Mors Smitt Railway Technology

Miniature circuit breakers

Hydraulic magnetic

Mors Smitt
A Wabtec Company

SERVING SAFETY

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Miniature circuit breakers


Always striving to be the best

Miniature circuit breakers

Mors Smitt offers a wide range of railway hydraulic magnetic circuit breakers. The circuit breakers are fully configurable to meet individual requirements.

Advantages

- Precise, temperature stable mechanism, due to hydraulic magnetic technology
- Overcurrent sensing mechanism reacts only to changes of current
- No 'warm-up' period to slow down its response to overload. No 'cooldown' period after overload before it can be reset. Derating considerations due to temperature variations are not normally required and heat-induced nuisance tripping is avoided
- A common trip linkage between all poles, another safety feature, ensures that an overload in one pole will trip all adjacent poles
- A trip-free mechanism, a safety feature, makes it impossible to manually hold the contacts closed during overcurrent or fault conditions
- Standard dimensions, mounting and current ratings provide maximum application versatility
- Wide range: current ratings to 700 Amps and rated voltages to 600 VAC and 110 VDC are available
- Options: series trip, mid-trip, switch only (with or without auxiliary switch), remote shutdown, shunt trip, and dual coil circuit options are available

Standards

The Mors Smitt minature circuit breakers are designed according the following railway standards:

IEC 60077	Electrical equipment for rolling stock in railway applications
EN 50155	Electronic equipment used on rolling stock for railway applications
EN 45545-2	Fire protection on railway vehicles
NF F16-101/-102	Fire behavior - Railway rolling stock
IEC 61373	Shock & vibration resistance - Railway rolling stock

Utrecht, September 2015

Mors Smitt continuous to improve its products and services. Specifications are changed without prior notice.
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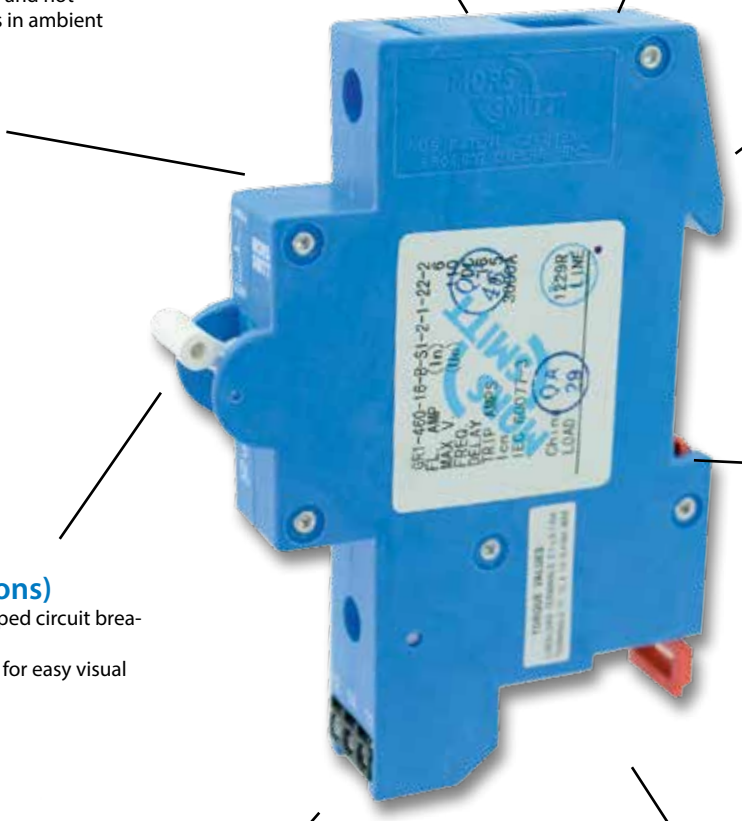
Features

Time delays
A wide range of time delays is available for optimal application compatibility.

Accessories
A wide range of accessories is availible for flexible connectivity. E.G. busbars and feeding terminals.

Hydraulic magnetic
Operation is precise and not affected by changes in ambient temperatures.



Trip-free mechanism
This safety feature makes it impossible to manually hold the contacts closed during over-current or fault conditions.

Circuit options
Several circuit options are available for easy adaption in any application.

Mid trip (handle options)
The handle of a tripped circuit breaker remains in the middle position for easy visual inspection.

Auxiliary contacts
The auxiliary switch presents the status of the circuit breaker and can be connected to external electronics, e.g. annunciators on a drivers desk.

Connection terminals
All Mors Smitt circuit breakers can be equipped with a terminal of your choice, to save installation time.

What makes a magnetic circuit breaker trip

Standard configuration

The most common magnetic circuit breaker configuration is called 'Series trip'. It consists of a current sensing coil connected in series with a set of contacts (figure 1).

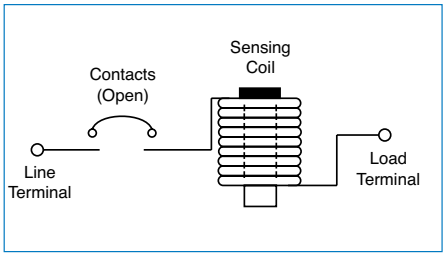


Figure 1 - Standard configuration

Rated current of less

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins (figure 2).

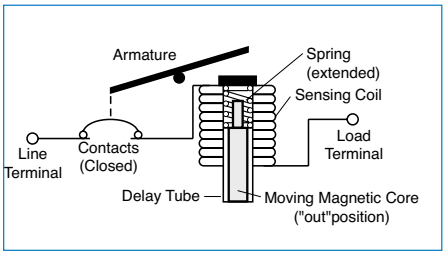


Figure 2 - Rated current or less

Moderate overload with induced delay

As the normal operating or 'rated' current flows through the sensing coil, a magnetic field is created around that coil. When the current flow increases, the strength of the magnetic field increases, drawing the springbiased, movable, magnetic core toward the pole piece. As the core moves inward, the efficiency of the magnetic circuit is increased, creating an even greater electro-magnetic force. When the core is fully 'in', maximum electro-magnetic force is attained, the armature is attracted to the pole piece, unlatching a trip mechanism, thereby opening the contacts (figure 3).

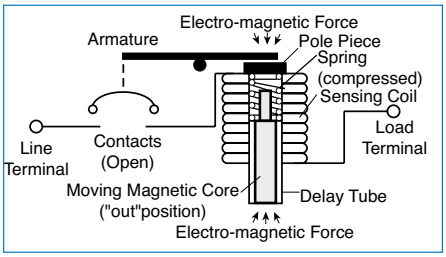


Figure 3 - Moderate overload with induced delay

Short circuit condition no induced delay

Under short circuit conditions, the resultant increase in electro magnetic energy is so rapid, that the armature is attracted without core movement, allowing the breaker to trip without an induced delay. This is called 'instantaneous trip'. It is a safety feature which results in a very fast trip response when most needed (figure 4).

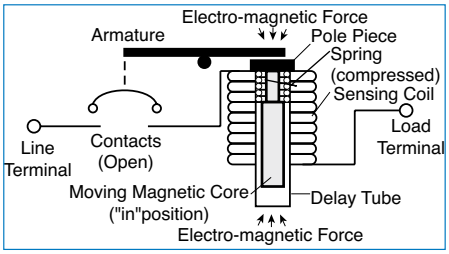


Figure 4 - Short circuit condition no induced delay

Circuit options

Available circuit options

Series trip
A basic two terminal device is usually used as a combination power switch and overload protector. the contacts and current sensing coil are connected in series with the line and load terminals (figure 1).

Series trip with auxiliary switch
Same as a series trip except with the addition of a S.P.D.T. snap-action switch, which is electrically isolated, but mechanically linked to the movement of the main breaker contacts. This switch is commonly used to remotely signal the status of the breaker (on or off / tripped) (figure 2). Series trip is also available with alarm switch.

Series mid-trip with alarm switch
Similar to 'Series trip with auxiliary switch' except the S.P.D.T. auxiliary switch is actuated only upon electrical trip of the breaker. upon electrical trip, the NO contact closes and the NC contact opens. This can be used to remotely signal the tripped status of the breaker. also, upon electrical trip, the handle moves to the 'mid' position as opposed to the 'full off' position typical of other breakers. This gives a specific visual panel indication of a tripped breaker as compared to one which is merely turned off (figure 2). Series mid-trip is also available without auxiliary switch.

Series trip with remote shutdown
For dump circuit or panic circuit applications. Same as a series trip but with an additional (self-interrupting) voltage coil pole (usually of opposite polarity) for remote shutdown. In the example, a momentary voltage pulse to pole 2 will shut down both pole 1 and pole 2. Because the voltage coil in pole 2 is self-interrupting, no additional components, such as auxiliary switches, are required in that circuit (figure 3).

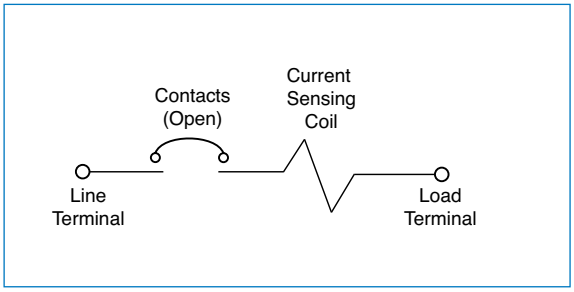


Figure 1 - Series trip

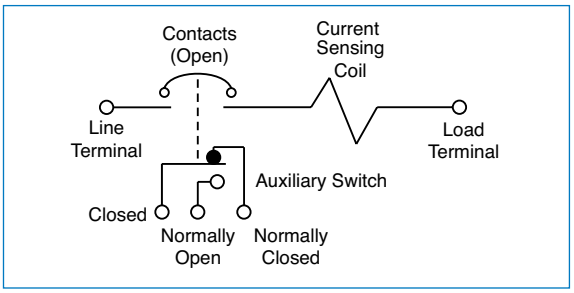


Figure 2 - Series trip with auxiliary switch

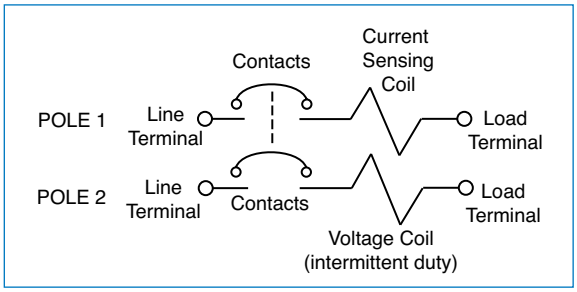


Figure 3 - Series trip with rmote shutdown

Dual coil with remote shutdown

Similar to 'Series trip with remote shutdown' except an extra pole is not required. A dual coil breaker has two coils in the space normally occupied by a single coil. A current coil is used for overload protection and the instant trip voltage coil can be used for remote shutdown. The dual coil option is the 'shunt trip dual coil', a three terminal device with one side of the voltage coil internally connected to the primary circuit (figure 4). The other side of the voltage coil is connected to an external third terminal on the bottom of the breaker. This circuit option uses line voltage for dual coil activation, saving wiring costs and resulting in a self-protecting voltage coil.

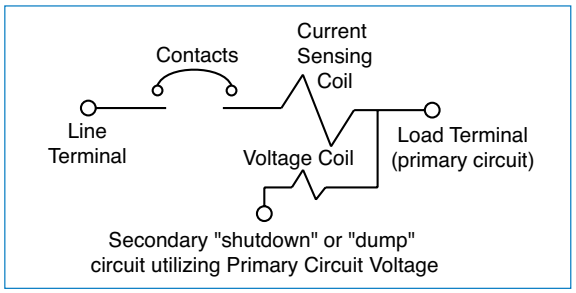


Figure 4 - Shunt trip dual coil

Switch only

Same as a series trip, but without a sensing coil. Provides low cost, heavy-duty switch capability when overload protection is not needed. 'Switch only' is available with and without an auxiliary switch (figure 5).

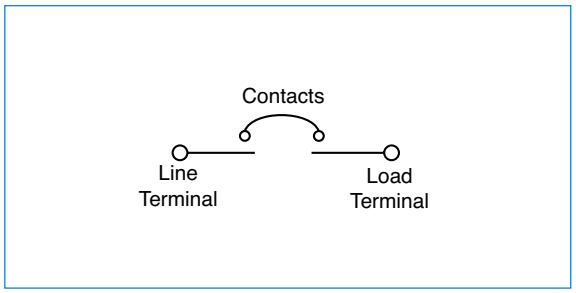


Figure 5 - Switch only

Shunt trip

A three terminal device similar to 'Series trip', but with the addition of a third terminal between the contacts and the coil. This circuit is usually used to control two separate loads (a&b) from the same power source, while sensing overload current in only one load (b). It should be noted that overload protection is not provided in the load (a) circuit, and if needed, must be provided by other means. Also, the sum of the current in circuit a & b must not exceed the contact rating of the device (figure 6).

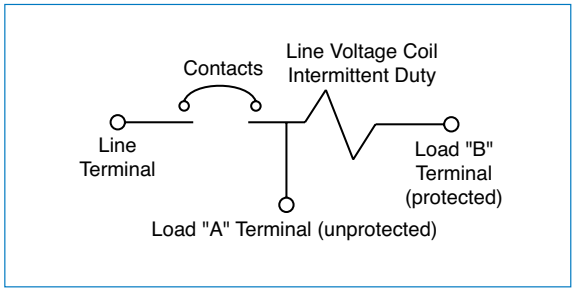


Figure 6 - Shunt trip

Time delays

The trip time of a hydraulic magnetic circuit breaker is directly related to the length of time it takes for the moving metal core to move to the full 'in' position.

If the delay tube is filled with air, the core will move rather quickly, and the breaker will trip quickly. This is characteristic of the ultrashort delay curves (figure 1).

Solid state devices, which cannot tolerate even short periods of current overload, should use Instantaneous curves (figure 2).

These curves have no intentional time delay. When the delay tube is filled with a light viscosity (temperature stable) fluid, the core's travel to the full 'in' position will be intentionally delayed. This results in the slightly longer medium delays (figure 3), which are used for general purpose applications.

When a heavy viscosity fluid is used, the result will be a long delay, such as figure 4. These curves are commonly used in motor applications to minimize the potential for nuisance tripping during lengthy motor start-ups.

By use of magnetic 'shunt' plates within the magnetic circuit, it is possible to divert magnetic flux resulting in higher 'inrush withstanding capability' (or high inrush delays). These delays disregard short duration, high pulse surges (typically 8ms or less and up to 25x rated current), characteristic of transformers, switching power supplies and capacitive loads (figure 5).

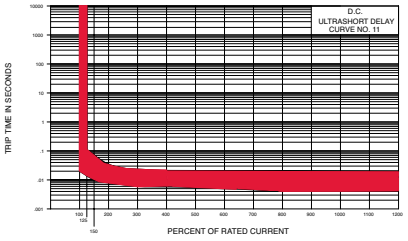


Figure 1 - Ultrashort delay curve

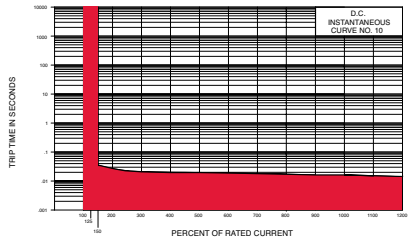


Figure 2 - Instantaneous curve

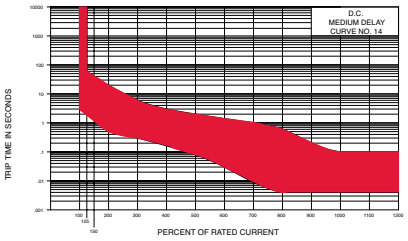


Figure 3 - Medium delay curve

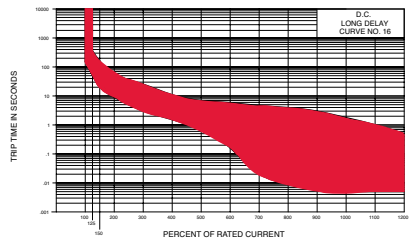


Figure 4 - Long delay curve

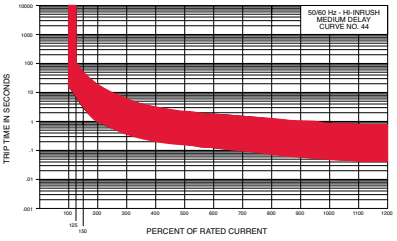


Figure 5 - Hi-inrush medium delay curve

SERVING SAFETY

Customized solutions

Perfect solutions

New built or retro-fit Mors Smitt will deliver a perfect and competitive on time solution for any onboard challenge of space limitations and / or technical requirement. In close co-operation with customers, the best configuration of power distribution, protection components such as miniature circuitbreakers, relays and contactors will be selected to
get the optimum result.

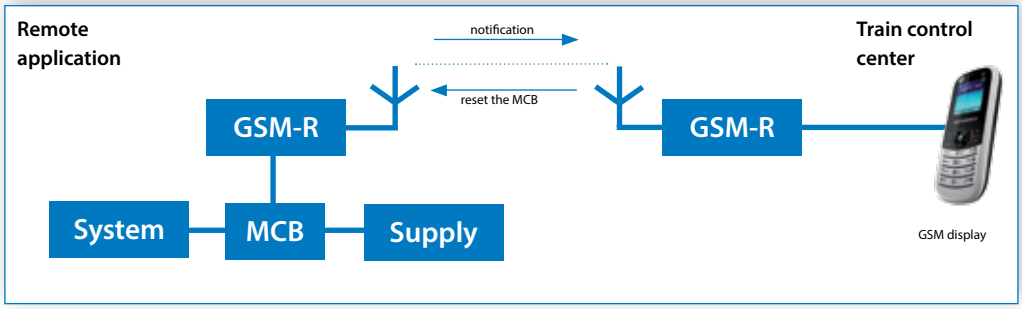
Application examples:

GFI (Ground fault detection)

For the London Sub Surface Line (SSL) Mors Smitt designed a GFI unit (Ground fault indicator). The GFI unit works together with a circuit breaker equipped with an additional voltage coil and detects unbalances between the 3 phases and ground. The GFI unit is connected to the voltage coil of the circuit breaker. When the voltage coil is energized the breaker will trip. When the GFI senses an unbalance the unit will trip the circuit breaker to disconnect application from the power supply to prevent any damage to the application.

Remote operated circuit breaker

Applications along the trackside are often on a big distance from the controlroom, so when a fault occurs the circuit breaker will trip and someone needs to go to the site to check and switch the installation back on again. A time consuming, expensive operation casusing long unnecesary downtime on the track for instance. Upon a failure just check the status and switch the MCB back on as tripping maybe caused by nuissance and not real problems. For ProRail in the Netherlands Mors Smitt designed a solution to control circuit breakers remotely.



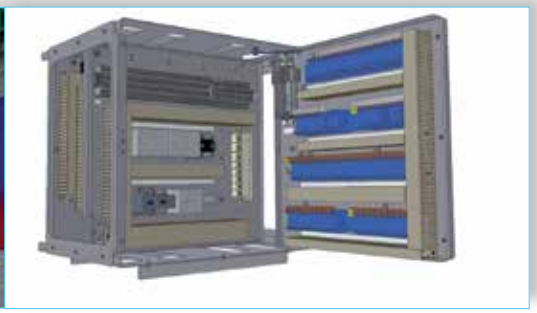
Reference projects

Sub Surface Line (SSL) - London

Together with Bombardier Transportation special electric power distribution panels (AC & DC) have been developed. A smart mechanical construction was designed for easy assembly and access under the seats in the train to optimize use of limited space .
A construction was selected where the earth leakage module is combined with circuit breakers to guarantee optimum user safety.

SEPTA Philadelphia

Especially for SEPTA Philadelphia Mors Smitt designed a solution with key points like low maintenance, plug and play installation and two sides accessible. Hyundai Rotem and Mors Smitt selected a configuration with circuit breakers, D-U relays and contactors in a square electrical distribution panel.



Selection table

Circuit breaker overview

	 AR	 CR	 ER	 FR	 GR	 RBR
Overcurrent protection	✓	✓	✓	✓	✓	✓
Remote operated						✓
Rated current	0.1 to 50 A	0.02 to 100 A	0.1 to 120 A	100 to 700 A	0.2 to 63 A	0.02 to 100 A
Panel mounting	✓	✓	✓	✓		✓
Wall mouning			✓			
35 mm rail mounting					✓	
Max. operating voltage DC	90	137.5	160	137.5	137.5	137.5
Max. operating voltage AC	227	484	625	277	484	484
Max. number of poles	6	6	6	3	4	3
Auxiliary or alarm contact available	✓	✓	✓	✓	✓	✓
See page	14	16	18	20	22	24

AR circuit breaker

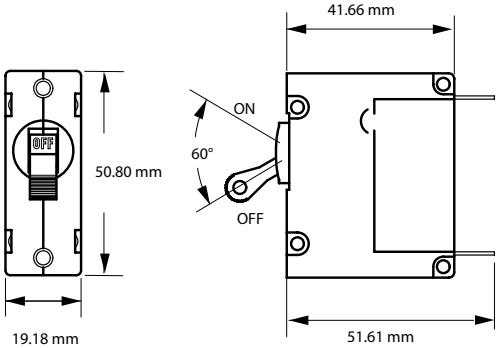
Panel mounting
Up to 6 poles

- Compact design
- Unique arc chute method which results in higher interrupting capacities
- Thermoset glass filled polyester halfshell construction for increased mechanical strength, electrical strength and to achieve highest level / rating on fire and smoke tests
- Standard blue housing and white handle to improve visibility
- Precise, temperature independent, operation
- Wide choice of time delays, terminal options and actuator colors
- The breakers can also be equipped with an optional mid-trip handle style actuator

Electrical characteristics

Application voltage	*DC for 1-6 poles*	*AC for 1-6 poles*
Rated voltage	12...72 VDC	12...251 VAC
Min. operating voltage	8.4 VDC	10.8 VAC
Max. operating voltage	90 VDC	277 VAC
	Remark: 8.4...80 VDC max 50 A, 80...90 VDC max 40 A	
Current ratings	0.1 - 50 A (other ratings on request)	
Standard voltage coils	6...65 VDC & 6...240 VAC	
Insulation resistance	Minimum 100 MΩ at 500 VDC	
Dielectric strength	1500 V 60 Hz for one minute between all electrically isolated terminals	
Max. interrupting capacity	UL 1077	7500 A @ 80 VDC, 0.1 - 50 A 3000 A @ 250 VAC, 0.1 - 50 A 5000 A @ 250 VAC, 0.1 - 50 A (with backup fuse) 5000 A @ 277 VAC, 0.1 - 30 A (with backup fuse)
	IEC 60934	3000 A @ 65 VDC, 0.1 - 50 A 5000 A @ 65 VDC, 0.1 - 50 A (with backup fuse) 1500 A @ 80 VDC, 0.1 - 50 A 3000 A @ 80 VDC, 0.1 - 50 A (with backup fuse) 3000 A @ 250 VAC, 0.1 - 50 A 5000 A @ 250 VAC, 0.1 - 30 A (with backup fuse)

Dimensions

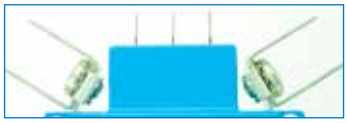


Mechanical characteristics

Endurance	10.000 On-off operations @ 6 per minute; with rated current & voltage
Trip free mechanism	All AR series circuit breakers will trip on overload, even when the actuator is forcibly held in the on position
Mid trip indication (optional)	The operating actuator moves positively to the off position when an overload causes the circuit breaker to trip. When mid-trip handle is specified, the handle moves to the mid position on electrical trip of the circuit breaker. When mid-trip handle with alarm is specified, the handle moves to the mid position & the alarm actuates when the circuit breaker is electrically tripped.

Terminals

Faston / tab 6.3 mm



Double faston / tab 6.3 mm + aux. switch

Stud M6

Other terminals availale. See AR series datasheets.

Handle

On and off switch

Black handle

Red handle

Other colours available. See AR circuit breaker datasheet.

Physical characteristics

Number of poles	1, 2, 3, 4, 5 or 6 poles. For DC and AC applications: 1-2 poles ≤ 50 A, 3-6 poles ≤ 30 A
Internal circuit	Series trip, shunt trip & switch only
Weight	Approx. 65 g/pole
Colours	Housing - blue, actuator - white with dual legends
Material	Half shell - BMC 605 Handle - Valox 420SEO UL94V0 Terminals - Brass with acid tin plate

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD G method 107 D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-3D test method Db variant 1
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP 40 when a panel is mounted over the circuit breaker
Moisture resistance / humidity	MIL-STD 202G method 106 D

More information on the circuit breakers is available on the datasheet on our website.
This datasheet also contains the ordering scheme.

CR circuit breaker

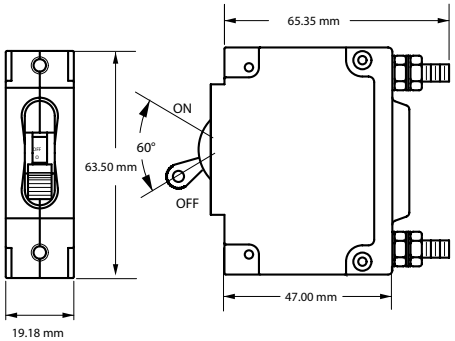
Panel mounting
Up to 6 poles

- Unique arc chute design which results in higher interrupting capacities
- Thermoset glass filled polyester halfshell construction for increased mechanical strength, electrical strength and to achieve highest level/rating on fire and smoke tests
- Wiping contacts - mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life
- Standard blue housing and white handle to improve visibility
- Available with metric threaded stud terminals and american standard terminals
- The breakers can also be equipped with an optional mid-trip handle style actuator
- 0.02 - 100 amps
- Precise, temperature independant, operation

Electrical characteristics

Application voltage	*DC for 1-6 poles*	*AC for 1 pole*	*AC for 2-6 poles*
Rated voltage	12...110 VDC	12...230 VAC	12...400 VAC
Min. operating voltage	8.4 VDC	10.8 VAC	10.8 VAC
Max. operating voltage	137.5 VDC	253 VAC	484 VAC
	Remark: 8.4...125 VDC max 100 A, 125...137.5 VDC max 70 A		
Current ratings	0.2...100 A (other ratings on request)		
Standard voltage coils	6...65 VDC / 6... 240 VAC (other ratings on request)		
Insulation resistance	Minimum 100 MΩ at 500 VDC		
Dielectric strength	5000 VAC 50/60 Hz for one minute between all electrically isolated terminals		
Max. interrupting capacity	UL 489	10000 A @ 80 VDC, 1 - 100 A	
	IEC 60077	5000 A @ 125 VDC, 1 - 70 A	
		4500 A @ 415 VAC, 1 - 60 A	
		4000 A @ 415 VAC, 61 - 100 A	
	IEC 60934	5000 A @ 80 VDC, 0.1 - 100 A	
		5000 A @ 125 VDC, 1 - 60 A	
		5000 A @ 250 VAC, 0.1 - 100 A	
	IEC 60947-2	6000 A @ 240 VAC, 1 - 70 A	
		4500 A @ 240 VAC, 71 - 100 A	
		6000 A @ 415 VAC, 1 - 30 A	
		4500 A @ 415 VAC, 31 - 70 A	

Dimensions



Mechanical characteristics

Endurance	20,000 On-off operations @ 6 per minute without current & voltage and 10,000 On-off operations with rated current & voltage
Trip free mechanism	Trips on short circuit overload, even when actuator is forcibly held in the On position.
Mid trip indication (optional)	The operating handle moves positive to the mid position and an auxiliary switch is actuated when an overload causes the circuit breaker to trip.

Terminals

Stud M5 or M6

Stud M5 or M6 + aux. switch

Shrouds (IP 20 protection)

Plug-in
Other colours available. See CR circuit breaker datasheet.

Handles

Small handle

On and off switch

Black handle

Red handle
Other colours available. See CR circuit breaker datasheet.

Physical characteristics

Number of poles	1, 2, 3, 4, 5 or 6 poles For DC & AC applications 1-2 poles ≤ 100 A, 3-6 poles ≤ 70 A
Internal circuit	Series trip, shunt trip, relay trip & switch only
Weight	Approx. 101 g/pole
Colours	Housing - blue, actuator - white with dual legends
Material	Half shell – BMC605 Handle – Valox 420SEO UL94V0 Terminals – Brass with acid tin plate

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD 107 D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-30 test method Db variant 1
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP 40 when a panel is mounted over the circuit breaker, when no panel is mounted IP20
Moisture resistance / humidity	MIL-STD 202G method

See page 26 for accessories for the CR circuit breakers.

More information on the circuit breakers is available on the datasheet on our website.
This datasheet also contains the ordering scheme.

ER circuit breaker

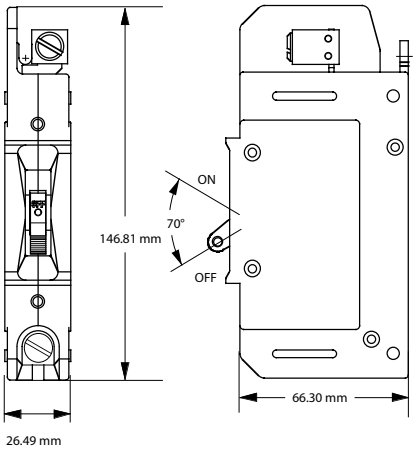
Higher voltage & current
Up to 6 poles

- Ideal for higher amperage applications
- Available with front and back mounting
- Heavy duty box wire connector for solid wire and a pressure plate connector for stranded wire
- Unique arc chute design, which results in higher interrupting capacities
- Thermoset glassfilled polyester halfshell construction for increased mechanical strength, electrical strength and to achieve highest level / rating on fire and smoke tests
- Wiping contacts, mechanical linkage with two-step actuation, cleans contacts, provides high, positive contact pressure & longer contact life
- Standard blue housing and white handle to improve visibility
- Precise, temperature independent, operation
- Large choice of time delays

Electrical characteristics

Application voltage	*DC for 1-6 poles*	*AC for 1 pole*	*AC for 2-6 poles*
Rated voltage	12...128 VDC	12...251 VAC	12...568 VAC
Min. operating voltage	8.4 VDC	10.8 VAC	10.8 VAC
Max. operating voltage	160 VDC	277 VAC	625 VAC
	Remark: 8.4...125 VDC max 120 A, 125...160 VDC max 100 A, 10.8...625 VAC max. 100 A		
Current ratings	0.1...120 A (other ratings on request) Remark: 4-6 poles max 100 A		
Insulation resistance	Minimum 100 MΩ at 500 VDC		
Dielectric strength	2200 VAC 50/60 Hz for one minute between all electrically isolated terminals		
Max. interrupting capacity	UL 1077	5000 A @ 160 VDC, 0.1 - 100 A 5000 A @ 277 VAC, 0.1 - 100 A 10000 A @ 277 VAC, 0.1 - 100 A (with backup fuse) 10000 A @ 600 VAC, 0.1 - 100 A (with backup fuse)	
	IEC 60934	5000 A @ 125 VDC, 0.1 - 100 A 5000 A @ 240 VAC, 0.1 - 100 A 4000 A @ 415 VAC, 0.1 - 100 A	
	IEC 6007	6000 A @ 125 VDC, 0.1 - 100 A	
	UEC60947-2	6000 A @ 240 VAC, 0.1 - 100 A	

Dimensions



Mechanical characteristics

Endurance	10.000 On-off operations with rated current & voltage
Trip free mechanism	All ER circuit breakers will trip on overload, even when the actuator is forcibly held in the on position
Trip indication	Standard trip indication, the operating actuator moves positively to the off position when an overload causes the breaker to trip.

Terminals

Box terminals

Stud M6

Many other terminals availale.
See ER circuit breaker datasheet.

Physical characteristics

Number of poles	1 - 6 poles
Mounting	A 7.62 mm (3") minimum spacing must be provided between the circuit breaker arc venting area on back connecting ER series circuit breakers and grounded obstructions. ER series circuit breakers must be mounted on a vertical surface.
Connectors, box type	Front connected ER series circuit breakers are supplied with box type pressure connectors that accept copper or aluminium conductors as follow: 1/0 - 14 copper, 1/0 - 12 aluminium.
Internal circuit	Series trip, shunt trup, elay trip & switch only
Weight	Approx. 252 g/pole
Colours	Housing - blue, actuator - white with dual legends
Material	Half shell – BMC605 Handle – Valox 420SEO UL94V0 Terminals – Brass with acid tin plate

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD 202G method 107D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-30 test method Db variant 1
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP40 when a panel is mounted over the circuit breaker
Moisture resistance / humidity	MIL-STD 202G method 106D

More information on the circuit breakers is available on the datasheet on our website.
This datasheet also contains the ordering scheme.

FR circuit breaker

Panel mounting
Up to 3 poles

- Unique arc chute design which results in higher interrupting capacities
- Thermoset glass filled polyester halfshell construction for increased mechanical strength, electrical strength and to achieve highest level/rating on fire and smoke tests
- Wiping contacts - mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life
- Standard blue housing and white handle to improve visibility
- The breakers can also be equipped with an optional mid-trip handle style actuator
- 100-700 amps
- Precise, temperature independant, operation

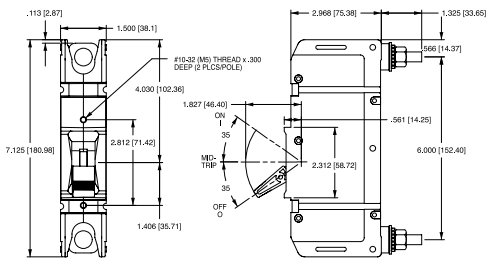
Electrical characteristics

Application voltage	*DC for 1-3 poles*	*AC for 1-3 pole*
Rated voltage	12...110 VDC	12...251 VAC
Min. operating voltage	8.4 VDC	10.8 VAC
Max. operating voltage	137.5 VDC	277 VAC
	Remark: DC applications: max. 250 A for 1 pole ,300 A - 450 A for 2 poles (parallel pole construction), 500 A - 700 A for 3 poles (parallel pole construction) AC applications: max. 250 A for 1-3 poles	
Current ratings	100...700 A (other ratings on request)	
Insulation resistance	Minimum of 100 MΩ @ 500 VDC	
Dielectric strength	1960 VAC, 50/60 Hz for 1 minute between all electrically isolated terminals	
Max. interrupting capacity	IEC 60947-2	25000 A @ 125 VDC, 50 - 250 A
	UL 489	50000 A @ 125 VDC, 50 - 250 A
		10000 A @ 277 VDC, 100 - 250 A
	UL489A	50000 A @ 125 VDC, 251 - 700 A

Mechanical characteristics

Endurance	Single or multipole: 8.000 operations @ 5 per minute (4.000 "ON-OFF" operations with rated current and voltage + 4.000 operations with no load). Parallel pole construction: 1.000 operations with rated current and voltage @ 5 per minute.
Trip free mechanism	Trips on short circuit overload, even when actuator is forcibly held in the On position.
Mid trip indication (optional)	The operating handle moves positive to the mid position and an auxiliary switch is actuated when an overload causes the circuit breaker to trip.

Dimensions



Physical characteristics

Number of poles	1, 2 or 3 poles
Internal circuit	Series trip
Weight	Approx. 950 g/pole
Colours	Housing - blue, actuator - black or white with dual legends
Material	Half shell – BMC605 Handle – Valox 420SEO UL94V0 Terminals – Brass with acid tin plate

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-PRF-55629, MIL-STD 202
Salt mist	MIL-PRF-55629, MIL-STD 202
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP 40 when a panel is mounted over the circuit breaker
Moisture resistance / humidity	MIL-PRF-55629, MIL-STD 202

More information on the circuit breakers is available on the datasheet on our website.
This datasheet also contains the ordering scheme.

GR circuit breaker

35 mm rail mounting
Up to 4 poles

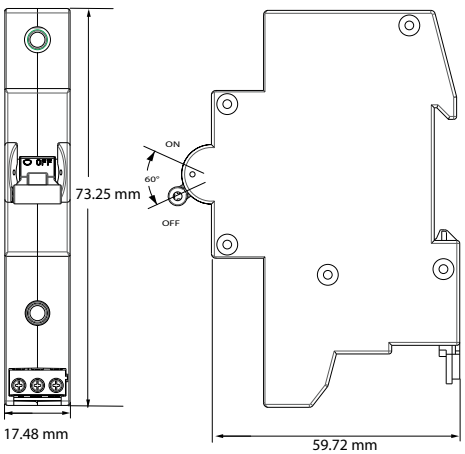
- Integrated auxiliary change over contacts are optional (pre-mounted)
- 0.2 - 63 Amps
- Optional mid-trip handle style actuator
- Precise, temperature independant, operation
- Wiping contacts - mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life
- Standard blue housing and white handle to improve visibility

Electrical characteristics

Application voltage	*DC for 1-4 poles*	*AC for 1-2 poles*	*AC for 3-4 poles*
Rated voltage	12...110 VDC	12...240 VAC	12...440 VAC
Min. operating voltage	8.4 VDC	10.8 VAC	10.8 VAC
Max. operating voltage	137.5 VDC	264 VAC	484 VAC

Current ratings	0.2 - 63 A, polarity insensitive (except 1-pole DC)	
Insulation resistance	Minimum 100 MΩ at 500 VDC	
Dielectric strength	3000 V 50/60 Hz for one minute between all electrically isolated terminals	
Max. interrupting capacity	IEC 60077	3000 A @ 137.5 VDC, 63 A (1-pole) 5000 A @ 137.5 VDC, 63 A (2-pole) 5000 A @ 264 VAC, 63 A (1- or 2-pole) 4000 A @ 484 VAC, 63 A (3- or 4-pole)
	IEC 60947-2	10000 A @ 63 VDC, 63 A (1-pole) 2500 A @ 116 VDC, 63 A (1-pole) 8200 A @ 116 VDC, 63 A (2-pole) 5000 A @ 252 VAC, 63 A (1-pole) 4000 A @ 462 VAC, 63 A (3- or 4-pole) 4000 A @ 572 VAC, 10 A (2-pole)

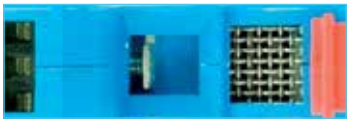
Dimensions



Mechanical characteristics

Endurance	10.000 On-off operations with rated current & voltage.
Trip free mechanism	Trips on short circuit, overload, even when actuator is forcibly held in the on position.
Mid trip indication (optional)	The operating handle moves positively to the mid position and an auxiliary switch is actuated when an overload causes the circuit breaker to trip.

Terminal



Box terminals with pressure plate

Physical characteristics

Number of poles	1, 2, 3 or 4 poles
Auxiliary contacts	Captive screws or with Combicon connection
Mounting	35 mm rail. Lock is located at bottom of circuit breaker (load terminal side) when mounted vertical.
Weight	Approx. 135 g
Colours	Housing - blue, actuator - white with dual legends
Material	Half shell – BMC605 Handle – Valox 420SEO UL94V0 Terminals – Brass with acid tin plate

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD 202G method 107D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-30 test method Db variant 1
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP40 when a panel is mounted over the circuit breaker, IP20 when no panel is mounted
Moisture resistance / humidity	MIL-STD 202G method 106D

See page 27 for accessories for the GR circuit breakers.

More information on the circuit breakers is available on the datasheet on our website. This datasheet also contains the ordering scheme.

RBR circuit breaker

Remote operated
Up to 3 poles

- On / off and trip indication
- Load shedding
- Energy management
- Compact size
- Automatic reset capable
- Choice of interface styles
- Panel mounting
- Manual operation override
- Fits into industry standard cut-out

The RBR remote operated circuit breaker combines the convenience of remote on, off and reset capability with the safety and accuracy of a standard magnetic current sensing device.

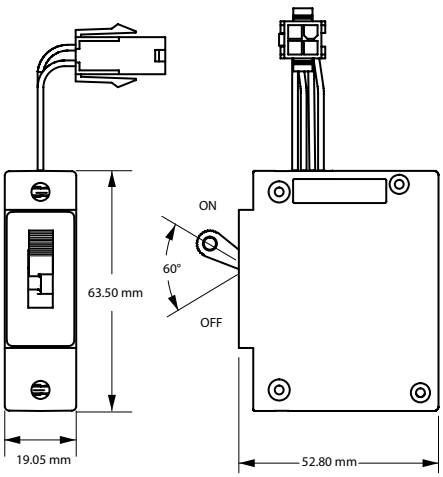
Thus allowing operation of the breaker from various locations in a system, facility or site (while not sacrificing the ability to manually operate the breaker if required). With the RBR service, diagnostics, load shedding and power distribution control functions can now be performed in areas that were previously unattended, inaccessible or unsafe.

The RBR module allows remote operation of CR series panelmount breakers, (up to 3 poles) through hard wiring with a single pole, double throw switch connected to a standard power source, or more sophisticated relay and modem networks.

Electrical characteristics

Application voltage	*DC for 1-6 poles*	*AC for 1 pole*	*AC for 2-6 poles*
Rated voltage	12...110 VDC	12...230 VAC	12...400 VAC
Min. operating voltage	8.4 VDC	10.8 VAC	10.8 VAC
Max. operating voltage	137.5 VDC	253 VAC	484 VAC
	Remark: 8.4...125 VDC max 100 A, 125...137.5 VDC max 70 A		
Current ratings	0.2...100 A (other ratings on request)		
Standard voltage coils	6...65 VDC / 6... 240 VAC (other ratings on request)		
Insulation resistance	Minimum 100 MΩ at 500 VDC		
Dielectric strength	5000 VAC 50/60 Hz for one minute between all electrically isolated terminals		
Max. interrupting capacity	UL 489	10000 A @ 80 VDC, 1 - 100 A	
	IEC 60077	5000 A @ 125 VDC, 1 - 70 A	
		4500 A @ 415 VAC, 1 - 60 A	
		4000 A @ 415 VAC, 61 - 100 A	
	IEC 60934	5000 A @ 80 VDC, 0.1 - 100 A	
		5000 A @ 125 VDC, 1 - 60 A	
		5000 A @ 250 VAC, 0.1 - 100 A	
	IEC 60947-2	6000 A @ 240 VAC, 1 - 70 A	
		4500 A @ 240 VAC, 71 - 100 A	
		6000 A @ 415 VAC, 1 - 30 A	
		4500 A @ 415 VAC, 31 - 70 A	

Dimensions



Mechanical characteristics

Endurance	20,000 On-off operations @ 6 per minute without current & voltage and 10,000 On-off operations with rated current & voltage
Trip free mechanism	Trips on short circuit overload, even when actuator is forcibly held in the On position.
Mid trip indication (optional)	The operating handle moves positive to the mid position and an auxiliary switch is actuated when an overload causes the circuit breaker to trip.

Terminals

Stud M5 or M6

Stud M5 or M6 + aux. switch

Many other terminals available.
See RBR circuit breaker datasheet.

RBR motor specifications

Interface options	- Flying leads - Integral connector - Flying lead with 4 pin dual row connector
Voltage input	12 VDC, 20-40 VDC, 41-80 VDC
Start current	< 1 A
Switching time	< 2 s

Physical characteristics

Number of poles	Up to 3 poles
Internal circuit	Series trip, switch only, shunt trip
Colours	Housing - blue, actuator - white with dual legends
Material	Half shells – BMC605 Handle – Valox 420SEO UL94V0 Terminals – Brass with acid tin plate

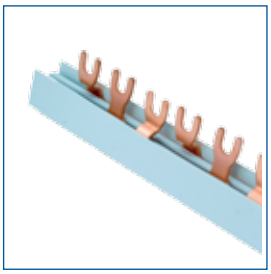
Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD 107 D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-30 test method Db variant 1
Fire and smoke	NF F16-101, NF F16-102, EN 45545-2
Protection	IEC 60529, IP 40 when a panel is mounted over the circuit breaker, when no panel is mounted IP20
Moisture resistance / humidity	MIL-STD 202G method

More information on the circuit breakers is available on the datasheet on our website.
This datasheet also contains the ordering scheme.

Accessoires

CR circuit breakers

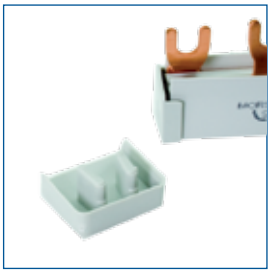


Busbar up to 80 A, fork type, 1m

Article number	*Phase*	*Poles*
631312152	1	52
631312252	2	52
631312351	3	51

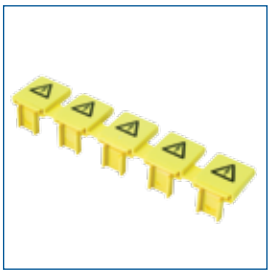
Feeding terminal, external, fork type

Article number:
631910001



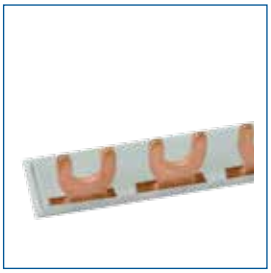
Endcap for busbar, fork and pin, 16 mm²

Article number	*Phase*
631912160	1
631912360	2 & 3



Touch protection, to cover free busbar connectors,yellow (1004), set of 5 caps

Article number
631910000



Corner shaped busbar, 1 phase, 63 A

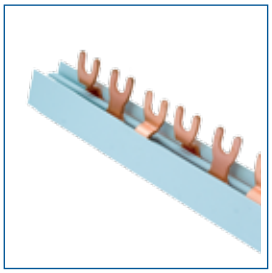
Article number	*Poles*		
631311102	*2*	*631311108*	*8*
631311103	*3*	*631311109*	*9*
631311104	*4*	*631311110*	*10*
631311105	*5*	*631311111*	*11*
631311106	*6*	*631311112*	*12*
631311107	*7*	*631311153*	*53*

Handle lock with locking ring

Article number	*Colour*
631310001	Red
631310002	Black
631312003	White

Accessoires

GR circuit breakers

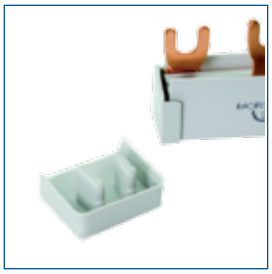


Busbar up to 63 A, fork type, 1 m

Article number	*Phase*	*Poles*
631911256	*2*	*56*
631911357	*3*	*57*

Busbar up to 80 A, fork type, 1 m

Article number	*Phase*	*Poles*
631912157	*1*	*57*
631912256	*2*	*56*
631912357	*3*	*57*
631912456	*4*	*56*

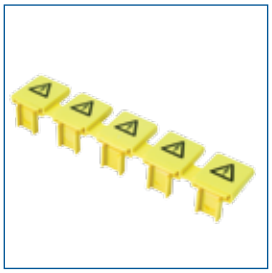


Endcap for busbar (fork and pin, 10 mm²)

Article number	*Phase*
631911260	*2*
631911360	*3*

Endcap for busbar (fork and pin, 16 mm²)

Article number	*Phase*
631912160	*1*
631912360	*2&3*
631912460	*4*

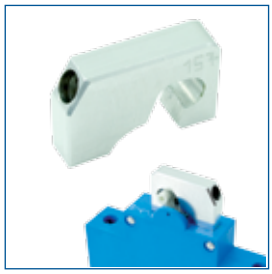


Touch protection, to cover free busbar connectors,yellow (1004), set of 5 caps

Article number
631910000

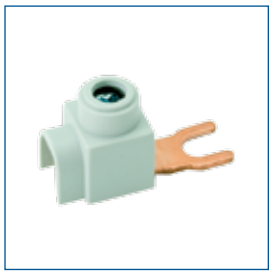
Single phase corner shaped busbar, 63 A

Article number	*Poles*
631911163	3
631911164	4
631911165	5
631911166	6
631911167	7
631911168	8
631911169	9
631911170	10
631911171	11
631911172	12



Handle lock

Article number	*Colour*
631910007	*Alluminium*



Feeding terminal, external fork, insulated

Article number
631910001

Feeding terminal, external pin, insulated

Article number	
631910002	*Short pin*
631910003	Long pin

Feeding terminal, external pin, insulated

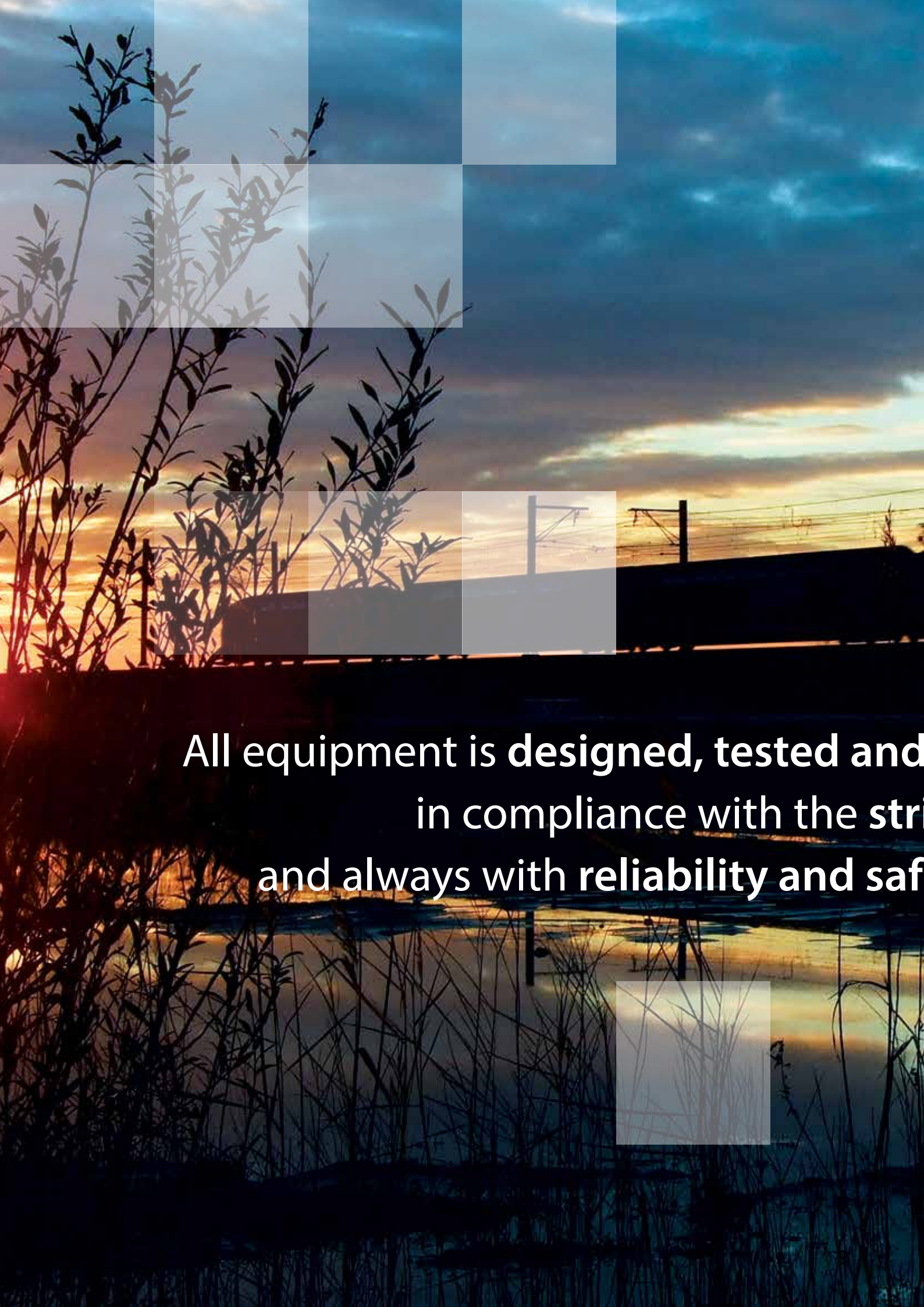
Article number	
631910004	*Side connected*

Feeding terminal, external pin, insulated

Article number	
631910005	*Screw connected, with 3 front connectors*

Busbar feeding terminal, connects stranded wires to busbar

Article number	
631910006	*Side by side, stackable*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