

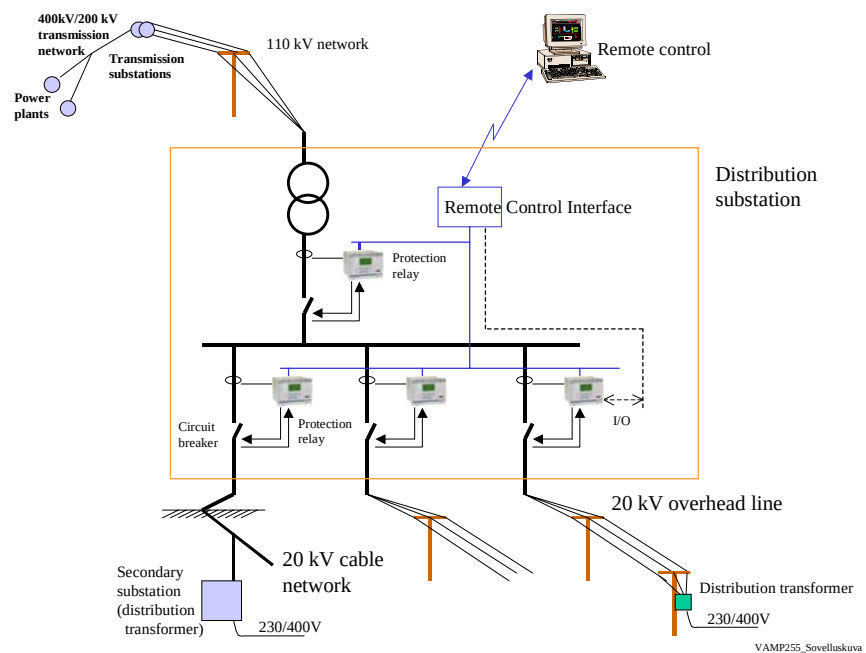
VAMP 255 / 245 / 230

Feeder terminals

Technical Data Sheet

Application

The numerical VAMP feeder terminals include all the essential protection functions needed to protect feeders in distribution networks of utilities, industry, power plants and offshore applications. Further, the terminal includes several programmable functions, such as arc (option), thermal, trip circuit supervision and circuit breaker protection and communication protocols for various protection and communication situations.



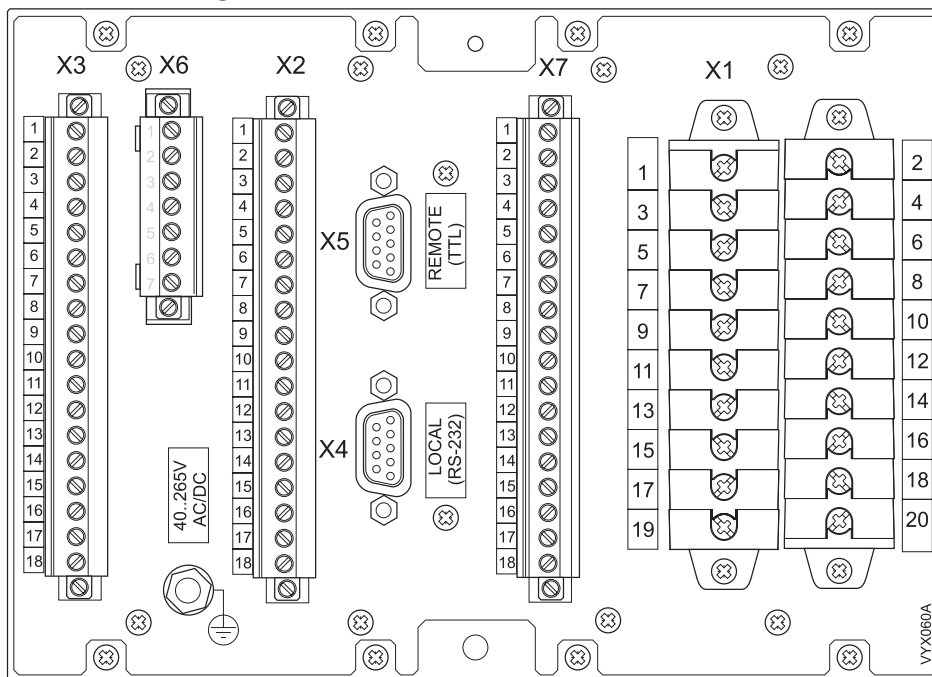
The VAMP feeder terminals can be used for selective short-circuit feeder protection of radial or meshed feeders regardless of the earthing principle of the network. The terminal can also be used for single-, two- or three-phase directional or non-directional overcurrent and/or sensitive, directional or non-directional earth fault protection. Furthermore, the voltage measurements enable several other protection functions like voltage and frequency protection.

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

Connections

Rear panel view

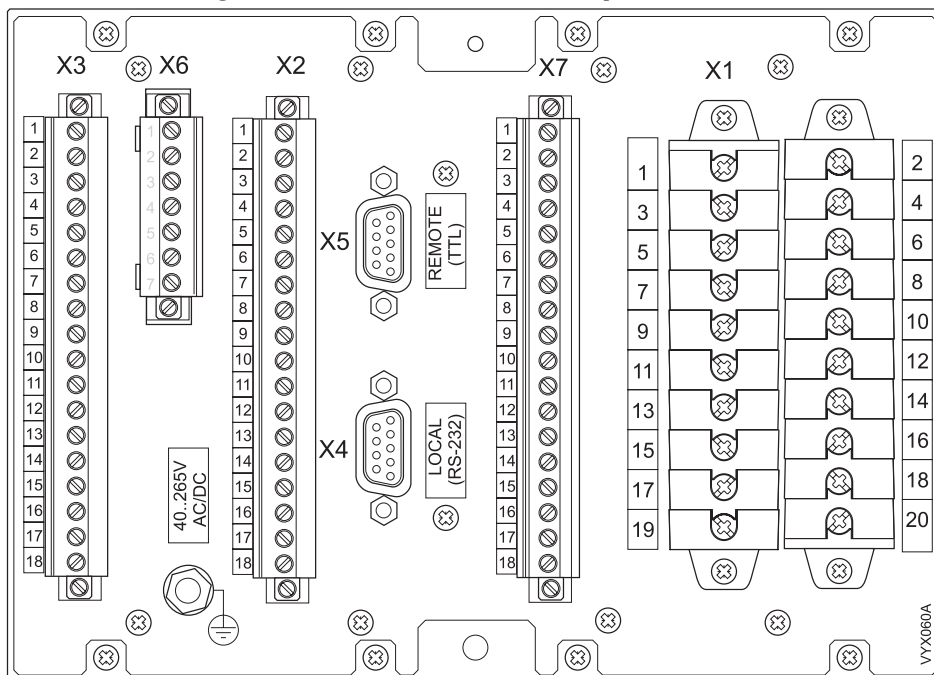
Feeder manager VAMP 255



The feeder manager VAMP 255 is connected to the protected object through the following measuring and control connections:

Power card				CPU card				I/O card		Transformer card	
X3		X6	Arc	X2		X5	Remote port	X7		X1	
X3:1	+48V	X6:1	Arc BI	X2:1	-	X5:1		X7:1	DI7	X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	-	X5:2	TX /TTL out	X7:2	DI8	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	-	X5:3	RX /TTL in	X7:3	DI9	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	-	X5:4	RTS /TTL out	X7:4	DI10	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	A5	X5:5		X7:5	DI11	X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	A5	X5:6		X7:6	DI12	X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	A4	X5:7	GND	X7:7	comm	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	A4	X5:8		X7:8	DI13	X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X7:9	DI14	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X7:10	DI15	X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X7:11	DI16	X1:11	UL1/U12 (a)
X3:12	T2			X2:12	A3 NO	X4:1		X7:12	DI17	X1:12	UL1/U12 (n)
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X7:13	DI18	X1:13	UL2/U23 (a)
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X7:14	comm	X1:14	UL2/U23 (n)
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X7:15	T4	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X7:16	T4	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X7:17	T3	X1:17	UL3/U31/Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X7:18	T3	X1:18	UL3/U31/Uo (n/da)
						X4:8	connected to 7			X1:19	-
						X4:9				X1:20	-

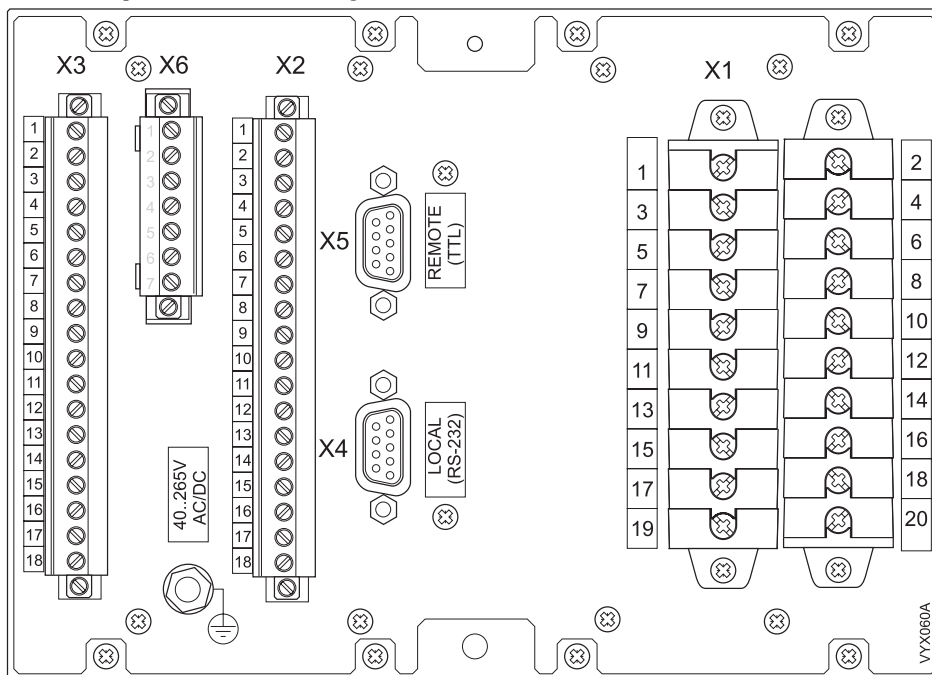
Feeder manager VAMP 255, with mA option



The feeder manager VAMP 255, with the optional analogue outputs, is connected to the protected object through the following measuring and control connections:

Power card				CPU card				I/O card		Transformer card	
X3		X6	Arc	X2		X5	Remote port	X7		X1	
X3:1	+48V	X6:1	Arc BI	X2:1	AO1+	X5:1		X7:1	DI7	X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	AO1-	X5:2	TX /TTL out	X7:2	DI8	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	AO2+	X5:3	RX /TTL in	X7:3	DI9	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	AO2-	X5:4	RTS /TTL out	X7:4	DI10	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	AO3+	X5:5		X7:5	DI11	X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	AO3-	X5:6		X7:6	DI12	X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	AO4+	X5:7	GND	X7:7	comm	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	AO4-	X5:8		X7:8	DI13	X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X7:9	DI14	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X7:10	DI15	X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X7:11	DI16	X1:11	UL1/U12 (a)
X3:12	T2			X2:12	A3 NO	X4:1		X7:12	DI17	X1:12	UL1/U12 (n)
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X7:13	DI18	X1:13	UL2/U23 (a)
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X7:14	comm	X1:14	UL2/U23 (n)
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X7:15	T4	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X7:16	T4	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X7:17	T3	X1:17	UL3/U31/Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X7:18	T3	X1:18	UL3/U31/Uo (n/da)
						X4:8	connected to 7			X1:19	-
						X4:9				X1:20	-

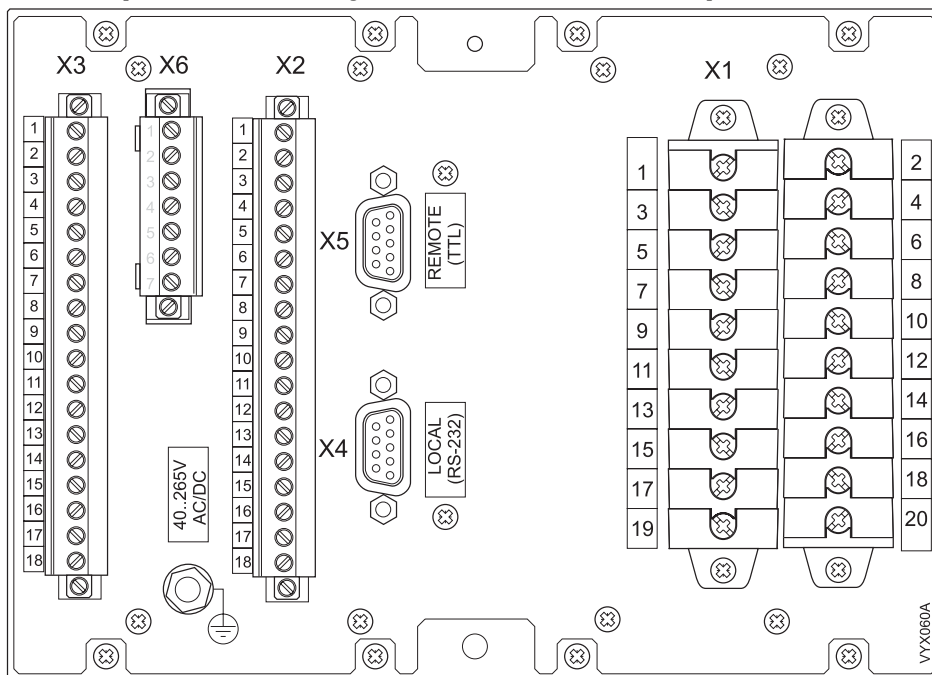
Feeder protection relay VAMP 245



The feeder protection relay VAMP 245 is connected to the protected object through the following measuring and control connections:

Power card				CPU card				Transformer card	
X3		X6	Arc	X2		X5	Remote port	X1	
X3:1	+48V	X6:1	Arc BI	X2:1	-	X5:1		X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	-	X5:2	TX /TTL out	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	-	X5:3	RX /TTL in	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	-	X5:4	RTS /TTL out	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	A5	X5:5		X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	A5	X5:6		X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	A4	X5:7	GND	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	A4	X5:8		X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X1:11	
X3:12	T2			X2:12	A3 NO	X4:1		X1:12	
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X1:13	
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X1:14	
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X1:17	Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X1:18	Uo (n/da)
						X4:8	connected to 7	X1:19	-
						X4:9		X1:20	-

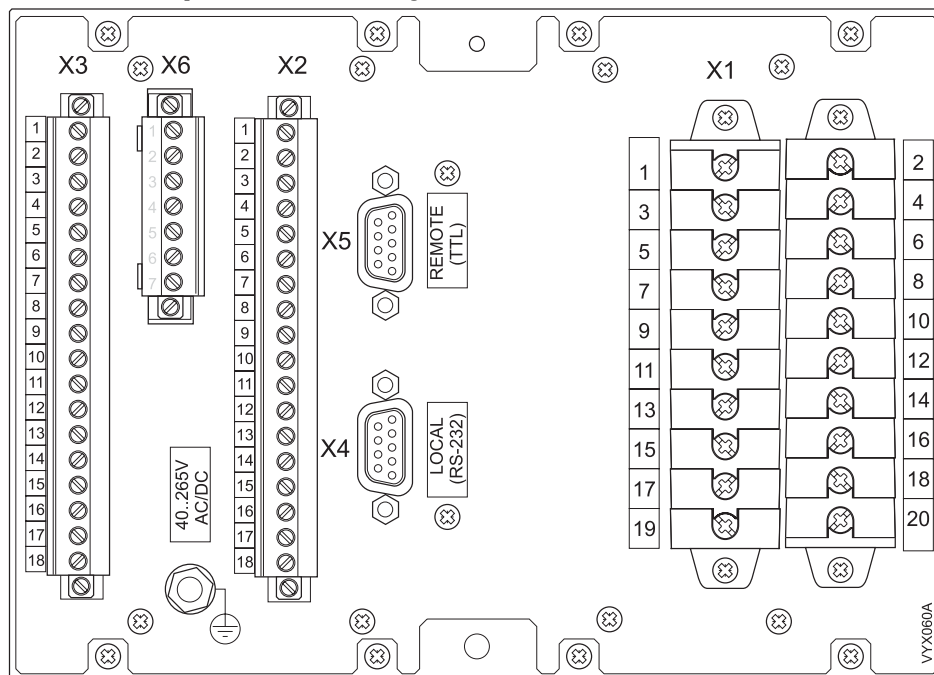
Feeder protection relay VAMP 245, with mA option



The feeder protection relay VAMP 245, with the optional analogue outputs, is connected to the protected object through the following measuring and control connections:

Power card				CPU card				Transformer card	
X3		X6	Arc	X2		X5	Remote port	X1	
X3:1	+48V	X6:1	Arc BI	X2:1	AO1+	X5:1		X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	AO1-	X5:2	TX /TTL out	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	AO2+	X5:3	RX /TTL in	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	AO2-	X5:4	RTS /TTL out	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	AO3+	X5:5		X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	AO3-	X5:6		X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	AO4+	X5:7	GND	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	AO4-	X5:8		X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X1:11	
X3:12	T2			X2:12	A3 NO	X4:1		X1:12	
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X1:13	
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X1:14	
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X1:17	Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X1:18	Uo (n/da)
						X4:8	connected to 7	X1:19	-
						X4:9		X1:20	-

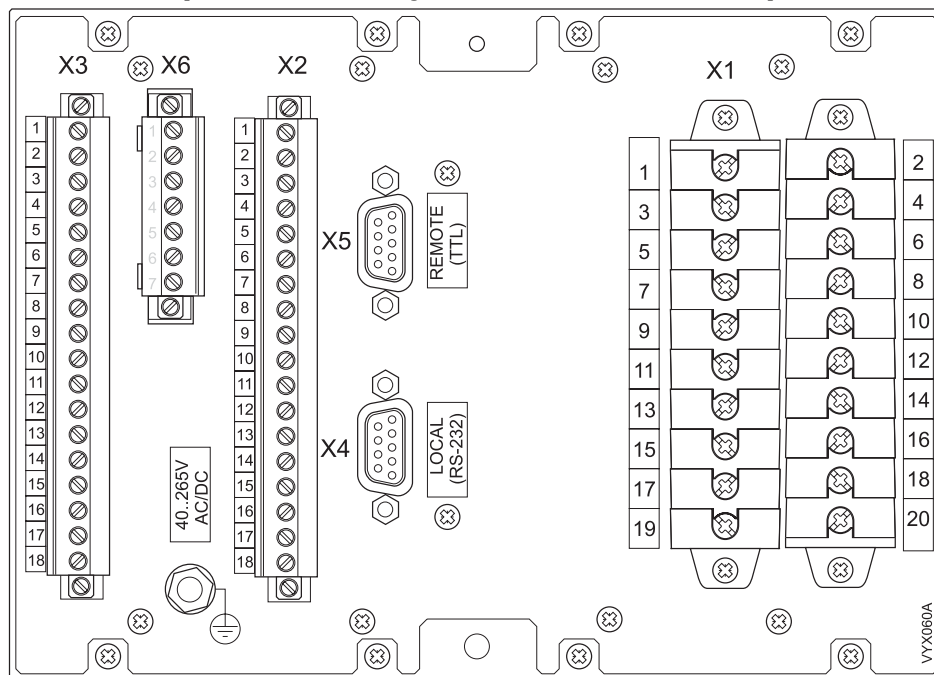
Directional protection relay VAMP 230



The directional protection relay VAMP 230 is connected to the protected object through the following measuring and control connections:

Power card				CPU card				Transformer card	
X3		X6	Arc	X2		X5	Remote port	X1	
X3:1	+48V	X6:1	Arc BI	X2:1	-	X5:1		X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	-	X5:2	TX /TTL out	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	-	X5:3	RX /TTL in	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	-	X5:4	RTS /TTL out	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	A5	X5:5		X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	A5	X5:6		X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	A4	X5:7	GND	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	A4	X5:8		X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X1:11	UL1/U12 (a)
X3:12	T2			X2:12	A3 NO	X4:1		X1:12	UL1/U12 (n)
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X1:13	UL2/U23 (a)
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X1:14	UL2/U23 (n)
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X1:17	UL3/U31/Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X1:18	UL3/U31/Uo (n/da)
						X4:8	connected to 7	X1:19	-
						X4:9		X1:20	-

Directional protection relay VAMP 230, with mA option



The directional protection relay VAMP 230, with the optional analogue outputs, is connected to the protected object through the following measuring and control connections:

Power card				CPU card				Transformer card	
X3		X6	Arc	X2		X5	Remote port	X1	
X3:1	+48V	X6:1	Arc BI	X2:1	AO1+	X5:1		X1:1	IL1 (S1)
X3:2	DI1	X6:2	Arc BO	X2:2	AO1-	X5:2	TX /TTL out	X1:2	IL1 (S2)
X3:3	DI2	X6:3	comm	X2:3	AO2+	X5:3	RX /TTL in	X1:3	IL2 (S1)
X3:4	DI3	X6:4	S1 >+	X2:4	AO2-	X5:4	RTS /TTL out	X1:4	IL2 (S2)
X3:5	DI4	X6:5	S1 >-	X2:5	AO3+	X5:5		X1:5	IL3 (S1)
X3:6	DI5	X6:6	S2 >+	X2:6	AO3-	X5:6		X1:6	IL3 (S2)
X3:7	DI6	X6:7	S2 >-	X2:7	AO4+	X5:7	GND	X1:7	Io1 / 1A (S1)
X3:8	-			X2:8	AO4-	X5:8		X1:8	Io1 / 1A (S2)
X3:9	A1 com.			X2:9	-	X5:9	+8V	X1:9	Io2 / 5A (S1)
X3:10	A1 NO			X2:10	A3 comm			X1:10	Io2 / 5A (S2)
X3:11	A1 NC			X2:11	A3 NC	X4	Local ser.port	X1:11	UL1/U12 (a)
X3:12	T2			X2:12	A3 NO	X4:1		X1:12	UL1/U12 (n)
X3:13	T2			X2:13	A2 comm	X4:2	RX /RS-232 in	X1:13	UL2/U23 (a)
X3:14	T1			X2:14	A2 NC	X4:3	TX /RS-232 out	X1:14	UL2/U23 (n)
X3:15	T1			X2:15	A2 NO	X4:4	DTR / +8Vout	X1:15	-
X3:16	-			X2:16	IF comm	X4:5	GND	X1:16	-
X3:17	Uaux			X2:17	IF NC	X4:6		X1:17	UL3/U31/Uo (a/dn)
X3:18	Uaux			X2:18	IF NO	X4:7	connected to 8	X1:18	UL3/U31/Uo (n/da)
						X4:8	connected to 7	X1:19	-
						X4:9		X1:20	-

Analogue measurements

- Phase currents I_{L1} , I_{L2} and I_{L3} (terminals X1: 1-6)
- Earth fault current I_0 (terminals X1: 7-8)
- Earth fault current I_{02} (terminals X1: 9-10)
- Voltage modes:
 - **Phase:** voltages U_{L1} , U_{L2} and U_{L3} (terminals X1: 11-14 and 17-18)
 - **Line+U₀:** Line voltages U_{12} and U_{23} (terminals X1: 11-14) and neutral voltage U_0 (terminals X1: 17-18)

Note!

The voltage measurements are only available in VAMP 255/230. VAMP 245 includes only residual voltage measurement U_0 (terminals X1: 17-18)

Digital inputs

Further, the terminal can collect status information and alarm signals via 6 (18)* digital inputs (terminals X3: 2-7 and X7: 1-14*). The digital inputs can also be used to block protection stages under certain conditions. The six digital inputs in terminal X3 use an internal 48 V dc auxiliary voltage of the terminal (terminal X3: 1).

Potential-free contacts must be available in the protected object for transferring status information to the terminal. In VAMP 255 the digital inputs 7-18 in terminal X7 need an external control voltage. These inputs are ideal for transferring the status information of switching devices into the terminal. Please note that it is possible to use two different control voltages in the terminal X7 as there are two common inputs: the common input X7: 7 for inputs X7: 1-6 and the common input X7: 14 for inputs X7: 7-13.

The digital input signals can also be used as blocking signals and control signals for the output relays.

*) Only in VAMP 255

Auxiliary voltage

The external auxiliary voltage U_{aux} (standard 40...265 V ac or dc) for the terminal is connected to the terminals X3: 17-18.

Note:

Polarity of the auxiliary voltage U_{aux} (24 V dc, option B):
- = X3: 17 and + = X3: 18.

Output relays

The terminal is equipped with nine configurable output relays, and a separate output relay for the self-supervision system.

- Trip relays T1 and T2 (terminals X3: 12-13 and 14-15)
- Trip relays T3 and T4 (terminals X7: 17-18 and 15-16) *
- Alarm relays A1 - A5 (terminals X3: 9-11, X2: 5-6, 7-8, 10-12, 13-15)
 - **In the mA version of the feeder terminals the alarm relays A4 and A5 are excluded.**
- Self-supervision system output relay IF (terminals X2: 16-18)

*) Only in VAMP 255

Analogue outputs (option)

A terminal with the mA option has four configurable analogue outputs that take up two of the output relays (A4 and A5). Thus, a relay with the mA option has two output relays less than the version without mA option.

The resolution of the analogue output is 12 bits resulting current steps less than 6 μ A. The output current range is configurable allowing e.g. the following ranges: 0 .. 20 mA and 4 .. 20 mA. More exotic ranges like 0 ... 5 mA or 10 ... 2 mA can be configured freely as long as the boundary values are within 0 ... 20 mA.

Connections:

- | | | | |
|---------|------|-------|------|
| • X2: 1 | AO1+ | X2: 2 | AO1- |
| • X2: 3 | AO2+ | X2: 4 | AO2- |
| • X2: 5 | AO3+ | X2: 6 | AO3- |
| • X2: 7 | AO4+ | X2: 8 | AO4- |

Note!

All positive poles (X2:1, -3, -5 and -7) are internally connected together, see figures in chapter 0.

Arc protection (option)

The optional arc protection card includes two arc sensor channels. The arc sensors are connected to terminals X6: 4-5 and 6-7.

The arc information can be transmitted and/or received through digital input and output channels. This is a 48 V dc signal.

Connections:

- X6: 1 Binary input (BI)
- X6: 2 Binary output (BO)
- X6: 3 GND
- X6: 4-5 Sensor 1
- X6: 6-7 Sensor 2

The GND must be connected together between the GND of the connected devices.

The binary output of the arc option card may be activated by one or both of the connected arc sensors, or by the binary input. The connection between the inputs and the output is selectable via the output matrix of the device. The binary output can be connected to an arc binary input of another VAMP protection relay or terminal.

Disturbance recorder

The disturbance recorder can be used to record all the measured signals, that is, currents, voltages and the 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. At the maximum, there can be 5 recordings, and the maximum selection of channels in one recording is 12 (limited in waveform recording). The digital inputs reserve one channel (includes all the inputs). Also the digital outputs reserve one channel (includes all the outputs). If digital inputs and outputs are recorded, there will be still 10 channels left for analogue waveforms.

The recorder can be triggered by any protection-stage start or trip signal, Arc sensors (S1, S2, BI) or by a digital input. The trig signal is selected in the output matrix (signal DR). The recording can also be triggered manually.

When a recording is made, also the time stamp will be memorized.

The recordings can be uploaded, viewed and analysed with the VAMPSET program (version 8.x or newer). The recording is in COMTRADE format. This means that also other programs can be used to view and analyse the recordings made by the terminal.

For more detailed information about, for example, uploading, please see a separate VAMPSET manual.

Available links

The following channels can be linked to a disturbance recorder:

- IL1, IL2, IL3, IL
- UL1, UL2, UL3, U12, U23, U31 *
- Io, Io2, IoCalc, I2/I1, I1, I2
- Uo
- U2/U1, U1, U2 *
- f
- DI, DO
- P, Q, S, Pf, Cosfii *

*) Only VAMP 255/230

Note!

The available channels (that is, what signals are measured) depend on the configuration.

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 terminal, 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 internal fault.

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

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

Communication

PC user interface

The PC user interface can be used for:

- On-site parameterization of the terminal
- Loading terminal software from a computer
- Reading measured values to a computer

Two RS 232 serial ports are available for connecting a local PC; one on the front panel and one on the rear panel of the terminal. The serial ports are connected in parallel. However, if the connection cables are connected to both ports, only the port on the front panel will be active. To connect a PC to a serial port, use a connection cable of type VX 003-3.

You can also use the VAMPSET software through a TCP/IP LAN connection. Optional hardware is required.

Remote control connection

The protection terminal communicates with higher-level systems, e.g. remote control systems, via the serial port (REMOTE) on the rear panel of the terminal.

ModBus, SPABus, IEC 60870-5-103, ProfiBus or ModBus TCP can be used as REMOTE communication protocols (see details in the technical description).

Additional operation instructions for various bus types are to be found in their respective manual.

Technical data

Connections

Measuring circuitry

Rated current I_n - Current measuring range - Thermal withstand - Burden	1...10 A (software parameter) 0...250 A (0...50 x I_n [$I_n=5$ A]; 0...250 x I_n [$I_n=1$ A]) 20 A (continuously) 100 A (for 10 s) 500 A (for 1 s) < 0.2 VA
Rated current I_{on} - Current measuring range	1 A 0...10 A (0...10 x I_{on})
Rated current I_{o2n} - Current measuring range	5 A 0...50 A (0...10 x I_{o2n})
Rated voltage U_n - Voltage measuring range - Continuous voltage withstand - Burden	50 - 120 V (configurable) 0 - 175 V (100 V/110 V) 250 V < 0.5V A
Rated frequency f_n - Frequency measuring range	50 / 60 Hz (45 - 65 Hz) 16 - 75 Hz
Terminal block: - Solid or stranded wire	Maximum wire dimension: 4 mm ² (10-12 AWG)

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 (normal conditions) < 15 W (output relays activated)	
Max. permitted interruption time	< 50 ms (110 V dc)	
Terminal block: - Phoenix MVSTBW or equivalent	Maximum wire dimension: 2.5 mm ² (13-14 AWG)	

Digital inputs

Internal operating voltage

Number of inputs	6
Internal operating voltage	48 V dc
Current drain when active (max.)	approx. 20 mA
Current drain, average value	< 1 mA
Terminal block: - Phoenix MVSTBW or equivalent	Maximum wire dimension: 2.5 mm ² (13-14 AWG)

External operating voltage (Only VAMP 255)

Number of inputs	12
external operating voltage	18 V...265 Vdc
Current drain	approx. 2 mA
Terminal block: - Phoenix MVSTBW or equivalent	Maximum wire dimension: 2.5 mm ² (13-14 AWG)

Trip contacts

Number of contacts	2 making contacts (relays T1 and T2) (VAMP 230/245) 4 making contacts (relays T1, T2, T3 and T4) (VAMP 255)
Rated voltage	250 V ac/dc
Continuous carry	5 A
Maximum making current	15 A
Breaking capacity, AC	2 000 W/VA
Breaking capacity, DC (L/R=40ms) at 48 VDC: at 110 VDC: at 220 VDC	5 A 3 A 1 A
Contact material	AgNi 90/10
Terminal block: - Phoenix MVSTBW or equivalent	Maximum wire dimension: 2.5 mm ² (13-14 AWG)

Alarm contacts

Number of contacts:	3 change-over contacts (relays A1, A2 and A3) 2 making contacts (relays A4 and A5) (Not available with the mA option) 1 change-over contact (IF relay)
Rated voltage	250 V ac/dc
Continuous carry	5 A
Breaking capacity, AC	2 000 VA
Contact material	AgNi 0.15 gold plated
Terminal block - Phoenix MVSTBW or equivalent	Maximum wire dimension 2.5 mm ² (13-14 AWG)

Local serial communication port

Number of ports	1 on front and 1 on rear panel
Electrical connection	RS 232
Data transfer rate	2 400 - 38 400 kb/s

Remote control connection

Number of ports	1 on rear panel
Electrical connection	TTL (standard) RS 485 (option) RS 232 (option) Plastic fibre connection (option) Glass fibre connection (option) Ethernet 10 Base-T (option, external module)
Data transfer rate	1 200 - 19 200 kb/s
Protocols	ModBus, RTU master ModBus, RTU slave SpaBus, slave IEC 60870-5-103 Profibus DP (option) ModBus TCP (option, external module)

Analogue output connections (option)

Number of analogue mA output channels	4
Maximum output current	1 - 20 mA, step 1 mA
Minimum output current	0 - 19 mA, step 1 mA
Exception output current	0 - 20,50 mA, step 10 μ A
Resolution	12 bits
Current step	< 6 μ A
Inaccuracy	$\pm$ 20 μ A

Arc protection interface (option)

Number of arc sensor inputs	2
Sensor type to be connected	VA 1 DA
Operating voltage level	12 VDC
Current drain, when active	> 11.9 mA
Current drain range	1.3...31 mA (Note! If the drain is outside the range, either sensor or the wiring is defected)
Number of binary inputs	1 (optically isolated)
Operating voltage level	+48 VDC
Number of binary outputs	1 (transistor controlled)
Operating voltage level	+48 VDC
Note! Maximally three arc binary inputs can be connected to one arc binary output without an external amplifier.	

Tests and environmental conditions**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 μ s, common mode 1 kV, 1.2/50 μ s, differential mode
- Conducted HF field	EN 61000-4-6 0.15 - 80 MHz, 10 V/m
- 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 μ s, 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)	208 x 155 x 225 mm
Material	1 mm steel plate
Weight	4.2 kg
Colour code	RAL 7032 (Casing) / RAL 7035 (Back plate)

Package

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

Protection stages**Non-directional current protection****Overcurrent stage I> (50/51)**

Start current	0.10 – 5.00 x I_n
Definite time function: - Operating time	DT 0.08 – 300.00 s (step 0.02 s)
IDMT function: - 4 curve groups (IEC 60255-3) - Time multiplier k	EI, VI, NI, LTI *) 0.05 - 3.20
Start time	<60 ms
Reset time	<60 ms
Reset ratio	0.97
Inaccuracy: - Starting - Operate time at definite time function - Operate time at IDMT function	$\pm 2\%$ of the set value $\pm 1\%$ or ± 30 ms $\pm 5\%$ or at least ± 30 ms ($I < 50 \times I_n$)

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

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

Start current	0.10 – 20.00 x I_n (I>>) 0.10 – 40.00 x I_n (I>>>)
Definite time function: - Operating time	0.04 – 300.00 s (step 0.01 s)
Start time	<30 ms
Reset time	<100 ms
Reset ratio	0.97

Inaccuracy:	
- Starting	±2% of the set value
- Operate time	±1% or ±25 ms

Unbalance / broken connector protection $I_2/I_1 >$ (46)

Settings:	
- Setting range $I_2/I_1 >$	5 – 70 %
Definite time function:	
- Operating time	1.0 – 600.0 s (step 0.1 s)
Start time	<300 ms
Reset time	<300 ms
Reset ratio	0.95
Inaccuracy:	
- Starting	±3% of the set value or 0.5% of the rated value
- Operate time	±5% or ±300 ms

Earth fault stage $I_0 >$ (50N/51N)

Setting range $I_0 >$	0.005 – 8.000 x I_{0n} (VAMP 255/245) 0.005 – 4.000 x I_{0n} (VAMP 230)
Definite time function:	DT
- Operating time	0.08 – 300.00 s (step 0.02 s)
IDMT function:	
- 4 curve groups (IEC 60255-3)	EI, VI, NI, LTI *)
- Time multiplier k	0.05 - 3.20
Start time	<60 ms
Reset time	<60 ms
Reset ratio	0.95
Inaccuracy:	
- Starting	±2% of the set value or ±0.3% of the rated value
- Operating time at definite time function	±1% or ±30 ms
- Operating time at IDMT function.	±5% or at least ±30 ms ($I_0 < 5 \times I_{0n}$)

Earth fault stages $I_0 >>$, $I_{02} >$, $I_{02} >>$ (50N/51N)

Setting range $I_0 >>$	0.01 - 8.00 x I_{0n} ($I_0 >>$ in VAMP 255/245) 0.01 – 4.00 x I_{0n} ($I_0 >>$ in VAMP 230) 0.005 - 2.00 x I_{02n} ($I_{02} >$) 0.01 - 2.00 x I_{02n} ($I_{02} >>$)
Definite time function:	
- Operating time	0.08 – 300.00 s (step 0.02 s)
Start time	<60 ms
Reset time	<60 ms
Reset ratio	0.95
Inaccuracy:	
- Starting	±2% of the set value or ±0.3% of the rated value
- Operate time	±1% or ±30 ms

Directional current protection**Directional overcurrent stages $I_{dir} >$ and $I_{dir} >>$ (67) ***

Start current	0.10 - 4.00 x I_n
Mode	Directional/non-directional
Minimum voltage for the direction solving	2 V
Base angle setting range	-180° to + 179°
Operation angle	±88°
Definite time function:	DT
- Operating time	0.06 – 300.00 s (step 0.02 s)

IDMT function: - 4 curve groups (IEC 60255-3) - Time multiplier T_p	EI, VI, NI, LTI **) 0.05 - 3.20
Start time Reset time Reset ratio	<60 ms <60 ms 0.95
Inaccuracy: - Starting (rated value $I_N = 1 - 5A$) - Angle - Operate time at definite time function - Operate time at IDMT function	$\pm 3\%$ of the set value or $\pm 0.5\%$ of the rated value $\pm 2^\circ$ $\pm 1\%$ or ± 30 ms $\pm 5\%$ or at least ± 30 ms ($I < 50 \times I_N$)

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

Limitations:

1. The maximum measured current is $50 \times I_N$. This limits the scope of inverse curves when the setting is more than $2.5 \times I_N$. For example, at setting $4 \times I_N$ the maximum setting relative current is $12.5 \times I_{set}/I_N$ although the curves are defined up to $20 \times I_{set}/I_N$.
2. The fastest possible operating time is about 60 ms at inverse time characteristic according to curve types VI and EI.

Directional overcurrent stages $I_{dir}>>>$ and $I_{dir}>>>>$ (67) *

Start current	$0.10 - 20.0 \times I_N$
Start voltage	$1 - 20 \% U_{on}$
Mode	Directional/non-directional
Minimum voltage for the direction solving	0.01 pu
Base angle setting range	-180° to $+179^\circ$
Operation angle	$\pm 88^\circ$
Definite time function: - Operating time	DT 0.06 - 300.00 s (step 0.02 s)
Start time Reset time Reset ratio	<60 ms <60 ms 0.95
Inaccuracy: - Starting (rated value $I_N = 1 \dots 5A$) - Angle - Operate time at definite time function	$\pm 3\%$ of the set value or $\pm 0.5\%$ of the rated value $\pm 2^\circ$ $\pm 1\%$ or ± 30 ms

*) Only in VAMP 255/230

Directional earth fault stages $I_{0\phi}>$, $I_{0\phi}>>$ (67N)

Start current	$0.01 - 4.00 \times I_{on}$
Mode	Directional/non-directional
Minimum voltage for the direction solving	2 V
Base angle setting range	-180° to $+179^\circ$
Operation angle	$\pm 88^\circ$
Definite time function: - Operating time	0.10 - 300.00 s (step 0.02 s)
IDMT function: - 4 curve groups (IEC 60255-3) - Time multiplier T_p	EI, VI, NI, LTI *) 0.05 - 3.20
Start time Reset time Reset ratio	<60 ms <60 ms 0.95

Inaccuracy:	
- Starting (rated value $I_N = 1 \dots 5A$)	$\pm 3\%$ of the set value or $\pm 0.5\%$ of the rated value
- Angle	$\pm 2^\circ$
- Operate time at definite time function	$\pm 1\%$ or ± 30 ms
- Operate time at IDMT function	$\pm 5\%$ or at least ± 30 ms ($I < 50 \times I_N$)

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

Limitations:

1. The maximum measured current is $5 \times I_N$.
2. The fastest possible operating time is about 100 ms at inverse time characteristic according to curve types VI and EI.

Overload protection

Thermal overload stage T> (49)

Settings:	
- Time constant τ	2 – 60 min
- Max. allowed continuous load current $k \times I_N$ (θ_{trip} = thermal trip level)	0.50 - 1.20 $\times I_N$
- Heating alarm level θ_{alarm}	60% - 99% $\times \theta_{trip}$

Auto-reclose function

AR function (79)

Settings:	
- Reclaim time	0.02 – 300.00 s (step 0.01 s)
- CB pulse length	0.02 – 10.00 s (step 0.01 s)
- CB ready timeout	0.02 – 30.00 s (step 0.01 s)
- DI to get open information	Any digital input
- DI to get close information	Any digital input
- DI to get ready information	Any digital input
- DI to block reclose function	Any digital input
- DI to inhibit reclose function	Any digital input
AR shot settings (shot1 - shot5):	
- Deadtime	0.02 – 300.00 s (step 0.01 s)
- Discrimination time	0.02 – 300.00 s (step 0.01 s)
- Start delay (start1 - start4)	0.02 – 300.00 s (step 0.01 s)

Voltage protection

Overvoltage stages U>, U>> and U>>> (59) *

Overvoltage setting range:	50 - 150 % U_N (U>) 50 - 160 % U_N (U>>, U>>>)
Definite time characteristic:	
- operating time	0.08 - 300.00 s (step 0.02) (U>, U>>) 0.06 - 300.00 s (step 0.02) (U>>>)
Release delay	0.06 - 300.00 s (step 0.02) (U>)
Hysteresis	0.1 - 20.0% (step 0.1%) (U>)
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	0.97 (depends on the hysteresis setting)
Inaccuracy:	
- starting	$\pm 3\%$ of the set value
- operate time	$\pm 1\%$ or ± 30 ms

Undervoltage stages $U_{<}$, $U_{<<}$ and $U_{<<<}$ (27) *

Undervoltage setting range	20 - 120 %Un
Definite time characteristic:	
- operating time	0.08 - 300.00 s (step 0.02) ($U_{<}$) 0.06 - 300.00 s (step 0.02) ($U_{<<}$, $U_{<<<}$)
Release delay	0.06 - 300.00 s (step 0.02) ($U_{<}$)
Hysteresis	0.1 - 20.0% (step 0.1%) ($U_{<}$)
Self-blocking value of the undervoltage	0 - 80 %Un
Starting time	<60 ms
Resetting time	<60 ms
Resetting ratio	1.03 (depends on the hysteresis setting)
Inaccuracy:	
- starting	±3% of the set value
- operate time	±1% or ±30 ms

*) Only in VAMP 255/230

Residual voltage stages $U_{0>}$ and $U_{0>>}$ (59N)

Residual voltage setting range	10 – 60 %Un
Definite time function:	
- Operating time	0.3 – 300.0 s (step 0.1 s)
Start time	<300 ms
Reset time	<300 ms
Reset ratio	0.97
Inaccuracy:	
- Starting	±2% of the set value or ±0.3% of the rated value
- Operate time	±1% or ±150 ms

Frequency protection ***Configurable frequency stages $f_{>}$ and $f_{>>}$**

Frequency measuring range	46.0 - 70.0 Hz
Definite time function:	
-operating time	0.10 - 300.0 s (step 0.02 s)
Starting time	<100 ms
Reset time	<100 ms
Reset ratio ($f_{>}$ and $f_{>>}$)	0.998
Reset ratio ($f_{<}$ and $f_{<<}$)	1.002
Inaccuracy:	
- starting	±20 mHz
- operating time	±1% or ±30 ms

Underfrequency stages $f_{<}$ and $f_{<<}$

Underfrequency measuring range	40.0 - 64.0 Hz
Definite time function:	
-operating time	0.10 - 300.0 s (step 0.02 s)
Undervoltage blocking	2 - 100 %
Starting time	<60 ms
Reset time	<60 ms
Reset ratio	1.002
Inaccuracy:	
- starting	±20 mHz
- operating time	±1% or ±30 ms

*) Only in VAMP 255/230

Second harmonic function**2. Harmonic stage / Inrush (68)**

Settings:	
- Setting range 2.Harmonic	10 – 100 %
- Operating time	0.05 – 300.00 s (step 0.01 s)

Circuit-breaker failure protection**Circuit-breaker failure protection CBFP (50BF)**

Relay to be supervised	T1, T2, T3 and T4
Definite time function	
- Operating time	0.1 – 10.0 s (step 0.1 s)
Inaccuracy	
- Operating time	±100 ms

Arc fault protection stages (option)

The operation of the arc protection depends on the setting value of the $\text{ArcI}_>$, $\text{ArcI}_0>$ and $\text{ArcI}_{02}>$ current limits. The arc current limits cannot be set, unless the terminal is provided with the optional arc protection card.

Arc protection stage $\text{ArcI}_>$ (50AR), option

Setting range	0.5 - 10.0 x I_n
Arc sensor connection	S1, S2, S1/S2, BI, S1/BI, S2/BI, S1/S2/BI
Operating time	~15 ms

Arc protection stage $\text{ArcI}_0>$ (50AR), option

Setting range	0.05 - 1.00 x I_{0n}
Arc sensor connection	S1, S2, S1/S2, BI, S1/BI, S2/BI, S1/S2/BI
Operating time	~15 ms

Arc protection stage $\text{ArcI}_{02}>$ (50AR), option

Setting range	0.05 - 1.00 x I_{02n}
Arc sensor connection	S1, S2, S1/S2, BI, S1/BI, S2/BI, S1/S2/BI
Operating time	~15 ms

Disturbance recorder (DR)

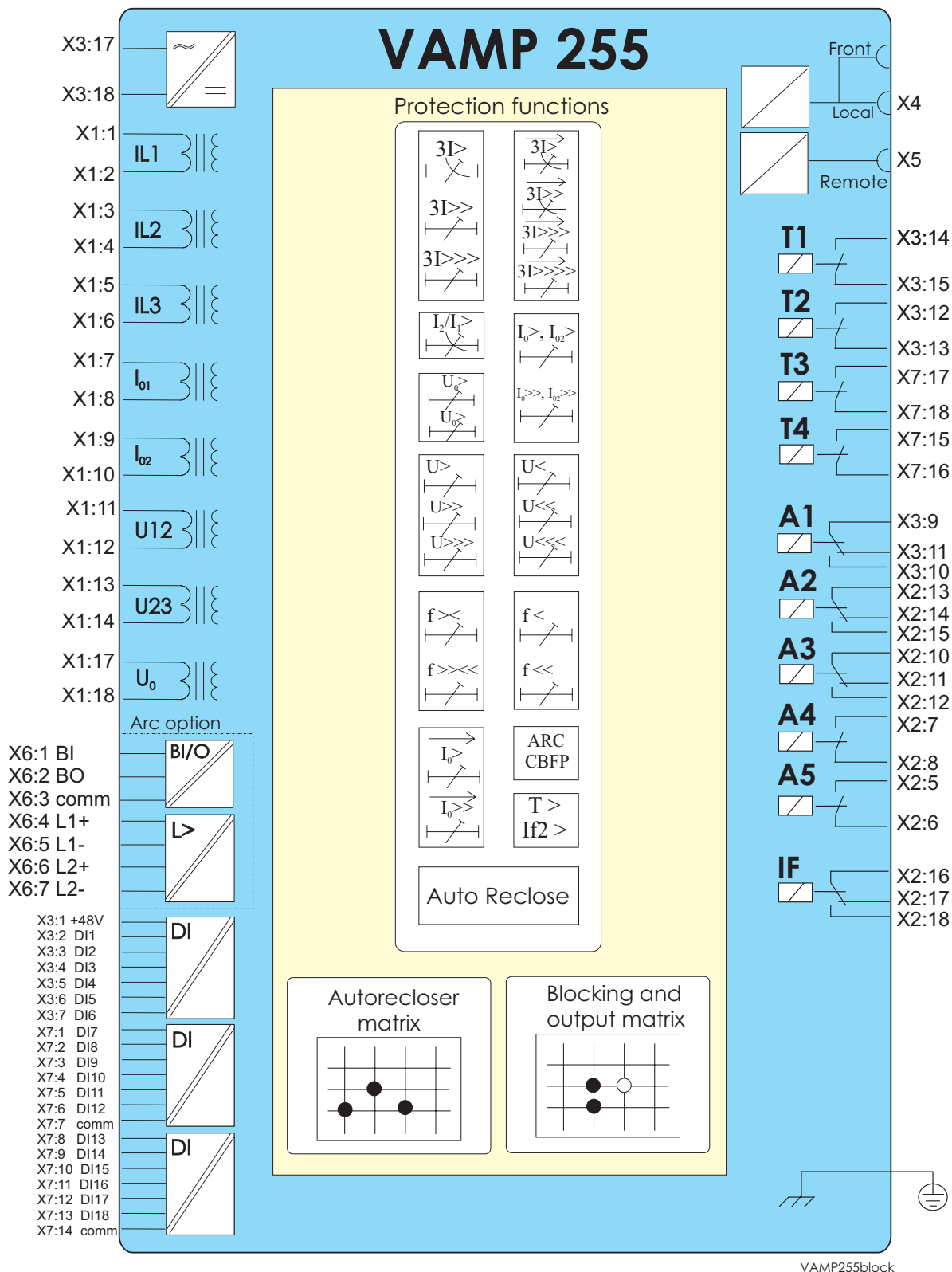
The operation of disturbance recorder depends on the following settings. The recording time and the number of records depend on the time setting and the number of selected channels.

Disturbance recorder (DR)

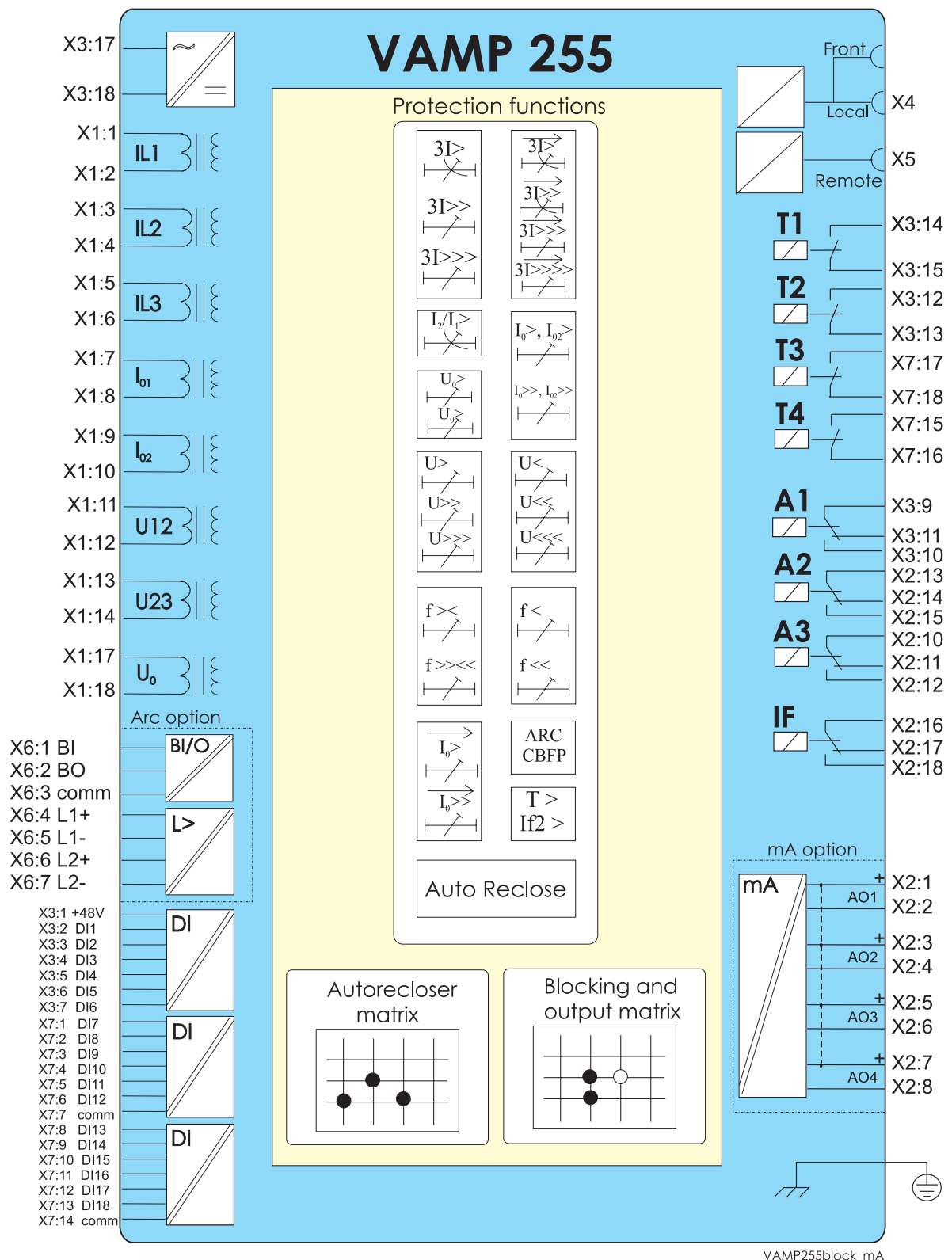
Mode of recording:	Saturated / Overflow
Sample rate:	
- Waveform recording	32/cycle, 16/cycle, 8/cycle
- Trend curve recording	10, 20, 200 ms
	1, 5, 10, 15, 30 s
	1 min
Recording time (one record)	0.1 s – 12 000 min (must be shorter than MAX time)
Pre-trigger rate	0 – 100%
Number of selected channels	0 – 12

Block diagrams

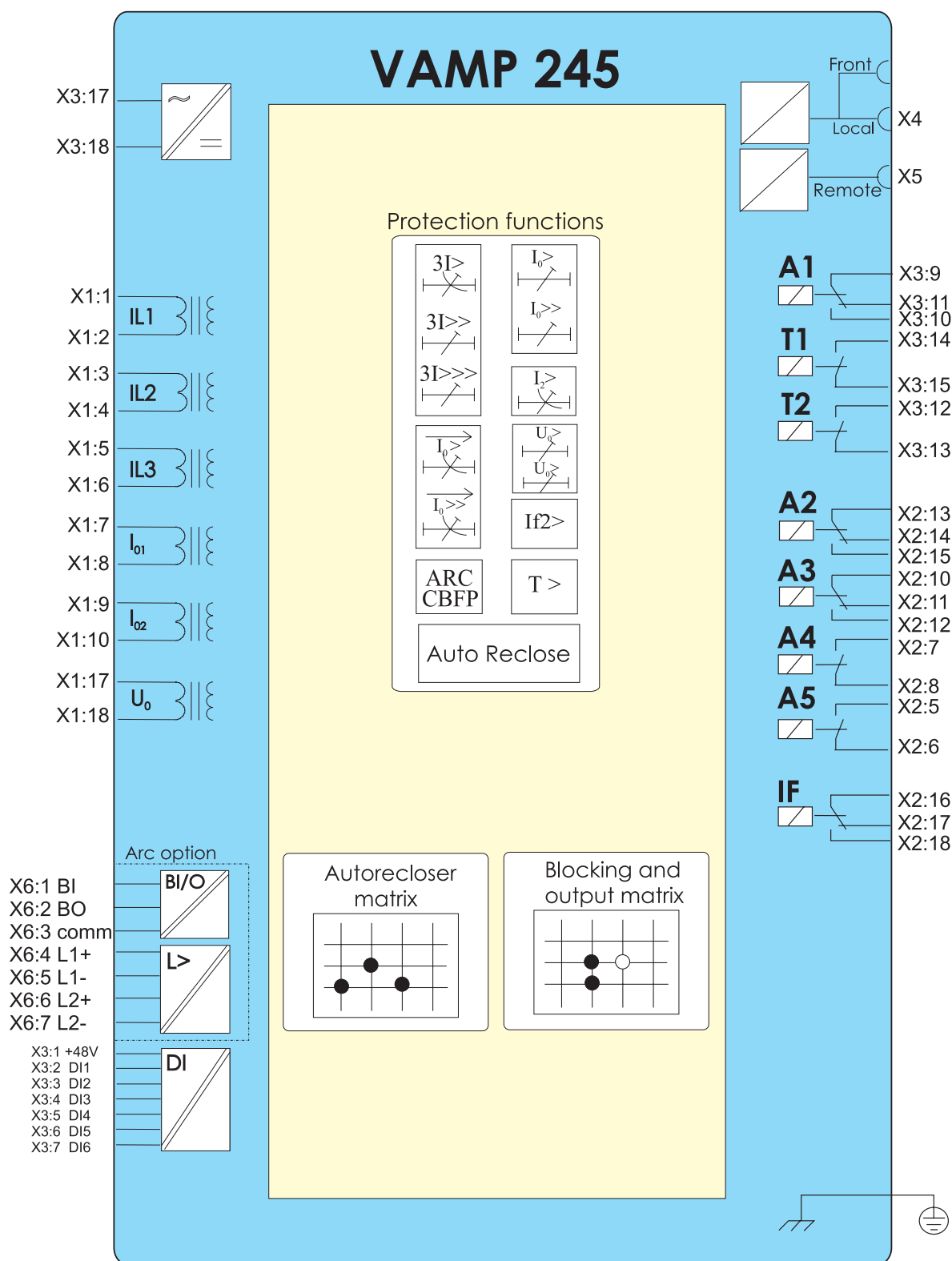
Feeder manager VAMP 255



Feeder manager VAMP 255, with mA option

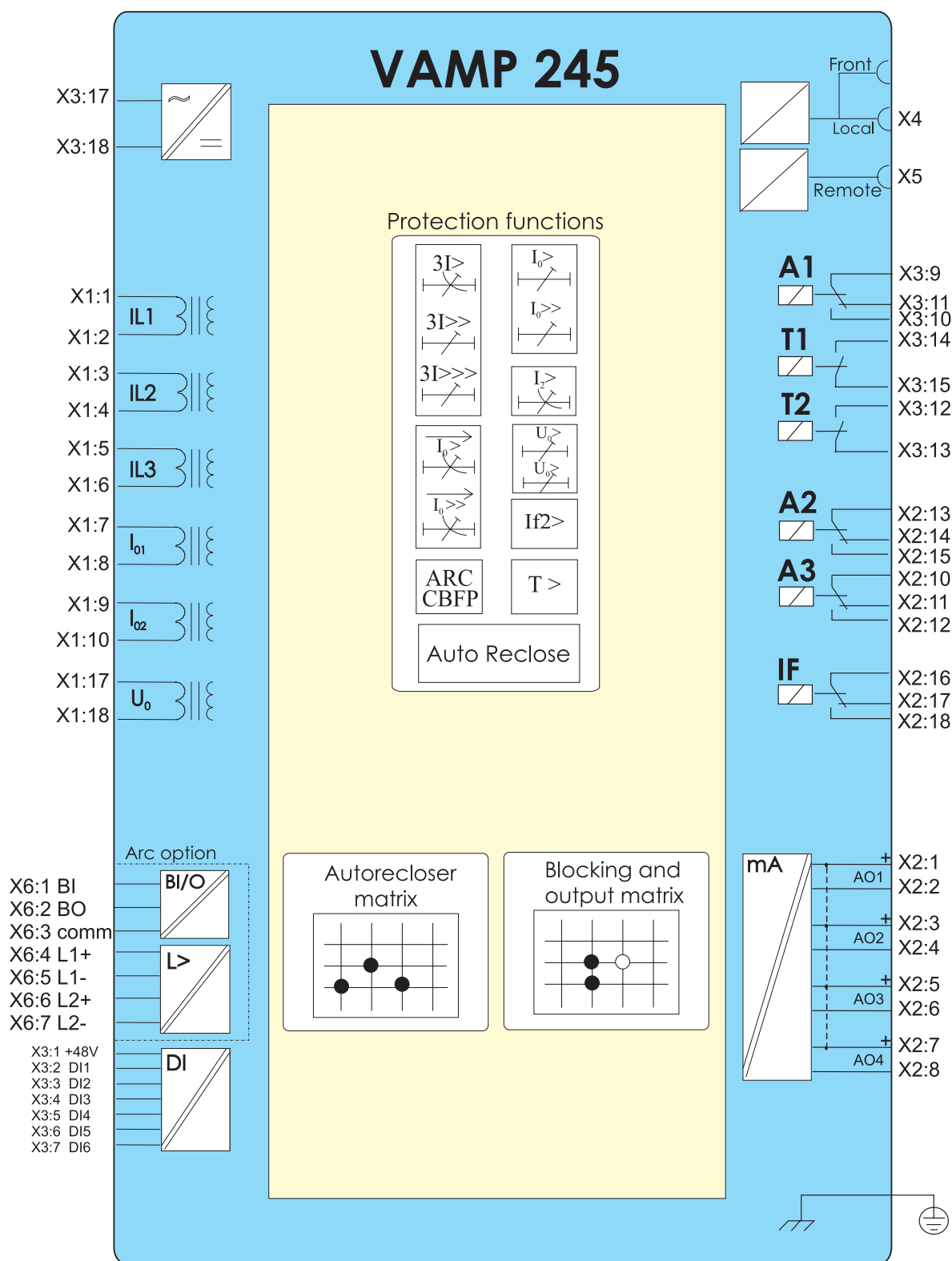


Feeder protection relay VAMP 245



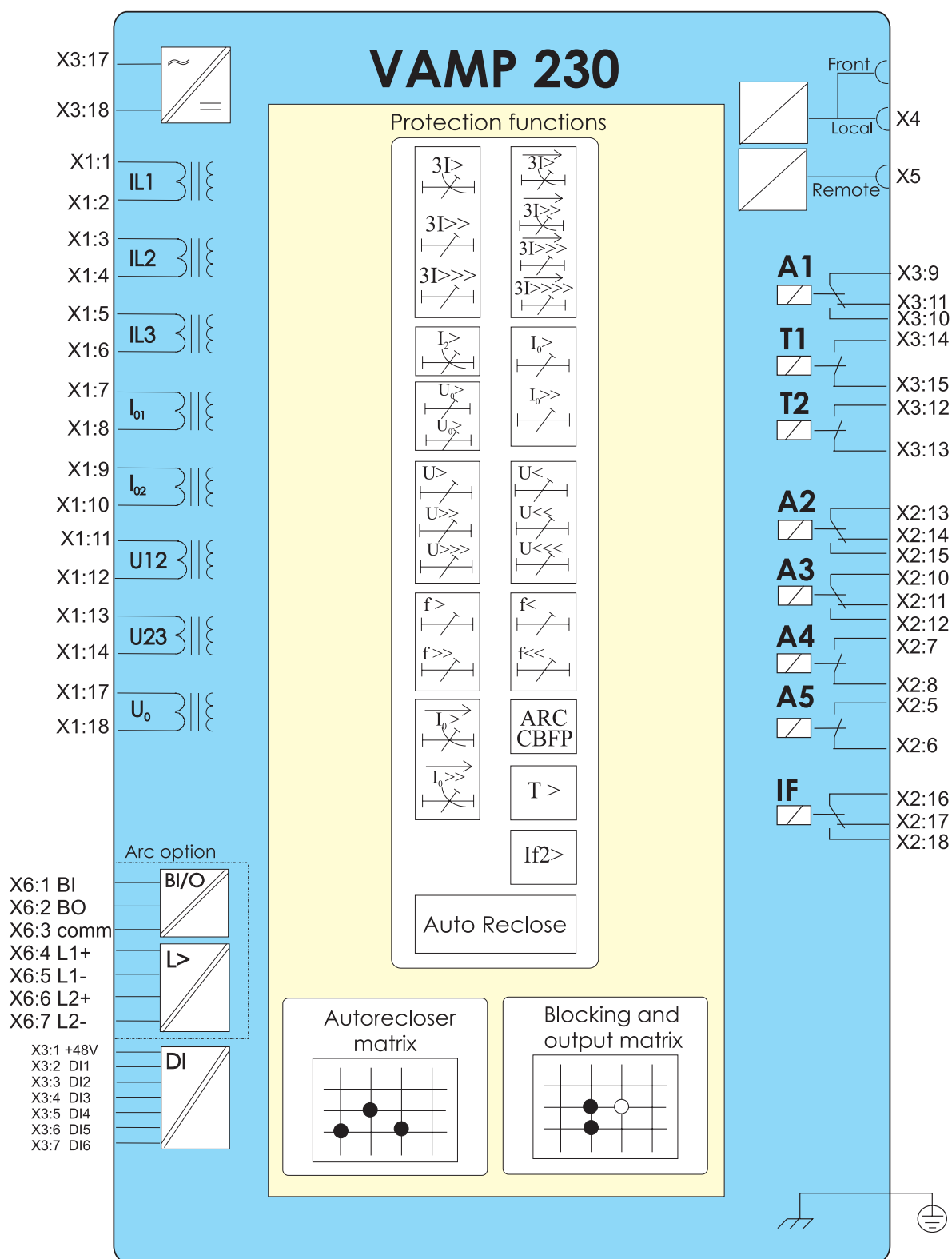
VAMP245Blockdiagram

Feeder protection relay VAMP 245, with mA option



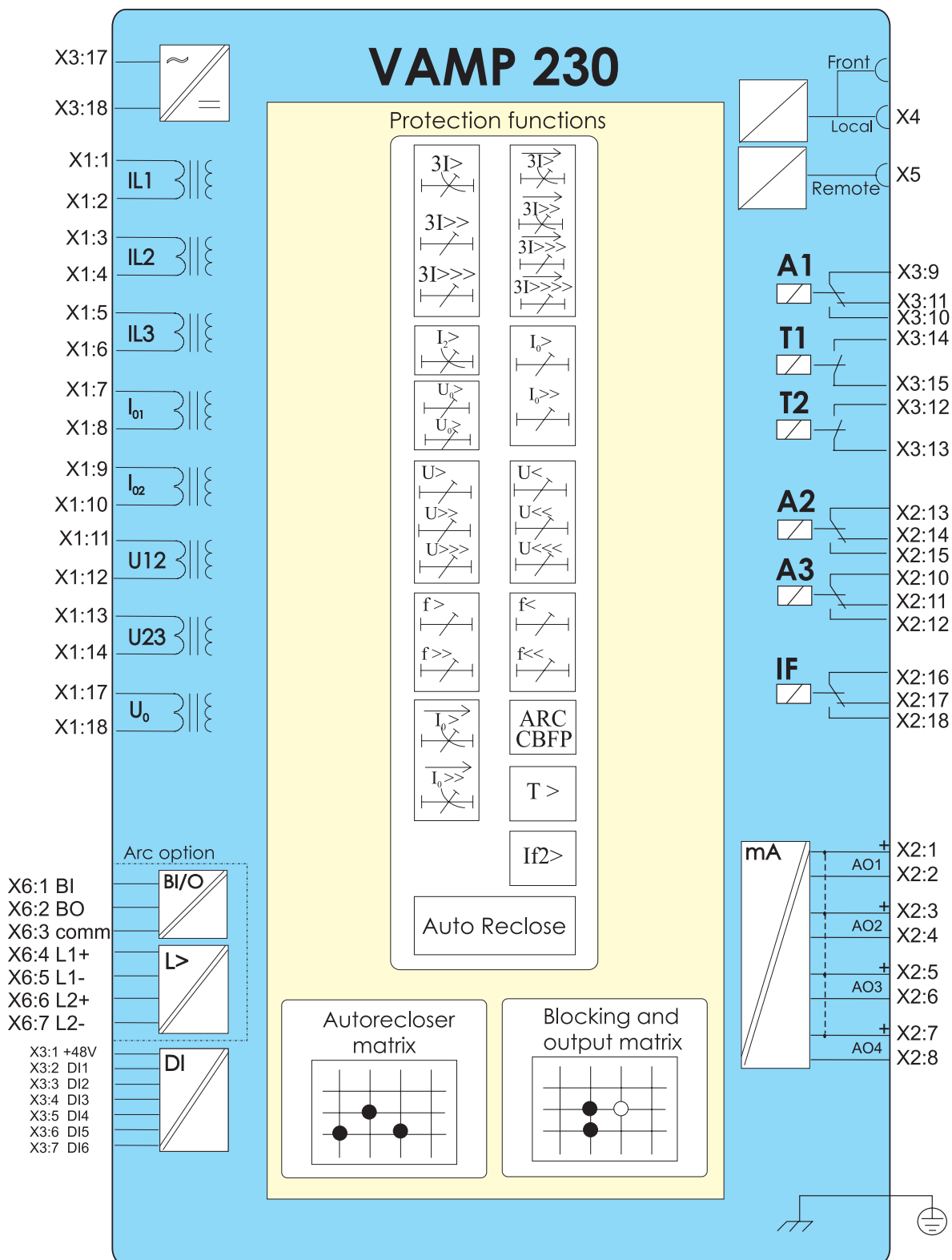
VAMP245BlockDiagram_mA

Directional protection relay VAMP 230



VAMP230blockdiagram

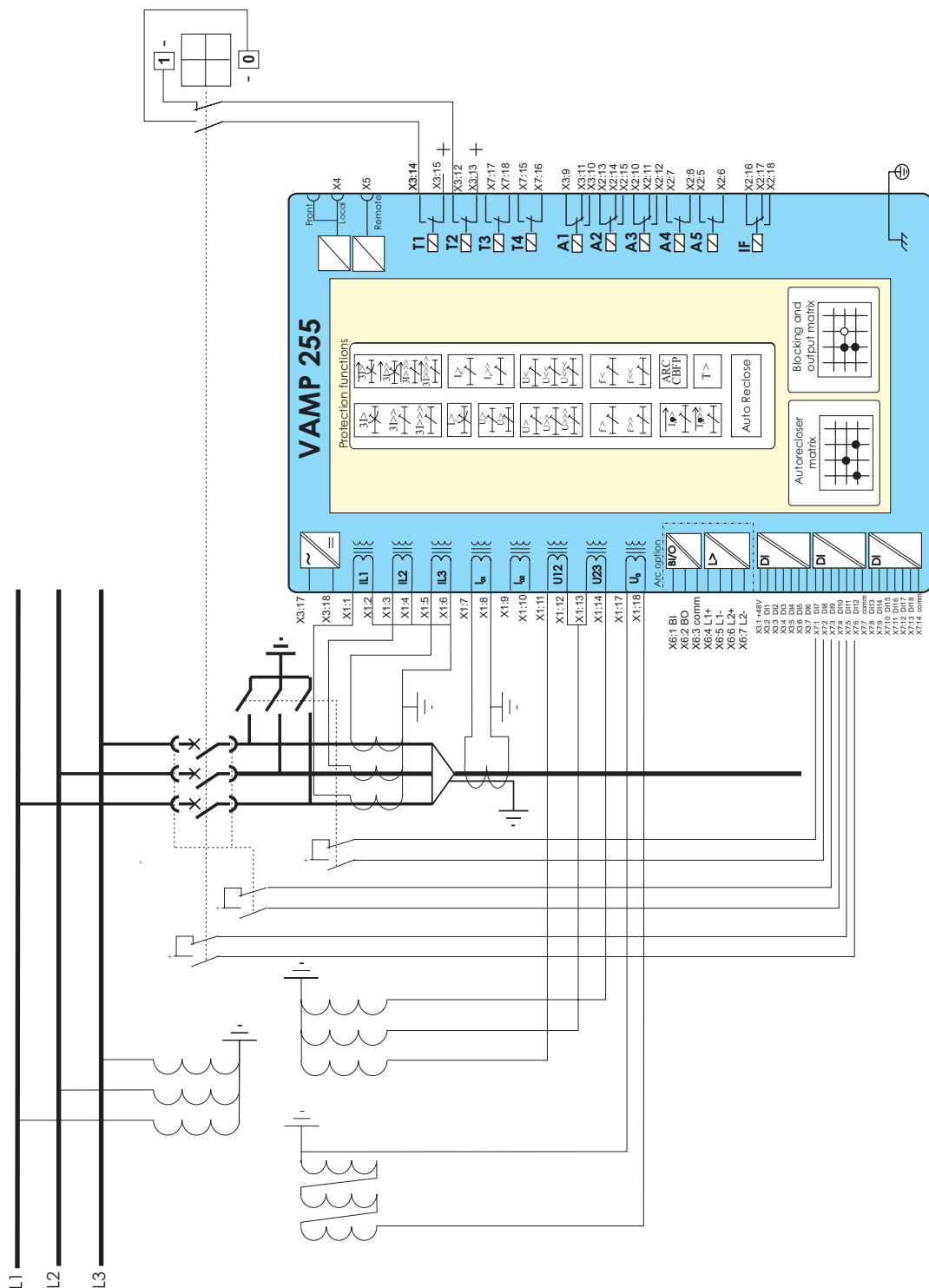
Directional protection relay VAMP 230, with mA option



VAMP230blockDiagram_mA

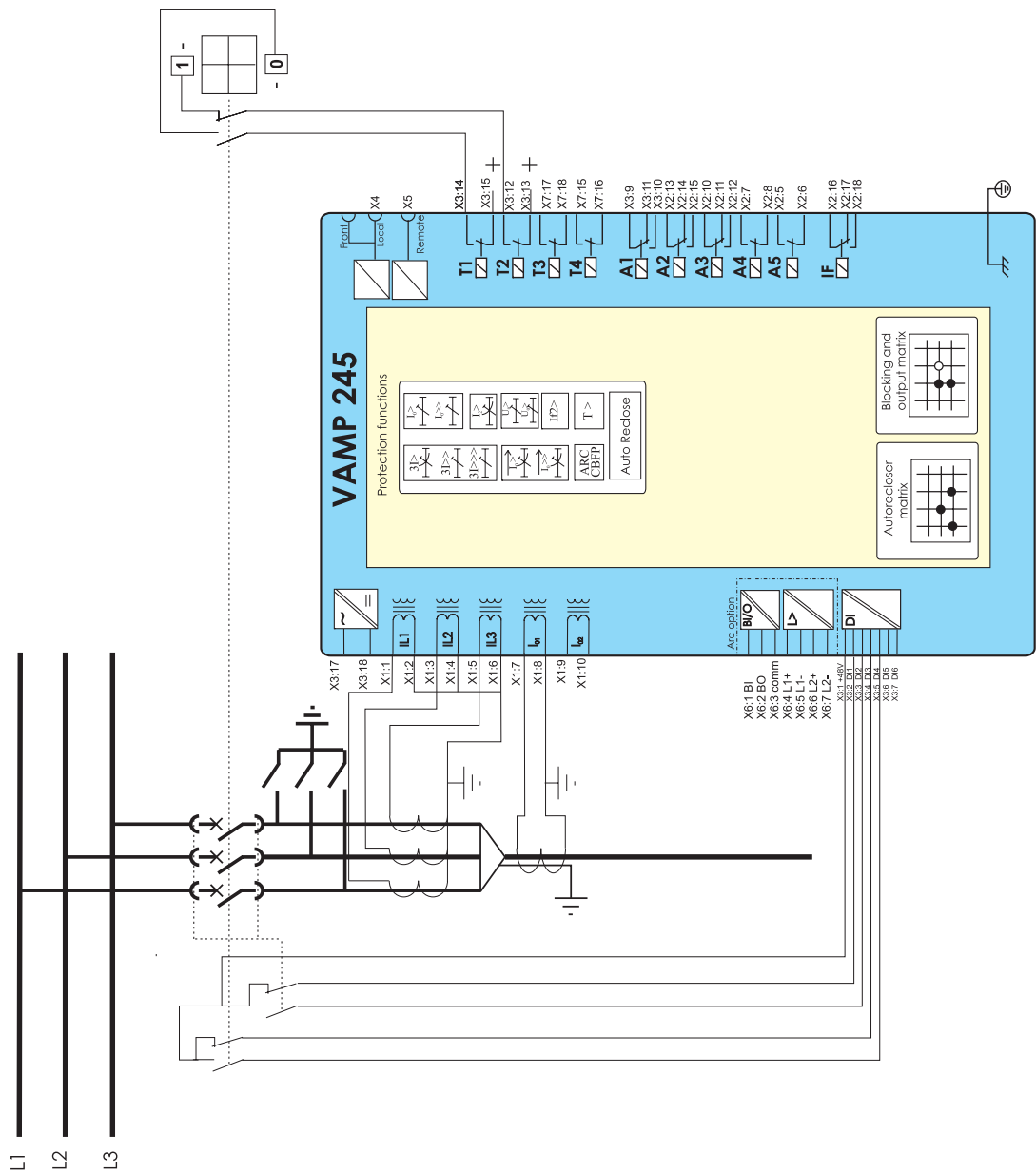
Connection examples

Feeder manager VAMP 255



VAMP255_truck_application

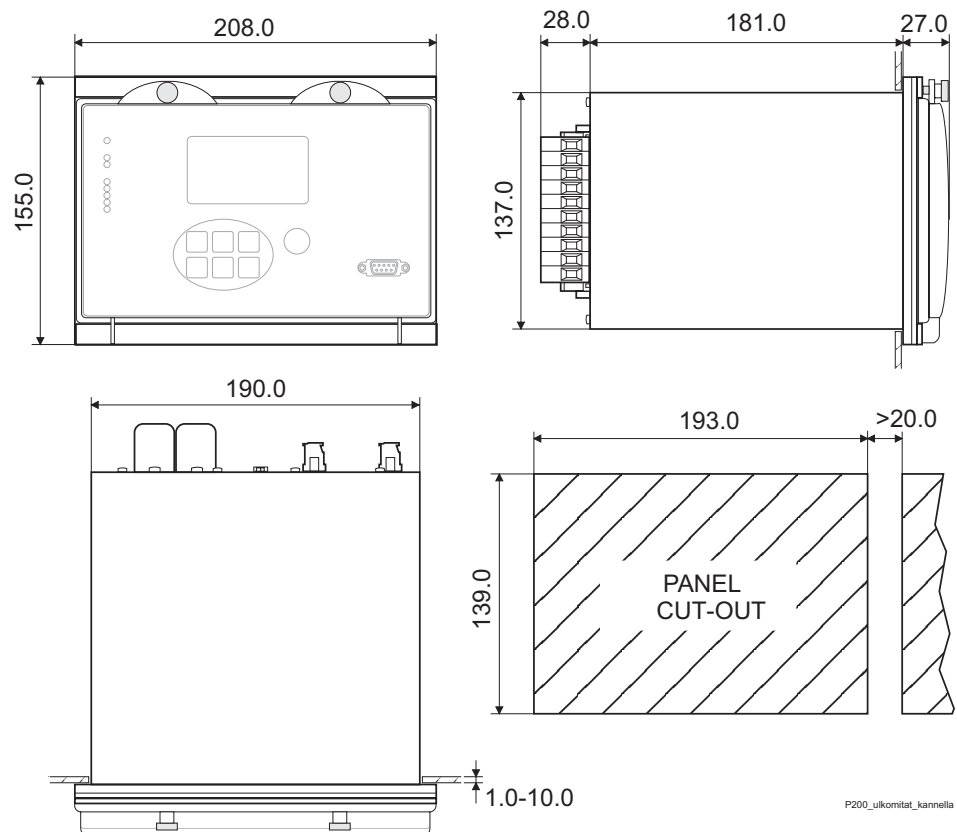
Feeder protection relay VAMP 245



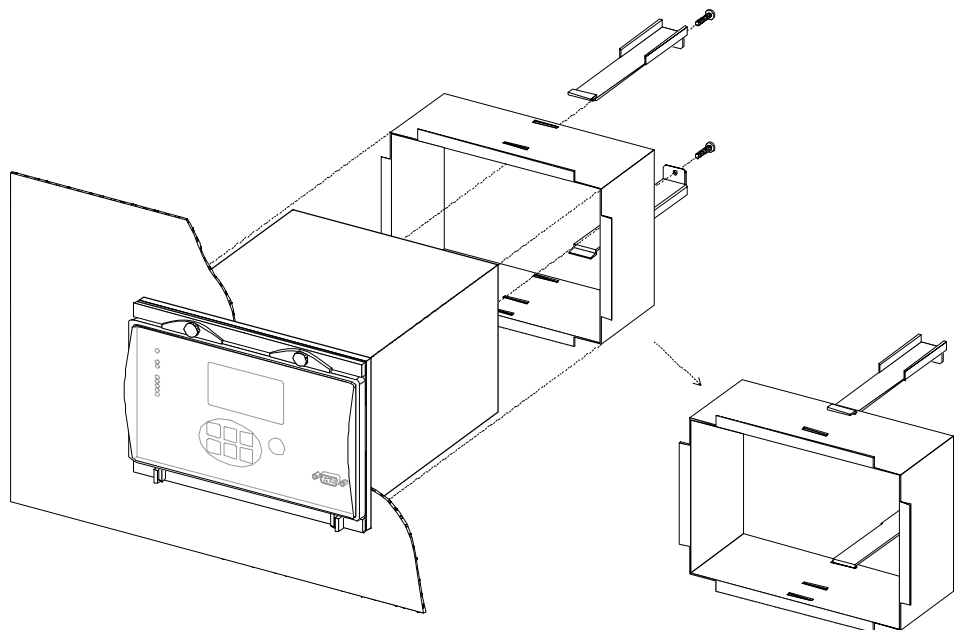
VAMP245_ruck_application

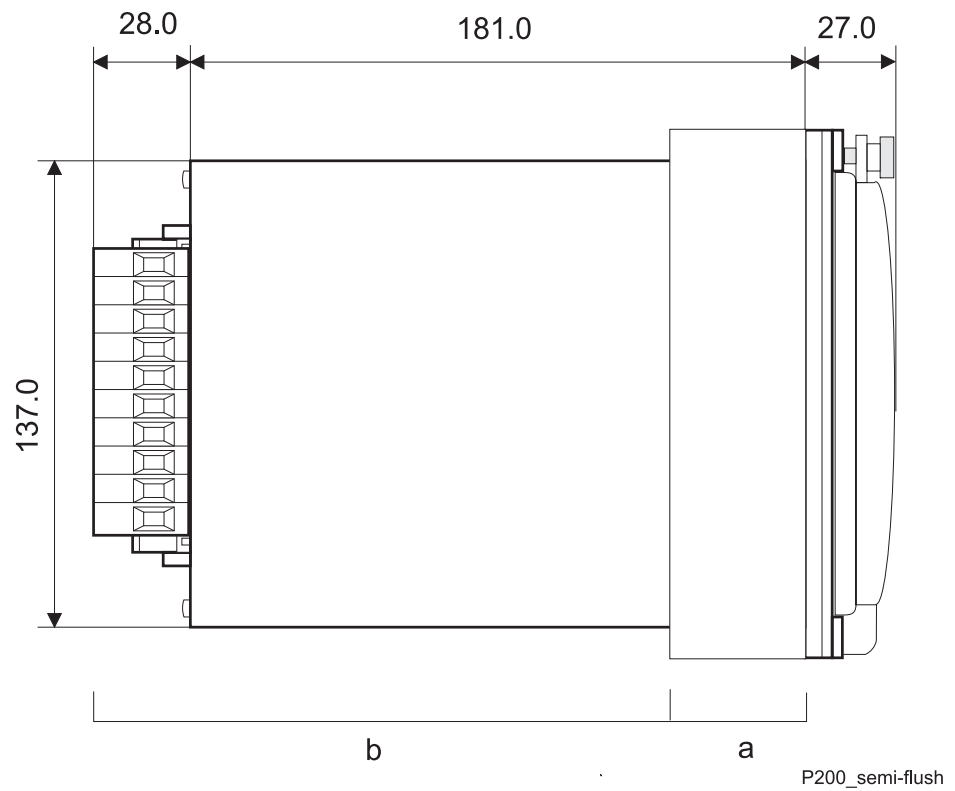
Construction

Dimensional drawing



Panel mounting



Semi-flush mounting**Depth with raising frames**

Type designation	a	b
VYX076	40 mm	169.0 mm
VYX077	60 mm	149.0 mm

Order information

When ordering, please state:

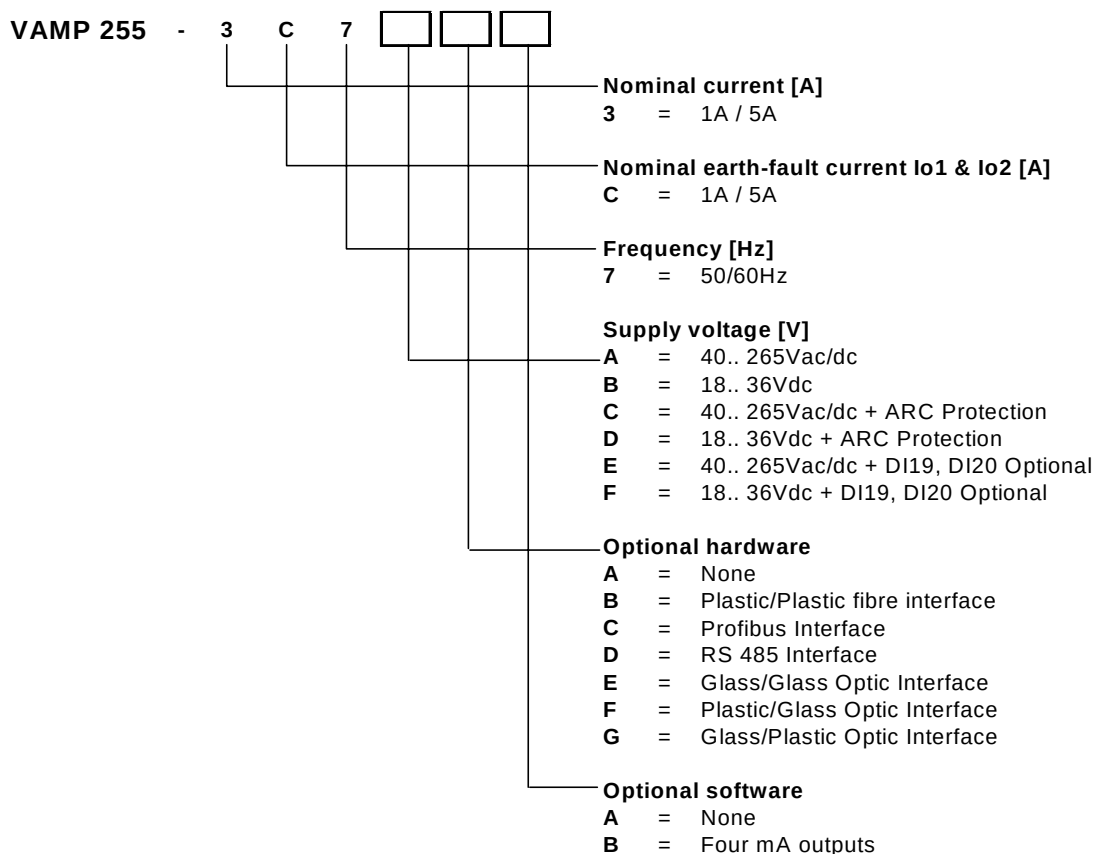
Type designation: VAMP 255, VAMP 230 or VAMP 245

Quantity:

Options (see respective ordering code):

Feeder manager VAMP 255 ordering code

VAMP 255 ORDERING CODE

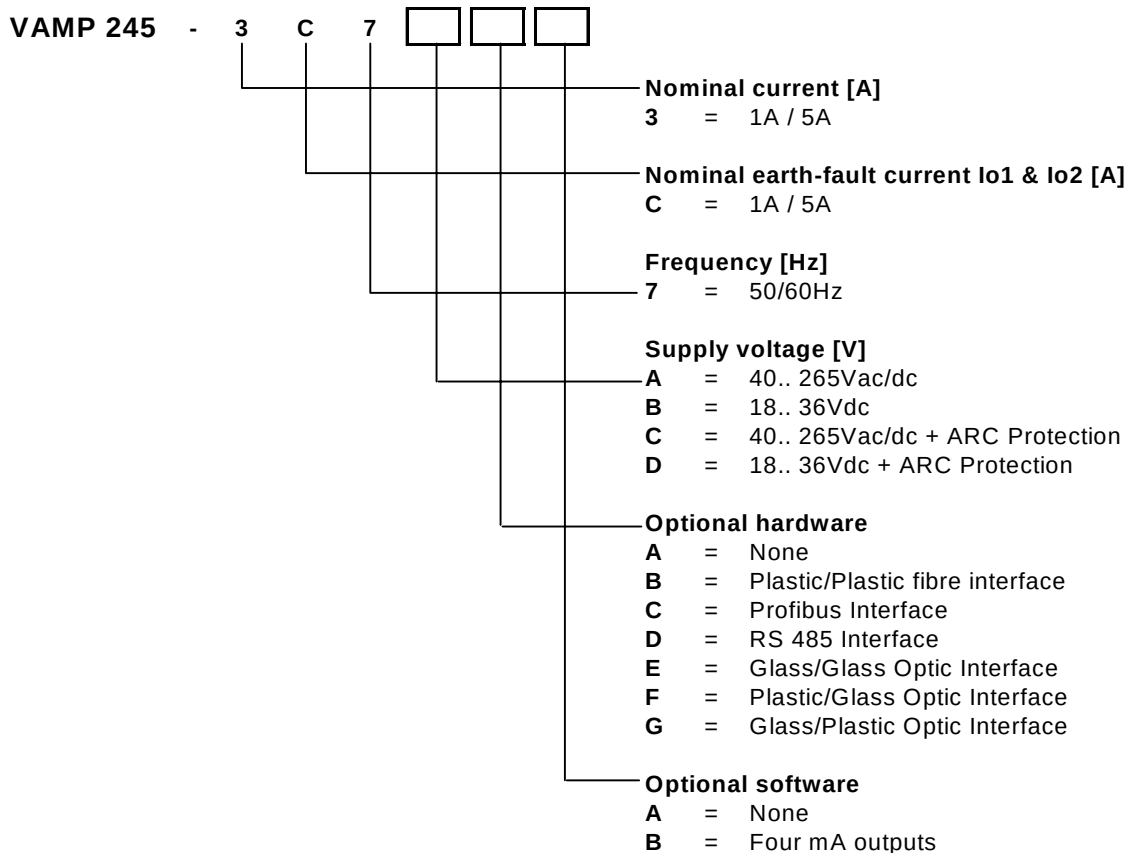


Accessories :

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 (VAMPSet, VEA 3 CG+200serie)	Cable length 3m
VX004-M3	TTL/RS232 Converter Cable (for PLC, VEA3CG+200serie)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VPA 3 CG or VMA 3 CG)	Cable length 3m
VX015-3	TTL/RS232 Converter Cable (for 100serie+VEA3CG)	Cable length 3m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4m
VA 1 DA-6	Arc Sensor	Cable length 6m
VYX076	Raising Frame for 200-serie	Height 40mm
VYX077	Raising Frame for 200-serie	Height 60mm

Feeder protection relay VAMP 245 ordering code

VAMP 245 ORDERING CODE

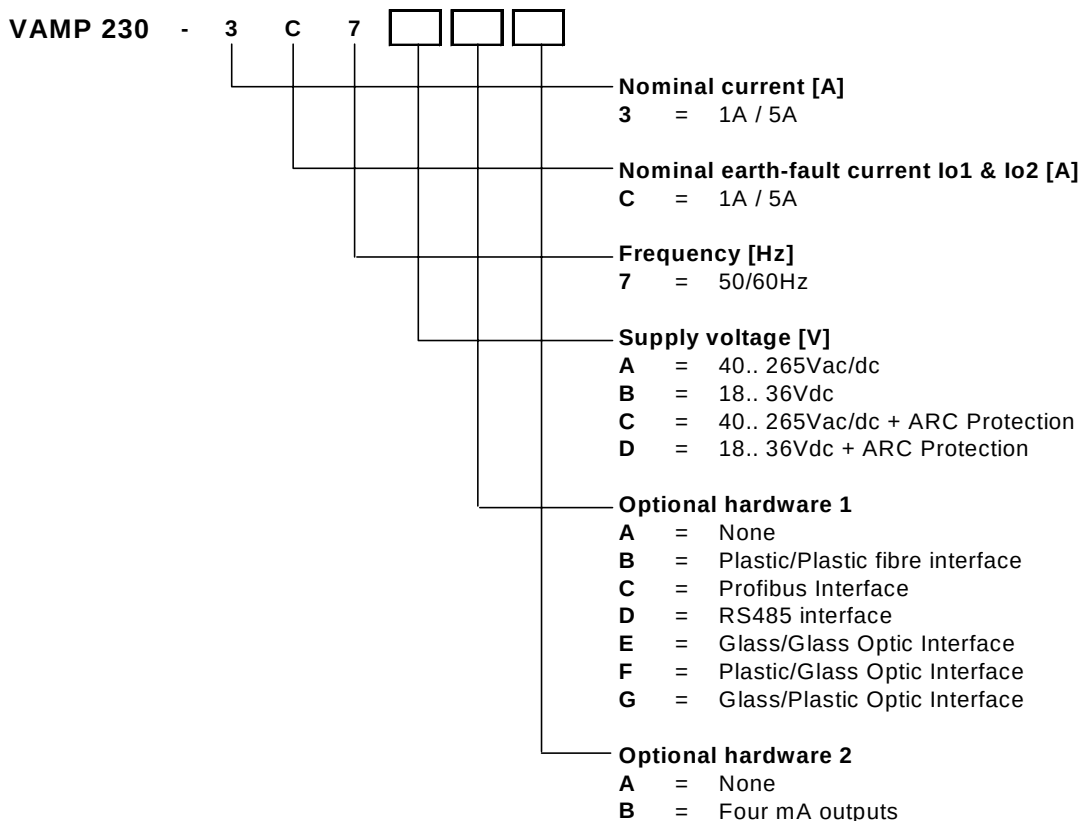


Accessories :

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 (VAMPSet, VEA 3 CG+200serie)	Cable length 3m
VX004-M3	TTL/RS232 Converter Cable (for PLC, VEA3CG+200serie)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VPA 3 CG or VMA 3 CG)	Cable length 3m
VX015-3	TTL/RS232 Converter Cable (for 100serie+VEA3CG)	Cable length 3m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4m
VA 1 DA-6	Arc Sensor	Cable length 6m
VYX076	Raising Frame for 200-serie	Height 40mm
VYX077	Raising Frame for 200-serie	Height 60mm

Directional protection relay VAMP 230 ordering code

VAMP 230 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 (VAMPSet, VEA 3 CG+200serie)	Cable length 3m
VX004-M3	TTL/RS232 Converter Cable (for PLC, VEA3CG+200serie)	Cable length 3m
VX007-F3	TTL/RS232 Converter Cable (for VPA 3 CG or VMA 3 CG)	Cable length 3m
VX015-3	TTL/RS232 Converter Cable (for 100serie+VEA3CG)	Cable length 3m
VX008-4	TTL/RS232 Converter Cable (for Modem MD42, ILPH, ..)	Cable length 4m
VA 1 DA-6	Arc Sensor	Cable length 6m
VYX076	Raising Frame for 200-serie	Height 40mm
VYX077	Raising Frame for 200-serie	Height 60mm

Reference information

Documentation:

Mounting and Commissioning Instructions VMMC.EN0xx

VAMPSET User's Manual VMV.EN0xx

Manufacturer data:

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We reserve the rights to changes without prior notice

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