VIO 12A / B

RTD INPUT MODULES

VIO 12C / D

RTD AND mA OUTPUT / INPUT MODULES

Publication version: VVIO12A/EN M/A005

User manual

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1 General

1. Measures as many as 12 RTD resistances
2. Measuring accuracy ±0,3Ω
3. Supported RTD types:
   - Pt100
   - Ni100
   - Ni120
   - Cu10
4. Communications:

   VIO 12AA:
   - ST-type glass fiber (only TX)
   - RS-232 (can only be used with VAMP40)

   VIO 12AB:
   - RS-485

   VIO 12AC & VIO 12AD:
   - ST-type glass fiber (TX and RX)
   - RS-232 (can only be used with VAMP40)
   - RS-485
5. Supported External I/O protocols: *
   - RTDinput (special protocol designed for VIO 12A)
   - Modbus RTU
6. Steel plate case
7. Assembly options:
   - 35mm DIN-RAIL
   - Wall mounted
   - VAMP40 back panel
8. Power supply:
   - VIO 12AA & VIO 12AB: 24 – 230Vac/dc, 50/60Hz
   - VIO 12AC: 24Vdc
   - VIO 12AD: 48 – 230Vac/dc, 50/60Hz
9. Operating temperature: 0°C - +55°C

Note: * In VAMP relays the Modbus RTU and RTDinput communications to VIO 12A (or other external I/O modules) are communally named as External I/O protocols.

2 Layout

2.1 VIO 12AA RTD input module

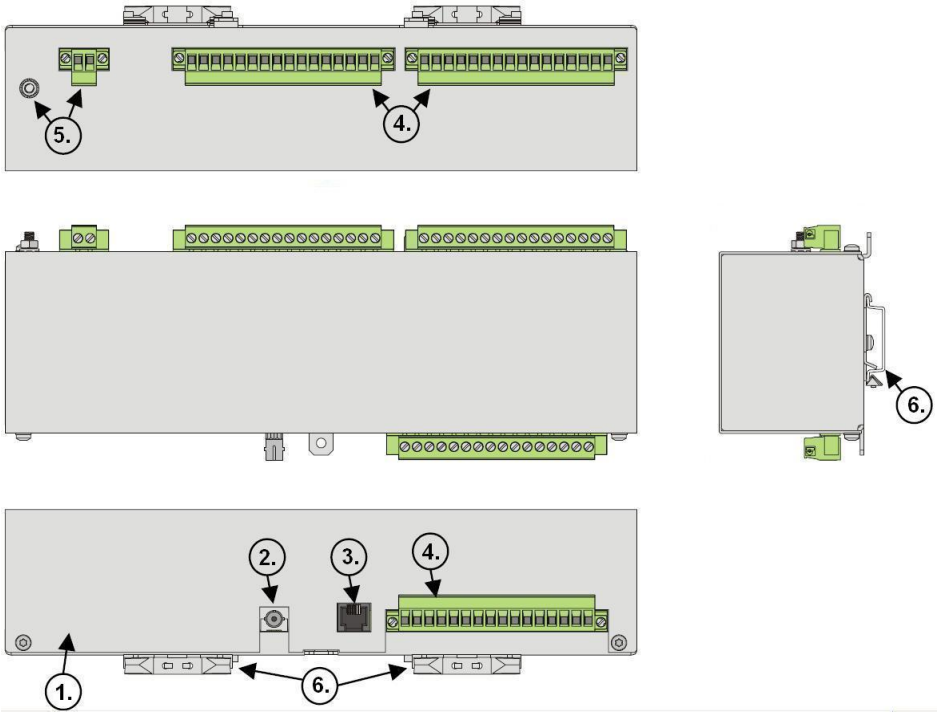


Figure 2.1-1 VIO 12AA RTD input module layout

1. Metal enclosure
2. Glass fiber Tx communication
3. RS-232 communication (can only be used with VAMP40)
4. RTD inputs (12 channels, 3-wire connection + shield / channel)
5. Power connector and PE connection
6. DIN Rail mounting

2.2 VIO 12AB RTD input module

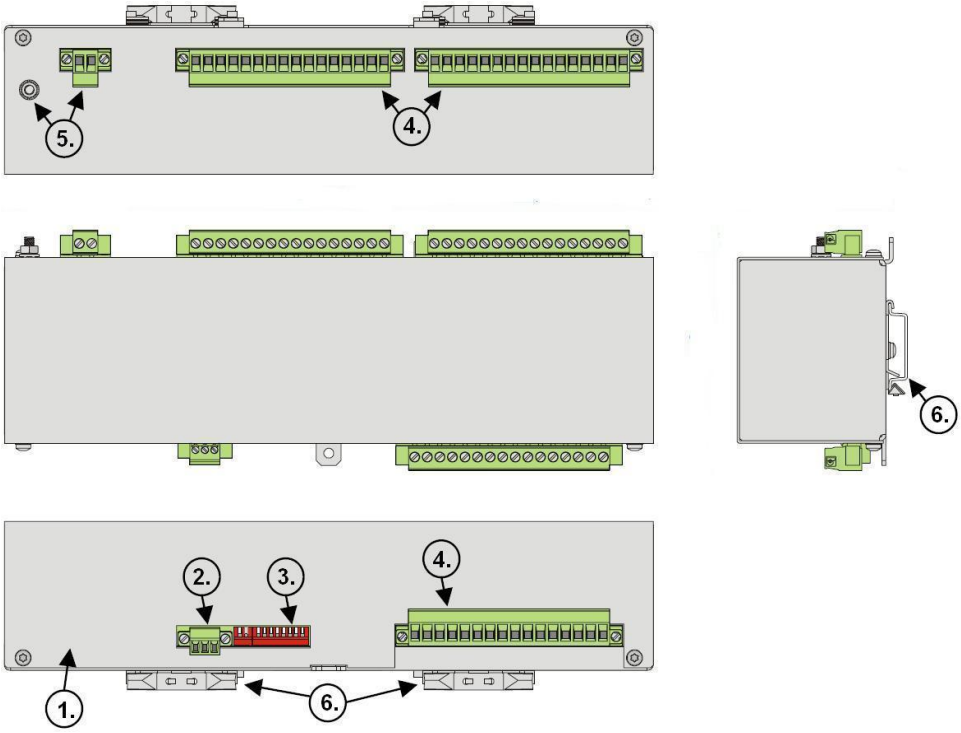


Figure 2.2-1 VIO 12AB RTD input module layout

1. Metal enclosure
2. RS-485 communication (including Termination switch)
3. Address DIP Switch
4. RTD inputs (12 channels, 3-wire connection + shield / channel)
5. Power connector and PE connection
6. DIN Rail mounting

2.3 VIO 12AC & VIO 12AD RTD input and mA input/output modules

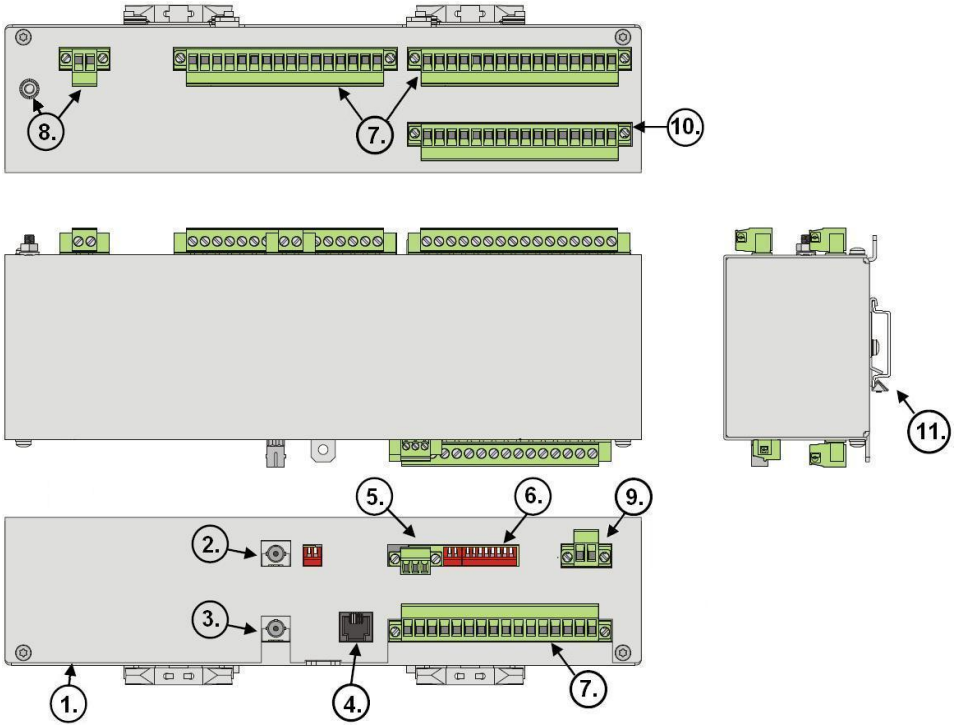


Figure 2.3-1 VIO 12AC / VIO 12AD RTD input module layout

1. Metal enclosure
2. Glass fiber Rx communication
3. Glass fiber Tx communication
4. RS-232 communication (can only be used with VAMP40)
5. RS-485 communication (including termination switch)
6. Address DIP switch
7. RTD inputs (12 channels, 3-wire connection + shield / channel)
8. Power connector and PE connection
9. PTC input (2-wire connection)
10. Four mA inputs / four mA outputs (2-wire connection /channel)
11. DIN Rail mounting

3 Operation

VIO 12A supports two different External I/O protocols:

- RTDinput (Figure 3-1)
- Modbus RTU (Figure 3-2).

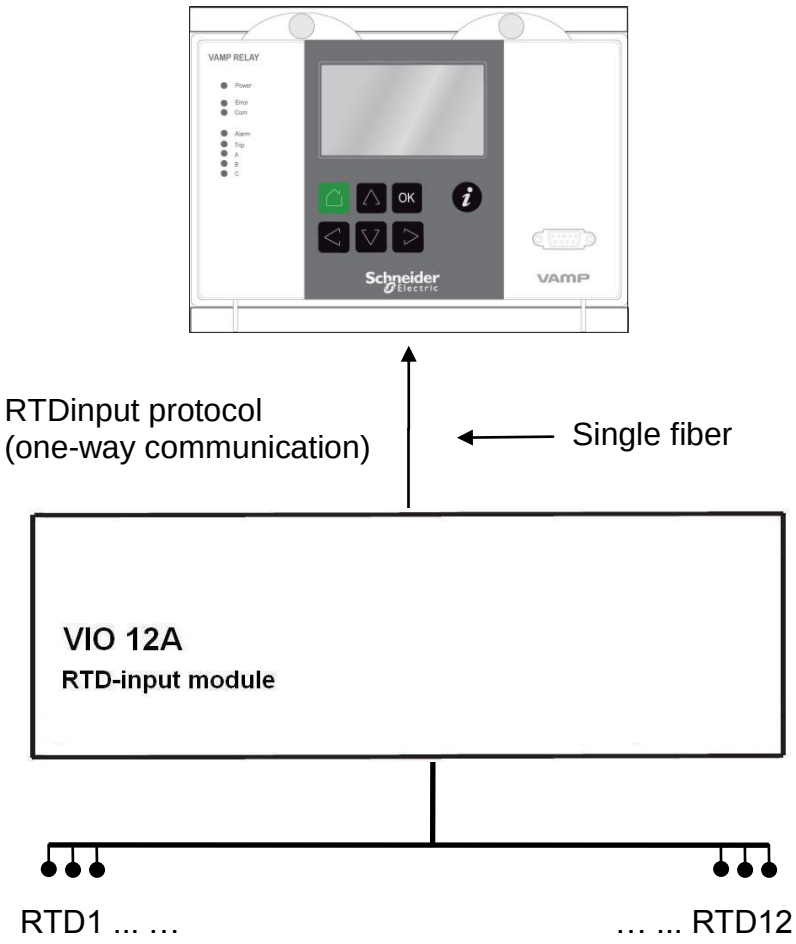


Figure 3-1 RTDinput protocol operation principle

Function

- Measure the resistances of RTD sensors and send results via RTDinput protocol.

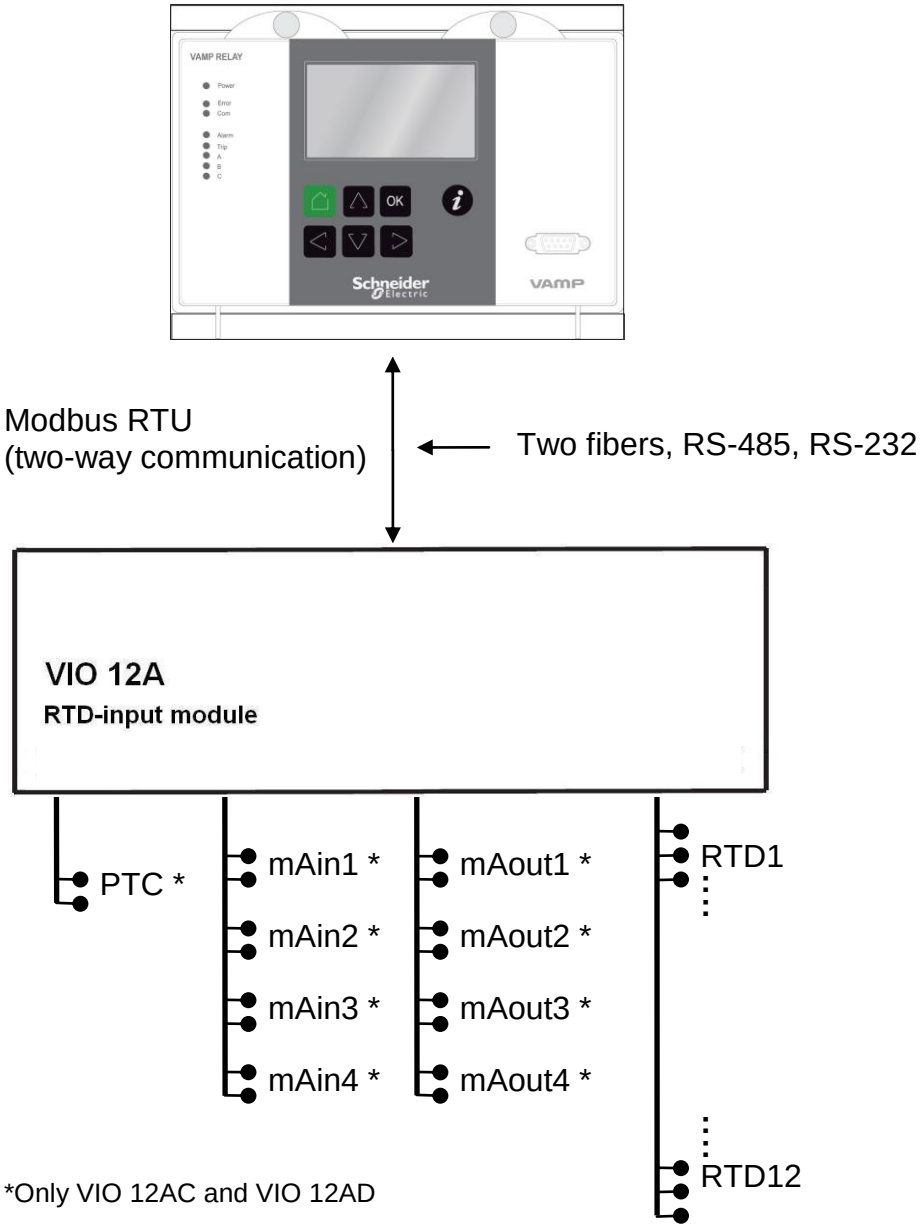


Figure 3-2 Modbus RTU operation principle

Function

- Measure the resistances of RTD sensors and send results via Modbus RTU.
- Measure analog inputs (mA and PTC) and send results via Modbus RTU. (Only VIO 12AC and VIO 12AD).
- Provide analog outputs (mA). (Only VIO 12AC and VIO 12AD)

Table 3-1 shows the resistances of supported RTDs in various temperatures.

Temperature (°C)	RTD type			
	Pt100	**Ni100**	**Ni120**	**Cu10**
300	212,02	-	439,44	-
200	175,84	223,20	303,46	16,78
100	138,50	161,80	200,64	12,90
90	134,70	154,90	191,64	12,51
80	130,89	148,30	182,84	12,12
70	127,07	141,70	174,25	11,74
60	123,24	135,30	165,90	11,35
50	119,40	129,10	157,74	10,97
40	115,54	123,00	149,79	10,58
30	111,67	117,10	142,06	10,19
20	107,79	111,20	134,52	9,81
10	103,90	105,60	127,17	9,42
0	100,00	100,00	120,00	9,04
-10	96,09	94,60	113,00	8,65
-20	92,16	89,30	106,15	8,26
-30	88,22	84,10	99,41	7,88
-40	84,27	79,10	92,76	7,49
-50	80,31	-	86,17	7,10

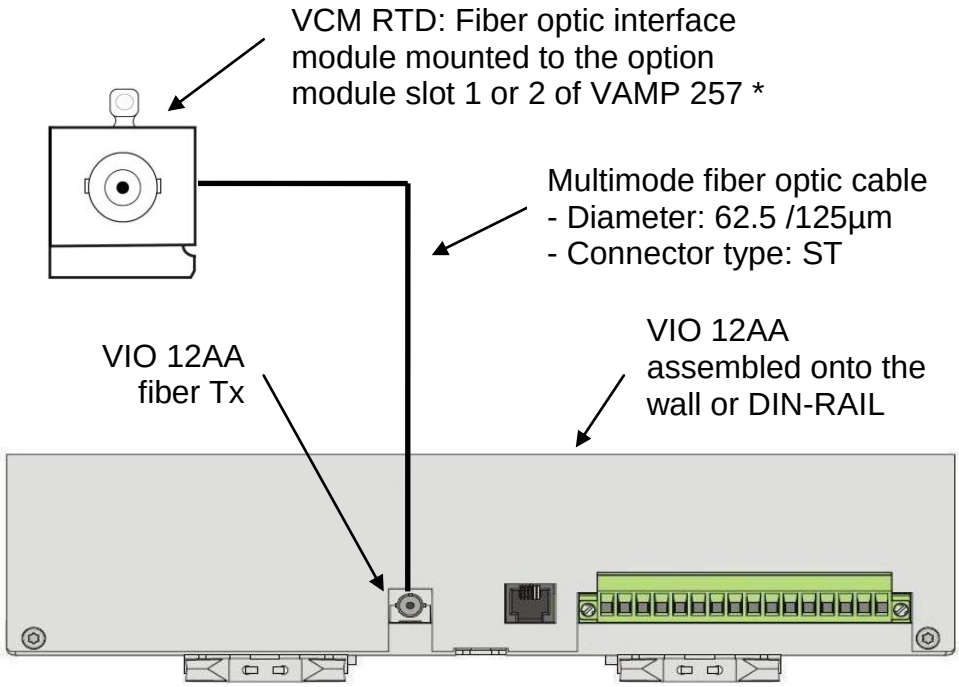
Table 3-1 Supported RTDs

4 Application

This chapter deals with the different ways to use VIO 12A and VAMP accessories with VAMP relays.

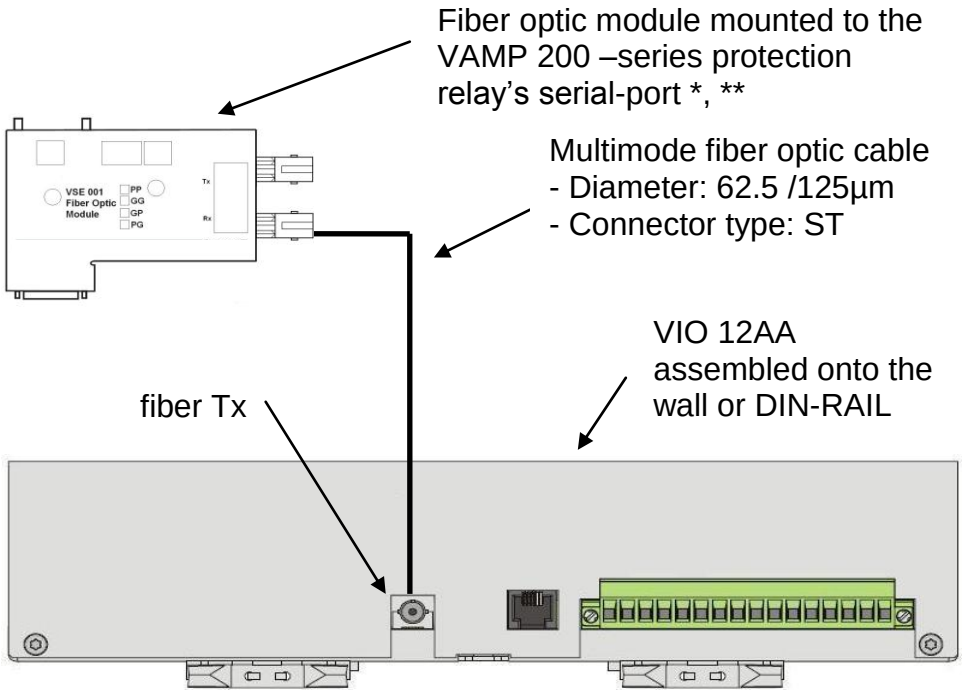
4.1 VIO 12AA

Glass fiber application with VAMP 257



* For detailed mounting instructions, refer to the VAMP257 User Manual

Glass fiber application with VAMP 200-series protection relays



* Refer to the Table 4.1-1 for compatible VAMP relays and fiber optic modules

** For detailed mounting instructions, refer to the User Manual of the particular fiber optic module

Table 4.1-1 shows fiber optic modules that can be used with VAMP relays in one-way glass fiber application.

Fiber optic module	VAMP relay
VCM RTD	257
VCM 485+FI, VCM232+FI, VCM FIBRE	50, 51, 52
VSE 001 GG	40, 50, 51, 52, 200-series
VSE 001 GP	40, 50, 51, 52, 200-series

Table 4.1-1 Compatible fiber optic modules and VAMP relays

Communication over glass fiber:

- External I/O (RTDinput): VIO 12AA transmits RTD measurements to VAMP relay.

RS-232 application:

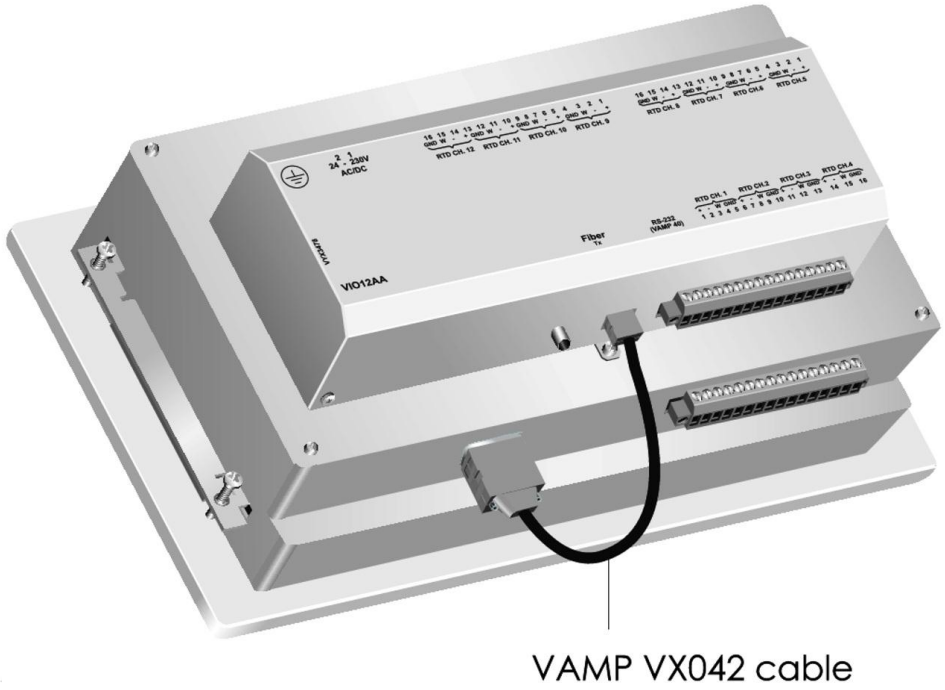


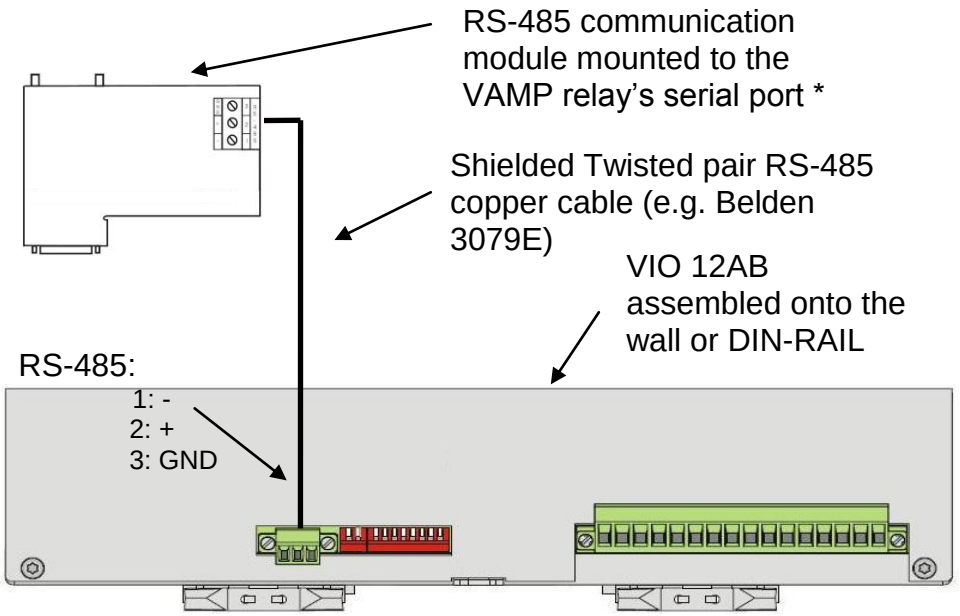
Figure 4.1-1 RS-232 application with VAMP 40

Communication over RS-232:

- External I/O (Modbus RTU): VAMP relay reads RTD measurements from VIO 12AA.

4.2 VIO 12AB

RS-485 application



* For detailed connecting instructions, refer to the User Manual of the particular RS-485 communication module

Table 4.2-1 shows RS-485 modules that can be used with VAMP relays in RS-485 application.

RS-485 module	VAMP relay
VSE 002	40, 50, 51, 52, 210, 230, 245, 255, 257, 265
VCM 485-2, VCM 485-4	257
VCM 485+XX	50, 51, 52
VSE 003	210, 230, 245, 255, 265
VSE 004	40
VSE 005-1	40
VSE 005-2	210, 230, 245, 255, 265

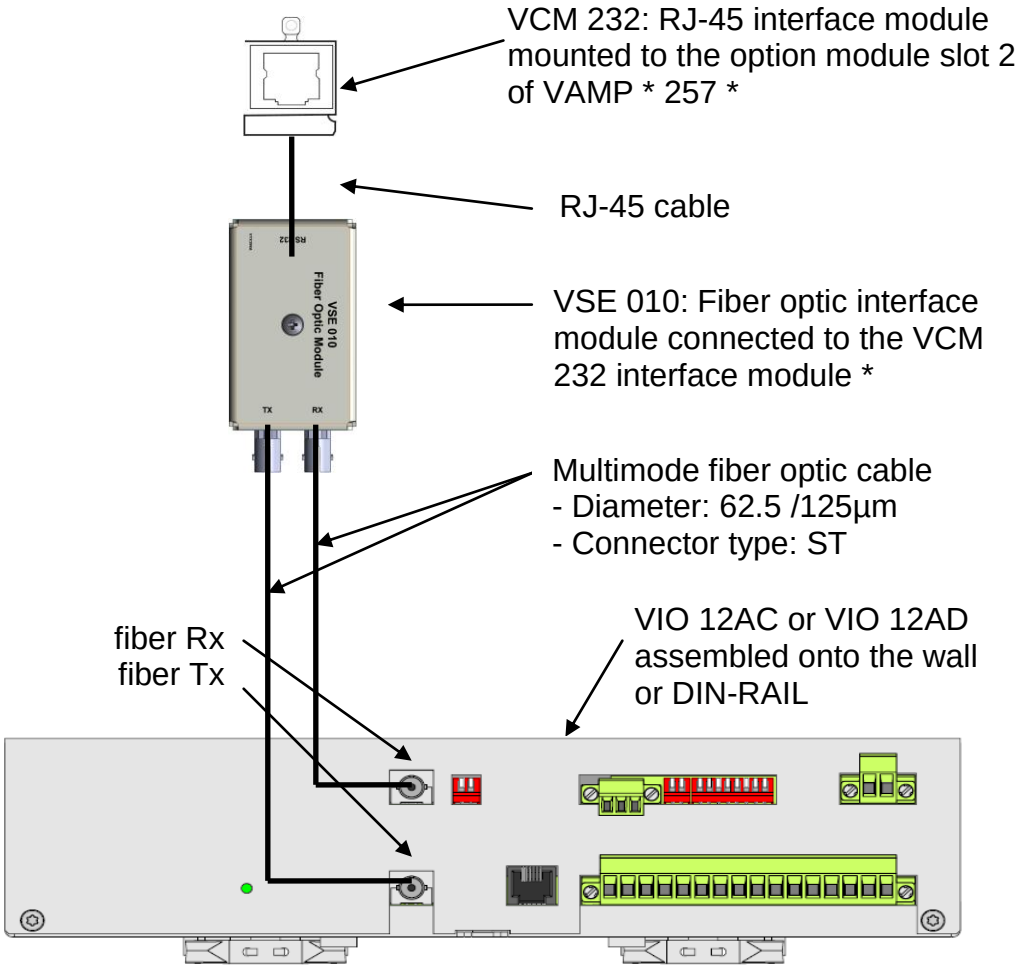
Table 4.2-1 Compatible RS-485 modules and VAMP relays

Communication over RS-485:

- External I/O (Modbus RTU): VAMP relay reads RTD measurements from VIO 12AB.
- External I/O (RTDinput): VIO 12AB transmits RTD measurements to VAMP relay.

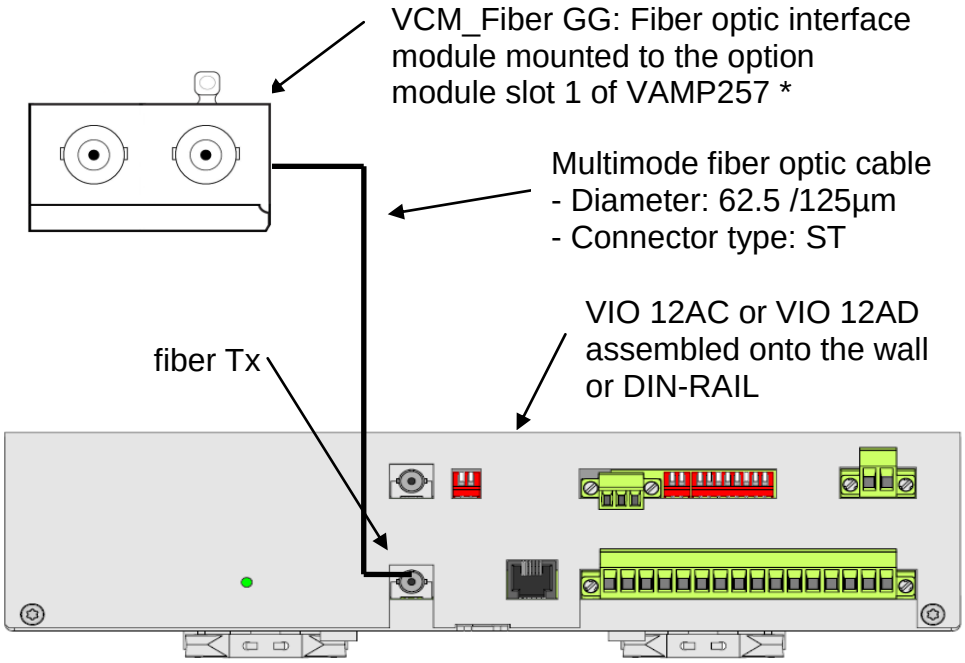
4.3 VIO 12AC & VIO 12AD

Glass fiber application with VAMP 257:



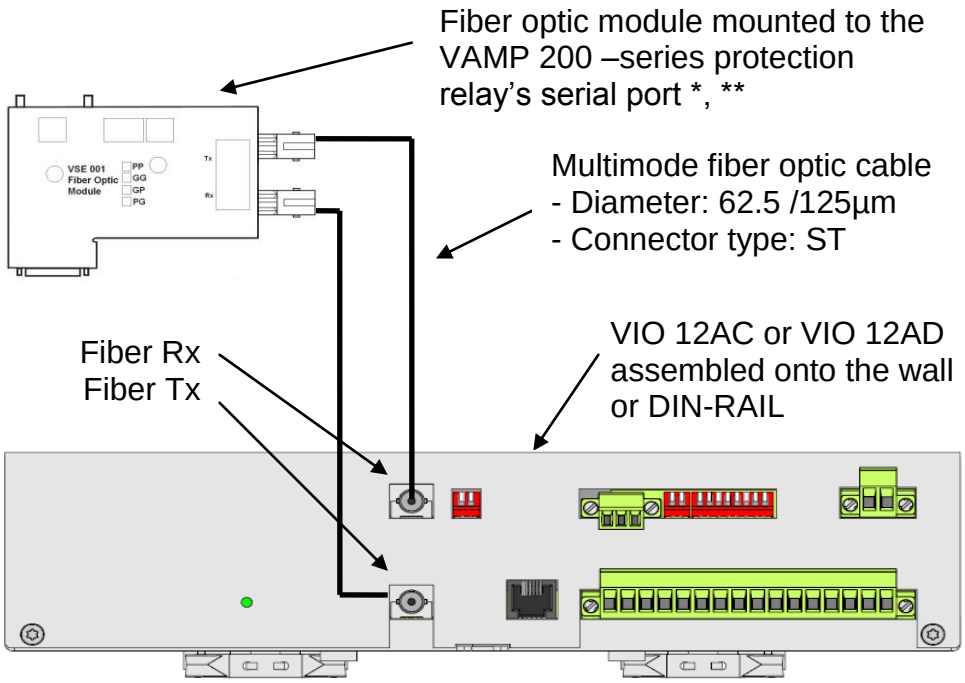
* For detailed connecting instructions, refer to the VAMP257 User Manual

Glass fiber application with VAMP 257:



* For detailed mounting instructions, refer to the VAMP257 User Manual

Glass fiber application with VAMP 200 –series protection relays:



* Refer to the Table 4.3-1 for compatible VAMP relays and fiber optic modules

** For detailed mounting instructions, refer to the User Manual of the particular fiber optic module

Table 4.3-1 shows fiber optic modules that can be used with VAMP relays in two-way glass fiber application.

Fiber optic module	VAMP relay
VSE 010	257
VCM_Fibre GG	257
VCM Fibre (GG)	50, 51, 52
VSE 001 GG	40, 200-series

Table 4.3-1 Compatible fiber optic modules and VAMP relays

Communication over glass fiber:

- External I/O (Modbus RTU): VAMP relay reads RTD measurements from VIO 12AC / VIO 12AD.
- External I/O (RTDinput): VIO 12AC / VIO 12AD transmits RTD measurements to VAMP relay.

RS-232 application:

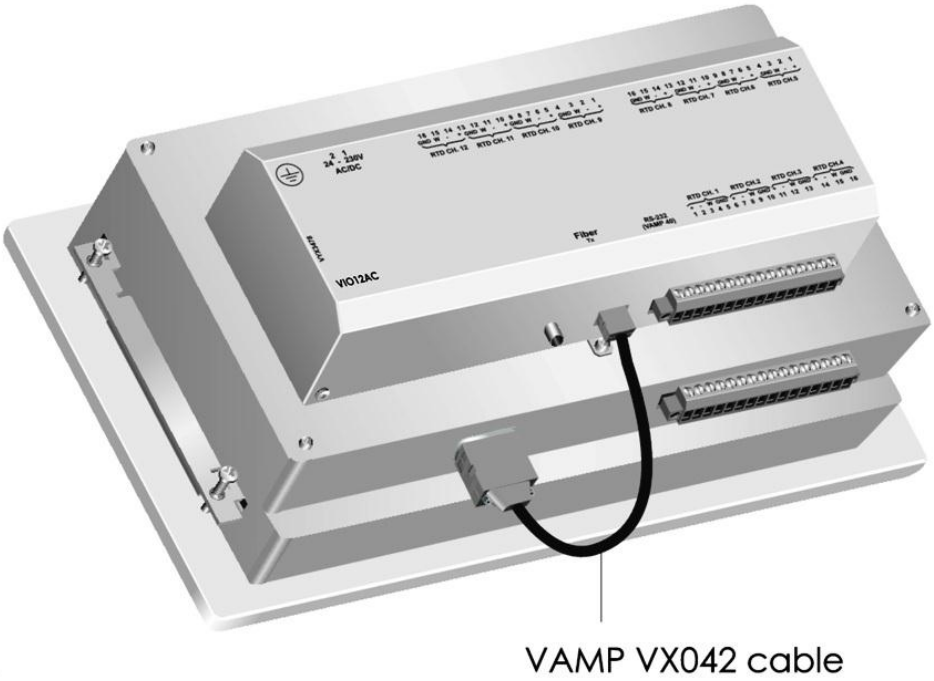
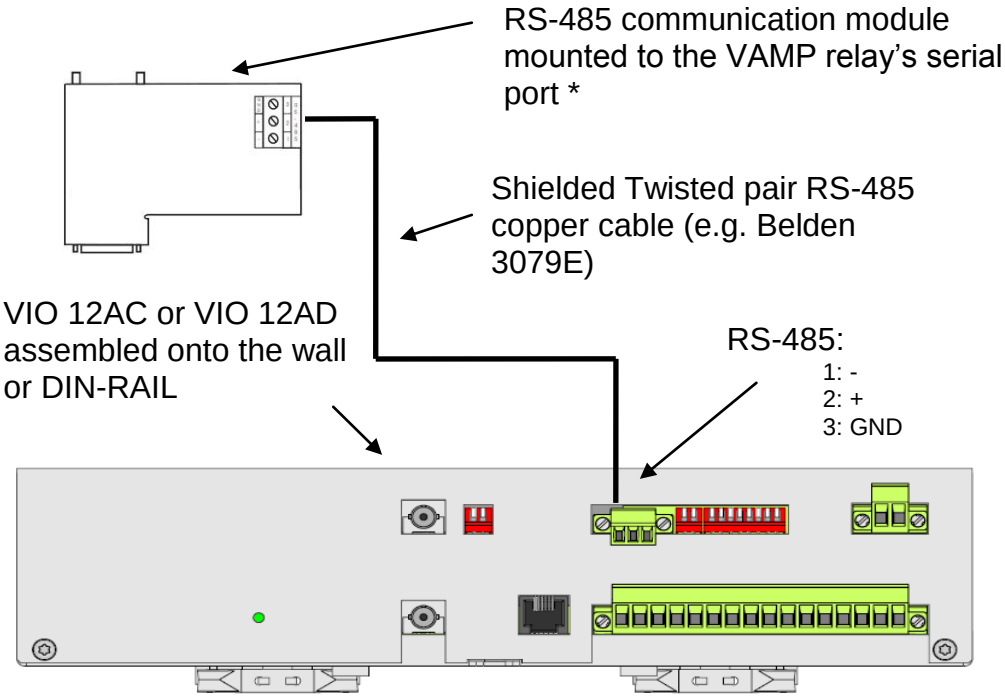


Figure 4.3-1 RS-232 application with VAMP 40

Communication over RS-232:

- External I/O (Modbus RTU): VAMP relay reads RTD measurements from VIO 12AC / VIO 12AD.

RS-485 application:



* For detailed connecting instructions, refer to the User Manual of the particular RS-485 communication module

Table 4.3-2 shows RS-485 modules that can be used with VAMP relays in RS-485 application.

RS-485 module	VAMP relay
VSE 002	40, 50, 51, 52, 210, 230, 245, 255, 257, 265
VCM 485-2, VCM 485-4	257
VCM 485+XX	50, 51, 52
VSE 003	210, 230, 245, 255, 265
VSE 004	40
VSE 005-1	40
VSE 005-2	210, 230, 245, 255, 265

Table 4.3-2 Compatible RS-485 modules and VAMP relays

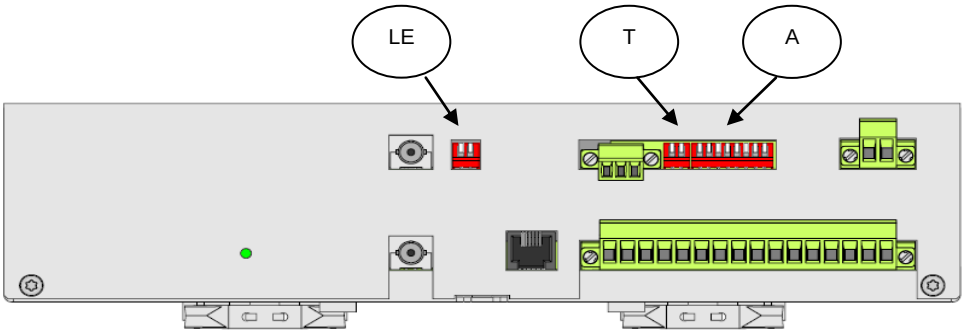
Communication over RS-485:

- External I/O (Modbus RTU): VAMP relay reads RTD measurements from VIO 12AC / VIO 12AD.
- External I/O (RTDinput): VIO 12AC / VIO 12AD transmits RTD measurements to VAMP relay.

4.4 Communication Settings

DIP-Switches – Functionality:

The purpose of the DIP switches on the VIO-12 modules is to allow the user to set the proper communication settings required by the application.



	VIO- Module		
Switch	**12AA**	**12AB**	**12AC/AD**
LE*			X
T		X	X
A		X	X

Table 4.4-1 DIP Switches in VIO 12

Notes:
***) LE switch is divided into two parts, LE:1 and LE:2**
****) "X" stands for: available in VIO module.**
*****) The switch position is ON when the switch is turned DOWNWARDS.**

LE. Light - Echo Switch

LE:1. Light Switch

Position	Function : VIO's optical fiber communication setup.
ON	Light is on when there is no data being sent.
OFF	Light is off when there is no data being sent.

LE:2. Echo Switch

Position	Function: VIO's optical fiber communication setup. Application: Multi-slave chain / Ring topology setup
ON	VIO echoes the data received to the next device in the chain.
OFF	VIO doesn't echo to the next device in the chain.

T. Term. Switch (Termination Switch)

The termination switch is related only to the RS-485 interface, both switches must be ON or OFF at the same time.

Position	Function : Selection of the termination resistor of 120 ohms for the RS-485 interface.
ON	Resistor is selected
OFF	Resistor is not selected

Note: Switch must be either ON or OFF at BOTH ENDS of the communication line.

A. Address Switch

The address switch is meant for selecting the slave address for the VIO module.

Position	Function : Assignment of slave address for the VIO module.
ON	Selected single address bit is set to 1.
OFF	Selected single address bit is set to 0.

The address switch has a total of 8 single switches. Their combination provides the user with an address space of 256 addresses (0-255). However, it is very important to notice that Modbus protocol's requirements restrict the use of addresses 0 and others larger than 247 (decimal base).

Example:

The address switch represents the VIO-12's address in its binary notation.

	Address Switch							
OFF		■		■	■	■	■	■
ON	■		■					
	1	2	3	4	5	6	7	8

5 (decimal) = (Switch 8→1) 00000101 (binary)

Note:

RTDinput protocol

By setting VIO 12AB/AC/AD module's address to '0' it is possible to use RTDinput protocol to send RTD measurements to the relay.

When implementing the connection between VIO 12AB/AC/AD and VAMP relay with RS-485 via RTDinput protocol, it needs to be taken into consideration that no other modules can be connected to the RS-485 bus.

Please note that mA outputs and inputs can not be used via RTDinput protocol

5 Connections

5.1 RTDs

RTD connections are equal in all versions of VIO 12A. Figure 5.1-1 shows the proper way to connect RTDs.

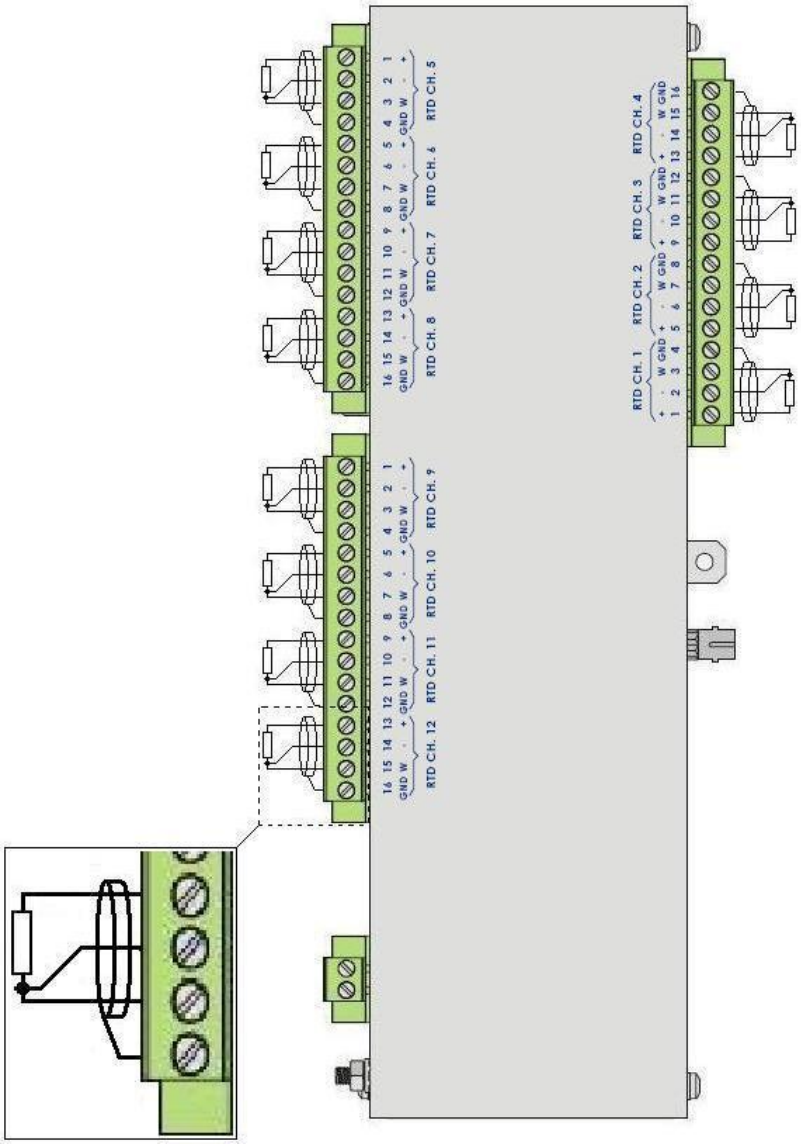


Figure 5.1-1 Connections of RTDs

Cable type:

Shielded non-paired control and instrumentation cable (e.g. Belden 8771)

5.2 mA inputs / -outputs connections

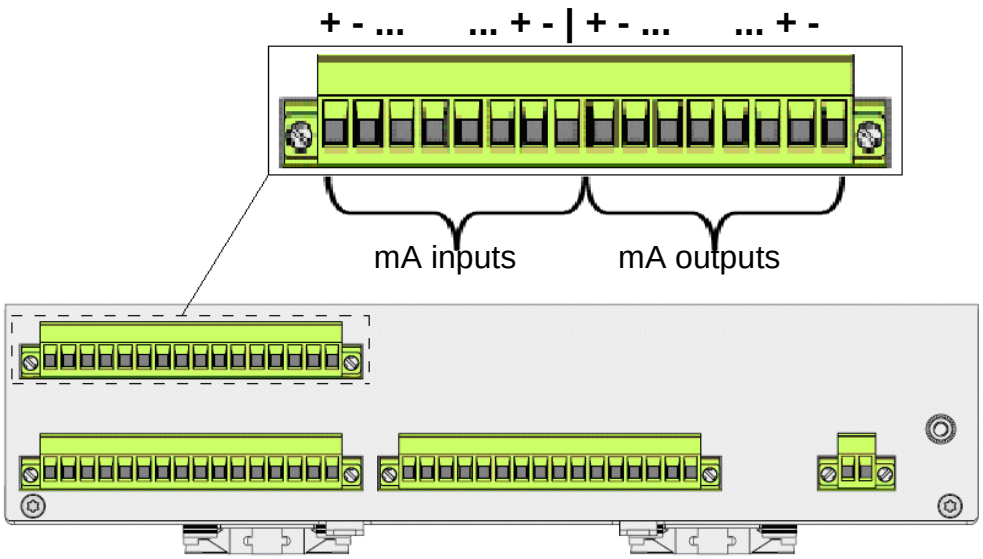


Figure 5.2-1 VIO 12AC / VIO 12AD mA input and mA output connection cables

Cable type:
Shielded non-paired control and instrumentation cable (e.g. Belden 8771).

PTC connections

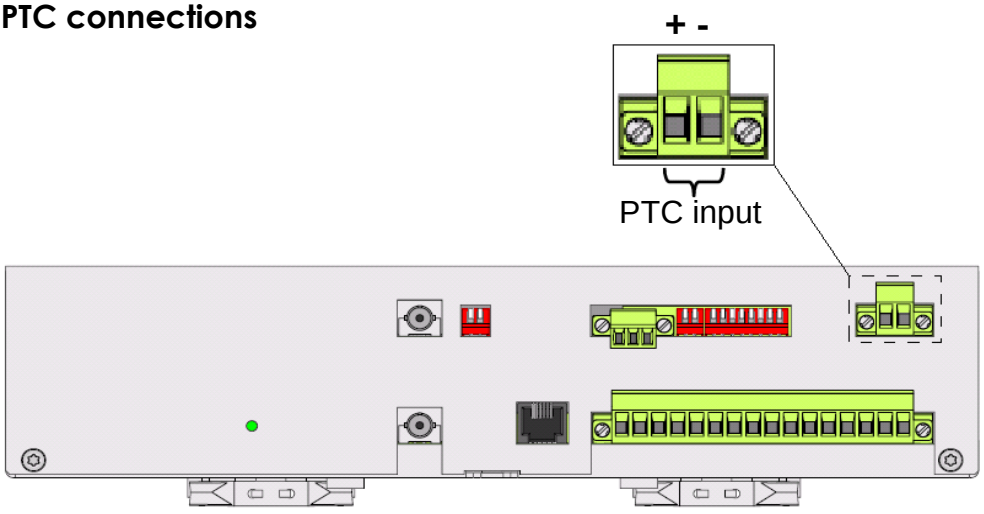


Figure 5.2-2 VIO 12AC / VIO 12AD PTC connection cables

Cable type:
Shielded non-paired control and instrumentation cable (e.g. Belden 8771).

6 Configurations

This chapter describes the configurations required to correctly set up VAMP relay and VIO 12A module.

6.1 Connecting VAMP relay to PC

Connect cable VX003 to relay's front panel (see Figure 6.1-1).

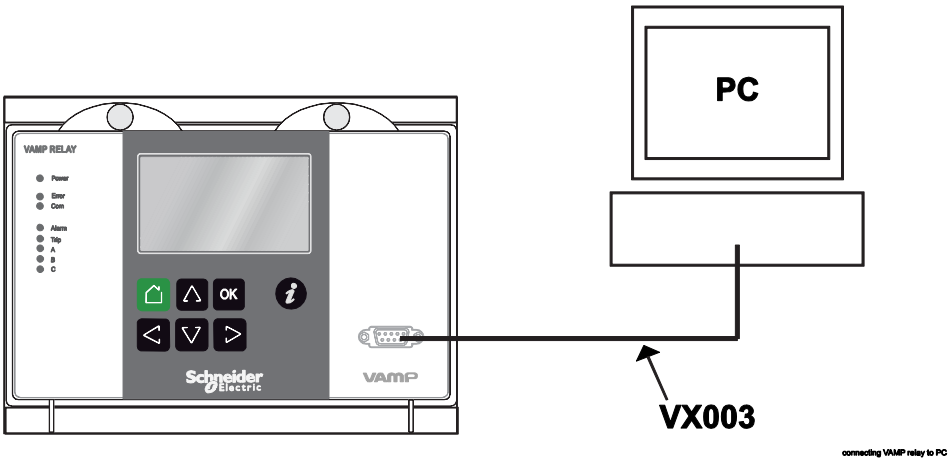


Figure 6.1-1 Connecting cable VX003 to the relay's front port for the External I/O settings of the relay.

For more information about communication between VAMP relay and PC refer to the User Manual of particular VAMP relay and VAMPSET.

6.2 Relay settings

All versions of VIO 12A include support for both of the External I/O protocols (RTDinput* and Modbus RTU). Settings to the relay must be done according to the protocol used.

Note: * Special protocol designed for VIO 12AA

6.2.1 Protocol configuration

In VAMPSET's "Protocol Configuration" -menu select "External I/O" as protocol to one of the available serial ports (Figure 6.2.1-1). The same port must be equipped with suitable hardware interface module to receive data from the module.

Figure 6.2.1-1 Protocol configuration

6.2.2 External I/O configuration

Find the "External I/O Configuration" –menu of the relay in VAMPSET (Figure 6.2.2-1) and select the protocol to be used according to the connection method of VIO 12A.

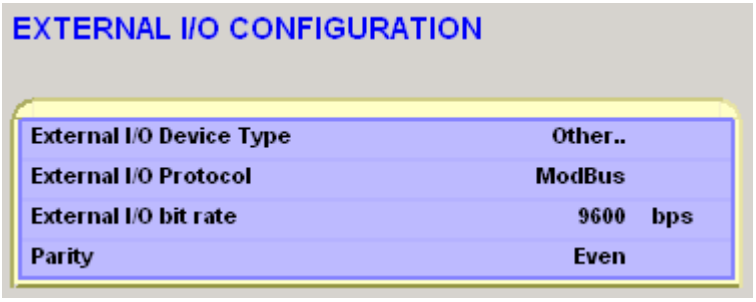


Figure 6.2.2-1 External I/O Configuration –menu

VIO 12A connection method: One fiber cable

Parameter	Value(s)
External I/O Device Type	VIO 12AA
External I/O Protocol *	RTDinput
External I/O bit rate *	9600
Parity *	Even

Table 6.2.2-1External analog input settings

Note: * After changing this parameter the relay needs to be rebooted.

VIO 12A connection method: RS-232, RS-485 or two fiber cables

Parameter	Value(s)
External I/O Device Type **	VIO 12AA, VIO 12AB, VIO 12AC
External I/O Protocol *	Modbus
External I/O bit rate *	9600
Parity *	Even

Table 6.2.2-2 External analog input settings

Note: * After changing this parameter the relay needs to be rebooted.
**** With this method VIO 12AA can be used only with VAMP 40.**

RTD Inputs- Quick Setup

In RTD Inputs- Quick Setup (Figure: 6.2.2-2) it is possible to easily set up relay's most common RTD settings.

Figure 6.2.2-2 RTD Inputs- Quick Setup

Parameter	Value(s)
AI Enabled	On / Off
RTD Ch	Not editable
RTD Sensor Type	Other.., Pt100, Ni100, Ni120, Cu10
RTD Sensor Function	Off, WindingG, BearingG, Ambient, Other..
Alarm Limit *	User defined
Trip Limit *	User defined

Table 6.2.2-3 RTD Inputs- Quick Setup parameters

Note: * Unit: Celsius

6.2.3 External analog inputs

Settings

Find the “External Analog Inputs” –menu of the relay with VAMPSET (Figure 6.2.3-1).

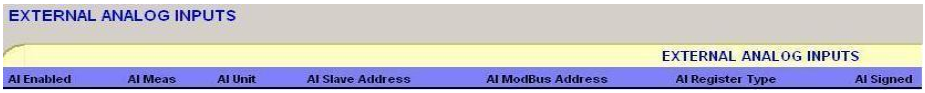


Figure 6.2.3-1 External analog inputs –settings of the relay

Refer to the Table 6.2.3-1 for the proper values to the parameters “AI Enabled”, “AI Unit”, “AI Slave Address”, “AI Modbus Address”, “AI Register Type” and “AI Signed”.

AI Enabled	AI Unit	AI Slave Address	AI Modbus Address	AI Register Type	AI Signed
On	C	1 - 247	Refer to the table 4.2.2-3	HoldingR	Off

Table 6.2.3-1 External analog input settings

Note: When External I/O-protocol selection is RTDinput, the AI Slave Address, AI Modbus Address, AI Register Type and AI Signed can be left to their default values.

Scalings

Also in the external analog inputs –menu give proper values to parameters “AI Offset”, “x1”, “x2”, “y1” and “y2”. Refer to the Table 6.2.3-2 for proper values of the particular RTD.

	AI Offset	X1	Y1	X2	Y2
Pt100	0	10000	0	13850	100
Ni100	0	10000	0	16180	100
Ni120	0	12000	0	20064	100
Cu10	0	904	0	1290	100

Table 6.2.3-2 Scaling values for each supported RTD type

Registers

	Modbus register	Properties
RTD1's resistance	301	Read
RTD2's resistance	302	Read
RTD3's resistance	303	Read
RTD4's resistance	304	Read
RTD5's resistance	305	Read
RTD6's resistance	306	Read
RTD7's resistance	307	Read
RTD8's resistance	308	Read
RTD9's resistance	309	Read
RTD10's resistance	310	Read
RTD11's resistance	311	Read
RTD12's resistance	312	Read
mA-input 1 *	313	Read
mA-input 2 *	314	Read
mA-input 3 *	315	Read
mA-input 4 *	316	Read
PTC-resistance *	317	Read
mA-output 1 *	318	Read / Write
mA-output 2 *	319	Read / Write
mA-output 3 *	320	Read / Write
mA-output 4 *	321	Read / Write

Table 6.2.3-3 VIO 12A External I/O registers

Note: * Only in VIO 12AC and VIO 12AD

6.2.4 External analog Outputs

Settings

Find the “External Analog Output”- menu (under +External) of the relay with VAMPSET (Figure 6.2.4-1).

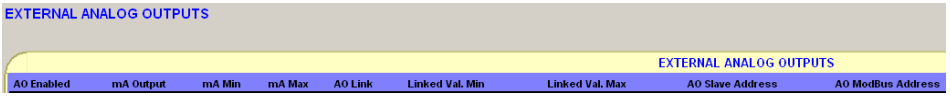


Figure 6.2.4-1 External analog outputs – settings

Refer to the table 6.2.4-1 for a more detailed explanation on the values that can be assigned to the parameters under this menu.

Parameter	Value	Explanation	Note
AO Enabled	ON	Analog output enabled	-
	OFF	Analog output not enabled	-
mA Output	Typical: 0-20	Analog output current	Unit: mA Depends on the values set for the parameters mA Min, mA Max, Linked Val. Min/Max and Modbus Min/Max parameters.
mA Min	Refer to note	Minimum output current	Unit : mA Value: user defined. Depends on the values set for the parameters: Linked Val. Min and Min Modbus. Value set is related to ModBus Min by a ratio of 1:1000. Typical Value : 0 mA
mA Max	Refer to note	Maximum output current	Unit: mA Value: user defined. Depends on the values set for the parameters: Linked Val. Max and Max Modbus. Value set is related to ModBus Max by a ratio of 1:1000. Typical Value : 20 mA or 25 mA (maximum)

Parameter	Value	Explanation	Note
AO Link	Refer to note	Relay's or Vio's analog input -measurement.	This parameter directly linked to the mA output parameter.
Linked Val. Min	Refer to note	AO Links Minimum Value	Value: User defined Allows scaling of the mA Output parameter
Linked Val. Max	Refer to note	AO Links maximum value	Value: User defined Allows scaling of the mA Output parameter.
Ao Slave address	1-247	VIO's modbus slave address	Value is restricted according to section 4.4 – Address Switch
Ao Modbus address	Refer to Note		Although there are 16 locations available only 4 can be assigned (VIO12-AD). Addresses are by default numbered from 1 to 16. However the address value must be set according the values in table 6.2.4-1. Meaning that: mA Output ←→ Ao ModBus A. ←→ 318 ←→ 319 ←→ 320 ←→ 321
Ao Register type	HoldingR	Holding register	Only available option.
ModBus Min	Refer to note	Minimum value which is sent to the VIO's ModBus register.	Typical value mA Min = 0 ModBus Min = 0
Modbus Max		Maximum value which is sent to the VIO's ModBus	Typical value: mA Max = 20 → ModBus Max = 20000
AO Counter	0 …	Error counter for AO	It increments itself if either Ao Slave Address or Ao Register Address are not set correctly

Table 6.2.4-1 VIO 12A External Analog Outputs parameter setup

6.2.5 Troubleshooting

If an RTD sensor is disconnected, VAMPSET displays a value of -200ºC in the External Analog Inputs –menus respective sensor channel.

If an RTD sensor is short circuited, VAMPSET displays a value of -250ºC in the External Analog Inputs –menus respective sensor channel.

In case of power failure or connection loss to VIO12AX-unit, when using RTDinput-protocol:

- Each sensor channel displays a value of -250ºC
- Timeout –counter increases in the Protocol –menu*

In case of power failure or connection loss to VIO12AX-unit, when using Modbus RTU-protocol:

- Each sensor channel value freezes
- AI error counter increases in the External analog inputs –menu
- Timeout –counter increases in the Protocol –menu*

Note: *If the application uses Remote- or Extension-communication port, an alarm can be generated using relay logic, for e.g inverted Remote.comm –signal can be used to drive a LED

6.3 VIO 12AA settings

6.3.1 RTDinput protocol

If the module is connected to the VAMP relay with the fiber optic cable, then RTDinput protocol is automatically used and no additional settings are needed for VIO 12AA.

6.3.2 Modbus RTU protocol

In order for the VIO 12AA/AC/AD to use Modbus RTU protocol in communication with VAMP relay, VIO 12AA/AC/AD needs to be connected to the VAMP relay with the RS-232 cable. By using RS-232 cable module's address is automatically fixed to 1, baud rate to 9600 b/s and parity is Even.

6.4 VIO 12AB settings

Modbus RTU protocol
VIO 12AB module's address is set with DIP switches. Available address range is 1 – 247. If multiple VIO 12AB modules (or other External I/O modules) are connected to the same RS-485 bus then each module has to have a unique address. The termination must be on in the last module of the RS-485 bus structure. Baud rate is fixed to 9600b/s, parity is Even.

6.4.1 RTDinput protocol

By setting VIO 12AB module's address to '0' it is possible to send RTD measurements to the relay via RTDinput protocol.

Note: When implementing the connection between VIO 12AB and VAMP relay with RS-485 via RTDinput protocol it needs to be taken into consideration that no other modules can be connected to the RS-485 bus.

6.5 VIO 12AC & VIO 12AD settings

6.5.1 Modbus RTU protocol

VIO 12AC / VIO 12AD module's address is set with DIP switches. Available address range is 1 – 247. If RS-485 interface is used and there are multiple VIO 12AC / VIO 12AD modules (or other External I/O modules) connected to the same RS-485 bus then each module has to have a unique address. The termination must be on in the last module of the RS-485 bus structure. Baud rate is fixed to 9600b/s, parity is Even.

6.5.2 RTDinput protocol

By setting VIO 12AC / VIO 12AD module's address to '0' it is possible to send RTD measurements to the relay via RTDinput protocol.

Note: When implementing the connection between VIO 12AC / VIO 12AD and VAMP relay with RS-485 via RTDinput protocol it needs to be taken into consideration that no other modules can be connected to the RS-485 bus. Please note that mA outputs and inputs can not be used via RTDinput protocol

7 Technical data

7.1 General

7.1.1 RTD inputs

	VIO 12AA	VIO 12AB	VIO 12AC	VIO 12AD
RTD inputs	12			
RTD types	Pt100, Ni100, Ni120, Cu10			
Measuring range	1 – 400 Ω			
Measuring accuracy	±0,3 Ω			
Measuring resolution	0,10 Ω			
Measuring time	1s / all channels (1s mean value)			
RTD open-circuit detection	>450 Ω			
RTD short-circuit detection	<1 Ω			

7.1.2 mA inputs

	VIO 12AC	VIO 12AD
mA inputs	4	
Input range	0 – 25 mA	
Input accuracy	±1%	
Input resolution	6 µA (12-bits)	
Input impedance	100 Ω	

7.1.3 mA outputs

	VIO 12AC	VIO 12AD
mA outputs	4	
Output range	0 – 25 mA	
Output accuracy	±1%	
Output resolution	6 μA (12-bits)	
Galvanic isolation	1000 V	
Max. Load / output	750 Ω	

7.1.4 PTC input

	VIO 12AC	VIO 12AD
PTC inputs	1	
Measuring accuracy	±10% (< 10 kΩ)	

7.2 Connections

7.2.1 Measuring circuitry

	VIO 12AA	VIO 12AB	VIO 12AC	VIO 12AD
Cable type	Shielded non-paired control and instrumentation cable (e.g. Belden 8771)			
RTD measuring current	~1 mA			
Maximum wire resistance	50 Ω per lead (corresponds to 2000m at 0,75 mm^2 copper wire)			
Terminal block Maximum wire dimensions	Phoenix MSTB or equivalent 2,5 mm^2 (13-14 AWG)			

7.2.2 Auxiliary voltage

	VIO 12AA	VIO 12AB	VIO 12AC	VIO 12AD
Rated voltage	24 – 230 Vac/dc		24Vdc	48-230Vac/dc
Power consumption	< 1 W (normal conditions)			
Terminal block **Maximum wire dimensions**	Phoenix MSTB or equivalent 2,5 mm^2 (13-14 AWG)			
Power Led	In normal conditions burns continuously. If blinking please contact VAMP support.			

7.2.3 Glass fiber connection

	VIO 12AA	VIO 12AC	VIO 12AD
Fiber type	Multimode fiber optic cable Ø 62,5 /125 µm		
Connector type	ST		
Maximum fiber length	2000 m		

7.2.4 RS-232 connection

	VIO 12AA	VIO 12AC	VIO 12AD
Cable type	VAMP VX042		

7.2.5 RS-485 connection

	VIO 12AB	VIO 12AC	VIO 12AD
Cable type	Shielded twisted pair RS-485 copper cable (e.g. Belden 3079E)		
Terminal block	Phoenix MC or equivalent		
Maximum cable length	1200 m		

7.3 Tests and environmental conditions

7.3.1 Disturbance tests

Emission (IEC / EN 61000-6-4) - Conducted (EN 55011 / CISPR 11) - Emitted (EN 55011 / CISPR 11)	 0.15 - 30 MHz 30 - 1 000 MHz
Immunity (IEC / EN 61000-6-2) - Static discharge (ESD) - Fast transients (EFT) - Surge - Conducted RF - Radiated RF - Power frequency magnetic field - Pulse magnetic field - Voltage dips 7 interruptions	 EN 61000-4-2, class III 6 kV contact discharge 8 kV air discharge EN 61000-4-4, class III 2 kV, 5/50 ns EN 61000-4-5, class III 1kV differential mode 2kV common mode IEC / EN 61000-4-6, Class III 0,15 – 80 MHz, 10V / m IEC / EN 61000-4-3, Class III 80 – 2000 MHz, 10V /m IEC / EN 61000-4-8 100A / m, 50 / 60Hz IEC / EN 61000-4-9 1000A / m, 1,2/50µs IEC / EN 61000-4-11

7.3.2 Test voltage

Voltage tests - dielectric voltage - impulse voltage	IEC 61810-1 2kV 1min 5kV 1,2 / 50µs

7.3.3 Environmental conditions

	VIO 12AA	VIO 12AB	VIO 12AC	VIO 12AD
Operating temperature	0°C - +55°C			

7.3.4 Casing

	VIO 12AA	VIO 12AB	VIO 12AC	VIO 12AD
Degree of protection (IEC 60529)	IP20			
Dimensions (W x H x D)	262,0 x 97,8 x 66,7 mm			
Material	1 mm steel plate			
Weight	About 1 kg			

8 Construction and mounting

8.1 DIN-RAIL mounting

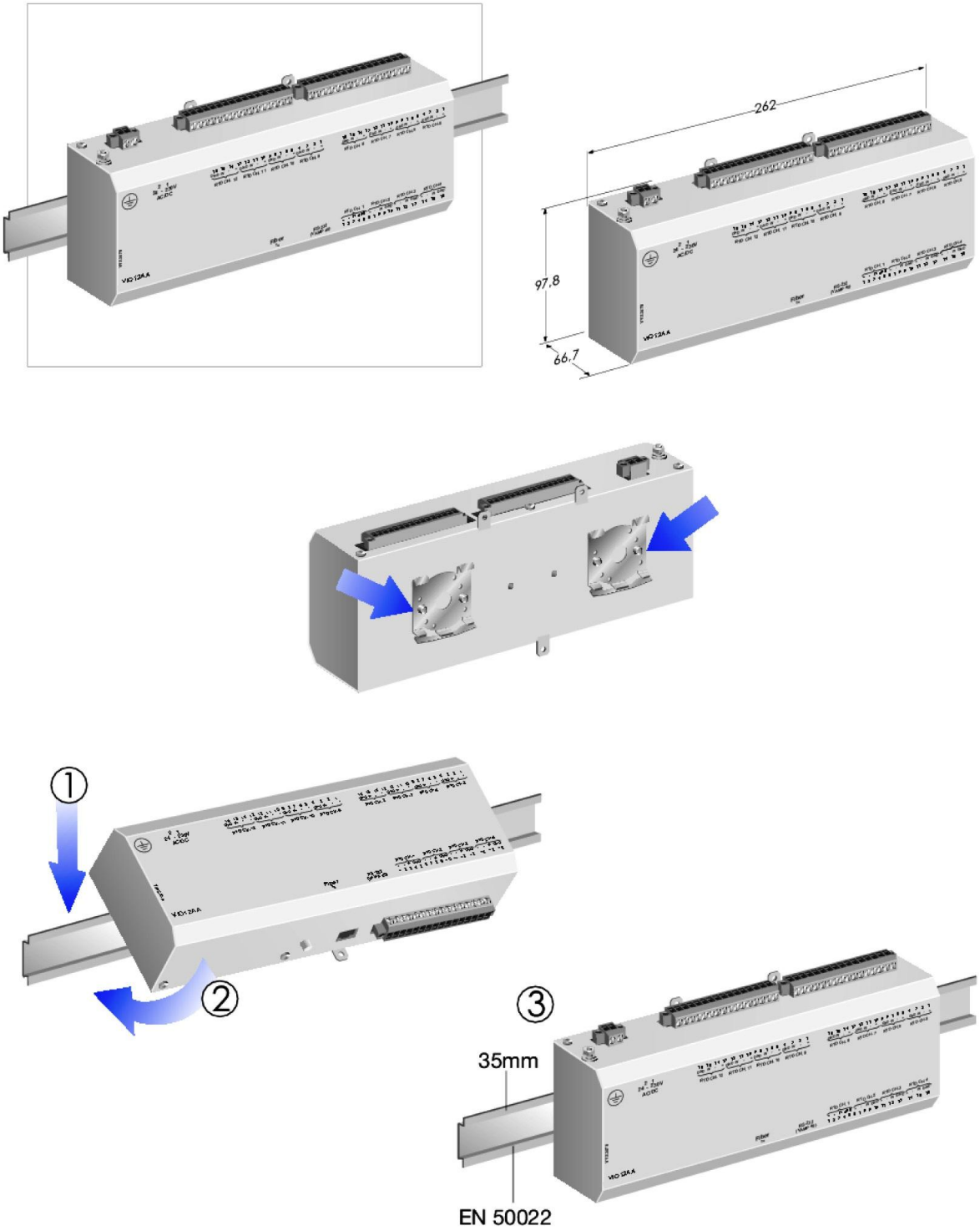


Figure 8.1-1 DIN-RAIL mounting

8.2 Wall mounting

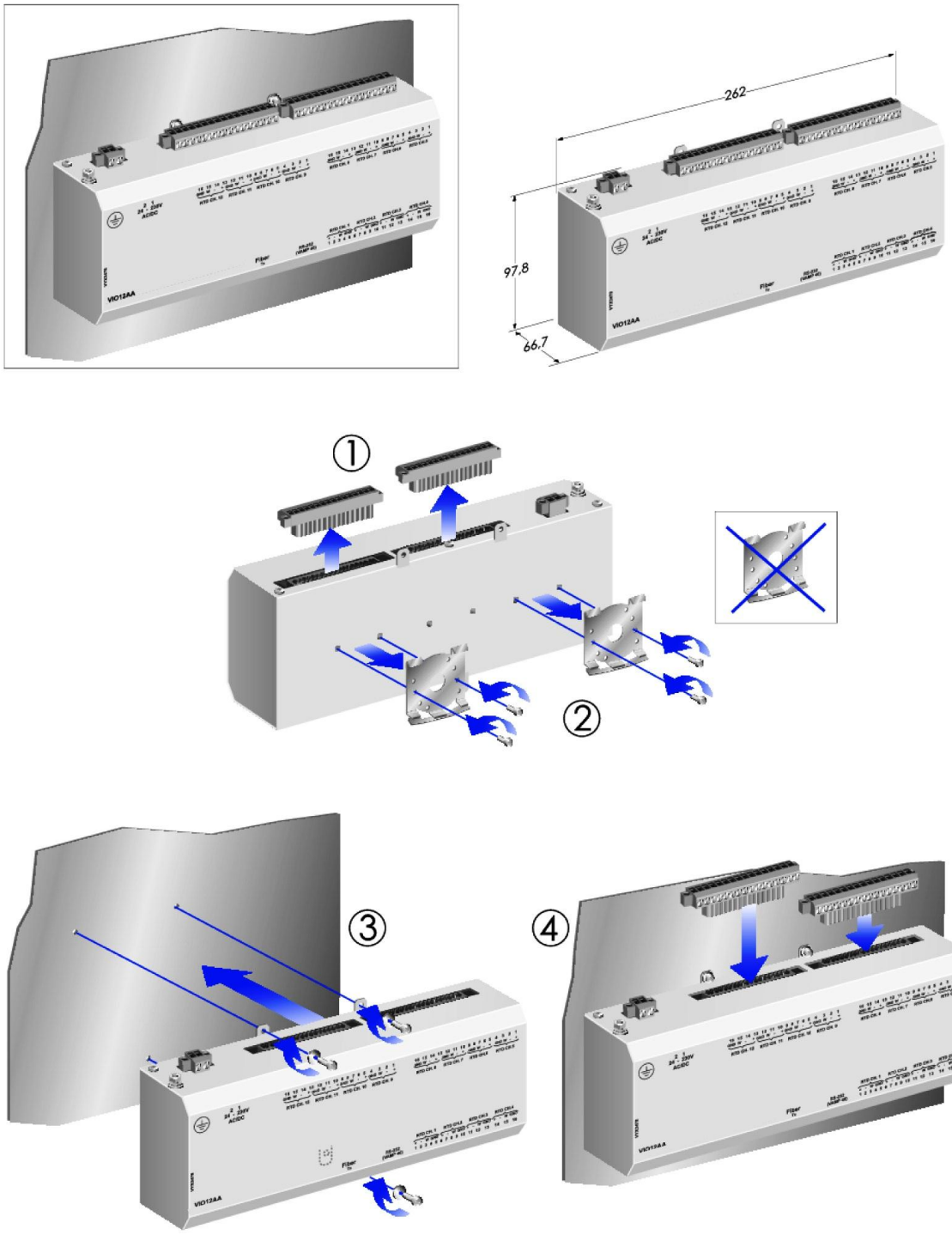


Figure 8.2-1 Wall Mounting

8.3 VAMP 40 mounting

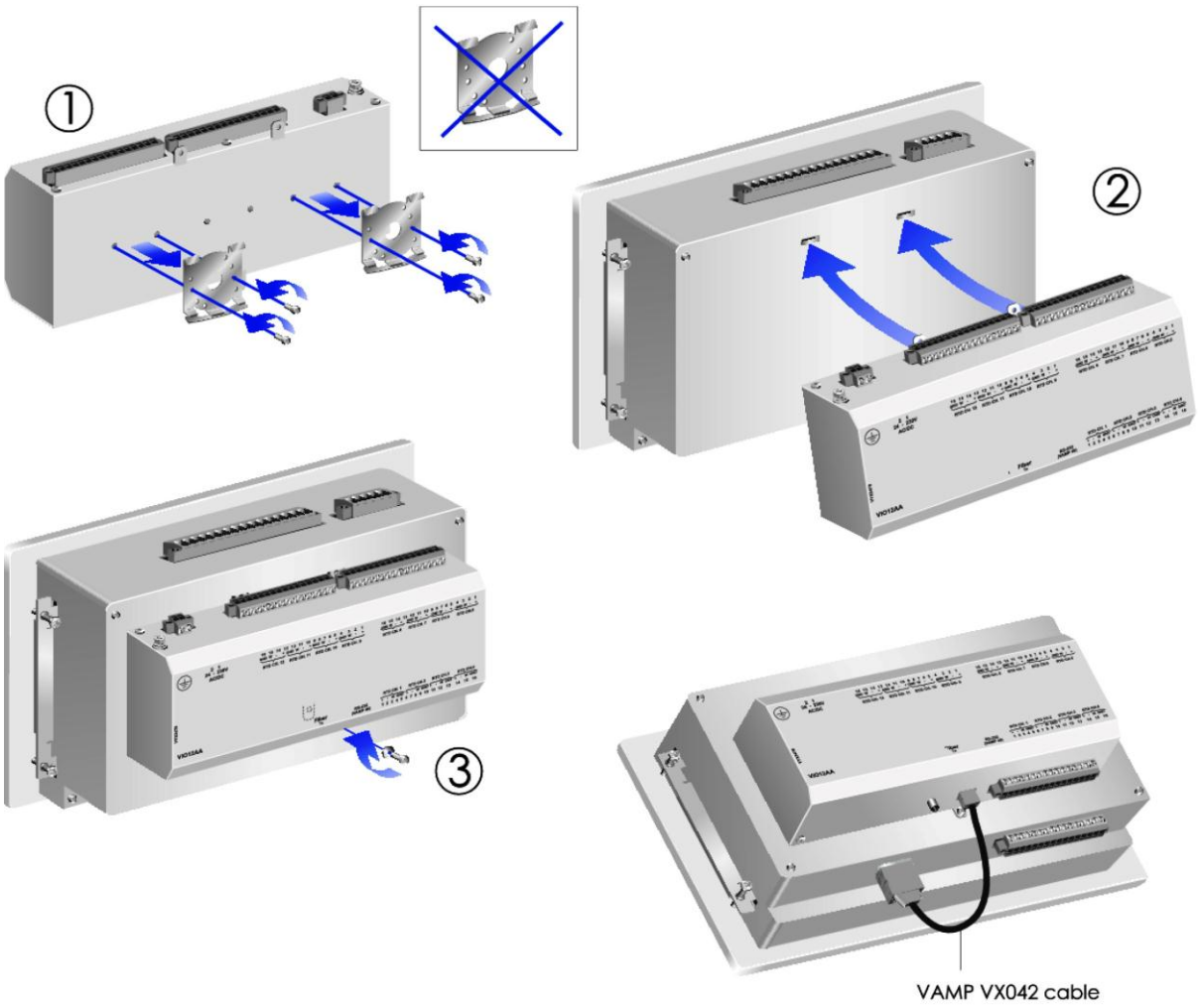


Figure 8.3-1 VAMP 40 mounting

9 Order information

When order, please state:

- Type designation:
  VIO 12AA, VIO 12AB, VIO 12AC or VIO 12AD
- Quantity:

Customers Care Center

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