Feeder/Motor Protection Relay VAMP 40

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.

• Comprehensive Measurements
Wide range of measurement functions including phase and residual currents, residual or line or phase voltage, frequency, current unbalance, maximum demand, negative phase sequence current, active and reactive power and energy according to the primary connection.

• Power Quality Assessment
Power quality assessment and analysis including supervision of harmonics up to the 15th order, THD of currents and voltage.

• 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, 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.

• Limited Depth Dimension
The slim casing gives a possibility to install this relay to the secondary equipment compartment which has limited space.

• Universal auxiliary power supply
The wide auxiliary power supply, 19-265 V ac/dc, 50/60 Hz makes this relay suitable to every installation.

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 measurement, primary circuit monitoring and communication functionality.

A unique feature of the VAMP relays is the arc fault protection system integrable 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.

Customer specific configuration is obtained by programming the device using keypad or VAMPSET software.

After a network fault the relays support a subsequent fault analysis by providing event sequence (200 events) 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.

Measurement and Monitoring Functions

The VAMP 40 offers a complete set of measurement functions to replace the conventional metering functions of traditional switchgear and control gear installations. The measurement functions cover currents, residual or phase to phase or phase to earth voltages. The voltage measurement vary according to the connected voltage that is either residual voltage (U_0), phase to earth voltage (U_{L1}) or phase to phase voltage (U_{12}) connection. The measured information can be read via the communication bus or display.

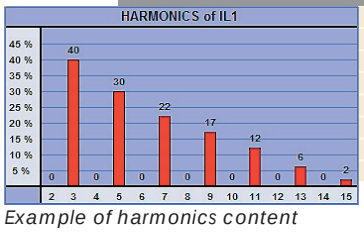
Besides the measurement functions VAMP 40 also encompasses a set of system supervision functions. All current circuits are continuously supervised, as are the trip circuits from the relay to the circuit breaker trip coils. The wear and tear of the circuit breaker is also continuously monitored providing an alarm when the circuit breaker needs maintenance.

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 40 feeder and motor protection relay is provided with integrated power quality measuring and analyzing functions, which help catching possible variations in the quality of the distributed power. The relay supervises harmonics of phase currents and one voltage from the 2nd to 15th order and the THD (Total Harmonic Distortion).

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 obtained from a VAMP 40 relay.

Functionality

Protection functions		
IEEE no	**IEC symbol**	**Function name**
50/51	3I>, 3I>>, 3I>>>	Overcurrent protection
50N/51N	I_0>, I_0>>, I_0>>>, I_0>>>>	Earth fault protection
67N	$I_{0\varphi}$>, $I_{0\varphi}$>>	Directional earth fault protection (1
67NT	I_{0T}>	Intermittent transient earth fault protection (1
87N	I_{0REF}	Restricted earth fault protection
46R	I_2/I_1>	Broken line protection
46	I_2>	Current unbalance protection
47	I_2>>	Incorrect phase sequence protection
48	Ist>	Stall protection
66	N>	Frequent start protection
37	I<	Undercurrent protection
49	T>	Thermal overload protection
32	P<	Reverse power, 1 phase
59C	Uc>	Capacitor overvoltage protection
59N	U_0>, U_0>>	Zero sequence voltage protection (1
59	U>, U>>, U>>>	Overvoltage protection, 1-phase (2
27	U<, U<<, U<<<	Undervoltage protection, 1-phase (2
68	I_{2f}>	Inrush and cold load detection
79		Auto reclose function
50BF	CBFP	Circuit-breaker failure protection
50ARC	ArcI>	Arc fault protection (3
50NARC	ArcI_0>, ArcI_{02}>	Arc fault protection (3
		Capacitor bank unbalance protection
86		Latched trip
99		Programmable stages 1 ... 8

IEC, IEEE programmable curves

Measurement and monitoring functions	
3I	Three-phase current
I_0	Neutral current
I_2	Current unbalance
I_L	Average and maximum demand current
U_0	Residual voltage
U_{L1} / U_{12}	Phase to earth and phase to phase voltages (2
P	Active power (2
Q	Reactive power (2
S	Apparent power (2
E+, E-	Active energy, exported / imported (2
Eq+, Eq-	Reactive energy, exported / imported (2
PF	Power factor
f	System frequency
	Phasor diagram views of currents, residual (1 or phase or line voltages (2
	2nd to 15th harmonics and THD of currents
	Condition monitoring CB wear
	Condition monitoring CT supervision
	Trip Circuit Supervision (TCS)
▭>	Disturbance recorder
	Temperature
	CB control

Communication
IEC 60870-5-101
IEC 60870-5-103
Modbus TCP
Modbus RTU
Profibus DP
SPA-bus
DNP 3.0
DNP 3.0 TCP
IEC 61850
Human Machine Interface, display
Human Machine Interface, PC

Hardware	
Number of phase current CT's	3
Number of residual current CT's	2
Number of voltage input VT's	1
Number of digital inputs	2
Number of trip outputs	4
Number of alarm outputs	1
Internal Failure, IF (NO/NC)	1
RTD inputs	4-16 (3

1) with zero sequence voltage connection
2) with phase to phase or phase to earth voltage connection
3) 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 interface 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.

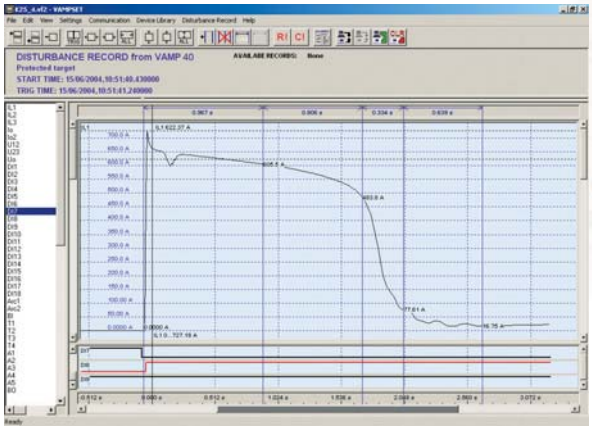
Traditional protection relay systems do not provide fast enough protection in an arc-fault situations.

The VAMP 40 protection relay with integrated arc protection also provides a cost efficient high-speed MV busbar protection.

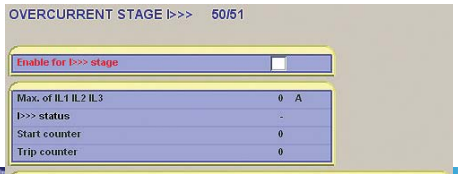
VAMPSET Setting and Configuration Tool

VAMPSET is a user-friendly, free-of-charge relay management software for setting, parameterization 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.

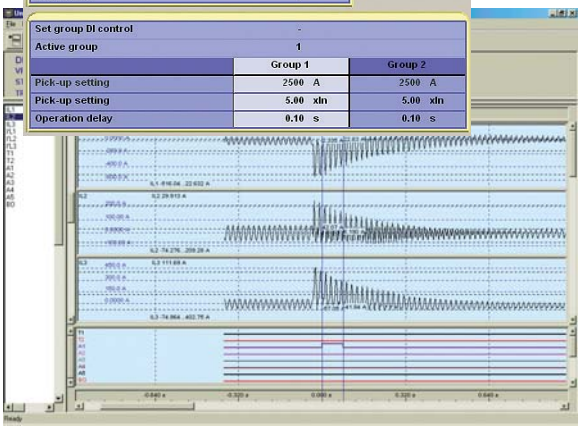
Using a standard RS cable the PC running VAMPSET connects to the front or rear port of the VAMP relays. The VAMPSET software also supports TCP/IP communication via an optional 10Base-T connection. Featuring true multi-language support the software runs on Windows XP/2000/NT and Windows 98/95 without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



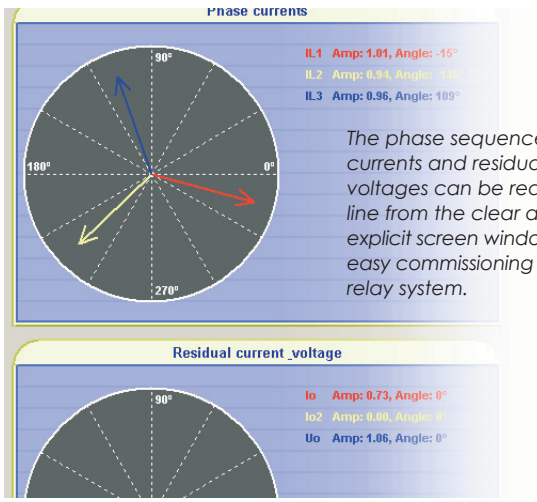
The motor start-up register stores the motor start-up values (start current, duration etc.) significantly facilitating the correct setting of the relay even if critical motor data are unavailable from the manufacturer.



Protection setting example



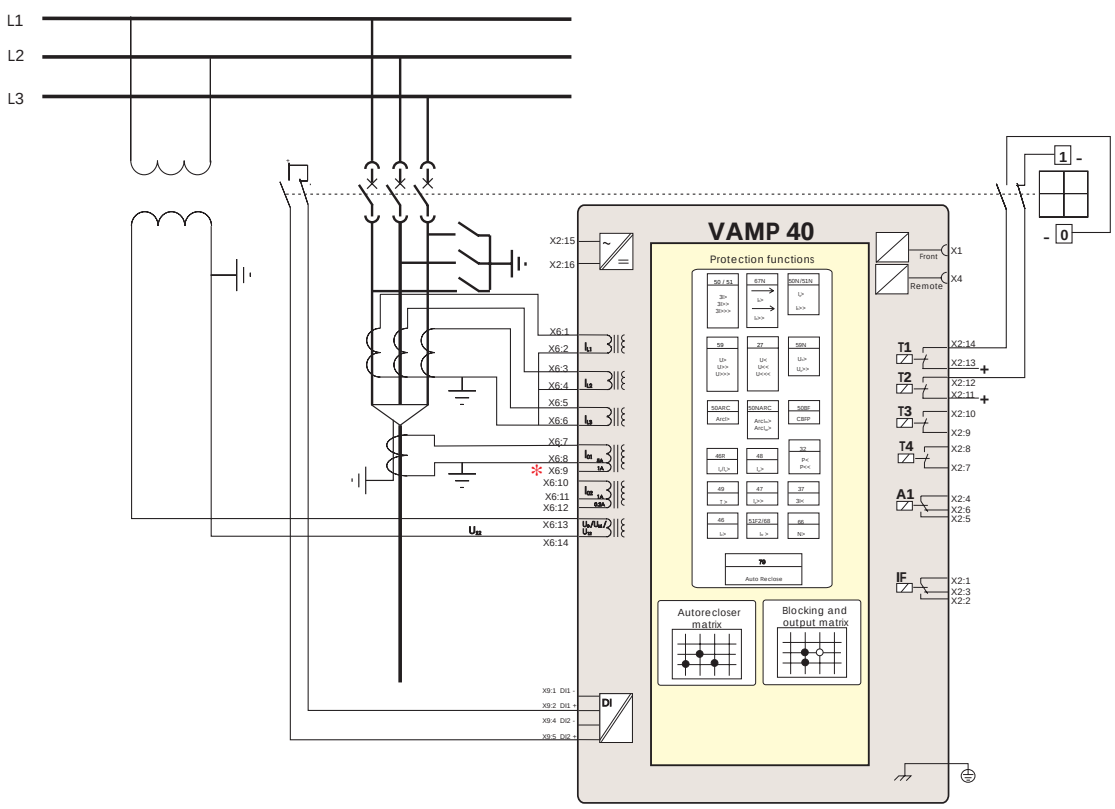
As a regular feature of the VAMP relays standard COMTRADE type disturbance recording files can be uploaded for subsequent evaluation of any network event recorded.



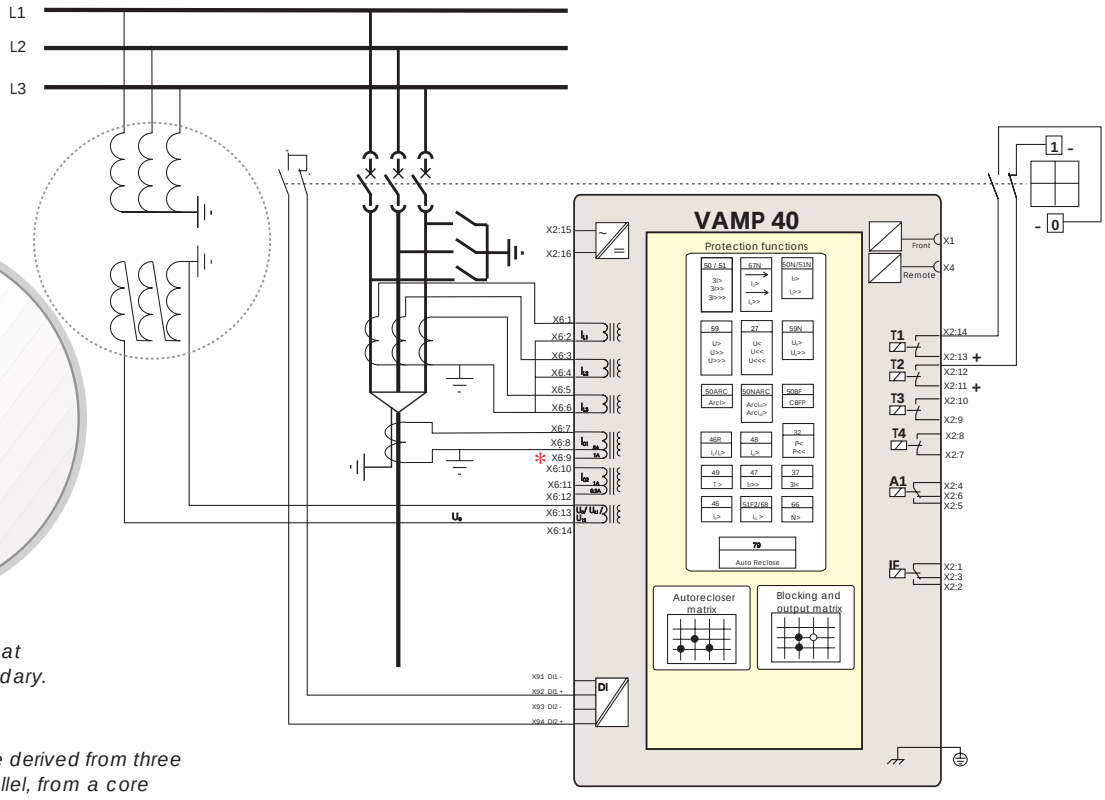
The phase sequences for currents and residual voltages can be read on-line from the clear and explicit screen windows for easy commissioning of the relay system.

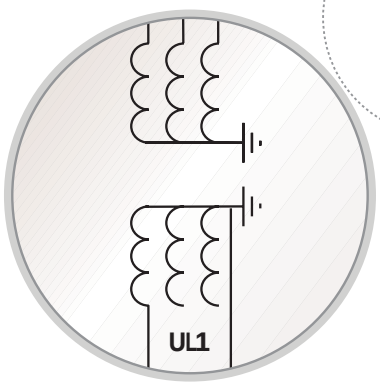
Connection Diagrams

Connection for overcurrent, directional earth fault and residual voltage protection



Connection for overcurrent, phase to phase or phase to earth voltage protection

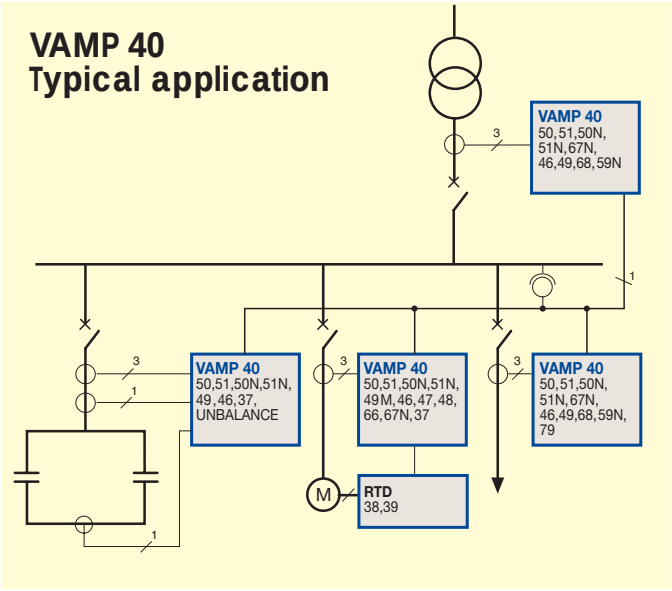


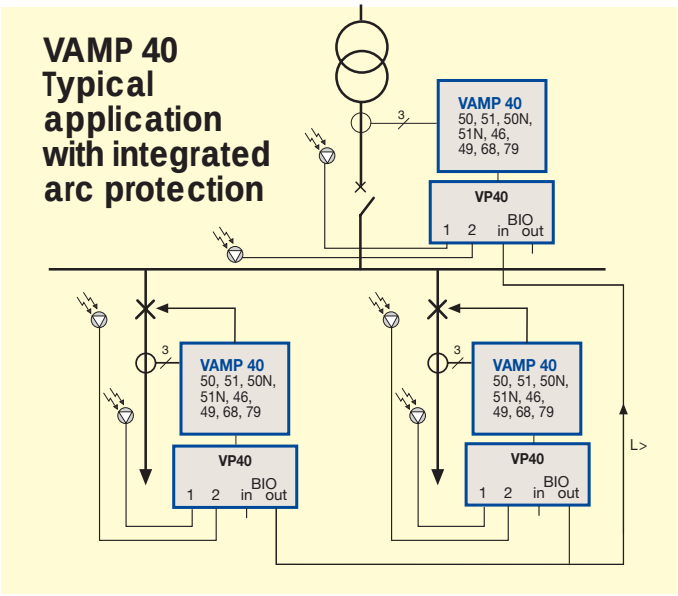


Connection for phase to earth voltage at voltage transformer secondary.

*) *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.*

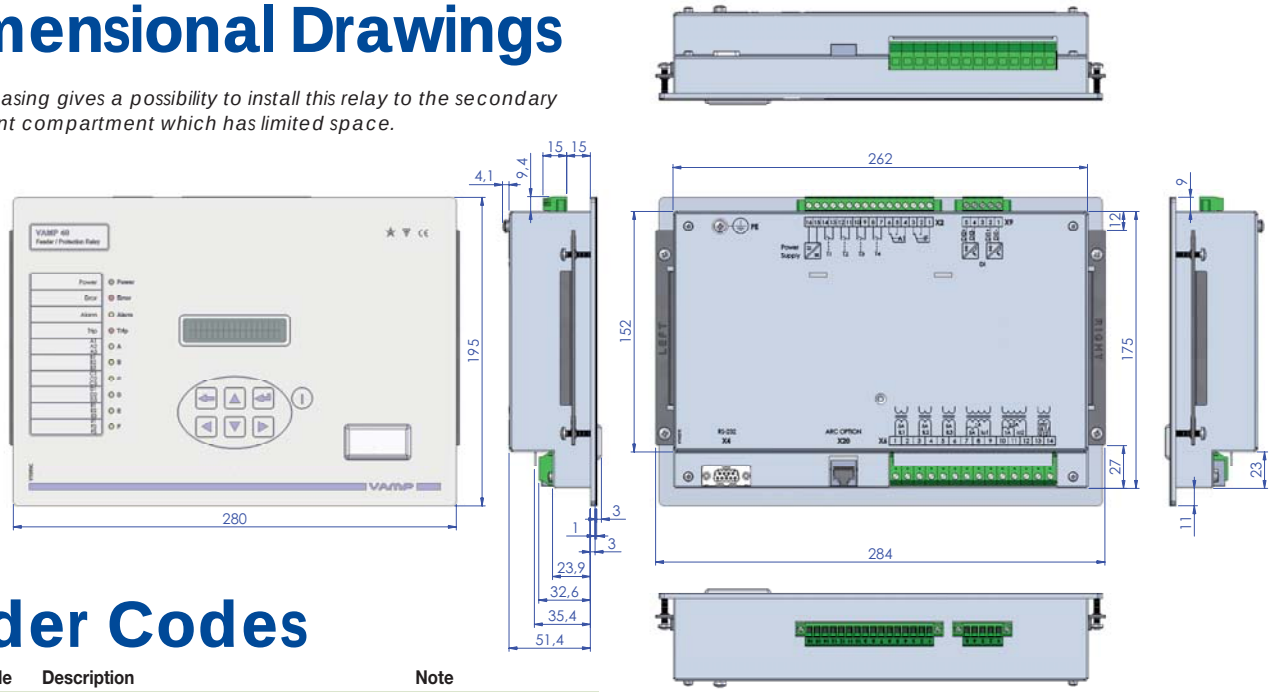
Applications





Dimensional Drawings

The slim casing gives a possibility to install this relay to the secondary equipment compartment which has limited space.



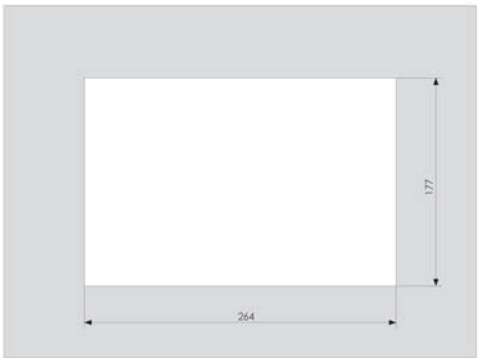
Order Codes

Order Code	Description	Note
VAMP 40	Feeder / motor protection relay VAMP Ltd	

Accessories

VEA3CG	Ethernet interface module	
VPA3CG	Profibus interface module	
VSE001	Fiber optic interface module	
VSE002	RS485 interface module	
VSE004	VAMP 40 RS-485 module	
VSE005-1	Ethernet and RS-485 module	
VSE006	IEC61850 module	
VX003-3	Programming cable (VAMPSET)	Cable length 3 m
VX028-3	Interface cable to VPA3CG (Profibus adaptor)	Cable length 3 m
VX030-3	Interface cable to VEA3CG (Ethernet adaptor)	Cable length 3 m
VX032-3	Rear panel programming cable	Cable length 3 m
VYX256A	Optional seal for IP54	
VP40	Arc option	
VA1DA-6	Arc sensor	Cable lenght 6 m
DI-934MB	RTD input module	DataQ Instruments Inc.
Adam 4015-B	RTD input module	Advantech Co., Ltd

Panel cut-out



Technical Data, Tests and Environmental Conditions

Measuring circuitry

Rated current I_N	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 current I_{0N}	1/ 5 A
- Current measuring range	0…50 A / 10 A
Rated current I_{02N}	0.2 / 1 A
- Current measuring range	0…10 A / 2 A
Rated voltage U_{0N} / U_N	100 V (configurable for
	VT secondaries 50 – 120 V)
- Voltage measuring range	0 - 175 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

Rated voltage U_{AUX}	19 - 265 V ac/dc
	For rated voltages 24 … 240 V ac /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)

Digital inputs

Qty	2 pcs
Rated voltage	18 - 265 Vdc

Digital outputs

Trip relays	4 pcs
Alarm relays	1 pc
Internal fault relay	1 pc

Casing

Dimensions (W x H x D)	280 x 195 x 55 mm
Degree of protection	IP 54
Weight	3 kg (terminal, package and manual)

Disturbance tests

Emission	EN 61000-6-4 / IEC 60255-26
- Conducted	EN55011 / IEC 60255-25 0.15 - 30 MHz
- Emitted	EN55011 / IEC 60255-25 30 - 1 000 MHz
Immunity	EN 61000-6-2 / IEC 60255-26
- Static discharge (ESD)	EN 61000-4-2 class IV / IEC 60255-22-2
	8 kV contact discharge
	15 kV air discharge
- Fast transients (EFT)	EN 61000-4-4 class IV /
	IEC 60255-22-4, class A
	4 kV, 5/50 ns, 2.5 / 5 kHz, +/-
- Surge	EN 61000-4-5 class IV / IEC 60255-22-5
	4 kV, 1.2/50 µs, line-to-earth
	2 kV, 1.2/50 µs, line-to-line
- Conducted HF field	EN 61000-4-6 class III / IEC 60255-22-6
	0.15 - 80 MHz, 10 V
- Emitted HF field	EN 61000-4-3 class III / IEC 60255-22-3
	80 - 1000 MHz, 10 V/m

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, class I
Shock and pump	IEC 60255-21-2, class I

Environmental conditions

Operating temperature	-10 to +65 °C
Transport and	
storage temperature	-40 to +70 °C
Relative humidity	< 75% (1 year, average value)
	< 90% (30 days per year,
	no condensation permitted)

CE Certified by: KEMA GL Lloyd's Register BUREAU VERITAS

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 our 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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