

***Electrical Workshop  
for  
Industrial Applications  
(Oil/ Gas/ Petrochem/ Power/ Metro... industries)***



**MULTI-TEK INTERNATIONAL**

**140 – 144 Freston Road (Industrial Area), London W10 6TR, England**

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## **Electrical Workshop**

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**Section1:** Workshop Equipment for winding and re-winding machine for industrial applications / varnishing and stoving

**Section2:** Test and measurement equipment/ diagnostic system

**Section3:** Tools

**Section4:** Battery testing

**Section5:** Work benches + Power supplies

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### **Section 1:**

**Workshop Equipment for winding and re-winding machine for industrial applications / varnishing and stoving**

- 1.1 Motorised coil winding machine type AL1 with bobbin holders, pre-setting digital revolution counter and safety guard.
- 1.2 Motorised coil winding machine for motor coils type GM500 compete with face plates, straight and concentric arbore, digital inverter, pre-setting digital revolution counter and safety guard.
- 1.3 **WINDING MACHINE TYPE GB.31**  
for layer windings, without automatic wire-guide  
Complete frame of cast-iron and steel  
Max coil diameter mm 1900  
Max coil length mm 2000  
Max coil weight Kg 400  
Feeding line 400 V 50/60 Hz three phase  
Winding speeds: 0÷373 rpm  
Dimensions mm 3500x800x1370 h - Weight Kg 1050  
Supplied complete with :  
n°1 Faceplate Ø mm 500  
n°1 Revolving center  
n°1 Digital revolution counter with double preset: slow-down + end  
n°1 Motor with Inverter, electronic foot pedal and control panel  
n°1 Safety guard CE



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## **Electrical Workshop**

- 1.4 Ancillary workshop equipment including:
    - Bobbing holder type CAV2
    - Stator holder/radial vice type ZV1
    - Engineering tool kit type professional
  - 1.5 Coil puller type PCP3
  - 1.6 Stator cut off machines SC series
  - 1.7 Stoving Oven RS series
  - 1.8 Varnish tank VT series
-



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## **Electrical Workshop**

### **Section2:**

#### Test and measurement equipment/ diagnostic system

- 2.1 Automatic 10kV insulation tester type MIT1025 complete with software
- 2.2 Multi-function winding/motor surge tester type H3/CPS series
- 2.3 Motor test bench type TC series
- 2.4 Insulation diagnostic analyzer with integrated computer and software type IDAX 350 complete with standard accessories
- 2.5 Precision bench version digital multimeter type 1604
- 2.6 AC/DC clamp meter type DCM340
- 2.7 Multifunction clamp meter type F series
- 2.8 Three phase energy analyzer type E-TRACKER up to 1000 Amp complete with software
- 2.9 Industrial insulation and continuity tester type MIT430
- 2.10 Multifunction tester MFT 1800 series
- 2.11 Digital low resistance ohmmeter type DLRO10X up to 10A with software
- 2.12 Tachometer for contact and non-contact usage type A2102.
- 2.13 Vibration meter type VIBCHECK with probe.
- 2.14 PD Detector type PD Surveyor
- 2.15 Multifunction calibration test bench type TE for current, voltage, resistance, capacitance, inductance, temperature and pressure complete with software





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## **Electrical Workshop**

### **Section 3:**

#### **Tools**

- 3.1 Short- circuiting system for Low Voltage equipment type MC- 166/60
- 3.2 Jumper cable with clamps type MT-315/2
- 3.3 Low Voltage safety tool kit type MO-510-03-EX + MO-34
- 3.4 Insulated tool kit with carry case type KIT-05
- 3.5 Compact safety carrying kit type CZ-53-MR/2 with instruction in English/ Arabic

### **Section 4:**

#### **Battery testing**

- 4.1 Battery condition testing type BITE3
- 4.2 Battery digital density testing type DMA35
- 4.3 Battery load testing type TORCEL

### **Section 5:**

#### **Work benches + Power supplies**

# SECTION 1

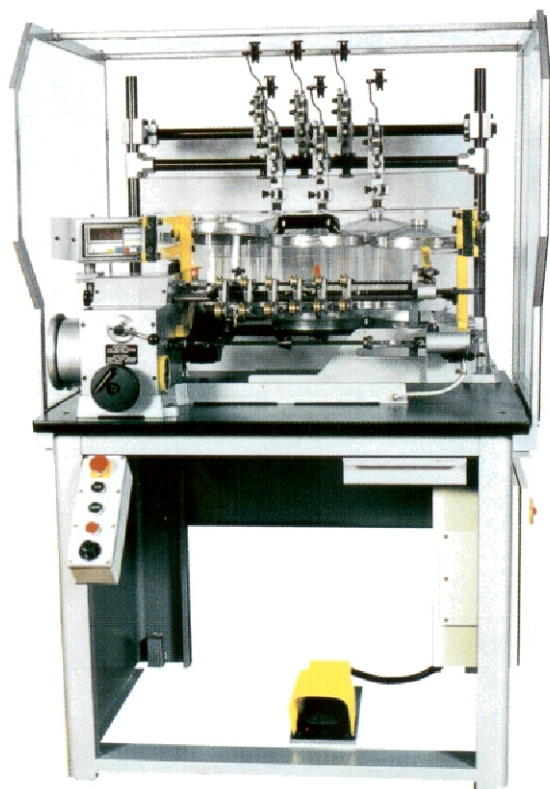
Workshop Equipment for winding and re-winding  
Machine for industrial applications / varnishing and  
stoving

**ITEM**

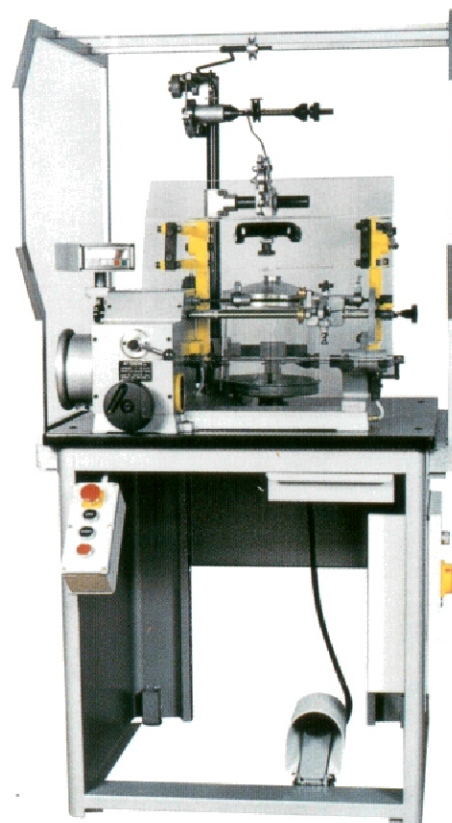
**1.1**

**AL 1**  
**AL 1** MULTIPLA

PER AVVOLGIMENTI LINEARI  
FOR LAYER WINDINGS  
POUR BOBINAGES LINEAIRES



Mod. AL 1 MULTIPLA/ELETTRONICA



Mod. AL 1/DIGIT

DATI TECNICI TECHNICAL DATA DONNEES TECHNIQUES		AL 1	AL 1 MULTIPLA
<p>Ø FILO Ø WIRE Ø FIL</p> <p>MAX. Ø BOBINA MAX. Ø COIL MAX. Ø BOBINE</p> <p>LUNGHEZZA MIN-MAX BOBINA LENGTH MIN-MAX COIL LONGUEUR MIN-MAX BOBINE</p> <p>DISTANZA TRA LE PUNTE DISTANCE BETWEEN CENTRES LOGEUR ENTRE POINTES</p> <p>Ø ALBERO AVVOLGITORE Ø WINDING SPINDLE Ø ARBRE ENROULEUR</p> <p>VELOCITA' SPEEDS VITESSES</p> <p>MOTORE MOTOR MOTEUR</p> <p>CAMBIO GEARBOX CHANGEMENT DE VITESSE</p> <p>STRUTTURA PORTANTE COMPLETE FRAME STRUCTURE PORTANTE</p> <p>ALIMENTAZIONE ELETTRICA FEEDING LINE RESEAU D'ALIMENTATION</p> <p>DIMENSIONI DIMENSIONS DIMENSIONS</p> <p>MASSA NET WEIGHT POIDS</p>	<p>mm</p> <p>mm</p> <p>mm</p> <p>mm</p> <p>mm</p> <p>r.p.m.</p> <p>mm</p> <p>Kg</p>	<p>0,06+1,40</p> <p>180</p> <p>5+190</p> <p>250</p> <p>10</p> <p>1400-3000</p> <p>Kw 0,18 V.230 A1,9 Hz50/60 4000 R.P.M. SERV.C</p> <p>INGRANAGGI GEARBOX ENGRANAGES</p> <p>ALLUMINIO ALUMINIUM ALUMINIUM</p> <p>1x230 V 50 Hz 0,5 Kw</p> <p>900x920x1630</p> <p>110</p>	<p>(MAX.0,8 PER 6 BOBINE) 0,06+1,40(MAX. 0,8 FOR 6 COILS) (MAX. 0,8 POUR 6 BOBINES)</p> <p>180</p> <p>5+50</p> <p>360 (500 OPTIONAL)</p> <p>10</p> <p>1600-3400</p> <p>Kw 0,25 V.230 A2,7 Hz50/60 4000 R.P.M. SERV.C</p> <p>INGRANAGGI GEARBOX ENGRANAGES</p> <p>ALLUMINIO ALUMINIUM ALUMINIUM</p> <p>1x230 V 50 Hz 0,75 Kw</p> <p>1150x1220x1630</p> <p>153</p>
<p>ACCESSORI DI SERIE EQUIPMENT ACCESSOIRES DE SERIE</p>		<p>N°1 SVOLGITORE TNR/R (0,3+2) N°1 BOBBIN-HOLDER TNR/R(0,3+2) N°1 DEVIDOIR TNR/R (0,3+2)</p> <p>N°1 SVOLGITORE TC (0,06+0,3) CON CONTENITORE N°1 BOBBIN-HOLDER TC (0,06+0,3) WITH BOX N°1 DEVIDOIR TC (0,06+0,3) AVEC CONTAINER</p> <p>N°1 COLONNA PORTASVOLGITORI N°1 BOBBIN-HOLDER COLUMN N°1 COLONNE PORTE-BOBINES</p> <p>N°1 CONTAGIRI MECCANICO N°1 MECHANICAL REV. COUNTER N°1 COMPTE-TOURS MECANIQUE</p> <p>N°1 MOTORE CON REOSTATO ELETTRONICO N°1 MOTOR WITH ELECTRONIC RHEOSTAT N°1 MOTEUR AVEC RHEOSTAT ELECTRONIQUE</p> <p>N°1 TAVOLO CON CASSETTO N°1 TABLE WITH DRAWER N°1 TABLE AVEC TIROIR</p> <p>N°1 PROTEZIONE ANTINFORT. N°1 SAFETY GUARD N°1 PROTECTION DE SECURITE'</p>	<p>N°6 GUIDAFILI N°6 WIRE-GUIDES N°6 GUIDE-FILS</p> <p>N°6 SVOLGITORI TC (0,06+0,3) CON CONTENITORI N°6 BOBBIN-HOLDERS TC (0,06+0,3) WITH BOXES N°6 DEVIDOIRS TC (0,06+0,3) AVEC CONTAINERS</p> <p>N°1 CASTELLO N°1 FRAME N°1 CHASSIS POUR DEVIDOIRS</p> <p>N°1 CONTAGIRI DIGITALE AD UNA PRESELEZIONE E FRENO N°1 DIGITAL PRESET COUNTER WITH BRAKE N°1 COMPTE-TOUR DIGITAL AVEC PRESELECTION ET FREIN</p> <p>N°1 MOTORE CON REOSTATO ELETTRONICO N°1 MOTOR WITH ELECTRONIC RHEOSTAT N°1 MOTEUR AVEC RHEOSTAT ELECTRONIQUE</p> <p>N°1 TAVOLO CON CASSETTO N°1 TABLE WITH DRAWER N°1 TABLE AVEC TIROIR</p> <p>N°1 PROTEZIONE ANTINFORT. N°1 SAFETY GUARD N°1 PROTECTION DE SECURITE'</p>
<p>ACCESSORI OPZIONALI OPTIONAL ACCESSORIES ACCESSOIRES OPTIONALS</p> <p>VEDI NS. DEPLIANT "SVOLGITORI" SEE OUR LEAFLET "BOBBIN HOLDER" VOIRE NOTRE DEPLIANT "DEVIDOIR"</p>		<p>GUIDAFILI PER AVVOLGIMENTO CONTEMPORANEO DI PIU' BOBINE WIRE-GUIDES FOR THE SIMULTANEUS WINDING OF SEVERAL BOBBINS GUIDE-FILS POUR L'ENROULEMENT SIMULTANE' DE PLUSIEURS BOBINES</p> <p>CONTAGIRI DIGITALE AD UNA PRESELEZIONE E FRENO DIGITAL PRESET COUNTER WITH BRAKE COMPTE-TOUR DIGITAL AVEC PRESELECTION ET FREIN</p> <p>MICROPROCESSORE CON POSSIBILITA' DI MEMORIZZARE PIU' PROGRAMMI MICROPROCESSING INSTRUMENT WITH POSSIBILITY TO MEMORIZE MORE PROGRAMS MICROPROCESSEUR QUI PERMET LA MEMORISATION DE PLUSIEURS PROGRAMMES</p>	<p>N°6 SVOLGITORI TC/R (0,2+1) CON CONTENITORI N°6 BOBBIN-HOLDERS TC/R (0,2+1) WITH BOXES N°6 DEVIDOIRS TC/R (0,2+1) AVEC CONTAINERS</p> <p>MICROPROCESSORE CON POSSIBILITA' DI MEMORIZZARE PIU' PROGRAMMI MICROPROCESSING INSTRUMENT WITH POSSIBILITY TO MEMORIZE MORE PROGRAMS MICROPROCESSEUR QUI PERMET LA MEMORISATION DE PLUSIEURS PROGRAMMES</p>



**ITEM**

**1.2**

**GM 500**

PER AVVOLGIMENTI MATASSE MOTORI

FOR ELECTRIC MOTOR COILS

POUR ENROULEMENT DE SECTIONS  
MOTEURS



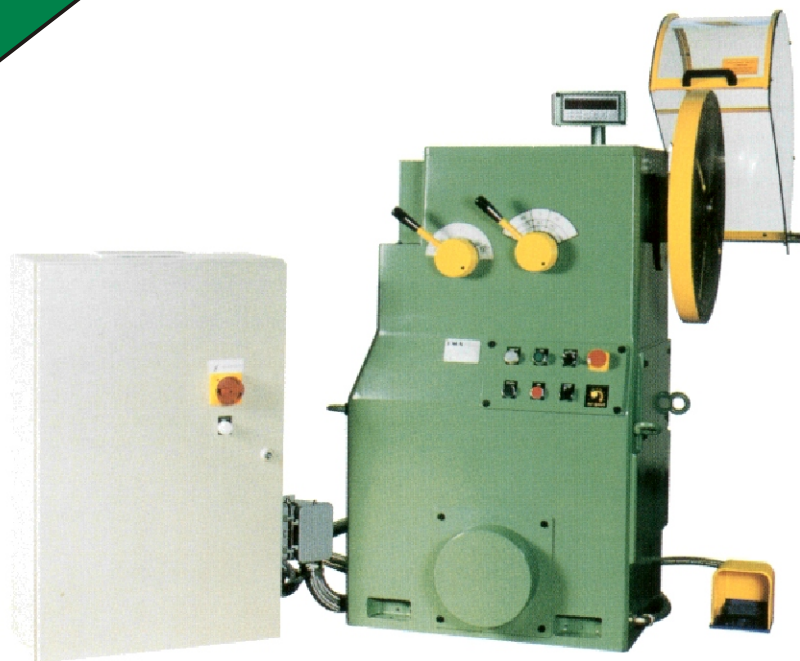
<b>DATI TECNICI</b> <b>TECHNICAL DATA</b> <b>DONNEES TECHNIQUES</b>		<b>GM 500</b>
<p>PER AVVOLGIMENTO MOTORI MAX. FOR MOTOR UP POUR ENROULEMENTS DE MOTEURS MAX.</p> <p>VELOCITA' SPEEDS VITESSES</p> <p>MOTORE MOTOR MOTEUR</p> <p>VARIAZIONE VELOCITA' SPEED VARIATOR VARIATION DE VITESSE</p> <p>STRUTTURA PORTANTE COMPLETE FRAME STRUCTURE PORTANTE</p> <p>ALIMENTAZIONE ELETTRICA FEEDING LINE RESEAU D'ALIMENTATION</p> <p>DIMENSIONI DIMENSIONS DIMENSIONS</p> <p>MASSA NET WEIGHT POIDS</p>	<p>HP</p> <p>R.p.m.</p> <p>mm</p> <p>Kg</p>	<p>50</p> <p>0+900</p> <p>Kw 0,55 V.230 Hz50/60 900 r.p.m. C.I.F IP54</p> <p>INVERTER DIGITALE DIGITAL INVERTER INVERTER DIGITAL</p> <p>ALLUMINIO ALUMINIUM ALUMINIUM</p> <p>1x230 V 50/60 Hz 1KW</p> <p>660x810x740 830x810x1490 (con tavolo, with table, avec table)</p> <p>80 127 (con tavolo, with table, avec table)</p>
<p><b>ACCESSORI DI SERIE</b> <b>EQUIPMENT</b> <b>ACCESSOIRES DE SERIE</b></p>		<p>N°1 PATEAU Ø 500 mm N°1 FACEPLATE Ø 500 mm N°1 PATEAU Ø 500 mm</p> <p>N°1 COPPIA DI PERNI QUADRI N°1 PAIR OF SQUARE MANDREALS N°1 COUPLE D'AXES PORTE-FORMES</p> <p>N°2 COPPIE DI FORME A 6 GOLE Ø 40-80 mm N°2 PAIRS OF ARBORS Ø 40-80 mm WITH 6 SPACES N°2 COUPLE DE FORMES A 6 GORGES Ø 40-80 mm</p> <p>N°1 CONTAGIRI DIGITALE A PRENOTAZIONE N°1 DIGITAL PRESET COUNTER N°1 COMPTE-TOURS DIGITAL AVEC PRESELECTION</p> <p>N°1 MOTORE AUTOFRENANTE N°1 MOTOR WITH BRAKE N°1 MOTEUR AVEC FREIN</p> <p>N°1 PROTEZIONE ANTINFORTUNISTICA N°1 SAFETY GUARD N°1 PROTECTION DE SECURITE</p>
<p><b>ACCESSORI OPZIONALI</b> <b>OPTIONAL ACCESSORIES</b> <b>ACCESSOIRES OPTIONALS</b></p> <div></div> <p>VEDI NS. DEPLIANT "ACCESSORI PER MATASSATRICI" SEE OUR LEAFLET "ACCESSORIES FOR WINDING MACHINES" VOIRE NOTRE DEPLIANT "ACCESSOIRES POUR MACHINES BOBINEUSES"</p> <div></div>		<p>TAVOLO CON CASSETTO TABLE WITH DRAWER TABLE AVEC TIROIR</p> <p>SERIE COMPLETA DI FORME LINEARI SET OF STRAIGHT ARBORS SERIE COMPLETE DE FORMES LINEAIRES</p> <p>SERIE COMPLETA DI FORME A SCALARE SET OF CONCENTRIC ARBORS SERIE COMPLETE DE FORMES A GRADINS</p> <p>PLATEAU AUTOREGOLABILE Ø 500 mm RAPID-ADJUSTING FACEPLATE Ø 500 mm PLATEAU AUTO-REGLABLE Ø 500 mm</p> <p>STRUMENTO A MICROPROCESSORE CON POSSIBILITA' DI MEMORIZZARE PIU' PROGRAMMI MICROPROCESSING ELECTRONIC INSTRUMENT WITH POSSIBILITY TO MEMORIZE MORE PROGRAMS INSTRUMENT ELECTRONIQUE A MICROPROCESSEUR QUI PERMET LA MEMORISATION DE PLUSIEURS PROGRAMMES</p>



**ITEM**

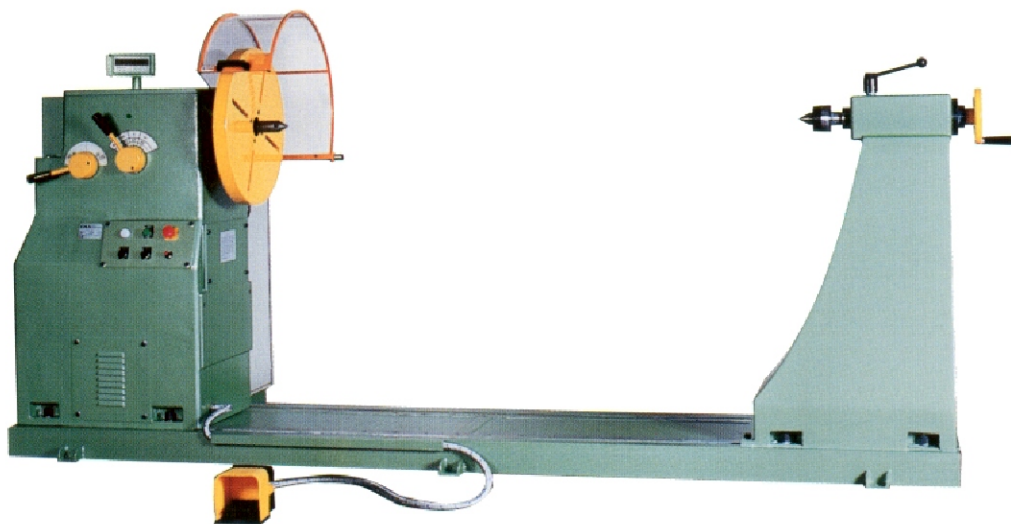
**1.3**

GB 30  
GB 31



**Mod. GB 30**

COMBINATA PER AVVOLGIMENTI LINEARI E AVVOLGIMENTO MATASSE MOTORI, SENZA GUIDAFILO AUTOMATICO  
BOTH FOR LAYER WINDINGS AND ELECTRIC MOTOR COILS, WITHOUT AUTOMATIC WIRE-GUIDE  
COMBINÉE POUR BOBINAGES LINEAIRES ET SECTIONS MOTEURS, SANS GUIDE-FILS



**Mod. GB 31**

PER AVVOLGIMENTI LINEARI SENZA GUIDAFILO AUTOMATICO  
FOR LAYER WINDINGS WITHOUT AUTOMATIC WIRE-GUIDE  
POUR BOBINAGES LINEAIRES SANS GUIDE-FILS AUTOMATIQUE

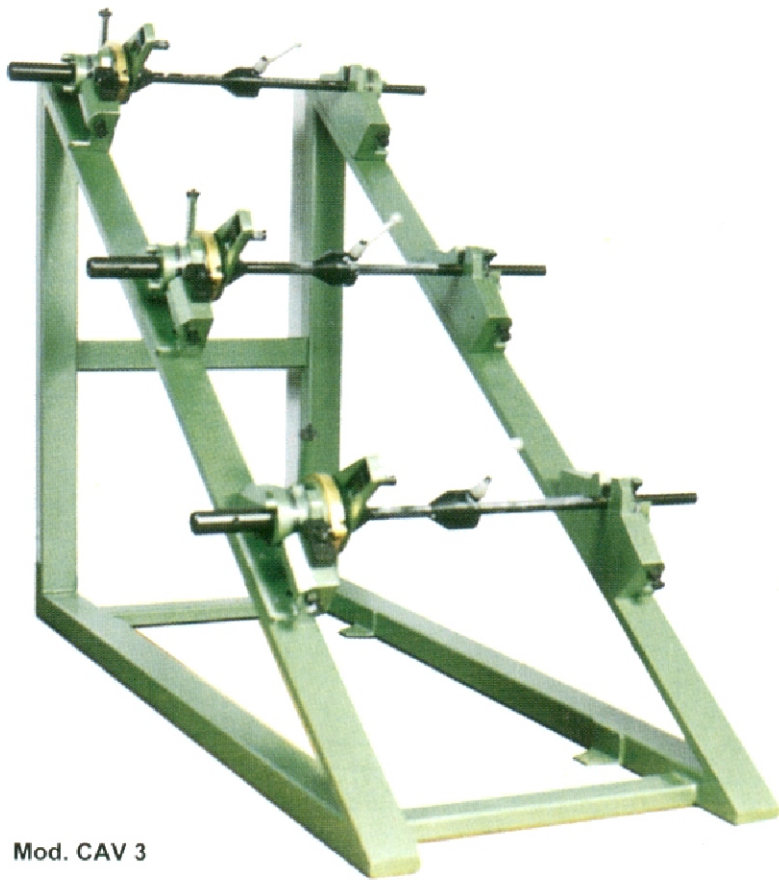
DATI TECNICI TECHNICAL DATA DONNEES TECHNIQUES		GB 30	GB 31
MAX. Ø BOBINA MAX. Ø COIL MAX. Ø BOBINE	mm	1900	1900
MAX. LUNGHEZZA BOBINA MAX. LENGTH COIL MAX. LONGUEUR BOBINE	mm	300	2000
MAX. PESO BOBINA MAX. WEIGHT COIL MAX. POIDS BOBINE	Kg	100	400
MAX. COPPIA MAX. TORQUE MAX COUPLE	kgm	650	650
VELOCITA' SPEEDS VITESSES	r.p.m.	0+373	0+373
MOTORE MOTOR MOTEUR		CV 4 V 400 A 6,7 Hz50/60 1500 R.P.M. C.I.F Ip55	CV 4 V 400 A 6,7 Hz50/60 1500 R.P.M. C.I.F Ip55
CAMBIO GEARBOX CHANGEMENT DE VITESSE		INGRANAGGI A BAGNO D"OLIO GEARBOX IN OIL ENGRANAGES EN BAIN D'HUILE	INGRANAGGI A BAGNO D"OLIO GEARBOX IN OIL ENGRANAGES EN BAIN D'HUILE
STRUTTURA PORTANTE COMPLETE FRAME STRUCTURE PORTANTE		GHISA CAST-IRON FONTE	GHISA CAST-IRON FONTE
ALIMENTAZIONE ELETTRICA FEEDING LINE RESEAU D'ALIMENTATION		3x400 V 50/60 Hz 4Kw	3x400 V 50/60 Hz 4Kw
DIMENSIONI DIMENSIONS DIMENSIONS	mm	800x650x1370	3500x800x1370
MASSA NET WEIGHT POIDS	Kg	600	1050
<b>ACCESSORI DI SERIE</b> <b>EQUIPMENT</b> <b>ACCESSOIRES DE SERIE</b>		N°1 PLATEAU Ø 500 mm N°1 FACEPLATE Ø 500 mm N°1 PLATEAU Ø 500 mm  N°1 CONTAGIRI DIGITALE A PRENOTAZIONE N°1 DIGITAL PRESET COUNTER N°1 COMPTE-TOURS AVEC DIGITAL PRESELECTION  N°1 INVERTER CON PEDALE ELETTRONICO N°1 INVERTER WITH ELECTRONIC FOOT-PEDAL N°1 INVERTER AVEC PEDALE ELECTRONIQUE  N°1 FRENO ELETTRONICO N°1 ELECTROMAGNETIC BRAKE N°1 FREIN ELECTROMAGNETIQUE  N°1 PROTEZIONE ANTINFORTUNISTICA N°1 SAFETY GUARD N°1 PROTECTION DE SECURITE	N°1 PLATEAU Ø 500 mm N°1 FACEPLATE Ø 500 mm N°1 PLATEAU Ø 500 mm  N°1 CONTROPUNTA GIREVOLE N°1 REVOLVING CENTER N°1 CONTRE POINTE TOURNANTE  N°1 CONTAGIRI DIGITALE A PRENOTAZIONE N°1 DIGITAL PRESET COUNTER N°1 COMPTE-TOURS AVEC DIGITAL PRESELECTION  N°1 INVERTER CON PEDALE ELETTRONICO N°1 INVERTER WITH ELECTRONIC FOOT-PEDAL N°1 INVERTER AVEC PEDALE ELECTRONIQUE  N°1 FRENO ELETTRONICO N°1 ELECTROMAGNETIC BRAKE N°1 FREIN ELECTROMAGNETIQUE  N°1 PROTEZIONE ANTINFORTUNISTICA N°1 SAFETY GUARD N°1 PROTECTION DE SECURITE
<b>ACCESSORI OPZIONALI</b> <b>OPTIONAL ACCESSORIES</b> <b>ACCESSOIRES OPTIONALS</b>		PLATEAU Ø 800 mm FACEPLATE Ø 800 mm PLATEAU Ø 800 mm  SERIE COMPLETA DI FORME LINEARI SET OF STRAIGHT ARBORS SERIE COMPLETE DE FORMES LINEAIRES  SERIE COMPLETA DI FORME A SCALARE SET OF CONCENTRIC ARBORS SERIE COMPLETE DE FORMES A GRADINS   MICROPROCESSORE CON POSSIBILITA' DI MEMORIZZARE PIU' PROGRAMMI MICROPROCESSING INSTRUMENT WITH POSSIBILITY TO MEMORIZE MORE PROGRAMS MICROPROCESSEUR QUI PERMET LA MEMORISATION DE PLUSIEURS PROGRAMMES	PLATEAU Ø 800 mm FACEPLATE Ø 800 mm PLATEAU Ø 800 mm  SERIE COMPLETA DI FORME LINEARI SET OF STRAIGHT ARBORS SERIE COMPLETE DE FORMES LINEAIRES  SERIE COMPLETA DI FORME A SCALARE SET OF CONCENTRIC ARBORS SERIE COMPLETE DE FORMES A GRADINS   MICROPROCESSORE CON POSSIBILITA' DI MEMORIZZARE PIU' PROGRAMMI MICROPROCESSING INSTRUMENT WITH POSSIBILITY TO MEMORIZE MORE PROGRAMS MICROPROCESSEUR QUI PERMET LA MEMORISATION DE PLUSIEURS PROGRAMMES



**ITEM**

**1.4**

**SVOLGITORI  
BOBBIN HOLDER  
DEVIDOIR**



**Mod. CAV 3**

TIPO TYPE TYPE	N° ROCHE N° REELS N° BOBINES	PORTATA LIFTING POWER PORTEE Kg	DIMENSIONI MAX. ROCCA MAX DIMENSIONS OF REEL DIMENSIONS MAX. DE LA BOBINE mm	Ø ALBERO Ø SHAFT Ø ARBRE mm	DIMENSIONI DIMENSIONS DIMENSIONS mm	MASSA WEIGHT POIDS Kg	DATI TECNICI TECHNICAL DATA DONNES TECHNIQUES
<b>CAV1</b>	1	140	Ø 650 / 300	20	580x820x670	59	LA TENSIONE DEL FILO E' REGOLABILE TRAMITE UNA VITE CHE AGISCE SU DI UN FRENO A GANASCE.
<b>CAV 2</b>	2	140	Ø 650 / 300	20	1130x820x970	109	THE WIRE STRETCHING IS ADJUSTABLE AN ADJUSTMENT SCREW THAT OPERATES ON SHOE BRAKE
<b>CAV3</b>	3	140	Ø 650 / 300	20	1620x820x1235	154	LE FREINAGE DU FIL EST REGLABLE AU MOYEN D'UNE VIS DE REGLAGE QUI AGIT SUR UN FREIN A MACHOIRES.

MORSA RADIALE  
RADIAL VICE  
PORTE-STATOR



TIPO TYPE TYPE	PORTATA LIFTING POWER PORTEE Kg	Ø UTILE WORKING Ø Ø UTILE mm	ALTEZZA/LARGHEZZA HEIGHT/WIDHT HAUTEUR/LARGEUR mm	MASSA WEIGHT POIDS Kg	DATI TECNICI TECHNICAL DATA DONNES TECHNIQUES
ZV 1	96	80+320	500/130	10	<p>LA MORSA RADIALE ZV1 E' COSTITUITA DA DUE ANELLI UNITI DA TRE MORSETTI, CHE POSSONO ESSERE AVVICINATI OD ALLONTANATI DALL'ASSE DELLA MORSA AGENDO, CON L'APPOSITA CHIAVE, SU DI UNA BARRA FILETTATA.</p> <p>ZV1 RADIAL VICE IS MADE UP OF TWO RINGS, CONNECTED BY THREE EQUAL CLAMPS, WHICH MAY BE MOVED CLOSER TO ORFARTHER FROM THE VICE AXIS BY TURNING THE PROPER THREAD SCREW TIGHTER OR LOOSER.</p> <p>LE PORTE-STATOR ZV1 EST CONSTITUE PAR DEUX ANNEAUX ASSEMBLES PAR TROIS BRAS IDENTIQUE. LES BRAS PEUVENT ETRE APPROCHES OU ELOIGNES DE L'AXE DU PORTE-STATOR EN FISSANT OU DEVISSANT LA BARRA FILETEE AVEC LA CLEF APPROPRIEE.</p>

**ITEM**

**1.5**

## Stator Coil Puller PCP3



designed to remove fault coils from electric motors which require rewinding. When the coil end has been cut off (using an SC2 or SC3B), the stator is turned on its end and then secured on the coil puller for the extraction operation.

### **MACHINE FEATURES AND OPERATION**

- Pneumatically powered
- Secure location of the stator
- Foot pedal operation

Before placing the stator on this machine, one end of the coils must be removed. For this, we recommend that our SC2 or SC3B Stator coil cut-off machine is used for this purpose.



# Stator Coil Puller

## PCP3

### SPECIFICATION

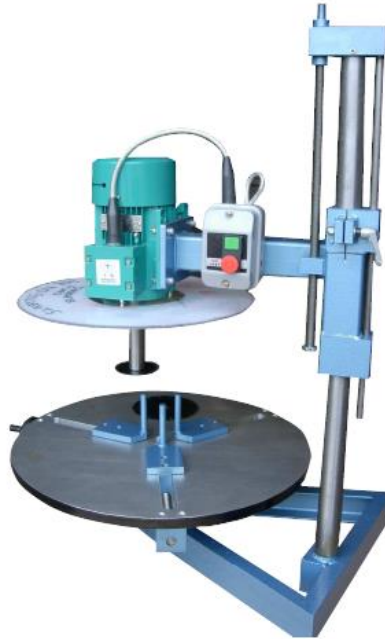
Maximum Stator Diameter:	860 mm	
Overall Dimensions	Height:	2640 mm
	Width:	2135 mm
	Depth:	1065 mm
Table Height	620 mm	
Table dimensions	1067 x 1067 mm	
Pulling stroke	405 mm	
Clamping Stroke	230 mm	
Air Pressure	7 - 8 bar	
Pulling Cylinder Diameter	100 mm	
Clamping Cylinder Diameter	200 mm	
Air Consumption	Pulling:	Clamping:
Cubic inches per minute	15	4.25
Cubic millimeters per minute	245806	696454
Cubic metres per minute	0.12	0.41
Cubic millimeters per minute	1966	6719
Thrust	680 kg @ 7 bar	

Weight and sizes are approximate

# **ITEM**

## **1.6**

## Stator Cut Off Machines SC2



comprehensive range of specialist equipment for the modern rewind shop, the SC2 are used to remove end windings from electrical machines quickly and without damaging the laminations.

### **MACHINE FEATURES AND OPERATION**

- The stator is secured to a table
- The table is then rotated past the cutting head to remove the end windings
- Can be floor or bench mounted

# Stator Cut Off Machines

## SC2

### SPECIFICATION

TECHNICAL PARAMETERS	
Min. stator bore	100 mm
Max. stator bore	450 mm
Max. stator height	460 mm
Mains supply	400 V 3 phase
Frequency	50 Hz
Rating	4 A
Supplied with	1.5 kW
Motor size	285
Motor speed	4" d

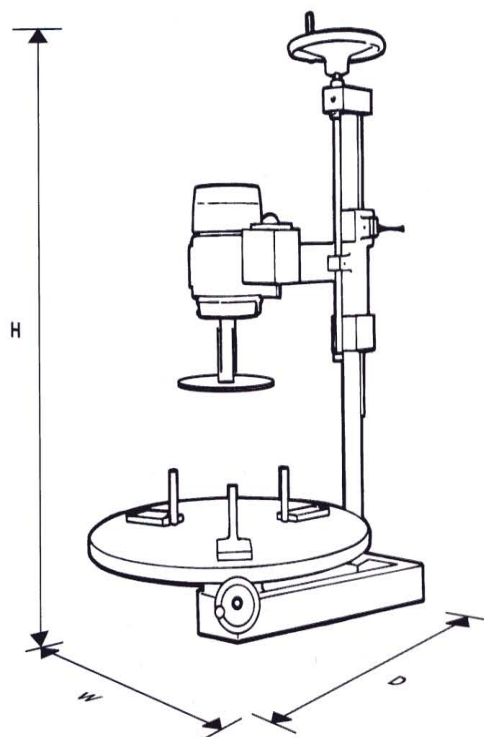
### OVERALL DIMENSIONS

Height (H)	1300 mm
Width (W)	785 mm
Depth (D)	965 mm
Weight	118 kg

### AVAILABLE EXTRAS

- Various sizes of cutting discs
- Shaft adaptor for smaller discs

### TECHNICAL SPECIFICATION



#### CAPACITY

Min Stator Bore	100mm
Max Stator Bore	450mm

#### OVERALL DIMENSIONS

(H) Height	1300mm
(W) Width	785mm
(D) Depth	965mm

## Stator Cut Off Machines SC3B



range of specialist equipment for the modern rewind shop, the stator cut off machines are used to remove end windings from electrical machines quickly and without damaging the laminations.

### **MACHINE FEATURES AND OPERATION**

- Direct drive motor spindle
- Depth stop and cutter path guides
- Tungsten carbide edged cutting disc designed for long life and difficult to cut materials
- Grit edge has no teeth to dull and leaves a smooth finish
- Emergency stop and guarded cutter
- Load binders are supplied for holding small stators or stators without housings in cutting position (not required for larger stators)
- Maintenance free design

# Stator Cut Off Machines

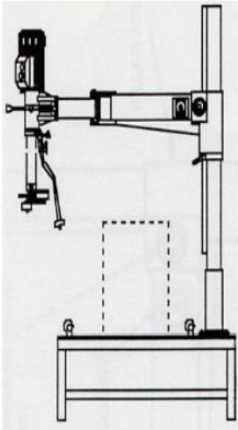
## SC3B

### SPECIFICATION

TECHNICAL PARAMETERS	
Electrical supply	400 V, 3 Phase and neutral
Frequency	50 Hz
Motor	2.2 Kw, with overload protection
Spindle speed	2850 rpm @ 50 Hz
Cutting disc	Tungsten carbide edged circular saw blade 1 x 7" (178mm) disc supplied as standard
Floor space (table only)	120 cm x 80 cm
Overall dimensions	120 cm x 80 cm x 200 xm
Weight	300 kg net (approx.)

## MACHINE CAPACITIES

Stator located on the table



### Lower limits

Stator bore 225 mm diameter

Height from table to cutter  $\approx 150$  mm

### Upper limits

Depends upon table size.

Height from table to cutter  $\approx 1100$  mm

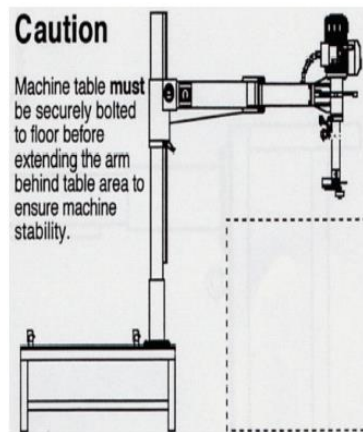
### Maximum depth of cut

$\approx 60$  mm with 7" (178 mm) dia. cutting disc, more with a 10" (250 mm) disc.

The above limits are for cutting off coil ends without any change in position of the stator.

Simply moving the position of the stator means coils of larger diameter stators can be cut off, providing even more flexibility.

Stator located on the floor



### Lower limits

Stators cannot be processed without restraint:

Height from floor to cutter 550 mm

### Upper limits

Stator bore 1100 mm diameter

Height from table to cutter 1500 mm

**ITEM**

**1.7**



## Stoving Ovens RS3/RS4/RS5/RS6



A range of stoving ovens are designed to offer stoving facilities for both large and small repair workshops and can be used in conjunction with a range of varnish tanks. They may also be used to dry out windings where dampness is thought to be causing low earth leakage insulation resistance.

### **MACHINE FEATURES AND OPERATION**

- Explosion panel fitted for safety
- Over-temperature device prevents runaway
- Circulation fan to equalize temperature
- Latest specification insulation material used throughout

The ovens are electrically heated and have a circulation fan to ensure uniform heat distribution. Operation is automatic and can be configured to make use of cheap off-peak electricity with the use of an in-built 24-hour timer. The oven is loaded via a trolley mounted on rails.

Available on request is the option of a chart recorder to monitor and log the oven temperature throughout the cycle.

In addition to our standard range, we have full in house design capability to design bespoke stoving ovens to meet our customers' individual requirements.

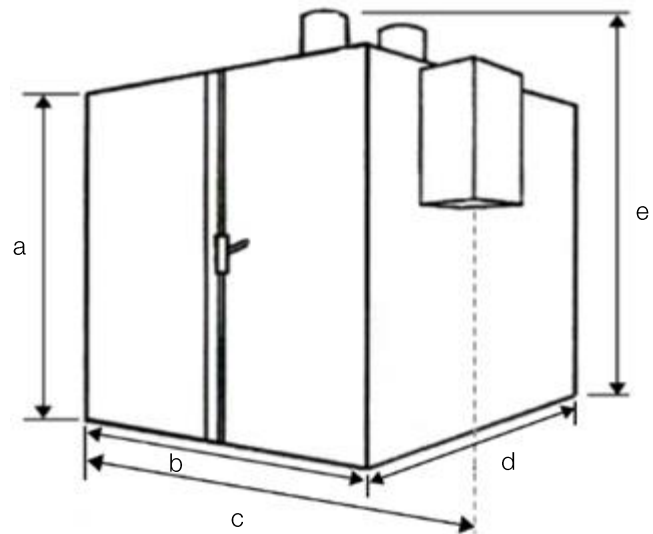
This product is the result of many years of experience in the rewind and repair industry, and has been in use in our own repair workshops.

Stoving ovens need to be located in a dry environment and placed on a flat and level concrete floor.

## Stoving Ovens RS3/RS4/RS5/RS6

### DIMENSIONS (mm)

	RS3	RS4	RS5	RS6
a	1200	1730	1900	2030
b	1300	1680	1900	2180
c	1550	2030	2200	2540
d	1400	1450	1750	2110
e	1650	2080	3200	2390



### SPECIFICATION

	RS3	RS4	RS5	RS6
Power Requirements	11 kW	19 kW	32 kW	42 kW
Weight (tonnes)	0.65 t	0.85 t	1.0 t	1.25 t
Usable internal space	0.915 x 0.915 x 0.915 m	1.22 x 1.22 x 1.22 m	1.525 x 1.525 x 1.525 m	1.83 x 1.83 x 1.83 m
Approx. internal volume	0.8 m <sup>3</sup>	1.8 m <sup>3</sup>	3.6 m <sup>3</sup>	6.1 m <sup>3</sup>
Electricity Supply	415 V, 3 phase and neutral, 50 HZ			
Temperature Range	Fully automatic			

# **ITEM**

## **1.8**

## Varnish Tank VT10 VT12 VT15

safe and clean way for the smaller repair workshop to impregnate windings.

Suitable for use with a wide range of propriety varnishes including trickle and water based types.

The job is lowered into the tank, the lid closed; varnish is then pumped in from the lower tank

After the soak time has elapsed the varnish is then pumped back and the job removed.

### MACHINE FEATURES AND OPERATION

- Minimises valuable overhead crane time.
- Safety protection is afforded by means of a drop down lid (operated by a fused link) in case of fire.
- By having a lid and extraction, fumes are kept away from the operator.
- A sealed storage tank reduces solvent loss and maintains varnish in peak condition.
- The varnish tank can be supplied with the immersion tank above or at the side of the storage vessel.

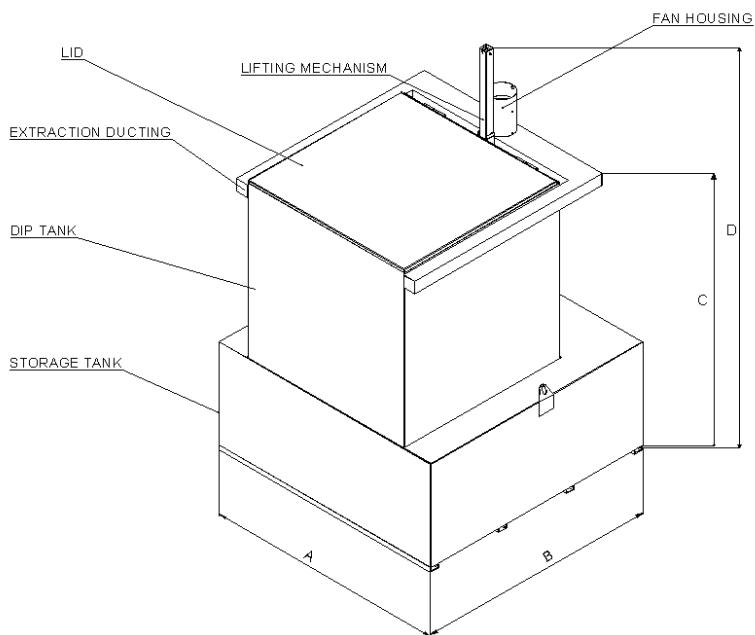


### TECHNICAL DATA

Pump Flow rate:	10 gallons (45 litres) per minute	
Power requirements:	Pump motor:	415V, 3 ph. + neutral; 10 amps /phase.
	Fan Motor:	240V, 1 phase; 5 amps.

All weights / dimensions and capacities are approximate and given as a guide only:

OVERALL DIMENSIONS		VT10	VT12	VT15
		mm	mm	mm
a	Width	1710	1790	2000
b	Depth	1270	1840	2000
c	Height	1720	2075	2268
d	Overall height	2130	2685	3020
	Weight	640 kg	1100 kg	2150 kg
Immersion tank capacity		1000 lt	1730 lt	3380lt



All dimensions shown above are for the main body of the dip tanks, they do not include extraction, fan housing / chimney and lid lifting mechanism.

Nominal dimensions of Varnish dip tanks		Width	Depth	Height
		mm	mm	mm
VT10	External Dimensions	1046	1046	1125
	Useable Internal Dimensions	1040	1040	1012
VT12	External Dimensions	1290	1290	1355
	Useable Internal Dimensions	1184	1184	1257
VT15	External Dimensions	1470	1470	1470
	Useable Internal Dimensions	1367	1464	1300

## Varnish Tank VT20

The motorised Varnish Tank offers a safe and clean way for the smaller repair workshop to impregnate windings.

Suitable for use with a wide range of propriety varnishes including trickle and water based types.

After the soak time has elapsed the varnish is then pumped back and the job removed.

### MACHINE FEATURES AND OPERATION

- Minimises valuable overhead crane time.
- Safety protection - by means of 2 drop down lids (operated by a fused link) in case of fire.
- By having lids and extraction ducting, fumes are kept away from the operator, minimising the health hazard.
- A sealed storage tank reduces solvent loss and maintains varnish in peak condition.
- The VT20 varnish tank is supplied with the immersion tank at one side of the storage vessel.
- The nominal capacity of the immersion tank is 2 m x 2 m x 2m.



### POWER REQUIREMENTS

Extractor fan motor:	220V / 240 V	1 phase	50Hz / 60Hz	(5A)
Pump motor:	380V / 415 V	3 phase	50Hz / 60Hz	(10A)
Pump Flow rate:	10 gallons (45 litres) per minute			
Important:	This unit must be earthed			

### INSTALLATION

Although connection of this unit to the mains is relatively simple, it must only be carried out by suitably qualified personnel.

For ease of operation and loading the VT20 varnish tank is supplied with the immersion tank at the side of the storage vessel.

For small models the customer may choose to have the immersion tank mounted on the storage tank to save space, however, the customers' preference must be indicated at the time of purchasing.

## OPERATING INSTRUCTIONS

The machine is designed to be easy to operate:

- Fill the storage tank, via the filler breather, with varnish.
- Lift the lids on the immersion tank until vertical and insert the job to be varnished.
- Switch extractor fan on.
- Switch on pump (forward) and fill immersion tank until the job is covered.
- Switch off pump and then close the lids.
- Leave job to soak.
- Switch on pump (reverse) to return the varnish into storage tank.
- Switch off pump.
- Leave job to drain.
- Switch extractor fan off.
- Lift the lids and remove the job from the immersion tank.

## MAINTENANCE

The level of oil in the gear box should be periodically checked and 'topped up' if necessary.

Periodically the immersion tank should be cleaned out and the filter mesh cleaned.

Ensure that at all times the varnish is at the correct viscosity. This can be done using a B. S. Flow Cup, Type 'B'.

# SECTION 2

Test and measurement equipment/ diagnostic  
system



# **ITEM**

## **2.1**

# MIT515, MIT525 and MIT1025

## 5 & 10 kV DC Insulation Resistance Testers



- Measures up to 10 T $\Omega$  or 20 T $\Omega$  (MIT1025)
- PI, DAR, DD, SV and ramp test
- Improved productivity – operate from line power/mains if battery dead
- Li ion battery - extended capacity, rapid charge
- Advanced memory with time/date stamp
- CATIV 600 V safety rating

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### DESCRIPTION

The new range of insulation resistance testers (IRTs) are smaller and lighter than previous models yet offer advanced features and rapid charge capability. The range consists of three models; an entry level 5 kV and two fully featured units, one 5 kV the other 10 kV. Resistance measurement up to 10 T $\Omega$  for the 5 kV models and 20 T $\Omega$  for the 10 kV model.

A key productivity feature is the ability to take measurements when connected to line power/mains with a dead battery. Intelligent battery charging ensures the optimum charge rate as a function of battery level, resulting in minimum charge times.

The rugged case provides ultimate protection for a portable instrument and a clip-on lead pouch ensures that leads remain with the instrument at all times. The case lid is removable for improved terminal access. IP rating is IP65 with the case closed preventing water/dust ingress. High reliability and safety are built in; all models are safety rated to CATIV 600 V and are double insulated.

Five preset voltage ranges are provided in insulation test mode, plus a user settable lock voltage range. Preconfigured diagnostic tests include Polarisation Index (PI), Dielectric Absorption Ratio (DAR), dielectric discharge (DD), Stepped Voltage (SV) and ramp test.

Simplicity of operation is achieved with two rotary switches and the large backlight display enables multiple results to be displayed simultaneously.

Advanced memory storage includes time/date stamping of results, logging of data and recall of results to screen. A fully isolated USB device interface (type B) is used for safe transfer of data to Megger's PowerDB / Pro, Advanced and Lite asset management software.

### FEATURES AND BENEFITS

- 10 T $\Omega$  (5 kV) / 20 T $\Omega$  (10 kV) max. insulation resistance
- Timed IR plus PI and DAR diagnostic tests
- Operate with dead battery when on line power/mains
- Rapid charge Li-ion battery – up to 6 hrs continuous testing (5 kV)
- Dedicated voltmeter function (30 V to 660 V)
- CATIV 600 V safety rating
- Large LCD display with automatic backlight
- Noise filter – rejects up to 3 mA noise
- High altitude operation up to 3000 m

### MIT525/1025 ADDITIONAL FEATURES

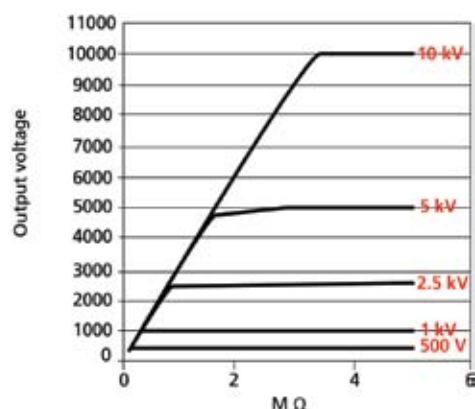
- Dielectric Discharge (DD), Step Voltage (SV) and ramp test functions
- Advanced memory with time/date stamp, on screen recall
- Real time clock
- Download of memory via isolated USB (type B) interface (USB cable to PC)
- PowerDB Lite asset management software

### APPLICATION

The Insulation Resistance (IR) test is a qualitative test that indicates the effectiveness of a product's electrical insulation. Applications include cables, transformers, motors/generators, circuit breakers and bushings. The IR test is ideal for measuring and recording long term stability of insulation over time, a process known as trending. IR tests are temperature dependent and require adjustment to a reference temperature. Storage models offer a temperature recording option.

**ELECTRICAL SPECIFICATIONS**

Voltage input range:	85-265 V rms, 50/60 Hz, 60 VA	Capacitance range (above 500 V):	10 nF to 25 $\mu$ F (dependant on measurement voltage)
Battery:	11.1 V, 5.2 A hour, meets IEC 62133:2003	Capacitance accuracy (23 °C):	$\pm$ 10% $\pm$ 5 nF
Battery life MIT515, MIT525:	Typical capacity 6 hours continuous at 5 kV with a 100 M $\Omega$ load	Voltage output accuracy (0 °C to 30 °C):	+4%, -0%, $\pm$ 10 V nominal test voltage at 1 G $\Omega$
MIT1025:	Typical capacity 4.5 hours continuous at 10 kV with a 100 M $\Omega$ load	Current measurement range:	0.01 nA to 6 mA
Battery charge time:	2.5 hours from deep discharge, 2 hours normal discharge	Current measurement accuracy (23 °C):	$\pm$ 5% $\pm$ 0.2 nA at all voltages
30 min. quick charge:	1 hour operation at 5 kV, 100 M $\Omega$	Interference (noise) rejection: MIT515, MIT525	1 mA per 250 V up to a maximum of 3 mA
Test voltages MIT515, MIT525:	250 V, 500 V, 1000 V, 2500 V, 5000 V	MIT1025	1 mA per 600 V up to a maximum of 3 mA
MIT1025:	500 V, 1000 V, 2500 V, 5000 V, 10000 V	Voltmeter range:	30 V to 660 V ac or dc, 50/60 Hz
User defined test voltage: MIT515, MIT525	100 V to 1 kV in 10 V steps, 1 kV to 5 kV in 25 V steps,	Voltmeter accuracy:	$\pm$ 3%, $\pm$ 3 V
MIT1025	5 kV to 10 kV in 25 V steps	Timer range:	Up to 99 minutes, 15 second minimum setting
Accuracy (23 °C): MIT515, MIT525	$\pm$ 5% to 1 T $\Omega$ , $\pm$ 20% to 10 T $\Omega$	Memory capacity:	5½ hours continuous logging every 5 s. or 33 logged PI tests or 350 logged IR tests
MIT1025	$\pm$ 5% to 2 T $\Omega$ , $\pm$ 20% to 20 T $\Omega$	Test regimes: MIT515	IR, IR(t), DAR, PI
Guard :	2% error guarding 500 k $\Omega$ leakage with 100 M $\Omega$ load	MIT525, MIT1025	IR, IR(t), DAR, PI, SV, DD, ramp test
Display range analogue:	100 k $\Omega$ to 10 T $\Omega$	Interface:	USB type B (device)
Display range digital: MIT515, MIT525	10 k $\Omega$ to 10 T $\Omega$	Real time output:	USB, 1 reading/second (voltage, current and resistance)
MIT1025	10 k $\Omega$ to 20 T $\Omega$	<b>ENVIROMENTAL CONDITIONS</b>	
Short circuit current:	3 mA nominal, max. power on all loads outperforming many 5 mA testers	Altitude:	3000 m, CAT rating maintained >2000 m* * Test leads connected
Insulation alarm:	10 k $\Omega$ to 1 T $\Omega$	Operating temperature	-20 °C to 50 °C
Capacitor charge: MIT515, MIT525	<3 s/ $\mu$ F at 3 mA to 5 kV	Storage temperature:	-25 °C to 65 °C
MIT1025	<5 s/ $\mu$ F at 3 mA to 10 kV	Humidity:	90% RH non-condensing at 40 °C
Capacitor discharge: MIT515, MIT525	<250 ms/ $\mu$ F to discharge from 5000 V to 50 V	Ingress protection:	IP65 (lid closed), IP40 (lid open)
MIT1025	<500 ms/ $\mu$ F to discharge from 10000 V to 50 V	<b>GENERAL SPECIFICATION</b>	
		Safety:	Meets the requirements of IEC 61010-1, CATIV 600 V
		EMC:	Meets the requirements of IEC61326-1
		Dimensions:	L 315 mm x W 285 mm x H 181 mm
		Weight:	4.5 kg



### ORDERING INFORMATION

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
MIT515-UK	1001-935	<b>Optional Accessories</b>	
MIT515-US	1001-936	HV test lead sets	
MIT515-EU	1001-937	3 m leadset x 3, medium insulated clips	1002-531
MIT515-AU	1001-938	10 m leadset x 3, medium insulated clips	1002-532
MIT525-UK	1001-939	15 m leadset x 3, medium insulated clips	1002-533
MIT525-US	1001-940	3 m leadset x 3, large insulated clips	1002-534
MIT525-EU	1001-941	10 m leadset x 3, large insulated clips	1002-535
MIT525-AU	1001-942	15 m leadset x 3, large insulated clips	1002-536
MIT1025-UK	1001-943	3 m leadset x 3, bare clips	8101-181
MIT1025-US	1001-944	8 m leadset x 3, bare clips	8101-182
MIT1025-EU	1001-945	15 m leadset x 3, bare clips	8101-183
MIT1025-AU	1001-946	Screened HV test lead sets	
		3 m, 5 kV screened un-insulated small clips	6220-835
		15 m, 5 kV screened un-insulated small clips	6311-080
		3 m, 10 kV screened un-insulated small clips	6220-834
		10 m, 10 kV screened un-insulated small clips	6220-861
		15 m, 10 kV screened un-insulated small clips	6220-833
<b>Included Accessories</b>		<b>Other</b>	
User guide CD		CB101, 5 kV Calibration Box	6311-077
Power lead		Calibration Certificate - CB101	1000-113
3 m leadset x 3, medium insulated clips	1002-531	UKAS calibration Certificate CB101	1000-047
3 m leadset x 3, large insulated clips (MIT1025 only)	1002-534		
<b>Included Accessories (MIT525, MIT1025)</b>			
USB cable	25970-041		
PowerDB Lite software			

# **ITEM**

## **2.2**



# COMPUTERISED POLYFUNCTIONAL SURGE TESTER

## Serie H3



**H3/6-CPS  
6KV FOR BENCH**

**H3/12-CPS  
12KV FOR BENCH**

**H3/12-CR  
12KV TROLLEY**



**H3/6-CR  
6KV TROLLEY CASE**

## Repairers, maintenance, laboratory, service, prevention

### EXPERIENCE

Going back to 1958, after the great success with the **H2** series, [redacted] to realise the new **H3** series, managed by PC integrated in the instrument. This machine considers all specific needs of end users of all levels. The different versions and option allow an easy customisation of the instrument.

### USE

Suitable to test on stators, single and three-phase motors and direct-current; transformers, coils, die-cast and wounded rotors, in low-medium voltage. Particular attention is given to accident prevention safety, simplicity of use, complete performance and toughness.

### THE TESTS

- **"SURGE" IMPULSE TEST** IMPULSE TESTS on any type of winding. It detects: short-circuit of turns, of windings, winding errors; it visualises micro discharges. (OPTION)
- **DIELECTRIC STRENGTH TEST** in D.C. to test also big electric machines
- **MEASURE OF THE INSULATION RESISTANCE.** Mohm reading for all the available voltage range

- **POLARISATION INDEX (IP), DAR AND DD** in automatic mode (OPTION). They allow to satisfy all normative requirements.
- **TEST ON DIE-CAST ROTORS** (OPTION). Detection of: interrupted bars, blowing, porosity, etc.
- **MEASURE OF THE OHMMIC RESISTANC.** Resolution at  $10\mu\Omega$ , calculation of unbalance between phases, compensation at ambient temperature, measure of  $\Delta T$  with checking of the thermal unbalance.



# TECHNICAL FEATURES OF THE TESTS

## 1. DIGITAL OHMMETER

- Measure with **4-wire** system (Kelvin)
- **Compensation at ambient temperature** with the use of a thermometric probe for copper and aluminium
- Thresholds for the acceptance of the absolute value and unbalance between phases (for three-phase systems), for automatic result
- SELF-TEST possibility and MANUAL or SELF-START
- **$\Delta T$  measurement** of single and three-phase systems; the calculation of the thermal unbalance between phases can also be performed



①

## 2. "SURGE" IMPULSE TEST ON WINDINGS

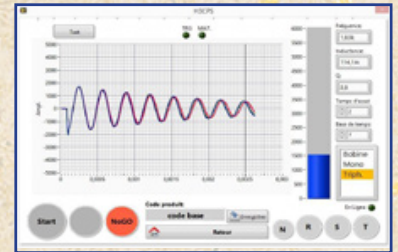
Possibility to test **single windings**, **single** (2 windings) **and three-phase motor stators** with connected and not connected phases internally.

Two test modes:

- **AGAINST MEMORY**: to compare responses of the same windings, with the memorised one.
- **DIRECT CONFRONTATION BETWEEN PHASES**: for three-phase systems with **TQF** reading (Total Quality Factor)

In both systems, **L** and **Q** are visualised and detected, with the possibility of acceptance thresholds for automatic GO/NO GO results.

- Test voltage: from 0 to a max value, adjustable with continuity with a panel knob and touch-screen.
- Commutation for three-phase, both in groups and automatic sequence.
- **Visualisation of the real voltage value applied to loading**
- **Micro discharge detection (option)**. EN 300270



②

## 3. DIELECTRIC STRENGTH IN D.C.

- Voltage, adjustable with continuity, from 0 to the max set value
- Setting of the max current threshold for automatic **GO/NO GO**
- **Automatic discharge** of the residual voltage on the testing object, when START buttons are released



③

## 4. MEASURE OF THE INSULATION RESISTANCE IEEE 43-2000

- Voltage, adjustable with continuity, from 350 to 2.500 V d.c.
- Setting of the minimum acceptable value threshold, with automatic **GO/NO GO** response
- **Automatic discharge** of the residual voltage at the end of the test



④

## 5. Measure of the POLARISATION INDEX - I.P. IEEE 43-2000

in automatic mode (*option*)

Ratio between the measurement done at 10 min. with the one done at 1 min.

### 5.1 DAR measurement (Dielectric Absorption Ratio) (*option*)

Ratio between the measurement done at 60 sec. with the one done at 30 sec.

### 5.2 DD measurement (Dielectric Discharge) (*option*)

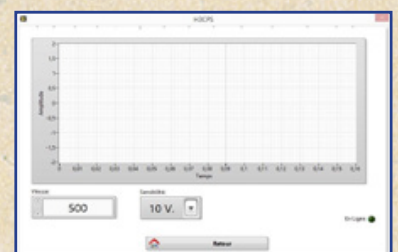
Ratio between the current at 1 min. and the test voltage for capacity



⑤

## 6. TESTS ON DIE-CAST ROTORS (OPTION)

- With the use of the **O4/BPR** transducer.
- The **quality of the die-cast cage** is tested for rotors of any dimension.
- Possibility to memorise response curves.
- The test is performed by rotating the rotor on the appropriate mechanical instrument (ex. Lathe. Please see the picture on the last page)



⑥



TESTS PERFORMED		H3/6-CPS H3/6-CR	H3/12-CPS H3/12-CR
<b>DIGITAL OHMMETER</b>			
• Minimum full-scale	mΩ	20	20
• Maximum full-scale	Ω	2.000	2.000
• Resolution	μΩ	10	10
• Test current	A	3 A self-ranging	3 A self-ranging
• Accuracy on all scales	%	0,5	0,5
<b>"SURGE"IMPULSE TEST</b>			
• Maximum voltage	KV	6	12
• Impulse freq. per sec.		50	25
• Max energy	Joule	1.2	3.6
• Max peak current	A	320	620
• Minimum inductance (for automatic result)	μH	10	15
• Capacity Surge	nF	66	50
<b>DIELECTRIC STRENGTH</b>			
• Max voltage in d.c	KV	6	12
• Max current	mA	5	5
• Resolution	μA	5	5
• Accuracy	%	0,5	0,5
<b>INSULATION RESISTANCE</b>			
• Voltage range	KV	0,4-2,5	0,4-2,5
• Full-scale	GΩ	1	1
• Accuracy	%	0,5	0,5
<b>POLARISATION INDEX - DAR</b>			
• Full-scale	GΩ	300	300
• PI time min	1-10	1/10	
• DAR time	min	0,5/1	0,5/1
<b>ASSEMBLY DIMENSION</b>			
Bench (CPS)	mm	<b>525x600xh320</b>	<b>526x600xh410</b>
Weight	Kg	<b>30</b>	<b>35</b>
Trolley (CR)	mm	<b>530x680xh270</b>	<b>565x600xh1.265</b>
Weight	Kg	<b>22</b>	<b>48</b>

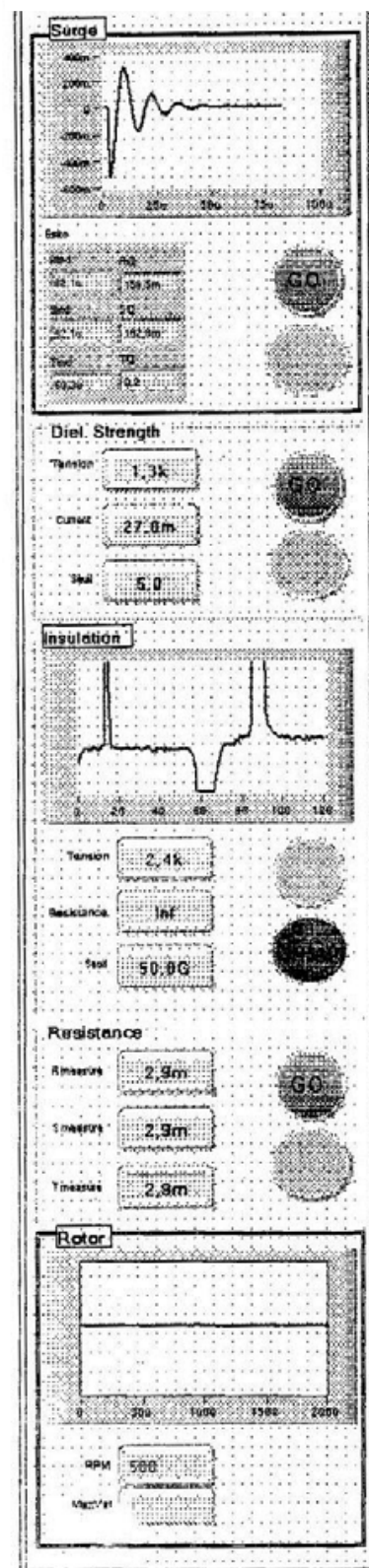
Assembly on wheels  
with bench for tools  
and reclining  
working plane

### TECHNICAL FEATURES OF THE PC and SW

- 10" PC PANEL with 2GB RAM, 32GB HSS (solid state)
- Touchscreen – display keyboard
- Windows Embedded Operative System
- 4 USB ports accessible from the outside, for connection to:
  - Keyboard, mouse, printer, etc
- External LAN socket for server or other PC.
- Memorisation of set data and results for each single test, with relating response curves (thousands)
- Data storage and parameterisation, under password
- Indication of the test result with the use of GREEN-RED signal on the monitor

### OTHER FEATURES

- **Double start button** with anti-repetitive
- **42 column printer**, internal or external (**option A**)
- Safety blocking key
- Tool to test **wounded rotors (option C)**
- Safety lamps (**option D**)
- Supply: 230 V. 50 – 60 Hz - 500 W
- **High insulation cable** for connection to the testing object (2m)
- SW in Italian and English. Other language under request
- Selection on the display of the various performable tests
- Trolley to contain accessories
- Automatic sequence of all tests (**option I**)



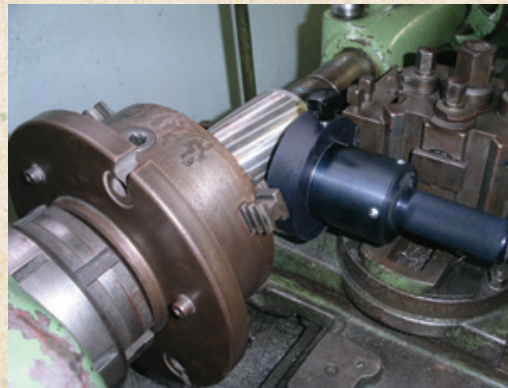


## OPTIONS

	H3/6-CPS	H3/6-CR	H3/12-CPS	H3/12-CR
A. 42 column printer placed on the instrument	•	•	•	•
*B. O4/BPR transducer for die-cast rotors	•	•	•	•
*C. Contact tool for armatures, with start pedal	•	•	•	•
*D. Safety lamps	•	•	•	•
E. MICRO DISCHARGE detection	•	•		
F. POLARISATION INDEX	•	•	•	•
G. DAR	•	•	•	•
H. DD	•	•	•	•
I. Automatic sequence of all tests (IN PREPARATION)				
*J. Trolley for H3/CPS-6	•		•	

• The options marked with (\*) can be provided successively

**O4/BPR transducer (B)**



**Example on lathe**

**Accessories for trolley (option)**



**Armature tool (C)**



**Trolley (J)**



**H3/6-CR Trolley**



MULTI-TEK INTERNATIONAL  
email: [mti@multitekintl.com](mailto:mti@multitekintl.com)

# **ITEM**

## **2.3**

## Motor Test Consoles TC100/TC150/TC250/TC320



is designed for off-load testing of 3 phase motors. A combined 0 – 5 kV AC flashtester and 500V DC mega oh meter enables suitable tests to be carried out prior to running.

### **MACHINE FEATURES AND OPERATION**

- On-load tap change switches which allow the motor under test to be run-up on a low voltage tapping to ensure there are no electrical or mechanical problems before switching in steps to full voltage.
- Motor HP can be determined using the 'locked rotor' method, whereby the rotor is locked electrically and the HP calculated using the 'locked rotor' formula with the measured 'locked rotor' current.
- 3 x ammeters, one for each phase
- 1 x single switched voltmeter
- 5 kV flash tester / 500 Vdc Megohmmeter combined unit
- Main supply to the test consoles is via an Secure location of the stator

## Motor Test Consoles

### TC100/TC150/TC250/TC320

#### SPECIFICATION

	TC100	TC150	TC250	TC320
Standard units	75 kW 100 HP	100 kW 150 HP	180 kW 250 HP	240 kW 320 HP
Standard electrical supply	415 V, 3 phase, 50 Hz Other supply voltages considered			
Standard tap change voltages	50 V, 110 V, 240 V, 415 V, 500 V, 550 V These may be changed to suit local supply voltage			
Optional specifications	Single phase AC output DC variable supply TCS Datalink Software Variations of 3 phase input and output voltages are considered for quotation			



# **ITEM**

## **2.4**

## **IDAX 300/350**

### **Insulation Diagnostic Analyzers**



- **Automated measurement and analysis of moisture content, tan delta/power factor and oil conductivity**
- **Individual temperature correction (ITC) of tan delta/power factor and oil conductivity**
- **40% faster measurements with the new IDAX 5.0 SW**
- **Reliable measurements in high-interference environments**
- **Multi-function test set for transformer measurements**

---

#### **Description**

IDAX 300 is a very compact instrument and is used together with an external computer. The IDAX 350 has a built-in computer but can also be used with an external computer.

IDAX 300/350 provides an accurate and reliable condition assessment of insulation in transformers, bushings, generators and cables. The IDAX system maximizes the outcome of maintenance activities allowing for load and service life optimization.

IDAX 300/350 are smaller, lighter and faster than their predecessor IDA200 and IDAX 206. It maintains better accuracy and ability to provide reliable data using true AC DFR (Dielectric Frequency Response), also known as FDS (Frequency Domain Spectroscopy), for reliable test results in high interference environments. The state-of-the-art software makes testing both easier and faster, allowing transformer moisture and oil assessment in about 22 minutes (20°C).

IDAX measures the capacitance and tan delta/power factor of the insulation between power transformer windings at multiple frequencies. Analyzing the results using modeling technique makes it possible to assess the moisture level in the solid insulation, oil conductivity/tan delta at reference temperature (25°C) and power frequency tan delta at reference temperature (20°C). The test can be performed at any temperature as the temperature dependence of the dissipation factor is included in the modeling.

---

#### **Application**

With an aging power transformer population, today's electrical utility industry faces a tough challenge as transformer failures and consequent repair and revenue loss costs millions of dollars. Transformers have become one of the most mission critical components in the electrical grid. The need for reliable monitoring and diagnostic methods drives the world's leading experts to evaluate new technologies that improve reliability and optimize the use of every grid component [1].

IDAX is a revolutionary insulation diagnostic instrument based on DFR (Dielectric Frequency Response), also known as FDS (Frequency Domain Spectroscopy). This analysis technique has been used in laboratories for decades and IDA/IDAX was the first instrument designed for field use (1996). The IDA/IDAX instrument and measurement principle has been used and verified around the world over the last 15+ years.

## Moisture in transformers

One of the most important applications for IDAX is to determine the moisture content in transformer insulation. Moisture in the insulation significantly accelerates the aging process. The insulation system of power transformers consists of oil and cellulose. Among factors contributing mostly to the degradation of transformer insulation, moisture plays an important role. Presence of water in solid part of the insulation, even in small concentrations

- increases its aging rate
- lowers the admissible hot spot temperature
- increases the risk of bubble formation
- reduces the dielectric strength of transformer oil
- reduces the inception level of partial discharge activity

IDAX provides reliable moisture assessments in one test. The test can be made at any temperature and takes about 22 minutes at 20-30 °C insulation temperature.

Decisions on maintenance and/or replacement should be based on knowing the condition of the insulation and the expected loading of the unit. Adding just a few operational years to the expected end-of-life for a transformer, generator or cable by optimizing the working condition based on reliable diagnostic data means substantial cost savings for the equipment owner.

The DFR technology can also be used to assess the condition and aging of the insulation in bushings, CTs, VTs and other components. Numerous ongoing research projects at institutes and universities around the world is adding experience and value to users of IDAX.

### Water in oil vs. paper

Assessing reliable moisture content in transformer insulation based on oil sample tests is unreliable as the water migrates between the solid insulation and oil as temperature changes. An oil sample has to be taken at relatively high temperature and when the transformer is in equilibrium. Unfortunately, this is a rare state for transformers thus resulting in unreliable assessments. Experience has shown that this method tends to overestimate the amount of water in the insulation.

Figure 1 shows how the significant and potentially critical difference of 0.5% respectively 3.0% moisture in paper, correlates to the insignificant difference of 1 respectively 4 Parts Per Million (PPM) in an oil sample obtained at 20°C (68°F) [2].

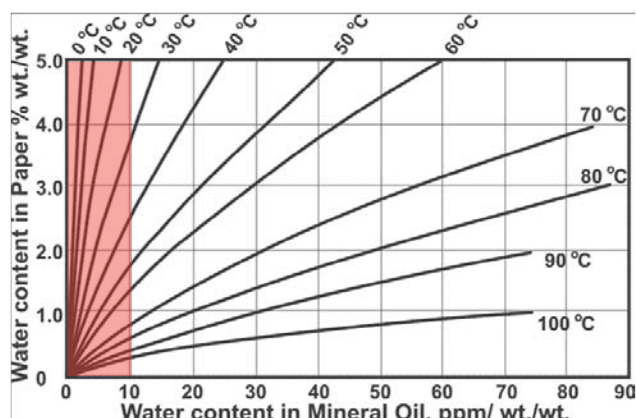


Fig. 1: Water in oil vs. paper correlation is unreliable at low temperature

### The test

Dielectric loss or power factor is frequency and temperature dependent, so by injecting test signals at discrete frequency steps typically between 1 kHz and 1 mHz while recording results at each point, a frequency response at a specific temperature is obtained (Fig 2).

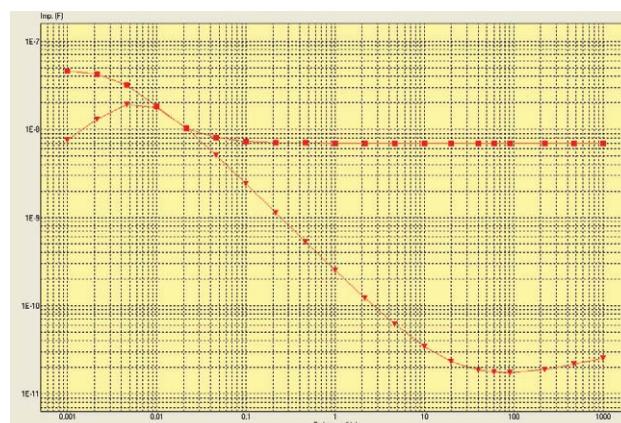


Fig. 2: Insulation measurements presented as capacitance and loss

This frequency response represent the properties of the insulation material in the transformer and will be used in further analysis as described below. The insulation temperature (oil or winding temperature) is recorded to be used in the model analysis described below.

### The model

The insulation between the windings in a transformer consists of a solid and a liquid part. The solid part consists of barriers and spacers to create an oil duct for cooling purposes (Fig 3). In the analysis, a SW algorithm varies all insulation and geometry parameters to simulate every possible design. The model also applies Arrhenius equation to calculate and compensate for temperature dependence in the material [3].

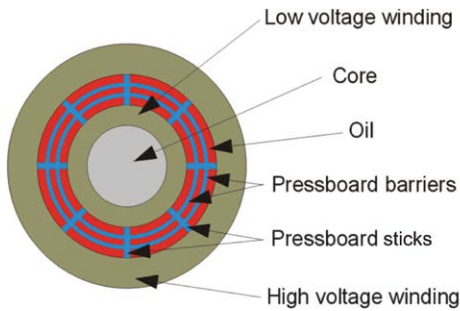


Fig. 3: Typical insulation design

The IDAX software creates new model curves and compares them to the measured curve until the best possible match is reached. The final results are presented as percent of moisture in paper and individually corrected power frequency tan delta and oil conductivity at reference temperature (Fig 4).

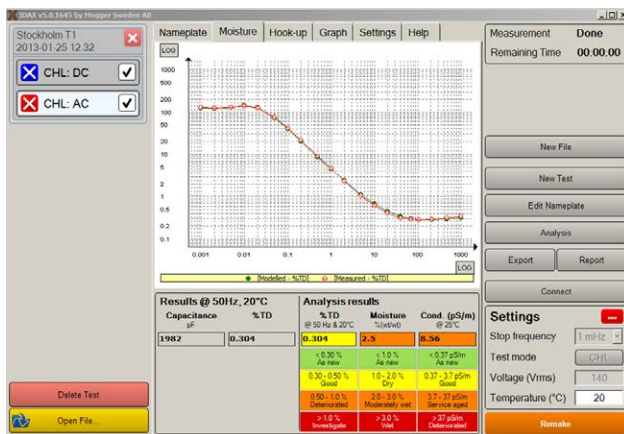


Fig. 4: Insulation assessment; Moisture, tan delta and oil conductivity

### What controls the response

The general rule is that moisture is visible in the highest and lowest frequencies. Oil conductivity is dominant in the medium frequency and the temperature shifts the curve to the right and to the left respectively (Fig 5).

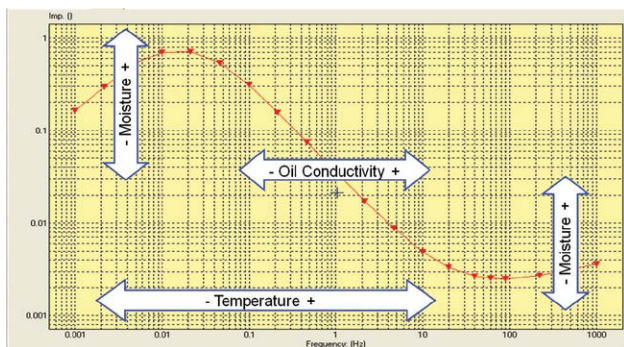


Fig. 5: Oil conductivity and moisture influence

### One point is not enough

Traditional tan delta/power factor testing provides one value at mains frequency 50/60 Hz. This is where the IDAX method makes the difference. Figure 6 shows

that a single tan delta/power factor value cannot provide conclusive information about the potential problem. At best it can provide information that a problem exists. In this example, two transformers have the same power factor value at 60 Hz. However, one of them is wet (3.6%) and should be considered for a dry-out while the oil in the other unit should be replaced or regenerated. The IDAX method provides accurate and conclusive information in one test.

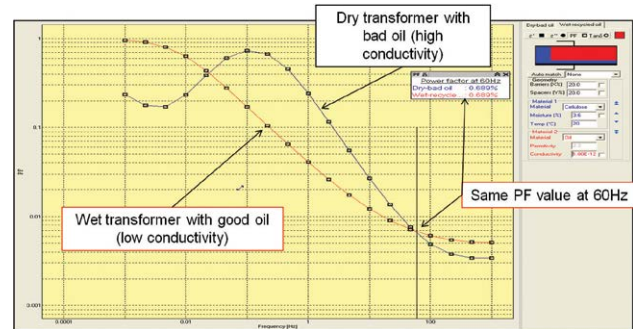


Fig. 6: Blue — dry with bad oil. Red — wet with good oil

### Test procedure

The test preparation and procedure is similar to a standard tan delta/power factor test, which means that the transformer has to be off-line and preferably disconnected.

The IDAX software operates on Windows XP, Vista, 7 and 8 and utilizes standard USB or Ethernet communication. The software guides the user through a test template where all connections are illustrated as in Figure 7. Color markings on clamps makes it easy to connect according to the built in instructions. The test can be started as soon as the test cables are connected and unlike DC-methods there is no need for discharging the test object.

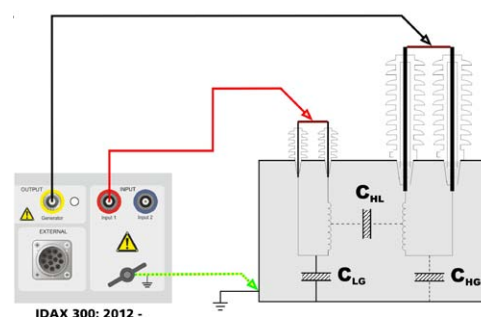


Fig. 7: Example of connections to a two-winding transformer. All IDAX have 3 measurement terminals (red, blue and ground) that allows measuring multiple tests in an automatic sequence without having to change cable connections on the transformer.

The extended versions IDAX 300S and IDAX 350 have dual separate current measurement channel, that allows for two completely independent measurements at the same time, thus minimizing test time.



## Multi-function test set

Besides performing moisture assessment on oil-immersed transformers, IDAX is a multi-function test set for testing transformers, bushings and other power components. With IDAX you can do:

- Power frequency tan delta/power factor measurements
- Power frequency capacitance measurements
- Hot collar testing
- Tip-up/step voltage testing
- DC insulation testing (Insulation Resistance, Polarization Index and Dielectric Absorption Ratio)
- Excitation current measurements

Maximum test voltage for IDAX is 200 V (DC/peak AC). With the optional VAX020 amplifier, test voltage is maximum 2 kV (DC/peak AC)

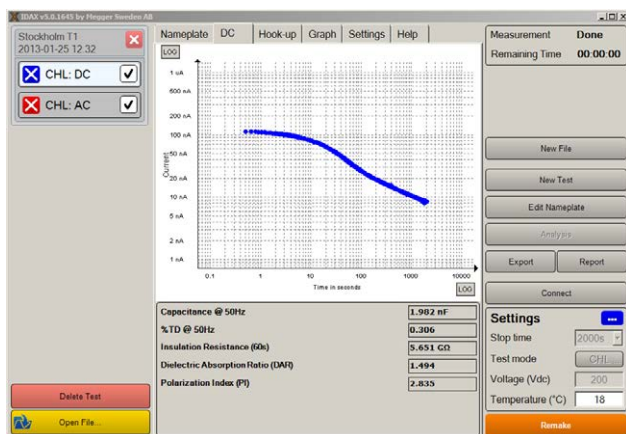


Fig. 8: DC insulation measurement

## Calibration

The calibration set enables simple and reliable calibration of the IDAX system. It also reduces instrument downtime and transport cost as the calibration box is the only part that needs to be sent in for calibration. The new design allows calibration in any local certified calibration facility to avoid long shipment turn-around times and transport costs.

## Conclusion

IDAX is a well-proven insulation diagnostic analyzer. The instrument and method including the insulation modeling algorithms for moisture assessment has been tested and verified with numerous customers over the years. In its latest 5th generation version it is faster, easier to use and more complete than ever before. With the wide frequency range from DC to 10kHz, the capability to handle substation interference, the fast measurement method and the range of test voltages from 200 V to 30 kV (with optional high-voltage amplifiers), IDAX fulfills the requirements from the most demanding customer looking for a complete insulation diagnostic test set.

## Specifications IDAX 300/350

### Environmental

**Application field** The instrument is intended for use in medium and high-voltage substations and industrial environments.

**Ambient temperature**  
**Operating** IDAX300: -20°C to +55°C (-4°F to +131°F)  
IDAX350: -10°C to +55°C (14°F to +131°F)

**Storage** -40°C to 70°C (-40°F to +158°F)

**Humidity** < 95%RH, non-condensing

### CE-marking

**EMC** 2004/108/EC

**LVD** 2006/95/EC

### General

**Mains voltage** 100 – 240V ±10%, 50/60 Hz

**Power consumption** 250 VA (max)

### Dimensions

**IDAX 300** 335 x 300 x 99 mm (17.7" x 6.3" x 16.1")

**IDAX 300 Flight case** 520 x 430 x 220 mm (20.5" x 17" x 8.7")

**IDAX 350** 520 x 430 x 220 mm (20.5" x 17" x 8.7")

### Weight

**IDAX 300** 4.9 kg (11 lbs), 9.9 kg (22 lbs) incl. flight case

**IDAX 350** 13.5 kg (29.8 lbs)

**Accessories** 8.5 kg (18 lbs) soft bag

### Measurement section

**Inputs** Channel 1, channel 2, ground

**Capacitance range** 10 pF – 100 µF

**Inaccuracy** 0.5% + 1 pF

**Dissipation factor range** 0 - 10 (with retained accuracy of capacitance; otherwise higher)

**Inaccuracy** < 0.5% + 0.0001, 45-70 Hz, C > 100 pF (with VAX020)

< 0.5% + 0.0002, 45-70 Hz, C > 300 pF

< 1% + 0.0003, 1 mHz-100 Hz, C > 1000pF

< 2% + 0.0005, 100 Hz-1 kHz, C > 1000 pF

**Max AC interference** 1 mA, 1:10 SNR (IDAX) 10 mA, 1:10 SNR (VAX020)

**Max DC interference** 2 µA (IDAX) 20 µA (VAX020)

**Test modes\***

UST: ungrounded Specimen Testing

UST-R: UST: Measure Red, Ground Blue

UST-B: UST: Measure Blue, Ground Red

UST-RB: UST: Measure Red and Blue

GST: Grounded Specimen Testing

GST-GND: GST: Ground Red and Blue

GSTg-R: GST: Guard Red, Ground Blue

GSTg-B: GST: Guard Blue, Ground Red

GSTg-RB GST: Guard Red and Blue

\*IDAX300 can measure multiple test modes

in an automatic sequence. IDAX 300S/350

can measure two test modes simultane-

ously.

**Calibration** Calibration set allows field calibration

### Time Domain Current Measurement (PDC)

**Range** ±20 mA

**Resolution** 0.1 pA

**Inaccuracy** 0.5% ±1 pA

**Input resistance** ≤10 kΩ

(DC mode)

### Outputs

#### GENERATOR

**Voltage/current ranges, 10 V** 0 – 10 Vpeak 0 – 50 mA peak

**Voltage/current ranges, 200 V** 0 – 200 Vpeak 0 – 50 mA peak

**Frequency range** DC – 10 kHz

#### EXTERNAL

**For VAX amplifiers** 2 to 30 kV

#### PC Requirements

Operating system	Windows 2000/ XP / Vista / 7 / 8
Processor	Pentium 500 MHz
Memory	512 Mb RAM or more
Interface	USB 2.0 and LAN

#### Included accessories



Picture shows some of the included accessories. Generator cable, USB cable, Ground cable and Measurement cables.



Rugged carrying case with wheels and space for cables and accessories.

#### References

- [1] S.M. Gubanski, J. Blennow, L. Karlsson, K. Feser, S. Tenbohlen, C. Neumann, H. Moscicka-Grzesiak, A. Filipowski, L. Tatarski "Reliable Diagnostics of HV Transformer Insulation for Safety Assurance of Power Transmission System" Cigre Paris Aug 2006
- [2] From. P. J. Griffin, C. M. Bruce and J. D. Christie: "Comparison of Water Equilibrium in Silicone and Mineral Oil Transformers", Minutes of the Fifty-Fifty Annual Conference of Doble Clients, Sec. 10-9.1, 1988
- [3] U. Gäfvert, L. Adeen, M. Tapper, P. Ghasemi, B. Jönsson, "Dielectric Spectroscopy in Time and Frequency Domain Applied to Diagnostics of Power Transformers", Proc. Of the 6th ICPADM, Xi'an, China, 2000

#### Ordering information

Item	Art. No.
<b>IDAX 300</b>	AG-19090
<b>IDAX 300S</b>	AG-19092
<b>IDAX 350</b>	
With internal computer	AG-19192
<b>Included accessories</b>	
Mains cable	
Ground cable 5 m (16 ft), GC-30060	
Generator cable 18 m (60 ft), GC-30312	
Measurement cable, red 18 m (60 ft), GC-30322	
Measurement cable, blue 18 m (60 ft), GC-30332	
USB cable, Windows software, Transport case	
<b>Optional accessories</b>	
IDAX calibration box CAL 300	AG-90010
IDAX demo box IDB 300	AG-90020
2nd channel option (factory upgrade to IDAX 300S)	AG-90200
Generator cable, 9 m (30 ft)	GC-30310
Measurement cable, 9 m (30 ft), red	GC-30320
Measurement cable, 9 m (30 ft), blue	GC-30330
Accessory kit:	
mini bushing tap connectors (4 pcs)	
hot collar straps (3 pcs)	
temperature and humidity meter	
.75" bushing tap connector	
1" bushing tap connector	
"J" probe bushing tap connector	
1 m (3 ft) non-insulating shorting leads (3 pcs)	
2 m (6 ft) non-insulating shorting leads (3 pcs)	
	AG-90100

# **ITEM**

## **2.5**

# 1604



## *40,000 count auto/manual ranging bench multimeter*

- ▶ Accuracy 0.08%; resolution 10 $\mu$ V, 10m $\Omega$  and 0.1 $\mu$ A
- ▶ Large and bright LED display; ac line operation
- ▶ True RMS ac functions; wide ac bandwidth
- ▶ Frequency measurement; audible continuity; diode test
- ▶ Relative, T-Hold and Min-Max functions included
- ▶ Isolated RS-232 interface as standard

# Model 1604 - 40,000 count bench multimeter

## A value-for-money DMM

The 1604 is a low-cost auto/manual ranging bench-top DMM with a large and bright LED display.

It offers 4½ digit (40,000 count) scale length, true RMS ac measurements, a basic accuracy of 0.08% and a resolution of 10µV, 10mΩ and 0.1µA.

## A substantial bench-top instrument

The 1604 is a robust mains-powered bench-top instrument. Unlike a hand-held multimeter it stays where you put it even with heavy test leads connected. The multi-position tilt stand ensures that the large display is always readable.

## Smart functions

The 1604 incorporates several "smart" functions such as Relative measurement and Minimum-Maximum storage.

The T-Hold function enables readings to be held on the display automatically each time a new test point is probed.

### DC VOLTAGE

Range	Accuracy	Resolution	Notes
400mV	0.08% 4 dig.	10 V	Max. Input 265V DC/AC rms
4V	0.08% 4 dig.	100 V	Input impedance 10MΩ nominal Max. input 1kV DC or AC pk NMR: >60dB @ 50/60Hz CMR: >90dB @ DC/50Hz/60Hz
40V	0.08% 4 dig.	1mV	
400V	0.08% 4 dig.	10mV	
1000V	0.09% 4 dig.	100mV	

### AC VOLTAGE (True RMS, 4000 count scale length)

Range	Accuracy	Resolution
	45Hz - 400Hz	400Hz - 5kHz
400mV	0.5% 4 dig.	1% 4 dig.
4V		3% 4 dig.
40V		1mV
400V		10mV
750V	1% 4dig.	3% 4 dig.

Accuracies apply for readings between 10% and 100% of full scale. Additional error at crest factor = 3 is typically 1%. Input impedance = 10MΩ nominal. Max. input = 750V rms, 1kV pk. (265V rms on 400mV range). 1kΩ unbalanced CMR = >60dB at DC or 50Hz (60Hz rejection available as factory option).

### RESISTANCE

Range	Accuracy	Resolution	Notes
400Ω	0.15% 6 dig.*	10mΩ	* 400Ω specification applies after null Max. input 265V DC or AC rms on any range. Max. open circuit voltage 4V
4kΩ	0.1% 4 dig.	100mΩ	
40kΩ	0.1% 4 dig.	1Ω	
400kΩ	0.15% 4 dig.	10Ω	40MΩ accuracy applies up to 20MΩ thereafter add 1%
4MΩ	0.3% 6 dig.	100Ω	
40MΩ	1.0% 10 dig.	1kΩ	

### DC CURRENT

Range	Accuracy	Resolution	Notes
4mA	0.1% 4 dig.	0.1 A	Max. input 1A (Fused) Voltage burden <500mV
400mA	0.1% 4 dig.	10 A	
10A (up to 1A)	0.3% 4 dig.	1mA	Max. input 10A (Fused) Voltage burden <500mV
10A (up to 5A)	1.0% 4 dig.	1mA	
10A (up to 10A)	3.0% 10 dig.	1mA	

### AC CURRENT (True RMS, 4000 count scale length)

Range	Accuracy	Resolution	Notes
1mA	0.5% 4 dig.	1 A	Max. input 1A (Fused) Voltage burden <500mV
100mA	0.5% 4 dig.	100 A	
10A (up to 1A)	0.8% 4 dig.	10mA	Max. input 10A (Fused) Voltage burden <500mV
10A (up to 5A)	1.5% 4 dig.	10mA	
10A (up to 10A)	3.0% 4 dig.	10mA	

Accuracies apply over 45Hz to 10kHz for readings between 10% and 100% of range. Additional error at crest factor = 3 is typically 1%.

## True RMS ac ranges

All AC measurements on the 1604 are True RMS. This avoids the errors on non-sinusoidal waveforms associated with other multimeters.

Good ac bandwidth enables measurement within the audio band and ensures that higher frequency components of switching waveforms are included within the measurement result.

## Frequency measurement

The 1604 has a frequency function which can be selected on any ac range in order to measure the frequency of the signal. Frequencies up to 40kHz can be measured and the maximum resolution is 0.1Hz.

## Isolated RS-232 interface

The 1604 is fitted with an isolated RS-232 interface. This permits remote control and data-logging to disk using optional Windows based software.

### FREQUENCY

Range	Accuracy	Resolution	Notes
4kHz	0.01% 1 dig.	0.1Hz	Sensitivity selected by AC range setting
40kHz	0.01% 1 dig.	1Hz	

Sensitivity better than 40mV (400mV range), better than 10% of range (other Vac & Iac ranges).

All accuracies apply for 1 year, 19°C to 25°C. Temperature coefficient outside these limits is <0.1 x quoted range accuracy per °C.

## FURTHER FUNCTIONS

### Continuity

Selects 4kΩ range and sounds audible tone for impedance <10Ω. Max. input 265V DC or AC rms.

### Diode Test

Displays junction voltages up to 3V at a test current of 1mA at 1V. Max. open circuit voltage approximately 4V. Max. input 265V DC or AC rms.

**Null (Relative):** Stores current reading and subtracts it from future readings.

**Hold:** Reading is frozen until released.

**T-Hold:** Reading is frozen when it becomes stable.

**Min/Max:** Minimum and maximum readings are stored.

## DISPLAY and RANGE CONTROL

0.56" (14mm) LED display. Annunciators for all ranges, functions and 'smart' modes. Scale Length 4½ digits (± 40,000 counts) except ac ranges (4,000 counts). Reading rate 2.5 per second. Overrange shows OFL on display. Each measurement function can use automatic or up/down manual ranging.

## RS-232 INTERFACE

Opto-isolated bi-directional RS-232 interface. 9600 baud.

## GENERAL

**Power:** 230V or 115V AC nominal 50/60Hz, adjustable internally; operating range ±14% of nominal; 3VA max.; Installation category II

**Size:** 260(W) x 88(H) x 235(D)mm, excl. handle/feet.

**Weight:** 2.0kg (4.4lb)

**Operating Range:** + 5°C to 40°C, 20-80% RH.

**Storage Range:** - 40°C to 70°C

**Safety:** Complies with EN61010-1.

**EMC:** Complies with EN61326.

Thurlby Thandar Instruments Ltd. operates a policy of continuous development and reserves the right to alter specifications without prior notice.

# **ITEM**

## **2.6**



# DCM340

## Digital clampmeter



- **DC and AC current and voltage**
- **600 A and 600 V**
- **Resistance and continuity**
- **3½ digit, 4000 count display with backlight**
- **High resolution digital bargraph**
- **Peak, min/max and data-hold functions**

### DESCRIPTION

The DCM340 is a highly versatile instrument and ideal for use in the installation, maintenance, monitoring or checking of a.c. or d.c. electrical systems and equipment.

There are four instruments in the DCM series of clampmeters, including the 400 A a.c. current-only DCM310; the DCM320 which includes voltage and resistance measurement; the DCM330 Fork-Multimeter, which is an open fixed jaw design; and this, the DCM340. Capable of measuring a.c. and d.c. current up to 600 A; a.c. and d.c. voltage up to 600 V; resistance up to 400  $\Omega$ ; and frequency up to 400 Hz, the DCM340 is the most versatile in the range.

Current measurement combined with the comprehensive and accurate multimeter functions of the DCM340 eliminate the need to carry around both a clampmeter and multimeter – this instrument does it all.

The large clear digits of the numeric display are complemented by the high-resolution digital bar graph, useful for indicating trending and fluctuation of measurement. The backlight assists use in poorly lit areas such as distribution cupboards and corners of switchrooms; and the data-hold feature enables use on difficult access cables where otherwise the display may be impossible to see.

Min/Max hold provides the ability to store the maximum and minimum d.c. or rms values over a period of time. While storage is taking place, either the present, maximum or minimum value can be displayed. Peak hold stores the maximum and minimum peak value of an a.c. signal at a 10 ms sample rate. The auto-off feature automatically places the meter in

power-save mode after 30 minutes from power-on, but this can be disabled if required for min/max measurements.

Using the Relative mode (REL), a stable value can be stored, the instrument zeroed at that point, and then any variation from that value is displayed as a direct measurement relative to it.

The DCM340 is safety rated to IEC 61010-1 Cat III 600 V, and is drop-tested to 1.2 m onto a hard floor. It is supplied with test leads and a carry case, and a full 1-year manufacturer's warranty.

### APPLICATIONS

The DCM340 is designed to be used on electrical systems and equipment where there is a need to measure current, volts, resistance and frequency. It is therefore intended for use while installing, maintaining, fault-finding or monitoring those systems.

The min/max and peak-hold enable maximum load currents from equipment to be identified such as start-up currents to motors and heaters.

With the added benefit of d.c. current measurement, it can also be used in applications including domestic power generation from solar panels and wind-turbines; battery monitoring; automotive uses for charging and load circuits; electric vehicle servicing such as fork-lift trucks; lift maintenance; UPS commissioning, servicing and maintenance; electro-plating plants and welding equipment servicing.

## SPECIFICATION

Base specifications only. For detailed specification, refer to User Guide

All accuracies specified at 23°C ±5° <80%Rh

## AC Current

	Accuracy	Accuracy
Range	50 - 60Hz	61 - 400Hz
0-60.0 A	±1.9% ±7 digits	±2.5% ±7 digits
60.0 - 400.0 A	±1.9% ±5 digits	±2.5% ±5 digits
400 - 600 A	±2.5% ±5 digits	±2.9% ±5 digits

## DC Current

Range	Accuracy
0 - 60.0A	±1.5% ±10 digits
60.0 - 400.0A	±1.9% ±5 digits
400 - 600 A	±1.9% ±10 digits

## Voltage

Range	50 - 500Hz Accuracy	DC Accuracy
0 - 400.0 V	±1.0% ±5 digits	±0.7% ±2 digits
400 - 600 V	±1.0% ±5 digits	±0.7% ±2 digits
Input impedance:	1 MΩ // < 100pF	

## Resistance and Continuity

Range	Accuracy
0 - 400.0 Ω	±1% ±3 digits
Open circuit voltage:	3 V
Continuity Check:	beeper sounds @ < 30 Ω

## Frequency

Range	Resolution	Accuracy
20 - 400 Hz	1 Hz	±0.1 % ±2 digits

Sensitivity:	3 A
Peak Hold:	±3% ±15 digits
Sample time:	10 ms

MIN/MAX Hold:	add 15 digits to accuracy for a.c. & d.c. A
Positional error:	±1% of reading
Overload protection:	600 V & 600 A rms
AC conversion:	Average sensing rms indication calibrated to the rms value of a sine wave input
Auto power-off:	30 minutes after power-on

## LCD

Display:	3½ digit large-scale readout
Count:	40,000
Sample Rate:	1.5 per second
Overrange:	"OL"

## Power Requirement

1 x 9V PP3 MN1604 6LR61 alkaline cell	
Battery life:	200 hours (alkaline)

## Operating Temperature

0°C - 30°C <80% Rh
30°C - 40°C <75% Rh
400°C - 50°C <45% Rh

## Storage Temperature

-20°C - +60°C (<81% Rh)
(batteries removed)

## Safety

Overvoltage safety category:	IEC 61010-1 600V CAT III
Operating Altitude:	2000 m
Drop-protection:	1.2 m onto a hardwood surface
Jaw size/maximum conductor:	35 mm diameter
Calibration period:	12 month recommended

**Dimensions** 68 mm (W) x 237 mm (H) x 42 mm (D)

**Weight** 225 g including batteries

## ORDERING INFORMATION

Item (Qty)	Order Code	Item (Qty)	Order Code
DCM340 Digital clampmeter;		User guide	
600 A ac & dc; 600 V a.c. & d.c.; 400 Ω; 400Hz	1000-305	Replacement test leads	
Included accessories		Red/black test leads with croc clips	6220-779
Batteries		Red/black fused test leads (500 mA) with croc clips	6220-789
Pouch			
Test leads			



# **ITEM**

## **2.7**

**F200 Series  
F400 Series  
F600 Series**

# ***11 Models with 1,000 V CAT IV Safety for Every Type of Use!***

**AC, DC  
and AC+DC  
TRMS Clamp  
Multimeters**

**F200** Serie

**F400** Serie

**F600** Serie

## **True *InRush***

- Current: 2,000 A<sub>AC</sub> / 3,000 A<sub>DC</sub>
- Voltage: 1,000 V<sub>AC/DC</sub>
- Clamping diameter: 60 mm
- Large 10,000-count display
- Automatic AC/DC detection
- Min, Max, Peak
- Relative and differential measurements
- Power values
- THD & Harmonics



# For Professional Use

- For electricians, clamp multimeters are ideal tools for any work in the field. Simple to use, they offer all the necessary functions in a single, compact solution.
- The F200 Series meets the needs of self-employed electricians and small and medium-sized business and industries in the electrical sector.
- For medium and high-power work, the F400 and F600 Series provide maximum safety whatever the measurement conditions and type of installation.
- With its large clamping diameter and current measurements up to 3,000 A, the F600 Series is perfect for working on electrical power distribution and transmission applications.

## Safe and Robust

1,000 V CAT IV, an unprecedented level of safety for clamp multimeters!

Users can be sure of working in total safety and in compliance with the applicable standards.

The instruments' IP54 protection safeguards them against dust, in particular, thus guaranteeing that safety is maintained over time.

The mechanical design of these clamps enables them to pass the standard test for falls from a height of 2 metres.

## Performance

All the clamps in the F200, F400 and F600 Series benefit from a fast 12-bit TRMS digital acquisition system offering high measurement accuracy.

Thanks to their large bandwidth and high crest factor, these clamps provide accurate measurements whatever the type of signal.

## Ergonomics

The whole range has been designed for one-handed use, even when wearing protective gloves.

For maximum efficiency, each type of measurement has its own specific switch position.

The "1 key, 1 function" concept makes it even simpler to use.

In addition, all these clamps are equipped with automatic detection of the type of signal (AC or DC) for current, voltage and power measurements.



Various clamping diameters up to 60 mm are available to ensure comfortable measurements.

The rotary switch is fitted with special moulding for excellent grip even with protective gloves.

The casing is equipped with a shockproof band to protect against falls.

The backlit LCD screen is particularly comfortable to read, offering contrasts and a viewing angle which are unprecedented for this type of instrument (up to 10,000 counts).



All these clamp multimeters are equipped with automatic AC/DC detection.



Each key corresponds to a single function whatever the mode.



CATegory IV up to 1,000 V for greater safety.

# The Quality of TRMS Measurements, Whatever the Type of Signal

A range offering unprecedented analytical and diagnostic functions!



## TRMS Version of Min and Max!

The Min and Max are TRMS values calculated over a duration of up to 100 ms. This feature is particularly useful for sizing an installation, the diameter of a power cable, a thermal protection device, etc.



## Peak+ and Peak-

Calculated over a period of 1 ms, the Peak+ and Peak- values help to characterize the distortion affecting the signal measured. For example, they may reveal variations in the installation's behaviour or even malfunctions.



## THD and Harmonics

When seeking the causes of a malfunction, knowledge of the overall signal distortion (THDr or THDf) or frequential distortion (harmonic analysis) helps you to identify the precise corrective solution required: filtering, oversizing, etc. Harmonic analysis also contributes to fire prevention.



## ΔREL, for Quick Evaluation

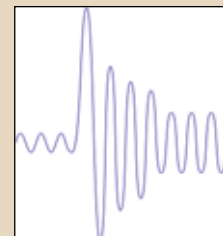
Comparison with a reference quantity is a quick way of evaluating and analysing your results. A signal's variations can be measured differentially or relatively. The first method indicates the difference between the value of reference and the value measured. The second method indicates the proportion. The ΔREL function can be applied to any type of measurement and can be used jointly with the Min, Max and Peak functions.

## True *InRush*

### True *InRush*

function makes it easy to analyse both the **inrush of a single motor** and the inrush of a **set of machines in operation**.

The clamp **automatically determines** the type of signal and the level of current in the installation and then **adapts the algorithm and measurement mode** to capture the expected overcurrent.



Indeed, correct sizing of electrical installations in terms of both the conductors and the protective systems implemented is a recurrent problem.

Overcurrents usually occur when an installation or a machine is started up or when machinery is subjected to heavy loads.

The **True *InRush*** function enables you to size the installation correctly.

# Choose Your Clamp Multimeter

This 11-model range of clamp multimeters meets all your needs in the field.

## 1/ MEASUREMENT RANGE

3 series identifiable by their first digit for 3 measurement ranges

- The F200 Series for currents up to 600 A<sub>AC</sub> / 900 A<sub>DC</sub>
- The F400 Series for average currents up to 1,000 A<sub>AC</sub> / 1,500 A<sub>DC</sub>
- The F600 Series for high currents up to 2,000 A<sub>AC</sub> / 3,000 A<sub>DC</sub>

All the models also innovate by proposing as standard features:

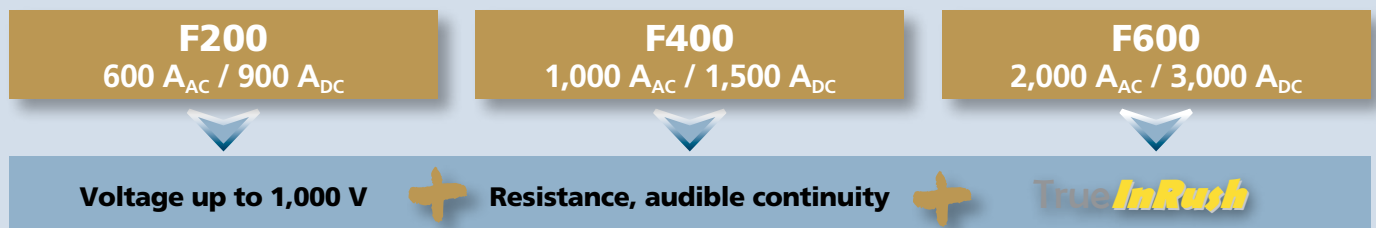
- AC and DC voltage measurement up to 1,000 V
- Resistance and audible continuity
- Min / Max analysis
- **True InRush** overcurrent measurement

## 2/ TYPE CURRENT & FUNCTIONS

Each series comprises 3 or 4 models.

The last digit in each clamp's name corresponds to different applications and levels of analysis.

So the F201, F401 and F601 clamps, for example, offer the same functions but with different measurement ranges.



### F201 / F401 / F601

#### AC Applications

All the basics for mains-powered installations and equipment.

### F203 / F403 / F603

#### "AC or DC" Applications

DC current  
Temperature  
Adapter function

### F205 / F405 / F605

#### "Mixed AC+DC" Applications + Testing & Maintenance

Power values  
THD  
 $\Delta$ REL  
Min/Max/Peak  
Phase rotation

### F407 / F607

#### "Mixed AC+DC" Applications + Analysis & Surveys

Power values  
Harmonics  
Ripple  
Recording  
PC software



**The Adapter function helps to extend the instrument's possibilities through the use of measurement probes** (luxmeter, Infrared temperature sensor, tachometer, etc.) with voltage output (AC or DC). A cleverly-designed system allows users to read the quantity measured directly.

#### Phase rotation

To determine the phase order, a "2-wire" microprocessor-based measurement system avoids the constraints and faults linked to instruments equipped with resistive or capacitive technologies when using protective accessories (gloves, mats, etc.) or isolating transformers.

#### Ripple

The ripple is a parameter that enables you to assess the quality of the smoothing on currents which are rectified and then smoothed. The lower the ripple factor, the greater the efficiency of the smoothing. If switching power supplies are involved, the voltage supplied includes residual ripple, particularly at high frequency. This ripple is harmful for electronic equipment, so it should be kept to a minimum.



# F200 SERIE

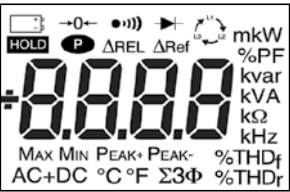


F200 serie	
Clamping diam.	34 mm
Current	600 A <sub>AC</sub> or AC+DC 900 A <sub>DC</sub>
Domain of use	600V CAT IV 1,000 V CAT III

The F200 clamps are ideal for low-power or medium-power low-voltage applications: maintenance of tertiary or industrial electrical installations or installed machines, power supply diagnostics and/or sizing, commissioning of air-conditioning and heating systems, work on electric vehicles, etc.



	F201	F203	F205
Display resolution	6,000 cts	6,000 cts	6,000 cts
Measurements displayed	x1	x1	x1
Display backlighting		•	•
Acquisition method	TRMS	TRMS	TRMS
Automatic AC/DC detection	•	•	•
A	AC	•	•
	DC	•	•
	AC+DC	•	•
V	AC	•	•
	DC	•	•
	AC+DC	•	•
Hz	•	•	•
Resistance/audible continuity	•	•	•
Temperature (°C / °F)	•	•	
Adapter function		•	
2-wire phase rotation			•
W, var, VA, PF			•
THDf / THDr			•
Min. / Max.	•	•	•
Peak+ / Peak-			•
True Inrush	•	•	•
ΔREL		•	•



Complete display  
of F200 Series models



# F400 SERIE



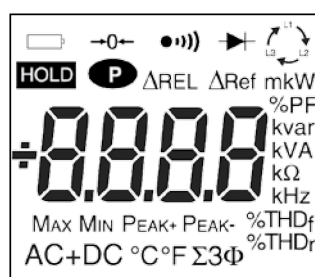
F400 serie	
Clamping diam.	48 mm
Current	1,000 A <sub>AC</sub> or AC+DC 1,500 A <sub>DC</sub>
Domain of use	1,000V CAT IV 1,000 V CAT III

The F400 Series is designed for medium-power low-voltage applications in sectors such as LV electricity production and distribution, industry, railways, etc. It is also suitable for lift/elevator technicians and other lifting and transport specialists.

The main applications for the clamps in this series are maintenance, testing, monitoring, diagnostics and connection.



	F401/F601	F403/F603
Display resolution	10,000 cts	10,000 cts
Measurements displayed	x1	x1
Display backlighting	•	•
Acquisition method	TRMS	TRMS
Automatic AC/DC detection	•	•
<b>A</b>	AC	•
	DC	•
	AC+DC	•
<b>V</b>	AC	•
	DC	•
	AC+DC	•
<b>Hz</b>	•	•
Resistance/audible continuity	•	•
T° (°C / °F)	•	•
Adapter function		•
2-wire phase rotation		
W, var, VA, PF		
DPF		
THDf / THDr		
Harm0... Harm25		
Min. / Max.	•	•
Peak+ / Peak-		
TrueInrush	•	•
ΔREL		•
Recording		
PC software (included) / Bluetooth		



Complete display for F401, F403, F405, F601, F603 & F605



# F600 SERIE



F600 serie	
Clamping diam.	60 mm
Current	2,000 A <sub>AC</sub> or AC+DC 3,000 A <sub>DC</sub>
Domain of use	1,000V CAT IV 1,000 V CAT III

The F600 Series is designed for the high-power LV market in sectors such as electrical power distribution, chemical and petrochemical industries, metallurgy, transport, etc.

Applications: maintenance, testing, monitoring, diagnostics, sizing, connection, etc.

[illegible]

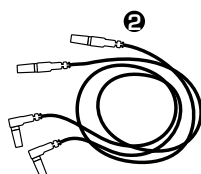
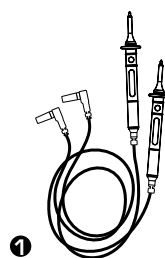
Figure 10 shows the Power Factor Correction (PFC) Mode. The display includes a battery icon, a 'P' icon, a signal strength icon, 'AC+DC', 'REC', and a Bluetooth icon. Below these are 'Σ3Φ' and 'HOLD'. The main display area shows six rows of data: 1. THDf- (kVVA Apc), 2. PEAK+ (% RMS), 3. RIPPLE (kvar Max), 4. THDr- (kVVA), 5. PFCF (% kΩHz), 6. DPF (kvar Avg), 7. PEAK- (kVVA Apc), 8. (RMS), 9. (kvar Min). The numerical values are displayed in a large, segmented font.

### Complete display for F407 & F607



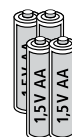


	F200 SERIES			F400 SERIES				F600 SERIES			
Model	F201	F203	F205	F401	F403	F405	F407	F601	F603	F605	F607
Clamping diameter	34 mm			48 mm				60 mm			
Display	LCD	Backlit LCD		Backlit LCD				Backlit LCD			
Resolution	6,000 counts			10,000 counts				10,000 counts			
Number of values displayed	1			1			3	1			3
Type of acquisition	TRMS [AC]	TRMS [AC]/DC	TRMS [AC, AC+DC]/DC	TRMS [AC]	TRMS [AC]/DC	TRMS [AC, AC+DC]/DC	TRMS [AC, AC+DC]/DC	TRMS [AC]	TRMS [AC]/DC	TRMS [AC, AC+DC]/DC	TRMS [AC, AC+DC]/DC
Autorange	YES			YES				YES			
Automatic AC / DC detection	-	YES		-	YES			-	YES		
A AC	0.15 to 600 A (900A peak)			0.15 to 1,000 A (1,500A peak)				0.15 to 2,000 A (3,000A peak)			
A DC		0.15 to 900A peak			0.15 to 1,500A				0.15 to 3,000A		
A AC+DC			0.15 to 600 A (900A peak)			0.15 to 1,000 A (1,500A peak)				0.15 to 2,000 A (3,000A peak)	
Best accuracy	1% reading + 3 cts			1% reading + 3 cts				1% reading + 3 cts			
V AC	0.15 to 1,000 V (1,400 V peak)			0.15 to 1,000 V (1,400 V peak)				0.15 to 1,000 V (1,400 V peak)			
V DC	0.15 to 1,400 V			0.15 to 1,400 V				0.15 to 1,400 V			
V AC+DC			0.15 to 1,000 V (1,400 V peak)			0.15 to 1,000 V (1,400 V peak)				0.15 to 1,000 V (1,400 V peak)	
Best accuracy			1% reading + 3 cts			1% reading + 3 cts				1% reading + 3 cts	
Hz	Current: 5.0 Hz to 3,000 Hz Voltage: 5.0 Hz to 20.00 kHz			Current: 5.0 Hz to 2,000 Hz Voltage: 5.0 Hz to 20.00 kHz				Current: 5.0 Hz to 1,000 Hz Voltage: 5.0 Hz to 20.00 kHz			
Ohm	0.1 Ω to 59.99 kΩ			0.1 Ω to 99.99 kΩ				0.1 Ω to 99.99 kΩ			
Open-circuit voltage	≤ 8 V			≤ 8 V				≤ 8 V			
Measurement current	≤ 680 μA			≤ 680 μA				≤ 680 μA			
Audible continuity	YES			YES				YES			
Continuity threshold	adjustable from 1 to 599 Ω			adjustable from 1 to 999 Ω			40 Ω	adjustable from 1 to 999 Ω			40 Ω
Diode test (semiconductor junction)	YES			YES			NO	YES			NO
Temperature (K type)	°C: -60.0 to +1,000.0°C °F: -76.0 to +1,832 °F			°C: -60.0 to +1,000.0°C °F: -76.0 to +1,832 °F				°C: -60.0 to +1,000.0°C °F: -76.0 to +1,832 °F			
Single-phase and total three-phase power values	YES			YES				YES			
Active power			1 W to 600 kW			1 W to 1,000 kW				1 W to 2,000 kW	
Reactive power			1 var to 600 kvar			1 var to 1,000 kvar				1 var to 2,000 kvar	
Apparent power			1 VA to 600 kVA			1 VA to 1,000 kVA				1 VA to 2,000 kVA	
FP / DPF			YES / NO			YES / NO	YES / YES			YES / NO	YES / YES
Harmonic analysis			YES			YES	YES			YES	YES
THDf / THDr			YES / YES			YES / YES	YES / YES			YES / YES	YES / YES
Frequency analysis			NO			NO	25th order			NO	25th order
Phase rotation (2-wire method)			YES			YES				YES	
Fonctions											
True InRush (Overcurrent measurement)	YES			YES				YES			
Motor inrush	YES			YES				YES			
Load change	YES			YES				YES			
Hold	YES			YES				YES			
Min. / Max.	YES			YES				YES			
Peak+ / Peak-			YES			YES				YES	
RELative ΔX / Differential ΔX/X (%)		YES / YES			YES / YES				YES / YES		
Auto Power Off	YES			YES				YES			
Data recording							YES				YES
Communication interface							Bluetooth				Bluetooth
Electrical safety as per IEC 61010	600V CAT IV			1000V CAT IV & CAT III				1000V CAT IV & CAT III			
Power supply	1 x 9 V LF22			4 x 1.5 V AA				4 x 1.5 V AA			
Dimensions & weight	78 x 222 x 42 mm / 340 g			92 x 272 x 41 mm / 600 g				111 x 296 x 41 mm / 640 g			



9 V for F200 Series

6



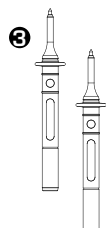
1.5 V for F400 / F600 Series



7

## TO ORDER

F201	P01120921
F203	P01120923
F205	P01120925
F401	P01120941
F403	P01120943
F405	P01120945
F407	P01120947
F601	P01120961
F603	P01120963
F605	P01120965
F607	P01120967



## STATE AT DELIVERY

	F201	F401	F205	F407
	F203	F403	F405	F607
		F601	F605	
		F603		
1	x1			
2		x1	x1	x1
3		x1	x1	x1
4			x1	x2
5	x1	x1		
6	x1	x1	x1	x1
7	x1	x1	x1	x1

+ Start-up Guide and Operating Manual  
(5 languages) on CD-Rom

# **ITEM**

## **2.8**

# e-Tracker Portable Energy Monitor



All data exported to Deltrax 5 software and Excel.

The e-Tracker is a portable kWh meter which monitors the incoming power supply to show the pattern of demand over an hour, day, week or month. As e-Tracker is portable you have the flexibility to use it for measuring circuits and specific equipment without the need to have a fixed sub-metering solution.

## Features:

- Mains or 16 day battery operation
  - Magnetic back for easy mounting
  - Multiple memory locations
  - Pulse input
  - Optional voltage connections
  - CT amps range indicator
  - Clip-on CTs for fast safe instalation
  - EV-Trac electrostatic phase identifier
  - Optical or magnetic gas meter reader available
  - Deltrax5 software is Windows 7 compatible
- The e-Tracker also displays average and peak demand to enable the calculation of load factor. Deltrax5 software highlights demand excursions and potential unauthorised consumption.

## Sold as a full kit comprising

- e-Tracker with integral EV-Trac
- 1Ø -3Ø Voltage reference converter
- Set of 3 F30-1000 Dual range flexeclamp CTs 30cm - 1000Amps/200Amps
- Set of 3 fused volt clips
- Single phase lead, EV-Trac phase identity probe
- Report and graphical analysis software
- 1 USB memory stick
- Carry case
- Total kit weight 4kg

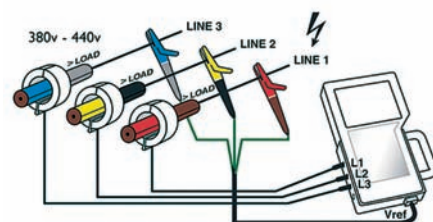


## Three practical, accurate connection options (for single and 3 phase use):

Use e-Tracker with its fused voltage clips for maximum accuracy on all parameters

3Ø direct voltage measurement

CT load direction arrows to face load, CT colour must match colour coded voltage clips

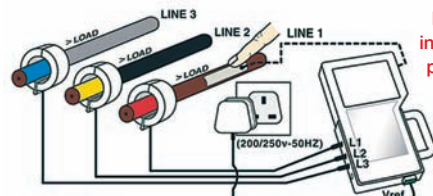


Follow standard safety procedure

EV-Trac 3 phase volt reference conversion from a single phase socket outlet

3Ø EV-Trac voltage pickup

1Ø to 3Ø voltage synthesis



Finger held probe included to identify phase on low load

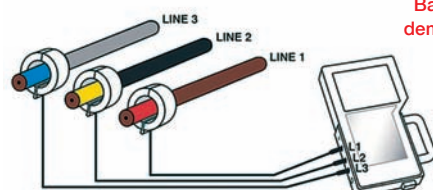
Battery on permanent charge via socket

For single phase use CT1 and 13A plug

Battery only operation measuring current and calculated kVA demand profiles

3Ø current recording

With calculated kVA demand profile

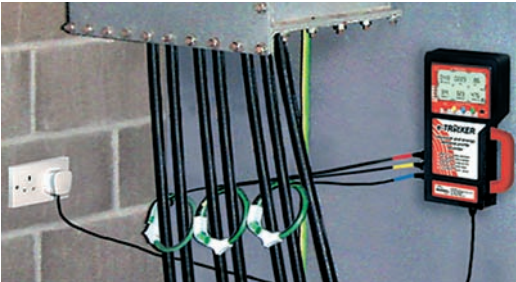


Basic recordings of demand profiles and phase balance

2+ weeks battery life

EV-Trac Installation examples

e-Tracker magnetically clamps to the transformer housing and tracks the voltage at the socket. The 3 phase vectorial equivalents are calculated then assigned to the appropriate measured current phases, thus maintaining power factor accuracy. Where the load current is too low for auto identification, e-Tracker will request the use of its EV-Trac Probe. This is simply touched to the cable installation for the display to indicate identity L1, L2 or L3.



e-Tracker Operational Specifications

ELECTRICAL	
Current Input	Clip-On or Flexeclamp CTs, 400mV. FS output
Current Range	50Amps full scale - 2500Amps full scale
Voltage Direct 3Ø	450V L-L 50Hz via voltage Clips
Voltage Direct 1Ø	240V 50Hz via 1Ø socket outlet
Voltage Nominal	Adjustable 1Ø 220V +/- 10%, 3Ø 400V +/-10%
Pulse Input	Volt free contact interface option
Battery	Rechargeable cyclon 4V/2.5AH battery
Charge sources	Integral charger via voltage connections
Battery life	Approx 2 weeks of recorded current and calculated kVA only
Insulation inc CTs	2.5kV for 1min
Connection Leads	CT to Plug 1.5m
ACCURACY	
Clip-On CTs	True RMS measurement of voltage & current +/-1% percentage of reading @25°C for PF -0.7 -1 & 10% -100%IP
Flexeclamp CTs	+/-2% of reading within conditions as above
CONSTRUCTION	
Material	ABS case with insulated magnetic mounting panel
Climatic	Oper.Temp -10°C--+50°C, 95% RH (NC), IP30 protection
STANDARDS	
Calibration & Safety	IEC 1036 and IEC 61010-1
EMC	EN55022:1994, EN50082 Pt.1 1992

Memory Span

e-Tracker has capacity to store 16,000 lines of all parameters, either on one file or as an aggregate total on up to five separate recording files. Recording will stop when the memory is full.

Integration Period Mins.	60	30	20	15	10	5	2	1	0.1(6s)	H1(1sec)
Memory Duration Days	666	333	222	166	111	55	22	11	25 hrs	9 hrs*

\*V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, I<sub>1</sub>, I<sub>2</sub> & I<sub>3</sub> only

e-Tracker CT Selection

CT Style	CT Part Number	Nominal Size		Amps range	Nominal Ip PF-0.7 to unity temp 25'c 50/60Hz	Accuracy Capacity mm	Clip-on Nom	Outlines
Hinged Clip On	TC16	16mm	54mm	4-200	1.0%	16x16	16	
	TC32	32mm	72mm	5-500	1.0%	32x18	32	
	TC48	48mm	84mm	6-1000	1.0%	42x25	48	
	TC60	60mm	90mm	8-1500	1.0%	58x25	60	
Flexeclamp Clip Round	TF30	300mm length		10-1000	2.0%	20x85	90	
	TF40	400mm length		10-1500	2.0%	60x130	120	
	TF50	500mm length		20-2000	2.0%	70x150	155	
	TF60	600mm length		20-2500	2.5%	70x200	190	
	TF70	700mm length		20-2500	3.0%	70x265	215	
Precision Clip On	THSSB	15mm	45mm	1-100	1.0%		15	

# **ITEM**

## **2.9**

# MIT400 CAT IV Industrial Insulation Testers



- **CAT IV 600 V applications**
- **TRMS & DC Voltage measurement**
- **Insulation testing up to 1000 V and 200 G $\Omega$**
- **Continuity testing at 200 mA or 20 mA down to 0.01  $\Omega$**
- **Pass/Fail limit alarms**
- **Combined Analogue and dual digital display**
- **PI/DAR and Timer function**
- **Test result storage (MIT420)**
- **Bluetooth® wireless data transfer (MIT430)**

## DESCRIPTION

The new Megger MIT400 series insulation and continuity testers has been designed for electrical testing by the utilities, industrial, commercial and domestic electricians. The wide range of features also makes the MIT400 series ideal for the maintenance and service/repair engineer.

Safety rated to CAT IV 600 V the MIT400 series of testers are suitable for use in high energy systems, up to the substation transformer, while lower test voltages can be used in data and telecommunication systems.

### The range

The range consists of five instruments:

**MIT400** 250 V, 500 V and 1000 V

**MIT410** 50 V, 100 V, 250 V, 500 V and 1000 V + PI, DAR

**MIT415** 10 V, 25 V, 50 V, 100 V, 250 V and 500 V + PI, DAR

**MIT420** 50 V, 100 V, 250 V, 500 V & 1000 V + PI, DAR and result storage

**MIT430** 50 V, 100 V, 250 V, 500 V & 1000 V + Bluetooth download

**MIT40X** 10 V to 100 V in 1 V steps

### Insulation testing

- **Test voltages** - 10 V to 1000 V insulation test voltages available
- **Test Lock** - Locks insulation test on continuously.
- **Test voltage display** - The actual test voltage is displayed on the smaller digital readout, with the insulation result on the larger digital display.

- **Analogue arc** - The display also features an analogue arc to replicate the response of a moving coil display.
- **PI and DAR** - Polarisation Index (PI) and Dielectric Absorption Ratio (DAR) functions
- **200 G $\Omega$**  - Insulation testing from 20 G $\Omega$  (MIT400) to 200 G $\Omega$  (MIT420 and MIT430).
- **Silicone leads** - High quality flexible silicone test leads are comfortable to use and prevent measurement errors on higher G $\Omega$  ranges.
- **Test inhibit** - prevents testing if voltages in excess of 50 V are detected when making insulation tests.
- **Insulation buzzer** - The buzzer can be set to buzz if the insulation resistance is above a preset limit, set via the Setup menu.

### Continuity testing

- **Auto-test** - Auto test on circuit contact enables real two handed operation without the need to press the test button.
- **200 mA or 20 mA** - Either 200 mA or 20 mA continuity test currents are available. 20 mA test current will considerably increase battery life.
- **Lead null** - Lead resistance compensation (NULL) operates up to 9.99  $\Omega$  of resistance.
- **Buzzer** - ON-OFF selected by simple push button.
- **Buzzer limit** - Continuity buzzer limit alarm provides adjustment of the maximum resistance the continuity buzzer sounds. This is adjustable from 1  $\Omega$  to 20  $\Omega$  in 5 steps.
- **k $\Omega$  range** extends resistance measurement to 1 M $\Omega$ .



## Display

The display offers a combination of analogue arc and a dual digital readout:

### Analogue arc:

- Full display width analogue arc.
- Patented arc display shows essential charge and discharge characteristics not visible on a digital display.
- Single pointer “needle” response is similar to a moving coil meter.
- Logarithmic display for better low insulation value measurements.

### Dual digital display:

- Large main digital readout for good visibility of all main measurement results
- **Second digital display for additional data such as:**
  - Insulation test voltage.
  - Insulation leakage current.
  - Supply frequency (when measuring volts).
  - Test mode eg. PI, DAR or TI (Timed mode).

## MIT40X - Variable insulation voltage tester

The MIT40X provides a unique solution for awkward insulation voltage measurement applications. The MIT40X has a variable insulation test voltage from 10 V to 100 V in 1 V steps, selectable in the “Set-Up” menu. Once selected this can only be changed by re-configuring in the Setup menu.

Typical applications include:

- Commercial avionics
- Military land, marine and air communications
- Manufacturing/production line goods
- Electrostatic measurement
- Component testing
- Battery powered traction and lifting equipment

## Storage & Downloading results

### MIT420

The MIT420 is capable of saving test results for recall to the screen. A simple storage structure allows for a test number and screen results to be recalled individually.

### MIT430

The MIT430 supports both test result storage and downloading.

Test results can be stored in the instrument and subsequently downloaded to a computer with the Megger download manager software.

Data transfer is by Bluetooth, with the MIT430 Bluetooth transmitter being enabled when the Download mode is selected on the instrument.

NOTE: The receiving PC needs to have Bluetooth capability or a USB port fitted a Bluetooth receiver. Class II (10m) is acceptable.

## Safety

Designed to be exceptionally safe to use, fast detecting circuitry prevents damage to the instruments if accidentally

connected to live circuits or across phases. Specifically, all instruments:

- Meet the international requirements of IEC1010-2 and EN61557.
- Live circuit detection inhibits insulation testing on circuits above 50 V.
- Live circuit detection and test inhibit on continuity measurements.
- Default display of live circuit voltage on all ranges.
- Detection and inhibit functions even if the protection fuse has failed.
- Suitable for use on CAT IV applications and supply voltages to 600 V.

## 600 V CAT IV

All MIT400 instruments are designed to meet the safety requirements for use on CAT IV 600 V installations.

## APPLICATIONS

### Electrical installations testing:

The MIT400 includes all the features required for electricians and engineers working in a range of industries. Available features are selected to make testing easy and fast in a range of situations. Typical industries include:

- Electrical supply companies
- Large and small scale electrical installation
- Periodic inspection and testing
- Cable testing

### Service, repair and maintenance:

The MIT410 and MIT420 add additional features required for engineers working on more demanding applications. Functions such as PI and DAR, capacitance measurement and higher insulation range increase the suitability for applications such as:

- Manufacturing/production testing
- Panel building
- Railway and other transportation
- Motor testing
- Cable inspection/quality control
- Street lighting maintenance
- Avionics ground testing and maintenance
- Military applications

The MIT415 also includes 25 and 50 V ranges for testing communication circuits for signalling controls :

- Elevator service engineers
- Street lights (Pedestrian controls)
- Machines and safety interlock/commissioning service
- HVAC controls
- Robotic Power and Control

### Electrostatic discharge testing:

The 10 V and 100 V insulation test voltage ranges are ideal for ESD testing, including servicing of equipment and routine maintenance of ESD conductive flooring, bench mats and grounding systems etc. Typical industries include:

- Electronic manufacturing
- Electronic servicing and repair
- Calibration houses



	Industrial					Special Apps
Insulation Voltage range	400	410	415	420	430	40X
Resolution	0.01 MΩ					
10-100 V variable (2 GΩ - 20 GΩ)						■
10 V			1 GΩ			
25 V			2 GΩ			
50 V		5 GΩ	5 GΩ	10 GΩ	10 GΩ	
100 V		10 GΩ	10 GΩ	20 GΩ	20 GΩ	
250 V	5 GΩ	20 GΩ	20 GΩ	20 GΩ	50 GΩ	
500 V	10 GΩ	50 GΩ	50 GΩ	100 GΩ	100 GΩ	
1000 V	20 GΩ	100 GΩ		200 GΩ	200 GΩ	
Leakage current display		■	■	■	■	■
INS test voltage display	■	■	■	■	■	■
<b>Continuity measurement</b>						
0.01 to 99.9 Ω	■	■	■	■	■	■
Variable current limit. 200 mA/20 mA	■	■	■	■	■	■
Fast buzzer- selectable threshold	■	■	■	■	■	■
kΩ range to 999 k Ω	■	■	■	■	■	
<b>Other functions and features</b>						
Live circuit warning at	50 V					
Default voltmeter	■	■	■	■	■	■
TRMS measurement to 600 V	■	■	■	■	■	■
Frequency measurement 15 Hz to 450 Hz		■	■	■	■	■
Capacitance (0.1 nf to 10 μF)				■	■	
Backlight	■	■	■	■	■	■
Battery condition display	■	■	■	■	■	■
Insulation timed - PI – DAR Tests		■	■	■	■	
Test button plus lock button	■	■	■	■	■	■
Limit alarm pass band on INS				■	■	■
Auto power down	■	■	■	■	■	■
<b>Other functions and features</b>						
Result storage				■	■	
Bluetooth downloading					■	
<b>Included accessories</b>						
Red/black silicone lead set with clips	■	■	■	■	■	■
Protective rubber boot	■	■	■	■	■	■
Remote switch probe		■	■	■	■	
Calibration certificate with product	■	■	■	■	■	■
Batteries	■	■	■	■	■	■
1 year warranty (upgradable to 3 years free within 3 months of purchase)	■	■	■	■	■	■

### SPECIFICATION

All quoted accuracies are at +20°C.

#### Insulation

##### Nominal test voltages

MIT400	250 V, 500 V, 1000 V
MIT410, 420, 430	50 V, 100 V, 250 V, 500 V, 1000 V
MIT415	10 V, 25 V, 50 V, 100 V, 250 V, 500 V
MIT40X	10 V to 100 V variable (1 V increments)

##### Insulation resistance range (at maximum test voltage)

MIT400	20 GΩ
MIT410	100 GΩ
MIT415	50 GΩ
MIT420, 430	200 GΩ
MIT40X	20 GΩ

#### Range Full Scale Accuracy

All ranges  $\pm 2\%$   $\pm 2$  digits up to 100 MΩ.

Then:

1000 volts	$\pm 3\%$ $\pm 2$ digits $\pm 0.2\%$ per GΩ
500 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 0.4\%$ per GΩ
250 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 0.8\%$ per GΩ
100 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 2.0\%$ per GΩ
50 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 4.0\%$ per GΩ
10 volts	$\pm 3\%$ $\pm 2$ digits $\pm 2.0\%$ per 100 MΩ

**Analogue range:** 1 GΩ full scale

**Short Circuit Current:** 2 mA +0% -50%

**Terminal voltage:** -0% +20%  $\pm 1$  V  
MIT40X  $\pm 1$  V

#### Test Current on load:

1 mA at min. pass value of insulation specified in BS7671, HD384 and IEC364, 2 mA max.

**EN61557 Operating range:** 0,10 MΩ to 1,00 GΩ

**Leakage current range** 10 μA 2000 μA

**Leakage current:** 10%  $\pm 3$  digits

**Voltage display:** 3%  $\pm 3$  digits  $\pm 0.5\%$  of rated voltage

**Polarisation Index (PI):** 10 min / 1minute ratio

**Dielectric Absorption Ratio (DAR):** 60 sec / 30 sec ratio

#### Notes:

- (1) All ranges measure from 0,00 MΩ upwards.
- (2) Above specifications only apply when high quality silicone leads are being used.

#### Continuity

**Measurement:** 0,01 Ω to 99,9 Ω (0 to 100 Ω on analogue scale)

**Accuracy:**  $\pm 2\%$   $\pm 2$  digits (0 to 100 Ω)

**Open circuit voltage:** 5 V  $\pm 1$  V

**Test current:** 205 mA ( $\pm 5$  mA)  
(0.01 Ω to 9.99 Ω)  
20 mA ( $\pm 1$  mA)  
(10.0 Ω to 99.9 Ω)

**Zero offset at probe tips:** 0,10 Ω typical

**Lead resistance zeroing:** Up to 9.99 Ω

**Buzzer:** Variable limit 1 Ω, 2 Ω, 5 Ω, 10 Ω, 20 Ω

#### Resistance

**Measurement:** 0.01 kΩ to 1000 kΩ (0 to 1 MΩ on analogue scale)

**Accuracy:**  $\pm 3\%$   $\pm 2$  digits up to 50 kΩ then  $\pm 5\%$   $\pm 2$  digits

**Open circuit voltage:** 5 V  $\pm 1$  V

**Short circuit current:** 1.5 mA  $\pm 0.2$  mA

#### Voltage range

0 to 600 V d.c.  $\pm 2\%$   $\pm 2$  digits

10 mV to 600 V TRMS sinusoidal (40 to 400 Hz)  $\pm 2\%$   $\pm 2$  digits

0 to 1000 V on Analogue scale

Unspecified input level 0 - 10 mV (40 to 400 Hz)

#### For non-sinusoidal waveforms additional specification apply:

$\pm 3\%$   $\pm 2$  digits 101 mV to 600 V TRMS and  $\pm 8\%$   $\pm 2$  digits 10 mV to 100 mV TRMS

**Default Voltmeter:** Operates at >25 V a.c. or d.c. on any range except OFF

**Frequency:** 15 - 450 Hz  $\pm 0.5\%$   $\pm 1$  digit

#### Capacitance measurement

MIT420, MIT430

**Measurement range:** 100 pF to 10 μF

**Accuracy:**  $\pm 5.0\%$   $\pm 2$  digits

#### Distance by capacitance:

MIT420, MIT430

Arithmetic conversion from capacitance measurement on

Default capacitance measurement: 50 nF/km

**Capacitance range:** 40 nF/km to 60 nF/km

#### Result storage

**Capacity:** >1000 test results

**Download:** Bluetooth wireless

**Bluetooth Class:** Class II

**Range:** up to 10 m

#### Power Supply:

5 x 1,5 V cells type IEC LR6 (AA, MN1500, HP7, AM3 R6HP) Alkaline NiMH rechargeable cells may be used.

**Battery life:** 2200 insulation tests with duty cycle of 5 sec ON /55 sec OFF @ 1000 V into 1 MΩ

#### Dimensions

**Instrument:** 220 x 92 x 50 mm (8.66 in. x 3.63 in. x 1.97 in.)

**Instrument + case:** 456 x 178 x 89 mm (18 in. x 7 in. x 3.5 in.)

#### Weight

**Instrument only:** 590 gms, 775 gms with boot (20.73 oz. 27.22 oz.)

**Instrument plus case:** 1.75kg (3.86 lb)

## Fuse

Use only a 500 mA (FF) 1000 V 32 x 6 mm ceramic fuse of high breaking capacity HBC 50 kA minimum. Glass fuses **MUST NOT** be fitted.

## Safety Protection

The instruments meet IEC 61010-1 to 600 V phase to earth, Category IV. Refer to safety warnings supplied.

## E.M.C.

In accordance with IEC 61326-1

## Temperature effects

**Temperature coefficient:** <0,1% per °C up to 1 GΩ

## Environmental

**Operating range:** -20 to +55 °C  
**Operating humidity:** 95% RH at 0 °C to +35 °C,  
 70% RH @ +35 °C to +55 °C  
**Storage temperature range:** -30 °C to +80 °C  
**Calibration Temperature:** +20 °C  
**Maximum altitude:** 2000 m  
**Dust and water protection:**  
 IP54 Protected against dust and splashing water

## Service error

Insulation range	±15% ±2 digits
Continuity range	±26% ±2 digits
Resistance range	±12% ±2 digits
Voltage range	±10% ±2 digits
Capacitance range	±18% ±2 digits
Distance range	±18% ±2 digits
Frequency range	±5% ±2 digits

The *Bluetooth* word mark and logo are owned by the Bluetooth SIG, Inc. and any use of such marks by Megger is under license.

## ORDERING INFORMATION

Item (Qty)	Order No.	Item (Qty)	Order No.
MIT400: basic CATIV 600 V with 250 V/500 V/1000 V insulation	MIT400-EN	<b>Included accessories</b>	
MIT410: as MIT400 + 50 V, 100 V, PI and DAR	MIT410-EN	Hard case	5410-420
	NSN:6625-99-354-2757	2 wire lead set to CAT IV 600 V, consisting of: Red and black leads, probes and clips with 1 x red long probe	
MIT415: 10 V, 25 V, 50 V, 100 V, 250 V, 500 V, PI and DAR	1000-351	Calibration certificate	
MIT420: as MIT410 + result storage and recall + 200 GΩ	MIT420-EN	SP5 Switched probe (not MIT400 or MIT40X)	1002-774
	NSN 6625-99-169-4728	Owners information user guide CD	
MIT420-MIN: (NATO version - no batteries)	1000-309	<b>Optional accessories</b>	
	NSN 6625-99-169-5675	Replacement 2 wire test lead set	1002-001
MIT430: as MIT420 with Bluetooth download	MIT430-EN	2 wire 500 mA fused test lead set	1002-015
MIT40X: Special applications - selectable IT voltage 10-100 V	MIT40X-EN	Rubber boot with stand	6231-802
		Pouch - test and carry case	2001-322

# **ITEM**

## **2.10**

# MFT1800

## Multifunction Tester



- **Simple colour-coded test selection and large clear backlit display for ease of use**
- **Two wire non trip loop testing for fast repeatable results**
- **Phase rotation indication for verification of rotating machinery**
- **Type-B RCD and 3-phase RCD testing for industrial applications with no Earth**
- **3-terminal Earth test and Stakeless testing for spike resistance measurement**
- **EN61010 CATIV safety ratings and tough IP54 case**

### DESCRIPTION

The MFT1800 range consists of 3 instruments designed for testing low voltage electrical installations. They provide all the tests required to complete the necessary electrical certification for industrial, commercial and domestic fixed wiring installations, including:

- System voltage and frequency measurement (TRMS AC + DC)
- Insulation test at 100 V, 250 V, 500 V and 1000 V
  - Including input protection against live circuits up to 600 V even when Insulation Test is locked-on
- Continuity resistance at 200 mA or 15 mA
  - Automatic – no need to press TEST so leaving both hands free
- Resistance range 0.01  $\Omega$  to 100 k $\Omega$ 
  - With fast continuity buzzer and selectable thresholds
- 2-wire Loop test
  - Non-trip (RCD) and high-current testing
  - Including Phase-to-Phase
- Prospective fault current measurement
  - Up to 40kA Phase-to-Phase
  - Increased resolution
- RCD testing including:
  - Type AC, A, S, B and programmable RCDs
  - 1/2 x I, 1 x I, 2 x I and 5 x I
  - 3-phase RCDs
  - Fast ramp test
  - Auto-test routine
  - Fault (Touch) voltage display

- Earth testing
  - 2-pole,
  - 3-pole
  - ART
  - Stakeless techniques

All instruments are IEC 61010 CAT IV 300 V rated for connection to low voltage systems with no protective device, so safe for connection anywhere on the system up to the source transformer without risk of damage from the large transient spikes which are possible up to the limit of IEC 61010 CAT IV definitions.

The unique modern styling allows it to be operated while stood on the floor, a ladder-shelf or platform, hung around the neck or held in the hand. Dual TEST and LOCK buttons – one pair at each end – make the testers easy to operate left or right handed.

Quick to pick up and use, the rotary controls are colour coded to make range selection easy and fast. They also reduce the chance of using the wrong function or range. The large crystal clear backlit display uses the patented Megger digital/analogue arc, providing indication of fluctuating readings while the dual digital display shows precise values of key measurements. The dual display shows test parameters simultaneously with the measured value, such as the output voltage on insulation testing as well as the resistance value in M $\Omega$ .

Visible and audible safety warnings are paramount when testing high-energy systems, and the MFT1800 range includes full input protection and safety warnings when a hazardous voltage is encountered. If live voltages exist on a circuit during insulation or continuity testing, the voltage is displayed on the screen. If this voltage exceeds a safe level, further testing is inhibited and a warning beep sounds for extra safety.

For intensive users the MFT1830 features internally rechargeable batteries and charger with a charge time of less than 4 hrs.

Future proof and fully compliant with all requirements of Harmonised Document 60364 derived standards including VDE 0100 and BS 7671, the new MFT includes all the latest measurement technology in a lightweight compact design and fully protected and usable on single phase and 3 phase installations.

New measurement functions include two wire non-trip loop test technology for fast repeatable results, comprehensive testing of RCDs including type B and the latest clamp-on techniques for Earth testing.

The MFT1835 includes built in memory and Bluetooth communications for downloading of memory using Megger Download Manager (supplied) for simple form filling of test results using the optional Megger PowerSuite software.

The new MFT1800 series has been designed for tough environments and ultimate reliability. Features include a rubber over mould for extra protection and grip, IP54 protection against dust and water and an EN61010 Cat IV safety rating.

Its class leading input protection ensures the new MFT can withstand accidental misuse and voltage transients when other testers can't.

All this in an intuitive and easy to use instrument with no hidden menus or complicated screens. Tests are easily selected using the colour coded rotary switches with results clearly displayed on the high contrast dual backlit display.

Included with the instrument are standard 3-wire leadset and a mains connection lead, a switched probe for fast and easy testing, a full 12-month calibration certificate and 3-year warranty for extra peace-of-mind. All this is housed in a robust moulded case with additional space for optional extras like the earth test kit, comprising 2 spikes and 3 long test leads.

## SELECTION CHART

INSULATION RANGES	MFT1815	MFT1825	MFT1835
100 V			■
250 V	■	■	■
500 V	■	■	■
1000 V		■	■
Test voltage display	■	■	■
Adjustable buzzer threshold		■	■
Test lock	■	■	■
25 V or 50 V test inhibit setup option	■	■	■
CONTINUITY AND RESISTANCE RANGES			
200 mA test	■	■	■
15 mA test		■	■
Lead null	■	■	■
Adjustable buzzer threshold	■	■	■
Auto-start test	■	■	■
Auto-reverse continuity test option	■	■	■
RCD TESTS			
1/2 x I RCD test		■	■
1 x I RCD test	■	■	■
2 x I RCD test		■	■
5 x I RCD test		■	■
Auto RCD test		■	■
Fast ramp test (setup option)	■	■	■
Type AC (General purpose AC) RCDs	■	■	■
Type A (AC + pulsed-DC) RCDs	■	■	■
Type S (time-delayed) RCDs		■	■
Type B (pure DC) RCDs			■
Programmable RCD		■	■
3-phase RCD (no Earth)		■	■
10 mA RCD		■	■
30 mA RCD	■	■	■
100 mA RCD	■	■	■
300 mA RCD	■	■	■
500 mA RCD	■	■	■
1000 mA RCD		■	■
LOOP TESTING			
2-wire non-tripping L~PE	■	■	■
2-wire high current L~L & L~N	■	■	■
50 V to 480 V (L~N) 5 0V to 280 V (L~PE)	■	■	■
Phase to Phase tests (L~L)		■	■
20 kA Fault current	■	■	■
40 kA Fault current		■	■
Auto-start loop test	■	■	■
Touch-voltage inhibit (25/50/60 V)	■	■	■
Touch-voltage display (0 V~253 V)	■	■	■

	MFT1815	MFT1825	MFT1835
<b>EARTH TEST</b>			
2-pole*		■	■
3-pole*		■	■
3-pole + clamp (ART)*			■
Stakeless*			■
25 V and 50 V output voltage		■	■
Ground-noise voltage check		■	■
<b>OTHER FEATURES</b>			
AC voltage measurement	■	■	■
True RMS			■
Frequency measurement	■	■	■
Current measurement*		■	■
Phase rotation	■	■	■
Temperature measurement		■	■
Backlight	■	■	■
Auto power-down	■	■	■
Calibration certificate supplied	■	■	■
Batteries included	■	■	■
Rechargeable batteries/Chgr included			■
Progressive battery monitor	■	■	■
SP5 Switched probe included	■	■	■
3-year warranty	■	■	■
Onboard memory with Bluetooth® download			■
CAT IV 300 V	■	■	■
IP 54	■	■	■
* additional accessories required			

## SPECIFICATIONS

### insulation test

<b>Output voltage</b>	-0% +20% at rated load or less	
<b>Voltage display</b>	±3% ±3 digits ±0.5% of rated voltage	
<b>Short circuit current</b>	1.5 mA nominal test current	
<b>Test current on load</b>	1 mA at min pass values of insulation	

### Measurement Accuracy

1000 V	10 kΩ ~ 999 MΩ	±3% ±2 digits
500 V	10 kΩ ~ 500 MΩ	±3% ±2 digits
	>500 MΩ	±10% ±4 digits
250 V	10 kΩ ~ 250 MΩ	±3% ±2 digits
	>250 MΩ	±10% ±4 digits
100 V	10 kΩ ~ 100 MΩ	±3% ±2 digits
	>100 MΩ	±10% ±4 digits

### Continuity/resistance

	0.01 Ω ~ 99.9 Ω	±2% ±2 digits
	100 Ω ~ 99.9 kΩ	±5% ±2 digits

### Open circuit voltage

<b>Test current (0 Ω ~ 9.99 Ω)</b>	5V ±1V
	205 mA or 1 5mA (user selectable)
	± 5 mA

### Loop test

<b>Live to earth supply</b>	48 V ~ 280 V (45 Hz ~ 65 Hz)
<b>Live to live supply</b>	48 V ~ 480 V (45 Hz ~ 65 Hz)
<b>Trip and non-trip tests</b>	±5% ±0.03 Ω
<b>Display range</b>	0.01 Ω ~ 1000 Ω
<b>Live to earth PFC range</b>	20 kA
<b>Live to live PSCC range</b>	0 kA

### RCD TESTS

<b>Supply</b>	48 V ~ 280 V (45 Hz ~ 65 Hz)
<b>RCD type</b>	Type AC, A, S Type B - pure dc
<b>No trip test (1/2xI)</b>	-8% ~ -2%
<b>Trip test (1xI, 2xI &amp; 5xI)</b>	+2% ~ +8%

### Ramp Test

<b>Auto RCD test</b>	
<b>Trip time</b>	±1% ±1 ms
<b>Trip current</b>	±3%
<b>Programmable step increments</b>	10 mA ~ 50 mA 1 mA steps. 50 mA ~ 500 mA 5 mA steps 500 mA ~ 1000 mA 10 mA steps

### Supply measurement

<b>Voltage</b>	10 V ~ 600 V (50 ~ 60 Hz) True RMS ±3% ± 1 V ±2 digits
<b>Phase rotation indication</b>	L1-L2-L3 & L1-L3-L2
<b>Touch voltage (0 ~ 253 V)</b>	+5% +15% ±0.5V
<b>Frequency</b>	15 Hz ~ 99 Hz ±0.5% ±1 digit 100 Hz ~ 400 Hz ±2.0% ±2 digit
<b>Frequency resolution</b>	0.1 Hz

### Earth test

<b>Resolution</b>	0.01 Ω
<b>Current</b>	0.45 mA or 4.5 mA
<b>Noise rejection</b>	20 V pk/pk (7 V rms).
<b>Max Probe Resistances Rp &amp; Rc</b>	@50 V 100 kΩ @25 V 5 kΩ

### 2 & 3 pole method (0.01 Ω ~ 1.999 kΩ)

	±2.0% ±3 digits
--	-----------------

### ART method (1.00 Ω ~ 1.999 kΩ)

	±5.0% ±3 digits
--	-----------------

### Stakeless method (1.00 Ω ~ 199 Ω)

	±7.0% ± 3 digits
--	------------------

### Temperature (via optional probe)

<b>Range</b>	-20 °C ~ +100 °C
<b>Accuracy</b>	±1.0% ± 2 digits.
<b>Resolution</b>	1 °C

### Current (via optional clamp meter)

	0.5 mA ~ 199.9 A ±5.0% ±3 digits.
<b>Resolution</b>	0.1 mA



## ENVIRONMENTAL

<b>Temperature (operational)</b>	-10 °C ~ +55 °C
<b>Temperature (storage)</b>	-25 °C ~ +70 °C
<b>Operating humidity</b>	93% R.H. at +40 °C max
<b>Max altitude</b>	2000 m

## Weight

1 kg (with batteries, excluding case)

## Moisture/Dust ingress protection

IP54

## Power

<b>Primary dry cells (6 cells)</b>	IEC LR6 type AA alkaline (supplied)
<b>Rechargeable (6 cells)</b>	1.2 V NiMH (optional)
<b>On-board re-charging</b>	Mains power or car-battery (4 hours typical)

## DESIGN STANDARDS

<b>Safety</b>	BS EN 61010 -1:2001 600 V Cat III / 300 V Cat IV (Max Phase to Phase 600 V)
<b>EMC</b>	IEC61326 edition 2 location class B
<b>Design</b>	EN61557

## ORDERING INFORMATION

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
MFT1815-SC	1001-081	<b>Optional accessories</b>	
MFT1825-SC	1001-088	Soft Carry case with lead/document pouch	6420-143
MFT1835-SC	1001-093	Switched Probe SP5	6220-812
<b>Included Accessories</b>		Euro Mains Test Lead SIA40	6220-832
Printed Quickstart Guide		Fused 10A test lead set (Red/Green) with Prods and clips (NEW) right angle plugs	6220-827
Full User Guide on CD		Earth bond test lead set (high current loop test only)	6231-586
Calibration Certificate		Fused prod and clip set, use with 6220-770	6180-405
Switched Probe SP5	6220-812	3 Wire lead set with separate prods and clips (MFT1500 mk1)	6220-770
Neck strap - Megger embroidered	2001-509	ETL30, 30 m extension test lead	1000-215
3 Wire lead set with prods and clips	6220-796	ETL50, 50 m extension test lead	1000-217
Euro Mains Test Lead SIA45	2000-674	12V charger lead	6280-332
Battery charger	2001-697		

### CERTIFICATION ISO

Registered to ISO 9001:2000 Cert. no. Q 09290  
Registered to ISO 14001:1996 Cert. no. EMS 61597

### MFT1800\_DS\_eu\_V01

Megger is a registered trademark

# **ITEM**

## **2.11**

# DLRO 10 and DLRO 10X

## Digital Microhmmeter



- **Auto current reversal cancels standing emfs**
- **Protected to 600 V**
- **Automatically detects continuity in potential and current connections**
- **Multiple operating modes including fully automatic**
- **Alpha-numeric keypad for entering test notes (DLRO 10X)**
- **User selectable high and low limits (DLRO 10X)**
- **Printer output and memory (DLRO 10X)**

### DESCRIPTION

DLRO 10 and DLRO 10X set the standards for low resistance measurement. DLRO 10 and DLRO 10X are fully automatic instruments, selecting the most suitable test current up to 10 A d.c. to measure resistance from  $0.1 \mu\Omega$  to  $2000 \Omega$ , on one of seven ranges.

For users who desire more control over the measurement process, DLRO 10X uses a menu system controlled by a two-axis paddle to allow the user to manually select the maximum test current.

DLRO 10X also adds real time download of results and on board storage for later download to a PC.

Both instruments are built into a strong, lightweight case that is equally at home in the field or in the laboratory. Light enough to be worn around the neck, they are small enough to be taken into areas that were previously too small to access.

DLRO 10 uses a large, bright 4 1/2 -digit LED display while DLRO 10X has a large, backlit LCD display. Normally, measurements are made with forward and reverse currents to cancel the effects of any standing voltages across the test sample.

The average value is then displayed within 3 seconds, to a basic accuracy of 0.2%. DLRO 10X displays both forward and reverse measurements as well as the average of the two.

DLRO 10X allows the user to set high and low pass limits, thereby enabling simple go-no-go testing.

At the end of a test DLRO10X will store the test results, as well as any notes relevant to the test.

To assist operator safety and ease of use, both instruments are supplied complete with a pair of duplex handspikes with 1.2 m (4 ft) leads. One of the probes is fitted with LED's, which duplicate indicators on the instrument display indicating that all four contacts have been made, the presence of a high voltage across the load, and the presence of current flow while a load is discharging. A full range of test leads is available with probes, clamps and Kelvin clips.

The instruments are supplied as standard with a Nickel Metal Hydride (NiMH) battery pack. The battery packs are interchangeable so that an exhausted battery may be recharged using the external charger supplied while testing continues using a spare pack. Although full charging will take 4 hours, a fast charge mode allows the battery to be 90% charged within 2 1/2 hours from a 12 volt battery or from a standard 120/230 V AC supply via the supplied charger. The battery pack contains its own battery state indicator, which allows the charge-state to be monitored, even without being connected to the instrument.

In addition an optional mains / line power supply, the DLRO10LPU is available. This enables the instruments to be directly powered from 90V to 264V, 50/60Hz ideal for repetitive testing applications such as manufacturing production line use."

DLRO 10X is fitted with RS232 communications that will allow results to be downloaded in real time or stored for later retrieval.

Up to 700 sets of results may be stored within DLRO 10X complete with notes containing up to 200 characters which may be added using the on board keypad. These results can also be downloaded to a PC.

**MEASUREMENT MODES:**

A variety of measurement modes are available. Since the introduction of V2.0 firmware, Normal, Auto, Continuous and Inductive mode are available on both the DLRO 10 and the DLRO 10X.

DLRO 10 will display the average of the measurements achieved using forward and reverse current, while DLRO 10X displays both individual measurements and the average.

**Normal mode** initiates a test by pressing the Test button on the instrument front panel after connecting the test leads. Continuity of all four connections is checked, forward and reverse currents are applied.

**Auto mode** allows forward and reverse current measurements to be made and the average displayed simply by making contact with all four probes. This mode is ideal when working with the supplied handspikes. Each time the probes are removed and reconnected to the load another test will be performed without the need to press the test button on the instrument.

**Continuous mode** allows repeated measurements to be made on the same sample. Simply connect the test leads and press the test button. The measurement is updated every 3 seconds until the circuit is broken.

**Inductive mode** is intended for use when measuring inductive loads. When measuring inductive loads it is necessary to wait for the voltage to stabilise. This means that the measurement could take a few seconds or several minutes. The test leads are firmly connected to the item to be measured and the Test button is pressed. The instrument will pass a current through the sample and wait for the voltage to stabilise. If possible the current will be increased. This procedure will be repeated until the voltage detected falls into the range 15 mV to 200 mV. The instrument will then continue to take readings, which will gradually decrease to the true value as the voltage stabilises further. The operator decides when the result is stable and presses the test button to terminate the test. Measurement is made with forward current only.

**Unidirectional mode**, on DLRO 10X only, applies a current in one direction only. This does not enable any standing emfs to be negated but speeds up the measurement process. Test starts automatically when probes are connected.

**APPLICATIONS**

The needs for accurate low resistance measurement are well known and very diverse. They range through Goods Receiving inspection of components to ground bonding and welded joints. Typical applications include, but are not limited to, making d.c. resistance measurements of:

- Switch and contact breaker resistance
- Busbar and cable joints
- Aircraft frame bonds and static control circuits
- Integrity of welded joints
- Inter-cell connections on battery systems up to 600 V peak
- Quality control of resistive components
- Transformer and motor winding resistance
- Rail and pipe bonds
- Metal alloys, welds and fuse resistance
- Graphite electrodes and other composites

- Wire and cable resistance
- Transmitter aerial and lightning conductor bonding

**FEATURES AND BENEFITS**

- Small, lightweight and portable - can be used in tight places, reduces the need for extra long leads and two person operation.
- Four terminal resistance method shows the true resistance of the item under test.
- Bright LED (DLRO 10) and LCD (DLRO 10X) displays are easily visible under all lighting conditions and reduce human error.
- Automatically applies forward and reverse currents which cancel out any standing voltages across the sample under test.
- Checks for undue noise during measurement, reducing the possibility of recording the incorrect result.
- Automatically detects continuity in P and C circuits, preventing erroneously high reading to be taken due to high resistance contact.
- Battery module has a battery condition indicator allowing the user to check the state of spare batteries without connecting to the instrument.
- RS232 connector on the DLRO 10X allows downloading of results in real time or stored for later retrieval.

Resistance ranges			Full scale volts		Test current	
Full Scale	Resolution	Accuracy*	Resistive	Inductive	Resistive	Inductive
1.9999 mΩ	0.1 μΩ	±0.2% ±0.2μΩ	20 mV	n/a	10 A	n/a
19.999 mΩ	1 μΩ	±0.2% ±2 μΩ	20 mV	20 mV	1 A	1 A
199.99 mΩ	10 μΩ	±0.2% ±20 μΩ	20 mV	200 mV	100 mA	1 A
1.9999 Ω	100 μΩ	±0.2% ±0.2 mΩ	20 mV	200 mV	10 mA	100 mA
19.999 Ω	1 mΩ	±0.2% ±2 mΩ	20 mV	200 mV	1 mA	10 mA
199.99 Ω	10 mΩ	±0.2% ±20 mΩ	20 mV	200 mV	100 μA	1 mA
1999.9 Ω	100 mΩ	±0.2% ±0.2 Ω	200 mV	200 mV	100 μA	100 μA

		DLRO 10	DLRO 10X
Measurement:	Mode:	Manual, Auto, Continuous, Inductive	Manual, Auto, Continuous, Inductive, Unidirectional
	Control:	Fully Automatic	Fully Automatic/Manual
	Speed:	<3s for forward & reverse current and to display average	
Display:	Measurement:	4 1/2 digit seven segment LED	
	Range and Safety:	LED indication	Large backlit LCD
Test Method:		Single cycle reversing d.c. ratiometric measurement -average result display.	
Test Current:	Accuracy:	±10%	
	Stability:	<10 ppm per second	
Maximum Lead Resistance:		100 mΩ total for 10 A operation irrespective of battery condition.	
Voltmeter input impedance:		> 200 kΩ	
Hum rejection:		Less than 1% ±20 digits additional error with 100 mV peak 50/60 Hz. on the potential leads. Warning will show if hum or noise exceeds this level.	
Data:			Real Time or from storage via RS232
Transfer:			
	Storage:		700 tests
	Memo Field:		Up to 200 characters per test via integral alphanumeric keypad
Battery:	Capacity:	7 Ah NiMH rechargeable	
	Life:	Typically 1000 x 10 A tests before recharge	
	Recharge:	Via external 90 V - 260 V 50/60 Hz charger or from 12 to 15 V dc supply	
Charging Rate:	Standard:	2.5 hours to 90% capacity, 4 hrs for full charge	
Temperature:	Operation:	+5 °C to +45 °C (41 °F to 113 °F) at full specification -10 °C to +50 °C (14 °F to 122 °F) at reduced accuracy	
	Storage Co-efficient:	-30 °C to +70 °C (-22 °F to 158 °F)	
	Slow charging:	<0.01% per °C over range 5 °C to 40 °C (<0.006% per °F from 4 1°F to 104 °F)	
Humidity (max):		+10 °C to +45 °C (50 °F to 113 °F)	
Altitude (max):		90% RH @ 40 °C (104 °F) non-condensing	
Safety:		2000 m (6562 ft) to full safety specifications	
EMC:		In accordance with IEC61010-1 600 V Category III - only when DH6 leads are used. In accordance with IEC61326-1	
Dimensions:		220 x 100 x 237 mm (8.6 x 4 x 9.5 in)	
Weight:		2.6 kg (5 3/4 lb.) including battery module	
* The accuracy stated assumes forward and reverse measurements. Inductive mode or unidirectional mode will introduce an undefined error if an external EMF is present.			



## OPTIONAL MAINS / LINE POWER SUPPLY UNIT



The DLRO10 and DLRO10X may also be powered from an optional mains / line power supply unit the DLRO10LPU. This unit is simply fitted to the instrument in place of the standard battery pack.

When in use a red LED is illuminated when the instrument is powered from a mains / line power supply



The DLRO10X is seen here fitted with the optional DLRO10LPU

Ideal for repetitive testing applications such as manufacturing production line use

## ORDERING INFORMATION

Item (Qty)	Order No.	Item (Qty)	Order No.
DLRO 10 Digital Low Resistance Ohmmeter	6111-428	loaded helical contacts.	2m/7ft 242011-7
DLRO10X Digital Low Resistance Ohmmeter	6111-429		2.5m/8ft 6111-022
<b>Complete with</b>			5.5m/18ft 242011-18
7 Ah NiMH battery module.	6121-492	only 1 lead supplied	6m/20ft 6111-023
DH4 Duplex handspikes (2),			9m/30ft 242011-30
one with indicator lights. 1.2m / 4 ft	6111-503	Straight Duplex Handspikes (2)	
Battery charger for operation from 115/230 V	.	Heavy Duty with fixed contacts.	2m/7ft 242002-7
50/60Hz supply.	6280-333		5.5m/18ft 242002-18
Cigar lighter adapter for battery charging.	6280-332		9m/30ft 242002-30
User guide.	6172-473	Duplex Heavy Duty 5cm (2")	
Warranty book.	6170-618	C-Clamps. (2)	2m/7ft 242004-7
<b>Optional accessories at extra cost</b>			5.5m/18ft 242004-18
Carrying case for DLRO10/10X			9m/30ft 242004-30
and all standard accessories.	6380-138	Duplex handspikes with replaceable	
Carrying case for optional lead sets.	18313	Needle Points	2m/7ft 242003-7
Calibration Shunt, 10 $\Omega$ , current rating 1 mA.	249000	Duplex 1.27 cm (1/2 ")	
Calibration Shunt, 1 $\Omega$ , current rating 10 mA.	249001	Kelvin Clips. (2) gold plated	2m/7ft 241005-7
Calibration Shunt, 100 m $\Omega$ current rating 1A.	249002	silver plated	2m/7ft 242005-7
Calibration Shunt, 10 m $\Omega$ current rating 10 A.	249003	Duplex 3.8 cm (1 1/2")	
Certificate of Calibration for Shunts, NIST	CERT-NIST	Kelvin Clips. (2)	2m/7ft 242006-7
Replacement tips for DH4, DH5 and DH6 hand			5.5m/18ft 242006-18
spikes.			9m/30ft 242006-30
Needle point	25940-012	<b>Single leads</b>	
Serrated end	25940-014	Single handspike (1) for	
DLRO10LPU-EU Mains power attachment - Schuko plug		potential measurement.	2m/7ft 242021-7
	1003-172		5.5m/18ft 242021-18
DLRO10LPU-UK Mains power attachment - UK plug			9m/30ft 242021-30
	1003-093	Current clip (1) for current	
DLRO10LPU-US Mains power attachment - US plug	1003-171	connections.	2m/7ft 242041-7
<b>Optional test leads at extra cost</b>			5.5m/18ft 242041-18
<b>Duplex Leads</b>			9m/30ft 242041-30
DH5 straight duplex handspikes (2).			
One has indicator lights.	2.5m/8ft 6111-517		
DH6 Duplex handspikes (2) suitable			
for working on 600 V. systems.	2.5m/8ft 6111-518		
Duplex Handspikes (2) with spring			

# **ITEM**

## **2.12**

# Advent general purpose Optical/Contact Tachometers

## A2102

### Main Features

Both models have inverting LCD display for greater machine access and measurement, both non-contact and contact rpm linear speed.

### Standard Optical Model A2102

Optical Range 50 - 1000mm  
Optical angle +/- 45 deg.

### Laser Model A2102/LSR

Optical Range 50 - 2000mm  
Optical angle +/- 80 deg.  
Laser Class Class II

### General Specification - All models

Speed range	3 to 99,999 rpm
Resolution	max. 0.01 (auto)
Accuracy	0.05% +/- 1 digit
Display	Inverting LCD
Memory	1 minute hold
On target ind.	Yes
Low Battery ind.	Yes
Power	4 x AAA batteries supplied
Contact Adaptor rpm & met/min	
Carrycase	Supplied

### Contact measurements

With A2100/01  
Adaptor fitted (supplied)  
Revs, Metres,



**Patented  
Inverting  
Vertical LCD  
Display**



Order codes	Description
A2102	Standard Hand Tachometer kit
A2102/U	Standard Hand Tachometer kit (USA)
A2102/LSR	Laser Hand Tachometer kit
RT 5	5 Metre roll of reflective tape

# **ITEM**

## **2.13**

# Hand held Vibration Meter

## VIBCHECK

### Key features

- Light weight & easy to use
- Low cost, entry level vibration monitoring
- Measures Vibration (velocity & Acceleration)
- Vibration management to ISO2372
- Optional fixed Transducers & mounting devices

### General information

The Vibcheck is an entry level product which is an easy to use, versatile Vibration Meter which comes complete with transducer, Probe & interconnect cable & carry case.

Ideal for the maintenance engineer, measurements can be taken quickly and easily in both Acceleration and Velocity units as required.

Addition probes & Transducers are optionally available where regular checks need to be made from fixed Transducers attached to machine, this method provides more accurate & consistent results.

### General Specification

Display:	3 1/2 digit LCD
Measuring Ranges	Acceleration: 0 - 20g Velocity: 0-50 mm/sec True RMS
Frequency range	10 Hz - 1kHz
Accuracy	Vibration: +/- 0.1mm/sec - Acceleration +/- 0.1g
Sensor Input:	For hand held or fixed Transducers
Power:	1 x PP3 Battery supplied
Battery state:	Low batt. Warning in display
Standard kit	Meter, Probe, Cable, Battery, Instructions, Vibration booklet and Carrycase

### Additional information

A range of accessories & alternative transducers, cables & probes available on request

**Signal Outputs** - No outputs available



Order Codes	Description
VIBCHECK	Portable Vibration Meter



# **ITEM**

## **2.14**



## The PDS Air™

### Handheld Partial Discharge (PD) Surveying Tool

**\*\*New\*\*** The **PDS Air™** partial discharge surveying tool from HVPD represents the very latest in handheld PD test technology. Incorporating a **digital TEV-dB display** and **external airborne acoustic probes**, the test unit provides the **'first-line of defence'** for the early detection of PD activity in MV cables and plant from 3.3 kV to 45 kV. Rapid, 'look-see' insulation condition testing is possible through the unique combination of three PD measurement technologies: HFCT, TEV and Airborne Acoustic.

The **PDS Air™** handheld test unit meets the requirements of both utility and industrial MV plant owners for a simple, portable, and easy-to-use handheld PD screening device for use by all operational staff in the substation. The unit is recommended for use in Phase 1 of the **HVPD 4-Phase PD Test and Monitoring Solution** which requires **PD pre-screening of 100% of the network**.

#### Features include:










- Digital TEV sensor measurement with numerical LED display.
- The only handheld PD test unit in the market to combine 3x PD sensor technologies (TEV, Acoustic and HFCT) in one device.
- Measurement of PD in metal-clad switchgear/plant with airborne acoustic sensors and accurate digital TEV-dB measurements.
- Measurement of PD in picocoulombs (pC) in power cables with a split-core HFCT sensor (connected around the cable earth).
- Test times of 3-5 seconds per plant item or cable, enabling large numbers of MV plant items to be scanned for PD quickly and easily, prior to diagnostic PD testing.
- Lightweight & portable device with an easy-to-understand, 7-level, colour-coded PD display.







**Optional Indoor Acoustic Probe (PDSIAP) in use with Headphones. Outdoor Parabolic Receiver (PDSOPR) also available.**

#### Standard Scope of Supply

The standard scope of supply of the **PDS Air™** is shown below and includes a split-core HFCT sensor, standard headphones, BNC signal cable, mains battery charger, a soft carry case and an inspection test pad with test labels.

1x	HVPD PDS Air™		1x	HVPD HFCT 100/50 Sensor	
1x	Standard Headphones		1x	AC/DC Mains Battery Charger	
1x	100 kHz High Pass Filter		1x	User Manual	
1x	1 metre RG223 BNC Signal Cable		1x	Inspection Test Pad and POA Labels	
1x	Soft Carry Case				

#### Optional Extras

1x	PDSIAP - Indoor Acoustic Probe		1x	PDSOPR Outdoor Parabolic Receiver and Laser Enhancement Eyewear	
1x	PDSPHH - Peltor PPE Headphones (PPE-Suitable)		1x	PDSACC Accessories Carry Case	

## Application Testing with Accessories

## Key Functions



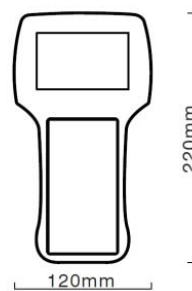
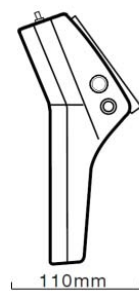
**PDS Air™ with Parabolic Acoustic Receiver measuring PD activity in outdoor sealing ends**



**PDS Air™ measuring TEV PD activity in metal-clad air-insulated switchgear**



## Unit Dimensions



**Dimensions:**

W: 120 mm  
D: 110 mm  
H: 220 mm

**Weight:**

1.26 kg

**Power Supply:**

Li-ion Battery

## How it Works

The **PDS Air™** test unit incorporates **three** individual PD sensors which are designed to pick up different types of PD activity in different types of MV plant, as follows:

**CT - Cable PD Circuit** – Cable PD activity is measured using the external, split-core, High Frequency Current Transformer (HFCT) sensor attached to the cable's earth straps.

**TEV Circuit** – Transient Earth Voltage (TEV) PD signals are generated by internal PD in metal-clad switchgear and plant. The unit provides **digital TEV-dB sensor measurement** in the form of numerical LED display measured in 1 dB steps from 15 dB to 50 dB.

**AA - Airborne Acoustic Circuit** – Acoustic PD signals are generated by PD in air and can be detected using the unit's airborne acoustic sensor with sound demodulator and standard headphones. Optional accessories enhance both the flexibility and range of detection of these airborne discharges. These include an **Indoor Acoustic Probe** (PDSIAP), an **Outdoor Parabolic Receiver** (PDSOPR) and **Peltor Headphones** (PDSPHP) which are suitable for use with PPE hard-hats.

The outputs of these PD sensors are displayed on 3x colour-coded universal LED scales. In addition the PDS Air™ unit has a digital TEV-dB numerical display from 15 dB to 50 dB.

The Guideline PD Levels vs. Plant Condition / Action for each LED level are shown opposite and below.

<b>LED 1</b>	<b>Green</b>	(Plant OK)
<b>LED 2 &amp; 3</b>	<b>Yellow</b>	(Moderate PD - Monitor)
<b>LED 4 &amp; 5</b>	<b>Orange</b>	(Moderate to High PD - Investigate Source of PD)
<b>LED 6 &amp; 7</b>	<b>Red</b>	(High PD – Diagnostic Test, Locate & Restrict Access)

## On-Line Partial Discharge Surveying System

PD Level Guide:

	CT	AA	TEV
●	300 pC	8 dB	15 dB
●	600 pC	12 dB	20 dB
●	1200 pC	15 dB	25 dB
●	3000 pC	19 dB	30 dB
●	7800 pC	22 dB	35 dB
●	20000 pC	26 dB	40 dB
●	30000 pC	30 dB	45 dB

**PD Level Indication Key**

**Group Exporter:**  
**Multi-Tek International**  
**Email: [mti@multitekintl.com](mailto:mti@multitekintl.com)**

# **ITEM**

## **2.15**



## TE CalBench

*A complete calibration laboratory in one test bench*

### *For on-site test facilities*

*Processing Plants*

*Offshore Platforms*

*Calibration Laboratories*

*Mining Operations*

*Refineries*

*Power Plants*

*Engineer Training Centres*

*Research and Design*

*Instrumentation Laboratories*

*Electricity and Electronics*

*Pharmaceuticals*

*Military / Defence*

**GROPU EXPORTER: MULTI-TEK INTERNATIONAL**

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**Fax: + 44 2073133191**





## About CalBench

Introduction, general specifications, bench fittings, and modifications ..... 2-4



## 7051 Multifunction Calibrator/Control Centre and EasyCal Software

Precision multi instrument calibration and software for the calibration process ..... 5-14



## Power Supply Modules

Fixed and adjustable AC and DC power supplies ..... 15-16



## Pressure Modules

Pressure calibrators, controllers, and indicators ..... 17-18



## Temperature and Loop Modules

High accuracy modules for loop, RTD, and thermocouple calibration ..... 19-20



## Electrical Test, DMM, and Oscilloscope Modules

Insulation tester calibrators, digital multimeters, and scopes ..... 21



## Frequency Counters, Function Generators, and RF Modules

Universal frequency counters, waveform generators, RF, and EMC test modules ..... 22



## Additional Modules and Accompanying Bench Instruments

Extra modules and external instruments for calibration, line pressure, and more ..... 23-26



## Laboratory Design and Supply, Installation and Training Services

The turnkey solution for test facilities ..... 27-28



## Full Bench Listings

Complete listing of modules and extras ..... 29-30

## About CalBench

CalBench is the ultimate multifunction calibration station. Each bench is custom-made to meet specific user requirements. Offering versatility and precision it is ideal for laboratories and workshops in need of multi-product testing that meets the highest industry standards.

A wide range of modules can be fitted to the primary console creating a highly flexible system that is both functional and easy to use. Further expansion can be achieved by adding the secondary console, mounted under the primary.

Calibration modules cover electronic signal, temperature, loop, and pressure applications. Power supplies, DMMs, oscilloscopes and generator modules can also be fitted into the bench consoles. Functions are clearly defined on each module and a competent technician will quickly master the operation of the system without training or constant reference to manuals.

Various fittings, functions, and additional devices can be added to CalBench to create a comprehensive work environment.



## Calibrates

Multimeters	Pressure Gauges	Thermocouple Transmitters
AC/DC Signal Sources	Clamp Meters, Tachometers	Pressure Transducers
Signal Generators	Power Supplies	Frequency Meters
Oscilloscopes	Temperature Indicators, Sensors	Decade Boxes
AC/DC Millivoltmeters	RTD Transmitters	Pressure Transmitters
Loop Signal Indicators	Timer Counters	Ohmmeters

## MODULE OPTIONS and EXTRAS

**Pressure:** Precision calibrators, indicators, and controller modules. Ranges from vacuum to 600bar.

**Power Supplies:** Fixed and adjustable AC and DC power supplies, dual and programmable units.

**Loop and Temperature:** High accuracy loop calibrator modules with source, measure and sink functions. Temperature calibrators capable of measuring and simulating RTDs/thermocouples.

**Multifunction Calibrator and DMM Modules:** The 7051 provides high accuracy multi-product calibration and has an internal 6½ digit multimeter. Also available are the 5065B (6½ digit) and 5075B (7½ digit) DMM modules.

**Additional Modules:** Further modules include oscilloscopes, frequency counters, function generators, and harmonics analyzers. Custom design modules can be fitted allows the user to integrate a familiar instrument into their system.

**External Options:** Pneumatic and hydraulic calibration pumps, pressure gauges, dead weight testers, dry block calibrators, pressure test kits, hoses and connectors, test lead sets, solder stations, vices, and much more.

**Bench Fittings:** Various fittings can be added to CalBench to improve usability and create a more efficient workspace. Under-worktop drawers, cabinets, CPU holders, and keyboard trays; tool holders and hooks for the perforated back panel; air preparation kits, desktop mountable devices, and more.

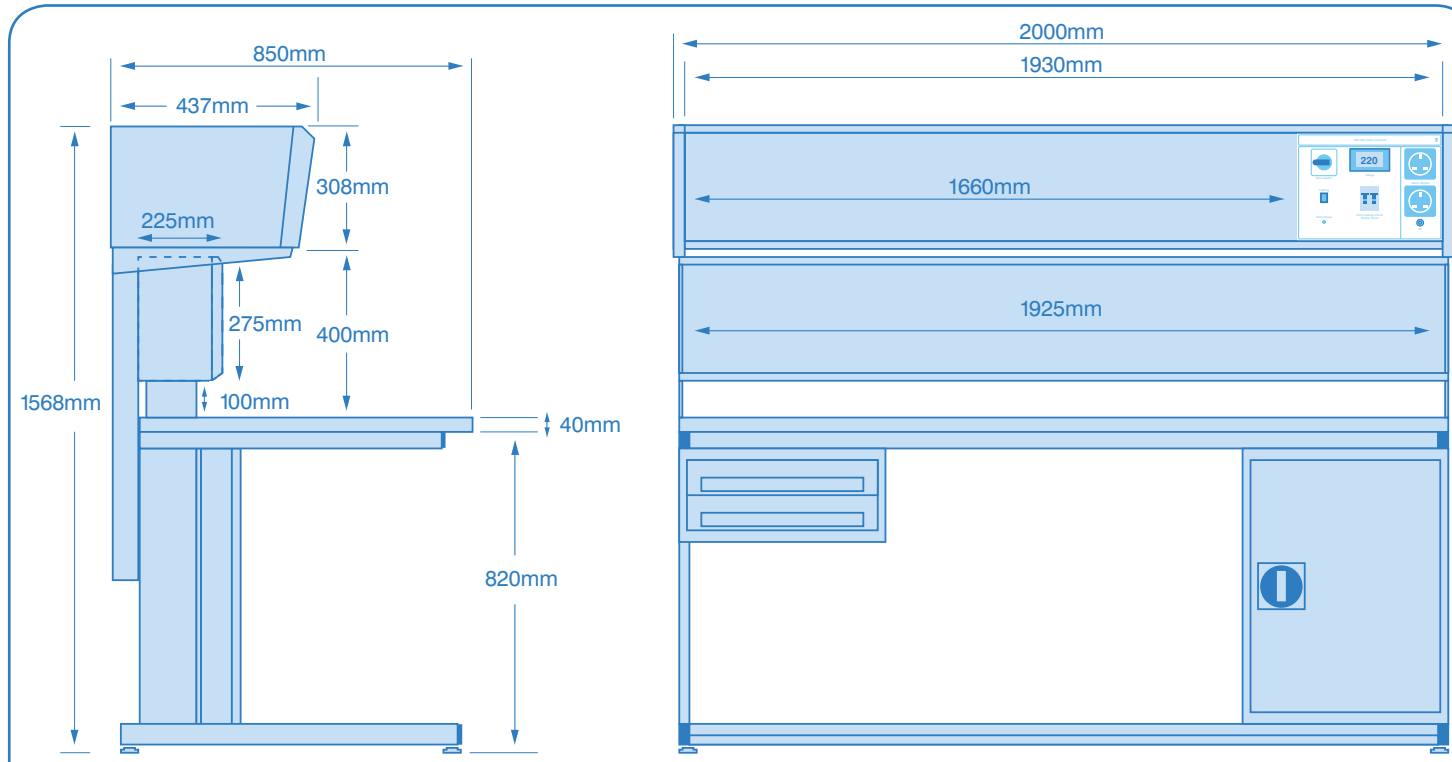
**Laboratory Design and Supply:** offers a turnkey laboratory design service for customers requiring a complete and efficient test facility. Using 3D software we create the layout then generate images and videos to visualise the concept. We supply all the necessary test equipment and surrounding laboratory furniture.





# CalBench General Specifications

Bench dimensions and console settings



The above drawing represents the bench with 7081 secondary console fitted. Without this option the overall height can be set at the shown 1568mm or 1413mm depending on user preference. The under-worktop fittings shown are optional (see page 4).

## CALBENCH DETAILS

The 7080 CalBench consists of the workstation frame, table top, and primary console. The 7082 mains power module is fitted as standard in every bench. The remaining space in the primary console houses the modules selected by the user for their applications.

The primary console is mounted on two support arms that fix to the rear of the workstation frame. There are two fixed settings available, allowing the user to position the console 250mm or 400mm above the worktop. A perforated back panel is fitted below the primary console. It is sized to accommodate both height settings and can be complemented with tool hooks, holders, and accessories.

The 7081 secondary console is an optional expansion that mounts under the primary, housing additional modules. Being 225mm deep it maintains user worktop space. When fitted the perfo panel is removed.

Each bench is heavy duty, constructed from mild steel throughout with side panels and console support arms welded to provide a reinforced frame. The bench worktop is a durable laminate finish with rolled front edge. An antistatic worktop is also available.

Bench set up is fast and simple as the consoles are supplied complete, fully tested, and with the modules installed. The complete system requires only basic construction and once the mains power and line pressure is connected it is ready for use.

The primary console is powered from a single-phase mains supply via a 16A heavy duty type IEC socket at the rear of the console. The secondary console is powered from the primary console via an IEC power link cable. For pressure, the external line input ports are arranged on the rear of the consoles.

## 7060 TABLETOP BENCH CONSOLE

The 7060 is a 1000mm wide tabletop console. It is designed for laboratories requiring a modular unit where space is limited or a mobile system is required. It can be supplied as a standalone unit ready for fitting or pre-mounted on either a standard or mobile workbench.

A compact 150mm 7082 mains power module is fitted as standard. This allows a further 830mm of module space for calibrators, power supplies, and more. Multiple 7060's can be used side by side or mounted on top of each other. Mains power can be separate for each console or combined, creating more module space.

The 7060 is supplied as a complete system with all modules fitted and tested, ready for use.

## 7082 MAINS POWER CONTROLLER MODULE

Fitted as standard in every bench the 7082 mains power controller module is a single-phase unit equipped with 2 power sockets and digital voltage meter.

- Mains power on/off switch to provide isolation for the entire bench
- Lighting switch to provide separate control of the worktop lighting
- 16A overload protection for bench. Residual current protection 0.03A
- 2 front panel earthed sockets (4 under console earthed sockets)
- Digital mains voltage meter (0 to 300V)
- 2 filters (mains and lighting) fitted to attenuate mains spikes
- Cooling via 2 mains powered 80mm extraction fans fitted internally
- PE socket is provided for wrist bands, mats, etc
- All metallic parts of the bench are connected to mains earth
- Optional isolated mains output sockets (7063)
- Various socket types available: UK 13A, Euro Shuko 16A, Indian Round Pin 15A, US 15A



## BENCH FITTINGS

A number of fittings can be added to each bench. Standard items include under worktop drawers and cabinets, and tool hooks/holders for the perforated back panel.

- Under console lighting and 4 power sockets fitted as standard
- Under worktop single and multi drawer units
- Combination drawer and cabinet units
- Slotted divider kits and rubber mat inserts for drawers
- Horizontal or vertical fitted under worktop PC holders
- 20, 40, or 60 piece tool hook kits for the perforated back panel
- Perforated panel shelf units, storage bins, and power strips
- Bench mounted side arms for monitors, tools, and more
- Air preparation kits and filters (fitted under bench)



## BENCH MODIFICATIONS and EXTRAS

Modifications and add-ons are available to incorporate user specified features. Also available is a wide range of laboratory furniture to accompany the bench and create a full workshop.

- Optional secondary console shelf unit (7081S)
- Custom modules for additional functions (see page 23)
- Optional quad power socket module
- Worktop mounted tools and instruments
- Side tables, mobile benches, trolleys, cabinets and cupboards
- Wall mounted perforated panels for tools, storage bins, and more
- Tool cases and service kits
- Bench stools, height adjustable chairs, and foot rests
- ESD workstation kits and mats





# 7051 Multifunction Calibrator & Control Centre

Universal calibration and system control



## Calibrates

Digital/Analogue Multimeters

Process Calibrators

Voltage and Current Sources

Transducers and Transmitters

Temperature Indicators

Oscilloscopes

Frequency Meters

Clamp Meters

Decade Boxes

R-C-L Meters

Temperature Simulators

Data Loggers

## And more

### CALIBRATOR / DMM / TOUCH SCREEN PC

Mounted centrally in the primary console the 7051 combines a precision multifunction calibrator, 6½ digit multimeter, and industrial touch screen PC. It is the principle module for on-site facilities that require high performance calibration and maximum functionality.

**Calibrator:** Provides a wide range of calibrated outputs for AC/DC voltage and AC/DC current, plus a range of resistance and frequency functions. Internal options can be added for increased capabilities. These include PT100 simulation, high voltage/current, capacitance/inductance, and oscilloscope calibration. Further enhancements can be made by additional side modules, adaptors, and benchtop instruments.

**DMM:** The integral 6½ digit multimeter that can measure DC voltages to 1000V, AC voltages to 750V, resistance to 100Mohms, and frequency to 300kHz.

**PC:** The operating system is Windows XP embedded, running on a 2GHz PC which allows standard peripherals to be connected. The calibrator control software allows the wide range of functions to be easily selected using mouse, keyboard, or touch screen.

**EasyCal:** Enables automatic calibration to increase speed and efficiency of work. In addition EasyCal has features to manage and administrate both inventory and quality control. To complement the system a printer and connectivity kit is supplied as standard, for generation of certificates and reports.

**Communication:** Using EasyCal the operator can read back from compatible electrical, temperature, pressure, and loop modules within the bench. Furthermore the software can be used with external instruments such as dry block calibrators and portable test instruments.

### STANDARD FEATURES

Calibrator (source)	Range	Best 1 year Specification
Voltage DC	0 to $\pm 22V$	$\pm 15\text{ppm}$ of setting
Current DC	0 to $\pm 220\text{mA}$	$\pm 80\text{ppm}$ of setting
Voltage AC	1mV to 22V (10Hz to 20kHz, sine-wave)	$\pm 300\text{ppm}$ of setting
Current AC	10 $\mu\text{A}$ to 220mA (20Hz to 1kHz, sine-wave)	$\pm 0.05\%$ of setting
Decade Resistance	1 $\Omega$ to 1G $\Omega$ (Fixed values, decade steps)	$\pm 20\text{ppm}$ of setting
Simulated Resistance	10 $\Omega$ to 40M $\Omega$	$\pm 0.02\%$ of setting
Conductance	1S to 1nS (Fixed values, decade steps)	$\pm 20\text{ppm}$ of setting
Thermocouple	-270 to 1800°C (Type J, K, R, T, S, B, E, N)	$\pm 0.15^\circ\text{C}$
PRT	-250 to 850°C	$\pm 0.1^\circ\text{C}$
Frequency/Period	0.1Hz to 10MHz / 100nS to 10S	$\pm 20\text{ppm}$ of setting

6.5 Digit Multimeter (measure)	Range	Best 1 year Specification
Voltage DC	0 to 1000V	35ppm of rdg + 6ppm of rng
Current DC	0 to 3A	500ppm of rdg + 50ppm of rng
Voltage AC	0 to 750V	0.06% of rdg + 0.04% of rng
Current AC	0 to 3A	0.1% of rdg + 0.04% of rng
Resistance	0 to 100M $\Omega$	100ppm of rdg + 50ppm of rng
Frequency	3Hz to 300kHz	0.01% of rdg

Internal PC	Specification/Details
Processor	2GHz
RAM	512MB
Hard Drive	60GB
Ports	4 x USB, 1 x Fast Ethernet
Display	10.5in LCD, (Touch Screen)
Operating System	Windows XP Embedded
Pre loaded Software Programs	EasyCal Calibration Software
Supplied Hardware/Accessories	USB keyboard, Printer, DVD-RW, 4 port USB hub, Numeric key pad, USB Stick

### OPTIONS

Calibrator (internal)	Range/Values	Best 1 year Specification
High Voltage/Current (9782)	220mA to 22A / 22V to 1050V AC/DC	DCI 250ppm. DCV 50ppm. ACI 0.2%. ACV 0.08%
Wideband AC Voltage (9771)	20 to 200mV/300kHz. 0.2 to 2V/1MHz. 2 to 20V/100kHz	$\pm 0.05\%$ of setting
Capacitance (9798)	1nF, 10nF, 100nF, 1 $\mu\text{F}$ , 10 $\mu\text{F}$ , 100 $\mu\text{F}$	$\pm 0.25\%$ of setting
Inductance (9798)	1mH, 1.9mH, 5mH, 10mH, 19mH, 50mH, 100mH, 190mH, 500mH, 1H, 10H	$\pm 0.1\%$ of setting
Full Range Resistance (9787)	1 $\Omega$ to 120M $\Omega$ (Variable)	$\pm 100\text{ppm}$ of setting
- PT100	-180 to 850°C	$\pm 0.2^\circ\text{C}$
Oscilloscope Calibration (9770)		
- Amplitude	0mV to 200V and 0mV to 2V 50 $\Omega$ (square-wave or DC)	$\pm 0.05\%$
- Frequency/Period	0.1Hz to 100MHz / 100nS to 10S	$\pm 20\text{ppm}$ ( $\pm 0.1\text{ppm}$ optional)
- Duty Cycle	3 frequencies: 100Hz, 1kHz, 10kHz, settable from 0 to 100%	
- Fast-Rise	< 300ps. Bandwidth checking up to 600MHz	
2.2GHz Sweep (9769)	100MHz to 2.2GHz levelled sine-wave (0.5, 1, 1.5V pk-pk)	Amplitude $\pm 1\%$ , Frequency $\pm 20\text{ppm}$

### Side Modules and Accompanying Bench Instruments (see page 7 for further details)

10 Channel Scanner Module (9714B)	Option for internal DMM. Allows multiple inputs to be measured
External Adaptors	Clamp meter adaptor (9780), tacho adaptor (9773), torque wrench calibration adaptor (9759)
External Instruments	Current transformers, bench/portable calibrators, attenuators, references
EasyCal Accessories	Bar code reader, Calibration and ID label printer, Job card and address label printer





# 7051 Accompanying Equipment

Supplied accessories and external options for use with the 7051 module



## SUPPLIED ACCESSORIES

Supplied as standard with the 7051. The printer and connectivity kit provides all the required components for use with the in-built PC. The test lead set has the necessary connections for virtually all test applications.

### Printer and Connectivity Kit

- USB keyboard and mouse
- Ink jet printer
- DVD-RW
- 4 port USB hub
- Numeric key pad
- USB memory stick

### Premium Test Lead Set (shown)

- Pair of High Voltage Leads (1.5kV)
- Pair of High Current Leads (30A)
- BNC Test Lead
- BNC to 4mm Adaptor
- 4mm Test Lead Couplers
- 4 Wire Screened Test Leads (Gold Plated)
- Pair of Low Thermal Test Leads (Gold Plated)
- Pair of 4mm to Spade Adaptors
- Thermocouple (mini) Adaptor
- Pair of 4mm Test Clips



## ADAPTORS

Various adaptors can be used with the 7051 for increased capabilities. Standard adaptors for clamp meters, tachometers and torque wrenches are available. Custom adaptors for user specific applications can be supplied upon request.

- Clamp meter adaptor x50 turn - AC/DC current up to 1100A (DC, 45 to 90Hz)
- Optical tacho adaptor - 6 rpm (0.1Hz) - 600,000 rpm (10kHz)
- Current probe adaptor (for 7051 with oscilloscope calibration option fitted)
- Torque wrench calibration adaptor
- Humidity and temperature sensor adaptors
- Picoamp source adaptors
- Customer specific adaptors



## ACCOMPANYING BENCHTOP INSTRUMENTS

The 7051 can be complemented by several benchtop instruments that enhance capabilities and provide more functions. Also available are portable versions of modules for site calibration work.

- 100A AC current Transformer (9790)
- Power calibrator: 0 to 20kW AC and DC (5077)
- Power amplifier: 60V AC, 90V DC – 100mA (9760 shown)
- Low noise attenuators: 100:1 and 1000:1 versions (9766 and 9767)
- Rubidium frequency reference (9762) for use with oscilloscope calibration option
- Additional instruments and modules for specific applications (see pages 23 to 25)



## EASYCAL SOFTWARE ACCESSORIES and OPTIONS

Several options are available for use with EasyCal calibration software. Items include a bar code reader which enables fast identification of devices in the pre-calibration stage, and label printers for tagging units after calibration.

- Bar code reader
- Calibration and ID label printer
- Job card and address label printer
- Extra user licenses for additional computers
- Durable over-laminate labels for field devices situated in harsh environments
- Cables, leads, and adaptors for interfacing EasyCal with separate computers

## 7051 GENERAL SPECIFICATION

Warm up .....	30 minutes to full accuracy
Settling Time .....	Less than 5 seconds
Interfaces .....	4 x USB, 1 x Fast Ethernet
Temperature Performance .....	Operating: 5 to 45°C. Calibration: 15 to 28°C. Storage: -10 to 50°C
Operating Humidity/Altitude .....	<80% non condensing. Altitude: 0 to 3km. Non operating: 3km to 12km
Line Power .....	100 to 230V AC 50/60 Hz. 200W maximum
Dimensions .....	w425mm, h201mm (primary console fitting only)

## 7051 ORDERING INFORMATION

### 7051 Multifunction Calibrator and Control Centre - Features and included items

- Precision Multifunction Calibrator
- AC/DC 22V / 220mA
- Decade Resistance 0 to 1GΩ
- Simulated Resistance 0 to 40MΩ
- PT100 (-180°C to 850°C)
- Thermocouple Simulation (J,K,R,T,S,B,E,N)
- 10MHz Frequency
- Internal DMM – 6.5 Digit (AC/DC 1kV/3A, 100MΩ, 300kHz)
- Internal PC – 10.5" colour LCD/touch screen
- 7051 Calibrator/DMM Control software
- EasyCal Calibration Software
- Printer and Connectivity kit
- Premium Test Lead Set
- User Manuals

### Internal Options

9782 .....	High Voltage/Current option AC/DC 1kV/22A (Multimeter Calibration)
9798 .....	Capacitance (1000pF to 100μF) / Inductance (1mH to 10H)
9787 .....	Full Range Resistance (1Ω to 120MΩ)
9771 .....	High Frequency AC Voltage (1MHz Max. 20mV to 20V )
9770 .....	Oscilloscope Calibration (1mV to 200V, 0.1Hz to 100MHz, < 1ns risetime)
9769 .....	Scope 2.2GHz Levelled Sine Generator
9783 .....	Oven-Controlled High Stability Frequency Reference (scope options only)
9714B .....	10 Channel Scanner Side Module (option for internal DMM)

### External Options

9762 .....	Rubidium High Stability Frequency Reference (oscilloscope calibration option must fitted)
9773 .....	Optical Tacho Adaptor
9780 .....	Clamp Meter Adaptor (1 and 50 turn coil)
9759 .....	Torque Wrench Calibration Adaptor
9764 .....	Current Probe Calibration Adaptor (oscilloscope calibration option must fitted)
9790 .....	100 Amp AC Current Transformer
5077 .....	Power Calibration (0 to 20kW AC and DC) - External Calibrator
9760 .....	Power Amplifier (60V AC, 90V DC – 100mA)
9766 .....	External Low Noise Attenuator 1000:1
9767 .....	External Low Noise Attenuator 100:1
C165 .....	Factory Calibration Certificate (NPL)
C134 .....	UKAS Calibration Certificate (17025)

### EasyCal Options

9777 .....	Bar Code Reader
9778 .....	Calibration and ID Label Printer
9779 .....	Job Card and Address Label Printer
9736 .....	Additional Users License - For use on separate PC's

Further options and full 7051 technical specifications available upon request.



## EASYCAL SOFTWARE - FOR THE CALIBRATION PROCESS

EasyCal is a complete software package with features covering all aspects of calibration work and management. With a familiar user interface all operators can quickly learn and navigate through the applications. EasyCal is supplied as standard with the 7051 module or can be used on separate computers in the test facility. It is network compatible meaning data can be shared and accessed around the site via a central server.

### FEATURES

- Communicate with calibrators and modules
- Automated planning and scheduling
- For use with multiple devices and instruments
- Print/email/store certificates and reports
- Network compatible
- Produce calibration labels
- Quickly generate procedures using templates
- 1000+ pre-written test procedures included
- Calibration due reminder system
- E-mail reminder letters and lists
- Customise reports and certificates
- Create PDF reports & certificates (PDF engine)
- Print and read bar codes
- Universal instrument control
- HART & Foundation Fieldbus communication
- Secure user log in and electronic signatures
- Create uncertainty tables for laboratory & site
- WebCert feature for online certificates

EasyCal simplifies the administration process from reminder reports through to despatch. Automating the calibration process brings important benefits and provides increased speed of calibration and consistency of results. Easily produce calibration certificates and reports to ISO 9001, ISO 17025, and other quality standards.

## EASYCAL SOFTWARE - MULTI-DEVICE CALIBRATION ACROSS INDUSTRIES

EasyCal incorporates specific features for use across industries. It offers a versatile solution to automated work flow, with the comprehensive functionality that is required in manufacturing and process plants, power stations, offshore platforms, refineries and many other sites.

**Pre-Calibration:** As a key aspect to improving efficiency, the calibration management features of EasyCal make the planning and organisation of on-site instrumentation calibration simple. A recall/reminder system informs the user of upcoming jobs, and search functions allow the user to quickly identify a unit for test.

**Calibration:** Whether performing automatic calibration runs using the 7051 calibrator/DMM module or manually testing devices, EasyCal optimises the process by allowing the user to create procedures quickly and easily. This can be done with the help of the included design wizards and pre-written templates.

**Post Calibration:** Once calibration has been performed the user can generate certificates, reports, and labels. These can be printed, stored, or emailed as PDFs. EasyCal has a selection of pre-formatted certificate templates suitable for displaying typical calibration results.



### DEVICES & INSTRUMENTS

- Electrical and Electronic
- Level, Pressure, and Flow
- Temperature
- Loop
- Mechanical
- Dimensional

### INDUSTRIES

- Oil and Gas
- Nuclear and Power
- Manufacturing and Design
- Electricity and Electronics
- Aviation and Automotive
- Metrology and Calibration

## EASYCAL SOFTWARE - THE BENEFITS

### Achieve compliance with quality standards

- Automated document control ensures conformity and quality
- Establish procedures to maintain repeatability and monitor quality
- Schedule and maintain calibration intervals.
- Evidence of traceability to national standards
- Record calibration environmental conditions
- Produce calibration labels, maintain calibration history
- Reduce possibilities for errors or omissions
- Electronic record retention ensures integrity for successful audits

### Create an efficient control and management system

- Reduce testing times
- Eliminate continual outsourcing calibration costs
- Full control over the calibration process
- Improve turnaround
- Quick and easy solution to instrument analysis when needed
- Internal scheduling for calibrations. No external factors
- Centralised document management
- On demand networked review of certificates and reports





## INVENTORY, REMINDERS, AND JOBS

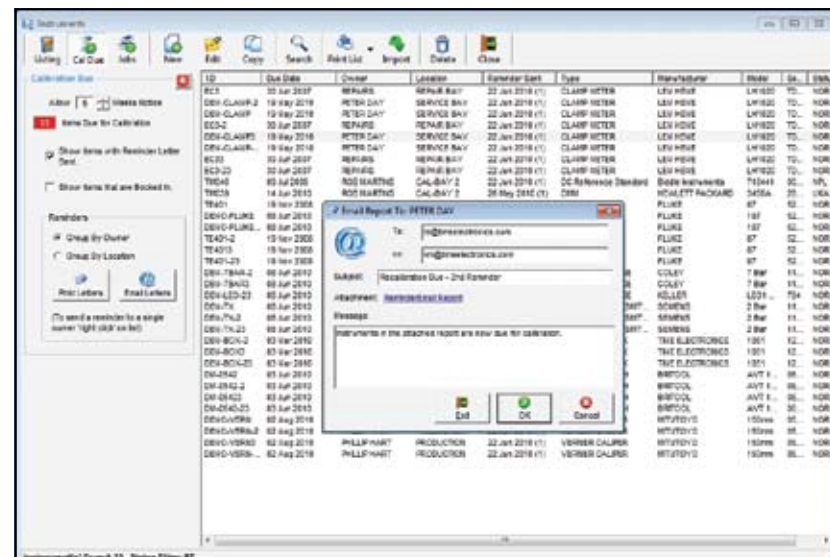
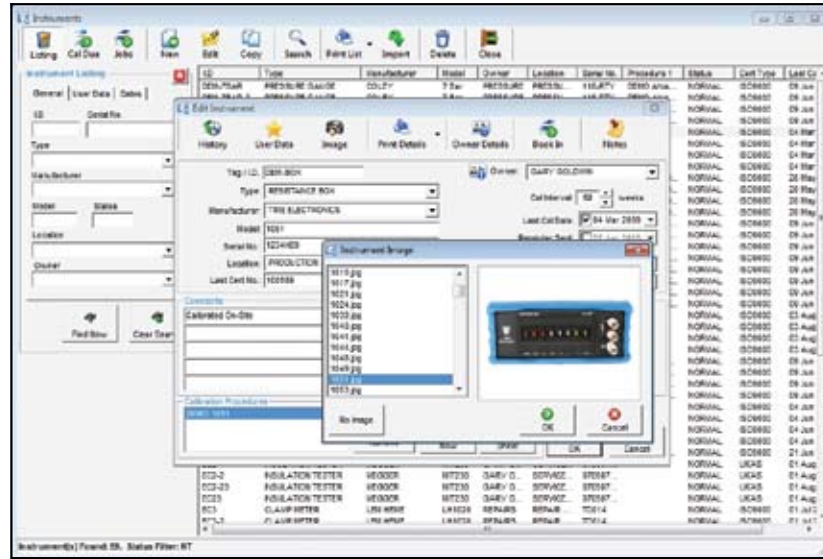
A comprehensive inventory database can be created and customised to company requirements. For internal calibration and quality management, departments and users can be specified. Alternatively EasyCal can be used as the controlling system for a calibration business based around customers and owners.

### Search

A powerful search feature enables the user to enter specific criteria to quickly find the required data. When adding details the user is aided by drop-down lists, which automatically update when new information is added.

### Input Fields

Used to add details such as ID and serial number, manufacturer and model, instrument status and service notes. In addition custom fields can be created to integrate with a company system. Images can be uploaded to provide further reference.

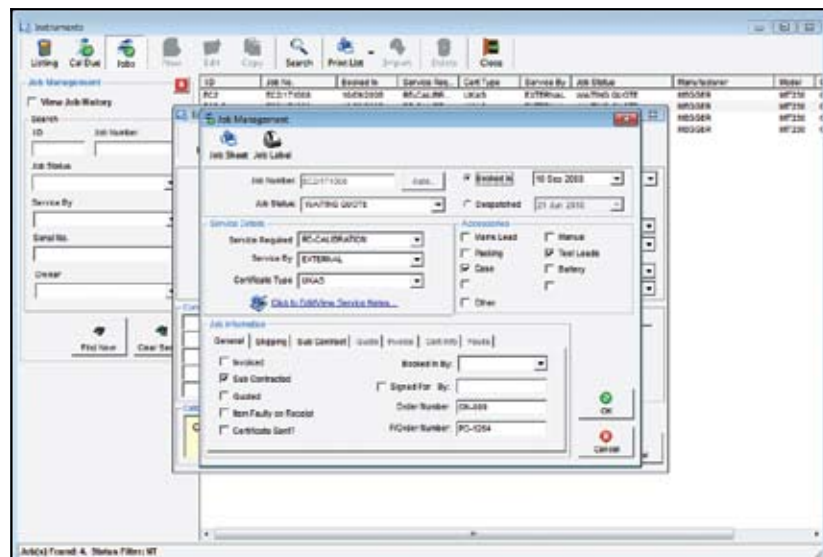


### Instrument Recall and Reminder System

Instruments which are due for calibration are listed on screen. Reminder letters and lists can be printed or emailed directly to the customer or department. An advanced notice period can be set to bring forward the recall date allowing for response time.

### Job Management

When a unit for test is booked in the job process starts. Specific information about the job is entered; such as 'service required', 'sub contracted' and 'accessories supplied'. A job sheet and label can be produced at this stage to accompany the instrument. As the job is put through the system these parameters can be updated, for example 'quote price', 'job status' and 'invoiced'.



### Devices and Standards used for Calibration

Traceability information for instruments and standards that perform the calibration work is stored and maintained by EasyCal.

### Uncertainties

Uncertainty tables for laboratory and site can be created for each calibrating instrument. These are then automatically processed and applied to certificates as required.

## PROCEDURE WRITING AND EDITING

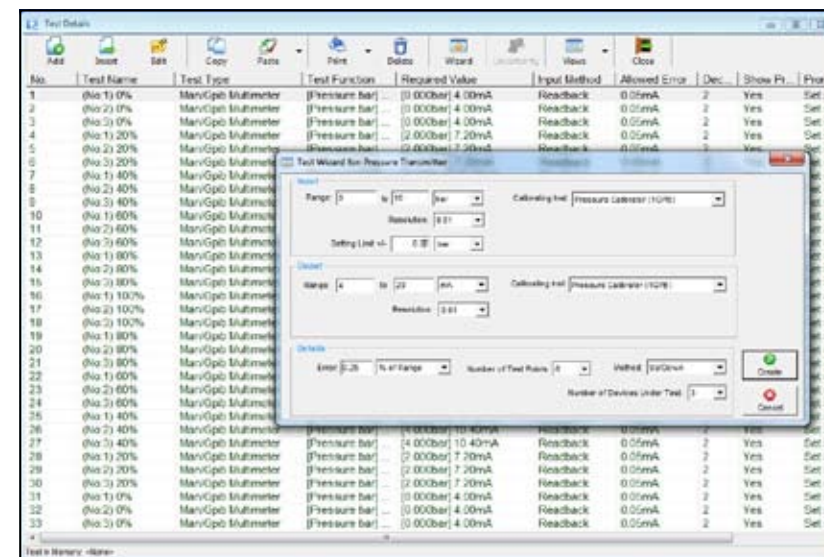
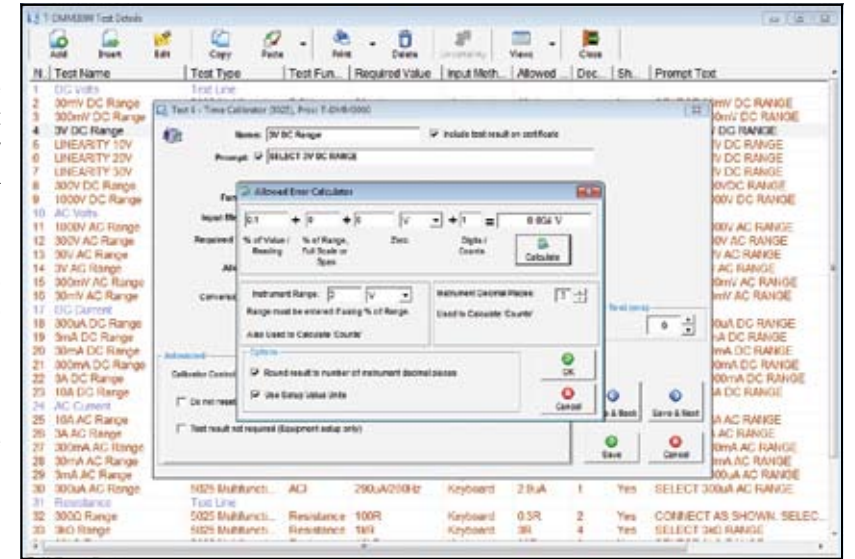
Creating and editing test procedures is made simple with an intuitive, user-friendly interface. Editing test information can be done by adding, inserting, or copy and pasting. EasyCal keeps track of each time a procedure is edited.

### Procedure Library

A calibration library comprising of over 1000 procedures covering a wide variety of instruments and devices is included as standard.

### Procedure Templates

Procedure templates for multimeters, clamp meters, decade boxes, insulation testers, and more can be used for creating any new procedures as required.



### Fast Procedure Creation and Editing

Copy and paste multiple tests. Globally edit a group of tests. Colour coded listing helps sort and identify different test types.

### Procedure Simulation

The Calibration Run Simulator enables a procedure to be tested without the need for a controlling instrument. To further assist with development of procedures a test can also be edited during the actual calibration run.

### Format Certificates

Colour code and add borders to test group titles. Add column headers where a change of layout is required. A preview feature allows the user to check the certificate layout to determine if formatting is correct.

### Document Links

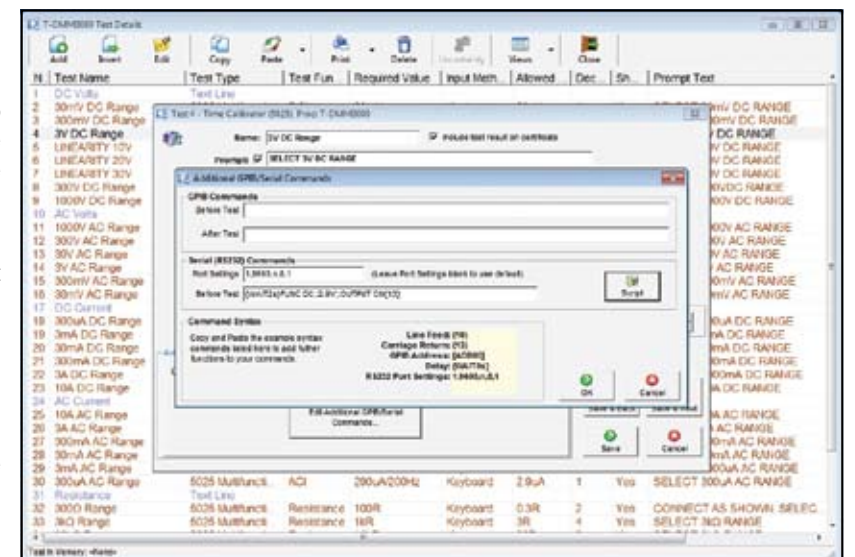
Create links to technical files, specifications, web pages, word documents, videos, and more. These can be set to automatically display prior to the calibration run.

### Conversion Tables

Conversion tables for thermocouples, RTDs, current transformers, and clamp meter adaptors are included. Alternatively user-defined tables can be created.

### Remote Commands

For more complex instrument control, commands can be sent on a test-by-test basis or run as a script. Closed loop calibration is also achievable using the universal readback feature.







## INSTRUMENT AND DEVICE CALIBRATION

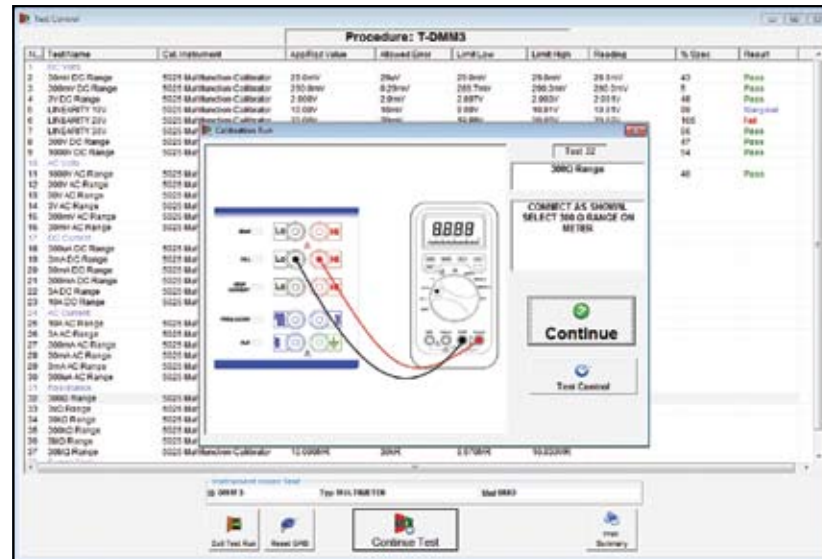
Automated calibration run provides fast and accurate collection of data, whether using direct instrument control or manual entry. EasyCal guides the operator through the procedure using graphical test screens and user prompts.

### Search

Selection of the device under test is quick and easy. With the use of a barcode scanner this selection becomes automatic.

### Calibration Prompts

Text and graphical prompts aid the user with instrument range selection and connection. So even the most complex calibrations can be performed with relative ease.



### Graphical Test Screen

The calibration run is made simple and efficient by a graphical user-interface, which increases speed of data entry. The colour coded indication bar displays the test limits. This allows the operator to easily identify out of tolerance results.

### Test Control

At any stage during the calibration run a summary can be displayed, this includes both completed and remaining tests. Colour coding indicates tests passed or failed. The operator is able to move forward or backward through the procedure as required.

### End of Calibration Run

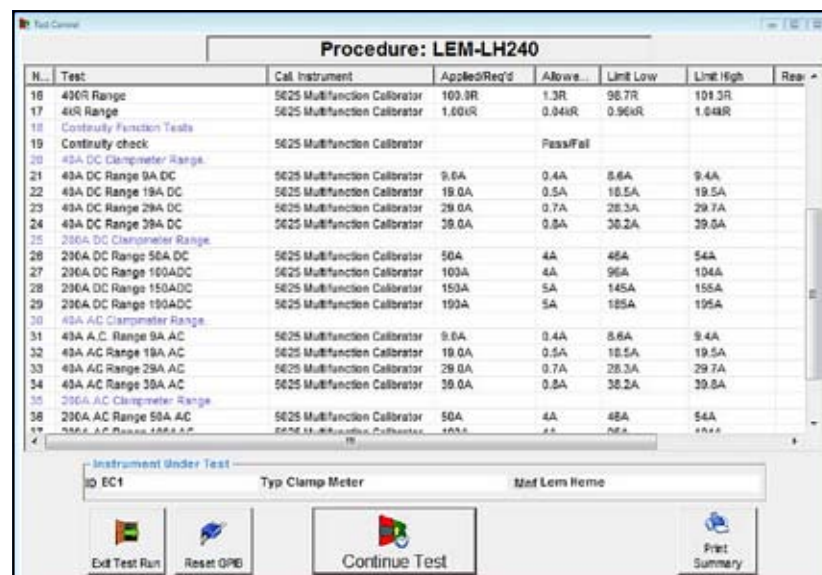
Data for every test is stored, including a snap shot of the procedure used. If required calibration comments and service history can be updated. The operator is able to print the certificate, produce a calibration label and/or store the results to be issued as required.

### Recovery Mode

If for any reason a calibration run is interrupted, recovery mode allows the user resume from the point of termination.

### Calibration Test Forms

Alternatively 'calibration test forms' for hand written results are available. This data is then entered manually into EasyCal at a later date.



## CERTIFICATES/REPORTS/DATA MANAGEMENT

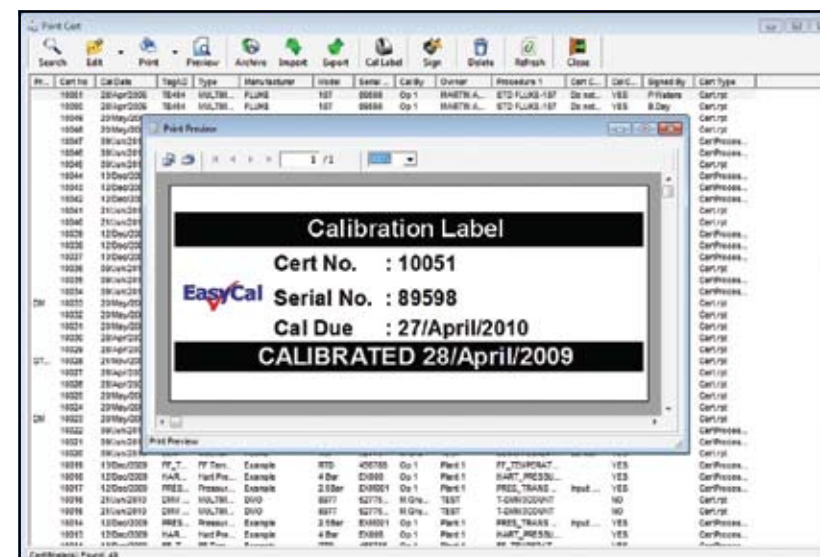
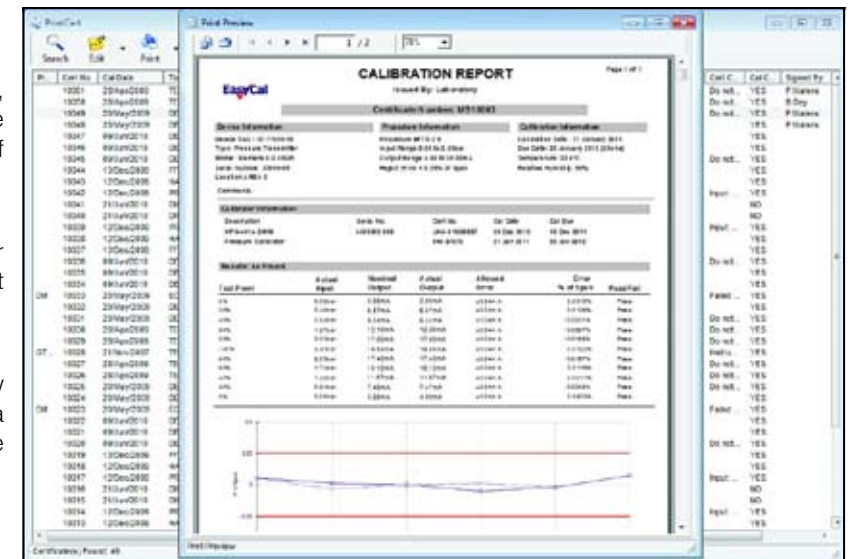
Produce, print, and store calibration certificates, reports, and labels. Simple search facilities enable the user to locate any data on demand. Keeping track of instrument history and servicing is made easy.

### Certificate Templates

A range of pre-formatted templates are available for immediate use. A company logo can be added without the need for 3rd party software.

### Electronic Signatures

Password protected electronic signatures allow management to approve certificates. In addition a scanned image of the signature can automatically be inserted, eliminating the need to print certificates.



### Built-in PDF Engine

Generate PDF reports and certificates ready for emailing and universal review.

### Calibration Reports

Documented traceability provides a recorded audit trail. Reports showing calibration duration times can assist with costing and assessments.

### Archive

The results database can be streamlined by using the archive feature. This improves data organisation and management. Archives are quickly retrieved, giving instant access to historical certificate data.

### Import and Export

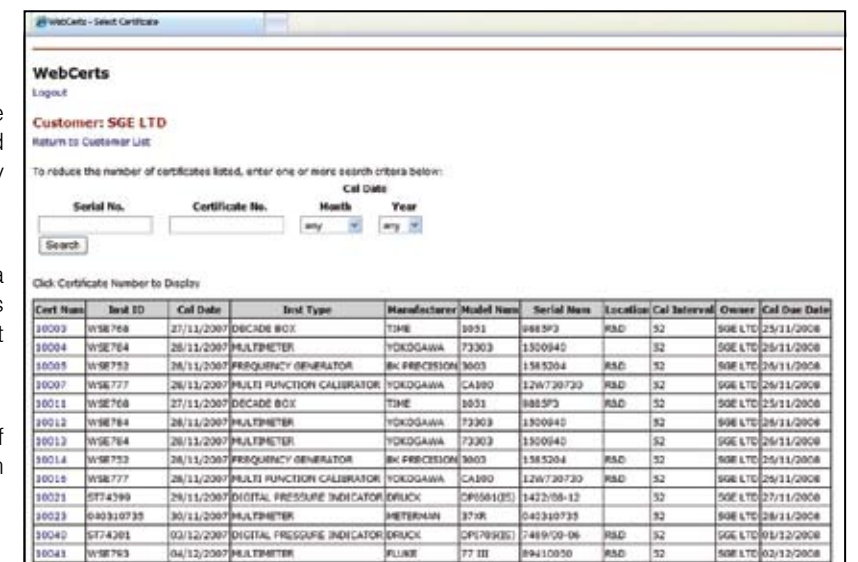
Exchange data from one system to another using the import/export feature. This method is ideal for site and field calibration work, where data is recorded externally then uploaded to the main database upon return.

### WebCerts

Enables the retrieval of PDF calibration certificates via a web based application. A secure log in feature allows access the user's private folder with their relevant documentation.

### Customise

Crystal Reports (optional) allows full modification of certificate, label, and report layouts. Design custom reports using queries, formulas, and running totals.

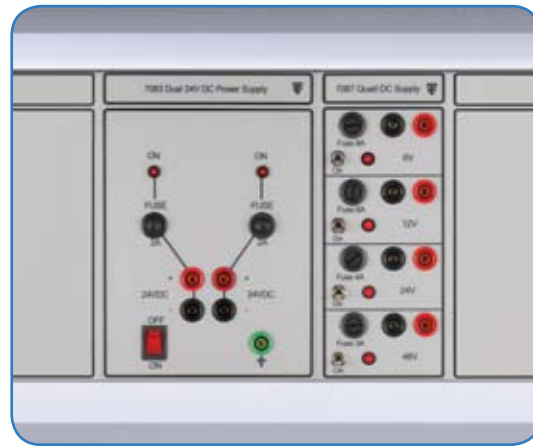






# Power Supply Modules

Fixed and adjustable AC and DC power modules



## 7083 and 7087 FIXED DC POWER SUPPLIES

Fixed DC power supplies suitable for powering loop signal instrumentation.

**7083** – 2 independent 24V (2A) floating supplies

- 4mm shrouded output sockets
- Ripple: Typically 240mV
- Regulation: Typically 2%
- Over-volt and current overload protection

**7087** – 4 fixed independent floating supplies: 6V (8A), 12V (8A), 24V (4A), 48V (3A)

- 4mm shrouded output sockets
- Ripple and Noise: 50mV or 1% pk-pk, whichever is greater
- Over-volt and current overload protection
- Supplies can be connected in series to obtain an alternative output voltage



## 7075 FIXED 110V DC POWER MODULE

The 7075 provides an isolated DC supply. Output is pre-specified between 96 and 144 volts with a current capacity up to 7.5 amps. Output voltage and current are monitored on two analogue moving coil meters, access is from two 4mm shrouded sockets.

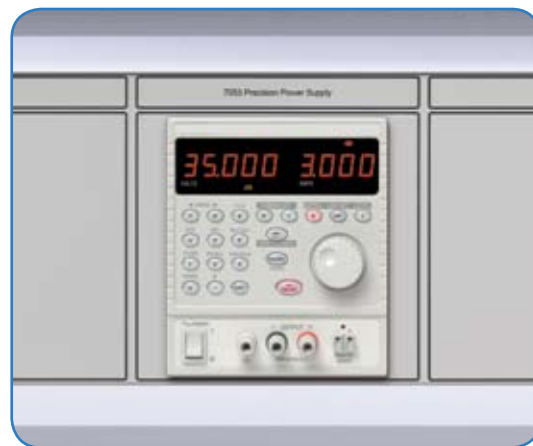
- 96V to 144V preset single fixed output
- Output Current 7.5A max (limit to 800 watts)
- 4mm shrouded output sockets
- Line regulation:  $\pm 0.1\%$
- Load regulation:  $\pm 0.5\%$
- Output accuracy:  $\pm 1.5\%$  of reading
- Output ripple ( $> 50\text{Hz}$ ):  $< 50\text{mV rms}$
- Hold up time:  $> 5\text{ms}$



## 7052 ADJUSTABLE DC POWER SUPPLY

A high performance linear regulated DC power supply with true analog controls and digital functionality.

- 0 to 30V, 0.1mA to 3A (90W maximum)
- High accuracy four digit meters have a fixed resolution for consistent readings
- Low current range gives 0.1mA meter resolution and finer low current setting
- S-Lock function - instantly lock settings
- V-Span function - customise the voltage range
- Independent, isolated tracking, ratio tracking
- DC output switches and "view limits" button
- Safety binding post terminals
- Programmable version available (USB, RS-232, LAN) - 7052P



## 7053 PRECISION ADJUSTABLE DC POWER SUPPLY

A DC linear power supply with high accuracy, resolution, stability and noise. Multiple output ranges provide increased current capability at lower voltages. An advanced user interface gives superior control, combining speed with safety.

- Single Output, 3 ranges: 0 to 56V, 0 to 2A. 0 to 25V, 0 to 4A. 0 to 56V, 0 to 500mA
- 112W maximum output power
- 1mV setting resolution at all output voltages
- Setting by direct numeric entry or spin wheel
- Multiple non-volatile setting memories with preview
- OVP and OCP trips with alarm output
- Selectable remote sense terminals
- Programmable version available (USB, RS-232, GPIB) - 7053P

## 7054 and 7055 HIGH VOLTAGE ADJUSTABLE DC SUPPLIES

Precision linear regulated DC power supplies with high power density and smart analog controls for voltages up to 120V or 250V.

- 7054: 0 to 120V / 0.01mA to 750mA (90W maximum)
- 7055: 0 to 250V / 0.01mA to 375mA (94W maximum)
- High accuracy four digit meters have a fixed resolution for consistent readings
- Low current range gives 0.1mA meter resolution and finer low current setting
- S-Lock function - instantly lock settings
- V-Span function - customise the voltage range
- Isolated analog remote control of voltage and current
- Low current range and current meter averaging
- Programmable version available (USB, RS-232, LAN) - 7054P and 7055P



## 7056 DUAL ADJUSTABLE DC POWER SUPPLY

A quad-mode dual output power supply with two identical outputs as per the 7052, with tracking and parallel modes.

- Dual outputs of 0 to 30V, 0.1mA to 3A (90W maximum)
- Single output of 0 to 30V, 0.2mA to 6A (180W maximum)
- 4 modes: Independent, isolated tracking, isolated ratio tracking, & true parallel
- In parallel mode power is channelled to the Master output for supply up to 6A
- In tracking mode the outputs can be wired in series to generate 0 to 60V
- High accuracy four digit meters have a fixed resolution for consistent readings
- Low current range gives 0.1mA meter resolution and finer low current setting
- Safety binding post terminals
- Programmable version available (USB, RS-232, LAN) - 7056P



## 7088 ADJUSTABLE AC POWER SUPPLY

The 7088 provides variable 50Hz AC power up to 10A. Two meters monitor the output voltage and current which is available from the front panel socket.

- Variable output voltage from 0 to 110% above line input
- 0 to 265V 50Hz, 10A at 240V input
- 0 to 121V 50Hz, 10A at 110V input
- Simple front panel analogue deviation control
- 0 to 10A output current
- Input fuse 10A slow blow
- Output circuit breaker: 10A (medium response time)
- AC moving iron meters to standard DIN specification
- Various socket types: UK 13A, Euro Shuko 16A, Indian Round Pin 15A, US 15A



## ADDITIONAL POWER MODULES

Further AC and DC power modules can be fitted in the bench consoles. These include fixed AC supplies, variable AC/DC supplies, 3 phase controllers, and custom fitted modules for specific user requirements.

- 7076 - 110V Fixed 8A AC Module (shown)
- 7043 - 3 phase mains controller module (shown)
- 7086 - 60V DC 3A Adjustable Power Supply (also see 7053)
- 7046 - Variable AC/DC Power Supply. AC 500VA, DC 400W, Freq 40 - 500Hz
- 7047 - Variable AC/DC Power Supply. AC 1000VA, DC 800W, Freq 40 - 500Hz
- 9758B - DC Electronic Load, 80A, 80V, 300W (see page 23)
- 7063 - Isolated mains output sockets for 7082 mains power module
- Customer specified power modules (supplies, sockets, controllers etc)





# Pressure Modules

Pressure calibrators, indicators, and controllers



## 7062 PRESSURE CALIBRATOR WITH REGULATOR 7059 VACUUM and PRESSURE CALIBRATOR

Regulated pneumatic pressure modules that are simple operation and high accuracy. The 7062 is pressure only, whilst 7059 is a combined vacuum and pressure calibrator.

- 7062 – Regulated low pressure: Vacuum, 0.2, 2, 5, 10, or 20bar versions
- 7059 – Dual Module with regulator: Vacuum plus 0.2, 2, 5, or 10bar versions

Range (bar)	Vacuum	0.2	2	5	10	20
Accuracy (%)	0.04	0.1	0.04	0.04	0.04	0.04
Resolution	.0001	0.01mbar	.0001	0.001	0.001	0.001

- 4.5 digit display
- 5 selectable pressure units
- Quick release fittings
- < 70ppm/°C temperature coefficient
- Over pressure warning
- Integrates with EasyCal software



## 7064 HIGH PRESSURE CALIBRATOR WITH REGULATOR

For pneumatic pressure calibration with versions available up to 200bar. Output pressure is controlled by a non-relieving type regulator, with bleed and block needle valves used to vent and isolate the output port. Common applications include testing pressure gauges and sensors.

Range (bar)	35	70	100	200
Accuracy (%)	0.04	0.04	0.04	0.1
Resolution	0.01	0.01	0.01	0.01

- 4.5 digit display
- 5 selectable pressure units
- Minimes fittings
- < 70ppm/°C temperature coefficient
- Over pressure warning
- Integrates with EasyCal software



## 7066 DIFFERENTIAL PRESSURE CALIBRATOR

A precision module designed for very stable measurement of differential pressures between its two output ports, enabling the calibration of differential pressure gauges, transducers, and transmitters.

Range (bar)	Vacuum	0.2	2	5	10
Accuracy (%)	0.04	0.1	0.04	0.04	0.04
Resolution	.0001	0.01mbar	.0001	0.001	0.001

- 4.5 digit display
- 5 selectable pressure units
- Quick release fittings
- 100ppm/°C temperature coefficient
- Over pressure warning
- Integrates with EasyCal software



## 7032 AUTOMATIC PRESSURE CALIBRATOR

A pneumatic pressure module designed to speed up routine calibration of pressure gauges, indicators and pressure transmitters. The user presets the required calibration points, typically 0%, 25%, 50%, 75%, 100% of full scale. If needed then other settings can be used, such as 0%, 10%, 50%, 70%, 95%.

Range (bar)	Vacuum	0.2	2	10
Accuracy (%)	0.04	0.1	0.04	0.04
Resolution	.0001	0.01mbar	.0001	0.001

- 4.5 digit display
- 5 selectable pressure units
- Quick release fittings
- < 70ppm/°C temperature coefficient
- Over pressure warning
- Integrates with EasyCal software

## 7030 PRECISION AUTOMATIC PRESSURE CALIBRATOR

The 7030 is a high performance calibrator that can control pressures to 0.005% stability across an extremely wide range, from vacuum to 210bar. Along with fully interchangeable SMART sensors, the 7030 provides a flexible and high accuracy solution for both industrial and metrological applications.

- Ranges from vacuum to 210bar
- Accuracy 0.01% F.S.D.
- Control Stability 0.005% F.S.D.
- Full colour touch-screen user interface
- Easy-to-use intuitive control menu
- Interchangeable SMART Sensors
- Integrates with EasyCal software



## 7038 and 7065 PRESSURE INDICATORS

Indicator modules with versions available up to 600bar. The 7038 has loop current measure, min/max logging (pressure & current), and leak rate display features. Fittings are quick release under 20bar and minimes from 35 to 600bar.

- 7038 – Multifunction Pressure Indicator (pneumatic or hydraulic input connection)
- 7065 – Standard Pressure Indicator (pneumatic or hydraulic input connection)

Range (bar)	Vac	0.2	2	5	10	20	35	70	100	200	400	600
Accuracy (%)	0.04	0.1	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.1	0.1	0.1
Resolution	.0001	0.01mb	.0001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	0.1	0.1

- 4.5 digit display
- 5 selectable pressure units (7066)
- 9 selectable pressure units (7038)
- < 70ppm/°C temperature coefficient
- Over pressure warning
- Integrates with EasyCal software



## 7084 LINE PRESSURE CONTROLLER

The 7084 is used to provide adjustable regulated pressure for connection bench modules and external pressure devices. Incoming pneumatic line pressure is connected via the rear of the console, with output via the front panel port. The 63mm gauge displays the regulated line pressure.

Range (bar)	5	35	70	100	200
Accuracy (%)	0.04	0.04	0.04	0.04	0.1
Resolution	0.001	0.01	0.01	0.01	0.01

- Pneumatic self-relieving regulator
- Front panel output connection
- Quick test fittings
- 63mm anti-shock analogue gauge
- Needle isolation valve
- Pneumatic input connection



## PRESSURE MODULE CONNECTORS, KITS, and EXTRAS

A full range of accessories for pressure calibration and generation are available. These include bench fitted options, connection kits, and accompanying instruments and tools.

- Set of hoses/adaptors for connections to modules and pumps (7073)
- Minimes high pressure hose test kit (7097 shown)
- Air preparation and filtration kits
- Pneumatic and hydraulic calibration pumps (7090/7095, see page 24)
- Pneumatic and hydraulic dead weight testers (see page 24)
- Portable pressure calibrators for use outside the laboratory (see page 24)
- Line pressure tools - Compressors, vacuum pumps, boosters (see page 26)
- Customer specified modules and instruments







# Temperature and Loop Modules

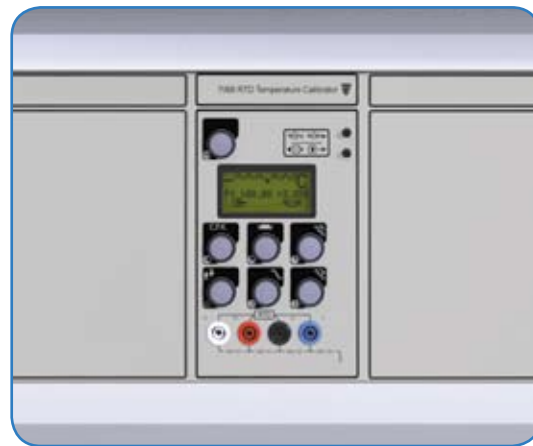
Loop calibrators, RTD and thermocouple calibrators



## 7085 TEMPERATURE DISTRIBUTION PANEL

A temperature distribution panel module that switches 7 thermocouple inputs and 1 RTD reference to a common output.

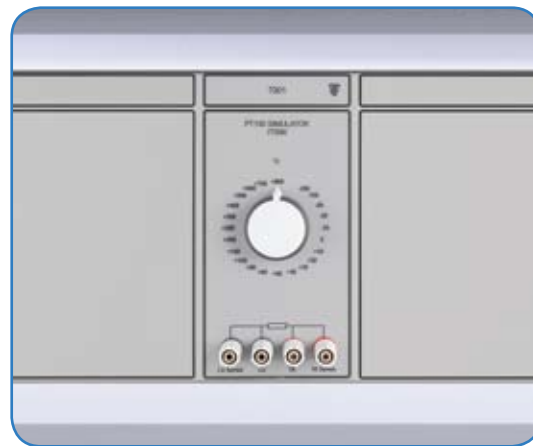
- Cold junction temperature display
- Records min/max ambient temperatures
- Integrates with 7051 and EasyCal
- Clear visual display of temperature (LCD)
- Suitable for use with dry block calibrators
- Automatic switching version available (7085A)



## 7068 PROGRAMMABLE RTD TEMPERATURE CALIBRATOR

A calibrator for accurately simulating and measuring the most commonly used RTD probes. The 7068 is specifically designed to automate and to speed up the task of calibrating instrumentation used in the process control industry. It can also be used as a temperature reference for dry block and other precision temperature baths.

- Temperature – Accuracy 0.05°C (0.09°F). Resolution 0.01°C (0.02°F)
- Resistance – Accuracy 0.03Ω. Resolution 0.01Ω
- 2, 3, and 4 wire connections
- Measure and simulate °C, °F, °K, and ohms
- Ramp and step
- PT100 plus 7 other RTD types
- User programmable



## 7001 CLASS A °C PT100 SIMULATOR

A precision simulator for PT100 0.3850 platinum resistance elements used for accurate temperature measurement. High performance metal film resistors are used throughout to ensure a good temperature coefficient and long term stability.

- -200°C to +800°C with 23 set points
- Accuracy  $\pm 0.3^\circ\text{C}$
- Less than 30ppm/°C temperature coefficient
- ITS-90 IEC60751
- Exceeds class A
- Passive resistance source
- °F version available (-100°F to 1000°F,  $\pm 0.5^\circ\text{F}$  accuracy)



## 7077 TEMPERATURE PROCESS CALIBRATOR

A key-press operation module that combines source and measurement functions for thermocouples, RTDs, mV and mA. The 7077 features a memory storage function that holds frequently used values.

- Measures/simulates 8 thermocouple types, PT100-RTD, mV and mA
- Displays units in °C, °F,  $\mu\text{V}/\text{mV}$ , or mA
- Automatic or manual cold junction compensation
- 10 point memory recall feature
- Inching and step functions with time configurable steps
- Process loops 4 to 20mA and 0 to 50mA
- 24V loop drive voltage

## 7061 MULTIFUNCTION PROCESS CALIBRATOR

A process calibrator that combines the essential functions of measurement and simulation of volts, millivolts, milliamps, and ohms with the direct readout simulation of thermocouples and RTDs in °C or °F units.

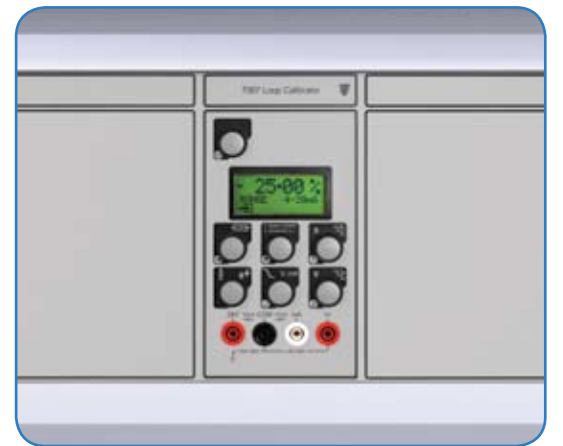
- Measure (3 ranges) up to 400V, 400mA, 40kΩ
- Output voltage (3 ranges) up to 10V, 1 $\mu\text{V}$  resolution
- Output current (3 ranges) up to 20mA, 1 $\mu\text{A}$  resolution
- Output resistance: 0 to 400Ω, 0.01Ω resolution
- Thermocouple measure and simulate: J, K, T, E, R, S, B, N
- RTD measure and simulate: PT100
- Ramp function



## 7067 LOOP CALIBRATOR

A high accuracy module for the calibration and simulation of voltage and current loops with source and measure capabilities.

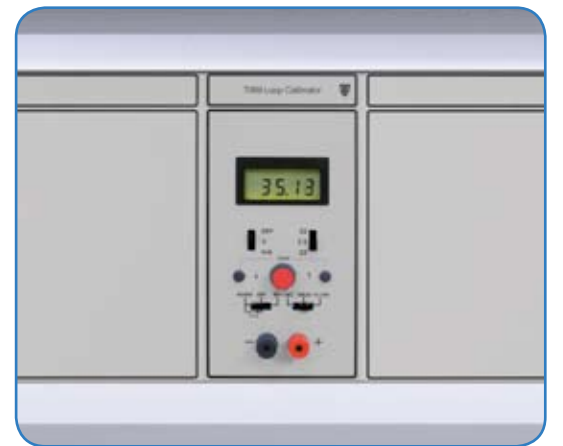
- Loop current/voltage source (simulating a transmitter and the loop supply)
- Sink of loop current (simulating a transmitter)
- Measurement of loop current/voltage (simulating a loop indicator)
- Current measurement: 125mA, source 50mA. Resolution 1 $\mu\text{A}$
- Voltage measurement: 25V, source 21V. Resolution 1mV
- Accuracy 0.01%
- Transmitter and square root functions
- Auto-ranging feature
- Programmable steps and ramp



## 7069 VOLTAGE/CURRENT/LOOP CALIBRATOR

A voltage, current, and process loop calibrator for ideal for process control applications. The 7069 combines digital accuracy with simple analogue control and is well suited to plant operations such as powering control loops.

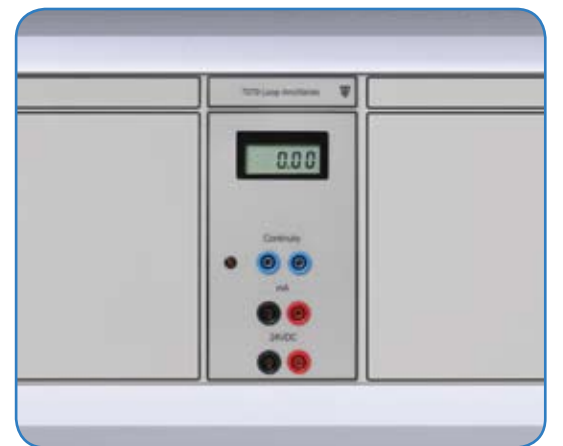
- Source/measure voltage and current
- 3 source ranges: 0 to 22mA and 0 to 22V
- 3 measure ranges: 0 to 70mA and 0 to 50V
- Accuracy 0.02%
- Transmitter simulator/sink loop control
- Output steps and ramps
- Fine adjustment (inching)



## 7079 LOOP ANCILLIARIES CALIBRATOR

A simple operation module suitable for powering process instrumentation such as pressure transmitters that require an external loop supply (4-20mA). An RS232 connection is available at the rear of the console enabling communication for data read back using EasyCal calibration software.

- Loop measure 0 to 199.99mA
- Continuity test (100Ω threshold or below - audible/visual indication is given)
- 24V output for powering 4 - 20mA loops
- 4.5 digit display
- Overload protection to loop
- Supply line protection by F250mA fuse
- RS232 connection - Allows read back with EasyCal software





# Electrical Test, DMMs, and Scope Modules

Insulation tester calibrators, digital multimeters, and oscilloscopes



## 5068B INSULATION TESTER/MEGOHMMETER CALIBRATOR

A precision module for calibrating general purpose insulation testers and megohmmeters with test voltages up to 2.5kV.

- Insulation resistance from 100KΩ to 10GΩ
- Low ohm verification at 1Ω, 10Ω, 100Ω, 1KΩ
- Basic accuracy 1%
- Up to 2.5kV operation
- Continuous connection – no arcing
- Fully shrouded safety connectors
- Display of open circuit voltage (0 to 1.999kV or 0 to 2.50kV)
- Display of short circuit current (0 to 2mA or 0 to 20mA)



## 5065B DIGITAL MULTIMETER

A versatile 6½ digit multimeter module with 19 measurement functions. Simple operation, stability, and high accuracy make the 5065B an ideal DMM for a variety of applications.

- 6½ digit resolution
- Accuracy 0.005% DC voltage
- RS232 and USB interface
- Optional GPIB interface
- Temperature measurements
- SCPI command set
- High sample rate
- 10 channel scanner card option
- PC control via EasyCal software (7051 has equivalent DMM internal)



## 5075B DIGITAL MULTIMETER

A digital multimeter that combines high performance with simple operation. The 5075B easily measures from nanovolts to 10kV, from picoamps to 30 amps, from micro-ohms up to 1GΩ, from picofarads to 300μF, with up to 7½ digit accuracy.

- 7 digit resolution
- 10nV to 10kV, 10pA to 30A
- Resistance, capacitance, frequency
- 18ppm accuracy/best 1 year
- 10 channel low thermal emf scanner option
- 7051/PC control via EasyCal software
- GPIB interface (USB adaptor available)



## OSCILLOSCOPE MODULES

Oscilloscope modules with standard features including USB connectivity, automated measurements, limit testing, data logging, and context-sensitive help.

- 5.7" LCD colour display
- Autoset and signal auto-ranging
- External trigger output
- Probe check wizard

Model	Bandwidth	Channels	Sample Rate/Ch	Record Length
7021	70MHz	2	1.0GS/s	2.5k points
7022	70MHz	4	1.0GS/s	2.5k points
7023	100MHz	4	2.0GS/s	2.5k points
7024	200MHz	4	2.0GS/s	2.5k points
7026	500MHz	4	5.0GS/s	10k points

# Frequency Counters, Generators, & RF Modules

Universal frequency counters, waveform generators, RF, and EMC test modules

## 7027 3GHz UNIVERSAL FREQUENCY COUNTER

The 7027 is a high quality 3GHz universal frequency counter which offers period measurement, frequency ratio, pulse width and event counting.

- 0.001Hz to 3000MHz frequency range
- TCXO timebase with better than 1ppm stability
- Frequency, period, pulse width and totalise modes
- Reciprocal counting measurements
- High impedance measurement up to 125MHz
- Low pass filter, attenuator and trigger level control
- AC or DC coupling, 1M/50Ω selection, polarity invert
- Large 10 digit LCD display with annunciators
- Remote control and readback via USB



## 7029 and 7031 FUNCTION GENERATORS

High performance DDS arbitrary/function generators that offer high quality standard waveforms, high speed arbitrary waveforms, and full pulse generator facilities.

- 1μHz to 50MHz (7031) or 25MHz (7029); 14 digits or 1μHz resolution
- Sine, square, ramp, pulse, sin(x)/x, noise, exponential logarithmic rise waveforms
- True pulse generator with variable delay and variable rise/fall
- Arbitrary waveforms of up to 128K points at up to 125MS/s
- Waveform storage using USB flash drives
- Large graphic LCD with simultaneous text and waveform display
- Internal and external digital modulations including AM, FM, PM, PWM, and FSK
- 20mV to 20V pk-pk output from 50Ω; plus multifunction aux. out
- Programmable via USB and LAN interfaces
- Also available: 7028 10MHz DDS function generator (6 digits or 1mHz resolution)



## 7048 SYNTHESISED RF SIGNAL GENERATOR

A signal generator with the essential features required for most development, test and service work. The 7048 has high frequency accuracy and stability, wide dynamic range, low phase noise and leakage, and flexible modulation capabilities.

- 150kHz to 2000MHz frequency range
- 10Hz setability, ± 1ppm frequency stability
- Locking to external frequency standard
- -127dBm to +7dBm amplitude, 0.1dB steps
- AM, FM and Phase modulation, internal or external
- 80 character back-lit LCD display
- Keyboard and rotary encoder control
- Full remote control via RS232 and GPIB
- Also available - 7028 6GHz signal generator



## 7170 MAINS/HARMONICS ANALYZER

A fast, easy to use power and harmonics analyzer with a large and high resolution graphical display, capable of continuous real-time analysis. The 7170 is suitable for both the product development environment and for production line test verification.

- Compliance quality measurements to EN61000-3-2 and EN61000-3-3
- Measures peak/rms voltage or current, real/apparent power, power factor, phase
- Tabular/histogram of 40 harmonics
- Voltage/current waveforms displays
- Continuous analysis with real-time graphical update
- 320 x 240 pixel high-contrast display
- USB, RS232 and printer interfaces fitted
- PC control and documentation software supplied
- Accompanying module 7171: 1kW low-distortion source







# Additional Bench Modules

Extra modules for communication, calibration, and more



## 9758B DC ELECTRONIC LOAD MODULE

The 9758B electronic load works by putting a required DC load across a power source under test. It can be also be used to investigate the behaviour of many different types of power source such as batteries, solar cells, fuel cells or wind generators, as well as electronic power supply units.

- Constant current, resistance, conductance, voltage and power modes
- Wide voltage and current range, 0 to 80 volts and 0 to 80 amps
- 300 watts continuous dissipation at 40°C
- Ten turn controls for level setting
- Built-in transient generator with variable slew
- Current monitor output for waveform viewing
- Variable drop-out voltage for battery testing
- Analogue remote control capability



## 7002H HART COMMUNICATOR MODULE 7002FB FOUNDATION FIELDBUS MODULE

Available as two independent modules or a combined Hart and Fieldbus unit as shown. Enables communication with Hart and Fieldbus devices.

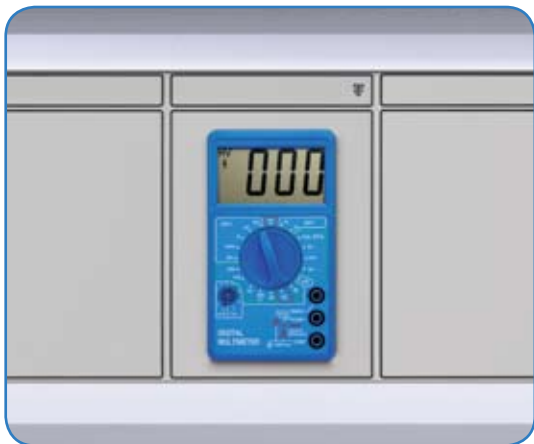
- EasyCal software communication programs for Hart and Foundation Fieldbus
- Provides monitoring of primary values and sensor outputs
- Provides conditioned power and network termination
- Device configuration and read back



## BENCH MODULE MODIFICATIONS

CalBench modules can be modified to incorporate features and functions depending on customer applications. These can be simple additions such as extra power sockets and input/output ports or internal fittings and components to provide extended capabilities.

- Existing modules can be modified to include specific functions
- Touch screen PC only module - 10.5" LCD display (shown)
- Automatic switching version of 7085 temperature distribution panel
- Programmable versions of DC power supplies 7052, 7053, 7054, 7055, and 7056
- Additional sockets, fittings, and connections on modules
- Interchangeable SMART sensors for 7030 automatic pressure calibrator
- Customer specified hand wheel types for regulators on high pressure modules



## CUSTOM DESIGN MODULES

Specific devices and instruments can be custom fitted into the bench as per customer requirement. This allows the user to integrate a familiar instrument into the workstation.

- Modules built from range of portable/benchtop instruments
- External instruments such as handheld DMMs, analyzers, and more
- Fitted instruments can be configured to communicate with EasyCal software
- Additional power sockets and controller modules
- Solder station modules
- Portable instruments can be fitted to perforated back panel for easy removal
- Empty module space can be made into shelving for tool storage
- Depth constraints are 425mm for the primary console, 200mm for the secondary.

# Pressure Instruments for Lab and Field

Pumps, dead weight testers, and portable calibrators

## 7090 PNEUMATIC CALIBRATION PUMP 7095 HYDRAULIC CALIBRATION PUMP

Pneumatic and hydraulic calibration pumps that combine high performance with durability. Features include contoured cushioned handles for comfort and dual o-rings on all pistons to ensure zero leakage.

- 7090 – Pneumatic pressure to 40bar, Vacuum to -950mbar
- 7095 – Hydraulic pressure to 700bar
- Non-oil based lubricant used on all moving parts
- Both supplied as kits with carry case, hoses, and fittings
- 7090 – H200 x w125mm, weight 0.91kg
- 7095 – H240 x w125mm, weight 1.4kg
- Digital pressure gauges available



## HYDRAULIC and PNEUMATIC DEAD WEIGHT TESTERS

High accuracy and robust dead weight testers that are the primary standard for pressure calibration. Each model is supplied with software that allows the users to correct for the effects of environmental factors such as gravity and temperature and to determine the precise pressure generated by the dead weight testers.

Model	Type	Range	Standard Accuracy	Class 'A' Accuracy
7190	Hydraulic	1 to 700bar	0.015%	0.007%
7191	Hydraulic	1 to 1200bar	0.015%	0.007%
7192	Hydraulic	1 to 2600bar	0.02%	0.008%
7193	Pneumatic	1 to 120bar	0.015%	0.006%



## 7010 SINGLE CHANNEL PRESSURE CALIBRATOR 7015 DUAL CHANNEL PRESSURE CALIBRATOR

Portable battery or mains powered pressure calibrators designed for both lab and field applications. Controls equivalent to bench pressure modules.

- Vacuum, 0.2, 2, 5, 10, 20, 35, 70, 100, 200, 400, or 600bar versions
- Accuracy 0.04% of full scale
- Pneumatic or hydraulic
- Up to 5 selectable engineering units per channel
- Loop current measure
- 24/36V loop power
- Over-pressure alarm
- RS232 serial interface and EasyCal software compatible
- W270 x H175 x D250mm, weight 3kg



## 7016 REGULATED LOW PRESSURE CALIBRATOR 7018 DIFFERENTIAL PRESSURE CALIBRATOR

Portable pressure calibrators that are rugged design and simple operation. Suitable for pneumatic field calibration. Controls equivalent to pressure modules.

- 7016 – Regulated low pressure: Vacuum, 0.2, 2, 5, 10, or 20bar versions
- 7018 – Differential pressure: Vacuum, 0.2, 2, 5, 10bar versions
- Pneumatic
- Up to 5 selectable engineering units
- Loop current measure
- 24/36V loop power
- Over-pressure alarm
- RS232 serial interface and EasyCal software compatible
- W270 x H175 x D250mm, weight 3kg





# Additional Calibration Instruments

Portable test instruments for use in the lab or field

# Supporting Laboratory Equipment

Air supply tools, test kits, repair and maintenance, and ESD options



## DRY BLOCK CALIBRATORS

Precision compact dry block calibrators for calibration of RTDs, thermocouples, thermoswitches, thermistors, and other common temperature sensing devices.

- Interchangeable inserts
- Multi information display
- Multi-hole insertion tubes
- Auto stepping
- MVI Mains Variance Immunity
- EasyCal software compatible

Model	Temp Range	Heating Time	Accuracy	Stability	Immersion depth	Insert diameter
7070	-17 to 140°C	15 min	0.4°C	0.05°C	115mm	19 mm
7071	33 to 320°C	4 min	0.5°C	0.1°C	110mm	26 mm
7072	33 to 650°C	20 min	0.9°C	0.1°C	110mm	26 mm



## 1090 PROCESS and TEMPERATURE CALIBRATOR

A precision calibrator that combines source and measurement functions for thermocouples, RTDs, mV and mA. The 1090 features a memory storage function that holds frequently used values. It is equivalent to the 7077 bench module.

- Measures/simulates 8 thermocouple types, PT100-RTD, mV and mA
- Displays units in °C, °F,  $\mu$ V/mV, or mA
- Automatic or manual cold junction compensation
- Inching and step functions with time configurable steps
- Process loops 4 to 20mA and 0 to 50mA
- 24V loop drive voltage
- Mains or battery operation – 60 hours typical use between charges
- Supplied with battery charger and carry case
- H235 x w150 x D75mm, weight 1.2kg



## 7005 VOLTAGE/CURRENT/LOOP CALIBRATOR

A handheld instrument for the calibration and simulation of voltage and current loops. The 7005 is equivalent to the 7067 bench module.

- Current measurement: 125mA, source 50mA. Resolution 1 $\mu$ A
- Voltage measurement: 25V, source 21V. Resolution 1mV
- Accuracy 0.01%
- Transmitter and square root functions
- Auto-ranging feature
- Programmable steps and ramp
- 9 hours typical use between charges
- Supplied with battery charger and carry case
- H165 x w90 x D45mm, weight 0.42kg



## 1067 – 6 DECADE PRECISION RESISTANCE BOX

A wide range of decade boxes for resistance, capacitance, and inductance. The 1067 is suitable for simulating and calibrating PT100 sensors and temperature indicators/meters that use resistive sensors.

- Range 0 to 12k $\Omega$  in 10m $\Omega$  steps, accuracy  $\pm$  0.01%
- Residual Resistance: Less than 10m $\Omega$ . Less than 1m $\Omega$  variation
- Power Rating: 0.35 watt per resistor
- Stability: 20ppm/year (>1 $\Omega$ ), 100ppm/year (<1 $\Omega$ )
- Voltage Rating: Maximum 200V DC/AC RMS
- Temperature Coefficient: 10ppm/°C (20ppm/°C below 1 $\Omega$ )
- Dimensions / Weight: w355 x H63 x D89mm / 1.1kg
- Other resistance, capacitance, inductance decade boxes available

## AIR COMPRESSORS, BOOSTERS, VACUUM PUMPS

For customers that require the supply of line pressure and vacuum to the CalBench. Standard compressors are available for pressures under 10bar, with air amplifiers and gas boosters to achieve higher pressures up to 600bar.

- 8bar compressor – 8.7 cfm displacement/50L/2.5hp (7173)
- 10bar silent running compressor – 14.9 cfm displacement/24L/3.3hp (7174)
- Optional external 200L receiver tank for the 7174 (7189)
- Single end air amplifier system – increases line pressure from 7 to 34bar (7175)
- Gas booster power unit – increases line pressure from 8bar up to 600bar (7176)
- Electrical vacuum pump (7149 shown)
- Units can be housed in cabinets for sound proofing and protection
- Air preparation kits, filters, and regulators for clean supply



## ADDITIONAL CALIBRATION TOOLS and TEST KITS

For applications that cannot be performed using the modules fitted to CalBench. These include test weights for calibrating scales and balances, and gauge block sets for vernier calibration.

- Test Weight Set (Stainless steel F1 class, 6110g total weight)
- 1mm Base Steel Gauge Block Set - 103 blocks, Tolerance Grade 1
- Mass flow controllers differential pressure, for gas, ranging from 0.01ml to 1000L
- Decade boxes, portable test instruments and DMMs
- Benchtop calibrators and analytical instruments
- 82 piece electronics service kit (7183 shown)
- Customer specified calibration tools and kits



## REPAIR and MAINTENANCE EQUIPMENT

Various repair and maintenance instruments such as oscilloscopes can be fitted into the bench as modules. External equipment is also supplied for benchtop use.

- Standard solder station (7144, module version also available)
- Advanced solder station and rework kit (7145 shown)
- Benchtop fume extraction kit for the above (7147)
- Heavy duty benchtop vice (7150)
- Tabletop circuit board holder (7180)
- Magnifying lamp (7181)
- Benchtop turntable with locking mechanism (7154)
- 82 piece electronics service kit (7183 shown above)



## ESD EQUIPMENT and OPTIONS

CalBench is a class 1 instrument, so for protection a ground connection must be provided. Each bench has earth bonding between the consoles and frame, a separate protective earth terminal on rear of console, and PE connection on the 7082 mains controller module. Various extras are available upon request.

- Melamine faced ESD bench worktop. Anti-static, scratch, impact & stain resistant.
- Anti-static benchtop mats
- Grounding products
- Anti-static wrist wraps
- Anti-static labels, tapes, and bags
- Heel and toe grounders
- Static test meters







# Laboratory Design and Supply

Turnkey workshop design service and supply

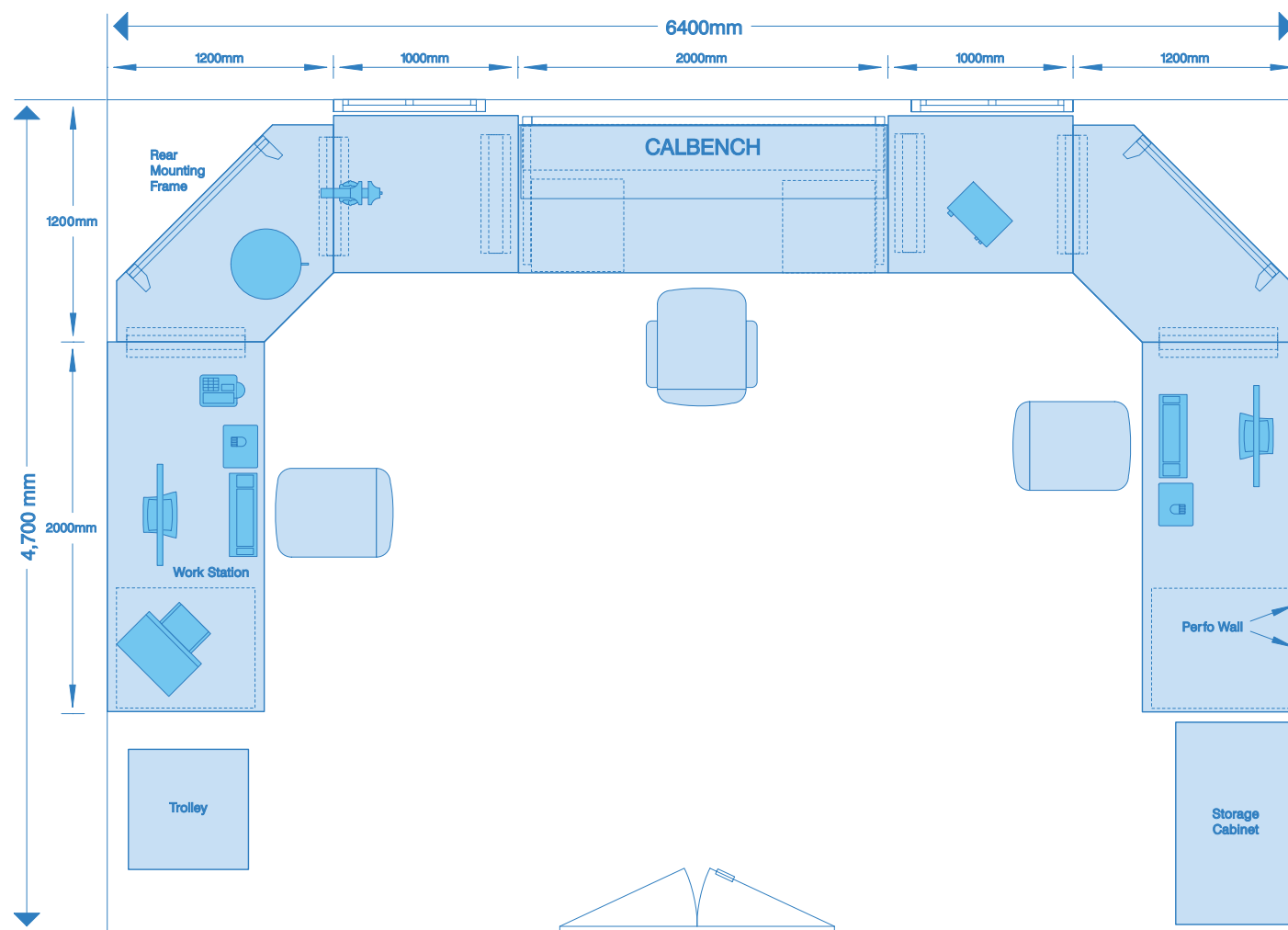
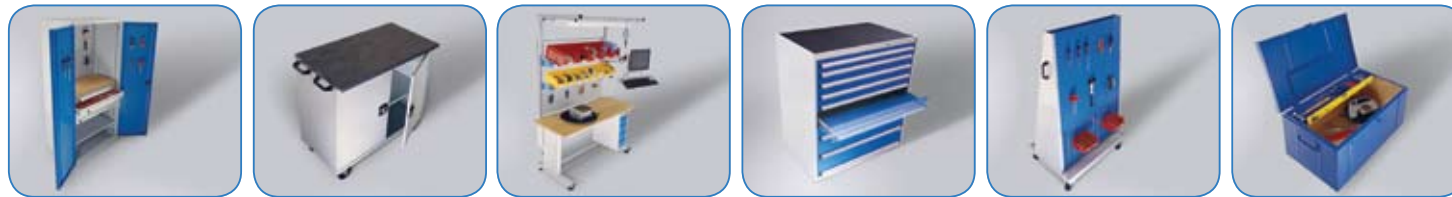
## THE DESIGN PROCESS

offer a turnkey design and supply service for customers requiring an efficient and ergonomic on-site calibration laboratory. It is created virtually, then supplied complete including all specified test instruments, tools, and furniture. CalBench acts as the primary work station of the laboratory, and is used for the main testing and verification workload.

The process starts by understanding the user's requirements and applications. Once this is determined the design team will firstly configure the suitable calibration bench or benches, and if necessary add supporting instruments for customer specific applications. Following this the workspace dimensions are supplied and the virtual design begins. Using custom software we create a 2D overview of the laboratory, then generate 3D images and videos to allow the end users to visualise the concept.

Each laboratory is designed to optimise the calibration process. This is accomplished by a dual approach of hardware and software. CalBench modules provide the functions to calibrate devices and instruments, whilst EasyCal software is the controlling platform for all work and management. It enables the operators to schedule workload, organise jobs, database and print/store information. It also speeds up calibration by automating test runs when used with the 7051 multifunction calibrator/DMM or other compatible bench modules and instruments.

In addition to the primary focus of calibration, the lab can incorporate customer designated areas of use. These could be stations for administration work, repair and maintenance, or storage units. Laboratories can be designed to be fully self-sufficient, including line pressure tools such as compressors and vacuum pumps.



## ON-SITE BENCH INSTALLATION, TRAINING, AND CALIBRATION

**On-site bench and lab installation:** A travelling engineer will visit the test facility and install and commission the CalBench, supporting instruments, and laboratory furniture. Our technicians can perform site visits worldwide and are qualified to work on offshore platforms, power and processing plants, and refineries.

**On-site training and demonstration:** Bench training can be included with the lab installation or scheduled for a later date. The technician will educate the users on how to set up the system and operate the bench modules and additional test instruments. They will also simulate the calibration process by demonstrating tests on actual devices at the site.



## CALIBRATION BENCHES and CONSOLES

7080	CalBench (W2000 x D850 x H1568/1413 mm). Includes frame, worktop, primary console, 7082 mains module. 1660mm module space. All modules can be fitted.
7081	Secondary Console (W2000 x D225 x H390 mm). 1925mm available module space.
- 7081S	Secondary Console Internal Shelf Version (page 4).
7060	Tabletop Bench Console (W1000 x D470 x H385mm). 830mm available module space.

### Standard Under Worktop Fittings (page 4)

7120	Cabinet with 1 door and 1 x shelf (W500 x D550 x H600mm)
7121	2 drawer Unit (W500 x D550 x H250mm)
7131	Combination Drawer/Cabinet Unit (W500 x D550 x H600mm)
7132	5 drawer Unit (W500 x D550 x H600mm)
7134	Slotted Divider Kit for drawers (3, 6, or 9 compartments)
7136	Soft Rubber Mat Insert for drawers inside 7121, 7131, 7132
7123	CPU Holder (Vertical)
7124	CPU Holder (Horizontal)

### Perforated Panel Options - only available without 7081 (page 4)

7125	20 piece Tool Hook Kit
7137	40 piece Tool Hook Kit
7138	60 piece Tool Hook Kit
7139	Shelf (W450 x D250 x H130mm)
7140	Shelf (W900 x D250 x H130mm)
7141	Storage Bin Strip (W450 x H75mm). With 4 x 1L bins
7142	Storage Bin Strip (W900 x H75mm). 6 x 3.5L or 4 x 10L bins
7143	Document Holder (W450 x H360mm)

## MODULES

### Multifunction Calibrator/Control Centre (for full listings with options see page 8)

7051	CalBench Control Centre and Multifunction Calibrator	425mm
- 9714B	10 Channel Scanner option (side module) for internal DMM	80mm

### Electrical and Power Supply Modules (page 15)

7082	Mains Power Controller (fitted as standard, socket type to be selected)	270mm
- 7063	Isolated mains output sockets for 7082 Mains Power Module	
7075	110V Fixed 7.5A DC Module with 2 shrouded 4mm safety sockets	160mm
7076	110V Fixed 10A AC Module	150mm
7043	3 phase mains controller Module	150mm
7083	Dual 24V DC Power Supply - 2 x 24v (2A)	131mm
7087	Quad DC Power Supply - 6V(8A), 12V(8A), 24V(4A), 48V(3A)	80mm
7052	30V DC 3A Adjustable Power Supply - Digital (programmable version 7052P)	150mm
7053	56V DC 4A Adjustable Power Supply - Digital (programmable version 7053P)	200mm
7086	60V DC 3A Adjustable Power Supply - Digital	168mm
7054	120V DC 750mA Adjustable Power Supply (programmable version 7054P)	150mm
7055	250V DC 375mA Adjustable Power Supply (programmable version 7055P)	150mm
7056	35V DC 4A Dual Adjustable Power Supply - Digital (programmable version 7056P)	295mm
7088	Adjustable AC Supply 0 - 270V/10A (or 110% above line voltage)	350mm
7046	Variable AC/DC Power Supply. AC 500VA, DC 400W, Frequency 40 - 500Hz	295mm
7047	Variable AC/DC Power Supply. AC 1000VA, DC 800W, Frequency 40 - 500Hz	500mm

### Pressure Modules and Connector Kits (page 17)

7062	Pressure Calibrator with regulator (Vac/0.2/2/5/10/20bar versions)	129mm
7059	Combined Vacuum/Pressure Calibrator (Vac and 0.2/2/5/10/20bar versions)	129mm
7064	High Pressure Calibrator with regulator (35/70/100/200bar versions)	200mm
7066	Differential Pressure Calibrator (0.2/2/5/10bar versions)	150mm
7032	Automatic Pressure Calibrator (0.2/2/5/10bar versions)	340mm
7030	Precision Automatic Pressure Calibrator (interchangeable sensors, versions up to 210bar)	500mm
7038	Multifunction Pressure Indicator (Vac/0.2/2/5/10/20/35/70/100/200/400/600bar versions)	100mm
7065	Pressure Indicator (Vac/0.2/2/5/10/20/35/70/100/200/400/600bar versions)	96mm
7084	Line Pressure Controller (5/35/70/100/200bar versions)	150mm
7073	Set of hoses/adaptors for connections to modules and pumps	
7097	Minimess high pressure hose test kit	
7148	Air Preparation Kit (Mounted on bench rear under panel or specified by customer)	

Pressure option codes for 7062, 7059, 7064, 7066, 7032, 7038, 7066, and 7084:

Range (bar)	Vac	0.2	2	5	10	20	35	70	100	200	400	600
Option Code	7111	7100	7101	7102	7103	7104	7105	7106	7107	7108	7109	7110

## MODULES

### Temperature and Loop Modules (page 19)

7001	PT100 Simulator Module	95mm
7085	Temperature Distribution Module (Thermocouple and RTD)	250mm
7085A	Auto Switching Temperature Distribution Module (requires 7051)	250mm
7068	RTD Temperature Calibrator Module	107mm
7077	Temperature and Process Calibrator Module	295mm
7061	Process Calibrator Module	285mm
7067	Precision Loop Calibrator Module	97mm
7069	V-I Loop Calibrator Module	97mm
7079	Loop Ancillaries Module	96mm

### Digital Multimeter and Electrical Test Modules (page 21)

5075B	Precision Digital Multimeter Module	500mm
5065B	6.5 Digital Multimeter Module	295mm
5068B	Insulation Tester Calibration Module (100kΩ - 10GΩ)	295mm

### Oscilloscope Modules (page 21)

7021	Digital Oscilloscope Module - 60MHz, 2 channel, colour LCD display	425mm
7022	Digital Oscilloscope Module - 60MHz, 4 channel, colour LCD display	425mm
7023	Digital Oscilloscope Module - 100MHz, 4 channel, colour LCD display	425mm
7024	Digital Oscilloscope Module - 200MHz, 4 channel, colour LCD display	425mm
7026	Digital Oscilloscope Module - 500MHz, 4 channel, colour LCD display	425mm

### Frequency Counters / Function Generators / RF / Harmonics Modules (page 22)

7027	3GHz Universal Frequency Counter	295mm
7028	10MHz DDS Function Generator	295mm
7029	25MHz Function/Arbitrary/Pulse Generator	295mm
7031	50MHz Function/Arbitrary/Pulse Generator	295mm
7048	2GHz Synthesised Signal Generator (AM, FM, phase modulation)	295mm
7058	6GHz Signal Generator	295mm
7170	Mains/Harmonics Analyzer including Flicker	400mm
- 7171	1kW Low Distortion Power Source (side module for 7170)	400mm

### Additional Modules

9758B	DC Electronic Load, 80A, 80V, 300W (aids power supply calibration)	295mm
7002H	Hart Communication Module	100mm
7002FB	Foundation Fieldbus Module (7002H+FB can be combined module)	100mm

## EXTERNAL EQUIPMENT

### Pressure / Temperature / Flow / Repair and Maintenance / ESD Equipment (page 23 to 26)

7090	Pneumatic Pump Kit (-950mbar to 40bar) hoses, fittings, case	7072	Dry Block Calibrator (33 to 650°C)
- 7091	Digital Pressure Gauge (Vacuum to 30bar, 0.2% Accuracy)	7177	Mass Flow Controller 0.1 to 10 L/min (other ranges available)
- 7089	Digital Pressure Gauge (0 to 40bar, 0.25% Accuracy)	7178	1mm Base Steel Gauge Block Set - 103 pc, Tolerance Grade 1
- 7078	Auto Ranging Digital Gauge (Vac to 200bar, 0.1% Accuracy)	7179	Test Weight Set (Stainless steel F1 class, 6110g total weight)
7095	Hydraulic Pump Kit (0 to 700bar) with hoses, fittings, case	7144	Standard Benchtop Solder Station
- 7096	Digital Pressure Gauge for 7095 (0 to 700bar, 0.25% Accuracy)	7145	Benchtop Solder Station and Rework Kit
7190	Hydraulic Dead Weight Tester (1 to 700bar, 0.015% accuracy)	- 7146	Extra Solder Tips for the above solder stations (3 piece set)
7191	Hydraulic Dead Weight Tester (1 to 1200bar, 0.015% accuracy)	- 7147	Benchtop Fume Extraction kit for above solder stations
7192	Hydraulic Dead Weight Tester (1 to 2600bar, 0.02% accuracy)	7150	Heavy Duty Vice with jaw width 120mm (other widths available)
7193	Pneumatic Dead Weight Tester (1 to 120bar, 0.015% accuracy)	- 7151	Turntable for above vice
7173	8bar Compressor (8.7cfm displacement/50L/2.5hp)	7180	Table top Circuit Board Holder
7174	10bar Silent Compressor (14.9 cfm displacement/24L/3.3hp)	7181	Magnifying Lamp (175mm diameter. 1.75x, 2.25x, or 3x mag lens)
- 7189	External receiver tank (200L) for 7174	7182	Table Base for magnifying lamp
7149	Electrical Vacuum Pump	7154	Benchtop Turntable with locking mechanism
7175	Single End Air Amplifier System	7183	Electronic service case (82 tools)
7176	Gas Booster Power Unit (for high output pressure)	7185	Melamine Faced ESD Tabletop for CalBench
7070	Dry Block Calibrator (-17 to 140°C)	7186	ESD wrist band with cable
7071	Dry Block Calibrator (33 to 320°C)		

MULTI-TEK INTERNATIONAL, email:mti@multitekintl.com, www.multitekintl.com

# SECTION 3

Tools

# **ITEM**

## **3.1+3.2**

# Short-circuiting and earthing systems



Below 1000V

Overhead lines systems

Consumer units system

Jumper cables

## Short-circuiting system for consumer units

The link assemblies, included in this equipment, consist of extra flexible 16 mm<sup>2</sup> multistrand copper cable with an IEC 1230 silicone envelope, recommended for indoor equipment.

The elements contained in the case can be used for establishing the equipment suited to the unit to be processed.

The cartridge equipment is intended for HBC 22 x 58 mm fuse cartridge connection boxes and knife cartridges size 00.

The knife equipment is intended for connection boxes or knife switch networks.

The mini-clip equipment is designed for the short-circuiting of take-off boxes more particularly using intermediate parts (sockets with 10 mm Ø terminals and M8 hexagonal end).

The standard equipment for a three phase installation includes: the sets of cartridges, knives or mini-clips for adaptation to any type of unit, the interconnecting assemblies consisting of 4 extra flexible 16 mm<sup>2</sup> copper cables connected at the center by a connector, 1 installation and crimping kit.

Rating: 4 kA/1s

Weight: 4.3 kg.



Reference	Composition
MC-290/2	8 cartridges 8 cartridges type "00" 8 clamps 8 M8 connections 2 (280 x 320 mm) cable connections 2 (370 x 440 mm) cable connections 1 M8 key wrench 1 right angle hexagonal key wrench 4 mm 1 13/17 and 14 mm open end spanner 1 handle MC-161

## Short-circuiting system for L.V equipment ISOSTOP™ system

Rating: 6 kA/1S

Standard equipment composition: 1 or 2 sets of 3 knives, cables connections: H07 RN-F 25 mm<sup>2</sup>, 1 earth clamp MT-841  
1 handle MC-161.

Reference	Composition	Weight (kg)
MC-165/40	3 MC-160 earth cable 0.60 m	4.00
MC-175/40	3 MC-115 earth cable 0.60 m	3.75
MC-166/40	3 MC-115 3 MC-160 earth cable 0.60 m	5.60
MC-166/60	3 MC-115 3 MC-160 earth cable 6 m	7.50



## Jumper cable with clamps on insulated handle

2 clamps on insulated handle - MT-315

Capacity (mm): Ø 4 - 27 - 40

Cable connection: 35 mm<sup>2</sup>

Rating: 6 kA/1s

Continuous rating: 75 A

Clamp material: copper aluminium alloy

1 insulated cable

Length: 1 m, Section: 25 mm<sup>2</sup>.

MT-315/2	Dimensions: 40 x 60 x 910 mm - Weight: 0.530 kg
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LOW VOLTAGE



**ITEM**

**3.3**

## Low voltage complete set

Complete equipment for live line (L.V.) interventions.



**MO-510-03-EX** Tool bag not included (MO-34)

### Personnel equipment

**MO-11001** 1 safety glasses

**CG-98** 1 working gloves

### Voltage detector

**MS-911-EX** 1 voltage multitester

### Insulating

**CG-05-B** 1 rubber gloves size B

**CG-36** 1 carrying bag for rubber gloves

**MP-42/16** 1 insulating mat

**MP-26-A** 10 insulating caps

**MP-35/12** 1 insulating blanket

**MP-39** 10 wood clamps for insulating blanket

**MP-32/15** 6 line protectors

**MP-19** 5 insulated adhesive tapes

### Insulated tools

**MO-61001** 1 stripping knife

**MO-67502** 1 cable cutter 230 mm

**MO-68008/19** 1 open end spanners set with  
8, 10, 11, 12, 13, 14, 17, 19 mm open end spanners

**MO-69903** 1 right angle hexagonal key wrench 3 mm

**MO-69904** 1 right angle hexagonal key wrench 4 mm

**MO-69906** 1 right angle hexagonal key wrench 6 mm

**MO-751** 1 insulating folding rule

**MO-69003** 1 adjustable spanner 250 mm

**MO-66002** 1 universal pliers 180 mm

**MO-66202** 1 round nose pliers 160 mm

**MO-66502** 1 water pump pliers 250 mm

**MO-67102** 1 side cutter 160 mm

**MO-69308/23** 1 sockets 3/8" wrench set with  
10 sockets: 8, 10, 12, 13, 14, 17, 19, 21, 22, 23

**MO-65205** 1 flat blade screwdriver 4 x 100

**MO-65207** 1 flat blade screwdriver 6,5 x 150

**MO-65209** 1 flat blade screwdriver 8 x 175

**MO-65232** 1 Phillips screwdriver n° 1

**MO-65234** 1 Phillips screwdriver n° 2

**MO-65236** 1 Phillips screwdriver n° 3

## Intervention kit for electricians

**MO-38510** Composition :

**M-87370** 1 Tool bag

**CG-02-C** 1 Pair of insulated gloves

**MO-11001** 1 Safety glasses

**AL-230** 1 Safety padlock

**MO-65204** Flat blade screwdriver  
3.5 x 100 mm

**MO-65206** Flat blade screwdriver  
5.5 x 125 mm

**MO-65209** Flat blade screwdriver  
8 x 175 mm

**MO-65242** Pozidriv screwdriver\*  
N°1 4.5 x 80 mm

**MO-65244** Pozidriv screwdriver  
N°2 6 x 100 mm

**MO-66002** Universal pliers overall length  
180 mm

**MO-66502** Water pump pliers overall  
length 250 mm

**MO-67302** End stripping pliers overall  
length 160 mm

**MO-66402** Bent snipe nose pliers overall  
length 160 mm

**MO-67500** Cable cutter overall length  
170 mm



# **ITEM**

## **3.4**

# Insulated tools



Tool sets

Below 1000V

Screwdrivers

Pliers

Cutters and pliers

Wrenches, spanners and sockets

Tool sets

## Tool bag

For intervention works, strong waterproof, canvas reinforced bottom, large capacity of storage, shoulder strap.



Reference	Characteristics	Weight (Kg)
M-87370	440 x 330 x 160 mm	1 100

## Tool bag

Black grained leather with handle. The interior includes: a pocket, a separation which forms a tool tray and a fold-down tool tray.



Reference	Characteristics	Weight (Kg)
MO-34	410 x 280 x 150 mm	3 200

## Insulated tool kits

For the most common operations, CATU proposes 4 kits of ISOMIL handtools.

Reference	Composition
KIT-03	MO-65242 Pozidriv screwdriver* N°1 4.5 x 80 mm
	MO-65244 Pozidriv screwdriver N°2 6 x 100 mm
	MO-65204 Flat blade screwdriver 3.5 x 100 mm
	MO-65206 Flat blade screwdriver 5.5 x 125 mm
	MO-65209 Flat blade screwdriver 8 x 175 mm

Reference	Composition
KIT-07	MO-66002 Universal pliers overall length 180 mm
	MO-66502 Water pump pliers overall length 250 mm
	MO-67302 End stripping pliers overall length 160 mm
	MO-66402 Bent snipe nose pliers overall length 160 mm
	MO-67500 Cable cutter overhall length 170 mm

Reference	Composition
KIT-04	MO-65242 Pozidriv screwdriver* N°1 4.5 x 80 mm
	MO-65244 Pozidriv screwdriver N°2 6 x 100 mm
	MO-65204 Flat blade screwdriver 3.5 x 100 mm
	MO-65206 Flat blade screwdriver 5.5 x 125 mm
	MO-65209 Flat blade screwdriver 8 x 175 mm
	MO-67302 End stripping pliers overall length 160 mm
	MO-66402 Bent snipe nose pliers overall length 160 mm
	MO-67500 Cable cutter overhall length 170 mm

Reference	Composition
KIT-05	MO-65242 Pozidriv screwdriver* N°1 4.5 x 80 mm
	MO-65244 Pozidriv screwdriver N°2 6 x 100 mm
	MO-65204 Flat blade screwdriver 3.5 x 100 mm
	MO-65206 Flat blade screwdriver 5.5 x 125 mm
	MO-65209 Flat blade screwdriver 8 x 175 mm
	MO-66002 Universal pliers overall length 180 mm
	MO-66502 Water pump pliers overall length 250 mm
	MO-67302 End stripping pliers overall length 160 mm
	MO-66402 Bent snipe nose pliers overall length 160 mm
	MO-67500 Cable cutter overhall length 170 mm



**ITEM**

**3.5**



# Electrical Safety KIT

## Serial CZ-53

Edition : 09 / 2009

Page 1/2

Technical sheet N° : CZ-53-GB



### FIELD OF USE

This kit is especially designed for safety electrical intervention.  
Operating voltage: **25 kV AC**.

### COMPONENTS

- 1 insulating stool (complies with specification EDF N°71).
- 1 yellow telescopic stick reference MT-830-P.
- 1 hook fitted with a voltage detector (127 V / 90 kV) reference CC-127-CS-C.
- 1 cable cutter reference CZ-60.
- 1 pair of insulating gloves reference CG-30-C.
- 1 protection case for the gloves reference CG-36-C.
- 1 pair of insulating boots reference MV-135 size 43/44 (complies with specification EDF MT 70 B).
- 1 talcum bottle.
- 1 adhesive tape reference AT-5005.
- 1 poster "first aid for electric shock victims" (language according to references).
- Visual instruction for use.

# Electrical Safety KIT

## Serial CZ-53

Edition : 09 / 2009

Page 2/2

Technical sheet N° : CZ-53-GB

REFERENCES	Poster « first aid for electric shock victims » Language
<b>CZ-53</b>	French
<b>CZ-53-E</b>	Spanish
<b>CZ-53-MR</b>	english / arabic
<b>CZ-53-R</b>	English
<b>CZ-53-NL</b>	Dutch

### CHARACTERISTICS

- Dimensions : 710 x 570 x 240 mm.
- Weight : 18,5 kg.

### MAINTENANCE

- Once a year for every component.
- Every 6 months for the gloves.

# SECTION 4

Battery testing

**ITEM**

**4.1**

**BITE<sup>®</sup> 3****Battery Impedance Test Equipment**

- **Determines health of lead-acid cells up to 2000 Ah**
- **On-line testing with Pass/Warning/Fail calculations**
- **Measures impedance, interconnection resistance and cell voltage**
- **Windows CE operating system with 32 MB of memory**
- **Measures float and ripple currents**
- **Includes ProActiv™ Database Management Software**

**DESCRIPTION**

The Megger BITE 3 Battery Impedance Test Equipment determines the health of lead-acid cells up to 2000 Ah by taking measurements of the most important battery parameters. The BITE 3 measures cell impedance, an internal ohmic test, cell voltage, intercell connection resistance and ripple current. And, for the first time in a battery instrument, the BITE 3 measures float current and the harmonic content of the ripple current. There is even a built-in spectrum analyzer to show the harmonic content of the ripple current. It has firmware that can be upgraded through the Internet and supports multiple languages.

The BITE 3 is one of the easiest instruments to use. Its measurements, along with temperature, specific gravity and other battery data, can provide the best basis for evaluating the overall health of batteries from terminal plate to terminal plate and to a lesser extent, the charger (from ripple current and its harmonic content.) Megger recommends that the BITE 3 be made part of a comprehensive battery maintenance program with readings taken and recorded semi-annually for flooded, lead-acid cells and quarterly for VRLA.

Unlike load-cycle testing which is expensive, non-predictive and time-consuming (but does provide actual capacity data), the BITE 3 is quick, reliable and easy to use. With a rapid test time, one person can easily, quickly and precisely measure cell and string parameters without taking the system off line. Furthermore, in as little as four keystrokes, the instrument is ready to take battery measurements (five, if the power button is included). The processor of the BITE 3 uses a Windows<sup>®</sup> CE Operating System and can store more than 1 million cells' data in any

string configuration. It is menu-driven that is easy to navigate. Its unique data analysis screens provide immediate feedback on the status of cell impedance, (see Figure 1, Battery Analysis Report). The first part of the report is the numerical data. The second part is the impedance deviation graph and the third part is the impedance deviation graph but in ascending impedance order. The ascending impedance graph groups the weakest cells together for easier analysis. With the optional printer, this report can be printed by the user and left at the site as a record for future reference.

**PROACTIV DATABASE MANAGEMENT SOFTWARE**

The first of its kind, ProActiv is a powerful software package that organizes and analyzes battery data in an MS Access database. Used in conjunction with the BITE 3, ProActiv manages the transferred test data from the BITE 3 by organizing it according to your needs and displaying it in an extremely useful manner. Once the database is configured to your liking and test data are transferred from the BITE 3, it provides red, yellow and green bands that coincide with user entered pass, warning and failure limits. ProActiv allows the user to organize and manage battery data such as voltages, impedance, intercell connection resistance, ripple current, and specific gravity. ProActiv even has a place for IR thermographs, diagrams and graphics to store with the battery data. It is an all-encompassing battery database management tool.

Having such a tool becomes even more important when you consider the following: battery testing is crucial to ensure a battery system provides standby and emergency power to operate devices such as emergency lighting, UPS



systems, operating controls, switchgear components, protective relays and continuous process systems. Failure of a battery system within environments such as utilities, hospitals and manufacturing plants can result in operational failure of the devices connected to it. ProActiv assists the user to avoid battery failures, budget for future battery string and cell replacements, and plan battery changeouts in an orderly manner.

The BITE 3 along with ProActiv software offer the most comprehensive data analysis system to provide confident and reliable evaluation of batteries in the dc network. Together, they combine to make the most powerful battery health analyzer available on the market today.

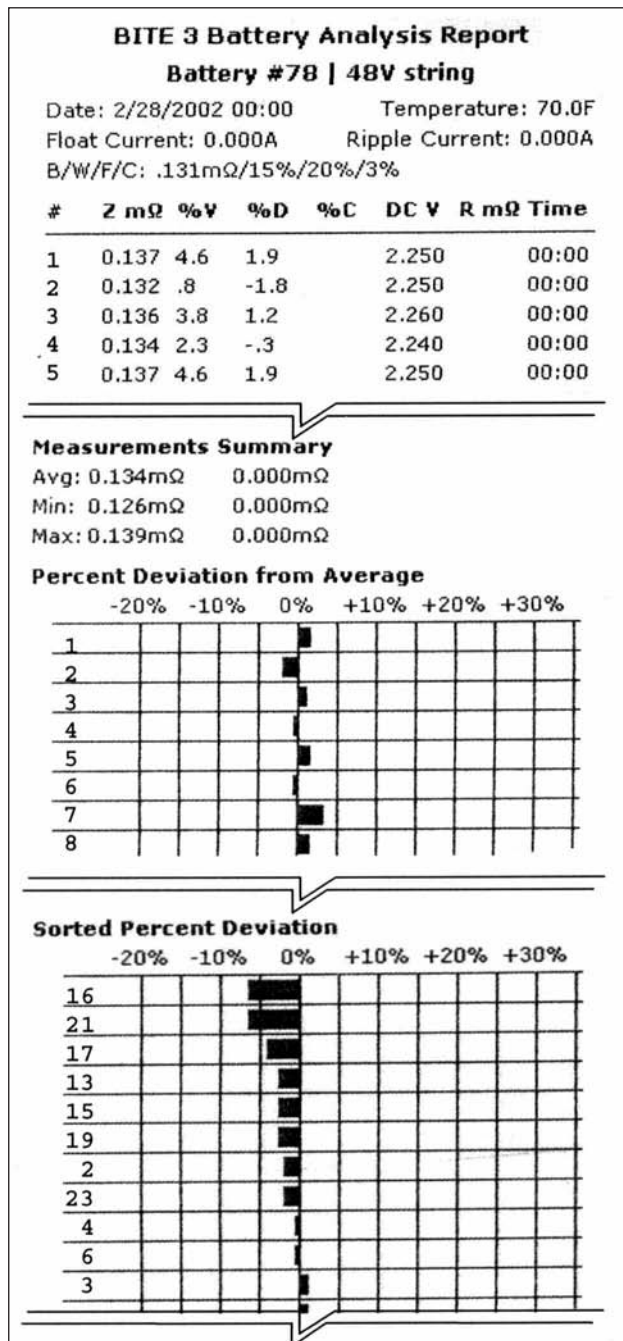


Figure 1: Battery Analysis Report

## APPLICATIONS

It is known that impedance is correlated to battery capacity and there has been a long-standing question as to when a user should replace a cell. See Figure 2. Recent studies by EPRI\* and other organizations indicate that when the impedance of a sealed battery increases by about 50% from its baseline value, the cell has degraded to less than about 70% capacity. BITE 3 and ProActiv allow the user to trend data and to enter baseline values for comparison purposes and to make decisions whether on-site or in the office. Both the BITE 3's impedance deviation graph and the trend graph in ProActiv clearly show the status of a cell which helps users to decide what action needs to be taken to ensure battery back up reliability based on users' criteria.

A battery's internal impedance increases as its capacity decreases due to various factors such as age, ambient temperature, discharge history, etc. The BITE 3 measures internal impedance and dc voltage for lead-acid cells up to 2000 Ah in capacity. It also measures intercell connection resistance, float current and ripple current and the harmonic content of the ripple current to provide a much better evaluation than any other single instrument. Impedance finds electrical path problems due to plate sulphation, post-seal corrosion, dry-out (loss of compression), poor intracell welds and intercell connections and more. These data let the user determine maintenance needs such as:

- Cell replacement criteria based on impedance trends
- Jumper out a cell or two
- Clean and/or retighten intercell connectors
- Shorten the maintenance interval, etc.,
- Evaluate float current and ripple current effects

Typical installations that can be tested using the BITE 3 include:

- Electrical power generation plants
- Substations — utility, railroad, industrial
- Telecommunications facilities — OSP, Wireless, POPs, MTSOs, Fiber Regens
- UPS systems — standard and cabinetized batteries
- Railroad — Signals and Communications, CTC
- Aircraft power supplies
- Marine and military

\*Stationary Battery Monitoring by Internal Ohmic Measurements  
EPRI, Palo Alto, CA: 2002. 1002925

## FEATURES AND BENEFITS

- Calculates impedance automatically and stores results for on-site review to make immediate decisions.
- Serial connector for uploading stored data to a personal computer and to download data from ProActiv.
- Measures lead-acid cells up to 2000 Ah to test a wide range of batteries.
- On-line testing requiring no downtime and introduces less risk to battery testing compared to load testing and other techniques.
- Stores more than 1 million cells' data in any string configuration – no need to stop, download, delete and continue.
- Firmware and software updates are fast and easy for ProActiv and the BITE 3 through the Internet.
- No programming skills required. ProActiv is an easy to use, fully functional battery database capable of storing as much information and data as your hard drive (or network) has memory to store.
- ProActiv has the ability to import images such as IR thermographs, diagrams or photographs. This helps to document visual inspections, string configurations, installation techniques, or other aspects of battery systems. Images and data are stored together, providing convenient and easy access.
- The BITE 3 and ProActiv accommodate multiple languages.

## TEST PROCEDURE

The BITE 3 works by placing the lead set at the cell terminals to measure the voltage drop of the ac current signal applied by the instrument to the cell while it is on-line. During each measurement, impedance is calculated following Ohm's Law, displayed on the LCD, and stored. It also measures, displays and records dc voltage, interconnection (strap) resistance, float and ripple currents. Float and ripple current measurements are performed separately at the start of the test. This is because current is the same everywhere in the series connection of the string in accordance with Kirchhoff's law. All of these data together help determine the overall health of the entire battery string's electrical path from terminal plate to terminal plate and to a lesser extent, the charger (by measuring ripple current and its harmonic content).

An innovative, patent-pending measuring technique is being employed so that a clamp-on current sensor is no longer necessary. It is well-recognized that the best way to measure current is with a shunt. Since the battery has many straps, simply by determining a strap's resistance, it can be used as a shunt to determine float and ripple currents. First, while across an intercell connector, the instrument applies a current and measures the voltage

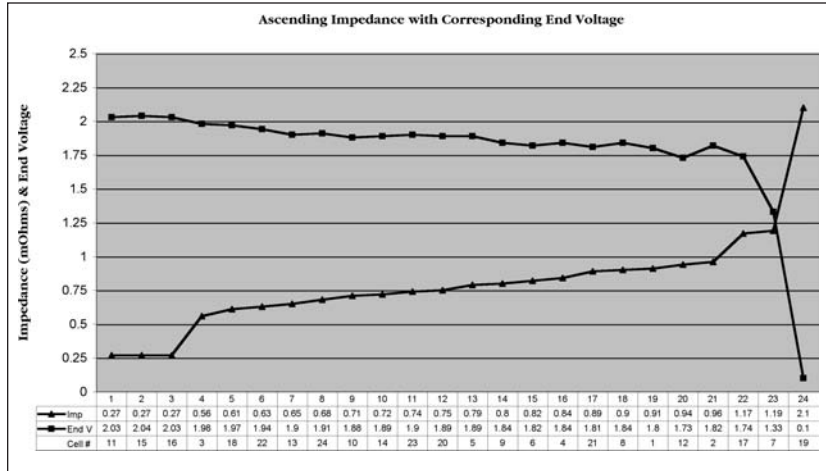


Figure 2: Ascending impedance compared to load test

drop of the intercell connector to calculate the resistance of the intercell connector. Then, it measures the strap again without the instrument current. A mathematical calculation is performed to determine float and ripple currents and the intercell connection resistance.

The optional CT can be used with short strings in parallel configurations to measure "escape current." Other techniques do not measure the current and can overstate the health of batteries in these types of configurations. By using a CT to measure the actual current in the cell being tested, better results are obtained.

ProActiv can download string header info (with baselines and limits) into the BITE 3 along with the most recent data (even if measured by a different BITE). See Figure 3. Then using the menus, simply scroll to the site and string and start taking readings. When finished, close the test and continue to the next string. At the conclusion of the test, simply download to a PC for further data analysis and long-term trending. Its versatility allows comments to be added about the string. These comments will be uploaded with the battery data. Additional comments about the site, string and/or cell such as ambient and pilot cell temperature can be stored by using the keypad to enter them.

## DATA ANALYSIS

The interface between BITE 3 and ProActiv is an advanced, state-of-the-art feature that ensures that everyone has access to the latest information and data on which to base intelligent battery decisions. Not only can emergency cell replacement criteria be developed but also budgetary planning for string replacements can now become part of the fiscal planning process.

ProActiv has the ability to download site and string information and data as well as firmware updates to the BITE 3. The data downloaded into the BITE 3 gives access to the most recent data for the strings being tested during the upcoming week or month.

With previous data loaded, better analysis can be performed simply by comparing the last result to the most recent result. Any cell that changes by more than a few percent suggests that further investigation is warranted.

### On-Site Interpretation

Impedance readings for individual cells can be used to compare to the string average. Individual cells with deviations of more than  $\pm 15\%$  for flooded and  $\pm 35\%$  for VRLA typically indicate a problem with that cell. The Battery Analysis Report clearly shows the cells that are weakest when compared to the string average and the other cells in the string. It is typically the one or two weak cells that can take the string off line. By comparing each cell to the string average, it is possible to determine which cell is the weakest in the string and by how much.

If previous data were downloaded through ProActiv, then a comparison of each cell to its previous reading (%C) can provide additional information about each cell. The Battery Analysis Report is designed to provide as much information as possible on which to make decisions while on site; decisions to ensure that the string will properly support the load.

### Trending Analysis

Impedance readings can be used for trending to determine replacement criteria. Battery cell impedance values should be recorded and compared to previous readings to determine the position of the cell on the curve of impedance versus cell life. Based on experience, a variation of  $\pm 20\%$  from baseline of a flooded lead-acid and  $\pm 50\%$  for VRLA cells indicate significant change in the electrical path to warrant serious evaluation of the health of the battery system. Megger maintains a database of impedance values by some manufacturers and battery size/type. The BITE 3 with baseline values entered can be used as a trending tool while on site. Trending is the best method available to know the most about the health of batteries.

### Configuring the ProActiv Database

There are three basic steps to setting up ProActiv:

- Configuring battery manufacturers, models, sites, and strings including baselines and limits
- Entering data from previous BITE downloads, manually or directly from the BITE 3
- Performing data analysis

ProActiv is configured by entering and setting up each battery manufacturer and battery model type used in a dc network. Optionally, other information such as sales contact names, purchase order numbers or technical support contact names may be added. Extensive model

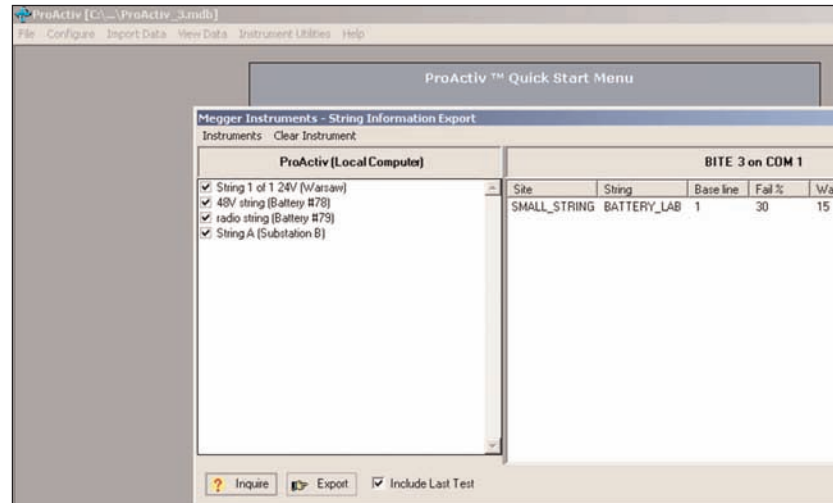


Figure 3: ProActiv to BITE 3 download screen

information may be entered including model type, plate count, rating, charger type, baseline impedance value as well as warning and fail percentages. Limits on other parameters can also be set such as upper and lower float voltage limits and specific gravity limits.

All of the individual battery cell information can then be configured under a specific site name, string ID, battery model, installation date, and charger information. If a cell needs to be replaced, but the same model is not available, ProActiv will allow it to be replaced with another manufacturer or model. ProActiv keeps track of cell-level information and data and this is reflected when viewing information and data for that string. In instances where there is such a large installed battery base and a string is replaced, some of the better cells may be used in other strings to replace weak cells. ProActiv allows the user to keep track of these movements.

### Entering Data

Data entry is easy with the Data Entry Wizard: direct import of test data from a BITE, manual entry, via browsing for a file. When uploading from a BITE 3, ProActiv can automatically create a site and string for a new site that hasn't been previously configured in ProActiv. Digital photographs and IR thermographs can be imported also into ProActiv to document the health and condition of the battery.

### Performing Data Analysis

The last step is "analyze." Using both numerical data displays and graphs, the user can see how the batteries in the dc network are performing based on the user-entered limits for each parameter. Graphs can be printed and saved as bitmaps to export to other programs for written reports. A summary report may be printed which lists all cells' data and each cell's status. The graph shown in Figure 4 clearly shows which cells are in the pass (green), warning (yellow) and fail (red) bands. It is possible to select and graph one cell and verify its entire history.

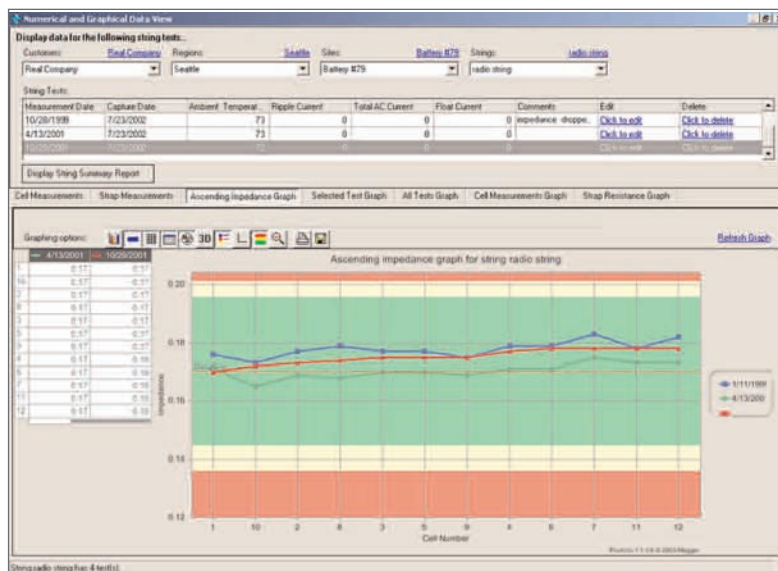


Figure 4: ProActiv ascending impedance graph with Pass/Warning/Fail bands

## ACCESSORIES

The BITE 3 has many accessories that enhance its versatility. There are several lead sets, a printer, lighted probe extensions and a CT.

The lead set family contains:

- AMP/Burndy lead set for small telco batteries
- Quick Disconnect lead set for ELU systems, security systems, etc.
- Kelvin Clip lead set for other types of batteries

The CT is for measuring escape current in short strings in parallel configurations. The lighted probe extensions are ideal for measuring batteries in (dark) cabinets. The extensions eliminate the need to take the battery off line and can be tested during normal working hours, saving time and money. As with previous BITEs, it is a one person job since the batteries need not be removed from the cabinet.

## SPECIFICATIONS

### BITE 3 Instrument

#### Impedance Range and Resolution

0.05 to 1.000 mΩ	1 μΩ resolution
1 to 10.00 mΩ	10 μΩ resolution
10 to 100.0 mΩ	0.1 mΩ resolution

#### Voltage Range and Resolution

1 to 30 V dc across probes	
1 to 8.0 V dc	1 mV resolution
8.0 to 30.00 V dc	10 mV resolution

#### Current Range and Resolution

0.5 — 9.99 A ac/dc	0.01 A resolution
10.0 — 99.9 A ac/dc	0.1 A resolution

### Accuracy

**dc voltage:** ±(1% rdg +1 lsd)

**ac impedance:** ±(5% of rdg +1 lsd)

**ac/dc current:** ±(5% rdg +0.5 A)

### Precision

Better than 0.5% one sigma

### Source Output Current

1/2 A rms

### Display

1/4 VGA LCD

### Settling Time per Reading

3 seconds maximum

### Battery Pack

2 to 4 hours continuous

4.8 V dc, 7000 mAh, quick charge NiMH battery pack

### Temperature

**Operating:** 32° to 105° F (0° to +40° C)

**Storage:** -5° to 130° F (-20° to +55° C)

**Humidity:** 20 to 90% RH, noncondensing

### Safety

Designed to meet IEC 61010-1 specifications

### Dimensions

8.6 x 4 x 9.5 in.

220 x 100 x 237 mm

### Weight

5.7 lbs (2.6 kg)

### Charger

#### Supply Voltage

100 to 130 V, 50/60 Hz, 14 VA

210 to 250 V, 50/60 Hz, 14 VA

#### Output

6.50 V dc at 1.10 A dc charging (max.)

### Optional Printer

Thermal, with 4-1/4 in. (110 mm) printing width



**ProActiv System Requirements****Processor**

300 MHz Pentium II or better

**Operating System**

Windows 98

Windows Me

Windows NT 4.0 (SP6a required)

Windows 2000 (SP2 recommended)

Windows XP

*Note: Windows 95 is not supported***Software**

Microsoft® Internet Explorer 5 or later

Microsoft .Net Framework

*Will be automatically installed by ProActiv if it is not already installed on your computer. For additional information about Microsoft .Net Framework please visit: [www.microsoft.com/net](http://www.microsoft.com/net)*

**Hard Drive Space**

100 MB

**System Memory (RAM)**

64 MB (128 MB recommended)

**Other Drives**

CD-ROM (used only for installation)

**Communications Port**

COM (used only for importing data from test equipment or to download information to the BITE 3)

**Monitor/Display**

True color, 800 x 600 resolution

**Additional Information**

For improved usage, an internet connection will make it easy to get automatic ProActiv software updates.

The user should have Microsoft Excel 9.0, or later, to import AVOLink or COMLink files into ProActiv.

**ORDERING INFORMATION**

Item	Cat. No.	Item	Cat. No.
BITE 3, 110/230 V ac, 50/60 Hz, CE-marked	BITE 3	<b>Optional Accessories</b>	
<b>Included Accessories</b>		Lead set, 6 ft (1.8 m) probe to probe	36616
ProActiv™ software	BI-90001	Printer, battery-operated, 110 V ac	35755-3
Canvas carrying case	35788	Printer, battery-operated, 220 V ac	35755-4
RS-232 null modem cable	33533-1	Printer paper, 1 roll	26999
Line charger	EV6280-333	AMP/Burndy lead set	BI-10004
Battery	EV6121-492	Kelvin clip lead set	BI-10005
Dual-point lead set	BI-10002	Quick Disconnect lead set	BI-10006
Tip kit	BI-10017	Cigarette lighter charger	EV6280-332
Operating manual	AVTMBITE3	Current transformer kit	35873
		USB-serial adapter	35871
		Probe extensions, lighted	35865
		Hard-sided carrying case	35890
		Standard transit case	35915
		Field test shunt, 0.01 $\Omega$ , current rating 10 A	249003
		Field test shunt, 0.001 $\Omega$ , current rating 100 A	249004
		Field test shunt, 0.0001 $\Omega$ , current rating 500 A	249005

**ISO STATEMENT**

Registered to ISO 9001:2000 Cert. no. 10006.01



# **ITEM**

## **4.2**

# DMA 35

Portable Density/Specific  
Gravity/Concentration Meter

::: Unique Density & Concentration Meters



# DMA 35

## Density Measurement on the Move

### DMA 35 ...

... is the new generation of Anton Paar portable density meters, using the oscillating U-tube technology. DMA 35 measures the density and density-related values of your sample and shows the measuring results within seconds on the large display, ready for storage, printout or export to a PC.

Are you tired of cable tangles within your measuring environment? DMA 35 provides completely wireless communication with a printer or PC via the integrated IrDA interface.

The product versions DMA 35 Tag&Log, DMA 35 Ex and DMA 35 Ex Petrol are additionally equipped with an RFID interface for quick sample identification and convenient change of the measurement method by reading RFID tags.

### DMA 35 ...

#### ... talks the same language

Your DMA 35 communicates with you in a language you will understand immediately. The user interface is clearly arranged and you will intuitively find your way through the menu. The display backlight, which switches on automatically when a new sample is filled, makes sure you clearly see your measuring results even in dark surroundings. The seven large keys enable operation of the instrument even when wearing protective gloves.

#### ... denies access to spills and humidity

The robust DMA 35 is designed to withstand the rough conditions of industrial and field applications. The leakproof sealed housing keeps humidity out of the electronics and stops pump spills entering the instrument.

#### ... saves you time and energy

Once defined, you can choose between up to 20 different customized measuring methods and up to 100 sample IDs for easy identification of samples, users or measuring locations. With a memory capacity for 1024 measurement results including timestamp and sample ID, DMA 35 is prepared for a long working day.




## 4 Versions of DMA 35

### The DMA 35 ...

... standard version, providing manual selection of sample IDs and methods, is the right choice for performing measurements with constant or only occasionally changing measurement settings. This basic model is an economic solution for general industrial and laboratory applications.

Additionally equipped with an RFID interface, the DMA 35 Tag&Log enables you to quickly and conveniently change the method and sample ID automatically, by just reading an RFID tag. DMA 35 Tag&Log is a big step forward in increasing the efficiency of your measuring process, especially when regularly measuring different samples according to different measuring units.

The intrinsically safe DMA 35 Ex (ATEX marking  II 2 G Ex ib IIC T4) is predominantly used for battery acid measurements and for chemical applications. It comes with an integrated RFID interface.

The DMA 35 Ex Petrol (ATEX marking  II 2 G Ex ib IIC T4) is the intrinsically safe product version with a special housing for the petrochemical industry. It is especially resistant to petrols and similar organic solvents and is equipped with an RFID interface. The DMA 35 Ex Petrol fully complies with the IP 559 standard.



### ... uses wireless technology

DMA 35 prints your measuring results and exchanges data with your PC completely wireless via the integrated IrDA interface. Update your instrument with the latest firmware, export measuring data for archiving purposes or simply write your method list and sample ID list on the PC and import it into your instrument via IrDA.

### ... works at the push of a button

Your sample is filled into the measuring cell of DMA 35 by simply pushing the lever on the built-in pump. DMA 35 measures the density of your sample or determines concentration using the preinstalled density/concentration tables. You also have the option of adding up to ten custom functions to the list of measuring units. This is useful if you measure specific samples regularly.

### ... lights up the cell

To obtain accurate measuring results it is essential that your sample is filled into the measuring cell without any gas bubbles. The measuring cell of DMA 35, visible from outside through an inspection window, is equipped with a backlight, making it easy for you to observe the filling process closely.



# Technical Specifications

Product version	DMA 35	DMA 35 Tag&Log	DMA 35 Ex	DMA 35 Ex Petrol
Measuring range	Density: 0 to 3 g/cm <sup>3</sup> Temperature: 0 °C to 40 °C (32 to 104 °F) Viscosity: 0 to 1000 mPa·s			
Accuracy	Density*: 0.001 g/cm <sup>3</sup> Temperature: 0.2 °C (0.4 °F)			
Repeatability	Density: 0.0005 g/cm <sup>3</sup> Temperature: 0.1 °C (0.2 °F)			
Resolution	Density: 0.0001 g/cm <sup>3</sup> Temperature: 0.1 °C (0.1 °F)			
Ambient temperature**	-10 °C to +50 °C (14 to 122 °F)			
Supported measuring units	Density, Density @ xx °C, Specific Gravity (SG), Alcohol % v/v, Alcohol % w/w, Alcohol US (°Proof), API Gravity, API SG, API Density, °Baumé, H <sub>2</sub> SO <sub>4</sub> % w/w, H <sub>2</sub> SO <sub>4</sub> @ 20 °C, °Brix, Extract (°Plato), ten programmable custom functions			
Data memory	1024 measurement results			
Power supply	Two 1.5 V LR06 AA alkaline batteries			
Sample volume	2 mL			
Dimensions	140 x 138 x 27 mm (5.5 x 5.4 x 1.0 inches)			
Weight	345 g (12.2 ounces)	351 g (12.4 ounces)	351 g (12.4 ounces)	396 g (14 ounces)
Interfaces	IrOBEX/IrLPT	IrOBEX/IrLPT, RFID	IrOBEX/IrLPT, RFID	IrOBEX/IrLPT, RFID
Protection class	IP54			

Available options	<ul style="list-style-type: none"> <li>- Elongated filling tube</li> <li>- Transportation suitcase</li> <li>- Portable thermal printer with IrDA interface</li> <li>- IrDA USB adapter</li> <li>- Wristband</li> </ul>
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Developed in cooperation with Labor für Messtechnik Dr. H. Stabinger GmbH, Graz

\*Viscosity < 100 mPa·s, density < 2 g/cm<sup>3</sup>

\*\*Sample must not freeze within the measuring cell!



# Applications

## Food and beverage industry

- Fruit juices
- Cider
- Liqueurs
- Spirits
- Wine
- Beer wort



## Pharmacy and chemistry

- Fermenters
- Serums
- Lab preparations
- Battery acid

## Electrical engineering & electronics

- Coatings
- Metallic coatings
- Etching baths



## Environment

- Pesticides
- Sewage sludge
- Waste water

## Petrochemistry

- Tankers
- Drums
- Filling/loading stations
- Storage tanks

## General quality control and rapid product identification



# **ITEM**

## **4.3**

# TORKEl 840/860

## Battery Load Units



- Batteries can be tested "in service"
- Unit adjusts to include load currents in the test parameters
- User adjustable alarm and shutdown points to avoid excessive discharge
- Easily expandable for larger battery banks using TXL extra load units
- View test parameters/results "real time" as testing progresses using TORKEl WIN software
- Easily save results to a PC for analysis, report generation and storage

### Description

Batteries in power plants and transformer substations must provide the equipment they serve with standby power in the event of a power failure. Unfortunately, however, the capacity of such batteries can drop significantly for a number of reasons before their calculated life expectancy is reached. This is why it is so important to check batteries at regular intervals, and the only reliable way of measuring battery capacity is to conduct a discharge test.

TORKEl™ 840 - UTILITY is used for battery systems ranging from 12 to 250 V – often encountered in switchgear and similar equipment. Discharging can take place at up to 110 A, and if higher current is needed, two or more TORKEl 840 units or extra load units, TXL, can be linked together. Tests can be conducted at constant current, constant power, constant resistance or in accordance with a pre-selected load profile.

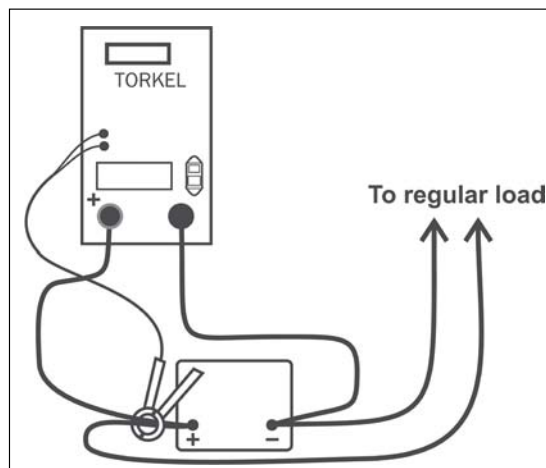
TORKEl 860 - MULTI is designed primarily for people who travel from place to place to maintain battery systems having different voltages. It features excellent discharging capacity plus a broad voltage range and outstanding portability – a unique combination.

TORKEl 860 is used for systems ranging from 12 to 480 V, and discharging can proceed at up to 110 A. If higher current is desired, two or more TORKEl 860 units or extra load units, TXL, can be linked together. Discharging can take place at constant current, constant power, constant resistance or in accordance with a pre-selected load profile.

### Application example

Testing can be carried out without disconnecting the battery from the equipment it serves. Via a DC clamp-on ammeter, TORKEl measures total battery current while regulating it at a constant level.

The TORKEl is connected to battery, the current and the voltage alarm level are set. After starting the discharge TORKEl keeps the current constant at the preset level. When the voltage drops to a level slightly above the final voltage, TORKEl issues an alarm. If the voltage drops so low that there is a risk for deep discharging the battery, TORKEl shuts down the test. The total voltage curve and the readings taken at the end of the test are stored in TORKEl. Later, using the TORKEl Win program, you can transfer these readings to your computer for storage, printout or export. If your PC is connected to TORKEl during the test, TORKEl Win builds up a voltage curve on the screen in real time and displays the current, voltage and capacity readings. You can also control the test using TORKEl Win.



## Features and benefits

1. Display
2. External measurement input used to measure current in an external path by means of a clamp-on ammeter or a current shunt.
3. Keys for operation and settings.
4. Alarm output equipped with a relay contact for triggering an external alarm device.
5. Start/Stop input used for starting and stopping discharging from an external device. Galvanically isolated.
6. Indicating lamps. Operating, Stop/Limit
7. TXL output used for control of TXL Extra Loads. Galvanically isolated.
8. Serial port used for connection to a PC or other controlling equipment.
9. Voltage controlled circuit breaker that connects / disconnects the loading circuits in TORKEl from the battery.
10. Positive current connection for battery being tested.
11. Input for sensing voltage at the battery terminals.
12. Negative current connection for battery being tested.
13. Mains connector, equipped with ON/OFF switch.



## Application examples with TORKEl/TXL systems

TORKEl and TXL can be combined into systems to match up for different battery capacities. These resistive extra loads do not perform any regulating functions. They are designed for use together with TORKEl Battery Load Units. Their purpose is to provide higher load currents for use in constant current or constant power tests. Together, TORKEl and the TXL Extra Loads form a system that can discharge batteries with currents of up to several kA. TXL Extra Loads are connected directly to the battery, and TORKEl measures the total current using a clamp-on ammeter.

TXL Extra Loads are shut down automatically when TORKEl is stopped.

### TORKEl / TXL - systems examples

Max. constant current (A)	Number of TORKEl-units	Number of TXL-units
<b>TORKEl 840/860 + TXL830, 24 V battery (12 cells)<sup>1)</sup></b>		
263	1	1
670	2	2
1005	3	3

### TORKEl 840/860 + TXL850, 48 V battery (24 cells)<sup>1)</sup>

264	1	1
909	2	3

### TORKEl 840/860 + TXL870, 110 V battery (54 cells)<sup>1)</sup>

188	1	1
532	2	4
845	2	8

### TORKEl 840/860 + TXL870, 120 V battery (60 cells)<sup>2)</sup>

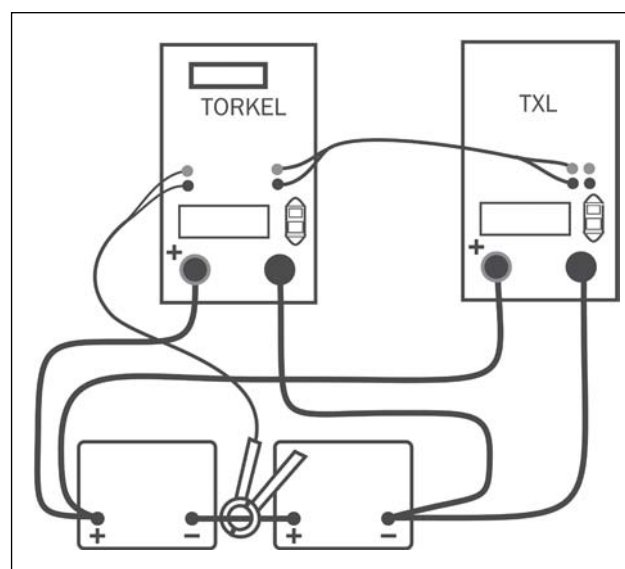
194	1	1
557	2	4
895	2	8

### TORKEl 840/860 + TXL870, 220 V battery (108 cells)<sup>1)</sup>

94	1	1
266	2	4
423	2	8

1) Discharge from 2.15 V to 1.8 V per cell

2) Discharge from 2.15 to 1.75 V per cell



TORKEl and the extra load TXL

## Specifications TORHEL 840/860

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

### Environment

**Application field** The instrument is intended for use in high-voltage substations and industrial environments.

#### Temperature

**Operating** 0°C to +40°C (32°F to +104°F)

**Storage & transport** -40°C to +70°C (-40°F to +158°F)

**Humidity** 5% – 95% RH, non-condensing

### CE-marking

**EMC** 2004/108/EC

**LVD** 2006/95/EC

### General

**Mains voltage** 100 – 240 V AC, 50/60 Hz

**Power consumption (max)** 150 W

**Protection** Thermal cut-outs, automatic overload protection

#### Dimensions

**Instrument** 210 x 353 x 700 mm  
(8.3" x 13.9" x 27.6")

**Transport case** 265 x 460 x 750 mm  
(10.4" x 18.1" x 29.5")

**Weight** 21.5 kg (47.4 lbs)  
38 kg (83.8 lbs) with accessories and transport case.

**Display** LCD

**Available languages** English, French, German, Spanish, Swedish

### Measurement section

#### Current measurement

**Display range** 0.0 – 2999 A

**Basic inaccuracy** ±(0.5% of reading +0.2 A)

**Resolution** 0.1 A

#### Internal current measurement

**Range** 0 – 300 A

#### Input for clamp-on ammeter

**Range** 0 – 1 V

**mV/A-ratio** Software settable, 0.3 to 19.9 mV/A

**Input impedance** >1 MΩ

#### Voltage measurement

##### Display range 0.0 – 60 V

**Basic inaccuracy** ±(0.5% of reading +0.1 V)

**Resolution** 0.1 V

##### Display range 0.0 – 500 V

**Basic inaccuracy** ±(0.5% of reading +1 V)

**Resolution** 0.1 V

#### Time measurement

**Basic inaccuracy** ±0.1% of reading ±1 digit

### Load section

**Max. battery voltage** 288 V DC (TORHEL 840)  
480 V DC (TORHEL 860)

**Max. current** 110 A

**Max. power** 15 kW

**Load patterns** Constant current, constant power, constant resistance, current or power profile

**Current setting** 0-110.0 A (2999.9 A) <sup>1)</sup>

**Power setting** 0-15.00 kW (299.99 kW) <sup>1)</sup>

**Resistance setting** 0.1-2999.8 Ω

**Battery voltage range, TORHEL 840** 4 ranges, selected automatically at start of test

**Battery voltage range, TORHEL 860** 5 ranges, selected automatically at start of test

**Stabilization (For internal current measurement)** ±(0.5% of reading +0.5 A)

	Battery voltage	Highest permissible current	Resistor element (Nominal values)
<b>Range 1</b>	10 – 27.6 V	110 A	0.165 Ω
<b>Range 2</b>	10 – 55.2 V	110 A	0.275 Ω
<b>Range 3</b>	10 – 144 V	110 A	0.55 Ω
<b>Range 4</b>	10 – 288 V	55 A	3.3 Ω
<b>Range 5 <sup>2)</sup></b>	10 – 480 V	55 A (max power 15 kW)	3.3 Ω

1) Maximum value for a system with more than one load unit

2) TORHEL 860

### Inputs, maximal values

**EXTERNAL CURRENT MEASUREMENT** 1 V DC, 300 V DC to ground. Current shunt should be connected to the negative side of the battery

**START/STOP** Closing/opening contact  
Closing and then opening the contact will start/stop Torkel. It is not possible to keep the contacts in closed position.

**Delay until start** 200 – 300 ms

**Stop delay** 100 – 200 ms

**Battery** 480 V DC, 500 V DC to ground

**VOLTAGE SENSE** 480 V DC, 500 V DC to ground

**SERIAL** < 15 V

**ALARM** 250 V DC 0.28 A  
28 V DC 8 A  
250 V AC 8 A

### Outputs, maximal values

**START/STOP** 5 V, 6 mA

**TXL** Relay contact

**SERIAL** < 15 V

**ALARM** Relay contact



## Discharging capacity, examples

### 12 V battery (6 cells) 3)

Final voltage	Constant current	Constant power
1.80 V/cell (10.8 V)	0 – 50.0 A	0 – 0.54 kW
1.75 V/cell (10.5 V)	0 – 49.0 A	0 – 0.51 kW
1.67 V/cell (10.0 V)	0 – 46.0 A	0 – 0.46 kW

### 24 V battery (12 cells) 3)

1.80 V/cell (21.6 V)	0 – 110 A	0 – 2.37 kW
1.75 V/cell (21.0 V)	0 – 110 A	0 – 2.31 kW
1.60 V/cell (19.2 V)	0 – 100 A	0 – 1.92 kW

### 48 V battery (24 cells) 3)

1.80 V/cell (43.2 V)	0 – 110 A	0 – 4.75 kW
1.75 V/cell (42.0 V)	0 – 110 A	0 – 4.62 kW
1.60 V/cell (38.4 V)	0 – 110 A	0 – 4.22 kW

### 110 V battery (54 cells) 3)

1.80 V/cell (97.2 V)	0 – 110 A	0 – 10.7 kW
1.75 V/cell (94.5 V)	0 – 110 A	0 – 10.4 kW
1.60 V/cell (86.4 V)	0 – 110 A	0 – 9.5 kW

### 120 V battery (60 cells) 3)

1.80 V/cell (108 V)	0 – 110 A	0 – 11.9 kW
1.75 V/cell (105 V)	0 – 110 A	0 – 11.5 kW
1.60 V/cell (96 V)	0 – 110 A	0 – 10.5 kW

### 220 V battery (108 cells) 3)

1.80 V/cell (194 V)	0 – 55 A	0 – 10.7 kW
1.75 V/cell (189 V)	0 – 55 A	0 – 10.4 kW
1.60 V/cell (173 V)	0 – 51.0 A	0 – 8.82 kW

### 240 V battery (120 cells) 3)

1.80 V/cell (216 V)	0 – 55 A	0 – 11.9 kW
1.75 V/cell (210 V)	0 – 55 A	0 – 11.5 kW
1.60 V/cell (192 V)	0 – 55 A	0 – 10.5 kW

### UPS battery (180 cells) 3) (TORCEL 860)

1.70 V/cell (306 V)	0 – 38 A	0 – 15 kW
1.60 V/cell (288 V)	0 – 38 A	0 – 15 kW

### UPS battery (204 cells) 3) (TORCEL 860)

1.80 V/cell (367 V)	0 – 34 A	0 – 15 kW
1.60 V/cell (326 V)	0 – 34 A	0 – 15 kW

3) 2.15 V per cell when test starts

## Specifications TXL850/870/890

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

### Environment

**Application field** The instrument is intended for use in high-voltage substations and industrial environments.

#### Temperature

**Operating** 0°C to +40°C (32°F to +104°F)

**Storage & transport** -40°C to +70°C (-40°F to +158°F)

**Humidity** 5% – 95% RH, non-condensing

### CE-marking

**EMC** 2004/108/EC

**LVD** 2006/95/EC

### General

**Mains voltage** 100 – 240 V AC, 50/60 Hz

**Power consumption** 75 W (max)

**Protection** Thermal cut-outs, automatic overload protection

#### Dimensions

**Instrument** 210 x 353 x 600 mm (8.3" x 13.9" x 23.6")

**Transport case** 265 x 460 x 750 mm (10.4" x 18.1" x 29.5")

**Weight** 13 kg (28.7 lbs)

21.4 kg (47.2 lbs) with transport case

#### Cable sets

**for TXL850** 2 x 3 m (9.8 ft), 70 mm<sup>2</sup>, 270 A, with cable lug.  
Max. 100 V. 5 kg (11 lbs)

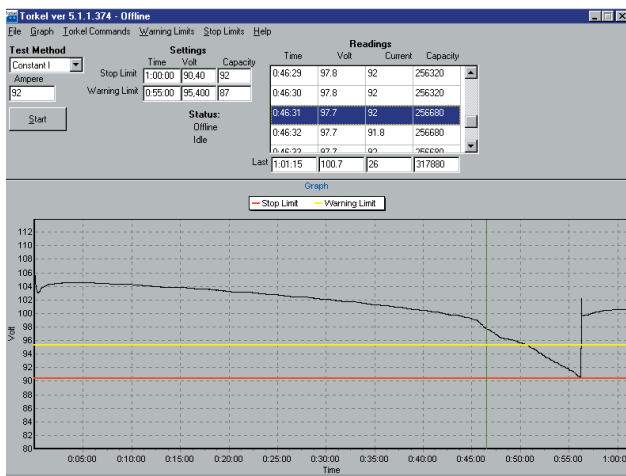
**for TXL870** 2 x 3 m (9.8 ft), 25 mm<sup>2</sup>, 110 A, with cable clamp/lug. Max. 480 V. 3 kg (6.6 lbs)

### Load section

	TXL850	TXL870	TXL890
<b>Max. voltage (DC)</b>	56 V	140 V/ 280 V	230 / 480 V
<b>Max. current</b>	300 A	112 A at 140 V 56 A at 280 V	63 A at 230 V 32 A at 480 V
<b>Max. power</b>	16.4 kW	15.8 kW	15.4 kW
<b>Internal resistance, 3-position selector</b>			
<b>Position 1</b>	<b>TXL850</b>	<b>TXL870</b>	<b>TXL890</b>
<b>Current</b>	0.55 Ω	4.95 Ω	14.10 Ω
100 A	at 55.2 V (24 x 2.3 V)	–	–
78.5 A	at 43.2 V (24 x 1.8 V)	–	–
50.1 A	–	at 248.4 V (108 x 2.3 V)	–
39.2 A	–	at 194.4 V (108 x 1.8 V)	–
32.3 A			at 469.2 V (204 x 2.3 V)
26.0 A			at 367.2 V (204 x 1.8 V)
<b>Position 2</b>	<b>TXL850</b>	<b>TXL870</b>	<b>TXL890</b>
<b>Current</b>	0.275 Ω	2.48 Ω	7.05 Ω
200 A	at 55.2 V (24 x 2.3 V)	–	–
156 A	at 43.2 V (24 x 1.8 V)–	–	–
35.2 A			at 248.4 V (108 x 2.3 V)
27.8 A			at 194.4 V (108 x 1.8 V)
<b>Position 3</b>	<b>TXL850</b>	<b>TXL870</b>	<b>TXL890</b>
<b>Current</b>	0.184 Ω	1.24 Ω	3.52 Ω
300 A	at 55.2 V (24 x 2.3 V)	–	–
235 A	at 43.2 A (24 x 1.8 V)	–	–
100 A	–	at 124.2 V (54 x 2.3 V)	–
78.4 A	–	at 97.2 V (54 x 1.8 V)	–
70.5 A			at 248.4 V (108 x 2.3 V)
55.2 A			at 194.4 V (108 x 1.8 V)

## Additional equipment

### TORKEL Win



- Shows the complete voltage curve
- Last recorded time, voltage, current and discharged capacity
- Scroll-window for all recorded values
- Remote control of TORKEL
- Report functions

### Extra loads



- There are three extra loads available TXL850, 870 and TXL890

### Clamp-on-ammeters



- Clamp-on ammeters, 200 A DC and 1000 A DC
- To measure current in circuit outside TORKEL

### BVM



- Automates battery voltage measurement during capacity tests
- "Daisy-chain" design allows expandability up to 120 units
- High accuracy and stability for precise data collection
- Integrates with TORKEL Win and PowerDB Test Data Management software
- For complete information see BVM data sheet

## Included accessories

### Cable set



Cable set GA-00550

## Ordering information

Item	Art. No.
<b>TORKEl 840</b> Complete with: Cable set GA-00550 Transport case GD-00054	BS-49094
<b>TORKEl 860</b> Complete with: Cable set GA-00550 Transport case GD-00054	BS-49096
<b>Optional</b>	
<b>TORKEl Win</b> PC software	BS-8208X
<b>Extra loads</b>	
TXL850	BS-59095
TXL870	BS-59097
TXL890	BS-59099
<b>Cable sets</b>	
<b>Cable set for TXL850</b> 2 x 3 m, 70 mm <sup>2</sup> , with cable lug. Max 100 V 270 A. Weight: 5.0 kg (11 lbs)	GA-00554
<b>Extension cable set, 110 A</b> 2 x 3 m, 25 mm <sup>2</sup> . Max 480 V Weight: 3.0 kg (6.6 lbs)	GA-00552
<b>Sensing lead set</b> Cable set for measuring voltage at battery terminals. 2 x 5 m (16.4 ft)	GA-00210
<b>Clamp-on ammeters</b>	
<b>DC clamp-on ammeter, 200 A</b> To measure current in circuit outside TORKEl	XA-12992
<b>DC clamp-on ammeter, 1000 A</b> To measure current in circuit outside TORKEl	XA-12990
<b>BVM</b> <i>Including:</i> Dolphin clips, Power & signal connector, Power supply, Connection cables and Carrying case	
<b>BVM150</b> With TORKEl Win software System of 16 BVM units	CJ-59092
<b>BVM300</b> With TORKEl Win software System of 31 BVM units	CJ-59093
<b>BVM600</b> With TORKEl Win software System of 61 BVM units	CJ-59096
<b>BVM150</b> With PowerDB software System of 16 BVM units	CJ-59192
<b>BVM300</b> With PowerDB software System of 31 BVM units	CJ-59193
<b>BVM600</b> With PowerDB software System of 61 BVM units	CJ-59196

# SECTION 5

Work benches + Power supplies

# Standard benches

## Basic benches

### STRATIFIED TOP



High temperature stratified top (40 mm)

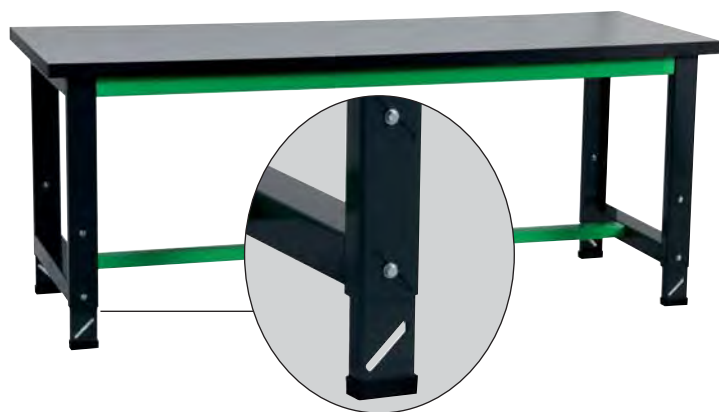
**Height of the bench : 840mm (top included)**

A PVC protective pad is placed underneath each foot.

Maximum load 1000kg uniformly distributed.

Dims (mm)	Ref.	Ref.
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

### ADJUSTABLE HEIGHT BENCHES



High temperature stratified top (40 mm)

**Adjustable height: 700 ~ 960mm (top included)**

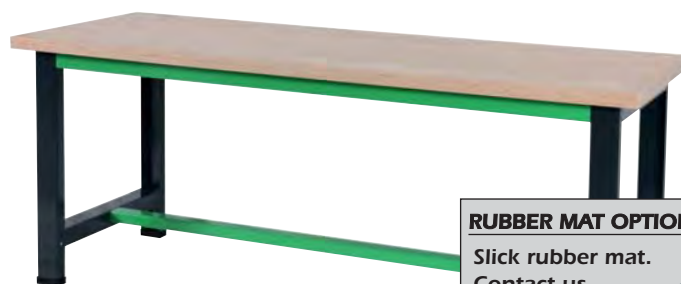
System with sliding foot components, adjustable continuously, tightened by screws and bolts. Each foot can be adjusted separately (if the floor is not completely flat). The strength of these adjustable benches is equal to standard benches.

A PVC protective pad is placed underneath each foot.

Maximum load 1000kg uniformly distributed.

Dims (mm)	Ref.	Ref.
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

### WOODEN TOP



#### RUBBER MAT OPTION

Slick rubber mat.  
Contact us

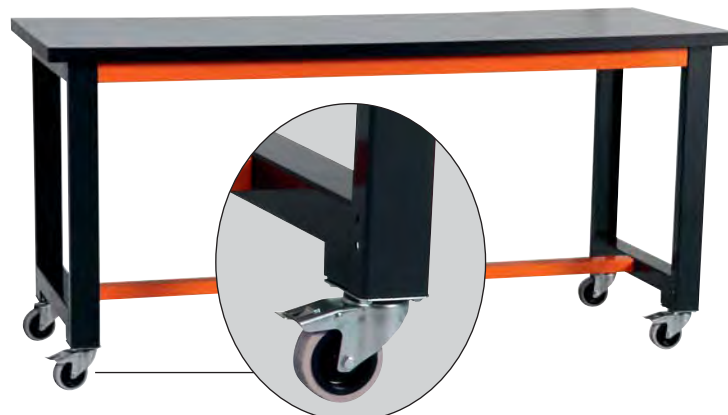
Wooden top, beech multilayer (40 mm)

**Height of the bench : 840mm (top included)**

A PVC protective pad is placed underneath each foot. Maximum load 1000kg uniformly distributed.

Dims (mm)	Ref.	Ref.
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

### 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.

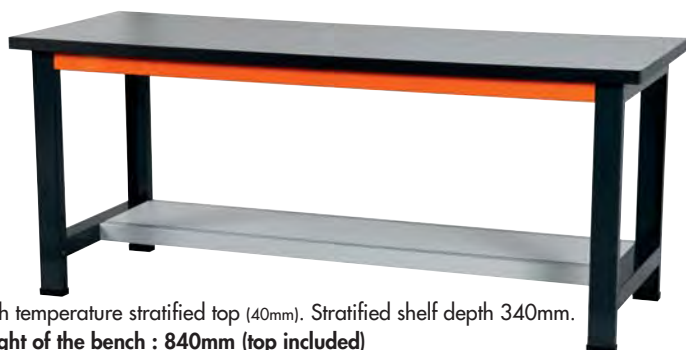
Maximum load 500kg uniformly distributed.

Other heights on request.

Dims (mm)	Ref.	Ref.
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



## BENCH WITH STRATIFIED SHELF



High temperature stratified top (40mm). Stratified shelf depth 340mm.

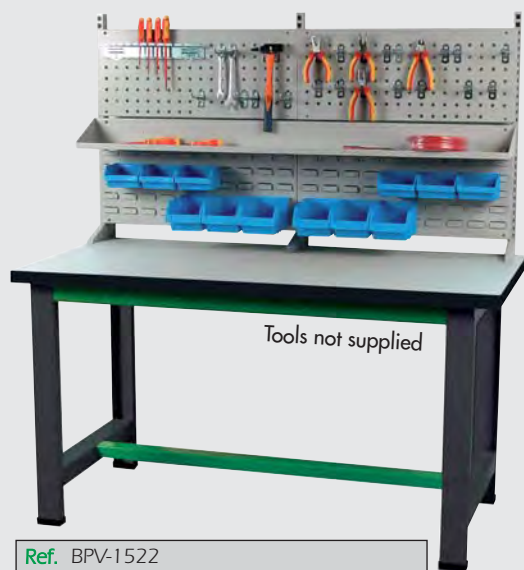
**Height of the bench : 840mm (top included)**

A PVC protective pad is placed underneath each foot.

Max load 1000kg uniformly distributed

Dims (mm)	Ref.	Ref.
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

## TOOL HOLDER BENCH



Bench with tool holder vertical panels and tray rests

High temperature stratified top (40mm)  
A PVC protective pad is placed underneath each foot

Tools not supplied

**TOOL HOLDER  
PANELS ARE SOLD  
SEPARATELY  
SEE PAGE 56**

Ref. BPV-1522

Ref. BPO-1522

Height of the bench : 840mm (top included). Top : 1500 x 750mm

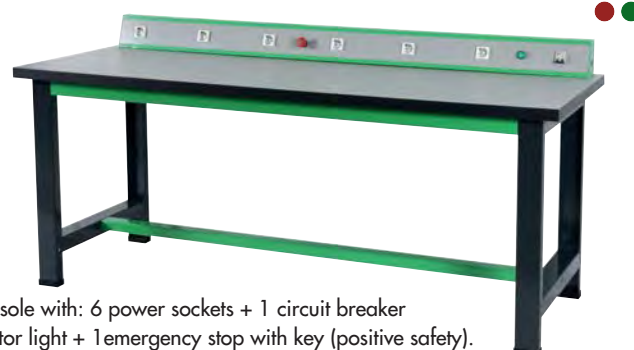
Height of the vertical panels : 830mm

Total height of the bench : 1670mm

Description of the delivered components	Quantity
1500x750mm stratified bench	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

Other configuration available upon request. Contact us.

## BENCH WITH POWER CONSOLE & EMERGENCY STOP



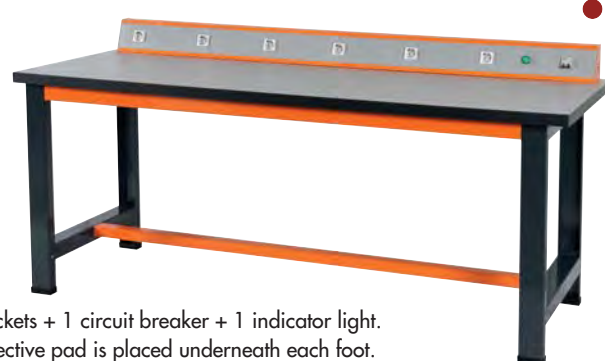
Power console with: 6 power sockets + 1 circuit breaker + 1 indicator light + 1 emergency stop with key (positive safety).

A PVC protective pad is placed underneath each foot.

Maximum load 1000kg uniformly distributed.

Dims (cm)	Thermal magnetic circuit breaker	30mA residual current circuit breaker
	Ref.	Ref.
180x75	ESV-187	ESO-187
180x100	ESV-1810	ESO-1810
200x75	ESV-207	ESO-207
200x100	ESV-2010	ESO-2010

## BENCH 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.

Dims (cm)	Thermal magnetic circuit breaker	30mA residual current circuit breaker
	Ref.	Ref.
180x75	FSV-187	FSO-187
180x100	FSV-1810	FSO-1810
200x75	FSV-207	FSO-207
200x100	FSV-2010	FSO-2010

### INFORMATION

All power sockets are wired (The power cable of the console is not supplied)  
Recommendation: use a power cable in 3x2.5mm<sup>2</sup> (phase + neutral + earth)

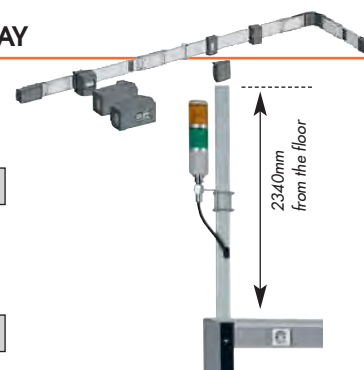
## VERTICAL CABLE RECEWAY

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



# Standard benches

## Benches with a shelf



### BENCH WITH A 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

Dims. (mm)	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
	Ref.	Ref.	Ref.	Ref.
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.

Dims. (mm)	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
	Ref.	Ref.	Ref.	Ref.
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



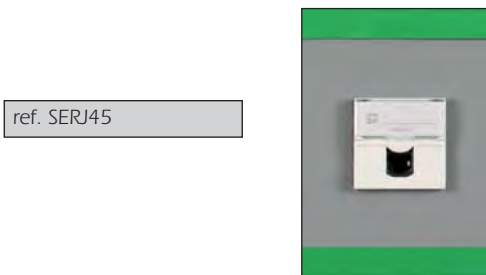
### BENCH WITH A HIGH SHELF & A POWER CONSOLE

- 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 650mm (depth: 400mm)
  - Height of the bench: 1490 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.

Dims. (mm)	Thermal magnetic circuit breaker		30mA residual current circuit breaker	
	Ref.	Ref.	Ref.	Ref.
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 (The power cable of the console is not supplied) Recommendation: use a power cable in 3x2.5mm<sup>2</sup> (phase + neutral + earth)

### RJ45 PLUG (NOT WIRED)



ref. SERJ45

### 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

# 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)

Dims (mm)	Ref.	Ref.
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 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

Dims (mm)	Ref.	Ref.
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

## 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**

Dims (mm)	Ref.	Ref.
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

## CABINET WITH 7 DRAWERS



- High temperature stratified top (40 mm). Maximum load 1000kg
- Height of the bench: 840mm (top included)
- Cabinet with 7 drawers (7 drawers H100mm)

Dims (mm)	Ref.	Ref.
1800 x 750	70TV-187S	70TO-187S
1800 x 1000	70TV-1810S	70TO-1810S
2000 x 750	70TV-207S	70TO-207S
2000 x 1000	70TV-2010S	70TO-2010S

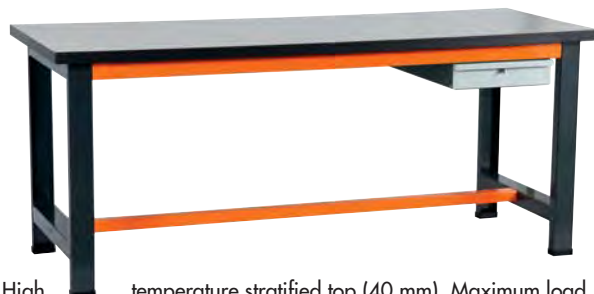
## CABINET WITH 3 DRAWERS



- 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)

Dims (mm)	Ref.	Ref.
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 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**

Dims (mm)	Ref.	Ref.
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

# Standard benches

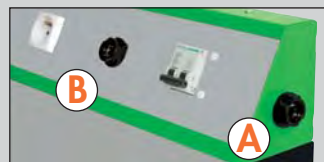
## Choose and configure your own workbench

### 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.

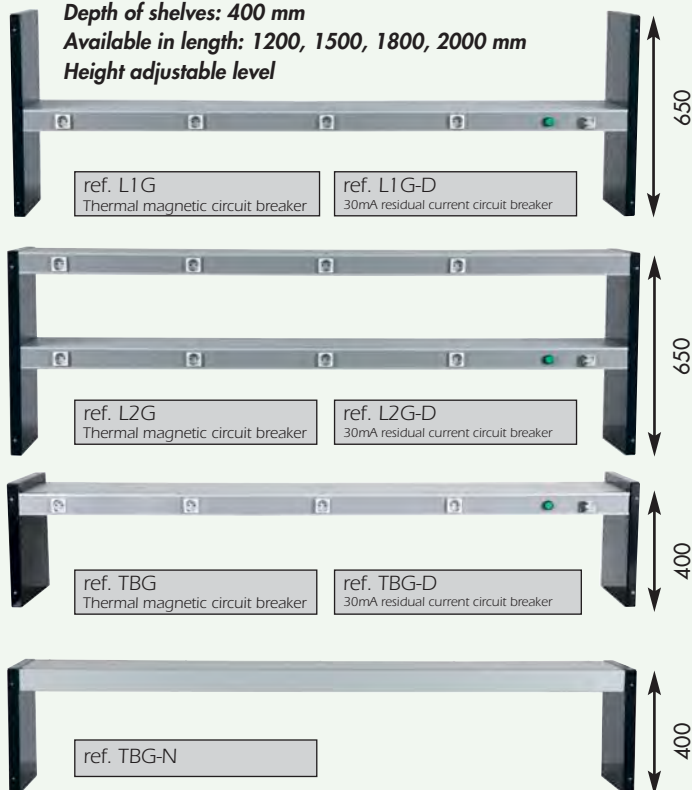
ref. PRISE+

### COMPUTER ITEMS SEE PAGES 18-19



### 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

ref. L2G  
Thermal magnetic circuit breaker

ref. L2G-D  
30mA residual current circuit breaker

ref. TBG  
Thermal magnetic circuit breaker

ref. TBG-D  
30mA residual current circuit breaker

ref. TBG-N

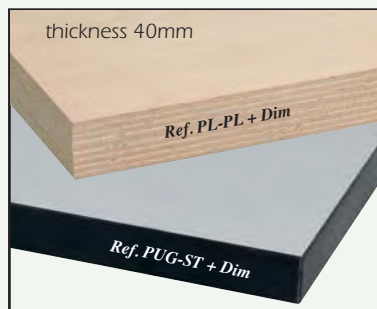
### LIGHTING OPTION

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



ref. ET-ECL

### HIGH TEMPERATURE STRATIFIED\* TOP AND WOODEN TOP



REF	WIDTH.	DEPTH
PUG-ST	1200mm STRAT	750mm or 1000mm
PL-PL	1200mm WOOD	750mm or 1000mm
PUG-ST	1500mm STRAT	750mm or 1000mm
PL-PL	1500mm WOOD	750mm or 1000mm
PUG-ST	1800mm STRAT	750mm or 1000mm
PL-PL	1800mm WOOD	750mm or 1000mm
PUG-ST	2000mm STRAT	750mm or 1000mm
PL-PL	2000mm WOOD	750mm or 1000mm

#### MAIN FEATURES OF HIGH TEMPERATURE STRATIFIED TOP



Uniformly  
distributed



Heat  
resistant



Abrasion  
resistant



Scratch  
resistant



Chemical  
resistant



Easy to  
clean

#### MAIN FEATURES OF WOODEN TOP



Uniformly  
distributed



Shock  
resistant



## 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

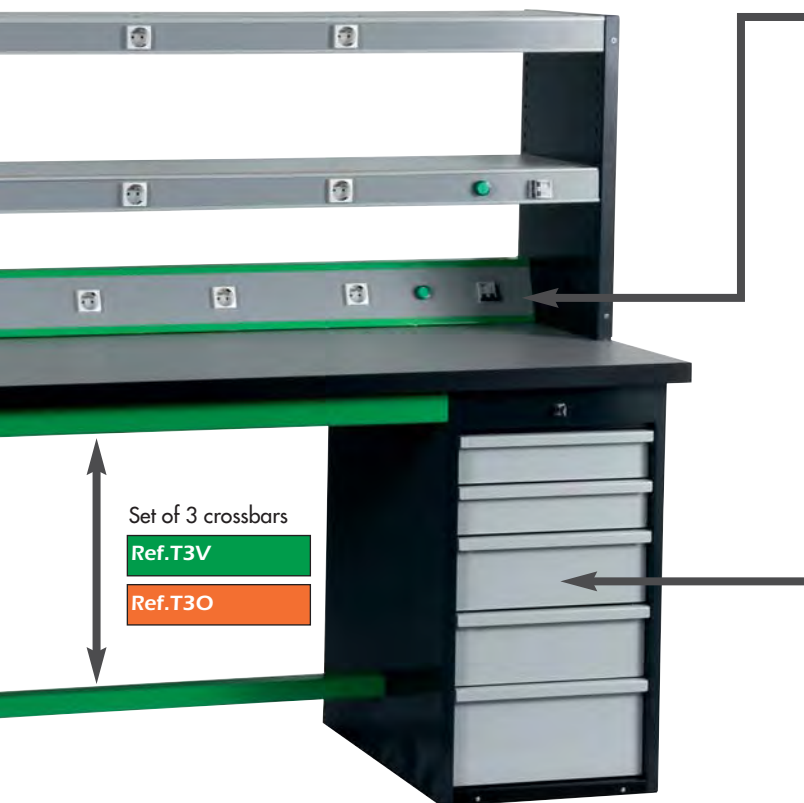
Model for power cable and network cable

ref. DEG-2

Beacon with 3 light indicators  
ref. VOY181

Beacon with 2 light indicators  
ref. VOY121

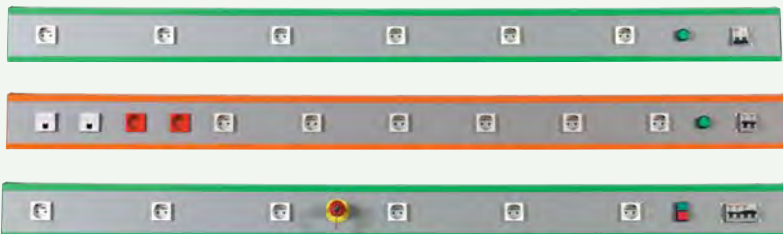
Beacon with 1 light indicator  
ref. VOY61



## 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 16 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 14 FOR MORE INFORMATION



## HANGING DRAWERS

- Hanging drawers, 1 to 4 drawers
  - For top in depth 750 mm or 1000 mm
- SEE PAGE 15 FOR MORE INFORMATION



## LAYOUT OF DRAWERS

- 3 different types of compartments
  - Suitable for drawers of leg-mounted cabinets or hanging drawers
- SEE PAGE 15 FOR MORE INFORMATION



## SINGLE LEGS



Model for top in 750mm depth

ref. PHG-75

Model for top in 1000mm depth

ref. PHG-100



# Standard benches

## 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)

I = 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

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

As standard, all keys are identical. Different keys are available upon request



Ref. TIG-30



Ref. TIG-32



Ref. TIG-33

## HANGING DRAWER WITH LOCK AND KEY

For top in depth 750 mm or 1000 mm  
Height: 100 mm - Width: 400 mm

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

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



Ref. TIG-40



Ref. TIG-41



Ref. TIG-42



Ref. TIG-43

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

# 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 ties 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 compartments)



REF. AMN-20

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



REF. AMN-24

**24 fixed spaces**  
24 small

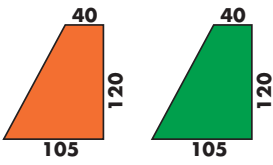
Power consoles on the bench top

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.



Ref.	Ref.	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



Ref.	Ref.	Protection type
PAV-20	PAO-20	Thermal magnetic circuit breaker
PAV-20D	PAO-20D	30mA Residual current circuit breaker

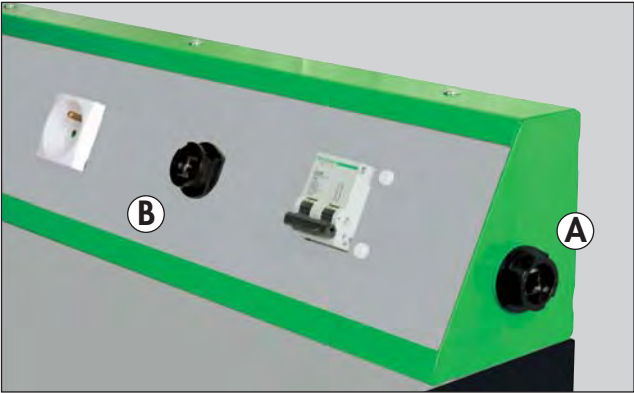
- 6 power sockets 230V (2P+E)
- A circuit breaker (two possible choices)
- A hardwearing Ø30 LED lamp indicating that sockets are switched on
- A key-operated emergency stop button which activates an undervoltage trigger, thereby ensuring positive safety



Ref.	Ref.	Protection type
XAV-20	XAO-20	Thermal magnetic circuit breaker
XAV-20D	XAO-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

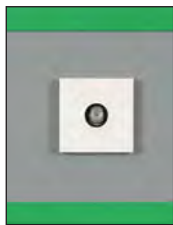
MADE TO MEASURE





# Additional items

All these elements can be added to the power consoles presented below cons.



## SATELLITE PLUG

Ref. SE-SAT



## TV PLUG

Ref. SE-TEL



## INVERTER PLUG

Ref. SE-UPS

Not wired.  
For U.P.S.



## 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/3A - 15V/3A

**INFORMATION:** All power sockets are wired  
(The power cable of the console is not supplied)  
Recommendation: use a power cable in 3x2.5mm<sup>2</sup>  
(phase + neutral + earth)

# 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 8 power sockets  
230V (2P+E) - 1930W.  
Dim: 290 x 85 x 55mm

# Short power console 500mm



Ref. VXV-1

Ref. VXO-1

Thermal magnetic circuit breaker

Ref. VXV-2

Ref. 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 2.5mm<sup>2</sup>

# Computer workbenches

## Computer items for workbenches



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

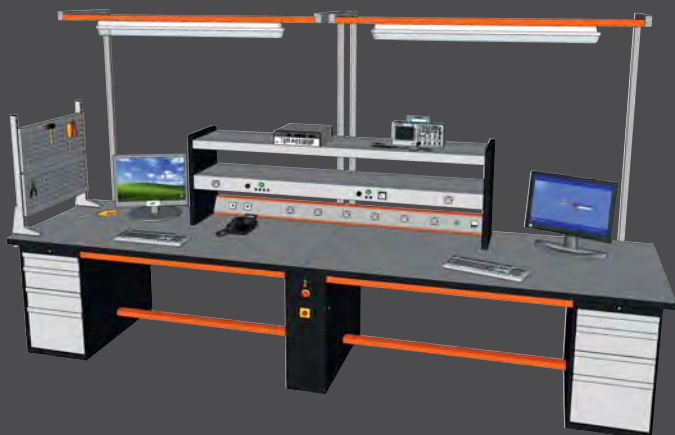
### SHELF



ref. IFG-ETG

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

## MADE TO MEASURE



### 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.

### BASIC CPU TOWER HOLDER



ref. IFG-ECO

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
- Total internal height = 500mm
- Internal width 245mm
- Internal depth 500mm
- Attached with lag screws (supplied)
- EPOXY paintwork. Steel sheet base plate. Unloaded weight: 5 kg

### CPU TOWER HOLDER adjustable in height from 360 to 480mm



ref. IFG-UC

Adjustable in increments of 30mm.  
Solid sheet box.  
With anti-theft bars at the front and rear.



ref. IFG-UC2

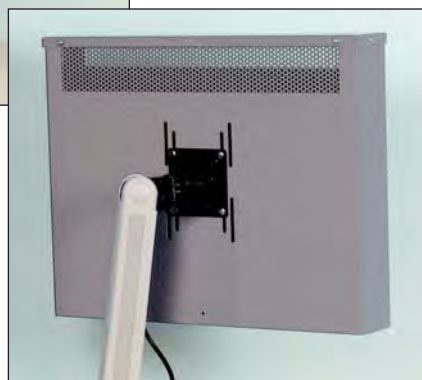
Adjustable in increments of 30mm.  
Solid sheet box.  
With anti-theft doors at the front and rear with locks.



## PROTECTIVE HOUSING FOR LCD SCREEN



ref. VES-187



Metallic housing with a transparent and shock resistant front panel, provided with an adjustable LCD monitor arm. The 3mm Lexan® (polycarbonate resin thermoplastic) panel is unbreakable and can be easily replaced in case of voluntary damages. It protects the LCD screen against all voluntary damages: Stanley knife®, shocks, tags and also modification of the LCD screen settings ...

The protective housing is set on a LCD monitor arm pivoting around 4 rotation axis. VES-187 is suitable for all LCD screen with a maximum dimensions of 480 x 380 x 80mm, 12kg max. The upper part behind is in wire netting for a good heat evacuation. In order to change parameters, the teacher only needs to unscrew the upper part and slide the transparent front panel.

DIMENSIONS:

Overall: 490 x 390 x 90 mm

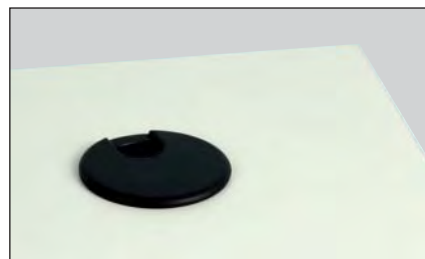
## FLAT SCREEN HOLDER



- For flat screen monitors up to 15 kg
- Attached to edge of table by locking pliers with two tightening screws.
- 4 rotation points on 3 ball joints
- Integrated cable guide
- Supplied with 4 screws for flat screen fixing

ref. VES-151

## CABLE GROMMET OPTION



- Optional raceway through the bench-top
- Factory assembly only

ref. PASS-70

## FLAT SCREEN SUPPORTS

### FEATURES SHARED BY 3 MODELS

- Attached to edge of table by locking pliers with a tightening screw for a table thickness between 15 and 100mm. The attachment consists of a 400mm high support pole fitted with a sliding ball joint to adjust the height of the screen.
- Built-in cable guide
- Supplied with 4 screws for the monitor.



### Model 500

- For flat screen monitors weighing up to 12kg
- 3 rotation points on 2 ball joints

ref. VES-500

### Model 501

- For flat screen monitors weighing up to 10kg
- 4 rotation points on 3 ball joints
- Arm length 250mm

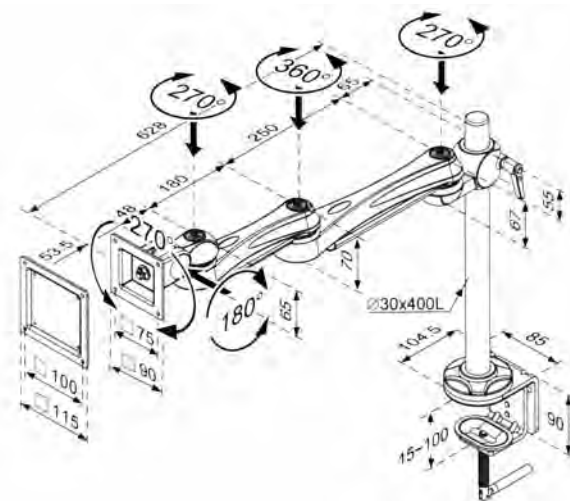
ref. VES-501



### Model 502

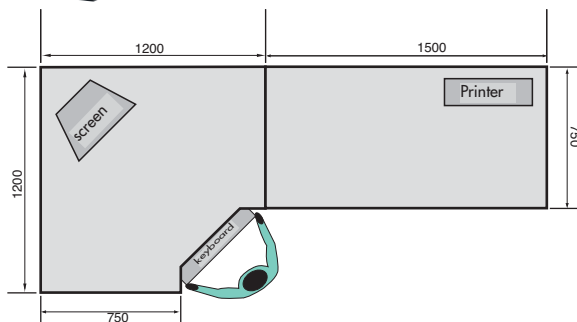
- For flat screen monitors weighing up to 8kg
- 5 rotation points on 4 ball joints
- Arm lengths of 250mm and 180mm

ref. VES-502



# Computer workbenches

## Computer workshop



This bench opens up a wealth of possibilities for expanding access to computer workshops, thanks to the large space available on the bench-top. Its standard supplied equipment, which is described below, can be modified on simple request. Its L-shape means that it is highly ergonomic. It is reversible; the return can be positioned either on the left or on the right.

### COMPONENTS AND FEATURES OF STATION

- 2 high-temperature stratified tops  
Separable corner and return  
PVC edges  
Thickness of 40mm
- A "cage"-type CPU tower holder with anti-theft bar at the front.
- A sliding keyboard/mouse holder in the corner
- 1 complete stand consisting of:  
Two single H-shaped legs, 2250mm apart  
Vertical support leg under bench-top  
Footrest bar
- Epoxy paintwork

ref. TSV-30

ref. TSO-30

*Computer hardware not supplied*

## Workstation for practical work



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 accommodate all the computer elements. The TXL40 is very convenient to use.

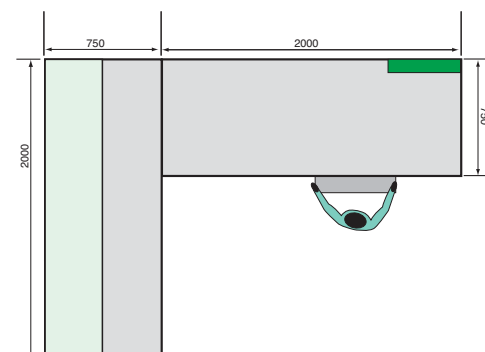
### COMPONENTS AND FEATURES OF THE STATION

- 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.
- 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

ref. TXV-40

ref. TXO-40

*Computer hardware not supplied*



## MADE TO MEASURE



# Industrial computer trolley



Industrial computer cart, ideal for the workshop.  
Dimensions (excluding screen support) 750 x 670mm. Height 965mm.  
Max load 500kg.

## FEATURES OF THE WORKSTATION

- High-temperature stratified bench-top 40mm thick  
PVC bench-top edges
- Cage type CPU holder  
With anti-theft bar at the front.
- 1 complete stand (epoxy paint) including:  
Two single H type feet  
3 cross rails including 1 foot rest  
4 casters Ø100mm including 2 with brakes
- 1 flat screen support arm  
Table edge attachment between 15 and 100mm thick.  
400-mm high pole, fitted with sliding ball joint.  
Built-in cable guide.

Supplied with 4 screws for the screen.

For flat screens up to 12 kg

3 rotation points on 2 ball joints

Sliding ball joint for screen height adjustment

ref. RSV-INF

ref. RSO-INF

*Computer hardware not supplied*

# Mobile workstation for industrial computer



Industrial computer cart, ideal for the workshop.  
Dimensions (excluding screen support) 1500 x 750mm Height 965mm.  
Max load 500kg.

## FEATURES OF THE WORKSTATION

- High-temperature stratified bench-top 40mm thick  
PVC bench-top edges
- Cage type CPU holder  
With anti-theft bar at the front.
- A sliding keyboard/mouse holder in the corner
- 1 complete stand (epoxy paint) including:  
Two single H type feet  
3 cross rails including 1 foot rest  
4 casters Ø100mm including 2 with brakes
- 1 flat screen support arm  
Table edge attachment between 15 and 100mm thick.  
400-mm high pole, fitted with sliding ball joint.  
Built-in cable guide.

Supplied with 4 screws for the screen.

For flat screens up to 12 kg

3 rotation points on 2 ball joints

Sliding ball joint for screen height adjustment

ref. RSV-PRO

ref. RSO-PRO

*Computer hardware not supplied*



## Option 230V multi sockets unit fixed under the top

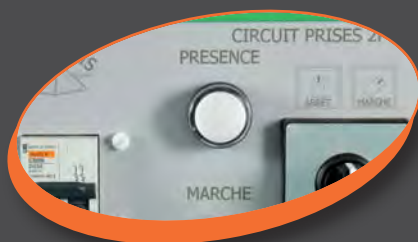
4 plugs 2P+E - 3860W Dim. 290 x 80 x 60mm.

ref. LGS-41



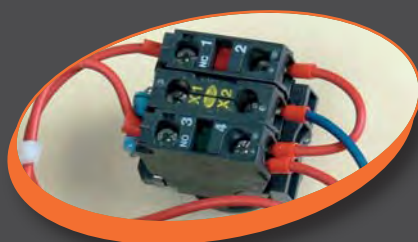
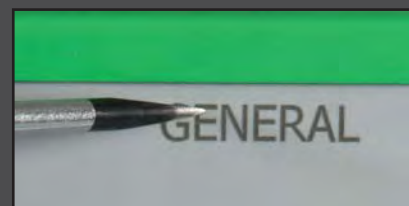
# WORKSTATIONS

## 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

Front cover non-removable.



Inaccessible contacts



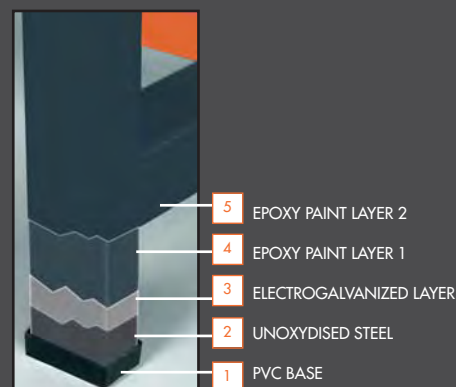
### Control console free of metal components

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

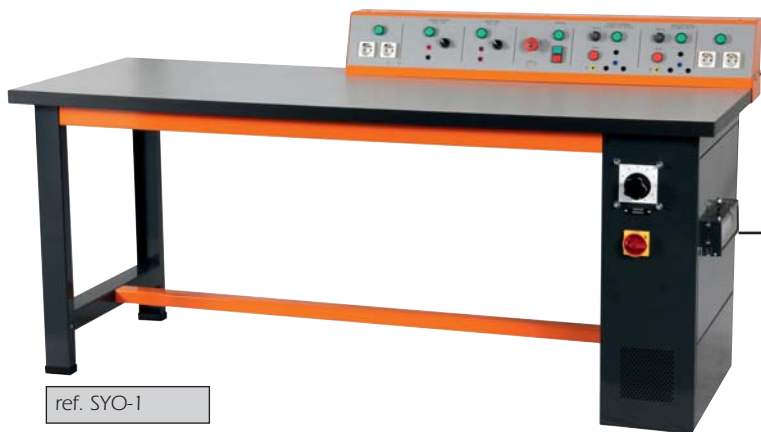
All of our leg assemblies are manufactured from electrogalvanised steel sheet, and makes the sheet extremely resistant to corrosion. This protection is strengthened further by two layers of furnace-baked epoxy paint, which means that it is suitable for use even in tropical settings.



# Multi purpose workstation

## Standard multi-purpose workstation

HARD-WEARING LAMP (without maintenance)



ref. SYO-1

### LOCKABLE COVER FOR CIRCUIT BREAKERS

Circuit breakers are placed behind a lockable transparent cover  
Restricted access  
IP2X protection



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.

### 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.

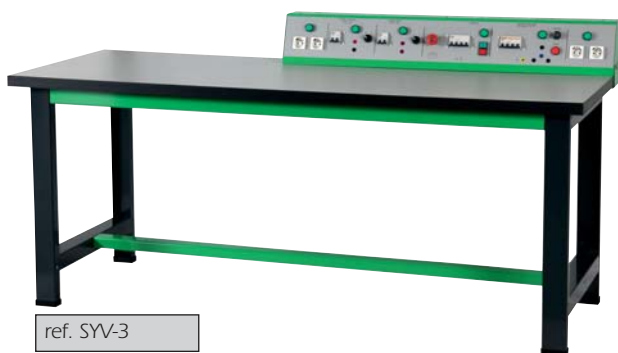


System of lock with hook taken in the plate. Compatibility with a shelf, contact us.

ref. VS-1200

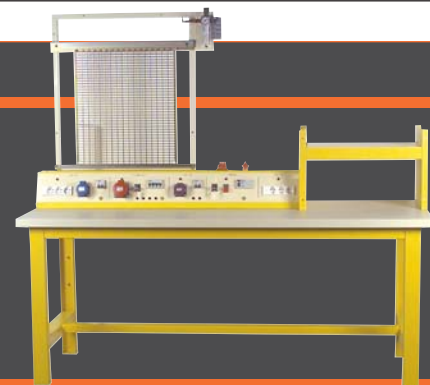
Ref.	Ref.	Thermal magnetic circuit breaker (D type)	3-phase mains on 4 safety terminals	4 power sockets 230V 2P+E	3-phase 0-430V 3.5kVA variable	Fixed 240VDC/2A insulated	Fixed 24VAC/5A with circuit breaker	Stratified bench-top 2000x750	Stratified bench-top 2000x1000	Technical leg
SYO-1	SYV-1	x	x	x	x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



ref. SYV-3

MADE TO MEASURE





# Multi purpose workstation

## Choose & configure your own workstation



First select the base unit (Stand + top + bare console) of your choice from the two versions available, and select the electrical elements that you wish to install from the various options listed (with an obligatory main module described next page).

Legs + stratified top 2000 x 750mm  
+ bare console

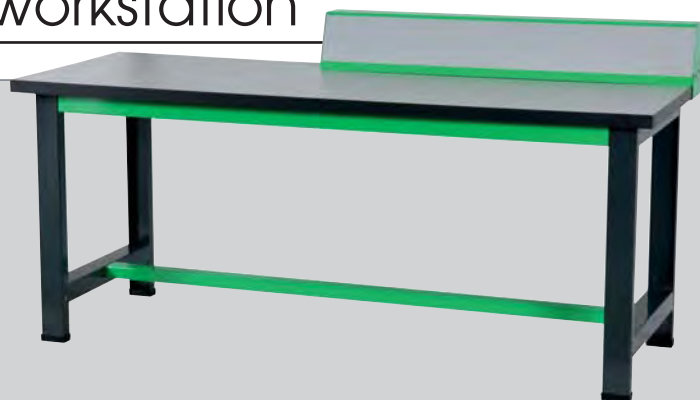
ref. SYV-750

ref. SYO-750

Legs + stratified top 2000 x 1000mm  
+ bare console

ref. SYV-1000

ref. SYO-1000



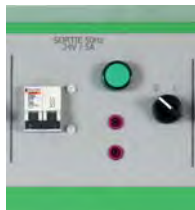
### 3-PHASE MODULE 3 X 400V



ref. SE5TR

3-phase supply module (4kVA – fixed 3x400V+N)  
On-Off key control

### AC SUPPLY MODULE 24V



ref. SE3BT

Module 24V/5A insulated from mains

### DC MODULE (240VDC)



ref. SE2SO

DC fixed 240V/2A insulated from mains

### DC MODULE -15VDC +15VDC 3A



ref. AD15I

DC fixed supply with 2 outputs  
+15V/3A -15V/3A

### 3-PHASE HYPRASOCKET MODULE



ref. HP4

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

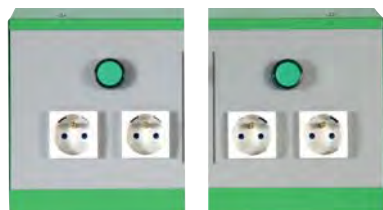
### 3-PHASE MODULE 0-430V



ref. SE6VA

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

### MAINS SOCKETS MODULE



ref. SE4PC

Module with 2 x 2 power sockets 230V + lamp.  
WITH POWER SOCKETS OF YOUR CHOICE

### MEASURED POWER SOCKET MODULE



ref. SEPCW

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

### 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

### ANTI-VANDALISM EMERGENCY STOP



The emergency stop head turns freely, vandals cannot tear out the electrical connections by  
forceably turning the head of the emergency stop which stays attached to the front.

ref. ARU-AV

**OBLIGATORY MAIN MODULES**

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

SE1MA without on/off key control

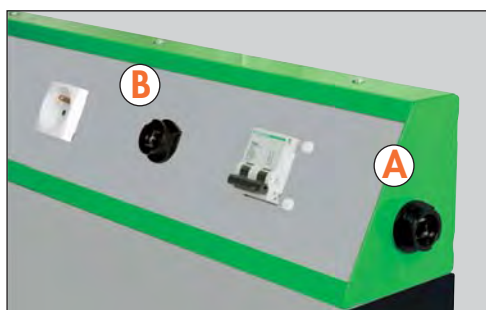
ref. SE1MA  
for 3-phase mains supply

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

**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

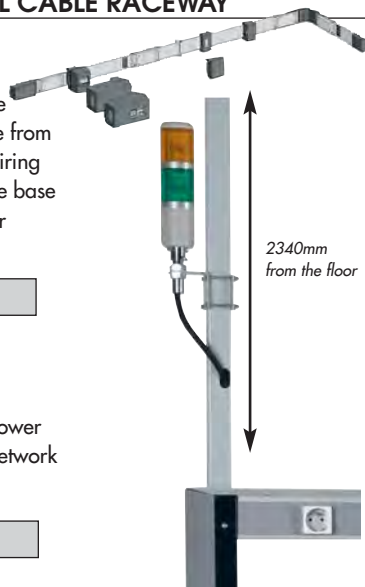
**VERTICAL CABLE RACEWAY**

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

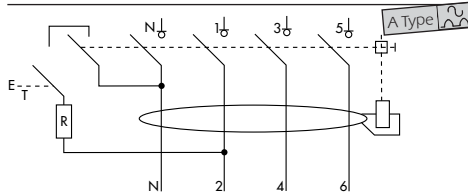


2340mm  
from the floor

**POWER SUPPLY BOX**

ref. CIA-A4

3-phase mobile power supply. On/off button + emergency push button. Outputs on safety terminals + protection by circuit breaker

**RESIDUAL CURRENT CIRCUIT BREAKER**

ref. DIF30-4S for 3-phase workstation

ref. DIF30-2C for single-phase workstation

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

**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



ref. VS-1200

**COMPUTER CONNECTION (COPY OF THE REAR PANEL OF A PC)**

ref. SEINF

The rear panel of a PC is transferred on the front console with:

- 2x serial & 1x parallel port
- 2x USB port
- 1x VGA 15 pins port
- 1x PS/2 Keyboard port

All cables get out under the worktop, ready to be linked to a CPU tower.

Other configurations are available upon request.

**LOW SHELF WITH POWER SOCKETS**

available in different lengths

Low shelf with 4 power sockets, lamp and circuit breaker  
Height: 400mm

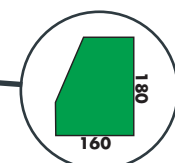
ref. TBG

# Electrotechnical benches

## Electrotechnical benches



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			

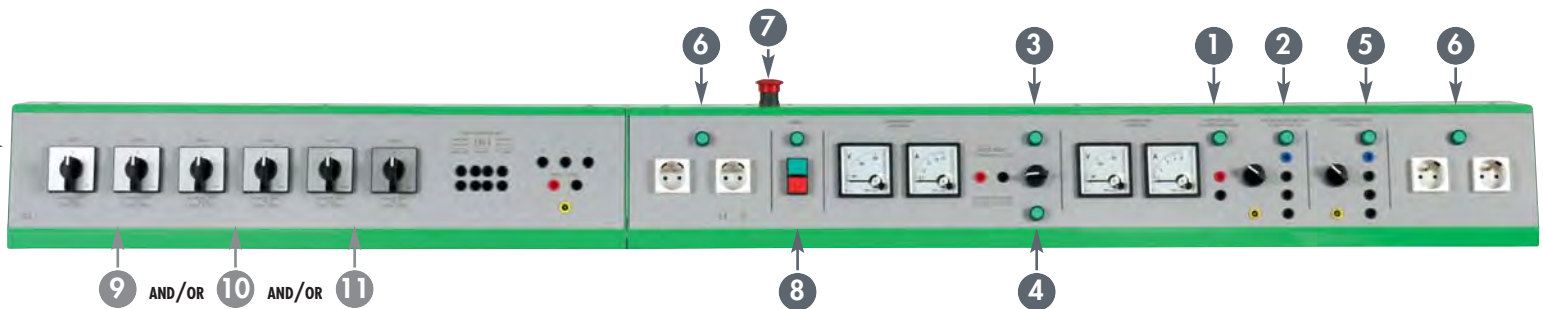
2000VA		ELECTROTECHNICAL BENCHES OF 2KVA RATING								
Ref.	Ref.	DC SUPPLY 0-270V 8A	3-PHASE 0-450V 5A	AUXILIARY 0-250VDC 2.5A	AUXILIARY 0-250VAC 2.5A	3-PHASE 3x400VAC 4 TERMINALS	4 POWER SOCKETS 230V 2P + E	RESISTIVE LOAD 2000W	INDUCTIVE LOAD 2000VAR	CAPACITIVE LOAD 2000VAR
BZO-20A	BZV-20A	x	x	x	x	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			

1000VA		ELECTROTECHNICAL BENCHES OF 1KVA RATING								
Ref.	Ref.	DC SUPPLY 0-270V 7A	3-PHASE 0-430V 5A	AUXILIARY 0-250VDC 2.5A	AUXILIARY 0-250VAC 2.5A	3-PHASE 3x400VAC 4 TERMINALS	4 POWER SOCKETS 230V 2P + E	RESISTIVE LOAD 1000W	INDUCTIVE LOAD 1000VAR	CAPACITIVE LOAD 1000VAR
BZO-10A	BZV-10A	x	x	x	x	x	x	x	x	x
BZO-10B	BZV-10B	x	x	x	x	x	x	x	x	
BZO-10C	BZV-10C	x	x	x	x	x	x	x		
BZO-10D	BZV-10D	x	x	x	x	x	x			

•HARD-WEARING LAMP WITHOUT MAINTENANCE

•INSULATED OUTPUT

•LOADS INSIDE THE LEFT-HAND CABINET



### 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.

*Auxillary supplies 3 & 4 can't work simultaneously*

### 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.

### 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)

### 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.

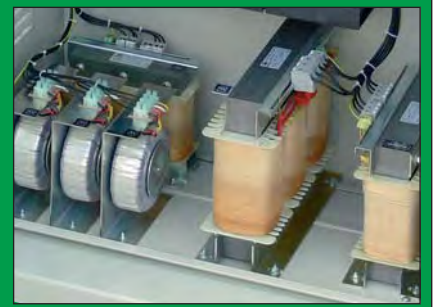
### 10 CAPACITIVE LOAD

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 version only)**

### 11 INDUCTIVE LOAD

3 moveable cores moved by a control wheel and an 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 accessible. 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



MADE TO MEASURE





# Electrotechnical benches

## Options for Electrotechnical bench

### 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



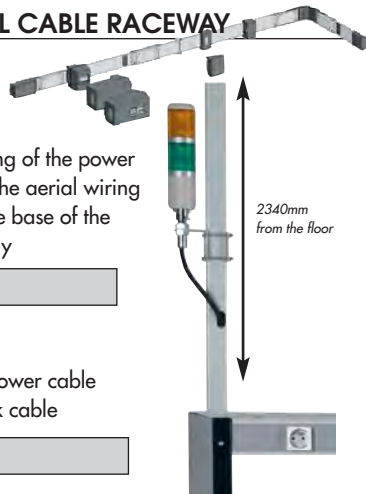
### VERTICAL CABLE RACEWAY

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



### 360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green

ref. VOY181

Beacon with 2 light indicators: red and green

ref. VOY121

Beacon with a red light indicator (voltage presence)

ref. VOY61

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



HARD-WEARING LED LAMPS

### ANTI-VANDALISM COVER WITH KEY

This pull-down cover in front of the electrical equipment prevents students from scribbling on or vandalising the front panel and its equipment. Standard dimensions: 1200mm or 2000mm.



ref. VSG-12  
for power console 1200mm

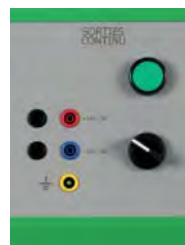


ref. VSG-20  
for power console 2000mm



System of lock with hook taken in the plate

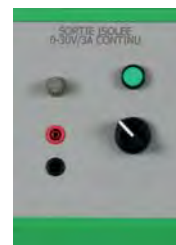
### DC SUPPLY



Unit of 2 fixed DC power supplies  
+15V/3A -15V/3A

ref. AD151

### DC VARIABLE SUPPLY



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

ref. R30301

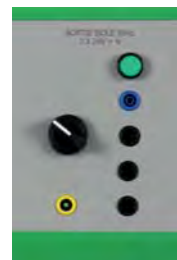
### 3-PHASE HYPRASOCKET (400VAC)



Fitted in parallel on the three-phase mains output terminals

ref. HP4

### 3-PHASE 24VAC SUPPLY

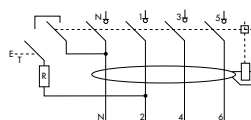


3-phase insulated from the mains, 3 x 24 VAC/250VA and protected by a circuit breaker. Output controlled by On/Off contactor and indicated by a LAMP.

ref. TRI24

### RESIDUAL CURRENT CIRCUIT BREAKER

30mA at the front.  
Only useful if the room is not equipped with this device.



ref. DIF30-4B

A Type

### CANALIS CONNECTER

Connector for KNA Canalis with fuses 10x38.



ref. KNA02CF5

### 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.

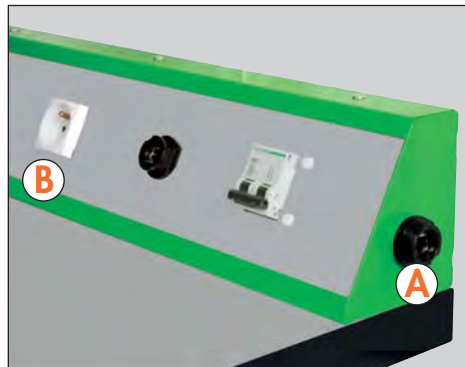


ref. CTRL-E



## 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

## RJ45 PLUG (NOT WIRED)



ref. SERJ45

## INVERTER SOCKET



Ref. SE-UTS

Not wired.  
For U.P.S.

## MEASURED POWER SOCKET MODULE



ref. SEPCW

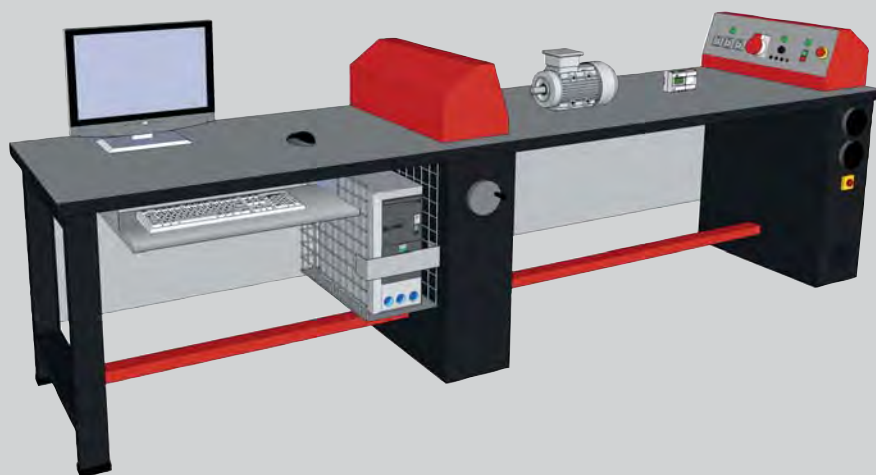
Output on power socket 2P+E with wattmeter direct display of consumed power.

Measuring apparatus: 10000 pts

Maximum power: 3500W

Protection by circuit breaker on the front panel

# MADE TO MEASURE



# Electrotechnical benches

## Touchscreen-controlled station



A reliable station, compliant with laboratory safety standards (checked by APAVE and SOCOTEC). It consists of one or two lockable electrical cabinets (depending on the model), connected by 3 cross members including a foot rest, a 2000 x 750mm bench-top with stratified coating as standard and a source distribution console fitted with safety terminals for all loads and sources.

This autonomous bench is fitted with voltage sources controlled by a touch screen. The 5.7-inch colour screen selects the voltage sources and displays information and safety messages such as Pb emergency stop activated or autotransformer not set to zero. A PLC with its Ethernet card manages the station and the connection to the computer network if several stations are used. A room equipped with several touchscreen-controlled stations has the advantage of being network wired from an Ethernet switch or a patch panel. In this way, the teacher can, from a single PC, lock and/or observe the controls on each bench.



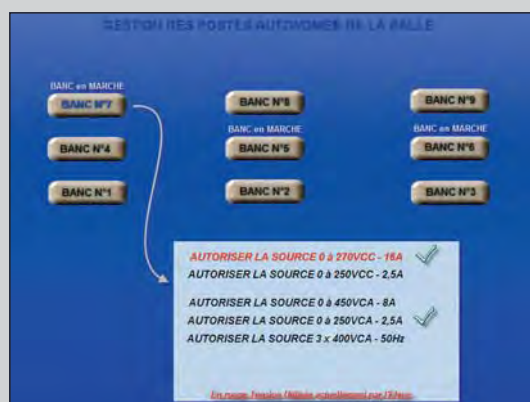
**Electrical specifications,**  
see **electrotechnical benches**  
**PAGE 27**

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

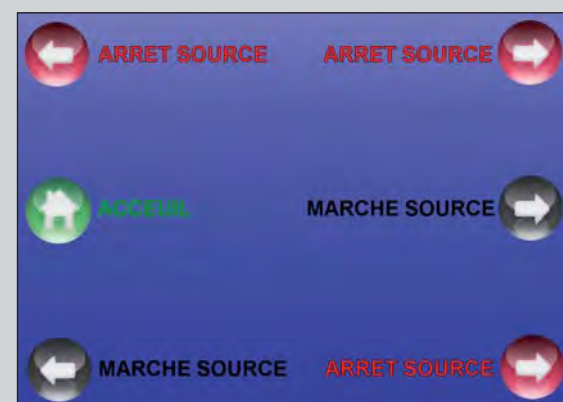


### FEATURES OF THE PLC/CONTROL SECTION

- 5.7-inch colour touch screen flush with the front of the console
- TWIDO PLC
- Ethernet interface



The teacher's PC screen supervising the benches in the room



The console touch screen managing the power sources

4000VA*		TOUCHSCREEN CONTROLLED 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
BTO-40A	BTV-40A	x	x	x	x	x	x	x	x	x
BTO-40B	BTV-40B	x	x	x	x	x	x	x	x	
BTO-40C	BTV-40C	x	x	x	x	x	x	x		
BTO-40D	BTV-40D	x	x	x	x	x	x			

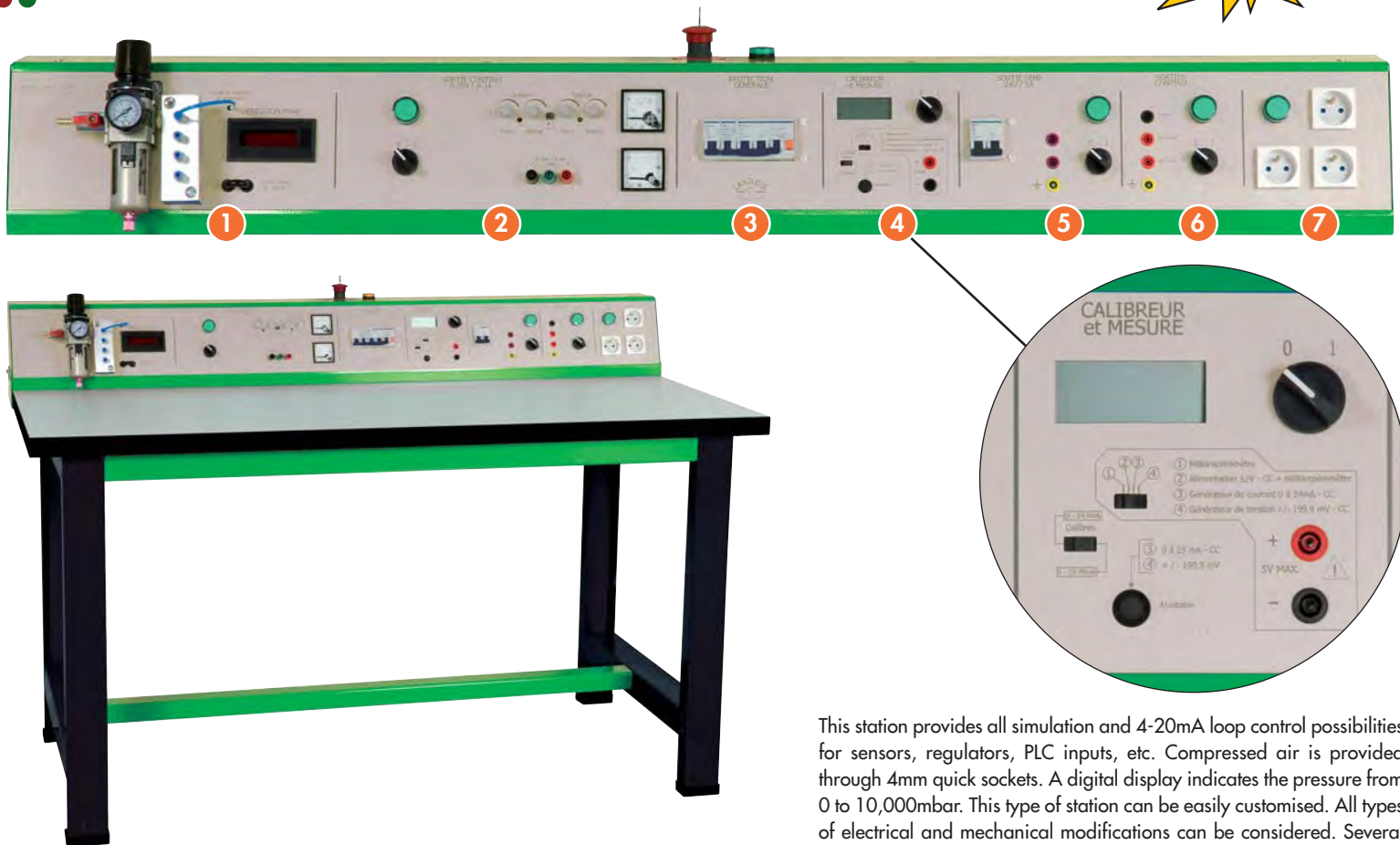
• **HARD-WEARING LAMP WITHOUT MAINTENANCE**

• **INSULATED OUTPUT**

• **LOADS INSIDE THE LEFT-HAND CABINET**

# 4-20mA loop calibrator

**NEW**



ref. CAO-33


ref. CAV-33

Calibrator features table ④

	Display	Accuracy
Milliammeter	0 – 19.99 mA ± 0.01 mA	± 0,25 % full scale + 1 Digit
	0 – 24 mA ± 0.1 mA	± 0,5 % full scale + 1 Digit
12V voltage generator + Milliammeter	0 – 19.99 mA ± 0.01 mA	± 0,25 % full scale + 1 Digit
	0 – 24 mA ± 0.1 mA	± 0,5 % full scale + 1 Digit
Current generator + Milliammeter	0 – 19.99 mA ± 0.01 mA	± 0,25 % full scale + 1 Digit
	0 – 24 mA ± 0.1 mA	± 0,5 % full scale + 1 Digit
Voltage generator + Milliammeter	-199,9 mV to +199,9 mV ± 0,1 mV	± 0,25 % full scale + 1 Digit

This station provides all simulation and 4-20mA loop control possibilities for sensors, regulators, PLC inputs, etc. Compressed air is provided through 4mm quick sockets. A digital display indicates the pressure from 0 to 10,000mbar. This type of station can be easily customised. All types of electrical and mechanical modifications can be considered. Several options are possible.

## Components and features of the station

- Workbench with laminated top 1500 x 750mm
  - ① Air feed system with digital pressure display from 0 to 10,000 mbar.  
A 4-20mA signal reflecting the pressure is provided instead of the jumper.
  - ② Variable output 0-30V/3A with current and voltage display and electronic auto-protection.
  - ③ 30mA residual current circuit breaker  + Emergency stop
  - ④ Calibrator / monitor / loop simulator
    - Milliammeter
    - 12V generator + milliammeter
    - 0 to 24mA DC current generator + milliammeter
    - +/- 199.9mV voltage generator + milliammeter
  - ⑤ 24V 50Hz - 5A output protected by circuit breaker
  - ⑥ 12 and 24VDC outputs with electronic auto-protection
  - ⑦ 3 2P+E sockets
- Maintenance-free LED indicator lights

## RJ45 PLUG (NOT WIRED)

ref. SERJ45



## 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



## Supplies and loads for renovation project

### STAND ALONE DC & AC POWER SUPPLY



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 an insulated transformer as specified by international 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 command start/stop functions, on condition that the autotransformer output is at 0V. An everlasting 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 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 on condition that 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 and insulated from the mains by an insulated transformer as specified by international safety standards for the use of direct currents. The whole unit is protected against overloads 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. An indicator light shows that the unit is powered up.

*Auxiliary supplies 3 & 4 can't work simultaneously*

#### 5 3-PHASE SUPPLY (3 X 400VAC 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)

4 x power sockets 230V (2P+E), protected, with indicator lights.

#### 7 EMERGENCY STOP BUTTON

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

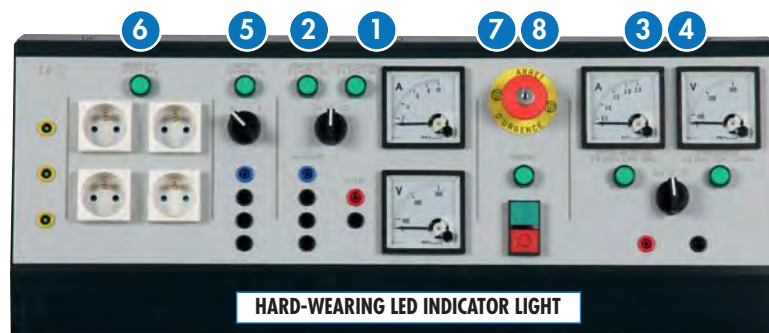
#### 8 PUSH BUTTON

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



**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
▼ DC AUXILIARY 0-250VDC	2.5A	2.5A	2.5A
▼ DC 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

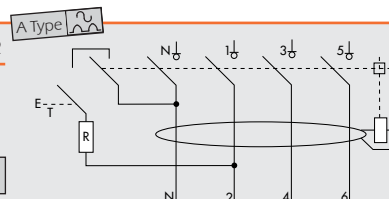
▼ with hard-wearing lamp without maintenance

▼ insulated from mains

#### RESIDUAL CURRENT CIRCUIT BREAKER

30mA at the front. Only useful if the room is not equipped with this device

ref. DIF30-4B



## 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 (please contact us).

**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

## 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

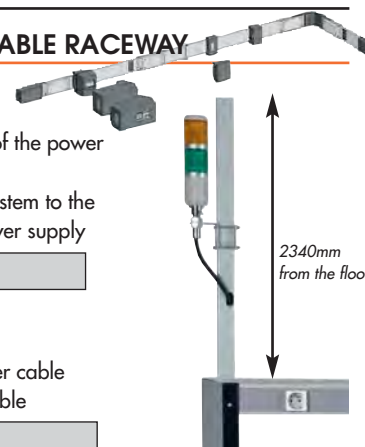
Side rails top and H leg available as options (see P08)

Side rails top and H leg available as options (see P08)



ref. AXG

## 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

## 360° LIGHT SIGNAL TOWERS



Beacon with 3 light indicators: red, yellow and green

ref. VOY181



Beacon with 2 light indicators: red and green

ref. VOY121



Beacon with a red light indicator (voltage presence)

ref. VOY61

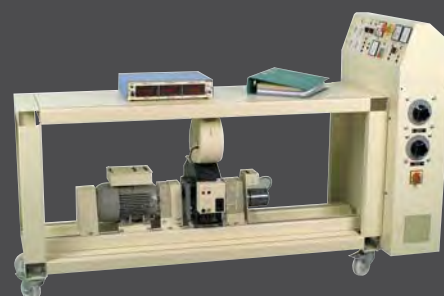
## COLOURS AVAILABLE UPON REQUEST

white - orange - red - green - blue



## HARD-WEARING LED LAMPS

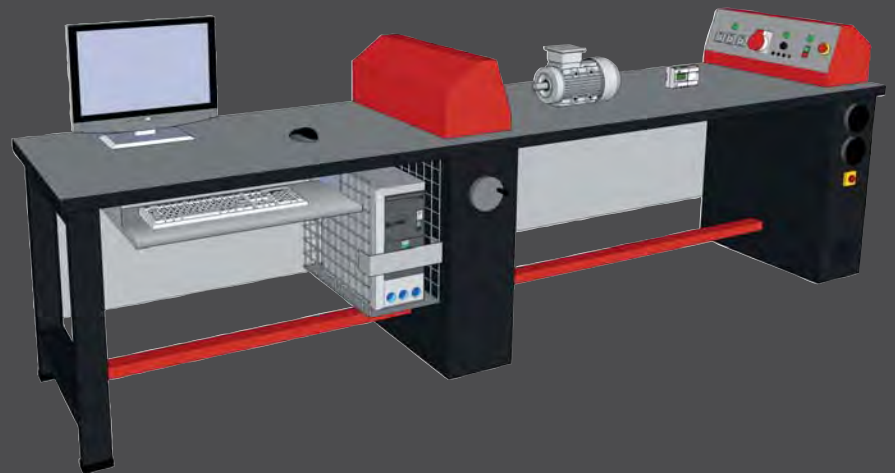
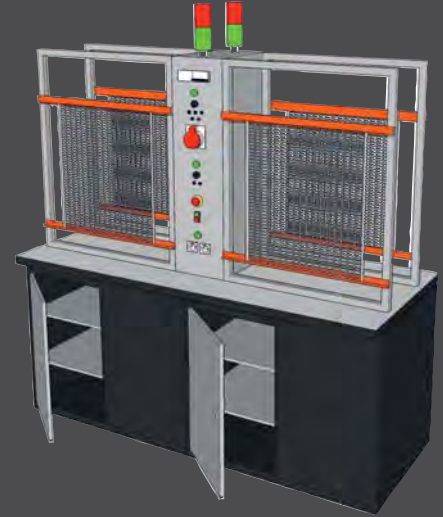
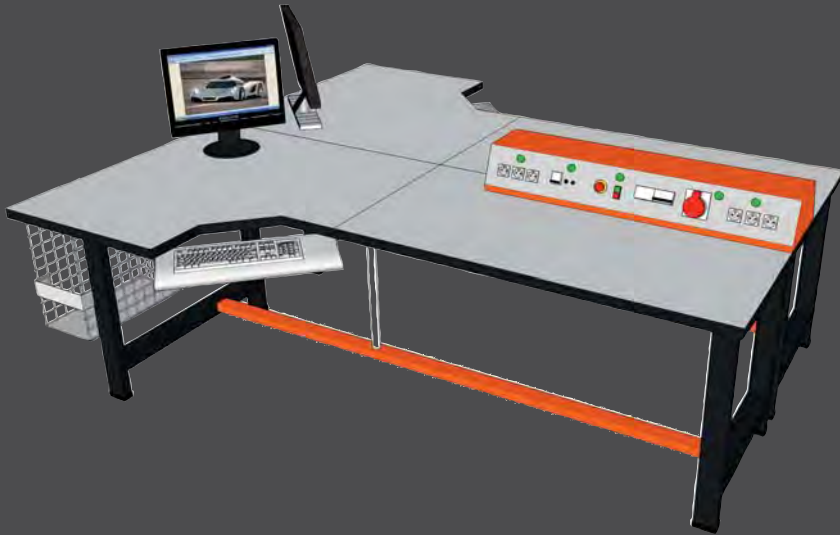
# MADE TO MEASURE





# MADE TO MEASURE

EXAMPLES OF PRODUCTS MADE TO MEASURE  
FOLLOWING CUSTOMERS NEEDS





Components mounted & Computer hardware not supplied.

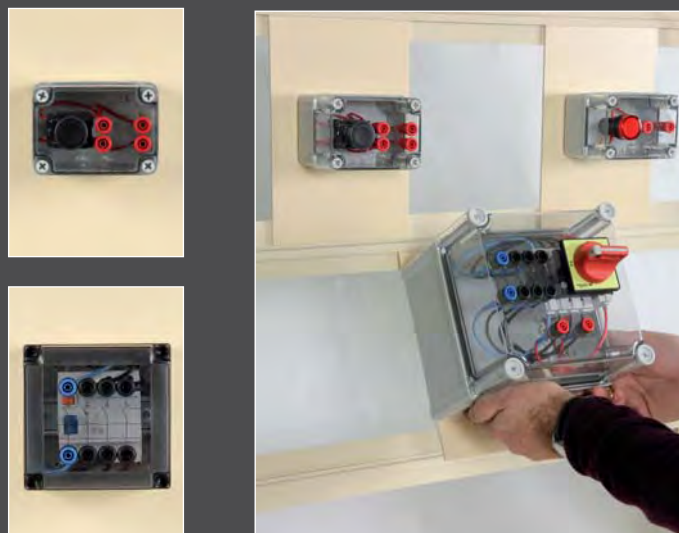
ref. LABO-FT

ref. LAO-FT

ref. LAV-FT

Industrial components with automatic functions mounted on plates compatible with IFTI stations

SEE PAGES 111 to 117




Supplied with:

- 1 1500 x 750mm stratified bench-top.
  - Workbench height: 840mm bench-top included. PVC base at the base of each leg.
  - 1 stand-alone vertical console for the electric power supply and the pneumatic feed system (see description given below)
  - 1 1200 x 1092mm frame with 4 pairs of rails for modules, height 250mm and thickness 4mm.
  - 1 sliding keyboard/mouse under the bench-top Lockable in the extended position. Dimensions: 620 x 320mm.
  - 1 CPU support, screwed under the table with lag screws. Anti-theft device. Height 500mm/Width 245mm/Depth 500mm
  - 1 support for a 15kg max flat screen 4 rotation points
- Attached to edge of table by locking pliers with a tightening screw. Cable guide. Supplied with 4 screws for the monitor.

### STAND-ALONE VERTICAL CONSOLE.

Requires a simple three-phase mains power supply 400V + N + E and a compressed air inlet. It consists of:

- 1 three-phase output on terminals controlled by a key-operated switch
- 1 24V/5A – 50Hz output with circuit breaker
- 1 24V/1.8A auto-protected DC output
- 2 2P+E sockets in the front
- 2 2P+E sockets in the rear (for computers or other items)
- Circuit breaker and general 30mA differential mechanism 
- General Start/Stop control with key-operated emergency stop
- 1 complete pneumatic feed system with air inlet pipe, stop valve, adjustable pressure regulator, filter, pressure gauge and feeder tank with 4 quick-fit, ø4mm self-sealing connections. In accordance with safety in workplace regulations.

Marking of outputs by maintenance-free LED indicator lights.

The entire system is fully protected against improper operation.

This equipment is often encountered in individualized maintenance technical training courses (IFTI).

### ITEMS SOLD SEPARATELY



1200 x 1092mm frame with 4 pairs of rails for modules, height 250mm and thickness 4mm.

ref. CADRE-FT

ref. PUP-FT



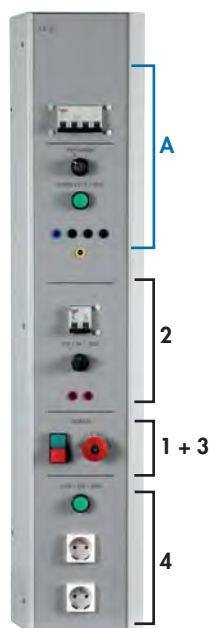
Set of 10 4mm thick blank PVC plates to attach your own components.  
6 plates dim. 250 x 166mm + 4 plates dim. 250 x 285mm

ref. PLA10

# Wiring benches

## 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 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



### BENCH WITH STRATIFIED TOP

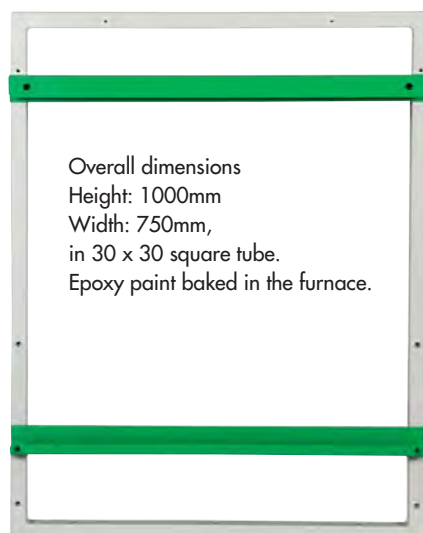


Highly-resistant and high-temperature stratified top.  
Dim. 1500 x 750mm  
Height of table top: 840mm

ref. ASO-157

ref. ASV-157

### GRID HOLDER FRAME (BARE WITHOUT GRID)



Overall dimensions  
Height: 1000mm  
Width: 750mm,  
in 30 x 30 square tube.  
Epoxy paint baked in the furnace.

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.

ref. CSO-10

ref. CSV-10

### SINGLE-PHASE VERTICAL CONSOLE



#### B. GENERAL PROTECTION

Protection by magneto-thermal circuit breaker (30mA residual current circuit breaker available as an option)

#### 1. "EMERGENCY STOP".

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

#### 2. 24VAC 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



### 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	765
width	434	534	534



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.	OUTPUT 0-250V DC	OUTPUT 0-430V 3-PHASE	AUXILIARY OUTPUT 0-250V
COMPAK20	8A + voltmeter & ammeter	5A + voltmeter & ammeter	2,5A + voltmeter & ammeter
COMPAK40	16A + voltmeter & ammeter	6A + 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.	MAX ELECTRIC CURRENT IN DC 0-250V	MAX ELECTRIC CURRENT 3-PHASE AC 0-450V	FOR MAINS SUPPLY	TOTAL POWER
PSY40K	16A monitored	8A	3-PHASE 400V+N+E	4.000VA
PSY60K	24A monitored	13A	3-PHASE 400V+N+E	6.000VA
PSY90K	36A monitored	13A	3-PHASE 400V+N+E	9.000VA
PSY120K	48A monitored	20A	3-PHASE 400V+N+E	12.000VA
PSY150K	60A monitored	20A	3-PHASE 400V+N+E	15.000VA



## 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
- On/Off
- DC variable output
- AC variable output
- Variable voltage setting
- Max current DC or AC
- Output displays
- Input protection
- Output protection
- User's safety
- DC output smoothing
- AC/DC commutation
- Connecting
- Dimensions / Weight

Mains cable  
General luminous switch  
0-240 volts  
0-230 volts  
rotating knob onto the unit  
3A  
1 voltmeter and 1 ammeter  
by time delay fuse  
thermal-magnetic circuit-breaker  
all outputs are insulated from mains  
by capacitors, without electronic regulation  
CC - 0 - CA by rotary switch  
Safety terminals 4mm  
210 x 245 x 350mm / 25kg

**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
- ON/OFF
- Emergency stop
- DC output
- AC output
- Adjustment
- Max output current
- Outputs display
- Input protection
- Outputs protection
- Users protection
- Filtering ACDC10
- Filtering DC10
- Switching
- Dimensions / Weight
- Wheels

230V, single-phase  
push button + LED lamp  
with key  
0-230V  
0-230V  
by a rotary button on the top  
10A  
1 voltmeter et 1 ammeter  
by fuse  
by circuit breaker  
by insulation from mains (in DC mode only)  
no filtering. double alternation rectification  
with filtering. 5% of residual ripple at 10A.  
DC - 0 - AC (by rotary switch)  
H 510 x P 280 x P 330 mm / 40 kg  
2 of them have a brake

ref. ACDC10



## 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 :
- On/Off :
- DC variable output :
- DC fixed output :
- Input protection:
- Output protection :
- Smoothing :
- Dimensions / weight :

Mains cable  
General switch and light  
0-240V / 3A  
190V / 1A  
by time delay fuses  
by thermal magnetic circuit-breakers  
by capacitors  
210 x 245 x 350mm / 30kg.

ref. ISOSEC2



**COMPATIBLE  
WITH 300W MOTORS**



ref. DC10

Version without AC output.  
For solar system.  
Special connections. (P. 132)