KROHNE

 7.02117.21.00

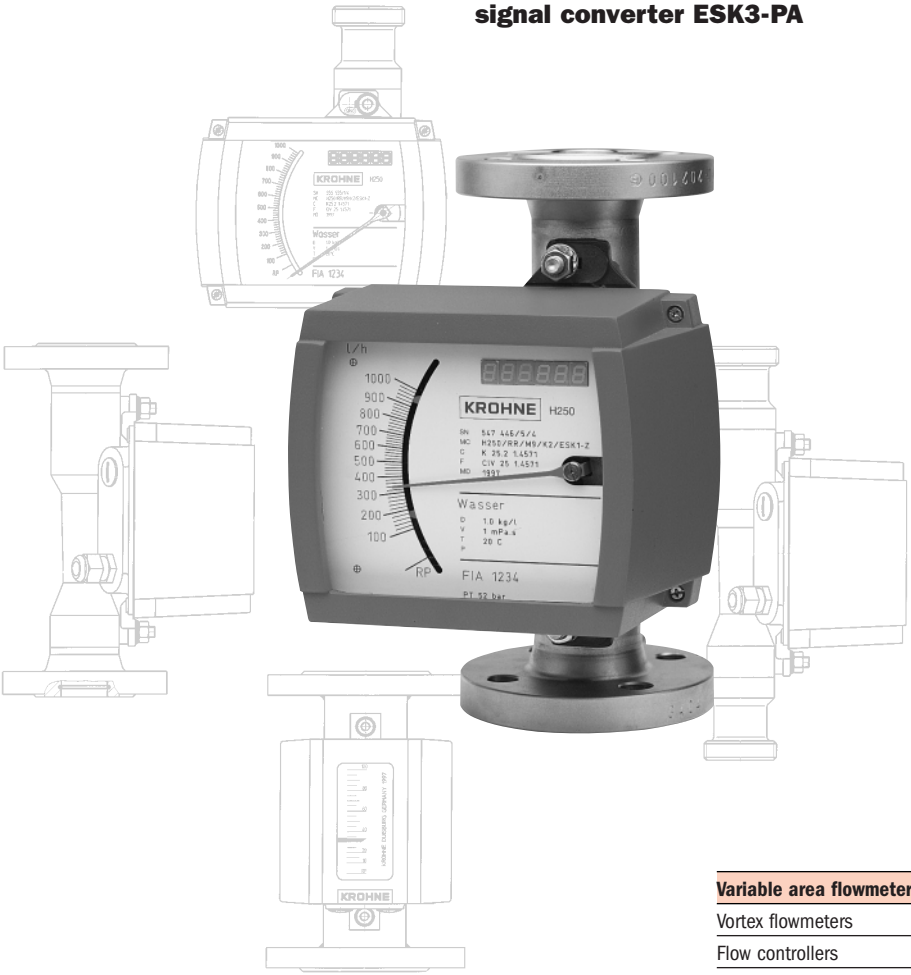
GR

Supplement to Installation and Operating Instructions

Variable area flowmeter

H 250

with PROFIBUS-PA signal converter ESK3-PA



Version: 1.02/00-06-29

Suitable for software version V-1.01 (ESK3-PA) and higher

Variable area flowmeters
Vortex flowmeters
Flow controllers
Electromagnetic flowmeters
Ultrasonic flowmeters
Mass flowmeters
Level measuring instruments
Communications engineering
Engineering systems & solutions

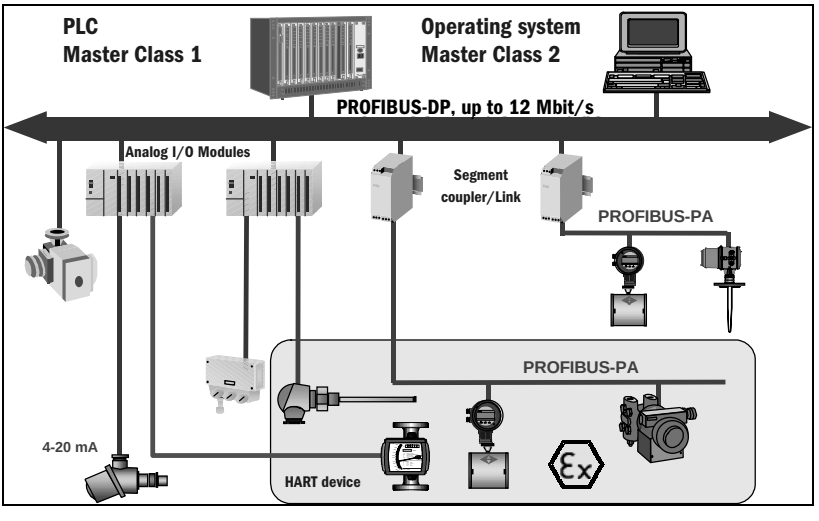
1 General

This is a supplement to the **Installation and Operating Instructions H250** and merely provides additional information for connecting and operating an ESK3-PA off a PROFIBUS-PA field bus. The details in these Instructions, especially the safety instructions, have not been modified by this supplement, and must continue to be observed.
The signal converter ESK3-PA is designed in the context of the modular concept to be installed exclusively in the M9 display component. Installation and attachment are identical to the signal converter ESKII (refer to Installation and Operating Instructions H250).

Scope of delivery

In addition to the standard scope of delivery, this supplement, along with a floppy containing all the available device master files of KROHNE devices, is supplied for the variable area flowmeter H250/.../M9/ESK3-PA with the PROFIBUS-PA interface.

2 Technical specifications



The above illustration shows a typical instrument set-up with PROFIBUS-PA devices in the hazardous and non-hazardous areas, as well as the connection of conventional non-PROFIBUS devices.

The PROFIBUS-PA is usually connected to a segment coupler which, among other duties, performs the conversion to the PROFIBUS-DP. Special care should be taken to ensure that the segment coupler on the DP side is normally set to a defined baud rate.

You can find more information about planning and operating PROFIBUS-PA networks in the KROHNE brochure entitled “PROFIBUS-PA Networks”.

2.1 GSD File

Accompanying each device are all the available device master data (GSD) of KROHNE devices. The GSD contain information about the device which is necessary for setting up the PROFIBUS-DP communication network. The corresponding files must be loaded into the set-up system / master system before bus system startup procedures can begin.

As an example, for **COMET 200** or **COM PROFIBUS** from Siemens this means:

- all GSD files (*.GSD) into device master data directory, e.g. *\GSD
- all BMP files (*.BMP) into the bitmap directory, e.g. *\BITMAPS

In **STEP7** the GSD file is automatically copied into the appropriate directory by selecting "Install new GSD" (from the HW-Config menu: EXTRAS). The bitmap is also installed at the same time. After "catalog update" you can place the device in the project. After the transfer into the connected assembly, cyclical communication (measurements and status) is enabled.

The ESK3-PA signal converter completely supports the PROFIBUS-PA Profile V. 3.0. As a result, the devices have two identification numbers and two GSD files. The Ident-No. "F201" is part of the GSD file KROHF201.GSD and contains the complete device functionality. The restricted functionality which is designed to permit using equivalent devices made by other manufacturers as substitutes can be achieved by using the generic Ident-No. "9740" and the GSD file "PA139740.GSD".

PA139740.GSD

The restricted, generic functionality which can be achieved by this GSD file contains two functional blocks (volume flow and volume meter).

To take advantage of this restricted functionality, you need the file PA139740.GSD.
But in advance you must use a Master Class 2 (operating tool) to alter the configuration from "complete device functionality" to "substitute enabled minimal configuration" (Ident_Number_Selector: Slot 0, Index 40, change the value of the bytes from 1 to 0).
Then you must set up the device again using PA139740.GSD.

KROHF201.GSD

KROHNE supplies you the with the GSD with complete device functionality which is shown in the following table:

Block Number	Assignment	KROHF201.GSD Ident No. F201	Address for the "channel parameter"
1	Volume flowrate [1)] Mass flowrate	AI(0)-FB	0x0111 0x0115
2	Volume meter	TOT(0)-FB	0x0111 (fixed)
3	Mass meter	TOT(1)-FB	0x0115 (fixed)

AI = Analog input
TOT = Totalizer
FB = Function block

[1)] **Standard** assignment;
AI-FB can transmit volume or mass flowrate by changing the corresponding address for the **"channel parameter"** .
To be able to change the standard assignment (volume flowrate) you must have an operating tool which can modify the **"channel parameter"** of the function block. You can find the **"channel parameter"** in the AI function block under the relative index 14.
In the above table, in the column headed **"Address for the channel parameter",** you can find the value which you must enter into the function block.
As part of the manufacturer's specific configuration (Identnumber 0xF201) there are usually two meters available; TOT(0) as volume meter and TOT(1) as mass meter.
The generic configuration (Identnumber 0x9740) is only available for the volume meter.

Important

When you set up the PROFIBUS communication network you must assign a function to each of the 3 blocks. For the Siemens PC-S7, for example, this is done with the HW-Config tool. The function “Empty Block” can be assigned to each block. That means that for this block no data are transmitted in the cyclic data telegram.
An AI block is NOT allowed at block positions 2 and 3! In addition to “Empty Block” only the totalizer functions are allowed here.
Four different totalizer functions are offered, which you can assign to blocks 2 and 3. But the significance of cyclic data transfer (count value and status) always corresponds to that in the chapter entitled “Significance of Measurement and Status Information”.

The differences of the four functions are:

Totalizer	cyclic transmission of count value with status to master
SETTOT_TOTAL	cyclic transmission of count value with status to master cyclic control data from master to device by byte **SetTot**
MODETOT_TOTAL	cyclic transmission of the count value with status to master cyclic control data from master to device by byte **ModeTot**
SETTOT_MODETOT_TOTAL	cyclic control data from master to device by byte **SetTot** and then **ModeTot**

Both the **SetTot** and the **ModeTot** byte are transmitted cyclically from the master to the device, when these bytes are entered as output data in the PLC configurator. The meaning of the control bytes is:

SetTot	
SetTot = 0x00:	The totalizer totalizes. For the change from **SetTot** “0x01” or “0x02” to “0x00”, the totalizer starts with its current count value (0.00000 or preset value).
SetTot = 0x01:	The count value of the totalizer is set to 0.00000 and remains at this value until **SetTot** is reset to 0x00.
SetTot = 0x02:	The count value of the totalizer is set to the value of **Preset_Tot**. **Preset_Tot** can be written by an acyclic master (totalizer in block 2 = slot 2; index 32; totalizer in block 3 = slot 3; index 32).
SetTot> 0x02:	is not authorized.

ModeTot	
ModeTot = 0x00:	The totalizer totalizes all positive and negative measured values.
ModeTot = 0x01:	The totalizer adds only positive measured values.
ModeTot = 0x02:	The totalizer adds only negative measured values.
ModeTot = 0x03:	The totalizer is interrupted and does not totalize any more measured values.
ModeTot > 0x03:	not authorized.

2.2 PROFIBUS-PA profile

The ESK3-PA signal converter supports PROFIBUS-PA Profile Version 3.0. Moreover, additional relevant parameters available in the device are offered via the PROFIBUS-PA interface. The blocks made available are:

- 1 function block analog input (AI(0)):
  Volume flowrate (standard)
  can be changed over via **"channel_parameter"** to mass flowrate.
- 2 function blocks totalizer (TOT(0) and TOT(1)):
  TOT(0) totalized volume (standard)
  TOT(1) totalized mass (only in manufacturer-specific configuration)
- 1 transducer block for variable-area flowmeters. This block makes the parameters and functions available which are defined in Profile 3.0,
  + additional device-specific parameters.
- 1 physical block
  This block contains the parameters defined in Profile 3.0
  + additional device-specific parameters

2.3 Meaning of measured-value and status information

When integrating the device into the PROFIBUS master using GSD, you can enter which measured values and count values should be cyclically transmitted via the PROFIBUS. Each value is given a status. First the 4 bytes for the value are transmitted (float format in conformance with IEEE standard 754 short real number) and then 1 byte for the status. That means, each measurement or count value is displayed by 5 bytes. The values are transmitted one after another in the sequence set up with the help of GSD. If, for example, 1 AI-FB and 2 TOT-FB were specified, then 15 bytes of useful data are transmitted.

First an example regarding the applied float format:

Byte n								Byte n+1								Byte n+2								Byte n+3							
Bit 7	Bit 6						Bit 0	Bit 7	Bit 6						Bit 0	Bit 7							Bit 0	Bit 7							Bit 0
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
VZ	Exponent							Mantissa								Mantissa								Mantissa							

Example: 40 F0 00 00 (hex) = 0100 0000 1111 0000 0000 0000 0000 0000 (binary)

Formula: Value $= (-1)^{VZ} * 2^{(Exponent - 127)} * (1 + Mantissa)$

Value $= (-1)^{0} * 2^{(129 - 127)} * (1 + 2^{-1} + 2^{-2} + 2^{-3})$

Value $= 1 * 4 * (1 + 0.5 + 0.25 + 0.125)$

Value $= 7.5$

Status meanings are given in the following tables:

Quality		**Quality-Substatus**				**Limits**		
Gr	Gr	QS	QS	QS	QS	Qu	Qu	
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
0	0							= bad
0	1							= uncertain
1	0							= good (Non Cascade)
1	1							= good (Cascade) - not supported
Status = bad								
0	0	0	0	0	0			= non-specific
0	0	0	0	0	1			= configuration error
0	0	0	0	1	0			= not connected
0	0	0	0	1	1			= device failure
0	0	0	1	0	0			= sensor failure
0	0	0	1	0	1			= no communication (last usable value)
0	0	0	1	1	0			= no communication (no usable value)
0	0	0	1	1	1			= out of service
Status = uncertain								
0	1	0	0	0	0			= non-specific
0	1	0	0	0	1			= last usable value
0	1	0	0	1	0			= substitute-set
0	1	0	0	1	1			= initial value
0	1	0	1	0	0			= sensor conversion not accurate
0	1	0	1	0	1			= engineering unit violation (unit not in the valid set)
0	1	0	1	1	0			= sub-normal
0	1	0	1	1	1			= configuration error
0	1	1	0	0	0			= simulated value
0	1	1	0	0	1			= sensor calibration
Status = good (Non-Cascade)								
1	0	0	0	0	0			= ok
1	0	0	0	0	1			= update event
1	0	0	0	1	0			= active advisory alarm (priority < 8)
1	0	0	0	1	1			= active critical alarm (priority > 8)
1	0	0	1	0	0			= unacknowledged update event
1	0	0	1	0	1			= unacknowledged advisory alarm
1	0	0	1	1	0			= unacknowledged critical alarm
1	0	1	0	0	0			= initiate fail safe
1	0	1	0	0	1			= maintenance required
Status = Limits								
						0	0	= ok
						0	1	= low limited
						1	0	= high limited
						1	1	= constant

Test the first two bits (quality) to identify the quality of the measured value:

Good (non Cascade)	Measured value is ok and can be used.
Uncertain	The measured value can be used, but its accuracy is not assured (e.g. measured value frozen or A/D converter is outside the valid range).
Bad	Measured value is not acceptable and should not be used for further processing.
Good (Cascade)	is not supported since not applicable to meters.

Diagnostics

If the device-internal diagnostic functions identily an error, additional diagnostic information is transmitted into the master. This information is explained in the GSD file under **UNIT_DIAG_BIT(i)**.

3 Connecting the device to the PROFIBUS-PA

3.1 Interconnecting devices in the hazardous area

We recommend the set-up of a PROFIBUS-PA network in the hazardous area conforming to PTB's FISCO model (discussed in the KROHNE brochure "PROFIBUS-PA Networks"). For this purpose, all the electrical components to be connected (including the bus termination) must be approved in conformance with the FISCO model.

3.2 Bus cable

The statements of FISCO model only apply if the bus cable in use complies with the following specifications: R´=15...150 Ohm/km; L´=0.4...1 mH/km; C´=80...200 nF/km.

3.3 Shielding and grounding

For optimum system electromagnetic compatibility it is very important that the system components, especially the bus cables connecting the components, are shielded and that these shields provide an electrical shield which is as complete as possible.

This means for use in **non-hazardous-systems** that the cable shield must be grounded as often as possible.

In hazardous systems, adequate equipotential bonding should be provided in the hazardous and non-hazardous areas throughout the whole field bus installation. Additional instructions regarding this subject can be found in the additional "Ex" documentation.

The use of twisted and shielded cables is urgently recommended, since otherwise the requirements for industrial flowmeters relating to "EMC" cannot be assured.

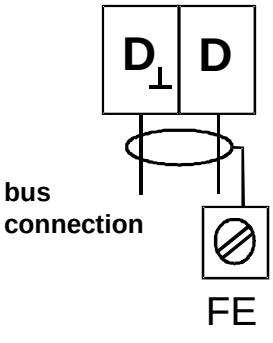
3.4 PROFIBUS-PA connection

Connection of the bus cable as shown on the right:

Connect the cable conductor to D and D_{Gnd} ;
(polarity reversal has no effect)

The cable shield should be connected at minimal length to the functional ground FE.

The potential equalizer must be connected to the device;
(if necessary using the external ground U-clamp terminal of display component M9)



4 Technical data

Hardware	
Physics	to IEC 61158-2, and the FISCO model
Supply voltage	
2 wire bus connection, not polarity sensitive	9 ... 32 V DC *
Power consumption	
Basic current	12 mA
Start-up current	< basic current
FDE (fault disconnect electronics), power in case of single error	< 18 mA
Accuracy	
In connection with H250/M9	Class 1.6
Measurement resolution	< 0.1 % of full scale range
Temperature effect	< 0.05 %/K of full scale range
EU type approval certificate	
II 2 G EEx ia IIC T6	PTB 00 ATEX 2063
* Supply voltage when used in potentially explosive areas	max. 24 V DC
Software	
GSD	is supplied on floppy
Device master file	or from the Internet http://www.krohne.com
Device profile	complete realization Profile B, V3.0
Function blocks	
Flowrate (AI0)	options of volume or mass flowrate selected using *Channel Parameter* Default units: Qv [m3/h]; Qm [kg/h]
Totalizer (TOT0)	Volume counter Default unit: [m^3]
Totalizer (TOT1)	Mass counter Default unit: [kg]
Address range	0 ... 126 (default = 126) **"Set slave address"** is supported
SAP´s	
Service access points	1
DD	
Device Description	DD for PDM (in preparation)
Operation	using PROFIBUS-PA (no operator control at device)

NOTES