FM Approvals
Member of the FM Global Group

FM Approvals
1151 Boston Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: **781 762 4300** F: 781-762-9375 www.fmapprovals.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

BA484DFabc Field Mounted Fieldbus Display
IS / I, II, III / 1 / ABCDEFG / T4 Ta = 60°C – CI480-17; Entity; FISCO; Type 4X, IP66
I / 0 / AEx ia IIC T4 Ta = 60°C – CI480-17; Entity; FISCO; Type 4X, IP66
NI / I / 2 / ABCD / T4 Ta = 60°C – CI480-18; NIFW; FNICO; Type 4X, IP66
S/ II, III / 2 / EFG / T4 Ta = 60°C – CI480-18: NIFW;Type 4X, IP66
I / 2 / IIC / T4 Ta = 60°C – CI480-18; NIFW; FNICO; Type 4X, IP66

Intrinsic Safety Parameters
Input Parameters

Terminals	Concept	Ui (V)	Ii (mA)	Pi (W)	Ci (nF)	Li (µH)
1 & 2	FISCO	17.5	380	5.32	1	8
S1 to S7	Entity	0	0	0	540	300
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	Entity	28	200	0.84	40	20

Output Parameters

Terminals	Concept	Uo (V)	Io (mA)	Po (W)	Co (nF)	Lo (µH)
1 & 2	FISCO	0	0	0	-	-
S1 to S7	Entity	14.7	146.7	0.58	80	1100
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	Entity	1.49	0.0001	0.003	-	-

Nonincendive Field Wiring Parameters
Input Parameters

Terminals	Concept	Ui (V)	Ii (mA)	Pi (W)	Ci (nF)	Li (µH)
1 & 2	FNICO	17.5	-	-	1	8
1 & 2	NIFW	32	-	-	1	8

Terminals	Concept	Ui (V)	Ii (mA)	Pi (W)	Ci (nF)	Li (µH)
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	NIFW	32	-	-	40	20

Output Parameters

Terminals	Concept	Uo (V)	Io (mA)	Po (W)	Co (nF)	Lo (µH)
S1 to S7	NIFW	14.7	146.7	-	80	1100

a = Fieldbus or Profibus
b = Blank or alarm options
c = Parameter not affecting safety.

Special conditions of use
1. The BA484DF shall be protected from direct exposure to sunlight.

BA488CFabc Panel Mounted Fieldbus Display
IS / I / 1 / ABCD / T4 Ta = 60°C – CI480-17; Entity; FISCO; Type 4X*, IP66*
I / 0 / AEx ia IIC T4 Ta = 60°C – CI480-17; Entity; FISCO; Type 4X*, IP66*
NI / I / 2 / ABCD / T4 Ta = 60°C – CI480-18; NIFW; FNICO; Type 4X*, IP66*
I / 2 / IIC / T4 Ta = 60°C – CI480-18; NIFW; FNICO Type 4X*, IP66*
*front panel only
Intrinsic Safety Parameters
Input Parameters

Terminals	Concept	Ui (V)	Ii (mA)	Pi (W)	Ci (nF)	Li (µH)
1 & 2	FISCO	17.5	380	5.32	1	8
S1 to S7	Entity	0	0	0	540	300
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	Entity	28	200	0.84	40	20

Output Parameters

Terminals	Concept	Uo (V)	Io (mA)	Po (W)	Co (nF)	Lo (µH)
1 & 2	FISCO	0	0	0	-	-
S1 to S7	Entity	14.7	146.7	0.58	80	1100
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	Entity	1.49	0.0001	0.003	-	-

Nonincendive Field Wiring Parameters
Input Parameters

Terminals	Concept	Ui (V)	Ii (mA)	Pi (W)	Ci (nF)	Li (µH)
1 & 2	FNICO	17.5	-	-	1	8
1 & 2	NIFW	32	-	-	1	8
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	NIFW	32	-	-	40	20

Output Parameters

Terminals	Concept	Uo (V)	Io (mA)	Po (W)	Co (nF)	Lo (µH)
S1 to S7	NIFW	14.7	146.7	-	80	1100

a = Fieldbus or Profibus
b = Blank or alarm options
c = Parameter not affecting safety.

Special conditions of use
1. To maintain the IP66 rating the BA488CF shall be installed in accordance with the mounting conditions provided on drawing numbers CI480-17 and CI480-18.
2. The BA488CF shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application.
3. The BA488CF shall be protected from direct exposure to sunlight.

Equipment Ratings:

BA484DFabc Field Mounted Fieldbus Display
Intrinsically safe for Class I, II and III, Division 1, Groups A, B, C, D, E, F and G and Class I, Zone 0, Group IIC Hazardous (Classified) Locations when installed in accordance with the entity concept or the FISCO concept in accordance with Control Drawings CI480-17 and CI40-18; Nonincendive for Class I, Division 2, Groups A, B, C and D and Class I, Zone 2, Group IIC, Hazardous (Classified) Locations when installed in accordance with the nonincendive field wiring concept or the FNICO concept in accordance with Control Drawings CI480-17 and CI40-18; Suitable for Class II and III, Division 2, Groups E, F and G Hazardous (Classified) Locations when installed in accordance with the nonincendive field wiring concept in accordance with Control Drawings CI480-17 and CI40-18. Temperature class T4 at an ambient of 60°C. Enclosure Type 4X and IP66.

BA488CFabc Panel Mounted Fieldbus Display
Intrinsically safe for Class I, Division 1, Groups A, B, C and D and Class I, Zone 0, Group IIC Hazardous (Classified) Locations when installed in accordance with the entity concept or the FISCO concept in accordance with Control Drawings CI480-17 and CI40-18; Nonincendive for Class I, Division 2, Groups A, B, C and D and Class I, Zone 2, Group IIC, Hazardous (Classified) Locations when installed in accordance with the nonincendive field wiring concept or the FNICO concept in accordance with Control Drawings CI480-17 and CI40-18. Temperature class T4 at an ambient of 60°C. Front panel Type 4X and IP66.

FM Approved for:

BEKA associates
Hitchin, Hertfordshire SG5 2DA, United Kingdom

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This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

Class 3600	1998
Class 3610	2010
Class 3611	2004
Class 3810	2005
NEMA 250	1991
IEC 60529	1989

Original Project ID: 3022546 Approval Granted: March 30, 2005

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
050427	April 29, 2005		
101217	March 16, 2011		

FM Approvals LLC

Timothy J Adam
Technical Team Manager

March 16, 2011
Date

Iss.	Date	Modification	Ckd.	Appd.
1	01.02 2005	First release	CJB	
2	28.04 2005	CRN0852 Pi for A1 & A2 to A11 & A12 was 0.85W		

HAZARDOUS (CLASSIFIED) LOCATION

BA484DF 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

BA488CF LOCATIONS:
Class I, Division 1, Groups A, B,C, D
Class I, Zone 0, Group IIC

BA484DF and BA488CF Entity Parameters

Terminals 1 & 2

Ui = 17.5V	Uo = 0
Ii = 380mA dc	Io = 0
Pi = 5.32W	Po = 0
Ci = 1nF	
Li = 8µH	

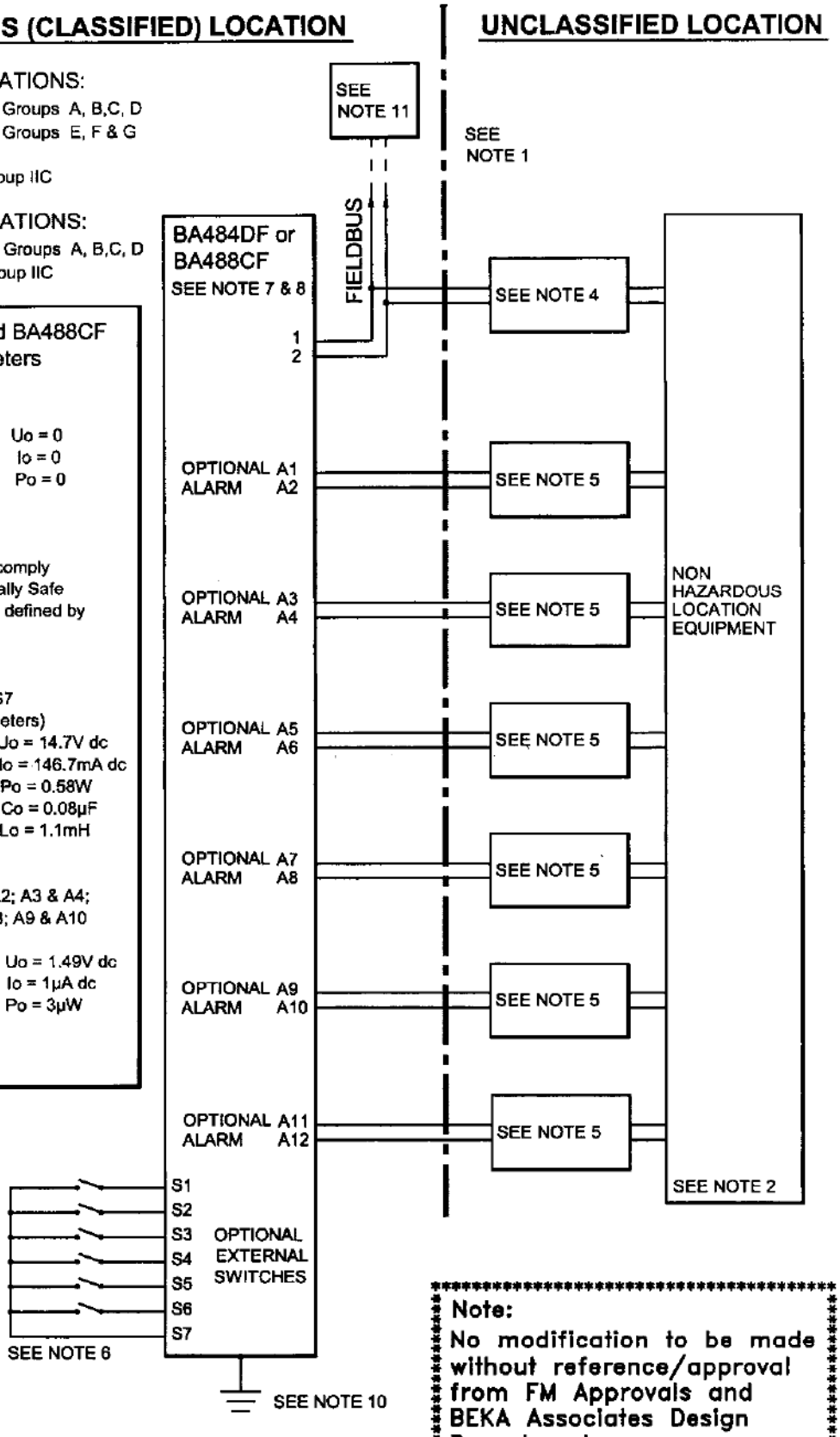
These terminals comply with The Intrinsically Safe Concept (FISCO) defined by IEC 60079-27

Terminals S1 to S7 (combined parameters)

Ui = 0V	Uo = 14.7V dc
Ii = 0mA	Io = 146.7mA dc
Pi = 0W	Po = 0.58W
Ci = 0.54µF	Co = 0.08µF
Li = 0.3mH	Lo = 1.1mH

Terminals A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10 and A11 & A12

Ui = 28V dc	Uo = 1.49V dc
Ii = 200mA dc	Io = 1µA dc
Pi = 0.84W	Po = 3µW
Ci = 0.04µF	
L_i = 0.02mH	



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

Title
FM Approvals Control Drawing for
Intrinsically Safe BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC	CJB	NTS

Drawing No. CI480–17
Sheet 1 of 4

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.

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:

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

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:

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

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:

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

7. To maintain IP66 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)

cont:

Iss.	Date	Modification	Ckd.	Appd.
1	01.02 2005	First release	CJB	
2	28.04 2005	CRN0852 See sheet 1		

Title: FM Approvals Control Drawing for Intrinsically Safe BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC	CJB	NTS

Drawing No. CI480–17
Sheet 2 of 4

8. When installed in a hazardous (classified) location the BA484DF Fieldbus Display shall be fitted with cable glands / conduit hubs selected from the following table

Metallic glands and hubs must be grounded – see note 9.

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

9. In addition to the supplied bonding plate, when 2 or 3 metallic glands or conduit hubs are fitted to a BA484DF Fieldbus Display, all metallic glands or conduit hubs must be connected together and grounded.

10. **CAUTION:** The BA484DF and BA488CF Fieldbus Display 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.

11. The terminator on the Fieldbus must be FM Approved.

12. The BA484DF should be mounted where it is shielded from direct sunlight.

Cont.

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2	28.04 2005	CRN0852 See sheet 1		

Title: FM Approvals Control Drawing for Intrinsically Safe BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC	CJB	NTS

Drawing No. CI480–17
Sheet 3 of 4

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."

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2	28.04 2005	CRN0852 See sheet 1		

Title
FM Approvals Control Drawing for
Intrinsically Safe BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC	CJB	NTS

Drawing No. CI480–17
Sheet 4 of 4

Iss.	Date	Modification	Ckd.	Appd.
1	01.03 2005	First release	.	.

HAZARDOUS (CLASSIFIED) LOCATION

BA484DF 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

BA488CF LOCATIONS:
Class I, Division 2, Groups A, B,C, D
Class I, Zone 2, Groups IIC

BA484DF and BA488CF Maximum input and output parameters

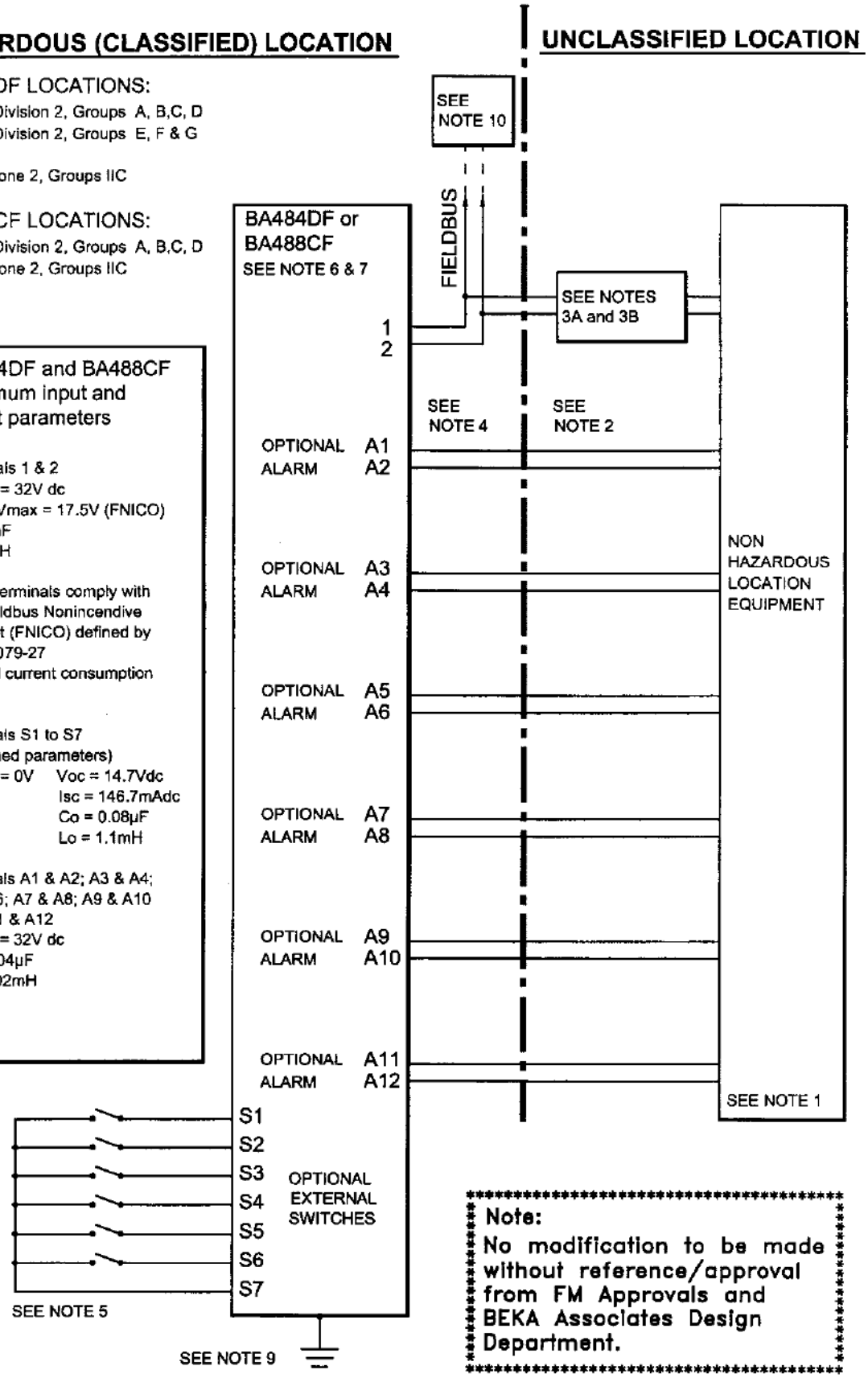
Terminals 1 & 2
Vmax = 32V dc
NIFW Vmax = 17.5V (FNICO)
Ci = 1nF
Li = 8µH

These terminals comply with The Fieldbus Nonincendive Concept (FNICO) defined by IEC 60079-27
(Typical current consumption 25mA)

Terminals S1 to S7
(combined parameters)
Vmax = 0V Voc = 14.7Vdc
Isc = 146.7mAdc
Co = 0.08µF
Lo = 1.1mH

Terminals A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10 and A11 & A12
Vmax = 32V dc
Ci = 0.04µF
Li = 0.02mH

UNCLASSIFIED LOCATION



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

Title
FM Approvals Control Drawing for Nonincendive BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC		NTS

Drawing No. CI480–18
Sheet 1 of 4

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.

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:

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

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:

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

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:

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

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 mounti ng 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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1	01.03 2005	First release	.	.

Title: FM Approvals Control Drawing for Nonincendive BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC		NTS

Drawing No. CI480–18
Sheet 2 of 4

7. When installed in a hazardous (classified) location the BA484DF Fieldbus Display shall be fitted with cable glands / conduit hubs selected from the following table.

   Metallic glands and hubs must be grounded – see note 8.

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 / Gedney hub** CHMG-50DT **REMKE hub** WH-1-G **Killark Glands** CMCXAA050 MCR050 MCX050

8. In addition to the supplied bonding plate, when 2 or 3 metallic glands or conduit hubs are fitted to a BA484DF Fieldbus Display, all metallic glands or conduit hubs must be connected together and grounded.

9. **CAUTION:** The BA484DF and BA488CF Fieldbus Display 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.

10. The terminator on the Fieldbus must be FM Approved.

11. The BA484DF should be mounted where it is shielded from direct sunlight.

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Title: FM Approvals Control Drawing for Nonincendive BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC		NTS

Drawing No. CI480–18
Sheet 3 of 4

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 intrinsic safety 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"

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Iss.	Date	Modification	Ckd.	Appd.

Title
FM Approvals Control Drawing for
Nonincendive BA484DF & BA488CF Fieldbus Displays

Drawn	Checked	Scale
RC		NTS

Drawing No. CI480-18
Sheet 4 of 4