Overload relays

1

E Line thermal overload relay



xStart series overload relay





1.1 E Line thermal overload relay

Thermal overload relays XTOD / XTOG 2

1.2 xStart series overload relays

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Overload relay ZW7 9
Electronic overload relays ZEB 11
EMT6 thermistor overload relay for machine protection 11
C441 Overload and monitoring relay 44

Powering Business Worldwide

Thermal overload relays XTOD/XTOG





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Thermal overload relays XTOD/XTOG

Product description

XTOD/XTOG thermal overload relays offer precision motor protection with phase loss protection and ambient temperature compensation. The seperate mount design allows for flexibility and the units can be mounted on DIN rail or directly on the panel adjacent the motor contactor.

XTOD... is for separate mounting; XTOG is for direct mounting.

Features

- Precision motor protection up to 97A
- Integral 1NO/1NC contact for contactor control and alarm signal
- Phase loss protection
- Ambient temperature compensation
- DIN rail or panel mount options

System overview

Thermal overload relays provide protective features for 1 or 3 phase motors. The relay monitors the operating current of the motor and switched the contactor off in the event of an overload situation. It also protects the motor from damage during phase loss.

Standards and certifications

- GB 14048
- IEC/EN 60947
- CCC
- CE

Thermal overload relays

XTOD..CC1S



For use with		Setting range of overload releases I_r (A)	Circuit symbol	Auxiliary contact N/O =Normally open N/C =Normally closed		Part no. Article no.	Standard package
XTCG007 XTCG009 XTCG012 XTCG018 XTCG025 XTCG032 XTCG038	Seperate mounting	0.3~0.45		1 N/O	1 N/C	**XTODP45CC1S** 167952	1 piece
	Seperate mounting	0.45 ~0.67		1 N/O	1 N/C	**XTODP67CC1S** 167953	1 piece
	Seperate mounting	0.67~1.0		1 N/O	1 N/C	**XTOD001CC1S** 167954	1 piece
	Seperate mounting	1.0 ~1.5		1 N/O	1 N/C	**XTOD1P5CC1S** 167955	1 piece
	Seperate mounting	1.4 ~2.1		1 N/O	1 N/C	**XTOD2P2CC1S** 167956	1 piece
	Seperate mounting	1.8~2.7		1 N/O	1 N/C	**XTOD2P7CC1S** 167957	1 piece
	Seperate mounting	2.4~3.6		1 N/O	1 N/C	**XTOD3P6CC1S** 167958	1 piece
	Seperate mounting	3.5~5.0		1 N/O	1 N/C	**XTOD005CC1S** 167959	1 piece
	Seperate mounting	4.0~6.0		1 N/O	1 N/C	**XTOD006CC1S** 167960	1 piece
	Seperate mounting	5.5~8.5		1 N/O	1 N/C	**XTOD8P5CC1S** 167961	1 piece
	Seperate mounting	8.5~12.5		1 N/O	1 N/C	**XTOD013CC1S** 167962	1 piece
	Seperate mounting	12.5~18		1 N/O	1 N/C	**XTOD018CC1S** 167963	1 piece
	Seperate mounting	17~24		1 N/O	1 N/C	**XTOD024CC1S** 167964	1 piece
	Seperate mounting	22~30		1 N/O	1 N/C	**XTOD030CC1S** 167965	1 piece

XTOG...



For use with		Setting range of overload releases I_r (A)	Circuit symbol	Auxiliary contact N/O =Normally open N/C =Normally closed		Part no. Article no.	Standard package
XTCG007 XTCG009 XTCG012 XTCG018 XTCG025 XTCG032 XTCG038	Direct mounting	0.1~0.16		1 N/O	1 N/C	**XTOGP16BC1** 173679	1 piece
	Direct mounting	0.16~0.24		1 N/O	1 N/C	**XTOGP24BC1** 173680	1 piece
	Direct mounting	0.24~0.4		1 N/O	1 N/C	**XTOGP40BC1** 173681	1 piece
	Direct mounting	0.4~0.6		1 N/O	1 N/C	**XTOGP60BC1** 173682	1 piece
	Direct mounting	0.6~1		1 N/O	1 N/C	**XTOG001BC1** 173683	1 piece
	Direct mounting	1~1.6		1 N/O	1 N/C	**XTOG1P6BC1** 173684	1 piece
	Direct mounting	1.6~2.4		1 N/O	1 N/C	**XTOG2P4BC1** 173685	1 piece
	Direct mounting	2.4~4		1 N/O	1 N/C	**XTOG004BC1** 173686	1 piece
	Direct mounting	4~6		1 N/O	1 N/C	**XTOG006BC1** 173687	1 piece
	Direct mounting	6~10		1 N/O	1 N/C	**XTOG010BC1** 173688	1 piece
	Direct mounting	9-12		1 N/O	1 N/C	**XTOG012BC1** 173689	1 piece
	Direct mounting	12~16		1 N/O	1 N/C	**XTOG016CC1** 173690	1 piece
	Direct mounting	16~24		1 N/O	1 N/C	**XTOG024CC1** 173691	1 piece
	Direct mounting	24~32		1 N/O	1 N/C	**XTOG032CC1** 173692	1 piece

Thermal overload relays

XTOG...



For use with		Setting range of overload releases I_r (A)	Circuit symbol	Auxiliary contact N/O =Normally open N/C =Normally closed		Part no. Article no.	Standard package
XTCG040 XTCG050 XTCG065 XTCG080 XTCG095	Direct mounting	17~25		1 N/O	1 N/C	**XTOG025DC1** 173693	1 piece
	Direct mounting	23~32		1 N/O	1 N/C	**XTOG032DC1** 173694	1 piece
	Direct mounting	30~40		1 N/O	1 N/C	**XTOG040DC1** 173695	1 piece
	Direct mounting	37~50		1 N/O	1 N/C	**XTOG050DC1** 173696	1 piece
	Direct mounting	48~65		1 N/O	1 N/C	**XTOG065DC1** 173697	1 piece
	Direct mounting	37~50		1 N/O	1 N/C	**XTOG050EC1** 173698	1 piece
	Direct mounting	48~65		1 N/O	1 N/C	**XTOG065EC1** 173699	1 piece
	Direct mounting	63~80		1 N/O	1 N/C	**XTOG080EC1** 173700	1 piece
	Direct mounting	77~97		1 N/O	1 N/C	**XTOG097EC1** 173701	1 piece

1.1 Thermal overload relays XTOD/XTOG

Technical data

General

			XTOD/XTOG
Standards			IEC/EN 60947, GB 14048
Climatic Proofing			Damp heat, constant, to IEC60068-2-78 Damp heat, cyclic, to IEC60068-2-30
Ambient temperature			
Open		°C	-25~55
Enclosed		°C	-25~40
Temperature compensation		°C	-5~40
Weight		kg	0.15
Protection type			IP20

Main contacts

			XTOD/XTOG
Rated impulse withstand voltage	U_{imp}	VAC	6000
Overvoltage category/pollution degree			III/3
Rated insulation voltage			
AC	U_i	VAC	690
Rated operational voltage	U_e	VAC	690
Overload release setting range		A	0.1-97
Terminal capacity			
Solid		mm^2	1 x (1-6) 2 x (1-6)
Flexible with ferrule		mm^2	1 x (1-6) 2 x (1-6)
Solid/stranded		AWG	
Terminal screw			M4
Tightening torque		Nm	1.2

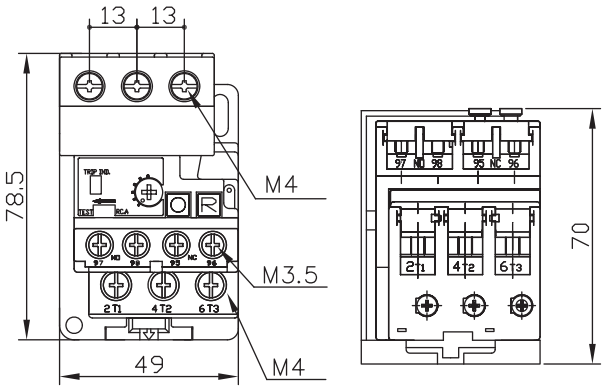
Auxiliary and control circuits

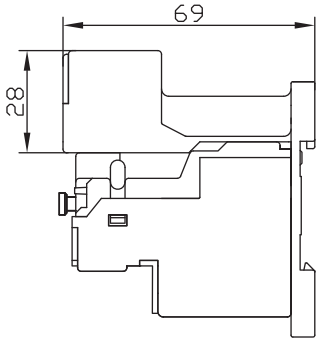
			XTOD/XTOG
Rated impulse withstand voltage	U_{imp}	V	6000
Overvoltage category/pollution degree			III/3
Terminal capacity			
Solid		mm^2	1 x (1-6) 2 x (1-6)
Flexible with ferrule		mm^2	1 x (1-6) 2 x (1-6)
Solid/stranded		AWG	
Terminal screw			M3.5
Tightening torque		Nm	0.8
Rated insulation voltage	U_i	VAC	690
Rated operational voltage	U_e	VAC	690
Conventional thermal current	I_{th}	A	10
Rated operational current			
AC-15			
120V	I_e	A	6
220/240V	I_e	A	3
380V	I_e	A	1.9
480V	I_e	A	1.5
500V	I_e	A	1.4
600V	I_e	A	1.2
DC-13			
125V	I_e	A	0.55
250V	I_e	A	0.27

Dimensions

Thermal overload relay + mounting adapter

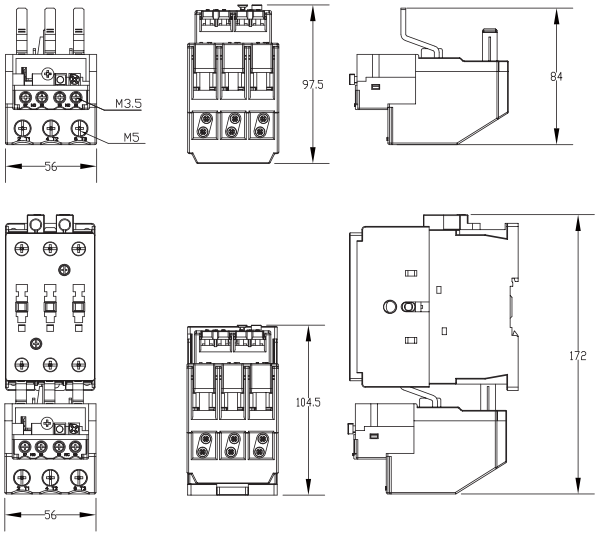
XTOD..CC1S



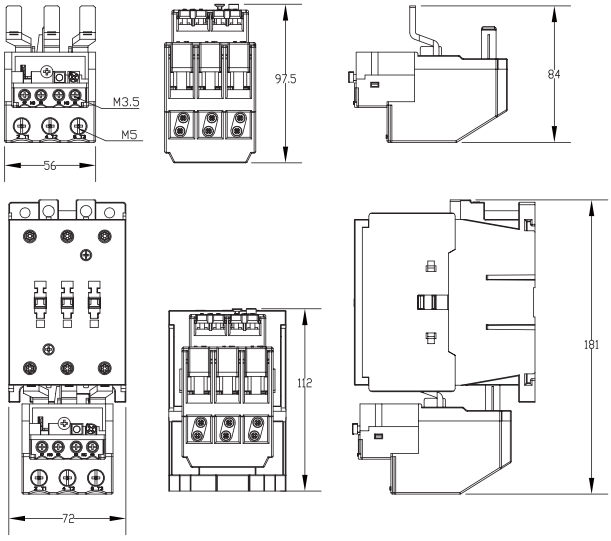


Thermal overload relays XTOG

17-65A



37-97A









Overload relay

Motor protection is a central task of electrical equipment for machinery. From cost-effective bimetal solutions to demanding full motor protection with cross-linkage - we offer the right solution for each application.

ATEX

Bimetal relay - overload relay up to 630 A

- Direct mounting on contactor saves mounting time.
- ATEX approval for the protection of EEx e motors up to 250 A.
- Comprehensive motor protection through phase failure sensitivity.
- Integrated test pushbutton facilitates high safety → Page 13.

ZEB electronic overload relay - overload relay up to 1500 A

- ATEX approval for protection of EEx e motors up to 1500 A.
- Adjustable tripping classes.
- Phase failure and unbalance protection.
- Optional earth fault detection.
- Additional current setting range (5:1) → Page 21.

EMT6 thermistor overload relay for machine protection

- Overload protection through direct evaluation of winding temperature.
- Quick detection of operating state through LED display.
- Suitable for overload monitoring of motors in EEx e range.
- Wide range power supply reduces amount of types → Page 26.

Overload relay



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1

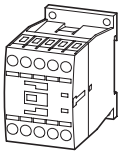
Technical overview

Overload relays, CT-operated overload relays

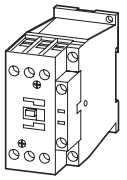
Setting ranges (A)
(note max. current of the contactor)



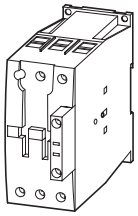
DILEM



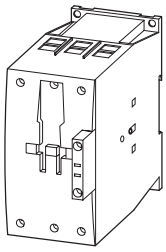
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DILM9 DILM15



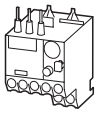
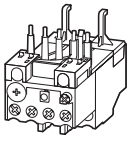
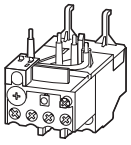
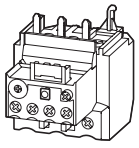
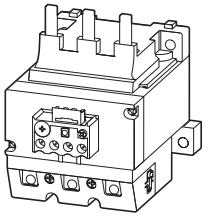
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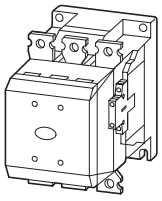
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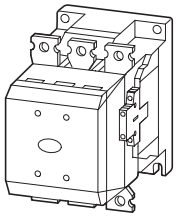
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Overload relays					
ZE 0.1-12					
ZB12 0.1-16					
ZB32 0.1-38					
ZB65 6-75					
ZB150 35-175					
Z5-.../FF225A 70-250					
Z5-.../FF250 50-300					

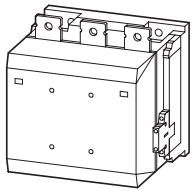
Current transformer-operated overload relay
ZW7-... 42-630



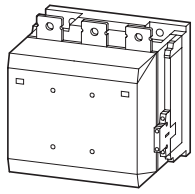
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DILM225A



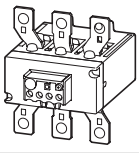
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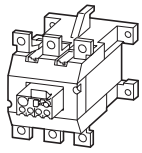


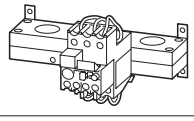
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DILM500



DILM650







1.2 Overload relays

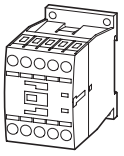
Electronic overload relays, thermistor overload relay for machine protection

Electronic overload relays, thermistor overload relay for machine protection

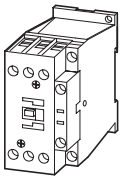
Setting ranges (A)
(note max. current of the contactor)



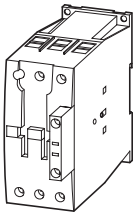
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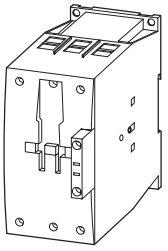
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DILM9 DILM15



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DILM25 DILM38



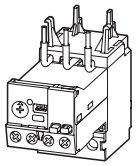
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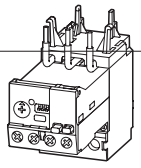
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Electronic overload relays

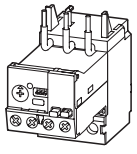
ZEB12
0.33-20



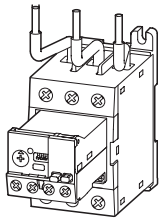
ZEB32
0.33-45



ZEB65
9-100

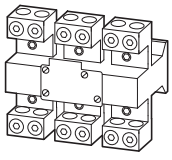


ZEB150
20-100



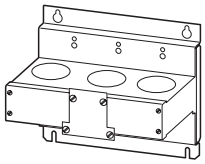
ZEB32-5-(GF)/KK combined with

ZEB-XCT300
60-300



ZEB-XCT600
120-600

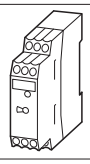
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200-1000

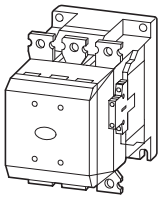


ZEB-XCT1500
300-1500

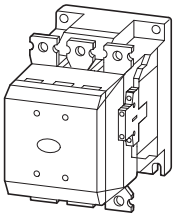
Thermistor overload relay for machine protection

EMT6((DB)K)

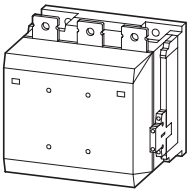




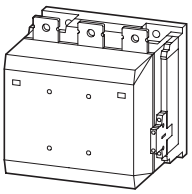
DILM185A
DILM225A



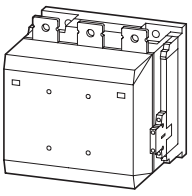
DILM250
DILM300



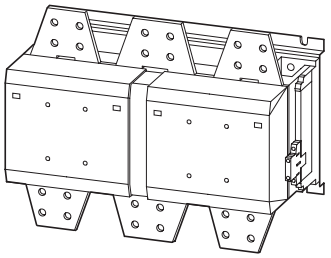
DILM400 DILM580
DILM500 DILM650



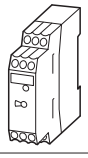
DILM750 DILM820



DILM1000



DILM1600



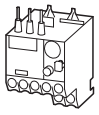
1.2 Overload relays

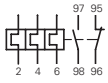
Bimetal relays for mini-contactor relays

Ordering

ZE overload relays for mini contactor relays

- **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102**
- **Test/off pushbutton**
- **Reset pushbutton manual/auto**
- **Trip-free release**
- **Direct mounting**



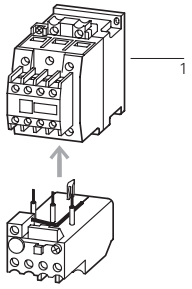
Setting range of overload releases	Circuit symbol	Auxiliary contact		For use with	Short-circuit protection	
		N/O = normally open contact NC = normally closed contact			Type "1" coordination	Type "2" coordination
I_r					gG/gL	gG/gL
A					A	A
0.1 – 0.16		1 N/O	1 NC	DILEM DIULEM/21/MV SDAINLEM	20	0.5
0.16 – 0.24		1 N/O	1 NC		20	1
0.24 – 0.4		1 N/O	1 NC		20	2
0.4 – 0.6		1 N/O	1 NC		20	2
0.6 – 1		1 N/O	1 NC		20	4
1 – 1.6		1 N/O	1 NC		20	6
1.6 – 2.4		1 N/O	1 NC		20	6
2.4 – 4		1 N/O	1 NC		20	10
4 – 6		1 N/O	1 NC		20	10
6 – 9		1 N/O	1 NC		20	10
9 – 12		1 N/O	1 NC		20	10

Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
UL File No.	E29184
UL CCN	NKCR
CSA File No.	12528
CSA Class No.	3211-03
NA Certification	UL Listed, CSA certified
Suitable for	Branch circuits
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP20, UL/CSA Type: -
See also	→ Page 31

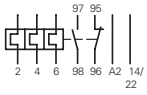
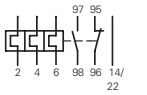
Part no. Article no.	Price See price list	Std. pack	Notes
ZE-0.16 014263		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EEx e motors Ex II (2) GD PTB 01 ATEX 3331 Observe manual AWB2300-1425D/GB.
ZE-0.24 014285			
ZE-0.4 014300			
ZE-0.6 014333			
ZE-1.0 014376			
ZE-1.6 014432			
ZE-2.4 014479			
ZE-4 014518			
ZE-6 014565			
ZE-9 014708			
ZE-12 014752			

With side-by-side mounting, there must be a minimum clearance of 5 mm between overload relays.



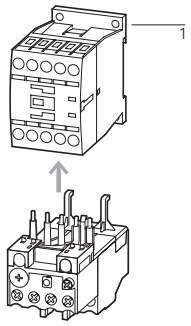
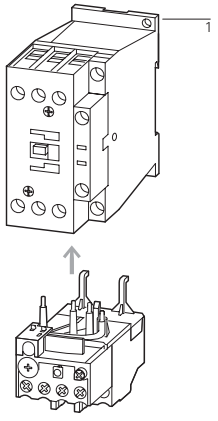
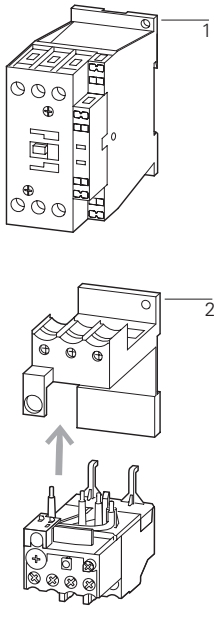
1 Contactor → Chapter 5
Accessories → Page 28
Manual → Page 28

ZB12, ZB32

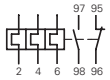
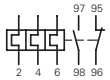
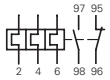
Setting range of overload releases	Circuit symbol	Auxiliary contact		For use with		Short-circuit protection	
		N/O = normally open contact NC = normally closed contact		Contactors	Soft starters	Type "1" coordination	Type "2" coordination
I_r A						gG/gL A	gG/gL A
ZB12 overload relay							
0.1 – 0.16		1 N/O	1 NC	DILM7, DILM9, DILM12, DILM15, DIULM7, DIULM9, DIULM12, SDAINLM12, SDAINLM16, SDAINLM22	–	25	0.5
0.16 – 0.24		1 N/O	1 NC		–	25	1
0.24 – 0.4		1 N/O	1 NC		–	25	2
0.4 – 0.6		1 N/O	1 NC		–	25	4
0.6 – 1		1 N/O	1 NC		–	25	4
1 – 1.6		1 N/O	1 NC		–	25	6
1.6 – 2.4		1 N/O	1 NC		–	25	10
2.4 – 4		1 N/O	1 NC		DS7-34…SX004…	25	16
4 – 6		1 N/O	1 NC		DS7-34…SX005…	25	20
6 – 10		1 N/O	1 NC		DS7-34…SX007… DS7-34…SX009…	50	25
9 – 12		1 N/O	1 NC		DS7-34…SX012…	50	25
12 – 16		1 N/O	1 NC		–	50	25
ZB32 overload relay							
0.1 – 0.16		1 N/O	1 NC	DILM17, DILM25, DILM32, DILM38, DILMF8, DILMF11, DILMF14, DILMF17, DILMF25, DILMF32, DIULM17, DIULM25, DIULM32, SDAINLM30, SDAINLM45, SDAINLM55	–	25	0.5
0.16 – 0.24		1 N/O	1 NC		–	25	1
0.24 – 0.4		1 N/O	1 NC		–	25	2
0.4 – 0.6		1 N/O	1 NC		–	25	4
0.6 – 1		1 N/O	1 NC		–	25	4
1 – 1.6		1 N/O	1 NC		–	25	6
1.6 – 2.4		1 N/O	1 NC		–	25	10
2.4 – 4		1 N/O	1 NC		–	25	16
4 – 6		1 N/O	1 NC		–	25	20
6 – 10		1 N/O	1 NC		–	50	25
10 – 16		1 N/O	1 NC		DS7-34...SX016...	63	35
16 – 24		1 N/O	1 NC		DS7-34...SX024...	100	35
24 – 32		1 N/O	1 NC		DS7-34...SX032...	125	63
32 – 38		1 N/O	1 NC		–	125	63

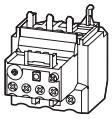
Information relevant for export to North America

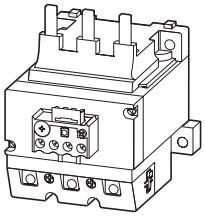
Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking	NA Certification	UL Listed, CSA certified
UL File No.	E29184	Suitable for	Branch circuits
UL CCN	NKCR	Max. Voltage Rating	600 V AC
CSA File No.	12528	Degree of Protection	IEC: IP20, UL/CSA Type: -
CSA Class No.	3211-03	See also	→ Page 31

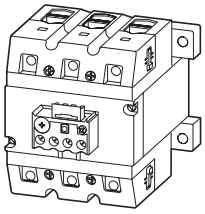
Part no. Article no.	Price See price list	Std. pack	Notes
ZB12-0,16 278431 **ZB12-0,24** 278432 **ZB12-0,4** 278433 **ZB12-0,6** 278434 **ZB12-1** 278435 **ZB12-1,6** 278436 **ZB12-2,4** 278437 **ZB12-4** 278438 **ZB12-6** 278439 **ZB12-10** 278440 **ZB12-12** 278441 **ZB12-16** 290168		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EEx e motors. Ⓔx II (2) GD PTB 04 ATEX 3022 Observe manual AWB2300-1527D/GB. • Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102 • Test/off pushbutton • Reset pushbutton manual/auto • Trip-free release • Direct mounting Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 28 Manual → Page 28
ZB32-0,16 278442 **ZB32-0,24** 278443 **ZB32-0,4** 278444 **ZB32-0,6** 278445 **ZB32-1** 278446 **ZB32-1,6** 278447 **ZB32-2,4** 278448 **ZB32-4** 278449 **ZB32-6** 278450 **ZB32-10** 278451 **ZB32-16** 278452 **ZB32-24** 278453 **ZB32-32** 278454 **ZB32-38** 112474		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EEx e motors. Ⓔx II (2) GD PTB 04 ATEX 3022 Observe manual AWB2300-1527D/GB. • Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102 • Test/off pushbutton • Reset pushbutton manual/auto • Trip-free release • Direct mounting Fitted directly to the contactor  Separate mounting  1 Contactor → Chapter 5 2 Base → Page 28 Manual → Page 28

ZB65, ZB150

Setting range of overload releases I_r A	Circuit symbol	Auxiliary contact N/O = normally open contact NC = normally closed contact		For use with	Short-circuit protection Type "1" coordination gG/gL A	Short-circuit protection Type "2" coordination gG/gL A
ZB65 overload relay • **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102** • **Test/off pushbutton** • **Reset pushbutton manual/auto** • **Trip-free release** • **Direct mounting**						
6 – 10		1 N/O	1 NC	DILM40, DILM50, DILM65, DILM72, DILMF40, DILMF50, DILMF65, DIULM40, DIULM50, DIULM65, SDAINLM70, SDAINLM90, SDAINLM115	50	25
10 – 16		1 N/O	1 NC		63	35
16 – 24		1 N/O	1 NC		63	50
24 – 40		1 N/O	1 NC		125	63
40 – 57		1 N/O	1 NC		160	80
50 – 65		1 N/O	1 NC		160	100
65 – 75		1 N/O	1 NC		250	160
ZB150 overload relay • **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102** • **Test/off pushbutton** • **Reset pushbutton manual/auto** • **Trip-free release** • **Direct mounting**						
35 – 50		1 N/O	1 NC	DILM80, DILM95, DILM115, DILM150, DILM170 DILMF80, DILMF95, DILMF115, DILMF150, DIULM80, DIULM95, DIULM115, DIULM150, SDAINLM140, SDAINLM165, SDAINLM200, SDAINLM260	160	125
50 – 70		1 N/O	1 NC		250	160
70 – 100		1 N/O	1 NC		315	200
95 – 125		1 N/O	1 NC		315	250
120 – 150		1 N/O	1 NC		315	250
145 – 175		1 N/O	1 NC		315	250
ZB150 overload relay • **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102** • **Test/off pushbutton** • **Reset pushbutton manual/auto** • **Trip-free release** • **Separate mounting**						
35 – 50		1 N/O	1 NC	DILM80, DILM95, DILM115, DILM150, DILM170 DILMF80, DILMF95, DILMF115, DILMF150, DIULM80, DIULM95, DIULM115, DIULM150, SDAINLM140, SDAINLM165, SDAINLM200, SDAINLM260	160	125
50 – 70		1 N/O	1 NC		250	160
70 – 100		1 N/O	1 NC		315	200
95 – 125		1 N/O	1 NC		315	250
120 – 150		1 N/O	1 NC		315	250
145 – 175		1 N/O	1 NC		400	315





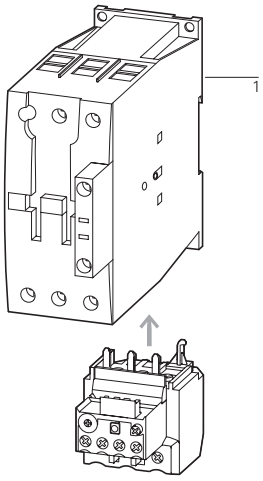


Information relevant for export to North America

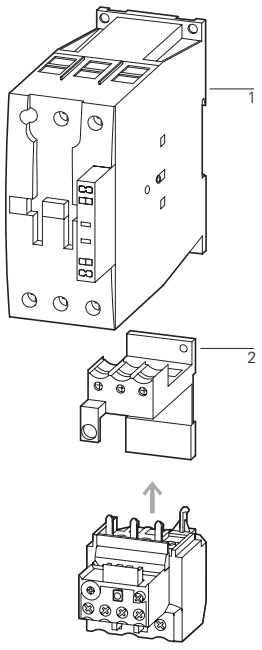
Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
UL File No.	E29184
UL CCN	NKCR
CSA File No.	12528
CSA Class No.	3211-03
NA Certification	UL Listed, CSA certified
Suitable for	Branch circuits
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP00, UL/CSA Type: -
See also	→ Page 31

Part no. Article no.	Price See price list	Std. pack	Notes
ZB65-10 278455 **ZB65-16** 278456 **ZB65-24** 278457 **ZB65-40** 278458 **ZB65-57** 278459 **ZB65-65** 278460 **ZB65-75** 108792		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EExe motors. II (2) GD PTB 04 ATEX 3022 Observe manual AWB2300-1545D/GB.
ZB150-50 278462 **ZB150-70** 278463 **ZB150-100** 278464 **ZB150-125** 278465 **ZB150-150** 278466 **ZB150-175** 107316		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EEx e motors. II (2) GD PTB 04 ATEX 3022 Observe manual AWB2300-1545D/GB.
ZB150-50/KK 278468 **ZB150-70/KK** 278469 **ZB150-100/KK** 278470 **ZB150-125/KK** 278471 **ZB150-150/KK** 278472 **ZB150-175/KK** 107317		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Suitable for protection of EEx e motors. II (2) GD PTB 04 ATEX 3022 Observe manual AWB2300-1545D/GB.

Fitted directly to the contactor



Separate mounting

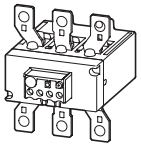


1 Contactor → Chapter 5
2 Base → Page 28
Manual → Page 28

Z5, ZW7

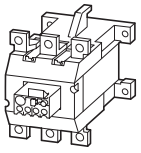
Z5 overload relays greater than 150A
- **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102**
- **Test/off pushbutton**
- **Reset pushbutton manual/auto**
- **Trip-free release**

Direct mounting



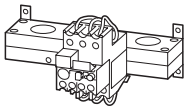
Z5 overload relays greater than 150A
- **Phase failure sensitivity to IEC/EN 60947, VDE 0660 Part 102**
- **Test/off pushbutton**
- **Reset pushbutton manual/auto**
- **Trip-free release**

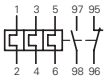
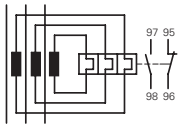
Separate mounting

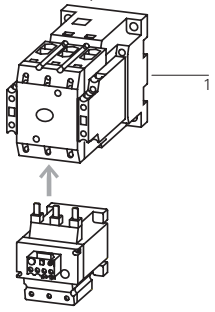


ZW7 current transformer-operated overload relays
- **Test/off button**
- **Reset pushbutton manual/auto**
- **Trip-free release**
- **Protection with heavy starting duty**

Separate mounting



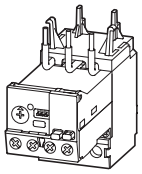
Setting range of overload releases I_r A	Circuit symbol	Auxiliary contacts N/O = normally open contact NC = normally closed contact		For use with	Short-circuit protection Type "1" coordination gG/gL A	Short-circuit protection Type "2" coordination gG/gL A
50 – 70		1 N/O	1 NC	DILM185A DILM225A	250 250	160 160
70 – 100		1 N/O	1 NC		315 315	200 200
95 – 125		1 N/O	1 NC		315 315	250 250
120 – 160		1 N/O	1 NC		400 400	250 250
160 – 220		1 N/O	1 NC		400 500	315 400
200 – 250		1 N/O	1 NC		400 500	315 400
50 – 70		1 N/O	1 NC	DILM250	250 250	160 160
70 – 100		1 N/O	1 NC		315 315	200 200
95 – 125		1 N/O	1 NC		315 315	250 250
120 – 160		1 N/O	1 NC		400 400	250 250
160 – 220		1 N/O	1 NC		400 500	315 400
200 – 250		1 N/O	1 NC		400 500	315 400
250 – 300		1 N/O	1 NC	DILM300A	500 500	400 400
42 – 63		1 N/O	1 NC	–	–	–
60 – 90		1 N/O	1 NC	–	–	–
85 – 125		1 N/O	1 NC	–	–	–
110 – 160		1 N/O	1 NC	–	–	–
160 – 240		1 N/O	1 NC	–	–	–
190 – 290		1 N/O	1 NC	–	–	–
270 – 400		1 N/O	1 NC	–	–	–
360 – 540		1 N/O	1 NC	–	–	–
420 – 630		1 N/O	1 NC	–	–	–

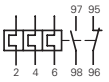
Part no. Article no.	Price See price list	Std. pack	Notes	Information relevant for export to North America
Z5-70/FF225A 139572 **Z5-100/FF225A** 139573 **Z5-125/FF225A** 139574 **Z5-160/FF225A** 139575 **Z5-220/FF225A** 139576 **Z5-250/FF225A** 139577		1 Off	Overload release: tripping class 10 A Short-circuit protection: With direct mounting, observe the maximum permissible fuse of the contactor. Z5-…/FF225A for protecting EEx electric motors in preparation. Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 29	Product Standards: UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking NA Certification: Request filed for UL and CSA Suitable for: Branch circuits Max. Voltage Rating: 600 V AC Degree of Protection: IEC: IP00, UL/CSA Type: - See also: → Page 31
Z5-70/FF250 210070 **Z5-100/FF250** 210071 **Z5-125/FF250** 210072 **Z5-160/FF250** 210073 **Z5-220/FF250** 210074 **Z5-250/FF250** 210075				Product Standards: UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking UL File No.: E29184 UL CCN: NKCR CSA File No.: 12528 CSA Class No.: 3211-03 NA Certification: UL Listed, CSA certified Suitable for: Branch circuits Max. Voltage Rating: 600 V AC Degree of Protection: IEC: IP00, UL/CSA Type: - See also: → Page 31
Z5-300/FF250 139578				Product Standards: UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking NA Certification: Request filed for UL and CSA Suitable for: Branch circuits Max. Voltage Rating: 600 V AC Degree of Protection: IEC: IP00, UL/CSA Type: -
ZW7-63 000245 **ZW7-90** 002618 **ZW7-125** 004991 **ZW7-160** 007364 **ZW7-240** 009737 **ZW7-290** 052448 **ZW7-400** 045329 **ZW7-540** 047702		1 Off	The main current characteristic values are defined by the main current wiring being used. Adjustment for smaller rated motor currents → Page 30	Product Standards: UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking UL File No.: E29184 UL CCN: NKCR CSA File No.: 12528 CSA Class No.: 3211-03 NA Certification: UL Listed, CSA certified Suitable for: Branch circuits Max. Voltage Rating: 600 V AC Degree of Protection: IEC: IP00, UL/CSA Type: -
ZW7-630 050075		1 Off		–

ZEB12, ZEB32

ZEB12 electronic overload relay
- **Phase-failure sensitivity**
- **Test/off pushbutton**
- **Reset button**
- **Manual/Auto reset selectable**
- **Protection with heavy starting duty (Class 10A-30)**

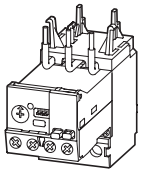
Direct mounting

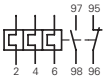


Ground fault detection	Setting range of overload releases I_r A	Circuit symbol	Auxiliary contact N/O = normally open contact NC = normally closed contact		For use with
Without	0.33 – 1.65		1 N/O	1 NC	DILM7 DILM9 DILM12 DILM15 DIULM7 DIULM9 DIULM12 SDAINLM12 SDAINLM16 SDAINLM22
Without	1 – 5		1 N/O	1 NC	
Without	4 – 20		1 N/O	1 NC	
With	0.33 – 1.65		1 N/O	1 NC	
With	1 – 5		1 N/O	1 NC	
With	4 – 20		1 N/O	1 NC	

ZEB32 electronic overload relay
- **Phase-failure sensitivity**
- **Test/off pushbutton**
- **Reset button**
- **Manual/Auto reset selectable**
- **Protection with heavy starting duty (Class 10A-30)**

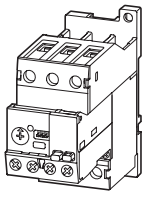
Direct mounting

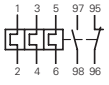


Without	0.33 – 1.65		1 N/O	1 NC	DILM17 DILM25 DILM32 DILM38 DIULM17 DIULM25 DIULM32 SDAINLM30 SDAINLM45 SDAINLM55
Without	1 – 5		1 N/O	1 NC	
Without	4 – 20		1 N/O	1 NC	
Without	9 – 45		1 N/O	1 NC	
With	0.33 – 1.65		1 N/O	1 NC	
With	1 – 5		1 N/O	1 NC	
With	4 – 20		1 N/O	1 NC	
With	9 – 45		1 N/O	1 NC	

ZEB32 electronic overload relay
- **Phase-failure sensitivity**
- **Test/off pushbutton**
- **Reset button**
- **Manual/Auto reset selectable**
- **Protection with heavy starting duty (Class 10A-30)**

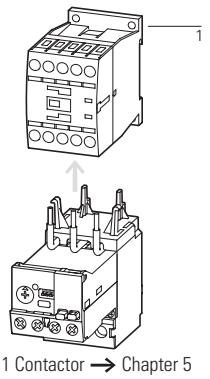
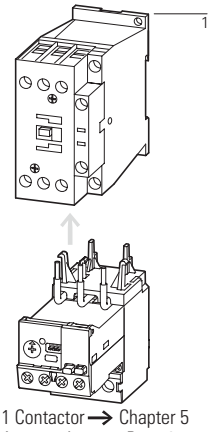
Separate mounting



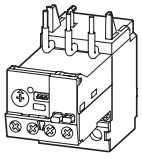
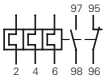
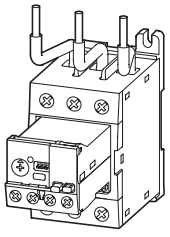
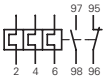
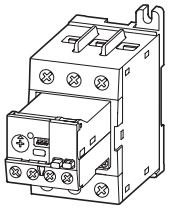
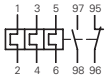
Without	0.33 – 1.65		1 N/O	1 NC	DILM17 DILM25 DILM32 DILM38 DIULM17 DIULM25 DIULM32 SDAINLM30 SDAINLM45 SDAINLM55
Without	1 – 5		1 N/O	1 NC	
Without	4 – 20		1 N/O	1 NC	
Without	9 – 45		1 N/O	1 NC	
With	0.33 – 1.65		1 N/O	1 NC	
With	1 – 5		1 N/O	1 NC	
With	4 – 20		1 N/O	1 NC	
With	9 – 45		1 N/O	1 NC	

Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
NA Certification	Request filed for UL and CSA
Suitable for	Branch circuits
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP20, UL/CSA Type: -

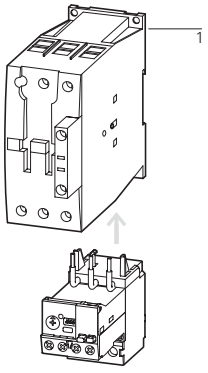
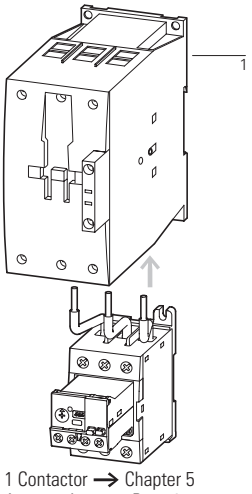
Part no. Article no.	Price See price list	Std. pack	Notes	
ZEB12-1,65 136480 **ZEB12-5** 136481 **ZEB12-20** 136482 **ZEB12-1,65-GF** 136483 **ZEB12-5-GF** 136484 **ZEB12-20-GF** 136485		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 25
ZEB32-1.65 136486 **ZEB32-5** 136487 **ZEB32-20** 136488 **ZEB32-45** 136489 **ZEB32-1,65-GF** 136490 **ZEB32-5-GF** 136491 **ZEB32-20-GF** 136492 **ZEB32-45-GF** 136493		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 25
ZEB32-1,65/KK 136494 **ZEB32-5/KK** 136495 **ZEB32-20/KK** 136496 **ZEB32-45/KK** 136497 **ZEB32-1,65-GF/KK** 136498 **ZEB32-5-GF/KK** 136499 **ZEB32-20-GF/KK** 136500 **ZEB32-45-GF/KK** 136501		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	

ZEB65, ZEB150

Ground fault detection	Setting range of overload releases I_r A	Circuit symbol	Auxiliary contact N/O = normally open contact NC = normally closed contact		For use with
ZEB65 electronic overload relay • **Phase-failure sensitivity** • **Test/off pushbutton** • **Reset button** • **Manual/Auto reset selectable** • **Protection with heavy starting duty (Class 10A-30)** **Direct mounting** 					
Without	9 – 45		1 N/O	1 NC	DILM40 DILM50 DILM65 DILM72 DIULM40 DIULM50 DIULM65 SDAINLM70 SDAINLM90 SDAINLM115
With	9 – 45		1 N/O	1 NC	
Without	20 – 100		1 N/O	1 NC	
With	20 – 100		1 N/O	1 NC	
ZEB150 electronic overload relay • **Phase-failure sensitivity** • **Test/off pushbutton** • **Reset button** • **Manual/Auto reset selectable** • **Protection with heavy starting duty (Class 10A-30)** **Direct mounting** 					
Without	20 – 100		1 N/O	1 NC	DILM80 DILM95 DILM115 DILM150 DIULM80 DIULM95 DIULM115 DIULM150 SDAINLM140 SDAINLM165 SDAINLM200 SDAINLM260
With	20 – 100		1 N/O	1 NC	
ZEB150 electronic overload relay • **Phase-failure sensitivity** • **Test/off pushbutton** • **Reset button** • **Manual/Auto reset selectable** • **Protection with heavy starting duty (Class 10A-30)** **Separate mounting** 					
Without	20 – 100		1 N/O	1 NC	DILM80 DILM95 DILM115 DILM150 DIULM80 DIULM95 DIULM115 DIULM150 SDAINLM140 SDAINLM165 SDAINLM200 SDAINLM260
With	20 – 100		1 N/O	1 NC	

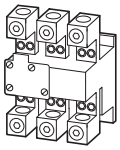
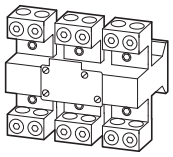
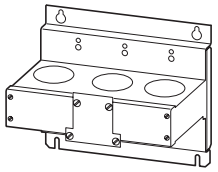
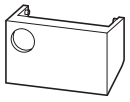
Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
NA Certification	Request filed for UL and CSA
Suitable for	Branch circuits
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP20, UL/CSA Type: -

Part no. Article no.	Price See price list	Std. pack	Notes	
ZEB65-45 136502 **ZEB65-45-GF** 136503 **ZEB65-100** 136504 **ZEB65-100-GF** 136505		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 25
ZEB150-100 136506 **ZEB150-100-GF** 136507		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	Fitted directly to the contactor  1 Contactor → Chapter 5 Accessories → Page 25
ZEB150-100/KK 136508 **ZEB150-100-GF/KK** 136509		1 Off	Suitable for protection of EEx e motors. II (2) GD PTB ATEX starting 08/2010 Observe manual AWB2320-1633D/GB. Switchgear and cable dimensioning according to CLASS → Page 25	

1

ZEB-XCT...

	Setting range of overload releases I_r A	Language	Can be used with	Part no. Article no.	Price See price list	Std. pack
Current sensors						
	60 – 300	–	ZEB32-5-GF/KK ZEB32-5/KK	**ZEB-XCT300**[1] 136511		1off
	120 – 600	–	ZEB32-5-GF/KK ZEB32-5/KK	**ZEB-XCT600**[1] 136512		1off
	200 – 1000	–	ZEB32-5-GF/KK ZEB32-5/KK	**ZEB-XCT1000**[1] 136517		1off
	300 – 1500	–		**ZEB-XCT1500**[1] 136513		1off
Sealable shroud Cover to prevent adjustment of motor current (tamper-proof)						
	–	–	–	**ZEB-XSC**[2] 136514		1 off
Reset adapter Cover to prevent adjustment of motor current (tamper-proof)						
	–	–	–	**ZEB-XRB**[2] 136515		1 off
Documentation ZEB electronic overload relay Overload monitoring of EEx e motors						
	–	Deutsch English	ZEB12 ZEB32 ZEB65 ZEB150	**AWB2320-1633DE/EN** 136516		1 off

1)

Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
NA Certification	Request filed for UL and CSA
Suitable for	Branch circuits
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP00, UL/CSA Type: -

2)

Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
NA Certification	Request filed for UL and CSA
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP20, UL/CSA Type: -

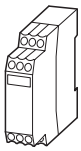
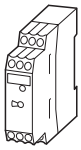
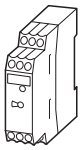
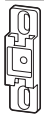
Switchgear and cable sizing corresponding to the respective starting inertia (CLASS) for ZEB

Switchgear is designed according to "CLASS 10" requirements for both normal and overload operation conditions. In order for the switchgear (circuit-breaker and contactor) and the cables not to be overloaded with long tripping times, they must be overdimensioned accordingly. The rated operational current, I_e, for switchgear and cables can be calculated with the following current factor taking the tripping class into account:

Trippling class	Class 5	Class 10	Class 15	Class 20	Class 25	Class 30	Class 35	Class 40
Current factor of rated operational current I_e	1.00	1.00	1.22	1.41	1.58	1.73	1.89	2.00

Ordering

EMT6

Function	Rated operational current AC-15 240 V I_e A	Rated operational current AC-14 400 V I_e A	Conventional thermal current I_{th} A	Rated control voltage U_s V	Part no. Article no.	Price See price list	Std. pack	Notes
EMT6 thermistor machine protection overload relays								
 Without automatic reset Mains and fault LED display	3	3	6	24 - 240 V 50/60 Hz, 24 - 240 V DC	**EMT6**[1) 2)] 066166		1 off	II (2) G II (2) GD only for EMT6-K PTB 02 ATEX 3162 Observe the manual AWB 2327-1446 → Page 26 Can be snap fitted on a top-hat rail to IEC/EN 60715. Device clearance ≧ 3 mm.
				230 V 50/60 Hz	**EMT6(230V)**[1) 2)] 066400			
Without automatic reset Mains and fault LED display Tripped in the event of a short-circuit in the sensor-cable	3	3	6	24 - 240 V 50/60 Hz, 24 - 240 V DC	**EMT6-K**[2)] 269470			
 Selector switch with/without automatic reset For manual or remote resetting Test button Mains and fault LED display	3	3	6	24 - 240 V 50/60 Hz, 24 - 240 V DC	**EMT6-DB**[1) 2)] 066167			
				230 V 50/60 Hz	**EMT6-DB(230V)**[1) 2)] 066401			
Selector switch with/without automatic reset For manual or remote resetting Test button Mains and fault LED display Trip with short-circuit in the sensor cable	3	3	6	24 - 240 V 50/60 Hz, 24 - 240 V DC	**EMT6-KDB**[2)] 269471			
 All-in-one device Selector switch with/without automatic reset Trip with short-circuit in the sensor cable Zero-voltage safe For manual or remote resetting Test button Short-circuit detection and retention can be deactivated Mains and fault LED display	3	3	6	24 - 240 V 50/60 Hz, 24 - 240 V DC	**EMT6-DBK**[2)] 066168			
Accessories Screw adapters for screw fixing								
					**CS-TE**[3)] 095853		10 off	–
Documentation EMT6 thermistor overload relay Overload monitoring of machines in the EEx e area								
German					**AWB2327-1446D** 264853		1 off	
English					**AWB2327-1446GB** 267010		1 off	

Notes

[1)] For EMT6, EMT6(230V), EMT6-DB and EMT6-DB(230V) applies: Provide additional short-circuit protection in the sensor circuit with a current monitoring relay.

[2)]

Information relevant for export to North America

Product Standards	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking
UL File No.	E29184
UL CCN	NKCR
CSA File No.	12528
CSA Class No.	3211-03
NA Certification	UL Listed, CSA certified
Max. Voltage Rating	600 V AC
Degree of Protection	IEC: IP20, UL/CSA Type: -

[3)]

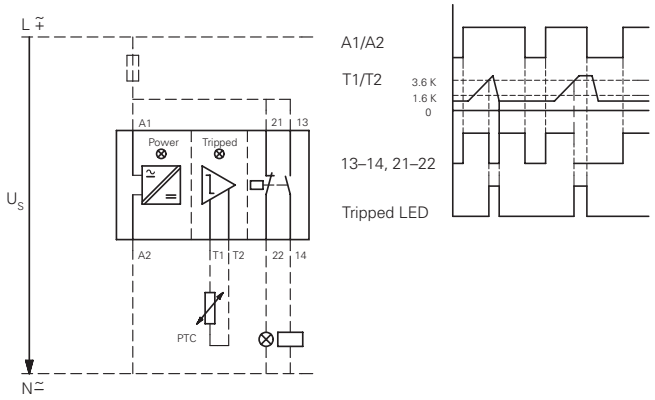
Information relevant for export to North America

UL/CSA certification not required

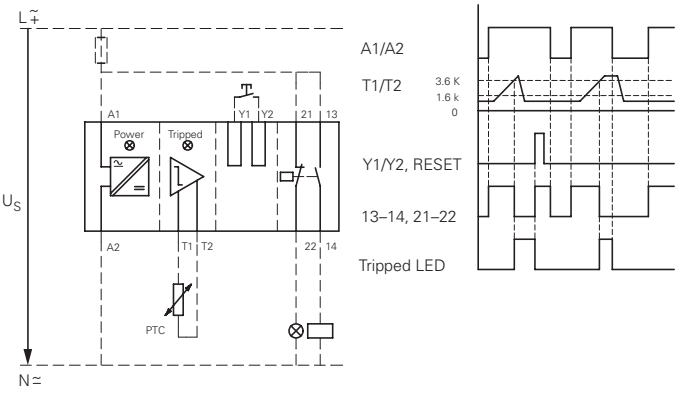
1 **Engineering**

Terminal marking according to EN 50005

EMT6(-K), EMT6-(K)DB, EMT6-DBK
Auto

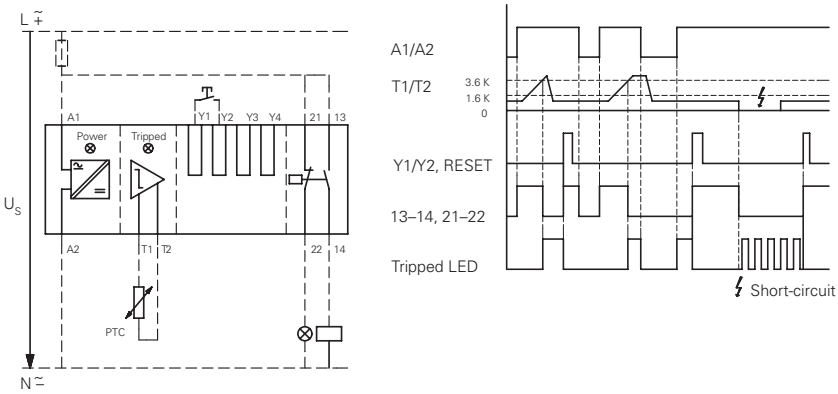


EMT6-(K)DB, EMT6-DBK
Manual



EMT6-DBK

Zero-voltage safe operation



LED display

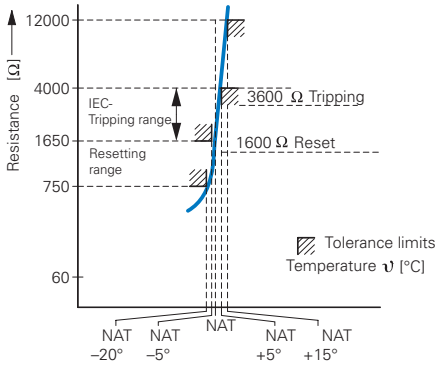
- Supply voltage present
- Device has tripped
- Device has tripped/short-circuit in the sensor circuit

Sensor circuit

At $R_K \leqq 250\,\Omega$ per sensor: 6 sensors, at $R_K \leqq 100\,\Omega$ per sensor: 9 sensors in the winding (provided by user), max. cable length to sensor 250 m (not shielded);
Total PTC thermistor resistance $\sum R_K \leqq 1500\,\Omega$

Sensor circuit characteristic values at U_s and +20 °C

	EMT6...	
$R_{T1\text{-}T2}$	$U_{T1\text{-}T2}$ V DC max.	$I_{T1\text{-}T2}$ mA max.
T1, T2 short-circuited	-	1.9
4 kΩ	3	0.8
T1-T2 open	5.1	-

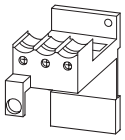


Functions that can be disconnected on the EMT6-DBK:

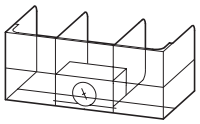
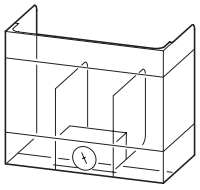
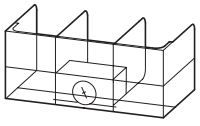
Function	Disconnection by link
Short-circuit monitoring	Y_1 - Y_3
Zero-voltage safety	Y_1 - Y_4

Ordering

ZB, Z5, ZW7

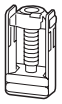
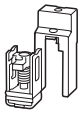
	For use with	Part no. Article no.	Price See price list	Std. pack	Notes	Information relevant for export to North America	
Documentation **Overload relays** **Overload monitoring of EEx e motors**	ZE… ZB12… ZB32… ZB65… ZB150…	**AWB2300-1425D** 258704 **AWB2300-1527D/GB** 284910 **AWB2300-1545D/GB** 102065		1 off 1 off 1 off	German German/English German/English		
Bases **For separate mounting** 	ZB32 ZB65	**ZB32-XEZ** 278473 **ZB65-XEZ** 278474		5 off 2 off	Can be snap fitted on a top-hat rail to IEC/EN 60715 or can be screw fitted. For ZB32-38, use BK25/3-PKZ0 additionally.	Product Standards UL File No. UL CCN CSA File No. CSA Class No. NA Certification Max. Voltage Rating Degree of Protection	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking E29184 NKCR 12528 3211-03 UL Listed, CSA certified 600 V AC IEC: IP00, UL/CSA Type: -
Pushbuttons **For enclosed** **Overload relay** **Mounting diameter: 22.3 mm** **External reset button, IP65** 	ZW7... ZE Z5 ZB12 ZB32 ZB65 ZB150	**M22-DZ-B** 254833		10 off	Button plate, blue	Product Standards UL File No. UL CCN CSA File No. CSA Class No. NA Certification	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking E29184 NKCR 12528 3211-03 UL Listed, CSA certified
	ZW7... ZE Z5 ZB12 ZB32 ZB65 ZB150	**M22-DZ-B-GB14** 254834		10 off	Button plate, blue RESET		
Pushbuttons **For enclosed** **Overload relay** **Mounting diameter: 22.3 mm** **Off button, IP65** 	ZW7... ZE Z5 ZB12 ZB32 ZB65 ZB150	**M22-DZ-X** 254835		10 off	Without button plate, add button plate.	Product Standards UL File No. UL CCN CSA File No. CSA Class No. NA Certification	UL 508; CSA-C22.2 No.14; IEC/EN 60947-4-1; CE marking E29184 NKCR 12528 3211-03 UL Listed, CSA certified
Pushbuttons **For enclosed** **Overload relay** **Mounting diameter: 22.3 mm** **Button plates**	M22-DZ-X	**M22-XD-R** 216423		10 off	Button plate, red	UL/CSA certification not required	
	M22-DZ-X	**M22-XD-R-X0** 218153			Red button plate with white circle		
	M22-DZ-X	**M22-XD-R-GB0** 218194			Button plate red STOP		

Z5..., K-B..., KS-B...

	For use with	Part no. Article no.	Price See price list	Std. pack	Notes
Covers 	Direct mounting Z5-.../FF225 to DILM185A DILM225A	**Z5/FF225A-XHB-Z** 139579		1 off	Fitted directly to the contactor DILM400 -XHB DILM185A/ 225A Z5/FF225A -XHB-Z Z5-.../FF225A Z5/FF250 -XHB
Covers 	Z5-.../FF225A Z5-.../FF250	**Z5/FF250-XHB** 215217		1 off	Separate mounting Z5/FF250 -XHB Z5-.../FF250/ FF225A Z5/FF250 -XHB Fitted directly to the contactor DILM400 -XHB DILM250/ 300A Z5/FF250 -XHB-Z Z5-.../FF250 Z5/FF250 -XHB Fitted directly to the contactor DILM400 -XHB DILM185A/ 225A Z5/FF225A -XHB-Z Z5-.../FF225A Z5/FF250 -XHB
Covers 	Direct mounting Z5-.../FF250 to DILM250 DILM300A	**Z5/FF250-XHB-Z** 215218		1 off	Fitted directly to the contactor DILM400 -XHB DILM250/ 300A Z5/FF250 -XHB-Z Z5-.../FF250 Z5/FF250 -XHB

Box terminals kit

Consisting of 3 individual clamps

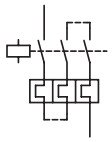
	For use with	For connection of copper flat strip max. W × H mm	Part no. Article no.	Price See price list	Std. pack	Notes
With protective cover 	Z5-.../FF250	24 × 26	**K-B-DIL6AM** 064062		1 off	When using box terminals the protective covers must be used.
With control circuit terminal and protective cover 	Z5-.../FF250	24 × 26	**KS-B-DIL6AM** 064063		1 off	When using box terminals the protective covers must be used.

for North America

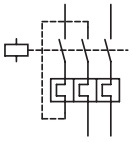
Engineering

Protection of single-phase and DC current motors:

1 pole

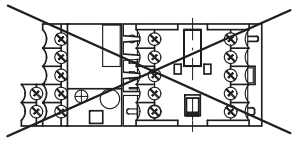


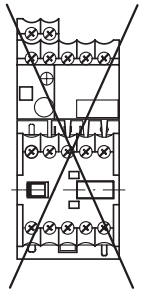
2 pole



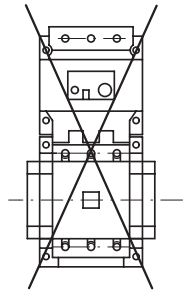
Mounting position:

ZE



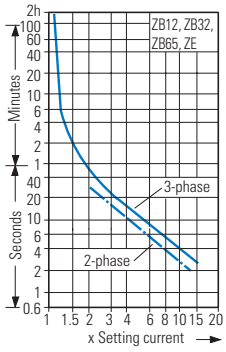


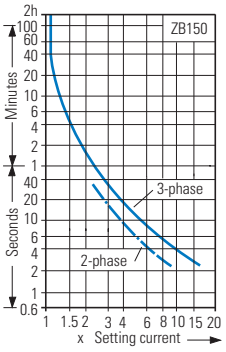
ZB12, ZB32, ZB65, ZB150, Z5

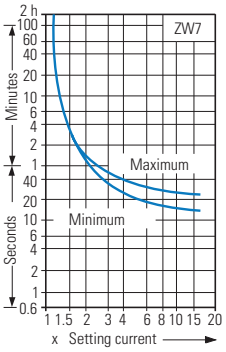


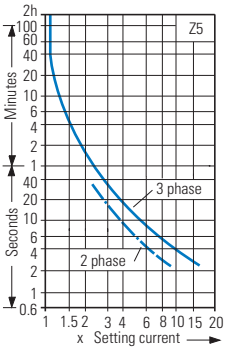
Tripping characteristics

These tripping characteristics are mean values of the spread at 20 °C ambient temperature in a cold state.
They show the tripping times in relation to the response current. When the devices are at operational temperature the tripping time of the overload relay drops to approx. 25% of the value shown. Specific characteristics for each individual setting range can be found in the manual on → Page 28









Adaption of ZW7 to smaller rated motor currents

Number of loops	ZW7 -63	-90	-125	-160	-240	-290	-400	-540	-630
	Rated motor current I_N [A]								
1	42-63	60-90	85-125	110-160	160-240	190-290	270-400	360-540	420-630
2	21-31,5	30-45	42.5-62,5	55-80	80-120	95-145	135-200	180-270	210-315
3	14-21	20-30	28.3-41,7	36.7-53,3	53.3-80	63.3-96,7	90-133,3	120-180	140-210
4	10.5-15,8	15-22,5	21.3-31,3	27.5-40	40-60	47.5-72,5	67.5-100	90-135	105-157,5
5	8.4-12,6	12-18	17-25	22-32	32-48	38-58	54-80	72-108	84-126

1

For North America

ZE, ZB, Z5
Overload relay short-circuit strength

UL508, CSA-C22,2 No. 14/SCCR values

	Fuse acc. to NEC, CEC		CB	
	A	kA	A	kA
	600V AC		480V AC	
ZE-0,16	1	5	15	5
ZE-0.24	1	5	15	5
ZE-0.4	1	5	15	5
ZE-0.6	1	5	15	5
ZE-1,0	3	5	15	5
ZE-1.6	6	5	15	5
ZE-2.4	6	5	15	5
ZE-4	15	5	15	5
ZE-6	20	5	15	5
ZE-9	35	5	15	5
ZE-12	45	5	-	-
	600V AC			
ZB12(32)-0,16	1 CLASS J/CC	100	-	-
ZB12(32)-0,24	1 CLASS J/CC	100	-	-
ZB12(32)-0,4	1 CLASS J/CC	100	-	-
ZB12(32)-0,6	1 CLASS J/CC	100	-	-
ZB-12(32)-1,0	1 CLASS J/CC	100	-	-
ZB-12(32)-1,6	3 CLASS J/CC	100	-	-
ZB-12(32)-2,4	3 CLASS J/CC	100	-	-
ZB-12(32)-4	6 CLASS J/CC	100	-	-
ZB-12(32)-6	10 CLASS J/CC	100	-	-
ZB-12(32)-10	15 CLASS J/CC	100	-	-
ZB12-12	15 CLASS J/CC	100	-	-
ZB12-16	30 CLASS J/CC	100	-	-
ZB32-16	35 CLASS J	100	-	-
ZB32-24	45 CLASS J	100	-	-
ZB32-32	60 CLASS J	100	-	-
	600V AC		600V AC	
ZB65-10	15 CLASS J	100	40	5
ZB65-16	35 CLASS J	100	60	5
ZB65-24	45 CLASS J	100	90	5
ZB65-40	60 CLASS J	100	125	5
ZB65-57	110 CLASS J	100	150	10
ZB65-65	125 CLASS J	100	150	10
ZB65-75	125 CLASS J	100	150	10

	Fuse acc. to NEC, CEC		CB	
	A	kA	A	kA
	600V AC		600 V AC	
ZB150-50	225	5	200	5
ZB150-70	250	10	250	10
ZB150-100	400 CLASS J	10	400	10
ZB150-125	500 CLASS J	10	500	10
ZB150-150	600 CLASS J	10	600	10
ZB150-175	600 CLASS J	10	600	10
ZB150-50(KK)	110 CLASS J	100	200	5
ZB150-70(KK)	125 CLASS J	100	250	10
ZB150-100(KK)	200 CLASS J	100	400	10
ZB150-125(KK)	250 CLASS J	100	500	10
ZB150-150(KK)	300 CLASS J	100	600	10
ZB150-175(KK)	300 CLASS J	100	600	10
	600V AC		600V AC	
Z5-70/...	250	10	250	10
Z5-100/...	400 CLASS J	10	400	10
Z5-125/...	500 CLASS J	10	500	10
Z5-160/...	600 CLASS J	10	600	10
Z5-220/...	800 CLASS J	10	800	10
Z5-250/...	700 CLASS J	10	600	10
Z5-70/...	125 CLASS J	100	-	-
Z5-100/...	200 CLASS J	100	-	-
Z5-125/...	250 CLASS J	100	-	-
Z5-160/...	300 CLASS J	100	-	-

Technical data

ZE, ZB

			ZE	ZB12, ZB32	ZB65	ZB150(KK)
General						
Standards			IEC/EN 60947, VDE 0660, UL, CSA			
Climatic proofing			Damp heat, constant, to IEC 60068-2-78 Damp heat, cyclic, to IEC 60068-2-30			
Ambient temperature						
Open [1]		°C	-25…50	-25…55	-25…55	-25…55
Enclosed [1]		°C	-25…40	-25…40	-25…40	-25…40
Temperature compensation			Continuous			
Mounting position			→ Page 30			
Weight		kg	0.07	0.15	0.25	1.64
Mechanical shock resistance half-sinusoidal shock, 10 ms to IEC 60068-2-27		g	10	10	10	10
Protection type			IP20	IP20	IP00	IP00
Protection against direct contact when actuated from front (EN 50274)			Finger- and back-of-hand proof			
Main contacts						
Rated impulse withstand voltage	U_{imp}	V AC	6000	6000	6000	8000
Overvoltage category/pollution degree			III/3	III/3	III/3	III/3
Rated insulation voltage						
AC	U_i	V AC	690	690	690	1000
Rated operating voltage	U_e	V AC	690	690	690	1000
Safe isolation according to EN 61140						
Between auxiliary contacts and main contacts		V AC	300	440	440	440
Between the main contacts		V AC	300	440	440	440
Overload relay setting range		A	0.1…12	0.1…38	6…75	25…175
Temperature compensation residual error > 40 °C		%/K	≦0.25	≦0.25	≦0.25	≦0.25
Short-circuit protection rating maximum fuse			→ Page 13	→ Page 15	→ Page 17	→ Page 17
Current heat loss (3 conductors)						
Lower value of setting range		W	2.5	2.5	3	16
Upper value of setting range		W	6	6	7.5	18
Terminal capacity						
Solid		mm²	2 × (0.75 - 2.5)	2 × (1 - 6) [5]	2 × (1 - 16) [4]	2 × (4 - 16)
Flexible with ferrule		mm²	2 × (0.5 - 1.5)	2 × (1 - 4) [5] 2 × (1 - 6) [3]	1 × (1…25) 2 × (1…10) [2]	1 × (4 - 70) 2 × (4 - 50)
Stranded		mm²	–	–	1 × (16…25)	1 × (16…50) 2 × (16…50)
Solid or stranded		AWG	18 - 14	14 - 8 [5]	14 - 2	3/0
Busbar	Width	mm	–	–	–	–
Terminal screw			M3.5	M4	M6	M10
Tightening torque		Nm	1.2	1.8 [5]	3.5	10
Tools						
Pozidriv screwdriver		Size	2	2	2	–
Flat-blade sc rewdriver		mm	0.8 × 5.5	1 × 6	1 × 6	–
Hexagon soc ket	SW	mm	–	–	–	5

Notes

[1] Ambient temperature: Operating range to IEC/EN 60947, PTB: -5°C to +55°C
[2] Use identical cross-section when using two conductors
[3] 6 mm flexible with ferrules to DIN 46228
[4] With ZB65-XEZ max 1 × (1… 16)
[5] ZB32-38: solid and flexible with ferrule, 2.5 - 25 mm², 3 Nm tightening torque. AWG10-b, 27 lb-in tightening torque for solid or stranded conductors.

Z5, ZW7

			Z5-…/FF225A(250)	ZW7
General				
Standards			IEC/EN 60947, VDE 0660, UL, CSA	IEC/EN 60947, VDE 0660, UL, CSA
Climatic proofing			Damp heat, constant, to IEC 60068-2-78 Damp heat, cyclic, to IEC 60068-2-30	
Ambient temperature				
Open [1]		°C	-25…50	-25…50
Enclosed [1]		°C	-25…40	-25…40
Temperature compensation			Continuous	Continuous
Mounting position			→ Page 30	Any
Weight		kg	1.55	0.8
Mechanical shock resistance half-sinusoidal shock, 10 ms to IEC 60068-2-27		g	10	10
Protection type			IP00	IP00
Protection against direct contact when actuated from front (EN 50274)			With terminal cover	Finger- and back-of-hand proof
Main contacts				
Rated impulse withstand voltage	U_{imp}	V AC	8000	6000
Overvoltage category/pollution degree			III/3	III/3
Rated insulation voltage				
AC	U_i	V AC	1000	690
Rated operating voltage	U_e	V AC	1000	690
Safe isolation according to EN 61140				
Between auxiliary contacts and main contacts		V AC	440	440
Between the main contacts		V AC	440	440
Overload relay setting range		A	50…300	42…630
Temperature compensation residual error > 40 °C		%/K	≦ 0.25	–
Short-circuit protection rating maximum fuse			→ Page 19	With overload relay in conjunction with a transformer as required for the contactor
Current heat loss (3 conductors)				
Lower value of setting range		W	16	3
Upper value of setting range		W	28	10
Terminal capacity				
Flexible with ferrule		mm²	95	–
Stranded with ferrule		mm²	120	–
Solid or stranded		AWG	250 MCM	–
Flat conductor. Number of segments × width × thickness		mm	6 × 16 × 0.8 [2]	–
Busbar	Width	mm	20 × 3	–
Push-through opening	∅	mm	–	27
Terminal screw			M8 × 25	–
Tightening torque		Nm	24	–
Tools				
Hexagonal socket	SW	mm	13	–

Notes

[1] Ambient temperature: Operating range to IEC/EN 60947, PTB: -5°C to +50°C
[2] Fixing with box terminals

ZE, ZB, Z5, ZW7

			ZE	ZB12, ZB32	ZB65	ZB150(KK)	Z5-.../FF225 Z5-.../FF250	ZW7
Auxiliary and control circuits								
Rated impulse withstand voltage	U_{imp}	V	6000	6000	6000	6000	6000	6000
Overvoltage category/Pollution degree			III/3	III/3	III/3	III/3	III/3	III/3
Terminal capacity								
Solid		mm²	2 × (0.75 - 2.5)	2 × (0.75 - 4)	2 × (0.75 - 4)	2 × (0.75 - 4)	2 × (0.75 - 4)	2 × (0.75 - 4)
Flexible with ferrule		mm²	2 × (0.5 - 1.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)
Solid or stranded		AWG	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)
Terminal screw			M3.5	M3.5	M3.5	M3.5	M3.5	M3.5
Tightening torque		Nm	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2
Tools								
Pozidriv screwdriver		Size	2	2	2	2	2	2
Flat-blade screwdriver		mm	0.8 × 5.5	1 × 6	1 × 6	1 × 6	1 × 6	1 × 6
Auxiliary circuit rated insulation voltage	U_i	V AC	690	500	500	500	500	500
Rated operating voltage	U_e	V AC	500	500	500	500	500	500
Safe isolation according to EN 61140								
Between the auxiliary contacts		V AC	300	240	240	240	240	240
Conventional thermal current	I_{th}	A	6	6	6	6	6	6
Rated operational current								
AC-15								
N/O								
120 V	I_e	A	1.5	1.5	1.5	1.5	1.5	1.5
240 V	I_e	A	1.5	1.5	1.5	1.5	1.5	1.5
415 V	I_e	A	0.5	0.5	0.5	0.5	0.5	0.5
500 V	I_e	A	0.3	0.5	0.5	0.5	0.5	0.5
NC								
120 V	I_e	A	1.5	1.5	1.5	1.5	1.5	1.5
240 V	I_e	A	1.5	1.5	1.5	1.5	1.5	1.5
415 V	I_e	A	0.7	0.9	0.9	0.9	0.9	0.9
500 V	I_e	A	0.5	0.8	0.8	0.8	0.8	0.8
DC-13 L/R ≦ 15 ms [1]								
24 V	I_e	A	0.9	0.9	0.9	0.9	0.9	0.9
60 V	I_e	A	0.75	0.75[3]	0.75[3]	0.75[3]	0.75[3]	0.75[3]
110 V	I_e	A	0.4	0.4	0.4	0.4	0.4	0.4
220 V	I_e	A	0.2	0.2	0.2	0.2	0.2	0.2
General Use								
AC operated		V	240 600	–	–	–	–	–
AC operated		A	1.5 0.6	–	–	–	–	–
DC operated		V	–	–	–	–	–	–
DC operated		A	–	–	–	–	–	–
Pilot Duty								
AC operated			D300	B300[4] B600[5]	B300[4] B600[5]	B300[4] B600[5]	B300[4] B600[5]	B300[4] B600[5]
DC operated			R300	R300	R300	R300	R300	R300
Short-circuit rating without welding								
Max. fuse [2]		A gG/gL	4	6	6	6	6	6

Notes

[1] Making and breaking conditions to DC-13, time constant as stated
[2] See transparent overlay "Fuses" for time/current characteristics (please enquire)
[3] Rated operational current DC-13, 60 V: N/O auxiliary contact 0.6 A
[4] With opposite polarity
[5] With same polarity

ZEB				ZEB12, ZEB32	ZEB65-45	ZEB65-100	ZEB150
General							
Standards				IEC/EN 60947, VDE 0660, UL, CSA			
Climatic proofing				Damp heat, constant, to IEC 60068-2-78 Damp heat, cyclic, to IEC 60068-2-30			
Ambient temperature							
Open			°C	–25…65	–25…65	–25…65	–25…65
Enclosed			°C	–25…65	–25…40	–25…40	–25…40
Temperature compensation				Continuous	Continuous	Continuous	Continuous
Mounting position				Any	Any	Any	Any
Mechanical shock resistance half-sinusoidal shock, 10 ms to IEC 60068-2-27			g	15	15	15	15
Protection type				IP20	IP20	IP20	IP20
Protection against direct contact when actuated from front (EN 50274)				Finger- and back-of-hand proof			
Main contacts							
Rated impulse withstand voltage		U_{imp}	V AC	6000	6000	6000	6000
Overvoltage category/pollution degree				III / 3	III / 3	III / 3	III / 3
Rated insulation voltage							
AC		U_i	V AC	690	690	690	690
Rated operating voltage		U_e	V AC	690	690	690	690
Safe isolation according to EN 61140							
Between auxiliary contacts and main contacts			V AC	600	600	600	600
Between the main contacts			V AC	600	600	600	600
Overload relay setting range			A	0.3…45	9…45	20…100	20…100
Terminal capacity							
Solid			mm²	1 × 2.5 - 16	1 × 2.5 - 16	1 × 6 - 50	1 × 6 - 50
Solid or stranded			AWG	1 × 14 - 4	1 × 14 - 4	1 × 10 - 1	1 × 10 - 1
Auxiliary and control circuits							
Rated impulse withstand voltage		U_{imp}	V	6000	6000	6000	6000
Overvoltage category/pollution degree				III / 3	III / 3	III / 3	III / 3
Terminal capacity							
Solid			mm²	2 × (0.75 - 4)	2 × (0.75 - 4)	2 × (0.75 - 4)	2 × (0.75 - 4)
Flexible with ferrule			mm²	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)	2 × (0.75 - 2.5)
Solid or stranded			AWG	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)	2 × (18 - 12)
Terminal screw				M3.5	M3.5	M3.5	M3.5
Tightening torque			Nm	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2	0.8 - 1.2
Tightening torque			lb-in	7 - 10.6	7 - 10.6	7 - 10.6	7 - 10.6
Tools							
Pozidriv screwdriver			Size	2	2	2	2
Flat-blade screwdriver			mm	1 × 6	1 × 6	1 × 6	1 x 6
Auxiliary circuit rated insulation voltage		U_i	V AC	500	500	500	500
Rated operating voltage		U_e	V AC	500	500	500	500
Safe isolation according to EN 61140							
Between the auxiliary contacts			V AC	240	240	240	240
Conventional thermal current		I_{th}	A	5	5	5	5
Rated operational current							
AC-15							
N/O	120 V	I_e	A	1.5	1.5	1.5	1.5
	240 V	I_e	A	1.5	1.5	1.5	1.5
	415 V	I_e	A	0.5	0.5	0.5	0.5
	500 V	I_e	A	0.5	0.5	0.5	0.5
NC	120 V	I_e	A	1.5	1.5	1.5	1.5
	240 V	I_e	A	1.5	1.5	1.5	1.5
	415 V	I_e	A	0.9	0.9	0.9	0.9
	500 V	I_e	A	0.8	0.8	0.8	0.8
DC-13 L/R ≦15 ms							
24 V		I_e	A	0.9	0.9	0.9	0.9
60 V		I_e	A	0.75	0.75	0.75	0.75
110 V		I_e	A	0	0.4	0.4	0.4
220 V		I_e	A	0.2	0.2	0.2	0.2
Short-circuit rating without welding							
Max. fuse			A gG/gL	6	6	6	6

EMT6

			EMT6
General			
Standards			IEC/EN 60947, VDE 0660, EN 55011
Climatic proofing			Damp heat, constant, to IEC 60068-2-78; Damp heat, cyclic, to IEC 60068-2-30
Ambient temperature			
Open		°C	-25…60
Enclosed		°C	-25…45
Storage		°C	-45 - 60
Mounting position			Any
Weight		kg	0.15
Shock resistance half-sinusoidal shock 10 ms to IEC 60068-2-27		g	10
Protection type			IP20
Protection against direct contact when actuated from front (EN 50274)			Finger- and back-of-hand proof
Safe isolation according to EN 61140			
Between the contacts		V AC	250
Between contacts and supply voltage		V AC	250
Auxiliary and control circuits			
Rated impulse withstand voltage	U_{imp}	V AC	6000
Overvoltage category/pollution degree			III/3
Auxiliary and control circuit terminal capacity			
Solid		mm^2	1 × 2.5 2 × (0.5 - 1.5)
Flexible with ferrule		mm^2	1 × 2.5 2 × (0.5 - 1.5)
Solid or stranded		AWG	20 - 14
Terminal screw			M3.5
Tightening torque		Nm	1.2
Tools			
Pozidriv screwdriver		Size	2
Flat-blade screwdriver		mm	1 × 6
Auxiliary circuit			
Rated insulation voltage	U_i	V	400
Rated operational current			
AC-14			
N/O			
415 V	I_e	A	3
NC			
415 V	I_e	A	3
AC-15			
N/O			
240 V	I_e	A	3
415 V	I_e	A	1
NC			
240 V	I_e	A	3
415 V	I_e	A	1
Max. short-circuit protective device			
Fuse	gG/gL	A	6
Control circuit			
Rated insulation voltage	U_i	V	240
Rated operational voltage	U_e	V	240[1)]
Voltage tolerance		x U_e	0.85 - 1.1
Power consumption			
AC		VA	3.5
DC		W	2
Trip at approx.		Ω	≧ 3600
Reset at approx.		Ω	≦ 1600

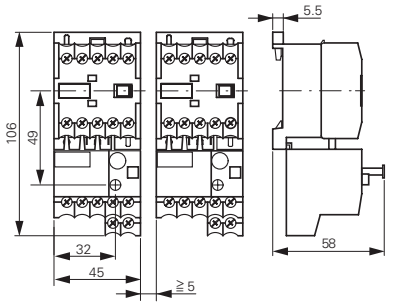
Notes [1)] EMT6(-DB)230V: U_e = 230 V

1

Dimensions

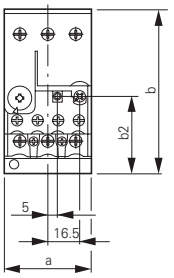
Overloadrelays

ZE-…

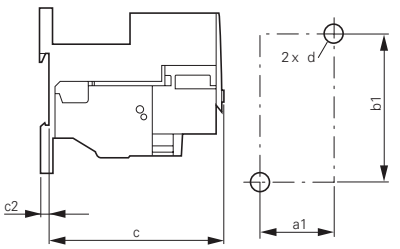


Base

ZB32-XEZ

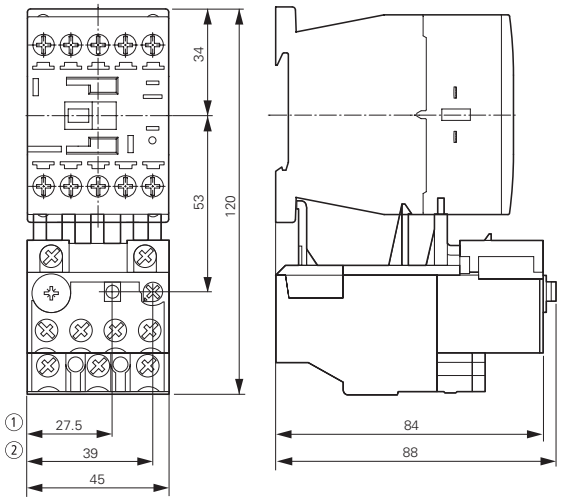


ZB65-XEZ



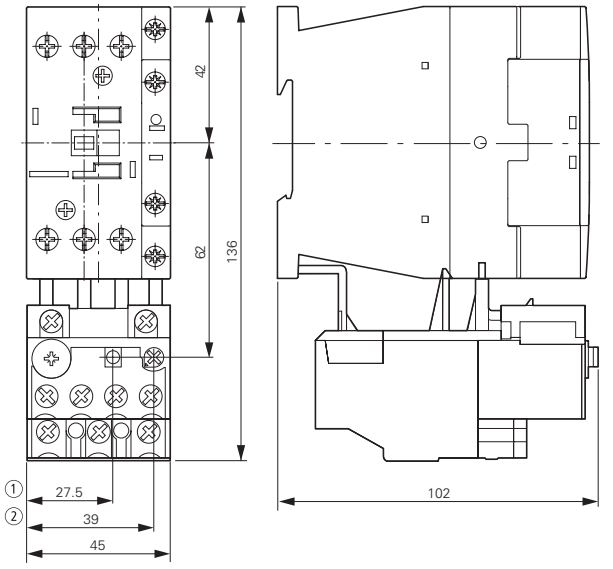
	ZB32	ZB65
a	45	60
b	85	86
c	90.5	112
c2	3.8	4.7
a1	35	50
b1	75	75
b2	40.5	47
d	M4	M5

ZB12



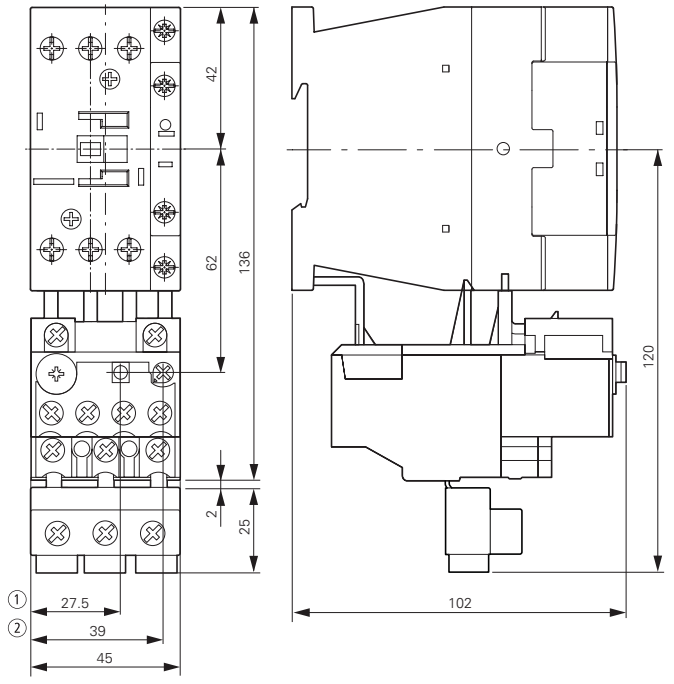
① OFF
② Reset/ON

ZB32



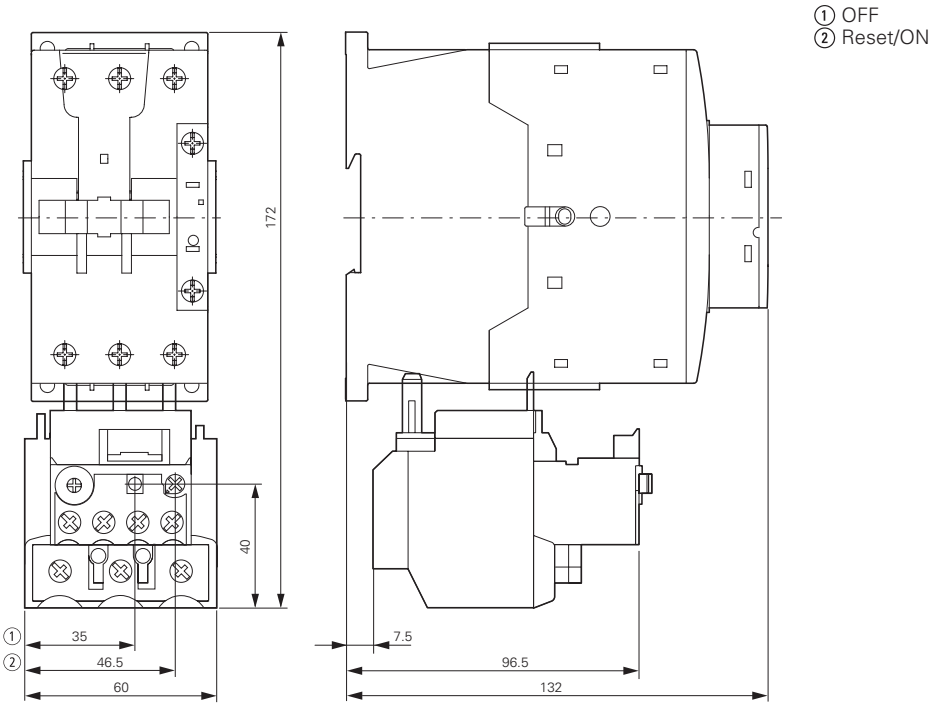
① OFF
② Reset/ON

ZB32-38

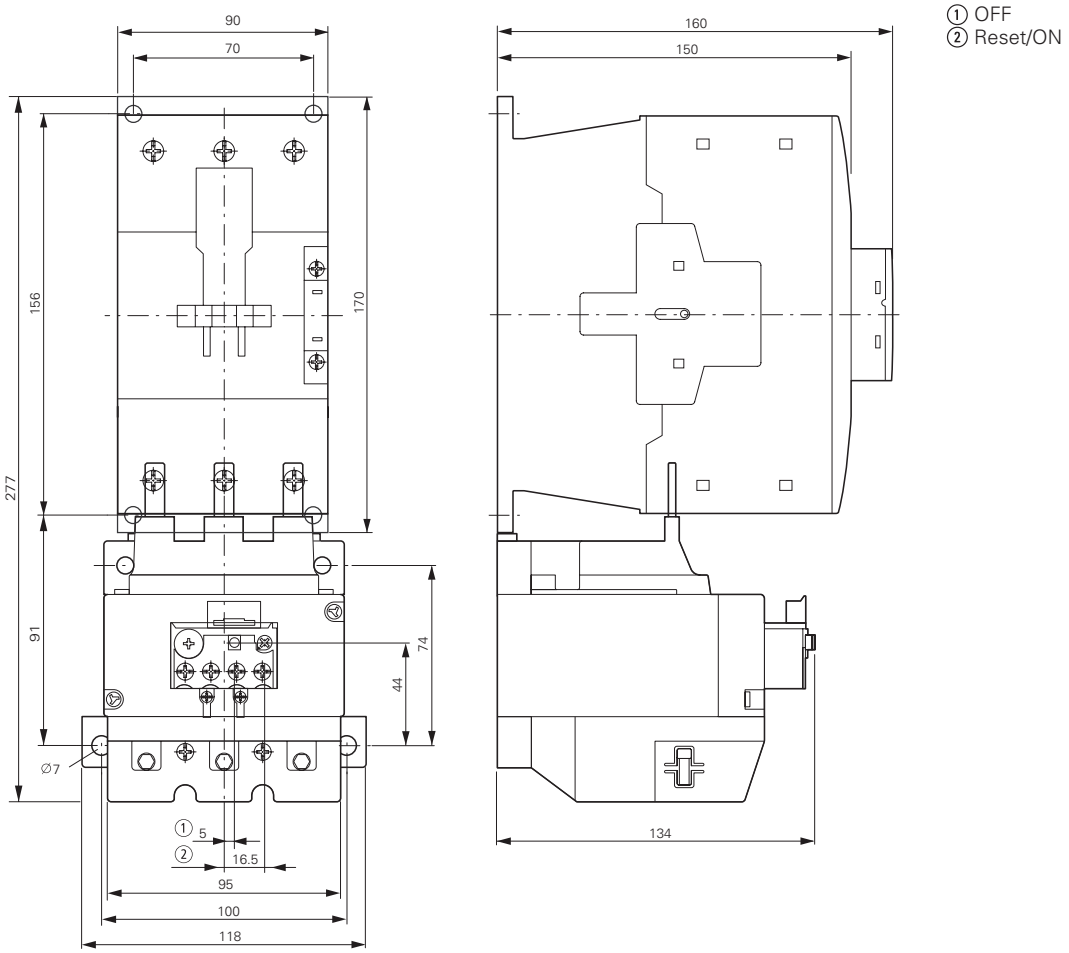


Overload relays

ZB65



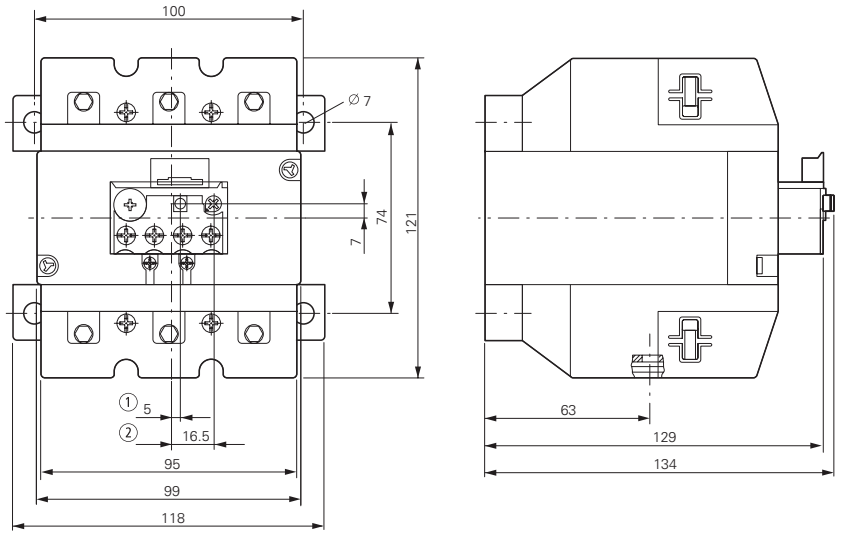
ZB150



1

Overload relays

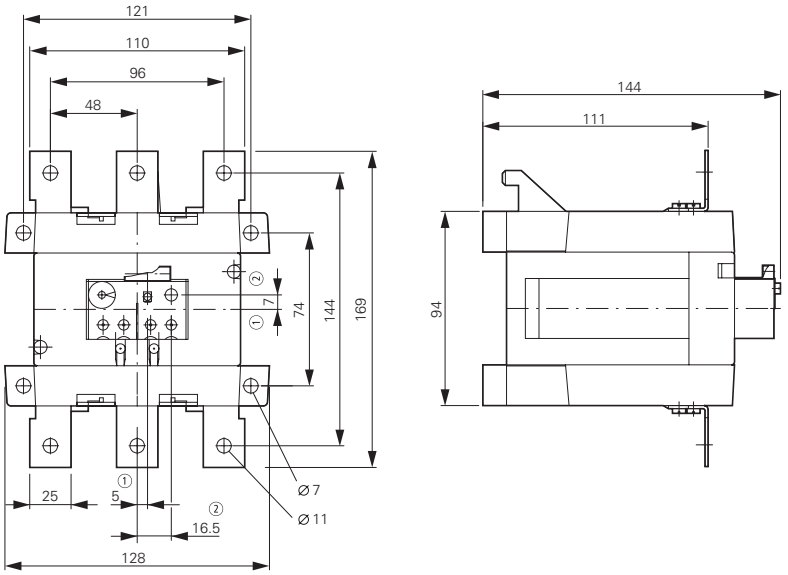
ZB150-50/KK



① OFF
② Reset/ON

Z5 overload relays greater than 150A

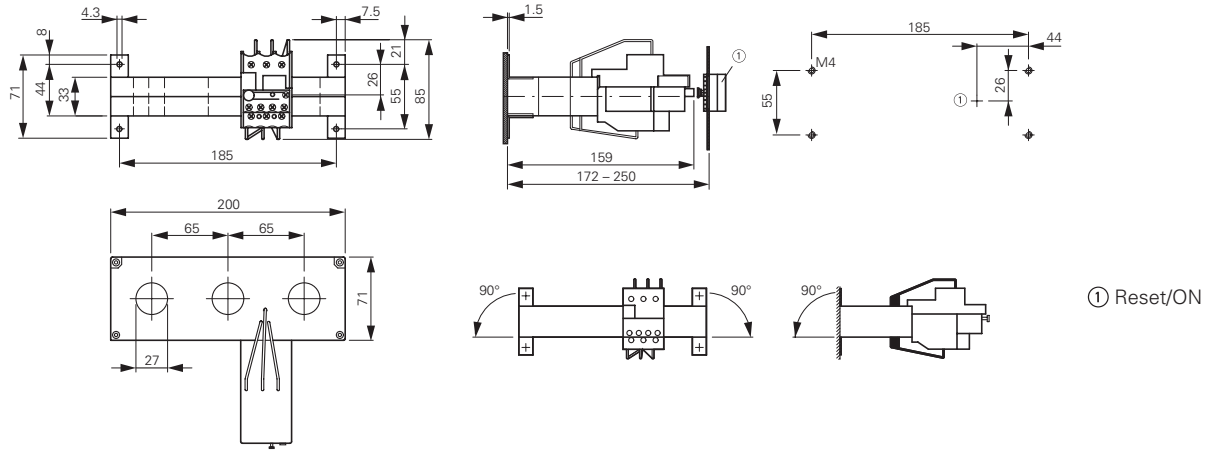
Z5-.../FF250



① OFF
② Reset/ON

Current transformer-operated overload relays

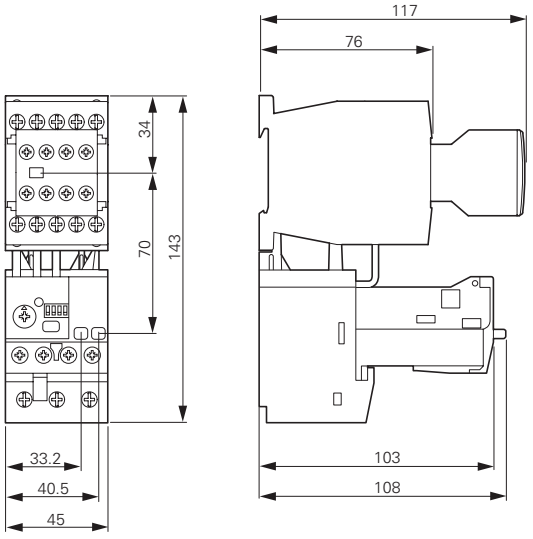
ZW7-...



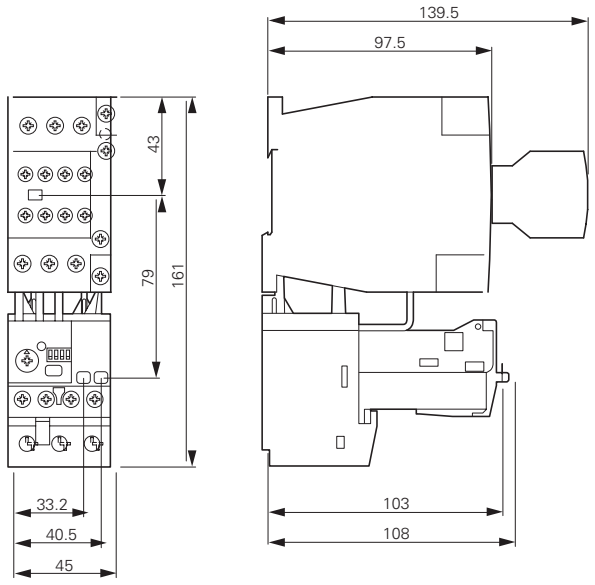
① Reset/ON

Electronic overload relays

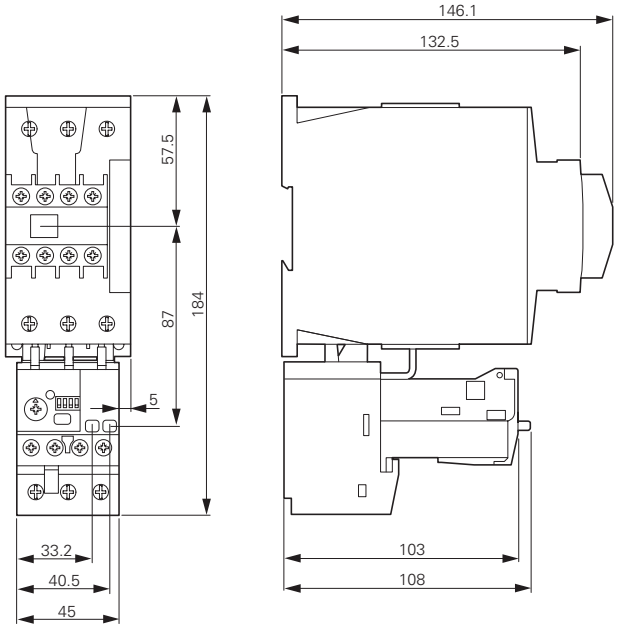
ZEB12



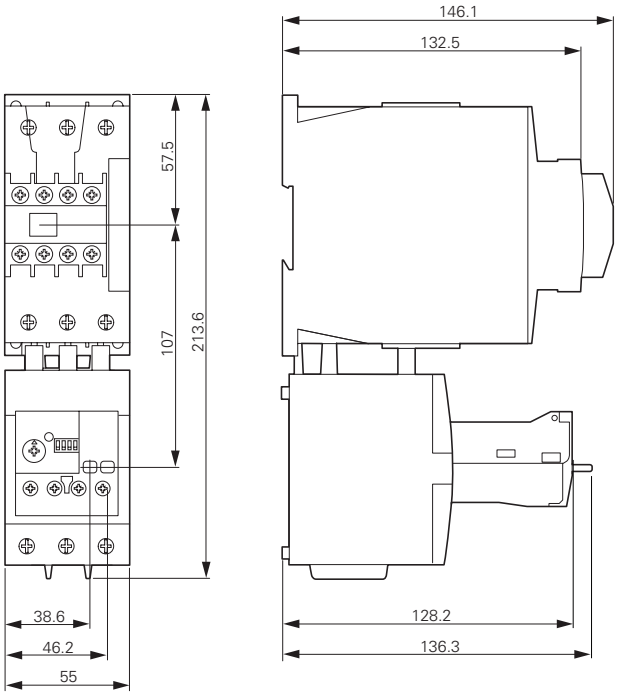
ZEB32



ZEB65-45



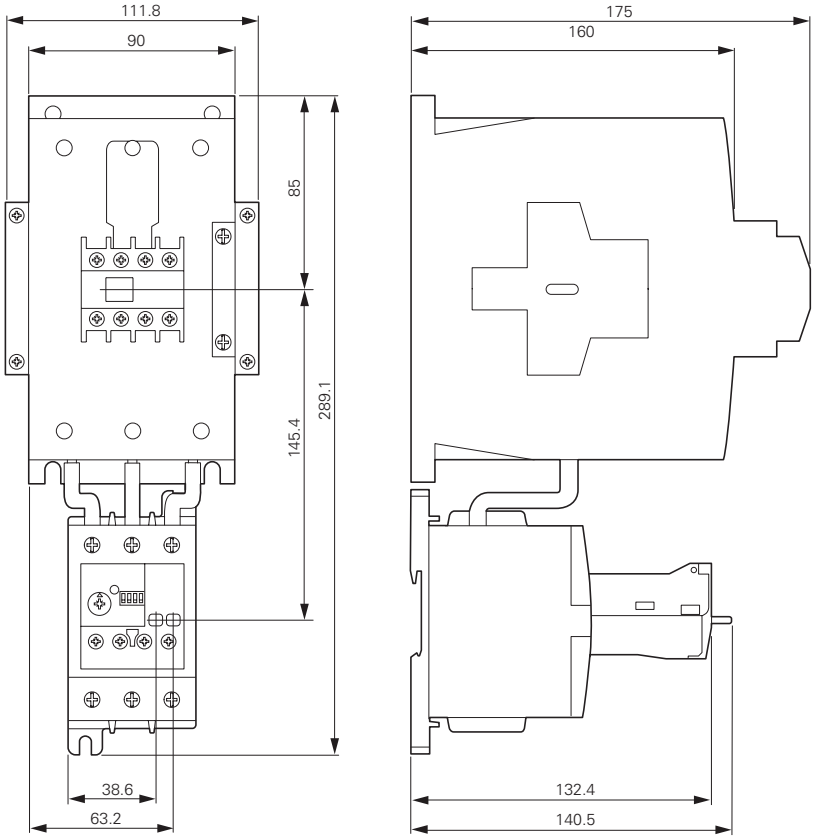
ZEB65-100



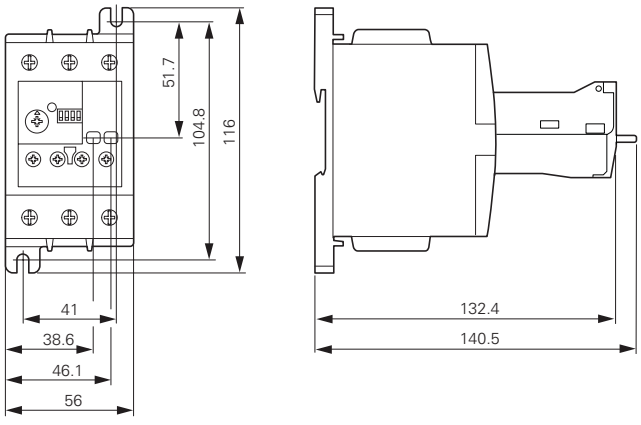
1

Electronic overload relays

ZEB150-100

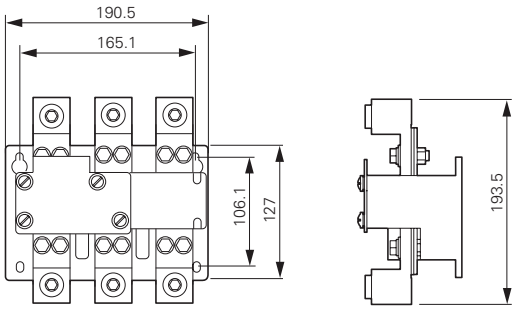


ZEB150-100/KK

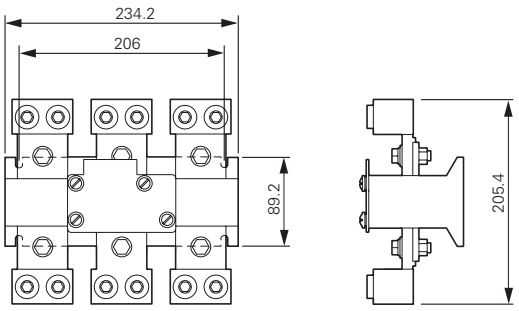


Current sensors

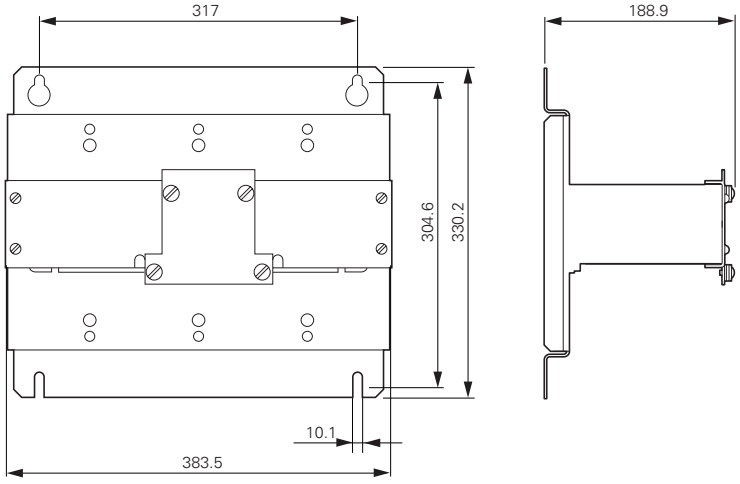
ZEB-XCT300

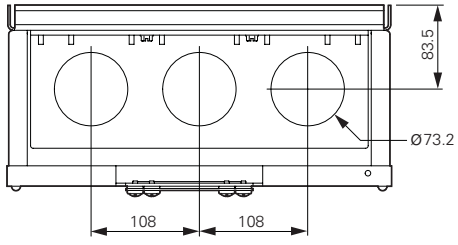


ZEB-XCT600



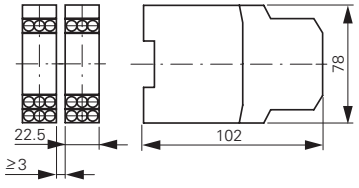
ZEB-XCT1000
ZEB-XCT1500





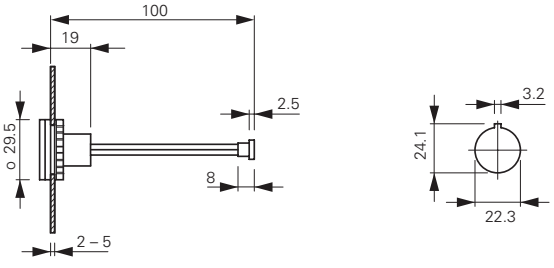
EMT6 thermistor overload relays for machine protection

EMT6…



External reset button

M22-DZ-B
M22-DZ-X



C441 Overload and monitoring relay



Contents

Description	*Page*
C441 Overload and monitoring relay	
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Catalog number selection	**48**
Product selection	**49**
Accessories	**50**
Technical data and specifications	**55**
Dimensions	**67**

C441 Overload and monitoring relay

Product description

Eaton's Motor Insight, the first product in the Intelligent Power Control Solutions family, is a highly configurable motor, load and line protection device with power monitoring, diagnostics and flexible communications allowing the customer to save energy, optimize their maintenance schedules and configure greater system protection, thus reducing overall costs and downtime.

Motor Insight is available in either a line-powered or 120 Vac control powered design, capable of monitoring voltages up to 660 Vac. Each of these units is available in a 1–9 amp or a 5–90 amp FLA model. With external CTs, Motor Insight can protect motors up to 540 amps FLA. Available add-on accessories include communication modules for Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, EtherNet/IP and HTTP web services all with I/O options. For ease-of-use and operator safety, Motor Insight offers a remote display that mounts easily with two 30 mm knockouts.

1.2 C441 Overload and monitoring relay

Features and benefits

1 Features and Benefits

Features

Size/Range

- Broad FLA range of 1–540A
- Selectable trip class (5–30)
- Four operating voltage options
  - Line-powered from 240 Vac, 480 Vac, 600 Vac
  - Control-powered from 120 Vac

Motor Control

- Two output relays
  - One B300 Form C fault relay and one B300 ground fault shunt relay
  - Other relay configurations are available, including one Form A and one Form B SPST (fault and auxiliary relays) allowing programmable isolated relay behavior and unique voltages
- One external remote reset terminal
- Trip status indicator

Motor Protection

- Thermal overload
- Jam protection
- Current imbalance
- Current phase loss
- Ground fault
- Phase reversal

Load Protection

- Under current
- Low power (kW)
- High power (kW)

Line Protection

- Over voltage
- Under voltage
- Voltage imbalance
- Voltage phase loss

Monitoring Capabilities

- Current—average and phase rms
- Voltage—average and phase rms
- Power—motor kW
- Power factor
- Frequency
- Thermal capacity
- Run hours
- Ground fault current
- Current imbalance %
- Voltage imbalance %
- Motor starts
- Motor run hours

Options

- Type 1, 12 remote display
- Type 3R remote display kit
- Communication modules
  - Modbus
  - Modbus with I/O
  - DeviceNet with I/O
  - PROFIBUS with I/O
  - Modbus TCP with I/O
  - EtherNet/IP with I/O

Benefits

Reliability and Improved Uptime

- Advanced diagnostics allows for quick and accurate identification of the root source of a motor, pump or power quality fault; reducing trouble-shooting time and the loss of productivity, reducing repeat faults due to misdiagnosis, and increasing process output and profitability
- Provides superior protection of motors and pumps before catastrophic failure occurs
- Increases profitability with greater process uptime and throughput, reduced costs per repair, reduced energy consumption and extended equipment life
- Adjustments to overload configuration can be made at any time

Safety

- IP20 rated terminal blocks
- Terminal blocks are set back from the display to reduce operator shock hazard
- Remote display (optional) does not require that the operator open the panel to configure the device

Flexibility

- Communications modules
  - Offered in a variety of configurations
  - External snap-on modules provide support for multiple communications protocols
- Advanced power, voltage and current monitoring capabilities
- Communications modules and remote display can be used simultaneously
- Highly configurable fault and reset characteristics for numerous applications
- Fully programmable isolated fault and auxiliary relays

Ease of Use

- Bright LED display with easy-to-understand setting and references
- Powered from line voltage or 120 Vac control power
- Remote display powered from base unit
- Full word descriptions and units on user interface

Standards and Certifications

- cULus listed NKCR, NKCR7, 508
- UL® 1053 applicable sections for ground fault detection
- CSA® certified (Class 3211-02)
- CE
- NEMA®
- IEC EN 60947-4-1
- RoHS
- CCC

Advanced Overload Education

Description	Definition	Source	Result	Motor Insight Protection
Motor Protection				
Thermal overload	Overload is a condition in which current draw to a motor exceeds 115% of the full load amperage rating over a period of time for an inductive motor.	An increase in the load or torque that is being driven by the motor. A low voltage supply to the motor would cause the current to go high to maintain the power needed. A poor power factor would cause above normal current draw.	Increase in current draw. Current leads to heat and insulation breakdown, which can cause system failure. Additionally, an increase in current can increase power consumption and waste valuable energy.	Thermal trip behavior is defined by UL, CSA and IEC standards. Trip class is settable from 5–30 by 1 Provides power factor monitoring and low voltage protection features.
Jam	Jam is similar to thermal overload in that it is a current draw on the motor above normal operating conditions.	Mechanical stall, interference, jam or seizure of the motor or motor load.	The motor attempts to drive the load, which has more resistive force due to the mechanical interference. In order to drive the load, the motor draws an abnormal amount of current, which can lead to insulation breakdown and system failure.	Provides a configurable Jam setting that is active during "motor run state" to avoid nuisance trips. Trip Threshold 150–400% of FLA. Trip Delay 1–20 seconds.
Ground fault	A line to ground fault.	A current leakage path to ground.	An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure.	Motor Insight has ground fault protection capability down to 0.15 amps estimated from the existing three-phase CTs using the residual current method. That is, the three-phase current signals should sum to zero unless a ground fault (GF) condition is present. In the case of a GF, Motor Insight can alarm, trip the starter, or trip an alternative relay that can be used to shunt trip a breaker or light up a warning light. GF current can also be monitored in real-time through the advanced monitoring capabilities. **Note:** GF settable thresholds vary with motor FLA. 0.15 amps may not be available in all cases.
Imbalanced phases (voltage and current)	Uneven voltage or currents between phases in a three-phase system.	When a three-phase load is powered with a poor quality line, the voltage per phase may be imbalanced.	Imbalanced voltage causes large imbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life.	Provides two protection settings that address this problem. The user can choose to set current imbalance thresholds or voltage imbalance thresholds, each of which can trip the starter. Additionally, both of these may be monitored through Motor Insight's advanced monitoring capabilities, allowing the customer to notice in real-time when and where a condition is present.
Phase loss—current (single-phasing)	One of the three-phase current is not present.	Multiple causes, loose wire, improper wiring, grounded phase, open fuse, and so on.	Single-phasing can lead to unwanted motor vibrations in addition to the results of imbalanced phases as listed above.	Fixed protective setting that takes the starter offline if a phase drops below 60% of the other two phases.
Phase rotation (phase-reversal)	Improper wiring, leading to phases being connected to the motor improperly.	A miswired motor. Inadvertent phase-reversal by the utility.	Phase-reversal can cause unwanted directional rotation of a motor. In the event that the load attached to the motor can only be driven in one direction, the result could be significant mechanical failure and/or injury to an operator.	Configurable phase protection, allowing the user to define the phase sequencing intended for that application. If no phase sequence is required, the user has the ability to disable this feature.
Frequency variance	When line frequency is inconsistent.	Malfunctioning alternator speed regulator, or poor line quality caused by an overload of a supply powered by individual sources.	Variations in frequency can cause increases in losses, decreasing the efficiency of the motor. In addition, this can result in interference with synchronous devices.	Advanced monitoring capabilities allow the user to monitor frequency in real-time.

1

Advanced Overload Education, continued

Description	Definition	Source	Result	Motor Insight Protection
Load Protection				
Under current or low power	Average rms current provided to the motor falls below normal operating conditions.	Under current is usually associated with a portion of the user's load disappearing. Examples of this would be a broken belt, a dry-pump (low suction head) or a dead-headed centrifugal pump.	If under current goes undetected, a mechanical failure can and has occurred. In the case of a pump, running a pump dry or running a pump in a dead-headed condition can cause excessive heating, damaging expensive seals and breaking down desired fluid properties.	Motor Insight has two protection settings to detect this: under current and low power. Low power is a more consistent way of ensuring detection as power is linear with motor load, where as current is not. An unloaded motor may draw 50% of its rated current, but the power draw will be less than 10% of rated power due to a low power factor.
High power	The motor load is drawing more power than it should at normal operating conditions.	This is typical of batch processing applications where several ingredients flow into a mixer. When a substance's consistency changes and viscosity increases from what is expected, the motor may use more power to blend the mixture. Out-of-tolerance conditions can be detected using the High Power and Low Power settings.	If a high-power fault goes undetected, the result may be a batch of material that does not meet specification.	Monitors the three-phase real power. If the real power value is estimated above the set threshold for the set length of time, a fault is detected and the overload will trip the starter. Additionally, power can be monitored in real-time.
Line Protection				
Over voltage	When the line voltage to the motor exceeds the specified rating.	Poor line quality.	An over voltage condition leads to a lower than rated current draw and a poor power factor. A trip limit of 110% of rated voltage is recommended. Over voltage can also lead to exceeding insulation ratings.	Monitors the maximum rms value of the three-phase voltages. If the rms value rises above the set threshold for the set length of time, a fault is detected and the overload can trip the starter or send and display an alarm of the condition. All line-related faults have an "alarm-no-trip" mode.
Under voltage	When the line voltage to the motor is below the specified rating.	Poor line quality.	An under voltage condition leads to excessive current draw. This increases the heating of the motor windings and can shorten insulation life. A trip limit set to 90% of rated voltage is recommended.	Monitors the minimum rms value of the three-phase voltages. If the rms value drops below the set threshold for the set length of time, a fault is detected and the overload can trip the starter or send and display an alarm of the condition. All line-related faults have an "alarm-no-trip" mode.
Power-up delay	Allows for starting motors and loads in a deliberate fashion.	When there is a power failure, or power cycle, multiple loads come online simultaneously.	Multiple loads starting simultaneously can cause sags affecting the operation of devices that may prevent successful startup. If power is lost to a motor driving a pump, it may be necessary to delay a restart to allow the pump to come to a complete stop to prevent starting a motor during backspin.	Configurable to delay closing the fault relay on power-up. For each Motor Insight controlling a motor, a different setting can be programmed, helping to maintain the integrity of your line power.

Catalog Number Selection

Motor Insight Overload Relays

C441 B A NOUI

Device Type
C441 = Motor Insight overload relay

Overload Relay Power Source Voltage	
B	= 240 Vac (170–264 Vac)
C	= 480 Vac (323–528 Vac)
D	= 600 Vac (487–660 Vac)
Blank	= 120 Vac control power (170–660 Vac)

Overload Relay Current Rating	
A	= 1–9A (1–540A refer to **Page 49**)
B	= 5–90A (5–90A refer to **Page 49**)
0109	= 120 Vac control power (0–660 Vac, 1–9A)
0590	= 120 Vac control power (0–660 Vac, 5–90A)

Internal User Interface	
Blank	= With user interface (line powered models)
NOUI	= Without user interface (120 Vac control models)

Motor Insight Overload Relays—Communications Modules and Accessory Types

C441 K

Device Type
C441 = Motor Insight overload relay

Communication Module	
K	= DeviceNet module 4IN/2OUT 120 Vac
L	= DeviceNet module 4IN/2OUT 24 Vdc
M	= Modbus RTU module
N	= Modbus RTU module 4IN/2OUT 120 Vac
P	= Modbus RTU module 4IN/2OUT 24 Vdc
Q	= PROFIBUS module 4IN/2OUT 120 Vac
R	= Modbus TCP / EtherNet/IP module 4IN/2OUT 120 Vac
S	= PROFIBUS module 4IN/2OUT 24 Vdc
T	= Modbus TCP / EtherNet/IP module 4IN/2OUT 24 Vdc

Accessory Type	
1	= Type 1 and 12 remote mounted display
3	= Type 3R kit for remote display
CMP1	= Conversion plate

1 Product Selection

Motor Insight





Motor Insight

Power Source	Monitoring Range	Current Range	Catalog Number
240 Vac (170–264)	170–264 Vac	1–9A	**C441BA**
		5–90A	**C441BB**
480 Vac (323–528)	323–528 Vac	1–9A	**C441CA**
		5–90A	**C441CB**
600 Vac (489–660)	489–660 Vac	1–9A	**C441DA**
		5–90A	**C441DB**
120 Vac (93.5–132)	170–660 Vac	1–9A	**C4410109NOUI**
		5–90A	**C4410590NOUI**

Motor Insight CT Multiplier and Wire Wrap Schedule

Catalog Number ①	Motor FLA	Number of Loops	Number of Conductors Through CT Primary	CT Multiplier Setting	External CT Kit Catalog Number ②
Current Range: 5–90A					
C441_B and C4410590NOUI	5–22.5A	3	4	4	—
	6.67–30A	2	3	3	—
	10–45A	1	2	2	—
	20–90A	0	1	1	—
Current Range: 1–9A					
C441_A and C4410109NOUI	1–5A	1	2	2	—
	2–9A	0	1	1	—
	60–135A	0	1	150–(150:5)	**C441CTKIT150**
	120–270A	0	1	300–(300:5)	**C441CTKIT300**
	240–540A	0	1	600–(600:5)	**C441CTKIT600**

Notes

① Underscore indicates Operating Voltage Code required.
Operating Voltage Codes:

Code	Voltage
B	240 Vac
C	480 Vac
D	600 Vac
<empty>	120 Vac Control Power

② Any manufacturer's CTs may be used.

Accessories

Modbus Communication Module

The Motor Insight Modbus Communication Module is a side-mounted device providing Modbus communication capability to the Motor Insight overload relay.

The Modbus Communication Module with I/O provides communication, monitoring and control for the Motor Insight overload relay.

Features and Benefits

- The Modbus communication module is capable of baud rates up to 115K
- The Modbus address and baud rate configuration can be easily changed using the Motor Insight user interface (C441M only)
- Modbus address and baud rate are set via convenient DIP switches (C441N and C441P); LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
  - Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
  - Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
  - Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

Modbus Communication Module

	Description	I/O	Catalog Number
Modbus Module	Modbus Communication Module	None	**C441M**
			
Modbus with I/O Module	Modbus Communication Module 4IN/2OUT	120 Vac	**C441N**
	Modbus Communication Module 4IN/2OUT	24 Vdc	**C441P**
			

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DeviceNet Communication Modules

The DeviceNet Communication Module provides monitoring and control for the Motor Insight overload relay from a single DeviceNet node. These modules also offer convenient I/O in two voltage options, 24 Vdc and 120 Vac.

Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
  - DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
  - Advanced configuration available using common DeviceNet tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
  - Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
  - Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
  - Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF
- Combined status LED

DeviceNet Module



DeviceNet Modules

Description	I/O	Catalog Number
DeviceNet Communication Module	120 Vac	**C441K**
DeviceNet Communication Module	24 Vdc	**C441L**

PROFIBUS Communication Module

The Motor Insight PROFIBUS Communication Module is a side-mounted device providing PROFIBUS communication capability to the Motor Insight overload relay.

The PROFIBUS Communication Module with I/O provides communication, monitoring and control for the Motor Insight overload relay.

Features and Benefits

- The PROFIBUS communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches (C441Q and C441S); LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

PROFIBUS with I/O Module



PROFIBUS Communication Module

Description	I/O	Catalog Number
PROFIBUS Communication Module 4IN/2OUT	120 Vac	**C441S**
PROFIBUS Communication Module 4IN/2OUT	24 Vdc	**C441Q**

1

Ethernet Communication Module

The Motor Insight Ethernet Communication Module is a side-mounted device providing both Modbus TCP and EtherNet/IP communication capabilities with built-in HTTP web services to the Motor Insight overload relay.

The Ethernet Communication Module with I/O provides communication, monitoring and control for the Motor Insight overload relay.

Features and Benefits

- Supports Modbus TCP or EtherNet/IP in a single device
- Contains internal embedded switch which provides two Ethernet ports allowing linear or ring network configurations
- Embedded web services allow for simple configuration and monitoring through Internet Explorer
- IP Address is set via convenient DIP Switches located on the device
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

Ethernet with I/O Module



Ethernet Communication Module

Description	I/O	Catalog Number
Modbus TCP / EtherNet/IP Communication Module 4IN/2OUT	120 Vac	**C441R**
Modbus TCP / EtherNet/IP Communication Module 4IN/2OUT	24 Vdc	**C441T**

Type 3R Kit with Remote Display Mounted Inside

Motor Insight offers several accessories for the customer's ease of use and safety:

- Types 1 and 12 remote display
- Type 3R remote display kit
- Mounting plate adapter

Features and Benefits

- Remote display unit:
  - Same user interface as the overload relay
  - Enhanced operator safety—operator can configure the overload without opening the enclosure door
- Type 3R kit mounts with standard 30 mm holes
- Mounting plate for retrofit in existing installations

Type 3R Kit with Remote Display Mounted Inside

	Description	Catalog Number
C4411 	Remote display Types 1 and 12 (UL 508)	**C4411**
C4413 	Type 3R kit for remote display (UL 508)	**C4413**
	Conversion plate (not shown)	**C441CMP1**

Communication Cables

The Remote Display requires a communication cable to connect to the Motor Insight overload relay:

Communication Cable Lengths

Length in Inches (meters)	Catalog Number
9.8 (0.25)	**D77E-QPIP25**
39.4 (1.0)	**D77E-QPIP100**
78.7 (2.0)	**D77E-QPIP200**
118.1 (3.0)	**D77E-QPIP300**

Current Transformer Kits

Description	Catalog Number
Three 150:5 CTs to be used with Motor Insight	**C441CTKIT150**
Three 300:5 CTs to be used with Motor Insight	**C441CTKIT300**
Three 600:5 CTs to be used with Motor Insight	**C441CTKIT600**

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Technical Data and Specifications

Motor Insight

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI	
Electrical Ratings					
Feature	**Range**				
Operating voltage (three-phase) and frequency	170–264 Vac 50/60 Hz	323–528 Vac 50/60 Hz	489–660 Vac 50/60 Hz	170–660 Vac 50/60 Hz	
Trip Class					
5–30	Selectable	Selectable	Selectable	Selectable	
FLA Range					
C441_A and C4410109NOUI	1–9A	Up to 540A with external CTs Refer to **Page 49** for CT multiplier and wire wrap schedule.	Up to 540A with external CTs Refer to **Page 49** for CT multiplier and wire wrap schedule.	Up to 540A with external CTs Refer to **Page 49** for CT multiplier and wire wrap schedule.	
C441_B and C4410590NOUI	5–90A				
Monitoring Capabilities					
Feature	**Value**				
Current	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	
Voltage	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	
Power	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	
Thermal capacity	0% cold, 100% trip	0% cold, 100% trip	0% cold, 100% trip	0% cold, 100% trip	
Motor run hours	0–65,535 hours	0–65,535 hours	0–65,535 hours	0–65,535 hours	
Frequency	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	
Motor Protection					
Thermal overload setting	1.05 x FLA: Does not trip 1.15 x FLA: Overload trip	1.05 x FLA: Does not trip 1.15 x FLA: Overload trip	1.05 x FLA: Does not trip 1.15 x FLA: Overload trip	1.05 x FLA: Does not trip 1.15 x FLA: Overload trip	
Feature	**Range**				**Fault Delay Setting**
Jam	150–400% of motor FLA, OFF	150–400% of motor FLA, OFF	150–400% of motor FLA, OFF	50–400% of motor FLA, OFF	1–20 seconds
Current imbalance	1–30%, OFF	1–30%, OFF	1–30%, OFF	1–30%, OFF	1–20 seconds
Current phase loss	Fixed threshold 60%	Fixed threshold 60%	Fixed threshold 60%	Fixed threshold 60%	1–20 seconds
Ground fault current					
C441_A and C4410109NOUI 1–9A	0.3–2.0A with one pass through the CTs ①	0.3–2.0A with one pass through the CTs ①	0.3–2.0A with one pass through the CTs ①	0.3–2.0A with one pass through the CTs ①	<150%, 1–60 seconds >150%, 2 seconds >250%, 1 second
C441_B and C4410590NOUI 5–90A	3.0–20A with one pass through the CTs ①	3.0–20A with one pass through the CTs ①	3.0–20A with one pass through the CTs ①	3.0–20A with one pass through the CTs ①	<150%, 1–60 seconds >150%, 2 seconds >250%, 1 second
Phase reversal	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	
Fault reset delay	2–500 minutes, auto ②	2–500 minutes, auto ②	2–500 minutes, auto ②	2–500 minutes, auto ②	
Fault reset attempts	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	

Notes

① Lower levels are achievable with multiple passes.

② Motor fault reset characteristics can be programmed as a group or for motor overloads only. Reference the user manual for more detailed information.

Motor Insight, continued

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI	
Load Protection					
Feature	**Range**				**Fault Delay Setting**
Under current	50–90% of motor FLA	50–90% of motor FLA	50–90% of motor FLA	50–90% of motor FLA	1–60 seconds
Low power (kW)	20–80% of rated kW	20–80% of rated kW	20–80% of rated kW	20–80% of rated kW	1–60 seconds
High power (kW)	50–110% of rated kW	50–110% of rated kW	50–110% of rated kW	50–110% of rated kW	1–60 seconds
Load reset delay	2–500 minutes, auto	2–500 minutes, auto	2–500 minutes, auto	2–500 minutes, auto	
Load reset attempts	0–4, auto	0–4, auto	0–4, auto	0–4, auto	
Supply Protection					
Feature	**Range**				**Fault Delay Setting**
Over voltage	170–264 Vac	323–528 Vac	489–660 Vac	0–660 Vac	1–20 seconds
Under voltage	170–264 Vac	323–528 Vac	489–660 Vac	0–660 Vac	1–20 seconds
Voltage imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance
Restart delay setting	1–500 seconds	1–500 seconds	1–500 seconds	1–500 seconds	1–500 seconds
Electrical/EMC					
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz	30–1000 mHz	30–1000 mHz	30–1000 mHz	30–1000 mHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz	0.15–30 mHz	0.15–30 mHz	0.15–30 mHz	0.15–30 mHz
ESD immunity IEC 60947-4-1 (Table 13)	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)
	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Voltage variations immunity IEC 60947-4-1	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms
Electromagnetic field IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m	10 V/m	10 V/m	10 V/m	10 V/m
Ground fault	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27

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Motor Insight, continued

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI
Environmental Ratings				
Feature	**Range**			
Ambient temperature (operating)	–4° to 122°F (–20° to 50°C)	–4° to 122°F (–20° to 50°C)	–4° to 122°F (–20° to 50°C)	–4° to 122°F (–20° to 50°C)
Ambient temperature (storage)	–40° to 85°C	–40° to 85°C	–40° to 85°C	–40° to 85°C
Operating humidity	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing
Altitude (no derating)	2000m	2000m	2000m	2000m
Shock (IEC 60068-2-27)	15G any direction	15G any direction	15G any direction	15G any direction
Vibration (IEC 60068-2-6)	3G any direction	3G any direction	3G any direction	3G any direction
Pollution degree per IEC 60947-1	3	3	3	3
Ingress protection	IP20	IP20	IP20	IP20
Capacity				
Input, auxiliary contact and external reset terminals				
Terminal capacity	18–12 AWG	18–12 AWG	18–12 AWG	18–12 AWG
Tightening torque	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)
Voltages				
Monitoring voltage	170–264 Vac 50/60Hz	323–528 Vac 50/60Hz	489–660 Vac 60Hz	0–660 Vac 50/60Hz
Insulation voltage U_i (three-phase voltage)	600 Vac	600 Vac	600 Vac	600 Vac
Insulation voltage U_i (control)	240 Vac	240 Vac	240 Vac	240 Vac
Impulse withstand U_{imp} (main/control)	6 kV	6 kV	6 kV	6 kV
Expected Life				
Mechanical/electrical	10 years	10 years	10 years	10 years
Output Contact Ratings				
Two output relays One Form C SPDT (fault relay) One Form A SPST (ground fault relay) C441_ _ _ _NOUI models: One Form A SPST One Form B SPST	B300 pilot duty 5A thermal continuous current 30A make 3.00A break at 120 Vac and 15A make 1.50A break at 240 Vac	B300 pilot duty 5A thermal continuous current 30A make 3.00A break at 120 Vac and 15A make 1.50A break at 240 Vac	B300 pilot duty 5A thermal continuous current 30A make 3.00A break at 120 Vac and 15A make 1.50A break at 240 Vac	B300 pilot duty 5A thermal continuous current 30A make 3.00A break at 120 Vac and 30A make 1.50A break at 240 Vac ①
External remote reset terminal	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1
Indications				
Trip	Fault	Fault	Fault	Fault
Reset	Ready	Ready	Ready	Ready
Autoreset	Trip faulted/Ready flashing	Trip faulted/Ready flashing	Trip faulted/Ready flashing	Trip faulted/Ready flashing
Power Consumption				
Maximum	5W	5W	5W	5W
Options				
Remote display	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit
Communications modules	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O

Note

① In this model, there are two isolated relays: one Form A and one Form B SPST. One is the fault relay, and one is a programmable auxiliary relay.

Motor Insight Short Circuit Ratings (North America CSA and UL)

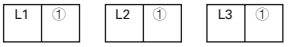
		Standard-Fault Short Circuit Data						
Overload FLA Range	**Maximum Operating Voltage**	**Withstand Rating**	**Maximum Fuse (RK5)**	**Maximum Thermal-Magnetic Circuit Breaker**	**Maximum Withstand Rating**	**Maximum Fuse (RK5)**	**Eaton Thermal-Magnetic Circuit Breaker**	**Catalog Number**
1–9A	264 Vac	5000A at 240 Vac	35A	35A	100 kA at 240 Vac	35A	—	**C441BA**
					100 kA at 240 Vac	—	FDC3035L	
1–9A	528 Vac	5000A at 480 Vac	35A	35A	100 kA at 480 Vac	35A	—	**C441CA**
					100 kA at 480 Vac	—	FDC3035L	
1–9A	660 Vac	5000A at 600 Vac	35A	35A	100 kA at 600 Vac	35A	—	**C441DA**
					35 kA at 600 Vac	—	FDC3035L	
1–9A	660 Vac	5000A at 600 Vac	35A	35A	100 kA at 240 Vac 100 kA at 240 Vac 100 kA at 480 Vac 100 kA at 480 Vac 100 kA at 600 Vac 35 kA at 600 Vac	35A — 35A — 35A —	— FDC3035L — FDC3035L — FDC3035L	**C4410109NOUI**
5–90A	264 Vac	10,000A at 240 Vac	350A	350A	100 kA at 240 Vac	350A	—	**C441BB**
					100 kA at 240 Vac	—	KDC3350	
5–90A	528 Vac	10,000A at 480 Vac	350A	350A	100 kA at 480 Vac	350A	—	**C441CB**
					100 kA at 480 Vac	—	KDC3350	
5–90A	660 Vac	10,000A at 600 Vac	350A	350A	100 kA at 600 Vac	350A	—	**C441DB**
					65 kA at 600 Vac	—	KDC3350	
5–90A	660 Vac	10,000A at 600 Vac	350A	350A	100 kA at 240 Vac 100 kA at 240 Vac 100 kA at 480 Vac 100 kA at 480 Vac 100 kA at 600 Vac 35 kA at 600 Vac	350A — 350A — 350A —	— KDC3350 — KDC3350 — KDC3350	**C4410590NOUI**

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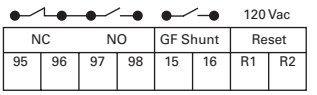
Line Powered Models

Terminal Connection Diagram

Use 75C CU wire only



18–12 AWG; Torque 5.3 lb-in/0.6 Nm
B300 Pilot Duty Only



For C441BA, BB, CA, CB, DA and DB

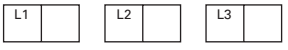


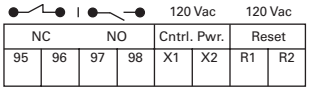
Terminal Connection Specifications

Name	Designation	Input	Description
Line voltage	L1, L2, L3	Line voltage	Three-phase line voltage input L1, L2, L3 connections must correspond to the respective CT1, CT2, CT3 current leads
Fault relay	95/96 96/97 (common) 97/98	B300 UL 508	Form C contact: 95/96 Contact opens when the unit is faulted or unpowered 97/98 Contact closes when the unit is faulted or unpowered
GF shunt	15 16	B300 UL 508	Form A contact: Contact closes when a ground fault is active
Reset input	R1, R2	120 Vac	Fault reset input IEC 61131-2 Type 1

Control Powered Models

Terminal Connection Diagram





For C4410109NOUI and C441059NOUI



Terminal Connection Specifications

Name	Designation	Input	Description
Line voltage	L1, L2, L3	Line voltage	Three-phase line voltage input L1, L2, L3 connections must correspond to the respective CT1, CT2, CT3 current leads Terminal provided for wiring control power transformer (9A maximum capacity)
Control power	X1, X2	110–120 Vac 50–60Hz (+10/–15%)	Control power option for C441_ _ _ _NOUI
Fault relay For C441_ _ _ _NOUI, the fault relay and auxiliary relay are isolated and do not share a common. By default they will behave like a Form C, but they can be programmed to act independently from one another.	95/96 96/97 (isolated) 97/98	B300 UL 508	Form C contact: 95/96 Contact opens when the unit is faulted or unpowered 97/98 Contact closes when the unit is faulted or unpowered Can be programmed to act independently of the 95/96 only in the C441_ _ _ _NOUI models
GF shunt This relay does not exist on the C441_ _ _ _NOUI models. Instead, this functionality is available in the fully programmable 97/98 auxiliary relay.	97/98	B300 UL 508	Form A contact: Contact closes when a ground fault is active Separate GF control can still be achieved by programming auxiliary relay 97/98 to act independently of the 95/96 relay
Reset input	R1, R2	120 Vac	Fault reset input IEC 61131-2 Type 1

Note

① No motor loads, 9A maximum.

Modbus Communication Modules

Description	Specification	
Electrical/EMC		
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz	
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz	
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact	
Radiated immunity IEC 60947-4-1	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz–80 mHz	
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method	
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 3	User IO and communication lines①: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	
Electromagnetic field [1] IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m	
Environmental Ratings		
Ambient temperature (operating)	–20° to 50°C	
Ambient temperature (storage)	–40° to 85°C	
Operating humidity	5 to 95% noncondensing	
Altitude (no derating)	2000m	
Shock (IEC 60068-2-27)	15G any direction	
Vibration (IEC 60068-2-6)	3G any direction	
Pollution degree per IEC 60947-1	3	
Degree of protection	IP20	
Over voltage category per UL 508	III	
C441P 24 Vdc Input		
Nominal input voltage	24 Vdc	
Operating voltage	18–30 Vdc	
Number of inputs	4	
Signal delay	5 ms (programmable to 65 sec)	
OFF-state voltage	<6 Vdc	
ON-state voltage	>18 Vdc	
Nominal input current	5 mA	
Isolation	1500V	
Terminal screw torque	7–9 in-lb	
24 Vdc source current	50 mA	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441N 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500V	
Terminal screw torque	7–9 in-lb	

Note

① Relates to C441M only.

Modbus Communication Modules, continued

Description	Specification	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

DeviceNet Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz–80 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3	10 V/m
Environmental Ratings	
Ambient temperature (operating)	–20° to 50°C
Ambient temperature (storage)	–40° to 85°C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000m
Shock (IEC 60068-2-27)	15G any direction
Vibration (IEC 60068-2-6)	3G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
DeviceNet	
DeviceNet connections	Group 2, polling, bit strobe, explicit, no UCMM
DeviceNet baud rate	125K, 250K, 500K

Note

① Resistive current at 55°C ambient.

DeviceNet Communication Modules, continued

Description	Specification	
C441L 24 Vdc Input		
Nominal input voltage	24 Vdc	
Operating voltage	18–30 Vdc	
Number of inputs	4	
Signal delay	5 ms (programmable to 65 sec)	
OFF-state voltage	<6 Vdc	
ON-state voltage	>18 Vdc	
Nominal input current	5 mA	
Isolation	250V	
Terminal screw torque	7–9 in-lb	
24V source current	50 mA	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441K 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	250V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

Note

① Resistive current at 55°C ambient.

PROFIBUS Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1 Table 13, IEC 61000-4-3	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz–80 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Environmental Ratings	
Ambient temperature (operating)	–20° to 50°C
Ambient temperature (storage)	–40° to 85°C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000m
Shock (IEC 60068-2-27)	15G any direction
Vibration (IEC 60068-2-6)	3G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
PROFIBUS	
PROFIBUS connections	Group 2, polling, bit strobe, explicit, no UCMM
PROFIBUS baud rate	9.6K, 19.2K, 45.45K, 93.75K, 187.5K, 500K, 1.5M, 3M, 6M, 12M
C441Q 24 Vdc Input	
Nominal input voltage	24 Vdc
Operating voltage	18–30 Vdc
Number of inputs	4
Signal delay	5 ms (programmable to 65 sec)
OFF-state voltage	<6 Vdc
ON-state voltage	>10 Vdc
Nominal input current	5 mA
Isolation	1500V
Terminal screw torque	7–9 in-lb
24V source current	50 mA

PROFIBUS Communication Modules, continued

Description	Specification	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441S 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<20 Vac	
ON-state voltage	>70 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

Note

① Resistive current at 55°C ambient.

Ethernet (Modbus TCP / EtherNet/IP) Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1, Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz
Conducted emissions IEC 60947-4-1, Table 15, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz to 80 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Environmental Ratings	
Ambient temperature (operating)	–20° to 50°C
Ambient temperature (storage)	–40° to 85°C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000m
Shock (IEC 60068-2-27)	15G any direction
Vibration (IEC 60068-2-6)	3G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
Ethernet	
Ethernet connections	Integrated two-port switch with dual RJ45 Ethernet connections
Ethernet type	Ethernet 10/100 Mbs, AutoMDX, Auto Negotiation
C441T 24 Vdc Input	
Nominal input voltage	24 Vdc
Operating voltage	18–30 Vdc
Number of inputs	4
Signal delay	5 ms (programmable to 65 sec)
OFF-state voltage	<6 Vdc
ON-state voltage	>18 Vdc
Nominal input current	5 mA
Isolation	1500V
Terminal screw torque	7–9 in-lb
24V source current	50 mA

Ethernet (Modbus TCP / EtherNet/IP) Communication Modules, continued

Description	Specification	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441R 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Maximum current per point ①	5A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

Note

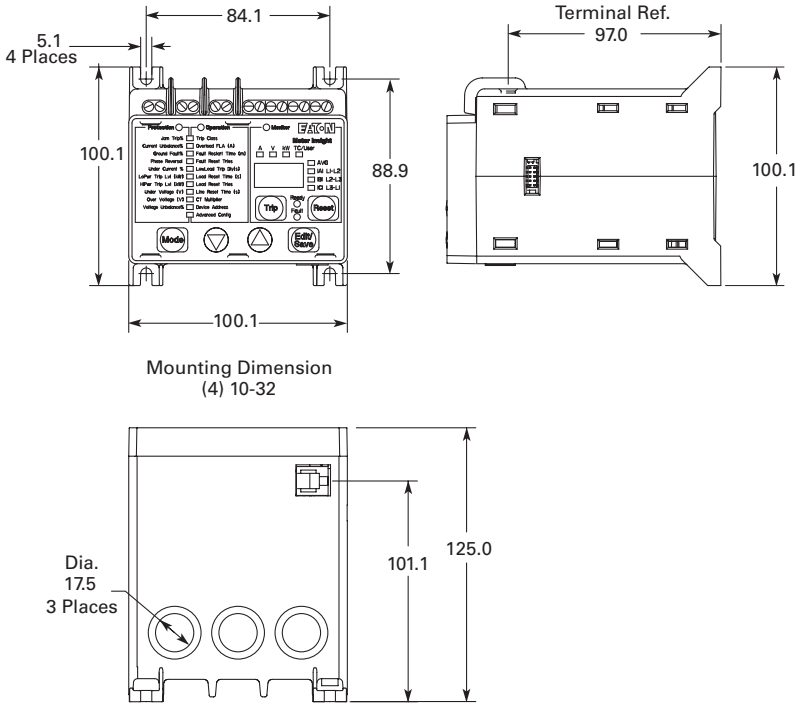
① Resistive current at 55°C ambient.

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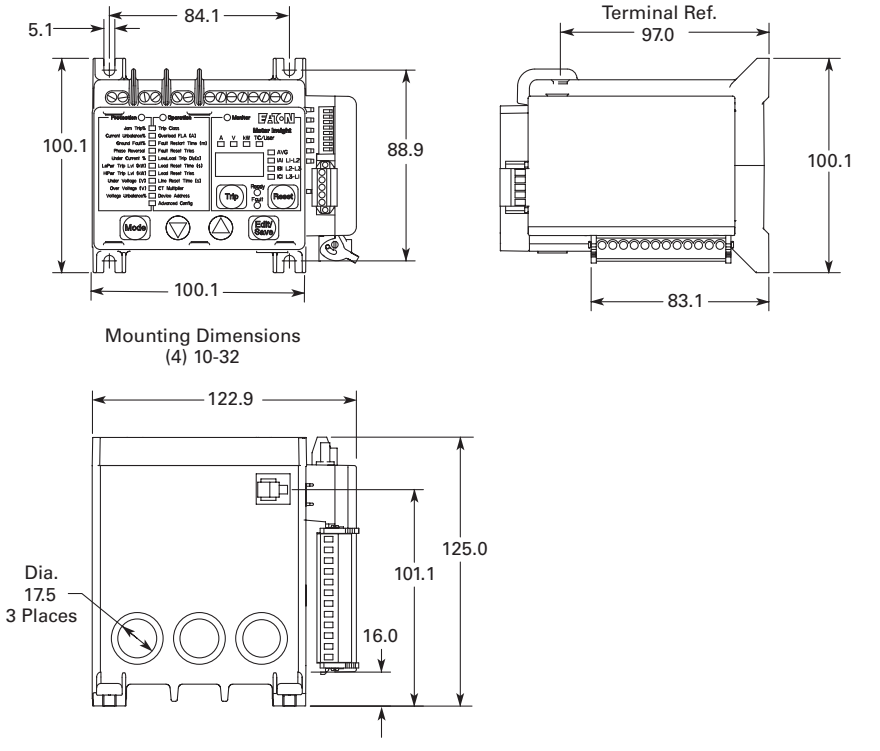
Dimensions

Approximate Dimensions in mm

Motor Insight Overload Relay

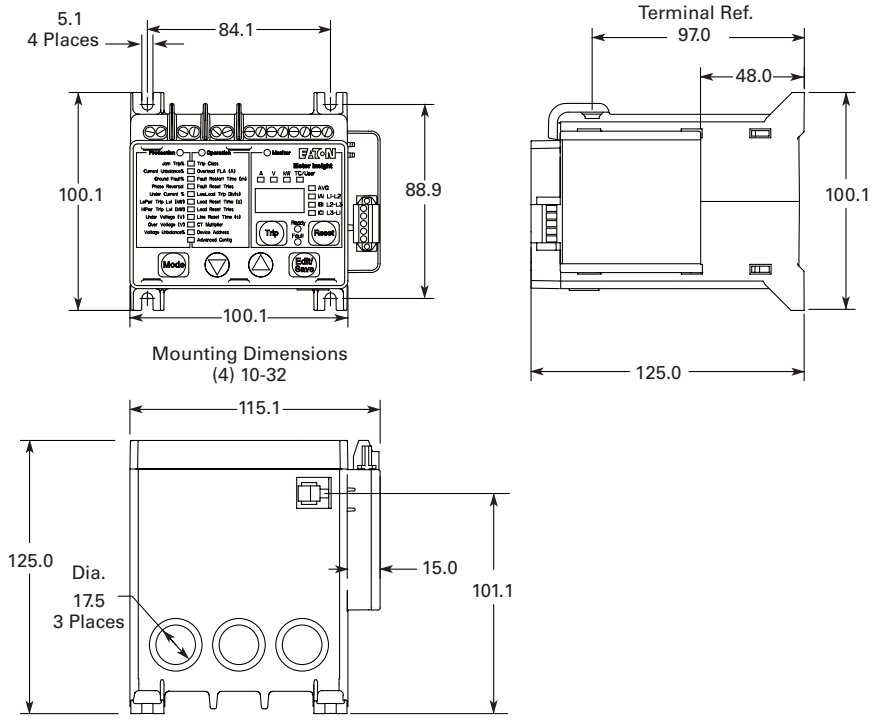


Motor Insight with Mounted DeviceNet, PROFIBUS or Modbus with I/O Communication Module

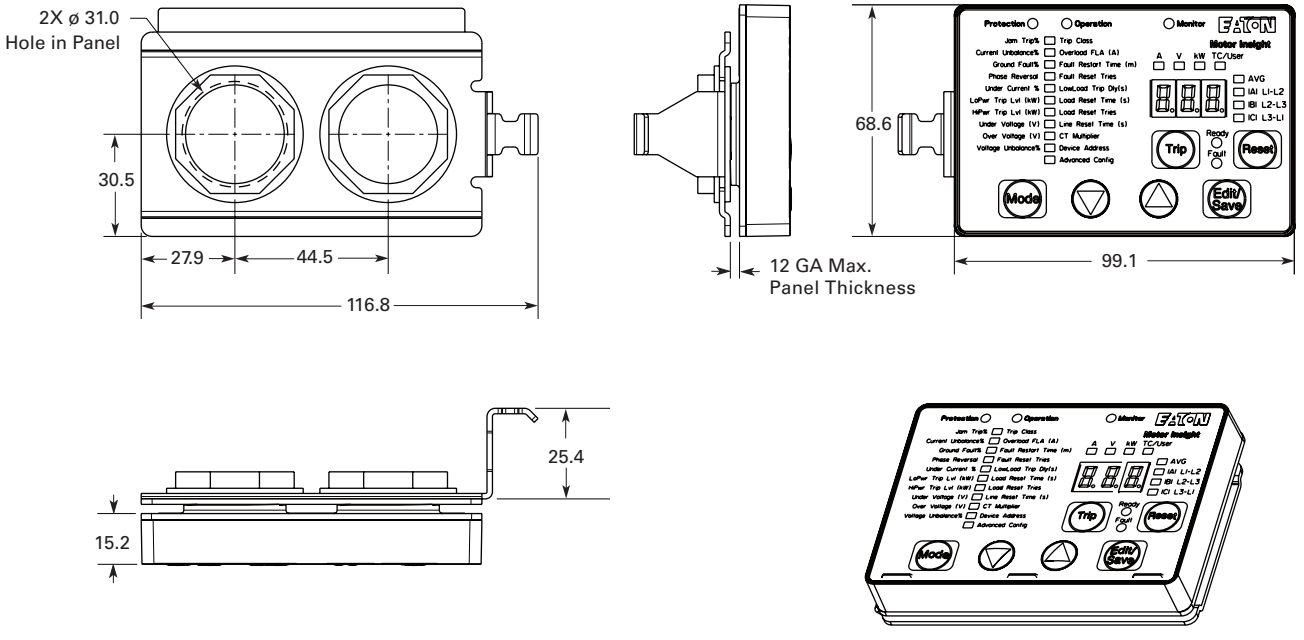


Approximate Dimensions in mm

Motor Insight with Mounted Modbus Communication Module



Motor Insight Remote Display



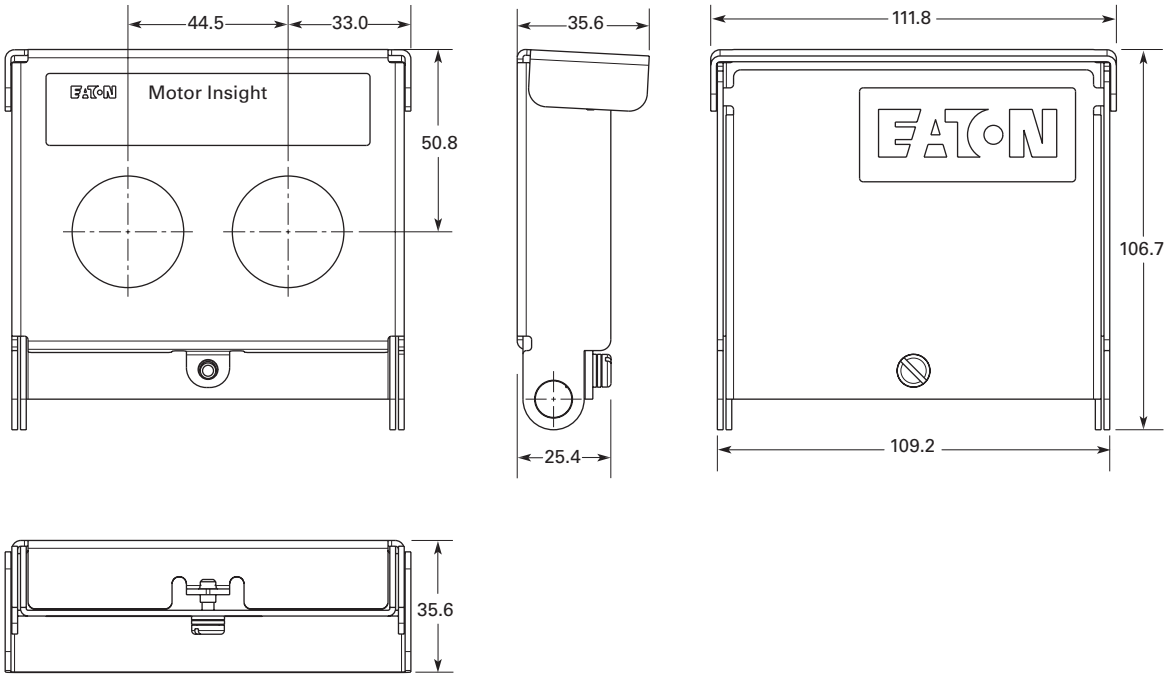
1.2 C441 Overload and monitoring relay

Dimensions

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Approximate Dimensions in mm

Motor Insight Cover Assembly



Motor Insight Conversion Plate

