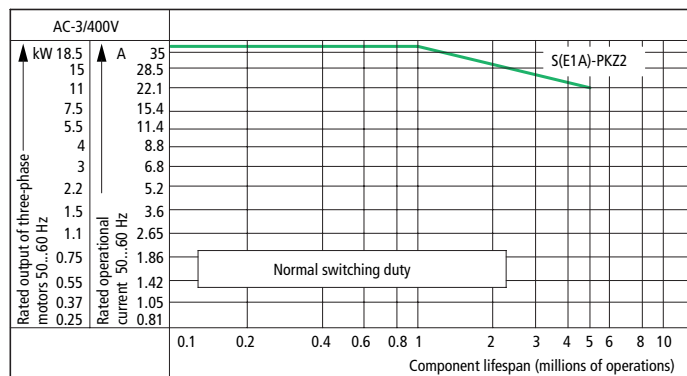


PKZ2 Motor-Protective Circuit-Breakers

Tripping Characteristics

S-PKZ2 high-capacity contact module, SE1A-PKZ2 contact module

Normal switching duty



Squirrel-cage motors

Operating characteristics:

Starting: from rest after attaining full running speed

Typical applications:

Compressors Lifts Mixers
Pumps Escalators Agitators
Fans Conveyors Centrifuges
Valves Bucket-elevators Air-conditioning systems

Drives in general for manufacturing and processing machines

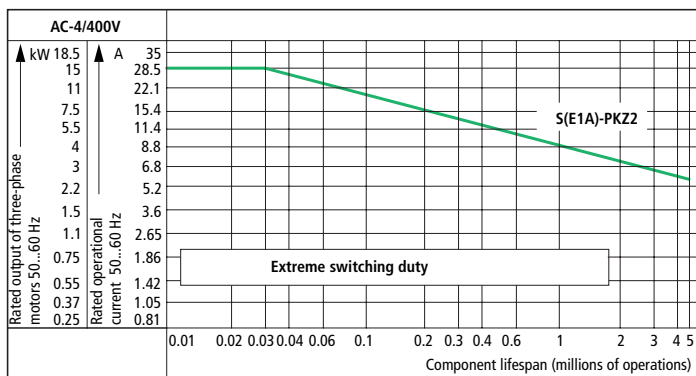
Electrical characteristics:

Starting: up to $6 \times$ motor rated current
Stopping: $1 \times$ motor rated current

Utilization category:

100 % AC-3

Extreme switching duty



Squirrel-cage motors

Operating characteristics:

Inching, plugging, reversing

Typical applications:

Printing machines
Wire-drawing machines
Centrifuges
Special drives for manufacturing and processing machines

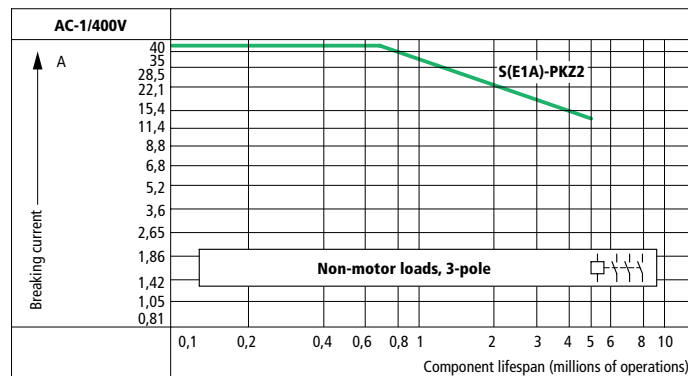
Electrical characteristics:

Starting: $6 \times$ motor rated current
Stopping: $6 \times$ motor rated current

Utilization category:

100 % AC-4

Light switching duty



Non-motor loads

Operating characteristics:

Non-inductive or slightly inductive load

Typical applications:

Electric heat

Electrical characteristics:

Starting: up to $1.5 \times$ rated current
Stopping: $1 \times$ rated current

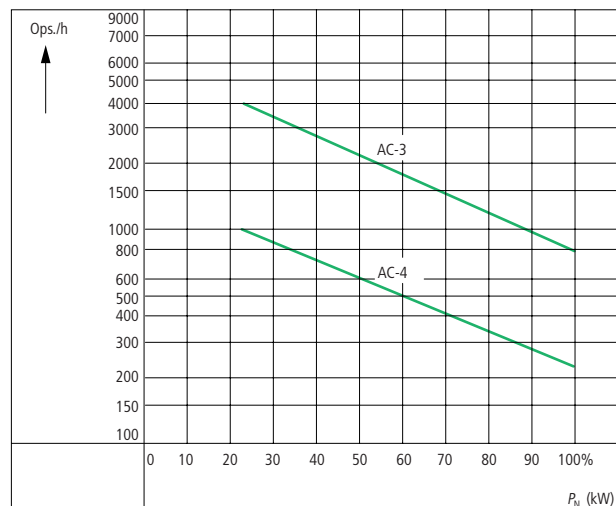
Utilization category:

100 % AC-1

Determination of the maximum number of operations per hour for (high-capacity) contact modules dependent on the switching capacity and utilization

P_N = Maximum motor rating (kW)

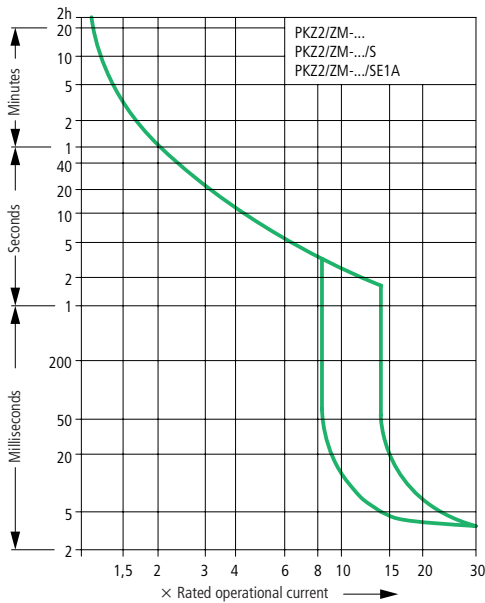
Ops./h = Maximum operating frequency per hour



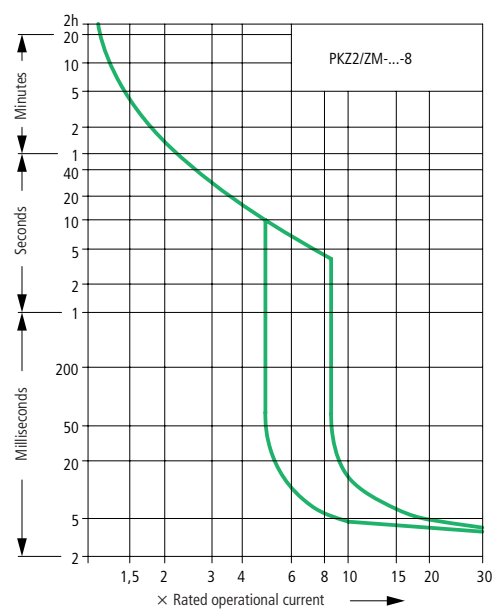
PKZ2 Motor-Protective Circuit-Breakers

Tripping Characteristics

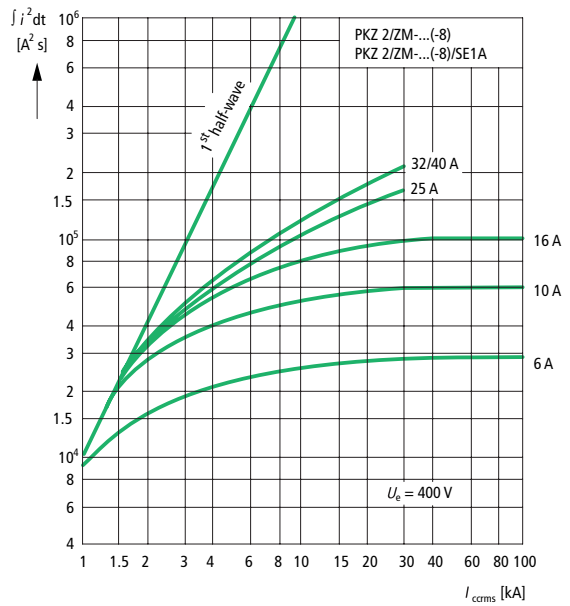
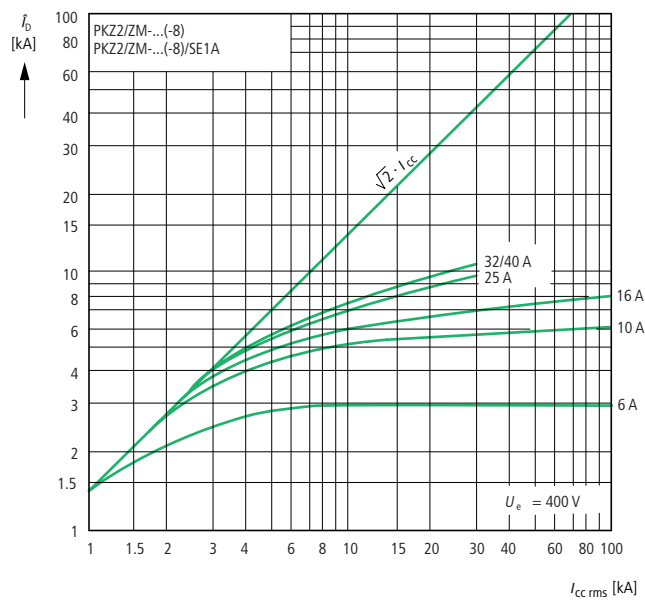
Tripping characteristics of motor-protective circuit-breakers, (high-capacity) compact starters



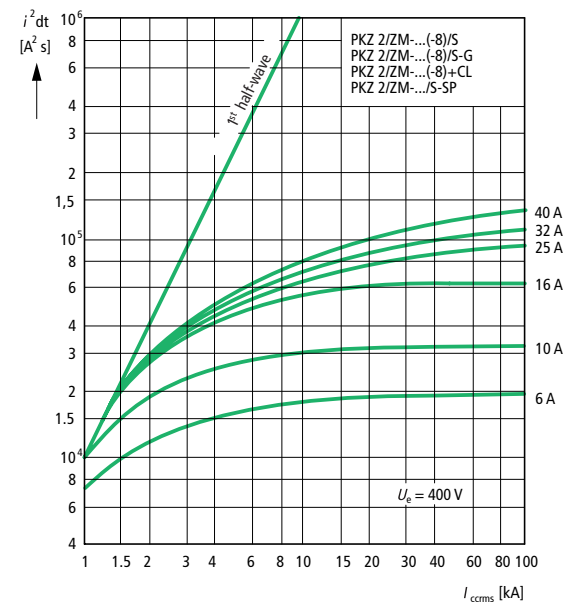
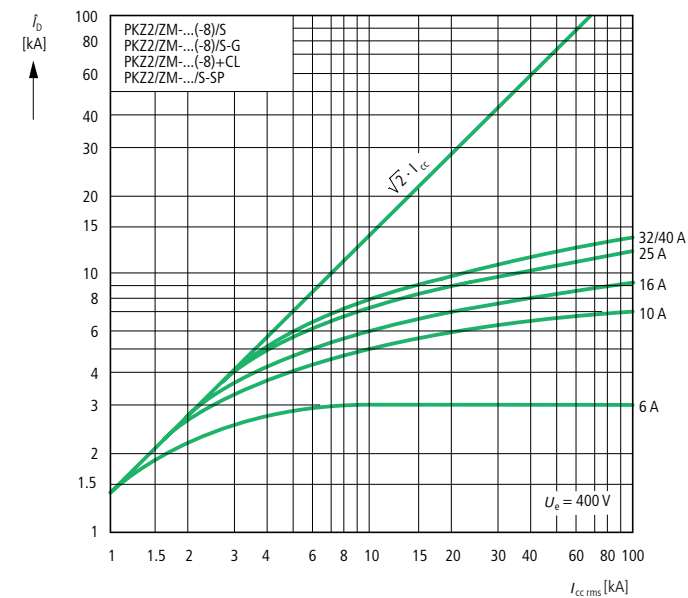
Tripping characteristics for cable and conductor protection



Let-through characteristics of circuit-breakers, compact starters

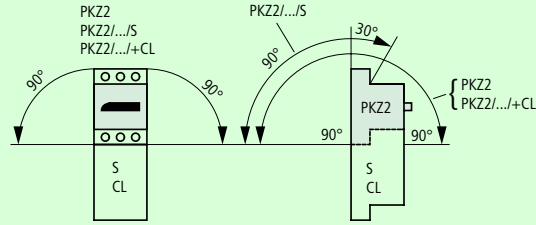


Let-through characteristics of high-capacity compact starters and circuit-breakers + CL current limiter



PKZ2 Motor-Protective Circuit-Breakers

Technical Data

General technical data					IEC/EN 60 947, VDE 0660, UL 508, CSA C 22.2 No. 14 GL, LR, DNV, PRS, BV, RINA, RS, EZU, MEEI
Standards					
Climatic proofing					Damp heat, constant, to IEC 60 068-2-3 Damp heat, cyclical, to IEC 60 068-2-30
Ambient temperature	Storage	Min./Max.	°C		–25/+70
	Open	Min./Max.	°C		–25/+60
	Enclosed	Min./Max.	°C		–25/+40
Mounting position					
Direction of incoming supply					As required
Degree of protection					IP20
Shock resistance (half-sinusoidal shock 20 ms) to IEC 60 068-2-27				g	Circuit-breaker: 30 (High-capacity) compact starter: 8
Altitude				m	2000
Terminal capacity					
	Solid or stranded		mm²		1 × (1 – 16) or 2 × (1 – 6)
	Flexible with ferrule		mm²		1 × (1.5 – 10) or 2 × (1.5 – 6)
	Solid or stranded		AWG		14 – 6
Specified tightening torque for terminal screws					
Main cable				Nm	1.8
Control circuit cable				Nm	1.0
Main contacts					
Rated impulse withstand voltage U_{imp}				V	6000
Overvoltage category/pollution degree					III/3
Rated operational voltage U_e				V AC	690
Rated uninterrupted current I_u = rated operational current I_e				A	40
Rated frequency				Hz	50 – 60
Current heat losses 3-pole, at operational temperature				W	Circuit-breaker: 14 (High-capacity) compact starter: 23
Lifespan	Mechanical		Ops.		Circuit-breaker: 0.1×10^6 (High-capacity) contact module: 5×10^6 (The mechanical lifespan is reduced by 30% for a dual-frequency coil 50/60Hz)
	Electrical	100 % AC-3 AC-4	Ops. Ops.		Circuit-breaker: 0.05×10^6 (High-capacity) contact module: 1×10^6 (High-capacity) contact module: 0.03×10^6
Maximum operating frequency				Ops/h	Circuit-breaker: 60 (High-capacity) contact module: Tripping characteristics → Page 08/072
Motor switching capacity	AC-3	Max.	V AC		690
	DC-5	Max.	V DC		250
		Max.	A DC		40
DC application					PKZ2/ZM-...(-8) PKZ2/ZM-...(-8)/S(+CL)
Rated short-circuit breaking capacity I_{cn}					
(250 V DC) L/R = 15 ms				kA	30 50
(125 V DC)				kA	50 65
Operating times under short-circuit conditions					
Minimum command time				Approx. ms	2 2
Opening delay				Approx. ms	Approx. 0.5 Approx. 0.5
Total opening time				Approx. ms	6 4
Trip blocks					
Temperature compensation					
IEC/EN 60 947-4-1				Min./Max. °C	–5/+40
Operating range				Min./Max. °C	–25/+60
Temperature compensation residual error				%/K	0.25
Short-circuit release tolerance				%	±20
ZM-...-PKZ2, ZMR-...-PKZ2 trip blocks for motor protection					
Adjustable overload releases				× I_u	0.6 – 1.0
Adjustable short-circuit releases				× I_u	8.5 – 14
Phase-failure sensitivity					IEC/EN 60 947-4-1
ZM-...-8-PKZ2 trip blocks for distribution circuit protection					
Adjustable overload releases				× I_u	0.6 – 1.0
Adjustable short-circuit releases				× I_u	5 – 8.5

PKZ2 Motor-Protective Circuit-Breakers

Technical Data

Switching capacity of motor-protective circuit-breakers and (high-capacity) compact starters

Rated uninterrupted current I_u Rated conditional short-circuit current I_q IEC/EN 60 947-4-1Rated ultimate short-circuit breaking capacity I_{cu} Rated service short-circuit breaking capacity I_{cs} } IEC/EN 60 947-2

I_u A	230 V				400 V				440 V				500 V				690 V			
	I_q kA	I_{cu} kA	I_{cs} kA	 ¹⁾ A	I_q kA	I_{cu} kA	I_{cs} kA	 ¹⁾ A	I_q kA	I_{cu} kA	I_{cs} kA	 ¹⁾ A	I_q kA	I_{cu} kA	I_{cs} kA	 ¹⁾ A	I_q kA	I_{cu} kA	I_{cs} kA	 ¹⁾ A
PKZ2/ZM with Type "1" and Type "2" coordination																				
0.16 – 1.6				N				N				N				N				N
2.4				N				N				N				N				N
4				N				N				N				N	4.5	4.5	2.5	63
6				N				N				N				N	4.5	4.5	2.5	80
10			30	N			30	N	10	10	5	80	10	10	3.5	80	4.5	4.5	2.5	80
16			30	N			30	N	10	10	5	100	10	10	3.5	100	4.5	4.5	2.5	100
25	30	30	7.5	160	30	30	7.5	160	10	10	5	125	10	10	3.5	125	4.5	4.5	2.5	125
32	30	30	7.5	160	30	30	7.5	160	10	10	5	160	10	10	3.5	160	4.5	4.5	2.5	160
40	30	30	7.5	160	30	30	7.5	160	10	10	5	160	10	10	3.5	160	4.5	4.5	2.5	160
PKZ2/ZM + CL-PKZ2 with Type "1" and Type "2" coordination																				
0.16 – 1.6				N				N				N				N				N
2.4				N				N				N				N				N
4				N				N				N				N	10	4.5	2.5	N
6				N				N				N				N	10	4.5	2.5	N
10			30	N			30	N			5	N			3.5	N	10	4.5	2.5	N
16			30	N			30	N			5	N			3.5	N	10	4.5	2.5	N
25			7.5	N			7.5	N			5	N			3.5	N	10	4.5	2.5	N
32			7.5	N			7.5	N			5	N			3.5	N	10	4.5	2.5	N
40			7.5	N			7.5	N			5	N			3.5	N	10	4.5	2.5	N
PKZ2/ZM(R)-.../SE1A(-G)... with Type "1" coordination																				
0.16 – 1.6		N	N	N		N	N	N		N	N	N		N	N	N		N	N	N
2.4		N	N	N		N	N	N		N	N	N		N	N	N		N	N	N
4		N	N	N		N	N	N		N	N	N		N	N	N	4.5	N	N	63
6		N	N	N		N	N	N		N	N	N		N	N	N	4.5	N	N	80
10		N	N	N		N	N	N	10	N	N	80	7	N	N	80	4.5	N	N	80
16		N	N	N		N	N	N	10	N	N	100	7	N	N	100	4.5	N	N	100
25	30	N	N	160	30	N	N	160	10	N	N	125	7	N	N	125	4.5	N	N	125
32	30	N	N	160	30	N	N	160	10	N	N	160	7	N	N	160	4.5	N	N	160
40	30	N	N	160	30	N	N	160	10	N	N	160	7	N	N	160	4.5	N	N	160
PKZ2/ZM-.../S(-G) with Type "1" and Type "2" coordination																				
0.6 – 2.4		N	N			N	N			N	N			N	N			N	N	
4 – 6		N	N			N	N			N	N			N	N		10	N	N	80
10 – 16		N	N			N	N			N	N			N	N		10	N	N	100
25 – 40		N	N			N	N			N	N			N	N		10	N	N	160
PKZ2/ZM-...-8 and PKZ2/ZM-...-8/SE1A(-G)																				
0.16 – 1.6	N			N	N			N	N			N	N			N	N			N
2.4	N			N	N			N	N			N	N			N	N			N
4	N			N	N			N	N			N	N			N	4.5	2.5		63
6	N			N	N			N	N			N	N			N	4.5	2.5		80
10	N		30	N	N		30	N	N	10	5	80	N	7	3.5	80	N	4.5	2.5	80
16	N		30	N	N		30	N	N	N	10	100	N	7	3.5	100	N	4.5	2.5	100
25	N	30	7.5	160	N	30	7.5	160	N	10	5	125	N	7	3.5	125	N	4.5	2.5	125
32	N	30	7.5	160	N	30	7.5	160	N	10	5	160	N	7	3.5	160	N	4.5	2.5	160
40	N	30	7.5	160	N	30	7.5	160	N	10	5	160	N	7	3.5	160	N	4.5	2.5	160
PKZ2/ZM-...-8/S(-G)																				
0.6 – 2.4	N			N	N			N	N			N	N			N				N
4 – 6	N			N	N			N	N			N	N			N	10	5		80
10 – 16	N			N	N			N	N			N	N			N	10	5		100
25 – 40	N			N	N			N	N			N	N			N	10	5		160

Notes

 No upstream protective device required.
 Inherently short-circuit-proof range (100kA)
 N Not required

¹⁾ Fuse (A gG/gL) increases the switching capacity of the motor-protective circuit-breaker to 100 kA

PKZ2 Motor-Protective Circuit-Breakers

Technical Data

(High-capacity) contact module						
Operating times						
	Closing delay	ms	9 – 30			
	Opening delay	ms	4 – 12			
Duty factor		% DF	100			
Rated making capacity cos φ = 0.45		A	400			
Rated breaking capacity cos φ = 0.45		A	400			
Magnet systems						
AC operation (S-PKZ2, SE-1A-PKZ2)						
Operating range	Pick-up	× U _s	0.85 – 1.1			
	Drop-out	× U _s	0.4 – 0.6			
Power consumption	Pick-up	VA	≤ 190			
	Sealing	VA	≤ 13			
DC operation (S-G-PKZ2, SE1A-G-10-PKZ2)						
Rated control supply voltage U _s		V DC	24			
Operating range						
Pick-up		× U _s	0.85 – 1.1			
Power consumption						
Pick-up		VA	150			
Pick-up		A	6.3 (16 – 22 ms)			
Sealing		W	2.7			
Sealing		mA	113			
Rated operational current I _e 50 – 60 Hz			AC-3	AC-4	AC-1	
AC voltage open, enclosed						
230 V AC		A	40	30	40	
400 V AC		A	40	30	40	
440 V AC		A	40	30	40	
500 V AC		A	40	28	40	
690 V AC		A	40	25	40	
Auxiliary contacts						
Rated impulse withstand voltage U _{imp}		V	6000			
Overvoltage category/pollution degree			III/3			
Rated operational voltage U _e		V AC	500			
Rated operational current I _e						
AC-15			230/240 V	400/415 V	440/500 V	
	NHI11, NHI11S, NHI2-11S, HI11S/EZ	A	6	3	1.5	
	NHI22, NHI22S, HI11S, HI20-S	A	6	1.5	1.5	
	AGM2-11	A	5	3	1.5	
	ZMR... 95 – 96	A	1.5	0.7	Approx. 0.5	
	ZMR... 97 – 98	A	1.5	Approx. 0.5	0.3	
DC-13			24 V	60 V	110 V	220 V
	ZMR... L/R ≤200 ms	A	1	0.8	0.7	0.3
Lifespan						
Mechanical	NHI, NHI..S	Ops.	0.1 × 10 ⁶			
	AGM	Ops.	0.01 × 10 ⁶			
	NHI2-11S, HI..-S, HI11-S/EZ	Ops.	5 × 10 ⁶			
	ZMR	Ops.	0.01 × 10 ⁶			
Electrical	NHI, NHI..S	Ops.	0.05 × 10 ⁶			
	AGM	Ops.	5 × 10 ³			
	NHI2-11S, HI..-S, HI11-S/EZ	Ops.	1 × 10 ⁶			
	ZMR	Ops.	5 × 10 ⁶			
Control circuit reliability at U _e = 24 V DC		Fault probability H _f	Fail-safe over the entire mechanical lifespan			
U _{min} = 24 V, I _{min} = 10 mA						
Interlocked opposing contacts to ZH 1/457			NHI2-11 S, AGM2-11			
Short-circuit rating without welding						
Fuseless			With PKZM0 – 6,3: 240 V PKZM0 – 4: 415 V PKZM0 – 1,6: 500 V			
Fuse		A gG/gL	10			
Terminal capacity 1 conductor or 2 conductors						
Solid and flexible with ferrule		mm ²	0.75 – 2.5			
Solid and stranded		AWG	22 – 14			

PKZ2 Motor-Protective Circuit-Breakers

Technical Data

Voltage releases			
Rated impulse withstand voltage U_{imp}		V	6000
Overvoltage category/pollution degree			III/3
Rated operational voltage U_e		V AC	24 – 600
		V DC	A-PKZ2: 24 – 250, U-PKZ2: 24 – 125
Terminal capacity 1 conductor or 2 conductors			
Solid and flexible with ferrule		mm ²	0.75 – 2.5
Solid and stranded		AWG	22 – 14
Shunt releases			
Operating range			
AC		$\times U_s$	0.7 – 1.1
DC		$\times U_s$	0.7 – 1.1
Power consumption			
AC	Pick-up	VA	5
	Sealing	VA	3
DC	Pick-up	W	3
	Sealing	W	0.3
Undervoltage releases			
Drop-out voltage		$\times U_s$	0.7 – 0.35
Power consumption			
AC	Pick-up	VA	5
	Sealing	VA	3
DC	Pick-up	W	3
	Sealing	W	3
Drop-out delay with UVHI-PKZ2		ms	200
Rated operational current I_e			
AC-15			230 V400 V440 V
U-HI20-PKZ2, UVHI-PKZ2		A	631.5
RE-PKZ2, RS-PKZ2 remote operators			
Rated impulse withstand voltage U_{imp}		V	6000
Overvoltage category/pollution degree			III/3
Rated operational voltage U_e			
AC (50/60 Hz), DC		V	24 – 240
AC (50/60 Hz)		V	380 – 440
Safe isolation			
To VDE 0106 Part 101 and Part 101 A1 between auxiliary contacts and main contacts		V AC	500
Required short-time rating (30 ms)		VA/W	700
Control transformer short-time rating		VA	1100 → STI0,4 Page 13/006
Short-circuit voltage		%	4.4 → Page 13/038
Closing delay		ms	≤ 30
Opening delay		ms	≤ 30
Reset time to Off		ms	≤ 30
Operating frequency		Ops/h	60
Operating range			
AC		$\times U_s$	0.85 – 1.1
DC		$\times U_s$	0.85 – 1
Lifespan, electrical		Ops.	50 000
Integral auxiliary contacts (make contact 33/34 Hand/Auto indication)			
Conventional free air thermal current I_{th}		A	1.5
Rated operational current I_e			
AC-14		50 Hz	230/240 V400/415 V440 V
		A	1.51Approx. 0.5
Terminal capacity 1 conductor or 2 conductors			
Solid and flexible with ferrule		mm ²	0.75 – 2.5
Solid and stranded		AWG	22 – 14

PKZ2 Motor-Protective Circuit-Breakers

Technical Data

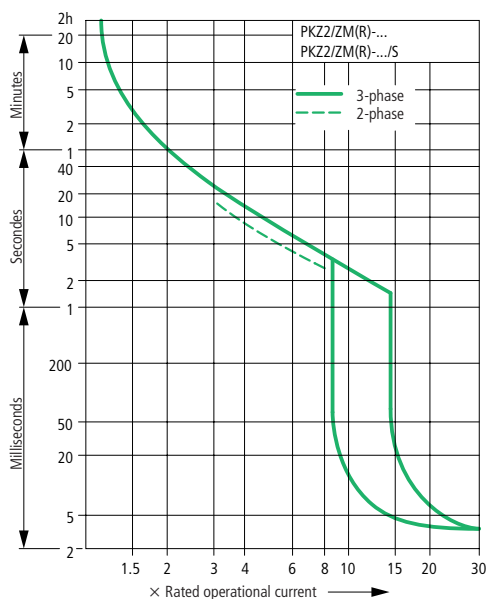
Current limiters		
Rated making capacity $\cos \varphi = 0.45$	A	400
Rated breaking capacity $\cos \varphi = 0.45$	A	400
AC-1 duty		
Conventional free air thermal current $I_{th} = I_e$ open, enclosed	A	40
Feeder terminal and three-phase commoning links		
Rated impulse withstand voltage U_{imp}	V	6000
Overtoltage category/pollution degree		III/3
Rated operational voltage U_e	V AC	690
Rated uninterrupted current I_u	A	120

Protection for EEx e motors

PKZ2 tripping characteristics

The tripping characteristics show the tripping time of the circuit-breakers as a function of the response current. They show mean values of the tolerance ranges at an ambient temperature of 20 °C, starting from cold. The tripping time of the bimetallic releases at operational temperature is reduced to approximately 25 % of the values shown.

Specific tripping characteristics for each individual setting range are available on request. These tripping characteristics, in 55 × 75 format, self-adhesive, correspond to the data in the PTB Certificates and can be used both for correct selection of motor-protective circuit-breakers for protection of EEx e motors and for documentation on site (2-phase characteristic between 3 and 8 times rated current to VDE 0165).



PTB Certificate No.

3.53/388.299

Tripping characteristics on

Setting range

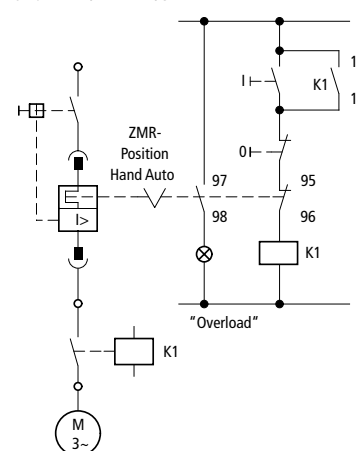
A

Tripping characteristic to AWA No.

0.4 – 0.6	128-881-1
0.6 – 1.0	128-881-2
1.0 – 1.6	128-881-3
1.6 – 2.4	128-881-4
2.4 – 4.0	128-881-5
4.0 – 6.0	128-881-6
6.0 – 10	128-881-7
10 – 16	128-881-8
16 – 25	128-881-9
25 – 32	128-881-10
32 – 40	128-881-11

Circuit diagram

For PKZ2/ZMR....
and PKZ2/ZMR..../S



ZMR...-PKZ2 trip block: In EEx e application the break contact 95–96 of the overload relay function **must** always be used to de-energize the (high-capacity) contact module or contactor.

PKZ2 Motor-Protective Circuit-Breakers
Technical Data

Selectivity table 400 V AC
See → Page 10/084

1 and 2-pole circuits for PKZM0, PKZM4, PKZ2 devices used for AC and DC switching



Protection of PVC insulated cables against thermal overload in fault conditions

The table shows which minimum cable cross-sections are protected PKZ(M) motor-protective circuit-breakers up to their conditional rated short-circuit current I_{cs} . For cross-sections protected by PKZM4, please enquire.

Minimum protected cross-section					Device
380 – 415 V, 50 Hz, Cu mm ²					Type
4	2.5	1.5	1	0.75	
					PKZM0-0,16
					⋮
					PKZM0-6,3
					PKZM0-10
					PKZM0-16
					PKZM0-20
					PKZM0-25
					PKZ2/ZM-0,6
					⋮
					PKZ2/ZM-2,4
					PKZ2/ZM-4
					PKZ2/ZM-6
					PKZ2/ZM-10
					PKZ2/ZM-16
					PKZ2/ZM-25
					PKZ2/ZM-32
					PKZ2/ZM-40

Fuseless installation with PKZ(M), back-up protection diagrams

