Heinemann® PROPAK Series
Circuit Protectors

ISO 9001/14001 Certified

Hydraulic-Magnetic Circuit Breakers

«All electrical circuits and electrical equipment have to be protected against short circuits or voltage surges which can destroy the equipment or put other nearby or interconnected equipment out of service. The serious consequences resulting from electrical failure, whether human or financial in nature, can be avoided by the means of protection as describeb hereafter. The devices currently used are the following:»

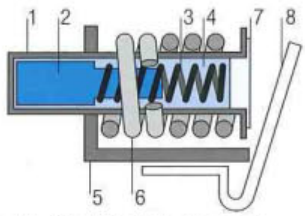


Fig. 3 Circuit breaker with no load

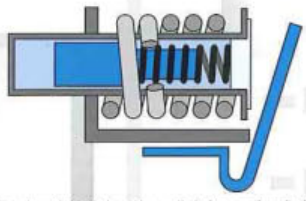


Fig. 4 Circuit breaker slightly overloaded

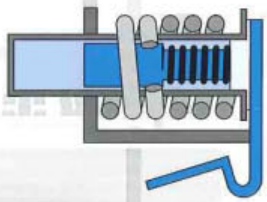


Fig. 5 Circuit breaker overloaded

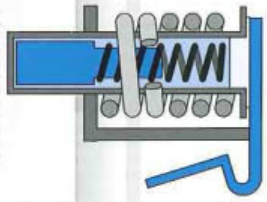


Fig. 6 Circuit breaker severely overloaded

Hydraulic-Magnetic parts of the circuit breaker:

1 Tube
2 Core
3 Spring
4 Fluid
5 Frame
6 Coil (sensor)
7 Pole piece
8 Armature.

The four figures below show the circuit breaker under four load status, as follows:

Hydraulic-Magnetic Circuit Breakers

With these protection devices, tripping of the circuit breaker results from changes in the magnetic field of a coil through which the current flows; **this is the principle of the electromagnetic relay.** The coil is wound on a sealed, non-ferrous tube which is filled with a silicone fluid. Inside there is a movable core held under the tension of a spring. This tube is an integral part of the magnetic circuit and the silicone fluid regulates the movement of the core. The principle of operation is illustrated in Figures 3 to 6.

At normal current or less, the magnetic field is not strong enough to move the core. During a small overload, the reluctance falls and the strength of the magnetic field increases and attracts the core towards the armature (Figure 4). The magnetic flux developed is proportional to the current and becomes sufficient to counteract the effect of the spring. The viscosity of the silicone fluid regulates the motion of the core thereby providing a required time delay, which is inversely proportional to the overload current.

When the magnetic flux reaches a predetermined value, the core is attracted towards the pole at a speed which is dependent on the viscosity of the fluid Figure 5). The reluctance of the magnetic circuit is then greatly reduced, the armature falls on to the pole there by breaking the circuit.
In the event of a large overload or of a short circuit, the magnetic field generated by the coil is in itself sufficient to attract the armature without the position of the core being changed. Tripping is therefore

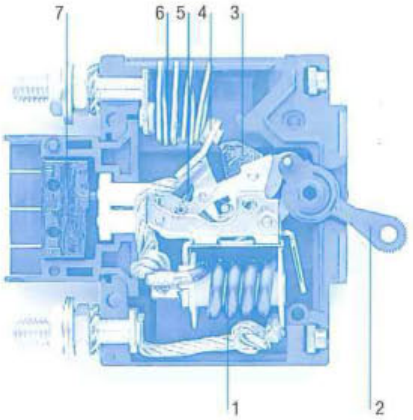


Fig. 7 Hydraulic-Magnetic Circuit Breaker

1 Solenoid
2 Two position lever
3 Balanced armature
4 Self-cleaning contact
5 Free-trip mechanism
6 Spark quenching chamber
7 Auxiliary contact (optional)

instantaneous (Figure 6). **In comparison to thermo-magnetic circuit breakers the must trip point does not change with the ambient temperature.**

The tolerance (minus 0 % to + 25 %) of the must trip point is considerably closer controlled than fuses or thermal breakers. **Furthermore, the hydraulic-magnetic circuit breaker can be re-closed immediately after removal of the fault whereas the thermal circuit breaker can only be re-closed after cooling.**
On the other hand, the time delay is modified as a result of the temperature because of the variation in viscosity of the fluid used. The change is inversely proportional to the temperature, circuit breaking will be faster at high temperature thereby raising safety margins. Figure 7 shows the most important components of a hydraulic-magnetic circuit breaker. By varying wire diameter and the number of turns in the coil, the circuit breaker's nominal trip current can be determined.

In principle, any value between 10 mA and 1200 A can be obtained. The fluid viscosity will determine the circuit

breaker's response time. It is of course possible to envisage a circuit breaker which trips instantly, in which the fluid will then be replaced by an iron cylinder. Mechanical circuit breaking devices have been developed in such a way that breaking the circuit cannot be prevented from outside the device, and manual re-closure in the event of a short circuit is rendered impossible. **The circuit breaker is fitted with a lever which acts as a manually operated switch having just two positions, "open" or "closed"**. This makes it possible to see if the circuit has been broken or not, without any chance of confusion.

General Characteristics of Hydraulic-Magnetic Circuit Breakers

NOMINAL CURRENT *(In)* *In*, is the current which the circuit breaker must stand over an indefinite period. In excess of 125 % of *In*, the circuit breaker must open within a specified time delay. Any current is permitted within the extreme limits of each device type. Any change in the way the device is mounted as compared with that specified in the catalogue may lead to changes in the trip parameters. If this variation (a small percentage only) is unacceptable this can be taken into account during manufacture and the circuit breaker will be adjusted accordingly.

NOMINAL VOLTAGE *(Un)* *Un* is the working voltage across the open-circuited circuit breaker terminals.

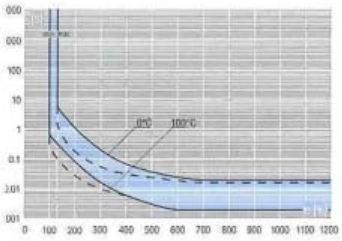


Fig. 8 Time delay graph for the hydraulic-magnetic circuit breakers

TIME DELAY Various selections of time delays are offered for most circuit breakers (see catalogues for graphs). In general, they show a graph on which one axis is graduated in percentages of *In*, and the other axis in seconds. The shortest trip time is limited to a few milliseconds due to inertia in the switching mechanism. For a value corresponding to 125 % of *In*, a trip delay time of up to three minutes can be achieved.

Figure 8 shows a typical graph for a hydraulic-magnetic circuit breaker in which **the tight tolerance of tripping times is evident.** The graph plotted with an unbroken line shows the time delays at a temperature of 0° C, while the broken line indicates values valid at 100° C. This variation is insignificant in comparison to those of thermal circuit breakers.

INTERRUPTING CAPACITY It is the highest current that the device can break at the nominal voltage without any damage. In practice, the highest current flow takes place when the conductors normally connected to the circuit breaker are short circuited. Trip speed, material used for the contacts, and the operating voltage, are the determining factors of interrupting capacity.

To increase its value, spark quenching surfaces are used inside the chamber where arcing occurs, in order to reduce the strength and duration of the arc. If the interrupting capacity or breaking current is exceeded, the arc could destroy the circuit breaker because of the resultant overheating. Depending of the size of the circuit breaker, interrupting capacities from 1000 A to 25 000 A can be achieved.

APPROVALS AND APPLICATIONS In most cases, users require protection equipment to be manufactured conform to the current norms and regulations in force. It is for this reason that catalogues refer to various standards, such as UL, CSA or VDE to quote some of the most common. Such standards confirm that certain parameters or essential safety standards, such as dielectric and mechanical strengths, electrical resistance, etc., are met by the manufacturer.

A SPECIAL CIRCUIT In the first part of this leaflet normal circuit protectors have been presented: a special circuit will be described now: the **«High-Inrush»** system.

«High-Inrush» Circuit Breakers

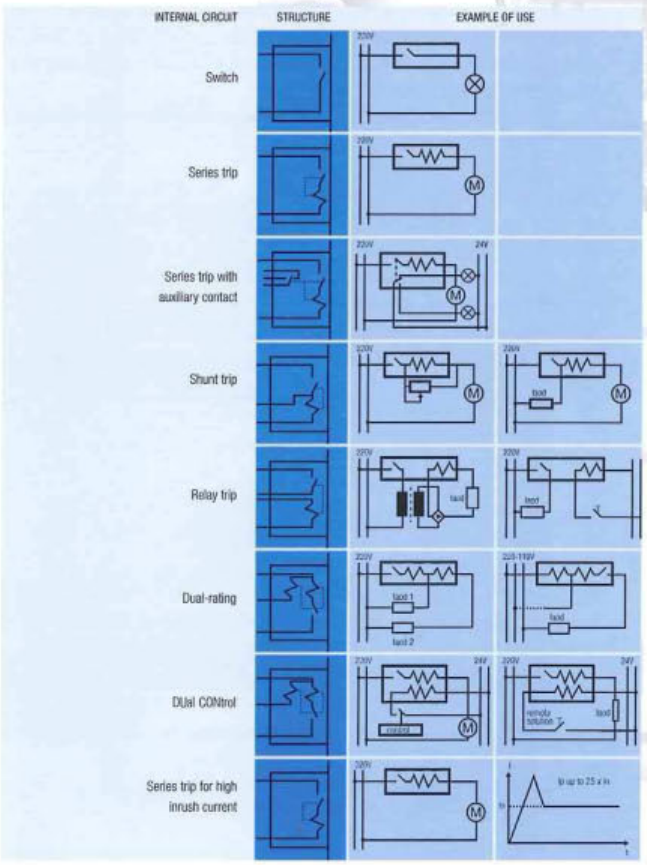
The manufacture of circuit breakers for high trip currents, known as "High-Inrush" devices, is based on the same hydraulic-magnetic principle described above, and has been used successfully by our company for many years.

This special operation ensures not only complete safety against overheating of machines, motors, transformers, etc., but also **avoids spontaneous tripping on start-up or shutdown of circuits.**

The addition of a magnetic squench to the coil system allows this type of circuit breakers to **withstand without nuisance tripping a current surge of up to 22 times the nominal value for a period of one half cycle at 50 Hz,** or 25 times the nominal value for a period of one half cycle at 60 Hz, whilst maintaining normal overload and short circuit protection.

Among the most frequently encountered applications are the protection of transformers, motors, power supplies of direct current to a highly capacitive or inductive load and fluorescent lamp circuits. The common feature of all these applications is a very high start-up or shutdown current. Start-up of a motor, depending on its type of power, may result in a current of 150 % to 600 % of the nominal value for a period of 0.1 to 2 seconds. Similarly, the switch-on current of a transformer is likely to exceed twenty times its nominal value for a few milliseconds.

INTERNAL CIRCUITS **The hydraulic-magnetic circuit breakers offer various internal configurations making them ideally suited for a wide range of applications.** A summary of possible applications for these circuit breakers is presented below.



NB: The above internal circuits are not applicable for all circuit breaker series.

Hydraulic-Magnetic Circuit Breakers

For all these applications, Heinemann is able to offer a range of suitable time delay curves, designed to resolve every problem presented by high transient currents (see Figure 10.)

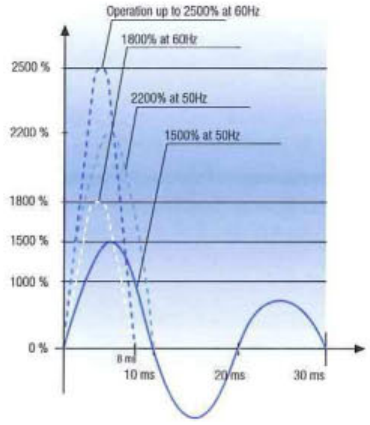


Fig. 10 Graphs of possible transient conditions

How to choose the right Circuit Breaker

In order to choose the appropriate circuit breaker and time delay for each application the user needs to be aware of, or to determine the following:

1. The nominal current of the *In* circuit. This value allows the appropriate circuit breaker to be selected from the manufacturer's catalogue. The JS type will be taken, for example, for nominal AC currents up to 50 A, and AS type for currents reaching 100 A. The value of *In* also determines the circuit breaker's nominal current.
2. Maximum overcurrent *Ip* at switch-on or shut-down and its duration *tp*.
3. The maximum time *tm* during which the protected circuit can stand a specified load.
4. For motor protection, it is also necessary to know the locked rotor (start/stall) maximum current *Ib*, as well as the time period *tb*, during which the motor can stand this without damage.
5. In order to choose the frame size and the interrupt capacity current it is important that the maximum potential short circuit is known.

With all this information, it is then possible to determine the most suitable time delay from the catalogue.

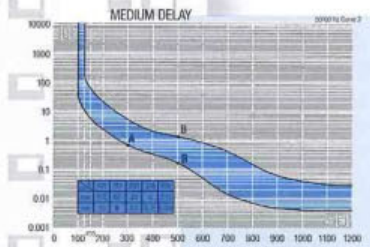


Fig. 11 Time delay graph for the motor cicuit breaker

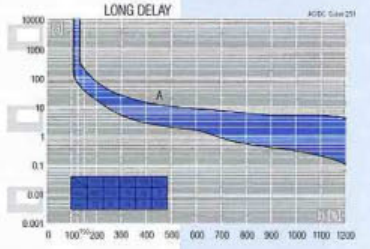


Fig. 12 Time delay graph for the lamp cicuit breaker

As an example, let us establish the appropriate parameters for a circuit breaker intended to protect a circuit containing a projector fitted with an incandescent lamp and a cooling fan. The following values relate to the fan:

- nominal current *In* = 4 A at 230 V/50 Hz
- start-up current *Ip* = 14 A for 0.5 s *(tp)*
- locked rotor current *Ib* = 22 A, time limit *tb* = 1.5 s

Concerning tbe lamp circuit, this has to be broken within 20 seconds in the event of a short circuit current reaching 50 A. Nominal current *In* is 10 A at 220 V/50 Hz. Switch on current *Ip* of the lamp is 240 A for about 4 ms (tp lamp).

Taking these facts into account, the JS type circuit breaker will be chosen to protect both circuits. The nominal current *In* of the circuit breaker will be 4.6 A allowing possible variations in the supply voltage of ± 15 %.

The study of the time delay curves given in the catalogue will result in selection of the curves shown in Figure 11. On start-up it can be seen that at 300 % of *In* (14:4.6 represents 300 %), the circuit breaker will trip after 0.6 s, maximum (point A, Figure 11). In the event of a locked rotor when *Ib* is five times greater than *In*, the circuit breaker trips between 0.15 and 1.5 seconds and therefore is fast enough (point B, Figure 11).

With regard to the lamp circuit, taking into account the same comments made for the fan circuit, the nominal current *In* will be 11.5 A. At 50 A or 430 % of the value of *In*, the circuit breaker must trip after no more than 20 seconds (point A, Figure 12). The start-up current is 21 times greater than *In*. The curve shown in Figure 12 meets this requirement.

In conclusion, it can be stated that Heinemann hydraulic-magnetic circuit breakers offer **reliable and efficient circuit and equipment protection** and are notable for their **ease of installation and connection.** This allows them to be **used in many different fields and applications, ranging from computer systems, telecommunication, industrial applications, robots, to marine, rail and air transportation.**

Heinemann® PROPAK Series Circuit Protectors (0.1 à 20 A AC/DC)

GENERAL POINTS

Heinemann ® wrote the book on the HYDRAULIC MAGNETIC CIRCUIT BREAKERS by patenting the original technology back in 1932. Today, Eaton Corporation, through its Electrical Division continues the tradition of technical leadership by introducing the latest innovation in the evolution of the hydraulic magnetic circuit breaker, the rugged and versatile Propak Series.
The Propak is designed to be a "World Product" and solve the toughest equipment circuit protection problems around the globe. It combines the proven high quality and reliability of the current Propak Series with the spacing, dielectric and interrupt requirements of International Standards.

PROPAK SERIES CHARACTERISTICS

- 1 and 2 pole models
- Short, medium, or instantaneous response times to accurately match load conditions.
- Auxiliary switch for signaling
- Current range up to 20 A à 50/60 Hz and DC
- Available with AC/DC rating
- Common trip on multipole breakers
- Shock, vibration, humidity and moisture according to MIL-STD
- Illuminated handle (LED or Neon)
- Various colors of handle available

Multi-Pole Trip Construction

2 Pole breakers incorporate true common trip construction. When an overload condition occurs on any pole, the mechanism of that pole actuates an internal tripper bar which is connected to and operates all poles simultaneously. Thus an overload condition on any pole causes all poles to trip.

Approximate Weights

1 pole, 30g.
2 poles, 60g.

Dielectric Strength

2000 V AC 50/60 Hz; tested in accordance with MIL-STD-202, Method 301.

Insulation Resistance

100 M Ω minimum at 500 V DC, per MIL-STD-202, Method 302.

Flammability Specifications

UL 94-VO, UL 94-HB

APPROVALS

The Propak Series is UL 1077 Recognized it is the solution for demanding AC and DC applications requiring 1k amps interrupting capacity and CSA C 22.2 certified (Canadian Standards Association) for industrial controls. The Propak is also approved according the European Standard for Circuit Breakers for Equipment (CBE), EN 60934.

PROTECTIONS

Humidity

Tested in accordance with MIL-STD-202, Method 103, test condition B.
Provided by treating all ferrous parts with a special moisture resistant finish and by using special springs and inherently fungus-resistant cases, covers and handles.

Shock

Tested for shock in accordance with MIL-STD-202, Method 213, test condition A (50 G, at 11 milliseconds.

Vibration

Tested for vibration in accordance with MIL-STD-202, Method 204; 10 to 55 Hz, 0,76 mm total excursion on three mutually perpendicular planes. Shock and vibration tests are conducted with breakers carrying full rated current. Shock and vibration specifications apply to time-delay breakers only.

Life

Breakers are subjected to an endurance test consisting of 30'000 On/Off operations; 10'000 at rated current and voltage, 20'000 at no load.

Impedance

(Internal Resistance)
See impedance chart on page 8.

Heinemann® PROPAK Series Circuits Protectors

Specifications

TECHNICAL CHARACTERISTICS	
Temperature	- 40° C + 60° C
Humidity	IEC 68-2-3 and MIL - STD - 202 Method 103 Test B
Protection	IEC 529 IP 00 Back terminals sealing IP 40 Front sealing
Shock	IEC 68-2-27 MIL - STD - 202, Method 213 50 G, 11 ms, test A
Vibration	IEC 68-2-6 MIL - STD - 202, Method 204 10 to 55 Hz amplitude 0,76 mm
Life	Electrical: 10 000 switching operations Mechinal: 20 000 switching operations
Approx. weights	1 pole 30 g 2 poles 60 g
Approvals	UL CSA and VDE
Dielectric strength **Insulation resistance**	2 000 V AC 50/60 Hz 100 Megaohms under 500 V DC
Auxiliary switches **Rated current**	125 V AC : 3 A (resistive) 30 V DC : 2 A (resistive)
Time delay	Curves P, 2, 3
Method of operation	S
Method of tripping	HM
Degree of trip-free	Trip-free (positively trip-free)

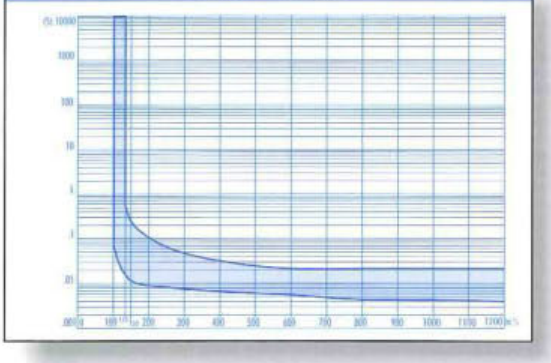
Remark: After use of circuit protector when scraped the law of the country will apply.

TRIP CURVE

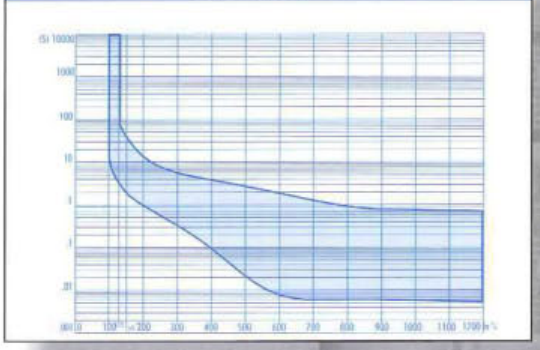
Time Delay Curves

INRUSH	Delay	100%	135%	150%	200%	400%	600%	800%	1000%	1200%
50/60 or DC	2	No trip	3 - 70	2 - 40	1 - 15	0.1 - 4	0.01 - 2	0.007 - 0.8	0.007 - 0.8	0.007 - 0.8
5x	3	No trip	0.3 - 7	0.2 - 5	0.1 - 2	0.03 - 0.5	0.01 - 0.3	0.007 - 0.15	0.007 - 0.15	0.007 - 0.15
50/60 or DC	2	No trip	3 - 70	2 - 40	1 - 15	0.1 - 4	0.01 - 2	0.007 - 0.8	0.007 - 0.8	0.007 - 0.8
10x	3	No trip	0.3 - 7	0.2 - 5	0.1 - 2	0.03 - 0.5	0.01 - 0.3	0.007 - 0.15	0.007 - 0.15	0.007 - 0.15
AC/DC	2	No trip		2 - 40	1 - 15	0.1 - 4	0.01 - 2	0.007 - 0.8	0.007 - 0.8	0.007 - 0.8
50/60 or DC	P Instantaneous Delay	No trip	0.015 - 0.5	0.01 - 0.25	0.009 - 0.1	0.006 - 0.03	0.005 - 0.02	0.004 - 0.02	0.004 - 0.02	0.004 - 0.02

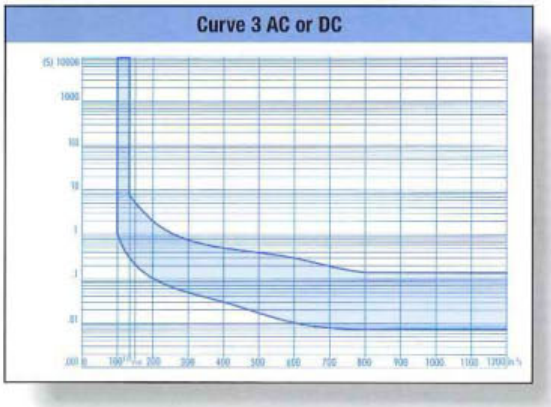
Curve P AC or DC



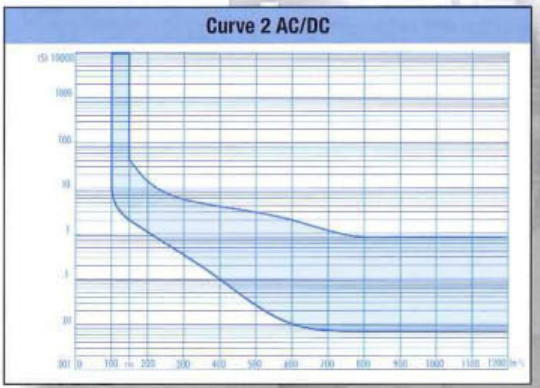
Curve 2 AC or DC



Curve 3 AC or DC



Curve 2 AC/DC



Tripping specifications

All curves describe breaker responses without preloading. Curves are plotted at an ambient temperature of 25°C, with breakers in the standard wall-mount position.

All circuit breakers shall hold 100% rated load continuously.

Breakers for AC or DC service may trip between 101% and 135% rated load, must trip at 135% and above, as shown on the time-delay curve selected.

No-time-delay circuit breaker (P curve) may trip instantaneously between 101% and 135% of rated load, must trip instantaneously at 135% and above.

Breakers for combined AC/DC use (code D page 18 of How to order, step 4) may trip at 150% and above instead of 135% for breakers used for AC or DC applications (code A or B on page 18 of How to order, step 4).

Heinemann® PROPAK Series Circuit Protectors

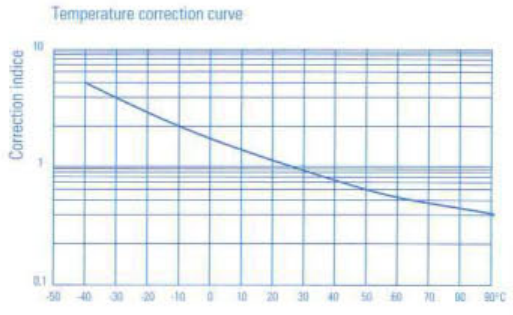
Approvals

Circuit Configuration	Voltage			Rated Current In	Interrupting Capacity
	Max. Rating	Frequency	Pole(s)		
UL 1077 CSA	250 V	50/60 Hz	1 - 2	0.1 - 20 A	1000 A
	50 V	DC	1 - 2	0.1 - 20 A	1000 A
	72 V	DC	1 - 2	0.1 - 10 A	1000 A
VDE 0642 (EN 60934)	250 V	50/60 Hz	1 - 2	0.1 - 20 A	*NA
	50 V	DC	1 - 2	0.1 - 20 A	*NA
	72 V	DC	1 - 2	0.1 - 10 A	*NA

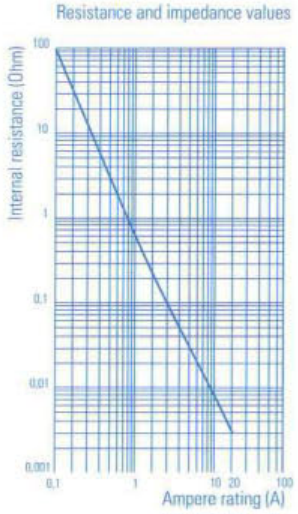
*NA: Not Available

Additional curves

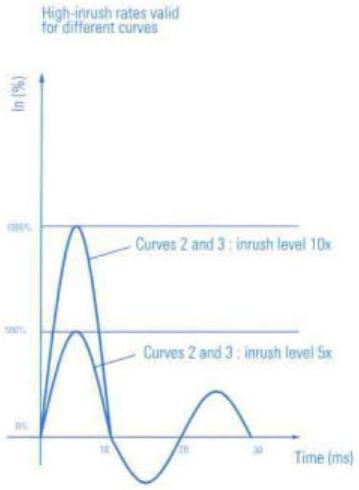
Temperature correction curve



Resistance and Impedance values



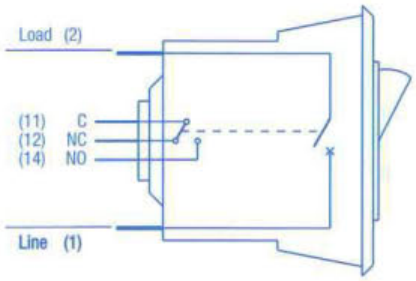
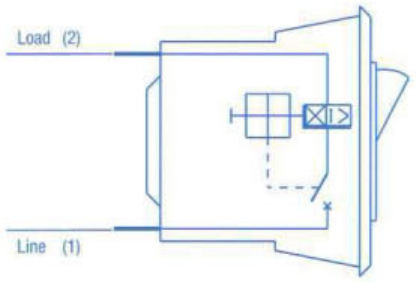
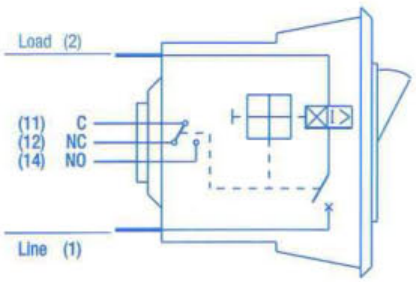
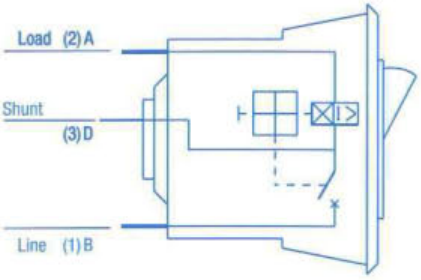
High Inrush



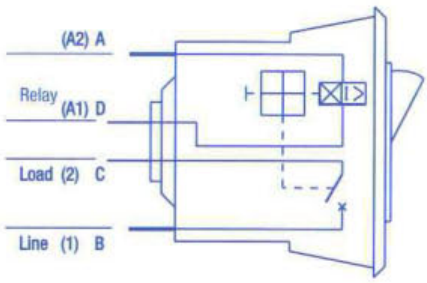
High-inrush rates valid for different curves

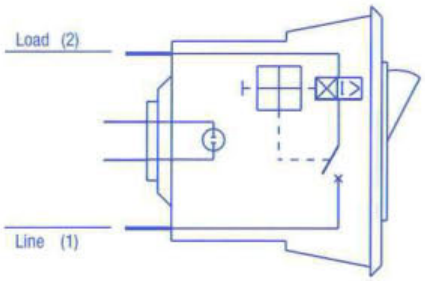
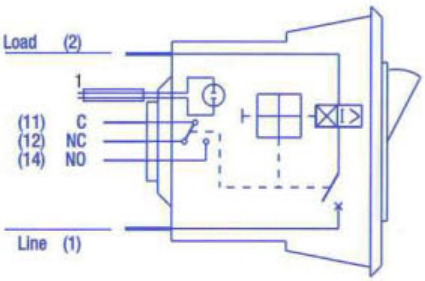
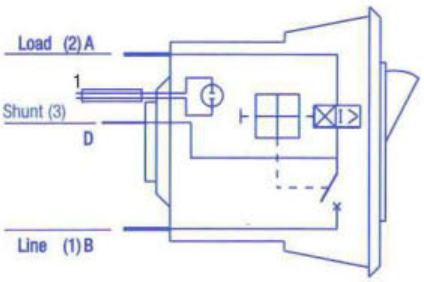
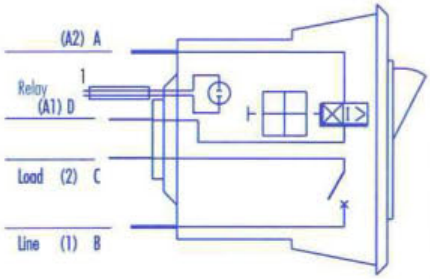
Propak circuit breakers are available with various levels of high-inrush currents avoiding nuisance trip during short starting periods at turn on.
In case of motor protections for example causing a steep wave front transient of very high current amplitude and short duration of overload, the breaker does not trip.
By using Propak high-inrush types, unnecessary and dangerous over calibrations involving use of thicker cables or wires can be avoided, thus saving energy and money.
The inertial wheel used offers maximum possibilities on half wave which is 10 ms when frequency is 50 Hz.
For selection of high-inrush values, see internal circuit codes pages 9 to 12.
For P curves high-inrush is not possible.

Internal Circuits

Circuit	Diagrams	Description	Auxiliary Contact	Inrush	Internal Circuit Codes
Switch	Internal Circuit represented: 12 	Switch only (without coil) with or without auxiliary contact.	No	No (Switch only)	**0**
			Yes	No (Switch only)	**12**
Serie Trip	Internal Circuit represented: 3,8 	The contacts and the coil are in serie. This is the current execution of the PROPAK circuit breaker. It is often used as main switch at the same time.	No	5X	**3**
			No	10X	**8**
Serie Trip With Auxiliary Contact	Internal Circuit represented: 2,9 	The contacts and the coil are in serie. Auxiliary contacts are placed behind the circuit breaker and mechanically connected to the releasing system.	Yes	5X	**2**
			Yes	10X	**9**
Shunt Trip	Internal Circuit represented: 5,22 	Enables two loads to be checked by means of a single circuit breaker. However it only releases if there is an overload in the main circuit. The sum of the two nominal currents must not exceed the maximum current of the contacts. With this execution it is also possible to adjust the tripping through a potentiometer between the load terminals.	No	5X	**5**
			No	10X	**22**

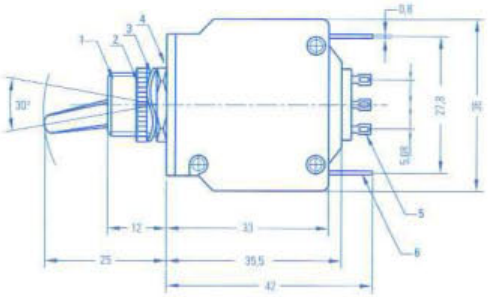
Internal Circuits

Circuit	Diagrams	Description	Auxiliary Contact	Inrush	Internal Circuit Codes
Relay Trip	Internal Circuit represented: 6,23 	Relay tripping can be used for releasing the circuit breaker by the intermediary of a monitor or a safety device installed remotely. The contacts are electrically separated from the coil. Consequently, all the currents and voltages within the permissible limits can be used. Coils are either current or voltage sensitive. Max. rated coil current: 7.5 A Coil voltage value: 100 V 50/60 Hz or 24/48 V DC	No	5X	6
			No	10X	23

Circuit	Diagrams	Description	Auxiliary Contact	Inrush	
Illuminated rocker (Switch or Serie Trip)	Internal Circuit represented: 3,8 	Available with switch or serie trip internal circúit. Illumination either by 125 V AC, 230 V AC neon or 6, 12, 24, 48, 72, 230 V AC/DC LED.	No	No (Switch only)	**0**
			No	5X	**3**
			No	10X	**8**
Illuminated rocker (Switch or Serie Trip with auxiliary contacts)	Internal Circuit represented: 2,9 	Available with switch or serie trip internal circuit. Auxiliary contacts are placed behind the circuit breaker and mechanically connected to the releasing system. Illumination either by 125 V AC, 230 V AC neon or 6, 12, 24, 48, 72, 230 V AC/DC LED. 1. Flying leads	Yes	No (Switch only)	**12**
			Yes	5X	**2**
			Yes	10X	**9**
Illuminated rocker (Shunt Trip)	Internal Circuit represented: 5,22 	Available with shunt trip internal circuit. Illumination either by 125 V AC, 230 V AC neon or 6, 12, 24, 48, 72, 230 V AC/DC LED. 1. Flying leads	No	5X	**5**
			No	10X	**22**
Illuminated rocker (Relay Trip)	Internal Circuit represented: 6,23 	Available with relay trip internal circuit. Illumination either by 125 V AC, 230 V AC neon or 6, 12, 24, 48, 72, 230 V AC/DC LED. Max. rated coil current:7.5 A 1. Flying leads	No	5X	**6**
			No	10X	**23**

Dimensions (Tolerance: ±0,5)

Type PBB 1 pole



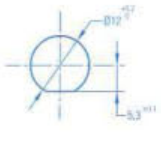
Legend

1. M12 x 1
2. Knurled nut
3. Pressure washer
4. Hexagon nut
5. Auxiliary contact terminal
6. Main terminal: Fast-on 6,3 x 0,8

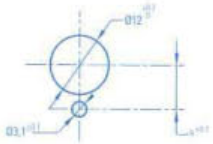
Torque for M12 thread mounting (PBB-PBP types)

Dimension	Torque
M12	0,5 - 0,8 Nm

Panel cut-out

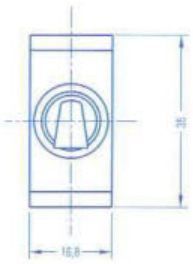


Without lock washers

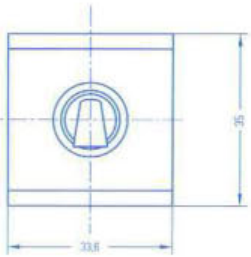


With lock washers

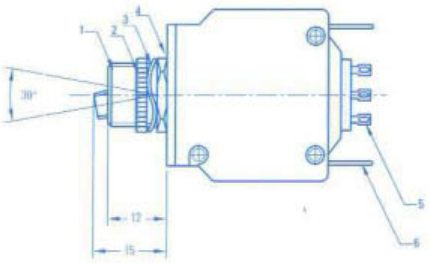
Type PBB 1 pole



Type PBB 2 poles

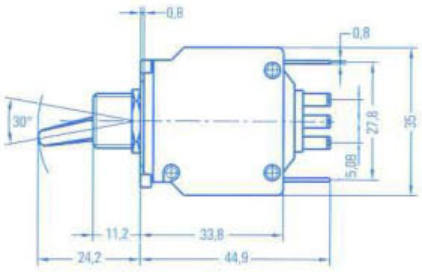


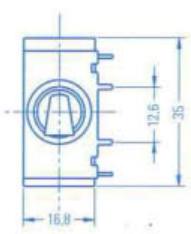
Option Short handle



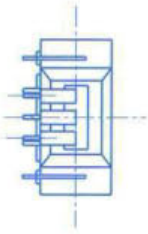
Dimensions

Type PBP

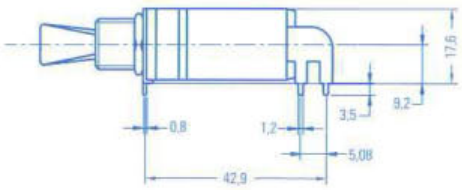




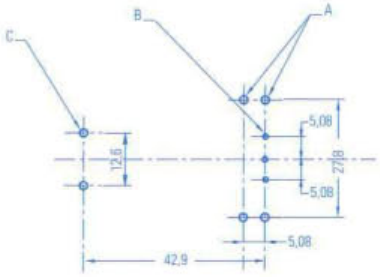
Front view



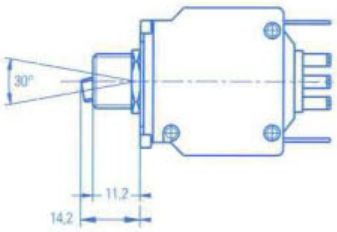
Rear view



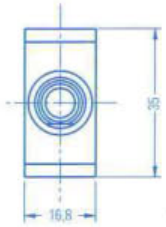
Printed board Cut-out



Option Short handle

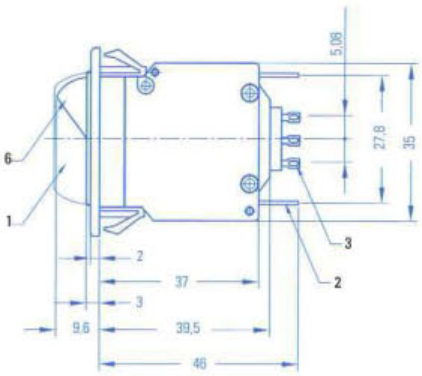


A: 4 x Ø1,9 $^{\pm 0.1}$ for main terminals
B: 3 x Ø1,2 $^{\pm 0.1}$ for auxiliary contact terminals
C: 2 x Ø1,9 $^{\pm 0.1}$ for mounting holes

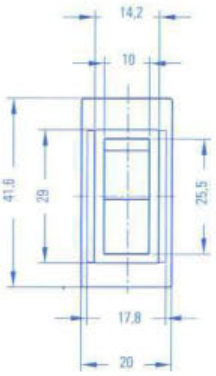


(Tolerance: ±0,5)

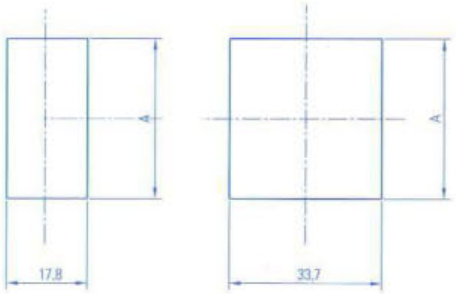
Type PAB (Snap-in mounting)



1 pole

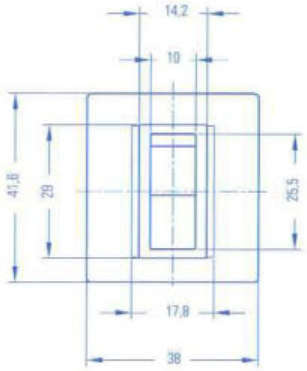


Panel cut-out for PAB and PAL types



Panel thickness	0,8-1,6	1,6-2,4	2,4-3,2
Dimensions A	35,3	36,1	37,0
	Tolerance: ± 0,1		

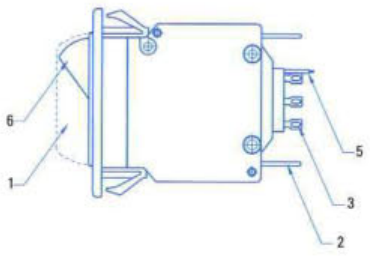
2 poles



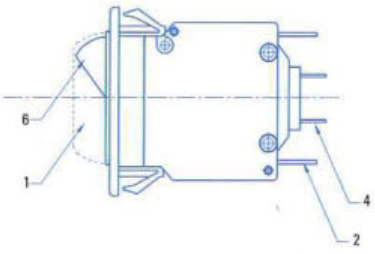
Legend

1. Handle-guard (optional)
2. Main terminal: Fast-on 6,3 x 0,8
3. Auxiliary contact terminal
4. Terminal for pilot lamp: Fast-on 2,8 x 0,5
5. Flying leads for pilot lamp (Approx. length 100 mm)
6. Rocker

Type PAL with flying leads for pilot lamp and auxiliary contact

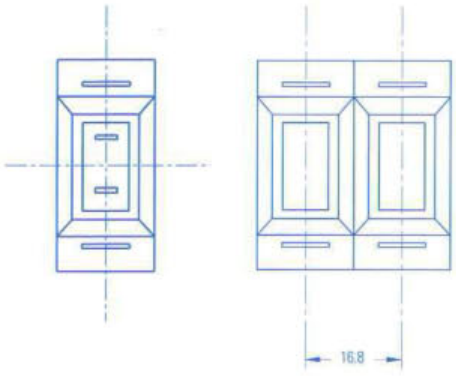


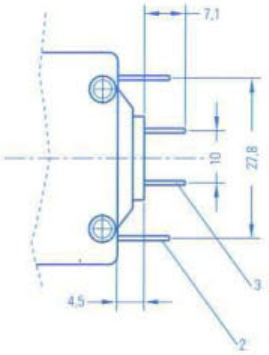
Type PAL without auxiliary contact



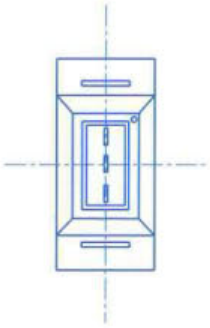
Dimensions and location of terminals and auxiliary contact

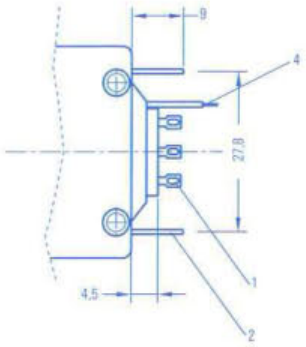
Type PAL with fast-on terminals for pilot lamp (without auxiliary switch)





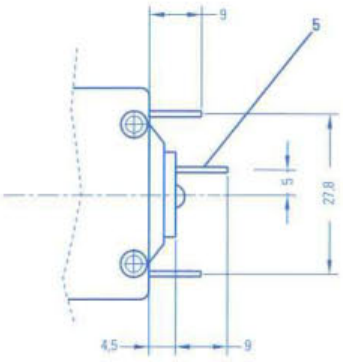
Type PAL with flying leads for pilot lamp (with auxiliary switch)





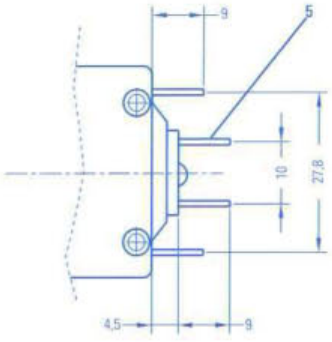
Shunt trip

Internal Circuit represented: 5,22

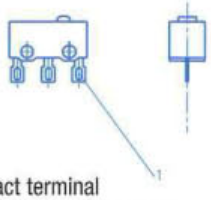


Shunt trip

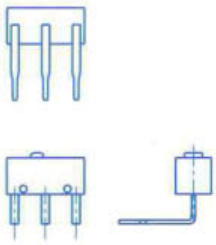
Internal Circuit represented: 6



53 Medium solder terminals



14 Printed circuit board terminals



Legend

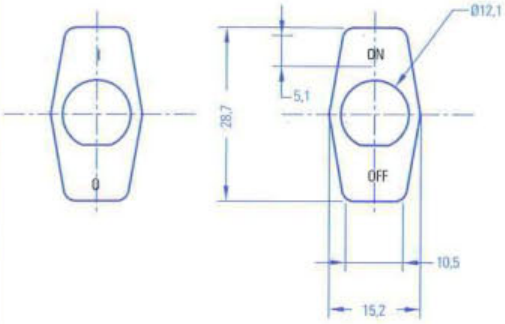
1. Auxiliary contact terminal
2. Main terminals: Fast-on 6,3 x 0,8
3. Terminals for pilot lamp: Fast-on 2,8 x 0,5
4. Flying leads for pilot lamp (Approx. length 100 mm)
5. Auxiliary terminal: Fast-on 6,3 x 0,8

Accessories (Tolerance: ±0,5)

Indicator plates (PBB-PBP types)

Vertical mount

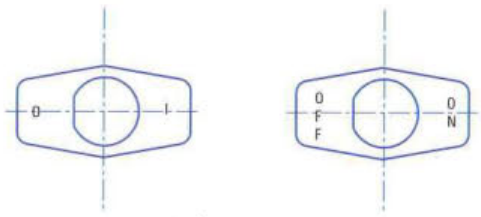
Ordering ref.:
I/O 01650
ON/OFF 01651



Indicator plates (PBB-PBP)

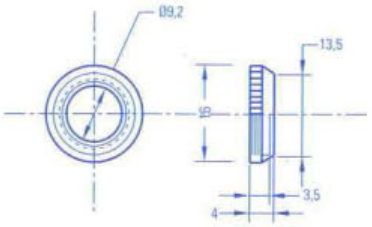
Horizontal mount

Ordering ref.:
I/O 01652
OFF/ON 01653



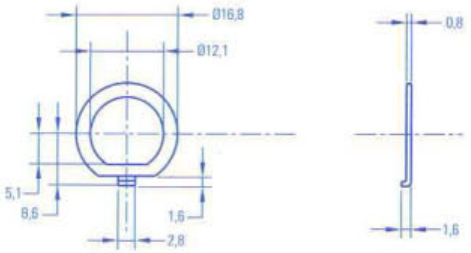
Round panel dress nut (PBB-PBP)

Ordering ref.:
01223



Locking washer (PBB-PBP)

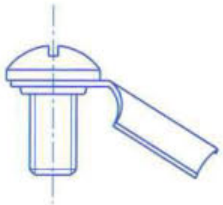
Ordering ref.:
01800

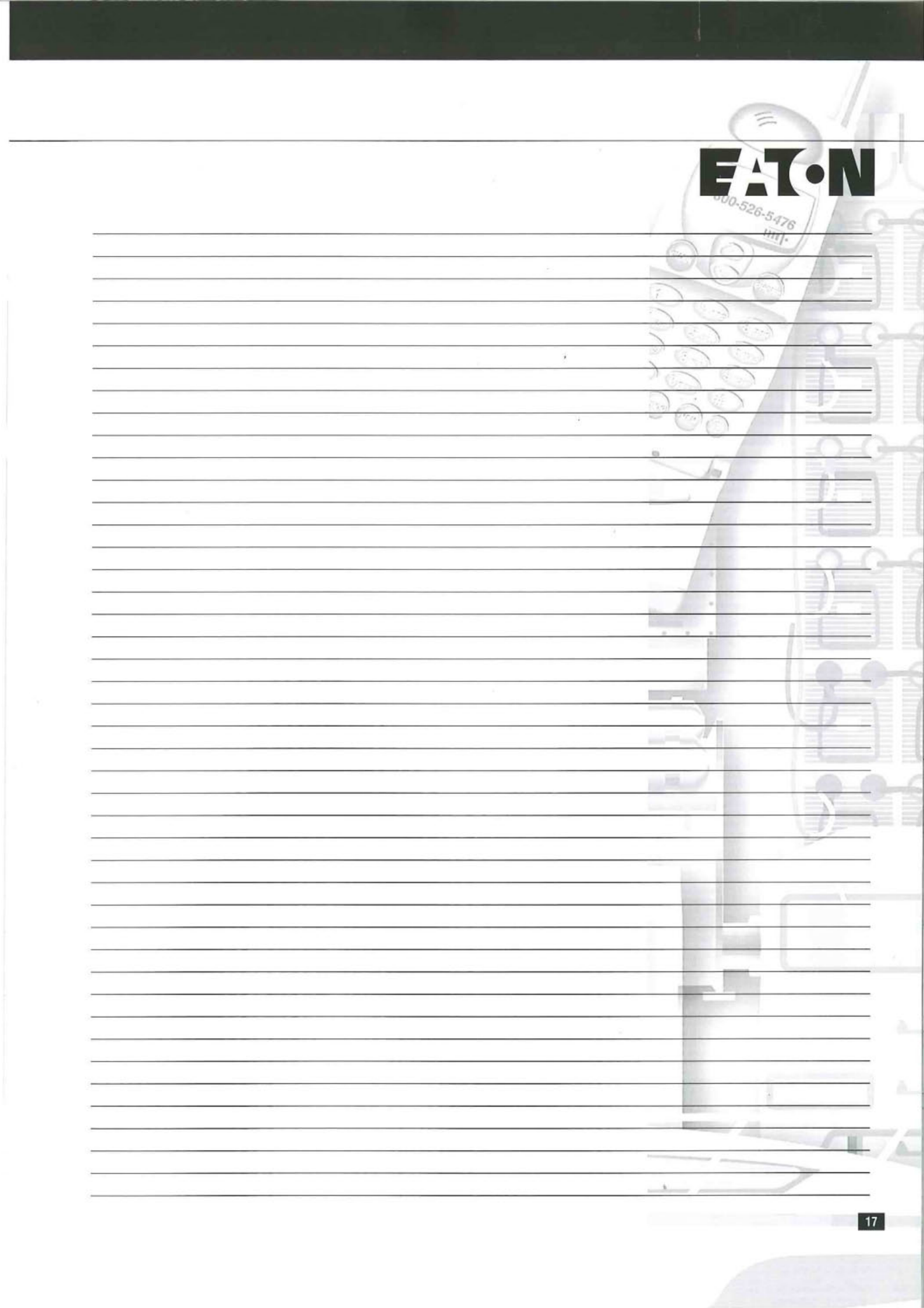


Screw terminal adapter

The screw terminal adapters are available with:

Screw	Ordering ref.
10-32 UNC	02819





HOW TO ORDER

To determine your **Complete Catalog Number,** you must start with appropriate **Series Prefix** and add the appropriate **Code Letters** and/or **Numbers** as in the examples below:

								Add each appropriate
Serie Code	Type	Number of poles	Frequency	Internal circuit	Frequency	Internal circuit	Handle illumination	Handle color
P	AL	2 -	A	2	A	3 -	5	D -

SELECTION TABLE

Serie	Mounting and handle		Number of poles	Frequency		Internal circuit				Handle illumination		Handle	
Code	Types	Code	Code		Code	Start overcurrent	Aux. contact	Description	Code	Description	Code	Color	Marking
P	Snap-in rocker	AB	1	50/60 Hz	A	---	No	Switch only	00	Without	S		For types PAB and PAL only
						---	Yes	Switch only	12	Neon, 125 VAC	1		
			2	DC	B	5 X	No	Serie trip	3	Neon, 230 VAC	2	Black	ON/OFF
	Snap-in illuminated rocker	AL				5 X	Yes	Serie trip	2	LED 6V AC/DC	3	Black	I/O
			(front view from left to right)	AC/DC	D	10 X	No	Serie trip	8	LED 12 V AC/DC	4	Black	Without
						10 X	Yes	Serie trip	9	LED 24 V AC/DC	5	Black	I-ON/O-OFF
						5 X	No	Shunt trip	5	LED 48 V AC/DC	6	White	ON/OFF
	Central M12 thread mounting, paddle handle	BB				10 X	No	Shunt trip	22	LED 72 V AC/DC	7	White	I/O
						5 X	No	Relay trip ❶	6	LED 230 V AC/DC	8	White	Without
						10 X	No	Relay trip ❶	23			White	I-ON/O-OFF
	Central M12 thread mounting, paddle handle, for printed board	BP										Red	ON/OFF
												Red	I/O
												Red	Without
												Red	I-ON/O-OFF
												Green	ON/OFF
												Green	I/O
												Green	Without
												Green	I-ON/O-OFF
										Standard handle	S		For types PBB-PBP only
										Short handle	C		
												Black	Indicator plate, ON/OFF vertical
												Black	Indicator plate, ON/OFF horizontal
												Black	Indicator plate, I-O vertical
												Black	Indicator plate, I-O horizontal
												Black	Without indicator plate

❶ Max. rated coil current: 7.5 A
❷ Allowed only without illumination
❸ I max. (A) at 125 V AC: 3A (UL/CSA and VDE)
❹ Other ratings on request

Number or letter... **Complete Catalog N°: *PAL2 - A2A3 - 5D - 03 - D - A - 53 - 10 - 3**

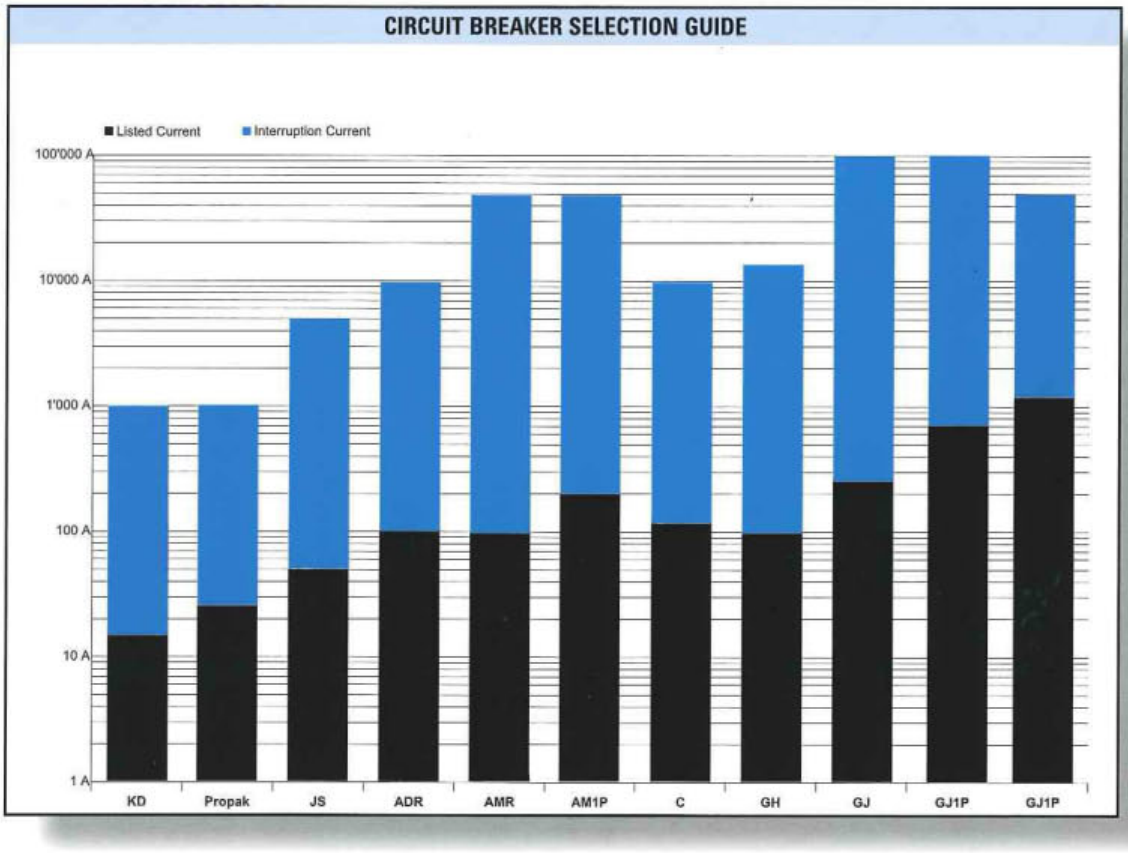
		Fixing	VDE approval	UL approval	Auxiliary switch	Amperating	Curve
		03 -	D -	A -	53 -	10 -	3

Code	Fixing	Code	VDE approval	Code	UL approval	Code	Auxiliary switch ③	Code	Amperating ④	Curve	Code
	Snap-in without handle-guard	---	Without	D	Without	NU	Solder terminals	53	0.1 0.5 1 2 3 4 5 7.5 10 12.5 15 20	Instantaneous	P
A ② I ② R ② C ②			VDE 0642/ DIN EN 60934	H	UL 1077	A	Printed board terminals	14		Medium delay	2
B J S K	Snap-in with handle-guard	03								Short delay	3
D L U T	Central M12 thread mounting	22									
M G F N											
X E Y H P											

* The proposed sample is a 2 poles circuit breaker of Propak series, type PAL, illuminated rocker, snap in mounting. The pole left-hand side front view has an auxiliary contact with solder terminals. Each pole 10 Amps with short delay curve, stard overcurrent: 5 X In. The electrical connection is designed for fast-on connectors. This selected type of circuit breaker is UL/CSA approved at 250V AC.

CIRCUIT BREAKER HEINEMANN®

For the Widest Selection of Circuit Protection, from 0,01 to 1200 Amperes, Look to Eaton's Heinemann Brand Products.



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