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Technical Information
Profile Vision Compact SPV350

Interface and density profile measurement in separation vessels

Application

Profile Vision Compact gives users a detailed insight into their separation processes. It is the perfect solution for full monitoring of interfaces and emulsion layers of different density. With this system, continuous density profiles and interface levels can be visualized easily and clearly. The results can be implemented quickly into a DCS for further process optimization and application control.

Your benefits

- Precise process information thanks to continuous interface and density profile measurement over the entire measuring range
- Reliable monitoring of up to 5 separation vessels with multiple sections
- Flexible adaptation of media characteristic values to varying conditions
- Easy HMI integration into customer control systems via Modbus TCP or OPC UA
- Detailed warnings and alarms enable swift decision-making and remedial action

Endress+Hauser
People for Process Automation

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About this document

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

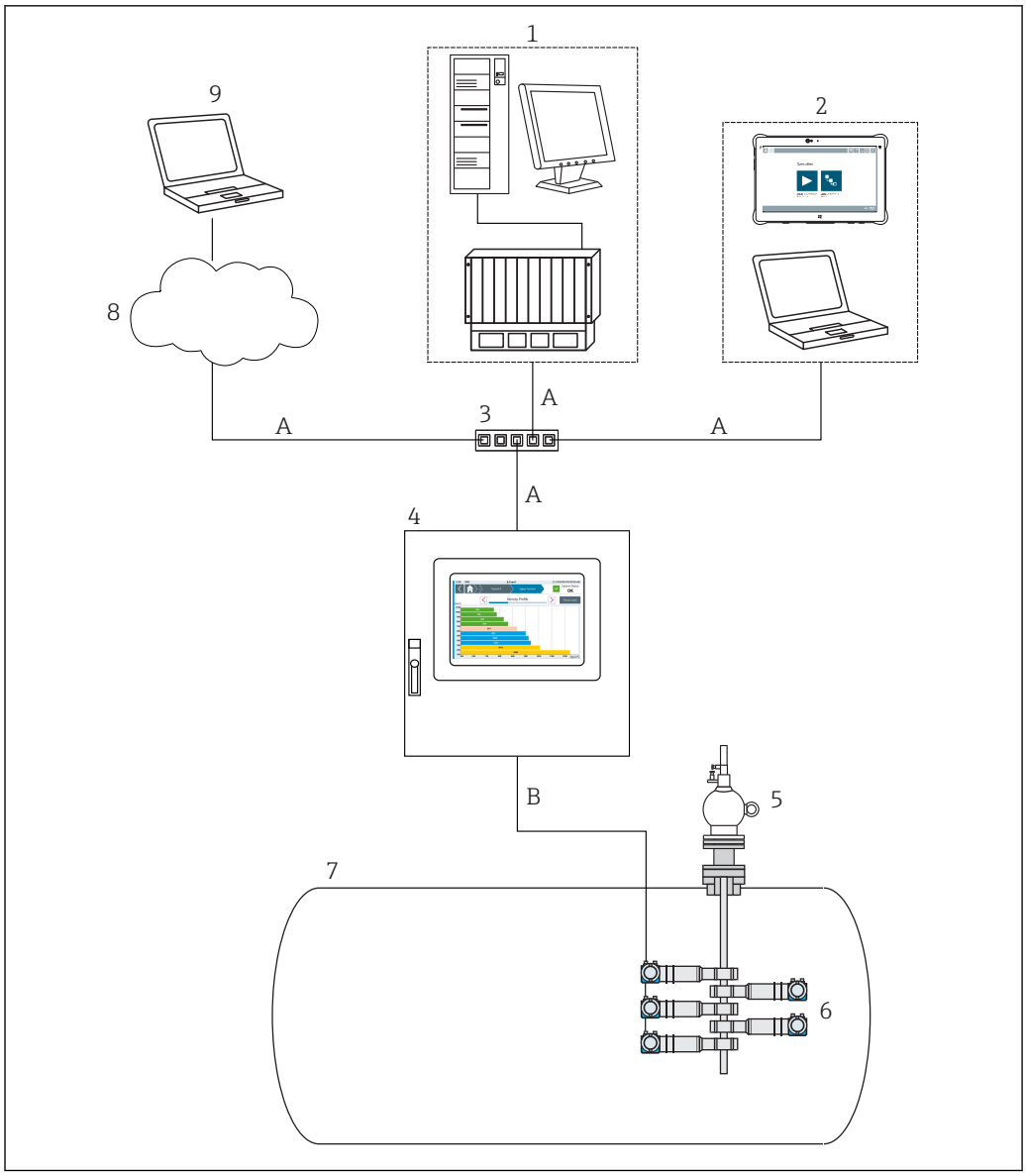
Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference to graphic.
	Visual inspection.

Function and system design

Function

Using radiometric measuring technology, the measured density values in the separation vessel are transmitted to the Profile Vision Compact SPV350 where they are converted to a density profile and visualized. In the system, you define the density threshold values of the media to be separated to be able to identify and visualize the interfaces/emulsion layers on the basis of these values. The threshold values can be adjusted at any time if conditions change, e.g. change in pressure or temperature. This enables the user to respond flexibly to changing environmental influences without having to recalibrate the system. The FMG60 radiometric compact transmitter communicates with the Profile Vision Compact SPV350 via PROFIBUS or 4 to 20 mA (HART). Status messages from the compact transmitter are also received by the Profile Vision Compact SPV350, visualized and forwarded to the customer control system. Data such as density values, interface levels in the separation vessel, the status of the compact transmitters, system and density threshold values can be communicated to the customer control system (PLC, DCS)via the optional Modbus TCP or OPC UA interface.



1 *Overview*

A Ethernet
B PROFIBUS network or 4 to 20 mA (HART)
1 Operator control system with visualization
2 Engineering computer such as SMT70 with FieldCare for device configuration and VNC client for SPV350 visualization (www.endress.com/smt70)
3 Switch
4 Profile Vision Compact System SPV350
5 Source container FQG with radioactive radiation generator FSG
6 FMG60 compact transmitter
7 Separation vessel
8 Internet access
9 Remote maintenance capability

System design

The Profile Vision Compact SPV350 comprises:
- Controller assembly with 15 digital inputs and 8 digital outputs
- Application software
- USB license dongle
- SiteManager for data transmission via Modbus TCP or OPC UA to a customer control system or for remote maintenance via WAN or 3G

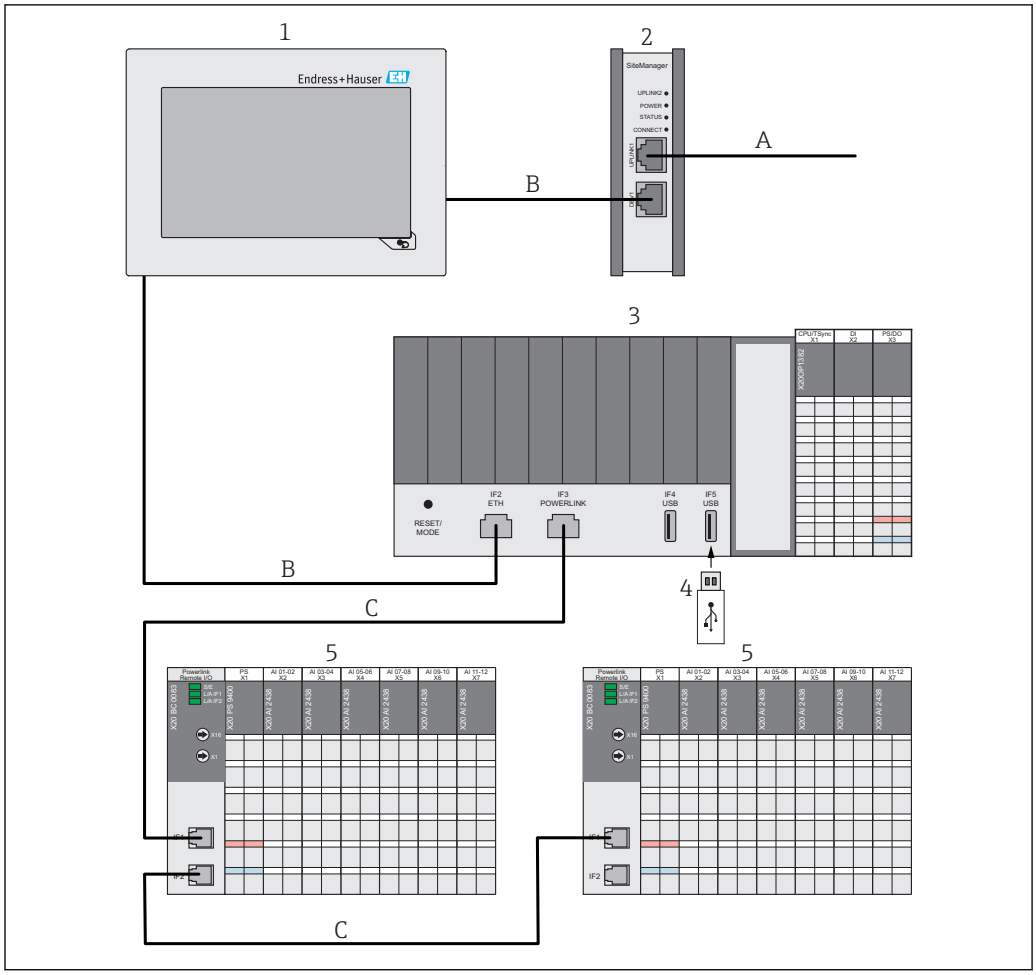
- Up to 5 optional remote IO assemblies for 4 to 20 mA devices (12 x 4 to 20 mA HART-transparent inputs per assembly)
- Optional PROFIBUS DP master module for PROFIBUS devices, integrated in the controller assembly
- Optional 7" touch display

The following components are not included in the delivery:
- SIM card for remote maintenance
- PROFIBUS DP/PA coupler for connecting PROFIBUS PA devices

Scaling

Feature	Definition	Comment
Number of separation vessels per system	1 to 5	–
Number of sections per separation vessel	1 to 5	–
Number of devices per section	1 to 15	Maximum 60 devices per system, such as ▪ 1 separation vessel divided into 5 sections with 12 devices per section ▪ 5 separation vessels divided into 2 sections per vessel with 6 devices per section
SiteManager per system	1	Can be used as a gateway, firewall and remote maintenance modem
7" touch display per system	1	Optional At a maximum distance of 100 m from the controller assembly

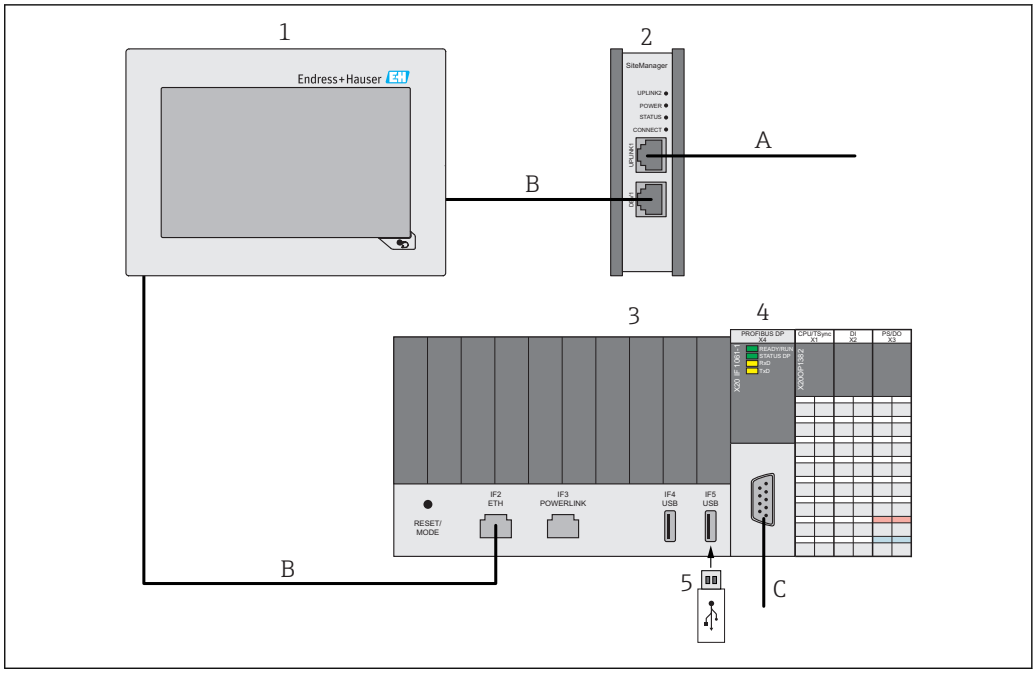
Structure of Profile Vision Compact SPV350 for 4 to 20 mA devices



2 *Structure of Profile Vision Compact SPV350 for 4 to 20 mA devices*

A Ethernet (customer network)
B Ethernet (private SPV350 network)
C Ethernet (Powerlink)
1 Optional 7" touch display
2 SiteManager can be used as a gateway, firewall and remote maintenance modem
3 Controller assembly with 15 digital inputs and 8 digital outputs
4 USB license dongle
5 Remote IO assembly for 4 to 20 mA devices (maximum 5 remote IO assemblies)

Structure of Profile Vision Compact SPV350 for PROFIBUS devices



3 *Structure of Profile Vision Compact SPV350 for PROFIBUS devices*

A Ethernet (customer network)
B Ethernet (private SPV350 network)
C PROFIBUS DP network (at customer's site)
1 Optional 7" touch display
2 SiteManager can be used as a gateway, firewall and remote maintenance modem
3 Controller assembly with 15 digital inputs and 8 digital outputs
4 PROFIBUS DP master module for PROFIBUS devices, integrated in the controller assembly
5 USB license dongle

Input

Input signals

Ordering information: → 19

PROFIBUS DP (order code "040", version "AA")

For connecting devices with a PROFIBUS signal to the optional PROFIBUS DP master module.

A PROFIBUS DP/PA coupler for connecting PROFIBUS PA devices is not included in the delivery.

4 to 20 mA (HART) inputs (order code "040", versions "BA" to "BE")

For connecting devices with a 4 to 20mA signal to the optional remote IO assemblies (maximum 5).

Digital input TSync (X1 of the controller assembly)

Digital input (24 V DC sink) for system time synchronization.

If a time synchronization signal from an external system is used, you must connect the signal via a relay with a floating contact.

Digital inputs DI 01 to DI 14 (X2 of the controller assembly)

- 14 digital inputs (24 V DC sink)
- DI 01 to DI 07: inputs for alarms, user-configurable in the system
- DI 08 to DI 14: inputs for warnings, user-configurable in the system

If signals from external systems are used, you must connect the signals via relays with a floating contact.

Output

Output signals

Digital outputs DO 01 to DO 08 (X3 of the controller assembly)

- 8 digital outputs (24 V DC source)
- For signaling the system status of the separation vessels available, user-configurable in the system.

If signals from external systems are used, you must connect the signals via relays with a floating contact.

Power supply

Supply voltages

Component	Nominal voltage	Supply voltage range
Controller assembly	24 V DC	−15 % / +20 %
Remote IO assembly	24 V DC	−15 % / +20 %
Gateway/firewall/remote maintenance modem	24 V DC	12 to 24 V DC
7" touch display	24 V DC	8 to 32 V DC

Power consumption

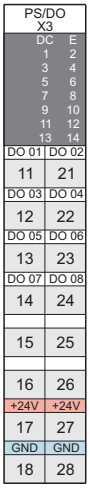
Component	Power consumption
Controller assembly with PROFIBUS DP master module	Approx. 7.8 W
Controller assembly without PROFIBUS DP master module	Approx. 6 W
Remote IO assembly [1)]	Approx. 11.2 W
Gateway/firewall/remote maintenance modem	Max. 5 W
7" touch display	Max. 9.34 W

1) Power consumption without power supply for connected devices. The power consumption depends on the connected devices.

Electrical connection: supply voltages

You must install a line fuse with max. 10 A slow blow for the supply voltages.

Supply voltage for controller assembly



4 *Connection of the controller assembly supply voltage*

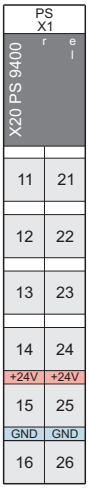
24 V DC power supply for CPU and backplane bus
- Terminal X3/17: +24 V (+)
- Terminal X3/18: GND (−)

24 V DC power supply for IOs
- Terminal X3/27: +24 V (+)
- Terminal X3/28: GND (−)

NOTICE

Power regeneration!
Damage to component parts
▶ If the supply voltage for the IOs is switched off at terminals X3/27 and X3/28, make sure there is no external voltage at terminals X3/13, X3/14, X3/23 and X3/24 (DO 05 to DO 08).

Supply voltage for remote IO assembly for 4 to 20 mA devices



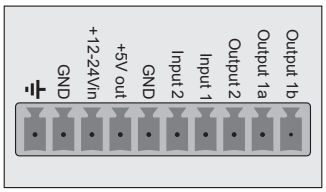
5 Connection of supply voltage for remote IO assembly

24 V DC power supply for bus node and backplane bus
- Terminal X1/15: +24 V (+)
- Terminal X1/16: GND (–)

24 V DC power supply for IOs
- Terminal X1/25: +24 V (+)
- Terminal X1/26: GND (–)

If you would like to supply the supply voltages for the bus nodes and the IOs with the same potential, you can supply power to the IOs via a jumper between terminals X1/14 and X1/24. In this case, you may not connect terminals X1/25 and X1/26.

Supply voltage for gateway/firewall/remote maintenance modem



6 Connection of gateway supply voltage

24 V DC power supply
- Terminal +12-24Vin: +
- Terminal GND: –

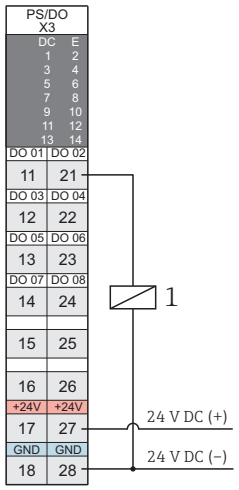
Supply voltage for 7" touch display

7 Connection of supply voltage for 7" touch display

24 V DC power supply
- Terminal 1: +
- Terminal 2: –

Connection of digital outputs

Connection of digital outputs DO 01 to DO 08 to the controller assembly



8 Connection example for DO 02

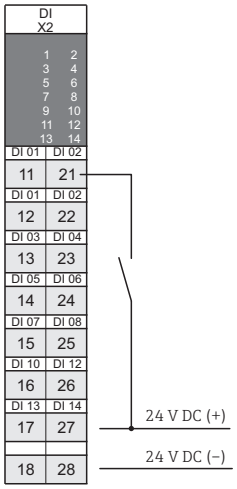
1 Actuator, relay, signal lamp etc.

Connect the digital outputs in the same way as shown in the connection example.
If signals from external systems are used, you must connect the signals via relays with a floating contact.

Output nominal current: 0.5 A

Connection of digital inputs

Connection of digital inputs TSync and DI 01 to DI 14 to the controller assembly



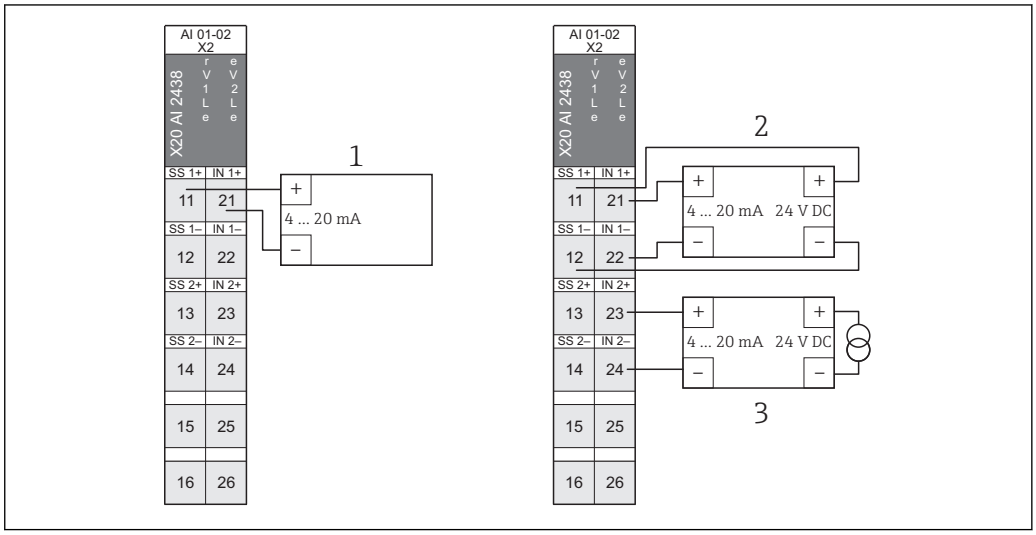
9 Connection example for DI 02

Connect the digital inputs in the same way as shown in the connection example.
If signals from external systems are used, you must connect the signals via relays with a floating contact.

- Low switching threshold: < 5 V DC
- High switching threshold: > 15 V DC

Connection of 4 to 20 mA inputs

Connection of 4 to 20 mA inputs to the remote IO assembly



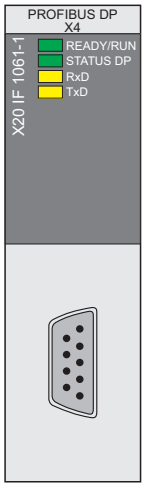
10 *Connection of 4 to 20 mA inputs to remote IO assembly*

1 *2-wire device (passive)*
2 *4-wire device with power supply from remote IO assembly (active), power supply of remote IO assembly: 25 V DC ± 2 %, max. 30 mA*
3 *4-wire device with external power supply (active)*

You must connect the FMG60 compact transmitters with a 4 to 20 mA output signal as indicated in version 3*.

In the case of the FMG60 compact transmitter with an analog Ex(i)-signal, you must use corresponding Ex(i) barriers.

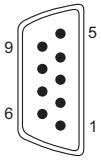
PROFIBUS DP connection



11 *PROFIBUS DP connection*

The PROFIBUS DP master module for the connection of PROFIBUS devices is integrated in the controller assembly. You must use a DP/PA coupler to connect PROFIBUS PA devices. The DP/PA coupler is not included in the delivery (→ 4).

- Fieldbus: PROFIBUS DP V0/V1 master
- Socket: 9-pin DSUB socket
- Max. line length: 1000 m
- PROFIBUS address of the master: 1
- Reserved PROFIBUS addresses for compact transmitters: 5 to 124

Interface	Terminal assignment for DSUB socket		
	Pin	RS-485	Description
	1	Reserved	–
	2	Reserved	–
	3	RxD/TxD-P	Data, red cable
	4	CNTR-P [1]	Transmit enable
	5	DGND	Potentially isolated power supply

12 *DSUB socket*

Interface	Terminal assignment for DSUB socket		
	Pin	RS-485	Description
	6	VP	Potentially isolated power supply
	7	Reserved	–
	8	RxD/TxD-N	Data, green cable
	9	CNTR-N	Transmit enable

1) CNTR: direction switching for external repeaters

Ethernet connection – private SPV350 network

You can incorporate the controller assembly, the gateway/remote maintenance modem and the optional 7" touch display into an individual machine network via the Ethernet interface (→ 🖹 3).

- Cable: min. category 5 Ethernet cable
- Sockets: RJ-45
- Max. line length: 100 m

If a free Ethernet connection should be available in the private network for maintenance purposes, you can also interconnect the components via a switch. You need a switch with at least 4 ports.

Ethernet connection – customer network

You can incorporate the system into your network via the UPLINK Ethernet interface of the gateway/ remote maintenance modem. Data can be transmitted from the system to the customer control system via the optional Modbus TCP or UPC UA interface. If your network has an internet connection, the system can be accessed for remote maintenance via a VPN connection. The SiteManager can be used as a gateway and remote maintenance modem (→ 🖹 3).

- Cable: min. category 5 Ethernet cable
- Sockets: RJ-45
- Max. line length: 100 m

The SiteManager is configured as a DHCP client by default.

Please refer to the SiteManager documentation (Secure Remote Maintenance) on the CD for information on changing the IP configuration.

Powerlink connection

Powerlink connection (only for version with remote IO assembly)

The remote IO assemblies can be connected via the Powerlink interfaces (daisy chain) (→ 🖹 3).

- Cable: min. category 5 Ethernet cable
- Sockets: RJ-45
- Max. line length: 100 m

If you want to interconnect the remote IO assemblies using a star topology, you must use a hub.

NOTICE

Unsuitable network components!

Malfunction

- ▶ Only integrate remote IO assemblies into the Powerlink network. Do not incorporate any other Ethernet devices into the Powerlink network
- ▶ A switch may not be used for star topologies.

Installation

Mounting location

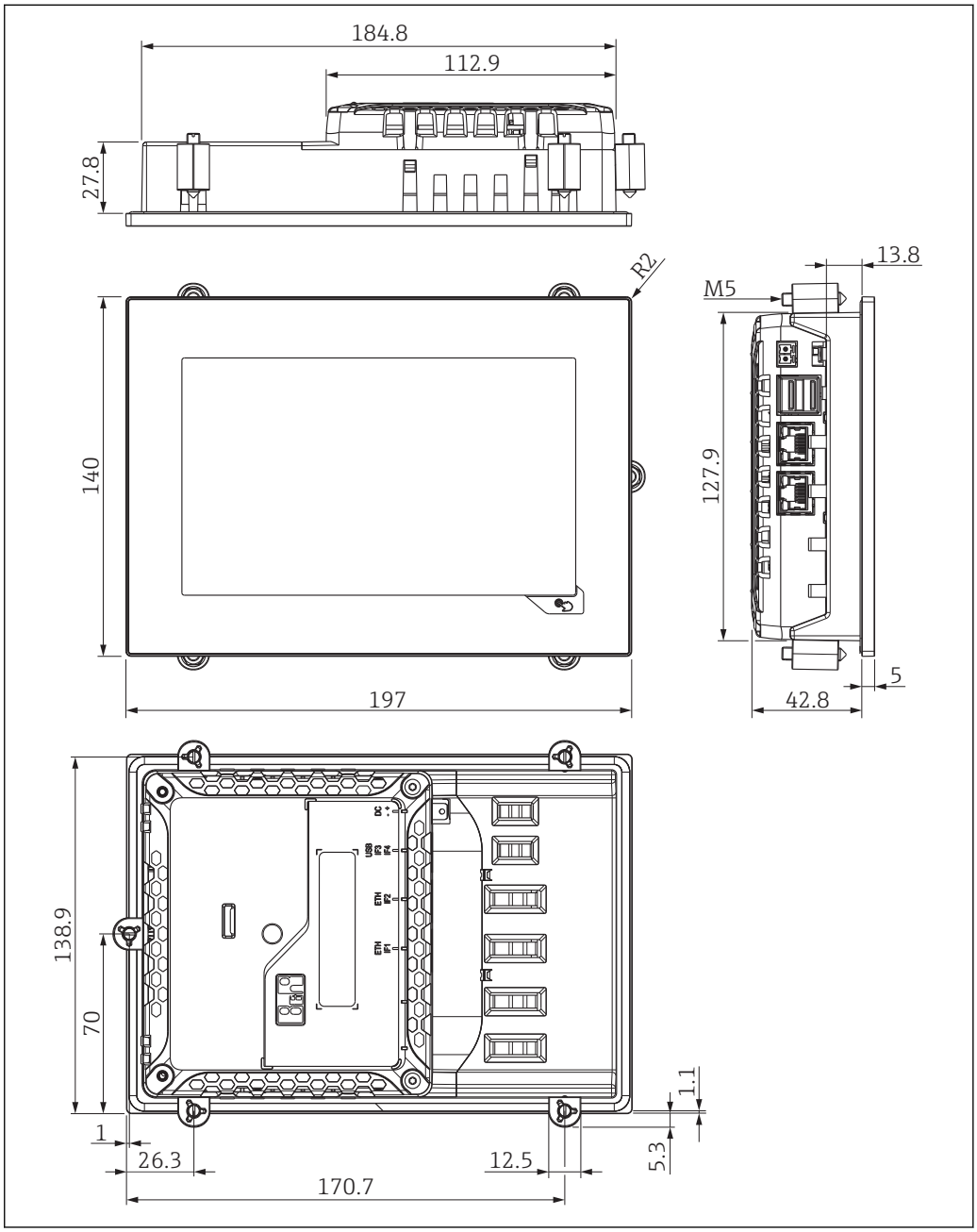
System components

The system components such as the controller assembly, remote IO assemblies and gateway/ firewall/remote maintenance modem are designed for DIN rail mounting in a control cabinet.

7" touch display

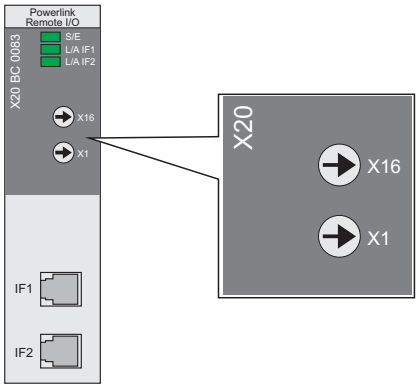
The 7" touch display is designed for installation in a panel.

- Dimensions of cutout: 186.8 mm ± 1 mm x 129.8 mm ± 1 mm
- Min. panel thickness: 2 mm
- Max. panel thickness: 6 mm



13 Connecting the 7" touch display

Special mounting instructions for remote IO assemblies



14 *Address of remote IO assembly*

Set the addresses of the remote IO assemblies on the bus controller via the two number switches prior to commissioning. In this case, you must set the "x1" number switch to the settings "1" to "5" for the remote IO assemblies "1" to "5".

The addresses of the remote IO assemblies are preset at the factory.

Special mounting instructions regarding the assignment of the device address (PROFIBUS)/input channels (4 to 20 mA)

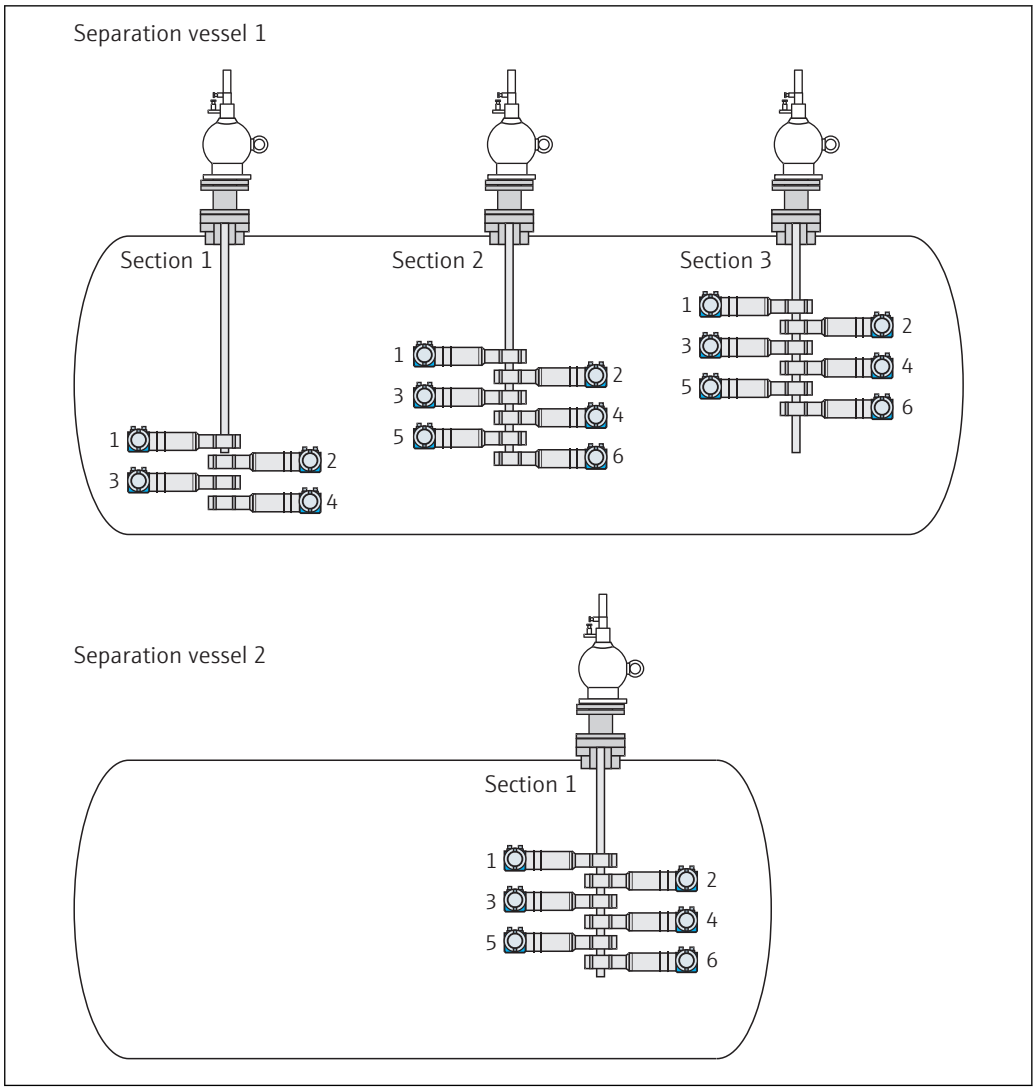
Device address/input channel assignment

Using the "Easy Setup" function, the FMG60 compact transmitters are assigned according to their position in the system.

A system is always subdivided into separation vessels, sections and devices.

Example:

- Separation vessel 1 consists of 3 sections: section 1 with 4 devices, section 2 with 6 devices and section 3 with 6 devices.
- Separation vessel 2 consists of 1 section with 6 devices.



15 *Example with 2 separation vessels*

The devices are assigned in the following order:
- Separation vessel 1, section 1, device position from top to bottom
- Separation vessel 1, section 2, device position from top to bottom
- Separation vessel 1, where applicable all other sections such as section 3, 4 and 5
- Where applicable, assign separation vessels 2, 3, 4 and 5 in the same way as separation vessel 1

Assignment of device address for PROFIBUS devices

The assignment of the device address starts with PROFIBUS address 5.

Example as per graphic (→ 15, 15):

Separation vessel	Section	Device	PROFIBUS address
1	1	1	5
		2	6
		3	7
		4	8
	2	1	9
		2	10
		3	11
		4	12

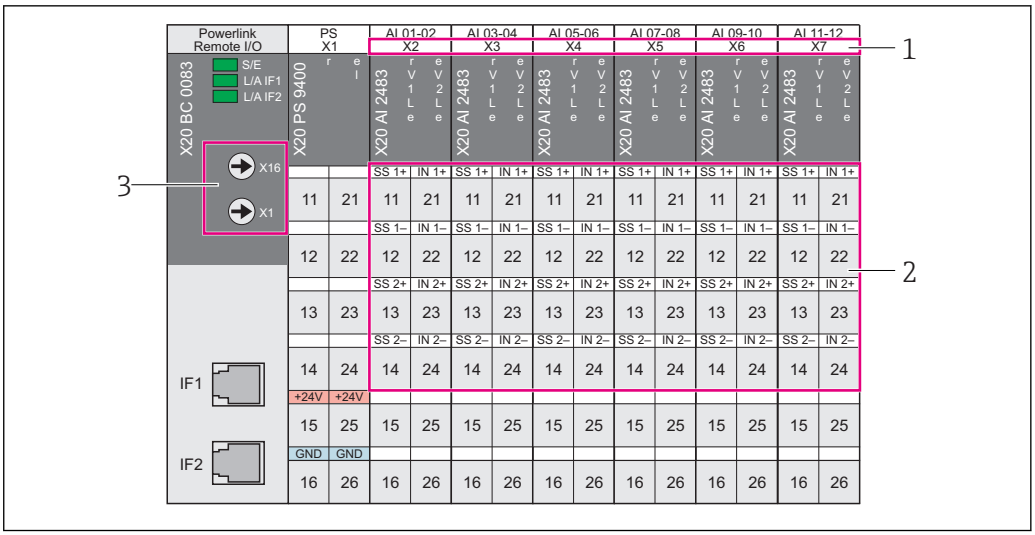
Separation vessel	Section	Device	PROFIBUS address
		5	13
		6	14
	3	1	15
		2	16
		3	17
		4	18
		5	19
		6	20
2	1	1	21
		2	22
		3	23
		4	24
		5	25
		6	26

Assignment of input channels for 4 to 20 mA devices

The assignment of the input channels starts with remote IO assembly 1, analog input 1, module X2 and input IN1.

Example as per graphic (→ 🖼 15, 🖹 15)

Separation vessel	Section	Device	Remote IO assembly	Module	Input	Software input channel
1	1	1	1	X2	IN1	1
		2			IN2	2
		3		X3	IN1	3
		4			IN2	4
	2	1		X4	IN1	5
		2			IN2	6
		3		X5	IN1	7
		4			IN2	8
		5		X6	IN1	9
		6			IN2	10
	3	1		X7	IN1	11
		2			IN2	12
		3	2	X2	IN1	13
		4			IN2	14
		5		X3	IN1	15
		6			IN2	16
2	1	1		X4	IN1	17
		2			IN2	18
		3		X5	IN1	19
		4			IN2	20
		5		X6	IN1	21
		6			IN2	22



16 *Remote IO assembly for 4 to 20 mA devices*

1 *Remote IO module number*
2 *Connections for analog inputs*
3 *Remote IO assembly address*

Environment

Ambient temperature range

Component	Ambient temperature range
Controller assembly	–25 to +60 °C (–13 to +140 °F)
Remote IO assembly	–25 to +60 °C (–13 to +140 °F)
Gateway/firewall/remote maintenance modem	–25 to +45 °C (–13 to +113 °F)
7" touch display	–20 to +60 °C (–4 to +140 °F)

Humidity

Component	Humidity
Controller assembly	5 to 95 % RH, non-condensating
Remote IO assembly	5 to 95 % RH, non-condensating
Gateway/firewall/remote maintenance modem	0 to 95 % RH, non-condensating
7" touch display	▪ Up to +40 °C (+104 °F): 20 to 90 % RH, non-condensating ▪ Up to +60 °C (+140 °F): 20 to 50 % RH, non-condensating

Degree of protection

Component	Degree of protection
Controller assembly	IP20
Remote IO assembly	IP20
Gateway/firewall/remote maintenance modem	IP20
7" touch display	▪ Front: IP65 ▪ Rear: IP20

Operating altitude

< 2000 m (6561 ft) over MSL

Mechanical construction

Dimensions

Component	Dimensions (width x height x depth)
Controller assembly	169 mm x 99 mm x 78 mm
Remote IO assembly	118 mm x 99 mm x 75 mm
Gateway/firewall/remote maintenance modem	32 mm x 107 mm x 97 mm
7" touch display	197 mm x 140 mm x 48 mm

Weight

Component	Weight
Controller assembly	Approx. 0.4 kg
Remote IO assembly	Approx. 0.6 kg per assembly
Gateway/firewall/remote maintenance modem	Approx. 0.5 kg
7" touch display	Approx. 0.6 kg

Operability

Operating concept

System configuration and operation either via the optional 7" touch display or a VNC client

Local operation

Via optional 7" touch display

- Model: TFT color graphic display with touch control
- Size (screen diagonal): 7" (178 mm)
- Resolution: WVGA, 800 x 480 pixels
- Touch technology: analog resistive

Operating languages

For optional 7" touch display and VNC client: English and German

System integration

The following optional protocols are available for the integration of the Profile Vision Compact SPV350 into a customer control system:

- Modbus TCP (server)
- OPC UA (server)

The customer control system is connected via the Ethernet interface (UPLINK1) of the gateway.

Certificates and approvals

CE mark

An individual Declaration of Conformity is available for all the components. The component manufacturer confirms the conformity of the product by affixing to it the CE mark.

UL approval

All the components are tested by Underwriters Laboratories and listed as "Industrial Control Equipment". The cULus approval mark applies for the USA and Canada and facilitates the approval of your machines and systems in this economic area.

EAC approval

All the components, with the exception of the SiteManager (gateway/remote maintenance modem), have been tested by an accredited test laboratory and may be introduced in the newly established Eurasian Customs Union (Russia, Belarus, Kazakhstan etc.). This facilitates the approval of your machines and systems in this economic area.

DNV GL approval

All the components, with the exception of the SiteManager (gateway/remote maintenance modem), are approved by DNV GL and are therefore suitable for use in the maritime sector.

Ex approval

Component	ATEX	HazLoc (CSA)
Controller assembly	II 3G Ex nA nC IIA T5 Gc	Class I, Division 2, Groups A, B, C and D
Remote IO assembly	II 3G Ex nA nC IIA T5 Gc	Class I, Division 2, Groups A, B, C and D
Gateway/firewall/remote maintenance modem	–	–
7" touch display	II 3G Ex nA IIA T5 Gc II 3D Ex tc IIIC T70°C Dc	–

Ordering information

Order code

SPV350	–	010	020	030	040	050	060	500	600

Feature	Designation	Option model	
010	Approval	AA	Non-hazardous area
		99	Special version, TSP-no. to be spec.
020	Power supply	1	24 V DC
		9	Special version, TSP-no. to be spec.
030	Application Package Profile Vision Compact	A	1 … 12 devices
		B	13 … 24 devices
		C	25 … 36 devices
		C	37 … 48 devices
		E	49 … 60 devices
		Y	Special version, TSP-no. to be spec.
040	Input	AA	PROFIBUS DP
		BA	4 … 20 mA, 1x IO assembly with 12 inputs (HART transparency)
		BB	4 … 20 mA, 2x IO assembly with 12 inputs (HART transparency)
		BC	4 … 20 mA, 3x IO assembly with 12 inputs (HART transparency)
		BD	4 … 20 mA, 4x IO assembly with 12 inputs (HART transparency)
		BE	4 … 20 mA, 5x IO assembly with 12 inputs (HART transparency)
		YY	Special version, TSP-no. to be spec.
050	Housing	1	DIN rail
		9	Special version, TSP-no. to be spec.
060	Display	1	7" color touch display (VNC client) for panel mounting, front IP65
		2	W/o
		9	Special version, TSP-no. to be spec.
500	Operation Language Display	AA	English
		AB	German

Feature	Designation	Option model	
		A9	Special version, TSP-no. to be spec.
600	Interface	MA	Modbus TCP (server)
		MR	OPC UA (server)
		M9	Special version, TSP-no. to be spec.

Accessories

Various accessories are available for the system, and can be ordered with the system or at a later stage from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser Sales Center or on the product page of the Endress+Hauser website: www.endress.com.

Other accessories

Field Xpert SMT70
- For easy device configuration
- For the visualization (VNC client) of the Profile Vision Compact application
- Product Configurator on the product page: www.endress.com/smt70

Supplementary documentation

Profile Vision Compact SPV350
- Operating Instructions BA01903S/00/EN
- Brief Operating Instructions KA01403S/00/EN

Gammapilot M FMG60
- Technical Information TI00363F/00/EN
- Operating Instructions BA0236F/00/EN (HART)
- Operating Instructions BA0329F/00/EN (PROFIBUS PA)

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