

REL52815 (VPA 3CG)

Profibus Interface Module

Publication version: VPA3CG/EN M/C004

User manual



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1. Important information

1.1. Hazard categories and special symbols

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury or equipment damage.

Protective grounding

The user is responsible for compliance with all the existing international and national electrical codes concerning protective grounding of any device.

Please Note

Use the device's password protection feature to prevent untrained persons from interacting with this device.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Electrical equipment should be installed, operated, serviced, and maintained only by trained and qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Failure to follow this instruction will result in death or serious injury.

1.2. Legal notice

Copyright

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Disclaimer

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this document. This document is not intended as an instruction manual for untrained persons. This document gives instructions on device installation, commissioning and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics. In the event of questions or specific problems, do not take any action without proper authorization. Contact Schneider Electric and request the necessary information.

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1.3. EU directive compliance

EMC compliance

 2014/30/EU

Compliance with the European Commission's EMC Directive. Product Specific Standard was used to establish conformity:

- EN 60255-26 2013

Product safety

 2014/35/EU

Compliance with the European Commission's Low Voltage Directive. Product Specific Safety Standard was used to establish conformity:

- EN 60255-27 2014

2. General

Easergy P3 protection relays (later called relays) can be connected to Profibus DP with an external REL52815 (VPA3CG) Profibus interface module (also called Profibus adapter). The relay can then be monitored from the host system.

3. Specifications

3.1. General

Table 1. Profibus DP communication data

Profibus DP – connections	Interface	9-pin DSUB connector (female)
	Transfer method	RS-485, Half-duplex
	Transfer cable	Twisted pair(1 pair and shield)
	Electrical isolation	500 VDC
Safety		Fulfils EN50178 Standard

Table 1. Specifications

Communication mode	Profibus DP
Communication parameters	
Address	1 to 126
Baud Rate	9.6 kBaud to 12 MBaud

3.2. Profibus cable

Profibus devices are connected in a bus structure. Up to 32 stations (master or slaves) can be connected in one segment. The bus is terminated by an active bus terminator at the beginning and end of each segment (see Figure 1. Cabling and bus termination). To ensure error-free operation, both bus terminations must always be powered. When more than 32 stations are used, repeaters (line amplifiers) must be used to connect the individual bus segments.

The maximum cable length depends on the transmission speed and cable type (see

Table 2. Line *parameters* and Table 3. Line length for different transmission speeds). The specified cable length can be increased by the use of repeaters. Using more than three repeaters in a series is not recommended.

Table 2. Line parameters

Parameter	Line A	Line B
Impedance	135 ... 165 Ω (3 to 20 MHz)	100 ... 130 Ω (f > 100 kHz)
Capacity	< 20 pF / m	< 60 pF / m
Resistance	110 Ω / km	-
Wire gauge	> 0,64 mm	> 0,53 mm
Conductor area	> 0,34 mm ²	> 0,22 mm ²

Table 3. Line length for different transmission speeds

Baud rate (kbit/s)	9.6	19.2	93.75	187.5	500	1500	3000-12000
Length line A (m)	1200	1200	1200	1000	400	200	100
Length line B (m)	1200	1200	1200	600	200	-	-

For example the following cables can be used:

Belden	Profibus Data Cable	3079A
Olflex	Profibus Cable	21702xx
Siemens	SINEC L2 LAN cable for Profibus	6XV1 830-0AH10

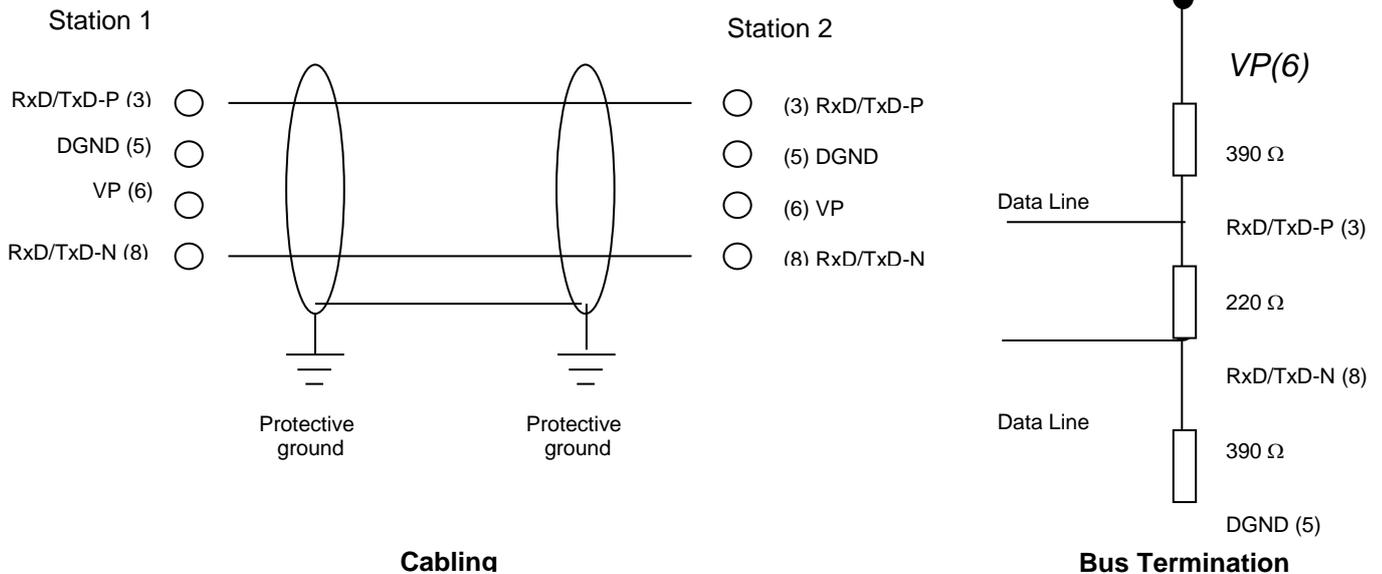


Figure 1. Cabling and bus termination

Table 4. D9 connector pins

Pin. No.	Signal	Designation
1	nc	Not connected
2	nc	Not connected
3	RxD/TxD-P	Receive data/transmission data plus
4	nc	Not connected
5	DGND	Data transmission potential (ground to 5 V)
6	VP	Supply voltage of the terminating resistance-P, (P5V)
7	nc	Not connected
8	RxD/TxD-N	Receive data/transmission data negative

9	nc	Not connected
---	----	---------------

4. Profibus DP

4.1. General

Profibus is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Vendor-independence and openness are guaranteed by the Profibus standard EN 50 170. With Profibus, devices of different manufactures can communicate without special interface adjustments. Profibus can be used for both high-speed, time-critical data transmission and extensive complex communication tasks. The Profibus family consists of three compatible versions.

Profibus DP

Optimised for high speed and inexpensive hook-up, this Profibus version is designed especially for communication between automation control systems and distributed I/O at the device level. Profibus DP can be used to replace parallel signal transmission with 24 V or 0 to 20 mA.

Profibus PA

Profibus PA is designed especially for process automation. It permits sensors and actuators to be connected to one common bus line even in intrinsically safe areas. Profibus PA permits data communication and power over the bus using 2-wire technology according to the international standard IEC 1158-2.

Profibus FMS

Profibus FMS is the general-purpose solution for communication tasks at the cell level. Powerful FMS services open up a wide range of applications and provide great flexibility. Profibus FMS can also be used for extensive and complex communication tasks.

Profibus specifies the technical and functional characteristics of a serial Fieldbus system with which decentralized digital controllers can be networked together from the field level to the cell level. Profibus distinguishes between master devices and slave devices.

Master devices determine the data communication on the bus. A master can send messages without an external request when it holds the bus access rights (the token). Masters are also called active stations in the Profibus protocol.

Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the

master when requested to do so. Slaves are also called passive stations.

4.2. Profibus User Organization

World market leaders in automation technology have joined together to form the Profibus User Organization. Since its establishment, 15 countries have formed national user organizations. These national organizations have been united under an organization called Profibus International (PI). The organization represents the interests of Profibus users and manufacturers. Together with its members, this association is pushing to establish the international use of Profibus. Several hundred companies are members of the association. Their primary tasks and goals are:

- joint marketing activities
- public relations work
- spreading of information
- further development of the technology
- preparation of certificates confirming conformance to the standard
- assignment and administration of the ident numbers
- definition of user profiles
- preparation of testing guidelines for test laboratories
- taking care of members

As a member of the Profibus international organization, you are kept informed of current developments in the area of Fieldbuses. Membership is open to all users and manufacturers as well as technical and scientific institutes.

5. Profibus DP device profiles

5.1. Continuous mode with fixed data set

In this mode, the protection relay is sending a configured set of parameters continuously to the Profibus DP master.

5.1.1. Calculation of the Profibus DP buffer length in continuous mode with fixed data set

The needed buffer length for Profibus DP data transfer depends on the biggest offset of any activated parameter and the size of this parameter. The offset and the activation for each available parameter are configurable.

The relay calculates the needed buffer length. For example, if the relay's display shows:

InBuf	32 byte
OutBuf	0 byte,

you have to select the corresponding module "INPUT: 32 Byte" from the .gsd file (for example VPA_00F7.gsd) when configuring the Profibus DP master for this relay.

The following example reveals the algorithm used by a relay to calculate the needed Profibus DP buffer length:

Example:

- The parameter Eimp (imported active energy) has the biggest offset, 30, of all activated Profibus DP data items in InBuf.
- The size of Eimp item is 4 bytes.
- The parameter DirectO5C (Direct Operate Object 5 Close) has the biggest offset, 13, of all activated Profibus data items in OutBuf.
- The size of DirectO5C is 1 byte.
- Both buffers are forced to the same length.

Input:

Offset of the last occupied byte:

$$30 + (4 - 1) = 33$$

Round up to next 2^n (n is an integer):

$$\log_2 33 = \log 33 / \log 2 = 5.044.$$

Round up to next integer $\rightarrow 6$.

$$2^6 = 64$$

Output:

Offset of the last occupied byte:

$$13 + (1 - 1) = 13$$

Round up to next 2^n (n is an integer):

$$\log_2 13 = \log 13 / \log 2 = 3.700.$$

Round up to next integer $\rightarrow 4$.

$$2^4 = \mathbf{16}$$

After restarting, the relay displays the following buffer sizes:

InBuf	64 byte
OutBuf	64 byte

If both buffers are in use in the continuous mode, the length of the smaller buffer is forced to match the longer buffer. In the example : $2^4 = 16$ is forced to $2^6 = 64$

Select the corresponding module "INPUT/OUTPUT : 64 Byte" from the .gsd file (for example VPA_00F7.gsd) when configuring the Profibus DP master for this relay.

Note!

It is recommended that the maximum size for output buffer in continuous mode is 64 bytes.

5.2. Request mode

Using the request mode, it is possible to read all available data from the relay and still use only a short buffer for Profibus data transfer. The drawback is the slower overall speed of the data transfer and the need of increased data processing at the Profibus master as every data item must be separately requested by the master from the slave.

Note!

It is not possible to read continuously only one single data item. In request mode, you have to request at least two items in turn to get updated data from the relay.

After setting the Profibus driver of the relay into request mode, the relay is restarted (wait for approximately 30 seconds). After restarting, the relay ignores parameter offsets and displays the following fixed buffer sizes:

InBuf	8byte
OutBuf	8byte.

Select the corresponding module "INPUT/OUTPUT:8 Byte" from the .gsd file (for example VPA_00F7.gsd) when configuring the Profibus DP master for this relay.

5.2.1. Data request message from the Profibus master

The request is 8 bytes long consisting of three fields:

ID		IND		VALUE			
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7

ID Type and number of the requested data
 IND Index 0...65535 of the parameter member to be requested or 0 if the parameter is scalar
 Value Not used

The identifier word, **ID**, consists of three bit fields:

Request type				SM	Parameter number										
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

Request type 0001 Read (0010 = Write)
 SM 0 Spontaneous bit(not used)
 Parameter number 0..2047 Each available data item in the relay has a fixed parameter number

5.2.2. Data response message from the relay

The response message is 8 bytes long consisting of three fields:

ID		IND		VALUE			
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7

ID Type and number of the requested data
 IND Requested index
 Value Value of the requested data or error code

The identifier word, **ID**, consists of three bit fields:

Response type				SM	Parameter number										
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

Response type 0001 Value is ready
 0111 Request rejected
 SM 0 Spontaneous bit(not used)
 Parameter number 0..2047 The number of the requested parameter.

Error codes in value field in case of response type 0111:

0 Illegal parameter
 18 Other fault
 101 Unknown request type

5.2.3. Examples of request and response messages

Example 1: Active power

The master requests the measured active power from the relay.
The hexadecimal byte values are:

ID		IND		VALUE			
10	00	00	00	00	00	00	00

ID:
1 Request type is read
0 00 Parameter number of active power P is 0
IND:
00 00 Index is 0
VALUE:
00 00 00 00 Dummy value

The slave responds with the active power value. The hexadecimal byte values are:

ID		IND		VALUE			
10	00	00	00	00	00	0D	7A

ID:
1 Response type is 'Value is ready'
0 00 Parameter number is 0. (Copy of request message parameter number)
IND:
00 00 Index is 0. (Copy of request message index)
VALUE:
00 00 0D 7A The active power is 3450 kW ($0D7A_{16} = 3450_{10}$)

6. Installation and commissioning

Use the Profibus interface module with Easergy P3 Standard and Advanced relays whenever Profibus is required in the system.

6.1. Cables for the Profibus interface module

Depending on the Easergy P3 relay type, a dedicated cable is needed for connecting the Profibus interface module (VPA 3CG adapter) to the relay.

Table 5. Required Profibus cables with Easergy P3 relays

Relay	Cable type
Easergy P3 Standard	REL52827 VX084 RS232 - VPA 3CG cable (Profibus)
Easergy P3 Advanced	REL52824 VX072 Profibus cable

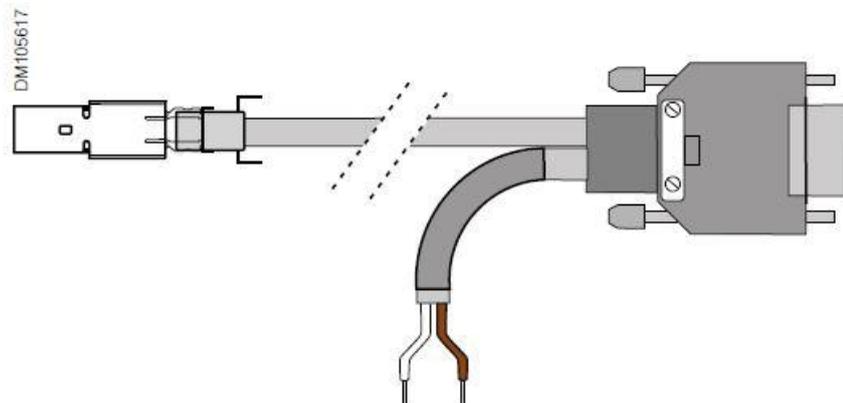


Figure 2. Profibus cable REL52827 (VX084) for Easergy P3 Standard



Figure 3.. Profibus cable REL52824 (VX072) for Easergy P3 Advanced

6.2. Connecting the interface module to Easergy P3 Standard

The Profibus interface module VPA-3CG is connected to the 'REMOTE' port (connector X5) on an Easergy P3 Standard relay's rear panel with the Profibus cable. The X4 (I/O with comms) option must be either E or F.

The Profibus interface module must be powered from an external 12 V power supply through the cable. The continuous power consumption is 1W.

See the relay's user manual for more detailed information on ordering the communication modules.

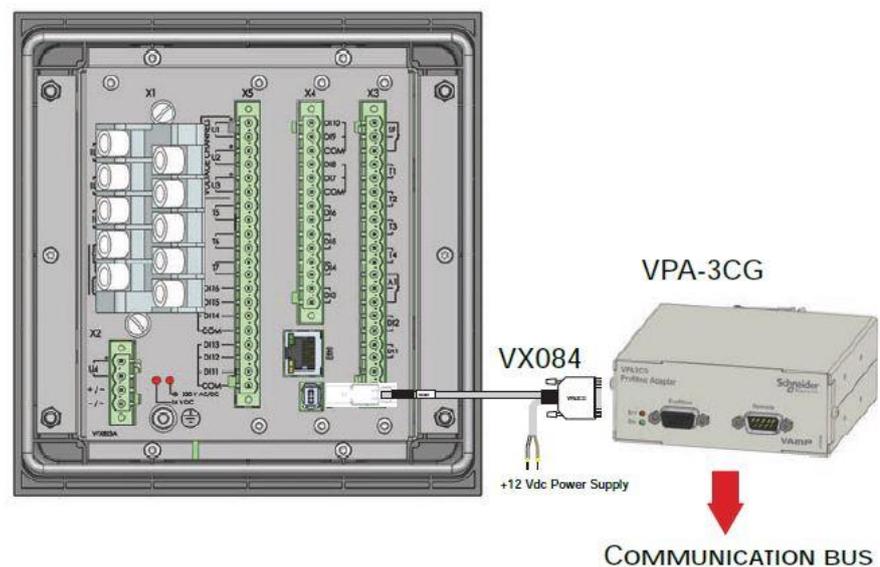


Figure 4. Connecting VPA-3CG to Easergy P3 Standard

6.3. Connecting the interface module to Easergy P3 Advanced

The Profibus interface module VPA-3CG can be connected to an Easergy P3 Advanced relay's RS-232 connector in slot 6 or slot 9 with the Profibus cable.

The following optional communication modules are needed:

- for slot 6 (option card I), option K
- for slot 9 (communication interface I), option B, C, or D

See the relay's user manual for more detailed information on ordering the communication modules.

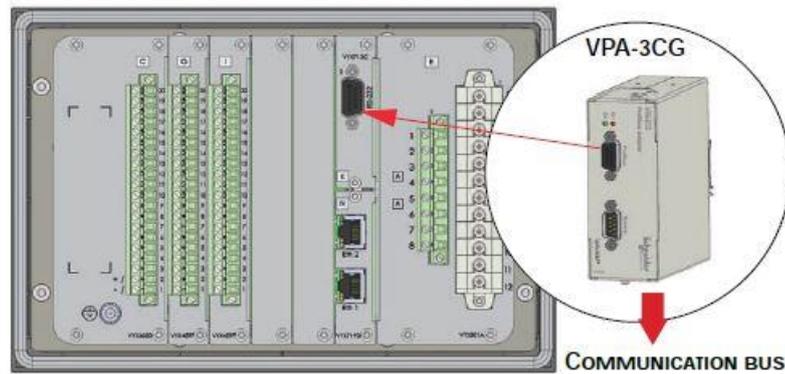


Figure 5. Connecting VPA-3CG to Easergy P3 Advanced

Note!

Use REL52824 (VX072) cable for connecting VPA-3CG to Easergy P3 Advanced.

6.4. Setting the Profibus address and other parameters

The Profibus parameters can be changed from the relay front panel or by Easergy Pro.

The parameters are:

Mode	Profibus mode: Continous / Request
bit/s	Speed between the relay and adapter
InBuf*	Input** buffer length
OutBuf*	Output** buffer length
Addr	Profibus address (range 1-126)
Conv*	Type of Profibus adapter (VE, HMS, -)

- *) Parameters are read only
- **) Input: Relay → Profibus master
Output: Profibus master → Relay

6.5. Dimension drawing

DIN RAIL MOUNTING VPA3CG

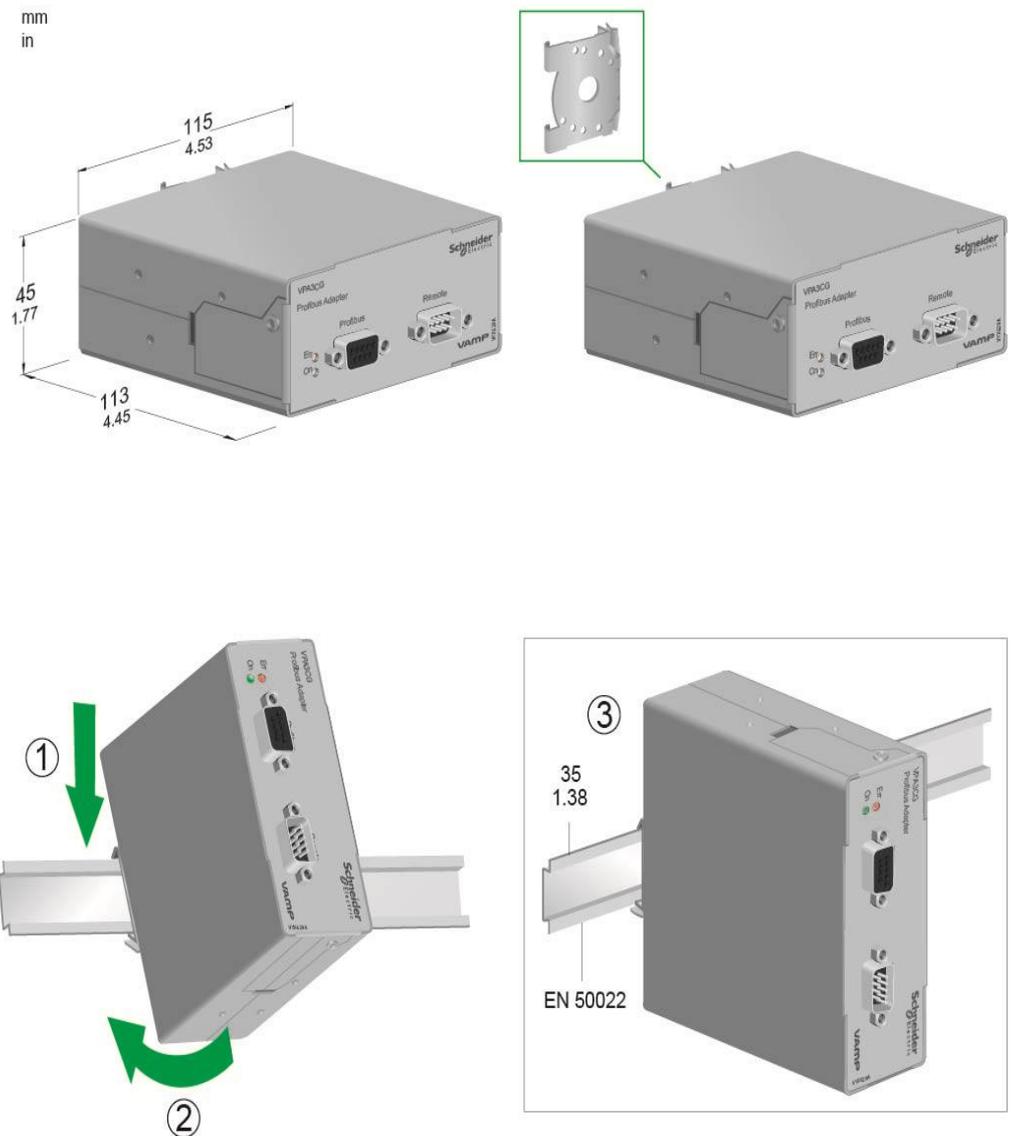


Figure 6. Dimension drawing

7. Type files

7.1. GSD file

```

;=====
;GSD file for VPA
;
;2002-07-22 JPH/Vaasa Electronics Ltd.
;
;File   : VPA_00F7.GSD
;=====
#Profibus_DP
; Unit-Defination-List:
GSD_Revision      = 1
Vendor_Name       = "Vaasa Electronics Ltd."
Model_Name        = "VPA"
Revision          = "1.0"
Ident_Number      = 0x00F7
Protocol_Ident    = 0
Station_Type      = 0                      ; DP-Slave
FMS_supp          = 0                      ; no FMS/DP Mixed
Device
Hardware_Release  = "HW1.0"
Software_Release  = "SW1.0"
;
9.6_supp          = 1                      ;baud rate supported
19.2_supp         = 1                      ;baud rate supported
93.75_supp        = 1                      ;baud rate supported
187.5_supp        = 1                      ;baud rate supported
500_supp          = 1                      ;baud rate supported
1.5M_supp         = 1                      ;baud rate supported
3M_supp           = 1                      ;baud rate supported
6M_supp           = 1                      ;baud rate supported
12M_supp          = 1                      ;baud rate supported
; Duration to answer a request by a responder
MaxTsdr_9.6       = 60
MaxTsdr_19.2     = 60
MaxTsdr_93.75    = 60
MaxTsdr_187.5    = 60
MaxTsdr_500      = 100
MaxTsdr_1.5M     = 150
MaxTsdr_3M       = 250
MaxTsdr_6M       = 450
MaxTsdr_12M      = 800
;
Redundancy        = 0                      ; redund. Transceiver
not supp.
Repeater_Ctrl_Sig = 2                      ; TTL
24V_Pins          = 0                      ; Not connected
;
Implementation_Type = "SPC3"
Bitmap_Device      = "DP_NORM"
;
; Slave-Specification:
Freeze_Mode_supp  = 1                      ; Freeze-Mode
supported
Sync_Mode_supp    = 1                      ; Sync-Mode supported
Auto_Baud_supp    = 1                      ; auto. Baud. detec.
supp.
Set_Slave_Add_supp = 0                      ; Set_Slave_Add not
supported
Min_Slave_Intervall = 10
;
Modular_Station   = 1
Max_Module        = 24
Max_Input_Len     = 200
Max_Output_Len    = 200
Max_Data_Len      = 400
Modul_Offset      = 200
;

```

```

Fail_Safe                = 0                ; data telegram
without data in          ;                  ; state CLEAR not
;
accepted
Slave_Family             = 0
Max_Diag_Data_Len       = 16
;
Unit_Diag_Bit(0)        = "OK"
Unit_Diag_Bit(1)        = "ERROR 1"
Unit_Diag_Bit(2)        = "ERROR 2"
Unit_Diag_Bit(3)        = "ERROR 3"
Unit_Diag_Bit(4)        = "ERROR 4"
Unit_Diag_Bit(127)     = "ERROR 127"
;
Module = "INPUT/OUTPUT: 1 Byte" 0x30
EndModule
Module = "INPUT/OUTPUT: 2 Byte " 0x70
EndModule
Module = "INPUT/OUTPUT: 4 Byte " 0x71
EndModule
Module = "INPUT/OUTPUT: 8 Byte" 0x73
EndModule
Module = "INPUT/OUTPUT: 16 Byte" 0x77
EndModule
Module = "INPUT/OUTPUT: 32 Byte" 0x7F
EndModule
Module = "INPUT/OUTPUT: 64 Byte" 0xC0,0x5F,0x5F
EndModule
Module = "INPUT/OUTPUT: 128 Byte" 0xC0,0x7F,0x7F
EndModule
Module = "INPUT: 1 Byte" 0x10
EndModule
Module = "INPUT: 2 Byte" 0x50
EndModule
Module = "INPUT: 4 Byte" 0x51
EndModule
Module = "INPUT: 8 Byte" 0x53
EndModule
Module = "INPUT: 16 Byte" 0x57
EndModule
Module = "INPUT: 32 Byte" 0x5F
EndModule
Module = "INPUT: 64 Byte" 0x40,0x5F
EndModule
Module = "INPUT: 128 Byte" 0x40,0x7F
EndModule
Module = "OUTPUT: 1 Byte" 0x20
EndModule
Module = "OUTPUT: 2 Byte" 0x60
EndModule
Module = "OUTPUT: 4 Byte" 0x61
EndModule
Module = "OUTPUT: 8 Byte" 0x63
EndModule
Module = "OUTPUT: 16 Byte" 0x67
EndModule
Module = "OUTPUT: 32 Byte" 0x6F
EndModule
Module = "OUTPUT: 64 Byte" 0x80,0x5F
EndModule
Module = "OUTPUT 128 Byte" 0x80,0x7F
EndModule

```



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