KROHNE

Supplementary Installation and Operating Instructions

PROFI PROCESS FIELD BUS BUS

IFC 090, IFC 090 i

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General

These Instructions are supplementary to the ìInstallation and Operating Instructions IFC 090 K / Fì dated 12/96. The details given there, in particular the Safety Information, are valid and should be observed. These Supplementary Instructions provide only additional information for device operation and connection to a PROFIBUS-PA fieldbus.
Attention: Please set the controller to manual mode before changing parameters of the IFC 090.

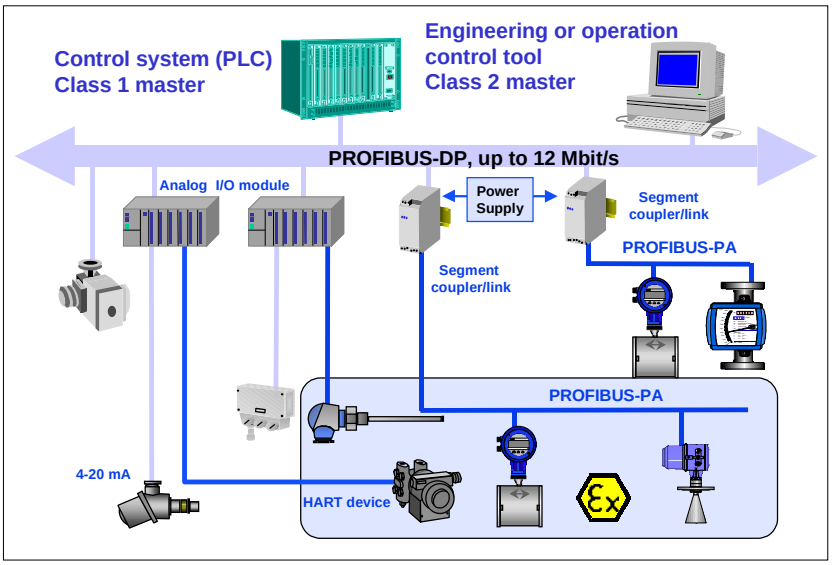
Items included with supply

In addition to the standard scope of supply, these Supplementary Instructions for the IFC 090 with PROFIBUS-PA interface, plus a diskette with all available GSD files of KROHNE devices.

Software history

Issued	Signal converter		User program			Instructions	
month/year	Hardware	Firmware	Hard-ware	Operating system	Soft-ware	Device	User program
09/98	PROFIBUS-PA Module	1.00				12/96+Supplement 01/99	
05/99	PROFIBUS-PA Module	2.00/990505	PC	Windows 95, 98, NT 4.0	PDM ≥ V 4.1.1	12/96+Supplement 05/99 + 08/99, 03/00	
07/00	PROFIBUS-PA Module	2.00/	PC	Windows 95, 98, NT 4.0	PDM ≥ V 4.1.1	12/96+Supplement 07/00	

1. PROFIBUS-PA



The above diagram shows a typical instrumentation with PROFIBUS-PA devices in hazardous and non-hazardous locations, including connection of conventional devices (e.g. with 4-20mA signals) to the PROFIBUS-PA. The PROFIBUS-PA is normally connected to a segment coupler which, among other things, carries out conversion to the PROFIBUS-DP. Here, it needs to be noted in particular that the segment coupler is normally set to a fixed baud rate on the DP side.
Further information on the planning and operation of PROFIBUS-PA networks is to be found in the KROHNE brochure ìPROFIBUS-PA networksî.

1.1 GSD

All available GSD files of KROHNE devices ñ including those of the IFC 090, of course - are supplied together with each device. The GSD contains information that is needed for project planning of the PROFIBUS-DP/PA communication network. The relevant data files must be loaded into the project planning system/master system before start-up of the bus system.

For example, the following applies to **COMET 200** or **COM PROFIBUS** from Siemens:

- all GSD files (*.GSD) into the directory of the GSD files, e.g. *\GSD
- all BMP files (*.BMP) into the directory of the bit maps, e.g. *\BITMAPS

In **STEP7,** the GSD file is automatically copied into the respective directory with ìinstall new GSDî (in the HW-Config Menu: EXTRAS). After that, the bit map must be copied into the directory *\SIEMENS\STEP7\S7data\Nsbmp. Following ìcatalog updatingî the device can be placed in the project. This will then enable the cyclic communication (measured values and status).

1.2 PROFIBUS-PA profile

The IFC 090 supports the PROFIBUS-PA Profile Version 2.0. Additionally, all relevant parameters in the device are offered via the PROFIBUS-PA interface. The IFC 090 defines the following blocks:

- Three Function Blocks (FB): One Analog Input-FB for flow and two Totalizer-FBs for totalizers.
  During configuration of the network you can distinguish between two different kind of totalizers. First the temporary Profibus totalizers (PA-Tot.1/2) which will be resetted after power on. These totalizers are according Profil 2.0. You also can choose the permanently stored device totalizers (Device-Tot.1/2). These device totalizers will be mapped to the totalizer function blocks whereas limits and the unit of this block can be used together with the device totalizers. Reset function is possible as well.
- One transducer block for electromagnetic flow measurement.
  This block provides the parameters defined in Profile 2.0.
- One physical block.
  This block contains the parameters defined in Profile 2.0, and also all device-specific parameters in the form of an appendix.

1.3 Meaning of measurement and status information

During integration of the KROHNE device into the PROFIBUS master you can choose which values should be transfered via PROFIBUS. This can be done by using the GSD file. Each value which is a 4 Byte Float Format according IEEE Standard 754 Short Real Number a status byte follows. That means each measurement value consists of 4 byte value plus 1 byte status. Other measurement values will directly follow as 5 Byte pakage if configured during integration. Below the meaning of the status byte is described:

Float Format

Byte n								Byte n+1								Byte n+2								Byte n+3							
Bit7	Bit6							Bit7	Bit6							Bit7								Bit7							
VZ	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}
	Exponent								Mantissa								Mantissa								Mantissa							

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

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

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

Value $= 1 * 4 * (1 + 0,5 + 0,25 + 0,125) =$ **7,5**

The meaning of the status byte is as following:

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

Status = good (Non-Cascade)								
1	0	0	0	0	0			= ok
1	0	0	0	0	1			= active block alarm
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 block alarm
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

Check the first two quality bits in order to get the quality information of the measurement value:

Good (non Cascade)	measurement value is ok and can be used without restrictions
Uncertain	measurement value can be used but the accuracy can not be guaranteed (e.g. measurement value has been frozen or A/D converter is saturated)
Bad	measurement value is bad don¥tuse it
Good (Cascade)	not supported because it¥s notapplicable for measurement devices

Diagnostics

If the device has been detected an error additional diagnostic information will be send to the master. The meaning of the additional information is described within the GSD file under UNIT_DIAG_BIT(i).

2. Electrical connection (see Section 2 in the Installation and Operating Instructions)

2.1 Interconnection of devices in the hazardous location

We recommend that a PROFIBUS-PA network in the hazardous location be projected in accordance with PTBís FISCO model (see KROHNE brochure îPROFIBUS-PA networksî). The FISCO-Model may be used, if:
all electrical components which should be connected to the bus must be approved according the FISCO model (even the termination),
the maximum cable length does not exceed 1000 m,
the values of the cable are within the following ranges R¥=15...150Ω/km; L¥=0,4...1mH/km; C¥=80...200nF/km,
the approved input values of the field devices (Uo, Io, Po) are matchable with the output values of the power supply (e.g. segmment coupler) which menas $U_I \leq U_o$, $I_I \leq I_o$ und $P_I \leq P_o$.

2.2 Bus cable

Further limitations to the cable than the FISCO limitations are not existent. Nevertheless a twisted pair and shielded cable is strongly recommended. The good quality cable could have the following data: 44Ω/km, <90nF/km, <3dB attenuation at 39kHz and 100 Ohm impedance at 31,25kHz.

2.3 Shielding and grounding

For optimum electromagnetic compatibility of systems it is extremely important that the system components, and particularly the bus cables connecting the components, be shielded and that such shields - if possible - form an unbroken cover, electrically speaking.
Hence it follows that, for use in non-hazardous duty systems , the cable shield should be grounded as often as possible.
In ìExì systems an adequate equipotential bonding in the hazardous and non-hazardous location along the entire fieldbus installation is strongly recommended. Multiple grounding of the shield is also of advantage.

Note: The use of twisted and shielded cables is strongly recommended, otherwise EMC protection of the IFC 090 cannot be assured.

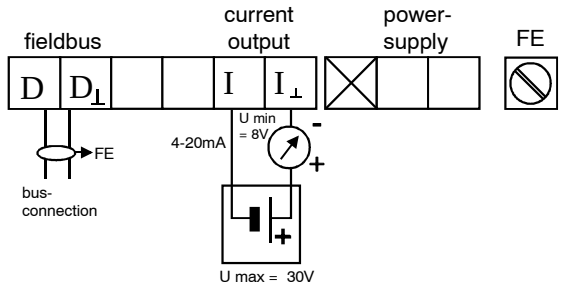
2.4 PROFIBUS-PA connection

Connect the bus cable as shown in the figure.

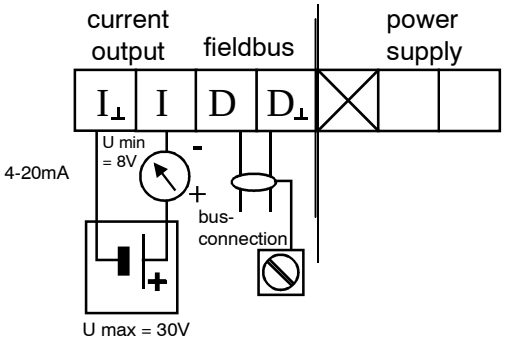
- Connect the cable cores to terminals D and D⊥.
- Polarity reversal will not have any effect.
- The cable shield should be connected with minimum length to the FE functional ground.
- The equipotential bonding conductor must be connected to the device by connecting it to FE functional ground.

PROFIBUS-PA with current output

Non Ex version

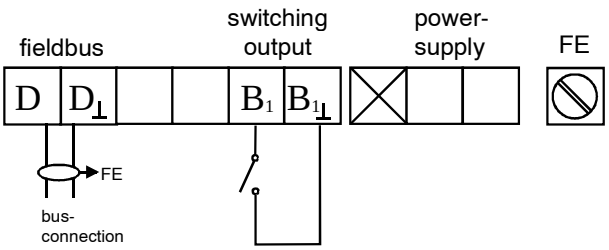


Ex version

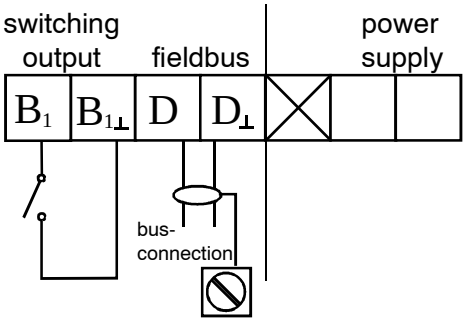


PROFIBUS-PA with pulse/switching output

Non Ex version



Ex version



3. Menu settings for PROFIBUS-PA (see Section 4 in the Installation and Operating Instructions)

The following settings need to be made for operation of the IFC 090 on a PROFIBUS-PA network. Note that the address can be set by the service ìset slave addressî as well.

Function (Fct.)	Description
3.8 TAG NO.	Text, measuring-point tag (max. 10 characters) Characters assignable to each place: ♦ A-Z,a-z, 0-9 or "_" (blank character)
3.9 COM	Select function for the communication port ♦ OFF ♦ HART ♦ PROFI PA Press key ↵ to transfer to subfunction "ADDRESS".
→ ADDRESS	Set address Range: 00-15 for HART (default 00) 00-126 for PROFI PA (default 126) Press key ↵ to return to Fct. 3.9 COM

4. Technical data, PROFIBUS Ident-No. F401

Hardware		Software	
Physical	to IEC 61158-2 and the FISCO model	GSD	all KROHNE GSD files supplied on diskette
Bus characteristics	9... 30 V; 0.3 A max.; 4.2 W max.	Device profile	complete implementation of Profile B, V2.0
Base current	10 mA	Functional blocks	flow [m3/h], totalizer1[m3], totalizer2 [m3] mentioned units are default units
FDE	yes: separate fault clearance electronics provided	Address range	0-126, default 126, ìset slave addressî supported
Fault current	6 mA; (fault current = max. continuous current ñ base current)	Operator control	local display and operator interface at device
Starting current	lower than the base current	SAP`s	1; typically the number of service access points is equal to the number of class 2 masters (operating tools)
ìExì approval	EEx ia IIC T6 or EEx ib IIC/IIB T6 in conformity with the FISCO model		
Connection	independent of polarity		