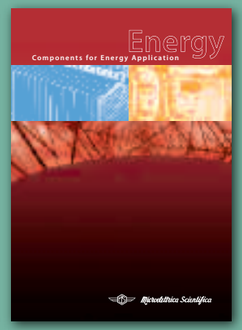

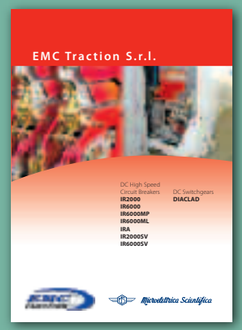

For information on sales network and products please visit

www.microelettrica.com

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KNORR-BREMSE

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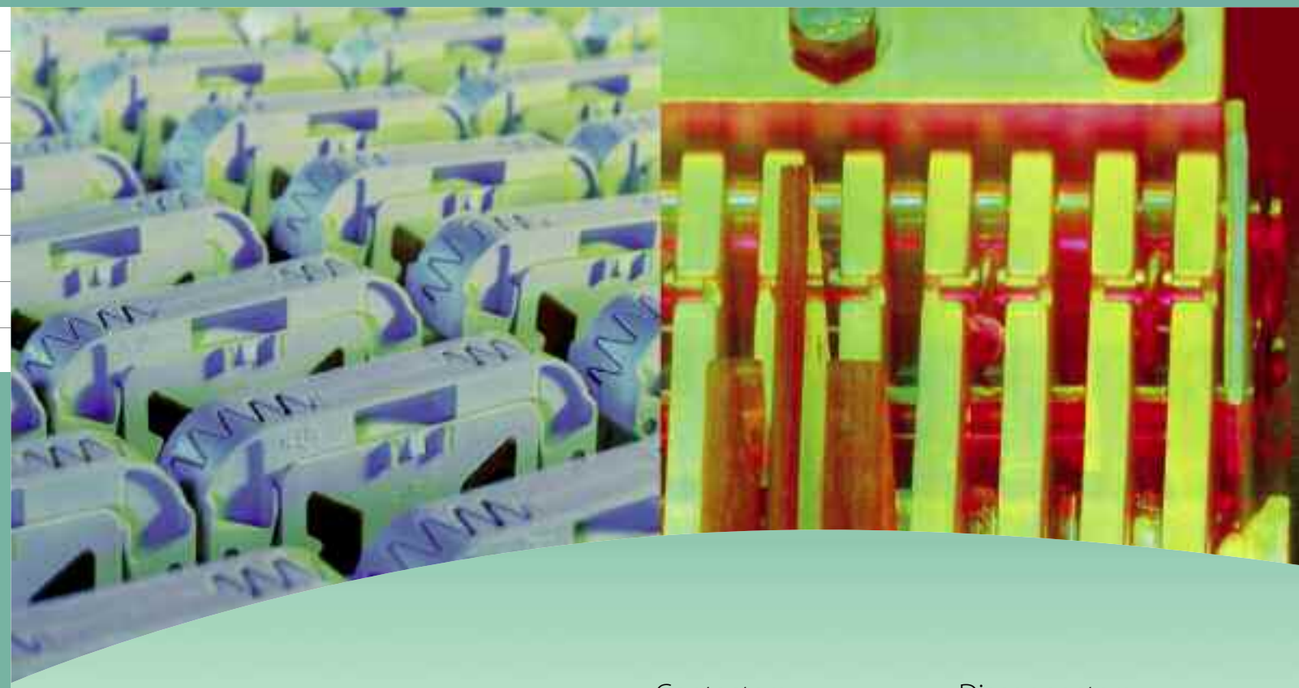
Switches

KNORR-BREMSE
WESTINGHOUSE *Platform screen doors*
IFE Automatic Door Systems
merak
Microelettrica Scientifica
transportdata
ZELISKO
railservice

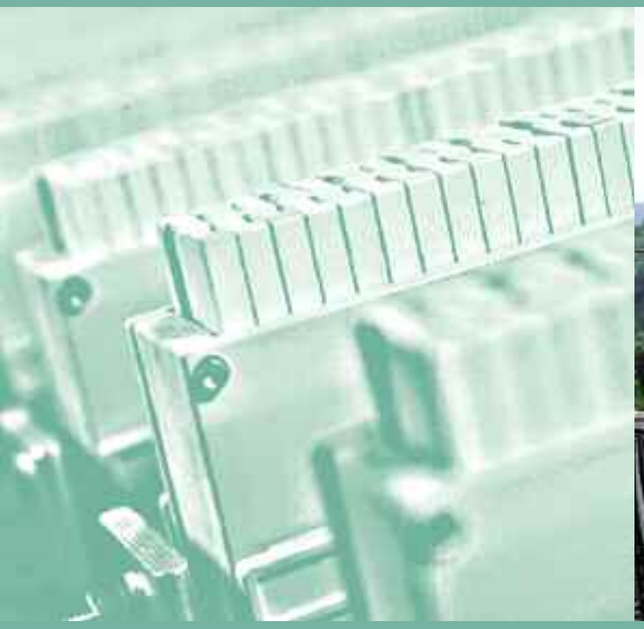


Contactors
LTHS line
LTC line
LTHH/LTE/LTP line
LTNS line
N line

Disconnectors
LTHM/P-U/D line
LTMP line

Microelettrica Scientifica

Switches



Applications
Rail on Board
DC Substation
Industry

Microelettrica Scientifica Switches Division is one of the world leading companies in the design and production of Contactors and Disconnectors for Rail, Substation and Industrial application.
The Microelettrica Scientifica Switches Division offers 5 families of contactors and 2 of disconnectors, every containing a wide variety of types and sizes that can be personalized in most details.
At the same time, we are capable of tailor-engineering and validation of customized versions of most of the products, to fit the customers application in the most efficient way. As all MS divisions, its quality is in compliance with standards ISO 9001: 2008 and ISO 14000.

The Microelettrica Scientifica Switches Division is located in Rozzano, approximately 10 km South of Milan along the route to Genova. The factory site comprises 8500 square-meters of which 6000 indoor.
The Microelettrica Scientifica contactors experience and tradition begins in the 1950's as the company develops its first bar mounted contactors for crane and motor control and industrial switchgear. It then evolves in the 1980's with the development of the LT lines, LTHS and LTNS first, followed by LTHH and in the 1990's by the LTE and LTC lines, as well as the LTHM/P disconnector line.

From the 1980's the Company rapidly expands on the Rail Vehicles market, going global in the 1990's and becoming today one of the world leading suppliers of Contactors and Disconnectors for traction and industrial application. As of 2005 Microelettrica Scientifica is member of the Knorr Bremse Group, the German world leader in rail and commercial vehicles braking systems. Knorr Bremse Group portfolio for Rail Vehicles also includes doors and entrance systems and HVAC systems for vehicles, as well as platform screen doors and gates for railway stations.

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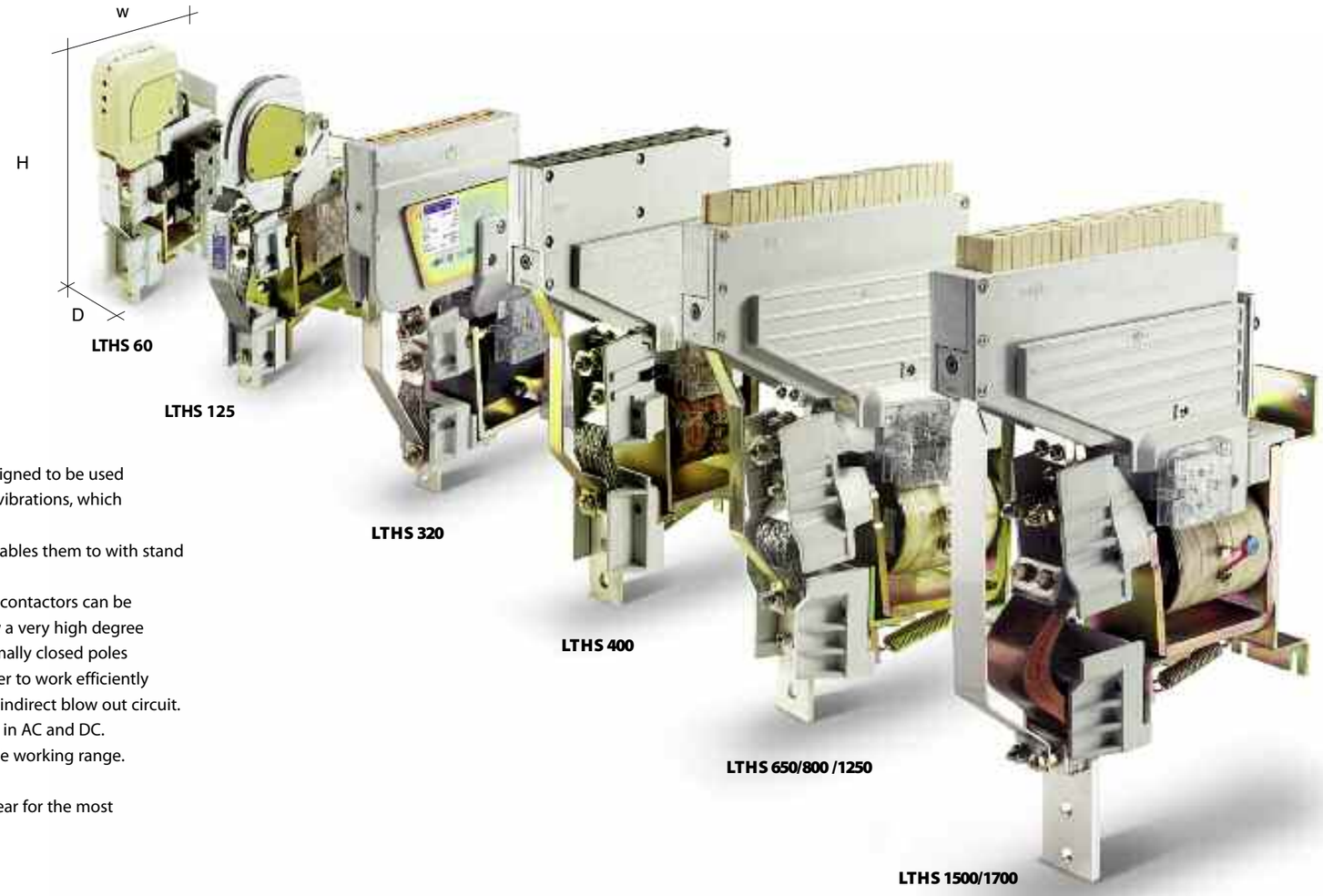
Products	
Contactors	LTHS line
	LTC line
	LTHH/LTE/LTP line
	LTNS line
	N line
Disconnectors	LTHM/P-U/D line
	LTMP line

LTHS line



Applications

- Line contactor
- Power or auxiliary converter input
- Filter pre-charging
- Traction motors on-load disconnection
- Electromagnetic brakes
- Heating/Air conditioning systems

Microelettrica Scientifica contactors for railway applications are designed to be used onelectrical equipment in presence of the most severe shocks and vibrations, which occur on board of traction vehicles.
The LTHS series of contactors displays a traditional design which enables them to with stand the highest current ratings in harsh working conditions.
To accomplish most of the possible applications, all the LTHS series contactors can be manufactured in single or multipolar form and, upon request, allow a very high degree of customisation. For example, versions with normally open or normally closed poles are manufactured, and mechanical latching can be supplied. 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 both in AC and 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 deenergized.
More than 20.000 LTHS contactors are delivered worldwide every year for the most important projects.

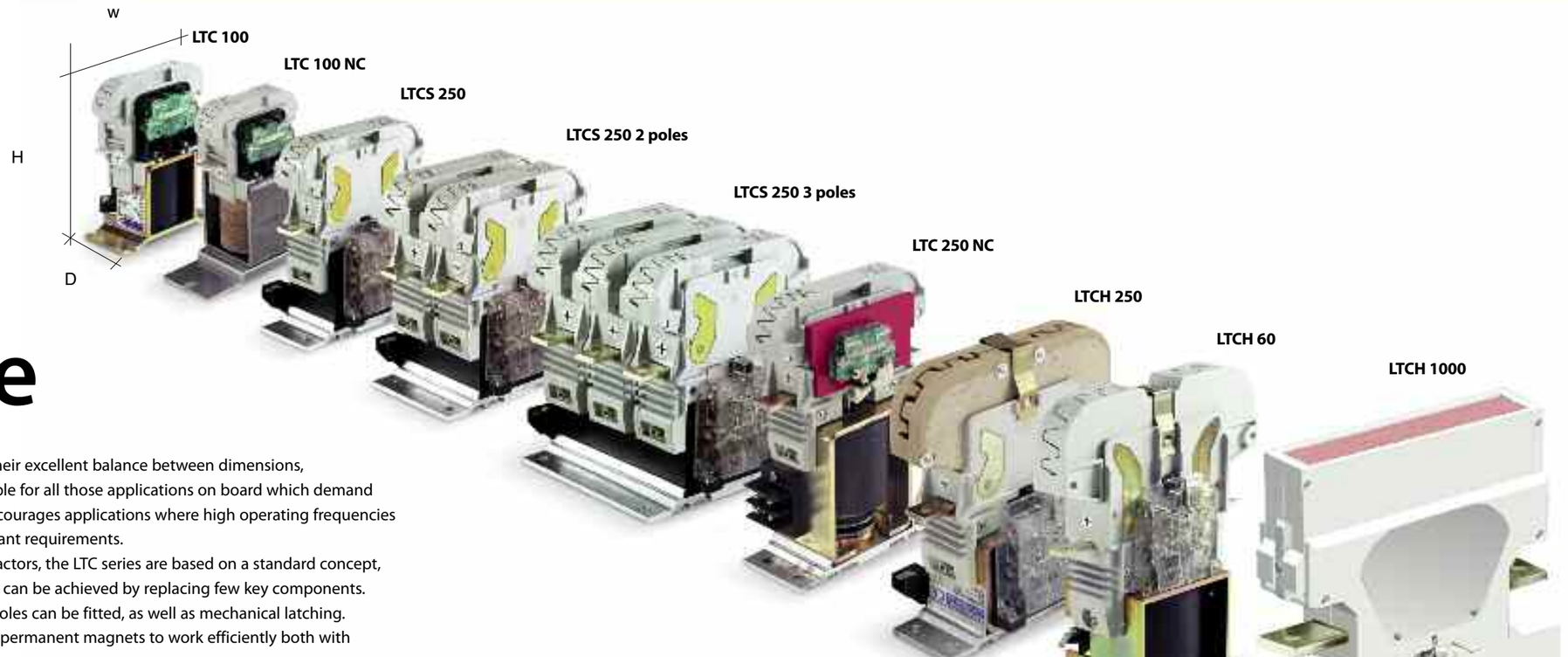
General Characteristics

- The long experienced extra heavy duty flexible line, up to 2000$V_{DC/AC}$ application, up to 1500A/pole
- On board and stationary application
- Combination of up to 3 NO or NC poles and auxiliary contact options
- High unit customization possible

Auxiliary Contact Blocks Type sk11

- Normally mounted on LTHS and LTC contactors
- Execution Makrolon, self extinguishing and transparent polycarbonate to allow contactors inspection
- Double interrupting, self cleaning, solid silver
- On request special execution with gold plated contacts

Type	Umax [$V_{AC/DC}$]	Ith [A]	W (mm)	H [mm]	D1/D2 [mm]
LTHS 60	1000	80	143	197	72/93
LTHS 125	1000	150	185	278	88/115
LTHS 320	1000	350	220	298	86/114
LTHS 400	2000	500	329	423	116/202
LTHS 650/800	2000	700/920	335	440	116/202
LTHS 1250	2000	1300	350	472	127/202
LTHS 1500	2000	1350	350	534	111/202
LTHS 1700	2000	1600	350	534	116/235



LTC line

Applications

- Auxiliary converter input
- Filter pre-charging
- Electromagnetic brakes
- Heating/Air conditioning systems
- Line contactor

The LTC series contactors, thanks to their excellent balance between dimensions, performances and strength, are suitable for all those applications on board 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 are based on a standard concept, but a very high level of customisation can be achieved by replacing 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 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 deenergized.
More than 20.000 LTC contactors are delivered worldwide for every year the most important projects.

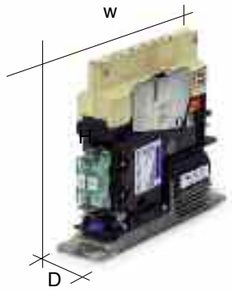
General Characteristics

- The modern and compact heavy duty line, up to 4000$V_{DC/AC}$ application, up to 1000A/pole
- On board and stationary application
- 1-2-3 pole configuration mostly available, NO and NC poles, permanent magnets or indirect arc blowouts
- Flexible control and auxiliary contacts options, customization possible

Auxiliary Contact Blocks Type rk11

- Contacts based on Reed relay technology
- Sealed tips, not affected by harsh environmental conditions
- Shielding case from external magnetic fields
- Same mechanical interface of standard SK11auxiliary blocks
- Power rating 10 VA

Type	Umax [$V_{AC/DC}$]	Ith [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	1000	250	140	156,5	86
LTCS 250 2 poles	2000	250/500	140	156,5	109
LTCS 250 3 poles	2000	250	140	156,5	154
LTC 250 NC	2000	250	140	196	78
LTCH 250	1000	250	154	176	86
LTCH 60	4000	60	168	220	88
LTCH 60 2 poles	4000	60/120	220	168	125
LTCH 1000	2000	1000	385	300	93



LTHH 40

LTHH 100

LTHH 250

LTE/P 2-400/600

LTE/P 4-400/600

LTE/P 4-2000

LTHH/LTE/LTP line

Applications

- Auxiliary converter input
- Filter pre-charging
- Capacitor discharging
- Heating/Air conditioning systems
- Line contactor
- Train supply line
- Resistors based traction systems, for starting and braking of electric motors

The Microelettrica Scientifica LTHH/LTE(P) series contactors for electric traction are supplied to railways and underground systems throughout the world.
Where high voltage ratings are required, the LTHH series contactors are the right solution.
The creepage and clearance distances are widely dimensioned for safe application in polluted ambient. Their narrow outline is especially conceived for applications where space is a critical issue - as more and more often happens on railway vehicles.
To meet all the possible applications, they are available both with electric and pneumatic control, and poles can be manufactured in normally open or normally closed configurations.
The indirect blow out circuit makes the LTHH contactors suitable to work both with high and low currents and with relatively high frequency (1500 Hz).
The DC control coil operates without economy resistor within a wide working range.
More than 10.000 LTHH contactors are delivered worldwide every year for the most important projects.

General Characteristics

- The higher voltage single pole heavy duty line, up to 4000$V_{DC/AC}$ application, up to 1300A/pole
- On board and stationary application
- Multipole assembles, NO and NC poles, indirect arc blow out
- Flexible control and auxiliary contacts options, high unit customization possible

Auxiliary Contact Blocks Type SJ11

- Normally mounted on LTHH contactors and on disconnectors/changeovers
- Execution in Makrolon, self extinguishing and transparent polycarbonate
- Double interrupting, self cleaning, solid silver, snap action contacts
- On request, special execution with gold plated contacts

Type	Umax [$V_{AC/DC}$]	Ith [A]	W [mm]	H [mm]	D1/D2 [mm]
LTHH 40	2000	60	200	162	48/106
LTHH 100	4000	120	377	274	60/130
LTHH 250	4000	300	377	295	70/160
LTE/P 2-400/600	2000	900	404	370	80/220
LTE/P 4-400/600	4000	900	403	394	85/220
LTE/P 4-2000	4000	1350	500	473	119/-

LTNS line

Applications

- Transit and railway systems
- Control of cranes
- Rolling mills
- Mining equipment
- Renewable energy

Microelettrica Scientifica LTNS series 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 750V, are available in a wide range of current ratings, from 80A up to 1300A (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.

General Characteristics

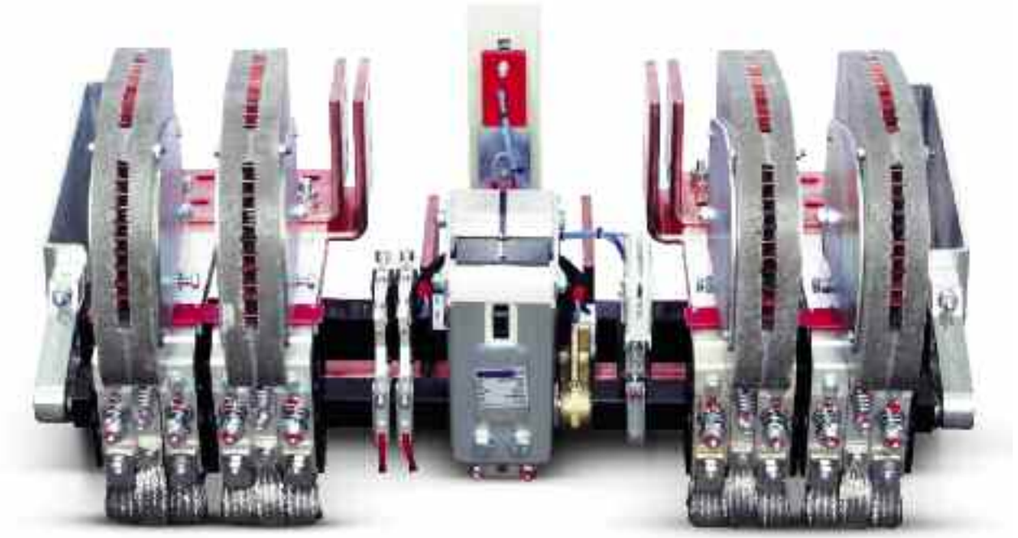
- The extra heavy duty flexible line, up to 1000$V_{DC/AC}$ application, up to 1500A/pole
- Stationary application only, derived from LTHS line
- 1-2-3 pole configuration, NO and NC poles indirect or direct arc blow out options available
- Flexible control and auxiliary contacts options, high unit customization possible

Type	Ith [A]	Rated Nominal Voltage Ue [V]	Rated Insulation Voltage Ui [V]	D1/D3 [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

N line

Applications
Transit and railway systems
Power generation
Control high power motors
Heavy industries
Crane control

Microelettrica Scientifica N series bar mounted contactors, in spite of their 50 years old technical concept are still 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 85A 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.
Microelettrica Scientifica has been certified since 1993 according to the International Quality Standard UNI EN ISO 9001:2008. Microelettrica has always paid great attention to the environment and is certified according to the standard UNI EN ISO 14001:2004 and all materials used are RoHS compliant.

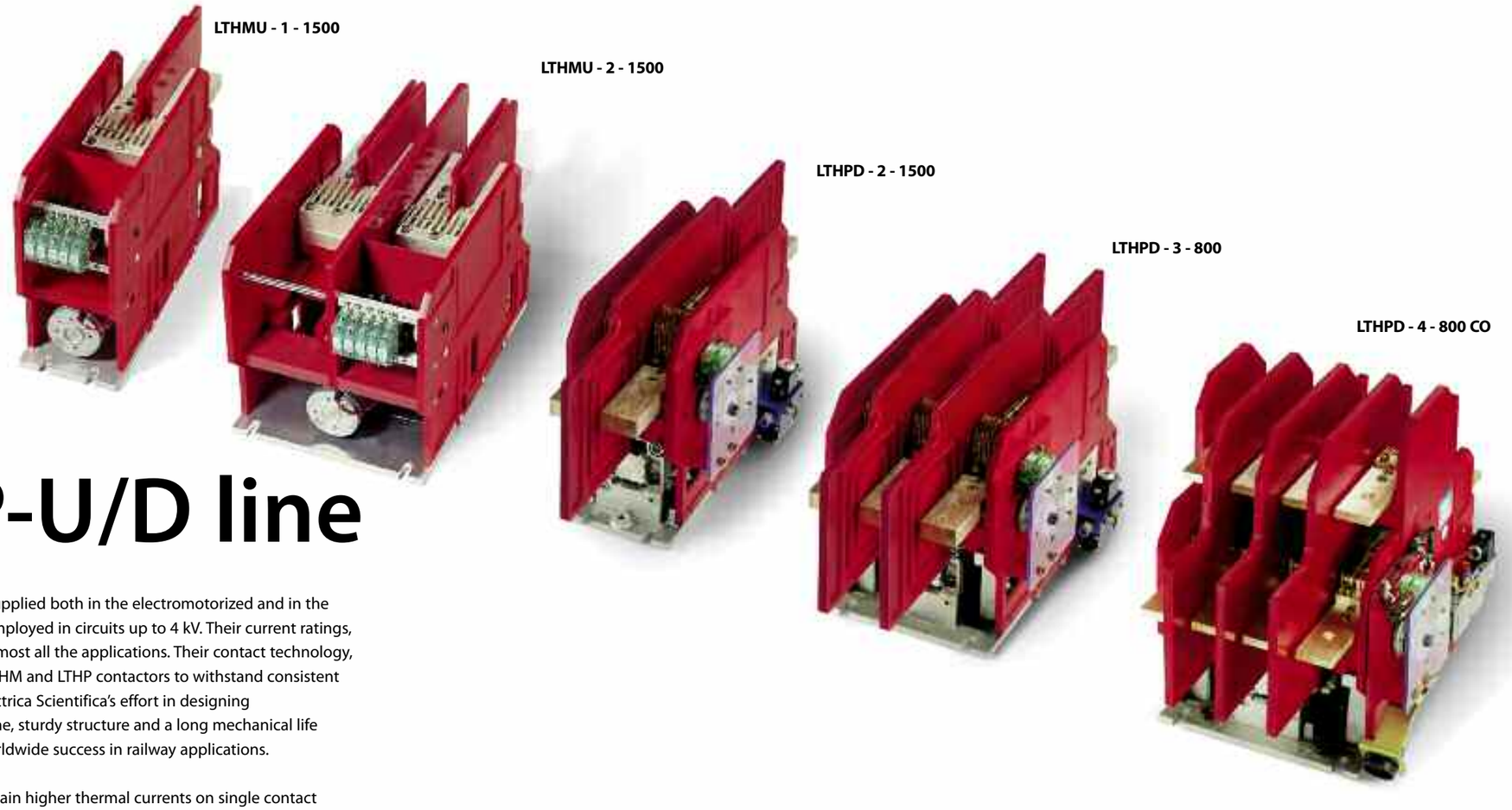


Type	Thermal Current Ith [A]	Rated Nominal Voltage Ue [V]	Rated Insulation Voltage Ui [V]	D1/D4 [mm] Length (1-4 poles)	H [mm]	W [mm]
N 85	85	600	1000	250-400	165	155
N 125	125	600	1000	250-400	175	155
N 190	190	600	1000	250-400	205	170
N 270	270	600	1000	250-500	265	215
N 350	350	600	1000	250-500	275	215
N 550	550	600	1000	105-277	300	160
N 650	650	600	1000	300-600	320	160
N 800	800	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

- The bar mounted modular extra heavy duty line, up to 1000$V_{DC/AC}$ application, up to 6000A/pole
- Stationary application only
- Up to 6 pole 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	Consumption of coils				Operation time (m sec.)		Mech. endurance in million operations
	A.C. cos ϕ = 0,5 I'ca [A] RMS value			D.C. L/R = 15 ms I' cc [A] (2 poles)			Ich [A]	A.C. [VA]		D.C. [W]				
	440 V	750 V	1000 V	220 V	440 V	660 V		Pick-up	Holding	Pick-up	Holding	Closing	Opening	
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	1500	110	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



LTHM/P-U/D line

Applications

- Traction circuit configuration change in multi-system locos
- Isolation of power converter
- Isolation of traction motors

Microelettrica Scientifica disconnectors, supplied both in the electromotorized and in the pneumatic versions, are designed to be employed in circuits up to 4 kV. Their current ratings, up to 1500 A per pole, allow them to fit almost all the applications. Their contact technology, based on multi-finger jaws, enables the LTHM and LTHP contactors to withstand consistent dynamic currents (up to 220 kA). Microelettrica Scientifica's effort in designing a product range with reduced space outline, sturdy structure and a long mechanical life (over 100,000 operations), has led to a worldwide success in railway applications.

- Poles can be connected in parallel to obtain higher thermal currents on single contact (up to 6,000 Amps)
- On D versions, poles can be reversed forming NC poles, or single-double pole changeover without additional structure
- On D versions, additional upper structure is available to create 1 to 4 changeover poles
- 24 combinations are available with more than 130 pole configurations
- Several options available for control circuits and for auxiliary contacts connection
- Integrated solutions: multiple switches are assembled on frame with customised busbar system and integrated control circuits

General Characteristics

- The long experienced heavy duty line for DC and AC application up to 4000V
- On board and stationary application, 2 thermal current rating per pole: 800 or 1500A
- Normally open, normally closed, changeover poles from 1 to 4 poles units with single control
- Electric DC motor or pneumatic cylinder control, with customized auxiliary contacts execution
- High customization level is possible and mostly used
- Integrated multifunctional units designed and customized on request

Auxiliary Connections

- To meet all customer requirements, special connections and cabling can be supplied both on the high voltage and on the low voltage circuits. On the HV side, poles can be connected in series or parallel. Terminals can be shaped according to customers' requirements
- LV circuits can be cabled to perform different logical functions. Any kind of connector available in commerce can be fitted to these circuits

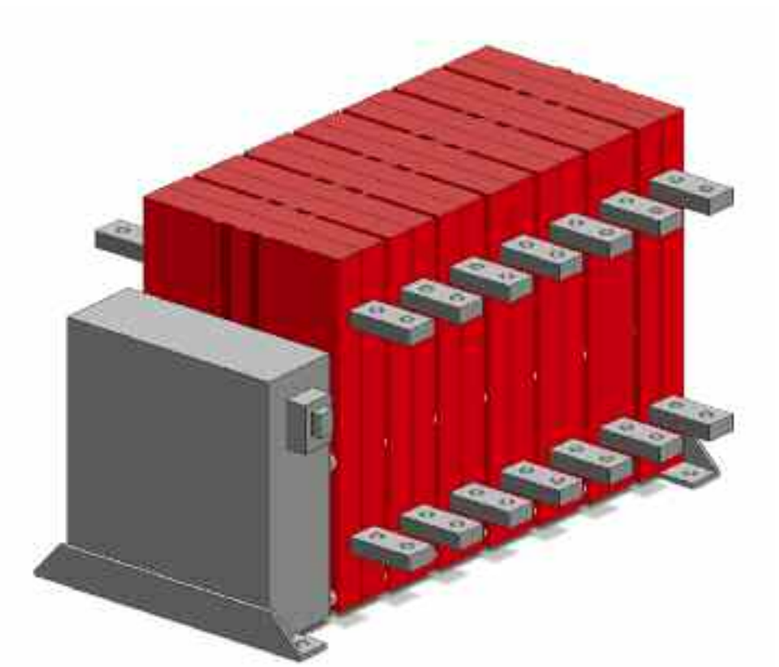
LTH	M	U	1	800
LTH	M	U	1	1500
LTH	M	U	2	800
LTH	M	U	2	1500

LTH	P	U	1	800
LTH	P	U	1	1500
LTH	P	U	2	800
LTH	P	U	2	1500

LTH	M	D	1	800
LTH	M	D	1	1500
LTH	M	D	2	800
LTH	M	D	2	1500
LTH	M	D	3	800
LTH	M	D	3	1500
LTH	M	D	4	800
LTH	M	D	4	1500

LTH	P	D	1	800
LTH	P	D	1	1500
LTH	P	D	2	800
LTH	P	D	2	1500
LTH	P	D	3	800
LTH	P	D	3	1500
LTH	P	D	4	800
LTH	P	D	4	1500

- M/P: Electromotorized or Pneumatic bistable control
- U/D: Power terminals on same side or on opposite side
- 1/2/3/4: Number of poles
- 800/1500: Thermal current of each pole (in Amps)



LTMP line

Applications
Traction circuit configuration change in multi-system locos
Isolation of power converter
Isolation of traction motors

Modular Multipole-Multiposition Off-Load Disconnector with Binary Control Option

Main Features of each Pole:
- 2 versions: 1000 or 2000 A thermal current
- 3 configurations: NO or NO+NC or CO
- Integrated control device for command logic
- Fully modular construction, up to 12 poles
- Visual indication of pole status
- Maintenance-free

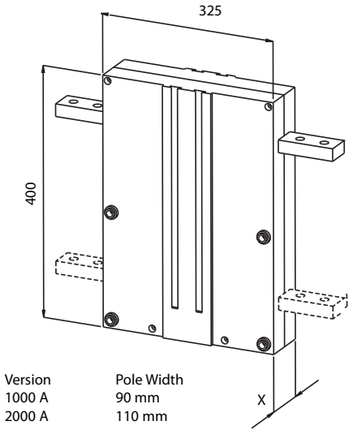
Main Features Control:
- Electric motor actuated
- Electronic control of poles positions
- Virtually infinite combinations of poles positions
- Predetermined positions accessed sequentially or by dedicated control signal

Options:
- Binary control code module (No. of digits = No. of poles)

Technical Data

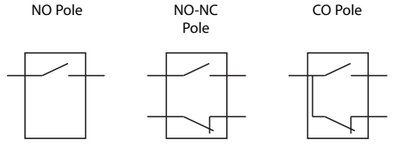
Rated Voltage (Un)	3000 V	
Rated Max Voltage (Umax)	4000 V	
Insulation Reference Voltage (Ui)	4000 V	
Rated Operational Current (Ie)	1000 A	2000 A
Rated Short Circuit Withstand for 15ms (Icc)	160 kA	220 kA
Rated Breaking Current at 4000V$_{DC}$	400mA	
Position Change Time at Uc	Max 5 sec	
Mechanical Endurance	> 500'000 operations	
Contact Opening Distance	> 40mm	
Dielectric Test Voltage	HV to ground 12000V Aux to ground 2000V Bwn open contacts 9500V	
Auxiliary Contacts (type SJ 11)	1NO+1NC per pole	
Control Module Weight	5 kg	
NO Pole Weight (per pole)	6.2 kg	7 kg
CO Pole Weight	7.5 kg	8.5 kg
NO-NC Pole Weight	8.2 kg	9 kg
Operating Temperature Range	-50°C ÷ +85°C	
Control Voltage (Uc)	24 / 72 / 110 V$_{DC}$	
Control Voltage Working Range at +85°c	± 30%	
Absorbed Power at 20°c and Uc	Max 150W	

Dimensions



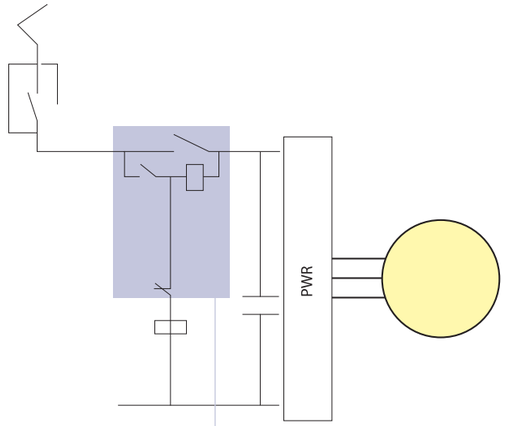
Version	Pole Width
1000 A	90 mm
2000 A	110 mm

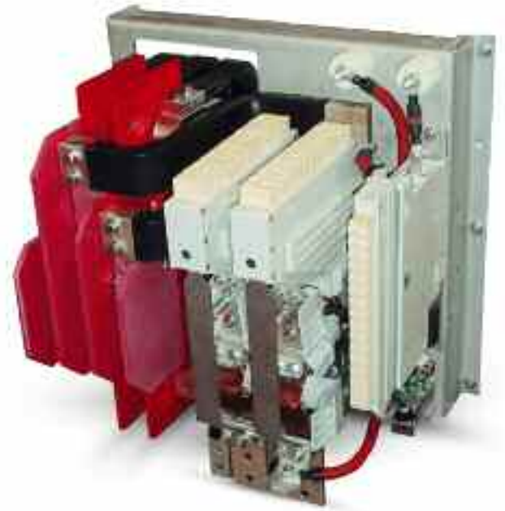
Pole Configuration

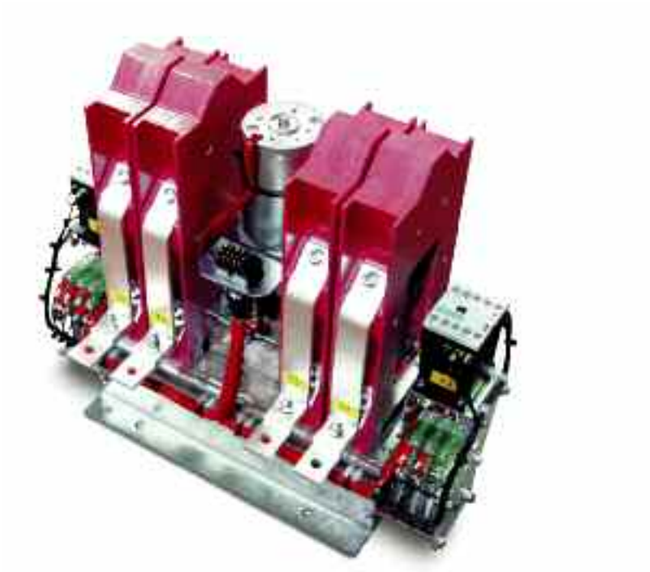


Integrated Functional Units

A key of Microelettrica Scientifica success is the ability to provide specific solutions to meet customers' requirements. One of these are LRUs: different Microelettrica Scientifica contactors and disconnectors are supplied already assembled on a structure. A few solutions have been supplied also including charging and discharging resistors on the same frame. In this way customers do not have to worry of installing several components on a vehicle: it's just a matter of inserting the whole assembly in its own cubicle and tightening some screws. For example, all the traction circuit switchgear can be part of just one LRU. Such a solution helps also in case of maintenance: a LRU is removed from the train in a short time and is replaced with another assembly, to speed up processes. Then, the removed LRU can be checked and revamped in the workshop, with no concerns of time and space.







Special product LTRM 300

- New 300A 4 kV motorized reverser with 4 NO/NC poles
- Expandable number of poles
- Poles can also be used as auxiliary lower current contacts on LTHM (P) disconnectors