

# Field Communication

## Power supply unit FXN 672

**Intrinsically safe power supply for HART transmitters**

**Connects HART transmitters to the Rackbus**



### Application

The FXN 672 is an intrinsically safe power supply unit for active or passive HART devices. The sensor loop, analogue output and external power circuit are galvanically isolated from each other. The connected HART transmitter can be configured locally by plugging a handheld terminal DXR 275 or Commubox FXA 191 into the sockets on the front panel of the FXN 672.

The FXN 672 also converts the HART signal into a Rackbus signal. By using a ZA gateway, information can be passed onto a supervisory bus system. This allows the transmitter to be configured, measured values to be read, or errors to be displayed, e.g. by Commuwin II. In this case, foreign devices are operated by the universal and common practice commands.

### Features and Benefits

- Digital system integration of HART devices via standard bus protocols, e.g. Modbus, Interbus, PROFIBUS, ControlNet
- HART multiplexer function
- Intrinsically safe power supply
- Suitable for both active and passive HART devices
- Full galvanic isolation
- HART conformance

Endress + Hauser

Nothing beats know-how



# Configuration

## LED Indicators

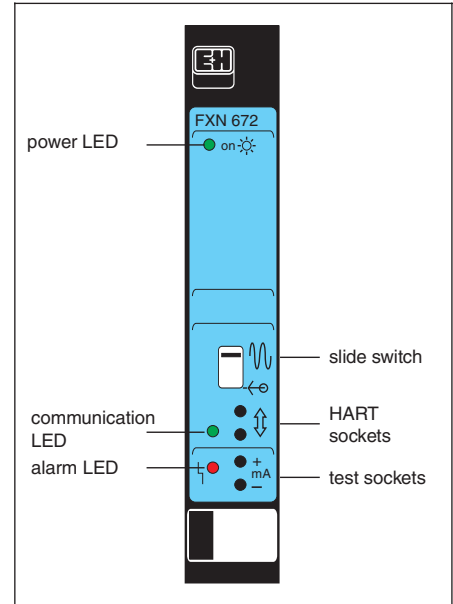
- Green power LED
  - lights when the unit is switched on
- Green communication LED
  - lights 1 s when data is transmitted
- Red alarm LED
  - lights on an alarm
  - flashes on a warning

## Slide Switch

- Up: Rackbus operation
- Down: Standard operation

## Sockets

- HART-configuration sockets:
  - plug in a DXR 275 handheld terminal or Commubox FXA 191 to configure the HART transmitter
- Test sockets:
  - check the 4...20 mA output here



Front panel of FXN 672

## Hook Switch

Set according to the type of transmitter:

- Up: Transmitter with passive output
- Down: Transmitter with active output

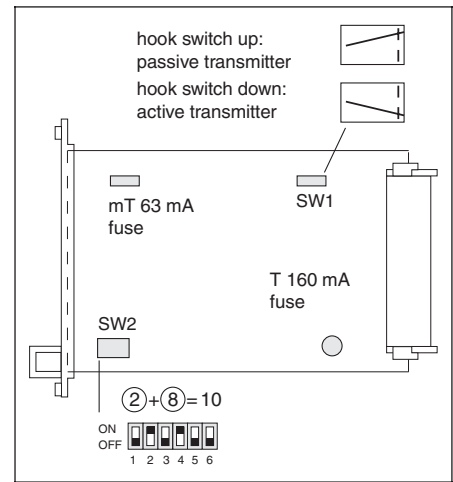
## Address Switch

For Rackbus operation, set a unique address between 0 and 63:

Switch	1	2	3	4	5	6
ON	1	2	4	8	16	32
OFF	0	0	0	0	0	0

## Fuses

- External power circuit: T 160 mA
- Sensor circuit: mT 63 mA



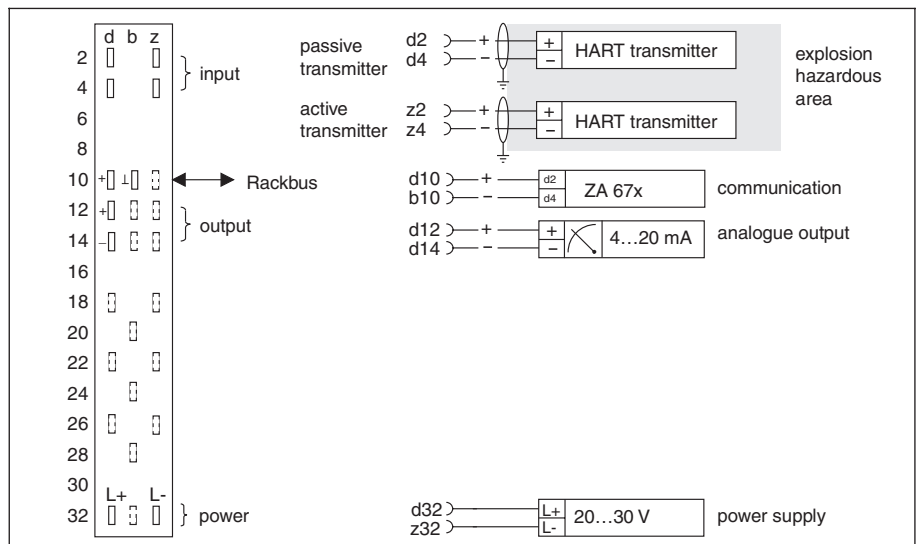
Configuration elements

# Electrical Connection

## Transmitter Cable

Use separate, screened, twisted pairs for the HART-Transmitter line. All other connections can be made with standard instrument cable, max. 25 Ω per core.

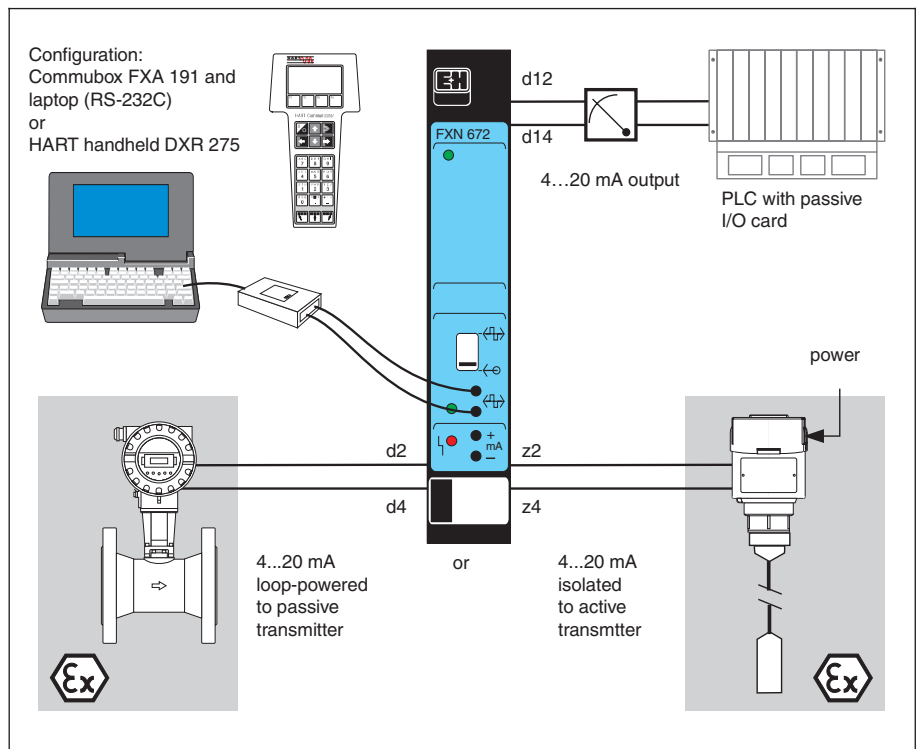
- Ground the screen at the sensor end: observe any Ex-regulations. For non-hazardous applications, if possible ground the screen at both ends.



Pin assignment of the 25-pin male connector on the rear of the instrument

# Standard Operation

Measuring system for standard operation. Slide switch on the front panel down. *Either passive or active transmitter.*



## Measuring System

The measuring system comprises the power supply unit FXN 672 and a passive or active HART transmitter:

- passive. e.g. Micropilot FMR 231, Prosonic T, Deltabar S, Cerabar S, Multicap, Deltapilot S, Mypro L, Prowirl or foreign device
- active: Micropilot FMR 130/131, Levelflex, Prosonic T, Promag, Promass or foreign device

Indicators, recorders, controllers, process computers, annunciators etc. can be connected to the FXN 672 current output, which provides a signal which is proportional to the transmitter measured value.

## Function

The FXN 672 loop-powers the connected passive HART transmitter. In the case of active transmitters, it acts as an isolator. The transmitter connection is intrinsically safe and electrically isolated from the rest of the circuitry.

The 4...20 mA current signal is also electrically isolated from the rest of the circuitry and made available at the FXN 672 current output (d12, d14). This carries no HART signals.

The current output can be tested by an ammeter at the two sockets on the front panel (no HART signals).

## Set-Up

The configuration elements on the FXN 672 must be set as follows:

- Slide switch on front panel:
  - down
- Hook switch on card:
  - up for passive transmitter
  - down for passive transmitter

An output load up to 500 Ω can be connected to pins d12/d14.

## Configuration of Transmitters

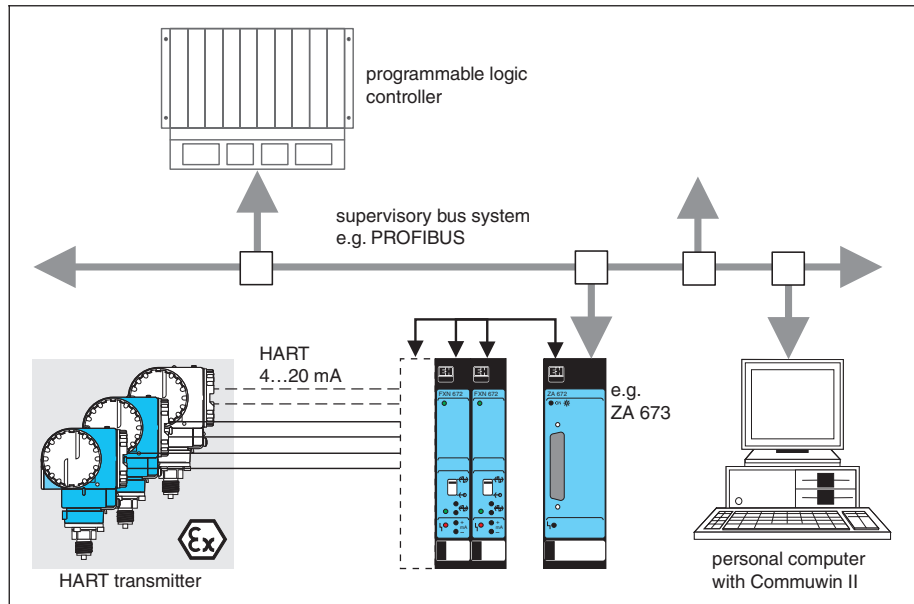
The HART transmitter can be configured at any time from the communication sockets via:

- a Commubox FXA 191 and laptop on which e.g. Commuwin II is running
- a HART handheld terminal DXR 275 (secondary master)

For matrix and error messages, see page 5 and 6.

# Rackbus Operation

In Rackbus operation the HART transmitter is connected to a supervisory process control system via a gateway ZA. Slide switch on the front panel up. Either passive or active transmitter.



## Measuring System

The measuring system comprises the power supply unit FXN 672, a passive or active HART transmitter, see page 3, and a Rackbus gateway ZA 67x or Commubox FXA 192. The galvanically isolated current output can also be used.

The gateway connects the Rackbus to a supervisory control system. Gateways are currently available for the following protocols:

- PROFIBUS-FMS, PROFIBUS-DP, MODBUS, INTERBUS, ControlNet or RS-232C serial port

## Function

The HART signals superimposed on the 4...20 mA current signal are transmitted, electrically isolated, to the safe side of the FXN 672. Data exchange is bidirectional, i.e. both transmitter and receiver signals are handled. The microcomputer converts HART signals to Rackbus protocol and vice versa. This communication interface allows the operating parameters of the HART transmitter to be accessed through the FXN 672.

## HART Multiplexer

Up to 64 FXN 672 units can be connected to the Rackbus. The ZA gateway scans the status of the FXN 672 and the measured value of the associated transmitter and stores the information in an auto-scan buffer. The supervisory system accesses the buffer and reads out the information block.

The FXN 672 status contains information as to whether the HART transmitter is in fault condition or not, but not the corresponding code, see page 6.

## Set-Up

The configuration elements on the FXN 672 must be set as follows:

- Slide switch on front panel:
  - up
- Hook switch on card:
  - up for passive transmitter
  - down for active transmitter
- Set Rackbus address, see page 2

An output load up to 500 Ω can be connected to pins d12/d14.

## Configuration of Transmitters

The HART transmitter can be configured from a personal computer on which Commuwin II is running.

- For the ZA 673 gateway, the personal computer communicates from the supervisory system
- For all other applications, it communicates directly with the gateway

Alternatively, a Commubox FXA 191 and laptop or HART handheld terminal DXR 275 (programmed as secondary master) can be plugged into the HART configuration sockets on the front panel or anywhere in the sensor line.

# Operation by Commuwin II

## Connect

The FXN 672 Rackbus-connection is made via the ZA 672 or ZA 673 server:

- If an E+H transmitter is connected, the transmitter name appears with the FXN 672 Rackbus address.
- If a foreign transmitter is connected, the manufacturer's name for the transmitter appears with the FXN 672 Rackbus address
- If the communication is switched off or no transmitter is connected, the designation FXN 672 appears with the FXN 672 Rackbus address.

If the HART communication sockets are used, the connection is made with the HART server:

- The transmitter name appears.

The transmitter can be operated after its line has been clicked and the menu quit.

## Matrix Display

The matrices from Endress+Hauser transmitters are mapped one to one in the FXN 672 (V0H0...V10H9). The FXN 672 matrix fields cannot be seen in Commuwin II.

Foreign devices are configured using the universal and common practice command set, which is also mapped onto the Endress+Hauser matrix.

## Graphic Support

The graphic support function offers an alternative means of configuring transmitters and viewing data. All important steps required to commission the transmitter have been compiled into a series of illustrated procedures.

## Up- and Download

An up- or download is possible for Endress+Hauser transmitters only. If a matrix parameter is changed, a period of one minute must elapse before an upload is started.

During the up-/download, an error code appears in V11H0, see page 6. No parameters can be entered during this time. If a fault occurs during the procedure, or the procedure cannot be correctly terminated, a corresponding error code appears.

When the download to the FXN 672 is complete, it proceeds to download to the HART transmitter. Depending on the HART transmitter, this may take several minutes. The procedure is complete when the red LED on the FXN 672 extinguishes. The connection to Commuwin II must now be closed and re-opened again in order to update the linearisation table.

## Missing Device Descriptions

If the error message "device description not supported" appears during connection, try the following procedure:

- Set the slide switch to down.
- Menu Connect: call a new live list.
- Select the FXN 672 and start the menu Device=>Matrix. Wait until all data have been read.
- Set the slide switch to up.
- Menu Connect: call a new live list.

If the error message appears again, the latest device descriptions must be obtained from Endress+Hauser. This also applies when the error message appears during operation from the HART configuration sockets.

Operating matrix for foreign devices with universal and common commands. The **grey fields** contain FXN 672 error codes. The standard matrix appears for E+H devices: The fields V9H0...V9H3 are then filled with HART parameters. For the Prosonic 93, the matrix positions V9H5 (SW version) and V9H6 (SW version COM) have been moved to V10H2 and V10 H3 respectively.

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
<b>V0 HART</b>	1st process value	lower range-value	upper range-value	set zero	set span	output damping	set PV zeror			
<b>V1</b>										
<b>V2 HART</b>	linearisation									
<b>V3 HART</b>	sensor serial number	lower sensor limit	upper sensor limit	vendor and device ID						
<b>V4 HART</b>	PV percent value	PV current output	2nd process value	3rd process value	4th process value	unit 2nd process value	unit 3rd process value	unit 4th process value		
<b>V5</b>										
<b>V6</b>										
<b>V7</b>										
<b>V8 HART</b>		self test	reset	software revision	poll address	hardware revision	universal command revision	transfer specification revision	PV alarm selection code	simulate PV output current
<b>V9 FXN 672</b>	current error code	last error code	last-but-one error code	device ID and software revision						
<b>V10 HART</b>	tag no.	message	descriptor	final assembly no.	PV unit code	date	reset configuration flag	preamble number	device status	store EEPROM
<b>V11 FXN 672</b>	current error code	last error code	last-but-one error code	device ID and software revision						
<b>V99 FXN 672</b>	vendor name or device name	tag no. (HART)	current error code							

# Trouble-Shooting

## Self-Monitoring Function

In order to increase reliability, FXN 672 is equipped with a self-monitoring system. An alarm is given, e.g., when there is no signal at the sensor input, when the HART transmitter is defective or when the FXN 671 power supply is defective.

On alarm the current output follows that of the HART transmitter. The alarm LED reacts as follows:

LED	Significance
Lights	Alarm at FXN 672
	Rackbus operation: alarm at HART transmitter
Flashes	Warning at FXN 672
	Rackbus operation: warning at HART transmitter

If the standard operation mode is selected, the LED does not react to a fault in the HART transmitter.

## Error Codes

An error code is output every time an alarm or warning is detected.

- The 3-digit codes for the HART transmitter appear at their normal position in the matrix, e.g. V9H0, V9H1 and V9H3, or in the corresponding line of the DXR 275.
- The 2-digit code for the FXN normally appears at V11H0, V11H1 and V11H2 and is invisible to Commuwin, see below and page 5.

The codes for the FXN 672 are listed in the table below. Those for the transmitters must be taken from the appropriate operating manual,

## Diagnostic Messages

The message associated with an alarm or warning can be viewed in the Status menu of Commuwin II. For FXN 672 alarms, proceed as follows:

- Set the slide switch to down.
- Menu Connect: call a new live list
- Select the FXN 672 and start the Status menu
- Set the slide switch to up.
- Menu Connect: call a new live list.

Alternatively, the code can be read from the Terminal program of Commuwin II using the following command:

- SR [RB address], e.g. SR 10.

Code	Type	Description
11	Alarm	EEPROM checksum error Can be cured by reconfiguring the auto-scan buffer or reconnecting to Commuwin II when the FXN 672 is in standard operation mode
12	Alarm	No communication with EEPROM
13	Warning	Initialisation following device reset
16	Alarm	Download via Rackbus active Disappears when download complete
22	Alarm	Up-/Download FXN 671/HART transmitter active No continuous measurement possible Disappears when download complete
23	Alarm	FXN 672/HART transmitter upload/download error or upload/download not completed correctly Repeat download
41	Alarm	No communication with HART transmitter Check that transmitter is connected to correct input and that the hook switch is correctly set.
42	Warning	Alarm/Warning in connected HART transmitter HART status = more status available Suppressed when FXN 672 is in standard mode
43	Alarm	Alarm in connected HART transmitter HART status = device defective Suppressed when FXN 672 is in standard mode
44	Alarm	More than one HART device connected FXN 672 is not suitable for HART buses Suppressed when FXN 672 is in standard mode
45	Warning	Read/write access error Check connections, check that cable shielding correctly grounded.
65	Warning	HART transmitter matrix is being loaded by FXN 672 Appears for about 1 s following reset

Error messages  
FXN 672

# Technical Data

## General specifications

Manufacturer	Endress+Hauser GmbH+Co.
Designation	Power supply unit FXN 672

## Application

Power supply unit/isolator for active or passive HART transmitters
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## Function and System Design

Function	Intrinsically safe power supply unit for HART transmitters with HART/Rackbus interface
System architecture	FXN 672 and HART transmitter, for Rackbus communication, with ZA gateway.
Sensors	All transmitters conforming to HART Protocol Revision 5.0 upwards with passive or active current output

## Input

Signal	4...20 mA current signal with superimposed HART signal Communication switchable at slide switch on front panel
Signal input	Galvanically isolated from the rest of the circuitry;
Transmission rate	HART signal: 1 200 Bit/s

## Output

### Sensor circuit (with loop-power for passive transmitter)

Output voltage	15.0 V $\pm$ 2% (for $I_a = 20$ mA)
Output current	Max. 22 mA
Short-circuit current $I_k$	<35 mA (electronic limitation), duration unlimited
Temperature effect	<0.1%/10K

### Sensor circuit (isolated for active transmitter)

Impedance	284 $\Omega$
Max. voltage drop	$\leq 8$ V at 20 mA

### Current output

4 ... 20 mA signal	As HART transmitter, but with no HART signal
Load $R_B$	$0 < R_B < 500 \Omega$
Current output (front panel)	Test sockets for the connection of potential-free ammeter ( $R_i \leq 10 \Omega$ )

### Communication interface

Front panel	Two sockets for handheld DXR 275 or Commubox FXA 191
Rackbus	For connection to a personal computer or supervisory system via Gateway ZA

## Operating Conditions

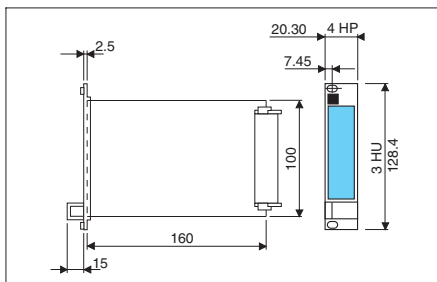
### Installation

Sensor cabling	Twisted pairs, screened max 1000 m long Line resistance max. 25 $\Omega$ per core, $\leq 100$ nF
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### Environment

Normal operating temperature	0°C ... +70°C
Temperature limits	-20°C ... +80°C
Storage temperature	-25°C ... +85°C
Ingress protection	to DIN 40 050, front panel IP 20, card IP 00
Climatic class	tested to IEC 68, Part 2-38
Electromagnetic compatibility	Emission to EN 50 081-1 Immunity to EN 50 082-2 and NAMUR industrial standard

## Mechanical Construction



Dimensions (mm), 1" = 25.4 mm

Design	4 HP Racksyst plug-in card to DIN 41 494, Parts 2 and 4 (Europa card format), Dimensions, see figure black synthetic with blue inlay, grip and tag field
Weight	approx. 0.2 kg
Connector	Male connector to DIN 41 612, Part 3, Type F Coding pins at positions 2 and 13

## Human Interface

Indicators	Red LED for fault indication Green LED for operational readiness Green LED for communication
Front panel sockets	Communication sockets for DXR 275 or FXA 191 Test sockets for 4...20 mA current output
Configuration elements	Hook switch for setting passive or active operation Slide switch for setting standard or Rackbus operation 6 pole DIP switch for setting Rackbus address

## Power Supply

Input voltage	24 V DC, tolerance 20 ... 30 V Permissible residual ripple 2 V <sub>pp</sub> within tolerance
Input current	max. 98 mA
Power consumption	for U <sub>V</sub> = 24 VDC, max. 2.25 W
Fuses	T 160 mA (TR5) with input and polarity protection Intrinsically safe circuit, mT 63 mA

## Certificates and Approvals

Electrical area classification (in preparation)	CENELEC: [EEx ia] IIC CSA General purpose, IS
Marine approval	GL and others in preparation
Electrical safety	EN 61010-1, EN 50 020
HART Conformity	HART FSK Physical Layer (Rev 8.0) Test Procedure
CE Mark	In attaching the CE Mark, Endress+Hauser confirms that the device conforms to the relevant EU directives

## Product Structure

<b>Power Supply Unit FXN 672</b>	
<b>Certificate</b> R Standard A ATEX II (I) G / [EEx ia] IIC C CSA IS [Ex ia] IIC: Class I, Zone 0	
FXN 672	product designation

## Supplementary Documentation

- HART transmitters

System/Product Information

Cerabar S, Deltabar S: SI 020P/00/en

Deltapilot S: SI 026F/00/en

Levelflex: SI 030F/00/en

Liquisys: SI 018C/07/en

Micropilot: SI 019F/00/en

Multicap: PI 008F/00/en,

PI 009F/00/en

Promass: SI 014D/06/en

Promass I: SI 021D/06/en

Promag: SI 010D/06/en

Prosonic T: SI 005F/00/en

Prosonic Flow: SI 006F/06/en

Prowirl 77: SI 021D/06/en

Temperatur sensor SI 008R/09/en

- HART Communication Foundation  
99390 Research Blvd, Suite 1-100  
Austin, Texas TX 787759, USA

Endress+Hauser  
GmbH+Co.  
Instruments International  
P.O. Box 2222  
D-79574 Weil am Rhein  
Germany

Tel. (07621) 975-02

Tx 773926

Fax (07621) 975345

<http://www.endress.com>

[info@ii.endress.com](mailto:info@ii.endress.com)

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