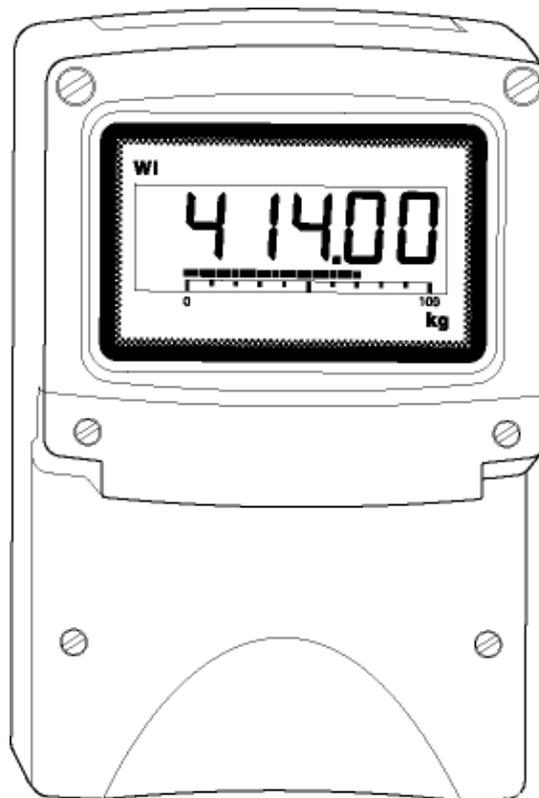


**BA414NDF-F**  
**FOUNDATION™ fieldbus**  
**Type nL**  
**Field mounting**  
**Fieldbus Indicator**

Issue: 3



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**The BA414NDF-F is CE marked to show compliance with the European Explosive Atmospheres Directive 94/9/EC and the European EMC Directive 89/336/EEC**

## 1. DESCRIPTION

The BA414NDF-F Fieldbus Indicator is a Type nL certified FOUNDATION™ fieldbus instrument that displays one fieldbus process variable in a Zone 2 hazardous area. The instrument is bus powered and has a 5 digit 20mm high display plus a 31 segment analogue bargrah.

Communication Protocol	Fieldbus Function Block
FOUNDATION™ fieldbus	Input Selector (1 x IS)

The Device Description files may be downloaded from The Fieldbus Foundation or the BEKA associates web site.

Housed in a robust IP66 glass reinforced polyester (GRP) enclosure with a toughened glass window, the BA414NDF-F is surface mounting, or may be pipe mounted using one of the accessory kits.

The instrument 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 BA414NDF-F is available with ATEX and IECEx Type nL dust certification. Dust certification is an option that must be requested when the instrument is ordered. See Appendix 1 for details of ATEX dust certification and Appendix 2 for IECEx dust 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.

### 1.1 Documentation

The main body of this manual describes ATEX design and installation requirements for BA414NDF-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.

For commissioning information please refer to:

FOUNDATION™ fieldbus  
Fieldbus Interface Guide  
for  
Fieldbus Displays and  
Fieldbus Indicators

which can be requested via the BEKA web site [www.beka.co.uk](http://www.beka.co.uk)

## 2. Type nL CERTIFICATION

### 2.1 ATEX certificate

The BA414NDF-F has been issued with a Type Examination Certificate by Notified Body Intertek Testing and Certification Ltd (ITS) confirming compliance with the European ATEX Directive 94/9/EC for Group II, Category 3 G, EEx nL IIC T4 (Tamb -20 to +70°C) and Category 3 GD, EEx nL IIC T4 (Tamb -20 to +60°C). 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 BS EN60079:Part14:2003 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 which describes ATEX installations complying with BS EN50281-1-2:1999.

### 2.2 Zones, gas groups and T rating

The BA414NDF-F has been issued with Type Examination Certificate ITS06ATEX45315 confirming that it complies with the requirements for Group II Category 3G EEx nL IIC T4 (Tamb -20 to 70°C) specified in the ATEX Directive. When connected to a suitable certified system the BA414NDF-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°C  
T2 300°C  
T3 200°C  
T4 135°C

At an ambient temperature between -20 and +70°C.

This allows the BA414NDF-F to be used with most common industrial gases.

### 2.3 Fieldbus connection

The BA414NDF-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 IEC 60079-27:2006 and also have the entity parameters shown below:

	<b>FNICO</b>	<b>Entity</b>
U <sub>i</sub>	= 17.5V dc	36V dc
I <sub>i</sub>	= 380mA dc	250mA dc
P <sub>i</sub>	= 5.32W	1.2W

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

$$\begin{aligned} C_i &= 0 \\ L_i &= 8\mu\text{H} \end{aligned}$$

### 2.4 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.

<b>BA414NDF Fieldbus Indicator</b>		<b>BEKA associates Hitchin England</b>	
		II 3 G	U <sub>i</sub> = 36V dc I <sub>i</sub> = 250mA P <sub>i</sub> = 1.2W
T <sub>amb</sub> = -20°C to +70°C		C <sub>i</sub> = 0 L <sub>i</sub> = 8μH	
EEx nL IIC T4 ITS06ATEX45315		Ex nL IIC T4	
FNICO Field Device EEx nL IIC T4		Ta = -20°C to +70°C IECEX ITS 06.0015	
		FNICO Field Device Ex nL IIC T4	
Year of manufacture shown within terminal compartment			
ATEX		IECEX	

## 3. SYSTEM DESIGN FOR HAZARDOUS AREAS

### 3.1 FNICO Systems

The BA414NDF-F may be connected to any ATEX certified FNICO compliant 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 with IEC60079 part 27:2006.

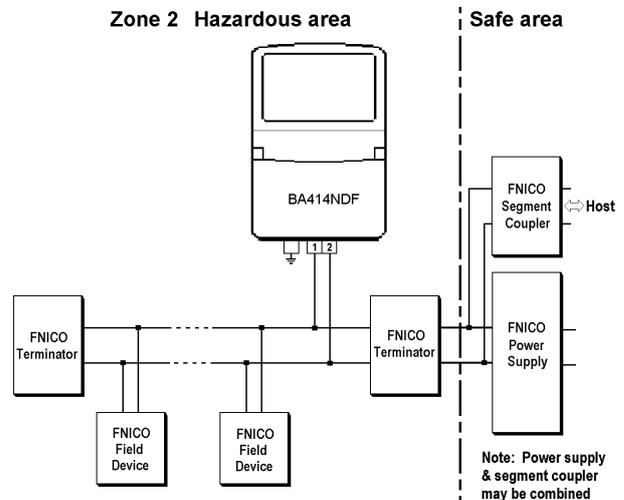


Fig 1 FNICO fieldbus system

### 3.2 Non-FNICO Systems

Although as shown in section 2.3 the BA414NDF-F has entity input parameters, the indicator complies with the requirements for 'Self protected energy-limited apparatus' as defined by Clause 30.1 Paragraph d of EN 60079-15:2005. This means that the BA414NDF-F contains its own energy limiting components and may be connected to any Type nL certified associated apparatus irrespective of its U<sub>o</sub> and I<sub>o</sub> providing:

C cable + (C<sub>i</sub> of other instruments connected to the segment) is equal to, or less than, C<sub>o</sub> of the Type nL associated apparatus powering the fieldbus segment to which the BA414NDF-F is connected.

L cable + 8μH + (L<sub>i</sub> of other instruments connected to the segment) is equal to, or less than, L<sub>o</sub> of the Type nL associated apparatus powering the fieldbus segment to which the BA414NDF-F is connected.

The fieldbus segment can provide an additional 13mA to power the BA414NDF-F Fieldbus Indicator.

These requirements are not restrictive and allow the BA414NDF-F fieldbus indicator to be connected to almost all Type nL fieldbus segments.

## 4. INSTALLATION

### 4.1 Location

The BA414NDF-F Fieldbus Indicator is housed in a robust IP66 glass reinforced polyester (GRP) enclosure incorporating a toughened 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 BA414NDF-F enclosure is surface mounting. Accessory kits described in sections 6.3 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 BA414NDF-F earth terminal is connected to the carbon loaded GRP enclosure. If this enclosure is not bolted to an earthed post or structure, the earth terminal should be connected to a local earth.

The BA414NDF-F enclosure is supplied with a bonding plate to ensure electrical continuity between the three conduit / cable entries.

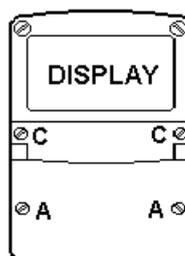
### 4.2 Installation Procedure

Fig 2 illustrates the instrument installation procedure.

- Remove the instrument terminal cover by unscrewing the two captive 'A' screws.
- 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 6.3
- Remove the temporary dust seals from the three cable entries and install the required cable glands, conduit fittings or blanking plugs. For use in Zone 2 cable glands, conduit fittings and blanking plugs must be EEx n or EEx e approved and be suitable for continuous use at the maximum operating temperature of the instrument.

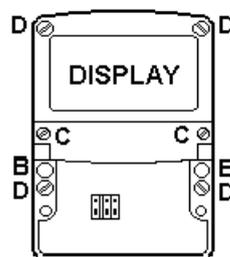
**Note:** The temporary dust seals fitted for transit do not maintain the IP66 protection of the BA414NDF-F enclosure.

- Connect the field wiring to the terminals as shown in Fig 3. Field wiring must be suitable for continuous use at the maximum operating temperature.
- Replace the instrument terminal cover and evenly tighten the two 'A' screws.



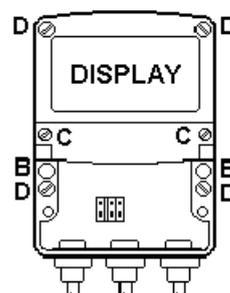
#### Step a

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.



#### Steps c, d and e

Install the required EEx n or EEx e approved cable glands, conduit fittings or blanking plugs and terminate the field wiring. Finally replace the terminal cover and tighten the two 'A' screws.

Fig 2 BA414NDF-F installation procedure

### 4.3 EMC

The BA414NDF-F complies with the requirements of the European EMC Directive 89/336/EEC. For specified immunity, all wiring should be in screened twisted pairs with the screens earthed at one point in the safe area.

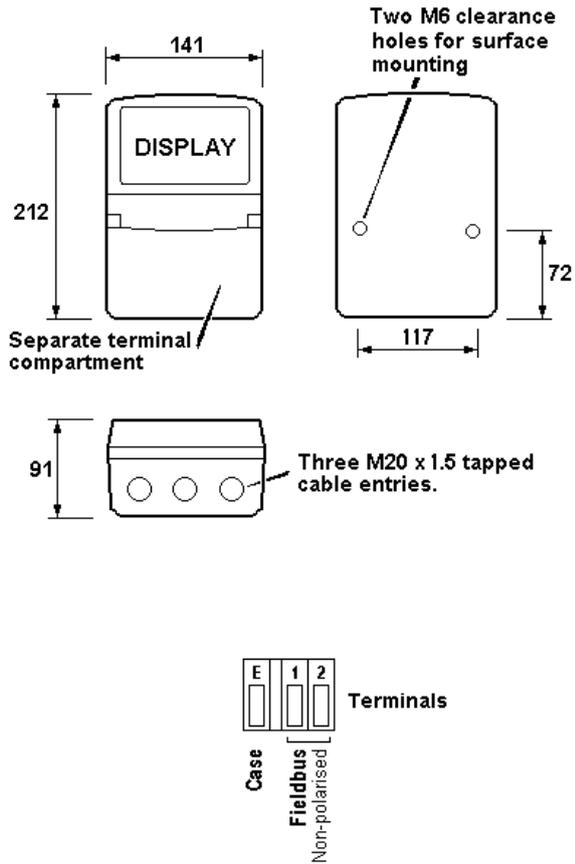


Fig 3 Dimensions and terminal connections

## 5. MAINTENANCE

### 5.1 Fault finding during commissioning

If a BA414NDF-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.
Display shows '9.9.9.9.9' with all decimal points flashing; all bargraph segments activated and bargraph scale flashing.	Value over-range	Variable source  Decimal point configuration.
Display shows '-9.9.9.9.9' with all decimal points flashing; no bargraph segments activated and bargraph scale flashing.	Value under-range	Variable source  Decimal point configuration
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.  Display has not yet received data.	Variable source  Fieldbus configuration.
Bargraph scale flashes.	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 firmware version will be displayed prior to entering the operational mode.

### 5.2 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 BA414NDF-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 BA414NDF-F fails after it has been functioning correctly, the table shown in section 5.1 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 be replaced.

### 5.3 Servicing

We recommend that faulty BA414NDF-F Fieldbus Indicators be returned to BEKA associates or to our local agent for repair.

### 5.4 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.

### 5.5 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.

### 5.6 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.

## 6. ACCESSORIES

### 6.1 Scale and tag marking

BA414NDF-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. Alternatively, information may be added on-site via an embossed strip, dry transfer or a permanent marker.

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 all these screws is shown in Fig 2.

After adding the required legends, or fitting a new pre-printed self-adhesive escutcheon, ensure that the gaskets are undamaged, free from foreign bodies and correctly positioned before reassembling the instrument enclosure.

### 6.2 Tag plate

The BA414NDF-F can be supplied with a blank or custom laser marked stainless steel plate secured by two screws to the front of the instrument terminal cover. 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

### 6.3 Pipe mounting kits

Two pipe mounting kits are available for securing the BA414NDF-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.

### 6.4 Fieldbus Interface Guide

The *FOUNDATION™ fieldbus Interface Guide for Fieldbus Displays & Fieldbus Indicators* contains commissioning information for the BA414NDF-F. A copy may be requested from the BEKA sales office or from the BEKA web site at [www.beka.co.uk](http://www.beka.co.uk)

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## 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, the BA414NDF-F is available with optional ATEX certification permitting use in the presence of combustible dusts. If ATEX dust certification is required it must be requested when the BA414NDF-F Fieldbus Indicator is ordered.

#### WARNING

**Before installing a BA414NDF-F Fieldbus Indicator in the presence of a combustible dust, ensure that the certification information label, which is located on the top of the instrument, specifies dust certification**  
See section A1.2

#### A1.1 Zones and Maximum Surface Temperature

The BA414NDF-F has been ATEX certified as Group II, Category 3 GD apparatus  $T_{amb} = -20$  to  $60^{\circ}\text{C}$ , with a Maximum Surface Temperature of  $100^{\circ}\text{C}$ . When installed as specified by EN 50281-1-2:1998 'Selection, installation and maintenance of electrical apparatus protected by enclosures', the 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	$150^{\circ}\text{C}$
Dust layer on BA414NDF-F up to 5mm thick	$175^{\circ}\text{C}$
Dust layer on BA414NDF-F over 5mm thick.	Refer to EN500281-1-2:1998

At an ambient temperature between  $-20$  and  $+60^{\circ}\text{C}$

#### 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.

<i>BA414NDF Fieldbus Indicator BEKA associates Hitchin England</i>	
  II 3 GD	$U_i = 36\text{Vdc}$ $I_i = 250\text{mA}$ $P_i = 1.2\text{W}$ $C_i = 0$ $L_i = 8\mu\text{H}$
$T_{amb} = -20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$	Ex nL IIC T4 DIP A22 TA100 IP66
EEx nL IIC T4 ITS06ATEX45315	$T_a = -20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ IECEx ITS 06.0015
FNICO Field Device EEx nL IIC T4	FNICO Field Device Ex nL IIC T4
Year of manufacture shown within terminal compartment	
ATEX	IECEx

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 BA414NDF-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](http://www.iecex.com)

### A2.1 IECEX Certificate of Conformity

#### For use in an explosive gas atmospheres

The BA414NDF-F 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°C to 70°C

	<b>FNICO</b>	<b>Entity</b>
Ui	= 17.5V dc	36V dc
Ii	= 380mA dc	250mA dc
Pi	= 5.32W	1.2W

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

Ci	= 0
Li	= 8µH

When connected to a certified IECEX system the BA414NDF-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°C
T2	300°C
T3	200°C
T4	135°C

At an ambient temperature between -20 and +70°C.

### A2.1.1 Installation

#### In an explosive gas atmosphere

For installations in gas atmospheres the BA414NDF-F IECEX and ATEX certifications have identical intrinsic safety parameters and installation requirements. The ATEX system design requirements described in section 3 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, the BA414NDF-F is available with optional IECEX certification permitting use in the presence of combustible dusts. If IECEX dust certification is required it must be requested when the BA414NDF-F Fieldbus Indicator is ordered.

#### WARNING

**Before installing a BA414NDF-F Fieldbus Indicator in the presence of a combustible dust, ensure that the certification information label, which is located on the top of the instrument, specifies dust certification – see below.**

<i>BA414NDF Fieldbus Indicator BEKA associates Hitchin England</i>	
 	<b>II 3 GD</b>
<b>Tamb = -20°C to +60°C</b>	<b>Ui = 36Vdc Ii = 250mA Pi = 1.2W</b> <b>Ci = 0 Li = 8µH</b>
<b>EEx nL IIC T4 ITS06ATEX45315</b>	<b>Ex nL IIC T4 DIP A22 TA 100 IP66</b> <b>Ta = -20°C to +60°C IECEX ITS 06.0015</b>
<b>FNICO Field Device EEx nL IIC T4</b>	<b>FNICO Field Device Ex nL IIC T4</b>
<small>Year of manufacture shown within terminal compartment</small>	
ATEX	IECEX

The IECEX Certificate of Conformity has the following code and parameters:

Ex nL IIC T4 DIP A22 TA 100 IP66  
Ta = -20°C to 60°C

Ui	= 36V dc
Ii	= 250mA dc
Pi	= 1.2W

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

Ci	= 0
Li	= 8µH

When connected to a certified IECEx system the BA414NDF-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°C
Dust layer on BA414NDF-F up to 5mm thick	175°C
Dust layer on BA414NDF-F over 5mm thick.	Refer to IEC 61241

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

The IECEx certificate may be downloaded from [www.beka.co.uk](http://www.beka.co.uk), [www.iecex.com](http://www.iecex.com) or requested from the BEKA sales office.

#### **WARNING**

**The IECEx 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.**