INSTRUCTION MANUAL

BS&B Safety Systems

77-1010I-EN (Rev B)

Installation Instructions for BURST ALERT SENSORS BAS+™, ABAS+™, LDAS+™ & ALDAS+™ Sensors

WARNING - Rupture disks are non-reclosing pressure relief devices and are intended to provide a pressure relief opening in the event of a rapid rise in pressure. Rupture disks are designed to open at a specified pressure and temperature, thereby relieving the excessive pressure or excessive vacuum in the structure to be protected. **It is imperative that the rupture disk device and sensor be properly installed and safely vented in order to avoid bodily injury, damage to property, pollution and loss of product.** BS&B Safety Systems L.L.C. and BS&B Safety Systems Limited supply rupture disk devices selected by their customers, which are manufactured in reliance upon information and specifications supplied by the customer. BS&B Safety Systems L.L.C. and BS&B Safety Systems Limited are not liable for any damage resulting from improper installation, improper system design, unsafe venting, or other factors beyond BS&B Safety Systems L.L.C. and BS&B Safety Systems Limited control. Do not locate the rupture disk where personnel, equipment or property will be exposed to released product, pressure and temperature through the activated rupture disk. Handle carefully; rupture disk and or sensor device tag may have sharp edges. Final determination of the size and suitability of BS&B products for the use contemplated by the buyer is the sole responsibility of the buyer.

Order Replacement Sensors by Lot Number

(Shown on Sensor Tag).

Before Installing the Sensor

1. **Inspect companion pipe flanges**
   - Ensure flange-mating surfaces are free of foreign materials, pits, dust or grit which can damage the sensor affecting performance or cause leakage.
   - Ensure pipe flanges are parallel to a sufficient standard that will permit proper functioning of the sensor.
2. **Inspect the Sensor**

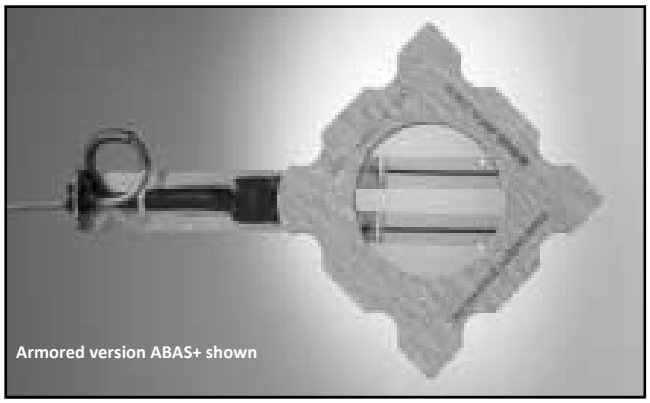
   Do not remove sensor from its package until it is required for installation. Handle the sensor with care, holding the sensor by the perimeter only. Examine the sensor checking the membrane and gasket for tears, scratches

   and foreign material that can damage the sensor, cause leakage, lead to false signals or otherwise affect the electrical or mechanical performance of the sensor.

   - Do not install a damaged sensor, for example, if the wire circuit mounted on the polyamide support has been severed, or if there is any damage to the polyamide membrane. Installation of a damaged sensor may result in a false signal or leakage.
   - Ensure that the size and pressure rating of the sensor are compatible with the companion flanges. The perimeter shape of the sensor may match the shape of the Safety Head for easy alignment.
   - Do not rub the sensor membrane. Clean using only a damp cloth.
   - Do not fold, twist or stretch the sensor as this may break or weaken the conductive circuit and cause a false signal.
   - Handle carefully, sensor and tag may have sharp edges.
   - Sensor does not produce excessive surface temperatures, infra-red, electromagnetic or ionizing radiation when appropriately powered according to these instructions.
   - Do not subject the sensor to excessive structural bending stresses through the pipe flanges.
   - Select gasket materials appropriate to the service conditions.
   - Check that the performance characteristics of the sensor match that required by the application.

Safety Precautions - Caution

- Competent trained personnel should install sensor devices in accordance with these installation instructions and user electrical requirements.



- Do not locate where the sensor membrane may be exposed to snow, ice, heavy rain or subjected to pressure or pressure evacuation in the vent piping. This may break the sensor wire.
- The LDAS+ and ALDAS+ sensors operate by allowing a small pressure differential build-up to occur across the sensing membrane. This must be taken into account when specifying rupture disks or other relieving devices up-stream of the LDAS+ or ALDAS+.
- Do not locate where the sensor to cable connection may be damaged from bending or stress.
- The sensor is not designed for dust service conditions.
- Check that all the sensor materials are compatible with the process conditions to avoid false signal generation due to corrosive attack.
- The sensor should not be installed in contact with conductive process media as this may cause a false signal.

- Ensure that the opening of the sensor does not affect the performance of downstream equipment. All the Burst Alert® Sensor Plus types will open with a petal of material extending one pipe diameter in the direction of flow.
- The sensor must not be modified in any way except with the approval of BS&B Safety Systems L.L.C. or BS&B Safety Systems Ltd. Unapproved modification may affect pressure containment and/or sensor performance. Failure to obtain such approval voids the warranty on this product. Do not reinstall a sensor that has been used between pipe flanges even if the conductor has not broken. The impression in the gasket seating area taken by the sensor during its original installation may prevent proper sealing and effect sensor performance if re-installed.
- Each sensor is provided with integral gaskets. Do not remove or modify gaskets before use as this may affect sealing to the pressure system and damage the sensor.
- Where a backpressure exists on a sensor this must be considered during the specification of the sensor to prevent damage and to avoid sensor failure. Contact BS&B Safety Systems L.L.C. or BS&B Safety Systems Ltd. for further information.

NOTE: LDAS+ and ALDAS+ sensors are not recommended for use where a back pressure exists on the sensor.
For assistance or advice on the compatibility of process media with the sensor, contact BS&B Safety Systems, L.L.C. or BS&B Safety Systems Ltd.

INSTALLATION

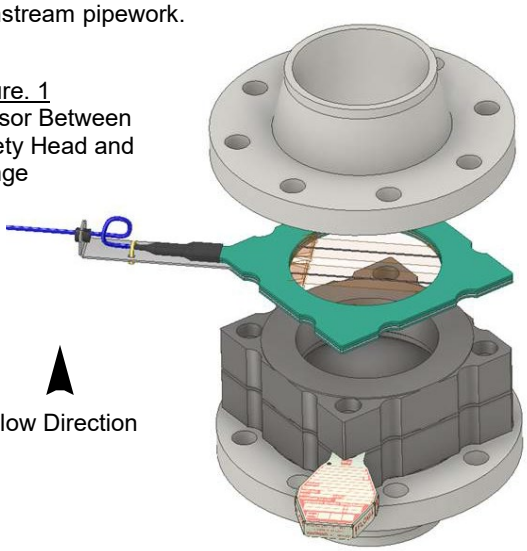
Follow the steps below for proper installation.

The sensor is typically installed on the VENT SIDE of the rupture disk between the Safety Head outlet and the companion flange outlet. See Figure 1.

(The sensor may also be mounted directly between companion flanges, See Figure 2.

When installing the LDAS+ or ALDAS+ sensor, ensure that the side marked 'VENT SIDE' is orientated towards the downstream pipework.

Figure. 1
Sensor Between Safety Head and Flange



WARNING

Should the LDAS+ sensor be installed upside down, the device will not function as intended to detect leakage.

1. Install the sensor in the pipeline before connecting the electrical monitoring equipment. When uninstalling a sensor, disconnect the electrical monitoring equipment prior to removal of the sensor from the piping system.
2. Follow the procedure as indicated in the rupture disk Installation Instructions and tighten the flange stud nuts to the specified torque value.

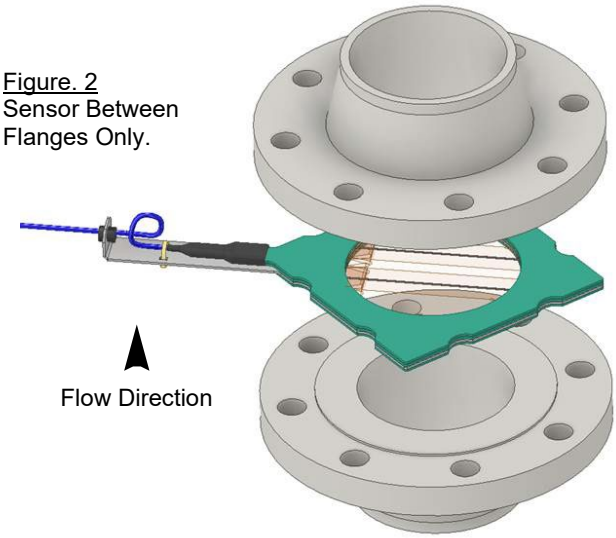
   CAUTION: Un-even or under-torqueing can cause leakage. Excessive torqueing causes damage to the sensor and the related Rupture Disk Device.

   CAUTION: Do not install additional companion flange gaskets.

Installation directly between Companion Flanges.

1. Insert sensor centrally between companion flanges in order that nameplate giving disk specification may be read easily. See Figure 2.

Figure. 2
Sensor Between Flanges Only.



2. Ensure that LDAS+ and ALDAS+ sensors are installed in the correct direction.
3. Install studs with nuts. Studs and nuts should be free running with lightly oiled threads
4. Tighten all nuts finger tight. Torque the nuts to the value shown in Table 1 or 2. Torque evenly in diagonal pattern by applying ¼ of the recommended torque to each stud. Repeat pattern by applying torque to ½ then ¾ of the recommended torque value. Then using the same pattern torque to full torque value.

NOTE: At process temperatures above 175° F (80 °C) the torque value should be checked and if necessary, the stud nuts tightened to the correct torque value.

Temperature Range

Suitable for process temperatures -40°F (-40°C) to a maximum of 450°F (232°C).

NOTE: For European CE marked sensors, certification classification is dependent on the ambient temperature at the sensor location, ensure that the correct temperature classification has been ordered.

CAUTION: Do not locate cable on or near hot surfaces.

Cable maximum operating temperature specification is:

- Standard Cable: -4°F (-20°C) to 167°F (75°C).
- High Temperature Cable: -85°F (-65°C) to 392°F (200°C).

Electrical Specification

- Maximum Voltage: 30 V DC
- Maximum Power: 3W (for ATEX, IECEx, EAC Ex)
- Maximum Current: 250mA (500mA without ATEX, IECEx or EAC Ex)

Lower values shall be used where Intrinsically Safe conditions are to be maintained. Sensors are designed to function at a few microwatts of power.

CE (ATEX) & IECEx Marked Sensors

The sensor assembly is deemed "simple apparatus" and where certified complies with EN/IEC 60079-0 & EN/IEC 60079-11, "Explosive Atmospheres - Equipment Protection by Intrinsic Safety" and the ATEX Directive 2014/34/EU and IECEx Standard under the following marking codes:

Ex II 1 G D

Ex ia IIC T6 Ga	EX ia IIIC T85°C Da	-40°C ≤ Ta ≤+75°C
Ex ia IIC T5 Ga	EX ia IIIC T100°C Da	-40°C ≤ Ta ≤+90°C
Ex ia IIC T4 Ga	EX ia IIIC T135°C Da	-40°C ≤ Ta ≤+125°C
Ex ia IIC T3 Ga	EX ia IIIC T200°C Da	-40°C ≤ Ta ≤ +190°C
Ex ia IIC T260°C Ga	EX ia IIIC T260°C Da	-40°C ≤ Ta ≤ +245°C

IMPORTANT - Within the "Safe Area" of the installation, the system designer / installer to ensure the sensor is connected to a customer supplied Ex safety barrier or Ex isolated barrier in line with requirements of EN/IEC 60079-25 and EN/IEC 60079-26. All electrical equipment should be installed and maintained to a recognized national standard.

Marking

Each sensor is marked with the following information;

- Sensor Type.
- Sensor nominal and corresponding pipe flange rating.
- Lot number.

In addition, for European CE Marked Sensor the following additional marking is applied to the sensor tag;

- CE mark and notified body number "2460".
- Electrical certification code markings.
- Certificate number "*Presafe 16 ATEX 8940X" & IECEx PRE 16.0085X".*
- Warning of possible Electrostatic Risk.
- Year of Manufacture.

EAC Ex Marked Sensors to TR-CU-012

The sensor assembly is deemed "simple apparatus" and where certified has explosion protection Exi (ia) as per GOST 31610.11-2014 (IEC 60079-11:2011), ensured by indicator design and build compliance to GOST 31610.0-2014 (IEC 60079-0:2011).

EAC Ex

Explosion proof & Ignition proof marks as per GOST 31610.0;

0Ex ia IIC T6 Ga X	EX ia IIIC T85°C Da X	-40°C ≤ Ta ≤+75°C
0Ex ia IIC T5 Ga X	EX ia IIIC T100°C Da X	-40°C ≤ Ta ≤+90°C
0Ex ia IIC T4 Ga X	EX ia IIIC T135°C Da X	-40°C ≤ Ta ≤+125°C
0Ex ia IIC T3 Ga X	EX ia IIIC T200°C Da X	-40°C ≤ Ta ≤+190°C
0Ex ia IIC T260°C (T2) Ga X	EX ia IIIC T260°C Da X	-40°C ≤ Ta ≤ +245°C

IMPORTANT - Within the Safe Area of the installation, the system designer / installer to ensure the sensor is connected to a customer supplied Ex safety barrier or Ex isolated barrier in line with requirements of GOST 31610 (EN/IEC 60079-25 and EN/IEC 60079-26). All electrical equipment should be installed and maintained to a recognized national standard.

EAC Ex Marking

Each sensor tag is laser marked with the following information;

- Sensor Type.
- Sensor nominal and corresponding pipe flange rating.
- Lot number.
- EAC Ex mark.
- Warning of possible Electrostatic Risk.
- Year of Manufacture.

Inspection

Ensure to periodically inspect the sensor for signs of wear or damage. Activated, worn or damaged sensors should be replaced. Do not attempt to repair damaged sensors. Order replacement sensors by lot number indicated on the sensor tag.

Service Life & Shelf Life

Provided the device is properly stored, handled and installed and provided the activation and temperature limits of the device are not exceeded, and provided no other process environment conditions exceed the operating limitations (pressure cycling, thermal variation, vibration, corrosion, erosion, pipe stresses, etc.) of each device type, the useful service of the device can be up to 30 years.

Storage Conditions

Inside dry storage (relative air humidity not more than 60%) at room temperature (+15°C to +25°C) and out of direct sunlight.

Disposal

Sensors or sensor packaging do not contain hazardous substances or hazardous materials in their construction. Sensor packaging is suitable for recycling. Sensors exposed to hazardous substances shall be decontaminated before disposal. Disposal of decontaminated sensors in authorized landfill in line with local and national laws is recommended.

TABLE 1 - Companion Flange Torque
ASME B16.5 Rating

Disk Size		Companion Flange	Torque	
in	mm		Nm	ft.lbs
2	50	150	57	42
		300	57	42
3	80	150	57	42
		300	102	75
4	100	150	57	42
		300	102	75
6	150	150	102	75
		300	102	75
8	200	150	102	75
		300	165	122
10	250	150	165	122
		300	248	183
12	300	150	165	122
		300	369	272
14	350	150	248	183
		300	369	272
16	400	150	248	183
		300	523	386
18	450	150	369	272
		300	523	286
20	500	150	369	272
		300	523	386
24	600	150	949	700
		300	523	386

The torque values in Table 1 & 2 are suitable for use with studs of a minimum design stress of 25,000 psi as defined in ASME Section II Table 3. The companion flanges must be compatible for use with stud stresses up to 25,000 psi. Consult BS&B Safety Systems, L.L.C. or BS&B Safety Systems Ltd. for flanges in other materials when suppliers recommend torque values lower than the BS&B Safety Systems, L.L.C. or BS&B Safety Systems Ltd. recommended torque values and if gasket type differs from BS&B Safety Systems, L.L.C. or BS&B Safety Systems Ltd. recommendations.

The torque values in Tables 1 & 2 are based on the assumption of lightly oiled, clean, free running threads with a coefficient of friction of $\mu = 0.16 \sim 0.20$. The customer is advised that the effects of corrosion, the use of thread compounds or dry assembly, may result in a change in the effective clamp load on the disk assembly. This may adversely affect the performance of the disk and or sensor.

TABLE 2 - Companion Flange Torque
DIN / AFNOR / UNI Ratings

Disk Size		Companion Flange	Torque	
in	mm		Nm	ft.lbs
2	50	10/16/25/40	62	46
3	80	10/16/25/40	62	46
4	100	10/16	62	46
		25/40	122	90
6	150	10/16	122	90
		25/40	210	155
8	200	10/16	122	90
		25	210	155
		40	312	230
10	250	10	122	90
		16	210	155
		25	312	230
		40	423	312
12	300	10	122	90
		16	210	155
		25	312	230
		40	423	312
14	350	10	122	90
		16	210	155
		25	423	31
		-	-	-
16	400	10	210	155
		16	312	230
		25	580	428
		40	650	480
18	450	10	210	155
		16	312	230
		25	N/A	N/A
		40	650	480
20	500	10	210	155
		16	423	312
		25	580	428
		40	813	600
24	600	10	312	230
		16	580	428
		25	650	480
		40	813	600
30	800	10	423	312
		16	650	480
		25	813	600
		40	881	650

Warranty

The manufacturer ("Manufacturer") of these goods ("Goods") warrants the Goods, when installed, used and maintained in accordance with the Manufacturer's specifications, requirements, installation instructions and other directions, against defective workmanship and materials for the periods specified below. Buyer's failure to install, use and maintain the Goods in strict compliance with all material operating specifications and at minimum recommended intervals shall void this warranty.

Manufacturer warrants its Goods as follows:

- Pressure relief devices, including rupture disk devices, pressure relief valves, sensors, explosion vents and buckling pin devices - 12 months from date of shipment.
- Flame arresters, breather vents - 12 months from date of shipment.
- Manufacturer's original equipment manufactured parts - 12 months from date of shipment.
- Spare parts for same - 90 days from date of shipment.

Warranty Limitations

Manufacturer manufactures and supplies Goods in reliance upon information and specifications provided by Buyer. The Buyer's or user's facility design, facility operating conditions and environment, process specifications, installation procedures, materials, hazard analysis risks, and/or other operational conditions can affect the performance of the Goods. Manufacturer shall have no liability, of whatever nature, resulting or arising from: (a) Buyer's failure to account for, disclose fully, and/or take appropriate precautions regarding all material operating conditions, facility design and operation details, design parameters, process specifications (including, but not limited to, fuel grade, process temperatures, process material, K_{st}, P_{max}, vibration involved and/or presence of corrosive or toxic materials), and system or vessel requirements; (b) placement of the Goods in a location other than represented to Manufacturer or required by Manufacturer; (c) Buyer's failure to protect other facility equipment and/or conduct an appropriate hazard analysis; (d) improper installation of the Goods; (e) any misrepresentations or omissions by Buyer; (f) and/or the system's operation, discharge or operation of the Goods as designed. If Manufacturer's quotation was based on assumptions regarding any of these factors (including K_{st} and/or P_{max} values), it is the Buyer's responsibility to verify the accuracy of such values.

Manufacturer does not warrant any article not manufactured by Manufacturer or its affiliated companies; those goods are subject solely to the warranties provided by their respective manufacturers and permitted to be passed through by a seller to Buyer. Manufacturer will provide a copy of those warranties upon request. Customer service or alteration of the Goods shall void this warranty.

Manufacturer does not warrant Goods against loss or damage caused directly or indirectly by Buyer's or user's improper system design; by the improper use, maintenance or installation (including improper mounting or torque) of the Goods; or by corrosion, erosion, malfunction or release from this or any other device caused by acids, chemicals, fumes, rust, dirt, debris, thermal shock, shock waves, water or moisture ingress, propagation from unprotected equipment, or other external agencies over which Manufacturer has no control.

No agent, distributor, employee or other representative (including Manufacturer's Distributors and Sales Representatives) has the right to modify or expand Manufacturer's standard warranty applicable to the Goods or to make any representations as to the Goods other than those set forth in Manufacturer's product literature and any such unauthorized affirmation, representation or warranty, if made, should not be relied upon by Buyer and shall not form a part of these Terms and Conditions.

The Goods should be inspected and replaced periodically. To determine the appropriate inspection and replacement intervals, the Buyer and user of the Goods should consider all application, installation precision, and process-environment conditions and parameters, including but not limited to, whether the user's process involves pressure cycles (pulsations), involves temperature fluctuations, has the potential for corrosion or degradation of the Goods, and whether there are other relevant process variables that may reduce the service life of the Goods or otherwise prevent the Goods from performing as designed and intended.

THE WARRANTIES HEREIN GIVEN ARE EXCLUSIVE AND IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BUYER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY SHALL BE, AT SELLER'S OPTION, THE REPAIR OR REPLACEMENT OF THE GOODS, EX WORKS, SELLER'S POINT OF SUPPLY. MANUFACTURER'S AGGREGATE TOTAL LIABILITY TO BUYER FOR ANY AND ALL LOSS OR DAMAGE ARISING OUT OF BUYER'S USE OR INABILITY TO USE THE PRODUCT SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES RESULTING FROM USE OF THE GOODS.

SERVICES WARRANTY

Warranty - Manufacturer warrants its labor, repair, installation, maintenance, and commissioning services for a period of ninety (90) days from the date of service.

BS&B Safety Systems, L.L.C. and BS&B Safety Systems Ltd. are here to assist you in providing a safe and efficient workplace.
For assistance on installation, audits, training or technical advice, please contact our Customer Service Department.

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This document is related to EU-Type examination certificate 'Presafe 16 ATEX 8940X' and related to EAC Ex examination certificate.
Document changes must be approved by the Engineering Department of BS&B Safety Systems Ltd.