



INTRINSICALLY SAFE S311X AND S313X Ex Series DUST MONITORS

User Manual

Version 1.3
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Distributor

Table of Contents

1.	INTRODUCTION.....	4
1.1	Safety	4
1.2	Product overview.....	4
1.3	How does it work?.....	5
2.	INSTALLATION.....	6
2.1	Selection of installation location.....	6
2.2	Installation of the sensor.....	7
2.3	Installation of the junction box and signal processing unit.....	9
2.4	Installation of cable between sensor and junction box.....	10
3.	WIRING OF POWER AND OUTPUT CIRCUITS	12
3.1	Power connectors (X3)	12
3.2	Output connector (X5)	13
4.	WIRING OF JUNCTION BOX	14
5.	TECHNICAL SPECIFICATION	16
6.	DIMENSIONS.....	18
7.	OPERATION	19
7.1	Parameter setting.....	19
7.2	How to change parameter values.....	19
7.3	Relay 1 trig value and relay 2 trig value.....	21
7.4	4mA trim and 20 mA trim.....	21
7.5	Relay filter time constant and mA output time constant	21
7.6	Automatic setup.....	22
7.7	The manual range option.....	23
7.8	User interface	24
	ZENER BARRIER REQUIRED PARAMETERS.....	25
	NOTES	27

1. INTRODUCTION

This manual refers to SINTROL's Triboelectric Dust Monitors. Sintrol welcomes any comments or suggestions relating to this document.

This manual is intended as a guide to the use and installation of the product. Sintrol shall not be liable for any loss or damage whatsoever arising from use of any information or details therein, or omission or error in this manual, or any misuse of the product.

1.1 Safety

This equipment operates from either 115 VAC, 50/60 Hz or 230 VAC, 50/60 Hz or 24 VDC. In either case, the voltages employed must at all times be treated as lethal and suitable precautions taken whenever carrying out any form of installation or maintenance, particularly when the cover of the unit is removed. S300 Ex Series dust monitors are virtually maintenance free. The customer under no circumstances should attempt to replace any component or the PC board. If there is a fault in monitor contact your local distributor or the manufacturer.

It is essential that the equipment be properly grounded! (See section 3)

It is possible that the sensor is installed in duct containing particulate which is hazardous to health. The particulate may be inflammable or explosive. Particulate could be toxic or contained in a high temperature gas.

Connection to the power supply is fixed installation with no separate mains disconnect. Customer has to arrange mains disconnect to the power line to be able to shut it off (if required). The electrical installation must be carried out following all applicable regulations.

Unless the process conditions are known to be entirely safe, suitable precautions must be taken before any entry is made into the duct for installation or maintenance purposes.

1.2 Product overview

The S311X and S313X intrinsically safe dust monitors are microprocessor-based, self-adjusting devices, equipped either with two alarm relays or one relay and 4-20 mA signal output. Sensor is designed for explosive environments fulfilling Atex certificate requirements, II ½ GD EEx ia IIC T6, IP65 T 85 °C. It is a measurement system with the Eex sensor, junction box



and signal processing unit (measuring instrument), that has been specifically designed for easy installation and operation.

The sensor is intended to measure the dust particle density in gas, which is flowing in the duct. The EEx-type sensor unit consists of a probe and a preamplifier, and is intended to be used with various SINTROL DUST MONITOR 300 Ex series measuring instruments.

Using of zener barrier devices between the preamplifier and main electronics is necessary. Any commercially available zener barrier devices with specifications fulfilling the requirements stated in the user manual may be used.

The probe is a steel rod, which is inserted in a duct or pipe. The dust particles flowing in the duct, which are electrically charged, induce a charge in the sensor rod, when passing by the rod.

1.3 How does it work?

The S300 Ex Series Dust Monitors utilise the proven and reliable triboelectric technology whereby the interaction of particles with the sensor rod causes a small electrical charge transfer to occur between the particulate and sensor. It is this small charge which provides the signal which is monitored by the electronics. Provided that the material type remains constant, the signal generated is proportional to the mass flow rate of solid particles even if an accumulation of dust forms on the sensor. Experience has shown that this method of solids flow monitoring will provide accurate results with minimal maintenance.

2. INSTALLATION

2.1 Selection of installation location

The best position to install the S300X Series sensor is in a section of duct or pipe where the particulate has an even distribution and the flow is linear. This is to ensure that the sensor rod comes into contact with a representative flow of particles. This would ideally be in a vertical or horizontal section of duct/pipe, having no bends, valves, dampers or other obstructions for at least three duct diameters downstream and upstream (preferable 5 x duct diameter). In some applications, a compromise must be made and the sensor would be fitted in a position which satisfies the majority of above requirements. The S300X Series sensor must be mounted to metal ductwork in order to be electrically shielded from interference and to provide a ground reference. The monitor should not be mounted in direct sunlight or in areas where the ambient temperature is above 45 oC. If you need temperature range higher than 45 oC, you should use 24VDC model. Please contact your local distributor or Sintrol if you require further advice.

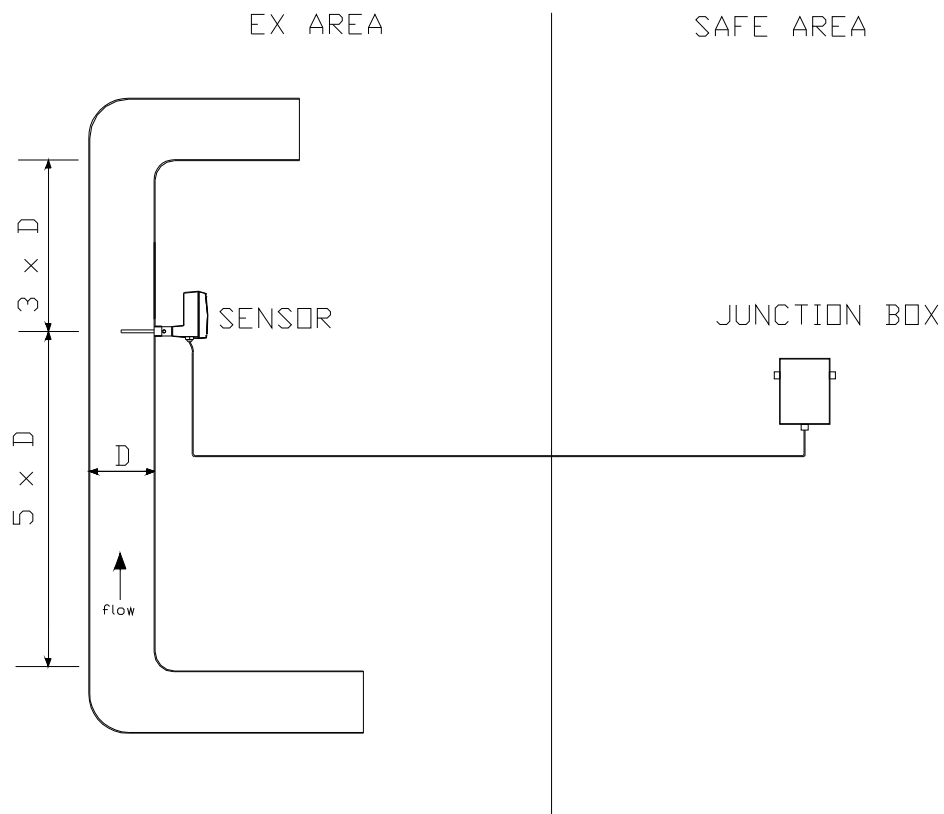


Figure 1. S300X Series Intrinsic Safe Dust Monitor recommended installation location

The sensor rod should be positioned pointing towards the centre line of the pipe or duct and perpendicular to the flow. For ducts of square cross-section, the sensor should be located in the centre of one of the sides. In either case, the tip of the sensor rod should reach at least 1/3 of the diameter. Depending on the dust concentration, the probe length could vary from 1/3 to 2/3 of the duct diameter. The lower the dust concentration the longer the probe.

When monitoring a dust collection system, good location is generally found upstream of the blower (assuming a negative pressure system). When the monitor is used to control system with an electrostatic precipitator (ESP), the distance from the ESP should be at least 20 m. Although the sensor (lengths under 1m) is immune to the effects of vibration, very high vibrations should be avoided.

2.2 Installation of the sensor

Once the location has been selected, the mounting fitting (socket) must be welded to the pipe or duct. The first step is to cut a hole in the pipe/duct **slightly larger than the OD of the mounting fitting, (mounting fitting outer diameter = 38 mm)**. The fitting should be perpendicular to the flow. The weld and fitting must be airtight. After welding the monitor can be inserted.

EARTH CONNECTIONS

Make sure that the case of the sensor is connected to the local ground, with a wire at least 1,5 square millimetres thick, between the earthing screw outside the case and the closest place where good ground is present, for instance the metal duct. Use earth connector that goes round the earthing screw to avoid earth wire to slip off.

WARNING!

THE SENSOR ENCLOSURE IS MADE OF LIGHT METAL ALLOY!!

Take care that you do not hammer the case or drop tools on the case, and that there does not exist danger of things to hit the case after installation, because this can cause danger of explosion. Make sure that the warning label, which is attached on the case, is clearly visible after installation is complete.

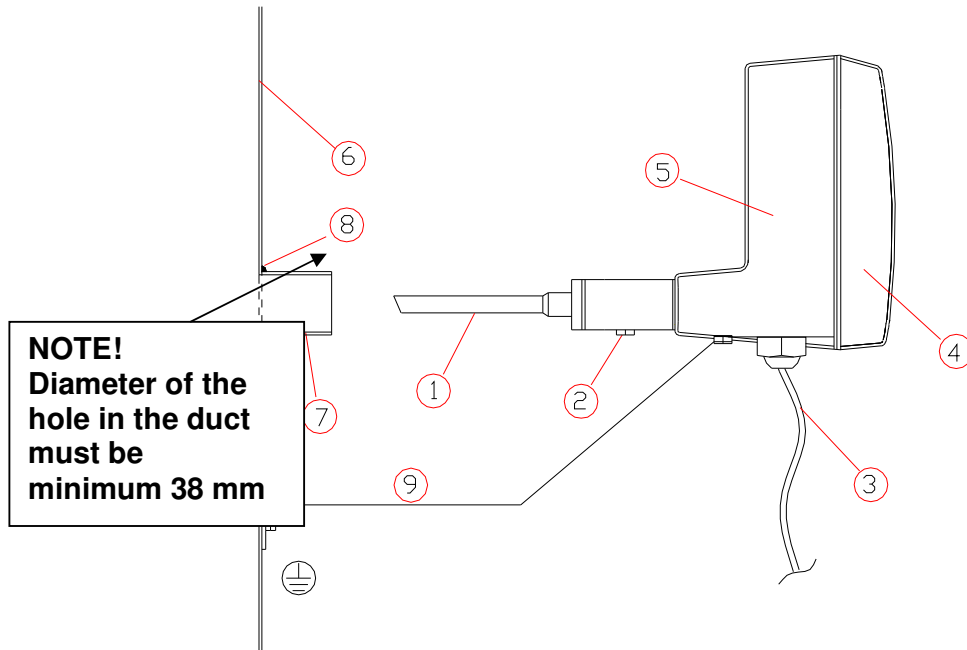


Figure 2. Sensor installation

1. Sensor probe
2. Lock nut
3. Cable (2 pairs) to junction box and main electronics
4. Cover
5. Enclosure
6. Duct wall
7. Mounting fitting (socket)
8. Weld
9. Grounding wire

Sensor printed circuit board connections:

Connector X1 position1:	cable pair shield drain wire
Connector X1 position2:	cable pair shield drain wire
Connector X2 position 1:	V_{out} - signal output
Connector X2 position 2:	V_{ref} $\frac{1}{2}$ - signal reference output, internally connected to ground
Connector X2 position 3:	V_+ $\frac{1}{-}$ - supply voltage1, +2,5V nominal
Connector X2 position 4:	V_- $\frac{2}{-}$ - supply voltage2, -2,5V nominal

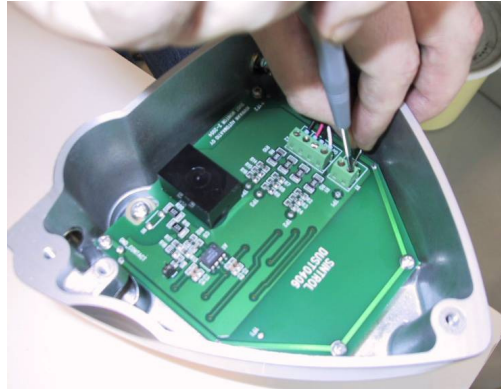


Figure 3. Connecting sensor wires

2.3 Installation of the junction box and signal processing unit

JUNCTION BOX

Connect the sensor only to a junction box, which has zener barrier devices to separate the sensor from main electronics. The junction box is not allowed to install in potentially explosive atmosphere. A junction box is available from Sintrol.

Requirements for the junction box:

- EMC regulations require use of the metallic junction box.
- Cable connections and separation between the safe side and the non-safe side (EEx) must be performed according to the requirements of European standard EN 60079-11, if installed inside European Union area, or local standard, which corresponds to standard EN 60079-11.
- Use EEx-type gland for the cable between the junction box and the explosion proof sensor. Cable gland has contact springs inside to connecting cable shield to enclosure = ground potential.
- **The junction box is not allowed to ground locally** to avoid ground current loop. The junction box and the main electronics are connected to ground potential with the cable shield through the sensor case.

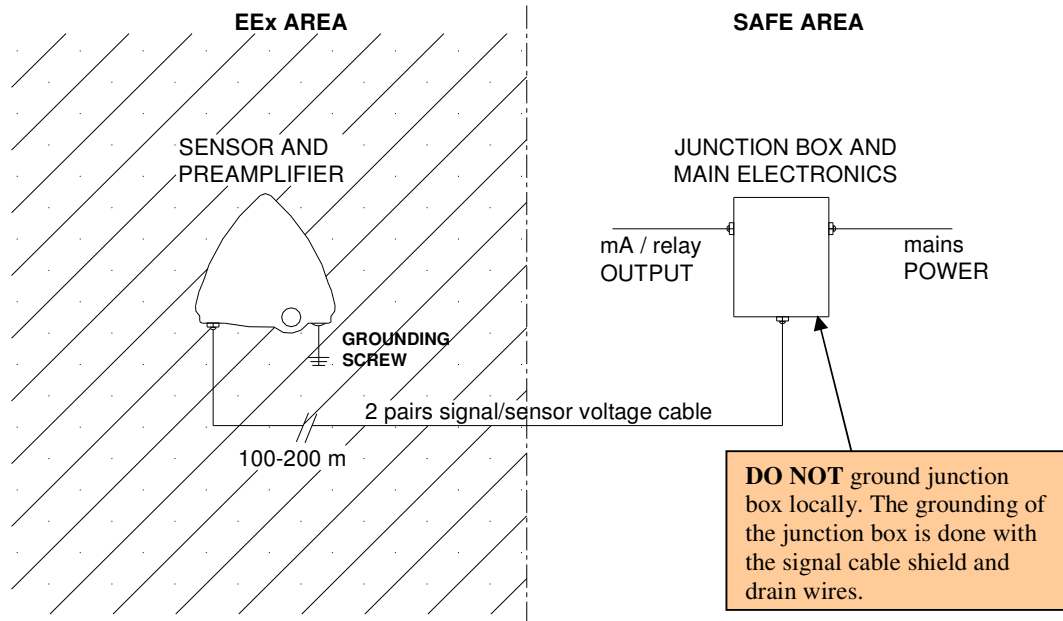


Figure 4. Sensor and Junction box

2.4 Installation of cable between sensor and junction box

Use shielded twisted pairs, individually shielded two pair cable between the junction box and the explosion proof sensor. Use crimped bootlace ferrules on wire ends to prevent loose strands of wire. Wire ends without ferrules are a potential explosion hazard, and are not approved to be used with the explosion proof sensor.

Maximum tested cable length between the junction box and the explosion proof sensor is 100 m. In good interference free conditions 200 m.

Connect outer shield of both cable ends as is shown in figure 5a, 5b and 5c. Connect only sensor enclosure to ground potential to avoid ground current loop. Do not connect junction box to local ground potential. The grounding of junction box is made with the cable shield and uninsulated drain wires of the signal cable.

Connector X2 is for the four external connections. Connect the other ends to zener barrier hazardous area side, which is marked blue. Use two dual channel zener barrier devices; see zener specification at the end of manual. Connect the signal and the signal reference wires to one zener barrier, and the sensor supply voltages to the other zener barrier. Connect uninsulated drain wires to the ground of zener barriers.

Make sure that you do not lay the wiring so that distance between bare metal in the safe side and the hazardous side may become less than 50 millimeters.

Cable gland installation for the cable between the sensor and the junction box.



Figure 5a
-Strip cable
-Expose braided shield



Figure 5b
-Feed cable through dome nut and clamping insert
-Fold braided shield over clamping insert
-Make sure braided shield overlaps O-ring



Figure 5c
-Push clamping insert into body in tighten dome nut

3. WIRING OF POWER AND OUTPUT CIRCUITS

3.1 Power connectors (X3)

Voltage:	230 VAC +/- 20 V or 115VAC +/- 10V or 24 VDC
Frequency:	45 Hz ... 65 Hz for 230V and 110V models.
Power cable:	3 x 1,5 mm ²
External fuses:	Two 200 mA slow (T) fuses

All power supply wiring inside the junction box is pre-wired at the factory. Power is fed to the junction box and to the main electronics via mains power cable.

Check the type label to confirm that the power supply type is correct. Connect AC or DC power supply wires to the first and third pin of the external connector. Polarity is free. The middle pin of the connector is for the earth wire, but the earth wire is not required.

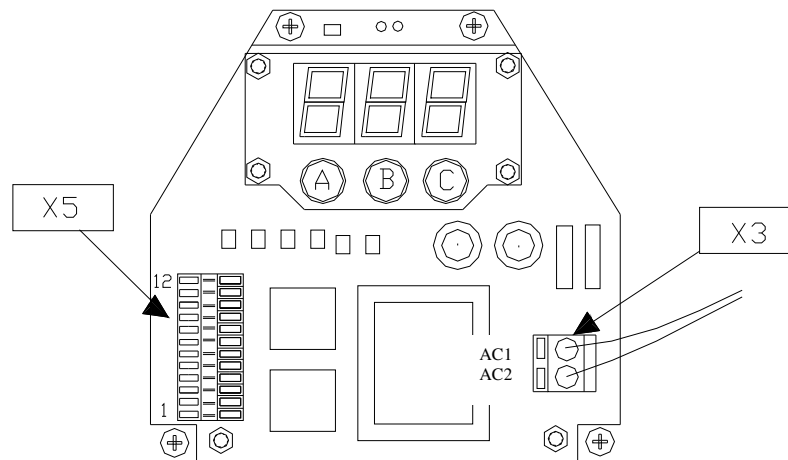


Figure 6. power connector X3

NOTE: Protect both power supply wires with an external 200 mA slow (T) fuse !!

Note: When using 24 VDC transformer please note that AC2 in X3 connector is for positive (+) voltage input and AC1 for negative (-) voltage input.

3.2 Output connector (X5)

The junction box contains zener barrier devices for the sensor signal. A two pair cable is connected between the sensor and the zener barrier blue end connector screws, as described in section 2.4.

Note: The output signal functionality depends on the dust monitor model.

Slot 1	Relay1 normally closed (NC) terminal.	}	ALL MODELS
Slot 2	Relay1 common (C) terminal.		
Slot 3	Relay1 normally open (NO) terminal.		
Slot 4	Relay2 normally closed (NC) terminal.		
Slot 5	Relay2 common (C) terminal.		
Slot 6	Relay2 normally open (NO) terminal.		
Slot 7	4-20 mA (+) positive terminal, active output	}	S312X, S313X, S314X, S315X
Slot 8	4-20 mA (-) negative terminal, active output.		
Slot 9	RS 485 output (+) terminal	}	S314X, S315X
Slot 10	RS 485 output (-) terminal		
Slot 11	RS 485 input (+) terminal		
Slot 12	RS 485 input (-) terminal		

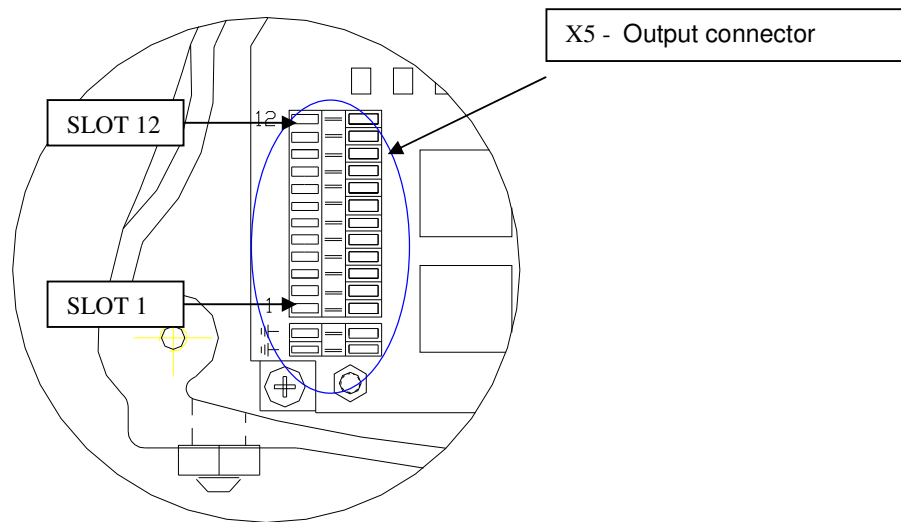


Figure 7. Output connector in main electronics

4. WIRING OF JUNCTION BOX

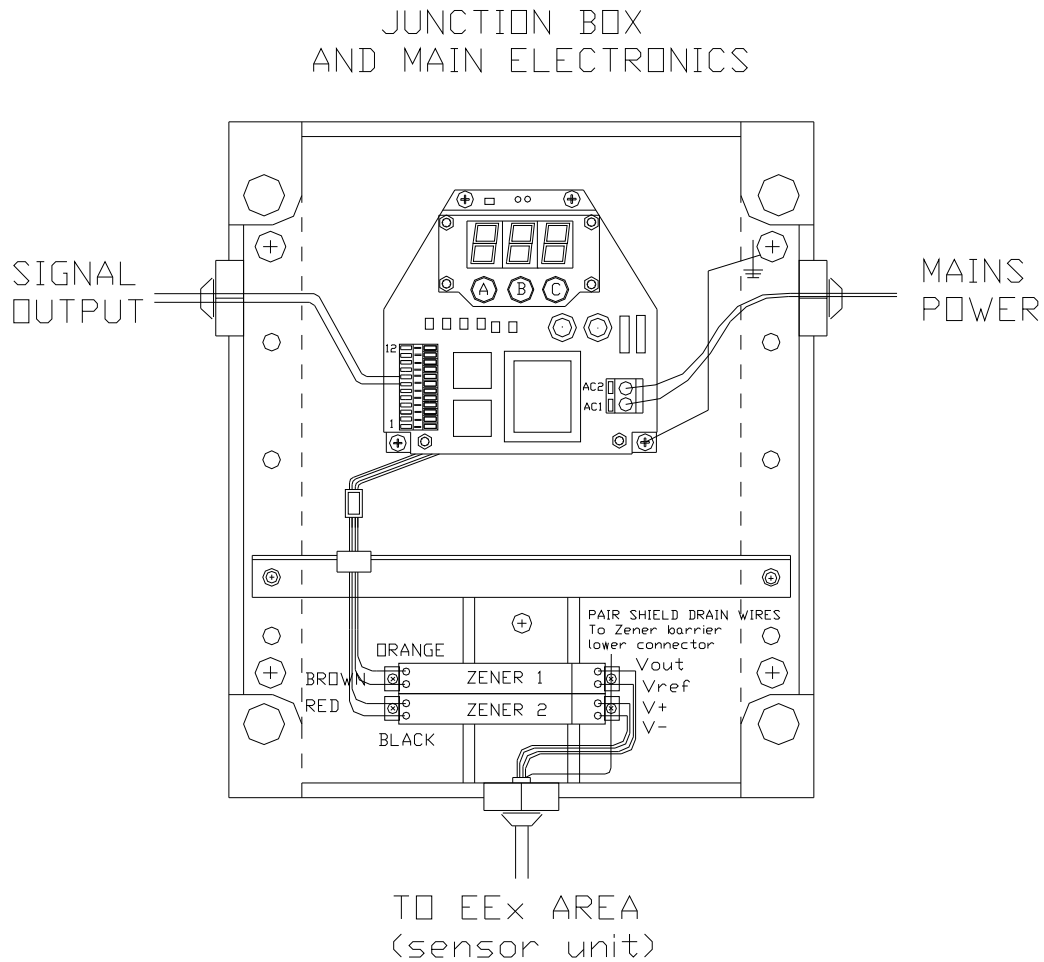


Figure 8. Wiring layout of Junction Box

NOTE:

The output signal cable shield is allowed to ground only in junction box end!!

Use cable gland contact springs for grounding output signal cable shield to same potential with the junction box

See picture 6.

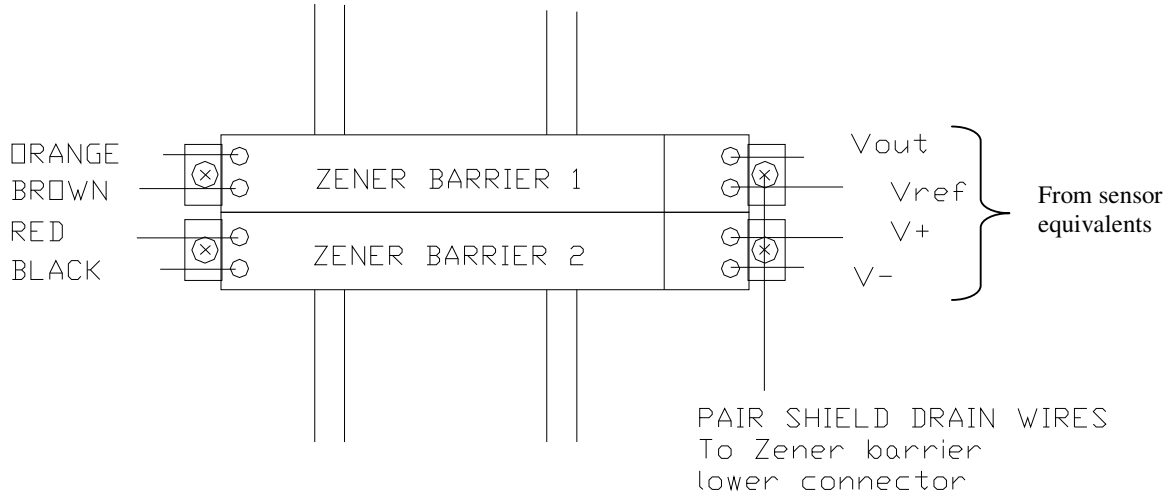
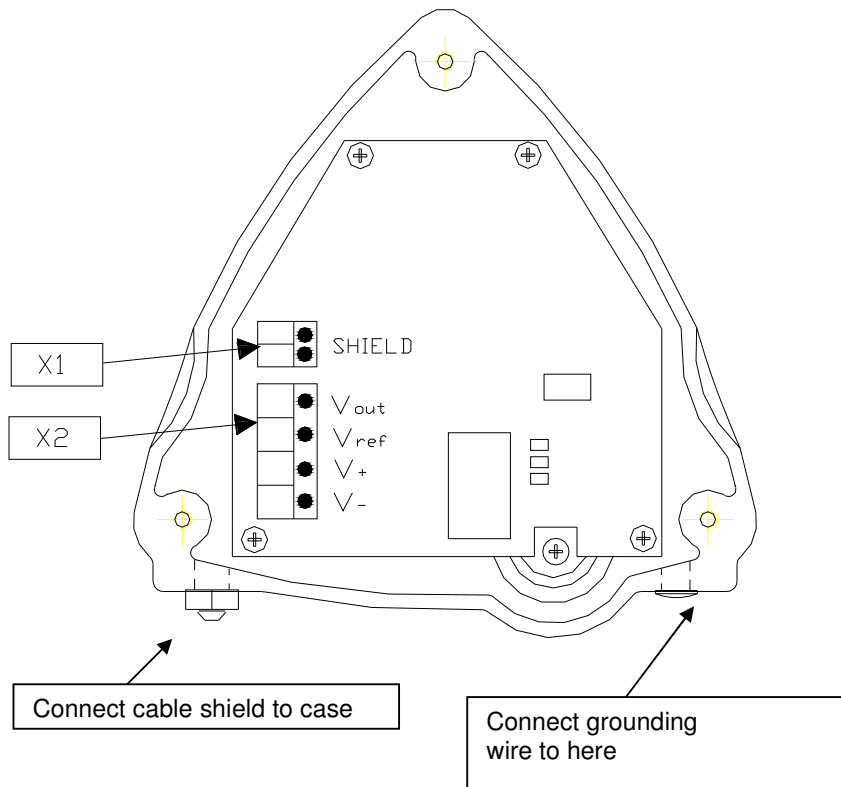


Figure 9. Wiring of Zener barriers in junction box

Figure 10. Sensor enclosure and connections



5. TECHNICAL SPECIFICATION

Measurement objects:	Solid particles in a gas flow
Particle size:	0.3 µm or larger
Measurement range:	0.1 mg/m ³ to 1 kg/m ³
Process Conditions:	
Temperature:	Max. 100°C (standard) / 200-350°C (option)
Pressure:	Max. 2 bar
Gas velocity:	Min. 4 m/s
Humidity:	95 % RH or less (non-condensing)
Input surge protection:	Under 20 kA pulses limited to 90 V
Measurement principle:	Electrostatic charge detection
Damping time constant:	10 to 180 seconds
Output signals:	isolated 4-20 mA (N/A in S301) relay 5 A , 24 V AC or DC
Ambient conditions:	
Temperature:	-20 to + 45°C
Humidity:	95% RH (non-condensing)
Vibration:	5 m/s ² or less
Materials:	
Probe:	SS 316 L
Insulation of sensor:	PEEK
Enclosure:	Aluminium
Power Supply:	115 VAC or 230 VAC or 24 VDC
External fuse requirement:	two 200 mA slow (T) fuses
Power consumption:	8 W for AC models, 3 W for 24VDC model
Wiring connections:	External mains connector DIN rail connector for output signals PG11 EMC-type cable glands for signals
Weight:	Sensor 2.0 kg Junction box 3.5 kg
Monitor warm up time	15 minutes
Range setup options:	
Normal measuring range:	-automatic, based on average measured dust flow
Extended measuring range	-manual range setup (not in model S315X)
Relay alarm options:	
- Alarm level:	two alternative methods: -automatic, set at factory (based on average measured dust flow) -set with operating terminal
Offset trim:	automatic


FULFILLS FOLLOWING ATEX REQUIREMENTS:



II 1/2 G Ex ia IIC T6
II 1/2 D Ex tD A20/A21 T 85 °C
IP 65

L_i : 10 μ H C_i : 1 nF
 U_i : 10 V I_i : 150 mA

Compliance with the Essential Health and Safety Requirements has been assured by compliance with the standards

	EN 60079-0 (2006)
	EN 60079-11 (2007)
	EN 60079-26 (2007)
	EN 61241-1 (2004)
	EN 61010-1:2001, LVD
	IEC 61326-1:2005 (First Edition) , EMC

6. DIMENSIONS

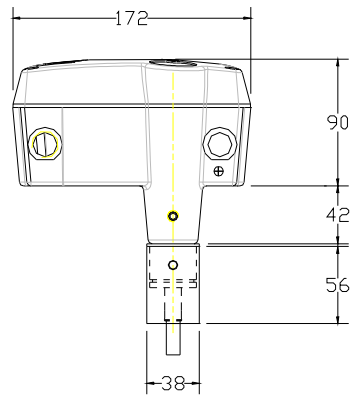


Figure 11. Dimensions of S300X series Dust Monitor ATEX Sensor

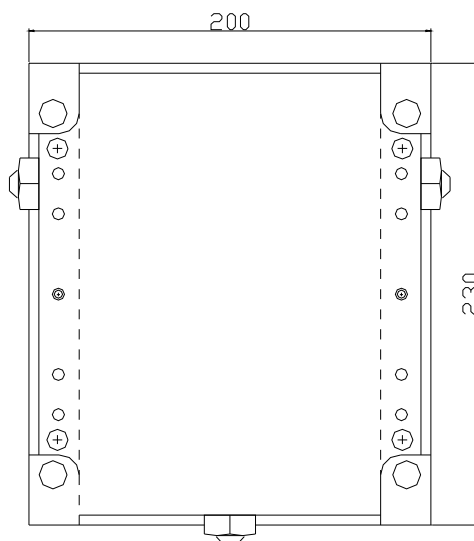


Figure 12. Dimensions of S300X series Junction Box

7. OPERATION

7.1 Parameter setting

The S311X/S313X Dust Monitor measures the dust flow rate by measuring the current induced in the probe by charged solid particles impacting or passing by the probe. The S313X instrument has a 4...20 mA output, and two relay contact alarm outputs. The S311X has two alarm relay outputs only.

The measured dust flow value is low pass filtered to remove the effect of short variations, like spikes in the input signal, with a user selectable time constant, then changed to a milliamper output, which follows the filtered value with a scale set by the AUTOMATIC SETUP procedure. The user may trim the milliamper output of the 4...20 mA signal.

The relay output(s) change their state, when the measured dust flow rate value exceeds a user selected alarm trig level. The relay output(s) are also protected against the effect of short variations in the input signal, with a user selectable time constant (damping parameter 5), common for both relays.

All the user selectable parameters have factory setup values, which in many cases will suffice. If your application requires changing of the parameters, proceed as follows.

7.2 How to change parameter values

Open the cover of the junction box. You see the front panel, display unit and three parameter change button. (A, B and C)

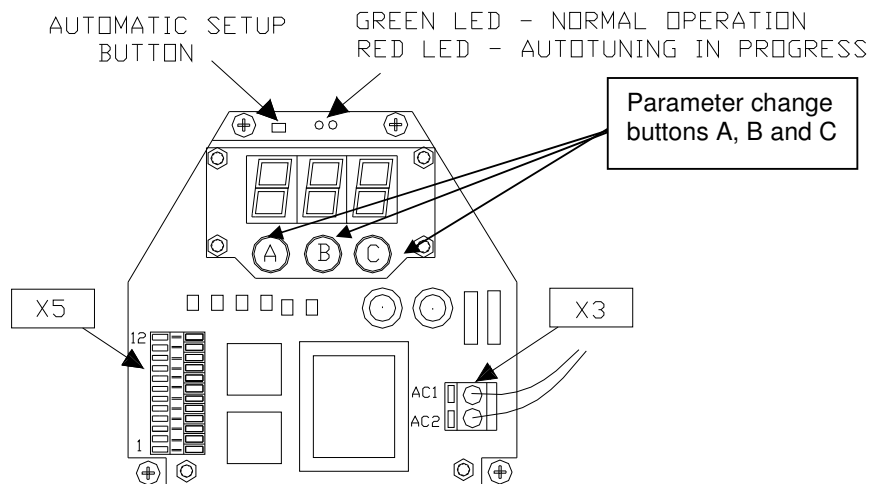


Figure 13.S300 Ex series Dust Monitor front panel in junction box

Press the leftmost (key A) of the three keys below the display, until the leftmost digit indicates the number of the parameter you wish to change, 1 .. 8. (See Table 1).

The two other display digits now show the parameter value. Pushing the middle key (B) and rightmost key (key C), you may now change the parameter value, see instructions below for each individual parameter.

When you have selected all the parameters, push the leftmost (A) key again until the leftmost display digit shows number 8 and two other digits shows - -. Push one of the other keys (B or C) to save all the parameters. NOTE: All parameters must be as you wish to have them, when you save them. If you want to make more changes, or decide not to save the parameters you have changed, push the leftmost (A) key again.

If any parameter value is different from the values which you have saved, when you return from changing parameters, the value will remain in effect until next power down. The saved parameter values will then be in effect after power supply is connected again.

PARAMETER CHANGE TABLE

PARAMETER	DISPLAY LEFT NUMBER	RANGE	KEY EFFECT KEY B	KEY EFFECT KEY C	FACTORY DEFAULT
Relay 1 trig value	1	1...99%	add 10%	add 1%	5%
Relay 2 trig value	2	1...99%	add 10%	add 1%	60%
4 mA trim	3	-	increase current	decrease current	set to 4 mA (Not in use model S311X)
20 mA trim	4	-	increase current	decrease current	set to 20 mA (Not in use model S311X)
Relay filter time constant	5	10...180 s	add 10s	-	0
Current filter time constant	6	10...300 s	add 10s	-	0 (Not in use model S311X)
Manual range	7	0 ... 5	Next range	Previous range	0
Save parameters	8(-SP)	- -	save all	save all	-

Table 1. PARAMETER CHANGE TABLE FOR S311X-model.

PARAMETER	DISPLAY LEFT NUMBER	RANGE	KEY EFFECT KEY B	KEY EFFECT KEY C	FACTORY DEFAULT
Relay 1 trig value	1	1...99%	add 10%	add 1%	5%
Relay 2 trig value	2	1...99%	add 10%	add 1%	60%
4 mA trim	3	-	increase current	decrease current	set to 4 mA
20 mA trim	4	-	increase current	decrease current	set to 20 mA
Relay filter time constant	5	10...180 s	add 10s	-	0
Current filter time constant	6	10...300 s	add 10s	-	0
Percent level of full Range*	7	10-50 %	increase 10 %	decrease 10 %	20 %
Manual range	8	0 ... 5	Next range	Previous range	0
Save parameters	9(-SP)	- -	save all	save all	-

Table 2. PARAMETER CHANGE TABLE for S313X-model.

7.3 Relay 1 trig value and relay 2 trig value

Parameter 1 and 2

Set the trig levels in percent of the output full scale value, which is determined by AUTOMATIC SETUP. You may only increase the trig value by pressing the keys. The percentage is displayed by the two rightmost display digits.

7.4 4mA trim and 20 mA trim

Parameter 3 and 4

Increase or decrease the output current. The display shows the nominal mA value with its two rightmost digits. Connect a calibrated mA meter to the milliamp output to check the actual current value. Allow 30 minutes warm up time before trimming the mA output.

7.5 Relay filter time constant and mA output time constant

Parameter 5 and 6 (latter not in use in S311X-model)

Change the time constant in increments of 10 seconds. The relay filter time constant will change back to 10s from 180s, the mA signal output time constant from 60s. The two leftmost digits of the value are displayed by the two rightmost display digits.

For example:

(three digit display shows digits 506 = parameter 5 and relay damping is set to 60s)

(three digit display shows digits 612 = parameter 6 and mA damping is set to 120s)

7.6 Automatic setup

To be able to detect variations in dust flow, and to set alarm in case of excessive dust flow variation, the dust monitor needs to know the typical dust flow in your application, when your process operates normally.

The dust monitor has an AUTOMATIC SETUP function. With this, you set the measuring range of the dust monitor such that typical dust flow in your application corresponds to 20% of the dust monitor output full scale.

The 4...20 mA output at the typical dust flow rate will then be 4 mA + 20% of 16 mA (20 mA– 4 mA) which makes 7.2 mA. If the dust flow rate is 5 times the typical value or higher, the output will be 20 mA, and if the dust flow rate is zero, the output will be 4 mA.

Parameter 7 (Only in model S313X)

If you want to change the default percent of full Range (factory default value is 20%) for some reason, it is possible to change it in steps of 10 % from 10 to 50%, see Table 2.

For AUTOMATIC SETUP you need to know that the process is running with a normal dust flow rate. Then open the cover of the dust monitor, and initiate AUTOMATIC SETUP by pressing the small white key button near the indicator lamp, on the lower printed circuit board (see Figure 13). NOTE: the indicator lamp should be green before you press the key.

The dust monitor starts collecting data of the dust flow. This takes an hour or less. The three digit display counts down towards zero, and the indicator lamp is red as long as the data are being collected. To avoid interference from the background electrical noise, you should close the cover of the junction box enclosure right after having initiated the AUTOMATIC SETUP. Cover of the sensor enclosure located in Ex - area must be closed during automatic setup. After an hour, the setup is ready and the dust monitor is in normal operation. If your environment is not electrically noisy, you may check the indicator lamp. It turns back to green, when setup is ready.

7.7 The manual range option

The MR parameter is not in use as factory default, but it can be activated by using other than 00 value and by saving the change with –SP command. The MR setup is used if the process is not stable and the automatic set up can not be made or if the auto setup 100% range is not big enough to monitor the dust concentration range in the process.

Parameter 7(S311X) and parameter 8(S313X) changes the manual range. By pressing key B or C desired range can be selected. Parameter value 0 means normal mode and auto setup is needed.

All fixed ranges (values from 1 to 5) do not need auto setup on commissioning because range settings are set at factory.

Parameter 8 Value	Gain	Mode	Dust level	Auto setup
0	Dynamic 5x	Automatic	all concentrations	auto setup is needed to do
1	1x	fixed	Very high dust concentration	NOT NEEDED
2	10x	fixed	High dust concentration	NOT NEEDED
3	100x	fixed	Moderate dust concentration	NOT NEEDED
4	1000x	fixed	Low dust concentration	NOT NEEDED
5	10000x	fixed	Very low dust concentration	NOT NEEDED

7.8 User interface

The user interface consists of the following:

- key button for AUTOMATIC SETUP (on the lower printed circuit board)
- red/green AUTOMATIC SETUP indicator led (on the lower printed circuit board)
- three digit display
- three control keys

The S311X/S313X Ex dust monitors have two independent alarm relay outputs and mA output (latter only in S313X). Relays may be triggered by either average or instantaneous levels. The alarms are arranged such that Alarm 1 is a high alarm (i.e. on increased flow) and Alarm 2 is a low alarm (i.e. on decreased flow). The average alarms may be used to effectively provide an alarm delay facility, preventing alarms on short-term deviations from the normal conditions. The alarms are fully programmable and may be set to Normally Open or Normally Closed.

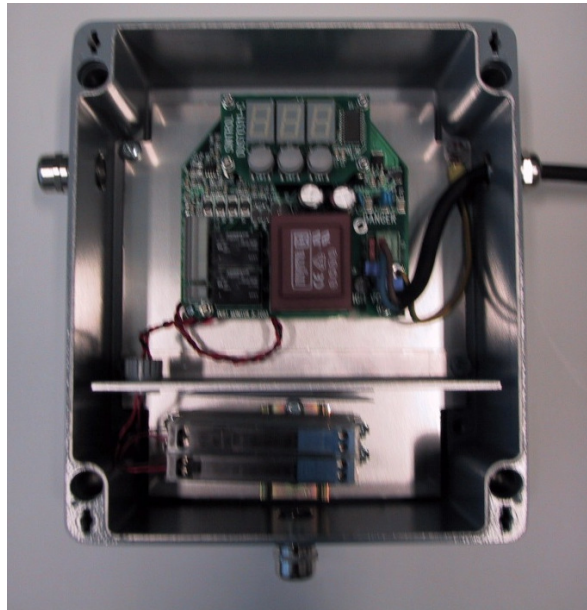


Figure 14. User interface of main electronics in the junction box

ZENER BARRIER REQUIRED PARAMETERS

Channels	4 (4 one channel devices, 2 two channel devices or 1 four channel device)
Type	BIPOLAR (STAR CONFIGURATION)
Rmax	100 ohm

PROPERTIES OF THE SENSOR ELECTRONICS:

All voltages in the sensor are between -2,75 V and +2,75 V, nominal. All currents in the sensor are less than 10 mA, nominal.

The sensor tolerates 10 V or less zener barrier channel to channel voltage.

The sensor tolerates 100 ohm or less zener barrier series resistance per channel.

The sensor tolerates 150 mA or less current limit per channel.

THE MAXIMUM INPUT VALUES OF THE TWO INTRINSICALLY SAFE CIRCUITS ARE:

U_i	=	10 V
i_i	=	150 mA
L_i	=	10 μ H
C_i	=	1 nF

RECOMMENDED DEVICE:

STAHL INTRINSPAK 9002/77-093-300-001

Type star configuration, dual channel

Rmax 82,1 ohm

Un 6,0 V

Uo 9,3V

Io 150 mA/channel, 300 mA both channels

Po 0,35 mW/channel, 0,7 mW both channels

Lo 1,3 mH/channel, 0,2 mH both channels

Co 4,1 uF/channel, 4,1 uF both channels

This device may only be connected to appliances, where no voltage higher than AC 250 V can occur.



Figure 15. Two dual channel STAHL INTRINSPAK 9002/77-093-300-001
Zener barriers in junction box



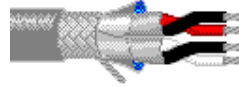
SPECIFICATION OF CABLE BETWEEN SENSOR UNIT AND JUNCTION BOX

Use cable that fulfills below specification or equivalent. Manufacturer of below cable is Belden Inc. <http://bwcecom.belden.com/>

PART NUMBER 8162 Paired - Low Capacitance Computer Cables for EIA R232/422
DESCRIPTION 24 AWG stranded (7x32) tinned copper conductors, twisted pairs, individually shielded with 100% Beldfoil®, 24 AWG stranded tinned copper drain wire, Datalene® insulation, overall Beldfoil® shield plus 65% tinned copper braid shield, PVC jacket.

CONDUCTOR

Number of Pairs: 2
Total Number of Conductors 4
AWG: 24
Stranding: 7x32
Conductor Material: TC - Tinned Copper



INSULATION:

Insulation Material Trade Name: Datalene®
Insulation Material: FPE - Foam Polyethylene

PAIR:

Pair Lay Length: 1 in.
Pair Twists/ft.: 12
Pair Shield Material Trade Name: Beldfoil®
Pair Shield Type: Tape
Pair Shield Material: Aluminum Foil-Polyester Tape
Pair Shield % Coverage: 100 %

PAIR SHIELD DRAIN WIRE:

Pair Shield Drain Wire AWG 24
Pair Shield Drain Wire 7x32
Stranding:
Pair Shield Drain Wire TC - Tinned Copper
Conductor Material:

PAIR COLOR CODE CHART:

Number	Color
1	Black & Red
2	Black & White

OUTER SHIELD:

Outer Shield Material Trade Name: Beldfoil® (Z-Fold®)
Outer Shield Type: Tape/Braid

Layer Number	Material Trade Name	Type	Material	% Coverage (%)
1	Beldfoil®	Tape	Aluminum Foil-Polyester Tape	100
2		Braid	TC-Tinned Copper	65

OUTER JACKET:

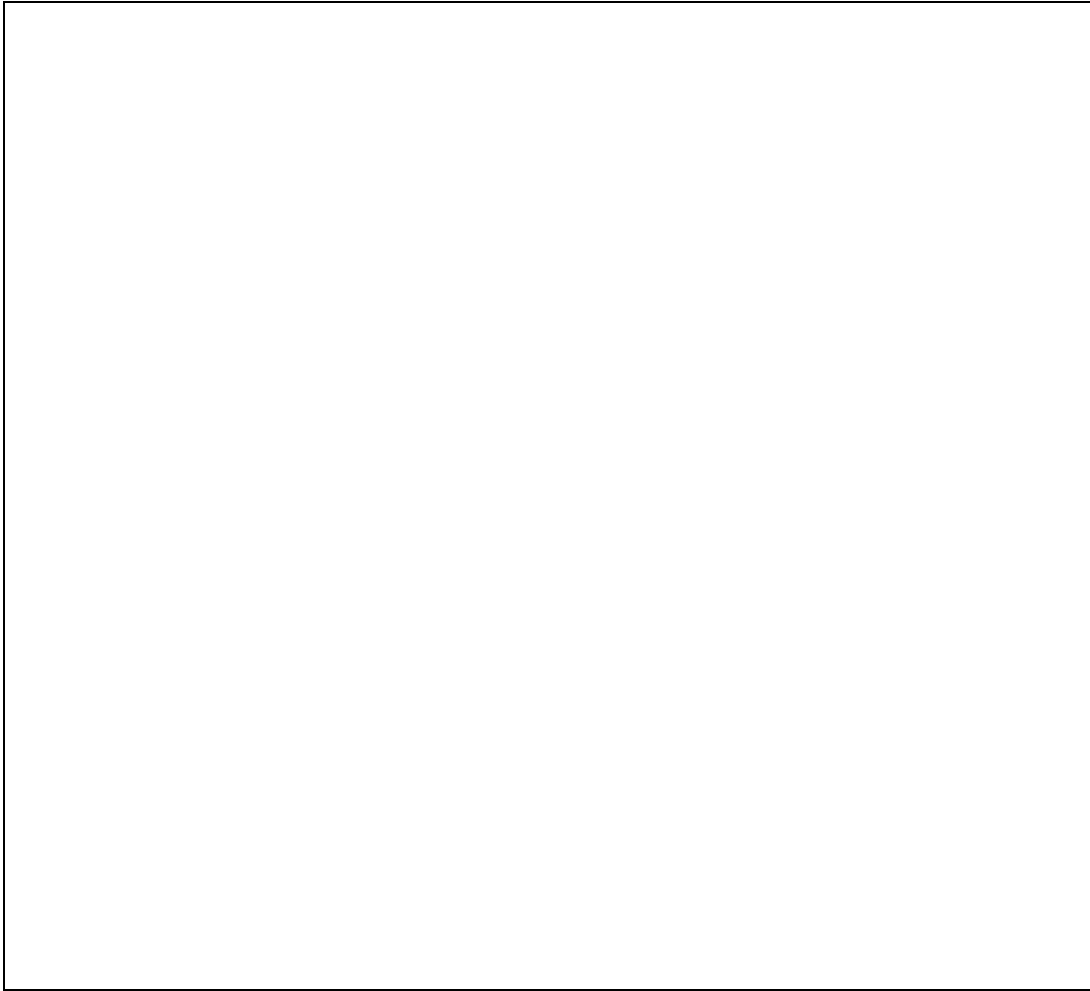
Outer Jacket Material PVC - Polyvinyl Chloride

MECHANICAL CHARACTERISTICS:

Operating Temperature Range: -40°C To +60°C
Non-UL Temperature Rating: 60°C (UL AWM Style 2493)

ELECTRICAL CHARACTERISTICS:

Nom. Characteristic Impedance: 100 Ω
Nom. Capacitance Conductor to Conductor @ 1 KHz: 12.5 pF/ft
Nom. Cap. Cond. to Other Cond. & Shield @ 1 KHz: 22 pF/ft
Nominal Velocity of Propagation: 78 %
Nom. Conductor DC Resistance @ 20 Deg. C: 24.0 Ω/1000 ft
Ind. Pair Nominal Shield DC Resistance @ 20 Deg. C: 18 Ω/1000 ft
Nominal Outer Shield DC Resistance @ 20 Deg. C: 4.3 Ω/1000 ft
Max. Operating Voltage - UL: 300 V RMS
Max. Recommended Current: 1.8 Amps per conductor @ 25°C



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