

VAMP 140

Overcurrent- and earthfault relay

Technical Data Sheet

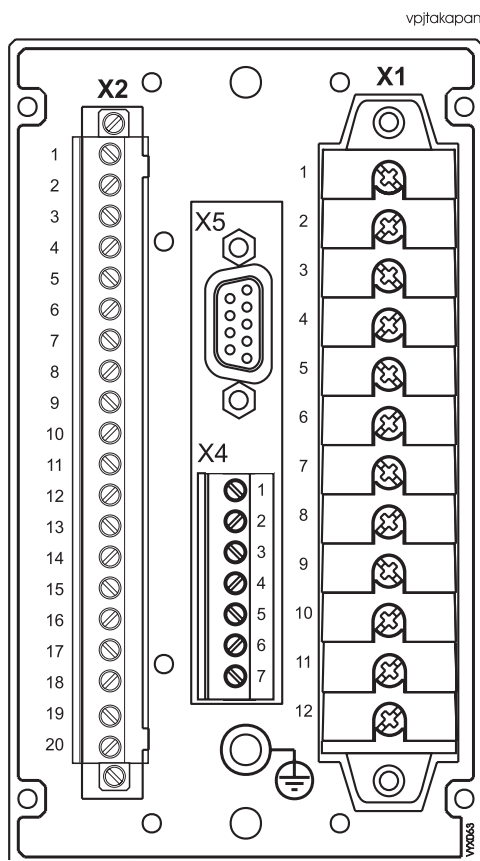
Application

The versatile basic protection functions, the wide variety of additional functions and several available communication protocols render the overcurrent and earthfault relay VAMP 140 an ideal protection relay for power plants and substations as well as for industry, marine and off-shore applications.

The modern technology in association with an extensive self-supervision system and a reliable construction ensures an extremely high availability for the VAMP 140 protection relay.

The relay is used for overcurrent and earthfault feeder protection. The relay can also be used in other applications where a single-, two- or three-phase protection relay is needed.

Connections



The VAMP 140 relay is connected to the protected object through the following measuring and control connections:

- Phase currents IL1, IL2 and IL3 (terminals X1: 1-6)
- Residual current I0 (5 A input: terminals X1: 9-10, 1 A input: terminals X1: 7-8)

Digital input

Further the relay can collect position information and alarm signals via the binary input (terminals X2: 4-5) and store the information in the event register.

The binary inputs can be used to:

- Block protection stages under certain conditions.
- Get time stamped event code from any auxiliary contact.
- Control the output relays.
- Supervise the trip circuit.

Potential-free contacts for position indication must be available in the protected application.

Auxiliary voltage

The external auxiliary voltage U_{aux} (standard 40 to 265 V ac/dc or 24 V dc, option B) for the relay is connected to the terminals X1: 11 - 12

Note!

Polarity of the auxiliary voltage U_{aux} (24 V dc, option B):
+ = X1:11 and - = X1:12.

Output relays

The VAMP 140 relay is equipped with five configurable output relays and a separate output relay for the self-supervision system

- Trip relays T1 and T2 (terminals X2: 19 - 20 and 16 - 17)
- Alarm relays A1 - A3 (terminals X2: 13 - 14, 11 - 12 and 9 - 10)
- Self-supervision system output relay IF (terminals X2: 7 - 8)
- The trip relay T2 can also be used for alarm purposes.

Current transducer

- The output signal, i.e. 0 - 20 mA or 4 - 20 mA, of the integrated mA transducer is available on terminal X2: 1 - 2.

Arc protection

The optional arc protection card includes two arc sensor channels. The arc sensors are connected to terminals X4: 4-5 and 6-7.

The arc information can be transmitted and/or received through the binary input and output channels. This is a 48 Vdc signal.

Connections:

- X4: 1 Binary input (BI)
- X4: 2 Binary output (BO)
- X4: 3 GND (connect between relays)
- X4: 4 Arc sensor 1 +
- X4: 5 Arc sensor 1 -
- X4: 6 Arc sensor 2 +
- X4: 7 Arc sensor 2 -

Disturbance recorder

The disturbance recorder can be used to record all measured signals i.e. currents and voltages, status information of digital inputs (DI) and digital outputs (DO). The digital inputs include also the Arc light information (S1, S2 and Arc binary input BI). The digital outputs include the Arc binary output information (BO).

Recorder capacity is 48 000 bytes. There can be a maximum of 5 recordings and the maximum selection of channels in one recording is 12 (limited in waveform recording).

The recorder can be triggered by any protection stage start or trip signal, Arc sensors (S1, S2, BI) and digital input. The trig signal is selected in the output matrix. The recording can also be triggered manually. When recording is made also the time stamp will be memorized.

The recordings can be viewed by VAMPSET program, version 8.x or newer. The recording is in COMTRADE format so also other programs can be used to view the recordings.

For more detailed information, see separate Disturbance Recorder manual VMDR.EN0xx.

Self supervision

The functions of the micro controller and the associated circuitry as well as the program execution are supervised by means of a separate watchdog circuit. Besides supervising the relay the watchdog circuit attempts to restart the micro controller in a fault situation. If the restarting fails the watchdog issues a self-supervision alarm because of a permanent relay fault.

When the watchdog circuit detects a permanent fault it always blocks any control of the other output relays, except for the self-supervision output relay.

Also the internal supply voltage is supervised. Should the auxiliary supply of the relay disappear, an IF alarm is automatically given, because the IF output relay functions on the working current principle, that is the IF relay is energized when the auxiliary supply is on and within the permitted range.

Communication

PC port

The PC port is used for on-site parameterization of the relay, for downloading of the program and for reading relay parameters to a PC.

For connection to a PC, one RS 232 serial port is available on the front panel of the relay. Any connection to the port is done with the connection cable type VX 003-3.

Remote control connection

The relay can be connected to higher level systems, e.g. network control systems via the serial port named REMOTE on the rear panel. To the port a SPA Bus, ModBus®, ProfiBus® or IEC-103 connection can be made using a special internal or external bus connection module. The bus type selection and the parameterisation of the bus are carried out as the relay is configured.

Optional accessories are available for RS485 connection (VMA 3CG), Ethernet connection with TCP/IP protocol (VEA 3CG) and Profibus connection (VPA 3CG). Please see the corresponding documentation for more details.

Protocol	Standard interface	Internal option cards Plastic	External option modules		
	RS232: VX004-M3 or VX008-4		RS485: VMA3CG + VX007-F3	ProfiBus: VPA3CG + VX007-F3	Ethernet: VEA3CG + VX015-3
ModBus	X	X	X		
SPA-Bus	X	X	X		
ProfiBus				X	
IEC-60870-5-103	X	X	X		
ModBus/ TCP					X
Transparent TCP/IP					X

Technical data

Connections

Measuring circuitry

Rated current I_n - Current measuring range - Thermal withstand - Power consumption - Inaccuracy $I \leq 1.5 \times I_n$ $I > 1.5 \times I_n$	1 A or 5 A 0 – 50 x I_n 4 x I_n (continuous) 20 x I_n (for 10 s) 100 x I_n (for 1 s) < 0.1 VA ($I_n = 1A$) < 0.2 VA ($I_n = 5A$) $\pm 0.5\%$ of value or $\pm 0.3\%$ of rated value $\pm 3\%$ of value
Residual current I_{0n} - Current measuring range - Thermal withstand - Power consumption - Inaccuracy $I_0 \leq 1.5 \times I_{0n}$ $I_0 > 1.5 \times I_{0n}$	1 A or 5 A 0 – 50 x I_{0n} 4 x I_{0n} (continuous) 20 x I_{0n} (for 10 s) 100 x I_{0n} (for 1 s) < 0.1 VA ($I_{0n} = 1A$) < 0.2 VA ($I_{0n} = 5A$) $\pm 0.5\%$ of value or $\pm 0.3\%$ of rated value $\pm 3\%$ of value
Rated frequency f_n - Frequency measuring range - Inaccuracy	50/60 Hz 16 · 65 Hz ± 10 mHz

Auxiliary voltage

	Type A (standard)	Type B (option)
Rated voltage U_{aux}	40 · 265 V ac/dc 110/120/220/240 V ac 48/60/110/125/220 V dc	18 · 36 V dc 24 V dc
Power consumption	< 7 W (under normal conditions) < 15 W (as the relay has started)	
Max. permitted ac component of dc supply, point-to-point	<= 12% of rated voltage <= 6% near the limits of the voltage range	
Max. permitted interruption time	< 50 ms (110 V dc)	

Digital input

Number of inputs	1
External control voltage	18 · 265 V ac/dc
Burden	< 2 mA

Trip contacts (T1 and T2)

Number of contacts	2 making contacts
Rated voltage	250 V ac
Continuous carry	5 A
Max. making current	15 A
Breaking capacity, AC	2 000 W/VA
Breaking capacity, DC (L/R=40ms)	50 W
Contact material	AgNi 90/10

Alarm contacts (A1...A3) and IF

Number of contacts	3 making contacts (relays A1...A3) 1 making contact (relay IF)
Rated voltage	250 V ac
Continuous carry	5 A
Breaking capacity	1 500 W/VA
Contact material	AgSnO ₂

Local serial communication port

Number of ports	1 on front panel
Electrical connection	RS 232
Data transfer rate	2 400...38 400 b/s

Remote control port

Number of ports	1 on rear panel
Electrical connection	TTL (standard) RS 485 (option) RS 232 (option) Plastic fibre connection (option)
Data transfer rate	1 200...38 400 b/s
Protocols	ModBus,, RTU master ModBus,, RTU slave SPA Bus, slave Profibus DP (option) ModBus TCP (option) Transparent TCP/IP (option) IEC-6870-5-103

mA output

Number of outputs	1
Output signal	0/1 - 5 mA or 0/4 - 20 mA or any between 0...20mA
Load resistance	RL < 600 W
Accuracy	Class 1

Arc option card

Binary input - operationg voltage	+48 Vdc (optically isolated input)
Binary output - Output voltage level	+48 Vdc (transistor controlled output) Max three binary inputs can be connected to one uotput. More inputs can be connected if an external amplifier is used.
Arc sensor inputs - Number of inputs - Operating voltage level	2 12 Vdc (optically isolated inputs) Arc sensor draws > 11.9 mA current from the 12 Vdc line, when arc has been detected. Sensor and sensor wiring is OK, when current is 1.3 mA..31 mA, otherwise sensor line is broken or short-circuited.

Connectors

Connector X1

Max. torque	1.2 Nm
AWG	14 - 10

Connectors X2 and X4

Max. torque	0.5 – 0.6 Nm
AWG	24 - 12

Tests and environmental conditions

Disturbance tests (EN 50263)

Emission	
- Conducted (EN 55022)	0.15 - 30 MHz
- Emitted (EN 55022)	30 - 1 000 MHz
Immunity	
- 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 1 kV, 1.2/50 µs, common mode 2 kV, 1.2/50 µs, differential mode
- Conducted RF field	EN 61000-4-6 0.15 - 80 MHz, 10 V/m, 80% AM (1 kHz)
- Emitted RF field	EN 61000-4-3 80 - 1000 MHz, 10 V/m, 80% AM (1 kHz)
- GSM test	EN 61000-4-3 900 MHz, 10 V/m, pulse modulated
1 MHz burst	IEC 60255-22-1 1 kV, differential mode 2,5 kV, common mode
Voltage interruption	IEC 60255-11

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 to +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)

Casing

Degree of protection (IEC 60529)	IP20
Dimensions (W x H x D)	99 x 155 x 225 mm
Weight	2.3 kg

Protection stages**Overcurrent protection****Overcurrent stage I> (50/51)**

Current setting range:	0.10 – 5.00 pu
Definite time characteristic:	
- Operating time	0.08 - 300.00 s (step 0.02)
Inverse time characteristic:	
- 4 characteristic curve sets: (IEC60255-3)	EI, VI, NI, LTI *)
- Time multiplier k	0.05 – 3.20
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	0.97
Inaccuracy:	
- Starting	±2% of set value
- Operating time definite time	±1% or ±30 ms
- Operating time inverse time	±5% or at least ±30 ms ($I < 50 \times I_n$)

*) EI = Extremely Inverse, VI = Very Inverse, NI = Normal inverse, LTI = Long Time Inverse

Overcurrent stages I>> and I>>> (50/51)

Current setting range	0.10 – 40.00 pu
Definite time characteristic:	
- Operating time	0.05 - 300.00 s (step 0.01)
Starting time	<30 ms
Resetting time	<60 ms
Resetting ratio	0.97
Inaccuracy:	
- Starting	±2% of set value
- Operate time	±1% or ±30 ms

Phase unbalance stage I2> (46)

Current setting range	5 – 70% I2/I1
Definite time characteristic:	
- Operating time	1.0 – 600.0s (step 0.1)
Starting time	<300 ms
Resetting time	<300 ms
Resetting ratio	0.95
Inaccuracy:	
- Starting	±3% of set value or ±0.5% of rated value
- Operate time	±5% or ±300 ms

Thermal overload stage T> (46)

Settings:	
- Max. continuous load current $k \times I_n$ (□trip = thermal trip level)	0.50 - 1.20 x I_n
- Thermal alarm level	60 – 99%
- Heating time constant □	2 – 60 min
- Cooling time constant □	1.0 x τ

Residual current protection**Residual current stage $I_0 >$ (50/51N)**

Residual current setting range	0.005 - 2.000 pu
Definite time characteristic:	
- Operating time	0.08 - 300.0 s (step 0.02 s)
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	0.97
Inaccuracy:	
- Starting	±2% of set value or ±0.3% of rated value
- Operate time	±1% or ±30 ms

Residual current stage $I_0 >>$ (50/51N)

Current setting range:	0.02 - 2.00 pu
Definite time characteristic:	
- Operating time	0.05 - 300.00 s (step 0.01)
Inverse time characteristic:	
- 4 characteristic curve sets: (IEC60255-3)	EI, VI, NI, LTI *)
- Time multiplier k	0.05 - 3.20
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	0.97
Inaccuracy:	
- Starting	±2% of set value or ±0.3% of rated value
- Operating time definite time	±1% or ±30 ms
- Operating time inverse time	±5% or at least ±30 ms ($I_0 < 5 \times I_{0n}$)

*) EI = Extremely Inverse, VI = Very Inverse, NI = Normal inverse, LTI = Long Time Inverse

Residual current stage $I_0 >>>$ (50/51N)

Residual current setting range	0.05 - 4.00 pu
Definite time characteristic:	
- Operating time	0.05 - 300.0 s (step 0.01 s)
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	0.97
Inaccuracy:	
- Starting	±2% of set value or ±0.3% of rated value
- Operate time	±1% or ±30 ms

Arc protection (option)

The operation of the arc protection depends on the setting value of the ArcI> current limit. The current limit cannot be set, unless the relay is provided with the optional arc protection card.

Arc protection stage ArcI> (51L>)

Current setting range	0.5 – 10.0 pu
Operating time	~ 15 ms
Arc sensor channel selection	S1, S2, BI, S1/S2, S1/BI, S2/BI, S1/S2/BI

The operation of the earth-fault arc protection depends on the setting value of the ArcIo> earth-fault limit. The earth-fault limit cannot be set, unless the relay is provided with the optional arc protection card.

Arc protection stage Arc Io> (51NL>)

Current setting range	0.05 – 10.0 pu
Operating time	~ 15 ms
Arc sensor channel selection	S1, S2, BI, S1/S2, S1/BI, S2/BI, S1/S2/BI

Delayed Arc S>

Delay time	0.01 – 0.15
Arc sensor channel selection	S1, S2, BI, S1/S2, S1/BI, S2/BI, S1/S2/BI

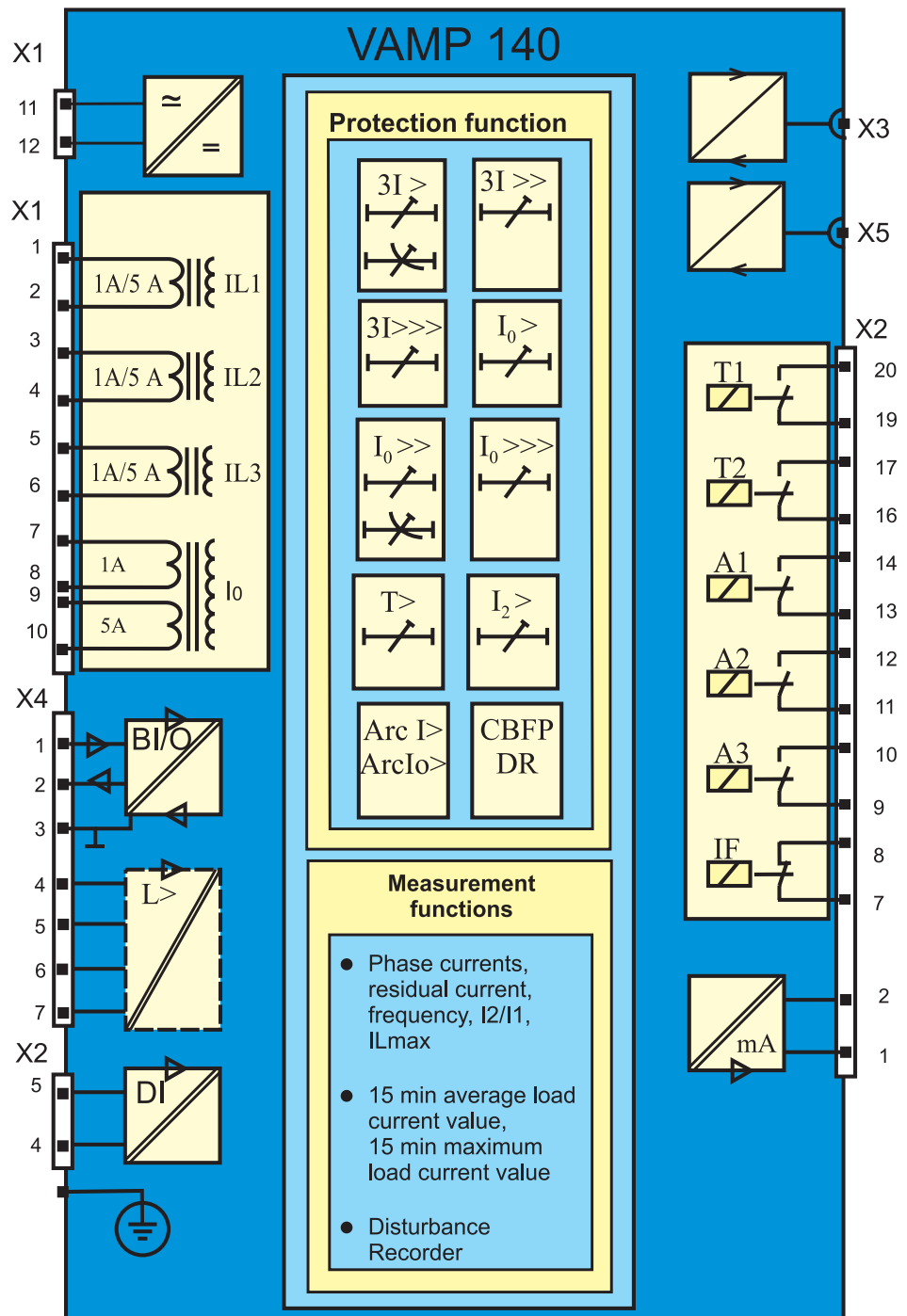
Disturbance Recorder (DR)

The operation of Disturbance recorder depends on the following settings. The recording time and number of records depend on the time setting and number of selected channels.

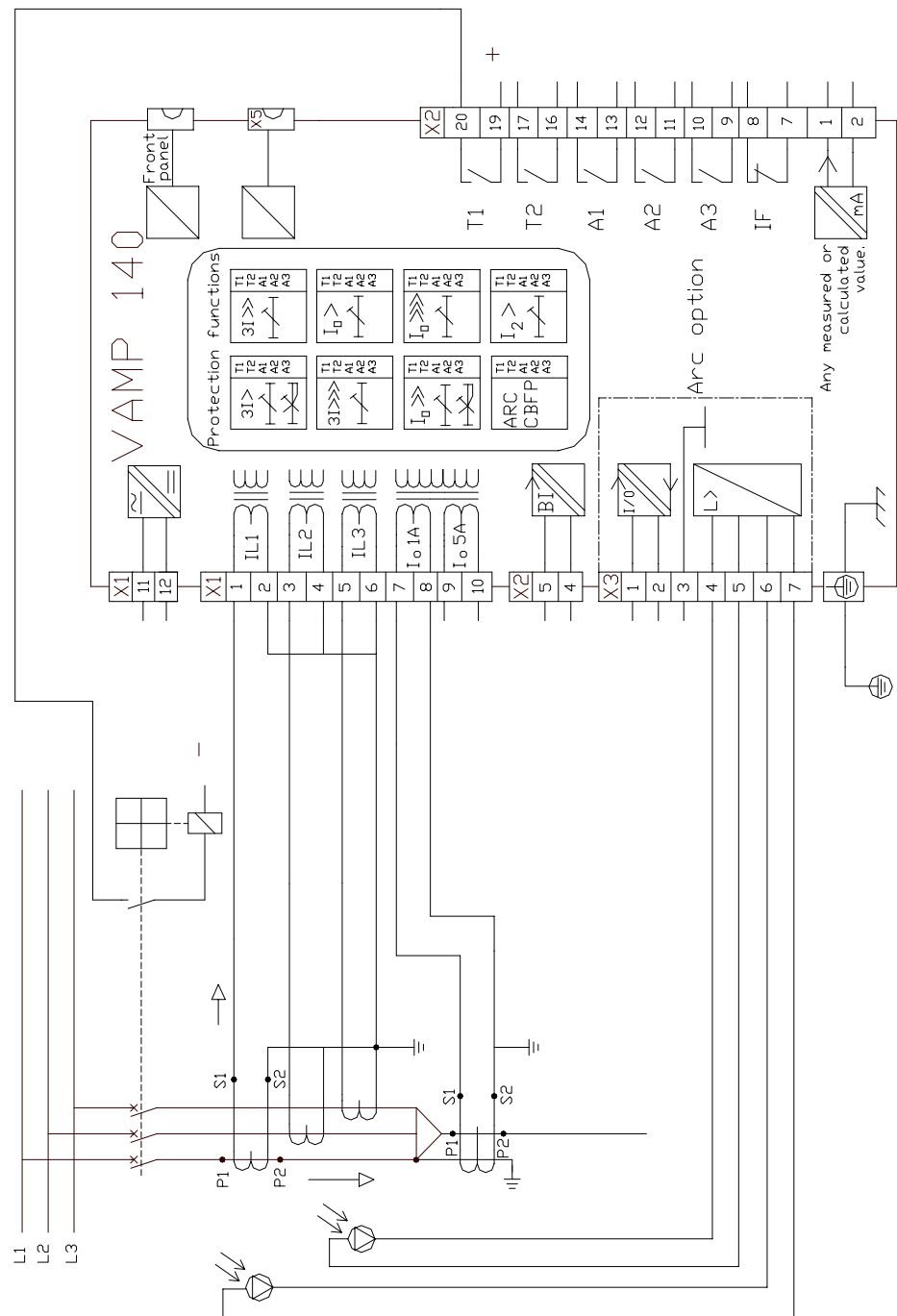
Disturbance recorder (DR)

Mode of recording:	Saturated / Overflow
Sample rate:	
- Waveform recording	16/cycle, 8/cycle
- Trend curve recording	10, 20, 200 ms
	1, 5, 10, 15, 30 s
	1 min
Recording time (one record)	0.1 s – 12 000 min (must be shorter than MAX time)
Pre trigger rate	0 – 100%
Number of selected channels	0 – 12

Block diagram

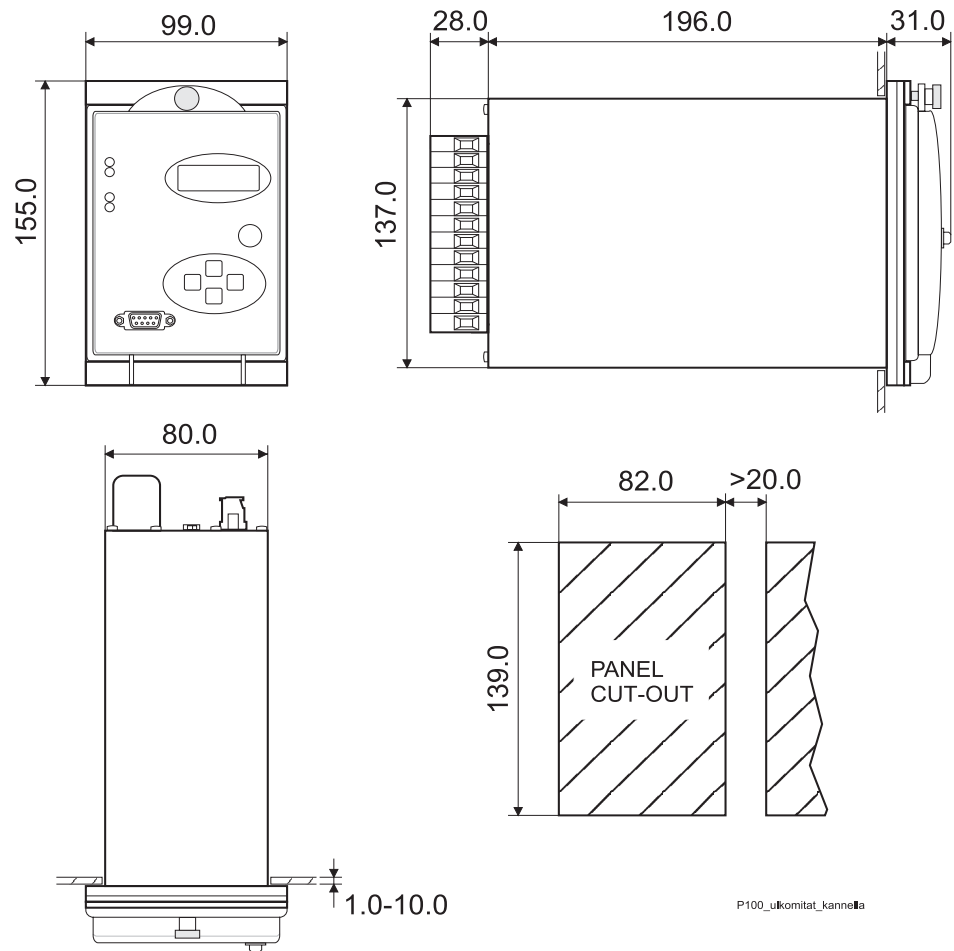


Connection diagram

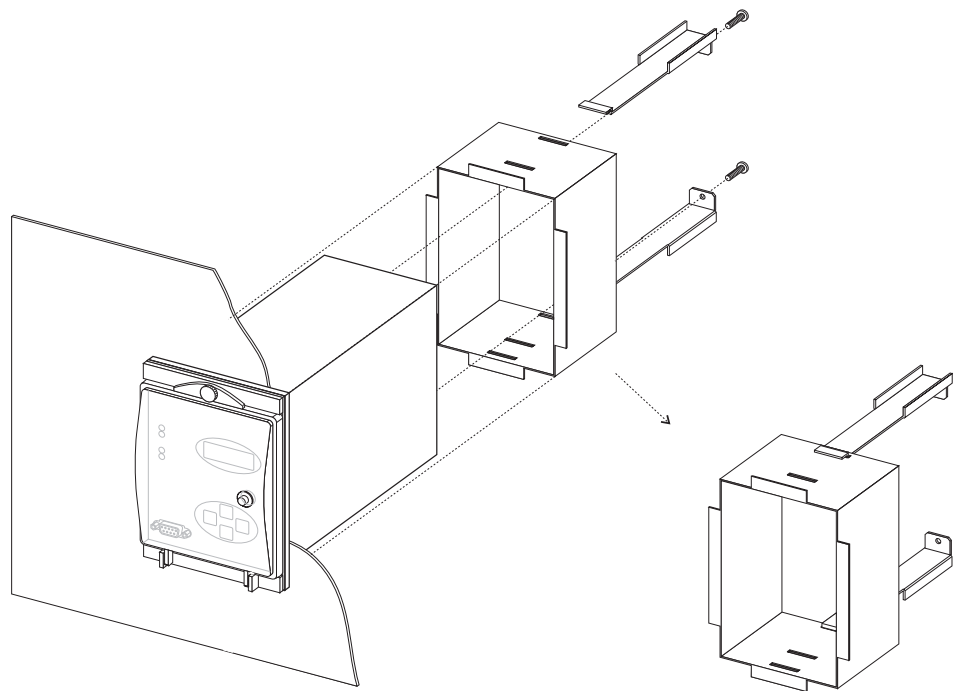


Construction

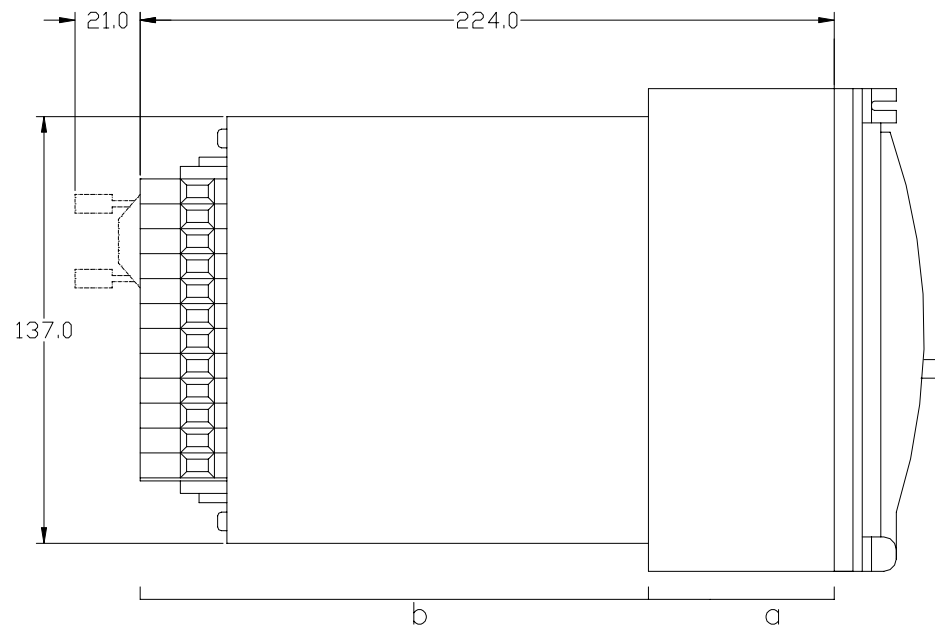
Dimensional drawing



Panel mounting



Semi-flush mounting



Depth with raising frames

Type designation	a	b
VYX078	40 mm	184.0 mm
VYX079	60 mm	164.0 mm

Order information

When ordering, please, state:

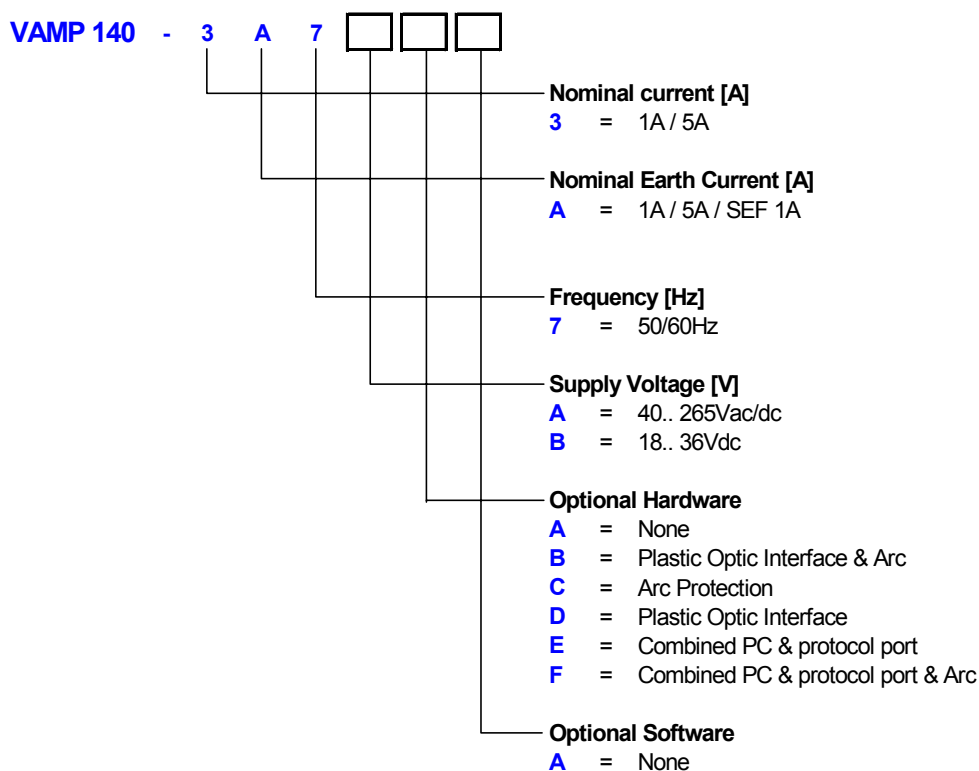
Type designation: VAMP 140

Quantity:

Auxiliary voltage:

Options:

VAMP 140 ORDERING CODE



Accessories :

Order Code	Explanation	Note
VEA 3 CG	Ethernet Interface Module	VAMP Ltd
VPA 3 CG	Profibus Interface Module	VAMP Ltd
VMA 3 CG	RS485 Interface Module	VAMP Ltd
VX003-3	Programming Cable (VepSet, VEA 3 CG)	Cable length 3m
VX004-M3	TTL/RS232 Converter Cable (for Modicon PLC, ..)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VPA 3 CG)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VMA 3 CG)	Cable length 3m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4m
VYX078	Raising Frame for 100-serie	Height 40mm
VYX079	Raising Frame for 100-serie	Height 60mm
VA 1 DA-6	Arc Sensor	Cable length 6m

Reference information

Documentation:

Mounting and Commissioning Instructions VMMC.EN0xx

VAMPSET User's Manual VMV.EN0xx

Manufacturer data:

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