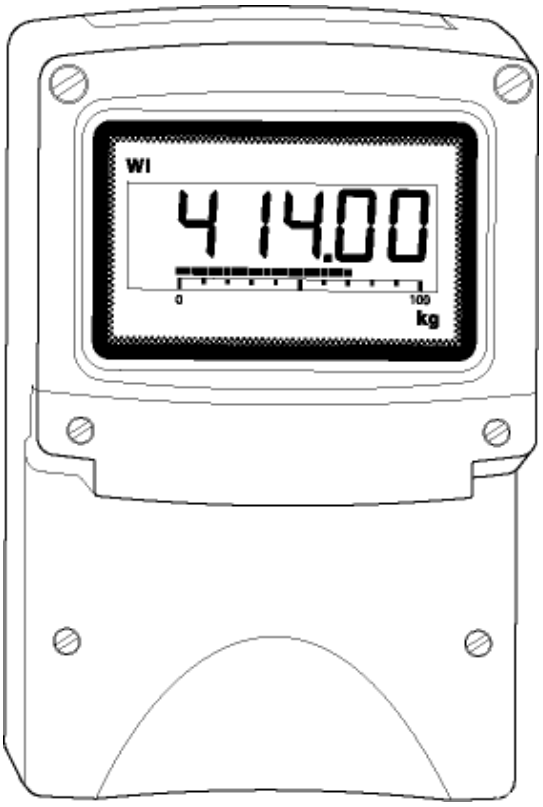
BA414DF-F
FOUNDATION™ fieldbus
Intrinsically safe
Field mounting
Fieldbus Indicator

Issue: 8



Issue: 8
16th December 2015

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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 has been certified intrinsically safe by European Notified Body Intertek Testing and Certification Ltd (ITS) 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

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 ITS06ATEX25313X by Notified Body Intertek Testing and Certification Ltd (ITS) confirming compliance with harmonised European standards. The BA414DF-F fieldbus indicator has Ex ia FISCO and entity parameter certification plus Ex ic entity parameter approval for use in Zone 2 with higher supply voltages.

The EC-Type Examination certificate has been used to confirm compliance with the European ATEX Directive 94/9/EC. The BA414DF-F carries 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 60079:14 *Electrical installation design, selection and erection.* 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 Ex ia Zones, gas groups and T rating

The BA414DF-F has Group II Category 1G Ex ia IIC T4 Ga Ta = –40 to 70°C FISCO and entity parameter approval. 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

In gases which may be used with equipment 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.

2.3 Ex ic Zones, gas groups and T rating

The BA414DF-F also has Group II Category 3G Ex ic IIC Gc T4 Ta = –40 to 70°C entity parameter approval with a higher Ui input voltage than the Ex ia approval. When connected to a suitable certified system the BA414DF-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

In gases which may be used with equipment 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

Ex ia and Ex ic entity certification plus FISCO certifiation allows the BA414DF-F to be installed in all Zones and to be used with most common industrial gases.

2.4 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) and have separate Ex ia and Ex ic entity input parameters as shown below:

		FISCO	Ex ia entity	Ex ic entity
Ui	=	17.5V	22.0V	32V
Ii	=	380mA	250mA	125mA
Pi	=	5.32W	1.2W	1W

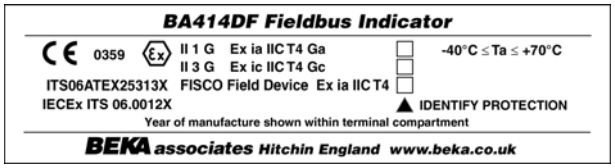
The maximum equivalent capacitance and inductance at terminals 1 & 2 is:

Ci = 0nF
Li = 8µH

2.5 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.



The label includes boxed areas which should be marked by the installer to show which of the three certifications is being used.

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 the FISCO requirements defined in EN 60079-11.

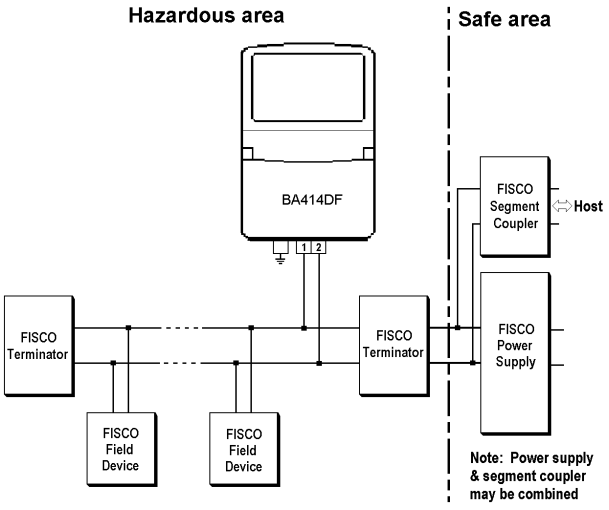


Fig 1 FISCO fieldbus system

3.2 Ex ia entity systems

The BA414DF-F Fieldbus Indicator has Ex ia certification with entity parameters for applications in Zone 0, 1 and 2.

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

The device powering the fieldbus segment is ATEX Ex ia certified for Zone 0, 1 or 2 applications, or Ex ib certified for application in Zone 1 or 2, or Ex ic certified for applications in Zone 2. The output parameters of the segment should be 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.

The equivalent capacitance Ci 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.

3.3 Ex ic entity systems

The BA414DF-F Fieldbus Indicator also has Ex ic certification with entity parameters for applications in Zone 2. The higher Ui voltage allows the indicator to be used with segment couplers powered by Ex e or Power-i fieldbus trunks.

When installed in Zone 2 the BA414DF-F Fieldbus Indicator may be connected to any intrinsically safe segment providing:

The device powering the fieldbus segment is ATEX Ex ia, ib or ic certified and has output parameters equal to or less than:

Uo = 32V dc
Io = 125mA dc
Po = 1W

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

The equivalent capacitance Ci 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 waste water 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.

Note: Although certified for safe use between –40 and +70°C, the guaranteed operating temperature range of the BA414DF-F Fieldbus Indicator is –20 to +70°C.

4.2 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 6.3

c. Remove the temporary hole plug and install a cable gland or conduit entry with required ingress protection. If more than one entry is required, replace one or both IP66 stopping plugs with a cable gland or conduit entry having the required ingress protection.

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.

CAUTION installation in Zone 0

When installed in a Zone 0 potentially explosive atmosphere requiring EPL Ga apparatus, the instrument shall be installed such that even in the event of rare incidents, an ignition source due to impact or friction between the aluminium label and iron/steel is excluded.

No special conditions apply when the indicator is installed in Zone 1 or in Zone 2.

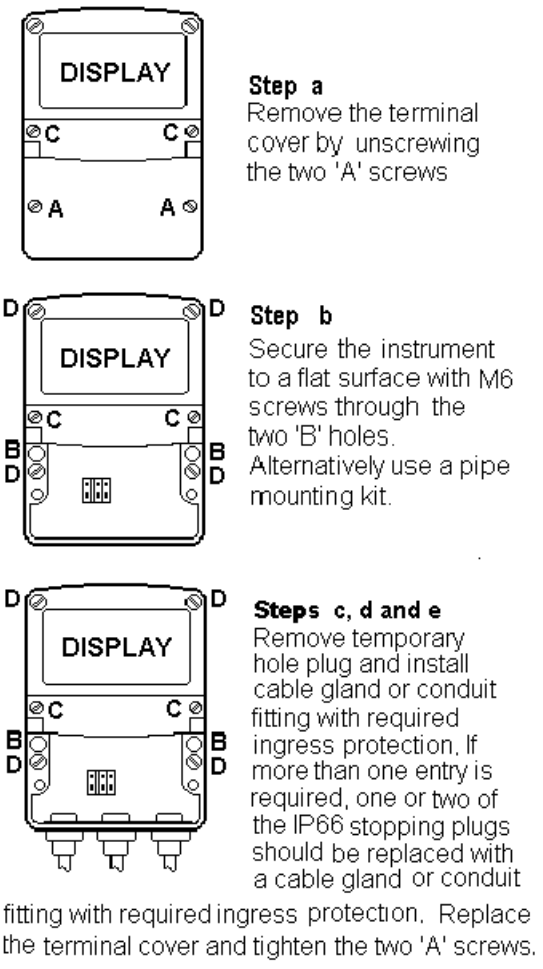


Fig 2 BA414DF-F installation procedure

4.3 EMC

The BA414DF-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.

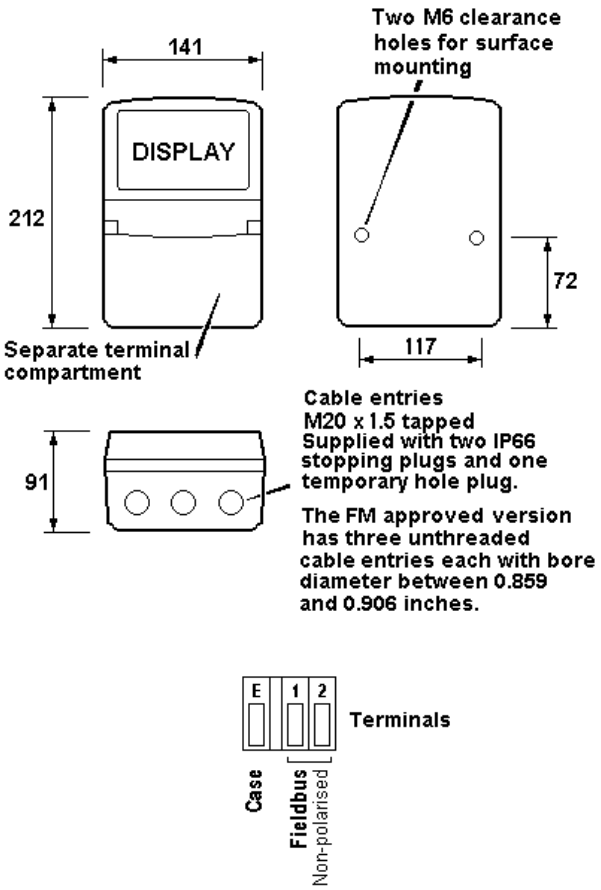


Fig 3 Dimensions and terminal connections

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.	Between terminals 1 & 2: FISCO 9 & 17.5V Ex ia 9 to 22V Ex ic 9 & 32V
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 engraved 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

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 Ex ia IIIC and Ex ic IIIC dust certification. If ATEX dust certification is required it must be requested when the BA414DF-F Fieldbus Indicator is purchased.

CAUTION

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 A1.3

A1.1 Ex ia IIIC entity systems
The BA414DF-F Fieldbus Indicator has Ex ia IIIC T100ºC Da IP66 certification. Installations should comply with EN 60079-14 *Electrical installation design, selection and erection.*

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 EN 60079:14

At an ambient temperature between -20 and +60°C
The Indicator may be connected to any intrinsically safe segment providing:

The device powering the fieldbus segment is ATEX Ex ia IIIC certified for Zone 20, 21 or 22 applications, or Ex ib IIIC certified for application in Zone 21 or 22. The output parameters should be 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.

The equivalent capacitance Ci 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.

A1.2 Ex ic IIIC entity systems
The BA414DF-F Fieldbus Indicator also has Ex ic IIIC certification for applications in Zone 22. The higher Ui voltage allows the indicator to be used with Power-i and intrinsically safe segment couplers powered from Ex e fieldbus trunks.

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°C
Dust layer on BA414DF-F up to 5mm thick	175°C
Dust layer on BA414DF-F over 5mm thick.	Refer to EN 60079:14

At an ambient temperature between -20 and +60°C
The BA414DF-F Fieldbus Indicator may be connected to any intrinsically safe segment providing:

The device powering the fieldbus segment is ATEX Ex ia IIIC, ib IIIC or ic IIIC certified and has output parameters equal to or less than:

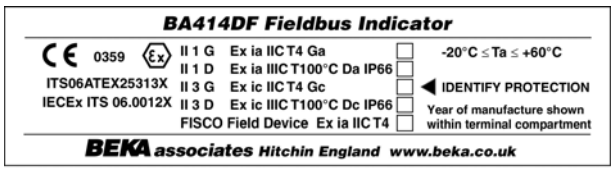
Uo = 32V dc
Io = 125mA dc
Po = 1W

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

The equivalent capacitance Ci 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.

A1.3 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.



The label includes boxed areas which should be marked by the installer to show which of the certifications is being used.

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

A1.4 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

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

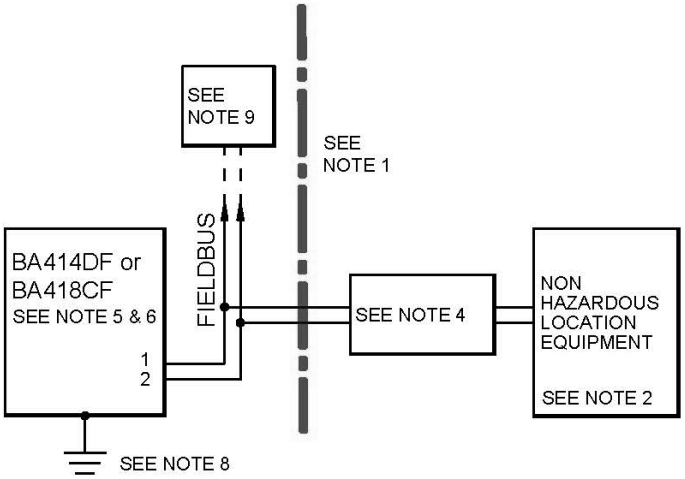
Iss.	Date	Modification	Ckd.	Appd.
1	28.03 2006	First release	.	.
2	15.09 2009	Provision for alternative instrument titles added.		

HAZARDOUS (CLASSIFIED) LOCATION

UNCLASSIFIED LOCATION

BA414DF LOCATIONS:
Class I, Division 1, Groups A, B,C, D
Class II, Division 1, Groups E, F & G
Class III
Class I, Zone 0, Group IIC

BA418CF LOCATIONS:
Class I, Division 1, Groups A, B,C, D
Class I, Zone 0, Group IIC



BA414DF and BA418CF

Terminals 1 & 2
These terminals comply with the Intrinsically Safe Concept (FISCO) defined by IEC 60079-27

Ui = 17.5V	Uo = 0
Ii = 380mA dc	Io = 0
Pi = 5.32W	Po = 0
Ci = 0	
Li = 8µH	

and have the following Entity Parameters

Ui = 22Vdc	Uo = 0
Ii = 250mA	Io = 0
Pi = 1.2W	Po = 0

Note:
No modification to be made without reference/approval from FM Approvals and BEKA Associates Design Department.

Notes:

1. 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.

2. 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.

3. 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

4. Fieldbus power supply with FISCO compliant output (IEC6009-27) or galvanic isolator with entity parameters complying with the following requirements:

Uo or Vt	equal to or less than	Ui
Io or It	equal to or less than	Ii
Po	equal to or less than	Pi
La	equal to or greater than	Lcable + Li
Ca	equal to or greater than	Ccable + Ci

cont:

Title
FM Approvals Control Drawing for Intrinsically Safe BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–12
Sheet 1 of 3

File: CI410–12s1.dwg 15.09.09

Iss.	Date	Modification	Ckd.	Appd.
1	28.03 2006	First release	.	.
2	15.09 2009	Provision for alternative instrument titles added.		

BEKA associates Hitchin England

5. To maintain IP66 protection between the BA418CF and the mounting panel:

   Four panel mounting clips should be used

   Minimum panel thickness should be — 2mm (0.08inches) Steel; 3mm (0.12inches) Aluminium

   Outside panel finish should be smooth, free from particle inclusions, runs or build-up around cut-out.

   Panel cut-out should be — 66.2 x 136.0mm -0.0 +0.5 (2.60 x 5.35 inches –0.00 +0.02)

   Edges of panel cut-out should be deburred and clean

   Each panel mounting clip should be tightened to between: — 20 and 22cNm (1.77 to 1.95 inLb)

6. When installed in a hazardous (classified) location the BA414DF Fieldbus Indicators shall be fitted with cable glands / conduit hubs selected from the following table

   Metallic glands and hubs must be grounded – see note 7.

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	**Crouse – Hinds Myler hubs** SSTG-1 STG-1 STAG-1 MHUB-1 **O-Z / Gedrey Hubs** CHMG-50DT **REMKE hub** WH-1-G **Killark Glands** CMCXAA050 MCR050 MCX050

7. In addition to the supplied bonding plate, when 3 metallic glands or conduit hubs are fitted to a BA414DF Fieldbus Indictors, all metalic glands or conduit hubs must be connected together and grounded.

8. **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.

9. The terminator on the Fieldbus must be FM or for Canadian installations CFM or CSA Approved.

10. The BA414DF and BA418CF should be mounted where they are shielded from direct sunlight.

11. The BA414DF may alternatively be titled:
    BA444DF Fieldbus Indicator
    BA444DL Fieldbus Listener
    BA424DF Fieldbus Set Point Station

cont:

Title: FM Approvals Control Drawing for Intrinsically Safe BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–12
Sheet 2

File: CI410–12s2.dwg 15.09.09

12. The BA418CF may alternatively be titled:
BA448CF Fieldbus Indicator
BA448CL Fieldbus Listener
BA428CF Fieldbus Set Point Station

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:
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.

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1	28.03 2006	First release	.	.
2	15.09 2009	Provision for alternative instrument titles added.		

BEKA associates Hitchin England

Title
FM Approvals Control Drawing for Intrinsically Safe BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–12
Sheet 3

File: CI410–12s3.dwg 15.09.09

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HAZARDOUS (CLASSIFIED) LOCATION

UNCLASSIFIED LOCATION

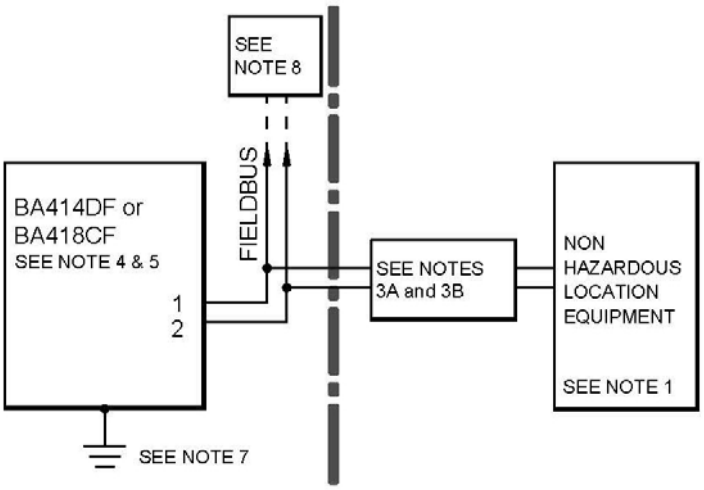
BA414DF LOCATIONS:
Class I, Division 2, Groups A, B,C, D
Class II, Division 2, Groups E, F & G
Class III
Class I, Zone 2, Groups IIC

BA418CF LOCATIONS:
Class I, Division 2, Groups A, B,C, D
Class I, Zone 2, Groups IIC

BA414DF and BA418CF
Maximum input and output parameters

Terminals 1 & 2
These terminals comply with The Fieldbus Nonincendive Cincept (FNICO) defined by IEC60079-27
(Typical current consumption 13mA)

Vmax = 32V dc
NIFW Vmax = 17.5V (FNICO)
Ci = 0
Li = 8µH



Note:
No modification to be made without reference/approval from FM Approvals and BEKA Associates Design Department.

Notes:

1. The unclassified location equipment connected to the associated nonincendive field wiring apparatus must not use or generate more than 250V rms or 250V dc.

2. Nonincendive field wiring installations shall be in accordance with the National Electrical Code ANSI/NFPA 70. The Nonincendive Field Wiring concept allows interconnection of Nonincendive Field Wiring Apparatus with Associated Nonincendive Field Wiring Apparatus using any of the wiring methods permitted for unclassified locations.
   Canadian installations shall be in accordance with the Canadian Electrical Code C22.2

3A. Linear power supply
   A linear fieldbus power supply shall be:
   FM Approved Associated Nonincendive Field Wiring Apparatus installed in the unclassified location with parameters complying with the following requirements:
   For Canadian Installations apparatus shall be CFM or CSA approved.

   OR

   FM Approved Nonincendive Field Wiring Apparatus installed in the classified location with parameters complying with the following requirements:
   For Canadian Installations apparatus shall be CFM or CSA approved.

Voc	equal to or less than	Vmax
La	equal to or greater than	Lcable + Li
Ca	equal to or greater than	Ccable

Cont.

Title	Drawn	Checked	Scale
FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators	RC		NTS
	Drawing No. Sheet 1 of 4	CI410–13	

File: CI410–13s1.dwg 15.09.09

3B. FNICO non-linear power supply

A FNICO non-linear fieldbus power supply shall be:

FM Approved Associated Nonincendive Field Wiring Apparatus installed in the unclassified location complying with the following table:

For Canadian Installations apparatus shall be CFM or CSA approved.

OR

FM Approved Nonincendive Field Wiring Apparatus installed in the classified location complying with the following table:

For Canadian Installations apparatus shall be CFM or CSA approved.

Voc	Maximum current for Groups AB [IIC]	Maximum current for Groups CD [IIB, IIA]
V	mA	mA
14	274	570
15	199	531
16	154	432
17.5	121	360

4. To maintain IP66 protection between the BA418CF and the mounting panel:

Four panel mounting clips should be used

Minimum panel thickness should be 2mm (0.08inches) Steel
3mm (0.12inches) Aluminium

Outside panel finish should be smooth, free from particle inclusions, runs or build-up around cut-out.

Panel cut-out should be 66.2 x 136.0mm -0.0 +0.5
(2.60 x 5.35 inches –0.00 +0.02)

Edges of panel cut-out should be deburred and clean

Each panel mounting clip should be tightened to between: 20 and 22cNm (1.77 to 1.95 inLb)

Cont.

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Title: FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–13
Sheet 2

File: CI410–13s2.dwg 15.09.09

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.

   Metallic glands and hubs must be grounded – see note 6.

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	**Crouse – Hinds Myler hubs** SSTG-1 STG-1 STAG-1 MHUB-1 **O-Z / Gedrey hub** CHMG-50DT **REMKE hub** WH-1-G **Killark Glands** CMCXAA050 MCR050 MCX050

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.
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.
8. The terminator on the Fieldbus must be FM Approved or for Canadian Installations CFM or CSA Approved
9. The BA414DF and the BA418CF should be mounted where they are shielded from direct sunlight.
10. The BA414DF may alternatively be titled:
    BA444DF Fieldbus Indicator
    BA444DL Fieldbus Listener
    BA424DF Fieldbus Set Point Station
11. The BA418CF may alternatively be titled:
    BA448CF Fieldbus Indicator
    BA448CL Fieldbus Listener
    BA428CF Fieldbus Set Point Station

Cont.

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Title: FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–13
Sheet 3

File: CI410–13s3.dwg 15.09.09

FNICO Rules

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.
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.
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 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.

Notes.
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.

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.

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Title: FM Approvals Control Drawing for Nonincendive BA414DF & BA418CF Fieldbus Indicators

Drawn	Checked	Scale
RC		NTS

Drawing No. CI410–13
Sheet 4

File: CI410–13s4.dwg 15.09.09

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

A3.1 IECEx Certificate of Conformity

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

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

For dust
Ex ia IIIC T100°C Da IP66
Ex ic IIIC T100°C Dc IP66
Ta = -20°C to 60°C

The specified IECEx gas and dust intrinsic safety parameters are identical to the ATEX safety parameters described in the main section and Appendix 1 of this manual.

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

A3.2 Installation

The IECEx and ATEX certificates specify identical safety parameters and installation requirements for both gas and dust approvals. The ATEX installation requirements specified in the main section and in Appendix 1 of this manual may therefore be used for IECEx installations, but the local code of practice should also be consulted.

CAUTION installation in Zone 0

When installed in a Zone 0 potentially explosive atmosphere requiring EPL Ga apparatus, the instrument shall be installed such that even in the event of rare incidents, an ignition source due to impact or friction between the aluminium label and iron/steel is excluded.

No special conditions apply when the indicator is installed in Zone 1 or in Zone 2.

A3.3 IECEx Dust certification

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

CAUTION

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.

A3.4 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.

ATEX version for use in gas and dust atmospheres has IECEx gas & dust certification.

Factory Mutual Approved version