VAMP

Feeder/Motor Manager
Series VAMP 230
VAMP 245
VAMP 255
VAMP 257

Main Characteristics

• Complete Protection

Comprehensive selection of protection functions for distribution network overhead line feeders, cable feeders, motor feeders including large motors, capacitor banks and reactors.

• Total Control

Extensive bay control functionality including local and remote control of six objects and status supervision of another two objects.

• Comprehensive Measurements

Wide range of measurement functions including phase-to-earth, phase-to-phase voltages, currents, frequency, active, reactive and apparent power, active and reactive energy imported and exported, power factor, negative phase sequence current, etc.

• Power Quality Assessment

Power quality assessment and analysis including supervision of harmonics up to the 15th order, THD as well as voltage swells and sags.

• Fault Location

Integrated fault location with distance indication for short circuits in distribution networks irrespective of power network earthing system and earth-faults in compensated networks.

• Ultra-fast Arc Protection

Unique integrated arc fault protection functionality for enhanced safety of switchgear and substations to people and property.

• Extensive Communication

Large number of supported communication protocols including IEC 60870-5-101, IEC 60870-5-103, Modbus TCP, Modbus RTU, Profibus DP, TCP/IP, SPA-bus slave, DNP 3.0 and IEC 61850.

• Easy Handling and Management

Easy commissioning, configuration and operation of the relays supported by the straight-forward VAMPSET relay management software.

Application

The protection relays of the VAMP Series are used for the selective protection of overhead line feeders, cable feeders, motor feeders, capacitor banks, reactors and busbars in power system distribution substations, power plants, industrial power systems, marine and offshore installations. Besides a comprehensive range of standard protection functions the VAMP series also offers bay control, measurement, primary circuit monitoring and communication functionality.

A unique feature of the VAMP relays is the arc fault protection system integratable into the relays. The extremely fast arc fault protection option adds a new dimension to the total safety of the installation and the reliability of the protection system.

Further, the VAMP relays incorporate power quality assessment based on fast Fourier transform and fault spot location based on fault reactance calculation.

Customer specific configuration is obtained by freely configurable mimic display and logic programming by means of the easy-to-use VAMPSET software.

After a network fault the relays support a subsequent fault analysis by providing event sequence recordings, fault value registration and disturbance recorder capability.

All this functionality and a comprehensive set of supported communication protocols make the VAMP Series an outstanding product portfolio on the world market of power system protection and control equipment.

Quick selection table of VAMP feeder/motor managers

VAMP 230, 245, 255 and 257 are all suitable for applications where reliable control and protection is needed. The features of the products vary in the number of digital inputs and outputs and in the number of analog measuring channels.

	VAMP 257			VAMP 255	VAMP 245	VAMP 230
Analog measurement	5xI 3xU			5xI 3xU	5xI 1xU	5xI 3xU
Digital inputs	18 (+2)	18 (+2)	26 (+2)	18 (+2)	6+(2)	6 (+2)
Output relays	9	19	13	9	7	7
Self-supervision contacts	1			1	1	1
Memory	Non-volatile			RAM	RAM	RAM
Number of events	200			50	50	50
Native IEC61850	x					

Power Quality Assessment

The power quality of electrical networks has become increasingly important in modern society. Sophisticated loads, such as computers and automation systems, require an uninterrupted supply of “clean” electricity.

The VAMP feeder managers are provided with integrated power quality measuring and analyzing functions, which help catching possible variations in the quality of the distributed power. The terminal supervises the harmonics of phase currents and voltages from the 2nd to the 15th order and the THD (Total Harmonic Distortion).

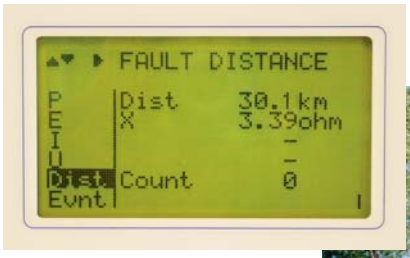
One of the most important power quality functions is the monitoring of voltage sags and swells. The VAMP feeder terminal provide separate monitoring logs for sags and swells. The fault log comprises four registers for voltage sags and another four for voltage swells.

The disturbance recorder functionality can be used for recording measured currents, voltages and for recording status information of digital inputs and outputs, also including the signals of the arc protection system. The time stamped recordings provide indispensable information for the subsequent analysis of a fault situation.

Many functions in modern society rely heavily on electric energy and therefore the quality of the energy supply is gaining increased importance

Example of harmonics content and voltage sag/swell registration obtained from a VAMP feeder manager.

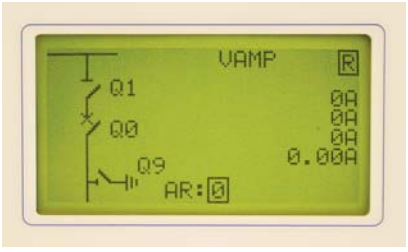
Fault Location

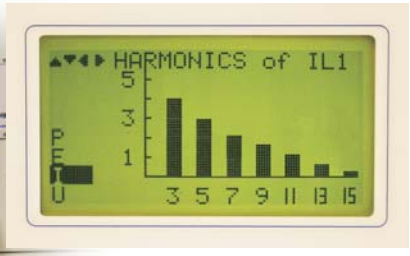


VAMP feeder managers provide accurate short-circuit fault location regardless of the MV network earthing method and earth-fault location in compensated networks.

The feeder manager includes a sophisticated stand-alone fault location function. The algorithm used can accurately locate short-circuits in any type of distribution networks and earth-faults in compensated distribution networks. The fault location is given as a reactance value, and the distance to the fault is also displayed on the local HMI, optionally as a mA signal and as a message over the communication system. The distance value can be exported, for example, as an event to a DMS (Distribution Management System). The system can then locate the fault. If a DMS is not available, the distance to the fault is displayed in kilometres, as well as a reactance value. The calculation of the distance is based on reactance measurement and homogenous lines with a known line reactance. This feature of the VAMP relay is a very cost-effective upgrade of an existing system.

Measurement and Monitoring Functions





The easy-to-use VAMP feeder managers are characterized by clear text parameters and multi-lingual support to facilitate normal relay management functions.

The VAMP feeder managers offer a complete set of measurement functions to replace the conventional metering functions of traditional switchgear and control gear installations. The measurement functions cover voltages, currents, frequency, power, energy, harmonics, voltage sags and swells, etc. The measured information can be read via the communication bus, via the configurable analogue outputs and energy measurements can be transferred via binary pulse outputs. The inaccuracy of the current and voltage measurements is +/- 0,3 % whereas it is +/- 0.5 % for active and reactive power.

Besides the measurement functions the feeder manager also encompasses a set of system supervision functions. All current and voltage transformer circuits are continuously supervised, as are the trip circuits from the feeder manager to the circuit breaker trip coils. The wear and tear of the circuit breaker is also continuously monitored providing an alarm when the circuit breaker needs maintenance.

The critical data like latest events, voltage sag/swell logs, energy counters are stored in the non-volatile memory to guarantee preservation of the information in case the relay auxiliary power is lost.

Communication

VAMP Ltd. is a communication expert with a wide experience in interfacing with different system integrators' and SCADA suppliers' RTU's, PLC's, gateways etc. using different protocols. Flexible adaptation of the communication protocols together with powerful and easy to use software tools are the key of successful integration. VAMP protection relays and the VAMPSET tool provide access to practically any power system information you may need.

The VAMP feeder manager series feature three serial communication ports, two on the rear plate for connection to the plant control system and maintenance terminal and one RS 232 port on the front panel for connection of a laptop computer.

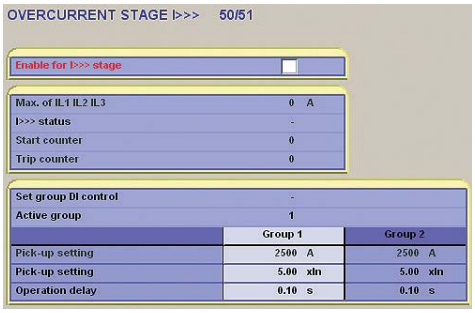
The VAMP relays communicate using the most common industrial and utility standard open communication protocols. Both the communication protocol and physical media to be used can be freely selected after acquisition of the protection devices. Therefore VAMP relays are a perfect choice also when the communication capability of the relays is to be utilized sometimes later. You may select the protocol and media according to the system you will apply.

VAMPSET Setting and Configuration Tool

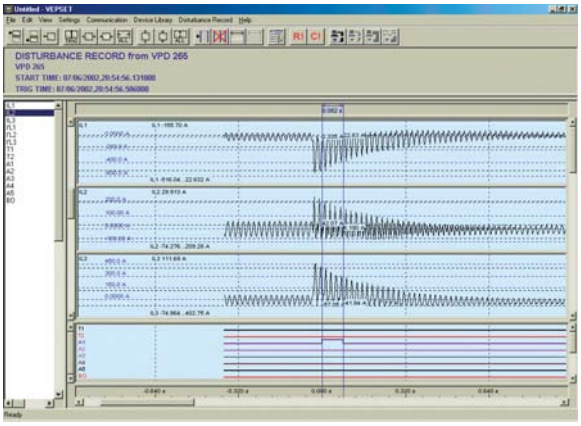
VAMPSET is a user-friendly, free-of-charge relay management software for setting, parameterising and configuring of VAMP relays. Via the VAMPSET software relay parameters, configurations and recorded relay data can be swapped between the operator's PC and the VAMP relays. Supporting the COMTRADE format VAMPSET also incorporates tools for analyzing relay events, waveforms and trends from data recorded by the relays, e.g. during a network fault situation.

Using a standard RS cable the PC running VAMPSET connects to the front or rear port of the VAMP relays. The VAMPSET software also supports TCP/IP communication via an optional 10Base-T connection. Featuring true multi-language support the software runs on Windows XP/2000/NT and Windows 98/95 without any need for configuration of the PC. The VAMPSET software is future-safe supporting coming updates and new VAMP products.

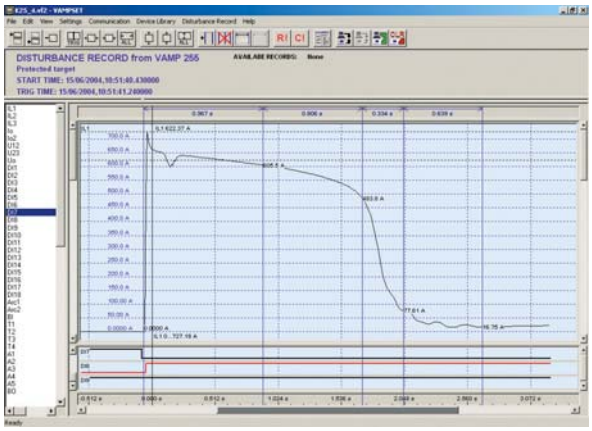
The VAMPSET software size is about 1 Mbytes; you may conveniently distribute it by e-mail or even on floppy disks saving valuable transport and waiting time – and money.



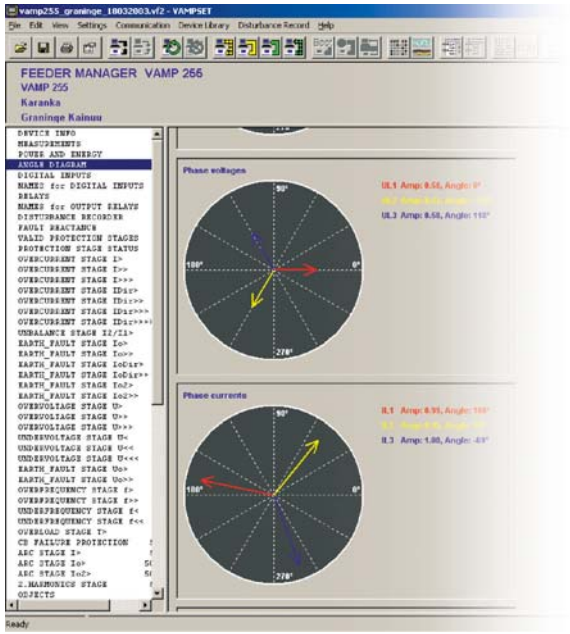
Protection setting example



As a regular feature of the VAMP relays standard COMTRADE type disturbance recording files can be uploaded for subsequent evaluation of any network event recorded.



The motor start-up register stores the motor start-up values (start current, duration etc.) significantly facilitating the correct setting of the relay even if critical motor data are unavailable from the manufacturer.



The phase sequences for currents and voltages can be read on-line from the clear and explicit screen windows for easy commissioning of the relay system.

Functionality

	IEEE no	IEC symbol	Function name	IEC, IEEE programmable curves	VAMP 230	VAMP 245	VAMP 255	VAMP 257	
Protection functions	50/51	3I>, 3I>>, 3I>>>	Overcurrent		■	■	■	■	
	50N/51N	I_0>, I_0>>, I_0>>>, I_0>>>>	Earth fault		■	■	■	■	
	67	I_{dir}>, I_{dir}>>, I_{dir}>>>, I_{dir}>>>>	Directional overcurrent		■		■	■	
	67N	$I_{0\varphi}$>, $I_{0\varphi}$>>	Directional earth fault		■	■	■	■	
	67NT	I_{0T} >	Intermittent transient earth fault		■	■	■	■	
	46R	I_2/I_1>	Broken line		■	■	■	■	
	46	I_2>	Current unbalance		■	■	■	■	
	47	I_2>>	Incorrect phase sequence		■	■	■	■	
	48	I_{st}>	Stall		■	■	■	■	
	66	N>	Frequent start		■	■	■	■	
	37	I<	Undercurrent		■	■	■	■	
	49	T>	Thermal overload		■		■	■	
	59C	U_c>	Capacitor overvoltage protection			■			
	59N	U_0>, U_0>>	Zero sequence voltage		■	■	■	■	
	59	U>, U>>, U>>>	Overvoltage		■		■	■	
	27	U<, U<<, U<<<	Undervoltage		■		■	■	
	81H/ 81L	f><, f>><<	Over frequency and under frequency		■		■	■	
	81L	f<, f<<	Under frequency		■		■	■	
	81R	df/dt	Rate of change of frequency		■		■	■	
	68	I_{2f}	Inrush and cold load		■	■	■	■	
	32	P<, P<<	Reverse power		■		■	■	
	79		Auto reclose function		■	■	■	■	
	50BF	CBFP	Circuit-breaker failure		■	■	■	■	
	50ARC/50NARC	ArcI>, ArcI_0>, ArcI_{02}>	Arc fault protection		■	■	■	■	*
			Capacitor bank unbalance		■	■	■	■	
	25		Synchrocheck		■		■	■	
	86		Latched trip		■	■	■	■	
	99	Prg1...8	Programmable stages		■	■	■	■	
Measurement and monitoring functions		3I	Three-phase current		■	■	■	■	
		I_0	Neutral current		■	■	■	■	
		I_2	Current unbalance		■	■	■	■	
		I_L	Average and maximum demand current		■	■	■	■	
		3U	Phase-to-earth, phase-to-phase voltages		■		■	■	
		U_0	Residual voltage		■	■	■	■	
		U_2	Voltage unbalance		■		■	■	
		Xfault	Short-circuit fault reactance, Fault location		■		■	■	
		Xfault	Earth-fault reactance, compensated network		■		■	■	
		f	System frequency		■	■	■	■	
		P	Active power		■		■	■	
		Q	Reactive power		■		■	■	
		S	Apparent power		■		■	■	
		E+, E-	Active Energy, exported / imported		■		■	■	
		Eq+, Eq-	Reactive Energy, exported / imported		■		■	■	
		PF	Power factor		■		■	■	
			Phasor diagram view of voltages		■		■	■	
			Phasor diagram view of currents		■	■	■	■	
			2nd to 15th harmonics and THD of currents		■	■	■	■	
			2nd to 15th harmonics and THD of voltages		■		■	■	
			Condition monitoring CB wear		■	■	■	■	
			Condition monitoring CT supervision		■	■	■	■	
			Condition monitoring VT supervision		■		■	■	
			Trip Circuit Supervision (TCS)		■	■	■	■	
			Trip Circuit Supervision with 4 x DI for T5...T8					■	
			Voltage interruptions		■		■	■	
			Voltage sags and swells		■		■	■	
		⇨	Disturbance recorder		■	■	■	■	
			Temperature		■	■	■	■	
Communication			IEC 60870-5-101		■	■	■	■	
			IEC 60870-5-103		■	■	■	■	
			Modbus TCP		■	■	■	■	
			Modbus RTU		■	■	■	■	
			Profibus DP		■	■	■	■	
			SPA-bus communication		■	■	■	■	
			DNP 3.0		■	■	■	■	
			IEC61850		■	■	■	■	*
			Human-Machine-Communication, display		■	■	■	■	
			Human-Machine-Communication, PC		■	■	■	■	
Hardware			Number of phase current CT's		3	3	3	3	
			Number of residual current CT's		2	2	2	2	
			Number of voltage input VT's		3	1	3	3	
			Number of digital inputs		6	6	18	18/18/26	
			Number of extra digital inputs with the DI19/DI20 option		2	2	2	2	
			Integrated trip supervision inputs					0/4/4	
			Number of trip outputs		2	2	4	8/12/18	
			Number of alarm outputs (including IF)		6	6	6	2	
			Number of optional mA outputs		4	4	4		*
			RTD inputs		4-16	4-16	4-16	4-16	*

*) Option

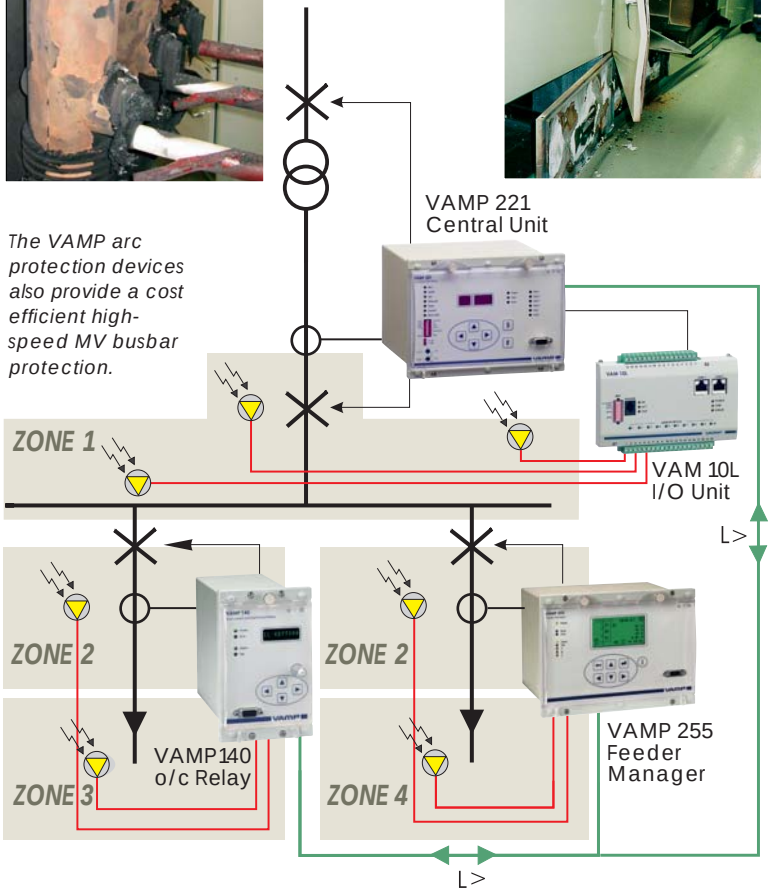
Arc Protection

Whether the time-grading or blocking based protection coordination principle is used, the traditional protection systems may not provide fast enough protection of substation faults. Further, high-impedance type of earth-faults may cause prolonged operation times of earth-fault relays leading to the significant release of the arcing energy. These facts pose a considerable risk to human beings and economical assets. By applying a modern, high-speed arc protection system the damage may be considerably reduced. Such an arc protection system is an optional feature incorporatable in all current measuring VAMP relays.

The VAMP relays measure the fault current. If the arc protection option is selected the relays also measure light via arc sensor channels monitoring the whole switchgear. Should an arcing fault occur in the switchgear the arc protection system provides an extremely fast tripping of the circuit breaker. The fault will be prevented from spreading and quickly isolated, which may save human lives and valuable economical assets.

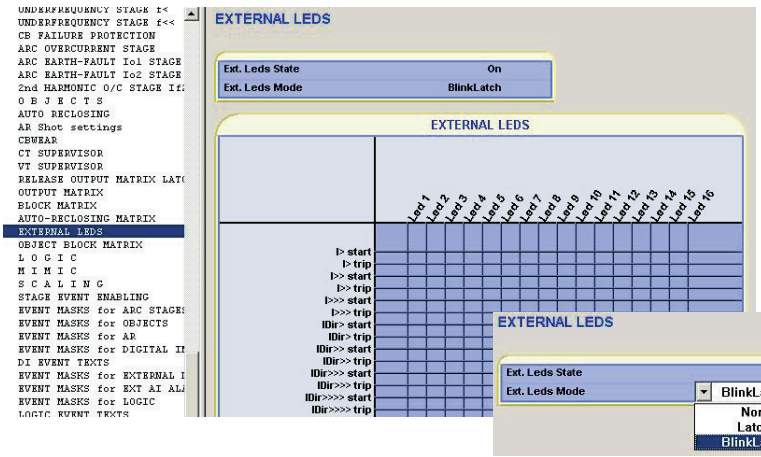
Traditional protection relay systems do not provide fast enough protection in arc-fault situations.

The VAMP arc protection devices also provide a cost efficient high-speed MV busbar protection.



External led module VAM 16D

External led module provides 16 extra led-indicators in external casing. Module is connected to the serial port of the relays front panel.

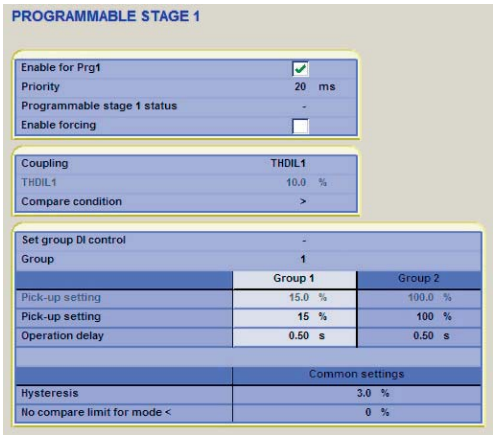


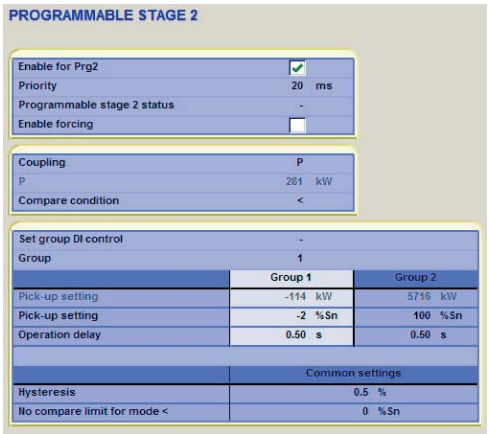
All signals of the feeder manager's output matrix are available to the external led module. For every led you can connect one or more signals.

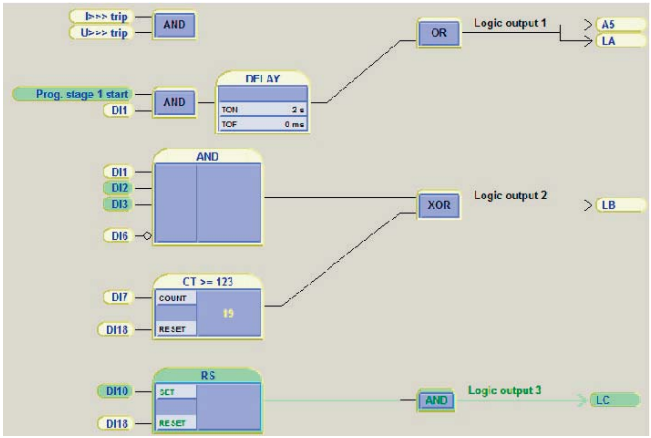
The display mode is either Latched i.e. singnal following, Latched or Blink latched.

Programmable stages

There are now eight stages available to use with various applications. Each stage can monitor any analog (measured or calculated) signal and issue start and trip signals. Programmable stages extend the protection functionality of the manager series to a new level. For example, if four stages of frequency stages are not enough, with programmable stages, the maximum of 12 stages can be reached. Another examples are using the stages to issue an alarm when there are a lot of harmonics (THD) or indicating reverse power condition.







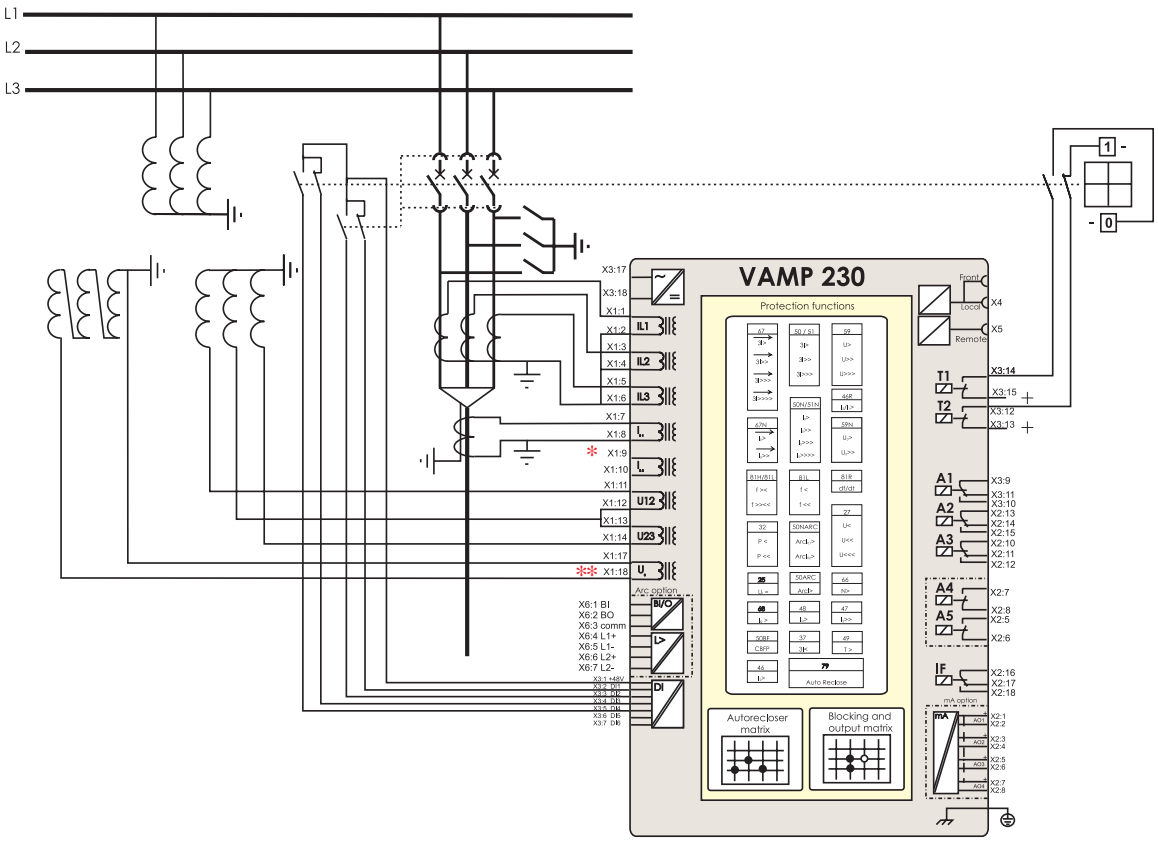
Programmable logic *The logic editor has colors to enable viewing of active statuses. Furthermore, each input status can be also seen on-line in VAMPSET view .*

Synchrocheck

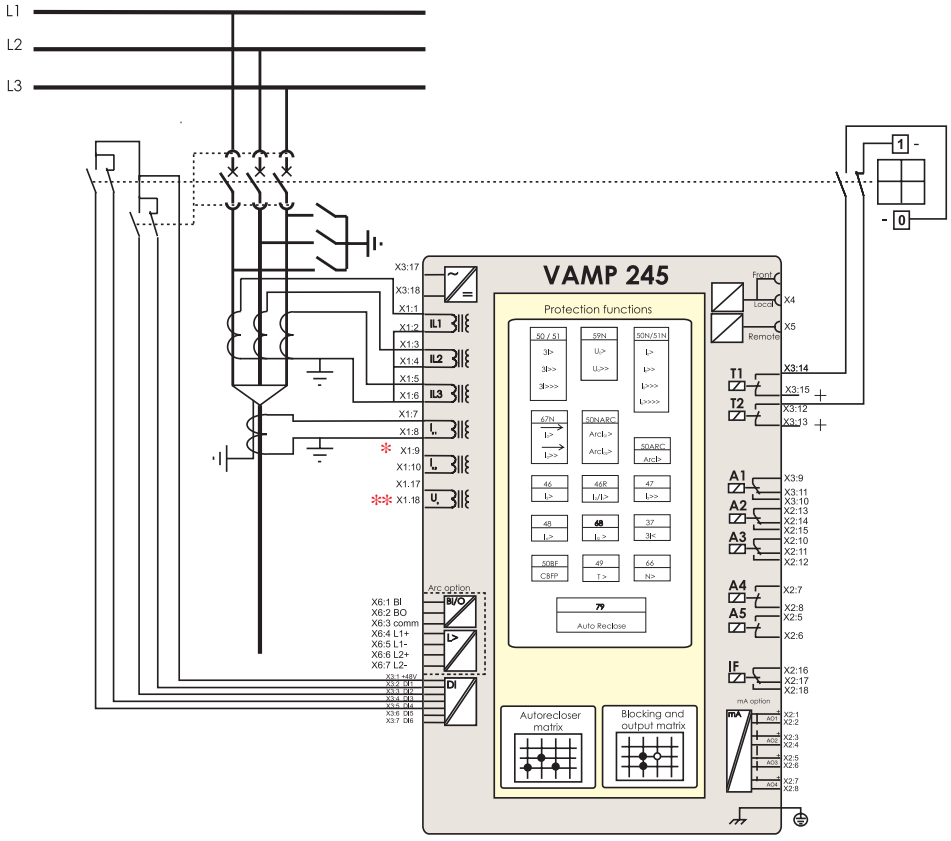
VAMP 257, 255 and 230 feeder / motor managers include a function that will check synchronism when the circuit-breaker is closed. The function will monitor voltage amplitude, frequency and phase angle difference between two voltages. Since there are two stages available, it is possible to monitor three voltages. The voltages can be busbar and line or busbar and busbar (bus coupler). Furthermore, the voltage check functionality is included.

Connection diagrams

VAMP 230 connection diagram



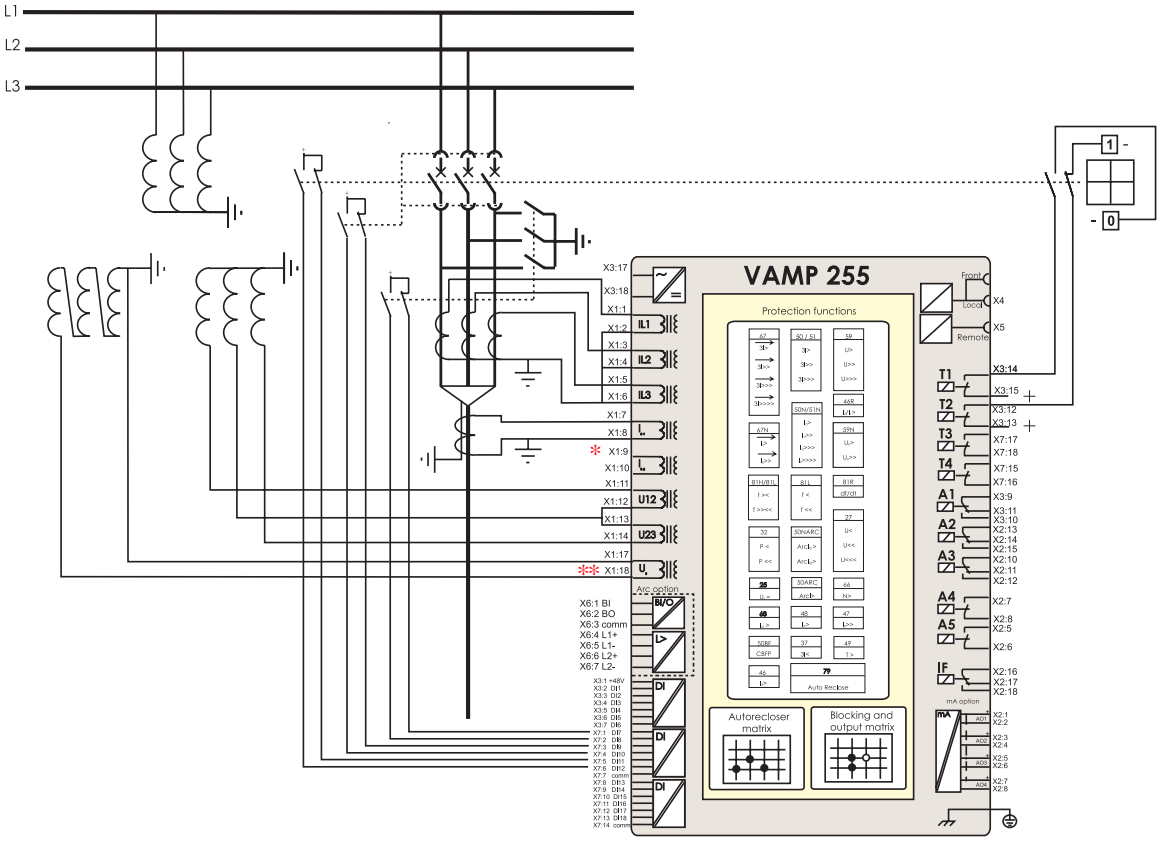
VAMP 245 connection diagram



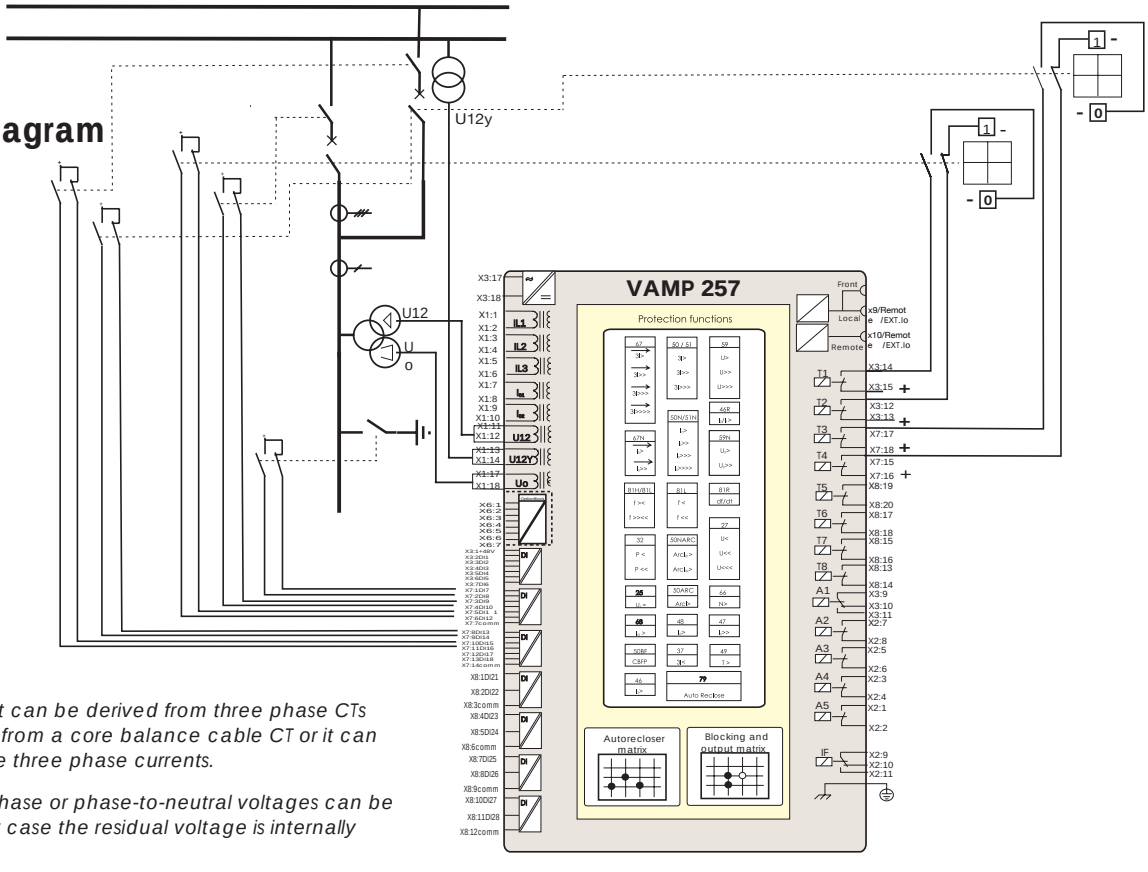
*) *The residual current can be derived from three phase CTs connected in parallel, from a core balance cable CT or it can be calculated from the three phase currents.*

**) *Either phase-to-phase or phase-to-neutral voltages can be measured. In the latter case the residual voltage is internally calculated.*

VAMP 255 connection diagram



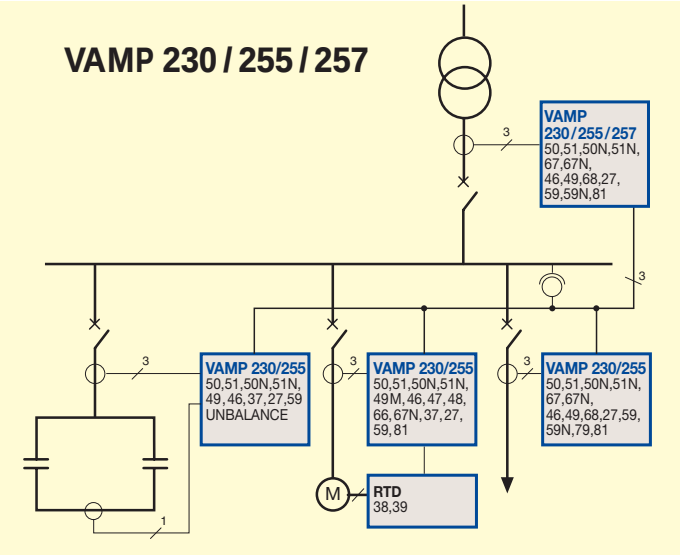
VAMP 257 connection diagram



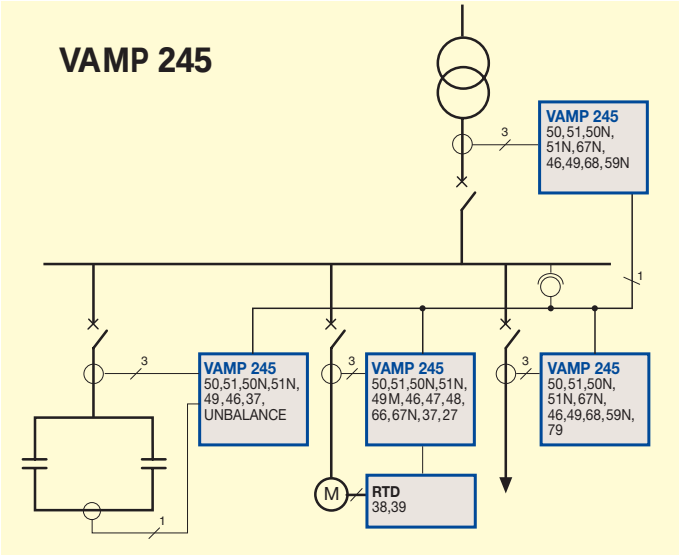
*) *The residual current can be derived from three phase CTs connected in parallel, from a core balance cable CT or it can be calculated from the three phase currents.*

**) *Either phase-to-phase or phase-to-neutral voltages can be measured. In the latter case the residual voltage is internally calculated.*

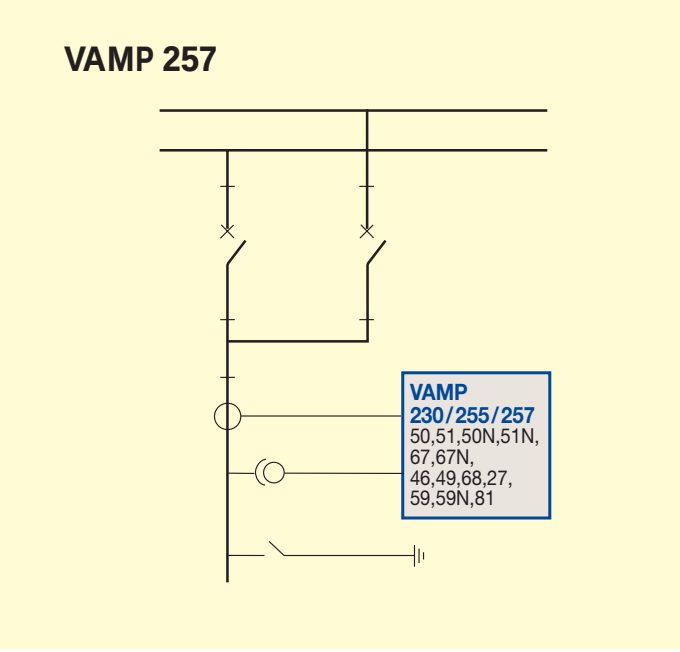
Typical applications



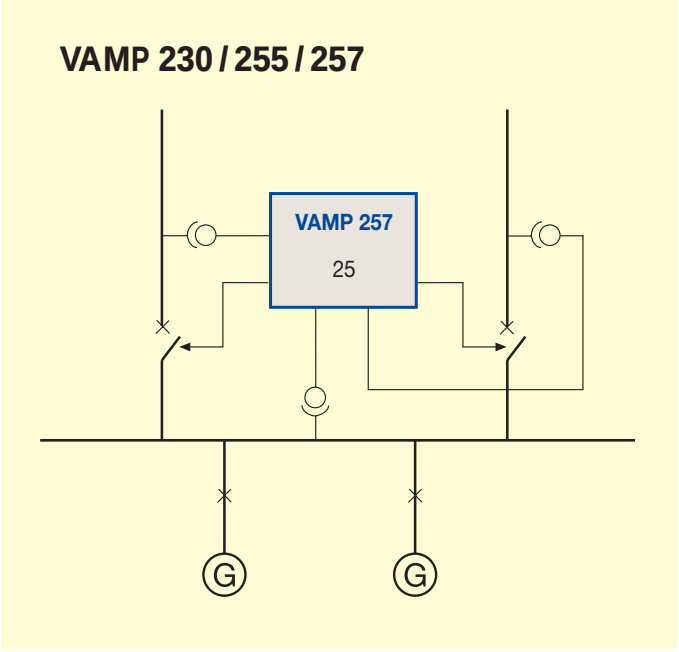
Use of feeder managers for capacitor banks, motors and incoming / outgoing feeders where a three phase voltage, phase and residual current as well as residual voltage connections are required. The RTD module interface with the VAMP feeder manager in order to capture temperature measurements from a motor for instance.



VAMP 245 feeder manager is optimized for capacitor banks, motors and incoming / outgoing feeders where a three phase current, residual current and residual voltage connections are required. The RTD module interface with the VAMP feeder manager in order to capture temperature measurements from a motor for instance.

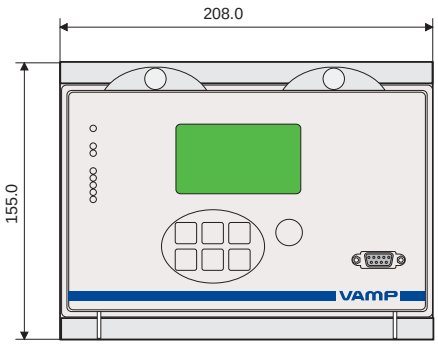


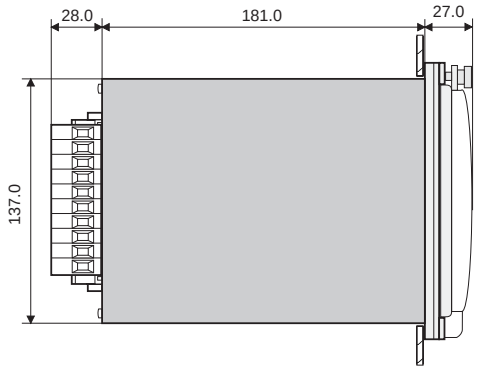
In order to control, collect and display the status information of the primary equipment of the double busbar switchgear, a large number of digital inputs and outputs are required. VAMP 257 feeder manager is designed for double busbar systems and other applications requiring extended I/O amounts.

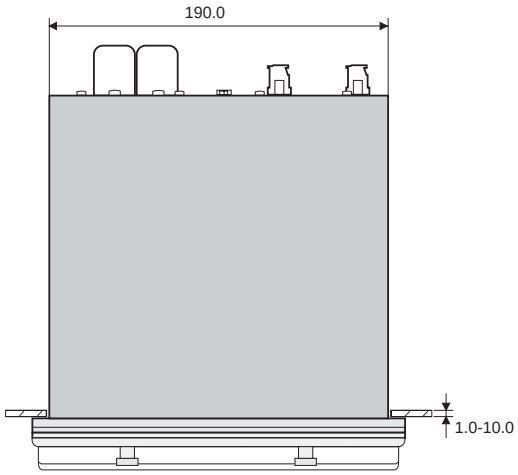


Standard feature of the VAMP 230 / 255 / 257 feeder managers incorporate voltage and synchrocheck functionality. The feeder manager allows safe connection of three alternative voltage sources together.

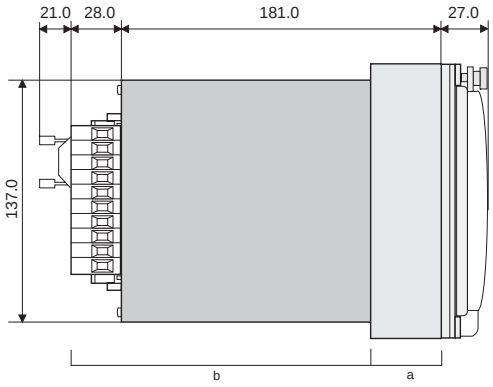
Dimensional Drawings







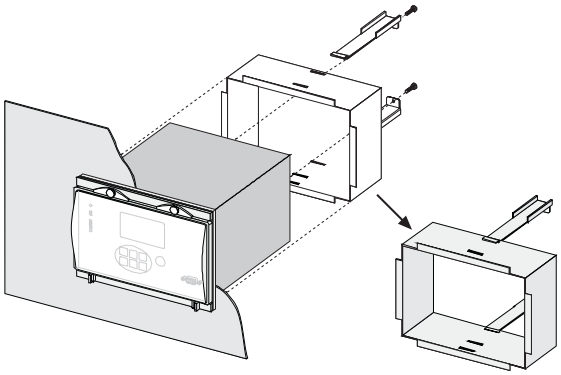
Semi-flush mounting

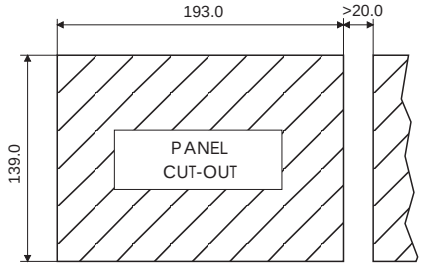


Depth with raising frames

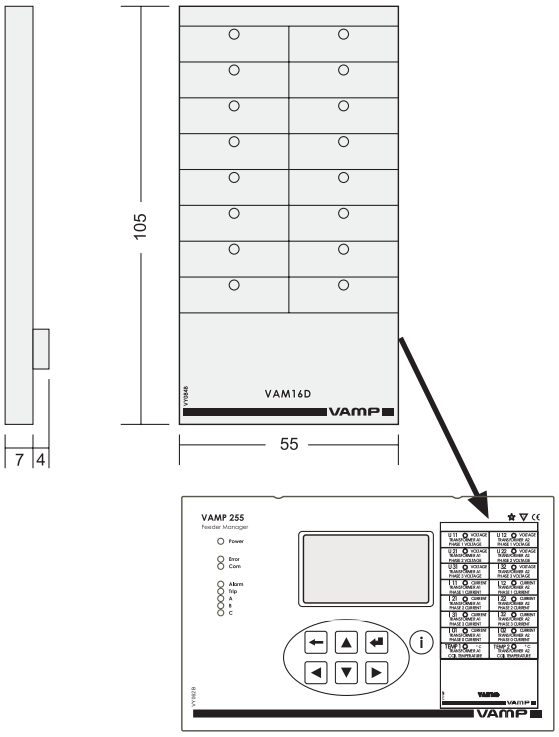
Type designation	a	b
VYX 076	40 mm	169 mm
VYX 077	60 mm	149 mm
VYX 233	100 mm	109 mm

Panel mounting





External led module VAM 16D



Order Codes

Feeder Manager VAMP 257

VAMP 257 - 3 [ ][ ][ ][ ][ ]

Nominal current [A]
- 3 = 1 A / 5 A

Nominal earth-fault current Io1 & Io2 [A]
- C = 1 A / 5 A
- D = 0.2 A / 1 A

Additional I/O (X8 terminal)
- 6 = None
- 7 = 8 inputs and 4 outputs
- 8 = 10 outputs
- 9 = for future purposes

Supply voltage [V]
- A = 40.. 265 V ac/dc
- B = 18.. 36 V dc
- C = 40.. 265 V ac/dc + ARC Protection
- D = 18.. 36 V dc + ARC Protection
- E = 40.. 265 V ac/dc + DI19, DI20 + arc channel, Optional
- F = 18.. 36 V dc + DI19, DI20 + arc channel, Optional

Optional hardware (communication port 1)
- A = TTL/RS-232
- B = Plastic/Plastic fibre interface (VCM fibre PP)
- C = N/A
- D = RS 485 Interface (VCM 485-4)
- E = Glass/Glass Optic Interface (VCM fibre GG)
- F = Plastic/Glass Optic Interface (VCM fibre PG)
- G = Glass/Plastic Optic Interface (VCM fibre GP)
- I = RJ-45 connection (RS-232, VCM 232)

Optional hardware (communication port 2)
- A = None
- B = RJ-45 connection (Ethernet, VCM TCP)
- C = RJ-45 connection (RS-232, VCM 232)
- D = RS-485 Interface (VCM 485-2)
- KK = IEC 61850 interface (communication port 1&2)
- L = Inbuilt internet, RJ-45 connection
- M = Inbuilt internet with IEC 61850

Accessories :

Order Code	Description	Note
VEA 3 CG	Ethernet Interface Module	
VPA 3 CG	Profibus Interface Module	
VSE001	Fibre optic Interface Module	
VSE002	RS-485 Interface Module	
VSE005-2	Ethernet and RS-485 Module	
VX003-3	Programming Cable (VAMPSet, VEA 3 CG+200serie)	Cable length 3 m
VX004-M3	TTL/RS232 Converter Cable (for PLC, VEA3CG+200serie)	Cable length 3 m
VX007-F3	TTL/RS232 Converter Cable (for VPA 3 CG)	Cable length 3 m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4 m
VA 1 DA-6	Arc Sensor	Cable length 6 m
VYX076	Raising Frame for 200-serie	Depth 40 mm
VYX077	Raising Frame for 200-serie	Depth 60 mm
VYX233	Raising Frame for 200-serie	Depth 100 mm
VCM TCP	Ethernet Interface Module, RJ-45, integrated for VAMP257	
VCM 485-4	RS-485 Interface Module, integrated for VAMP257	
VCM 485-2	RS-485 Interface Module, integrated for VAMP257	
VCM fibre	Fibre Interface Module, integrated for VAMP257	
VCM 232	RS-232 Interface Module, RJ-45, integrated for VAMP257	
VCM 61850	IEC 61850 Interface Module RJ-45, integrated for VAMP257	
VAM 16D	External LED Module	

Feeder Managers VAMP 255/245/230

VAMP [ ] - 3 C 7 [ ][ ][ ]

Manager type
- 255 = VAMP 255 feeder manager
- 245 = VAMP 245 feeder manager
- 230 = VAMP 230 feeder manager

Nominal current [A]
- 3 = 1 A / 5 A

Nominal earth-fault current Io1 & Io2 [A]
- C = 1 A / 5 A
- D = 0.2 A / 1 A

Frequency [Hz]
- 7 = 50/60 Hz

Supply voltage [V]
- A = 40.. 265 V ac/dc
- B = 18.. 36 V dc
- C = 40.. 265 V ac/dc + ARC Protection
- D = 18.. 36 V dc + ARC Protection
- E = 40.. 265 V ac/dc + DI19, DI20 + arc channel, Optional
- F = 18.. 36 V dc + DI19, DI20 + arc channel, Optional

Optional hardware
- A = None
- B = Plastic/Plastic fibre interface
- C = Profibus Interface
- D = RS 485 Interface
- E = Glass/Glass Optic Interface
- F = Plastic/Glass Optic Interface
- G = Glass/Plastic Optic Interface
- H = Intergated Ethernet Interface
- K = IEC 61850 Interface

Optional software
- A = None
- B = Four mA outputs

Accessories :

Order Code	Description	Note
VEA 3 CG	Ethernet Interface Module	
VPA 3 CG	Profibus Interface Module	
VSE001	Fibre optic Interface Module	
VSE002	RS-485 Interface Module	
VSE005-2	Ethernet and RS-485 Module	
VX003-3	Programming Cable (VAMPSet, VEA3 CG+200-series)	Cable length 3 m
VX004-M3	TTL/RS232 Converter Cable (for PLC, VEA3 CG+200-series)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VPA3 CG)	Cable length 3 m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4 m
VA 1 DA-6	Arc Sensor	Cable length 6 m
VYX076	Raising Frame for 200-series	Depth 40 mm
VYX077	Raising Frame for 200-series	Depth 60 mm
VYX233	Raising Frame for 200-series	Depth 100 mm
DI-934MB	RTD Input Module	DataQ Instruments Inc.
Adam 4015-B	RTD Input Module	Advantech Co., Ltd
VAM 16D	External LED module	

Technical Data, Tests and Environmental Conditions

Measuring circuitry

Rated phase current	5 A (configurable for CT secondaries 1 – 10 A)
- Current measuring range	0…250 A
- Thermal withstand	20 A (continuously)
	100 A (for 10 s), 500 A (for 1 s)
- Burden	< 0.2 VA
Rated residual current (optional)	5 A (configurable for CT secondaries 1 – 10 A)
- Current measuring range	0…50 A
- Thermal withstand	20 A (continuously)
	100 A (for 10 s), 500 A (for 1 s)
- Burden	< 0.2 VA
Rated residual current	1 A (configurable for CT secondaries 0.1 – 10.0 A)
- Current measuring range	0…10 A
- Thermal withstand	4 A (continuously)
	20 A (for 10 s), 100 A (for 1 s)
- Burden	< 0.1 VA
Rated residual current (optional)	0.2 A (configurable for CT secondaries 0.1-10.0 A)
- Current measuring range	0…2 A
- Thermal withstand	0.8 A (continuously)
	4 A (for 10 s), 20 A (for 1 s)
- Burden	< 0.1 VA
Rated voltage U_n	100 V (configurable for VT secondaries 50-120 V)
- Voltage measuring range	0 – 160 V (100 V/110 V)
- Continuous voltage withstand	250 V
- Burden	< 0.5V A
Rated frequency f_n	45 – 65 Hz
- Frequency measuring range	16 – 75 Hz
Terminal block:	Maximum wire dimension:
- Solid or stranded wire	4 mm² (10-12 AWG)

Auxiliary voltage

	Type A (standard)	Type B (option)
Rated voltage U_{aux}	40 - 265 V ac/dc	18...36 V dc
	110/120/220/240 V ac	24 V dc
	48/60/110/125/220 V dc	
Power consumption	< 7 W (normal conditions)	
	< 15 W (output relays activated)	
Max. permitted		
interruption time	< 50 ms (110 V dc)	
Terminal block:	Maximum wire dimension:	
- Phoenix MVSTBW or equivalent	2.5 mm² (13-14 AWG)	

Package

Dimensions (W x H x D)	215 x 160 x 275 mm
Weight	
(Terminal, Package and Manual)	5.2 kg

Tests performed by third party accredited laboratory SGS.

Functionality verified by KEMA

Disturbance tests

Emission (EN 50081-1)	
- Conducted (EN 55022B)	0.15 - 30 MHz
- Emitted (CISPR 11)	30 - 1 000 MHz
Immunity (EN 50082-2)	
- Static discharge (ESD)	EN 61000-4-2, class III
	6 kV contact discharge
	8 kV air discharge
- Fast transients (EFT)	EN 61000-4-4, class III
	2 kV, 5/50 ns, 5 kHz, +/-
- Surge	EN 61000-4-5, class III
	2 kV, 1.2/50 µs, common mode
	1 kV, 1.2/50 µs, differential mode
- Conducted HF field	EN 61000-4-6
	0.15 - 80 MHz, 10 V
- Emitted HF field	EN 61000-4-3
	80 - 1000 MHz, 10 V/m
- GSM test	ENV 50204
	900 MHz, 10 V/m, pulse modulated

Test voltages

Insulation test voltage	
(IEC 60255-5)	2 kV, 50 Hz, 1 min
Surge voltage (IEC 60255-5)	5 kV, 1.2/50 µs, 0.5 J

Mechanical tests

Vibration (IEC 60255-21-1)	10...60 Hz, amplitude ±0.035 mm
	60...150 Hz, acceleration 0.5g
	sweep rate 1 octave/min
	20 periods in X-, Y- and Z axis direction
Shock (IEC 60255-21-1)	half sine, acceleration 5 g,
	duration 11 ms
	3 shocks in X-, Y- and Z axis direction

Environmental conditions

Operating temperature	-10...+55 °C
Transport and	
storage temperature	-40 to +70 °C
Relative humidity	< 75% (1 year, average value)
	< 90% (30 days per year,
	no condensation permitted)

Vamp Ltd is a Finnish company specialized in developing and manufacturing of protection relays needed for the electrical power generation and distribution system. Vamp Ltd offers complete MV protection, arc flash protection as well as measuring and monitoring units.

Our success is based on competitive standard products, constant development by our designers possessing experience from three protection relay generations, our long-term partnerships, flexibility and 24 hour care of the customers.

Our organization has been audited and found to be in accordance with the requirements of the ISO 9001:2000 management system.

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