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# **Components for Energy Application**



**Protection Relays** 

Microelettrica Scientifica



#### Applications Power generation **Transmission & Distribution**

#### **Industrial Evolution**

Microelettrica Scientifica boasts decades of experience in designing and manufacturing products for Industrial Application of high quality and performances. Today, Microelettrica Scientifica wide ranges of power resistors and protection relays have become the standard of reference for a growing number of highly qualified customers of the energy industry all over the world.

#### Know how in continuous evolution

The frontiers of power generation, transmission and distribution are changing continuously and Microelettrica Scientifica is evolving with them through continuous innovation of products and technologies.

All the steps of our processes, from product conception to product validation, from choice of materials to final routine tests, are accurately controlled to guarantee total safety of equipment, persons and lines, as well as full customers satisfaction, but more than that to constantly find innovative solutions that improve the cost/performance/features balance of our products.

#### We work together with our customers

Our industrial philosophy is to manage the evolution of our products in full coordination and collaboration with our customers. Since the first contacts, we are pleased to foster relations with them. In this way we can help in selecting the product from our wide range which better fits the requirements. And, in case of special requirements, we are always eager to develop custom-designed products: our company is well prepared to manage the most challenging projects and our factories will easily realize them.

# To achieve the best results, the EMC Traction facility in get supported locally.

#### Components for Energy Application

#### Made in Microelettrica Scientifica

Microelettrica Scientifica develops and produces the entire range of products in its own facilities in Rozzano and Lacchiarella, as well as Vimodrone, all very near to Milano. But we also run operations in USA, South Africa, India and China. Wherever in the world customers know they can always count on quality, excellence and accuracy in the realization of each single product and component, but also

#### Products

## tationary



# Neutral Grounding



Short circuits between phase and ground can result in irreversible damage to networks and equipments; it is therefore of the utmost importance to be able to control and reduce their effects: Grounding Resistors limit the fault current that arises due to phase-neutral short circuits. Grounding through resistor offers several advantages with respect to alternative methods (such as insulated grounding, direct grounding or grounding through a reactance). The main advantages are: easier detection of fault location, limitation of fault current, no transient over voltages.

Relevant parameters in the design of a Neutral Grounding Resistors may vary greatly: Microelettrica has developed a line of standard products (for the most common requirements) along with tailored projects, each developed and customised according to the required characteristics. Our products range from Low Voltage systems (<1kV) to High Voltage (132kV insulation class), as well as from very low fault current values (tens of Amps) to very high (>10kA).

The essential pieces of information needed to design a Grounding Resistors are:

- Nominal Voltage
- Fault Current
- Fault Duration (10s is customary)



Other relevant parameters are:

- Protection degree of enclosure; from IP00 i.e. no enclosure to IP55, standard solution IP23
- Enclosure finish; our standard is mild galvanised, but different stainless steel (such as AISI304 or AISI316) are also available. Painting in the desired RAL colour is also an option
- Continuous current rating; it may affect significantly the performance of the resistor, especially when high IP degrees are required
- · Environment and Elevation; we design resistors for the harshest industrial or natural settings
- Auxiliary components; during our many years of operation we have selected a number of trusted suppliers for a wide choice of ancillary components, such as Current Transformers, Switches, Disconnectors, etc.



#### Components for Energy Application



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Energy Industry

## tationary



# **Harmonic Filter**



Quality of power is becoming ever more important for both suppliers and end users, as the number of devices that may feed harmonics in power systems is increased, resulting in higher line losses, interferences and resonances. Harmonic Filters - made up by capacitors, inductors and resistors - help clearing harmonics

which inevitably tend to occur. The LC circuit filters all spurious frequencies and only lets fundamental frequency through, while the Harmonic Filter Resistors (Harmonic Filters Resistors, also referred to as Damping Resistors) dissipate harmonic currents into heat.

Typical fields of applications for Harmonic Filters Resistors are HVDC networks and electrical induction furnaces.

Our team of experienced engineers designs the best solution for the different characteristics required and the most diverse environment. Microelettrica can custom design Harmonic Filters Resistors from a few kW power up to tens of MW, as well as B.I.L. up to 600kV. Our Harmonic Filter Resistors employ non-magnetic low temperature-coefficient elements, to minimise Ohmic value drift and therefore preventing excessive power increase. They also show low parasitic inductance values, which is a key feature for the effective design of damping elements.

The essential pieces of information needed to design an Harmonic Filters Resistors are:

- Nominal Voltage
- Current or Power
- Ohmic Value (with tolerance in %)

#### Other relevant parameters are:

- B.I.L.
- Required Insulation Level; HV terminal to hearth, LV terminal to earth, between terminals
- Clearance and Creepage
- · Enclosure finish; our standard is mild galvanised, but different stainless steel (such as AISI304 or AISI316) are also available. Painting in the desired RAL colour is also an option
- Environment; we design resistors for the harshest industrial or natural settings
- Maximum Inductance
- Bushing Layout; top or side mounted
- Mounting; three-phase stacked, side by side, others





#### Components for Energy Application

Applications

Energy

Industry



### tationary



# **Load Banks**

Load Banks allow to effectively check the efficiency of emergency sets (generators, Uninterrutible Power Supplies...) and can be employed as dummy loads to prevent wet stacking on diesel engines. They represent a reliable and economic way to prolong the lifetime of extremely expensive and important equipments.

Microelettrica custom designs Load Banks to satisfy all requirements, both in terms of power to be dissipated (from tens of kW to tens of MW), of insulation level (from hundreds of Volts up to 36kV insulation class) and of integration of the most diverse power steps, thanks to the wide variety of grid types designed and produced by Microelettrica itself. Thanks to its many years of experience in both industrial and railway field, Microelettrica has also developed reliable ventilation curves, and can therefore offer forced-ventilated Load Banks, whose main advantage is that of allowing higher power-per-element and thus smaller size. Microelettrica Load Banks are suitable for indoor and/or outdoor use; they are placed in enclosures with up to IP23 protection degree. Ventilation can be without distinction horizontal or vertical.





Microelettrica Load Banks can be controlled either locally or remotely (on request), through switches and contactors (also produced by Microelettrica Scientifica).

The essential pieces of information needed to design a Load Banks are:

- Nominal Voltage
- Power
- Number and type of steps, if any
- Type of ventilation (natural or forced)

Other relevant parameters are:

- Maximum Ohmic value drift; in case it is necessary to contain the thermal drift of the resistance value, alloys with extremely low temperature coefficients can be employed
- Protection degree of enclosure; up to IP23, standard IP20 (vertical ventilation) or IP21 (horizontal ventilation, only for forced air cooled Load Banks)
- Enclosure finish; our standard is mild galvanised, but different stainless steel (such as AISI304 or AISI316) are also available. Painting in the desired RAL colour is also an option
- · Environment and Elevation; we design resistors for the harshest industrial or natural settings
- · Auxiliary components; contactors for step switching, also manufactured by Microelettrica

#### Components for Energy Application

Applications

Energy

Industry



### Relays



### **General Characteristics**

A line

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:

- · 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)**

164



#### Components for Energy Application



• Standard version: the output relays are deenergized on normal operating conditions and are energized on relay's tripping



## Relays

# **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

#### **Relays** Type

Three-phase Overcurrent and Earth Fault - Dual Setting : 50/51, 50N/51N, 51BF
Three-phase Overcurrent and Earth Fault: 50/51, 50N/51N, 51BF
Capacitor Overload, Earth Fault And Unbalance Protection: 50/51, 50N/51N, 46N, 37, 51BF
Three-phase Overcurrent + Directional Earth Fault: 50/51, 50N/51N/67N, 59Uo, I <sup>2</sup> t, 51BF
Multishot Programmable Single/Three Phase Autoreclose: 79
Three Inputs Synchrocheck: 25, 27/59, 81.
Motor Protection: 12/14, 37, 46, 47, 48, 49, 50/51, 51LR, 64, 66
Motor Protection With Directional Earth Fault: 12/14, 37, 46, 47, 48, 49, 50/51, 51LR, 64N, 66
Motor Protection Relay With Voltage & Power Control: 12/14, 27/59, 37, 46, 47, 48, 49, 50/51, 51LR, 55, 64, 66, 81
Three-phase Thermal + Overcurrent + Earth Fault: 46, 49, 50/51, 50N/51N, 51BF, I <sup>2</sup> t
Percentage Biased Transformer Differential: 87, 87N
Percentage Biased Differential Relay For 3-winding Transformers: 87, 50/51
Transformer On-load Tap-Changer Control: 27, 59, 37, 50/51, 90
Multifunction Generator Protection: 32, 40, 46, 50/51, 51BF, 64S
Earth Fault Relay - Dual Setting: 50N/51N, 51BF
Three-phase Overcurrent with Directional Earth Fault + Autoreclosing: 50/51, 50N/51N/67N, 46, 79, 51BF
Generator Protection & Management: 21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 81
Percentage Biased Generator Differential Relay: 50/51, 87N or 64S, F87, 51BF
Generator Synchronizing Relay: 25, 27/59/81, 90
Modular Low-Impedance Bus-bar Protection: 87B
High Impedance Biased Differential Relay: 87, 51BF
Three Phase High Impedance Busbar Differential Relay With Supervision of CT Secondary Circuits: 87B, 59S
Pilot Wire Differential Protection Relay for Cables & Lines: 87/85, 50/51, 51BF
Three-phase Voltage, Frequency & Zero Sequence Voltage with Vector Shift Detection: 24, 27d/59d, 47, 59, 59Uo, 81
Three-phase Digital 4-stage Frequency Relay With Df/dt & Dv/dt Control: 27/59, 81, df/dt, dv/dt
Multifunction Three-phase Measuring Unit
Power Management Relay: 27/59, 81, 32
Programmable Interface & Control Module: 7 Digital Inputs & 5 Output Relays
Programmable Interface & Control Module: 14 Digital Inputs & 5 Output Relays

#### **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



27

28 39 29

41 30 32

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#### **Overall Dimensions (mm)**



28 39 29

31

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30

32

43

31

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AUXILIARY 12

SUPPLY

#### Wiring Diagram

#### Components for Energy Application



### Relays



# **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.

Communications

port on rear side

4 Output Relays

• "14DI" 14 Digital Inputs

• "14DO" 14 Output Relays

Totally draw-out execution

port on front panel

• 1 RS485 Serial communication

1 RS232 Serial communication

Communication Protocols

Expansion Modules (optional)

• "UX10-4" 10 Digital Input and

• Modbus RTU/IEC870-5-103/IEC61850

#### 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**

• 4 Leds for signalization

- Complete autodiagnostic program
- Display LCD 16 (2x8) characters

### • IP44 protection case (on request IP54)

Software

Execution

 MSCom2 Program interface for device management

• 1 Module box. (2 modules with expansion)

Wiring Diagram



#### **Overall Dimensions (mm)**

164



#### **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
МСМ	Motor Protection Relay: 37, 46, 47, 48, 49, 50/51, 51LR, 64S, 66, 68

#### Components for Energy Application

# Relays **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

with dedicated relay

- Multilanguage Display (English/Italian
- standard, available other on request)
- Complete autodiagnostic program

#### **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

#### 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





#### **Overall Dimensions (mm)**





PANEL CUT-OUT 165X137 (LXH)

115X137 (LXH)







#### Components for Energy Application

# **N-DIN line**

#### **General Characteristics**

Relays

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
СРВ	Profibus Converter Module
TA-DIN	Current Transformer
TAR-DIN	Current Transformer











FFP Height= 16

#### Components for Energy Application





RMB Height= 72