on ceramic tubes (protected from oxidation by a coating).
The 6 switches (snap switches) vary the charge in steps of 5%. These controls are placed on the console with inputs terminals and coupling jumpers (for a use in 240VAC single phase and 240VDC, 3-phase 240VAC or 3-phase 400VAC).
Available option: charge in steps of 2.5% in the 4kW version.

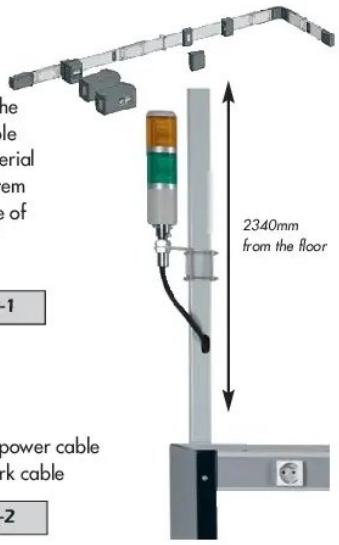
Height of attachment under bench-top: adjustable from 720 to 830mm
Length: 665mm
Total height: 1050mm (including console).
Maximum width: 250mm

Ref	ARG-40	ARG-20	ARG-10
Rating	4000VA	2000VA	500VA

VERTICAL CABLE RACEWAY

For the wiring of the power cable from the aerial wiring system to the base of the power supply

ref. DEG-1



Model for power cable and network cable

ref. DEG-2

EXAMPLE OF USE WITH YOUR OWN TABLE



ref. AXG

Place your complete power supply unit to the right or left of your existing workbench. Bench-top attachment kit supplied.

EXAMPLES OF COMPLETE WORKSTATION



ref. ARG

ref. AXG

Side rails top and H leg available as options
(see P10)



Side rails top and H leg available as options
(see P10)

ref. AXG

360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green Ø60mm

ref. VOY181



Beacon with 2 light indicators: red and green Ø60mm

ref. VOY121



Beacon with a red light indicator (voltage presence) Ø60mm

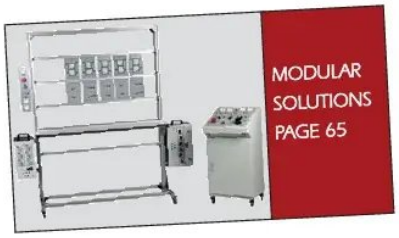
ref. VOY61

COLOURS AVAILABLE UPON REQUEST
white - orange - red - green - blue

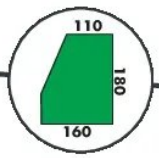


HARD-WEARING LED LAMPS

Electrotechnical benches











*Model without load type BZO**-D*

Range of stand-alone, complete and reliable bench. This equipment complies with laboratory international safety standards. It is made up of 1 or 2 electrical cabinets locked by key, connected by a foot rest. The top of dimensions 2000 x 750 mm in standard is stratified. All outputs are equipped with safety terminals 4mm (Supplies & Loads).

LOCKABLE COVER FOR CIRCUIT BREAKERS
Circuit breakers are placed behind a lockable transparent cover
Restricted access IP2X protection

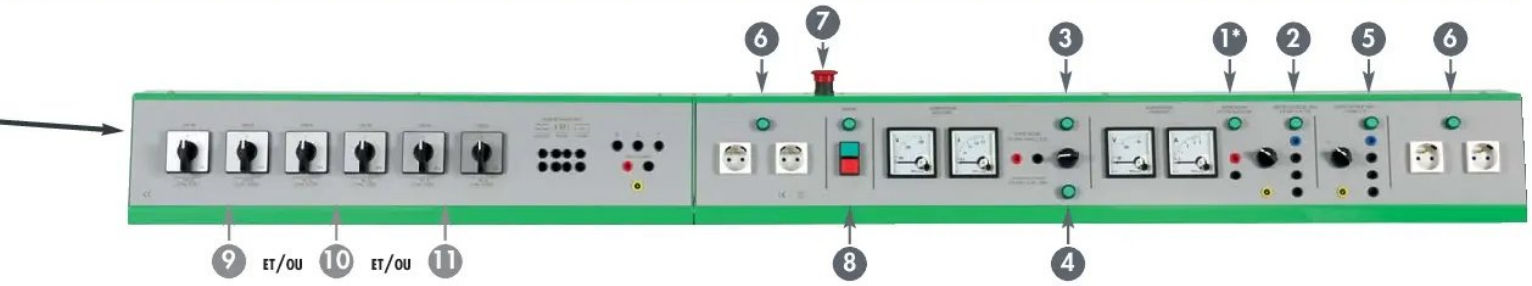


4000VA		ELECTROTECHNICAL BENCHES OF 4KVA RATING								
Ref. ●	Ref. ●	DC SUPPLY 0-270V 16A ■ ■	3-PHASE 0-450V 8A ■	AUXILIARY 0-250VDC 2,5A ■ ■	AUXILIARY 0-250VAC 2,5A ■	3-PHASE 3x400VAC 4 TERMINALS ■	4 POWER SOCKETS 230V 2P + E ■	RESISTIVE LOAD 4000W ■	INDUCTIVE LOAD 4000VAR ■	CAPACITIVE LOAD 4000VAR ■
BZO-40A	BZV-40A	x	x	x	x	x	x	x	x	x
BZO-40B	BZV-40B	x	x	x	x	x	x	x	x	
BZO-40C	BZV-40C	x	x	x	x	x	x	x		
BZO-40D	BZV-40D	x	x	x	x	x	x			
BXO-40A	BXV-40A		x	x	x	x	x	x	x	x
BXO-40B	BXV-40B		x	x	x	x	x	x	x	
BXO-40C	BXV-40C		x	x	x	x	x	x		
BXO-40D	BXV-40D		x	x	x	x	x			

2000VA		ELECTROTECHNICAL BENCHES OF 2KVA RATING								
Ref. ●	Ref. ●	DC SUPPLY 0-270V 8A ■ ■	3-PHASE 0-430V 5A ■	AUXILIARY 0-250VDC 2,5A ■ ■	AUXILIARY 0-250VAC 2,5A ■	3-PHASE 3x400VAC 4 BORNES ■	4 POWER SOCKETS 230V 2P + E ■	RESISTIVE LOAD 2000W ■	INDUCTIVE LOAD 2000VAR ■	CAPACITIVE LOAD 2000VAR ■
BZO-20A	BZV-20A	x	x	x	x	x	x	x	x	x
BZO-20B	BZV-20B	x	x	x	x	x	x	x	x	
BZO-20C	BZV-20C	x	x	x	x	x	x	x		
BZO-20D	BZV-20D	x	x	x	x	x	x			
BXO-20A	BXV-20A		x	x	x	x	x	x	x	x
BXO-20B	BXV-20B		x	x	x	x	x	x	x	
BXO-20C	BXV-20C		x	x	x	x	x	x		
BXO-20D	BXV-20D		x	x	x	x	x			

■ HARD-WEARING LAMP WITHOUT MAINTENANCE ■ INSULATED OUTPUT ■ LOADS INSIDE THE LEFT-HAND CABINET

hard-wearing led indicator light



1* MAIN DC SUPPLY*

0-270V variable and insulated from the mains by insulated transformer as specified by safety standards for the use of direct currents. The whole unit is protected against overloads and short circuits. Rectification is provided by a generously over-specified Graetz bridge (ripple rate 4%). Voltmeter and ammeter displays. A magneto-thermal circuit breaker protects this output. A contactor with a control button gives start/stop functions command, on condition that this the autotransformer output is at 0V. An indicator light shows that the unit is powered up. ** except BXo & BXV*

2 VARIABLE 3-PHASE SUPPLY

Variable by autotransformer and protected against overloading and short circuits. The voltage range on offer is 0-430V between phases (450V for the 4000VA model). A thermal magnetic circuit breaker protects this output. A push button contact performs start/stop switching as long as the autotransformer is at 0 voltage. An indicator light shows that the unit is powered up

Main supplies 1 and 2 can't work simultaneously

3 DC AUXILIARY SUPPLY

0-250V variable by single phase autotransformer protected against overloading and short circuits. Voltmeter and ammeter displays. An On/Off button control. An indicator light shows that the unit is powered up. Double alternating rectification, the ripple factor varies with the loads.

4 SINGLE-PHASE AUXILIARY SUPPLY

0-250V variable by single phase autotransformer protected against overloading and short circuits. Voltmeter and ammeter displays. An On/Off button control.

Main supplies 3 and 4 can't work simultaneously

5 3-PHASE SUPPLY (3X400VAC FIXED)

On four terminals, protected, with switch and On/Off button control.
An indicator light shows that the unit is powered up

6 4 POWER SOCKETS 230V (2P + E)

230V sockets (2 on either side), protected, with indicator ligts.

7 EMERGENCY STOP BUTTON

Key controlled in the centre of the console (can be mounted in alternative positions on request). It cuts out a single bank without affecting the others. Positive security stop.

8 PUSH BUTTON

Start/Stop with indicator providing start-up with "memory" function.
An indicator light shows that the unit is powered up

9 RESISTIVE LOAD

Consisting of a resistive wire wound on ceramic cores (protected against oxydation). The 6 switches (rapid breaking type for inductive loads) can be varied in 5% steps.
The switches are placed on the bank next to the input connectors and selector links for single-phase and DC 240V, 3-phase 240VAC or 3-phase 400VAC.

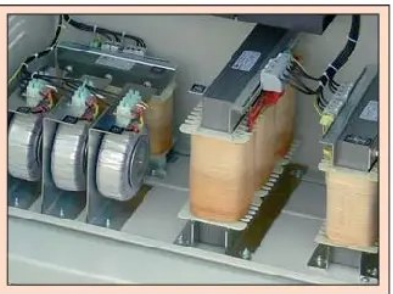
10 CAPACITIVE LOAD

Consisting of capacitors which can operate at 450VAC. The switches, selector links and input connectors are on the bank and easy to access. The load can be varied in 5% steps. It may be used in single-phase on DC 240V, 3-phase 240VAC or 3-phase 400VAC. **(A, B and C versions only)**

11 INDUCTIVE LOAD

3 moveable cores moved by a control wheel and a endless screw, altering the inductance of the 3 windings allows regulation of power factor from 0.9 to 0.1 in single- or 3-phase. The links and input connectors are mounted on the console and easily accessable. It may be used in single-phase DC 240V, 3-phase 240V or 3-phase 400V. The coils are all protected by fuses **(A and B versions only).**

FOR YOUR SAFETY THE DC OUTPUTS ARE SEPARATED FROM THE MAINS BY SAFETY ISOLATING TRANSFORMER



CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs



Options for electrotechnical benches

BENCH TOP IN 1000mm DEPTH

Dimensions 2000 x 1000 mm
Usable space 2000 x 850 mm

ref. AUG1000-ST

SHELF

Lowered shelf (400mm high)
Depth: 400mm

ref. TBG-200



DC SUPPLY



Unit of 2 fixed DC power supplies
+15V/3.4A -15V/3.4A

ref. AD15I

3-PHASE 24VAC SUPPLY



3-phase insulated from the mains, 3 x 24 VAC/250VA and protected by a circuit breaker. Output controlled by On/Off contactor and indicated by a LAMP.

ref. TRI24

DC VARIABLE SUPPLY



DC power supply with adjustable voltage
0-30V DC/3A

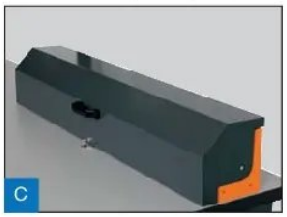
ref. R3030I

ANTI-VANDALISM COVER WITH KEY

This pull-down cover in front of the electrical equipment in the console prevents students from scribbling on or vandalising the front and its equipment. Standard dimensions:1200mm. **Other dimensions upon request.**







ref. VSG-12 (1200mm)

ref. VSG-20 (2000mm)





System of lock with hook taken in the plate. Compatibility with a shelf, contact us.

360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green Ø60mm

ref. VOY181



Beacon with 2 light indicators: red and green Ø60mm

ref. VOY121



Beacon with a red light indicator (voltage presence) Ø60mm

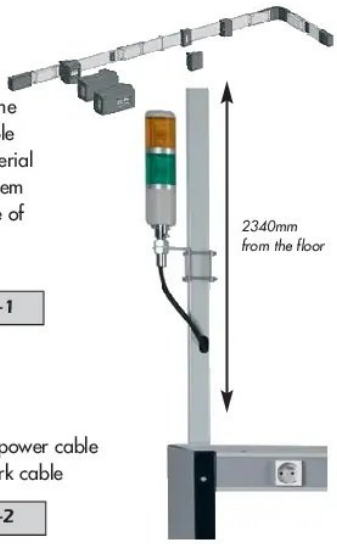
ref. VOY61

COLOURS AVAILABLE UPON REQUEST
white - orange - red - green - blue



HARD-WEARING LED LAMPS

VERTICAL CABLE RACEWAY



For the wiring of the power cable from the aerial wiring system to the base of the power supply

ref. DEG-1

Model for power cable and network cable

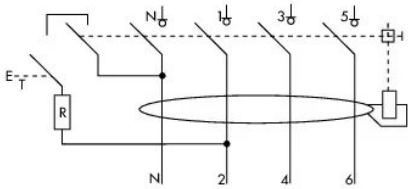
ref. DEG-2

OPTION RESIDUAL CURRENT CIRCUIT BREAKER

30mA protection at the front. Useful only if the room is not equipped with this device.

ref. DIF30-4L A Type

ref. DIF30-4LAC AC Type



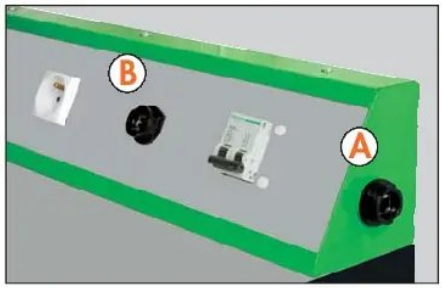
CANALIS CONNECTOR

Connector for descent of KNA Canalis, with space for modular protections. (Protections and cable not supplied).

ref. KNB25CF5



RJ45 WIRED PLUG



ref. CARJ45

Combination of 2 RJ45 connectors connected together in the console.The side connector **A** is used to connect the network input, the front connector **B** is for the user's connection.

RJ45 PLUG (NOT WIRED)



ref. SERJ45

RJ45 socket installed but not connected.

INVERTER SOCKET



Not wired.
For U.P.S.

Réf. SE-UPS

3-PHASE HYPRA SOCKET (400VAC)



Fitted in parallel on the three-phase mains output terminals

ref. HP4

OVERSPEED MONITORING

Overspeed monitoring option for DC motors. This system, which can be overridden, enables the operator to monitor the minimum auxiliary power supply current in the event of cutting off the main DC power supply.

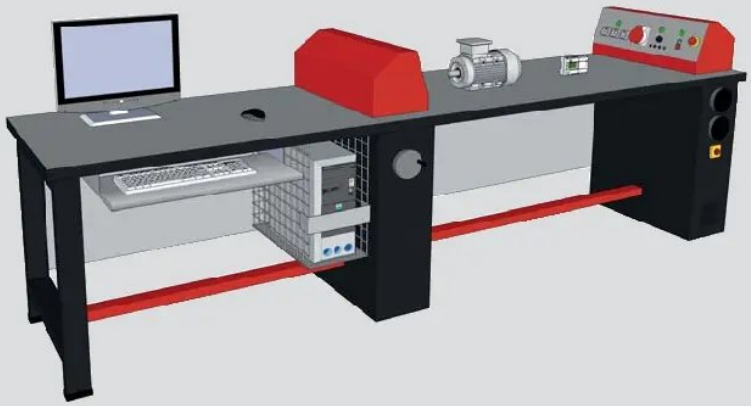
1500 t/min

ref. CTRL-E

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs







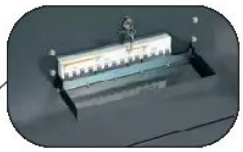
Tailor-made autonomous electro-technical workstations

These tailor-made solutions allow you to create specific workstations and remain within market standards. **Enjoy the unlimited manufacturing flexibility of our workshops to create your ideal workstations!**

First, select the base mechanical solution from 8 possible choices:
- choice of 2 top depths (fixed width).
- choice of 2 colour combinations.
- choice of 2 console sizes.

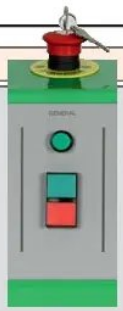
A 1200mm console is better for computer installation.





All circuit breakers are placed behind a lockable transparent cover. Restricted access IP2X protection.

MANDATORY MAIN MODULE



This module provides for the positive safety of all the additional modules.
It consists of:
- start/stop button.
- emergency stop button with key.
- main switch (positioned on the front of the technical leg)

This module provides overall protection and switching up to 11kW.

ref. BCMA

VARIABLE THREE-PHASE MODULE

The variable autotransformer accessible on the front of the technical leg means this variable three-phase module is available with a choice of 2 powers.
Signalling of the 'on' position by LEDs with protection and control separated from the other sources.
Starting only possible with zero voltage.



A voltmeter displays one of the single voltages, an ammeter displays the current in a phase.
This module is compatible with the DC module BCDC2 or 4 but the two sources do not operate at the same time.

ref. BC37VA for one output 0-430V / 5A (3,7kW)

ref. BC62VA for one output 0-450V / 8A (6,2 kW)

VARIABLE DC POWER MODULE

The variable autotransformer accessible on the front of the technical leg means this variable three-phase module is available with a choice of 2 powers.
Signalling of the 'on' position by LEDs with protection and control separated from the other sources.
Starting only possible with zero voltage.
Output insulated from the mains, in compliance with the standards, with transformer NFC 61558.
A voltmeter and an ammeter display the electrical values.

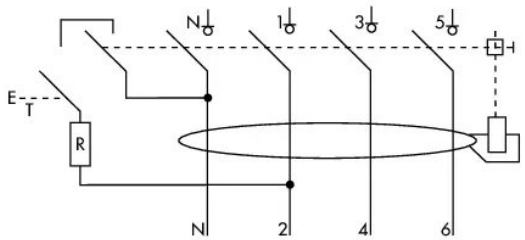


This module requires the presence of the variable three-phase module.
The two sources do not operate at the same time.

ref. BCDC2 for one output 0-270V / 8A (2kW)

ref. BCDC4 for one output 0-270V / 16A (4 kW)

OPTION RESIDUAL CURRENT CIRCUIT BREAKER



30mA protection at the front. Useful only if the room is not equipped with this device.

ref. DIF30-4L A Type

ref. DIF30-4LAC AC Type

MAINS SOCKETS MODULE (2 X 2)



ref. BC4PC

FIX THREE-PHASE MODULE ON TERMINALS

Mains distribution with protection and control separated from the other sources.
Signalling of the 'on' position by LEDs.

ref. BC5TR



Reference ●		BCO-7512		BCO-1012		BCO-7520		BCO-1020
Reference ●	BCV-7512		BCV-1012		BCV-7520		BCV-1020	
Top 2000 x 750mm	X	X			X	X		
Top 2000 x 1000mm			X	X			X	X
Grey & Green	X		X		X		X	
Grey & orange		X		X		X		X
1200mm Console	X	X	X	X				
2000mm Console					X	X	X	X

AUXILIARY SOURCES MODULE 2.5A



0-250VAC or VDC variable by single-phase autotransformer, with isolating transformer, to standard NFC 61558 for DC insulation.
The assembly is protected against overloads and short circuits. Viewing by voltmeter and ammeter.
A button provides Start/Stop switching.
An LED indicator signals powering up.
Double alternating rectification, the ripple factor of which varies with the load.

The two sources do not operate at the same time.

ref. BC600

CANALIS CONNECTOR



Connector for descent of KNA Canalis, with space for modular protections. (Protections and cable not supplied).

ref. KNB25CF5

ANTI-VANDALISM COVER WITH KEY

This pull-down cover in front of the electrical equipment in the console prevents students from scribbling on or vandalising the front and its equipment. Standard dimensions:1200mm. **Other dimensions upon request.**







ref. VSG-12 (1200mm)

ref. VSG-20 (2000mm)





System of lock with hook taken in the plate. Compatibility with a shelf, contact us.

360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green Ø60mm

ref. VOY181

Beacon with 2 light indicators: red and green Ø60mm

ref. VOY121

Beacon with a red light indicator (voltage presence) Ø60mm

ref. VOY61

COLOURS AVAILABLE UPON REQUEST
white - orange - red - green - blue

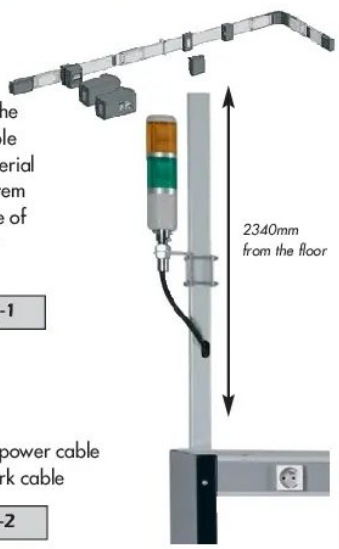


HARD-WEARING LED LAMPS

VERTICAL CABLE RACEWAY

For the wiring of the power cable from the aerial wiring system to the base of the power supply

ref. DEG-1

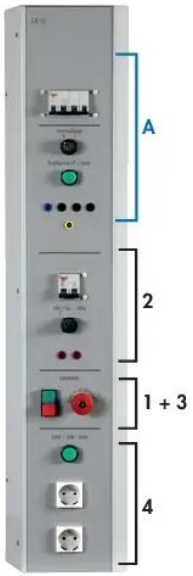


Model for power cable and network cable

ref. DEG-2

Choose and configure your own wiring bench (for 2 students)

3-PHASE VERTICAL CONSOLE



A. "THREE-PHASE SUPPLY"
A lamp indicating that the power is on.
Output via 4 safety terminals.
Protection by thermal magnetic circuit breaker (30mA residual circuit breaker available as an option). Key-operated power-on switch

1. "EMERGENCY STOP"
This push button cuts off the power in the case of an emergency. Key-resettable (positive safety).

2. 24VAC / 5A INSULATED SUPPLY.
Output via 2 safety terminals. Primary winding of transformer protected by auto-protection and secondary wiring by circuit breaker and switch.

3. GENERAL "START/STOP".
- A lamp indicating that the power is on.
- Start/stop operated using a double push-button.

4. 230VAC MAINS DISTRIBUTION
Two power sockets 230V with lamp.

ref. LAG-PT

SINGLE-PHASE VERTICAL CONSOLE



B. GENERAL PROTECTION
Protection by magneto-thermal circuit breaker (30mA residual current circuit breaker available as an option - See Page 36)

1. "EMERGENCY STOP".
This push button cuts off the power in the case of an emergency. Key-resettable (positive safety).

2. 24VAC / 5A INSULATED SUPPLY.
Output via 2 safety terminals. Primary winding of transformer protected by auto-protection and secondary wiring by circuit breaker and switch.

3. "START/STOP".
- A lamp indicating that the power is on.
- Start/stop operated using a double push-button.

4. 230VAC MAINS DISTRIBUTION.
Two power sockets 230V with lamp.

ref. LAG-PM

BENCH WITH STRATIFIED TOP



Highly-resistant and high-temperature stratified top.
Dim. 1500 x 750mm
Height of table top: 840mm

Reference ● ASO-157

Reference ● ASV-157

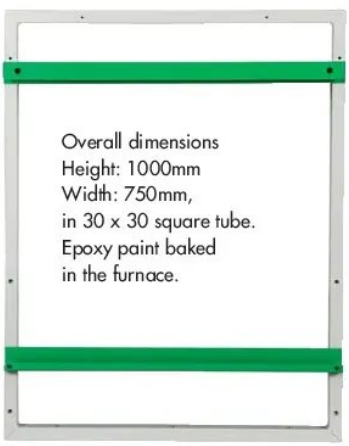
ECONOMICAL SINGLE-PHASE CONSOLE



Horizontal console (wired), ready to be connected to the mains with:
- A 24VAC output insulated from the mains with LED indicator lamp, 100VA, protected by its own circuit breaker and start/stop button
- Two power sockets 230V with LED indicator lamp
- An emergency stop with key + an On/Off button
- Total length 750mm
- Drilling on the back side for fastening on grid holder frame (ref. CSO/CSV)
- Only available in grey colour
- Steel sheet case, PVC front panel

ref. PUG-1

GRID HOLDER FRAME (BARE WITHOUT GRID)



This frame can accommodate any type of grid up to a size of 800 x 750mm.

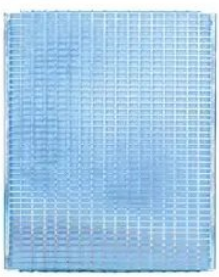
It is fitted with a lower rail, which can be adjusted in steps, and an upper rail, which slides up and down the vertical shafts.

The system has been designed in such a way that you can remove the wired grids without moving the rails.

Reference ● CSO-10

Reference ● CSV-10

REMOVABLE GRIDS



REF	PA6040	PA6050	PA7050
Height	660	660	750
Width	434	534	550

EXAMPLES OF WIRING BENCHES					
CHARACTERISTICS	REF.	QTY	QTY	QTY	QTY
Bench	ASO-157 or ASV-157	1	1	1	1
Vertical 3-phase console	LAG-PT	2			
Vertical single-phase console	LAG-PM		2		
Horizontal single-phase console	PUG-1			2	
Universal bare frame	CSO-10 or CSV-10	2	2	2	2
● **EXAMPLES OF COMPOSITION**		**LAO-3T**	**LAO-2M**	**LAO-ECO**	**LAO-N**
● **EXAMPLES OF COMPOSITION**		**LAV-3T**	**LAV-2M**	**LAV-ECO**	**LAV-N**



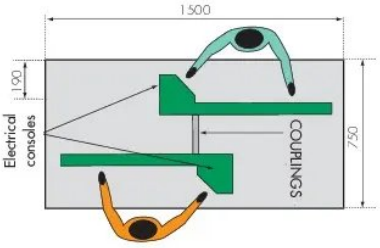
ref. LAV-3T

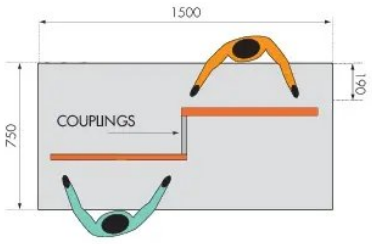


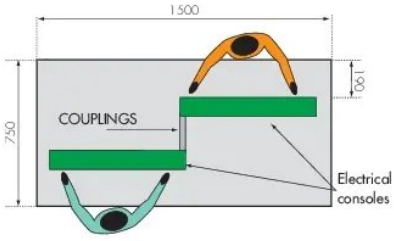
ref. LAO-N



ref. LAV-ECO







Mobile cabling area for six students

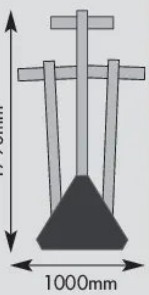
NEW

Solution having the advantage of folding up for storage in minimum space. Mobility / stability: The 9 large-diameter casters make the assembly easy to move, and it is very stable when the six brakes are locked.

Characteristic of the structure

- Structure made of matt anodized aluminium sections.
- Mounted on nine casters with brakes.
- Width of grills 750mm max.
- Easy to fold after use.
- Dimensions: Unfolded: Ø 2580mm Height 1850mm
  Footprint when folded: 1790 x 1000mm







ref. SDG-6F

Workstations for 4 users

WIRING BENCH WITH GRIDS



Reference ● LAO-42T	Reference ● LAV-42T	3-phase
Reference ● LAO-42M	Reference ●LAV-42M	single-phase

Workstation for 4 users. It is delivered with:
- 2 vertical electrical consoles with various outputs (see below)
- 4 grid frames
- 4 fixed grids 800 x 150mm
- 4 removable grids 600 x 500mm (usefull area)
- 1 stratified bench of dimensions 2000 x 750mm
- 2 storage areas for 4 removable grids each

WIRING BENCH WITHOUT GRIDS



Reference ● LAO-22T	Reference ● LAV-22T	3-phase
Reference ● LAO-22M	Reference ● LAV-22M	single-phase

Workstation for 4 users (see below drawing) :
- 2 vertical electrical consoles with various outputs (see below)
- 4 frames (1000 x 750mm) for 800 x 750mm grids (maximum size). These grid frames have horizontal and adjustable rails to receive all grids up to 800mm height and 750mm width (maximum).
- 1 stratified bench of dimensions 1800 x 750mm
- Delivered without grid.

Reference ● LAO-22C	Reference ● LAV-22C
Same as LA*-22T but with 4 3-phase consoles	

ELECTRICAL FEATURES OF THE VERTICAL CONSOLES (2 sides)



EMERGENCY STOP
- The push-button cuts off the power in the case of an emergency. Key-resettable (positive safety).

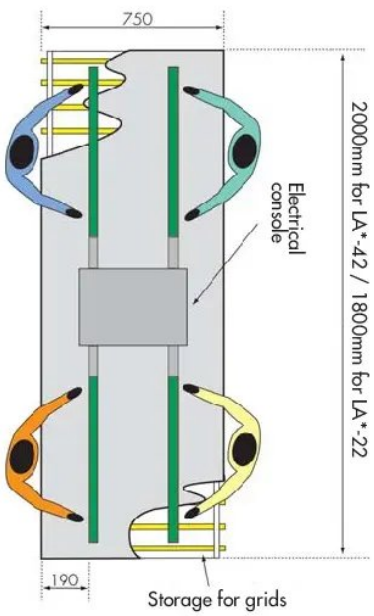
24VAC SUPPLY (insulated from mains)
- Used via 2 safety terminals. Primary winding of transformer protected by auto-protection and secondary wiring by circuit breaker.

GENERAL START/STOP
- A lamp indicating that the power is on.
- Start/stop operated using a double push-button.

230V MAINS DISTRIBUTION
- Two mains sockets 230V with lamp.

GENERAL PROTECTION
- Protection by thermal magnetic circuit breaker (30mA residual circuit breaker available as an option).

3-PHASE SUPPLY (3 X 400V + N+ E)
(only for LA*-42T / LA*-22T / LA*-22C / LA*-4C)
- A lamp indicating that the power is on.
- Output via 4 safety terminals.
- Key-operated power-on switch.

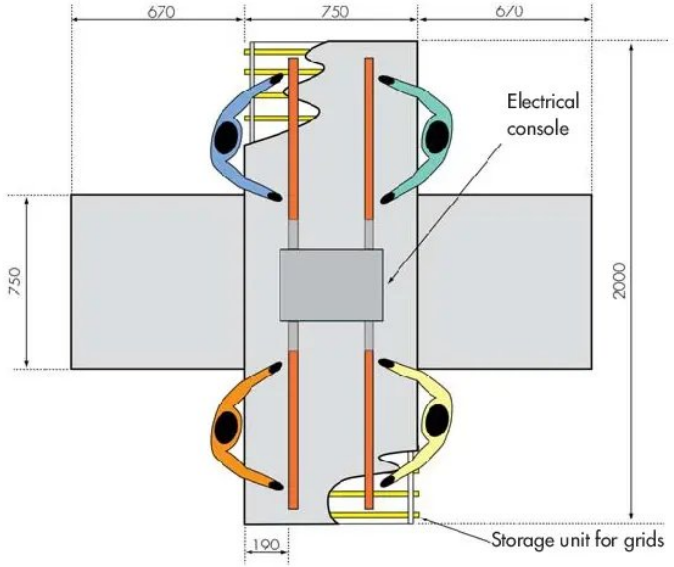


CROSS-SHAPED WIRING BENCH



Reference ● LAO-4C **Reference ● LAV-4C** **3-phase workstation**

Workstation for 4 users. Supplied with:
- 4 vertical electrical consoles with various outputs (see previous page).
- 4 grid frames
- 4 fixed grids 800 x 150mm
- 4 removable grids 600 x 500mm (useful area)
- 1 stratified bench 2000 x 750mm and 2 small ones 750 x 670mm.
- 2 storage areas for 4 removable grids each.

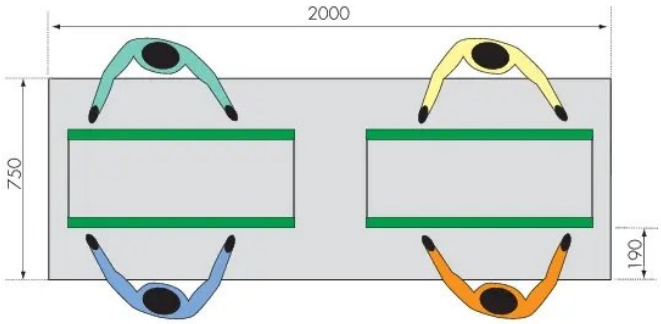


WIRING BENCH WITHOUT ELECTRICAL CONSOLE



Reference ● LAO-44N **Reference ● LAV-44N**

This bench enables users to wire up movable grids without testing possibility (bench without power supply). Wiring bench for 4 users.
- Dim. 2000 x 750mm.
- High temperature stratified top.
- The 4 frames (ref CSO-10 or CSV-10) can accommodate grids up to 800 x 750mm max.



Options for wiring benches

See Pages 38-39

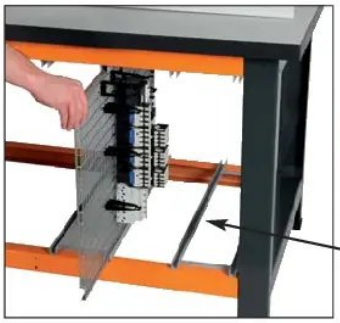




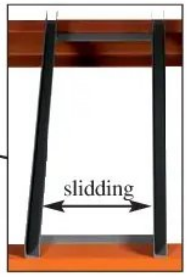
Options for wiring benches

STORAGE UNIT FOR 2 GRIDS

Standard model



Vertical with upper and lower guide.
Made for grids 660 x 534mm.
For storing 2 grids.
Foresee an area of 330mm by GLS-2

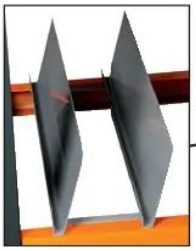


to calculate the number of possible options by bench.

ref. GLS-2

Economical model

Compatible with grids of dimensions 580 x 750mm max. (tilted by 15 ° relative to the vertical). For storing 2 grids.
Foresee an area of 380mm by RAILECO to calculate the number of possible options by bench.





ref. RAILECO

PNEUMATICS KIT FOR 4mm OUTPUT



A pneumatic distribution can be fitted on the wiring benches. This option is delivered complete with air entry pipe, stop valve, regulator with filter and manometer, feeder tank with 4 quick-fit junctions, means of fixing and screws.

ref. DISLAB

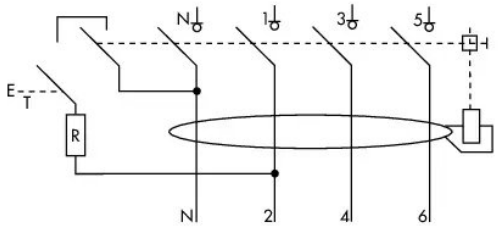
24VDC - 2.2A OUTPUT



Electronic auto-protection.
Safety terminals 4mm
On/off switch
LED indicator light.

ref. CC24L

30mA RESIDUAL CURRENT CIRCUIT BREAKER



30mA residual current circuit-breaker. Single-phase bench.

ref. DIF30-2L A Type

ref. DIF30-2LAC AC Type

30mA residual current circuit-breaker. 3-phase bench.

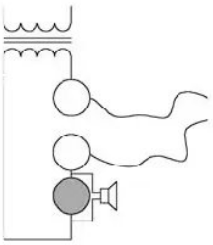
ref. DIF30-4L A Type

ref. DIF30-4LAC AC Type

CIRCUIT CONTINUITY TEST

An optional circuit "Continuity test" is available.
This option allows to do some acoustic and visual tests under 24VAC.

ref. CAV



360° LED LAMP

REPLACE YOUR OLD LAMPS BY SOME NEW HARD-WEARING LED LAMPS

- LED lamp with ten electroluminescent LED diodes without maintenance.
- Bulb with a bayonet fitting (B15D type), 2 contact terminals
- Available in 2 voltages:
  230VAC and 24VAC

ref. T15-230	230V
ref. T15-24	24V



VERTICAL CABLE RACEWAY

For the wiring of the power cable from the aerial wiring system to the top of upright supply console

ref. LABO-CANNE



360° LIGHT SIGNAL TOWERS





ref. VOY61	ref. VOY121	ref. VOY181

WARNING: FORESEE 1 TOWER BY STUDENT. THEY CAN BE SEEN THROUGH 360°.
CAN BE PLACED EITHER ON THE CONSOLE OR ON A VERTICAL CABLE RACEWAY.

COLOURS AVAILABLE UPON REQUEST white - orange - red - green - blue

HARD WEARING LED LAMP



HANGING DRAWERS (300 SERIES) WITH LOCK AND KEY

For top in depth 750mm or 1000mm - Height: 400mm - Width: 450mm

REF	Drawer H=100mm	Drawer H=200mm	Drawer H=300mm
TIG-30	3	/	/
TIG-32	1	1	/
TIG-33	/	/	1


Ref. TIG-30


Ref. TIG-32

HANGING DRAWERS (400 SERIES) WITH LOCK AND KEY

For top in depth 750mm or 1000mm - Height: 490mm - Width: 450mm

REF	Drawer H=100mm	Drawer H=200mm	Drawer H=300mm
TIG-40	4	/	/
TIG-41	2	1	/
TIG-42	/	2	/
TIG-43	1	/	1


Ref. TIG-41


Ref. TIG-42

HANGING DRAWER WITH LOCK AND KEY

For top in depth 750mm or 1000mm
Height: 100mm - Width: 400mm
With lock & key

ref. TIG-10



FAST CONNECTIONS HARTING®

These items are sold separately.
They allow the quick connection/disconnection of 24 contact points.
The female base is fixed, the male connector is movable.



Female base easy to fix on a wiring grid, 24 contact points female + ground.

ref. HA-24S



Simple connector, without protection, 24 points male + ground.

ref. HA-M24

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs

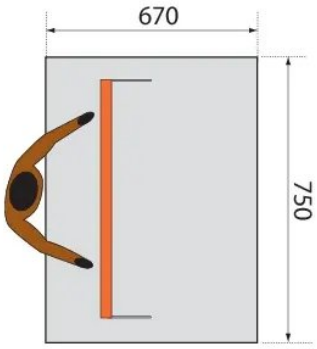


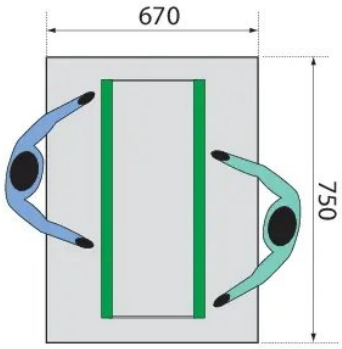
Mobile wiring benches



MBO-1 & MBV-1 enables you to wire up detachable grids without a testing option.
It can be moved around thanks to its 4 wheels, 2 of them are fitted with brakes.
The frame can accommodate grids or any other items with dimensions of up to 800 x 750mm maximum.
750 x 670mm high-temperature laminated top
Height of wiring unit = 1970mm.

MBO-2 & MBV-2 as the same features as **MBO-1 & MBV-1.**
except that it has two frames and therefore enables two users to work at the same time.







Reference ● MBO-1
Reference ● MBV-1

SUPPLIED WITHOUT GRID

Reference ● MBO-2
Reference ● MBV-2

Storage unit for grids

NEW

Simple and economical solution for storage of 16 or 24 grids.
16 compartiments model :
Dimensions 1890 x 665mm - Height 850mm without grid.
24 compartiments model :
Dimensions 1890 x 665mm - Height 1630mm without grid.

Compartment	Reference ●	Reference ●
16	V-MILABO16	O-MILABO16
24	V-MILABO24	O-MILABO24


O-MILABO16


V-MILABO24

Pneumatic and electrical benches

HARD-WEARING LAMP (without maintenance)





EMERGENCY STOP
- This push button cuts off the power in the case of an emergency. Key-resettable (positive safety).

24VAC / 5A INSULATED SUPPLY
- Output via 2 safety terminals. Primary winding of transformer protected by auto-protection and secondary wiring by circuit breaker and switch.

START/STOP
- A lamp indicating that the power is on.
- Start/stop operated using a double push-button.

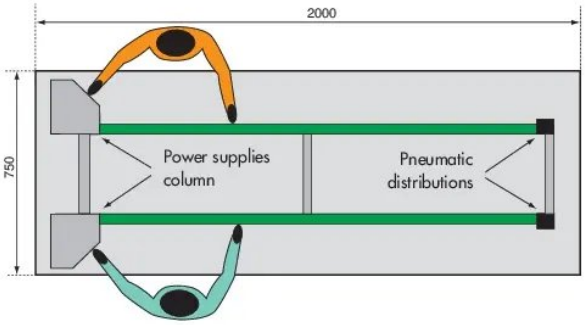
230VAC MAINS DISTRIBUTION
- Two power sockets 230V with lamp.

GENERAL PROTECTION
- Protection by magneto-thermal circuit breaker (30mA residual current circuit breaker available as an option - See Page 36)

THREE-PHASE SUPPLY (only LAO-PNT & LAV-PNT)
- A lamp indicating that the power is on.
- Output via 4 safety terminals.
- Key-operated power-on switch

Reference ● LAO-PNM	Reference ● LAV-PNM	2 single-phase consoles
Reference ● LAO-PNT	Reference ● LAV-PNT	2 three-phase consoles

These workstations have a dual function, pneumatic on the right, electrical on the left. The quick grids frame are adjustable to different grids up to maximum dimensions of 800 x 750mm. Workstation for 2 users. Delivered with:
- One stratified table-top 2000 x 750mm
- Two vertical power consoles
- Two complete pneumatic distributions with air input connector, stopping valve, regulator with filter and manometer, air feeder equipped with 4 quick auto obturating 4mm connection, mechanics and fastenings, in compliance with working rules and regulation.



Storage unit for 6 grids

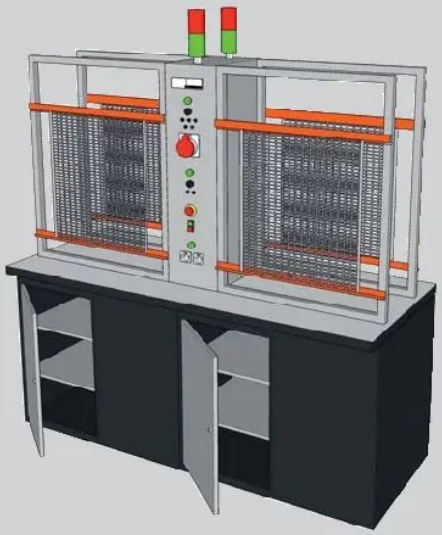


ref. G-MILABO6

- Storage cabinet for 6 grids.
- Sliding lockable doors .
- Rubber fluted carpet glued on top.
- Maximum dimensions of the grids:
  Width: 550mm / Height: 900mm / 200mm of installed equipments.
- Dimensions: 1000 x 1200 x 600mm.

CUSTOM-MADE PRODUCTS

Examples of manufacturing carried out according to customers' needs



Grids supports

WALL MODEL



Reference ● MURECO-O

Reference ● MURECO-V

- Cabling grid support, with wall fixing. (Supplied without grid)
- Adjustable horizontal rails for using several grid sizes.
- This system also takes wood panels 12mm thick or BA13 plaster panel.
- Overall dimensions of the main frame: 1000 x 750mm
- Maximum dimensions of the work area: 800 x 750mm (panels or grid)
- The bottom bracket extends 150mm to hold hand tools. (Angled corners)
- Screws supplied (except for wall fixing).


Angled corners for safety

MOBILE MODEL







Reference ● FREE-SUP-O

Reference ● FREE-SUP-V

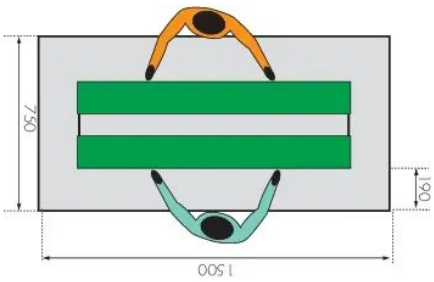
- Mobile easy-to-store cabling support. (Supplied without grid)
- On a bench, the work area (grids or panels) can be angled by the cabler simply by using the screw handles on the sides.
- The ball joints in contact with the table adjust automatically according to the work angle.
- The holding bars make the assembly very rigid for comfortable working.
- Adjustable horizontal rails for using grids with varied dimensions.
- This system also takes wood panels 12mm thick and BA13 plaster panel.
- Overall dimensions of the main frame: 1000 x 750mm
- Maximum dimensions of the work area: 800 x 750mm (panels or grids)
- Footprint on table in maximum open position: 750 x 530 mm



The console ref. PUG-1 can be fixed on the top of the references MURECO.
Features: see next page

Multifunction home learning workstation





NEW



Workbench for learning how to mount and connect home components.
Two learners are separated by two independent frames 1200 x 800mm.
These frames can take wood plates, industrial frames or the BA13 plaster panel.
Speedy installation and replacement of work supports (plate, frame, BA13 plaster panel).
- High-temperature laminated top 40mm thick, dimensions 1500 x 750mm.
- Maximum dimensions of wood plate or BA13 or wiring frame: 1150 x 785 x 15mm thick.

Reference ● P1O-2P-N

Reference ● P1V-2P-N

There are other solutions as opposite with a workbench 2400 x 750mm with 3 feet, for accommodating 4 learners at the same time.

Please contact us to give us your ideas.

We can prepare a free estimate for you with 3D illustrations.



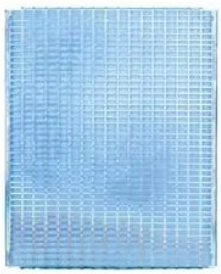
ECONOMICAL SINGLE-PHASE CONSOLE



Horizontal console (wired), ready to be connected to the mains with:
- A 24VAC output insulated from the mains with LED indicator lamp, 100VA, protected by its own circuit breaker and start/stop button
- Two power sockets 230V with LED indicator lamp
- An emergency stop with key + an On/Off button
- Total length 750mm
- Drilling on the back side for fastening on grid holder frame (ref. CSO/CSV)
- Only available in grey colour
- Steel sheet case, PVC front panel

ref. PUG-1

REMOVABLE GRIDS



REF	PA6040	PA6050	PA7050
Height	660	660	750
Width	434	534	550

Drawer cabinet



MAIN FEATURES

- Sturdy drawer cabinets in steel for an intensive use.
- Furnace-baked epoxy paint : grey housing, pearl grey drawers
- Width : 720mm / Depth : 645mm / Height : 1000mm
- Maximum load by drawer : 100 kg
- Total weight : between 150 and 160 kg according the model
- Handles with label holder

DESCRIPTION OF THE DRAWERS

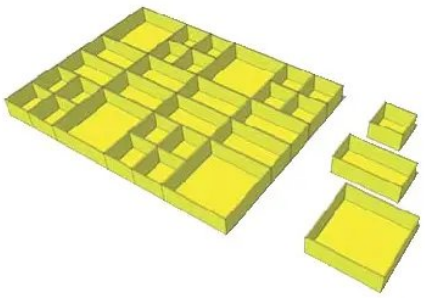
- Drawers with ball bearing slides. A safety device allows the opening of only one drawer at one time. This device prevents the risk of knocking over on the user. The lock jams all the drawers at one time. All the drawers are delivered already equipped.
- Inside dimensions of a drawer : 630 x 450 mm

STANDARD EQUIPMENT OF DRAWERS

Height	Drawer fittings
75 mm	28 plastic boxes among 3 sizes 16 boxes 75 x 75mm 8 boxes 75 x 150mm 4 boxes 150 x 150mm
100 mm	4 metallic storages including - 28 removable dividers
150 mm	4 metallic storages including - 20 removable dividers
200 mm	4 metallic storages including - 12 removable dividers



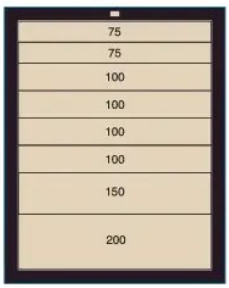
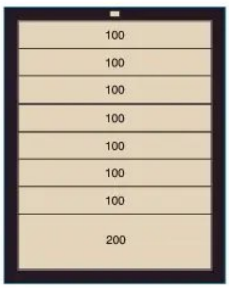
metallic storage + dividers layout



plastic boxes layout 75 x 75mm

plastic boxes layout 150 x 75mm

plastic boxes layout 150 x 150mm

Ref.	AAG-70	AAG-80	AAG-90
Weight	133kg	136kg	157kg
			
Drawer 75mm	2	/	2
Drawer 100mm	4	7	6
Drawer 150mm	1	/	1
Drawer 200mm	1	1	/

Trolleys & Servants

TROLLEYS



ref. DES-16

- Trolley
- Tubular steel frame
- Removable upper shelf
- Melaminated shelves (beech surface)
- 2 swivelling wheels (diameter 125mm) with a brake
- 2 fixed wheels (diameter 125mm)
- Delivered unmounted. Easy to assemble.
- Length : 1030mm
- Width : 500mm
- Height : 1010mm
- Useful dimensions : 850x500mm
- Height of the shelf: 185/810mm
- Max load of the upper shelf : 80kg
- Total max load (on both shelves) : 200kg
- Net weight : 31kg



ref. DES-18

- Trolley
- Tubular steel frame
- The 2 upper shelves are removable
- Melaminated shelves (beech surface)
- 2 swivelling wheels (ø 125mm) with brake
- 2 fixed wheels (diameter 125mm)
- Delivered unmounted. Easy to assemble.
- Length : 1030mm
- Width : 500mm
- Height : 1010mm
- Useful dimensions: 850x500mm
- Height of the shelf: 185/500/810mm
- Max load of the upper shelf: 80kg
- Max load of the middle shelf: 80kg
- Total max load (the whole trolley): 200kg
- Net weight: 37kg



ref. DDG-90

- Trolley
- Electrogalvanised steel frame
- 3 fixed shelves with 30mm edge
- Protective grooved rubber mat on the upper shelf
- Handle
- 4 80mm diameter wheels. 2 of them have a brake
- Space between the shelves : 330mm
- Height : 850mm (wheels included)
- Width : 615mm
- Length : 900mm (handle included)
- Max load by shelf : 30 kg
- Net weight : 33 kg

WORKSHOP TROLLEYS



ref. DES-24

- 2 swivelling wheels Ø200mm with brakes, 2 fixed wheels.
- Carrying handle
- 1 cabinet lockable by key (1 fixed shelf and 2 moveable).
- Lenght 1200mm.
- Width 700mm.
- Height 915mm.
- Useful dimensions 1050 x 700mm.
- Max load of the upper shelf: 200kg.
- Max load of the shelves inside the cabinet: 30kg.
- Total max load: 500kg.
- Net weight: 79kg.



ref. DES-58

- Worktop reinforced melamine 19mm.
- 4 swivelling wheels Ø125mm, 2 with brakes.
- 2 cabinets lockable by key (1 fixed shelf and 2 moveable in each cabinet).
- lenght 1120mm.
- Width 650mm.
- Height 910mm.
- Useful dimensions 1120 x 650mm.
- Max load of the shelves inside the cabinet: 30kg.
- Total max load 150kg.
- Weight 76kg.

Chairs & Stools

5-pronged swivel stools and chairs for workbenches.
Swivels, height can be adjusted by using a pneumatic gas lift.
Height adjustable from 470 to 670mm maxi.



ref. TAB5 with footrest



ref. TAB6 without footrest



ref. C5BAR with footrest



ref. C5BSR without footrest



5-pronged swivel chair for workbenches.
Padded seat and back, with footrest.
Covered in black vinyl.
Height adjustable from 470 to 670mm

ref. C5-PRO
with footrest

5-pronged comfortable chair in polyurethane for workbench. Seat and back in compact foam. With footrest. Swivel model.
Height adjustable from 470mm to 670mm



ref. C5-POL
with footrest

Ergonomic polyurethane sit-stand chair. Height can be adjusted by using the pneumatic gas lift.
Height adjustable from 620 to 870mm



ref. ASS-D
without footrest

Trolley with trays



2-sides trolley

ref. CH-C84R

- 4 swivel wheels for an easy moving. 2 wheels have a brake
- Steel frame with beige epoxy paint
- height: 1120mm / width: 500mm / length: 1040mm

84 blue plastic trays
- 42 trays of dims 105 x 115 x 70mm (21 front / 21 back)
- 42 trays of dims 175 x 105 x 95mm (21 front / 21 back)

Workshop cupboard



Steel cupboard with swing doors, very sturdy, **delivered dismantled.**

- Equipped with 4 height adjustable shelves (5 storage levels in total)
- Maximum load by level : 100 kg
- Rotating handle with lock on the right door
- Single colour : pearl grey (furnace-baked epoxy paint)
- Width : 900mm
- Depth : 450mm
- Height : 1800mm



Cupboard delivered dismantled

ref. HB58

MODULAR TEACHING SOLUTIONS















Choice of frames



ref. MODULO-1

- Wheeled frame.
- Takes 20 modules (W-166mm x H-250mm)
- Dimensions: H-1610 x W-940 x D-500mm
- Power supply panel + rack for leads



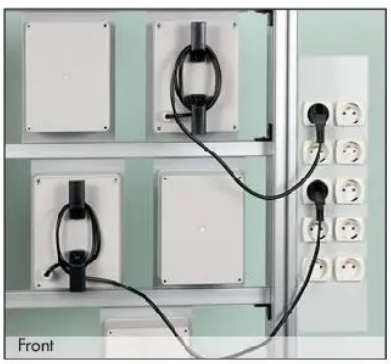
ref. MODULO-2

- Wheeled frame.
- Takes 40 modules (W-166mm x H-250mm)
- Wood shelf 150 x 35cm, easy height adjustment
- Dimensions : H-2040 x W-1620 x D-650mm
- Power supply panel + rack for leads



ref. MODULO-3

- Frame for attaching to a table. (table not supplied)
- Takes 24 modules (W-166mm x H-250mm)
- Dimensions (without table): H-1100mm x W-1500 x D-500mm
- Depth adjustable using 2 slides attached to your table. Horizontal travel 250mm.
- Power supply panel + rack for leads



Front



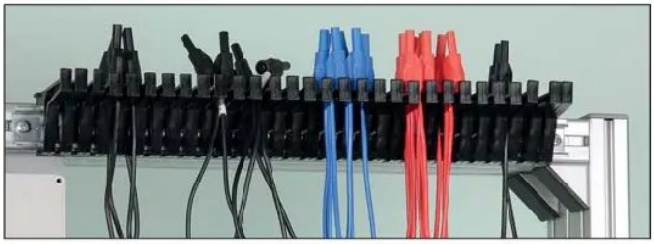
Rear

COMMON ELEMENTS TO THE FRAME MODELS MODULO-1 / 2 / 3

Power supply panel

Front
- 1 16A thermal magnetic circuit breaker
- 1 Emergency stop button
- 1 Pushbutton + ON indicator light
- 1 Mains output 230V+E on 4-mm safety terminals
- 2 Mains sockets 2P+E 230VAC

Rear
- 10 Mains sockets 2P+E 230VAC



Rack for leads

- Length: 50cm.
- 30 fingers.
- The assembly can be moved longitudinally over the whole width of the frame.
- Positioned at the back of the frame.

Portable frame
6 modules maximum



- Dimensions H 610mm x L 590mm x l 310mm
- takes 6 modules (W-166mm x H-250mm)

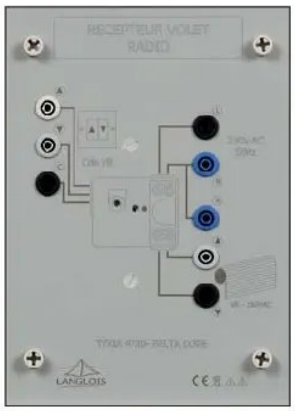
ref. SUP-AK

"Intelligent Home" energy control system



QUICK-NRJ presented on MODULO-1 frame





EDUCATIONAL OBJECTIVES

- **Study a measurement system for energy consumption according to new standard for energy saving.**
- **Study the principle of a home control installation equipped with DELTA DORE® radio components**
- **Parameter the DELTA DORE® radio components (RF technology)**
- **Produce wiring for home components.**
- **Learn how to use a clamp ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Production of the complete wiring diagram.
- Study of the production of the wiring and programming of the components from the DELTA DORE touch screen module
- Study and production of radio commands for lighting, roller blinds and heating.
- Reading of power according to the heating operating cycles.
- Comparison of the power displayed on screen with that calculated from the different readings.
- Creation of scenarios according to the outside temperature and sunshine.

ref. QUICK-NRJ

More and more standards and directives require individual homes to be equipped with a system enabling energy consumption to be measured or estimated. QUICK-NRJ groups all the DELTA DORE® components needed to learn about electrical energy consumption.
A colour touch screen module displays all the energy use information as graphs.
The different components are prepared in plastic housings engraved and equipped with 4mm terminals to facilitate and make safe the wiring using safety leads.
The modules are very easy to install on the aluminium wheeled frame.

Comprises

- 1 Module - data transmitter with off-peak hours control
- 1 Module - colour touch screen displaying all the detail of consumption, for controlling heating (pilot wire and load shedding), lighting and roller blinds.
- 1 Module - 3 current transformers (max 60A) for measuring 3 different circuits.
- 1 Module - power interface technical unit for touch screen.
- 1 Radio module - sunlight sensor.
- 1 Radio module – outside temperature sensor
- 2 Radio modules – roller blind control
- 1 Simulation module - 2 blinds.
- 1 Radio module – lighting variation.
- 1 Radio module - lighting variation, off/on, timing
- 2 Modules – bulkhead lights 230V AC – 60 W
- 3 Modules – load 320 W + indicator lights
- 1 Simulation module - 3 pilot wire convector heaters,1 hot water tank and 1 pellet burner.

The colour touch screen module displays all the detail of consumption, for controlling heating (pilot wire and load shedding), lighting and roller blinds.

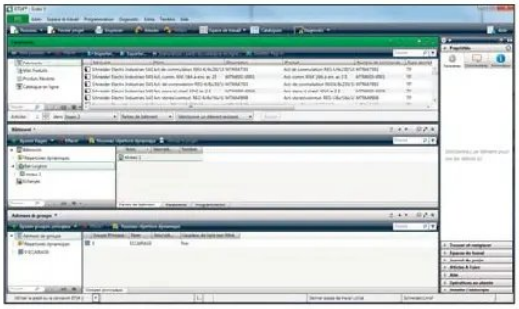


Study system for the KNX bus



Ref. QUICK-KNX

Supplied without frame - See frames on page 48



ETS Lite programming software

The KNX bus offers a standard of compatibility and interoperability that is unique and global in the home control sector. With "KNX PARTNER" certified manufacture, the QUICK-KNX model enables the study and putting into service of multibrand KNX products, SCHNEIDER® and HAGER® (other on request). The KNX devices are prepared in plastic housings with the front engraved and equipped with Ø4mm terminals. The wiring of the Bus and the power are then created using safety leads. We selected the most commonly used KNX modules in the "intelligent home" domain. These modules are easy to install on the aluminium wheeled frame. The KNX devices are configured using the ETS Lite tool supplied with the model.

EDUCATIONAL OBJECTIVES

- **Studying KNX communication media**
- **Studying the principle of a home control installation with KNX devices**
- **Configuration of KNX devices**
- **Creating the wiring of KNX devices**
- **Creating home control scenarios**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the complete wiring diagram
- Study the creation of KNX wiring and programming for the functions of lighting control, shutter and opening control using pushbuttons
- Creation of home control scenarios like using a single key to switch off the lights, lower the blinds and open the garage door and the gate
- Combine several different brands makes with the same KNX standard

Comprises

- 1 30V power supply module for the bus
- 1 USB interface module for programming from a PC
- 2 4-key pushbutton modules with indicator lights (1 per brand)
- 1 2-key pushbutton module with indicator lights
- 1 universal pushbutton interface module
- 1 Presence detector module
- 1 4-output switch actuator module
- 1 2-outputs switch actuator module
- 1 2-outputs control actuator module
- 1 1-outputs control actuator module
- 1 2-outputs roller blind actuator module
- 1 Module with printing and signalling for two roller blinds
- 1 Module with printing and signalling for opening / closing gate and garage
- 4 Modules for bulkhead lights 60W – 230VAC

ADDITIONAL KNX MODULES



HEAT AND LIGHT SENSOR LOT

- Hager 4-output switch actuator module
- Schneider heat and light sensor module

ref. DOMO-4



SMARTPHONE CONTROL LOT

ref. DOMO-3



- InSideControl gateway module with power supply
- WiFi switch module

The InSideControl gateway links the KNX installation to the IP network (LAN). Up to 5 smartphones / tablets can control the installation using the InSideControl App/HD App, available for IOS and Android. The gateway can be used as access interface to the bus (e.g. for. The functionalities of the application are configured with the InSideControl Builder software supplied. Smartphones or tablets communicate with KNX devices by WiFi. Smartphone and InSideControl App/HD App are not supplied with the lot.



KNX HEATING CONTROL LOT

- 2-key pushbutton module with indicator light.
- Thermostat module with programming screen + keys.
- 2-output switch actuator module.
- Resistive load module 320W – 230VAC + indicator light.

ref. DOMO-1

KNX TOUCH SCREEN CONTROL LOT

The touch screen is used to view the states and control the KNX functionalities

- 7" touch screen (17.8cm) 65000 colours.
- Power supply 230VAC 50-60Hz.
- USB port
- LAN interface (10/100 Mbit/s)

ref. DOMO-2





Study of the KNX bus – Autonomous subassemblies

On frame ref. SUP-AK. Height 610mm – Width 590mm.

Study of lighting control by pushbutton

- 1 bus power supply module 30V + USB interface.
- 1 pushbutton module, four keys with indicator lights.
- 1 switch actuator module, 2 outputs.
- 2 Bulkhead lighting modules 60W – 230VAC.

ref. QUICK-AK1 with frame

ref. QUICK-AK1-N without frame



Study of variation lighting control by pushbutton

- 1 bus power supply module 30V + USB interface.
- 1 4-key pushbutton module with indicator lights.
- 1 variation actuator module, 2 outputs.
- 2 Modules for bulkhead lights 60W – 230VAC.

ref. QUICK-AK2 with frame

ref. QUICK-AK2-N without frame



Study of lighting control by presence detector

- 1 bus power supply module 30V + USB interface.
- 1 presence detector module.
- 1 switch actuator module, 2 outputs.
- 2 Modules for bulkhead lights 60W – 230VAC.

ref. QUICK-AK3 with frame

ref. QUICK-AK3-N without frame



Study of roller blind control by pushbutton

- 1 bus power supply module 30V + USB interface.
- 1 4-key pushbutton module with indicator lights
- 1 roller blind actuator module, 2 outputs.
- 1 module with diagram and signalling of two roller blinds.

ref. QUICK-AK4 with frame

ref. QUICK-AK4-N without frame



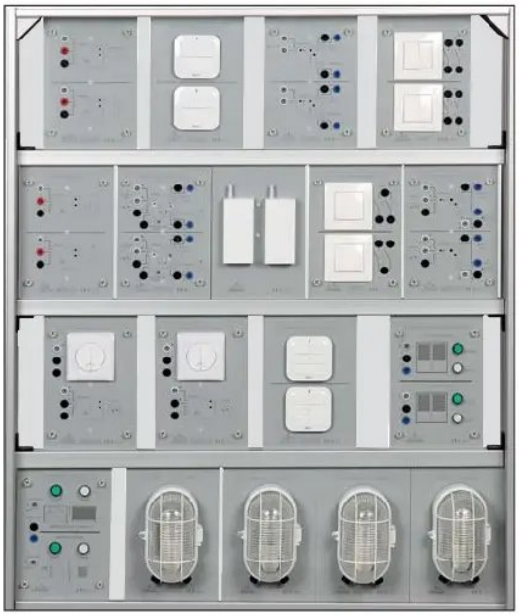
Study of opening control of gate and garage door

- 1 bus power supply module 30V + USB interface.
- 1 4-key pushbutton module with indicator lights.
- 1 switch actuator module, 2 outputs.
- 1 module with diagram and signalling, opening/closing gate and garage.

ref. QUICK-AK5 with frame

ref. QUICK-AK5-N without frame

Study of electrical radio installation – Complete solution



Ref. QUICK-P

Supplied without frame - See frames on page 48

QUICK-P is a set of modules (H 250mm) for studying home automation with DELTA DORER® radio components.
For the student to learn about radio configuration, the transmitter and receiver modules are instructively put in plastic boxes with the fronts engraved and equipped with terminals diameter 4mm.
The various components of the lighting and opening controls are controlled by conventional domestic switches and pushbuttons and by radio switches.

EDUCATIONAL OBJECTIVES

- **To learn about home automation.**
- **To study the compatibility of conventional lighting controls with radio controls.**
- **To study the wiring and configuration of communicating components.**
- **To study the programming of and the DELTA DORE radio solution**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Radio programming of four lighting circuits by pushbutton, two-way and double lighting.
- Wiring of four lighting circuits with conventional and radio switches.
- Radio programming of opening and closing of two roller blinds, gate and garage.
- Creation of several operating scenarios.

Comprises

- 1 domestic double pushbutton and double switch module.
- 1 module with 2 double transmitter switches.
- 1 module with 2 lighting control receivers.
- 1 module with 2 double transmitter switches for roller blinds.
- 1 transmitter module for roller blinds with domestic pushbutton.
- 1 module with 2 domestic two-way switches.
- 1 transmitter module for garage opening with domestic pushbutton.
- 1 module with 2 lighting variation control receivers.
- 2 modules with 2 transmitters for pushbutton and switch.
- 1 module with 2 receivers of gate and garage opening/closing controls.
- 1 simulation module of gate and garage opening/closing with diagram and indicator light signalling
- 1 simulation module of 2 roller blinds with diagram and indicator light signalling
- 1 module with 2 receivers of roller blind controls.
- 4 lighting modules with Bulkhead lights 60W – 230VAC

Compatible frames
See on page 48







Autonomous subassemblies of radio installation

On frame ref. SUP-AK. Height 610mm – Width 590mm.



Study of radio lighting control

- 1 single-phase power module with MT circuit-breaker 16A.
- 1 domestic double PB and double switch module.
- 1 module with 2 transmitters for PB and switch.
- 1 module with 2 double transmitter switches.
- 1 module with 2 lighting control receivers.
- 1 lighting module with 2 Bulkhead lights 60W – 230VAC.

ref. QUICK-AK6 with frame

ref. QUICK-AK6-N without frame

Study of radio lighting variation control

- 1 single-phase power module with MT circuit-breaker 16A.
- 1 module with 2 domestic double pushbuttons.
- 1 module with 2 transmitters for pushbutton
- 1 module with 2 double transmitter switches.
- 1 module with 2 lighting variation control receivers.
- 1 lighting module with 2 Bulkhead lights 60W – 230VAC.

ref. QUICK-AK7 with frame

ref. QUICK-AK7-N without frame





Study of radio roller blind control

- 1 single-phase power module with MT circuit-breaker 16A.
- 1 simulation module of 2 roller blinds with diagram and indicator light signalling
- 1 module with 2 double transmitter switches for roller blinds.
- 1 module with 2 receivers of roller blind controls.
- 1 transmitter module for roller blinds with domestic pushbutton.

ref. QUICK-AK8 with frame

ref. QUICK-AK8-N without frame

Study of different wirings for lights



ref. QUICK-A

Supplied without frame - See on page 48

QUICK-A is a set of modules (H-250mm) for studying the different types of wiring of lights. The modules are cabled using safety leads Ø4mm.

EDUCATIONAL OBJECTIVES

- **Study of house wiring diagrams.**
- **Study and operation of a single lighting circuit.**
- **Study and operation of a double lighting circuit.**
- **Study and operation of a two-way circuit.**
- **Study and operation of a remote control switch circuit**
- **Study and operation of a timer circuit.**
- **Study and operation of a dusk switch circuit.**
- **Study and operation of an energy meter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of house lights wiring diagrams.
- Creation of different light wiring such as single, double, two-way, timer, remote control, dusk switch.
- Creation of energy meter wiring.
- Creation of reading of light power consumption.

Comprises

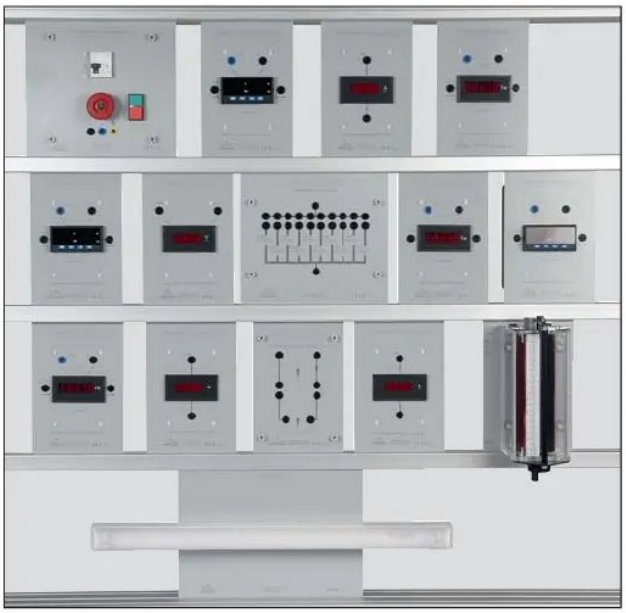
- 1 Module – Two pushbuttons
- 1 Module – Two-way switch
- 1 Module - Two single lighting switches
- 1 Module – Two double lighting switches
- 1 Module – Single phase energy meter 63A
- 1 Module – Circuit-breaker 1P+E 16A
- 1 Module – Residual current circuit-breaker 30mA
- 1 Module – Timer, coil 230VAC-50Hz
- 1 Module – Remote control switch, coil 230VAC-50Hz
- 1 Module – Dusk switch + photocell
- 1 Module – Analogue ammeter 2.5A and Analogue voltmeter 250VAC
- 4 Modules – Bulkhead lights 230VAC-40W
- 1 set of safety leads for carrying out the different practical works.

Study of the role of the earth and a residual current circuit-breaker





Study of power factor rectification



ref. QUICK-L

Supplied without frame - See on page 48

QUICK-L is a set of modules for studying the power factor rectification of an electrical installation.
The modules are cabled using safety leads Ø4mm.
Compatible load 230V-5A Max.

EDUCATIONAL OBJECTIVES

- **Study of the power factor.**
- **Study of the powers.**
- **Demonstrate the advantage of rectifying power factor on the kWh cost**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Study of an industrial lighting installation using a fluorescent tube: Readings of current, power and voltage in each energy transmission line.
- Creation of the Fresnel diagram using active and reactive powers.
- Study of pure inductance in order to determine the capacitor battery to be installed.
- Study of resonance, max/min current.

Comprises

- 1 Module – Distribution of single-phase voltage 230VAC-50Hz
- 3 Modules – Digital ammeters 5A
- 1 Module – Digital voltmeter single-phase 230VAC
- 3 Modules – Digital multifunction displays 230VAC-5A. Displays of P/U/I/Power factor.
- 3 Modules – Reactive power 230VAC-5A.
- 1 Module for load connection
- 1 Module – battery of 10 capacitors 0.1 to 41µF with jumpers.
- 1 Module – safety inductance, variable from 0.1 to 1.4H - 2A
- 1 Module – Fluorescent tube 230VAC-18W
- 1 set of safety leads for carrying out the different practical works.

QUICK-H is a set of modules (H250mm) for studying the role of the earth and an RC circuit-breaker.
The synoptic diagrams on the modules show the path of electrical energy from a transformer substation and a house. Resistive dipoles, for insertion in the modules, allow students to simulate two earth resistance values and two fault resistance values.
To prevent any risk of electrocution to the student, the modules operate at extra-low voltage using an isolating transformer to standard NFC61558.

ref. QUICK-H

Supplied without frame - See on page 48

Proposed Practical Works

- Operation of a magneto-thermal circuit-breaker: rating, breaking capacity, tripping curve, and symbols.
- Operation of an RC circuit-breaker: rating, tripping time, and symbols.
- Physiological effects of the current: risk areas, risk according to the current, and dangerous voltages.
- Maximum resistance of the earth.

EDUCATIONAL OBJECTIVES

- **Make students aware of electrocution risks in the event of indirect contact.**
- **Make students aware of risks related to the quality of the earth.**
- **Explain the role of the RC circuit-breaker 30mA in a domestic installation.**

TEACHING RESOURCES STUDENT & TEACHER

Comprises

- 1 Transformer module 230V AC, 24V AC. A printed diagram shows the public network, with its medium/low voltage transformer substation, and the neutral to earth connection in this substation.
- 2 Modules of transmission lines from the transformer substation to a domestic installation.
- 2 Modules with the RC circuit-breaker 30mA, and a washing machine simulation.
- 1 Module with a printed diagram of a person, equipped with an LED on the heart. If a dangerous leakage current flows, the LED comes on.
- 1 Dipole support module. Two earth resistances (100 ohms and 5 ohms), 2 fault resistances (10 ohms and 2 kohms) and four blanks so you can use your own resistance values.
- 1 set of safety leads for carrying out the different practical works. Mains power supply 230V - 50/60Hz. 3-metre lead with plug 2P+E.

Study of the feeding of photovoltaic energy to the electrical grid





QUICK-M is a set of photovoltaic modules (H-250mm) and solar panels for studying a solar installation with energy feeding to the 230V AC grid.

Supplied without frame - See on page 48

ref. QUICK-M

The set can be supplied without the two solar panels, please ask for details.

Comprises

- 1 Coupler module of photovoltaic terminals to 4mm terminals.
- 1 Surge arrester module.
- 1 Circuit switching module.
- 1 Double fuse holder module 10x38 gPV.
- 3 Single-phase energy meters modules 63A. Reset key. Resolution 0.1kW
- 1 Grid inverter module 500W. Automatic synchronization with the grid 230V. Input voltage from 65 to 130V DC. Thermal protection integral to the box.
- 1 Module of photovoltaic two-pole circuit-breaker with fault current VDE0126.
- 1 Grid synchronization switch module.
- 1 Module with outlet 2P+E, 4mm terminals.
- 1 Analogue voltmeter/ammeter module.
- 1 Digital voltmeter module.
- 1 Digital ammeter module.
- 2 Solar panels 200Wc on frame that tilts from 5° to 70°.
- 1 Photovoltaic cable, 30 metres.
- 1 set of safety leads for carrying out the different practical works.

EDUCATIONAL OBJECTIVES

- **Learn about a photovoltaic installation with energy feeding to the grid.**
- **Study the types of energy feeding to the grid, e.g. total or partial.**
- **Learn about and understand the photovoltaic elements present.**
- **Create the wiring of a photovoltaic installation.**
- **Take the electrical measurements of the different values.**
- **Study the efficiency and incidences related to the positioning of the solar panels.**
- **Study the use of a grid inverter and energy meter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the complete wiring diagram for feeding all the energy produced by the panels.
- Creation of the complete wiring diagram for feeding the non-consumed energy produced by the panels.
- Take the measurements of voltage, current and power of the solar panels.
- Take the measurements of the fed voltage, current and power.
- Calculation of the efficiency of the installation.

Study of the programming of PLC and human machine interface (HMI)

EDUCATIONAL OBJECTIVES

- **Study of a complete diagram with automation sensors and components for connecting to the inputs/outputs of a PLC.**
- **Study the configuration of an Ethernet for computers.**
- **Study the programming of a PLC in contact language.**
- **Study the programming of an HMI (Human Machine Interface).**
- **Study an analogue signal by current and voltage.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the complete wiring diagram of a PLC, an HMI and binary and analogue sensors.
- Creation of the configuration of an Ethernet.
- Creation of a complete PLC program in contact language.
- Creation of a supervision program with control from the HMI.
- Configuration of the PLC with analogue inputs/outputs for 4-20mA and 0-200mV signal.



Study of photovoltaic energy on an isolated site

QUICK-N is a set of photovoltaic modules (H-250mm) and solar panels for studying a solar installation on an isolated site.

Supplied without frame -
See on page 48





ref. QUICK-N

The set can be supplied without the two solar panels, please ask for details.

EDUCATIONAL OBJECTIVES

- **Learn about a photovoltaic installation on an isolated site.**
- **Learn about and understand the photovoltaic elements present.**
- **Creating a Photovoltaic installation.**
- **Taking the electrical measurements of the different values.**
- **Study the efficiency and incidences related to the positioning of the panels.**
- **Study the energy system (production, storage, charge, discharge).**
- **Study the use of a solar charge regulator for batteries.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the complete wiring diagram.
- Creation of the configuration of the charge regulator for batteries.
- Take the measurements of voltage, current and power of the solar panels.
- Take the measurements of voltage, current and power at output 24V DC.
- Calculation of the efficiency of the installation.
- Calculation of the charge/discharge time of the battery.

Comprises

- 1 Coupler module of photovoltaic terminals to 4mm terminals.
- 1 Surge arrester module.
- 1 Circuit switching module.
- 3 Double fuse holder modules 10x38 gPV.
- 1 Solar charge regulator module 24V DC - 20A
- 1 Voltage converter module 350VA - 24V DC - 230V AC on outlet 2P+E.
- 2 Voltmeter/ammeter analogue display modules.
- 1 Two batteries module 12V – 12Ah.
- 2 Solar panels 200Wc on frame that tilts from 5° to 70°.
- 1 Photovoltaic cable, 30 metres.
- 1 set of safety leads for carrying out the differentpractical works.

ref. QUICK-D (Siemens)

ref. QUICK-E (Schneider)

QUICK-D and QUICK-E are sets of modules (H-250mm) and sensors for studying a PLC with touch screen

Supplied without frame - See on page 48
SIEMENS® (QUICK-D) - SCHNEIDER® (QUICK-E)

Comprises

QUICK-D version : SIEMENS®

- 1 Siemens® PLC module SIMATEC S7-1200 Ethernet 14I/10O binary with 1 input and 1 output 4-20mA.Optional LOG-STEP programming software.
- 1 Siemens HMI module Simatic KTP600 Ethernet 5.7". Optional LOG-STEP programming software.

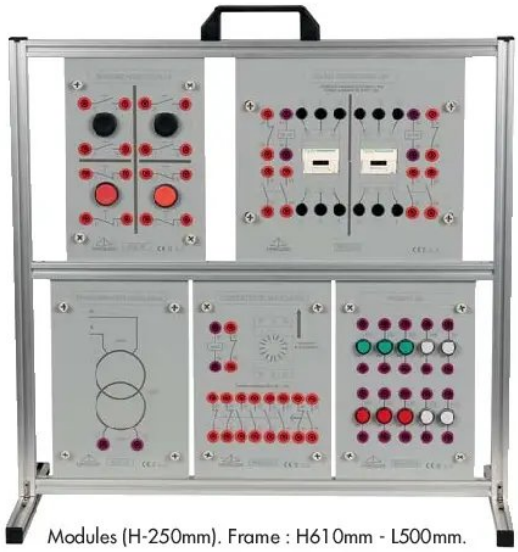
QUICK-E version : SCHNEIDER®

- 1 Schneider® PLC module M221 Ethernet 14I/10O binary with 1I/1O 4-20mA, 0-10V and 1 input PT100. Supplied with SoMachine Basic programming software.
- 1 Schneider HMI module HMISTU Ethernet 3.7" colour. Supplied with VijeoDesigner programming software.

Common modules

- 1 Emergency stop module.
- 1 Distribution module of 230VAC on 4mm terminals with RC circuit-breaker 30mA-16A.
- 1 Power supply module 230V AC - 24V DC - 2A.
- 1 Pushbutton and switch module.
- 1 Module with limit switch and PT100 temperature sensor.
- 1 Signal generator module 0-10V and 0-200mV.
- 1 Light sensor module.
- 1 Wind sensor module.
- 1 Voltage dimmer module 230V AC with analogue input 4-20mA.
- 1 Module with 2 auxiliary contactors 24V DC.
- 1 Indicator light module 24V DC.
- 3 Bulkhead light modules 230V AC, 40W.
- 1 Set of safety leads for carrying out the different practical works.

Study of contactor + timing



Modules (H-250mm). Frame : H610mm - L500mm.

Powered by 230VAC sector 1.5m cord.

EDUCATIONAL OBJECTIVES

- **To study the connection diagram of 2 contactors and 1 timer**
- **To study the configuration of a timer.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of several wiring diagrams of type:
  - on/off
  - on/off with self-maintain
  - on/off with timing.

ref. QUICK-AK10 with frame

ref. QUICK-AK10-N without frame

Comprises

- 1 module 2 auxiliary contactors 24VAC. Contacts 2 x 5 NO + 2 x 1 NC
- 1 module 1 timed contactor with 1 NO + NC timed and 3 NO + 3 NC
- 1 transformer module 230VAC - 24VAC
- 1 module 2 On pushbuttons and 2 Off pushbuttons.
- 1 module of 10 Indicator lights 24VAC.
- 1 set of safety leads for carrying out the different practical works.

study of temperature regulation by proportional integral derivative (PID)



Modules (H-250mm). Frame : H610mm - L500mm.

Powered by 230VAC sector 1.5m cord.

EDUCATIONAL OBJECTIVES

- **Learn about and wire a system of temperature regulation by PID.**
- **Study, configure, and control a PID regulator.**
- **Study an analogue signal 4-20mA.**
- **Study a PT100 temperature sensor signal.**
- **Use a dimmer 230V, 4-20mA.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the complete wiring diagram of the temperature regulation system.
- Configuration of the PID regulator for an analogue signal 4-20mA.
- Temperature regulation according to several set points.

Comprises

- 1 DC power supply module 230V AC, 24V DC - 3A.
- 1 PID temperature regulator module. Self-adjusting and manual. 4-digit display for set point, input and output 4-20mA.Binary alarm output.
- 1 PT100 temperature sensor module. Three wires.
- 1 PT100 signal converter module, 4-20mA.
- 1 Indicator light module 230V AC
- 1 Single-phase power dimmer module. Variation of the thyristor conduction angle according to the control current 4-20mA.
- 1 Heating unit module equipped with a 75W lamp powered at 230VAC. Thanks to two supports, the temperature sensor can be put into the unit.
- 1 set of safety leads for carrying out the different practical works. Mains power supply 230V - 50/60Hz. 3-metre lead with plug 2P+E.

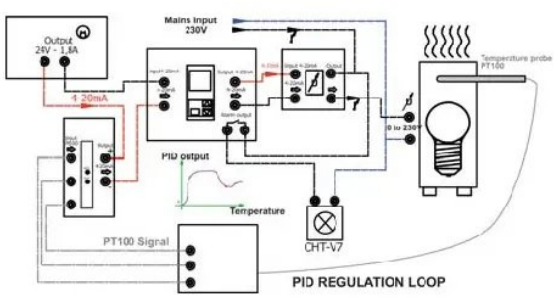
ref. QUICK-K with frame

ref. QUICK-K-N without frame

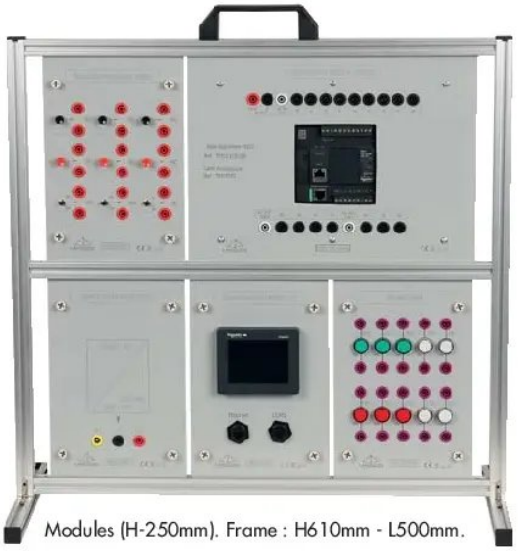
ref. QUICK-KS communicating with frame

ref. QUICK-KS-N communicating without frame





Simplified study of M221 controller



Modules (H-250mm). Frame : H610mm - L500mm.

Powered by 230VAC sector 1.5m cord.

ref. QUICK-AK9 with frame

ref. QUICK-AK9-N without frame

EDUCATIONAL OBJECTIVES

- **To study the connection diagram of the inputs and outputs of a PLC.**
- **To study the configuration of a computer Ethernet.**
- **To study the programming of a PLC in contact language.**
- **To study the programming of an HMI (Human Machine Interface).**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of a complete wiring diagram of the programmable logic controller and the HMI.
- Creation of the complete wiring.
- Creation of Ethernet configuration with IP addressing of the PLC, HMI and PC.
- Creation of a complete controller program in contact language.
- Creation of a complete supervision program of the HMI in contact language.

Comprises

- 1 Schneider® M221 PLC module. Ethernet. 14 I and 10 O on/off.
  Supplied with Somachine basic software.
- 1 Schneider® HMI Colour 3.7" module.
  Supplied with the VigéoDesigner supervision software.
- 1 PS module 24VDC
- 1 pushbutton and switch module.
- 1 module of 10 Indicator lights 24VDC.
- 1 set of safety leads for carrying out the different practical works.

Study of on/off temperature regulation



Modules (H-250mm). Frame : H610mm - L500mm.

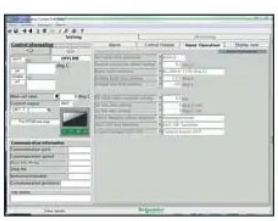
Powered by 230VAC sector 1.5m cord.

ref. QUICK-O with frame

ref. QUICK-O-N without frame

ref. QUICK-OS communicating with frame

ref. QUICK-OS-N communicating without frame



EDUCATIONAL OBJECTIVES

- **To learn about and cable one system of on/off temperature regulation**
- **To study, configure and control an on/off regulator.**
- **To recover data by computer (communicating version)**
- **To discover the resistance / temperature relationship as measurement principle**

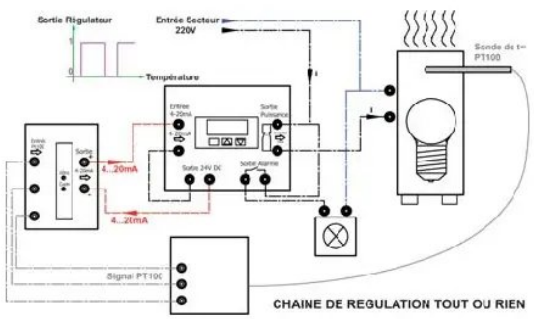
TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the wiring diagram of the regulation system.
- Configuration of the regulator.
- Observation of temperature regulation phenomena.

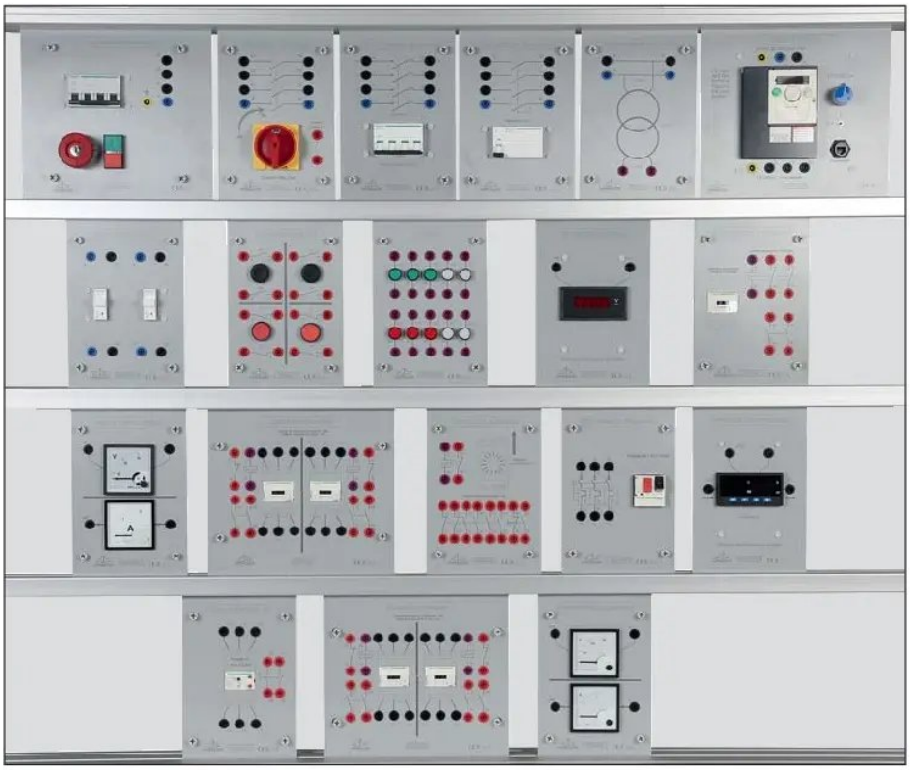
Comprises

- 1 PS module 230VAC / 24VDC - 3A.
- 1 on/off regulator module. With display.
  Communicating for QUICK-OS version by USB lead (software supplied).
- 1 temperature probe PT100 module + Signal converter PT100 / 4-20mA.
  1 heating unit module equipped with lamp 60W powered at 230VAC.
  The temperature probe can be put into the unit thanks to two supports.
- 1 indicator light module 230VAC.
- 1 set of safety leads for carrying out the different PAs.



CHAINE DE REGULATION TOUT OU RIEN

Study of wirings for starting asynchronous motors



QUICK-C is a set of modules for studying the different types of wiring for starting asynchronous motors.
The modules are cabled using safety leads Ø4mm.
Compatible with asynchronous motors 400/690V 1500W max.

Supplied without frame - See on page 48

ref. QUICK-C

EDUCATIONAL OBJECTIVES

- **Study of wiring diagrams for starting asynchronous motors.**
- **Study and operation of direct start-up.**
- **Study and operation of direct start-up with reversal of the direction of rotation.**
- **Study and operation of star/delta start-up.**
- **Configuration of a speed controller with software.**
- **Study and operation of start-up with speed controller.**
- **Using a digital wattmeter, ammeter and voltmeter.**

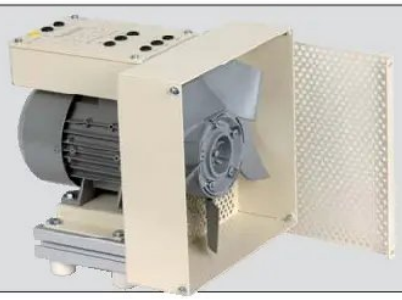
TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the wiring diagrams of different types of motor start-up.
- Creation of the different wirings of motor start-ups such as direct, direct with reversal of the direction of rotation, star/delta, with speed controller.
- Configuration of the speed controller using the SOMOVE software from Schneider
- Reading of the currents and voltages at the terminals of the asynchronous motor.
- Calculation of the absorbed power.

Comprises

- 1 Module – Distribution of three-phase voltage + Neutral 400V-50Hz
- 1 Module – 2 two-pole cut-out devices
- 1 Module – Four-pole magneto-thermal circuit-breaker 4A D-curve
- 1 Module – Residual current four-pole switch 30mA
- 1 Module – Three-pole thermal magnetic circuit-breaker, motor support
- 1 Module – Four-pole isolating switch
- 1 Module – Transformer 230V/24VAC-50Hz 120VA
- 1 Module – Four pushbuttons
- 1 Module – 10 indicator lights 24VAC-50Hz
- 1 Module – Reversing contactor 24VAC-50Hz with 2NO+2NC
- 1 Module – Doble contactor 24VAC-50Hz with 2NO+2NC
- 1 Module – Contactor 24VAC-50Hz with 2NO+2NC
- 1 Module – Timed contactor 24VAC-50Hz
- 1 Module – Thermal relay
- 2 Modules – Analogue voltmeter (400V) and ammeter (10A) displays.
- 2 Modules – Digital wattmeter displays.
- 1 Module – Speed controller 1.5kW power supply and 3-phase 400V output.
- 1 set of safety leads for carrying out the different practical works.



FAN OPTION

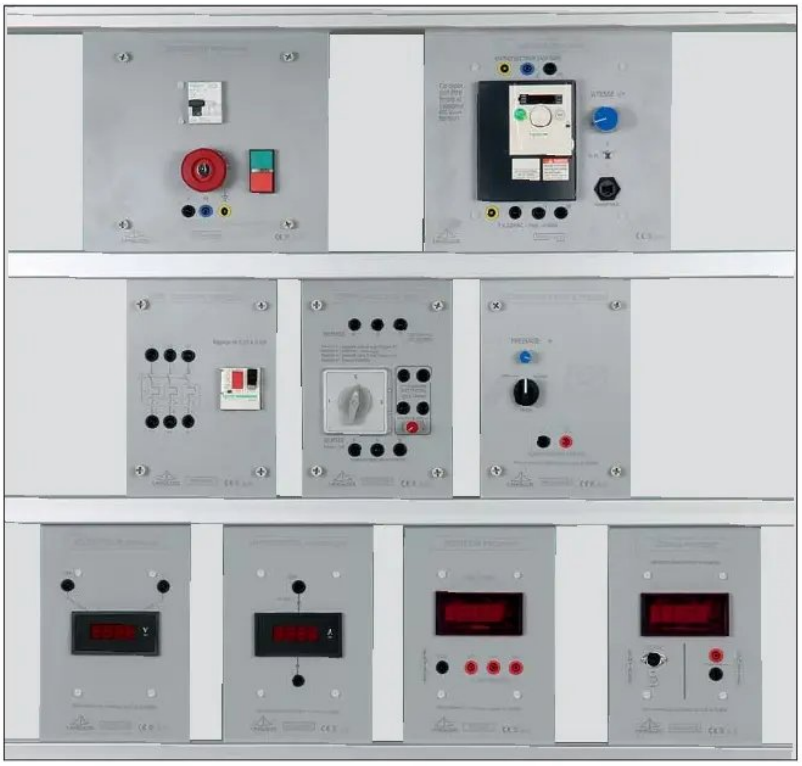
QUICK-C can be completed by a fan.

- 300W 400/690V three-phase fan
- Rated speed 1500 rpm
- Power supply through 4mm dual chamber safety terminals

ref. KT-1M

Protection grid removed for photo purposes only

Study of an asynchronous motor 1500W with powder brake





ref. QUICK-F (single-phase)
Requires connection to a mains single-phase electricity supply 230V AC

ref. QUICK-FT (3-phase)
Requires connection to a mains 3-phase electricity supply 3 x 400V AC + Neutral

Sets of modules (H-250mm) and rotating machinery for studying an asynchronous motor 1500W coupled with a powder brake with torque sensor and tachometer generator.
Supplied without frame - See on page 48

EDUCATIONAL OBJECTIVES

- **Study the wiring diagram between a speed controller and an asynchronous motor.**
- **Study the configuration of a speed controller using SoMove software.**
- **Study the no-load behaviour of a three-phase asynchronous motor 1500W.**
- **Study the with-load behaviour of a three-phase asynchronous motor 1500W.**
- **Read and plot the electrical and mechanical characteristics of an asynchronous motor.**

TEACHING RESOURCES STUDENT & TEACHER

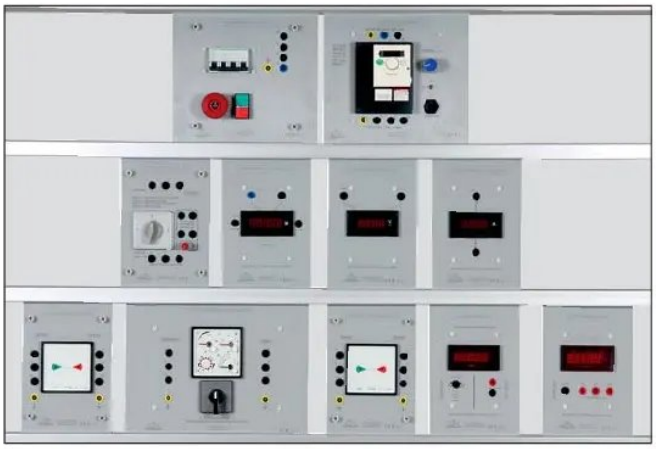
Proposed Practical Works

- Creation of the wiring diagram of a speed controller and an asynchronous motor.
- Creation of the configuration of a speed controller using SoMove software.
- Creation of the no-load and with-load tests of the asynchronous motor.
- Calculations & plots of the electrical and mechanical characteristics of the motor bench.

Comprises

- 1 Power supply module with RC circuit-breaker and emergency stop button.
- 1 Speed controller module 1500W (single-phase or 3-phase according to version) with SoMove programming software.
- 1 Module with magneto-thermal circuit-breaker for motor support.
- 1 Wattmeter switch module.
- 1 Power supply module 0-20V DC for powder brake supply.
- 1 Voltage digital display module.
- 1 Current digital display module.
- 1 Motor torque digital display module.
- 1 Rotation speed digital display module.
- 1 Analogue wattmeter RMS AC+DC.
- 1 Complete motor set on wheeled cart equipped with three-phase asynchronous motor 230/400V - 1500W, powder brake, rotary torque sensor, and tachometer generator.
- 1 set of safety leads for carrying out the different practical works.
  A version without motor set can be offered on request.

Study of the synchronization of an alternator with the electrical grid





QUICK-J is a set of modules (H-250mm) and rotating machinery for studying the synchronization of an alternator 1500W with the electricity grid 3 x 400V.





ref. QUICK-J

Supplied without frame - See on page 48

The set can be supplied without the motor set, please ask for details.

EDUCATIONAL OBJECTIVES

- **Understand the operation of a synchronous alternator.**
- **Understand the rules of synchronization with the electricity grid.**
- **Use a synchronoscope.**
- **Study the wiring diagram between a speed controller and an asynchronous motor.**
- **Creation of the configuration of a speed controller with software.**
- **Study the no-load and with-load behaviour of a 3-phase asynchronous motor 1500W.**
- **Study the no-load and with-load behaviour of an alternator.**
- **Read and plot the electrical and mechanical characteristics of the motor bench.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the wiring diagram of a speed controller and the asynchronous motor.
- Configuration of the speed controller with software.
- Creation of the wiring of the alternator and the synchronoscope.
- Creation of the no-load and with-load tests of the asynchronous motor.
- Creation of the no-load and with-load tests of the alternator.
- Calculations and plots of the electrical and mechanical characteristics of the motor bench.

Comprises

- 1 Single-phase power supply module with RC circuit-breaker and emergency stop button.
- 1 Single-phase speed controller module 230V AC – 3x230V AC, 1500W. Adjustment of the rotation speed setting by potentiometer on the front.
- 1 Wattmeter switch module.
- 5 digital display modules:
  Voltage - Current - Power - Motor torque - Rotation speed.
- 1 Indicator module of phase order on the alternator side.
- 1 Indicator module of phase order on the electricity grid side.
- 1 Switching module with display of the matching of the voltages, speed of synchronism, frequency of the alternator, and output voltage of the alternator.
- 1 Machinery set on wheeled cart comprised of:
  1 Asynchronous motor 1500W - 3x 230V/3x400V
  1 Brushless rotary dynamic torque sensor
  1 Synchronous machine 1500W - 3x230V/3x400V
  1 Tachometer generator 10V/1000 revs
- 1 Analogue wattmeter RMS AC+DC.
- 1 Variable power supply 0-240V AC/DC for supplying the rotary field of the alternator.
- 1 set of safety leads for carrying out the different practical works.
  Mains power supply 230V - 50/60Hz. 3-metre lead with plug 2P+E.

Study of a single-phase transformer 230V-140VA

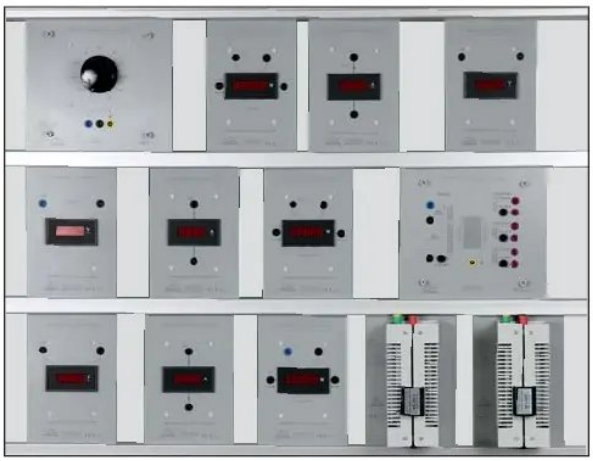
EDUCATIONAL OBJECTIVES

- **Study a single-phase transformer with no load, in short-circuit and loaded.**
- **Measurement of the different electrical values at the primary and secondary windings.**
- **Calculation of the powers, efficiency, transformation ratio, and losses of the transformer.**

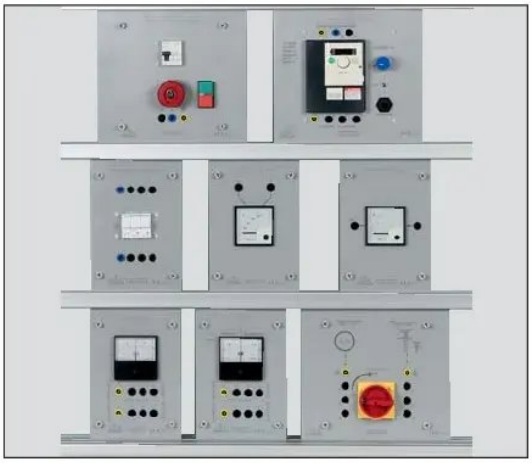
TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of the wiring diagram with measuring devices.
- Study of the use of the compensation winding at the primary.
- Readings of the electrical values of the transformer with no-load.
- Readings of the electrical values of the transformer with load.
- Calculations of the electrical characteristics, power and the transformation ratio.
- Plots of the curves of electrical power and efficiency.



Study of the behaviour of a machine in hypo and hypersynchrony





Supplied without frame - See on page 48
Presented on MODULO-2 frame
The set can be supplied without the motor set, without capacitive or resistive load, please ask for details.

EDUCATIONAL OBJECTIVES

- **Study the hyposynchronous and hypersynchronous operations of an asynchronous motor.**
- **Study the effect of a battery of capacitors on the power factor value.**
- **Study the synchronisation with the national grid.**
- **Study energy use at an isolated site.**
- **Calculate the efficiencies of an energy production system.**
- **Use a clamp ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Procedure of synchronization with the national grid.
- Hyposynchronous and hypersynchronous measurement.
- Reading power factor using a battery of capacitors and consequences.
- Plot of the electrical characteristics of the energy production system.
- Calculation of the overall efficiency.
- Study of the operation at an isolated site.

ref. QUICK-I

An asynchronous motor can convert mechanical energy into electrical energy. To perform this conversion, it has to be driven above the synchronous speed. QUICK-I is a set of modules of measurement (H-250mm) of switching and 2 asynchro-nous motors mounted on the same axis of rotation for studying hypersynchrony. The speed controller module drives the first motor above its synchronous speed so that the second becomes a three-phase generator. A central zero wattmeter module indicates the direction of the electrical energy consumed or fed in the case of feeding into the grid. A central 0 phase-meter module demonstrates the change of powzr factor according to the addition of capacitors or speed variation.

Comprises

- 1 Single-phase power supply module 230V AC with RC circuit-breaker and emergency stop button.
- 1 Speed controller module 1500W. Single-phase power supply 230V AC, motor supply output 3 x 230V AC.
  Adjustment of the rotation frequency by potentiometer on the front.
- 1 Three-pole cut-out module.
- 2 digital display module : Current - .Voltage
- 1 Module with central zero analogue display of the power.
- 1 Module with central 0 analogue display of power factor.
- 1 Start/Stop switch module for synchronizing with the electricity grid 3x230/400V.
- 1 Set of rotating machinery: 2 asynchronous motors 1500W, 3x 230/400V.
- 1 Resistive load 2000W.
- 1 Capacitive load 2000 kVAR.
- 1 set of safety leads for carrying out the different practical works.
  Mains power supply 230V - 50/60Hz. 3-metre lead with plug 2P+E.

QUICK-G is a set of modules (H-250mm) for studying a compensated single-phase trans-former 230V with three secondary windings. **Supplied without frame - See on page 48**

ref. QUICK-G

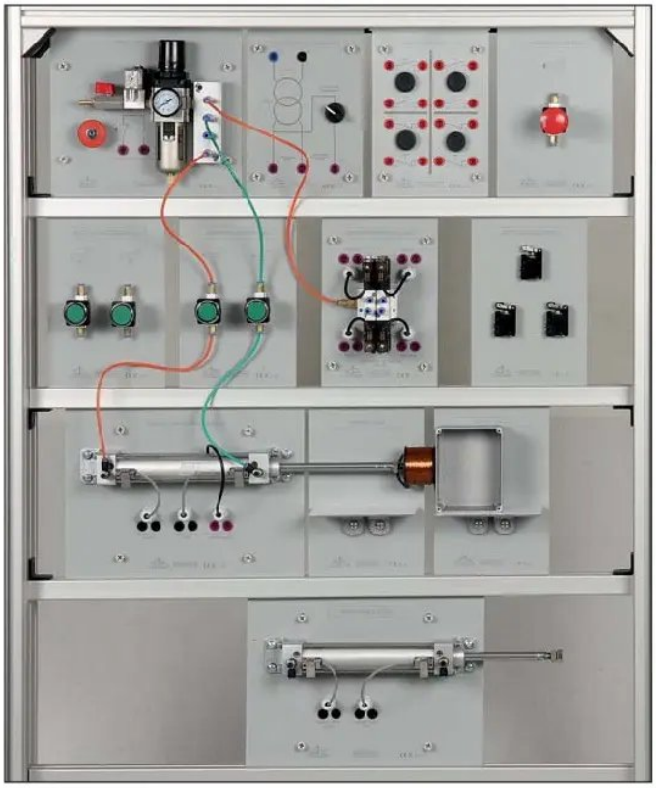
Comprises

- 1 Variable autotransformer module 0-250V AC - 5A.
- 1 Single-phase transformer module 140VA.
  Primary winding 230V, 1 secondary winding 15V/3.6A and 2 fuse-protected separate secondary windings 12V/3.6A.
- 3 Voltage digital display modules.
- 3 Current digital display modules.
- 3 Power digital display modules.
- 1 Variable rheostats module 0-22 ohms.
- 1 Variable rheostats module 0-3.3 ohms.
- 1 set of safety leads for carrying out the different practical works.
  Mains power supply 230V - 50/60Hz. 3-metre lead with plug 2P+E.

MADE TO MEASURE
CONTACT US



Study of pneumatic components



ref. QUICK-PN1

Supplied without frame - See on page 48

Sets of modules (H 250mm) for studying pneumatic automation.
Comprised of cylinders, electropneumatic distributors, pneumatic controls that can be connected via pneumatic quick-fit connectors 4mm and safety terminals Ø4mm for electrical connection at 24V.

EDUCATIONAL OBJECTIVES

- **To study the symbols used to represent pneumatic components**
- **To study the operation of a double-acting cylinder**
- **To study the operation of a double-acting cylinder with electromagnet**
- **To study the wiring of pneumatic and electropneumatic automation**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Creation of pneumatic automation diagram
- Study of the operation of a pneumatic double-acting cylinder, with pressure adjustment to optimize displacement.
- Study of the operation of a pneumatic cylinder with electromagnet.
- Study of a pneumatic and electropneumatic distributor.

Comprises

- 1 pneumatic distributor module with 4 outputs, with manometer, filter, pressure regulator, coil 24VAC and emergency stop. Quick-fit connections for hose 4mm.
- 1 safety transformer module 220VAC/24VAC with on/off switch for electromagnet power supply.
- 1 pneumatic emergency stop module with quick-fit connections for hose 4mm.
- 2 modules of 2 pneumatic pushbuttons with quick-fit connections for hose 4mm.
- 1 module of 3 pneumatic limit switches with quick-fit connections for hose 4mm.
- 1 module of 2 electropneumatic distributors 5/2. Coils 24VAC with quick-fit connections for hose 4mm
- 2 part support modules with 1 metal box.
- 1 pneumatic double-acting cylinder module. With quick-fit connections with pressure variation for hose 4mm. 2 Position detectors.
- 1 pneumatic double-acting cylinder module. With quick-fit connections with pressure variation for hose 4mm. 2 Position detectors and one electromagnet 24VAC.



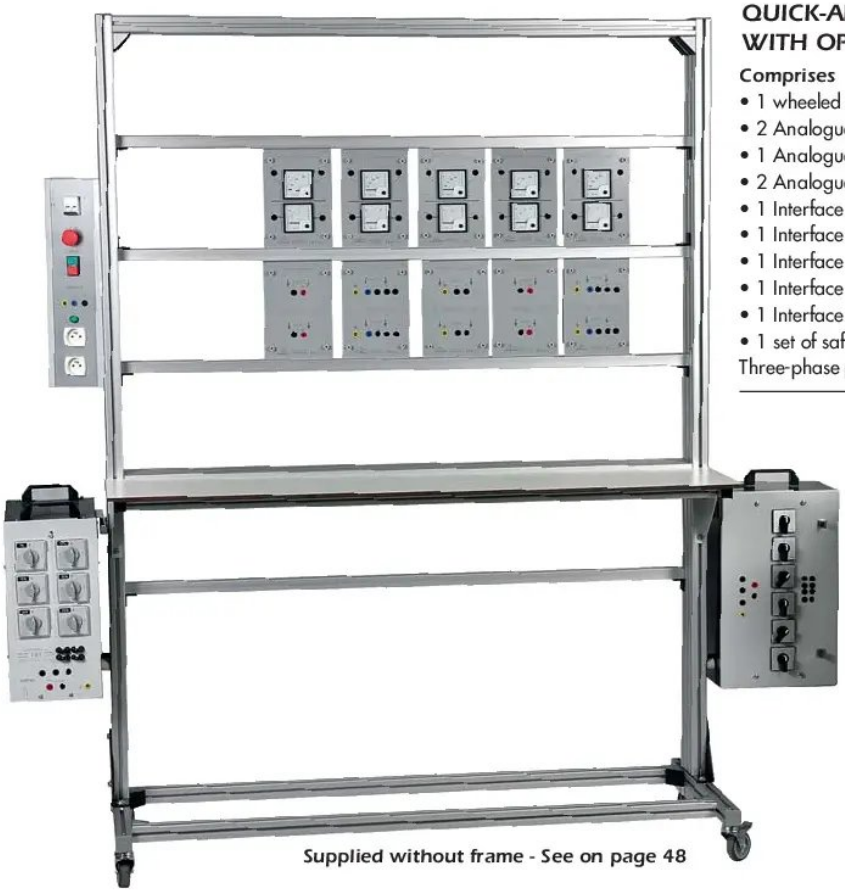
COMPRESSOR OPTION

Four oil-free cylinders compress clean air into a tank which maintains a stable steady pressure. Each cylinder has a filter. A regulator and pressure gauge enable service pressure adjustments from a few tenths of a bar to the maximum tank pressure.
The latter can be selected between two values: 4 bars with motor shutdown by pressure switch or 6 bars in continuous operation.
The compressor has thermal protection. Very low sound nuisance.

- Flow rate: 70 l/min
- Connection: 4mm
- Pressure adjustable from 0 to 6 bars
- Tank volume: 4 litres
- Power: 180W
- Sound level: 70dBA (very low sound nuisance)
- Power supply: 230V AC 50Hz
- Dimensions/Weight: 385 x 205 x 325mm / 8.4kg

ref. PRESS-35

Modular power supply system AC + DC



Supplied without frame - See on page 48

QUICK-AL40 PRESENTED ON MODULO-2 FRAME WITH OPTIONAL LOADS.

Comprises

- 1 wheeled cabinet (see description page 117)
- 2 Analogue voltmeter 450V and ammeter 20A modules.
- 1 Analogue voltmeter 450V and ammeter 10A module
- 2 Analogue voltmeter 300V and ammeter 2.5A modules.
- 1 Interface module, 4mm safety terminals for MAIN THREE-PHASE output.
- 1 Interface module, 4mm safety terminals for MAIN DC output.
- 1 Interface module, 4mm safety terminals for AUXILIARY SINGLE-PHASE output.
- 1 Interface module, 4mm safety terminals for AUXILIARY DC output.
- 1 Interface module, 4mm safety terminals for MAINS THREE-PHASE output.
- 1 set of safety leads for making connections.

Three-phase power supply 3 x 400V + N. Mains lead, 3 metres.



QUICK-AL40 is a set of modules combined with a power supply on wheels, for using several voltage sources AC/DC, fixed or variable.
Operates with a resistive load (optional) and a capacitive load (optional) with permanent power 4000VA.

ref. QUICK-AL40

Description of the cabinet

Wheeled cabinet equipped with magneto-thermal and RC circuit-breakers for safely distributing the different sources of power supply.

- **Emergency stop and main start/stop button**
- **Main three-phase: 0–450V AC, 8A**
  Can be varied by autotransformer on the side of the cabinet and protected against overloads and short-circuits. The proposed voltage is 0-450V between phases.
  A thermal magnetic circuit-breaker protects this output. A contactor with control button ensures Start/Stop switching, provided that the autotransformer is at 0 voltage.
  An indicator signals powering up.
- **Main DC voltage: 0-270V DC, 16A**
  0-270V variable, by autotransformer, with isolating transformer, to standard NFC 61558;
  the set is protected against overloads and short-circuits.
  Rectification is generously oversized (ripple factor 4%).
  Thermal magnetic circuit-breakers protect the motor. A contactor with control button ensures Start/Stop switching, provided that the autotransformer is at 0 voltage.
  An indicator signals powering up.
- **Auxiliary single-phase voltage: 0–250VAC 2.5A**
  0-250V variable, by single-phase autotransformer protected against overloads and short-circuits. A button provides Start/Stop switching. An indicator signals powering up.
- **Auxiliary DC voltage: 0-250VDC / 2,5A**
  0-250V variable, by single-phase autotransformer with isolating transformer, to standard NFC61558; the set is protected against overloads and short-circuits.
  A button provides Start/Stop switching. An indicator signals powering up. Double alternating rectification, with ripple factor varying with the load.
- **Mains three-phase 3 x 400V AC**
  Protected by circuit-breaker. A contactor with control button provides Start/Stop switching. An in-dicator signals powering up.
- **Mains outlets 230V AC – 2P+E**
  Protected by circuit-breaker. An indicator signals powering up.

Options compatible with MODULO frames



SCREEN/KEYBOARD SUPPORT

- Screen support arm
- 3 rotation points on 2 ball joints
- Supports one screen up to 12kg
- With shelf for keyboard and mouse

ref. QUICK-ECRAN

CAPACITIVE LOAD

- Adjustable from 0 to nominal power
- 6 switches
- Jumpers for coupling
- Power 0.5 or 2 or 4kVAR

ref. QUICK-CH05 (0.5kVAR)

ref. QUICK-CH20 (2kVAR)

ref. QUICK-CH40 (4kVAR)



The loads are designed to be easily removed from the frame.





CENTRAL UNIT SUPPORT

- Wire mesh 45x45mm
- Cabling space to rear
- Epoxy paint
- Dimensions: 400x400x195mm

ref. QUICK-UC

RESISTIVE LOAD

- Adjustable from 0 to nominal power
- 6 switches
- Jumpers for coupling
- Power 0.5 or 2 or 4kW

ref. QUICK-RHP05 (0.5kW)

ref. QUICK-RHP20 (2kW)

ref. QUICK-RHP40 (4kW)



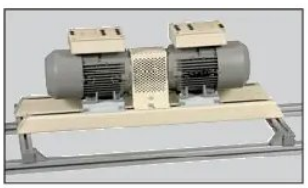
WIRING GRID

Equipped with:

- 1 Omega rail 300mm
- 1 set of 20 terminals 6mm²
- 1 box equipped with 20 safety terminals Ø4mm
- Dimensions 500x350mm

The grid can be removed instantly without tools.

ref. QUICK-GRIL



GUIDE RAILS

- Rails for rotating machines.
- The distance between the rails can be adjusted from 70 to 380mm
- Dimension: Length 900mm

Supplied with sliding nuts.

ref. QUICK-RGA





STORAGE CABINET FOR MODULES

Takes at least 80 modules.

dim 900 x 1800 x 450mm

ref. HB58 (supplied dismantled)

KITS & COMPONENTS

Kits for housing units

PAGES 67 - 75





Components for housing units

PAGES 76 - 79





Components & industrial kits

PAGES 80 - 86





Kits of electrical equipment & conduits for surface-mounting

These kits are made up of electrical equipment, rigid tubes, flexible conduits, cabletray, for students to produce surface-mounted electrical installations.The kits are delivered without cables or electrical conductors.

Ref.		KI-ZDP1	KI-ZDP2
Landmark	Designation	Qty	Qty
A	13-module modular panel, 1 sealed row	1	1
B	branch box 105 x 105 x 35mm	2	2
C	surface-mounting pushbuttons	4	2
D	socket outlets 230V 2P+E for surface mounting	4	2
E	metre of rigid tube, diameter 16 mm	15	6
F	metre of rigid tube, diameter 32 mm	15	6
G	sleeve for rigid tube, dia: 16mm	15	5
H	elbow for rigid tube, dia: 16mm	15	5
I	Ts for rigid tube, dia: 16mm	10	4
J	sleeve for rigid tube, dia: 32mm	15	5
K	elbow for rigid tube, dia: 32mm	15	5
L	Ts for rigid tube, dia: 32mm	10	4
M	box of 100 ties for rigid tubes 16/32mm	1	1
O	box of Instacable 100 ties for rigid tubes 16/32mm	1	1
P	DCL pack, complete surface-mounting fitting + B22 socket	2	-
Q	50-metre reel of flexible conduit, dia. 32 mm	1	1
R	Bulkhead lights without lugs for E27 lamp 60W max.	4	2
S	metre of Isofil cable tray 50 x 100 mm	6	3
T	fixing bracket for Isofil cable tray	15	5



Wiring kits for housing units



BASIC KIT

ref. KX-A2

- 4 two-way switches
- 2 push-buttons
- 2 16A circuit breakers
- 1 32A circuit breaker
- 1 analogue timer switch
- 2 cable outputs
- 1 230V remote control switch
- 1 wall-mounted spotlight
- 2 viewing ports + lamps
- 1 fluorescent tube
- 1 one-way switch
- 1 double push-button
- 1 20A circuit breaker
- 1 timer (1 to 7 mins)
- 6 sockets
- 2 10A thermal magnetic circuit breakers
- 1 distribution box
- 1 ceiling light
- 1 built-in 12V spotlight
- 1 wall fitting + lamp
- 5 branch boxes with connections
- 1 residual current switch - A class - 40A bipolar - 30mA
- 1 residual current switch - AC class - 25A bipolar - 30mA
- 100 meters of 20mm protective, insulating, pliable sheathing
- 100 meters of cable 1.5mm² Red / blue / green-yellow / purple
- 100 meters of cable 2.5mm² Red / blue / green-yellow
- 10 meters of cable 3 x 6mm²
- 20 boxes of flush fittings for hollow wall (16Ø65; 4Ø40)
- 1 10m nylon needle.
- 2.5m of raceway + end fitting + partition + connection
- Detailed assembly instructions with diagrams.



LIVING ROOM

ref. KX-B

- 1 TV socket
- 1 push-button
- 10m TV cable
- 10m phone cable
- 1 telephone socket
- 1 set of door bell
- 1 2A thermal magnetic circuit breaker



CMV WIRING

ref. KX-C

- 1 220V controlled mechanical ventilation (CMV) unit
- 2 80mm diameter suction slots
- 1 2-position switch
- 6 metres of 80mm-diameter PVC sheathing
- 1 2A thermal magnetic circuit breaker
- 1 Ø65 box to be flush-fitted



DOOR OPENER

ref. KX-H

- 1 electric door opener to be flush-fitted
- 1 bell transformer
- 1 1P+N / 2 C trip circuit breaker
- 1 push-button
- 1 box of flush fittings for hollow wall

Electrical wiring kit for an apartment with a surface area around 35m²



All electrical components in this kit are flush mounted.

ref. KX-T

- 1 modular table with 2 rows of 13 modules
- 1 40A-30mA class A double pole differential circuit breaker
- 1 40A-30mA class AC double pole differential circuit breaker
- 2 1P+N 2A – C circuit breakers
- 1 1P+N 10A – C circuit breaker
- 4 1P+N 16A –C circuit breakers
- 4 1P+N 20A – C circuit breakers
- 1 1P+N 32A – C circuit breaker
- 1 230V remote control switch
- 1 contactor for off-peak hours
- 1 FIPO Timer for the convectors pilot wire
- 1 multi-function timer with switch off warning
- 3 switches
- 2 double two-way switches
- 3 cable outputs
- 3 push-buttons
- 6 16A 2P+E sockets
- 2 500W convectors
- 5 visible DCL packs + B22 sockets + bulbs
- 3m of raceway with connections
- 22 equipment boxes for dry partitions
- 7 100m coils of 1.5mm² rigid cable in blue, red, violet, green yellow, and in blue, red, green yellow for 2.5mm² rigid cable.
- 7 branch boxes
- 1 needle
- 1 100m coil of 20mm corrugated tube
- Supplied with wiring diagram & instructions.

Video kit for electrical door opener



ref. KX-M

- 1 IP54 protruding external entry phone terminal
- 1 internal black and white video entry phone
- 1 modular power transformer
- 1 2A thermal magnetic circuit breaker
- 1 13-module PVC unit
- 1 branch box
- 1 10m Nylon needle
- 100m of 16mm-diametre ICO sheathing
- 20m of multi-pair cable

This kit requires a 24V AC electric door opener.
You will find this electric door opener in the KX-H kit.

Audio kit for electrical door opener



ref. KX-L

- 1 IP54 protruding external entry phone terminal
- 1 internal entry phone
- 1 modular power transformer
- 1 2A thermal magnetic circuit breaker
- 1 8-module PVC box
- 1 branch box
- 1 10m Nylon needle
- 100m of 16mm-diametre ICO sheathing
- 25m of multi-pair cable

This kit requires a 24V AC electric door opener.
You will find this electric door opener in the KX-H kit.

Heating power management kit



ref. KX-R

- 1 power controller
  - weekly programming of 8 heating areas with pilot wire
  - adjustment to the nearest minute
  - copy/paste function for simpler programming
  - programmable absences of between 1 and 99 days
  - Optional control based on external temperature
  - Single-phase load shedding
  - Control of 2 relay outputs
  - 230V power supply
- 2 radio break contacts designed to switch off the convectors
- 1 external temperature probe
- 1 telephone transmitter associated with a telephone & an automatic switchboard unit:
  - communicates with the controller
  - voice assistance & interphone dialogue.
  - indicates the temperature of the part
  - allows the roller-blind, heating and lighting to be controlled via the telephone.
- 2 500W convectors with pilot wire
- 1 1200 x 800mm electric roller-blind
- 1 external light
- 1 modular table
- A set of circuit breakers, including a 30mA residual current unit
- Control switches for the roller-blind and lighting
- Rolls of cables, 100m of 20mm-diameter protective, pliable insulating sheathing and branch boxes, required for wiring the assembly
- Supplied with instructions & diagrams

Cut-off device + convector kit



ref. KX-D

- 2 750W wall convectors
- 2 16A thermal magnetic circuit breakers
- 1 cut-off device 2 outputs
- 3 cable outputs
- 100 meters of 20mm protective, insulating, pliable sheathing
- 100 meters of 1.5mm² cable Red / blue / green-yellow
- 1 auxiliary heater 600W
- 3 boxes to be flush-fitted Ø65
- 1 branch box

Kit for the visible wiring of a double garage with storeroom



ref. KX-S

- 36m of Ø16 and 20mm rigid insulating tube.
- 10 sleeves for Ø16 and 20mm rigid insulating tubes
- 20 elbows for Ø16 and 20mm rigid insulating tubes
- 6 T-fittings for Ø16 and 20mm rigid insulating tubes
- 100 clamps for Ø16 and 20mm rigid insulating tubes
- 100 pins for the clamps
- 1 sealed modular table
- 1 row of 13 modules
- 1 40A-30mA class A double pole differential circuit breaker
- 2 1P+N 10A – C circuit breakers
- 1 1P+N 16A –C circuit breaker
- 2 1P+N 20A – C circuit breakers
- 1 dusk-to-dawn switch
- 1 230V remote control switch
- 1 multi-function timer with switch off warning
- 2 surface-mounted two-way switches
- 1 surface-mounted double two-way switch
- 6 surface-mounted push-buttons
- 7 surface mounted 16A 2P+E sockets
- 3 36W fluorescent tubes
- 2 60W-E27 viewing ports
- 2 500W convectors
- 2 visible DCL packs + B22 sockets
- 2m of raceway
- 6 branch boxes
- 7 100m coils of 1.5mm² rigid cable in blue, red, violet, green yellow, and in blue, red, green yellow for 2.5mm² rigid cable.
- supplied with wiring diagram and instructions.

All electrical components in this kit are surface mounted and facing out.

Code access control kit



ref. KX-P

- 1 protruding case into which the code is programmed directly via the keypad. Relay outputs
- 1 power supply
- 1 electric door opener
- 1 2A thermal magnetic circuit breaker
- 1 8-module PVC box / 1 branch box / 1 10m Nylon needle
- 20m of multi-pair conductor
- 100m of 16mm-diametre ICO sheathing

Video surveillance + 500Gb recorder kit



ref. KX-VID17

- Digital color video recorder with 4 channels, 500GB SATA HDD, H264 compression, 4 alarm inputs and 1 relay output, integrated Ethernet card for your network connection.
- 17" TFT LCD with BNC connection
- 4 color cameras with CCD 1/3". 18 Infrared LEDs for night vision integrated, high degree of protection IP68 for indoor and outdoor use, equipped with a protective visor and an adjustable mounting foot.
- 4 220/240V power supply - 12VDC for camera
- 4 cables of 20 meters for connecting the cameras to the recorder
- 100 meters of 16mm duct ICA
- 1 nylon needle (10 meters)
- Detailed technical instructions

New concept Quick-Elec

See Pages 47 to 66







Anti intrusion alarm kit



ref. KX-K

- 1 230V alarm unit
- 1 coded lock
- 2 IR motion sensors
- 1 alarm contact under entrance mat
- 2 sets of magnetic contacts for doors and windows
- 1 flashing light 12V
- 1 siren 12V
- 1 spare battery
- 1 8-module box
- 1 set of blanking pieces
- 1 nylon needle 10m
- 1 2A medium voltage circuit breaker
- 50m of reinforced cable 5x0.6mm²
- 100m of 16mm protective, pliable insulating sheathing
- 2m of raceway
- Assembly instructions

Anti intrusion alarm kit



ref. KX-KFIL

- 1 2-area wired unit, 4 loops with control keypad, built-in siren & phone transmitter
- 1 wired keypad with vocal code for the control of the intruder protection
- 1 infrared sensor detecting the changes in infrared radiation produced by body movement in a detection area of 90°
- 1 dual-technology with infrared detection analyzing the change of infrared radiation emitted during a movement, and hyper frequency detection analyzing the movement speed of a person.
- 1 opening universal contact, protected, white
- 1 internal siren
- 1 optical smoke sensor (built-in buzzer)
- 50m of wire
- 100m of 16mm protective, pliable insulating sheathing
- 1 10m nylon needle
- Supplied with detailed manufacturer's instructions

Wireless anti-intrusion alarm kit



ref. KX-KSF2

- 1 radio unit fitted with a siren which can be disabled. 4 programmable tones (intrusion, fire, technical and emergency).
- 1 radio keypad for receiving information and remote control, with LCD display: activation and deactivation.
  Fully on and partially on. 3 access codes: 1 master, 2 users. Log of the last 200 events. Information about the system status: activated and deactivated, open doors, etc. Siren test. System configuration. Allocation of sensors to partially on.
- 1 infrared sensor. 12m range (90°)
- 1 dual technology intrusion sensor: infrared + microwave frequency 12m range (90°).
- 2 break contacts for protecting access points (doors and windows, etc.)
- 1 optical smoke detector (Integrated buzzer)
- 1 telephone transmitter, which is associated with a telephone and an automatic switchboard unit, carries out all the alarm transmission and reception functions. Voice assistance and interphone dialogue. 4 programmable telephone numbers. Message which can be personalised. Built-in keypad for activating and deactivating monitoring and for programming telephone numbers.
- 2 radio remote controls. 4 keys. A range of 100m to 300m.

All components are fitted with alkaline batteries ensuring an autonomy of several years. Supplied with detailed manufacturer's instructions.

Fire door management kit - DAD

ref. KX-G



- 1 fire central alarm DAD
- 1 automatic smoke detector
- 2 manual triggers
- 1 illuminated evacuation unit
- 1 magnetic vacuum 12V/24V
- 1 aerosol spray for the smoke detector test
- 1 thermal magnetic circuit breaker
- 100m of 16mm-diametre ICO sheathing
- 30m of MXE cable
- 100m of cable 3x 0.75mm²
- 2m of electrical distribution raceway
- 1 branch box
- Assembly instructions

New concept Quick-Elec
See Pages 47 to 66



Emergency lighting units control kit

ref. KX-41



KX-41 is an emergency lighting unit control kit with two operating methods: addressable, self-contained or powered from a central source 48V DC.

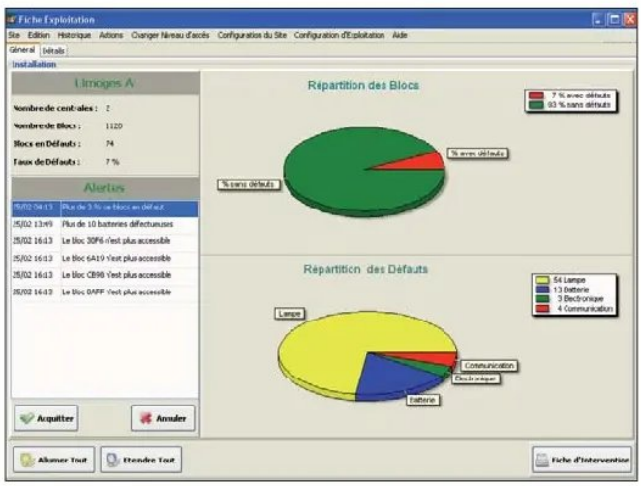
Components for operating from a central source 48V DC:

- 2 LED 'EVACUATION' lighting units
- 2 LED 'MOOD' lighting units
- 1 modular remote control for switching lighting units on and off
- 1 switching unit controlling the 'MOOD' lighting units
- 1 central power source 48V DC/160W, equipped with sealed batteries, 4 fuse outputs, digital display

of operating voltage, drain current, mains presence indicator lights, battery operation, battery charging and faults.

Components for operating self-contained units:

- 1 addressable, LED 'MOOD' self-contained emergency lighting unit (SELU), with information transfer to PC.
- 1 addressable, LED 'EVACUATION' self-contained emergency lighting unit (SELU), with information transfer to PC.
- 1 addressable, 'TWO-FUNCTION' LED self-contained emergency lighting unit (SELU), with information transfer to PC.
- 1 modular BTI URAVISION interface for ETHERNET linking between the SELU network and computer
- 1 SELU monitoring program with faulty units reported to PC screen



Home VDI Kit with Communication Unit



ref. KX-U

All components for the GRADE 3 wiring of a home VDI (voice, data, image) system.
Satisfies new multimedia requirements for the home Based on the implementation of a star-wired wire network, and which carries computer, TV/SAT and telephone signals.
The RJ45 sockets, wired directly into the VDI unit, become universal.
They can receive any of the 3 desired signals: Voice (telephone) Data (Computer) Image (terrestrial TV)
Wiring possible with partial or complete unbundling.

- 1 communication unit with patch, GRADE3
- 1 internal termination device (DTI connexion box)
- 1 telephone distributor
- 1 kit to fasten equipment on the grid
- 1 modular Terrestrial/ satellite TV distributor
- 1 modular broadband filter
- 1 set of GRADE3 RJ45 leads in 50cm and 3m lengths
- 1 set of RJ11/RJ45 telephone leads and RJ45/Type 'F' TV leads
- 10 RJ45 wall sockets GRADE3
- 2 TV/SAT wall sockets
- 1 ETHERNET switch 5 ports
- 25 metres of 75 Ohms TV /SAT co-axial cable
- 50 metres of cable 4 pairs GRADE3 900MHz
- 1 set of equipment flush fittings for dry partitions.
- 1 100m coil of Ø20mm corrugated sheath

Computer wiring kit

- 4 230V inverter system sockets
- 4 ISDN RJ45 connectors
- 2 16A circuit breakers
- 1 mini switch
- 1 telephone socket
- 1 PVC box
- 1 UDI mosaic distributor
- 9 boxes of flush fittings
- 2 branch boxes
- 1 10m nylon needle
- 2 metres of raceway
- 4 red plastic polarising slots
- Assembly instructions
- 40m of multi-pair computer cable
- 10m of multi-pair telephone cable
- 100m of 20mm protective, pliable insulating sheathing
- 100m of cable 2.5mm² Red / blue / green-yellow
- 5 RJ45 leads (1.5m)



ref. KX-F

KNX bus study devices kit

NEW

This kit is a set of devices for studying and putting into service SCHNEIDER® and HAGER® multibrand KNX products.
The KNX devices offered are the most commonly used ones in the "intelligent home" domain.
The ETS Lite configuring software (20 participants max.) is supplied. Kit ready for installation in a modular panel (electrical protection to be provided).



ref. KI-KNX

The kit comprises

- 1 30V power supply for the bus.
- 1 USB interface for programming from a PC.
- 2 4-key pushbuttons with indicator light (1 per make).
- 1 2-key pushbutton with indicator light.
- 1 presence detector.
- 1 4-output switch actuator.
- 1 2-output switch actuator.
- 1 2-output control actuator.
- 1 1-output control actuator.
- 1 2-output roller blind actuator.
- 4 Bulkhead lights 60W – 230VAC.
- ETS Lite configuration software.

Receiver equipment

These components of buildings are wired into small boxes and connected to safety terminals to be used with safety test leads.
Features are indicated on each box, with a no-deteriorating hardwearing engraving.



Single-phase bell.
24V-50Hz
Dim. 130 x 80 x 85mm.

ref. CIA-DIV17



Single-phase transformer
230V-24VAC.
120VA
Dim. 125 x 125 x 100mm.

ref. CIA-T24



ref. CHT-P4

2P + E socket 16A/250V-AC.
Dim. 150 x 73 x 57mm.



ref. CHT-FLUO

Striplight + fluorescent tube 230VAC-18W.
Dim. 660 x 50mm.



Radio receiver for lighting control. A switch can be connected for local lighting control. 230V-100W contact on compact fluo lamps or 300W contact on incandescent lamps. Power supply 230V-AC-Ph+N.
Dim 130 x 80 x 85mm.

ref. CHT-REC

Requires transmitter (Ref. CIA-EM - Page 56).



Radio receiver for roller shutter control.
A roller shutter control can be connected for local up and down control.
Contact 230V-1AMax
Power supply 230V-AC-Ph+N
Dim 130 x 80 x 85mm.

ref. CHT-REVO



ref. CHT-SP24

Spotlight 12V- base GU5.3 with transformer 230V/12V-AC
Dim. 250 x 80 x 85mm.



ref. CHT-SP

LED spotlight 230VAC base GU10
Dim. 180 x 80 x 85mm.



ref. CHT-VE27

60W wall light. E27 bulb.
Dim. 170 x 115 x 100mm.



ref. CHT-V10

Mobile heater on feet, with power 2000W. Equipped with safety terminals for mains supply. 230V-50/60Hz.
Dim 660 x 440 x 115mm.



ref. CHT-VOLET

Mobile roller shutter on feet 230VAC with up and down stop adjustments.
Dim 1200 x 500mm.



ref. CHT-V5
White light 230VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

ref. CHT-V54
White light 24VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

ref. CHT-V6
Red light 230VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

ref. CHT-V64
Red light 24VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

ref. CHT-V7
Green light 230VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

ref. CHT-V74
Green light 24VAC – Lamp 5W – Dim. 150 x 73 x 57mm.

Production equipment (settings & controls accessible whitout opening the boxes)

These components of buildings are wired into small boxes and connected to safety terminals to be used with safety test leads.
Features are indicated on each box, with a no-deteriorating hardwearing engraving.

Ref	Characteristics	Terminals	Dimensions
CIA-DB500	Connection circuit breaker DB90 – 2 poles - 45 A – with differential 500 mA - 250 V 50 Hz AC	6	280x190x135mm
CIA-DB90T	Connection circuit breaker DB90 – 4 poles - 30 A – with differential 500 mA - 250 V 50 Hz AC	9	280x190x135mm
CIA-ID64	Instantaneaous residual current circuit protection switch 25A - 30mA Classe AC	4	125x125x100mm
CIA-ID65	Instantaneaous residual current circuit protection switch 40A - 30mA Classe AC	4	125x125x100mm
CIA-ID66	Instantaneaous residual current circuit protection switch 40A - 30mA Classe A	4	125x125x100mm
CIA-ID67	Instantaneaous residual current circuit protection switch 63A - 30mA Classe A	4	125x125x100mm
CIA-MT46	Modular circuit breaker Multi 9 Déclic 1 pole + E, 2 A curve C	4	130x80x85mm
CIA-MT47	Modular circuit breaker Multi 9 Déclic 1 pole + E, 10 A curve C	4	130x80x85mm
CIA-MT48	Modular circuit breaker Multi 9 Déclic 1 pole + E, 16 A curve C	4	130x80x85mm
CIA-MT49	Modular circuit breaker Multi 9 Déclic 1 pole + E, 20 A curve C	4	130x80x85mm
CIA-MT50	Modular circuit breaker Multi 9 Déclic 1 pole + E, 25 A curve C	4	130x80x85mm
CIA-MT51	Modular circuit breaker Multi 9 Déclic 1 pole + E, 32 A curve C	4	130x80x85mm



ref. CIA-DB500



ref. CIA-ID66



ref. CIA-MT49

Control equipment

Ref.	Characteristics	Terminals	Dimensions
CHT-B3	Push button 10A/250V-AC	2	150x73x57mm
CHT-B4	Double push button 10A/250V-AC	3	150x73x57mm
CHT-C1	2 way switch 10A/250V-AC	3	150x73x57mm
CHT-S2	Simple switch 10A/250V-AC	2	150x73x57mm
CHT-S3	Double switch 10A/250V-AC	3	150x73x57mm
CHT-R5	Control for roller shutter Up - Down 10A/250V-AC	3	150x73x57mm
CHT-EM	Radio transmitter for lighting or roller shutter control. For changing the mechanical action of a switch to radio waves. Very simple setting. Powered by integral button battery. Requires radio receiver (see CHT-REVO page 55).	6	130x80x85mm


ref. CHT-B3


ref. CHT-S3


ref. CHT-R5


ref. CHT-S2

Management equipment (settings & controls accessible whitout opening the boxes)

These components of buildings are wired into small boxes and connected to safety terminals to be used with safety test leads.
Features are indicated on each box, with a no-deteriorating hardwearing engraving.

Ref	Characteristics	Terminals	Dimensions
CIA-DIV5	**Dusk switch with photocell.** Power supply 230 V - 50/60 Hz. Two-way contact 10 A – 230 V AC. Sensitivity adjustment on front.	5	125x125x100mm
CIA-DIV6	**'Stairwell' timer 230 V - 50/60 Hz.** Timing adjustable from 0.5 to 10 min on front. Manual forced operation contact. Output on contact 250 V AC – 16 A at cos φ=1	4	130x80x85mm
CIA-DIV7	**Single pole remote control switch.** Coil 24 V - 50/60 Hz. Forced operation button on front. Contact 10 A – 230 V AC.	4	130x80x85mm
CIA-DIV72	**Single pole remote control switch.** Coil 230 V - 50/60 Hz. Forced operation button on front. Contact 10 A – 230 V AC.	4	130x80x85mm
CIA-DIV8	**Time switch.** Time period adjustment on front. Coil power supply 230 V - 50/60 Hz. Contact 16 A – 230 V AC.	4	130x80x85mm
CIA-DIV9	**Single phase consumption indicator.** For showing the number of kilowatt-hours consumed by part of an electrical installation and especially intended for heating and hot water circuits. Digital display and adjustment button on front. Power supply 230 V – 50 Hz. Nominal I from 2 A to 30 A resistive. Electrical energy supplier remote data bus input. Dry contact input HP/HC	8	125x125x100mm
CIA-DIV10	**Single phase circuit contactor/load shedder.** Integral core. 230V-50/60Hz. 2 channels. Load sheds or picks up 2 non-priority circuits in cascade. Forced load shedding input. Thresholds 5-10-15-25-30-40-45-50-60-70-75-90A. Load shedding signalled by LED. Imax: 30 A	9	280x190x135mm
CIA-DIV11	**Contactor peak time with manual control.** 2 Contacts - 40A - 230VAC	6	125x125x100mm
CIA-DIV12	**Single-Phase 2-pole contactor** 16A. 230V coil.	6	130 x 80 x 85mm


ref. CIA-DIV10


ref. CIA-DIV5


ref. CIA-DIV9


ref. CIA-DIV72


ref. CIA-DIV6


ref. CIA-DIV8


ref. CIA-DIV12

Living area wiring kit



Wiring kit for the main electrical equipment, type HOUSING in units, to complete an electrical installation similar to a 35m² apartment.
Each module has 4mm dual chamber safety terminals for the various connections.
The kit is supplied with the wiring and architectural diagrams as well as instructions for the various components.
Your kit can be customised upon request. Please contact us.

ref. KT-2

The kit comprises

- 1 DB90 connection circuit breaker unit with 500mA residual current type
- 1 25A class AC two-pole 30mA residual current circuit breaker unit
- 1 40A class A two-pole 30mA residual current circuit breaker unit
- 1 2A C curve thermal magnetic circuit breaker unit
- 2 10A C curve thermal magnetic circuit breaker units
- 5 20A C curve thermal magnetic circuit breaker units
- 1 32A C curve thermal magnetic circuit breaker unit
- 1 230V single pole remote control switch unit
- 1 2000W staircase timer unit
- 1 2F manually controlled Off-peak contactor unit
- 5 viewing ports with 60W E27 Bulbs
- 2 230V colourless indicator lights
- 2 230V red indicator lights
- 1 movable convector on a stand with a power of 2000W- 230V
- 1 manual control unit for roller blinds
- 2 single switch units
- 2 two-way switch units
- 3 push button units
- 5 2P+E – 230V socket units
- 1 Set of safety leads in several colours and lengths to wire all components

Wiring kit to start an asynchronous motor



Wiring kit for industrial electrical equipment in housings to start-up a 300W asynchronous motor. Various diagrams are proposed:
Direct, Star/Triangle, reversal of the direction of rotation...
Each component unit has 4mm dual chamber safety terminals for the various connections.

The Kit is supplied with diagrams and instructions for the components.
Option to complete this kit at a later date with for example, a speed controller, a starter/decelerator, etc.
Your kit can be customised upon request. Please contact us.

ref. KT-1

The kit comprises

- 1 three phase power supply unit with circuit beaker, emergency stop and On/Off
- 4 power contactor units
- 2 single-pole + neutral circuit breaker units
- 1 25A – 30mA differential four-pole switch unit
- 1 4A D curve four-pole thermal magnetic circuit breaker unit
- 2 auxiliary contactor units for a 2F+2O control circuit
- 1 auxiliary contactor unit for a 4F+3O-time O+F work control circuit
- 1 emergency stop switch/disconnector unit with 4 25A contacts
- 1 0.4 to 0.63A + 1O three-pole thermal relay unit
- 1 230V/24V single phase 120VA safety transformer unit
- 1 24V green LED indicator light unit
- 1 24V red LED indicator light unit
- 1 24V white LED indicator light unit
- 2 black push-button units with 'F+O' contact
- 1 red push-button unit with 'O' contact
- 1 emergency stop unit with 'O' contact, key override
- 1 double push-button unit with 'F+O' contact and 24V indicator light
- 1 set of safety leads in several colours and lengths to wire all components.

FAN OPTION



Protection grid removed for photo purposes only

ref. KT-1M

The KT-1 kit can be completed by a fan.

- 300W 400/690V three-phase fan.
- Rated speed 1500 rpm
- Power supply through 4mm dual chamber safety terminals

Source switching kit



ref. KI-COMS

Despite the 125A current supported by the reversing switch, and in order to prevent damage to the attached components (terminals and fuse holders, etc), the charging current must not exceed 16A.

A pedagogical manual comprising diagrams, properties and instructions relating to each component is supplied with the kit.

This industrial kit comprises a motorised source switch and control accessories used for switching from one power source to another. One of them is deemed «NORMAL» and the other "EMERGENCY». The latter is used if the former experiences an outage. The main application is to provide an uninterrupted power supply in case of mains network fail. This switch (or reverser) is often built into the low-voltage master distribution board cabinets.
Switching from the normal source to the emergency source is performed either manually (using the palm switch) or automatically (using a control module).
The control module detects the absence of the normal source and controls the switch which activates the emergency source. Lamps show the status of the switch.

COMPRISES

- 1 motorised reversing switch with three stable positions (I-0-II), in charge switching.
  Sectioning by means of fully visible power cut-off
  Electrical control of position by means of potential-free dry contacts
  - emergency manual control
  - with padlock
  - 4-pole, 125A, 400V network, 3P+N+E
- 1 automatic control module for source switch
  - DIN modular case
  - relay output for control of the reversing switch
  - display + keys on the front for programming
- 1 600 x 500mm detachable wiring grid
- 5 4-pole fuse holders
- 1 auto/manual switch
- 1 3-position switch (source1-0-emergency source)
- 3 220V lamps
- 2 plastic cases for the switches and lamps
- 1 set of connection terminals
- 1 set of HARTING® industrial connectors for connection to the control components, lamps and charge.

Asynchronous motor start-up kit



ref. KI-BASE Basic kit required

Male and female HARTING® industrial rapid connectors, with mobile covers and fixed bases, are supplied with the KIT. They are used for connections between the following:

- cabling plate
- pushbuttons
- switches
- indicator lights
- motor.

A teaching manual including diagrams, characteristics and instructions for each component is supplied with the kit. This industrial kit includes actuators and control components for studying and creating the main start-up diagrams for asynchronous motors:

- direct start-up, with or without reversal of the direction of rotation.
- star/delta start-up
- star/delta start-up with reversal of the direction of rotation

COMPOSITION

- 1 25A-400V 4-pole disconnector
- 1 two-pole fuse holder
- 2 4-pole fuse holders
- 3 25A power contactors with 24V coil
- 2 auxiliary contactors with 24V coil
- 1 unit of auxiliary contacts with timing from 1 to 30 s
- 3 units of auxiliary contacts 1 "O" + 1 "C"
- 1 4 to 6A thermal relay with support
- 1 230V/24V - 100 VA single-phase transformer for control circuit
- 1 plate, dimensions 600 x 500 mm
- 16 clip-on guides
- 1 set of 4-mm connection terminals
- 1 set of pushbuttons, emergency stop and indicator lights for controlling and viewing all operations of the wired frame.
- 1 set of HARTING industrial connectors for connecting the controls and motor from the frame.

SELECT THE CONTROLLER AND STARTER KITS TO BE COMBINED WITH YOUR BASIC KIT

SCHNEIDER® ATV312 CONTROLLER + STARTER



This addition to the KI-BASE kit includes:
- 1 Schneider® Altivar ATV312 controller for 1500W rotary machines.
  Single-phase mains power supply 230V AC 50-60 Hz. 3 x 230V AC outputs.
  A potentiometer on the front enables local setting of the controller and rotation speed control
- 1 USB cable and the SoMove® software.
- 1 GV2 motor circuit-breaker.
- 1 Schneider® soft starter 3 x 400 V - 6 A.
  Adjustment of acceleration, deceleration time and couple by front potentiometer.

ref. KI-VAR1

SCHNEIDER® ATV32 CONTROLLER + STARTER



This addition to the KI-BASE kit includes:
- 1 Schneider Altivar ATV32 controller for 1500W rotary machines.
  Single-phase mains power supply 230V AC 50-60 Hz. 3 x 230V AC outputs.
- 1 graphic terminal which connects directly to the controller front. Very simple to use, it lets you program the controller easily locally. A front potentiometer enables motor rotation speed adjustment.
- 1 USB cable and the SoMove software.
- 1 GV2 motor circuit-breaker.
- 1 Schneider® soft starter 3 x 400 V - 6 A.
  Adjustment of acceleration, deceleration time and couple by front potentiometer.

ref. KI-VAR32

SIEMENS® CONTROLLER + SCHNEIDER® STARTER



This addition to the KI-BASE kit includes:
- 1 Siemens® G120 controller for 1500W rotary machines.
  Power supply 3 x 400V AC 50/60 Hz. 3 x 400V AC outputs. A potentiometer on the front enables local setting of the controller and rotation speed control
- 1 USB cable and the STARTER software.
- 1 GV2 motor circuit-breaker.
- 1 Schneider soft starter 3 x 400V - 6A.
  Adjustment of acceleration, deceleration time and couple by front potentiometer.

ref. KI-VAR3

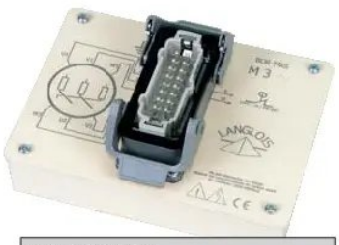
FAN OPTION AND CONNECTION INTERFACE



The KT-1 kit can be completed by a fan.
- 300W 400/690V 3-phase fan.
- Rated speed 1500 rpm
- Power supply through 4mm dual chamber safety terminals

Protection grid removed for photo purposes only

ref. KT-1M



ref. BOR-MAS

This interface plugs into the terminals of the fan motor and allows quick connection HARTING ® connector.



Bottom view

Industrial automation components (settings & controls accessible whitout opening the boxes)


ref. CIA-ORG13


ref. CIA-ORG14


ref. CIA-ORG15


ref. CIA-ORG16


ref. CIA-ORG17

CONTROL AND SIGNAL UNITS

Ref	Characteristics	Comments
CIA-ORG1	Black pushbutton with NO contact	/
CIA-ORG2	Black pushbutton with NO+NO contact	/
CIA-ORG3	Black pushbutton with NO+NC contact	/
CIA-ORG4	Red pushbutton with NC contact	/
CIA-ORG5	Trigger action emergency stop pushbutton - NC contact	Turn to release
CIA-ORG6	Trigger action emergency stop pushbutton - NC contact	Key to release
CIA-ORG7	Double headed pushbutton NO+NC	/
CIA-ORG8	ON pushbutton OFF pushbutton, 24V LED	3 units in 1 box
CIA-ORG9	Double headed pushbutton NO+NC	With pilot light 24V
CIA-ORG10	2 positions selector switch NO	0 – 1 Positions
CIA-ORG11	3 positions selector switch NO+NO	1 – 0 – 1 Positions
CIA-ORG12	3 positions selector switch NO+NC	1 – 0 – 1 Positions
CIA-ORG13	Pilot light with green LED	24V– 50 Hz
CIA-ORG14	Pilot light with red LED	24V– 50 Hz
CIA-ORG15	Pilot light with white LED	24V– 50 Hz
CIA-ORG16	Pilot light with yellow LED	24V– 50 Hz
CIA-ORG17	Pilot light with blue LED	24V– 50 Hz


ref. CIA-ORG9


ref. CIA-ORG8



ref. CIA-ORG6

F — Normally open contact NO
O — Normally closed contact NC


ref. CIA-ORG7


ref. CIA-ORG12


ref. CIA-ORG3


ref. CIA-ORG4

OPTION FOR HANGING COMPONENTS

HANGING ON RAILS.
SEE PAGE 85







These components are in plastic cases with a transparent cover.
Characteristics are engraved on the cover.
Connection is made with 4mm safety terminals.
Control circuit in red.
Main circuit or power circuit in black.

Normally open contact NO
Normally closed contact NC

POWER CONTACTOR

Ref	Type 3-pole	Current AC1	Power AC3	Auxiliary	Coil(s) voltage
CIA-C12	standard	25A	5.5kW / 400V	2 NO + 1 NC	24V–50/60Hz
CIA-C25	standard	40A	11kW / 400V	2 NO + 1 NC	24V–50/60Hz
CIA-C212	reversing	25A	5.5kW / 400V	2 NO + 2 NC	24V–50/60Hz
CIA-CT212	Star / Delta	25A	5.5kW / 400V	1NC+1NC+tempo	24V–50/60Hz

The reversing and star/delta contactor sets are mechanical locking of positions.
Other voltage upon request.


ref. CIA-C212


ref. CIA-C12

AUXILIARY CONTACT BLOCKS FOR CONTROL CIRCUITS (10A MAX)

Ref	NO Contacts	NC Contacts	Tempo delay	Coil(s) voltage
CIA-R40	4	0	NO	24V – 50/60 Hz
CIA-R31	3	1	NO	24V – 50/60 Hz
CIA-R22	2	2	NO	24V – 50/60 Hz
CIA-R42	4	2	NO	24V – 50/60 Hz
CIA-R44	4	4	NO	24V – 50/60 Hz
CIA-R62	6	2	NO	24V – 50/60 Hz
CIA-RT40	4	0	NC + NO work	24V – 50/60 Hz
CIA-RR40	4	0	NC + NO stand by	24V – 50/60 Hz
CIA-RT43	4	3	NC + NO work	24V – 50/60 Hz
CIA-RR43	4	3	NC + NO stand by	24V – 50/60 Hz

Other voltage upon request.


ref. CIA-RT40


ref. CIA-R31


ref. CIA-R22

AC THERMAL-MAGNETIC CIRCUIT BREAKERS

Ref	TYPE	Rating Current	Curve	Breaking capacity	230V/30mA residual current circuit breaker
CIA-MT36	2-pole	6A	C	6000A	YES
CIA-MT37	2-pole	10A	C	6000A	YES
CIA-MT38	2-pole	16A	C	6000A	YES
CIA-MT97	2-pole	2A	C	6000A	NO
CIA-MT99	2-pole	4A	C	6000A	NO
CIA-MTD8	2-pole	4A	D	10 000A	NO
CIA-MT20	2-pole	6A	C	6000A	NO
CIA-MT21	2-pole	10A	C	6000A	NO
CIA-MT92	2-pole	16A	C	6000A	NO
CIA-MT10	3-pole	2A	C	6000A	NO
CIA-MT12	3-pole	4A	C	6000A	NO
CIA-MTD9	3-pole	4A	D	10 000A	NO
CIA-MT13	3-pole	6A	C	6000A	NO
CIA-MTD1	4-pole	6A	C	6000A	YES
CIA-MT23	4-pole	2A	C	6000A	NO
CIA-MT25	4-pole	4A	C	6000A	NO
CIA-MTD3	4-pole	4A	D	10 000A	NO
CIA-MT27	4-pole	6A	C	6000A	NO


ref. CIA-MT92


ref. CIA-MT38


ref. CIA-MT21

Industrial automation components (settings & controls accessible whitout opening the boxes)

3-POLE THERMAL OVERLOAD RELAYS

Ref	TYPE	Relay setting range	Auxiliary
CIA-T3	Compensated	0.25 to 0.40A	1NC + 1NO
CIA-T4	Compensated	0.40 to 0.63A	1NC + 1NO
CIA-T5	Compensated	0.63 to 1A	1NC + 1NO
CIA-T6	Compensated	1 to 1.60A	1NC + 1NO
CIA-T8	Compensated	2.5 to 4A	1NC + 1NO

Other voltage upon request.


ref. CIA-T6

INSTANTANEAOUS RESIDUAL CURRENT CIRCUIT PROTECTION SWITCHES

Ref	TYPE	Rating max	Sensitivity AC	Voltage rating
CIA-ID64	2-pole	25A	30mA	240V
CIA-ID92	4-pole	25A	30mA	400V


ref. CIA-ID92

DISCONNECTING SWITCHES

Ref	TYPE	Number of poles	Rating current	Auxiliary
CIA-SE0	Emergency stop switch	3	25A	/
CIA-SE1	Emergency stop switch	4	25A	/
CIA-SE3	Emergency stop switch	4	25A	1NO


ref. CIA-SEO

SAFETY TRANSFORMERS

Ref	Power	TYPE	Primary	Secondary
CIA-T24	120VA	single-phase	230V	24V
CIA-T220	300VA	single-phase	230V	230V
CIA-TT400	250VA	3-phase	400V	3x24V



ref. CIA-T24

OTHERS COMPONENTS

Ref	Description	Comments
CIA-DIV1	Single pole + neutral fuse switch disconnector	without cartridge fuse
CIA-DIV2	3-pole + neutral fuses switch disconnector	without cartridge fuse
CIA-DIV3	bridge, single pole (4 diodes)	35A
CIA-DIV4	Diodes bridge, 3-phase (6 diodes, Graetz bridge)	50A

Other voltage upon request.


ref. CIA-DIV1


ref. CIA-DIV4

Starter & retarder



This unit starts up and decelerates squirrel-cage asynchronous, single-phase and three-phase motors smoothly with a low current.
All settings can be performed without opening the unit. These settings are: acceleration time, deceleration time and torque.
Lamps indicate the "On" and "rated speed" operating statuses.

- Supply voltage: 400V three-phase
- Control: On/Off operated using a built-in push-button.
- Acceleration adjustment: from 1.1 to 5 seconds
- Deceleration adjustment: from 0 to 5 seconds
- Torque adjustment: from 20% to 65% of the breakaway torque of the direct motor
- Maximum current: 6A

ref. DEMELEC

THERMAL-MAGNETIC CIRCUIT-BREAKERS FOR MOTOR

Ref	Control	Power rating of 3-phase motor	Setting range of thermic trip
CIA-DM3	Internal pushbutton	90W / 400V	0.25 to 0.40A
CIA-DM6	Internal pushbutton	370W / 400V	1 to 1.60A
CIA-DM8	Internal pushbutton	1200W / 400V	2.5 to 4A

Other voltage upon request.


ref. CIA-DM8

MOBILE POWER SUPPLY BOX

Ref	Type	Input power cable	Control	Outputs	Protection
CIA-A2	Single-phase	With blue socket	On/Off+emergency stop	Terminals	Circuit-breaker
CIA-A4	3-phase	With red socket	On/Off+emergency stop	Terminals	Circuit-breaker


ref. CIA-A4


ref. CIA-TR690

BENCHTOP MOTORS

Ref	Type	Voltage
CIA-MO220	Single-phase	230V
CIA-TR924	3-phase	3 x 24V
CIA-TR690	3-phase	400V / 690V

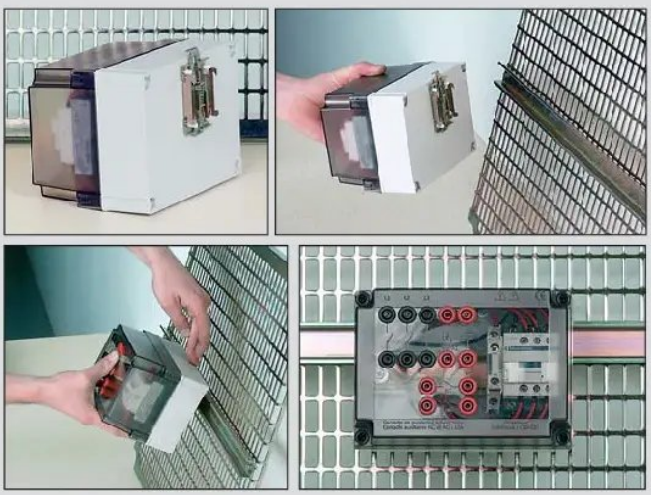
CURRENT TRANSFORMERS

A Current transformers unit delivers at the secondary a standard current proportional to the primary current (50/5 rate). Safety lead is delivered with the unit (single-phase = 1 / 3-phase = 3) but you can use your own electrical conducer.
A maximum of 10 whorls of a 2.5mm² conductor can be done through the torus.
The secondary of the current transformer is wired on 2 safety sockets 4mm.

Ref	Type	Characteristic
CIA-TIM	Single-phase	Current transformer (50/5 rate)
CIA-TIT	3-phase	Current transformer (50/5 rate)



ref. CIA-TIT



OPTION FOR HANGING ON RAILS

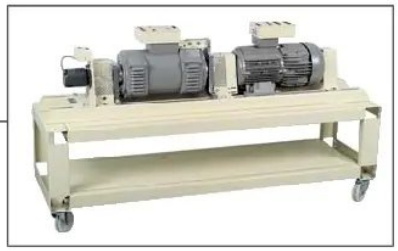
Example of industrial component (Ref. CIA-C12) with hanging option for fast attachment onto a universal rail. In this way, you can attach your various industrial components onto a grid in order to make wiring and testing easier. This option is available for all components on pages 75 to 77 and 82 to 85. To order this option, simply add –FIX to the end of the reference.

Ex : CIA-C12-FIX Plus value

MOTORS & ELECTROTECHNIC

Range 90W to 3kW

PAGES 87 - 98



Displays & Acquisition

PAGES 99 - 101



IE3 SIEMENS

High energy-efficiency motors, IE3 according to IEC 60034-30. Globally there is a choice of standards for the energy-efficiency of asynchronous motors. The international standard EC 60034-30 was devised for global uniformity. Shortly, high and premium energy-efficiency asynchronous motors will be mandatory.

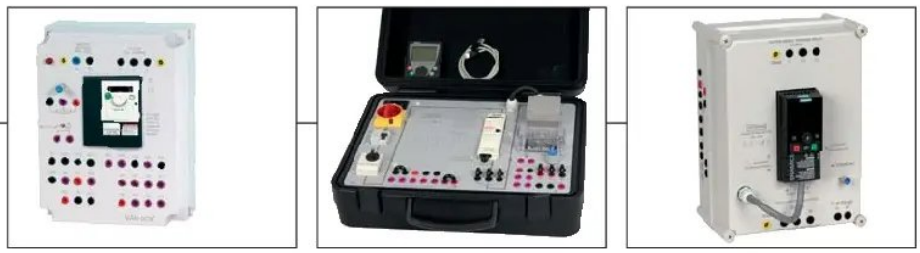
Packs of motors

PAGE 102 - 108



Converters

PAGES 109 - 113



Power supplies & Loads

PAGES 114 - 121



Plug & Play motors

PAGES 122 - 123



Rheostats, Inductances & Transformers

PAGES 124 - 131



Complete 1500rpm rotating units

Consisting of machines whose features are shown in the previous pages, these are the most commonly used units in the field of education.
300W units: supplied complete with couplings, housings and guide rails (ST10).
Each machine is equipped with a binary temperature sensor with a contact that can be inserted into a control circuit.

ROTATING UNITS 90W



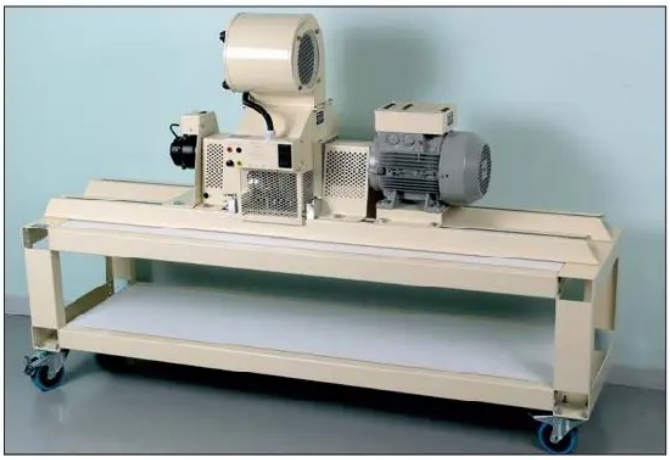
REF.		GM36-90	GM24-90
AI90-24	DC motor permanent magnet 24V	✔	
TR90-220	3-phase asynchronous cage motor 230V		✔
FR90	Powder brake	✔	✔
	Torque sensor	✔	✔
	DC tachogenerator 10V/1000rpm	✔	✔

ROTATING UNITS 300W



REF.		GM56-300	GM57-300
MAS12	3-phase squirrel cage motor	✔	✔
FP1	Powder brake	✔	✔
JA1	Static sensor	✔	
CR1	Rotary sensor		✔
DYTA1	DC tachogenerator	✔	✔
ST10	Guide rails	✔	✔

ROTATING UNITS 1500W



REF.		GM56-1500	GM57-1500
MAS22	3-phase squirrel motor	✔	✔
FP2	Powder brake	✔	✔
JA2	Static sensor	✔	
CR2	Rotary sensor		✔
DYTA2	DC Tachogenerator	✔	✔
RGC	Guide rails	✔	✔
CTC	Stand on wheels	✔	✔

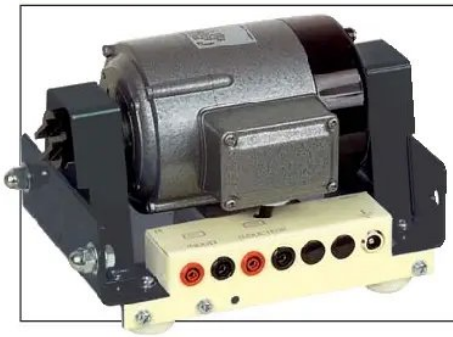
ROTATING UNITS 3000W



REF.		GM80-3000
MAS32	3-phase squirrel motor	✔
MSM30	3-phase synchronous machine	✔
CR3	Rotary sensor	✔
DYTA3	DC tachogenerator	✔
RGC	Guide rails	✔
CTC	Stand on wheels	✔

RANGE 90W - 230V & 24V rotary machines & compatible items

DC SERIES WOUND MOTOR



- Voltage : 230V
- Current : 1,2A
- Dim. 210 x 150 x 150mm

ref. SE90

DC SHUNT MOTOR SEPARATE WINDING



- Dim. 210 x 150 x 150mm
- Works as motor or generator
- Induced Voltage: 230V/0.75A
- Field excitation voltage: 230V/90mA

ref. SH90-220

- Induced Voltage: 24V/6.4A
- Field excitation voltage: 24V/0.62mA

ref. SH90-24

Built-In tachogenerator (See text box)

DC MOTOR PERMANENT MAGNET



- Dim. 210 x 150 x 150mm
- Induced Voltage: 230V/0,6A

ref. AI90-220

- Induced Voltage: 24V/5,5A

ref. AI90-24

Built-In tachogenerator (See text box)

DC GENERATOR SHUNT ON ROCKING STAND



- Dim. 210 x 150 x 150mm
- Induced Voltage: 180V/0,5A
- Field excitation voltage: 230V/90mA

ref. GE90-220

- Induced Voltage: 24V/6.4A
- Field excitation voltage: 24V/0.56mA

ref. GE90-24

Built-In tachogenerator (See text box)
Built-In Torque sensor (See text box)

compatible

DC SPEED CONTROLLERS



For 230V
ref. VAR126P



For 24V
ref. VAR24D

compatible

POWER SUPPLY FOR 230V

Adjustable between 0 and 240V DC or AC, this power with voltmeter and ammeter delivers a permanent 3A current. It is protected by a thermal magnetic circuit breaker.
Protection of the user is done by separation of circuits. Filtering is done by capacitors.



ref. ISOSEC1

compatible

TACHYMETER



TAC-90 displays in rpm the rotary speed of machines SH90, AI90, GE90 by converting the frequency of the tachogenerator into a voltage. Display 3 1/2 digits.
Analog output 0-10V 10 mA max.

ref. TAC90

compatible

DIGITAL TORQUE METER



It displays via a DIN plug, the strength of torque of generator GE90 and brake FR90.

Analog output: 0 to 10V 2mA max.

ref. GAMA96

INERTIA WHEEL

The inertia wheel VOL90 connects to all the machines and can be also inserted between two machines

- Mass of wheel 5.5kg.
- Moment of inertia = 0.011kgm2



ref. VOL90

POWER SUPPLY FOR 24V



Adjustable voltage 0 to 30V
Adjustable current 0 to 6A
Protected against overload and short circuit

ref. GPR3060D

TACHOGENERATOR BUILT-IN INTO THE SH90 & AI90 & GE90



The machines SH90, AI90 &GE90 are equipped with a tachogenerator. It's an alternating tachometer which provides a voltage & a frequency proportional to the speed of rotation.
- frequency: 200Hz at 1000rpm
- Voltage: 5VAC at 1000rpm

TORQUE SENSOR BUILT-IN INTO THE GE90 & FR90



The machines GE90 & FR90 are equipped with a torque sensor. It's an aluminium construction equipped with a strain gauge in Wheatstone bridge.
Sensitivity: 10mV/Nm Maximum stress: 1Nm
Supply: 6V DC

compatible

3-PHASE ASYNCHRONOUS SQUIRREL CAGE MOTOR

- Dim. 210 x 150 x 150mm
- Induced voltage separate windings 230-400V / 0.2-0.36A by phase
- Associated converter: VAR90R

ref. TR90-220

- Induced voltage separate windings 24-42V / 6.6A-3.8A by phase
- Associated converter: VAR24S

ref. TR90-24



compatible

SPEED CONTROLLERS

The three-phase motors can be controlled by this converter from 10 to 150% of their normal operating speed.

3 x 230V on terminals

ref. VAR90R

3 x 24V on terminals

ref. VAR24S



SINGLE-PHASE CAPACITOR MOTOR

- Dim. 210 x 150 x 150mm
- Voltage: 230V
- Current: 0.8A
- Capacitor: permanent

ref. MO90-220

- Voltage: 24V
- Current: 7.6A
- Capacitor: permanent

ref. MO90-24



compatible

POWDER BRAKE

- Break voltage: 0-10V DC
- Current: 0-60mA locking at 60mA
- Dim. 210 x 150 x 150mm)
- Built-In Torque sensor (See text box)

ref. FR90

ref. FR-DYN90

***FR-DYN90** = **FR90** but with DC tachogenerator for data acquisition* 10V/1000rpm

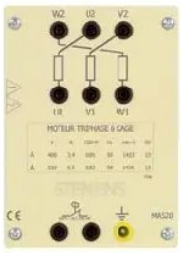


Rotary machines **300W RANGE** - 1500rpm

3-PHASE SQUIRREL CAGE INDUCTION MOTOR







This engine works as well with a speed variator as directly connected to a 3-phase supply.

REF	U (V)	I (A)	H	B	L	Weight
MAS12*	230/400V	1.5 / 0.9	90	172	235	8.2kg
MAS42*	400V/690V	0.9 / 0.5	90	172	235	8.2kg

*IE3 see the specifications Page 86

STAR/DELTA STARTER

Manual STAR/DELTA starter into a safety box

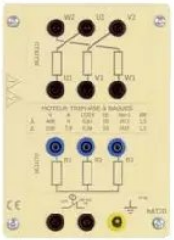
ref. CO-ET-8A



3-PHASE ASYNCHRONOUS SLIP RING INDUCTION MOTOR







REF	U (V)	I (A)	H	B	L	Weight
MAT10	230/400V	2.3/1.33	90	172	300	9kg

SAFETY STARTER RHEOSTAT

Safety starter rheostat for **low** powerful slip ring machines.

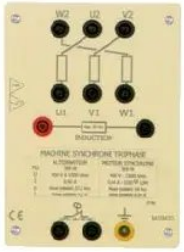
ref. RD3



Each machine is equipped with a binary temperature sensor with a contact that can be inserted into a control circuit.

3-PHASE SYNCHRONOUS MACHINE





Works as a synchronous motor and 3-phase alternator.
Equipped with LEBLANC poles for the mains network synchronization.

REF	U (V)	H	B	L	Weight
MSM10	230/400V	90	172	420	15kg

SYNCHRONOSCOPE

Safety laboratory synchronoscope
16A - 400V max.

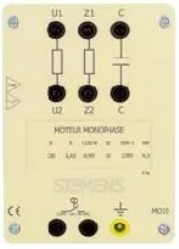
ref. CHR3



SINGLE PHASE MOTOR WITH 2 CAPACITORS







2 capacitors, 1 starting and 1 running

REF	U (V)	I (A)	H	B	L	Weight
MO10	230V	2.6A	90	172	295	9kg

SHUNT / SEPARATED DC MOTOR 220/220V



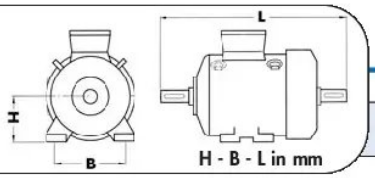




This engine works as well with a **speed variator** as directly connected to a DC supply.

REF	U (V)	I (A)	H	B	L	Weight
CC10	220/220V	2A on 230V	90	172	390	21kg

The couplings are compatible across a single power range. Coupling and fastening screws provided with each reference number.



H - B - L in mm

POLYEXCITATION (COMPOUND) MOTOR







Designed to be high-performance motor (characteristics below), this machine also works as a generator.

REF	U (V)	I (A)	H	B	L	Weight
PM10	220V	2.2A	90	172	420	26kg

STARTER RHEOSTAT

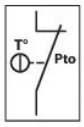
Safety starter rheostat for **low** powerful DC machines.

ref. RDC



SHUNT / SEPARATED DC GENERATOR







Designed for a didactic use.

REF	U (V)	I (A)	H	B	L	Weight
CG10	220V	1.45A	90	172	420	26kg

POLYEXCITATION (COMPOUND) GENERATOR





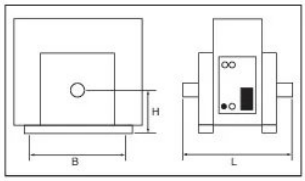


Designed to be high-performance generator (characteristics below), this machine also works as a motor.

REF	U (V)	I (A)	H	B	L	Weight
PE10	220V	1.45A	90	172	420	26kg

POWDER BRAKE





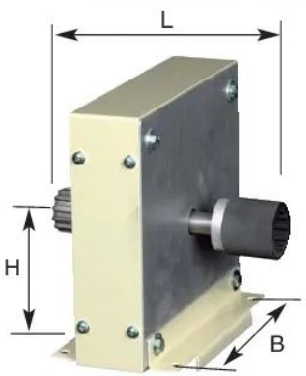
POWDER BRAKE PRINCIPLE

The DC current injected into the brake coil creates a field which causes the magnetic powder placed in the air gap to agglomerate. The braking torque is proportional to the field current alone; in particular it is independent of the speed of rotation. Waste heat is eliminated by natural ventilation. A circuit breaker cuts the field current in the event of the brake overheating.

This brake is always mounted in balance so that it can be equipped with a static sensor with a strain gauge. Additionally, **it is delivered on guide rails (Ref ST10) with housings, couplings and screws**.

Réf.	FP1
Voltage/Current max for blocking	2V / 0.1A
Max torque	35Nm
H / B / L in mm	90x172x240
Weight	18kg
Ventilation	Natural

INERTIA WHEEL FOR 300W MACHINES



This inertia wheel allows to simulate rotary machines with a high moment of inertia. Supplied with 1 coupling + 1 cover + screws.

REF	VOL1
Inertia	0,025m²kg
Weight	18kg
H	90mm
B	172mm
L	111mm

Fault finding
in asynchronous motor
See Page 214

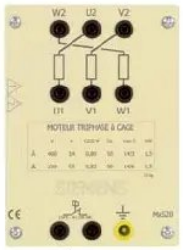


Rotary machines **1500W RANGE** - 1500rpm

3-PHASE SQUIRREL CAGE INDUCTION MOTOR







These engines work as well with a speed variator as directly connected to a 3-phase supply.

REF	U (V)	I (A)	H	B	L	Weight
MAS22*	230/400V	5.7/3.3	112	190	355	20kg
MAS52*	400V/690V	3.3/1.9	112	190	355	20kg

*IE3 see the specifications Page 86

STAR/DELTA STARTER

Manual STAR/DELTA starter into a safety box

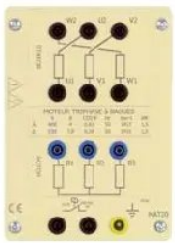
ref. CO-ET-8A



3-PHASE ASYNCHRONOUS SLIP RING INDUCTION MOTOR







REF	U (V)	I (A)	H	B	L	Weight
MAT20	230/400V	6.4 / 3.7	112	190	665	43kg
MAT20-C1	similar than MAT20 with 1024 points encoder.					

SAFETY STARTER RHEOSTAT

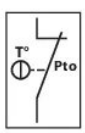
Safety starter rheostat for **high** powerful slip ring machines

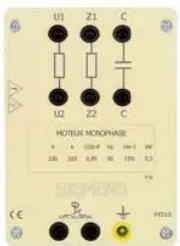
ref. REDA12



SINGLE PHASE MOTOR WITH 2 CAPACITORS







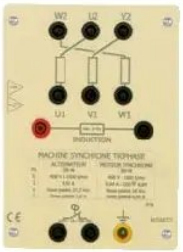
2 capacitors, 1 starting and 1 running

REF	U (V)	I (A)	H	B	L	Weight
MO20	230V	8.7A	112	190	335	19kg

3-PHASE SYNCHRONOUS MACHINE







Works as a synchronous motor and 3-phase alternator.
Equipped with LEBLANC poles for mains network synchronization.

REF	U (V)	H	B	L	Weight
MSM20	230/400V	112	190	550	48kg

SYNCHRONOSCOPE

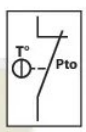
Safety laboratory synchronoscope
16A - 400V max.

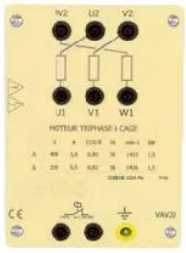
ref. CHR3



3-PHASE ASYNCHRONOUS CAGE MOTOR WITH VECTORIAL CONTROL







Fitted with a 1024 pts encoder and a forced ventilation to run at slow speed

REF	U (V)	I (A)	H	B	L	Weight
VAV20	230/400V	5.9 / 3.4	112	190	580	24kg
VAV50	400/690V	3.4 / 1.95	112	190	580	24kg

POLYEXCITATION COMPOUND DC GENERATOR



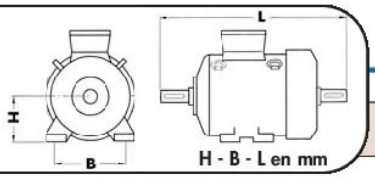




Designed to be high-performance generator (characteristics below), this machine also works as a motor.

REF	U (V)	I (A)	H	B	L	Weight
PE20	255V	6A	112	190	510	53kg

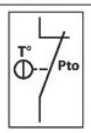
The couplings are compatible across a single power range. Coupling and fastening screws provided with each reference number.



H - B - L en mm

SHUNT / SEPARATED DC MOTOR 220/220V







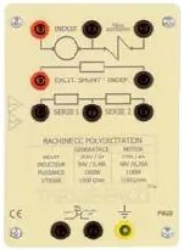
This engine works as well with a **DC speed variator** as directly connected to a **DC supply.**

REF	U (V)	I (A)	H	B	L	Weight
CC20	220/220V	9A with 230V	112	190	510	51kg

POLYEXCITATION COMPOUND DC MOTOR







Designed to be high-performance motor (characteristics below), this machine also works as a generator.

REF	U (V)	I (A)	H	B	L	Weight
PM20	220V	8.6A	90	172	420	26kg

STARTER RHEOSTAT

Safety starter rheostat for **high** powerful DC machines.

ref. REDA34



SHUNT / SEPARATED DC GENERATOR







Designed for a didactic use.

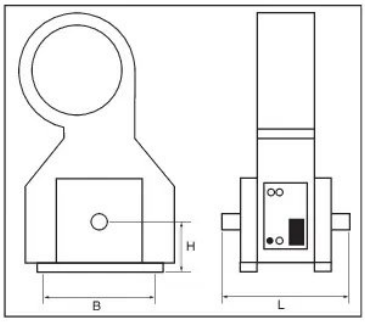
REF	U (V)	I (A)	H	B	L	Weight
CG20	240V	7A	112	190	510	53kg



Each machine is equipped with a binary temperature sensor with a contact that can be inserted into a control circuit.

POWDER BRAKE





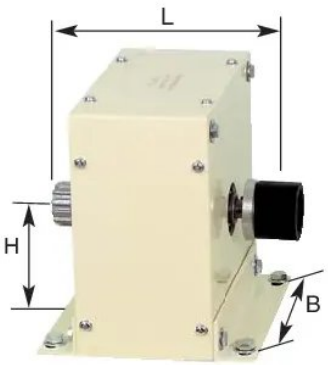
POWDER BRAKE PRINCIPLE

The DC current injected into the brake coil creates a field which causes the magnetic powder placed in the air gap to agglomerate. The braking torque is proportional to the field current alone; in particular it is independent of the speed of rotation. Waste heat is eliminated by forced ventilation. A circuit breaker cuts the field current in the event of the brake overheating.

This brake is always mounted in balance so that it can be equipped with a static sensor with a strain gauge. Additionally, it is delivered on guide rails (Ref RGC) with housings, couplings and screws.

REF	FP2
Voltage/Current max for blocking	10V / 0.5A
Max torque	65Nm
H / B / L in mm	112 x 190 x 356
Weight	43kg
Ventilation	Fan

INERTIA WHEEL FOR 3000W MACHINES



This inertia wheel allows to simulate rotary machines with a high moment of inertia. Supplied with 1 coupling + 1 cover + screws.

Ref.	VOL2
Inertia	0,2m²kg
Weight	39kg
H	112mm
B	190mm
L	220mm

tachometer for 1024pts encoder



ref. VICOD

Speed variator
See P. 112

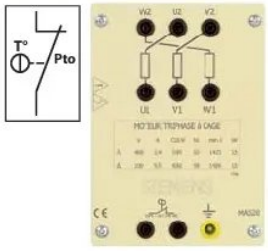
ref. VCV52



Rotary machines **3000W RANGE** - 1500rpm

3-PHASE SQUIRREL CAGE INDUCTION MOTOR





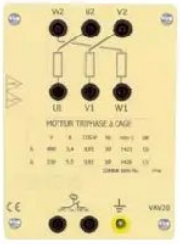
These engines work as well with **a speed variator** as directly connected to a **3-phase supply.**

REF	U (V)	I (A)	H	B	L	Weight
MAS32*	230/400V	10.6/6.1	132	216	445	28kg
MAS62*	400V/690V	6.1/3.5	132	216	445	28kg

*IE3 see the specifications Page 86

3-PHASE ASYNCHRONOUS CAGE MOTOR WITH VECTORIAL CONTROL





Fitted with a 1024 pts encoder and a forced ventilation to run at a slow speed.

REF	U (V)	I (A)	H	B	L	Weight
VAV30	230/400V	10.6 / 6.7	132	216	620	28kg
VAV60	400/690	6.1 / 3.5	132	216	620	28kg

STAR/DELTA STARTER

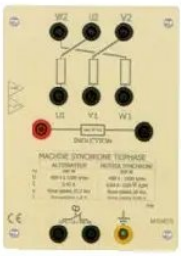
Manual STAR/DELTA starter into a safety box

ref. CO-ET-8A



3-PHASE SYNCHRONOUS MACHINE



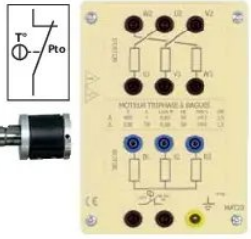


Works as a synchronous motor and a 3-phase alternator.
Equipped with LEBLANC poles for mains network synchronization.

REF	U en V	H	B	L	Masse
MSM30	230/400V	132	216	540	49kg

3-PHASE ASYNCHRONOUS SLIP RING INDUCTION MOTOR





REF	U (V)	I (A)	H	B	L	Weight
MAT30	230/400V	13.2 / 7.5	132	216	685	70kg

SYNCHRONOSCOPE

Safety laboratory synchronoscope 16A - 400V max.

ref. CHR3



SAFETY STARTER RHEOSTAT

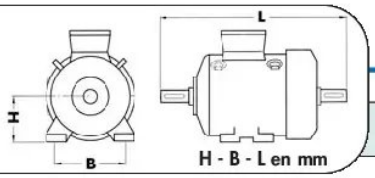
Safety starter rheostat for **high** powerful slip ring machines.

ref. REDA12



Each machine is equipped with a binary temperature sensor with a contact that can be inserted into a control circuit.

The couplings are compatible across a single power range. Coupling and fastening screws provided with each reference number.



SHUNT / SEPARATED DC MOTOR 220/220V







This engine works as well with **a speed variator** as directly on **a DC supply**.

REF	U (V)	I (A)	H	B	L	Weight
CC30	Multitensions	16.5A with 220V	132	216	550	80kg

SAFETY STARTER RHEOSTAT

Safety starter rheostat for **high** powerful DC machines.

ref. REDA34



SHUNT / SEPARATED DC GENERATOR





Designed for a didactic use.

REF	U (V)	I (A)	H	B	L	Weight
CG30	220V	14.2A	132	216	570	83kg

POLYEXCITATION COMPOUND DC GENERATOR







Designed to be high-performance generator (characteristics below), this machine also works as a motor.

REF	U (V)	I (A)	H	B	L	Weight
PE30	270V	13.6A	132	216	570	83kg

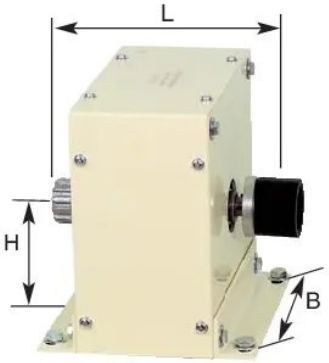
POWDER BRAKE REINFORCED



As the powder brakes of the other ranges, a simple DC current under a low voltage around 14V generates a constant braking torque for all the speeds between 0 to 1500 rpm.
This reinforced model is composed of 2 independent units and linked together by the rotating shaft. Thanks to this power distribution, dissipation of energy is most effective. An automatic monitoring avoid the functioning of only one unit or if the ventilation is not complete.
The measure of the torque required a rotating unit (see page 96) which needs to be placed indifferently on the left or on the right.
Maximum rotating unit: 1800 rpm
FP332 is delivered on guide rails (Réf : RGC) with housing, couplings + screws.

REF	FP332
Voltage/Current max for blocking	14V / 0.8A
Max torque	80Nm
Moment of inertia	30cm²kg
H / B / L in mm	132 x 216 x 720
Weight	86kg
Ventilation (MAINS 230V)	Fan

INERTIA WHEEL FOR 3000W MACHINES



This inertia wheel allows to simulate rotary machines with a high moment of inertia. Supplied with 1 coupling + 1 cover + screws.

Ref.	VOL3
Inertia	0,2m²kg
Weight	40kg
H	132mm
B	216mm
L	220mm

Accessories for rotary machines - **All ranges**

TORQUE SENSORS



DISPLAYS PAGE 99

** The use of an inertia wheel + a rotary sensor (CR design) between the motor and the brake gives starting torques which can go to 7 times the operating torque.*

Connecting cable and protection casing supplied with all our sensors.

STANDARD VERSION

JA : Sensor designed for mounting only on particle brakes.

CR : Rotary sensor for installing between 2 machines, for measuring the torque by torsion, even when greatly variable.

Maximum recommended speed of rotation 1500 rpm to prevent early wear.

Ref	Power	Sensor design	Sensor range	L mm	Use with an important inertia	Movement
JA1	300W	Static	4Nm	/	Yes	Buckling
JA2	1500W	Static	20Nm	/	Yes	Buckling
CR1	300W	Rotary	20Nm	140	Yes	Torsion
CR2*	1500W	Rotary	50Nm	140	no*	Torsion
CR2100	1500W	Rotary	100Nm	140	Yes	Torsion
CR3*	3000W	Rotary	50Nm	140	no*	Torsion
CR3100	3000W	Rotary	100Nm	140	Yes	Torsion

BRUSHLESS VERSION

These brushless torque sensors have to be placed between 2 machines and measure the torque sensor V2 and the twist torques and speeds for the version V22. It is equipped with an optical torque so without mechanical wear and maintenance, with a dynamic range allowing to measure some important torque changes and high speeds. The values of starting are so easily measurable.

Torque output signal: 0 to 5V for the measuring span in Nm (0 to -5V according the rotating way).

Speed output signal: 5V to 2500 rpm (V22 version only) or 10 V to 1000rpm.

Maximum rotating speed: 2000 rpm

Sensor supply: between 12 and 28 VDC

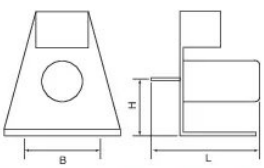
REF	Power	Sensor range	Speed output	L mm	Use with an important inertia
CR1-V2	300W	20 Nm	no	140	Yes
CR1-V22	300W	20 Nm	5V at 2500 rpm	140	Yes
CR2-V2*	1500W	50 Nm	no	140	no*
CR2-V22*	1500W	50 Nm	10V at 1000 rpm	140	no*
CR2-100-V2	1500W	100 Nm	no	140	Yes
CR2-100-V22	1500W	100 Nm	10V at 1000 rpm	140	Yes
CR3-V2*	3000W	50 Nm	no	140	no*
CR3-V22*	3000W	50 Nm	10V at 1000 rpm	140	no*
CR3-100-V2	3000W	100 Nm	no	140	Yes
CR3-100-V22	3000W	100 Nm	10V at 1000 rpm	140	Yes

DC TACHOGENERATORS



These tachogenerators deliver a continuous voltage proportional to the rotating speed.

Supplied complete with couplings, housings and screws bolt.



REF	Power	Voltage at 1000 rpm	Connector	H (mm)	B (mm)	L (mm)
DYTA1	300W	20V	Terminals	90	172	170
DYTA2	1500W	10V	Terminals	112	190	130
DYTA62	1500W	20V/60V	Dyn/ Terminals	112	190	170
DYTA3	3000W	10V	Terminals	132	216	130
DYTA63	3000W	20V / 60V	Dyn/ Terminals	132	216	170

MOTORS STAND ON WHEELS & GUIDE RAILS

Designed to transport a complete set of machines. 4 wheels, 2 of them with a brake.

REF	Useful Length	Width	Height	Weight
CTA	950mm	470mm	500mm	30kg
CTB	1300mm	470mm	500mm	30kg
CTC	1610mm	470mm	500mm	39kg
CTH	1610mm	470mm	845mm	45kg
CTL	1900mm	470mm	500mm	45kg



Ref. CTH



Ref. CTC



Ref. CTA

These rails will be used for aligning and fixing the machines constituting of the made up groups according to your own configuration.
With each pair of guide rails are included 2 end of shaft protective covers and 1 intermediate housing.
A powder brake is always fitted with its own rails.

REF	Power	Overall length	Pitch of rails	Weight
ST10	300W	1100mm	172mm	7kg
STL	300W	1450mm	172mm	8kg
RGA *	1500/3000W	950mm	190/216mm	16kg
RGC	1500/3000W	1600mm	190/216mm	24kg
RGL**	1500/3000W	1900mm	190/216mm	28kg

*RGA is only compatible with the stand on wheels CTA

*RGL is only compatible with the stand on wheels CTL



Ref. ST10



Ref. RGC

Protective covers for machine coupling



ref. BT80



ref. CART812



ref. CART80



ref. VS10

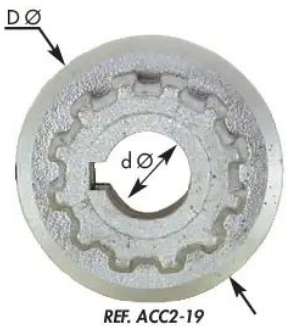
REF	Power	Protection length	Height	Specifications
CART300W/80	300W	80mm	125mm	Intermediate housing between 2 machines
CART90	300W	95mm	125mm	Intermediate housing between 2 machines
BT300	300W	60mm	125mm	Housing for unused end of shaft
BT80	1500W	80mm	185mm	Housing for unused end of shaft
CART80	1500/3000W	80mm	185mm	Intermediate housing between 2 machines
CART120	1500/3000W	126mm	185mm	Intermediate housing between 2 machines
CART140	1500/3000W	140mm	185mm	Intermediate housing between 2 machines
CART812	1500/3000W	from 80 to 115mm	185mm	Length-adjustable intermediate housing
VS300	300W	/	/	Screw + Washers + Special Nut
VS10	1500/3000W	/	/	Screw + Washers + Slide Nut

Replacement couplings



REF. ACC1-19 + AC43 + ACC1-19

These are spare parts, the rotating machines are fitted with their original couplings. A complete set of spare part couplings comprises 2 metal hubs and a rubber sleeve (3 references in total)



REF. ACC2-19

These are spare parts, as the rotating machines are fitted with their original couplings.

REF	Power	Specification	d Ø	D Ø
ACC1-14	**300W**	HUB	14mm	42mm
ACC1-17	**300W**	HUB	17mm	42mm
ACC1-19	**300W**	HUB	19mm	42mm
AC-43	**300W**	SLEEVE	sleeve	45mm
ACC2-19	**1500W**	HUB	19mm	52mm
ACC2-24	**1500W**	HUB	24mm	52mm
AC-56	**1500W**	SLEEVE	sleeve	56mm
ACC3-19	**3000W**	HUB	19mm	69mm
ACC3-24	**3000W**	HUB	24mm	69mm
ACC3-28	**3000W**	HUB	28mm	69mm
AC-66	**3000W**	SLEEVE	sleeve	74mm

Speed & Torque displays units



GAMA97



TAGA



TACH10BO

	Torque displays							Speed displays	
REF	Zero setting & sensor gain	Range	Analogical output of the torque	Compatible with static sensor	Compatible with rotary sensor	Compatible with brushless rotary sensor	Break manual control	Range	Compatible with DC tachogenerator
GAMA84	potentiometer	200,0 Nm	-5V / 0 / +5V	Yes	Yes	/	/	/	/
GAMA96	pulse push button	200,0 Nm	-5V / 0 / +5V	Yes	Yes	/	/	/	/
GAMA85	potentiometer	200,0 Nm	-5V / 0 / +5V	Yes	Yes	/	Yes	/	/
GAMA97	pulse push button	200,0 Nm	-5V / 0 / +5V	Yes	Yes	/	Yes	/	/
GAMA-SB	automatic	200,0 Nm	-5V / 0 / +5V	/	/	Yes	/	/	/
TAGA*	potentiometer	200,0 Nm	-5V / 0 / +5V	Yes	Yes	/	/	2000rpm	10, 20, 60V 1000rpm
TAGA-V2*	potentiometer	200,0 Nm	-5V / 0 / +5V	/	/	Yes	/	2000rpm	10, 20, 60V 1000rpm
TACH10BO	/	/	/	/	/	/	/	2000rpm	10V 1000rpm
TACH20BO	/	/	/	/	/	/	/	2000rpm	20V 1000rpm
TACH60BO	/	/	/	/	/	/	/	2000rpm	60V 1000rpm

* Speed analog output ± 1V / 1000rpm

CONTROLLABLE POWER SUPPLY FOR BRAKE

GC-420 is a current supply box for powder brake.Current control is devised around a microcontroller circuit providing high precision of the delivered current. Control of the manual brake or by analogue input 0-10V DC.



Genral informations :
- Mains power supply 230V AC - 50/60 Hz
- Max output current 2A.
- Output load 4-20 ohms
- Brake control analogue input signal 0-10V DC
- Dimensions: 240 x 180 x 130 mm

ref. GC-420

ref. GC-FP
Non controllable version with manual control

On the front:
- A start/stop indicator light.
- A potentiometer for controlling the set point.
- A 2-position switch provides control of the stop mode by blocking or disengaging.

On the rear:
- Socket/switch/fuse unit assembly for box power supply.
- 6 terminals for choice of control coupling by potentiometer or by external analogue signal 0-10V DC.
- 2 terminals for connecting the powder brake.

DISPLAY COMPATIBLE WITH A 1024 PTS ENCODER

2000rpm range compatible with the VAV20 motor.



ref. VICOD

INTERFACE WITHOUT DISPLAYS



The brushless torque sensor is connected to the DIN jack of the **INTER-SB** interface, which is powered by an external 12 to 28V DC power supply (not provided).
The 0 to 5V measuring signal (5V for the nominal torque) is the image of the mechanical torque in Nm.
A suitably calibrated voltmeter will display the torque directly in Nm.

ref. INTER-SB

Speed, torque & power



ref. GRANMECA
For rotary sensors with brushes and static sensor

ref. GRANMECA-V2
only for brushless sensors

GENERAL FEATURES
GRANMECA is a display unit for showing 3 mechanical values of torque, speed, and power, with measurements taken on rotating machines using a torque sensor and a tachogenerator. It also includes:
- a manually adjustable energising source for a powder brake
- analog copies of output of the three mechanical values.

Supply : 230V 50Hz, 30VA.
Dimensions : 375 x 80 x 275 mm - 5.8kg.
Height of digits : 15mm

DIRECT DISPLAY
• of the mechanical torque in Nm
Sensors used: any type of standard rotating or static sensor with 4 strain gauges on the Wheatstone bridge. GRANMECA feeds the bridge at 10V, recovers the signal and displays the mechanical torque through an adjustable gain amplifier.

• of the speed of rotation n in rpm.
Sensors used: any tachometric dynamo of rating 10 - 20 - 60 V at 1000 rpm.

• of the power W
GRANMECA calculates internally the mechanical power
$Pu = M\ 2\pi\ n/\ 60$ and directly displays the results in watts.

FRONT PANEL ADJUSTMENTS
- zero calibration of the torque sensor
- calibration of the torquemeter depending on the sensor
- manual control of braking intensity (compatible with brakes FP1, FP2, FP3)

ANALOGUE INPUTS AND OUTPUTS
The rear of GRANMECA is equipped with:
- a brake control input by 0 to 10V externally controlled by an analog signal . Impedance 1kΩ
- a 0 to 5VDC output at 500mA manual energising adjustment for a powder brake
- a -5 to +5V* instantaneous torque image output.
- a -5 to +5V* average torque image output**
- a -5 to +5V* instantaneous speed image output.
- a -5 to +5V* average speed image output.
- a -5 to +5V* average power image output.

* The sign indicates the direction of rotation of the motor.
** The integration time constant of the average values is 1s.

GRANMECA is compatible with:
- motors of 90 – 300 – 1500 – 3000W
- static and rotating torque sensors of 2 to 100 Nm
- tachometric dynamos of 10 - 20 - 60V at 1,000 rpm.

TRMS wattmeter



ref. DIGIWATT

DIGIWATT is a digital multimeter with floating inputs simultaneously displaying the 3 electric values: voltage, current and power. DIGIWATT measures the TRMS effective values of the U I W measurements, possibly with direct component superimposed. The wide bandwidth of the apparatus allows measurements to be made from DC to 70kHz or on chopped signals (frequency converters, industrial choppers, rectified supplies etc.). The apparatus voltage and current inputs are insulated between each other and relative to earth. DIGIWATT measures single phase and balanced three phase powers.

DISPLAY:
By two 3 1/2 and one 4 1/2 digits displays, height of digits 15mm.
Power ranges are switched automatically.

INPUTS
Voltage inputs: Three floating potential voltage terminals, situated at the rear of the apparatus allowing either the application of an alternating, continuous or composite voltage, or a balanced three phase voltage.
These inputs are electronically protected against over voltages.
Max. voltage: 400Vrms single phase, 700Vrms three phase
Current inputs: Two floating potential current terminals, situated at the rear of the apparatus allowing the application of an alternating, continuous or composite current. Imax = 20A. The current input is protected by a delay fuse, allowing measurements on starting up a motor

RECOPY OUTPUTS
Voltage output: 0 to 10V DC signal for 0 to 1000Vrms entering.
Current output: 0 to 10V DC signal for 0 to 20Arms entering.
Power output: 0 to 10V DC for 0 to 0.2kW - 0 to 2kW - 0 to 20kW; these three ratings are switched automatically.
Important: these three outputs are insulated from the voltage and currents applied to the input terminals of the apparatus.

OTHER CHARACTERISTICS
A switch on the front panel selects the mode single or three-phase.
A diode informs the user that an overvoltage has been applied to the voltage input; he must remove it and reset the voltage circuit. Input and outputs through 4mm safety terminals
Dims: 375 x 80 x 275 mm - 5kg
Supply: 220V 50Hz 30VA.

Function	U	I	W
Ranges	400Vrms single-phase 700Vrms 3-phase	20Arms	0.2 - 2 - 20kW
Accuracy in % of reading	1% from 0 to 70kHz	2% 0 ~ 20kHz 3% 20 ~ 70kHz	2% 0 ~ 20kHz 3% 20 ~ 30kHz 5% 30 ~ 70kHz
Protection	Electronic breaker	20A delayed fuse	
Impedance	1.5MΩ	<5mΩ	
Recopy outputs	10VDC/1000Vrms	10VDC/20Arms	10VDC/ 0,2kW - 2kW - 20kW

Torque simulator



ref. MECASIM

MECASIM is a current generator designed to drive a powder brake control circuit, for the purpose of generating different types of brake torque.
Motors used in industrial environments must resist various types of counter-torque:

- constant torque (e.g. a motor connected to lifting equipment)
- torque proportional to speed (e.g. feed screw)
- torque proportional to speed squared (e.g. liquid mixing systems)
- torque inversely proportional to speed (e.g. cutting tool on a lathe)

To simulate torque dependent on rotation speed, a tachometric dynamo connected to the motor being tested transmits the speed information via a cable attached to the rear of the MECASIM. The generator is capable of producing the 5 types of torque described above. Parameters a and b are directly adjustable by means of two potentiometers on the front of the system.

- **Constant torque: T = b**
  The moment of the resisting torque is constant (conveyor belt, crane motor)
- **Torque proportional to speed: T = an + b**
  The moment of the torque is an affine function of speed
  (screw compressors, measuring pumps)
- **Torque proportional to speed squared: $T = an^2 + b$**
  The moment depends on the speed squared (mixers, fans, centrifugal pumps)
- **Torque inversely proportional to speed: T = a/n**
  The product nT = constant, giving constant motor power
  (uncoilers, saws, machine tools)
- **Oscillating torque: T = b or T = a + b**
  Torque oscillates between two values according to time. The cycle frequency is adjustable from 0 to 200s and the cyclic ratio from 0% to 100%

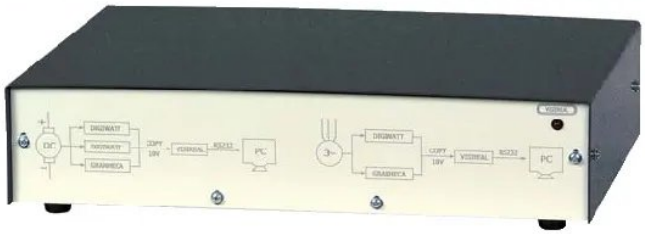
THE FOLLOWING FEATURES ARE ON THE FRONT OF THE APPARATUS

- Two potentiometers for adjusting parameters a and b
- 6-position push-button selector: five types of torque plus a manual position
- A LED display indicates which function has been selected
- Two switches to adjust frequency and cyclic ratio (if oscillating torque is selected)
- Potentiometer controlling manual braking
- Switch to cut off the power supply to the brake at the "brake activation" terminal. This switch does not cut off the output to the "braking signal copy" terminals, making it possible to adjust parameters a and b.

THE FOLLOWING FEATURES ARE ON THE REAR OF THE APPARATUS

- 4 speed information inputs (0-5V and 10 – 20 – 60 V/ rpm) from the tachometric dynamo
- 0 – 20V "brake activation" output: connected directly to the brake
- 0 – 5V "braking signal copy" output. On/Off switch.

Acquisition system



ref. VISIREAL

VISIREAL lets you record and display on a screen mechanical and electrical quantities from the rotating machines (asynchronous motors, synchronous machines, single-phase motors and DC machines).

VISIREAL is an interface that connects the motor test bench to a PC via a measuring bay composed of at least GRANMECA and DIGIWATT (see all the arrangements possible on the next page).

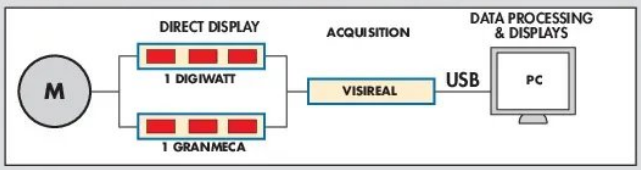
The LOGIREAL software delivered with VISIREAL lets one display these quantities in real time. During acquisition, the values for voltage, current, power consumed, torque, rotation speed and useful power are shown both as curves and as numeric displays.

After acquisition, VISIREAL uses the recorded values to calculate and trace additional mechanical and electrical characteristics, such as slip, efficiency, active power, reactive power, the power factor, and so on.

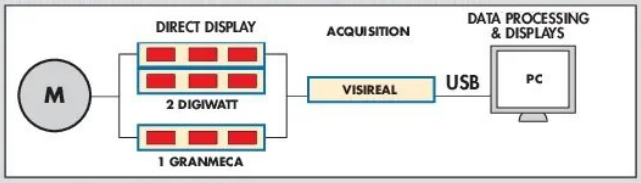
LOGYREAL

Software supplied with VISIREAL

REQUIRED UNITS FOR AC MACHINES STUDY



REQUIRED UNITS FOR DC MACHINES STUDY



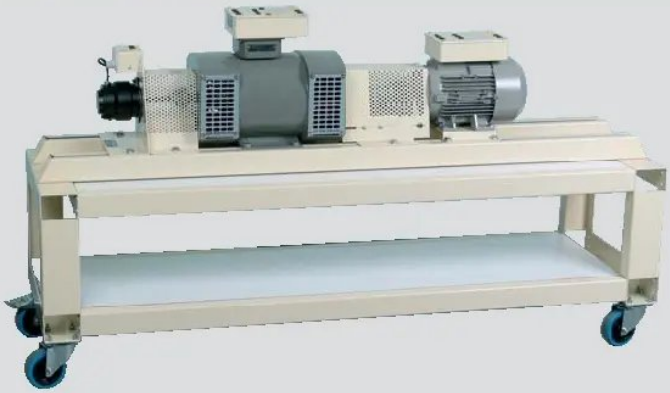


EXAMPLE OF COMPLETE ACQUISITION SOLUTION FOR AC MACHINES STUDY

1 DIGIWATT
1 GRANMECA
1 MECASIM (OPTION)
1 VISIREAL (supplied with software)

Complete kit for studying the 1.5kW asynchronous motor & 3-phase alternator

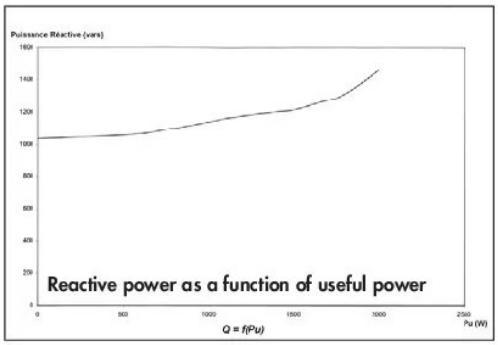
DESCRIPTION OF THE 18 ITEMS INCLUDED IN PACK-AC2 REFERENCE

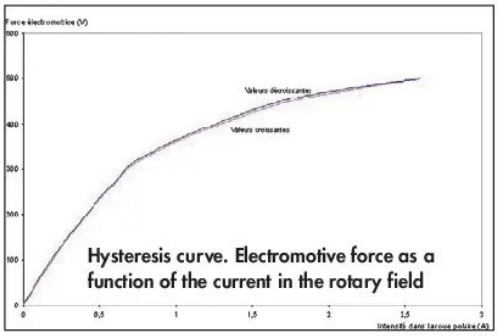


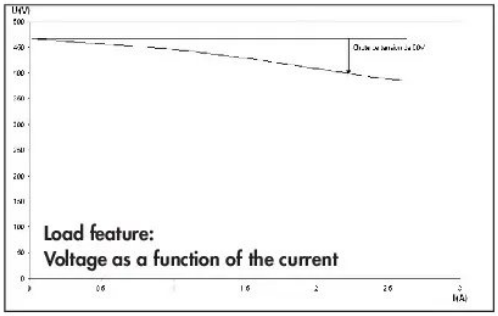
3-phase asynchronous motor **Ref. MAS22 - Qty 1** (features P. 76) **Rotary torque sensor** **Ref.CR2-V2 - Qty 1** (features P. 96)	**3-phase alternator** **Ref. MSM20 - Qty 1** (features P. 76) **DC tachogenerator** **Ref. DYTA2 - Qty 1** (features P. 96)	**Stand on wheels** **Ref. CTC - Qty 1** (features P. 81) **Guide rails** **Ref. RGC - Qty 1** (features P. 97)
 **DC variable supply** **Ref. COMPAK40 - Qty 1** (features P. 116)	 **2000W Resistive load** **Ref. RHP20 - Qty 1** (features P. 121)	 **3-phase wattmeter** **Ref. PSY14 - Qty 1** (features P. 254)
 **Synchronoscope** **Ref.CHR3 - Qty 1** (features P. 98)	 **Safety wattmeter switch** **Ref. COWAT11 - Qty 1** (features P. 254)	 **Magnetoelectric voltmeter** **Ref. V1001 - Qty 1** (features P. 253)
 **Digital wattmeter** **Ref. DIGIWAT - Qty 1** (features P. 100)	 **Measurement of mechanical quantities** **Ref. GRANMECA-V2 - Qty 1** (features P. 100)	 **Rheostat** **Ref. ECO2-106 - Qty 1** (features P. 124)
 **Set of 67 safety leads** **Ref. 300S - Qty 1 set** (features P. 273)	 **20A magnetoelectric ammeter** **Ref. A11 - Qty 1** (features P. 253	 **Frequency converter** **Ref. ACVAR5 - Qty 1** (features P. 95)

OPERATING PRINCIPLE

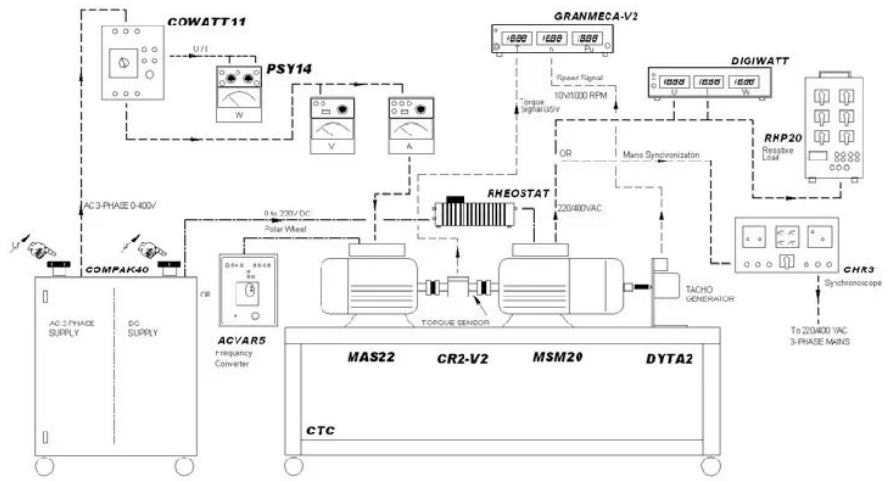
A 1500W asynchronous motor, powered by a 3 X 400V source, is charged by means of an alternator.
The electrical power generated by the alternator is drained either in the form of an adjustable resistive charge or throughout the public network.
The power consumed by the motor is measured using the "two powers" method by using a wattmeter switch and an analogue wattmeter.
The voltage and current consumed by the motor are measured using an analogue voltmeter and ammeter.
On the alternator, the electrical quantities such as power, voltage and current supply are measured using a digital wattmeter with three displays.
A brushless torque sensor (requiring no maintenance) measures the motor torque, whereas the tachometer generator measures the rotation speed. An analogue unit with three displays shows the torque, speed and useful power values.







MODULAR SOLUTIONS PAGE 62



The PACK-AC2 power unit kit (power unit + accessories) can be used for studying a 1500W asynchronous motor.

Charged by a 1500W three-phase alternator, the charge properties are plotted based on measurements taken by various analogue or digital devices.

Comprises 18 items, motors + accessories.

ref. PACK-AC2
ALSO AVAILABLE IN 300W. CONTACT US.

TUTORIALS DESCRIBED IN THE INSTRUCTIONS SUPPLIED WITH PACK-AC2

STUDY OF THE ASYNCHRONOUS INDUCTION MOTOR

- **Study of the star/delta coupling of the asynchronous motor.**
  - Understanding and undertaking motor wiring.
  - Measurements and comparison of the various voltage and current values according to the coupling type selected.
- **Study of the "two powers" method.**
  - Understanding and undertaking of wiring.
  - Power measurements P1/P2.
  - Calculation of the total power and total speed consumed by the motor.
- **Study of motor operation with no load, with a load and with an overload, using the 1500W alternator.**
  - Theoretical reminders of the mathematical formulae concerning an asynchronous motor.
  - Understanding and undertaking motor wiring with measuring devices.
  - Calculations of the electrical and mechanical quantities of the motor using its identification plate, such as:
    - ✔ *Synchronism speed*
    - ✔ *Slip*
    - ✔ *Power consumption*
    - ✔ *Reactive power*
    - ✔ *Number of pairs of motor poles*
    - ✔ *Torque*
    - ✔ *Efficiency*
    - ✔ *Apparent power*
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load:
    - ✔ *Current consumption*
    - ✔ *Rotation speed*
    - ✔ *Motor torque*
    - ✔ *Apparent power*
    - ✔ *Slip*
    - ✔ *Power consumption*
    - ✔ *Useful power*
    - ✔ *Power factor*
    - ✔ *Reactive power*
    - ✔ *Efficiency*
  - Comparison of the theoretical calculation of values with those values measured during the motor tests
  - Plotting of properties based on motor measurements such as:
    - ✔ *Torque as a function of useful power**
    - ✔ *Efficiency as a function of useful power**
    - ✔ *Current as a function of useful power**
    - ✔ *Rotation speed as a function of useful power**
    - ✔ *Slip as a function of useful power**

    ** or other variable*

STUDY OF THE ALTERNATOR

- **Study of the star/delta coupling of the asynchronous motor.**
  - Understanding and undertaking alternator wiring.
  - Measurements and comparison of the various voltage and current values according to the coupling type selected.
- **Study of alternator operation with no load, with a load and with an overload, using a resistive load:**
  - Theoretical reminders of the mathematical formulae which apply to the alternator.
  - Understanding and undertaking alternator wiring with measuring devices.
  - Measurement and plotting of the properties of the magnetic circuit's hysteresis cycle.
  - Calculations of the electrical quantities of the alternator based on its identification plate, such as:
    - ✔ *Number of pairs of poles*
    - ✔ *Power consumed by the rotary field*
    - ✔ *Power supplied*
    - ✔ *Joule loss*
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load
  - Comparison of the theoretical calculation of values with those values measured during the practical tests
  - Plotting the properties of the alternator's load: voltage as a function of the supplied current
  - Calculation of the voltage decrease as a function of the load
  - Theoretical plotting of the shapes of the capacitive and inductive loads, compared with a resistive load
  - Analysis of results and conclusion
- **Study of the operation of the synchronised alternator on the public network**
  - Understanding and undertaking alternator wiring on the network.
  - Use of the speed controller
  - Use of the synchroscope with its various displays
  - Synchronisation on the mains network
- **Study of the operation of a short-circuited alternator:**
  - Measurement of the short-circuit current & the current in the rotary field
  - Plotting of properties

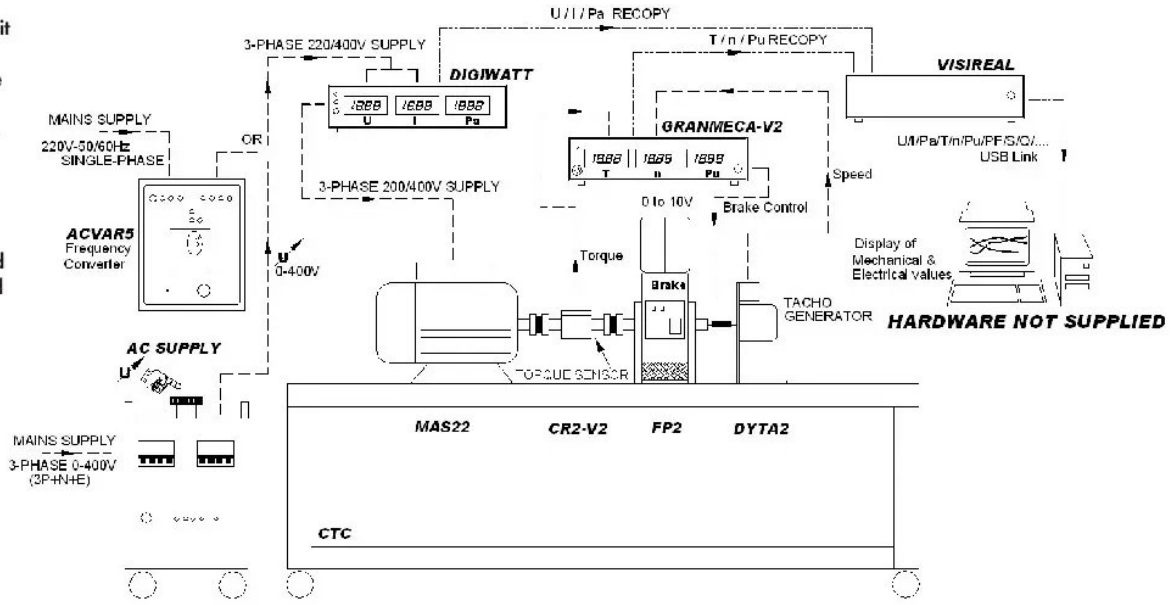
DELIVERED COMPLETE WITH TEACHING RESOURCES
STUDENT BOOKLET : THEORETICAL STUDIES & PRACTICAL WORK
TEACHER BOOKLET : WITH CORRECT VERSIONS OF THE PRACTICAL WORKS



Complete kit for studying the 1.5kW asynchronous motor with PC monitoring

The PACK-AC1 power unit kit (power unit + accessories) can be used for studying the short-circuited 220/400V 1500W, 3-phase, asynchronous induction motor with rotor in short-circuit.

Several measurements can be taken and the motor load properties can be monitored on a PC.



ref. PACK-AC1

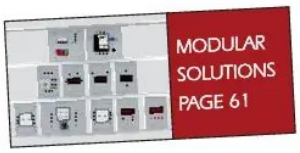
ALSO AVAILABLE IN 300W. CONTACT US.

TUTORIALS DESCRIBED IN THE INSTRUCTIONS SUPPLIED WITH PACK-AC1

- **Study of the star/delta coupling of the asynchronous motor.**
  - Understanding and undertaking motor wiring.
  - Measurements and comparison of the various voltage and current values according to the coupling type selected.
  - Measurement of properties on a PC.

- **Study of the operation of the motor controlled by the speed controller (frequency converter)**
  - Understanding and undertaking the wiring of the speed controller to the motor.
  - Adjustment of speed controller settings.
  - Adjustment of motor acceleration and deceleration rotation speed settings.
  - Measurement on a PC of the rotation speed properties as a function of time.

- **Study of motor operation with no load, with a load and with an overload, using the 230/400V three-phase power supply.**
  - Theoretical reminders of the mathematical formulae concerning an asynchronous induction motor.
  - Understanding and undertaking motor wiring with measuring and monitoring devices.
  - Calculation of the electrical and mechanical quantities of the motor based on its identification plate, such as:
    - ✓ *Synchronism speed*
    - ✓ *Number of pairs of motor poles*
    - ✓ *Slip*
    - ✓ *torque*
    - ✓ *Efficiency*
    - ✓ *Apparent power*
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load:
    - ✓ *Current consumption*
    - ✓ *Power consumption*
    - ✓ *Rotation speed*
    - ✓ *Useful power*
    - ✓ *Motor torque*
    - ✓ *Power factor*
    - ✓ *Apparent power*
    - ✓ *Reactive power*
    - ✓ *Slip*
    - ✓ *Efficiency*
  - Monitoring on the PC and comments about the various motor load curves
  - Comparison of the theoretical calculation of values with those values measure during the motor tests
  - Plotting of properties based on motor measurements such as:
    - ✓ *Torque as a function of the speed (or other variable)*
    - ✓ *Torque as a function of useful power (or other variable)*
    - ✓ *Efficiency as a function of useful power (or other variable)*
    - ✓ *Reactive power as a function of useful power (or other variable)*
    - ✓ *Current as a function of useful power (or other variable)*
    - ✓ *Power factor as a function of useful power (or other variable)*
    - ✓ *Rotation speed as a function of useful power (or other variable)*
    - ✓ *Slip as a function of useful power (or other variable)*



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STUDENT BOOKLET : THEORETICAL STUDIES & PRACTICAL WORK
TEACHER BOOKLET : WITH CORRECT VERSIONS OF THE PRACTICAL WORKS



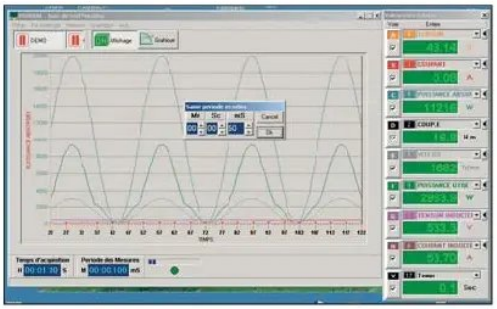
OPERATING PRINCIPLE

A speed controller, constant V/F frequency converter, controls the motor's rotation speed according to the various acceleration or deceleration ramps. A three-phase power supply on casters is also used to supply power to the motor, replacing the speed controller.

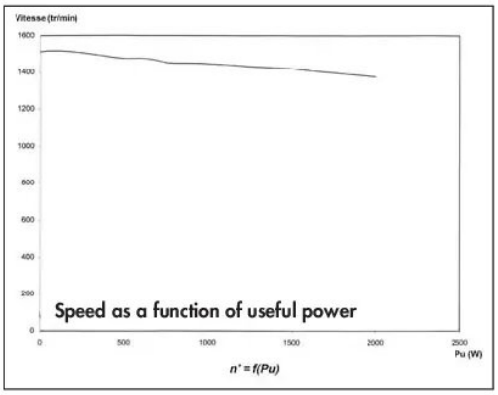
A 1500W ventilated powder brake loads the motor with values of between 0 and 125% inclusive of the rated load. A brushless torque sensor (requiring no maintenance) measures the various torque values, whereas a DC tacho-generator provides an image signal of the motor's rotation speed.

A first unit, with three digital displays, shows the electrical quantities such as voltage, current and power used by the motor. The second unit, which also has three displays, shows the mechanical quantities such as torque, rotation speed and useful power.

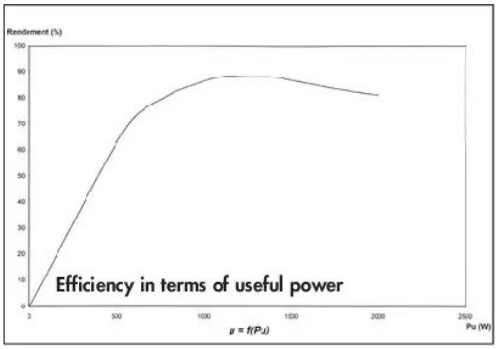
All of these quantities, as well as the motor load curves, can be displayed in real time on a PC, before being printed out.



Example of monitoring with a display of curves and values

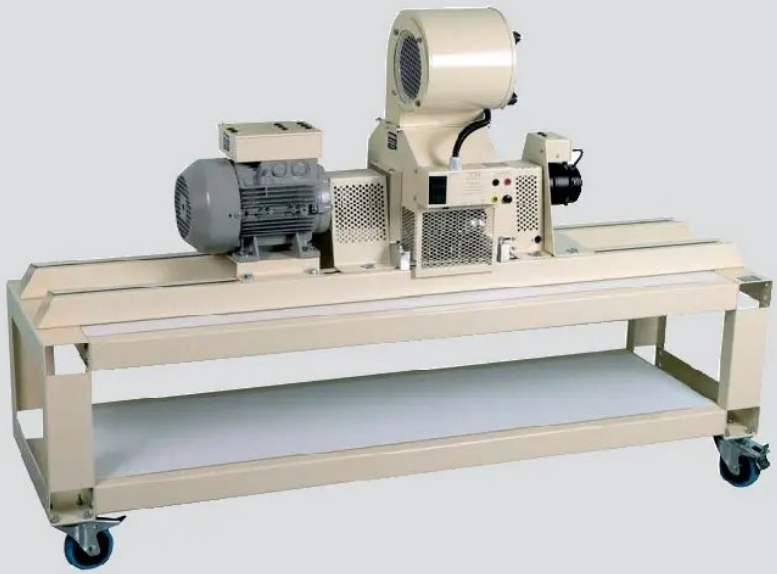


Speed as a function of useful power



Efficiency in terms of useful power

DESCRIPTION OF THE 12 ITEMS INCLUDED IN PACK-AC1 REFERENCE



3-phase asynchronous motor
Ref. MAS22 - Qty 1
(features P. 92)

Rotary torque sensor
Ref.CR2-V2 - Qty 1
(features P. 96)

Powder brake
Ref. FP2 - Qty 1
(features P. 93)

DC tachogenerator
Ref. DYTA2 - Qty 1
(features P. 96)

Stand on wheels
Ref. CTC - Qty 1
(features P. 97)

Guide rails
Ref. RGC - Qty 1
(features P. 97)



3-phase supply on wheels
Ref. TRT8PE - Qty 1
(features P. 130)



Frequency converter
Ref. ACVAR5 - Qty 1
(features P. 109)



Set of 38 safety leads
Ref. 300S - Qty 1 set
(features P. 273)



Digital wattmeter
Ref. DIGIWAT - Qty 1
(features P. 100)



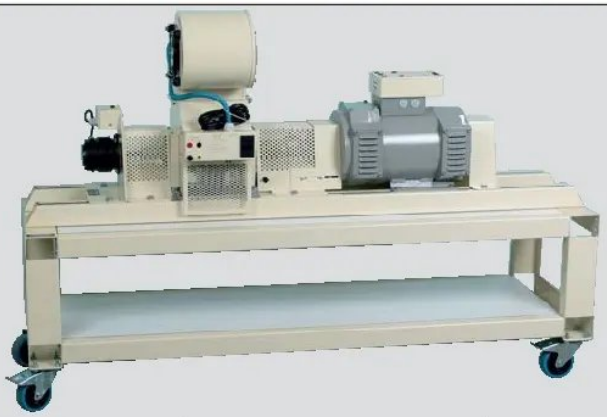
Measurement of mechanical quantities
Ref. GRANMECA-V2 - Qty 1
(features P. 100)



Real time and monitoring system
Ref. VISIREAL - Qty 1
(features P. 101)

Complete kit for studying the 1.5kW DC motor

DESCRIPTION OF THE 19 ITEMS INCLUDED PACK-DC1 REFERENCE



DC motor **Ref. CC20 - Qty 1** (Features P. 93) **Rotary torque sensor** **Ref.CR2-V2 - Qté 1** (Features P. 96)	**Powder brake** **Ref. FP2 - Qty 1** (Features P. 93) **DC tachogenerator** **Ref. DYTA2 - Qté 1** (Features P. 96)	**Stand on wheels** **Ref. CTC - Qty 1** **Guide rails** **Ref. RGC - Qty 1** (Features P. 97)
 **DC variable supply** **Ref. COMPAK40 - Qty 1** (Features P. 116)	 **Wattmeter** **Ref. P7405 - Qty 1** (Features P. 254)	 **Magnetoelectric voltmeter** **Ref. V1001 - Qty 2** (Features P. 253)
 **20A magnetoelectric Ammeter** **Ref. A11 - Qty 2** (Features P. 253)	 **Power supply master/slave** **Ref. GPS3303 - Qty 1** (Features P. 241)	 **Torque measuring interface for brushless sensor** **Ref. INTER-SB - Qty 1** (Features P. 99)
 **Multimeter** **Ref. TRG803 - Qty 2** (Features P. 246)	 **Safety starter Rheostat** **Ref. REDA34 - Qty 1** (Features P. 93)	 **Rheostat** **Ref. ECO1-470 - Qty 1** (Features P. 124)
 **Set of 46 safety leads** **Ref. 300S - Qty 1 set** (Features P. 273)		

ref. PACK-DC1
ALSO AVAILABLE IN 300W. CONSULT US.

TUTORIAL WITH PACK-DC1

- **Study of connection schematics with shunt excitation and separate excitation (independent).**
  - Understanding and undertaking motor wiring depending on the selected excitation type.
  - Measurements and comparisons of the various consumed power, voltage and current values depending on the selected excitation type.

- **Calculation method used for determining the resistance value:**
  - of the start-up rheostat
  - of the excitation rheostat

- **Study of the motor's operation when unloaded, when loaded and when overloaded with separate excitation (independent) and with shunt excitation:**
  - Theoretical reminders of the mathematical formulae applying to a DC motor.
  - Understanding and undertaking motor wiring with measuring devices.
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load:
    - ✔ Current consumption of field system/in the rotor
    - ✔ Power consumption of field system/in the rotor
    - ✔ Rotation speed
    - ✔ Useful power
    - ✔ Motor torque
    - ✔ Counter-electromotive force
    - ✔ Rotor Joule decrease
    - ✔ Efficiency

- **Plotting of properties based on motor measurements:**
  - Rotation speed as a function of the field system current
  - Rotation speed as a function of the rotor current
  - Efficiency as a function of the rotor current
  - Torque as a function of the rotor current
  - Power consumption as a function of the rotor current

- **Analysis of results and conclusion**

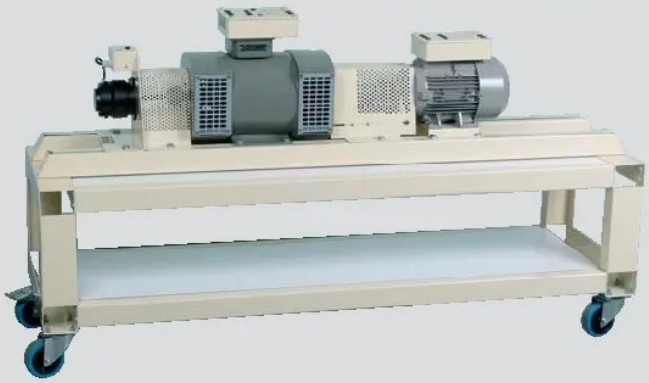


PACK-DC1 PACK-DC2

Delivered with teaching resources
Student booklet: theoretical studies and practical work
Teacher booklet: with correct versions of the practical works

Complete kit for studying the 1.5kW DC motor and 3-phase alternator

DESCRIPTION OF THE 20 ITEMS INCLUDED PACK-DC2 REFERENCE



DC motor
Ref. CC20 - Qty 1
(Features P. 93)
Rotary torque sensor
Ref.CR2-V2 - Qty 1
(Features P. 96)

3-phase alternator
Ref. MSM20 - Qty 1
(Features P. 92)
DC tachogenerator
Ref. DYTA2 - Qty 1
(Features P. 96)

Stand on wheels
Ref. CTC - Qty 1
Guide rails
Ref. RGC - Qty 1
(Features P. 97)



DC variable supply
Ref. COMPAK40 - Qty 1
(Features P. 116)



2000W Resistive load
Ref. RHP20 - Qty 1
(Features P. 121)



3-phase wattmeter
Ref. PSY14 - Qty 1
(Features P. 254)



Synchronoscope
Ref.CHR3 - Qty 1
(Features P. 92)



AC/DC Power supply
Ref. ISOSEC1 - Qty 1
(Features P. 118)



Magnetoelectric voltmeter
Ref. V1001 - Qty 2
(Features P. 253)



Digital wattmeter
Ref. DIGIWATT - Qty 1
(Features P. 100)



Measurement of mechanical quantities
Ref. GRANMECA-V2 - Qty 1
(Features P. 100)



Rheostat
Ref. ECO2-106 - Qty 1
(Features P. 124)



Set of 67 safety leads
Ref. 300S - Qty 1 set
(Features P. 273)



20A magnetoelectric Ammeter
Ref. A11 - Qty 2
(Features P. 253)



Rheostat
Ref. ECO1-470 - Qty 1
(Features P. 124)

ref. PACK-DC2
ALSO AVAILABLE IN 300W. CONSULT US.

TUTORIAL WITH PACK-DC2

STUDY OF THE DC MOTOR

- **Preliminary study**
  - Reading of the specifications plate, calculation of the torque & nominal efficiency
  - Calculation of the starting torque
  - Calculation method for determining the resistance value of the starting rheostat
- **Study of the motor's operation when unloaded, when loaded & when overloaded**
  - Theoretical reminders of the mathematical formulae applying to a DC motor.
  - Understanding & undertaking motor wiring with measuring devices.
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load:
  - Current & Power consumption of field system/in the rotor
  - Rotation speed
  - Useful power
  - Motor torque
  - Counter-electromotive force
  - Rotor Joule decrease
  - Efficiency
- **Plotting of properties based on motor measurements such as:**
  - Rotation speed as a function of the field system current
  - Rotation speed as a function of the rotor current
  - Efficiency as a function of the rotor current
  - Torque as a function of the rotor current
  - Power consumption as a function of the rotor current
- **Results of powers**
  - Calculation of losses motor unloaded
  - Results of power in nominal functioning
- **Analysis of results and conclusion**

STUDY OF THE ALTERNATOR

- **Preliminary study**
  - Reading of the specifications plate, calculation of the torque & nominal efficiency
- **Study of alternator operation with no load, with a load and with an overload, using a resistive load:**
  - Theoretical reminders of the mathematical formulae which apply to the alternator.
  - Understanding and undertaking alternator wiring with measuring devices.
  - Measurement and plotting of the properties of the magnetic circuit's hysteresis cycle.
  - Creation of a table containing calculations and measurements of electrical and mechanical quantities at various points of the motor load
  - Plotting the properties of the alternator's load: voltage as a function of the supplied current
  - Calculation of the voltage decrease as a function of the load
- **Study of the operation of the synchronised alternator on the public network**
  - Understanding and undertaking alternator wiring on the network.
  - Use of the synchronoscope with its various displays
  - Synchronisation on the mains network
- **Results of powers**
  - Calculation of losses motor unloaded
  - Results of power in nominal functioning
- **Analysis of results and conclusion**

Hypersynchronous study set



3-phase asynchronous motor
Ref. MAS22 - Qty 2
230/400 VAC- 1,5KW
with housings
(Features P. 92)

Stand on wheels
Ref. CTA - Qty 1
Guide rails
Ref. RGA - Qty 1
(Features P. 97)



Display unit of the power factor
Ref. PSY-C - Qty 1
Indicates from 0.5 inductive to 0.5 capacitive with "1" vertical in the center of the dial.



Display unit of the central zero power
Ref. PSY-W - Qty 1
Indicates from -1.5kW to 1.5kW with the vertical zero in the center of the dial.



Speed controller
Ref. ACVAR5 - Qty 1
Mains single-phase 230VAC, output 3 x 230VAC- 1.5KW
(Features P. 109)



1 Capacitive load bank
Ref. CH20 - Qty 1
Widely sized
(Features P. 120)



Set of 47 safety leads
Ref. 300S - Qty 1 set
(features P. 273)

1 switching case
For an easy synchronization on the national electrical network

An asynchronous motor can convert mechanical energy into electrical energy.
To perform this conversion, it has to be driven above the synchronous speed.
PACK-HYPER is a set of 2 asynchronous motors mounted on the same axis of rotation with accessories to study hypersynchronous behaviour. The speed controller drives the first motor above its synchronous speed so that the second becomes a three-phase generator.
A central zero wattmeter indicates the direction of the electrical energy consumed or fed in the case of feeding into the grid. A central COS ϕ phase-meter demonstrates the change of COS φ following the addition of capacitors or speed variation.

EDUCATIONAL OBJECTIVES

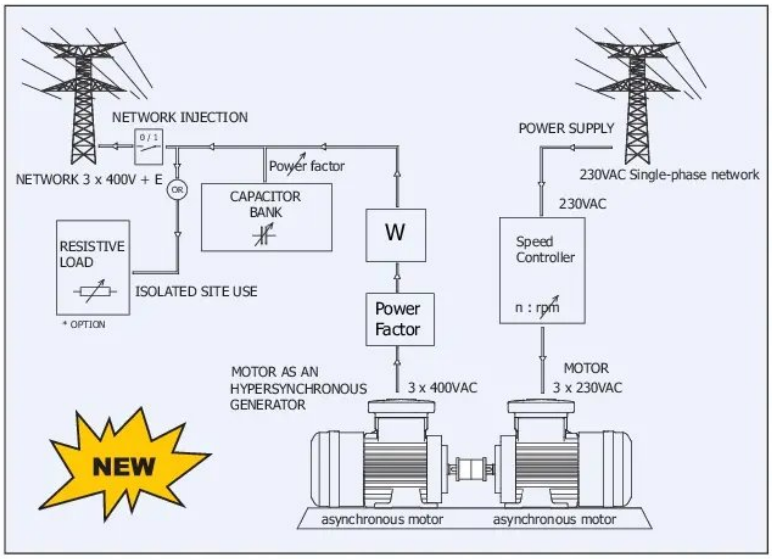
- **Studying the hyposynchronous and hypersynchronous operations of an asynchronous motor.**
- **Studying the effect of a battery of capacitors on the COSϕ value.**
- **Studying synchronisation with the national grid.**
- **Studying energy use at an isolated site.**
- **Calculating the outputs of an energy production system.**
- **Using a clamp ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical work

- Procedure of synchronisation with the national grid.
- Hyposynchronous and hypersynchronous measurement.
- Reading COS ϕ using a battery of capacitors and consequences.
- Plotting of the electrical characteristics of the energy production system.
- Calculation of the overall output.
- Study of the operation at an isolated site.

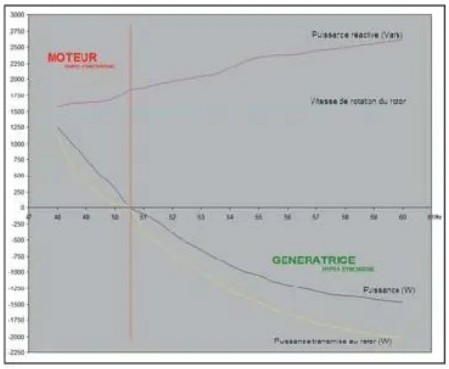
ref. PACK-HYPER





OPTION
2000W Resistive load
Ref. RHP20 - Qty 1
(features P. 121)





AC/AC frequency converters (speed variators)







REFERENCES WITH PRIMARY IN 230V SINGLE-PHASE 50/60Hz
Output voltages of these variators: three phase 230V - variable frequency.

REF	ACVAR1	ACVAR1-U	ACVAR5	ACVAR5-U	VAR-BOX
Emergency stop push button	No	Yes	No	Yes	No
For motor power	300W	300W	1500W	1500W	1500W
Constant output current	4,4A	4,4A	8A	8A	8A
Maximum transient current	5A	5A	12A	12A	12A

REFERENCES WITH PRIMARY IN 400V THREE-PHASE 50/60Hz
Output voltages of these variators: three phase 400V - variable frequency.

REF	ACVAR1-T	ACVAR1-TU	ACVAR5-T	ACVAR5-TU	VAR-BOX-T	ACVAR6
Emergency stop push button	No	Yes	No	Yes	no	no
For motor power	300W	300W	1500W	1500W	1500W	3000W
Constant output current	1.8A	1.8A	4.8A	4.8A	4.8A	7.1A
Maximum transient current	2.3A	2.3A	6.2A	6.2A	6.2A	10.7A

The variators for 1500W and 3000W machines are frequency converters (at constant V/f) for three-phase asynchronous squirrel-cage induction motors.
Converters are supplied ready-to-use for most applications. They include a built-in adjusting terminal (4-digit display, 7 segments, and 4 knobs) to customize your application by modifying the settings as required and extend the functions. A potentiometer on the front is used to adjust the converter's sampling frequency, and thus the motor rotation speed. Dimensions: 390 x 280 x 185 mm.
Link jump to choose the rotation's direction, except VAR-BOX.
Supplied with operating/programming instructions, software SoMove and USB lead.

Supplied with SoMove

MAIN COMMON FUNCTIONS

Main configurable functions
- Up to 8 preselected speeds
- Rapid stop, freewheel stop, etc.
- Acceleration/deceleration slope
- Default reset
- Sense of rotation choice

Converter protection and safety systems
- Short-circuit protection:
  on outputs, between phases
- Internal power supply
- On outputs, between phases and earth
- Overheating and overcurrent protection

Motor protection
- Heat protection built into the converter by calculating I^2t
- Phase outage protection

TECHNICAL SPECIFICATIONS OF VAR-BOX
All inputs and outputs of the frequency converter are present on safety sockets 4mm on the front panel:
Power terminals
- Mains inputs/outputs to the motor
- Output to a brake resistance (PA/+, PB, PC/-)

Control terminals
- Control inputs: 0-10V, 4-20mA, potentiometer (AI3, COM, AOV, AOC, AI1, 10V, AI2)
- Relay contacts outputs (R1A, R1B, R1C, R2A, R2C)
- Logic inputs (24C, LI1, LI2, LI3, LI4, LI5, LI6, CLI)

1 potentiometer 5 kΩ, output on 3 sockets / 1 On/Off switch, output on 2 sockets

Study case for
speed controller ATV32
See Page 113



Communicating circuit breaker Contactor



ref. CONTYS

CONTYS from mecatronics is a motor starter which combines mechanical, electrotechnical and electronic technologies. It is designed to be used for directly starting up motors of up to 3kW. This compact device combines power functions (disconnecting switch, commutation) and control functions (protection). Motor settings can be displayed and programmed via a numeric screen. Supplied with **SoMove**.

FEATURES
- protection against overloads and short-circuits.
- protection against undervoltages
- protection against isolation faults (equipment protection only)
- reset can be adjusted manually or automatically
- display of motor settings on the front or on the offset terminal:- electric current consumed per phase - adjustment of thermal circuit breaker-alarm for motor values (current, thermal status, etc.)

FRONT FACE
- 6 terminals for three-phase power contacts
- 2 terminals for the coil's 24V AC/DC power supply
- 2 terminals for an auxiliary NO contact
- 2 terminals for an auxiliary NC contact

ELECTRICAL FEATURES

Compatible with 1-3kW motors

3-phase contact
- 600V max / 12A max.

Coil
- supply voltage 24V DC/AC

Auxiliary contact
- 400V max / 10A max.

Variable frequency AC/AC speed controllers

These speed controllers for 1500W and 3000W asynchronous machines are for supplying and programming applications such as belt conveyers, blenders, extruders, pumps, fans and compressors. Putting them into service is rapid and their programming console makes them very easy to use. Software specific to each make lets you configure and monitor operation of the speed controllers. All speed controller and PLC inputs and outputs are available on the front on Ø4mm safety sockets.
A potentiometer lets you adjust the sampling frequency of the speed controller, and the rotation speed of the motor.
Dimensions 390 x 280 x 185mm.
Supplied with operating/programming instructions, software and USB lead.



Supplied with SoMove

Schneider Electric

ATV32

MAIN FUNCTIONS COMMON TO THE 2 MODELS

Main configurable functions
- Adjustment of the deceleration/acceleration ramp
- Adjustment of the minimum/maximum speed of rotation
- Quick stop/free wheel
- Input configuration to manage the 2 rotation directions, RUN, stop type, preselected speeds, etc.
- USB lead output for PC link
- Software for speed controller setting

Speed controller and motor protection devices
- Output protection against short-circuits between phases
- Protection against overloads
- Protection against heating
- Protection against phase outages

Power terminals
- Mains input / output to motor
- Output to a braking resistance (PA/+, PB, PC/-)

Inputs / Outputs Signals on terminals
- 6 Input binary
- 1 Input Analogue - 10-10VDC
- 1 Input Analogue x...y mA
- 1 Safety Input STO
- 3 binary outputs
- 1 O Analogue 0-10V or 0-20mA
- 1 O Logic 30V/100mA

REF	ACVAR325	ACVAR326
Motor power	up to 1500W	up to 3000W
Power supply	200 to 240V single-phase	380 to 500V 3-phase
Frequency	50/60Hz	
Output voltage	3 x 230V	3 x 400V
Nominal output current	8A	7.1A
Bluetooth	Yes	
Braking resistance output	On terminals	
programmation console	Yes	

Variable frequency AC/AC and AC/DC speed controllers

AC/AC SPEED CONTROLLERS - SIEMENS G120



These speed controllers for 1500W and 3000W asynchronous machines are for supplying and programming applications such as belt conveyers, blenders, extruders, pumps, fans and compressors. Putting them into service is rapid and their programming console makes them very easy to use. Software specific to each make lets you configure and monitor operation of the speed controllers.
All speed controller inputs and outputs are available on the front on Ø4mm safety sockets.
A potentiometer lets you adjust the sampling frequency of the speed controller, and the rotation speed of the motor.
Dimensions 390 x 280 x 185mm.
Supplied with operating/programming instructions, software and USB lead.

MAIN FUNCTIONS COMMON TO THE 2 MODELS

Main configurable functions

- Adjustment of the deceleration/acceleration ramp
- Adjustment of the minimum/maximum speed of rotation
- Quick stop/free wheel
- Input configuration to manage the 2 rotation directions, RUN, stop type, preselected speeds, etc.
- USB lead output for PC link
- Software for speed controller setting

Speed controller and motor protection devices

- Output protection against short-circuits between phases
- Protection against overloads
- Protection against heating
- Protection against phase outages

Inputs / Outputs Signals on terminals

- 6 Input binary
- 1 Input Analogue - 10-10VDC or x...y mA
- 2 binary outputs
- 2 switchables from 0 to 10V and from 0/4 to 20mA
- 2 inverter relays 250Vac - 2A / 30Vdc - 5A

REF	ACVAR425	ACVAR426
Motor power	up to 1500W	up to 3000W
Power supply	380 to 480V 3-phase	
Frequency	50/60Hz	
Output voltage	3 x 400V	
Nominal output current	4.1A	7.3A
Braking resistance output	Yes on terminals	
Programmation console	Yes	

AC/DC SPEED CONTROLLERS



DCVAR2 and DCVAR43 speed controllers control separately excited or permanent magnet DC motors. On the front, the RUN button powers up the speed controller and the potentiometer varies the speed of rotation of the motor.
The mains and the motor connect to Ø4mm safety terminals.
Supplied with operating instructions.
Dim: 390 x 280mm x 185mm.

Speed controller protection and safety devices

- Mains side input protection by 30mA residual current circuit-breaker A Type
- Output protection against short-circuits
- Protection against overloads
- Thermal protection against abnormal temperature rise

Features

• Motor power	from 1500W to 3000W
• Power supply	110-115V, 220-240V or 380-415V Single-phase.
• Frequency	50/60Hz
• Armature output voltage	180V
• Nominal armature current	16A
• Field system output voltage	210V
• Field system nominal current	3A Max
• Number of quadrant in operation	1Q (Ref. DCVAR2) 4Q (Ref. DCVAR43) energy release on mains

DCVAR2	DCVAR43
Adjustments on front	
Speed: Max. and Min.	
Current limitation	
Speed stability	
Acceleration/deceleration time 1 to 15s	Acceleration/deceleration time 0 to 40s
Ri compensation	
-	Speed: Proportional gain
-	Speed: Integral gain
-	Current: Proportional gain
-	Current: Integral gain
Zero speed offset	
-	Zero speed limit

Vector speed controller for encoder motor



ref. VCV52

Digital speed controller unit with vector flux control for asynchronous and synchronous motor with max power 2000 W (compatible with our 300 W and 1500 W motors). 8-pin connector for linking a 1024-pt encoder. A cut-out, on the unit front, gives access to the different programming keys and to a screen showing the various settings of the speed controller. A potentiometer adjusts the speed of
rotation, while a switch controls motor rotation on/off. A set of security terminals gives access to the cabling of 3 programmable inputs (e.g. motor stopping in 'free wheel', reversal of the direction of rotation, preselected speed), of 2 analogue inputs 0-10 V/4-20 mA and one external braking resistor not supplied.

Features

- vector speed controller 2.2 kW / 3 HP max.
- Power supply 3x400 V AC 50/60 Hz + Earth
- Output 3x400 V + Earth – 5.5 A
- Speed controller output frequency adjustable from 0.1 to 599 Hz.
- Acceleration and deceleration ramp with separate adjustment.
- Vector control of current flux
- Encoder input 1024 pts
- Protection against phase loss, overcurrent, overvoltage, thermal, etc.
- Dim. 390 x 280 x 185mm

SoMove **Supplied with SoMove**

Schneider Electric

Economical AC/AC frequency converters



Ref. ECOVAR-03



Ref. ECOVAR-15

Ref. ECOVAR-30

Variators for three-phase, squirrel-cage asynchronous machines with a power of 400 to 4000W.
With their integrated control console, these variators are easy to use.
Speed control by potentiometer Start/Stop button.
From the control unit, the user can configure:

- the motor's rated characteristics, such as rotation speed, current, voltage, and so on
- the rotational direction
- the acceleration ramp
- the deceleration ramp
- resetting of defaults

OPTIONS * : CONTACT US

- 1 brake resistance output
- 1 fault contact output
- 2 programmable inputs
- 1 analog 0-10V input
- 1 analog 4-20mA input

* *These options require to fit these ECOVAR-15 & ECOVAR-30 variators in a plastic box*

Reference	ECOVAR-03	ECOVAR-15	ECOVAR-30
Motor power	Up to 400W	Up to 2200W	Up to 4000W
Supply / Frequency	230V 50/60Hz on safety terminals 4mm	230V 50Hz/Single on 2P+E socket with power cable 2m	400V 3-phase on CEI 3-phase socket with power cable 2m
Output voltage	230V 3-phase on safety terminals 4mm		400V triphasé sur bornes de sécurité 4mm
Constant output current	4A	10A	8,5A
Output frequency possibility to set a maximum frequency	0 – 400Hz		
Protection against the short-circuits between phase	Secondary by fuses		
Protection against over-current	Yes		

4 years guarantee. Instructions manual is supplied with the variator..

Study case for speed controller ATV32 programmable inputs / outputs

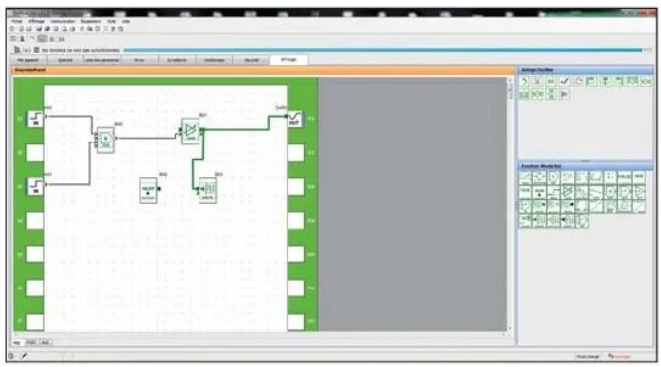


ref. VAL-VAR

EDUCATIONAL OBJECTIVES

- **Studying a 3-phase speed controller**
- **Studying a setup software and setting the speed controller**

TEACHING RESOURCES STUDENT & TEACHER



Programming screen of logical inputs/outputs of the variator.





VAL-VAR is a study case for the speed controller ATV32 for asynchronous machine.
It contains all the equipment required for autonomous operation.
The case connects directly to the mains 230V single-phase.
The printed PVC face includes the electrical protection and control equipment, safety terminals for cabling the inputs/outputs of the speed controller and taking current measurements in each phase of the motor.

COMPRISES

- 1 socket + switch unit module for linking to the mains 230V-50/60Hz.
- 1 main switch.
- 1 differential magneto-thermal circuit-breaker 16A-30mA.
- 1 motor circuit-breaker type GV2
- 1 speed controller for asynchronous machine ATV32 from Schneider® power 0.18kW. This speed controller can be programmed using controls on its front or from the offset programming graphic terminal. It can also be linked to a PC using the RJ45/USB lead or Bluetooth link if your PC is so equipped. All the control inputs and outputs of the speed controller are offset to the safety terminals:
  - 6 binary inputs
  - 1 analogue input -10...10VDC
  - 1 analogue input x...y mA
  - 1 Safety Input STO
  - 3 binary outputs
  - 1 analogue output 0...10V or 0...20mA
  - 1 logic output 30V/100mA
- 1 multifunction programming graphic terminal with large screen monochrome (8 lines) 240x160 pixels.
  This terminal is offset using RJ45 1-m lead (supplied).
- 1 three-phase asynchronous motor 0.12kW-230/400V-AC.
  The rotation of its shaft can be seen through a translucent safety window.
- 1 set of jumpers, a switch and a potentiometer enable immediate operation of the speed controller.

CASE SUPPLIED READY TO USE WITH

- 1 set of safety leads and jumpers.
- 1 programming graphic terminal
- 1 SoMove software (Schneider Electrique®) with RJ45/USB lead to link to PC
- 1 instruction manual, on CD, including the component data sheets and practical assignments for speed controller programming help.

Supervision units for electric motor benches Schneider® tools & equipment

The MTD series is a complete system for monitoring a 1500W motor bench. From a PC or touch screen (according to the version), the supervisor controls and observes the operation of a bench. The electrical cabinet encloses the PLC, the speed controller and the protection devices required for the supervision and control functions.
Settings and supervision software is supplied. The supervision unit is fully programmed, ready to run and open to all modifications without restriction.

General features

- Technical cabinets with braked wheels.
- High-temperature 40 mm laminated top 750 x 670 mm.
- Console, dimensions 350 x 160 x 180 mm
- Overall dimensions: 750 x 670 x (h) 1210 mm (1460 mm touch version).
- Power supply by single-phase mains cord 230V AC.

Software supplied with all versions

- SoMove: For settings on the speed controller.
- PLC software For settings on the PLC.
- VijeoDesigner: For supervision. Fully programmed, ready to run. Modifiable to create your own supervision.

	To be combined with a 1500W motor bench (not supplied) equipped with: Essential: 1 MOTOR + 1 POWDER BRAKE Recommended: 1 torque sensor + 1 tacho-generator			To be combined with a 1500W motor bench (not supplied) equipped with: Essential: 1 motor + 1 three-phase alternator Recommended: 1 torque sensor + 1 tacho-generator		
REF	**MTD1**	**MTD2**	**MTD3**	**MTD4**	**MTD5**	**MTD6**
						
Controls by	Integral 10-inch touch screen	Your PC	Your PC or Manual (on console)	Integral 10-inch touch screen	Your PC	Your PC or Manual (on console)
Supervision by	Integral touch screen	Your PC	Your PC	Integral touch screen	Your PC	Your PC
Controls and Supervision	**On the motor** Start Stop - Speed 0 to 1600 rpm - 1st and 2nd speed of rotation - Forward/Back Operation - Speed of rotation (+ and -) - Motor overload - Display of torque and speed (if brushless torque sensor) **On the brake**: From 0 to 100% - Blocking - Free wheel **Other**: Speed controller overload			**On the motor** Start Stop - Speed 0 to 1600 rpm - 1st and 2nd speed of rotation - Forward/Back Operation - Speed of rotation (+ and -) - Motor overload - Display of torque and speed (if brushless torque sensor) **On the alternator:** Voltage variation at terminals of rotary field. **On the resistive load:** load variation from 0 to 100% in 6 steps.		
Equipment of the console	Emergency stop General Start/Stop 2 RJ45 sockets Mains socket 230V Touch screen colour	Emergency stop General Start/Stop 2 RJ45 sockets Mains socket 230V	Emergency stop - General start/stop 2 RJ45 sockets Mains socket 230V Motor, Load & Speed control	Emergency stop General Start/Stop 2 RJ45 sockets Mains socket 230V Touch screen colour	Emergency stop General Start/Stop 2 RJ45 sockets Mains socket 230V	Emergency stop - General start/stop 2 RJ45 sockets Mains socket 230V Motor, Load & Speed control
Equipment of the cabinets	• Front door, closing by 2 key locks: Control panel with indicator lights (marked PVC panel). Transparent panel: view of the speed controller and PLC information. Safety system cutting off electrical distribution if opened. • Rear door, closing by 2 key locks: Large PVC surface with complete wiring diagram. Safety terminals 4 mm and connection sockets for: - Earths - Three-phase asynchronous motor 3 x 230V AC - 1500W - Brushless torque sensor (Din. socket) - Powder brake. - Tacho-generator 0-10/20/60V for 1000 rpm • Main components Differential 30mA and magneto-thermal circuit-breakers. Contactor for motor control. PLC software with 24 Inputs/24 Outputs binary, Ethernet RJ45. Analogue board 4 Inputs 0-10V DC and 2 Outputs 0-10V DC Speed controller ATV32, 1500W - 3 x 230V AC.			• Front door, closing by 2 key locks: Control panel with indicator lights (marked PVC panel). Transparent panel: view of the speed controller and PLC information. Safety system cutting off electrical distribution if opened. • Rear door, closing by 2 key locks: Large PVC surface with complete wiring diagram. Safety terminals 4 mm and connection sockets for: - Earths - Three-phase asynchronous motor 3 x 230V AC - 1500W - Brushless torque sensor (Din. socket) - Powder brake. - Tacho-generator 0-10/20/60V for 1000 rpm • Main components Differential 30mA and magneto-thermal circuit-breakers. Contactor for motor control. PLC software with 24 Inputs / 32 Outputs binary, Ethernet RJ45. Analogue board 4 Inputs 0-10V DC and 2 Outputs 0-10V DC Speed controller ATV32, 1500W - 3 x 230V AC. Power supply controlled from the PLC. Powers the rotary field. Resistive load of 2kW can be controlled from 0 to 100% of load in 6 steps.		



Front view MTD3

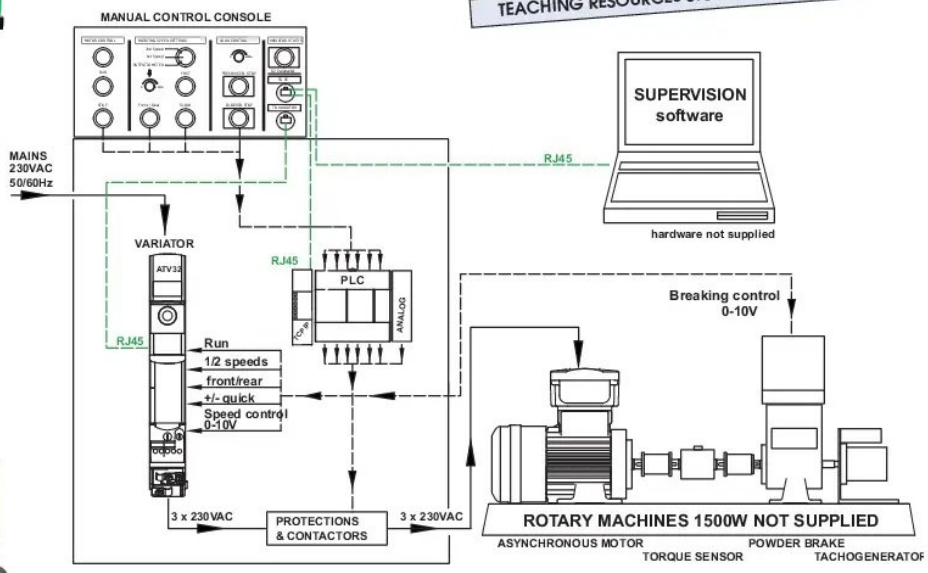


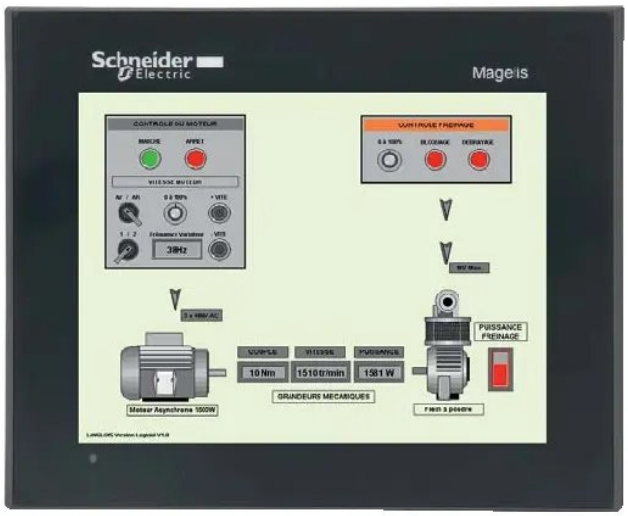
Rear view MTD3



BLOCK DIAGRAM OF MTD3 VERSION WITH 1500W MOTOR GROUP

TEACHING RESOURCES STUDENT & TEACHER





EXAMPLE OF SUPERVISION ON TOUCH SCREEN OF MTD1 MODEL (MOTOR + POWDER BRAKE)



EXAMPLE OF SUPERVISION ON PC OF MTD5 MODEL MOTOR + THREE-PHASE ALTERNATOR

ACQUISITION OPTION

All the versions shown are compatible with the acquisition option.

Enables the acquisition of:
- electrical values (Voltage - Current - Absorbed power).
- mechanical values (Torque - Speed - Power).

Supplied with measuring panel and acquisition software.
This option requires a bench that should be equipped with a brushless torque sensor and tacho-generator.
Add -ACQUI to the end of the reference. Example: MTD4-ACQUI
Factory assembly only.

ref. -ACQUI





Stand-alone DC and 3-phase power supplies



Transportable variable supplies unit (2000W or 4000W)
Supply from mains: 3-phase 380V/400V + neutral + earth
Outputs: 2 variable DC supplies 0-250V and 1 variable AC 3-phase supply 0-430V

PROTECTION OF THE USER IN DC

- DC supplies are isolated from mains by an insulation transformer.
- The outputs are protected against surges and short-circuits.

OTHER SPECIFICATIONS

- The DC power supply is delivered from a Graetz bridge (Ripple 4%)
- The DC auxiliary outputs is with a double alternation rectification of which the ripple rate changes with the load
- Emergency stop push button - key reset
- Voltage regulation by two autotransformers
- Power cable with industrial 3-phase plug supplied
- Hard-wearing LED lamps
- Outputs on safety terminals Ø 4mm.
- Dimensions 710 x 600 x 375mm

REF	COMPAK20	COMPAK40
OUTPUT 0-250VDC	8A + voltmeter & ammeter	16A + voltmeter & ammeter
OUTPUT 0-430V 3-PHASE	5A + voltmeter & ammeter	6A + voltmeter & ammeter
AUXILIARY OUTPUT 0-250V	2.5A + voltmeter & ammeter	2.5A + voltmeter & ammeter

High power DC and 3-phase power supplies

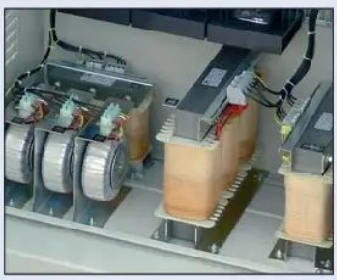


This power supply, which is varied using an autotransformer, can be networked so that it can power other stations. The DC outputs are insulated from the mains, as stipulated in the standard, and monitored by a continuous insulation monitoring device for the safety of users. This monitoring allows the DC output to be networked. The transformer complies with the NFEN6158 norm.

INTRODUCTION AND DESCRIPTION:

- Sheet metal cabinet, fitted on a wheeled base.
- For 3-phase 400V + Neutral + Earth supply from mains
- Voltages can be adjusted using a flywheel.
- One disconnecting switch.
- Hardwearing indicator lights
- One key-operated emergency-stop circuit breaker.
- One ammeter for the DC
- One three-position switch: DC / 0 / three-phase
- Two voltmeters: one for the DC and one for the three-phase
- Outputs: Can be connected in one of two ways – either using an internal terminal for a network cable, or safety terminals for direct use with safety leads.
- Protection: by circuit breakers
- insulation checking by a continuous insulation monitoring device
- UNIT Height: 1000mm / Width: 600mm / Depth: 350mm
- BASE Height: 100mm / Width: 810mm / Depth: 600mm

For safety the DC outputs are separated from the mains by safety isolating transformer



REF.	PSY40K	PSY60K	PSY90K	PSY120K	PSY150K
MAX ELECTRIC CURRENT IN DC 0-250V	16A monitored	24A monitored	36A monitored	48A monitored	60A monitored
MAX ELECTRIC CURRENT 3-PHASE 0-450V	8A	13A	13A	20A	20A
TOTAL POWER	4.000VA	6.000VA	9.000VA	12.000VA	15.000VA
FOR MAINS SUPPLY	3-PHASE 400V+N+E				

Variable power supplies with integral speed controller



Ref. AL40-AC



Top Ref. AL40-DC

Cable storage and sockets at rear.

The cabinet door open and close by key.



NEW

Power supplies on wheels with speed controller 2kW, 4kW, AC and/or DC according to the version selected.

Main start/stop and emergency stop controls on the front. Each voltage output is active from a Start/Stop switch.
An indicator light signals their operation. A complete measuring unit displays the alternating values of consumption of the workstations. Other sources are not taken into account in these measurements.
All the outputs are protected against overloads and short circuits.

MEASURING UNIT (on AC and ACDC models)
Simple to use thanks to 6 keys on front, it displays the electrical values of the variable three-phase + fixed three-phase + AC speed controller outputs:
- current in each phase.
- phase-to-ground and composite voltage.
- frequency.
- active, reactive and apparent power in each of the phases and in three-phase.
- power factor in each phase and in three-phase.
- total harmonic distortion for current and voltage.
- measurement of active, reactive and apparent energy on 4 dials.

REMOTE CONTROL OF THE MEASURING UNIT
An RJ45 connector on the front of the cabinet enables the unit to be used remotely by means of an integral web page which displays the electrical values measured.

Dims: AL20-DC / AL20-AC / AL40-DC / AL40-AC : 500 x 500 x 980mm. Weight 90kg.

Dims: AL20-ACDC / AL40-ACDC : 500 x 800 x 980mm. Weight 175kg.

POWER 4000VA

Ref.	VARIABLE BY AUTOTRANSFORMER				3-PHASE 3x400VAC	SPEED CONTROLLER DC 3KW	SPEED CONTROLLER AC 4KW	3 SOCKETS 230V 2P+T	MEASURING UNIT CM
	DC 0-270VDC-16A	3-PHASE 0-450VAC-8A measuring by CM	DC AUXILIARY 0-250VDC-2.5A	AC AUXILIARY 0-250VAC-2.5A	measuring by CM		measuring by CM		
AL40-DC	✔		✔	✔		✔		✔	
AL40-AC		✔	✔	✔	✔		✔	✔	✔
AL40-ACDC	✔	✔	✔	✔	✔	✔	✔	✔	✔

POWER 2000VA

Ref.	VARIABLE BY AUTOTRANSFORMER				3-PHASE 3x400VAC	SPEED CONTROLLER DC 2KW	SPEED CONTROLLER AC 2KW	3 SOCKETS 230V 2P+T	MEASURING UNIT CM
	DC 0-270VDC-8A	3-PHASE 0-450VAC-5A measuring by CM	DC AUXILIARY 0-250VDC-2.5A	AC AUXILIARY 0-250VAC-2.5A	measuring by CM		measuring by CM		
AL20-DC	✔		✔	✔		✔		✔	
AL20-AC		✔	✔	✔	✔		✔	✔	✔
AL20-ACDC	✔	✔	✔	✔	✔	✔	✔	✔	✔

Variable DC 0-270VDC
With isolating transformer, to standard NFC 61558.
Rectification is generously oversized (ripple factor 4%).
Output on 4mm terminal valid provided the autotransformer is at 0 voltage.
Viewing by voltmeter and ammeter.

Variable three-phase 0-450VAC
The proposed voltage is 0-430V between phases (450V for 4000VA model).
Output on 4mm terminal valid provided the autotransformer is at 0 voltage.

Auxiliary 0-250VDC
With isolating transformer, to standard NFC 61558.
Viewing by voltmeter and ammeter.
Double alternating rectification, the ripple factor of which varies with the charge.

Auxiliary 0-250VDC
Viewing by voltmeter and ammeter.

3-phase 3x400V on 4 terminals.

DC speed controller
Operation 1 quadrant, from 1.5 to 3kW, outputs for armature 180V-16A and field system 210V-3A on 4mm terminals.
Adjustment of the rotation speed setting by potentiometer on the front.

AC speed controller
Operation 1 quadrant, 2 or 4kW outputs 3x400VAC on 4mm terminals.
Adjustment of the rotation speed setting by potentiometer on the front.
Configuration with SOMOVE software supplied.



AC/DC portable power supply

Adjustable from 0 to 230V in DC or AC, this power supply delivers a constant current of 3A.
Protected by a thermal-magnetic circuit breaker, the safety of users is ensured by the separation of circuits.

• Mains input	Mains cable
• On/Off	General luminous switch
• DC variable output	0-240 V
• AC variable output	0-230 V
• Variable voltage setting	rotating knob onto the unit
• Max current DC or AC	3A
• Output displays	1 voltmeter and 1 ammeter
• Input protection	by time delay fuse
• Output protection	thermal-magnetic circuit-breaker
• User's safety	all outputs are insulated from mains
• DC output smoothing	by capacitors, without electronic regulation
• AC/DC commutation	CC – 0 – CA by rotary switch
• Connecting	Safety terminals 4mm
• Dimensions / Weight	210 x 245 x 350mm / 14kg

COMPATIBLE WITH 300W MOTORS

ref. ISOSEC1



AC/DC power supply on wheels (10A)

Supply of AC or DC current in 10A max.AC/DC selector switch on the front of the unit.
Mains cable of 3 metres with plug.

• Mains supply	230V, single-phase
• ON/OFF	push button + LED lamp
• Emergency stop	with key
• DC output	0-230V
• AC output	0-230V
• Adjustement	by a rotary button on the top
• Max output current	10A
• Outputs display	1 voltmeter et 1 ammeter
• Input protection	by fuse
• Outputs protection	by circuit breaker
• Users protection	by insulation from mains (in DC mode only
• Filtering ACDC10	no filtering. double alternation rectification
• Filtering DC10	with filtering. 5% of residual ripple at 10A.
• Switching	DC – 0 – AC (by rotary switch)
• Dimensions / Weight	H 510 x P 280 x P 330 mm / 49 kg
• Wheels	4 (2 of them have a brake)

ref. ACDC10



ref. DC10

Version without AC output. For solar system. Special connections **(P. 151)**



Dual DC portable power supply

This power supply includes :
- one variable DC supply with voltmeter & ammeter
- one fixed DC supply
Protection of users is ensured by galvanic insulation of outputs.

• Mains :	Mains cable
• On/Off :	General switch and light
• DC variable output :	0-240V / 3A
• DC fixed output :	190V / 1A
• Input protection:	by time delay fuses
• Output protection :	by thermal magnetic circuit-breakers
• Smoothing :	by capacitors
• Dimensions / weight :	210 x 245 x 350mm / 20kg.

COMPATIBLE WITH 300W MOTORS

ref. ISOSEC2

Dynamic loads

PROPELLER FAN

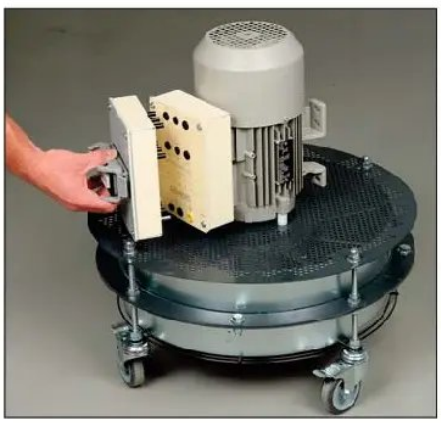


ref. VH20 moteur 230/400V

ref. VH20-400 moteur 400/690V

On the base of a propeller fan, a 1500W motor is direct-coupled to the propeller in a 500mm diameter shaft. In this way, this small group forms a dynamic load designed for studying the load currents of a motor.

- Four wheels
- Height: 560mm
- Max. external diameter: 530mm
- Power consumption: 0.5kW
- 2 models available
  Ref. VH20 :
  motor 230/400V - 4A/2,3A cosφ 0,33
  Ref. VH20-400 :
  motor 400/690V - 2,3A/1,3A cosφ 0,33
- Total weight : 27Kg
- Supplied with type-changing interface for fast connections using HARTING® connectors.



INDUSTRIAL FAN MODELS



REF	SHT-40	SHT-50	SHT-60
Absorbed power	1000 W	1550 W	1650 W
Rotational speed at 50Hz	2800	2800	1400
Current by phase in A	1,8	3	3,5
Power factor	0,8	0,76	0,7
Air flow in m3/min	96	200	240
Pressure in Pa	700	1050	1100
Sound level in dB(A) at 1 meter	97	98	92
Weight in kg	28	40	78
Diameter in mm	400	500	600
Overall length	570x560x480	680x660x520	920x830x550

These fans, mounted on a wheeled chassis for easy movement, rotate around a horizontal axis so that the airflow can be pointed in any direction. These fans make up ideal three-phase loads for connection to a control requiring inductor currents to study.

- Supply: 3-phase 400V + earth
- On/Off switch on the housing of the fan
- Power cord of 5 metre without plug
- Compatible with the 3-phase 400V frequency converter

FAST CONNECTION OPTION FOR VH20 & VH20-400

3 metre cable with a Harting® female socket (16 points)

ref. INT-VH



Mobile inductive loads (single & 3-phase)



- The inductor LH** can vary the power factor continuously from 0.9 to 0.1 in single-phase and 3-phase.

PRINCIPLE

- 3 moving laminated cores made from silicium sheets, are moved by a control wheel through 3 coils.
- The reactive power varies from 0.1kVAR to the rated power. (ie 4kVAR for LH40)
- It is possible to exceed the rated power during few minutes.

CONNECTION

- 4 (safety) jumps connect the coils to either 3-phase star 400V, delta 240V or single-phase 240V.
- Each phase is protected by a fuse.
- This inductor exists in 3 standard power ratings.
- Dimensions 670 x 400 x 1000mm
- Weight 70kg
- Male earth socket in standard. Female earth socket upon request.
- CEI1010 CATIII 1000Vrms pol2

REF	LH20	LH40	LH60
Reactive rated power	2kVAR	4kVAR	6kVAR
Constant current by phase	3A	6A	9A
Resistance of each coil	2.5 Ω		1.1 Ω
Weight	78kg		75kg

Variable inductive load (single & 3-phase)



- **LH10** is a bench mounted inductive load, single-phase and 3-phase.
- A screw with a handle moves the 3 laminated cores made in silicium sheets in their coils between 2 limits, the safety terminals may be connected to 3-phase star 400V, delta 240V or single-phase 240V
- PVC sealed box with safety terminals
- Dimensions 280 x 270 x 150 mm.
- Weight 21 kg.
- CEI1010 CATIII 1000Vrms pol2

Normal reactive power	1 kVAR
Reactive power for 10 min	1.5 kVAR
Constant current by phase	2A max
Variation of inductance for each phase	3 x 0.1 to 1.4H

ref. LH10

Portable capacitive loads (single & 3-phase)



- The CH is a capacitve load useable from 0 to the rated power. 4 jump leads to plug in safety terminals, connect a bank of capacitors in 3-phase star 400V, delta 240V or single-phase 240V.
- 6 switches 5%, 10%, 15%, 20%, 25%, 25% regulate the load from 0 to the rated power without interupting the load (ie 0 to 4kVAR for CH40).
- Safety : a discharge resistor is placed at the terminals of each capacitor.
- Male earth socket in standard. Female earth socket upon request.
- Portable unit (in steel). Dim. 500 x 300 x 200mm.
- CEI1010 CATIII 1000Vrms pol2

REF	CH05	CH20	CH40	CH60
Power	500VAR	2KVAR	4KVAR	6KVAR
Nb of switch	6			
Variation in	steps of 5%			
Type	portable			
Weight	11kg	12kg	13kg	16kg

Mobile resistive loads





- The high quality of loads depends directly of the quality of switches used. All of our loads use ultra fast breaker switches, capable of breaking a DC current with an inductive load, for example the current generated by a 3kW dynamo.
- The resistive elements consist of a wire coil wound onto a ceramic core and have a good life because they are coating against the oxydation.
- The input terminals are double insulated and accept equally Ø4mm standard or safety leads.

REF	RH20	RH40	RH40S	RH60	RH80
W	2kW	4kW		6kW	8kW
Nb switches	6		7	6	
Variation in	Steps of 5%		Steps of 2.5%	Steps of 5%	
Type	with wheels				
Weight	44kg	38kg		53kg	50kg

OPERATING MODE

- The selection of the operating mode is by 4 insulated input switches
  DC mode or 240V single-phase.
  3-phase star 400V.
  3-phase delta 240V.
  (Exists also for voltages 127/220V in 4kW upon request)

VARIATION

- 6 switches (7 on RH40S model) with the gradation 5%, 10%, 15%, 20%, 25%, 25% allow a continual progression without a break of the load from 0 to 100% in steps of 5% (2.5% on the RH40S).
- All of the intermidiate values are obtained by turning 1 or 2 switches which can be made simultaneously using 2 hands.
- Male earth socket in standard. Female earth socket upon request.

WHEELED UNITS

- Robust construction with furnace baked epoxy paintwork. Excess heat is vented by natural convection through a grid which prevents contact with any voltages.
- Dimensions: 660 x 400 x 880mm
- CEI1010 CATIII 1000Vrms pol2

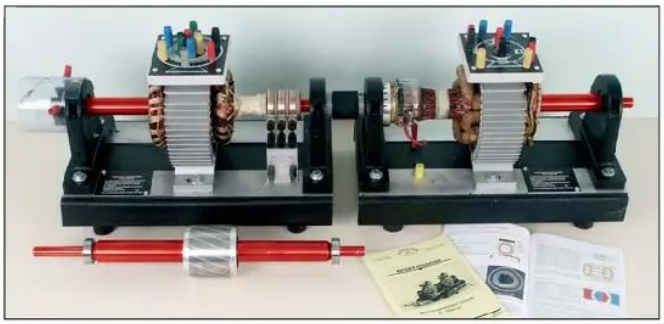
Compact resistive loads (single & 3-phase)



- Using the same switches and resistors as the other models, this load is intended for use on the laboratory bench.
- The ultra fast switches and operating mode jump leads are found on the front panel.
- DC and single-phase 240V mode/3-phase delta 240V/ 3-phase star 400V.
  (Exists also for voltages 127/220V in 4kW - upon request)
- Dimensions: 500 x 220 x 400mm
- Male earth socket in standard. Female earth socket upon request.
- CEI1010 CATIII 1000Vrms pol2

REF	RHP05	RHP20	RHP40
W	0,5kW	2kW	4kW
Nb switches	6		
Variation in	Steps of 5%		
Type	Portable		
Weight	15kg	18kg	17kg

Demo plug & play motor (AC or DC)

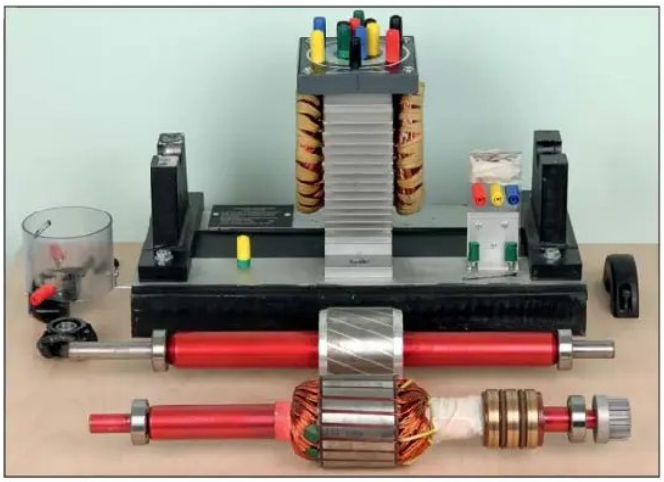


EDUCATIONAL OBJECTIVES

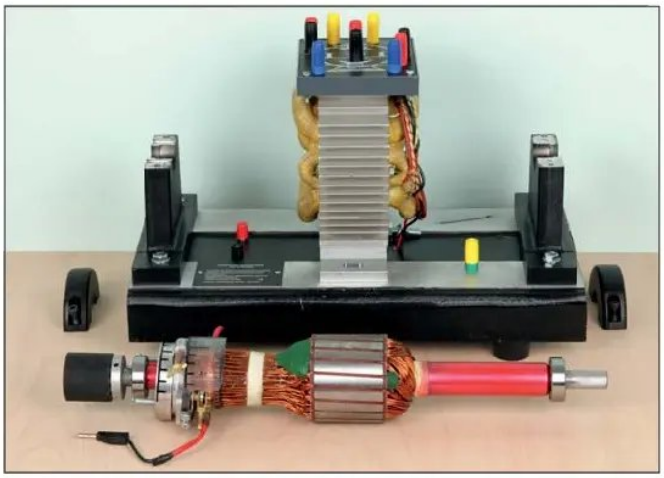
- **Understanding the different types of electrical motors & generators.**
- **Studying the operating characteristics of each device.**

TEACHING RESOURCES STUDENT & TEACHER

The various functions can be obtained by simple coupling, perfectly explained in the instructions.
Although powered by non-hazardous voltages (< 50VAC / < 100VDC), the powering up of these products is restricted to authorised staff due to the lack of protective housing.



ref. DEMO-AC 48V alternating current



ref. DEMO-DC 48V direct current unit

DEMO-AC: 48V ALTERNATING CURRENT

Works with the 3-phase variable 0-48V 15A power supply (not included). See Ref. ALI-DEMO.

Presentation: The interconnection of the widings on to a didactic terminal box provides a visual understanding of the coil of the various electrical machines and their functions. Users are able to see the position of the brushes and their movement. It is powered by 48 volt ELV. A full user manual is provided with the motor/alternator.

TECHNICAL DESCRIPTION

- Open frame.
- An alternating current stator.
- An aluminium base.
- Two aluminium bearings for supporting the motor shaft.
- Possibility for studying 8 different motors, with safety terminal connections
  Single-phase motor with capacitors
  2-pole star connection three-phase motor
  4-pole delta connection three-phase motor
  Star-delta three-phase asynchronous motor
  Dahlander connection asynchronous squirrel cage motor
  Three-phase slip-ring motor
  Synchronous three-phase motor
  Three-phase alternator
- Extension shafts.
- One squirrel cage rotor.
- One slip ring rotor. Enables the functioning of the motor and the alternator.
- One rotating brush holder.
- One brush holder mount.
- Three brushes for the slip-ring motor.
- Half coupling.
- A rotating centrifugal contact.
- A user manual.

DEVELOPED PRACTICAL WORK

- Single-phase alternating motor.
- Alternating motor theory.
- Repulsion-induction motor with auxiliary wiring.
- Capacitor motor.
- Capacitor start and run motor.
- Three-phase alternating motor theory.
- 2-pole star motor.
- 4-pole delta motor.
- Slip-ring motor.
- Alternator theory.
- Three-phase alternator functions.
- Synchronous motor.

DEMO-DC: 48V DIRECT CURRENT UNIT

Works with the 3-phase variable 0-48V 15A power supply (not included). See Ref. ALI-DEMO.

Presentation: The interconnection of the windings on to a didactic terminal box provides a visual understanding of the coil of the various electrical machines and their functions. Series poles can be added or removed to/from the shunt poles to create a compound machine. Users are able to see the position of the brushes and their movement. It is powered by 48 volt ELV. A full user manual is provided with the motor/alternator.

TECHNICAL DESCRIPTION

- Open frame.
- A direct current stator.
- An aluminium base.
- Two aluminium bearings for supporting the motor shaft.
- Possibility for studying 14 different motors, with safety terminal connections
  DC shunt motor/DC shunt motor with commutating poles
  DC series motor/DC series motor with commutating poles

Long shunt compound generator
Long shunt compound generator with commutating poles
Short shunt compound motor
Short shunt compound motor with commutating poles.
Separately excited shunt motor
Universal motor without commutating poles/with commutating poles
Repulsion motor
Series generator with commutating poles.
Separately excited series source rotor generator
Separately excited series source stator generator
Self-excited long shunt compound generator
Self-excited short shunt compound generator

- An armature
- Half coupling.
- A user manual.

DEVELOPED PRACTICAL WORK

- Direct current motor theory.
- Armature reaction.
- Winding polarities.
- DC shunt motor
- DC shunt motor with commutating poles.
- Speed control.
- Long shunt compound DC motor.
- Long shunt compound DC motor with commutating poles.
- Short shunt compound DC motor.
- Short shunt compound DC motor with commutating poles.
- DC shunt motor, separately excited.
- DC generator theory.
- DC shunt generator.
- Separately excited generator.
- Series DC generator with commutating poles.
- Series-excitation generator.
- Compound generator.
- Long shunt compound DC generator.
- Short shunt compound DC motor.

Dismantled motor



ref. MAS-DEM

MAS-DEM educational objective is theoretical research into, and discovery of, the three-phase asynchronous squirrel-cage motor. Presented in a case containing the following items:

- The motor carcass with stator wiring, fitted with a terminal block.
- The squirrel-cage rotor.
- The left and right flanges + fan.
- Screws + screwdriver kit

The 370W motor can be assembled and disassembled depending on needs.
This provides a better understanding of three-phase motor technology.
The instructions cover all theoretical research into the operation and technology involved in the 3-phase squirrel-cage motor

FEATURES OF THE CASE

- Dim. 534 x 427 x 182mm
- Weight: 10Kg

SIEMENS

Power supply bench DEMO-AC & DC



Workbench for the study of motors ref. DEMO-AC and DEMO-DC.
Fitted with a 1200 x 750mm worktop and a 250mm width electrical cabinet.
High mechanical and high temperature resistance stratified worktop.

The lateral console delivers below outputs:

- variable 3-phase + N 0-48V / 15A per phase, usable in two-phase
- variable DC 0-48V / 6A
- 12V DC / 4,2A
- 2 x 230V power sockets (2P+E)

Common features for all outputs:

- Hard-wearing LED lamp, without maintenance
- Emergency key release stop button, and start/stop push button
- Each output is controlled independently
- Outputs protected with circuit breakers or auto-protection with auto reset
- Outputs with voltmeter and ammeter
- Electrical drawing available on request

ref. ALI-DEMO



MOBILE VERSION WITHOUT TABLE
POWER SUPPLY ON WHEELS

ref. ALI-DEMO-M

Rheostats with safety terminals 4mm

MODELS 320W - 640W - 1300W - 1900W



ECO1/2

Rheostats 320W	
Ref.	VALUES
ECO1/2-1	0 to 1Ω / 18A
ECO1/2-3.3	0 to 3,3Ω / 10A
ECO1/2-10	0 to 10Ω / 5.7A
ECO1/2-15	0 to 15Ω / 4.5A
ECO1/2-22	0 to 22Ω / 3.8A
ECO1/2-33	0 to 33Ω / 3.1A
ECO1/2-47	0 to 47Ω / 2.6A
ECO1/2-68	0 to 68Ω / 2.2A
ECO1/2-100	0 to 100Ω / 1.8A
ECO1/2-150	0 to 150Ω / 1.5A
ECO1/2-220	0 to 220Ω / 1.2A
ECO1/2-330	0 to 330Ω / 1A
ECO1/2-470	0 to 470Ω / 0.8A
ECO1/2-680	0 to 680Ω / 0.7A
ECO1/2-1000	0 to 1000Ω / 0.6A
ECO1/2-3300	0 to 3300Ω / 0.3A

Dim. : 270 x 92 x 163mm / 1.9kg

ECO2

Rheostats 1300W	
Ref.	VALUES
ECO2-0.5	0 to 0,5Ω / 50A
ECO2-1.6	0 to 1,6Ω / 28A
ECO2-5	0 to 5Ω / 16A
ECO2-11.5	0 to 11,5Ω / 10A
ECO2-16.5	0 to 16,5Ω / 8.7A
ECO2-23.4	0 to 23,4Ω / 7.2A
ECO2-33	0 to 33Ω / 6A
ECO2-50	0 to 50Ω / 5A
ECO2-106	0 to 106Ω / 3.3A
ECO2-165	0 to 165Ω / 2.8A
ECO2-325	0 to 325Ω / 1.9A
ECO2-500	0 to 500Ω / 1.6A
ECO2-1650	0 to 1650Ω / 0.9A
ECO2-5000	0 to 5kΩ / 0.5A

Dim. : 470 x 164 x 163mm / 5.5kg

ECO1

Rheostats 640W	
Ref.	VALUES
ECO1-1	0 to 1Ω / 25A
ECO1-3.3	0 to 3,3Ω / 14A
ECO1-4.7	0 to 4,7Ω / 12A
ECO1-6.8	0 to 6,8Ω / 10A
ECO1-10	0 to 10Ω / 8A
ECO1-15	0 to 15Ω / 6,5A
ECO1-25	0 to 25Ω / 5A
ECO1-33	0 to 33Ω / 4.4A
ECO1-50	0 to 50Ω / 3.6A
ECO1-68	0 to 68Ω / 3A
ECO1-100	0 to 100Ω / 2.5A
ECO1-150	0 to 150Ω / 2A
ECO1-210	0 to 210Ω / 1.7A
ECO1-330	0 to 330Ω / 1.4A
ECO1-470	0 to 470Ω / 1.2A
ECO1-650	0 to 650Ω / 1A
ECO1-1000	0 to 1000Ω / 0.8A
ECO1-1500	0 to 1500Ω / 0.65A
ECO1-2200	0 to 2200Ω / 0.54A
ECO1-3300	0 to 3300Ω / 0.44A
ECO1-4700	0 to 4700Ω / 0.37A
ECO1-6800	0 to 6800Ω / 0.31A
ECO1-10000	0 to 10kΩ / 0.25A

Dim. : 470 x 92 x 163mm / 3kg

ECO3

RhEostats 1900W	
ref.	VALUES
ECO3-0.33	0 to 0,33Ω / 76A
ECO3-1.1	0 to 1,1Ω / 42A
ECO3-3.3	0 to 3,3Ω / 24A
ECO3-11	0 to 11Ω / 13A
ECO3-33	0 to 33Ω / 7.6A
ECO3-110	0 to 110Ω / 4.2A
ECO3-333	0 to 333Ω / 2.4A
ECO3-1100	0 to 1100Ω / 1.4A
ECO3-3300	0 to 3300Ω / 0.76A

Dim. : 470 x 248 x 163mm / 8.3kg

3-PHASE RHEOSTAT (3 RESISTORS)



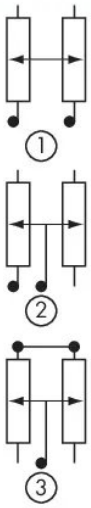
Rheostats 1900W	
Ref	VALUES
ECOTRI-1	0 to 3 x 1Ω / 3 x 25A
ECOTRI-3.3	0 to 3 x 3,3Ω / 3 x 14A
ECOTRI-10	0 to 3 x 10Ω / 3 x 8A
ECOTRI-33	0 to 3 x 33Ω / 3 x 4.4A
ECOTRI-100	0 to 3 x 100Ω / 3 x 2.5A
ECOTRI-330	0 to 3 x 330Ω / 3 x 1.4A
ECOTRI-1000	0 to 3 x 1kΩ / 3 x 0.8A
ECOTRI-3300	0 to 3 x 3,3kΩ / 3 x 0.44A
ECOTRI-10000	0 to 3 x 10kΩ / 3 x 0.25A

Dim. : 470 x 248 x 163mm / 8.3kg

- There are 3 resistors inside this rheostat all insulated from each other
- One button allows the varying of the resistance of all of them simultaneously.
- Connected in star or delta, these rheostats act as a balanced 3-phase load.
- 9 safety terminals + 1 earth terminal.

Rheostats with 3 ranges according to the coupling

Ref.	MODE 1	MODE 2	MODE 3
SPECO-2	0 to 2Ω / 25A	0 to 1Ω / 25A	0 to 0.5Ω / 50A
SPECO-6	0 to 6.6Ω / 14A	0 to 3.3Ω / 14A	0 to 1.6Ω / 28A
SPECO-20	0 to 20Ω / 8A	0 to 10Ω / 8A	0 to 5Ω / 16A
SPECO-50	0 to 46Ω / 5A	0 to 23Ω / 5A	0 to 11.5Ω / 10A
SPECO-66	0 to 66Ω / 4.4A	0 to 33Ω / 4.4A	0 to 16.5Ω / 8.8A
SPECO-100	0 to 92Ω / 3.6A	0 to 46Ω / 3.6A	0 to 23Ω / 7.2A
SPECO-136	0 to 132Ω / 3A	0 to 66Ω / 3A	0 to 33Ω / 6A
SPECO-200	0 to 200Ω / 2.5A	0 to 100Ω / 2.5A	0 to 50Ω / 5A
SPECO-420	0 to 420Ω / 1.7A	0 to 210Ω / 1.7A	0 to 105Ω / 3.4A
SPECO-660	0 to 660Ω / 1.4A	0 to 330Ω / 1.4A	0 to 165Ω / 2.8A
SPECO-1,3K	0 to 1.3kΩ / 1A	0 to 650Ω / 1A	0 to 325Ω / 2A
SPECO-2K	0 to 2kΩ / 0.8A	0 to 1kΩ / 0.8A	0 to 500Ω / 1.6A
SPECO-6K	0 to 6.6kΩ / 0.44A	0 to 3.3kΩ / 0.44A	0 to 1.6kΩ / 0.9A
SPECO-20K	0 to 20kΩ / 0.25A	0 to 10kΩ / 0.25A	0 to 5kΩ / 0.5A



Standard transformers

From 63 to 160VA transformers are moulded. For higher power, transformers are covered (steel protective cover).
Summary table of the single-phase transformers the most frequently sold.



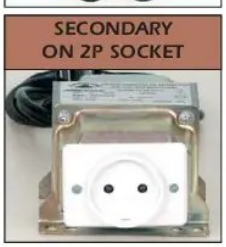
Ref.	Type	Power	Primary 230V	Secondary	
MN00-10	single-phase steel-covered	40VA		230V	
MN00-11	single-phase steel-covered	40VA		230V	
MN00-15	single-phase moulded	40VA		12V	
MN01-02	single-phase moulded	63VA		24V	
MN01-11	single-phase steel-covered	63VA		230V	
MN01-13	single-phase moulded	63VA		2 x 12V	
MN02-02	single-phase moulded	100VA		24V	
MN02-03	single-phase moulded	100VA		2 x 12V	
MN02-13	single-phase moulded	100VA		2 x 12V	
MN03-01	single-phase steel-covered	160VA		230V	
MN03-02	single-phase moulded	160VA		24V	
MN03-11	single-phase steel-covered	160VA		230V	
MN03-12	single-phase moulded	160VA		24V	
MN03-13	single-phase moulded	160VA		2 x 12V	
MN05-02	single-phase steel-covered	250VA		24V	
MN08-00	single-phase steel-covered	500VA		230V	
TR10-07	3-phase steel-covered	750VA	3 x 230V on separate coil terminals	6 x 127V on ZIG-ZAG terminals	











Single-phase transformers



Insulation transformers which conform to standard NFEN61558 with protective cover (contact us regarding bare models).
- Tolerance 10%
- Value at 100Hz (or 50Hz in fullwave)

CONNECTION METHOD
To be specified when ordering
- Primary : ø4mm safety terminals or mains cable 2P+E (please select).
- Secondary : ø4mm safety terminals or fitted power socket (2 pins)

The transformers of this table are with one winding at the primary and one winding at the secondary, without intermediate taps.
In other cases, please contact us.

Ref.	Poxer VA	Type
MN00	40	Moulded
MN01	63	Moulded
MN02	100	Moulded
MN03	160	Moulded
MN04	200	Covered
MN05	250	Covered
MN06	300	Covered
MN07	400	Covered
MN08	500	Covered
MN09	630	Covered
MN10	750	Covered
MN11	1000	Covered
MN12	1600	Covered
MN13	2500	Covered
MN14	3000	Covered
MN15	4000	Covered

SAMPLE OF ORDER

LABORATORY SINGLE-PHASE TRANSFORMER

POWER _____ 750VA (see selection table opposite)
REF. _____ MN10 (see selection table opposite)

PRIMARY _____ 230V (SELECT)
CONNECTION METHOD
_____ MAINS CABLE
ou
_X_ SAFETY TERMINALS

SECONDARY _____ 24V (SELECT)
CONNECTION METHOD
_X_ SAFETY TERMINALS
ou
_____ POWER SOCKET (2P)

Covered single-phase induction coils (safety terminals)

	1mH	3mH	10mH	30mH	100mH	300mH	1H	3H
0,1A	/	/	/	/	/	/	***L101***	***L301***
0,5A	/	/	/	***L30M05 (4,70Ω)***	***L100M05 (11Ω)***	***L300M05 (10,3Ω)***	***L105 (23Ω)***	***L305 (30,8Ω)***
1A	***L1M1 (0,25Ω)***	/	***L10M1 8(0,6Ω)***	***L30M1 (1,74Ω)***	***L100M1 (2,27Ω)***	***L300M1 (2,80Ω)***	***L11 (8Ω)***	***L31 (18,00Ω)***
2A	/	/	***L10M2 (0,5Ω)***	***L30M2 (0,80Ω)***	***L100M2 (1,40Ω)***	***L300M2 (4,00Ω)***	***L12 (4,70Ω)***	***L32 (8,30Ω)***
3A	/	***L3M3 (0,24Ω)***	***L10M3 (0,34Ω)***	***L30M3 (0,66Ω)***	***L100M3 (1,00Ω)***	***L300M3 (0,90Ω)***	***L13 (4,30Ω)***	***L33 (6,40Ω)***
4A	***L1M4 (0,16Ω)***	***L3M4 (0,20Ω)***	***L10M4 (0,29Ω)***	***L30M4 (0,44Ω)***	***L100M4 (0,85Ω)***	***L300M4 (4,10Ω)***	***L14 (2,00Ω)***	/
5A	***L1M5 (0,09Ω)***	***L3M5 (0,13Ω)***	***L10M5 (0,19Ω)***	***L30M5 (0,20Ω)***	***L100M5 (0,52Ω)***	***L300M5 (1,70Ω)***	***L15 (2,30Ω)***	/
6A	***L1M6 (0,09Ω)***	***L3M6 (0,13Ω)***	***L10M6 (0,19Ω)***	***L30M6 (0,40Ω)***	***L100M6 (0,60Ω)***	***L300M6 (0,90Ω)***	***L16 (1,60Ω)***	/
8A	***L1M8 (0,04Ω)***	***L3M8 (0,07Ω)***	***L10M8 (0,12Ω)***	***L30M8 (0,15Ω)***	***L100M8 (0,30Ω)***	***L300M8 5(0,66Ω)***		/
10A	***L1M10 (0,04Ω)***	***L3M10 (0,066Ω)***	***L10M10 (0,15Ω)***	***L30M10 (0,16Ω)***	***L100M10 (0,40Ω)***	***L300M10 (0,51Ω)***		
15A	***L1M15 (0,021Ω)***	***L3M15 (0,041Ω)***	***L10M15 (0,07Ω)***	***L30M15 (0,13Ω)***	***L100M15 (0,30Ω)***	***L300M15***		
20A	***L1M20 (0,019Ω)***	***L3M20 (0,03Ω)***	***L10M20 (0,06Ω)***	***L30M20 (0,09Ω)***	***L100M20***	***L300M20***		



3-phase transformers



Insulated transformers which conform to standard NFEN61 558, with protective cover.
Contact us regarding bare model

The transformers of this table are with 3 windings at the primary and 3 windings at the secondary, without intermediate taps.
In other cases, please contact us.

REF	Power VA
TR05	250
TR08	500
TR09	630
TR10	750
TR11	1000
TR12	1600
TR13	2500
TR14	3000
TR15	4000

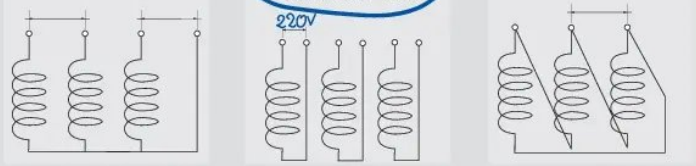
SAMPLE OF ORDER

LABORATORY 3-PHASE TRANSFORMER

POWER ——— 1000VA (see selection table above)
REF. ——— TR11 (see selection table above)

PRIMARY (choice of couplings and voltage)

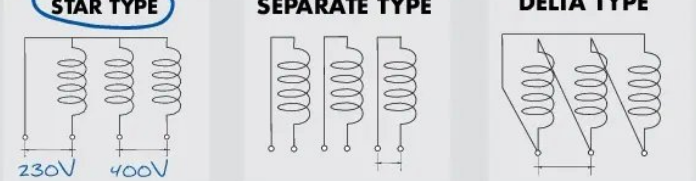
STAR TYPE | **SEPARATE TYPE** (220V) | **DELTA TYPE**



CONNECTION TO SAFETY TERMINALS

SECONDARY (choice of couplings and voltage)

STAR TYPE | **SEPARATE TYPE** | **DELTA TYPE**



CONNECTION TO SAFETY TERMINALS

Zig-Zag transformers



	POWER		All couplings
REF	Secondary	Primary	Secondary
ZIG11	1000VA	230/400 V	6x115V or 6x133V
ZIG12	1600VA	230/400 V	6x115V or 6x133V
ZIG13	2500VA	230/400 V	6x115V or 6x133V
ZIG14	3000VA	230/400 V	6x115V or 6x133V
ZIG15	4000VA	230/400 V	6x115V or 6x133V

PRINCIPLE

Our primary zig-zag transformer comprises three windings, whereas the secondary one comprises six half-windings. All of these windings are galvanically isolated from each other. Students practise wiring the primary winding into a star or delta, and the secondary winding into a star, delta or zig-zag. In total, this is six schematics: Yy , Yd , Yz , Dy , Dd , Dz.

The coils are designed in such a way that the voltage outputs always correspond to the 230/400V standard. The section of the wire is calculated in such a way that the rated power in the secondary is available regardless of the connection schematic used.

Interconnections are made using safety cables, directly on the terminal board. The following are symbolised on the terminal board:

- the coils
- with a point, the direction of the coil
- with upper case letter, the terminals of the primary transformer
- with lower case letters, the terminals of the secondary transformer.
- the safety conductor

Comprehensive instructions with Fresnel diagrams explain how the combination of coils alters the phase-to-ground and composite voltages. They explain how to determine the time index.

A method shows how to find out the direction of the coils in an unmarked zig-zag transformer.

Study of the 1500VA three-phase transformer



Upper face
4 multi-displays show the active powers, voltages, currents and power factors at the primary and at the secondary.
Engraved synoptic equipped with safety sockets to facilitate the wiring.



ref. ETT-1500

EDUCATIONAL OBJECTIVES

- **Study of a 3-phase transformer with no load, in short-circuit and loaded**
- **Creation of Star / Delta wiring according to the primary/secondary voltages selected**
- **Electrical measurements of the different values**
- **Calculation of the powers with the method of the 2 wattmeters**

TEACHING RESOURCES & PRACTICAL WORK

Proposed practical work

- Understanding of the characteristics given on the identification plate
- Readings of the characteristics with no load, in short-circuit and loaded
- Study and influence of the different primary and secondary couplings
- Calculation of the transformation ratio
- Study of the clock hour figure
- Power statement with the method of the 2 wattmeters
- Study of the equivalent diagram for one phase

COMPOSITION OF THE MOBILE CABINET ON WHEELS

- Emergency stop, main switch, 'On' indicator light
- Primary and secondary electrical protection
- Variable three-phase autotransformer
- 1500VA three-phase transformer
  Primary 3 x 230V / Secondary 3 x 230V separate windings
- 4 digital multi-displays (2 at primary and 2 at secondary) showing the active power, voltage, current and cosϕ
- 4mm safety terminals including 3 at secondary for connecting a load
- HYPRA plug with 3-m lead for linking to the three-phase network
- Dimensions: 710 x 600 x 375mm - Weight: 72 kg
- Supply voltage: 3 x 400V-AC 50Hz + N +E

An autotransformer enables the voltage at the primary to be varied.
Separate windings allow for practical work with no load, in short-circuit, and loaded with different Star or Delta couplings.

Training model of single-phase transformer 140VA



ref. ETM140

EDUCATIONAL OBJECTIVES

- **Theoritical practical study of a single-phase transformer with no load and loaded.**
- **Studying the electromagnetic induction**

User's manual with theoretical study

MODULAR SOLUTIONS
PAGE 62-63

ETM140 allows the study of a single phase transformer. It is made up with a portable console which includes:

- 1 X 140VA single phase transformer
  Primary: 230V power supply. Use: 240V protected by fuses and output on safety terminals.
  Secondary: 1 x 15V/3.6A winding, 2 x 12V/3.6V independent windings, fuses protected and output on safety terminals.
- 3 displays on the primary (Current – Voltage – Power) show the absorbed electric values.
- 6 displays on the secondary (2 x Current – 2 x Voltage – 2 x Power) show electric values of secondary outputs.
- 1 variable single phase autotransformer, 0-240V 2.5A output, fuses protected, with safety terminals, can supply the transformer primary.
- 1 set of Ø4mm safety test leads.

User's manual includes: A theoretical study about single phase transformer and practical works with the 140VA transformer.

Specifications:

- Dimensions: 1000x160x180mm + handle
- Weight: 16kg
- Supply: 230V mains cable

Variable transformer (insulated)



- The case contains one insulation transformer and one variable autotransformer.
- The primary is powered by the mains supply (230V)
- The secondary can be connected by secure terminals of Ø4mm.
- 2 powers available.
- Dimensions : 210 x 245 x 350mm.

REF	SEC1	SEC2	SEC3	SEC4
Output voltage	0-240V		0-48V	
Current	2.5A	5A	12.5A	25A
Weight	19kg	25kg	27kg	26kg

TRANSFORMERS
ISOLATED FROM THE MAINS

Safety dismantled transformer

MAGNETIC CIRCUIT



ref. MAG800

User safety is maintained by SAFETY TERMINALS and a double insulation unit. ⧈

- Stacking of silicon sheet in U-shape.
- H: 200mm.
- L: 120mm.
- 40 x 40mm section
- The magnetic circuit is fixed onto a 230 x 150mm base with rubber feet.
- Two quick gripping clamps hold the head, closing the magnetic circuit.

SECONDARY COIL



- consists of 2 windings in series, each one with 230 turns, 3.6A.
- When empty, this coil delivers 220V, with a mid-point of 110V.
- Outputs to safety terminals.
- Double insulation ⧈
- Dimensions: 115 x 115 x 95mm

ref. BOB4

PRIMARY COIL



- 230V power supply.
- 800VA power
- 440 turns max. I = 4A
- Supplied with a power lead, an On/Off button, a safety fuse
- Dimensions. : 115 x 115 x 95mm

ref. BOB1

PRIMARY COIL



- 230V power supply.
- 800VA power
- 440 turns max. I = 4A
- Connexion on safety terminals
- Dimensions. : 115 x 115 x 95mm

ref. BOB6

SECONDARY COIL



- Consists of 5 windings in series.
- Outputs to safety terminals.
- Double insulation ⧈
- Dimensions: 115 x 115 x 95mm

Nb of turns	6	12	24	48	96
Current in A	50	25	13	6,6	3,3

ref. BOB2

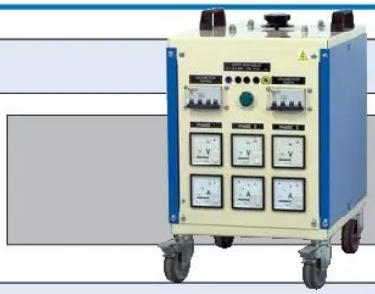
SECONDARY COIL



- Consists of 2 windings in series, each with 1000 turns, 0.8A.
- Warning - when empty, this coil delivers 1000V.
- Outputs to safety terminals.
- Double insulation ⧈
- Dimensions. : 115 x 115 x 95mm

ref. BOB3

Variable autotransformers



These variable autotransformers are available in 3 designs.
- Bare for references finishing with a "N"
- With a stainless steel case for references finishing with "A" or "P"
- Protected by a case, fitted with 4 casters, circuit breaker and ON/OFF LED for references finishing with a "PE"

Covered (P and PE) units have a mains cable at the primary and safety terminals at the secondary.

BARE DESIGN



TRT8N

Single-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
ALT5N	1.25kVA	220/240V	0-250V	5A	5,2kg	151 x 151 x 123mm
ALT7N	1.85kVA	220/240V	0-260V	7A	7,7kg	175 x 175 x 123mm
ALT13N	3.38kVA	220/240V	0-260V	13A	13,3kg	233 x 233 x 123mm
VAR92N	5.20kVA	220/240V	0-260V	20A	16kg	294 x 294 x 145mm

Three-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
TRT5N	3.72kVA	380/400V	0-430V	5A	19kg	155 x 155 x 407mm
TRT8N	6.23kVA	380/400V	0-450V	8A	27kg	181 x 181 x 407mm
TRT13N	10.13kVA	380/400V	0-450V	13A	39kg	233 x 233 x 422mm
3VAR92N	15.60kVA	380/400V	0-450V	20A	56kg	310 x 310 x 402mm

COVER DESIGN - PRIMARY ON MAINS CABLE



TRT30A

Single-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
ALT5A*	1.25kVA	220/240V	0-250V	5A	6.2kg	Ø170 x 157mm
ALT7A*	1.85kVA	220/240V	0-260V	7A	8.8kg	Ø202 x 157mm
ALT13A*	3.28kVA	220/240V	0-260V	13A	13.5kg	Ø268 x 157mm
ALT15A	3.90kVA	220/240V	0-260V	15A	22kg	286 x 286 x 200mm
VAR92P	5.20kVA	220/240V	0-260V	20A	19kg	350 x 320 x 550mm

* fuses at secondary

Three-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
TRT8A	6.23kVA	380/400V	0-450V	8A	33kg	200 x 200 x 468mm
TRT13A	10.13kVA	380/400V	0-450V	13A	48kg	286 x 286 x 468mm
TRT30A	23.38kVA	380/400V	0-450V	30A	92kg	450 x 450 x 700mm

COVER DESIGN WITH CIRCUIT BREAKERS & LIGHT - PRIMARY ON MAINS CABLE



TRT8-PE

Single-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
ALT5-PE	1.25kVA	220/240V	0-250V	5A	8.9kg	230 x 140 x 250mm
ALT7-PE	1.85kVA	220/240V	0-260V	7A	11.5kg	230 x 140 x 250mm
ALT13-PE	3.28kVA	220/240V	0-260V	13A	14.6kg	230 x 140 x 250mm

Three-phase						
Ref	**Power**	**Primary**	**Secondary**	**Secondary**	**Weight**	**Dims mm**
TRT5-PE	3.72kVA	380/400V	0-430V	5A	30kg	280 x 340 x 510mm
TRT8-PE	6.23kVA	380/400V	0-450V	8A	37kg	280 x 340 x 510mm
TRT13-PE	10.13kVA	380/400V	0-450V	13A	48kg	280 x 340 x 530mm
3VAR92P	15.60kVA	380/400V	0-450V	20A	71kg	350 x 360 x 600mm

Models on wheels

MADE TO MEASURE



ALT5N



ALT5A



ALT15A



ALT5-PE

Safety variable inductance (insulated case)



ref. PSYJR

CEI1010 CATIII 1000Veff pol2

Inductor equipped with safety terminals. The whole unit is double insulated.
The inductance coil is fitted in a transparent case.
The handle and moving parts are metal.

- Inductance: progressively adjustable from 0.1 to 1.4H.
- Resistance: 10Ω
- Max. current: 2A
- Overvoltage factor: 22
- Core made with a stacking of silicon sheets
- Graduated in Henry and in centimetres.
- Dimensions: 280 x 150 x 90mm
- Weight: 7kg

RENEWABLE ENERGY & ENERGY SAVING

Solar energy

PAGES 133 - 155



Wind turbine energy

PAGES 156 - 160



Control & energy saving

PAGES 161 - 164



Solar central unit with supervisor



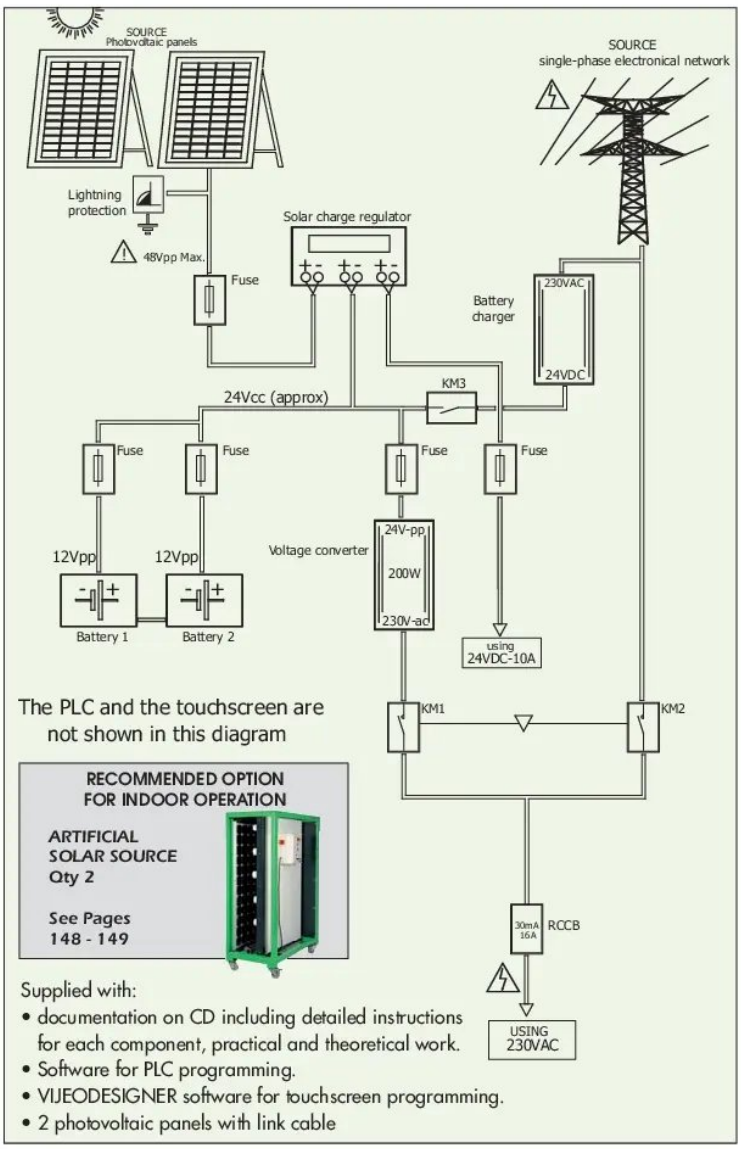


Box seen from above



ref. SOLHAB

ref. SOLHAB-N Sold without panel.
Contact us to check the compatibility of your own panels.



Supplied with:
- documentation on CD including detailed instructions for each component, practical and theoretical work.
- Software for PLC programming.
- VIJEODESIGNER software for touchscreen programming.
- 2 photovoltaic panels with link cable

EDUCATIONAL OBJECTIVES

- **Studying of a photovoltaic system in a isolated site.**
- **Creation of a PLC program.**
- **Creation of a supervision application of a touch screen.**
- **Using a clamp-on ammeter.**
- **Studying the efficiency of a photovoltaic system.**

TEACHING RESOURCES STUDENT & TEACHER

Feasible practical works

- Theoretical work on the positioning of solar panels.
- Studying the sizing of photovoltaic components in a isolated site.
- Understanding of the wiring.
- Calculation of powers.
- Programming of the PLC and the touch screen.
- Producing or modification of a supervision application.

Possible scenarios

Alterable by the programming software of the PLC and the touch screen

- Using of the energy provided by the solar panels.
- Batteries recharging by the charger.
- Automatic sources switching.
- Use of solar energy during the day and electrical network at night.
- Use of the energy provided by the electrical network.

Technical characteristics

On the top surface:

- 1 main ON/OFF switch + 1 emergency stop button.
- 1 24VDC batteries charging switch.
- 1 touchscreen 3x4" colour QVGA, 320 x 240 pixels, Ethernet socket.
  Control interface between the user and the system, it displays electrical parameters necessary for the understanding of the functioning.
  It allows a simple and complete supervision, monitoring and control.
- 1 solar load regulator.
- 1 set of signalling indicator lamps.
- 2 synoptics / complete diagram of the system with terminals and indicator lamps.
- Safety terminals for 230V-AC use output.

On the side:

- 2 safety terminals for voltage input from the solar panel.
- 1 main isolating switch from the public network.
- 1 solar panel isolating safety switch
- 1 RJ45 Ethernet connector.



In the cabinet

- 2 batteries 12VDC-12Ah + 1 battery charger 24V.
- 1 pure sine inverter 24VDC/230VAC-50Hz - 300W.
- 1 PLC Ethernet.
- 1 analogue board 2 Inputs 0-10V/4-20mA and 1 Output 0-10V/4-20mA
- 1 4-port Ethernet coupler.
- 1 set of protection devices included 1 open door safety device.

Photovoltaic solar panel on tilting frame

- Useful surface area of the cells 1.5m².
- Open circuit voltage: 57V DC, Optimum operating voltage: 47V DC
- Short-circuit current: 4.6A
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Light and easy to move.

Dimensions:
Folded position: 1620 x 1060 x 100mm
Unfolded to 70° position: 2100 x 1060 x 700mm

System power by plug. 2P+E. 230VAC 50/60Hz

Choose your solution for studying photovoltaic energy

SOLAR CENTRAL UNIT WITH NETWORK INJECTION AND ISOLATED SITE



Complete solution comprising an electrical cabinet, 2 portable photovoltaic panels (on frames), and all the accessories required **for studying solar energy on the network and an isolated site**.

REF. SOL-1 SEE PAGE 136

SOLAR CENTRAL UNIT WITH NETWORK INJECTION



Partial solution.
Supplied with 2 portable photovoltaic panels (on frames), and all the accessories required **for studying solar energy on the network**.

REF. SOL-2 SEE PAGE 137

SOLAR CENTRAL UNIT WITH ISOLATED SITE



Partial solution.
Supplied with 2 portable photovoltaic panels (on frames), and all the accessories required **for studying solar energy on an isolated site**.

REF. SOL-3 SEE PAGE 138

LOADING ZONE FOR USE ON SITE WITH ELECTRICITY NETWORK OR ISOLATED SITE



REF. HABITAT-1 SEE PAGE 139

LOADING ZONE FOR USE ON SITE WITH ELECTRICITY NETWORK



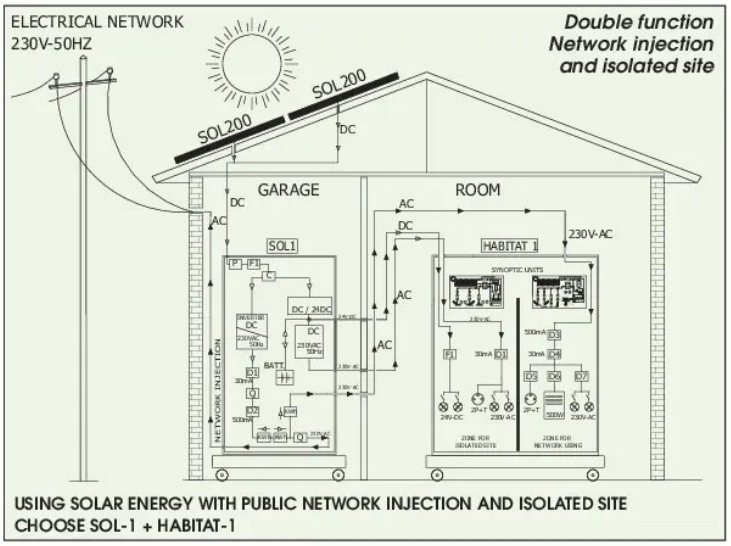
REF. HABITAT-2 SEE PAGE 139

LOADING ZONE FOR ISOLATED SITE USE

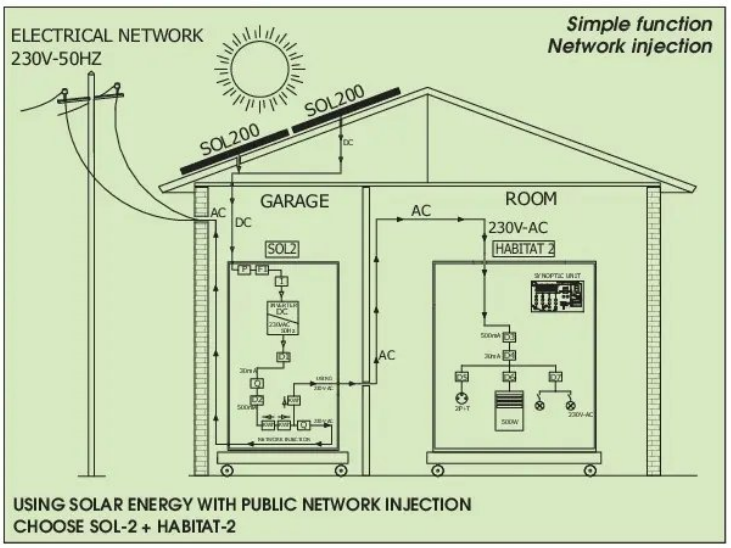


REF. HABITAT-3 SEE PAGE 139

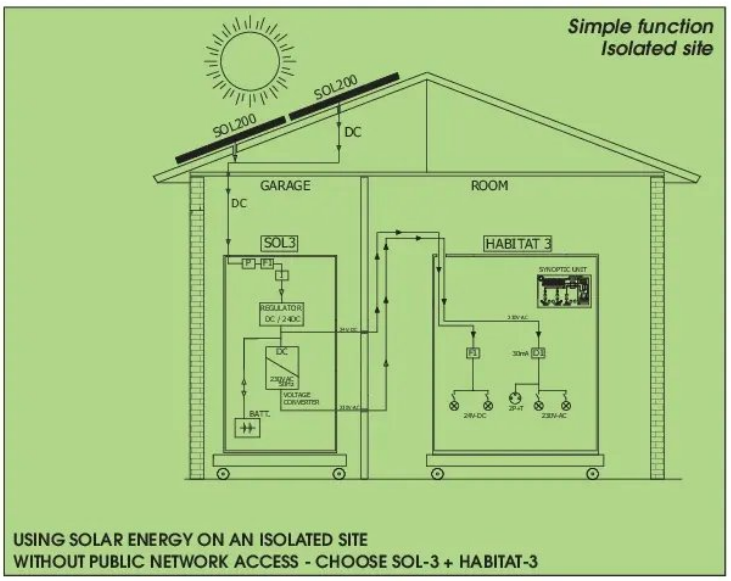
Acquisition for central unit



USING SOLAR ENERGY WITH PUBLIC NETWORK INJECTION AND ISOLATED SITE
CHOOSE SOL-1 + HABITAT-1



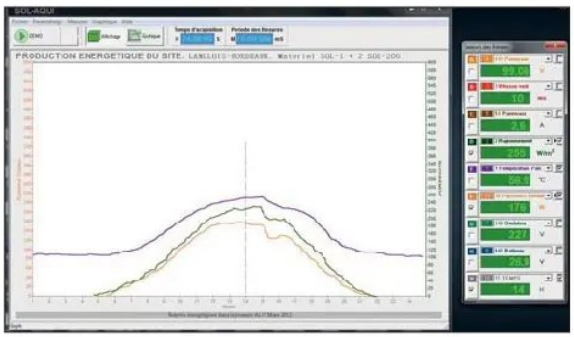
USING SOLAR ENERGY WITH PUBLIC NETWORK INJECTION
CHOOSE SOL-2 + HABITAT-2



USING SOLAR ENERGY ON AN ISOLATED SITE
WITHOUT PUBLIC NETWORK ACCESS - CHOOSE SOL-3 + HABITAT-3



ref. ACQUI-SOL



Set of sensors, interfaces and software for the real time data monitoring of a photovoltaic installation.

COMPRISES

- Three 4-20mA sensors for reading wind speed (m/s), solar irradiation (W/m2) and the temperature of the solar panel (°C).
- 1 sealed "solar panel power interface" box for reading the voltage and current supplied by the photovoltaic panels.
  This interface transmits information (U / I / Wind speed /temperature / irradiance) to the data interface as 4-20mA signals. Voltage 250VDC Max./Current 25A Max.
- 1 "inverter power interface" box to be installed near the inverter reads the voltage and current supplied to the installation. U/I information is transmitted to the data interface as 4-20mA signals. Voltage 250VDC Max./Current 20A Max
- 1 "battery power interface" box to be installed near the batteries reads the voltage supplied to the installation. U information is transmitted to the data interface as 4-20mA signals. Voltage 250VDC.
- 1 "data interface" box collects the 4-20mA signals from the different power interfaces to transmit them to your PC. Mains power supply 230VAC - PC link by USB lead supplied.
- 1 Software for monitoring photovoltaic settings and data
  Allows:
  - you to create your photovoltaic installation.
  - real time display as curves and numeric blocks of the different data of: wind speed, solar irradiation, panel temperature; U / I supplied by the solar panel; U / I supplied by the inverter; U supplied by the battery
  - the display, after acquisition, of the curves of electrical power supplied by the solar panels, electrical power supplied by the inverter, installation efficiency
  - selection of the sampling frequency for data acquisition (1 to 60 minutes), the acquisition period (1 minute to 24H), the display scales of the curves and their colours, data export to a spreadsheet like Excel®.

The Software is compatible with Windows XP, W7. Supplied on CD.
All the connection cables and mounting accessories are supplied.

Solar central unit with network injection and isolated site

RECOMMANDED OPTION FOR INDOOR OPERATION

ARTIFICIAL SOLAR SOURCE
Qty 2

See Pages 148 - 149



EDUCATIONAL OBJECTIVES

- Understanding the different elements of a photovoltaic system.
- Understanding the safety components involved in the system.
- Electrical measurements of different parameters.
- Analyzing and interpreting results.
- Studying the efficiency and impacts related to the positioning of the solar panels.
- Studying of the chain of solar energy (production, storage, consumption, resale, energetic behavior).
- Wiring of a photovoltaic system.

TEACHING RESOURCES STUDENT & TEACHER



Supplied with 1 pyranometer

ref. SOL-1 electrical cabinet + 2 photovoltaic solar panels + 1 link cable

ref. SOL-1-N electrical cabinet
Sold without panel. Contact us to check the compatibility of your own panels.

PARTIAL OR TOTAL RESALE OPERATION

In the cabinet a DC/AC inverter converts the DC from the photovoltaic panels to AC 220VAC 50Hz, and injects its power in synchronism into the network through an isolation transformer. This inverter is protected against any polarity reversal and any overload on the DC or AC side. When the panels are not lit, the inverter consumes no current.

Technical characteristic for the inverter coupled to the public network.

INVERTER	Voltage	Max current	Power
INPUT	65~125VDC	8A	
OUTPUT	230VAC-50Hz	2,25A	500W

OPERATION IN ISOLATED SITE WITH NO RESALE

The photovoltaic current charges two 12V sealed batteries cabled in series through a charging controller. This DC voltage is used directly by low energy consumption lamps 24VDC, and/or converted to 250VAC 50Hz by a 200W voltage converter.

Technical characteristics for the isolated site converter

VOLTAGE CONVERTER	Voltage	Max Current	Power
INPUT	20~32 VDC	11A	210W
OUTPUT	230VAC 50Hz	1,5A	300VA

1. ELECTRICAL CABINET

Technical cabinet of standardized solar central unit on wheeled frame.
Dimensions: 810 x 600 x 1890mm

Comprises

- 2 disconnectors
- 1 500mA -30A differential
- 1 30mA differential
- 1 lightning arrester + fuses
- 3 100 Wh resolution meters
- 1 Mushroom head emergency stop
- 1 source inverter
- 1 charging controller 12/24VDC-20A
- 2 batteries 12V-12Ah
- 1 set of photovoltaic connectors
- 1 500W inverter for network synchronisation
- 1 Voltage converter 24VDC/230VAC-200W

2. LINK CABLE

30-m cable for connecting the solar panels to any type of solar system.

3. PHOTOVOLTAIC SOLAR PANEL 200WC ON TILTING FRAME (FOR EACH PANEL)

- Open circuit voltage: 57V DC
- Short-circuit current: 4.6A
- Optimum operating voltage: 47V DC
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Sealed connections IP65 – 1000V on the rear of the panel.
- Type of cells: Monocrystalline silicon
- Robust aluminium frame.
- Useful surface area of the cells 1.5m².
- Output 47VDC – 4.2A – 200Wc per panel on 2 photovoltaic terminals.
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Two ball joints with clamping levers for positioning the panel to the required tilt angle.
- Light and easy to move.
  Folded position: 1620 x 1060 x 100mm
  Unfolded to 70° position: 2100 x 1060 x 700mm

Solar central unit with network injection

RECOMMANDED OPTION FOR INDOOR OPERATION

ARTIFICIAL SOLAR SOURCE
Qty 2

See Pages 148 - 149





Supplied with 1 pyranometer

EDUCATIONAL OBJECTIVES

- Understanding the different elements of a photovoltaic system.
- Understanding the safety components involved in the system.
- Electrical measurements of different parameters.
- Analyzing and interpreting results.
- Studying the efficiency and impacts related to the positioning of the solar panels.
- Studying of the chain of solar energy (production, storage, consumption, resale, energetic behavior).
- Wiring of a photovoltaic system.

TEACHING RESOURCES STUDENT & TEACHER

1. ELECTRICAL CABINET

Technical cabinet of standardized solar central unit on wheeled frame.
Dimensions: 810 x 600 x 1890mm

Comprises

- 2 disconnectors
- 1 500mA -30A differential
- 1 30mA differential
- 1 lightning arrester + fuses
- 1 Mushroom head emergency stop
- 3 100 Wh resolution meters
- 1 set of photovoltaic connectors
- 1 500W inverter for network synchronisation

2. LINK CABLE

30-m cable for connecting the solar panels to any type of solar system.

ref. SOL-2 electrical cabinet + 2 photovoltaic solar panels + 1 link cable

ref. SOL-2-N electrical cabinet
Sold without panel. Use your own panels with characteristics comprise between 35 and 150VDC.

PARTIAL OR TOTAL RESALE OPERATION

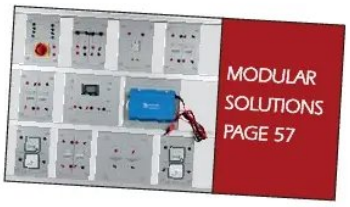
In the cabinet a DC/AC inverter converts the DC from the photovoltaic panels to AC 220VAC 50Hz, and injects its power in synchronism into the network through an isolation transformer. This inverter is protected against any polarity reversal and any overload on the DC or AC side. When the panels are not lit, the inverter consumes no current.

Technical characteristic for the inverter coupled to the public network.

INVERTER	Voltage	Max current	Power
INPUT	65~125VDC	8A	
OUTPUT	230VAC-50Hz	2,25A	500W

3. PHOTOVOLTAIC SOLAR PANEL 200WC ON TILTING FRAME (FOR EACH PANEL)

- Open circuit voltage: 57V DC
- Short-circuit current: 4.6A
- Optimum operating voltage: 47V DC
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Sealed connections IP65 – 1000V on the rear of the panel.
- Type of cells: Monocrystalline silicon
- Robust aluminium frame.
- Useful surface area of the cells 1.5m².
- Output 47VDC – 4.2A – 200Wc per panel on 2 photovoltaic terminals.
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Two ball joints with clamping levers for positioning the panel to the required tilt angle.
- Light and easy to move.
  Folded position: 1620 x 1060 x 100mm
  Unfolded to 70° position: 2100 x 1060 x 700mm



Solar central unit for isolated site

RECOMMANDED OPTION FOR INDOOR OPERATION

ARTIFICIAL SOLAR SOURCE
Qty 2

See Pages 148 - 149



EDUCATIONAL OBJECTIVES

- Understanding the different elements of a photovoltaic system.
- Understanding the safety components involved in the system.
- Electrical measurements of different parameters.
- Analyzing and interpreting results.
- Studying the efficiency and impacts related to the positioning of the solar panels.
- Studying of the chain of solar energy (production, storage, resale, energetic behavior).
- Wiring of a photovoltaic system.

TEACHING RESOURCES STUDENT & TEACHER



MODULAR SOLUTIONS PAGE 56

1. ELECTRICAL CABINET

Technical cabinet of standardized solar central unit on wheeled frame.
Dimensions: 810 x 600 x 1890mm

Comprises

- 2 disconnectors
- 1 lightning arrester + fuses
- 1 Mushroom head emergency stop
- 1 charging controller 12/24VDC-20A
- 2 batteries 12V-12Ah
- 1 set of photovoltaic connectors
- 1 Voltage converter 24VDC/230VAC-200W

2. LINK CABLE

30-m cable for connecting the solar panels to any type of solar system.

3. PHOTOVOLTAIC SOLAR PANEL 200WC ON TILTING FRAME (FOR EACH PANEL)

- Open circuit voltage: 57V DC
- Short-circuit current: 4.6A
- Optimum operating voltage: 47V DC
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Sealed connections IP65 – 1000V on the rear of the panel.
- Type of cells: Monocrystalline silicon
- Robust aluminium frame.
- Useful surface area of the cells 1.5m².
- Output 47VDC – 4.2A – 200Wc per panel on 2 photovoltaic terminals.
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Two ball joints with clamping levers for positioning the panel to the required tilt angle.
- Light and easy to move.
  Folded position: 1620 x 1060 x 100mm
  Unfolded to 70° position: 2100 x 1060 x 700mm

ref. SOL-3 electrical cabinet + 2 photovoltaic solar panels + 1 link cable

ref. SOL-3-N electrical cabinet
Sold without panel. Use your own panels with characteristics comprise between 18 and 50VDC.

OPERATION IN ISOLATED SITE WITH NO RESALE

The photovoltaic current charges two 12V sealed batteries cabled in series through a charging controller. This DC voltage is used directly by low energy consumption lamps 24VDC, and/or converted to 250VAC 50Hz by a 200W voltage converter.

Technical characteristics for the isolated site converter

VOLTAGE CONVERTER	Voltage	Max current	Power
INPUT	20~32 VDC	11A	210W
OUTPUT	230VAC 50Hz	1,5A	300VA

Loading panels for solar central units

Wheeled frame which reproduces domestic electrical installations on a vertical panel and enables the use of the voltage sources (AC + DC) produced by our solar central units SOL-1 to SOL-3. At the back another blank panel protects the electrical cables.
Dimensions: 1000 x 500 x h 1600mm
The frame is supplied assembled, fully cabled, ready to operate, with safety leads for the measuring units, and a CD including the technical data and cabling diagram.



Profile view of the frame

Measurement with a clamp



NETWORK INJECTION AND ISOLATED SITE



ref. HABITAT-1

LOADING ZONE FOR ISOLATED SITE USE
This part includes a standard unit with standardized protection described below, and the different loads.
- 1 differential circuit-breaker 16A/30mA
- 1 two-pole fuse holder with fuse cartridges gPV 10x38 1000V
- 2 24V DC low energy consumption light fittings with switches
- 2 light fittings 230VAC with switches
- 1 230VAC 50Hz 2P+E socket
- 1 mimic unit with safety terminals for I and U measurements in different circuits.

LOADING ZONE FOR USE ON SITE WITH ELECTRICITY NETWORK
This part includes a standard unit with standardized protection described below, and the different loads.
- 1 connection circuit-breaker 500mA
- 1 differential circuit-breaker 16A/30mA
- 3 magnetothermal circuit breakers
- 2 light fittings 100W-230VAC with switches
- 1 500W convector
- 1 230VAC 50Hz 2P+E socket
- 1 mimic unit with safety terminals for I and U measurements in different circuits.

NETWORK INJECTION



ref. HABITAT-2

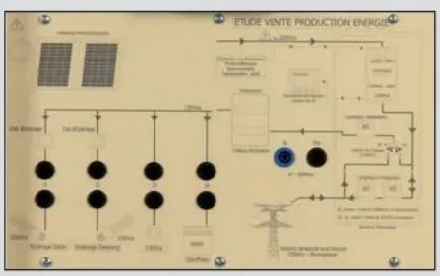
LOADING ZONE FOR USE ON SITE WITH ELECTRICITY NETWORK
This part includes a standard unit with standardized protection described below, and the different loads.
- 1 connection circuit-breaker 500mA
- 1 differential circuit-breaker 16A/30mA
- 3 magnetothermal circuit breakers
- 2 light fittings 100W-230VAC with switches
- 1 500W convector
- 1 230VAC 50Hz 2P+E socket
- 1 mimic unit with safety terminals for I and U measurements in different circuits.

ISOLATED SITE

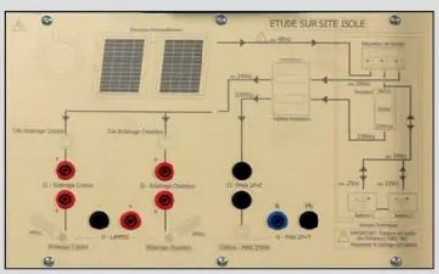


ref. HABITAT-3

LOADING ZONE FOR ISOLATED SITE USE
This part includes a standard unit with standardized protection described below, and the different loads.
- 1 differential circuit-breaker 16A/30mA
- 1 two-pole fuse holder with fuse cartridges gPV 10x38 1000V
- 2 24V DC low energy consumption light fittings with switches
- 2 light fittings 230VAC with switches
- 1 230VAC 50Hz 2P+E socket
- 1 mimic unit with safety terminals for I and U measurements in different circuits.



Synoptic sale of energy production



Synoptic for isolated site use

Solar central units - **800Wc** - with acquisition

NETWORK INJECTION + ISOLATED SITE			NETWORK INJECTION
	SOL-4-EXP	ELECTRICAL CABINET	SOL-5-EXP
	1	1500W inverter for network synchronisation	1
	1	Interface + 4-20mA sensors	1
	1	Voltage converter 24VDC/230VAC. 200W	-
	1	Charging controller 12/24VDC-20A	-
	2	batteries 12V-12AH	-
	3	100Wh resolution meter	3
	1	lightning arrester	1
	1	2P-45A circuit breaker with residal current protection 500mA	1
	1	Residual current circuit breaker 30mA/16A	1
	2	Thermal magnetic circuit breaker 2A (controls)	2
	5	2-pole fuse holder and fuses	1
	2	Interrupteur de puissance	2
	2	Disconnector	2
	1	Mushroom head emergency stop	1
	1	Power socket 2P+E 230VAC	1





ref. SOL-4-EXP
Electrical cabinet + 4 solar panels + link cable

ref. SOL-5 -EXP
Electrical cabinet + 4 solar panels + link cable



EDUCATIONAL OBJECTIVES

- **Understanding the different elements of a photovoltaic system.**
- **Understanding the safety components in the system.**
- **Electrical measurements of different parameters.**
- **Analyzing and interpreting results.**
- **Studying the efficiency and impacts related to the positioning of the solar panels.**
- **Studying of the chain of solar energy (production, storage, consumption, resale, energetic behavior).**
- **Wiring of a photovoltaic system (coupling of panels).**

TEACHING RESOURCES STUDENT & TEACHER

SOL-4-EXP and SOL-5-EXP are solar centrals with an electric power of 800Wp (+/- 10%) necessary to inject a significant current on the electrical network by the inverter and the other components of the housing part, to load the batteries and to allow equivalent measures as in a real housing installation. The system of data acquisition (temperature, radiation, wind speed and all the electrical parameters) allows making some practical works even in the absence of sun.

Supplied with 1 pyranometer



1. ELECTRICAL CABINET

See the table

2. LINK CABLE

30-m cable for connecting the solar panels to any type of solar system.

3. PHOTOVOLTAIC SOLAR PANEL 200WC ON TILTING FRAME (FOR EACH PANEL)

- Open circuit voltage: 57V DC
- Short-circuit current: 4.6A
- Optimum operating voltage: 47V DC
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Sealed connections IP65 – 1000V on the rear of the panel.
- Type of cells: Monocrystalline silicon
- Robust aluminium frame.
- Useful surface area of the cells 1.5m².
- Output 47VDC – 4.2A – 200Wc per panel on 2 photovoltaic terminals.
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Two ball joints with clamping levers for positioning the panel to the required tilt angle.
- Light and easy to move.
  Folded position: 1620 x 1060 x 100mm
  Unfolded to 70° position: 2100 x 1060 x 700mm

PARTIAL OR TOTAL RESALE OPERATION (SOL-4-EXP AND SOL-5-EXP)

In the cabinet a DC/AC inverter converts the DC from the photovoltaic panels to AC 220VAC 50Hz, and injects its power in synchronism into the network through an isolation transformer.
This inverter is protected against any polarity reversal and any overload on the DC or AC side.
When the panels are not lit, the inverter consumes no current.

TECHNICAL CHARACTERISTIC FOR THE INVERTER COUPLED TO THE PUBLIC NETWORK.

INVERTER	Voltage	Max current	Power	Cos	Distorsion	Rendement
INPUT	150~450VDC	10,8A				
OUTPUT	230VAC-50Hz	6,5A	1,5kW	1	≤3,5%	91%

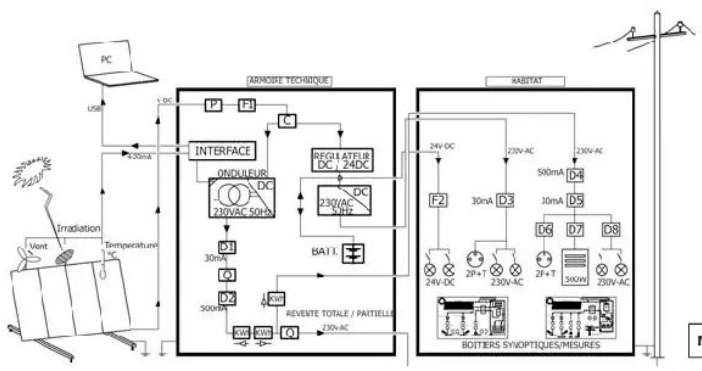
OPERATION IN ISOLATED SITE WITH NO RESALE (SOL-4-EXP ONLY)

The photovoltaic current charges two 12V sealed batteries cabled in series through a charging controller.
This DC voltage is used directly by low energy consumption lamps 24VDC, and/or converted to 250VAC 50Hz by a 200W voltage converter.

TECHNICAL CHARACTERISTICS FOR THE ISOLATED SITE CONVERTER

VOLTAGE CONVERTER	Voltage	Max current	Power
INPUT	20~32 VDC	11A	210W
OUTPUT	230VAC 50Hz	1A	200VA

FUNCTIONING DIAGRAM OF SOL-4-EXP + HABITAT-1

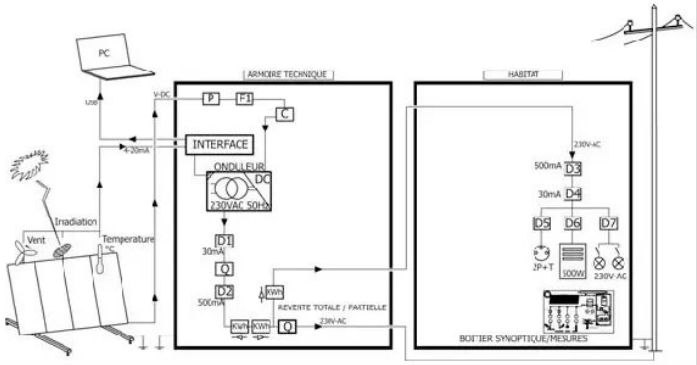




ref. HABITAT-1 PAGE 139

FUNCTIONING DIAGRAM OF SOL-5-EXP + HABITAT-2





ref. HABITAT-2 PAGE 139

INTERFACE AND SENSORS DELIVERED WITH SOL-4-EXP AND SOL-5-EXP

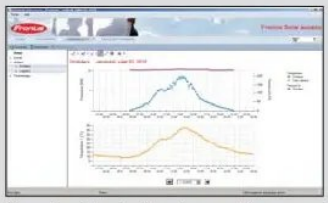
Measure of the solar radiation
Temperature of the solar panels
Wind speed

These physical parameters and also the electrical parameters (voltage and current AC/DC), the power and the energy are recorded (1 year of data maximum) by an interface placed in the electrical cabinet and monitored by a PC.

The software provided with SOL-5-EXP and SOL-4-EXP allows to display one or several curves on the screen, diagrams, ...
All data can be exported to Excel®.



Screenshoot of 3 recordings made during the day : Instant alternative power, temperature of panels, intensity of solar radiation.



Screenshoot showing the voltage and the power at the output of the inverter, the temperature of panels. Scales are specified with units.

SUPPLIED ACCESSORIES

- A connection cable of 30 meters – 3x 6mm² panels/electrical cabinet
- A connection cable of 30 meter for the link sensors/interface for signal 4-20mA
- A CD-rom with all the pratical works
- A software for the exploitation of data
- A pyranometer for measuring the solar radiation (200 and 2000 W/m² range)

WARRANTY

Factory guarantee of the inverter: 5 years
The website of Fronius offers the free update of the software, and answers the Frequently Asked Questions.

Portable solar central unit for isolated site with artificial light source



ref. SOL-PRO

The SOL-PRO solar unit includes:
1 technical case + 2 photovoltaic panels + 1 artificial light source (3 spotlights) + 2 cords for connecting the panels to the case.

EDUCATIONAL OBJECTIVES

- ***Understanding of a photovoltaic system in an isolated site.***
- ***Understanding the safety components involved in the system.***
- ***Understanding of the wiring of a photovoltaic system.***
- ***Make electrical measurements of different parameters.***
- ***Analyzing and interpreting results.***
- ***Studying the performance and impacts related to the positioning of the solar panels.***
- ***Studying of the the chain of solar energy (production, storage, use of the solar charge regulator for battery).***

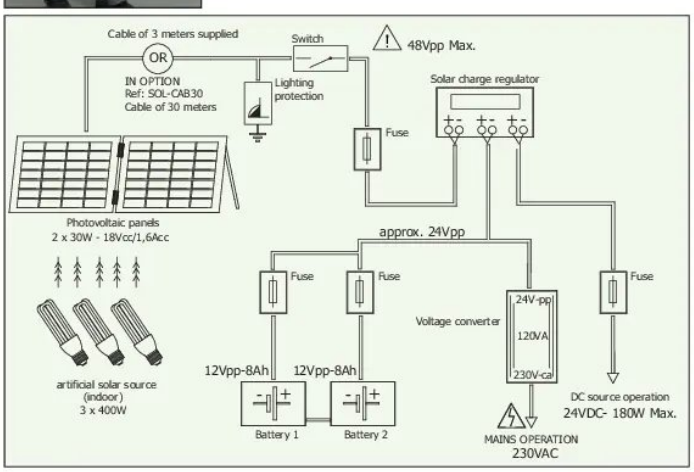
TEACHING RESOURCES STUDENT & TEACHER

A synoptic shows the different components and the interconnections.
Connection in jump wires by safety leads 4mm.
Connection of the panels to the technical case by 2 photovoltaic leads (delivered).
Measures are possible indoor by using the artificial solar source.



Electrical characteristics of the solar unit

- photovoltaic panel (panel features):
  - nominal power Pmpp: 30 Wc
  - max power voltage Vmpp: 18V DC
  - max power current Impp: 1.67 A
  - open circuit voltage Voc: 22.5V DC
  - short-circuit current Isc: 2A
- Power injected, with artificial source: 17 Wc (24V/0.7A)
- Output voltage 230 V - 50 Hz pure sinusoidal. 120 VA max.
- Output voltage 24V DC. 180W max



Composition of the technical case

- Case made of impact-resistant polypropylene. It can be closed without disconnecting the safety cords from the front. Light and easy to carry by its handle.
- 2 photovoltaic sockets for connecting solar panels.
- 1 surge arrester.
- 1 Start/Stop switch to isolate the solar panel circuit from the technical case.
- 4 two-pole fuse holders with gPV cartridge protecting the solar panel circuit, batteries and use.
- 1 24V/20A solar charge controller with display showing:
  - battery charge
  - current supplied by the solar panels
  - battery charge current
  - current consumed by the use circuit
  - battery voltage.
- 1 voltage converter pure sinusoidal 50 Hz - 24/230V AC, 120 VA. Auto-protection by resettable thermal fuse.
- 1 set of 4 mm safety cords.
- 1 output 230V AC - 120 VA on 4 mm safety terminals
- 1 use output 24V DC - 180 VA on 4 mm safety terminals
- Dimensions: 540 x 430 x 215mm

Composition of the photovoltaic panels frame

- Aluminium frame
- 2 mono-crystalline photovoltaic panels, each 30 Wc.
- 2 hinges for folding them together.
- Separate cabling for series or parallel connection.
- Useful surface area of the cells on each panel 0.2 m²
- 2 ball joints for putting the panels at the tilt angle required.
- 1 device for measuring the tilt angle.
- 2 3-metre photovoltaic cords.
- Light and easy to move (Carrying handle).
- Dimensions in unfolded position: 1140 x 470 x 200 mm
- Dimensions in folded position: 570 x 470 x 100 mm

Composition of the artificial light source

- 3 400W spotlights with variable tilt.
- Power supply 230V AC 50/60 Hz by 2-metre mains cord.
- Spotlight dimensions: 300 x 220 x h360 mm

Supplied with CD containing

- Theoretical summary of the different types of photovoltaic cells and energy.
- The detailed wiring diagram of the solar unit
- 5 theoretical assignments and 3 complete practical assignments as student/instructor book.
- Full instructions for each component

Solar kit



ref. VALSOL









EDUCATIONAL OBJECTIVES

- **Studying the principles of solar energy, storage and conversion.**
- **Electrical measurements of different parameters.**
- **Analyzing and interpreting results.**
- **Studying the efficiency and impacts related to the positioning.**

TEACHING RESOURCES STUDENT & TEACHER

Suggested tutorials

One of the jumpers isolates the photo-voltaic panels from the rest of the electronics. In this way, students can measure

- The voltage in the no-load circuit (approximately 21V)
- The short-circuit current (approximately 1.9A)
- The current and the voltage according to the lighting, by covering one of the two panels or by varying the tilt of the kit's lid in relation to the sun by an angle α; and check that the power output is a function of the power factor
- Using a rheostat (e.g. ECO1/2-330), students can look for the charge which corresponds to a maximum power supplied by the panel

The control panel's second jumper measures the DC level at the converter's input. Students can:

- Measure the no-load voltage and current at the converter's input, and calculate the no-load power input
- Measure currents and voltages upstream and downstream of the converter and calculate the converter's efficiency and losses by loading the 220V AC output.
- Check that the converter can supply up to 150W. Compare this power with the power supplied instantly by the panels. Draw conclusions about the role of the battery.

Mesure de l'angle d'incidence des rayons solaires

The solar kit VALSOL is supplied with a protractor and a simplified targeting system ❸ allowing the measuring (within a few degrees of precision) the angle of incidence of sun rays on the solar panels. This targeting system which is placed on side can be removed and stored in the side compartment ❷ dedicated to accessories storage. A stand ❶ (also removable) allows the stepless adjustment of the inclination of the solar panels.

When closed, the panels are protected against impact and scratches. The following can be found underneath the solar panel:

- 2 standard 12V DC 12 Ah Li-ion batterIES
- a 12V DC/220V AC, 50Hz, 150W converter
- a safety and monitoring electronics device

Control panel

- On/Off button
- a circuit breaker to protect against over-currents
- 4mm safety terminals for voltage and electric current inputs, with jumpers
- the converter's On/Off button
- a 230V AC 50Hz socket with on and defect lamps
- a two-line LCD display delivering messages about the battery: temperature, % charge, charging current and voltage, usage current and voltage, undercharged battery, overcharged battery and overheating, etc., as well as the power output. NB: these are indications, rather than highly accurate measurements.

PROTECTION OF COMPONENT IN THE CASE OF

- battery overcharge: when its voltage reaches 16.5V the charging current is automatically cut, in order to preserve the battery's service life.
- excessive battery discharge: When its voltage reaches 11.5V, an audible alarm will be triggered.
  When it falls below 10.5 V the output will be disconnected automatically.
- overload or short-circuit on the converter's output

SPECIFICATIONS OF THE SOLAR PANEL

- Total surface area: 420 x 680mm
- Total power: 30W
- Typical voltage: 17.5V
- Typical current: 1.7A
- Short-circuit current: 1.9A
- No-load circuit: 21.5V

OTHER CHARACTERISTICS

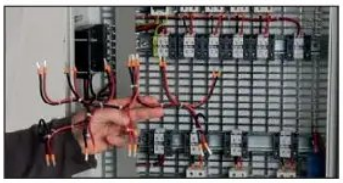
- Fitted side compartment for the storage of leads, jumpers, the targeting system and the inclination stand ❷. Dims: 570 x 380 x 160mm. Weight 17kg.

Solar pumping station

EDUCATIONAL OBJECTIVES

- **Understanding a photovoltaic system dedicated to the power supply of a water pump.**
- **Measurements of electrical parameters.**
- **Analyzing and interpreting results.**
- **Understanding live wiring tests with putting into service and functioning.**
- **Studying the efficiency and impacts related to the positioning of the solar panels.**
- **Studying the solar charge regulator.**

TEACHING RESOURCES STUDENT & TEACHER



Simply remove the strand before asking students to do the cabling.

Dictatical solar pumping station simulating the water supply of a population in a desert area.





Comprises

- 1 photovoltaic solar panel 200Wc mounted on a robust frame that tilts from 5° to 70°.
  Open circuit voltage: 57V DC.
  Optimum operating voltage: 47V DC.
  Short-circuit current: 4.6A.
  Optimum operating current: 4.3A.
- 1 30m. link cable.
- 1 100-l tank simulates the underground water source.
- 1 60-l transparent container acts as water reserve.
  A tap simulates user consumption and returns water to the tank.
- 1 sealed motor pump 140W- 24DVC-6A. 13l/min capable of pumping dry. It takes water from the tank and fills the reserve water container.
- 2 12V/6Ah batteries supply the pumping station when sunlight is absent.
- 1 24VDC-20A regulator controls battery charging. One 2-button display accessible outside the cabinet enables configuration and viewing of the currents of the solar panel, the battery charge and the lamp and the battery voltage.
- 1 electrical cabinet includes the cabling of all the solar components on connection terminals. A lightning arrester protects the installation and each component is protected by fused circuit-breaker type gPV. The cabling is fully marked and students can easily remove the original strand to do their cabling.
  Students can also take voltage and current readings. A main switch isolates the solar panel from the electrical cabinet.
- A switched 24VDC lamp lights the area.

A wheeled frame for passing under doors.
SOLPUITS requires no direct water connection. Once the 80-l tank is filled with water, the system is totally self-contained.
Supplied cabled with detailed instructions and complete practical works.
Dimensions: 750 x 670 x 1980mm. Weight 141kg.

ref. SOLPUITS

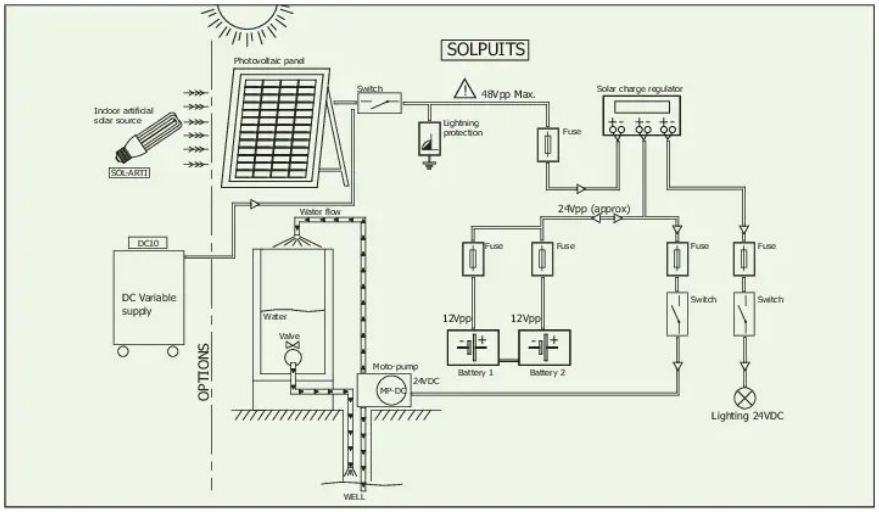
ref. SOLPUITS-N Sold without panel.
Use your own panels with characteristics comprises between 18 and 50VDC.

RECOMMANDED OPTION FOR INTERNAL OPERATION



ARTIFICIAL SOLAR SOURCE
Qty 1

See Pages 148 - 149



Self-contained public lighting with LEDs

MAQ-LED demonstrates public lighting with LEDS which is increasingly found in new housing schemes. Completely self-contained, the assembly operates using solar energy (Polycristalline panel combined with a large capacity battery).
Two artificial solar sources, for connection to the mains 230VAC, enable the battery to be recharged for better organization of the explanations and practical assignments.



ref. MAQ-LED

EDUCATIONAL OBJECTIVES

- **Studying street lighting with LED lamp and solar energy.**
- **Putting a solar system into service.**
- **Demonstrating the ecological operation of LED technology.**
- **Discovering the different technologies of solar panels.**
- **Wiring the components of a lighting installation with presence sensor & light sensor.**
- **Reading the different electrical values of a production system of solar energy.**
- **Calculating the installation's efficiency.**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Lessons on the different solar panel technologies (Monocristalline, Polycristalline, Amorphous)
- Study on the positioning of solar panels for maximum output.
- Study of solar radiation.
- Reminder on Direct, Diffused and Reflected solar radiation.
- Interpretations of the theoretical curves produced from the 3 solar sensors.
- Study and creation of the wiring for a solar energy system in an isolated site.
- Reading the currents and voltages at different points of the wiring.
- Interpreting the measurements then calculation of the efficiency.
- Calculation of the discharge time of the battery according to the load.

Comprises

- Easy-to-move wheeled frame with large heavy-duty wheels.
- 1 Battery 12VDC – 90Ah.
- 1 Solar load regulator 12VDC-20A.
- 1 Plastic unit that is easy to remove to directly access the wiring of the battery, solar panel and load regulator.
- 1 Solar panel 12V/80W pivoting and swivelling on an easy-to-remove pole.
- 1 Lamp with LEDS 12VDC-50W equipped with a presence and light sensor.
- 2 artificial solar sources 230VAC on removable pole.



Battery + load regulator unit.



Dimensions : 600 x 800 x 1700mm. Weight : 92kg.

Worksite traffic lights - LED technology – Self-contained

Simulator of worksite traffic lights powered with solar energy.
Two artificial and variable light sources simulate sunlight and enable the batteries to be recharged.
Fully self-contained, operation of the FEU-LED is managed with a Schneider® controller.
One solution for manually recharging the batteries is included in the electrical unit for better organization of the explanations and practical work.



ref. FEU-LED

EDUCATIONAL OBJECTIVES

- **Study and putting into service of solar energy worksite traffic lights.**
- **Reminder on the different solar panel technologies.**
- **Wiring of the components of a photovoltaic installation at an isolated site.**
- **Reading the different electrical values of the production system of solar energy.**
- **Calculation of the efficiency of the installation.**
- **Programming a controller (PLC).**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Lessons on the different technologies of solar panels (Monocristalline, Polycristalline, Amorphous)
- Study on the positioning of solar panels for maximum output.
- Study of solar radiation.
- Reminder on Direct, Diffused and Reflected solar radiation.
- Interpretations of the theoretical curves produced from the 3 solar sensors.
- Study and creation of the wiring of a solar energy system at an isolated site.
- Reading the currents and voltages at different points of the wiring.
- Interpreting the measurements then calculation of the efficiency.
- Calculation of the discharge time of the battery according to the load.
- Creation of a controller program in contact language.

Comprises

Electrical cabinet

- 1 Voltmeter measures the voltage of the photovoltaic panels.
- 1 Voltmeter measures the voltage of the 2 batteries.
- 1 Set of pushbuttons, switches and indicator lights.
- 1 front synoptic gives the overall diagram of the system.
  4mm connection terminals enable reading of U/I panels, U/I batteries, U/I charge and I charger.
- 1 SCHNEIDER® programmable logic controller (PLC).
- 1 solar load regulator 12VDC/20A.
- 1 battery charger 12V.
- 2 batteries 12V-8Ah.
- 1 set of electrical protection with gPV cartridge fuses.

Pole

- 2 traffic lights with Red / Orange / Green LEDS.
- 2 photovoltaic panels 30W/12V Monocristalline.
- 2 artificial sources with light controller.



Features

- 3-metre mains lead included, for the charger and artificial source.
- Dimensions: 1000 x 1000 x 2035mm. Weight: 68kg.
- The pole and the panels are easy to remove for going through doorways.

Photovoltaic installation analyzer



ref. VA1011



Professional device for testing, maintaining, troubleshooting and checking the efficiency of solar panels.

The VA1011 analyzer measures and displays:

- the search for maximum solar energy (Pmax) with the AUTO SCAN function (1000V, 12A)
- the maximum voltage (Vmaxp) at Pmax
- the maximum current (Imaxp) at Pmax
- the open circuit voltage (Vopen)
- the short-circuit current (Ishort)
- the I / V curve of a panel or set of solar panels.
- The efficiency calculation (%) of your installation
- Solar radiation as W/m²
- The temperature of your solar panel
- The series resistance (Rs) of solar panels

All these functions are accessible through the software.

Using the amps and watts clamps

- P min/max as DC/AC upstream and downstream of the inverter.

Digital display and as curves.

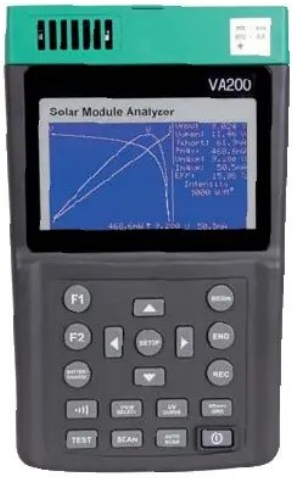
- U and I min/max as DC / AC upstream and downstream of the inverter.
- The power factor as AC.

All the readings taken can be saved as easy to recover dated files.
3980 measurements by file.

Scope of supply

- 1 portable solar analyzer, power supply by lithium battery with its mains charger 230V AC 50/60 Hz. Dim: 257x155x57 mm. Weight: 1.55 kg
- 1 program + cord for USB link to PC.
- 1 amps clamp (direct link to analyzer using specific cord).
- 1 watts clamp (direct link to analyzer using specific cord).
- 1 solar radiation sensor with its support for attaching to solar panel
- 1 temperature sensor for attaching to solar panel.
- set of safety and photovoltaic cords.
- 1 carrying case.
- Detailed instructions with connection diagrams.

Solar analyser



- Current/voltage graph drawing (characteristic of the solar panel)
- Autoscan search of the solar panel maximum power – Pmax (60V – 6A)
- Maximal voltage Vmaxp at Pmax power
- Maximal voltage Imaxp at Pmax power
- Opened circuit voltage Vopen
- Short-circuit opened Ishort
- I = f(V) graph with a cursor
- Efficiency calculation in %
- Power by area unit (in W/m2)
- Manual test for a particular point
- Range 10V / accuracy 0.001V
  Range 60V / accuracy 0.01V
  Range 1A / accuracy 0.1mA
  Range 6A / accuracy 1mA
  Accuracy 1% + 18dgt

Battery info: 8 x LR6

ref. VA200



Package includes:

- bag
- AC power
- accumulators
- cables connecting panels
- USB cable & software.

Pyranometer



The PYR1307 pyranometer measures the power of solar radiation in watts per m2: W/m2

- Ratings: 199.9 W/m2 and 1,999 W/m2
- Measuring error: < 10W/m2 or 5% of the reading
- Display: 2,000 pixel LCD
- Captures min. and max. values
- "Hold" key allows one to freeze the display
- Backlighting
- Supplied with a carry case
- Dimensions: 162 x 63 x 28mm
- Weight: 250g

Battery info: 2 x LR03

ref. PYR1307

Artificial solar source

This source for getting around the loss of sunlight by illuminating the solar panel with artificial light whose spectrum is close to sunlight. While not having as much luminosity as unclouded sunlight, it illuminates with sufficient intensity for the panel to generate 1/3 of its peak power Wc (corresponding to sunlight at 1kW/m²)

Comprise a solar panel (depends on the version) placed facing a set of evenly distributed spotlights. The solar panel can be removed easily in order to replace a spotlight quickly if necessary.

The unit located on the back of the spotlights panel includes
- a key-operated emergency stop button for cutting the electricity supply to the spotlights
- a digital thermometer shows the temperature at the surface of the solar panel. Accuracy 1°C.
- a potentiometer for lighting adjustment, by dimmer built into the unit
- a flow control for the forced ventilation
- automatic power supply cut-off to the spotlights in the event of abnormal temperature rise of the solar panel

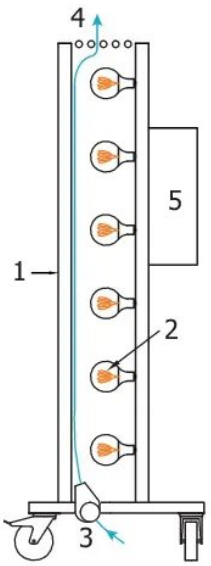
ELECTRICAL FEATURES OF THE SOLAR PANEL AT 25°C

LIGHTING	SOLAR	ARTIFICIAL
Maximum power	220Wc	70Wc
Open circuit voltage	43V	43V
Short-circuit current	6.2A	2.3A

- Sealed connections IP65 – 1000V
- Power supply: 230VAC.
- Dimensions/Weight: 1228 x 665mm height 1926mm.
- 4 casters including 2 with brake



SOL-ARTI
Side protection panel removed for the photograph.



1. solar panel
2. spotlights
3. fan and air inlet
4. grid and air outlet
5. electrical cabinet.

PRACTICAL WORK

Adjustment of the light intensity demonstrates the correlation between the light flow and the current delivered by the photovoltaic panel, at constant voltage.
A temperature probe linked to the unit thermometer is located on the solar panel. This shows its instantaneous temperature. Any reduction of the ventilation flow causes the panel temperature to rise, and lowers the photovoltaic current in constant lighting.

REF	Photovoltaic panel delivered installed	Side protection against the direct access to the lamps	Forced ventilation to simulate the wind	Poles and chains for zone boundary
SOL-ARTI	Yes	Yes	Yes	No
SOL-ARTI-N	No	Yes	Yes	No
SOL-ECO	Yes	No	No	Yes
SOL-ECO-N	No	No	No	Yes

The versions without "installed photovoltaic panels" are compatible with the reference SOL-200 of page 152 and the solar panels of all our systems.



SOL-ARTI: Side panel of protection and ventilation system with protection grid.

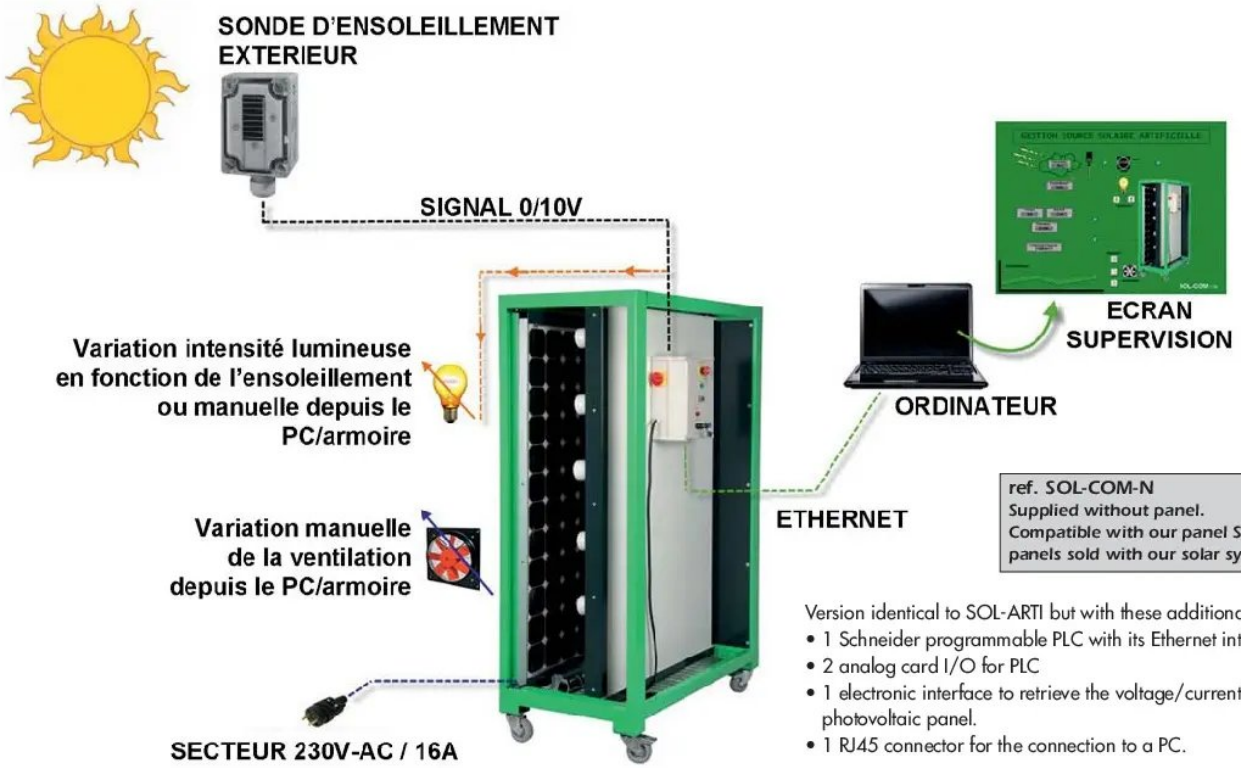
Special characteristics only for SOL-ARTI and SOL-ARTI-N
Two opaque side panels prevent the accidental blinding of a student. With the solar panel and spotlight support they also make a closed duct for evacuating heat by an air current going from bottom to top. Centrifugal fans, located in the bottom part, inject fresh air that runs up the panel.
Grids in the bottom and top parts let the air flow pass evacuating the heat, and prevent accidental contact by hand with a burning spotlight or with the fan blades.

The versions SOL-ECO and SOL-ECO-N have no lateral protection, no forced ventilation.
Versions delivered with 4 poles and 2 chains for the delimitation of a safety zone around the system



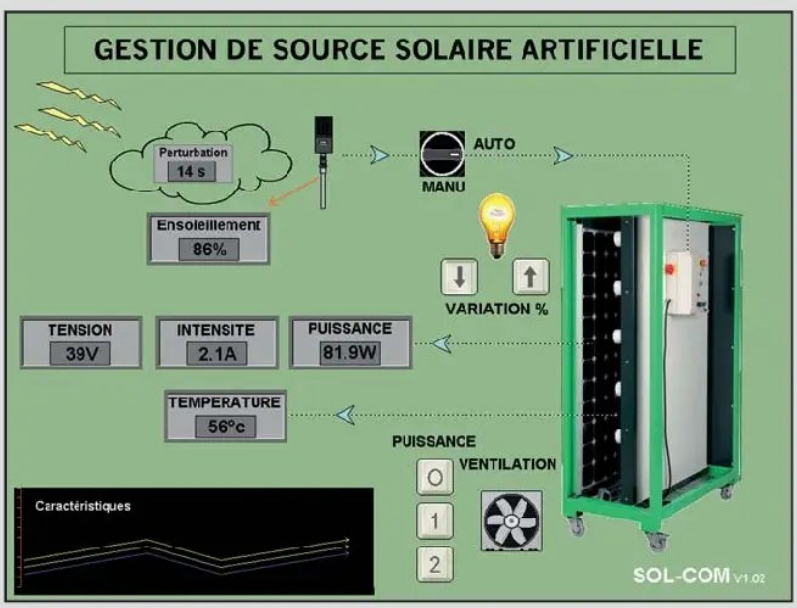
SOL-ECO:
protection by bounded safety zone

Artificial solar source : communicating version



ref. SOL-COM-N
Supplied without panel.
Compatible with our panel SOL-200 and all panels sold with our solar systems

Version identical to SOL-ARTI but with these additional features:
- 1 Schneider programmable PLC with its Ethernet interface
- 2 analog card I/O for PLC
- 1 electronic interface to retrieve the voltage/current parameters of the photovoltaic panel.
- 1 RJ45 connector for the connection to a PC.



SUPERVISION SOFTWARE SUPPLIED
Vijeo designer of Schneider®.

Allows:
- the acquisition and the display of PLC variables
- the supervision and the process control
- the programming of your own supervision
- the creation of your own Ethernet computer network

Displays:
- The values of U(V) / I(A) / P(W) supplied by the solar panel
- The temperature (°C) of the solar panel
- The level of sunshine (solar radiation)
- The level of ventilation

Controls:
- The level of the artificial light intensity
- The disturbance which simulate the passing of a cloud (you can select the duration if the effect).
- The level of ventilation

PRACTICAL WORKS

- Theoretical study on the solar panel functioning
- Theoretical study on the solar panel positioning
- The Ethernet networking of the system
- The influence of the panel temperature on the intensity supplied
- The programming of the PLC
- The setting of the analog cards
- The creation of a supervision programming

Photovoltaic solar panels and frame

FEATURES OF EACH PANEL

- Open circuit voltage: 57VDC
- Short-circuit current: 4.6A
- Optimum operating voltage: 47VDC
- Optimum operating current: 4.3A
- Maximum power: 200Wc (variation of ± 10% depending on the series)
- Sealed connections IP65 – 1000V on the rear of the panel.
- Type of cells: Monocrystalline silicon

PHOTOVOLTAIC SOLAR PANELS 200Wc ON TILTING FRAME (1 PANEL)

- Robust aluminum frame.
- Useful surface area of the cells 1.5m².
- Device for measuring the tilt angle
- Tilt adjustable from 5° to 70°
- Two ball joints with clamping levers for positioning the panel to the required tilt angle.
- Several SOL-200 can be coupled electrically to increase power.
- Light and easy to move.
  Dimensions Folded position: 1620 x 1060 x 100mm
  Dimensions Unfolded to 70° position: 2100 x 1060 x 700mm
  Weight 27kg

ref. SOL-200



LINK CABLE

30-m cable for connecting the solar panels to any type of solar system.



ref. SOL-CAB30

PHOTOVOLTAIC SOLAR PANELS 400WC ON TILTING WHEELED FRAME (2 PANELS)

- Compact wheeled frame.
- Sufficiently compact to be rolled through a door-way.
- An instantly removable stand is fixed to the wheeled frame
- Four actuators raise the SOL-400 to a stable and horizontal position
- Unfolded stand wheelbase: 225 x 260cm
- Overall folded stand dimensions: 227 x 75cm high 195cm
- Effective surface area of cells: 3.1m²
- Total power of the panels 400Wc (may vary by 10%)
- Tiltable from the vertical to the horizontal position in 5° increments.
- A protractor measures the panel tilt.

ref. SOL-400





PHOTOVOLTAIC SOLAR PANELS 800WC ON TILTING WHEELED FRAME (4 PANELS)

- Compact wheeled frame.
- Sufficiently compact to be rolled through a door-way.
- An instantly removable stand is fixed to the wheeled frame
- Four actuators raise the SOL-800 to a stable and horizontal position
- Unfolded stand wheelbase: 225 x 260cm
- Overall folded stand dimensions: 227 x 75cm high 195cm
- Effective surface area of cells: 6.3m²
- Total power of the panels 800Wc (may vary by 10%)
- Tiltable from the vertical to the horizontal position in 5° increments.
- A protractor measures the panel tilt.

ref. SOL-800





Solar tracker with battery



ref. TRACSOL

The solar tracker is a technical innovation for tracking the sunlight, in order to increase the efficiency of photovoltaic panels. The productivity gain can reach 40% with a 2-axis tracking installation. TRACSOL is a teaching solution for learning this technique. Equipped with 2 axes and 4 cells for automatic sunlight tracking, it is completely self-contained. No connection to the mains 230V is required. Only the artificial solar source enabling TRACSOL to be used indoors is powered with 230VAC. The transparent sides of the mechanical box enclosing the two axes provide a full view of the chain drive linkages.
4 BNC attached to the front of the cabinet enable the reading on oscillocope of the signals generated by the 4 solar cells.
The voltage of the solar panels is available on the two safety terminals.
The assembly is mobile thanks to 4 heavy-duty wheels attached under the frame.

EDUCATIONAL OBJECTIVES

- **Study and putting into service of a solar tracker.**
- **Understanding the operation of solar cells.**
- **Mastering the wiring of the components of a photovoltaic installation at an isolated site.**
- **Taking measurements using an oscilloscope and clampammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Lessons on the different solar panel technologies (Monocristalline, Polycristalline, Amorphous)
- Study on the positioning of solar panels for maximum output.
- Study of solar radiation.
- Reminder on Direct, Diffused and Reflected solar radiation.
- Comparison of the read powers with fixed panels and tracking panels.
- Study and creation of the wiring of a solar energy system at an isolated site.
- Reading the currents and voltage at different points of the wiring.
- Interpreting the measurements then calculate the efficiency.
- Calculation of the discharge time of the battery according to the load.

Comprises

- 2 solar panels 30W-12V Monocristalline.
- 1 azimuth rotation motor of 160° maximum, that is more than 8 hours of tracking in position perpendicular to the sun.
- 1 zenith rotation motor 43° for full tracking of the sun's elevation.
- 1 set of solar cells.
- 1 cabinet with door.
- 1 Solar load regulator 12V/20A.
- 1 battery 12V-14Ah.
- 1 output 12VDC-60W available on 4mm terminal.
- Protection with gPV cartridge fuse.
- Emergency stop and switch + 'on' indicator light.
- 1 printed side with 4 BNC plugs.
- 1 artificial solar source mounted on telescopic stand.

Features

- 3-metre mains lead for the artificial source.
- Dim.: 800 x 600 x h 1700mm. Weight: 80kg.
- The pole and the panels are easy to remove for going through doorways.

Simulation of a solar panel

Given that photovoltaic panels do not produce significant power in cloudy conditions, it is not possible to complete the related tutorials. DC10 is a source which, by replacing the solar panels, overcomes unpredictable sunshine.

• Mains input	230V single-phase
• Stop/start switching	Push-button + LED indicator lights
• Emergency stop	Key operated
• DC output	Adjustable from 0 to 230V DC
• Maximum current	10A
• Filtering	5% of residual ripple at 10A.
• Adjustment method	Button on the top
• Display of outputs	1 voltmeter and 1 ammeter
• Output terminals in parallel	2 photovoltaic type connectors 2 4mm safety terminals
• Upstream protection	By fuse
• Output protection	By circuit breaker
• Protection of individuals	By safety isolation transformer
• Dimensions/Weight	330 x 280mm height 510mm/49kg
• Castors	4 including 2 with brakes

Suitable for indoor operation with our products.



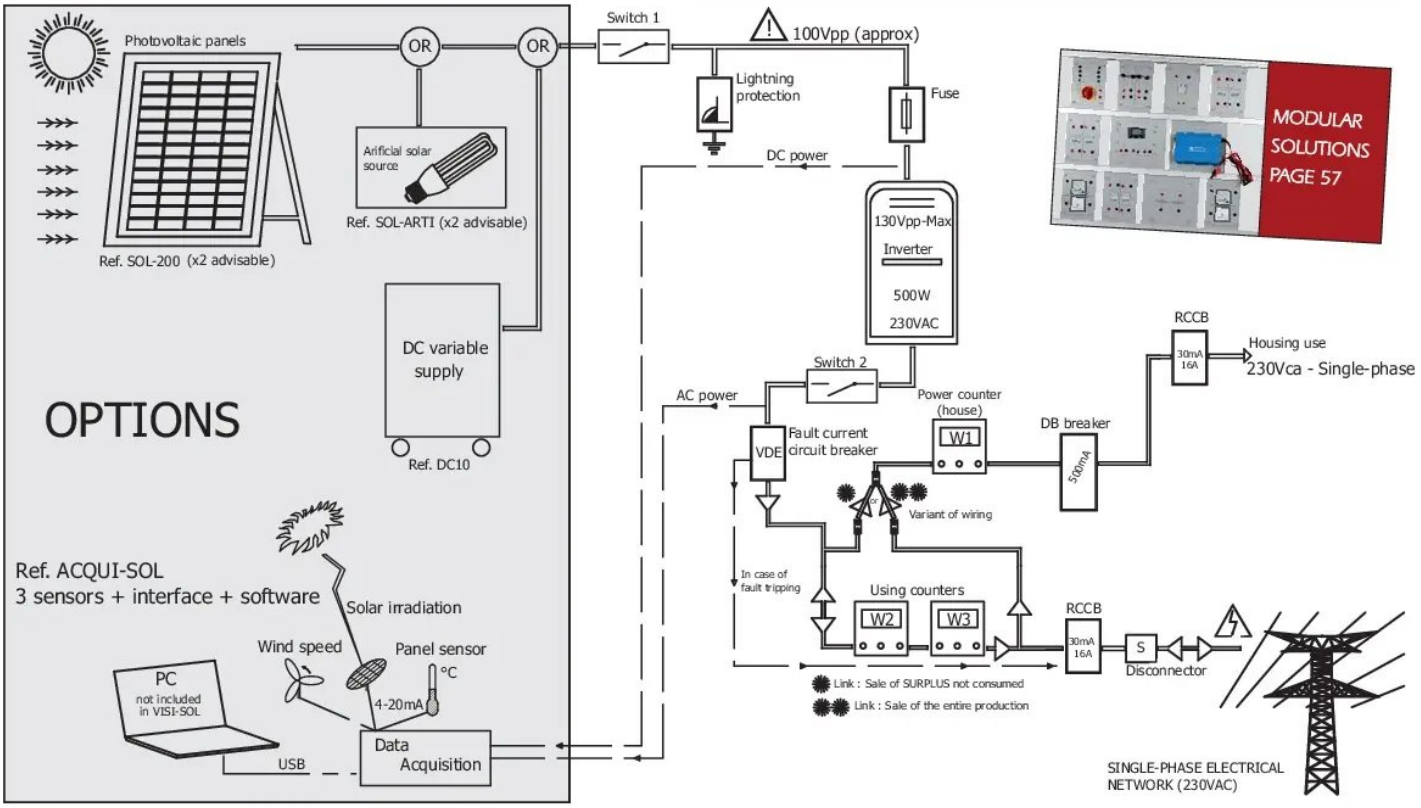
SOL-1
SOL-2
SOL-3
SOL-4-EXP
SOL-5-EXP
SOLPUITS
SOLHAB



ref. DC10

Supplied with cable (1m) for connection to the management system of photovoltaic panels.

Photovoltaic kit for energy injection





ref. KX-EDU

Kit of photovoltaic components for studying a solar installation with total or partial energy injection to the electricity network 230VAC-50Hz.

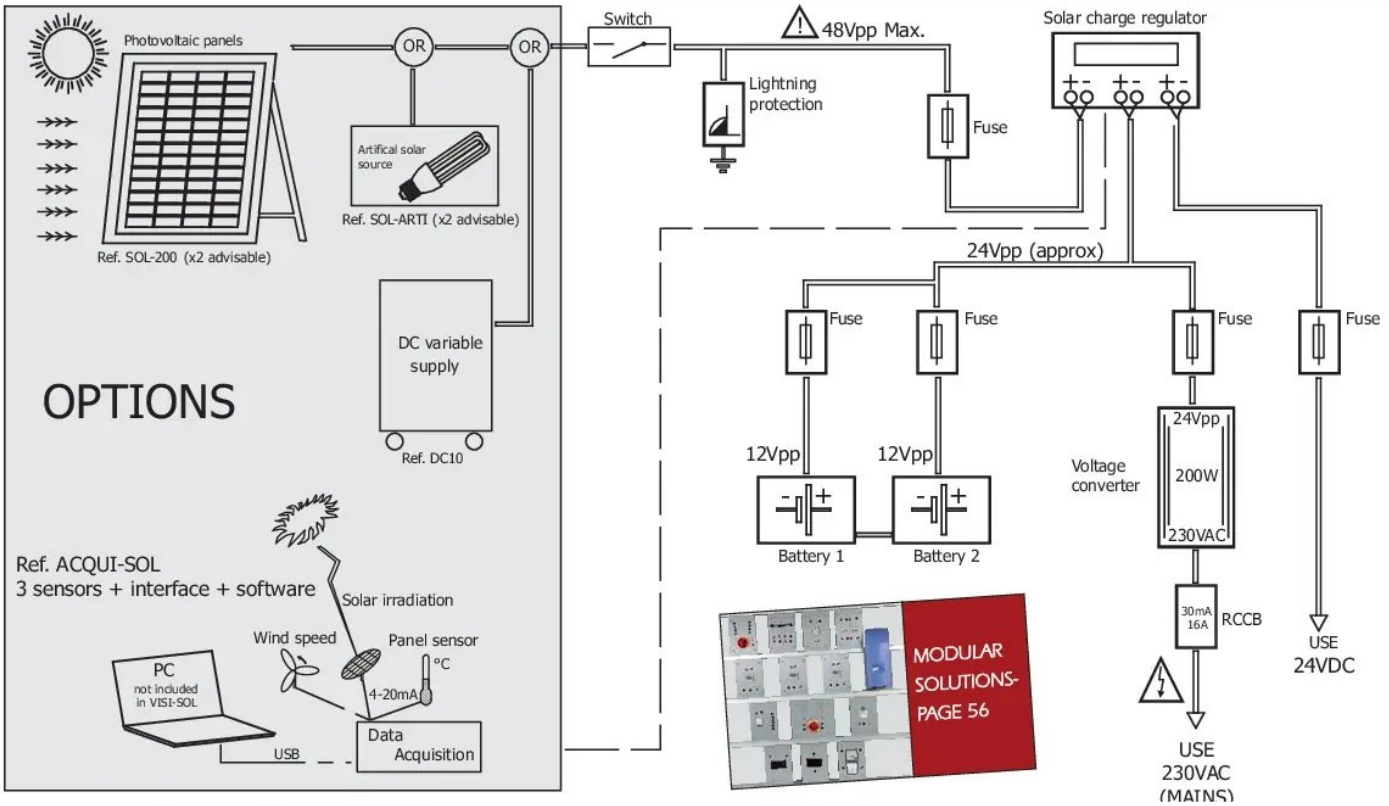
The kit comprises

- 2 photovoltaic switches 0/1 – 32A/500VDC – 3-pole.
- 1 lightning arrester 500VDC
- 1 photovoltaic fuse holder 1000VMax. 2-pole. 10x38mm
- 4 photovoltaic fuse cartridges gPV 1000V. 10x38mm
- 1 network inverter 500W. Automatic synchronization on the network 230VAC-50Hz. Input voltage from 65 to 130VDC. Thermal protection integral to the box. 1 residual current circuit-breaker 30mA-10A two-pole.
- 3 single-phase modular energy meters 63A. Gauges key kW.h/kW/Partial. Reset key. Resolution 0.1kW
- 1 two-pole Photovoltaic circuit-breaker with EMS default current in compliance with Standard VDE0126. Gauge 16A-30mA. Use voltage from 196 to 250VAC
- 1 Main switch 25A – 5.5kW/400V.
- 2 residual current circuit-breakers 30mA/16A two-pole.
- 1 two-pole connection circuit-breaker 500mA, 230 V CA, 15/30/45 A
- 1 plug 2P+E male.
- 1 set of 10mm² connection terminals
- 1 set of photovoltaic connectors 4-6mm²
- 1 sheet of 10 photovoltaic labels showing different safety operations
- 1 file on CD: detailed instructions for each component, cabling diagram and practical assignments.
- Works with photovoltaic panels with voltage between 35 and 150VDC

OPTIONS

Ref. SOL-200	(2 panels recommended) Photovoltaic panel 200W on tilting foot with device for measuring the tilt angle (description P.150)
Ref. SOL-CAB30	Connection cable for photovoltaic panels 30m 3G6mm² (description P.150)
Réf. EOLYS-500	400W Wind turbine (description P.158).
Ref. ACQUI-SOL	Interface with 3 sensors and acquisition software to read the installation's electrical characteristics. (description P.135).
Ref. DC10	Power supply DC 0 - 220 volts - 10A protected. Simulates the panels. (description P.151).
Ref. SOL-ARTI	Source of artificial sunlight. (description P.148).
Ref. HABITAT-2	Load panel for use on site with electricity network. (description P.139)

Photovoltaic kit for isolated site





ref. KX-TEST

Kit of photovoltaic components for studying a solar installation on isolated site.

The kit comprises

- 2 sealed solar batteries 12VDC -12Ah.
- 1 photovoltaic switch 0/1 – 32A/500VDC – 3-pole.
- 1 pure sine-wave voltage converter with power 300W. input voltage from 20 to 32VDC and output voltage 230VAC-50Hz.
- 1 lightning arrester 500VDC
- 5 photovoltaic fuse holder 1000VMax. 2-pole. 10x38mm
- 12 photovoltaic fuse cartridges gPV 1000V. 10x38mm
- 1 Solar charge regulator with LCD. Max current 20A. Operating voltage 12V or 24V with automatic recognition. Input voltage area from 6.9 to 17.2VDC and from 17.3 to 43VDC. Front pushbuttons for displaying the voltage and current of the charge in the battery and in the use circuit. Solar panels input 48VDC Max. Minimum battery voltage 6.9V.
- 1 residual current circuit-breaker 30mA-16A two-pole.
- 1 set of 10mm² connection terminals
- 1 set of photovoltaic connectors 4-6mm²
- 1 sheet of 10 photovoltaic labels showing different safety operations
- 1 file on CD: detailed instructions for each component, cabling diagram and practical assignments.
- Works with photovoltaic panels with voltage between 18 and 50VDC

OPTIONS

Ref. SOL-200	(2 panels recommended) Photovoltaic panel 200W on tilting foot with device for measuring the tilt angle (description P.150)
Ref. SOL-CAB30	Connection cable for photovoltaic panels 30m 3G6mm² (description P.150)
Ref. ACQUI-SOL	Interface with 3 sensors and acquisition software to read the installation's electrical characteristics. (description P.135).
Ref. DC10	Power supply DC 0 - 220 volts - 10A protected. Simulates the panels. (description P.151)
Ref. SOL-ARTI	Source of artificial sunlight. (description P.148).
Ref. HABITAT-3	Load panel for use on isolated site. (description P.139)

Boxed components for studying solar energy

These components are made safe in plastic boxes with transparent covers.
They are perfectly visible and the cabling is facilitated by the different safety terminals Ø4mm.
Each box is supplied with detailed instructions

OPTIONS

Ref. SOL-200 Photovoltaic panel 200W on tilting foot with device for measuring the tilt angle (description P.150)

Ref. SOL-CAB30 Connection cable for photovoltaic panels 30m 3G6mm² (description P.150)

Ref. ACQUI-SOL Interface with 3 sensors and acquisition software to read the installation's electrical characteristics. (description P.141).

Ref. DC10 Power supply DC 0 - 220V - 10A protected. Simulates the panels. (description P.141).

Ref. SOL-ARTI Source of artificial sunlight. (description P.148)

SEALED SOLAR BATTERIES



ref. CIA-BAT24

- Lot of 2 sealed solar batteries 12V-12Ah.
- Separate cabling of the two sources for putting the 2 batteries in series or parallel.
- L x l x h: 280x190x130mm

LIGHTNING ARRESTER PROTECTION



ref. CIA-PRF

- Lightning arrester protection for 2-pole DC circuit - 500VDC.
- L x l x h: 180x80x90mm

SOLAR CHARGE REGULATOR



ref. CIA-REG

- Solar charge regulator with LCD.
- Max current 20A.
- Operating voltage 12V or 24V with automatic recognition.
- Input voltage area from 6.9 to 17.2VDC for 12VDC and from 17.3 to 43VDC for 24VDC.
- Front pushbuttons for displaying the voltage and current of the charge in the battery and in the use circuit.
- Solar panel input 48VDC Max
- Minimum battery voltage 6.9V.
- L x l x h: 200x200x130mm

NETWORK INVERTER



ref. CIA-OND05

- Network inverter 500W.
- Automatic synchronization on the network 230VAC-50Hz.
- Input voltage from 65 to 130VDC.
- Input on safety terminals and output on 2 1-m cables fitted with safety plugs Ø 4mm male.
- Thermal protection integral to the box.
- L x l x h: 350x150x60mm

VOLTAGE CONVERTER



ref. CIA-CONV

- Pure sine-wave voltage converter 300W.
- Input voltage, on safety terminal, from 20 to 32VDC and output 230VAC-50Hz on 2P socket.
- Thermal protection integral to the box.
- L x l x h: 210x210x70mm

For instance : set of components for the study of the wiring of a solar energy system with energy release on the electrical network 230 Vac (mains).

2 x CIA-COM
1 x CIA-PRF
1 x CIA-FUS
4 x SBT-FUS10
1 x CIA-OND05
3 x CIA-CPT
1 x CIA-BORN
1 x CIA-VDE
1 x CHT-V6 (See Page 75)
1 x CIA-SE0 (See Page 84)
2 x CIA-MT37 (See Page 83)
2 x SOL-200 (See Page 150)
1 x SOL-CAB30 (See Page 150)
6 leads 302S-R (See Page 273)
15 leads 302S-N (See Page 273)
10 leads 302S-B (See Page 273)
2 leads 304S-R (See Page 273)
6 leads 304S-N (See Page 273)
2 leads 304S-B (See Page 273)
4 leads T200 (See Page 273)

Tips and wiring diagrams provided

INTERFACE FOR SAFETY TERMINALS



ref. CIA-BORN

- Interface unit for converting 2 photovoltaic type terminals into safety terminals 4mm.
- 32A Max.
- L x l x h: 105x80x90mm

MODULAR ENERGY METER



ref. CIA-CPT

- Single-phase modular energy meter 63A.
- Gauges key kW.h/kW/Partial.
- Reset key.
- Resolution 0.1kW
- L x l x h: 170x140x100mm

PHOTOVOLTAIC SWITCH



ref. CIA-COM

- Photovoltaic switch 500VDC.
- 3-pole – 32A.
- Front operation control 90°
- Position: O/I
- L x l x h: 120x120x100mm

PHOTOVOLTAIC 2-POLE FUSE HOLDER



ref. CIA-FUS

- Photovoltaic two-pole fuse holder 10x38mm,
- 2-pole for DC.
- Fuse replacement without opening box
- Max: 1000VDC.
- L x l x h: 130x80x90mm
- Supplied without fuse cartridges gPV.
  Option Fuse gPV 10x38 1000V:
  Ref. SBT-FUS12

2-POLE CIRCUIT-BREAKER



ref. CIA-VDE

- 0126 two-pole Photovoltaic circuit-breaker with EMS default current in compliance with Standard VDE0126.
- Adjustable without opening box
- Gauge 16A-30mA.
- Use voltage from 196 to 250VAC
- L x l x h: 170x140x100mm

PHOTOVOLTAIC INVERTER



ref. CIA-INV

- Photovoltaic inverter switch 500VDC.
- 6-pole – 32A.
- Front operation control 190°
- Position I/O/I
- L x l x h: 170x140x100

OPTION FOR HANGING ON RAILS



Option for fast attachment onto an universal rail. In this way, you can attach your various industrial components onto a grid in order to make wiring and testing easier. To order this option, simply add –FIX to the end of the reference
Ex : CIA-VDE-FIX

1 x CIA-COM	1 x CIA-MT37 (See Page 83)
1 x CIA-BAT12	2 x SOL-200 (See Page 150)
1 x CIA-PRF	1 x SOL-CAB30 (See Page 150)
5 x CIA-FUS	15 leads 302S-R (See Page 273)
12 x SBT-FUS10	15 leads 302S-N (See Page 273)
1 x CIA-REG	2 leads 304S-R (See Page 273)
1 x CIA-CONV	2 leads 304S-N (See Page 273)
1 x CIA-BORN	2 leads T200 (See Page 273)

For instance : set of components for the study of the wiring of a solar energy system for isolated site using batteries.

Tips & wiring diagrams provided

SOLAR PUMP 24VDC - 3.5A



ref. CIA-POMP

- Self-priming
- Power supply on safety terminals

Wind turbine simulator - Network injection

EOLYP is a test bench dealing with the study of the hyper synchronous activity of a wind turbine for its electricity production aspects, excluding the mechanical aspects.
Due to noise pollution and draughts, which are incompatible with a classroom environment, the propeller has been replaced by a variable speed drive motor.

The functional diagram presents the operating principle. The safety components placed in the electrical cabinet are not represented to simplify reading.
The propeller, for which the operator adjusts the speed, drives the generator from 0 to 1800 rpm. Two sensors placed on the shaft, returns rotation speed and torque information to the console which displays this information. The generator is coupled to the public three-phase network, through an electrical measurement bench indicating the:

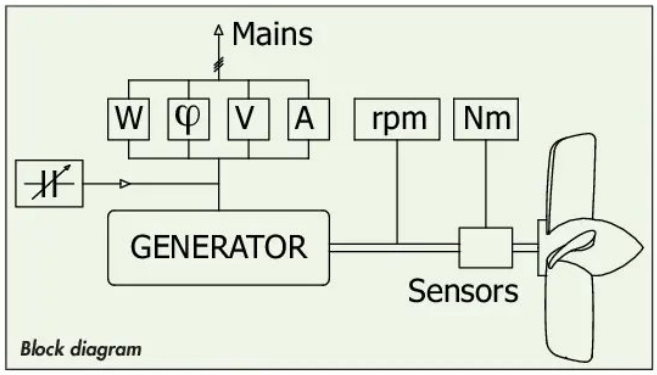
- active power injected into the network.
- voltage between phases
- current
- power factor.

The central-zero wattmeter shows that depending on the drive speed, the generator consumes or produces energy highlighting the hypersynchronous and hyposynchronous operations. The voltage/current distortion also changes with the rotation speed as indicated by the central-zero power factor meter. The adjustable capacitors battery is used to adjust the power factor to around 1 depending on the speed and power produced.



ref. EOLYP

ref. EOLYP-ECO ***without sensor and display unit***



Block diagram

EDUCATIONAL OBJECTIVES

- **Understanding the mechanical & electrical principles of a wind turbine.**
- **Studying the hypo-synchronous and hyper-synchronous operating modes of an asynchronous motor.**
- **Studying the synchronization of the electrical network.**
- **Calculating the efficiency of the energy production system.**
- **Using a clamp-on Ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Reminders on the wind turbine functioning.
- Synchronization procedure on the electrical network.
- Raising the power factor by a capacitors bank and study the results.
- Plotting the electrical characteristics of the energy production system.
- Calculating the overall efficiency.
- Studying of the functioning in an isolated site.

COMPRISES

- 1 frame on casters, dim. 1200x750mm height : 1820mm. Weight: 143kg.
- 1 asynchronous motor 1.5 kVA
- 1 generator
- 1 DC tachogenerator / 1 torque sensor
- 1 command console
- 1 electrical cabinet
- 1 network coupling unit

GENERATOR FEATURES

- Generator: 3 x 400VAC Asynchronous motor.
- Active power injected into the network: 0 to 1.2kVA
- Generator efficiency: 78%
- Speed variation: 0 to 1800 rpm

ELECTRICAL CABINET FEATURES

Interior

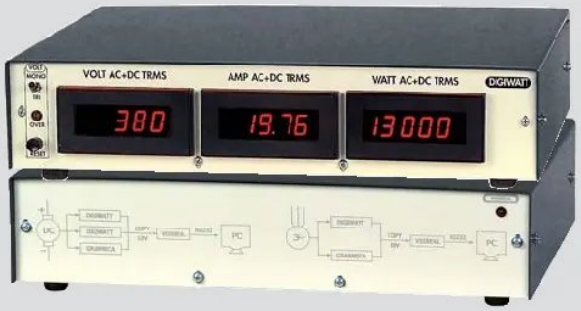
- 30 mA circuit breakers & magnetothermal and thermal circuit breakers.
- 2.2kVA speed controller with control unit on the console.
- stepped capacitors battery

On the front

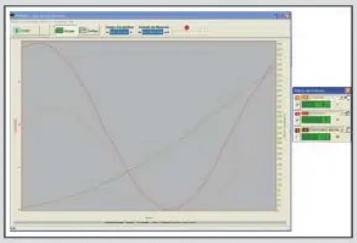
- 1 emergency stop circuit breaker
- 1 switch disconnector
- 1 stop/Start button with push button
- 4 switches triggering the capacitors to rectify the cosφ
- 2 indicator lights show a thermal fault on the motor and generator



Pack Acquisition



ref. EOL-COM



EOL-COM is an option for EOLYP and EOLYP-ECO. This option allows recording and plotting on PC the electrical values as voltage, current and power provided to the Electrical network. The software supplied displays these electrical values in real time and collects them in Excel format.

During the acquisition, the values of U/I/P are displayed at the same time as curves and numerical values. Connection on PC by a USB cable of 2m (supplied).
Mains supply: 230Vac – 50/60Hz

DISPLAY

By two 3 1/2 and one 4 1/2 digits displays, height of digits 15mm.

INPUTS

Voltage inputs: Three floating potential voltage terminals, situated at the rear of the apparatus allowing either the application of an alternating, continuous or composite voltage, or a balanced three phase voltage. These inputs are electronically protected against over voltages. Max. voltage: 400Vrms single phase, 700Vrms three phase

Current inputs: Two floating potential current terminals, situated at the rear of the apparatus allowing the application of an alternating, continuous or composite current. Imax = 20A. The current input is protected by a delay fuse, allowing measurements on starting up a motor

RECOPY OUTPUTS

Voltage output: 0 to 10V DC signal for 0 to 1000Vrms entering.
Current output: 0 to 10V DC signal for 0 to 20Arms entering.
Power output: 0 to 10V DC for 0 to 0.2kW - 0 to 2kW - 0 to 20kW; these three ratings are switched automatically.
Important: these three outputs are insulated from the voltage and currents applied to the input terminals of the apparatus.

OTHER CHARACTERISTICS

Dimensions of each case : 375 x 80 x 275mm. Weight : 5kg.

Function	U	I	W
Ranges	400Vrms single-phase 700Vrms 3-phase	20Arms	0.2 - 2 - 20kW
Accuracy in % of reading	1% from 0 to 70kHz	2% 0 ~ 20kHz 3% 20 ~ 70kHz	2% 0 ~ 20kHz 3% 20 ~ 30kHz 5% 30 ~ 70kHz
Protection	Electronic breaker	20A delayed fuse	
Impedance	1.5MΩ	<5mΩ	
Recopy outputs	10VDC/1000Vrms	10VDC/20Arms	10VDC/ 0,2kW - 2kW - 20kW

Three-phase wind turbine 400W



EOLYS-500 is a three-phase wind turbine 400W belt-linked to a driven motor that simulates the wind strength. This system is suited to class room conditions. It perfectly simulates wind turbine operation without noise or draughts since there is no fan. Protected by a transparent cover, the wind turbine can be seen with no risk of direct contact. EOLYS-500 is more than a simulator because it rotates a true three-phase generator and short blades.

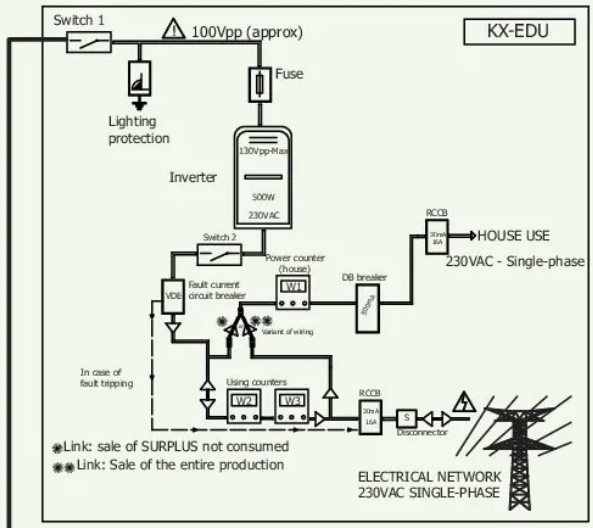


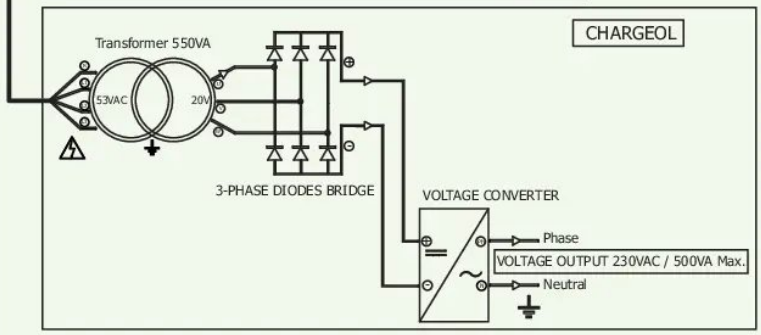
EDUCATIONAL OBJECTIVES

- **Understanding the different elements of a wind turbine.**
- **Make the measurements of electrical parameters (3-phase and continuous).**
- **Analyzing and interpreting results.**
- **Studying the efficiency and impacts related to the wind force.**
- **Studying the chain of wind energy (production, storage, consumption, energetic behavior).**
- **Control and set a speed variator from a PC.**

DELIVERED WITH TESTS & PRACTICAL WORKS

EXAMPLES OF COMPATIBLE LOADS





ref. EOLYS-500

Wind turbine features

- Three-phase output 3 x 53V AC - 400W at 370 rpm on safety terminals.
- Direct current output 90V DC - 400W at 370 rpm on safety terminals.
- Selection of these outputs by using an included rectifier or by direct connection.

Features of the wind simulation

- Squirrel-cage three-phase asynchronous motor.
- Speed controller simulating wind turbine speed 0-400 rpm.
- Using the supplied SOMOVE software, the PC operations are:
  - Acceleration of the wind speed.
  - Deceleration of the wind speed.

General features

- Wheeled frame with brakes
- Overall dimensions: 750 x 670 x (h) 1500 mm
- Top cover made with aluminium frame and Lexan sides (translucent and unbreakable).
- Power supply 2P+N+E 230V AC - 50/60 Hz (5m lead with mains plug)
- Supplied with: Practical assignments in the form of measurements/tests; RJ45-USB cable for linking between the speed controller and the PC. **Schneider® SoMove software.**

SoMove **Supplied with SoMove**

Three-phase wind turbine units, 400W

EDUCATIONAL OBJECTIVES

- **Understanding the different parts of a wind turbine.**
- **Make the measurements of electrical parameters.**
- **Analyzing and interpreting results.**
- **Studying the efficiency and impacts related to the wind force.**
- **Study the chain of wind energy (production, storage, consumption, energetic behavior).**
- **Wiring of a wind turbine installation.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Studying and reading of the electrical features of the wind turbine.
- Calculate the system's efficiency.
- Realization of the diagram and wiring for the energy injection on the electrical network.
- Realization of a diagram & wiring for the energy use in an isolated site.



NEW

Reference EOL-1

1. WIND TURBINE 400W

- SEE opposite EOLYS-500

2. ELECTRICAL CABINET

Standard technical cabinet on wheeled frame.
Dimensions: 810 x 600 x 1890mm base included.

Comprises

- 2 disconnectors
- 1 500mA -30A RC device
- 1 30mA RC device
- 1 lightning arrester + fuses
- 3 100Wh resolution meters
- 1 Mushroom head emergency stop
- 1 source inverter
- 1 charging controller 12/24VDC-20A
- 2 batteries 12V-12Ah
- 1 set of photovoltaic connectors
- 1 500W inverter for network synchronisation
- 1 Voltage converter 24VDC/230VAC-200W

Réf	Features
EOL1	Operation with partial and total resale + at isolated site
EOL2	Partial or total resale operation only
EOL3	Operation at isolated site only

Each reference includes:
1 turbine (Ref. EOLYS-500) + 1 specific electrical cabinet + 1 link cable

PARTIAL OR TOTAL RESALE OPERATION

In the cabinet, a DC/AC inverter converts the DC current from the turbine into alternating current 220VAC 50Hz and feeds it into the grid in synchronism. This inverter is protected against any polarity reversal and any overload on the DC or AC side.

When the turbine is stopped, the inverter consumes no current

INVERTER	VOLTAGE	Max current	Power
INPUT	65~125VDC	8A	
OUTPUT	230VAC-50Hz	2,25A	400W

OPERATION AT ISOLATED SITE

The turbine current charges two 12V sealed batteries cabled in series through a charging controller. This DC voltage is either available on safety terminals at the rear of the cabinet, or transformed into 250VAC 50Hz voltage by a 200W voltage converter.

Technical characteristics for the isolated site converter

VOLTAGE CONVERTER	Voltage	Max Current	Power
INPUT	20~32 VDC	11A	210W
OUTPUT	230VAC 50Hz	1.5A	300VA

Studying the conversion of renewable energy





ref. CONVERTYS

ref. CHARGEOL

EDUCATIONAL OBJECTIVES

- **Study of the conversion of the electrical energy from 3-phase to single-phase.**
- **Make some measurements with a clamp-on ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Understanding of the wiring diagram.
- Sizing of the electrical components related to the voltage and the power.
- Reading of currents and voltage in different points of the circuit.
- Calculation of powers.
- Calculation of electrical efficiencies.

These converters operate on the same principle as an industrial model.
They treat the electrical power supplied by a wind turbine.
The output cannot be synchronized with the network
but can be used in isolated site.

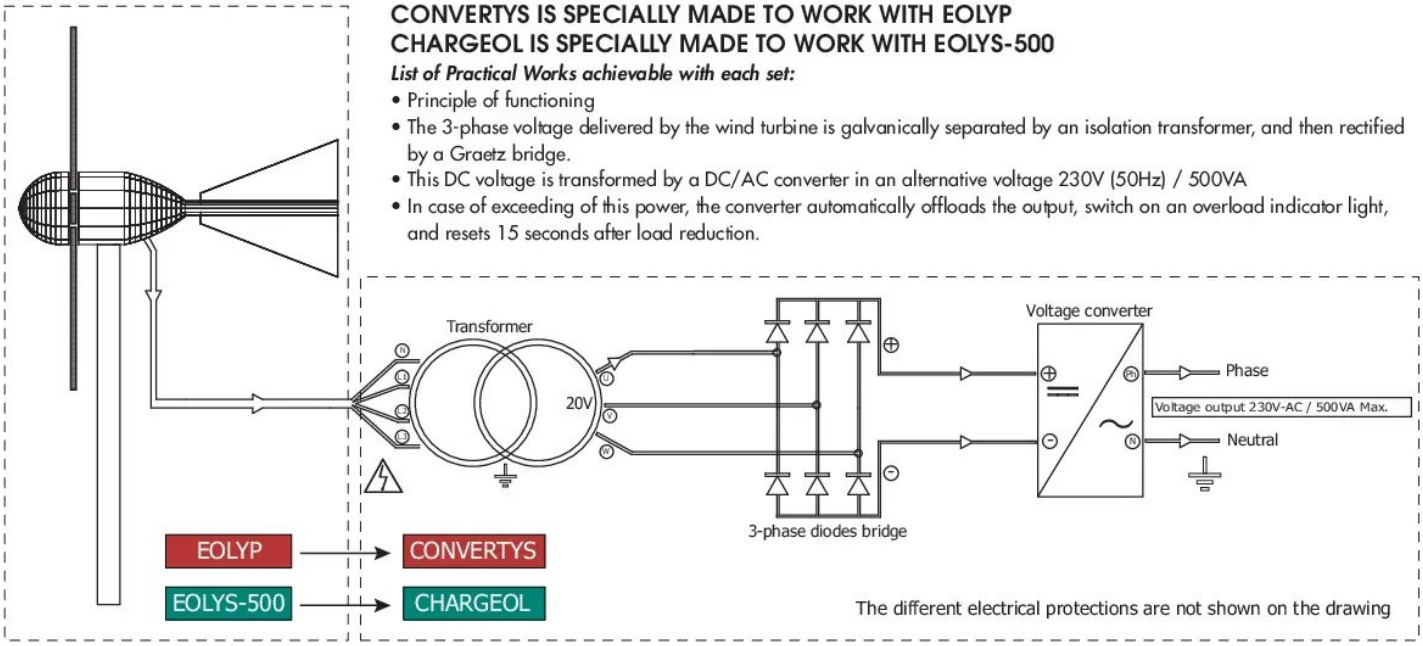
TECHNICAL CHARACTERISTICS

- The converter's synoptic, printed on the front, facilitates location of the components and measurement points.
- The three-phase voltage from the wind turbine is applied to CONVERTYS or CHARGEOL through 4 safety terminals 4mm dia. The wind turbine-to-converter interconnection is made using laboratory leads.
  CONVERTYS : Inputs between 375 and 460V three-phase.
  CHARGEOL : Inputs between 80 and 120V three-phase.
- A main switch located on the top of the box, starts and stops the converter's power supply.
- Safety terminals 4mm diam. located between each component enable the voltages and currents to be measured at each conversion step.
- A magneto-thermal circuit-breaker protects the transformer primary against any overload.
- Output converter 500W/230V.
- A differential circuit-breaker 30mA protects the output to the use network cabled according to neutral system TT.
- Unit on casters dimensions: 600 x 450mm. Height 530mm

CONVERTYS IS SPECIALLY MADE TO WORK WITH EOLYP
CHARGEOL IS SPECIALLY MADE TO WORK WITH EOLYS-500

List of Practical Works achievable with each set:

- Principle of functioning
- The 3-phase voltage delivered by the wind turbine is galvanically separated by an isolation transformer, and then rectified by a Graetz bridge.
- This DC voltage is transformed by a DC/AC converter in an alternative voltage 230V (50Hz) / 500VA
- In case of exceeding of this power, the converter automatically offloads the output, switch on an overload indicator light, and resets 15 seconds after load reduction.



Speed controller used for energy saving



EDUCATIONAL OBJECTIVES

- **Energy savings by speed controller demonstrated.**
- **Creation of the configuration of a speed controller with software.**
- **Using an energy measuring unit.**
- **Using a clamp ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Configuration of the speed controller with software.
- Configuration of the energy measuring unit.
- Comparison of energy consumption.
- Calculation of the cost of depreciation of the speed controller.
- Reading and plot of the electrical characteristics.

ref. MAQ-WATT

In a pumping or ventilation installation, the motor, supplied direct from the mains, rotates at its nominal speed. The flow rate can be regulated with manual valve or speed controller. The speed controller enables significant electricity savings to be made, which is not the case of the manual valve.
MAQ-WATT demonstrates this phenomenon by comparing the consumption in the two situations.
2 types of operation are offered:

- Direct supply of the pump with a contactor and regulation of the water flow with manual valve.
- Supply of the pump with controller and regulation of the flow rate by variation of the speed of rotation.

A measuring unit compares, among other things, the 2 powers absorbed.
A float provides a visual indication of the flow rate.

Comprises

- Wheeled frame.
- One surface pump 750W – three-phase 400VAC. Self-priming and protected against dry running.
- A 30-litre water tank makes the model self-contained.
- A manual valve for regulating the water flow.
- A float flow rate indicator.
- A cabinet with top engraved showing the diagram of operation of the system.
- A set of magneto-thermal and RC protection devices.
- A set of switches and indicator lights to select the type of operation required.
- An energy measuring unit with display of P/Q/S/I/U/V/Cosphi.
- Speed controller with software. 1500W – three-phase 400VAC.
  Offset control box for controlling the controller from the top of the cabinet.
- 3 safety sockets are available at the output of the speed controller for the connection of your own pump or any other load as a fan (3x 400V / 1.5kW max.)

Features

- Three-phase mains lead 400V 3 metres long for power supply.
- Dimensions: 600 x 800 x h 1400mm. Weight: 85kg.





"Intelligent Home" energy control system

NEW



EDUCATIONAL OBJECTIVES

- **Study a measurement system for energy consumption according to standard RT2012.**
- **Study the principle of a home control installation equipped with DELTA DORE® radio components**
- **Parameter the DELTA DORE® radio components (RF technology)**
- **Produce wiring for home components.**
- **Learn how to use a clamp ammeter.**

TEACHING RESOURCES STUDENT & TEACHER

Possible practical works

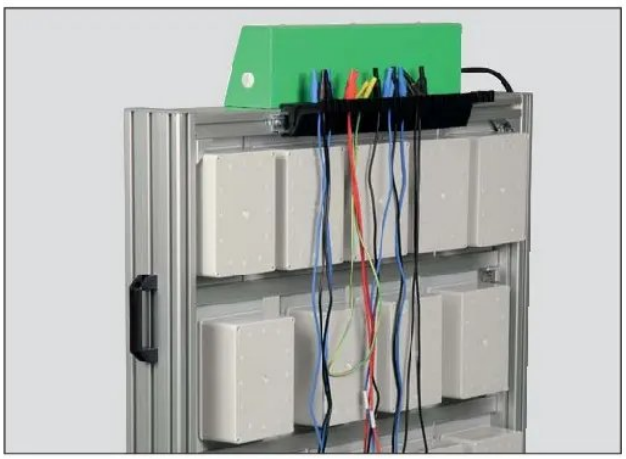
- Production of the complete wiring diagram.
- Study of the production of the wiring and programming of the components from the DELTA DORE touch screen module
- Study and production of radio commands for lighting, roller blinds and heating.
- Reading of power according to the heating operating cycles.
- Comparison of the power displayed on screen with that calculated from the different readings.
- Creation of scenarios according to the outside temperature and sunshine.

ref. MAQ-NRJ

More and more standards and directives require individual homes to be equipped with a system enabling energy consumption to be measured or estimated. MAQ-NRJ groups all the DELTA DORE® components needed to learn about electrical energy consumption.
A colour touch screen module displays all the energy use information as graphs.
The different components are prepared in plastic housings engraved and equipped with 4 mm terminals to facilitate and make safe the wiring using safety leads.
The modules are very easy to install on the aluminium wheeled frame.

Characteristics

- Power supply 230V AC by 5-metre mains cord
- Dimensions of the frame: 950 x 50 x 1620 mm
- Dimensions of each module: 250 x 165 mm
- Total weight: 50 kg

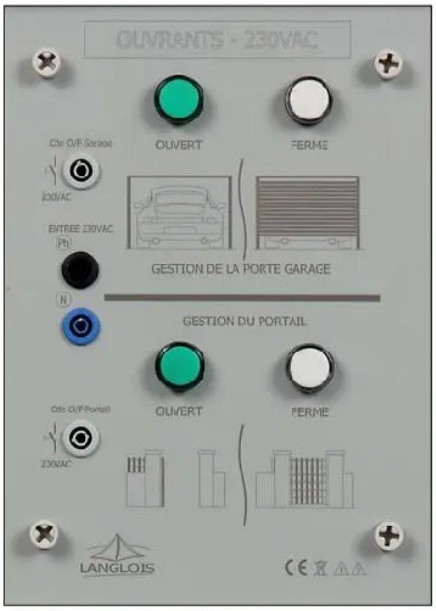


Composition

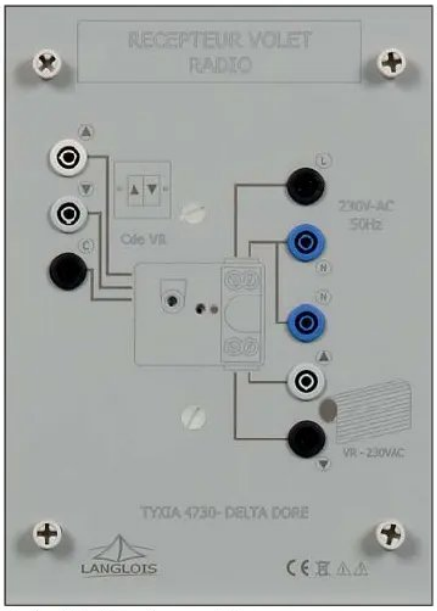
- One wheeled aluminium frame taking 4 rows of 5 modules
- One power supply console 230 V AC on Ø 4 mm terminals
  - protection by 30mA RC circuit breaker
  - emergency stop button
  - 2 2P+E sockets with lamp
- 1 rack for leads - 20 fingers.
- 1 Module - data transmitter with off-peak hours control
- 1 Module - colour touch screen displaying all the detail of consumption, for controlling heating (pilot wire and load shedding), lighting and roller blinds.
- 1 Module - 3 current transformers (max 60A) for measuring 3 different circuits.
- 1 Module - power interface technical unit for touch screen.
- 1 Radio module - sunlight sensor.
- 1 Radio module – outside temperature sensor
- 2 Radio modules – roller blind control
- 1 Simulation module - 2 blinds.
- 1 Radio module – lighting variation.
- 1 Radio module - lighting variation, off/on, timing
- 2 Modules – bulkhead lights 230V AC – 60 W
- 3 Modules – load 320 W + indicator lights
- 1 Simulation module - 3 pilot wire convector heaters, 1 hot water tank and 1 pellet burner.



Rapid installation of modules on the frame



Openings control module

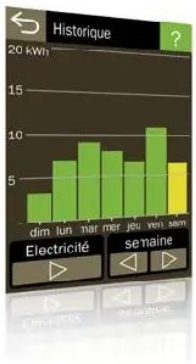


Roller blind interface module

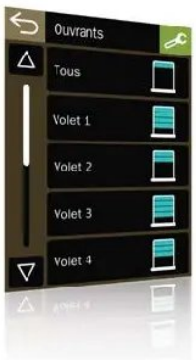
The colour touch screen module displays all the detail of consumption, for controlling heating (pilot wire and load shedding), lighting and roller blinds.













KIT OF COMPONENTS FOR HOME ENERGY CONTROL

We propose, with this kit of modular panel devices, an alternative enabling your study of intelligent home energy control. Supplied without cables or electrical protective devices.

- 1 data transmitter with off-peak hours control.
- 1 colour touch screen module displays all the detail of consumption, for controlling heating (pilot wire and load shedding), lighting and roller blinds.
- 3 current transformers (max 60A) for measuring 3 different circuits.
- 1 Module - power interface technical unit for touch screen.
- 1 sunlight radio sensor.
- 1 outside temperature radio sensor.
- 2 radio controls for roller blinds.
- 1 lighting variation radio control.
- 1 lighting variation, off/on, timing control.
- 2 bulkhead lights 230V AC – 60 W.

ref. KI-NRJ

Automatic leak alert system

NEW



Model ref. MAQ-FUIT-A. *Lenght: 1005mm.*

EDUCATIONAL OBJECTIVES

- **Learning about water leak detection by sensor.**
- **Using a GSM phone transmitter**
- **Using and programming a ZELIO logic module**

TEACHING RESOURCES STUDENT & TEACHER

practical works

- Configuration and installation of the water leak sensor
- Configuration of the GSM phone transmitter and test with mobile phone
- Creation of the ZELIO logic module programmes with or without presence in the home, with or without solenoid valve control.

Fully self-contained version thanks to its tank and pump 24V. Requires no water inlet.

ref. MAQ-FUITE-A

Version with no pump or tank. Requires a pressurized water inlet in the room.

ref. MAQ-FUITE

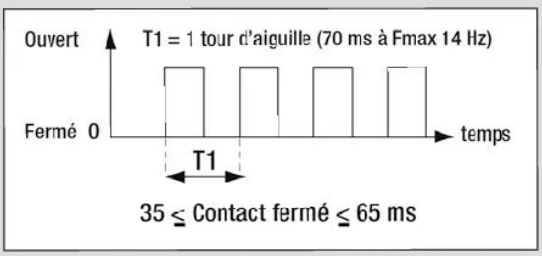
A leak of water can be very costly and statistics show that this fault is common at all distribution points. This model represents the drinking water supply circuit of a house equipped with a leak detection system and GSM alert device. When the house is declared unoccupied, a sensor, connected to the water meter, detects the slightest abnormal consumption. A GSM phone transmitter then sends an SMS to warn you of the problem.
The assembly is managed by a ZELIO logic module.

PULSE WATER METER

ref. CHT-EAU



Water meter equipped with 2-wire pulse transmitter for remotely sending information relating to the water meter.
Ratio K = 1 - 1 meter unit equal to 1 pulse.
Connection to the water circuit using 2 quick connectors (not supplied).



Composition OF THE sytem

- 1 tank, 5 litres (for the MAQ-FUITE-A version)
- 1 pump 24VDC – 3.5A (for the MAQ-FUITE-A version)
- 1 quick connector for water inlet (for the MAQ-FUITE version)
- 1 water meter
- 1 pulse sensor attached to the meter
- 1 solenoid valve 24V
- 1 valve for creating a water leak
- 1 valve for cutting off the water inlet
- 1 unit with connector for linking to the technical cabinet

Composition of the technical cabinet

- 1 set of magneto-thermal and RC protection devices.
- 1 modular power supply 24VDC.
- 1 ZELIO logic module
- 1 GSM transmitter
- 1 set of switches, emergency stop and indicator lights

Features

- Dimensions of the frame
  MAQ-FUITE-A version: 370 x 230 x 1005mm.
  MAQ-FUITE version: 370 x 230 x 700mm.
- Technical cabinet dimensions: 330 x 200 x 440mm
- Total weight, frame + cabinet
  MAQ-FUITE-A version: 25kg.
  MAQ-FUITE version: 19 kg
- Mains power supply 230V + E with 3-metre lead
- **Requires phone SIM card with subscription or prepaid.**

TRAINING SYSTEMS & MODELS

Training panels
PAGES 166 - 174





Fieldbus
PAGES 175 - 177

Safety training
PAGES 178 - 181





Training systems
PAGES 182 - 191

PLC
PAGES 192 - 195





Programming
PAGES 196 - 199

Regulation
PAGES 200 - 210





Energy
PAGES 211 - 213

Motor system
PAGES 214 - 216





Circuit Lab
PAGES 217 - 223

Test units
PAGES 224 - 226



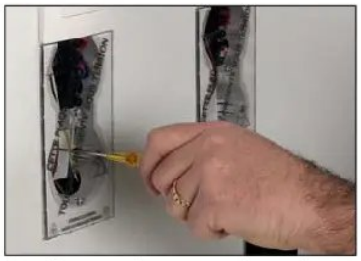


Sensors
PAGES 227 - 229

Home automation panel with touchscreen and radio components



FRONT VIEW



Coupling a receiver + transmitter pair through the protection window by pressing a contact.

Panel delivered wired, programmed, with instructions of each components, diagrams and practical works

ref. DOMOPLUS



REAR VIEW

EDUCATIONAL OBJECTIVES

- **Understanding of the housing automation made for the housing renovation**
- **Understanding of a real and complete solution for a flat**
- **Studying the wiring and settings of communicating components**
- **Studying the programming and the DELTA DORE solution**

TEACHING RESOURCES STUDENT & TEACHER

Proposed Practical Works

- Renovation of different circuits (lightings, thermal circuit ...)
- Programming according different imposed scenarios

Features of the basement

- Base on large wheels.
- Dim L x l x H : 1500 x 750 x 1980mm.
- Melamine surface : 1200 x 1700mm.
- Weight : 128kg.



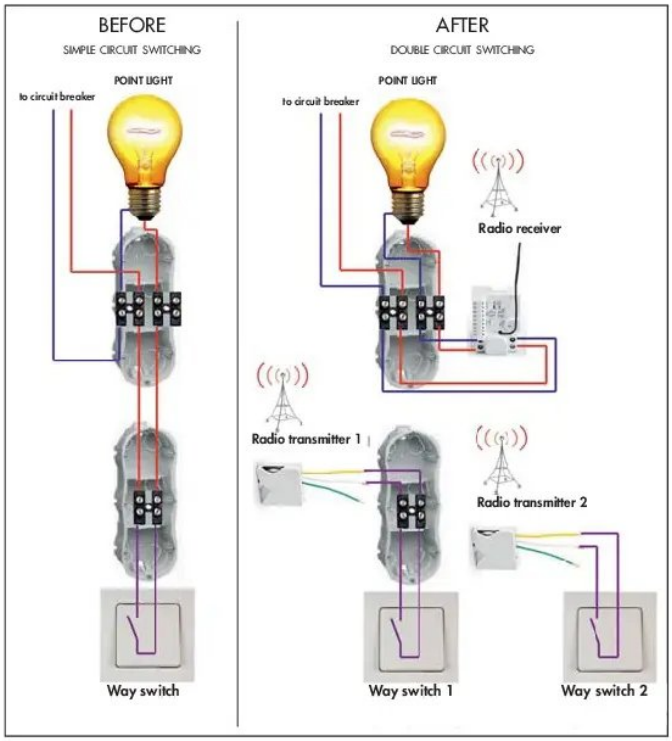
Controlled by switch, remote telephone or colour touchscreen, these control lighting, openings (blinds, gates), heating, sprinklers, etc. To familiarize students with the cabling, each electrical component is connected using a terminal strip to its control or receiver module. A removable translucent plate covers the connections and protects the electrical contacts.

Components located on the panel:

- 1 modular panel equipped with 5 circuit-breakers and one differential 30mA
- 5 lighting circuits "living room" "kitchen" "garage" "garden".
- 3 motor opening circuits:
  1 motor roller shutter - 1 garage door and 1 gate (simulated by 2 boxes with indicator lights)
- 1 heater 500W + 1 radio receiver.
- 1 sprinkler pump (simulated by indicator light) + 1 radio receiver.
- 1 remote control by telephone controlling 2 lighting sets or the roller shutter.

All these components are associated with radio transmitters and or receivers

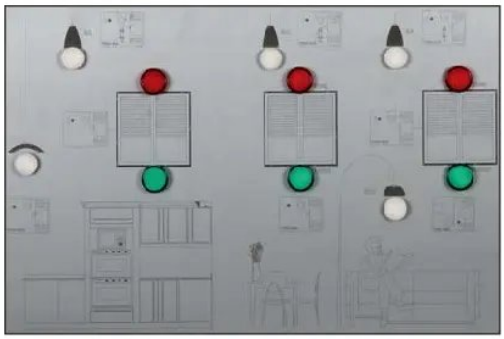
- 1 touchscreen 480x272 pixels capable of managing the radio components of the dwelling with built-in tutorial for component configuration.

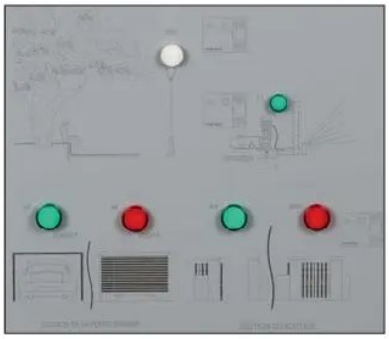


IMPORTANT:
The panel is fitted with a stand-alone telephone line.
Commands sent from the telephone set that is supplied with the system are not routed via the school's telephone network or via the public telephone network.

Creating a complete radio installation









ref. DOMORADIO

DOMORADIO is a panel of generally used home automation components. This includes conventional components such as switches and pushbuttons as well as radio communicating components.
For students to learn about radio configuration; the transmitter receiver micromodules are flush-mounted behind two large PVC panels. Each micromodule is shown on the panels with specific diagrams for the student to recognize them quickly and configure them safely.
A complete diagram shows the different rooms of the house (kitchen, dining room, lounge), the garden, and the garage and electric gate. Indicator lights show:
- the operating state of the lamps of the different rooms
- opening/closing of roller blinds, gate and garage door.
- operation of the sprinkler pump.

A radio colour touchscreen controls all the radio components of the panel.

Characteristics of the frame

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1400 x 670 mm
- Dimensions H1840 x W750 x D750 mm. Weight 87kg
- Mains power supply lead 2P+E, 3 metres.



EDUCATIONAL OBJECTIVES

- **To learn about home automation.**
- **To study the compatibility of conventional lighting controls with radio controls.**
- **To study the configuration of communicating components by creating several home automation scenarios.**
- **To study the programming of and the DELTA DORE radio solution**
- **To study the programming of a radio touchscreen.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

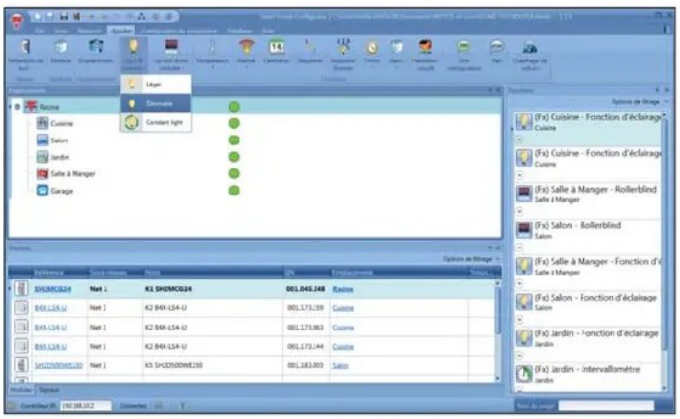
- Radio programming of lighting circuits by pushbuttons, two-way and double illumination.
- Radio programming of opening and closing of three roller blinds, gate and garage.
- Creation of several operating scenarios using the touchscreen.

Comprises

- 1 touchscreen 480 x 272 pixels capable of managing the home radio components with built-in tutorial for component configuration
- 1 modular panel with magneto-thermal circuit-breakers
- 1 mechanical "up-down" pushbutton for roller blinds
- 2 double mechanical switches
- 2 double mechanical pushbuttons
- 2 radio pushbuttons
- 2 radio switches
- 1 set of radio micromodules
- 1 PVC panel with diagram of the kitchen and dining room
  5 indicator lights to simulate the kitchen and dining room lights
  6 indicator lights to signal the up and down of three roller blinds
- 1 PVC panel with diagram of the garden, garage and gate
  1 indicator light to simulate the garden lighting
  1 indicator light to signal operation of the sprinkler pump
  4 indicator lights to signal the opening and closing of the garage and shutter.

CARLO GAVAZZI home automation panel





EDUCATIONAL OBJECTIVES

- **To study and put into service a home automation installation**
- **To study the CARLO GAVAZZI home automation bus**
- **To create home automation scenarios**
- **To use software for programming home automation components**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Recap on the use of home automation
- Creation of the configurations of different components
- Creation of the wiring diagram
- Programming the CARLO GAVAZZI modules with the software
- Programming several operating scenarios

Characteristics of the frame

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1000 x 750 mm
- Dimensions H1950 x W750 x D670 mm. Weight 88kg
- Mains power supply lead 2P+E, 3 meters.

ref. TAG-9

Home automation, a constantly developing sector, is a market where several makes and protocols coexist requiring specific training.
The TAG-9 panel enables the study and programming of communicating components using the CARLO GAVAZZI bus.
Mobile panel equipped with casters, two with brakes.

Composition of the panel
Modular panel

- 1 set of residual current and magneto-thermal protective devices
- 1 power supply 24VDC
- 1 Ethernet module
- 1 bus generator module
- 1 module, 2 roller blind outputs
- 1 module, lighting variation
- 2 modules, 4 lighting outputs
- 1 module, 2 on/off outputs
- 1 programming software

Indicator panels

- 1 panel engraved "Equipped kitchen" with 2 indicator lights representing 2 light points
- 1 panel engraved "Dining room" with 1 indicator light for the light point and 2 indicator lights for the up and down of the roller blind
- 1 panel engraved "Lounge" with 1 indicator light for the light point, 1 lamp 6W for the dimmer light point, and 2 indicator lights for the up and down of the roller blind
- 1 panel engraved "garage / gate" with 2 indicator lights for the opening and closing of the garage and 2 indicator lights for the opening and closing of the gate
- 1 panel engraved "Outside" with 1 light cell, 1 indicator light for the garden lighting and 1 indicator light for the supply of the sprinkler pump
- 3 controls by pushbuttons, 4 keys with 4 indicator lights

Home PLC panel (ZELIO)



EDUCATIONAL OBJECTIVES

- **Discovery and introduction to the home automation.**
- **Study of the ZELIO PLC programming (Schneider®).**
- **Creation of home automation scenarios like the control of an alarm, a lighting, a roller-blind, a heating, a telephone transmitter, a lighting sensor...**
- **Study of a control by telephone transmitter.**

TEACHING RESOURCES STUDENT & TEACHER

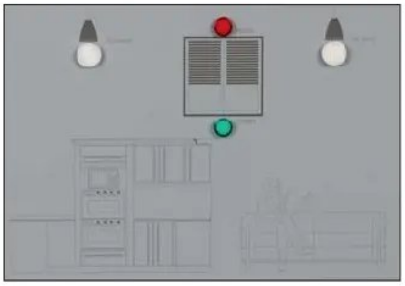
Proposed practical works

- Put into practice of 5 home automation programs with a ZELIO PLC (Schneider®).
- Telephone transmitter programming to control the heating system and the roller-blind.
- Test of various PLC functions.

Characteristics of the frame

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1400 x 670 mm
- Dimensions H1840 x W750 x D750 mm. Weight 92kg
- Mains power supply lead 2P+E, 3 meters.

ref. TAG-1



The software offers many friendly features as: clock, timer, counter... The « simulation » function tests the program before a real use.

Panel supplied with a full wiring diagram and all of the detailed instructions for each component. The items on the panel may be different from one series to another depending on manufacturer alterations.

Components located on the panel

- A modular table with protective devices (30mA).
- 1 PLC ZELIO from Schneider®
- 3 lighting circuits (outside, living room and kitchen)
- 1 dusk-to-dawn switch with its own cell
- 1 500W convector
- 1 adjustable thermostat
- 1 external temperature probe
- 1 electric roller blind with Up/Down switch
- 1 intrusion detector and 1 siren
- 1 remote telephone transmitter
- 1 remote telephone set



Electrical cables placed between the 2 melamine plates of the panel connect the components together.



Features of the programmable interface ZELIO from Schneider®

- 12 inputs
- 8 dry contact outputs
- 1 local programming and status display
- 1 CD-based programming software package
- 1 RS232 lead between the PC and the programmable

IMPORTANT: *The panel is fitted with a stand-alone telephone line. Commands sent from the telephone set that is supplied with the system are not routed via the school's telephone network or via the public telephone network.*

Fire door control panel



EDUCATIONAL OBJECTIVES

- **Understanding and settings of a fire door control system.**
- **Programming and setting of the Schneider® PLC (for the COM version)**
- **Understanding and use of the supervision on PC (for the COM version)**
- **Understanding of an IP network (for the COM version)**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Making of the wiring diagram of a fire door control system.
- Wiring of the fire door control system components.
- Replacement of a trigger.
- Programming and setting of the SCHNEIDER® PLC (for the COM version).
- Making of a supervision program (for the COM version).
- Configuration of IP addressing (for the COM version).

ref. TAG-5-COM

ref. TAG-5 no communicating, without PLC

Wiring and study panel for an independent initiating detector. The independent initiating detector detects a fire using 2 optical smoke detectors and 2 manual triggers. If a warning occurs, a magnetic bolt allows an emergency exit door to open. The student is required to interconnect the optical smoke detectors, the manual triggers, the independent initiating detector and the electric bolt. All of the marked connections are wired to a terminal block. Communicating version supplied with a **Schneider® PLC**, and the software **Vijeo Designer®**.

Control panel for wireless anti-intrusion alarm



ref. TAG-3

EDUCATIONAL OBJECTIVES

- **To understand and configure an anti-intrusion alarm unit**
- **To program the different parts of an anti-intrusion alarm such as the central unit, detectors, code keypad, siren, GSM transmitter, remote controls**

TEACHING RESOURCES STUDENT & TEACHER

Panel for studying and programming a wireless anti-intrusion alarm unit with siren. The unit is equipped with four passive infrared detectors, and a magnetic detector tripped by opening the window. The code keypad enables or disables the alarm remotely. A GSM transmitter signals any tripping of the alarm to a mobile phone (not supplied).
The unit can be controlled by the two remote controls.

Composition

- 1 radio unit, 2 areas.
- 1 external siren.
- 1 radio keypad for data reception and remote control, with LCD display, enabled and disabled. Full and partial operation

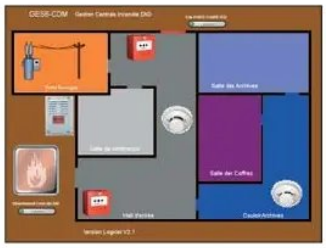
3 access codes: 1 master, 2 users. Log of the last 200 events. Information on system status: enabled and disabled, doors open, etc. Siren test. System configuration.

- 4 infrared detectors. Range 12m.
- 1 fire detector.
- 1 mains disconnection detection unit.
- 2 radio remote controls. 4 keys. Range 100-300 m.
- 2 break contacts for protecting openings (doors, windows, etc.)
- 1 GSM phone transmitter (supplied without SIM card) performs all alarm transmission and reception functions. Voice assistance, interphone communication. 4 programmable phone numbers. Message which can be personalized. You can insert your SIM card easily and safely for call transfer. All operator compatible.

Monitoring software
Enables:
- acquire and display PLC variables
- Monitor and control of process
- create your own monitoring

Displays:
- opening of the emergency exit
- power supply to the electric bolt
- mains power on

Controls:
- opening the electric door latch
- Resetting the independent initiating detector



Composition
- 2 resettable manual triggers with diaphragms.
- 2 optical smoke detectors.

They can be activated using an aerosol that is supplied with the panel.
- 1 independent initiating detector fitted with a maintenance-free battery (3 hours autonomy)
  - With a reset push-button
  - With operating test push-button
- 2 electric suction cups
- One M221 PLC (communicating version)



CHARACTERISTICS OF THE FRAME FOR TAG-3 - TAG-4 - TAG-5

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1400 x 670 mm
- Shelf of grey melamine 19mm, depth 400mm.
- Dimensions H1840 x W750 x D750 mm. Weight 87kg
- Mains power supply lead 2P+E, 3 metres.

Characteristocs of the electrical cabinet for COM versions
- Dimensions 500 x 400 x 200mm

Control panel for communicating anti-intrusion alarm

Control panel for an alarm unit monitoring three areas in an office environment, via two infrared detectors and one magnetic detector tripped by opening the window.
The student has to interconnect the unit, infrared detectors, magnetic contact, keypad, siren and flashing light.
All the marked connections are wired to a terminal block.
The student also has to program the access code.
Supplied with a Schneider® PLC, controller programming software and Vijeo Designer® monitoring software.

ref. TAG-4-COM

ref. TAG-4 no communicating, without PLC

EDUCATIONAL OBJECTIVES

- **To understand and configure an anti-intrusion alarm unit**
- **To learn about configuring and programming by SCHNEIDER® PLC (for COM version)**
- **To learn about supervision on PC (for COM version)**
- **To understand Ethernet IP (for COM version)**

TEACHING RESOURCES STUDENT & TEACHER

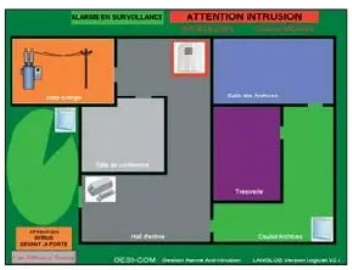
Composition
- 1 alarm unit self-powered by battery and mains
- 1 power supply for the sensors
- 2 infrared detectors
- 1 code keypad (4 digits) - 1 siren - 1 flashing light
- 1 opening magnetic detector mounted on the window
- 1 programmable logic controller (communicating version)



Monitoring software
Enables:
- acquisition and display of PLC variables
- monitoring and control of the process
- creation of own monitoring

Displays:
- status of infrared and magnetic detectors and status of siren
- state of alarm ON/OFF
- room where intrusion occurred
- mains presence

Controls:
- monitoring and shutdown
- siren



Control panel for fire alarm, type 4

EDUCATIONAL OBJECTIVES

- **To understand and configure a fire alarm unit, type 4.**
- **To understand the operation of an optical smoke detector.**
- **To understand the operation of a manual call point.**
- **To create the wiring of components of a fire alarm, type 4**
- **To configure a fire alarm unit.**
- **To learn about configuring and programming by SCHNEIDER® PLC (for COM version)**
- **To learn about supervision on PC (for COM version)**
- **To understand Ethernet IP (for COM version)**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Creation of the wiring diagram for a fire alarm installation.
- Creation of the complete wiring.
- Study of the operation of the optical smoke detector and the manual call point.
- Configuration of the fire unit.
- Creation of a PLC M221 program
- Creation of a monitoring program with VigeoDesigner
- Configuration of a computer Ethernet
- Maintenance operations.

ref. TAG-8-COM

ref. TAG-8 no communicating, without PLC

Monitoring software

Enables:

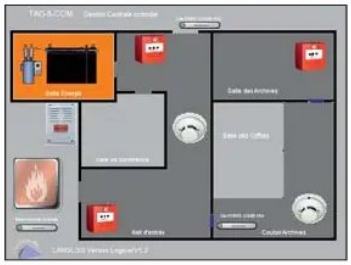
- acquire and display PLC variables
- Monitor and control of process
- create your own monitoring

Displays:

- status of fire unit
- status of emergency exit doors
- mains power on

Controls:

- light indicator
- the siren
- 2 emergency exit doors



Composition

- 1 Electrical cabinet including magneto-thermal protective devices, set of screw terminal blocks for interconnecting all electrical components.
- 1 uninterruptible power supply
- 1 control unit for fire alarm, type 4, two detection areas.
- 3 Red rearming manual call points.
- 2 Optical smoke detectors.
- 1 Sound diffuser, class B.
- 1 Red light diffuser.
- 2 electric locks.

Control panel for analogue video surveillance - 4 cameras



This system is for studying analogue video surveillance with 4 colour cameras, 1 LCD monitor and 1 recorder LAN 500GB.

EDUCATIONAL OBJECTIVES

- **To understand and configure a video surveillance unit with video recorder.**
- **To create video surveillance wiring.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Creation of complete wiring diagram for a video surveillance installation.
- Creation of the complete wiring.
- Study of the operation of video recorder.
- Configuration of cameras and recorder.
- Maintenance operations.

ref. TAG-6

Composition

- 1 Video recorder LAN 500GB with mouse and remote control. 4 Video inputs.
  Connector RJ45.
  Integral web server (PC & MAC compatible).
  - Recording on detection
  - Live display
  - Notification by email (if compatible with your Ethernet and router)
  - Recording on timeslots
  - User multiple profiles
- 1 LCD monitor, colour 17".
- 4 Swivelling colour cameras
  - Fixed lens 3.6mm - Resolution 700 lines
  - Day/night operation – Integral infrared lighting (20m)





CHARACTERISTICS OF THE FRAME FOR TAG-6 - TAG-7 - TAG-8

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1400 x 670 mm
- Shelf of grey melamine 19mm, depth 400mm.
- Dimensions H1840 x W750 x D750 mm. Weight 87kg
- Mains power supply lead 2P+E, 3 meters.

Characteristics of the electrical cabinet for TAG-7 - TAG-8 - TAG-8-COM

- Dimensions 500 x 400 x 200mm

Control panel for emergency lighting by AUTODIAG controller



This system is for centrally controlling an installation of emergency lighting units distributed in three areas. A multiple area display indicates the number of SELUs installed and in fault.

EDUCATIONAL OBJECTIVES

- **To understand and configure an Autodiag emergency lighting unit.**
- **To understand the difference between ambient and evacuation SELUs.**
- **To create the wiring of SELU components and an Autodiag controller**
- **To configure an area controller with multiple area display.**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Creation of the complete wiring diagram for an installation of Autodiag SELUs divided into three areas.
- Creation of the complete wiring.
- Study of the operation of an ambient and evacuation SELU on mains disconnection.
- Configuration of the area controller with its display.
- SELU maintenance operations.

ref. TAG-7

Composition

- 1 Electrical cabinet including magneto-thermal circuit-breakers to simulate mains disconnection, a set of screw terminal blocks for interconnecting all the electrical components.
- 1 Autodiag ambient LED SELU with On/Off Switch to simulate battery failure.
- 5 Autodiag evacuation LED SELUs with On/Off Switch to simulate battery failure.
- 1 Autodiag area controller
- 1 Autodiag multiple area display
  - Displays the total number of SELUs installed, SELUs installed per area, SELUs in fault
  - Area labels can be personalized
- 1 Autodiag SELU remote control which puts the SELUs to rest with mains power cut
- 3 Bulkhead lights 230V.
- 1 IP transmitter to signal a problem with automatic sending of email.

Jumper lead panel



ref. TAG-2

EDUCATIONAL OBJECTIVES

- **Theoretical study of wiring of usual home components and creation via the secure technique of jumper leads**

TEACHING RESOURCES STUDENT & TEACHER

Proposed practical works

- Simple introduction to circuit protection
- Wiring of single lighting and phase and neutral tapping
- Wiring of energy sensor
- Wiring of two-way lighting
- Wiring of lighting with timer switch, dusk switch, remote switch
- Wiring of lighting with presence selector
- Wiring of lighting variation
- Creation of circuits controlled by the timer switch (clock)
- Creation of sockets circuit
- Power supply of radiator with built-in thermostat
- Up/Down control of roller blind

Characteristics of the frame

- Frame of matt anodized aluminium, double sided on casters.
- 2 panels of melamine 19mm with area 1400 x 670 mm
- Dimensions H1840 x W750 x D750 mm. Weight 89kg
- Mains power supply lead 2P+E, 3 meters.

Panel supplied with a complete wiring diagram and all detailed instructions for each component. The panel elements can differ from one series to another depending on manufacturer changes.



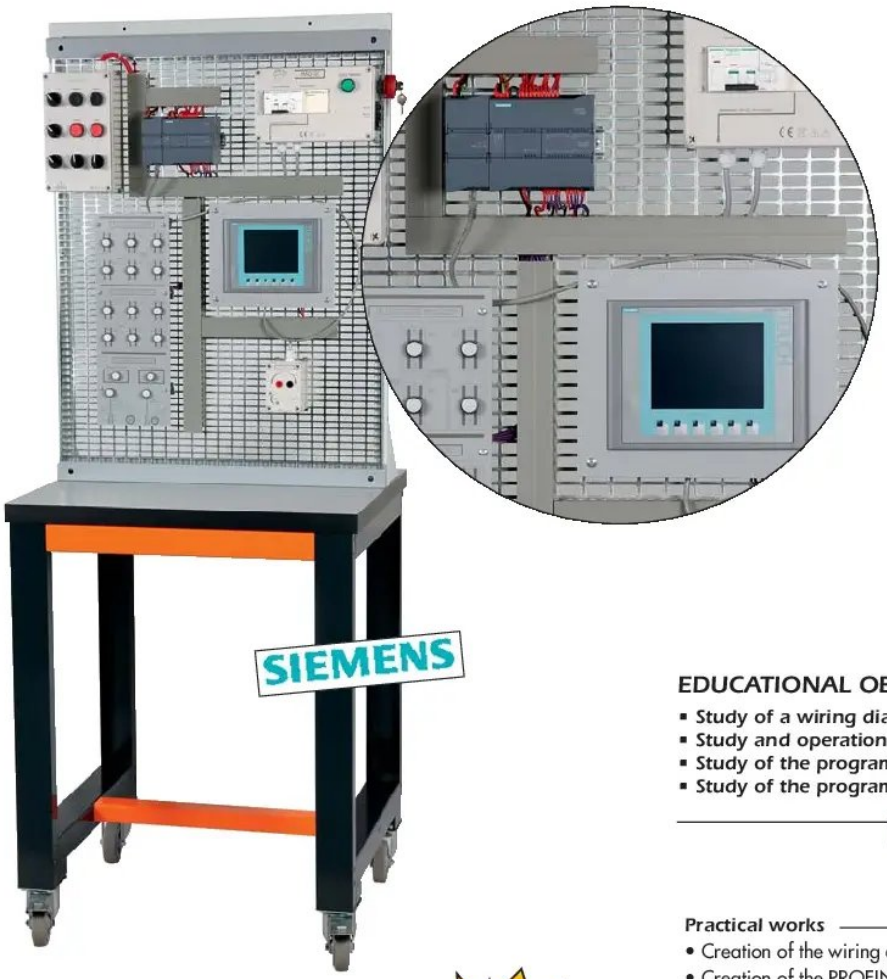
Very instructive panel with elements fixed on unbreakable Perspex sheets for a clear view of the components.

Components present on the panel

- 1 RC device 30mA mono + 2 circuit-breakers 10A + 1 circuit-breaker 16A
- 1 dusk switch with photocell
- 1 timer
- 1 remote control switch
- 1 clock
- 3 bulkhead lights 40W
- 1 single lighting switch
- 2 two-way switches
- 1 single pushbutton
- 1 socket 2P+E 16A
- 2 controls for roller blinds
- 2 connection terminal blocks
- 2 modular contactors
- 1 convector 500W
- 1 energy meter
- 1 simulation module, 2 roller blinds
- 1 light dimmer
- 1 presence detector

Other components: on request

Study model for the PROFINET system with supervision – SIEMENS®



PROFINET is an open communication standard for industrial automation.

Developed by SIEMENS, PHOENIX Contact, MOLEX and other constructors, it provides automation solutions for processes, production and movement control.

Through its opening and the use of standard communications media (Ethernet), PROFINET enables the use of all brand of equipment.

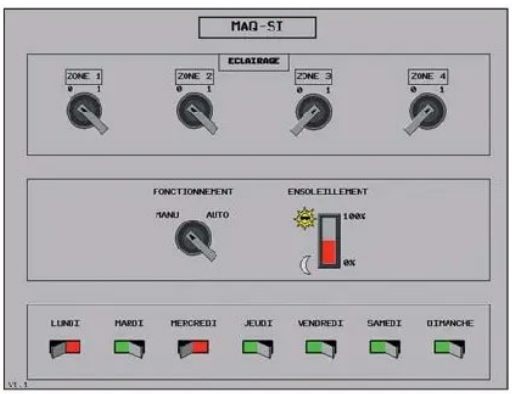
MAQ-SI is a study system equipped with SIEMENS® components and designed for understanding the PROFINET system with programmable controller, touch screen and standard pushbuttons.

MAQ-SI uses the simulation of lighting commercial spaces to facilitate the teaching process.

ref. MAQ-SI

ref. MAQ-SI-N (without table)

NEW



EDUCATIONAL OBJECTIVES

- **Study of a wiring diagram developed in automation.**
- **Study and operation of a PROFINET® computer network**
- **Study of the programming of a SIEMENS® PLC.**
- **Study of the programming of an HMI (Human Machine Interface).**

TEACHING RESOURCES STUDENT & TEACHER / VIDEO

Practical works

- Creation of the wiring diagram
- Creation of the PROFINET computer network
- Creation of the PLC programs in contact language
- Creation of the supervision from the HMI (Human Machine Interface).
- Change of IP addressing
- Test of the assembly

Features of the basement

- Base on wheels
- Dim L x l x H : 750 x 670 x 1950mm
- Weight : 64kg

Composition of the model

Power supply from the mains 230VAC – Mains lead 3m.

- 1 unit with magneto-thermal protection, residual current device 30mA and emergency stop.
- 1 SIEMENS PROFINET S7-1200 14 inputs/10 outputs PLC with analogue board 4-20mA / 0-10V.
- 1 SIEMENS KTP600 PROFINET touch screen 5.7 inches, 256 colours.
- 1 Day/Night simulation unit 4-20mA /0-10V.
- 1 printed face with 16 indicator lights.
- 1 control unit with 4 pushbuttons and 5 switches.
- 1 Ethernet RJ45 switch
- 6 Ethernet leads, 1.5 metres

Fieldbus study for PROFINET® & PROFIBUS® - SIEMENS® Components

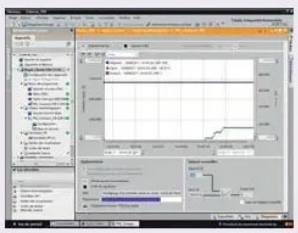


ref. MAQ-NET

ref. MAQ-NET-N (without table)

SOFTWARE OPTION

LOG-STEP is highly intuitive. On-line help and the practical assignments let students learn quickly with the different programming screens. Single workstation licence. Compatible with Windows XP Home/Pro, 7 Home/Pro 32bits. Recommended PC configuration: Dual Core Processor 2Ghz or equivalent, RAM 2GB and screen resolution 1280x1024.
For programming the PLC and the touchscreen HMI.



Programming of the PIF function

ref. LOG-STEP

EDUCATIONAL OBJECTIVES

- **Studying of Fieldbus communication between different automatism components**
- **Studying of Profinet® and Profibus® wiring**
- **Settings of components Profinet® and Profibus®**
- **Programming of the set**

TEACHING RESOURCES STUDENT & TEACHER / VIDEO

Features of the basement

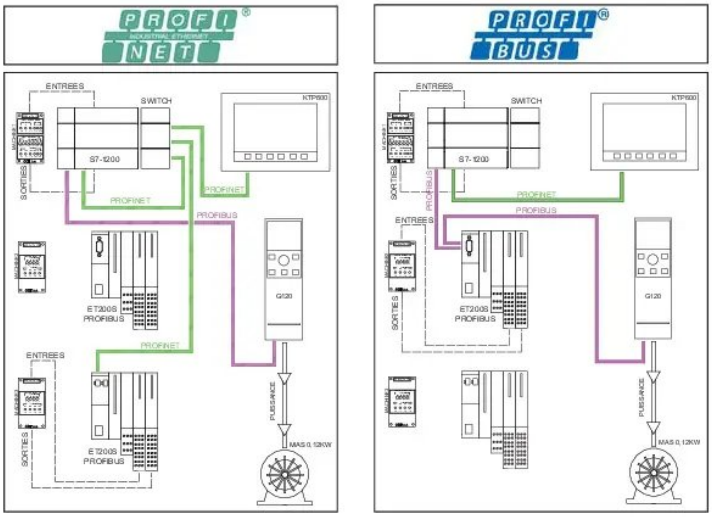
- Base on wheels
- Dim L x l x H : 750 x 670 x 1950mm
- Weight : 64kg

Composition of the model

Power supply from three-phase mains 3 x 400V + N + E.

- 1 power supply unit with user and appliance protection (30mA) distributes voltage 24VAC to the speed controller (for the PLC, HMI*, offset I/O interfaces and 400VAC-3p+E) .
- 1 "machine" box with 3 PB, 3 switches, 7 indicator lamps and 3 PB and 3 switches for simulating sensors.
- 2 "machine" boxes each with 4 indicator lamps and 2 PB and 2 switches for simulating sensors.
- 1 PLC SIMATIC S7-1200. 14I / 10O. Integral Ethernet port.
- 1 Profibus interface
- 1 ETHERNET switch 4 ports RJ45
- 1 HMI colour touchscreen 5.7" with Profinet RJ45 port
- 1 interface ET200S 4I/4O offset with Profinet coupler
- 1 interface ET200S 4I/4O offset with Profibus coupler
- 1 speed controller SINAMICS G120C 0.55kW with integral graphic terminal.
- 1 Asynchronous motor 230/400V- 0.12kW with fan for viewing rotation.
- 1 set of Profinet, Profibus leads.
- 1 set of Profinet, Profibus connectors for mounting.
- 20 metres of Profinet, Profibus cable.
- 1 Starter software for programming the speed controller.
- 1 CD includes the instructions for the different components and the practical assignments and programming examples for the PLC, the speed controller and the HMI*

**HMI: Human Machine Interface*



Fieldbus study for ETHERNET - SCHNEIDER® Components

EDUCATIONAL OBJECTIVES

- **Studying of Fieldbus communication between different automatism components**
- **Studying of the ethernet wiring and IP network creation**
- **Settings of Ethernet components**
- **Programming of the set**

TEACHING RESOURCES STUDENT & TEACHER / VIDEO



Features of the basement

- Base on wheels
- Dim L x l x H : 750 x 670 x 1950mm
- Weight : 60kg

Practical works

- Creating an company IP Ethernet network with multiple PCs
- Programming a PLC with a built-in or remote Ethernet bus on a TCP/IP interface
- Programming a HMI* interface, touch screen, with built-in Ethernet bus
- Programming of a speed converter from the So Move software
- Interconnecting and settings of components for a global operation
- Using the PLC programming software

In the practical works, the sequences of programming of each components is provided in the form of video files for a better understanding of the student.

**HMI: Human Machine Interface*

Composition of the model

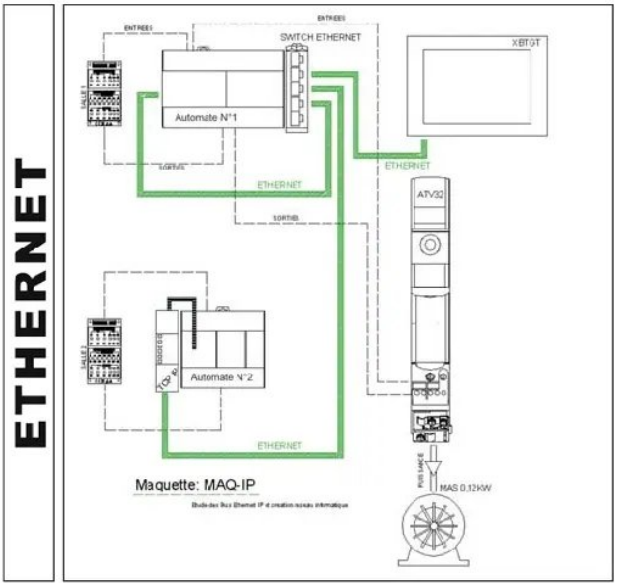
Power supply from mains 230V-2P+E.

- 1 power supply unit with user and appliance protection (30mA) distributes voltage 24VAC to the speed controller (for the PLC, HMI*, offset I/O interfaces and 230VAC-2p+E).
- 2 "machine" boxes each with 3 PB, 3 switches, 7 indicator lamps and 3 PB and 3 switches for simulating sensors.
- 1 PLC Ethernet 24 inputs /16 outputs
- 1 PLC Ethernet 14 inputs /10 outputs
- 1 ETHERNET switch 5 ports RJ45
- 1 touchscreen HMI 3.8" with Ethernet ports
- 1 speed controller ATV32-0.18kW
- 1 asynchronous motor 230/400V- 0.12kW with fan for viewing rotation.
- 1 multifunction programming graphic terminal with large monochrome screen (8 lines) 240x160 pixels for programming the speed controller
- 1 set of Ethernet leads.
- 1 set of Ethernet mounting connectors.
- 20 metres of Ethernet cable
- 1 software for PLC programming.
- 1 Vijéo designer software for programming the HMI.
- 1 SoMove software for programming the speed controller ATV32.
- 1 DVD includes the instructions for the different components and the practical assignments and programming examples for the PLC, the speed controller and the HMI* (video).

**HMI: Human Machine Interface*

ref. MAQ-IP

ref. MAQ-IP-N (Without table)



Study of earthing connections (neutral system)

PEDAGOGICAL INNOVATION



ref. SLT-1

Version with PC not supplied



ref. SLT-1-T8

Version with HMI and support arm (supplied)

SLT-1 is a teaching system covering the main elements employed in protection against the electrical hazards of indirect or direct contact (residual current devices with several sensitivities, magneto-thermal circuit-breakers, three-phase transformer). It demonstrates the principle of electrical protective devices in TN, TT and IT earthing connection schemes. The teaching sequences are organized so as to discover the restrictions, outcomes and adjustments required for good protection against electrical hazards.
Use of the system and running the tests are clearly guided by means of an HMI with touchscreen. The student has no cabling to create as the connections are transparently controlled by relaying. The student can thus concentrate on understanding the phenomena. Using the touchscreen, the student can select the type of neutral system to be studied, the different resistance values of faults, earthing and the human body, see the equipotential bonding, visualize the leakage current, simulate a fault and produce the insulation fault without danger.
Each test is linked to a clear synoptic diagram, displayed on screen. Voluntary action on the HMI displays the potentials at the different points of the installation, as well as the path of the fault current and its intensity. The indicated values result from different case simulations:

- with or without insulation fault,
- with or without contact
- before or after protective device tripping.

The student validates the results of the simulation (and its calculations) by performing a test to see a protective device trip or not, and to measure the contact voltage and fault current with measuring instruments (not supplied).

Characteristics

- Three-phase power supply 400V +N +E with cable 5m and mains plug.
- Laminated worktop 670 x 750 mm
- Supplied operational with complete Student / Instructor teaching manual
- Dimensions

ref. SLT-1-T8	270 x 750 x 1180mm - 112kg
ref SLT-1	270 x 750 x 940mm - 110kg

Comprises

- Electrical cabinet on casters with worktop.
- HMI 7.5", colour + support arm (ref. SLT-1-T8 only).
- 1 PVC panel equipped with emergency stop button, Start/Stop button and 2 Operation + Fault indicator lights.
- 1 PVC panel equipped with:
  - diagram with 3 indicator lights for visualizing the selected neutral system
  - 4 safety terminals 4mm for reading the contact voltage between the earth and body as well as between the earth and a second body. 2 additional terminals 4mm for reading the fault current.
  - an insulation monitoring device (IMD)
  - a set of circuit-breakers and residual current devices used in each earthing connection scheme.
- 1 programmable logic controller (PLC) M221 (inside the cabinet) for managing all the functionalities.

EDUCATIONAL OBJECTIVES

- **To learn about the notion of electrical hazard (qualitatively and quantitatively).**
- **To demonstrate the features of each earthing connection scheme (TT, TN, IT)**
- **To be able to explain the role of each element of the protective arrangements (earthing connection, magneto-thermal circuit-breaker, residual current device, IMD).**
- **To show the fault current paths without danger.**
- **To take into account standard NFC 15-100**

TEACHING RESOURCES STUDENT & TEACHER

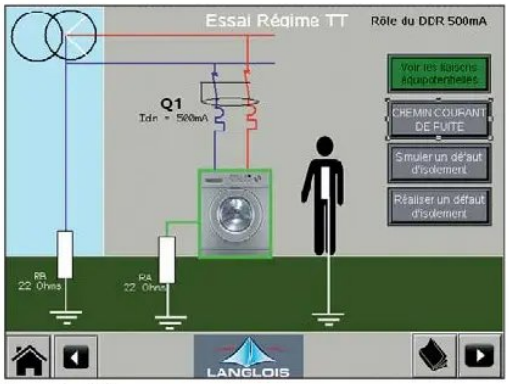
Pratical works - 2 types

- Demonstrating the structure of the protective arrangements against indirect and direct risks.
- Defining the selection criteria for the different components (protection sensitivity, etc.)

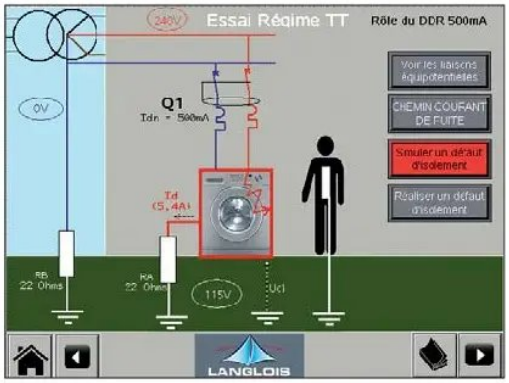
Study of 7 scenarios for the TT system, 3 for TN and 5 for IT.
Supplied with booklet for guiding the student through the course.
Contains a note on the 3 NEUTRAL SYSTEMS and some recaps of standard NFC 15-100.
For each test, this gives the objectives, the diagram, questions on the calculations to be done, on the measurements to be carried out and on the diagnostics to make.



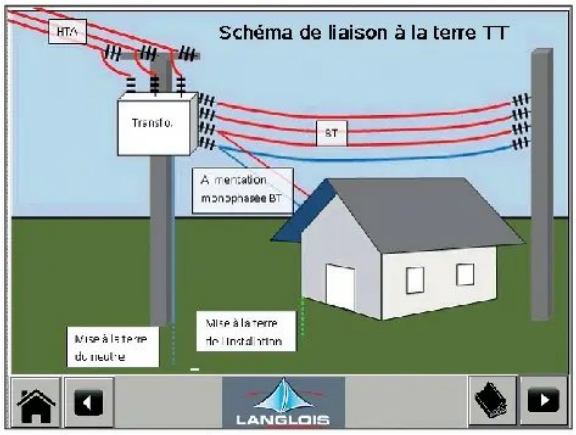
Home page
For selecting the neutral system to study



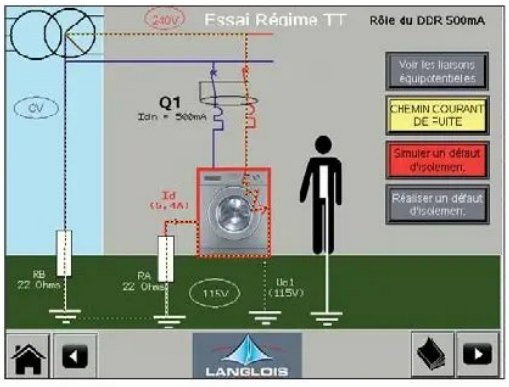
Example of the screen
Test in TT system: View of equipotential bonding.



Example of the screen
Test in TT system: Simulation of the fault current.
The student can read, on the front panel, the voltage UC1 and fault current Id.



TT earthing connection diagram
Representation of the TT neutral system



Example of the screen
Test in TT system: view of the leakage current path.
After pressing the "Create an insulation fault" button, the circuit-breakers actually trip.

Cabinet for electrical authorization



The service voltage of 24VDC, protected by fuse and circuit-breaker, makes use of the cabinet completely safe. The integrated load, comprised of six 60W lamps, enables a sufficiently significant current to be generated. The cabinet is self-contained and requires no connection to the mains 230V when in use. A mains cable is nevertheless included for recharging the batteries using an integral charger.
Available in 2 versions, fixed or mobile.

ref. HABILIT24 Fixed version

ref. HABILIT24-S Mobile version with base on wheels

EDUCATIONAL OBJECTIVES

- **Put into application the knowledge, rules and methods for certification for authorization to electrical hazards**
- **Carry out practical assignments, wiring tasks relevant to electrical authorization**
- **Perform maintenance and cleaning operations in an industrial cabinet**
- **Perform removal from service operations of electrical equipment**
- **Take measurements using a clampammeter**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Reminder on electrical authorization
- Changing sets of copper busbars
- Removing the cabinet from service
- Complete the removal from service and authorization documents
- Check correct use of PPE
- Reading the current in the electrical cabinet using a clamp ammeter

Comprises

- 1 main source and one secondary source 24VDC distributed on 2 sets of flat copper busbars, 100A
- 2 disconnectors with visible cutting, for padlocking
- 2 special circuit-breakers DC 10A
- 1 set of protection devices by fuse + RC circuit-breaker 10A-10mA, IS type
- 4 gel batteries 12V/14Ah
- 3 dual switches
- 6 bulkhead lights 24VDC-60W
- 1 battery charger 230VAC/24VDC
- 1 panel of safety instructions for electrical authorization
- 1 2-colour light column indicating 24VDC 'on' and battery recharging
- 1 lot of 2 posts + 5m of red and white chain
- 1 insulating mat
- 1 insulating blanket
- 2 removal-from-service padlocks

Features

- 3-metre mains lead for battery charger
- Dimensions: HABILIT24: 450 x 700 x h 2000mm - Weight: 96 kg
  HABILIT24-S: 600 x 800 x h 2120mm - Weight: 111 kg

Above HABILIT24-S version, mobile version.
Below HABILIT24 version, fixed.
Close up on disconnectors, busbar sets and panel of safety instructions attached to the cabinet bottom.





Study of the role of the earth & a differential circuit-breaker



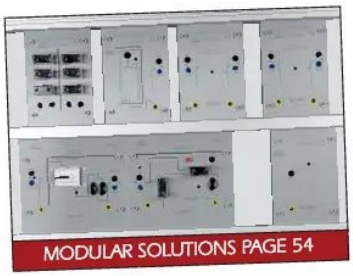
ref. SELDIF

The front synoptic shows

- the public network, with its medium voltage/low voltage transformer substation, and the neutral to earth connection, in this substation.
- the transmission line from the transformer substation to the dwelling
- the domestic installation, with the residual current circuit-breaker 30mA, the local earth, and a washing machine. The TT neutral system is the same as that of a domestic installation
- A person in the right-hand part has an LED for a heart. If a dangerous leakage current flows here, the LED comes on
- A two-pole industrial residual current circuit-breaker 30mA is located in the centre of the synoptic.
- Two jumpers enable the washing machine to be fully isolated, and current measurements to be taken.
- An ON pushbutton starts the washing machine, and a green LED comes on, symbolizing rotation of the machine.

Safety terminals 4mm, located on the front, let the student measure the fault currents, and insert different resistive modules. These modules simulate two earth resistance values, and two leakage current values. One module with variable resistance enables the differential's tripping current to be measured.

To prevent any risk of electrocution to the student, the model operates at extra low voltage using an isolating transformer to standard NFC61558.



MODULAR SOLUTIONS PAGE 54

EDUCATIONAL OBJECTIVES

- **Educating students about the risks of electrocution in the event of direct contact**
- **Educating students about the risks concerning the quality of the earth**
- **Showing the role of a 30mA residual current circuit breaker in a house**

TEACHING RESOURCES STUDENT & TEACHER

Theoretical recalls provided

- Operation of a magneto-thermal circuit-breaker rating, breaking capacity, tripping curve, symbols
- Operation of a residual current circuit-breaker rating, tripping time, symbols
- Physiological effects of the current hazard zones: current function times, dangerous voltages
- Maximum resistance of the earth

Practical work supplied

No earth and no insulation fault

- potential risk

Earth < 100Ω and net insulation fault

- with person in contact with the metal enclosure of the machine
- with no contact

Appearance of a fault current greater than 30mA, tripping of the differential.
Demonstration of the short circuit

Earth < 100Ω and low insulation fault

Appearance of a fault current less than 30mA, no tripping of the differential.
Measurement of the fault current in the person in contact with the machine

Earth > 100Ω and low insulation fault

Appearance of a fault current less than 30mA, no tripping of the differential.
Measurement of the fault current in the person in contact with the machine

Earth > 100Ω and net insulation fault

- with person not in contact with the metal enclosure of the machine measurement of the fault current
- with person in contact with the enclosure: measurement of the fault current greater than 30mA, no tripping of the differential. LED symbolizing the heart, coming on.

Others characteristics

- Power supply : 230VAC 50Hz
- Dimensions : 390 x 270 x 100mm
- Weight : 2.8kg
- Supplied with 5 resistive modules, coupling jumpers & leads

Supermarket checkout simulator

OPERATIVE PART ONLY

EDUCATIONAL OBJECTIVES

- ***Understanding, putting into service, getting started and setting of the system***
- ***Making different wirings and functioning tests***
- ***Illustration and visualization of the result of a PLC program***

USER'S MANUAL + PW

Proposed Practical Works

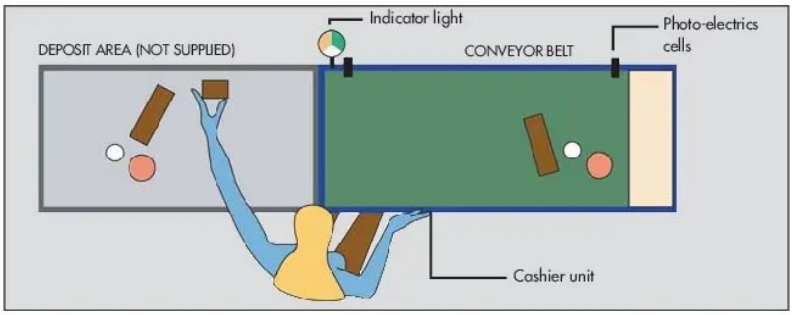
- Studying and locating of the different components
- Wiring of cells, light signal tower and gearmotor
- Making different wirings corresponding to various operating scenarios of the system

Features of the basement

- Frame on wheels
- Dimensions : 1600 x 650 x 1150mm (Hight without indicator light)
- Weight : 60kg



ref. TAPIX



TAPIX is a conveyor belt for a cash register with the same features as the ones you would find in a supermarket.
It comprises a conveyor belt driven by a gear motor, a control unit used by the cashier, an indicator light showing the status of the cash till and start and end of belt sensors.
The TAPIX system will only operate once the console has been connected to an external electrical cabinet.

MIMIC CONSOLE ALLOWING ELECTRICAL CONNECTION

- 1 HARTING ® rapid connector (on the console) for connecting sensors, the cashier unit and the status indicator light.
- 1 set of safety terminals (on the console) bringing together the wiring for the motor's terminal board.
- This area can take a HARTING® rapid connection interface if the user does not have any electrical measurements to take from the motor.

CASHIER UNIT CONNECTED TO THE CONSOLE

It comprises all of the various controls that the cashier requires.

- "Till open" push-button
- "Last customer" push-button
- "Information request" push-button
- 3-position switch:
  (1) Forced belt operation:
  The belt will continue to move forwards.
  (2) Automatic operation of belt:
  The belt will move forwards depending on the objects that are placed on it
  (3) Switch off belt

STATUS INDICATOR LIGHT CONNECTED TO THE CONSOLE

Indicates the status of the till to customers

- Green = till open
- Orange = last customer
- White = Call

PHOTO-ELECTRIC CELLS CONNECTED TO THE CONSOLE

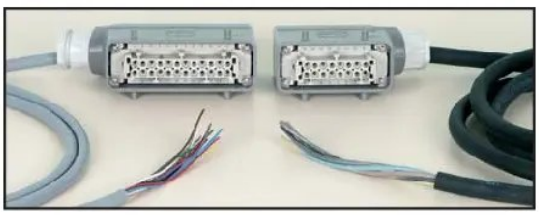
- Placed at the start and end of the belt, they detect
  - the presence of an item on the belt, which in turn activates the belt
  - that items are building up at the end of the belt, which in turn shuts down the belt
- These cells are of the NO, dry contact output type

GEAR MOTOR

Three-phase 230/380V. The motor's terminal board, which protrudes onto the console, enables the user to add an ammeter or a wattmeter in order to measure the current and power.

SET OF CABLES

Set of two 3-metre-long cables supplied with TAPIX



MODEL WITH TEST CABINET



These versions are identical to TAPIX, only the connection console is replaced by a control panel and a test cabinet. The setting up of the grid is immediate.
It's an autonomous system.
4 Harting® connectors connect the grid to the test cabinet end the control panel. The right panel of the test cabinet is equipped with the buttons and the indicator lights necessary to the startup of the student's grid.

ref. TAPIX-ARM-GD

ref. TAPIX-CAB model with wired grid

FEATURES OF THE POWER CONSOLE
- Console which is used for safe testing and supplies the three-phase and 24V power.
- Circuit breaker, in front of the power source
- General residual current circuit breaker protection.
- General emergency stop and Start/Stop
- 2 circuit breakers for protecting the three-phase and 24V power supply
- Cabinet door safety contact control.

FEATURES OF THE TEST CABINET
- 800 x 600 x 250mm steel cabinet
- Plate on door with actuators and control lamps wired to the HARTING® connector.
- Free spaces for the addition of control accessories DIAM 22.
- Rapid hanging and connection of a grid no bigger than 750 x 550mm.
- Door safety contact
  (power to the cabinet is cut off automatically if the door is opened)
- 4 fixed connectors on grid, to be wired by students
- 4 rapid connection jacks to the sensors, controls and motor.

KEY-OPERATED DOOR OVERRIDE
- Allows the live cabinet to be used with the door open if the switch has been activated. Operates with a different key to the No.455.

MODEL WITH TEST CABINET AND MONITORING



Some versions as TAPIX-ARM-GD.
It's an autonomous system.

USER'S MANUAL + SUPERVISION PW

REF.	TAPIX-S	TAPIX-S-T6
PLC programming software	▪	▪
Software for touchscreen		▪
Software for PC	▪	
5.7 inch colour touchscreen		▪

MONITORING ON TAPIX SYSTEMS ENABLES THE USER

TO DISPLAY
- till open information
- last customer information
- information request details
- Presence of items on the belt
- The build-up of items on the belt
- Motor operation
- Mains power on 400V
- 24V mains power on

TO CONTROL
- till open information
- last customer information
- information request details
- the operation of the motor

You can also create your own monitoring.

5.7-INCH TOUCHSCREEN COLOUR
- High-visibility 256-colour TFT screen
- Communication, via RJ45 connector, for the TCP/IP ETHERNET network
- Adjustable contrast and brightness
- 24V DC/0.3A power supply
- Dim. 130 x 104 x 41mm

The systems which include a monitoring function are all supplied assembled and fully wired. Detailed instructions with full features of each component and tutorial supplied.
The monitoring is fully developped and operational.

Drinking water supply simulator (VijeoDesigner-Schneider®)

SYSTEM DESCRIPTION

- 1 150-litre tank simulates the river.
- 2 transparent tank (60 L) simulates the settling basin and the water tower Fitted with 3 water-level sensor (all or nothing).
- 2 motorised pumps draws the water (river to the basin / basin to the water tower)
- 1 tap drains the water tower.
- 2 all or nothing flow sensors.
- 1 valve drains the settling basin.
- 2 valves at the motorised pump output to adjust the flowrate of the water.
- 2 emergency overflows.
- 1 test cabinet, with PLC, Analog card and Ethernet...
- Protection main control panelwith circuit breakers including one 30mA control and consignment.

THE MONITORING ENABLES TO DISPLAY

- The water-levels
- The settling basin pump feed
- The water tower pump feed
- Movement of the water from the river into the settling basin
- Movement of the water in the settling basin to the water tower Low water level warning message for each tank

THE MONITORING ENABLES TO CONTROL

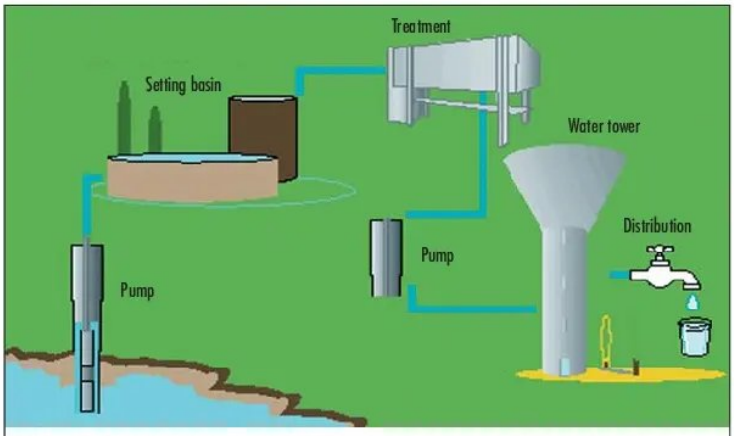
- the settling basin pump feed manually
- the water tower pump feed manually
- the cycle start
- MANUAL / AUTOMATIC / MAINTENANCE mode

THE MONITORING ENABLES TO SIMULATE

- the detection of the 6 water level sensors

Features of the PLC supplied

- sequential function chart or ladder language programming
- 230V mains power supply.
- 14 inputs 24V DC on terminal
- 10 binary outputs 230V/2A on terminal
- RJ45 Ethernet output, used for connecting the PLC to the IP computer network.
- The programming software and index in the form of ladder language is supplied.



The water that comes out of our taps is drinkable and has travelled a long way. In some cases, it is pumped from rivers and then undergoes various treatment processes before it becomes fit for drinking. It flows into a settling basin, at the bottom of which the heaviest materials are deposited, then it is filtered through layers of sand and sterilised, in order to remove bacteria. This clean water is then transported by means of pipes and pumping before it is stored in a water tower. These provide consumers with a constant pressure. The CHATO system enables students to simulate this entire circuit, from the stage where water is pumped from rivers to the stage where it arrives in people's homes.

TRANSPARENT TANKS MADE FROM UNBREAKABLE LEXAN





System characteristics

- Frame on wheels.
- Dim 1500 x 750 x 1970mm.
- Weight : 190kg.

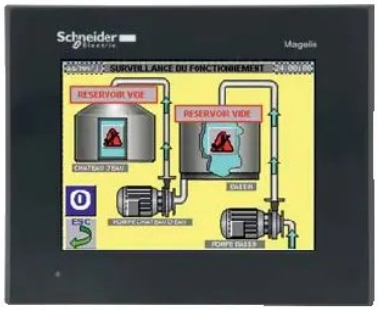
EDUCATIONAL OBJECTIVES

- **Understanding, putting into service, getting started and setting of the system**
- **Understanding the settings and the programming of the PLC**
- **Know more about the monitoring application**

USER'S MANUAL + MONITORING PW

Proposed Practical Works

- Setting of the PLC
- IP addressing management
- Loading, modification, monitoring creation



MONITORING ON TOUCHSREEN

REF.	CHATO-4S-T6
PLC programming software	
Monitoring software VijeoDesigner	
5.7 inch colour touchscreen	

The monitoring software delivered with the set allows to modify the initial program and to create your own programming.



MONITORING ON PC ONLY

REF.	CHATO-4S
PLC programming software	
Monitoring software VijeoDesigner	

The system is the same than in the version above but without the touch screen. The monitoring is made on PC with the software SCHNEIDER VijeoDesigner.

FEATURES OF THE DIFFERENT COMPONENTS

PUMPS & FLOW CONTROL VALVES



2 PUMPS
- 230/400V 3-phase motor *(SINGLE-PHASE UPON REQUEST)*
- Power 750W
- Stainless-steel body and turbine
- Auto-start

FLOW CONTROL VALVES
- 1 for setting tank pump
- 1 for water-tower pump

SENSORS



- Dry-contact horizontal level sensors.
- max voltage 24V
- Max current 3A

ALL OR NOTHING FLOW SENSOR



Detects water flowing in the PVC pipe of the CHATO circuit. An NO or NC contact at the sensor output sends information to a PLC or a contactor.

DRAIN VALVES



Used to drain the tank, e.g. to simulate reservoir maintenance.

TAP



Simulates domestic water consumption.
Connected by hoses to the tank that simulates the river.

150L TANK



- Simulate the river.
- Plastic tank with drain plug.
- Installed on a base so it can be moved with the system.

OPTION FLOWMETER



The sensor shows the flowrate of the water on the display unit when it leaves the pump. Students can observe a change in the flowrate, depending on the valve setting. 4-20mA signal output on Ø4mm safety terminals.

ref. CHATO-DEBIT

HYDROSTATIC PRESSURE SENSOR OPTION



This option, supported by the PLC and the monitoring program, measures the water level. The monitoring screen displays the levels in the tanks proportionally to the pressure. Possibility to install 2 sensors, one on each tank (Basin / Water tower).
- Piezoelectric measuring cell
- Scale precision +/- 0.5%
- 4-20 mA

ref. CHATO-NIV

Drinking water supply simulator with electrical cabinet (not wired)

Version without monitoring

TRANSPARENT TANKS MADE FROM UNBREAKABLE LEXAN



ref. CHATO-4-GD

Open solution to traditional cabling solution in electrical engineering wiring.

- Door panel prewired
- Free spaces for adding some control components (Diam 22mm)
- The grid is easy to disconnect due to Harting connectors and plugs for the level sensors, the moto- pumps and the power supplies 400V and 24V.

SYSTEM DESCRIPTION

- 1 150-litre tank simulates the river.
- 2 transparent tank (60L) simulate the settling basin.
  Fitted with 3 water-level sensor (all or nothing).
- 2 motorised pumps draws the water
  (river to the basin / basin to the water tower)
- 1 tap drains the water tower.
- 2 All or nothing flow sensors.
- 1 valve drains the settling basin.
- 2 valves at the motorised pump output to adjust the flowrate of the water.
- 2 emergency overflows.
- 750 x 1500mm base on wheels enables you to move the system
- 1 test cabinet not wired.
- 1 electric console with control and protection.

EDUCATIONAL OBJECTIVES

- **Understanding, putting into service, getting started & setting of the system**
- **Wiring of different components and connection**

USER'S MANUAL + PW

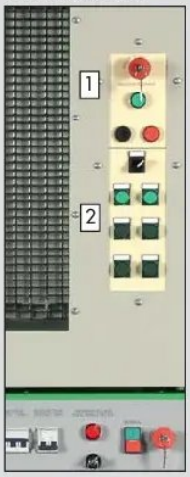
Proposed Practical Works

- Wiring of electrical components according the different operating modes
- Troubleshooting and maintenance

DOOR OF THE CABINET OPENED



DOOR CLOSED



TECHNICAL FEATURES OF THE CABINET

800 x 600 x 250mm steel cabinet, supplied with a grid.

1. Plate on door with unwired control lamps and actuators.
2. Free spaces for the addition of DIAM 22 control components
3. Rapid connection and hanging of the grid (not exceeding 750 x 750mm).
4. Door safety contact
5. Fixed connectors on grid, to be wired by students
6. Male Harting® connectors to level sensors, to motorised pumps, to the 400 and 24V power sources and to the control panel.

TECHNICAL FEATURES OF THE CONSOLE

Console which makes testing safe, with control of the cabinet door's safety contact.

- A Circuit breaker, in front of the power source
- B General residual current circuit breaker 30mA.
- C General emergency stop and Start/Stop
- D 2 circuit breakers for protecting the three-phase and 24V power supply
- E **DOOR OVERRIDE**
  Key-operated door override switch. Allows the live cabinet to be used with the door open if the switch has been activated. Operates with a different key to the No.455.

Drinking water supply simulator (operative part only)



ref. CHATO

SYSTEM DESCRIPTION

- 1 150-litre tank simulates the river.
- 2 transparent tanks (60L) simulates the settling basin and the water tower. Fitted with 3 water-level sensors (All or Nothing).
- 1 moto-pump draws the water from the "river" to the "basin".
- 1 moto-pump draws the water from the "river" to the "water tower".
- 1 tap simulates the water consumption. The water flows from the "water tower" to the "river".
- 1 valve drains the settling basin. Flow rates are adjusted by 2 valves at the output of moto-pumps.
- 2 safety overflows devices on the upper parts of tanks avoid any overflow.
- 1 set of 2 cables (3m) equipped with female Harting connector can connect the operative part on your connection box of a control unit.
- 750 x 1500mm base on wheels enables you to move the system easily.
- 1 mimic console + quick connection interface.

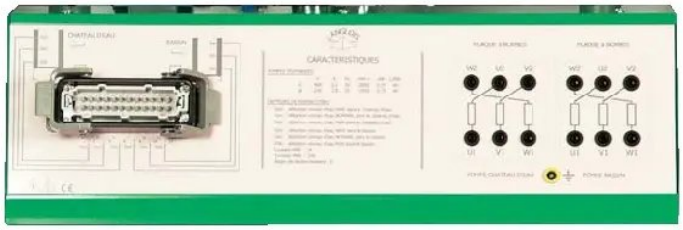
MIMIC CONSOLE

All the connections and measuring are made on this user-friendly mimic console.

- 1 male HARTING connector on the left section is connected to the 6 water level sensors.
- A synoptic indicates the function of each connection and the main features of the system.
- 12 safety terminals and 1 earth socket (4mm) are connected to the electrical windings of the moto-pumps. The student is able to measure the currents with a multimer.

CONNECTION BY SAFETY SOCKETS OR BY MEANS OF THE QUICK CONNECTION INTERFACE

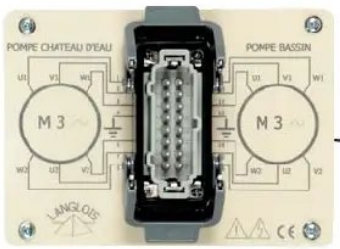
- A quick connection interface (4mm terminals / male Harting) is plugged on 13 connection sockets for the connection to a control cabinet (not supplied). A detailed synoptic on the interface shows the function of each connection.



RAPID CONNECTION INTERFACE FOR THE PUMPS

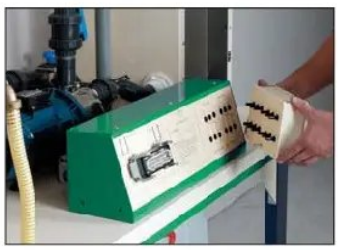
This unit is plugged directly into the mimic console, transforming the 12 safety terminals 4mm into a HARTING ® industrial rapid connector





HARTING









SET OF 2 CABLES

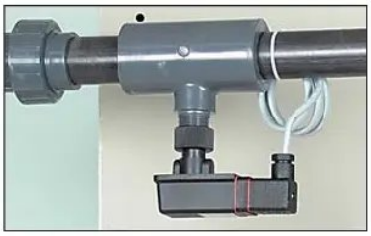


Set of 2 3-metre-long cables supplied with CHATO.

- 1 interconnection cable for sensors
- 1 interconnection cable for motors

Options for drinking water supply simulator CHATO-4 & CHATO

ALL OR NOTHING FLOW SENSOR



ref. CO-DEB

Detects water flowing in the PVC pipe of the CHATO circuit. An NO or NC contact at the sensor output sends information to a PLC or a contactor.

Features

- Can be fitted in any position
- PVC connection Diam: 40mm to be stuck on
- Switchable, potential-free contact
- NO or NC 1A/230VAC
- Electrical connection via a DIN connector

FLOW INDICATOR WITH FLOAT



A moving float in a transparent tube indicates the pump's water flowrate in cubic meter/hour

Features

- Upright fitting
- Measuring scale: 0.6 to 6 cubic meter/hour
- Ascending fluid
- Float and stop
- PVC connection Diam: 40mm (to be stuck on)

ref. FLO-DEB

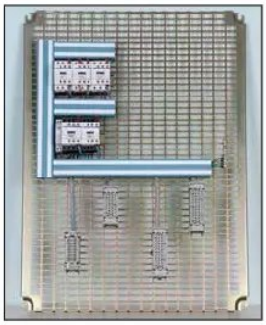
GRID & PLATE FOR PLCS



Wired door plate and grid for system operation with a PLC. Supplied with programming and training software.

ref. CHATO-AUTO

GRID & PLATE FOR RELAY



Wired door plate and grid for system operation with relay.

ref. CHATO-REL

FAULT SIMULATOR UNIT



Unit with concealed switches to simulate sensor faults.
6 switches linked to 6 sensors.
Unit fixed onto the system's frame.

ref. CHATO-PAN

SUMMARY AND HELP IN THE SELECTION OF THE DIFFERENT CHATO SYSTEM

PRESENTED PAGES 184 TO 187

Ref. CHATO-4S-T6



Simulator with electrical cabinet and monitoring on touchscreen

Ref. CHATO-4S



Simulator with electrical cabinet and monitoring on PC only

Ref. CHATO-4-GD



Simulator with electrical cabinet

Ref. CHATO



Operative part only

Didactic lift

USER'S MANUAL + 7 PRACTICAL WORKS



The ASC89 lift is a model which may be connected to a PLC or any microprocessor system.
It comprises 24 outputs and 21 inputs.
You can only use a part of input/outputs if you want to do easy programmes

MAIN FEATURES :

- Opening and closing of the doors on each floor is done by electric servo motors.
- The rear of the lift is visible through the sides and the bottom which are transparent
- The route of the lift is sensed at each floor by a photo-detectors.
- Two limit switches, high & low, (without program control) stop the lift if there is an error in the program.
- All of the buttons and switches are fitted with de-bounce circuits.
- The outputs are protected against the possibility of a short-circuit.
- The rear sliding door is of a transparent Plexiglass design and there is no manual access possible, as there is risk of damaging the servomotor.

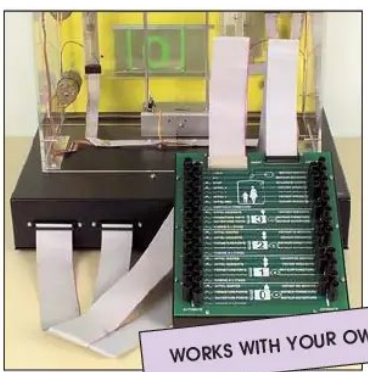
The mechanical controls are sturdy and can withstand any likely faults.

4 LEVELS EACH LEVEL HAS	1 electrically opening door - 1 photo-detector for 'door closed' - 1 photo-detector for 'door-open' 2 safety limit switches for door open/close (No control from the program possible) 1 button to call the lift 'up' (except the 3rd floor) with indicator lamp. 1 button to call the lift 'down' (except the ground floor) with indicator lamp 1 lamp to indicate the presence of the lift - 1 photodetector to indicate the presence of the lift
CONTROLS INSIDE THE LIFT	4 buttons for each floor - 1 stop button 1 switch to simulate a blocked door 4 lights for each floor - 1 light inside the lift (simulating the lighting)
UNIT SUPPLIES POWER TO	the motors - the LED - internal logic to the unit.
OTHERS SPECIFICATIONS	Dims 780 x 480 x 440mm Weight 15kg Supply 230V 50Hz The unit is available in two driving logic values, 24V or 5V.

ref. ASC89-24 LOGIC CONTROLS IN 24V

ref. ASC89-05 LOGIC CONTROLS IN 5V

INTERFACES FOR DIDACTIC LIFT (CHOOSE ONE OF THEM)



WORKS WITH YOUR OWN PLC

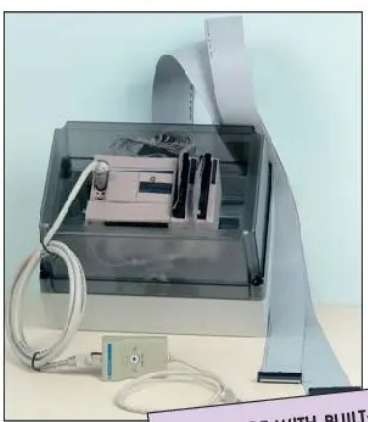
CHOICE N°1

ASMAT is an interface allowing a quick connection to the ASC89 lift from a PLC. To help in quickly identifying the functions of the connectors, small symbol and piece of text next to each connector, allowing immediate understanding of its function. The operating sense: Lift - PLC or PLC - Lift. It is clearly indicated by vertical arrows. Metal box: 22 x 272 x 32mm. Weight: 250g.

CONNECTION	CONNECTION
ASMAT - LIFT	**ASMAT - PLC**
Two flat cables with: One connector for the inputs and the other for the outputs.	The front face of the board has two columns of 4mm plugs, which are used to connect to the PLC with normal leads. The plugs on the left are for the inputs to the PLC, on the right for the outputs.

ref. ASMAT

PLC which can control the 24V lift via ASMAT interface. Réf. 221-MAX see page 192.



INTERFACE WITH BUILT-IN PLC

CHOICE N°2

AUTOMASC is delivered in a plastic box including:

- a 30 inputs / 26 outputs PLC (dry contacts)
- a USB connection interface with the PC
- supplies for the PLC outputs
- All cables to the lift, mains cable.

It is connected to the lift rear connectors with 2 flat cables, one for inputs, the other one for outputs.

PROGRAMMING

User can program AUTOMASC with 2 languages: Instructions list or contact language. You can program it from PC, using the software (included). Delivered with a program designed for complete functioning of the lift.

OTHER FEATURES

The front panel is transparent to see many LED, showing the PLC state. AUTOMASC is supplied with a demo program, which can be modified or completed. The technical leaflet indicates the corresponding between the lift inputs and outputs and the ones of the PLC, allowing the development of a complete program.
Mains: 230/240V - 50Hz - 50VA - Dimensions: 250 x 180 x 175 mm - Weight: 2.7kg

ref. AUTOMASC - compatible only with ASC89-24

Motorized gates



ref. PO-PB2

- Double casement
- Current consumed 0.8A
- Max power 200W.
- Speed reduction ratio 1/296



ref. PO-PC1

- Sliding
- Current consumed 1.5A
- Max power 290W.
- Speed reduction ratio 1/30

EDUCATIONAL OBJECTIVES

- ***Understanding, putting into service, getting started and setting of a automatic or semi-automatic portal***
- ***Interconnecting of the different components in jumper wires mode***

USER'S MANUAL + 4 PRACTICAL WORKS

Tutorials are supplied with automatic functions

- Wiring of all of the components
- Adjusting the various operating settings
- Measuring the properties of gear motors and comparing these values with the ones for the rating plate.
- Looking for one or more faults

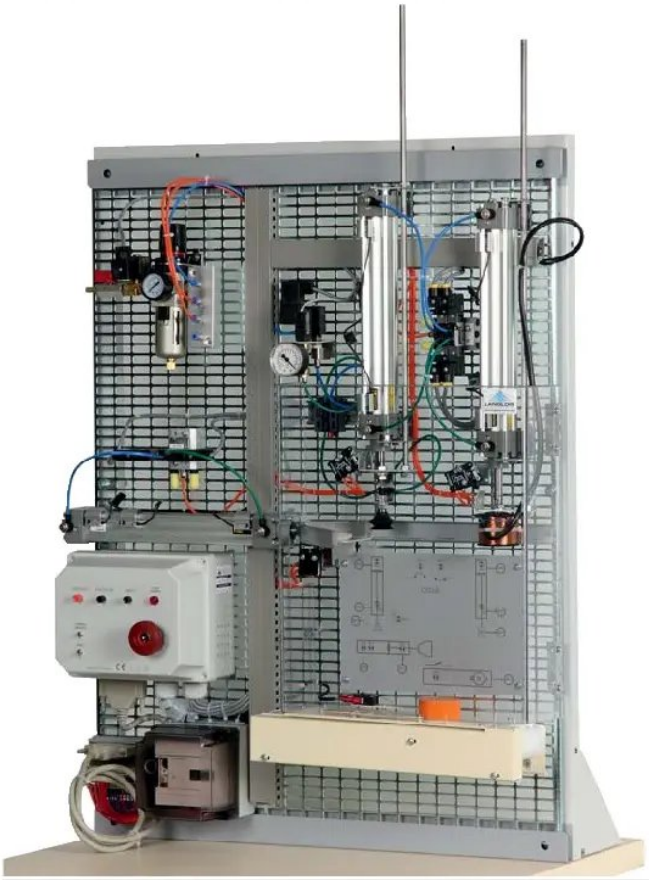
Features common to both gates

- Emergency stop circuit breaker
- 230V AC mains power supply
- Power supply to photoelectric cells: 24V AC. (internal power supply).
- Fault simulator unit with 4 circuit breakers, causing a fault on each cell.
- Life-time pre-lubrication using grease.
- Dimension of the unit: 1400 x 800 x 1700mm / Weight 90kg
- Sold with all connection diagrams and all the various settings to be entered for the smooth operation of the gates.

Components involved in the automatic operations (common to both gates)

- 1 frame on wheels with brake.
- 1 or 2 gear motors, depending on the selected automatic operation model.
- 2 pairs of photoelectric cells, to secure the opening and closing of the gate.
- 1 unit fitted with an electronic card controls the operation of all of the different settings (such as closure time-delay, activating the remote control, etc.).
- 1 gate opening and closing remote control
- 1 gate operation indicator light.
- 3 consoles, consisting of 4mm safety terminals for the 230V and 2mm for the extra-low voltage, containing the wiring for:
  - the key-operated "gate opening and closing" push-button
  - the gear motor(s), the light, the 24V power supply for the cells and the mains power supply
  - for the 4 photoelectric cells
- 1 fault simulator unit enables the user to create a malfunction in the photoelectric cells.
- 1 set of keys for unlocking the door mechanically.

Pneumatic handling line



ref. PNEU99 with PLC and software

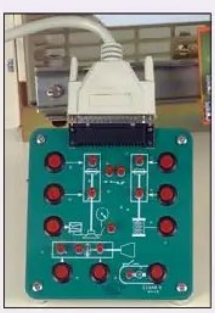
ref. PNEU98 without PLC

EDUCATIONAL OBJECTIVES

- **Introduction to pneumatic components**
- **Programming approach by PLC**
- **Monitoring of the system in manual or automatic mode**

USER'S MANUAL & THEORETICAL COURSES

The model is delivered ready for use (the electric part is completely wired and all the pneumatic connections made). The quick-fit joints allow dismounting/reassembly of pneumatic interconnections with Ø4mm tubes of various colors.
A manual gives details of the operation of all the electro-pneumatic components used and their adjustment. Several cycles are described, including one complete with its grafcet.



MANUAL CONTROL BOX SUPPLIED

This box contains
- 9 push buttons corresponding to each actuator
- 11 indicator lights which give information about the state of the sensors

It allows very slow observation of pneumatic phenomena and learning about the basic regulation of flow control, actuator speed, and detector positions.

OPERATING CYCLE

The parts placed on the conveyor belt are held by the vacuum suction grip of a first pneumatic jack, then placed on the horizontal jack, grasped by the electromagnet jack undergoing a complete handling cycle before being returned to the belt.

PNEUMATIC COMPONENTS

- 3 double effect pneumatic jacks Ø32mm. Travel 250mm, each equipped with:
  - flow reducers allowing fine adjustment of their movement
  - magnetic position detectors (2 or 3 per actuator) with LED
  - quick-fit joints for Ø4mm tubes
- 2 5/2 electropneumatic distributors
- 1 5/3 electropneumatic distributor
  All distributors are fitted with
  - 24V DC coils
  - LED visual display of the state of the coils
  - quick-fit joints for Ø4mm tubes
  - fitted on mountings with silencers
- Vacuum generator
  One of the actuators is fitted with a suction grip with its vacuum system.
  An adjustable threshold vacuostat delivers an electrical presence or absence of vacuum signal.
  A vacuometer allows visual checking on the vacuum.
- Jacks protection
  To avoid any risk of destroying a pneumatic jack, an entirely pneumatic logic system (without student access) prevents the simultaneous movement of the horizontal jack with a vertical jack.

ELECTRIC BOX

- Contains a regulated 24V DC 2A source to feed the PLC if necessary if it does not have an internal supply. The necessary supplies to the model.
- A Start cycle button, a Stop cycle button,
- a reset button.
- a general emergency button stopping the electric and pneumatic supplies.
- The connector which the user connects to the PLC or to the manual control box.

USER'S PROTECTION

- A transparent color door is a barrier between the pneumatic jacks and the user's hand. The opening turns off the air pressure

PLC (only for PNEU99 version)

- 14 inputs / 10 outputs (RELAYS)
- 2 languages : Grafcet instructions, contact language.
- Programming : from a PC using a software (included).
- Delivered with a complete and functional program.

OTHER CHARACTERISTICS

The conveyor belt is either controlled by the automatic system and the end of belt detection switch or by being forced into operation. An electromagnet illustrates picking up by a magnetic field. PNEU** is connected to the air network by splined terminal placed on the valve block of stop + regulator + filter + distribution output by quick coupling. PNEU** is delivered on a 1000 x 750mm chassis with lateral fixing brackets on a table.



OPTION COMPRESSOR

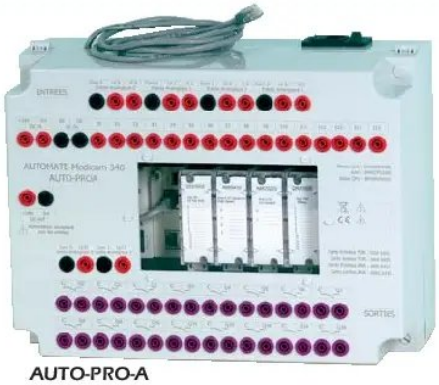
ref. PRESS-35

Integrated PLC units





MAT-BOX



AUTO-PRO-A



AUTO-238-A

Ref.	MAT-BOX	AUTO-221	AUTO-221-A	221-MAX
Brand	SIEMENS	SCHNEIDER		
Model	SIMATIC S7-1200	M221		
Number of Inputs	14 inputs 24VDC			30 inputs 24VDC
Number of outputs	10 All or Nothing outputs 2A max on resistive load	10 All or Nothing outputs 2A max		26 All or Nothing outputs 2A max
Analog	2 inputs 0-10VDC 1 output 0-10VDC or 4-20mA	no	2 inputs PT100 1 output 0-10VDC or 4-20mA	2 analog inputs 0-10V
Ethernet	yes + 1 mini switch 4 ports RJ45	yes		
Software	LOG-STEP (in option)	SoMachine Basic (supplied)		
Power supply	230VAC-50/60Hz by means of socket unit+ switch			
Dimensions	330 x 200 x 80mm	330 x 200 x 80mm		380 x 280 x 180mm
Supplied with	1 Ethernet RJ45 3-m cable. 6 detailed practical works (PLC configuration, use and programming.)	1 Ethernet RJ45 3-m cable. 1 USB cable PC/PLC		

Integrated touchscreen units

Ref.	TOUCH-BOX	STU-BOX4	STU-BOX6
Brand	SIEMENS	SCHNEIDER	
Modèel	Simatic KTP600	HIMISTU	
Touchscreen	5,7" TFT 256 colours	3,5" 65536 colours	5,7" 65536 colours
Resolution	320 x 240 pixels		
Ethernet	1 RJ45 connector	6 RJ45 connectors (Including 1 5 ports switch)	1 RJ45 connector
USB	-	1 USB connector	
Software	LOG-STEP (in option)	VijeoDesigner (supplied)	
Power supply	230VAC-50/60Hz by means of socket unit + switch		
Dimensions	330 x 200 x 80mm		
Supplied with	1 Ethernet RJ45 3-m cable. User's manual with tutorials.	1 Ethernet RJ45 3-m cable.	

SOFTWARE OPTIONS



For PLC
MAT-BOX
For Touchscreen
TOUCH-BOX

ref. LOG-STEP

Very intuitive, it proposes an online help and tutorials allowing the user to start quickly with the different programming screen.



For PLC
AUTO-PRO
AUTO-PROA

ref. UNITY-SMALL

Very intuitive, it allows a multitasking programming. It can convert easily your programs made under PL7.



For PLC
AUTO-238
AUTO-238A
AUTO-221
AUTO-221-A
221-MAX

ref. SOMACHINE

Effective and open professional software solution wich includes Vijeodesigner. Include the programming of controlers and HMI interface (Human Machine Interface)

Réf.	AUTO-PRO	AUTO-PROA	AUTO-238	AUTO-238-A
Brand	SCHNEIDER			
Model	MODICOM M340		M238	
Number of Inputs	16 isolated inputs 24Vcc		14 inputs 24V	
Number of outputs	16 outputs 2A max - TOR		6 all or nothing outputs + 4 static outputs (24V)	
Analog	-	4 voltage / current inputs ±10V / 0-10V / 0-5V / 1-5V / ±5V 0-20mA / 4-20mA / ±20mA 2 voltage / current outputs ±10V / 0-20mA / 4-20mA	-	2 inputs 4-20mA / 0-10Vcc 1 output 4-20mA / 0-10Vcc
Ethernet	Ethernet module TCP/IP on RJ45		1 Ethernet port + 1 Modbus port	1 Ethernet port
Software	UNITY SMALL (in option)		SoMachine (in option)	
Power supply	230VAC-50/60Hz by means of socket unit + switch			
Dimensions	360 x 270 x 170mm		330 x 200 x 80mm	
Supplied with	1 ethernet RJ45 3-m cable.		1 ethernet RJ45 3-m cable. 1 USB cable.	



TOUCH-BOX



STU-BOX4



STU-BOX6

Programmable controls system

BASIC MODEL

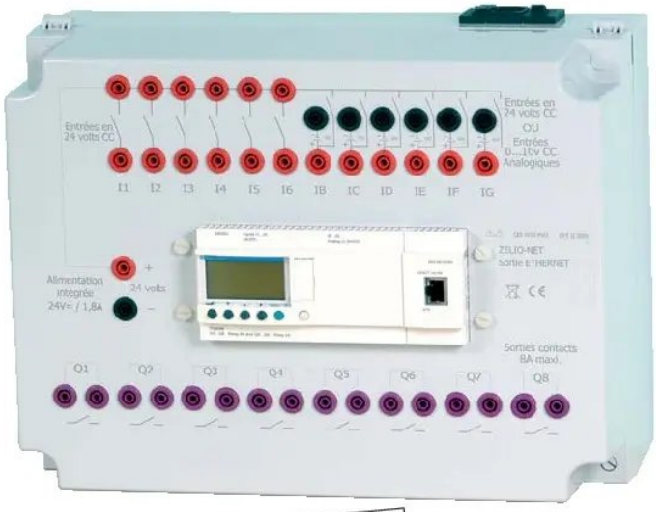


ref. ZELIO-201-24

This unit is a programmable interface working as a PLC with orders (inputs) and contacts (outputs). Its particularity is to integrate a clock which sets controls. Its programming software is very easy to use. Among its various and user-friendly functions, the function "SIMULATION" which allows to check the program before using it in real condition.
Dimensions of the box: 360 x 270 x 170mm

Sum up of functions and possibilities of the unit and its software:
- 12 inputs 24V DC, 6 can be wired in analog inputs 0-10V
- 8 dry contacts outputs
- a display indicating state and local programming
- 6 keys for local programming

MODEL WITH TCP-IP ETHERNET MODULE



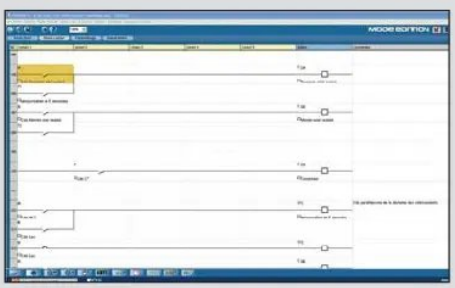
ref. ZELIO-NET

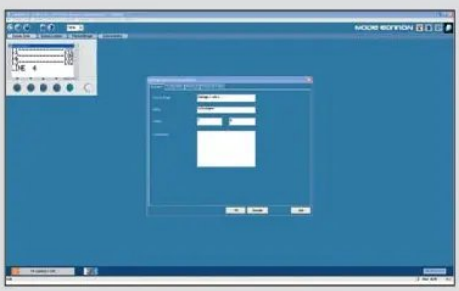
We have added to the ZELIO-201-24 (opposite) a network communication module which can be used to connect the ZELIO to the Ethernet using the Modbus TCP protocole

Ethernet module features:
- direct connection to the ZELIO
- female RJ45 reinforced cable
- a communication display LED (LK/ACT 10/100)
- a STATUS display LED (STS)

SOFTWARE SUPPLIED WITH ZELIO-201-24 AND ZELIO-NET







The multilanguage software also has :
- 3 programming languages
- a good viewing of clock settings
- a free keyboarding of associated comments for the follow up of steps.
- a simplified communication between the unit and the PC (serial connection)
- a direct display of the text on the unit display
- a visualization of outputs state
- an input/output computer simulation by a simple click on the mouse.

Help function for user
Besides its help function always available as a Search Menu, the software has a demo video functioning like a VCR. Short films show the main steps for programming the system.

Simulator for checking controller (PLC) programming

Checking a PLC program requires the connection of an operative part.
PUP-PLC groups together a set of actuators, power supplies and components required for checking programs.
Its complete composition provides great comfort for this check.



ref. PUP-PLC

Features
- 3-metre mains lead for power supply 230V-50/60Hz single phase.
- Console dimensions: 1000 x 160 x h 300mm. Weight: 14kg.

Composition of the console
- 1 Start / Stop button with indicator light (general control)
- 1 magneto-thermal + RC circuit-breaker 30mA
- 3 pushbuttons NO
- 3 pushbuttons
- 2 ON/OFF switches NO
- 2 ON/OFF switches
- 1 wind sensor, binary contact
- 1 light sensor, binary contact
- 3 limit switches NO
- 1 Temperature sensor PT100, 3-wire output
- 1 voltage generator adjustable by potentiometer from 0 to 10VDC
- 1 current generator adjustable by potentiometer from 4 to 20mA
- 1 dimmer 230VAC with control 0-10VDC
- 1 dimmer 230VAC with control 4-20mA
- 1 buzzer 24VDC
- 2 3-pole contactors 24VAC + 2 auxiliary contacts NO
- 3 green indicator lights 24VAC
- 3 red indicator lights 24VAC
- 1 source of fixed voltage 230VAC 50Hz
- 1 source of fixed voltage 24VDC
- 1 source of voltage 24VAC 50Hz
- 1 carrying handle

Quality control system by vision sensor



ref. MAQ-VISION

MAQ-VISION is a model equipped with a vision sensor combined with configuration software for part surveillance and recognition by video. This type of automatic visual quality control is nowadays used on many production lines. It enables the checking of parameters like presence, position, orientation, sorting, integrity and marking. It is also used for guiding before gripping. The image of the reference part and its acceptance tolerances are saved in the sensor's memory. The "good part" or "bad part" result is obtained from "binary" outputs.
MAQ-VISION is equipped with a motorized conveyor belt 24VDC. It carries the part under the sensor for checking. An indicator light signals if the part is conform or not.
Supplied with the video recognition programming software.

Features
- 2-metre mains lead for power supply.
- Dimensions of the housing: 240 x 180 x h 130mm.
- Dimensions of the conveyor belt: 300 x 110 x 120mm.

EDUCATIONAL OBJECTIVES

- **Study and putting into service of a quality control system by vision sensor**
- **Creating the wiring for motorized conveyor belt and video and position sensors**
- **Using video recognition programming software**

TEACHING RESOURCES STUDENT & TEACHER

Practical works proposed
- Carry out the configuration and programming of the video sensor using the software
- Creation of the wiring diagram
- Wiring of the conveyor belt, vision sensor and position sensor
- Testing with different part samples

Composition of the model
- Power supply unit, magneto-thermal protection device and indicator light.
- Motorized conveyor belt 24VDC.
- Colour vision sensor on height and tilt adjustable support.
- Binary position sensor.
- Indicator light for "nonconform part".
- 1 Configuration software.
- 2 part samples, conform and nonconform.

Managing of hypermarket lighting by supervision









ref. MAQ-LIGHT

Large floor area buildings, like supermarkets, require a lot of lighting. The control of this lighting is a real economic and ecological issue which requires thinking about the concept of zoning and presence.
MAQ-LIGHT offers the study of this need through controllers (PLC) and supervision controlled by 2 touch screens.
The presentation with two-sided vertical panels on a wheeled frame provides an ergonomic view of the zones to be controlled.

Comprises

- 1 unit with magneto-thermal, RC protection devices & emergency stop.
- 3 SCHNEIDER® Ethernet PLCs
- 1 Ethernet colour touch screen HMIS5T 3.5"
- 1 Ethernet colour touch screen HMIS5T 5.7"
- 1 presence detector
- 1 Day / Night simulation unit with potentiometer
- 1 engraved face defining the 3 lighting zones
  Face equipped with 16 indicator lights simulating the light points
- 3 control units with 7 pushbuttons and 7 indicator lights
- 1 Ethernet RJ45 switch
- 6 Ethernet leads, 1.5 metres

EDUCATIONAL OBJECTIVES

- **Study and putting into service of a lighting management system for hypermarket by supervision**
- **Studying the configuration of an Ethernet type computer network**
- **Studying the programming of a PLC in contact language**
- **Studying the programming of an HMI (Human Machine Interface)**
- **Studying the coexistence of several PLCs and HMIs**

TEACHING RESOURCES STUDENT & TEACHER

Practical works

- Creation of the architectural diagram of the electrical installation
- Creation of the computer Ethernet
- Creation of PLC programs in contact language
- Creation of the supervision from the two touch screens
- Change of IP addressing
- Testing the assembly

Features of the unit

- Power supply 230VAC by 3-metre mains cord
- Dimensions: 750 x 670 x h 1950mm
- Weight: 64 kg

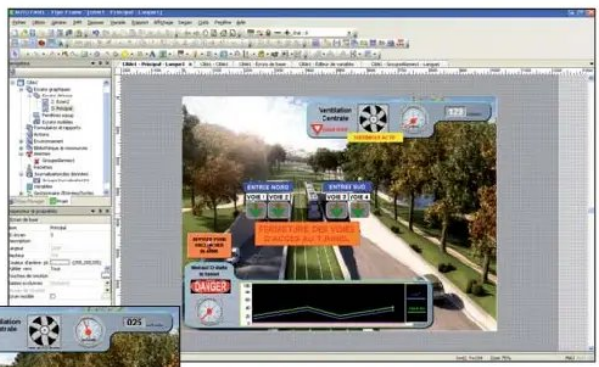
Ventilation control and tunnel access

Features of the unit
- Wheeled frame 750x670mm
- Total height: 1870mm
- Powered by a 400V three-phase hypra socket
- 1000VA Fan, 96m³/min maximum flow rate, 400V 3-phase, Ø 400mm.



ref. TA11

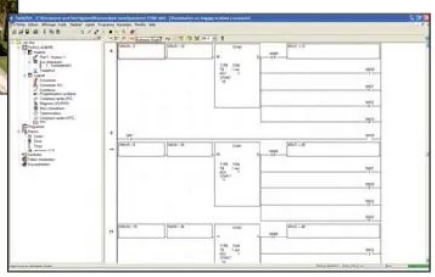
Monitoring software program





Monitoring from a PC

PLC program



EDUCATIONAL OBJECTIVES

- **Studying, putting into service, getting started and setting of the system**
- **Understand the setting and the programming by PLC**
- **Understanding and use of a supervision**
- **Practical approach of analog inputs**

USER'S MANUAL + TUTORIALS + MONITORING

Proposed Practical Works
- PLC programming
- Loading, modification, creation of a supervision program
- Ethernet network configuration
- Analysis of the regulation

TA11 is a study system used to regulate the CO2 level in a motorway tunnel. It consists of a fan for air renewal and an electrical cabinet grouping the regulation system components. The cabinet and fan are placed on a wheeled frame and connected by a 5m cable.
Complete unit supplied ready for operation with monitoring.
The PLC is supplied as well as the monitoring program and wiring diagrams.
Are also supplied: The Teachers/Students tutorials on PLC programming, monitoring, the Ethernet network, analogue regulation.

Operation
On the cabinet's door, a potentiometer simulates the CO2 level in the tunnel. Depending on the CO2 level, the PLC controls the fan's rotation speed and plans the access to the 4 traffic lanes represented by 8 indicator lights positioned above the cabinet. A stand-alone fire sensor indicates there is a fire in the tunnel An electronic buzzer warns that the CO2 level is too high. An anemometer fixed in the fan's air flow controls the rotation. This regulation system is PC monitored via the Schneider® software supplied.

The main cabinet components
- 1 Schneider® PLC
- 1 2.2kW speed controller
- 1 analogue card controls the 4-20mA or 0-10V speed controller signal.
- 1 Ethernet card is used to connect the entire system to an IP computing network such as, for example, the establishment's network to monitor operations from a remote computing room.
- Controls on the front of the door:
  General Start/Stop button
  Emergency stop
  CO2 level potentiometer
  Auto/Manual
  Fan Start/Stop button
  Potentiometer for the fan air flow
  Warning buzzer if excessive CO2 level
  RJ45 connector for the PC link
  Electrical protective devices for users and equipment.

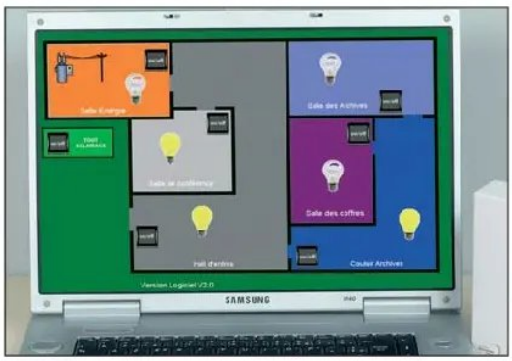
Monitoring functions on the PC screen
Display on digital displays and by curves
- CO2 level and air flow in the tunnel
- number of open or closed traffic lanes
- presence of a fire in the tunnel
- controls access to each traffic lane
- regulates the fan air flow
- triggers the fire alarm
- select the Auto or Manual operating mode

Programming systems (with USB connection)

LIGHTING CONTROL SYSTEM WITH PLC



ref. COFEC
these different equipments can be sold separately



This model is a room lighting unit comprising an electrical cabinet and a console fitted with low-voltage spotlights. Using a TCP/IP PLC and monitoring software, it is possible to control the model and view its operation on a computer.

OPERATING PART: ELECTRICAL CABINET + LIGHTING CONSOLE

- 1 32A rated 30mA residual current four-pole circuit breaker
- 2 double pole circuit breakers for protecting the 6 lighting circuits
- 6 double pole remote control switches.
- 1 double pole circuit breaker for protecting the PLC.
- 1 connection terminal block
- 6 24V LED lamps
- 6 push-buttons for manual lighting control
- 1 3m multiwire cable for connecting the lights to the electrical cabinet.

PLC

- with 10 relay outputs and 14 inputs, supplied with
- a cable for interconnection with the model
- programming software in English/French in ladder language.
- Dimensions: 170 x 130 x 130 mm. 220-240V AC

MONITORING

- Allows you to manage the lighting control model from a PC
- Offers the basic features of a graphical tool
- acquisition and display of PLC variables
- monitoring and control of lights (switching on, switching off and timer)
- The software's graphics editor supports many applications.

The user can modify the preloaded demo program or create a new one

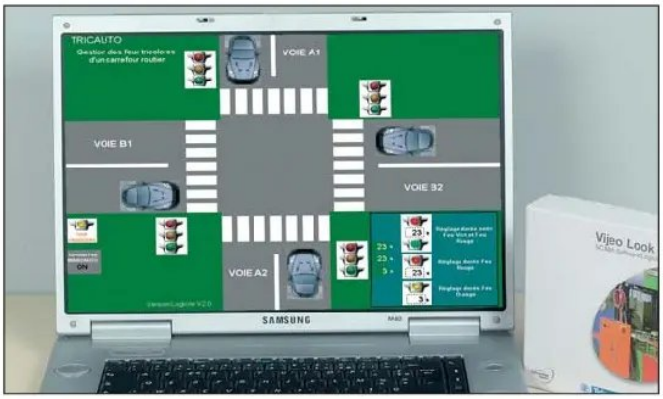
FEATURES OF THE ASSEMBLY

- Powered by a 230V mains cable
- Metal industrial cabinet with a glazed door. Dims: 400 x 300 x 200 mm
- Lighting console: dim. 400 x 330 x 200mm
- The assembly is supplied already wired with a monitoring example and all mains leads necessary for proper operation

TRAFFIC LIGHTS WITH PLC



ref. TRICAUTO
these different equipments can be sold separately



This model simulates a crossroad equipped with 4 traffic lights. Using a TCP/IP PLC and monitoring software, it is possible to control the model and view its operation on a computer.

OPERATIVE PART

- 6 x traffic lights control INPUT by 24 VDC level
- 4 x car detection sensor OUTPUT by 24 VDC level (supplied by the PLC)
- 6 x traffic lights manual swith on/off
- Interconnection : DB25 plug
- Dimensions : 390 x 325 x 140 mm

PLC (PC connection via USB)

- model : 9 output & 7 relay inputs, supplied with :
  - one interconnection wire plug link on the didactical model.
  - one programming software (english/french) based on "contact" language.
- Dimensions : 170 x 130 x 130 mm / 230-240 VAC

MONITORING

- Traffic lights system controlled from a computer
- Visual and intuitive display interface :
  - Acquisition of PLC parameters and visual control
  - Cars and traffic lights monitoring
  - Traffic lights control (switch on/off adjustement time, orange flashing)
- The software visual editor allowed to adapt the basic settings and to change software visual interface. Large possibility of use according to your particular teaching needs.

FEATURES OF THE ASSEMBLY

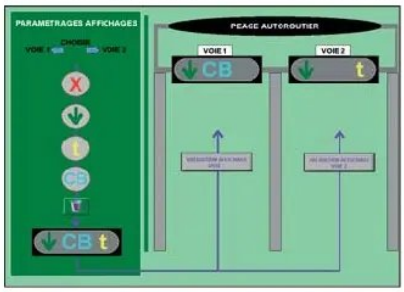
- Dim. 390 x 325 x 160mm
- The assembly is supplied already wired with a monitoring example and all mains leads necessary for proper operation

USER'S MANUAL + MONITORING TUTORIALS

LIGHT SIGNS SYSTEM (FOR A MOTORWAY TOLL)



ref. AUTO-PEAG
these different equipments can be sold separately



Simulates a motorway toll. Comprises 1 electrical cabinet and 2 toll lane indication signs. Using a TCP/IP PLC and monitoring software, it is possible to control the model and view its operation on a computer : opening/closure of lanes, management of banker's card or telepayment (electronic road pricing (ERP)) payments, manual or automatic function with time-stamp on the PLC, etc.

ELECTRICAL CABINET
- 1 32A rated 30mA residual current four-pole circuit breaker
- 1 bipolar circuit breaker for protecting the PLC and sign
- 1 set of junction boxes

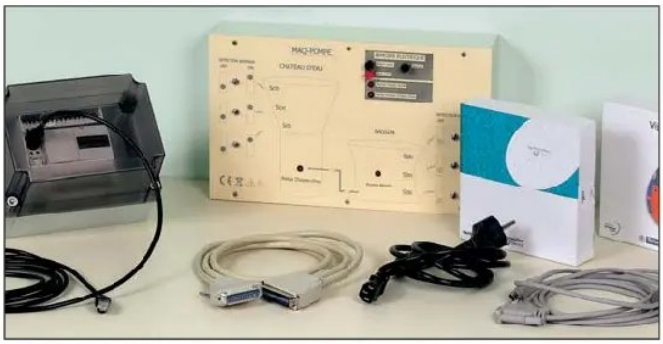
OPERATING PART, EACH CONSISTING OF
- 4 24V lamps (Open / Closed / Banker's card / Telepayment)
- 2 m of multiwire cable for connecting to the electrical cabinet.

PLC (PC connection by USB)
- with 10 relay outputs and 14 inputs, supplied with
- 1 TCP/IP interface for Ethernet connection
- 2 1.5m multiwire cables for interconnection with the model
- programming software in English/French in ladder language.
- Dimensions: 170 x 130 x 130 mm. 230-240VAC

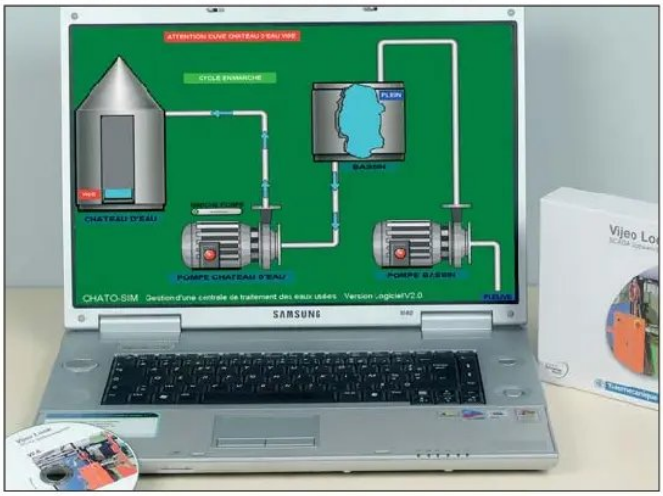
MONITORING
- Multilingual programming software for managing the toll indication cabinet from a PC.
- Offers the basic features of a graphical tool
  - acquisition and display of PLC variables
  - monitoring and control of the toll lane (lane open, lane closed, payment by BC or telepayment)
- The software's graphics editor supports many applications.
  The user can modify the preloaded demo program or create a new one

FEATURES OF THE ASSEMBLY
- Powered by a 230V mains cable
- Metal industrial cabinet with a glazed door
  Dimensions: 400 x 300 x 200 mm
- Indication sign: 420 x 80 x 70 mm
- The unit is supplied already wired with an example of monitoring and all the linking cables which are required for its proper operation

PUMPING STATION



ref. CHATO-SIM
these different equipments can be sold separately



This model simulates a drinking water pumping station. Using a TCP/IP PLC and monitoring software, it is possible to control the model and view its operation on a computer.

OPERATING PART
- 3 push-buttons for On / Cycle Start / Cycle Stop
- 6 switches representing the water level sensors.
- 4 lamps representing the operation of the two pumps.

PLC (PC connection by USB)
- with 7 relay outputs and 9 inputs, supplied with
- a TCP/IP interface for the Ethernet connection
- a 1.5m M/F DB25 cable for interconnection with the model.
- programming software in English/French in ladder language.
- Dimensions: 170 x 130 x 130 mm. 230-240V AC

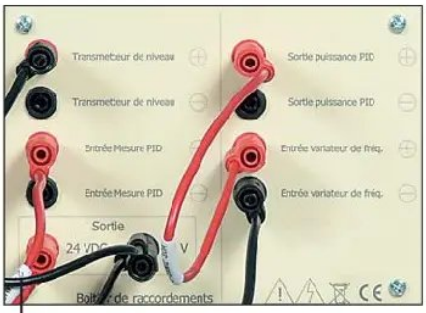
MONITORING
- Multilingual software for controlling the lights using a PC
- Offers the basic features of a graphical tool
  - acquisition and display of PLC variables
  - monitoring and control of the station' operation (start-up and shutdown of the pumps and maintenance operations, etc.).)
- The software's graphics editor supports many applications.

The user can modify the preloaded demo program or create a new one

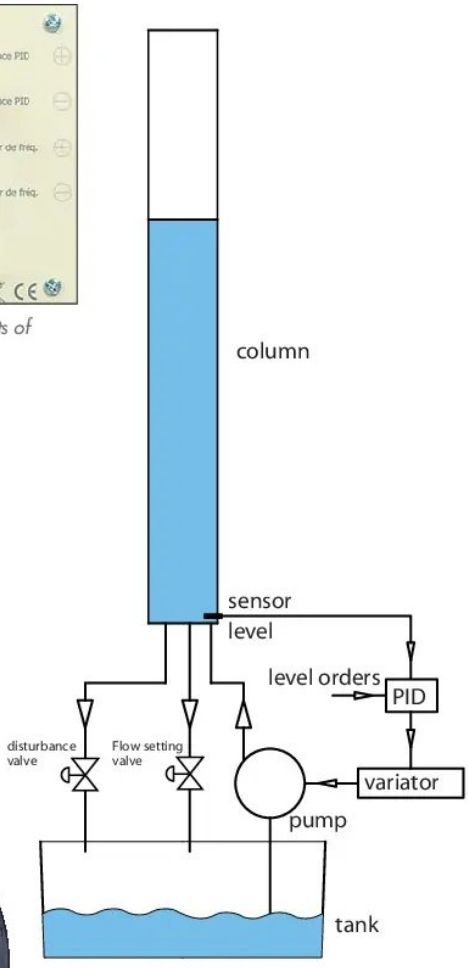
FEATURES OF THE ASSEMBLY
- Dimensions: 330 x 200 x 80mm
- The assembly is supplied already wired with a monitoring example and all mains leads necessary for proper operation

System for water level & flow regulation by PID





Terminal block with inputs and outputs of variator control and PID sensors



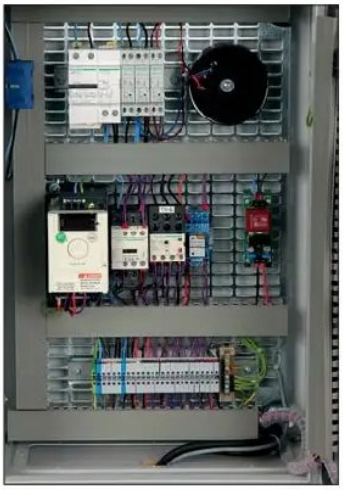
- Power supply : 230VAC
- Overall dimensions: 1100 x 670mm Height: 1980mm. Weight 104kg.

ref. DESNIV





Pressure sensor and disturbance valves



Wired grid including with a speed controller

OPERATING PRINCIPLE

The objective is to adjust the water-level in a transparent polycarbonate column –diameter 160mm, height 1370mm. A pump draws the water from a 50-litre tank at the bottom of the column. The water constantly flows through the setting valve from the column towards the tank under gravity.

The PID regulator receives the "water-level" information from a 4-20mA sensor. It compares this signal with the level reference and controls the pump delivery via a frequency variator.

The system operates in two modes: servo control and regulation.

In regulation mode, a manual valve creates the disturbance.

EDUCATIONAL OBJECTIVES

- **Studying, putting into service, getting started and setting of the system**
- **Understanding and setting of the PID level regulation**
- **Calculating the span & zero offset of a level measurement by hydrostatic pressure of wet column. Adjust the level transmitter**
- **Wiring, putting into service & adjustment of components: transmitter, regulator ...**
- **Make current measurements as in industry, without opening loops, with the help of a multimeter.**
- **Taking in hand the setting software of the frequency converter.**

TEACHING RESOURCES – 19 PRACTICAL WORKS

PRACTICAL WORKS ON THE MEASURING CIRCUIT

- Wiring the measuring loop which comprises the 4-20mA output differential pressure transmitter, a 24V DC power supply and the PID.
- Calibrating the level transmitter Dry column method.
- Calibrating the level transmitter Wet column method.
- Producing a calibration sheet for the transmitter, and a calibration curve.
- Calculating the scale range of the transmitter.
- Measuring the current in the loop, without opening it.
- Using a calibrator for measuring the transmitter current or generating a 4-20mA current on the PID input.

PRACTICAL WORKS OF REGULATION

- Producing a regulation loop diagram, with a view to wiring the correction component and the measuring circuit
- Producing an operating diagram through the identification of various components, namely: the regulator, the correction component and the process.
- Identifying the quantities at play, namely: the adjusted quantity, controlled variable, correcting variable and disturbances
- Determining the direction of the regulator depending on the direction of the process and the correction component
- Determining the static features of the procedure, with a view to calculating the following adjustments: integration constant, dead time
- Implementing various empirical methods for setting PID correctors
- Testing the performance of the loop, in servo-control mode and in regulation mode
- Displaying on a flatbed plotter or PC, or by manual measuring, the responses of the PID adjusters, by requesting the measurement input by position or speed level
- Implementing and verifying a level measurement for a dry column or a wet column

DESIGN

The DESNIV model uses only industrial components.

- A PID regulator – 4-20mA standard on the measuring input and on the output.
- An industrial three-phase pump, with a bronze body
- A differential pressure level sensor
- An industrial frequency variator

The column is large in size, as is the volume of water it contains. Therefore, it has high inertia. This means that the physical phenomena are very similar to those for high-capacity tanks used by the pharmaceutical and oil industries. Pressure differences due to the significant height of the water column can be used to adjust the water-level to the nearest 5mm.

The inputs and outputs for the following are grouped together on a terminal block which is separate from the electrical cabinet: sensor, regulator, variable speed drive and 24V DC power supply. Students wire up the control and measuring loops on this terminal block. They cannot come into contact with dangerous voltages, as these are confined to the electrical cabinet. The maximum voltage that can be accessed on the student terminal block is 24V DC.

The terminal block and the components allow all wiring errors and fault finding exercises.The "water-level" and "pump delivery" curve charts (curve charts used to determine the static gain, loop gain and critical gain, the dead time and the time constant) are noted either manually (the slow speed of the phenomena means that this procedure is possible), or using a PC combined with LOGINIV software (option) and the associated interface, or by using general software.

The DESNIV model does not need to be connected to the water network. In order to prevent any overflow, a binary level sensor stops the pump if the water rises up to the top section of the column.

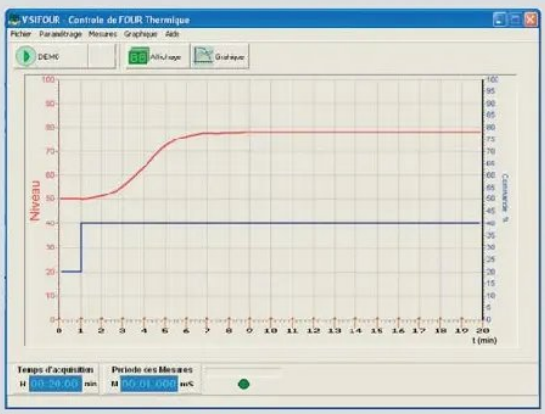
SUPPLIED WITH A 4-20MA LOOP CALIBRATOR



- Programming in % of the output span to supply a typical intensity like 4 – 8 – 12 – 16 or 20mA
- linear ramps, manual ramps, auto ramps
- Display: 5 digits
- Carry case, user's manual, external battery Pack (for 6x 1.5V AA batteries)
- Input for mains adapter DC 12V (not included)
- Dimensions : 88x168x26mm Weight : 330g

RANGE	RESOLUTION	ACCURACY
4 - 20 mA	1µA	0.025% + 5µA
0 - 20mA	1µA	0.025% + 5µA
0 - 24mA	1µA	0.025% + 10µA
4 - 20V	1mV	0.05% + 5mV
0 - 20V	1mV	0.05% + 5mV
0 - 24V	1mV	0.05% + 10mV

LOGINIV INTERFACE & SOFTWARE (OPTION)



ref. LOGINIV

This PC interface – connected to the DB9 outlet – and software are used to record and draw graphs of instantaneous water level and control signal of the pump speed directly on PC. The connection to PC is made by USB.

Additional functions

- Numerical display of the two measurements
- Cursor function
- Compilation of data in a spreadsheet
- Zoom function

Level control system by means of PLC & touchscreen

EDUCATIONAL OBJECTIVES

- **Studying, putting into service, getting started and setting of the system**
- **Understanding the setting and the programming by PLC**
- **Understanding the PID level regulation, probes and sensors**

TEACHING RESOURCES – PRACTICAL WORKS

Practical works

- Drawing of wiring diagrams
- Setting and programming the PLC
- Configuration of the PC Ethernet links / PLC / Touch Screen
- Configuration and setting of the touch screen
- Setting the 4-20mA water level regulation with the PID of the programmable PLC
- Wiring the grid
- Understanding the functioning of the level regulation by PID, probes and sensors

REGULEAU is a level control system relying on a PLC and touchscreen, which can be used in three detection modes, using

- 3 binary floats
- 4 height-adjustable conductive probes
- 1 4-20mA hydrostatic pressure sensor

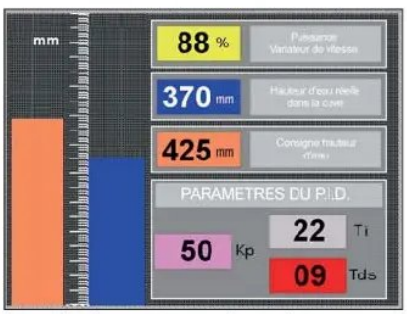
The water drawn from the lower tank supplies the upper tank (where the sensors are located) before running away via a manual valve.
The PLC's PID and the variable flow pump allow a level control.

COMPONENTS PARTS OF THE MODEL

- 1 100L lower tank
- 1 transparent 60L upper tank, graduated in cm
- 3 level sensors with binary float (24V-3A).
- 4 50cm long Ø 6mm conductive probes.
- 1 hydrostatic pressure sensor.
  Rating: 4-20mA output for 0-600mm water level
- Cabinet and console
- 1 5.7" TFT touchscreen
- 1 4-port RJ45 Ethernet hub
- 1 three-phase speed controller
- 1 PLC with software, fitted with a TCP/IP interface for the RJ45 link to a PC and the touchscreen.
  14 Inputs + 10 Binary Outputs (24V)
  1 analog input 4-20mA
  1 analog output 4-20mA and 0-10V
- 1 Vijeo Designer® software with a complete monitoring program
- 1 30mA residual current circuit breaker. thermal-magnetic circuit breakers
- 230V power supply
- Base with wheels + brake. 1500 x 750mm - Weight 144kg

ACTION OF THE MONITORING

- starting and stopping the system
- choice of level control type
- water level and settings bargraphs
- display and adjustment of the PID parameters
- display of the speed controller's power in correlation with the pump delivery
- adjusting the settings



Example of monitoring on the touchsreen



ref. REGULEAU

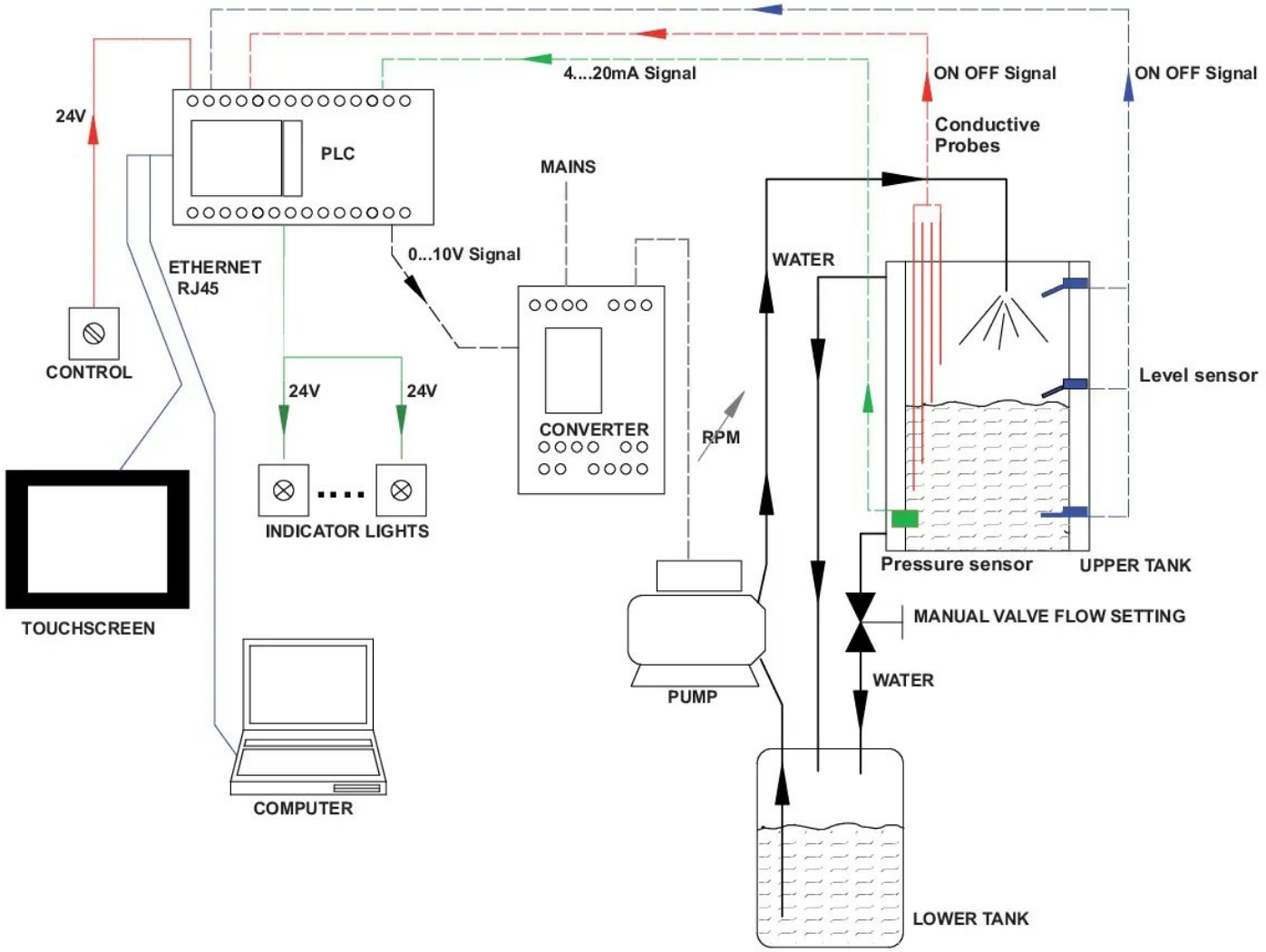
REGULEAU IS SUPPLIED ALREADY WIRED AND READY FOR USE WITH TUTORIALS, INSTRUCTIONS, SOFTWARE PLC AND MONITORING PROGRAMS.

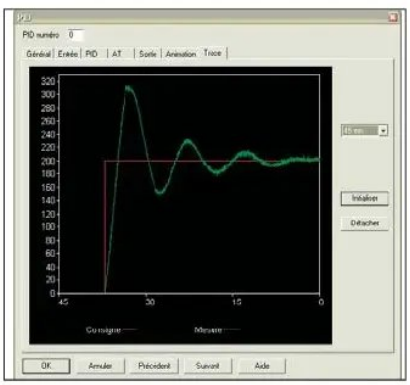




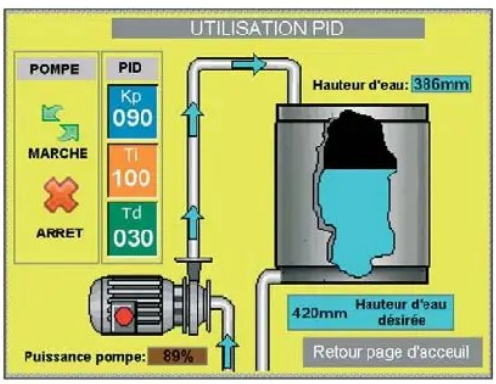


Removable grid quickly taken through Harting ® plugs.

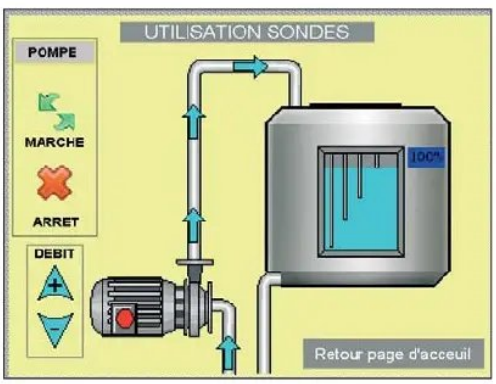




Automatic drawing of the measuring value/order value

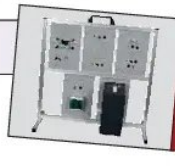


PID status on the touchscreen (english version available)



Probes status on the touchsreen (english version available)

All or nothing temperature regulation



MODULAR SOLUTIONS PAGE 59

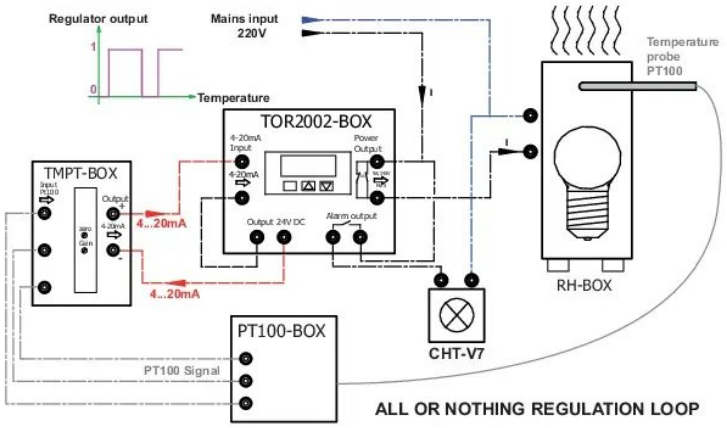
EDUCATIONAL OBJECTIVES

- Understanding and wiring of a regulation chain All-Or-Nothing.
- Studying, setting, control of a All-Or-Nothing regulator.
- Retrieving information by computer (communicating version).
- Understanding of the link resistance / temperature as measuring principle.

USER'S MANUAL & THEORETICAL COURSES

Set of components for the study of a All or Nothing temperature regulation loop with a PT100 temperature sensor and 4-20mA signal.

These solutions of regulation are delivered with all the necessary safety leads, a user's manual for each component and also wiring diagrams.



ALL OR NOTHING REGULATION LOOP

ref. REGULOR standard model

MAIN COMPONENT - STANDARD VERSION

REGULATOR TOR
Ref. TOR2002-BOX
See Page 208



ref. REGUL-S communicating model

MAIN COMPONENT - COMMUNICATING VERSION



COMMUNICATING
REGULATOR TOR
Ref. TOR-COM
See Page 208



COMPONENTS COMMON TO THE BOTH REFERENCES



HEATING UNIT
Ref. RH-BOX
See page 207



PT100 TEMPERATURE
CONVERTER
Ref. TMPT-BOX
See page 207



LIGHT
Ref. CHT-V7
see page 75



PT100 TEMPERATURE SENSOR
Ref. PT100-BOX
See Page 207

PID temperature regulation



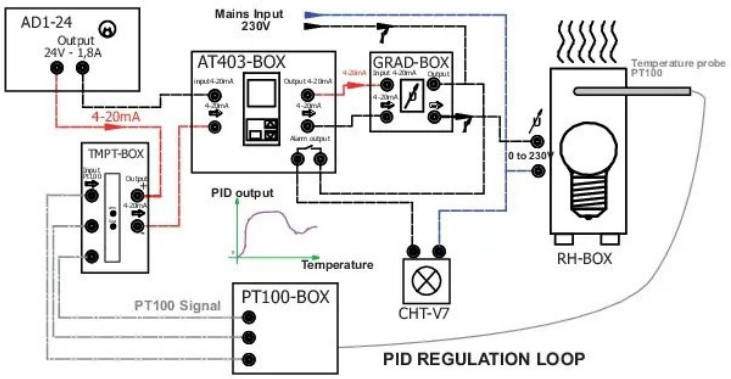
EDUCATIONAL OBJECTIVES

- **Understanding and wiring of a regulation chain of temperature by PID**
- **Studying, setting, control of a PID regulator**
- **Retrieving information by computer (communicating version).**
- **Understanding of the link resistance / temperature as measuring principle.**

USER'S MANUAL & THEORETICAL COURSES

Set of components for the study of a 4-20mA temperature regulation loop with a PT100 temperature sensor and a dimmer switch, all controlled by PID regulator.

These solutions of regulation are delivered with all the necessary safety leads, a user's manual for each component and also wiring diagrams.



ref. REGULIDE standard model

MAIN COMPONENT - STANDARD VERSION

PID REGULATOR
Réf. AT403-BOX
Voir page 209



ref. REGUL-G communicating model

MAIN COMPONENT - COMMUNICATING VERSION



COMMUNICATING
PID REGULATOR
Ref. PID-G
See Page 209



COMPONENTS COMMON TO THE BOTH REFERENCES



HEATING UNIT
Ref. RH-BOX
See page 207



PT100 TEMPERATURE CONVERTER
Ref. TMPT-BOX
See page 207



LIGHT
Ref. CHT-V7
see page 75



PT100 TEMPERATURE SENSOR
Ref. PT100-BOX
See Page 207

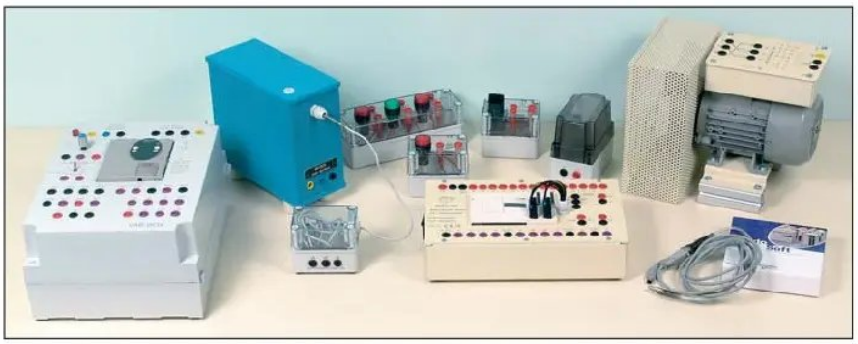


DC POWER SUPPLY
Ref. AD1-24
See page 209



SCR POWER CONTROL
Ref. GRAD-BOX
See Page 207

Temperature control by PLC



ref. REGULAIR

EDUCATIONAL OBJECTIVES

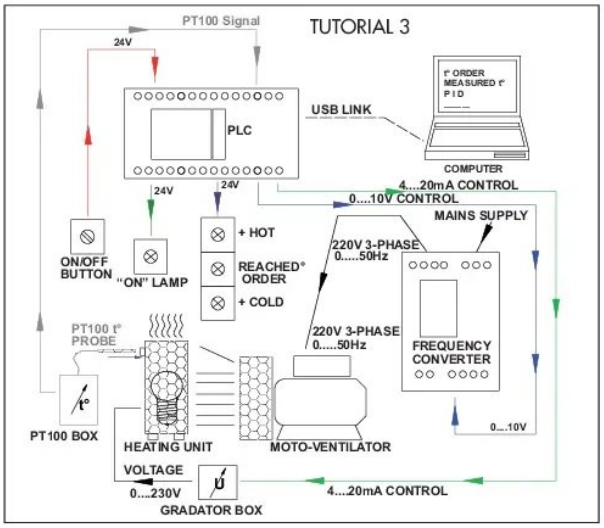
- **Studying the analogical regulation loop**
- **Studying the role of the frequency converter in a regulation system**
- **Understanding the PID configuration by PLC**

USER'S MANUAL + PRACTICAL WORK

Practical works

TUTORIAL-1 STUDY OF THE 0-10V CONTROL
TUTORIAL-2 STUDY OF THE 4-20mA CONTROL
TUTORIAL-3 STUDY OF THE TEMPERATURE REGULATION BY PID

SUPPLIED READY FOR OPERATION WITH THE TECHNICAL INSTRUCTIONS, THE PROGRAMMING SOFTWARE AND THE PLC PROGRAMS WHICH CORRESPOND TO THE VARIOUS TUTORIALS TO BE UNDERTAKEN.
ALL OF THE COMPONENTS CAN BE SOLD SEPARATELY.



For each tutorial, students must:

- Develop the PLC program
- Configure the speed controller (tutorial-1 and tutorial-3)
- Produce the wiring diagram
- Wire the components
- Modify and observe the speed settings (tutorial-1), temperature settings (tutorial-2) and PID settings in order to regulate the temperature around a setting (tutorial-3)
- Using the PLC, measure on the PC the setting and instantaneous temperature curves (tutorial-3)

PID function from the PLC. The values of the settings, temperature, power output and the proportional and derived coefficients are completely configurable.

COMPONENTS OF THE REGULAIR SYSTEM

Moto ventilator
230/400V 3-phase asynchronous motor
Rated speed 1500 RPM
Power supply on safety sockets 4mm



Electric fan shown without its protection cover

- **SCR power unit**
  Single-phase SCR power unit
  Connection by means of safety leads
  4-20mA control
  1 max. output: 15A
  Dim: 100 x 80 x 90mm

- **Heating unit**
  230V mains power supply by means of safety terminals
  75W lamp
  Max. heating temperature of approximately 90°C
  Can accommodate temperature probes up to 7mm in Ø

- **Pt100 box**
  Pt100 Temperature Probe – 3 wires
  Connection by means of safety leads
  Cable length: 90cm
  Dim: 10x 80 x 90mm

- **PLC Unit**
  14 inputs (24V)
  10 binary outputs
  1 Pt100 analogue input
  2 outputs 0...10V and 4....20mA
  Mains power supply by means of socket unit + switch
  PLC programming software

- **Speed variator (frequency converter)**
  230V mains input
  Output to 230V three-phase motor
  1 input 0...10V
  Protection against short circuits
  Protection against overloads
  Protection against phase outages
  Connection by means of safety terminals

- **Control units + lamps**
  1 2-position switch
  4 24V lamps (3Red + 1Green)
  Connection by means of safety leads
  2 outputs 0...10V or 4....20mA
  Mains power supply by means of socket unit + switch

SRC power control and loads for regulation

HEATING UNIT



ref. RH-BOX

230V power supply heating unit fitted with a 75W lamp. Completely safe thanks to two 4mm double channel terminals. The Pt100 temperature probe, with a maximum diameter of 7mm, can be inserted sideways (e.g. PT100-BOX).
Powered via 230V mains supply or SCR power unit (e.g. GRAD-BOX), which regulates the light intensity and therefore the temperature in the unit.
This temperature can be measured by a temperature probe (e.g. PT100-BOX)

Features

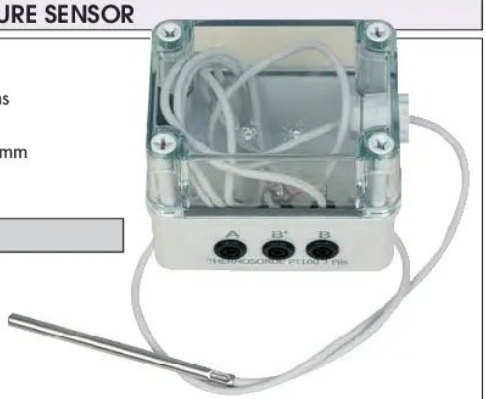
- 75W incandescent lamp – E27
- Mains power supply via 2 safety terminals
- Inlet port can accommodate temperature probe up to 7mm in Ø maximum
- Dim: 250 x 250 x 110mm

PT100 TEMPERATURE SENSOR

FEATURES

- Connection by means of safety leads.
- Dim: 100 x 80 x 90mm
- Cable length: 90cm

ref. PT100-BOX



SINGLE-PHASE SCR POWER CONTROL

Controls the power in the charge by varying the conduction angle of the thyristors according to the control current of 4-20mA.
Can be connected directly to the built-in PLC unit ref. AUTO-BOX-A.

FEATURES

- Connection by means of safety leads.
- Max. current output: 15A
- Dim: 100 x 80 x 90mm

ref. GRAD-BOX



SCR POWER CONTROLS

These SCR power units control the power in the charge by varying the conduction time of the thyristors according to the control current 4 – 20mA

The power, the output power, the control input 4-20mA and the potentiometer can be used on 4mm safety terminals.

A potentiometer front allows to vary the conduction time.

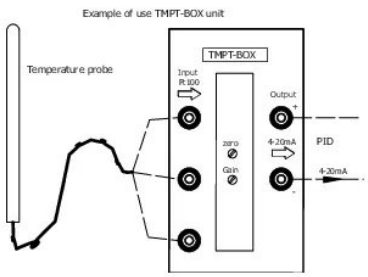
Compatible with resistive loads only.



Ref.	CIA-GRA30M	CIA-GRA30T
Supply type	Single-phase	3-phase
Main supply	230VAC	3 x 400VAC
Auxiliary supply	-	220VAC from mains (for the cooling fan)
Output voltage	230VAC	3 x 400VAC
Max. output current	30A	30A
Control	4-20mA and/or potentiometer	4-20mA and/or potentiometer
Dimensions	290 x 190mm x 135mm	390 x 280mm x 185mm

PT100 - 4-20mA TEMPERATURE CONVERTER

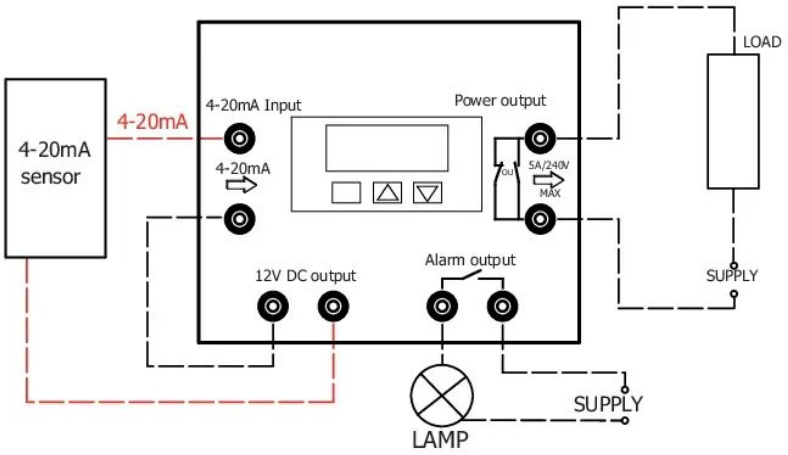




- This unit allows the connection of a temperature probe to the 4-20mA input of the PID.
- Adjustment of the signal gain & zero thanks 2 potentiometers
- Compatibility with the 2 or 3 wires temperature probes (see PT100-BOX)
- Input/output connection on safety sockets 4mm
- Works without any external supply
- DIMS: 77 x 106 x 92 mm

ref. TMPT-BOX

All-or-nothing regulators for regulation



The regulator unit controls in all-or-nothing the supply of the load from a 4-20mA signal.
EXAMPLES OF USE Enter the order value directly in the regulator. When the 4-20mA signal from the sensor reaches the order value, the state of the dry contact changes and opens (or closes) the supply circuit of the load (programming of the contact state: NO or NC).
Supply of the unit in 230V (power cord)

The communicating version has the same features and includes in addition a possible programming by software and retrieving datas (files + curves).

STANDARD MODEL



ref. TOR2002-BOX

- 4-20mA input on safety sockets 4mm
- 10 000 counts configurable display
- Settings of the display :
  - For 4mA input, the user can choose the value displayed between -1000 and 9999
  - For 20mA input, the user can choose the value displayed between 0 and 9999.
- Setting of the decimal point
- Example of a 5bars converter: :
  - For 4mA, display indicates 0.000
  - For 20mA, select 5.000 (for the maximum value)
- Output: 250VAC / 0.5A relay on safety sockets 4mm
- Output: 12VDC (allow the wiring a 4-20mA loop without an external supply)
- Alarms: high and low, relay output on safety sockets 4mm
- Settings: offset, hysteresis, gain, filter
- Dimensions: 145 x 185 x 100 mm

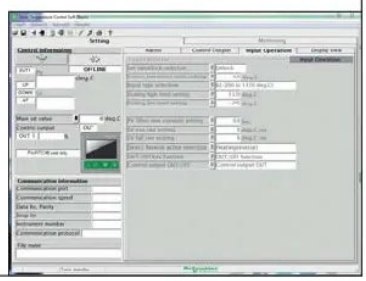
COMMUNICATING MODEL SCHNEIDER®



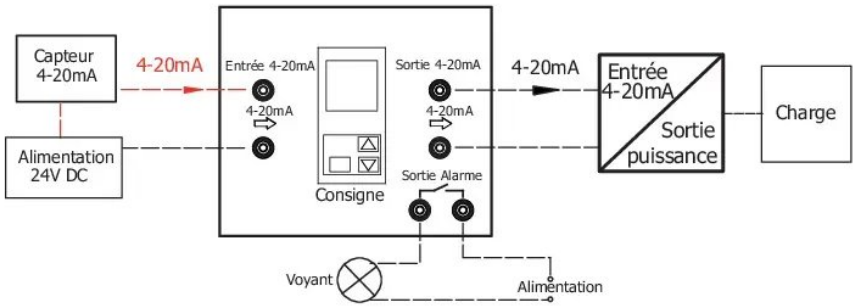
NEW

ref. TOR-COM

- LCD display in 11 segments of 3 colours (green, red, orange)
- 1 0-10V input, 4-20mA thermocouple on safety sockets configurable from the keyboard or the software.
- 1relay output dedicated to heating or cooling on safety sockets.
- 1 All-or-nothing alarm output on safety sockets
- Auto setting or automatic reset
- Hysteresis functions for the activation or deactivation control
- 230 VAC power supply by power cord
- ZELIO temperature software + connection cable to PC supplied
- Dims: 150 x 200 x 100 mm



PID regulators for regulation



The PID regulator is the correcting component into a regulation loop for the monitoring of a process (boiler, compressor, pump ...). It receives a 4-20mA signal from the sensor which is the image of the value to regulate (temperature, pressure, flow...). It compares it to the set-point (programmed in the PID) and drive the process to reduce the difference "process variable / set-point"

The communicating version has the same features and includes in addition a possible programming by software and retrieving datas (files + curves).

STANDARD MODEL



ref. AT403-BOX

- Automatic tuning and manual PID
- 4 digits display for the instant value
- 4 digits display for the set-point
- Bar graph image of the power output
- 4-20mA input on safety sockets 4mm
- 4-20mA output on safety sockets 4mm
- 250V / 5A relay output on safety sockets 4mm
- Alarms output (high & low) on safety sockets
- Internal timer
- Supply: 240VAC - 50Hz
- Dimensions: 145 x 185 x 100mm

DC POWER SUPPLY

ref. AD1-24

24V / 2.2A DC Supply. Output on safety sockets 4mm. Protection: overload and short-circuit by electronic limitation



COMMUNICATING MODEL GEFRAN®



ref. PID-G

NEW

- Universal input on safety sockets
  Configurable according the different types of signals like thermocouple, thermoresistance, thermistance 0-10V and 4-20mA linear outputs.
- Configurable output in 0-10V and 4-20mA on safety sockets.
- All-or-nothing alarm relay output on safety sockets.
- The PID unit is fully configurable from the keys on the front panel or from the software.
- Power supply (230VAC – 50Hz) – power cord
- Programming software + connection lead to PC delivered with the unit
- Dims: 150 x 200 x 100 mm



System for heat regulation by P.I.D.



ref. DESP

In aeronautics, gluing techniques between metals and composite materials require accurate temperature of polymerization glues, to ensure maximum grip.
This model of oven of glues polymerizing, which the airflow is used to carry the parts to be glued to the appropriate temperature, has a PID temperature regulation accurate to a tenth of a degree.

EDUCATIONAL OBJECTIVES

- ***Understanding of the regulation principles by PID, from theory to practice.***
- ***Wiring, calibration, loop measuring, statement of curves.***

USER'S MANUAL + 15 PRACTICAL WORKS

Practical works

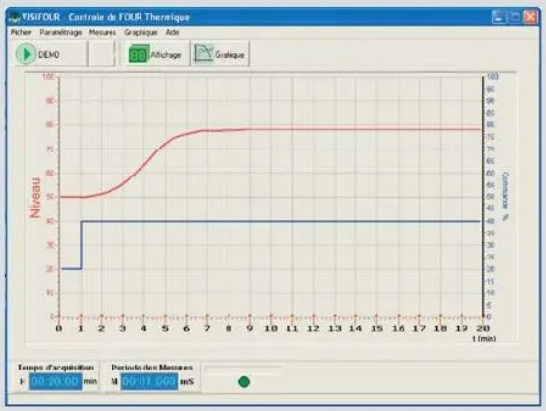
- Wiring of a measuring loop according the standard 4-20mA with Pt100 probe and transmitter
- Calibration of the converter Pt100 / 4-20mA with the help of a decade box (not supply)
- Establishing a calibration sheet, drawing the calibration curve
- Identifying and testing of a Pt100 probe. Calculation of the current through the Pt100 probe.
- Measuring of a loop current without opening the loop
- Using a 4-20mA calibrator
- Establishing the functional diagram and determining the role of different components
- Establishing the loop diagram of regulation and the wireline diagram
- Identifying the controlled value, the monitoring value, the disturbance values.
- Determining the direction of action of the regulator, according to the direction of the process and the direction of the correction member
- Determining the static characteristics of the process (static gain, timeout, time constant) in order to calculate the transfer function
- Determining the oscillations period and the gain of the critical loop, the integration factor. Determining using models Broida and Pessen correctors P, I and D
- Viewing of the response curves with 3 correctors: P, I and D
- Adjusting of the PID correctors and testing according two methods: enslavement and regulation
- Testing of different empirical methods for adjusting PID correctors
- Troubleshooting training by fault simulation

FEATURES

- Supply : 230VAC
- Dimensions : 350 x 200 x 122 mm
- Weight : 3.7kg

This small oven, where an air stream is used to bring the parts to the correct temperature, is equipped with PID to control the temperature accurately to within a tenth of a degree. The DESP model uses only industrial components. The PID control system - 4-20mA standard for measuring input and output - controls air stream temperature. To prevent any risk of burning, oven power has been limited to 250W and air temperature to 100°C. The student wires the Pt100 3-wire probe, 4-20mA measuring loop, 4-20mA control loop, temperature transmitter, and loop power supply to the terminal strip. Current is measured at the conversion resistance using a multimeter, without opening the loops. Maximum accessible voltage (without dismantling the apparatus): 24VDC. The system operates in two modes: automatic and control. In the latter case, an adjustable-speed fan sets up a disturbance. The terminal strip and components are suitable for demonstrating all types of wiring errors and troubleshooting. The temperature and thermostat control current graphs (used to determine static, loop, and critical gains, as well as dead time, and the time constant) are produced either manually (possible due to the slow changes in temperature), or on a PC using LOGIFOUR software (option) and PC interface.

OPTION INTERFACE & LOGIFOUR SOFTWARE



ref. LOGIFOUR

This PC interface – connected to the DB9 outlet – and software are used to record and draw graphs of temperature and heating control directly on PC. The connection to PC is made by USB.

ADDITIONAL FUNCTIONS

- Digital display of the two variables
- Cursor function
- Data transfer to plotter
- Zoom function

OPTION 4-20mA LOOP CALIBRATOR

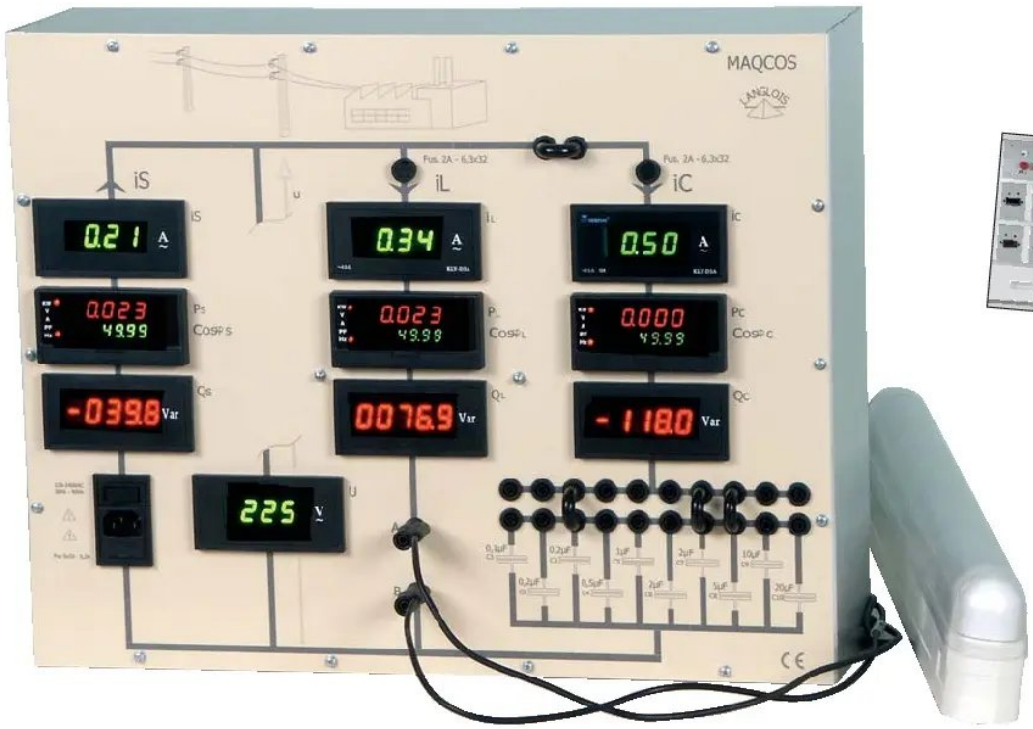


- Programming in % of the output span to supply a typical intensity like 4 – 8 – 12 – 16 or 20mA
- linear ramps, manual ramps, auto ramps
- Display: 5 digits
- Carry case, user's manual, external battery Pack (for 6x 1.5V AA batteries)
- Input for mains adapter DC 12V (not included)
- Dimensions : 88x168x26mm Weight : 330g

ref. VA100

RANGE	RESOLUTION	ACCURACY
4 - 20 mA	1µA	0.025% + 5µA
0 - 20mA	1µA	0.025% + 5µA
0 - 24mA	1µA	0.025% + 10µA
4 - 20V	1mV	0.05% + 5mV
0 - 20V	1mV	0.05% + 5mV
0 - 24V	1mV	0.05% + 10mV

Power factor correction system





ref. MAQCOS

EDUCATIONAL OBJECTIVES

- **Studying the power factor & Demonstrating the interest of power factor corrector for the cost of the power (kWh)**

USER'S MANUAL + 3 PRACTICAL WORKS

Proposed Practical Works

- studying of an industrial lighting installation from fluorescent tubes:
  Current of branches – power of the transport line with and without power factor correction – Active and reactive power in the branches – Fresnel diagrams
- Study of the pure inductance of a plant in working in order to determine the capacitor bank necessary
  Role of automatic compensation
- Study of resonance, max / min current

The MAQCOS model is designed for studying and rectifying power factors.
It consists of three branches:

- source branch, S, representing the energy supplied by the electricity mains (Network)
- plant branch, L , symbolizing a plant's energy consumption
- plant branch, C, including the padding condensers (integrated in the model and connected using jumper wires)

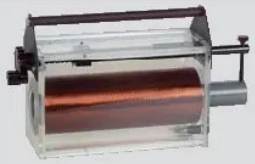
Each branch is equipped with the same measuring instruments:

- ammeter
- wattmeter, measuring active energy
- Power factor meter, measuring the power factor
- varmeter, measuring reactive energy

Students are thus able to compare four electrical variables in the three branches at the same time. They will observe (surprisingly?) that the source current value in the mains network branch may be much lower than the value in the plant branches. That source reactive energy is close to zero when power factor is around 1, whereas plant reactive energy is at maximum value. The model shows the impact of a power factor regulator on the cost per kWh transmitted and the resulting electricity bill.
MAQCOS is supplied with a fluorescent tube and IPXX connection.

TECHNICAL SPECIFICATIONS

- 13 displays: 3 x A , 3 x W , 3 x power factor , 3 x VAR , 1 x V
- 10 condensers: 0.1µF - 41µF
- Fuse protection
- Dimensions: 510 x 400 x 150 mm - Weight 8.2kg



ref. PSYJR

VARIABLE INDUCTANCE OPTION

Students have to find out the pure resistances and inductances of an installation, without interrupting its operation and with a view to deciding on the compensation condenser battery to activate, via a power factor regulator.

Study of the 3rd and 5th order harmonics



ref. HARMOVAR



EDUCATIONAL OBJECTIVES

- **Studying, putting into service, getting started and setting of the system**
- **Studying of harmonic filtering of orders 3 & 5 and the power factor**
- **Practical corrections of harmonics generated by a speed variator.**

USER'S MANUAL + PRACTICAL WORKS

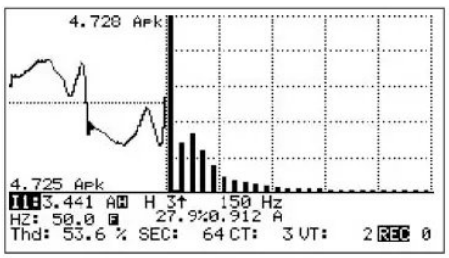
Unit on wheels consisting of passive filters used for studying the filtering of the third and fifth order harmonics (and, as a result, the increase in the power factor) during the use of a speed controller for an AC motor or apparatus with a diode-thyristor bridge with a capacitor filter. HARMOVAR uses the industrial methods employed for decreasing the harmonic pollution generated by U/f-type frequency converters or other pollutant receivers with third or fifth order harmonic currents (inverter, switch mode power supply and discharge lamps). The passive filters found there have been specially sized for optimal use and so that the LC-type filtering systems can be studied. They eliminate third or fifth order harmonic currents and show the effect of the third order harmonic current on the neutral.

- The network analyser ref. 6830 (option on page 259) records the harmonic graph
- A switch on the front of the unit is used for activating or deactivating the H3 and H5 filters.
- Jumpers and double channel terminals are used for electrical measurements (current, voltage and power), not only on the network side but also on the receiver side and in each filter.

FEATURES

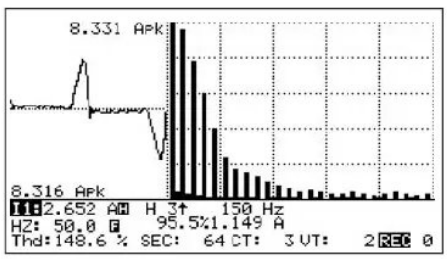
- Operation on 230V single-phase network or 230V/400V three-phase network
- Fitted with induction coils and capacitors which have been specially calculated for optimum filtering.
- Equipment sized under rated conditions for 1500W motor test bench controlled by frequency converter.
- Compatible with our frequency converters (pages 109-113)
- Supports the max. effective line current: 15A/H3 max: 10A/H5 max: 5A
- Wiring consisting of 4mm safety leads
- Supplied with instructions for use and tutorials
- Easy to move, thanks to its wheels
- Dimensions: 450 x 450mm Height: 530mm - Weight: 73kg





H3 filter activated

Examples of line current measurements taken with our 6830 network analyser (Page 259), on HARMOVAR associated with our ACVAR5 frequency converter (Page 109)



H3 filter deactivated

Power quality control





Inside view of the cabinet

EDUCATIONAL OBJECTIVES

- **Understanding and using of the method of Fourier series decomposition**
- **Studying of the power in presence of harmonics**
- **Understanding the compensation of the power factor by harmonics correction**
- **Studying the functioning of the dephasing dimmer**

USER'S MANUAL + PRACTICAL WORKS

Proposed Practical Works

- Making a power balance in presence of harmonic of currents and voltage
- Observing the disturbances caused by a dimmer
- Raising the power factor, by offsetting a portion of the reactive power and filtering of harmonic of order 3
- Observing network disruptions, caused by a dimmer
- Increasing the power factor by canceling the reactive power (with an anti-resonance circuit)
- Reading the evolution of the PLC program
- Producing a summary document as a record

Four 500W halogen lamps on a tripod are powered by a SCR power regulator which creates harmonic pollution and reactive power degrading the power factor.
A passive filter with an LC circuit is used for:

- minimising the third order harmonic pollution
- measuring the power factor by decreasing the reactive power
- observing the resonance phenomenon.

It is also possible to study the operation of the phase-shift of the SCR regulator.

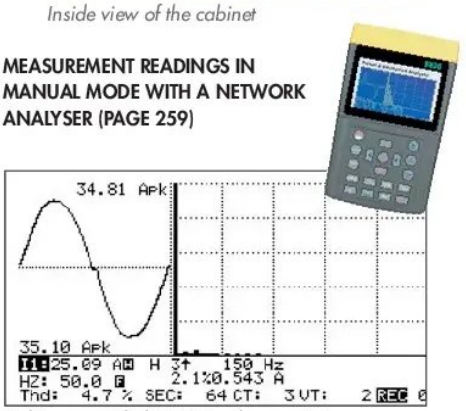
Principle : the industrial lighting of the panel – simulated by the four halogen lamps on a tripod – varies depending on the ambient sunlight, simulated by one low-voltage spotlight placed in the cabinet. When the current in the halogen lamps is significantly degraded, the filtering components are activated, either manually via the switches on the front or automatically by a PLC.

Auto mode: 3 sunlight levels are programmed. For weak sunlight the 3rd order current harmonic is high.
The PLC activates a passive filter which tends to decrease this harmonic.

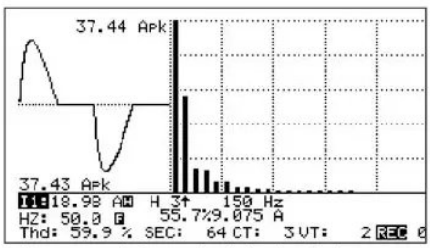
Manual Mode: a potentiometer is used for continually adjusting the sunlight level. Varying it makes it possible to:

- VIEW, with the help of the network analyser (ref. 6830), the effect of the dimmer on the level of the current harmonics;
- MEASURE THE power factor by inserting a capacitor induction coil. The network analyser reveals that the solution can be found in the induction coil.
- FILTER HARMONIC 3 by using a resonant filter which will reduce noticeably its current

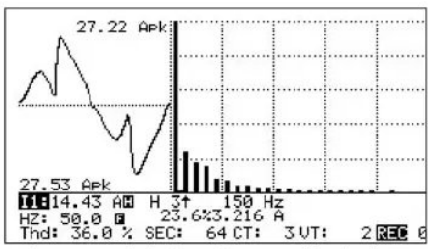
MEASUREMENT READINGS IN MANUAL MODE WITH A NETWORK ANALYSER (PAGE 259)



Lighting provided 100% (no harmonics)



Lighting provided 50% (high third order harmonic)



Lighting provided 50% with passive filter (reduction of third order harmonic)

THE FRONT PANEL COMPRISES

- Safety terminals for the measurements
  - voltages and currents supplied by the network
  - voltages and currents in the halogen lamps
  - voltages and currents in the filter components
- Switches for activating or deactivating the filter components
- An Automatic/Manual mode switch
- A lighting potentiometer

OTHER FEATURES

- Light column indicating that the mains power is on
- PLC Software, tutorial and instructions for use are supplied.
- Power supply: 230V 50Hz
- Cabinet: 820 x 400mm Height: 930mm
- Base with wheels, with laminated bench-top: 1200 x 750 x 970mm
- Overall dimensions: 1200 x 750mm Height: 1900mm - Weight: 128kg

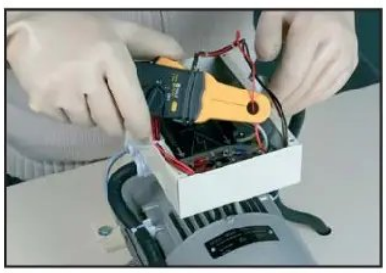
Fault finding in motor



View of the teacher side, door closed and open.



View of the student side, door closed



Faults can be looked for inside the student unit and in the motor terminal.

EDUCATIONAL OBJECTIVES

- **Simulating common failures encountered with a cage induction motor with brake: damage winding, cut, shorted to ground**
- **Diagnosis by performing measurements and safety tests**

TEACHING RESSOURCES + PRACTICAL WORKS

Practical works

- Cut Winding
- Winding in short circuit
- Winding to ground
- Damaged winding
- Cut brake control system

The user's manual has been made by teachers, allowing the quick implementation of the product and the creation of practical work in the spirit of fault finding in the industry.

ref. MOTODIAG

This complete kit on casters, comprising two back-to-back units and an asynchronous squirrel cage motor and a parking brake, can be used to simulate the faults which occur most frequently.
The principle and the instructions have been devised by teachers who want to propose a method for diagnosing faults.

PRINCIPLE

Faults are recreated when the teacher rotates a single switch. Students can take measurements or perform tests in complete safety, regardless of the fault type. Faults can be looked for inside the student unit and in the motor terminal. The unit is isolated from the mains by means of an insulation transformer. In addition, a TT earthing system is recreated on the secondary for safety reasons.
Therefore, even isolation faults are detected by a 30mA differential mechanism. All safety measures are implemented in order to protect individuals and equipment. (See the faults in the description of the teacher unit)

TEACHER SIDE UNIT

The teacher uses this lockable area to manage faults activated by key switches he/she knows, and to view all of the simulator's workings. Thanks to indicator light.
The position of the switches and indicator lights remain invisible to students.
The following faults are possible:

- 3 faults involving «damaged coil». A resistor is connected in series with a coil to change its impedance.
  One switch per phase, or three switches.
- 3 faults involving «power being cut in a coil». The power is cut in a coil. One switch per phase, or three switches.
- 3 faults involving a «short-circuit in a coil». The coils are short-circuited two at a time. One switch per possibility or three switches.
- 3 faults involving «coil earthing». A coil is earthed. One switch per phase, or three switches.
- 1 fault on the brake.
  The power in the parking brake is cut.



Unit from the teacher side, open door

STUDENT SIDE UNIT

This lockable area is used for starting up the simulator (if authorised by the teacher). The transparent door gives the unit a highly didactic appearance.
The student control panel is simpler than the teacher control panel, offering standard normal operation indications. This means that fault finding, testing and measurement are identical to reality in the field.

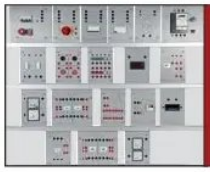


Unit from the student side, open door.

- Overall dims: 670 x 750 x 1180 mm. Weight: 136 kg
- Laminated bench-top: 670 x 750 mm
- 4 casters Ø 80 mm
- 3-phase Hypra socket on 5m mains cable

Motor start-up studies



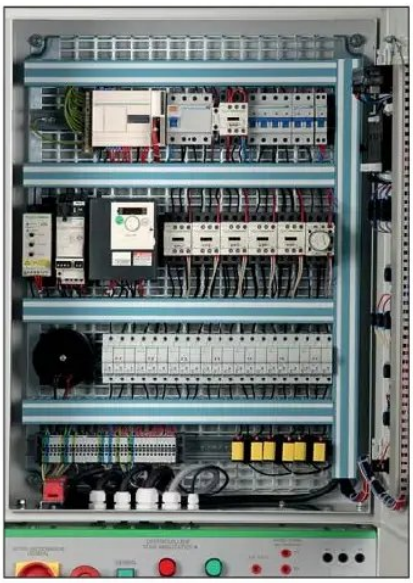


MODULAR SOLUTIONS PAGE 60

DEMARAC is supplied already wired tutorials, a diagram and technical instructions.
Safety leads Ø4mm supplied.

The unit can be supplied without the power unit. Please ask us for details.

Compatibility with motors with a power of up to 1500W, with powder brakes controlled 0-12VDC and all 1000RPM tachometer generators with 0-10V, 0-20V or 0-60V outputs.







FEATURES

- Three-phase 400V supply voltage.
- Protected by residual current device, circuit breakers and fuses.
- Set of lamps and push-buttons for viewing and controlling the required type of start-up.
- Multifunction measuring unit with digital display, which is wired at the start of the circuit measuring the phase-to-ground and composite voltages, the line currents, the active, reactive and apparent power, in total, the power factor, the THD (total harmonic distortion)
- Digital display showing the motor's rotation speed
- Starter/Decelerator Schneider®. All of the settings are adjusted using potentiometers on the front of the device (acceleration time, deceleration time and torque, etc.)
  Acceleration time: from 1.1 to 5 seconds
  Deceleration time: from 0 to 5 seconds
  Torque adjustment: from 20% to 65% of the breakaway torque of the direct motor
- Frequency converter Schneider® (ATV31 type). Possible adjustments:
  - Acceleration ramp
  - Quick stop/free wheel
  - Pre-selected speeds...
- 2 potentiometers at the front of the cabinet adjust the motor's rotation speed and the motor's load.
- Contactor/circuit breaker, wired upstream of the motor, protect against overloads and short-circuits. A display built into the unit indicates the current consumed by the motor and the thermal protection threshold.
- 300W 400V/690V – 1/0.75A asynchronous motor 1500rpm.
- 300W powder brake. 0-10V power supply
- 20V for 1000rpm tachometer generator

EDUCATIONAL OBJECTIVES

- **Understanding the different ways of starting an induction motor**

TEACHING RESSOURCES + PRACTICAL WORKS

Proposed Practical Works

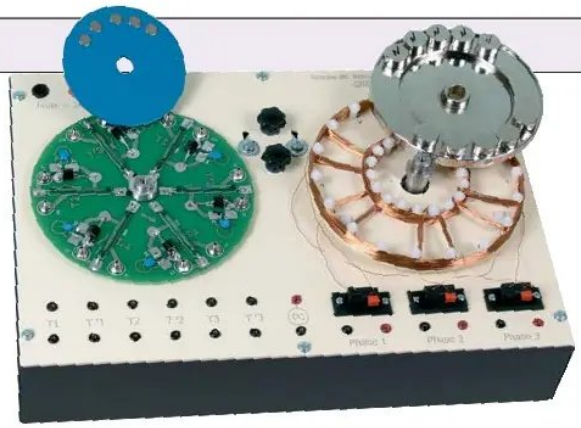
- Studying of the functioning star/delta starting, direct, by frequency converter, by soft starter
- Statement of engine characteristics, taking measurement of U and I
- Study of current transformers
- Modification of the acceleration and deceleration ramp of the frequency converter
- Setting the PC connection – PLC

ref. DEMARAC

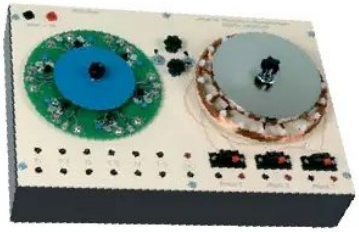
System for studying the start-up of asynchronous motors. For this completely stand-alone system, all you have to do is connect it to a 3-phase 400V mains socket. Selection of the required motor start-up type via push-buttons at the front of the electrical cabinet.
A 300W asynchronous motor, a powder brake and a tachometer generator are fixed directly onto the base with wheels. The power unit and the electrical cabinet are linked together using 4mm safety leads so that measurements can be taken using a hook-on ammeter or voltmeter, etc.
A key-operated switch at the front makes it possible to use the electrical cabinet when it is switched on with the door open. In this way, a qualified individual may take electrical measurements inside the cabinet.
A multifunction measuring unit displays the electrical quantities on the front door.
A digital tachometer shows the motor rotation speed.
A potentiometer at the front is used for varying the motor load.

- Dimensions:
  Base with wheels: 750 x 670mm
  Total height: 1970mm - Weight: 118kg

Automatically controlled synchronous machine







ref. MICROMAG

SCOPE OF SUPPLY

Supplied complete and in working order, together with:

- 1 wound stator
- 2 additional bare combs for winding
- enamelled wire dia. 0.5 mm
- 14 leads dia. 2 mm
- 1 full set of instructions with amended tutorials.

EDUCATIONAL OBJECTIVES

- ***Identifying the internal components of a auto-controlled synchronous machine (theoretical and practical)***
- ***Functioning in motor and in generator***
- ***Achieving the coils and set the switch***

TEACHING RESOURCES MADE BY THE SCHOOL ENSEEIHT

MICROMAG uses only dry contacts (with no complex electronic circuit) so that its operation is accessible to everyone. Using this model, students discover little by little the various components of an automatically controlled synchronous machine and, more generally, of a motor, via a theoretical and practical approach. The theoretical approach can be accessed at different study levels. At the secondary school level, the torque, the EMF and the number of turns in the winding are calculated simply by applying formulae. Engineering students will have the necessary mathematical knowledge to establish these relationships by using the laws of electromagnetism and applying them to the MICROMAG machine.
MICROMAG comes with a manual containing all of the basic laws which are necessary for understanding the tutorials. Wherever necessary, colour drawings are used to illustrate comments. Angular diagrams, timing diagrams and schematic diagrams are used to illustrate, step-by-step, the operation and/or stages of implementation.
In addition, the following is required for all tutorials:

- a 30V DC 2A power supply
- an oscilloscope with a memory function
- a dynamometer
- a gaussmeter – not essential – used for checking the current of the field
- enamelled wire for winding on the rotor(s) (supplied)

TUTORIALS : ALL LEVELS OF TRAINING

Because the motor is open, students can see the air gap, the orientation of the magnetic field, the direction of the current, the direction of rotation, the "active" winding part and the yoke.
MICROMAG can be used as a motor or a generator. By manually rotating the rotor, the machine will operate as a generator. Students read out from the oscilloscope the EMF on the two-phase terminals. This voltage indicates indirectly the torque ripple when the machine is operating as a motor.

EXAMPLE 1

For each of the three phases, students produce a static torque diagram (or EMF diagrams for each phase) based on the rotor's angular position. Students check the values experimentally by measuring torques using a dynamometer and the EMFs shown on the oscilloscope.
They plot torques in a graph and check them experimentally (EMFs respectively) when the two phases are connected in anti-series, or three phases in anti-series and parallel. They produce a phase power diagram based on the rotor's angular position.

EXAMPLE 2

The MICROMAG winding can include one, two or three notches per pole and per phase.
Students perform a theoretical calculation to determine the number of notches and turns of the winding required for a torque specified by the teacher. They then perform this winding on a comb using enamelled wire. Next, they check the obtained static torque in practice using a dynamometer.

EXAMPLE 3

Using these diagrams, students study the principle of the switch, which powers in sequence the phases of a synchronous machine, based on the rotor's angular position. This switch comprises a "position sensor" and "electrical switching".
This is performed in MICROMAG by means of a rotating disk, which is synchronous with the rotor and carries magnets. The magnets activate reed switches, in series with the windings. Students have to place the magnets onto an angular sector of 120° on the switch's disk in order to power two phases. It is also possible to perform a 180° control by using one anti-series phase and the other two in parallel. By manually activating the disk, students check on the ohmmeter whether the opening/closing sequence of the switches matches the previously established phase power diagram exactly, based on the rotor position.

EXAMPLE 4

Students place the windings that they have produced inside the motor. By manually powering one phase after another, they firstly check the connection. Next, they connect the switches of the switching system with the three phases of the stator. By overriding the rotor/switch drive system, students check that its rotation is driving the rotor in synchronism. Finally, by resetting the switch drive by the rotor, students test the machine in automatically controlled operating mode. Students read out from the oscilloscope the currents in two successive phases and their conduction diagram.

EXAMPLE 5

The aim of the tutorials is to draw students' attention to the various power supply strategies, with a view to establishing a rotating field. To this end, they have a document to complete, which shows the successive angular positions of the switch and the rotor, the status of the switches, the current in the windings and the angular diagrams for each phase. They must determine the shape of the torque for each phase, as well as the resulting torque.

TUTORIALS : UNIVERSITY & ENGINEERING SCHOOL

- Principle of axial motor
- Main μa and Ja parameters of a permanent magnet
- Recoil line
- Ampere-turns of a coil equivalent to a magnet.
- Hypotheses about the field and materials
- Magneto-static laws used
- Calculation of field B and comparison with the measurement
- Motor torque calculation Generator EMF calculation
- Relationship between EMF and torque
- Calculation of a number of turns for a given torque
- EMF waveform for a winding with one notch
- Torque wave form for a winding with one notch
- Calculation of the resistance of a phase. Practical check
- For each phase power supply strategy
  - establish the opening and closing sequences of the switches
  - wire the control circuit.
  - based on the waveforms of the torques for each phase, determine the waveform of the resulting torque and currents
  - determine the optimal polar arc

Electronic & electrical circuit lab



Electronic circuit lab equipped with a main unit and 11 experiment modules.
Each module permits to realize several practical work.
Supplied with leads and user's manual.



ref. PSY2101

MAIN UNIT PSY2101 INCLUDING

4 fixed DC supplies with output overload protection
+5V -5V +12V -12V / 300mA on each output.
Dual DC power supply with output overload protection
± 3V to ±18V / 1A continuously adjustable.
AC power supply with output overload protection
0-9VAC / 500mA
Signal generator
Sine, square and triangle 10Hz to 100kHz.
- 4 ranges 100Hz - 1 - 10 - 100 kHz
- Output impedance: 50Ω
- Output voltage : 9Vpp (with 50Ω load), 18Vpp (open loop).

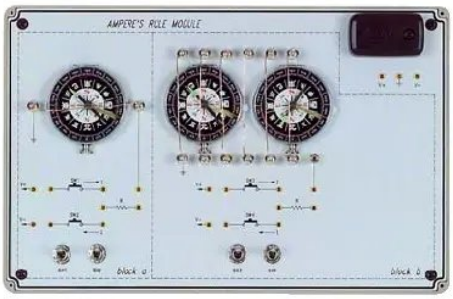
3 1/2 digit digital voltmeter and ammeter
Range: 2V - 200V - accuracy 0.3%
Range 200µA - 2A - accuracy 0.5%
Analogue voltmeter and ammeter
0 to 20V DC - 0 to 100mA DC - 0 to 1A DC
0 to 15 V AC - 0 to 100mA AC - 0 to 1A AC
Speaker 8Ω, 0.25W with driver circuit.
0.25W potentiometers : 1kΩ, 10kΩ, 100kΩ, 1MΩ.
Breadboard : 1680 tie-point breadboard on top panel can be easily put into and taken off (permutable).
Dim: 400 x 300 x 130 mm. Weight: 5.8kg

EDUCATIONAL OBJECTIVES

- **Studying by different modules of electrical & electronical circuits commonly encountered**

TEACHING RESSOURCES + PRACTICAL WORKS

11 EXPERIMENT MODULES
Designed with a 215 x 165 x 30mm solid body plastic housing, with electrical wiring printed on the front panel. An 8-bit DIP switch, located on the right top corner allows the user to simulate faults. Each analogue module is delivered with 2 experiment manuals.



STUDENT BOOK
(supplied with each module)
A theoretic part, definitions, terminology, characteristics curves, schemas, theoretical schemas, and wiring diagrams with link slots.
The functioning is explained in details.
An experimental part to guide step by step the student to do practical works: choice of measurement appliances, settings, measurement to do, blank tables to be filled, curves to be drawn.
Result commentaries, additional practical works

INSTRUCTOR BOOK
(supplied with each module)
Practical works presentation: purposes, manipulation interpretation
Switches position to simulate troubleshooting.
Detailed and pedagogical solutions of practical works
Calculation shown in extenso. Moreover, the instructor will find technical complements, which can be distributed to students without any modifications.



DC voltage and current measurement.
Ohm's law. Power in DC circuit.
Series – Parallel network and Kirchhoff's law.
Thevenin's and Norton's theorems.
Maximum power transfer theorem.
RC circuit and transient phenomena. AC voltage and current measurement. RC, RL, RLC circuits.
Transformer characteristics.
Series and parallel resonant circuits. LC filter.
ref. ELEC1

Magnetic devices. Magnetic field.
ref. ELEC2

Drawing magnetic curves. Magnetic field strength.
Lentz's and Faraday's laws.
ref. ELEC3

Ampere's rule
ref. ELEC4

Fleming's rule
ref. ELEC5

Self induction. Mutual induction.
Magnetic flux detection by sensor and amplifier
ref. ELEC6

Diode characteristics.
Rectifier circuit half and full wave.
Filter circuit.
LC filters and RC filters in π. Zener diode characteristics. LED characteristics. Transistor characteristics NPN PNP Vce IB. Multimeter functions.
FET characteristics.
Triac UJT characteristics.
ref. ELEC7

One stage transistor amplifier.
AB class Push-pull - Voltage regulator - SCR power dimmer - Two stages amplifier - Relay characteristics - Touch controller switch.
ref. ELEC8

Two stages amplifiers by transformers.
Coupling - Push-pull output on speaker
Wheatstone bridge.
ref. ELEC9

Photoresistor characteristics - Using a switch.
Thermistor characteristics. Wheatstone using.
Thyristor drived by thermistor.
3 stages amplifiers controled by microphone.
ref. ELEC10

Blocking oscillator.
Blocking oscillator with speaker output.
Astable multivibrator. LC resonant circuit.
Electronic birdcall circuit
ref. ELEC11

Digital logic lab

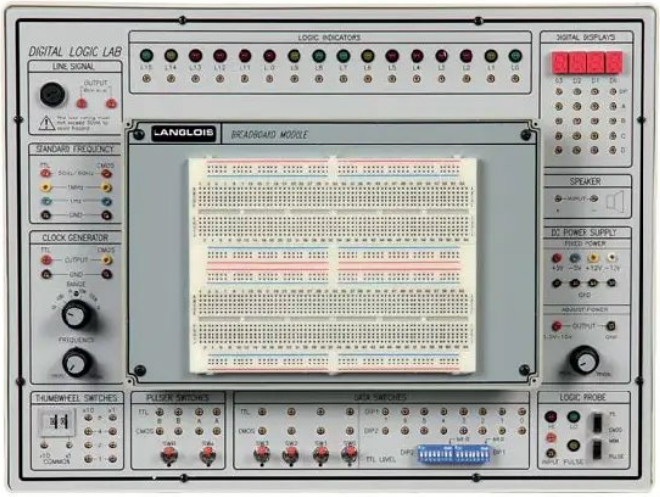


Digital logic lab equipped with a main unit and 13 experiment modules. Each module permits to realize several practical works. Supplied with leads and user's manual.

EDUCATIONAL OBJECTIVES

- **Studying by different modules of logic circuits commonly encountered**

TEACHING RESSOURCES + PRACTICAL WORKS



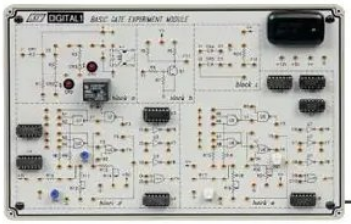
ref. PSY3101

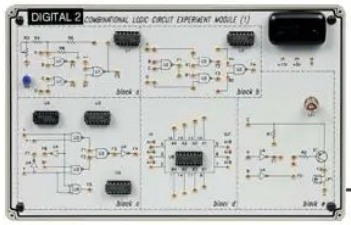
PSY3101 MAIN UNIT WITH:

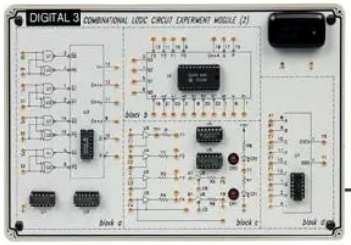
4 fixed DC supplies with output overload protection: +5V -5V +12V -12V / 300mA on each output.
1 adjustable DC power supply with output overload protection: from 1.5 to 15V / 500mA
3 fixed frequencies: 1Hz, 50Hz, 1MHz 0.01%, fanout : 10 TTL load
1 variable signal generator
6 ranges from 1Hz to 1MHz - Fanout: 10 TTL or CMOS load.
2 x 8 outputs, edge 0 ⌐ 1 TTL level
4 outputs: edge 0 ⌐ 1 TTL or CMOS level each with debounce circuit
1 fixed AC output - 6Vrms with overload protection
Thumbwheel switch, 2 digit, BCD code output, common point input.
16 x LED indicating high and low logic state
4 sets of independent 7-segment LED display, with BCD.
3 x LED functioning as a logic probe.
1 speaker with driver circuit.
Dimensions : 400 x 300 x 130 mm. Weight : 5.8kg

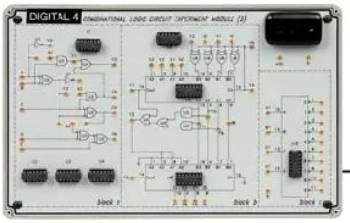
ACCESSORIES SUPPLIED

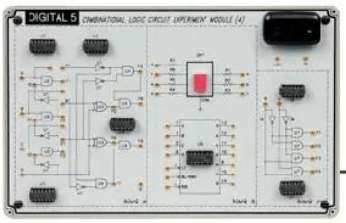
- 1680 tie-point breadboard which can be easily put into and taken off (permutable with the modules).
- jumpers, leads

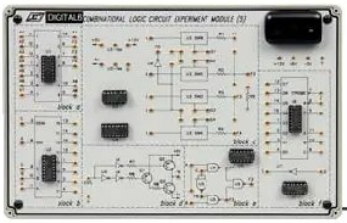














13 EXPERIMENT MODULES.
Designed with a 215 x 165 x 30mm solid body plastic housing, with electrical wiring printed on the front panel. An 8-bit DIP switch, located on the right top corner allows the user to simulate faults. Solution for faults are listed in the experiment manual for user's reference. Comprehensive experiment and instructor's manual are supplied with modules and contains theoretical drawings, wiring drawings. The experiment part has input signals, location of test points, tables to be filled up, comments and exercises.

Logic gates circuits, transistors, TTL and CMOS logic circuits. TTL/CMOS I/O voltage and current measurement experiments. Basic logic gate transmission delay measurement. AND, OR, NAND, NOR, XOR gate characteristics. Interface between TTL/CMOS and CMOS/TTL.

ref. DIGITAL1

NOR NAND XOR gate circuits, reverser, comparator circuit experiments, Schmitt trigger, open collector gate circuits.

ref. DIGITAL2

Three-state gate circuit. Adder.
Arithmetic logic unit.
Bit parity generator.

ref. DIGITAL3

Adder. Subtractor. 2 and 3 inputs reverser.
BCD code adder circuit.
Bit parity generator with XOR gate.
10 to 4 bit decoder with TTL IC.

ref. DIGITAL4

4 to 2 bit encoder. 4 to 2 bit decoder.
Decoder circuit experiments
(decoding 7-segment display with BCD code).

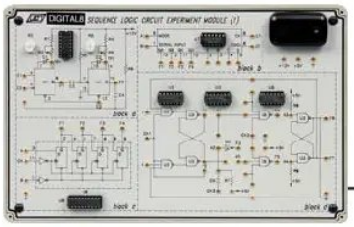
ref. DIGITAL5

10 to 4 bit encoder.
Multiplexer circuit experiments.
Digitally controlled analog
Multiplexer/demultiplexer circuits.
Bi-directional transmission with CMOS IC.

ref. DIGITAL6

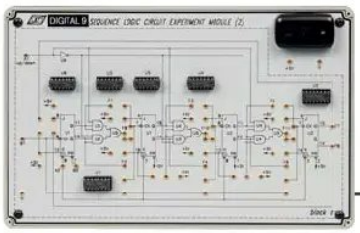
Oscillator circuit with basic logic gates, with Schmitt trigger. Voltage controlled oscillator circuit, with 555 trigger. Monostable multivibrator and synchronous astable multivibrator.

ref. DIGITAL7



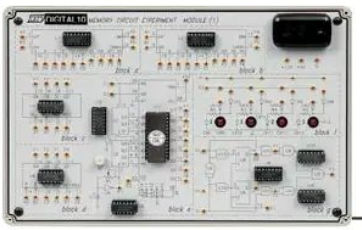
Variable duty ratio oscillator. RS, T, D, JK flip flop. Preset left/right shift register circuit.
Noise elimination circuit.

ref. DIGITAL8



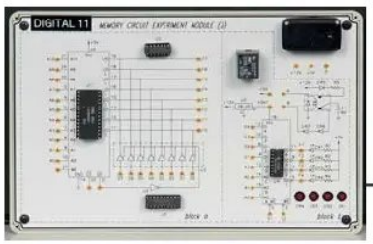
JK flip flop: asynchronous/synchronous, binaries up/down bi-directional counters.
Ring counter circuit, Johnson's counter circuit.

ref. DIGITAL9



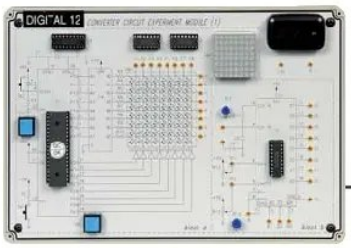
JK flip flop: asynchronous counter:
decimal, divide by N, preset synchronous binary/decimal.
Constructing ROM memories with diodes,
RAM memories with D flip flop. Constructing EPROM

ref. DIGITAL10



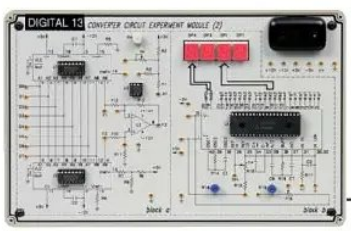
Constructing 64 bits RAM circuit.
Constructing Electronic EPROM circuit

ref. DIGITAL11



Construction dynamic scanning counter with single chip microprocessor. 8- bit analog/digital converter circuit.

ref. DIGITAL12



Digital/analog converter circuit, unipolar and bipolar.
3 digits analog/digital converter circuit.

ref. DIGITAL13

Analog circuit lab



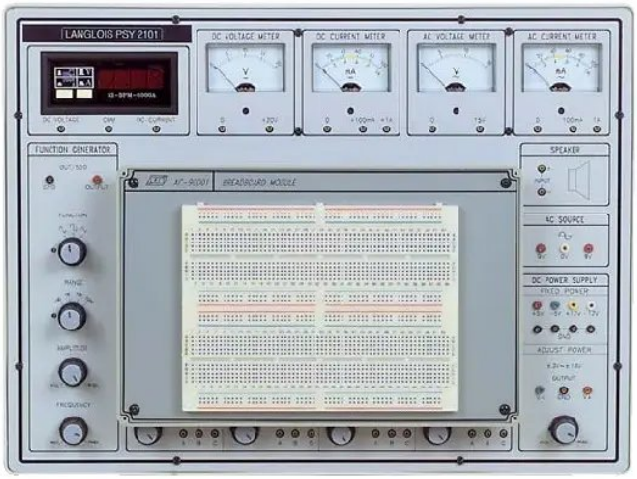
Analog circuit lab equipped with a main unit and 17 experiment modules. Each module permits to realize several practical works. Supplied with leads and user's manual.

17 EXPERIMENT MODULES.
Designed with a 215 x 165 x 30mm solid body plastic housing, with electrical wiring printed on the front panel. An 8-bit DIP switch, located on the right top corner allows the user to simulate faults. Each analogue module is delivered with 2 experiment manuals.

EDUCATIONAL OBJECTIVES

- **Studying by different modules of analog circuits commonly encountered**

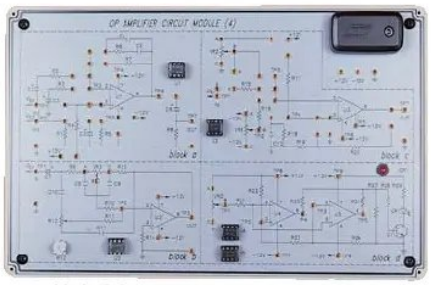
TEACHING RESSOURCES + PRACTICAL WORKS



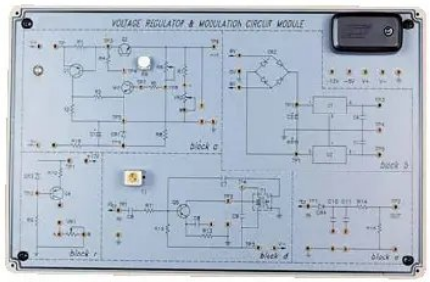
ref. PSY2101

MAIN UNIT PSY2101 WITH :
4 fixed DC supplies with output overload protection
+5V -5V +12V -12V / 300mA on each output.
Dual DC power supply with output overload protection
± 3V, ±18V / 1A continuously adjustable.
2 AC power supplies with output overload protection 0-9VAC / 500mA
Signal generator
Sine, square and triangle 10Hz to 100kHz.
- 4 ranges 100Hz - 1 - 10 - 100 kHz
- Output impedance: 50Ω
- Output voltage : 9Vpp (with 50Ω load), 18Vpp (open loop).

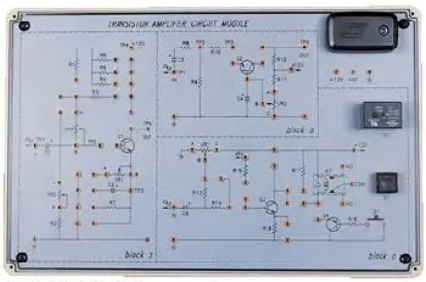
3 1/2 digit digital voltmeter/ammeter
Range: 2V - 200V - accuracy 0.3%
Range 200µA - 2A - accuracy 0.5%
Analogue voltmeter/ammeter
0 to 20V DC - 0 to 100mA DC - 0 to 1A DC
0 to 15 V AC - 0 to 100mA AC - 0 to 1A AC
Speaker 8Ω, 0.25W with driver circuit.
0.25W potentiometers : 1kΩ, 10kΩ, 100kΩ, 1MΩ.
Breadboard: 1680 tie-point breadboard wich can be easily put into and taken off (permutable with the modules).
Dimensions : 400 x 300 x 130 mm. Weight : 5.8kg



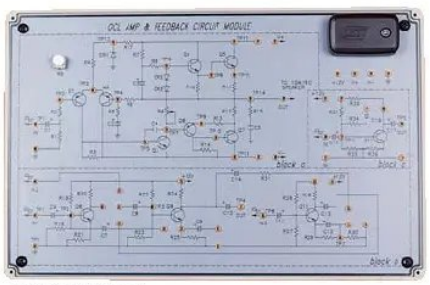
REF. ANALOG 1



REF. ANALOG 2



REF. ANALOG 3



REF. ANALOG 4

Silicium, Germanium, Zener, Photodiode and LED diode characteristics experiments.
Clipping and clamping circuits
ref. ANALOG1

Half wave and full wave rectifier circuit.
Bridge rectifier circuit.
Dual power rectifier circuit.
Voltage doubler & multiplier circuit.
RC direct current charge & discharge circuit.
Differentiator, integrator.
RL charge & discharge circuit.
NPN and PNP circuit. IE IB IC measurement
ref. ANALOG2

Transistor amplification circuit: common emitter circuit, common base, common collector.
Automatic and voltage divider bias point.
Feedback collector/base. Switching.
Switching type transistor circuit. Relay control.
ref. ANALOG3

Darlington's circuit.
Photoelectric control circuit.
Delay control circuit.FET measurement of IDSS, IGS, Vp.
MOSFET measurement of IDSS, Vp - FET and MOSFET amplifiers:common source, common drain.
Schemes.
Automatic and voltage divider bias point.
ref. ANALOG4

Two stage amplificator circuit, RC coupled.
Direct coupled amplification circuit.
Transformer coupled amplification circuit.
Push-pull amplification circuit with impedance adapter transformer.
ref. ANALOG5

Condenser coupling multi-stage amplification circuit.
OTL amplification circuit.
OCL amplification circuit.
IC amplification circuit.
ref. ANALOG6

Multistage amplifiers with direct coupling.
Transistor negative feedback circuit.
Serial voltage negative feedback circuit.
Parallel voltage negative feedback circuit.
Serial current negative feedback circuit.
Parallel current negative feedback circuit.
ref. ANALOG7

Direct feedback circuits. Low frequency sine wave oscillating circuit (RC phase-shifting and Wien bridge oscillator circuit). High frequency sine wave oscillating circuit (Hartley oscillator circuit). Astable oscillating circuit with fixed or ajustable frequency and output on transformer.
ref. ANALOG8

Sine wave oscillating circuit (Colpitts).
Crystal.
Square generator with fixed variable frequency, flip-flop, timers, divider by Z.
Bistable, Intermittent oscillating circuit.
ref. ANALOG9

Schmitt's trigger circuit. Sawtooth wave oscillating circuit linear ramp generator. Regulated voltage/current circuit with zener diode/transistor.
Regulated adjustable voltage. Current limiting.
ref. ANALOG10

Regulated voltage circuit with IC. Constant current circuit. Amplitude modulation circuit (AM).
ref. ANALOG11

Frequency modulation circuit (FM).
Transistor differential amplification.
Characteristics of OP amplifiers: input/output impedance, bandwidth, slew rate, offset voltage measurements for direct and inverse amplifier.
ref. ANALOG12

OP amplifier circuits: inverse and non inverse amplification, voltage follower, Difference amplification, Sum amplification, clipping circuit, constant voltage and current circuit, integrator circuit.
ref. ANALOG13

OP amplifier circuits: logarithm amplification, exponential amplification circuit, peak value detection circuit, precision clipping circuit, voltage regulator circuit, sampling/hold circuits.
ref. ANALOG14

OP amplifier : instrument amplification circuit, high pass, low pass and band pass amplification circuit.
ref. ANALOG15

Tone controller circuit. RIAA amplifier circuit.
Single power bias amplification circuit.
Positive feedback OP amplifier: comparator, Schmitt trigger, window type comparator.
ref. ANALOG16

Operational amplifier oscillators:
Monostable and astable multivibrator: square wave generator.
Sine wave: oscillation circuit:
RC oscillator, Wien oscillator.
ref. ANALOG17

STUDENT BOOK

(supplied with each module)

- A theoretic part, definitions, terminology, characteristics curves, schemas, theoretical schemas, and wiring diagrams with link slots. The functioning is explained in details.
- An experimental part to guide step by step the student to do practical works: choice of measurement appliances, settings, measurement to do, blank tables to be filled, curves to be drawn.
- Result commentaries, additional practical works.

INSTRUCTOR BOOK

(supplied with each module)

- Practical works presentation: purposes, manipulation interpretation.
- Switches position to simulate troubleshooting.
- Detailed and pedagogical solutions of practical works.
- Calculation shown in extenso. Moreover, the instructor will find technical complements, which can be distributed to students without any modifications.

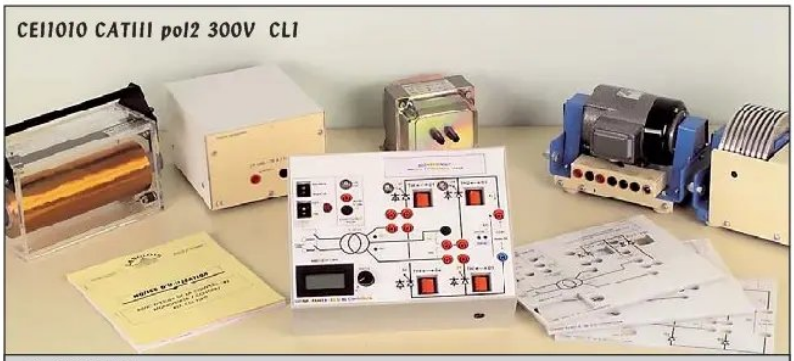


Conversion test benches

RECTIFIER

SINGLE-PHASE / DIRECT CURRENT CONVERSION TEST BENCH

CO-1000 IS SUPPLIED WITH 4 MOVEABLE FRONT PANELS, INSTRUCTION BOOK INCLUDED TUTORIALS



ref. CO-1000

ACCESSORIES FOR CO-1000

Ref. ECO1/2 10Ω	Rheostat ECO1/2 10Ω (P.124)
Ref. SH90/24	Motor **90W** (P.88)
Ref. FR90	Powder brake FR90 (P.89)
Ref. PSYJR	Variable coil (P.131)
Ref. CO-104	Smoothing coil 40mH - 3A
	→ Advised option
Ref. CO-105	Smoothing coil 20mH - 3A
Ref. CO-108	Smoothing coil 60mH - 3A
Ref. CO-106	12V/24V Battery

EDUCATIONAL OBJECTIVES

- **Studying of the controlled, non-controlled and mixed rectification of the single-phase**

TEACHING RESSOURCES + PRACTICAL WORKS

All types of practical tests on the rectification of controlled and uncontrolled single-phase current can be carried out with this single box, which comprises built-in supplies (including a power supply), a probe for measuring the AC+DC current output, an ignition angle display, and 4 switches to change from the diode assembly to the rectifier assembly. The test bench is supplied with 4 movable front panels. Each one is a specific mask, with holes for the indicator lights, input/output terminals, and switches required for a particular set of tests. Each panel is printed with the instructions for just those tests. None of the components are directly accessible to avoid short circuits. Rectifiers and diodes are specially mounted to facilitate maintenance and are visible behind a movable, transparent cover. The 30V x 6A output is capable of running a powerful motor (electrical power: 150W, mechanical power: 90W) connected to a brake, making it possible to observe the influence of braking on the conduction angle.
The instruction book supplied with the test bench explains the tests listed below for each front panel.

RECTIFIER CONTROL

The ignition angle is controlled by a potentiometer and displayed. The control pulses, applied to the trigger through separation pulse transformers, are output via BNC to the oscilloscope.

CURRENT PROBE

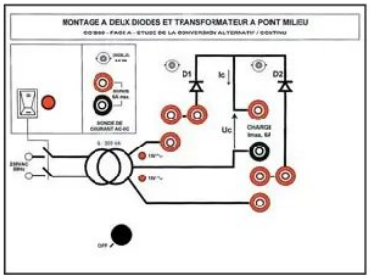
This probe consists of a Hall-effect sensor and is connected in series, like an ammeter. The current image is a voltage of 0.5 V/A available via BNC .

INDICATOR LIGHTS

LEDs indicate which rectifiers and diodes have been selected, which transformer windings are connected to the power supply, and the rectifier / inverter mode.

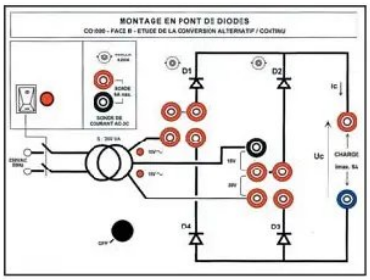
BUILT IN 200VA POWER SUPPLY

2 mid-point reactors: 2 x 15 Vrms
Power supply: 230VAC 50Hz 250VA
Dimensions: 670x370x170mm. Weight: 5.2kg



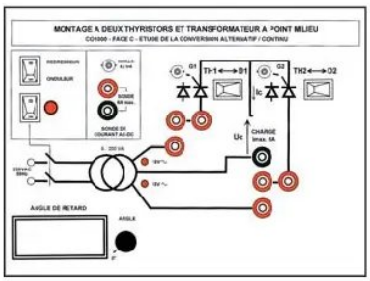
PANEL A: ASSEMBLY WITH TWO DIODES AND MID-POINT TRANSFORMER

Return to single half-wave rectification and switching to double half-wave rectification by simply adding jumper straps.
Experiment 1 Power flow on resistive load (R)
Experiment 2 Power flow on inductive load (R,L)



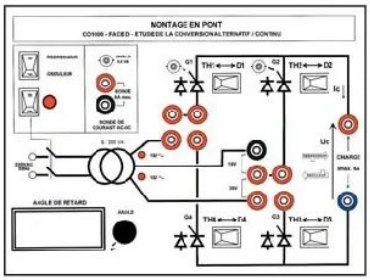
PANEL B: DIODE BRIDGE CIRCUIT ASSEMBLY

Experiment 1 Power flow on resistive load (R)
Experiment 2 Power flow on inductive load (R,L)
Experiment 3 Power flow on active load (E,R)
Experiment 4 Power flow on active inductive load (E,R,L)
Experiment 5 Application to a DC motor power supply
Any of these 4 diodes can be replaced by a rectifier at any time, simply by throwing the appropriate switch. This facilitates comparisons between all-diode, all-rectifier, symmetrical mixed, and asymmetrical mixed assemblies.



PANEL C: ASSEMBLY WITH TWO RECTIFIERS AND MID-POINT TRANSFORMER

Controlled single- and double-wave rectification.
The tests on panel A may be used again for comparison.



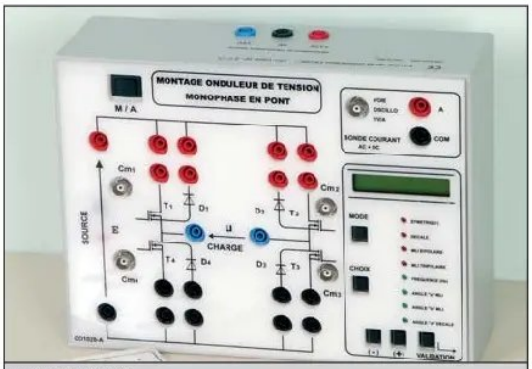
PANEL D: BRIDGE CIRCUIT ASSEMBLY (ALL RECTIFIERS OR MIXED)

Comparative studies of diode / rectifier / mixed assemblies
Experiment 1 Power flow on active inductive load (E, R, L)
Operates as a static convertor
Operates as a grid-interactive inverter
Experiment 2 Application to a DC motor power supply (DCM)
Mixed bridge-circuit assembly
Experiment 3 Power flow on active inductive load (E, R, L)
Experiment 4 Application to a DC motor power supply (DCM)

INVERTER

SINGLE-PHASE CONTINUOUS/ALTERNATING CURRENT CONVERSION TEST BENCH

CO-1000 IS SUPPLIED WITH 2 MOVEABLE FRONT PANELS, INSTRUCTION BOOK INCLUDED TUTORIALS



ref. CO-1020

ACCESSORIES FOR CO-1020

Ref. ECO1/2 10Ω	Rheostat ECO1/2 10Ω (P.124)
Ref. ECO1/2 15Ω	Rheostat ECO1/2 15Ω (P.124)
Ref. ECO1/2 22Ω	Rheostat ECO1/2 22Ω (P.124)
Ref. ECO1/2 33Ω	Rheostat ECO1/2 33Ω (P.124)

for an optimal use, low resistance loads are better

Ref. PSYJR	Variable coil (P.131)
Ref. CO-106	12V/24V Battery
Ref. CO-107	Single-phase transformer 12V - 230V wth its lamp 230V - 40W
Ref. CO-109	load made up of a 40W machine 12V/230V
Ref. CO-122	Capacitor 22µF

EDUCATIONAL OBJECTIVES

- ***Studying of a 24V single-phase inverter, in half bridge and in bridge***

TEACHING RESSOURCES + PRACTICAL WORKS

This bench is suitable for all types of tests on independent, single-phase static voltage converters. It has 2 detachable front panels, with holes forming a mask that reveals the layout diagram for the specific type of test to be carried out.
The choice of layout (consisting of MOS power transistors) is thus determined by the front panel slotted into the casing:
PANEL A: "Single-phase, static, half-bridge voltage converter (two switches)"
PANEL B: "Single-phase, static, bridge voltage converter (four switches)"
The system includes a control panel offering the following options: (SYMMETRICAL, OFF-SET, BIPOLAR PWM, and THREE-POLE PWM), a display (frequency and offset angles), indicator lights (control mode selection and adjustment parameters), and an AC+DC current probe for measuring and displaying all the current in the layout. It runs both on batteries and the laboratory continuous power supply and has reinforced safety systems (for reversed polarity and shutdown of unused transistors). The output (IMAX = 3A) is sufficient to run a motor of significant power and, in particular, to study the U/F control.

TRANSISTOR CONTROL PANEL

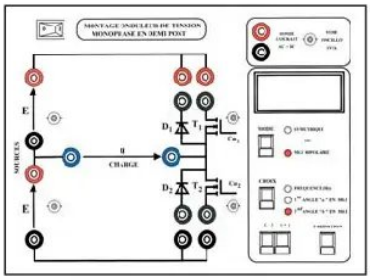
This flexible, easy-to-use control panel is entirely managed by micro-controller and is capable of all variable frequency controls.
CONTROL MODE
The control mode is selected by pressing the "MODE" key:
- SYMMETRICAL
- OFFSET
- BIPOLAR PWM
- THREE-POLE PWM

A LED indicates which mode has been selected.
SELECTING ADJUSTMENT PARAMETERS:
Adjustment parameters are selected by pressing the "SELECT" key:
- FREQUENCY (Hz)
- OFFSET ANGLE
- 1st ANGLE "a" IN PWM
- 2nd ANGLE "b" IN PWM

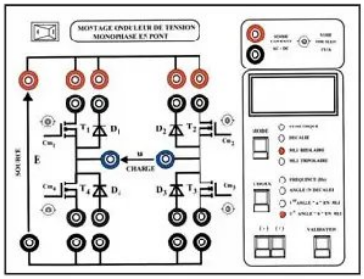
A LED indicates which parameter has been selected. In PWM mode, the signal pattern is determined by the size of the angle (a, b) selected (which amounts to setting the pulse width). Depending on the values of these angles, it is possible to eliminate the 3rd- and 5th-rank harmonics to obtain a spectrum with fewer harmonics, closer to the sinusoid curve.

CURRENT PROBE

This probe measures AC, DC, and AC + DC current and is connected in series, like an ammeter, in the circuit to be measured. A BNC terminal displays an image of the current intensity at a voltage of 1 V/A.



PANEL: A "SINGLE-PHASE, STATIC, HALF-BRIDGE VOLTAGE CONVERTER (2 SWITCHES)"
The diode and power transistor operate by cross-barring
Presentation of symmetrical control
Presentation of the Pulse-Width Modulation control: Bipolar PWM wave
Experiment N°1: Throughput over resistive load (R)
Experiment N°2: Throughput over inductive load (R, L)
Experiment N°3: Throughput over resonant load (R, L, C)

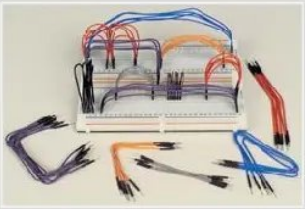


PANEL B "SINGLE-PHASE, STATIC, BRIDGE VOLTAGE CONVERTER (4 SWITCHES)"
Presentation of offset control
Presentation of the Pulse-Width Modulation control: Three-pole PWM wave
Experiment N°1: Throughput over resistive load (R)
Experiment N°2: Throughput over inductive load (R, L)
Experiment N°3: Throughput over resonant load (R, L, C)
Application to induction heating
Experiment N°4: Application to speed variations in an alternating current motor
Experiment N°5: Application to a backup power supply
Using the "C0-1000 test bench as a charger.

Analog test unit



ref. AT106



MICRO-LEADS
NOT SUPPLIED
SEE PAGE 226

AT106 is a test bed for analog circuits.
Easy maintenance: common circuits and diagrams provided.
Dimensions: 340 x 265 x 130mm Weight 3.7kg. Mains 230V.

1 BOARD 1896 contacts with spacing 2.54, 1,280 bearing the components, 400 for supply distribution.

4 SUPPLIES short circuit protected.

SUPPLY	+5V/1A	0 to +15V/0,3A	0 to -15V/0,3A	-5V/100mA	
REGULATION	<100mV <50mV	<0,05% of V <30mV	<0,05% of V <30mV	Load variation 100% Mains variation 15%	<100mV <50mV

1 FUNCTION GENERATOR Sinusoidal, Square, Triangular, Ranges 0.1Hz à 200 kHz, fine adjustment vernier, Sinusoidal adjustable between 0 and 5Vcc, Triangular 5Vcc, Square 5Vcc, TTL 5V

1 VOLTMETER 0 to 30V analogue, impedance 320 kΩ

1 UNIVERSAL COUNTER 8 DIGITS
Frequencymeter 1Hz to 100MHz. Periodmètre 0,01µs to 99 999 999µs.
TTL and CMOS Internal / External Input

1 MICRO-AMMETER 0 to 100 µA analogue, impedance 1kΩ

1 LOUDSPEAKER

4 ADAPTERS
These adapters allow the unit to be connected to an external electronic unit.
- 2 banana inputs of 4mm diameter
- 2 inputs of female BNC connectors

3 SWITCHES
2 to 2 positions and 1 to 3 positions

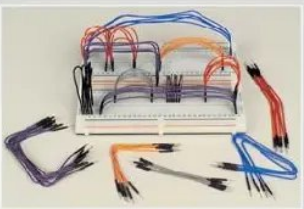
6 positions rotary switche

2 POTENTIOMETERS 0 to 1kΩ - 0 to 100kΩ

Logic test unit



ref. AT104



MICRO-LEADS
NOT SUPPLIED
SEE PAGE 226

AT104 is a test bed intended for learning about logic circuits. Several of the commonest circuits are integrated into the test bed. They are fed and their inputs/outputs are clearly indicated on short summaries. There are: 3 inverters - 3 exclusive OR - 6 AND - 6 OR - 6 NAND - 6 NOR.
A manual supplied with the test bed shows how to make: an RS, D bistable, a comparison unit, a trigger, a counter etc.
Maintenance: the cover is removable, the standard circuits are easily replaced.
Dimensions: 340 x 265 x 130mm Weight 4.7kg. Mains 230V.

1 INTERCONNECTION BREADBOARD with 1580 contacts, 2 fields of 640 contacts bearing the components, 3 fields of 100 feed distribution contacts

4 SUPPLIES immediately next to the board, short circuit protected.

SUPPLY	+5V/1A	0 to +15V/0,5A	0 to -15V/0,5A	-5V/0,5A	
REGULATION	<100mV <50mV	<150mV <150mV	<150mV <150mV	<30mV <25mV	Load variation 100% Mains variation 15%

3 CLOCKS at fixed frequencies of 1Hz - 10Hz - 100Hz square signal 0 to 5V
Short circuit protected.

1 SHORT CIRCUIT INDICATOR lights up when a supply or clock has short circuited.

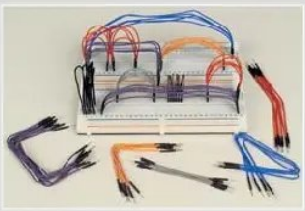
4 SWITCHES delivering between 0 and +5V.

8 LED DISPLAYS marked 0 to 7

Electronic test unit



ref. AT102



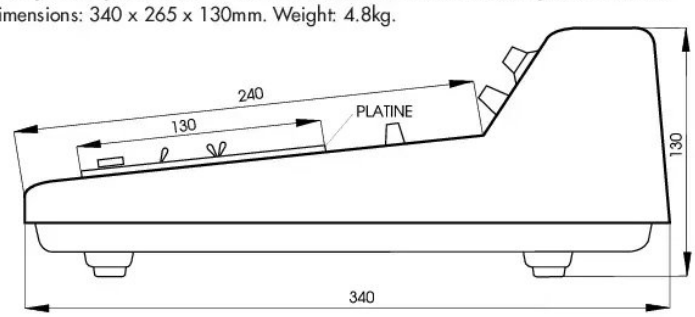
MICRO-LEADS NOT SUPPLIED
SEE PAGE 226

ELEMENT OF REPLACEMENT

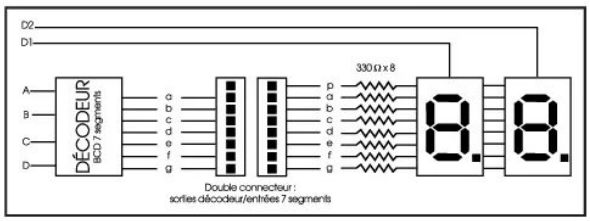
The central board.
Identical for the 3 benches (AT102 - AT104 - AT106).
For receptacle 173 x 120mm.

ref. PR6

Designed for installation and rapid testing of prototypes and for practical experiments with analog and digital circuits. The contact board, which is hardwearing, is removable.
Dimensions: 340 x 265 x 130mm. Weight: 4.8kg.



The components are inserted on the contact board with the normal pitch spacing of 2.54mm.
There are 1896 contact points divided into:
12 contact points of supply lines
256 separate sets of 5 contact points receiving components and interconnetions.



4 SUPPLIES
Positioned in view immediately on the face, they are protected against short circuits
- Variable DC from 0 to +15V 300mA (ripple 30mV)
- Variable DC from 0 to -15V 300mA (ripple 30mV)
- Fixed DC +5V, 1A (100mV ripple)
- Fixed DC -5V, 100mA (30mV ripple)

1 FUNCTION GENERATOR
From 0.1Hz to 200kHz in 6 ranges varied with a control dial. The output is protected against short circuits. - Sinewave, level variable from 0 to 10V peak-to-peak - Triangular wave, level variable from 0 to 5V peak-to-peak - Square wave, level variable from 0 to 15V peak-to-peak

2 DIGITAL DISPLAYS
7 segments and decimal point display. Switched by the inputs of D1 & D2.
- Direct control of each segment, a b c d e f
- Access to the input of the ABCD decoder IC

1 DC DIGITAL VOLTMETER
3 1/2 digits with a maximum reading of 2,000.
Ranges 200mV-2-20-200VDC. Input impedance 10MΩ

1 UNIVERSAL COUNTER 8 DIGITS
Frequencymeter 1 Hz to 100MHz. Periodmeter 99,999 999µs.
TTL & CMOS Internal/External Input

8 DIODE DISPLAY
Status from 0 to 7 with lamps to view logic levels.

10 LOGIC SWITCHES
- 8 with 2 positions giving a voltage a either 0 or 5V
- 2 with 3 positions giving voltages of -5V 0V +5V

2 LOGIC PUSHBUTTONS
2 anti-bounce outputs A and $\overline{A}$ (respectively B and $\overline{B}$) supplying a level between 0 and 5V on the side of the unit.

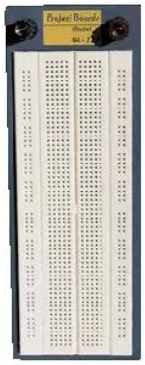
4 ADAPTERS
These adapters allow the unit to be connected to an external electronic unit.
- 2 banana inputs of 4mm diameter
- 2 inputs of female BNC connectors

Electronic test boards

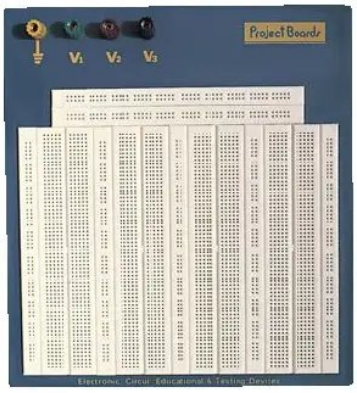
Contact boards for the design and rapid testing of circuits. The double reed contacts of these boards are in nickel plated bronze. They are pitched 1 inch/2.54 mm apart in an insulating ABS base. Contacts grouped in strips of 5 or 10, can be fully dismantled from the rear. Use components or leads with maximum diameter 0.6mm.



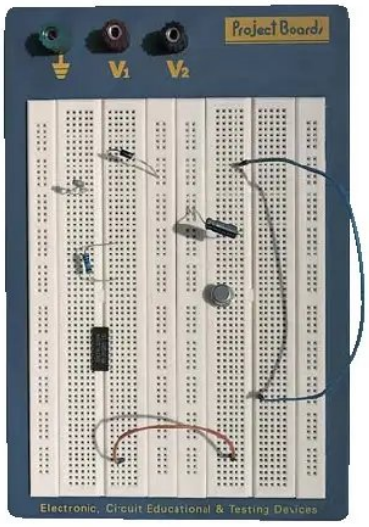
REF. PAL2420



REF. GL12



REF. GL48



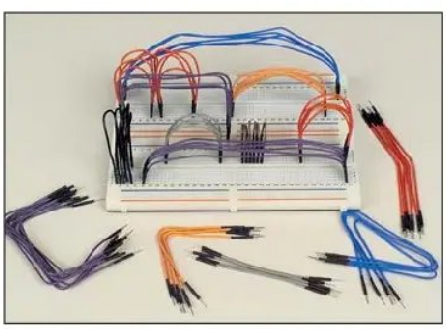
REF. GL24

Model with integrated power supply protected from short-circuits (PAL2420): 0 to +15V/500mA continuously variable ; 0 to -15V/500mA continuously variable ; +5V/1A fixed

Ref.	PAL2420	PAL2420S*	GL12	GL12S*	GL24	GL24S*	GL48	GL48S*
Nb of contacts	2420	2420	840	840	1680	1680	3260	3260
Dimensions mm	245 x 195	245 x 195	200 x 75	200 x 75	225 x 150	2250 x 150	260 x 240	260 x 240

** With safety sockets*

Micro-leads



Storage box for micro-leads

8 racks. Transparent plastic cover.
Total capacity of the box:
160 micro-leads.
Dimensions : 230 x 160 x 30mm.
Weight : 180g

ref. MICRO-B



Ref.	M5	G7	O1	R10	N10	V1	B2
Length	50 mm	70 mm	100 mm	100 mm	100 mm	150 mm	200 mm
Color obligatory	BROWN	GREY	ORANGE	RED	BLACK	PURPLE	BLUE

The flexible wire used for these leads is terminated at each end by a 0.6mm diameter nickel-plated plug. The electrical contact is excellent.

Interface lead

Special lead to connect the testing boards and any system in diameter 2mm.
Max current 500mA.



ref. INTER-2R
25cm Red color

ref. INTER-2N
25cm Black color

Temperature sensors and heating control



ref. CAPTEMP

EDUCATIONAL OBJECTIVES

- **Studying the regulation of temperature all or nothing**
- **Studying the regulation of temperature with control loop with variable gain**
- **Studying of thermal sensors: thermocouple, thermistor NTC and PTC.**

USER'S MANUAL + PRACTICAL WORKS

Proposed Practical Works

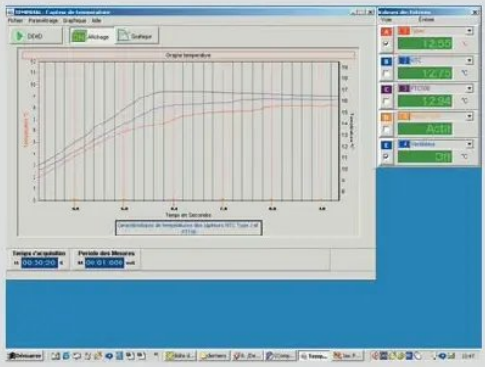
- Studying and calibration of a conditioner temperature sensor
  - Studying the gain of the amplifier sensor PTC100
  - Studying of the offset of the amplifier
  - Gain calibration by a standard 22 ohm resistor
  - Adjusting the offset of the amplifier
  - Thermocouple calibration
- Features of temperature transducers
- Control of the temperature by hysteresis
- Control of the temperature by feedback

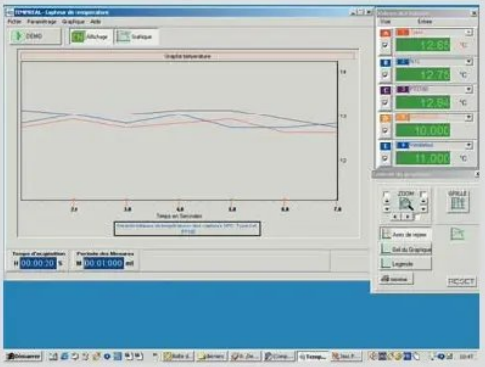
This model includes 3 temperature sensors: NTC thermistor – J thermocouple – PT100 platinum probe. These sensors are attached to a resistance or cooled by a built-in fan. The resistance and fan are controlled separately by short circuiting two terminals. The screen-printed front panel shows actual cabling of electronic circuits such as amplifiers and automated temperature control.... All the components are surface-mounted to facilitate signal capture.
Each of the three analog sensors is connected to an amplifier to suit its voltage, impedance, and linearity. The output levels of the three amplifiers are all calibrated at 10mV/°C to facilitate comparisons of accuracy and thermal inertia.
Two temperature control systems may be studied: all or nothing heating by hysteresis circuit or proportional heating with a variable gain automatic control loop. The heating " power " circuit is either powered by transistor-controlled direct current or by Triac-controlled 15VAC alternating current. A digital thermometer provides a continuous readout of heating element temperature.

CHARACTERISTICS

- +15V / -15V DC power supply
- Equipped with a DB25 male plug to connect to the PC interface.
- Dimensions : 330 x 200 x 50mm
- Weight : 1kg

DATA ACQUISITION SOFTWARE (OPTION)





ref. LOG-CAPTEMP

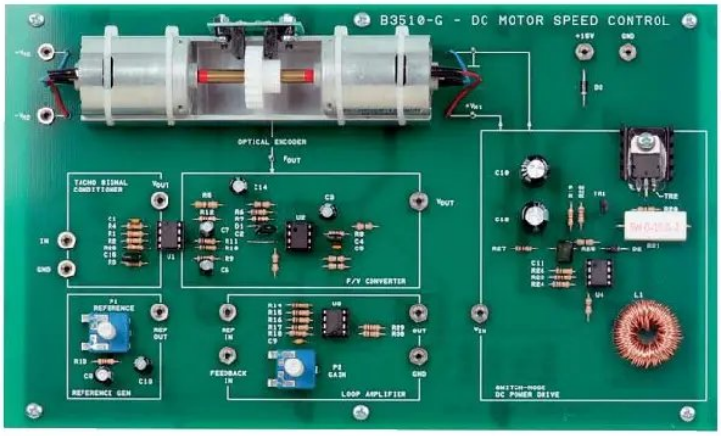
This option consists of an interface unit, a connecting cable, and software.
This software records the temperature readouts for the PT100, NTC, and J sensors on the SENSOR model and displays them on the computer screen. Characteristics such as the "all or nothing" setting for heating and fan power supply may also be displayed on the screen.

CHARACTERISTICS

- On-screen temperature display for the 3 sensors.
- On-screen display of the fan and heating control signal characteristics.
- Configurable acquisition time.
- Zoom function.
- Cursor function x and y axes configurable
- (Scale, notation, Max and Min values)
- Curve and background colours configurable.
- Print characteristics after page layout configuration.
- Acquisition data recovery in spreadsheet form

SOFTWARE AVAILABLE IN ENGLISH AND IN FRENCH

Speed feedback



This model is designed for the simplified study of a speed feedback on a closed loop, with a feedback signal generated either by a tachometric dynamo, or by an optical impulsion encoder. It consists of a direct current motor which drives a second direct current motor, functioning as a generator. The signal issuing from this generator is used as an image of the speed. The shaft assembly also drives a toothed disc, which cuts a luminous barrier, the impulses of which are applied to a frequency voltage converter. A direct current adjustable source integrated in the model is used as the voltage reference level. A switching supply controlled by the error voltage supply the motor.

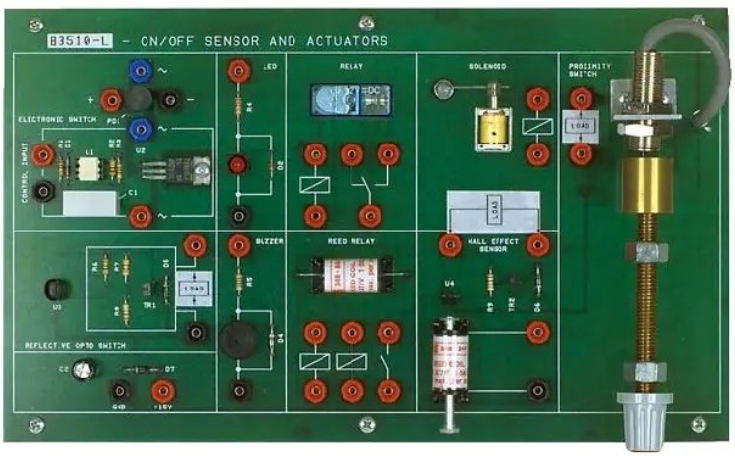
ACCESSORIES SUPPLIED

1 set of leads Ø2mm : 2 x 100cm / 2 x 30cm / 2 x 15cm

ref. B3510-G

Dim. : 250 x 150 x 30mm. Weight : 900g.

All or nothing sensors and actuators



This model includes sensors currently used in industry:

- an optoelectro-reflection barrier, with its output amplifier
- a Hall effect sensor with its output amplifier
- an inductive proximity sensor with its output amplifier
- facing a metallic mass which the operator progressively displaces using a worm screw.

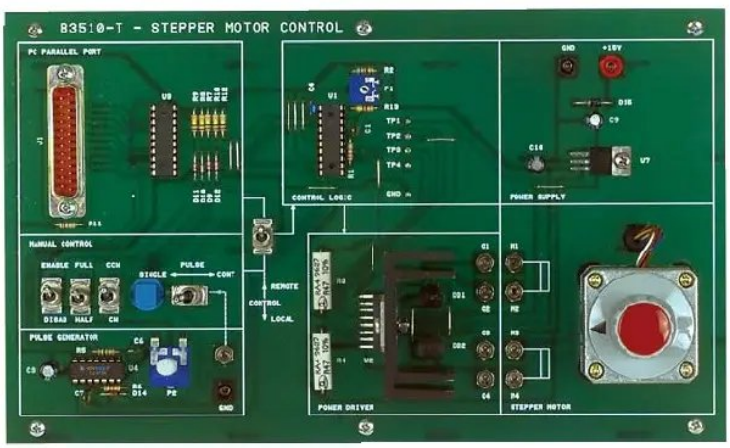
The model also includes:

- an electronic switch consisting of a triac and its electronic control
- a dry relay and a reed relay with two coils
- two solenoids
- one facing the Hall sensor
- a visual LED display and a piezoceramic type buzzer with integral micro-oscillator.

ref. B3510-L

Dim. : 250 x 150 x 30mm. Weight : 900g.

Stepping motor



Includes a stepping motor with 2 separate coils, the motor driver and the specialised logic test circuit. The latter can be accessed either by a PC via a 25 pin parallel port, or by a manual control logic system integrated.
This logic comprises a controled impulse generator by push button for the step by step lead and a variable frequency generator for the continuous working.

ACCESSORIES SUPPLIED

1 set of leads Ø2mm : 2 x 100cm / 4 x 30cm / 3 x 15cm
1 lead DB25 SERIE
1 software on CD

ref. B3510-T

Dim. : 250 x 150 x 30mm. Weight : 900g.

SOFTWARE SUPPLIED

PRACTICAL WORKS

- Study of the luminous barrier/frequency voltage converter.
- Study of the tachometric filter.
- Study of the loop amplifier and of the controlled switching power supply.
- Comparison of tachometric voltages and optical encoder + converter.
- Comparison of low rotation frequencies with and without feedback loop.
- Study of the feedback response for different values of loop gain.

PRACTICAL WORKS

- Description of the different components and their usage.
- Functioning of the amplifiers.
- Measurement of the detection distance of the inductive sensor.
- Analysis of the electronic switch, controlled by direct or alternating current.
- Study of a line consisting of an optoelectro-barrier, a switch and a solenoid.
- Possibility of making other lines: optoelectro-barrier - reed relay - Hall sensor - electronic switch - buzzer

ACCESSORIES SUPPLIED

1 set of leads Ø2mm :
2 x 100cm / 2 x 50cm / 3 x 30cm / 3 x 15cm

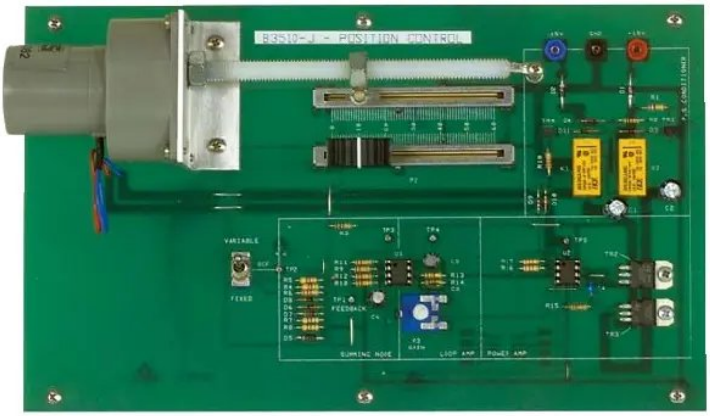
PRACTICAL WORKS

- Study of the principle of a stepping motor and its different ways of functioning by step and half-step.
- Vibrations seen at low frequency, loss of steps at high frequency.
- Determination of the take-in resonance frequency and of the rotation limit frequency
- Observation of signals delivered by the driver to the motor windings.
- Inversion of currents in the motor coils.
- Observation of 4 signals applied by the control logic to the driver out of phase with one another.

PRACTICAL WORK WITH COMPUTER

A program in basic and working in DOS is supplied. This completely listed program can be freely copied and if necessary modified by the user. In particular, it allows control of the speed and direction of rotation.

Position feedback



ref. B3510-J

This model is designed for the simplified study of a closed position feedback loop. It is composed of a direct current motor, the rotation of which drives a worm-screw.
The screw cursor is integrally attached to a copying potentiometer which supplies an electrical image of its position.
The potentiometer operated manually determines the basic position.

PRACTICAL WORKS

- Study of the principle of a closed feedback loop: error voltage, pre-amplification, driver stage, push-pull.
- Study of limitation of movements circuits.
- Anti-jamming system.
- Study of the feedback response to a voltage step for different values of loop gain.

ACCESSORIES SUPPLIED

1 set of leads Ø2mm : 3 x 100cm / 2 x 30cm

Incremental & absolute encoder



ref. B3510-R

This model illustrates how an incremental encoder and an absolute encoder work. They work in exactly the same way as commercial encoders. However, since resolution is not important in our application, the number of sensors is limited to 5. The model has two interchangeable encoder discs, with the sectors representing DCB encoding and Gray encoding.
When the operator turns the disc by hand, the phototransistors underneath send their signals to the decoding logic and the display (4 line x 20 character LCD screen) and to 4mm-diameter terminals, in order to control all of the control or decoding logics performed by the operator. The sensitivity of the phototransistors can be adjusted depending on the ambient light.

PRACTICAL WORKS

- 3-BIT ABSOLUTE DCB ENCODER correspondence between the position of the disc, the status of the sensors and the display. Transition codes and synchronisation sensor.
- INCREMENTAL DCB ENCODER use of the encoder in counter and count-down mode. Detection of the direction of rotation, improvement of accuracy using an angle sensor.
- 4 BIT GRAY ENCODER GRAY/DCB code comparison. A synchro. sensor is required.

MEASURING APPARATUS

Oscilloscopes & probes

PAGES 231 - 238





Power supplies

PAGES 239 - 241





Generators

PAGES 242 - 243





Multimeters

PAGES 244 - 246





Clamps

PAGES 247 - 251





Wattmeters - Volt - Amp

PAGES 252 - 257





Various apparatus

PAGES 258 - 263





Decade boxes

PAGES 264 - 265



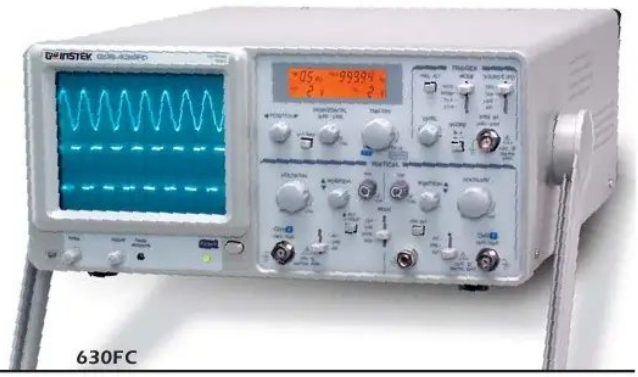


Analog oscilloscopes 20 to 30MHz



620

- Cathode tube screen 8 x 10 div (1div = 1cm)
- Magnifier: 100 – 50 – 20 ns/div non cal
- Wehnelt modulation
- XY mode
- CEI1010 CL1 CATII 300Vrms Pol2



630FC

- Cathode tube screen 8 x 10 div (1 div = 1cm)
- Magnifier: 100 – 50 – 20 ns/div non cal
- Frequency meter 5 digits
- Ranges 50Hz to 30MHz – sensitivity 2 mV
- Display Volt/div, Time/div, Frequency, XY mode
- Screen display: vertical range, Time base, Frequency
- Wehnelt modulation
- XY mode
- CEI1010 CL1 CAT II 300Vrms Pol2

REF.	620	630FC
Channels	2	2
Bandwidth -3dB	20MHz	30MHz
Rise time	17.5ns	11.7ns
Input impedance	1mΩ / 25pF	
Sensitivity	5mV to 5V/div (10 pos)	1mV to 5V/div (12 pos)
Magnifying control	x 5 up to 1mV/div	1mV/div
Coupling	AC - DC - Ground	
Max input voltage	400Vcc	
Operating modes	CH1 - CH2 - CH1 & CH2 (ALT & CHOP)	
Sum & difference / XY mode	CH1 ± CH2 / XY	
Time base / accuracy	20 steps: 200ns to 0,5s/div / 3%	
Synchronisation	Auto - Normal - TV	
Autoset	no	Time base autoset
Power source	100 - 120 - 230VAC 70VA	115 - 230VAC
Dimensions	310 x 150 x 455mm	
Weight	8.2kg	
Supplied with	2 probes 10/1 and 1/1 0 à 60MHz - User's manual	

ADDITIONAL ACCESSORIES

Differential probes - Page 236



Probes - Pages 238



Coaxial accessories - Page 275



Digital storage oscilloscopes 50 to 150MHz



GDS1000-U serie

USB | PC software | Labview Driver

- Color screen TFT LCD - backlight - Vision 45 ° - 234 x 320 points
- save/recall: 15 waveforms and 15 setups
- GO – NO GO functions
- ΔV ΔT cursors
- Data logger
- HELP key
- Multilangage



GDS1000A-U serie

USB | PC software | Labview Driver | PictBridge

- Color screen TFT LCD - backlight - Vision 45 ° - 234 x 320 points
- save/recall: 15 waveforms and 15 setups
- GO – NO GO functions
- ΔV ΔT ΔF cursors
- Data logger
- Assistant for test probes x0.1 to x2000
- HELP key
- Multilangage

REF.	GDS1052-U	GDS1072-U	GDS1102-U	GDS1072A-U	GDS1102A-U	GDS1152A-U
Channels	2	2	2	2	2	2
Bandwidth -3dB	50MHz	70MHz	100MHz	70MHz	100MHz	150MHz
Rise time	7ns	5ns	3,5ns	5ns	3,5ns	2,3ns
Sampling rate	250MSa/s real time, 25GSa/s equivalent time			1GSa/s real time, 25GSa/s equivalent time		
Record length by channel	4.000 points			2.000.000 points		
Vertical resolution	8 bits					
Sensitivity / Accuracy	2mV/div to 10V/div increment 1 - 2 - 5 / 3%					
Time base / Accuracy	1ns/div to 50s/div increment 1 - 2 - 5 / 0,01%					
Modes	Auto - Normal - Single - Edge - Pulse - Width - TV - (↑↓ 1000A-U series only)					
Math functions - FFT	+ - FFT, XY			+ - x FFT, FFTrms, Zoom FFT, XY (dephas. 3%)		
Auto measurements	19			27		
Autoset	yes (deactivation possible)					
USB device	USB1.1 & USB2.0 full speed compatible					
Power source	100 - 240VAC					
Dimensions	310 x 142 x 140mm					
Weight	2.5kg					
Supplied with	Software on CD - User's manual					

ADDITIONAL ACCESSORIES

Differential probes - Pages 236



Probes - Pages 238



Clamps - Pages 248

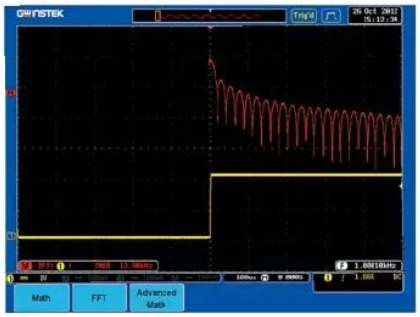


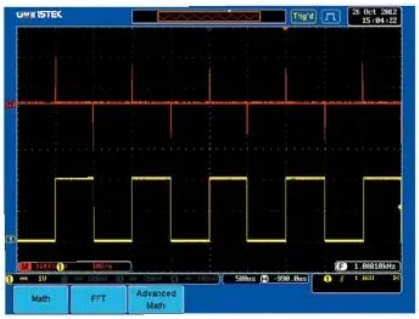
Coaxial accessories - Page 275



Digital storage oscilloscopes 70 to 300MHz







GDS2000A serie

USB full speed | PC software | Labview Driver | PictBridge | RS-232

GPIB (option) | Ethernet (option) | LAN (option) | VGA (option)

- Colour screen 20cm TFT high resolution (800 x 600 points)
- Save/recall: 24 waveforms and 20 setups
- Fast update rate of 80,000 waveform per second
- Curve plotting: points, vectors , variable persistence
- Acquisition by segments at your choice (2048 possible observations)
- Search function of the wave form by criteria in the entire memory. Zoom.
- XY mode : 2 simultaneous displays
- 6 digits frequencymeter
- 8 or 16 logic inputs (option)
- 8 or 16 additional chanels, either 12 or 20 with time chanels (option)
- HELP touch / Multilangage

REF.	GDS2072A	GDS2102A	GDS2202A	GDS2302A	GDS2074A	GDS2104A	GDS2204A	GDS2304A
Channels	2	2	2	2	4	4	4	4
Bandwidth -3dB	70MHz	100MHz	200MHz	300MHz	70MHz	100MHz	200MHz	300MHz
Rise time	5ns	3,5ns	1,75ns	1,17ns	5ns	3,5ns	1,75ns	1,17ns
Sampling rate	2GSa/s real time, 100GSa/s equivalent time							
Record length by channel	2.000.000 points							
Vertical resolution	8 bits							
Sensitivity	1mV to 10V/div							
Time base	10ns to 10s/div							
Modes	Auto (mode ROLL) - Normal - Single - Front - TV - Pulse width - Video - Runt - Rise & Fall - Alternate							
Math functions - FFT	+ - x ÷ d/dt, ∫dt, √, FFT, FFTrms, ZOOM FFT							
Auto measurements	36							
Autoset	yes							
USB device	USB - RS232 - LAN (in option) - VGA (in option) - PictBridge (GPIB in option)							
Power source	100 to 240VAC - 48 to 63Hz							
Dimensions	380 x 220 x 145mm							
Weight	4.2kg							
Supplied with	Labview driver - Complete software - User's manual							

OPTIONS

Logic analyzer

- Sample rate : 500MSa/s
- Bandwidth : 200MHz
- Record length : 2MSa max
- Input channels 16 / 8
- Triggering on 2 fronts, pattern, pulse, width, serie BUS (I2C, SPI, UART) parallel.

Range

- Max input voltage : ±40V
- Mini voltage swing : ±500mV
- Input impedance : 100KΩ
- Vertical resolution : 1 bit



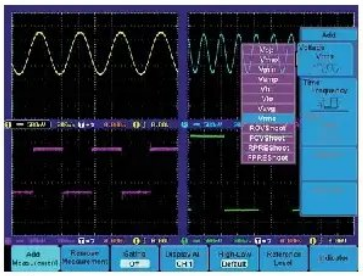
ref. DS2-16LA 16 channels

ref. DS2-8LA 8 channels

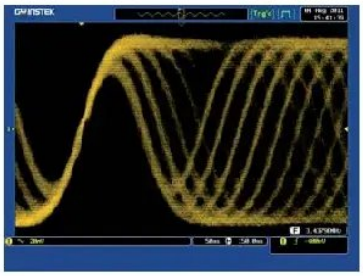
ref. DS2-GPIB

Digital storage oscilloscopes 2 & 4 channels 150 to 350MHz





Split screen



GDS3000 serie

USB high speed | PC software | Labview Driver | PictBridge | VGA output | GPIB (option)

- Color screen 20cm TFT high resolution 800x600pixels
- Internal memory 64Mbits - 25kpts for each input channel
- Save / Recall 24 waveforms and 20 setups
- Screen split to show both the standard signal and his zoom
- Screen split with independant setting and display for each channel
- Adjustable persistence for less frequently occurred signal
- Autoset and Autoranges, automatic measurements, cursors
- 3 input impedance selections: 50Ω - 75Ω - 1MΩ
- Online help multilanguages

REF.	GDS3152	GDS3252	GDS3352	GDS3154	GDS3254	GDS3354
Channels	2	2	2	4	4	4
Bandwidth -3dB	150MHz	250MHz	350MHz	150MHz	250MHz	350MHz
Rise time	2,3ns	1,4ns	1s	2,3ns	1,4ns	1s
Sampling rate	2,5GSa/s to 5GSa/s (100GSa/s equivalent time)					
Record length by channel	25.000 points					
Vertical resolution	8 bits					
Sensitivity	2mV to 5V/div					
Time base	1ns to 100s/div					
Modes	Auto (mode ROLL) - Normal - Single - Front - Pulse - Width - Video - Runt - Rise & fall - Alternate					
Math functions - FFT	+ - x ÷ FFT, FFTrms, FFT, amplitude spectral, RMS, dBVrms, FFt window, Hamming, Hanning,Blackman					
Auto measurements	28					
Autoset	yes					
Interfaces	USB - RS232 - LAN - VGA - PictBridge (GPIB in option)					
Power source	100 to 240VAC - 48 to 63Hz					
Dimensions	400 x 200 x 130mm					
Weight	4kg					
Supplied with	Driver LabView - Software - User's manual					

OPTIONS

Serial BUS analysis software

The serial bus analysis software has full analysis tools for triggering and decoding commonly used serial bus interfaces, including I²C, SPI and UART.

ref. DS3SBD

Electrical network analysis software

It measures: VRMS, peak Vfactor, frequency, Irms, peak Ifactor, active, reactive, apparent power, cos φ, phase angle. Harmonics: Freq., Amplit., Amplit.rms, phase, THD-F, THD-R, RMS

ref. DS3PWR

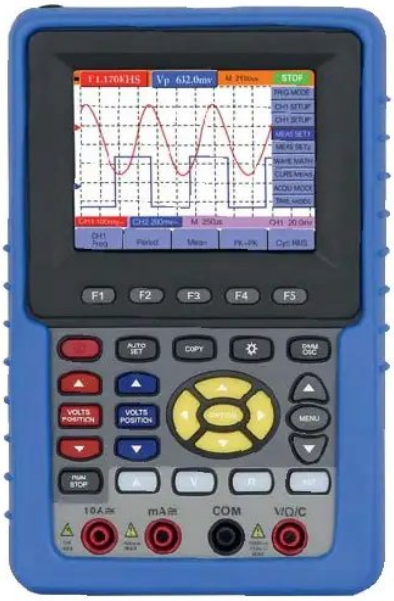
Standard Interfaces

One **GPIB USB** adapter is available as an option for interface conversion



ref. GUG001

20 to 60MHz hand-held oscilloscope multimeter







RS-232 USB

- Colour screen 75 x 56mm, 640 x 480 points
- Save/Recall 4 waveforms & 4 setup
- Zoom on the window. Choise of the window and zoom as far as 5ns/div
- Autoset and Autoranges, auto. measurements, cursors
- Digital multimeter TRMS

REF.	1022MN	2062MN
Channels	2	2
Bandwidth -3dB	20MHz	60MHz
Rise time	17.5ns	5.8ns
Sampling rate	100MSa/s	250MSa/s
Record length by channel	6.000 points	
Vertical resolution	8 bits	
Sensitivity	5mV to 5V/div in séquence 1 - 2 - 5	
Modes	Auto., normal, single, edge ↑↓, video	
Fonctions Math - FFT	± x ÷ FFT	
Mesures automatiques	20	
Measurement cursors	V1/zero V2/zero ΔV T1/zero T2/zero ΔT	
Fonctions Autoset	yes	
Interfaces	USB - RS232	
Multimeter	VDC - VAC - IDC - IAC - RΩ - CpF - Test diodes	
Power source	Battery Li-ion. Operate time 6 hours.	
Dimensions / Weight	180 x 113 x 40mm / 700g	
Supplied with	2 oscilloscope probesx1 & x10 / 2 test leads for multimeter / Mains adaptor / USB lead Capacitance adaptor / Shunt 20A / Software / Transport case / User's manual.	

ADDITIONAL ACCESSORIES

Differential probes - Pages 236



probes - Pages 238



Coaxial accessories - Page 275



Differentials probes



Safety connectors

ISOL-710



DP25

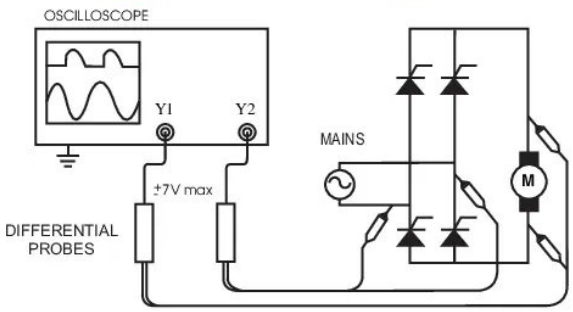
OPTIONS

Mains adapter for ISOL probes



ref. ADA6

These probes are used for displaying and measuring of dangerous voltages with a Class I oscilloscope, in accordance with the user safety standards. In fact, the image voltage applied to the oscilloscope is no more than a few volts. On the other hand, by using two probes the voltages applied to the oscilloscope inputs are isolated from one another. So, differential probes can measure high voltages (DP50) and/or voltages which relate to different potentials, without any risk of short-circuiting through the base of the oscilloscope.



REF.	ISOL-710	ISOL-720	DP25
Channel	1	1	1
Bandwidth to -3dB	DC to 25MHz		
Attenuation ratio	1/10 and 1/100	1/20 and 1/200	1/20 1/50 1/200
Measurable input voltage DC + AC	140Vpp on 1/10 1400Vpp on 1/100	280Vpp on 1/20 2000Vpp on 1/200	respect. 200Vpp / 500Vpp / 1400Vpp
Output voltage to oscilloscope	+/- 7V		+/- 5V
Max. differential input voltage	1000Vrms		
Max common mode voltage (1)	500Vrms	1000Vrms	600Vrms
Input impedance	4 MΩ / 5pF		4 MΩ / 1,2pF
Rise time	14 ns		
Accuracy	2%		
CEI1010 cat III Pol 2	1000Vrms		600Vrms
Power source	Battery (4 x LR6) and mains adapter		Mains adapter 230V 50/60Hz
Dimensions / Weight	158 x 62 x 20mm / 290g		210 x 58 x 35mm / 200g
Supplied accessories	Rubber jacket + test clip		Holster + test clips + mains adapter

(1) Common mode voltage: voltage between, on one hand, the interconnected inputs and on the other hand the ground or the BNC terminal on the oscilloscope

Oscilloscope not supplied



ISOL-712



COMPACT DIFFERENTIALS PROBES

Ergonomic solutions of differential probes, supplied from mains, with 2 or 4 channels according the models. The housing is strong enough to put an oscilloscope on top.

RMS CONVERTER FOR CURRENT PROBES

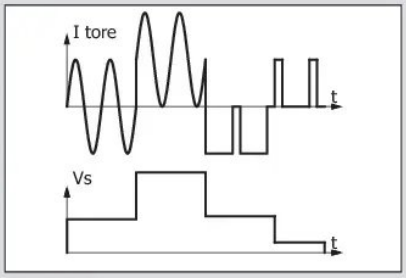


ref. ADA-SONDE

ADA-SONDE converts any complex signal, even with superimposed continuous component, into a continuous signal image of the RMS value of the input signal. Connects between a current or voltage probe and an oscilloscope.

Accuracy*	Bandwidth
1%	DC to 30KHz
10%	DC to 100KHz

* For input sine-wave signal 100mV



Gain is 1
Thus if Ve = 1Vrms , Vs = 1VDC
Max input voltage: ± 1V

Supplied with mains adapter and 2 BNC cables

REF.	ISOL712	ISOL714	ISOL722	ISOL724
Channel	2	4	2	4
Bandwidth to -3dB	DC to 25MHz			
Attenuation ratio	1/10 and 1/100		1/20 and 1/200	
Measurable input voltage DC + AC	140Vpp on 1/10 1400Vpp on 1/100		280Vpp on 1/20 2000Vpp on 1/200	
Output voltage to oscilloscope	+/- 7V			
Max. differential input voltage	1000Vrms			
Max common mode voltage (1)	500Vrms		1000Vrms	
Input impedance	4 MΩ / 5pF			
Rise time	14 ns			
Accuracy	2%			
CEI1010 cat III Pol 2	1000Vrms			
Power source	Mains 230V			
Dimensions / Weight	300 X 65 X 350mm			
Supplied accessories	2 or 4 BNC leads (25cm)			

(1) Common mode voltage: voltage between, on the one hand, the interconnected inputs and on the other hand the ground or the BNC terminal on the oscilloscope

True RMS DC and AC low current probes



VA15 DCA60 PSY500 PSY510

These probes are used with an oscilloscope, a multimeter or a recording instrument. They deliver a secondary image voltage of the primary current (a few dozen millivolts), thereby allowing the user to take measurements in complete safety and without having to switch off the power to the circuit. The Hall sensor fitted in them can detect a DC component overlaid onto the AC component. When used with a true RMS multimeter, these probes will provide a true RMS current measurement.

REF.	VA15	DCA60	PSY500	PSY510
Output voltage / Input current	100mV/A range 4A 10mV/A range 30A 1000mV/A range 400mA AC only.	100mV/A range 20A 10mV/A range 60A	200mV/A range 5A 20mV/A range 50A	1 V / A range 4A 0,1V / A range 40A
Ranges DC + AC	4A & 30A	20A & 60A	5A & 50A	4 & 40 A
Range AC only	400mA AC	-		
Accuracy	1% DC ~ 1kHz	2% 40Hz ~ 2kHz 4% 2kHz ~ 10kHz 6% 10kHz ~ 40kHz	2% DC ~ 50Hz 3% 50Hz ~ 100kHz 5% 100kHz ~ 120kHz	2% DC to 80Hz 3% 80Hz to 180kHz 5% 180kHz to 270kHz 6% 270kHz to 350khz
Diameter of the jaws	21mm	8mm	9mm	
Power source	battery : 2 x LR6	battery : 1 x 6LR61	Mains or battery 1LR61 (9V)	
CEI100	CATIII 300Veff pol2			
Supplied with	2 safety leads 1 BNC adapter	1 BNC adapter	1 BNC lead 1 BNC adapter 1 mains adapter	1 BNC lead 1 BNC adapter 1 mains adapter

Multi-outputs power supplies



AL841C



ALF1501D



AM061205



AL890NX



AL843A



AM061210

Complete range of DC or AC&DC power supplies, fixed or variable, fully protected for various type of use in laboratory.

Ref	DC OUTPUTS	AC OUTPUTS	Power	Informations
AL841C	3V / 4,5V / 6V / 7,5V / 9V / 12V - 1A	-	12 W	6 selectable voltage
AL890NX	±15v / 0,5mA	-	15 W	symmetric
ALF1501D	±15V 1A or 24V 1 A or 12V 2,5A	-	30 W	±15V (Aj. ±10 à ±15V)
AL843A	6V, 12V / 10A or 24V / 5A	6V, 12V / 10A or 24V / 5A	120 W	AC & DC simultaneous
AM061205	6V , 12V / 5A	6V , 12V / 5A	120 W	AC & DC simultaneous
AM061210	6V / 20A , 12V / 10A	6V / 20A , 12V / 10A	120 W	AC & DC simultaneous

STABILIZED POWER SUPPLY, RS232, LABVIEW, USB*



Réf. AL991S

- ± 0-15V / 1A or 0-30V / 1A and 2-5,5V / 3A and -15 - 0 - +15V / 200mA
- Power : 48 Watts
- Display: Digital
- Interface: RS-232
- Software: Windows95 minium, LabVIEW

***USB OPTION**
Set comprising an USB/RS232 adapter + null modem lead

Réf. USBRS232

CURRENT GENERATOR AC/DC POWER SUPPLY



Réf. ALR3002M

- 0 to 5V, 6V, 12V or 30V / 0 - 25 mA, 250 mA or 2,5A DC
- 6V or 12V or 24V / 5 A AC
- Power : 120 Watts

Reading of voltages and currents on separate displays.
AC & DC voltages available at the same time.

Single output DC power supplies (with safety terminals Ø4mm)



GPS3030A



GPS3030D



GPS3030DD



GPR3510HD



GPR30H10A

REF.	GPS3030A	GPS3030D	GPS1850D	GPS3030DD	GPR3060D	GPR3510HD	GPR6030D	GPR30H10A	DC6140
Display type	TYPE A	TYPE D		TYPE DD				TYPE A	TYPE DD
Power	90VA				180VA à 1000VA				
Voltage	0 to 30V	0 to 30V	0 to 18V	0 to 30V	0 to 30V	0 to 35V	0 to 60V	0 to 300V	0 to 30V
Adjustable	by 2 knobs coarse and fine from 0 to Vmax								
Current	0 to 3A	0 to 3A	0 to 5A	0 to 3A	0 to 6A	0 to 10A	0 to 3A	0 to 1A	0 to 5A
Adjustable	by 2 knobs coarse and fine from 0 to I max or 0 to 0								1 setting
Regulation	Output voltage variation : < 0,01% + 3mV - Output current variation < 0,2% + 3mA by mains variation of 15% or load variation 0 ~ 100%								
Ripple & noise	0.5mVrms								
Protection	Electronic by current limitation against overload and short circuit								
Power source	Mains 120-240V - 50/60Hz								
Supplied with	Power lead and user's manual								

DISPLAY TYPE

A : analogue type (with voltmeter & ammeter) Class 2,5%

D : digital type. (1 switchable display for Voltage/current)

DD : 2 digital type (1 display for voltage + 1 display for current)

ADDITIONAL ACCESSORIES

Safety leads - Page 273



OPTION

GREEN/YELLOW male earthing socket

Put a «-M» at the end of the references

Multi output power supplies (with safety terminals Ø4mm)



SPD3606



GPD3303 - WITH USB CONNECTOR

High resolution 1mV – 1mA,
can be remotely controlled via the USB connection.
Adjustable by numeric keypad or encoder

- Accuracy of programming: voltage 0.03%+10dgt, current 0.3%+10dgt
- Accuracy of reading: voltage 0.03%+10dgt, current 0.3%+10dgt

Saving of 4 different configurations
High-resolution display: 30,000V – 3,000 A.
Labview driver.



GPS3303

REF.	SPD3606	GPS2303	GPS3303	GPD3303
INDEPENDENT 1	2 x 0 to 30V - 2 x 0 to 6A	2 x 0 to 30V - 2 x 0 to 3A		
INDEPENDENT 2	2 x 0 to 60V - 2 x 0 to 3A	-		
SERIAL 1	0 to 60V - 0 to 6A	0 to 60V - 0 to 3A		
SERIAL 2	0 to 120V - 0 to 3A	-		
PARALLELE	0 to 30V - 0 to 12A	0 to 30V - 0 to 6A		
AUXILIARY	0,1 to 5V - 3A	-	5V - 3A	2,5 - 3,3 - 5V - 3A
Dims	255 x 145 x 265mm	255 x 145 x 265mm		210 x 130 x 265mm
Weight	6kg	8kg		
Power source	Mains 120-240V - 50/60Hz			

Multiple power supplies consist of two or three power sources which are galvanically isolated from each other.

- 2 adjustable power supplies with rectangular features

AC POWER SOURCES

- Voltage can be adjusted progressively from 0 to Vmax.
- Voltage variation: <0.01% + 3mV or <0.02% + 3mA for 100% load variation or 15% mains variation.
- Current can be adjusted progressively from 0 to Imax.
- Regulation: background noise <1mVrms.
- Slave repeater error: <0.5% of the master voltage.
- Response time: 0 to Vmax. = 0.1ms.

AUXILIARY SOURCE (except for GPS2303)

- Auxiliary fixed voltage: 5V, 3A rating
- Voltage regulation:
  <10mV for 100% charge variation
  <5mV for 15% mains variation
- Background noise <2mVrms

PROTECTIVE DEVICES

All of the outputs are protected against short-circuits, even those lasting a long time. In this case, the power supply will automatically switch to a current source.

DISPLAYS

Digital: 3 digits 1/2 LED 13mm. 0.5%

THREE OPERATING MODES	
Independent mode	*Both power supplies are completely independent from each other.*
Tracking Series mode	*Allow the two power supplies to be used as a 0 to double rating voltage supply.*
Tracking Parallel mode	*Allow the two power supplies to be used as a 0 to double rating current supply.*

Function generators 2 & 3MHz with or without frequency counter


GFG8219 - 3MHz - AM - FM


GFG8215 - 3MHz


GFG8020G - 2,2MHz


SFG1013 - 3MHz - DDS

REF.	GFG8219	GFG8215	GFG8020G	SFG1013
Waveforms	sine - square - triangle - pulse - TTL - CMOS - (GFG8219 only : AM - FM)			sine - square - pulse - TTL
Frequency	0,01Hz to 3,3 MHz - 7 ranges		0,01Hz to 2,2 MHz - 7 ranges	0,1Hz to 3 MHz - 7 ranges
Output voltage	20 Vpp on 600Ω 10Vpp on 50Ω			
Attenuators	2 : -20dB ±1dB		1 : -20dB ±1dB	1 : -40dB
Offset	Continuously variable from -10V to +10V into 600Ω			
Duty	variable from 20% to 80% Calibrate to 50%		variable from 10% to 90% Calibrate to 50%	variable from 25% to 75% Calibrate to 50%
TTL output	≥ 3Vpp . Rise time ≤25ns. Load : 20 TTL gates			
CMOS output	Adjust 4Vcc to 14,5Vpp. Rise time < 120ns			no
Sinus	1% from 0,3Hz to 200kHz.		1% from 0,2Hz to 200kHz.	>-55dBc 0,1Hz to 200kHz.
Triangle	Linear and symetry > 98% from 0.1Hz to 100kHz >95% after			
Square	Rise time < 100ns (120ns for GFG8020G) - Symétry : 2% from 0,2Hz to 100kHz (5% for SFG1013)			
VCF	Input impedance 10kΩ - Δf/f = 1/10 for a voltage step of 10VDC			no
Internal sweep	Δf/f variable from 1/1 to 1/100	no	no	no
Amplitude modulation	Depth of modulation 0 to 100 %	no	no	no
Frequency modulation	yes	no	no	no
Frequency ranges	Internal 0,01 Hz to 3,3 MHz External 0,01 Hz to 150 MHz / 6digits	no	internal : 0,01 Hz to 2,2MHz / 4digits	internal : 0,1 Hz o 3MHz / 6digits
Protection	against overload			
CEI1010	CATII 250Vrms pol2		CATII 300Vrms pol2	
Power source	115 - 230 VAC 50/60Hz		120 - 230 VAC 50/60Hz	115 - 230 VAC 50/60Hz
Dimensions	251 x 91 mm. Depth 291mm		230 x 95 mm. Depth 280mm	251 x 91 mm. Depth 291mm
Weight	2kg		2kg	2,1kg

ADDITIONAL ACCESSORIES

Coaxial accessories - Page 275









Arbitrary function generators 5 to 25MHz





USB

PC software

Labview Driver

11cm TFT LCD resolution 480x272
Frequency + voltage and settings.
Programming of an arbitrary signal with the keyboard.
Sample rate 20MSa/s and 10 bits amplitude resolution.
4000 points memory.
AM FM FSK SWEEP Modulation (série 2100).
Frequencymeter (2100 serie).

REF.	AFG2105	AFG2112	AFG2125	AFG2005	AFG2012	AFG2025
Frequency range	0,1Hz à 5MHz	0,1Hz à 12MHz	0,1Hz à 25MHz	0,1Hz à 5MHz	0,1Hz à 12MHz	0,1Hz à 25MHz
Waveforms	Sinus, Carré, Triangle, Rampe, Bruit et arbitraire					
Arbitrary functions - Sample rate - Repetition rate - Waveform lenght - Amplitude resolution	 20 Mech/s 10 MHz 4 kpoints 10 bits					
Amplitude	2mV à 20Vcc (à vide) - 10Vcc sur 50Ω					
Rise / Fall time	< 25ns avec l'amplitude maximale sur 50Ω					
Offset ranges	± 10V (à vide) / ± 5V sur 50Ω					
Rise time	< 25ns (50Ω)					
AM / FM Modulation	oui			non		
FSK Modulation	oui			non		
Frequency	5Hz à 150MHz			non		
Sweeping	yes					
Memory	10 storage memory					
TTL output	yes					
Interface	USB					
Power source	100 - 240VAC - 50/60Hz - 25VA					
Dimensions	266 x 107mm. Depth 293mm.					
Weight	3.2kg					
Supplied with	Arbitrary waves editing software and user's manual					

Follower amplifier

REF. AS150



- The output of a low frequency generator applied to the AS150 input, amplifies the voltage until 80V peak to peak, and the current up to 7A with an impedance ≥ 4Ω.
- Bandwidth at 0.1dB: 20Hz-20kHz. (at 0.7dB: 10Hz - 50kHz)
- The output level of the low frequency generator adjusts the AS150 output amplitude from 0 to 80Vpp.
- The AS150 output is protected against overloads.

OTHER FEATURES

- Input on BNC terminal Two parallel outputs: on 2 ∅4mm terminals and on BNC
- AS150 does not amplify the low frequency generator DC component
- 100 – 240VAC 50-60Hz power supply. Dimensions/weight: 500 x 300 x 65mm 4.7kg

Auto ranging multimeters



ST9929



ST9919



ST9927T



ST9915

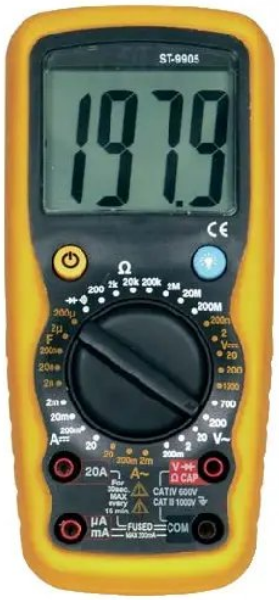
Range of reliable and robust automatic multimeters.
Sturdy ABS housing, protected by a shock resistant soft moulded holster, waterproof (IP67)

- Peak hold function. Min et Max (exept ST9915)
- Relative measurements
- Bargraph (exept ST9915)
- Hold (ST9929)
- Data recording, max 200s (ST9929)
- Auto power-off after 15min

REF.	ST9929	ST9919	ST9927T	ST9915
Display	40.000 points		6.000 points	4.000 points
Converter	TRMS AC+DC	TRMS AC	TRMS AC	-
Bandwidth	40Hz to 10kHz	40Hz to 1kHz	40Hz to 1kHz	-
VDC accuracy	400mV to 1000V 0,06% + 4dgt		600mV to 1000V 0,09% + 2dgt	400mV to 1000V 1,2% + 2dgt
VAC accuracy	400mV to 1000V RMS 1% + 30dgt - 5% + 30dgt from 1kHz to 10kHz		6 to 1000V TRMS 1 to 2% +3dgt	400mV to 1000V 1,5% + 3dgt
IDC accuracy	400µA to 10A 1% + 3dgt		600µA to 10A 1% + 3dgt	400µA to 10A 1,5% + 3dgt
IAC accuracy	400µA to 10A RMS 1,5% + 30dgt - 5% + 30dgt from 1kHz to 10kHz		600µA to 10A TRMS 1,5% +3dgt	400µA to 10A 1,8% + 5dgt
OHM accuracy	400Ω to 40MΩ 0,3% +4 to 9dgt		600Ω to 60MΩ 0,3% + 4dgt	400Ω to 40MΩ 1,2% + 2dgt
Farad accuracy	40nF to 40mF 3,5% +10 to 40dgt		60nF to 1000µF 3,5% + 4dgt	4nF to 200µF 3% + 5dgt
Frequency accuracy	40Hz to 10MHz 0,50%		10Hz to 40MHz 0,1% + 1dgt	10Hz to 40MHz 1,2% + 3dgt
Diode test	Test 0,9mA - 2,8V			Test 0,3mA - 1,5V
·ıl))	Ring for R < 35Ω		Ring for < 100Ω	Ring for < 150Ω
Duty accuracy	0,1% to 99,9% 1,2% + 2dgt		0,1% to 99,9% 1,2% + 2dgt	0,1% to 99,9% 1,2% + 2dgt
°C (type K) accuracy	-50 to 1000°C 1% + 2,5°C		-45 to 750°C 3% + 5°C	-
4 - 20mA	4mA~0% ; 20mA~100%		-	-
Ranging	Auto & Manual			
Protection				
Power source	1 battery 9V type 6LR61			
Dimensions / Weight	182 x 82 x 55mm / 430g		182 x 82 x 55mm / 375g	
Supplied with	Test leads, thermocouple, carrying case, battery, user's manual.			

Input impedance as voltmeter: 10MΩ

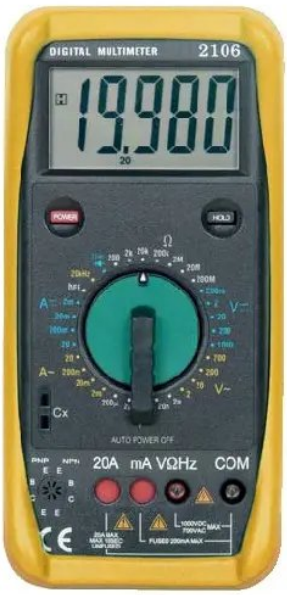
Manual ranging multimeters



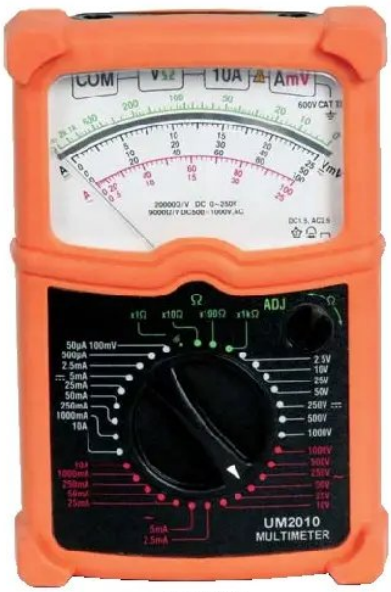
ST9905



2005DMM



TRG2106



UM2010

Range of reliable and robust manual multimeters.
Sturdy ABS housing, protected by a shock resistant soft moulded holster, waterproof (IP65)

ST9905 - 2005DMM - TRG2106
- Auto power-off after 15min

UM2010
- Length of the scale: 90mm
- Safety sockets 4mm

REF.	ST9905	2005DMM	TRG2106	UM2010
Display	2.000 points	2.000 points	20.000 points	Analogical
VDC Accuracy	200mV to 1000V 0,5% + 2dgt	200mV to 1000V 0,5% + 3dgt	200mV to 1000V 0,05% + 3dgt	100mV to 1000V 1,5 %
VAC Accuracy	200mV to 700V 1,2% + 3dgt from 50Hz to 400Hz	200mV to 200V from 40Hz to 400Hz 750V from 40Hz to 100Hz 1,2% + 3dgt	200mV to 700V 0,8% + 10dgt from 50Hz to 400Hz	10 to 1000V 2,5 %
IDC Accuracy	2mA to 10A (20A during 30s) 1,5% + 3 dgt (3% +10dgt/20A)	2mA to 10A (20A during 10s) 1,2% + 3 dgt (20A ±2%)	2mA to 20A 0,8% + 5dgt	50µA to 10A 1,5 %
IAC Accuracy	2mA to 10A (20A during 30s) 2% + 3dgt (3% +10dgt/20A)	2mA to 10A (20A during 10s) 1 to 2% + 5dgt from 40Hz to 200Hz 3% à 20A	2mA to 20A 2% + 10dgt	2,5mA to 10A 2,5 %
OHM Accuracy	200Ω to 200MΩ 1,2% + 1dgt up to 20MΩ	200Ω to 2GΩ 0,8% + 3dgt up to 2MΩ	200Ω to 200MΩ 0,2% + 3dgt up to 20MΩ	1 to 1000 kΩ 2 %
Farad Accuracy	2nF to 200µF 4% + 3dgt to 2µF	20nF to 200µF 2,5% + 20dgt up to 20µF	2nF to 200µF 4% + 10dgt	-
Henry Accuracy	-	2mH to 20H 2,5% + 20dgt	-	-
Frequency Accuracy	-	2kHz to 10MHz 1% + 10dgt	20kHz 1,5% + 5dgt	-
Diode test	1mADC under 2,8VDC max			
·)))	Ring for R< 50Ω	Ring for R< 90Ω	Ring for R< 70Ω	Ring for R< 50Ω
°C (type K) Accuracy	-	-20 to 1000°C 1% thermocouple K	-	-
Ranging	Manual			
Protection	CAT III 1000V Pol 2	CAT III 1000V Pol 2	CAT III 300V Pol 2	CAT III 600V Pol 2
Power source	1 battery 9V type 6LR61			3 batteries LR6
Dimensions	182 x 82 x 55mm / 360g	190 x 95 x 45mm / 400g	200 x 90 x 40mm / 600g	170 x 110 x 53mm / 500g
Fuses	0,2A/250V - 5x20mm - fast 20A/250V - 6,3x25mm - fast	200mA - 5 x 20 fast 20A - 5 x 20 fast	0,5A/250V - 6,3x25mm - fast	HPC 600V 1A HPC 600V 10A
Supplied with	Housing, user's manual, test lead	User's manual, test lead		

Bench multimeters



TRG803

- True RMS measurements
  AC+DC or AC only
- Min & max measurements
- Software
- Transistor tester
- Capacitymeter & frequencycounter
- Temperatures. Transistor tester
- Autorange & manual





GDM8251

- True RMS measurements:
  - DC level only
  - AC RMS level only
  - AC + DC RMS
- Remote control from PC
- Ohmmeter 2 & 4 wires
- dBm, dB, Max Min, compare, store
- Math functions : ax + b, 1/x, %
- **Auxiliary display for Hz, dB, ripple**
- Option SC1 :16 channels scanner SC1



GDM8246

- True RMS measurements:
  - DC level only
  - AC RMS level only
  - AC + DC RMS
- dBm measures -97,7dBm to +63,8dBm
- Min & max measurements - Relative measurements
- **Auxiliary display for Hz ou dB**

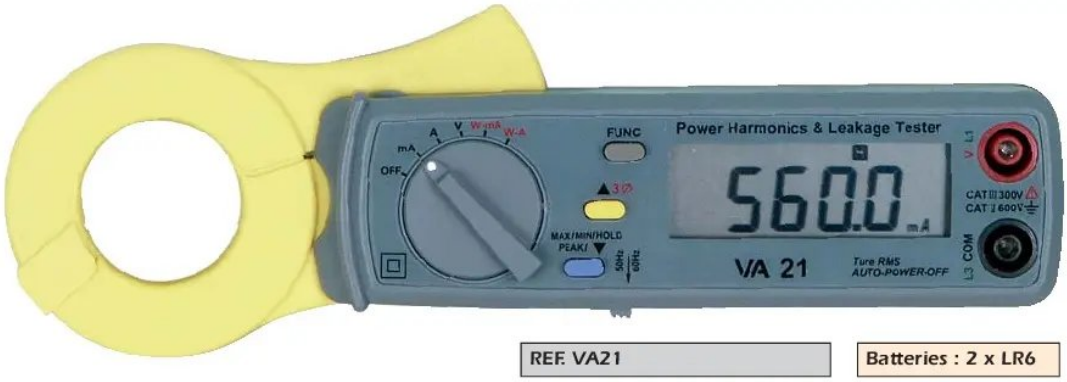


GDM8145G

- True RMS measurements:
  DC level only
  AC RMS level only
  AC + DC RMS

REF.	GDM8251	GDM8246	GDM8145G	TRG803
Display	120.000 points	50.000 points	20.000 points	6.000 points
Converter	TRMS AC+DC			
Bandwidth	100kHz		50kHz	100kHz
VDC	100mV to 1000V	500mV to 1000 V	200mV to 1200 V	600mV to 1000V
VAC	100mV to 750V	500mV to 1000 V	200mV to 1000 V	600mV to 1000V
IDC	10mA - 10A	500µA to 20A	200µA to 20A	600µA to 10A
IAC	10mA - 10A	500µA to 20A	200µA to 20A	600µA to 10A
OHM	100Ω to 100MΩ	500Ω to 20MΩ	200Ω to 20MΩ	600Ω to 60MΩ
Farad	-	5nF to 50µF	-	6nF to 6mF
Frequencymeter	10Hz to 800kHz	10 Hz - 150 kHz	-	10 Hz - 60MHz
Diode test	Max voltage : 2V Beeper	Max voltage: 1,5V. Buzzer <5Ω	Displays the voltage drop	
°C (type K)	0 to 300°C type J, K, T	-	-	- 40°C - 1000°C
Ranging	Auto & Manual			
Interface	RS232 - USB	RS232 (GPIB option)	-	RS232 - USB
Protection	CEI1010 CATIII 300Vrms pol2			
Power source	115- 230VAC 50/60Hz		230VAC 50/60Hz	Battery or mains 230VAC 50/60Hz
Dimensions / Weight	267 x 107 x 350mm / 2,6kg	251 x 91 x 291mm / 2,6kg	245 x 95 x 280mm / 2,6kg	240 x 105 x 310mm / 2,4kg
Supplied with	PC software & Driver Labview User's manual	User's manual	User's manual	Software, User's manual

High sensitivity RMS test clamp



REF. VA21 | **Batteries : 2 x LR6**

MEASUREMENTS

ACTIVE POWER	AC VOLTAGE	HARMONICS AC VOLTAGE	POWER FACTOR	• Auto ranging
REACTIVE POWER	AC CURRENT	HARMONICS AC CURRENT	PHASE ANGLE	• Auto power-off after 30min.
ENERGY	LEAKAGE CURRENT	TOTAL HARMONIC DISTORTION	CREST FACTOR	• Dim: 210 x 62 x 36mm. Weight: 500g
				• Supplied with test leads and carrying case

SINGLE & BALANCED THREE PHASES POWER

	W or VA or VAR			KW or kVA or kVAR	
RANGES	0.050 ~ 9.999	10.00 ~ 99.99	100.0 ~ 999.9	1.000 ~ 9.999	10.00 ~ 99.99
RESOLUTION	0,001	0,01	0,1	0,001	0,01
ACCURACY*	1%	1%	1%	1%	1%

AC CURRENT RMS

	in mA		in A		
RANGES	0.30 ~ 60.00	60.00 ~ 600.0	0.030 ~ 3.000	3.00 ~ 30.00	30.00 ~ 50.00
RESOLUTION	0,01	0,1	0,001	0,01	0,01
ACCURACY*	0,5%	0,5%	0,5%	0,5%	1%

AC VOLTAGE RMS

RANGES	3,0 to 250,0VAC	250 to 600VAC	Accuracy : 0,5% *

*Bandwith 50Hz ~ 5kHz Accuracy 5% from 50Hz to 10kHz

HARMONICS of AC VOLTAGE in % or in VAC order 1 to 99

ORDER	RESOLUTION in %	RESOLUTION in VAC	Accuracy
1 to 99	0,1%	0,1 VAC	1 to 35% as per order

HARMONICS of AC INTENSITY in % or in IAC order 1 to 99

	in mA		in A		
RANGES	0.10 ~ 60.00	60.00 ~ 600.0	0.600 ~ 3.000	3.00 ~ 30.00	30.00 ~ 50.00
RESOLUTION in mA - A	0,01	0,1	0,001	0,01	0,01
RESOLUTION in %	0,1%	0,1%	0,1%	0,1%	0,1%
ACCURACY as per order	1-10: 1% + 7dgt	11-20: 5% + 7dgt	21-50: 15% + 7dgt	51-99: 35% + 7dgt	

OTHER FUNCTIONS

	RANGES	RESOLUTION	ACCURACY
POWER FACTOR	0.000 ~ 1.000	0.001	± 0.04
PHASE ANGLE	-180 ~ 180°	0.1°	± 2°
THD * 1 to 99 order	0.0 ~ 999.9%	0.10%	2 ~ 20% **
CREST FACTOR	1.00 ~ 99.99	0.01	5% + 30 dgt
ENERGY	mWh Wh et kWh SINGLE & BALANCED 3-PHASE		

*THD total harmonics distortion ** according the rate

AC, DC, AC&DC clamps



MS330 - AC

- Peak hold function Max
- Auto power off after 15mn



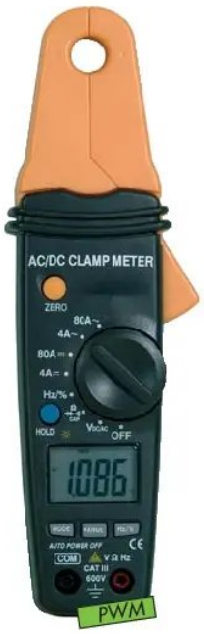
MS332 - AC & DC

- Duty 0,5 ~ 99%
- Auto power off after 10mn



MS3347 - DC & TRMS AC

- Peak hold function Min & Max
- Auto power off after 20mn
- Bargraph



MS337

- Auto power off after 25mn
- Recopy output 10mV/A 20kHz
- Back lighting of the screen



MS223

- Peak hold function Min & Max
- Auto power off after 10mn
- Recopy output 10mV/A 20kHz

PWM *The clamps with the PWM logo are compatible with PWM variator.*

REF.	MS330	MS332	MS3347	MS337	MS223
Display	2.000 points	4.000 points			10.000 points
Converter	AC	AC & DC	DC & TRMS AC	AC & DC	AC & DC
Bandwidth	50 to 100Hz			50Hz to 500Hz	50Hz to 20kHz
Opening of the jaws	25mm	29mm	35mm	12mm	
VDC / VAC	2 to 600V	4 to 600VDC / 400mV to 600VAC	400mV to 600V		600V
IDC / IAC	2 to 400A AC only	40 to 400A	40 to 1000A	4 to 80A	9,999 to 99,99 A
OHM	200Ω to 20MΩ	400Ω to 40MΩ		4Ω to 40MΩ	9,999 kΩ
Farad	-	40nF to 100µF	4nF to 40mF	40nF to 100µF	-
Frequencymeter	-	5Hz to 150kHz	0 to 4,000 kHz	5Hz to 10MHz	-
Diode test	0,4mA - 1,5VDC test	0,3mA - 1,5VDC test		-	-
·)))	Ring for R< 50 Ω	Ring for R< 150 Ω	Ring for R< 35 Ω	Ring for R< 150Ω	Ring for R< 100Ω
°C	-	-	-40°C to 1000°C	-	-
Ranging	Auto & Manual	Auto		Auto & Manual	Auto
Protection	CATIII 600Vrms pol2				
Power source	2 batteries LR03		1 battery 6LR61	2 batteries LR03	
Dimensions / Weight	205 x 70 x 37 mm / 200g	200 x 50 x 35 mm / 200g	230 x 80 x 50 mm / 300g	210 x 70 x 37mm / 200g	202 x 70 x 34 mm / 180g
Supplied with	Test lead, soft carry case, batteries				

ADDITIONAL ACCESSORIES

Oscilloscopes - Pages 231 - 235



Coaxial leads - Pages 275



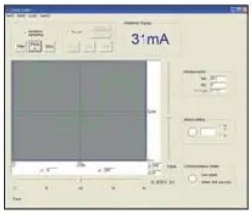




High sensitivity clamps









UT251A

ULTRA SENSITIVE CLAMP

- Allows to measure AC current of some µA (50/60Hz)
- A memory function: storage of 99 measurements
- PEAK measurement
- Autoranging: 0,001mA to 60,00A
- Resolution 1 µA, accuracy ± 1,5% +5dgt
- Allows to measure a current difference between two conductors (differential).

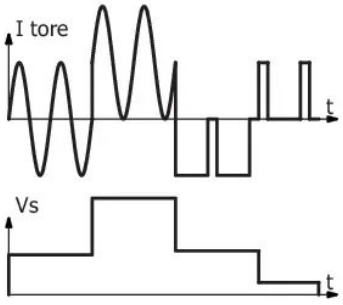
ST9809

LEACKAGE CURRENT CLAMP

- Allows to measure AC currents of some hundred µA
- Peak hold function: max & min
- Auto power off after 30min
- Bargraph

REF.	UT251A	ST9809
Display	10.000 points	4.000 points
IAC (accuracy)	0,001mA to 60A, automatic ±1,5%	40mA to 100A (2,5% + 15dgt)
VAC (accuracy)	-	400V (2% + 4dgt)
OHM (accuracy)	-	400Ω (1% + 2dgt)
Protection	CEI1010 CAT III 600Vrms Pol2	CEI1010 CAT III 300V
Power source	1 battery 6LR61	
Dimensions / Weight	175 x 70 x 38mm / 120g	210 x 62 x 35mm / 200g
Supplied with	Acquisition software, specific USB cable, briefcase.	Test leads, soft carry case

RMS converter for MS223 clamp



ADA-RMS plugs on clamp MS223 (see page 248).
The ADA-RMS output supplies DC voltage image of the rms current flowing in the clamp core, even for current with superimposed continuous component.
The output voltage is viewed with the oscilloscope.

- Output voltage: 10mV/A
- Accuracy of the MS223+ADA-RMS system: 5% of DC at 20kHz
- Automatic shutdown
- Power supply: 9V pressure battery.
- Supplied with BNC cable

ref. ADA-RMS only the converter



Multifunctional clamps



MS232

- RMS AC+DC power measurement
- VAC & IAC TRMS measurements
- Peak hold function : Max
- Autopower off after 30mn



ST3348

- RMS AC+DC power measurement
- VAC & IAC TRMS measurements
- Frequency
- Back lighting of the screen
- Autopower off after 30mn



ST3353

- Double display (W & VA, W & φ etc.)
- Vrms – Irms - W - VA - VAR - cosφ - kWh
- Single- and three-phase (3 & 4 wires)
- TRMS in IAC & VAC
- Peak measurements Min and Max
- USB interface + software supplied
- Memory (99 measurements)
- Automatic shutdown at 30mn
- LCD 4 digits and bar graph (lit)



VA6600

- RMS AC + DC
- Dual display
- U & I , U & Hz , I & Hz , W & cosφ , VA & VAR.
- Active, reactive and apparent power
- A memory function: storage of 4 measurements

PWM *The clamps with the PWM logo are compatible with PWM variator.*

REF.	MS232	ST3348	ST3353	VA6600
Display	10.000 points	4.000 points	10.000 points	2 x 4 figures
Converter	DC + TRMS AC		RMS AC	RMS AC+DC
Bandwidth	50 to 500Hz	50 to 60Hz	50 to 200Hz	DC to 400Hz
Opening of the jaws	Ø 30mm		Ø 53mm	Ø 55mm
VDC	600V (1% + 5dgt)	400mV to 600V (1,5% + 3dgt)	-	-
VAC	600V (1% + 5dgt from 50 to 500Hz)	400mV to 600V (1,5% + 3dgt)	15 to 750V (1,2% + 5dgt)	VAC+VDC 200 to 600V 2%+5dgt
IDC	600A (1,5% + 5dgt)	1000 A (1,8% + 5dgt)	-	-
IAC	600A (1.5% + 5dgt from 50 to 500Hz)	1000 A (1,8% + 5dgt)	40 to 1000A (2% + 5dgt)	IAC+IDC 200 to 2000A 2%+5dgt
WDC	100 to 360kW	40 to 240kW	-	-
WAC	100 to 360kW RMS	40 to 240kW RMS	0,6 to 750kW	99,99 to 1200kW 2%+5dgt
VA	-	-	0,6 to 750kVA (3% + 5dgt)	99,99 to 1200kVA 2%+5dgt
VAR	-	-	0,6 to 750kVAR (4% + 5dgt)	99,99 to 1200kVAR 2%+5dgt
OHM	10 000Ω (1% + 5dgt)	400Ω to 40MΩ (1,5% + 2dgt)	-	-
frequencymeter	-	5Hz to 100kHz	20 to 200Hz	-
Energy kWh	-	-	1 to 9999kWh (3% + 2dgt)	-
Diode test	-	Test 0,3mA	-	-
·ıl))	Ring for R< 100Ω		-	-
Power factor	-	-	0.3 ~ 1Capacitive or inductive (0,02 + 2 dgt)	0,999 2%+5dgt
Ranging	Auto	Auto & Manual	Auto	Auto
Protection	CATIII 600Vrms pol2		CATIV 600Vrms pol2	CATIII 600Vrms pol2
Power source	2 batteries LR03	1 battery 6LR61	4 batteries LR6	1 battery 6LR61
Dimensions / Weight	218 x 84 x 30 mm / 270g	229 x 80 x 49 mm / 300g	295 x 100 x 46 mm / 540g	270 x 100 x 45mm / 800g
Supplied with	Test lead, soft carry case, batteries, user's manual.		Test lead, soft carry case, batteries, user's manual, USB cable, software.	soft carry case, batteries, user's manual.



A138 : 25 functions

- Manual or auto measurements
- RMS measurements in AC and AC+DC
- 10mV to 1000V in DC, ACrms, DC+ACrms
- 10mA to 1000A in DC, ACrms, DC+ACrms
- Measurement of the call current up to 1400A AC
- Max and Min peaks in voltage and current
- Active power from 1W to 1000kW
- Power factor cosφ from -1.00 to +1.00
- Measurement of the THD and harmonics to row 25
- Resistance from 0.1ohm to 100kohms
- Sound continuity R< 30ohms and LED test
- Frequencemeter 0.01Hz to 10kHz
- Measurement of capacitances from 1nF to 4000µF
- Measurement of temperatures from -50°C to 1000°C
- Indication of the direction of rotation of the phases
- Contactless voltage detector
- Low-pass filter (removes noise)
- Reset button
- Bar graph
- Illumination of the cable to be tested when jaws open
- Display blocking. Backlit display
- Automatic shutdown after 15 minutes
- Low battery indicator

REF.	A138	
Display	10.000 points - digital height 12mm	
Converter	RMS AC AC+DC	
Bandwidth	50 to 400Hz (500Hz VAC)	
Opening of the jaws	Ø 42mm	
VDC*	100,00 - 1000,0V	Best accuracy 0.7% + 2dgt
VACrms* & VDC+VACrms	100,00-1000,0V	Best accuracy 1% + 5dgt
MAX & MIN (VAC only)	140,0 - 1400V	Best accuracy 3% + 15dgt
IDC	100,00 - 1000,0A	Best accuracy 1,5% + 5dgt
IACrms & IDC+ IACrms	100,00-1000,0A	Best accuracy 1,5% + 5dgt
MAX & MIN (IAC only)	140,0 - 1400,0A	Best accuracy 3% + 15dgt
Frequency	100,00-1000,0Hz-10,000kHz	Best accuracy 0.5% + 3dgt
THD total harmonic distorsion	100,0 %	Best accuracy 3% + 10dgt
Harmonic distorsion 1 to 12	100,0 %	Best accuracy 5% + 10dgt
Harmonic distorsion 13 to 25	100,0 %	Best accuracy 10% + 10dgt
Inrush current	100,00-1000,0A	Best accuracy 2,5% + 5dgt
Active power WAC+WDC	10,000-100,00-1000,0 kW	Best accuracy V x A +10dgt
Power factor cos φ	-1,00 to +1,00	Best accuracy 3% + 1dgt
Resistance	1000,0Ω-10,000-100,00 kΩ	Best accuracy 1% + 3dgt
·))) —▷—	Ring for R< 30Ω / Max voltage 1,8V	
Capacitance	4,000-40,000-400,0-4000µF	Best accuracy 1,9% + 8dgt
Temperature °C	-50°C to 1000°C	Best accuracy 1% + 1°C
Overload protection	1000Vrms 1000Arms	
Ranging	Auto & Manual	
Protection	CATIV 600Vrms pol2 / CATIII 1000Vrms pol2	
Power source	1 battery 6LR61	
Dimensions / Weight	257 x 87 x 50mm / 470g	
Supplied with	Soft carry case, test leads, probe, battery, user's manual.	

*Impedance : 3.5MΩ //100pF AC & DC



VA6200 : Mains analysis clamp RMS AC

The screen on this clamp can be used either as a numeric display or as a graphical screen like an oscilloscope, or as a logging instrument. The clamp measures the true RMS voltage and current, apparent, reactive, active, balanced three-phase and single-phase power, cosφ, peak factor, total distortion, power consumption and max power demand. In graphics mode, it displays and quantifies the first 50 harmonics of the signal, the form of the U and I signals, the single-phase and three-phase diagram. In logging mode, the clamp stores information in its memory.
The sampling frequency and the start/stop cues can be programmed. Long acquisitions at high frequencies, with several simultaneous quantities, are possible by using an RS232 output to a PC and special software.

- Measurement of the maximum demand in kW and kVA
- Programmable threshold for transient capture (128 events)
- 32 to 256 points/cycle can be saved on the internal memory
- Memory size: 50,000 logs can be programmed.
- Real time output of: oscillograms, power, settings and harmonics
- Autopower off automatically if not used
- Opto insulated interface (RS232)

REF.	VA6200
Display	128 x 64 pts
Converter	TRMS AC
Bandwidth	50/60Hz
Opening of the jaws	Ø 55mm
VAC	4 to 600Vac (0,5% + 5 dgt)
IAC	4 to 1500Aac (0,5% + 5 dgt)
Power W - VA - VAR	1000W to 1000kW (1% + 20 dgt)
Energy Wh kWh	0 Wh to 999 999 kWh (resp VAh &VARh) (1% + 20dgt)
Crest factor CF	1,00 - 99,99 (5% + 30 dgt)
THD total harmonic distortion	0,0 to 1000,0 % (2% - 6% - 10% as per range)
Power factor	0,000 - 1,000 Accuracy 0,4
Phase angle	- 180° à +180° Accuracy 0,1°
Harmonics of AC voltage in V and in %	0,0 to 100,0% (2% Rang 1 to 20 / 4% Rang 20 to 50)
Harmonics of AC current in V and in %	0,0 to 100,0% (2% Rang 1 to 20 / 4% Rang 20 to 50)
Peak IAC and VAC	Capture of transient events (32000)
Ranging	Auto
Interface	RS232
Protection	CATIII 600Vrms pol2
Power source	2 batteries LR06
Dimensions / Weight	270 x 100 x 45mm / 800g
Supplied with	RS232 Interface & software, probes soft carry case. User's manual.

Moving-iron voltmeters & ammeters (true RMS)



Used for measuring TRMS values in DC, AC, DC with alternative component, rectified single and double alternation, square wave currents, hatched currents. This ammeter has one semi-linear scale with a precision of 0.5% from 0 to 500Hz (except PSY122B : 1,5%), and of 2% up to 2kHz. Its resistance to surges is excellent as it has a single coil wound with high-capacity copper wire.

- Safety terminals
- Lenght of scale 110mm.
- Dim. 154 x 210 x 86mm.
- Weight 1.5kg.

DC & AC			AC ONLY*
REF. P7478	**REF. P7480**	**REF. PSY122B****	**REF. P7481**
750mA	75mA	1,2A	600mA-1,2A
1,5A	150mA	3A	3A-6A
info fuse : 5x20mm 3,15AT	info fuse : 5x20mm 2,5AT	6A	12A-30A
		12A	

**Special case of the P7481 : this ammeter uses a current transformer. As a result, it only measures in AC current.*
*** Special case of the PSY122B : accuracy of 1,5% from 0 to 500Hz and 2% up to 2kHz.*



Used for measuring TRMS voltages in DC, AC, AC with offset, rectified currents, chopped currents, squares.... This voltmeter is particulary good for electro-mechanical measurements, such as rotary machines, thyristors, rectifiers. It has a very good surge suppression and can withstand prolonged overvoltages.

- Safety terminals.
- Lenght of scale 110mm.
- Dim. 154 x 210 x 86mm.
- Weight 1.5kg.

Ref.	P7475	P7476
RANGES	7,5-15-30-60V	75-150-300-600V
ACCURACY DC to 500Hz	0,5%	0,5%
ACCURACY 500Hz to 2kHz	2%	2%

Varmeters



- VAR varmeters measure the reactive power absorbed by a 50Hz sinusoidal curve.
- Varmeters VAR01 to VAR05 are protected against any overloads in their current and voltage circuits, by fuses.
- Scale length: 110mm graduated from 0 to 100.
- Dimensions: 154 x 210 x 86mm.
- Weight: 1.5kg.

CEI1010 CATIII 1000Veff pol2

Ref	I (Imax=1,5 x I)	V (Vmax=1,5 x V)
VAR01	500 mA - 1 A	100 - 200 - 400 V
VAR02	1 A - 2 A	100 - 200 - 400 V
VAR03	2,5 A - 5 A	100 - 200 - 400 V
VAR04	5 A - 10 A	100 - 200 - 400 V
VAR05	10 A - 20 A	100 - 200 - 400 V

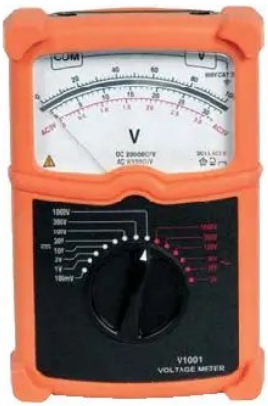
Magnetoelectric Ammeter & Voltmeter (easy to read)



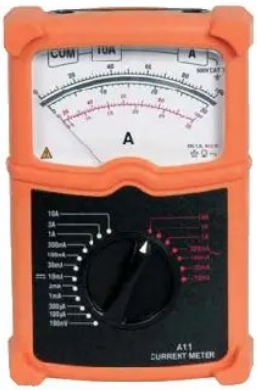
PSY600V



PSY30UA



V1001



A11



Shock absorbers

PSY600V - PSY30UA

- Anti-flash switch with silver contacts
- The 2mm space between contacts protects the switch from arcing due to voltage overload.
- Taut band mechanism

V1001 - A11

- Sturdy ABS housing, protected by a shock resistant soft moulded holster, waterproof (IP65)
- The four salient corners act as shock absorbers.
- All ranges are selected by one rotary switch.

RANGES 10A and 20A OF THE PSY30UA**

Designed for tests on rotary machines, these ranges support permanent nominal currents of 10 and 20A. They are unprotected, but take the following overloads without being destroyed:

- 10A range: 20A for 5 minutes, 40A for 5 seconds
- 20A range: 40A for 5 minutes, 80A for 5 seconds

REF.	PSY600V	V1001	PSY30UA	A11
	Voltmeter		Ammeter	
VDC	30mV to 600V (1,5%)	100mV to 1000V (1,5%)	-	-
VAC	1V to 600V (1,5%)	3 to 1000V (2%)	-	-
IDC	-	-	30µA to 20A (1,5%)**	100µA to 10A (1,5%)
IAC	-	-	1mA to 20A (2,5%)**	10mA to 10A (2%)
mV	-	-	100mV for the use of external shunts	
Scale length	125mm with antiparallax mirror	90mm	125mm with antiparallax mirror	90mm
Protection	CAT III 600V Pol 2			
Safety terminals	yes	yes	yes	yes
Fuses	5 x 20mm 0,05A/250V	HPC 500V 500mA	Gas tube and diodes protection	HPC 500V 3A + HPC 500V 10A
Impedances	VDC : 30kΩ/V - VAC : 5kΩ/V	VDC : 20kΩ/V - VAC : 6,3kΩ/V	-	-
Dimensions / Weight	196 x 147 x 70mm / 1,4kg	170 x 110 x 53mm / 500g	196 x 147 x 70mm / 1,4kg	170 x 110 x 53mm / 500g
Supplied with	Notice			

RMS AC+DC Wattmeters



REF. PSY12



REF. P7401



REF. PSY13

The PSY wattmeters measure true RMS and instantaneous power, DC, single phase, balanced three-phase, alternating signal with or without DC offset in the frequency range DC up to 2kHz.

ACCURACY : 0.5 %

PROTECTION
- All PSY wattmeters are guaranteed within their accuracy limits for 5 years.
- A fuse to protect the voltage circuit and another for the current.
- The fuses can be accessed from the outside of the meter.

EASY TO READ
- A single scale graduated from 0 to 100.
- The reading on the scale shows the maximum values:
  I max = 1.5 x I V max = 1.5 x V
- A lookup table for three phase power can be found on the back of the unit.

EXAMPLE READING
- For instance we wish to measure the power dissapated in a load with 0.6A at 125V.
- Put the selector knobs to 1A and 100V.
- The needle moves to the marking corresponding to 75W.
- The reading is direct.
- The 100V scale is not overloaded.
  (V max = 1.5 x V therefore 150V).

GENERAL SPECIFICATIONS
- Voltage circuit resistance: 150Ω/V
- Length of scale: 110 mm
- Dimensions 154 x 210 x 86mm.
- Weight: 1.5kg
- CEI1010 CATIII 1000Vrms pol2

UF30 FUSES OPTION

Spare voltage fuse

ref. UF30



Safety wattmeter switch



ref. COWAT11

The COWAT11 is a wattmeter switch enabling the measurement of power on an unbalanced network, with a single wattmeter.
3 positions on the unit:
1 - Measure the current on phase R with voltage between R & T
2 - Wattmeter out of work.
3 - Measure the current on phase S with voltage between S & T.

- Operating voltage: 400V 3-phase + N
- Cutting power
  at power factor 0.3=10A
  at power factor 1=16A
- Plastic case: 145x185x100mm
- Weight 1kg.
- CEI1010 CATIII 1000Vrms pol2

Ref.	CONTINUOUS - SINGLE PHASE		3-PHASE	INTENSITY FUSE	VOLTAGE
	I (I max = 1,5 x I)	V (V max = 1,5 x V)	V (V max = 1,5 x V)	5 x 20 mm	FUSE
PSY10	100 - 200mA	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	315mA temp.	UF30
PSY11	500mA - 1A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	2A temp.	UF30
PSY12	1 - 2A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	3,15A temp.	UF30
PSY13	2,5 - 5A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	8A temp.	UF30
PSY14	5 - 10A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	16A temp.	UF30
PSY15	10 - 20A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	/	UF30
PSY16*	500mA-1-2,5-5-10-25A	10 - 20 - 50 - 100 - 200 - 400V	380 - 220 - 100 - 50 - 20V	/	UF30

* only measures in AC current

Ref.	CONTINUOUS - SINGLE PHASE		INTENSITY FUSE	OPTION BOX OD41
	I (I max = 1,5 x I)	V (V max = 1,5 x V)	5 x 20 mm	for 3-phase
P7401	500mA - 1A	100 - 200 - 400V	2A temp.	400 - 200 - 100V
P7402	1 - 2A	100 - 200 - 400V	3,15A temp.	400 - 200 - 100V
P7403	2,5 - 5A	100 - 200 - 400V	8A temp.	400 - 200 - 100V
P7404	5 - 10A	100 - 200 - 400V	16A temp.	400 - 200 - 100V
P7405	10 - 20A	100 - 200 - 400V	/	400 - 200 - 100V

Electrodynamic wattmeter



ref. PSY44

PSY44 measures the true RMS active power of single phase AC, balanced three phase alternating current signal with or without DC offset.
PSY44 has 44 ranges to measure from 1.2W full scale to 6kW.

RANGES	
INTENSITY	200mA - 1A - 5A - 10A
VOLTAGE	6 - 12 - 24 - 36 - 48 - 60 - 120 - 240 - 360 - 480 - 600V
ACTIVE POWER	1,2W to 6kW in 44 ranges

- Frequency range: DC and 15Hz ~ 500Hz
- Accuracy 1%
- Protection : one fuse on each intensity input

READING

- A single scale graduated from 0 to 120 and a lookup table shows the factor to apply to the reading according to the selected intensity and voltage ranges.

GENERAL CHARACTERISTICS

- Voltage circuit resistance: 333Ω/V
- Length of scale: 120mm
- Dimensions: 150 x 200 x 72mm
- Weigh: 1,2kg
- CEI1010 Pol2 CATIII 600Vrms

Power factor meter



ref. PSYPHI

PSYPHI measures the power factor of single phase and three phase circuits.
No source of energy (battery or mains) is needed for it to operate.

- Spread of power factor measurement: -0.4 - 1 - 0.4
- Current ranges: 1A 5A 10A
- Single phase voltage ranges: 30 - 100 - 240 - 380V
- Three phase voltage ranges: 120 - 240 - 380V
- Accuracy: 2.5%

Protection by 2 current circuit fuses.

- Safety terminals
- Dimensions: 200 x 150 x 70mm.
- Weight: 1.7kg
- CEI1010 CATII 300Vrms pol2

1MHz AC Millivoltmeter

GVT417 is a millivoltmeter for the measuring of sinusoidal voltages from 10µV to 100V, in the 10 Hz to 1MHz band. The dial is graduated in volts and dB for the direct measurement of amplifier increases.

RANGES V	300 µV - 1 - 3 - 10 - 30 - 100 - 300mV 1 - 3 - 10 - 30 - 100V
RANGES dB	-70 -60 -50 -40 -30 -20 -10 0 +10 +20 +30 +40 dB
ACCURACY	3 % from 20 Hz to 200kHz - 10% from 10 Hz to 1MHz
IMPEDANCE	1 MΩ - 40 pF
OVERLOAD	from 300µV to 0,3V: 150VAC / from 1 to 100 VAC: 300 VAC

OUTPUT

A 100mVrms copy output for the full deviation allows the GVT417 to be used as an attenuator/ amplifier at a constant signal input level.

OTHER FEATURES

Power supply: 115–230VAC 50Hz.
Dim. 142 x 210mm. Depth: 235mm
Weight: 3kg
CEI1010 CATII CL1 300Vrms pol2



ref. GVT417

Single-phase digital wattmeter



ref. WECO

The WECO wattmeter is a multimeter able to measure the following values:

- Active power
- Apparent power
- Power factor
- DC and AC voltage or intensity
- Resistance
- Frequency
- Energy

MEASURING CHARACTERISTICS

WECO displays up to 4 values at the same time, e.g.
U – I – W - PF or U – I – VA – Hz
The WECO energy meter displays the energy consumed in the load in real time in Wh – kWh and elapsed time in hours, minutes, and 1/10 min.

FUNCTION	RANGES	RESOLUTION	ACCURACY
WATT	6000W	1W	1,5% + 1dgt
VA	99,99 VA	0,01 VA	1,5% + 1dgt
	999,9 VA	0,1 VA	1,5% + 1dgt
	9999 VA	1 VA	1,5% + 1dgt
cosφ	1,00	0,01	1,5% + 2dgt
VDC	299,9 V	0,1 V	1% + 1dgt
	600 V	1 V	1% + 1dgt
VAC	299,9 V	0,1 V	1% + 1dgt
	600 V	1 V	1% + 1dgt
IDC	10,00 A	0,01 A	1% + 1dgt
IAC	10,00 A	0,01 A	1% + 1dgt
OHM	9999 ohms	1 ohm	1% + 1dgt
	19,99 kohms	10 ohms	1% + 1dgt
Hz	10,0 to 99,9 Hz	0,1 Hz	1% + 1dgt
	999 Hz	1 Hz	1% + 1dgt
Wh	10Wh to 10MWh	as per range	1% + 1dgt

- Auto ranging mode
- Accuracy specified in the 40 Hz – 400 Hz frequency range for sine wave signals.
- It has an alarm with adjustable upper and lower set points.
- Voltmeter input impedance: 10 MΩ
- Circuit intensity resistance: 10 mΩ
- 4 mm safety connector terminals
- Dimensions: 240 x 100 x 280 mm. LCD display: 93 x 52 mm
- CEI1010 CATIII 300Vrms pol2
- Supply: 6x 1.5V AA Batteries (mains adapter ref. ADAX in option)

MAINS ADAPTER OPTION

The wattmeter WECO works with 6x1.5V batteries in standard, but it has a 9V DC input. It can be supplied from mains 230VAC 50/60Hz

ref. ADAX



TRMS AC+DC - wattmeter 70kHz



ref. DIGIWATT

CEI1010 CATIII 600Veff pol2 / CEI1010 CATII 1000Veff pol2

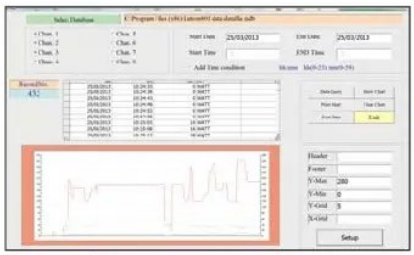
Function	U	I	W
Ranges	400Vrms single-phase 700Vrms 3-phase	20Arms	0,2 - 2 - 20kW
Accuracy in % of reading	1% from 0 to 70kHz	2% from 0 to 20kHz 3% from 20 to 70kHz	2% from 0 to 20kHz 3% from 20 to 30kHz 5% from 30 to 70kHz
Protection	Electronic breaker	20A delayed fuse	
Impedance	1,5MΩ	<5mΩ	
Recopy output	10VDC/1000Vrms	10VDC/20Arms	10VDC / 0,2kW - 2kW - 20kW

DIGIWATT is a digital multimeter with floating inputs simultaneously displaying the 3 electric values: voltage, current and power. DIGIWATT measures the TRMS effective values of the U I W measurements, possibly with direct component superimposed. The wide bandwidth of the apparatus allows measurements to be made from DC to 70kHz or on chopped signals (frequency converters, industrial choppers, rectified supplies etc.). The apparatus voltage and current inputs are insulated between each other and relative to earth. DIGIWATT measures single phase and balanced three phase powers.

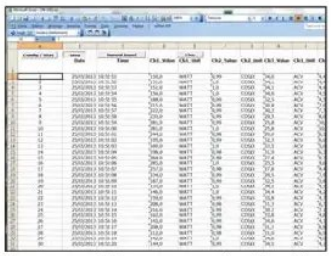
Low ranges AC wattmeters



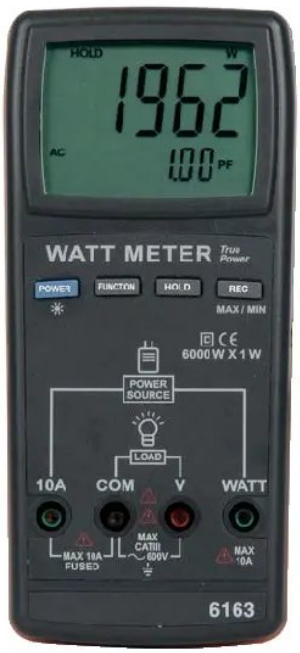




Data acquisition program



Data acquisition program for Excel®



These single-phase wattmeters are very easy to connect and use. Double display, clear marking, low ratings and accuracy are among the advantages of these wattmeters. Also, two free acquisition programs, very simple to use, make the product complete and very accessible.
All measurements are AC RMS between 40 and 400 Hz.

- RMS power
- Automatic rating change (PSY6063)
- Integrated phase-meter 0.01 to 1.00
- Voltage measurement
- Current measurement
- Double display: W & cosφ or by simple press U & I
- Automatic reset
- Memory: Min. / Max. / Hold
- Backlit display
- Voltage impedance: 10 Mohms
- Data acquisition program giving characteristic plots in Windows® with PC USB connection cable.
- Data acquisition program for Excel® type spreadsheets in Windows® with PC USB connection cable.

Ref	PSY6063	PSY6163
U	260 VAC x 0,1V	600 VAC x 0,1V
I	1A x 0,1mA / 2A x 1mA	10A x 0,01A
W	0 to 99,99W x 0,01 W / 0 to 520W x 0,1 W	0 to 6000W x 1W
Accuracy	+/- 1% + 0,5W / 50Hz	+/- 1% + 5W / 50Hz

DISPLAY:
By two 3 1/2 and one 4 1/2 digits displays, height of digits 15mm.
Power ranges are switched automatically.

INPUTS
Voltage inputs: Three floating potential voltage terminals, situated at the rear of the apparatus allowing either the application of an alternating, continuous or composite voltage, or a balanced three phase voltage. These inputs are electronically protected against over voltages.
Max. voltage: 400Vrms single phase, 700Vrms three phase

Current inputs: Two floating potential current terminals, situated at the rear of the apparatus allowing the application of an alternating, continuous or composite current. Imax = 20A. The current input is protected by a delay fuse, allowing measurements on starting up a motor

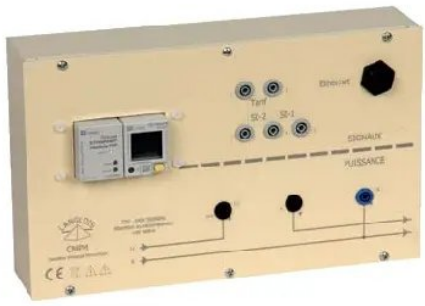
RECOPY OUTPUTS
Voltage output: 0 to 10V DC signal for 0 to 1000Vrms entering.
Current output: 0 to 10V DC signal for 0 to 20Arms entering.
Power output: 0 to 10V DC for 0 to 0.2kW - 0 to 2kW - 0 to 20kW; these three ratings are switched automatically.
Important: these three outputs are insulated from the voltage and currents applied to the input terminals of the apparatus.

OTHER CHARACTERISTICS
A switch on the front panel selects the mode single or three-phase.
A diode informs the user that an overvoltage has been applied to the voltage input; he must remove it and reset the voltage circuit.
Input and outputs through 4mm safety terminals
Dims: 375 x 80 x 275 mm - 5kg
Supply: 220-240V 50/60Hz 30VA.

Single phase and three phase multifunctional counters



CMPT



CMPM



UL37

Ref.	CONNECTION	ELECTRICAL NETWORK	SPAN RANGE 1	COMMUNICATION	DIMENSIONS
CMPT	3-phase	230/400VAC 50/60Hz	20mA...30A	Ethernet	330 x 200 x 80mm
CMPM	Single-phase	230...240VAC 50/60Hz	20mA...30A	Ethernet	330 x 200 x 80mm
UL37	3-phase	230/400VAC 50/60Hz	20mA...30A	-	250 x 150 x 110mm

Energy counters (ULYS type) for the counting and the measuring of consumed powers.
For the communicating versions, the direct reading of values is possible on embedded web pages thanks to the Ethernet module.
The connection is done on safety terminal 4mm.

Common features
- Works by direct measuring without current transformer
- Backlit LCD display
- Measuring range: from 0 to 9 999 999.9 kWh
- Programming and simple use thanks to navigation keys.
- Indicator of capacitive or inductive values

- Energy balance between consumed energy and produced energy
- Phases rotation direction indicator
- One All-or-Nothing input - tariff change
- Two All-or-Nothing output – assignable à P, Q and S
- The apparatus is protected up to 80A

Record values	Direct screen reading	Via communication
Active energy receptor and generator (L1, L2, L3, total)	▪	▪
Reactive energy (L1, L2,L3, total)	▪	▪
Apparent energy (L1, L2, L3, total)	▪	▪
Zero reset partial energy counter (kWh, kVarh, kVah)	▪	▪
4 quadrants energy balance (kWh, kVarh, kVah)	▪	▪

Instant values	Direct screen reading	Via communication
V1, V2, V3, V		▪
U12, U23, U31		▪
I1, I2, I3, In, I		▪
FP1, FP2, FP3, FP		▪
S1, S2, S3, S	▪	▪
P1, P2, P3, P	▪	▪
Q1, Q2, Q3, Q	▪	▪
Frequency		▪

Energy meter



Energy counter (ME type) commonly encountered in housing buildings.
Easy to use thanks to 3 intuitive navigation keys
Works by direct measuring without current transformer
- LCD display
- Current up to 63A
- Totalizer counter
- Partial counter with zero reset
- Autonomous supply

Ref	ME66 single-phase	ME71 3-phase + N
Voltage and frequency of use	230/400V – 50/60Hz	230V – 50/60Hz
Measuring range	0 to 99 999 999,99 kWh	0 to 99999 kWh
Display of date and hour of zero-reset	No	Yes
Impersonal output	-	Adjustment from 1Wh to 1 kWh
Counter indicator light	1000 lightnings by kWh	500 lightnings by kWh

Mains analyser



ref. 6830

Supplied accessories
- 3 multiple-rating hook-on ammeters: 1 - 10 - 100A
- 4 measurement leads + crocodile clips
- 1 RS232/USB cable + software + handbook
- 1 mains adapter
- 1 carry case



V A W VAR VA POWER FACTOR THD HARMONICS

The 6830 analyser is well suited to taking measurements in both living and educational spaces due to low current ratings (999.9mA) and low power ratings (999.9 W – 999.9VAR – 999.9VA). It is also suitable for industry due to its high ratings, the analysis of 3-wire and 4-wire unbalanced three-phase and single phase networks, the detection of transience, a comprehensive current and voltage analysis, and harmonic distortion. 4 display modes: electrical quantities (35 simultaneous parameters), dual-trace oscilloscope, harmonic analysis and Fresnel diagram.

FUNCTIONS	RANGES	Band-width	ACCURACY
ACTIVE POWER	999,9 W - 9,999 - 99,99 - 999,9 - 9999 kW	6kHz	1% + 8dgt
REACTIVE POWER	999,9 VAR - 9,999 - 99,99 - 999,9 - 9999 KVAR	6kHz	1% + 8dgt
APPARENT POWER	999,9 VA - 9,999 - 99,99 - 999,9 - 9999 kVA	6kHz	1% + 8dgt
INTENSITY TRMS	999,9 mA - 9,999 - 99,99 A	12kHz	0,5% + 5 dgt
VOLTAGE TRMS	600,0 V	12kHz	0,5% + 5 dgt
POWER FACTOR	0,00 à 1,00		0,04
PHASE ANGLE	-180° to 180°		1°
Capture of pics V	600,0 V		5%
Capture of pics A	999,9 mA - 9,999 - 99,99 A		5%
CREST FACTOR	1,00 to 99,99		5%
THD-F	0,0 to 20,0 %		1%
	20,0 to 100,0 %		3%
	100,0 to 999,9 %		10%

HARMONICS order 1 ~ 100	RANGES	ACCURACY
measured in / expressed in		as per order
VOLTAGE / in VOLT	600.0 V	2 ~ 6%
VOLTAGE / % of the fundamental	0.0 ~ 100.0%	2 ~ 6%
CURRENT / in mA or A	999.9 mA - 9.999 - 99.99 A	0.2 ~ 35%
CURRENT / % of the fundamental	0.0 ~ 100.0%	0.2 ~ 35%

Networks
- 2- and 3-wire single-phase
- 3- and 4-wire three-phase Balanced or otherwise.

Displayed measurements
- phase-to-ground and composite RMS voltages
- RMS voltage of the neutral/earth
- RMS currents in phases and neutral
- RMS voltages and current peaks
- average current, average voltage
- Power, W, VAR and VA in each phase
- total power W, VAR and VA in the charge
- average power W, VAR and VA
- power peaks W, VAR and VA
- Power factor and average Power factor
- phase shift of the phase-to-ground and composite voltages
- phase shift of currents in the phases
- consumption WH, VARH and VAH

Harmonics 1 to 99
- RMS currents and voltages of harmonics
- harmonic currents and voltages as a % of the fundamental component
- frequency and distortion of harmonics
- THD-F (total harmonic distortion)
- Imbalance ratio between voltages
- Fluctuation ratio between voltages
- Imbalance ratio between currents
- Fluctuation ratio of currents

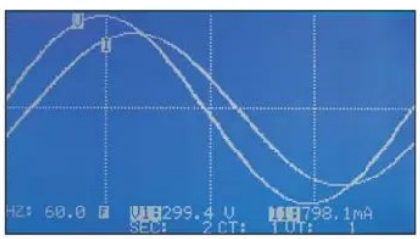
Capture of transients
- overvoltages – undervoltages – lack of a phase

Memory capacity
- up to 28 files of transients (from all of the measurements)
- 2.4 MB

Data transfer
- screen files (measurements, harmonics, Fresnel diagrams and transients)
- RS232 – USB optical link.
- Supplied software.

Screen hard copy
- table of measurements, oscillograms, harmonics and Fresnel diagrams

Miscellaneous
- Internal calendar: year-month-day-hour-min-sec
- Power supply 230VAC 50/60Hz
- 106 x 60mm backlit LCD screen
- Dim: 25 x 155 x 57mm Weight: 1.2kg



Residual Current Circuit Breaker Tester

- Measurement & check possible under voltage
- Rechargeable apparatus (batteries supplied)
- LCD display
- TRMS converter
- Automatic test sequences
- Programmable delay lines
- Loop impedance and line impedance
- Good / bad indicators
- Test lock
- Tests on single and three phase systems
- Magnetic back for hands free
- On the screen edge, green light for test OK, and red light for all errors.
- Direct help on the screen
- Protection: 300V CAT IV / 600V CAT III
- Test of residual current circuit breakers according the norm EN 61557-6
- RS232 / USB Interfaces



Inspection, maintenance and periodic testing of electrical installations. Evaluation of measures of protection low voltage installation. Troubleshooting on under voltage installations. Field device with rechargeable batteries.

ref. SMARTEC-22 (with accessories)

ref. SMARTEC-LOG data mining software option

FUNCTIONS	RANGES	RESOLUTION	ACCURACY
Nominal trip out current IΔn	IΔN: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
Contact voltage in V	0.0 V ... 19.9 V 20.0 V ... 99.9 V	0.1 V 0.1V	-0+15% reading ± 10 dgt
Trip out current	(0.2 ... 1.1) x IΔN (AC Type) (0.2 ... 1.5) x IΔN (A type, IΔN ≥ 30 mA) (0.2 ... 2.2) x IΔN (A type, IΔN < 30 mA)	0.05 x IΔN 0.05 x IΔN 0.05 x IΔN	± 0.1x IΔN ± 0.1x IΔN ± 0.1x IΔN
RCD trip out time (ms)	0.0 ms ... 40.0 ms 0.0 ms ... at maximum time	0.1 ms 0.1 ms	± 1 ms ± 3 ms
Loop impedance	0.0 Ω ... 9.99 10.0 Ω ... 99.9 100.0 Ω ... 999 1.00 kΩ ... 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	± 5 % reading + 5 dgt ±5 % reading + 5 dgt ±10 % reading ±10 % reading
Line impedance	0.0 Ω ... 9.99 10.0 Ω ... 99.9 100.0 Ω ... 999 1.00 kΩ ... 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	± 5 % reading + 5 dgt ±5 % reading + 5 dgt ±10 % reading ±10 % reading
Operating voltages	0 V ... 550V	1V	± 2 % reading + 2 dgt
Operating frequency	15.0 ... 449.9 Hz	0.1 Hz	± 0.2 % reading +15 dgt

Delivered with a set of test leads with alligator clips, probes, batteries, an AC adapter / charger, CD-ROM and a user guide



Earth tester

EARTH is a tester which can perform three types of earth measurements in accordance with standard NCF15-100.

- 4-wires measurement (the most reliable because it avoids contact problems).
- Selective measurement of an earth connection in parallel with others, using a clamp.
- Selective measurement of an earth connection, without an auxiliary earth connection, using two clamps.
- Measurement of ground resistance
- Measurement of the effective intensity of stray currents in a multiple earth network

EARTH is equipped with a memory that can store up to 250 measurements.
The data is transferred to a PC via the RS232 output. The optional SMART software can be used: to compile a sheet of results and export this data to a spreadsheet.



ref. EARTH (with accessories)

ref. EARTH-PA set of 2 clamps

ref. EARTH-SMART option software

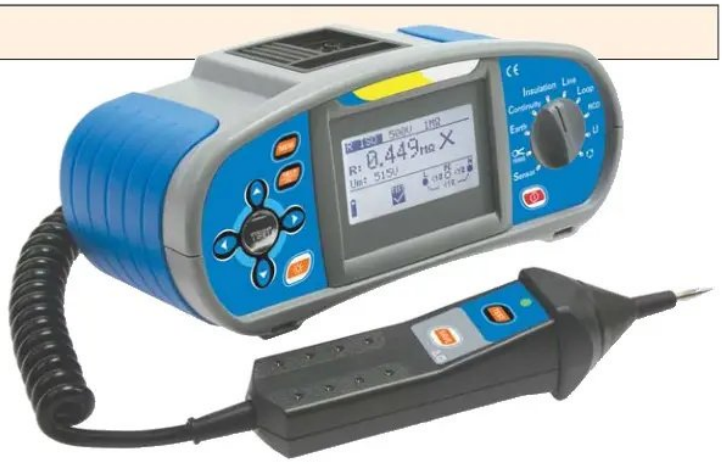


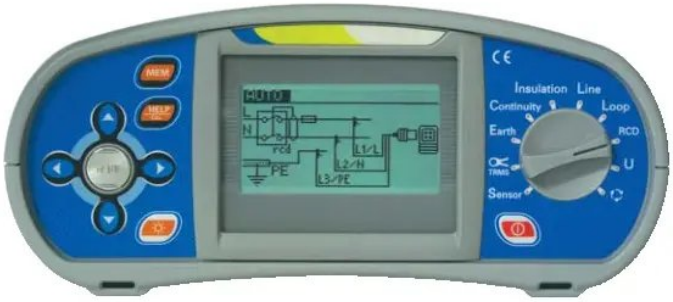
Option EARTH-PA

MEASURE / METHOD	IN	RANGES					ACCURACY
RESISTANCE / 4 WIRE	Ω	0,00 to 19,99	20,0 to 199,9	200 to 999	1,000 to 1,999k	2,00 to 19,99k	2% reading +3dgt
RESISTANCE / 1 CLAMP	Ω	0,00 to 19,99	20,0 to 199,9	200 to 999	1,000 to 1,999k		2% reading +3dgt
RESISTANCE / 2 CLAMPS	Ω	0,0 to 19,9					10% reading +3dgt
RESISTIVITY	Ωm	0,01	0,1				-
CURRENT	mA	0,0 to 99,9	100 to 999	1,00 to 9,99A	10,0 to 19,9A		5% reading

Electrical installation tester

The XE electrical installation tester brings together in a single piece of equipment the majority of the functions which are necessary for checking domestic and business premises in accordance with standard NFC15-100. In particular: current, voltage, earth measurement, earth continuity, trigger current and time of differentials, insulation resistance, calculation of short-circuit and fault currents, resistance of the mains and earth loop, calculation of fuses and phase rotation, etc.
The graphical screen displays the results and the measurement settings numerically. By simply pressing the HELP key, the connection diagram(s) corresponding to the position of the switch will appear on the screen.
XE has 2 ports: RRS232 and USB to be connected to a PC. The software, which is supplied as standard, can be used to export data from the memory of the XE to a spreadsheet, or to edit a measurement report.
The unit is supplied with a storage case and all of the accessories required to undertake all measurements, except for a blind clamp ammeter and the luxmeter unit (available as an option).
CEI1010 CAT III 600V POL2





ref. XE (with accessories)

ref. LUX1172 Luxmeter unit

CLAMP OPTION



This precision clamp is used either for measuring a leakage current (in the PE conductor for instance), or for measuring the current in a phase. It can be used in the 40Hz to 5kHz band.

ref. P1018



Supplied accessories

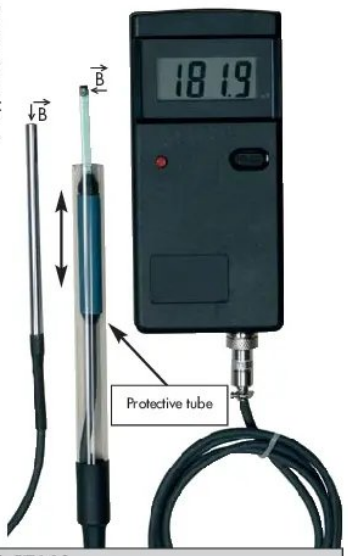
FUNCTIONS	RANGES					ACCURACY
INSULATION RESISTANCE in MΩ Test voltages: 250-500-1000VDC	0.000 ~ 1.999	2.00 ~ 99.99	100.0 ~ 199.9	200.0 ~ 999.9		5% reading + 3dgt
AC VOLTAGE in VAC	0 ~ 1200					3% reading + 3dgt
CONTINUITY (low impedance source) in Ω I >200mA for 2Ω. Vmax = 9VDC	0.00 ~ 19.99	20.00 ~ 99.9	100 ~ 1999			3% reading + 3dgt
CONTINUITY in Ω Imax = 8mA Vmax = 9VDC	0.0 ~ 99.9	100 ~ 1999				5% reading + 3dgt
RCD test in mA	10 - 30 - 100 - 300 - 500 - 1000 mA					
CONTACT VOLTAGE in VAC	0.0 ~ 9.9	10.0 ~ 99.9				10% reading + 2dgt
RCD trip out time in ms	0 ~ 300(IΔn)	0 ~ 150(2xIΔn)	0 ~ 40(2xIΔn)			3ms
Delayed RCD trip out time in ms	0 ~ 500(IΔn)	0 ~ 200(2xIΔn)	0 ~ 150(2xIΔn)			3ms
RCD trip out current in IΔn	0.2 ~ 1.1	0.2 ~ 2.2				0.1 x IΔN
Earth loop resistance in Ω	0.00 ~ 19.99	20.0 ~ 99.9	100 ~ 1999			5% reading + 3dgt
Earth loop defective current estimated A	0.00 ~ 19.99	20.0 ~ 99.9	100 ~ 999	1.00 ~ 9.99 kA	10.0 ~ 24.4kA	
EARTH MEASUREMENT in Ω	0.00 ~ 19.99	20.0 ~ 99.9	100 ~ 1999			2% reading + 3dgt
AC RMS CURRENT in mA and A	0.0 ~ 99.99mA	1.00 ~ 999mA	1.00 ~ 19.99A			5% reading + 3dgt
Resistance of mains line in Ω	0.00 ~ 19.99	20.0 ~ 99.9	100 ~ 1999			5% reading + 3dgt
Short circuit current estimated in A	0.00 ~ 19.99	20.0 ~ 99.9	100 ~ 999	1.00 ~ 9.99 kA	10.0 ~ 24.4kA	
LUXMETER (optional probe) in lux	0.01 ~ 19.99	20.0 ~ 199.9	200 ~ 1999	2.00 ~ 19.99klux		5% reading + 2dgt

TESLAMÈTRE GAUSSMÈTRE

This portable teslameter measures the magnetic field intensity of few hundred micro teslas until 2 teslas. The meter is supplied with two probes. The axial probe measures the field in the axis of a solenoid, the side probe in a gap, or more generally next to a magnet.

- Accuracy: 0,5%
- Display: 2000 counts LCD screen
- Polarity indicator
- One 9V batery (6LR61 type)
- Dim : 150x70x25mm / 170g

2 probes included (length of the cable: 1.5m). Axial probe Ø6.5mm . Side probe, 4mm large, 1mm thick. Delivered with a protective tube



Info battery : 1 x 6LR61

ref. ST640

PYRANOMETER

The PYR1307 pyranometer measures the power of solar radiation in watts per m2: W/m2

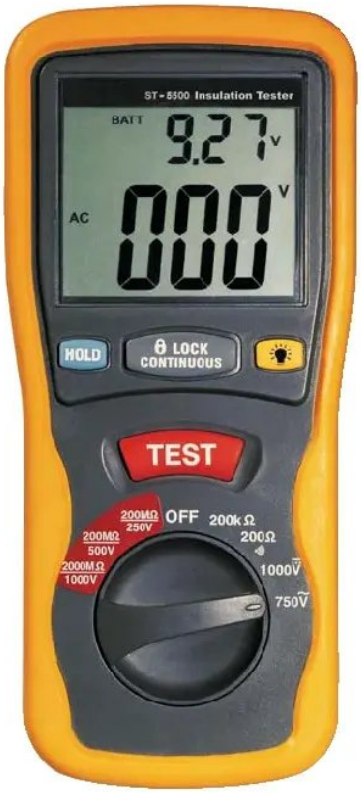
- Ratings: 199.9 W/m2 and 1,999 W/m2
- Measuring error: < 10W/m2 or 5% of the reading
- Display: 2,000 pixel LCD
- Captures min. and max. values
- "Hold" key allows one to freeze the display
- Backlighting
- Supplied with a carry case
- Dimensions: 162 x 63 x 28mm
- Weight: 250g



Info battery : 1 x 6LR61

ref. PYR1307

INSULATION TESTER



ref. ST5500

Info battery : 6 x LR14

The ST5500 megohmmeter has 4 measuring functions: insulation resistances with 3 test voltages (250V, 500V, 1000V), resistors, DC voltage and AC voltage.

FUNCTION	RANGES	RESOLUTION	Withstanding voltage /current	ACCURACY
MΩ	200 - 2000MΩ	100kΩ - 1MΩ	250 – 500 – 1000V/1mA	3,5% + 5dgt
Ω	200Ω - 200kΩ	0,1Ω - 100Ω	< 8V	1% + 2dgt
.ı))	Ring for R< 40Ω		200 mA when R < 40Ω	
VDC	1000V	1V		0,8% + 3 dgt
VAC	750V	1V		1,2% + 10 dgt

TECHNICAL CHARACTERISTICS

- Insulation tests: 1mA rated current using the rated test voltage for fast-charging of the capacitors.
- .))) in the ohmmeter position, the unit will make a sound if the tested resistance is less than 40Ω. In this case, the 200mA current is used to detect a poor connection.
- The HOLD key locks the display, and the LOCK key maintains the test voltage in the high-capacity wires which take longer to charge.
- Batteries: 6 x 1.5V (AA type)
- Dimensions: 200 x 92 x 50mm. Weight: 700g.
- Supplied accessories: test leads and case
- CEI1010 cat III 1000V pol2



CONTACT AND NON-CONTACT TACHOMETER

The AT8 tachometer combine in one case a light-sensing detector and a sensor for measurement by contact. A microprocessor switches between ranges automatically, eliminates non-significant zeroes and controls a memory which records the maximum, minimum and average value. It is delivered with one rubber cone for direct measuring by contact on shafts, and one disk for the scrolling measuring (band in movement).

REF	AT8
Info Battery	1 x 6LR61
DISPLAY : 5 DIGITS	LCD 11mm
LIGHT SENSOR MEASUREMENT	2 ~ 100 000 rpm
CONTACT MEASUREMENT	2 ~ 20 000 rpm
ACCURACY	0,05% lecture + 1dgt
MEASUREMENT UNITS	rpm m/min Hz m
SAMPLE TIME	0,5s
DETECTION DISTANCE	50 ~ 500mm
TIME BASE	Quartz
MEMORY	10 measurements
MIN MAX AVERAGE VALUE	For each measurement
DIMENSIONS	210x58x36mm 180g





STROBOSCOPES

STA10K and STA269 are both stroboscopes with the same flash lighting circuits.

COMMON FEATURES

- Stroboscopes with xenon lamp, a flash duration of approximately 60µs and a power of 40W.
- LED digital display indicating the rotation speed in revolutions/minute (RPM)
- 230V AC mains power supply.
- Ventilated focussing lens to protect the flash tube. Parabolic mirror.
- Power supply 230VAC 50/Hz
- Dimensions: 210 x 120 x 120mm. Weight: 1kg.
- ABS housing



ref. STA10K



External synchro

ref. STA269

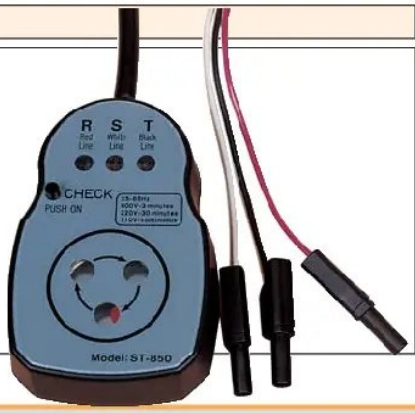
Réf	Rotation speed *	Accuracy	Functions	Nb dgts	Ext trigger	Memory	RS232 output
STA10K	100 to 10000 rpm	0,05%	rpm	4	/	/	/
STA269	5 to 12500 rpm	0,01%	rpm & Hz	5	pulse 5V	10 memories	yes

3-PHASE TESTER

ST850 is a simple and robust tester allowing the detection of a voltage on a line and the order of the phases.

- Voltage sensing: 3 lamps indicate the presense/absense of a voltage on each of the three 3 phases
- Phase order: The circle turns clockwise, if the phases are connected in the right order
- Maximum voltage 1600 VAC for 1 min
- Box fully isolated 130x80x43mm. Weight. 550g.
- CEI1010 CATII 600Vrms pol2
- CEI1010 CATIII 300Vrms pol2

ref. ST850



DECADE BOXES

Decade resistance boxes



R80



R4

- Safety terminals
- Double insulation
- Frequency range:
  0 to 500 kHz at an accuracy 0.5%.

RESISTANCES
Power : 0.5 W permanent
Type : 0.1 et 1Ω coils / 10Ω to 1MΩ
metal film to 50 ppM.

Ref.	Nb of decades	Resistances	Dims.
R0	1	10x0,1Ω	82x82x60
R1	1	10x1Ω	82x82x60
R2	1	10x10Ω	82x82x60
R3	1	10x100Ω	82x82x60
R4	1	10x1kΩ	82x82x60
R5	1	10x10kΩ	82x82x60
R6	1	10x100kΩ	82x82x60
R7	1	10x1MΩ	82x82x60
R40	4	from 10x1Ω to 10x1kΩ	290x80x60
R50	5	from 10x1Ω to 10x10kΩ	420x80x60
R60	6	from 10x1Ω to 10x100kΩ	490x80x60
R70	7	from 10x1Ω to 10x1MΩ	490x80x60
R80	8	from 10x0,1Ω to 10x1MΩ	490x80x60

CEI1010 CATIII 1000Vrms pol2

Decade inductor boxes



L70



L2

- Safety terminals
- Double insulation

TYPE OF COILS
Coils-wound on ferrite cores, with a central core, which ensures a high Q factor. L70-AR coils without core hence best accuracy & inductance independent of the frequency

Ref.	Nb of decades	Accuracy	Inductance	Dims.
L1	1	10%	10x1µH	82x82x60
L2	1	10%	10x10µH	82x82x60
L3	1	10%	10x100µH	82x82x60
L4	1	10%	10x1mH	82x82x60
L5	1	10%	10x10mH	82x82x60
L6	1	10%	10x100mH	82x82x60
L7	1	10%	10x1H	82x82x60
L40	4	10%	10x1mH to 10x1H	290x80x60
L50	5	10%	10x100µH to 10x1H	420x80x60
L70	7	10%	10x1µH to 10x1H	490x80x60
L70-AR	7	5%	10x1µH to 10x1H	490x80x60

CEI1010 CATIII 1000Vrms pol2

Ref	Decade	10x1µH	10x10µH	10x100µH	10x1mH	10x10mH	10x100mH	10x1H
L70 **10%**	I R in Ω	250mA 10 x 0,003	180mA 10 x 0,05	150mA 10 x 0,02	100mA 10 x 1,5	70mA 10 x 12	50mA 10 x 100	30mA 10 x1k
L70-AR **5%**	I R in Ω	1A 10 x 0,005	1A 10 x 0,05	1A 10 x 0,5	400mA 10 x 5	125mA 10 x 50	40mA 10 x 500	12mA 10 x 5k

Laboratory inductors



These inductors, without magnetic core, are wound on insulating material chucks, giving them a good stability on a wide frequency range.
- Shock-proof plastic box with safety terminals.
- Dimensions : 82 x 82 x 64 mm

Ref.	Inductance	Accuracy*	Current	Resistance at 20°C
LA01	0,1H	5%	400mA	36,0 ohms
LA1	1H	5%	125mA	380,0 ohms
LA5	5H	5%	50mA	2100 ohms

* 1% to 1kHz

CEI1010 CATIII 1000Vrms pol2

Decades capacitor boxes



C50



C4

Ref.	Nb of decade	Accuracy. at 20°C	Capacitance	Dims.
C50	5	1%	from 10x100pF to 10x1µF	420x80x60
C1	1	1%	10x1nF	82x82x60
C2	1	1%	10x10nF	82x82x60
C3	1	1%	10x100nF	82x82x60
C4	1	1%	10x1µF	82x82x60

CEI1010 CATIII 1000Vrms pol2

- Capacitors are plastic film, non polarisated.
- Operating voltage : 400 VDC or 250 VAC
- Temperature drift : 80 ppM / °C
- Safety terminals
- Double insulation

Capacitor link boxes



C20

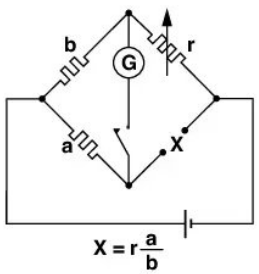
Ref.	Nb of link	Accuracy. at 20°C	Capacitance	Dimensions. (mm)
C30	5	5%	from 5µF to 105µF	170x135x110
C20	6	1%	from 0,5µF to 20,5µF	190x110x60
C10	6	1%	from 0,05µF to 2,05µF	190x110x60

CEI1010 CATIII 1000Vrms pol2

- Capacitors are plastic film, non polarisated.
- Operating voltage : 400 VDC or 250 VAC
- Temperature drift : 80 ppM / °C
- Safety terminals
- Double insulation

Box with 7 positions of ratio





The K7 box is made up of two arms « a » and « b » of a Wheatstone Bridge. The two other arms form the resistance « X » to be measured and the calibrated variable resistor « r ».

- At balance X = r a / b
- Number of scales k = a / b: 7 positions
  0.001 - 0.01 - 0.1 - 1 - 10 - 100 - 1000
- Dimensions: 82 x 82 x 60mm.
- Double insulation

ref. K7

CEI1010 CATIII 1000Vrms pol2

Zeroing galvanometer

- Suitable for assembling in Wheatstone or Thomson bridge.
- Length of the scale: 90mm
- Safety sockets 4mm
- Protection at all ranges
- 1 fuse HBC 500V / 500mA
- Double insulation

CEI1010 CATIII 600Vrms pol2

FUNCTIONS	RANGES	INTERNAL RESISTANCE	ACCURACY
VDC	- 100mV 0 + 100mV	4 kΩ	1,5 %
IDC	- 30µA 0 + 30µA	1,7 kΩ	1,5 %
IDC	- 3 mA 0 + 3 mA	40 Ω	1,5 %

ref. GAL

ACCESSORIES & CONNECTORS

Electrician's tools

PAGES 267 - 269



Various accessories

PAGES 270 -271



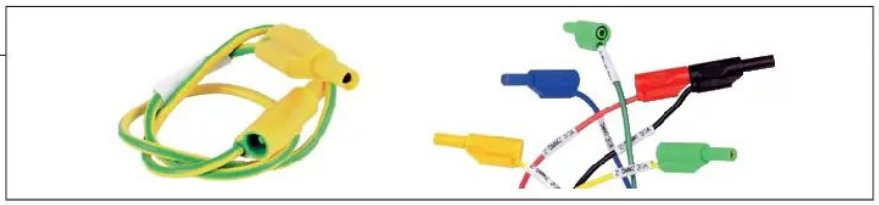
Sockets, plugs

PAGE 272



Leads & Racks

PAGES 273 - 274



Coaxial accessories

PAGE 275



Personnal Protective Equipment (PPE)

VOLTAGE TESTER





The probes are equipped with contact plates with retractable cover for connection to terminals 4mm in diameter.

ref. ST9121B

Info battery : 2 x LR03

Voltage detector ST9121 complies with IEC standard 61243-3 concerning test equipment for low-voltage electrical installations.
⚠ This mark certifies this compliance.
The mobile probe can also be attached laterally alongside the main probe, with a standard gap of 19mm from the 230V sockets to the safety eclipses.
The probes are equipped with contact plates with retractable cover for connection to terminals 4mm in diameter.

The mini-flashlight at the end of the probe allows one to illuminate a dark area.
The AUTO TEST key checks the ST9121 before and after each use.
⚠ This LED indicates the presence of dangerous voltage, even with no batteries.
8 LEDs indicate DC or AC voltage from 12 to 690V DC or V AC 50Hz.
2 LEDs determine the polarity if voltage is DC or AC.
ϟ This LED lets one distinguish neutral phase(s).
The L and R LEDs determine the order of the L1 L2 L3 phases in three-phase setups.

VDC or VAC 50Hz	12,24,36,50,120,230,400,690 VAC or VDC
PHASE IDENTIFICATION	from 100 to 690VAC - 50Hz to 60Hz
IMPEDANCE TEST	rings if the tested resistance is < 30kOhms
PHASES ORDER (in 3-phase)	indication of the order L1 L2 L3
AUTOTEST	activate the voltage LED and the buzzer
SUPPLY	two AAA 1,5V batteries
DIMENSIONS/WEIGHT	250x50x40mm / 220g
CASE	with IP64 moulded holster
CARRYING CASE	delivered in standard

Other characteristics
Double insulation case ⧈ . Working cycle : ED=30s
Response time < 0,1s In < 3mA AC or DC Is<20mA at 690Vrms
Conforms with the CEI 1010 norm Pol2 CATIV-600V CATIII-1000V

RESIDUAL CURRENT DEVICE TESTER

CA-DT33 gathers in one device all the essential functions to control and visualize instantly the quality and the conformity of electrical installations 230V :
- voltage presence
- connection to the earth
- residual current device of type AC or A

This apparatus is made for domestic, commercial and industrial installations.
- Control switch of residual currents of type AC and A, from 10 to 650mA (5 steps).
- Usable on standard wall socket 2P or 2P+E 10/16A of single-phase 230V circuit between PHASE and NEUTRAL.
- Earth connection indicator (GREEN LED).
- Phase position on the left or the right by manual selection (RED LIGHT).

Weight: 0.75 kg



ref. CA-DT33

EARTH & CONTINUITY MONITOR AND TESTER

Once it has been directly connected to a 2P+E socket, the earth & conductivity monitor and tester
CA-OHM2 can provide the following information:
- Voltage presence
- Normal or abnormal voltage
- Phase position
- Connection of earth to male prong
- Measurement of earth resistance
- Continuity control of metal parts (accessory supplied)

The display will be BLUE
- if all of the controls are normal.

The display will be RED
- if the earth value is greater than 100 ohms
- if the mains voltage is abnormally high
- if there is no earth

Weight: 0.75kg



ref. CA-OHM2

Accessory supplied
Probe on cable drum with 7m thread for checking conduction.

SMALL POLE OPTION
For distance works, in 2 nestable elements. Ergonomic handle.
Operating voltage 1000V max
Connection of test probes on IP2X (4mm) sockets.
Length: 80cm.



ref. CA-PER

Tool chest for student electricians





REF	BOX11	BOX12
Stepstool chest	yes	yes
set of 7 screwdrivers	yes	yes
Set of 4 pliers	yes	yes
Voltagte tester	yes	no

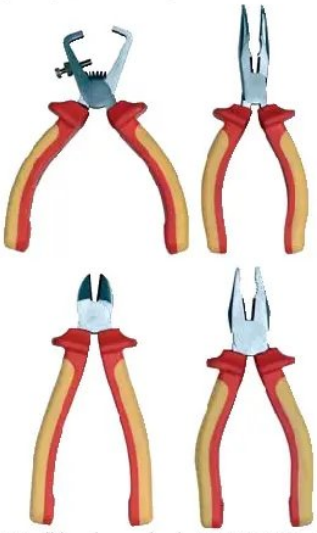
STEPSTOOL CHEST



Extremely sturdy, in plastic and steel, it stores tools and can serve as a stepstool for small jobs.

- Dimensions: 390 x 180mm. Height: 170mm.
- Interior dimensions: 380 x 150 x 140mm.
- Firmly attached plastic and rubber handle on a steel shaft
- Upper panel in riveted stainless steel
- Clasp and grommet closings for padlock
- Lid stays vertical when opened
- Interior inset box

SET OF 4 PLIERS



Professional quality, no loosening on the shaft, rotates flexibly, in chrome/vanadium alloy.
Steel used by the biggest tool manufacturers for its sturdiness.
These pliers comply with regulations on safety in the workplace for voltages up to 1,000V.
Ergonomic and comfortable handle because of its combination of rigid and flexible plastics.

- 1 pair of cutting pliers, length: 165mm (can cut through carbon steel)
- 1 pair of stripper pliers, section up to 10mm2, length: 160mm
- 1 set of bent nose pliers, length: 165mm (with cutting section at the rear)
- 1 pair of combination pliers, length: 170mm (with cutting section at the rear)

IEC60900 1000 V

Brinell hardness : body HB470-510 cutting part HB600-620
Rockwell hardness : corps HRC44-48 cutting part HRC57-59

VOLTAGE TESTER



- 6-400V, 0-60Hz.
- Works without batteries.
- LED indicators.
- CAT II – 400V

SET OF 7 SCREWDRIVERS



Professional quality, in chrome/vanadium/molybdenum alloy, compliant with regulations on work products for voltages up to 1000V. Ergonomic and comfortable handle because of its combination of rigid and flexible plastics. The end of each screwdriver is magnetic.

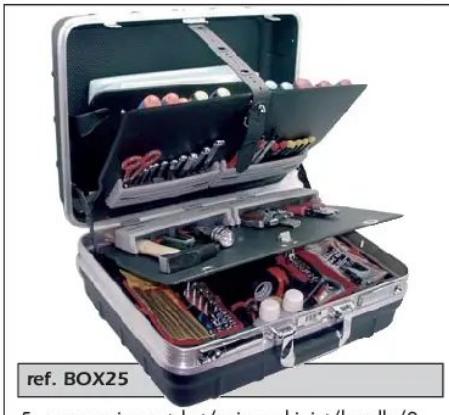
- 1 flat, 6.5 x 150mm, total length: 260mm
- 1 flat 5.5 x 125mm, total length: 225mm
- 1 flat 4 x 100mm, total length: 195mm
- 1 flat 2.5 x 75mm, total length: 170mm
- 1 Phillips 6 x 175mm, total length: 285mm
- 1 Phillips 4.5 x 150mm, total length: 255mm
- 1 Phillips 3 x 100mm, total length: 200mm

IEC60900 1000 V

Brinell hardness of the blades : HB600-630
Rockwell hardness of the blades : HRC57-60

Maintenance tool kit

ELECTROMECHANICAL MAINTENANCE TOOL KIT



ref. BOX25

5 accessories: ratchet/universal joint/handle/2 extensions
1 return spring pin
2 polyethylene tanks
3 storage boxes
1 spot oiler
3 drift punches

1 adjustable wrench
4 4/5/6/8mm pipe wrenches
15 male wrenches, between 0.28" and 3/8"
10 male wrenches, between 1 and 6mm
2 red and black shunt leads
13 combination wrenches, between 3.2 & 14 mm
1 electrician's knife
1 magnetic finger
1 double tape-measure
13 sockets, between 3.2 and 14mm
11 sockets, between 3/16" and 9/16"
1 dual-power soldering iron
2 red and black wire grips
2 sets of mm and inch thickness gauges
1 penlight
6 needle files
1 riveting hammer
1 insulated mirror
3 welding tools
1 pair of electrician's scissors
2 red and black wire picks
2 straight and bent half round nose pliers

1 pair of stripper pliers
1 pair of pliers for removing the integrated circuits
1 pair of reversible retaining ring pliers
1 pair of multiple slip joint pliers
1 pair of combination pliers
1 silk brush
3 pairs of laboratory forceps (straight/bent/reversed)
2 pairs of cutting pliers
3 nickel-plated red and black crocodile clips
1 scriber
1 punch
1 solder pump
1 steel rule and 1roll of adhesive
2 flat stubby and cross-threaded screwdrivers
4 2.5/3/4/5.5mm insulated screwdrivers (1000V)
2 PH00-PH000 microelectronic screwdrivers
6 1.2/1.5/1.8/2/2.5/3mm flat microelectronic screwdrivers
3 PH0-PH1-PH22 Philips screwdrivers flat-blade
2 Screw-holding and cross-threaded screwdrivers
3 PZ0/PZ1/PZ2 Pozidriv screwdrivers
1 testing screwdriver
2 welding braids

ELECTRONIC MAINTENANCE TOOL KIT



ref. BOX36

6 accessories: ratchet/universal joint/2 handles/2 extensions
2 polyethylene tanks
3 storage boxes

1 spot oiler
6 3.2 to 13mm open-end wrenches
1 adjustable wrench
8 male wrenches, between 1.5 and 8mm
15 male wrenches, between 0.28" and 3/8"
2 red and black shunt leads
1 electrician's knife
13 sockets, between 3.2 and 14mm
11 sockets, between 3/16" and 9/16"
1 soldering iron
2 red and black wire grips
2 sets of mm and inch thickness gauges
1 penlight
6 files
1 insulated mirror
1 pair of electrician's scissors
1 pair of flat-nosed pliers
2 straight and bent half round nose pliers
1 pair of stripper pliers

1 pair of welding pliers
1 pair of pliers for removing the integrated circuits
1 pair of straight laboratory forceps
1 pair of diagonal cutting pliers
1 pair of multiple slip joint pliers
1 brush
1 scriber
1 solder pump
1 steel rule
1 roll of adhesive
1 spring-hook
1 testing screwdriver
1 welding braid
1 jeweller's screwdriver with 3 blades
2 6.5-8mm screwdrivers
2 PH1-PH2 cross-threaded screwdrivers
2 flat stubby and cross-threaded screwdrivers
2 3.5-5.5mmmm insulated screwdrivers (1000V)
2 flat-blade screw-holding and cross-threaded screwdriver

ELECTRICAL MAINTENANCE TOOL KIT



3 storage boxes
1 1000V insulated adjustable wrench
5 1000V insulated flat wrenches 8 -10 - 12 - 13 - 14mm
1 1000V insulated cable cutter
1 skinning knife
1 fibre tape measure
46 bit sockets and square accessories measuring 1/4"
1 gas cutter
10 saw blades
1 saw frame
2 pairs of lug crimping pliers

1 pair of Colson pliers
1 pair of 1000V insulating cutting pliers
1 pair of locking pliers
1 pair of 1000V insulated multiple slip joint pliers
1 pair of 1000V insulated telephone pliers
1 pair of 1000V insulated combination pliers
1 weld roll
7 PH 00 -0-1-2 PZ 0-1-2 1000V insulated cross-threaded screwdrivers
5 2.5/3.5/4/5.5/6.5mm 1000V insulated flat screwdrivers
1 welding braid

ref. BOX47

Various accessories

ADAPTERS 50V MAX & EXTENSIONS



ref. ADM42



ref. ADM24



ref. MA42



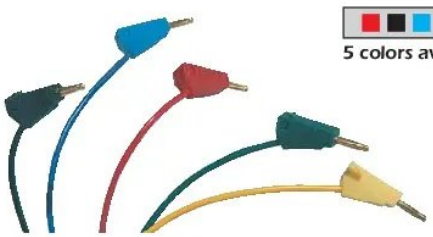
ref. FDN2

2 colors available except FDN2



ref. MA44

LEADS Ø2MM 50V MAX



5 colors available

Ref.	Length
211	10 cm
212	20cm
214	50cm
215	100cm

TEST PROBES



Length : 120mm
Compatible with safety connector Ø4mm
CEI1010 pol2 CATIV 600Vrms 10A

COLORS

ref. PT4



Length : 142mm
Compatible with safety connector Ø4mm
CEI1010 pol2 CATIV 600Vrms 10A

COLORS

ref. PT170

TEST CLIP



Compatible with safety connector Ø4mm
Length 160mm
CEI1010 pol2 CATIVrms 600V 5A

COLORS

ref. H30S

CABLE LUG ADAPTER 50V MAX



With fork lug suitable for screw terminals with screw diameter up to 6mm. Compatible with safety leads.
Max. current: 30A

COLORS

ref. SC17

SAFETY CROCODILE CLIPS 10A



Compatible with safety connector Ø4mm
Length 95mm.
Clamping limit : Ø30mm
CEI1010 pol2 CATIII 600Vrms 10A

COLORS

ref. PC30

CONNECTOR ADAPTER



Compatible with safety connector.
Max current 30A.
Max voltage 30VAC / 60VDC

COLORS

ref. SAA

CONNECTORS / ADAPTERS

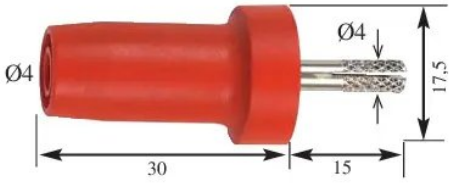
Adapters to connect on circuit-breakers, contactors, switches...
Compatible with safety leads 4mm.

Ref.	COLORS	Fixation	C	L
ADAM3		Threaded M3,5	5mm	38mm
ADAM4		Threaded M4	5mm	38mm
ADAL3		Threaded M3,5	5mm	73mm
ADAL4		Threaded M4	5mm	73mm
ADAS2		Smooth Ø2,4	9mm	28mm
ADAS3		Smooth Ø3,2	10mm	28mm
ADAK3		Threaded M3	5mm	38mm
TELA4-3.5		Threaded M3,5	5mm	21mm
TELA4-4		Threaded M4	5mm	20mm



SAFE ADAPTERS

Allows the adaptation from a standard connector to a safe connector. Comes supplied with an allen key (AL15) to allow the head to be expanded for a secure fit

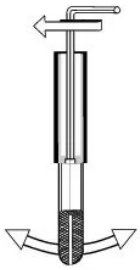


ref. NSAG



ref. NSAP





expansion clamping

ref. AL15

Allen key

MOUNTING TOOLS



Keys for tightening sockets with screw threads

ref. CLESEC

LINK JUMPER Ø4MM



19mm apart

ref. CA19S

PRE-INSULATED CRIMPING LUGS

Ref	PHOTO	TYPE	SECTION
CM-102		Ring lug for Ø4 connection	from 0.75 to 1.5mm2
CM-002		Ring lug for Ø4 connection	from 1.5 to 2.5mm2
CM-060		Ring lug for Ø4 connection	from 4 to 6mm2
CM-114		Half-insulated Faston lug 6.3	from 0.75 to 1.5mm2
CM-013		Half-insulated Faston lug 6.3	from 1.5 to 2.5mm2

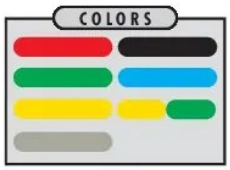
Ref	PHOTO	TYPE	SECTION
CM-153		Fully-insulated Faston lug 6.3	from 0.75 to 1.5mm2
CM-055		Fully-insulated Faston lug 6.3	from 1.5 to 2.5mm2
CM-124		Half-insulated Faston lug 6.3 with male connector	from 0.75 to 1.5mm2
CM-024		Half-insulated Faston lug 6.3 with male connector	from 1.5 to 2.5mm2

Sockets and plugs

JUTTING SOCKET



Current 32A.
Fixing hole Ø8,2



ref. BOX

CAT. III - 1000V

SOCKET TO STRIKE



For soldering or for a faston connector. Current 32A
Fixing hole Ø12.5



ref. DFF

CAT. III - 1000V

SOCKET TO STRIKE



Current 32A.
Fixing hole Ø12,5



ref. DF4

CAT. III - 1000V

SCREW-DOWN SOCKET



Current 32A.
Fixing hole Ø12,8



ref. DV4

CAT. III - 1000V

JUTTING MALE SOCKET



Compatible with all female sockets.



Support location

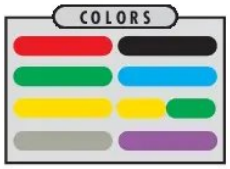
ref. BOZ

CAT. III - 1000V

SCREW-DOWN SOCKET



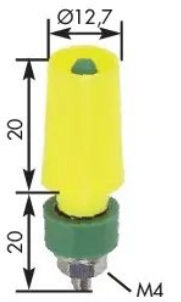
For soldering or for a faston connector. Current 32A
Fixing hole Ø12.8



ref. DVF

CAT. III - 1000V

JUTTING EARTHING SOCKET



Current 32A.
Fixing hole Ø8,2



ref. BOM

EARTHING SOCKET



Male
Current 32A.
Fixing hole
Ø12,2

ref. TERRA-M

SCREW-DOWN EARTHING



Current 32A.
Fixing hole Ø12,8



ref. D4M

Plugs

SAFETY PLUG Ø4mm rear stacking





ref. F97S

CAT. III - 1000V

EARTH SAFETY Ø4mm rear stacking



Only for foolproof earth sockets (BOM / D4M / TERRA-M)

ref. FT98

STANDARD PLUG 50V MAX. Ø4mm

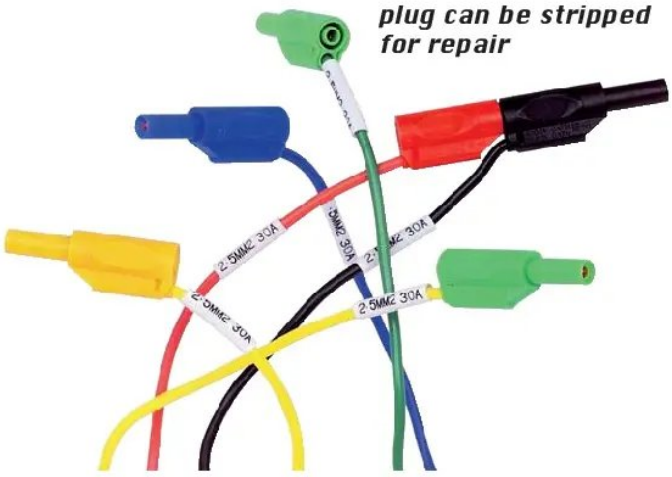


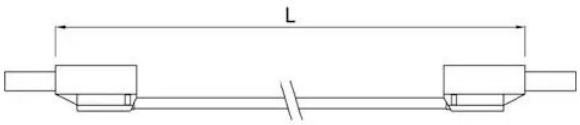
Rear stacking



ref.74

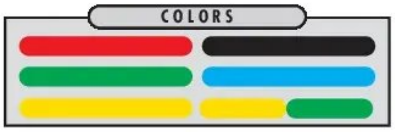
Ø4 safety leads - rear stacking





- Leads - rear stackable
- Excellent quality
- Insulated coupling
- Fixed cover
- Insulated body
- Detachable plug
- Very supple wire 30A
- Contacts formed into spring strips
- Working voltage 1000V CAT III
- Test voltage 7400V during 1 mn
- Tensile strength 150N
- Conforms to the standard CEI1010-1

COLORS



Ref	Length
300S	25cm
301S	50cm
302S	100cm
303S	150cm
304S	200cm



SAFETY PLUG
Current 30A.
One piece moulding.

ref. F97S

CAT. III - 1000V

Ø4 safety earth leads - rear stacking



- Leads are male rear-stacking
- Conforms to the standard CEI1010-1
- Very supple wire 30A
- Fixed cover
- Strippable plug
- Contacts are formed into spring strips
- For foolproof earth sockets ref. BOM, TERRA-M

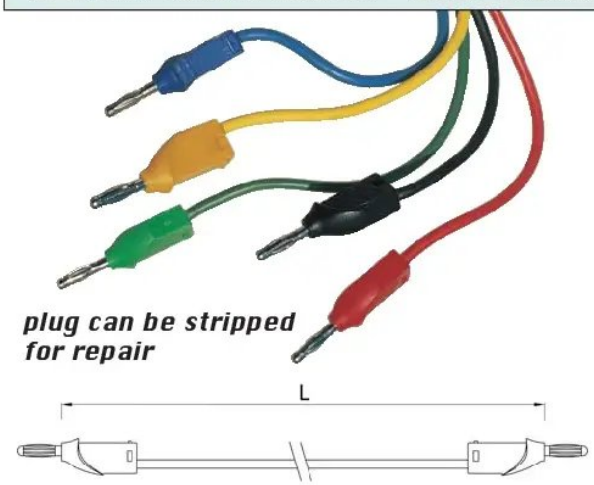
Ref	Length
T025	25cm
T050	50cm
T100	100cm
T150	150cm
T200	200cm



EARTH SAFETY PLUG Ø4
(FOOLPROOF)

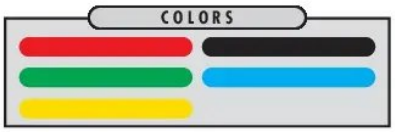
ref. FT98

Ø4 standard leads - rear stacking



- All of the leads are rear stacking.
- The plugs can be stripped for repair.
- The contacts are formed into spring strips.
- Very supple wire, current of 20A allowable.
- 50V max

COLORS



Ref	Length
N025	25cm
N050	50cm
N100	100cm
N150	150cm
N200	200cm



Standard BANANA
plug Ø4mm.
Rear stacking.
50Vmax

ref. 74

Test leads

SET OF TEST LEADS WITH BUIL-IN FUSE



The body of the test probe has a standard fuse 6 x 30mm in it. The user can change the fuse according to the type of multimeter.
CATIII 600V Pol2 10A
Total length: 1.4m

ONE LEAD OF EACH COLOR

ref. PTFUSE the pair

SET OF 2 TEST PROBES



ONE LEAD OF EACH COLOR

Ø4mm ends. Length 1,4m.
Safety male connectors. CATIII 1kV 10A

ref. PT1KV the pair

MALE - MALE LEAD Ø4mm



- Length 120cm
- CEI1010 Pol2 CATIV 600Vrms 10A

COLORS

ref. 209S

KIT FOR TESTS

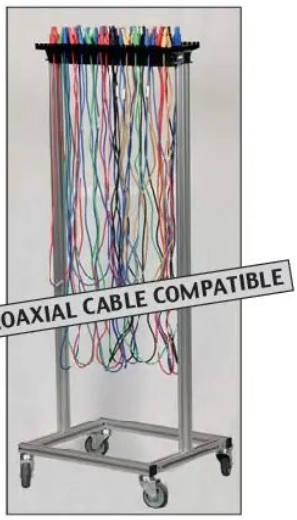
Kit comprises
- 1 pair of leads with test leads
- 1 pair of test clips



ref. KITEST

Racks

CASTORS FITTED RACK



These test leads racks allows to put 150 test leads and to move them easily with their castors
Height: 1350mm (from the floor)
Depth: 410mm
Width: 500mm
4 swivel wheels

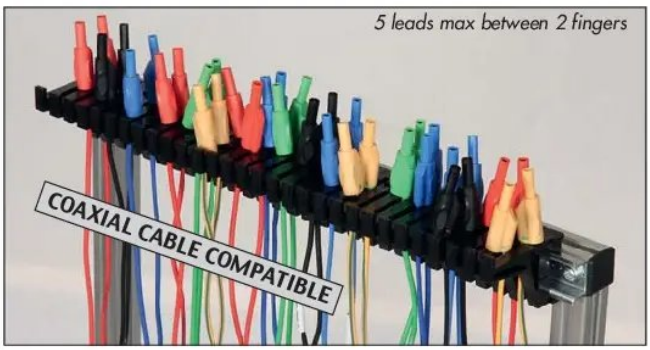
One side - 150 test leads

ref. RAN-CO

Two sides - 300 test leads

ref. RAN-CO-2

SIMPLE RACKS



ref. RAT10	Length 17 cm, 10 fingers
ref. RAT20	Length 33 cm, 20 fingers
ref. RAT30	Length 50 cm, 30 fingers

Coaxial accessories

PROBES



Ref	HZ30	HZ36 switchable
Attenuation factor	10	directe / 10
Bandwidth MHz	100	10 / 100
Impedance on MΩ	10	1 / 10
Capacitance on pF	12	45 / 12
Max voltage V	600	600 / 600

Cable length 1.5m. BNC plug.
A wire grip and sleeves fit on the point.

COAXIAL CABLES BNC - BANANA



Ref	X20	X21	X22
Length	25cm	50cm	100cm

INSULATED COAXIAL CABLES



Completely insulated IPXX

BNC 50Ω - 4mm
Safety plugs.

CATIII - 300V

Ref	X61	X62
Length	50cm	100cm



Completely insulated IPXX

BNC 50Ω at both ends

CATIII - 300V

Ref	X71	X72	X74
Length	50cm	100cm	200cm

BNC ADAPTERS



BNC BANANA
radial fitting

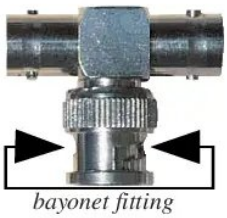
ref. ADA1



bayonet fitting

BNC BANANA
radial fitting

ref. ADA2



bayonet fitting

ref. TE

INSULATED BNC ADAPTERS



Insulated straight
connector female 50Ω

ref. XRD



Insulated T
connector male 50Ω

ref. XRT



BNC - BANANA
safety adapter 50Ω

CATIII - 300V

ref. ADA3

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