BA444NDF-F
FOUNDATION™ fieldbus
Type n
Field mounting
8 variable
Fieldbus Indicator
Issue 3

Certification information label

Optional scale & tag marking

Numerical annunciator

WI

444.00

8

0   100
Kg

External push buttons

Field terminals located in separate compartment

Fieldbus protocol shown on inside of terminal cover

CONTENTS

1. DESCRIPTION

The BA444NDF-F fieldbus indicator is a Type n, FOUNDATION™ fieldbus instrument that may be configured as a fieldbus node or as a fieldbus listener. It can display up to eight fieldbus process variables on a five digit LCD and a 31 segment analogue bargraph. The instrument is bus powered so no additional power supply is required.

As a fieldbus node the indicator is configured via the fieldbus host.

Communication Protocol	Fieldbus Function Blocks
FOUNDATION™ fieldbus	Input Selector (2 x IS) Digital input (6 x DI)

Device Description files may be downloaded from the Fieldbus Foundation or from the BEKA associates websites.

When configured as a fieldbus listener the BA444NDF-F is not visible to the fieldbus host and can only be configured using the push buttons on the front of the instrument.

Housed in a robust IP66 glass reinforced polyester (GRP) enclosure with a toughened glass window, the BA444NDF-F is surface mounting, or may be pipe mounted using one of the accessory kits.

The indicator is ATEX Group II Category 3G certified for use in Zone 2 explosive gas atmospheres. The instrument also has IECEx Type nL approval for international applications.

For use in combustible dust atmospheres the BA444NDF-F has ATEX and IECEx Ex tD dust certification. See Appendix 1 for details of ATEX dust certification and Appendix 2 for IECEx certification.

The instrument's communication protocol is shown on a label inside the terminal cover. The '-F' order code suffix also indicates the protocol but is not shown on the instrument certification label. There is an alternative version of the fieldbus display, order code BA444NDF-P for use on PROFIBUS PA networks

1.1 Documentation

The main body of this manual describes ATEX design and installation requirements for BA444NDF-F applications in flammable gas atmospheres. System design and installation requirements for ATEX dust and for IECEx gas and dust applications are shown in appendices to this manual.

2. OPERATION

The BA444NDF-F fieldbus indicator can display up to eight pre-configured FOUNDATION™ fieldbus process variables designated in-1 to in-8. The operator can select which variable is displayed using the ▼and ▲ push buttons which scroll the display through the eight inputs. A numeric annunciator on the left hand side of the display shows which of the eight inputs is currently being displayed.

2.1 Error messages

When the BA444NDF-F is configured as a listener the following error messages may be displayed:

'no ConF'	No inputs have been configured or are enabled.
'no dAtA'	No data is being received with the current configuration

3. Type nL CERTIFICATION

3.1 ATEX certificate

The BA444NDF-F has been issued with an Type Examination Certificate by Notified Body Intertek Testing and Certification Ltd (ITS) which has been used to confirm compliance with the European ATEX Directive 94/9/EC for Group II, Category 3GD equipment. The instrument bears the Community Mark and, subject to local codes of practice, may be installed in any of the European Economic Area (EEA) member countries. ATEX certificates are also acceptable for installations in Switzerland.

This manual describes ATEX installations in explosive gas atmospheres which conform with EN 60079:Part14 Electrical Installation in Hazardous Areas. When designing systems for installation outside the UK, the local Code of Practice should be consulted.

For use in the presence of combustible dust, please refer to Appendix 1 that describes ATEX installations complying with EN 61241-14.

3.2 Zones, gas groups and T rating

The BA444NDF-F has been issued with Type Examination Certificate ITS06ATEX45315 that have been used to confirm that it complies with the requirements for Group II Category 3G Ex nL IIC T4 (Tamb –20 to +60℃) specified in the ATEX Directive. When connected to a suitable certified system the BA444NDF-F may be:

Installed in:

> Zone 2   explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:
Group   A   propane
Group   B   ethylene
Group   C   hydrogen

Having a temperature classification of:
T1   45℃
T2   300℃
T3   200°C
T4   135°C

At an ambient temperature between –20 and +60°C.

This allows the BA444NDF-F to be used with most common industrial gases.

3.3 Fieldbus connection

The BA444NDF-F Indicator is powered and communicates via the fieldbus, which is connected to terminals 1 and 2.   These terminals are non-polarised, comply with the Fieldbus Non-Incendive Concept (FNICO) defined in EN 60079-27 and also have the entity parameters shown below:

		FNICO	Entity
U_i	=	17.5V dc	36V dc
I_i	=	380mA dc	250mA dc
P_i	=	5.32W	1.2W

The maximum equivalent capacitance and inductance at terminals 1 & 2 is:

C_i	=	0
L_i	=	8µH

3.4 Certification Label Information

The certification information label is fitted in a recess on the top outer surface of the enclosure. It shows details of the ATEX certification; a statement that the instrument is a FNICO Field Device, plus BEKA associates name and location. IECEx approval information is also included.

The instrument serial number and year of manufacture are recorded on a separate label inside the terminal compartment.

BA444NDF Fieldbus Indicator		
CE (Ex) II 3 G Ex nL IIC T4		Ta = -20°C to +60°C
ITS06ATEX45315 II 3 D Ex tD A22 IP66 T100°C		Year of manufacture shown within
IECEx ITS06.0015 Ex tD IIIC T100°C Dc IP66		terminal compartment
FNICO Field Device Ex nL IIC T4		
BEKA *associates Hitchin England www.beka.co.uk*		

4. SYSTEM DESIGN FOR HAZARDOUS AREAS

4.1 FNICO Systems

The BA444NDF-F may be connected to any ATEX certified FNICO compliant FOUNDATION™ fieldbus segment, providing the segment can supply the additional 13mA required to power the instrument.

Fig 1 shows a typical fieldbus segment. To comply with FNICO requirements, the power supply, terminators, field devices and the interconnecting cables must conform to the requirements specified in EN 60079 part 27.
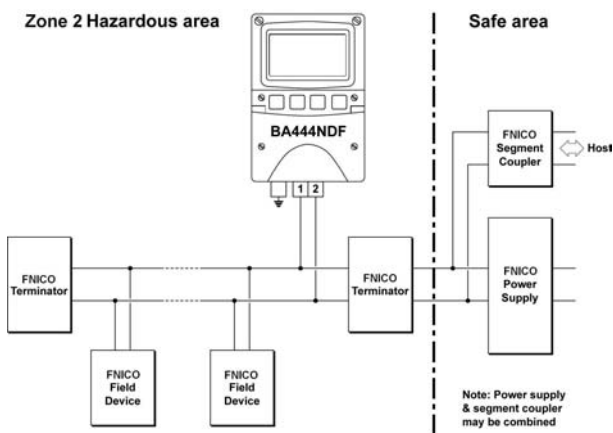

Fig 1   FNICO FOUNDATION™ fieldbus system

4.2 Non-FNICO Systems

As shown in section 3.3 the BA444NDF-F also has entity input parameters. The indicator complies with the requirements for *'Self protected energy-limited apparatus'* as defined by Clause 30.1 Paragraph b of EN 60079-15. This means that the BA444NDF-F contains its own current limiting components and may be connected to any Type nL certified associated apparatus irrespective of its Io providing:

Uo of the Type nL certified associated apparatus is equal to or less than 36V which is the Ui of the BA444NDF. **Note:** maximum operating voltage is 32V.

C cable + sum of Ci of all other instruments connected to the segment is equal to, or less than, Co of the Type nL associated apparatus powering the fieldbus segment to which the BA444NDF-F is connected.

L cable + 8µH + sum of Li of all other instruments connected to the segment is equal to, or less than, Lo of the Type nL associated apparatus powering the fieldbus segment to which the BA444NDF-F is connected.

The fieldbus segment can provide an additional 13mA at between 9 and 32V to power the BA444NDF-F Profibus Indicator.

These requirements are not restrictive and allow the BA444NDF-F 8 variable FOUNDATION™ fieldbus indicator to be connected to almost all Type nL fieldbus segments powered by Type n associated apparatus or Zone 2 mounted segment isolators.

5. INSTALLATION

5.1 Location
The BA444NDF-F FOUNDATION™ fieldbus indicator is housed in a robust IP66 glass reinforced polyester (GRP) enclosure incorporating an armoured glass window and stainless steel fittings. It is suitable for exterior mounting in most industrial environments, including offshore and wastewater treatment installations. Please consult BEKA associates if high vibration is anticipated.

The BA444NDF-F enclosure is surface mounting. Accessory kits described in sections 8.3 of this manual enable the instrument to be mounted onto a vertical or horizontal pipe.

The field terminals and the two mounting holes are located in a separate compartment with a sealed cover allowing the instrument to be installed without exposing the display assembly.

The BA444NDF-F earth terminal is connected to the carbon loaded GRP enclosure. If this enclosure is not bolted to a post or structure connected to the plant potential equalising network, the instrument's earth terminal should be connected to the potential equalising network as recommenced in EN 60079-14.

The BA444NDF-F enclosure is supplied with a bonding plate to ensure electrical continuity between the three conduit / cable entries.

5.2 Installation Procedure
Fig 2 illustrates the instrument installation procedure.

a. Remove the instrument terminal cover by unscrewing the two captive 'A' screws.

b. Mount the instrument on a flat surface and secure with two M6 screws through the 'B' holes. Alternatively use one of the mounting kits described in section 8.3

c. Remove the temporary dust seals from the three cable entries and install the required glands, conduit fittings or blanking plugs.
Note: The temporary dust seals fitted for transit do not maintain the IP66 protection of the BA444NDF-F enclosure.
Cable glands, conduit fittings, blanking plugs and cables must be Ex n certified and suitable for continuous use at the maximum operating temperature of the instrument.

d. Connect the field wiring to the terminals as shown in Fig 3.

e. Replace the instrument terminal cover and evenly tighten the two 'A' screws.
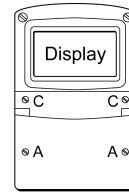
Step A
Remove the terminal cover by unscrewing the two 'A' screws
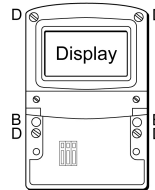
Step B
Secure the instrument to a flat surface with M6 screws through the two 'B' holes. Alternatively use a pipe mounting kit.
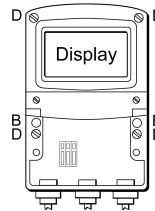
Step C and D
Install appropriate IP rated cable glands, conduit fittings or blanking plugs and terminate field wiring. Finally replace the terminal cover and tighten the two 'A' screws.

Fig 2   BA444NDF-F installation procedure

5.3 EMC
The BA444NDF-F complies with the requirements of the European EMC Directive 2004/108/EC. For specified immunity, all wiring should be in screened twisted pairs with the screens earthed at one point in the safe area.

Fig 3 Dimensions and terminal connections

6. CONFIGURATION

The BA444NDF-F 8 variable FOUNDATION™ fieldbus indicator may be configured as a fieldbus node or as a fieldbus listener. When used as a fieldbus node the indicator is configured via the fieldbus host. For detailed node conditioning information please refer to the BEKA FOUNDATION™ fieldbus Interface Guide which may be downloaded from www.beka.co.uk

As a fieldbus listener the BA444NDF-F is not visible to the fieldbus host and can only be configured via the front panel push buttons using the menu shown in Fig 6.

Throughout this manual the four BA444NDF-F push buttons are identified *P E* ▼ ▲ and legends displayed by the fieldbus indicator are shown within inverted commas e.g. 'CodE' and 'LiSt'.

6.1 Configuration menus

The configuration menu is separated into two sections, fieldbus node and fieldbus listener. Both contain the 'tYPE' function that enables transfer between the two. Unless otherwise requested when ordered, all FOUNDATION™ fieldbus BA444NDF-F indicators are supplied as fieldbus nodes but can easily be reconfigured on-site.
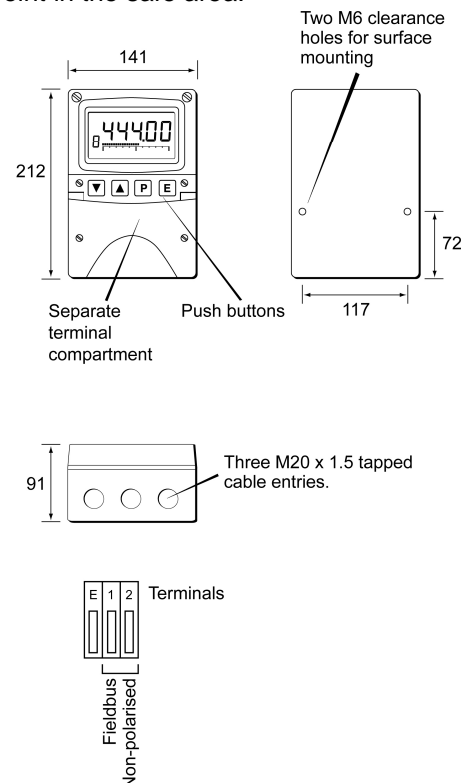
6.2 Node configuration menu

The node configuration menu is shown in Fig 4. Access to the menu is obtained by operating the *P* and *E* buttons simultaneously. If the BA444NDF-F is not protected by an access code the first parameter 'rESEt' will be displayed*. If the instrument is protected by an access code, 'CodE' will be displayed first. Pressing *P* will allow the four digit security code to be entered digit by digit using the ▼ or ▲ button to adjust the flashing digit and *P* to move control to the next digit. When the correct code has been entered, pressing *E* will cause the first parameter 'rESEt' to be displayed*. If an incorrect code is entered, or no button is pressed for ten seconds, the BA444NDF-F will automatically return to the display mode.

* If the indicator displays 'SCAn' it is conditioned as a fieldbus listener, see section 6.3.13 to change it to a fieldbus node.

6.2.1 Reset the indicator to node factory defaults 'rESEt'

The BA444NDF-F may be reset to the factory defaults that are shown below:

Security Code	0000 (disabled)
Device address	Unconfigured
Last variable	8

For each of the eight inputs:

Decimal point	XXX.XX
Bar Type	Left
Bar lower limit	0.0
Bar Upper limit	100.0
Gain	1.0
Offset	0.0

To reset the BA444NDF-F select 'rESEt' in the configuration menu by operating the ▼ or ▲ button. To enter the function press *P* which will reveal '0000' with the left hand digit flashing. To prevent accidental use of this function, '5urE' must be entered to confirm that the instrument is to be reset.

Using the ▼ or ▲ button set the flashing digit to '5' and press the *P* button to move control to the next digit which should be set to 'u'. When the four letters of '5urE' have been entered operating the *E* button will reset the BA444NDF-F to the factory defaults.

CAUTION
All the instrument's node configuration and links will be lost when it is reset.

6.2.2 Change from node to listener 'tYPE'

This function enables the instrument to be changed from a fieldbus node to a fieldbus listener. Select 'tYPE' in the node configuration menu using the ▼ or ▲ button. To enter the function press *P* which will show that the instrument is configured as a fieldbus node, to change to a fieldbus listener press the ▼ or ▲ button which will toggle the display to 'LStnr' To prevent accidental changes this request must be confirmed by operating the *P* button and entering '5urE'. The instrument will display '0000' with the first digit flashing, using the ▼ or ▲ button set the flashing digit to '5' and press the *P* button to move control to the next digit which should be set to 'u'. When the four letters of '5urE' have been entered, operating the *E* button will cause the instrument to restart as a fieldbus listener in the display mode.

CAUTION
All the instrument's node configuration and links will be lost when it is changed from a fieldbus node to a fieldbus listener.

6.2.3 Access code for node configuration menu 'CodE'

Access to the node configuration menu may be protected by a four digit security code which must be entered to gain access. New instruments are supplied configured with the default code 0000 which disables this protection and allows unrestricted access to the configuration menu.

To enter a new access code select 'CodE' in the configuration menu by operating the ▼ or ▲ button. To enter the function press **P** which will reveal the current access code with one digit flashing. The code may be changed using the ▼ or ▲ button to adjust the flashing digit and the **P** button to move control to the next digit. When the required code has been selected, press **E** to enter the selection and return to the 'CodE' prompt in the configuration menu. The revised access code will be activated when the indicator is returned to the display mode.

If the access code is lost please contact BEKA associates.
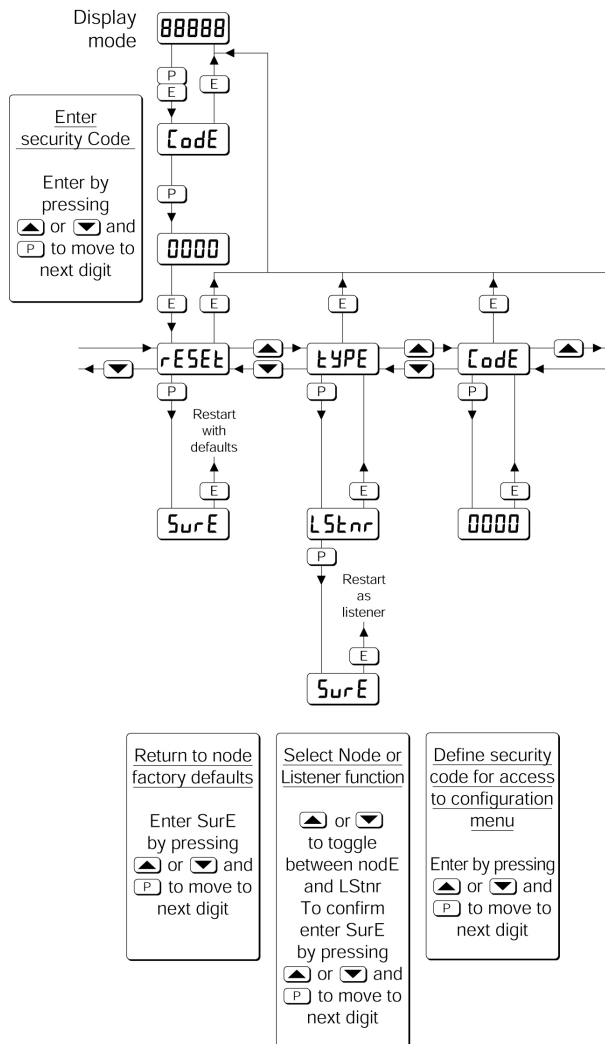
6.3 Listener configuration menu

The listener configuration menu is separated into three sections, 'SCAn', 'LISt' and 'Edit', plus three housekeeping functions 'CodE', 'tYPE' and 'rESEt' as shown in Fig 6.

'SCAn' is the simplest method of configuration if the fieldbus Device Address and Variable Identity of the data to be displayed by the BA444NDF-F listener are not known.

In the 'SCAn' function pressing the **P** button causes the BA444NDF-F indicator to search the fieldbus segment to which it is connected for all publishers. Fig 5 shows how the indicator displays the hexadecimal Device Address and Variable Identity associated with each publisher.

A **Publisher** is a device that places it's output data onto the bus as part of a cyclical pre-determined data exchange schedule.

The **Device Address** is a unique address that identifies each fieldbus instrument connected to the bus.

The **Variable Identity** is the fieldbus device Data Link Connection End Point (DLCEP) which identifies each Function Block output (process variable) transmitted by a fieldbus device such as flow and temperature transmitted by a fieldbus flowmeter.

The ▼ and ▲ push buttons scroll the display through all the publishers on the segment showing the Device Address and Variable Identity for each one - see Fig 5. To aid identification, operating the **P** button will preview the value of the data at each selected address, if required it may then be allocated to one of the eight BA444NDF-F listener inputs in-1, to in-8 by operating the **P** button again. If the format of the data at the selected Device Address and Variable Identity is not DS-65 (float + status) 'no dAt' will be displayed.

Fig 5 Device Address and Variable Identity

If the Device Address and Variable Identity of the process variable to be displayed by the BA444NDF-F indicator are known, they may be directly entered via the edit sub-menu. This sub-menu also provides full control of both the numeric and bargraph display parameters.

Fig 4 Node configuration menu

6.3.1 Access

Access to the listener configuration menu is obtained by operating the *P* and *E* buttons simultaneously. If the BA444NDF-F is not protected by an access code the first param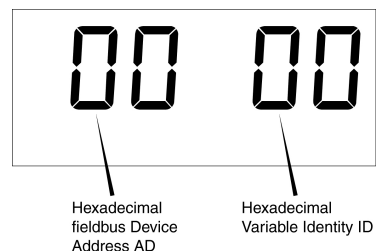eter 'SCAn' will be displayed.* If the indicator is protected by an access code, 'CodE' will be displayed first. Pressing *P* will allow the four digit security code to be entered digit by digit using the ▼ or ▲ button to adjust the flashing digit and *P* to move control to the next digit. When the correct code has been entered, pressing *E* will cause the first parameter 'SCAn' to be displayed.* If an incorrect code is entered, or no button is pressed for ten seconds, the indicator will automatically return to the display mode.

* If the indicator displays 'rESEt' it is conditioned as a fieldbus node, see section 6.2.2 to change it to a fieldbus listener.

6.3.2 Summary of listener configuration functions.

This section contains a summary of all the listener configuration functions including a reference to more detailed information. It should be read in conjunction with Fig 6.

Indicator display	Summary of function
'SCAn'	**Scan fieldbus segment**
	Identifies all publishers on the fieldbus segment to which the listener is connected and enables selected data to be allocated to one of the eight listener inputs.
	See section 6.3.3
'LiSt'	**List configured input parameters**
	For each of the eight BA444NDF-F listener input, in-1 to in-8 shows if the input is enabled and the allocated Device Address and Variable Identity. Parameters can not be changed from within this function.
	See section 6.3.4
'Edit'	**Enter addresses and display parameters**
	Contains six sub-functions that enable known fieldbus Device Address and Variable Identity to be entered and all display parameters adjusted for each of the eight fieldbus listener inputs.
	See section 6.3.5

'Enb'	**Enable listener input**
	Each of the eight listener inputs in-1 to in-8 may be enabled or disabled without affecting any parameters.
	See section 6.3.6
'Adr'	**Enter fieldbus Device Address**
	Allows hexadecimal fieldbus device address for each of the eight listener inputs in-1 to in-8 to be entered.
	See section 6.3.7
'id'	**Enter Variable Identity**
	Allows hexadecimal Variable Identity for each listener input in-1 to in-8 to be entered.
	See section 6.3.8
'dP'	**Decimal point position**
	Defines position of displayed decimal point for each listener input in-1 to in-8.
	See section 6.3.9
'bAr'	**Configuration of bargraph display.**
	Defines bargraph type, plus digital display at which bargraph is zero and full scale for each listener input in-1 to in-8.
	See section 6.3.10
'SCALE'	**Scale numeric display**
	Applies zero offset and scale factor to the numeric display for each listener input in-1 to in-8.
	See section 6.3.11
'CodE'	**Access code for listener configuration menu**
	Enters a four digit security access code for configuration menu. Default code 0000 disables this function.
	See section 6.3.12
'tYPE'	**Change from listener to node**
	Changes the function of the fieldbus indicator from a listener to a node.
	See section 6.3.13
'rESEt'	**Reset**
	Returns the BA444NDF-F listener to factory defaults.
	See section 6.3.14

Fig 6 Listener configuration menu

Display mode

Enter security code — ► or ▼ and P to move to next digit

88888 → CodE → XXXX → SCAn

SCAn branch

Scan network segment. Scans segment for all DS-65 data. Device Address A0-65 & Variable Identity ID of each variable may be displayed by pressing P ► or ▼

Display selected variable. Shows value of selected variable with maximum resolution on ±5 digit display

Allocate Listener input to fieldbus Listener input: in-1 to in-8 by pressing ► or ▼

AD ID — XXXXX — in-1

SCAn provides the simplest way of entering Device Addresses and Variable Identities.

LiSt branch

Select Listener input. Select Listener input: in-1 to in-8 by pressing ► or ▼

Display status. Shows sequentially: Enb: Y or N, Adr: FF, id: FF for selected input.

LiSt — in-1 — XXXXX

LiSt enables configuration to be checked but does not allow changes to be made.

Edit branch

Select Listener input. Select Listener input: in-1 to in-8 by pressing ► or ▼

Edit — in-1 — Enb

Enable Listener input ► or ▼ to toggle between on and oFF. — oFF

Define device address. Enter hexadecimal address by P ► or ▼ and P to move to second digit. — Adr — 00

Define variable identity. Enter hexadecimal identity by P ► or ▼ and P to move to second digit. — id — 00

Decimal point position ► or ▼ to select position of decimal point. — dP — 00000

bAr

Select bargraph justification ► or ▼ to select bargraph justification or disable. — b.tYPE — LEFt

Define display at which bargraph is zero. Enter by pressing ► or ▼ and P to move to next digit. — bArLo — 88888

Define display at which bargraph is full scale. Enter by pressing ► or ▼ and P to move to next digit. — bArhi — 88888

SCALE

Define display gain. Enter by pressing ► or ▼ and P to move to next digit. — GAin — 1.0000

Define display offset. Enter by pressing ► or ▼ and P to move to next digit. — oFFSt — 0.0000

Edit allows Device Addresses and Variable Identities to be entered in hexadecimal and all parameters to be adjusted.

CodE branch

Define security code for access to configuration menu. Enter by pressing ► or ▼ and P to move to next digit. — XXXX

CodE — tYPE

Select Node or Listener function. ► or ▼ to toggle between nodE and LStnr. To confirm enter SurE by pressing ► or ▼ and P to move to next digit. — nodE — SurE

Restarts as fieldbus Node. Enter SurE by pressing ► or ▼ and P to move to next digit

Return to factory defaults and reset Listener. — rESEt — 00000

Enter by pressing ► or ▼ and P to move to next digit
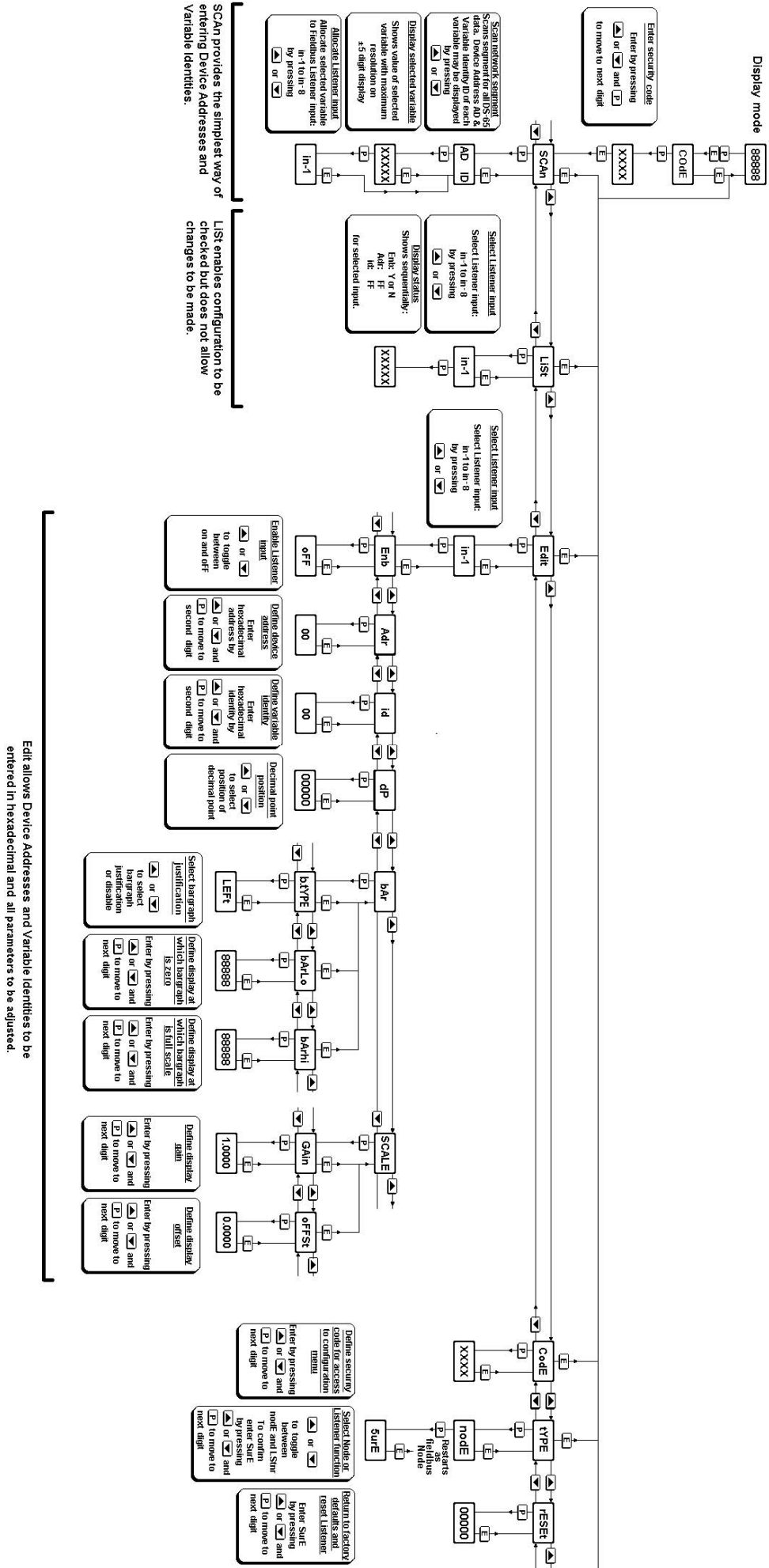
6.3.3 Scan fieldbus segment 'SCAn'

If the Device Address and Variable Identity of a process variable are not known, the 'SCAn' function provides a simple way to identify them. This function scans the fieldbus segment to which the BA444NDF-F indicator is connected and identifies all the publishers. To aid identification it enables the value of each process variable to be pre-viewed and, if required, allocated to one of the eight BA444NDF-F Fieldbus indicator inputs.

The BA444NDF-F indicator only supports DS-65 formatted data (float + status) which is the usual format for analogue process variables.   The 'SCAn' function will identify all publishers on the segment irrespective of format, but when pre-viewed, non DS-65 formatted data will produce a 'no dAt' error message.

'SCAn' is the first function displayed when entering the listener configuration menu, or it may be selected from within the menu by operating the ▼ or ▲ button.   To scan the fieldbus segment to which the indicator is connected for all published data press **P** which will reveal the hexadecimal Device Address and Variable Identity of the first publisher found as shown in Fig 5.   If there is more than one publisher operating the ▼ or ▲ button will scroll though all of them.

If no cyclic data is being published on the fieldbus segment the BA444NDF-F indicator will display 'noPub'.

When the Device Address and Variable Identity of a process variable is being displayed, pressing **P** will preview the value of the process variable displayed with maximum resolution on the five digit display.   If this confirms that it is one of the process variables to be displayed, it may be allocated to one of the eight BA444NDF-F listener inputs in-1 to in-8.

To select the required indicator input press **P** to display the first input in-1, operating the ▼ or ▲ button will scroll the display through the other inputs.   When the required input is displayed pressing **E** will allocate the selected process variable to the selected input and return the display to the Device Address and Variable Identity from which another process variable may be selected.

When a process variable is allocated to a indicator input any previous allocation will be overwritten.

6.3.4 List configured input parameters 'LiSt'

The 'LiSt' function enables the Device Address and Variable Identity allocated to each lindicator input to be viewed without danger of it being accidentally changed.

The 'LiSt' function may be selected from within the menu by operating ▼ or ▲ button. To enter the function press **P** which will display the indicator input currently selected in the display mode, other inputs may be selected using the ▼ or ▲ button. Operating the **P** button will cause the following parameters for the selected input to be displayed sequentially:

Display	Explanation
'Enb: Y or N'	Input Enabled yes or no
'Adr: 00'	Device Address
'id: 00'	Variable Identity

The display then automatically returns to the selected BA444NDF-F indicator input from where another input may be selected.

If one of the eight BA444NDF-F indicator's inputs in-1 to in-8 has not had a Device Address and Variable Identity allocated to it, 'LiSt' will show both as invalid address FF.

6.3.5 Enter address & display parameters 'Edit'

The 'Edit' function may be selected from within the menu by operating ▼ or ▲ button. To enter the function press **P** which will display the indicator input currently selected in the display mode, other listener inputs may be selected using the ▼ or ▲ button.   When the required input has been selected operating the **P** button will enter the edit sub-menu at 'Enb' for the selected input.

6.3.6 Enable selected input 'Enb'

'Enb' turns the indicator input selected in the Edit function on or off without affecting the conditioning. To enter the function press **P** which will reveal whether the selected input is 'on' or 'oFF'. Operating the ▼ or ▲ buttons will toggle between the two conditions.   When set as required operating the **E** button will enter the selection and return to the edit sub-menu.

6.3.7 Enter Device Address 'Adr'

This function allows a known fieldbus Device Address to be entered and allocated to the indicator input selected in the Edit function. To enter the function press *P* which will reveal the existing two digit hexadecimal address with one digit flashing which may be changed by operating the ▼ or ▲ button.   When set as required operating the *P* button will transfer control to the second digit that may be adjusted in the same way.   When both digits are set as required operating the *E* button will enter the selection and return to the 'Adr' prompt in the edit sub-menu.

6.3.8 Enter Variable Identity 'id'

Enables a known Variable Identity to be entered and allocated to the indicator input selected in the Edit function. To enter the function press *P* which will reveal the existing two digit hexadecimal address with one digit flashing which may be changed by operating the ▼ or ▲ button. When set as required operating the *P* button will transfer control to the second digit that may be adjusted in the same way.   When both digits are set as required operating the *E* button will enter the selection and return to the 'id' prompt in the edit sub-menu.

6.3.9 Decimal point position 'dP'

Defines the position the decimal point in the numeric display. To enter the function press *P* which will reveal the existing decimal point position. Operating the ▼ or ▲ button will move the decimal point to the required position, omit it, or activate all the decimal points which automatically provides maximum resolution in the display mode irrespective of the numeric value.

When positioned as required, operating the *E* button will enter the selection and return to the 'dP' prompt in the edit sub-menu.

6.3.10 Configuration of bargraph display 'bAr'

This function contains three sub-functions that enable the bargraph, justify its position and define the relationship between the bargraph and the instrument's numeric display.

Sub-function 'b.tYPE' allows the bargraph to be left, centre or right justified, or to be turned off. Sub-functions 'bArLo' and 'bArhi' define the listener's numeric display at which the bargraph starts and is at full scale.

The 'bAr' function may be selected from within the edit sub-menu by operating the ▼ or ▲ button. To enter the function press *P* which will display the 'b.tYPE' sub-function, pressing *P* again will reveal the existing bargraph justification.

The ▼ or ▲ button will scroll through the four options, when the required justification is displayed, pressing *E* will enter the selection and return the display to the 'b.tYPE' prompt in the edit sub-menu from which 'bArLo' may be selected using the ▼ or ▲ button.

'bArLo' defines the indicator's numeric display at which the bargraph starts, to enter the function press *P* which will reveal the existing setting.   The display may be changed using the ▼ or ▲ button to adjust the flashing digit and the *P* button to move control to the next digit. When the required starting display has been selected, press *E* to return to the 'bArLo' prompt in the edit sub-menu from which the 'bArHi' function may be selected.

'bArHi' defines the indicator's numeric display at which the bargraph is full scale, to enter the function press *P* which will reveal the existing setting.   The display may be changed using the ▼ or ▲ button to adjust the flashing digit and the *P* button to move control to the next digit. When the required display has been selected, press *E* twice to enter the new values and return to the 'bAr' prompt in the edit sub-menu.

Note: If the 'dP' function has been set to provide automatic maximum resolution irrespective of the displayed value, it may be necessary to manually position the decimal point before adjusting 'bArLo' or 'bArHi'.   This can be achieved by repeatedly operating the *P* button until the activated decimal point flashes, the decimal point can then be positioned using either the ▼ or ▲ button. Pressing the *P* button again will return control to one of the digits.

6.3.11 Scale numeric display 'SCALE'

A scaling factor 'Gain' and an offset 'oFFSt' may be applied to the fieldbus process variable using this function, thus allowing the indicator to display the fieldbus process variable in alternative units.

The 'SCALE' function may be selected from within the edit sub-menu by operating the ▼ or ▲ button. To enter the function press *P* which will display the 'GAin' sub-function, pressing *P* again will reveal the existing gain with one digit flashing. This flashing digit may be changed by operating the ▼ or ▲ button; when adjusted the *P* button will move control to the next digit or to the decimal point which can be positioned using the ▼ or ▲ button. When 'GAin' has been set to the required value operating the *E* button will enter the selection and return to the 'GAin' prompt in the sub-menu from where the 'oFFSt' function can be selected using the ▼ or ▲ button.

To enter the 'oFFSt' function press *P* which will reveal the existing offset with one digit flashing. Again the flashing digit may be changed by operating the ▼ or ▲ button and the *P* button will move control to the next digit or to the decimal point. When 'oFFSt' has been set to the required value operating the *E* button will enter the selection and return to the 'oFFSt' prompt in the sub-menu. Three operations of the *E* button will return to the 'Edit' function in the listener configuration menu.

6.3.12 Access code for listener configuration menu. 'CodE'

Access to the listener menu may be protected by a four digit security code which must be entered to gain access. New instruments are supplied configured with the default code 0000 which disables this protection and allows unrestricted access to the configuration menu.

To enter a new access code select 'CodE' in the listener configuration menu by operating the ▼ or ▲ button. To enter the function press *P* which will reveal the current access code with one digit flashing. The code may be changed using the ▼ or ▲ button to adjust the flashing digit and the *P* button to move control to the next digit. When the required code has been selected, press *E* to enter the selection and return to the 'CodE' prompt in the listener configuration menu. The revised access code will be activated when the indicator is returned to the display mode.

If the access code is lost please contact BEKA associates.

6.3.13 Change from listener to node 'tYPE'

This function enables the instrument to be changed from a fieldbus listener to a fieldbus node by selecting 'tYPE' in the listener configuration menu using the ▼ or ▲ button. To enter the function press *P* which will show that the instrument is configured as a fieldbus listener, to change to a fieldbus node press the ▼ or ▲ button which will toggle the display to 'nodE' To prevent accidental changes this request must be confirmed by operating the *P* button and entering '5urE'. The instrument will display '0000' with the first digit flashing, using the ▼ or ▲ button set the flashing digit to '5' and press the *P* button to move control to the next digit which should be set to 'u'. When the four letters of '5urE' have been entered, operating the *E* button will cause the instrument to restart as a fieldbus node in the display mode.

CAUTION
All the instrument's listener configuration will be lost when it is changed from a fieldbus listener to a fieldbus node.

6.3.14 Reset the indicator to listener factory defaults 'rESEt'

The BA444NDF-F indicator may be reset to the listener factory defaults shown below:

Security Code   0000 (disabled)

For each of the eight inputs:
Input enable	Off
Decimal point	Auto (maximum resolution)
Bar Type	Left
Bar lower limit	0.0
Bar Upper limit	100.0
Gain	1.0
Offset	0.0

To reset the BA444NDF-F indicator to the listener factory defaults select 'rESEt' in the listener configuration menu by operating the ▼ or ▲ button. To enter the function press *P* which will reveal '0000' with the left hand digit flashing. To prevent accidental use of this function, '5urE' must be entered to confirm that the instrument is to be reset.

Using the ▼ or ▲ button set the flashing digit to '5' and press the *P* button to move control to the next digit which should be set to 'u'. When the four letters of '5urE' have been entered operating the *E* button will reset the BA444NDF-F to the factory defaults. Any existing configuration and addresses will be lost when the indicator is reset.

7. MAINTENANCE

7.1 Fault finding during commissioning
If a BA444NDF-F fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No Display	Instrument not correctly connected or powered.	9 to 32V between terminals 1 & 2.
When configured as a listener displays 'no ConF'	No inputs are enabled.	Configuration of each input.
When configured as a listener displays 'no dAtA'	No data being received with the current configuration.	Addresses and Index are correct. That data has DS-33 format.
Display shows '9.9.9.9.9' with all decimal points flashing; all bargraph segments activated and bargraph scale flashing.	Value over-range	Configuration. and decimal point position.
Display shows '-9.9.9.9.9' with all decimal points flashing; no bargraph segments activated and bargraph scale flashing.	Value under-range	Configuration And Decimal point position.
Display alternates between value and the word 'bAd'. Bargraph flashes.	Status of fieldbus variable has a quality of 'BAD' or a fault state is active.	Fieldbus configuration.
Bargraph scale flashes.	Process variable is outside the limits defined for the bargraph.	Bargraph configuration.
All display segments activated.	Display is initialising.	This is normal operation, after a few seconds the model number followed by the firmware version will be displayed prior to entering the display mode.

7.2 Fault finding after commissioning

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE
Live maintenance is permitted on FNICO systems, but should only be performed on non-FNICO systems when there is no risk of a flammable atmosphere being present.

The BA444NDF-F terminal cover should only be removed when dust and water can not enter the enclosure. Before replacing the terminal cover ensure that the sealing gasket is undamaged and that it is free from foreign bodies.

If a BA444NDF-F fails after it has been functioning correctly, the table shown in section 7.1 may help to identify the cause of the failure.

If this procedure does not reveal the cause of the fault, it is recommended that the instrument is replaced.

7.3 Servicing
We recommend that faulty BA444NDF-F FOUNDATION™ fieldbus indicators are returned to BEKA associates or to our local agent for repair.

7.4 Routine maintenance
The mechanical and electrical condition of the instrument should be regularly checked. Initially annual inspections are recommended, but the inspection frequency should be adjusted to suit the environmental conditions.

7.5 Guarantee
Instruments which fail within the guarantee period should be returned to BEKA associates or our local agent. It is helpful if a brief description of the fault symptoms is provided.

7.6 Customer comments
BEKA associates is always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

8. ACCESSORIES

8.1 Scale and tag marking
BA444NDF-F indicators are fitted with a blank escutcheon around the liquid crystal display. If specified when the instrument is ordered, this can be supplied printed with units of measurement and tag information, plus a scale for the horizontal bargraph. Alternatively, information may be added on-site via an embossed strip, dry transfer or a permanent marker.

If separate units of measurement or identification are required for each process variable this can be provided on the tag plate see 8.2

To gain access to the display escutcheon remove the terminal cover by unscrewing the two 'A' screws which will reveal two concealed 'D' screws. Unscrew all four 'D' screws and carefully lift off the front of the instrument. The location of these screws is shown in Fig 2.

After adding the required legends, or fitting a new pre-printed self-adhesive escutcheon, ensure that the gasket is correctly positioned before reassembling the instrument enclosure.

8.2 Tag plate
The BA444NDF-F can be supplied with a blank or custom laser marked stainless steel plate secured by two screws to the front of the instrument enclosure. This plate can accommodate:

    1 row of 9 alphanumeric characters 10mm high

or 1 row of 11 alphanumeric characters 7mm high

or 2 rows of 18 alphanumeric characters 5mm high.

or 8 cells each containing units of measurement or identification for one of the 8 inputs.

1 °C TANK 1	2 % FULL TANK 1	3 °C TANK 2	4 % FULL TANK 2
5 mbar TANK 1	6 RPM TANK 1	7 mbar TANK 2	8 RPM TANK 2

Fig 7 Typical 8 cell tag plate

8.3 Pipe mounting kits
Two pipe mounting kits are available for securing the BA444NDF-F to a horizontal or vertical pipe.

BA392D Stainless steel bracket secured by two worm drive hose clips for 60 to 80mm outside diameter pipes.

BA393 Heavy-duty stainless steel bracket secured by a single 'V' bolt. Will clamp to any pipe with an outside diameter between 40 and 80mm.

APPENDIX 1
ATEX dust certification

A1.0 ATEX dust certification
In addition to ATEX certification permitting installation in explosive gas atmospheres which is described in the main section of this instruction manual, all BA444NDF-F FOUNDATION™ fieldbus indicators have ATEX certification permitting use in the presence of combustible dusts.

A1.1 Zones and Maximum Surface Temperature
The BA444NDF-F has been ATEX certified as Group II, Category 3D Ex tD A22 IP66 T100ºC apparatus Tamb = -20 to 60℃. When installed as specified by EN 61241-14, the BA444NDF-F FOUNDATION fieldbus™ indicator may be installed in:

Zone 22   explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation, but if it does occur, will only persist for a short period.

Be used with dusts having a Minimum Ignition Temperature of:

Dust cloud   150℃

Dust layer on BA444NDF-F 175℃
up to 5mm thick

Dust layer on BA444NDF
over 5mm thick.
Refer to EN 61241-14

At an ambient temperature between -20 and +60℃

A1.2 Certification Label Information
The certification label is fitted in a recess on the top outer surface of the enclosure. It shows details of the ATEX dust certification plus BEKA associates name and location. IECEx dust approval information is also shown.
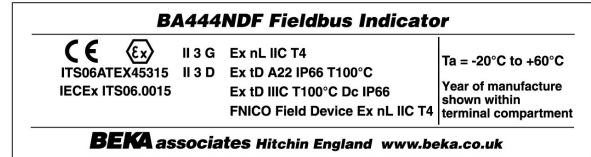
The instrument serial number and date of manufacture are recorded on a separate label inside the terminal compartment.

A1.3 Installation & maintenance

WARNING

The Fieldbus non-incendive concept (FNICO) only applies to installations in flammable gases. Live working is therefore not permitted on installations in combustible dusts.

The BA444NDF-F ATEX dust certification relies on the Fieldbus Indicator enclosure being dust-tight. Therefore the terminal cover should only be removed when dust can not enter the instrument enclosure. Before replacing the terminal cover ensure that the sealing gaskets are undamaged and are free from foreign bodies.

APPENDIX 2
IECEx Certification

A2.0   The IECEx Certification Scheme
IECEx is a global certification scheme for explosion protected products which aims to harmonise international certification standards.
For additional information about the IECEx certification scheme and to view the BEKA associate certificates, please visit www.iecex.com

A2.1 IECEx Certificate of Conformity
      For use in an explosive gas atmospheres
The BA444NDF-F FOUNDATION™ fieldbus indicator has been issued with an IECEx Certificate of Conformity number IECEx ITS 06.0015 having the following code and parameters which are identical to the ATEX parameters:

Ex nL IIC T4   Ta -20℃ to +60℃

		FNICO	**Entity**
U_i	=	17.5V dc	36V dc
I_i	=	380mA dc	250mA dc
P_i	=	5.32W	1.2W

The maximum equivalent capacitance and inductance at terminals 1 & 2 is:

C_i	=	0
L_i	=	8µH

When connected to a certified IECEx system the BA444NDF-F may be installed in:

Zone 2   explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:
Group   A   propane
Group   B   ethylene
Group   C   hydrogen

Having a temperature classification of:
T1   450℃
T2   300℃
T3   200℃
T4   135℃

At an ambient temperature between –20 and +60℃.

**A2.1.1 Installation**
      In an explosive gas atmosphere
For installations in gas atmospheres the BA444NDF-F IECEx and ATEX certifications have identical intrinsic safety parameters and installation requirements.   The ATEX system design requirements described in section 4 of this manual may therefore be used for IECEx installations in gas atmospheres, but the local code of practice should also be consulted.

A2.2 IECEx Certificate of Conformity
      Use in presence of combustible dusts
In addition to IECEx certification permitting installation in explosive gas atmospheres, all BA444NDF-F FOUNDATION™ fieldbus indicator have IECEx certification permitting use in the presence of combustible dusts.
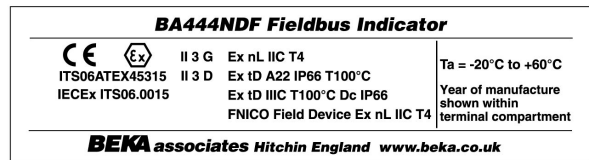
The IECEx Certificate of Conformity has the following code and parameters for use in combustible dusts:

Ex tD IIIC T100℃ Dc IP66
Ta = -20℃ to 60℃

U_i	=	36V dc
I_i	=	250mA dc
P_i	=	1.2W

The maximum equivalent capacitance and inductance at terminals 1 & 2 is:

C_i	=	0
L_i	=	8µH

When connected to a certified IECEx system the BA444NDF-F may be installed in:

Zone 22   explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation, but if it does occur, will only persist for a short period.

Be used in the presence of dusts having the following Minimum Ignition Temperatures:

Dust cloud	150℃
Dust layer on BA444NDF-F up to 5mm thick	175℃
Dust layer on BA444NDF-F over 5mm thick.	Refer to IEC 61241-14

At an ambient temperature between -20 and +60℃.

The IECEx certificate may be downloaded from www.beka.co.uk, www.iecex.com or requested from the BEKA sales office.

WARNING
The IECEx dust certification relies on the FOUNDATION™ fieldbus indicators enclosure being dust-tight. Therefore the terminal cover should only be removed when dust can not enter the instrument enclosure. Before replacing the terminal cover ensure that the sealing gaskets are undamaged and are free from foreign bodies.

TR Automatyka Sp. z o. o.
ul. Lechicka 14 ; 02-156 Warszawa

Tel. (+48 022) 886 10 16
Fax. (+48 022) 846 50 37

www.trautomatyka.pl
biuro@trautomatyka.pl