

F. Bamford (Instruments) Ltd.

Ajax Works Whitehill Stockport Cheshire SK4 1NT England

Telephone 0161 480 6507

Fax 0161 474 7990

www.bamfordajax.com

instruments@bamfordajax.com

Ajax

a member of the



F. BAMFORD (INSTRUMENTS) LIMITED.

INSTALLATION OPERATING AND MAINTENANCE INSTRUCTIONS FOR THE "AJAX" RANGE OF SERIES XP ELECTRIC FLOW INDICATORS FITTED WITH AN 'ATEX' CERTIFIED SWITCHBOX EExd I/11B + H₂ T6

CSA CERTIFICATE NO: 03ATEX1507 Issue 2 AS TYPICAL GA DRG NUMBERS:

321/2081 'G', 321/2364 'D', 321/2128 'A', 321/2344B, 321/2095B, 321/2344 'C', 321/2408B & 321/2082 'E'

(Ta = -20 C to + 50 C)



I M2 / II 2G (Ta = -20 C to + 50 C)

2813

EExd 1 / 11B + H₂ T6

• SIRA Certificate No: 03ATEX1507 Issue 2

EU Directive 2014/34/EU (ATEX Directive)

CENELEC EN 50014, EN 50018

(Zones 1 and 2 Hazardous Areas)

- **Weatherproof Enclosure in BS EN 1982 LG2/LG4 or Stainless Steel BS 3100 316C16.**
Environmental Protection Approval to IP66 according to IEC-144.
- **Versatility of Switching Circuits.**
- **Rugged Construction, Vibration and Shock Resistant.**
- **Range ¾" to 16" bore**
Flow range 25 litres/min to 20,000 litres/min.
- **Low pressure drop**
- **Visual indication of flow.**

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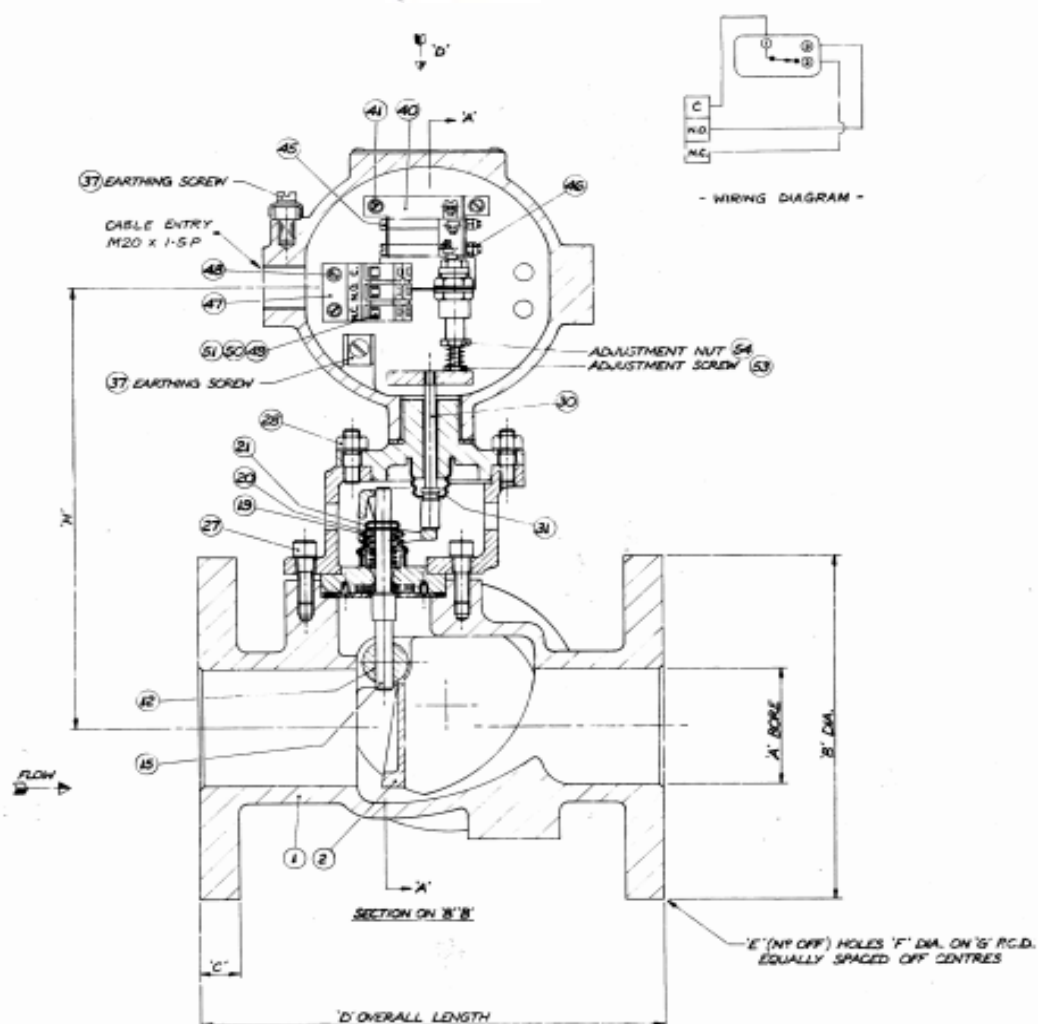
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The Bamford **Ajax** XP Series 'ATEX' Certified Electric Flow Indicators are a proven generation of ruggedly constructed devices for automatic control and reliable protection of plant and machinery in hazardous areas. The units can be mounted in horizontal, vertically upward or downward attitudes. The certified enclosure is standard on all models and is designed to meet the arduous conditions in the petro-chemical, offshore and mining industries. The certified enclosure is available with one or two cable entries for fitting with approved glands and contains a precision snap-action microswitch of the single pole double throw type. However, one or two microswitches with silver plated noble metal contacts may be fitted to provide versatility of switching circuits, which may be factory set or field adjustable.

The Flow Indicator is specifically designed to warn instantly of a failure or change in a liquid system. Based on simple principles, the flow-induced movement of a hinged flap is converted by eccentrically mounted bearings into a rocking motion of a vertical spindle, which is pivoted about a special double seal and operates the adjustable single or double microswitch assembly. The materials of construction cater for the majority of liquids, with the toughened soda lime viewing windows offering a visual indication of flow by reference to the Vane/Flap position.

IMPORTANT: The requirements of these standards have been checked against BS EN 60079-1:2014 and BS EN IEC 60079-0:2018 and there are no differences affecting the latest technical knowledge for the product identified on this declaration.

G J Potts 19th October 2018



CAUTION

The following instructions apply to equipment covered by 'CSA Certificate No: 03ATEX1507' Issue 2

1. Do not attempt to access the Certified Switch Enclosure (GA Drawing No. 321/1871 Rev 'L' refers) while energised. Access to the enclosure should only be undertaken while there is no risk of a flammable atmosphere being present, dust and water should also be prevented from entering the enclosure. Before replacing the enclosure cover ensure that the sealing face of the cover (Part No. 1869C) and body (Part No. 1868B) for the enclosure are undamaged. The sealing 'O' Ring (Part No. 5185) should also be inspected for damage and any contamination from foreign bodies.
2. The equipment may be used with flammable gases and vapours with apparatus groups IM2 / II2G – EExd I / IIB+H₂ T6 with temperature class T6 in the ambient temperature range –20°C to +50°C
3. Installation to be carried out by suitably trained personnel in accordance with BS EN 60079-17:2014
4. Inspection and maintenance of this equipment shall be carried out by suitably trained personnel in accordance with BS EN 60079-17:2014
5. Repair of this equipment shall be carried out by suitably trained personnel in accordance with BS EN 60079-1:2014 and BS EN IEC 60079-0:2018
6. For assembly and adjustment of the equipment please refer to GA Drawing No. 321/2081 'G', 321/2364 'D', 321/2128 'A', 321/2344B, 321/2095B, 321/2344 'C', 321/2408B & 321/2082 'E'
7. Components to be incorporated into or used as replacement parts for the equipment shall be fitted by suitably trained personnel in accordance with the manufacturers documentation.
8. The certification of this equipment relies upon the following materials used in its construction: Gunmetal BS1400 LG2, Viton, Stainless Steel BS6105 A2-70, Nickel Plated Brass, Brass BS2870 CZ108, Brass BS2874 CZ121, Stainless Steel BS970 316L, Nylon 66, Spring Steel, Bakelite.

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

Aggressive Substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the materials Data Sheets for its resistance to specific chemicals.

INSTALLATION INSTRUCTIONS

Carefully unpack the instrument and clear any loose packing material which may have entered the inside of the body. Ensure that any blanking tape/plugs are removed from the pressure release holes in the offset adapter. Check with the order or delivery note to see if the instrument is arranged for horizontal, upward or downward flow. When mounted in a horizontal pipeline the switch housing must be positioned in the northern axis. If the instrument is of the flanged type, the mating flanges should be true parallel. Use a soft packing of cork or rubber or a corrugated metallic joint and tighten flange bolts evenly. If a stop valve is fitted in the circuit the instrument should be fitted after this.

Where possible It is recommended that the unit be fitted in the pipeline at a distance of at least ten times the pipe bore size up-stream and five times downstream from bends or other instruments to give effective operation.

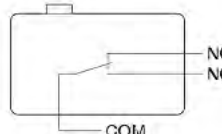
ENTRY INTO SWITCH HOUSING - NOTE: If already wired and in service, **ISOLATE ELSEWHERE BEFORE OPENING**. Remove the four securing screws (Item 52). It is imperative that these screws be used on re-assembly. There are two notches in the switchbox cover, place blunt instrument into one and tap gently in a rotary direction. When the seal is broken the switchbox cover can be withdrawn from the switchbox.

The switchbox is tapped M16, M20 or M25 conduit (as required) to suit the cable gland, an appropriate approved cable gland must be used.

ELECTRICAL CONNECTIONS: When the cover has been removed from the switchbox, the terminal block(s) is (are) accessible. Conductor size, 0.5 to 2.5 sq. mm. The connection marked “**C**” (common) on the terminal block(s) is the supply to the switch. Terminal marked “**N.C.**” is normally closed (at normal flow) and terminal marked “**N.O.**” normally opens at alarm flow condition. Wire as required to make or break (or change over when all three terminals are used) the electrical circuit on a rising or falling flow accordingly. Test that the micro switch is making/breaking correctly.

EARTH CONNECTIONS Maximum conductor size; single strand 6 mm

MICROSWITCH SPDT

<p>SPDT</p>  <p>The diagram shows a rectangular switch housing with a lever on top. Inside, a common contact (COM) is connected to two other contacts: one normally closed (NC) and one normally open (NO).</p>	<p>ELECTRICAL RATINGS: 15A 1/2 HP 125 250V AC 0.1A 125V DC</p>
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OPERATING INSTRUCTIONS

ADJUSTMENT: The design of the sliding carriage assembly has been incorporated to prevent accidental or playful adjustment; thus, time and consideration is required when adjusting these instruments. The following sequence has been found best for adjustment. Increase the liquid flow through the instrument to well above the safe minimum quantity (if out of the pipeline, operate the vane manually to simulate this condition). Using two spanners - use one to hold the adjustment nut (**Item 54**) stationary and use the other one to rotate the adjustment screw (**Item 53**) anti-clockwise until the micro switch(es) is (are) changing over at this higher flow. Now reduce the liquid flow to the trip setting required and adjust the micro switch(es) to the required setting - rotating the adjustment screw clockwise. Check the operation of the instrument and if satisfactory re-fit cover. N.B. to check that the micro switch(es) have not been set below the minimum trip point of the instrument - the sliding carriage assembly can be manually operated upwards and released to check the function of the micro switch(es).

DISMANTLING: If the occasion arises for the instrument to be dismantled, the following sequence must be adhered to. (If possible, removal from the pipeline makes the operation much more convenient). Remove the 2 nuts and spring washers (**Item 27**) the switch housing assembly can now be removed. Unscrew the adapter (**Item 22**) securing screws (**Item 27**) and withdraw the seal assembly, but under no circumstances should this unit be further dismantled. Remove the windows (**Item 8**) and bezels (**Item 10**). Back off locknuts (**Item 6**) and unscrew (**Item 5**) pivots. The vane assembly can now be removed. Note: The vane spindles are handed and should not be reversed. When re-assembling, the reverse to this sequence must be followed. The pivots should be adjusted so that there is neither stiffness nor play in the vane.

The following tools are necessary for the above work:-

1. M6 Allen Key
2. 1/2" A/F Spanner
3. 5/16" A/F Spanner
4. 1/4" Allen Key
5. 9/16" A/F Tube Spanner
6. Small and large screwdrivers

MAINTENANCE INSTRUCTIONS

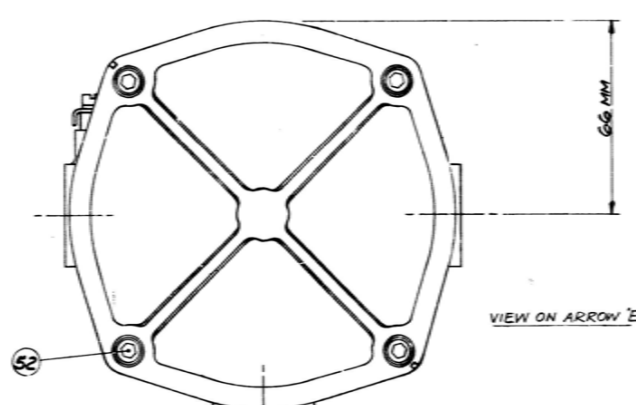
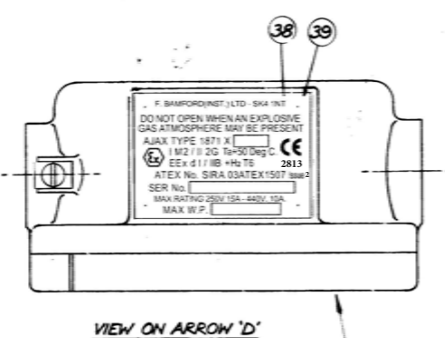
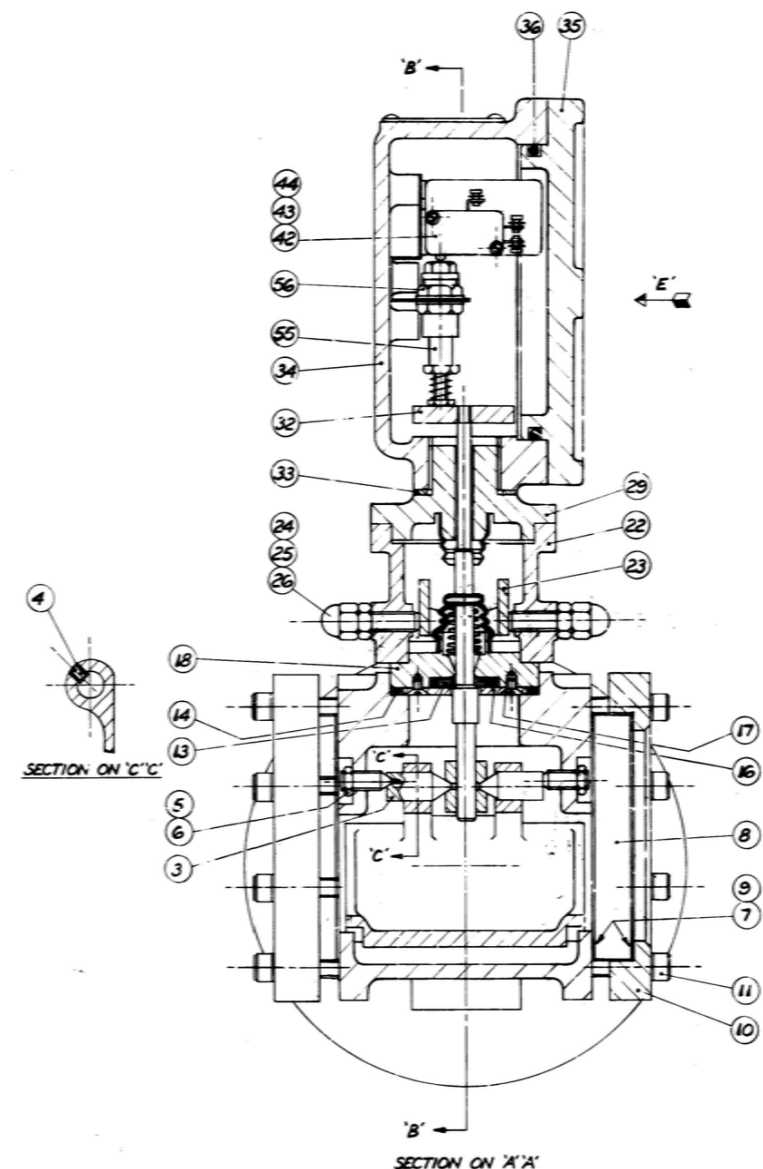
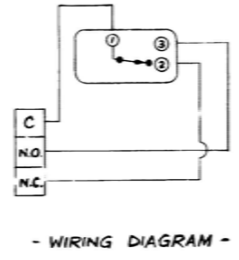
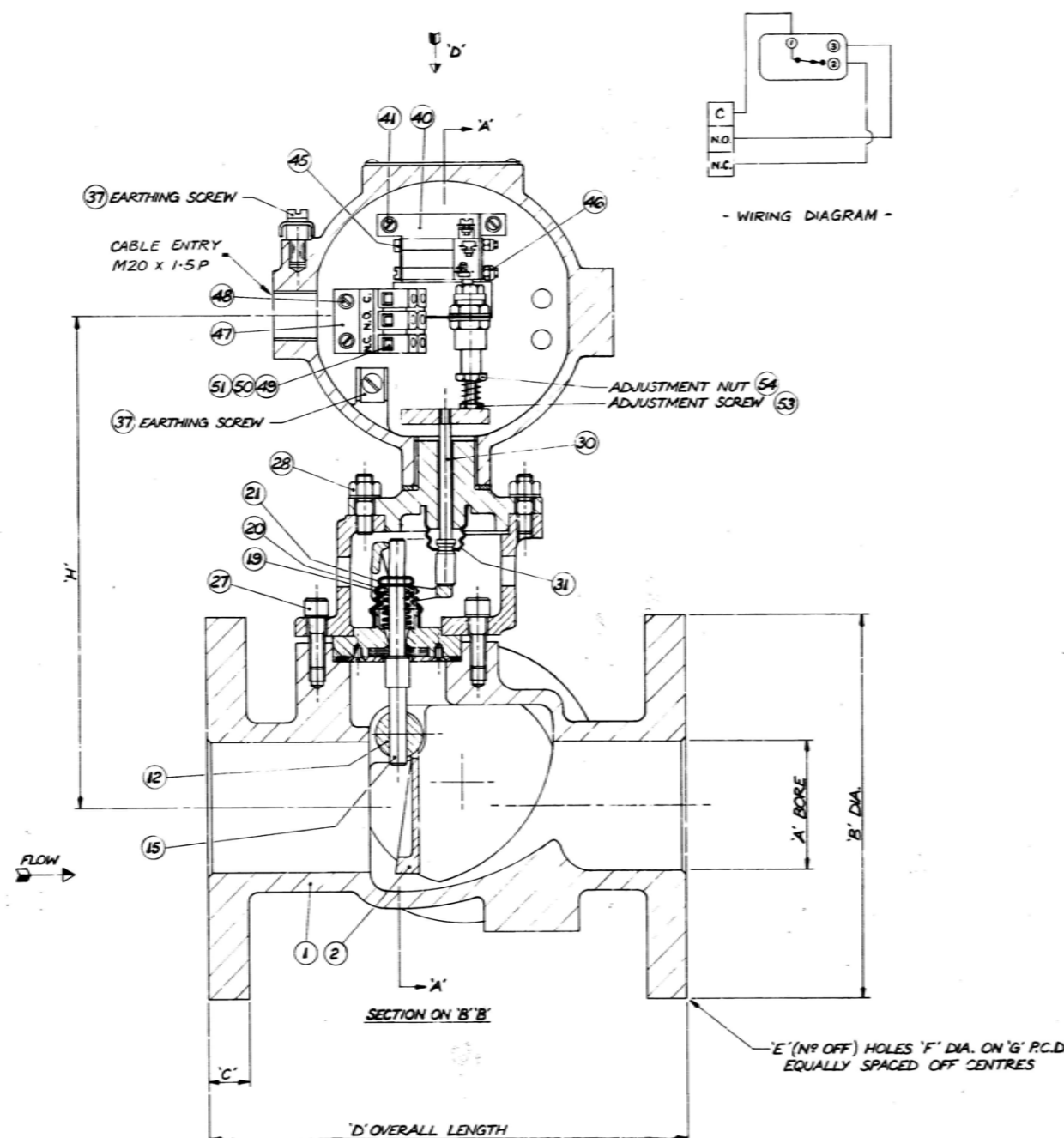
All instruments are of proven reliability and robust construction and as such require minimal maintenance. However, in certain circumstances, and depending on the preventative maintenance schedule adopted, it may be necessary to check the condition of the window glasses and where practical remove and clean them. At the same time it would be advisable to fit a new set of window joints and also inspect the vane assembly for any signs of wear on the pivots and vane spindles, which could be detrimental to the smooth operation of the device. We would also suggest that the operating spindle and "O" ring seals are checked every 12 months and replaced every 5 years.

After 12 months a check should also be made on the 'O' Ring Seal in the EExd Enclosure and replaced if necessary.

To secure the cover to the switchbox, the following screws **MUST** be used.
M6 x 16.0 long x 1.0P Socket head cap screws to conform to BS1605 Class A2-70.
Material **STAINLESS STEEL 304** Grade A2 - 70 (700 N/mm²).

To check that the cover has been secured correctly after wiring - the maximum allowable gap, if one exists between the surfaces of the switchbox and cover, shall nowhere exceed 0.1 mm.

In conclusion, we are pleased to offer all recommended spare parts ex. stock and a 48 hour repair and refurbishing service.



FLANGE RATINGS

BS 4504 TABLE G/21 (DIMMS IN MM)

A	B	C	D	E	F	G	H
20	90	6	165	4	11	65	190
25	100	8	165	4	11	75	190
32	120	8	175	4	14	90	196
40	130	9	175	4	14	100	196
50	140	11	185	4	14	110	194
65	160	13	196	4	14	130	207
80	190	13	217	4	18	150	207
100	210	16	230	4	18	170	223
125	240	20	320	8	18	200	236
150	265	20	320	8	18	225	234

BS 4504 TABLE K/21 (DIMMS IN MM)

A	B	C	D	E	F	G	H
20	105	6	172	4	14	75	190
25	115	8	172	4	14	85	190
32	140	8	175	4	18	100	196
40	150	9	175	4	18	110	196
50	165	11	185	4	18	125	194
65	185	13	215	4	18	145	207
80	200	13	217	8	18	160	207
100	220	16	270	8	18	180	223
125	250	22	320	8	18	210	236
150	285	22	320	8	22	240	234

BS 10 TABLE D'E & F (DIMMS IN INCHES)

A	B	C	D	E	F	G	H
3/4"	4"	1/2"	7"	4	5/16"	2 7/8"	7 1/2"
1"	4 1/2"	5/16"	7"	4	5/16"	3 1/4"	7 1/2"
1 1/4"	4 3/4"	5/16"	7"	4	5/16"	3 3/8"	7 3/4"
1 1/2"	5 1/4"	3/8"	7"	4	5/16"	3 7/8"	7 3/4"
2"	6"	3/8"	7 1/4"	4	11/16"	4 1/2"	7 5/8"
2 1/2"	6 1/2"	7/16"	7 3/4"	4	11/16"	5"	8 1/8"
3"	7 1/4"	1/2"	7 3/4"	4	11/16"	5 3/4"	8 1/8"
4"	8 1/2"	5/8"	11"	4	11/16"	7"	8 3/4"
5"	10"	11/16"	12 1/4"	8	11/16"	8 1/4"	9 5/16"
6"	11"	11/16"	12 1/4"	8	11/16"	9 1/4"	9 1/4"
6"	11"	11/16"	12 1/4"	8	7/8"	9 1/4"	9 1/4"
3"	8"	3/8"	8 3/4"	8	11/16"	6 1/2"	8 1/4"
4"	9"	11/16"	10 3/4"	8	11/16"	7 1/2"	8 3/4"

A.N.S.I. CLASS 150 FF OR RF

A	B	C	D	E	F	G	H	1/16" R.F.
3/4"	3 3/8"	7/16"	7"	4	5/8"	2 3/4"	7 1/2"	1 1/16"
1"	4 1/4"	7/16"	7"	4	5/8"	3 1/8"	7 1/2"	2"
1 1/4"	4 5/8"	1/2"	7"	4	5/8"	3 3/8"	7 3/4"	2 1/2"
1 1/2"	5"	9/16"	7 1/4"	4	5/8"	3 7/8"	7 3/4"	2 7/8"
2"	6"	5/8"	7 1/2"	4	3/4"	4 1/4"	7 5/8"	3 3/8"
2 1/2"	7"	11/16"	8 3/4"	4	3/4"	5 1/2"	8 1/8"	4 1/8"
3"	7 1/2"	3/4"	9"	4	3/4"	6"	8 1/8"	5"
4"	9"	15/16"	11 1/8"	8	3/4"	7 1/2"	8 3/4"	6 3/16"
5"	10"	1 1/16"	12 3/8"	8	7/8"	8 1/2"	9 5/16"	7 5/16"
6"	11"	1 1/8"	13"	8	7/8"	9 1/2"	9 1/4"	8 1/2"

FLANGES TO ANS1 B16.24 CLASS 300 FF OR RF

A	B	C	D	E	F	G	H	1/16" R.F.
3/4"	4 5/8"	1 1/32"	7 7/16"	4	3/4"	3 1/4"	6 13/32"	1 1/16"
1"	4 7/8"	1 9/32"	7 11/16"	4	3/4"	3 1/2"	6 10/32"	2"
1 1/4"	5 1/4"	5/16"	7 1/2"	4	3/4"	3 7/8"	6 23/32"	2 1/2"
1 1/2"	6 1/8"	11/16"	7 1/2"	4	7/8"	4 1/2"	6 23/32"	2 7/8"
2"	6 1/2"	3/4"	8"	8	3/4"	5"	6 21/32"	3 3/8"
2 1/2"	7 1/2"	13/16"	9"	8	7/8"	5 7/8"	7 5/32"	4 1/8"
3"	8 1/4"	2 9/32"	9 3/4"	8	7/8"	6 5/8"	7 5/32"	5"
4"	10"	1 1/16"	11 1/16"	8	7/8"	7 7/8"	7 23/32"	6 3/16"
5"	11"	1 1/8"	13"	8	7/8"	9 1/4"	8 33/32"	7 5/16"
6"	12 1/2"	1 1/16"	13 7/8"	12	7/8"	10 9/8"	8 7/32"	8 1/2"

CERTIFIED PRODUCT
This drawing has been certified by F.B.T. LTD. and MUST NOT be changed without their written authority.

REV DRAWN:GJP
G CHECKED:PB
DATE: 24/01/20
Notified body number changed from 0518 to 2813, issue number was 1 now 2
FOR DETAILS OF EExd I/11B CERTIFIED SWITCH ENCLOSURE SEE DRG NO. 321/1871 ISSUE 'L'

REV	DRAWN	WD	REV	DRAWN	PTL	REV	DRAWN	PTL	REV	DRAWN	PTL	REV	DRAWN	PTL	
F			E			D			C			B			
CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:		CHECKED: DATE:	
BS10 TABLE 'F' 4" NB. DIMS ADDED		BS10 TABLE 'F' 3" NB. DIMS ADDED.		ATEX CERTIFICATION DETAILS ADDED.		BASEEFA NOTE: ISSUE 'K' WAS ISSUE 'J'		ANSI 300 FLANGE TABLE ADDED		CABLE ENTRY SIZE ADDED		OVERALL LENGTHS 'D' CHANGED AS FOLLOWS: 16/21 WAS 175 MM 16/21 - 180 B.S.T.D' - 7"			

DRG. NO.	REV.	DESCRIPTION	QTY.	MATERIAL SPECIFICATION	REMARKS
TITLE	GENERAL ARRANGEMENT OF FLOW INDICATOR SWITCH WITH EExd I/11B ENCLOSURE (IP66)	QUANTITY	WORKS NO.	CLIENT	
THIS DRAWING IS THE PROPERTY OF F. BAMFORD (MARINE) LTD. STOCKPORT. IT SHOULD NOT BE COPIED OR ITS CONTENTS DIVULGED TO ANY THIRD PARTY WITHOUT OUR WRITTEN CONSENT.					
ALL DIMENSIONS IN MILLIMETRES			DRAWN IN ACCORDANCE WITH B.S.308-1972		
DRAWN: J.J.C. DATE: 1.8.86		ORIGINAL SCALE: 1:1		INSPECTION: QA/206 AS	
DRG. NO. 321/2081		REV. G		SHEET NO. 1 OF 1	

F. BAMFORD (INSTRUMENTS) LTD.
AJAX WORKS, WHITEHILL, STOCKPORT, SK4 1NT, CHESHIRE.
TEL: 061-480 8507
TLX: 688518 AJAX G

Ajax

Series **XP** FLAMEPROOF ELECTRIC FLOW INDICATORS



CE
2813



I M2 / II 2G
EExd I / IIB + H₂T6
(Ta = -20 C to + 50 C)

- **SIRA** Certificate No: 03ATEX1507 Issue 2
EU Directive 94/9/EC (ATEX Directive)
CENELEC EN 50014, EN50018
(Zones 1 and 2 Hazardous Areas)
- **Weatherproof Enclosure in BS EN 1982 LG2/LG4 or Stainless Steel BS 3100 316C16.**
Environmental Protection Approval to IP66 according to IEC-144.
- **Versatility of Switching Circuits.**
- **Rugged Construction, Vibration and Shock Resistant.**
- **Range ¾" to 16" bore**
Flow range 25 litres/min to 20,000 litres/min.
- **Low pressure drop**
- **Visual indication of flow.**

The Bamford Ajax XP series of Flameproof Electric Flow Indicators are a proven generation of ruggedly constructed devices for automatic control and reliable protection of plant and machinery in hazardous areas. The units can be mounted in horizontal, vertically upward or downward attitudes. The functionally designed enclosure is standard on all models to meet the arduous conditions experienced in the petro-chemical, offshore, and mining industries. The certified enclosure is available with one or two cable entries for fitting with approved glands and contains a precision snap-action microswitch of the single pole, double throw type. However, one or two microswitches with silver plated noble metal contacts may be fitted to provide versatility of switching circuits, which may be factory set or field adjustable.

The flow indicator is specifically designed to warn instantly of a failure or change of flow in a liquid system. Based on simple principles, the flow induced movement of a hinged flap is converted by eccentrically mounted bearings into a rocking motion of a vertical rod, which, pivoted about a special double seal, operates at its upper end the adjustable microswitch, or switches. The materials of construction cater for the majority of liquids, with the toughened glass viewing windows offering a visual indication of flow.

F. Bamford (Instruments) Ltd.

Ajax Works,
Whitehill,
Stockport, SK4 1NT. United Kingdom.

Telephone: 0161-480 6507

Fax: 0161-474 7990

Web: www.bamfordinstruments.com
Email: sales@bamfordinstruments.com

Specifications

Screwed connections -

¾" to 3" nom. bore female
BSP parallel or taper, NPT.

Flanged connections -

¾" to 16" BST 'D', BST 'E', ASME B16.24,
Class 150 & 300.
BS EN 1092-3; NP6, NP10, NP16 or NP40.

Maximum working pressure standard version

all models - 7 BAR G

Maximum working pressures high pressure version

(screwed connections) -
¾" to 2½" nom. bore - 28 BAR G
3" nom. bore - 21 BAR G.

Maximum working pressures high pressure version

(flanged connections) -

¾" to 2½" - 28 BAR G
3" - 21 BAR G
4" - 17.5 BAR G
5" to 6" - 14 BAR G
8" to 16" - 7 BAR G

Ambient temperature range

of switch enclosure:

-20°C to +50°C

Maximum operating temperature range of working medium:

-10°C to +93°C

SWITCH RATING (STANDARD)

VOLTS	DC		AC	
	RES	IND	RES	IND
30	10A	10A	10A	10A
125	0.5A	0.07A	10A	10A
250	0.25A	0.03A	10A	10A

Alternative switches may be fitted for 440 volts or intrinsic safe circuits.

Cable entry:

Either one or two M16, M20 or M25 x 1.5 pitch

Connector size - 0.5mm² - 2.5mm²

Earthing screws M5.

Materials of construction:

- **Switch housings:**

Gunmetal BS EN 1982 LG2/LG4, or
Stainless Steel BS 3100 316C16.

- **Indicator Body and Flap:**

Gunmetal BS EN 1982 LG2/LG4, or
Stainless Steel BS 3100 316C16

- **Wetted parts:**

Stainless Steel 316 or
Manganese Bronze BS2874 CZ114

- **Window glass:**

Toughened soda lime BS 3463

- **Window joint:**

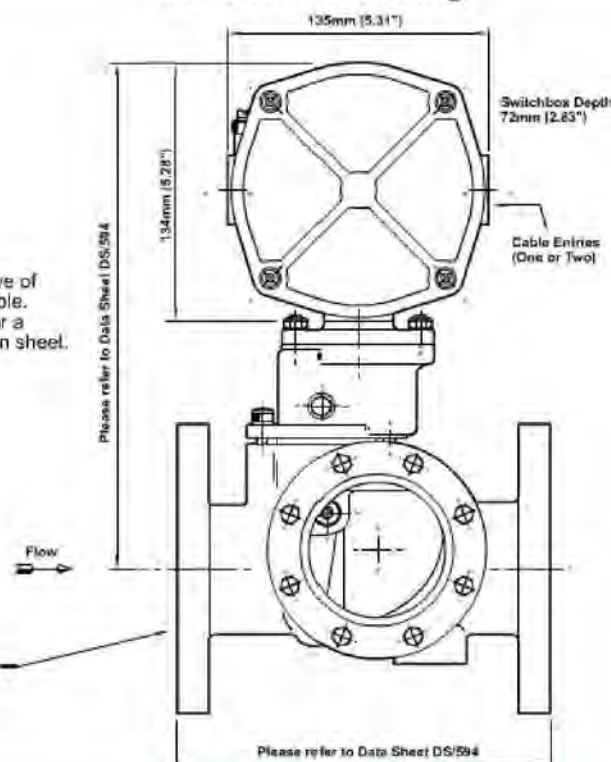
Non-asbestos fibre BS 7531 Grade Y

- **Internal seals:** Viton

(Other materials available to special order)

Dimension Drawing

This drawing is representative of
the range of switches available.
Please consult the factory for a
detailed drawing/specification sheet.



Connections:
Screwed - ¾" to 3" N.B.
Flanged - ¾" to 16" N.B.

Please refer to Data Sheet DS/594

Specifications

Screwed connections -
 $\frac{3}{4}$ " to 3" nom. bore female
 BSP parallel or taper, NPT.

Flanged connections -
 $\frac{3}{4}$ " to 16" BST 'D', BST 'E', ASME B16.24,
 Class 150 & 300
 BS EN 1092-3; NP6, NP10, NP16 or NP40.

**Maximum working pressure
 standard version**
 all models - 7 BAR G

**Maximum working pressures
 high pressure version
 (screwed connections) -**
 $\frac{3}{4}$ " to 2 $\frac{1}{2}$ " nom. bore - 28 BAR G
 3" nom. bore - 21 BAR G.

**Maximum working pressures
 high pressure version
 (flanged connections) -**
 $\frac{3}{4}$ " to 2 $\frac{1}{2}$ " - 28 BAR G
 3" - 21 BAR G
 4" - 17.5 BAR G
 5" to 6" - 14 BAR G
 8" to 16" - 7 BAR G

**Ambient temperature range
 of switch enclosure:**
 -20°C to +50°C

**Maximum operating temperature range
 of working medium:**
 -10°C to +93°C

SWITCH RATING (STANDARD)

VOLTS	DC		AC	
	RES	IND	RES	IND
30	10A	10A	10A	10A
125	0.5A	0.07A	10A	10A
250	0.25A	0.03A	10A	10A

Alternative switches may be fitted for 440 volts or intrinsic safe circuits.

Cable entry:

Either one or two M16, M20 or M25 x 1.5 pitch

Connector size - 0.5mm² - 2.5mm²

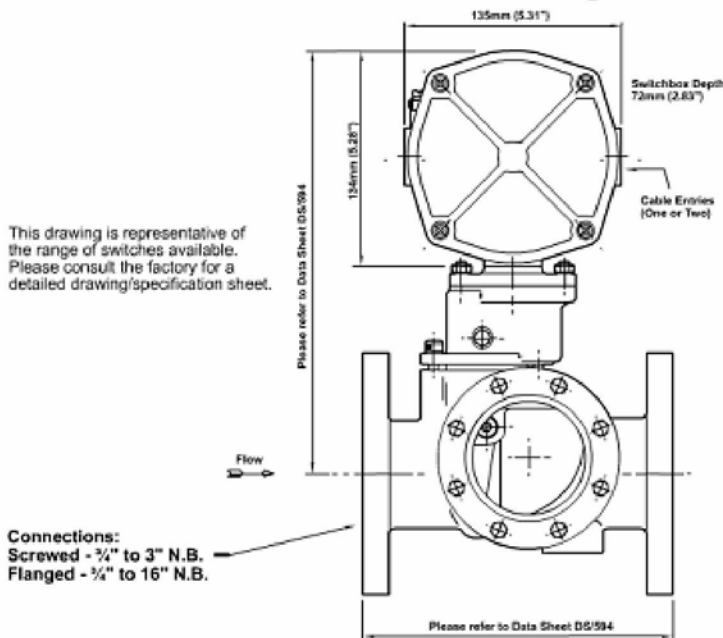
Earthing screws M5.

Materials of construction:

- **Switch housings:**
 Gunmetal BS EN 1982 LG2/LG4, or
 Stainless Steel BS 3100 316C16.
- **Indicator Body and Flap:**
 Gunmetal BS EN 1982 LG2/LG4, or
 Stainless Steel BS 3100 316C16.
- **Wetted parts:**
 Stainless Steel 316 or
 Manganese Bronze BS2874 CZ114
- **Window glass:**
 Toughened soda lime BS 3463
- **Window joint:**
 Non-asbestos fibre BS 7531 Grade Y
- **Internal seals:** Viton

(Other materials available to special order)

Dimension Drawing



F. BAMFORD (INSTRUMENTS) LTD
AJAX WORKS, WHITEHILL
STOCKPORT SK4 1NT, CHESHIRE
UNITED KINGDOM

TELEPHONE: 0161 480 6507
FAX: 0161 474 7990
e-mail: instruments@bamfordajax.com
www.bamfordajax.com