BENDER
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Product overview

Power Quality

Electronic measuring and monitoring relays

Measuring and monitoring relays

Voltage and phase monitoring

Multifunctional voltage and frequency monitoring relays are available for monitoring various parameters in main and auxiliary circuits. They provide essential information well in advance so that faults and disturbances are detected at an early stage and take appropriate action before time and cost intensive operational interruptions and damage to property occur.

Device overview voltage monitoring

									
		VME420 Page 12	**VME421H Page 12**	**VMD420 Page 14**	**VMD421H Page 14**	**VMD423 Page 16**	**VMD423H Page 16**	**VMD460-NA Page 16**	**VMD258 Page 18**
AC	**with U_s**	$< U, > U$						$<U, <<U, <U, <<U, >U_{10min}$	
	without U_S		$< U, > U$						
3 AC	**with U_s**			$< U, > U$				$<U, <<U, <U, <<U, >U_{10min}$	
	without U_S				$< U, > U$				<U/>U
3/N AC	**with U_s**			$< U, > U$		$<U, >U, >U_{10min}$		$<U, <<U, <U, <<U, >U_{10min}$	
	without U_S				$< U, > U$		$<U, >U, >U_{10min}$		
DC	**with U_s**	$< U, > U$							
	without U_S		$< U, > U$						
Unbalance				■	■	■	■	■	
Phase sequence				■	■	■	■	■	
Phase failure				■	■	■	■	■	
Frequency		$<f, >f$	$<f, >f$	$<f, >f$	$<f, >f$	$<f, >f$	$<f, >f$	$<f, >f, <<f, >>f$	

Example applications of voltage and phase monitoring

Measured quantity	Common causes of faults	Possible effects
Undervoltage	Voltage variations Blown fuses Wire breakage	Failure or destruction of motors due to overheating Accidental reset of a device Undefined switching and system states Accidental restart
Overvoltage	Voltage variations	Damage to system components due to overvoltage Accidental switching on of a system
Phase sequence	Reversed conductors, faulty extension cords	Incorrect rotation direction of a motor, destruction of roller drives Hazardous situations to man and machine when using mobile devices and systems
Phase failure	Blowing of fuse(s)/control voltage failure Wire breakage	Overheating of motors due to single-phase operation
Phase unbalance	Unbalanced distribution of the load Phase failure with energy recovery	Overheating of motors due to unbalanced voltages Failure of system parts

Current monitoring

Current relays are mainly used to monitor the load current of motors and other electrical loads. They also provide essential information well in advance so that faults and disturbances are detected at an early stage and appropriate action is taken before time and cost intensive operational interruptions and damage to property occur.

Device overview: current monitoring

		 CME420 Page 19	 CMD420/CMD421 Page 20	 CMS460 Page 21
AC	with U_s	<*I*, >*I*		<*I*, >*I*
3 AC	with U_s		<*I*, >*I*	<*I*, >*I*

Example applications

Measured quantity	Application
Current monitoring	Current consumption of motors, such as pumps, elevators, cranes
	Monitoring of lighting systems, heating circuits, charging stations
	Overload control of hoisting gear and means of transportation
	Monitoring of locking devices, driving to end stops
	Monitoring of emergency lighting
	Monitoring of navigation lighting on high-rise buildings
	Monitoring of screw conveyors, for example, in sewage plants, in case of blocking of conveyor systems
	Dust removal in wood working
	Monitoring of small currents, for example, low-power motors, indicator lamps

Special monitoring tasks

Fault voltage relays are used as a protective measure for welding systems. The relays monitor the secondary windings of welding transformers in accordance with the requirements of DIN VDE 0545-1(VDE 0545-1):1990-01.
Loop monitoring relays monitor conductor loops for interruptions and short-circuits, for example, supply leads of mobile machines and devices.

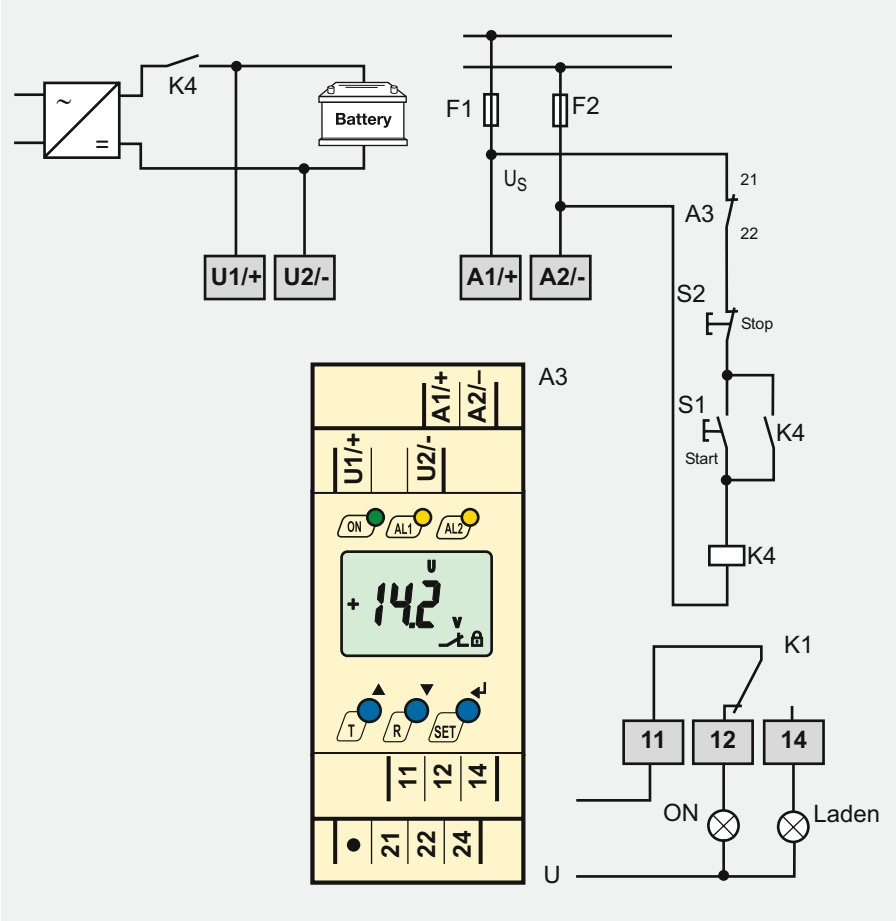
Device overview: specific applications

	 GM420 Page 22	 RM475LY Page 22	 SB146 Page 22	 ES258 Page 18
Loop monitoring	■	■		
Fault voltage relay			■	
Energy storage				■

Voltage and frequency monitoring relays for AC and DC systems

		 LINETRAXX® VME420	 LINETRAXX® VME421H
Mains voltage	AC	■	■
	DC	■	■
Function	Underfrequency/overfrequency	■	■
	Undervoltage/overvoltage	■	■
	Preset function	■	■
	Password protection	■	■
	History memory (first alarm value)	■	■
Supply voltage U_S		DC 9.6…94 V/AC 16…72 V, AC/DC 70…300 V	U_n
Response values	Undervoltage U <	AC/DC 6…300 V	AC/DC 70…300 V
	Overvoltage U >	AC/DC 6…300 V	AC/DC 70…300 V
	Underfrequency Hz <	10…500 Hz	70…500 Hz
	Overfrequency Hz >	10…500 Hz	70…500 Hz
	Rated frequency	DC, 15…460 Hz	DC, 15…460 Hz
	Hysteresis U	1…40 %	1…40 %
	Hysteresis f	0.1…2 Hz	0.1…2 Hz
	Response time	AC ≤ 70 ms/DC ≤ 130 ms	AC ≤ 70 ms/DC ≤ 130 ms
	Integrated energy storage device	–	■
	Response delay t_{on}	0…300 s	0…300 s
	Start-up delay/delay on release t_{off}	0…300 s	0…300 s
	Start-up delay t	0…300 s	0…300 s
Alarm LEDs	Power On LED	■	■
	Alarm LEDs	■	■
Switching elements	Number of switching elements	2 x 1 changeover contacts, programmable	2 x 1 changeover contacts, programmable
	Operating principle	N/O operation or N/C operation, programmable	N/O operation or N/C operation, programmable
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5	90 x 36 x 105.5
	Accessories	Mounting clip	Mounting clip
	Interface option	M	M
	Standards, approvals and certifications	UL, Lloyd's Register	UL, Lloyd's Register

The voltage and frequency monitoring relays are designed to monitor the upper and lower limits of one or several defined response values. The devices are suitable for AC and DC systems.



Ordering information

Nominal system voltage[2] U_n	Supply voltage [1] U_S	Type	Art. No.
AC 16…72 V, DC 9.6…94 V	AC 16…72 V, 15…460 Hz/DC 9.6…94 V	VME420-D-1	B 7301 0001
AC/DC 70…300 V	AC 70…300 V, 15…460 Hz/DC 70…300 V	VME420-D-2	B 7301 0002
AC 9.6…150 V, 15…460 Hz/DC 9.6…150 V	U_n	VME421H-D-1	B 7301 0003
AC 70…300 V, 15…460 Hz/DC 70…300 V	U_n	VME421H-D-2	B 7301 0004

Device version with screw terminals on request.

[1] Absolute values

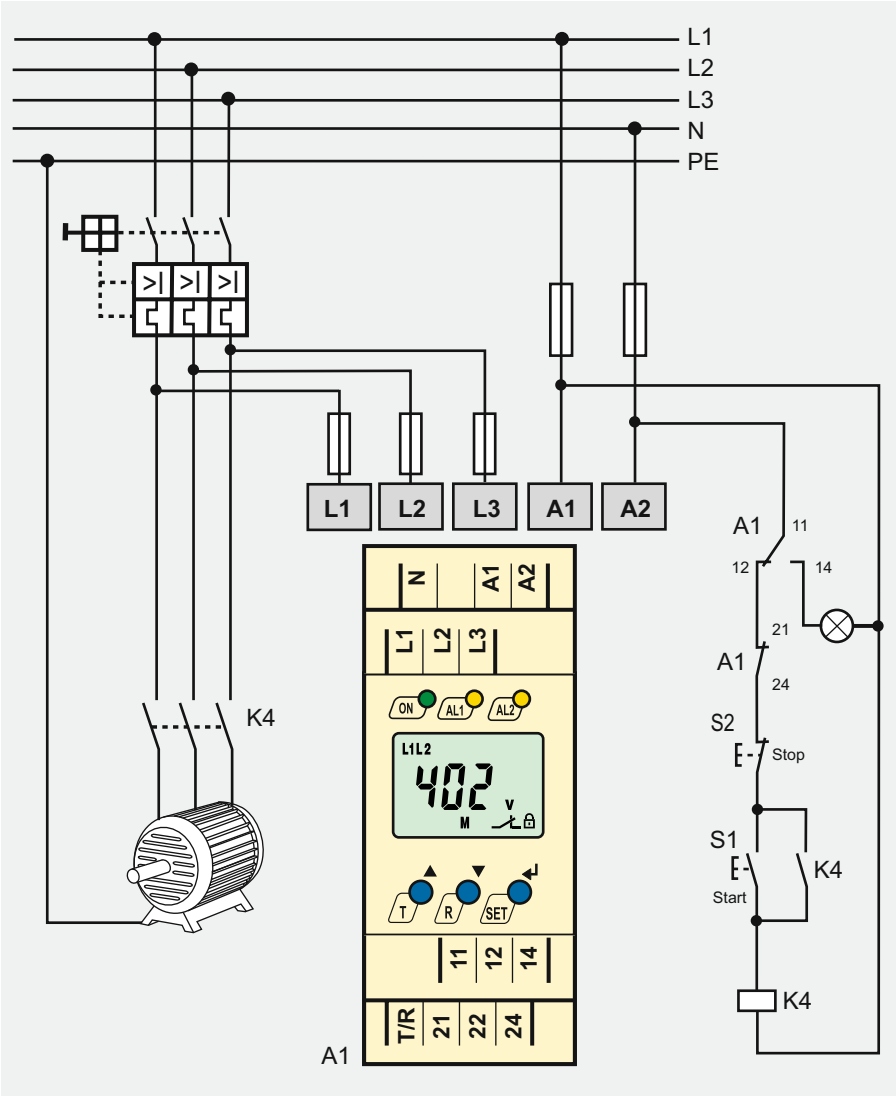
Accessories

Type designation	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Voltage and frequency monitoring relays for 3(N)AC systems

		 LINETRAXX® VMD420	 LINETRAXX® VMD421H
Mains voltage	3AC	■	■
	3NAC	■	■
Function	Undervoltage	–	–
	Overvoltage	–	–
	Undervoltage/overvoltage	■	■
	Unbalance/phase failure	■	■
	Phase sequence/frequency	■	■
	Preset function	■	■
	Password protection	■	■
	History memory (first alarm value)	■	■
Supply voltage	Supply voltage range U_S	AC 16…72 V/DC 9.6…94 V, AC/DC 70…300 V	U_n
	Undervoltage $U<$	AC 6…500 V/6…288 V	AC 70…500 /70…288 V
	Overvoltage $U>$	AC 6…500 V/6…288 V	AC 70…500 V/70…288 V
	Underfrequency Hz <	10…500 Hz	10…500 Hz
	Overfrequency Hz >	10…500 Hz	10…500 Hz
	Rated frequency	15…460 Hz	15…460 Hz
	Unbalance	5…30 %	5…30 %
	Hysteresis U	1…40 %	1…40 %
	Hysteresis f	0.1…2 Hz	0.1…2 Hz
	Operating time voltage/frequency	≤ 140/335 ms	≤ 140/335 ms
	Integrated energy storage device	–	min. 2.5 s
	Response delay t_{on}	0…300 s	0…300 s
	Delay on release t_{off}	0…300 s	0…300 s
	Start-up delay t	0…300 s	0…300 s
Alarm LEDs	Power On LED	■	■
	Alarm LEDs	■	■
Switches/ buttons	Undervoltage/overvoltage	–	–
	AC/DC switches	–	–
	Buttons	Test "T"/Reset "R"/MENU	Test "T"/Reset "R"/MENU
Switching elements	Number of switching elements	2 x 1 changeover contacts, programmable	2 x 1 changeover contacts, programmable
	Operating principle	N/O or N/C operation, programmable	N/O or N/C operation, programmable
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5	90 x 36 x 105.5
	Accessories	Mounting clip	Mounting clip
	Interface option	M	M
	Standards, approvals and certifications	UL, Lloyd's Register	UL, Lloyd's Register

The VMD420/421H series voltage and frequency monitoring relays are designed to monitor the upper and lower limits of one or several defined response values. The devices can be used for three-phase systems with or without an N conductor. Furthermore, the devices feature additional monitoring functions such as phase sequence, phase failure, frequency, and unbalance monitoring.



Ordering information

Nominal system voltage[1] U_n	Supply voltage [1] U_S	Type	Art. No.
3(N)AC 0…500/288 V	AC 16…72 V/DC 9.6…94 V, 15…460 Hz	VMD420-D-1	B 7301 0005
	AC/DC 70…300 V, 15…460 Hz	VMD420-D-2	B 7301 0006
3(N)AC 70…500 V, 15…460 Hz	U_n	VMD421H-D-3	B 7301 0007

Device version with screw terminals on request.

[1] Absolute values

Accessories

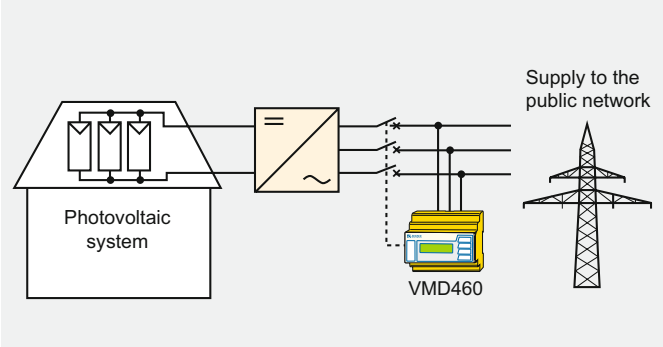
Type designation	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Voltage and frequency monitoring relays for mains decoupling of power generation systems

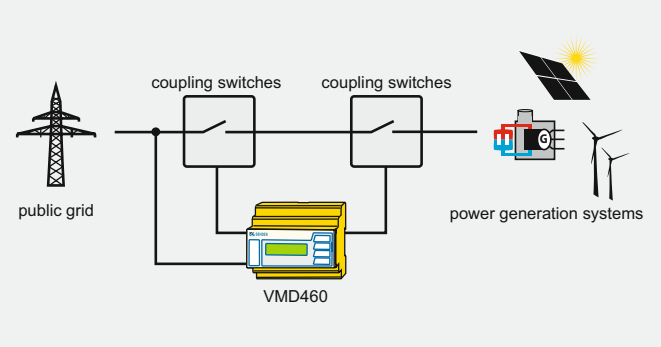
		 LINETRAXX® VMD423	 LINETRAXX® VMD423H	 LINETRAXX® VMD460
Mains voltage	3AC	■	■	■
	3NAC	■	■	■
Function	Overvoltage (10 minute measuring interval)	■	■	■
	Undervoltage/overvoltage	■	■	■
	Undervoltage << *U*	–	–	■
	Overvoltage >> *U*	–	–	■
	Underfrequency/overfrequency Hz	■	■	■
	Underfrequency Hz <<	–	–	■
	Overfrequency Hz >>	–	–	■
	Unbalance/phase failure	■	■	■
	Phase sequence/frequency	■	■	■
	Password protection	■	■	■
	History memory	■	■	■
	ROCOF df/dt	–	–	■
	Vector surge	–	–	■
Supply voltage U_S		AC 16…72 V/DC 9,6…94 V, AC/DC 70…300 V	U_n	AC/DC 100…240 V
Indication	Power On LED	■	■	■
	Alarm LED undervoltage	■	■	■
	Alarm LED overvoltage	■	■	■
Switching elements	Number of switching elements	2 x 1 changeover contacts, programmable	2 x 1 changeover contacts, programmable	2 x 1 changeover contact
	Operating principle	N/O or N/C operation, programmable	N/O or N/C operation, programmable	N/O or N/C operation, programmable
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5	90 x 36 x 105.5	90 x 108 x 74
	Accessories	Mounting rail	Mounting rail	Mounting rail
	Standards, approvals and certifications	UL508	UL508	CSA, UL508, CEI 0-21, VDE-AR-N 4105, C10/11, BDEW guideline, G59/2, G59/3, G83/2, DIN VDE V 0126-1-1/A1

The VMD460 is an external Network and System protection (NS protection) the purpose of which disconnects the power generation system from the grid by coupling switches in the event that the threshold values are exceeded.
If voltage and frequency measurement values of the power generation system do not meet the thresholds in the standards, the power generation system is disconnected from the grid.

The VMD460 is multifunctionally configurable for a wide variety of applications arising from country-specific or system-specific requirements.
The related parameters are saved in pre-set basic programs.
The VMD460 combines safe function with a high degree of flexibility and straightforward configuration.



Block diagram for continuous voltage and frequency monitoring



The principle of an installation according to CEI 0-21; VDE-AR-N 4105 (30 kW or higher), C10/11, BDEW guideline, DIN V VDE V 0126-1-1, G59/2, G59/3, G83/2

Ordering information

Supply voltage [1] U_S	Response value	Type	Art. No.
AC/DC 100…240 V	AC 400/230 V	VMD460-NA-D-2	B 9301 0045
AC 16…72 V, 15…460 Hz/DC 9.6…94 V	AC 10…500 V	VMD423-D-1	B 7301 0020[2]
AC 70…300 V, 15…460 Hz/DC 70…300 V	AC 10…500 V	VMD423-D-2	B 7301 0021[2]
U_n	AC 70…500 V	VMD423H-D-3	B 7301 0022[2]

[1] Absolute values
[2] Device version with screw terminals on request.

Accessories

Type designation	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Voltage relay for 3AC systems

LINETRAXX® VMD258

Voltage relays monitor the upper and lower limits of preset response values in 3AC systems up to 690 V.
The VMD258 is a purely analogue device with no microcontroller and software and is highly accurate for plant protection.

Mains voltage 3AC		■
Function	Undervoltage	–
	Overvoltage	–
	Undervoltage/overvoltage	■
Supply voltage U_S		3AC 100/110/230/400/440/480/500/690 V
Measuring circuit	Measuring range/ nominal system voltage U_n	3AC 100/110/230/400/440/480/500/690 V
	Response values	adjustable $>U$, $<U$
	Rated frequency	45…66 Hz
	Hysteresis	< 3 %
	Response time	100 ms
	Energy storage	External energy storage device ES258
	Response delay	0…5 s ± 10 %
	Delay on release	100 ms ± 20 %
Alarm LEDs	Power On LED	■
	Alarm LED undervoltage	■
	Alarm LED overvoltage	■
Potentiometer	Undervoltage	■
	Overvoltage	■
	Response value	■
Switching elements	Number of switching elements	2 x 2 changeover contact
	Operating principle	N/C operation (undervoltage) N/O operation (overvoltage)
Enclosure	Enclosure dimensions in mm (H x W x D)	93 x 107.5 x 110.1
	Accessories	ES258

Ordering information

Connection	Type	Art. No.
3AC 100 V	VMD258 3AC 100 V	B 9301 0060
3AC 110 V	VMD258 3AC 110 V	B 9301 0061
3AC 230 V	VMD258 3AC 230 V	B 9301 0062
3AC 400 V	VMD258 3AC 400 V	B 9301 0063
3AC 440 V	VMD258 3AC 440 V	B 9301 0064
3AC 480 V	VMD258 3AC 480 V	B 9301 0065
3AC 500 V	VMD258 3AC 500 V	B 9301 0066
3AC 690 V	VMD258 3AC 690 V	B 9301 0067

Accessories

Type designation	Art. No.
Additional mounting clips (screw mounting)	B 9806 0008
External storage ES258	B 9301 0068

Energy storage device

ES258

Supply voltage U_S	DC 41…47 V
Enclosure dimensions in mm (H x W x D)	85 x 52.5 x 70

Current relay for AC currents

LINETRAXX® CME420

Mains voltage AC		■
Function	Undercurrent/overcurrent	■
	Window discriminator function	■
	Password protection	■
	History memory (first alarm value)	■
Supply voltage U_S		AC 16…72 V/DC 9,6…94 V, AC/DC 70…300 V
Response values	Current	AC 0.05…16 A true r.m.s.
	Setting range	0.1…16 A x transformation ratio n
	Rated frequency	42…2000 Hz
	Transformation ratio *n*	1…2000
	Hysteresis	10…40 %
	Response time	≤ 70 ms
	Response delay	0…99 s
	Startup delay/delay on release	0…99 s
Alarm LEDs	Operation	■
	Alarm undercurrent	■
	Alarm overcurrent	■
Switching elements	Number of switching elements	2 x 1 changeover contacts, programmable
	Operating principle	N/O or N/C operation, programmable
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5
	Accessories	Mounting clip
	Interface option	M
	Standards, approvals and certifications	UL508

Current relays are designed to monitor the upper and lower limits of one or several defined response values.

Ordering information

Setting range	Supply voltage U_S[1)]	Type	Art. No.
AC 0.1…16 A	AC 16…72 V, 42…460 Hz/ DC 9.6…94 V	CME420-D-1	B 7306 0001
AC 0.1…16 A	AC 70…300 V, 42…460 Hz/ DC 70…300 V	CME420-D-2	B 7306 0002

Device version with screw terminals on request.

[1)] Absolute values

Accessories

Type designation	Art. No.
Mounting clip for XM420 enclosure	B 9806 0008

Current relay for 3AC currents

LINETRAXX® CMD420/CMD421

AC current relays are designed to monitor the upper and lower limit of a defined response value.

Mains voltage 3AC		■
Function	Alternating/pulsating current	–
	Undercurrent/overcurrent	■
	Unbalance monitoring	■
	Window discriminator function	■
Supply voltage U_S		AC 16…72 V/DC 9.6…94 V, AC/DC 70…300 V
Response values	Current	AC 0.05…16 A True r.m.s.
	Setting range	0.1…16 A x transformation ratio n
	Rated frequency	42…2000 Hz
	Hysteresis approx.	1…40 %
	Response time approx.	100 ms
	Response delay	0…300 s
	Delay on release	0…300 s
Alarm LEDs	Operation	■
	Alarm undercurrent	■
	Alarm overcurrent	■
	Alarm, window discriminator function	■
Switching elements	Number of switching elements	2 x 1 changeover contacts, programmable
	Operating principle	N/O or N/C operation
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5
	Accessories	Mounting clip

Ordering information

Supply voltage U_S[1)]	Type	Art. No.
AC 16…72 V/DC 9.6 V…94 V, 15…460 Hz	CMD420-D-1	B 7306 0006
AC/DC 70…300 V, 15…460 Hz	CMD420-D-2	B 7306 0007
AC 16…72 V/DC 9.6 V…94 V, 15…460 Hz	CMD421-D-1	B 7306 0008
AC/DC 70…300 V, 15…460 Hz	CMD421-D-2	B 7306 0009

Device version with screw terminals on request.

[1)] Absolute values

Accessories

Type designation	Art. No.
Mounting clip for XM420 enclosure	B 9806 0008

Current relay for AC currents

LINETRAXX® CMS460

12 channel AC current relays monitor the upper and lower limits of a defined values.

Mains voltage AC		■
Function	Alternating/pulsating current	■
	Undercurrent/overcurrent	
	Unbalance monitoring	
	Window discriminator function	
Supply voltage U_S		AC 16…72 V, 42…460 Hz/DC 16…94 V AC 70…276 V, 42…460 Hz/DC 70…276 V
Measuring circuit	Measuring channels per device	12
	Rated frequency	42…2000 Hz
	Hysteresis approx.	2…40 %
	Response time	≤ 180 ms
	Response delay	0…999 s
	Delay on release	0…999 s
Indication/ alarm LEDs	LC display	■
	Operation	■
	Alarm undercurrent	■
	Alarm overcurrent	■
Switching elements	Number of switching elements	2 x 1 changeover contact
	Operating principle	N/O or N/C operation
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 108 x 74
	Accessories	–

Ordering information

Supply voltage U_S[1)]	Type	Art. No.
AC 16…72 V, 42…460 Hz/DC 16…94 V	CMS460-D-1	B 9405 3017
AC 70…276 V, 42…460 Hz/DC 70…276 V	CMS460-D-2	B 9405 3018

[1)] Absolute values