Brief Operating Instructions **Proline 100 Modbus RS485**

Transmitter with Coriolis sensor





These instructions are Brief Operating Instructions; they are **not** a substitute for the Operating Instructions pertaining to the device.

Transmitter Brief Operating Instructions

Contain information about the transmitter.

Sensor Brief Operating Instructions $\rightarrow \cong 3$





Brief Operating Instructions for the device

The device consists of a transmitter and a sensor.

- The process of commissioning these two components is described in two separate manuals:
- Sensor Brief Operating Instructions
- Transmitter Brief Operating Instructions

Please refer to both Brief Operating Instructions when commissioning the device as the contents of the manuals complement one another:

Sensor Brief Operating Instructions

The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.

- Incoming acceptance and product identification
- Storage and transport
- Installation

Transmitter Brief Operating Instructions

The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).

- Product description
- Installation
- Electrical connection
- Operation options
- System integration
- Commissioning
- Diagnostic information

Additional device documentation



These Brief Operating Instructions are the **Transmitter Brief Operating Instructions**.

The "Sensor Brief Operating Instructions" are available via:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: Endress+Hauser Operations App

Detailed information about the device can be found in the Operating Instructions and the other documentation:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: Endress+Hauser Operations App

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1 Document information

1.1 Symbols used

1.1.1 Safety symbols

Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	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.

1.1.2 Symbols for certain types of information

Symbol	Meaning	Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.		Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.	i	Tip Indicates additional information.
	Reference to documentation		Reference to page
	Reference to graphic	1., 2., 3	Series of steps
4	Result of a step		Visual inspection

1.1.3 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current	\sim	Alternating current
R	Direct current and alternating current	<u> </u>	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbol	Meaning
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.
	 The ground terminals are situated inside and outside the device: Inner ground terminal: Connects the protectiv earth to the mains supply. Outer ground terminal: Connects the device to the plant grounding system.

1.1.4 Tool symbols

Symbol	Meaning	Symbol	Meaning
0	Torx screwdriver		Flat blade screwdriver
96	Cross-head screwdriver	$\bigcirc \not \models$	Allen key
Ń	Open-ended wrench		

1.1.5 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,	Item numbers	1., 2., 3	Series of steps
A, B, C,	Views	A-A, B-B, C-C,	Sections
EX	Hazardous area	×	Safe area (non-hazardous area)
≈➡	Flow direction		

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ► Trained, qualified specialists must have a relevant qualification for this specific function and task.
- Are authorized by the plant owner/operator.
- Are familiar with federal/national regulations.
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

2.2 Designated use

Application and media

- The measuring device described in these Brief Operating Instructions is intended only for flow measurement of liquids and gases.
- The measuring device described in these Brief Operating Instructions is intended only for flow measurement of liquids.

Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

Measuring devices for use in hazardous areas, in hygienic applications or where there is an increased risk due to process pressure, are labeled accordingly on the nameplate.

To ensure that the measuring device remains in proper condition for the operation time:

- ► Keep within the specified pressure and temperature range.
- Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- ► If the measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Documentation" section.
- Protect the measuring device permanently against corrosion from environmental influences.

Incorrect use

Non-designated use can compromise safety. The manufacturer is not liable for damage caused by improper or non-designated use.

WARNING

Danger of breakage due to corrosive or abrasive fluids!

- ► Verify the compatibility of the process fluid with the sensor material.
- Ensure the resistance of all fluid-wetted materials in the process.
- Keep within the specified pressure and temperature range.

NOTICE

Verification for borderline cases:

 For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability as minute changes in the temperature, concentration or level of contamination in the process can alter the corrosion resistance properties.

Residual risks

WARNING

The electronics and the medium may cause the surfaces to heat up. This presents a burn hazard!

▶ For elevated fluid temperatures, ensure protection against contact to prevent burns.

Only applies for Proline Promass E, F, O, X and Cubemass C

WARNING

Danger of housing breaking due to measuring tube breakage!

► In the event of a measuring tube breakage for a device version without rupture disk it is possible for the pressure loading capacity of the sensor housing to be exceeded. This can lead to rupture or failure of the sensor housing.

2.3 Workplace safety

For work on and with the device:

 Wear the required personal protective equipment according to federal/national regulations.

For welding work on the piping:

• Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:

• Due to the increased risk of electric shock, gloves must be worn.

2.4 Operational safety

Risk of injury.

- Operate the device in proper technical condition and fail-safe condition only.
- ► The operator is responsible for interference-free operation of the device.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet stateof-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

The device consists of a transmitter and a sensor.

The device is available as a compact version: The transmitter and sensor form a mechanical unit.

Applies for Promass, Cubemass, CNGmass, LNGmass and LPGmass

If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.



For detailed information on the product description, see the Operating Instructions for the device

4 Installation

For detailed information about mounting the sensor, see the Sensor Brief Operating Instructions $\rightarrow \square 3$

4.1 Mounting the measuring device

4.1.1 Turning the display module

The local display is only available with the following device version: Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

The display module can be turned to optimize display readability.

Aluminum housing version



Compact and ultra-compact housing versions



5 Electrical connection

NOTICE

The measuring device does not have an internal circuit breaker.

- For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.
- ► Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 16 A) should be integrated into the system installation.

5.1 Connection conditions

5.1.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp (on aluminum housing): Allen screw3 mm
- For securing screw (for stainless steel housing): open-ended wrench 8 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule

5.1.2 Requirements for connecting cable

The connecting cables provided by the customer must fulfill the following requirements.

Electrical safety

In accordance with applicable federal/national regulations.

Permitted temperature range

- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Power supply cable

Standard installation cable is sufficient.

Signal cable

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.



For detailed information about the specification of the connecting cable, see the Operating Instructions for the device.

Connecting cable between Safety Barrier Promass 100 and measuring device

Cable type	Shielded twisted-pair cable with $2x2$ wires. When grounding the cable shield, observe the grounding concept of the plant.
Maximum cable resistance	2.5 Ω , one side



Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

Wire cros	ss-section	Maximum cable length		
[mm ²]	[AWG]	[m]	[ft]	
0.5	20	70	230	
0.75	18	100	328	
1.0	17	100	328	
1.5	16	200	656	
2.5 14		300	984	

Cable diameter

- Cable glands supplied: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring terminals: Wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- With Safety Barrier Promass 100: Plug-in screw terminals for wire cross-sections0.5 to 2.5 mm² (20 to 14 AWG)

5.1.3 Terminal assignment

The terminal assignment for the electrical connection of the device can be found on the connection nameplate of the electronics module.

In addition, the device version with Modbus RS485 is supplied with the Safety Barrier Promass 100 whose nameplate also bears information on the terminals.

Transmitter

Device version with Modbus RS485 communication protocol



- I Modbus RS485 terminal assignment, connection version for use in non-hazardous areas and Zone 2/Div. 2
- 1 Power supply: DC 24 V
- 2 Output: Modbus RS485



A0017053

- Image: 2 Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)
- 1 Power supply: DC 24 V
- 2 Output: Modbus RS485

Safety Barrier Promass 100



- Safety Barrier Promass 100 with terminals
- 1 Non-hazardous area and Zone 2/Div. 2
- 2 Intrinsically safe area

5.1.4 Pin assignment, device plug

Supply voltage

Promass 100

2	Pin		Assignment
	1	L+	Supply voltage, intrinsically safe
	2	А	Madhua DC/QE intringically and
	3	В	woodbus K3463 munisically sale
3 TO QUTI	4	L-	Supply voltage, intrinsically safe
$ \setminus \bigcirc \vee$	5		Grounding/shielding
5	Cod	ling	Plug/socket
4	1	ł	Plug
A0016809			

Device plug for signal transmission with supply voltage (device side), MODBUS RS485 (intrinsically safe)

Device plug for supply voltage (device side), MODBUS RS485 (not intrinsically safe)

For use in the non-hazardous area and Zone 2/Div. 2.

2	Pin		Assignment
	1	L+	DC 24 V
	2		Not assigned
	3		Not assigned
	4	L-	DC 24 V
$ \setminus \bigcirc \vee$	5		Grounding/shielding
5	Cod	ling	Plug/socket
4	1	Ą	Plug
A0016809			

Signal transmission

Promass

Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)

For use in the non-hazardous area and Zone 2/Div. 2.



5.1.5 Shielding and grounding

Modbus

The shielding and grounding concept requires compliance with the following:

- Electromagnetic compatibility (EMC)
- Explosion protection
- Personal protection equipment
- National installation regulations and guidelines
- Observe cable specification .
- Keep the stripped and twisted lengths of cable shield to the ground terminal as short as possible.
- Seamless cable shielding.

Grounding of the cable shield

To comply with EMC requirements:

- Ensure the cable shield is grounded to the potential matching line at multiple points.
- Connect every local ground terminal to the potential matching line.

NOTICE

In systems without potential matching, the multiple grounding of the cable shield causes mains frequency equalizing currents!

Damage to the bus cable shield.

 Only ground the bus cable shield to either the local ground or the protective ground at one end.

5.1.6 Preparing the measuring device

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

- ► Use suitable cable glands corresponding to the degree of protection.
- 1. Remove dummy plug if present.
- If the measuring device is supplied without cable glands:
 Provide suitable cable gland for corresponding connecting cable.
- If the measuring device is supplied with cable glands:
 Observe requirements for connecting cables →
 ⁽¹⁾
 ⁽²⁾
 ⁽²⁾

5.2 Connecting the measuring device

NOTICE

Limitation of electrical safety due to incorrect connection!

- ► Have electrical connection work carried out by appropriately trained specialists only.
- Observe applicable federal/national installation codes and regulations.
- Comply with local workplace safety regulations.
- ► Always connect the protective ground cable ⊕ before connecting additional cables.
- ► For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.
- ▶ The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

5.2.1 Connecting the transmitter

The connection of the transmitter depends on the following order codes:

- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



- E 4 Housing versions and connection versions
- A Compact, coated aluminum
- B Compact hygienic, stainless or compact, stainless
- 1 Cable entry or device plug for signal transmission
- 2 Cable entry or device plug for supply voltage
- C Ultra-compact hygienic, stainless or ultra-compact, stainless
- 3 Device plug for signal transmission
- 4 Device plug for supply voltage



■ 5 Device versions with connection examples

- 1 Cable
- 2 Device plug for signal transmission
- 3 Device plug for supply voltage
- ▶ Connect the cable in accordance with the terminal assignment \rightarrow 🗎 12 or the device plug pin assignment .

5.2.2 Connecting the Safety Barrier Promass 100

In the case of the device version with Modbus RS485 intrinsically safe, the transmitter must be connected to the Safety Barrier Promass 100.



Electrical connection between the transmitter and Safety Barrier Promass 100



- *2 Observe cable specifications* $\rightarrow \square 11$
- 3 Safety Barrier Promass 100: terminal assignment
- 4 *Observe cable specifications* $\rightarrow \square 11$
- 5 Non-hazardous area
- 6 Non-hazardous area and Zone 2/Div. 2
- 7 Intrinsically safe area
- 8 Transmitter: terminal assignment

5.2.3 Ensuring potential equalization

Promass, Cubemass, CNG, LNG, LPG

Requirements

No special measures for potential equalization are required.



For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

5.3 Special connection instructions

5.3.1 Connection examples

Modbus RS485

Modbus RS485, non-hazardous area and Zone 2/Div. 2



In Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications $\rightarrow \square 11$
- 3 Distribution box
- 4 Transmitter

Modbus RS485 intrinsically safe





- 1 Control system (e.g. PLC)
- 2 Cable shield, observe cable specifications
- 3 Safety Barrier Promass 100
- 4 Observe cable specifications
- 5 Non-hazardous area
- 6 Non-hazardous area and Zone 2/Div. 2
- 7 Intrinsically safe area
- 8 Transmitter

5.4 Hardware settings

5.4.1 Enabling the terminating resistor

Modbus RS485

To avoid incorrect communication transmission caused by impedance mismatch, terminate the Modbus RS485 cable correctly at the start and end of the bus segment.





9 Terminating resistor can be enabled via DIP switch on the main electronics module

If the transmitter is used in the intrinsically safe area



10 Terminating resistor can be enabled via DIP switch in the Safety Barrier Promass 100

5.5 Ensuring the degree of protection

The measuring device fulfills all the requirements for the IP66/67 degree of protection, Type 4X enclosure.

To guarantee IP66/67 degree of protection, Type 4X enclosure, carry out the following steps after the electrical connection:

- 1. Check that the housing seals are clean and fitted correctly.
- 2. Dry, clean or replace the seals if necessary.
- 3. Tighten all housing screws and screw covers.
- 4. Firmly tighten the cable glands.
- To ensure that moisture does not enter the cable entry: Route the cable so that it loops down before the cable entry ("water trap").



6. Insert dummy plugs into unused cable entries.

5.6 Post-connection check

Are cables or the device undamaged (visual inspection)?	
Do the cables used meet the requirements $\rightarrow \square$ 11?	
Do the cables have adequate strain relief?	
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" \rightarrow \square 23?	
Depending on the device version: are all the device plugs firmly tightened ?	
 Does the supply voltage match the specifications on the transmitter nameplate ? For device version with Modbus RS485 intrinsically safe: does the supply voltage match the specifications on the nameplate of the Safety Barrier Promass 100 ? 	
Is the terminal assignment or pin assignment of the connector $\rightarrow \square$ 14 correct?	
 If supply voltage is present, is the power LED on the electronics module of the transmitter lit green ? For device version with Modbus RS485 intrinsically safe, if supply voltage is present, is the power LED on the Safety Barrier Promass 100 lit ? 	
Depending on the device version, is the securing clamp or fixing screw firmly tightened?	

6 Operation options

6.1 Overview of operating options



Computer with "FieldCare" or "DeviceCare" operating tool via Commubox FXA291 and service interface
 Control system (e.g. PLC)

6.2 Structure and function of the operating menu

6.2.1 Structure of the operating menu



🖻 11 Schematic structure of the operating menu

6.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles (operator, maintenance etc.). Each user role contains typical tasks within the device lifecycle.



For detailed information on the operating philosophy, see the Operating Instructions for the device.

6.3 Access to the operating menu via the operating tool

6.3.1 Connecting the operating tool

Via service interface (CDI)

Modbus RS485



A003021

- 1 Service interface (CDI) of measuring device
- 2 Commubox FXA291
- 3 Computer with "FieldCare" operating tool with COM DTM "CDI Communication FXA291"

Via service interface (CDI)



- 1 Service interface (CDI = Endress+Hauser Common Data Interface) of the measuring device
- 2 Commubox FXA291
- 3 Computer with FieldCare operating tool with COM DTM CDI Communication FXA291

6.3.2 FieldCare

Function scope

FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field devices in a system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

Typical functions:

- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

For additional information about FieldCare, see Operating Instructions BA00027S and BA00059S

Source for device description files

- www.endress.com \rightarrow Downloads
- CD-ROM (contact Endress+Hauser)
- DVD (contact Endress+Hauser)

Establishing a connection

- 1. Start FieldCare and launch the project.
- 2. In the network: Add a device.
 - └ The **Add device** window opens.
- 3. Select the CDI Communication FXA291 option from the list and press OK to confirm.
- 4. Right-click **CDI Communication FXA291** and select the **Add device** option in the context menu that opens.
- 5. Select the desired device from the list and press **OK** to confirm.
- 6. Establish the online connection to the device.

For additional information, see Operating Instructions BA00027S and BA00059S

User interface



- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal
- 6 Display area for current measured values
- 7 Edit toolbar with additional functions such as save/restore, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

7 System integration

For detailed information on system integration, see the Operating Instructions for the device.

- Overview of device description files
 - Current version data for the device
 - Operating tools
- Compatibility with previous model
- Modbus RS485 information
 - Function codes
 - Response time
 - Modbus data map

8 Commissioning

8.1 Function check

Before commissioning the measuring device:

- ► Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist
- "Post-connection check" checklist $\rightarrow \cong 23$

8.2 Setting the operating language

Factory setting: English or ordered local language

The operating language can be set in FieldCare or DeviceCare: Operation \rightarrow Display language

8.3 Configuring the measuring device

The **Setup** menu with its submenus enable fast commissioning of the measuring device. The submenus contain all the parameters required for configuration, such as parameters for measurement or communication.



The submenus available in the particular device can vary on account of the device version (e.g. sensor).

Submenu	Meaning	
Medium selection	Define the medium	
Output conditioning	Define the output conditioning	
System units	Configure the units for all measured values	
Communication	Configure the digital communication interface	
Low flow cut off	Set the low flow cut off	
Partially filled pipe detection	Configure partial and empty pipe detection	

8.4 Protecting settings from unauthorized access

The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:

- Protect access to parameters via access code
- Protect access to local operation via key locking
- Protect access to measuring device via write protection switch



For detailed information on protecting the settings against unauthorized access, see the Operating Instructions for the device.

9 Diagnostic information

Any faults detected by the measuring device are displayed as a diagnostic message in the operating tool once the connection has been established and on the home page of the web browser once the user has logged on.

Remedial measures are provided for each diagnostic message to ensure that problems can be rectified quickly.

In FieldCare: Remedial measures are displayed on the home page in a separate field below the diagnostic message.

1	L		
D 🛎 🖬 🛎 📾 🖾 Q 📖 🗽			
Xxxxxx//			
Device name: Xxxxxxx		Mass flow: 🔁 12.34 kg/h	
Device tag: Xxxxxxx		Volume flow: 🔁 12.34 m³/h	
Status signal:	W Function check ((C)	
	* 🖭 👍 🌀		
E Vanana		Instrument health status	
Diagnostics 1:	C485 Simu	instrument nearth status	
Remedy information:	Deactivate		
P□ Access status tooling:	Mainenance	Sailure (F)	
Deration		W Function check (C)	— 2
Diagnostics		Diagnostics 1: C485 Simulation measured vari	
		Remedy information: Deactivate Simulation (Service	
		Out of spezification (S)	3
			2
		Maintenance required (M)	

A0021799-EN

- 1 Status area with status signal
- 2 Diagnostic information
- 3 Remedy information with Service ID
- Perform the remedial measure displayed.

www.addresses.endress.com

