EMC Traction S.r.l.

DC High Speed Circuit Breakers
IR2000 IR6000 IR6000 MPIR6000 ML IR AIR2000 SV IR6000 SV

DC Switchgears DIA CLAD

Components for Industry Application
- Resistors
  - Stationary
  - Neutral Grounding Filter
  - Load Bank
  - Starting/Braking
  - Line Test
- On Board
  - Braking
  - Continuous duty control resistors
  - Impulsive duty control resistors

Components for Energy Application
- Switches
  - Contactors
  - L THS Line
  - L TC Line
  - L THH/L TE/L TP Line
  - L TNS Line
  - N Line
- Disconnectors
  - L THM/P-UD Line
  - L TMP Line

Components for DC Substation Application

Components for Rail On Board Application
- Automatic Door Systems

Software
- MS Com2

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

Transducers
- MHIT
- MHCO
- Eurometer
- Integrameter

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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 transducers 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.
Relays

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.

<table>
<thead>
<tr>
<th>Relays Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB../..</td>
<td>Dual level current relay: 50/51</td>
</tr>
<tr>
<td>UB0-A</td>
<td>Earth fault current relay desensitized to the third harmonic: 51N</td>
</tr>
<tr>
<td>BI20/..</td>
<td>Two phase + earth fault overcurrent relay: 49,51,51N</td>
</tr>
<tr>
<td>BI2C</td>
<td>Dual level D.C. current relay: 49,76</td>
</tr>
<tr>
<td>BF3</td>
<td>Three phase breaker failure relay: 50BF</td>
</tr>
<tr>
<td>UB../..</td>
<td>Under/Over-voltage relay: 27,59,43,80</td>
</tr>
<tr>
<td>UB0</td>
<td>Zero sequence voltage relay desensitized to the third harmonic: 64</td>
</tr>
<tr>
<td>UB/60</td>
<td>Voltage balance relay: 60</td>
</tr>
<tr>
<td>UB0/100</td>
<td>Relay for 100% generator stator earth fault protection: 64s</td>
</tr>
<tr>
<td>UB12/C</td>
<td>Battery positive/negative leakage to earth fault protection</td>
</tr>
<tr>
<td>UB3/59-S</td>
<td>Overvoltage relay for supervision of CTs circuits</td>
</tr>
<tr>
<td>RBW</td>
<td>Directional overcurrent relay: 32,67,67N</td>
</tr>
<tr>
<td>RRS</td>
<td>Automatic load sharing control relay for generators: 95</td>
</tr>
<tr>
<td>UB0/CR</td>
<td>Rotor earth fault relay: 64R</td>
</tr>
<tr>
<td>RB4</td>
<td>Lock-out relay: 86</td>
</tr>
<tr>
<td>RHS</td>
<td>Rotating diode failure detection relay: 58</td>
</tr>
<tr>
<td>RCA</td>
<td>Trip circuit supervision relay: 74</td>
</tr>
<tr>
<td>UB0/ATR</td>
<td>High impedance differential relay: 87N(87G)</td>
</tr>
</tbody>
</table>

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
- Fiberglass 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/F) 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)

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 desensitized 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: 27,59,43,80
- UB0 Zero sequence voltage relay desensitized to the third harmonic: 64
- UB/60 Voltage balance relay: 60
- UB0/100 Relay for 100% generator stator earth fault protection: 64s
- UB12/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 impedance 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
- Fiberglass 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/F) 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.

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Signalization
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- 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)
# 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

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

## Technical Characteristics

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

## Communications

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

## Mounting

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

## Software

- MSCom Program interface for device management

## Relays

<table>
<thead>
<tr>
<th>Relays Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM30-AB</td>
<td>Three-phase Overcurrent and Earth Fault - Dual Setting: 50/51, 50N/51N, 51BF</td>
</tr>
<tr>
<td>IM30-AP</td>
<td>Three-phase Overcurrent and Earth Fault: 50/51, 50N/51N, 51BF</td>
</tr>
<tr>
<td>IM30-C</td>
<td>Capacitor Overload, Earth Fault And Unbalance Protection: 50/51, 50N/51N, 46N, 37, 51BF</td>
</tr>
<tr>
<td>IM30-D</td>
<td>Three-phase Overcurrent + Directional Earth Fault: 50/51, 50N/51N/67N, 59Lo, 51BF</td>
</tr>
<tr>
<td>M-ARM513</td>
<td>Multishot Programable Single/Three Phase Autoreclose: 79</td>
</tr>
<tr>
<td>SCM21</td>
<td>Three Inputs Synchrocheck: 25, 27/59, 81</td>
</tr>
<tr>
<td>MM30</td>
<td>Motor Protection: 12/14, 37, 46, 47, 48, 49, 50/51, 51BF, 64, 66</td>
</tr>
<tr>
<td>MM30-D</td>
<td>Motor Protection With Directional Earth Fault: 12/14, 37, 46, 47, 48, 49, 50/51, 51BF, 64, 66</td>
</tr>
<tr>
<td>MM30-W</td>
<td>Motor Protection Relay With Voltage &amp; Power Control: 12/14, 27/59, 37, 46, 47, 48, 49, 50/51, 51BF, 64, 66, 81</td>
</tr>
<tr>
<td>IM30-T</td>
<td>Three-phase Thermal + Overcurrent + Earth Fault: 46, 49, 50/51, 50N/51N, 51BF, 79</td>
</tr>
<tr>
<td>MD32-T</td>
<td>Percentage Biased Transformer Differential: 87, 87N</td>
</tr>
<tr>
<td>MD33-T</td>
<td>Percentage Biased Differential Relay For 3-winding Transformers: 87, 50/51</td>
</tr>
<tr>
<td>MTR33</td>
<td>Transformer On-load Tap-Changer Control: 27, 59, 37, 50/51, 90</td>
</tr>
<tr>
<td>IM30-G</td>
<td>Multifunction Generator Protection: 32, 40, 46, 50/51, 51BF, 64S</td>
</tr>
<tr>
<td>IM30-B00</td>
<td>Earth Fault Relay - Dual Setting: 50/51N, 51BF</td>
</tr>
<tr>
<td>IM30-DR</td>
<td>Three-phase Overcurrent with Directional Earth Fault + Autorecloasing: 50/51, 50N/51N/67N, 46, 79, 51BF</td>
</tr>
<tr>
<td>MG30</td>
<td>Generator Protection &amp; Management: 21, 24, 27/59, 32, 37, 46, 49, 50/27, 50/51V, 51BF, 60FL, 64S, 64S, 81</td>
</tr>
<tr>
<td>MD32-G</td>
<td>Percentage Biased Generator Differential Relay: 50/51, 87N or 64S, 87, 51BF</td>
</tr>
<tr>
<td>SPM21</td>
<td>Generator Synchronizing Relay: 25, 27/59, 81, 90</td>
</tr>
<tr>
<td>M-LIB3</td>
<td>Modular Low-impedance Bus-bar Protection: 87B</td>
</tr>
<tr>
<td>M-HIB3</td>
<td>High Impedance Biased Differential Relay: 87, 51BF</td>
</tr>
<tr>
<td>M-HIV3</td>
<td>Three Phase High Impedance Busbar Differential Relay With Supervision of CT Secondary Circuits: 87B, 59S</td>
</tr>
<tr>
<td>MFP</td>
<td>Pilot Wire Differential Protection Relay for Cables &amp; Lines: 87/85, 50/51, 51BF</td>
</tr>
<tr>
<td>UM30-A</td>
<td>Three-phase Voltage, Frequency &amp; Zero Sequence Voltage With Vector Shift Detection: 24, 27/59d, 47, 59, 59Lo, 81</td>
</tr>
<tr>
<td>UPD34</td>
<td>Three-phase Digital 4-stage Frequency Relay With D/d/d &amp; d/d/d Control: 27/59, 51B, 66, d/d/d</td>
</tr>
<tr>
<td>MU30</td>
<td>Multifunction Three-phase Measuring Unit</td>
</tr>
<tr>
<td>MW33</td>
<td>Power Management Relay: 27/59, 81, 32</td>
</tr>
<tr>
<td>MX7-S</td>
<td>Programmable Interface &amp; Control Module: 7 Digital Inputs &amp; 5 Output Relays</td>
</tr>
<tr>
<td>MX14-S</td>
<td>Programmable Interface &amp; Control Module: 14 Digital Inputs &amp; 5 Output Relays</td>
</tr>
</tbody>
</table>

## Wiring Diagram

![Wiring Diagram](image_url)

## Overall Dimensions (mm)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>115</td>
</tr>
<tr>
<td>Width</td>
<td>134</td>
</tr>
<tr>
<td>Depth</td>
<td>213</td>
</tr>
<tr>
<td>Overall</td>
<td>252</td>
</tr>
</tbody>
</table>

PANEL CUT-OUT 115x317 (5.30)
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

Relays Type

<table>
<thead>
<tr>
<th>Relays Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC1V</td>
<td>Multifunction Single Phase Overvoltage/Undervoltage Relay: 59, 27, 81&gt;, 81&lt;</td>
</tr>
<tr>
<td>MC3V</td>
<td>Multifunction Three Phase Overvoltage/Undervoltage Relay: 59, 27, 81&gt;, 81&lt;, 59A0, 59V2, 27V1</td>
</tr>
<tr>
<td>MC20</td>
<td>Overcurrent &amp; Earth Fault Relay: 50/51, 50N/51N, 51BF</td>
</tr>
<tr>
<td>MC30</td>
<td>Three Phase Overcurrent &amp; Earth Fault Relay: 49, 50, 50N/51N, 51BF</td>
</tr>
<tr>
<td>MC40</td>
<td>Three Phase Overcurrent &amp; Earth Fault (connection with 4 CT’s): 49, 50/51, 50N/51N, 51BF</td>
</tr>
<tr>
<td>MC20-R</td>
<td>Overcurrent &amp; Earth Fault Relay: 50/51, 50N/51N, 51BF, 79</td>
</tr>
<tr>
<td>MC30-R</td>
<td>Three Phase Overcurrent &amp; Earth Fault with reclosing function Relay: 50/51, 50N/51N, 51BF, 79</td>
</tr>
<tr>
<td>MC30-BC</td>
<td>Three Phase Overcurrent &amp; Earth Fault + Broken Conductor Relay: 50/51, 50N/51N, 51BF, BC (I2/I2)</td>
</tr>
<tr>
<td>MCDC-I</td>
<td>D.C. Current Relay: 76/32, 49, 51BF</td>
</tr>
<tr>
<td>MCDC-V</td>
<td>D.C. Voltage Relay: 45, 80</td>
</tr>
<tr>
<td>MCM</td>
<td>Motor Protection Relay: 37, 46, 47, 48, 49, 50/51, 51LR, 64S, 66, 68</td>
</tr>
</tbody>
</table>

Communications

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485 Serial</td>
<td>Communication port on rear side</td>
</tr>
<tr>
<td>RS232 Serial</td>
<td>Port on front panel</td>
</tr>
<tr>
<td>Modbus RTU/IEC870</td>
<td>Communication Protocols</td>
</tr>
<tr>
<td>IEC870-5-103/IEC6185</td>
<td></td>
</tr>
</tbody>
</table>

Overall Dimensions (mm)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>184</td>
</tr>
<tr>
<td>Width</td>
<td>120</td>
</tr>
<tr>
<td>Depth</td>
<td>204</td>
</tr>
<tr>
<td>Overall Dimensions</td>
<td>213 x 220</td>
</tr>
</tbody>
</table>

Wiring Diagram
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)

Wiring Diagram

Overall Dimensions (mm)

Removable Front Face (FFP)
Height = 9

Transparent Cover
Dimension 45x108
Height = 9

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/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, lapp, CMI, LT, BF
- U-MLC D.C. Feeder Manager Relay (Italian Railway Certification): 27/59, 32, 45, 49, 64, 76, 79, 80
- DTMR Differential Transformer Relay: 50/51, 87T, 87N/51N
- FMR Feeder Manager Relay: 49, 50/51/67, 50N/51N/67N, 27/59, 81, 46, 59U0, 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, 46, 49, 50/27, 50/51V, 51BF, 60FL, 64S, 81

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

Overall Dimensions (mm)

Wiring Diagram
MSCom2

Interfacing Program

MSCom2 is a communication program for Windows systems allows to:

- Simultaneously communicate 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 upload relay’s memory

System Requirements

- IBM PC compatible computer
- Pentium 3 microprocessor (recommended Pentium 4 or higher)
- Min. 1 MByte RAM (recommended 2 MByte)
- Min. 200 MByte 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

System Settings

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-TV-I**
  - 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.

Wiring Diagram

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 high 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% of full scale @ (20/+70)°C
Response 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)
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 (MHICO) 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.

**Fibre Optic Link**
Transmitter and Receiver units are connected by means of a Fibre Optic link which guarantee a very high 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)n In-0.05% In/0.05% Full Scale
  - channel (0¸10)In-0.5% In/0.05% Full Scale
- Accuracy class: 0.2
- Response 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**

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 channel(s); 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.
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 data, 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.

<table>
<thead>
<tr>
<th>Maximum Speed of the rolling stock (on which the device is installed)</th>
<th>350 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature</td>
<td>from -45°C to +80°C</td>
</tr>
<tr>
<td>Class of air temperature (EN50125-1)</td>
<td>TX (from -45°C to +75°C)</td>
</tr>
<tr>
<td>Class of altitude range (EN50125-1)</td>
<td>A1 (up to 1400m)</td>
</tr>
<tr>
<td>Relative humidity at 40°C</td>
<td>95%</td>
</tr>
<tr>
<td>Maximum solar radiation (EN50125-1)</td>
<td>1120W/m²</td>
</tr>
<tr>
<td>Protection level for terminal box (EN60529)</td>
<td>IP 66 (RTL); IP 54 (IRTL)</td>
</tr>
<tr>
<td>Transvers acceleration (EN50125-1)</td>
<td>GT1</td>
</tr>
<tr>
<td>Longitudinal acceleration</td>
<td>GL1</td>
</tr>
<tr>
<td>Shock and vibrations</td>
<td>EN 61373</td>
</tr>
<tr>
<td>Contaminating fluids (60721-3-5)</td>
<td>SF3</td>
</tr>
<tr>
<td>Lateral wind withstand</td>
<td>up to 25m/s, gusts up to 40 m/s 1s</td>
</tr>
<tr>
<td>Weight</td>
<td>18kg (RTL) + 7.5kg (IRTL)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Electrification System/Nominal Voltage</th>
<th>Working Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 1.5 kV</td>
<td>900 ÷ 2.200 Vdc</td>
</tr>
<tr>
<td>DC 3kV</td>
<td>2.000 ÷ 4.000 Vdc</td>
</tr>
<tr>
<td>AC 15kV 6/3 Hz</td>
<td>10.000 ÷ 19.000 Vac</td>
</tr>
<tr>
<td>AC 25kV 50 Hz</td>
<td>17.000 ÷ 30.000 Vac</td>
</tr>
</tbody>
</table>

Overall Dimensions (mm)

Functional Scheme
Terminal A is connected to the pantograph
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)
- Energy measurement (RS485)
- Testing port 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 Breaker.
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.