NETWORK ANALYZER

NETWORK ANALYZER

S.A. DE CONSTRUCCIONES INDUSTRIALES

PRODUCTS RANGE

- **NETWORK ANALYZERS – ALTERNATING CURRENT**

LCD DISPLAY

DIN RAIL MOUNTING — LCAM, LABM, AR3AC

PANEL (96 x 96) MOUNTING — AHM3, ANG96, LAB96, SNG96

PANEL (144 x 144) MOUNTING — LDA 144, LDA 144 (con Memoria)

LED DISPLAY

DIN RAIL MOUNTING — TCEM

PANEL (96 x 96) MOUNTING — MAR 96, MDA 96

PANEL (144 x 144) MOUNTING — MAR 144. MDA 144

PRODUCTS RANGE

- **NETWORK ANALYZERS – DIRECT CURRENT**

  LCD DISPLAY

  DIN RAIL MOUNTING — **M2DL2, AR3DC**

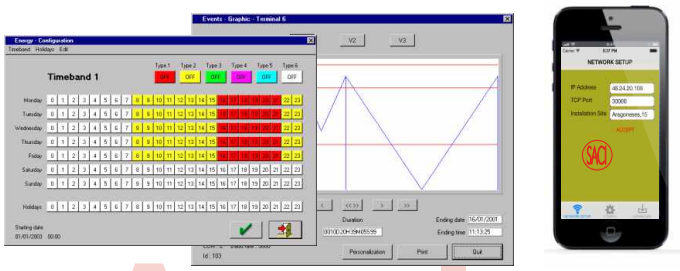
  LED DISPLAY

  PANEL (144 x 144) MOUNTING — **TMCC**

- **NETWORK QUALITY ANALYZER (144 x 144)** — **TMCQ**

- **RS232 / RS485 CONVERTER, RS485 REPEATER ETHERNET CONVERTER** — **IFR1, IFRA, IFR4, RT485, etherGATE**

- **MANAGEMENT SOFTWARE - APP iPHONE** — **SACIgest**



CONTENTS

NETWORK ANALYZER - AHM3

The AHM3 is designed to be used for the measurement and calculation of electrical variables such as voltage, current, frequency, power, power factor, energy, harmonic components, etc. in low, medium and high voltage power distribution.

NEW

GENERAL FEATURES

- **DIN 96 x 96 mm.**
- **13 ADDITIONAL MODULES.**
- **4 INTERFACES FOR MODULES.**
- **THD on V and I.**
- **HARMONIC RMS (1-63).**
- **MAXIMUM DEMAND, A, kW, kVA, kvar.**
- **MAXIMUM AND MINIMUM VALUES.**
- **PROGRAMMABLE RATED V AND I.**
- **4 QUADRANT MEASUREMENT.**
- **WAVEFORM**

ELECTRICAL PARAMETER	UNIT	L1	L2	L3	TOTAL	MAX/MIN	DEMAND
Voltage Phase - Neutral)	V, kV	•	•	•		•	
Voltage (Phase - Phase)	V, kV	•	•	•		•	
Current	A, kA	•	•	•		•	•
Neutral current	A, kA				•		
Active power (P)	kW, MW, GW	•	•	•	•	•	•
Reactive power (Q)	kvar, Mvar, Gvar	•	•	•	•	•	•
Apparent power (S)	kVA	•	•	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•	•	
Frequency	Hz				•		
Import active energy (EP+)	kWh, MWh, GWh				•		
Export active energy (EP-)	kWh, MWh, Gwh				•		
Reactive energy (Q1, Q2, Q3, Q4)	kvarh, Mvarh,Gvarh				•		
Backup energy	kWh				•		
Hour meter	h: min				•		
THD Current and Voltage	A, V	•	•	•			
Harmonic RMS-U and I (1-63)	%	•	•	•			
Unbalance -U and I	%				•		

ADDITIONAL MODULES

	COMMUNICATION PROTOCOL
DM10	Profibus-DP VO
DM11	Ethernet: Mobus/TCP
DM12	Wifi: Modbus/TCP
DM13	GPRS: Modbus/TCP, SMS

	DIGITAL I/O
DM6	2 digital inputs + 2 digital outputs
DM7	4 digital inputs
DM8	2 relay outputs
DM9	1 AC digital input

	ANALOG I/O
DM2	2 analog inputs: mA
DM5	2 aanalog outputs: mA

	TEMPERATURE MEASUREMENT
DM3	2 analog inputs: PT100
DM4	2 analog inputs: TC (J, K or E)

	DATA RECORDER
DM1	Memory: 8MB, include RTC

It is capable of single-phase, two-phase, or three-phase measurement and can be used in two-wire, three-wire, four-wire, TN, TT and IT systems. There are four interfaces on the meter for modules which are used to extend functions.

Up to 4 modules combined at your choice at the same time

INPUT	
Rated voltage (Un)	3 x 400 / 690 V AC
Overload	1,2 Un
Impedance	> 1MΩ
Rated current (In)	1 A and 5 A
Overload continuous	2 In
Overload instantaneous	10 In/5s or 20 In/1s
Burden	< 0,1 VA
Rated value	< 20 mΩ

AUXILIARY VOLTAGE	
Aux. V. AC/DC	80 - 270 V
Burden	< 10 VA

OUTPUT	
Relay output	250V/5A AC; 30V/5A DC
Isolation	2500 V AC
Energy pulse width	80 ± 20% ms
RS 485 port	Modbus-RTU
Baud rate	Up to 38400 bps programmable

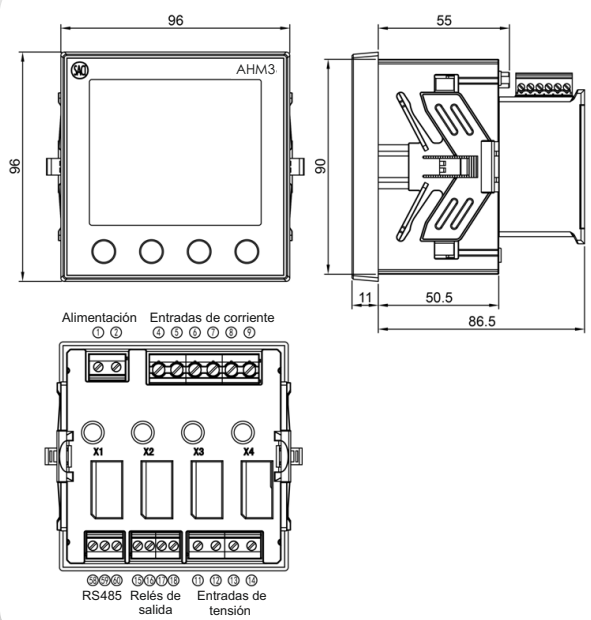
GENERAL FEATURES	
Case material	ABS, UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 Kg
Protection	IP 65 - front panel
	IP 20 - meter body
Operating temperature	-10 - 60 °C
Storage temperature	-25 - 70 °C
Relative humidity	5 - 95 %

ACCURACY

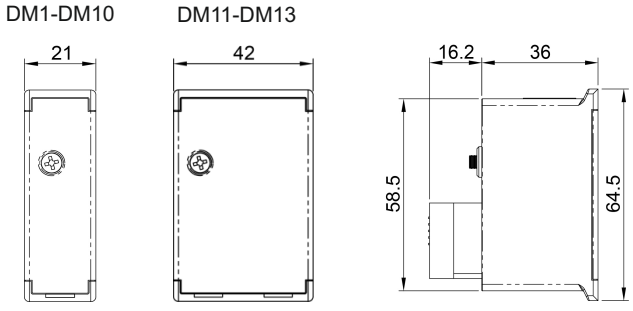
PARAMETER	OPERATING RANGE	ACCURACY
Tensión	2,5-120 %	0,2 %
Corriente	0,005-6 A	0,2 %
Potencia activa	1-120 %	0,2 %*
Potencia reactiva	1-120 %	0,2 %*
Potencia aparente	1-120 %	0,2 %*
Factor de potencia	± 0,5 %	0,5 %
Frecuencia	45-65 Hz	± 0,01 Hz
Energía activa	5-120 %	Clase 0,5 S
Energía reactiva	5-120 %	Clase 2

* Class 0,2 (25ºC) and Class 0,5 (-10 - 60 ºC)

DIMENSIONS



DIMENSIONS OF MODULES



NETWORK ANALYZER - ANG96 STANDARD VERSION

The ANG96 is a digital device, able to measure all the variables associated with an electrical line. It accepts the three currents and three voltage signal in a four-wire configuration. It is also possible to use it in a three-wire configuration, using two or three current transformers.

GENERAL FEATURES

- DIN SIZE 96 x 96
- LCD 128 x 64 DISPLAY WITH BACKLIGHT
- 4 CUADRANT MEASUREMENT
- NEUTRAL CURRENT MEASUREMENT
- HARMONIC DISTORTION (THD on V and I)
- MAXIMUM DEMAND (A, kW, kVA and kvar)
- MAXIMUM AND MINIMUM VALUES
- TRUE RMS VOLTAGE AND CURRENT
- SERIAL PORT RS485
- 2 HOUR COUNTERS

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	kW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Import active energy (EP+)	kWh				•
Hour counter active positive (T+)	h-m-s				•
Export active energy (EP-)	kWh				•
Hour counter active negative (T-)	h-m-s				•
Import inductive react energy (Eq+)	kvarh				•
Import capaitive react energy (Eq-)	kvarh				•

HOUR COUNTERS

2 hour counters:
- Active power + (consumed)
- Active power - (generated)
- Limit: 50.000 hours
- Resolution: 1 second

TECHNICAL SPECIFICATIONS

INPUT	
Rated voltage (Un)	0-520 V AC.
Burden	<1 mA per phase
Rated current (In)	1 and 5 A
Burden	< 0,3 VA per phase
Operating range	10 - 120% In
Frequency	45 - 65 Hz
Overload	2 In permanent, 20 In 1 s 1,2 Vn permanent, 2 Vn 10 s

OUTPUT	
Relays	250 V AC.,3A
Pulse weight	60 ms
Serial port	RS485
Protocol	MODBUS RTU
Baud rate	Programmable 1200-19200 bps Standard 9600 bps
Connection	2 wires

MAXIMUM/ MINIMUM MODE

Maximum and minimum values of:
- 3 Currents I1, I2, I3
- 3 Voltages V1, V2, V3
- 3 Single phase powers. P1, P2, P3
- 3 Three phase powers P, Q and S
- Power factor Cos (φ) and Hz

AUXILIARY VOLTAGE	
UNIVERSAL Aux. V.	85/264 V AC.;80/300 V DC.
Burden	< 4 VA

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

MAXIMUM DEMAND FUNCTION

The maximum demand is calculated as the mean value reached during the time specified of the next parameters.
- I1, I2, I3, P, Q and S
- Integration period: 15 or 30 Minutes

GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 Kg
Protection	IP20 Terminals
Optional protection	IP54 Front IP65 Front cover
Electrical safety	(EN 61010) Class 2 Category III

LCD DISPLAY

- 4 parameters per page
- Built-in keypad (5 keys)
- Selectable pages with up and down buttons
- Back lighting

CONTACT OUTPUTS

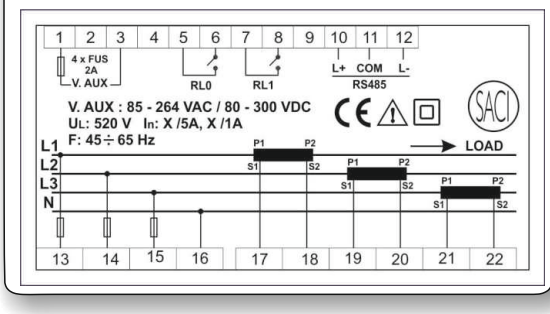
Contact outputs can be set as max. or min. alarm contacts associated to any measured parameter or as active energy and reactive enrgy pulses. They can also be set as contacts managed from the central unit.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full scal.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+fin sca.)
Apparent power	1-120%	0,4%(read.+fin sca.)
Power factor	± 0,5%	1%(Full scale)
Frequency	45-65Hz	0,2%(Full scale)
Active energy	5-120%	0,5% reading
Reactive energy	5-120%	1% reading

CONNECTIONS

Max. 3 x 300 (520) V
X /5 A, X /1A
Universal Aux. V
45 - 65 Hz



NETWORK ANALYZER - ANG96 ETHERNET VERSION

The ANG96 is a digital device, able to measure all the variables associated with an electrical line. It accepts the three currents and three voltage signal in a four-wire configuration. It is also possible to use it in a three-wire configuration, using two or three current transformers.

NEW

GENERAL FEATURES

- DIN SIZE 96 x 96
- LCD 128 x 64 DISPLAY WITH BACKLIGHT
- 4 CUADRANT MEASUREMENT
- NEUTRAL CURRENT MEASUREMENT
- HARMONIC DISTORTION (THD on V and I)
- MAXIMUM DEMAND (A, kW, kVA and kvar)
- MAXIMUM AND MINIMUM VALUES
- TRUE RMS VOLTAGE AND CURRENT
- SERIAL PORT RS485
- 2 HOUR COUNTERS
- ETHERNET TCP/IP PORT

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	kW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Import active energy (EP+)	kWh				•
Hour counter active positive (T+)	h-m-s				•
Export active energy (EP-)	kWh				•
Hour counter active negative (T-)	h-m-s				•
Import inductive react energy (Eq+)	kvarh				•
Import capaitive react energy (Eq-)	kvarh				•

HOUR COUNTERS

2 hour counters:
- Active power + (consumed)
- Active power - (generated)
- Limit: 50.000 hours
- Resolution: 1 second

ETHERNET TCP/IP CONNECTOR

- TCP/IP protocol in a RJ45 connector for a LAN network The device only needs to be configured with its own IP, the Netmask, the gateway and a free TCP port to communicate with any internal or external equipment..

TECHNICAL SPECIFICATIONS

INPUT	
Rated voltage (Un)	0-520 V AC.
Burden	<1 mA per phase
Rated current (In)	1 and 5 A
Burden	< 0,3 VA per phase
Operating range	10 - 120% In
Frequency	45 - 65 Hz
Overload	2 In permanent, 20 In 1 s 1,2 Vn permanent, 2 Vn 10 s

OUTPUT	
Relays	250 V AC.,3A
Pulse weight	60 ms
Serial port	RS485
Protocol	MODBUS RTU
Baud rate	Programmable 1200-19200 bps Standard 9600 bps
Connection	2 wires
Ethernet port	TCP/IP

AUXILIARY VOLTAGE	
UNIVERSAL Aux. V.	85/264 V A.C.;80/300 V DC.
Burden	< 4 VA

MAXIMUM/ MINIMUM MODE

Maximum and minimum values of:
- 3 Currents I1, I2, I3
- 3 Voltages V1, V2, V3
- 3 Single phase powers. P1, P2, P3
- 3 Three phase powers P, Q and S
- Power factor Cos (φ) and Hz

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

MAXIMUM DEMAND FUNCTION

The maximum demand is calculated as the mean value reached during the time specified of the next parameters.
- I1, I2, I3, P, Q and S
- Integration period: 15 or 30 Minutes

GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 Kg
Protection	IP20 Terminals
Optional protection	IP54 Front IP65 Front cover
Electrical safety	(EN 61010) Class 2 Category III

LCD DISPLAY

- 4 parameters per page
- Built-in keypad (5 keys)
- Selectable pages with up and down buttons
- Back lighting

CONTACT OUTPUTS

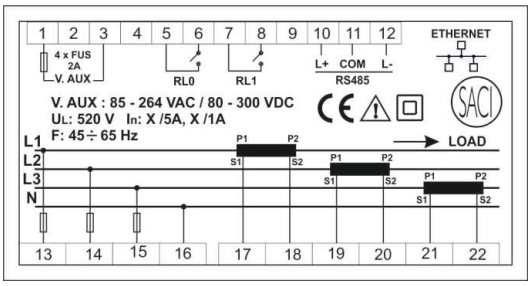
Contact outputs can be set as max. or min. alarm contacts associated to any measured parameter or as active energy and reactive enrgy pulses. They can also be set as contacts managed from the central unit.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full scal.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+fin sca.)
Apparent power	1-120%	0,4%(read.+fin sca.)
Power factor	± 0,5%	1%(Full scale)
Frequency	45-65Hz	0,2%(Full scale)
Active energy	5-120%	0,5% reading
Reactive energy	5-120%	1% reading

CONNECTIONS

Max. 3 x 300 (520) V
X /5 A, X /1A
Universal Aux. V
45 - 65 Hz



NETWORK ANALYZER - ANG96 GENERATOR VERSION

The ANG96 is a digital device, able to measure all the variables associated with an electrical line. It accepts the three currents and three voltage signal in a four-wire configuration. It is also possible to use it in a three-wire configuration, using two or three current transformers.

NEW

GENERAL FEATURES

- DIN SIZE 96 x 96
- LCD 128 x 64 DISPLAY WITH BACKLIGHT
- 4 CUADRANT MEASUREMENT
- NEUTRAL CURRENT MEASUREMENT
- HARMONIC DISTORTION (THD on V and I)
- MAXIMUM DEMAND (A, kW, kVA and kvar)
- MAXIMUM AND MINIMUM VALUES
- TRUE RMS VOLTAGE AND CURRENT
- SERIAL PORT RS485
- 4 HOUR COUNTERS

	ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
	Voltage (Line-to-neutral)	V	•	•	•	
	Voltage (Line-to-Line)	V	•	•	•	
	Current	A	•	•	•	
	Neutral current	A				•
	Active power (P)	kW	•	•	•	•
	Reactive power (Q)	kvar	•	•	•	•
	Apparent power (S)	kVA	•	•	•	•
	Power factor (Cos φ)	PF	•	•	•	•
	Maximum demand (I)	A	•	•	•	
	Maximum demand (P)	kW				•
	Maximum demand (Q)	kvar				•
	Maximum demand (S)	kVA				•
	Frequency	Hz				•
	THD Current	A	•	•	•	
	THD Voltage	V	•	•	•	
Energy counters* Hour counters **	Import active energy (EP+),(DP+)*	kWh				•
	Hour counter active positive (T+)**	h-m-s				•
	Export active energy (EP-),(DP-)*	kWh				•
	Hour counter active negative (T-)**	h-m-s				•
	Import induct. react. energy (Eq+),(Dq+)*	kvarh				•
	Import capacit. react. energy (Eq-),(Dq-)*	kvah				•

*E: Normal operating mode; D: Generator mode.

** 2 Hour counter per operating mode.

HOUR COUNTERS

4 Hour counters:
- Active power +(consumed) Normal Mode
- Active power - (generated) Normal Mode
- Active power +(consumed) Generator Mode
- Active power - (generated) Generator Mode

- Limit: 50.000 hours
- Resolution: 1 second

GENERATOR ENERGY MEASUREMENT

- External voltage input to connect to an external generator. When voltage is detected, ANG96G accumulates energy in independent counters of those used when it is connected to the main network..

TECHNICAL SPECIFICATIONS

INPUT	
Rated voltage (Un)	0-520 V AC.
Burden	<1 mA per phase
Rated current (In)	1 and 5 A
Burden	< 0,3 VA per phase
Operating range	10 - 120% In
Frequency	45 - 65 Hz
Overload	2 In permanent, 20 In 1 s 1,2 Vn permanent, 2 Vn 10 s
Generator Voltage	230 V AC.

OUTPUT	
Relays	250 V AC.,3A
Pulse weight	60 ms
Serial port	RS485
Protocol	MODBUS RTU
Baud rate	Programmable 1200-19200 bps Standard 9600 bps
Connection	2 wires

MAXIMUM/ MINIMUM MODE

Maximum and minimum values of:
- 3 Currents I1, I2, I3
- 3 Voltages V1, V2, V3
- 3 Single phase powers. P1, P2, P3
- 3 Three phase powers P, Q and S
- Power factor Cos (φ) and Hz

AUXILIARY VOLTAGE	
UNIVERSAL Aux. V.	85/264 V A.C.;80/300 V DC.
Burden	< 4 VA

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

MAXIMUM DEMAND FUNCTION

The maximum demand is calculated as the mean value reached during the time specified of the next parameters.
- I1, I2, I3, P, Q and S
- Integration period: 15 or 30 Minutes

GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 Kg
Protection	IP20 Terminals
Optional protection	IP54 Front IP65 Front cover
Electrical safety	(EN 61010) Class 2 Category III

LCD DISPLAY

- 4 parameters per page
- Built-in keypad (5 keys)
- Selectable pages with up and down buttons
- Back lighting

CONTACT OUTPUTS

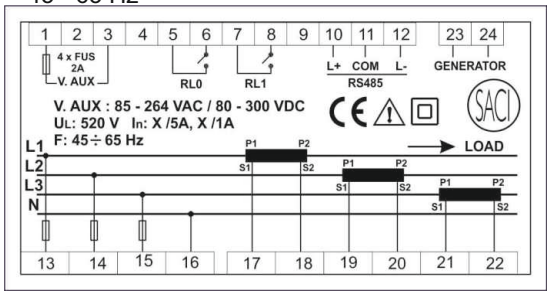
Contact outputs can be set as max. or min. alarm contacts associated to any measured parameter or as active energy and reactive enrgy pulses. They can also be set as contacts managed from the central unit.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full scal.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+fin sca.)
Apparent power	1-120%	0,4%(read.+fin sca.)
Power factor	± 0,5%	1%(Full scale)
Frequency	45-65Hz	0,2%(Full scale)
Active energy	5-120%	0,5% reading
Reactive energy	5-120%	1% reading

CONNECTIONS

Max. 3 x 300 (520) V
X /5 A, X /1A
Universal Aux. V.
45 - 65 Hz



NETWORK ANALYZER - LAB96

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- DIN 96 X 96 INSTRUMENT
- MEASUREMENT IN 4 QUADRANTS
- THREE-PHASE 3 or 4 WIRE
- NEUTRAL CURRENT
- HARMONIC DISTORTION (THD V and I)
- HARMONIC MEASURING (up to 15) (optional)
- MAXIMUM DEMAND A, kW, kVA
- MAX. and MIN. VALUES
- TRUE RMS.
- RS485 SERIEAL PORT
- 1 CONTACT OUTPUT

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current and neutral current	A	•	•	•	•
Active power (P)	kW	•	•	•	•
Inductive reactive power (QL)	kvar	•	•	•	•
Capacitive reactive power (QC)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	•
Maximum demand (P)	kW				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	15th
THD Voltage	V	•	•	•	15th
Import active energy (EP+)	kWh				•
Import capacitive react. energy (EQC+)	kvarh				•
Import inductive react. energy (EQL+)	kvarh				•
Import apparent energy (ES+)	kVAh				•
Export active energy (EP-)	kWh				•
Export capacitive react. energy (EQC-)	kvarh				•
Export inductive react. energy (EQL-)	kvarh				•
Export apparent energy (ES-)	kVAh				•

MODEL	LAB96	MODEL	LAB96
- LAB96-B	Basic model.	- LAB96-CH	LAB96-C Harmonic measuring. (up to 15)
- LAB96-BA	Basic model. Current insulated.		
- LAB96-C	Basic model. Current insulated. RS485 Serial port. 1 Relay.	- LAB96-U	LAB96-C Universal auxiliary power supplied.

MAXIMUM DEMAND FUNCTION

- Average values of I1, I2, I3, P and S.
- Integration period: 1 to 60 minutes.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.

SERIAL PORT (LAB96-C,CH,U models)

- Type: RS 485.
- Connection: 2 wire.
- Protocol: MODBUS RTU.
- Baud rate: Programmable. 300 - 19200 Bauds. Standard 9600 Bauds.

MAX. AND MIN. VALUES.

- Maximum and minimum values of: V1, V2, V3, V12, V23, V31, I1, I2, I3, P, Q, S, Cos φ and Hz

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

TECHNICAL SPECIFICATIONS

INPUT	
3-Phase, 3 or 4 wire,balanced or unbalanced	
Rated Voltage (Un)	300 V (line to neutral) 520 V (line to line)
Burden	< 0,7 VA
Rated current (In)	5 A
Burden	< 0,75 VA
Operating range	0 - 110 % In
Frequency	45-65 Hz

CONTACT OUTPUT *(LAB96-C, -CH, -U)	
Number of outputs	1
Type	Opto-insulate transistor NPN 24 V D.C. 50 mA

*Contact output can be set as max. or min. alarm contacts associated to a measured parameter, or as active energy and reactive energy pulses.

AUXILIARY VOLTAGE	
Aux. V. A.C.	230 V
Burden	5 VA
Operating range	85-110 % Un
Universal Aux. V.	85/265 V AC.;95/300 V DC.
Burden	5 VA
Frequency	50-60 Hz

GENERAL

GENERAL FEATURES	
Case material	UL94 V0
Dimensions	DIN 96 x 96 mm (Depth 63)
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 kg
Protection	IP51 Frontal IP31 terminals
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Management software SACIgest.
- Reading software (without additional cost).

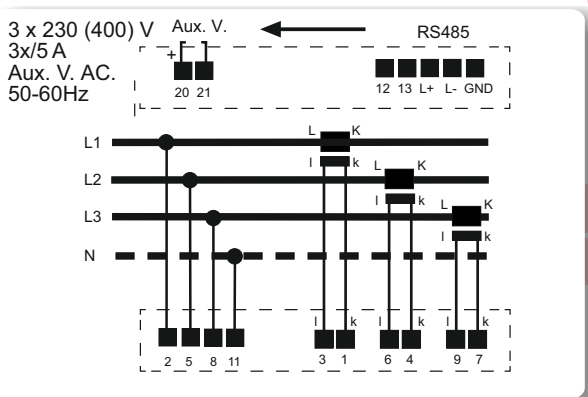
DISPLAY

- LCD display with built in keypad.
- Height of digits: 8 mm (4 parameters per page).
- Back lighting.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	10-100%	0,5 ± 2 digits
Current	10-100%	0,5 ± 2 digits
Active power	10-100%	1% ± 2 digits
Reactive power	10-100%	1% ± 2 digits
Apparent power	10-100%	1% ± 2 digits
Power factor	0,5 - 1	± 6º
Frequency	45-65Hz	0,2% ± 2 digits
Active energy	10-100%	1% ± 2 digits
Reactive energy	10-100%	1% ± 2 digits

CONNECTIONS



NETWORK ANALYZER - LABM

Instrument with microprocessor, programmable, LCD display indicating three measurements, and built-in keypad.

GENERAL FEATURES

- MODULAR DIN INSTRUMENT
- MEASUREMENT IN 4 QUADRANTS
- THREE-PHASE 3 or 4 WIRE
- NEUTRAL CURRENT
- HARMONIC DISTORTION (THD V and I)
- HARMONIC MEASURING (up to 15) (optional)
- MAXIMUM DEMAND A, kW, kVA
- MAX. and MIN. VALUES
- TRUE RMS
- RS485 SERIAL PORT
- 2 CONTACT OUTPUTS
- CURRENTS, 100, 250 or 500 A (t/e)
- INTERNAL TEMPERATURE SENSOR

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current and neutral current	A	•	•	•	•
Active power (P)	kW	•	•	•	•
Inductive reactive power (QL)	kvar	•	•	•	•
Capacitive reactive power (QC)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	•
Maximum demand (P)	kW				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	15th
THD Voltage	V	•	•	•	15th
Import active energy (EP+)	kWh				•
Import capacitive react. energy (EQC+)	kvarh				•
Import inductive react. energy (EQL+)	kvarh				•
Import apparent energy (ES+)	kVAh				•
Export active energy (EP-)	kWh				•
Export capacitive react. energy (EQC-)	kvarh				•
Export inductive react. energy (EQL-)	kvarh				•
Export apparent energy (ES-)	kVAh				•

MODEL	LABM	MODEL	LABM
- LABM-B	Basic model.	- LABM-CH	LABM-C Harmonic measuring. (up to 15)
- LABM-BA	Basic model. Current insulated.		
- LABM-C	Basic model. Current insulated. RS485 Serial port. 1 Relay.	- LABM-U	LABM-C Universal auxiliary power supplied.

MAXIMUM DEMAND FUNCTION

- Average values of I1, I2, I3, P and S.
- Integration period: 1 to 60 minutes.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.

CONTACTS OUTPUT (LABM-C,CH,U models)

- Type: RS485.
- Connection: 2 wire.
- Protocol: MODBUS RTU.
- Baud rate: Programmable. 300 - 19200 Bauds. Standard 9600 Bauds.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

MAX AND MIN. VALUES.

- Maximum and minimum values of: V1, V2, V3, V 12, V23, V31, I1, I2, I3, P, Q, S, Cos φ and Hz.

TECHNICAL SPECIFICATIONS

INPUT	
Three-phase, 3 or 4 wire, balanced or unbalanced	
Rated Voltage (Un)	300 V (line to neutral) 520 V (line to line)
Burden	0,7 VA
Rated current (In)	100, 200 or 500 A
Burden	0,9 VA
Operating range	0- 110 % In
Frequency	50-60 Hz

CONTACTS OUTPUT *(LABM-C,CH,U)	
Number of outputs	2
Type	Opto-insulated transistor NPN 24 V DC. 50 mA

*Contact output can be set as max. or min. alarm contacts associated to a measured parameter, or as active energy and reactive energy pulses.

AUXILIARY VOLTAGE	
Aux. V. A.C.	230 V
Burden	5 VA
Operating range	85-110 % Un
Universal Aux. V.	85/265 V A.C.;95/300 V DC.
Burden	5 VA
Frequency	50-60 Hz

GENERAL

GENERAL FEATURES	
Case material	UL94 V0
Dimensions	3 modules, 52,5 x 85 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,21 Kg
Protection	IP41 Frontal IP20 Terminals
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Management software SACIgest.
- Reading software (without additional cost).

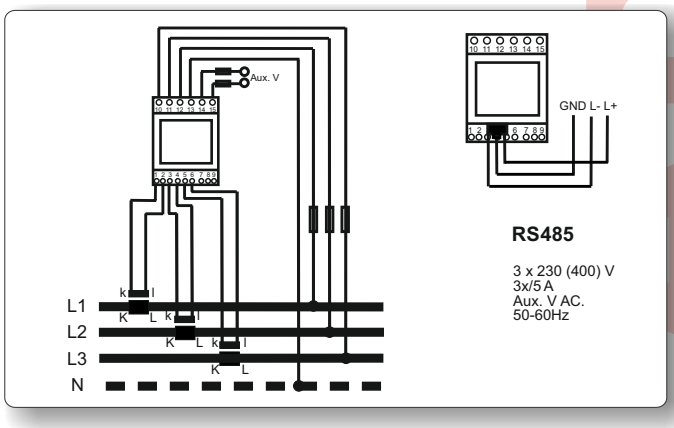
DISPLAY

- LCD display with built in keypad.
- Height of digits: 8 mm (4 parameters per page).
- Back lighting.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+full sca.)
Apparent power	1-120%	0,4%(read.+full sca.)
Power factor	± 0,5%	1%(F.S)
Frequency	45-65Hz	0,2%(F.S)
Active energy	5-120%	0,5% reading
Reactive energy	5-120%	1% reading

CONNECTIONS



NETWORK ANALYZER - AR3AC

Programmable instrument with microprocessor and LCD display indicator for measurements.

GENERAL FEATURES

- **DIN MODULAR INSTRUMENT**
- **SINGLE-PHASE**
- **TRUE RMS**
- **RS485 SERIAL PORT**
- **VALUE ALTERNATIVE MEASURE EVERY 4 S**
- **1 OPTOCOUPLER OUTPUT**

ELECTRICAL PARAMETER	SYMBOL	TOTAL
Voltage (Line-to-neutral)	V	•
Current	A	•
Active power (P)	kW	•
Reactive power (Q)	kvar	•
Apparent power (S)	kVA	•
Power factor (Cos φ)	PF	•
Frequency	Hz	•
Import active energy (EP+)	kWh	•
Export active energy (EP-)	kWh	•
Inductive reactive energy (EQ+)	kvarh	•
Capacitive reactive energy (EQ-)	kvarh	•

MODEL **AR3AC**

SETTING

- Instrument identify code.
- Primary current.
- Contacts operating mode.
- Energy pulse value.

The equipment is set through the serial port.

SERIAL PORT

- Type: RS 485.
- Protocol: MODBUS RTU.
- Baud rate: Optional. Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.

LCD DISPLAY

- 1 LCD display (4 digits + sign).
- Height of digits: 8 mm.
- Up to 11 measuring parameters.

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	230 V AC.
Burden	1 mA
Operating range	20-120 % Un.
Rated current (In)	1 or 5 A
Direct connection	30 A AC.
Connection to external C.T	x/5 A
Operating range	1-120 % In

CONTACTS OUTPUT *	
Number of outputs	1
Type	Optocoupler 48 V DC 10 mA

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as active energy and reactive energy pulses. They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. AC.	Self supplied

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

CONNECTIONS

GENERAL

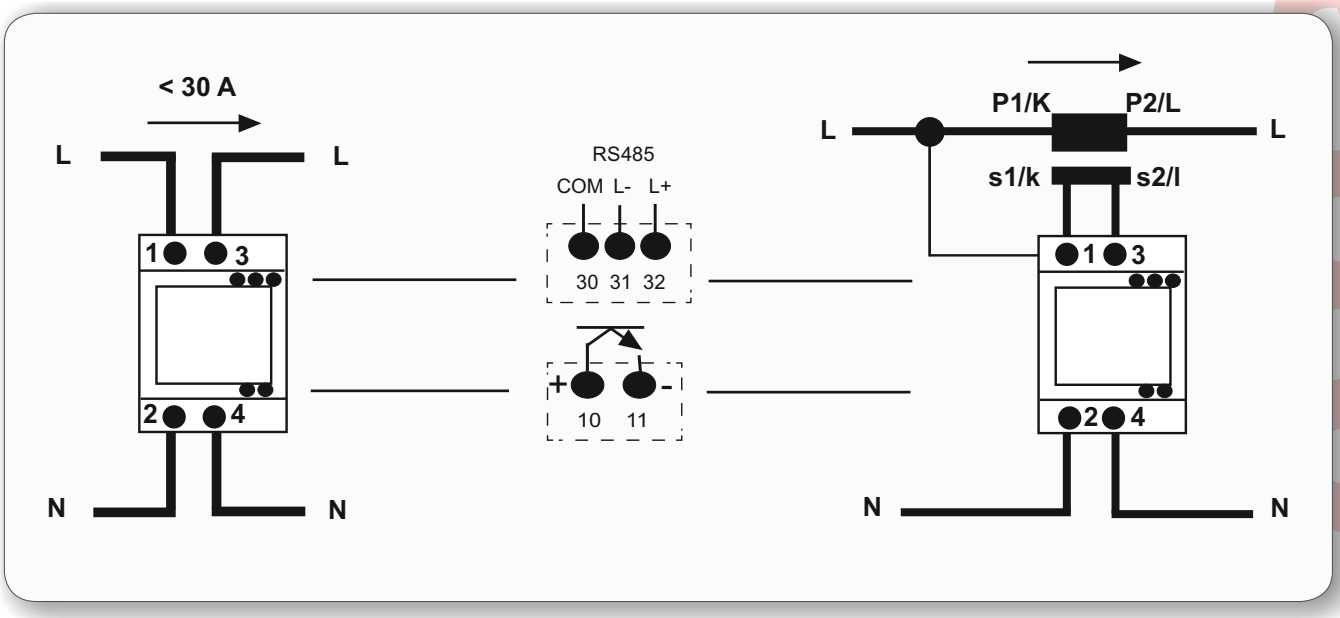
GENERAL FEATURES	
Mounting	DIN rail
Case material	ABS,UL94 V0
Dimensions	3 Modules DIN (52x90) mm
Terminals	With screws
Max. wire section	16 mm²
Weight	0,15 Kg
Temperature range	-10...60º C
Protection	IP54 Frontal IP20 Terminals
Electrical safety	(EN 61010) Class 2 Category III

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	80-120%	0,5%(read.+full sca.)
Current	1-120%	0,5%(read.+full sca.)
Active power	1-120%	0,5%(read.+full sca.)
Reactive power	1-120%	0,5%(read.+full sca.)
Apparent power	1-120%	0,5%(read.+full sca.)
Power factor	± 0,5%	1%(F.S)
Frequency	45-65Hz	0,2%(F.S)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading



NETWORK ANALYZER - LCAM

Programmable instrument with microprocessor , LCD display indicating three measurements, and built-in keypad.

GENERAL FEATURES

- **DIN RAIL MOUNTING**
- **MEASUREMENT IN 4 QUADRANTS**
- **THREE-PHASE, 4 WIRE**
- **MAX. and MIN. VALUES**
- **TRUE RMS**
- **RS485 SERIAL PORT**
- **2 CONTACTS OUTPUT**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	(*)	(*)	(*)	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Frequency	Hz				•
Import active energy (EP+)	kWh				•
Export active energy (EP-)	kWh				•
Import inductive reactive energy (EQL+)	kvarh				•
Import capacitive reactive energy (EQC+)	kVAh				•

(*) Through serial port only

MODEL **LCAM**

- **LCAM-BA** Basic model. Current insulated.
- **LCAM-C** Basic model. Current insulated. RS485 Serial port. 2 Relays.

SETTING

- Instrument identify code.
- Primary current.
- Contacts operating mode.
- Energy pulse value.
- Primary voltage.
- Alarms.

The equipment is set through the serial port by keypad.

SERIAL PORT (LCAM-C model)

- Type: RS 485.
- Protocol: MODBUS RTU.
- Baud rate: Programmable. 300 - 19200 Bauds.
- Max. Nº of instruments per line: 32.
- Max. length of system per line (without amplifier): 1250 m.

LCD DISPLAY

- LCD display with built-in keypad.
- Over 30 measuring parameters in different pages.
- Pages selectable with un (↑) and down (↓).
- Back lighting.

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un.
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1 - 120 % In
Frequency	50 or 60 Hz

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O. 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses. They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. A.C.	63,5/110 V or 230/400 V
Operating range	80-120% Un
Aux. V. C.C	18 - 72 V
Burden	3 VA

MAX. AND MIN. VALUES.

- Maximum and minimum values of: V12, V23, V31, I1, I2, I3, P, Q, S, Cos φ and Hz.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+full sca.)
Apparent power	1-120%	0,5%(read.+full sca.)
Power factor	± 0,5%	0,6%(F.S)
Frequency	45-65Hz	0,2%(F.S)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

GENERAL

GENERAL FEATURES	
Mounting	DIN rail
Case material	ABS,UL94 V0
Dimensions	3 Modules DIN (52x90) mm
Terminals	With screws
Max. wire section	16 mm²
Weight	0,15 Kg
Temperature range	-10...60º C
Protection	IP54 Frontal IP20 Terminals
Electrical safety	(EN 61010) Class 2 Category III

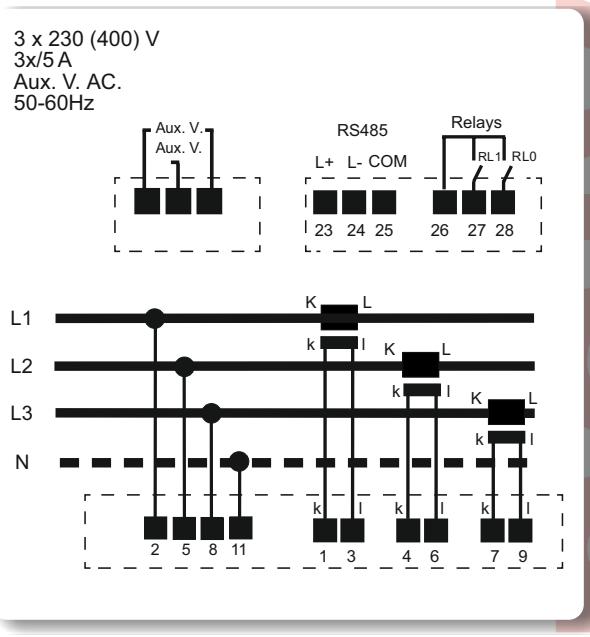
ACCESORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

CONNECTIONS



NETWORK ANALYZER - LDA 144

Programmable instrument with microprocessor , LCD display indicating three measurements, and built-in keypad.

GENERAL FEATURES

- DIN 144x144 INSTRUMENT
- MEASUREMENT IN 4 QUADRANTS
- THREE-PHASE, 4 WIRE
- NEUTRAL CURRENT
- HARMONIC DISTORTION (THD V and I)
- MAXIMUM DEMAND, A, kW, kVA, kvar
- MAX. and MIN. VALUES
- TRUE RMS
- RS485 SERIAL PORT
- 2 CONTACTS OUTPUT

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	kW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Import active energy (EP+)	kWh				•
Export active energy (EP-)	kWh				•
Import reactive energy (EQ+)	kvarh				•
Export reactive energy (EQ-)	kvarh				•

MODEL **LDA 144**

- **LDA 144-BA** Basic model. Current insulated.
- **LDA 144-C** Current insulated. RS485 Serial port. 2 Relays.

MAXIMUM DEMAND FUNCTION

- Average values of: I1, I2, I3, P, Q and S.
- Integration period: 15 or 30 Minutes.
- These values can be displayed as current average values and saved as maximums.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.
- Energy references.
- Alarms.
- Maximum demand.

SERIAL PORT (LDA 144-C model)

- Type: RS485.
- Protocol: MODBUS RTU.
- Baud rate: Programmable. Standard 9600 Bauds.

TECHNICAL SPECIFICATIONS

INPUT	
3-Phase, 4wire, unbalanced	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un.
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50-60 Hz

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

CONTACTS OUTPUT * (LDA-C)	
Number of outputs	2
Type	Relay N.O. 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as active energy and reactive energy pulses. They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. A.C.	63,5/110 V or 230/400 V.
Burden	3 VA
Operating range	80-120 % Un
Aux. V. D.C.	18-72 V
Burden	3 W
Universal Aux. V.	85/264 V A.C.;90/300 V DC
Burden	5 VA

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+full sca.)
Apparent power	1-120%	0,5%(read.+full sca.)
Power factor	± 0,5%	0,6% reading
Frequency	45-65Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

GENERAL

GENERAL FEATURES	
Display lighting	Back (optional)
Case material	Metal+ABS, UL94 V0
Dimensions	DIN 144x144 mm.
Connection	Pluggable
Max. wire section	2,5 mm²
Weight	0,85 kg
Protection	IP54 Frontal IP20 Terminals
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

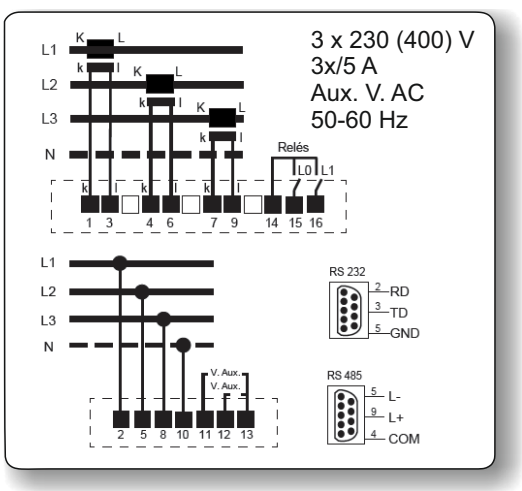
DISPLAY

- LCD display with built in keypad.
- Height of digits: 14 mm (3 parameters per page).
- Over 30 measuring parameters in differents pages.
- Pages selectable with up (↑) and down (↓).
- Back lighting (optional).

MAX. AND MIN. VALUES.

- Maximum and minimum values of: V1, V2, V3, V12, V23, V31, I1, I2, I3, P, Q, S, Cos φ and Hz

CONNECTIONS



NETWORK ANALYZER - LDA 144 with memory

Programmable instrument with microprocessor , LCD display indicating three measurements, and built-in keypad.

GENERAL FEATURES

- LOAD CURVE UP TO 60 DAYS
- RECORDING UP TO 4000 ALARM DATA
- MEASUREMENT IN 4 QUADRANTS
- THREE-PHASE. 4 WIRE
- NEUTRAL CURRENT
- HARMONIC DISTORTION (THD V and I)
- MAXIMUM DEMAND, A, kW, kVA, kvar
- MAX. and MIN. VALUES
- TRUE RMS
- RS232 (front) / RS485 (back) SERIAL PORT
  RS232 (back) optional
- 2 CONTACTS OUTPUT

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	KW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Import active energy (EP+)	kWh				•
Export active energy (EP-)	kWh				•
Import reactive energy (EQ+)	kvarh				•
Export reactive energy (EQ-)	kvarh				•

ROTATING MEMORY

The equipment is equipped with a rotating memory to store the following values:

1 - FIXED

1.1 - Average values of (I1, I2, I3, P, Q y S) at the end of a predeterminated period of time (5, 10, 15, 20, or 30 minutes, selectable) and their corresponding maximum values.

1.2 - Acumulated EP+ value.
- 60 days + 4000 alarms storage.

2 - PROGRAMMABLE

2.1 - Up to 9 variables can be selected from the folowing (V1, V2, V3, V12, V23, V31, P1, P2, P3, Q1, Q2, Q3, S1, S2, S3, cos φ1,cos φ2, cos φ3, Hz and I Neutral), plus the three energy values (EP-,EQL, EQC)

- 45 days + 4000 alarms storage.

Up to 4 alarms can be set and saved. These can be defined as maximum or minimum , as % of the rated value and measurement variable. Alarm data is recorded with satrt time, length and variable affected.

MODEL — LDA 144

- **LDA 144-M** — Current insulated. RS485 Serial port. 2 Relays

MAXIMUM DEMAND FUNCTION

- Average values of: I1, I2, I3, P, Q and S.
- Integration period: 5, 10, 15, 20 or 30 minutes.
- These values can be displayed as current average values and saved as maximums.

TECHNICAL SPECIFICATIONS

INPUT	
Three-phase, 4 wire, unbalanced	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un.
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50-60 Hz

CONTACTS OUTPUT * (LDA-C)	
Number of outputs	2
Type	Relay N.O. 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses. They can also be set as contacts managed from the central unit.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

AUXILIARY VOLTAGE	
Aux. V. A.C.	63,5/110 V or 230/400 V.
Burden	3 VA
Operating range	80-120 % Un
Aux. V. D.C	18-72 V
Burden	3 W
Universal Aux. V.	85/2654 V AC.;90/300 V DC
Burden	5 VA

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.

SERIAL PORT

- Type: RS485.
- Protocol: MODBUS RTU.
- Baud rate: Programable. Standard 9600 Bauds.
- RS232 Serial port (on the front): 9600 Bauds.
- RS485 (back), RS232 (optional)

GENERAL

GENERAL FEATURES	
Display lighting	Back (optional)
Case material	Metal+ABS, UL94 V0
Dimensions	DIN 144x144 mm.
Connection	Pluggable
Max. wire section	2,5 mm²
Weight	0,85 kg
Protection	IP54 Frontal IP20 Terminals
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

DISPLAY

- LCD display with built in keypad.
- Height of digits: 14 mm (3 parameters per page).
- Over 30 measuring parameters in differents pages.
- Pages selectable with up (↑) and down (↓).
- Back lighting. (optional)

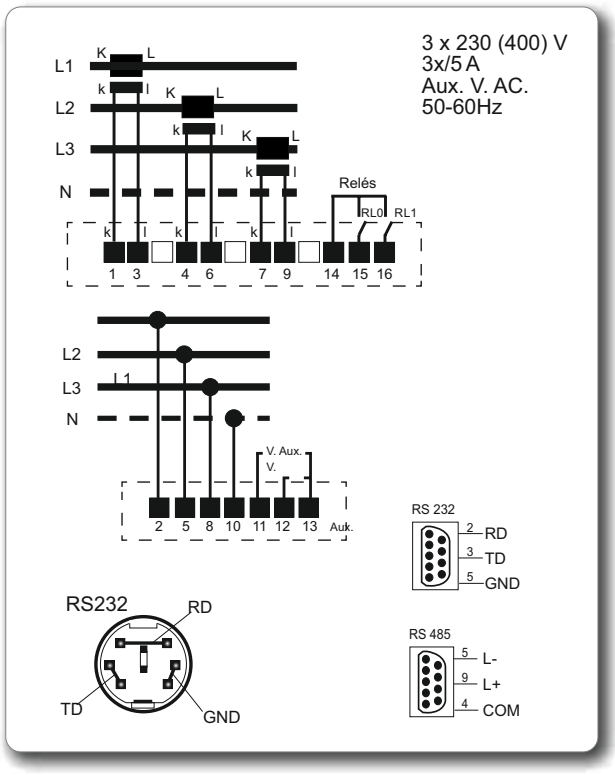
MAX. AND MIN. VALUES.

- Maximum and minimum values of: V1, V2, V3, V12, V23, V31, I1, I2, I3, P, Q, S, Cos φ and Hz

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+full sca.)
Apparent power	1-120%	0,5%(lect.+fin esc.)
Power factor	± 0,5%	0,6% reading
Frequency	45-65Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

CONNECTIONS



NETWORK ANALYZER - SNG96

Programmable instrument with microprocessor and LCD display indicator for measurements and built-in keypad.

GENERAL FEATURES

- **DIN 96X96 INSTRUMENT**
- **THREE-PHASE 4 WIRE**
- **MAXIMUM DEMAND, A**
- **TRUE RMS**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Maximum demand (I)	A	•	•	•	
Import active energy (EP+)	kWh				•
Export active energy (EP-)	kWh				•

MODEL **SNG96**

TECHNICAL SPECIFICATIONS

INPUT	
Three-phase, 4 wire, unbalanced	
Rated Voltage (Un)	400 V
Burden	1 mA per phase
Operating range	50-600 V
Rated current (In)	5 A
Burden	0,3 VA per phase
Operating range	0- 120 % In
Frequency	45-65 Hz

AUXILIARY VOLTAGE

AUXILIARY VOLTAGE	
Aux. V. AC.	Self supplied
Burden	< 4 VA

SETTING

- Primary current.
- Integration time of maximum demand.

MAXIMUM DEMAND FUNCTION

- Average values of: I1, I2, I3
- Integration period: 15 or 30 minutes.

GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,4 Kg
Temperature range	-10 ºC - 70 ºC
Protection	IP20 Terminals
Optional protection	IP54 Frontal IP65 with frontal cover
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A transformers.

DISPLAY

- LCD display built-in keypad (5 Keys)
- Selectable pages with up (↑) and down (↓).
- Back lighting.

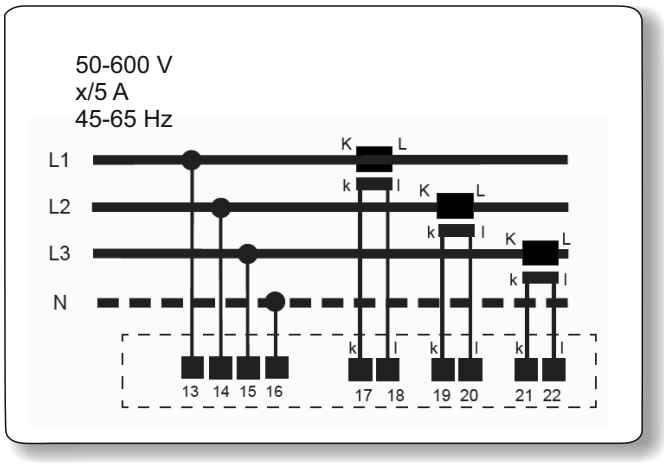
OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active energy	5-120%	0,5% reading
Reactive energy	5-120%	1% reading

CONNECTIONS



NETWORK ANALYZER - MAR96

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- **DIN 96 x 96 INSTRUMENT**
- **MEASUREMENT IN 4 QUADRANTS**
- **THREE- PHASE, 4 WIRE**
- **MAX. and MIN. VALUES**
- **TRUE RMS**
- **RS232/RS485 SERIAL PORTS**
- **2 CONTACTS OUTPUT**
- **4 DIGITAL INPUTS**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	(*)	(*)	(*)	•
Apparent power (S)	kVA	(*)	(*)	(*)	(*)
Power factor (Cos φ)	PF	(*)	(*)	(*)	•
Frequency	Hz				•
Import active energy (EP+)	kWh				•
Export active energy (EP-)	kWh				•
Inductive reactive energy (Eq+)	kvarh				•
Capacitive reactive energy (Eq-)	kvarh				•

(*) Through serial port only.

MODEL

- MAR96
- MAR96-I
- MAR96-II
- MAR96-3

MAR96

Single-phase.
Three-phase, 3 wire, balanced.
Three-phase, 3 wire, unbalanced.
Three-phase, 4 wire, unbalanced.
Current insulated.
2 Relays.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.
- Alarms.
- Energy references.
- Integration time.

MAX. AND MIN. VALUES.

- Maximum and minimum values of: V12, V23, V31, V1, V2, V3, I1, I2, I3, P1, P2, P3, P, Q, Cosφ and Hz

SERIAL PORT

- Type: RS 485.
- Protocol: MODBUS RTU.
- Connection: 2 or 4 wire.
- Baud rate: Programmable. 300 - 19200 Bauds. Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.
- Max length of system per line (without amplifier): 1250 m. (On request RS232 serial port).

LED DISPLAY

- 3 LED displays (4 Digits + Sign).
- Height of digits: 10mm.
- Built in keypad (5 Keys).
- 7 selectable parameters for each display.
- Over 30 measuring parameters.

4 DIGITAL INPUTS

Digital inputs can be used to:

- Signal the position of cantacts or alarms.
- Indicate energy consumption for external processes and synchronisation pulses for the maximum demand function.
- Pulse totalizer for external instruments.

TECHNICAL SPECIFICATIONS

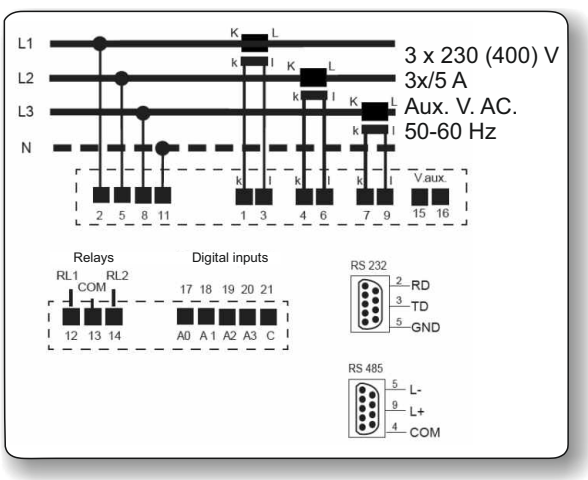
INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50 - 60 Hz

CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O., 250 V, 8 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses imported by the receptor connected to the device. (Ep+ and Eq+). They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. A.C.	63,5, 110, 230, 400 V
Burden	6 VA
Operating range	80-120 % Un

CONNECTIONS



GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,6 Kg
Protection	IP20 Terminals
Optional protection	IP54 Frontal IP65 with frontal cover
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,2%(read.+full sca.)
Current	1-120%	0,2%(read.+full sca.)
Active power	1-120%	0,2%(read.+full sca.)
Reactive power	1-120%	0,2%(read.+full sca.)
Apparent power	1-120%	0,4%(read.+full sca.)
Power factor	±0,5	0,4% reading
Frequency	45-65 Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

NETWORK ANALYZER - MAR144

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- **DIN 144 x 144 INSTRUMENT**
- **MEASUREMENT IN 4 QUADRANTS**
- **THREE- PHASE, 4 WIRE**
- **MAX. and MIN. VALUES**
- **TRUE RMS**
- **RS232/RS485 SERIAL PORTS**
- **2 CONTACTS OUTPUT**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	(*)	(*)	(*)	•
Apparent power (S)	kVA	(*)	(*)	(*)	(*)
Power factor (Cos φ)	PF	(*)	(*)	(*)	•
Frequency	Hz				•
Consumed active energy (EP+)	kW-h				•
Generated active energy (EP-)	kW-h				•
Inductive reactive energy (Eq+)	kvar-h				•
Capacitive reactive energy (Eq-)	kvar-h				•

(*) Through serial port only.

MODEL

- MAR144-BA
- MAR144
- MAR144-I
- MAR144-II
- MAR144-3

MAR144

Basic model.
Current insulated.
Single-phase
Three-phase, 3 wire, balanced.
Three-phase, 3 wire, unbalanced.
Three-phase, 4 wire, unbalanced.
Current insulated.
2 Relays
Barden insulated (optional)

SERIAL PORT (OPTIONAL)

- Type: RS 485.
- Protocol: MODBUS RTU.
- Connection: 2 or 4 wire.
- Baud rate: Programmable.
  300 - 19200 Bauds.
  Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.
- Max length of system per line (without amplifier): 1250 m.
  (On request RS232 serial port).

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.
- Energy references.
- Alarms.

LED DISPLAY

- 3 LED displays (4 Digits + Sign).
- Height of digits: 14,5 mm.
- Built in keypad (5 Keys).
- 7 selectable parameters for each display.
- Over 30 measuring parameters.

MAX. AND MIN. VALUES.

- Maximum and minimum values of: V12, V23, V31, V1, V2, V3, I1, I2, I3, P1, P2, P3, P, Q, Cosφ and Hz

4 DIGITAL INPUTS (Optional)

Digital inputs can be used to:

- Signal the position of cantacts or alarms.
- Indicate energy consumption for external processes and synchronisation pulses for the maximum demand function.
- Pulse totalizer for external instruments.

DIGITAL OUTPUTS (Optional)

10 independent programmable relays, for assigning variables and alarm setting.

ANALOGUE OUTPUT (Optional)*

Number of outputs: 1.
Type: 4-20 mA.
Moperating range: programmable.
(*) Voltage isolation needed.

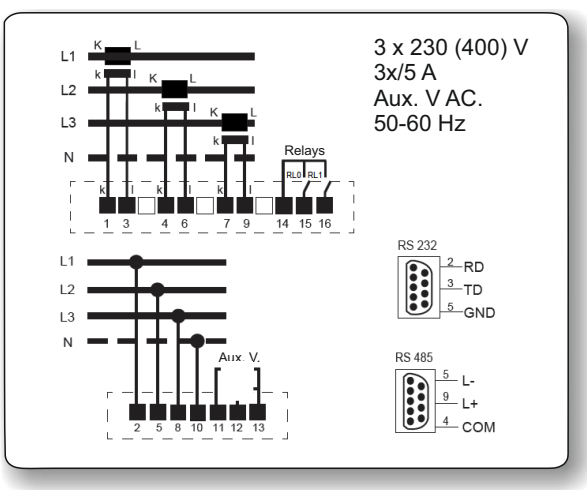
TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50 - 60 Hz

CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O., 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses imported by the receptor connected to the device. (Ep+ and Eq+). They can also be set as contacts managed from the central unit.

CONNECTIONS



AUXILIARY VOLTAGE	
Aux. V. AC.	63,5/110 V or 230/400 V
Burden	6 VA
Operating range	80-120 % Un
Aux. V. DC.	18-72 V
Burden	3 W
UNIVERSAL Aux. V.	85/264 V A.C; 90/300 V DC
Burden	4 VA

GENERAL

GENERAL FEATURES	
Case material	Metal+ABS,UL94V0
Dimensions	DIN 144 x 144 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,75 Kg
Protection	IP20 Terminals
Optional protection	IP54 Frontal
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,2%(read.+full sca.)
Current	1-120%	0,2%(read.+full sca.)
Active power	1-120%	0,2%(read.+full sca.)
Reactive power	1-120%	0,2%(read.+full sca.)
Apparent power	1-120%	0,4%(read.+full sca.)
Power factor	±0,5	0,4% reading
Frequency	45-65 Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

NETWORK ANALYZER - MDA96

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- **DIN 96 x 96 INSTRUMENT**
- **MEASUREMENT IN 4 QUADRANTS**
- **THREE-PHASE, 4 WIRE**
- **NEUTRAL CURRENT**
- **HARMONIC DISTORTION (THD V and I)**
- **MAXIMUM DEMAND, A, kW, kVA, kvar**
- **MAX and MIN VALUES**
- **TRUE RMS**
- **RS232/RS485 SERIAL PORT**
- **2 CONTACTS OUTPUT**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	kW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Consumed active energy (EP+)	kWh				•
Generated active energy (EP-)	kWh				•
Inductive reactive energy (Eq+)	kvarh				•
Capacitive reactive energy (Eq-)	kvarh				•

MODEL

MDA96

- MDA96-BA — Basic model. Current insulated.
- MDA96-C — Current insulated. RS485 Serial port. 2 Relays.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.

SERIAL PORT

- Type: RS 485.
- Protocol: MODBUS RTU.
- Connection: 2 or 4 wire.
- Baud rate: Programmable. 300 - 19200 Bauds. Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.
- Max length of system per line (without amplifier): 1250 m. (On request RS232 serial port).

MAXIMUM DEMAND FUNCTION

- Average values of: I1, I2, I3, P, Q and S.
- Integration period: 15 or 30 minutes.
- These values can be displayed as current average values and saved as maximums.

DISPLAY LED

LED DISPLAY

- 3 LED displays (4 Digits + Sign).
- Height of digits: 14,5 mm.
- Built in keypad (5 Keys).
- 6 selectable parameters for each display.
- Over 43 measuring parameters.

MAXIMUM AND MINIMUM VALUES

- Maximum and minimum values of: V12, V23, V31, V1, V2, V3, I1, I2, I3, P1, P2, P3, P, Q, Cosφ and Hz

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50 - 60 Hz

CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O., 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses imported by the receptor connected to the device. (Ep+ and Eq+). They can also be set as contacts managed from the central unit.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

AUXILIARY VOLTAGE	
Aux. V. AC	63,5/110 V or 230/400 V
Burden	3 VA
Operating range	70-120 % Un
Aux. V. DC	18-72 V
Burden	3 W
Universal Aux. V.	85-264 V AC; 90-300 V DC
Burden	4 VA

GENERAL FEATURES	
Case material	Metal+ABS,UL94 V0
Dimensions	DIN 96 x 96 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,6 Kg
Protection	IP20 Terminals
Optional protection	IP54 Frontal IP65 frontal cover
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

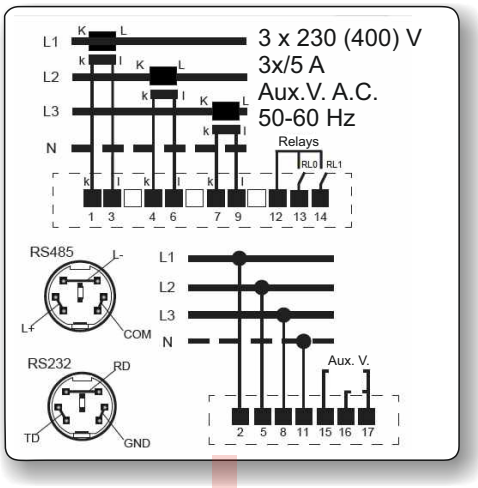
OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,3%(read.+full sca.)
Current	1-120%	0,3%(read.+full sca.)
Active power	1-120%	0,3%(read.+full sca.)
Reactive power	1-120%	0,3%(read.+full sca.)
Apparent power	1-120%	0,5%(read.+full sca.)
Power factor	±0,5	0,6% reading
Frequency	45-65 Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

CONNECTIONS



NETWORK ANALYZER - MDA144

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- **DIN 144 x 144 INSTRUMENT**
- **MEASUREMENT IN 4 QUADRANTS**
- **THREE-PHASE, 4 WIRE**
- **NEUTRAL CURRENT**
- **HARMONIC DISTORTION (THD V and I)**
- **MAXIMUM DEMAND, A, kW, kVA, kvar**
- **MAX and MIN VALUES**
- **TRUE RMS**
- **RS232/RS485 SERIAL PORT**
- **2 CONTACTS OUTPUT**
- **OPTION: MDA144-M WITH MEMORY. See LDA144-M**

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	•	•	•	
Current	A	•	•	•	
Neutral current	A				•
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Maximum demand (I)	A	•	•	•	
Maximum demand (P)	kW				•
Maximum demand (Q)	kvar				•
Maximum demand (S)	kVA				•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Consumed active energy (EP+)	kWh				•
Generated active energy (EP-)	kWh				•
Inductive reactive energy (Eq+)	kvarh				•
Capacitive reactive energy (Eq-)	kvarh				•

MODEL

MDA144

Current insulated.
RS485 Serial port.
2 Relays.
Burden insulated (optional)

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.
- Alarms.
- Integration time.

MAX AND MIN. VALUES.

- Max. and min. values of: V12, V23, V31, V1, V2, V3, I1, I2, I3, P1, P2, P3, P, Q, Cosφ and Hz

SERIAL PORT

- Type: RS 485.
- Protocol: MODBUS RTU.
- Connection: 2 or 4 wire.
- Baud rate: Programmable. 300 - 19200 Bauds. Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.
- Max length of system per line (without amplifier): 1250 m. (On request, RS232 serial port)
- Optional:
  (1) Frontal connection of the back connector. (Copy of serial port)
  (2) Independent serial port RS232C.

MAXIMUM DEMAND FUNCTION

- Average values of: I1, I2, I3, P, Q and S.
- Integration period: 15 or 30 minutes.
- These values can be displayed as current average values and saved as maximums.

4 DIGITAL INPUTS

Digital inputs can be used to:

- Signal the position of cantacts or alarms.
- Indicate energy consumption for external processes and synchronisation pulses for the maximum demand function.
- Pulse totalizer for external instruments.

DIGITAL OUTPUTS

10 independent programmable relays, for assigning variables and alarm setting.

ANALOGUE OUTPUT *

Number of outputs:	1.
Type:	4-20 mA.
Moperating range:	programmable.

(*) Voltage isolation needed.

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50 - 60 Hz

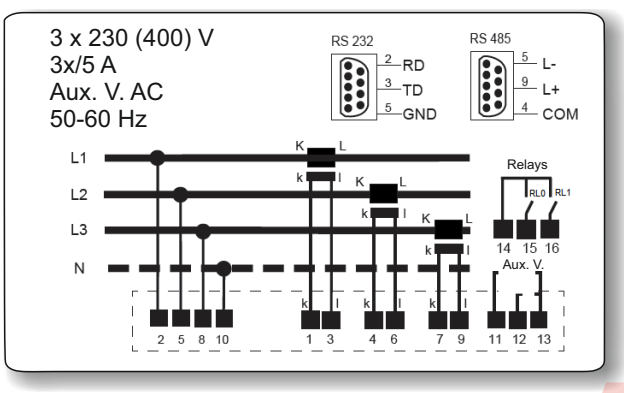
CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O., 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy pulses imported by the receptor connected to the device. (Ep+ and Eq+). They can also be set as contacts managed from the central unit.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

CONNECTIONS



AUXILIARY VOLTAGE	
Aux. V. AC.	63,5/110 V or 230/400 V
Burden	4 VA
Operating range	80-120 % Un
Aux. V. DC.	18-72 V
Burden	5 W
UNIVERSAL Aux. V.	85/264 V A.C; 90/300 V DC
Burden	4 VA

GENERAL

GENERAL FEATURES	
Case material	Metal+ABS,UL94 V0
Dimensions	DIN 144 x 144 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,75 Kg
Protection	IP20 Terminals
Optional protection	IP54
Electrical safety	(EN 61010) Class 2 Category III

LED DISPLAY

- 3 LED displays (4 Digits + Sign).
- Height of digits: 14,5 mm.
- Built in keypad (5 Keys).
- Over 43 measuring parameters.
- Up to 9 variables by display through keyboard.

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

ACCURACY

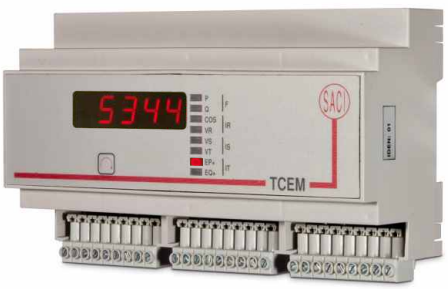
Parameter	Operating range	Accuracy
Voltage	20-120%	0,2%(read.+full sca.)
Current	1-120%	0,2%(read.+full sca.)
Active power	1-120%	0,2%(read.+full sca.)
Reactive power	1-120%	0,2%(read.+full sca.)
Apparent power	1-120%	0,4%(read.+full sca.)
Power factor	±0,5	0,4% reading
Frequency	45-65 Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

NETWORK ANALYZER - TCEM

Instrument with microprocessor, programmable, in DIN rail and LED display.

GENERAL FEATURES

- **DIN RAIL MOUNTING**
- **LED DISPLAY**
- **MEASUREMENT IN 4 QUADRANTS**
- **TRUE RMS**
- **CURRENT INSULATED**
- **RS232/RS485 SERIAL PORTS**
- **1 OPTOCOUPLER OUTPUT**



ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage (Line-to-neutral)	V	•	•	•	
Voltage (Line-to-Line)	V	*	*	*	
Current	A	•	•	•	
Active power (P)	kW	•	•	•	•
Reactive power (Q)	kvar	•	•	•	•
Apparent power (S)	kVA	•	•	•	•
Power factor (Cos φ)	PF	•	•	•	•
Frequency	Hz				•
Consumed active energy (EP+)	kWh				•
Generated active energy (EP-)	kWh				•
Inductive reactive energy (Eq+)	kvarh				•
Capacitive reactive energy (Eq-)	kvarh				•

* Only model TCEM-1 and TCEM-2

MODEL

	TCEM
TCEM	Single-phase.
TCEM-1	Three-phase, 3 wire, balanced.
TCEM-2	Three-phase, 3 wire, unbalanced.
TCEM-3	Three-phase, 4 wire, unbalanced.

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contact operating mode.

SERIAL PORT

- Type: RS485.
- Protocol: MODBUS RTU.
- Connection: 2 or 4 wire.
- Baud rate: 9600 Bauds.
- Max. Nº of instruments per line: 32.
- Max length of system per line (without amplifier): 1250 m.
  (On request, RS 232 serial port)

CONTACT OUTPUT

Type: Voltage-free contact (optocoupler).

4 DIGITAL INPUTS

Digital inputs can be used to:

- Signal the position of cantacts or alarms.
- Indicate energy consumption for external processes and synchronisation pulses for the maximum demand function.
- Pulse totalizer for external instruments.

LED DISPLAY

- LED Display (4 Digits + Sign).
- Built-in keypad
- 12 consecutive displayed parameters by pressing the rotate button.

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	100, 110, 230 or 400 V
Burden	1 mA per phase
Operating range	20-120 % Un
Rated current (In)	1 or 5 A
Burden	0,2 VA per phase
Operating range	1- 120 % In
Frequency	50 - 60 Hz

CONTACTS OUTPUT *	
Number of outputs	1
Optocoupler	N.O. 5 - 48 V DC
Pulse length	≥ 100 ms

* Contact output can be set as pulse for active energy. It can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. AC.	110, 230 or 400 V
Burden	6 VA
Operating range	80-120 % Un

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,2%(read.+full sca.)
Current	1-120%	0,2%(read.+full sca.)
Active power	1-120%	0,2%(read.+full sca.)
Reactive power	1-120%	0,2%(read.+full sca.)
Apparent power	1-120%	0,4%(read.+full sca.)
Power factor	±0,5	0,4% reading
Frequency	45-65 Hz	0,2%(rated freq.)
Active energy	5-120%	1% reading
Reactive energy	5-120%	2% reading

GENERAL

GENERAL FEATURES	
Modules	DIN rail
Case material	ABS,UL94 V0
Dimensions	9 modules 155 x 90 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,65 Kg
Protection	IP40
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- RS232/RS485 converters.
- RS485 amplifiers.

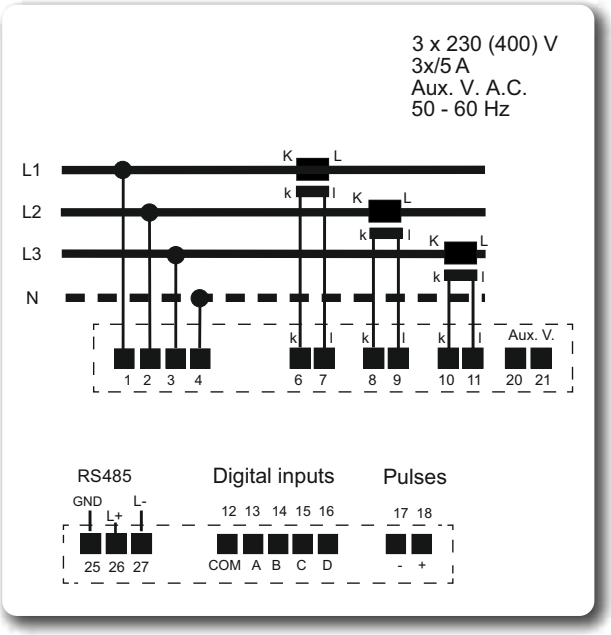
OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

CONNECTIONS



ANALYZER AC AND ENERGY METER RS-485 - M2DL2

- Analyzer and single-phase energy meter
- Accuracy Cl.1 Active Cl.2 reactive (EN 62053)
- Direct measurement up to 80 A
- RS-485 communication. MODBUS protocol
- Energy consumtion LED
- LCD display 6 digits
- Pulse output: SO (DIN 43864)
- 2 DIN modules
- Partial active energy counter ressettable

NUEVO

TECHNICAL SPECIFICATIONS

VOLTAGE INPUT	
Rated voltage (Un)	230 V AC
Burden	< 8 VA, 2 W
Operating range	± 30% Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (80) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT	
Pulse weight	1600 pulses / kWh
Type	SO (DIN 43864)
Insulation	3 kV, 1 min.
Voltage	18 - 27 V C.C.
Pulse length	> 30 ms

GENERAL FEATURES

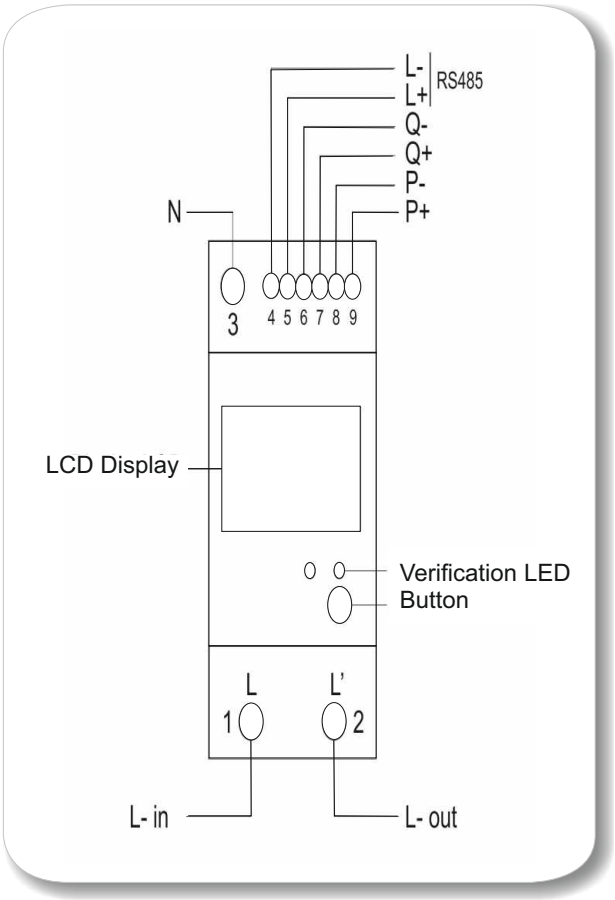
GENERAL FEATURES	
Counter type	LCD Display
Digits	5 + 1 decimal
2 active energy counter	total and parcial
Class	1 active - 2 reactive
Operating temperature	-20 to +60 ºC
Energy indicator	LED
Case material	ABS, UL94 V0
Dimensions	2 modules (35 mm)
Terminals	Sealable
Connection	With screw
Max wire section:	
Phase input terminals	6x6 mm^2
Neutral terminals	3,5x3,5 mm^2
Terminals SO and RS-485	1,8 mm Ø

The **M2DL2** energy meter and network analyzer is designed to act as an energy meter and also measure parameters of a single phase network, such as **voltage, current, active power, reactive power factor and frequency** in low voltage.

The M2DL2 is characterized through its **RS-485 communication** with potential to connect up to 32 computers in a same loop or 128 through converter, being able to be controlled from any computer or any other network device.

ELECTRICAL PARAMETER	UNIT	TOTAL
Voltage	V	•
Current	A	•
Active power (P)	kW	•
Reactive power (Q)	kvar	•
Power factor (Cos φ)	PF	•
Frequency	Hz	•
Import active energy (EP+)	kWh	•
Export active energy (EP-)	kWh	•
Reactive energy (Q1, Q2, Q3, Q4)	kvarh	•

CONNECTION DIAGRAM



D.C. NETWORK ANALYZER - AR3DC

Instrument with microprocessor,programmable , LCD display, designed for measuring variables in a network of low voltage DC.

GENERAL FEATURES

- **DIN MODULAR INSTRUMENT**
- **DIRECT CURRENT**
- **RS485 SERIAL PORT**
- **VALUE ALTERNATIVE MEASURE EVERY 2 S.**
- **1 OPTOCOUPLER OUTPUT**

ELECTRICAL PARAMETER	SYMBOL	TOTAL
Voltage	V	•
Current	A	•
Active power (P)	kW	•
Consumed active energy (EP+)	kWh	•
Generated active energy (EP-)	kWh	•
Ampere Hour (+)	Ah+	•
Ampere Hour (-)	Ah-	•
Shunt rated current	Ip	•

MODEL **AR3DC**

SETTING

- Instrument identify code.
- Primary current.
- Contacts operating mode.
- Energy pulse value.

The equipment is set through the serial port.

SERIAL PORT

- Type: RS485.
- Protocol: MODBUS RTU.
- Connection: 2 wire.
- Baud rate: Standar 9600 Bauds.
- Max Nº of instruments per line: 32.

LCD DISPLAY

- LCD display (4 digits + Sign).
- Height of digits: 8 mm.
- Up to 8 measuring parameters.

TECHNICAL SPECIFICATIONS

INPUT	
Rated Voltage (Un)	12, 24, or 48 V DC.
Burden	<1 W
Operating range	80-120 % Un
Rated current (In)	
Direct connection	10, 20, or 40 A D.C
Connection to external shunt	50-1000 A/60mV DC
Operating range	1- 120 % In

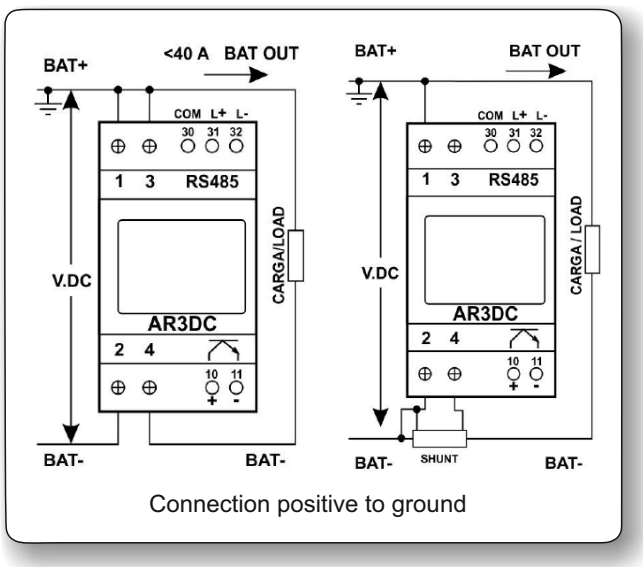
* Optional 125 V D.C.

CONTACTS OUTPUT *	
Number of outputs	1
Optocoupler	< 48 V DC.(24 V DC. 1 kΩ)

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy. They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. D.C.	Self supplied

CONNECTIONS



Connection positive to ground

GENERAL

GENERAL FEATURES	
Mounting	DIN rail
Case material	ABS,UL94 V0
Dimensions	3 modules 52 x 90 mm
Terminals	With screws
Max. wire section	16 mm²
Weight	0,15 Kg
Temperature range	0 - 40 ºC
Protection	IP20 terminals
Optional protection	IP54 frontal
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- Shunt x/60 mV.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.
- Connection negative to ground.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	80-120%	0,5%(read.+full sca.)
Current	1-120%	0,5%(read.+full sca.)
Active power	1-120%	0,5%(read.+full sca.)
Active energy	1-120%	1%(read.+full sca.)
Reactive energy	1-120%	1%(read.+full sca.)
Ampere hour (+)	1-120%	1%(read.+full sca.)
Ampere hour (-)	1-120%	1%(read.+full sca.)

D.C. NETWORK ANALYZER - TMCC

Instrument with microprocessor, programmable, with three LED display indicating measurements and built-in keypad.

GENERAL FEATURES

- **DIN 144 x 144 INSTRUMENT**
- **DIRECT CURRENT**
- **RS485 SERIAL PORT**
- **2 CONTACTS OUTPUT**
- **1 ANALOGUE OUTPUT 4-20 mA**

ELECTRICAL PARAMETER	SYMBOL	TOTAL
Voltage	V	•
Current	A	•
Active power (P)	kW	•
Consumed active energy (EP+)	kWh	•
Generated active energy (EP-)	kWh	•
Ampere Hour (+)	Ah+	•
Ampere Hour (-)	Ah-	•
Shunt rated current	Ip	•

MODEL **TMCC**

SETTING

- Instrument identify code.
- Primary voltage.
- Primary current.
- Contacts operating mode.
- Energy pulse value.

Setting the device can be by keypad or through serial port.

SERIAL PORT (OPTIONAL)

- Type: RS 485.
- Protocol: MODBUS RTU.
- Connection: 2 wire.
- Baud rate: Optional. Standard 9600 Bauds.
- Max. Nº of instruments per line: 32.

ANALOGUE OUTPUT

- Number of outputs: 1.
- Type: 4-20 mA.
- Accepted measurement: parameters.

LED DISPLAY

- 3 LED Display (4 digits + Sign)
- Height of digits: 14,5 mm
- Built in keypad (5 Keys)
- Up to 8 measuring parameters

TECHNICAL SPECIFICATIONS

INPUT	
Rated voltage (Un)	24,48,110,230 or 400 V DC.*
Burden	1mA per phase
Operating range	20-120 % Un
Rated current (In)	In / 60mV DC
Operating range	1- 120 % In

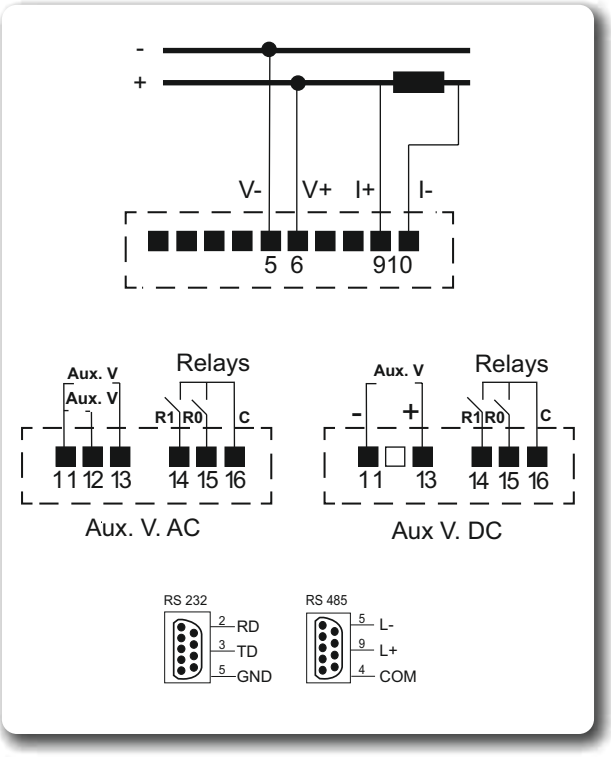
* Optional 1000 V D.C.

CONTACTS OUTPUT *	
Number of outputs	2
Type	Relay N.O 250 V, 3 A

* Contact output can be set as max. or min. alarm contacts associated to any measured parameter, or as energy. They can also be set as contacts managed from the central unit.

AUXILIARY VOLTAGE	
Aux. V. DC	24 or 48 V (*)
Aux. V. AC	110, 230 or 400 V
Universal Aux. V.	85-264 V A.C 90-300 V DC
Burden	2,8 VA
Operating range	85-110 % Un
Frequency	50 or 60 Hz

CONNECTIONS



GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 144 x 144 mm
Depth	88 mm
Terminals	Pluggable
Max. wire section	16 mm²
Weight	0,72 Kg
Temperature range	0 - 40 ºC
Protection	IP20 terminals
Optional protection	IP54 frontal
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- Shunts x/60mV.
- RS232/RS485 converters.
- RS485 amplifiers.

OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	20-120%	0,5%(read.+full sca.)
Current	1-120%	0,5%(read.+full sca.)
Active power	1-120%	0,5%(read.+full sca.)
Active energy	1-120%	1%(read.+full sca.)
Reactive energy	1-120%	1%(read.+full sca.)
Ampere hour (+)	1-120%	1%(read.+full sca.)
Amperio hour (-)	1-120%	1%(read.+full sca.)

NETWORK QUALITY ANALYZER - TMCQ

Instrument with microprocessor, programmable, four-line LCD display and integrated keyboard. It detects and records defects voltage supply network, such as overvoltage or undervoltage, Dips and microcuts that exceeds programmed limits.

GENERAL FEATURES

- **DIN 144 x 144 INSTRUMENT**
- **MEASUREMENT OF TRUE RMS**
- **THREE-PHASE 3 or 4 WIRE**
- **OVERVOLTAGES**
- **UNDERVOLTAGES**
- **DIPS and MICROCUTS**
- **EVENTS RECORDING**
- **RS232 / RS485 SERIAL PORTS**
- **ANALYSIS SOFTWARE**

MODEL	**TMCQ**
- TMCQ II	Three-phase, 3 wire
- TMCQ 3	Three-phase, 4 wire

OPERATING MODE

The equipment measures the true effective value of the voltage (RMS) of a three-phase system, taking 128 samples per period. The measured values are compared with the predefined upper and lower values (both programmable). If the values measured are within the preset limits, they are not considered and therefore not recorded. On the other hand, if the predefined limits are exceeded, the detection process begins, the event is classified and measured, the detection process begins, the event is classified and measured and once finished, data is saved in a memory powered by a rechargeable battery.

Events contai the following information.

- Nº.
- Type.
- Phase.
- Date.
- Time.
- Length.
- Maximum or minimum value.
- Average value.

While operating, the equipment displays the following information:

- Voltage per phase.
- Date.
- Time.
- Battery voltage.
- Device identity.

SETTING

- Device identity code.
- Rated voltage.
- Primary voltage.
- Secondary voltage
- Upper and lower limit values (% of rated value) (Setting software on request).

SERIAL PORT

- Type: RS485 (optional RS232).
- Connections: 2 or 4 wire.
- Protocol: MODBUS RTU.
- Standard baud rate: 9600 Bauds.
- Insulation by optocoupler between output and measurement inputs.

LCD DISPLAY

- 4 lines, 20 characters.
- Built-in keypad (5 keys)
- Allows recorded data to be displayed.

ROTATING MEMORY

The RAM standard rotating memory allows up to 1360 events to be saved. DATA recovery can be via the serial port and MODBUS protocol output or via a SW/Driver in a file format compatible with Excel.

TECHNICAL SPECIFICATIONS

INPUT	
Rated voltage (Un)	100,110,230 or 400 V DC
Burden	1mA per phase
Operating range	0-150 % Un

AUXILIARY VOLTAGE	
Self supplied in any of the three phases. 4 wire version	
Self supplied between phases. 3 wire version	
Burden	< 3 VA
Frequency	50 or 60 Hz

OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 144 x 144 mm
Depth	88 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,72 Kg
Temperature range	0 - 40 ºC
Protection	IP20 terminals
Optional protection	IP54 frontal
Electrical safety	(EN 61010) Class 2 Category III

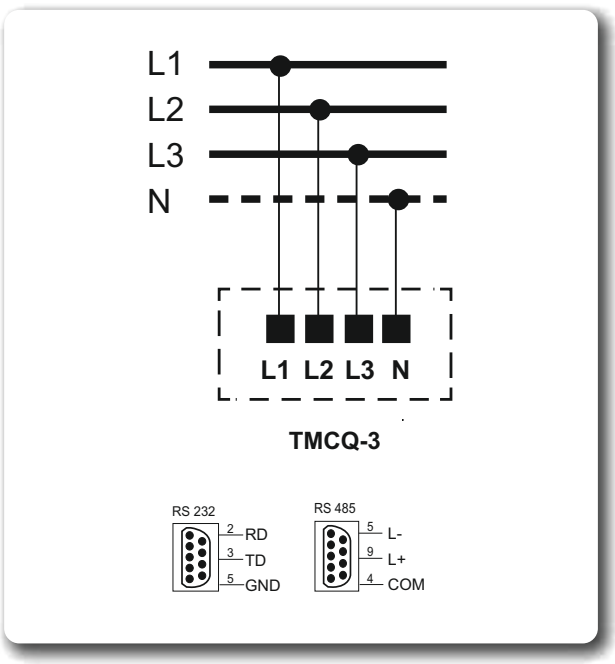
ACCESSORIES

- RS232/RS485 converters.
- RS485 amplifiers.

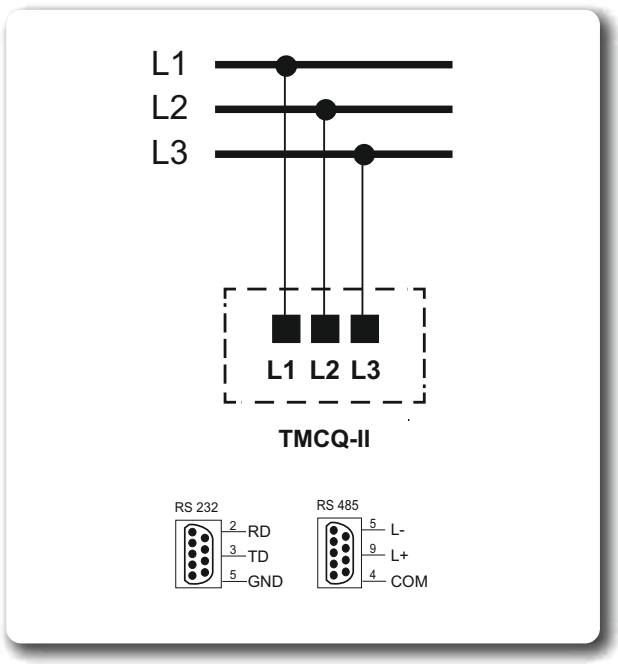
OPTIONAL

- Reading software (without additional cost).
- Management software SACIgest.

CONNECTIONS



CONNECTIONS



RS232/RS485 CONVERTER - IFR

IFR equipment converts the RS232 standard levels to the corresponding levels in the RS485 standard.

IFR converters allow a PC with RS232 to be connected to an RS485 bus.

RS232 drivers activations can be with RTS or automatically if this option has been selected with internal bridges.

For the automatic option, data from the RS232 line activates the drivers.

When data transfer finishes, the IFR converters return to receive mode.

GENERAL FEATURES

- **DIN RAIL MOUNTING**
- **CONNECTIONS: 2 or 4 WIRE**
- **OPTICAL INSULATION BETWEEN RS232 and RS485 SERIAL PORTS**
- **UP TO RS485 SERIAL PORTS**

MODEL	IFR
- IFR1	2 WIRE. 1 serial port RS232. 1 Serial port RS485.
- IFRA3 **- IFRA**	2 or 4 wire. Optically insulated. 1 serial port RS232. 1 Serial port RS485.
- IFR4	2 or 4 wire. Optically insulated. 1 serial port RS232. 4 serial port RS485.

TECHNICAL SPECIFICATIONS

INPUT	
Number of outputs	1
Type	RS232 (RD, TD, RTS, CTS)

OUTPUT	
Number of outputs	
IFR1, IFRA, IFRA3	1
IFR4	4
Type	RS485
Baud rate	300-76800 Bauds

OVERLOAD

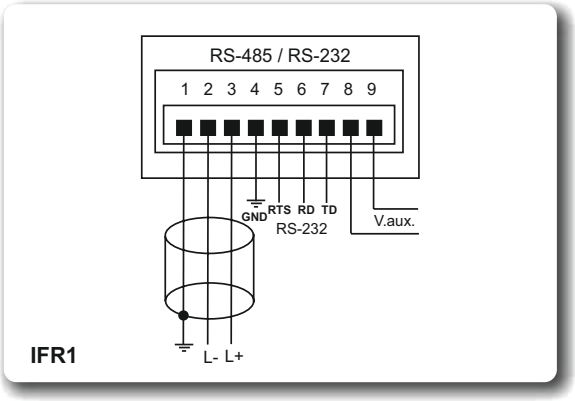
- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

AUXILIARY VOLTAGE	
Aux. V. AC.	110 or 220 V.
Aux. V. DC.	12, 24 or 48 V
Burden	
IFR1	3 VA
IFRA, IFR4	6 VA
IFRA	3 W

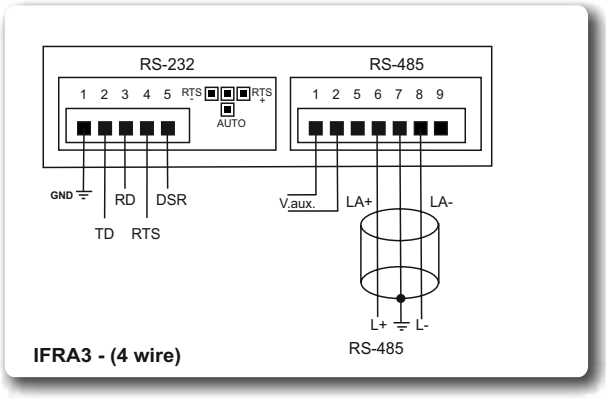
GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	
IFR1	(3 Modules), 52 x 90 mm.
IFRA3	(3 Modules), 52 x 90 mm.
IFRA	(6 Modules), 105 x 90 mm.
IFR4	(9 Modules), 155 x 90 mm.
Terminals	Pluggable
Max wire section	2,5 mm²
Weight	
IFR1-IFRA3	0,30 kg
IFRA	0,45 kg
IFR4	0,65kg
Mounting	DIN rail

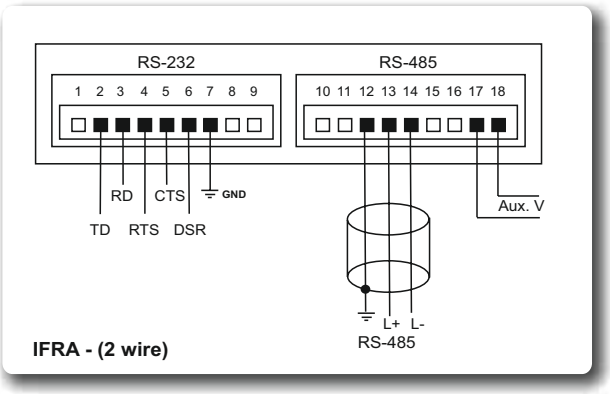
CONNECTIONS



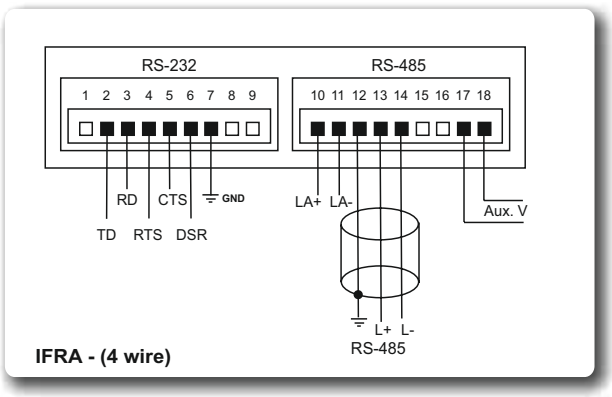
IFR1



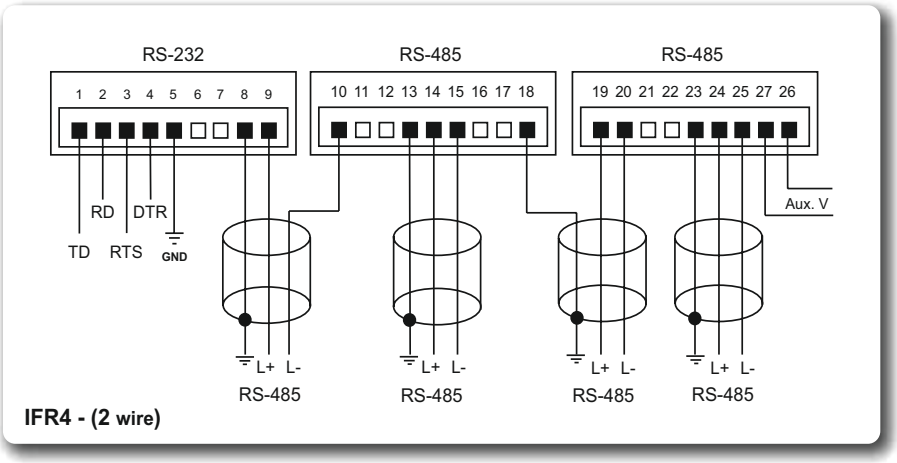
IFRA3 - (4 wire)



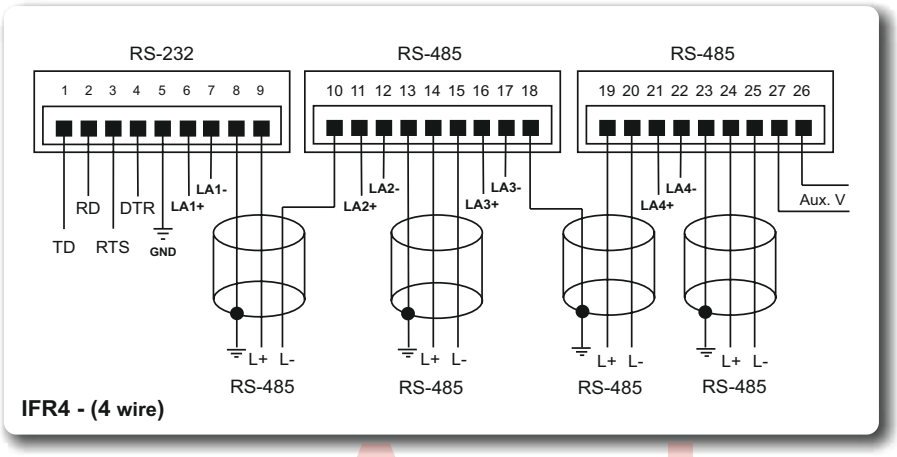
IFRA - (2 wire)



IFRA - (4 wire)



IFR4 - (2 wire)



IFR4 - (4 wire)

REPEATER RS485/RS485 - RT485

The RT485 repeater is a communication equipment that allows the extension of a RS485 bus in order to increase communication distance, or the maximum recommended number of terminals.

It receives a communication from the bus and sends it to the other bidirectionally. It allows two or four wires connection and due to an auxiliary power supply it separates the two communications buses electrically. LEDs on the front display operation signals.

GENERAL FEATURES

- **DIN RAIL MOUNTING**
- **CONNECTIONS: 2 or 4 WIRE**
- **OPTICAL INSULATION BETWEEN RS232 and RS485 SERIAL PORT**

MODEL **RT485**
2 or 4 wire.

TECHNICAL SPECIFICATIONS

INPUT	
Number of outputs	1
Type	RS485

OUTPUT	
Number of outputs	1
Type	RS485
Baud rate	300-19200 Bauds

AUXILIARY VOLTAGE	
A.C.	110, 220 or 400 V
D.C.	24, 48, 110 or 220 V

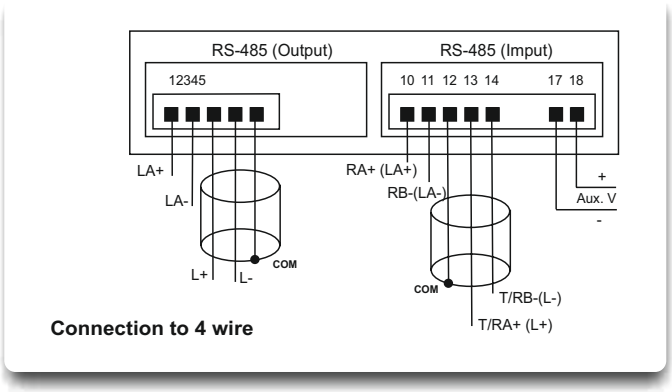
GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
IFRA	(6 Modules), 105 x 90 mm.
Terminals	Pluggable
Max. wire section	1,5 mm²
Weight	0,45 kg
Mounting	DIN rail
LED indication	
Rx4	Received data (4wire)
Rx2	Received data (2wire)
TX	Sent data

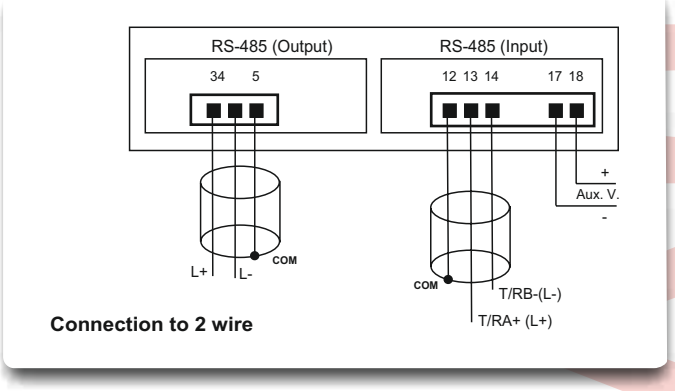
OVERLOAD

- 2 Vn x 10 s.
- 1,2 Vn permanent.
- 20 In x 1 s.
- 2 In permanent.

CONNECTIONS



Connection to 4 wire



Connection to 2 wire

ETHERNET CONVERTER - etherGATE

The etherGATE is a communications gateway used to convert the physical Ethernet environment to serial RS-485 or RS-232 communications or vice versa in the routing mode.

GENERAL FEATURES

- **CONVERT ETHERNET TO RS485 or RS232**
- **TRANSPARENT CONVESION UNDER TCP or UPD CONNECTIONS**
- **NETWORK PROTOCOLS MODBUS/TCP, TCP, UPD - HTTP**
- **CONFIGURATION THROUGH FIXED IP or DHCP NAME**
- **DIN RAIL 2 MODULES**

TECHNICAL SPECIFICATIONS

POWER CIRCUIT	
Single-phase (A1 – A2)	1
Frequency	47…63 Hz
Maximum consumption	4,6…7,5 V.A
Working temperature	-10 …..+ 60 ºC

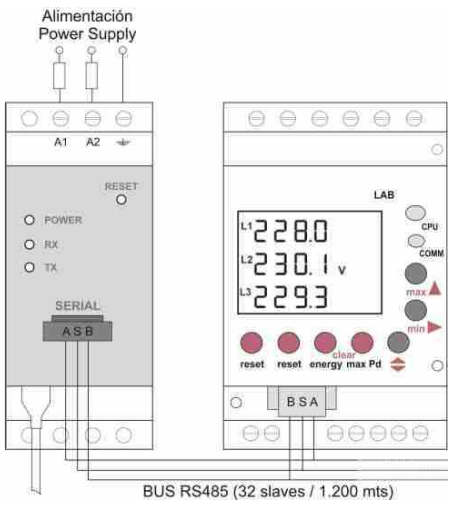
NETWORK INTERFACE	
Type	Ethernet 10 BaseT / 100Base TX
Connector	RJ 45
Network protocols	TCP / UDP / Modbus/TCP - HTTP

MECHANICAL FEATURES	
Case material	UL94 - V0 Plastic
Protection degree	IP 20.
Dimensions (mm)	35,4 x 73 x 84,7 (2 modules)
Weight (g)	120 g
Maximum operating height	2.000 m

SERIAL INTERFACE	
Type	RS-485 / RS-232 three wires
Transmission speed	4.800 - 115.200 bps
Data bits	7, 8
Parity	No parity, odd, even
Stop bit	1 or 2

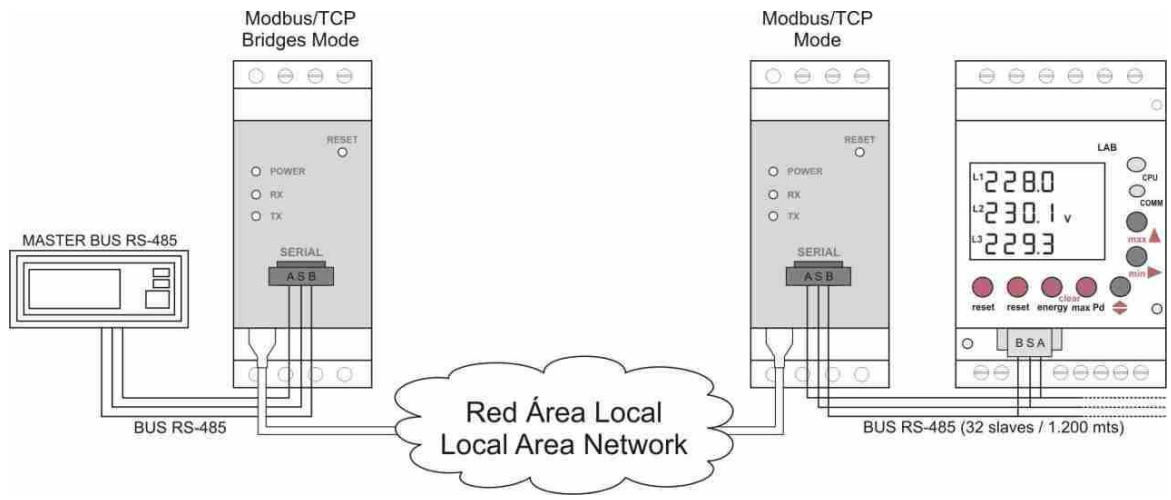
CONNECTIONS

Figure 1. Standard connection of serial equipment



CONNECTIONS

Figure 2. Systems over Ethernet infrastructures (Modbus/TCP Bridges Mode)



MANAGEMENT SOFTWARE - SACIGEST

The SACIgest program is a system allowing the SACI terminals installed on the net to be easily managed as graphs. The electrical installation is grouped by sections, each of which is displayed differently, in the way they are inserted in their corresponding terminals.

A variable for each terminal can be monitored on the screen and placed in an appropriate position on the graph.

The system includes the easy creation of virtual terminals based on actual terminals by simply applying a definition formula.

Given the possible inclusion of direct current analyzer terminals, alternating current sections and direct current sections can be created.

Terminal models handling the system are as follows:

MAR, TMC
MDA
LCA_, LDA_, LAB, ANG
TCEM,
CP2000, CP3000, CP4000
TMCQ
M1D, M2D, TCID, TCI, TCIV (*)
TMC-C TMCC-H
TTI
VIRTUAL
(*) Via TTI.

The SACIgest software can work in several languages, initially prepared in Spanish and English. The customer can choose or define his own language.

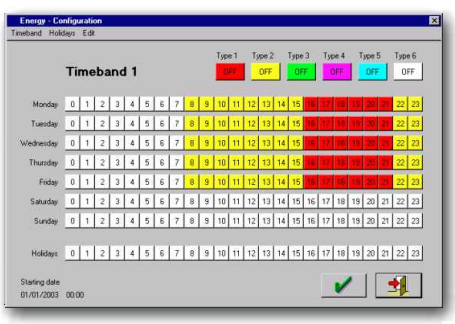
All definition and setting operations can be password protected. The software is capable of handling up to 4 communication ports (COM1 - COM4), as well as using a modem to communicate with the different terminals installed on the network. The communication speed with the terminals can also be configured (where possible).

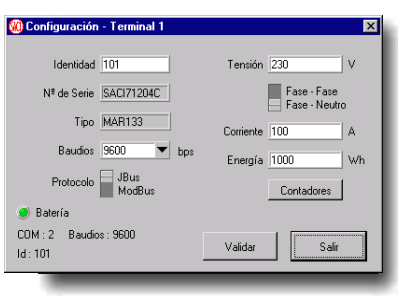
The Client - Server operating mode via an Ethernet network can be selected.

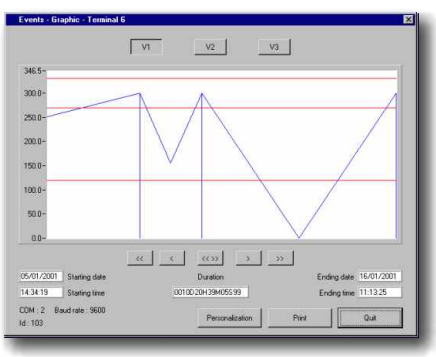
Minimum requirements:

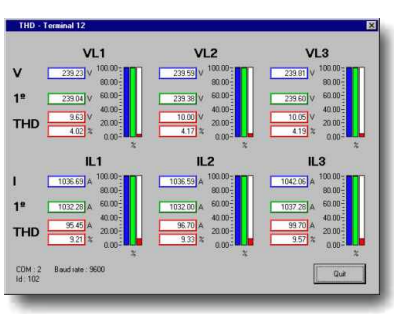
CPU: Microprocessor:	Pentium III
RAM:	128 Mb
Video card:	SVGA
Monitor:	Colour, 15'' 800 x 600
Software:	XP, Win , Vista, Win 8, 32 bits,

It must also have a serial port for the RS-232 - RS485 converter connection (IFRxx Model). It can be phisically or through a converter USB-RS232.









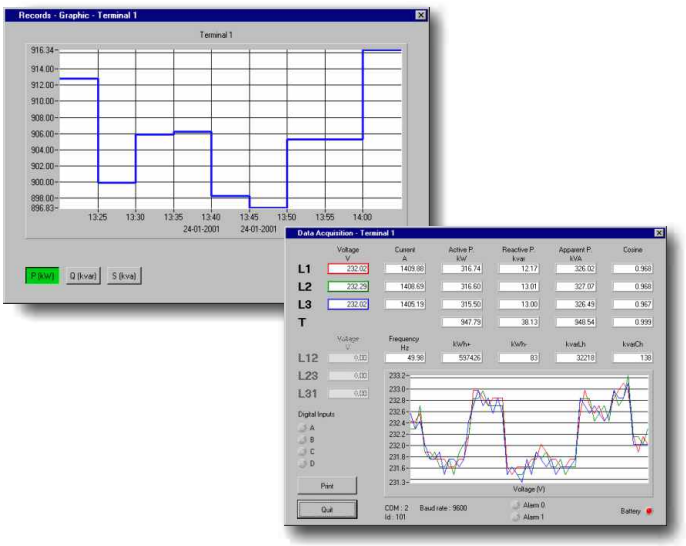
MANAGEMENT SOFTWARE - SACIGEST

Versions

The system has different versions according to its applications:

- SACIgest 01: Version for terminal monitoring and setting options. All terminal parameters can be set and the monitoring data can be accessed. It has a numerical indicator next to the terminal where the value of the selected variable appears.

- SACIgest 02: Version which adds the Energies option to 01. The energy consumption of the instalation can be displayed using the terminals or sections. The values can be shown as a graph. Energy closures can be generated and displayed. Setting of up to 6 types of different tariffs for 12 time periods with holidays defined. The sampling period is programmable by the user in intervals of 5, 10, 15, 20, 30 and 60 minutes based on the PC clock for terminals directly connected to a PC. Also, a different sampling interval can be defined for terminals connected via modem.



- SACIgest 03: The possibility of having historical values is added to version 02. The voltage, current and power variables are sampled and their historical values are generated. The sampling interval can be defined by the end user. In fact, all parameters are quickly sampled and when it is time to generate the history, the values sampled during the selected interval are averaged.

- SACIgest 04: Alarm option is added to 03. Different alarms on the system can be defined for each terminal allowing actions to be taken on the digital outputs of the terminal or on any other terminal. Pending alarm recordings and already registered alarms are shown. A button on the main screen will indicate if any alarm has been set off.

Sub-versions

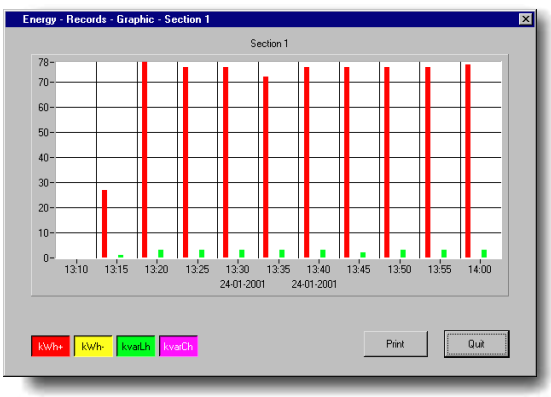
Within each SACIgest version there are different subversions which shall be defined below.

- Normal: This is the version for the majority of users. It consists of a single PC connected to the SACI instrument network.

- Server: The SACIgest software can operate in a Client.

- Server environment using an Ethernet interface with NetBios and TCP/IP protocol. This is the Server version which is physically installed in the terminals and provides the service to the clients.

- Client: Within the Client - Server operating mode, this is the client version which accesses the terminals and data allocated on the server. The client version is free, as many clients as required can be installed, but the Server version is required to operate.



There are also the following installation options for all of the above mentioned versions:

- Normal: This is the normal installation with no limit on terminals.

- Reduced: Same as above, but with a limit of 6 terminals in the installation. The price is also lower.

- Demo: There are completely operational trial versions, which exits after using it for 60 minutes.

All versions, except for the DEMO and Client versions require hardware protection to operate. Each version has its specific protection and it cannot operate without its protection.

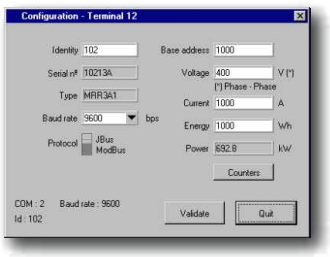
The depth of section graph has to be edited by the final user with any graphic design program or with digital photographs.

MANAGEMENT SOFTWARE - SACIGEST

SOFTWARE - LCDA

LCDA software is designed to manage the most common LCA, LCAM, LCC, LCCM, LDA96 and LDA144 versions.

This version can manage different equipment on the network with the option to program the communication speed and to program it via modem. Equipment in the first four communication ports on the PC can be managed.

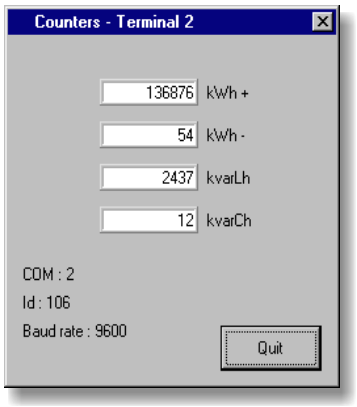


With this version, the two digital outputs of the instrument, maximums and minimums, harmonics and maximum required values (LDA) can be managed. It takes data for 30 electrical parameters and displays the variables as a graph.

This software version operates on a 32 bit platform, i.e. for Win 7, Win 8, XP, Vista.

SOFTWARE - LCDAM

LCDAM software is designed to manage the more common versions of LCA, LCAM, LCC, LCCM, LDA96, LDA144 and LDA144 with memory. This version can manage different equipment on the system with the option to set the communication speed and program it via modem. It allows to manage any equipment connected to the first four communication ports on the PC.



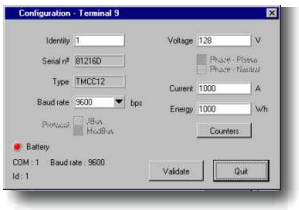
With this version, the two digital outputs of the instrument, maximums and minimums, harmonics, maximum required values (LDA and LCC) and the historical values of the LDA144 with memory can be managed. It takes data for 30 electrical parameters and displays the variables as a graph.

SOFTWARE - REMREADER

This is a software for remote readings at a predetermined time of all connected and configured terminals showing their values as a text file. It saves and registers the configuration of the terminals.

RemReader software manages all SACI terminals except for the TMCQ and TTI, although it includes meters connected to the TTI.

The program allows showing the results and the use of a modem to establish communications.

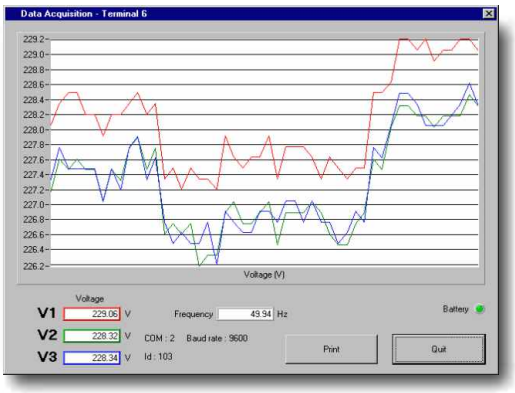


This software version operates on a 32 bit platform, i.e. for Win 7, Win 8, XP, Vista...

SOFTWARE - MODEMCFG

This software allows to choose the optimal way to properly operate with the network.

Given that two identical modems do not exist and that not all modems accept the same commands, this software has been created to extract the existing configuration in Windows and to reconfigure it. It is easy to assume that the modem has to be installed previously using Windows to allow this configuration software to receive its information.



APPLICATION - APP FOR iPHONE - SACIGEST

NEW

New APP for iPhone, SACIgest v1.0 with which making accuracte readings of SACI equipments of the installation, is possible from anywhere in the world.
The new APP has 3 main screens

- **Network setup:**

This menu is to configurate, the public IP address, the TCP port location Software SACIgest. and a geographical place where facility is located.(Last one just to clarify)

- **Configuration:**

In this menu, it will be necessary, SACI devices used in the installation and their MODBUS ID identification.

Once accepted, the equipment must be identified within the application and you can visualize the corresponding readings.

- **Download:**

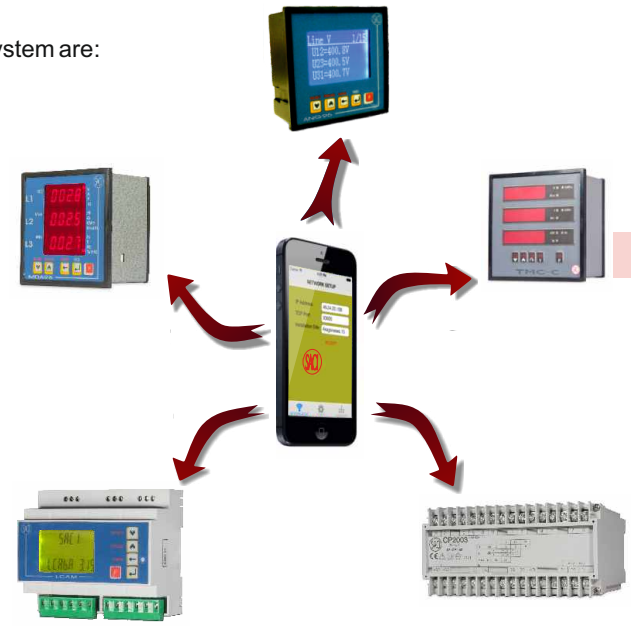
If the device is configured correctly, in this third screen will appear the corresponding readings in real time.
It accepts as many devices as devices in the installation.

- SACIgest program is a system that allows management of SACI terminals installed on a network in a simple and graphic way
The electrical installation is grouped by sections, each one with a different visualization, in which the corresponding terminals are inserted.

Models of terminals managed by the system are:

Network analyzers:
ANG96
LCC, LCCM
LCA, LCAM, LDA, LDA144
LAB96, LABM
MAR96, MAR144
MDA96, MDA144
TCEM,TMCC, TMCQ

Measuring transducers
CP 2000, CP 3000, CP 4000...



ACCESSORIES - IP65 PROTECTION COVER

Protective cover IP65 for panel mounting devices.

GENERAL FEATURES

- **EASY ASSEMBLY.**
- **PROTECCTION AGAINST BUMPS, SCRATCHES OR ANY OTHER EXERNAL EXPOSURE, RAIN, LIQUIDS...**
- **FULLY ADJUSTABLE.**
- **AVAILABLE IN 2 STANDAD SIZES.**

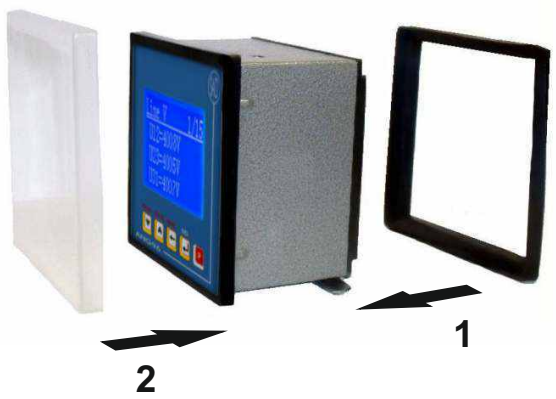
Model	Dimension	Ordering code
3V	96x96 mm	YVARSV193
4V	72x72 mm	YVARSV194

MOUNTING.

1- Insert the rubber into the device through the back area. Then introduce the device into the panel hole intended, and help yourself to him to bring the rubber at the front area of the device.

2- Fit the plastic cover from the front. The pressure between the rubber, the device and the panel will make sure it is securely attached

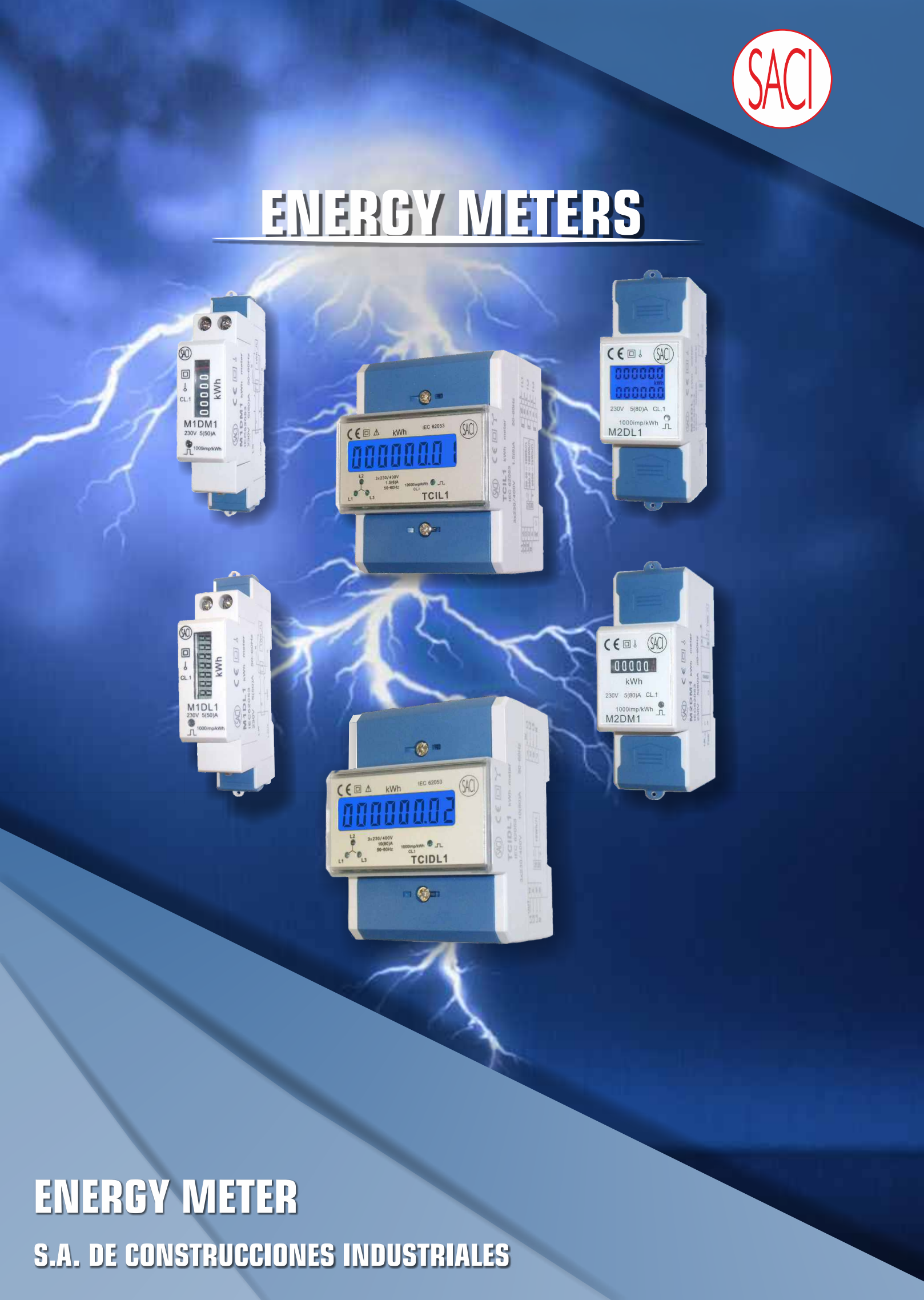
3- Hold the device to the panel with the corresponding fixing system.



- The device will be fully adjusted and protected. The material composed it makes it completely waterproof against dust, liquids ... avoiding the risk that may occur against rain or another external exposures.

3

ENERGY METERS



ENERGY METER

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

ENERGY METER

SINGLE PHASE - DIRECT INPUT - M1DL-MID

GENERAL FEATURES

- **MID CERTIFIED CLASS B (EN 50470-1 AND EN 50470-3**
- **SINGLE-PHASE**
- **DIRECT MEASUREMENT UP TO 50 A**
- **ENERGY CONSUMPTION LED**
- **7 DIGITS ELECTRONIC COUNTER**
- **PULSE OUTPUT S0 (DIN 43864)**
- **1 DIN MODULE**

NEW

TECHNICAL SPECIFICATIONS

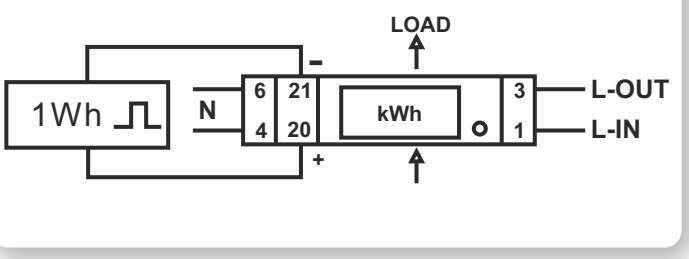
VOLTAGE INPUT	
Rated Voltage (Un)	230 V AC
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 Hz

CURRENT INPUT	
Current Imin...IB (IMAX)	0,25...5 (50) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	1 pulse / Wh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	50 mA
Voltage	5 - 48 V DC
Pulse length	>70ms

GENERAL FEATURES	
Counter type	LCD Display
Digits	5+ 2 decimals
N° of counters	1 (Total)
Class	B (EN 50470-1 and -3)
Operating temperature	-25 to +55 °C
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	1 module (17,5 mm)
Terminals	Sealable
Connection	With screw
Max. wire section	12 mm²
Mounting	35 mm DIN rail
Mechanical environment	M1
Electromagnetic environment	E2

CONNECTION DIAGRAM



Energy

MID CERTIFIED

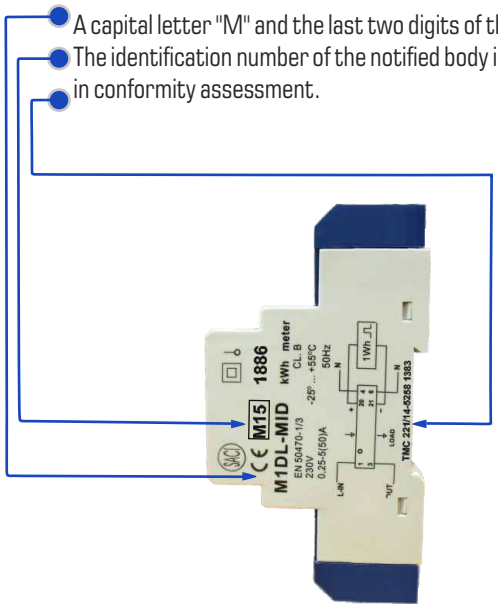
The Measuring Instruments Directive is a directive by the **European Union**, which seeks to harmonise many aspects of legal metrology across all member states of the EU. Its most prominent concept is that all kinds of energy meters which receive a MID approval may be used in all countries across the European Union.

Those energy meters used for billing should have MID certification. Thus, the **quality** of the instruments is ensured having been necessary to control by a notified body that justifies it.

The energy meter M1DL-MID has the approval that accredits the correct reading of the energy consumed.

Measuring instruments that comply with the MID bear:
The CE mark.

- A capital letter "M" and the last two digits of the year.
- The identification number of the notified body involved in conformity assessment.



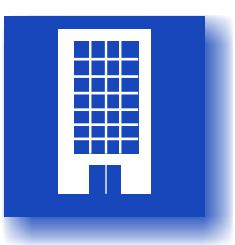
There are many situations where control of individual consumption is necessary.

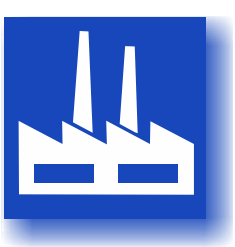
Situations such as when an owner wants to use a meter to measure the power consumption of the apartments in a building, and send individual invoices to the tenants for the energy used.

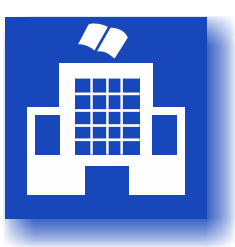
When the owner of a camping or caravan wants to use a meter to determine the consumption of their customers and charge them.

When the owner of a shopping center wants to use a meter to measure the power consumption of stores within his shopping center and charge them for the energy consumed.

The same situation can occur in offices, student residence, airports and marinas etc. where there is only one official billing meter and partial energy meters are needed.







ENERGY METER

SINGLE PHASE - DIRECT INPUT - RS485 - M2DL2

GENERAL FEATURES

- SINGLE-PHASE
- ACCURACY CL.1 ACTIVE CL.2 REACTIVE (EN 62053)
- DIRECT MEASUREMENT UP TO 80 A
- RS485 COMMUNICATION. MODBUS PROTOCOL
- ENERGY CONSUMPTION LED
- LCD DISPLAY 6 DIGITS
- PULSE OUTPUT S0 (DIN 43864)
- 2 DIN MODULES
- PARTIAL ACTIVE ENERGY COUNTER RESETTABLE

NEW

TECHNICAL SPECIFICATIONS

VOLTAGE INPUT	
Rated voltage (Un)	230 V AC
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (80) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT	
Pulse weight	1600 pulses / kWh
Type	S0 (DIN 43864)
Insulation	3 kV, 1 min.
Voltage	18 - 27 V DC
Pulse length	> 30 ms

GENERAL FEATURES	
Counter type	Display LCD
Digits	5 + 1 decimal
Active energy counter	Total and partial
Class	1 active - 2 reactive
Operating temperature	-20 to +60 °C
Energy indicator	LED
Case material	ABS, UL94 V0
Dimensions	2 modules (35 mm)
Terminals	Sealable
Connection	With screw
Max. wire section:	
Phase input terminals	6x6 mm^2
Neutral terminals	3,5x3,5 mm^2
S0 and RS-485 terminals	1,8 mm Ø

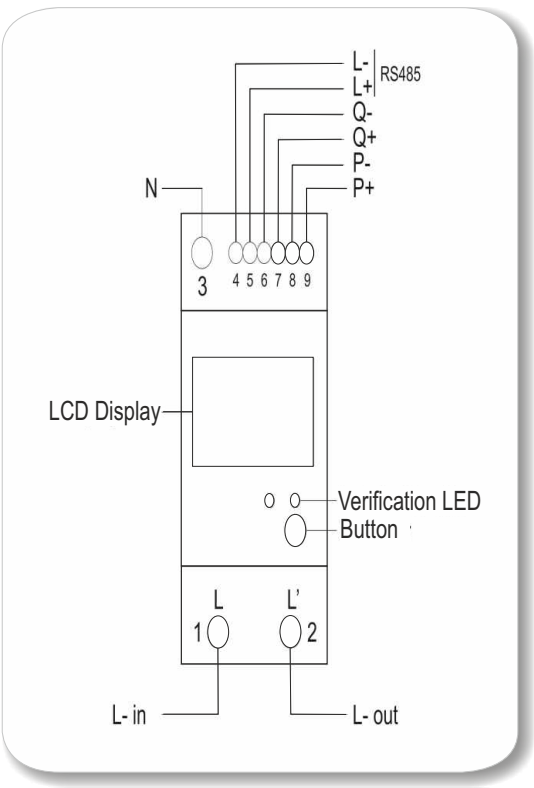
Energy

The **M2DL2** energy meter and network analyzer is designed to act as an energy meter and also measure parameters of a single phase network, such as **voltage, current, active power, reactive power factor and frequency** in low voltage.

The M2DL2 is characterized through its **RS-485 communication** with potential to connect up to 32 computers in a same loop or 128 through converter, being able to be controlled from any computer or any other network device.

ELECTRICAL PARAMETER	UNIT	TOTAL
Voltage	V	•
Current	A	•
Active power (P)	kW	•
Reactive power (Q)	kvar	•
Power factor (Cos φ)	PF	•
Frequency	Hz	•
Import active energy (EP+)	kWh	•
Export reactive energy (EP-)	kWh	•
Reactive energy (Q1, Q2, Q3, Q4)	kvarh	•

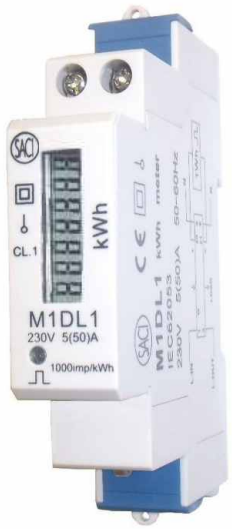
CONNECTION DIAGRAM



SINGLE PHASE - DIRECT INPUT - M1DL1

GENERAL FEATURES

- **SINGLE-PHASE**
- **ACCURACY CL.1 (EN 62053)**
- **DIRECT MEASUREMENT UP TO 50 A**
- **INTERNAL SHUNT**
- **ENERGY CONSUMPTION LED**
- **7 DIGITS ELECTRONIC COUNTER**
- **PULSE OUTPUT S0 (DIN 43864)**
- **1 DIN MODULE**



TECHNICAL SPECIFICATIONS

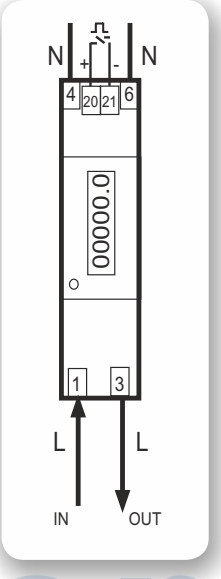
VOLTAGE INPUT	
Rated Voltage (Un)	230 V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (50) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	1000 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	50 mA
Voltage	5 - 48 V D.C.
Pulse length	>70ms

GENERAL FEATURES	
Counter type	LED Display
Digits	5 + 2 decimals
Nº of counters	1 (Total)
Class	1 (EN 62053)
Operating temperature	-20 to +60 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	1 module (17,5 mm)
Terminals	Sealable
Connection	With screw
Max. wire section	12 mm^2
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



Energy

SINGLE PHASE - DIRECT INPUT - M1DM1

GENERAL FEATURES

- **SINGLE-PHASE**
- **ACCURACY CL.1 (EN 62053)**
- **DIRECT MEASUREMENT UP TO 50 A**
- **INTERNAL SHUNT**
- **ENERGY CONSUMPTION LED**
- **6 DIGITS ELECTROMECHANICAL COUNTER**
- **PULSE OUTPUT S0 (DIN 43864)**
- **1 DIN MODULE**

TECHNICAL SPECIFICATIONS

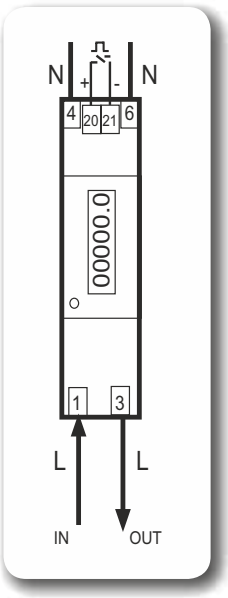
VOLTAGE INPUT	
Rated Voltage (Un)	230 V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (50) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	1000 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	50 mA
Voltage	5 - 48 V D.C.
Pulse length	> 70 ms

GENERAL FEATURES	
Counter type	Electromechanical
Digits	5 + 1 decimal
Nº of counters	1 (Total)
Class	1 (EN 62053)
Operating temperature	-20 to +60 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	1 module (17,5 mm)
Terminals	Sealable
Connection	With screw
Max. wire section	12 mm^2
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



SINGLE PHASE - DIRECT INPUT - M2DL1

GENERAL FEATURES

- **SINGLE-PHASE**
- **ACCURACY CL.1 (EN 62053)**
- **DIRECT MEASUREMENT UP TO 80 A**
- **INTERNAL SHUNT**
- **ENERGY CONSUMPTION LED**
- **6 DIGITS ELECTRONIC COUNTER**
- **PULSE OUTPUT S0 (DIN 43864)**
- **2 DIN MODULE**

TECHNICAL SPECIFICATIONS

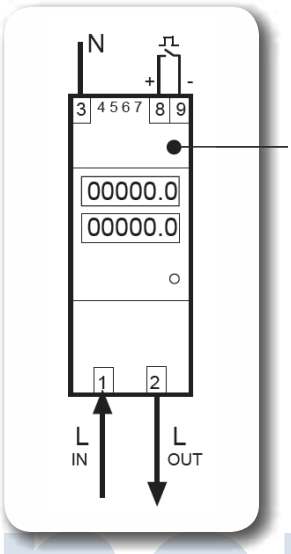
VOLTAGE INPUT	
Rated Voltage (Un)	230 V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (80) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	1000 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	50 mA
Voltage	5 - 48 V D.C.
Pulse length	> 70 ms

GENERAL FEATURES	
Counter type	LED Display
Digits	5 + 1 decimal
Nº of counters	2 (Total and partial)
Class	1 (EN 62053)
Operating temperature	-20 to +60 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	2 modules (35 mm)
Terminals	Sealable
Connection	With screw
Max. wire section:	
Phase input terminals	24 mm²
Pulse and neutral terminals	12 mm²
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



Resetable partial counter
(underneath terminal cover)

Energy

SINGLE PHASE - DIRECT INPUT - M2DM1

GENERAL FEATURES

- SINGLE-PHASE
- ACCURACY CL.1 (EN 62053)
- DIRECT MEASUREMENT UP TO 80 A
- INTERNAL SHUNT
- ENERGY CONSUMPTION LED
- 6 DIGITS ELECTROMECHANICAL COUNTER
- PULSE OUTPUT S0 (DIN 43864)
- 2 DIN MODULE

TECHNICAL SPECIFICATIONS

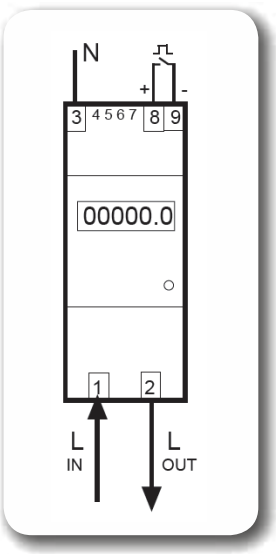
VOLTAGE INPUT	
Rated Voltage (Un)	230 V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	5 (80) A
Burden	< 1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	1000 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	50 mA
Voltage	5 - 48 V D.C.
Pulse length	> 70 ms

GENERAL FEATURES	
Counter type	Electromechanical
Digits	5 + 1 decimal
Nº of counters	1 (Total)
Class	1 (EN 62053)
Operating temperature	-20 to +60 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	2 modules (35 mm)
Terminals	Sealable
Connection	With screw
Max. wire section:	
Phase input terminals	24 mm²
Pulse and neutral terminals	12 mm²
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



THREE-PHASE - DIRECT INPUT - TCIDL1

GENERAL FEATURES

- 3 OR 4 WIRE UNBALANCED 3-PHASE
- ACCURACY CL.1 (EN 62053)
- DIRECT INPUT UP TO 80 A
- ENERGY CONSUMPTION LED
- CURRENT CHECKING LED
- 8 DIGITS ELECTRONIC COUNTER
- PULSE OUTPUT S0 (DIN 43864)
- 4 DIN MODULE

TECHNICAL SPECIFICATIONS

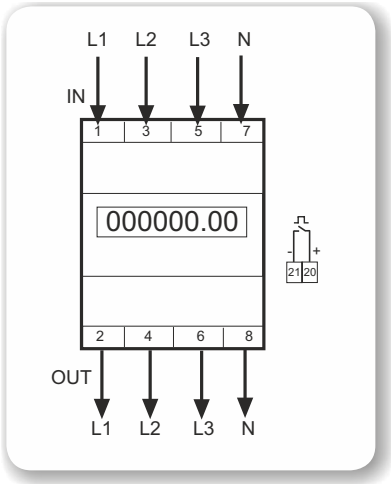
VOLTAGE INPUT	
Rated Voltage (Un)	3x230 (400) V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

CURRENT INPUT	
Current IB (IMAX)	10 (80) A
Burden	< 3 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	100 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	< 20 mA
Voltage	< 24 V D.C.
Pulse length	> 50 ms

GENERAL FEATURES	
Counter type	LED Display
Digits	6 + 2 decimals
Nº of counters	1 (Total)
Class	1 (EN 62053)
Operating temperature	-20 to +55 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	4 modules (70 mm)
Terminals	Sealable
Connection	With screw
Max. wire section:	
Phase input terminals	25 mm^2
Pulse and neutral terminals	2,5 mm^2
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



Energy

THREE-PHASE - INDIRECT INPUT - TCIL1

GENERAL FEATURES

- 3 OR 4 WIRE UNBALANCED 3-PHASE
- ACCURACY CL.1 (EN 62053)
- PROGRAMMABLE INDIRECT INPUT (X/5 A)
- ENERGY CONSUMPTION LED
- CURRENT CHECKING LED
- 8 DIGITS ELECTRONIC COUNTER
- PULSE OUTPUT S0 (DIN 43864)
- 4 DIN MODULE

TECHNICAL SPECIFICATIONS

VOLTAGE INPUT	
Rated Voltage (Un)	3x230 (400) V A.C.
Burden	< 8 VA, 2 W
Operating range	± 15 % Un
Frequency	50 - 60 Hz

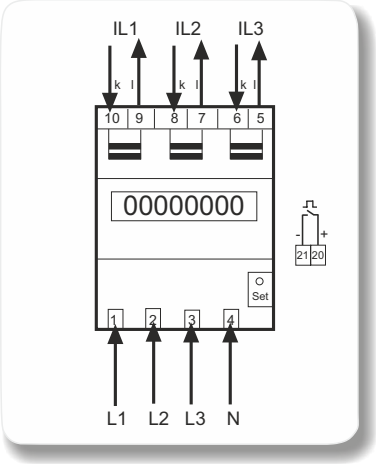
CURRENT INPUT	
Current IB (IMAX)	1,5 (6) A
Burden	< 0,1 VA
Operating range	0-100 % IMAX
Starting current (In)	< 0,4 % IB

SELECTABLE PRIMARY CURRENT
5, 10, 15, 25, 30, 40, 50, 60, 75, 80, 100, 120
150, 200, 250, 300, 400, 500, 600, 750, 1000, 1200, 1500
1600, 2000, 2500, 3000, 4000, 5000 or 6000 /5

PULSE OUTPUT (OPTOCOUPLER)	
Number of outputs	1
Pulse weight	100 pulses / kWh
Type S0 (DIN 43864)	Optocoupler
Insulation	3 kV, 1 min.
Maximum current	< 20 mA
Voltage	< 24 V D.C.
Pulse length	> 50 ms

GENERAL FEATURES	
Counter type	LED Display
Digits	6 + 2 decimals
Nº of counters	1 (Total)
Class	1 (EN 62053)
Operating temperature	-20 to +55 ºC
Energy indicator	Flashing LED
Pulse weight	1000 pulses / kWh
Case material	ABS, UL94 V0
Dimensions	4 modules (70 mm)
Terminals	Sealable
Connection	With screw
Max. wire section:	
Phase input terminals	10 mm²
Pulse terminals	1,5 mm²
Voltage terminals	5 mm²
Mounting	35 mm DIN rail

CONNECTION DIAGRAM



THREE-PHASE - INDIRECT INPUT - TI96 - TIV96

GENERAL FEATURES

- **UNBALANCED 3-PHASE**
- **ACTIVE ENERGY OR ACTIVE ENERGY + REACTIVE ENERGY**
- **CL. 2 ACCURACY (EN 62053)**
- **SELECTABLE PRIMARY CURRENT**
- **INSULATED CURRENT (INTERNAL TRANSFORMERS)**
- **ENERGY CONSUMPTION LED**
- **7 DIGITS ELECTROMECHANICAL COUNTER**
- **PULSE OUTPUT (RELAY): S0 (DIN 43864)**
- **96 X 96 DIN DIMENSIONS**

ACTIVE ENERGY	MODEL
Three-phase, unbalanced, 3 wire	TI96-II
Three-phase, unbalanced, 4 wire	TI96-3
ACTIVE ENERGY + REACTIVE ENERGY	**MODEL**
Three-phase,unbalanced,3 wire	TIV96-II
Three-phase, unbalanced, 4 wire	TIV96-3

TECHNICAL SPECIFICATIONS

VOLTAGE INPUT	
Tensión nominal (Un)	110, 230,or 400 V C.A.
Burden	< 1 mA x U phase N
Operating range	20-120 % Un
Frequency	50 - 60 Hz

CURRENT INPUT

CURRENT INPUT	
Current IB (IMAX)	X/1 or X/5 A
Burden	< 0,2 VA
Operating range	0-100 % IMAX
Starting current (In)	1 % IB

VERSIONS

TYPE 1
PRIMARY CURRENT
5, 10, 25, 50, 75, 100, 125, 150, 200, 250...
300, 400, 500, 600, 800 or 1000 A
TYPE 2
PRIMARY CURRENT
300, 400, 500, 600, 750, 800, 1000, 1200, 1250...
1500, 1600, 2000, 2500, 3000, 4000 or 5000 A

PULSE OUTPUT RELAY

PULSE OUTPUT RELAY	
Number of outputs TI...	1
Number of outputs TIV...	2
Pulse weight version 1	1 pulse / kWh
Pulse weight version 2	1 pulse / 10 kWh
Relay contacts 250 V, 3 A	(24 V D.C, 3 A D.C)
Insulation	2 kV, 1 min.
Pulse length	> 100 ms
(optional)	> 300 ms

GENERAL FEATURES

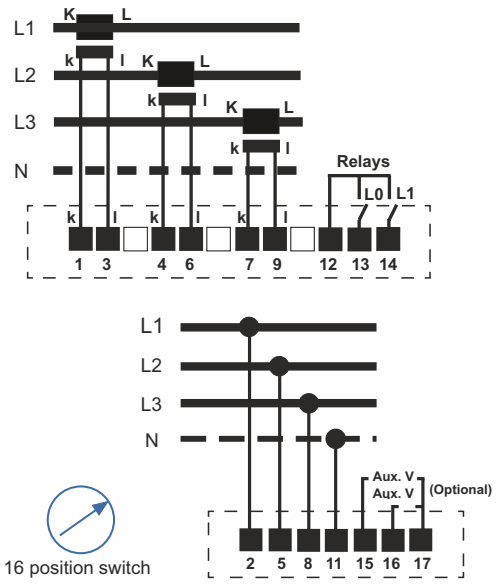
GENERAL FEATURES	
Accuracy	Class 2
(Optional)	Class 1
Operating temperature	-5 to +55 ºC
Energy indicator	Flashing LED
Pulse weight	16 pulses / kWh
Case material	Metálica+ABS, UL94 V0
Dimensions	DIN 96x96 mm
Connection	Current inputs, M4
Terminals	Pluggable
Max. wire section	2,5 mm^2

Energy

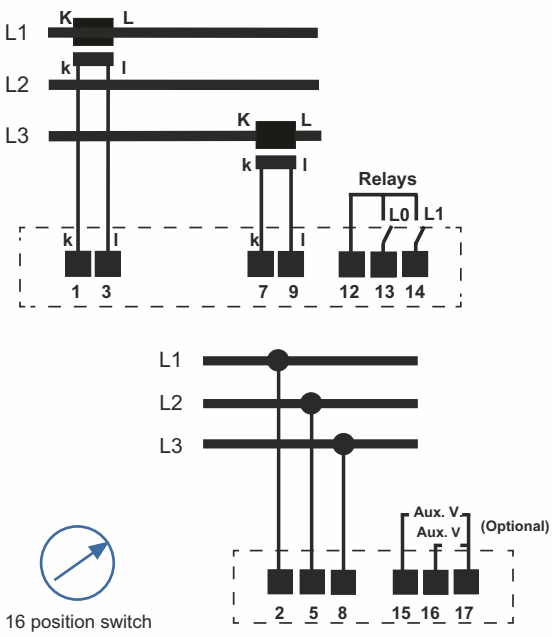
AUXILIARY VOLTAGE

AUXILIARY VOLTAGE	
Aux. V	110, 230, or 400 V AC.
Burden	2,8 VA
Operating range	80-120% Un

CONNECTION DIAGRAM

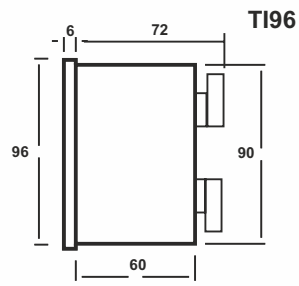


TI96-3 / TIV96-3 - Unbalanced three-phase, 4 wire



TI96-II / TIV96-II - Unbalanced three-phase, 3 wire

DIMENSIONS (mm)



TOTALIZER TERMINALS TTI /TTIM

TTI: Totalyzer module with microprocessor and seria output.
TTIM: Totalyzer module with microprocessor and serial output.
128 kB, LCD display and built-in keypad.

GENERAL FEATURES

- **8 IDEPENDENT PULSE COUNTERS**
- **INDEPENDENT COUNTER RESET**
- **PROGRAMMABLE COUNTER VALUE**
- **TTIM: 90 DAYS OF LOAD CURVE PER COUNTER**
- **RS485 SERIAL OUTPUT**
- **PROGRAMMABLE (ABLE TO MEASURE CLOSED CONTACT TIME IN SECONDS, TIME OR PULSES**

MODEL

TTI
Basic model
TTIM
Basic model
128 kB Circular memory, LCD Display
90 days of load curve

TECHNICAL SPECIFICATIONS

INPUT	
Number of outputs	8
Pulse length	> 100 ms
Time between pulses	> 100 ms
Max. Voltage	12 V
Max. Current	10 mA
Insulation by optocoupler	2,5 kV, 1 min

CONTACTS OUTPUT	
Number of outputs	1
Type	RS485
Connection	2 or 4 wires
Baud rate (standard)	9600 Bauds
Communication protocol	MODBUS
Max. Nº of instruments per line	32
Max. length of system per line	1250 m

AUXILIARY VOLTAGE

AUXILIARY VOLTAGE	
Aux. V.	100, 110, 230 or 400 V C.A
Burden	4 VA
Operating range	80-120% Un

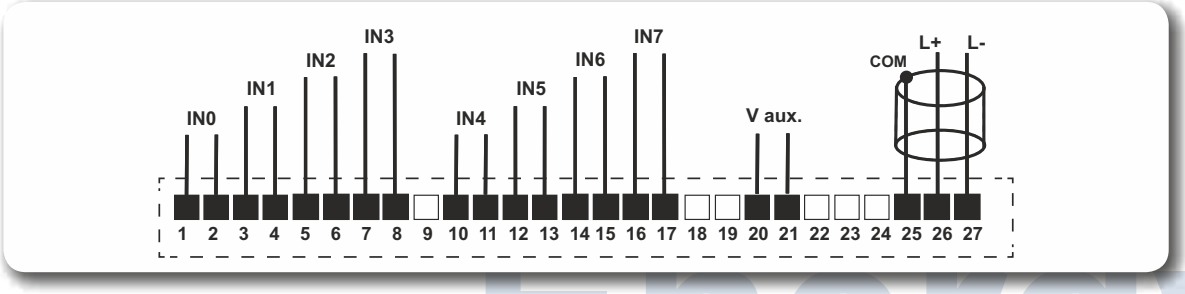
GENERAL FEATURES

GENERAL FEATURES	
Case material	ABS, UL94 V0
Dimensions	(9 modules) 155 x90
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,40 kg
Operating temperature	-5 to +55 ºC
Electrical safety (EN 61010)	Class 2, Category 3

ACCESSORIES

ACCESSORIES
RS232/RS485 Converters
RS485 Amplifiers

CONNECTION DIAGRAM



Energy

SOFTWARE - TTIgest

SACI has developed the TTIgest to optimize and check water, gas, electricity, consumption etc., in applications such as hotels, harbours, rented offices, etc. The system is compatible with our 'TTI - TTIM' totalizers and 'MAR' power analyzers.

It is designed to manage power consumption by these meters and to issue the corresponding bills. It is not an accounting or billing system. It is a program which checks meters and issues bills.

First all required data is defined to issue these bills. Then the physical elements comprising the instrument network are configured, such as the meters and totalizers.

Its operation is very simple. An 'Input customer' button associates the required meters to customer use. They take the meter's values and store them. Another button, 'Customer Output' reads the associated meters again, calculates power consumption and issues a bill with the relevant charges. The self billing option may be chosen for each time period.

The totalizers with memory (TTIM) can create load curves, examining the data numerically or as a graph as well as printing and exporting it.

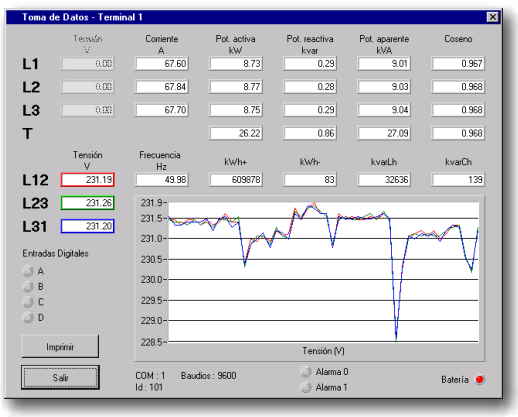
The new version includes all unchecked consumption histories for all meters (using header meters) plus the assigned and non assigned checked consumption.

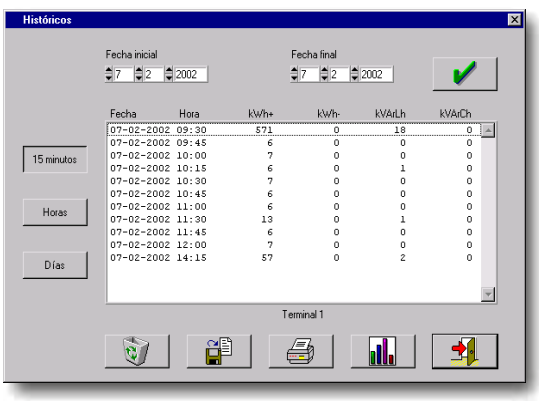
Innovations include the prepaid checking, allowing each meter's balance to be checked or allowing collective or individual contributions to be made. It also checks the free consumption limit and the minimum amount to be invoiced.

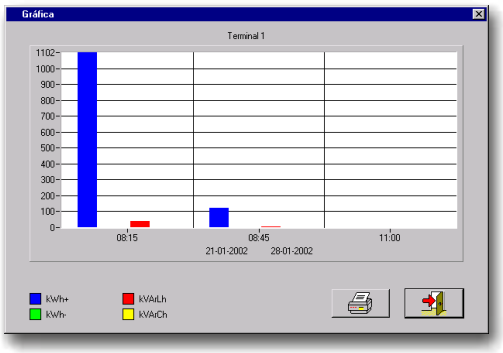
The TTIgest program must be installed on a PC with the following minimum requirements:

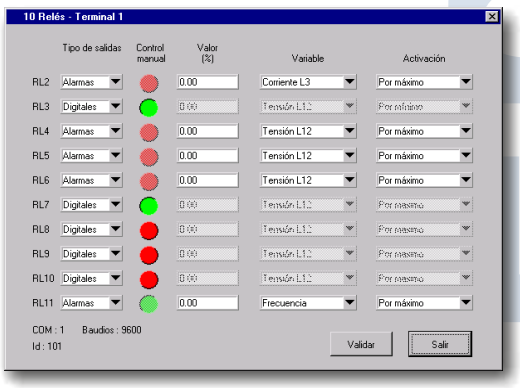
CPU: Pentium 200 MMX
RAM: 64 Mb
Screen: VGA with 1Mb
Monitor: Colour, 14''
Software: Windows 98, Me, NT4, 2000 or Xp
DOES NOT OPERATE WITH WIN95

It must also have a serial port for the RS-232 - RS485 (IFRxx) converter connection and a series port for the mouse. It must also have a parallel port for connecting the anti-copying device and a printer.
Microsoft Internet Explorer 4.x or above must be installed.









STARTING-UP

Start-up consists in identifying all the physical elements comprising the instrument system and the necessary data for issuing bills.

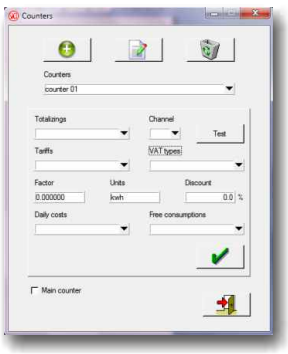
- **Definition:** Necessary elements are as follows:
- **Currency:** The currency appearing on the bills is defined.
- **VAT Types:** Different types of VAT may be defined.
- **Tariffs:** Also different tariffs may be set.
- **Daily costs:** Daily fixed contract costs may be associated to preset meters.
- **Free consumption:** Free consumption limits may be assigned to meters.
- **Bill:** All components on the bill are defined, including the automatic billing option.
- **Customer:** Option for accessing the customer data base.
- **Password:** To protect the operations to be carried out.
- **Setting:** Representing the physical elements comprising the system.
- **Modems:** Modem communication may be established.
- **Totalizers:** Identifies the totalizers (TTI or TTIM) on the system.
- **Meters:** All existing meters with their VAT identification, tariff, daily cost, free consumption, units, factor, etc. Header meters are also defined.
- **Groups:** Option for associating several meters in one group to manage them as one single element.
- **Reports:** To check the system's default settings, communications and bills.

Customer input

That is to say, when a customer enters to use the installation, he only has to be started as a customer, if not one already, and then he is shown which meter system or group to which he is to be assigned. Once this is done, the system reads the meters and stores the values. An innovation allows the use of histories to be used for inputs and the option for not issuing bills.

Customer Output

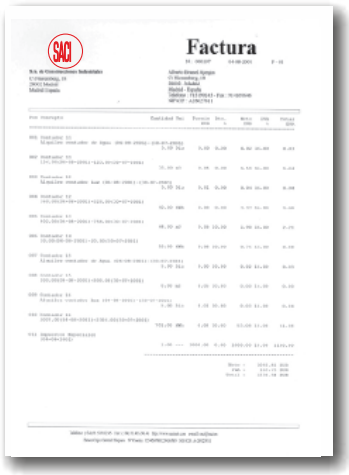
When a customer leaves the installation, the elements associated with that customer are selected and the meters are read. Consumption is calculated and the bill issued. Histories may also be used on departure. Customer departure may be previously set so that it is automatically carried out.



Bills

Allows the bills which are to be issued to be checked, deleted and printed. It is also possible to add independent items to a customer as required.

Stored bills may be displayed, cancelled, deleted and printed. Automatic manual billing is allowed.



Errors

The system detects all communication errors and manages them, allowing it to act as a system administrator.

Histories

This allows load data curves for meters connected to a totalizer with memory to be examined. Data may be printed and exported and a load curve graph displayed between the two selected dates.

This new version includes a load curve for all meters, uncontrolled consumption recordings and assigned and non assigned controlled consumption recordings.

Prepayment

Main innovation in this version. Manages the prepayment checking for customers and informs them to the balance on each in real time. It allows collective or individual payment including setting prepayment tariffs.

Header

SACI MAR - 3 instruments may located at the connection of the electrical installation to display all electrical parameters in the system and, using the software, save and show as a graph energy histories for 15 minute periods, by hours and by days. It also displays instant values.

Tools

The language may be defined, the data base compressed, preset or manual copies made, old data deleted, ...

MULTIFUNCTION RECORDING METERS CTMRII And CTMRIID

For type 2, 3 and 4 customers

FUNCTIONAL DESCRIPTION

CTMRII and CTMRIID are static meters for 3-phase connection. They measure active and reactive energy with classes 1 and 2. respectively. Moreover, these meters include built-in recording functions for type 2, 3 and 4 customers.
They have a four line, twenty character display for data displaying, two buttons, one for bill closures and another for display management, LED diodes for checking active and reactive energy measurement, signal outputs using relays and pulse emission by solid state relays. They also have three communication interfaces, a UNE EN 62056-21 optical one, a RS232 electrical one and a RS232 or RS485 one. Communication protocol is UNE EN 61870-5-102, which can be adapted by the System Operator.

AVAILABLE INFORMATION

Additionally, the meter has the following information

- Phase voltage and line voltage
- Currents
- Active, reactive and apparent power, global and per phase phi cos
- Frequency
- Information about software updates
- Information about special actions (reset to zero, transformation ratio, and burden curve periods).
- Backup of the main values.

CONFIGURABLE PARAMETERS

Global:

- Date and time*
- Automatic or scheduled season change
- Date of winter/summer change
- Minimum time between bill closures
- Transformation ratio*
- Setting of communication ports and modem setting
- Description of measurement point (twenty character string)
- Programming identification (twenty five character string)
- Recording and measurement point address
- General access and only read password
- Outputs setting
- Turn on/off the closing button
- Private password for electronic sign

For each active or latent contract:
Latent contract is understood to mean one which will start operating on a preset date.

- Seasons: it defines the seasons into which the year is divided, the dif ferent types of days and time slots for those days*.
- Activation date of the latent contact.*
- Table of holidays.*
- Table of special days.*
- Contracted powers in each billing period.*
- Day of automatic billing closure (if applicable).*
- Preset bill closures (a date and time for a closure is set).

* Limitations according to legal metrology.

TECHNICAL CHARACTERISTICS

ELECTRICAL REFERENCE VALUES

Reference current Un:

Indirect	3 x 63,5 / 110 V
Semi-Indirect	3 x 230 / 400 V
Direct	3 x 230 / 400 V

Reference current In (Imax):

Indirect	0,05-5 (10) A
Semi-Indirect	0,05-5 (10) A
Direct	0,5-10 (80) A

Reference frequency: 50 Hz.

Over currents:

Indirect	20 Imax.0,5s.
Semi-Indirect	0,05-5 (10) 20 Imax.0,5
Direct	30 Imax half cycle

Over voltages: 2 Un 10 s.

ACCURACY

	UNE EN 50470	UNE EN 62053
CTMRII	B and C	0,5S & 1(Active);1*& 2 (Reactive)
CTMRDII	B	1 (Active); 2 (Reactive)

* Extrapolated from class 2.

Starting current on active:

Indirect	10 mA
Semi-Indirect	10 mA
Direct	40 mA

Clock accuracy: 0,5 s/day between 20 and 26 ºC
Variation of clock accuracy with temperature: < 0,1s/ºC/24h.

Check contant:

CTMRII Indirect	20.000 Imp/kWh
	20.000 Imp/kvarh
CTMRII Semi-Indirect	5.000 Imp/kWh
	5.000 Imp/kvarh
CTMRDII Direct	500 Imp/kWh
	500 Imp/kvarh

CASING

Dimensions: According to DIN 43857
Weight: Indirect, Semi-Indirect 1,9 Kg. Direct 2,4 Kg.

Mounting triangle: 230 mm between upper and lower points and 150 between lower points.

Terminal box: Interchangeable
Protection class: II
Mechanical strength: 0,22 0,05Nm.
Shock: 30gn, 18ms.
Vibration: f<60Hz, 0,075mm. f>60Hz, 1g

Resistance to heat and fire: 960 ± 15 on terminal box, 650 ± 10 on terminal cover and casing for 301s.
Protection against water and dust penetration.: IP 51.
Dry heat: 70±2ºC, 72h.
Cold: -25±3ºC, 72h.
Humid heat: According to IEC-2-30, variant 1.

CLIMATE CONDITIONS

Temperature range:

Operation	-10 ºC to 55 ºC.
Operating limit	-20 ºC to 60 ºC.
Storage and transport	-25 ºC to 70 ºC.

ELECTRICAL REQUIREMENTS

Burden:
Voltage circuits: <2W and 3VA
Current circuits: <3x1VA
Un range:
Operation 0,9 to 1,1 Un.
Operation limit 0 to 1,15 Un.

Insulation:
Alternating voltage: 4kV , 50 Hz. 1 minute.
Pulse voltage: 6kV. 1.2/5s

ELECTROMAGNETIC COMPATIBILITY

Electrostatic discharges:
Severity level: 4, 10 discharges of 8kV
Immunity to HF electromagnetic fields: 10 V/m from 80 to 1000MHz. Severity level 3.

Insulation against rapid transient bursts: 2 kV and 4 kV

Radio-interference measurement: between 0,15 and 300 MHz. 4, 10 discharges of 8 KV

Immunity to HF electromagnetic fields: 10 V/m from 80 to 1000MHz. Severity level 3.

Insulation against rapid transient bursts: 2 kV and 4 kV

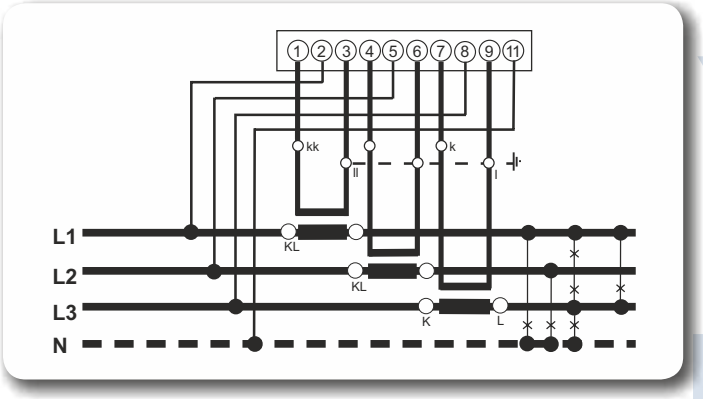
Radio-interferences measurement: between 0,15 and 300 MHz.

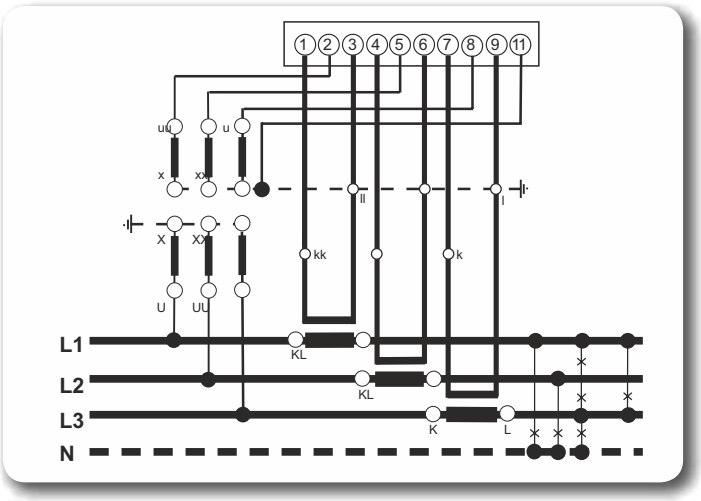
GENERAL FEATURES

Display: 4x20 LCD alphanumeric characters
Communication:
Protocol: published by System Operator
Optical: According to UNE EN 61107, programmable baud rate up to 9600 bauds, parity programmable.
Local port: RS232 direct or via modem, programmable, speed up to 115200 bauds, parity programmable.
Operating reserve: 10 years.
Buttons: 1 sealable for manual reset to zero
1 for display management.
Battery: polarized housing for easy change over

CONNECTION DIAGRAM

CTMRII - SEMI-INDIRECT
Three-phase, 4 wire, low voltage



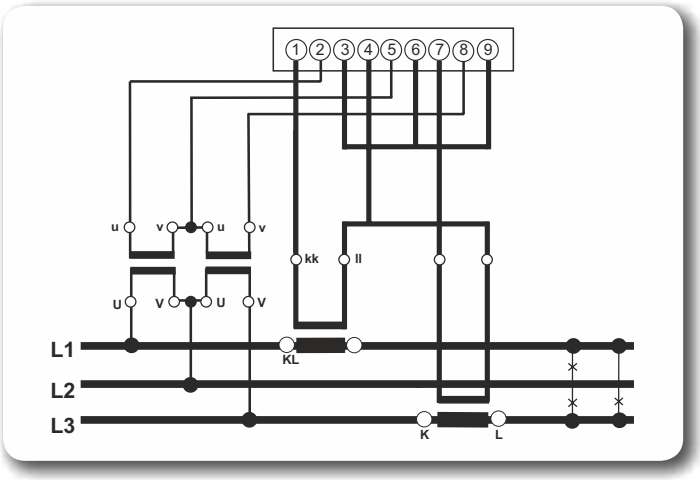


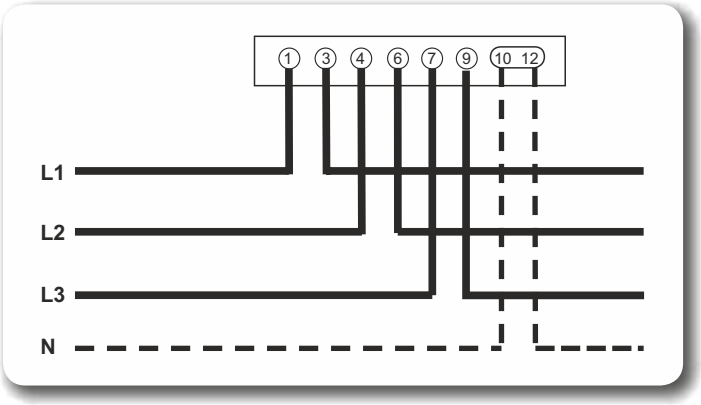
CONNECTION DIAGRAM

CTMRII - INDIRECT
Three-phase, 4 wire, med voltage

CONNECTION DIAGRAM

CTMRII - INDIRECT
Three-phase, 3 wire, med voltage

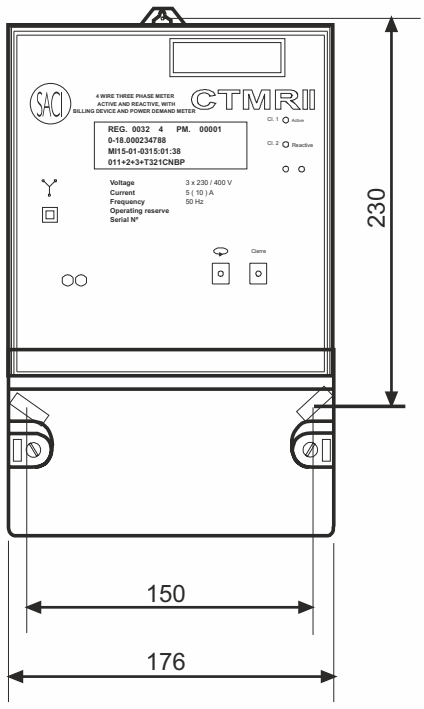


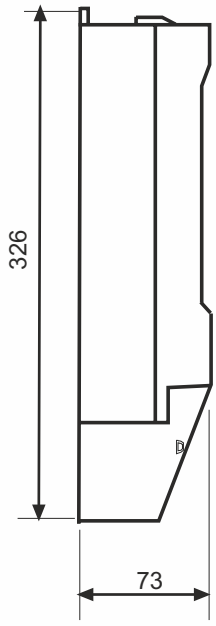


CONNECTION DIAGRAM

CTMRDII - DIRECT
Three-phase, 4 wire, low voltage

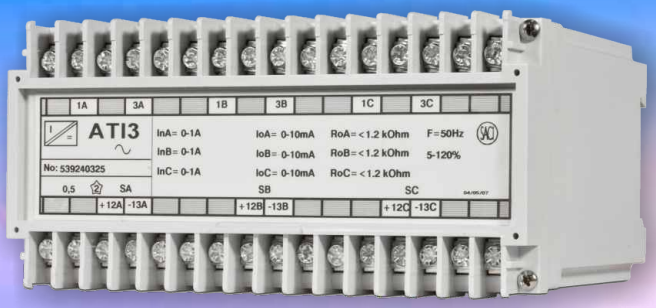
DIMENSIONS (mm)

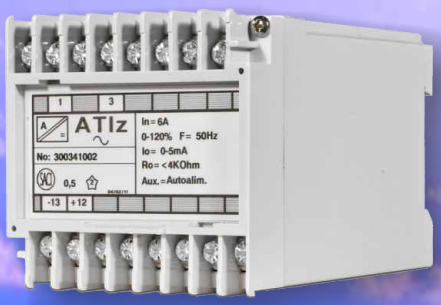




Energy

MEASURING TRANSDUCERS





MEASURING TRANSDUCERS

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

PROGRAMMABLE MEASURING TRANSDUCER

A measuring Transducer is a device which transforms the value of any physical magnitude in D.C. Signal (current or voltage, standardized)

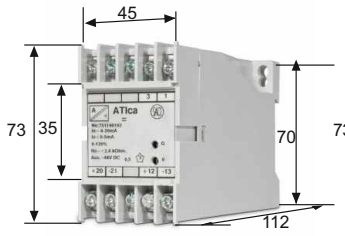
GENERAL FEATURES

All electrical parameters.
Direct current.
Alternating current.
Temperature (ºC).
Resistance.

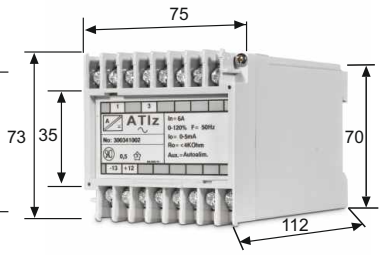
DIN casings: AT Serie
DIN RAIL casings: AM Serie

DIMENSIONS

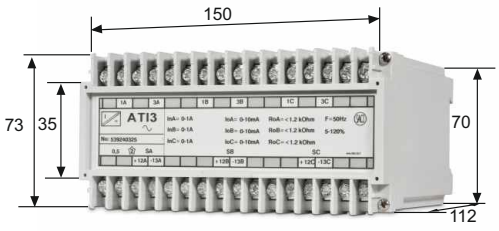
AT-0



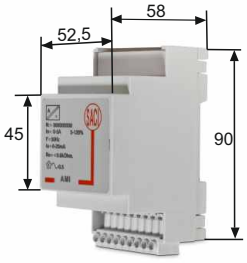
AT-1



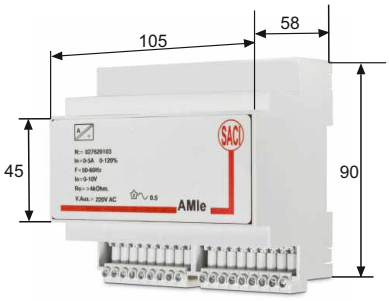
AT-2



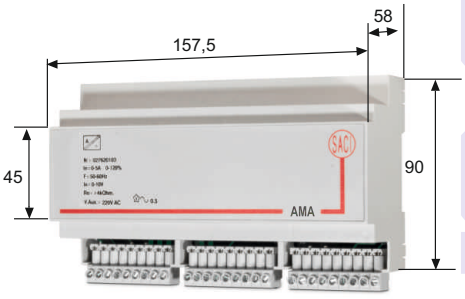
AM- 1 (3 MODULES)



AM- 2 (6 MODULES)



AM- 3 (9 MODULES)



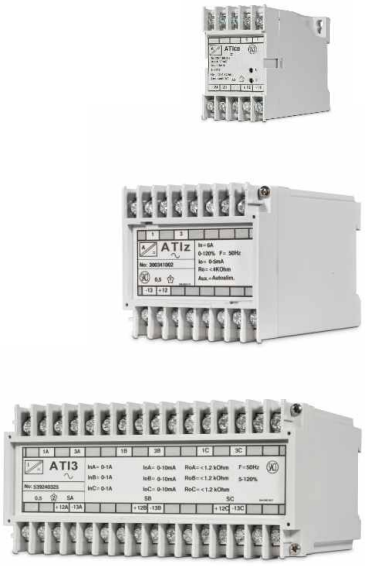
STANDARDS

EN 60688	Electrical measuring transducers.
IEC 255	Insulation test.
EN 60068	Environment and vibration test.
EN 60801	Electromagnetic compatibility.
IEC 1000	Electromagnetic compatibility.
EN 61010	Safety requirements.
EN 61036	Static meters for active energy, classes 1 and 2.
EN 61268	Static meters for reactive energy, classes 2 and 3.
EN 60529	Casing protection class (IP Code).
EN 50081	Electromagnetic compatibility - Emission.
EN 50082	Electromagnetic compatibility - Immunity.
DIN 43864	Pulse interface.
UL 94	Flammability test.
IEC 38	Standard voltage and current values.
IEC 664	Insulation coordination.

GENERAL TECHNICAL SPECIFICATIONS

Insulation	3,7 kV, 50 Hz, 1 min. Double insulation Installation category III Pollution degree 2		
Impulse voltage strength	5 kV, 1,2/50 µs.		
High frequency disturbances (HF)	2,5 kV, 1 MHz.		
Overloads			
	Current input	**Serie AT**	**Serie AM**
		2 In continuously	2 In continuously
		20 In, 3 s.	20 In, 1 s.
		40 In, 1 s.	-
		30 In 3 s. (on request)	-
		60 In 1 s. (on request)	-
	Voltage input	1.2 Vn continuously 2 Vn, 10 s.	1.2 Vn continuously 2 Vn, 10 s.
Accuracy	0,5 – 0,2		
Reference temperature	23 ºC ±1 ºC		
Temperature coefficient	≤0.003 % / C		
Operating temperature	-10 ºC a +55 C		
Storage temperature	-30 ºC a +70 C		
Linearity error	≤0,1 %		
Ripple (peak to peak)	≤0,3 %		
Response time	≤200 ms (0-90 %Io).		
Operating frequency	50, 60 and 400 Hz		
Variation with frequency			
50-60 Hz	A,W not affected		
50-60 Hz	V not affected		
50-60 Hz	V 0,1 %/Hz		
50-60 Hz	Var, cos ϕ 1 %/Hz		

AM



AT

ORDERING INFORMATION

1.- Type of measuring transducer: AT…, or AM
For example: a) ATI
b) AMW

2.- Input range of the measuring parameter (A,V, Hz, W, Var, ϕ , Wh, Varh, Ω , ºC).
For example: a) 0-5 A
b) 45-55 Hz
c) 10 kW

3.- Current output or Voltage output (mA or V).
For example: a) 0-5 mA
b) 4-20 mA
c) 10 V

The two last data define the Transfer curves (see page MT21).

4.- Auxiliary voltage: AC or DC.(if it is required)

5.- Data

Measuring transducers for frequency:	Rated voltage.
Measuring transducers for active power:	Rated current and rated voltage between phases.
Measuring transducers for phase angle:	Rated current and rated voltage between phases.
Measuring transducers for energy:	Rated current and rated voltage between phases and number of output pulses per kWh.

INPUTS (*)

TYPE 1 -	Alternating current (A.C.)	
	In	**5 A or 1 A**
	Burden (per circuit)	0,2 VA
		1,5 VA (Self supplied)
TYPE 2 -	Alternating voltage (A.C.)	
	Vn	**100, 110, 115, 230, 400 or 440 V**
	Burden (per circuit)	(Vn 1mA) VA
		1,5 VA (Self supplied voltage and frequency transducers)
TYPE 3 -	Direct current (D.C.)	
	In	**100 µA ÷ 5 A**
	Burden (per circuit)	In 60 mV
TYPE 4 -	Direct voltage (D.C.)	
	Vn	**60 mV ÷ 440 V**
	Burden (per circuit)	Vn 1 mA
TYPE 5 -	Frequency (Hz)	
	Fn	**50, 60 or 400 Hz**

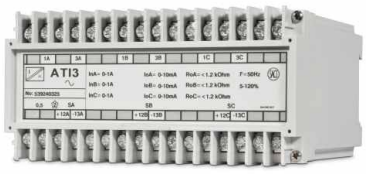
OUTPUTS (*)

TYPE 1 -	Current output (D.C.)	
	Io	**1, 5, 10 or 20 mA**
	Load resistance	Ro (kΩ) = 12 V / Io (mA)
	Saturation limit	2 Io
TYPE 2 -	Current output (D.C.)	
	Io (auxiliary voltage required)	**4-20 mA**
	Load resistance	Ro (kΩ) = 12 V / Io (mA)
	Saturation limit	2 Io
TYPE 3 -	Voltage output	
	Vo (auxiliary voltage required)	**1, 5 or 10 V**
		1-5 or 2-10 V
	Load resistance	Ro (kΩ) = Vo / 10 mA
	Saturation limit	2 Vo
	Max. open circuit voltage	30 V
TYPE 4 -	Pulse output	
	Type	Relay
		Normally open (NO)
		Voltage free
	Frequency	200 ÷ 6000 Imp./h
	Pulse lenght	200 ÷ 300 ms
	Voltage	250 V
	Maximum current	8 A

AUXILIARY VOLTAGES (*)

TYPE 1 -	A.C. auxiliary voltage	
	Aux. V	**115, 230, 400 or 440 V ±20 %**
	Burden	See model.
TYPE 2 -	DC. auxiliary voltage	
	Aux. V	**12, 24, 48, 110 or 220 V ±20 %**
	Burden	See model.

(*) Other technical specifications, on request



ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% In	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATI	1	1	-	AT-1	Self supplied	5-120%	A	Nr. 01	< 0,5%
AMI	1	1	-	AM-1	Self supplied	5-120%	A	Nr. 01	< 0,5%
ATIz	1	1	-	AT-1	Self supplied	0-120%	A	Nr. 01	< 0,5%
ATI3 (Triple)	1	1	-	AT-2	Self supplied	5-120%	A	Nr. 06	< 0,5%
ATIz3 (Triple)	1	1	-	AT-2	Self supplied	0-120%	A	Nr. 06	< 0,5%
ATIa	1	1-2-3	1-2	AT-1	1,5VA/1,5W	0-120%	A,B,G	Nr. 02	< 0,5%
AMIa	1	1-2-3	1-2	AM-2	1,5VA/1,5W	0-120%	A,B,G	Nr. 02	< 0,5%
ATIa3 (Triple)	1	1-2-3	1-2	AT-2	4,5VA/4,5W	0-120%	A,B,G	Nr. 03	< 0,5%
ATIe (RMS)	1	1-2-3	1-2	AT-2	2VA/2W	0-120%	A,B,G	Nr. 02	(**)
AMIe (RMS)	1	1-2-3	1-2	AM-2	2VA/2W	0-120%	A,B,G	Nr. 02	(**)

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

(**) Not affected by THD

ALTERNATING VOLTAGE

MODEL	Types (*)			Dimens.	Aux.Voltage	% Un	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATU	2	1	-	AT-1	Self supplied	40-120%	A	Nr. 05	< 0,5%
AMU	2	1	-	AM-1	Self supplied	40-120%	A	Nr. 05	< 0,5%
ATU3 (Triple)	2	1	-	AT-2	Self supplied	40-120%	A	Nr. 09	< 0,5%
ATUa	2	1-2-3	1-2	AT-1	1,5VA/1,5W	0-120%	A	Nr. 04	< 0,5%
AMUa	2	1-2-3	1-2	AM-2	1,5VA/1,5W.	0-120%	A	Nr. 04	< 0,5%
ATUa3 (Triple)	2	1-2-3	1-2	AT-2	4,5VA/4,5W	0-120%	A,B,G	Nr. 12	< 0,5%
ATUe (RMS)	2	1-2-3	1-2	AT-2	2VA/2W	0-120%	A,B,G	Nr. 04	(**)
AMUe (RMS)	2	1-2-3	1-2	AM-2	2VA/2W	0-120%	A,B,G	Nr. 04	(**)
ATUVn	2	1	-	AT-1	Self supplied	0±120%	A,B,G	Nr. 05	<0,5%

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

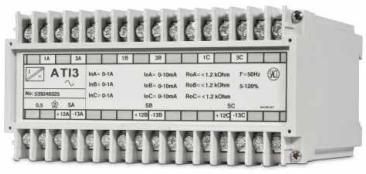
(**) Not affected by THD

FREQUENCY

MODEL	Types (*)			Dimens.	Aux.Voltage	% Vn	% Fn	Transfer. (I/O)	Diagram	THD In
	I	O	Aux							
ATF	2-5	1-2-3	-	AT-1	Self supplied	80-120%	90-110%	G,H	Nr. 05	< 20%
AMF	2-5	1-2-3	-	AM-1	Self supplied	80-120%	90-110%	G,H	Nr. 05	< 20%
ATFa	2-5	1-2-3	1-2	AT-1	3VA/3W	10-120%	10-120%	A,G,H	Nr. 04	(**)
AMFa	2-5	1-2-3	1	AM-1	3VA/3W	10-120%	10-120%	A,G,H	Nr. 04	(**)

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

(**) Not affected by THD



ACTIVE POWER

SINGLE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATW	1-2	1-2-3	1-2	AT-2	3VA/3W	0-144%	A, B, C, D, E, F	Nr. 07	< 20%
AMW	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 07	< 20%

BALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWI - 3 Wire	1-2	1-2-3	1-2	AT-2	3VA/3W	0-144%	A, B, C, D, E, F	Nr. 17	< 20%
AMWI - 3 Wire	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 17	< 20%
ATWIn - 4 Wire	1-2	1-2-3	1-2	AT-2	3VA/3W	0-144%	A, B, C, D, E, F	Nr. 14	< 20%
AMWIn - 4 Wire	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 14	< 20%

UNBALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWII - 3 Wire	1-2	1-2-3	1-2	AT-2	3,5VA/3,5W	0-144%	A, B, C, D, E, F	Nr. 18	< 20%
AMWII - 3 Wire	1-2	1-2-3	1	AM-3	3,5VA/3,5W	0-144%		Nr. 18	< 20%
ATW3 - 4 Wire	1-2	1-2-3	1-2	AT-2	3,5VA/3,5W	0-144%	A, B, C, D, E, F	Nr. 15	< 20%
AMW3 - 4 Wire	1-2	1-2-3	1	AM-3	3,5VA/3,5W	0-144%		Nr. 15	< 20%

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

REACTIVE POWER

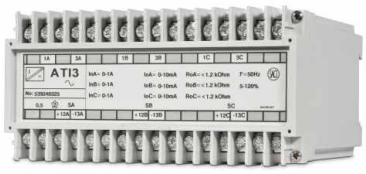
SINGLE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWr	1-2	1-2-3	1-2	AT-2	3VA/3W	0-144%	A, B, C, D, E, F	Nr. 07	< 0,5%
AMWr	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 07	< 0,5%

BALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWIr - 3 Wire	1-2	1-2-3	1-2	AT-2	3VA/3W	0-144%	A, B, C, D, E, F	Nr. 17	< 0,5%
AMWIr - 3 Wire	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 17	< 0,5%
ATWInr - 4 Wire	1-2	1-2-3	1-2	AT-2	VA/3W	0-144%	A, B, C, D, E, F	Nr. 14	< 0,5%
AMWInr - 4 Wire	1-2	1-2-3	1	AM-3	3VA/3W	0-144%		Nr. 17	< 0,5%

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08



REACTIVE POWER

UNBALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWIIr - 3 Wire	1-2	1-2-3	1-2	AT-2	3,5VA/3,5W	0-144%	A, B, C, D, E, F	Nr. 18	< 0,5%
AMWIIr - 3 Wire	1-2	1-2-3	1	AM-3	3,5VA/3,5W	0-144%		Nr. 18	< 0,5%
ATW3r - 4 Wire	1-2	1-2-3	1-2	AT-2	3,5VA/3,5W	0-144%	A, B, C, D, E, F	Nr. 15	< 0,5%
AMW3r - 4 Wire	1-2	1-2-3	1	AM-3	3,5VA/3,5W	0-144%		Nr. 15	< 0,5%

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

COMBINED MEASURING TRANSDUCERS FOR ACTIVE AND REACTIVE POWER

Insulation between outputs, 5kV, 50 Hz, 1 min.

SINGLE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux (ª)						
ATWV	1-2	1-2-3	1-2	AT-2	4VA/4W	0-144%	A, B, C, D E, F	Nr. 08	Pn 20% Qn< 0,5%

(ª) No es posible 220V C.C

BALANCED THREE-PHASE, ALTERNATING CURRENT

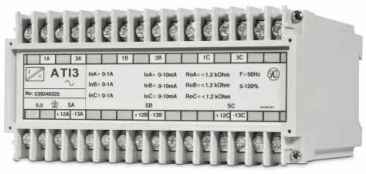
MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWVI - 3 Wire	1-2	1-2-3	1-2	AT-2	4VA/4W	0-144%	A, B, C, D E, F	Nr. 27	Pn 20% Qn< 0,5%
ATWIn - 4 Wire	1-2	1-2-3	1-2	AT-2	4VA/4W	0-144%	A, B, C, D E, F	Nr. 13	Pn 20% Qn< 0,5%

UNBALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Pn	Transfer. (I/O)	Diagram	THD Vn In
	I	O	Aux						
ATWVII - 3 Wire	1-2	1-2-3	1-2	AT-2	4VA/4W	0-144%	A, B, C, D E, F	Nr. 24	Pn 20% Qn< 0,5%
ATWV3 - 4 Wire	1-2	1-2-3	1	AT-2	4VA/4W	0-144%	A, B, C, D E, F	Nr. 21	Pn 20% Qn< 0,5%

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

COMBINED MEASURING TRANSDUCERS FOR POWER + ENERGY
See PROGRAMMABLE MEASURING TRANSDUCER, Cp2000 MODEL



DIRECT CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% In	Transfer. (I/O)	Diagram
	I	O	Aux					
ATIca	3	1-2-3	1-2	AT-1	4VA/4W	0-120%	A, B, C, D, E, F	Nr. 11
ATIca (a)	3	1-2-3	2	AT-0	4VA/4W	0-120%		Nr. 11

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

DIRECT VOLTAGE

MODEL	Types (*)			Dimens.	Aux.Voltage	% Vn	Transfer. (I/O)	Diagram
	I	O	Aux					
ATUca	4	1-2-3	1-2	AT-1	4VA/4W	0-120%	A, B, C, D, E, F	Nr. 10
ATUca (a)	4	1-2-3	2	AT-0	4VA/4W	0-120%		Nr. 10

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

PHASE ANGLE

SINGLE PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Φ	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATA	1-2	1-2-3	1-2	AT-2	3VA/3W	-60-0-60	C, D, F	Nr. 07	< 20%
AMA	1-2	1-2-3	1	AM-3	3VA/3W	-90-0-90		Nr. 07	< 20%

BALANCED THREE-PHASE, ALTERNATING CURRENT

MODEL	Types (*)			Dimens.	Aux.Voltage	% Φ	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATAI	1-2	1-2-3	1-2	AT-2	3VA/3W	-60-0-60	C, D, F	Nr. 22	< 20%
AMAI	1-2	1-2-3	1	AM-3	3VA/3W	-90-0-90		Nr. 22	< 20%

PHASE ANGLE BETWEEN VOLTAGE

MODEL	Types (*)			Dimens.	Aux.Voltage	% Φ	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATAU	2	1-2-3	1	AT-2	3VA/3W	-180-0-180	C, D, F	Nr. 23	< 20%

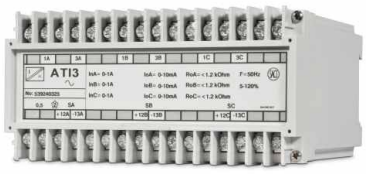
(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

ALTERNATING CURRENT. BIDIRECTIONAL CURRENT (R.M.S)

MODEL	Types (*)			Dimens.	Aux.Voltage	% In	Transfer. (I/O)	Diagram	THD In
	I	O	Aux						
ATIB Single-phase	1-2	1-2-3	1-2	AT-2	3VA/3W	0-120%	C, D, F	Nr. 07	(**)
ATIBI Balanced three-phase	1-2	1-2-3	1	AT-2	3VA/3W	0-120%		Nr. 17	(**)

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

(**) Not affected by THD



RESISTANCE (0-100; 0-3000Ω)

MODEL	Types (*)			Dimens.	Aux.Voltage	% Rn	Transfer. (I/O)	Diagram
	I	O	Aux					
ATS2	100%	1-2-3	1-2	AT-1	2VA/2W	0-100 %	A, B, G	Nr. 25

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

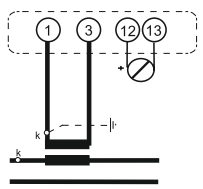
TEMPERATURE SENSOR PT100 (0-100; 0-600 ºC)

MODEL	Types (*)			Dimens.	Aux.Voltage	% Tn	Transfer. (I/O)	Diagram
	I	O	Aux					
ATS1	100%	1-2-3	1-2	AT-1	2VA/2W	0-100 %	A, B, D, F, G	Nr. 25

(*) I: Input; O: Output; Aux: Auxiliary voltage; Type: See page MT-08

CONNECTION DIAGRAMS

Nº 01



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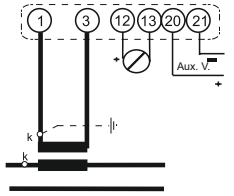

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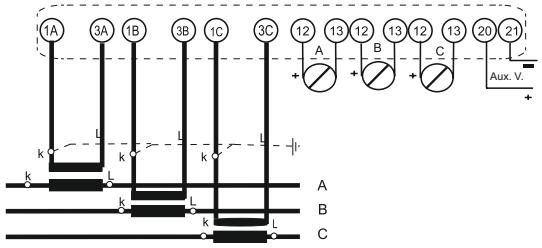

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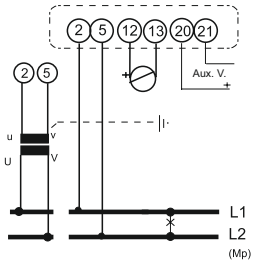

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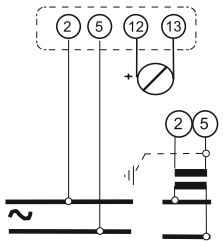

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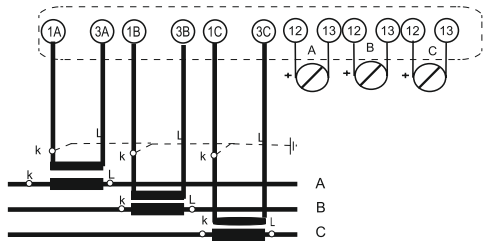

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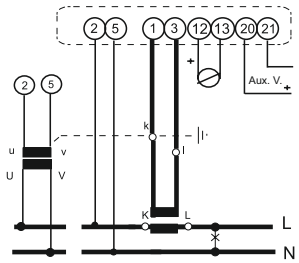

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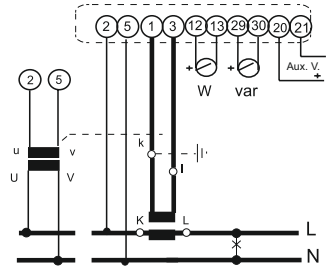

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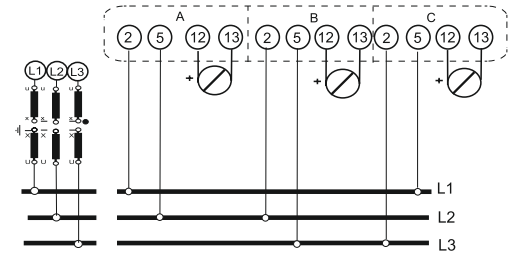

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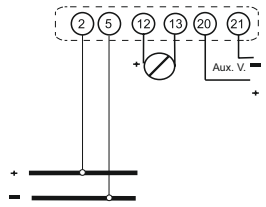

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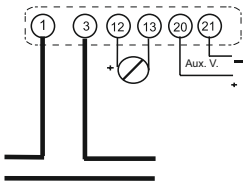

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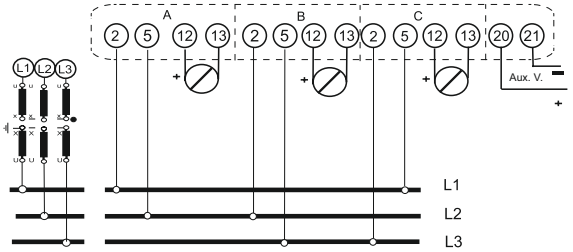

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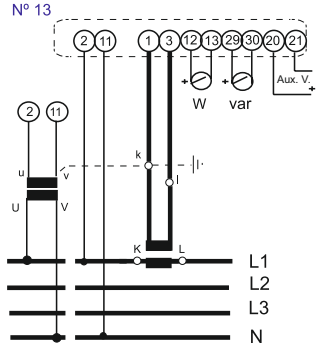

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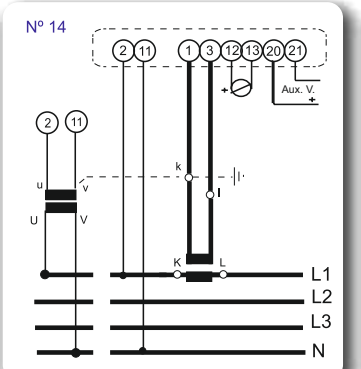

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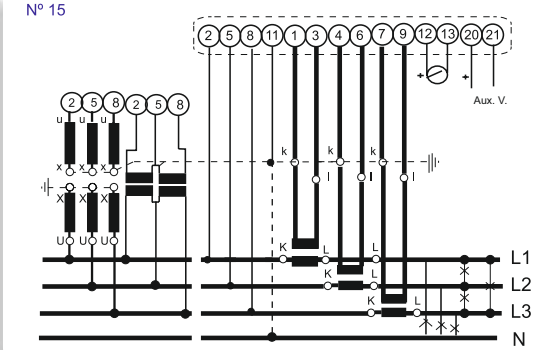
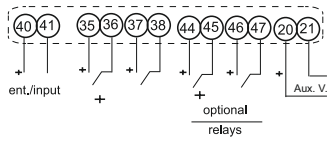


CONNECTION DIAGRAMS

Nº 16



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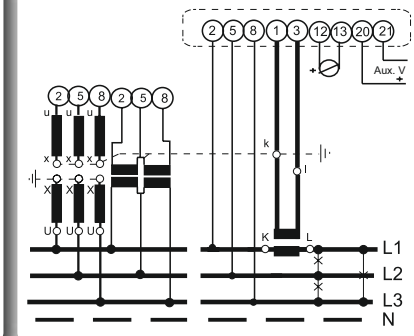

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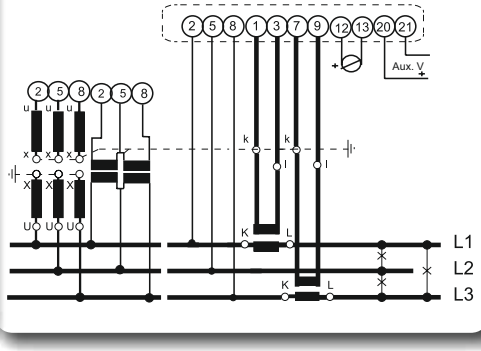

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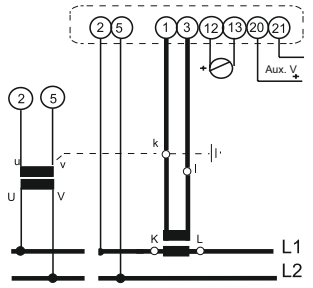

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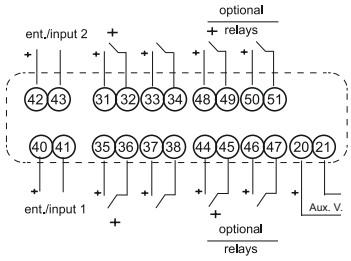

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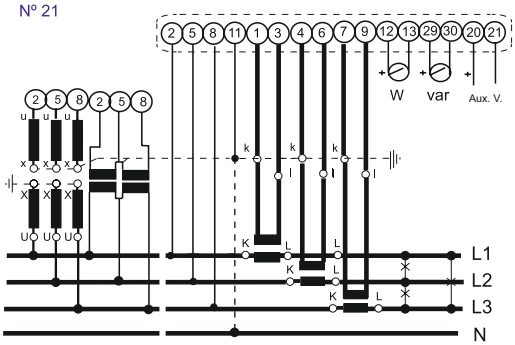

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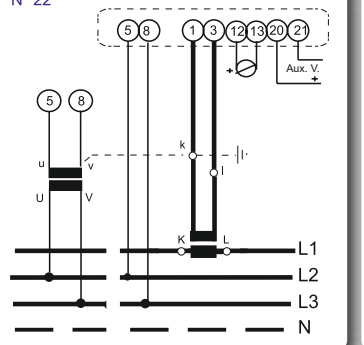

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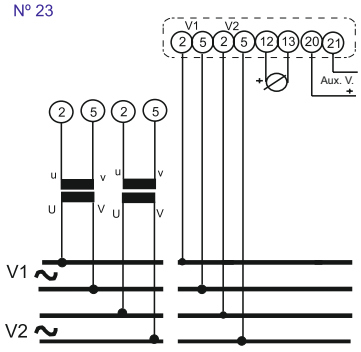

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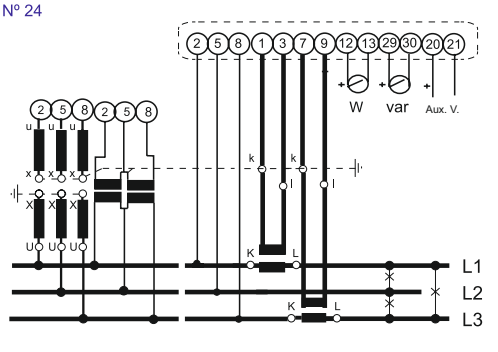

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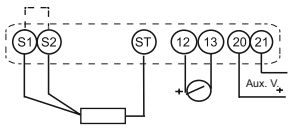
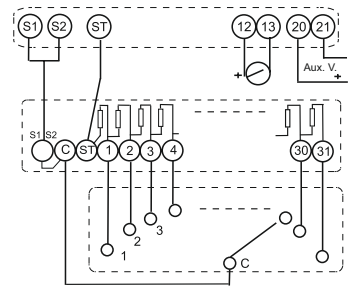


Nº26



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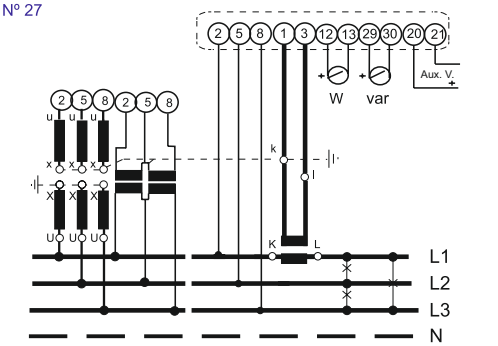


TRANSFORMER WITH BUILT-IN MEASURING TRANSDUCER

OUTPUT 0-20 mA

Without auxiliary voltage.
Class 1.
Operating range: 10-120%.
Maximum open circuit voltage: 30 V.
Frequency: 50-60 Hz.
Maimum load impedance: 600 Ω.
Response time: <200 ms.

TC_

	BUS-BAR TRANSFORMERS		
MODEL	TC40	TC60	TC80
Bus-Bar	40x10	60x10	80x30
Cable	Ø32	Ø51	Ø65
Accuracy Class	1	1	1
Ipn (A)	Output (mA)	Output (mA)	Output (mA)
50 - 400	0 - 20		
400 - 2000		0 - 20	
400 - 2500			0 - 20

OUTPUT 4-20 mA

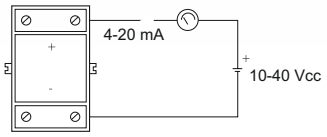
Auxiliary voltage: 10-40 V D.C.
Selectable primary current.
Class 1.
Operating range: 10-120%.
Frequency: 50-60 Hz.
Maximun load impedance 600 Ω.
Response time: <200 ms.

Selection of transformer ratio by switch.

TC_CV

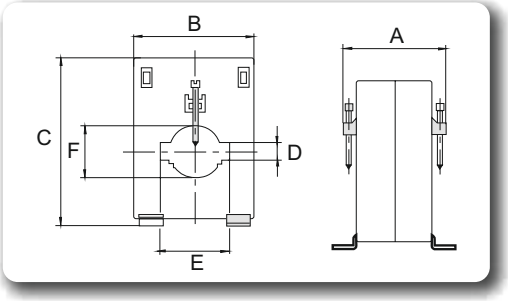
	BUS-BAR TRANSFORMERS		
MODEL	TC20CV	TC30CV	TC40CV
Bus-Bar	20x5	30x10	40x10
Cable	Ø16	Ø22	Ø30
Accuracy Class	1	1	1
Ipn (A)	Output (mA)	Output (mA)	Output (mA)
10; 12,5; 15 & 20	4-20		
20; 25; 30 & 40	4-20	4-20	
50; 60; 75 & 100	4-20	4-20	4-20
125; 150; 200 & 250	4-20	4-20	4-20
300; 400; 500 & 600		4-20	4-20

Connection diagram



TC_CV

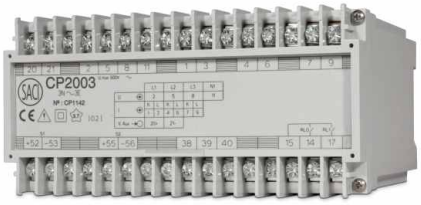
DIMENSIONS



	TC20CV	TC30CV	TC40CV	TC40	TC60	TC80
F	ø =16	ø =22	ø =30	ø =30	ø =51	ø =65
A	48,5	51,5	61	61	76	76
B	56	60	71	71	105	131
C	74	79	96	96	136,5	161,5
D	5,5	10,5	10,5	10,5	11	31
E	20,5	31	41	41	61	81

Dimensions in mm.

PROGRAMMABLE MEASURING TRANSDUCER
CP200_ - CP300_ - CP400_



- Measuring transducer controlled by a 16-bit microprocessor.
- Settable through software.
- Two, three or four analogue outputs.
- Two outputs with contacts (settable as energy pulses, alarm or programmable contacts).
- RS-232, RS-485 or RS-232 and RS-485 serial port.

MEASURING PARAMETER	
Line-to-neutral voltage	Sen φ per phase and total
Line-to-line voltage	Frequency
Current (true effective value)	Active energy +
Active power, per phase and total	Active energy -
Reactive power, per phase and total	Inductive reactive energy
Apparent power, per phase and total	Capacitive reactive energy
Cos φ per phase and total	THD Current and Voltage

ANALOGUE OUTPUTS

Selectable measuring parameter for each analogue output.
Programmable zero and full scale in the output range.
Rated values of full scale 1, 5 and 20 mA DC. and 1, 5 and 10 V DC., uni or bidirectional.
Insulation by optocoupler.

DIGITAL OUTPUTS

Two relay outputs (10 A, 30 V DC. / 250 V AC.).
Programmable as:
Active or reactive energy pulses.
- Maximum or minimum alarm signalling for any of the parameters measured.
- Output contacts (operated from the central unit).

SERIAL PORT

RS-232, RS-485 or RS-232 and RS-485, bidirectional:
- Reading only: Electrical parameters and data.
- Writing only; Program data, reset and activating of output contacts.

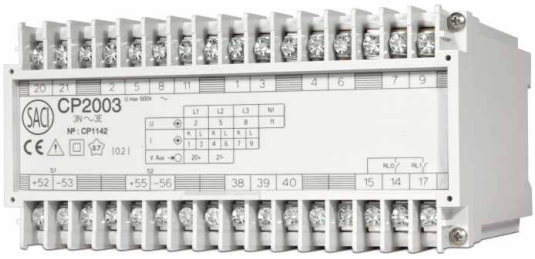
2 or 4 wire direct to the device.
MODBUS / JBUS communication protocol.
Insulation by optocoupler.

SETTING

Via serial port:
- Baud rate: default 9600 bauds.
  Address: 0-255.
- Primary current.
- Primary voltage.
  Analogue outputs: Measuring parameter, zero and full scale.
- Digital outputs, settable as:
  1.- Energy pulses:
  2.- Alarm: Measuring parameter, value and alarm mode (max. or min.).
  3.- Output contacts operated from the computer

TECHNICAL SPECIFICATIONS

ACCURACY 0,2



INPUTS	
Alternating current (A.C.)	5 A or 1 A(.../5 or.../1 A)
Measuring range	0-120 %
Alternating voltage (A.C.)	100, 110, 230, 400 or 440 V

ANALOGUE OUTPUTS (D.C)	
1, 5, 10, 20 or 4-20 mA	
1, 5, 10, 1-5 or 2-10 V	
Load impedance	Ro (kΩ) = 12 V / Io (mA) Max. Ro (kΩ) = Vo / 30 mA Min.
Saturation Limit	1,2 Io – 1,2 Vo

OTHER CHARACTERISTICS	
Digital outputs	2 Relays
Serial port	RS-232, RS-485 or both
Protocol	JBUS/MODBUS
Baud rate	Selectable 300 – 19200 Bauds
Operating frequency	50 and 60 Hz
Reference temperature	23 ºC ±1ºC

OTHER CHARACTERISTICS	
Temperature coefficient	2 Relays
Operating temperature	-10 ºC to +55 ºC
Linearity error	≤0,05
Ripple	≤0,1 %
Response time	≤200 ms (0-90 % Io)
Frequency coefficient	Not affected

MODELS

CP2000 – 2 Analogue outputs

	Network	Diagram
CP2000	SINGLE-PHASE	Nº 28
CP2001	BALANCED THREE-PHASE	Nº 29 or 30
CP2002	UNBALANCED THREE-PHASE, 3 WIRE	Nº 31
CP2003	UNBALANCED THREE-PHASE, 4 WIRE	Nº 32

Outputs: Nº.35

CP3000 – 3 Analogue outputs

	Network	Diagram
CP3000	SINGLE-PHASE	Nº 28
CP3001	BALANCED THREE-PHASE	Nº 29 or 30
CP3002	UNBALANCED THREE-PHASE, 3 WIRE	Nº 31
CP3003	UNBALANCED THREE-PHASE, 4 WIRE	Nº 32

Outputs: Nº.35

CP4000 – 4 Analogue outputs

	Network	Diagram
CP4000	SINGLE-PHASE	Nº 28
CP4001	BALANCED THREE-PHASE	Nº 29 or 30
CP4002	UNBALANCED THREE-PHASE, 3 WIRE	Nº 31
CP4003	UNBALANCED THREE-PHASE, 4 WIRE	Nº 32

Outputs: Nº.35

CP2000	
Auxiliary voltage UNIVERSAL A.C.- D.C	85...264 V C.A.
	90...300 V C.C.
Auxiliary voltage A.C.	110 or 230 V ±20%
Auxiliary voltage D.C.	18…72 V
Burden	4VA/4W
Energy measuring	Only in the digital outputs (relays)
Maximum open circuit voltage	30 V
THD harmonic distortion	Not included
Without insulation between serial port and analogue output S2	

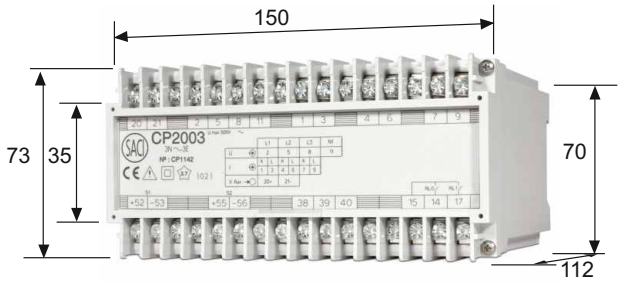
CP3000 - CP4000	
Auxiliary voltage UNIVERSAL A.C.- D.C	85...264 V C.A.
	90...300 V C.C.
Auxiliary voltage D.C.	18…72 V
Burden	5W (CP3000)
	6W (CP4000)
Energy measuring	Digital outputs (relays)
	Serial port (option)
Maximum open circuit voltage	15 V
Double line, CP3000 series	RS232-RS485 (optional)

OPTIONAL

Setting and reading software.
Management software - SACIGEST.

ORDERING INFORMATION

1.- Type of transducer.
For example: a) CP2001
b) CP3003
c) CP4002
2.- Secondary rated voltage and current.
3.- Auxiliary voltage.
4.- Analogue outputs, mA (1, 5, 20) or V (1, 5, 10).
5.- RS-232, RS-485 or RS-232 and RS-485 serial port.



DIMENSIONS CP2000 – CP3000 – CP4000

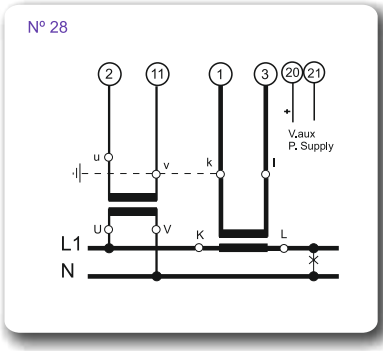
SETTING DATA

1.- Primary rated voltage and current.
2.- Analogue output range.
3.- Transfer curves (page MT.21).
4.- Digital outputs type: Energy pulses (incl. energy constant), alarm mode or free contacts.
5.- Serial port: Baud rate

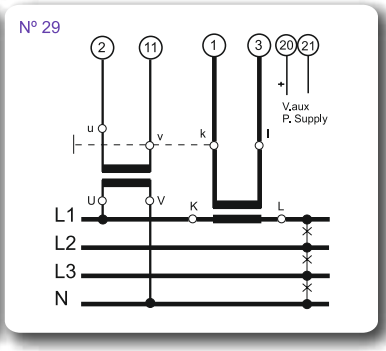
ACCESORIES

IFR1 RS485/232 Converter.
IFRA RS485/232 Converter with galvanic separation.
IFR4 4RS485/1RS232 Converter.
C01 RS232-DB9 power cable (2m).
C02 RS485-IFRA power cable (2m).
C03 IFRA-DB9(PC) power cable (2m).
SF2 WINDOWS-Programming software CP2000.
SF3 WINDOWS-Programming software CP3000.
SF4 WINDOWS-Programming software CP4000.

Nº 28



Nº 29



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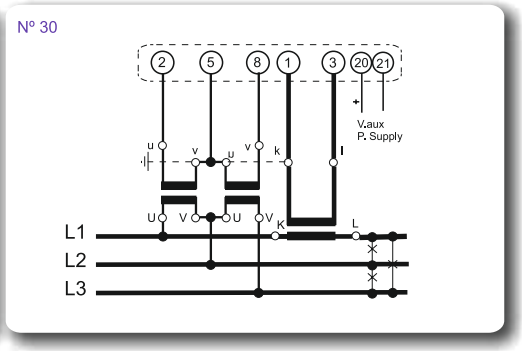

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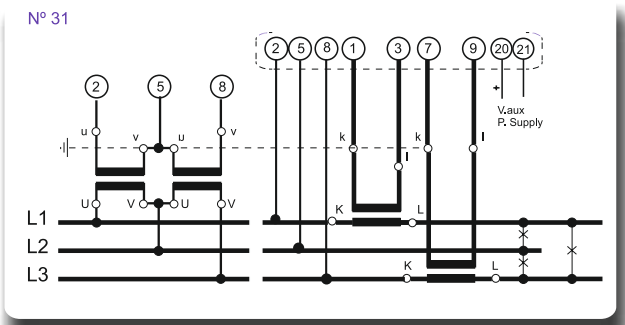

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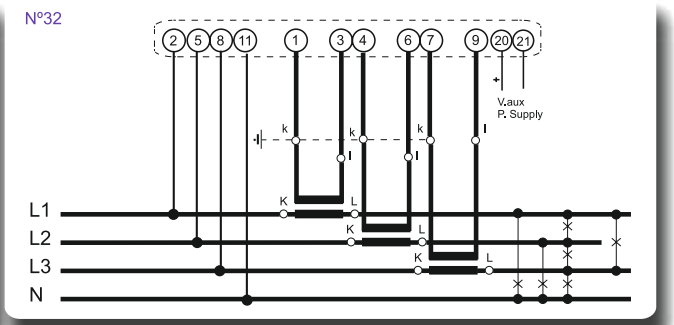
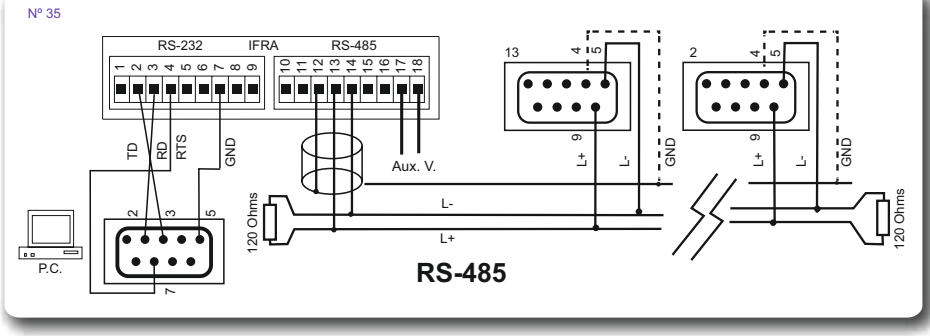
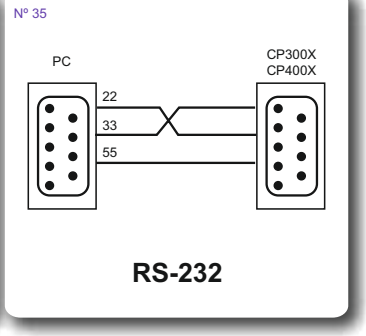


Nº 35	OUTPUT TERMINALS								
MODEL		CP2000		CP3000				CP4000	
RS232				YES				YES	
RS485		GND 38	L+ 39 L- 40	YES				YES	
DIGITAL OUTPUT	RLO	15-14		15-14				15-14	
	RL1	15-17		15-17				15-17	
ANALOGUE OUTPUT		+	-	+	V -		+ mA -	+	-
	S1	52	53	52	54	52	53	52	53
	S2	55	56	55	57	55	56	55	56
	S3			58	60	58	59	58	59
	S4							61	62

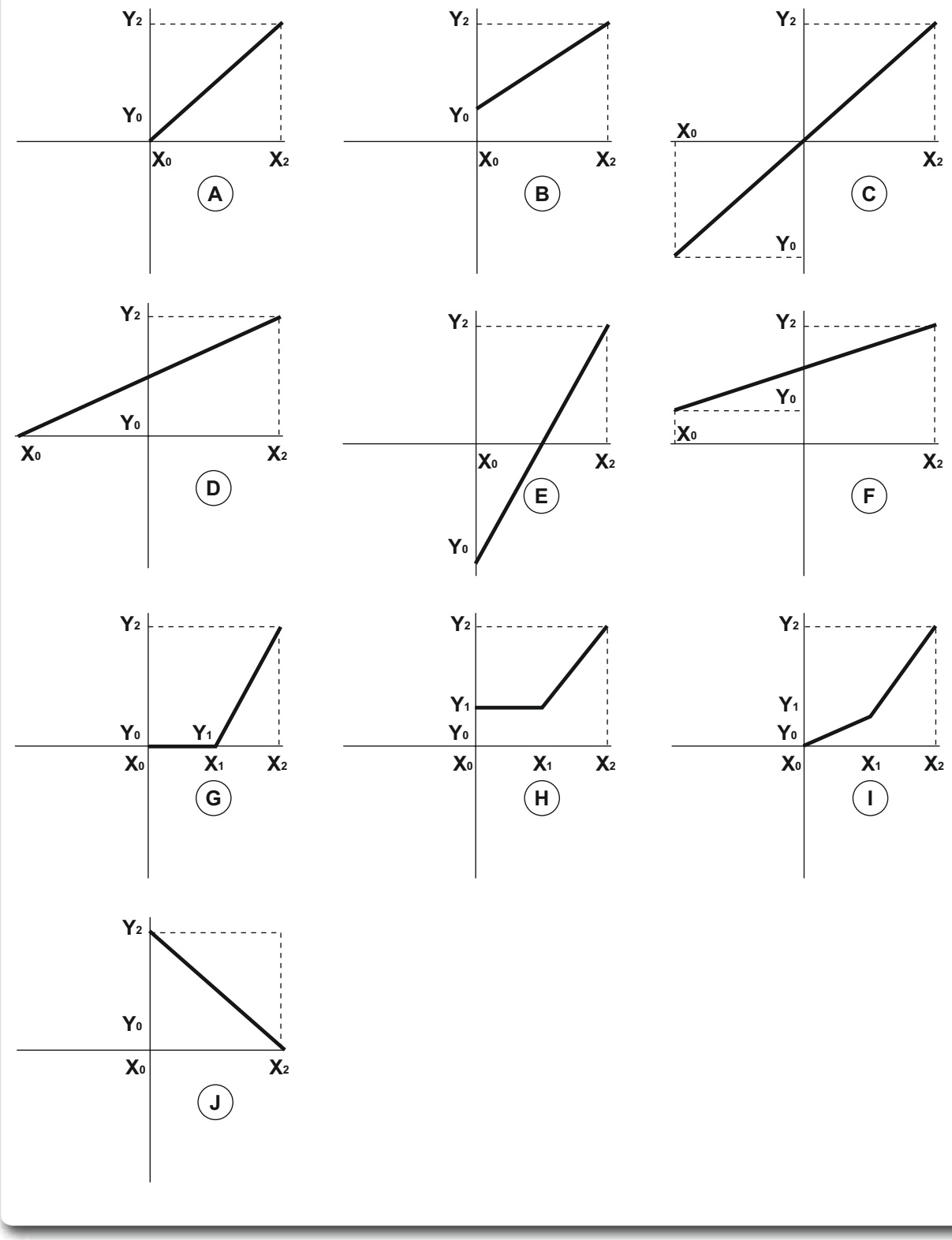
Nº 35



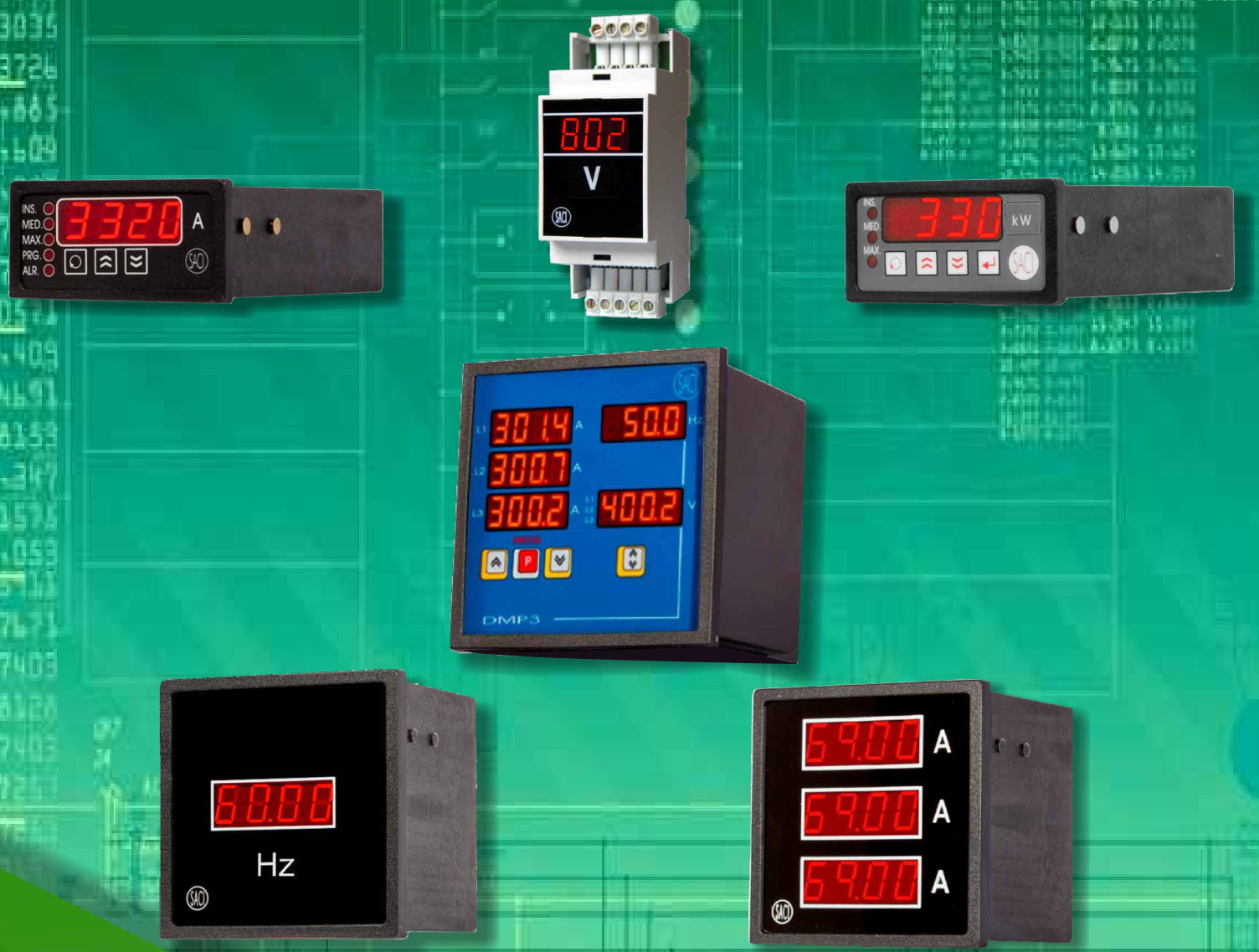
Nº 35



TRANSFER CURVES



DIGITAL INSTRUMENTS



DIGITAL INSTRUMENTS

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

GENERAL

- 3, 3½, 4 & 4½ Digits
- Direct Current (DC.)
- Alternating Current (AC.)
- Auxiliary power supply A.C.(110, 230 or 400 V)
- Auxiliary power supply D.C.(12, 24, 48,110 or 220 V)
- Universal auxiliary power supply AC. and DC. (45-275 V)

DIMENSIONS

48x24, 72x24, 96x24 mm
72x36, 96x48 mm
48x48, 72x72, 96x96 mm
Din Rail 2 modules

STANDARDS

EN 60051	Direct measuring equipment.
EN 60068	Environmental and vibration tests.
EN 60801	Electromagnetic compatibility.
EN 61010	Safety requirements for electrical equipment.
EN 60529	Casing protection class (IP Code).
EN 61000	Electromagnetic compatibility.
UL 94	Flammability test.
IEC 664	Insulation requirements.
IEC 255	Insulation test.

TECHNICAL SPECIFICATIONS

Test Voltage	2 kV, 50 Hz, 1 min.
Impulse voltage strength test	5 kV, 1,2/50 µs.
Admissible overloads	
- Current input	
Standard	1,2 In continuously
	2 In, 10 s.
Starting motors	2 In continuously
	5 In , 10 s.
- Voltage input	1,2 Vn continuously
	2 Vn, 10 s.
Measuring range	5-120% (4 digits)
	0-120% (3, 3½ and 4½ digits)
Reference Temperature	23 ºC ±1 ºC
Operating Temperature	-10 ºC to + 55 ºC
Storage Temperature	-30 ºC to + 70 ºC

(*) Other technical specifications on request.

THREE-PHASE PROGRAMMABLE DIGITAL MULTIMETER
4 DIGITS
DMP3

3 CURRENTS
3 VOLTAGE Phase-Phase
3 VOLTAGE Phase-Neutral
FREQUENCY
CURRENT and VOLTAGE INSULATED

The DMP3 is a multimeter designed to measure current, voltage and frequency in a three-phase network, through the connection to current transformers. A five line of displays allows to represent simultaneously the three currents, one voltage and frequency.

(*) PRIMARY NOMINAL CURRENT
1, 5, 10, 15, 20, 25, 30, 40, 50, 70, 75, 80, 90, 100, 120, 125, 150,160, 200, 250, 300, 400...
500, 600, 700, 750, 800, 900, 1000, 1200, 1250, 1400, 1500, 1600, 1750, 1800, 2000, 2200...
2250, 2400, 2500, 2750, 3000, 3500, 4000, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 9000 A

TECHNICAL FEATURES	
Voltage	Max. 300 V phase-neutral. Max. 500 V phase-phase.
Burden	<1 VA
Frequency	10-100 Hz
Current	x/5 A (programmable) (*)
Burden	< 0,5 VA
Accuracy	0,5% Full range + 2 digits
Aux. V	230 V A.C. ± 20%
Burden	< 5 VA
Dimensions	DIN 96x96 mm
Display updating	3 times / sec (approx.)
Weight	0,5 kg
Terminals	Pluggable for maximum wire section of 2,5 mm²

ENVIRONMENTAL CONDITIONS

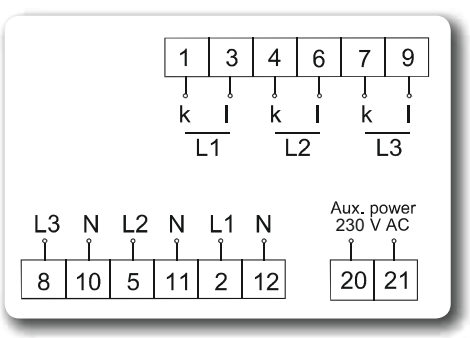
ENVIRONMENTAL CONDITIONS	
Storage	-25…70 ºC, 75% HR.
Operation	-20… 55 ºC, 85% HR.

OPERATION

Display mode.

The display is provide with 4 keys: P , UP , DOWN and SB. The three currents are shown in the three displays on the left side, frequency is shown in the upper right display and voltage in the lower right display.
Pressing SB key sequentially sets the voltage from, L1-L2-L3-L12-L23-L31.

CONNECTION DIAGRAM



PROGRAMMABLE/MULTIRRANGE
ALTERNATING CURRENT
Auxiliary voltage Supply: UNIVERSAL (45-275) or STANDARD A.C/D.C.
4 DIGITS

Display:	Red light, digit height 14,3 mm, high luminosity.
Max. Reading:	9999
Overrange:	HHHH
Accuracy:	0,5% of reading ± 1 Digit
Auxiliary Voltage:	UNIVERSAL (45-275 V) A.C./D.C.
	Burden A.C.< 4 VA D.C.< 2 W
Auxiliary Voltage:	UNIVERSAL (45-275 V) A.C./D.C.
	Burden C.A.< 4 VA; D.C.< 2 W
Standard Auxiliary Voltage:	A.C. 110, 230 or 400 V ± 20%
	Burden < 3 VA
	D.C 12, 24, 48, 110 or 220 V ± 20%
	Burden < 2 W
Temperature coefficient:	0,01% / ºC

PROGRAMMABLE AMMETERS

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH5EM** (48x48)	**DP46EM** (72x36)
	DH4EM (72x72)	**DP35EM** (96x48)
	DH3EM (96x96)	
PROGRAMMABLE RANGE		
Measuring range X/5 - X/1 A	1...9999 A Decimal point and display value selection using the front keys ▲ ▼	

PROGRAMMABLE VOLTMETERS

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH5EM** (48x48)	**DP46EM** (72x36)
	DH4EM (72x72)	**DP35EM** (96x48)
	DH3EM (96x96)	
PROGRAMMABLE RANGE		
Measuring range X/100 - X/110 V	1...9999 V or kV Decimal point and display value selection using the front keys ▲ ▼	

DIRECT INPUT VOLTMETERS

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH5EM** (48x48)	**DP46EM** (72x36)
	DH4EM (72x72)	**DP35EM** (96x48)
	DH3EM (96x96)	
DISPLAY		
Measuring range	500 V	

PROGRAMMABLE/MULTIRRANGE VOLTMETER-AMMETER
ALTERNATING CURRENT
Auxiliary voltage Supply: UNIVERSAL (45-275)
4 DIGITS

Display:	Red light, digit height 14,3 mm, high luminosity.
Max. Reading:	9999
Overrange:	HHHH
Accuracy:	0,5% of reading ± 1 Digit
Auxiliary Voltage:	UNIVERSAL (45-275 V) A.C./D.C.
	Burden A.C.< 4 VA D.C.< 2 W
Temperature coefficient:	0,01% / ºC

VOLTMETER-AMMETER

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH3B** (96x96)	**DP35B** (96x48)
	DH4B (72x72)	**DP46B** (72x36)
MEASURING RANGE	**DISPLAY**	
X/5 A X/1 A	Programmable 1...9999 A Decimal point and display value selection using the front keys ▲ ▼	
500 V	No programmable	

AMMETERS FOR STARTING MOTORS
ALTERNATING CURRENT
Auxiliary Voltage Supply: UNIVERSAL (45-275 V) or STANDARD A.C/D.C
4 DIGITS

Specially designed for installations where the startng current is several times the rated current.

Display:	Red light, digit height 14,3 mm, high luminosity. Models DH5EM, DP46EM, digit height 10,2 mm.
Max. Reading:	9999
Overrange indication:	HHHH
Accuracy:	0,5% of reading ± 1 Digit
Auxiliary Voltage:	UNIVERSAL (45-275 V) A.C./D.C. Burden C.A.< 4 VA; D.C.< 2 W
Standard Auxiliary Voltage:	A.C. 110, 230 or 400 V ± 20% Burden < 3 VA D.C 12, 24, 48, 110 or 220 V ± 20% Burden < 2 W
Temperature coefficient:	0,01% / ºC

PROGRAMMABLE AMMETERS

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH5EM** (48x48)	**DP46EM** (72x36)
	DH4EM (72x72)	**DP35EM** (96x48)
	DH3EM (96x96)	
PROGRAMMABLE RANGE		
Measuring range X/5 - X/1 A	1...9999 A Decimal point and display value selection using the front keys ▲ ▼	

PROGRAMMABLE/MULTIRRANGE
DIRECT CURRENT
Auxiliary Voltage Supply: UNIVERSAL (45-275 V) or STANDARD A.C/D.C
4 DIGITS

Display Red light, digit height 14,3 mm, high luminosity.
Models DH5CM, DP46CM, digit height 10,2 mm.

Max. Reading: 9999
Overrange indication: HHHH
Accuracy: 0,5% of reading ± 1 Digit
Auxiliary Voltage: UNIVERSAL (45-275 V) A.C./D.C.
Burden A.C.< 4 VA D.C.< 2 W
Standard Auxiliary Voltage: A.C. 110, 230 or 400 V ± 20%
Burden < 3 VA (A.C.);
D.C 12, 24, 48, 110 or 220 V ± 20%
Burden < 2 W (D.C.)
Temperature coefficient: 0,01% / ºC

PROGRAMMABLE AMMETERS

DIRECT CURRENT		
MODEL (Dimensions)	**DH5CM** (48x48)	**DP46CM** (72x36)
	DH4CM (72x72)	**DP35CM** (96x48)
	DH3CM (96x96)	
PROGRAMMABLE RANGE		
Measuring range X/60mV	1...9999 A Decimal point and display value selection using the front keys ▲ ▼	

DIRECT INPUT VOLTMETERS

DIRECT CURRENT		
MODEL (Dimensions)	**DH5CM** (48x48)	**DP46CM** (72x36)
	DH4CM (72x72)	**DP35CM** (96x48)
	DH3CM (96x96)	
DISPLAY		
Measuring range	500 V	

DOUBLE AND TRIPLE DISPLAY INSTRUMENTS
ALTERNATING CURRENT
4 DIGITS

Display		Red light, digit height 14,3 mm, high luminosity.
Max. Reading:		9999
Overrange indication:		HHHH
Accuracy:		0,5% of reading ± 1 Digit
		0,05% of reading ± 1 Digit (Freq.)
Auxiliary Voltage:		UNIVERSAL (45-275 V) A.C./D.C.
		Burden C.A.< 4 VA; D.C.< 2 W
	A.C.	110, 230 or 400 V ± 20%
		Burden < 3 VA (per display)
	D.C.	12, 24, 48 110 or 220 V ± 20%
		Burden < 2 W (per display)
Temperature coefficient:		0,01% / ºC
Programmable by keys:		See below table(**).

Range	Dimensions	Models	Display 1	Display 2	Display 3
V - A	72 x72	**DH4EM2**	AMMETER x/5 A (*)	VOLTMETER 0-500 V	---------
V_{12}-V_{13}-V_{23}	96 x 96	**DH3EM3**	VOLTMETER 0-500 V (phase-phase)	VOLTMETER 0-500 V (phase-phase)	VOLTMETER 0-500 V (phase-phase)
V_1-V_2-V_3	96 x 96	**DH3EM3**	VOLTMETER 0-300 V(phase-neutral)	VOLTMETER 0-300 V(phase-neutral)	VOLTMETER 0-300 V(phase-neutral)
A_1-A_2-A_3	96 x 96	**DH3EM3**	AMMETER x/5A (*)	AMMETER x/5 A (*)	AMMETER x/5 A (*)
V-A-Hz	96 x 96	**DH3EM3**	VOLTMETER 0-500 V	AMMETER x/5 A (*)	FREQUENCY 0-999 Hz

(*) C.T.operated

(**) PROGRAMMABLE RANGE	
Measuring range X/5 A	5-10-15-20-25-30-40-50-60-70-75-80-90-100-120-125-150-160-200-250-300-400-500 ... 600-750-800-900-1000-1200-1250-1400-1500-1600-1750-1800-2000-2200-2250-2400 ... 2500-2750-3000-3500-4000-4500-5000-5500-6000-6500-7000-7500-8000-9000-P000 A

FREQUENCY METERS
4 DIGITS

Display:	Red light, digit height 14,3 mm, high luminosity.
Max. Reading:	9999
Accuracy:	0,05% of reading ± 1 Digit.
Operating Voltage:	10-500 V
Auxiliary Voltage:	C.A. 110, 230, 400 V ± 20%
	Burden < 3 VA
Temperature coefficient:	0,005% / ºC

ALTERNATING CURRENT		
MODEL (Dimensions)	**DH4**F (72x72) **DH3F** (96x96)	**DP46F** (72x36) **DP35F** (96x48)
DISPLAY		
Measuring range	0 - 999,9 Hz	0 - 999,9 Hz

DOUBLE AND TRIPLE DISPLAY INSTRUMENTS
ALTERNATING CURRENT/DIRECT CURRENT
3½ DIGITS

GENERAL

Display		Red light, digit height 14,3 mm, high luminosity. Model DH5E, digit height 10,2 mm.
Max. Reading:		1999
Overrange indication:		1---
Accuracy:		0,5% of reading ± 1 Digit A.C. 0,2% of reading ± 1 Digit D.C.
Auxiliary Voltage	A.C.	110, 230 or 400 V ± 20% Burden < 3 VA (per display)
	D.C.	12, 24, 48, 110 or 220 V ± 20% Burden < 2 W (per display)
Temperature coefficient:		0,01% / ºC

RANGES (A)

	DIRECT CURRENT	ALTERNATING CURRENT
Measuring range	199,9 µA 1,999 - 19,99 - 199,9 mA 1,999 A ../60 mV or /150 mV	199,9 or 1999 mA X/1 or X/5

RANGES (V)

	DIRECT CURRENT	ALTERNATING CURRENT
Measuring range	199,99 mV 1,999 - 19,99 - 199 mV or 600 V	1,999 - 19,99, 199,9 or 600 V

RANGES (Hz)

		MEASURING RANGE
Frequency Maximum reading Accuracy	4 Digits 9999 0,05% of the reading ±1 Digit	40.00-999,9 Hz

DOUBLE AND TRIPLE INSTRUMENTS

ALTERNATING CURRENT				
MODEL (Dimensions)	DH5E2	DH4E2	DH3E2	DH3E3
	(48x48)	(72x72)	(96x96)	(96x96)
	(2 Display) (1)	(2 Display) (1)	(2 Display)	(3 Display)
Measuring range	A, V			A, V, Hz

DIRECT CURRENT				
MODEL (Dimensions)	DH5C2	DH4C2	DH3C2	DH3C3
	(48x48)	(72x72)	(96x96)	(96x96)
	(2 Display) (1)	(2 Display) (1)	(2 Display)	(3 Display)
Measuring range	A, V or transducer output (mA)			

(1) Auxiliary voltage ; 12, 24 or 48 C.C.

MULTIRRANGE
ALTERNATING CURRENT/ DIRECT CURRENT
3 DIGITS

VOLTMETERS-AMMETERS AND FREQUENCY METERS MULTIRRANGE

Display:		Red Led, high luminosity
		DB4_: Digit height 14,2 mm
		DB5R_: Digit height 9 mm
Max. Reading:		999
Overrange indication:		EEE
Accuracy:		1% of reading ± 1 Digit
Auxiliary Voltage:	A.C.	115 or 230 ± 20%
		Burden < 3 VA
Temperature coefficient:		0,01% / ºC

ALTERNATING CURRENT	
MODEL	**DB5RE** (DIN RAIL)
VOLTMETERS	100 and 600 V
AMMETERS .../5	5-10-15-20-25-30-40-50-60-75... A 100-125-150-200-250-300-400-500-600-750-800-1000 ... A 1200-1250-1500-1600-2000-2500-3000-4000-5000-6000 or 8000 A

DIRECT CURRENT	
MODEL	**DB5RC** (CARRIL DIN)
VOLTMETERS	100 and 600 V
AMMETERS .../60mV	5-10-15-20-25-30-40-50-60-75... A 100-125-150-200-250-300-400-500-600-750-800 ... A 1000-1200-1250-1500-1600-2000-2500-3000-4000-5000-6000 or 8000 A

ALTERNATING CURRENT	
MODEL	**DB5RF** (DIN RAIL)
FREQUENCY METER	30 - 500 Hz
Operating voltage	100 and 600 V ± 20%

ALTERNATING CURRENT / DIRECT CURRENT (RMS) 4 ½ DIGITS

Display		Red light, digit height 14,3 mm, high luminosity.
Max. Reading:		19999
Overrange indication:		0000 (flashing)
Accuracy:		0,5% of reading ± 1 Digit A.C. 0,2% of reading ± 1 Digit D.C.
Auxiliary Voltage	A.C.	110, 230 or 400 V ± 20% Burden < 3 VA
Temperature coefficient:		0,007% / ºC

AMMETERS

	DIRECT CURRENT		ALTERNATING CURRENT	
MODEL (Dimensions)	**DQ4C** (72x72)	**DQ46C** (72x36)	**DQ4E** (72x72)	**DQ46E** (72x36)
	DQ3C (96x96)	**DQ35C** (96x48)	**DQ3E** (96x96)	**DQ35E** (96x48)
Measuring range	199,99 µA 1,9999 - 19,999 - 199,99 or 4-20 mA 1,9999 A ../60 mV or /150 mV		199,99 or 1999,9 mA X/1 or X/5	

VOLTMETERS

	DIRECT CURRENT		ALTERNATING CURRENT	
MODEL (Dimensions)	**DQ4C** (72x72)	**DQ46C** (72x36)	**DQ4E** (72x72)	**DQ46E** (72x36)
	DQ3C (96x96)	**DQ35C** (96x48)	**DQ3E** (96x96)	**DQ35E** (96x48)
Measuring range	19,999 - 199,99 or 1999,9 mV 1,9999 - 19,999 - 199,99 or 600 V		19,999 - 199,99 or 1999,9 mV 1,9999 - 19,999 - 199,99 or 600 V ../100 or /110 V	

ALTERNATING CURRENT/ DIRECT CURRENT 3 ½ DIGITS

Display		Red light, digit height 10,2 mm, high luminosity.
Max. Reading:		1999
Overrange indication:		1---
Accuracy:		0,2% of reading ± 1 Digit D.C. 0,5% of reading ± 1 Digit A.C.
Auxiliary Voltage:	A.C.	110, 230 or 400 V ± 20%
	D.C.	12, 24, 48, 110 or 220 V ± 20% (*) Burden < 2 W
Temperature coefficient:		0,007% / ºC

AMMETERS

	DIRECT CURRENT			ALTERNATING CURRENT		
MODEL (Dimensions)	**DP57C**(48x24)*	**DH5C** (48x48)	**DP46C** (72x36)	**DP57E**(48x24)*	**DH5E** (48x48)	**DP46E** (72x36)
	DP47C(72x24)*	**DH4C** (72x72)	**DP35C** (96x48)	**DP47E**(72x24)*	**DH4E** (72x72)	**DP35E** (96x48)
	DP37C(96x24)*	**DH3C** (96x96)		**DP37E**(96x24)*	**DH3E** (96x96)	
Measuring range	199,9 µA 1,999 - 19,99 - 199,9 mA 1,999 A ../60 mV or /150 mV			199,9 or 1999 mA X/1 or X/5		

VOLTMETERS

	DIRECT CURRENT	ALTERNATING CURRENT
Measurig range	199,9 mV 1,999 - 19,99 - 199,9 or 600 V	1,999 - 19,99 - 199,9 or 600 V X/100 or X/110

(*) Auxiliary voltage 12-24 or 48 V D.C.

TRANSDUCER OUTPUT
DIRECT CURRENT
3½ and 4½ DIGITS

TRANSDUCER OUTPUT	
Voltage (V)	0-1 ; 0-5 or 0-10 V 1-0-1 ; 5-0-5 or 10-0-10 V 1-5 or 2-10 V
Current (mA)	0-1 ; 0-5 ; 0-10 ; 0-20 mA 4-20 mA

3½ DIGITS

Display — Red light, digit height 14,3 mm, high luminosity.
Models DH5_ y DP57_, Digit height 10,2 mm.
Max. Reading: 1999
Overrange indication: 1---
Accuracy: 0,2% of reading ± 1 Digit
Auxiliary Voltage: A.C 110, 230 or 400 V ± 20%
Burden < 3 VA
D.C 12, 24, 48, 110 or 220 V ± 20%
Burden < 2 W
Temperature coefficient: 0,01% / ºC

3½ DIGITS

DIRECT CURRENT			
MODEL (Dimensions)	**DH5C** (48x48) (1)	**DP46C** (72x36) (1)	**DP57C** (48x24) (1)
	DH4C (72x72) (1)	**DP35C** (96x48)	**DP47C** (72x24) (1)
	DH3C (96x96)		**DP37C** (96x24) (1)
UNITS	**mA - A - kA - mV - V - kV - rpm - % - m - Kg - bar - mm - kN Hz - W - kW - MW - VA - var - kvar - Mvar - kVA - ºC - ºF**		

(1) Auxiliary Voltage: 12, 24 or 48 D.C

4½ DIGITS

Display — Red light, digit height 14,3 mm, high luminosity.
Max. Reading: 19999
Overrange indication: 0000 (flashing)
Accuracy: 0,2% of reading ± 1 Digit
Auxiliary Voltage: C.A. 110, 230 or 400 V ± 20%
Burden < 3 VA
Temperature coefficient: 0,007% / ºC

4½ DIGITS

DIRECT CURRENT	
MODEL (Dimensions)	**DP46C** (72x36) **DP35C** (96x48)
UNITS	**mA- A- kA- mV -V -kV -rpm- %- m- Kg- bar- mm- kN Hz- W- kW- mW- VA- var- kvar- mvar- kVA- ºC- ºF**

PROGRAMMABLE WATTMETERS AND VARMETERS
3½ or 4 DIGITS

- Keypad available to set the current and voltage transformer ratio.
- Optional programmable alarm.

Display	Red light, digit height 14,3 mm, high luminosity.
Max. Reading:	From -1999 to 9999
Overrange indication:	OFL
Voltage input:	110, 230 or 400 V A.C.
Burden:	< 1 mA per phase (measurement) < 3 VA between phases (Balanced three-phase) or between phase and neutral (Single.-phase)
Current input:	1 or 5 A A.C. / Burden < 0,25 VA
Accuracy:	0,5% of end scale value ± 1 Digit
Temperature coefficient:	0,01% / ºC
Alarm circuit:	Optional programmable alarm, Max. or Min. value 1 commutated potential-free contact (250 V, 3A, 200 VA)

	WATTMETERS		VARMETERS	
MODEL (Dimensions)	**DP35W** (96x48)	**DP35WI** (96x48)	**DP35Wr** (96x48)	**DP35WIr** (96x48)
Type	Single-phase Alternating current	Balanced three-phase Alternating current	Single-phase Alternating current	Balanced three-phase Alternating current

PHASE ANGLE METERS
3½ DIGITS

Display	Red light, digit height 14,3 mm, high luminosity.
Max. Reading:	1.000
Overrange indication:	----
Voltage input:	110, 230 or 400 V A.C. (DH3_, DP35_).
Burden:	< 1 mA per phase (measurement) < 3 VA between phases (Balanced Three-phase) or between phase and neutral (Single-phase)
Current input:	1 or 5 A A.C. Burden < 0,25 VA
Accuracy:	0,5% (90 electrical degrees)
Temperature coefficient:	0,01% / ºC
Measuring range:	CAP 0-1-0 IND
IND:	without sign on the display
CAP:	negative sign on the display
Other information:	LO.I for current < 10% In HI.I for current > 120% In HI.U for voltage > 120% Vn

	PHASE ANGLE METERS			
MODEL (Dimensions)	**DH4S** (72x72) **DP46S** (72x36)	**DH3S** (96x96) **DP35S** (96x48)	**DH4SI** (72x72) **DP46SI** (72x36)	**DH3SI** (96x96) **DP35SI** (96x48)
Type	Single-phase Alternating current		Three-phase Alternating current	

PROGRAMMABLE DIGITAL INSTRUMENTS
DIRECT CURRENT
3½ DIGITS and 4 DIGITS

Measuring instruments complementing physical or electrical parameters converters.

UNITS
mA - A - kA - mV - V - kV - rpm - % - m - Kg - bar - mm - kN
Hz - W - kW - mW - VA - var - kvar - mvar - kVA - ºC - ºF

3½ DIGITS

- Keypad available to set the current and voltage transformer ratio (offset, end of scale and decimal point)
- Optional programmable alarm.

Display		Red light, digit height 14,3 mm, high luminosity.
Max. Reading:		±1999
Accuracy:		0,1% of reading ± 1 Digit.
Overrange indication:		OFL
Temperature coefficient:		0,01% / ºC
Auxiliary voltage:	A.C.	110, 230 or 400 V ± 20% Burden < 3 VA
	D.C.	12, 24, 48, 110 or 220 V ± 20% Burden < 2 W
Alarm circuit:		1 commutated potential-free contact (250 V, 3 A, 200 VA).Max. or Min.Value.

	AMMETERS	VOLTMETERS
MODEL (Dimensions)	**DP35CP** (96x48)	**DP35CP** (96x48)
Measuring range	0 -1; 0 -5; 0 -10: 0 -20 or 4-20 mA	0 -1; 0 -5; 0 -10: 1-0-1; 5-0-5;10-0-10 V 1-5 or 2-10 V

4 DIGITS

- Instantaneous, average and maximum value of the parameter.
- Programmable scale range through the keypad (offset, end of scale and decimal point).
- 2 Maximum and Minimum programmable alarms available.

Display		Red light, digit height 14,3 mm, high luminosity.
Max. Reading:		9999; -999 (Negative divided)
Accuracy:		0,1% of reading ± 1 Digit.
Overrange indication:		OFL
Temperature coefficient:		0,01% / ºC
Auxiliary voltage:	A.C.	110, 230 or 400 V ± 20% Burden < 3 VA
	D.C.	12, 24, 48, 110 or 220 V ± 20% Burden < 2 W
Alarm circuit:		1 commutated potential-free contact (250 V, 3 A, 200 VA).Max. or Min.Value.

	AMMETERS	VOLTMETERS
MODEL (Dimensions)	**DP46CPM** (72x36)	**DP46CPM** (72x36)
Measuring range	0 -1; 0 -5; 0 -10: 0 -20 or 4-20 mA	0 -1; 0 -5; 0 -10: 1-0-1; 5-0-5;10-0-10 V 1-5 or 2-10 V

PROGRAMMABLE MAXIMUM DEMAND AMMETERS
ALTERNATING CURRENT
4 DIGITS

- Maximum and instantaneous value of the current.
- Average value of the current (programmable period of time of 8, 15, 20 and 30 Mins).
- True RMS value.
- Programmable alarm set point.

Display		Red light, digit height 10,2 mm, high luminosity.
Max. Reading:		9999
Accuracy:		0,5% of reading ± 1 Digit
Overrange indication:		F.ESC
Temperature coefficient:		0,007% / ºC
Alarm circuit:		1 communicate potential-free contact (250 V, 3A, 200 VA)
Auxiliary Voltage:	A.C.	110, 230 V ± 20 %
		Burden < 3 VA
	D.C.	12, 24, 48 or 110 V ± 20%
		Burden < 2 W

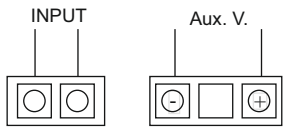
ALTERNATING CURRENT			
MODEL	**DP46M**	**DP46MIR**	**DP46MII**
(Dimensions)	(72x36mm)	(72x36mm)	(72x36 mm)
Measuring range	x/1 A or x/5 A	x/1 A or x/5 A	x/1 A or x/5 A

ALARM SETTING			
Alarm over the current type	Integrated	Instantaneous	Inverted instantaneous
Contacts	NC	NC	NO
Delay	NO	0...99,9 s	NO
Hysteresis	NO	5%	5%

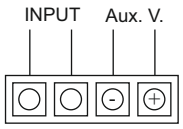
NC: Normally closed NO: Normally open

CONNECTION DIAGRAMS (4 DIGIT INSTRUMENTS)

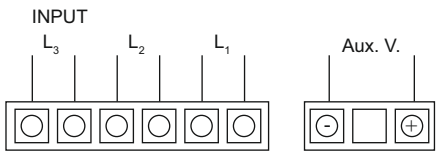
AMMETER / VOLTMETER



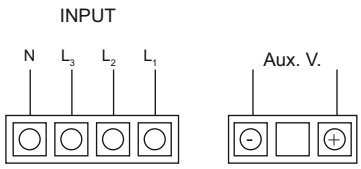
AMMETER / VOLTMETER (DH5-)



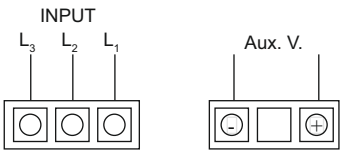
TRIPLE AMMETER (A-A-A)



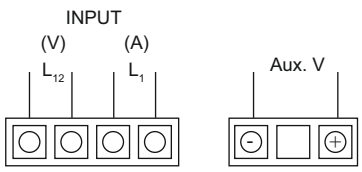
TRIPLE VOLTMETER (Phase / Neutral)



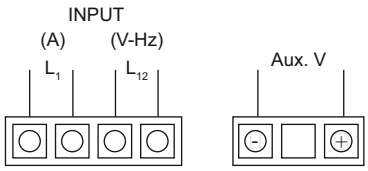
TRIPLE VOLTMETER (Phase/Phase)



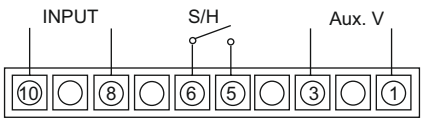
DOUBLE INSTRUMENTS (V-A)



TRIPLE VOLTMETER (A-V-Hz)

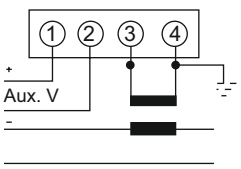


AMMETER / VOLTMETER (4½ DIGITS)



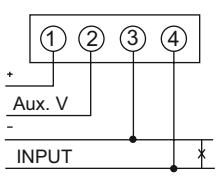
CONNECTION DIAGRAMS

AMMETER DB5RE/ DB4E (A.C)



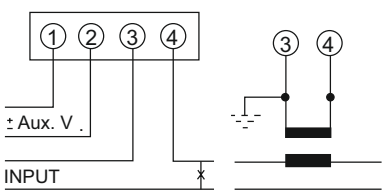
	Terminal Nº		
	Aux. V	Input	Aux. V
DB5RE	115 V	6-7	3-5
	230 V	6-7	1-5
DB4E	115 V	3-4	7-8
	230 V	3-4	6-8

VOLTMETER / DB4E (A.C)

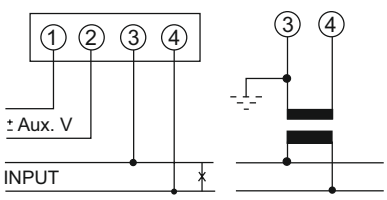


	Terminal Nº		
	Aux. V	Input	Aux. V
DB5RE 100 V	115 V	6-8	3-5
	230 V	6-8	1-5
DB5RE 600 V	115 V	6-9	3-5
	230 V	6-9	1-5
DB4E 100 V	115 V	2-4	7-8
	230 V	2-4	6-8
DB4E 600 V	115 V	1-4	7-8
	230 V	1-4	6-8

3½ DIGITS AMMETERS (A.C)

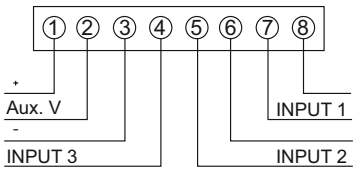


3½ DIGITS VOLTMETERS (A.C)

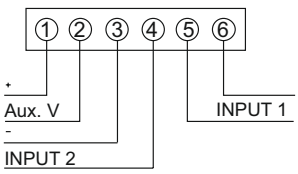


CONNECTION DIAGRAMS

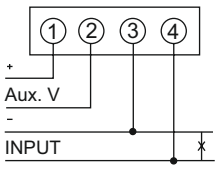
TRIPLE INSTRUMENTS



DOUBLE INSTRUMENTS

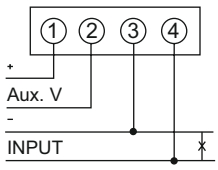


3 DIGITS FREQUENCY METERS - DB5RF



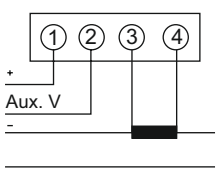
	Terminal Nº.		
	Aux. V.	Imput	Aux.V.
DB5RF 100V	115 V	6-8	3-5
	230 V	6-8	1-5
DB5RF 600V	115 V	6-9	3-5
	230 V	6-9	1-5

3 DIGITS FREQUENCY METERS - DB4F



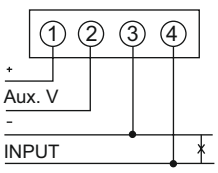
	Terminal Nº.		
	Aux.V.	Imput	Aux.V.
DB4F 100V	115 V	2-4	7-8
	230 V	2-4	6-8
DB4F 600V	115 V	1-4	7-8
	230 V	1-4	6-8

AMMETERS DB5RC / DB4C (D.C)



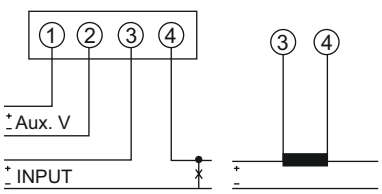
	Terminal Nº		
	Aux. V.	Input	Aux. V.
DB5RC	115 V	6-7	3-5
	230 V	6-7	1-5
DB4C	115 V	3-4	7-8
	230 V	3-4	6-8

VOLTMETER DB5RC / DB4C (D.C)

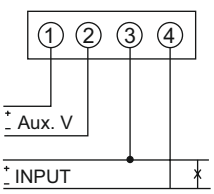


	Terminal Nº		
	Aux. V	Input	Aux. V
DB5RC 100 V	115 V	6-8	3-5
	230 V	6-8	1-5
DB5RC 600 V	115 V	6-9	3-5
	230 V	6-9	1-5
DB4C 100 V	115 V	2-4	7-8
	230 V	2-4	6-8
DB4C 600 V	115 V	1-4	7-8
	230 V	1-4	6-8

3½ DIGITS AMMETERS (D.C)

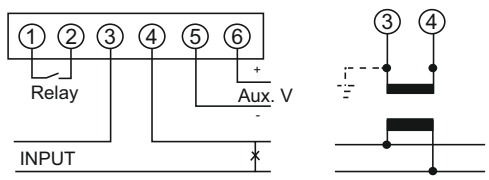


3½ DIGITS VOLTMETERS (D.C)

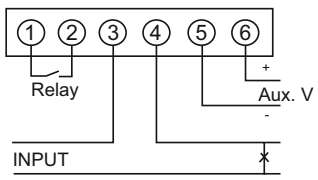


CONNECTION DIAGRAMS

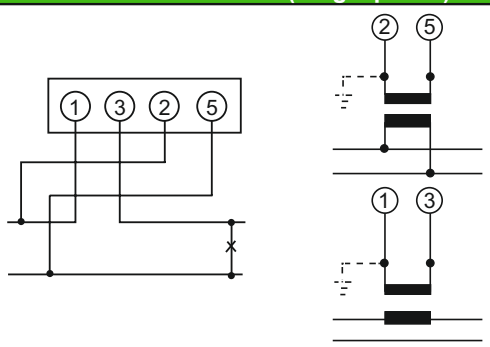
MAXIMUM DEMAND AMMETERS (A.C.)



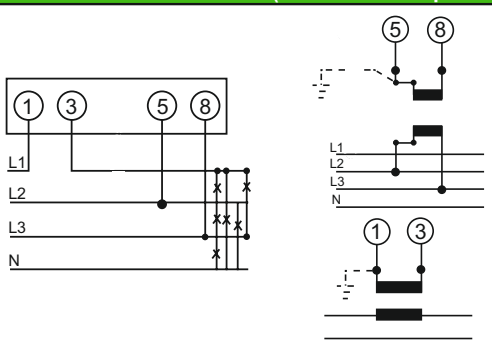
MAXIMUM DEMAND AMMETERS (D.C.)



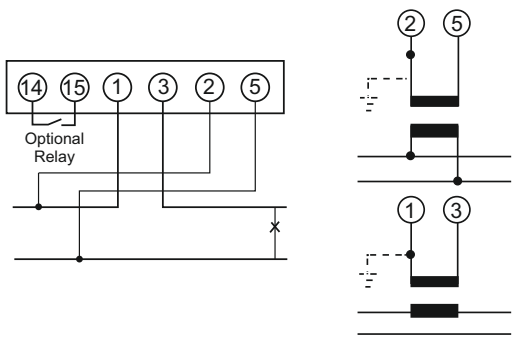
PHASE ANGLE METER (Single phase)



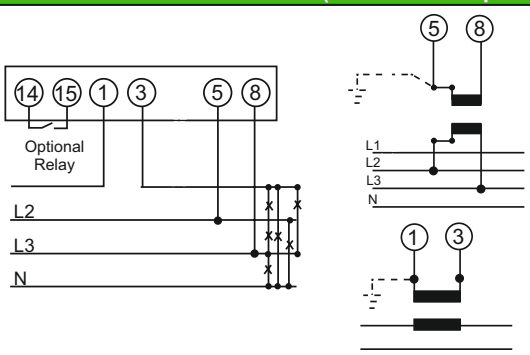
PHASE ANGLE METER (Balanced three-phase)



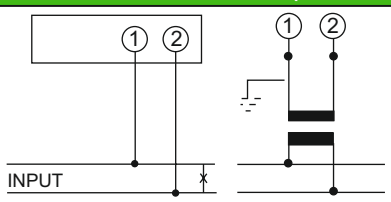
WATTMETER and VARMETERS (Single phase)



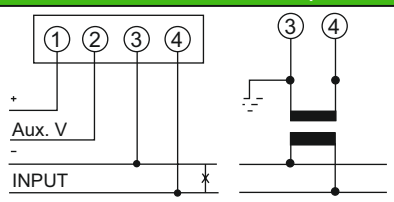
WATTMETER and VARMETERS (Balanced three-phase)



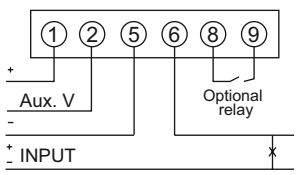
4 DIGITS FREQUENCY METERS (without Aux. V.)



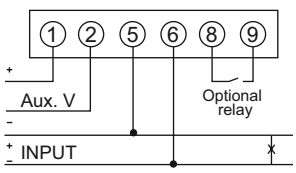
4 DIGITS FREQUENCY METERS (with Aux. V.)



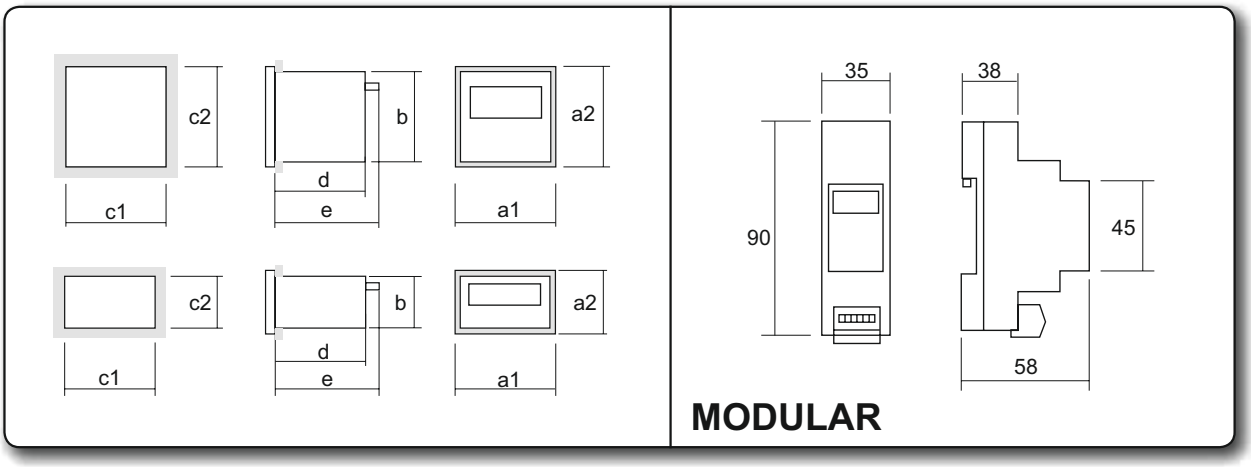
PROGRAMMABLE AMMETER



PROGRAMMABLE VOLTMETER



DIMENSIONS



3, 3½ & 4½ DIGITS		DQ4_(*) DH4_2 DH4S_(*) DB4_(**)	DQ3_ (*) DH3_2 DH3_3 DH3S_(*)	DP46_ DP46F(*) DP46M_ DP46S_(*)	DP35_ DP35CP (*) DP35S_(*) DP35W_			
	DH5_					DP57_	DP47_	DP37_
a1 x a2	48x48	72x72	96x96	72x36	96x48	48x24	72x24	96x24
b	42,6x42,6	66x66	90x90	66x32	90x42,6	42x21	66x21	90x21
c1 x c2	$44,5^{+0,7}$x$44,5^{+0,7}$	$67,5^{+0,7}$x$67,5^{+0,7}$	$91,5^{+0,7}$x$91,5^{+0,7}$	$68^{+0,7}$x$32,5^{+0,7}$	$91,5^{+0,7}$x$43,5^{+0,7}$	$44^{+0,7}$x$22^{+0,7}$	$67,5^{+0,7}$x$22^{+0,7}$	$92^{+0,7}$x$22^{+0,7}$
d	77	77	77	78,5	78,5	78,5	78,5	78,5
e	87	87	87	88,5	88,5	88,5	88,5	87,5
(*) d	---	112	112	112	112	---	---	---
(*) e	---	122	122	122	122	---	---	---
(**) d	---	51	---	---	---	---	---	---
(**) e	---	61	---	---	---	---	---	---
4 DIGITS	**DH5_M**	**DH4_M**	**DH3_M**	**DP46_M**	**DP35_M**			
a1 x a2	48x48	72x72	96x96	72x36	96x48			
b	44,6x44,6	66x66	90x90	66x32	90x43,7			
c1 x c2	46x46	$67^{+0,4}$ x $67^{+0,4}$	$91^{+0,4}$ x $91^{+0,4}$	$67^{+0,4}$ x $32^{+0,6}$	$91^{+0,4}$ x $45^{+0,1}$			
d	77	77	77	78,5	78,5			
e	87	87	87	88,5	88,5			

REACTIVE POWER REGULATORS

REACTIVE POWER REGULATORS

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

REACTIVE POWER REGULATOR REG 144

Automatic power factor regulator, which is only necessary to connect to a current and the three phase voltages, with display indicating measurements and integrated keyboard.

- **DIN 144 x 144 INSTRUMENT**
- **LCD DYSPLAY**
- **COS φ DISPLAY**
- **AUTOMATIC SELF ADJUSTMENT FOR C/K VALUE**
- **AUTOMATIC STEP SETTING FOR CONNECTED CAPACITORS**
- **RS485/RS232 COMMUNICATION (optional)**

DISPLAY

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage	V	•	•	•	
Current (ref. to secondary)	A				•
Active power (P)	kW				•
Reactive power (Q)	kvar				•
Apparent power (S)	kVA				•
Power factor (Cos φ)	PF				•
Frequency	Hz				•
Connected steps					•
Operating program					•
Correct transformer connection					•
Transformer phase					•
Errors					•

MODEL

- **REG-144**
  - 6 Output relays
  - 9 Output relays
  - 12 Output relays
  - 14 Output relays

- Output relays 6, 9, 12 or 14
- Serial port RS485-RS232 (Optional)

CONTACT OUTPUTS

- Type: RS485/RS232.
- Connections: 2 wire.
- Protocol: MODBUS RTU
- Baud rate: Programmable.
  300 – 19200 Bauds.
  Standard 9600 Bauds.
- Max lengh of system per line (without amplifier) 1250 m.

SETTING

Mode 1: Automatic

Automatically checks the connected capacitor steps, (Automatic self adjustment for C/k value).
Prevents mistakes through poor current transformers or phase connection.

Mode 2: Manual

LCD DISPLAY

- LCD display with built in keypad.
- Digit height: 14 mm.
- Selectable pages with up (↑) and down (↓) keys.

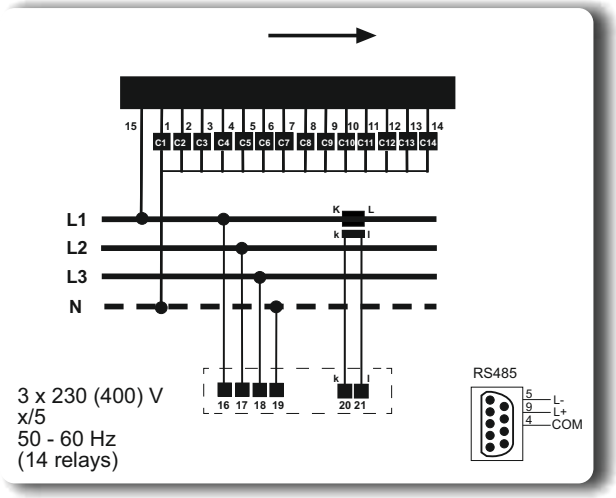
TECHNICAL SPECIFICATIONS

INPUT	
3-phase, 4 wire, balanced	
Rated voltage	230 or 400 V ± 50 %
Consumo propio	5 VA
Operating range	10-120 % Un
Rated current (In)	../5 or .../1 A
Burden	0,2 VA
Operated range	4 -120 % In
Frequency	45-65 Hz
Overload	2 In (continuosly) 5 In (10 s.)

CONTACT OPUTPUTS	
Number of outputs	6,9,12 or 14 (According to model)
Type	Relay N.O 250 V, 3 A
Mechanical life	$20x10^6$
Electrical life	$100x10^3$
Maximum voltage	250 V A.C./125 V D.C.
Connection delay	4 s
Security time	10 s
Insulation	2 kV

AUXILIARY VOLTAGE	
Aux. V	Self supplied

CONNECTION DIAGRAM



GENERAL

GENERAL FEATURES	
Case material	ABS,UL94 V0
Dimensions	DIN 144 x 144 mm
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	1,75 kg
Protection	IP20 Terminals
Optional protection	IP54 Front
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- 5+5+5/5 A summation current transformers.
- RS232 / RS485 converters.

ACCURACY

Parameter	Operating range	Accuracy
Voltage	10-120%	0,5%(read.+scale end)
Current	4-120%	0,5%(read.+scale end)
Active power	10-150%	0,5%(read.+scale end)
Reactive power	10-150%	1%(read.+scale end)
Apparent power	10-150%	1%(read.+scale end)
Power factor	0-1-0	1%(read.+scale end)
Frequency	45-65 Hz	0,1%(Rated freq.)

AUTOMATIC REACTIVE POWER REGULATOR REG 96

Automatic power factor regulator, which is only necessary to connect to a current and the three phase voltages, with display indicating measurements and integrated keyboard.

- **DIN 96x96 INSTRUMENT**
- **LCD DYSPLAY**
- **COS φ DYSPLAY**
- **AUTOMATIC SELF ADJUSTMENT FOR C/K VALUE**
- **AUTOMATIC STEP SETTING FOR CONNECTED CAPACITORS**

DISPLAY

ELECTRICAL PARAMETER	SYMBOL	L1	L2	L3	TOTAL
Voltage	V	•	•	•	
Current (ref. to secondary)	A				•
Active power (P)	kW				•
Reactive power (Q)	kvar				•
Apparent power (S)	kVA				•
Power factor (Cos φ)	PF				•
Frequency	Hz				•
Connected steps					•
Operating program					•
Correct transformer connection					•

MODEL

- **REG-96** - 3 Output relays
  - 6 Output relays
- Output relays 3 or 6

SETTING

Mode 1: Automatic

Automatically checks the connected capacitor steps, (Automatic self adjustment for C/k value).
Prevents mistakes through poor current transformers or phase connection.

Mode 2: Manual

DISPLAY LCD

- LCD display with built in keypad
- Selectable pages with up (↑) and down (↓) keys.

TECHNICAL SPECIFICATIONS

INPUT	
3-Phase 4 wire, balanced	
Rated voltage (Un)	230 or 400 V ± 50 %
Burden	5 VA
Operating range	10-120 % Un
Rated current (In)	../5 or .../1 A
Burden	0,2 VA
Operating range	4 -120 % In
Frequency	45-65 Hz
Overload	2 In (continuously) 5 In (10 s.)

Regulator

TECHNICAL SPECIFICATIONS

CONTACT OPUTPUTS	
Number of outputs	3 or 6 (according to model)
Type	Relay N.O 250 V, 3 A
Mechanical life	$20x10^6$
Electrical life	$100x10^3$
Maximum voltage	250 V A.C./125 V D.C.
Connection delay	4 s
Security time	10 s
Insulation	2 kV

AUXILIARY VOLTAGE	
Aux. V	63,5/110 V or 230/400 V A.C.± 20 %

ACCURACY

Parameter	Operating range	Accuracy
Voltage	10-120%	0,5%(read.+scale end)
Current	4-120%	0,5%(read.+scale end)
Active power	10-150%	0,5%(read.+scale end)
Reactive power	10-150%	1%(read.+scale end)
Apparent power	10-150%	1%(read.+scale end)
Power factor	0-1-0	1%(read.+scale end)
Frequency	45-65Hz	0,1% (rated freq.)

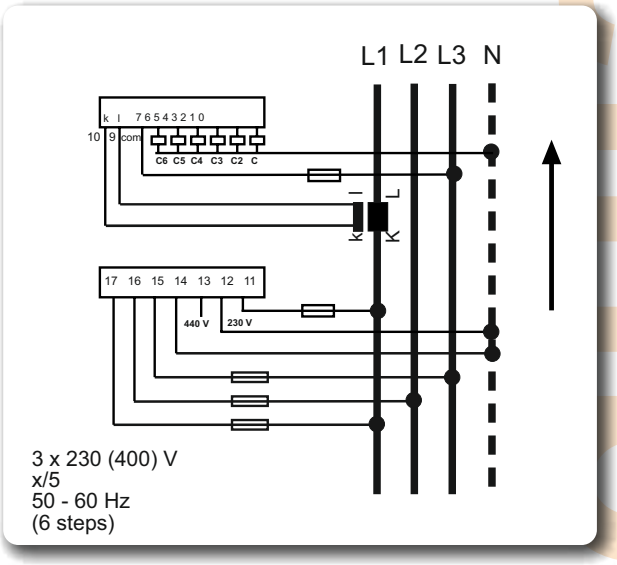
GENERAL

GENERAL FEATURES	
Case material	Metal+ABS,UL94 V0
Dimensions	DIN 96x96 mm (74 depth)
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	1,75 kg
Protection	IP20 Terminals
Optional protection	IP54 Front IP65 Front
Electrical safety	(EN 61010) Class 2 Category III

ACCESSORIES

- x/5 A or x/1 A transformers.
- 5+5+5/5 A summation current transformers.

CONNECTION DIAGRAMS



REACTIVE POWER REGULATOR REG 144 DA

Reactive power regulator measure cos φ and regulate the capacitor connection and disconnection to correct it.

- **144 x 144 INSTRUMENT**
- **LCD DYSPLAY**
- **COS φ DYSPLAY**
- **PROGRAMMABLE**

DISPLAY

ELECTRICAL PARAMETER	SYMBOL	TOTAL
Cos φ value (inductive)	PF	•
Cos φ value (capacitive)	PF	•
Nº of connected and disconnected steps	Hz	•
Current value		•
Voltage value		•
THD value		•

MODEL

- **REG-144DA**
  - 6 Output relays
  - 12 Output relays

LCD DISPLAY

- LCD Display
- 1 line x 3 digits x 7 segments

ACCESSORIES

- x/5 A transformers.
- 5+5+5/5 A summation current transformers.

GENERAL

GENERAL FEATURES	
Case material	Metal+ABS,UL94 V0
Dimensions	DIN 144x144 mm (50 depth)
Terminals	Pluggable
Max. wire section	2,5 mm²
Weight	0,540 kg
Protection	IP20 Terminals IP21 Front
Electrical safety	(EN 61010) Class 2 Category III

TECHNICAL SPECIFICATIONS

INPUT	
3-phase, 4 wire, balanced	
Rated voltage (Un)	110, 230, 400 or 480 V
Operating range	-10 / +15 % Un
Rated current (In)	../5 A
Operating range	2 -120 % In
Frequency	45-65 Hz
Burden	8 VA (6 steps); 9,8 VA (12 steps)

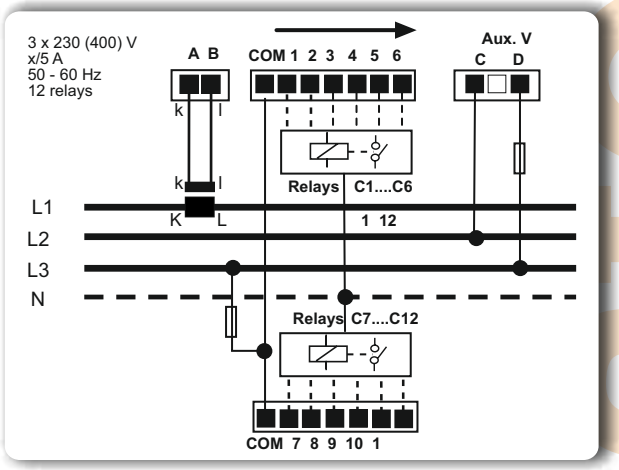
CONTACT OPUTPUTS	
Number of outputs	6 or 12 (according to model)
Type	Relay N.O 250 V, 10 A
Insulation	2 kV

AUXILIARY VOLTAGE	
Aux. V	Self supplied

ACCURACY

Parameter	Operating range	Accuracy
Voltage	-10/+15%	1%
Current	4-120%	1%
Power factor	0-1-0	2% ± 1digit
Frequency	45-65Hz	0,1%(Rated freq.)

CONNECTION DIAGRAM



ANALOGUE INSTRUMENTS

ANALOGUE INSTRUMENTS

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

CONTENTS

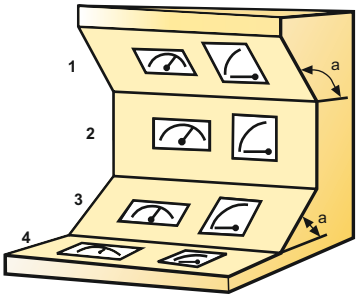
CONTENTS

SYNCHRONIZING INSTRUMETS
RELAYS
EQUIPMENT FOR VESSEL

GENERAL FEATURES

Standards	**EN60051, VDE 0410, BS-89, EN50081, EN50082, EN61010**
Certifications	**ISO 9001-2008** **DET NORSKE VERITAS, BUREAU VERITAS** **GERMANISCHER LLOYD (relay)**
Casings	**IEC 61554** **72x72, 96x96, 144x144, 80x64, 105x80, 130x100** **MODULAR (for DIN rail)**
Scales	**Full scale value, DIN 43701** **Scale division, DIN 43802**
Pointers	**DIN 43802**

1	a > 90º
2	⊥
3	a < 90º
4	⊓



Overloads	**1.2 Vn continuous, 2 Vn 5 s** **1.5 In continuous, 5 In 30 s, 10 In 5 s, 40 In 1 s**
Vibration resistance	**VDE 0410, Section 27: 2.5 g, ±0.25 mm, 50 Hz**
Shock resistance	**VDE 0410, Section 28: 15 g**
Operating temperature	**-25ºC..+40ºC**
Reference temperature	**+10ºC..+30ºC (for accuracy class)**
Test voltage	**2kV, 50 Hz, 1 min.**
Tropicalization	**DIN 40040 (on request)**
Protection	**IP52, (IP54, IP65 on request) casings** **IP00, (IP20 on request) terminals**

MOVING IRON

Voltage and alternating current. True efective value.

AMMETERS (INTERCHANGEABLE SCALE)

- Measuring range: x/1 A, x/5 A
- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 15..100 Hz
- Burden: 0,4 VA

Model		EC5VR	EC5V	EC4V	EC3V
Dimensions	mm	45x52,5 DIN RAIL	48x48	72x72	96x96
Approx. weight	kg.	0,15	0,14	0,20	0,25
CT OPERATED AMMETERS (INTERCHANGEABLE SCALE)					
Module	In	X/5A or X/1A			
Standards scales		10; 15; 20; 25; 30; 40; 50; 60 or 75 A and multiples			
Module	2xIn	2X/5A or 2X/1A			
Standards scales		10..20; 15..30; 20..40; 25..50; 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples			
Module	5xIn	5X/5A or 5X/1A			
Standards scales		10..50; 15..75; 20..100; 25..125; 30..150; 40..200; 50..250; 60..300 or 75..375 A and multiples			

DIRECT INPUT AMMETERS

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 15..100 Hz
- Burden: 0,3..1 VA

Model		EC5VR*	EC5V	EC4V	EC3V	EC2V	ECb7**	ECb3**	ECb8**
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144	80x64	105x80	130x100
Approx. weight	kg.	0,25	0,09	0,20	0,25	0,50	0,14	0,18	0,25
DIRECT INPUT AMMETERS									
MEASURING RANGE	In	1; 1,5; 2; 2,5; 3; 4; 5; 6; 10; 15; 20; 25; 30; 40; 50; 60; 75 or 100 A							
	2xIn	1..2; 1,5..3; 2..4; 2,5..5; 3..6; 4..8; 5..10; 6..12; 10..20; 15..30							
		20..40; 25..50; 30..60; 40..80; 50..100; 60..120; 75..150 or 100..200 A							
	5xIn	1..5; 1,5..7,5; 2..10; 2,5..7,5; 3..15; 4..20; 5..25; 6..30; 10..50; 15..75							
		20..100; 25..125; 30..150; 40..200; 50..250; 60..300; 75..375 or 100..500 A							

* Maximum measuring range: 40 A, 40..80 A, 40..200 A
** Maximum measuring range: 50 A, 50..100 A, 50..250 A

AMMETERS (mA)

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 15..100 Hz
- Burden: 0,3..1 VA

Model		EC5VR	EC5V	EC4V	EC3V	EC2V	ECb7	ECb3	ECb8
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144	80x64	105x80	130x100
Approx. weight	kg.	0,15	0,14	0,20	0,25	0,50	0,14	0,18	0,25
AMMETERS (mA)									
MEASURING RANGE	In	100; 150; 200; 250; 300; 400; 500 or 600 mA							
	2xIn	100..200; 150..300; 200..400; 250..500; 300..600; 400..800; 500..1000 or 600..1200 mA							
	5xIn	100..500; 150..750; 200..1000; 250..1250; 300..1500; 400..2000; 500..2500 or 600..3000 mA							

VOLTMETERS (INTERCHANGEABLE SCALE)

- Measuring range: 100V, 110V
- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 45..65 Hz
- Burden: 1,5..3 VA

Model		EC5VR	EC5V	EC4V	EC3V
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96
Approx. weight	Kg.	0,15	0,14	0,20	0,25
VT OPERATED VOLTMETERS (INTERCHANGEABLE SCALE)					
Module	Vn	1,2 x/100V or 1,2x/110V			
Scales		1,2 Vn			

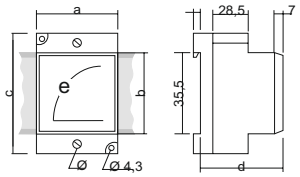
DIRECT INPUT VOLTMETERS

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 45..65 Hz
- Burden: 1,5..3 VA

Model		EC5VR*	EC5V	EC4V	EC3V	EC2V	ECb7	ECb3	ECb8
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144	80x64	105x80	130x100
Approx. weight	kg.	0,25	0,09	0,20	0,25	0,50	0,14	0,18	0,25
DIRECT INPUT VOLTMETERS									
Measuring range	Vn	6; 10; 15; 25; 30; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V							

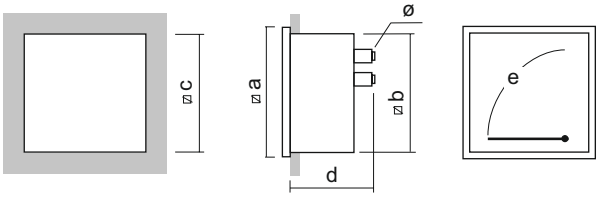
* IP20 protection

Dimensions (mm)



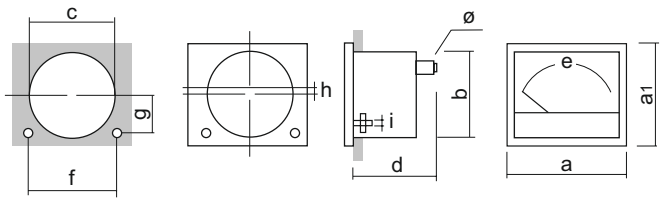
Model	Ranges	a	b	c	d	e	ø
EC5VR	A - mA - V	52,5	45	75	60	38	M.6

Dimensions (mm)



Models	Ranges	⍁a	⍁b	⍁c	d	e	ø
EC5V	>15..40 A The rest	48	44,5	$45^{+0,6}$	62 59	38	M.6 M.4
EC4V	>15..100 A The rest	72	66,5	$68^{+0,7}$	68 60	65	M.6 M.4
EC3V	>15..100 A The rest	96	89	$92^{+0,8}$	61 59	100	M.6 M.4
EC2V	>15..100 A The rest	144	135	138^{+1}	61 59	140	M.6 M.4

Dimensions (mm)



Models	Ranges	a x a1	Ø b	Ø c	d	e	f	g	h	i	ø
ECb7	>15..50 A The rest	80x64	57,6	$58,6^{+0,6}$	63 55	57	63	12,5	1,5	M.3	M.6 M.4
ECb3	>15..<50 A The rest	105x80	66	$67^{+0,7}$	63 55	75	81	13	4,5	M.3	M.6 M.4
ECb8	>15..<50 A The rest	130x100	66	$67^{+0,8}$	63 55	100	100	13	13	M.4	M.6 M.4

Conection diagrams

AMMETERS WITH SWITCH

(INTERCHANGEABLE SCALE)
4-POSITION SWITCH (0, L1, L2, L3)

- Measuring range: x/1 A , x/5 A
- Scale: 90º - Frequency: 15..100 Hz
- Accuracy: 1,5 % - Burden: 0,4 VA

Models		EC4V4	EC3V4
Dimensions	mm	72x72	96x96
Approx. weight	kg.	0,25	0,50
AMMETERS WITH SWITCH (INTERCHANGEABLE SCALE)			
Module	In	X/5A or X/1A	
Standards scales		10; 15; 20; 25; 30; 40; 50; 60 or 75 A and multiples	
Module	2xIn	2X/5A or 2X/1A	
Standards scales		10..20; 15..30; 20..40;25..50 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples	
Module	5xIn	5X/5A or 5X/1A	
Standards scales		10..50; 15..75; 20..100; 25..125; 30..150; 40..200; 50..250; 60..300 or 75..375 A and multiples	

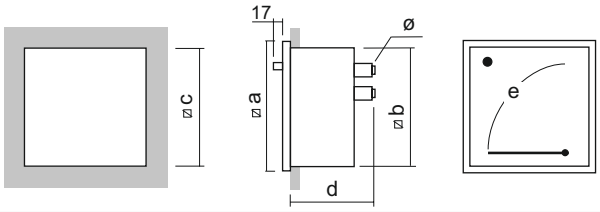
VOLTMETERS WITH SWITCH

3-POSITION SWITCH (L12, L23, L31)
6-POSITION SWITCH (L1, L2, L3, L12, L23, L31)

- Scale: 90º - Frequency: 45..65Hz
- Accuracy: 1,5 % - Burden: 1,5..3 VA

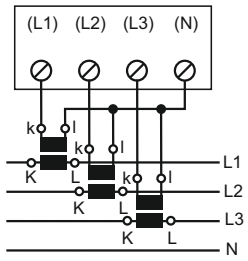
Models		EC4V3	EC3V3	EC4V6	EC3V6	EC4V7	EC3V7
Dimensions	mm	72x72	96x96	72x72	96x96	72x72	96x96
Approx. weight	kg.	0,25	0,50	0,25	0,50	0,25	0,50
Switch		3 positions		6 positions		6 positions + sequence meter	
CT OPERATED VOLTMETERS							
Module	Vn	1,2 x/100V or 1,2x/110V					
Standard scales		1,2 times the primary of the voltage transformer					
DIRECT VOLTMETERS							
Measuring range	Vn	150, 200, 250, 300, 400, 500 and 600 V					

Dimensions (mm)

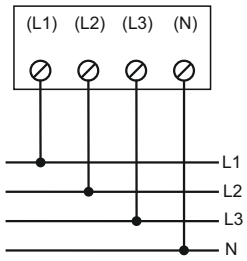


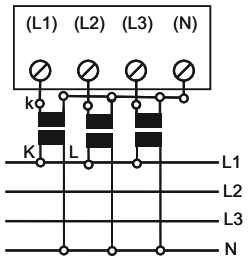
Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
EC4V3 **EC4V6** **EC4V7**	V	72	66,5	$68^{+0,7}$	68	65	M.4
EC3V3 **EC3V6** **EC3V7**	V	96	89	$92^{+0,8}$	67	100	M.4
EC4V4	A	72	66,5	$68^{+0,7}$	68	65	M.4
EC3V4	A	96	89	$92^{+0,8}$	67	100	M.4

Connection diagrams



Current





Voltage

MOVING COIL WITH CONVERTER

Voltage and current measuring on alternating current circuits.
True RMS

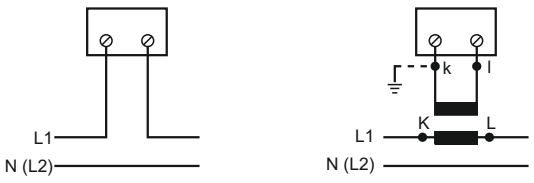
AMMETERS
VOLTMETERS

- Scale: 240º
- Accuracy: 1,5 %
- Frequency: 20..100 Hz
- Burden: 2,5 VA

Model		EC5CE*	EC4CE*	EC3CE	EC2CE
Dimensions	mm	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,84	0,84	0,87	1,55
CT OPERATED AMMETERS					
Module	In	X/5A or X/1A			
Standards scales		10; 15; 20; 25; 30; 40; 50; 60 or 75 A and multiples			
Module	2xIn	2X/5A or 2X/1A			
Standards scales		10..20; 15..30; 20..40;25..50 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples			
Module	5xIn	5X/5A or 5X/1A			
Standards scales		10..50; 15..75; 20..100; 25..125; 30..150; 40..200; 50..250; 60..300 or 75..375 A and multiples			
DIRECT INPUT AMMETERS					
Measuring range	In	1; 1,5; 2,5; 4; 5; 6 or 10 A			
	2xIn	1..2; 1,5..3; 2,5..5; 4..8; 5..10; 6..12 or 10..20 A			
	5xIn	1..5; 1,5..7,5; 2,5..12,5; 4..20; 5..25; 6..30 or 10..50 A			
VT OPERATED VOLTMETERS					
Measuring range		1,2 x/100V or 1,2x/110V			
Standards scales	Vn	1,2 times the primary of the voltage transformer			
DIRECT INPUT VOLTMETERS					
Measuring range	Vn	50; 60; 100; 150; 250; 300; 400; 500 or 600 V			

* With additional module: MBRMS model

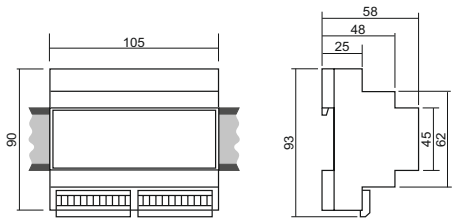
Connection diagrams — Current



Connection diagrams — Voltage

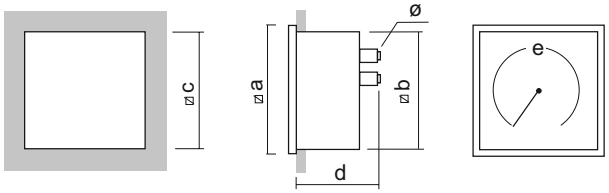
Dimensions (mm)

Din rail MBRMS additional module



Weight = 0,240
Plug-in connectors

Dimensions (mm)



Models	Ranges	Ø a	Ø b	Ø c	d	e	ø
EC5CE	A - V	48	44,5	45+0,6	83	72	M.4
EC4CE	A - V	72	66,5	68+0,7	88	101	M.4
EC3CE	A - V	96	89	92+0,8	74	140	M.4
EC2CE	A - V	144	135	138+1	88	220	M.4

MOVING COIL WITH RECTIFIER

Voltage and alternating current measuring (average value of the signal)

AMMETERS (µA,mA and A)
VOLTMETERS

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 50 or 60 Hz

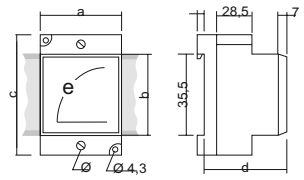
Models		CC5VR	CC5VG	CC4VG	CC3VG	CC2VG	CCb7G	CCb3G	CCb8G
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144	80x64	105x80	130x100
Approx. weight	kg.	0,15	0,14	0,20	0,28	0,50	0,15	0,19	0,25
AMMETERS (µA, mA and A)									
MEASURING RANGE	In	40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 µA							
		1; 1,5; 2; 2,5; 3; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 mA							
		1; 1,5; 2; 2,5; 3; 4 or 5 A							
VT OPERATED VOLTMETERS									
Measuring range	Vn	1,2 x/100V or 1,2 x/110V							
Standards scales		1,2 times the primary of the voltage transformer							
DIRECT INPUT VOLTMETERS									
Measuring range	Vn	6; 10; 15; 25; 30; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V							

AMMETERS (µA, mA and A)
VOLTMETERS

-Scale: 240º
-Accuracy: 1,5 %
-Frequency: 50 or 60 Hz

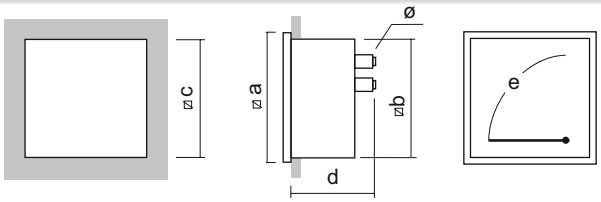
Model		CC5CG	CC4CG	CC3CG	CC2CG
Dimensions	mm	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,20	0,32	0,38	0,68
DIRECT INPUT AMMETER (µa, mA y A)					
MEASURING RANGE	In	150; 200; 300; 400; 500 or 600 µA			
	In	1; 1,5; 2; 2,5; 3; 4; 5; 6; 10; 15; 20; 25; 30; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 mA			
	In	1; 1,5; 2; 2,5; 3; 4; 5; 10 or 15 A			
	2xIn	1..2; 1,5..3; 2..4; 2,5..5; 3..6; 4..8; 5..10; 10..20 or 15..30 A			
	5xIn	1..5; 1,5..7,5; 2..10; 2,5..12,5; 3..15; 4..20; 5..25; 10..50 or 15..75 A			
CT OPERATED AMMETERS					
Module	In	X/5A or X/1A			
Standards scales		10; 15; 20; 25; 30; 40; 50; 60 or 75 A and multiples			
Module	2xIn	2X/5A or 2X/1A			
Standards scales		10..20; 15..30; 20..40; 25..50 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples			
Module	3xIn	5X/5A or 5X/1A			
Standards scales		10..50; 15..75; 20..100; 25..125; 30..150; 40..200; 50..250; 60..300 or 75..375 A and multiples			
VT OPERATED VOLTMETERS					
Measuring range	Vn	1,2 x/100V ó 1,2 x/110V			
Standards scales		1,2 times the primary of the voltage transformer			
DIRECT INPUT VOLTMETERS					
Measuring range	Vn	6; 10; 15; 25; 30; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V			

Dimensions (mm)



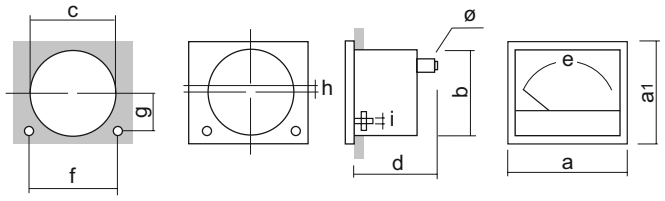
Models	Ranges	a	b	c	d	e	ø
CC5VRG	µA; mA; A; V	52,5	45	75	60	38	M.6

Dimensions (mm)



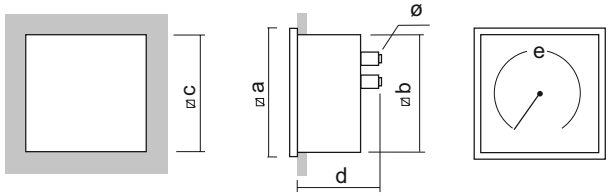
Models	Ranges	⍁a	⍁b	⍁c	d	e	ø
CC5VG	µA; mA; A; V	48	44,5	$45^{+0,6}$	63	38	M.4
CC4VG	µA; mA; A; V	72	66,5	$68^{+0,7}$	64	65	M.4
CC3VG	µA; mA; A; V	96	89	$92^{+0,8}$	63	100	M.4
CC2VG	µA; mA; A; V	144	135	138^{+1}	63	140	M.4

Dimensions (mm)



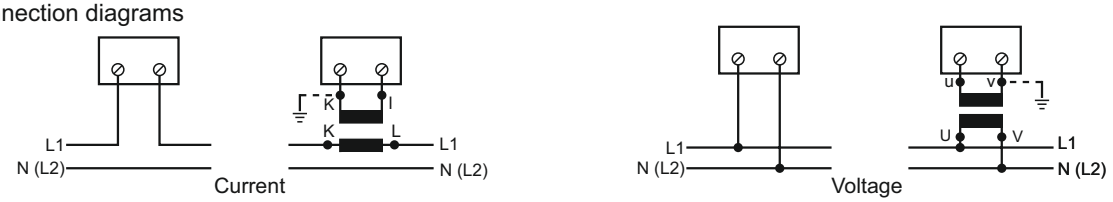
Models	Ranges	a x a1	Ø b	Ø c	d	e	f	g	h	i	ø
CCb7G	µA; mA; A; V	80x64	57,6	$58,6^{+0,6}$	59	57	63	12,5	1,5	M.3	M.4
CCb3G	µA; mA; A; V	105x80	66	$67^{+0,7}$	59	75	81	13	4,5	M.3	M.4
CCb8G	µA; mA; A; V	130x100	66	$67^{+0,8}$	59	100	100	13	13	M.4	M.4

Dimensions (mm)



Models	Ranges	⍁a	⍁b	⍁c	d	e	ø
CC5CG	µA; mA; A; V	48	44,5	$45^{+0,6}$	87	72	M.4
CC4CG	µA; mA; A; V	72	66,5	$68^{+0,7}$	92	101	M.4
CC3CG	../5 A The rest	96	89	$92^{+0,8}$	92 78	140	M.4
CC2CG	µA; mA; A; V	144	135	138^{+1}	92	220	M.4

Connection diagrams



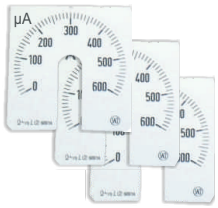
MOVING COIL WITH RECTIFIER

Voltage and alternating current measuring (sinusoidal waveforms)

AMMETERS (µA, mA and A)
VOLTMETERS

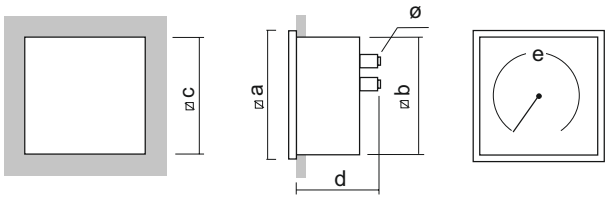
(INTERCHANGEABLE SCALE)

- Scale: 90º
- Frequency: 50 or 60 Hz
- Accuracy: 1,5 %



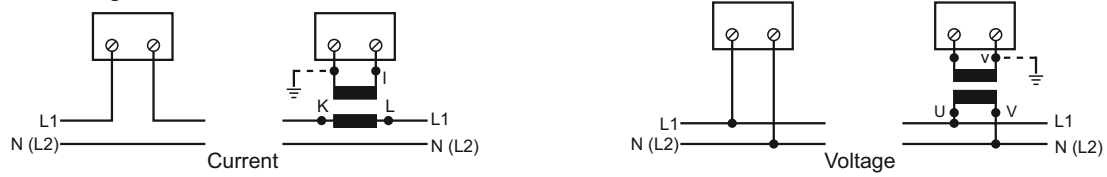
Model		CC3CGS
Dimensions	mm	96x96
Approx. weight	kg.	0,38
AMMETERS (µA, mA)		
MEASURING RANGE	In	150; 200; 300; 400; 500 or 600 µA
	In	1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 mA
AMMETERS (A)		
MEASURING RANGE	In	1; 1,5; 2; 2,5; 3; 4; 5; 10 or 15 A
	2xIn	1..2; 1,5..3; 2..4; 2,5..5; 3..6; 4..8; 5..10; 10..20 or 15..30 A
	5xIn	1..5; 1,5..7,5; 2..10; 2,5..12,5; 3..15; 4..20; 5..25; 10..50 or 15..75 A
VT OPERATED VOLTMETERS		
Measuring range	Vn	X/100V or X/110V
Standard scales		1,2 times the primary of the voltage transformer
DIRECT INPUT VOLTMETERS		
Measuring range	Vn	6; 10; 15; 25; 40; 60; 100; 150; 250; 300; 400; 500 or 600 V

Dimensions (mm)



Models	Ranges	a	b	c	d	e	ø
CC3CGS	µA; mA; A; V	96	89	92	63	160	M.4

Connection diagrams

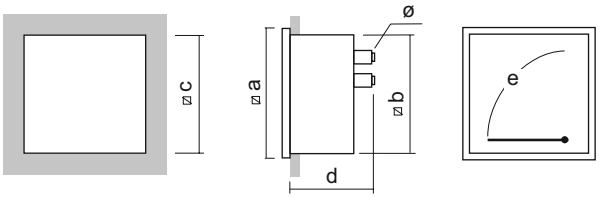


RATED VALUE VOLTMETERS

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 50 or 60 Hz
- Burden: 2 mA

Models		CC4VGN	CC3VGN	CC2VGN
Dimensions	mm	72x72	96x96	144x144
Approx. weight	kg.	0,17	0,25	0,48
VOLTMETERS				
Measuring range	Vn	100; 110; 230 or 400 V		
Standards scales	Vn	90..110 V or ±10% X/100 V 100..120 V or ±10% X/110 V 210..250 V 380..420 V		

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
CC4VGN	V	72	66,5	$68^{+0,7}$	64	38	M.4
CC3VGN	V	96	89	$92^{+0,8}$	63	65	M.4
CC2VGN	V	144	135	138^{+1}	63	100	M.4

Connection diagrams

Voltage

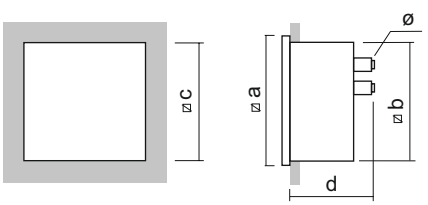
ELAPSED TIME METER

Operating time control of machines and equipment.

- Meter: mechanical, 7 digits (99999.99)
- Voltage (Vn): 110, 230, 400 V - Burden: 10 mA
- Voltage range: ±10 % Vn - Frequency: 50 or 60 Hz

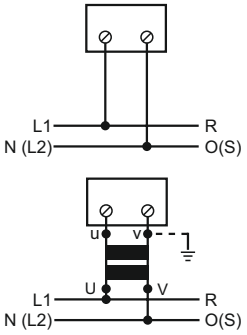
Models		HC5	HC4	HC3
Dimensions	mm	48x48	72x72	96x96
Approx. weight	kg.	0,06	0,14	0,175

Dimensions (mm)



Models	Ranges	ø a	ø b	ø c	d	ø
HC5	110÷400	48	44,5	$45,2^{+0,6}$	34	M.3
HC4	110÷400	72	66,5	$68^{+0,7}$	60	M.3
HC3	110÷400	96	89	$92^{+0,8}$	60	M.3

Connection diagrams



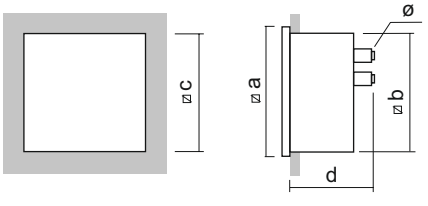
PHASE SEQUENCE INDICATORS

Phase sequence detection on a three-phase system.

- Voltage: (Vn): 100..600 V - Burden: 1,2 VA
- Frequency: 50 or 60 Hz

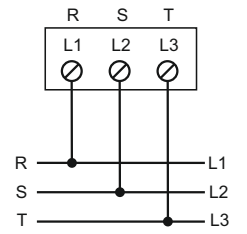
Models		IRC4E	IRC3E
Dimensions	mm	72x72	96x96
Approx. weight	kg.	0,20	0,26

Dimensions (mm)



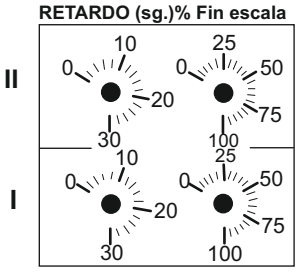
Models	Ranges	ø a	ø b	ø c	d	ø
IRC4E	100÷600 V	72	66,5	$68^{+0,7}$	79	M.4
IRC3E	100÷600 V	96	89	$92^{+0\,8}$	78	M 4

Connection diagrams



INSTRUMENTS WITH CONTACTS

2 contacts and 2 control LEDs.
Rear adjustment.
2 channels.
2 potentiometers per channel.



MODELS
..A/1 - 1Min. and 1 Max. contact
..A/2 - 2Max. or Min contacts

Setting:	0 - 100% of full scale value or ±100% (bidirectional)
Delay time:	0-30 s. ±10%
Repeatability:	±1% of full scale value
Output relays:	2 (Max. 400 V, 1 A, 200 VA AC.)
Mechanical life:	107 operations
Control unit cover:	Lockable
Auxiliary power supply:	110, 230, 400 V AC. Burden, 3 VA.

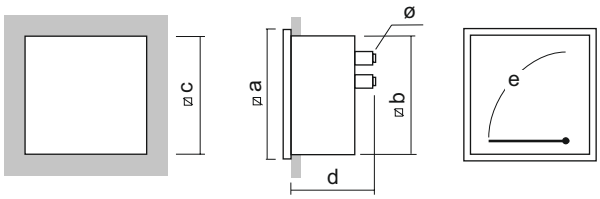
Technical specifications same as pointer instruments.

- MOVING IRON (mA y A)
- MOVING COIL (mV, V, µA, mA and A)
- MOVING COIL WITH RECTIFIER (mV, V, mA and A)
- FREQUENCY METERS (Hz)
- MEASURERS FOR CONVERTERS (mA and V)

- Scale: 90º
- Accuracy: 1,5 %
- Frequency: 50 or 60 Hz

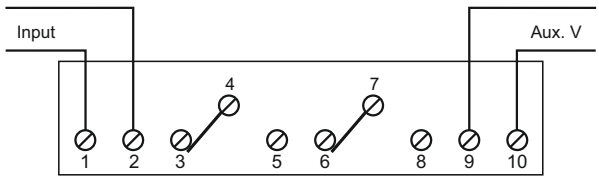
Models		..A/1	..A/2
Contacts		1 Min. - 1 Max.	2 Max.-
Dimensions	mm	96x96	96x96
Approx. weight	kg.	0,55	0,55

Dimensions (mm)



Models	Ranges	⍁a	⍁b	⍁c	d	e	ø
C3V-A/1	-	96	89	92	98	100	M.4
C3V-A/2	-	96	89	92	98	100	M.4

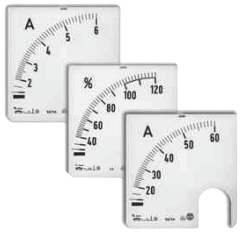
Connection diagrams



With voltage on 9-10; 4-5 and 7-8 closed.
With alarm, 3-4 and 6-7 closed.

BIMETAL

Maximum demand ammeters for alternating current:
Effective current value averaged over 15 or 8 minutes.



MAXIMUM DEMAND AMMETERS

(INTERCHANGEABLE SCALE)

- Measuring range: 5A, 1A
- Scale: 90º
- Frequency: 0..1000 Hz
- Accuracy: 2,5 %
- Burden: 2,3 VA

Models		BC5VR*	BC5V*	BC4V	BC3V	BC2V***
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,25	0,09	0,20	0,25	0,60
MAXIMUM DEMAND AMMETER (INTERCHANGEABLE SCALE)						
Module	1,2xIn	1,2X/5A or 1,2X/1A				
Scales		1,2; 6; 12; 18; 24; 30; 36; 48; 60; 72, 90 A or 120% and multiples				

* 1.2X/5A only
*** BC2V, interchangeable scale not available

MAXIMUM DEMAND AMMETERS WITH CONTACTS

BIMETALLIC SYSTEM WITH ALARM CIRCUIT

- Measuring range: 5A, 1A
- Scale: 90º
- Frequency: 0..1000 Hz
- Accuracy: 2,5 %
- Burden: 2,3 VA

Models		BC4VA	BC3VA	BC2VA
Dimensions	mm	72x72	96x96	144x144
Approx. weight	kg.	0,20	0,25	0,60
MAXIMUM DEMAND AMMETERS WITH CONTACTS				
Module	1,2xIn	1,2X/5A or 1,2X/1A		
Scales		1,2; 6; 12; 18; 24; 30; 36; 48; 60; 72, 90 A or 120% and multiples		

ALARM CIRCUIT:

- Max. with contacts (red LED)
- Aux. V: 100; 110; 230; 400 V (AC.) Burden: 3.75 VA (AC.)
- Aux. V: 12; 24; 48 V (DC.) Burden: 66; 56; 38 mA (DC.)
- Relay output: 1 Relay (Max. 400 V, 1 A, 200 VA)
- Accuracy: 2%
- Hysteresis: ≤1%
- Adjustable from the front

BIMETAL + MOVING IRON

MAXIMUM DEMAND AMMETERS (bimetallic system) with moving iron system.

DOUBLE AMMETERS

(INTERCHANGEABLE SCALE)

- Measuring range: 5A, 1A
- Frequency: 15..100 Hz
- Scale: 90º
- Burden: 2,7 VA
- Accuracy: 2,5 % (bimetallic syst.) / 1,5% (moving iron system)

Model		BEC4V	BEC3V	BEC2V**
Dimensions	mm	72x72	96x96	144x144
Approx. weight	kg.	0,23	0,31	0,60
DOUBLE AMMETERS (INTERCHANGEABLE SCALE)				
Module				
Bimetal	1,2xIn	1,2X/5A or 1,2X/1A		
Moving iron	2xIn	2X/5A or 2X/1A		
Scales				
Bimetal	1,2xIn	1,2; 6; 12; 18; 24; 30; 36; 48; 60; 72, 90 A or 120%		
Moving iron	2xIn	1..2; 5..10; 10..20; 15..30; 20..40; 25..50; 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples		

** BC2V, interchangeable scale not available

DOUBLE AMMETERS WITH CONTACTS

BIMETALLIC SYSTEM WITH ALARM CIRCUIT

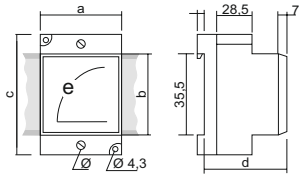
- Measuring range: 5A, 1A
- Frequency: 15..100 Hz
- Scale: 90º
- Burden: 2,7 VA
- Accuracy: 2,5 % (bimetallic syst.) / 1,5% (moving iron system)

Models		BEC4VA	BEC3VA	BEC2VA
Dimensions	mm	72x72	96x96	144x144
Approx. weight	kg.	0,40	0,50	0,88
DOUBLE AMMETERS (WITH CONTACTS)				
Module				
Bimetal	1,2xIn	1,2X/5A or 1,2X/1A		
Moving iron	2xIn	2X/5A or 2X/1A		
Scales				
Bimetal	1,2xIn	1,2; 6; 12; 18; 24; 30; 36; 48; 60; 72, 90 A or 120%		
Moving iron	2xIn	1..2; 5..10; 10..20; 15..30; 20..40; 25..50; 30..60; 40..80; 50..100; 60..120 or 75..150 A and multiples		

ALARM CIRCUIT:

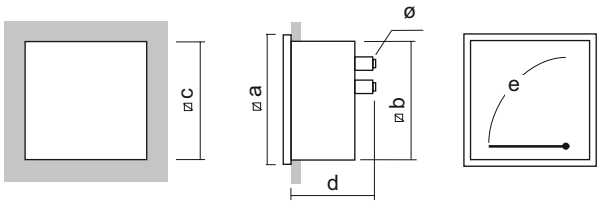
- Max. with contacts (red LED)
- Aux.V: 100; 110; 230; 400 V (AC.) Burden: 3.75 VA (AC.)
- Aux.V: 12; 24; 48 V (DC.) Burden: 66; 56; 38 mA (DC.)
- Relay output: 1 Relay (Max. 400 V, 1 A, 200 VA)
- Accuracy: 2%
- Hysteresis: ≤1%
- Adjustable from the front

Dimensions (mm)



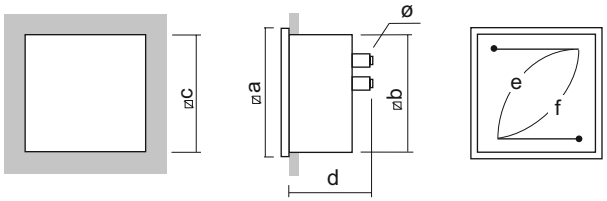
Models	Ranges	a	b	c	d	e	ø
BC5VR	/5 A	52,5	45	75	60	38	M.6

Dimensions (mm)



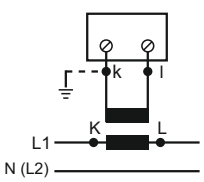
Models	Ranges	□a	□b	□c	d	e	ø
BC5V	/5 A	48	44,5	$45^{+0,6}$	59	38	M.4
BC4V	../1 ../5	72	66,5	$68^{+0,7}$	88	65	M.4
BC3V	../1 ../5	96	89	$92^{+0,8}$	92 88	100	M.4
BC2V	../1 ../5	144	135	138^{+1}	88	140	M.4
BC4VA	../1 ../5	72	66,5	$68^{+0,7}$	93	65	M.4
BC3VA	../1 ../5	96	89	$92^{+0,8}$	92	100	M.4
BC2VA	../1 ../5	144	135	138^{+1}	92	140	M.4

Dimensions (mm)

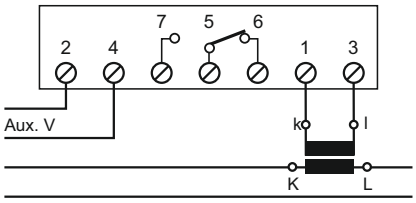


Models	Ranges	□a	□b	□c	d	e	f	ø
BEC4V	../1 ../5	72	66,5	$68^{+0,7}$	124 88	65	65	M.4
BEC3V	../1 ../5	96	89	$92^{+0,8}$	92 88	100	100	M.4
BEC2V	../1 ../5	144	135	138^{+1}	88	140	140	M.4
BEC4VA	../1 ../5	72	66,5	$68^{+0,7}$	124	65	65	M.4
BEC3VA	../1 ../5	96	89	$92^{+0,8}$	88	100	100	M.4
BEC2VA	../1 ../5	144	135	138^{+1}	88	140	140	M.4

Connection diagrams



Maximum demand and double ammeters with contacts



Maximum demand and double ammeters

MOVING COIL

Voltage and current measuring on direct current circuits.

AMMETERS (INTERCHANGEABLE SCALE)

Via resistors (Shunt)

- Scale: 90º
- Accuracy: 1,5 %
- Measuring range: 60 mV, 150 mV
- Burden: 60 - 150 Ω

Model		CC5VR	CC5V	CC4V	CC3V
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96
Approx. weight	kg.	0,10	0,09	0,21	0,28
AMMETERS (INTERCHANGEABLE SCALE)					
Module	Vn	X/60mV or X/150mV			
Scales	In	1, 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 30; 40; 50; 60; 80 or 100A and multiples			

IP20 protection

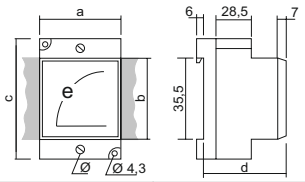
AMMETERS (µA, mA and A)
VOLTMETERS (mV, and V)

- Scale: 90º
- Accuracy: 1,5 %

Model		CC5VR*	CC5V	CC4V	CC3V	CC2V	CCb7	CCb3	CCb8
Dimensions	mm	45x52,5 DIN	48x48	72x72	96x96	144x144	80x64	105x80	130x100
Approx. weight	kg.	0,25	0,09	0,21	0,28	0,50	0,15	0,19	0,25
AMMETERS (µA)									
MEASURING RANGE	In	40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 µA							
		AMMETERS (mA)							
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 mA 4-20 mA							
		AMMETERS (A)							
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40 or 50 A							
	Vn	VOLTMETERS (mV)							
		10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 mV							
		VOLTMETERS (V)**							
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V							

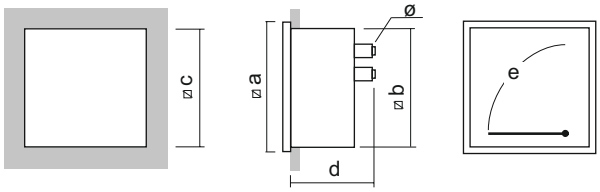
* Maximum measuring 40 A
** >600-<1000 V, resistor box 1.2.1. (page 42) /1000-2000 V, resistor box - 3.3.1 / >2000-4000 V, resistor box -3.3.2 (page 42)

Dimensions (mm)



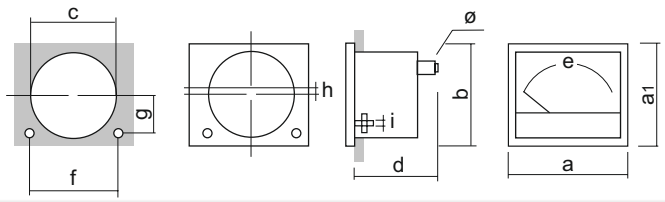
Models	Ranges	a	b	c	d	e	ø
CC5VR	µA; mA; A; V	52,5	45	75	60	38	M.6

Dimensions (mm)



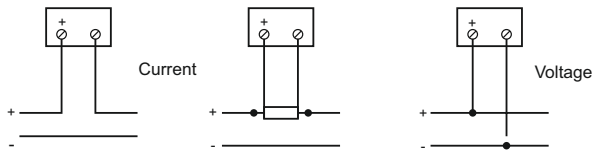
Models	Ranges	⧄a	⧄b	⧄c	d	e	ø
CC5V	x/60..x/150 mV	48	44,5	45+0,6	59	38	M.4
CC4V	x/60..x/150 mV	72	66,5	68+0,7	60	65	M.4
CC3V	x/60..x/150 mV	96	89	92+0,8	59	100	M.4
CC5V	>4..15 A >15..50 A The rest	48	44,5	45+0,6	63 62 59	38	M.4 M.6 M.4
CC4V	>4..15 A >15..50 A The rest	72	66,5	68+0,7	63 68 60	65	M.4 M.6 M.4
CC3V	>4..15 A >15..50 A The rest	96	89	92+0,8	63 68 59	100	M.4 M.6 M.4
CC2V	>4..15 A >15..50 A The rest	144	135	138+1	63 68 59	140	M.4 M.6 M.4

Dimensions (mm)



Models	Ranges	axa1	b	c	d	e	f	g	h	i	ø
CCb7	<4...15A >15..50 A The rest	80x64	57,6	58,6+0,6	63	59 57 55	63	12,5	1,5	M.3	M.4 M.6 M.4
CCb3	<4...15A >15..<50 A The rest	105x80	66	67+0,7	63	59 75 55	81	13	4,5	M.3	M.4 M.6 M.4
CCb8	<4...15A >15..<50 A The rest	130x100	66	67+0,8	63 63 55	59 100 100	100	13	13	M.4	M.4 M.6 M.4

Connection diagrams



MOVING COIL

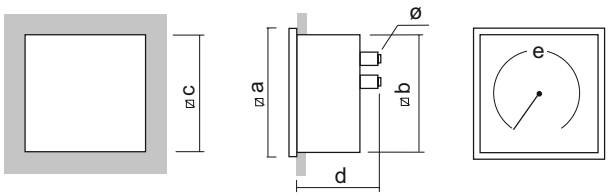
Voltage and current measuring on direct current circuits.

AMMETERS (µA, mA and A)
VOLTMETERS (mV and V)

- Scale: 240º
- Accuracy: 1,5 %

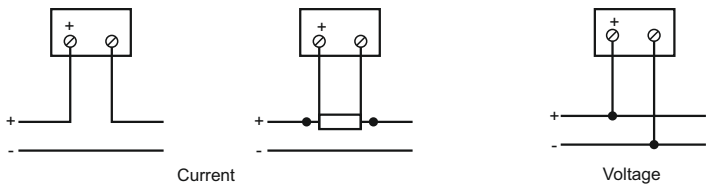
Models		CC5C	CC4C	CC3C	CC2C
Dimensions	mm	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,20	0,32	0,38	0,68
AMMETERS (µA, mA and A)					
MEASURING RANGE	In	150; 200; 300; 400; 500 or 600 µA			
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500; 600 mA or 4-20 mA			
		1; 1,5; 2,5; 4; 5; 6; 10; 15 A			
	VOLTMETERS (mV and V)				
	Vn	60; 100; 150; 250; 300; 400; 500 or 600 mV			
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V			

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
CC5C	>4..15 A	48	44,5	$45^{+0,6}$	87	72	M.4
	The rest				83		M.4
CC4C	>4..15 A	72	66,5	$68^{+0,7}$	92	101	M.4
	The rest				88		M.4
	>4..15 A				78		M.4
CC3C	>4..20 mA	96	89	$92^{+0,8}$	92	140	M.4
	The rest				74		M.4
CC2C	>4..15 A	144	135	138^{+1}	92	220	M.4
	The rest				88		M 4

Connection diagrams

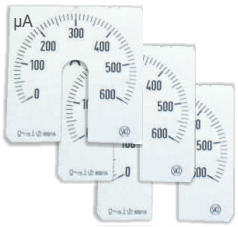


AMMETERS (µA, mA and A)
VOLTMETERS (mV and V)

(INTERCHANGEABLE SCALE)

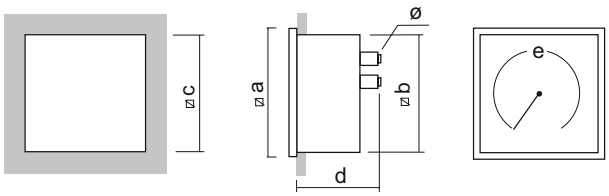
- Scale: 240º
- Accuracy: 1,5 %

NEW



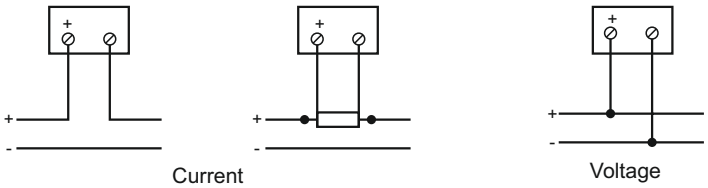
Model		CC3CS
Dimensions	mm	96x96
approx. weight	kg.	0,38
AMMETERS (µA, mA, A)		
MEASURING RANGE	In	150; 200; 300; 400; 500 or 600 µA
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500; 600 mA or 4-20 mA
		1; 1,5; 2,5; 4; 5; 6; 10; 15 A
AMMETERS (INTERCHANGEABLE SCALE)		
MEASURING RANGE	Vn	X/60mV or X/150mV
	In	1, 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 30; 40; 50; 60; 80 or 100A
		and multiples
VOLTMETERS (mV and V)		
MEASURING RANGE	Vn	60; 100; 150; 250; 300; 400; 500 or 600 mV
		1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 40; 50; 60; 100; 150; 250; 300; 400; 500 or 600 V

Dimensions (mm)



Models	Ranges	a	b	c	d	e	ø
CC3CS	µA; mA; A; V	96	89	92	63	160	M.4

Connection diagrams



NON-ELECTRIC UNIT INDICATORS

Parameter measurements from transducers or converters, calibrated according to their function curves.

DIRECT CURRENT

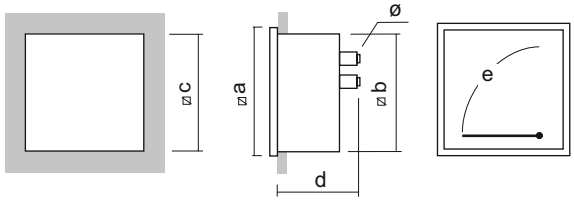
- Scale: 90 or 240º
- Accuracy: 1,5 %

Models		CC5V	CC4V	CC3V
Dimensions	mm	48x48	72x72	96x96
Approx. weight	kg.	0,10	0,21	0,28
VOLTMETERS				
Measuring range	Vn	0-1; 0-5 or 0-10 V	1-5 or 2-10 V	
MILLIAMMETERS				
Measuring range	In	0-1; 0-5; 0-10 or 0-20 mA	4-20 mA	

Model		CC5C	CC4C	CC3C
Dimensions	mm	48x48	72x72	96x96
Approx. weight	kg.	0,20	0,32	0,38
VOLTMETERS				
Measuring range	Vn	0-1; 0-5 or 0-10 V	1-5 or 2-10 V	
MILLIAMMETERS				
Measuring range	In	0-1; 0-5; 0-10 or 0-20 mA	4-20 mA	

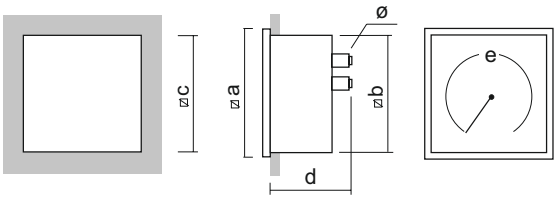
May be manufactured in several models and direct current ranges with or without zero suppressed.
Other features as corresponding models.

Dimensions (mm)



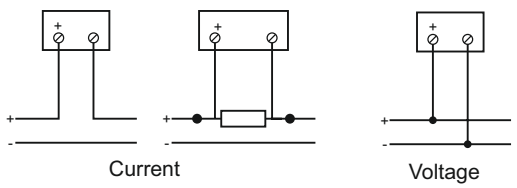
Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
CC5V	V - mA	48	44,5	$45^{+0,6}$	59	38	M.4
CC4V	V - mA	72	66,5	$68^{+0,7}$	60	65	M.4
CC3V	V - mA	96	89	$92^{+0,8}$	59	100	M.4

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
CC5C	V - mA	48	44,5	$45^{+0,6}$	83	72	M.4
CC4C	V - mA	72	66,5	$68^{+0,7}$	88	101	M.4
CC3C	V - mA 4 - 20 mA	96	89	$92^{+0,8}$	74 92	140	M.4

Connection diagrams



Examples of units

mA - A - kA - N - mV - V - kV - kN - Hz
ºφ - ºC - ºF - W - kW - MW - VA
var - kvar - Mvar - kVA - kW - MW - Ω

rpm - % - min^{-1} - m - l/h - pH - m^3/h
mbar - bar - mm - m^3/min - Kg - Kgcm - Kg/cm^2
mm/sec - mmHg - mmH_2O - dB - kPa - MPa

TEMPERATURE INDICATORS

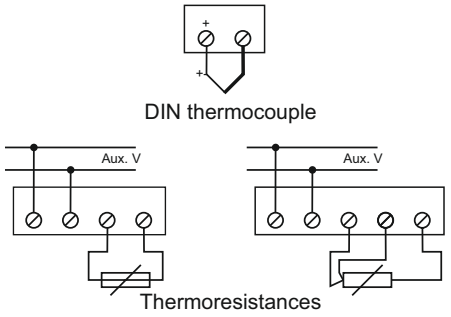
Temperature measuring via thermocouples or thermoresistances.

- Scale: 90 - Accuracy: 1,5 %

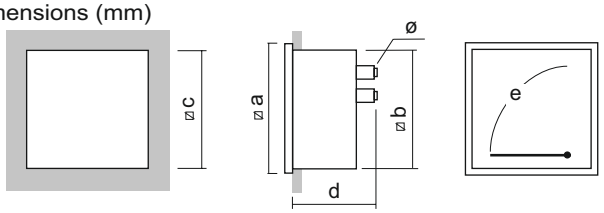
Models		CC4V					CC3V				
Dimensions	mm	72x72					96x96				
Approx. weight	kg	0,20					0,26				
TEMPERATUREINDICATORS - DIN THERMOCOUPLE											
Type		J FE- Const			k Chr-Alu		E Chr-Const	T Cu-Const			S Pt-PtRh
Scales		20-400º	20-600º	20-900º	20-600º	20-900º	20-1200º	20-1000º	20-400º	20-1200º	20-1600º
Ranges		20,83	32,08	50,86	24,10	36,53	48,03	75,16	20,08	11,83	16,66
TEMERATURE INDICATORS -THERMORESISTANCES											
Type		Pt-100 DIN					NI-100 DIN				
Scales		0-100º		0-150º			0-100º		0-150º		
Aux. V	V	12, 24, 48 or 110 V C.C					12, 24, 48 or 110 V C.C				
		-					110, 230, or 400 V C.A				

The instrument indicates the temperature difference between the thermocouple welding point and the connection point of the two thermocouple elements with the instrument interconnection line. If, in this last connection point, the temperature is 20° higher than the instrument calibration point, then a suitable correction line in each thermocouple is necessary.
The instrument is calibrated according to the thermometric resistance boards. The 2 or 3 wire connection must be specified.

Conection diagrams



Dimensions (mm)



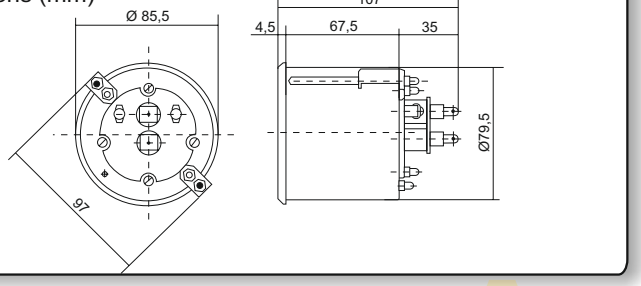
Models	Ranges	Ø a	Ø b	Ø c	d	e	ø
CC4V	V	72	66,5	$68^{+0,7}$	60	65	M.4
CC3V	V	96	89	$92^{+0,8}$	59	100	M.4

SPECIAL EXECUTIONS: MOBILE INSTRUMENTS - CR2C

Moving coil Instrument for mobile equipment (railways, tractor).

Measuring range and scales: please enquire.
Scale: 240º Black scale
Accuracy: 1.5% Aux. v: 12 or 24 V (DC.)
Shock resistance: 15 g Vibration resistance: 10..55 Hz
White or yellow pointer, numbering and division

Dimensions (mm)



SHUNTS

High value current connection on direct current circuits.

- Accuracy: 0,5%
- Overloads:

Operating t.: -20..+60 ºC
1.2 In continuously
10 In 5 s (10..500 A)
5 In 5 s (600..2000 A)
2 In 5 s (2500..4000 A)

DIN 43703 standard

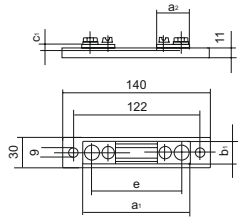
Models		Form 1		Form 2		Form 3	
Voltage drop	mV	60 mV	150 mV	60 mV	150 mV	60 mV	150 mV
MEASURING RANGE	In	1; 1,5; 2,5; 4; 5; 6; 10; 15; 20; 25; 30; 40; 50; 60; 80; 100 or 150		200; 250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1500; 2000 or 2500	200; 250; 300; 400; 500; 600; 750; 800 or 1000	3000 or 4000	1200; 1500; 2000 ó 2500

Aproximate weight (Kg).																		
In	1	1,5	2,5	4	5	6	10	15	20	25	30	40	50	60	80	100	150	200
60 mV	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,120	0,120	0,125	0,125	0,125	0,125	0,130	0,535
150 mV	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,140	0,160	0,170	0,175	0,180	0,190	0,210	0,240	0,750
In	250	300	400	500	600	750	800	1000	1200	1500	2000	2500	3000	4000	-	-	-	-
60 mV	0,540	0,815	0,820	0,830	0,840	1,420	1,420	1,440	1,970	1,990	2,870	2,990	4,220	4,300	-	-	-	-
150 mV	0,790	1,130	1,200	1,250	1,310	2,350	2,390	2,510	3,670	3,860	5,220	5,530	-	-	-	-	-	-

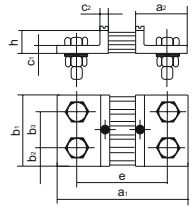
Voltage drop mV	Rated current A	Exec. according to figure	a1	a2	b1	b2	b3	c1	c	eh		Current splice				Voltage splice
												Nº. of screws	Hexagonal screw DIN 933-5-8	Washer DIN 125-Sc	Nut DIN 934-5	
60	1; 1,5; 2,5; 4; 5*; 6; 10; 15; 20*; 25	1	100	33	20	-	-	8	-	80	-	2 x 1	M.8x16	8,4	-	2 M.5x8 cylinder-head screw DIN 84-4.8 and 2 ø 5.3 washers DIN 433-St.
	30*; 40; 50; 60; 80*; 100; 150	1	100	33	20	-	-	8	-	80	-	2 x 1	M.8x16	8,4	-	
	200*; 250	2	145	55	30	15	-	10	10	105	30	2 x 1	M.12x40	13	M.12	
	300*; 400; 500*; 600				40	20	-						M.16x45	17	M.16	
	750*; 800*; 1000	2	165	65	60	30	-	10	10	115	30	2 x 1	M.20x50	21	M.20	
	1200*; 1500				90	21	48					2 x 2	M.16x45	17	M.16	
	2000*; 2500	2	165	65	120	30	60	10	10	115	30	2 x 2	M.20x50	21	M.20	
	3000*; 4000	3						15			60		M.20x60			
150	1; 1,5; 2,5; 4; 5*; 6; 10; 15; 20*; 25	1	100	33	20	-	-	8	-	80	-	2 x 1	M.8x16	8,4	-	
	30*; 40; 50; 60; 80*; 100; 150	1	225	33	25	-	-	8	-	205	-	2 x 1	M.8x16	8,4	-	
	200*; 250	2	270	55	30	15	-	10	10	230	50	2 x 1	M.12x40	13	M.12	
	300*; 400; 500*; 600				40	20	-						M.16x45	17	M.16	
	750*; 800*	2	275		85	42,5	-			240			M.20x60	21	M.20	
	1000*	2				21	43					2 x 2	M.16x45	17	M.16	
	1200*; 1500	3	290	65	90	21	48	15	10	240	60	2 x 2	M.16x60	17	M.16	
	2000*; 2500	3			120	30	60						M.20x60	21	M.20	

* Non-DIN ranges, but of standard production.

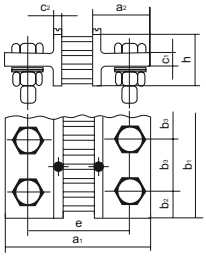
Form 1



Form 2

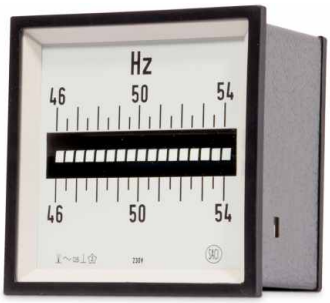


Form 3



FREQUENCY METERS

System frequency measuring.

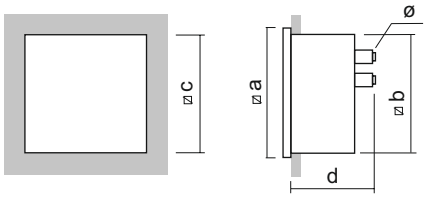


REED FREQUENCY METERS

- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110
  230, 400, 440 V
- Accuracy: 0,5 %
- Burden: 1,2..2,2 VA
  FC3VI, FC2VI:
  2x (1,2..2,2 VA)

Model		FC5V	FC4V	FC3V		FC2V	FC3VI	FC2VI
Dimensions	mm	48x48	72x72	96x96		144x144	96x96	144x144
Approx. weight	kg.	0,23	0,39	0,47		0,88	0,84	1,50
REED FREQUENCY METERS								
Reed		7	13	13	17	21	2x17	2x21
Scales	Hz	48,5..51,5 58,5..61,5	47..53 57..63	47..53 57..63	46..54 56..64	45..55 55..65	46..64	45..65

Dimensions (mm)



Models	Ranges	⧄a	⧄b	⧄c	d	ø
FC5V	100÷440	48	44,5	$45^{+0,6}$	59	M.4
FC4V	100÷440	72	66,5	$68^{+0,7}$	75	M.4
FC3V	100÷440	96	89	$92^{+0,8}$	74	M.4
FC2V	100÷440	144	135	138^{+1}	88	M.4
FC3VI	100÷440	96	89	$92^{+0,8}$	124	M.4
FC2VI	100÷440	144	135	138^{+1}	88	M.4

Conection diagrams

POINTER FREQUENCY METERS

- Voltage range: ±15 % Vn
- Voltage (Vn): 100, 110, 230, 400, 440 V
- Accuracy: 0,5 %
- Burden: 10 mA

SCALE 90º

Models		FC5VR	FC5A	FC4A	FC3A	FC2A	FC5ARI	FC5AI	FC4AI	FC3AI	FC2AI
Dimensions	mm	45x52,5	48x48	72x72	96x96	144x144	45x52,5	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,20	0,20	0,21	0,28	0,50	0,20	0,20	0,21	0,28	0,50
POINTER FREQUENCY METERS 90º											
Scales	Hz	45..55; 48..52; 55..65; 58..62 or 380..420 Hz					45..65 Hz				

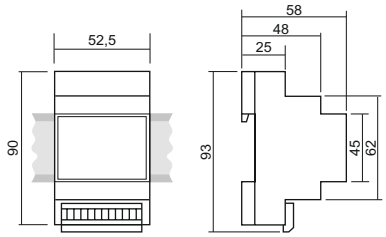
SCALE 240º

Models		FC5C	FC4C	FC3C	FC2C	FC5CI*	FC4CI	FC3CI	FC2CI
Dimensions	mm	48x48	72x72	96x96	144x144	48x48	72x72	96x96	144x144
Approx. weight	kg.	0,25	0,46	0,55	1,05	0,25	0,46	0,55	1,05
POINTER FREQUENCY METERS 240º									
Scales	Hz	45..55; 48..52; 55..65; 58..62 or 380..420 Hz				45..65 Hz			

* With additional module: MBF model

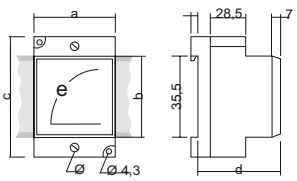
Dimensions (mm)

DIN rail MBFmodule



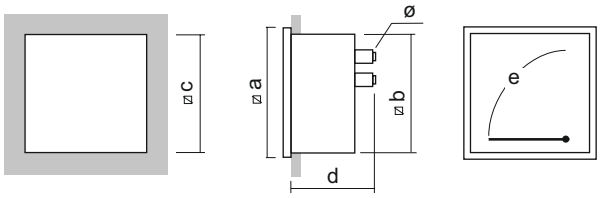
Weight= 0,120
Plug-in connectors

Dimensions (mm)



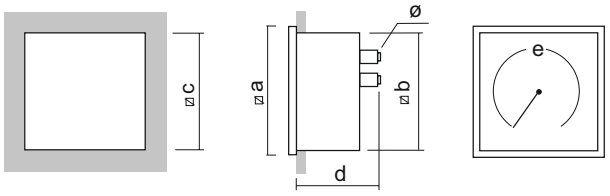
Models	Ranges	a	b	c	d	e	ø
FC5AR	100÷230	52,5	45	75	60	38	M.6
FC5ARI	100÷230	52,5	45	75	60	38	M.6

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
FC5A	100÷440	48	44,5	$45^{+0,6}$	83	38	M.4
FC4A	100÷440	72	66,5	$68^{+0,7}$	64	65	M.4
FC3A	100÷440	96	89	$92^{+0,8}$	63	100	M.4
FC2A	100÷440	144	135	138^{+1}	63	140	M.4
FC5AI	100÷440	48	44,5	$45^{+0,6}$	83	38	M.4
FC4AI	100÷440	72	66,5	$68^{+0,7}$	64	65	M.4
FC3AI	100÷440	96	89	$92^{+0,8}$	63	100	M.4
FC2AI	100÷440	144	135	138^{+1}	63	140	M.4

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
FC5C	100÷440	48	44,5	$45^{+0,6}$	83	72	M.4
FC4C	100÷440	72	66,5	$68^{+0,7}$	92	101	M.4
FC3C	100÷440	96	89	$92^{+0,8}$	128	140	M.4
FC2C	100÷440	144	135	138^{+1}	92	220	M.4
FC5CI	100÷440	48	44,5	$45^{+0,6}$	83	72	M.4
FC4CI	100÷440	72	66,5	$68^{+0,7}$	92	101	M.4
FC3CI	100÷440	96	89	$92^{+0,8}$	128	140	M.4
FC2CI	100÷440	144	135	138^{+1}	92	220	M.4

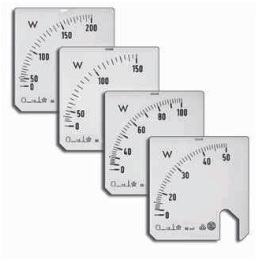
Connection diagrams

WATTMETERS (ELECTRONIC)

System active power measuring.

Alternating current

- Frequency: 50 or 60 Hz
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110 230, 400, 440 V
- Current range: 20-120%
- Current input: (In): 5A, 1A
- Accuracy: 1,5 %
- Burden: 3..12 mA (Voltage circuits)
- Burden: 1..3,5 VA (Current circuits)



		90° SCALE	90° SCALE			
Dimensions	mm	45x52,5 CARRIL DIN	48x48	72x72	96x96	144x144
A.C SINGLE PHASE - BALANCE THREE-PHASE						
Approx. weight	kg.	0,55	0,55	0,55	0,84	0,84
A.C. Single-phase		**WC5VRE***	**WC5VE***	**WC4VE***	**WC3VE**	**WC2VE**
3-phase, 3 or 4 wire		**WC5VRIE***	**WC5VIE***	**WC4VIE***	**WC3VIE**	**WC2VIE**
UNBALANCE THREE-PHASE						
Approx. weight	kg.	1,00	1,00	1,00	1,55	1,55
3-phase, 3 wire		**WC5VRIIE***	**WC5VIIE***	**WC4VIIE***	**WC3VIIE**	**WC2VIIE**
3-phase, 4 wire		**WC5VR3E***	**WC5V3E***	**WC4V3E***	**WC3V3E**	**WC2V3E**

		240 ° SCALE			
Dimensions	mm	48x48	72x72	96x96	144x144
A.C SINGLE PHASE - BALANCE THREE-PHASE					
Approx. weight	kg.	0,55	0,55	0,84	0,84
A.C. Single-phase		**WC5CE***	**WC4CE***	**WC3CE**	**WC2CE**
3-phase, 3 or 4 wire		**WC5CIE***	**WC4CIE***	**WC3CIE**	**WC2CIE**
UNBALANCE THREE-PHASE					
Approx. weight	kg.	1,00	1,00	1,55	1,55
3-phase, 3 wire		**WC5CIIE***	**WC4CIIE***	**WC3CIIE**	**WC2CIIE**
3-phase, 4 wire		**WC5C3E***	**WC4C3E***	**WC3C3E**	**WC2C3E**

* With additional module: MBW.. Models

INTERCHANGEABLE SCALE (90° scale only), for models: WC5V..., WC5VR..., WC4V... and WC3V...
For 3 or 4 wire, balanced or unbalanced three-phase systems, the instruments and scales are:

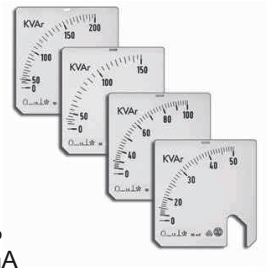
Instruments	110 V, 5 A	230 V, 5 A	400 V, 5 A	440 V, 5 A
Calibration	1000 W	2000 W	3000 W	3000 W
Transformator		Scales		
10/5 A	0-2 kW	0-4 kW	0-6 kW	0-6 kW
15/5 A	0-3 kW	0-6 kW	0-9 kW	0-9 kW
20/5 A	0-4 kW	0-8 kW	0-12 kW	0-12 kW
25/5 A	0-5 kW	0-10 kW	0-15 kW	0-15 kW
30/5 A	0-6 kW	0-12 kW	0-18 kW	0-18 kW

Instruments	110 V, 5 A	230 V, 5 A	400 V, 5 A	440 V, 5 A
Calibration	1000 W	2000 W	3000 W	3000 W
Transformator		Scales		
40/5 A	0-8 kW	0-15 kW	0-24 kW	0-24 kW
50/5 A	0-10 kW	0-20 kW	0-30 kW	0-30 kW
60/5 A	0-12 kW	0-24 kW	0-36 kW	0-36 kW
75/5 A	0-15 kW	0-30 kW	0-45 kW	0-45 kW
Multiples	Multiples	Multiples	Multiples	Multiples

Dimensions and connection diagrams, available on page AN-35-36.

VARMETERS (ELECTRONIC)

System's reactive power measuring.



Alternating current

- Frequency: 50 or 60 Hz
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110
  230, 400, 440 V
- Current range: 20-120%
- Current input: (In): 5A, 1A
- Accuracy: 1,5 %
- Burden: 3..12 mA
  (Voltage circuits)
- Burden: 1..3,5 VA
  (Current circuits)

		90º SCALE	90º SCALE			
Dimensions	mm	45x52,5 DIN RAIL	48x48	72x72	96x96	144x144
AC. SINGLE-PHASE - BALANCED THREE-PHASE						
Approx. weight	Kg.	0,55	0,55	0,55	0,84	0,84
AC. Single-phas		**WC5VRrE***	**WC5VrE***	**WC4VrE***	**WC3VrE**	**WC2VrE**
Three-phase, 3 or 4 wire		**WC5VRIrE***	**WC5VIrE***	**WC4VIrE***	**WC3VIrE**	**WC2VIrE**
UNBALANCED THREE-PHASE						
Approx. weight	Kg.	1,00	1,00	1,00	1,55	1,55
Three-phase, 3 wire		**WC5VRIIrE***	**WC5VIIrE***	**WC4VIIrE***	**WC3VIIrE**	**WC2VIIrE**
Three-phase, 4 wire		**WC5VR3rE***	**WC5V3rE***	**WC4V3rE***	**WC3V3rE**	**WC2V3rE**

240º SCALE					
Dimensions	mm	48x48	72x72	96x96	144x144
AC. SINGLE-PHASE - BALANCED THREE-PHASE					
Approx. weight	kg.	0,55	0,55	0,84	0,84
AC. Single-phas		**WC5CrE***	**WC4CrE***	**WC3CrE**	**WC2CrE**
Three-phase,3 or 4 wire		**WC5CIrE***	**WC4CIrE***	**WC3CIrE**	**WC2CIrE**
UNBALANCED THREE-PHASE		UNBALANCED THREE-PHASE			
Approx. weight	kg.	1,00	1,00	1,55	1,55
Three-phase,3 wire		**WC5CIIrE***	**WC4CIIrE***	**WC3CIIrE**	**WC2CIIrE**
Three-phase,4 wire		**WC5C3rE***	**WC4C3rE***	**WC3C3rE**	**WC2C3rE**

* With additional module: MBW... Models

INTERCHANGEABLE SCALE (90° scale only), for models: WC5V...rE, WC5VR...rE, WC4V...rE y WC3V...rE
For 3 or 4 wire, balanced or unbalanced three-phase systems, the instruments and scales are:

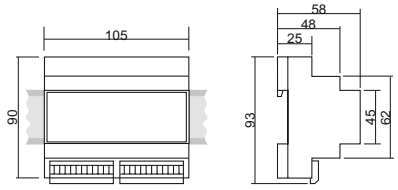
Instruments	110 V, 5 A	230 V, 5 A	400 V, 5 A	440 V, 5 A
Calibration	500 Var	1000 Var	1500 Var	1500 Var
Transformator		Scales		
10/5 A	0-1 Kvar	0-2 Kvar	0-3 Kvar	0-3 Kvar
15/5 A	0-1,5 Kvar	0-3 Kvar	0-4,5 Kvar	0-4,5 Kvar
20/5 A	0-2 Kvar	0-4 Kvar	0-6 Kvar	0-6 Kvar
25/5 A	0-2,5 Kvar	0-5 Kvar	0-7,5 Kvar	0-7,5 Kvar
30/5 A	0-3 Kvar	0-6 Kvar	0-9 Kvar	0-9 Kvar

Instruments	110 V, 5 A	230 V, 5 A	400 V, 5 A	440 V, 5 A
Calibration	500 Var	1000 Var	1500 Var	1500 Var
Transformator		Scales		
40/5 A	0-4 Kvar	0-7,5 Kvar	0-12 Kvar	0-12 Kvar
50/5 A	0-5 Kvar	0-10 Kvar	0-15 Kvar	0-15 Kvar
60/5 A	0-6 Kvar	0-12 Kvar	0-18 Kvar	0-18 Kvar
75/5 A	0-7,5 Kvar	0-15 Kvar	0-22,5 Kvar	0-22,5 Kvar
Multiples	Multiples	Multiples	Multiples	Multiples

Dimensions and connection diagrams, available on page AN-35-36.

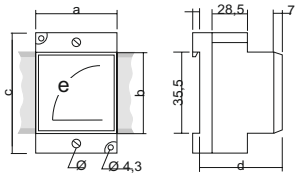
Dimensions (mm)

DIN rail MBW and MBWr modules



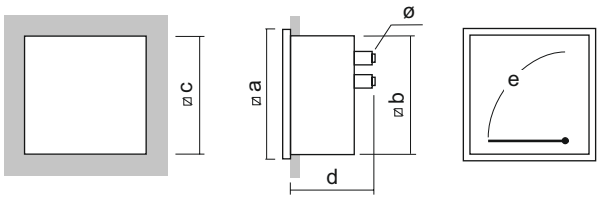
Weight= 0,24
Plug.in connectors

Dimensions (mm)



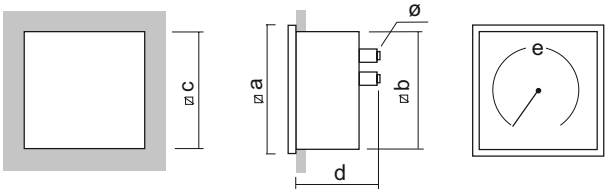
Active power model	Reactive power model	Range	a	b	c	d	e	ø
WC5VR..E	**WC5VR..rE**	../5 ../1	52,5	45	75	60	38	M.6

Dimensions (mm)



Active power model	Reactive power model	Range	⍁a	⍁b	⍁c	d	e	ø
WC5V..E	**WC5V..rE**	../5 ../1	48	44,5	$45^{+0,6}$	59	38	M.4
WC4V..E	**WC4V..rE**	../5 ../1	72	66,5	$68^{+0,7}$	60	65	M.4
WC3V..E	**WC3V..rE**	../5 ../1	96	89	$92^{+0,8}$	75	100	M.4
WC2V..E	**WC2V..rE**	../5 ../1	144	135	138^{+1}	87	140	M.4

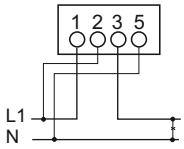
Dimensions (mm)



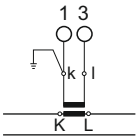
Active power model	Reactive power model	Range	⍁a	⍁b	⍁c	d	e	ø
WC5C..E	**WC5C..rE**	../5 ../1	48	44,5	$45^{+0,6}$	83	72	M.4
WC4C..E	**WC4C..rE**	../5 ../1	72	66,5	$68^{+0,7}$	88	101	M.4
WC3C..E	**WC3C..rE**	../5 ../1	96	89	$92^{+0,8}$	124	140	M.4
WC2C..E	**WC2C..rE**	../5 ../1	144	135	138^{+1}	134	220	M.4

Connection diagrams

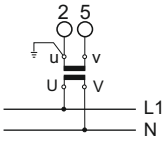
Single-phase, Active and Reactive Power



Connection: Direct input



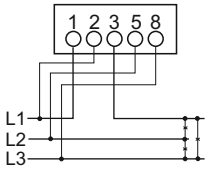
Current Transf.



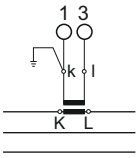
Voltage Transf.

Connection diagrams

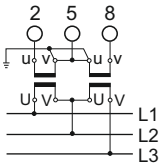
Balanced three-phase, Active and Reactive Power



Connection: Direct input



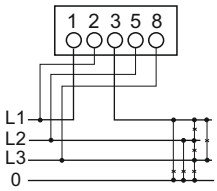
Current Transf.



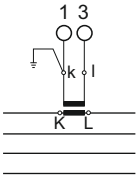
Voltage Transf.

Connection diagrams

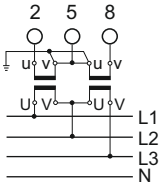
4 wire balanced three-phase, Active and Reactive Power



Connection: Direct input



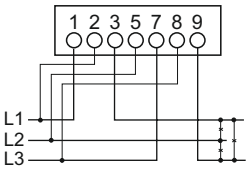
Current Transf.



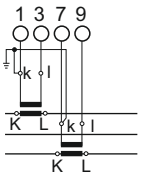
Voltage Transf.

Connection diagrams

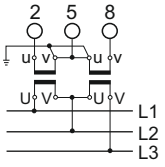
3 wire unbalanced three-phase, Active and Reactive PowerPower



Connection: Direct input



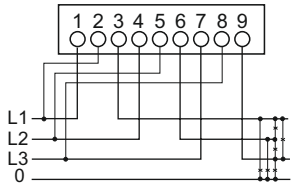
Current Transf.



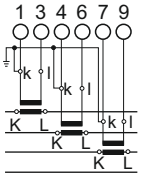
Voltage Transf.

Connection diagrams

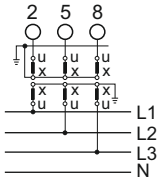
3 wire unbalanced three-phase, Active and Reactive Power



Connection: Direct input



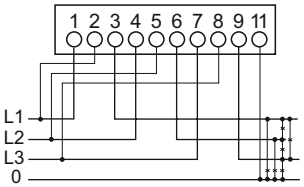
Current Transf.



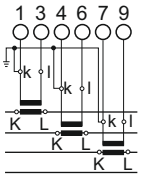
Voltage Transf.

Connection diagrams

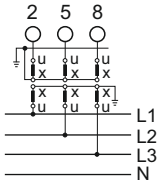
4 wire unbalanced three-phase, Active and Reactive Power



Connection: Direct input



Current Transf.



Voltage Transf.

WATTMETERS (INDUCTION)
VARMETERS (INDUCTION)

System active/reactive power measuring

Alternating current

- Scale: 90º
- Frequency: 50, 60 Hz
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110 230, 400, 440 V
- Current input: (In): 5A, 1A
- Current range: 20-120%
- Accuracy: 1,5 %
- Burden: 3..12 mA (Voltage circuits)
- Burden: 1..3,5 VA (Current circuits)

		WATTMETERS		VARMETERS	
Dimensions	mm	96x96	144x144	96x96	144x144
AC. SINGLE-PHASE - BALANCED THREE-PHASE					
Approx. weight	kg.	0,55	0,84	0,55	0,84
AC Single-phase		**WC3V**	**WC2V**	**WC3Vr**	**WC2Vr**
3-phase, 3 or 4 wire		**WC3VI**	**WC2VI**	**WC3VIr**	**WC2VIr**
UNBALANCED THREE-PHASE					
Approx. weight	kg.	1,00	1,55	1,00	1,55
3-phase, 3 wire		**WC3VII**	**WC2VII**	**WC3VIIr**	**WC2VIIr**
3-phase, 4 wire		**WC3VIIn**	**WC2VIIn**	**WC3VIInr**	**WC2VIInr**

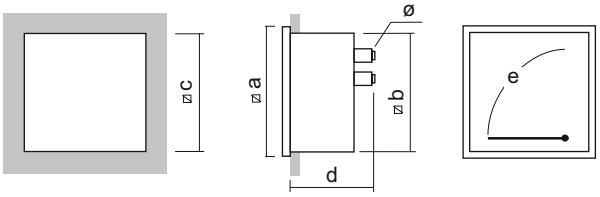
- Full scale value: 0,6..1,2 P_a

$P_a = Vn \cdot In$ (Single-phase, Alternating current)

$P_a = Vn \cdot In \cdot 3$ (Three-phase)

If not indicated otherwise, full scale value will be P_a rounded

Dimensions (mm)



Active power model	Reactive power model	Range	⍁a	⍁b	⍁c	d	e	ø
WC3V **WC3VI** **WC3VII** **WC3VIIn**	**WC3Vr** **WC3VIr** **WC3VIIr** **WC3VIInr**	../5 ../1	96	89	$92^{+0,8}$	88 88 135 135	100	M.4
WC2V **WC2VI** **WC2VII** **WC2VIIn**	**WC2Vr** **WC2VIr** **WC2VIIr** **WC2VIInr**	../5 ../1	144	135	138^{+1}	88 88 135 135	140	M.4

Connection diagrams available on page AN-36

PHASE METERS (ELECTRONIC)

System's power factor measuring.

Alternating current

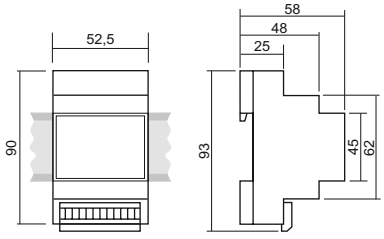
- Scale: CAP 0,5 - 1 - 0,5 IND
- Frequency: 50 or 60 Hz
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110
  230, 400, 440 V
- Current range: 20-120%
- Current input: (In): 5A, 1A
- Accuracy: 1,5 % of 90 electrical degrees
- Burden: 6,5 mA
  (Voltage circuits)
- Burden: 1 VA
  (Current circuits)

		90 ºSCALE	90º SCALE			
Dimensions	mm	45x52,5 DIN RAIL	48x48	72x72	96x96	144x144
AC SINGLE PHASE - BALANCED THREE PHASE						
Approx. weight	kg.	0,48	0,48	0,48	0,73	0,73
AC. Single-phase		**SC5VRE***	**SC5VE***	**SC4VE***	**SC3VE**	**SC2VE**
3-phase, 3 wire		**SC5VRIE***	**SC5VIE***	**SC4VIE***	**SC3VIE**	**SC2VIE**

		240º SCALE			
Dimensions	mm	48x48	72x72	96x96	144x144
AC SINGLE-PHASE - BALANCED THREE PHASE					
Approx. weight	kg.	0,48	0,48	0,73	0,73
AC. Single-phase		**SC5CE***	**SC4CE***	**SC3CE**	**SC2CE**
3-phase, 3 wire		**SC5CIE***	**SC4CIE***	**SC3CIE**	**SC2CIE**

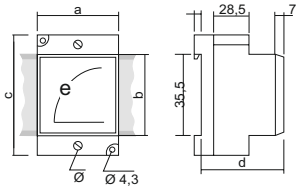
* With additional module: MBPF model

DIN rail MBPF module



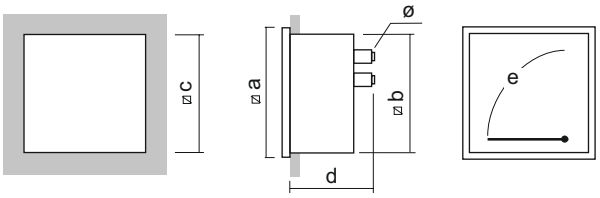
Weight = 0,120
Plug-in connectors

Dimensions (mm)



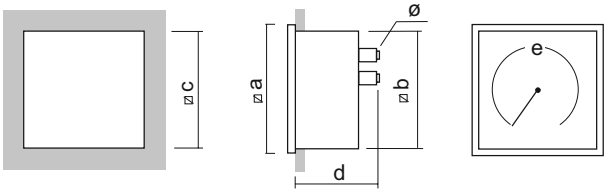
Models	Range	a	b	c	d	e	ø
SC5VRE	100÷440	52,5	45	75	60	38	M.6
SC5VRIE	100÷440	52,5	45	75	60	38	M.6

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
SC5VE SC5VIE	100÷440 100÷440	48	44,5	$45^{+0,6}$	59	38	M.4
SC4VE SC4VIE	100÷440 100÷440	72	66,5	$68^{+0,7}$	60	65	M.4
SC3VE SC3VIE	100÷440 100÷440	96	89	$92^{+0,8}$	92	100	M.4
SC2VE SC2VIE	100÷440 100÷440	144	135	138^{+1}	92	140	M.4

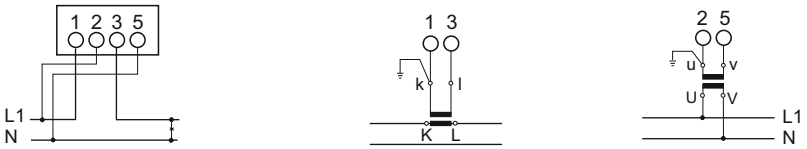
Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
SC5CE SC5CIE	100÷440 100÷440	48	44,5	$45^{+0,6}$	83	72	M.4
SC4CE SC4CIE	100÷440 100÷440	72	66,5	$68^{+0,7}$	88	101	M.4
SC3CE SC3CIE	100÷440 100÷440	96	89	$92^{+0,8}$	128	140	M.4
SC2CE SC2CIE	100÷440 100÷440	144	135	138^{+1}	92	220	M.4

Connection diagrams

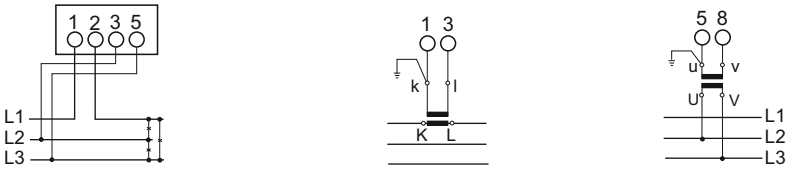
Single-phase



Direct input | Current Transf. | Transf. Voltage

Connection diagrams

Balanced three-phase



Connection: Direct input | Current Transf. | Transf. Voltage

PHASE METERS (INDUCTION)

System's power factor measuring.

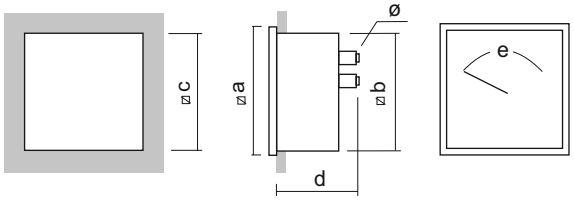
Alternating current

- Scale: CAP 0,5 - 1 - 0,5 IND or 0,8 - 1 0,2 IND (90º)
  CAP 0,1 - 1 - 0,1 IND 4 quadrants (360º)
- Accuracy: 1,5 % of 90 electrical degrees
- Frequency: 50 or 60 Hz
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110
  230, 400, 440 V
- Current range: 20-120%
- Current input: (In): 5A, 1A
- Burden: 20..30 mA
  (Voltage circuits)
- Burden: 1 VA
  (Current circuits)

		SCALE 90º		SCALE 360º	
Dimensions	mm	96x96	144x144	96x96	144x144
AC. SINGLE-PHASE - BALANCED THREE-PHASE					
Approx. weight	kg.	1,07	1,57	1,10	1,60
A.C Single phase*		**SC3V**	**SC2V**	**SC3C**	**SC2C**
3-phase 3-4 wire**		**SC3VI**	**SC2VI**	**SC3CI**	**SC2CI**
UNBALANCED THREE-PHASE					
Approx. weight	kg.	1,40	2,35	1,43	2,38
3-Phase 3 wire**		**SC3VII**	**SC2VII**	**SC3CII**	**SC2CII**
3-Phase 4 wire***		**SC3VIIn**	**SC2VIIn**	**SC3CIIn**	**SC2CIIn**

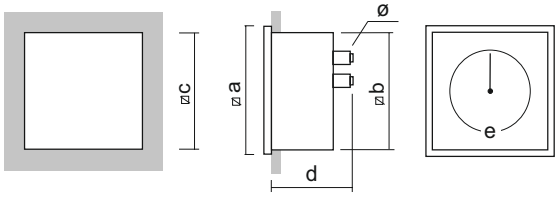
* With additional resistor box (external): Model 4.5.1
** 400 V and 600 V with additional resistor box (external): Model 2.6.1
*** 400 V and 600 V only with additional resistor box (external): Model 2.4.1

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
SC3V	100÷440	96	89	$92^{+0,8}$	135	73	M.4
SC3VI	100÷440				135		
SC3VII	100÷440				165		
SC3VIIn	100÷440				165		
SC2V	100÷440	144	135	138^{+1}	135	160	M.4
SC2VI	100÷440				135		
SC2VII	100÷440				165		
SC2VIIn	100÷440				165		

Dimensions (mm)

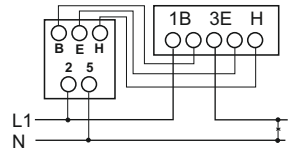


Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
SC3C	100÷440	96	89	$92^{+0,8}$	124	210	M.4
SC3CI	100÷440						
SC3CII	100÷440						
SC3CIIn	100÷440						
SC2C	100÷440	144	135	138^{+1}	135	330	M.4
SC2CI	100÷440						
SC2CII	100÷440						
SC2CIIn	100÷440						

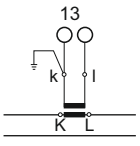
Resistor boxes on page AN-42

Connection diagrams

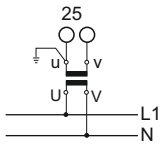
Single-phase



Connection: Direct input



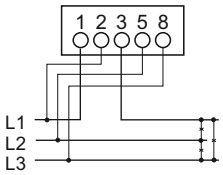
Current Transf.



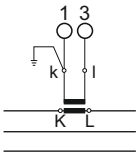
Transf. Voltage

Connection diagrams

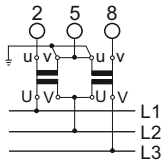
Balanced three-phase (100, 230 V)



Connection: Direct input



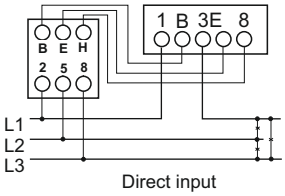
Current Transf.



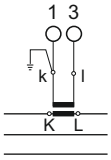
Transf. Voltage

Connection diagrams

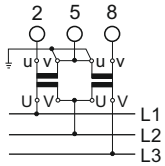
Balanced three-phase (400, 440 V)



Connection: Direct input



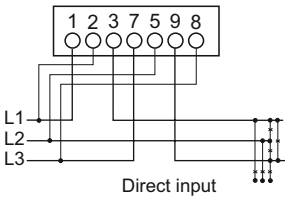
Current Transf.



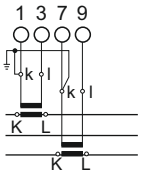
Transf. Voltage

Connection diagrams

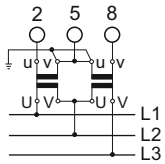
Unbalanced three-phase, 3 wire (110, 230 V)



Connection: Direct input



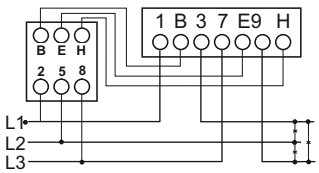
Current Transf.



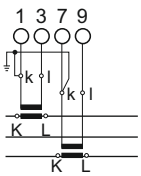
Transf. Voltage

Connection diagrams

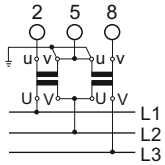
Unbalanced three-phase, 3 wire (400, 440 V)



Connection: Direct input



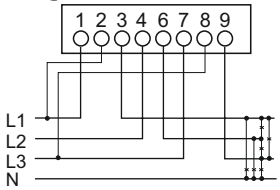
Current Transf.



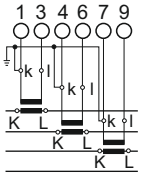
Transf. Voltage

Connection diagrams

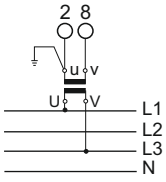
Unbalanced three-phase, 4 wire (100, 230 V)



Connection: Direct input



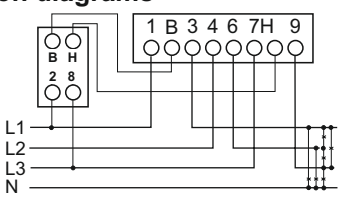
Current Transf.



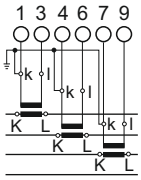
Transf. Voltage

Connection diagrams

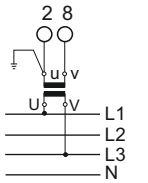
Unbalanced three-phase, 4 wire (400, 440 V)



Connection: Direct input



Current Transf.



Transf. Voltage

RESISTOR BOXES

Connection to measuring elements.

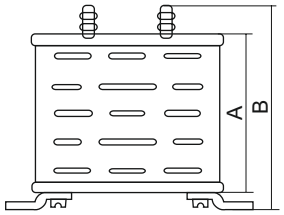
- Accuracy: 0,5 %

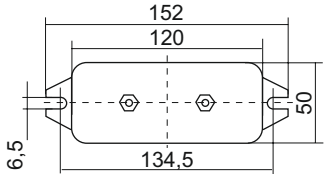
Models		1.2.1	1.3.1	1.4.1	1.4.2	1.5.1	1.6.1	1.6.2
Terminals		2	3	4	4	5	6	6
Approx. weight	kg.	0,23	0,23	0,24	0,31	0,50	0,25	0,40

Models		2.2.1	2.3.1	2.4.1	2.4.2	2.5.2	2.6.1	2.6.2	2.6.3	2.7.1	2.8.1	2.8.2
Terminals		2	3	4	4	5	6	6	6	7	8	8
Approx. weight	kg.	0,31	0,31	0,31	0,31	0,32	0,32	0,55	0,74	0,40	0,60	0,77

Models		3.3.1	3.3.2	4.2.1	4.3.1	4.4.1	4.5.1	4.6.1	4.8.1
Terminals		3	3	2	3	4	5	6	8
Approx. weight	Kg.	0,27	0,70	0,90	0,90	0,95	1,00	1,00	1,00

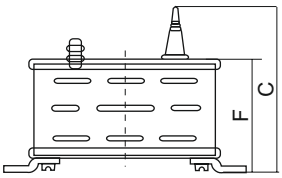
Dimensions (mm)

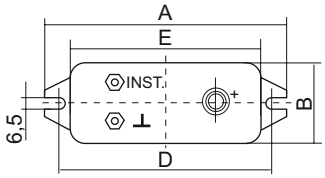




Models	1..1	2..1
A	64	99
B	86	121

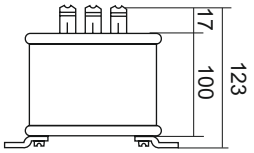
Dimensions (mm)

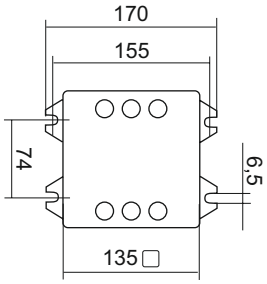




Models	3.3.1	3.3.2
A	155	270
B	50	100
C	101	148
D	135	235
E	120	220
F	69	102

Dimensions (mm)





Models
4.5.1
4.6.1
4.8.1

SYNCHRONIZATION RELAYS INSTRUMENTS FOR VESSELS

ANALOGUE INSTRUMENTS

S.A. DE CONSTRUCCIONES INDUSTRIALES

CONTENTS

SYNCHRONIZING INSTRUMETS
RELAYS
EQUIPMENT FOR VESSEL

MEASURING INSTRUMENTS FOR VESSELS

Recommendations.

VOLTMETER

Depending on the system voltage, its full scale value will be 1.2 of that voltage as a minimum. This will be marked with a red line.
In the event of being connected to voltage transformers, the full scale will be 1.2 of the value of the transformer primary as a minimum. This will be marked with a red line.

AMMETER

Its full scale value will be 1.2 of the alternator rated current as a minimum. This will be marked with a red line.
The transformer current ratio must be as near as possible to the alternator's rated current.

WATTMETER

Its scale will have a full value between 0.6 and 1.2 of Un x In x √3. Where (Un) is the rated voltage or the primary of the voltage transformer, and (In) the primary current of the current transformer.
The alternator kW value is marked with a red line and in all cases its full scale value must exceed 20% of that value, which means that the final value will be approximately the same as its kVA.
When alternators are synchronised with others, the watt meter scale will be reversed to the left of zero. Its value must be 15% of full scale.
In each case the watt meter will be 3-wire unbalanced three-phase.

REVERSE POWER RELAY

The adjustment value will be the alternator kW value (it will match the red line on the watt meter) and its value cannot be lower than 0.6 x Un x In x √3.
Setting is from 2 to 15% of that power. The transformer primary and secondary current and voltage values must be known. It will have a 5 s. delay.

MEASURING INSTRUMENTS FOR VESSELS

Recommendations.

MAXIMUM CURRENT RELAY

It may be connected to any x/5 A current transformer, but the available auxiliary voltage must be known.

SYNCHRONIZING RELAY

As a synchronizing auxiliary element, the selection and polarity of the voltage power supply must be correct.
The width of the chosen phase and time for meters will depend on the level of response sensitivity to the alternators' speed and voltage settings and the value allowed by the group.

BAR INSULATION INDICATORS

The instrument must be supplied directly by the three phases via a leakage analysis switch and never to the voltage transformer secondaries. The system power supply voltage and the available auxiliary power supply of the alarm circuit will be indicated.
This instrument must never be connected to three-phase systems with neutral connected to earth.

CURRENT TRANSFORMERS

Their power depends on the consumption of the instruments to be connected. At least 10 VA in class 0.5 is recommended to avoid accuracy and angle errors. Polarity must be correct.

VOLTAGE TRANSFORMERS

The TE-15R model is specially designed for this application due to its power and accuracy (25 VA, class 1). This allows all instruments that the control equipment usually has to be connected to the secondary without the introduction of ratio or phase errors.
No special recommendations are required for other instruments used in vessel control equipment.

FOR SYNCHRONIZING INSTRUMENTS

DOUBLE VOLTMETERS

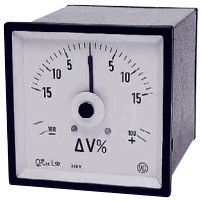
Two moving iron systems. True effective value.

- Scale: 90º
- Accuracy: 1,5 %
- Measuring range: 100, 110, 230, 400, 440 V
- Frequency: 45..65 Hz
- Burden: 1,5..3 VA

Model		EC3VII				EC2VII
Dimensions	mm	96x96				144x144
Approx. weight	Kg.	0,31				0,46
DOUBLE VOLTMETERS						
Measuring range	Vn	2x100 V	2x110 V	2x230 V	2x400 V	2x440 V
Scales		2x165 V	2x180 V	2x380 V	2x660 V	2x720 V

DIFFERENTIAL VOLTMETERS

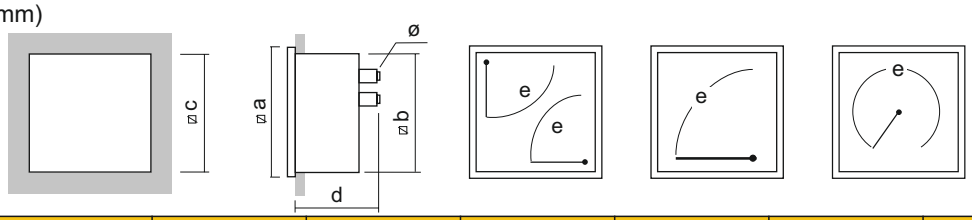
Difference (%) between two synchronizing voltages.



- Accuracy: 1,5 %
- Burden: 10 mA
- Frequency: 50 or 60 Hz
- Measuring range: 100, 110, 230, 400, 440 V

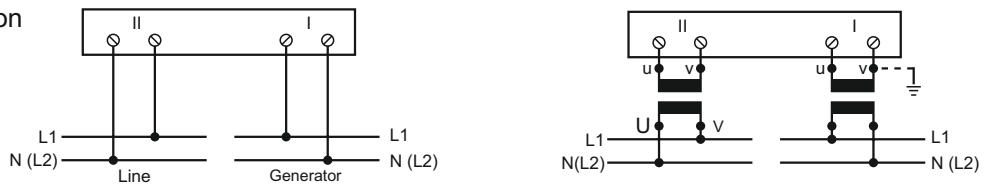
Model		CC3VGD	CC2VGD	CC3CGD	CC2CGD
Dimensions	mm	96x96	144x144	96x96	144x144
Approx. weight	Kg.	0,40	0,65	0,74	0,80
DIFFERENTIAL VOLTMETERS					
Scales		100..15 - 0 - 15..100 % ΔV			

Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
EC3VII	100÷440	96	89	$92^{+0,8}$	59	2x55	M.4
EC2VII	100÷440	144	135	138^{+1}	59	2x68	M.4
CC3VGD	100÷440	96	89	$92^{+0,8}$	78	100	M.4
CC2VGD	100÷440	144	135	138^{+1}	92	140	M.4
CC3CGD	100÷440	96	89	$92^{+0,8}$	128	140	M.4
CC2CGD	100÷440	144	135	138^{+1}	92	220	M.4

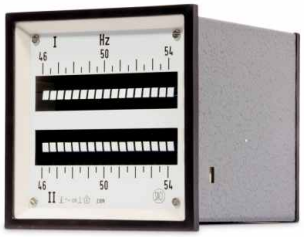
Connection diagrams



DOUBLE FREQUENCY METERS (REEDS)

Double measurement (two systems) of two system frequencies.

- Accuracy: 0,5 %
- Voltage range: ±15 % Vn
- Burden: 1,2..2,2 mA
- Voltage: (Vn): 100, 110, 230, 400, 440 V



Model		FC3VII		FC2VII
Dimensions	mm	96x96		144x144
Approx. weight	Kg.	0,87		1,25
DOUBLE FREQUENCY METERS				
Divisions		13	17	21
Scales	Hz	47..53	46..54 or 56..64	45..55 or 55..65

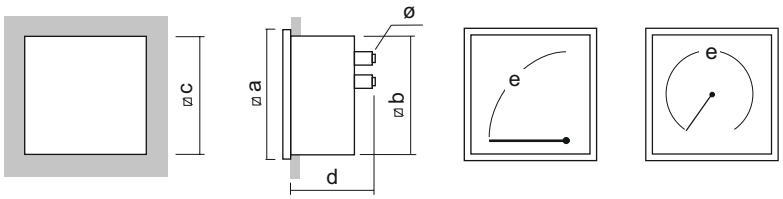
DIFFERENTIAL FREQUENCY METERS

Frequency difference (%) between two systems.

- Accuracy: 0,2 %
- Voltage range: ±15 % Vn
- Frequency: 50 or 60 Hz
- Burden: 10 mA
- Voltage: (Vn): 100, 110, 230, 400, 440 V

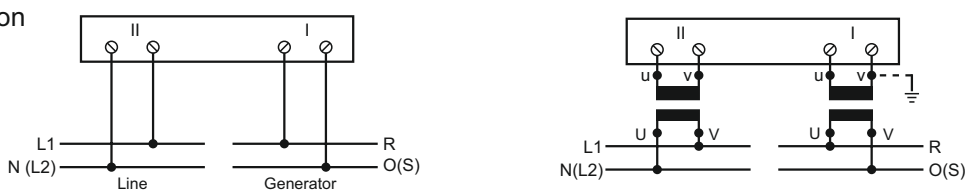
Model		FC3AD	FC2AD	FC3CD	FC2CD
Dimensions	mm	96x96	144x144	96x96	144x144
Approx. weight	Kg.	0,32	0,50	0,55	0,75
DIFFERENTIAL FREQUENCY METERS					
Scales	%	10 - 0 - 10 % ΔHz			

Dimensions (mm)



Models	Ranges	⧄a	⧄b	⧄c	d	e	ø
FC3AD	100÷440	96	89	$92^{+0,8}$	78	100	M.4
FC2AD	100÷440	144	135	138^{+1}	92	140	M.4
FC3CD	100÷440	96	89	$92^{+0,8}$	128	140	M.4
FC2CD	100÷440	144	135	138^{+1}	92	220	M.4
FC3VII	100÷440	96	89	$92^{+0,8}$	124	-	M.4
FC2VII	100÷440	144	135	138^{+1}	88	-	M.4

Connection diagrams



SYNCHRONOSCOPES

Phase synchronisation measurement (frequency and phase equality) between two single-phase or three-phase alternating current systems, or between system and generator.

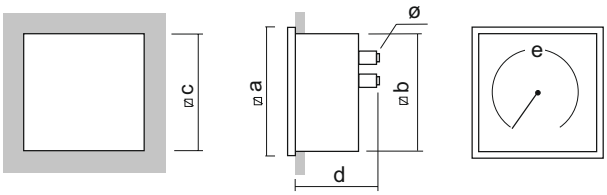
- Accuracy: 1,5 % of 90 electrical degrees
- Voltage range: ±15 % Vn
- Voltage: (Vn): 100, 110, 230, 400, 440 V
- Burden: 20..30 mA
- Frequency: 50 or 60 Hz

		SYNCHRONOSCOPES	
Dimensions	mm	96x96	144x144
Approx. weight	Kg.	1,37	1,83
		AC. SINGLE-PHASE	
AC. Single-phase*		**SC3V-360º**	**SC2V-360º**
		BALANCED THREE-PHASE	
Balanced three-phase**		**SC3VI-360º**	**SC2VI-360º**

* With additional resistor box (external): 100, 110, 230 V: Model 4.5.1
400, 440 V: Model 4.5.1 and 2.4.1

** With additional resistor box (external): 230 V: Model 1.6.1
400, 440 V: Model 2.6.1 and 2.4.1

Dimensions (mm)

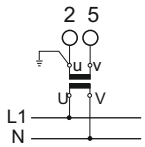


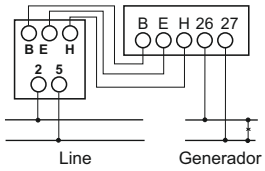
Models	Ranges	⌀a	⌀b	⌀c	d	e	ø
SC3V-360º	100÷440	96	89	$92^{+0,8}$	135	100	M.4
SC3VI-360º	100÷440						
SC2V-360º	100÷440	144	135	138^{+1}	135	140	M.4
SC2VI-360º	100÷440						

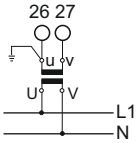
Resistor boxes on page AN-42

CONNECTION DIAGRAMS

Connection diagrams — Single-phase (100, 110, 230 V)

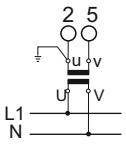


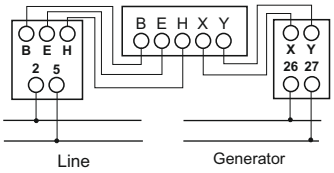


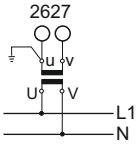


Connection: Current Transf. | Direct input | Transf. Voltage

Connection diagrams — Single-phase (400, 440 V)

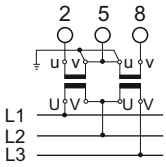


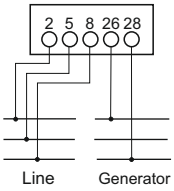


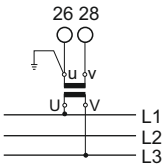


Connection: Voltage transf. | Direct input | Voltage transf.

Connection diagrams — Three-phase (100, 110 V)

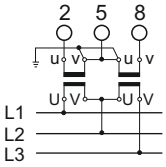


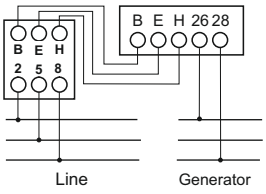


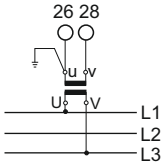


Connection: Voltage transf. | Direct input | Voltage transf.

Connection diagrams — Three-phase (230 V)

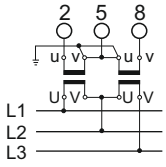


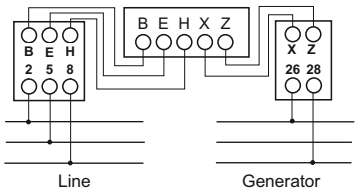


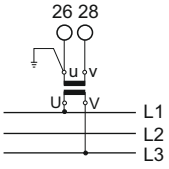


Connection: Voltage transf. | Direct input | Voltage transf.

Connection diagrams — Three-phase (400, 440 V)







Connection: Voltage transf. | Direct input | Voltage transf.

LAMP SYNCHRONOSCOPE

Genset synchronization for manual operation.

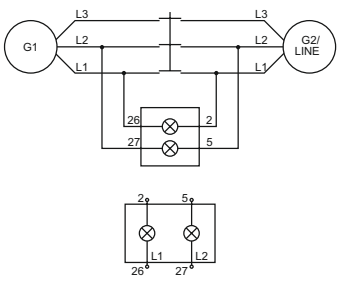
ALTERNATING CURRENT - NAVAL SERIES

- Frequency: 50 or 60 Hz - Voltage: 110, 230, 400 or 440 V ±20 %

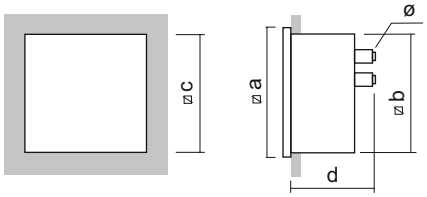
Model		SC3VL	SC2VL
Dimensions	mm	96x96	144x144
Approx weight	Kg.	0,20	0,26

Its operation is based on detecting voltage between similar phases in the two systems to be synchronized, so that when there is zero voltage the operator may give the connection order.

Connection diagrams



Dimensions (mm)



Models	Ranges	⌀a	⌀b	⌀c	d	ø
SC3VL	110÷440	96	89	$92^{+0,5}$	78	M.4
SC2VL	110÷440	144	135	138^{+1}	78	M.4

SEQUENCE METER / SEQUENCE RELAY WITH ALARM

Displays the correct phase sequence in a three-phase system and provides a contact to allow the connection of the receiving device.

ALTERNATING CURRENT - NAVAL SERIES

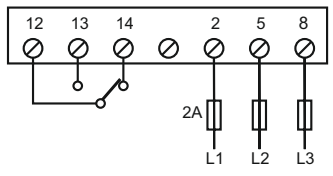
- Frequency: 50 or 60 Hz - Burden: 1,2 VA - Voltage: 110, 230, 400 or 440 V ±20 %

Model		RSQ
Dimensions	mm	96x96
Approx. weight	Kg.	0,35

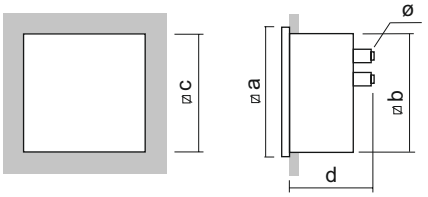
Has three LEDs showing:
- Inverse sequence (red), marked L3-L3-L2.
- Direct sequence (green), marked L3-L2-L3.
- Operates enable relay (green), marked OK.

Close enable output: 250 V, 8A relay

Connection diagrams



Dimensions (mm)



Model	Ranges	⌀a	⌀b	⌀c	d	ø
RSQ	110÷440	96	89	$92^{+0,8}$	78	M.4

SYNCHRONOSCOPE / DIGITAL SYNCHRONIZING RELAY

Allows both the phase and parameters of the two voltages from two systems to be displayed and their synchronization.

ALTERNATING CURRENT - NAVAL SERIES

- Input: 110, 230, 400 or 440 V ±20 %
- Frequency range: 45 a 65 Hz
- Phase-difference range: ±180º
- Voltage-difference range: ±100 %

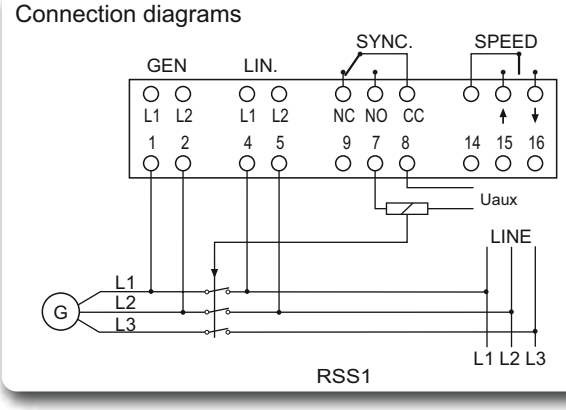
- Accuracy: 0,5 %
- Accuracy: 0,1 %
- Accuracy: 1 %
- Accuracy: 1 %

Model		RSS1 (2 wire)	RSS3 (3 wire)
Dimensions	mm	96x96	96x96
Approx. weight	Kg.	0,85	0,85
SYNCHRONOSCOPE/DIGITAL SYNCHRONIZING RELAY			
	V	110 or 230 V	110, 230, 400, or 440 V

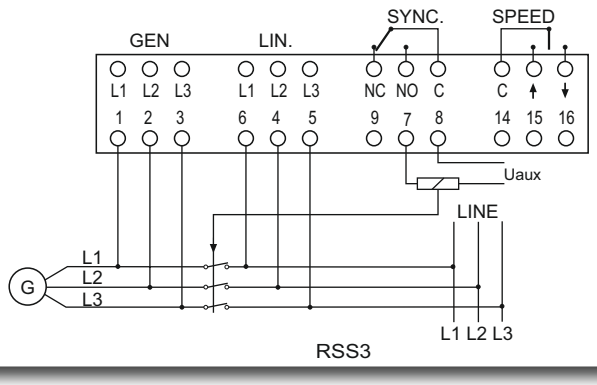
Has a rotating display showing the phase between two voltages and two number indicators which display their module.
Allows the current module difference, phase difference and trip time to be set. Once the enable conditions have been met, the output relay closes, either for a fixed time (300 ms) or continuously while the condition lasts.
Receives power from the bus/bars signal. When operating as an automatic synchronizer it supplies acceleration/delay pulses for the alternator speed.
LEDs on the front display the operation of the 8 output relays.

The front keypad programs:
- Voltage difference: ±10 %
- Phase difference: ±20º
- Permanent time: 0,1 - 5 s.
- Operate enable relay: Pulse, 300 msg. - Continuous (SYNC)
- Operate control relays (SPEED)

Connection diagrams

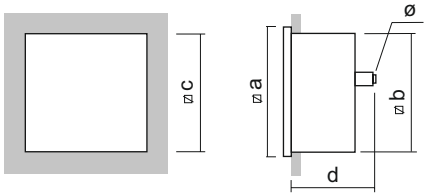


RSS1



RSS3

Dimmensions (mm)



Model	Ranges	ø a	ø b	ø c	d	ø
RSS-	110÷440 V	96	89	$92^{+0,8}$	78	Term.

SYNCHRONIZING EQUIPMENT

Equipment with three instruments, double or differential voltmeter, double or differential frequency meters and synchronoscope, for connecting two generators in parallel, or connecting a generator with system.

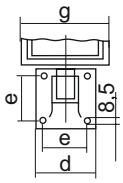
Position: Vertical (as column with 180º turn)
Horizontal (with two supports)

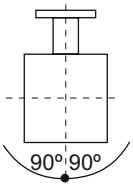
Technical specifications: see instrument data..

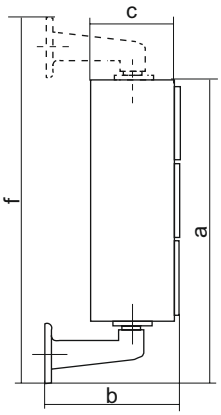
Model	VOLTMETERS	FREQUENCY METERS	SYNCHRONOSCOPES
ES3V	EC3VII or CC3VGD	FC3VII ó FC3AD	SC3V-360º
ES3VI	EC3VII or CC3VGD	FC3VII or FC3AD	SC3VI-360º
ES2V	EC2VII or CC2VGD	FC2VII , FC2AD or FC2AD	SC2V-360º
ES2VI	EC2VII or CC2VGD	FC3VII, FC3AD or FC2AD	SC2VI-360º
ES3C	CC3CGD	FC3CD	SC3V-360º
ES3CI	CC3CGD	FC3CD	SC3VI-360º
ES2C	CC2CGD	FC2CD	SC2V-360º
ES2CI	CC2CGD	FC2CD	SC2VI-360º

		90º SCALE		360º SCALE	
Dimensions EQUIPMENT	mm	410x223x120	576x258x170	410x223x120	576x258x170
Dimensions INSTRUMENTS	mm	96x96	144x144	96x96	144x144
Approx. weight	Kg.	5,70	9,00	5,80	8,70
			SINGLE -PHASE		
Single-phase		**ES3V**	**ES2V**	**ES3C**	**ES2C**
			BALANCE THREE-PHASE		
Balanced three-phase		**ES3VI**	**ES2VI**	**ES3CI**	**ES2CI**

Dimensions (mm)



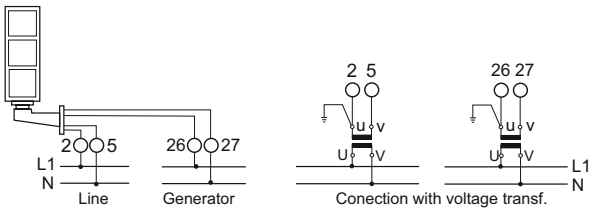




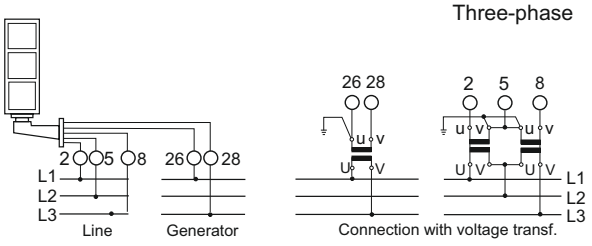
Models	Øa	Øb	Øc	d	e	f	g
ES3V-ES3VI	410	223	176	80	60	500	120
ES2V-ES2VI	576	258	176	115	85	692	170
ES3C-ES3CI	410	223	176	80	60	500	120
ES2C-ES2CI	576	258	176	115	85	692	170

Connection diagrams

Single-phase



Three-phase



REVERSE POWER RELAY

Power relay to limit the inverse power (antimotoring) between two alternating current generators connected in parallel.

ALTERNATING CURRENT - NAVAL SERIES

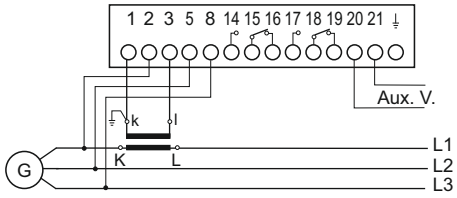
- Accuracy: ±1,5 % (Pn)
- Frequency: 50 or 60 Hz

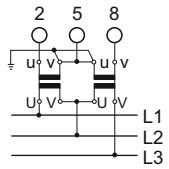
Model		RIC2VI
Dimensions	mm	144x144
Approx. weight	Kg.	1,25
		REVERSE POWER RELAY
Un	V	100, 110, 230, 400 or 440
In	A	../5
Aux. V	V	100, 230 or 400

- Un range: -40 ÷ +20%
- In range: 20 ÷ 120%
- Hysteresis: <1% (of Pn)
- Aux. v. range: ±20%
- Scale: UnxInx√3xcosφ (KW)
- Adjustment limit: 2-15% (of the alternator Pn in KW)
- Delay for output signal: 5 ± 0.3 secs. (optional, without delay)
- Output contacts power: Max 200 Va, 400 V, 5A

Two lights indicators determine the period of time between overload and the closing of the output relay

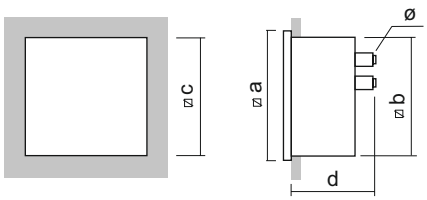
Connection diagrams





- Output contacts: Timing switch relay: 15 common
- Without auxiliary voltage: 14 open, 16 closed
- With auxiliary voltage: 15 and 14 closed
- With overload: 15 and 16 closed after time-out
- Instant relay: 18 common, 17 open, 19 closed
- With overload: 18 and 17 closed

Dimensions (mm)



Model	Ranges	⌀a	⌀b	⌀c	d	ø
RIC2VI	100÷440 V	144	135	138^{+1}	89	M 4

SYNCHRONISING RELAY

Electronic relay for synchronization of two alternating current generators comparing their voltage, phase and frequency.

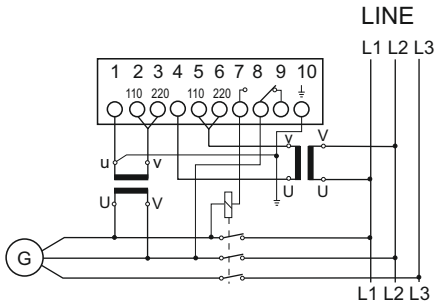
ALTERNATING CURRENT - NAVAL SERIES

- Precisión en fase ±2,5 %
- Frequency: 50 or 60 Hz
- Time: ±0,5 s.
- Un Range: ±15 %

Model		RSC2
Dimensions	mm	144x144
Approx. weight	Kg.	2,00
		SYNCHRONISING RELAY
Un	V	2x110, 230, 400 or 440

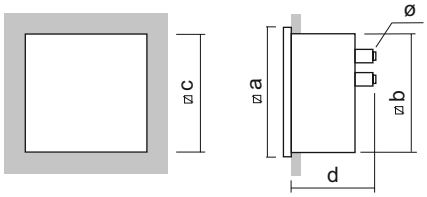
A check adjusts the phase difference from 5 to 40 electrical degrees, and another adjusts the minimum time from 0.2 to 2,5 secs, during which this difference must be maintained.
When both FORmeters go into the set limits, the output relay operates the synchronizing switch and an LED indicates that coupling may be carried out.
To adjust operating limit, remove security cover or screw.

Connection diagrams



Output relay: 1 switching contact (max. 200 VA, 250 V, 5 A AC.)

Dimensions (mm)



Model	Ranges	⧄a	⧄b	⧄c	d	ø
RSC2	100÷440 V	144	135	138^{+1}	134	M.4

MAXIMUM CURRENT RELAY

Electronic overcurrent relay which detects the current level in each phase in three-phase alternators.

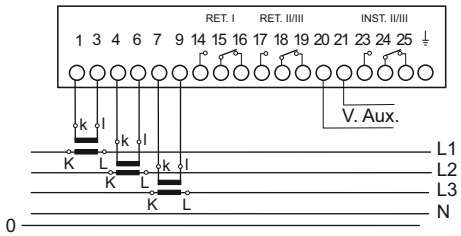
ALTERNATING CURRENT - NAVAL SERIES

- Accuracy Current: ±2,5 % (Trip set value)
  Time: ±3 % ±1 sg. of set value
- Frequency: 50 or 60 Hz

Model		RMC2	RMC2A
Dimensions	mm	144x144	144x144
Approx. weight	Kg.	1,33	1,33
MAXIMUM CURRENT RELAY			
In	A	../5	../5
Aux. V	V	100, 110, 230, 400 or 440 ±30% C.A	.

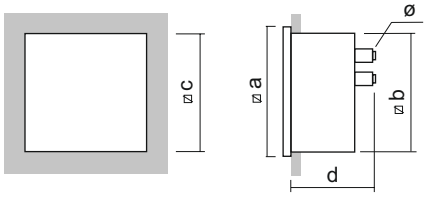
- Overload: 10 In for 1 s
- Aux. v range: ±30 %
- Hysteresis: <0.16 A
- Adjustment limit: 0.6÷1.6 (of In independent of each phase)
- Delay on output signal: (independent of overload): 1 from 2 to 60 secs in phases II and III
- Output contacts power: Max. 200 VA, 400 V, 5 A
- Indicators to check operation time.
- To adjust operating limit, remove security cover or screw.

Connection diagrams



- Output contacts: Phase I, Relay I
- 15-14 switch normally open and 15-16 closed
- In overload: 15-14 closed after time-out
- Phases II/III: Relay II/III, 18-17 switch normally open and 18-19 closed
- With auxiliary voltage, without overload, 18-17 closed
- In overload: 18-19 closed after time-out
- Instant relay.
  Switch, 24-23 open, 24-25 closed In overload, 24-23 closed
- On standby, 18-17 is open and 18-19 closed
- With auxiliary voltage, without overload, 18-19 remain closed
- In overload, 18-17 closed after time-out
- RMC2A:
  The same features as RMC2 except that II/III relay operation is reversed

Dimensions (mm)



Models	Ranges	⧄a	⧄b	⧄c	d	ø
RMC2	../5	144	135	138^{+1}	89	M.4
RMC2A	../5	144	135	138^{+1}	89	M.4

MIN-MAX VOLTAGE AND FREQUENCY RELAY

Instrument for voltage and frequency control in a three-phase or single-phase system.

ALTERNATING CURRENT - NAVAL SERIES

- Accuracy: ±2 % - Frequency: 50 or 60 Hz

Model		RUFC2
Dimensions	mm	144x144
Approx. weight	Kg.	1,25
MINIMUM-MAXIMUM VOLTAGE AND FREQUENCY RELAY		
Un	V	100, 110, 230, 400 or 440
Aux. V	V	110, 230 ó 400 ±30% C.A

- Un range: -40 ÷ +20 %
- Aux. v range: ±30 %

MINIMUM VOLTAGE SETTING
- Un range: 60-100 % (Accuracy 1%)
- Timer: 0-5 s. (Accuracy 2% ±0.2 s)

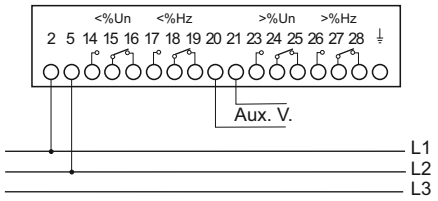
MAXIMUM VOLTAGE SETTING
- Un range: 80-120 % (Accuracy 1%)
- Timer: 0-5 s. (Accuracy 2% ±0.2 s)

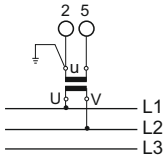
MINIMUM FREQUENCY SETTING
- Range: 45-55 / 55-65 Hz (Accuracy 1%)
- Timer: 0-10 s. (Accuracy 2% ±0.2 s)

MAXIMUM FREQUENCY SETTING
- Range: 45-55 / 55-65 Hz (Accuracy 1%)
- Timer: 0-10 s. (Accuracy 2% ±0.2 s)

Instant alarm and relay operation indicators.
To adjust operating limit, remove security cover or screw.

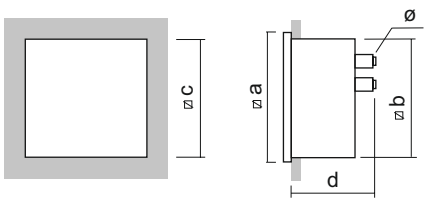
Connection diagrams





- One switch output relay each setting (max. 200 VA, 400 V).
- Hysteresis <2 %

Dimensions (mm)



Models	Ranges	⧄a	⧄b	⧄c	d	ø
RUFC2	100÷440 V	144	135	138^{+1}	89	M.4

INSULATION INDICATORS

Instrument which detects and measures an earth insulation failure in a three-phase circuit with insulated neutral with direct and continuous connection to the system (position G on switch). The IAC_VA models have a built-in alarm system with continuous adjustable setting device from 0 and 5 MΩ.

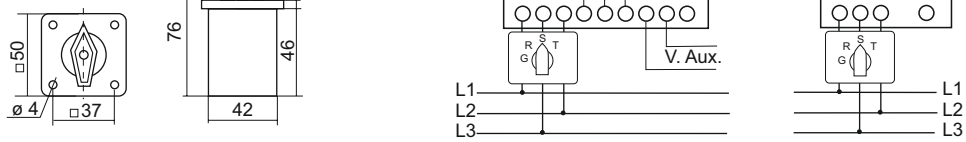
ALTERNATING CURRENT - NAVAL SERIES

- Accuracy: ±1,5 % (of Un scale arch)
- Frequency: 50 or 60 Hz

Model		IAC3V	IAC2V	IAC3VA	IAC2VA
Dimensions	mm	96x96	144x144	96x96	144x144
Approx. weight	Kg.	0,92	1,20	0,92	1,20
INSULATION INDICATORS					
	V	230-400 or 440 V		230-400 or 440 V	
Aux. V	V	- - -		110 or 230 C.A.	

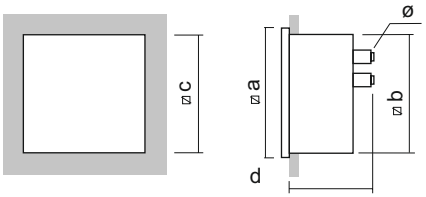
- Scale; 0..50..0 MΩ (1 MΩ to centre)
- Aux. v. range: ±20%
- Guaranteed number of operations: 107
- Output contact: Switched at 2A, 230 V A.C. 200 VA
- Scale: 0-100 (Insulation comparison)
- Setting accuracy: ±3% of scale value
- To adjust operating limit, remove security cover or screw

Connection diagrams



If the insulation drops below the selected level, an internal spdt micro-relay closes the alarm circuit as the indicator, located beside the setting device, comes on. Moving the switch to position R, S or T, allows the faulty phase to be located. The phase with the lowest reading will have the insulation fault.

Dimensions (mm)



Models	Ranges	ø a	ø b	ø c	d	e	ø
IAC3V IAC3VA	230÷440	96	89	$92^{+0,8}$	92	100	M.4
IAC2V IAC2VA	230÷440	144	135	138^{+1}	89	140	M.4

RUDDER DEGREE INDICATOR FOR VESSELS

Rudder position indicator through connection to potentiometer using resistance variations..

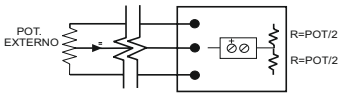
DIRECT CURRENT - NAVAL SERIES

- Scale: 90º - Accuracy: ±1,5 % - Burden: 2000 Ω/V

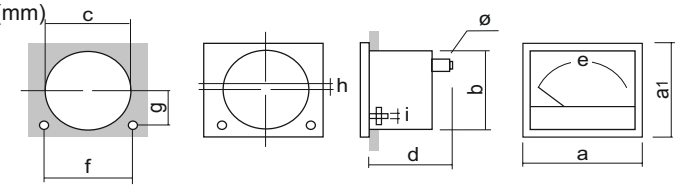
Model		CCb8
Dimensions	mm	130x100
Approx. weight	Kg.	0,25
INDICADOR DE GRADOS DE TIMÓN		
Scales	º	40-0-40 or 45-0-45
Range	V	7-0-7 or 12-0-12

Standardised scales. PORT (red arc); STARBOARD (green arc). Lighting: Grade line at 12 V (two 2W lamps). The central value or 0º on the scale coincides with the potentiometer centre.

Connection diagram



Dimensions (mm)



Models	Ranges	axa1	b	c	d	e	f	g	h	i	ø
CCb8	V	130x100	66	67	59	$100^{+0,8}$	100	13	13	M.4	M.4

R.P.M. INDICATOR FOR VESSELS

Supplied by a generator located at the propeller axis indicating its r.p.m. AHEAD or ASTERN.

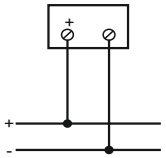
DIRECT CURRENT - SERIE NAVAL

- Scale: 240º - Accuracy: ±1,5 % - Burden: 100 Ω/V

Model		CC2C
Dimensions	mm	144x144
Approx. weight	Kg.	0,68
R.P.M. INDICATOR FOR VESSELS (MAIN MOTOR)		
Scales	r.p.m.*	150-0-150, 180-0-180, 200-0-200 or 300-0-300
Ranges	V**	10-0-10

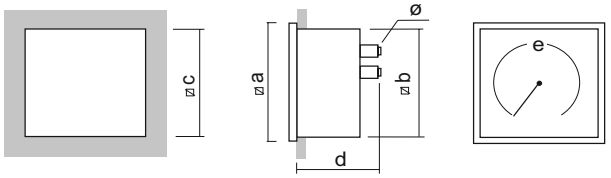
*Standardised scales. ASTERN (red arc); AHEAD (green arc). ** Standardised ranges, according to voltage/speed curve (V.DC./r.p.m.) of the generator. Full scale adjustment: With built-in potentiometer ±10 % of total value. Lighting: Translucent at 12 or 24 V.

Connection diagram



Voltage

Dimensions (mm)



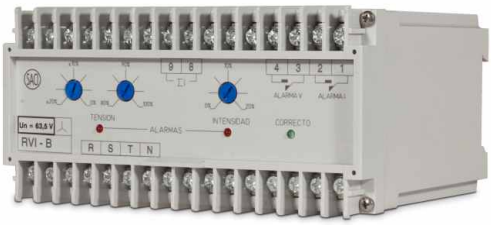
Models	Ranges	⧄a	⧄b	⧄c	d	e	ø
CC2C	V	144	135	$138^{+0,8}$	88	220	M.4

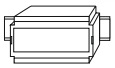
VOLTAGE AND CURRENT SURVEILLANCE RELAY

Designed for supervising measurement board connections in installations or substations.
Detection of Current Unbalance, Voltages, Overvoltage and Undervoltage.

ALTERNATING CURRENT

- Detection range:
  - · Unbalance 0 to 20 % of Vn.
  - · Unbalance 0 to 20 % of In.
  - · Undervoltage 80 to 100 % of Vn.
  - · Overvoltage 120 % of Vn.
- Class: 1
- Output features: 250 V, 3 A, 300 VA.
- Burden: 0.48 VA per phase

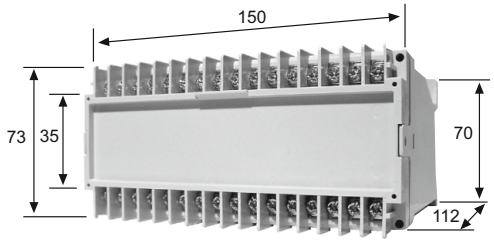




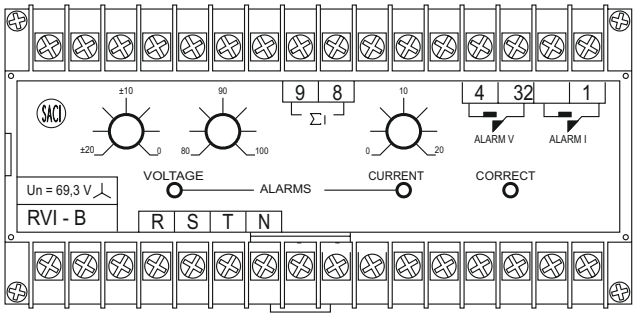
Model		RVIA (three-phase, 3 wire)	RVIB (three-phase, 4 wire)
Dimensions	mm	150x70x112	150x70x112
Approx. weight	Kg.	1,20	1,20
VOLTAGE AND CURRENT SURVEILLANCE RELAY			
	V	110, 230 or 400 V	
	A	../5 A or ..1/A	

Current faults activate an alarm relay and any form of voltage fault activates a second relay. Has an indicator to show "CORRECT" status and two indicators to show "CURRENT FAILURE" and "VOLTAGE FAILURES".
Controls on the front allow comparison levels to be selected to set off the alarm. Two controls are for voltage, for unbalance levels (from 0 to 20 %), and undervoltage levels (from 80 to 100 %) and a third for current (from 0 to 20 %).
To operate, the three phases to be supervised are connected to the voltage inputs and the three currents pass through the associated toroidal transformer.

Dimensions (mm)



Connection diagrams

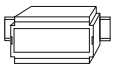


Connections:
Voltages, connected to terminals marked R, S, T and N. For three wire equipment, obviously neutral is not connected.
Currents, the toroidal transformer output is connected to terminals marked I (8 and 9).
Output relays have potential-free contacts and are insulated for complete connection flexibility.

NAVAL SURVEILLANCE RELAY - RSN

PRODUCT DESCRIPTION

RSN is a naval supervision relay whose mission is to protect the generating sets usually installed on board of vessels. It is a multifunction equipment built with a microprocessor which makes RNS a versatile and reliable device. It can be connected to a centralized control board through a serial port so that the configuration and data sending of the different operations can be carried out. A liquid crystal screen facilitates the display of the measured data as well as the local configuration of the equipment through a keypad located in front of the device.



Model		RSN (Three-phase 4 wire)
Dimensions	mm	150x75x115
Approx. weight	Kg.	1,20
		NAVAL SURVEILLANCE RELAY - RSN
	V	500 V (line-line) Max.
	A	../5 A
Aux. V	V	110,230 or 400 V A.C.
Aux. V	V	24-48-110 V A.C.
Aux. V	V	UNIVERSAL 85-264 V A.C. and D.C.

MEASURING ENVIRONMENT

ELECTRICAL QUANTITY	Symbol	L1	L2	L3	Total
Voltage (Line-to-Neutral)	V	•	•	•	Average
Voltage (Line-to-Line)	V	•	•	•	
Neutral current	A	•	•	•	Average
Active Power	kW	•	•	•	•
Reactive Power	kVAr	•	•	•	•
Apparent Power	kVA	•	•	•	•
Power factor	PF	•	•	•	•
Frequency	Hz				•
THD Current	A	•	•	•	
THD Voltage	V	•	•	•	
Neutral current	A				Average

FUNCTIONAL DESCRIPTION

RSN relay can be set as:

- RMC2 Over current relay
- RU H Over voltage relay
- RU L Under voltage relay
- RUCM Maximum and minimum average voltage and maximum average current
- RIC Direct power and reverse power relay
- RUF Maximum and minimum voltages and maximum and minimum frequency relay
- RUNB Unbalanced voltages, currents, over voltages and under voltages relay

Setting can be modified through the keypad or the serial line. The different values assigned to each input, as well as the alarm values must be set for each mode.

NAVAL SURVEILLANCE RELAY - RSN

SETTING

Operations to be carried out through the keyboard:

- Rated voltage value of the installation.
- Rated current transformer value.
- Equipment identity in a RS-485 net.
- Baud rate of the serial line RS-485
- Operating mode of the output relays
- Reference value and delays used in relay operation

Operations to be carried out through the serial line:

- Equipment settings.
- Identity and serial number settings.
- Reading of the system FORmeters.
- Change of voltage, current and energy range.
- Change of the access code to keypad setting.
- Change of the baud rate
- Other functions related to different options installed in the equipment

TECHNICAL SPECIFICATIONS

Input	
Current:	5 A.
Voltage:	500 V (Line-to-Line) max
Auxiliay supply:	110, 230, or 400 V AC.±20% 24, 48, 110 V DC ±20%. Universal from 85 to 264 VDC, 47-65 Hz.

DIGITAL OUTPUTS

Number of outputs:	Six
Type:	SPDT relay 230 V; 3 A; 300 VA

Output relays are grouped in pairs with one common to each point which must be taken into account in the external circuit. There is no load limitation in the contacts, therefore, they must be protected by some external protection device. Connections are displayed on the previously shown diagram.

SERIAL OUTPUT

Type:	RS485 (DB9 male connector)
Options	
Output	RS232(DB9 female connector)
Protocol	MODBUS/JBUS

MOUNTING

Equipment can be mounted in EN 50022 DIN RAIL or through screws into a board

DIMENSIONS.

Box: ERNI LDG-A-46.	150x75x115 mm.

ACCEPTABLE OVERLOADS

Current circuits	2*In continuamente 20*In durante 3 s. 40*In durante 1 s.
Voltage circuits	1,22*Un continuous

INSULATION (as EN 61010)

Insulation grade.	Double
Category of the installation	III
Pollution grade	2

Rated values

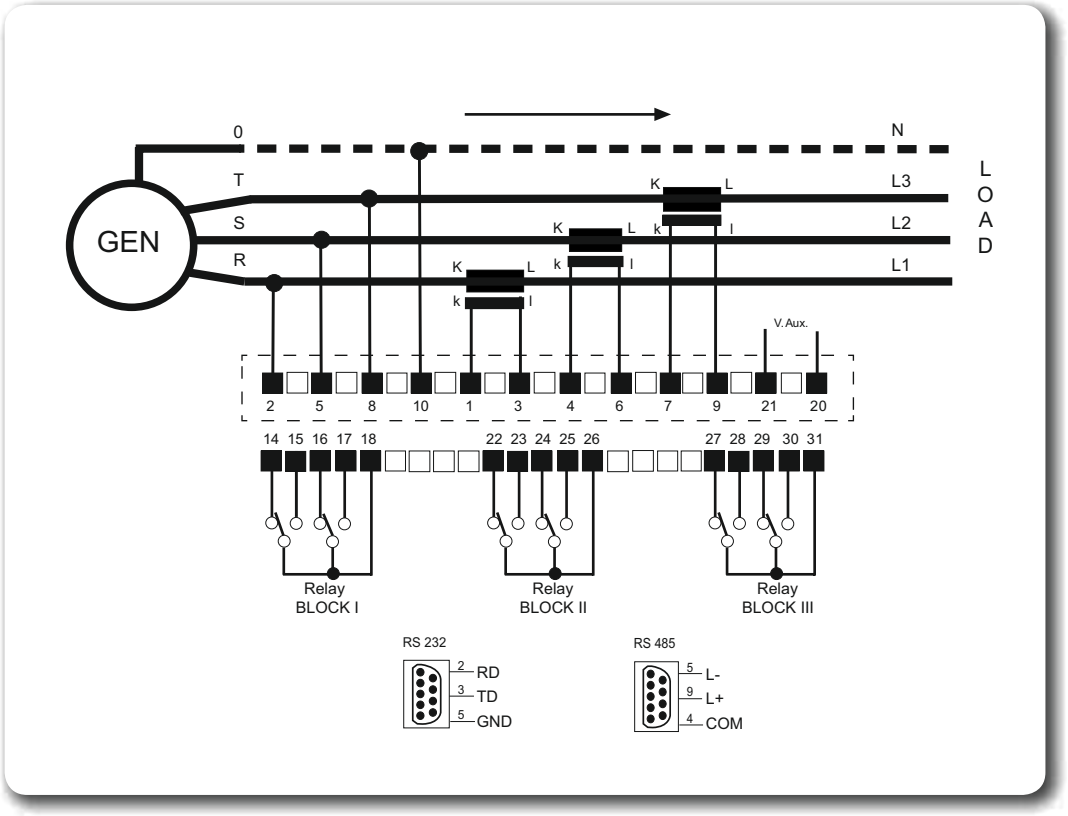
Voltage, 500V (350 V to GND)
Current, 350 V
Output, 50 V
Serial line, 50 V
Digital output, 300 V

NAVAL SURVEILLANCE RELAY - RSN

Required data is displayed on screens in the following figure:

TEXT	VARIABLE	DESCRIPTION
RMC2 - OVER CURRENT RELAY		
IL1	VALUE_ALAR0	REFERENCE % FOR I L1
IL2	VALUE_ALAR1	REFERENCE % FOR I L2
IL3	VALUE_ALAR2	REFERENCE % FOR I L3
TIL1	DELAY_ALAR0	DELAY FOR I L1 IN TENTHS OF SECONDS
TIL2	DELAY_ALAR1	DELAY FOR I L2 IN TENTHS OF SECONDS
TIL3	DELAY_ALAR2	DELAY FOR I L2 IN TENTHS OF SECONDS
RUH - OVER VOLTAGE RELAY		
U L1	VALUE_ALAR0	REFERENCE % FOR U L1
U L2	VALUE_ALAR1	REFERENCE % FOR U L2
U L3	VALUE_ALAR2	REFERENCE % FOR U L3
T U1	DELAY_ALAR0	DELAY FOR U L1 IN TENTHS OF SECONDS
T U2	DELAY_ALAR1	DELAY FOR U L2 IN TENTHS OF SECONDS
T U3	DELAY_ALAR2	DELAY FOR U L2 IN TENTHS OF SECONDS
RUL - UNDER VOLTAGE RELAY		
U L1	VALUE_ALAR0	REFERENCE % FOR U L1
U L2	VALUE_ALAR1	REFERENCE % FOR U L2
U L3	VALUE_ALAR2	REFERENCE % FOR U L3
T U1	DELAY_ALAR0	DELAY FOR U L1 IN TENTHS OF SECONDS
T U2	DELAY_ALAR1	DELAY FOR U L2 IN TENTHS OF SECONDS
T U3	DELAY_ALAR2	DELAY FOR U L2 IN TENTHS OF SECONDS
RUCM - MAXIMUM AND MINIMUM AVERAGE VOLTAGE AND MAXIMUM AVERAGE CURRENT		
UM H	VALUE_ALAR0	REFERENCE % FOR MAXIMUM RATED VOLTAGE
UM L	VALUE_ALAR1	REFERENCE % FOR MMINIMUM RATED VOLTAGE
IM H	VALUE_ALAR2	REFERENCE % FOR MAXIMUM RATED VOLTAGE
TUMH	DELAY_ALAR0	DELAY FOR U MAXIMUM RATED VOLTAGE IN TENTHS OF SECOND
TUML	DELAY_ALAR1	DELAY FOR U MAXIMUM RATED VOLTAGE IN TENTHS OF SECOND
TIMH	DELAY_ALAR2	DELAY FOR I MAXIMUM RATED VOLTAGE IN TENTHS OF SECOND
RIC - DIRECT POWER AND REVERSE POWER RELAY		
P d	VALUE_ALAR0	REFERENCE % FOR DIRECT ACTIVE POWER
P I	VALUE_ALAR1	REFERENCE % FOR REVERSE ACTIVE POWER
T Pd	DELAY_ALAR0	DELAY FOR DIRECT POWER IN TENTHS OF SECOND
T PI	DELAY_ALAR1	DELAY FOR DIRECT POWER IN TENTHS OF SECOND
RUF - MAXIMUM AND MINIMUM VOLTAGES AND MAXIMUM AND MIN FREQUENCY		
U H	VALUE_ALAR0	REFERENCE % FOR MAXIMUM VOLTAGE (1-2-3)
U L	VALUE_ALAR1	REFERENCE % FOR MAXIMUM VOLTAGE (1-2-3)
Fr H	VALUE_ALAR2	FOR MAXIMUM FREQUENCY
Fr L	VALUE_ALAR3	FOR MAXIMUM FREQUENCY
TUHL	DELAY_ALAR0	DELAY FOR MAXIMUM OR MINIMUM VOLTAGE IN TENTHS OF SECOND
TFHL	DELAY_ALAR1	DELAY FOR MAXIMUM OR MINIMUM VOLTAGE IN TENTHS OF SECOND
RUNB - UNBALANCED VOLTAGES, CURRENTS, OVER VOLTAGES AND UNDER VOLTAGES RELAY		
UUnb	VALUE_ALAR0	REFERENCE % FOR VOLTAGE UNBALANCE
Iunb	VALUE_ALAR1	FOR CURRENT UNBALANCE
U H	VALUE_ALAR2	FOR MAXIMUM VOLTAGE (1-2-3)
U L	VALUE_ALAR3	FOR MINIMUM VOLTAGE (1-2-3)
TUUn	DELAY_ALAR0	DELAY FOR UNBALANCED VOLTAGE IN TENTHS OF SECOND
TIUn	DELAY_ALAR1	DELAY FOR UNBALANCED CURRENT IN TENTHS OF SECOND
TUHL	DELAY_ALAR2	DELAY FOR MAXIMUM OR MINIMUM VOLTAGE IN (1-2-3) TENTHS OF SECOND

NAVAL SURVEILLANCE RELAY - RSN



CURRENT OR POWER RELAY R2M / R2MC

R2M is an equipment that measures current or power in a three phase network. Its functioning mode is based on the activation of the contacts of a step control relay when the range, which is chosen on the frontal panel, is exceeded.

It has a x/5A current input that must be connected to the secondary of a current transformer and to the voltage input that can be directly connected to the net.

Depending on the connection and on the chosen mode it can be used as:

- R2M –CURRENT RELAY
- R2M – ACTIVE POWER RELAY
- R2M – REVERSE POWER RELAY
- R2MC – REACTIVE CURRENT RELAY

TECHNICAL FEATURES

VOLTAGE INPUT

Rated voltage (Un)	230 or 400 V A.C
Burden	< 3 VA, 2W
Frequency	50 - 60 Hz

CURRENT INPUT

Current (In)	x/5 A
Burden	< 0,2 VA
Permanent overload	1,2 In

- Current relay
- Active power relay
- Reverse power relay

Range of the variable adjustment:	5 A; 0-100%
Ton connection delay	4 s
Toff disconnection delay	4 s

- Reactive current relay

Range of the variable adjustment:	0,15....2 A
Ton connection delay	5 s
Toff disconnection delay	2 s

Output relay

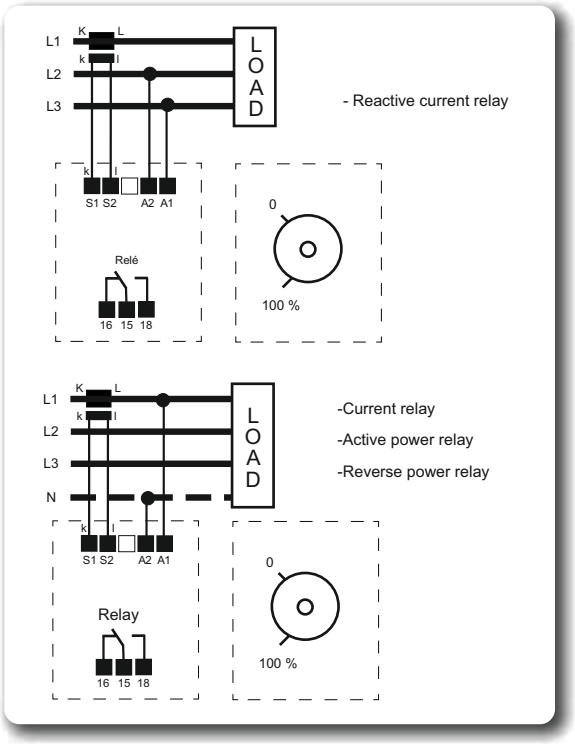
Insulation rated voltage Ui		250 V A.C.
	A.C.11 Ie/Ue	4 A / 240 V A.C.
	D.C.11 Ie / Ue	1 A / 110 V D.C.

Auxiliary voltage:	autosupplied
Connection indication	
	green LED: supply
	Red LED: connected relay.

GENERAL

Case material	ABS, UL94 V0
Dimensions	(2 DIN modules) 35 mm
Connection	Terminals with screw
Max. wire diameter	12 mm^2 (inputs)
	2,5 mm^2 (pulse output)
Mounting	DIN RAIL 35 mm

CONNECTION DIAGRAM



SPECIALITIES

Dimensions	⎅ 48	⎅ 72	⎅ 96	⎅ 144	80 x 64	105 x 80	130 x 100	MODULAR	⎅ 48	⎅ 72	⎅ 96	⎅ 144
POINTERS												
Knife pointer + fine divisions	- - -	●	●	●	- - -			- - -	- - -			
Knife pointer + fine divisions + mirror	- - -	●	●	●	●			- - -	- - -			
Red pointer, set externally	●				●			- - -				
SCALE												
Non standard scale (*)	●				●			●	●			
Antiparallax scale	- - -				- - -			- - -	- - -	●	●	---
Black scale, white div., figures and pointer	- - -	●	●	●	●			- - -	- - -			
Black scale, yellow div., figures and pointer	- - -	●	●	●	- - -			- - -	- - -	●	●	●
Double scale	- - -	●	●	●	●			- - -	●			
Double numbering	- - -	●	●	●	●			- - -	- - -	●	●	●
Red line	●				●			●	●			
Colour arc (until 20 mm)	●				●			●	●			
Add text (<10 letters)	●				●			●	●			
Non electrical unit measuring												
PROTECTION												
Naval series or tropicalized	●				●			●	●			
Protection IP43	●				●			- - -	●			
Housing protection IP54	●				- - -			- - -	●			
Terminal cover (protection IP20)	●	●	●	- - -	- - -			- - -	●	- - -	- - -	- - -
Movil equipment and critical damping	●				●			- - -	●			
Frontal protection (IP65)	- - -	●	●	- - -	- - -			- - -	- - -	●	●	- - -
MISCELLANEUS												
Makrolon glass	●				●			- - -	●			
Antirreflecting glass	●				●			- - -	●			
Lighting 12, 24 V (with white scale)	- - -	●	●	●	- - -	●	●	- - -	- - -	●	●	●
Indirect Lighting 12, 24 V (with black scale)	- - -	●	●	●	- - -	●	●	- - -	- - -	●	●	●
Non vertical working position	●				●			●	●			
Rubber gasket (Panel)	- - -	●	●	- - -	---			- - -	- - -			

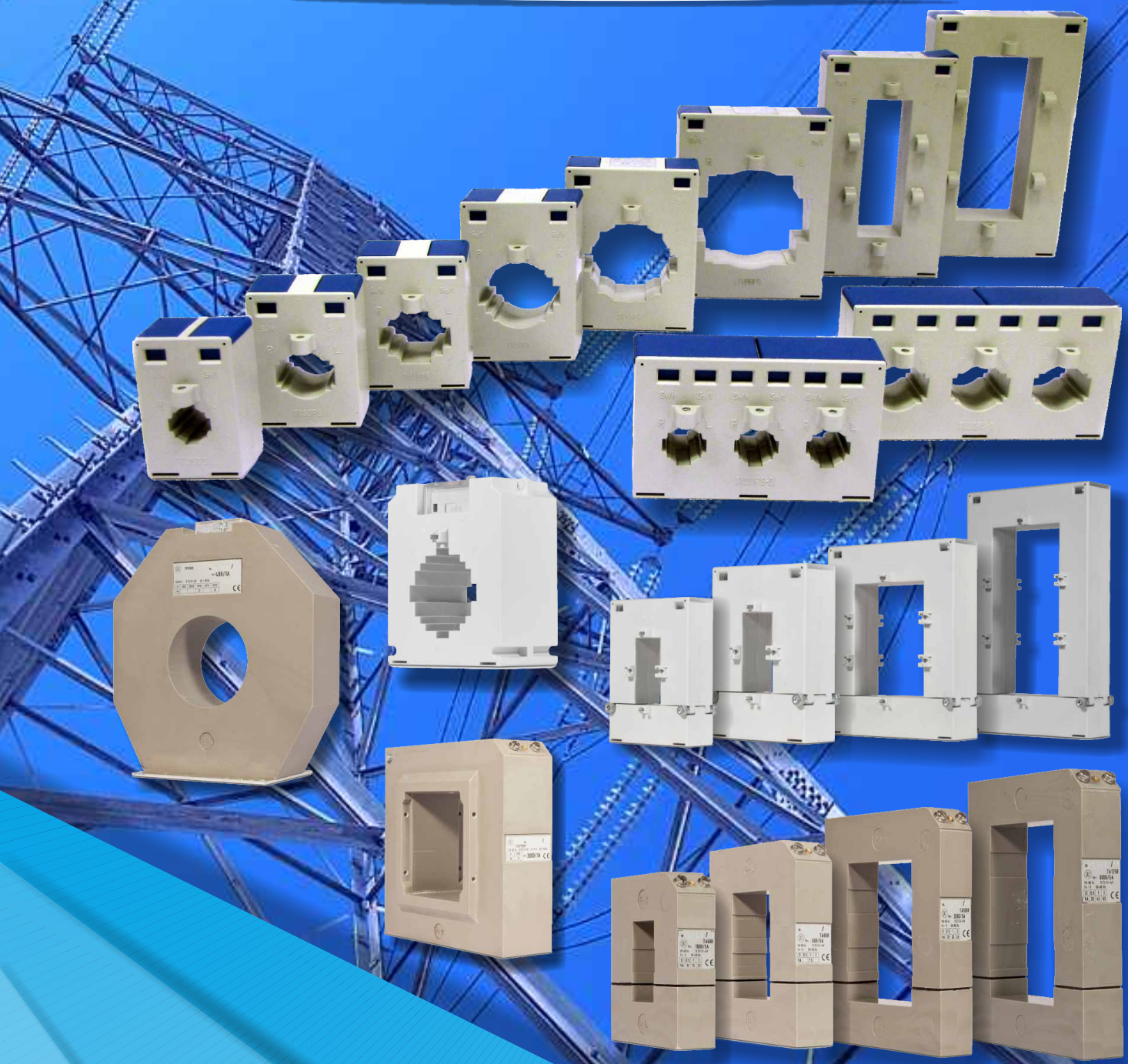
MOVIN IRON METERS												
Non standard input (**)	●				●			●	- - -			
Calibrated for 150 or 400 Hz	●				●			●	- - -			
Calibrated in D.C.	●				●			●	- - -			
Accuracy 1%	●				●			●	- - -			
Insulation 3 kV	●				●			●	- - -			
750 to 1000V (with external box)	●				●			●	- - -			
Overload 200% (A, mA)	●				●			●	- - -			
Overload 500% (A, mA)	●				●			●	- - -			
Double range	●				●			●	- - -			
MOVING COIL AND MOVING COIL RECTIFIED METERS												
Non standard input (**)	●				●			●	●			
Insulation 3 kV	●				●			●	●			
Central zero	●				●			●	●			
Displaced zero	●				●			●	●			
Zero mechanically suppressed (max. 25%)	●				●			●	●			
Overload 200 or 500% (for Amm. A.C.)	●				●			●	●			
Non linear function scale (Ohm, db, etc.)	●				●			●	●			
Adjusted to specific internal resistance	●				●			●	●			
Accuracy	●				●			●	●			
600 up to 1000 V D.C.(with external box)	●				●			●	●			
>1.000÷2.000V D.C.(with external box)	●				●			●	●			
>2.000÷4.000V D.C (with external box)	●				●			●	●			
Full scale adjustable by potentiometer (±10%)	- - -	●	●	●	- - -			- - -	- - -	●	●	●
Double range	●				●			●	●			

(*) Scale: striped and numbered.
(**) Current or voltage required to move the needle at the end of the measurement zone.

SPECIALITIES

Dimensions	 ⎅ 48	⎅ 72	⎅ 96	⎅ 144	 MODULAR	 ⎅ 48	⎅ 72	⎅ 96	⎅ 144
INDUCTION WATTMETERS AND VARMETERS									
Central zero	●				●	●			
Displaced zero	●				●	●			
Non standard voltage	●				●	●			
Current 1 A	●				●	●			
Calibrated between 0,4 and 0,5 of appa. power	●				●	- - -			
Calibrated between 0,6 and 0,8 of appa. power	- - -				- - -	●			
Calibrated between 1,3 and 1,5 of appa. power	●				●	●			
Accuracy 1%	●				●	●			
ELECTRONIC WATTMETERS AND VARMETERS									
Calibrated to 400 Hz	●				●	●			
Current 1 A	●				●	●			
Accuracy 1%	●				●	●			
INDUCTION POWER FACTOR METERS									
Non standard voltage (single phase)	●				●	●			
Non standard voltage (three phase)	●				●	●			
Current 1A	●				●	●			
ELECTRONIC POWER FACTOR METERS									
Non standard voltage	●				●	●			
Scale 0-1-0 (single phase), 0,1-1-0,1 (three phase)	●				●	●			
Current 1A	●				●	●			

TRANSFORMERS



TRANSFORMERS

S.A. DE CONSTRUCCIONES INDUSTRIALES

RANGE OF PRODUCTS

MEASURING TRANSFORMER (PLASTIC CASING)

BUS-BAR

• NARROW PROFILE; PS, THREE-PHASE; PS-3 — TU__PS, TU__PS-3

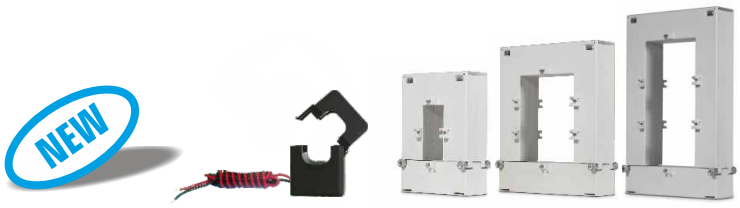
•OTHER MODELS — TU_, TUC_,TL_

WOUND PRIMARY

TU3_P , TU40CP

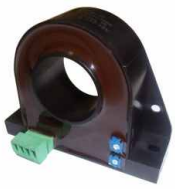
SPLIT CORE

TA__P



HALL EFFECT CURRENT TRANSDUCER

TEH-132



RANGE OF PRODUCTS

PROTECTION TRANSFORMERS (PLASTIC CASING)

BUS-BAR

TUC_, TL_

WOUND PRIMARY

TU3BC

WITH BUILT-IN MEASURING TRANSDUCER

TC_, TC_CV

MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

INSULATION CLASS B (130 °C)

BUS-BAR

- NARROW PROFILE

TU_RS

- OTHER MODELS

TUP20RC, TUP_R

TPR_

RANGE OF PRODUCTS

MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN) — INSULATION CLASS B (130 °C)

WOUND PRIMARY

TU3aR,TU3bR, TU3R

SPLIT CORE

TA_R

PROTECTION TRANSFORMERS (ENCAPSULATED IN RESIN) — INSULATION CLASS B (130 °C)

BUS-BAR

TUP20RC, TUP_R

WOUND PRIMARY

TU3PR

SUMMATION CURRENT & VOLTAGE TRANSFORMER (RESIN)

TRS, TE15P

OUTDOOR CURRENT TRANSFORMERS WITH CABLE (RESIN)

TU60PRI, TA60RI

NEW

CONTENTS

GENERAL

Measuring and protection transformers. Wound primary, bus-bar, split core and narrow profile transformers
For cable or bus-bar.
Plastic or resin encapsulated casing (depending on type).
With fixing support and/or bar enclosing screws depending on type.
Fixing to DIN rail (on request)

STANDARDS

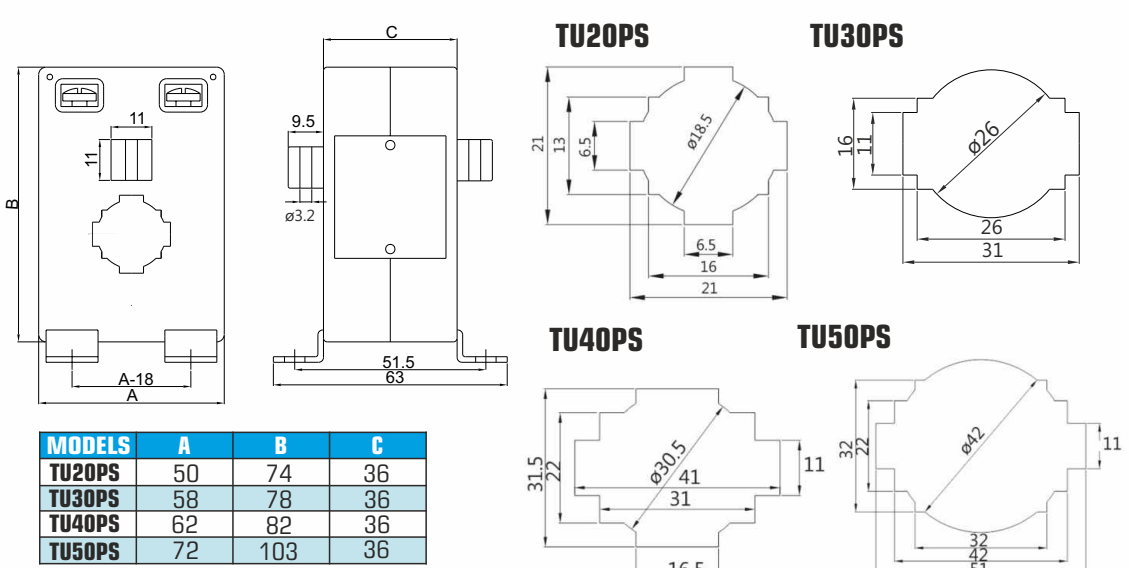
IEC 185
UNE EN 61869 (IEC 61869)
VDE 0414
IEC 801/1-3.4
DIN 57414
BS 3938
EN 50081
EN 50082
IEC 1010

GENERAL TECHNICAL SPECIFICATIONS

Security factor	Fs < 5
Rated voltage (maximum)	720 V
Test voltage	3 kV A.C. (1 min)
Frequency	50-60 Hz
Rated short-time thermal current	Ith = 60 In for wound primary transformers. Ith limited by cable sizes or primary bus-bar for other cases.
Rated dynamic current	IDyn = 2,5 x Ith
Continuous overload	ID = 1,2 x IN
Operating temperature	-10...50 ºC.
Accuracy	0,5 ; 1 and 3 (0,2S, 0,5S on request)
Rated secondary current	/5 or /1 A
Insulation class	Class E Class B (130 ºC) Available

NARROW PROFILE CURRENT TRANSFORMERS (PLASTIC CASING)

BUS-BAR TRANSFORMERS										
MODEL	TU20PS			TU30PS		TU40PS		TU50PS	
Bus-Bar	20x6			30x10		40x10		50x10	
Cable	Ø18			Ø25		Ø30		Ø40	
Accuracy Class	0,5	1	3	0,5	1	0,5	1	0,5	1
Ipn (A)	VA			VA		VA		VA	
30			0,5						
40			1						
50			1						
60		1	1,5						
75		1,5	1,5						
100		1,5	2,5		1,5				
125	1,5	2,5	3,75		1,5				
150	2,5	3,75	5	1,5	2,5		2		
200	3,75	5	5	2,5	3,75	2,5	3,75		
250	5	7,5	7,5	3,75	5	2,5	3,75		
300				3,75	5	5	5		
400				3,75	5	5	5	3,75	5
500				5	7,5	5	7,5	5	7,5
600				5	7,5	5	7,5	7,5	10
750						5	7,5	7,5	10
800						5	7,5	7,5	10
1000								10	15

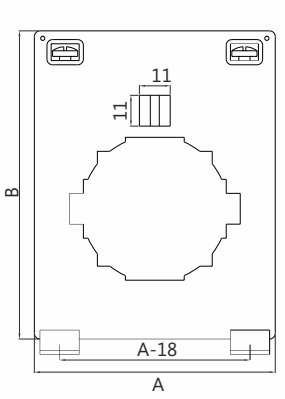


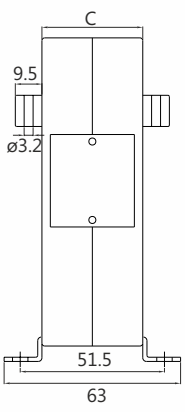
MODELS	A	B	C
TU20PS	50	74	36
TU30PS	58	78	36
TU40PS	62	82	36
TU50PS	72	103	36

Dimensions in mm.

NARROW PROFILE CURRENT TRANSFORMERS (PLASTIC CASING)

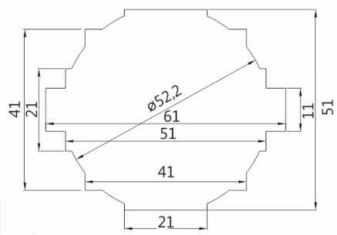
BUS-BAR TRANSFORMERS								
MODEL	TU60PS		TU80PS		TU100PS		TU125PS	
Bus-Bar	60x10		80x30		100x30		125x50	
Cable	Ø50		Ø70		-		-	
Accuracy Class	0,5	1	0,5	1	0,5	1	0,5	1
Ipn (A)	VA		VA		VA		VA	
400	5	5	5	7,5				
500	5	7,5	5	7,5	5	7,5	5	7,5
600	5	7,5	7,5	10	7,5	10	5	7,5
750	5	7,5	7,5	10	7,5	10	7,5	10
800	7,5	10	7,5	10	7,5	10	7,5	10
1000	10	15	10	15	10	15	10	15
1200	15	20	15	20	15	20	15	20
1500	15	20	15	20	15	20	15	20
1600	15	20	15	20	15	20	15	20
2000			15	20	15	20	20	25
2500					20	25	20	25
3000					20	25	20	25
4000							25	30





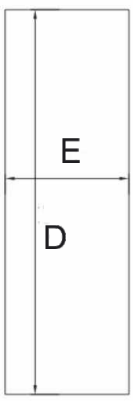
MODELS	A	B	C
TU60PS	86	110	36
TU80PS	106	132	36
TU100PS	95	165	36
TU125PS	115	190	36

TU60PS

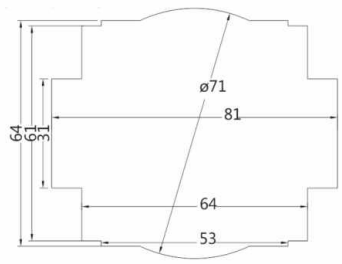


TU100PS TU125PS

MODELS	D	E
TU100PS	103	33
TU125PS	128	53



TU80PS



Dimensions in mm.

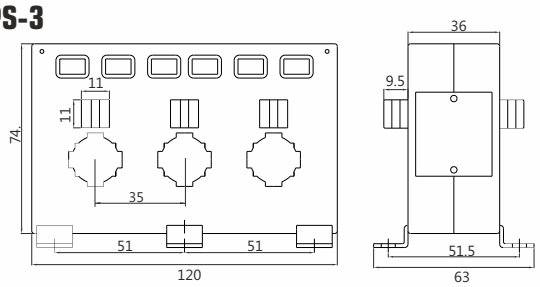
NARROW PROFILE CURRENT TRANSFORMERS (PLASTIC CASING)

TRHEE-PHASE

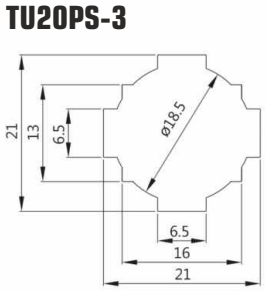
	BUS-BAR TRANSFORMERS				
MODEL	TU20PS-3			TU30PS-3	
Bus-Bar	20x6			30x10	
Cable	Ø18			Ø25	
Accuracy Class	0,5	1	3	0,5	1
Ipn (A)	VA			VA	
30			0,5		
40			1		
50			1		
60		1	1		
75		1	1,5		
100		1,25	1,5		
125	1	1,5	2,5		
150	1	1,5	2,5		1,5
200	1,5	2,5	3,75		2,5
250	2,5	3,75	5		2,5
300				2,5	2,5
400				2,5	2,5
500				3,75	3,75
600				5	5

DIMENSIONS

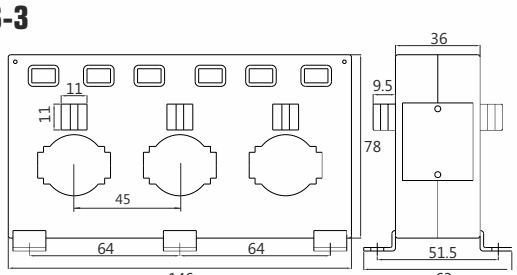
TU20PS-3



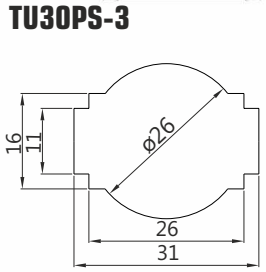
TU20PS-3



TU30PS-3



TU30PS-3



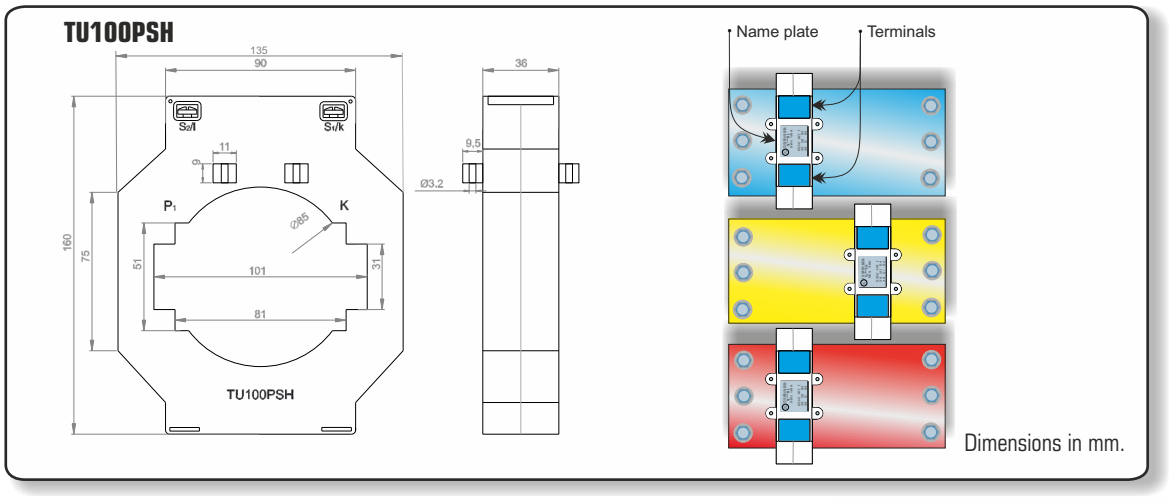
Dimensions in mm.

NARROW PROFILE CURRENT TRANSFORMERS (PLASTIC CASING)

TU100PSH is fully adapted to small spaces between bus-bars

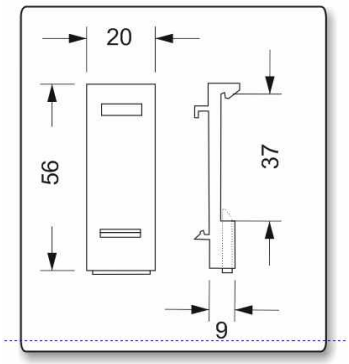
BUS-BAR TRANSFORMERS		
MODEL	TU100PSH	
Bus-Bar	100x30	
	80x50	
Cable	Ø85	
Accuracy Class	0,5	1
Ipn (A)	VA	
400		10
500	5	10
600	5	10
750	15	15
800	15	15
1000	15	15
1200	15	15
1500	15	15
1600	15	15
2000	15	15
2500	15	15
3000	15	15
4000	15	15
5000	15	15

DIMENSIONS



ACCESSORY DIN RAIL

Accessories for DIN Rail incorporation, optionally available for the new line of narrow profile transformers.



CURRENT TRANSFORMERS (PLASTIC CASING) TU3_P , TU40CP

Also available in resin: TU3_PR

TU3BP

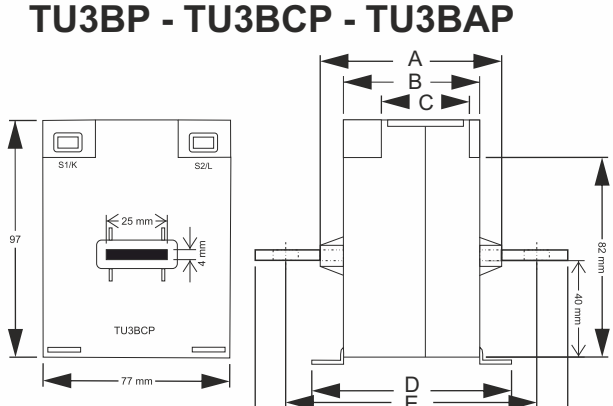
TU3AP

TU40CP

WOUND PRIMARY										
MODEL	TU3BP		TU3BCP		TU3BAP		TU3AP		TU40CP	
Bus Bar (mm)	4x25		4x25		4x25		-		-	
Cable (mm)	-		-		-		-		-	
Accuracy	0,5	1	0,5	1	0,5	1	0,5	1	0,5	1
Ipn (A)	VA		VA		VA		VA		VA	
5	10	15	15	20	5	7,5	2,5	5	5	7,5
10	10	15	15	20	5	7,5	2,5	5	5	7,5
15	10	15	15	20	5	7,5	2,5	5	5	7,5
20	10	15	15	20	5	7,5	2,5	5	5	7,5
25	10	15	15	20	5	7,5	2,5	5	5	7,5
30	10	15	15	20	5	7,5	2,5	5	5	7,5
40	10	15	15	20	5	7,5	2,5	5	5	7,5
50	10	15	15	20	5	7,5	2,5	5	5	7,5
60	10	15	15	20	5	7,5	2,5	5	5	7,5
75	10	15	15	20	5	7,5	2,5	5	5	7,5
100	10	15	15	20	5	7,5	2,5	5	5	7,5
125	10	15	15	20	5	7,5	2,5	5	5	7,5
150	10	15	15	20	5	7,5	2,5	5	5	7,5
200	10	15	15	20	5	7,5	2,5	5	5	7,5
250	10	15	15	20	5	7,5	2,5	5	5	7,5
300	10	15	15	20	5	7,5	2,5	5	5	7,5
400	10	15	15	20					5	7,5
500									5	7,5
600									5	7,5

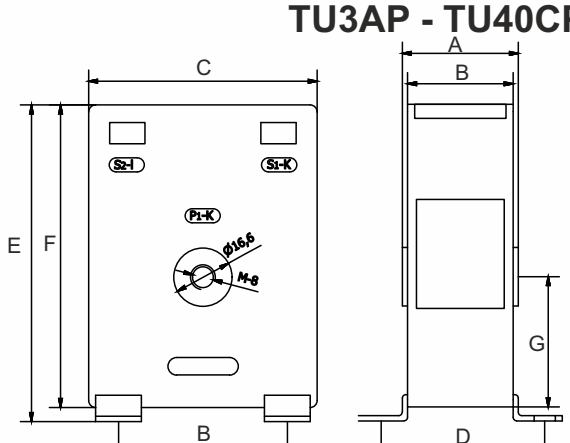
DIMENSIONS

TU3BP - TU3BCP - TU3BAP



	A	B	C	D	E	F
TU3BP	74	56	36	82	103	128
TU3BCP	86	67	36	93	114	140
TU3BAP	63	45	36	71	92	117

TU3AP - TU40CP



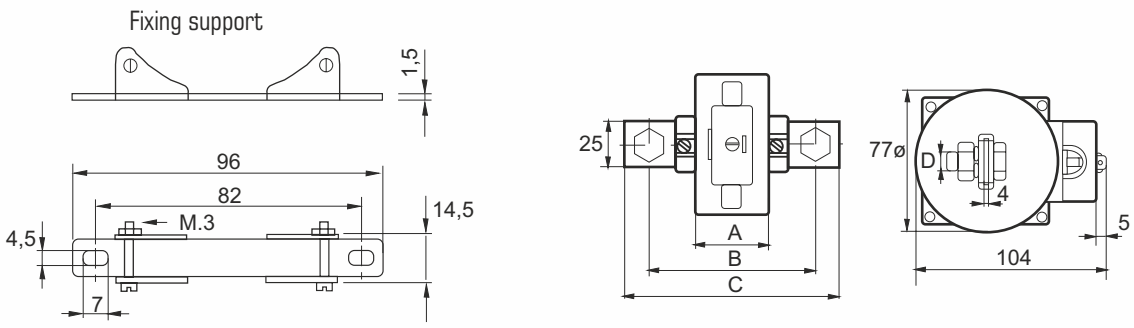
	A	B	C	D	E	F	G
TU3AP	33	30	65	48	90	86	37
TU40CP	51	46	72	64	93,5	89	40

Dimensions in mm.

MEASURING TRANSFORMERS (PLASTIC CASING)

	WOUND PRIMARY							
MODEL	TU 3ba		TU3B			TU 3bc		
Accuracy Class	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA		VA			VA		
5	5	7,5	10	20	30	15	25	40
10	5	7,5	10	20	30	15	25	40
15	5	7,5	10	20	30	15	25	40
20	5	7,5	10	20	30	15	25	40
25	5	7,5	10	20	30	15	25	40
30	5	7,5	10	20	30	15	25	40
40	5	7,5	10	20	30	15	25	40
50	5	7,5	10	20	30	15	25	40
60	5	7,5	10	20	30	15	25	40
75	5	7,5	10	20	30	15	25	40
100			10	20	30	15	25	40
125			10	20	30	15	25	40
150			10	20	30	15	25	40

DIMENSIONS



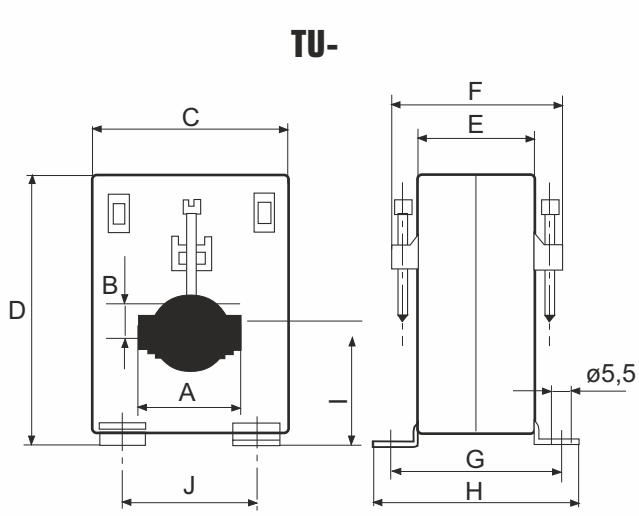
MODEL	TU3ba		TU3B		TU3bc	
Sizes in mm.	5/5 a 25/5	30/5 a 75/5	5/5 a 25/5	30/5 a 150/5	5/5 a 25/5	30/5 a 150/5
A	41		52		63	
B	81	90	92	101	103	112
C	101	115	112	126	123	137
D	M.6	M.10	M.6	M.10	M.6	M.10

Dimensions in mm.

MEASURING TRANSFORMERS (PLASTIC CASING)

BUS-BAR TRANSFORMERS									
MODEL	TU20			TU30			TU 40		
Bus-Bar	20x5			30x10			40x10		
Cable	Ø16			Ø22			Ø30		
Accuracy Class	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA		
30			1						
40			1						
50			1					0,75	1,5
60		1	2					1,25	2
75		1,5	2,5					2	3,75
100		2,5	3,75		1,25	2,5	1	3	5
125		3,75	5		1,25	2,5	2,5	3,75	5
150	3,75	5	7,5	1,5	2,5	3,75	3,75	5	7,5
200	5	7,5	10	2,5	3,75	5	3,75	5	7,5
250	7,5	10	15	3,75	5	7,5	5	7,5	10
300				3,75	5	7,5	7,5	10	15
400				3,75	5	7,5	10	15	20
500				5	7,5	10	10	15	20
600				5	7,5	10	10	15	20
750							10	15	20
800							15	20	30
1000							15	20	30

DIMENSIONS



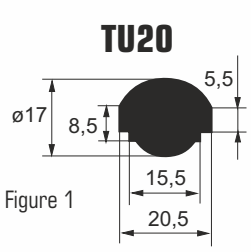


Figure 1

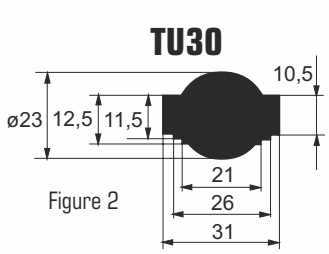


Figure 2

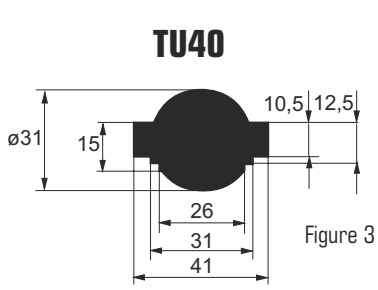
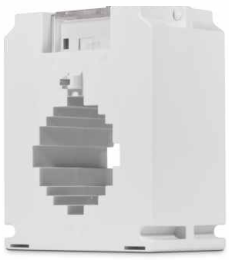


Figure 3

MODELS	A B	C	D	E	F	G	H	I	J
TU20	Figure 1	56	74	33	48,5	48,5	60	32,5	37
TU30	Figure 2	60	79	36	51,5	51,5	63	34,5	41
TU40	Figure 3	71	96	45,5	61	61	72,5	44,5	52

Dimensions in mm.

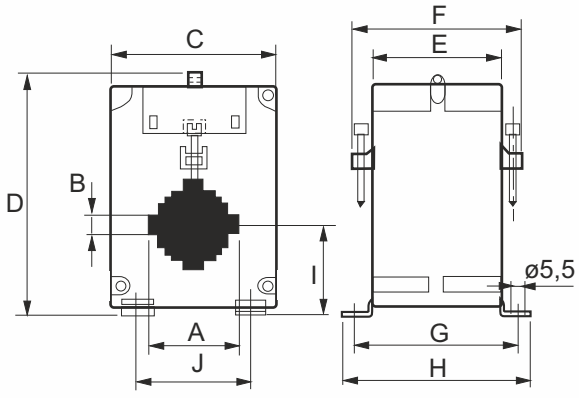
MEASURING TRANSFORMERS (PLASTIC CASING)



BUS-BAR TRANSFORMERS															
MODEL	TUC30			TUC40			TUC50	TU C60			TUC80				
Bus-Bar	30x10			40x10			50x10	60x10			80x30				
Cable	Ø25			Ø32			Ø40	Ø51			Ø65				
Accuracy Class	0,5	1	3	0,5	1	3	0,5	0,5	1	3	0,5	1	3		
Ipn (A)	VA			VA			VA	VA			VA				
50					0,75	1,5									
60					1,25	2									
75					2	3,75									
100				1	3	5									
125				2,5	3,75	5									
150				3,75	5	7,5									
200	15	20	30	3,75	5	7,5									
250	15	20	30	5	7,5	10									
300	15	20	30	7,5	10	15									
400	15	20	30	10	15	20	10	15	20	30	15	20	30		
500	15	20	30	10	15	20	10	15	20	30	15	20	30		
600	15	20	30	10	15	20	10	15	20	30	15	20	30		
750				10	15	20	10	15	20	30	15	20	30		
800				15	20	30	10	15	20	30	15	20	30		
1000				15	20	30	10	15	20	30	15	20	30		
1200							10	15	20	30	15	20	30		
1500							10	15	20	30	15	20	30		
2000							10	15	20	30	15	20	30		
2500											15	20	30		

DIMENSIONS

TUC-



TUC30

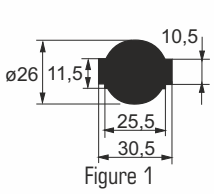


Figure 1

TUC40

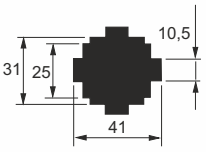


Figure 2

TUC50

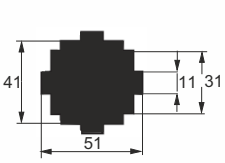


Figure 3

TUC60

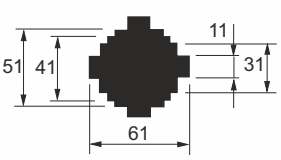


Figure 4

TUC80

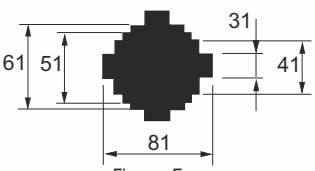


Figure 5

MODELS	A B	C	D	E	F	G	H	I	J
TUC30	Figure 1	77	112	60,5	76	76	87,5	44,5	41
TUC40	Figure 2	71	106,5	45	61	60,5	72	40	47
TUC50	Figure 3	84	117	45	61	60,5	72	44,5	61
TUC60	Figure 4	105	136,5	60	76	75,5	87	54	81
TUC80	Figure 5	131	161,5	60	76	75,5	87	69	107

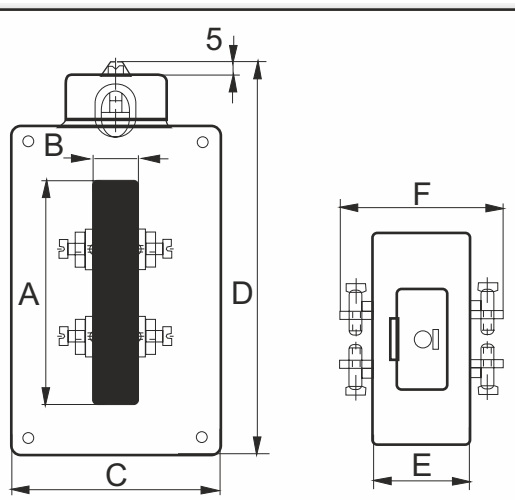
Dimensions in mm.

MEASURING TRANSFORMERS (PLASTIC CASING)

BUS-BAR TRANSFORMERS									
MODEL	TL2			TL3			TL4		
Bus-Bar	100x20			100x30			100x60		
Cable	Ø20			Ø30			Ø60		
Accuracy Class	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA		
750	10	20	30						
800	15	20	30						
1000	20	30	45						
1200	20	30	45						
1500	30	45	60	10	20	30			
2000	30	60	90	15	25	40	10	20	30
2500				25	30	45	10	20	30
3000				30	45	60	20	30	45
4000							30	60	90
5000							30	60	90

DIMENSIONS

TL-



MODELS	A	B	C	D	E	F
TL2	102	20	94	178	38	66
TL3	103	32	114	210	45	71
TL4	104	62	156	224	50	78

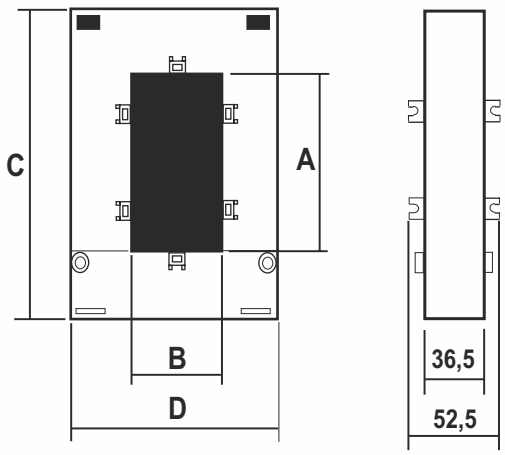
Dimensions in mm.

SPLIT-CORE TRANSFORMERS (PLASTIC CASING)

SPLIT-CORE TRANSFORMERS																		
MODEL	TA30P			TA60P			TA80P			TA100P			TA125P			TA160P		
Bus-Bar	30x20			60x30			80x50			100x80			125x80			160x80		
Cable	Ø20			Ø30			Ø50			Ø80			Ø80			Ø80		
Accuracy	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA			VA			VA			VA		
100			3															
150			3,75															
200		2,5	4															
250		3,75	5		2,5	3,75		2,5	3,75		2,5	3,75						
300	2,5	4	6		3,75	5		3,75	5		3,75	5						
400	3,75	5	10	2,5	3,75	7,5	2,5	3,75	7,5	2,5	3,75	7,5						
500				3,75	5	15	3,75	5	15	3,75	5	15		5	7,5	2,5	3,75	7,5
600				5	7,5	20	5	7,5	20	5	7,5	20		5	15	3,75	5	10
750				7,5	10	20	7,5	10	20	7,5	10	20	5	10	20	5	10	20
800				7,5	10	20	7,5	10	20	7,5	10	20	7,5	10	20	7,5	10	20
1000				10	15	20	10	15	20	10	15	20	10	20	30	10	20	30
1200										15	20	30	15	20	30	15	20	30
1500										15	20	30	20	30	45	20	30	45
2000										20	30	45	25	30	45	25	30	45
2500													25	30	45	25	30	45
3000													30	45	60	30	45	60
4000																30	45	60
5000																30	45	60

DIMENSIONS

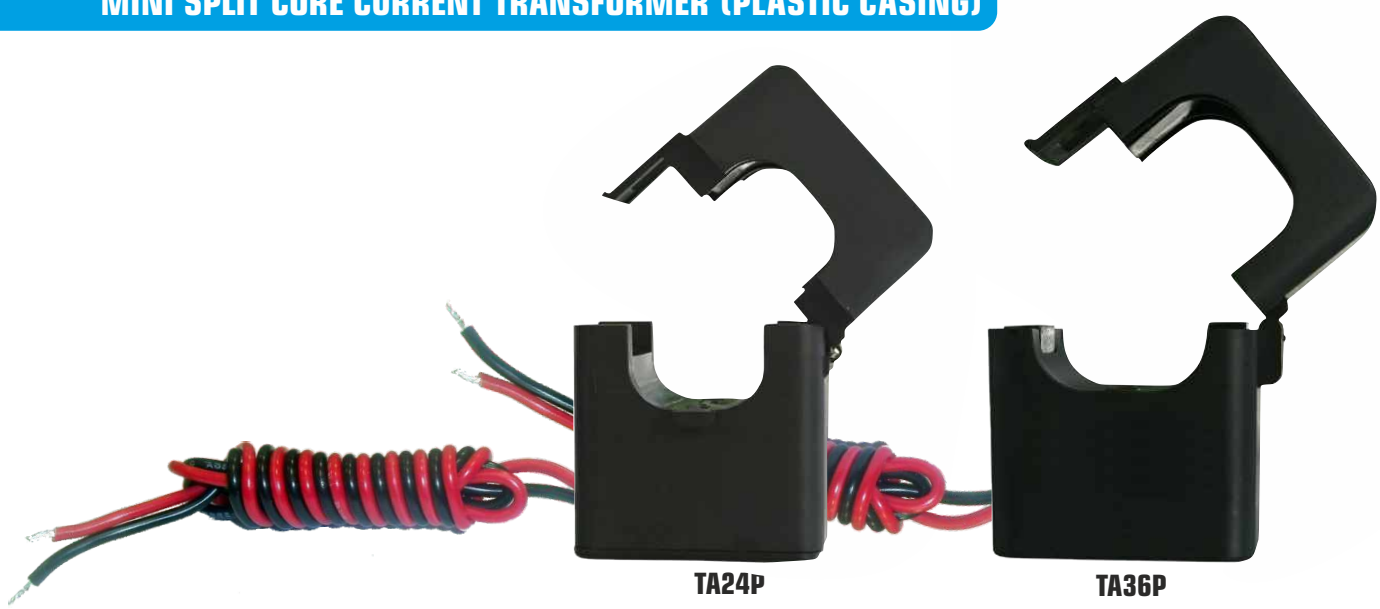
TA-P



MODELS	A	B	C	D
TA30P	32	22	106	90
TA60P	62	32	136	100
TA80P	82	52	156	120
TA100P	104	82	178	150
TA125P	127	82	201	150
TA160P	162	82	236	150

Dimensions in mm.

MINI SPLIT CORE CURRENT TRANSFORMER (PLASTIC CASING)



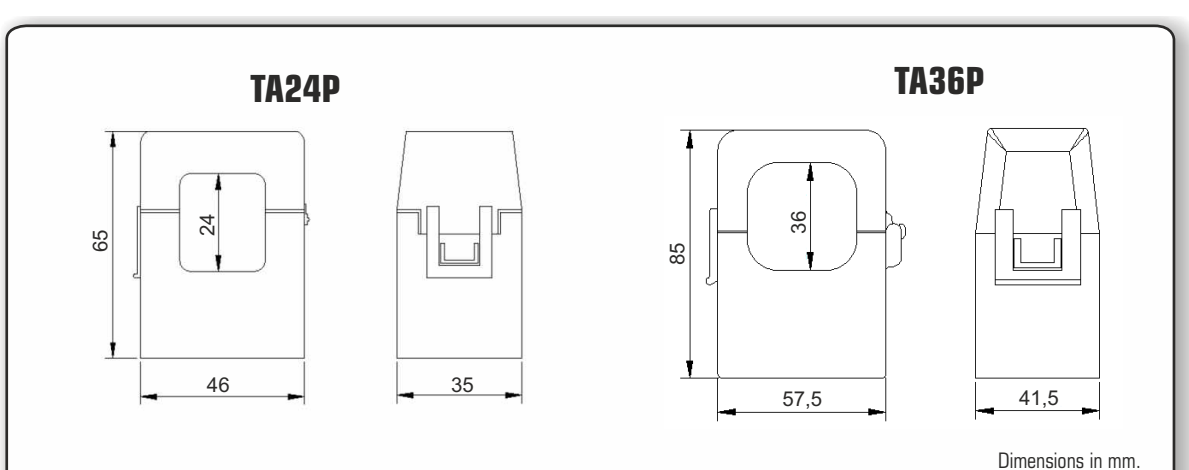
TECHNICAL SPECIFICATIONS

SECURITY DATA	
Continuous overload	1,5 x In
Rated short-time thermal current	60 x In
Rated dynamic current	2,5 x Ith
Rated voltage (maximum)	720 V AC.
Test voltage	3 kV, 1 min.
Frequency	50-60 Hz

ADDITIONAL INFORMATION	
Standard	EN 61869-2
Operating temperature	-15 ºC to +45º C
Storage temperature	-25 ºC to +75 ºC
Rated secondary current	/5 or /1 A
Integral cable length	1 m

MINI SPLIT CORE C.T				
MODEL	TA24P		TA36P	
Bus-Bar	-		-	
Cable	Ø24		Ø36	
Accuracy Class	0,5	1	0,5	1
Ipn	VA		VA	
100		1		1
200		1	1	1
300		1,5	1	1,5
400	1	1,5	2,5	5
500			5	7,5
600			5	10

DIMENSIONS



Dimensions in mm.

HALL EFFECT CURRENT TRANSDUCER - TEH-132

TECHNICAL DATA

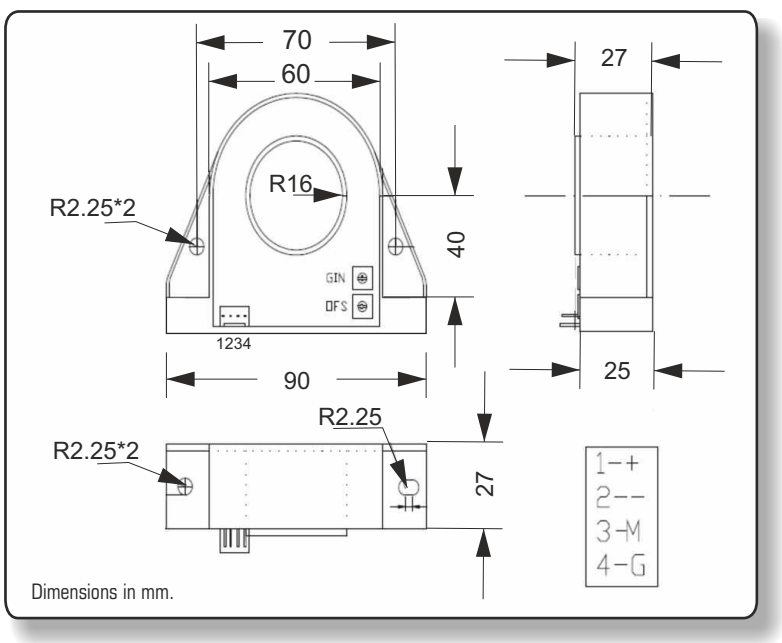
MODEL	TEH-132
Ipn (A)	100 200 300 400 500 600 1000 A
Range	±300 ±600 ±900 ±1100 ±1200 ±1300 ±1500 A

Voltage Supply (Vc):	±12 V - 15V DC (±5%)
Load resistor(RL):	>1 kΩ
Output Voltage (analog) ±Ipn(Vout):	±4 V
DC Accuracy:	± 0.5 %
AC Accuracy:	± 1 %
Linearity Error:	± 0.5 %
Electric offset Voltage:	<± 10 mV
Thermal Drift of Voe:	<± 1mV / ºC
Thermal Drift of Vout:	± 0.05% / ºC
Response time:	< 3 µs
Accurately Followed di/dt:	> 50 A/µs
BW Band width:	DC 50 kHz
VIS Isolation voltage:	5 KV
RIS Isolation resistor:	> 500 MΩ
Ic Current Consumption:	< 20 mA

GENERAL DATA

TA Ambient Operating Temperature:	-25 ºC - +85 ºC
TS Ambient Storage Temperature:	-25 ºC - +85 ºC
M Mass:	200 gr

DIMENSIONS



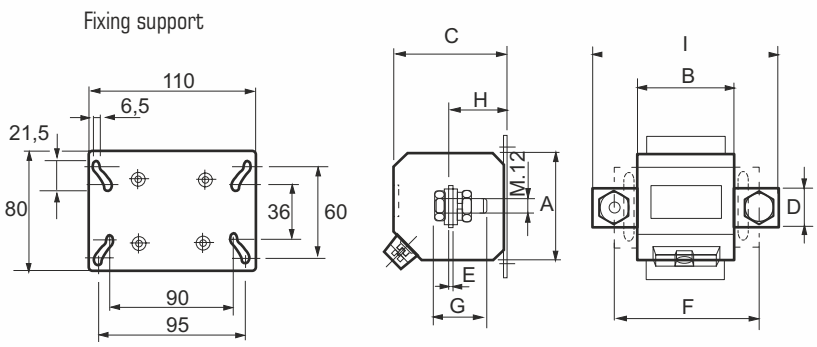
MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

	WOUND PRIMARY			
MODEL	TU3R		TU50R	
Accuracy Class	0,5	1	0,5	1
Ipn (A)	VA		VA	
5				
10				
15				
20				
25				
30				
40				
50	15	25		
60	15	25		
75	15	25		
100	15	25		
125	15	25		
150	15	25		
200	15	25		
250	15	25		
300	15	25		
400	15	25	15	25
500	15	25	15	25
600	15	25	15	25
750			15	25
800			15	25

DIMENSIONS

TU3R - TU50R

Fixing support



MODELS	Ratio	A	B	C	D	E	F	G	H	I
TU3R	50/5-	80	73,5	96	30	5	110	38	42	140
TU3R	400/5-	80	73,5	101	30	10	110	48	47	140
TU50R	400/5-	100	73,5	100	50	10	135	48	50	175

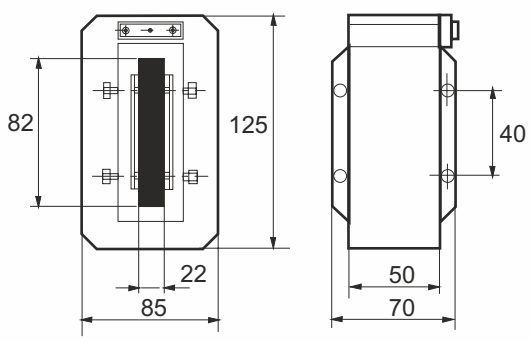
Dimensions in mm.

MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

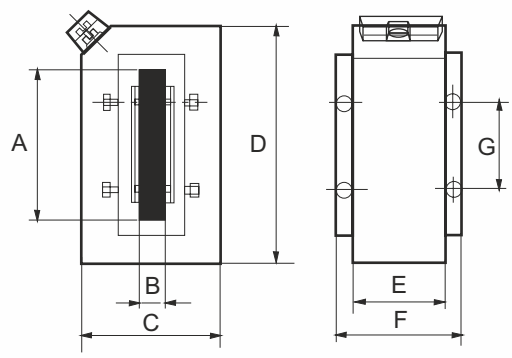
BUS-BAR TRANSFORMERS								
MODEL	TUP20RC		TUP20R		TUP60R		TUP95R	
Bus-Bar	80x20		100x20		100x60		100x95	
Cable	Ø20		Ø20		Ø60		Ø95	
Accuracy Class	0,5	1	0,5	1	0,5	1	0,5	1
Ipn (A)	VA		VA		VA		VA	
500	10	15						
600	15	25						
750	15	25	15	25				
800	15	25	15	25				
1000	15	25	15	25				
1200	15	25	15	25				
1500	15	25	15	25				
2000			15	25	15	25		
2500					15	25		
3000					15	25	15	25
4000					15	25	15	25
5000							15	25

DIMENSIONS

TUP20RC



TUP-R



MODELS	A	B	C	D	E	F	G
TUP20R	105	20	95	160	60	80	60
TUP60R	105	60	150	193	60	80	60
TUP95R	105	95	200	200	60	80	60

Dimensions in mm.

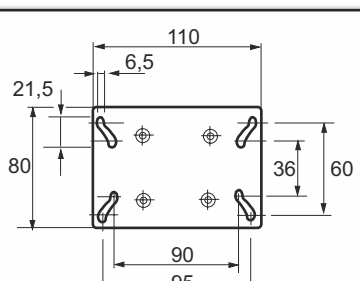
MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

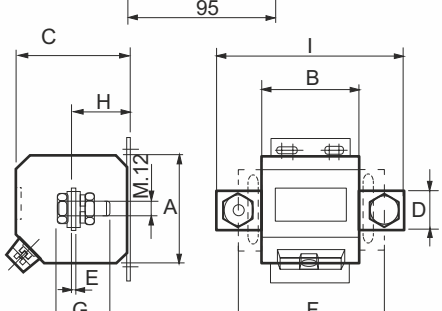
MEASURING EQUIPMENT / ENERGY METERS

	WOUND PRIMARY	BUS-BAR
MODEL	TU3R	TUP20R
Bus-Bar	-	100x20
Cable	-	Ø20
Accuracy Class	0,5 S	0,5 S
Ipn (A)	VA	VA
50	10	
60	10	
75	10	
100	10	
125	10	
150	10	
200	10	
250	10	
300	10	
400	10	
500	10	
600	10	
750		10
800		10
1000		10
1200		10
1500		10
2000		10

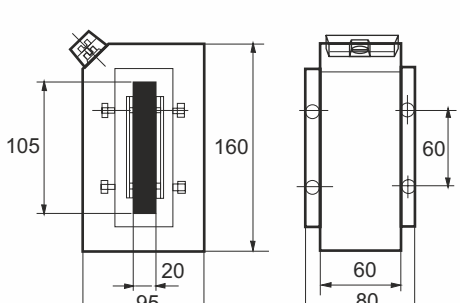
DIMENSIONS

TU3R





TUP20R



MODELS	Ratio	A	B	C	D	E	F	G	H	I
TU3R	50/5-	80	73,5	96	30	5	110	38	42	140
TU3R	400/5-	80	73,5	101	30	10	110	48	47	140

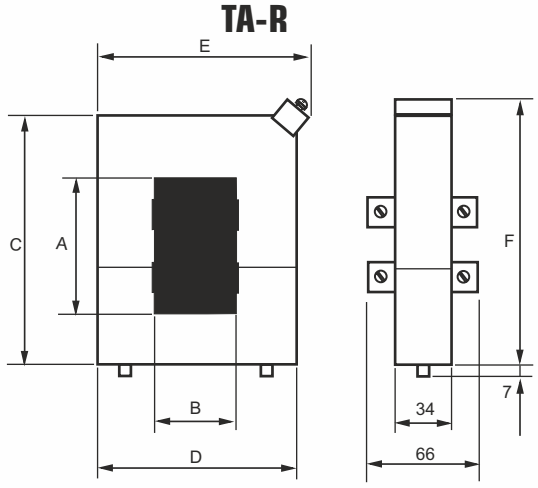
Dimensions in mm.

SPLIT-CORE TRANSFORMERS (ENCAPSULATED IN RESIN)

SPLIT-CORE TRANSFORMERS																		
MODEL	TA30R			TA60R			TA80R			TA100R			TA125R			TA160R		
Bus-Bar	30x20			60x30			80x50			100x80			125x80			160x80		
Cable	Ø20			Ø30			Ø50			Ø80			Ø80			Ø80		
Accuracy	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA			VA			VA			VA		
100			3															
150			3,75															
200		2,5	4															
250		3,75	5		2,5	3,75		2,5	3,75		2,5	3,75						
300	2,5	4	6		3,75	5		3,75	5		3,75	5						
400	3,75	5	10	2,5	3,75	7,5	2,5	3,75	7,5	2,5	3,75	7,5						
500				3,75	5	15	3,75	5	15	3,75	5	15		5	7,5	2,5	3,75	7,5
600				5	7,5	20	5	7,5	20	5	7,5	20		5	15	3,75	5	10
750				7,5	10	20	7,5	10	20	7,5	10	20	5	10	20	5	10	20
800				7,5	10	20	7,5	10	20	7,5	10	20	7,5	10	20	7,5	10	20
1000				10	15	20	10	15	20	10	15	20	10	20	30	10	20	30
1200										15	20	30	15	20	30	15	20	30
1500										15	20	30	20	30	45	20	30	45
2000										20	30	45	25	30	45	25	30	45
2500													25	30	45	25	30	45
3000													30	45	60	30	45	60
4000																30	45	60
5000																30	45	60

DIMENSIONS

TA-R



MODELS	A	B	C	D	E	F
TA30R	32	21	105	90	99	114
TA60R	62	32	130	100	109	139
TA80R	82	52	150	120	129	159
TA100R	104	82	172	150	159	181
TA125R	127	82	195	150	159	204
TA160R	162	82	230	150	159	239

Dimensions in mm.

MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

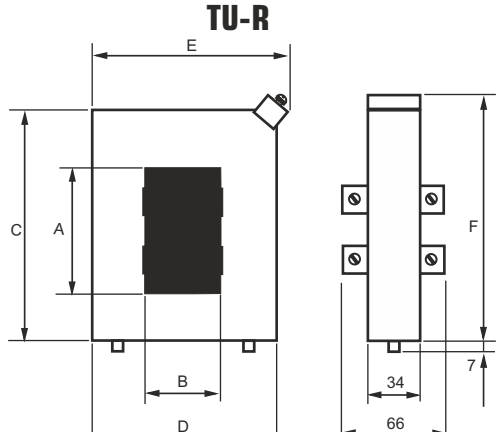
NARROW PROFILE




BUS-BAR TRANSFORMERS																		
MODEL	TU30R			TU60R			TU80R			TU100R			TU125R			TU160R		
Bus-Bar	30x20			60x30			80x50			100x80			125x80			160x80		
Cable	Ø20			Ø30			Ø50			Ø80			Ø80			Ø80		
Accuracy	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA			VA			VA			VA		
100			3,75															
150		3,75	5															
200		5	7,5															
250	5	7,5	10	2,5	3,75	5	2,5	3,75	5	2,5	3,75	5						
300	5	7,5	10	3,75	5	7,5	3,75	5	7,5	3,75	5	7,5						
400	7,5	10	15	5	7,5	10	5	7,5	10	5	7,5	10						
500				7,5	10	15	7,5	10	15	7,5	10	15	10	15	20	10	15	20
600				10	15	20	10	15	20	10	15	20	15	20	30	15	20	30
750				15	20	30	15	20	30	15	20	30	15	20	30	15	20	30
800				15	20	30	15	20	30	15	20	30	15	20	30	15	20	30
1000				15	20	30	15	20	30	15	20	30	15	20	30	15	20	30
1200										15	20	30	15	20	30	15	20	30
1500										15	20	30	15	20	30	15	20	30
2000										15	20	30	15	20	30	15	20	30
2500													15	20	30	15	30	30
3000													15	20	30	15	20	30
4000													15	20	30	15	20	30
5000																15	20	30
6000																15	20	30

DIMENSIONS

TU-R



MODELS	A	B	C	D	E	F
TU30R	32	21	105	90	99	114
TU60R	62	32	130	100	109	139
TU80R	82	52	150	120	129	159
TU100R	104	82	172	150	159	181
TU125R	127	82	195	150	159	204
TU160R	162	82	230	150	159	239

Dimensions in mm.

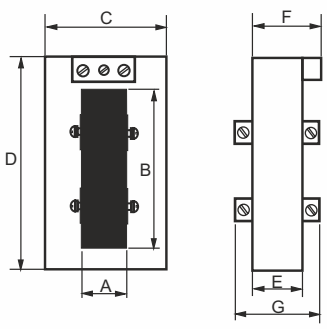
MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

NARROW PROFILE - HORIZONTAL BUS-BAR

	BUS-BAR TRANSFORMERS												BUS-BAR TRANSFORMERS					
MODEL	TU60RS			TU80RS			TU100RS			TU125RS			TU100RT			TU125RT		
Bus-Bar	15x60			50x80			60x100			80x125			100x20			125x35		
Cable	Ø45			Ø50			Ø60			Ø80			Ø20			Ø35		
Accuracy	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA			VA			VA			VA		
400	5	7,5	10	5	7,5	10												
500	7,5	10	15	5	7,5	10												
600	10	15	20	10	15	20												
750	10	15	20	10	15	20	15	20	30				10	20	30			
800	10	15	20	10	15	20	15	20	30				15	20	30	7,5	10	15
1000	10	15	20	10	15	20	15	20	30				20	30	45	7,5	10	15
1200	10	15	20	10	15	20	15	20	30				20	30	45	7,5	10	15
1500	10	15	20	10	15	20	15	20	30				30	45	60	10	15	20
2000	10	15	20	10	15	20	15	20	30	15	20	30	30	60	90	15	20	30
2500				10	15	20	15	20	30	15	20	30				20	25	30
3000							15	20	30	15	20	30				25	30	45
4000										15	20	30						
5000										15	20	30						
6000										15	20	30						

DIMENSIONS

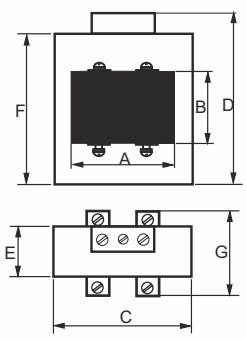
TU-RT

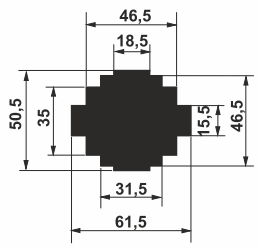


MODELS	A	B	C	D	E	F	G
TU100RT	22	101	83	145	40	55	66
TU125RT	38	127	98	170	40	55	66

Dimensions in mm.

TU-RS





TU60RS

Figure 1

MODELS	A	B	C	D	E	F	G
TU60RS	Figure 1		90	115	40	103	66
TU80RS	82	57	110	135	40	120	66
TU100RS	102	62	140	153	34	130	66
TU125RS	127	82	165	189	42	166	66

Dimensions in mm.

MEASURING TRANSFORMERS (ENCAPSULATED IN RESIN)

NARROW PROFILE - HORIZONTAL BUS-BAR

	BUS-BAR TRANSFORMERS											
MODEL	TU40RS			TU40RSD			TU100RTC			TU125RTC		
Bus-Bar	40x10			37x18			100x20			125x35		
Cable	Ø25			Ø36			Ø20			Ø35		
Accuracy Class	0,5	1	3	0,5	1	3	0,5	1	3	0,5	1	3
Ipn (A)	VA			VA			VA			VA		
200				5	7,5	10						
250				5	7,5	10						
300	10	15	20	10	15	20						
400	10	15	20	10	15	20						
500	10	15	20	10	15	20						
600	10	15	20	10	15	20						
750	10	15	20	10	15	20	10	20	30			
800	10	15	20	10	15	20	15	20	30	7,5	10	15
1000	10	15	20	10	15	20	20	30	45	7,5	10	15
1200							20	30	45	7,5	10	15
1500							30	45	60	10	15	20
2000							30	45	60	15	20	30
2500							30	45	60	20	25	30
3000							30	45	60	25	30	45

DIMENSIONS

TU40RS

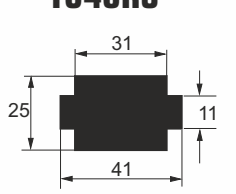
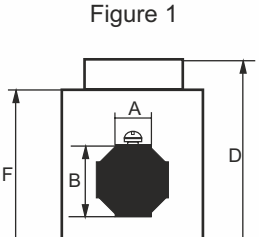
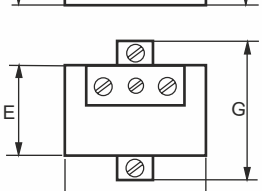


Figure 1





TU40RSD

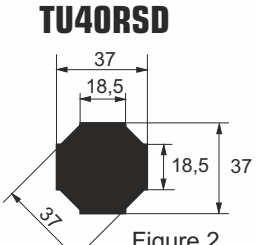
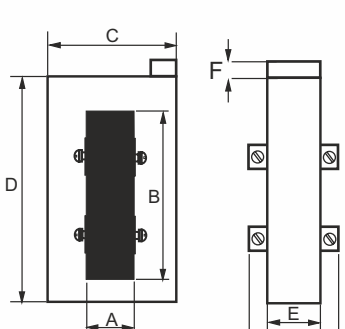


Figure 2

TU-RTC



MODELS	A	B	C	D	E	F	G
TU40RS	Figure 1		72	100	48	90	71
TU40RSD	Figure 2		72	100	48	90	71

Dimensions in mm.

MODELS	A	B	C	D	E	F	G
TU100RTC	22	101	83	145	40	15	66
TU125RTC	38	127	98	170	40	15	66

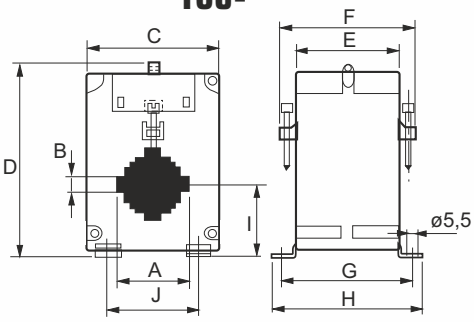
Dimensions in mm.

PROTECTION TRANSFORMERS (PLASTIC CASING)

	BUS-BAR TRANSFORMERS											
MODEL	TU C30		TUC60		TU C80		TL2		TL3		TL4	
Bus-Bar	30x10		60x10		80x30		100x20		100x30		100x60	
Cable	Ø25		Ø51		Ø65		Ø20		Ø30		Ø60	
Accuracy	5P10	10P10	5P10	10P10	5P10	10P10	5P10	10P10	5P10	10P10	5P10	10P10
Ipn (A)	VA		VA		VA		VA		VA		VA	
200	3,5	5	3,5	3,5	3,5	3,5						
250	5	5	3,5	3,5	3,5	3,5						
300	5	7,5	5	5	5	5						
400			5	5	5	5						
500			5	7,5	5	7,5						
600			7,5	10	7,5	10						
750			7,5	10	7,5	10						
800			10	10	10	10						
1000			10	10	10	10						
1200			10	10	10	10						
1500			10	12,5	10	12,5						
2000			10	12,5	10	12,5	5	7,5				
2500							5	7,5	7,5	10		
3000									7,5	10	5	7,5
4000											7,5	10
5000											7,5	10

DIMENSIONS

TUC-



TUC30

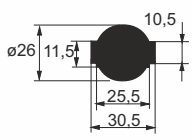


Figure 1

TUC60

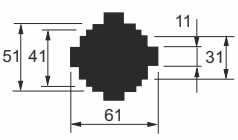


Figure 2

TUC80

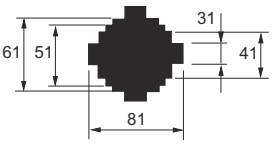
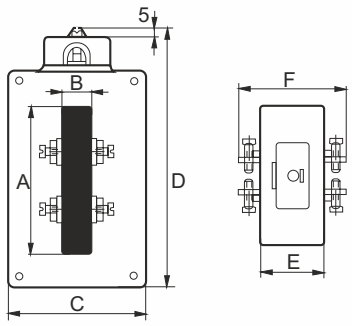


Figure 3

MODELS	A B	C	D	E	F	G	H	I	J
TUC30	Figure 1	77	112	60,5	76	76	87,5	44,5	41
TUC60	Figure 2	105	136,5	60	76	75,5	87	54	81
TUC80	Figure 3	131	161,5	60	76	75,5	87	69	107

Dimensions in mm.

TL-



MODELS	A	B	C	D	E	F
TI2	102	20	94	178	38	66
TL3-	103	32	114	210	45	71
TL 4	104	62	156	224	50	78

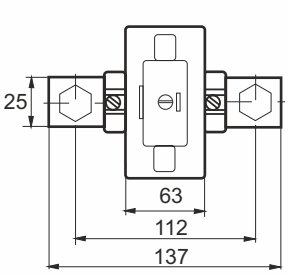
Dimensions in mm.

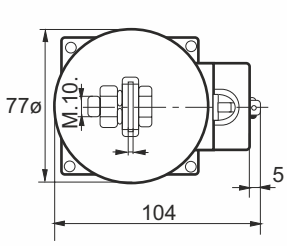
PROTECTION TRANSFORMERS

	PRIMARY WOUND				BUS-BAR IN RESIN	
	IN PLASTIC		IN RESIN			
MODEL	TU3bc		TU3PR		TU50R	
Accuracy Class	5P10	10P10	5P10	10P10	5P10	10P10
Ipn (A)	VA		VA		VA	
50	3,5	3,5	10	10		
60	3,5	3,5	10	10		
75	3,5	3,5	10	10		
100	3,5	3,5	10	10		
125	3,5	3,5	10	10		
150	3,5	3,5	10	10		
200			10	10		
250			10	10		
300			10	10		
400			10	10		
500					7,5	7,5
600					7,5	7,5
750					10	12,5
800					10	12,5

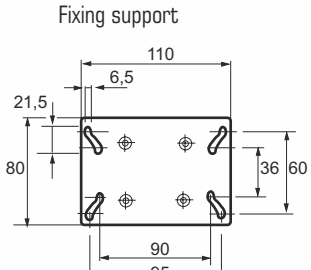
DIMENSIONS

TU3bc

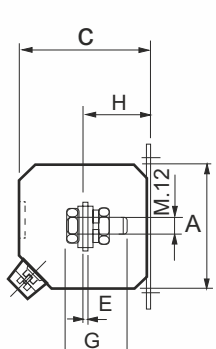


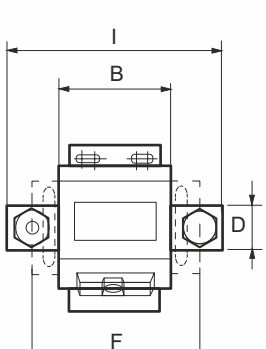


Fixing support



TU-R





MODELS	Ratio	A	B	C	D	E	F	G	H	I
TU3PR	50-300/5	100	75	110	30	5	110	38	55	140
TU3PR	400-600/5	100	75	110	30	10	110	48	60	140
TU50R	500-800/5	100	75	100	50	10	135	48	50	175

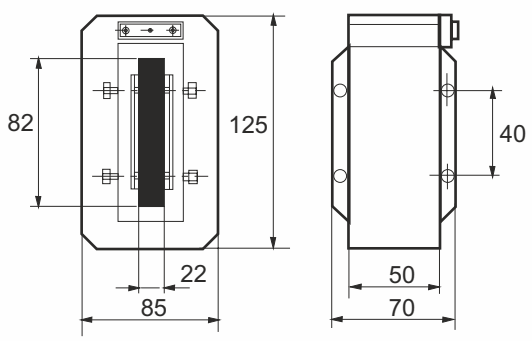
Dimensions in mm.

PROTECTION TRANSFORMERS (ENCAPSULATED IN RESIN)

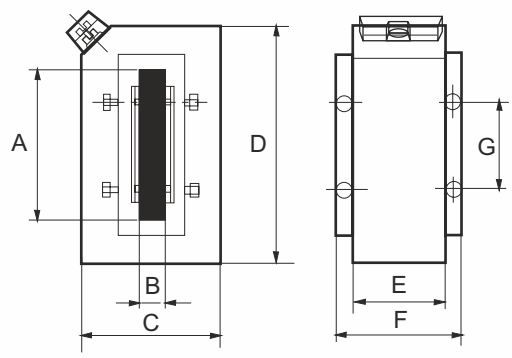
	BUS-BAR TRANSFORMERS							
MODEL	TUP20RC		TUP20R		TUP60R		TUP95R	
Bus-Bar	80x20		100x20		100x60		100x95	
Cable	Ø20		Ø20		Ø60		Ø95	
Accuracy Class	5P10	10P10	5P10	10P10	5P10	10P10	5P10	10P10
Ipn (A)	VA		VA		VA		VA	
500	3,5	5						
600	3,5	5						
750	3,5	5	7,5	10				
800	3,5	5	7,5	10				
1000	5	5	12,5	15	12,5	15		
1200			15	15	15	15		
1500			15	20	15	20		
2000			15	20	15	20		
2500					15	20		
3000					20	30	15	20
4000							20	30
5000							20	30

DIMENSIONS

TUP20RC



TUP-R



MODELS	A	B	C	D	E	F	G
TUP20R	105	20	95	160	60	80	60
TUP60R	105	60	150	193	60	80	60
TUP95R	105	95	200	200	60	80	60

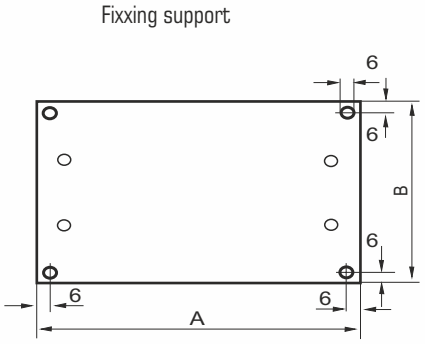
Dimensions in mm.

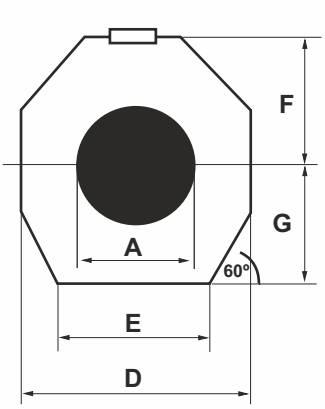
PROTECTION TRANSFORMERS (ENCAPSULATED IN RESIN)

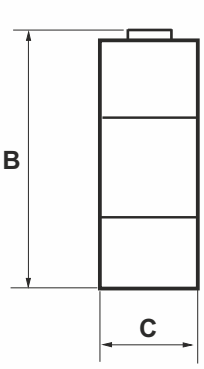
	BUS-BAR TRANSFORMERS							
MODEL	TPR60		TPR80		TPR100		TPR125	
Bus-Bar	-		-		-		-	
Cable	Ø60		Ø80		Ø100		Ø125	
Accuracy Class	5P10	5P20	5P10	5P20	5P10	5P20	5P10	5P20
Ipn (A)	VA		VA		VA		VA	
100	10	5						
150	15	7						
200	20	10						
250	25	12	12	5				
300	30	15	15	7				
400	40	20	22	10				
500	50	25	30	12	15	7		
600	60	30	35	15	15	8		
750	75	38	45	18	20	10		
800	80	40	48	20	25	12		
1000	100	50	48	20	30	15	20	10
1200			48	22	30	17	30	15
1500			73	28	40	20	30	15
2000			97	35	60	30	30	15
2500					65	35	40	20
3000					65	35	40	20
4000					80	45	50	25
5000					120	70	70	35

DIMENSIONS

Fixxing support







MODELS	A	B
TPR60	124	120
TPR80	136	100
TPR100	150	100
TPR125	166	100

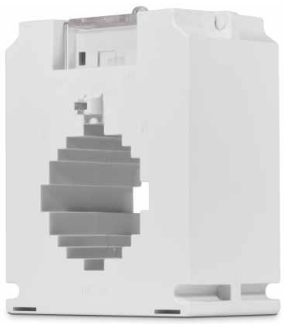
Dimensions in mm.

MODELS	A	B	C	D	E	F	G
TPR60	62	211	80	185	124	110	93
TPR80	82	231	60	205	136	120	103
TPR100	102	251	60	225	150	130	113
TPR125	127	276	60	250	166	143	125

Dimensions in mm.

TRANSFORMERS WITH BUILT-IN MEASURING TRANSDUCER

(PLASTIC CASING)



TECHNICAL SPECIFICATIONS:

Operating range: 10-120%
Maximum load impedance: 600 Ω
Frequency: 50-60 Hz
Response time: <200 ms

	BUS-BAR TRANSFORMERS		
MODEL	TC40	TC60	TC80
Bus-Bar	40x10	60x10	80x30
Cable	Ø32	Ø51	Ø65
Accuracy Class	1	1	1
Ipn (A)	Output (mA)	Output (mA)	Output (mA)
50	20		
60	20		
75	20		
100	20		
125	20		
150	20		
200	20		
250	20		
300	20		
400	20	20	20
500		20	20
600		20	20
750		20	20
800		20	20
1000		20	20
1200		20	20
1500		20	20
2000		20	20
2500			20

DIMENSIONS

TC40

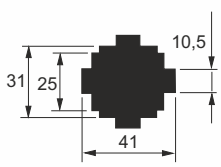


Figure 1

TC60

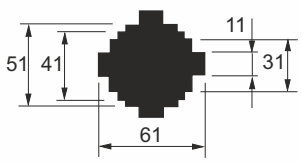


Figure 2

TC80

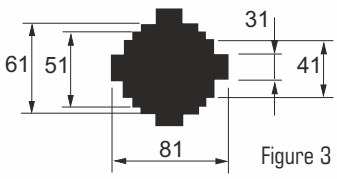
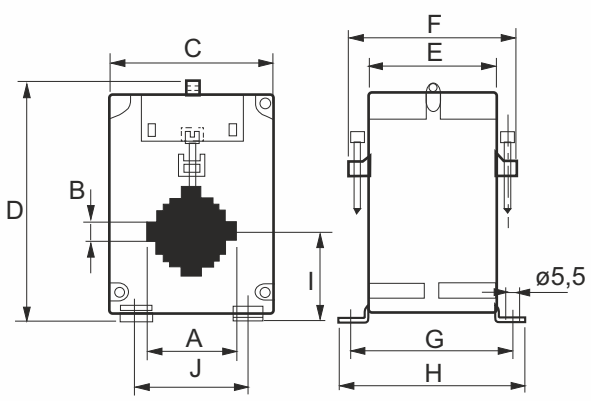


Figure 3

TC-



MODELS	A B	C	D	E	F	G	H	I	J
TC 40	Figure 1	71	106,5	45	61	60,5	72	40	47
TC 60	Figure 2	105	136,5	60	76	75,5	87	54	81
TC 80	Figure 3	131	161,5	60	76	75,5	87	69	107

Dimensions in mm.

TRANSFORMERS WITH BUILT-IN MEASURING TRANSDUCER

(PLASTIC CASING)

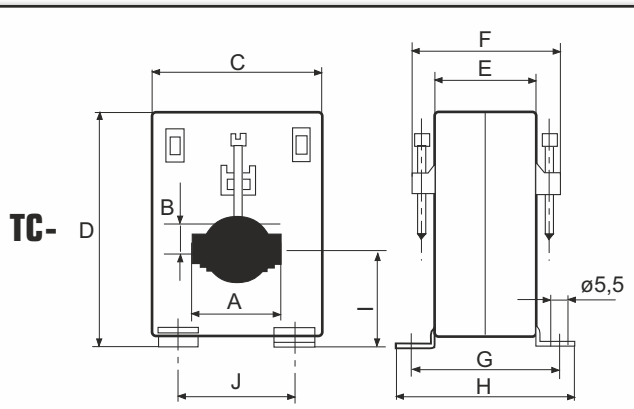
Selection of transformer ratio by switch

	BUS-BAR TRANSFORMERS		
MODEL	TC20CV	TC30CV	TC40CV
Bus-Bar	20x5	30x10	40x10
Cable	Ø16	Ø22	Ø30
Accuracy	1	1	1
Ipn (A)	Output (mA)	Output (mA)	Output (mA)
10; 12,5; 15 & 20	4-20		
20; 25; 30 & 40	4-20	4-20	
50; 60; 75 & 100	4-20	4-20	4-20
125; 150; 200 & 250	4-20	4-20	4-20
300; 400; 500 & 600		4-20	4-20

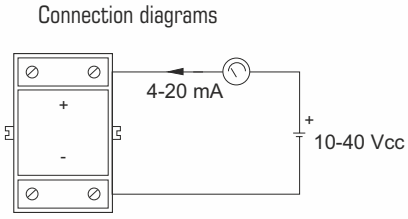
TECHNICAL SPECIFICATIONS:

Operating range: 10-120%
Maximum load impedance: 600 Ω
Frequency: 50-60 Hz
Response time: <200 ms

DIMENSIONS



Connection diagrams



TC20

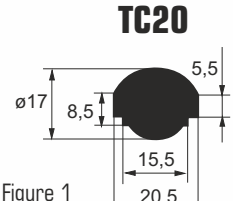


Figure 1

TC30

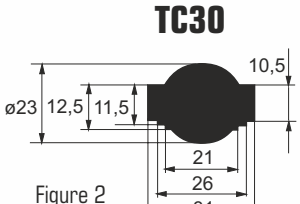


Figure 2

TC40

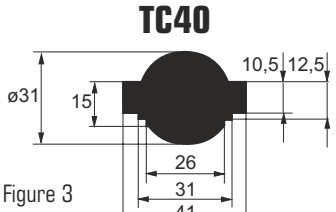


Figure 3

MODELS	A B	C	D	E	F	G	H	I	J
TC20CV	Figure 1	56	74	33	48,5	48,5	60	32,5	37
TC30CV	Figure 2	60	79	36	51,5	51,5	63	34,5	41
TC40CV	Figure 3	71	96	45,5	61	61	72,5	44,5	52

Dimensions in mm.

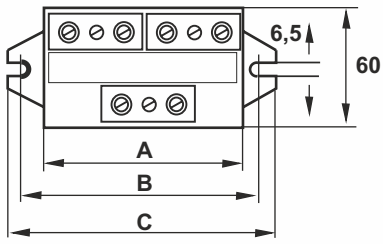
SUMMATION CURRENT TRANSFORMERS (ENCAPSULATED IN RESIN)

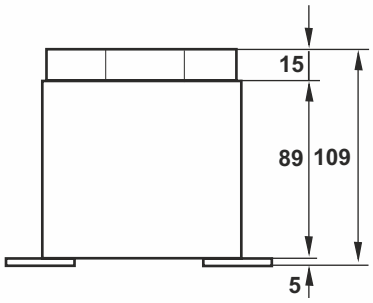
TRS-

SUMMATION CURRENT TRANSFORMERS				
MODEL	TRS2	TRS3	TRS4	TRS5
Accuracy	0,5	0,5	0,5	0,5
VA	10	10	10	10
Ipn	5+5 / 5	5+5+5 / 5	5+5+5+5 / 5	5+5+5+5+5 / 5

In this transformers, the secondary current is the vectorial addition of primary currents.

DIMENSIONS





MODELS	A	B	C
TRS2	100	119	135
TRS3	100	119	135
TRS4	150	169	185
TRS5	150	169	185

Dimensions in mm.

VOLTAGE TRANSFORMERS (ENCAPSULATED IN RESIN)

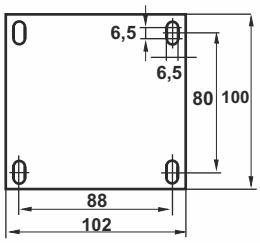
TE15P AND TE15PR

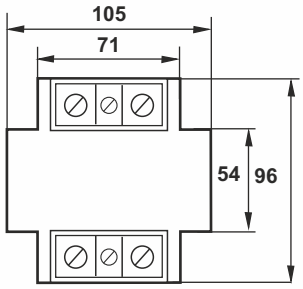
MODEL		TE 15_
Accuracy Class		1
Primary voltage	Secondary voltage	VA
440	230	25
440	110	25
440	100	25
400	230	25
400	110	25
400	100	25
230	110	25

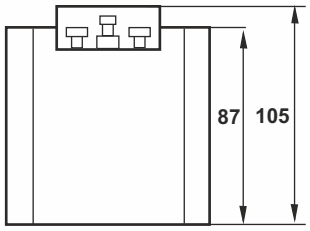
Operating range: 80 – 120 % Vpn
Load: 25 - 100 % (cos φ = 0,8)

DIMENSIONS

Fixing support







Dimensions in mm.

CURRENT TRANSFORMER ENCAPLSULATED IN RESIN (OUTDOOR)

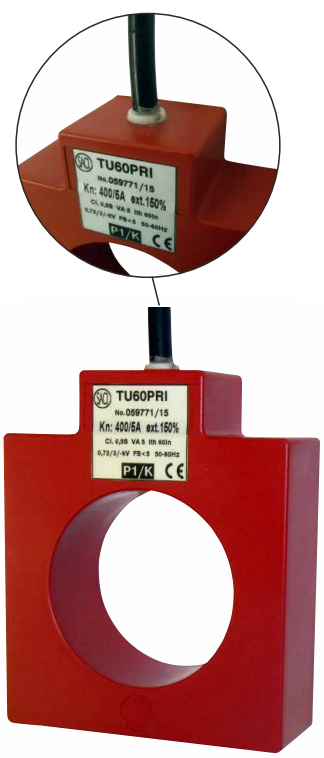
NEW

Current transformer encapsulated in resin, extended range of 150% built-in cable of:

- 6 meters (2x1,5 mm^2) or 6 meters (2x2,5 mm^2)
- 10 meters (2x2,5 mm^2)

BUS-BAR TRANSFORMERS	
MODEL	TU60PRI
Cable	Ø62
Accuracy	0,5 S
Ipn / Isn (A)	VA
400 / 5	5*

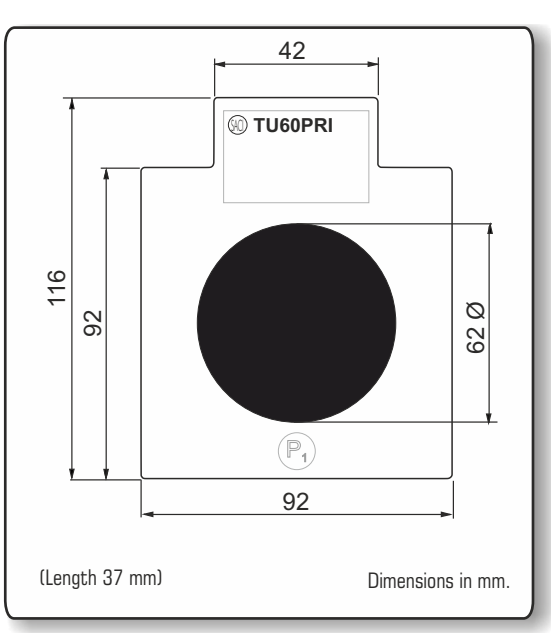
* At the beginning of the cable



SECURITY DATA	
Continuous overload	1,5 x In
Rated short-time thermal current	60 x In
Rated dynamic current	2,5 x Ith
Rated voltage (maximum)	720 V c.a
Test voltage	3 kV, 1 min.
Insulation class	A

ADDITIONAL INFORMATION	
Standard	EN 61869-2
Operating temperature	-10 ºC to +60º C
Storage temperature	-25 ºC to +75 ºC
Type of resin	Polyurethane
Flammability	UL VO.
IP	65

DIMENSIONS



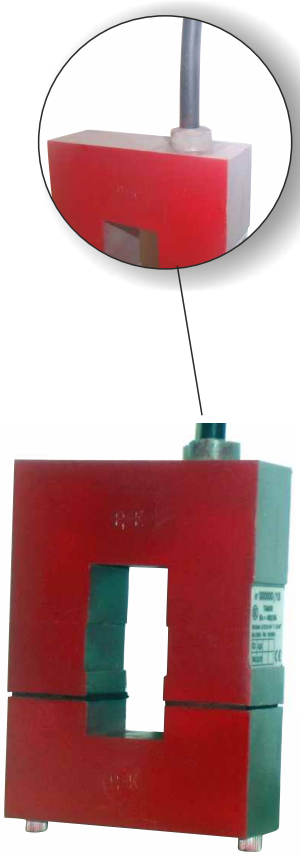
SPLIT CORE CURRENT TRANSFORMER IN RESIN (OUTDOOR)

NEW

Split core current transformer encapsulated in resin, extended range of 150% built-in cable of 6 meters (2x2,5 mm^2)

BUS-BAR TRANSFORMERS	
MODEL	TA60RI
Bar (mm)	30 x 60
Cable	Ø30
Accuracy	0,5
Ipn / Isn (A)	VA
400 / 5	3,75*

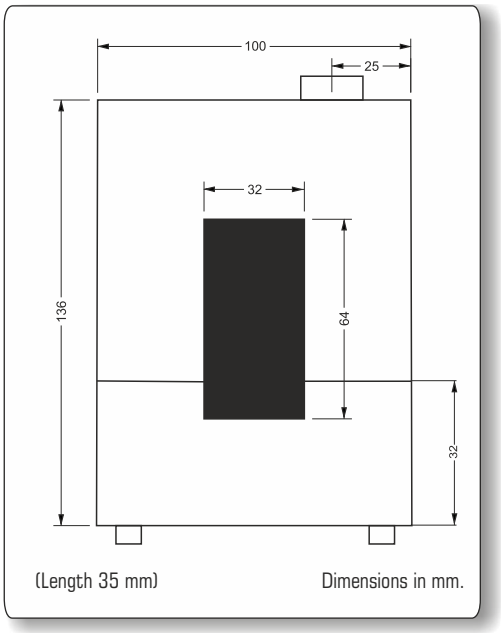
* At the beginning of the cable



SECURITY DATA	
Continuous overload	1,5 x In
Rated short-time thermal current	60 x In
Rated dynamic current	2,5 x Ith
Rated voltage (maximum)	720 V c.a
Test voltage	3 kV, 1 min.
Insulation class	A

ADDITIONAL INFORMATION	
Standard	EN 61869-2
Operating temperature	-10 ºC to +60º C
Storage temperature	-25 ºC to +75 ºC
Type of resin	Polyurethane
Flammability	UL V0.
IP	65

DIMENSIONS



(Length 35 mm) Dimensions in mm.