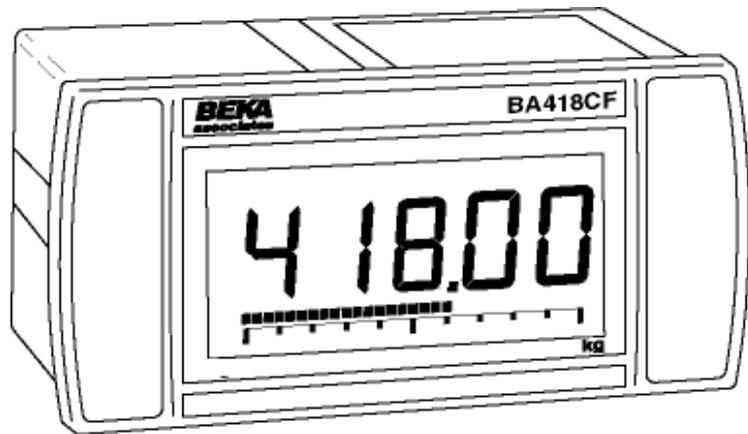


BA418CF
Intrinsically safe
Panel mounting
Fieldbus Indicator

Issue: 2



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Appendix 1

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

Appendix 2

IECEx certification

The BA418CF 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 BA418CF 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 site.

Housed in a robust 72 x 144 panel mounting DIN enclosure, the BA418CF fieldbus indicator has an IP66 front panel and is supplied with a gasket to seal the joint between the instrument and the panel.

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 atmospheres.

The BA418CF also has intrinsic safety and nonincendive FM and CFM Approval allowing installation in the USA and Canada – see Appendix 1.

For international applications the BA418CF fieldbus indicator has IECEx intrinsic safety approval – see Appendix 2.

1.1 Documentation

This instruction manual describes ATEX system design and installation of the BA418CF 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

System design information for FM, CFM and IECEx is shown in separate appendices to this manual.

2. INTRINSIC SAFETY CERTIFICATION

2.1 ATEX certificate

The BA418CF 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 2, gas atmospheres, EEx ia IIC T4. 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.

2.2 Zones, gas groups and T rating

The BA418CF has been issued with EC Type Examination certificate ITS06ATEX25314 confirming that it complies with the requirements for Group II Category 2G EEx ia IIC T4 (Tamb –40 to 70°C) specified in the ATEX Directive. When connected to a suitable certified system the BA418CF may be installed in:

- | | |
|--------|---|
| 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 Fieldbus Indicator is –20 to +70°C

This allows the BA418CF to be used with most common industrial gases.

2.3 Fieldbus connection

The BA418CF 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:

	FISCO	Entity
Ui	= 17.5V dc	22.0V dc
Ii	= 380mA dc	250mA dc
Pi	= 5.32W	1.2W

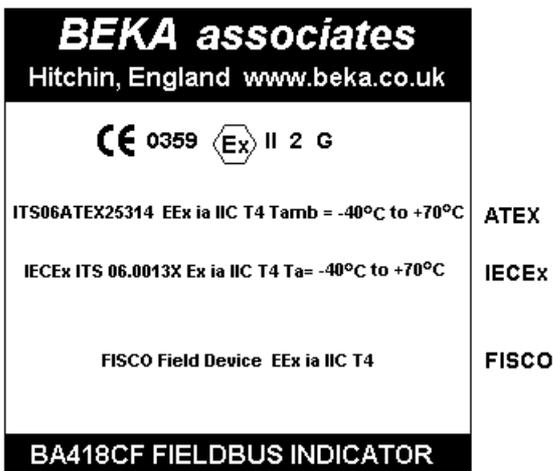
The maximum equivalent capacitance and inductance at terminals 1 & 2 is:

Ci	= 0
Li	= 8µH

2.4 Certification Label Information

The certification information label is fitted to the top outer surface of the enclosure. It shows details of the ATEX certification and a statement that the instrument is a FISCO Field Device, plus BEKA associates name and location. IECEx approval information is also included. The label may also contain non-European certification information. The instrument serial number and year of manufacture are shown on the rear panel.

The instrument serial number is shown on the rear of the instrument adjacent to the terminals.



3. SYSTEM DESIGN FOR HAZARDOUS AREAS

3.1 FISCO Systems

The BA418CF may be connected to any ATEX certified FISCO 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 FISCO requirements, the power supply, terminators, field devices and the interconnecting cables must conform with IEC60079 part 27.

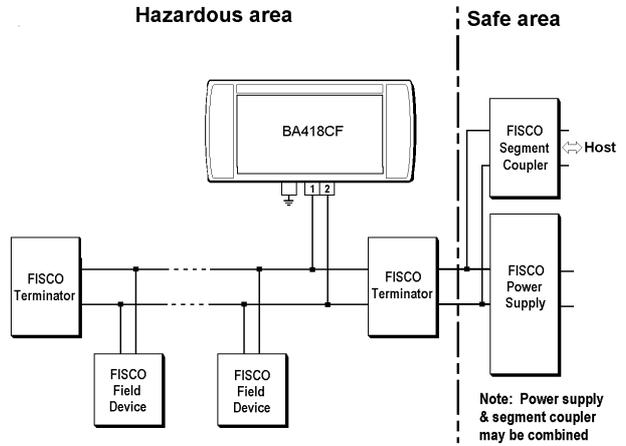


Fig 1 FISCO fieldbus system

3.2 Non-FISCO Systems

For non-FISCO applications the BA418CF Fieldbus Indicator has a higher voltage entity intrinsic safety input parameter allowing connection to a wide range of fieldbus segments.

The BA418CF 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:

Uo	= 22V dc
Io	= 250mA dc
Po	= 1.2W

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

Note: The equivalent capacitance Ci of the BA418CF Fieldbus Indicator is zero and the equivalent inductance is insignificant. Therefore these BA414DF parameters do not need to be considered.

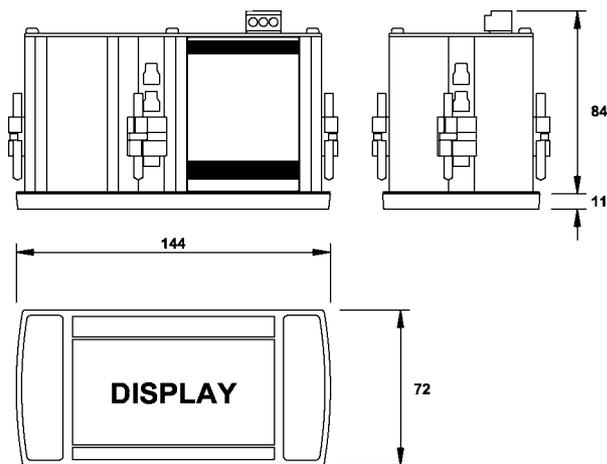
4. INSTALLATION

4.1 Location

The BA418CF is housed in a robust aluminium enclosure with a toughened glass window mounted in a Noryl bezel. The front of the instrument provides IP66 protection and a gasket seals the joint between the instrument enclosure and the panel. The instrument may be installed in any panel providing the environmental limits shown in the specification are not exceeded.

Fig 2 shows the overall dimensions of the BA418CF and the panel cut-out. To achieve an IP66 seal between the instrument enclosure and the panel, the smaller cut-out must be used and the instrument secured with four panel mounting clips.

The BA418CF liquid crystal display has maximum contrast when viewed from directly ahead and slightly below the centre line of the instrument.



Cut-out Dimensions

DIN 43 700

138.0 +1.0/-0.0 x 68.0 +0.7/-0.0

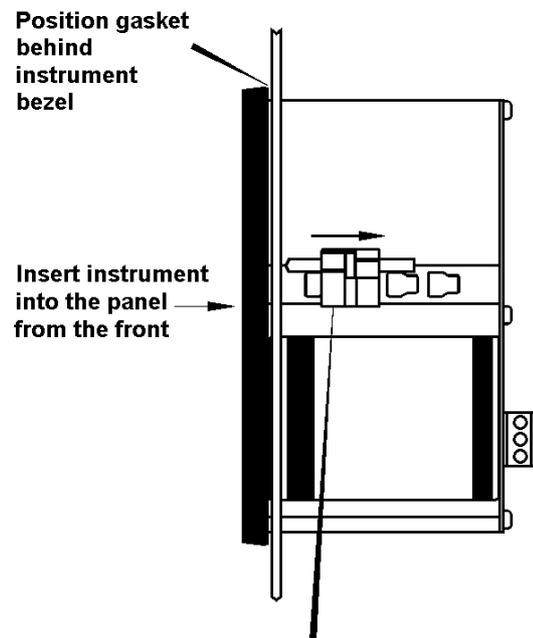
**To achieve an IP66 seal
between instrument enclosure
and panel**

136.0 +0.5/-0.0 x 66.2 +0.5/0.0

Fig 2 BA418CF dimensions

4.2 Installation Procedure

- Insert the BA418CF into the instrument panel cut-out from the front of the panel.
- Fix panel mounting clips to opposite sides of the instrument and tighten until the instrument is secure. Four clips are required to achieve an IP66 seal between the instrument enclosure and the panel.
- Connect the panel wiring to the rear terminal block as shown in Fig 3. To simplify installation, the terminals are removable so that panel wiring can be completed before the instrument is installed.



Slide panel mounting clip into the slotted rail on the side of the enclosure. Four clips are required to achieve an IP66 seal between instrument and panel.

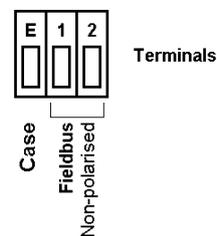


Fig 3 Installation and terminal connections

4.3 EMC

The BA418CF 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.

5. MAINTENANCE

5.1 Fault finding during commissioning

If a BA418CF 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 BA418CF 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 BA418CF 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 marking

BA418CF 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 a scale for the horizontal bargraph.

6.2 Tag number

The BA418CF can be supplied with a thermally printed tag number on the rear panel adjacent to the terminals.

6.3 Fieldbus Interface Guide

The *FOUNDATION Fieldbus Interface Guide for Fieldbus Displays & Fieldbus Indicators* contains commissioning information for the BA418CF. A copy may be requested from the BEKA sales office or from the BEKA web site at www.beka.co.uk

7. INDEX

Subject	Section	Subject	Section
ATEX Directive	2.1	Notified Body	1; 2.1
Codes	2.2		
Certification		Servicing	5.3
ATEX	2.1	Scale marking	6.1
CFM Canada	1.0; Appendix 1	Tag number	6.2
EC-Type Examination	2.1	T rating	2.2
FM USA	Appendix 1	Terminal numbers	Appendices 1 & 2. Fig 3
IECEX	Appendix 2		
Label ATEX	2.4	Units of measurement	6.1
Decimal Points	5.1	Zones	2.2
Divisions	Appendix 1		
Documentation	1.1		Appendices 1 & 2.
EMC	4.3		
Fault finding			
During commissioning	5.1		
After commissioning	5.2		
Fieldbus			
Connection	2.3; Fig 3		
Foundation	1; 3		
Guide	1.1; 6.3		
Firmware version number	5.1		
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Installation	4.		
Intrinsic safety	2.0; Appendices 1 & 2.		
Location	4.1 Appendices 1 & 2.		
Maintenance	5.		
Routine	5.4		

APPENDIX 1

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

A1.0 Factory Mutual Approval

For installations in the USA and Canada the BA418CF has FM and CFM intrinsic safety and nonincendive approvals, project identification 3027031 and 3027031C. Copies of the Certificates of Compliance are available from BEKA associates sales office and www.beka.co.uk.

A1.1 Intrinsic safety approval

The BA418CF is approved to FM Class 3610 intrinsic safety standard for use in 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 BA418CF has a T4 rating at ambient temperatures up to +70°C and may be used with the following gases:

Intrinsic Safety	
Division 1 or 2	
Class I	Group A & B Group C Group D
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 BA418CF 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 Approval also allows the BA418CF to be connected to non-FISCO systems using the entity concept – see section 3.2 of this manual.

A1.2 Nonincendive approval

The BA418CF is also Class 3611 nonincendive approved by Factory Mutual allowing it to be installed in Division 2 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 BA418CF fieldbus indicator to be connected to any appropriately certified FNICO compliant fieldbus segment.

The BA418CF has a T4 rating at ambient temperatures up to +70°C and may be used with the following gases:

Nonincendive	
Division 2	
Class I	Group A & B Group C Group D
Zone 2	
Class I	Group IIC Group IIB Group IIA

Appd.			
Ckd.			
Modification			
Date			
Iss.			
 <p>BEKA associates Hitchin England company confidential, copyright reserved.</p>			<p>FISCO Rules</p> <p>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.</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 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.</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</p> <p>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.</p> <p>Length of spur cable: max. 30m Length of trunk cable: max. 1km Length of splice: max = 1m</p> <p>Terminators At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable: R= 90....100Ω C = 02.2µF</p> <p>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.</p> <p>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: Uo or Voc or Vt ≤ Vmax, Io, Isc or It ≤ Imax, Po ≤ Pi. 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: Uo or Voc or Vt ≤ Vmax, Io, Isc or It ≤ Imax, Po ≤ Pi.</p>
Appd.			
Ckd.			
Modification	First release		
Date	28.03 2006		Title
Iss.	1		FM Approvals Control Drawing for Intrinsically Safe BA414DF & BA418CF Fieldbus Indicators
Drawn	RC	Checked	Scale NTS
Drawing No.	CI410-12		
Sheet	3		

Iss.		Date		Modification		Ckd.		Appd.							
1		28.03 2006		First release		.		.							
					<p>5. When installed in a hazardous (classified) location the BA414DF Fieldbus Indicator shall be fitted with cable glands / conduit hubs selected from the following table.</p> <p>Metallic glands and hubs must be grounded – see note 6.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Class</th> <th>Permitted gland or conduit hub</th> </tr> </thead> <tbody> <tr> <td>Class I</td> <td>Any metallic or plastic cable gland or conduit hub that provides the required environmental protection.</td> </tr> <tr> <td>Class II and III</td> <td> <p>Crouse – Hinds Myler hubs SSTG-1 STG-1 STAG-1 MHUB-1</p> <p>O-Z / Gedrey hub CHMG-50DT</p> <p>REMKE hub WH-1-G</p> <p>Killark Glands CMCXA050 MCR050 MCX050</p> </td> </tr> </tbody> </table> <p>6. In addition to the supplied bonding plate, when 3 metallic glands or conduit hubs are fitted to BA414DF Fieldbus Indicators, all metallic glands or conduit hubs must be connected together and grounded.</p> <p>7. CAUTION: The BA414DF and BA418CF Fieldbus Indicator enclosures are manufactured from conductive plastic per Article 250 of the National Electrical Code the enclosures shall be grounded using the 'E' terminal on the terminal block.</p> <p>8. The terminator on the Fieldbus must be FM Approved or for Canadian Installations CFM or CSA Approved</p> <p>9. The BA414DF and the BA418CF should be mounted where they are shielded from direct sunlight.</p>					Class	Permitted gland or conduit hub	Class I	Any metallic or plastic cable gland or conduit hub that provides the required environmental protection.	Class II and III	<p>Crouse – Hinds Myler hubs SSTG-1 STG-1 STAG-1 MHUB-1</p> <p>O-Z / Gedrey hub CHMG-50DT</p> <p>REMKE hub WH-1-G</p> <p>Killark Glands CMCXA050 MCR050 MCX050</p>
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Title					Cont.										
FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators					Drawn RC	Checked	Scale NTS								
					Drawing No. Sheet 3	C1410-13									

Iss.	1	Date	28.03 2006	Modification	First release	Ckd.		Appd.		
Iss.		Date		Modification		Ckd.		Appd.		
 <p>associates England company confidential, copyright reserved.</p>										
<p>FNICO Rules</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:</p>										
<p>Loop resistance R': 15....150Ω/km</p>										
<p>Inductance per unit length L':0.4....1mH/km</p>										
<p>Capacitance per unit length C': 80....200nF/km</p>										
<p>C' = C' line/line+0.5 C' line/screen, if both lines are floating</p>										
<p>or</p>										
<p>C' = C' line/line + C'line/screen, if the screen is connected to one line.</p>										
<p>Length of spur cable: max. 30m</p>										
<p>Length of trunk cable: max. 1km</p>										
<p>Length of splice: max = 1m</p>										
<p>Terminators</p>										
<p>At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable:</p>										
<p>R= 90...100Ω</p>										
<p>C = 0....2.2µF</p>										
<p>System evaluation</p>										
<p>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>Notes.</p>										
<p>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>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>										
Date	28.03 2006	Title	<p>FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators</p>				Drawn RC	Checked	Scale NTS	
Iss.	1						Drawing No.	<p style="font-size: 24pt; color: red;">CI410-13</p>		
							Sheet 4			

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

The BA418CF Fieldbus Indicator has been issued with an IECEx Certificate of Conformity number IECEx ITS 06.0013X which specifies the following certification codes and marking:

Ex ia IIC T4
Ta = -40°C to 70°C

CAUTION

The 'X' certificate number suffix warns users that, because of its aluminium enclosure, the BA418CF panel mounting indicator should not be installed in Zone 0.

When connected to an IECEx certified system the BA418CF may be installed in:

- 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 BA418C Fieldbus Indicator is -20 to +70°C

This allows the BA418CF to be used with most common industrial gases.

The IECEx safety parameters are identical to the ATEX parameters and, like the ATEX certification, confirm that the BA418CF complies with the FISCO Field Device requirements specified in IEC60079-27.

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

A2.2 Installation

The BA418CF 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, but the local code of practice should always be consulted.

Modifications

Issue 1: 17th Nov 06
First issue

Issue 2: 8th December 06
Details of FM & CFM Approval added.
See CRN 0966