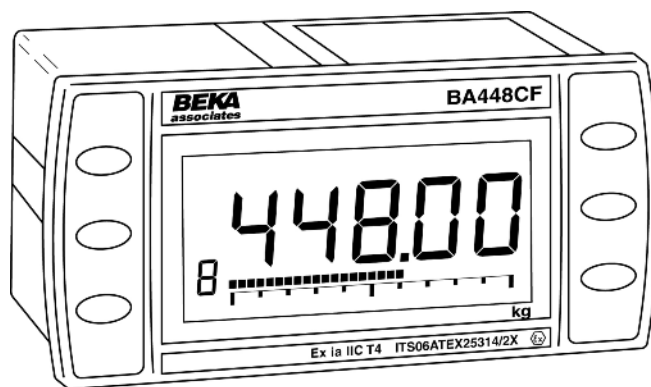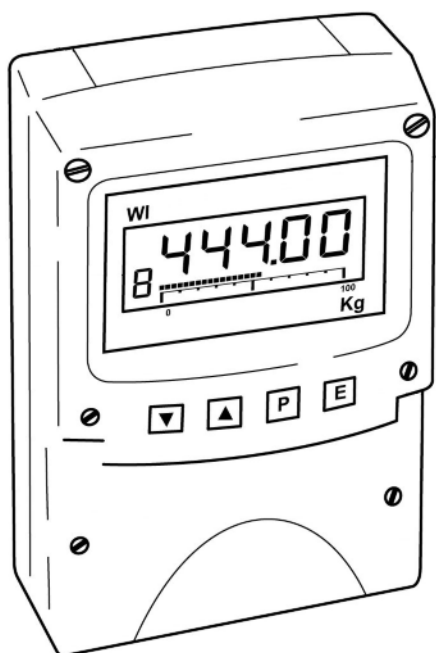# Profibus PA
Fieldbus Display *[Revision 2]*
and Fieldbus Indicator

Fieldbus Interface Guide

This guide applies to the following models:

<u>Multiple Variable Fieldbus Display</u>

BA488CF - *Panel mounted, Intrinsically Safe*
BA484DF - *Field mounted, Intrinsically Safe*
BA688CF - *Panel mounted, Safe Area*
BA684DF - *Field mounted, Safe Area*

<u>Eight Variable Fieldbus Indicator</u>

BA444DF - *Field mounted, Intrinsically Safe*
BA444NDF - *Field mounted, Type nL*
BA448CF - *Panel mounted, Intrinsically Safe*
BA644DF - *Field mounted, Safe Area*
BA648CF - *Panel mounted, Safe Area*

<u>Please note:</u> *There are significant differences between Revision 2 Fieldbus Displays (those with version 3 firmware) and prior versions. Documentation for these earlier products is available from our website, or by contacting our sales department.*

Can't make it work ?

Please refer to the Troubleshooting section in Appendix B for common problems and their solutions, and Appendix C for a worked example of setting up the Listener.

If you still need assistance, please contact us directly:
Tel: +44 (0)1462 438301
Email: `support@beka.co.uk`

Contents

Introduction

This guide gives all the necessary information to use our Fieldbus Displays and Indicators on a Profibus PA installation.

Several other protocols are commonly used in industry which we may choose to support as market demand rises. This guide and others will periodically be updated, so please come back to our website regularly for the latest information.

For hardware installation information, please refer to the separate instruction manuals available for each model.

What's in this Fieldbus Interface Guide

- An overview of each instrument
- A description of the parameters that are applicable to each instrument.
- Instructions on how to use the instrument in its standard modes

What's in the Instruction Manuals

- An overview of the instrument
- Intrinsic Safety Certification information
- System Design and Installation
- Configuration
- Maintenance

Other sources of information

Our website at *www.beka.co.uk* is kept up to date with the latest literature and information

After reading through this guide, if you still have a problem getting the results you need then email us at *support@beka.co.uk* and we will do our best to help you

Displays Vs Indicators

The displays and indicators are internally very similar, but present the data in totally different ways. The simpler Indicators have a non-backlit 5 digit, 7 segment display and 31 segment bargraph and are designed to give a cost effective indication to operators. The more comprehensive Displays have a configurable backlit dot-matrix LCD, and have provision for external pushbuttons and alarm outputs.

The Indicator is able to operate in a "Listener" mode whereby it does not appear as a device on the network, but simply listens for appropriate data on the segment it is connected to. All configuration must be performed locally, but thereafter it imposes no overhead on the network. This mode is useful where timing is critical, in retrofit applications or when node licensing costs need to be minimised.

Both products can display up to eight variables, selectable by pushbuttons on the front of the instrument. In addition, the pushbuttons can be used for operator feedback.

General Operation

The primary purpose of a BEKA fieldbus display is to enable local indication of up to 8 fieldbus process variables. This is normally achieved using cyclic data writes to the AO Function blocks.

The configuration of the display can be manually carried out using the local configuration menus, or acyclic data transfers can be sent to parameters in the custom transducer blocks using DPV1 or DPV0 user prm data.

Profibus Introduction

Profibus is a fieldbus protocol designed for communicating between host and field devices. There are several layers to the Profibus standard: Profibus DP (Decentralised Periphery) is the high speed solution designed and optimised especially for communication between automation systems and decentralised field devices. Profibus DP exchanges input and output information in a cyclic manner. This cyclic data traffic is the basis of the system and is described as Version 0 or DPV0.
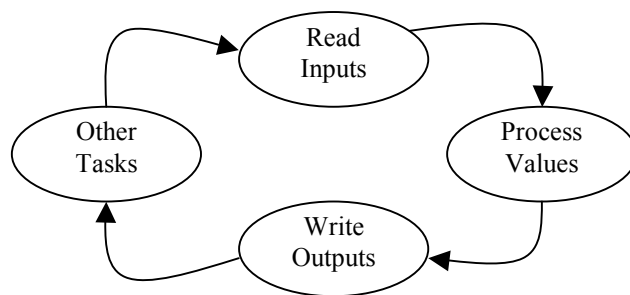
A typical automation system will read all the inputs and then use this data in conjunction with the process design parameters to calculate the new output values. These values will then be written to the output devices. The whole cycle will then start all over again. This sequence is described as Cyclic Data.

The time cycle required to control the process on the plant often leaves the host with some spare time that can be used for background and other tasks. This, combined with the need of the instrument engineer to be able to configure and maintain the field devices without going out on to the plant, led to the development in 1997 of a revised standard, Profibus DPV1.

DPV1 provides the host with a mechanism to get data about the configuration and health of each field device. This only happens when specifically requested, and only when the host controller has the time to be able to do it. This kind of data transfer is known as Acyclic data.

It is important to note that Cyclic Data traffic has priority over the Acyclic Data traffic as it is used for the plant control.

The following diagram shows how the data flows from the host to the BEKA Fieldbus device:

HOST Controller

BEKA Fieldbus Display

Host Application capable of dealing with Profibus DPV1 extensions e.g. Softing Configurator, Siemens PDM or via an OPC Server

Data transfer is acyclic when the host has time available.

PROFIBUS DPV1 Area

Display Application Software

Slot 16 – DI Transducer Block

Slot 15 – AO Transducer Block

Slot 14 OUT_D

Slot 14 – DI Function Block

PROFIBUS DPV0 Area

Slot 9 OUT_D

Slot 9 – DI Function Block

14 Slots in Profibus Host System

Data transfer is cyclic and routine

Slot 8 Module n

Slot 8 – AO Function Block

Slot x Module n

Slot x – AO Function Block

Slot 1 Module n

Slot 1 – AO Function Block

Slot 0 – Physical Block

Module	1	2	3	4	5	6	7	8	Variable
Bytes Used	0	5	12	8	15	10	13	25	
		*	*	*	*			*	Set point
			*		*			*	ReadBack
			*		*			*	Pos D
				*	*		*	*	Checkback
						*	*	*	Rcas_In
						*	*	*	Rcas_Out

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The BEKA Fieldbus Display is shown on the right side of the diagram. It consists of 17 virtual blocks named Slot 0 to Slot 16. Data is transferred between the host and these slots by either routine cyclic data, or occasional acyclic data.

The resource block at Slot 0 gives the host a point of reference to find out about the facilities of the unit. This is only done occasionally, so an acyclic data transfer is used for this purpose. The 8 AO function blocks at slots 1 – 8 are where the host places the data to be displayed. The 6 DI function blocks at slots 9 – 14 are where the display places the keypad information. As these are constantly being updated, routine cyclic data transfers are used. The remaining two transducer blocks at slot 15-16 are used to configure the display, again by using (occasional) acyclic data.

The 8 AO function blocks are standard Profibus blocks, the specifications of which are available from the Profibus organisation (As such the fine detail is not repeated in this manual). Each function block has 6 variables that can be made accessible to the host system. These are shown in the first column of this table:-

Variable	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7	Module 8
Set Point		√	√	√	√			√
Readback			√		√			√
POS D			√		√			√
Checkback				√	√		√	√
RCas_In						√	√	√
RCas_Out						√	√	√
Number of bytes used in memory map	0	5	12	8	15	10	13	25

There are defined combinations of these 6 variables available as modules which are defined in the GSD description of the BEKA device. These modules are used to selectively show or hide the variables that are relevant to the host application. The choice of which module to use will depend on the design of the process and is left to the user to decide, but for simple display applications the Set Point Module, Module 2 will be adequate.

When the Fieldbus Display is first loaded on the host system, the user will find 8 slots that can be configured with the 8 different types of module. If the user configures each slot with Module 2 then the host will only be able to access the Setpoint on each function block. Each slot on the host will then take up 5 bytes of space thus defining the memory map that the host is able to access. Writing to the Setpoint value will cause that value to be display on the field device.

From the memory map perspective, write a 32 bit float to the first four bytes of the slot, and write a **GOOD** status value (128) to the status byte. The number will then appear on the screen.
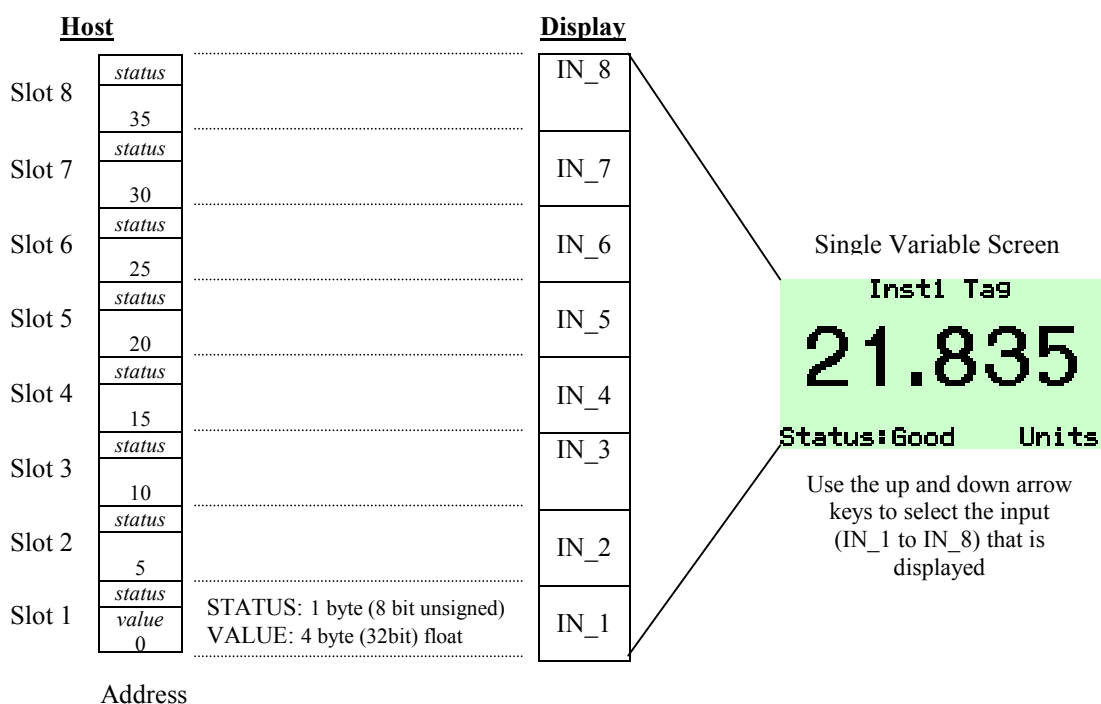
However if the user needs the more complex functions of the AO Function block, other modules can be chosen, the choice of which will affect the memory map of the instrument seen by the host

General Information

Configuration Methods

Configuration may be performed via either DPV1 or DPV0 user prm data. However, some items must be configured using the local menus as described in the Instruction Manual. The following table summarises what method can be used to configure each parameter.

Item	Display			Indicator	
	Menu	DPV0	DPV1	DPV0	DPV1
INDATA (1 to 8)					
Bargraph				Yes	Yes
Bargraph Minimum	Yes	Yes	Yes	Yes	Yes
Bargraph Maximum	Yes	Yes	Yes	Yes	Yes
Display Format	Yes	Yes	Yes	Yes	Yes
Zero_Offset	Yes	Yes	Yes	Yes	Yes
Gain_Factor	Yes	Yes	Yes	Yes	Yes
Descriptor	Yes	No	Yes		
Units	Yes	No	Yes		
Status Text	Yes	Yes	Yes		
Instrument Temperature	No	No	Read Only	No	Read Only
Last Variable	Yes	Yes	Yes	Yes	Yes
Optional Local Alarms	Yes	No	No		

Fieldbus Display : Product Overview

A detailed overview of the instrument is given in the instruction manual for each product. This should be read before implementing any system using these instruments. However it is useful to summarise the main features of the product before attempting to design any controlling software application.

Display

The instrument display is organised as 120 pixels horizontally by 64 pixels vertically. Each pixel is 0.7mm square, the size of which improves the contrast and hence the readability at greater distances.

The display is also backlit by an ultra-efficient green LED module which enables the screen to be viewed in all conditions, from bright sunlight to total darkness.

Analogue Input Display

The primary purpose of this instrument is to display process variables that exist in a system. Eleven pre-programmed screen layouts are available to display one, two, three, four or eight variables simultaneously. A total of eight (8) variables can be accessed by using the front panel push buttons.

Switch Inputs

There are six push buttons on the front of the panel mounted instrument, and four on the field mounted instrument. Both models have the option of overriding these with up to six external switches which can be sized and labelled to suit the application.

Switch Outputs

As an optional accessory (available only at the time of ordering), there can be six switch outputs available. These are totally isolated and can be energised or de-energised independently of each other. They can be driven by alarm set-point values that can be assigned so that they operate automatically. Note that they are not intended to be used as conventional Profibus Alarms and should be used for indication only. They are under the control of the local application and are actioned on received values against stored setpoints. There is no communication of status across the fieldbus.

Profibus Block Structure

There are eight Analogue Output function blocks, one for each input value. In addition there are six Digital Input function blocks, one assigned to each key. All data is transmitted using cyclic data.

Profibus Configuration

Configuration may be performed via either DPV1 or DPV0 user prm data. However, some items must be configured using the local menus as described in the Instruction Manual. These are summarised in the table on page 8.

Fieldbus Display : Features

The following sections describes how to use the features of the display. The relevant instruction manual for the instrument being used must be read in conjunction with these notes, as the operation and description of the menu structure is not detailed here.

Standard Screens

There are eleven standard screens available. They are capable of displaying a selection of up to eight process variables, together with their units of measure and tag description. Once a screen format has been chosen, each input variable can be brought into view by pressing the up and down arrow keys.

The screen format is selected by using the local configuration menu as described in the Instruction Manual. One of eleven standard display formats can be selected as shown in the following table:

One Variable	Inst1 Tag **21.835** Status:Good Units	Two Variables	Inst1 Tag Units **21.8350** Inst2 Tag Units **529.3300**
Four Variables	Inst1 Tag │ Inst3 Tag Units │ Units 21.835 │ -3.105 Inst2 Tag │ Inst4 Tag Units │ Units 529.33 │ -5600.	One + H-Bar	Inst1 Tag **21.835** Status:Good Units
Two + H-Bars	Temperature °C 21.46 Pressure Pa 1.7500	One + V-Bar	Temperature **25.25** °C
Two + V-Bars	Temp │ Pressure 25.22 │ 1.750 °C │ Pa	Three + V-Bars	Temp │ Press │ Flow 24.46│1.7500│48.9 °C │ Pa │ 1/min
Four + V-Bars	Temp│Pres│Flow│Fill 22.73│1.750│45.4│11.36	Eight Variables	In_1 Tag│10.000│Units In_2 Tag│20.000│Units In_3 Tag│30.000│Units In_4 Tag│40.000│Units In_5 Tag│50.000│Units In_6 Tag│60.000│Units In_7 Tag│70.000│Units In_8 Tag│80.000│Units
Eight + Bars	In_1 │10.000Unit In_2 │20.000Unit In_3 │30.000Unit In_4 │40.000Unit In_5 │50.000Unit In_6 │60.000Unit In_7 │70.000Unit In_8 │80.000Unit		

Setting the Fieldbus Address

Each unit is supplied from the factory at the special address 126. This address *MUST* be changed to one between 1 and 125 before the display can be put into service.

The address should be set by using the local configuration menu as this is the simplest procedure. There are no hardware links or DIP switches that need to be altered.

However, it is possible to set the address via the host software's configuration package. The exact method varies between packages, but as an example the Siemen's SIMATIC PDM package adopts the following approach:

1. Open the PDM with a double-click on a PA device which supports assigning addresses via network, but do not open the newly inserted device.
2. Assign the new address with "Device > Assign address" (e.g. from old:126 to new:51).
   Note:
   The function "Assign address" can change the addresses of all available PA devices. This function works independently from currently open PA devices.

Configuring the values to be displayed

The unit can be configured to display up to eight values. The screen format is selected via the local configuration menu which is detailed in the Instruction Manual.

The AO Function Blocks *AO_1* to *AO_8* should be assigned to the variables that need to be displayed. The data structure used is DS-33 Floating Point Value + Status.

If the data has a status of BAD, or a status of GOOD but with a quality sub-status of "INITIATE FAULT STATE" or "FAULT STATE ACTIVE" then the appearance of the value will be in inverse video i.e. clear pixels on a dark background.

If local alarm setpoints have been defined, then the displayed value will flash when that point has been reached. The appropriate output will also be activated .

Configuring Units display and Tag information

The "Tag" and "Units" displayed on each of the standard screens can be entered remotely by writing to the *IN_DATA_1* to *IN_DATA_8* parameters in the AO Transducer Block. The DS-BEKA-6 data structure has a 16 byte Visible String *DESCRIPTOR* parameter which corresponds to the Tag value, and a 8 byte Visible String *UNITS* parameter. Each input can therefore be given its own unique data.

Information written in this way is saved to non-volatile memory and is retained if the power is cycled.

To simplify temperature display, the ' character (alt+096) is mapped to the degrees symbol.
For example, the string `Temp 'C` is displayed as `Temp °C`

Reading the keypress status

Each of the six keys is connected to a DI function block, making it simple to use them for operator confirmation. Each DI mirrors the status of the key and is not latched in any way. A momentary keypress over 50mS will be 'stretched' to provide a change in status for at least 400ms. Shorter keypresses are discarded.

The unit has the facility to connect external switches in addition to the front panel buttons. By selecting the appropriate "Keys" configuration in the local menu these external switches can be simple normally open or closed contacts that can be used for a variety of basic signalling tasks.

Controlling the (optional) alarm outputs

The outputs can only be controlled by configuring alarm set-points. It is not possible to control the outputs directly via the fieldbus, nor is it possible to read the status.

Configuring alarm setpoints

The alarm setpoints are primarily intended for local indication uses, and the only method of setting these up is to use the local configuration menu, as described in the Instruction Manual.

Reading the approximate ambient temparture

The Analogue Out Transducer Block has an *INSTRUMENT_TEMPERATURE* parameter which shows the approximate temperature (+/- 5°C) of the display in degrees Celcius as a read-only 4-byte float.

Fieldbus Indicator : Product Overview

A detailed overview of the instrument is given in the instruction manual for each product. This should be read before implementing any system using these instruments. However it is useful to summarise the main features of the product before attempting to design any controlling software application.

Display

The instrument display is organised as 5 digits, plus sign and a bargraph. There is an additional numeric indicator showing the selected variable. There are no backlighting options available for these indicators; a Fieldbus Display must be used if this feature required.

Analogue Input Display

The primary purpose of this instrument is to display process variables that exist in a system. A total of eight (8) variables can be accessed by using the front panel push buttons.

Switch Inputs

There are six push buttons on the front of the panel mounted instrument, and four on the field mounted instrument. Neither models have the option of external switches; a Fieldbus Display must be used if this feature required.

Switch Outputs

There are no alarm outputs on these models. A Fieldbus Display must be used if this feature required.

Profibus Block Structure

There are eight Analogue Output function blocks, one for each input value. In addition there are six Digital Input function blocks, one assigned to each key. All data is transmitted using cyclic data.

Profibus Configuration

Configuration may be performed via either DPV1 or DPV0 user prm data. However, some items must be configured using the local menus as described in the Instruction Manual. These are summarised in the table on page 8.

Fieldbus Indicator

Fieldbus Indicator : Features

The following sections describes how to use the features of the display. The relevant instruction manual for the instrument being used must be read in conjunction with these notes, as the operation and description of the menu structure is not detailed here.

Setting the Fieldbus Address

Each unit is supplied from the factory at the special address 126. This address *MUST* be changed to one between 1 and 125 before the display can be put into service.

The address should be set by using the local configuration menu as this is the simplest procedure. There are no hardware links or DIP switches that need to be altered.

However, it is possible to set the address via the host software's configuration package. The exact method varies between packages, but as an example the Siemen's SIMATIC PDM package adopts the following approach:

3. Open the PDM with a double-click on a PA device which supports assigning addresses via network, but do not open the newly inserted device.
4. Assign the new address with "Device > Assign address" (e.g. from old:126 to new:51).
   Note:
   The function "Assign address" can change the addresses of all available PA devices. This function works independently from currently open PA devices.

Configuring the values to be displayed

The unit can be configured to display up to eight values. The screen format is selected via the local configuration menu which is detailed in the Instruction Manual.

The AO Function Blocks *AO_1* to *AO_8* should be assigned to the variables that need to be displayed. The data structure used is DS-33 Floating Point Value + Status.

If the data has a status of BAD, or a status of GOOD but with a quality sub-status of "INITIATE FAULT STATE" or "FAULT STATE ACTIVE" then the value will be alternated with a the word "BAD".

Reading the keypress status

Each of the six keys is connected to a DI function block, making it simple to use them for operator confirmation. Each DI mirrors the status of the key and is not latched in any way. A momentary keypress over 50mS will be 'stretched' to provide a change in status for at least 400ms. Shorter keypresses are discarded.

Reading the approximate ambient temparture

The Analogue Out Transducer Block has an *INSTRUMENT_TEMPERATURE* parameter which shows the approximate temperature (+/- 1°C) of the display in degrees Celcius as a read-only 4-byte float.

Appendix A

Profibus PA

Reference Information

Block Identifiers

Block ID	PA blocks
0	Physical block
1	AO_1 function block
2	AO_2 function block
3	AO_3 function block
4	AO_4 function block
5	AO_5 function block
6	AO_6 function block
7	AO_7 function block
8	AO_8 function block
9	DI_1 function block
10	DI_2 function block
11	DI_3 function block
12	DI_4 function block
13	DI_5 function block
14	DI_6 function block
15	DI custom transducer block
16	AO custom transducer block

The execution time for all blocks is 100ms

Data Types and Structures

Data Types

The data types (1-Boolean to 10-OctetString) are used as defined in the underlying PROFIBUS specification IEC61158-5-10.

	Data Type	Size	Comments
1	Boolean	1	True or false
2	Integer8	1	
3	Integer16	2	
4	Integer32	4	
5	Unsigned8	1	
6	Unsigned16	2	
7	Unsigned32	4	
8	FloatingPoint	4	
9	VisibleString	1,2,3..	they are one byte per character, and include the 7 bit ASCII character set.
10	OctetString	1,2,3..	Octet strings are binary

All structures use Profibus standard definitions apart from the four special structures given below:

Data Structure Identifier
DS-BEKA-6
DS-BEKA-7
DS-BEKA-8
DS-BEKA-9

DS-BEKA-6 – 488 Display IN_DATA Structure (DPV1)

	Parameter	Data Type	Size
1	BARGRAPH_MIN	Float	4
2	BARGRAPH_MAX	Float	4
3	DISPLAY_FORMAT	Unsigned8	1
4	ZERO_OFFSET	Float	4
5	GAIN_FACTOR	Float	4
6	DESCRIPTOR	VisibleString	16
7	UNITS	VisibleString	8

Enumeration for DISPLAY_FORMAT:
0	No decimal places
1	One decimal place
2	Two decimal places
3	Three decimal places
4	Four decimal places
5	Auto format

DS-BEKA-7 – 444 Indicator IN_DATA Structure (DPV1)

	Parameter	Data Type	Size
1	BARGRAPH	Unsigned8	1
2	BARGRAPH_MIN	Float	4
3	BARGRAPH_MAX	Float	4
4	DISPLAY_FORMAT	Unsigned8	1
5	ZERO_OFFSET	Float	4
6	GAIN_FACTOR	Float	4

Enumeration for BARGRAPH:
0	Disabled
1	Left Align
2	Centre Align
3	Right Align

Enumeration for DISPLAY_FORMAT:
0	No decimal places
1	One decimal place
2	Two decimal places
3	Three decimal places
4	Four decimal places
5	Auto format

DS-BEKA-8 – 488 Display IN_DATA Structure (DPV0)

	Parameter	Data Type	Size
1	BARGRAPH_MULT	Unsigned8	1
2	BARGRAPH_MIN	Signed16	2
3	BARGRAPH_MAX	Signed16	2
4	DISPLAY_FORMAT	Unsigned8	1
5	ZERO_MULT	Unsigned8	1
6	ZERO_OFFSET	Signed16	2
7	GAIN_MULT	Unsigned8	1
8	GAIN_FACTOR	Signed16	2

Enumeration for DISPLAY_FORMAT:
0	No decimal places
1	One decimal place
2	Two decimal places
3	Three decimal places
4	Four decimal places
5	Auto format

PA Reference

BARGRAPH_MULT, ZERO_MULT and GAIN_MULT are multiplying factors applied to the corresponding Signed16 parameters to create a float.

Enumeration for Multiplying Factors:

0	0.00001
1	0.0001
2	0.001
3	0.01
4	0.1
5	1.0
6	10.0
7	100.0
8	1000.0
9	10000.0
10	100000.0

The default value for all multipliers is 5 which equates to a multiplication factor of 1.0.

Size of user-prm-data = 1 + 8 * (12 + 2) + 1 + 1 = 115 bytes.

DS-BEKA-9 – 444 Indicator IN_DATA Structure (DPV0)

	Parameter	Data Type	Size
1	BARGRAPH	Unsigned8	1
2	BARGRAPH_MULT	Unsigned8	1
3	BARGRAPH_MIN	Signed16	2
4	BARGRAPH_MAX	Signed16	2
5	DISPLAY_FORMAT	Unsigned8	1
6	ZERO_MULT	Unsigned8	1
7	ZERO_OFFSET	Signed16	2
8	GAIN_MULT	Unsigned8	1
9	GAIN_FACTOR	Signed16	2

Enumeration for BARGRAPH:

0	Disabled
1	Left Align
2	Centre Align
3	Right Align

Enumeration for DISPLAY_FORMAT:

0	No decimal places
1	One decimal place
2	Two decimal places
3	Three decimal places
4	Four decimal places
5	Auto format

BARGRAPH_MULT, ZERO_MULT and GAIN_MULT are multiplying factors applied to the corresponding Signed16 parameters to create a float.

Enumeration for Multiplying Factors:

0	0.00001
1	0.0001
2	0.001
3	0.01
4	0.1
5	1.0
6	10.0
7	100.0
8	1000.0
9	10000.0
10	100000.0

The default value for all multipliers is 5 which equates to a multiplication factor of 1.0.

Size of user-prm-data = 1 + 8 * (13 + 2) + 1 = 122 bytes.

The standard Profibus data structures used in BEKA products are given below:

DS-32 – Block Structure

	Element Name	Data Type (Index)	Size
1	Reserved	Unsigned8 (5)	1
2	Block Object	Unsigned8 (5)	1
3	Parent Class	Unsigned8 (5)	1
4	Class	Unsigned8 (5)	1
5	DD Reference	Unsigned32 (7)	4
6	DD Revision	Unsigned16 (6)	2
7	Profile	OctetString (10)	2
8	Profile Revision	Unsigned16 (6)	2
9	Execution Time	Unsigned8 (5)	1
10	Number of Parameters	Unsigned16 (6)	2
11	Address of VIEW_1	Unsigned16 (6)	2
12	Number of Views	Unsigned8 (5)	1

DS-33 – Value & Status – Floating Point Structure (data type 101)

This data structure consists of the values and the state of the Floating Point parameters. These parameters can be inputs or outputs.

	Element Name	Data Type (Index)	Size
1	Value	Float (8)	4
2	Status	Unsigned8 (5)	1

DS-34 – Value & Status – Integer Structure (data type 102)

This data structure consists of the values and the state of the integer parameters. These parameters are inputs.

	Element Name	Data Type (Index)	Size
1	Value	Unsigned8 (5)	1
2	Status	Unsigned8 (5)	1

DS-37 – Mode Structure

This data structure consists of bit strings for actual, permitted, and normal modes.

	Element Name	Data Type (Index)	Size
1	Actual	OctetString (10)	1
2	Permitted	OctetString (10)	1
3	Normal	OctetString (10)	1

DS-42 – Alarm Summary Structure

This data structure consists of data that summarize 16 alarms.

	Element Name	Data Type (Index)	Size
1	Current	OctetString (10)	2
2	Unacknowledged	OctetString (10)	2
	Unreported	OctetString (10)	2
3	Disabled	OctetString (10)	2

Floating Point Format

Many values are given as 4 byte floating point numbers. This is defined in IEEE 754 as the Single-Precision format.

Visible String Format

It is very important that no non-printing characters are used in variables defined with the VisibleString format. Specifically, only ASCII values between 0x20 and 0x7E may be used.

PA Reference

AO Transducer block – 488 Display

Index	Parameter	Type	Size	Store	Read / Write	
0	TB Block Characteristics RESERVED BLOCK_OBJECT CLASS DD_REFERENCE DD_REVISION PROFILE PROFILE_REVISION EXECUTION_TIME NUMBER_OF_PARAMETERS ADDRESS_OF_VIEW_1 NUMBER_OF_VIEWS	DS-32			RO	
1	ST_REV	Unsigned16	2	N	RO	
2	TAG_DESC	Octet String	32	S	R/W	
3	STRATEGY	Unsigned16	2	S	R/W	
4	ALERT_KEY	Unsigned8	1	S	R/W	
5	TARGET_MODE	Unsigned8	1	S	R/W	
6	MODE_BLK	DS-37	3	D	R/W	
7	ALARM_SUM	DS-42	8	D	RO	
8	FINAL_VALUE_1	DS-33	5	D	RO	
9	FINAL_VALUE_2	DS-33	5	D	RO	
10	FINAL_VALUE_3	DS-33	5	D	RO	
11	FINAL_VALUE_4	DS-33	5	D	RO	
12	FINAL_VALUE_5	DS-33	5	D	RO	
13	FINAL_VALUE_6	DS-33	5	D	RO	
14	FINAL_VALUE_7	DS-33	5	D	RO	
15	FINAL_VALUE_8	DS-33	5	D	RO	
16	IN_DATA_1	DS-BEKA-6	41	N	R/W	
17	IN_DATA_2	DS-BEKA-6	41	N	R/W	
18	IN_DATA_3	DS-BEKA-6	41	N	R/W	
19	IN_DATA_4	DS-BEKA-6	41	N	R/W	
20	IN_DATA_5	DS-BEKA-6	41	N	R/W	
21	IN_DATA_6	DS-BEKA-6	41	N	R/W	
22	IN_DATA_7	DS-BEKA-6	41	N	R/W	
23	IN_DATA_8	DS-BEKA-6	41	N	R/W	
24	INSTRUMENT_TEMPERATURE	Float	4	D	RO	
25	LAST_VARIABLE	Unsigned8	1	N	R/W	
26	STATUS_TEXT	Unsigned8	1	N	R/W	

Configuration of 488 Display AO transducer parameters with DPV0

It is possible to configure all custom parameters of the AO transducer block via DPV0 services. The configuration of the device via DPV0 must not exceed the limit of 234 bytes for user-prm-data. For this reason DS-BEKA-8 has to be used as this data structure does not contain strings.

The DPV0 configurable AO transducer parameters are:

AO TB parameter user-prm-data	Data Type	Size	Store	Description
USE_DPV0_CONFIG	Boolean	1	N	1 = True, 0 = False
IN_DATA_1	DS-BEKA-8	12	N	The DESCRIPTOR and UNITS values are not initialised during DPV0 configuration.
IN_DATA_2	DS-BEKA-8	12	N	See above
IN_DATA_3	DS-BEKA-8	12	N	See above
IN_DATA_4	DS-BEKA-8	12	N	See above
IN_DATA_5	DS-BEKA-8	12	N	See above
IN_DATA_6	DS-BEKA-8	12	N	See above
IN_DATA_7	DS-BEKA-8	12	N	See above
IN_DATA_8	DS-BEKA-8	12	N	See above
LAST_VARIABLE	Unsigned8	1	N	
STATUS_TEXT	Unsigned8	1	N	

Usage of parameter USE_DPV0_CONFIG:

True : The device is configured via DPV0. DPV1 configuration is not possible. Acyclic writes to configuration parameters result in an error when the value to write is different to the stored value.

False : The device is configured via DPV1. DPV0 user-prm-data is ignored during startup of the device.

AO Transducer block – 444 Indicator

Index	Parameter	Type	Size	Store	Read / Write	
0	TB Block Characteristics RESERVED BLOCK_OBJECT CLASS DD_REFERENCE DD_REVISION PROFILE PROFILE_REVISION EXECUTION_TIME NUMBER_OF_PARAMETERS ADDRESS_OF_VIEW_1 NUMBER_OF_VIEWS	DS-32			RO	
1	ST_REV	Unsigned16	2	N	RO	
2	TAG_DESC	Octet String	32	S	R/W	
3	STRATEGY	Unsigned16	2	S	R/W	
4	ALERT_KEY	Unsigned8	1	S	R/W	
5	TARGET_MODE	Unsigned8	1	S	R/W	
6	MODE_BLK	DS-37	3	D	R/W	
7	ALARM_SUM	DS-42	8	D	RO	
8	FINAL_VALUE_1	DS-33	5	D	RO	
9	FINAL_VALUE_2	DS-33	5	D	RO	
10	FINAL_VALUE_3	DS-33	5	D	RO	
11	FINAL_VALUE_4	DS-33	5	D	RO	
12	FINAL_VALUE_5	DS-33	5	D	RO	
13	FINAL_VALUE_6	DS-33	5	D	RO	
14	FINAL_VALUE_7	DS-33	5	D	RO	
15	FINAL_VALUE_8	DS-33	5	D	RO	
16	IN_DATA_1	DS-BEKA-7	18	N	R/W	
17	IN_DATA_2	DS-BEKA-7	18	N	R/W	
18	IN_DATA_3	DS-BEKA-7	18	N	R/W	
19	IN_DATA_4	DS-BEKA-7	18	N	R/W	
20	IN_DATA_5	DS-BEKA-7	18	N	R/W	
21	IN_DATA_6	DS-BEKA-7	18	N	R/W	
22	IN_DATA_7	DS-BEKA-7	18	N	R/W	
23	IN_DATA_8	DS-BEKA-7	18	N	R/W	
24	INSTRUMENT_TEMPERATURE	Float	4	D	RO	
25	LAST_VARIABLE	Unsigned8	1	N	R/W	

Configuration of 444 Indicator AO transducer parameters with DPV0

It is possible to configure all custom parameters of the AO transducer block via DPV0 services. The configuration of the device via DPV0 must not exceed the limit of 234 bytes for user-prm-data. For this reason DS-BEKA-9 has to be used as this data structure does not contain strings.

The DPV0 configurable AO transducer parameters are:

AO TB parameter user-prm-data	Data Type	Size	Store	Description
USE_DPV0_CONFIG	Boolean	1	N	1 = True, 0 = False
IN_DATA_1	DS-BEKA-9	13	N	
IN_DATA_2	DS-BEKA-9	13	N	
IN_DATA_3	DS-BEKA-9	13	N	
IN_DATA_4	DS-BEKA-9	13	N	
IN_DATA_5	DS-BEKA-9	13	N	
IN_DATA_6	DS-BEKA-9	13	N	
IN_DATA_7	DS-BEKA-9	13	N	
IN_DATA_8	DS-BEKA-9	12	N	
LAST_VARIABLE	Unsigned8	1	N	

Usage of parameter USE_DPV0_CONFIG:

True :   The device is configured via DPV0. DPV1 configuration is not possible. Acyclic writes to configuration parameters result in an error when the value to write is different to the stored value.

False :   The device is configured via DPV1. DPV0 user-prm-data is ignored during startup of the device.

PA Reference

DI Transducer block – 488 Display and 444 Indicator

Index	Parameter	Type	Size	Store	Read / Write	
0	TB Block Characteristics RESERVED BLOCK_OBJECT CLASS DD_REFERENCE DD_REVISION PROFILE PROFILE_REVISION EXECUTION_TIME NUMBER_OF_PARAMETERS ADDRESS_OF_VIEW_1 NUMBER_OF_VIEWS	DS-32			RO	
1	ST_REV	Unsigned16	2	N	RO	
2	TAG_DESC	Octet String	32	S	R/W	
3	STRATEGY	Unsigned16	2	S	R/W	
4	ALERT_KEY	Unsigned8	1	S	R/W	
5	TARGET_MODE	Unsigned8	1	S	R/W	
6	MODE_BLK	DS-37	3	D	R/W	
7	ALARM_SUM	DS-42	8	D	RO	
8	PRIMARY_VALUE_D1	DS-34	2	D	RO	
9	PRIMARY_VALUE_D2	DS-34	2	D	RO	
10	PRIMARY_VALUE_D3	DS-34	2	D	RO	
11	PRIMARY_VALUE_D4	DS-34	2	D	RO	
12	PRIMARY_VALUE_D5	DS-34	2	D	RO	
13	PRIMARY_VALUE_D6	DS-34	2	D	RO	

PA Reference

Appendix B

Troubleshooting

What version do I have?

Single Variable Versions:
The version number can be seen during the unit power-up cycle. At power up the unit will first turn all the LCD segments on. It will then display the model number without options i.e. BA444 and following this it will display PNx.xx or PLx.xx where x.xx is the firmware version. A PNx.xx version means that the unit is currently configured as a node, and a PLx.xx version means that the unit is currently configured as a listener.

Multiple Variable Versions:
There are two methods to identify the version of product that you have. The first is to watch the splash screen on power up and note the SW number at the bottom of the screen. The second is to enter the configuration menu, scroll down to User Info. This screen gives the model number and the software version.

How do I reset it to Factory Defaults?

The display can be reset using the main configuration menu. Please refer to the instruction manual for full details.

Why does the unit always display 0.0 BAD?
This occurs because the default failsafe is set to that setting, and the IN_n variable is not being sent a value with a good status.

Appendix C

Using a Profibus Listener

Worked Example

Setting up the Profibus Listener

In order to be able to set up a BEKA Profibus listener it is necessary to have a basic understanding of how data on a Profibus system is passed between the host and the devices. This document aims to provide that information at a very simplified level.

As a general rule a Profibus PA segment will be connected to a Profibus DP network and controller, via a segment coupler. The segment coupler adjusts the communication speed and signalling so that the PA devices are visible to the controlling host and software.
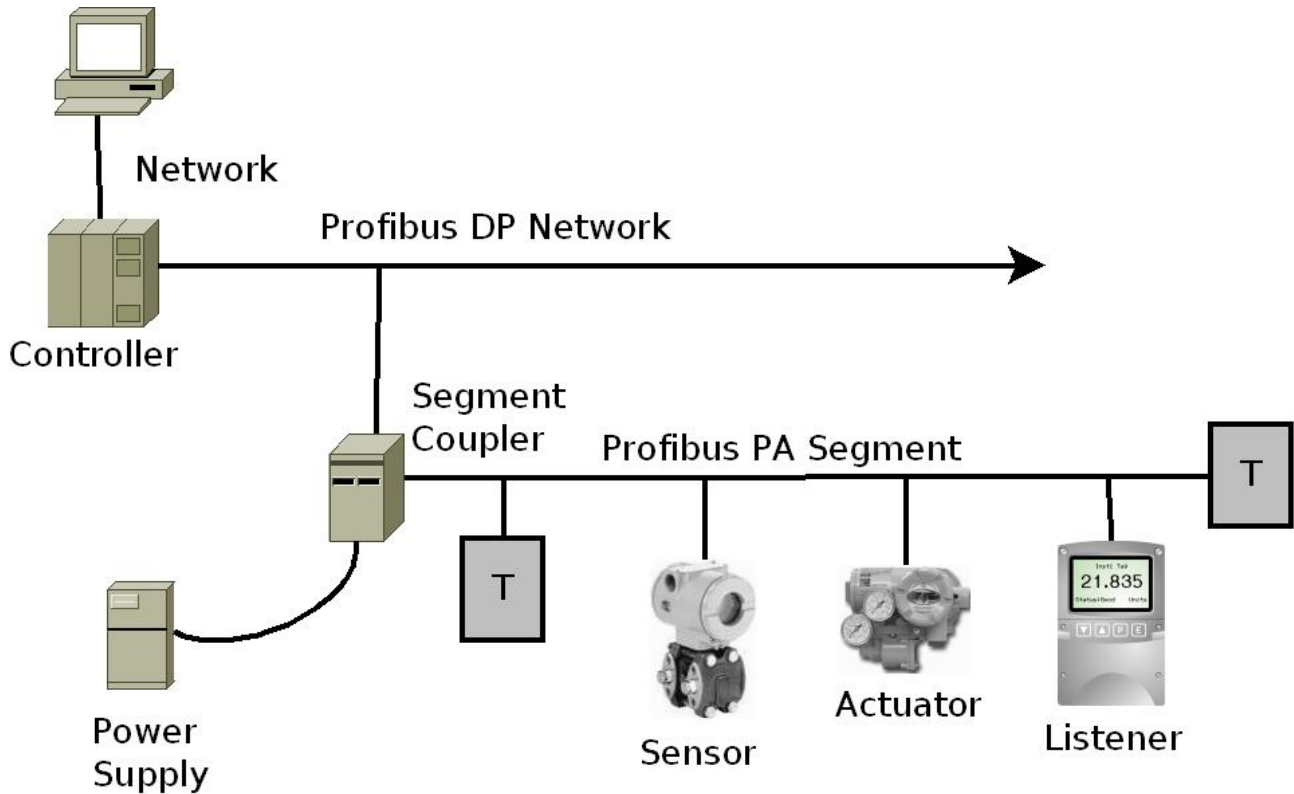
Each device attached to the segment has a physical address between 1 and 125 with address 1 or 2 being reserved for the controller. To make a process happen, the controller will read data from a number of instruments, it will process the data and finally write the data out to other devices in order to keep the process running smoothly. It is the data that is being "read from" and "written to" the devices on the segment that the listener can tap into.

In order to capture the data, we need to know how to locate it. When each device is loaded on to the segment it has a number of "Slots" in which the plant engineer places a software module representing the data that the slot is capable of dealing with. e.g. a SP Module consists of a 4 byte floating point number and a status byte. (known as a DS-33 data type).

The following example shows a temperature transmitter with two slots, the first one represents the temperature read from the external sensor, the second one represents the body temperature used for CJ compensation:

Worked Example
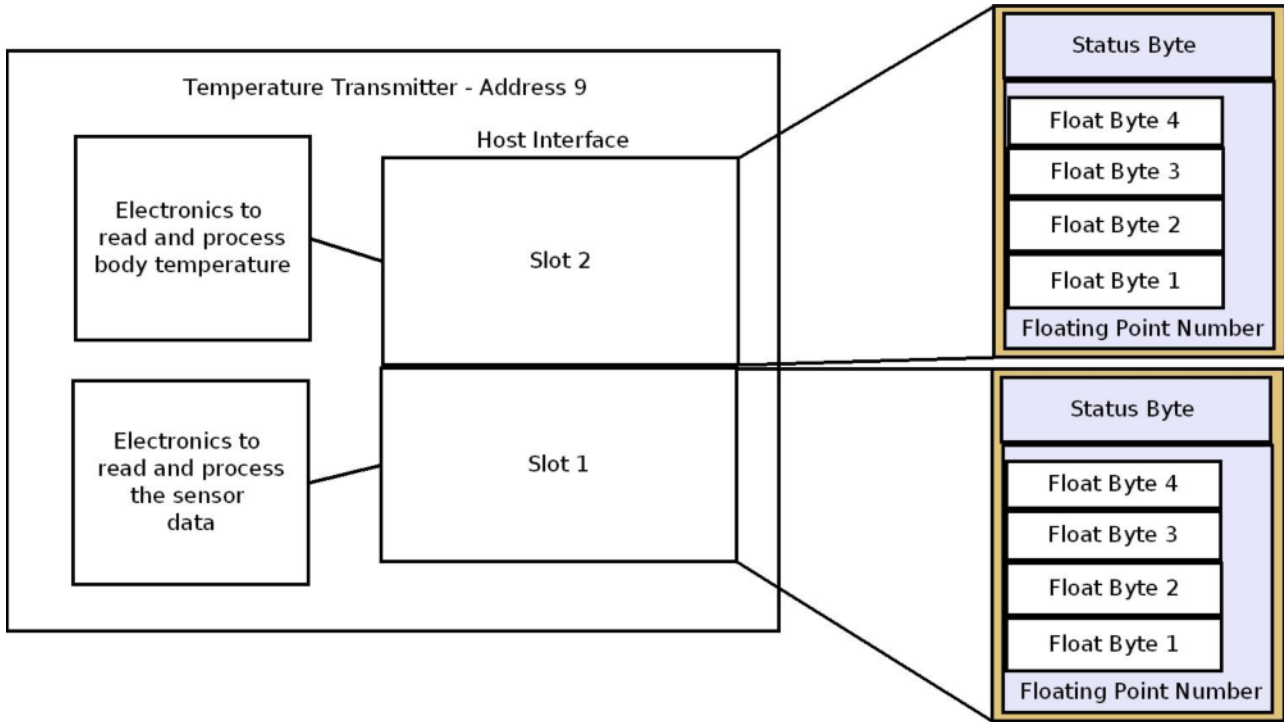
The plant engineer has set the address to 9 and loaded a SP module into both slots on the device. The slot data for a device is read in one go. Therefore a read of the device at address 9 with consist of 10 bytes containing a float with its status followed by another float with its status. The first item of data will start at Address 9 index 0 while the second value, status combination will start at Address 9 index 5. This address and index data is available to the plant engineer on the programming workstation for the host. When data is transmitted by the host it takes the form of Source_Address,Destination_Address and Data.

The BEKA listener uses this information to display the value that the user wants to view. The user simply sets up the Source Address, Destination Address and the Index into the data packet. In the above example, setting a source address of 9, a destination address of 1 (Host Controller) and an Index of 5 would point at the second DS-33 data block i.e. the body temperature.

The following example gives the 7 steps to display a temperature value that is being read by a host at address 1 from a temperature transmitter at address 9.

  o   Press P+E and the word SCAn will appear.
  o   Press P and the display will now show two numbers. The first is the Source Address, the second is the Destination Address.
  o   Press the UP Arrow or Down Arrow until 09-01 appears. i.e the data is coming from Address 9 and being sent to Address 1.
  o   Press P – The display will show the value of the data at index 0
  o   Press P – The display will now show IN_1 which is the display input to assign the data to.
  o   Press the UP Arrow or Down Arrow to change the display input to IN_2, IN_3 etc as required
  o   Press E – To save this configuration and move back up the menu.
  o   Press E – a further three times to return to the unit to operate mode.

The listener will now display live data on the screen and in this case it will show the process value.

To get the body temperature it will be necessary to edit the settings for IN-1 and change the Index to 5. The number of decimal points, bargraph settings and display scaling can also be set up on the listener using the local configuration menu entries.

There are many data formats available on a system. The DS-33 (Value,Status) data format is the most common one for passing real process values about on a segment and currently this listener can only tune into that data format.

Worked Example

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