Product overview

Power Quality

Electronic measuring and monitoring relays

Universal measuring devices and measuring relays to monitor electrical installations

Safety of power supply

To ensure personnel and equipment safety, operating conditions of electrical installations have to be monitored continuously. The physical quantities of current and voltage are not visible to humans without the use of appropriate measuring devices.

PEM series universal measuring devices (Power Quality and Energy Measurement) record all relevant parameters such as current, voltage, frequency, power, harmonics and the energy consumption of electrical supply systems, to mention but a few.

LINETRAXX® monitoring relays cover a broad spectrum; from single-channel current relays (CME420), loop monitoring (GM420) up to three-phase voltage relays (VMD460) for power generation systems in accordance with VDE-AR-N 4105. Bender also offers special solutions for specific applications such as fully analogue devices (VMD258) or fault voltage relays (SB146).

Highest level of availability despite system reactions

Increasing requirements regarding the high availability of electrical installations, and more and more complex production and automation processes conflict with an increased use of power electronics. System reactions become a topic of increasing concern to both operators and suppliers. Therefore digital universal measuring devices do more than record r.m.s. current and voltage values, they also replace analogue indicating instruments in switchboard and distributor cabinet doors. Harmonics, flicker severity, neutral currents and many more measuring quantities are recorded, evaluated and transferred via communication interfaces. Exceeded of configurable threshold values can also be signalled via relay outputs. The control centre of **Bender Monitoring Systems** centrally provides all relevant electrical installation data, which are easily accessible by means of a browser.

Power Quality and Energy Measurement PEM

Measuring and monitoring relays

Power Quality and Energy Measurement
Transparency for electrical installations

Electrical supply systems are becoming larger over time. It is not rare that failures and disturbances are the consequence of overloaded systems. By means of a monitoring system comprising universal PEM series measuring devices of the potential impacts on protective measures, risks due to overloads or changes in energy consumption can be readily assessed before the next expansion stage.
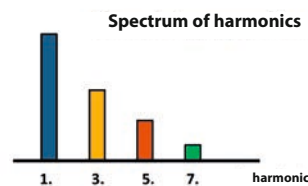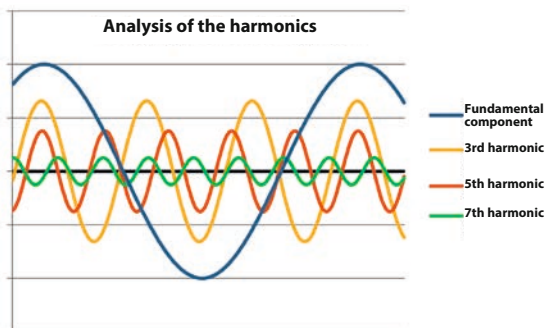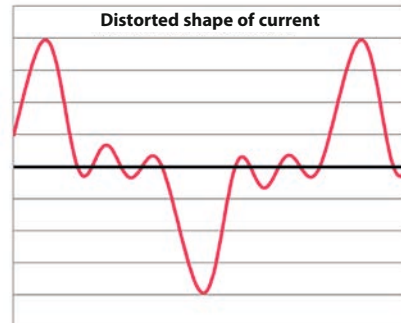
Design of the monitoring system
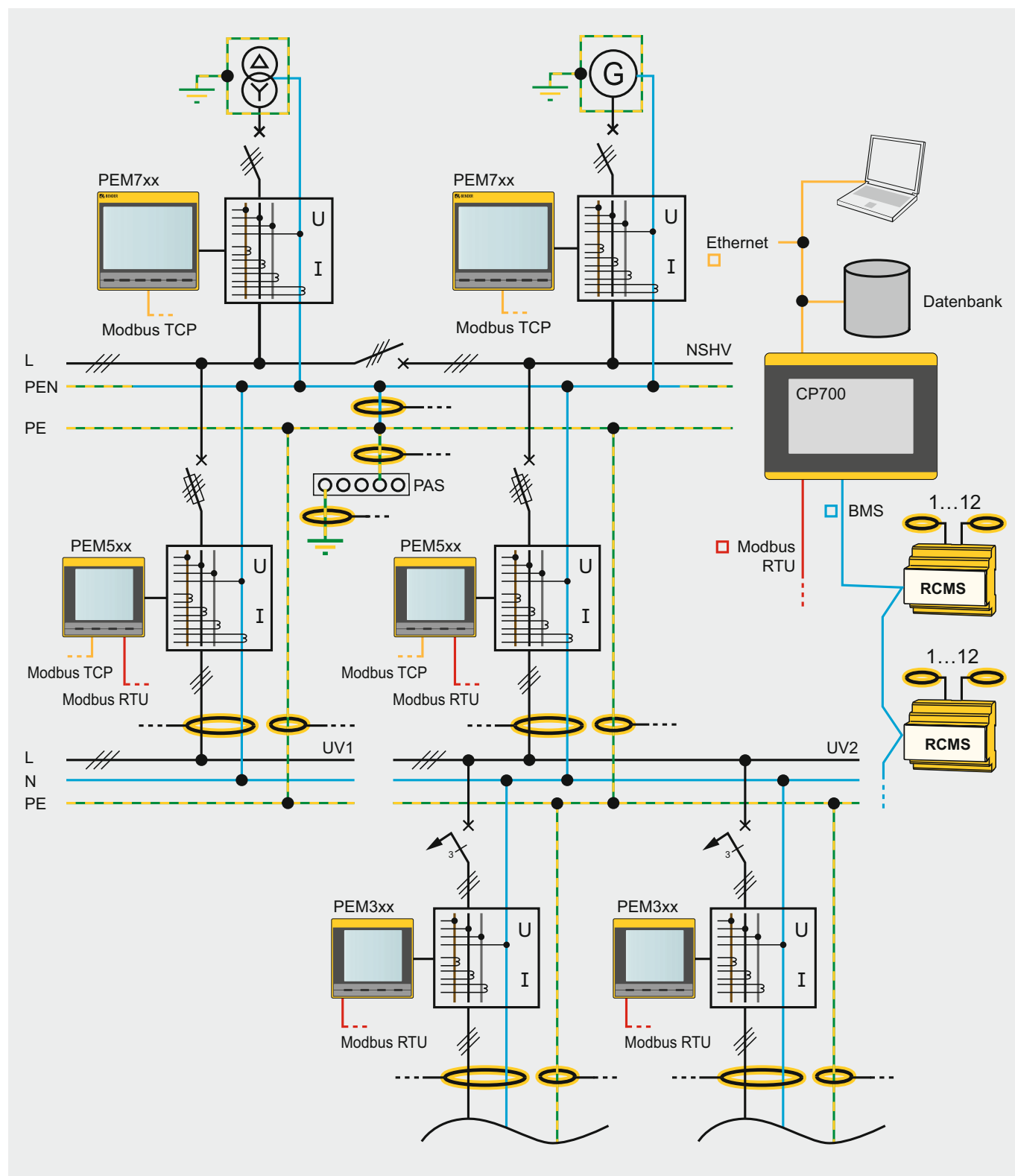A granular design of the monitoring system allows:

- Energy data acquisition by cost centres
- Faster fault localisation in the event of a fault
- An economic pyramid structure

The goal of a monitoring system must be to recognise even small changes in relevant measuring quantities such as leakage current or the harmonic content and to generate a prewarning in the event of deviations at the earliest possible stage.
A single measuring point in an electrical installation is not sufficient to generate curves of relevant measuring quantities that adequately represent voltage quality or leakage currents. Several measuring points need to be installed and adapted to correspond to the structure of the system.

Distorted shape of current

Analysis of the harmonics

Fundamental component
3rd harmonic
5th harmonic
7th harmonic

Spectrum of harmonics

1.   3.   5.   7.   harmonic

Example for system set-up

Universal measuring devices
Power Quality and Energy Measurement PEM

		LINETRAXX® PEM330	LINETRAXX® PEM333	LINETRAXX® PEM533	LINETRAXX® PEM555	LINETRAXX® PEM575	LINETRAXX® PEM735
Normative requirements	Accuracy class according to IEC 62053-22	0.5 S	0.5 S	0.5 S	0.5 S	0.2 S	0.2 S
	DIN EN 50160	–	–	–	–	–	■
	DIN EN 61000-4-7, DIN EN 61000-4-15, DIN EN 61000-4-30	–	–	–	–	–	■
Measured quantities	Phase conductor voltages/ line conductor voltages	■	■	■	■	■	■
	Phase currents	■	■	■	■	■	■
	Neutral current I_4				■	■	■
	Neutral current I_4 (calculated)	■	■	■	■	■	■
	Frequency/phase angle	■	■	■	■	■	■
	Reactive and active power import/ Reactive and active power export	■	■	■	■	■	■
	Voltage unbalance/current unbalance	■	■	■	■	■	■
	Power	per phase and total S in kVA, P in kW, Q in kvar					
	Displacement factor cos (φ)/ power factor λ	■	■	■	■	■	■
	Total harmonic distortion (THD_U/THD_I)	up to the 15th	up to the 15th	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Harmonic components voltage	–	–	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Harmonic components current	–	–	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Transient detection	–	–	–	longer than 80 µs	longer than 80 µs	longer than 40 µs
	Overvoltage (swell)	–	–	–	–	■	■
	Undervoltage (sag)	–	–	–	–	■	■
	Flicker severity P_{ST}	–	–	–	–	–	■
Features	Digital inputs	–	2	6	6	6	8
	Digital outputs	–	2	2	3	3	3
Technical aspects	Voltage supply	AC 95…260 V (47…440 Hz)/DC					
	Sampling rate	1.6 kHz	1.6 kHz	3.2 kHz	6.4 kHz	12.8 kHz	25.6 kHz
	Temperature	-25…+55 ℃					
	Communication	–	Modbus RTU	Modbus RTU	Modbus RTU & TCP	Modbus RTU & TCP	Modbus RTU & TCP

Ordering information

Digital inputs/outputs	Nominal system voltage	Interface		Current input	Type	Art. No.
		RS-485	Ethernet			
–	3(N)AC 230/400 V	–	–	5 A	PEM330	B 9310 0330
				1 A	PEM330-251	B 9310 0331
2/2	3(N)AC 230/400 V	■	–	5 A	PEM333	B 9310 0333
				1 A	PEM333-251	B 9310 0334
2 pulse outputs (kWh/kvarh)	3(N)AC 230/400 V	■	–	5 A	PEM333-255P	B 9310 0335
				1 A	PEM333-251P	B 9310 0336
6/2	3(N)AC 230/400 V	■	–	5 A	PEM533	B 9310 0533
				1 A	PEM533-251	B 9310 0534
	3(N)AC 400/690 V	■	–	5 A	PEM533-455	B 9310 0535
				1 A	PEM533-451	B 9310 0536
6/3	3(N)AC 230/400 V	■	■	5 A	PEM555	B 9310 0555
				1 A	PEM555-251	B 9310 0556
	3(N)AC 400/690 V	■	■	5 A	PEM555-455	B 9310 0557
				1 A	PEM555-451	B 9310 0558
6/3	3(N)AC 230/400 V	■	■	5 A	PEM575	B 9310 0575
				1 A	PEM575-251	B 9310 0576
	3(N)AC 400/690 V	■	■	5 A	PEM575-455	B 9310 0577
				1 A	PEM575-451	B 9310 0578
8/3	3(N)AC 100…690 V	■	■	1/5 A	PEM735	B 9310 0735

Energy meters and measuring current transformers

Energy meter

Along with numerous measuring values, all PEM series devices can measure energy and power values. If, however, a measuring point is used for billing purposes, special requirements must to be met (subject to obligatory calibration). Energy meters with the Measurement Instrument Directive (MID) conformity mark meet these requirements.
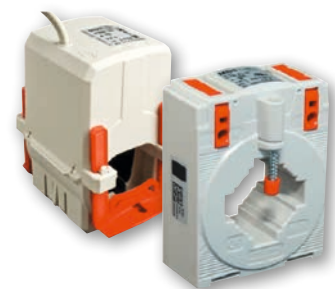
Ordering information

Description	Type	Art. No.
Energy meter 1Ph/32 A MID Modbus RTU	ALD1	B 9310 1005
Energy meter 3Ph/65 A MID Modbus RTU	ALE3	B 9310 1006
Energy meter 3Ph/6 A MID Modbus RTU	AWD3	B 9310 1007
S0 pulse counter (four-fold) with Modbus RTU	PCD7	B 9310 1008
Sealable cover for ALD1 (two per counter)	–	B 9310 1009
Sealable cover for ALE3/AWD3 (four per counter)	–	B 9310 1010

Measuring current transformers

All PEM series measuring devices can be operated with standard measuring current transformers (1 A or 5 A). To comply with the accuracy class (e.g. 0.5 S), the measuring device and the measuring current transformers used must comply with class 0.5 S or better.

Ordering information

Primary current	Accuracy	Secondary current	Type	Design	Art. No.
60	1	5	WL605 KL.1	CTB41	B 9808 6001
		1	WL60-1 KL.1	CTB41	B 9808 6002
75	1	5	WL755 KL.1	CTB41	B 9808 6003
		1	WL75-1 KL.1	CTB41	B 9808 6004
125	0.5	5	WL1255 KL.0,5	CTB41	B 9808 6005
		1	WL125-1 KL.0,5	CTB41	B 9808 6006
	1	5	WL125-5 KL.1	CTB41	B 9808 6007
		1	WL125-1 KL.1	CTB41	B 9808 6008
150	0.5	5	WL1505 KL.0,5	CTB41	B 9808 6009
		1	WL150-1 KL.0,5	CTB41	B 9808 6010
	1	5	WL150-5 KL.1	CTB41	B 9808 6011
		1	WL150-1 KL.1	CTB41	B 9808 6012
200	0.5	5	WL2005 KL.0,5	CTB41	B 9808 6013
		1	WL200-1 KL.0,5	CTB41	B 9808 6014
	1	5	WL200-5 KL.1	CTB41	B 9808 6015
		1	WL200-1 KL.1	CTB41	B 9808 6016
250	0.5	5	WL2505 KL.0,5	CTB41	B 9808 6017
		1	WL250-1 KL.0,5	CTB41	B 9808 6018
	1	5	WL250-5 KL.1	CTB41	B 9808 6019
		1	WL250-1 KL.1	CTB41	B 9808 6020
300	0.5	5	WL3005 KL.0,5	CTB41	B 9808 6021
		1	WL300-1 KL.0,5	CTB41	B 9808 6022
	1	5	WL300-5 KL.1	CTB41	B 9808 6023
		1	WL300-1 KL.1	CTB41	B 9808 6024

Primary current	Accuracy	Secondary current	Type	Design	Art. No.
400	0.5	1	WL400-1 KL.0,5	CTB41	B 9808 6025
	1	5	WL400-5 KL.1	CTB41	B 9808 6026
	0.5	5	WL400-5 KL.0,5	CTB41	B 9808 6027
	1	1	WL400-1 KL.1	CTB41	B 9808 6028
500	1	5	WL500-5 KL.1	CTB41	B 9808 6029
	0.5	5	WL500-5 KL.0,5	CTB41	B 9808 6031
	1	1	WL500-1 KL.1	CTB41	B 9808 6032
	0.5	1	WL500-1 KL.0,5	CTB41	B 9808 6033
600	1	5	WL600-5 KL.1	CTB51	B 9808 6034
	0.5	5	WL600-5 KL.0,5	CTB51	B 9808 6035
	1	1	WL600-1 KL.1	CTB51	B 9808 6036
	0.5	1	WL600-1 KL.0,5	CTB51	B 9808 6037
800	1	5	WL800-5 KL.1	CTB51	B 9808 6038
	0.5	5	WL800-5 KL.0,5	CTB51	B 9808 6039
	1	1	WL800-1 KL.1	CTB51	B 9808 6040
	0.5	1	WL800-1 KL.0,5	CTB51	B 9808 6041
1000	1	5	WL1000-5 KL.1	CTB51	B 9808 6042
	0.5	5	WL1000-5 KL.0,5	CTB51	B 9808 6043
	1	1	WL1000-1 KL.1	CTB51	B 9808 6044
	0.5	1	WL1000-1 KL.0,5	CTB51	B 9808 6045
50	3FS5	1	WLS501 KL3FS5	KBR18	B 9808 6046
100	3FS5	1	WLS1001 KL.3FS5	KBR18	B 9808 6047
150	3FS5	1	WLS1501 KL.3FS5	KBR18	B 9808 6048
250	3FS5	1	WLS2501 KL.3FS5	KBR32	B 9808 6049
500	3FS5	1	WLS5001 KL.1FS5	KBR32	B 9808 6050

Condition Monitor for Bender BMS and universal measuring devices


COMTRAXX® CP700

Several measured values per second are generated by a monitoring system. This information is collected automatically, evaluated according to the system and processed specifically for each user groups.

Webserver

	Application	Condition Monitoring/Gateway
Functions	Protocol input	BMS/Modbus RTU/TCP
	Protocol output	Ethernet/Modbus/TCP
	Indication	7" colour LCD
	Alarm messages	◼ 1, 2, 3)
	Measured values	◼ 1, 2, 3)
	Device parameterisation	◼ 1)
	Alarm list	◼ 1, 3)
	History memory	◼ 1)
	Diagrams	◼ 1, 3)
	Visualisation	◼ 1)
	E-mail notification	◼ 1)
	Device tests	◼ 1, 2)
	Data logger	◼ 1)
Connection	BMS	pluggable screw terminals
	Output	RJ 45
System requirements	Supply voltage U_S	DC 24 V
	Browser	Internet Explorer, Opera, Firefox etc. with Silverlight plugin
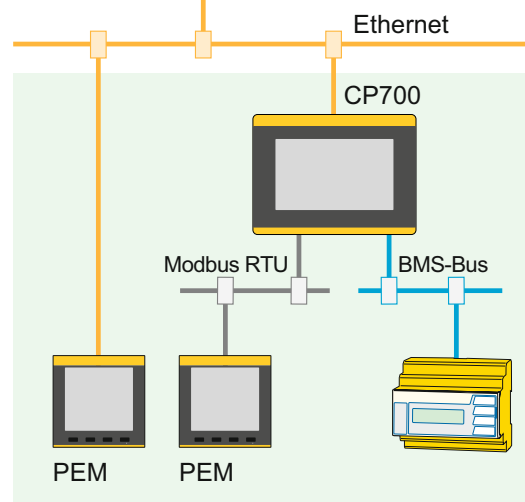
1) Available functions on the web server – Accessible by means of a PC using a browser
2) Available via protocol
3) On the device's own LC display

Ordering information

Supply voltage/ frequency range U_S	Power consumption	Type	Art. No.
DC 24 V/± 25 %	typ. 11 W/max. 26 W	**CP700**	**B 9506 1030**

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	$<U, >U$						$<U, <<U, <U, <<U, >U_{10min}$	
AC	without U_S		$<U, >U$						
3 AC	with U_S			$<U, >U$				$<U, <<U, <U, <<U, >U_{10min}$	
3 AC	without U_S				$<U, >U$				$<U/>U$
3/N AC	with U_S			$<U, >U$		$<U, >U, >U_{10min}$		$<U, <<U, <U, <<U, >U_{10min}$	
3/N AC	without U_S				$<U, >U$		$<U, >U, >U_{10min}$		
DC	with U_S	$<U, >U$							
DC	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.
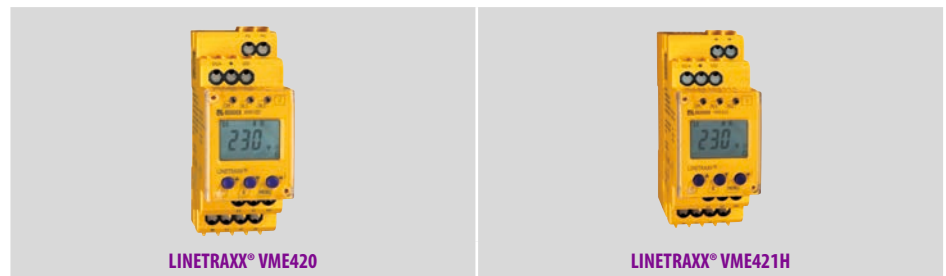
Device overview: specific applications

	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.
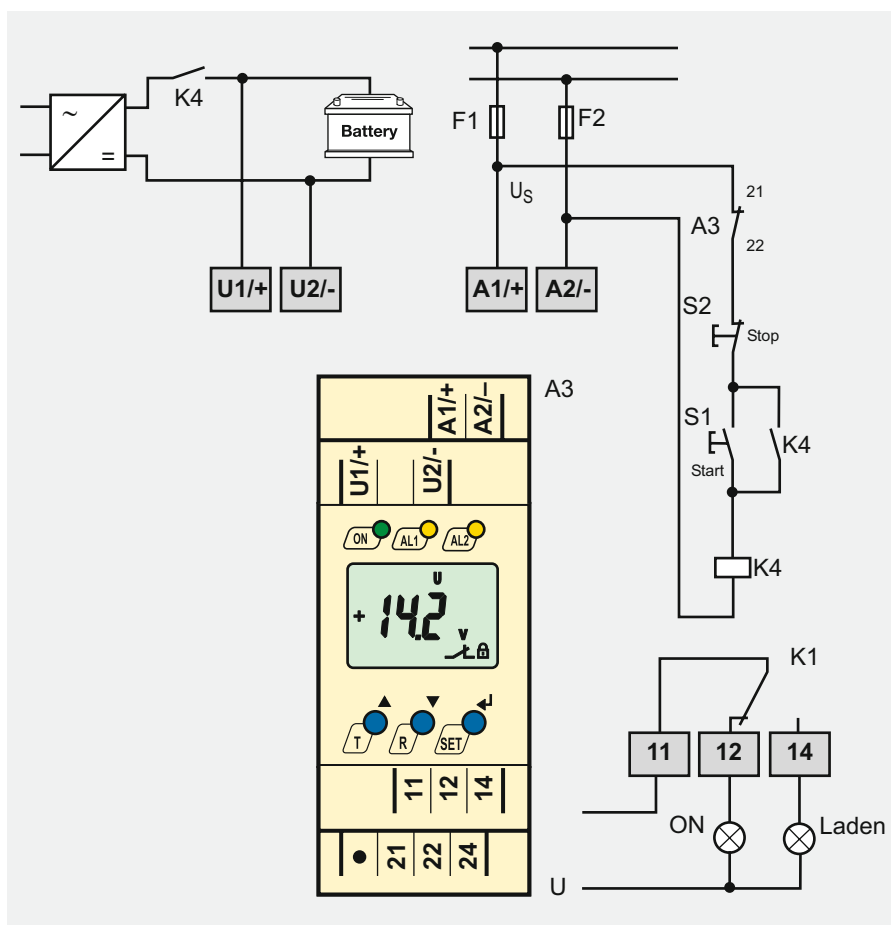
Ordering information

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.
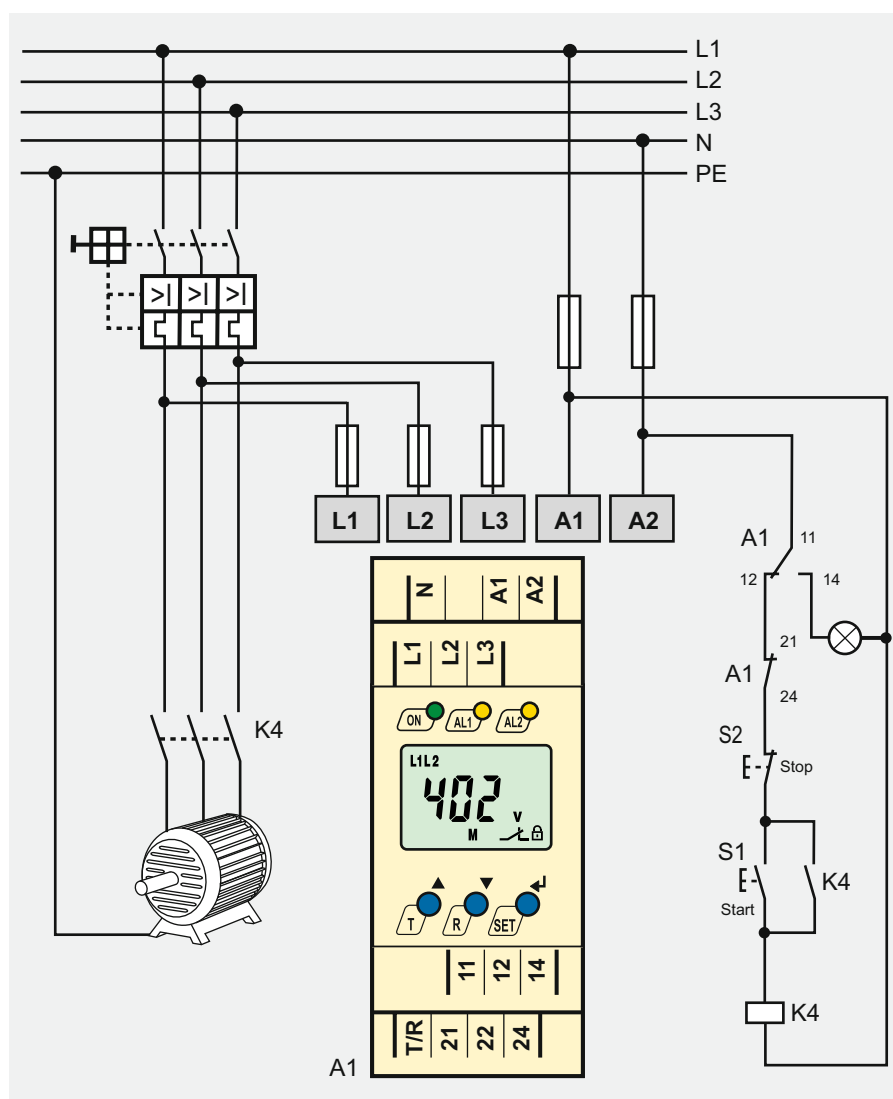
Ordering information

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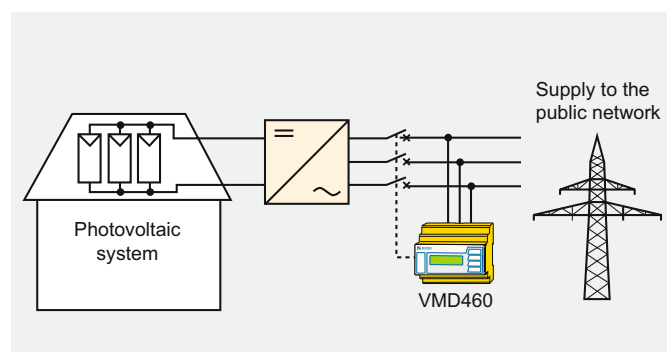
Block diagram for continuous voltage and frequency monitoring
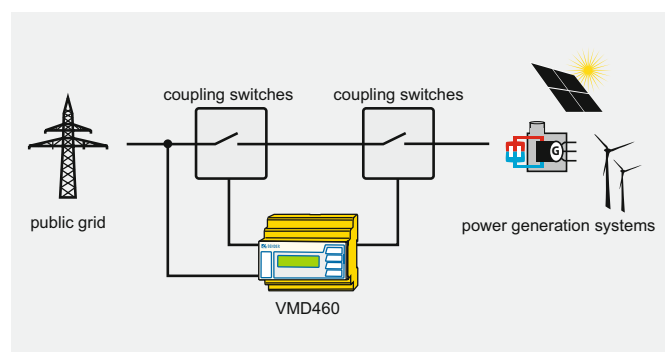
The principle of an installation according to CEI 0-21; VDE-AR-N 4105 (30 kW or higher), C10/11, BDEW guideline, DIN V VDE V 0126-1-1, G59/2, G59/3, G83/2

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

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.

LINETRAXX® VMD258

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 $\pm$ 10 %
Delay on release		100 ms $\pm$ 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

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

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

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

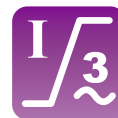Device version with screw terminals on request.
[1] Absolute values

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	■
Function · Undercurrent/overcurrent	
Function · Unbalance monitoring	
Function · 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
Measuring circuit · Rated frequency	42…2000 Hz
Measuring circuit · Hysteresis approx.	2…40 %
Measuring circuit · Response time	≤ 180 ms
Measuring circuit · Response delay	0…999 s
Measuring circuit · Delay on release	0…999 s
Indication/ alarm LEDs · LC display	■
Indication/ alarm LEDs · Operation	■
Indication/ alarm LEDs · Alarm undercurrent	■
Indication/ alarm LEDs · Alarm overcurrent	■
Switching elements · Number of switching elements	2 x 1 changeover contact
Switching elements · Operating principle	N/O or N/C operation
Enclosure · Enclosure dimensions in mm (H x W x D)	90 x 108 x 74
Enclosure · 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

Monitoring relays for special applications

		Loop monitoring		Fault voltage monitoring
		LINETRAXX® GM420	**RM475/RM475LY**	**SB146**
	Supply voltage U_S	AC 16…72 V/DC 9.6…94 V, AC/DC 70…300 V	AC 90…132/230/400/500 V DC 9.8…84/77…286 V	AC 10…65 V/DC 10…90 V AC 65…276 V/DC 90…308 V
Measuring circuit	Loop resistance > R	■	–	
	Series resistance	–	50…500 Ω	
	Cross resistance	–	1000 Ω	
	Max. system leakage capacitance	–	50 µF	
	Measuring channels	–	–	6
	Rated frequency	42…460 Hz	50…60 Hz	50…1000 Hz
	Hysteresis approx.	1…40 %	–	–
	Response time	in case of open loop connection ($R > 50$) ≤ 40 ms in case of closed loop connection ($R >$) ≤ 500 ms in case of extraneous voltage ($> U$) ≤ 100 ms	< 1 s	≤ 100 ms
	Response delay	0.1…10 s	1…10 s	–
	Response value U_A	0.1…100 Ω	–	–
	Fault voltage U_F	–	–	AC 21.6…24 V/DC 19…24 V
Alarm LEDs	Operation	■	■	■
	Alarm	■	Cross/series resistance	■ (connection) and per channel
	Loop resistance > R	■	–	–
	Extraneous voltage> U_f	■	–	–
	Switches/buttons	Test "T"/Reset "R"/MENU	TEST/RESET	TEST/RESET
	Potentiometer/series resistance	–	■	–
Switching elements	Number of switching elements	2 x 1 changeover contact	1 x 2	1 x 1 changeover contact
	Operating principle	N/O or N/C operation	N/O or N/C operation	N/C operation
Enclosure	Enclosure dimensions in mm (H x W x D)	90 x 36 x 70.5	73 x 99 x 75	99 x 45 x 114.5
	Accessories	Mounting clip	EV22S	–

Loop monitoring relays monitor conductor loops, for example, supply leads of mobile machines and devices, for interruptions and short-circuits.

Ordering information

Series resistance	Response delay	Supply voltage U_S[1]	Type	Art. No.
–	0…99 s	AC 16…72 V, 15…460 Hz/DC 9.6…94 V	**GM420-D-1**	**B 7308 2001**[2]
		AC 70…300 V, 15…460 Hz/DC 70…300 V	**GM420-D-2**	**B 7308 2002**[2]
200 Ω	< 1 s	AC 230 V, 50…60 Hz	**RM475**	**B 9702 2001**
		AC 90…132 V, 50…60 Hz	**RM475-13**	**B 9702 2002**
		DC 9.8…84 V	**RM475-21**	**B 9702 2005**
		DC 77…286 V	**RM475-23**	**B 9702 2006**
adjustable 50…500 Ω	adjustable 1…10 s	AC 230 V, 50…60 Hz	**RM475LY**	**B 9702 2007**
		AC 90…132 V, 50…60 Hz	**RM475LY-13**	**B 9702 2008**
		AC 400 V, 50…60 Hz	**RM475LY-15**	**B 9702 2009**
		AC 500 V, 50…60 Hz	**RM475LY-16**	**B 9702 2010**
		DC 9.8…84 V	**RM475LY-21**	**B 9702 2011**
		DC 77…286 V	**RM475LY-23**	**B 9702 2012**
–	–	AC 10…65 V/DC 10…90 V	**SB146-34**	**B 9308 3017**
–	–	AC 65…276/DC 90…308 V	**SB146-35**	**B 9308 3018**

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

Accessories

Type designation	Art. No.
Mounting clip for XM420 enclosure	**B 9806 0008**
EV22S Cable end unit	**B 984 800**

BENDER
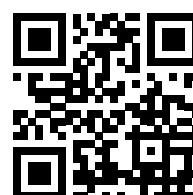
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