

**SIEMENS**



# Acoustic Sensors

SITRANS AS100

Operating Instructions

Edition

06/2016

## Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

## Qualified Personnel

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

## Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

**Warning:** Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

**This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.**

**Note:** Always use product in accordance with specifications.

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## European Authorized Representative

Siemens AG  
Industry Sector  
76181 Karlsruhe  
Deutschland

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## Acoustic Sensors SITRANS AS100

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## Legal information

### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

#### DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

#### WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

#### CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

#### NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

### Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

### Proper use of Siemens products

Note the following:

#### WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

### Trademarks

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### Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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## General Information

### SITRANS AS100 Sensor

SITRANS AS100 is an acoustic sensor for flow detection. It monitors high frequency acoustic emissions (sound waves) generated by:

- the friction and impact of solids flow in pipes, chutes, and conveyors
- cavitation occurring in pumps, pipes, and valves
- turbulence of gases or liquids leaking through valves and flanges
- friction and jarring of mechanical parts

Acoustic emissions travel readily through solid materials such as metal, but are strongly attenuated when traveling through air. As such, the Sensor is immune to airborne interferences and provides a non-invasive method of monitoring process activities.

The sensor can be configured electrically during wiring to operate in either low or high sensitivity range mode. The high sensitivity range applies where highest signal levels vary up to 40 dB. The low sensitivity range applies where highest signal levels vary between 28 and 68 dB.

SITRANS AS100 Sensor provides an analog output for use with the Sitrans Control Unit. The Sensor may be operated independently from the Control Unit by providing an external supply. The output is fed into a control panel, chart recorder, data logger, or programmable logic controller with a suitable input.

SITRANS AS100 Sensor is primarily used for solids flow detection. However, this device can be used in pump cavitation and fluid leak detection, provided sufficient noise levels are generated.

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#### Note

- The SITRANS AS100 is to be used only in the manner outlined in this manual
  - This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications
- 

### Features

- non-invasive
- screw in, bolt on, weld, or bond in place
- analog output
- high and low sensitivity range of operation





# Specifications

## Model

- standard standard operating temperature range (see below)
- extended extended operating temperature range (see below)

## Power

- 20 to 30 V DC
- 18 mA typical

## Operating Temperature

- standard -20 to 80 °C (-4 to 176 °F)<sup>1</sup>
- extended: -30 to 120 °C (-22 to 248 °F)<sup>2</sup> or  
-40 to 125 °C (-40 to 257 °F)<sup>3</sup>

---

### Note

<sup>1</sup> Available for CSA/FM Class II, ATEX versions

<sup>2</sup> Available only for CSA Class II version

<sup>3</sup> Not available for hazardous rated versions

---

## Relative Sensitivity

- 0.5% / °C of reading, average over the operating range

## Output

- analog, 0.08 to 10 V DC nominal, 100 K $\Omega$  minimum load impedance

## Construction

- housing 304 stainless steel  
303 stainless steel (CSA/FM Class II, ATEX II 3D version)  
aluminum (ATEX II 2GD version)
- cable standard: 4 m (13 ft) cable, PVC jacketed, 3 twisted pairs, 24 AWG, shielded  
extended: 4 m (13 ft) cable, thermoplastic elastomer jacketed, 6 conductor, 24 AWG conductor, shielded

## Ingress Protection

- IP68 (waterproof) The IP68 test was performed by immersing the enclosure in 1.8 m of water for 30 minutes.

## Weight

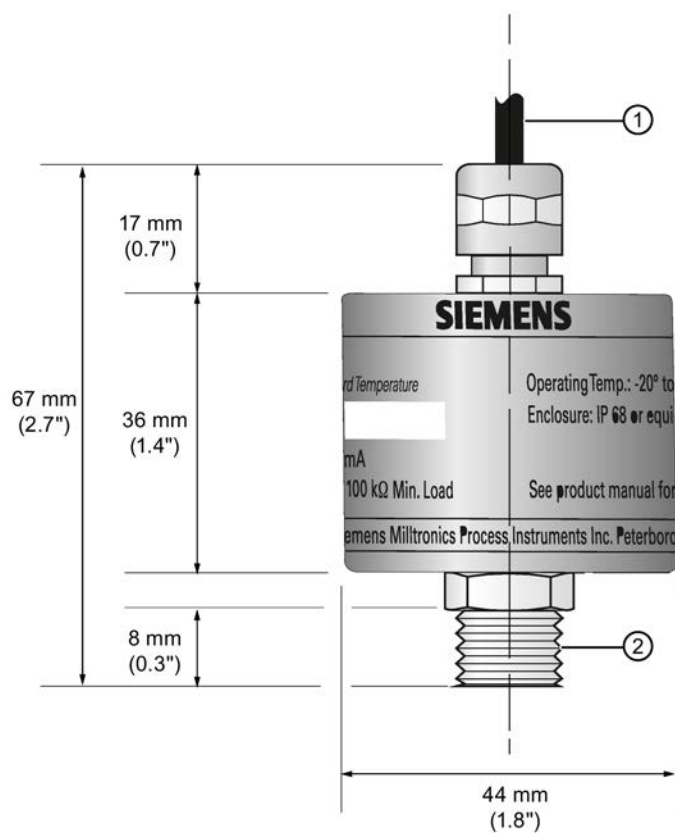
- 0.4 kg (1 lb.)
- 1.2 kg (2.65 lb.) (ATEX II 2GD version)

## Approvals

General	CE, C-TICK, KCC
Hazardous Europe:	ATEX II 2GD <ul style="list-style-type: none"><li>• Ex II 2G Ex d IIC T4 Gb</li><li>• Ex II 2D Ex tb IIC T100 °C Db</li><li>• DEKRA cert #: DEKRA 13ATEX0006 X</li><li>• Standards: 60079-0 : 2009, EN 60079-1 : 2007 and EN 60079-31 : 2009</li></ul>
	ATEX II 3D
US:	FM Class II, Div. 1, Groups E, F, G
Canada:	CSA Class II, Div. 1, Groups E, F, G

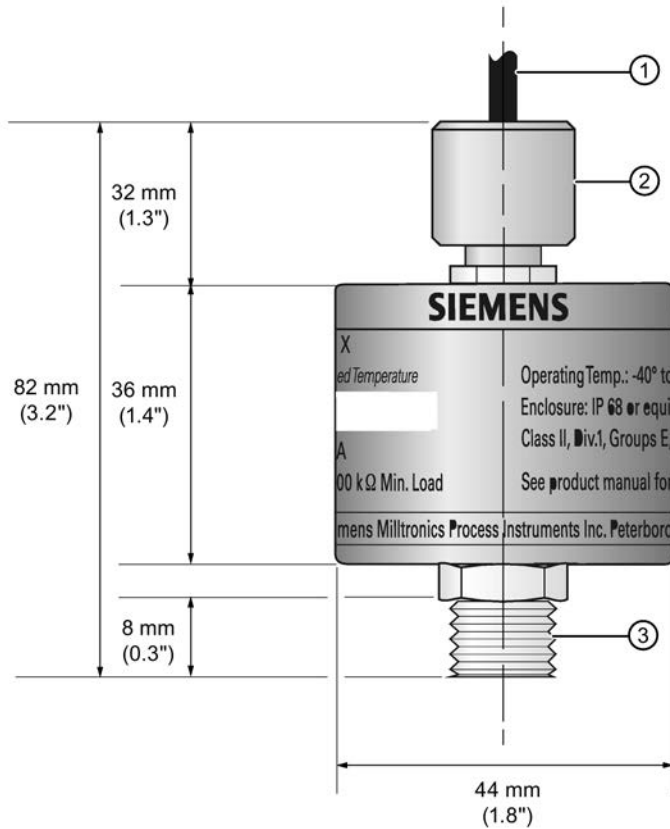
## Outline and Dimensions

### SITRANS AS100 (ST and ET versions)



- ① 6 x 24 AWG cable
- ② Mounting post, 17A/F nut and M10 thread

SITRANS AS100 (CSA/FM Class II Rated ST and ET versions)

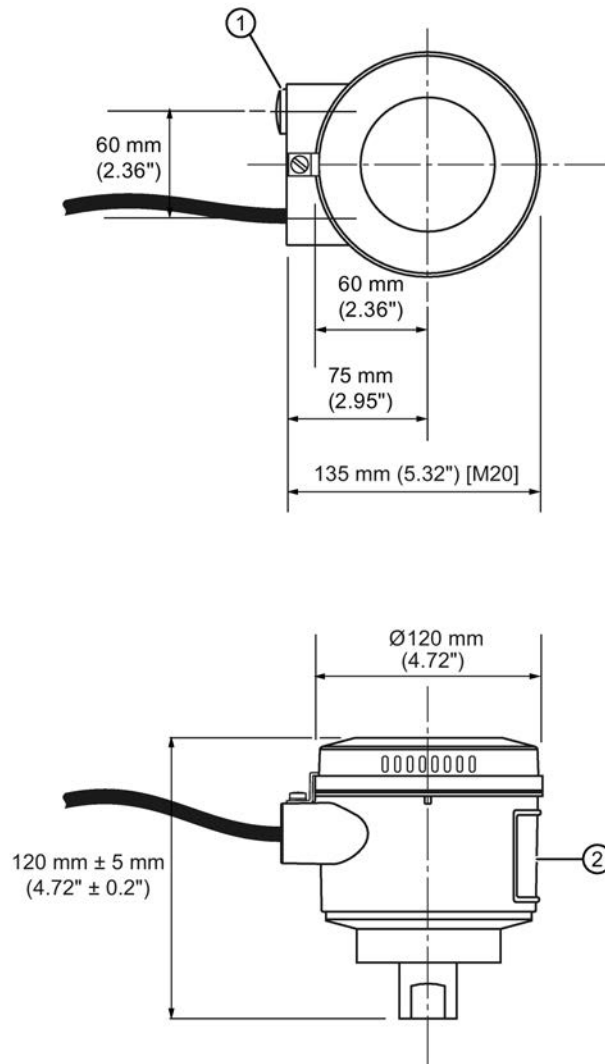


- ① 6 x 24 AWG cable
- ② ½" NPT (CSA and FM approvals) or M20 (ATEX approval) female conduit fitting
- ③ Mounting post, 17A/F nut and M10 thread

SITRANS AS100 (ATEX II 2GD version)

**! WARNING**

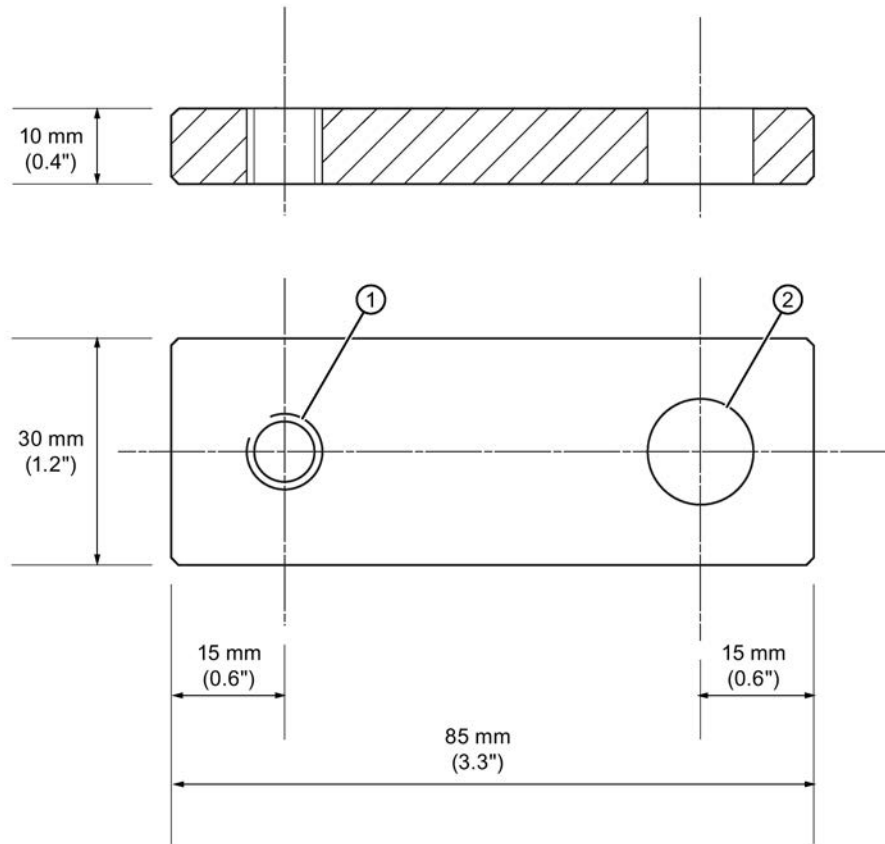
Do not open when an explosive atmosphere is present. Possible static hazard. Do not rub or clean the product on site.



- ① Cable entry (2) M20 x 1.5
- ② Enclosure

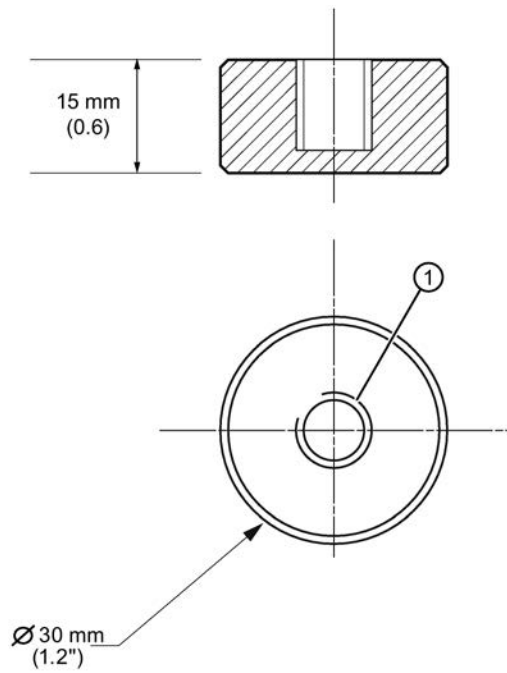
## Accessories

### Extension Tab (optional, not available for ATEX II 2GD version)



- ① SITRANS AS100 mounting hole M10 thread
- ② Bolt hole, 14mm (0.55")Ø

Mounting Disc (optional, not available for ATEX II 2GD version)



① SITRANS AS100 mounting hole M10 thread

---

**Note**

Both Tab and Disc are 304SS.

---





# Installation

## Ideal Locations

- areas where the acoustic emission levels are highest and most consistent
- where the material impact is greatest
- areas closest to the point of leakage (e.g. valve body)
- closest point to source of cavitation (e.g. pump body)

## Conditions to Avoid

- non-metallic surfaces, as these tend to attenuate acoustic emission levels
- pipes with non-metallic liners as these tend to attenuate acoustic emission levels

## Conditions to Consider

- joints and interfaces attenuate the acoustic emission levels.
- minimal temperature variation where acoustic emission levels are weak.
- location should provide sufficient response time in alarm or control circuit. e.g. loss of bearing lubrication, plug chute detection.

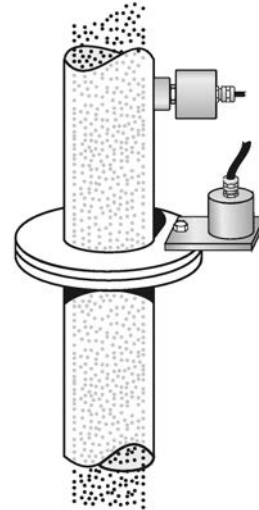
## Solids Flow Sensing

Recommended



Good friction between product and piping. Mount Sensor on the upstream side of gasket for highest level of acoustic emission activity.

Not Recommended



Minimal amount of acoustic emission activity due to limited friction between product and piping.

## Mounting

### Note

- To ensure the most ideal location, test the SITRANS AS100 by clamping the Sensor to the application, and running a trial period to determine the system's performance. The acoustic emission level can be monitored by a voltmeter across the analog output. Refer to Interconnection (Page 21).
- Coating the contact surfaces with grease enhances the propagation of acoustic emissions to the Sensor.

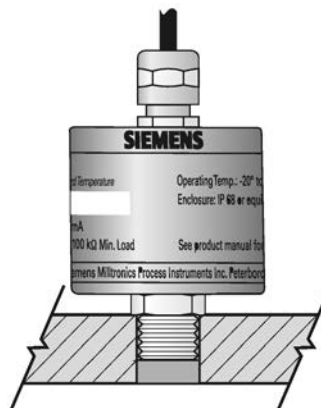
Mounting Method	Acoustic Coupling and Sensitivity
Clearance hole	Good
Drill and Tap	Good
Mounting Disc	Good
Extension Tab	Fair

### Direct Mounting



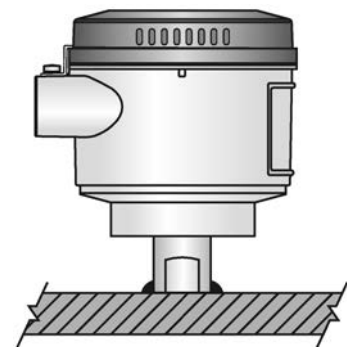
#### Clearance Hole

Insert mounting post through hole in device being monitored and fasten with customersupplied washers and nut.



#### Drill and Tap

Screw mounting post into threaded hole in device being monitored.



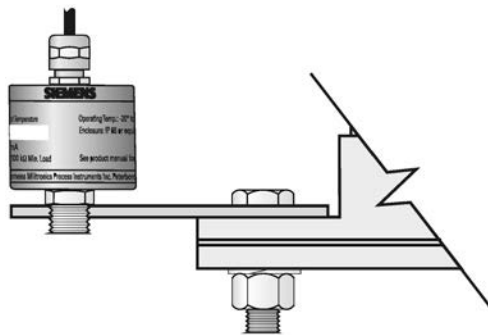
#### Contact

Weld or bond mounting post to device being monitored. When welding, first remove the acoustic sensor from the housing.

### Note

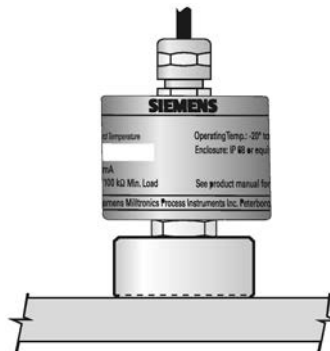
To ensure proper coupling, the face of the Sensor nut must be tight to the application surface.

## Accessory Mounting



### Extension Tab

Screw Sensor into threaded hole of tab, and fasten onto device being monitored.



### Mounting Disc

Screw Sensor into disc, after welding or bonding disc onto device being monitored.

---

### Note

- If welding, weld must be a continuous bead. Tacking does not provide sufficient acoustical coupling.
  - Do not arc weld on equipment connected to a SITRANS AS100. Remove the SITRANS AS100 or disconnect electrically to avoid current flowing through the sensor.
  - If gluing, use Loctite 326 adhesive, or equivalent. Follow manufacturer's instructions to ensure proper adhesion.
-

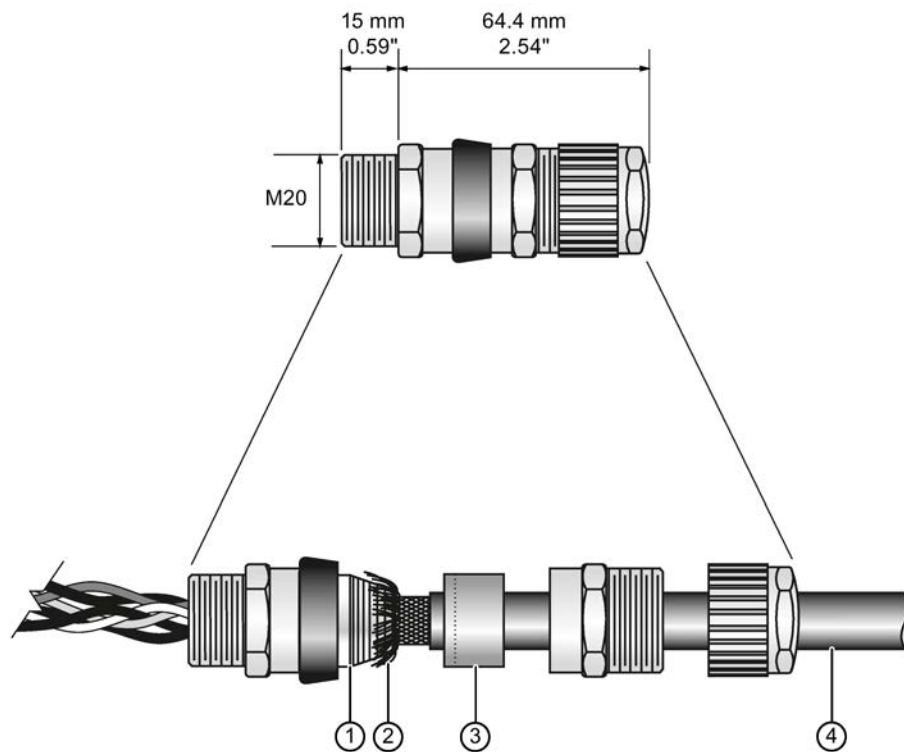


Figure 5-1 Cable Gland (optional for use with ATEX II 2GD version)

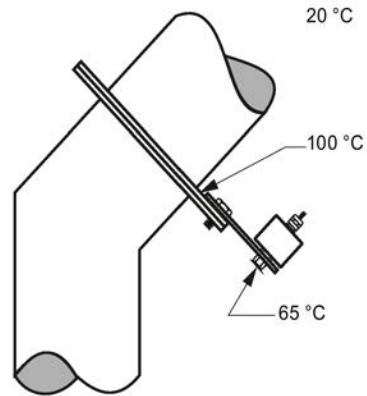
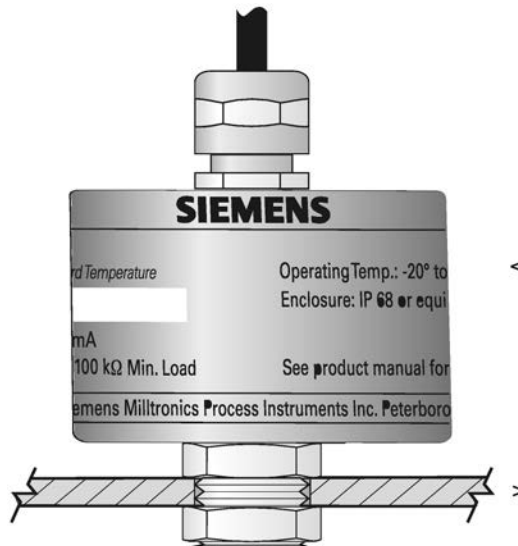
- ① Rubber component
- ② Foil Jacket
- ③ Sleeve
- ④ Cable with outer jacket

The ATEX II 2GD version is supplied with an approved cable gland. Installation of glands/ conduit must conform to local governing codes.

1. Disassemble the cable gland and discard the plastic membrane inside.
2. Route the cable into the M20 section of the gland and thread it onto the housing.
3. Mark the cable 2" (50 mm) from the entry of the housing then remove the acoustic sensor from the housing.
4. Remove the outer jacket of the cable from the acoustic sensor to the mark on the cable.
5. Reinstall the acoustic sensor into the housing and route the cable through the M20 section and into the throat of the rubber component.
6. Peel back the foil jacket (on the cable) over the tapered steel (connected to the rubber component).
7. Install the sleeve over the tapered steel part, and thread the remaining two parts of the gland onto the cable.
8. Tighten the assembly to ensure a seal of the gland over the cable with outer jacket.

## Temperature Considerations

<b>⚠ WARNING</b>
Temperature at Sensor must not exceed minimum or maximum ratings.



Ensure adequate isolation from hot surfaces by providing additional spacing.

**Note**

For standard Temperature range model, maximum temperature is 80°C.

\*maximum range dependent on model.

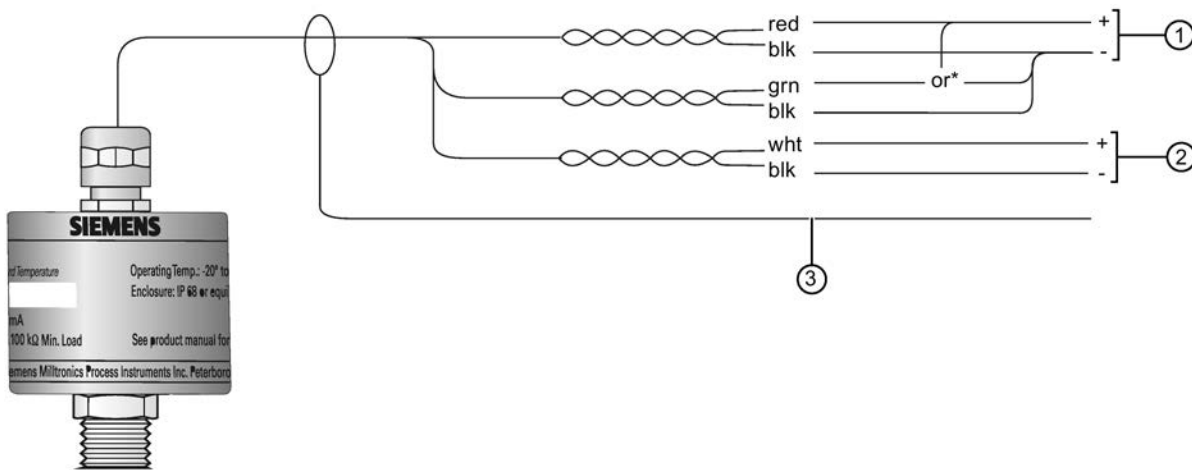
Tab acts as heat sink.

**Note**

If the flange temperature is 100°C and the ambient temperature is 20°C, the Sensor temperature at the electronics is below the maximum rating.

## Interconnection

### SITRANS AS100 Standard Temperature Version (ST)



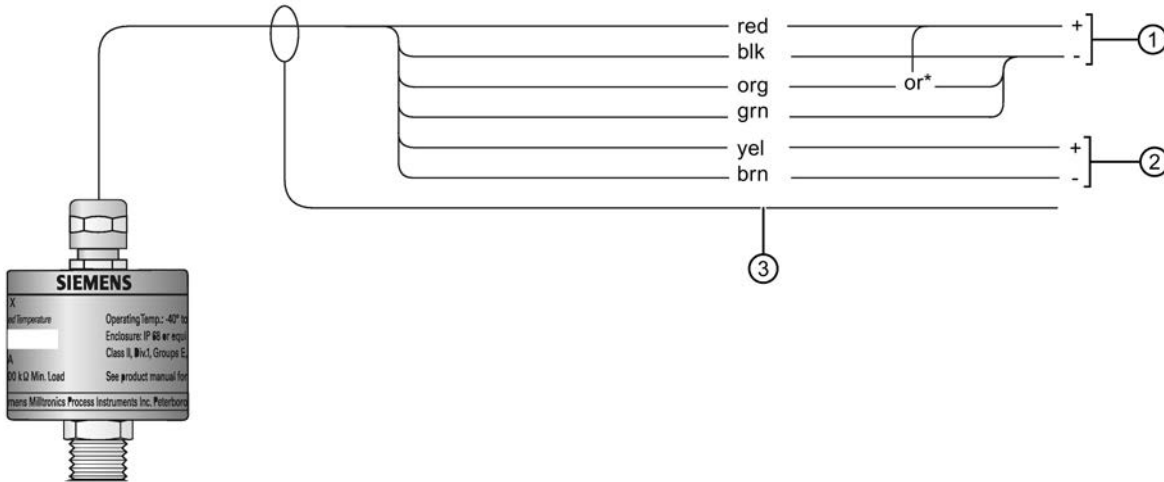
- ① Vsup: 20 to 30 V DC supply input
- ② Vsens: analog output 0.08 to 10 V DC nominal
- ③ shield--tied to Sensor casing

\*Sensor range selection

high sensitivity range = red and green to Vsup +

low sensitivity range = red to Vsup + and green to Vsup -

Extended Temperature Version (ET)



- ① Vsup: 20 to 30 V DC supply input
- ② Vsens: Analog output 0.08 to 10 V DC nominal
- ③ shield--tied to Sensor casing

\*Sensor range selection

- high sensitivity range = red and orange to Vsup +
- low sensitivity range = red to Vsup + and orange to Vsup -

**Note**

- Connect shield to ground at one end only!
- If Sensor mounting is grounded, leave cable shield disconnected
- If Sensor mounting is not grounded, connect cable shield to ground

The longer the cable, the more susceptible it is to noise and earth loops. We recommended using cable with heavy gauge conductors and good RF/electrical shielding (copper braid rather than drain and foil). A proper junction box close to the sensor is an ideal location not only to extend the cable, but to also to configure the wiring for high or low sensitivity range operation.

This table provides a guideline for suitable wire gauges where distances are considerable.

*Maximum distance between Sensor and supply (24V or Control Unit)*

wire size			distance	
AWG	mm	mm <sup>2</sup> *	meters	feet
24	7 x 0.20	0.22	500	1600
22	7 x 0.25	0.35	800	2600
20	10 x 0.25	0.5	1200	3900

\* nominal wire size



## Analog Output

The Sensor provides an analog output proportional to the level of acoustic emission activity. As the level of acoustic emission activity is a relatively good indication of process or mechanical activity, the output is suitable as an input to devices such as dataloggers chart recorders and programmable logic controllers.

The output is 0.08 to 10V (nominal), dc coupled, short circuit protected with a 60  $\mu$ s timeconstant. The minimum load impedance is 100 K $\Omega$ . Refer to Installation. (Page 15)

## Relative Sensitivity

The sensitivity of acoustic emission is affected by temperature. In most applications this is not a concern when considering the much greater changes in signal level due to changes in flow. However, it is important to be aware of the effect.

The sensitivity of the SITRANS AS100 Sensor decreases with increasing temperatures at a rate of approximately 0.5% per degree Celsius.

For example, if the temperature of the standard Sensor increased from 20 °C to 50 °C, its sensitivity would decrease by 15%. If the Sensor were to be used to monitor flow changes over such a temperature range, you should set an associated alarm setpoint at least 30% away from the normal operating level measured at 20 °C.

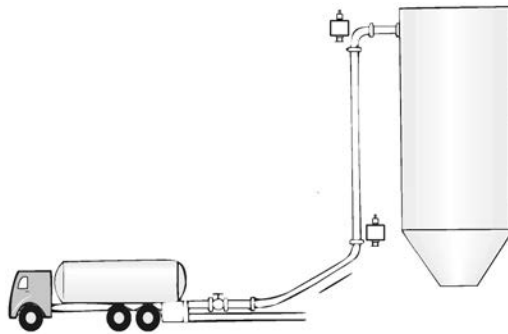


# Applications

## Pneumatic Conveyor

A tanker load of bulk solid material is being pneumatically conveyed into a silo. The Sensor detects the acoustic emissions generated by the particles impacting against the pipe wall and the output is used to activate the silo dust filter system.

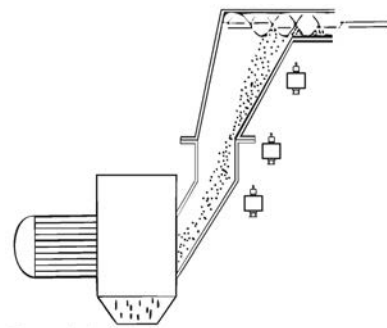
Recommended location is any impact point along the line, such as an elbow.



## Screw Conveyor Discharge

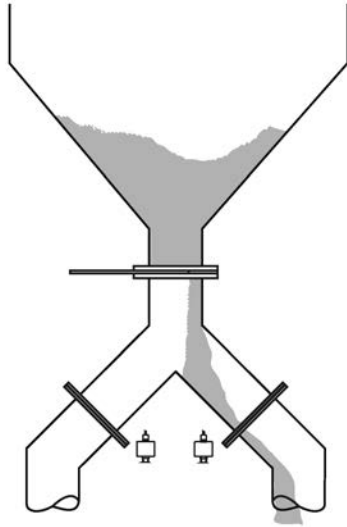
A fibrous material is being delivered to a pelletiser by means of a screw feeder. When loss of flow is detected by the Sensor, an alarm in the control room informs the operator of a possible blockage.

Recommended location is any point along the under side of chute, where there is friction due to the flow of material.

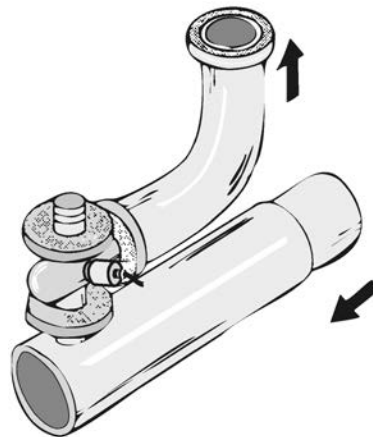
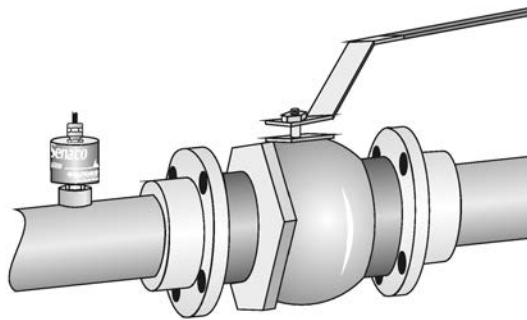


## Diverter Gate

The process material is stored in a hopper and fed into the process through a diverter gate. A Sensor mounted to each leg of the diverter indicates the presence or absence of flow in the open leg. Low alarm gives early indication of problems in the diverter gate or slide gate, or of blockage or material shortage in the hopper.

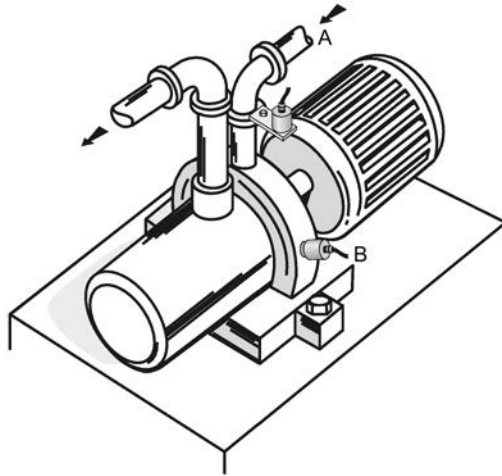


## Leak detection



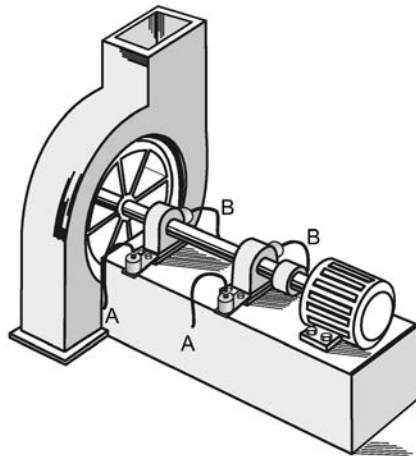
### Cavitation Monitoring

Install the SITRANS AS100 Sensor in B either A or B locations.



### Machine Condition Monitoring

Install the SITRANS AS100 Sensor in either A or B locations.



## Manufactured Date

To identify when the product was built use the tables below based on the serial number on the product.

Serial Number Scheme									
Company/Plant code	Separator	Year of MFG.	Month of MFG.	Day of MFG.		4 digit sequential # (0000 to 9999)			
PBD	/	S	1	0	1	0	0	0	1
PBD	/	S	1	0	1	0	0	0	2
PBD	/	S	1	0	1	0	0	0	3

Refer to following tables for encoding formats.

### Encoding of Letters

Year of Manufacture (one character alpha entry)										
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ALPHA CODE	M	N	P	R	S	T	U	V	W	X
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ALPHA CODE	A	B	C	D	E	F	H	J	K	L

Month of Manufacture (one character alpha or numeric entry)											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2	3	4	5	6	7	8	9	0	N	D

Day of Manufacture (two character numerical entry)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

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## For more information

[www.siemens.com/level](http://www.siemens.com/level)

[www.siemens.com/weighing](http://www.siemens.com/weighing)

Siemens Canada Limited  
1954 Technology Drive  
P.O. Box 4225  
Peterborough, ON  
Canada K9J 7B1

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