



# Power electrics for Industrial Application

SYSTEMS & COMPONENTS FOR INFRASTRUCTURE

- DC HIGH SPEED CIRCUIT BREAKERS
- CONTACTORS
- RESISTORS
- PROTECTION RELAYS
- FANS & VENTILATION SYSTEMS
- RECTIFIERS



**MICROELETTRICA**



## ENERGY

Microelettrica Scientifica's extensive product ranges have become the standard of reference for a growing number of customers worldwide in the challenging Energy Market. Microelettrica Scientifica has been evolving through innovation to support new technology in generation, renewable energy and smart grid.

## INDUSTRY

A close relationship with our customers has been created since over 60 years of cooperation. Microelettrica products are present in most of the industries such as Steel making, Cement, Glass, Chemical, Oil&Gas and Utilities.

### Applications

Photovoltaic interface relay  
 Feeder and bus relay  
 Generator relay  
 Resistor for harmonic filters  
 Neutral grounding resistors  
 Load banks  
 DC contactors for inverters and UPSs  
 Photovoltaic string contactors  
 Ground fault neutralizer system

Motor and generator protection  
 Feeder and bus bar relay  
 Generator relay  
 Resistor for harmonic filters  
 Neutral grounding resistors  
 Load banks  
 DC contactors for inverters and UPSs  
 Photovoltaic string contactors  
 Ground fault neutralizer system

### Products

- Contactors - Disconnectors
- DC High Speed Circuit Breakers
- Power Resistor
- Protection Relays
- Transducers
- Fans and Blowers

- Traction Power Systems
- DC Switchgears and Switching Cubicles
- DC High Speed Circuit Breakers
- Power Resistor for Line Testing
- Braking Resistors for Fixed Installation
- Feeder manager and DC Relays for Traction
- DC Transducers
- Negative Protection Cubicles
- Fans and Blowers









## RAILWAY INFRASTRUCTURE

Today, Microelettrica Scientifica is a leading supplier of equipment for DC traction substations. We also offer our customers a consultancy service about the integration of components into DC traction systems. We are capable of handling complex projects by means of our engineering and project management experience.

DC Power Substations  
Traction lines  
DC Switchgears  
Depot  
Underground ventilation

## MADE IN MICROELETTRICA SCIENTIFICA

Always aiming to the best results, Microelettrica Scientifica develops and manufactures the entire range of products in Buccinasco close to Milan. We also run operations in U.S.A., South Africa, China, India, France, Brasil and Russia through which our Customers have access to immediate local assistance and the possibility of localization of Microelettrica Scientifica products. Our Customers know they can always count on quality, excellence and accuracy of Microelettrica Scientifica Products and Services.

-  Contactors - Disconnectors
-  DC High Speed Circuit Breakers
-  Power Resistor for Line Testing
-  Braking Resistors - Resistors for Traction Control
-  High Voltage Transducers
-  Fans/Cooling Systems/Filtration Systems

# A tailored solution for every substation component need



Feeder Trolley



ε-Clad



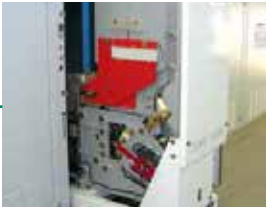
Rectifire



DC Pro



LTX



Feeder



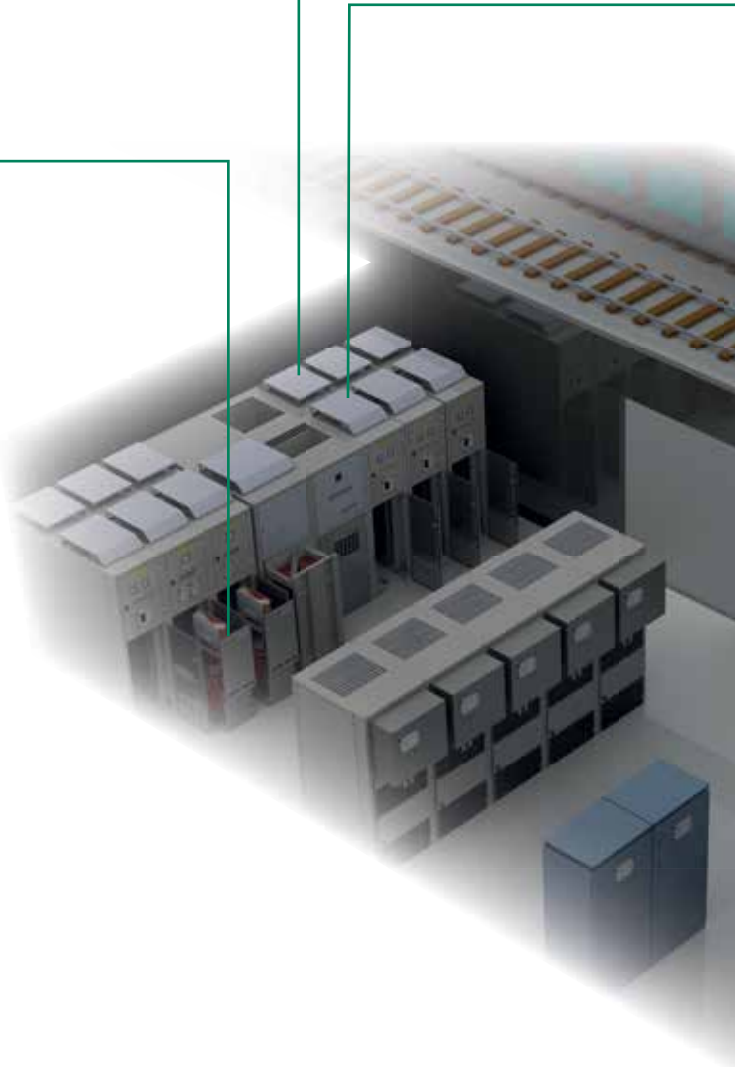
IR3000



Disconnecter



IR4000





Negative overvoltage protection



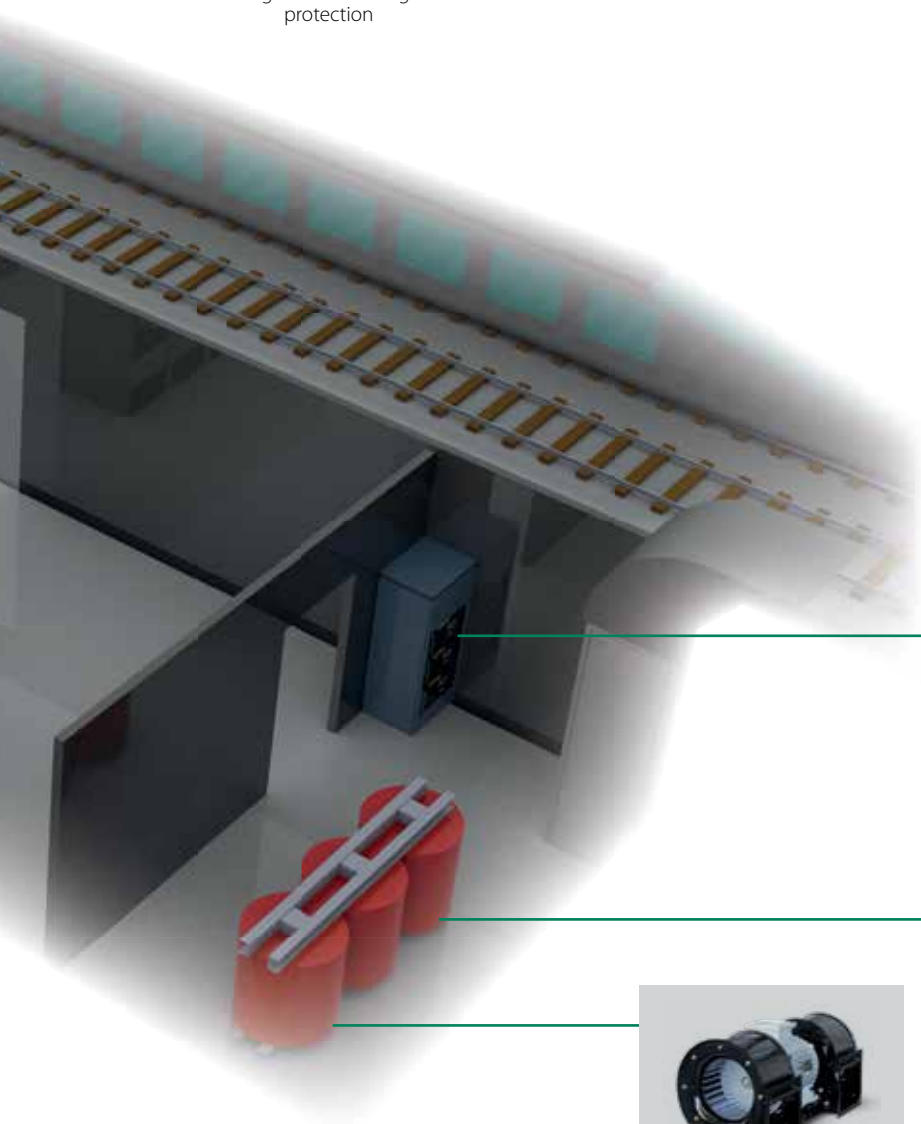
Bar DIN Contactor



Hall effect transducer



V-I Transducer



Resistor

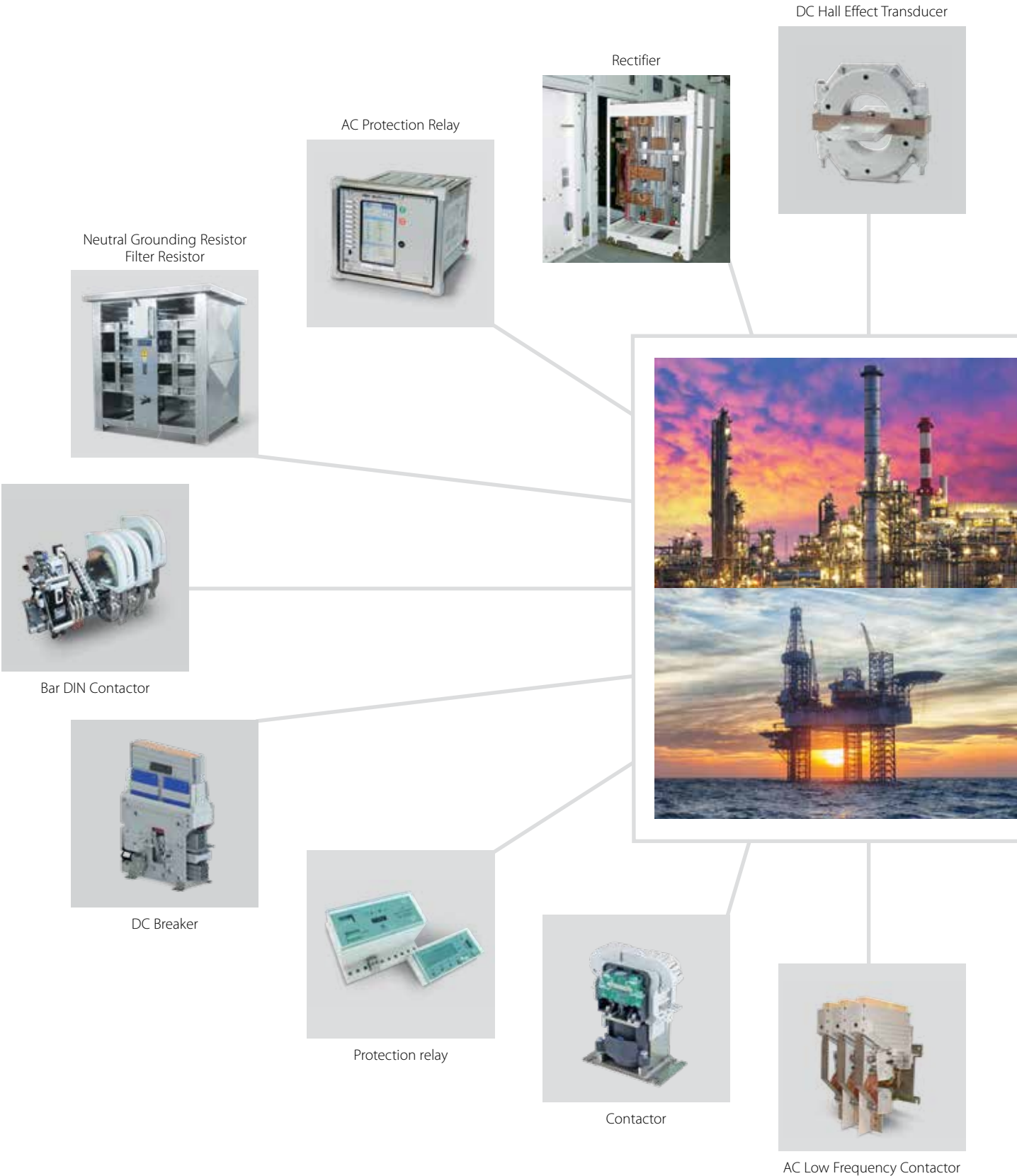


Inverter Cooling Fan



Ventilation Units

# A tailored solution for every industry component need



Breaker



Interface Protection Relay



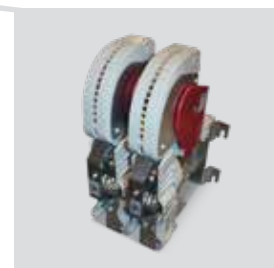
Disconnect



Interface Protection



Contactor



Inverter DC Contactor



Impellers



Centrifugal Fans



Axial Fans

# IR3000F line

The IR3000F is a range of DC High Speed Circuit Breakers conceived for installation within DC cubicles for railway infrastructure or in industrial applications.

It is specifically designed to protect the downstream power circuits against fault conditions that lead to overcurrents and short circuits. It includes single pole breakers for DC applications with breaking in air, available in two voltage ratings of 900 V<sub>DC</sub> and 1800 V<sub>DC</sub> and with thermal current up to 3 kA. The main contacts of IR3000F are held closed by a holding coil or by permanent magnets. The Circuit Breaker is equipped with a direct acting over-current trip device which may be either unidirectional or bidirectional. The closing mechanism is an independent motor-operated type.

Several solutions implemented in the IR3000F are intended to ensure a longer life and reduced maintenance costs.

For example, the arc chute is made of ceramic fins, capable of withstanding better than any other materials the high temperatures typical of breaking operations, even if repeated in short sequence.

The adoption of arched contacts is intended to preserve the main contacts from wear and extends the electrical life of the Breaker.

Its modular design allows to configure the IR3000F in different version by changing only the arc chute:

Low Power version (09L)

Medium Power version (09M and 18M)

High Power version (09H and 18H)

This allows to minimize the space occupied within the switchgear in relation to the requested breaking capacity.

The breaker is compliant to all the relevant standard for railway infrastructure and industrial solutions (IEC61992; IEEE C37-14; IEEE C37-16 and IEC60947) as well as the newest fire and smoke EN45545.

## Applications

Light railways substations

Metro substations

DC drives in rolling mills

Generator excitation drives

DC drives for marine industry

DC supplied data centre

Low Power version



Medium Power version

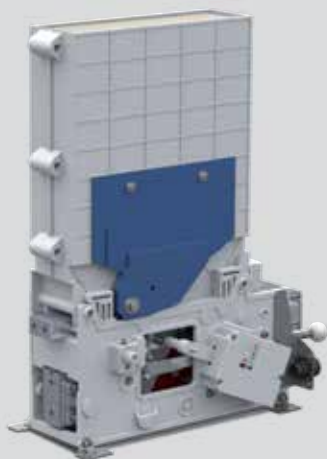




**FIXED APPLICATION**

				Max Breaking Current INSS/TNC(kA/ms) according to IEC61992			
IR3000F line		Holding System	I <sub>th</sub> (A) @ 40°C	U <sub>e</sub> (V <sub>dc</sub> )=900	U <sub>e</sub> (V <sub>dc</sub> )=1800		
<b>Low Power</b>	IR3015FC09L	Holding coil	1500	30/31.5 kA/ms Duty F: 30/0 kA/ms Duty E: 25/16 kA/ms Duty D: 6/31.5 kA/ms	-		
	IR3015FP09L	Permanent Magnet					
	IR3030FC09L	Holding coil	3000				
	IR3030FP09L	Permanent Magnet					
<b>Medium Power</b>	IR3015FC09M	Holding coil	1500	50/31.5 kA/ms Duty F: 50/0 kA/ms Duty E: 32.5/20.5 kA/ms Duty D: 6/31.5 kA/ms	-		
	IR3015FP09M	Permanent Magnet					
	IR3030FC09M	Holding coil	3000				
	IR3030FP09M	Permanent Magnet					
	IR3015FC18M	Holding coil	1500			-	30/31.5 kA/ms Duty F: 30/0 kA/ms Duty E: 25/16 kA/ms Duty D: 6/31.5 kA/ms
	IR3015FP18M	Permanent Magnet					
	IR3030FC18M	Holding coil	3000				
IR3030FP18M	Permanent Magnet						
<b>High Power</b>	IR3015FC09H	Holding coil	1500	70/63 kA/ms Duty F: 70/0 kA/ms Duty E: 35/31.5 kA/ms Duty D: 6/63 kA/ms	-		
	IR3015FP09H	Permanent Magnet					
	IR3030FC09H	Holding coil	3000				
	IR3030FP09H	Permanent Magnet					
	IR3015FC18H	Holding coil	1500			-	50/63 kA/ms Duty F: 50/0 kA/ms Duty E: 25/31.5 kA/ms Duty D: 6/63 kA/ms
	IR3015FP18H	Permanent Magnet					
	IR3030FC18H	Holding coil	3000				
IR3030FP18H	Permanent Magnet						

High Power version



**STANDARD CHARACTERISTICS**

- Thermal current rating 1500 or 3000 A
- Rated voltages of 900 or 1800 V<sub>dc</sub>
- Contacts holding system based on holding coil or permanent magnets
- Bidirectional direct acting over-current trip device
- Fixed version
- Reed-type auxiliary contacts (protected against dust, pollution and oxidation)

**OPTIONAL CHARACTERISTICS**

- Unidirectional direct acting over-current trip device
- Dual voltage arc chute
- Withdrawable version
- Fast opening device panel (FOD), to achieve high speed opening performances also under external command

# IR4000F line

The IR4000F is a new range of DC High Speed Circuit Breakers for industrial and DC railway infrastructure applications. Their extremely high breaking performances obtained with a compact design makes them a unique solution in the railway scenario. The IR4000F line is a range of single pole, high speed circuit breakers for DC applications with breaking in air, available in three voltage ratings of 900, 1800 and 3600 V<sub>DC</sub> and two thermal currents of 3 and 4.5 kA.

The main contacts of IR4000F are held closed by a holding coil or permanent magnets. The Circuit Breaker is equipped with a direct acting over-current trip device which may be either unidirectional or bidirectional. The closing mechanism is an independent motor-operated type.

Several solutions implemented in the IR4000F are intended to ensure a longer life and reduced maintenance costs.

The arc chute is made of ceramic fins, capable of withstanding better than any other materials the high temperatures typical of breaking operations, even if repeated in short sequence. The adoption of arcing contacts is intended to preserve the main contacts from wear and extends the electrical life of the Breaker.

## Applications

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Light railways substations

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Metro substations

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DC drives in rolling mills

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Generator excitation drives

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DC drives for marine industry

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DC-supplied data center

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Its modular design allows to configure the IR4000F in different version by changing only the arc chute:

- 900 V<sub>DC</sub> version (09M)
- 1800 V<sub>DC</sub> version (18M)
- 3600 V<sub>DC</sub> version (36M)

This allows to minimize the space occupied within the switchgear in relation to the requested breaking capacity.

The breaker is compliant to all the relevant standard for railway infrastructure and industrial solutions (IEC61992; IEEE C37-14; IEEE C37-16 and IEC60947) as well as the newest fire and smoke EN45545.

### FIXED APPLICATION

IR4000F line	Holding System	I <sub>th</sub> (A) @ 40°C	Max Breaking Current INSS/TNC(kA/ms) according to IEC61992		
			U <sub>e</sub> (V <sub>DC</sub> )=900	U <sub>e</sub> (V <sub>DC</sub> )=1800	U <sub>e</sub> (V <sub>DC</sub> )=3600
IR4030FC09M	Holding Coil Permanent Magnet	3000	125/100 kA/ms Duty F: 125/0 kA/ms Duty E: 63/50 kA/ms Duty D: 9/100 kA/ms	-	-
IR4030FP09M					
IR4045FC09M	Holding Coil Permanent Magnet	4500	-	-	-
IR4045FP09M					
IR4030FC18M	Holding Coil Permanent Magnet	3000	-	100/63 kA/ms Duty F: 100/0 kA/ms Duty E: 50/31.5 kA/ms Duty D: 9/63 kA/ms	-
IR4030FP18M					
IR4045FC18M	Holding Coil Permanent Magnet	4500	-	-	-
IR4045FP18M					
IR4030FC36M	Holding Coil Permanent Magnet	3000	-	-	70/63 kA/ms Duty F: 70/0 kA/ms Duty E: 35/31.5 kA/ms Duty D: 9/63 kA/ms
IR4030FP36M					
IR4045FC36M	Holding Coil Permanent Magnet	4500	-	-	-
IR4045FP36M					

### STANDARD CHARACTERISTICS

- Thermal current rating 3000 or 4500 A
- Rated voltages of 900, 1800 or 3600 V<sub>DC</sub>
- Contacts holding system based on holding coil or permanent magnets
- Bidirectional direct acting over-current trip device
- Fixed version
- Reed-type auxiliary contacts (protected against dust, pollution and oxidation)

### CUSTOMIZATION AVAILABLE

- Unidirectional direct acting over-current trip device
- Dual voltage arc chute
- Withdrawable version
- Fast opening device panel (FOD), to achieve high speed opening performances also under external command

# IR6000F line

The IR6000 Series are single pole, magnetic blow out, trip free, air circuit breakers.

The closing mechanism is an independent motor operated type.

The IR6000 Circuit Breaker is held closed by holding coil or by permanent magnet device and is equipped with a direct acting over-current trip device which may be either unidirectional and bidirectional.

The arc chute is made in ceramic material for a longer life and reduced maintenance.

The use of arcing contacts ensure a long duration in electrical life.

The breakers can be used in single voltage or dual voltage applications, where multisystem solution is required (ex 1800/3600 V).

The breaker conforms to IEC61992, IEEE C37-14, IEEE C37-16.

A special version of the IR6000F is with mechanical latching. This ensures an high withstand capability to the short circuit currents up to 150 kA.

## Applications

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Light railways substations

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Metro substations

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DC drives in rolling mills

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Generator excitation drives

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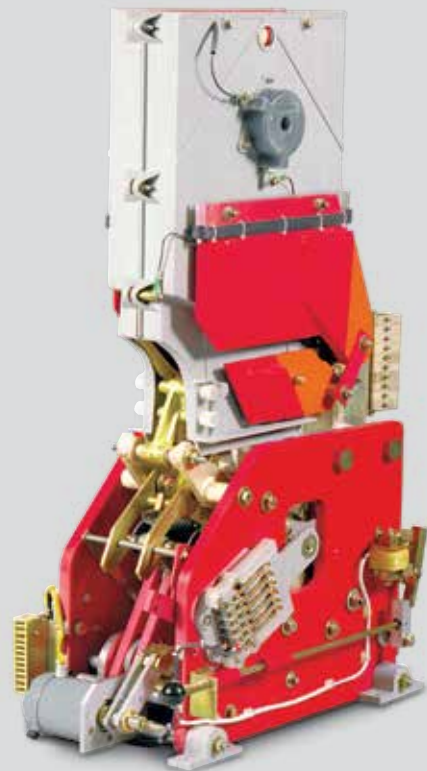
DC drives for marine industry

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DC-supplied data center

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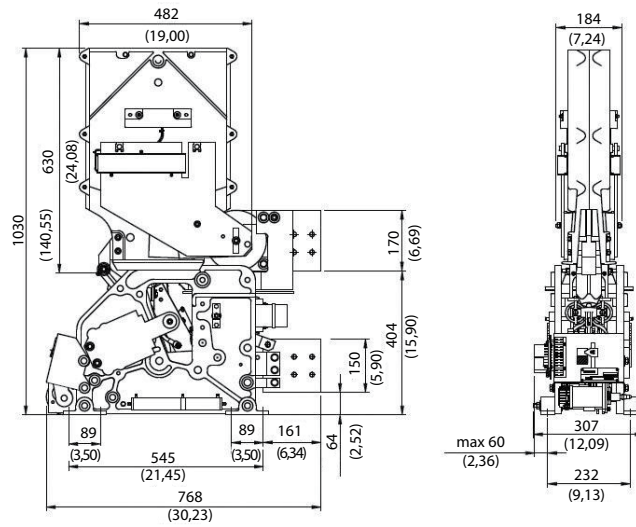
IR6000F Mechanical



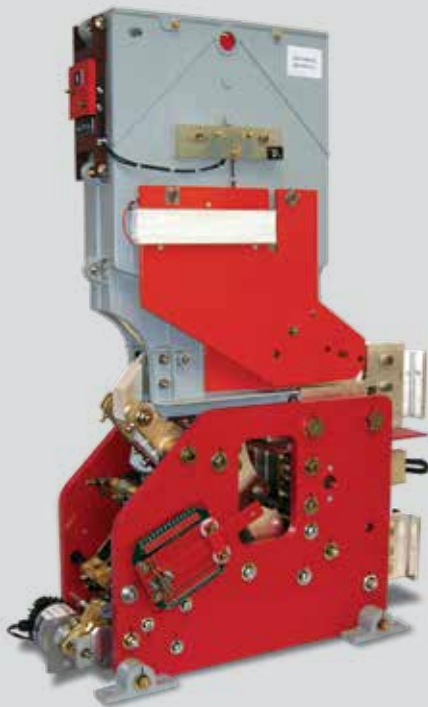
SWITCHES  
**DC HIGH SPEED CIRCUIT  
 BREAKERS**

SYSTEMS & COMPONENTS  
 FOR INFRASTRUCTURE

Overall Dimensions: mm



IR6080F



IR6040F



Type	U <sub>max</sub> [V]	I [A]	W [mm]	H [mm]	L [mm]
IR6000F Mechanical	up to 1200 (IEEE)	8000	340	1030	650
IR6080F	up to 3600	8000	340	1030	650
IR6040F	up to 3600	4000	300	1030	650

# LTX line

LTX contactors combine the typical robustness of Microelettrica Scientifica products with new and advanced concepts in electric arc breaking. They represent the right solution where high voltage rating, high thermal current and high breaking capacity are required. Specifically, they incorporate the traditional arc-chute design based on ceramic fins with an innovative blow-out system that enhances the contactor's breaking capacity and guarantees the maximum breaking reliability over the entire range of currents. The opening mechanism enhances the LTX's breaking and insulating performances, thanks to a fast opening speed and the highest distance between open contacts available on the market.

This allows to achieve the highest performances and reliability demanded by the railway and industrial markets.

Creepage and clearance distances designed to withstand voltages over 4 kV allow a safe use in polluted environments.

The main power terminals are conceived to match all busbar and cable interfaces. This, combined with an extremely compact outline, reduces all efforts of integration and installation.

The control circuit called "ECOBoost" has an energy saving function during the holding phase, to minimize energy consumption.

It extends the control range to cover a wide variety of railway LV control ratings, without need of coil customization or external DC/DC converters, and is not sensitive to any voltage or temperature oscillation. Its LV interface has two separate channels, for power and control.

The contactor's feedback circuit is based on up to four IP67 auxiliary contact blocks, that are very resistant to pollution, dust and oxidation, and maximize the reliability of the feedback also under the lowest voltage and current conditions.

LTX is available in 1-pole and 2-pole configurations, and is based on a modular concept that allows to combine several types of main body and arc-chute, to adapt it to the current and voltage performances required by the application.

**The LTX line is protected by International PATENT.**

## Applications

Railway substations

Industry contactors

Filter pre-charging

Motors on-load disconnections

Electromagnetic brakes control

Heating/air conditioning systems

Renewable energy

LTX S 900 1P 1000 V



LTX S 900 1P 2000 V



## GENERAL CHARACTERISTICS

LTX is the latest development resulting from Microelettrica Scientifica's long experience in railway and industrial applications

Its working principles are declined in a wide range of products that fulfill all application-related standards

Ratings up to 4000 V<sub>DC/AC</sub> and 900 A per pole

1-pole and 2-pole configurations

Highly customizable design

LTX	U <sub>e</sub> max [V <sub>oc</sub> ]	I <sub>th</sub> [A]	W [mm]	H [mm]	D [mm]
LTX S 900 1P	1000	900	113	345	300
	2000		113	360	320
	3600		113	440	360
LTX E 900 1P	1000	900	113	345	300
	2000		113	360	320
	3600		113	440	360
LTX B 900 1P	1000	900	113	345	300
	2000		113	360	320
LTX S 900 2P	1000	900	197	345	300
	2000		197	360	320
	3600		197	440	360
LTX E 900 2P	1000	900	197	345	300
	2000		197	360	320
	3600		197	440	360
LTX B 900 2P	1000	900	197	345	300
	2000		197	360	320

LTX S 900 1P 3600 V



### STANDARD VERSION

Standard configuration 1 (a0 b0) auxiliary contact

+ 1 (a1 b1) auxiliary contact

LV connector type AMP 16 poles

### OPTIONALS AVAILABLE

Different combination 2 (a0 b0) auxiliary contact

and 2 (a1 b1) auxiliary contact up to a total

of four auxiliary contact

LV connector from any brand

# LTHS line

Microelettrica Scientifica's LTHS contactors range is designed for demanding applications in railway and industry, where high performances in terms of electrical endurance and current rating are requested, also in presence of harsh working conditions. To accomplish most of the possible applications, all the LTHS contactors can be manufactured in single or multipolar form and, upon request, allow a very high degree of customization.

Available with normally open or normally closed configuration, LTHS line contactors are manufactured also in the mechanical latch version. In order to work efficiently both with high and low currents, the contactors are equipped with indirect blow out circuit. This arc-extinguishing technology allows to work indifferently in AC as well as DC.

The DC control coil operates without economy resistor within a wide working range. A "varistor" cuts off the peak voltage when the coil is de-energized.

More than 20000 LTHS contactors are delivered every year for the most demanding projects and applications worldwide.

## Applications

Railway substations

Industry contactors

Filter pre-charging

Motors on-load disconnections

Electromagnetic brake control

Heating/air conditioning systems

Renewable energy

LTHS 320



## GENERAL CHARACTERISTICS

The most experienced extra heavy duty line

Designed for industrial applications according to IEC 61992-60947

Ratings up to 2000  $V_{DC/AC}$  and up to 1600 A/pole application

Direct or indirect arc blow-out systems available according specific application requirements

Multi-pole combination up to 4, NO or NC, poles

Very high level of customization available

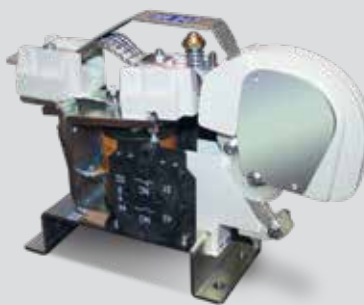
Suitable for OV3, PD3 systems



LTHS 60



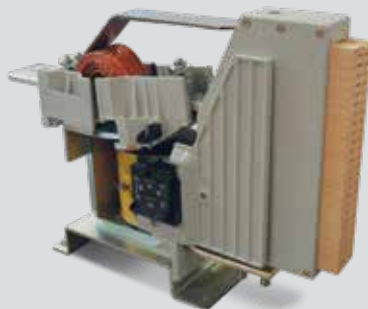
LTHS 125



LTHS 400



LTHS 650/800/1250



LTHS 1500/1700



Type	U <sub>max</sub> [V <sub>AC/DC</sub> ]	I <sub>th</sub> [A]	W [mm]	H [mm]	D1/D2 [mm]
LTHS 60	1000	80	143	197	72/93
LTHS 125	1000	150	185	276	86/114
LTHS 320	2000	350	220.5	300.5	86/114
LTHS 380	2000	380	220.5	300.5	86/114
LTHS 400	2000	500	329	423	115.5/202
LTHS 650/800	2000	700/920	335	438(D1)/441(D2)	119/206.5
LTHS 1250	2000	1300	350	473(D1)/476(D2)	127.2/206.5
LTHS 1500	2000	1350	350	533.5(D1)/536.5(D2)	111/215
LTHS 1700	2000	1600	350	533.5(D1)/536.5(D2)	127/235

# LTC line

The LTC Series contactors, thanks to their excellent balance between dimensions, performances and robustness, are suitable for all those switchgear applications which demand a small, smart device.

Their design encourages applications where high operating frequencies and small available spaces are important requirements. Like all Microelettrica Scientifica contactors, the LTC Series is based on a standard concept, but a very high level of customization can be achieved by replacing a few key components. Normally open and normally closed poles can be fitted, as well as mechanical latching.

The breaking circuit is equipped with permanent magnets or indirect arc blow out coil to work efficiently both with high and low currents.

The DC control coil operates without economy resistor within a wide working range. A "varistor" cuts off the peak voltage when the coil is de-energized.

More than 20000 LTC contactors are delivered every year for the most demanding projects and applications worldwide.

## Applications

Railway substations

Industry contactors

Filter pre-charging

Motors on-load disconnections

Electromagnetic brake control

Heating/air conditioning systems

Renewable energy



## GENERAL CHARACTERISTICS

The most compact and modern heavy duty line

Designed for switchgear applications according to IEC 61992-60947

Ratings up to 4000 V<sub>DC/AC</sub> and up to 1000 A/pole application

Permanent magnet or indirect arc blowout systems available according specific application requirements

Multi-pole combination up to 4 NO or NC poles

Very high level of customization available

Suitable for OV3, PD3 systems

LTC 100



LTC 100 NC



LTCS 250



LTC 250 NC



LTCH 250



LTCH 60



LTCH 1000



Type	U <sub>max</sub> [V <sub>AC/DC</sub> ]	I <sub>th</sub> [A]	W [mm]	H [mm]	D [mm]
LTC 100	1000	100	106	127.5	63
LTC 100 2 poles	1000	100/200	120	127	93
LTC 100 NC	1000	100	106	155	60
LTCS 250/300	2000	250	140	156.5	86
LTCS 250/300 2 poles	2000	250/500	140	156.5	109.2
LTCS 250/300 3 poles	2000	250	140	156.5	165.5
LTC 250/300 NC	2000	250	140	196	78
LTCH 250	2000	250	154	176	86
LTCH 60	4000	60	168	221	88
LTCH 60 2 poles	4000	60/120	168	221	125
LTCH 1000	2000	1000	385	300	93

# LTHH/LTE/LTP line

Microelettrica Scientifica LTHH/LTE/LTP range is renowned for its high-voltage performances and have been supplied for a wide array of applications. The creepage and clearance distances are widely dimensioned for safe application in polluted environments. Their narrow outline is especially conceived for applications where space is a critical issue - as more and more often happens in electrical cabinets. To meet all possible applications, they are available both with electric (LTHH/LTE) and pneumatic (LTP) control, and poles can be manufactured in normally open or normally closed configurations. The direct or indirect blow out circuit makes the LTHH contactors suitable to work both with high and low currents. The DC control coil operates without economy resistor within a wide working range. More than 10000 LTHH contactors are delivered every year for the most demanding projects and applications worldwide.

## Applications

Railway substations
Industry contactors
Filter pre-charging
Motors on-load disconnections
Electromagnetic brake control
Heating/air conditioning systems
Renewable energy

LTHH 250/400



## GENERAL CHARACTERISTICS

- High-voltage heavy-duty range
- Designed for switchgear applications according to IEC 61992-60947
- Ratings up to 4000 V<sub>DC/AC</sub> and up to 1350 A/pole application
- Direct or indirect arc blow-out systems available according specific application requirements
- Multi-pole assemblies, NO or NC poles
- Very high level of customization available
- Suitable for OV3, PD3 systems

LTHH 40



LTHH 100



LTP 2-400/600



LTP 4-400/600



LTP 4-2000



Type	U <sub>max</sub> [V <sub>AC/DC</sub> ]	I <sub>th</sub> [A]	W [mm]	H [mm]	D1/D2 [mm] (1/2 poles)
LTHH 40	2000	60	200(D1)/244(D2)	162.5(D1)/174.5(D2)	48/106
LTHH 100	4000	120	377(D1)/410(D2)	274(D1)/279(D2)	60/130
LTHH 250	4000	300	380.5(D1)/424(D2)	297(D1)/302(P2)	70/160
LTHH 400	4000	400	380.5(D1)/424(D2)	297(D1)/302(P2)	70/160
LTE 2-400	2000	900	428	367	80/-
LTE 2-600	2000	900	430	370(D1)/365(D2)	80/220
LTP 2-400	2000	900	402	367	80/- LTP 2-600
LTE 4-600	4000	900	429.4	423	85/- LTP 4-400
LTE 4-400	4000	900	429.4(D1)/379.3(D2)	394	85/175
LTE 4-600	4000	900	429.4	423	85/-
LTP 4-400	4000	900	402	394	85/-
LTP 4-600	4000	900	402	423	85/-
LTE 4-2000	4000	1350	501	473	119/-
LTP 4-2000	4000	1350	501	473	151.5/-

# LTNS line

Microelettrica Scientifica LTNS Series contactors have been developed to answer to the constantly increasing market need of reduced dimensions and weight, taking most of the huge know-how in designing and manufacturing of industrial bar mounted contactors. These contactors have been designed starting from the N series electric arc management concept, grafted on the light and compact structure of a rail unit, developed around the control electromagnet.

The LTNS contactors, characterised by a nominal voltage of 750 V, are available in a wide range of current ratings, from 80 A up to 1300 A (up to 3 poles). They can be configured in any combination of Normally Open or Normally Closed poles, with a common rating.

They have been designed and tested according to the international standard IEC 60947-4-1 and are suitable for almost any industrial low voltage application, such as: cranes, rolling mills, electric energy production and transformation, photovoltaic panels, induction furnaces, galvanic treatments.

## Applications

Transit and railway systems

Control of cranes

Rolling mills

Mining equipment

Renewable energy

Type	I <sub>th</sub> [A]	Rated Nominal Voltage U <sub>e</sub> [V]	Rated Insulation Voltage U <sub>i</sub> [V]	L [mm] Length (1-3 poles)	W [mm]	H [mm]
LTNS 60	80	600	750	72-130	193	138
LTNS 125	150	750	1000	86-169	260	185
LTNS 320	320	750	1000	105-277	350	260
LTNS 450	450	750	1000	105-277	360	260
LTNS 650	700	750	1000	105-277	405	280
LTNS 800	900	750	1000	105-277	405	280
LTNS 1000	1100	750	1000	125-340	459	350
LTNS 1250	1300	750	1000	125-340	459	350

### GENERAL CHARACTERISTICS

- Extra heavy-duty modular line, up to 1000 V<sub>DC/AC</sub> application, up to 1350 A/pole
- Stationary application only, derived from LTHS line
- 1-2-3 pole configuration, NO and NC poles indirect or direct arc blow out options available
- Flexible control and auxiliary contacts options, high unit customization possible



# N line

Microelettrica Scientifica N Series bar mounted contactors, in spite of their 60 years old technical concept see their design regularly updated and remain the state of the art for many industrial, low voltage, heavy duty applications. These contactors are designed and tested according to the standard IEC 60947-4-1. They provide excellent operational performances, making them the best choice for high power load connection, often covering the function of a fault clearing protection device.

The N series contactors are characterised by modular design so that their configuration can be tailored to the specific requirements of each application. In fact, the pole ratings cover a wide range, from 85 A up to 6000A, and can be mounted side by side regardless of their size and number on a customisable length shafts set, this way offering custom solutions to a wide range of technical needs.

The maintenance is simplified by direct accessibility to all parts due to open construction so that, in most cases, it is not necessary to remove the contactor from the cabinet. All materials used are RoHS compliant.

## Applications

Transit and railway systems

Power generation

Control high power motors

Heavy industries

Crane control

Type	Thermal Current I <sub>th</sub> [A]	Rated Nominal Voltage U <sub>e</sub> [V]	Rated Insulation Voltage U <sub>i</sub> [V]	L [mm] Length (1-4 poles)	H [mm]	W [mm]
N 85	85	600	1000	250-400	165	155
N 125	125	600	1000	250-400	175	155
N 190	190	600	1000	250-400	205	170
N 270	270	600	1000	250-500	265	215
N 350	350	600	1000	250-500	275	215
N 550	550	600	1000	105-277	300	160
N 650	800	600	1000	300-600	320	160
N 800	650	600	1000	350-650	365	300
N 1000	1000	600	1000	350-650	365	300
N 1250	1250	600	1000	350-700	380	345
N 1600	1600	600	1000	350-800	420	420
N 2000	2000	600	1000	350-800	425	420
N 3000	3000	600	1000	400-1000	475	470
N 4000	4000	600	1000	500-1250	425	420
N 6000	6000	600	1000	600-1500	475	470



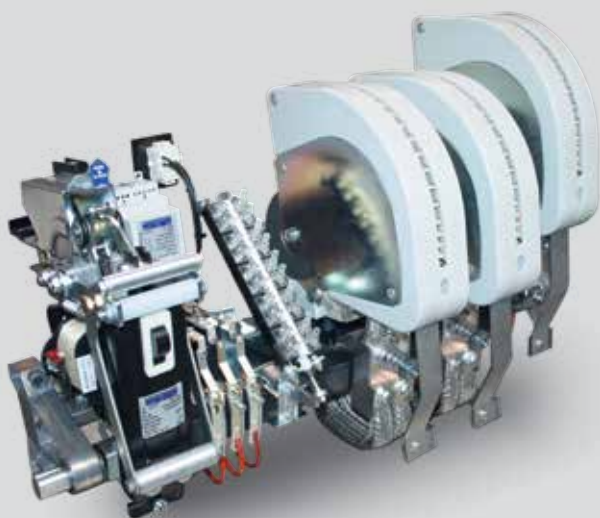
## GENERAL CHARACTERISTICS

Bar mounted modular extra heavy duty line, up to 1000 V<sub>DC/AC</sub> application, up to 6000 A/pole

Stationary application only

Up to 6 poles configuration, NO and NC poles direct arc blow out various aux contacts options

Flexible control and adjustment configurations, total unit customization possible



Contactor	Breaking Capacity						Making capacity I <sub>ch</sub> [A]	Consumption of coils				Operation time (m sec.)		Mech. endurance in million operations)
	AC cos φ = 0,5 I' <sub>ca</sub> [A] RMS value			DC L/R = 15 ms I' <sub>cc</sub> [A] (2 poles)				AC [VA]		DC [W]		Closing	Opening	
	440 V	750 V	1000 V	220 V	440 V	660 V		Pick-up	Holding	Pick-up	Holding			
N 85	1600	700	600	1700	1000	800	2750	350	50	110	15	26	13	15
N 125	2100	1000	900	2500	1500	1000	3500	450	60	130	15	23	13	15
N 190	2500	1600	1300	3000	2000	1400	4200	450	60	130	15	23	12	15
N 270	4300	2500	2000	4500	3000	2500	7000	1300	110	180	12	30	18	15
N 350	4800	3000	2500	5000	3500	3000	8500	1300	110	180	12	30	18	15
N 550	6000	4500	3900	7000	5000	4000	10000	-	-	300	20	65	15	15
N 650	8000	5500	4500	9000	6000	5000	12000	-	-	300	20	65	15	10
N 800	9500	6500	6000	10000	7000	6000	16000	-	-	650	30	80	16	10
N 1000	12500	8000	7000	13000	9000	7500	21000	-	-	650	30	80	16	10
N 1250	15000	10000	9000	16000	12000	10000	30000	-	-	1000	50	90	10	10
N 1600	20000	15000	10000	25000	16000	12000	35000	-	-	1000	50	95	11	10
N 2000	20000	15000	10000	30000	20000	15000	35000	-	-	1000	50	95	11	10
N 3000	30000	15000	10000	35000	25000	18000	50000	-	-	1500	80	90	10	10
N 4000	35000	20000	10000	40000	30000	20000	50000	-	-	1500	80	90	10	10
N 6000	40000	20000	10000	40000	35000	20000	80000	-	-	2500	100	90	10	10

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

The essential parameters needed to design a Grounding Resistor are:

- Nominal Voltage
- Fault Current
- Fault Duration (10 s 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 grades (such as AISI304 or AISI316) are 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 components, such as Current Transformers, Switches, Disconnectors, etc.

## Applications

Energy





**POWER SUPPLY RATINGS**

Type 1: 24 V(-20%)/110 V(+15%) AC

-24 V(-20%)/125 V(+20%) DC

Type 2: 80 V(-20%)/220 V(+15%) AC

-90 V(-20%)/250 V(+20%) DC

24 V<sub>DC</sub> output for HMI direct connection

# 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 into power systems is increased, resulting in higher line losses, interferences and resonances.

Harmonic Filters - made up by capacitors, inductors and resistors - help eliminating harmonics which inevitably tends to occur. The LC circuit filters all spurious frequencies and only let the fundamental frequency through, while the Harmonic Filter Resistors (also referred to as Damping Resistors) dissipate harmonic currents into heat.

Typical 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 for the most diverse environmental conditions. Microelettrica can custom design Harmonic Filter Resistors from a few kW rating up to tens of MW, as well as B.I.L. up to 600 kV. Our Harmonic Filter Resistors employ non-magnetic low temperature-coefficient elements, to minimise Ohmic value drift thus preventing excessive power increase. They also have low parasitic inductance values, which is a key feature for the effective design of damping elements.

The essential parameters needed to design a Harmonic Filter Resistor are:

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

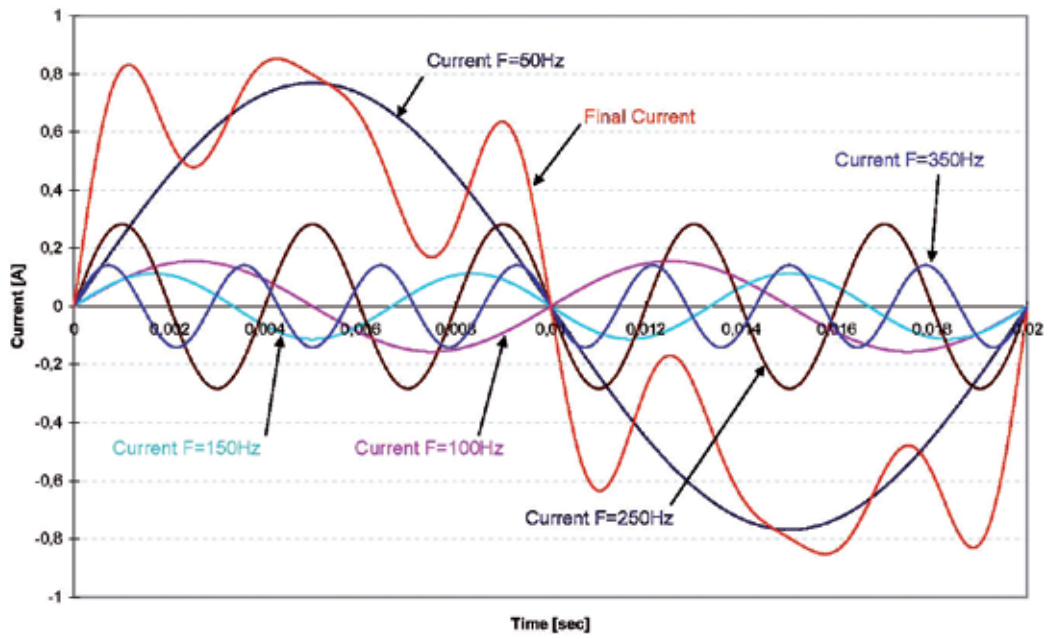
Other relevant parameters are:

- 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 grades (such as AISI304 or AISI316) are 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

## Applications

Industry





# Load Banks

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

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), insulation level (from hundreds of Volts up to 36 kV insulation class) and integration of the most diverse power steps, thanks to the wide variety of grid element types designed and produced by Microelettrica itself.

Thanks to its many years of experience in both industrial and railway fields, Microelettrica has also developed reliable ventilation curves, and can therefore offer forced-ventilated Load Banks, which 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 horizontal or vertical.

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

The essential parameters needed to design a Load Bank are:

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

## Applications

Energy



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 used

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 grades (such as AISI304 or AISI316) are 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



# Starting Braking Discharge

Starting and Braking Resistors are widely employed for controlling motors during start and/or stop.

Starting Resistors may be used for wound rotor induction motor and DC wound motor (this last type of motor is less and less common): adding a series resistor to each rotoric phase reduces the current and improves the starting torque. Starting Resistors may also be employed for squirrel cage induction motors, where series resistors added to the stator, limit initial current to three times its nominal value. Starting Resistors for squirrel cage motors are also known as Ballast Resistors.

The essential parameters needed to design a **Starting Resistor** are:

- Horsepower
- Rotor/Stator Voltage
- Rotor/Stator Current
- RPM
- Application: different applications require different solutions

Crane control is a quite common application for **Braking Resistors**: during descent the load, especially if heavy, may cause the motor to generate power. Resistors are thus used to avoid unwanted and uncontrolled acceleration.

Braking Resistors for large motors are customised to best comply with any requirement: we have developed special Braking Resistors for important research institutes (among them Max Planck Institute) and for energies in excess of 3400 MJ.

De-excitation of large capacitors and inductors must be carried out with care to avoid impulsive currents that could damage them permanently. Discharge Resistors limit the peak current and protect the capacitive/inductive device.

The essential parameters needed to design a Discharge Resistor are:

- Nominal Voltage
- Discharge Current
- Discharge Duration

Discharge Resistors are often used by research institutes and they require a very high level of customisation, sometimes also leading to the development of new technologies for resistive elements. Microelettrica has cooperated with Universities all over the world and with the most prestigious research centers (among them, CERN in Geneve).

## Applications

Industry







# Line Test

High Speed DC circuit breakers are valuable components which must be protected against wear and tear and excessive current flow. Before closing High Speed Circuit Breaker on a power line, it is therefore advisable to test whether a short circuit is occurring by means of line test resistors. The resistor is electrically connected through a contactor - if no fault current is detected - then it is safe to activate the circuit breaker; otherwise, there is a fault somewhere on the line. It is as well possible that activating the resistor for a few times in a row (On - Off cycles with the desired number of consecutive on steps) may help in getting rid of the physical cause of the short circuit.

The essential pieces of information needed to design a Line Test Resistor are:

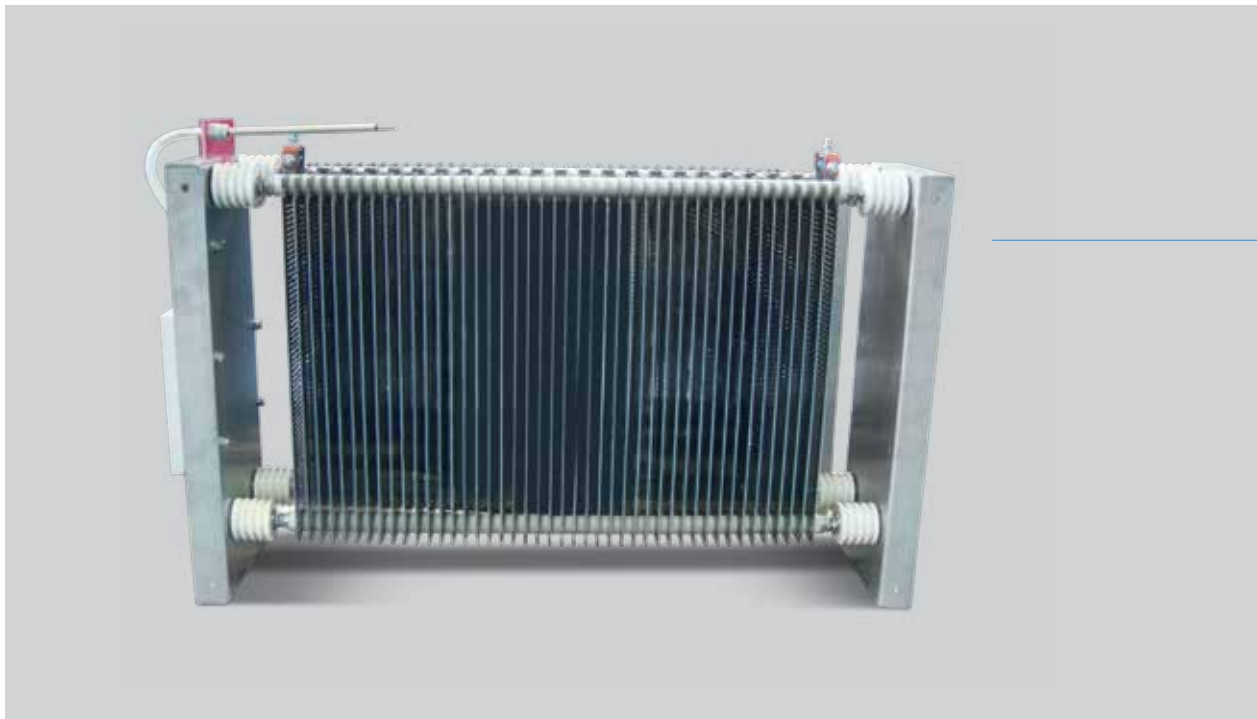
- Nominal Voltage
- Test Current
- Duty cycle

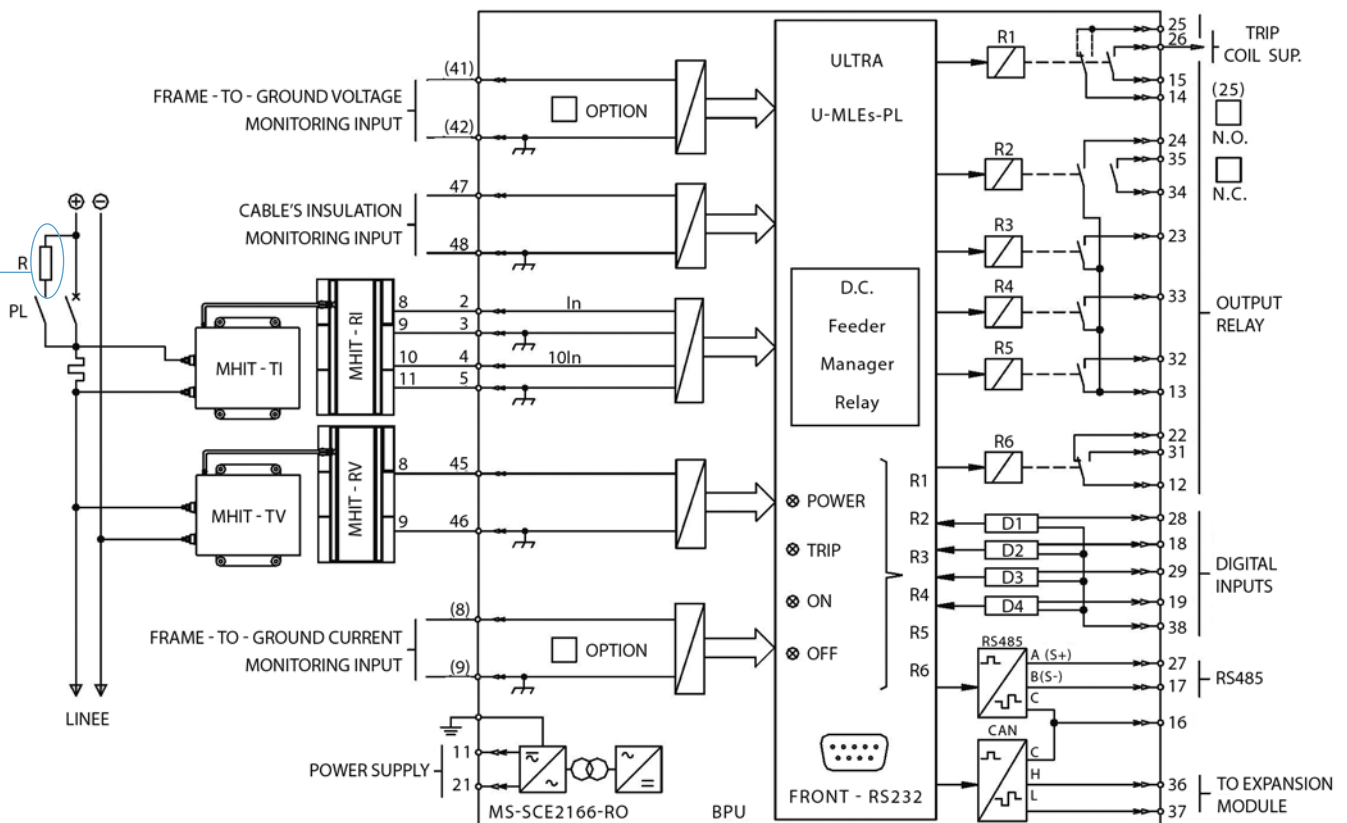
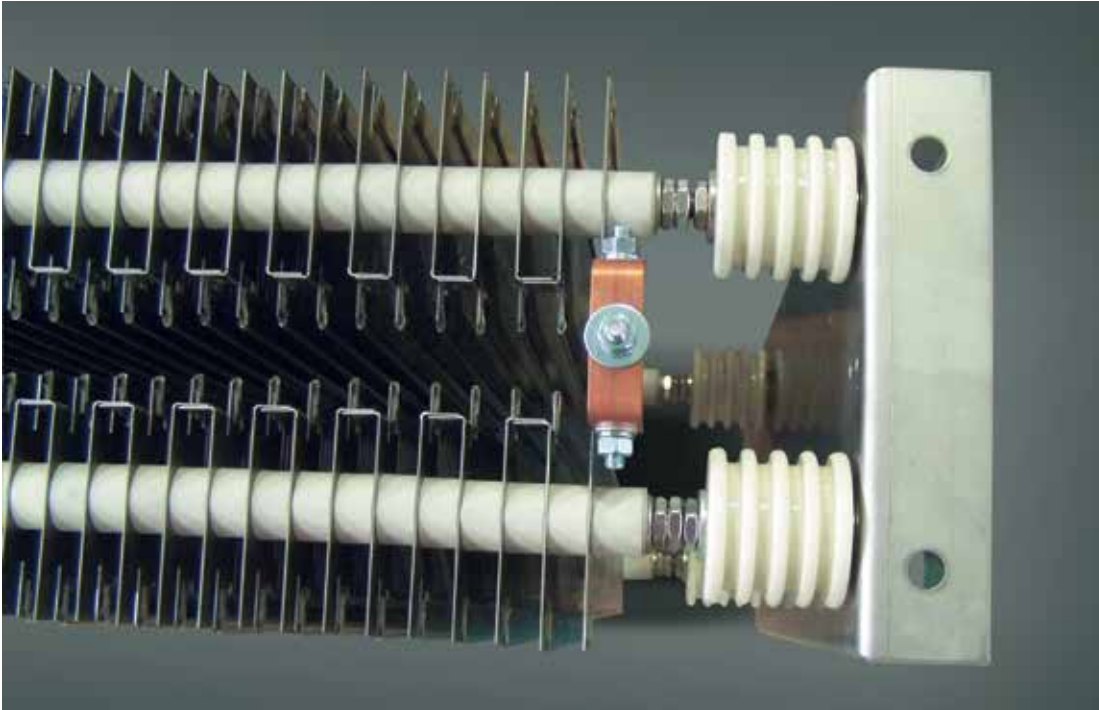
## Applications

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Industry

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# Compact Resistors

Compact and modern design, low inductance, can be subjected to pulse loads.

**Resistance material support:** moulded ceramic base

**Resistance wire:** NiCr-alloy special heat sink casing

**Degree of protection:** IP64 up to IP66

Load and testing resistors:

In test bays

In narrow spaces

In dusty and splash water environments



## Applications

Braking/chopper resistors for variable speed drives, in particular in the fields of:

- Hoisting and conveying equipment
- Printing and paper
- Packing, plastic, textile
- Wire and wood processing

RESISTORS  
**STATIONARY RESISTORS**

SYSTEMS & COMPONENTS  
FOR INFRASTRUCTURE



# Frame Resistors

Flat modular design, high energy absorption capacity, low-inductance versions, can be subjected to pulse loads.

**Resistance material support:** grooved ceramic insulators fixed on both longitudinal sides of a metal or temperature-resistant insulating material frame

**Resistance wire:** CuNi 44 or NiCr alloy

**Taps (tapping eyes):** on request

**Degree of protection:** IP00 - IP23 possible



## Applications

Braking/chopper resistors for frequency converters, load and testing resistors

RESISTORS  
**STATIONARY RESISTORS**

SYSTEMS & COMPONENTS  
FOR INFRASTRUCTURE



# G - Base

## THREE PHASE + NEUTRAL CURRENT PROTECTION RELAY

### GENERAL CHARACTERISTICS

G-Base is the new generation of Microelettrica Scientifica's base-performance protection relays.

This range is the ideal solution for protection and automation, thanks to its high configurability.

It is based on the same powerful microprocessor adopted on high-performance G-Pro range.

G-Base platform is based on a four-channel configuration, allowing it to be used for current and voltage protection functions.

GB310, part of the G-Base range, is a relay designed for the interface to the power distribution grid.

### PROTECTIVE FUNCTIONS

F49: Thermal Image (one element)

F50/51: Overcurrent, with standard IEC inverse time curves (three elements)

F50N/51N: Earth Fault, with standard IEC inverse time curves (three elements)

F46: Inverse sequence (two elements)

74TCS: Trip circuit supervision

F51BF: Breaker Failure protection

F79: Four-shot programmable autoreclosing, with reclosing sequence coordination and reclosing disabling push button

Two complete setting programs, switchable locally or remotely

### MEASUREMENTS

Real Time Measurements (IA - IB - IC - Io)

Maximum Demand and Inrush Recording (IA - IB - IC - Io)

Trip Recording

### HARDWARE

8 Output Relays

8 Digital Inputs

Hi-resolution graphic display (240\*128)

10 Leds for signalization

6 programmable push buttons

Two-piece plastic enclosure, IP44 protection degree (IP54 available on request)

### FIRMWARE

Time tagged multiple event recording and journal

Oscillographic wave form capture up to 40 s

Complete autodiagnostic program

Blocking Outputs and Blockings Input for pilot wire selectivity coordination

### POWER SUPPLY RATINGS

Type 1:24 V(-20%)/110 V(+15%) AC

- 24 V(-20%)/125 V(+20%) DC

Type 2:80 V(-20%)/220 V(+15%) AC

- 90 V(-20%)/250 V(+20%) DC

### COMMUNICATIONS

RS485 Serial communication port on rear side

USB communication port on front panel

Modbus RTU/IEC870-5-103 Communication Protocols

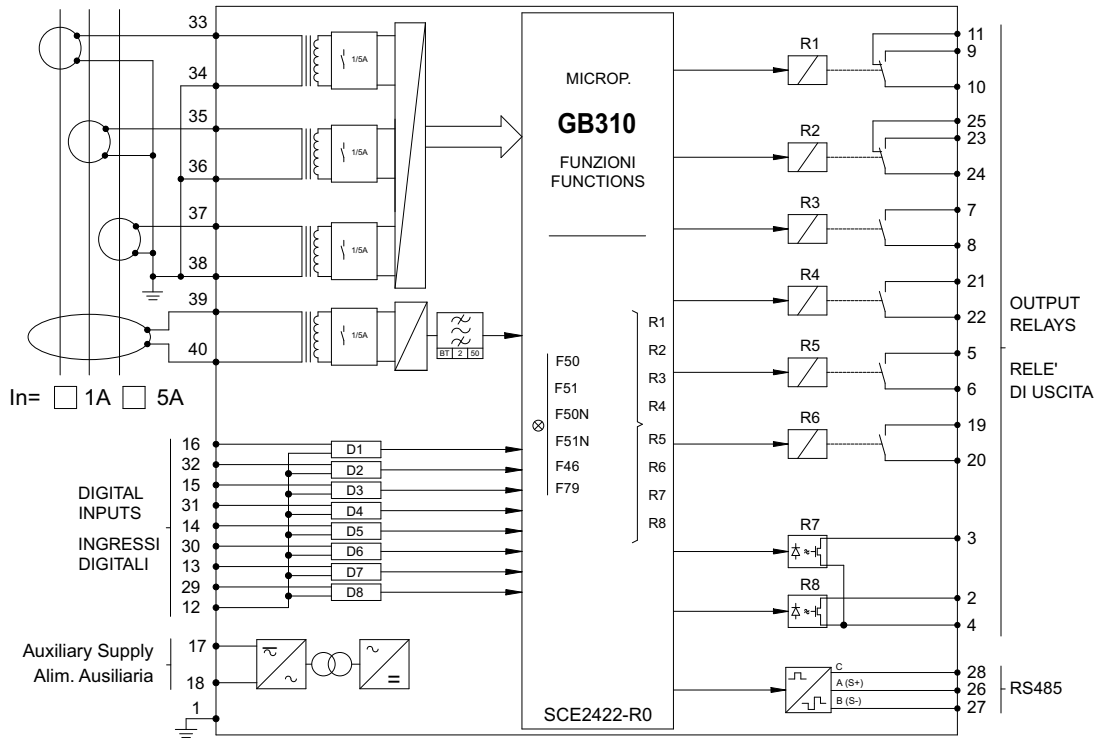
### SOFTWARE

MSCom2 Program interface for device management





Connection Diagram



Typical Characteristics

Accuracy at reference value of influencing factors	2% In - 0.2% On	for measurements
	2% + (to = 20 ÷ 30 ms @ 2xIs)	for times
Rated Current	In = 1 A/5 A - On = 1 A/5 A	
Current Overload	500 A for 1 s, 20 A continuous	
Burden on current input	0.1 VA a In = 1 A; 0.3 VA a In = 5 A	
Average power supply consumption	≤ 7 VA	
Output relays	rating 6 A; Vn = 250 V	
	AC resistive switching = 1500 W (400 V max)	
	make = 30 A (peak) 0.5 s	
	break = 0.3 A, 110 Vcc	
	L/R = 40 ms (100.000 op.)	

# 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 self diagnosis 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

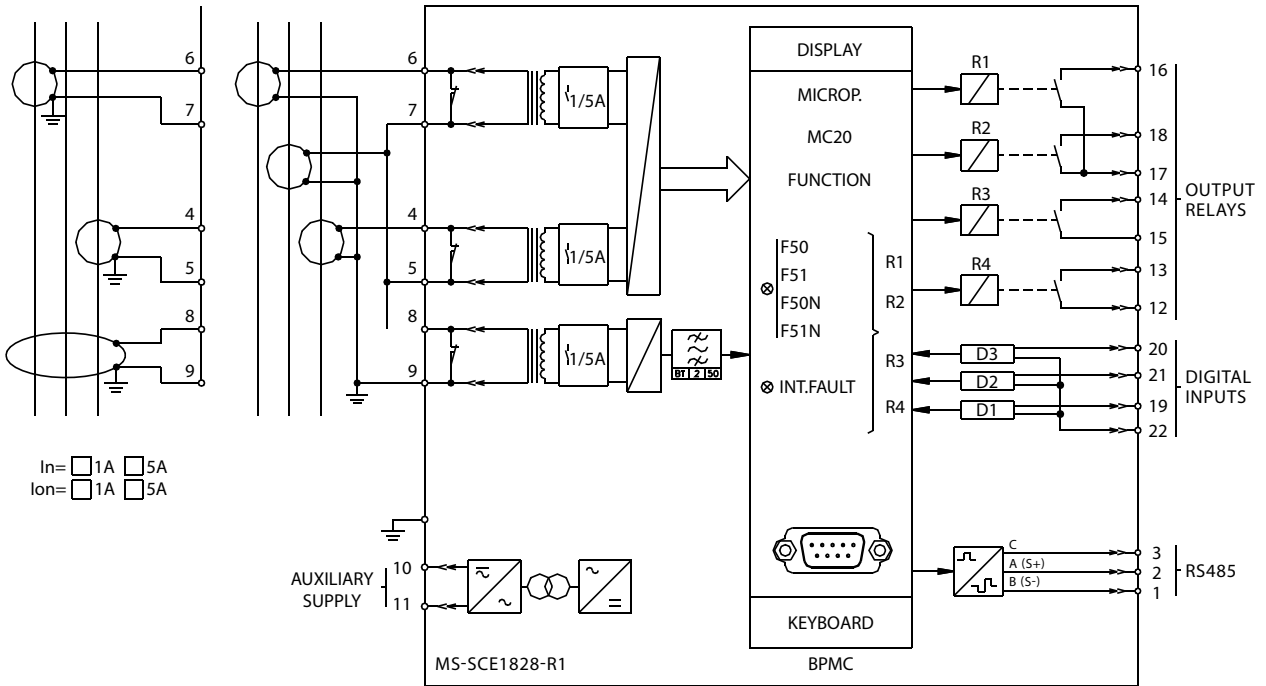
- 1 Module box (2 modules with expansion)
- Totally draw-out execution
- IP44 protection case (on request IP54)

## SOFTWARE

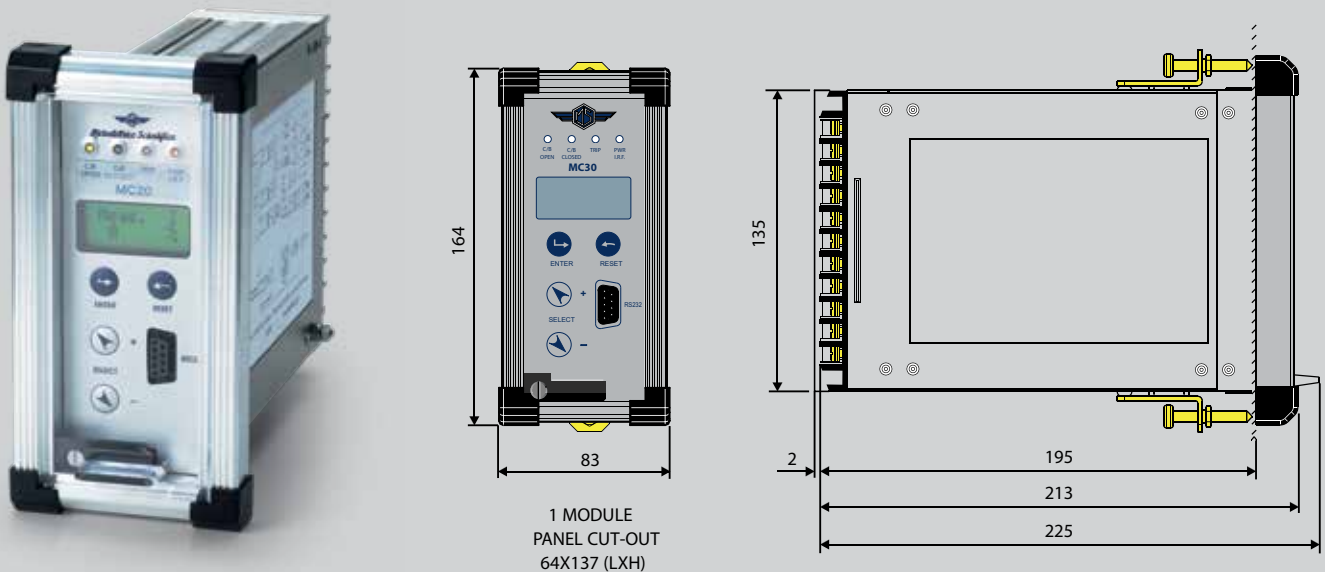
- MSCom2 Program interface for device management

Relays Type	
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	DC Current Relay: 76/32, 49, 51BF
MCDC-V	DC Voltage Relay: 45, 80
MCM	Motor Protection Relay: 37, 46, 47, 48, 49, 50/51, 51LR, 64S, 66, 68

Wiring Diagram



Overall Dimensions: mm



# 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 s 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 - others on request)
- Complete self diagnosis 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

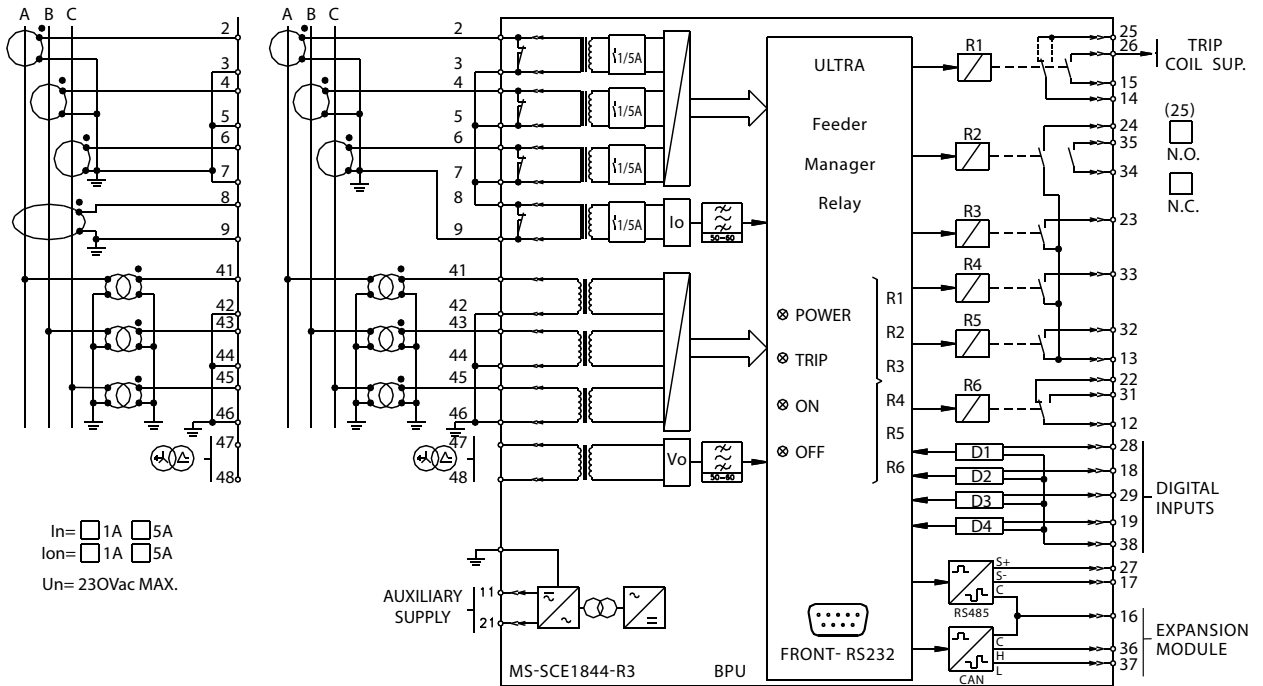
- 2 Module box (3 modules with 1 expansion, 4 modules with 2 expansion)
- IP44 protection case (on request IP54)
- Totally draw-out execution

## SOFTWARE

- MSCom2 Program interface for device management



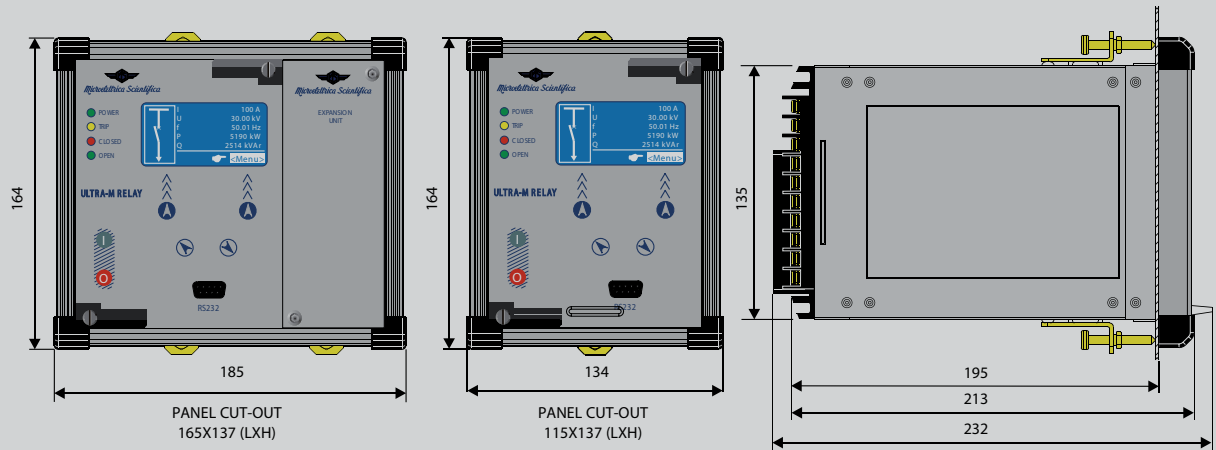
Wiring Diagram



Relays Type

U-MLEs	DC Feeder Manager Relay: 49, 32/76, 80, 45, 64, 79, DI, di/dt, Rapp, Iapp, CMI, LT, BF
U-MLC	DC Feeder Manager Relay (Italian Railway Certification): 27/59, 32, 45, 49, 64, 76, 79, 80
U-MLC- M	DC 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

Overall Dimensions: mm



# 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 centres. 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 6 A
- 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:

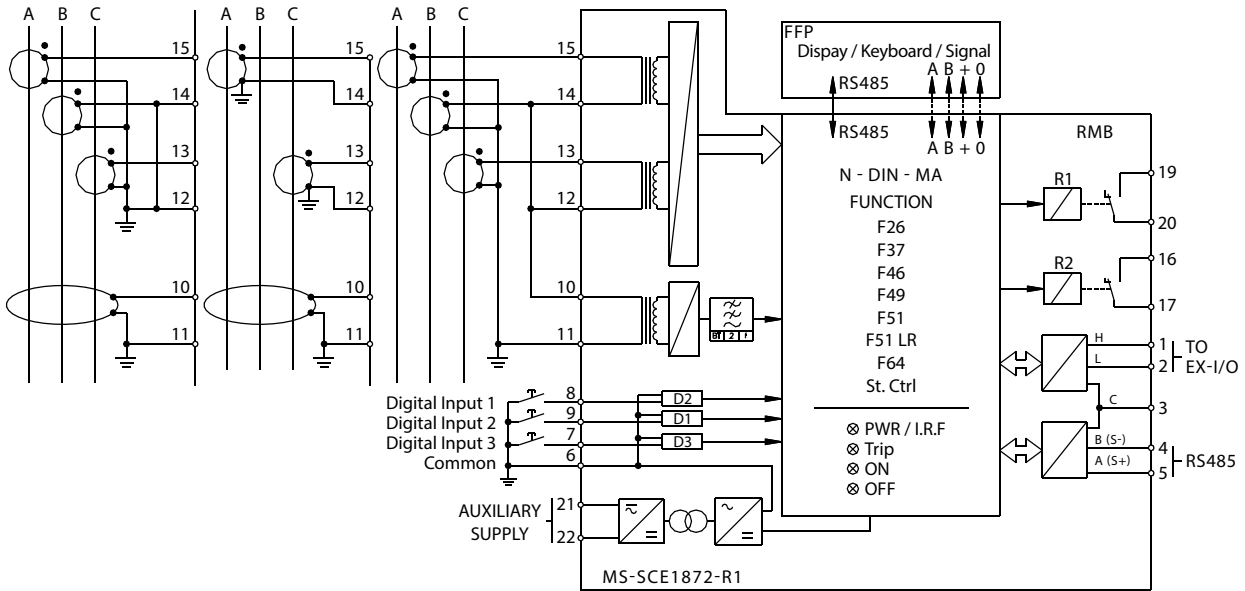
- 2x16 characters LCD display
- Four Key buttons for local relay management,
- Four signal leds
- One RS232 port for connection to a local PC (on front side)
- One RS485 port for interconnection with the RMB (on back side)
- Complete self diagnosis program

## MOUNTING

- DIN46227 (EN50022)



Wiring Diagram



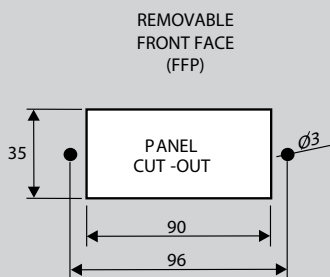
Relays Type

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	DC Current Relay with High Sensitivity Hall Effect Transducer: 64, 51BF

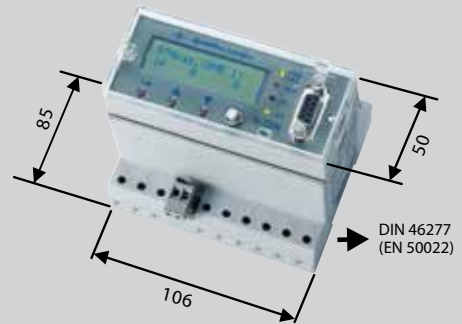
Accessories

EX-I/O	Input/Output Expansion Module
CPB	Profibus Converter Module
TA-DIN	Current Transformer
TAR-DIN	Current Transformer

Overall Dimensions: mm



FFP  
Height= 16



RMB  
Height= 72

# TRANSDUCER line

## DC MEASURING CONVERTER

### GENERAL CHARACTERISTICS

The DC measuring transducers are designed for high voltage measurement. The Transducers 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 (750 V, 1.5 kV and 3 kV) give very accurate and safe analogue outputs for measuring and protective purposes.

### The MHCO line includes three models:

#### TRANSDUCER-TV

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

#### TRANSDUCER-TI

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

#### TRANSDUCER-TI

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



### HIGHLIGHTS

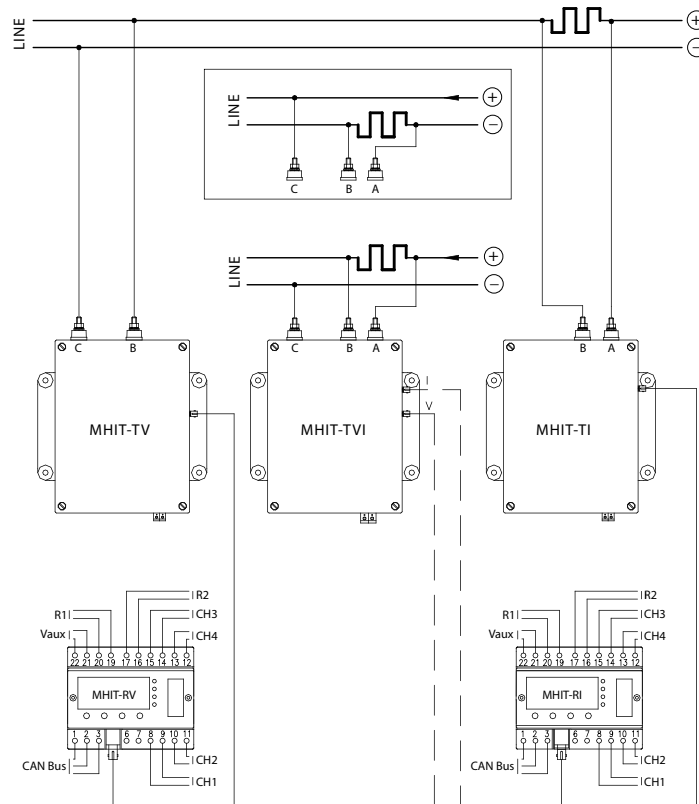
- HV Transducer for Current & Voltage measurement
- Direct Connection up to 6 kV
- Fibre Optic connection between HV transmitter and LV receiver
- Measuring channel fully redundant
- Autoranging Multivoltage Power supply (self-powered version available as optional)
- Compatible with traction application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



## Wiring Diagram



## 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. 0-20/4-20 mA etc.). The setting of this unit can be easily done using our MCom2 software tool.

The receiver is equipped with two output relays: one relay is used for self diagnosis (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: 62.5/125  $\mu$

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) $^{\circ}$ C

Response time: 200ms

Connection: Fiber optic type 200.230.500 m HCS (plastic) or 62.5/125 m (glass) connection type ST  
Fiber optic standard length 5 m (max 1 km with glass fiber)

# DC-PRO

## HIGH PERFORMANCE PROTECTION RELAY

### GENERAL CHARACTERISTICS

DC-Pro protection relay provides top-performance in terms of protection functions, memory and communication characteristic. Designed for DC railway applications, is the best solution for the most demanding protection and control tasks.

### COMMUNICATION

- IEC61850 server with GOOSE messages
- "Internet ready" with multiple connections
- FTP server (File Transfer) to download/upload files from/to internal memory, or from external USB memory stick.
- Web server provides information on protection status. DHCP/AUTO IP/STATIC IP/Telnet/UDP
- Modbus on TCP, MODBUS RTU on RS485 and USB, IEC103/NTP (time sync), NMEA (GPS), IRIG-B

### HARDWARE

- New 32 bit microprocessor, extremely short response time and high memory capacity
- Analogue inputs fully programmable to accept a wide range of transducers (insulation amplifier, hall effect sensor, etc.)
- Two fiber optic inputs and two fiber optic output for direct connection with Microelettrica transducers
- Four fully programmable analog outputs for SCADA or analog instrumentation
- 7" capacitive touch screen with 10 programmable LEDs.
- 24 digital inputs and 14 digital outputs available on the module

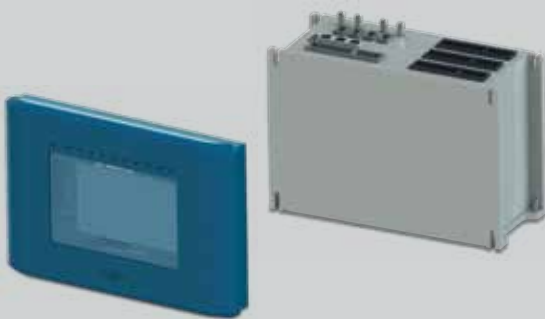
### FIRMWARE

- Four independent setting groups
- PLC functionality: logical operator between inputs and outputs (logical and physical)
- Complete set of protection functions able to cover all requirement in DC traction switchgear Intertripping logic: through digital IO or communication protocol (GOOSE messages).
- Events, trips and oscillographic recorder

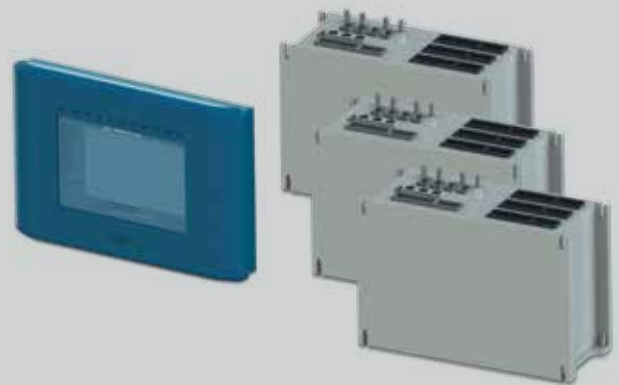
Local Display Version



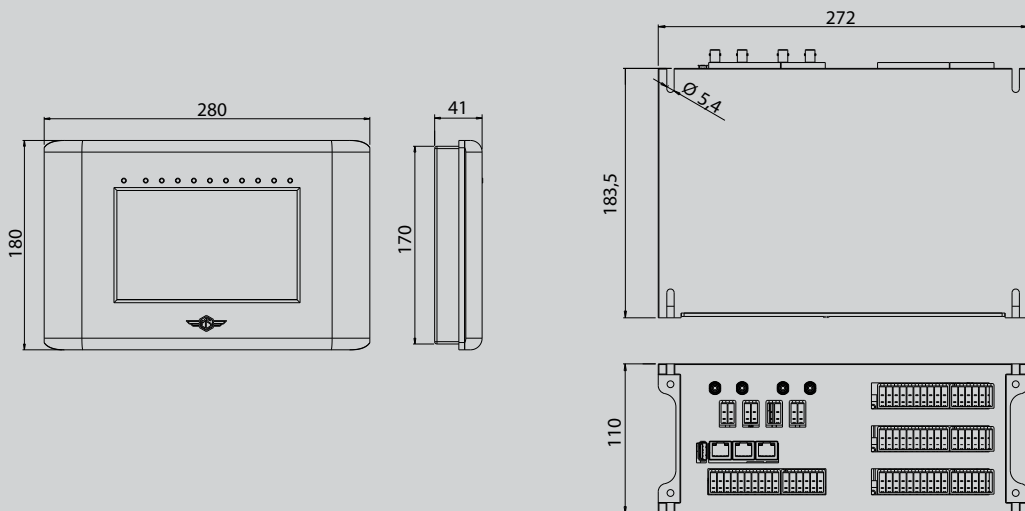
Remote Display One-to-One Version



One Display for all Substation Relay



Overall Dimensions: mm



# AF/LA Series

The medium performance "AF" and "LA" fan Series were designed to meet the majority of cooling and ventilation requirements typical of industrial applications. They were conceived to provide the best mix of reliability, versatility, performance, quality, environmental impact and cost. All of these products have features making them easily compliant with the most widespread technical specifications and allowing significant modification based on specific customer requirements. Direct-coupling solutions with motors from 2 to 16 poles are available, to suit fan performance and noise requirements. Belt-driven solutions with larger diameters and selected speed are also available (see "AFT").

The "AF" and "LA" Series are versatile and reliable, characteristics that make them the COMET's most successful products, suitable for the most frequent ventilation needs. COMET "AF" and "LA" Series of fans have proved their efficiency every day in over 60 countries worldwide, in extreme climates, harsh environments and a wide range of temperatures for the most demanding operations.

These Series of fans are selected using COMET's dedicated software, based upon the results of a huge number of tests performed by Comet on test tunnels and actual installations.

The selection is based on five blade profiles in aluminium alloy, and others in fibreglass or polypropylene, with number of blades varying between 3 and 12 blades.

## Applications

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Aircoolers

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Heat exchangers/Radiators

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Cooling of electrical machines  
(motors, converters, inductors,  
generators, transformers)

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Naval

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Ventilation and Air Conditioning Plants

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LA



**GENERAL CHARACTERISTICS**

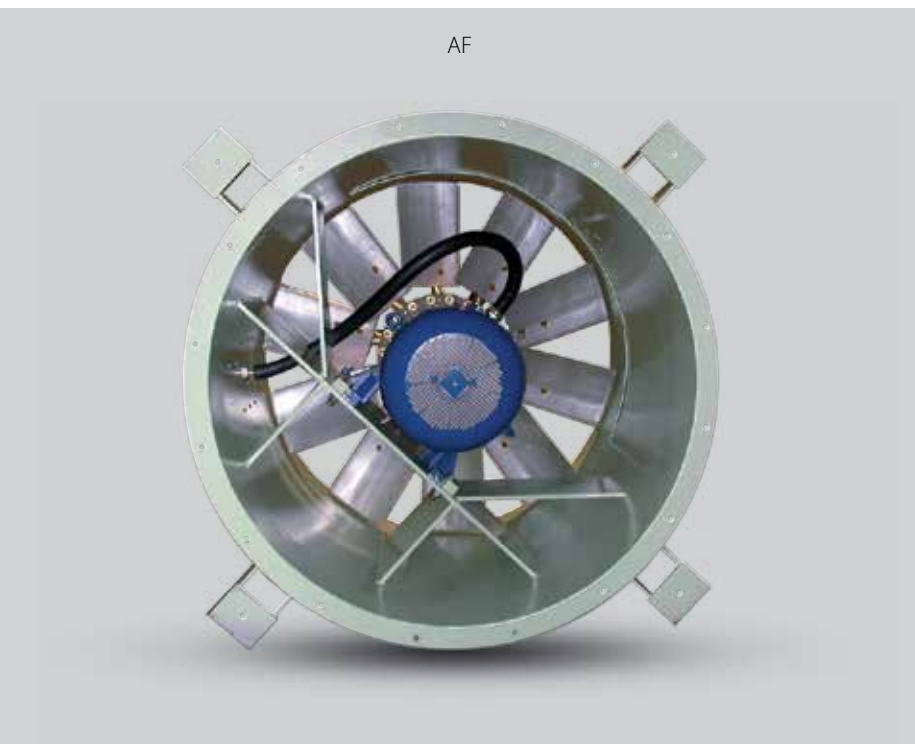
**AF**

- Impellers with aerofoil profile blades in extruded aluminium alloy low-noise type
- Adjustable blade pitch when standstill
- Three-phase motors IP55 with Class F or H insulation, 50/60 Hz, 2-16 pole, from the best European manufacturers
- Casings in carbon steel, electro-welded, with anti-corrosive finishing by hot-dip galvanization

Wide range of ancillary parts and customizations.  
 Special versions with special materials, certified components, motors according to customer's specifications.  
 Impellers in PPG, FRP or steel are available upon request.

**LA**

- Impellers with aerofoil profile blades in PPG, low-noise type
- Three-phase motors IP55 with Class F insulation
- Casings in carbon steel, electro-welded
- Finishing by hot-dip galvanization: longer durability in harsh environment



Series	Diameter [mm]	Air Flow	Pressure	Power [kW]
AF	400 ÷ 2400	up to 400,000 mc/h	up to 1500 Pa	0.55 ÷ 90
LA	310 ÷ 800	up to 35,000 mc/h	up to 800 Pa	0.25 ÷ 7.5

# AFT Series

The "AFT" Series fans are designed for applications requiring very high air flows and medium-low pressures, when it is impossible or unadvisable to couple the impeller direct to the motor.

They are normally used in the presence of:

- Large diameters (air coolers, heat exchangers, cooling towers)
- Dusty atmospheres
- High temperatures of the air flow
- Low noise installations
- Need to set the motor outside the air flow for access

Supports and drives are sized by COMET according to criteria based on 20 years of experience and hundreds of installations. For some models the bearing blocks are designed and built entirely by COMET.

The "AFT" Series fans are selected using the COMET's dedicated software, which provides a clear and concise data sheet with operating curves, including electrical and noise level data, as well as preliminary outline drawing. The selection is based on five blade profiles, with number of blades varying between 3 and 12 blades. This versatility gives unrivalled design options when selecting a fan unit.

## Applications

- Aircoolers
- Heat exchangers
- Cooling towers
- Condensers
- Ventilation Plants



**GENERAL CHARACTERISTICS**

- Impellers with aerofoil profile blades in extruded aluminium alloy low-noise type
- Adjustable blade pitch when standstill, or autovariable in operation
- Three-phase motors IP55 with Class F or H insulation, 50/60 Hz, 2-16 pole, from the best European manufacturers
- Casings in carbon steel, electro-welded, with anti-corrosive finishing by hot-dip galvanization
- V-belt or toothed belt drive, with heavy-duty bearing blocks and external grease lines

Wide range of ancillary parts and customizations.

Versions with special materials, special dimension, motors according to customer's specifications.

Impellers in PPG, FRP or fitted with anti-corrosion coatings are available upon request.

Series	Diameter [mm]	Characteristics	Power [kW]
AFTE	800 ÷ 2240	Motor mounted outside the fan and the airflow	0.55 ÷ 45
AFTS	2000 ÷ 4800	With vertical axis, motor mounted under the fan ring on a bridge (for aircoolers)	0.55 ÷ 90
AFTN	1600 ÷ 2240	Motor mounted inside the fan casing, fully enclosed	0.55 ÷ 55

AFTN



AFTS



# MAP/AVP/MF/XF Series

Comet aluminium impellers come in 4 different construction types, aimed at satisfying numerous industrial applications. COMET manufactures 10 different blade profiles and three different impeller designs, giving rise to one of the most extensive and efficient product ranges available on the market.

The larger Series can be selected for large installations with diameters up to 12 metres.

The smaller Series are suitable for installation on equipments, machineries or in environments requiring ventilation or cooling, and on small and medium fan units with diameters starting from 350 mm.

The "MAP" and "AVP" Series impellers have high-efficiency and low-noise blades made of extruded aluminium alloy. All "MAP" models have variable pitch blades with motor stopped, while "AVP" impellers have variable pitch blades in operation. They were designed to provide precise and continuous adjustment of the air flow as the thermal conditions of the system vary. The blade pitch variation is controlled pneumatically and these impellers are supplied complete with rotating joint for connection to the line and with precision position valve.

Special versions of all COMET impeller Series are available for critical operating conditions or special environments.

The extensive production in aluminium is supported by "MF" and "XF" Series of impellers, with blades made of fiberglass-reinforced plastic (FRP-GRP-PPG). These Series have Very Low-Noise characteristics and are suitable for corrosive environments.

By using COMET selection software, it is possible to select the most advantageous combination of speed, number of blades and blade profile to obtain the best results in terms of noise and power consumption.

## Applications

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Aircoolers

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Heat exchangers/Radiators

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Cooling towers

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Condensers

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Axial Fans

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Series	Blade Material	Hub Type	Blade Series	Diameter Range [mm]
MAP	Aluminium	F	12/1N	350 ÷ 1000
		P	1N/2N/3N/31	500 ÷ 3100
		D	2N/3N/4N/8N/31/51	1000 ÷ 12000
AVP	Aluminium	P	1N/2N/3N/31	1120 ÷ 3100
		D	2N/3N/4N/8N/31/51	2000 ÷ 8000
MF	FRP - GRP	D	MF	1200 ÷ 10000
XF	FRP - GRP	D	XF	2000 ÷ 12000

AVP



MF



# ATEX Fans

Most of COMET's fans can be supplied in the ATEX certified version (Directive 94/9/EC).

Series AF/AFT/AFH/AFTH/CNX are always available in ATEX versions.

All these fans are equipped with motors and components of leading brands and are rigorously certified.

Materials and components are checked and recorded for complete traceability.

Design, manufacture and testing are carried out by COMET in accordance with the procedures established by the COMET ATEX Technical File, filed with ICIM (ATEX Notified Body).

COMET products are certified for the following categories:

Group II, category 3G

Group II, category 3D

Group II, category 2G

Group II, category 2D

The general characteristics and the performances of the products do not vary when they are produced in the ATEX versions.

At the same time, it is still available an high grade of customization according to the installation needs and the project specifications.

## Applications

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Refineries

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Chemical plants

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Turbines

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Plants and installations with presence of dangerous gas or dust

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**GENERAL CHARACTERISTICS**

- Impellers in carbon steel, stainless steel, aluminium, FRP or PAGAS
- Three-phase motors IP55/IP65, with Class F or H insulation, T3/T4, Ex-N/Ex-d, 50/60 Hz, suitable for inverter supply
- Casings in carbon steel or stainless steel, electro-welded, with bolted anti-spark track
- Finishing by 3-layers epoxy-pack painting, certified for 500 hours salt mist test resistance, or hot-dip galvanization
- Cables and electrical components made by leading brands and certified
- ATEX certificate and running test report is supplied with each unit

Wide range of ancillary parts and customizations.  
 Versions with special materials, special dimension, motors according to customer’s specifications.

Series	Diameters [mm]	Characteristics	Power [kW]
AF-Ex	400 ÷ 2400	Medium-performance direct drive Axial	0.55 ÷ 90
AFT-Ex	1000 ÷ 4800	Belt driven Axial	1.5 ÷ 75
AFH-Ex	400 ÷ 1800	High Performance Axial	1.1 ÷ 90
AFTH-Ex	200 ÷ 700	Belt-Driven High Performance Axial	0.55 ÷ 30
CNX-Ex	400 ÷ 1400	Centraxial	1.5 ÷ 55

ATEX



# Traction Rectifier

## Functions

Traction Rectifiers are used to convert AC power to DC power for railway traction applications using silicon diodes and aluminium heatsinks.

## General characteristics

Traction Rectifiers could be convection cooled or forced-air cooled (using blowers), and are usually installed:

- In modular, metalclad enclosures
- As a self-contained, open-frame unit in a secured (inter-locked) area

Semiconductor Solutions, an ISO 9001:2008 company based in South Africa, designs and manufactures customised rectifiers in accordance with SANS60146 (IEC146), EN50328 standards and customer requirements, where constructive and technological principles are applied in a project specific mechanical layout.

Due to high demand for maintainability from our customer, our designs apply specific focus on these elements, for example:

- Easy maintenance, with direct accessibility to the diode modules due to open-frame construction
- Easy component replacement due to modular design and removal of individual power modules in less than 5 minutes



## References

(Only approved supplier in South Africa on all 3.3 kV DC rail systems)

Transnet Freight Rail/PRASA	Rectifier, Diode (4.5 MW, Forced-air cooled) – [x120]
Transnet Freight Rail/PRASA	Rectifier, Diode (5 MW, Forced-air cooled) – [x159]
Transnet Freight Rail/PRASA	Rectifier, Diode (6 MW, Forced-air cooled) – [x10]
Transnet Freight Rail/PRASA	Rectifier, Diode (10 MW, Forced-air cooled) – [x10]

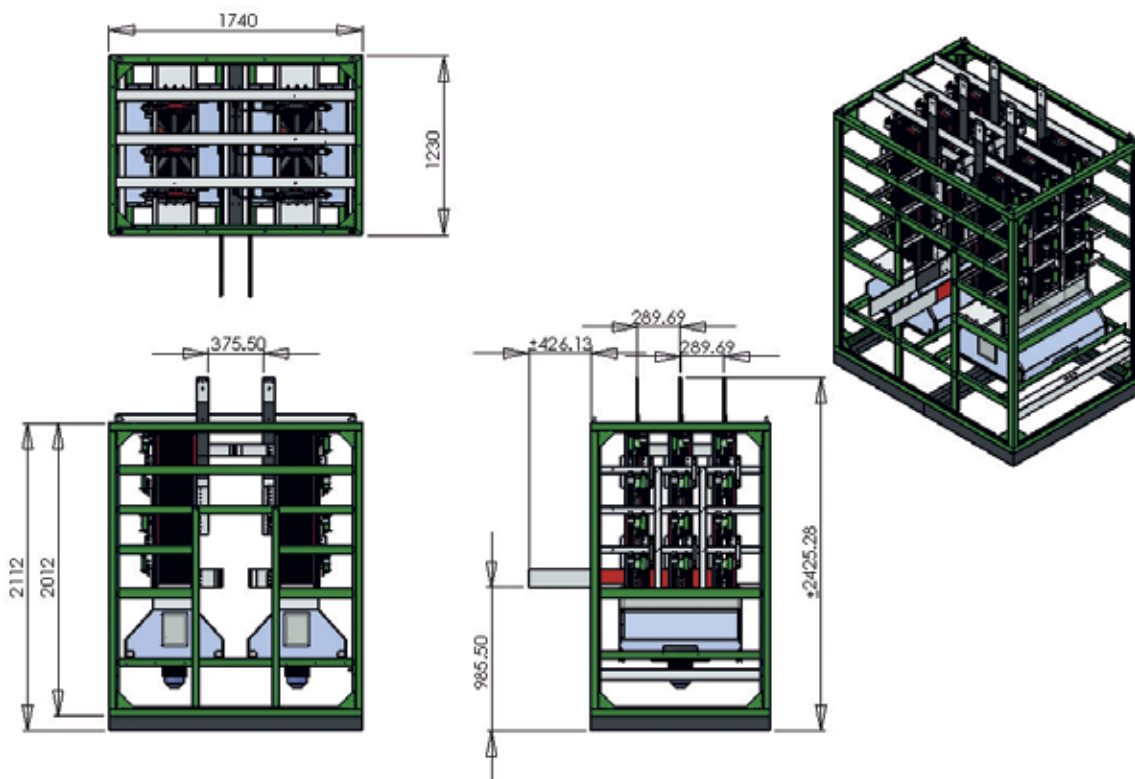
## Main Characteristics

Construction	Open-frame/Metal-clad enclosure
Cooling type	Natural convection/forced-air cooled

Technical Characteristics	
Rated power [MW]	1 - 10
Rated DC output voltage [V <sub>DC</sub> ]	750, 1500, 3000
Rated AC input voltage [V <sub>AC</sub> ]	555 - 2400
Rated frequency [Hz]	50/60
Duty class	To customer specification
Rectifier Connections	Series & parallel bridges
No. of pulses	6 & 12-pulse
Semiconductor type	Capsule diode (hockey-puck)
Redundancy	N-1 (Customer to specify)
Protection degree	IPxx (Customer to specify)
Ambient temperature [°C]	-5/+50
Over-temperature protection	Included (Fibre-optically connected)
Diode fuse protection	Optional
Failed diode monitoring	Optional (Fibre-optically connected)
DC surge protection	Optional (Fuse protected)
Metering	Optional (Voltmeter & Ammeter)

Features	
Diode monitoring	Failed diode LED identification & signal output via potential-free contact
Fan control	Fan controller card can be used to stop/start the fan/s via thermo-switches
Fan protection	Vane switch on each fan signals fan failure/stoppage
Maintenance & repair	Quick & easy diode module change-out
Connection	Many different rectifier connections/configurations possible

Overall Dimensions: mm



# Industrial Rectifier

## FUNCTIONS

Industrial Rectifiers are used to convert AC power to DC power for many different applications and utilise silicon diodes for uncontrolled applications and thyristors for controlled.

## GENERAL CHARACTERISTICS

Industrial Rectifiers could be convection cooled, forced-air cooled (using blowers), or water-cooled in conjunction with a cooling tower and are usually installed

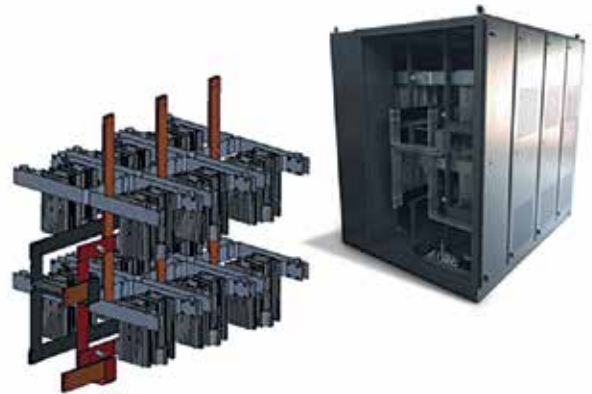
In modular, metalclad enclosures to customer specified protection rating (IPxx)

As a self-contained, open-frame unit in a secured (inter-locked) area

## TYPICAL APPLICATIONS:

Applications involved with to date include but are not limited to:

- Electro-winning
- Arc-furnace control
- Haulage truck assist
- Winder/elevator armature & field converters
- Electro-plating
- Soft starters
- Heater control etc.



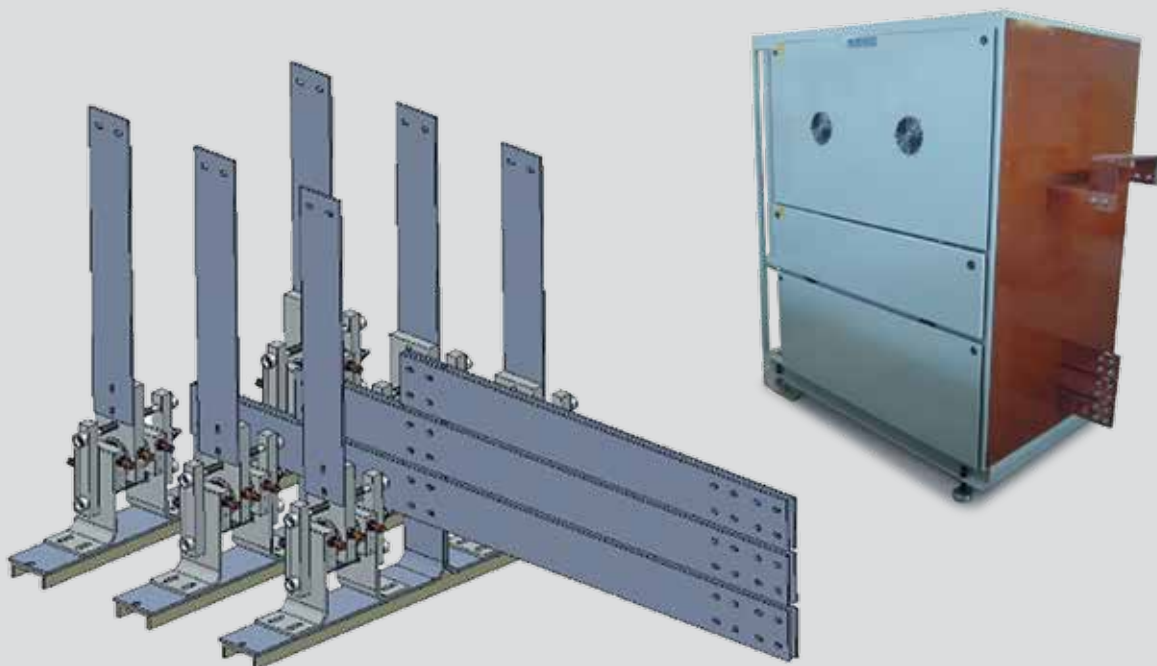
Semiconductor Solutions, an ISO 9001:2008 company based in South Africa, have built up extensive experience in the design and manufacture of customised rectifiers, in accordance with SANS60146 (IEC146) standards and customer requirements, for industry (e.g. mining operations & plating plants) in the last two decades.

References	
(Extensive experience and know-how in forced-air and water-cooled, controlled, high current rating per mechanical volume systems)	
Industrial diamond manufacturing	Rectifier, Thyristor (100 V, 40 kA, Water-cooled)
Haul-truck propulsion (on-board & fixed)	Rectifier, Diode (2.5 MW, 2.6 kV, Forced-air cooled)
DC Arc-furnace supply	Rectifier, Thyristor (900 V, 76 kA, Water-cooled)
Hoist system DC drive	Rectifier, Thyristor (690 V, 2 kA, Forced-air cooled)
Electro-plating plants	Rectifier, Thyristor (760 V, 40 kA, Water-cooled)

Main Characteristics	
Construction	Open-frame/Metal-clad enclosure
Cooling type	Natural convection, forced-air & water-cooled

Technical Characteristics	
Rated current [kA]	Up to 75
Rated DC output voltage [V <sub>DC</sub> ]	0 - 3000
Rated AC input voltage [V <sub>AC</sub> ]	0 - 2400
Rated frequency [Hz]	50/60
Heatsink	Aluminium (air-cooled)/copper (water-cooled)
Duty class	To customer specification
Rectifier Connections	Series & parallel bridges, hexa-phase
No. of pulses	6 & 12-pulse
Semiconductor type	Capsule diode or thyristor (hockey-puck)
Redundancy	N-1 (Customer to specify)
Protection degree	IPxx (Customer to specify)
Ambient temperature [°C]	-5/+50
RC snubber	Normally included
Over-temperature protection	Included (Fibre-optically connected)
Diode fuse protection	Optional
Failed diode monitoring	Optional (Fibre-optically connected)
DC surge protection	Optional (Fuse protected)
Metering	Optional (Voltmeter & Ammeter)

Features	
Diode monitoring (optional)	Failed diode LED identification & signal output via potential-free contact
Maintenance & repair	Quick & easy diode module change-out
Connection	Many different rectifier connections/configurations possible



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