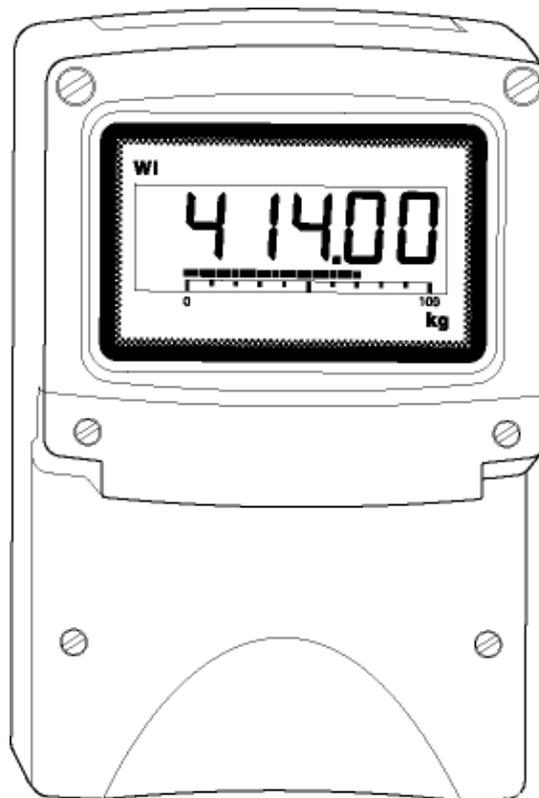


**BA414DF-F**  
**FOUNDATION™ fieldbus**  
**Intrinsically safe**  
**Field mounting**  
**Fieldbus Indicator**

Issue: 5



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#### Appendix 1

ATEX dust certification

#### Appendix 2

FM Approval for use in the USA and  
cFM Approval for use in Canada.

#### Appendix 3

IECEX certification

The BA414DF-F is CE marked to show compliance with the European Explosive Atmospheres Directive 94/9/EC and the European EMC Directive 2004/108/EC

## 1. DESCRIPTION

The BA414DF-F Fieldbus Indicator is an intrinsically safe, FOUNDATION™ fieldbus instrument that can display one fieldbus process variable on a five digit LCD and 31 segment analogue bargraph. The instrument is bus powered so no additional power supply is required.

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 sites.

Housed in a robust IP66 glass reinforced polyester (GRP) enclosure with a toughened glass window, the BA414DF-F is surface mounting, or may be pipe mounted using one of the accessory kits.

The instrument is intrinsically safe and has been certified by European Notified Body Intertek Testing and Certification Ltd (ITS) to the ATEX Directive 94/9/EC for use in explosive gas and combustible dust atmospheres. ATEX dust certification is an option – see Appendix 1.

For use in the USA and Canada, the BA414DF-F is available with optional intrinsic safety and nonincendive FM and CFM Approval – see Appendix 2.

For international applications, all versions of the BA414DF-F fieldbus indicator have IECEx intrinsic safety approval allowing installation in explosive gas atmospheres. IECEx dust certification is available as an option – see Appendix 3.

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

This instruction manual describes ATEX system design and installation of the BA414DF-F Fieldbus Indicator. 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)

System design information for non-ATEX and dust approvals is shown in appendices to this manual.

## 2. INTRINSIC SAFETY CERTIFICATION

### 2.1 ATEX certificate

The BA414DF-F has been issued with an EC-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 1, gas and dust atmospheres. 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 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.

### 2.2 Zones, gas groups and T rating

The BA414DF-F has been issued with EC Type Examination certificate ITS06ATEX25313 confirming that it complies with the requirements for Group II Category 1G Ga Ex ia IIC T4 (Tamb –40 to 70°C) specified in the ATEX Directive. When connected to a suitable certified system the BA414DF-F may be installed in:

- |        |   |
|--------|---|
| Zone 0 | explosive gas air mixture continuously present.   |
| Zone 1 | explosive gas air mixture likely to occur in normal operation.                                  |
| 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 –40 and +70°C.

**Note:** the guaranteed operating temperature range of the BA414DF-F Fieldbus Indicator is –20 to +70°C

This allows the BA414DF-F to be installed in all Zones and to be used with most common industrial gases.

**2.3 Fieldbus connection**

The BA414DF-F Indicator is powered and communicates via the fieldbus, which is connected to terminals 1 and 2. These are non-polarised, comply with the Fieldbus Intrinsically Safe Concept (FISCO) defined in IEC 60079 Part 27 and have separate entity parameters shown below:

	<b>FISCO</b>	<b>Entity</b>
U <sub>i</sub>	= 17.5V dc	22.0V 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:

C <sub>i</sub>	=	0nF
L <sub>i</sub>	=	8µH

**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 FISCO Field Device, plus BEKA associates name and location. IECEx approval information is also included. The label for some versions of the instrument will also contain non-European certification information.

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

<b>BA414DF Fieldbus Indicator</b>	
 	0359 II 1 G T <sub>amb</sub> = -40°C to +70°C EEx ia IIC T4 ITS06ATEX25313
	<b>FISCO</b> FISCO Field Device EEx ia IIC T4
	<b>IECEX</b> Ex ia IIC T4 T <sub>a</sub> = -40°C to +70°C IECEx ITS 06.0012
Year of manufacture shown within terminal compartment BEKA associates Hitchin England www.beka.co.uk	

**3. SYSTEM DESIGN FOR HAZARDOUS AREAS**

**3.1 FISCO Systems**

The BA414DF-F may be connected to any ATEX certified FISCO compliant fieldbus segment, providing the segment can supply the additional 13mA required to operate the instrument.

Fig 1 shows a typical fieldbus segment. To comply with FISCO requirements, the power supply, terminators, field devices and the interconnecting cables must conform with IEC60079 part 27.

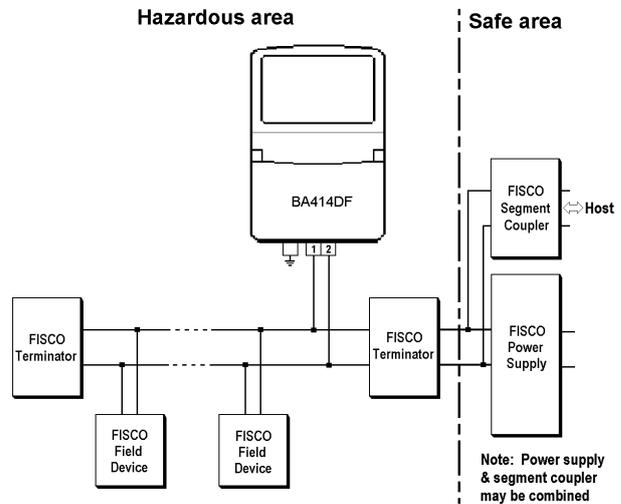


Fig 1 FISCO fieldbus system

**3.2 Non-FISCO Systems**

For non-FISCO applications the BA414DF-F Fieldbus Indicator has a higher voltage entity intrinsic safety input parameter allowing connection to a wide range of fieldbus segments.

The BA414DF-F Fieldbus Indicator may be connected to any intrinsically safe segment providing:

The device powering the fieldbus segment is ATEX certified and has output parameters equal to or less than:

U <sub>o</sub>	=	22V dc
I <sub>o</sub>	=	250mA dc
P <sub>o</sub>	=	1.2W

The segment can provide an additional 13mA to power the Fieldbus Indicator.

The equivalent capacitance C<sub>i</sub> of the BA414DF-F Fieldbus Indicator is zero and the equivalent inductance is insignificant. Therefore these BA414DF-F parameters do not need to be considered.

## 4. INSTALLATION

### 4.1 Location

The BA414DF-F 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 BA414DF-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.

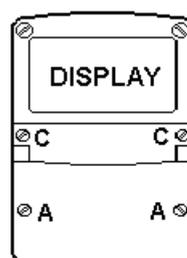
The BA414DF-F earth terminal is connected to the carbon loaded GRP enclosure. If this enclosure is not bolted to an earthed post or structure, the earth terminal should be connected to a local earth.

The BA414DF-F enclosure is supplied with a bonding plate to ensure electrical continuity between the three conduit / cable entries.

### 4.2 Installation Procedure

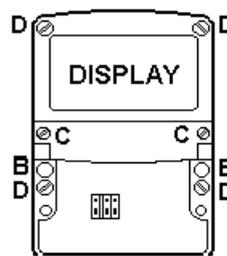
Fig 2 illustrates the instrument installation procedure.

- 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 glands, conduit fittings or blanking plugs.  
**Note:** The temporary dust seals fitted for transit do not maintain the IP66 protection of the BA414DF-F enclosure.  
Cable glands, conduit fittings, blanking plugs and cables must be suitable for continuous use at the maximum operating temperature of the instrument.
- Connect the field wiring to the terminals as shown in Fig 3.
- Replace the instrument terminal cover and evenly tighten the two 'A' screws.



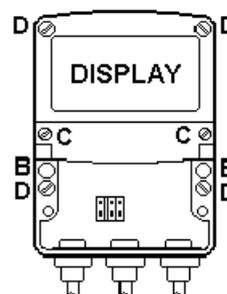
#### Step a

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 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 BA414DF-F installation procedure

### 4.3 EMC

The BA414DF-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.

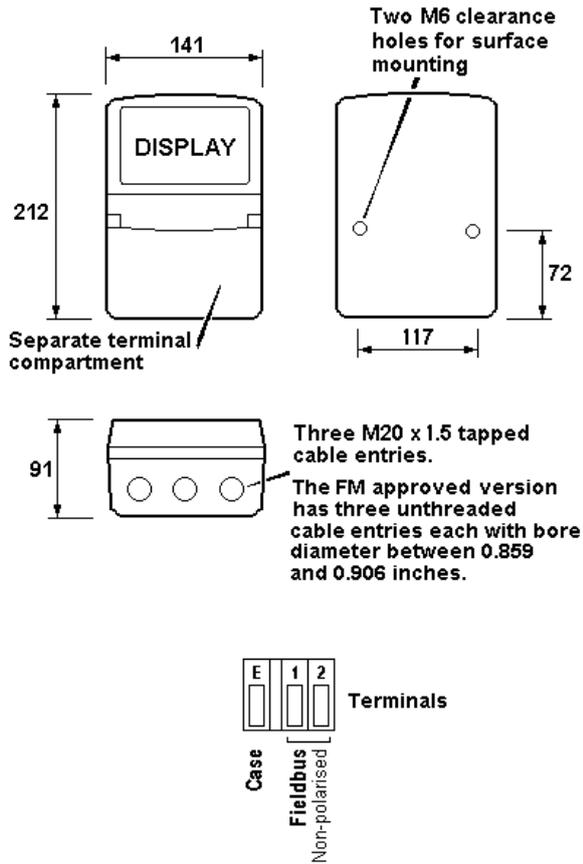


Fig 3 Dimensions and terminal connections

## 5. MAINTENANCE

### 5.1 Fault finding during commissioning

If a BA414DF-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 22V 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 intrinsically safe equipment installed in a hazardous area, but only certified test equipment should be used unless a gas clearance certificate is available.**

If a BA414DF-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 is replaced.

### 5.3 Servicing

We recommend that faulty BA414DF-F Fieldbus Indicators are 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

BA414DF-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.

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 gasket is correctly positioned before reassembling the instrument enclosure.

### 6.2 Tag plate

The BA414DF-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

### 6.3 Pipe mounting kits

Two pipe mounting kits are available for securing the BA414DF-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 BA414DF-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)

## 7. INDEX

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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 BA414DF-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 BA414DF-F Fieldbus Indicator is purchased.

#### WARNING

**Before installing a BA414DF-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 BA414DF-F has been ATEX certified as Group II, Category 1 GD apparatus Tamb = -20 to 60°C, with a Maximum Surface Temperature of 100°C. When installed as specified by EN 61241 Part 14 the Fieldbus Indicator may be installed in:

- Zone 20 explosive atmosphere in the form of a cloud of combustible dust in air is continuously present, or for long periods or frequently.
- Zone 21 explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur occasionally in normal operation.
- 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°C
Dust layer on BA414DF-F up to 5mm thick	175°C
Dust layer on BA414DF-F over 5mm thick.	Refer to EN61421 part 14.

At an ambient temperature between -20 and +60°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 including the maximum surface temperature and ingress protection; a statement that the instrument is a FISCO Field Device, plus BEKA associates name and location. IECEX dust approval information is also shown, non-European certification information may also be included.

BA414DF Fieldbus Indicator	
CE 0359 Ex II 1 GD	T100°C Tamb = -20°C to +60°C IP66 EEx ia IIC T4 ITS06ATEX25313
	FISCO Field Device EEx ia IIC T4
Ex ia IIC T4 DIPA21 TA100°C IP66 Ta = -20°C to +60°C	IECEX ITS 06.0012
Year of manufacture shown within terminal compartment	
BEKA associates Hitchin England www.beka.co.uk	

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

### A1.3 Installation & maintenance

The 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

### FM Approval for use in the USA and CFM Approval for use in Canada

#### A2.0 Factory Mutual Approval

For installations in the USA and Canada, a version of the BA414DF-F is available with FM and CFM intrinsic safety and nonincendive approval, project identifications 3027031 and 3027031C. Copies of the Certificates of Compliance are available from BEKA associates sales office and [www.beka.co.uk](http://www.beka.co.uk)

The FM and CFM Approved version is identical to the ATEX version except the three M20 x 1,5 tapped cable entries are replaced by three plain unthreaded 22.25mm diameter entries. Approved hubs and glands are listed in note 6 of Intrinsically Safe Control Drawing CI410-12 and note 5 of Nonincendive Control Drawing CI410-13. The certification label on the FM and CFM Approved version includes ATEX gas certification information so that the Fieldbus Indicator may be used in systems covered by either authority.

#### A2.1 Intrinsic safety approval

The BA414DF-F is approved to FM Class 3610 intrinsic safety standard for use in indoor and outdoor hazardous (classified) locations. Installations must comply with BEKA associates Control Drawing CI410-12, which is attached to this Appendix, ANSI/ISA RP12.06.01 'Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations' and with the National Electrical Code ANSI/NFPA70.

Canadian installations must comply with the Canadian Electrical Code C22.2 and with BEKA associates Control Drawing CI410-12, which is attached to this Appendix.

The BA414DF-F has a T4 rating at ambient temperatures up to +70°C and may be used with the following gases and dusts:

Intrinsic Safety	
Division 1 or 2	
Class I	Group A & B Group C Group D
Class II	Group E, F & G
Class III	
Zone 0, 1 or 2	
Class 1	Group IIC Group IIB Group IIA

The FM and CFM entity parameters are identical to the ATEX parameters and, like the ATEX certification, confirm that the BA414DF-F complies with the FISCO Field Device requirements specified in IEC60079-27. The intrinsically safe system shown in Fig 1 of this manual may therefore be used for installations in the USA and Canada, providing the fieldbus power supply, terminators, Zener barriers and galvanic isolators are FM Approved for US installations and CFM or CSA Approved for Canadian installations. All installations must comply with BEKA associates Control Drawing CI410-12.

FM and CFM Approvals also allows the BA414DF-F to be connected to non-FISCO systems using the entity concept – see section 3.2 of this manual.

#### A2.2 Nonincendive approval

The BA414DF-F is FM Class 3611 nonincendive approved allowing it to be installed in Division 2 indoor and outdoor hazardous (classified) locations without the need for Zener barriers or galvanic isolators. US installations must comply with the BEKA associates Control Drawing CI410-13, which is attached to this Appendix, and with the National Electrical Code ANSI/NFPA70.

Canadian nonincendive installations must comply with the Canadian Electrical Code C22.2 and with BEKA associates Control Drawing CI410-13, which is attached to this Appendix.

The FM and CFM Nonincendive Approvals also allow the BA414DF-F fieldbus indicator to be connected to any appropriately certified FNICO compliant fieldbus segment.

The BA414DF-F has a T4 rating at ambient temperatures up to +70°C and may be used with the following gases and dusts:

Nonincendive	
Division 2	
Class I	Group A & B Group C Group D
Class II	Groups E, F & G
Class III	
Zone 2	
Class I	Group IIC Group IIB Group IIA

Iss.	Date	Modification	Ckd.	Appd.	<p><b>HAZARDOUS (CLASSIFIED) LOCATION</b></p> <p><b>BA414DF LOCATIONS:</b>                  Class I, Division 1, Groups A, B,C, D                  Class II, Division 1, Groups E, F &amp; G                  Class III                  Class I, Zone 0, Group IIC</p> <p><b>BA418CF LOCATIONS:</b>                  Class I, Division 1, Groups A, B,C, D                  Class I, Zone 0, Group IIC</p>	<p><b>UNCLASSIFIED LOCATION</b></p>													
Iss.	Date	Modification	Ckd.	Appd.															
<p><b>BEKA associates</b>                  Hitchin England                  company confidential, copyright reserved.</p>					<p><b>BA414DF and BA418CF</b></p> <p>Terminals 1 &amp; 2                  These terminals comply with the Intrinsically Safe Concept (FISCO) defined by IEC 60079-27</p> <p> <math>U_i = 17.5V</math>      <math>U_o = 0</math>  <math>I_i = 380mA</math> dc    <math>I_o = 0</math>  <math>P_i = 5.32W</math>      <math>P_o = 0</math>  <math>C_i = 0</math>  <math>L_i = 8\mu H</math> </p> <p>and have the following Entity Parameters</p> <p> <math>U_i = 22Vdc</math>      <math>U_o = 0</math>  <math>I_i = 250mA</math>      <math>I_o = 0</math>  <math>P_i = 1.2W</math>      <math>P_o = 0</math> </p>														
<p>*****                  Note:                  No modification to be made without reference/approval from FM Approvals and BEKA Associates Design Department.                  *****</p>																			
<p>Notes:</p> <ol style="list-style-type: none"> <li>The associated intrinsically safe barriers and fieldbus power supply must be FM approved and the manufacturers' installation drawings shall be followed when installing this equipment.                      For installations in Canada the associated intrinsically safe barriers and fieldbus power supply must be CFM or CSA approved and the manufacturers' installation drawings shall be followed when installing the equipment.</li> <li>The unclassified location equipment connected to the associated intrinsically safe barriers and fieldbus power supply shall not use or generate more than 250V rms or 250V dc.</li> <li>Installation shall be in accordance with ANSI/ISA RP 12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code ANSI/NFPA 70.                      Installations in Canada shall be in accordance with the Canadian Electrical Code C22.2</li> <li>Fieldbus power supply with FISCO compliant output (IEC6009-27) or galvanic isolator with entity parameters complying with the following requirements:</li> </ol> <table border="0" style="width: 100%; margin-left: 40px;"> <tr> <td style="width: 30%;"><math>U_o</math> or <math>V_t</math></td> <td style="width: 40%;">equal to or less than</td> <td style="width: 30%;"><math>U_i</math></td> </tr> <tr> <td><math>I_o</math> or <math>I_t</math></td> <td>equal to or less than</td> <td><math>I_i</math></td> </tr> <tr> <td><math>P_o</math></td> <td>equal to or less than</td> <td><math>P_i</math></td> </tr> <tr> <td><math>L_a</math></td> <td>equal to or greater than</td> <td><math>L_{cable} + L_i</math></td> </tr> <tr> <td><math>C_a</math></td> <td>equal to or greater than</td> <td><math>C_{cable} + C_i</math></td> </tr> </table> <p style="text-align: right;">cont:</p>					$U_o$ or $V_t$	equal to or less than	$U_i$	$I_o$ or $I_t$	equal to or less than	$I_i$	$P_o$	equal to or less than	$P_i$	$L_a$	equal to or greater than	$L_{cable} + L_i$	$C_a$	equal to or greater than	$C_{cable} + C_i$
$U_o$ or $V_t$	equal to or less than	$U_i$																	
$I_o$ or $I_t$	equal to or less than	$I_i$																	
$P_o$	equal to or less than	$P_i$																	
$L_a$	equal to or greater than	$L_{cable} + L_i$																	
$C_a$	equal to or greater than	$C_{cable} + C_i$																	
Date	Iss.	28.03 2006	1	Title	<p style="color: red;">FM Approvals Control Drawing for Intrinsically Safe                  BA414DF &amp; BA418CF Fieldbus Indicators</p>	Drawn	RC	Checked		Scale	NTS								
<p>Drawing No. <span style="color: red; font-size: 1.2em;">CI410-12</span>                  Sheet 1 of 3</p>																			



Iss.	1	Date	28.03 2006	Modification	First release	Ckd.	.	Appd.	.
 <p><b>BEKA associates</b> Hitchin England company confidential, copyright reserved.</p>				Iss.		Date		Modification	
				Ckd.		Appd.			

**FISCO Rules**

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Vmax), the current (Imax) and the power (Pmax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc or Vt), the current (Io, Isc or It) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5nF and 10uH respectively.

In each I.S. Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc or Vt) of the associated apparatus used to supply the bus cable must be limited to the range 14Vdc to 24Vdc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50µA for each connected device. Separately powered equipment needs galvanic isolation to ensure the intrinsically safety Fieldbus circuit remains passive.

The cable used to interconnect the devices needs to comply with the following parameters:  
 Loop resistance R': 15....150Ω/km  
 Inductance per unit length L':0.4....1mH/km

Capacitance per unit length C': 80....200nF/km  
 C' = C' line/line+0.5 C' line/screen, if both lines are floating  
 or  
 C' = C' line/line + C'line/screen, if the screen is connected to one line.  
 Length of spur cable: max. 30m  
 Length of trunk cable: max. 1km  
 Length of splice: max = 1m

Terminators  
 At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable:  
 R= 90....100Ω  
 C = 0 ....2.2µF

System evaluation  
 The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and the capacitance of the cable need not be considered and will not impair the intrinsic safety of the installation.

Notes.  
 1. The intrinsic safety FISCO concept allows the interconnection of FM Approved Intrinsically Safe devices with FISCO parameters not specifically examined in combination as a system when:  
 $U_o \text{ or } V_{oc} \text{ or } V_t \leq V_{max}$ ,  $I_o, I_{sc} \text{ or } I_t \leq I_{max}$ ,  $P_o \leq P_i$ .  
 For Canadian installations the intrinsic safety FISCO concept allows the interconnection of CFM or CSA Approved Intrinsically Safe devices with FISCO parameters not specifically examined in combination as a system when:  
 $U_o \text{ or } V_{oc} \text{ or } V_t \leq V_{max}$ ,  $I_o, I_{sc} \text{ or } I_t \leq I_{max}$ ,  $P_o \leq P_i$ .

Title  FM Approvals Control Drawing for Intrinsically Safe BA414DF & BA418CF Fieldbus Indicators	Drawn RC	Checked	Scale NTS
	Drawing No. Sheet 3	CI410-12	







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 <p><b>BEMA associates</b> Hitchin England company confidential, copyright reserved.</p>									
<p style="text-align: center;"><b><u>FNICO Rules</u></b></p> <p>The FNICO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Vmax), the current (Imax) and the power (Pmax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc or Vt), the current (Io, Isc or It) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5nF and 20uH respectively.</p> <p>In each I.S. Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc or Vt) of the associated apparatus used to supply the bus cable must be limited to the range 14Vdc to 17.5Vdc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50µA for each connected device. Separately powered equipment needs galvanic isolation to ensure the intrinsically safety Fieldbus circuit remains passive.</p> <p>The cable used to interconnect the devices needs to comply with the following parameters:                  Loop resistance R': 15....150Ω/km                  Inductance per unit length L':0.4....1mH/km                  Capacitance per unit length C': 80....200nF/km                  C' = C' line/line+0.5 C' line/screen, if both lines are floating                  or                  C' = C' line/line + C'line/screen, if the screen is connected to one line.                  Length of spur cable: max. 30m                  Length of trunk cable: max. 1km                  Length of splice: max = 1m                  Terminators                  At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable:                  R= 90...100Ω                  C = 0....2.2µF</p> <p><b>System evaluation</b>                  The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to nonincendive reasons. Furthermore, if the above rules are respected, the inductance and the capacitance of the cable need not be considered and will not impair the intrinsic safety of the installation.</p> <p><b>Notes.</b>                  1. The FNICO concept allows the interconnection of FM Approved nonincendive devices with FNICO parameters not specifically examined in combination as a system when:                  Uo or Voc or Vt ≤ Vmax.</p> <p style="text-align: center;">For Canadian installations the FNICO concept allows the interconnection of CFM or CSA Approved nonincendive devices with FNICO parameters not specifically examined in combination as a system when:                  Uo or Voc or Vt ≤ Vmax.</p>									
Title						Drawn	Checked	Scale	
FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators						RC		NTS	
						Drawing No.		CI410-13	
						Sheet 4			

## APPENDIX 3 IECEX Certification

### A3.0 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)

### A3.1 IECEx Certificate of Conformity

#### For use in an explosive gas atmospheres

The BA414DF-F Fieldbus Indicator has been issued with an IECEx Certificate of Conformity number IECEx ITS 06.0012 which specifies the following certification codes and marking:

Ex ia IIC T4 Ga  
FISCO Field Device Ex ia IIC T4  
Ta = -40°C to 70 °C

When connected to a certified IECEx system the BA414DF-F may be installed in:

- |        |   |
|--------|---|
| Zone 0 | explosive gas air mixture continuously present.   |
| Zone 1 | explosive gas air mixture likely to occur in normal operation.                                  |
| 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 -40 and +70°C.

#### A3.1.1 Installation

##### In an explosive gas atmosphere

For installations in gas atmospheres the BA414DF-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.

### A3.2 IECEx Certificate of Conformity

#### Use in presence of combustible dusts

In addition to IECEx certification permitting installation in explosive gas atmospheres, the BA414DF-F is available with optional IECEx certification permitting use in the presence of combustible dusts.

The IECEx Certificate of Conformity specifies the following certification codes and marking:

Ex ia IIIC T4 T100°C Da IP66  
Ta = -20°C to 60 °C

If IECEx dust certification is required it must be requested when the BA414DF-F Fieldbus Indicator is purchased.

### WARNING

**Before installing a BA414DF-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.**

BA414DF Fieldbus Indicator	
 0359  II 1 GD	T100°C Tamb = -20°C to +60°C IP66 EEx ia IIC T4 ITS06ATEX25313
FISCO Field Device EEx ia IIC T4	
Ex ia IICT4 DIPA21 TA100°C IP66 Ta=-20°C to +60°C IECEx ITS 06.0012	
Year of manufacture shown within terminal compartment	
BEKA associates Hitchin England <a href="http://www.beka.co.uk">www.beka.co.uk</a>	

ATEX  
FISCO  
IECEX

When connected to a certified IECEx system the BA414DF-F may be installed in:

- |         |  |
|---------|--|
| Zone 20 | explosive atmosphere in the form of a cloud of combustible dust in air is continuously present, or for long periods or frequently.   |
| Zone 21 | explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur occasionally in normal operation.  |
| 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. |

### 3.2.1 Installation

#### In presence of combustible dusts

Installation should comply with IEC 61241-14 and the local code of practice. The allowable dust Minimum Ignition Temperatures are:

Dust cloud	150°C
Dust layer on BA414DF-F up to 5mm thick	175°C
Dust layer on BA414DF-F over 5mm thick.	Refer to IEC 61241 part 14

At an ambient temperature between -20 to +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.

### A3.3 Versions of the BA414DF-F

All versions of the BA414DF-F Fieldbus Indicator have IECEx certification. This includes:

#### ATEX version for use in gas atmospheres.

IECEx code Ex ia IIC T4 Ga  
FISCO Field Device Ex ia IIC T4  
Ta = -40°C to 70°C

#### ATEX version for use in gas and dust atmospheres.

IECEx code Ex ia IIC T4 Ga  
FISCO Field Device Ex ia IIC T4  
Ex ia IIIC T4 T100°C Da IP66  
Ta = -20°C to 60°C

#### Factory Mutual Approved version

IECEx code Ex ia IIC T4 Ga  
FISCO Field Device Ex ia IIC T4  
Ta = -40°C to 70°C