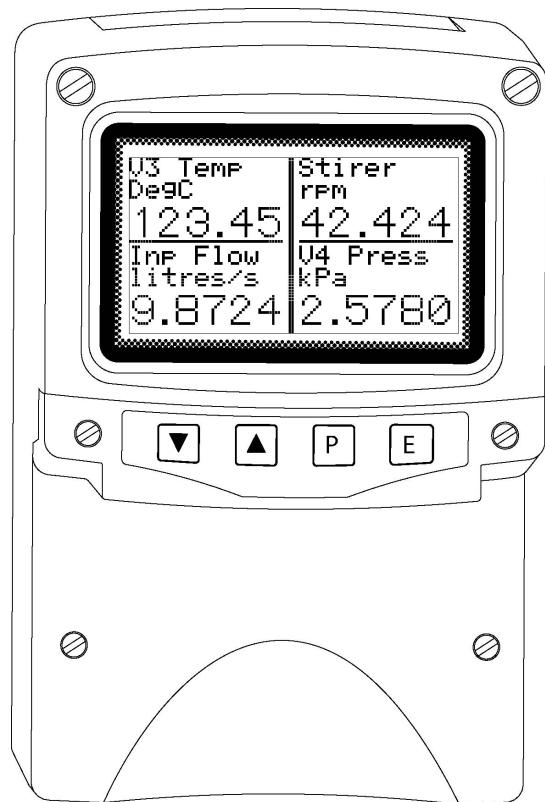


BA484DF-F
FOUNDATION™ fieldbus
Intrinsically safe
Field mounting display

Issue: 18

For version 3 instruments with
revision 4.03 firmware



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Appendix 1

ATEX & UKEX dust certification

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EU Declaration of Conformity

The BA484DF-F is CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU and the European EMC Directive 2014/30/EU.
 It is also UKCA marked to show compliance with UK statutory requirements Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations UKSI 2016:1107 (as amended) and with the Electromagnetic Compatibility Regulations UKSI 2016:1091 (as amended).

1. DESCRIPTION

The BA484DF-F display is an intrinsically safe instrument that can simultaneously display up to eight FOUNDATION™ fieldbus process variables, together with their units of measurement and tag information. The instrument is bus powered so no additional power supply is required.

The instrument's communication protocol is shown on a label inside the terminal cover. The '-F' order code suffix also indicates the protocol but is not shown on the instrument certification label. There is an alternative version of the fieldbus display, order code BA484DF-P for use on PROFIBUS PA networks.

This instruction manual describes revision 3 BA484DF-F Foundation fieldbus displays which were introduced in January 2019. Revision 3 displays have been verified in the FieldComm Labs as compliant with ITK 6.3.

Instruction manuals for the earlier revision 1 and 2 instruments may be downloaded from the superseded documentation section of the BEKA website.

Most of the BA484DF-F display parameters are configured on-site via the fieldbus. Screen format selection and alarm configuration is performed using an internal menu and the instrument's front panel push buttons.

Up to eight process variables can be displayed using the two Input Selector function blocks.

The required Device Description files, which may be downloaded from either the FieldComm or the BEKA websites, depend upon which BA484DF-F FOUNDATION™ fieldbus display revision is selected.

Eleven selectable standard display screen formats enable one, two, three, four or eight process variables, some with bargraphs to be displayed on one screen.

The BA484DF-F FOUNDATION™ fieldbus display can be supplied with six optional alarm outputs that may be linked to any of the displayed fieldbus variables. These alarm outputs are locally activated from the fieldbus variables and are configured via the instrument menu and push buttons. They cannot be controlled via the fieldbus.

The instrument has ATEX and UKEX intrinsic safety certification for use in Europe and the UK which is described in the main section of this manual.

For use in the USA the instrument has intrinsic safety and nonincendive FM Approval – see Appendix 2, plus IECEx intrinsic safety approval for international applications – see Appendix 3.

Housed in a robust IP66 glass reinforced polyester (GRP) enclosure with a toughened glass window, the BA484DF-F FOUNDATION™ fieldbus display is surface mounting, or may be pipe mounted using one of the accessory kits.

1.1 Documentation

This instruction manual describes system design, conditioning and installation of the BA484DF-F FOUNDATION™ fieldbus display. For detailed commissioning information please refer to the FOUNDATION™ fieldbus Interface Guide that can be downloaded from the BEKA website www.beka.co.uk

1.2 Version 4.03 firmware

Updated firmware was released in January 2019 which includes the following key features:

11 standard screens

Multiple bargraph limits

Individual input scaling

Two 4-input Input Selector function blocks:

Last variable parameter prevents display of unused inputs.

Fieldbus compliance verified to ITK 6.3

Option added to remove status text from single variable screens.

The instrument's firmware version can be established using the 'Unit Info' function in the main configuration menu – see section 6.7.8 of this manual.

2. OPERATION

Fig 1 shows a simplified block diagram of the BA484DF-F FOUNDATION™ fieldbus display. When the optional alarms are not fitted, the instrument only requires a two-wire connection to the fieldbus.

Parameters that cannot be configured via the fieldbus can be configured via the four front panel push buttons. Menus enable the required standard display screen format to be selected.

The optional alarms are locally activated from the fieldbus variables and can only be configured and the setpoints adjusted using the BA484DF-F push buttons. The alarms cannot be configured or controlled via the fieldbus.

Description Files for the BA484DF-F FOUNDATION™ fieldbus display may be downloaded from either the FieldComm or from the BEKA associates websites.

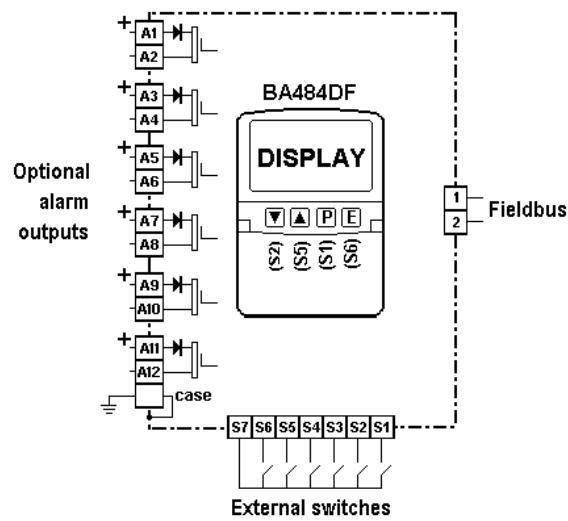


Fig 1 Simplified block diagram of BA484DF-F

2.1 Controls

The user can scroll through the display screens by operating the ▼ or ▲ push buttons. The number of screens available depends upon how the BA484DF-F display has been configured. If one fieldbus variable per screen has been configured, eight screens will be present; if four fieldbus variables per screen have been configured, only two screens will be available.

Irrespective of the number of fieldbus variables assigned to the BA484DF-F, the instrument always has provision for displaying eight variables. Unassigned inputs are displayed as zero with a bad data warning i.e. light digits on a dark background. The Last Input parameter allows unused inputs to be skipped when scrolling through the instrument display screens, see section 6.7.5.

If enabled, operating the **P** and **▲** push buttons simultaneously activates the Quick Access Menu, allowing the user to adjust the display contrast without providing access to any of the other configuration parameters. Additional security may be provided by an optional access code.

3. INTRINSIC SAFETY CERTIFICATION

3.1 ATEX & UKEX certification

The BA484DF-F has ATEX & UKEX certification for use in gas and dust atmospheres.

It carries the EU community CE mark and the UKCA mark. Subject to local codes of practice it may be installed in any of the European Economic Area (EEA) member countries and in the UK.

This manual describes ATEX & UKEX installations in explosive gas atmospheres which conform with EN 60079:14 *Electrical installation design, selection and erection*. When designing systems for installation the local Code of Practice should be consulted.

For use in the presence of combustible dust, please refer to Appendix 1

3.2 Zones, gas groups and T rating

The BA484DF-F ATEX & UKEX certifications confirm compliance with the requirements for Group II Category 1 G Ex ia IIC T4 (Tamb -40 to 60°C). When connected to a suitable certified system the BA484DF-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 +60°C.

Note: the guaranteed operating temperature range of the Fieldbus Display is -20 to +60°C

This allows the BA484DF-F FOUNDATION™ fieldbus display to be installed in all Zones and to be used with most common industrial gases.

3.3 Fieldbus connection

The BA484DF-F Fieldbus Display is powered and communicates via the fieldbus, which is connected to terminals 1 and 2. These terminals comply with the Fieldbus Intrinsically Safe Concept (FISCO) defined in EN 60079 Part 27, which simplifies intrinsic safety system design.

The BA484DF-F may also be connected to non-FISCO compliant fieldbus segments by using the entity concept to assess safety.

Terminals 1 and 2 of the BA484DF-F FOUNDATION™ fieldbus display are not polarised and have the following safety parameters:

$$\begin{aligned} U_i &= 17.5V \text{ dc} \\ I_i &= 380\text{mA dc} \\ P_i &= 5.32\text{W} \end{aligned}$$

For non-FISCO compliant segments, the safety parameters of the power supply or isolator powering the fieldbus segment must be equal to or less than these figures.

The maximum equivalent capacitance and inductance at terminals 1 & 2 of the BA484DF-F Fieldbus Display is:

$$\begin{aligned} C_i &= 1\text{nF} \\ L_i &= 8\mu\text{H} \end{aligned}$$

To determine cable parameters for non-FISCO compliant segments, the sum of Ci and Li of all the field devices should be subtracted from the maximum cable parameters permitted by the device powering the fieldbus segment.

3.4 External switches

For applications requiring operator inputs to be made by large industrial push buttons, terminals S1 to S7 facilitate external switches to be connected to the BA484DF-F. When external switches are connected, the BA484DF-F may be configured so that the front panel push buttons continue to function or are disabled.

Terminals S1 to S7 have the following combined output safety parameters:

$$\begin{aligned} U_o &= 14.7V \text{ dc} \\ I_o &= 146.7\text{mA dc} \\ P_o &= 0.58\text{W} \end{aligned}$$

The switches and associated wiring connected to the terminals must comply with the requirements for *simple apparatus*. i.e. the switch must be mechanically activated and have IP20 protection, and both the switch and the wiring must be capable of withstanding a 500V rms insulation test to earth for one minute. Most industrial push buttons and wiring satisfy these requirements.

The input safety parameters of terminals S1 to S7 are zero, therefore only mechanically activated switches or intrinsically safe relays may be connected.

The total maximum permitted cable parameters for all the cables connected to terminals S1 to S7 in a IIC hydrogen gas must be less than:

$$\begin{aligned} C_o &= 0.22\mu\text{F} \\ L_o &= 0.26\text{mH} \end{aligned}$$

Although these parameters are not restrictive, for reliable operation it is recommended that the cables between the fieldbus display and the external switch is less than 5m long.

3.5 Alarm outputs

Each of the six optional alarm outputs is a separate galvanically isolated, solid state, single pole switch. The EC-Type Examination Certificate specifies that under fault conditions the voltage, current and power at each switch output will not exceed those specified for *simple apparatus* in Clause 5.7 of EN 60079-11. This allows each of the BA484DF-F alarm outputs to be connected to any intrinsically safe circuit protected by a certified Zener barrier or galvanic isolator providing that the output parameters of each circuit are less than:

$$\begin{aligned} U_o &= 28V \text{ dc} \\ I_o &= 200\text{mA} \\ P_o &= 0.84\text{W} \end{aligned}$$

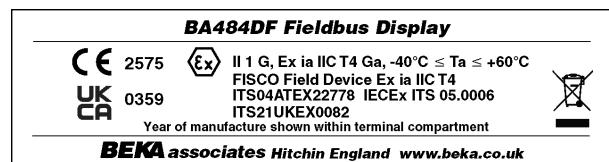
The maximum equivalent capacitance and inductance of each BA484DF-F alarm output is:

$$\begin{aligned} C_i &= 40\text{nF} \\ L_i &= 20\mu\text{H} \end{aligned}$$

To determine the maximum permissible cable parameters, C_i and L_i should be subtracted from the maximum cable capacitance and inductance specified for the circuit connected to the switch.

3.6 Certification Label Information

The certification label is fitted in a recess on the top outer surface of the enclosure. It shows the ATEX certification information, a statement that the instrument is a FISCO Field Device, plus BEKA associates name and location. Non-European certification information may also be included. The instrument serial number and year of manufacture are recorded on a separate label inside the terminal compartment.



4. SYSTEM DESIGN FOR HAZARDOUS AREAS

4.1 FISCO Systems

The BA484DF-F FOUNDATION™ fieldbus display may be connected to any FISCO compliant fieldbus segment providing the segment can provide the additional 25mA required to operate the Fieldbus Display.

Fig 2 shows a typical fieldbus segment. To comply with FISCO requirements, the power supply, terminators, field devices and the interconnecting cables must conform with the requirements specified in IEC 60079-11.

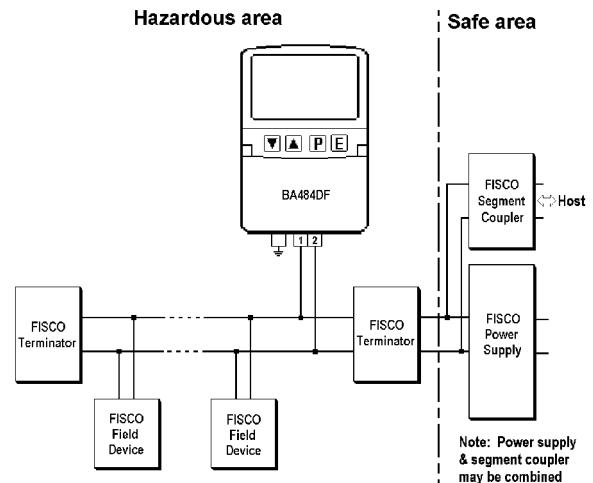


Fig 2 FISCO fieldbus system

4.2 Non-FISCO Systems

If the BA484DF-F Fieldbus Display is to be connected to a fieldbus segment that does not comply with FISCO requirements, the safety parameters of the power supply and the Fieldbus Display should be compared using the entity concept.

The maximum output safety parameters of the device powering the fieldbus segment must be equal to, or less than, the input safety parameters of terminals 1 & 2 of the BA484DF-F Fieldbus Display, namely:

$$\begin{aligned} U_i &= 17.5V \text{ dc} \\ I_i &= 380mA \text{ dc} \\ P_i &= 5.32W \end{aligned}$$

The maximum permitted cable parameters for the fieldbus segment must be reduced by the equivalent internal capacitance C_i and inductance L_i of the BA484DF-F. The BA484DF-F equivalent capacitance and inductance are very small and make little practical difference.

$$\begin{aligned} C_i &= 1nF \\ L_i &= 8\mu H \end{aligned}$$

4.3 External switches

For applications requiring operator inputs to be made by large industrial push buttons, terminals S1 to S7 allow up to six external switches to be connected to the Fieldbus Display. When external switches are connected, the front panel push buttons may be operated in parallel or disabled – see section 6.7.6

For installation in a hazardous area the switches and associated wiring must comply with the requirements for *simple apparatus*. i.e. the switch must be mechanically activated and have IP20 protection, and both the switch and the wiring must be capable of withstanding a 500V rms insulation test to earth for one minute. Most industrial push buttons and wiring satisfy these requirements.

Although the allowable cable parameters are large, it is recommended that the cables are less than 5m long.

If a safe area switch is to be connected to a Fieldbus Display located in a hazardous area, the switch contact must be transferred via a certified intrinsically safe relay or a galvanic isolator having zero output safety parameters as shown in Fig 3.

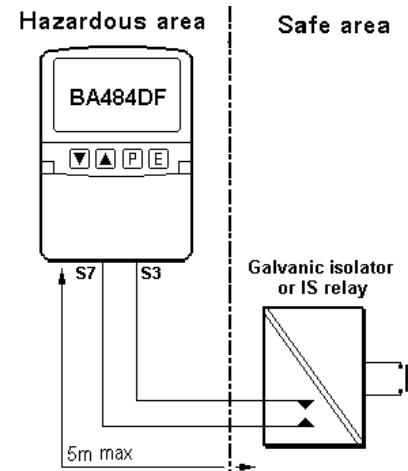


Fig 3 External push-button switch in safe area

4.4 Alarm outputs

Each alarm output is a galvanically isolated single pole solid state switch output as shown in Fig 4.

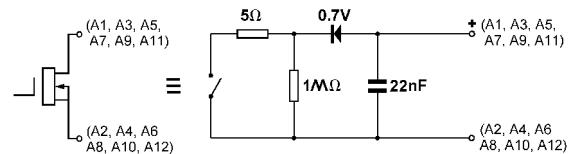


Fig 4 Equivalent circuit of each switch output

The outputs are polarised and current will only flow in one direction. Odd numbered terminals should be connected to the positive side of the supply.

$$\begin{aligned} R_{on} &= 5\Omega + 0.7V \\ R_{off} &= \text{greater than } 1M\Omega \end{aligned}$$

Note: Because of the series protection diode, some test meters may not detect a closed alarm output.

CAUTION
These Alarm Outputs should not be used for critical safety applications such as an emergency shut down system.

When the BA484DF-F is disconnected from the fieldbus, or the fieldbus is de-energised, all the alarm outputs will open irrespective of how they have been configured.

5. INSTALLATION

5.1 Location

The BA484DF-F FOUNDATION™ fieldbus display 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 off-shore and waste water treatment installations. Please consult BEKA associates if high vibration is anticipated.

The BA484DF-F enclosure is surface mounting. Accessory kits described in sections 8.2 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.

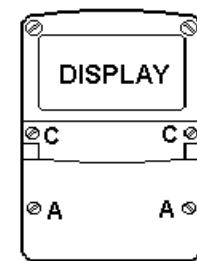
The BA484DF-F earth terminal is connected to the carbon loaded GRP case. If the case is not bolted to a post or structure connected to the plant's potential equalising network, the instrument's earth terminal should be connected to the potential equalising network as recommended in EN 60079-14.

The BA484DF-F enclosure is supplied with a bonding plate to ensure electrical continuity between the three conduit / cable entries.

5.2 Installation Procedure

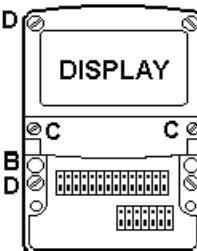
Fig 5 illustrates the instrument installation procedure.

- a. Remove the instrument terminal cover by unscrewing the two captive 'A' screws.
- b. Mount the instrument on a flat surface and secure with two M6 screws through the 'B' holes. Alternatively use one of the mounting kits described in section 8.2
- c. Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting. If more than one entry is required, one or both of the IP66 stopping plugs may be replaced with an appropriate IP rated cable gland or conduit fitting.
- d. Connect the field wiring to the terminals as shown in Fig 6.
- e. Replace the instrument terminal cover and evenly tighten the two 'A' screws.



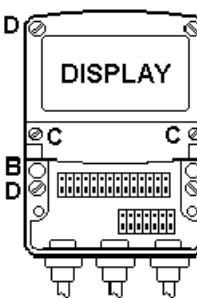
Step a

Remove the terminal cover by unscrewing the two 'A' screws



Step b

Secure the instrument to a flat surface with M6 screws through the two 'B' holes.
Alternatively use a pipe mounting kit.



Steps C and D

Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting. If more than one entry is required, one or both of the IP66 stopping plugs may be

replaced with an appropriate IP rated cable gland or conduit fitting. Finally replace the terminal cover and tighten the two 'A' screws.

Fig 5 BA484DF-F installation procedure

5.3 EMC

The BA484DF-F complies with the European EMC Directive and with the UK statutory requirements. For specified immunity, all wiring should be in screened twisted pairs with the screens earthed at one point in the safe area.

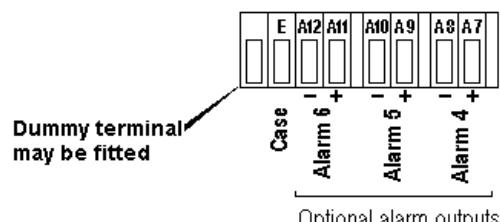
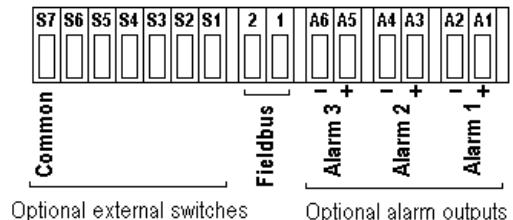
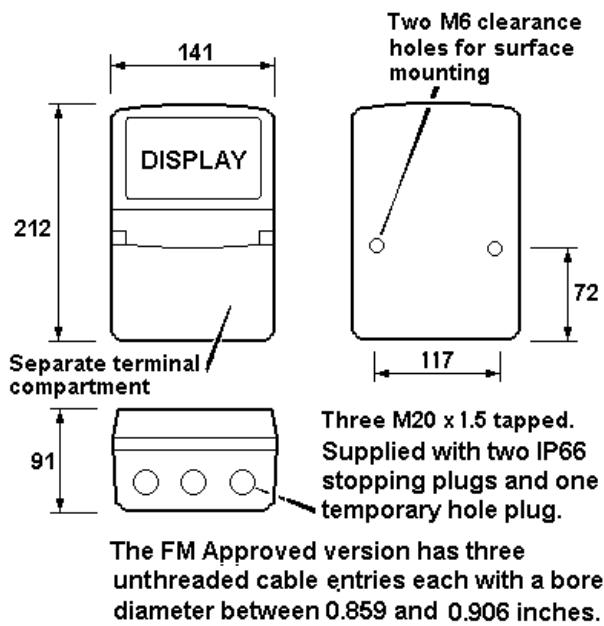


Fig 6 Dimensions and terminal connections

6. CONFIGURATION

6.1 Display transducer block

In addition to loading the BA484DF-F FOUNDATION™ fieldbus display Device Description files onto the system host, the eight inputs require individual configuration.

Each of the four inputs of the two Display Transducer Blocks has the following fieldbus configurable parameters:

Bargraph_Min	Defines bargraph lower limit
Bargraph_Max	Defines bargraph higher limit
Display_format	Defines the position of the displayed decimal point. Six options are available:
Auto	Max resolution with selected display format.
4 DP	4 digits on right of decimal point
3 DP	3 digits on right of decimal point
2 DP	2 digits on right of decimal point
1 DP	1 digit on right of decimal point
0 DP	No decimal point
Zero_offset	Adds a positive or negative offset to the fieldbus variable before it is displayed.
Gain_factor	Multiplies the fieldbus variable by a factor before it is displayed.
Display = (Gain factor x fieldbus variable) + Offset	
Descriptor	Displayed fieldbus variable identification. Up to 16 characters can be accepted but the number displayed varies depending upon the display screen selected.
Units	Displayed units of measurement. Up to 8 characters can be accepted, but the number displayed varies depending upon the display screen selected.
IN_value	Fieldbus value to be displayed
IN_value_status	Indicates validity of displayed fieldbus value.

6.2 Screen selection and alarm configuration

Screen selection and, if fitted, alarm configuration is performed via the four front panel push buttons.

All the display and alarm configuration functions are contained in an easy to use menu that is shown in Fig 7. Where necessary the sub-menus contain on-screen prompts to guide the user through each adjustment.

When navigating through the configuration menu, the push button(s) should be held until the required screen is displayed.

6.3 Default configuration

Unless otherwise requested at the time of ordering, BA484DF-F FOUNDATION™ fieldbus displays will be supplied configured as follows:

Keys	Both
Display brightness	100%
Display contrast	50%
Quick access menu	On
Quick access menu code	0000
Configuration menu access code.	0000
Screen	Single variable
Number Format	Auto
All alarms	Disabled
Alarm activation	Good data only
Alarm outputs	N/C
Bargraph	
Low	0
High	100
Input scaling	
Zero offset	0
Gain factor	1
Status text	On
Last input	8
Revision	Revision 3 (2 x IS function blocks)

6.4 Accessing the instrument configuration menu.

Throughout this manual push buttons are shown in *italics* e.g. **P** **E** **▼** **▲** and legends displayed by the instrument are shown within inverted commas e.g. 'Enter Access Code'. Operating the **P** and **E** push buttons simultaneously accesses the display configuration menu. If the BA484DF-F is not protected by an access code the main menu will be displayed. If an access code other than the default code 0000 has already been entered, the BA484DF-F will request that the access code be entered.

Using the **▼** or **▲** button set the first digit of the code which will be flashing. Pressing **P** will transfer control to the next digit, which should be adjusted in the same way. When all four digits have been set, pressing the **E** button will enter the access code. If the code is correct the main menu will be displayed, if the code is incorrect 'Invalid Code' will be displayed.

When entering an access code, timeout will occur and the instrument will automatically return to the operating mode ten seconds after a push button was last operated. In all other menus, timeout occurs after sixty seconds.

The structure of the display configuration menu is shown in Fig 7. Navigation is achieved by highlighting the required function using the **▼** and **▲** buttons and then operating the **P** button to display the selected function sub-menu, from which a further selection or adjustment may be made. Operating the **E** button moves the display back one level.

A flashing highlight indicates that an option or alphanumeric character may be selected using the **▼** and **▲** buttons and entered using the **E** button. If only one entry or adjustment can be made in a sub-menu, the display will automatically move up one menu level when the adjustment is entered. If more than one adjustment can be made in a sub-menu, the highlight may be moved to the second variable using the **▼** or **▲** button after the first setting has been entered. Operating the **P** button allows the second variable to be adjusted.

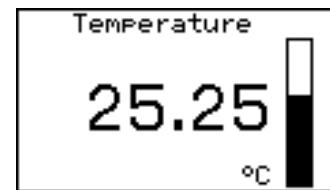
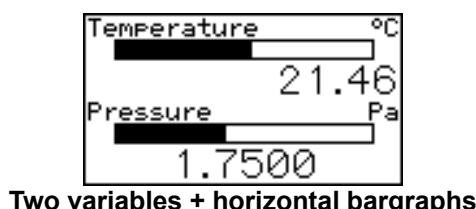
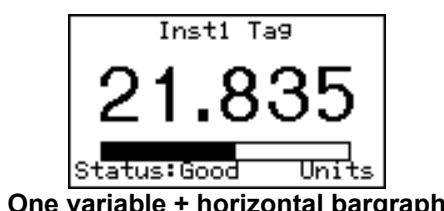
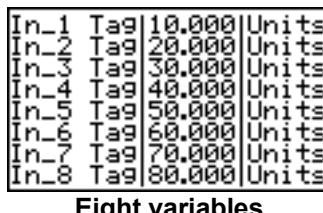
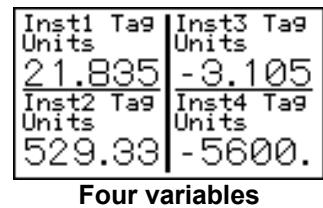
When multiple numeric or alpha characters are adjusted e.g. an alarm setpoint or a tag legend, the adjustment is made one digit at a time using the **▼** and **▲** buttons. After the first flashing digit has been set as required, the flashing highlight can be moved to the next digit by operating the **P** button. When all digits have been set, operating the **E** button will enter the setting.

Following completion of the instrument configuration, the **E** button should be operated to step the display back to the main menu. One more operation of the **E** button will then return the BA484DF-F to the operating mode.

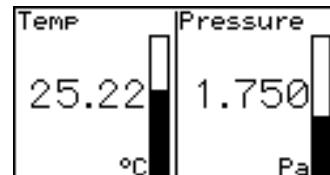
6.5 Screen selection

The BA484DF-F can display up to eight fieldbus variables. These are identified as IN_1 to IN_8. The fieldbus variable that each one represents is determined by the BA484DF-F configuration at the fieldbus system host – see the *FOUNDATION™ fieldbus Interface Guide*.

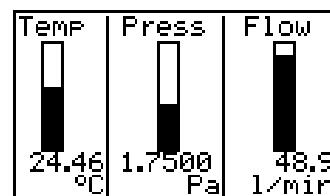
This sub-menu allows one of eleven standard display formats to be selected. The standard formats contain one, two, three, four or eight fieldbus variables some with bargraphs as shown below.



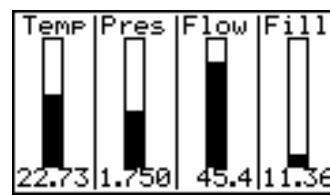
One variable + vertical bargraph



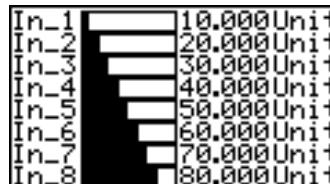
Two variables + vertical bargraphs



Three variables + vertical bargraphs



Four variables + vertical bargraphs



Eight variables + horizontal bargraphs

6.6 Alarm configuration

Note: Alarm menus are only included when the BA484DF-F is fitted with optional alarm outputs. Outputs are locally activated from the fieldbus variables and are configured via the instrument menus and push buttons. They cannot be controlled via the fieldbus.

Each of the six alarms may be linked to any one of the eight fieldbus variables displayed by the BA484DF-F. Each alarm output can be conditioned to function as a high or a low alarm, or as a combined high and low alarm. The output can be conditioned as normally open 'N/O', or normally closed 'N/C' in the non-alarm condition. Irrespective of settings alarm outputs will be open when the instrument is not powered from the fieldbus.

When an alarm is activated, the associated fieldbus variable display flashes, i.e. alternates between dark figures on a light background and light figures on a dark background.

There are eight alarm-conditioning sub-menus.

6.6.1 Alarm summary

Shows to which fieldbus variable each alarm is linked and how each alarm has been conditioned i.e. high, low, or combined high & low alarm with normally open or closed output. No adjustments can be made in this sub-menu.

6.6.2 Alarm activation

Fieldbus variables that have not been validated are displayed with dark characters on a light background, and some screen formats also contain a status indication. This sub-menu allows the alarm outputs to be conditioned so that they only operate with validated fieldbus data, or to operate irrespective of data validity.

6.6.3 Alarm output

There is a separate sub-menu for each of the six alarm outputs; these link the alarm to one of the displayed fieldbus variables and define the alarm function and the setpoints.

To link the alarm to a displayed variable, position the cursor over the 'IN_n' field, press **P** and using the **▼** or **▲** button select the required input source. Enter the selection by pressing the **E** button.

Each alarm output can be N/O or N/C in the non-alarm condition. To change the setting, position the highlight over the 'N/O' or 'N/C' field, press **P** and use the **▼** or **▲** button to toggle the setting. Enter the selection by pressing the **E** button.

Each alarm has three functions that can be independently enabled to condition the output as a low or high alarm, or as a combined low and high alarm, either with or without hysteresis.

The required functions can be individually enabled by positioning the highlight over the Enb/Dis (Enabled/Disabled) column, pressing **P** and toggling the function to the required state, then entering the selection by pressing the **E** button.

Alarm setpoints are entered digit by digit. Place the highlight over the setpoint to be adjusted and press **P**; the flashing digit to be adjusted may then be selected by again pressing **P**. When all the digits have been adjusted, operating the **E** button enters the value and moves the menu up one level.

The function of all alarms may be reviewed from the alarm summary menu - see 6.6.1.

6.7 Display configuration

6.7.1 Settings

The backlight brilliance and display contrast are adjustable from this sub-menu.

6.7.2 Quick Access

This sub-menu enables the Quick Access Menu which is described in sections 2.1 & 6.8. When enabled, an operator can adjust the display contrast and backlight brilliance without having access to any other conditioning menus.

6.7.3 Access Code

Defines a four digit alphanumeric code that must be entered to gain access to the Quick Access Menu. Alpha characters are case sensitive. Default code 0000 allows direct access without a code.

6.7.4 Status Text

The two single variable screens 1 and 4 will show the status of the FOUNDATION™ fieldbus variable as 'Good' or 'Bad' if the Status Text function is activated.

6.7.5 Last Input

This function allows the maximum number of FOUNDATION™ fieldbus variables to be defined so that unused inputs are skipped when the display is scrolled in the operating mode.

6.7.6 Keys

The function of the front panel push buttons may be transferred to the six optional external push buttons, with or without disabling the BA484DF-F front panel push buttons. The table below shows the function of the BA484DF-F front panel and the external push buttons for each of the four options that may be selected in the Keys sub-menu.

Selected option from Keys sub-menu	Push buttons	Function of push buttons		
		Screen scrolling	P+E access to configuration menu	P+Up access to quick access menu
Internal	BA484DF	Yes	Yes	Yes
	External	No	No	No
External	BA484DF	No	Yes	No
	External	Yes	Yes	Yes
Both	BA484DF	Yes	Yes	Yes
	External	Yes	Yes	Yes

For applications where the instrument is only displaying 1, 2, 3, 4 or 8 variables on a single screen, it is recommended that external buttons are selected but not fitted. This will disable the instrument front panel buttons, but still provide access to the configuration menu, which may be protected by a security code.

6.7.7 Code

Defines the four digit alphanumeric code that must be entered to gain access to the instrument configuration menus. Alpha characters are case sensitive. Default code 0000 allows direct access without a code.

6.7.8 Unit Info

Displays the instrument model number and the firmware version.

6.7.9 Defaults

This function enables the display and interface board factory defaults to be restored.

6.7.10 Display Defaults

This function restores the display defaults defined in section 6.3.

CAUTION

Existing settings cannot be recovered after this function has been used.

6.7.11 Interface Board Defaults

This function restores the Fieldbus Interface Board factory defaults.

CAUTION

Do not use this function when the BA484DF-F is connected to an operational fieldbus, as communication will be terminated.

6.8 Quick Access Menu

The Quick Access Menu allows an operator to adjust the backlight brilliance and the display contrast without having access to the other configuration parameters.

The quick access menu is accessed by operating the **P** and **▲** push buttons simultaneously. If the Quick Access Menu is not protected by an access code the contrast and brilliance controls will be displayed immediately. If an access code other than the default code 0000 has already been entered, the BA484DF-F will request that the access code be entered.

The display backlight brilliance is adjusted using the **▼** and **▲** push buttons. Operating the **P** push button will transfer control to the display contrast adjustment. When both are set as required, operating the **E** button will store both settings and return the instrument to the operating mode.

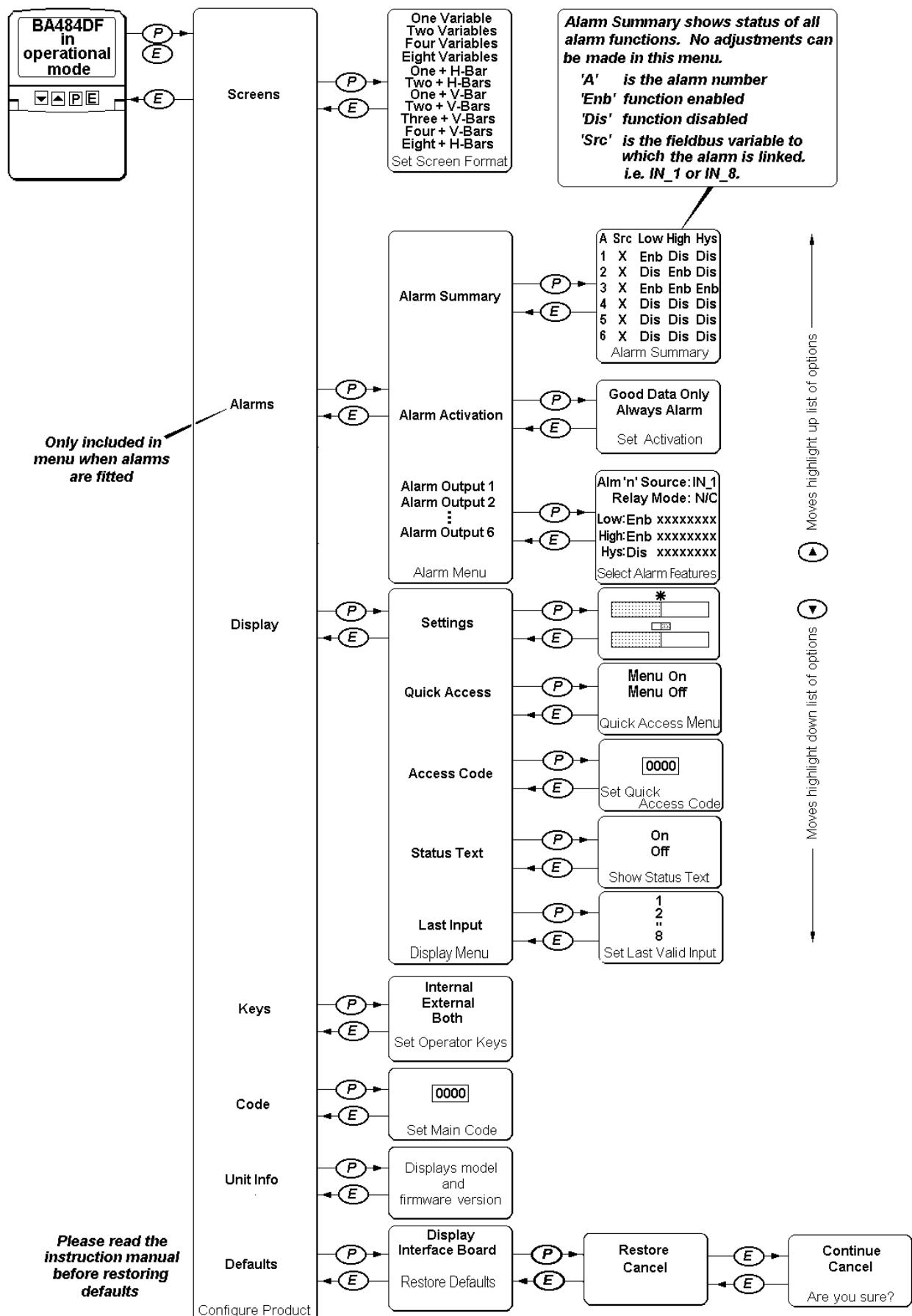


Fig 7 Structure of Configuration Menu

7. MAINTENANCE

7.1 Fault finding during commissioning

If a BA484DF-F FOUNDATION™ fieldbus display fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No Display	Fieldbus not powered	9 to 17.5V between terminals 1 & 2.
No variables	Fieldbus not configured	Instrument configuration at host
Wrong variable displayed	Wrong screen selected	Other screens by operating <i>Up</i> or <i>Down</i> button
Display shows '?????'	Display overrange	Number format
No backlight	Brilliance turned down	Setting in display menu
Low or excessive contrast	Incorrect contrast setting	Setting in display menu
Displayed variable is inverted i.e. light digits on dark background	Variable has 'bad' status	Configuration and instrument supplying variable
Displayed variable is flashing	Associated alarm has been activated	Setpoints
Bargraph on standard display format is shown dotted	Displayed fieldbus variable is outside bargraph limits or data is 'bad'	Bargraph limits

7.2 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 BA484DF-F fails after it has been functioning correctly, the table shown in section 7.1 may help to identify the cause of the failure.

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

7.3 Servicing

We recommend that faulty BA484DF-F FOUNDATION™ fieldbus displays are returned to BEKA associates or to our local agent for repair.

7.4 Routine maintenance

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

7.5 Guarantee

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

7.6 Customer comments

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

8. ACCESSORIES

8.1 Tag plate

The BA484DF-F FOUNDATION™ fieldbus display can be supplied with a blank or custom 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

8.2 Pipe mounting kits

Two pipe mounting kits are available for securing the BA484DF-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.

8.3 FOUNDATION™ fieldbus Interface Guide

The BEKA FOUNDATION™ fieldbus Interface Guide which may be downloaded from the BEKA web site at www.beka.co.uk contains conditioning information for all BEKA FOUNDATION™ fieldbus products.

APPENDIX 1

ATEX & UKEX dust certification

A1.0 ATEX and UKEX dust certification

In addition to ATEX & UKEX certification permitting installation in explosive gas atmospheres which is described in the main section of this instruction manual, the BA484DF-F FOUNDATION™ fieldbus display is available ATEX & UKEX certified for use in the presence of combustible dusts. If ATEX & UKEX dust certification is required it must be requested when the BA484DF-F FOUNDATION™ fieldbus display is purchased.

CAUTION

Before installing a BA484DF-F Fieldbus Display 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 BA484DF-F has been ATEX & UKEX certified as Group II, Category 2D Ex ia IIIC T125°C Db apparatus Tamb = -40 to 60°C. When installed as specified by IEC 60079-14, the Fieldbus Display may be installed in:

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:

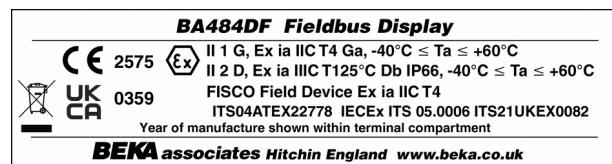
Dust cloud	188°C
Dust layer on BA484DF-F	200°C up to 5mm thick
Dust layer on BA484DF-F	Refer to over 5mm thick. EN 60079-14

At an ambient temperature between -40 and +60°C

Note: Operating temperature range of BA484DF-F is -20°C 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 the ATEX and UKEX dust certification information including the maximum surface temperature and ingress protection, plus the ATEX & UKEX gas certification information. Non European information may also be shown.



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

A1.3 Calibration & maintenance

The ATEX & UKEX dust certification relies on the BA484DF-F FOUNDATION™ fieldbus display enclosure being dust-tight. Therefore the control and terminal covers should only be removed when dust cannot enter the instrument enclosure. Before replacing the control and terminal covers ensure that the sealing gaskets are undamaged and are free from foreign bodies.

APPENDIX 2

FM approval for use in the USA

A2.0 Factory Mutual Approval

For installations in the USA, the BA484DF-F FOUNDATION™ fieldbus display and optional alarms have been approved intrinsically safe and nonincendive by FM Approvals, project identification 3022546. Copies of the Certificate of Compliance are available from BEKA associates.

The FM Approved version of the BA484DF-F Fieldbus Display 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 8 of Control Drawing CI480-17 and note 7 of Control Drawing CI480-18. The certification label on the FM Approved version includes ATEX gas certification information so that the Fieldbus Display may be used in systems covered by either authority.

A2.1 Intrinsic safety approval

The BA484DF-F is approved to the FM Class 3610 intrinsic safety standard for use in indoor and outdoor hazardous (classified) locations. Installations must comply with BEKA associates Control Drawing CI480-17, 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.

The BA484DF-F has a T4 rating at ambient temperatures up to +60°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 entity parameters are identical to the ATEX parameters and, like the ATEX certification, confirm that terminals 1 & 2 of the BA484DF-F comply with the requirements for a FISCO Field Device specified in IEC60079-27. The intrinsically safe circuits shown in Figs 2 and 3 of this manual may therefore be used for installations in the USA, providing the fieldbus power supply, terminators, Zener barriers and galvanic isolators are FM Approved and comply with BEKA associates Control Drawing CI480-17. The FM Approval also allows the BA484DF-F to be connected to non-FISCO systems using the entity concept – see section 4.2 of this manual.

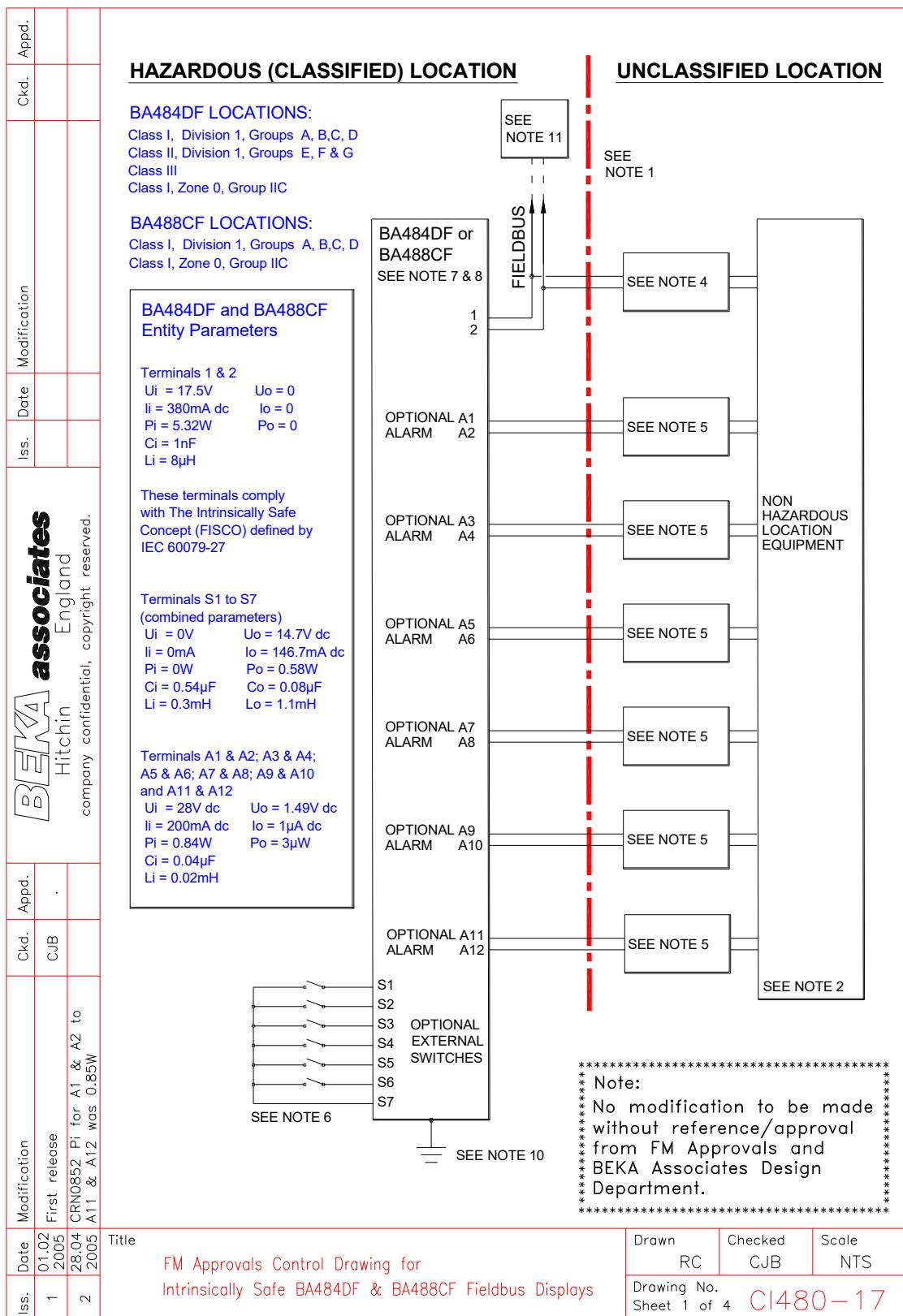
A2.2 Nonincendive approval

The BA484DF-F FOUNDATION™ fieldbus display is Class 3611 nonincendive approved by Factory Mutual allowing it to be installed in Division 2 indoor and outdoor hazardous (classified) locations without the need for Zener barriers or galvanic isolators. Installations must comply with the BEKA associates Control Drawing CI480-18, which is attached to this Appendix, and with the National Electrical Code ANSI/NFPA70.

The FM Nonincendive Approval also allows the instrument to be connected to any FNICO compliant fieldbus segment powered by FM Approved Associated Nonincendive Field Wiring Apparatus.

The BA484DF-F has a T4 rating at ambient temperatures up to +60°C and may be used with the following gases and dusts:

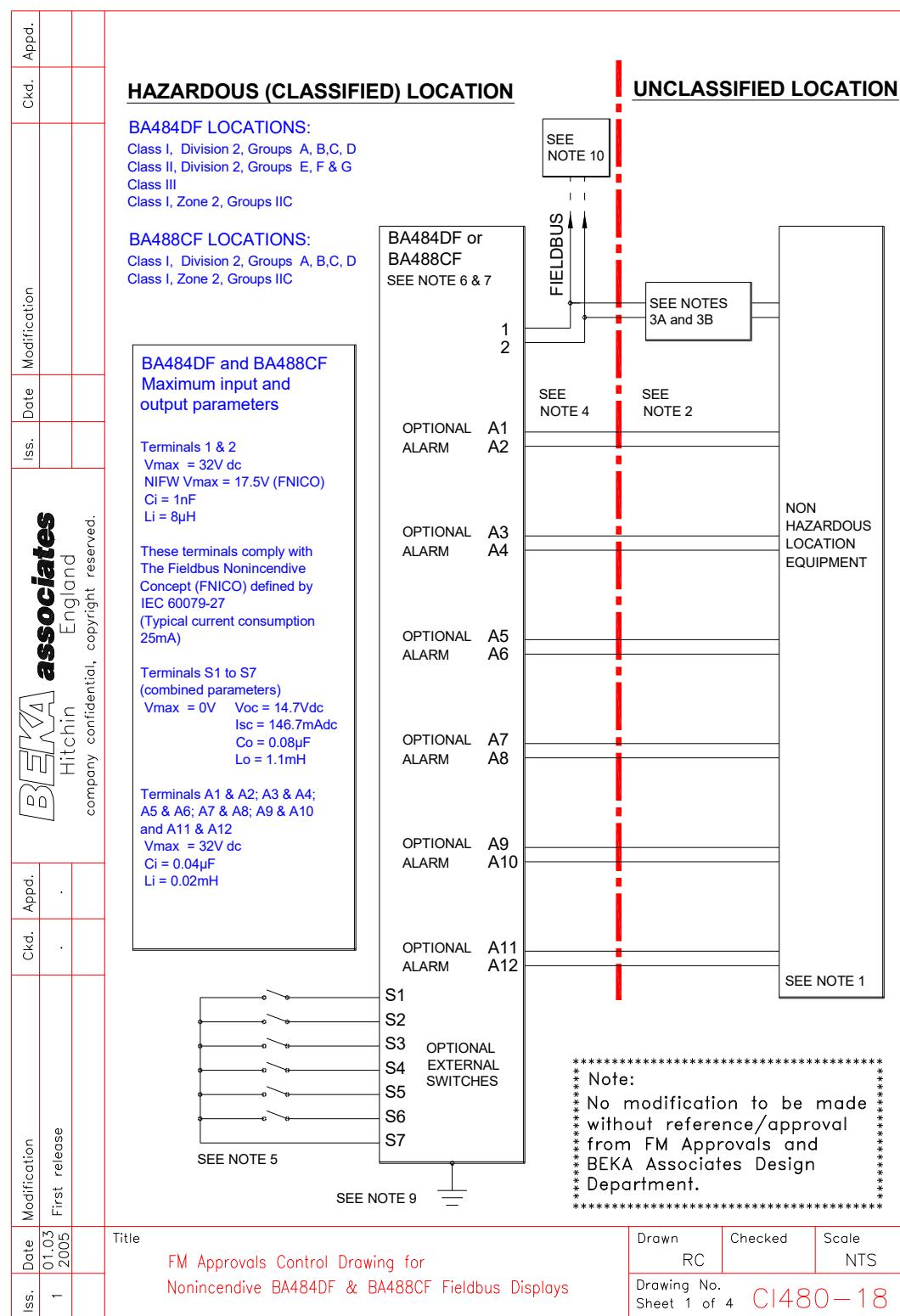
Nonincendive	
Division 2	
Class I	Group A & B
	Group C
	Group D
Class II	Groups E, F & G
Class III	
Zone 2	
Class I	Group IIC
	Group IIB
	Group IIA



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1	01/02 2005	First release	CJB	.	CJB	.	CJB	.																																																					
2	28/04 2005	CRN0852 See sheet 1																																																											
BETVA associates Hitchin England company confidential, copyright reserved.																																																													
<p>Notes:</p> <ol style="list-style-type: none"> 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. 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. 4. Fieldbus power supply with FISCO compliant output (IEC6009-27) or galvanic isolator with entity parameters complying with the following requirements: <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Uo or Vt</td> <td>equal to or less than</td> <td>Ui</td> </tr> <tr> <td>Io or It</td> <td>equal to or less than</td> <td>li</td> </tr> <tr> <td>Po</td> <td>equal to or less than</td> <td>Pi</td> </tr> <tr> <td>La</td> <td>equal to or greater than</td> <td>Lcable + Li</td> </tr> <tr> <td>Ca</td> <td>equal to or greater than</td> <td>Ccable + Ci</td> </tr> </table> 5. One single channel or one channel of a dual channel associated intrinsically safe barrier or galvanic isolator with entity parameters complying with the following requirements: <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Uo or Vt</td> <td>equal to or less than</td> <td>Ui</td> </tr> <tr> <td>Io or It</td> <td>equal to or less than</td> <td>li</td> </tr> <tr> <td>Po</td> <td>equal to or less than</td> <td>Pi</td> </tr> <tr> <td>La</td> <td>equal to or greater than</td> <td>Lcable + Li</td> </tr> <tr> <td>Ca</td> <td>equal to or greater than</td> <td>Ccable + Ci</td> </tr> </table> 6. Hazardous (classified) location equipment may be simple apparatus e.g. mechanically activated switches OR FM approved equipment with entity parameters complying with following requirements: <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Uo or Vt</td> <td>equal to or less than</td> <td>Ui</td> </tr> <tr> <td>Io or It</td> <td>equal to or less than</td> <td>li</td> </tr> <tr> <td>Po</td> <td>equal to or less than</td> <td>Pi</td> </tr> <tr> <td>La</td> <td>equal to or greater than</td> <td>Lcable + Li</td> </tr> <tr> <td>Ca</td> <td>equal to or greater than</td> <td>Ccable + Ci</td> </tr> </table> 7. To maintain IP66 protection between the BA488CF and the mounting panel: <p>Four panel mounting clips should be used</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Minimum panel thickness should be</td> <td>2mm (0.08inches) Steel</td> </tr> <tr> <td></td> <td>3mm (0.12inches) Aluminium</td> </tr> </table> <p>Outside panel finish should be smooth, free from particle inclusions, runs or build-up around cut-out.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Panel cut-out should be</td> <td>66.2 x 136.0mm -0.0 +0.5 (2.60 x 5.35 inches -0.00 +0.02)</td> </tr> </table> <p>Edges of panel cut-out should be deburred and clean</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>Each panel mounting clip should be tightened to between:</td> <td>20 and 22cNm (1.77 to 1.95 inLb)</td> </tr> </table> 									Uo or Vt	equal to or less than	Ui	Io or It	equal to or less than	li	Po	equal to or less than	Pi	La	equal to or greater than	Lcable + Li	Ca	equal to or greater than	Ccable + Ci	Uo or Vt	equal to or less than	Ui	Io or It	equal to or less than	li	Po	equal to or less than	Pi	La	equal to or greater than	Lcable + Li	Ca	equal to or greater than	Ccable + Ci	Uo or Vt	equal to or less than	Ui	Io or It	equal to or less than	li	Po	equal to or less than	Pi	La	equal to or greater than	Lcable + Li	Ca	equal to or greater than	Ccable + Ci	Minimum panel thickness should be	2mm (0.08inches) Steel		3mm (0.12inches) Aluminium	Panel cut-out should be	66.2 x 136.0mm -0.0 +0.5 (2.60 x 5.35 inches -0.00 +0.02)	Each panel mounting clip should be tightened to between:	20 and 22cNm (1.77 to 1.95 inLb)
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						Scale NTS
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<p>Notes:</p> <ol style="list-style-type: none"> 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. 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: OR FM Approved Nonincendive Field Wiring Apparatus installed in the classified location with parameters complying with the following requirements: <table> <tr> <td>Voc</td> <td>equal to or less than</td> <td>Vmax</td> </tr> <tr> <td>La</td> <td>equal to or greater than</td> <td>Lcable + Li</td> </tr> <tr> <td>Ca</td> <td>equal to or greater than</td> <td>Ccable + Ci</td> </tr> </table> 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: OR FM Approved Nonincendive Field Wiring Apparatus installed in the classified location complying with the following table: <table> <thead> <tr> <th>Voc</th> <th>Maximum current for Groups AB [IIC]</th> <th>Maximum current for Groups CD [IIB, IIA]</th> </tr> <tr> <th>V</th> <th>mA</th> <th>mA</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>274</td> <td>570</td> </tr> <tr> <td>15</td> <td>199</td> <td>531</td> </tr> <tr> <td>16</td> <td>154</td> <td>432</td> </tr> <tr> <td>17</td> <td>121</td> <td>360</td> </tr> <tr> <td>17.5</td> <td>112</td> <td>319</td> </tr> </tbody> </table> 4. Apparatus connected to the optional alarm contacts shall be FM Approved as Associated Nonincendive Field Wiring Apparatus and shall comply with the following requirements: <table> <tr> <td>Voc</td> <td>equal to or less than</td> <td>Vmax</td> </tr> <tr> <td>La</td> <td>equal to or greater than</td> <td>Lcable + Li</td> </tr> <tr> <td>Ca</td> <td>equal to or greater than</td> <td>Ccable + Ci</td> </tr> </table> 5. Terminals S1 to S7 shall be connected to simple apparatus or volt free contacts of FM Approved Nonincendive Field Wiring Apparatus or FM Approved Associated Nonincendive Field Wiring Apparatus installed using Division 2 wiring methods. 6. To maintain IP65 protection between the BA488CF 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) 	Voc	equal to or less than	Vmax	La	equal to or greater than	Lcable + Li	Ca	equal to or greater than	Ccable + Ci	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	121	360	17.5	112	319	Voc	equal to or less than	Vmax	La	equal to or greater than	Lcable + Li	Ca	equal to or greater than	Ccable + Ci	Cont.	
Voc	equal to or less than	Vmax																																							
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1	01/03/2005						
FNICO Rules							
<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 (V_{max}), the current (I_{max}) and the power (P_{max}) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_o, V_{oc} or V_t), the current (I_o, I_{sc} or I_t) and the power (P_o) which can be provided by the associated apparatus (supply unit). In addition the maximum unprotected residual capacitance (C_i) and inductance (L_i) 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 (U_o, V_{oc} or V_t) 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 $50\mu A$ 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 $R' = 15 \dots 150 \Omega/km$</p> <p>Inductance per unit length $L' = 0.4 \dots 1mH/km$</p> <p>Capacitance per unit length $C' = 80 \dots 200nF/km$</p> <p>$C' = C'_{line/line} + 0.5 C'_{line/screen}$, if both lines are floating 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>$R = 90 \dots 100 \Omega$</p> <p>$C = 0 \dots 2.2 \mu F$</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 intrinsic safety FNICO concept allows the interconnection of FM Approved nonincendive devices with FNICO parameters not specifically examined in combination as a system when: U_o or V_{oc} or $V_t \leq V_{max}$"</p>							
Title				Drawn	Checked	Scale	
FM Approvals Control Drawing for Nonincendive BA484DF & BA488CF Fieldbus Displays				RC		NTS	
Drawing No. Sheet 4 of 4				C1480-18			

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 BA484DF-F FOUNDATION™ fieldbus display has been issued with an IECEx Certificate of Conformity number IECEx ITS 05.0006 which specifies the following certification codes and marking:

For gas	Ex ia IIC T4 Ga Ta = -40°C to 60°C
For dust	Ex ia IIIC T125°C Db IP66 Ta = -40°C to 60°C

The specified intrinsic safety parameters are identical to the ATEX parameters and confirm that terminals 1 & 2 comply with the requirements for a FISCO Field Device specified in IEC 60079-11.

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

A3.2 Versions of the BA484DF-F

All versions of the BA484DF-F Fieldbus Display have IECEx certification. This includes:

ATEX version for use in gas atmospheres.

IECEx code Ex ia IIC T4 Ga
 Ta = -40°C to 60°C

ATEX version for use in gas and dust atmospheres.

IECEx code Ex ia IIC T4 Ga
 Ex ia IIIC T125°C Db IP66
 Ta = -40°C to 60°C

Factory Mutual Approved version

IECEx code Ex ia IIC T4 Ga
 Ta = -40°C to 60°C

A3.3 Installation

As the IECEx and ATEX certifications specify identical safety parameters and installation requirements for both are defined by IEC 60079-14, the ATEX installation requirements specified in sections 3.2 to 3.5 may therefore also be used for IECEx installations in gas or dust atmospheres. The local code of practice should also be consulted.

APPENDIX 4



This certificate is issued for electrical apparatus BA484DF-F and BA484DF-P

Description

BA484DF is a field mounting, intrinsically safe, eight variable Fieldbus Display. Suffix F denotes FOUNDATION™ fieldbus & suffix P PROFIBUS PA protocol.

Manufactured by

BEKA associates Ltd, Old Charlton Road, Hitchin, Herts. UK. SG5 2DA

Council Directives this equipment complies with:

2014/34/EU (ATEX Directive)

Relating to equipment and protective systems intended for use in potentially explosive atmospheres.

Provisions of the Directive fulfilled by the equipment:



Group II Category 1G Ex ia IIC T4 Ga Ta -40°C to +60°C

Group II Category 2D Ex ia IIIC T125°C Db Ta -40°C to +60°C

Notified Body for EU-Type Examination and production

INTERTEK ITALIA SPA 2575 Via Guido Miglioli, 2/A 20063 Cernusco sul Naviglio (MI) Italy

EU-Type Examination Certificate

ITS04ATEX22778 Issue 3 dated 18/03/2020.

Standards used:

EN IEC 60079-0:2018 and EN 60079-11:2012

2014/30/EU (EMC Directive)

Standards used:

EN 61326-1:2021

2011/65/EU (RoHS Directive) relating to hazardous substances in electronic and electrical equipment.

2015/863/EU additional substances added by amending Annex II to Directive 2011/65/EU as regards the list of restricted substances.

CE mark first affixed in 2004

Authorised Signatory:

Olivier Lebreton CEng MIET
Managing Director

Issue 15

17th August 2021

Issue 16

19th Jan 2023

Issue 17

24th May 2023