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Electronic

KNORR-BREMSE
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Relays
A Line
M Line
MC Line
N-DIN Line
Ultra Line

Transducers
MHIT
MHCO
Eurometer
Integrameter

Software
MSCom2

Microelettrica Scientifica

Electronic

Applications
Rail On Board
DC Substation
Energy
Industry

Microelettrica Scientifica Electronic Division is one of the world leading companies in the design and production of Protection Relays and High Voltage Transducers for Rail, Substation, Energy and Industrial application.
The MS Electronic division offers 5 families of analog and digital protection relays and a variety of high voltage transducers and metering devices that can be personalized in most detail.
A very fast customization process is at the core of our competencies and allows us to serve those customers who require best in class, but tailored solutions in very quick times. As all MS divisions, its quality is in compliance with standards ISO 9001: 2008 and ISO 14000. The MS Electronic division is located in the Rozzano MS Headquarter, approximately 10 km South of Milan along the route to Genova.
The Microelettrica Scientifica Electronic experience and tradition begins in the 1980's as the company develops its first microprocessor based Protection Relays, that have constantly evolved into new lines and types.
On board tranducers and electronic meters, based on the international patent of the eurometer have been added from the mid 1990's, while transducers for DC traction substations came in the early 2000's. On board meters were previously hosted in the separate company Microdigit located in Lodi, but have been merged and fully integrated in the MS electronic division in Rozzano since 2008. As of 2005 Microelettrica Scientifica is member of the Knorr Bremse Group, the German world leader in rail and commercial vehicles braking systems. Knorr Bremse Group portfolio for Rail Vehicles also includes doors and entrance systems and HVAC systems for vehicles, as well as platform screen doors and gates for railway stations.

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Products	
Protection Relays	A Line
	M Line
	MC Line
	N-DIN Line
	Ultra Line
Software	MSCom2
Transducers	MHIT Line
	MHCO Line
	Eurometer Line
	Integrameter Line

A line

General Characteristics

The series of electronic analogic protective relays herebelow presented has been designed according to the most advanced technologies in order to obtain the highest reliability, accuracy and immunity to interference and is made with first choice components safely dimensioned and protected.

The application of severe testing and quality control procedures guarantees the reliability of the product.

Relays Type

PB../..	Dual level current relay: 50/51
UB0-A	Earth fault current relay desensitised to the third harmonic: 51N
BI20/..	Two phase + earth fault overcurrent relay: 49,51,51N
BI2C	Dual level D.C. current relay: 49,76
BF3	Three phase breaker failure relay: 50BF
UB./.	Under/Over-voltage relay: 27,59,45,80
UB./.	Dual level voltage relay: 27,59,45,80
UB0	Zero sequence voltage relay desensitised to the third harmonic: 64
UB./60	Voltage balance relay: 60
UB0/100	Relay for 100% generator stator earth fault protection: 64s
UB1/2/C	Battery positive/negative leakage to earth fault protection
UB3/59-S	Overvoltage relay for supervision of CTs ' circuits
RBW	Directional overcurrent relay: 32,67,67N
RRS	Automatic load sharing control relay for generators: 95
UB0/CR	Rotor earth fault relay: 64R
RB4	Lock-out relay: 86
RHS	Rotating diode failure detection relay: 58
RCA	Trip circuit supervision relay: 74
UB0/ATR	High impedence differential relay: 87N(87G)

The main features are the following:

- Measuring inputs supplied through internal adaptor transformers
- Multivoltage a.c. and d.c. autoranging power supply unit
- Draw-out modular execution on standard european size P.C. boards
- Fibreglass reinforced epoxy resin P.C. boards with tinplated copper tracks, solder mask special silicon humidity protection and screen printed component designators
- P.C. board connectors with golden plated pins rated 10A continuous and 200A 1sec

Execution

"E" For flush mounting with back connection terminals, draw-out relay boards with automatic short circuiting of the current inputs. Transparent front cover. Protection degree IP54; accessories for surface mounting (E/I) are also available.

"E/R" Standard 19"3U (8 modules) or 6U (16 modules) rack with back connection terminals, draw-out relay boards with short circuiting of the current.

Output Relays

Two versions are provided:

- Standard version: the output relays are deenergized on normal operating conditions and are energized on relay's tripping
- Positive protected version (on request): the output relays are energized on normal operating conditions, (i.e. with auxiliary supply on and input values at normal levels) and are deenergized on relay 's tripping, failure of power supply, internal relay fault

Signalization

- Green led: auxiliary power supply presence
- Red led: trip indication
- Yellow led: trip memorisation

Control

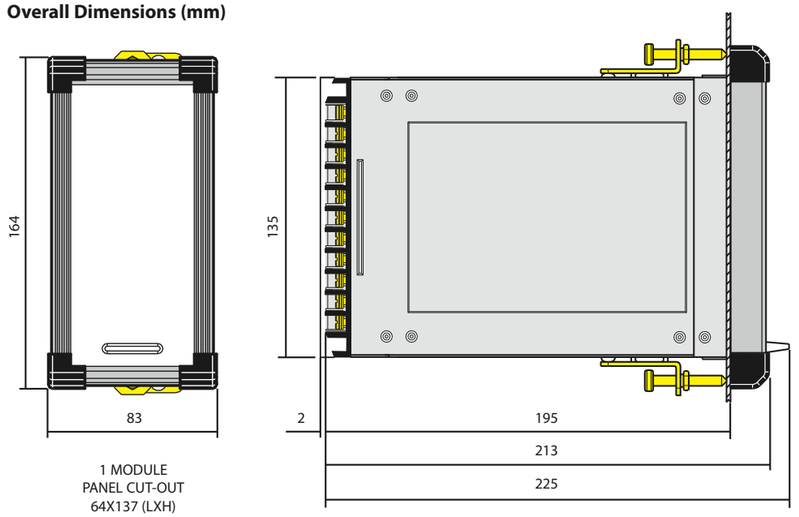
- Relay test with or without tripping of output contacts
- Automatic and/or local/remote reset of the output relays
- Local manual reset only for signal leds

Blocking and Intertripping Circuits

On request are available:

- Blocking input (BI)
- Blocking output (BO)
- Time start output (TO)

Overall Dimensions (mm)



M line

General Characteristics

M line is a complete series of microprocessor based relays suitable for protection of high and medium voltage systems; it offers a unique combination of performances, functionalities, innovation and reliability. The line is completed by a number of communication and control modules giving a good level of modularity.

Measurements

- Real Time Measurements
- Maximum Demand and Inrush Recording
- Trip Recording (last 5 trips with date & time)

Control

- 5 Output Relays (programmable)
- 3 Digital Inputs
- Time tagged event recording
- Blocking Outputs and Blocking Input for pilot wire selectivity coordination

Communications

- 1 RS485 Serial communication port on rear side
- Modbus RTU Communication Protocols

Technical Characteristics

- Complete autodiagnostic program
- 8 Digit alphanumerical Display
- 8 Leds for signalization

Mounting

- 2 Module boxes
- IP44 protection case (on request IP54)
- Totally draw-out execution

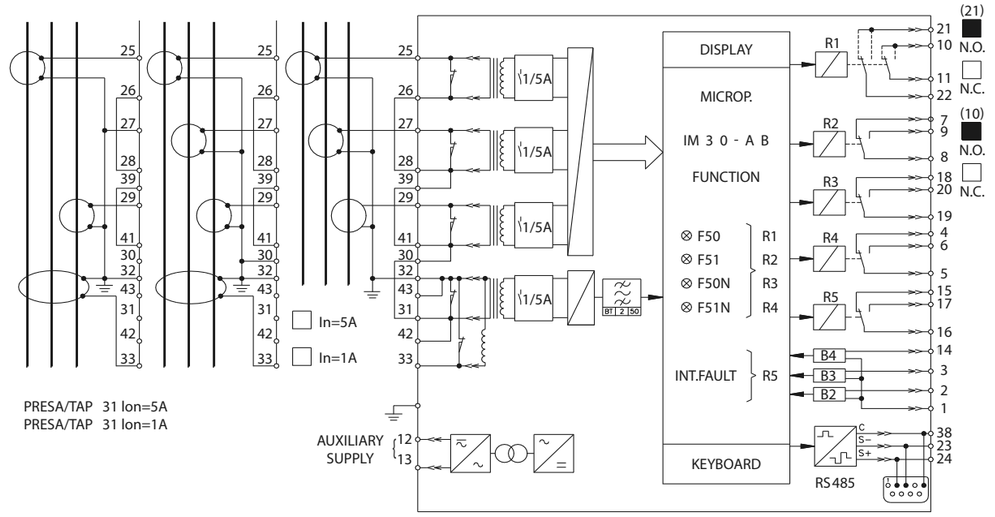
Software

- MSCom Program interface for device management

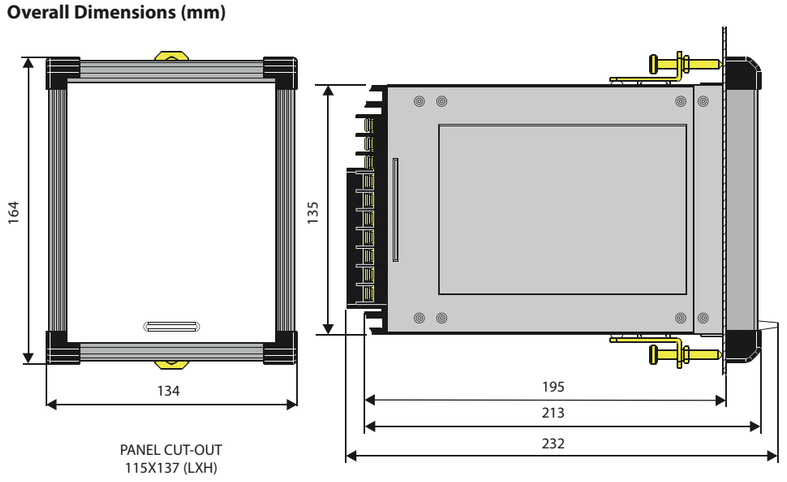
Relays Type

IM30-AB	Three-phase Overcurrent and Earth Fault - Dual Setting : 50/51, 50N/51N, 51BF
IM30-AP	Three-phase Overcurrent and Earth Fault: 50/51, 50N/51N, 51BF
IM30-C	Capacitor Overload, Earth Fault And Unbalance Protection: 50/51, 50N/51N, 46N, 37, 51BF
IM30-D	Three-phase Overcurrent + Directional Earth Fault: 50/51, 50N/51N/67N, 59Uo, I^2t, 51BF
M-ARM513	Multishot Programmable Single/Three Phase Autoreclose: 79
SCM21	Three Inputs Synchrocheck: 25, 27/59, 81.
MM30	Motor Protection: 12/14, 37, 46, 47, 48, 49, 50/51, 51LR, 64, 66
MM30-D	Motor Protection With Directional Earth Fault: 12/14, 37, 46, 47, 48, 49, 50/51, 51LR, 64N, 66
MM30-W	Motor Protection Relay With Voltage & Power Control: 12/14, 27/59, 37, 46, 47, 48, 49, 50/51, 51LR, 55, 64, 66, 81
IM30-T	Three-phase Thermal + Overcurrent + Earth Fault: 46, 49, 50/51, 50N/51N, 51BF, I^2t
MD32-T	Percentage Biased Transformer Differential: 87, 87N
MD33-T	Percentage Biased Differential Relay For 3-winding Transformers: 87, 50/51
MTR33	Transformer On-load Tap-Changer Control: 27, 59, 37, 50/51, 90
IM30-G	Multifunction Generator Protection: 32, 40, 46, 50/51, 51BF, 64S
IM30-B00	Earth Fault Relay - Dual Setting: 50N/51N, 51BF
IM30-DR	Three-phase Overcurrent with Directional Earth Fault + Autoreclosing: 50/51, 50N/51N/67N, 46, 79, 51BF
MG30	Generator Protection & Management: 21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 81
MD32-G	Percentage Biased Generator Differential Relay: 50/51, 87N or 64S, F87, 51BF
SPM21	Generator Synchronizing Relay: 25, 27/59/81, 90
M-LIB3	Modular Low-Impedance Bus-bar Protection: 87B
M-HIB3	High Impedance Biased Differential Relay: 87, 51BF
M-HIV3	Three Phase High Impedance Busbar Differential Relay With Supervision of CT Secondary Circuits: 87B, 59S
MFP	Pilot Wire Differential Protection Relay for Cables & Lines: 87/85, 50/51, 51BF
UM30-A	Three-phase Voltage, Frequency & Zero Sequence Voltage with Vector Shift Detection: 24, 27d/59d, 47, 59, 59Uo,81
UFD34	Three-phase Digital 4-stage Frequency Relay With Df/dt & Dv/dt Control: 27/59, 81, df/dt, dv/dt
MU30	Multifunction Three-phase Measuring Unit
MW33	Power Management Relay: 27/59, 81, 32
MX7-5	Programmable Interface & Control Module: 7 Digital Inputs & 5 Output Relays
MX14-5	Programmable Interface & Control Module: 14 Digital Inputs & 5 Output Relays

Wiring Diagram



Overall Dimensions (mm)



MC line

General Characteristics

The MC line has been designed to offer to the market a very competitive protective relay responding to the latest requirements in terms of control and communication capabilities with an extremely high level of modularity. Each relay includes a limited number of protective functions but, thanks to their very compact sizes, different units can be combined in a modular enclosure to satisfy the most demanding needs.

Measurements
- Real Time Measurements
- Trip Recording (last 20 trips with date & time)
- Event recording (last 10 trips)

Control
- 4 Output Relays (programmable)
- 3 Digital Inputs
- Time tagged multiple event recording
- Oscillographic wave form capture
- Blocking Outputs and Blocking Input for pilot wire selectivity coordination
- Associate C.B. control

Technical Characteristics
- Complete autodiagnostic program
- Display LCD 16 (2x8) characters
- 4 Leds for signalization

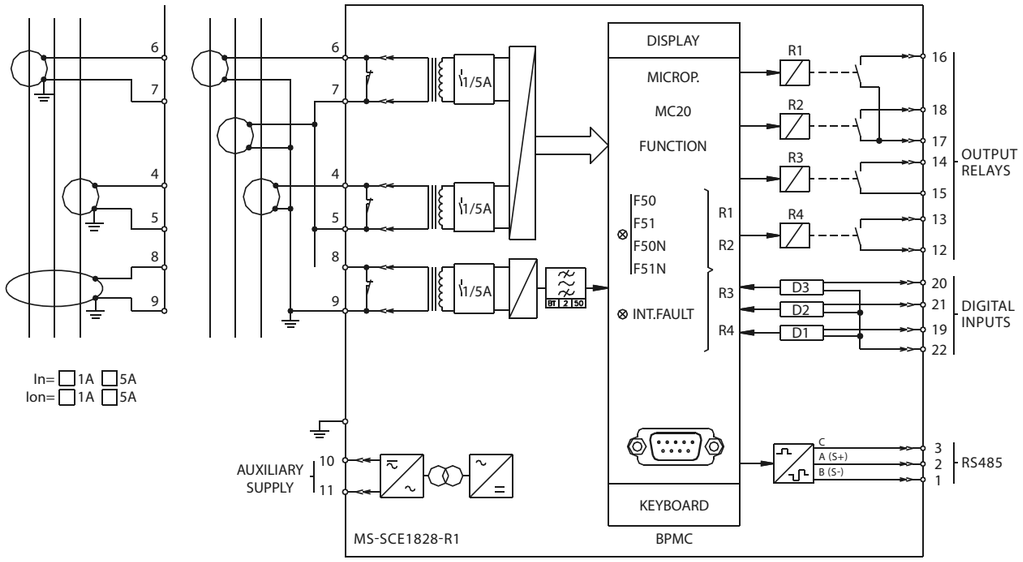
Communications
- 1 RS485 Serial communication port on rear side
- 1 RS232 Serial communication port on front panel
- Modbus RTU/IEC870-5-103/IEC61850 Communication Protocols

Expansion Modules (optional)
- "UX10-4" 10 Digital Input and 4 Output Relays
- "14DI" 14 Digital Inputs
- "14DO" 14 Output Relays

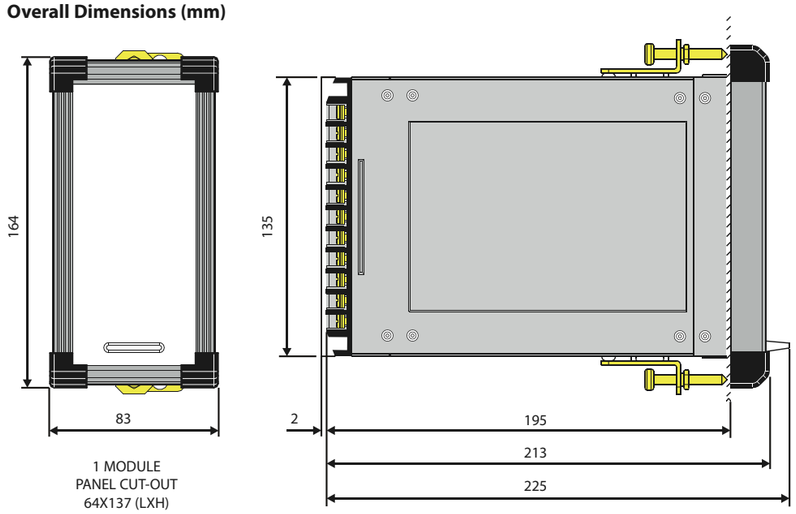
Execution
- 1 Module box. (2 modules with expansion)
- Totally draw-out execution
- IP44 protection case (on request IP54)

Software
- MSCom2 Program interface for device management

Wiring Diagram



Overall Dimensions (mm)



Relays Type

MC1V	Multifunction Single Phase Overvoltage/Undervoltage Relay: 59, 27, 81>, 81<
MC3V	Multifunction Three Phase Overvoltage/Undervoltage Relay: 59, 27, 81>, 81<, 59Vo, 59V2, 27V1
MC20	Overcurrent & Earth Fault Relay: 50/51, 50N/51N, 51BF
MC30	Three Phase Overcurrent & Earth Fault Relay: 49, 50/51, 50N/51N, 51BF
MC40	Three Phase Overcurrent & Earth Fault (connection with 4 CT's): 49, 50/51, 50N/51N, 51BF
MC20-R	Overcurrent & Earth Fault Relay: 50/51, 50N/51N, 51BF, 79
MC30-R	Three Phase Overcurrent & Earth Fault with reclosing function Relay: 50/51, 50N/51N, 51BF, 79
MC30-BC	Three Phase Overcurrent & Earth Fault + Broken Conductor Relay: 50/51, 50N/51N, 51BF, BC (I2/I2)
MCDC-I	D.C. Current Relay: 76/32, 49, 51BF
MCDC-V	D.C. Voltage Relay: 45, 80
MCM	Motor Protection Relay: 37, 46, 47, 48, 49, 50/51, 51LR, 64S, 66, 68

N DIN line

General Characteristics

The N-DIN line has been conceived to obtain the most efficient space/performance as well as cost/performance ratio. The execution of the relay is for DIN Rail, but its Front Face Panel (FFP) - including Controls, Signals and Display - is removable and can be flush mounted apart from the Relay Main Body (RMB), on the front panel of the switchboards or the motor control centers. One FFP only can control up to 31 RMB units. The relay main body RMB can also be used as a stand-alone unit, without the front panel FFP.

Measurements

- Real Time Measurements
- Trip Recording (last 5 trips with date & time)
- Load Profile recording

Technical Characteristics

The Relay Main Body (RMB) includes:

- 2 Self powered programmable Digital Inputs for remote controls (start, stop, rev., ETC)
- 1 RTD input or User available Digital Input
- 2 Programmable output relays each with one N.O. contact rating 6A
- 1 RS485 port for connection to the communication serial bus (Modbus RTU)
- 1 RS485 port for communication to the Front Face Panel
- 2 Signal Leds, 1 Reset button

The Front Face Panel (FFP) includes:

- 2x16 characters LCD display
- Four Key buttons for local relay management, Four signal leds
- One RS232 port for connection to a local PC (on front side)
- One RS485 port for interconnection with the RMB (on back side)
- Complete autodiagnostic program

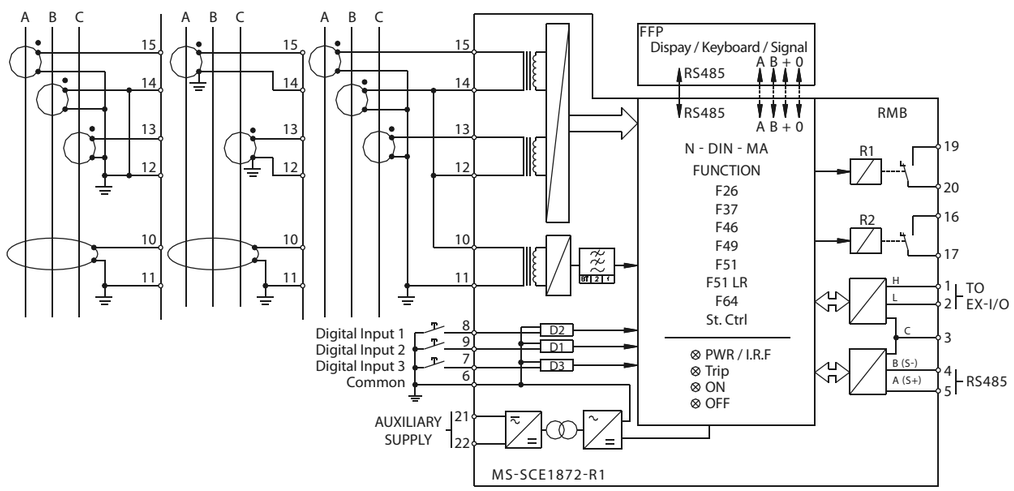
Mounting

- DIN46227 (EN50022)

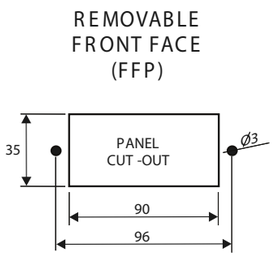
Relays Type

N-DIN-MA	Motor Protection Relay: 37, 46, 49, 51, 51LR, 64/51N, 66
N-DIN-F	Feeder Protection Relay: 46, 49, 51, 50N/51N, 51BF
N-DIN TO64	D.C. Current Relay with High Sensitivity Hall Effect Transducer: 64, 51BF
Accessories	
EX-I/O	Input/Output Expansion Module
CPB	Profibus Converter Module
TA-DIN	Current Transformer
TAR-DIN	Current Transformer

Wiring Diagram



Overall Dimensions (mm)



FFP
Height = 16

RMB
Height = 72

Ultra line

General Characteristics

ULTRA is the top line of Microelettrica Scientifica protective relays; it has been designed to meet the most demanding specifications for any application in Transmission, Distribution and Industrial plants. The ULTRA relays are used in all the applications where, besides the protection, a complete measuring system is needed. Each relay is a multifunctional unit combining protection, measurements and control. Thanks to the CAN BUS communication port and to a complete range of additional modules, the relays of this line can perform a complex input/output logic for interlocking substation system avoiding the use of an additional PLC. The multiprotocol makes the relay very versatile and suitable to be implemented in the most common DCS and SCADA systems.

Recording

- Event Recording (last 100 events)
- Trip Recording (last 20 trips) complete with cause of tripping and values of the input quantities at the moment of trip
- Oscillographic recording of input quantities (8 channels, 32 sample/cycle, 3 sec each)

Control

- 6 Output Relays user programmable
- 4 Digital Inputs user programmable
- Blocking input and Blocking output for pilot wire selectivity coordination
- Time tagging resolution 1ms
- Trip circuit supervision
- Associated Circuit Breaker control (OPEN/CLOSE)

Technical Characteristics

- Graphical Display (128x64 dot)
- 4 Leds for signalization
- Multilanguage Display (English/Italian standard, available - other on request)
- Complete autodiagnostic program with dedicated relay

Communications

- 1 RS485 Serial communication port on rear side
- 1 RS232 Serial communication port on front panel
- Modbus RTU/IEC870-5-103/IEC61850/ TCP-IP Modbus Communication Protocols
- Canbus port for external additional modules

Expansion Modules (optional)

- "UX10-4" 10 Digital Inputs and 4 Output Relays
- "14DI" 14 Digital Inputs
- "14DO" 14 Output Relays

Execution

- 2 Module box. (3 modules with 1 expansion, 4 modules with 2 expansion)
- IP44 protection case (on request IP54)
- Totally draw-out execution.

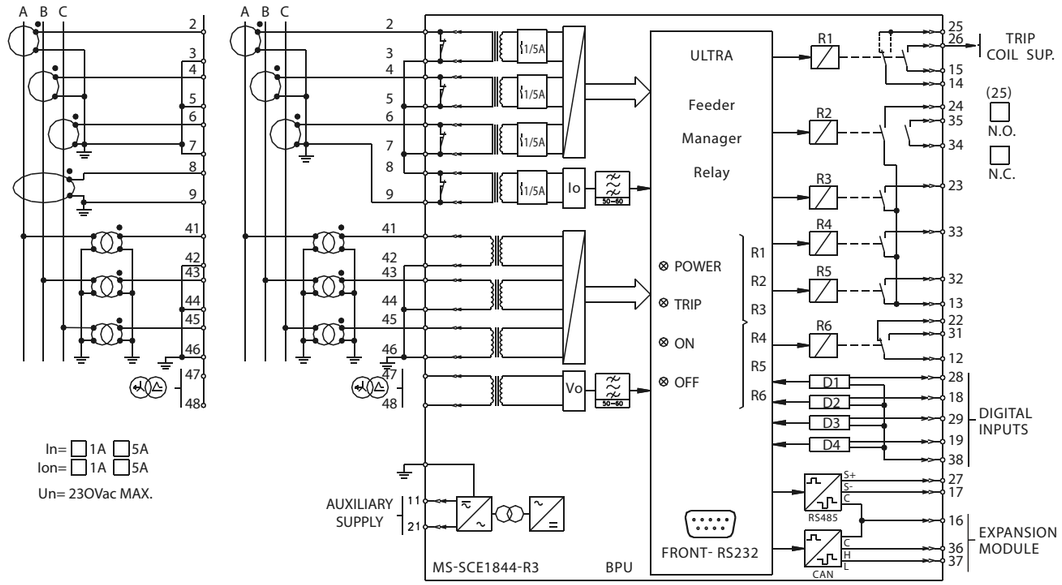
Software

- MSCom2 Program interface for device management

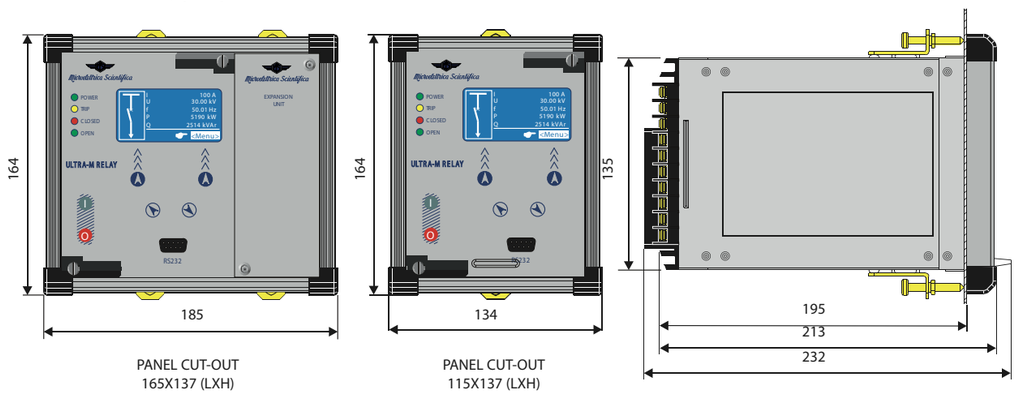
Relays Type

U-MLEs	D.C. Feeder Manager Relay: 49, 32/76, 80, 45, 64, 79, DI, di/dt, Rapp, Iapp, CMI, LT, BF
U-MLC	D.C. Feeder Manager Relay (Italian Railway Certification): 27/59, 32, 45, 49, 64, 76, 79, 80
U-MLC- M	D.C. Energy Metering: I, V, W, E
DTMR	Differential Transformer Relay: 50/51, 87T, 87N/51N
FMR	Feeder Manager Relay: 49, 50/51/67, 50N/51N/67N, 27/59, 81, 46, 59Uo, 51BF, F 27U1, 59U2/47, 79
MMR	Motor Manager Relay: 12/14, 37, 27/59, 46, 49, 50/51, 51LR, 51BF, 55, 64, 66, 81
GMR	Generator Protection & Management Relay: 21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 81

Wiring Diagram



Overall Dimensions (mm)



MSCom2

Interfacing Program

MSCom2 is a communication program for Windows systems allows to:

- Simultaneously comunicate on serial port with up to 250 Microeletrica Scientifica relays
- Save data coming from relays on disk
- Manage the configurations of many relays at the same time and store information on hard disk
- Print data as tables or diagrams
- Periodically poll the relays and send measurement or event data directly to the hard disk or a printer
- Access the relays via modem (PC-modem …….. modem-relays)
- Access the relay over TCP/IP protocol
- On-line firmware update
- Prepare off-line relay setting files and directly up load relay's memory

System Requirements

- IBM P.C. compatible computer
- Pentium 3 microprocessor (recommended Pentium 4 or higher)
- Min. 1 MByte RAM (recommended 2 MByte)
- Min. 200MB free on hard disk
- Min. 1 serial port dedicated to communication
- Resolution min.: 640 x 480, 256 colors (recommended 1024x768, 65535 colors)
- Keyboard
- Mouse
- Operating systems: Microsoft Windows

Supported Lines

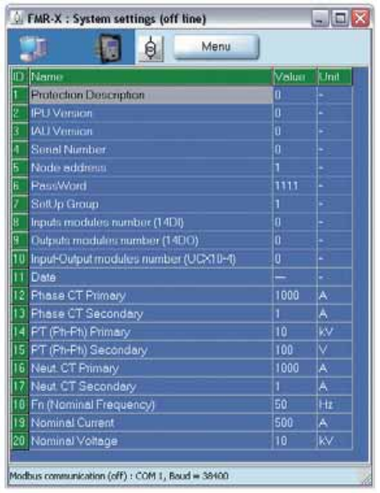
ULTRA-Line, MC-LIne, M-Line, N-DIN-Line

MSCom2 Software

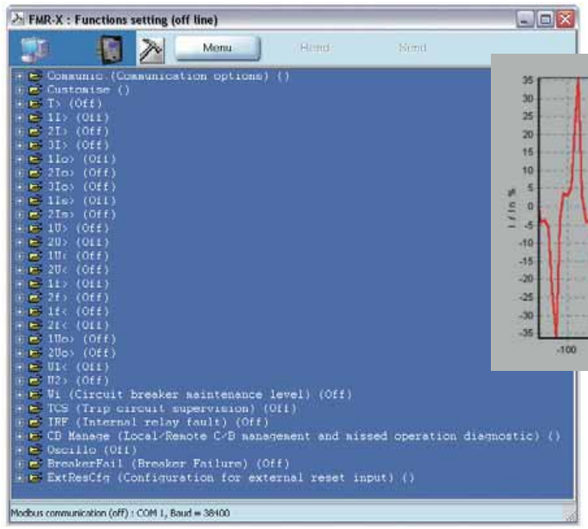
Actual Measurements

ID	Name	Value	Unit
1	Imax (Largest phase current (Ia, Ib, Ic))	0	A
2	Ia (rms value phase A current)	0	A
3	Ib (rms value phase B current)	0	A
4	Ic (rms value phase C current)	0	A
5	Io (Zero Sequence Current)	0	A
6	I1 (Positive sequence current)	0	In
7	I2 (Negative sequence current)	0	In
8	Frq (Frequency)	0	Hz
9	Uan (Phase Voltage A-N)	0	V
10	Ubn (Phase Voltage B-N)	0	V
11	Ucn (Phase Voltage C-N)	0	V
12	Uab (Phase-to-phase Voltage A-B)	0	V
13	Ubc (Phase-to-phase Voltage B-C)	0	V
14	Uca (Phase-to-phase Voltage C-A)	0	V
15	Uo (Zero Sequence Voltage)	0	V
16	V1 (Positive Sequence Voltage)	0	Vn
17	V2 (Negative Sequence Voltage)	0	Vn
18	PhA (Phase angle Ia ^ Uan)	0	Dg
19	PhB (Phase angle Ib ^ Ubn)	0	Dg
20	PhC (Phase angle Ic ^ Ucn)	0	Dg
21	Ph0 (Phase angle Io ^ Uo)	0	Dg
22	W (Three Phase Active Power)	0	k
23	VAr (Three Phase Reactive Power)	0	k
24	VA (Three Phase Apparent Power)	0	k
25	Cos (Power Factor)	0	
26	Tem (Thermal Status %Tn)	0	%T
27	Wir (C/B residual interruption energy)	0	%W

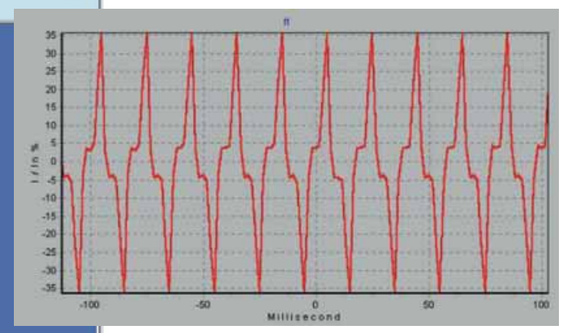
System Settings



ID	Name	Value	Unit
1	Protection Description	0	-
2	IPU Version	0	-
3	IAU Version	0	-
4	Serial Number	0	-
5	Node address	1	-
6	PassWord	1111	-
7	SetUp Group	1	-
8	Inputs modules number (14DI)	0	-
9	Outputs modules number (14DO)	0	-
10	Input-Output modules number (UCX10-I)	0	-
11	Date	—	-
12	Phase CT Primary	1000	A
13	Phase CT Secondary	1	A
14	PT (Ph-Ph) Primary	10	kV
15	PT (Ph-Ph) Secondary	100	V
16	Neut. CT Primary	1000	A
17	Neut. CT Secondary	1	A
18	Fn (Nominal Frequency)	50	Hz
19	Nominal Current	500	A
20	Nominal Voltage	10	kV



Function Settings



Oscillographic wave form

MHCO line

DC measuring converter

General Characteristics

The DC measuring transducers MHCO are the transducers for high voltage measurement designed by Microelettrica Scientifica. The MHCO are designed and manufactured to allow safe and full isolated HV measurement of DC currents and Voltages. They find their main application in all the DC Traction Substations (Railways, Tramways and Metro) where, directly connected to the high voltage systems (750V, 1,5kV and 3kV) gives very accurate and safe analogue outputs for measuring and protective purposes.

The MHCO line includes three models:

MHCO-TV
For VOLTAGE measurement. Directly connected to the high voltage line up to 6kV through internal voltage divider.

MHCO-TI
For CURRENT measurement. Connected to the high voltage line through a dedicated shunt (not supplied).

MHCO-TVI
For combined CURRENT & VOLTAGE measurement. Connected to the high voltage line up to 6kV through internal voltage divider & through a dedicated shunt (not supplied).

Highlights

- HV Transducer for Current & Voltage measurement
- Direct Connection up to 6kV
- Fibre Optic connection between HV transmitter and LV receiver
- Measuring channel fully redundant
- Autoranging Multivoltage Power supply (self-powered version available as optional)
- Compatible with traction application standard

Transmitter Unit

Three different models available, one for each type of transducers (current, voltage and current/voltage). Directly connected to the High Voltage DC system acquires the input signals by a redundant input channel and transmit them, after comparison and confirmation of validity, to the receiver unit through dedicated Fibre Optic connections. It has an autoranging multivoltage Power supply. As option a self powered version is available; in this case the power supply is directly taken from the line voltage through a set of dumping resistors.

Receiver Unit

Two models available, respectively suitable to be connected to the current and to the voltage transmitter by means of a dedicated Fibre Optic connection. The input signal is converted into 4 linear analogue output signals independently programmable (ie. 0-20/4-20mA etc..). The setting of this unit can be easily done using our MSCom2 software tool.

The receiver is equipped with two output relays: one relay is used for autodiagnostic (it trips in case of interruption of the Fibre Optic channels or internal failure of the receiver unit, including power supply failure or as alarm for measurement discrepancy between the two transmitter channels); the second relay can be programmed as alarm for under/over voltage and/or current level. Optionally a Front face display and Keyboard panel is available for local measurement and programming.

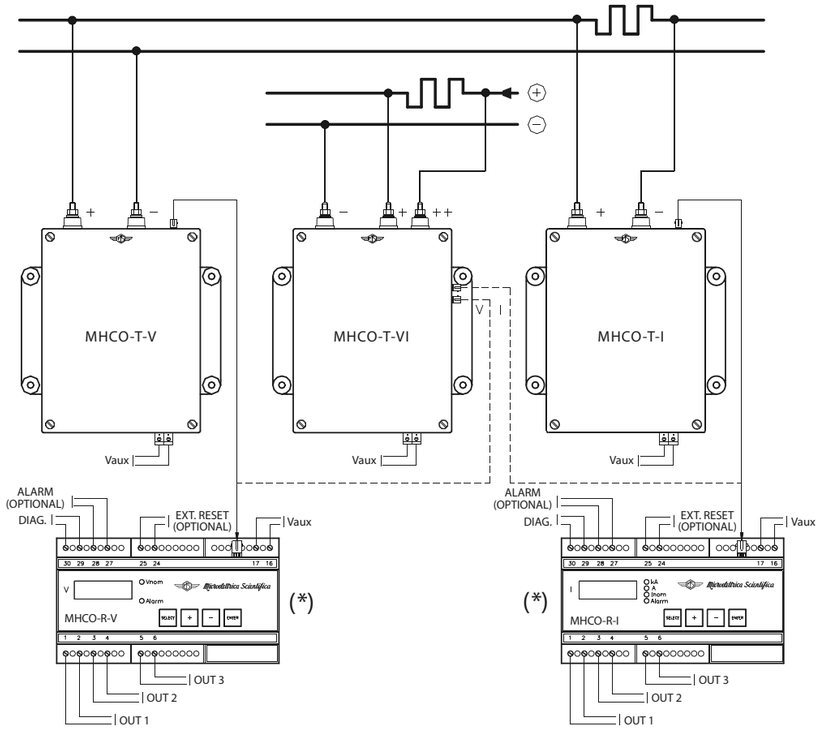
Fibre Optic Link

Transmitter and Receiver units are connected by means of a Fibre Optic link which guarantee a very hight insulation level.
Two Fibre Optic type are available both provided with standard ST connectors:
PLASTIC FIBRE: 62,5/125µ
GLASS FIBRE: 200 m HSC
The standard length of the fibre opti connection is 5 meters, other lengths are available on request.

Characteristics Transmitter/Receiver

Measurement solution: 0.1% of full scale @ (20/+70)°C
Responce time: 200ms
Connection: Fiber optic type 200.230.500m HCS (plastic) or 62.5/125m (glass) connection type ST
Fiber optic standard length 5m (max 1 km with glass fiber)

Wiring Diagram



(*) Version with optional display shown in the figure

MHIT line

DC measuring converter

General Characteristics

The DC measuring transducers MHIT are the latest generation of transducers for high voltage measurement designed by Microelettrica Scientifica. They are the result of the long experience of Microelettrica in this field with the addition compared to the previous line (MHCO) of the full redundancy of the measuring channel which gives a further level of reliability to the product. The MHIT are designed and manufactured to allow safe and full isolated HV measurement of DC currents and Voltages. They find their main application in all the DC Traction Substations (Railways, Tramways and Metro) where, directly connected to the high voltage systems (750V, 1,5kV and 3kV) gives very accurate and safe analogue outputs for measuring and protective purposes.

The MHIT line includes three models:

MHIT-V
For VOLTAGE measurement. Directly connected to the high voltage line up to 6kV through internal voltage divider

MHIT-I
For CURRENT measurement. Connected to the high voltage line through a dedicated shunt (not supplied)

MHIT-VI
For combined CURRENT & VOLTAGE measurement. Connected to the high voltage line up to 6kV through internal voltage divider & through a dedicated shunt (not supplied)

Highlights

- HV Transducer for Current & Voltage measurement
- Direct Connection up to 6kV
- Fibre Optic connection between HV transmitter and LV receiver
- Measuring channel fully redundant
- Autoranging Multivoltage Power supply (self-powered version available as optional)
- Compatible with traction application standards

Transmitter Unit

Three different models available, one for each type of transducers (current, voltage and current/voltage). Directly connected to the High Voltage DC system acquires the input signals by a redundant input channel and transmit them, after comparison and confirmation of validity, to the receiver unit through dedicated Fibre Optic connections. It has an autoranging multivoltage Power supply. As option a self powered version is available; in this case the power supply is directly taken from the line voltage through a set of dumping resistors.

Receiver Unit

Two models available, respectively suitable to be connected to the current and to the voltage transmitter by means of a dedicated Fibre Optic connection. The input signal is converted into 4 linear analogue output signals independently programmable (ie. 0-20/4-20mA etc..). The setting of this unit can be easily done using our MSCom2 software tool.

The receiver is equipped with two output relays: one relay is used for autodiagnostic (it trips in case of interruption of the Fibre Optic channels or internal failure of the receiver unit, including power supply failure or as alarm for measurement discrepancy between the two transmitter channels); the second relay can be programmed as alarm for under/over voltage and/or current level. Optionally a Front face display and Keyboard panel is available for local measurement and programming.

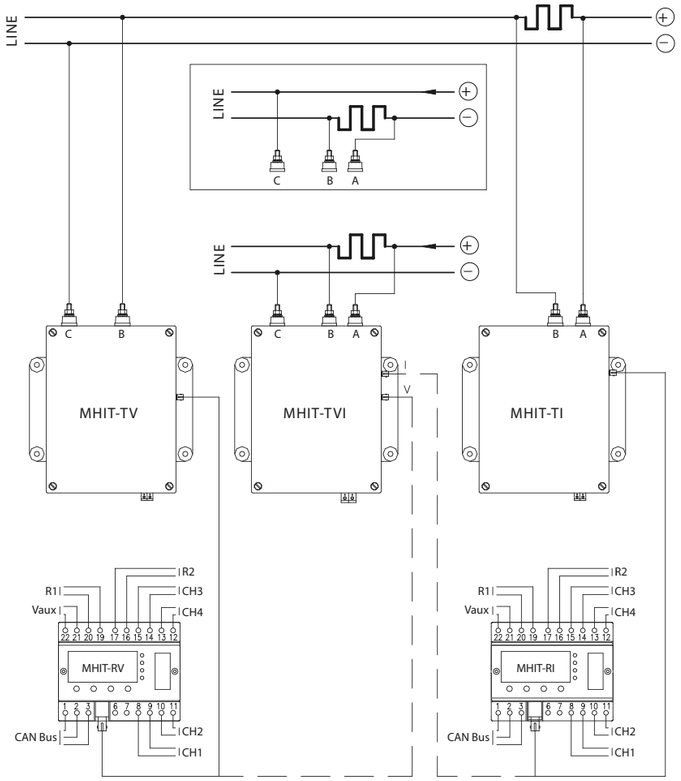
Fibre Optic Link

Transmitter and Receiver units are connected by means of a Fibre Optic link which guarantee a very hight insulation level.
Two Fibre Optic type are available both provided with standard ST connectors:
PLASTIC FIBRE: 62,5/125µ
GLASS FIBRE: 200 m HSC
The standard length of the fibre optic connection is 5 meters, other lengths are available on request.

Characteristics Transmitter/Receiver

Measurement solution: 0.1% Vn/0.05% Full Scale (2Vn)
channel (0¸1)In-0.05% In/0.05% Full Scale
channel (0¸10)In-0.5% In/0.05% Full Scale
Accuracy class: 0.2
Responce time: 200ms
Connection: Fiber optic type 200.230.500m HCS (plastic) or 62.5/125m (glass) connection type ST
Fiber optic standard length 5m (max 1 km with glass fiber)

Wiring Diagram



Eurometer

General Characteristics
EUROMETER is a compact solution that allows the measurement of the voltage of the catenary line and in combination with its interface (IRTL) distributes the information through the whole train. Having just one certified product that integrates so many functions, allows easy communication and interchange of datas, with the maximum control on the whole productive process.

Functions
EUROMETER's functions are highly customized according to our customers' needs or suggestions coming from our experience:
- Detection and measurement of the instantaneous catenary AC and DC voltages
- Analog and/or digital output signals
- Insulated optical fiber output
- On-line diagnostic

Possible options may include:
- Measurement of harmonics
- Measurement of energy consumption

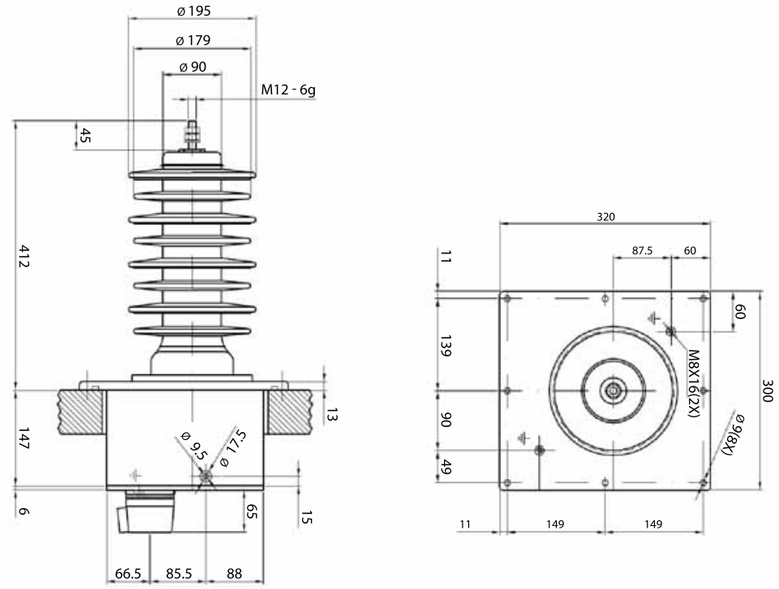
Environmental Performance
The device is compliant with all the regulations of the rail market. All the components are homologated for the industrial temperature range (from -45°C to +80°C - Class TX - EN 50125-1) and ensure a proper working in the worst environmental conditions.

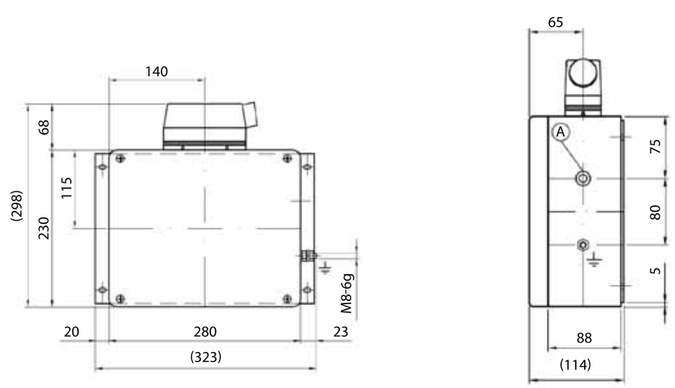
Maximum Speed of the rolling stock (on which the device is installed)	350 km/h
Storage temperature	from -45°C to +80°C
Class of air temperature (EN50125-1)	TX (from -45°C to +75°C)
Class of altitude range (EN50125-1)	A1 (up to 1400m)
Relative humidity at 40°C	95%
Maximum solar radiation (EN50125-1)	1120W/m2
Protection level for terminal box (EN60529)	IP 66 (RTL); IP 54 (IRTL)
Transvers acceleration (EN50125-1)	GT1
Longitudinal acceleration	GL1
Shock and vibrations	EN 61373
Contamining fluids (60721-3-5)	5F3
Lateral wind withstand	up to 25m/s, gusts up to 40 m/s 1s
Weight	18kg (RTL) + 7.5kg (IRTL)

Electrical Performances
The EUROMETER operates under the following four different power supply systems (EN 50163 - Railway Systems Supply Voltages).

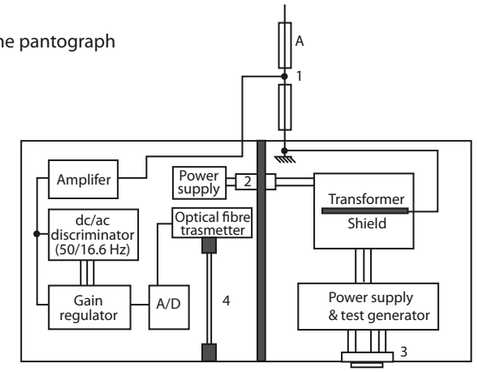
Electrification System/Nominal Voltage	Working Range	
DC 1.5 kV	900 ÷ 2.200	Vdc
DC 3kV	2.000 ÷ 4.000	Vdc
AC 15kV 16 2/3 Hz	10.000 ÷ 19.000	Vac
AC 25kV 50 Hz	17.000 ÷ 30.000	Vac

Overall Dimensions (mm)





Functional Scheme
Terminal A is connected to the pantograph



1. High voltage divider
2. Connector for communication between two separate internal compartments
3. Power supply connector
4. Internal optical fibre

Integrameter

General Characteristics
INTEGRAMETER is the last born in our line of on-board metering products and integrates in a single product many functions that were previously divided into multiple components from different suppliers. Thanks to this patent, Microelettrica has become the one supplier in the world to create and deliver a compact and fully integrated device whose characteristics, both in the high voltage section and in the low voltage metering section, offer maximum reliability and safety.

Functions
INTEGRAMETER's functions are highly customized according to our customers' needs or suggestions coming from our experience:
- Detection and measurement of the instantaneous catenary AC and DC voltages
- Detection and measurement of the instantaneous catenary AC and DC currents
- Measurement of energy consumption
- Analog and/or digital output signals
- RS422 or RS485 serial outputs
- On-line diagnostic through optical fibre

Possible options may include:
- Measurement of harmonics
- GSM communication
- GPRS on board

Environmental Performance
The device is compliant with all the regulations of the rail market. All the components are homologated for the industrial temperature range (from -45°C to +80°C - Class TX - EN 50125-1) and ensure a proper working in the worst environmental conditions.

Maximum Speed of the rolling stock on which the device is installed	350 km/h
Storage temperature	from -45°C to +80°C
Class of air temperature (EN50125-1)	TX (from -45°C to +75°C)
Class of altitude range (EN50125-1)	A1 (up to 1400m)
Relative humidity at 40°C	95%
Maximum solar radiation (EN50125-1)	1120W/m2
Protection level for terminal box (EN60529)	IP 66
Transverse acceleration (EN50125-1)	GT1 (2 m/s2 for less than 50ms, 1m/s2 for more than 50ms)
Longitudinal acceleration	GL1 (max 2 m/s2)
Shock and vibrations	EN 61373
Contamining fluids (60721-3-5)	5F3
Lateral wind withstand	up to 25m/s, gusts up to 40 m/s 1s
Weight	58kg

Electrical Performances
The INTEGRAMETER operates under the following power supply systems (EN 50163 – Railway Systems Supply Voltages).

Electrification System/Nominal Voltage	**Working Range**	
DC 1.5 kV	900 ÷ 2.200	Vdc
DC 3kV	2.000 ÷ 4.000	Vdc
AC 15kV 16 2/3 Hz	10.000 ÷ 19.000	Vac
AC 25kV 50 Hz	17.000 ÷ 30.000	Vac

The basic configuration includes up to:
- 8 redundant analog outputs are available for the measurement of the catenary voltages
- 2 analog outputs for catenary AC currents
- 10 redundant digital outputs (relays) for detection of the catenary line system or for diagnosis (see appendix 2
- Serial ports allow both a redundant serial transmission of voltage and current (RS422 in the basic configuration) and energy measurement (RS485)
- Testing port it is possible to activate a TEST function to check the INTEGRAMETER's proper voltage and current output generation
- Precision. 1% class TX

Connections
The INTEGRAMETER is supposed to be mounted on the vehicle's roof, by the pantograph.
A terminal is connected to the pantograph while the other is directly connected to the AC High Speed Vacuum Circuit Braker.
A third terminal is directly connected to the DC High Speed Circuit Braker with an external device that provides the measurement of the current under 3kVdc lines.