DCS-400 Measuring Chains with LIN-340 Signal Conditioner and 10m Triaxial Cable

Front End Installation Manual

(P/N: 9428-25I5A-300)

Applies to measuring chain model #: LIN-340-10J-0.5/2.5
LIN-340-10S-0.5/2.5

This manual divides into the following sections:

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1. OVERVIEW OF MEASURING CHAINS BASED ON LIN-340 SIGNAL CONDITIONING MODULES

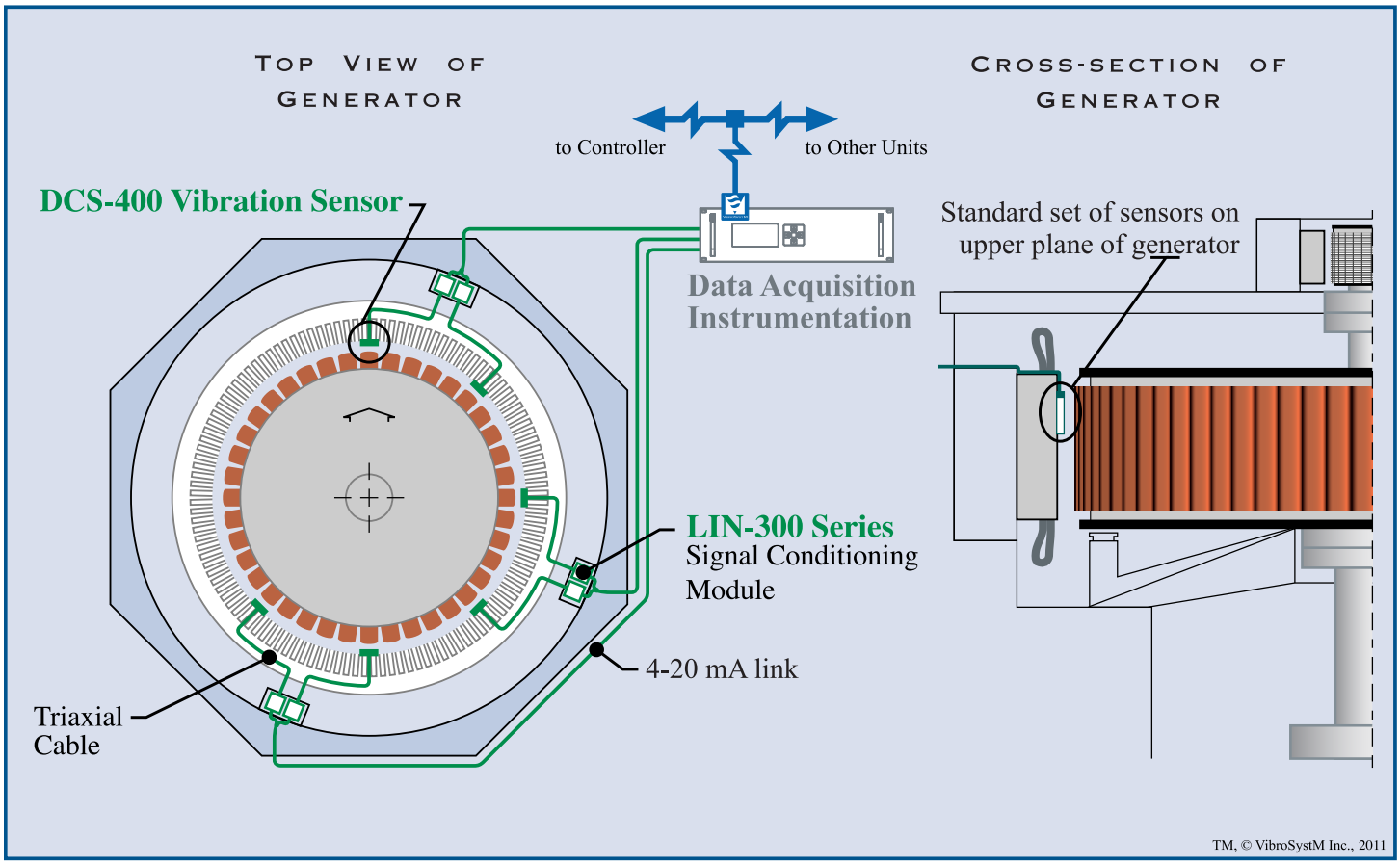


Figure 1 : Typical installation of measuring chains with a ZOOM Processing Unit (ZPU) data acquisition instrumentation

Each measuring chain includes:

Qty	Description
1	DCS-400 sensor
1	Triaxial extension cable
1	LIN-340 signal conditioning module
1	M12 cable for signal conditioning module power input and signal output

LIN-300 modules are usually installed in an enclosure. Available options are:

Option	Description
A)	10x8x4 Metal Enclosure (for one module) without power supply
B)	14x12x8 Metal Enclosure (for two modules) without power supply
C)	14x12x8 Metal Enclosure (for two modules) with universal +24V_{DC} power supply

1.1 Safety information

This manual contains information and warnings that must be observed to keep the instrument in a safe condition and ensure safe operation.

Warning - Danger messages identify conditions or practices that could cause bodily harm, and result in damage to the measuring chain and other equipment to which it is connected.

Caution messages identify conditions or practices that could result in permanent loss of data.

Warning - Danger	Caution
• To use the described measuring chains correctly and safely, read and follow all the safety instructions or warnings given throughout this manual. • To avoid electric shock, personal injury, or death, carefully read the information under “Safety Information” before attempting to install, use, or service the measuring chains. • In addition, follow all generally accepted safety practices and procedures required when working with and around electricity. • For safe operation and to ensure that your system functions at its optimum capability, the installation and adjustment process should be handled only by VibroSystM trained service specialists.	

- Although most instruments and accessories are normally used at non-hazardous level voltages, hazardous conditions may be present in some situations.
- This product in intended for use by qualified operators and maintenance personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product.
- Install and use the measuring chains only as specified in this manual, or the protection provided by the measuring chain might be impaired.
- Do not use the measuring chain in wet environments.
- Whenever it is likely that safety protection has been impaired, make the measuring chain inoperative and secure it against any unintended operation.
- Have the LIN-300 Series modules serviced only by qualified service personnel.

- Safety and electrical symbols that appear in this manual and on the material:

	**Warning - Danger** - identifies conditions or practices that could cause bodily harm, and result in damage to the measuring chain and other equipment to which it is connected. Conditions include a risk of electric shock (voltage > 30 V_{DC} or V_{AC} peak might be present).
	**Caution** - identify conditions or practices that could result in permanent loss of data.
	Emphasizes important information.
	Do not apply paint or other coating.
	Earth (ground) terminal.
	Category 1 protective conductor terminal, including grounding and equipotential protection.

1.2 Measuring chain components

- Linearization modules — LIN-340-10J-0.5/2.5, LIN-340-10S-0.5/2.5
- Matching sensor — DCS-400
- Matching extension cable — 10J, 10S

2. INSTALLATION OF THE DCS-400 SENSOR

2.1 Preliminary considerations

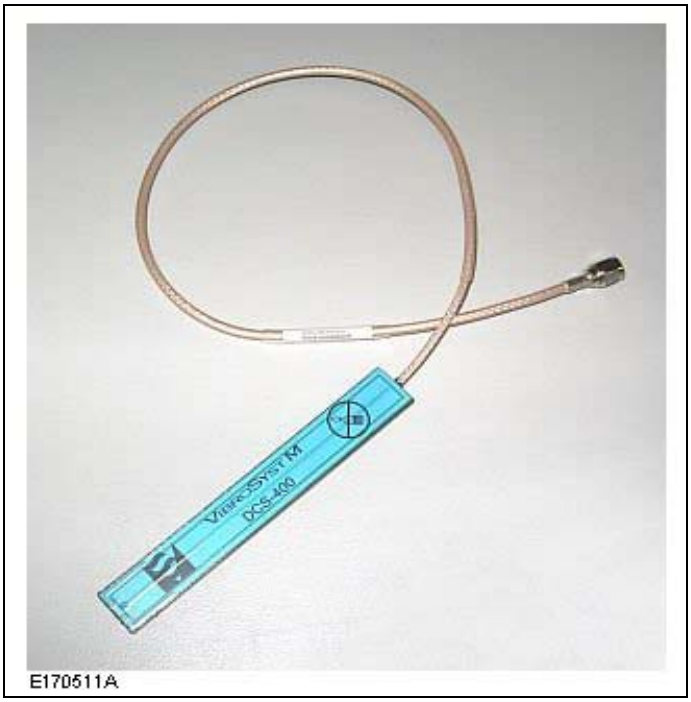


Figure 2 : Installation of DCS-400 sensor

- DCS-400 stator bar vibration capacitive sensors are embedded in stator slots, lodged in small cavities made by removing a section of the wedges. The sensors are held in place by a mounting plate glued against the stator wall.
- A triaxial extension cable connects the sensor to a LIN-340 signal conditioning module. The output produced by the module is a linearized 4 to 20 mA signal which can be sent to an acquisition unit, control unit, or any other instrument.
- The length of the integral cable (29.85 cm *[11.75 in.]*) limits the depth at which the sensor can be glued, as the connector must remain outside the airgap.
- The integral cable must also be glued to the stator, and covered with a bead of silicone for protection.

The installation usually involves one of two possible situations: either the rotor is in place or it has been removed.

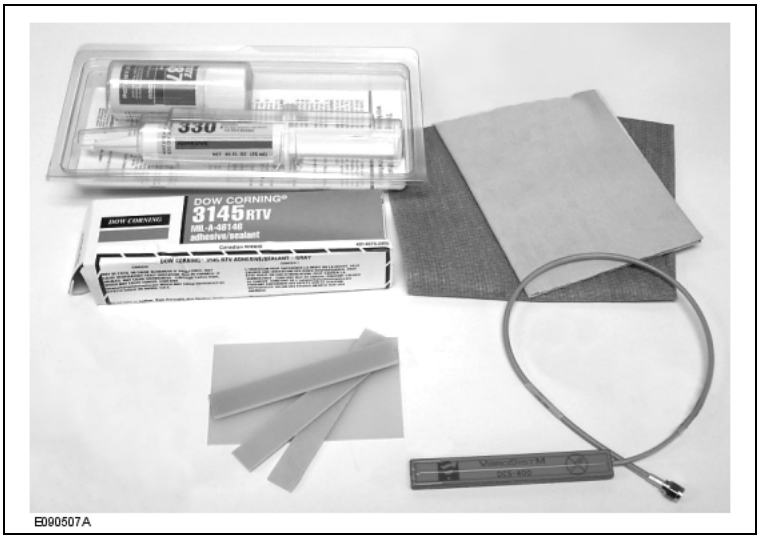
- **Rotor is in place and can be rotated:** In this case, we suggest to rotate the rotor so that the space between two poles provides access to the selected stator slots. If possible, remove one pole to facilitate access to the stator.
- **Rotor removed:** The work is done more easily when the stator wall is accessible. Still, be careful and take all security measures.

Warning - Danger **Caution**

- **Integral cables must be installed on the stator core or a grounded surface to avoid disrupting the equipotential.**
- **Never install triaxial cables on high voltage components.**
- **Avoid using silicone or PVC based products and components when installing the sensors in an hydrogen-cooled machine.**

- Handle the sensor with great care.
- Never pull on the triaxial cable or on the connector.
- Do not apply paint or silicone on the sensor sensing surface.

2.1.1 Supplies needed



- clean dry cloth
- fine sandpaper (with non metallic particles)
- a sensor installation kit including:
- set of three spacers of various thicknesses
- one mounting plate
- silicone adhesive sealant (3145RTV) or equivalent
- glue (Loctite 330) and its activator (Loctite 7387) or equivalent

Figure 3 : DCS-400 sensor and installation supplies

2.1.2 Tools needed

- filler gage
- hack saw
- hammer and all necessary equipment to remove wedges
- hot melt glue gun
- multimeter
- ohmmeter
- permanent marker
- round needle file

2.2 Preparation of stator and sensor assembly

2.2.1 Selection of the bars to be monitored

Before starting the installation of the SBV sensors, you must select and identify the bars to be monitored. We recommend that line bars be monitored. Their high voltage and longer extensions outside the stator make them prone to vibration. Depending on the size of the machine, two to eight sensors per phase are needed. In the examples below, monitoring of stator bar vibration levels requires 12 measuring points (4 sensors per phase). Consult the stator coil plans to identify output bars, as shown next.

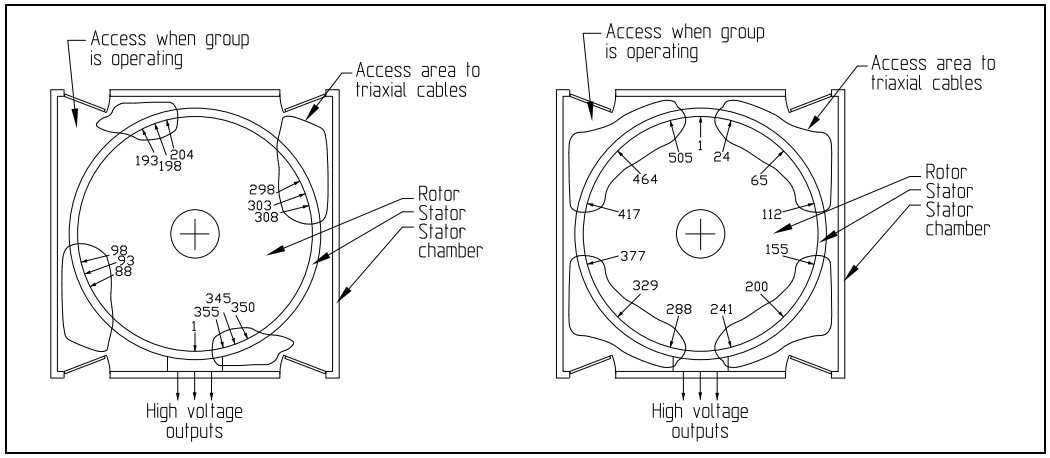


Figure 4 : Access to high voltage output bars

Select and identify the bars to be monitored. Fill the following table with stator bar and stator slot numbers. Distance **D** is the distance between the stator bar and the stator wall, which you will measure in the next step.

Position no.	Stator Bar no.	Stator Slot no.	Distance D
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

2.2.2 Measuring the distance between the stator bar and the stator wall surface

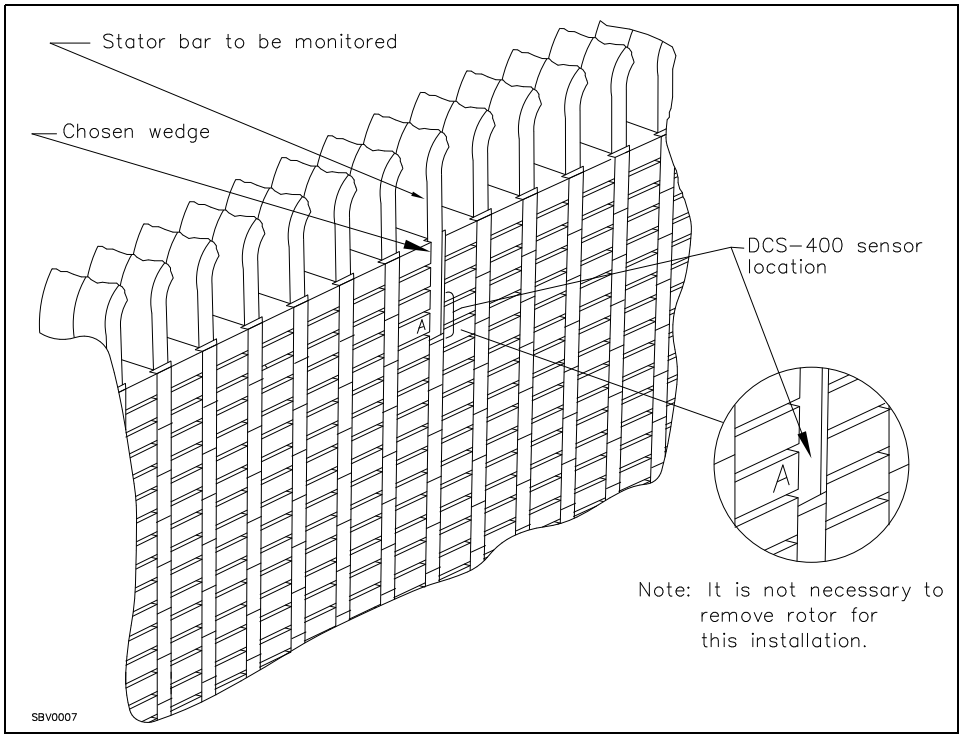


Figure 5 : DCS-400 sensor location

At each selected stator slot, remove the first and second wedges, either from the top or bottom (top is generally more accessible).

Locate point **A** as shown on *Figure 5 : "DCS-400 sensor location"*. You will have to measure at that point the distance between the stator bar and the stator wall. This distance is used for calculating the spacers needed.

Verify that there is no protruding sheet steel stacking around point **A**, and that the surface is flat (roughness height index value between 0 and 0.5 mm *[0 and 20 mils]* max.). If the wall is not uniform, choose another location below the first wedge for the probe.

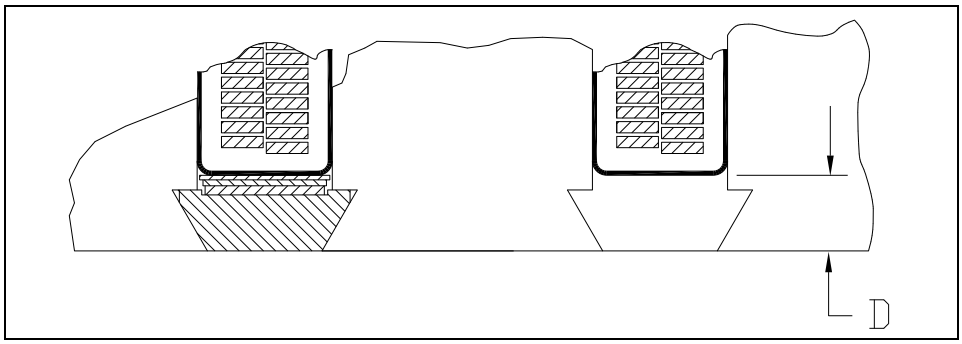


Figure 6 : Distance from stator bar to stator wall

Hold the mounting plate for the DCS-400 sensor over the stator slot tightly against the stator wall. Use a sliding gauge to measure the distance between the stator bar and the mounting plate facing it.

This is distance **D**.

2.2.3 Assembling the spacers for the DCS-400 Sensor

To meet the requirements of its specified measuring range (0,5 to 2.5 mm, or *[20 to 99 mils]*), the sensor must initially be positioned at a distance **G** of 1.5 mm *[59 mils]* from its target at rest. You will have to add spacers to the assembly to bring the sensor to this mid-range measurement position. Three spacers are available, each of a different thickness: 0.8 mm *[32 mils]*, 1.6 mm *[63 mils]*, 3.2 mm *[126 mils]*.

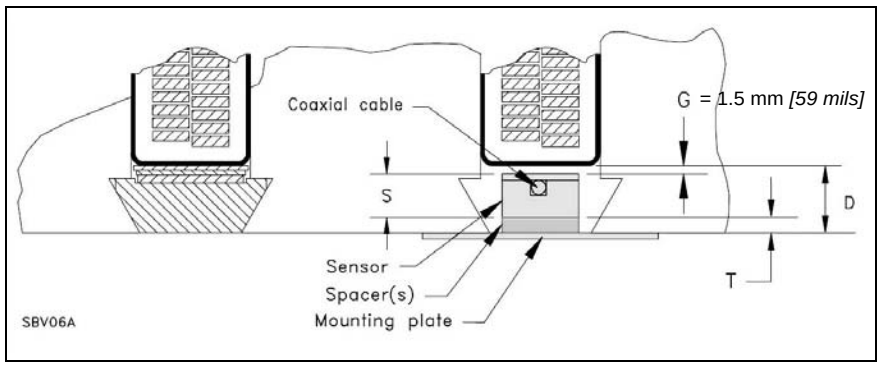


Figure 7 : Gap between sensor and target at rest

Apply the following formula to determine the thickness of stacked spacers **T** needed between sensor and mounting plate:

$$T = D - (G + S)$$

or

$$T = D - 7.1$$

T = total thickness (mm) of spacers to be added

D = distance between stator bar and support, measured using a sliding gauge

G = gap of 1.5 mm *[59 mils*] required between sensor face and stator bar

S = DCS-400 sensor thickness of 5.60 mm *[220 mils*]

Example: For a distance between stator bar and support of **D** = 11.1 mm *[437 mils]*,

T = 11.1 - 7.1 = 4 mm *[158 mils]*

Hence, for **T** = 4 mm *[158 mils]*, choose a spacer of 3.2 mm *[126 mils]* and another of 0.8 mm *[32 mils]* to obtain a total spacer thickness of 4 mm *[158 mils]*

Having calculated the thickness of spacers needed, follow these steps to prepare and assemble sensor, spacers and mounting plate:

1. Choose a combination of the provided standard spacers to obtain a total spacer thickness nearest to calculated **T** value.
2. With a clean dry cloth, clean the mounting plate and the spacers on the side exempt of adhesive film.
3. Peel off the protective paper on the adhesive film at the back of the sensor. Align and press the first spacer against the sensor. Mount all spacers needed to obtain the total spacer thickness.
4. Attach the sensor and spacer assembly to the mounting plate. Make sure to center the assembly on the mounting plate.

5. With a permanent marker, label the probe by writing the slot number and the depth **D** on its back. Refer to *Figure 11 : "Finalizing the DCS-400 sensor installation with application of silicone adhesive sealant"* for an example of a labeled probe.
6. It is also essential to note this information on a sketch of the installation if you plan to connect the sensor to the ZOOM system. You will need it to configure the ZOOM software properly.

2.2.4 Preparation of Stator Surface

Installation of the DCS-400 probe requires preparation of stator surface before gluing the probe.

⚠ **Caution**
It is imperative that the stator surface be thoroughly cleaned before the sensor mounting plate can be glued on to it. This step must not be neglected as the mounting plate adherence depends on the preparation of the surface.

Before sensor mounting plate installation, prepare the stator slot as follows:

1. Clean the stator wall where the sensor mounting plate is to be glued. Use a clean dry cloth to remove dust and oil deposits.
2. Run fine sandpaper on the stator surface, straight along the laminations, just enough to remove surface dirt as preparation for glueing. Make sure only non-metallic paper is used.
3. After sanding, clean the stator surface again with a dry cloth.

2.2.5 Preliminary verification of the output

It is important to verify the output and confirm that the correct combination of spacers has been stacked at the back of the DCS-400 probe before permanently gluing the probe against the stator wall. To verify the output, hold the DCS-400 sensor in place against the stator wall, connect the measuring chain (triaxial cable, grounding wires, and conditioner), and take a reading of the output. Refer to Section “INSTALLATION OF LIN-300 SERIES SIGNAL CONDITIONING MODULES” on page 51 for details. The main steps in the connection and verification of the measuring chain are as follows:

1. Connect the probe to the triaxial cable
2. Connect the ground wire (sensor end) to the grounded structure
3. Connect the triaxial cable to the conditioner
4. Connect the ground wire (conditioner end) to the grounding lug and ground the conditioner case
5. Power up the conditioner
6. Take a reading of the output

⚠ Caution

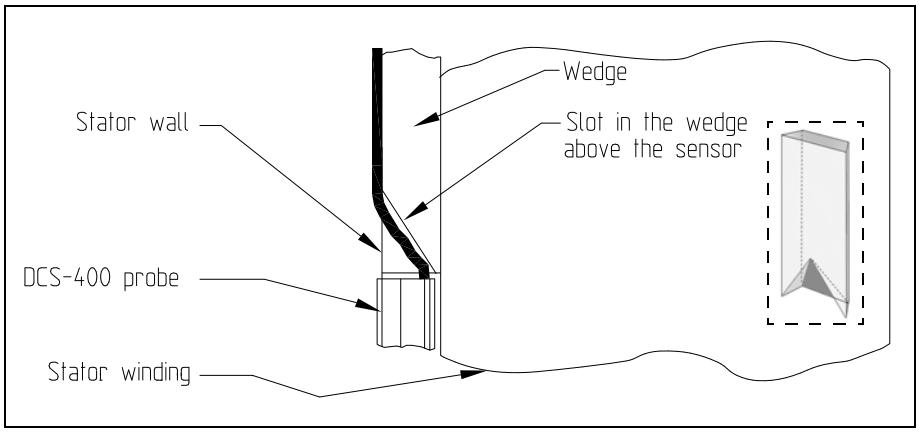
Proceed with gap distance adjustment only after the complete measuring chain, **including grounds**, has been installed. Ground wires **at both ends** of the triaxial cable must be connected.

The reading at the output of the conditioner should be 12 mA (± 1.6 mA). If the output falls outside that range, the spacers will have to be adjusted. For instance, if the reading is below10.4 mA, the probe is too close to the stator bar. The total thickness of the spacers will have to be diminished to place the DCS-400 probe further from the stator bar.

2.3 Step by step installation of DCS-400 sensor

2.3.1 Installing the sensor and mounting plate assembly

1. Before reinserting the wedges into their groove, cut off a portion of wedge, ripple spring, and filler of approximately 105mm *[4.125"]*, to allow nesting the DCS-400 probe into the stator slot.



2. Using a hand file or shaping tool, make a slot in the wedge that will be abutting the cable side of the DCS-400 probe. The slot will minimize bending and alleviate strain on the coaxial cable.

Figure 8 : Slot in the wedge

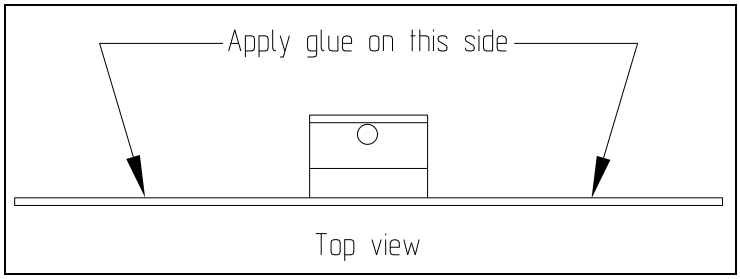
3. Place the sensor and mounting plate assembly against the stator and slide the wedges, ripple springs, and fillers into the stator slot above the probe.

4. Remove the sensor and mounting plate assembly carefully, so as to leave the wedges in place.

⚠ Caution

- The glue bonds and sets quickly. All preparation must be completed before applying the glue.
- Handle glue with care to avoid skin contact.
- Take precautions to prevent the sensor from falling into the air gap.

5. Apply glue on wedge tips around the sensor mounting plate location. The glue will prevent the ripple springs and fillers from sliding between the sensor and the bar.



6. Make sure that the sensor mounting plate is clean. Apply glue on the back surface of the sensor mounting plate. Spread glue to a thin and even coat, which will not run down when the sensor assembly is pressed against the stator.

Figure 9 : Glue on the sensor mounting plate

7. Apply the catalyst on the fresh glue.

8. Position sensor mounting plate on the clean surface of the stator. Pivot sensor mounting plate slightly in order to spread the glue evenly and then reposition vertically. Maintain in a straight upright position for 60 seconds.

Figure 10 : Coaxial cable of a DCS-400 sensor temporarily taped to the stator

9. Temporarily fasten the coaxial cable with adhesive tape so that it does not hang into the air gap or gets pulled inadvertently.

2.3.2 Application of silicone

You will need to glue the integral flat cable to the stator, but only after having completed the installation of the extension triaxial cable. Finally, you must also apply a fine bead of silicone around the sensor edges and over the integral cable to prevent damage from dirt and particles, and to protect the sensor edges from deterioration.

⚠ Caution

- When handling silicone, avoid leaving any trace on the sensor sensing surface.
- **DO NOT USE SILICONE IN A HYDROGEN ENVIRONMENT.**

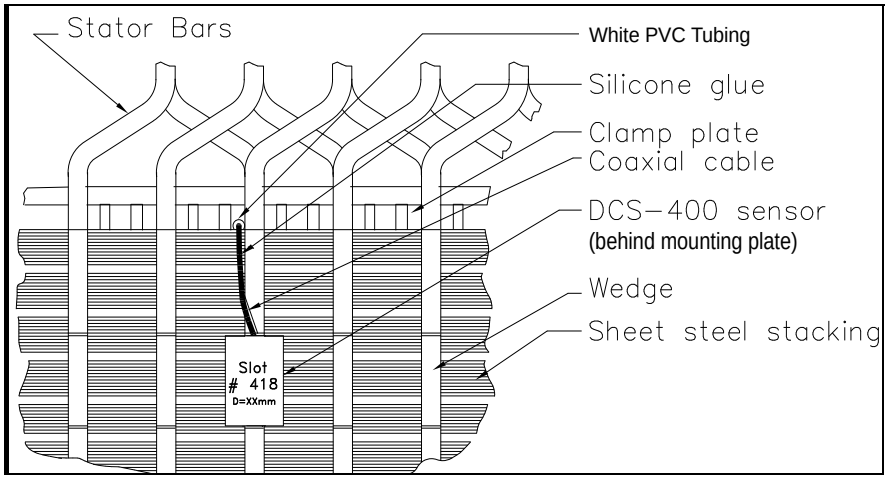


Figure 11 : Finalizing the DCS-400 sensor installation with application of silicone adhesive sealant

1. Apply a fine bead of silicone around the sensor mount edges to prevent dirt and particles accumulation around and behind the sensor. It will protect the sensor edges from deterioration.
2. Apply silicone on the sensor coaxial cable to keep it tight against the wall of the sensor.

2.4 General specifications of the DCS-400 Sensor

Operation

- Linear measuring range with:
  - LIN-340-10J-0.5/2.5 — 0.5 to 2.5 mm *[19.7 to 98.4 mils]*
  - LIN-340-10S-0.5/2.5 — 0.5 to 2.5 mm *[19.7 to 98.4 mils]*
- Frequency response — limited by the LIN-340 linearization module
- Interchangeability — ± 5 %

Connection

- Integral cable
  - Type — coaxial
  - Length — 40 cm *[15.75 in.]*
  - Connector — SMA plug (male contact)

Environmental

- Temperature range:
  - Operation — 0° to 125°C *[32° to 257°F]*
  - Storage — 0° to 125°C *[32° to 257°F]*
- Magnetic field — up to 2 Tesla (50 or 60 Hz)
- Dust and oil contamination — films have no effect on performance
- Humidity — up to 95%, non condensing

Physical characteristics

- Dimensions:
  - Height — 102 mm *[4.00 in.]*
  - Width — 14 mm *[0.55 in.]*
  - Thickness — 5.6 mm *[0.22 in.]*
  - Connector diameter (hex) — 7.92 mm *[0.312 in.]*

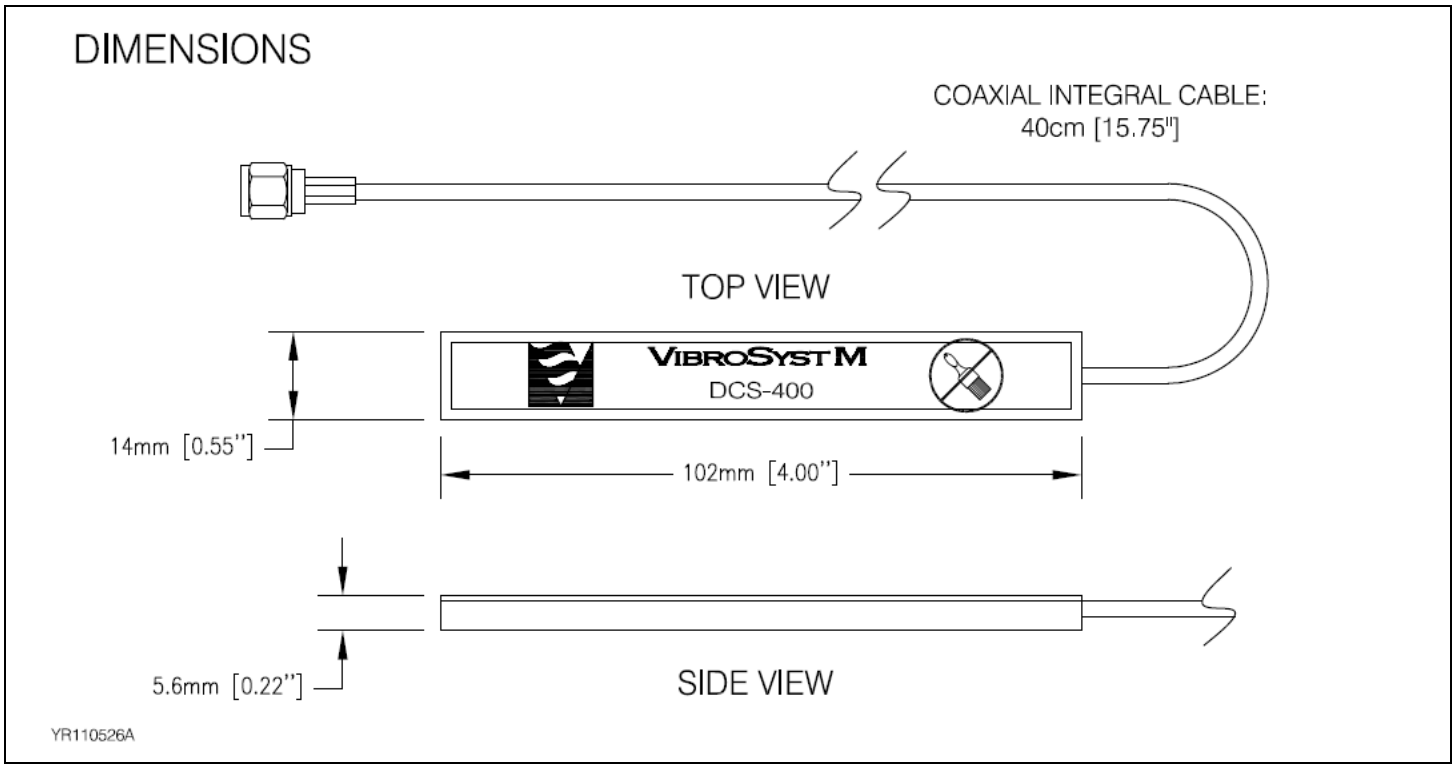


Figure 12 : Dimensions of the DCS-400 sensor

3. INSTALLATION OF THE TRIAXIAL EXTENSION CABLE

3.1 Preliminary considerations

- The cable type to be used is determined by the sensor type. It is very important that you use the triaxial extension cable sent with the sensor.

Warning - Danger	Caution
Never install triaxial extension cables on high voltage components.	

Caution
Triaxial extension cables are calibrated and must never be cut or altered.

- Installation of the triaxial extension cable usually follows that of the sensor.
- Before installing the triaxial extension cable, it is important to determine where the enclosure (containing one or two modules) will be installed, keeping in mind the length of the triaxial extension cable. The cable must be protected by a combination of conduit, protective tubing, and heat-shrinkable tubing.

The ground lugs must be electrically connected on BOTH ends of the triaxial extension cable. On the sensor side, the ground lug must be connected to the stator frame. On the LIN-300 Series signal conditioning module end, the ground lug must be connected to the module ground screw.

- LIN-300 Series triaxial extension cables are terminated with an SMA plug (male contact) connector on the LIN-300 Series signal conditioning module end, and an SMA jack (female contact) connector on the sensor end.

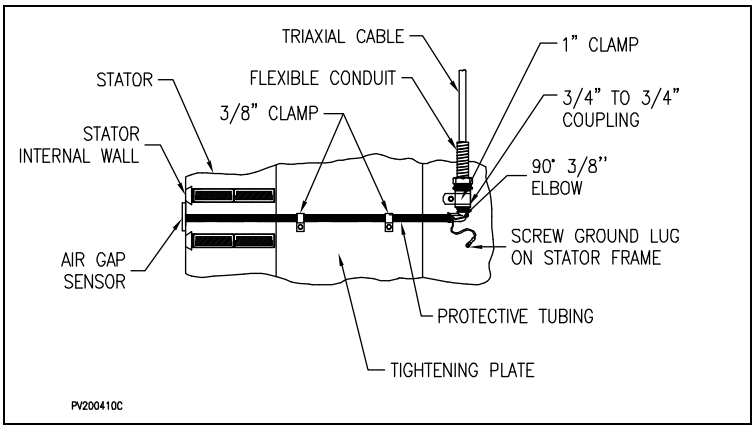


Figure 13 : Securing the protective tubing and coupling

Cable clamps must be used to secure all components subjected to vibrations. This step of the installation is essential to prevent damage from wear by abrasion.

Use clamps to secure the protective tubing and elbow assembly to the top of the stator. Refer to *Figure 15 : "Preparing holes for the cable clamps"*.

3.1.1 Supplies needed

Figure 14 : Installation kit for one air gap sensor

- triaxial extension cable installation kit, comprised of:
  - two (2) lengths of protective tubing 1/2 x 24”
  - one (1) 3/4” watertight connector
  - one (1) 90° 3/8” elbow
  - one (1) 3/4” to 3/4” coupling
  - one (1) 3/4” to 1/2” reducer
  - one (1) piece of 3/8” heat-shrinkable tubing
  - three (3) hex screws 1/4-20 x 5/8
  - three (3) metric hex screws M6-1,00 x 16mm
  - three (3) 1/4” flat washer
  - three (3) 1/4” spring lock washer
  - two (2) 3/8” cable clamps for protective tubing
  - one (1) 1” cable clamp for elbow assembly
- flexible conduit (not supplied)

3.1.2 Tools needed

- assorted drill bits and taps
- heat gun
- cutters or saw for protective tubing
- fish-tape
- two (2) 8mm (or *[5/16”]*) flat wrenches
- screwdriver (flat or Phillips # 2)
- glue (Loctite 404 or equivalent)
- threadlocker (Loctite 242 or equivalent)

3.2 Step by step installation of the triaxial extension cable

3.2.1 On site preparation

Determine the run of the flexible conduit, from the location of the elbow assembly, on top of the stator frame, to the enclosure. Always keep in mind the length of the triaxial extension cable.

Warning - Danger **Caution**
Triaxial extension cables must be installed on the stator frame or a grounded surface to avoid disrupting the equipotential, and prevent the formation of surface partial discharges and arcing.

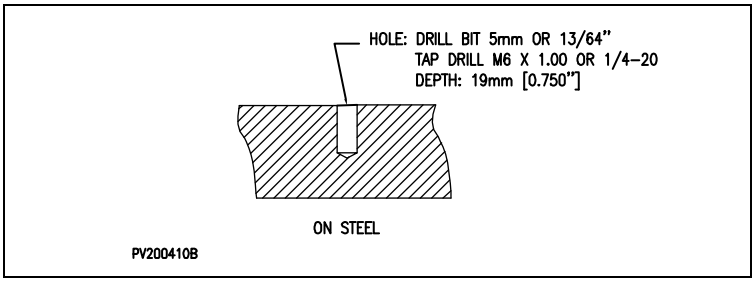


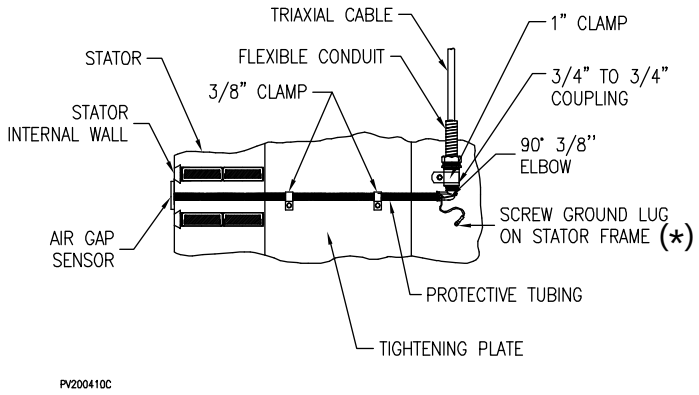
Figure 15 : Preparing holes for the cable clamps

1. Prepare the holes for the cable clamps.

3.2.2 Installation of triaxial extension cable - sensor end

Warning - Danger **Caution**

The protective tubing supplied with the installation kit must be installed on the stator core or stator frame (ground potential).

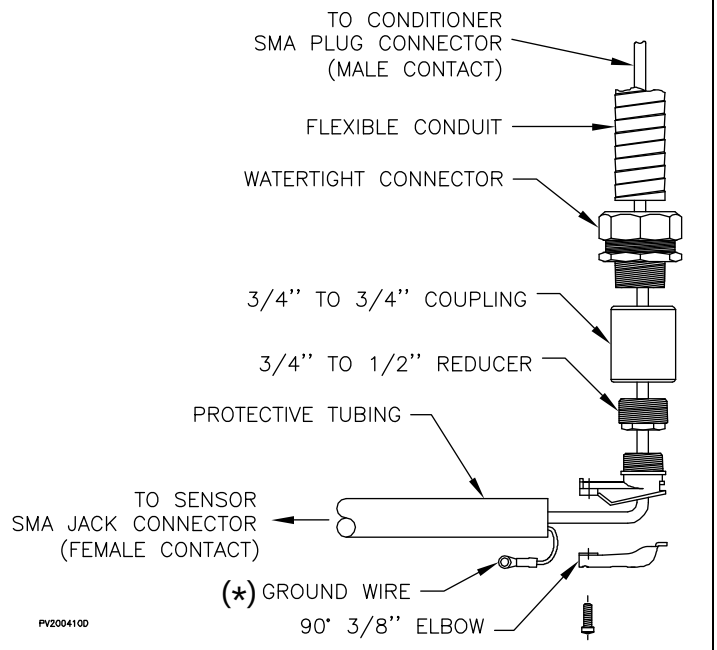


* Note: Two ground wires may be present if the sensor cable is also equipped with a ground wire.

Figure 16 : Assembly on top of stator frame

1. On top of the stator, install a length of protective tubing to protect the triaxial extension cable and its connection to the sensor.

   Cut the tubing to the right length so that it will not extend beyond the stator edge. The tubing can be heated and bent. Install the tubing in close contact, as much as possible, with the top of the stator frame.



* Note: Two ground wires may be present if the sensor cable is also equipped with a ground wire.

Figure 17 : Elbow assembly

2. Attach the 3/4 to 3/4 coupling and the 3/4 to 1/2 reducer to the 90° 3/8" elbow. Temporarily leave the cover of elbow open, to allow pulling the triaxial extension cable.
3. Carefully pull the end of the triaxial extension cable terminated with a SMA jack (female contact) into the elbow assembly and protective tubing. Use a fish tape if needed.

   Pull out just enough extra length to work on the connection, without pulling the ground wire completely into the protective tubing.

   If the sensor cable is also equipped with a ground wire, this ground wire will have to be pulled into the protective tubing and connected to the ground structure at the same location as the triaxial extension cable ground wire.

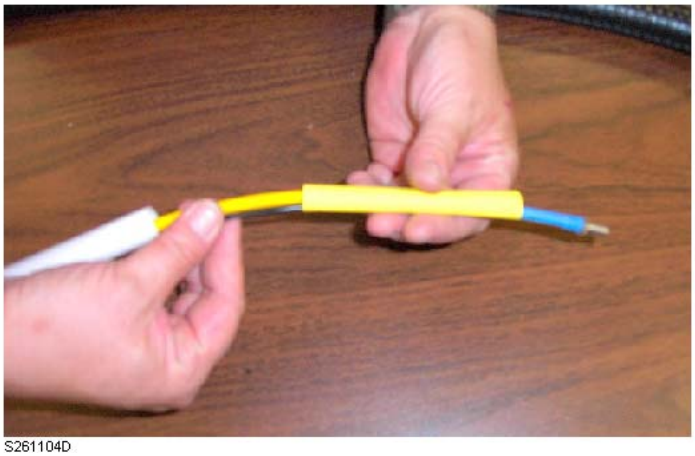


Figure 18 : Slipping on a piece of heat-shrinkable tubing

4. Slip a piece of heat-shrinkable tubing on the portion of triaxial extension cable sticking out of the protective tubing,

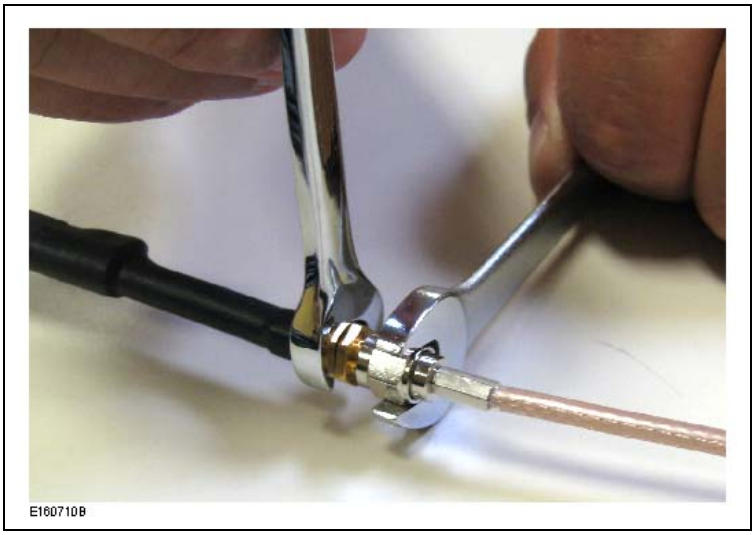


Figure 19 : Tightening the SMA plug and SMA jack connection

5. Attach the SMA plug from the sensor integral cable to the SMA jack at the end of the triaxial extension cable. Use two 8mm (or *[5/16"]*) flat wrenches to tighten the connection firmly.

Recommended connection torque: 1.7 Nm *[15 in-lb]*

Figure 20 : Heating the heat-shrinkable tubing

6. Slide the heat-shrinkable tubing over the connection and shrink the tubing with a heat gun.

The heat-shrinkable tubing must be placed over the connection to prevent accidental short-circuits between connectors and metallic parts such as flexible conduit, stator frame, etc., and to secure the connector.

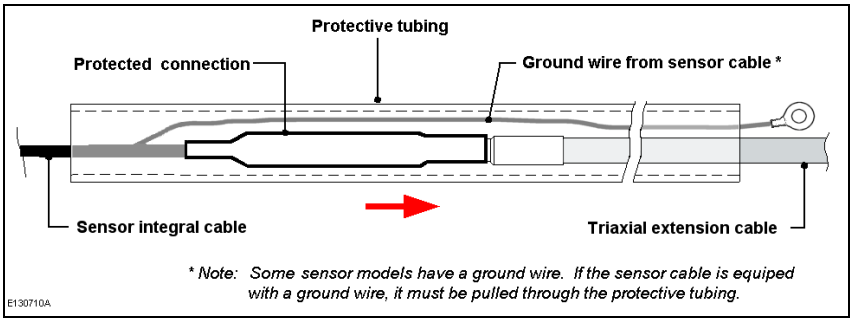


Figure 21 : Pulling the SMA connection inside the protective tubing

7. Pull the connection inside the tubing, just enough to straighten the cable.

   If the sensor integral cable is equipped with a ground wire, also pull this wire through the protective tubing.

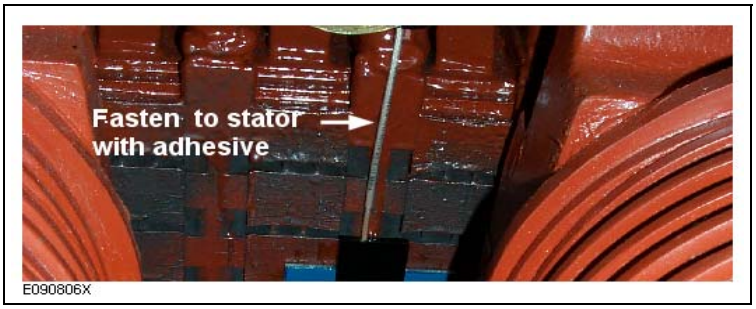


Figure 22 : Fastening integral cable to stator

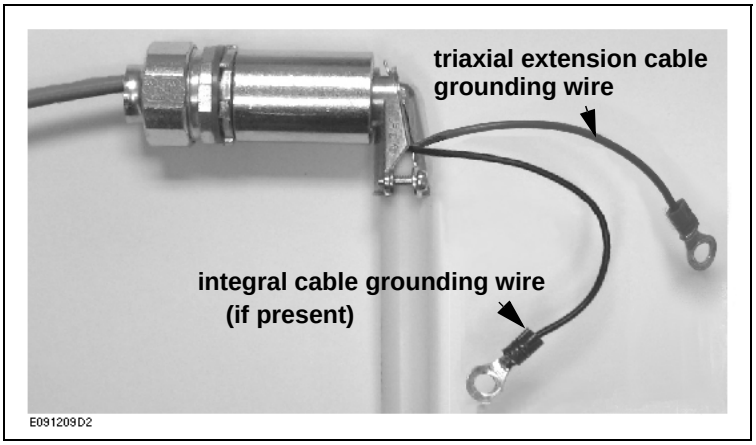


Figure 23 : Pulling ground wire out of the elbow assembly

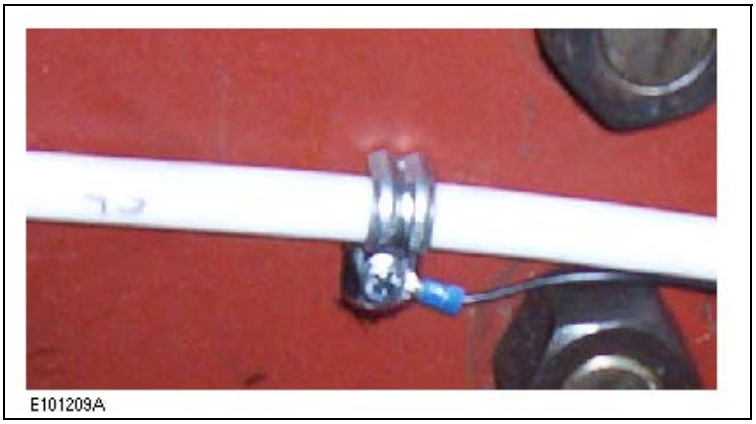


Figure 24 : Attaching a grounding wire to the structure through a cable clamp

8. Using instant adhesive (Loctite 404 or equivalent), glue the sensor's integral cable against the stator, from the sensor to the tubing opening.

   Remove the slack between the protective tubing and the elbow assembly. Leave just enough looseness to allow for thermal expansion and contraction.

9. Install the cover on the 90° 3/8" elbow, and attach the assembly to the protective tubing.

   Let the triaxial extension cable grounding wire exit the assembly through the open space that remains between the body and cover, near one of the screws. If the sensor integral cable is equipped with a ground wire, also pull this wire through the open space.

   The elbow must be firmly clamped to the protective tubing.

10. The grounding wire(s) must be attached to the grounded structure.

Adequate installation of the ground wire to the grounded structure is essential for reliability of results.

It is common practice to attach the ground lugs to the structure through a cable clamp. When doing this, however, make sure that the connection point is at the same potential level as the stator frame.

Note: Do not cut or extend the grounding wire.

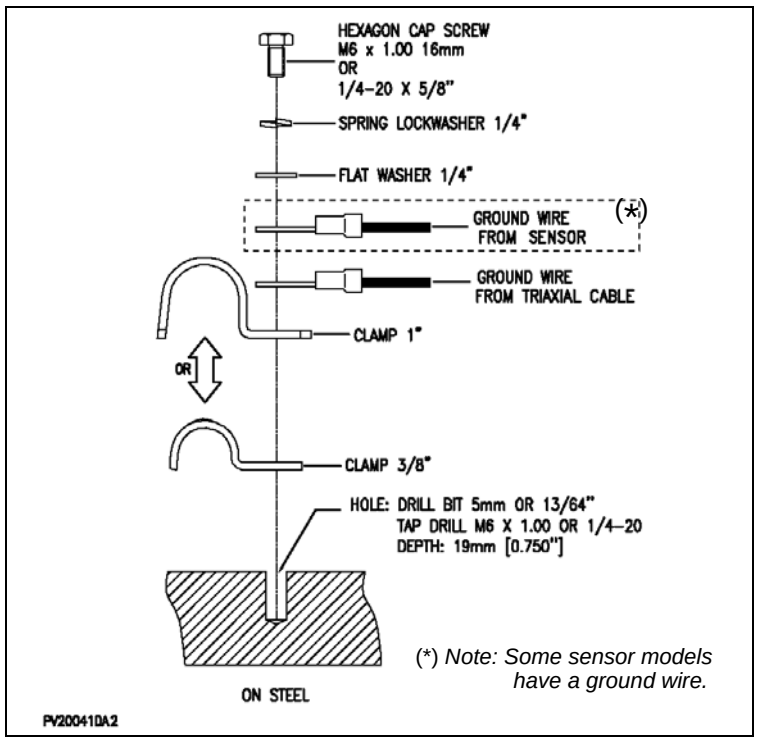


Figure 25 : Securing the cable clamps

11. Install the cable clamps and grounding wire.

    If the sensor cable is also equipped with a ground wire, this ground wire will have to be connected to the ground structure at the same location as the triaxial extension cable ground wire.

    Use threadlocker (Loctite 242 or equivalent) to secure the hexagon cap screws

3.2.3 Silicone application

Caution

- **DO NOT APPLY SILICONE IN HYDROGEN-COOLED LOCATIONS.**
- When applying silicone, keep the detection surface of the sensor clean and free of silicone.

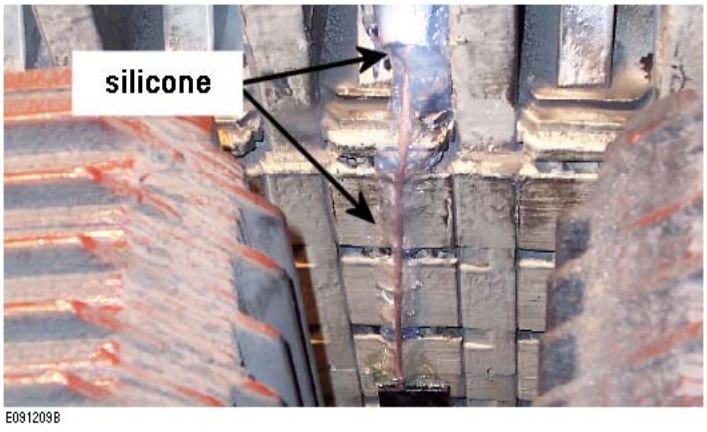


Figure 26 : Application of silicone

1. Cover the sensor's integral cable with silicone, from the top of the sensor to the edge of the protective tubing.

   To prevent cable deterioration, and dust and debris from entering, apply silicone inside the tubing to form a plug.

3.2.4 Installation of triaxial extension cable - LIN-300 Series signal conditioning module end

Figure 27 : Flexible conduit connection to enclosure

1. Unroll the flexible conduit, following the planned course of the triaxial extension cable. Cut the conduit to desired length.

   At the enclosure end, attach the flexible conduit to the 19mm (3/4") liquidtight connector.

Avoid installing two triaxial extension cables or more in parallel close to one another. Keep cables at least 30 cm *[12 in.]* apart.

Caution

To prevent damage to the cable when pulling it into the conduit:

- protect the connector by wrapping electrical tape over it
- proceed slowly
- avoid placing too much tension
- do not force beyond the minimal bending radius (5 cm *[2.5"]*).

2. From the enclosure, use a fish tape to pull the LIN-300 Series signal conditioning module end of the triaxial extension cable into the flexible conduit.

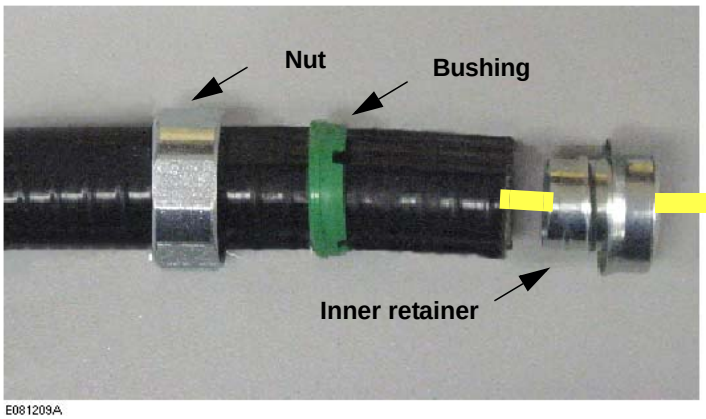


Figure 28 : Flexible conduit connector assembly

3. Remove the nut, bushing, and inner retainer from the elbow assembly, and install these components on the sensor end of the flexible conduit.

Figure 29 : Flexible conduit attached to elbow assembly

4. Attach the flexible conduit to the elbow assembly, and tighten firmly.

Figure 30 : Excess cable stored in enclosure

5. Excess cable can be coiled and stored in the enclosure.

Coil the cables individually, and keep the coils apart inside the enclosure.

3.3 General specifications of the triaxial extension cables for LIN-300 Series modules

10J, 10S, 15Q Extension Cable

Physical characteristics

• Type	triaxial	
• Connectors		
- on the sensor end:	SMA jack (female contact), and lug-terminated grounding wire	
- on the conditioner end:	SMA plug (male contact), and lug-terminated grounding wire	
• Minimum bending radius	5 cm	*[2.0 in.]*
• Interchangeability	< 5%	
• Length:		
- Nominal		
10J, 10S	10 m	*[32.8 ft.]*
15Q	15 m	*[49.2 ft.]*
- Minimum		
10J, 10S	9.5 m	*[31.2 ft.]*
15Q	14.5 m	*[47.6 ft.]*
• SMA connector diameter (hex)	7.92 mm	*[0.312 in.]*
• Cable diameter		
10J	6.121 mm	*[0.241 in.]*
10S	6.197 mm	*[0.244 in.]*
15Q	8.89 mm	*[0.350 in.]*
• Temperature range		
- Operation 10J	-40° to 75°C	*[-40° to 167°F]*
- Operation 10S	-40° to 80°C	*[-40° to 176°F]*
- Operation 15Q	-55° to 135°C	*[-67° to 275°F]*

4. INSTALLATION OF LIN-300 SERIES ENCLOSURES

LIN-300 signal conditioning modules are usually protected by an enclosure. The installation procedure for various types of enclosures is presented in the following sections.

4.1 10x8x4 enclosure installation

4.1.1 Preliminary considerations

Figure 31 : Front view of the 10x8x4 enclosure

The standard 10x8x4 enclosure is a NEMA 12 (IP54) corrosion-resistant metal cabinet that protects various electronic components. Outer dimensions are 254 mm x 203 mm x 102 mm *[10 x 8 x 4 in.]*.

Except for the ground wire, all connected cables must be protected, either by using armored cable, or by running the wiring inside flexible conduits. The installation kit includes two 3/4" liquidtight connectors for spirally wound flexible conduit, and one liquidtight strain relief connector for armored cable.

Prepare the openings on the enclosure and set the liquidtight connectors in place before fastening the enclosure to a wall or structure.

To prevent damage to the electronic components, always remove the mounting panel before working on an enclosure.

Figure 32 : Suitable location for an enclosure

The location chosen for the enclosure must respect the following limitations:

- the distance to the connected instruments must be within the minimum length of the triaxial extension cables;
- connecting cables should be placed inside 19mm *[3/4"]* liquidtight flexible conduits or equivalent;
- sufficient space must be allowed around the enclosure for the installation of the liquidtight connectors and protective conduits;
- sufficient clearance is needed to fully open the door, and easily access the electronic components inside.

Warning - Danger **Caution**

The enclosure must be grounded in accordance with all local codes and ordinances to ensure personnel safety and protection of the equipment.

The length of the grounding cable must be as short as possible

4.1.1.1 Supplies needed

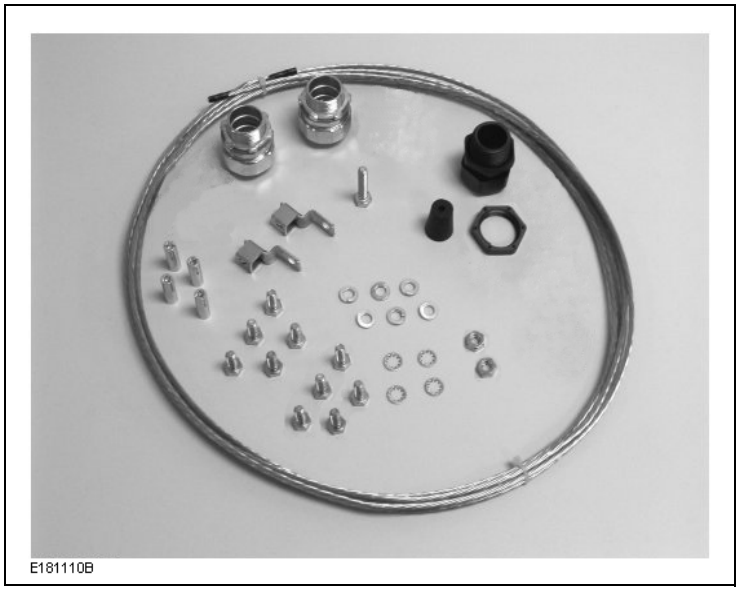


Figure 33 : Installation kit for 10X8X4 enclosure

- (2) 3/4” flexible conduit liquidtight connectors
- (2) hex machine screw nuts 1/4-20
- (6) spring lockwashers 1/4”
- (4) tooth lockwashers 1/4”
- (5) bolts 1/4-20 x 5/8”
- (1) bolt 1/4-20 x 1-1/4”
- (5) bolts M6 x 1.00 x 16mm
- (4) concrete anchors for 1/4-20NC bolts
- (2) copper lugs
- (1) length (5m) bare copper wire, AWG 8
- (1) liquidtight strain relief connector
- (1) nylon locknuts 3/4”
- (1) rubber adapters for liquidtight strain relief connectors

4.1.1.2 Tools needed

- 3/4” conduit hole saw or knockout punch set for 3/4” liquidtight fittings
- Hammer drill
- Drill bits for metal: 5mm *[or 13/64”]*, and 8mm *[or 5/16”]*
- Taps: M6 x 1.00 *[or 1/4-20NC]*
- Assorted set of flat wrenches or socket wrenches

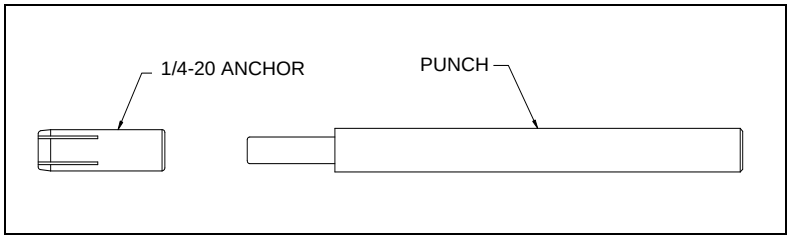


Figure 34 : Anchor and special punch for anchors

To install in a concrete wall:

- Concrete drill bit: 8mm *[or 5/16”]*
- Hammer and special punch for anchors

4.1.2 Preparing the holes for the liquidtight connectors and grounding assembly

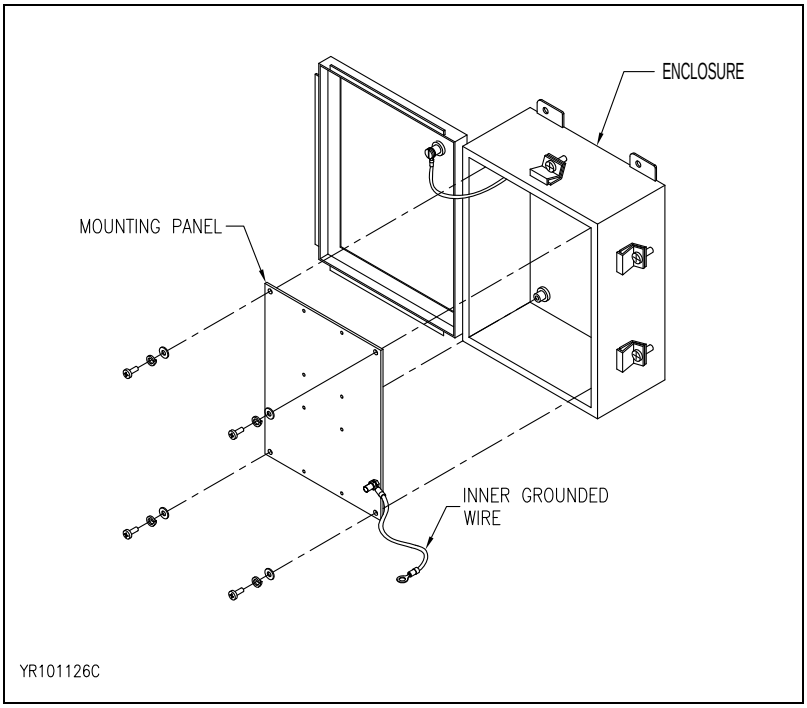


Figure 35 : Removing the mounting panel

1. As a precaution before drilling the enclosure, remove the mounting panel to prevent metal particles infiltration.

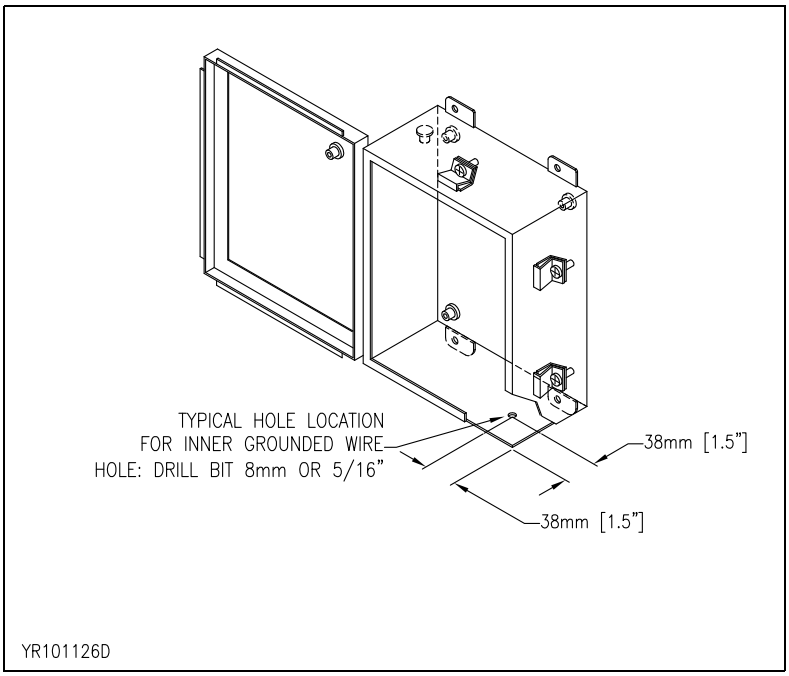


Figure 36 : Typical hole location for grounding wire

2. Drill a grounding hole in a corner of the enclosure, as shown in *Figure 36 : "Typical hole location for grounding wire"*.

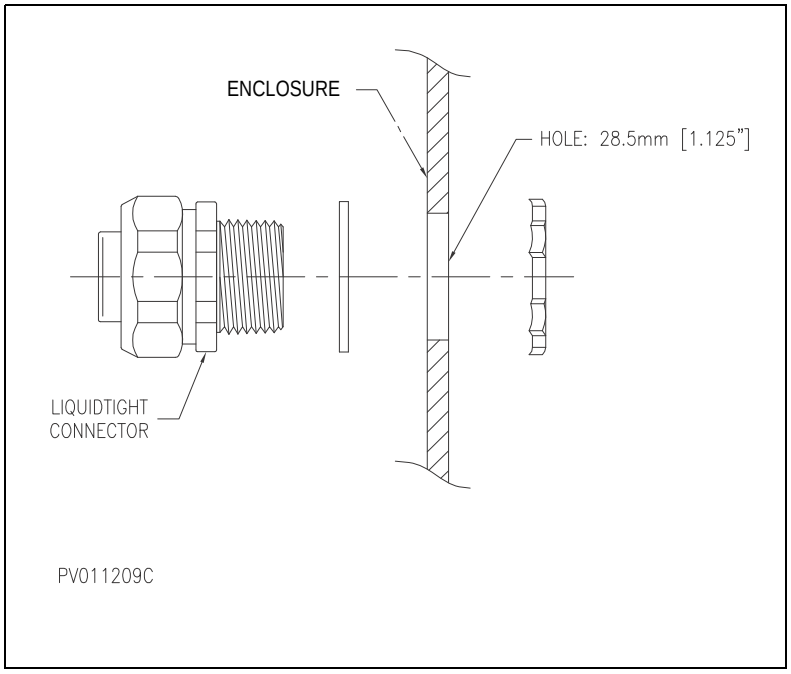


Figure 37 : Mounting the liquidtight connectors for flexible protective conduit

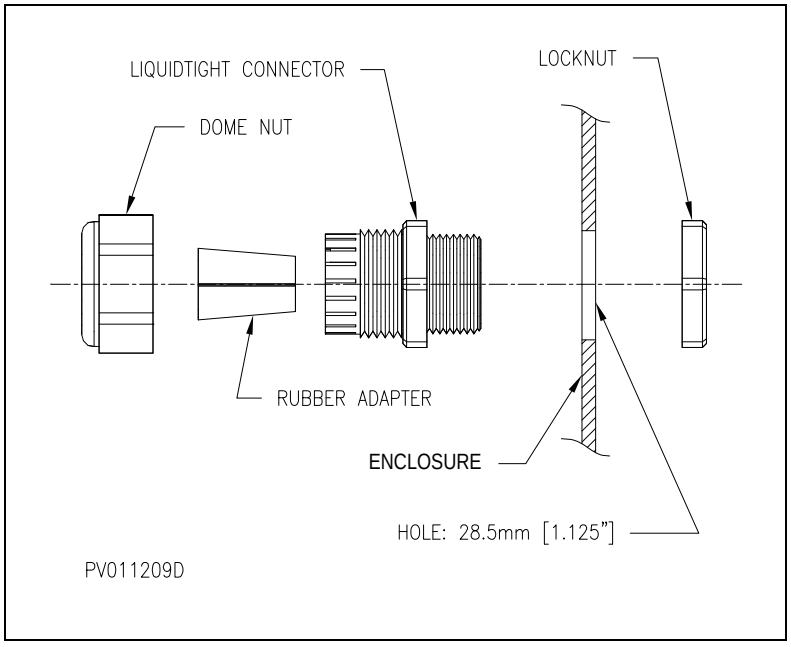


Figure 38 : Mounting the liquidtight strain relief connectors for armored cable

3. After visualizing the routing of all cables, drill holes for the liquidtight connectors.

   To determine the location for the holes, keep in mind the components on the mounting panel. Make sure the components will not get in the way of the connectors once the mounting panel is reinserted.

   Refer to *Figure 37 : "Mounting the liquidtight connectors for flexible protective conduit"* if 3/4" liquidtight conduit is used, or *Figure 38 : "Mounting the liquidtight strain relief connectors for armored cable"* if liquidtight conduit is not used.

4. Install the connectors.
5. Reinsert the mounting panel.

4.1.3 Fastening the enclosure

The enclosure can be mounted on a concrete wall or, whenever possible, directly onto the structure of the stator or machine casing.

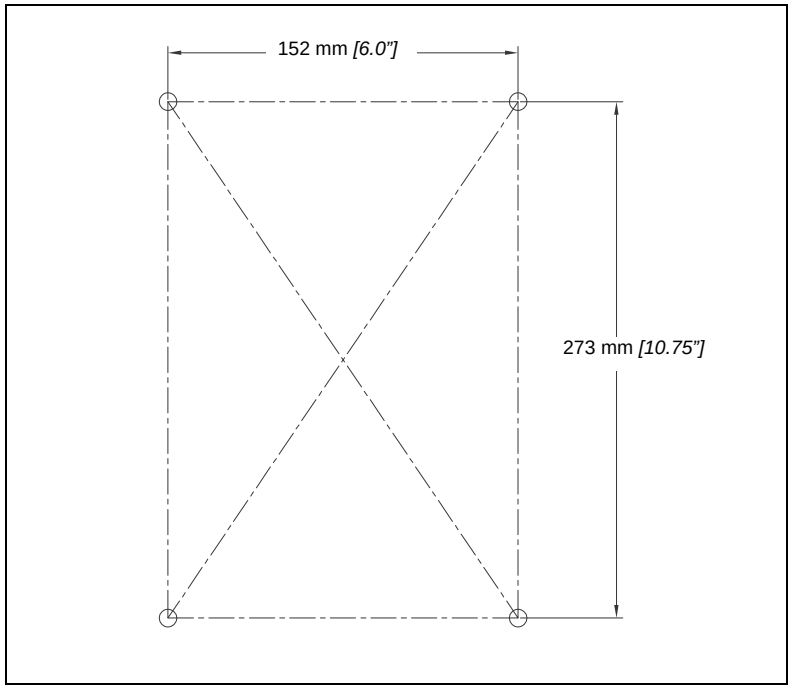


Figure 39 : Mounting holes location

Mark the location of the mounting holes according to *Figure 39 : "Mounting holes location"*.

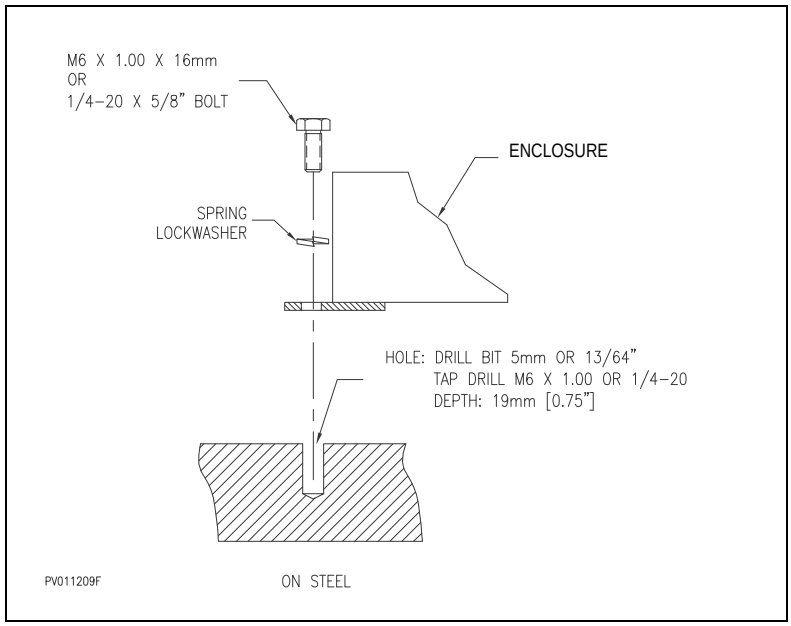


Figure 40 : Fastening the enclosure on steel

Mounting the enclosure on a metallic structure:

1. Drill and thread into the structure according to *Figure 40 : "Fastening the enclosure on steel"*.
2. Fasten the enclosure.

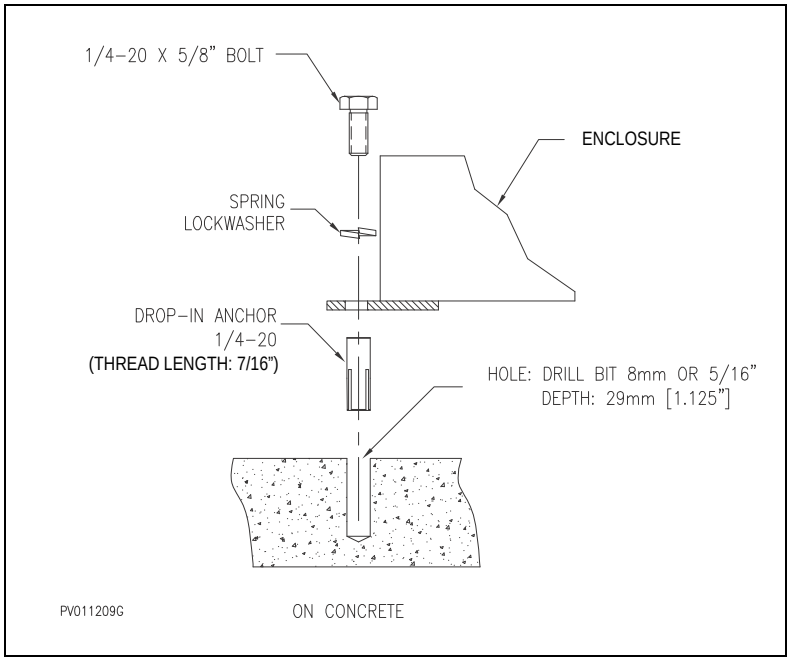


Figure 41 : Fastening the enclosure on concrete

Mounting an enclosure on concrete:

1. Drill into the concrete wall according to *Figure 41 : "Fastening the enclosure on concrete"* and insert the anchors in the holes.
2. Use the anchor punch to drive and permanently set the anchors into the concrete. Hammer the anchors with the punch until each is flush with the concrete surface.
3. Fasten the enclosure to the anchors.

4.1.4 Grounding the enclosure

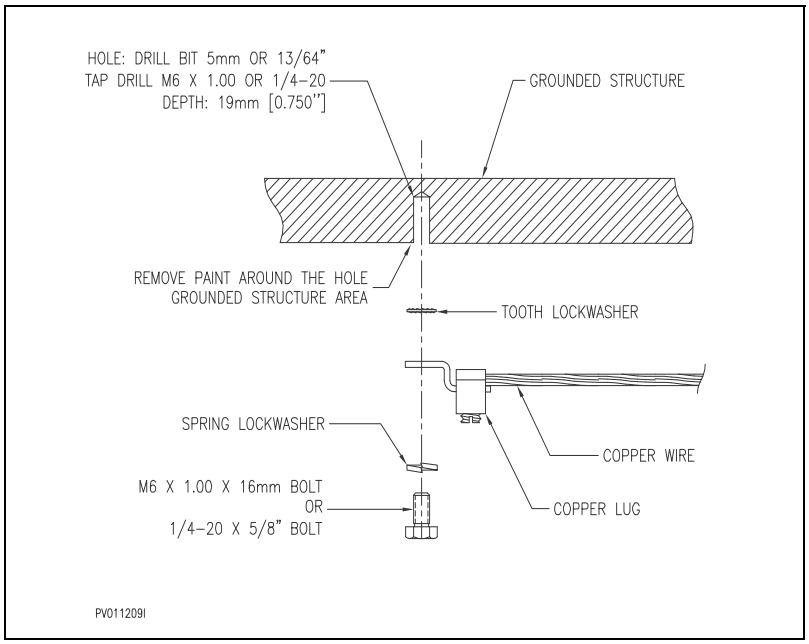


Figure 42 : Fastening the ground wire to grounded structure

Grounding is essential for protection against hazardous voltage as well as for system operation integrity. For best grounding, provide the shortest path possible between the enclosure and the grounded structure.

1. Drill and tap a hole in a grounded structure. Make it as close as possible to the 8mm *[or 5/16"]* hole in the bottom of the enclosure.
2. Fasten the copper wire to the structure according to *Figure 42 : "Fastening the ground wire to grounded structure"*.

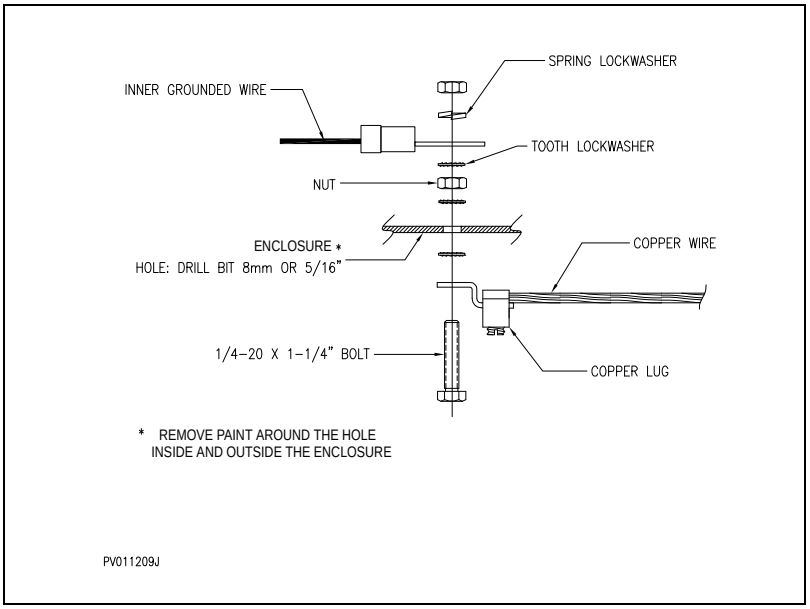


Figure 43 : Fastening the grounding wires to the enclosure

3. Cut the copper wire and fasten it to the outside of the enclosure as shown in *Figure 43 : "Fastening the grounding wires to the enclosure"*.

4.1.5 General specifications of the 10x8x4 enclosure

Physical characteristics

• Dimensions		
- Height	25.4 cm	*[10 in.]*
- Width	20.32 cm	*[8 in.]*
- Depth	10.16 cm	*[4 in.]*
• Weight (without panel)	4.1 kg	*[9 lb]*
• Protection level	NEMA 12 (IP54)	
• Color	ASA 61 gray	
• Material	Steel	

4.2 14x12x8 enclosure installation

4.2.1 Preliminary considerations

Figure 44 : Front view of the 14x12x8 enclosure

The standard 14x12x8 enclosure is a NEMA 12 (IP54) corrosion-resistant metal cabinet that protects various electronic components. Outer dimensions are 356 x 305 x 203mm *[14 x 12 x 8 in.]*.

Except for the ground wire, all connected cables must be protected, either by using armored cable, or by running the wiring inside flexible conduits. The installation kit includes two 3/4" liquidtight connectors for spirally wound flexible conduit, and one liquidtight strain relief connector for armored cable.

Prepare the openings on the enclosure and set the liquidtight connectors in place before fastening the enclosure to a wall or structure.

To prevent damage to the electronic components, always remove the mounting panel before working on an enclosure.

Figure 45 : Suitable location for an enclosure

The location chosen for the enclosure must respect the following limitations:

- the distance to the connected instruments must be within the minimum length of the triaxial extension cables;
- connecting cables should be placed inside 19mm *[3/4"]* liquidtight flexible conduits or equivalent;
- sufficient space must be allowed around the enclosure for the installation of the liquidtight connectors and protective conduits;
- sufficient clearance is needed to fully open the door, and easily access the electronic components inside.

Warning - Danger **Caution**

The enclosure must be grounded in accordance with all local codes and ordinances to ensure personnel safety and protection of the equipment.

The length of the grounding cable must be as short as possible

4.2.1.1 Supplies needed

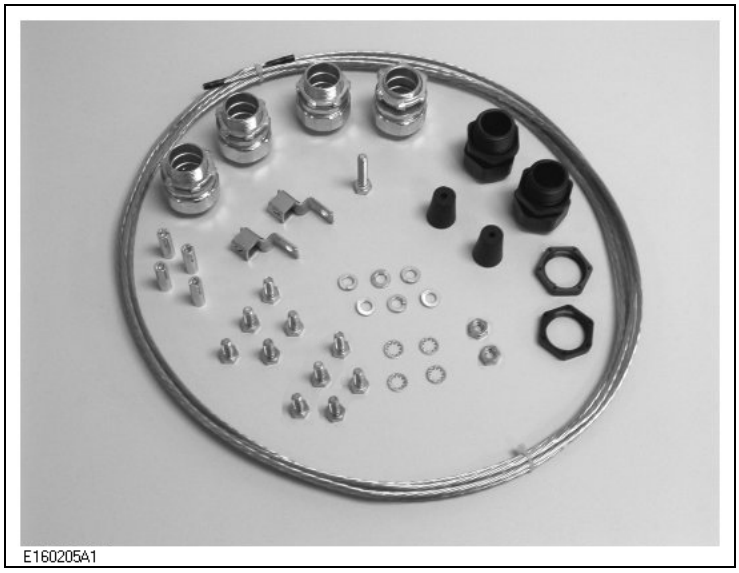


Figure 46 : Installation kit for 14X12X8 Enclosure

- (4) 3/4” flexible conduit liquidtight connectors
- (2) hex machine screw nuts 1/4-20
- (6) spring lockwashers 1/4”
- (4) tooth lockwashers 1/4”
- (5) bolts 1/4-20 x 5/8”
- (1) bolt 1/4-20 x 1-1/4”
- (5) bolts M6 x 1.00 x 16mm
- (4) concrete anchors for 1/4-20NC bolts
- (2) copper lugs
- (1) length (5m) bare copper wire, AWG 8
- (2) liquidtight strain relief connector
- (2) nylon locknuts 3/4”
- (2) rubber adapters for liquidtight strain relief connectors

4.2.1.2 Tools needed

- 3/4” conduit hole saw or knockout punch set for 3/4” liquidtight fittings
- Hammer drill
- Drill bits for metal: 5mm *[or 13/64”]*, and 8mm *[or 5/16”]*
- Taps: M6 x 1.00 *[or 1/4-20NC]*
- Assorted set of flat wrenches or socket wrenches

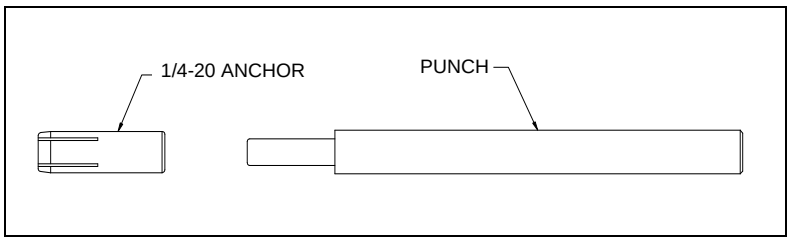


Figure 47 : Anchor and special punch for anchors

To install in a concrete wall:

- Concrete drill bit: 8mm *[or 5/16”]*
- Hammer and special punch for anchors

4.2.2 Preparing the holes for the liquidtight connectors and grounding assembly

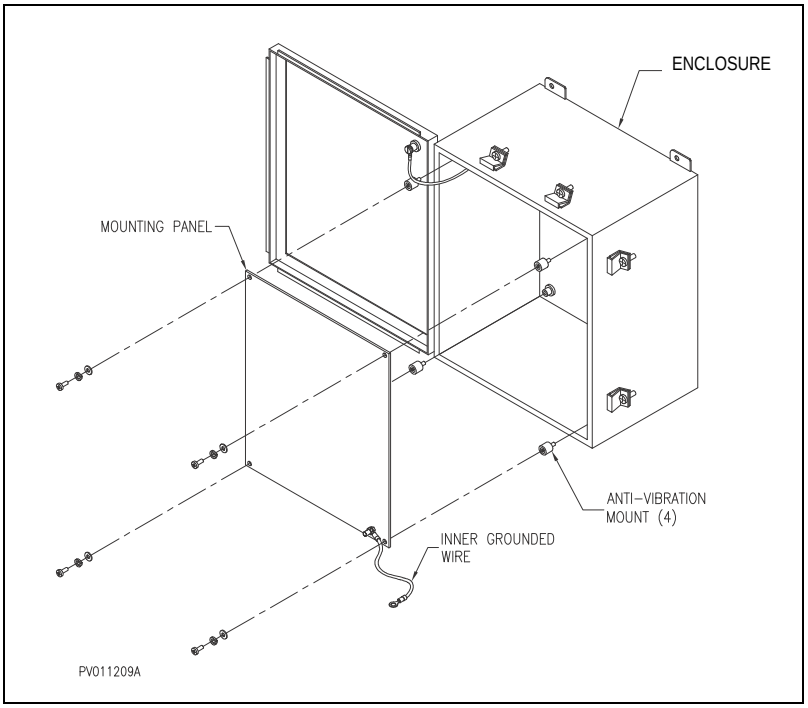


Figure 48 : Removing the mounting panel and anti-vibration mounts

1. As a precaution before drilling the enclosure, remove the mounting panel to prevent metal particles infiltration.

   The anti-vibration rubber mounts must be kept in a safe place, as these are important parts of the mounting panel assembly.

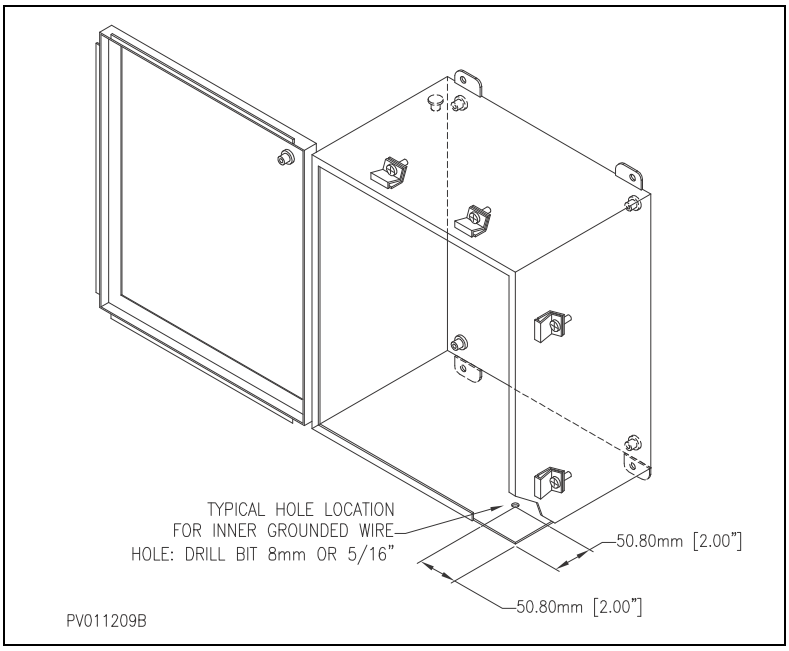


Figure 49 : Typical hole location for grounding wire

2. Drill a grounding hole in a corner of the enclosure, as shown in *Figure 49 : "Typical hole location for grounding wire"*.

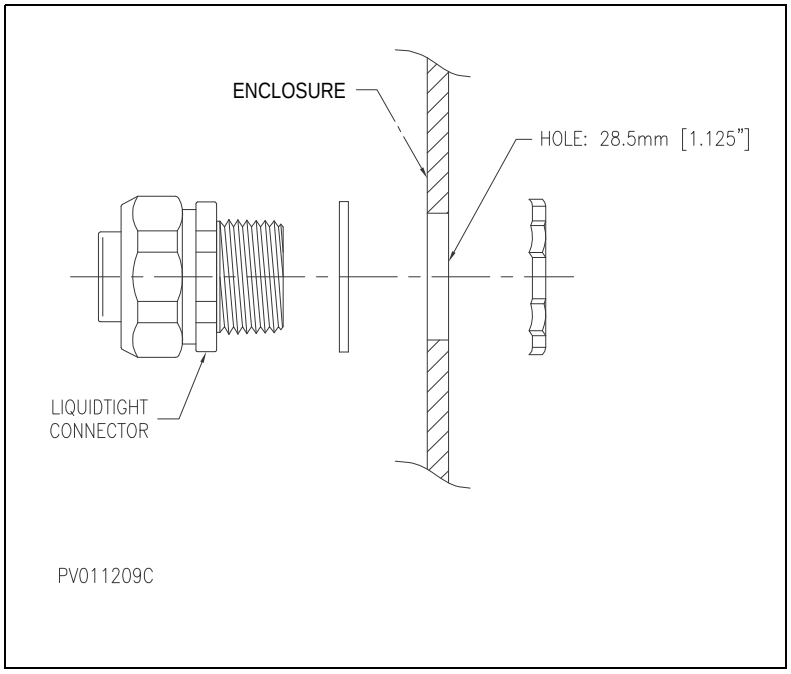


Figure 50 : Mounting the liquidtight connectors for flexible protective conduit

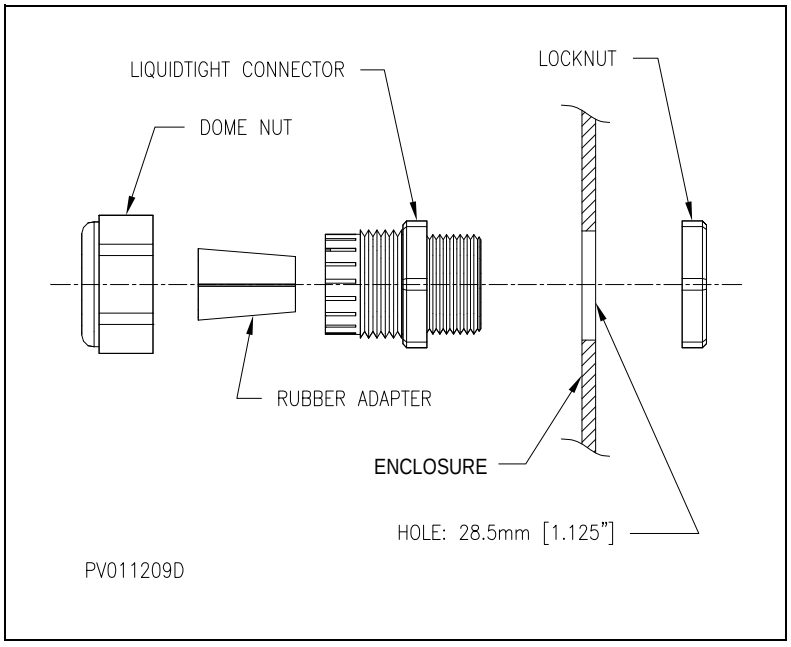


Figure 51 : Mounting the liquidtight strain relief connectors for armored cable

3. After visualizing the routing of all cables, drill holes for the liquidtight connectors.

   To determine the location for the holes, keep in mind the components on the mounting panel. Make sure the components will not get in the way of the connectors once the mounting panel is reinserted.

   Refer to *Figure 50 : "Mounting the liquidtight connectors for flexible protective conduit"* if 3/4" liquidtight conduit is used, or *Figure 51 : "Mounting the liquidtight strain relief connectors for armored cable"* if liquidtight conduit is not used.

4. Install the connectors.
5. Reinsert the mounting panel.

4.2.3 Fastening the enclosure

The enclosure can be mounted on a concrete wall or, whenever possible, directly onto the structure of the stator or machine casing.

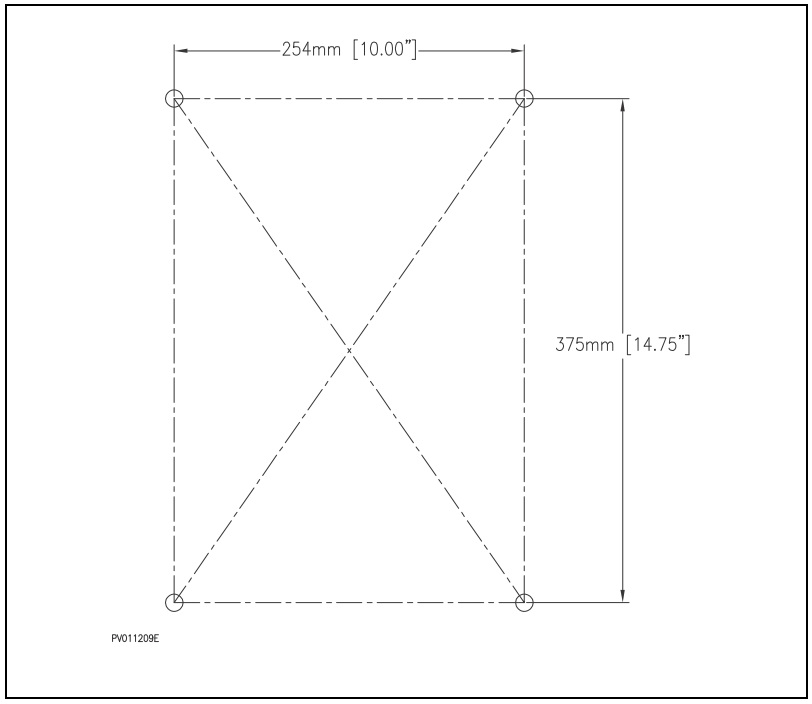


Figure 52 : Mounting holes location

Mark the location of the mounting holes according to *Figure 52 : "Mounting holes location"*.

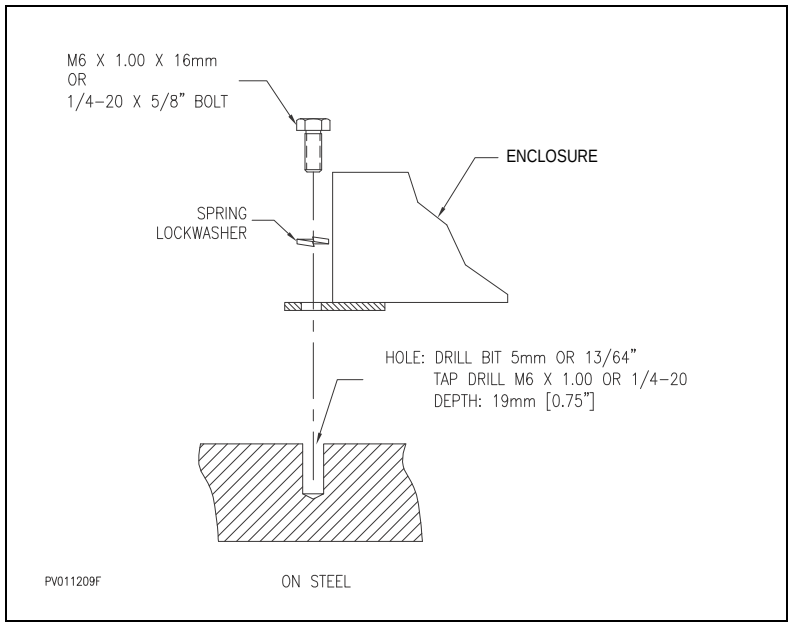


Figure 53 : Fastening the enclosure on steel

Mounting the enclosure on a metallic structure:

1. Drill and thread into the structure according to *Figure 53 : "Fastening the enclosure on steel"*.
2. Fasten the enclosure.

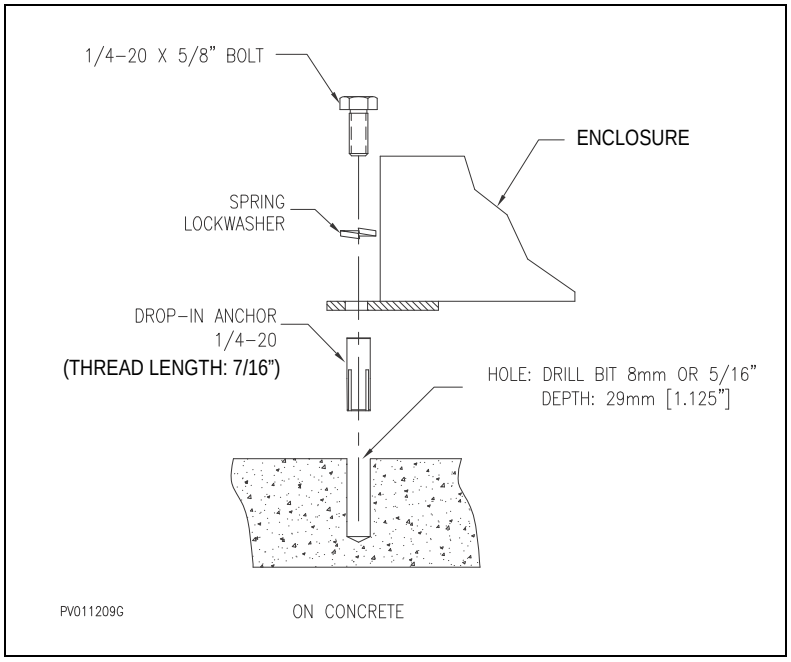


Figure 54 : Fastening the enclosure on concrete

Mounting an enclosure on concrete:

1. Drill into the concrete wall according to *Figure 54 : "Fastening the enclosure on concrete"* and insert the anchors in the holes.
2. Use the anchor punch to drive and permanently set the anchors into the concrete. Hammer the anchors with the punch until each is flush with the concrete surface.
3. Fasten the enclosure to the anchors.

4.2.4 Grounding the enclosure

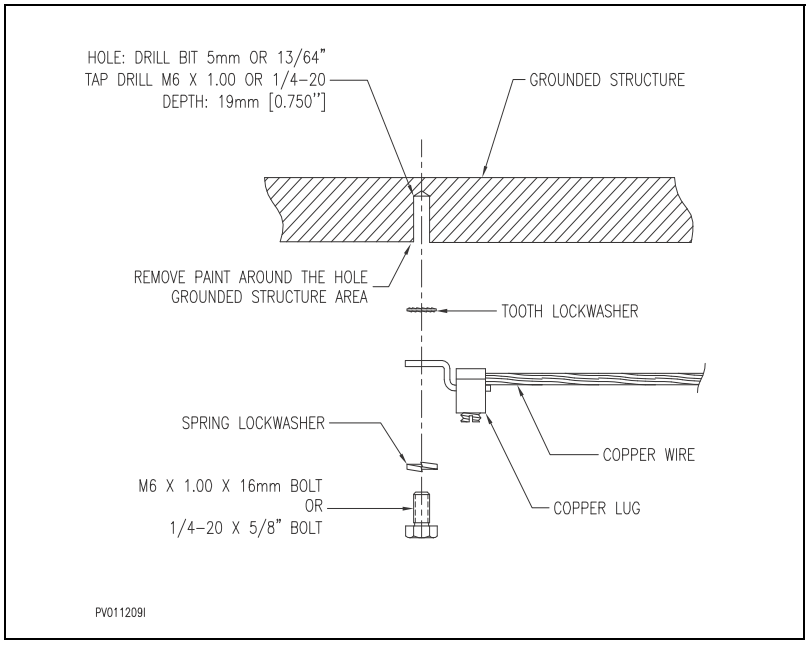


Figure 55 : Fastening the ground wire to grounded structure

Grounding is essential for protection against hazardous voltage as well as for system operation integrity. For best grounding, provide the shortest path possible between the enclosure and the grounded structure.

1. Drill and tap a hole in a grounded structure. Make it as close as possible to the 8mm *[or 5/16"]* hole in the bottom of the enclosure.
2. Fasten the copper wire to the structure according to *Figure 55 : "Fastening the ground wire to grounded structure"*.

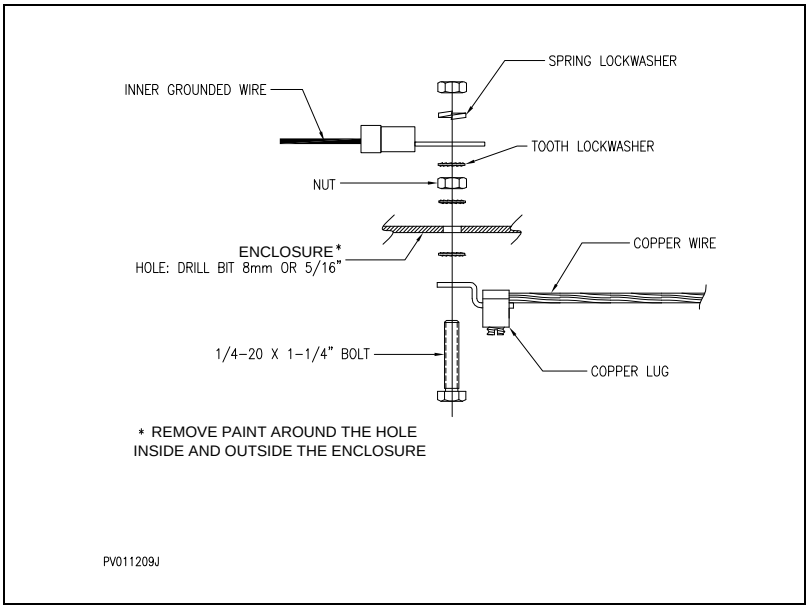


Figure 56 : Fastening the grounding wires to the enclosure

3. Cut the copper wire and fasten it to the outside of the enclosure as shown in *Figure 56 : "Fastening the grounding wires to the enclosure"*.

4.2.5 General specifications of the 14x12x8 enclosure

Physical characteristics

• Dimensions		
- Height	35.56 cm	*[14 in.]*
- Width	30.48 cm	*[12 in.]*
- Depth	20.32 cm	*[8 in.]*
• Weight (without panel)	9 kg	*[20 lb]*
• Protection level	NEMA 12 (IP54)	
• Color	ASA 61 gray	
• Material	Steel	

5. INSTALLATION OF LIN-300 SERIES SIGNAL CONDITIONING MODULES

5.1 Preliminary considerations

Figure 57 : LIN-300 Series signal conditioning module

- LIN-300 Series signal conditioning modules, when supplied with 24V_{DC} and paired with matching sensors, deliver a 4 to 20 mA linearized raw output signal representing a distance. This signal can be used by AGMS and ZOOM systems, ZPU-5000, PCU-5000, PCU-100 Programmable Monitor, or third-party instrumentation.
- The matching sensor connects, via a triaxial extension cable, to an SMA jack and grounding screw. Depending on the measuring chain model, this triaxial cable is either a separate extension cable, or integral to the sensor. A cable for power input and signal output connects to an M12 socket.

- LIN-300 Series signal conditioning modules are usually installed in a wall-mounted enclosure.
- +24 V_{DC} power input is required to power up the LIN-300 Series signal conditioning modules.
- The power input and signal output cable can be assembled on site, using 4-conductor shielded cable and an M12 connector, or a standard single-ended M12 over-molded cable assembly can be used. The standard power input and signal output cable offered by VibroSystM features a molded M12 female connector at one end, is available in various standard lengths, and is rated for a maximum operating temperature of 80°C (176°F). Since this cable is not calibrated, it can be cut if needed.
- Installation of the enclosure, protective conduits, and triaxial extension cables should be completed before proceeding with the installation of the power input and signal output cable, and connection of the LIN-300 Series signal conditioning modules.
- A protective conduit must be installed between the enclosure and the location of the power source and data-receiving instrumentation. This conduit, attached with liquidtight connectors and supported by conduit clamps, will protect the power input and signal output cable.
- The length of the power input and signal output cable, from LIN-300 Series signal conditioner to instrument, should not exceed 300m (1000 ft.).
- Allow sufficient clearance around the enclosures housing the LIN-300 Series signal conditioning modules for verification and maintenance of enclosed components.
- The LIN-300 Series signal conditioning module (and power supply, if present) must be kept away from sources of electrically conductive dust, as well as oil, water or moisture.
- Cabling must be kept away from sources of electrical noise, power lines and fluorescent lighting fixtures. Keep signal cable apart from power cables.

A connection that has not been correctly tightened or has become loose can cause erratic readings. To ensure correct system operation, all connections must be correctly tightened.

5.1.1 Supplies needed

When an enclosure without the optional power supply is used, a power input and signal output cable assembly terminated with an M12 connector is needed. This cable can be either a:

a) standard single-ended M12 over-molded cable assembly, or

b) field-assembled power input and signal output cable from a kit comprised of:

- 4-conductor extension cable *[Belden® #9940]*
- M12 connector

When an enclosure with optional power supply is used, the power input and signal output M12 socket of the LIN-300 Series signal conditioning module is already pre-wired to terminal blocks. Only a length of 4-conductor extension cable is needed to connect the terminal blocks to the power supply and receiving instrumentation. This cable can be ordered as:

- 4-conductor extension cable *[Belden® #9940]*

5.1.2 Tools needed

- fish-tape (to pull the power input and signal output cable inside the protective conduit)
- wire-stripper
- assorted miniature flat screwdriver

5.2 Step by step installation

5.2.1 Connection of the SMA triaxial extension cable from the sensor

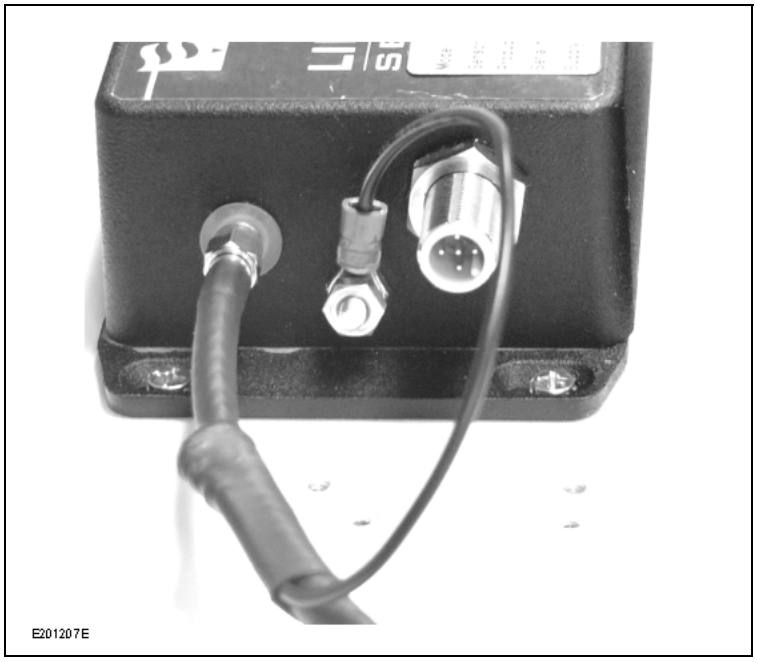


Figure 58 : Triaxial extension cable connected to a LIN-300 Series module

1. Insert the SMA male connector and engage by turning clockwise.

Recommended SMA connection torque: 1.7 Nm *[15 in-lb]*

2. Insert the tooth lock washer, the round lug, the spring lock washer and the nut onto the grounding bolt. Screw the nut firmly to ensure the grounding connection.

- **Recommended grounding connection torque: 2.8 Nm *[25 in-lb]***
- **The ground lug must not come in contact with neither SMA connector nor M12 connector.**

5.2.2 Connection of LIN-300 Series signal conditioning modules fed by an external power source

A standard power input and signal output cable with molded straight M12 female connector is available. A power input and signal output cable can also be assembled from an M12 connector and 4-conductor cable

5.2.2.1 Field-assembly of an M12 connector to a 4-conductor cable

⚠ Caution

To prevent damage to the equipment when the connection has already been completed at the other end of the 4-conductor cable, make sure power is turned off at the source before proceeding.

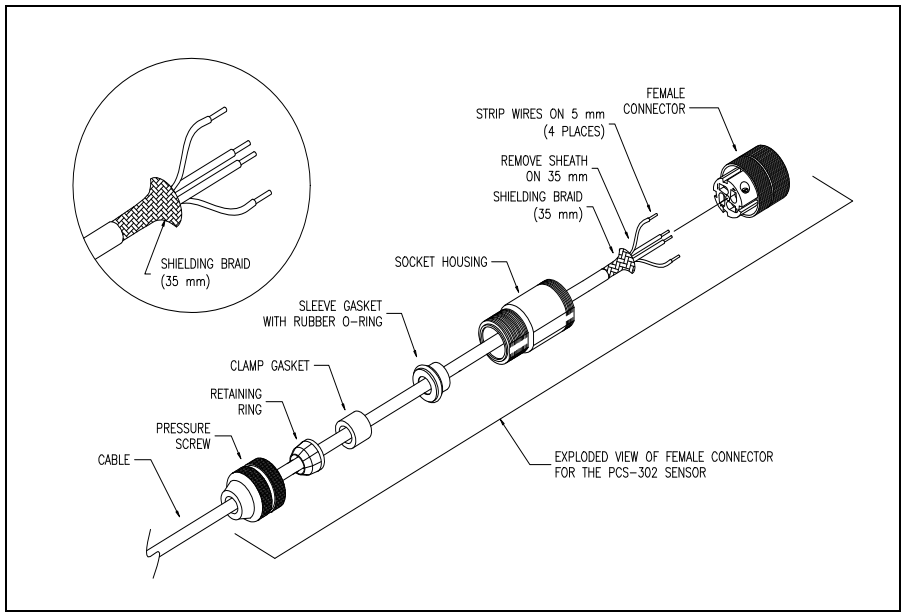


Figure 59 : M12 Connector assembly

1. Slip the various parts on the cable: pressure screw, retaining ring, clamp gasket, sleeve gasket with its rubber o-ring, and socket housing.
2. Strip 35 mm off the external sheathing of the cable.
3. Push shielding braid back.
4. Remove foil and nylon thread (under the shielding braid).
5. Strip 5 mm off the insulation of the wires. Install the wires to the female connector the pin-out table, push together and fasten all housing components.

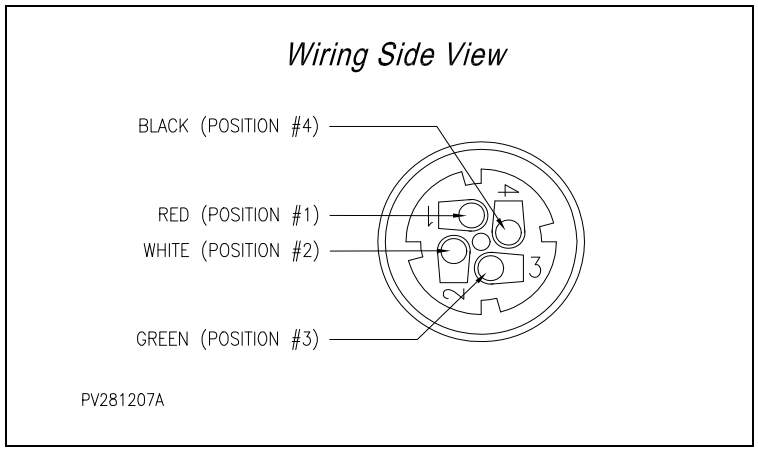


Figure 60 : M12 Female Connector - wiring assignment

Pin-out for the M12 connector using Belden® #9940 cable is shown in *Figure 60 : "M12 Female Connector - wiring assignment"*.

Correspondence with standard single-ended M12 over-molded cable is shown in *Table 1: "Power input and signal output cable pin-out"*.

Table 1: Power input and signal output cable pin-out

Pin #	Standard M12 over-molded cable	#9940 Belden®* cable for field-assembly	Designation
1	Brown	Red	Power supply +24 VDC
2	White	White	Signal Output (I_{OUT})
3	Blue	Green	Common (GND)
4	Black	Black	-

Note: Belden® #9940 cable may be replaced with any cable with similar characteristics (4 conductors / overall shield / conductor size: AWG 22)*

5.2.2.2 Connection of the power input and signal output cable

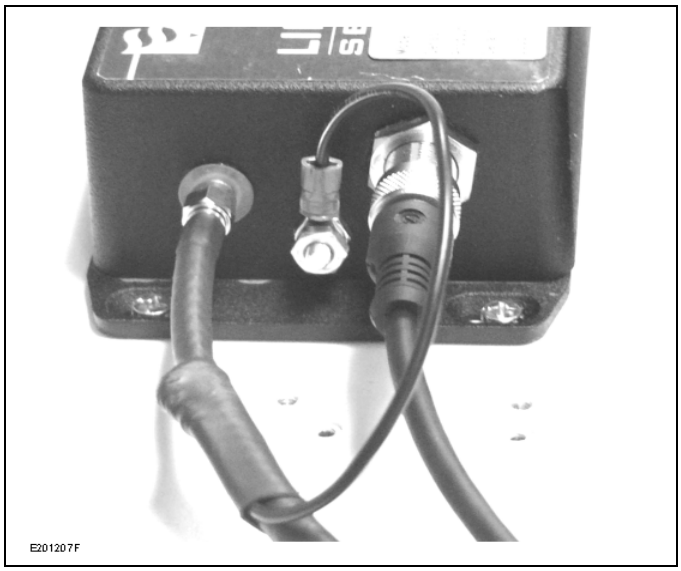


Figure 61 : Power and Signal output cable (right) connected to a LIN-300 Series module

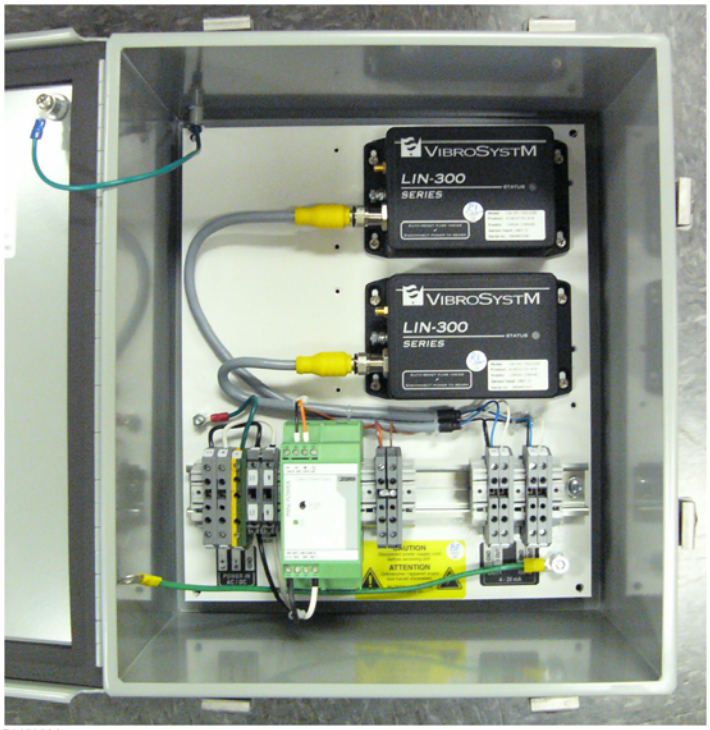
1. Insert the M12 connector and engage by turning clockwise until completely seated.

- **The M12 connection must be made as tight as possible without a tool (finger tight).**
- **The ground lug must not come in contact with neither SMA connector nor M12 connector.**

On some models of molded cables, the M12 connector is equipped with an internal ratchet element preventing unintentional loosening of the compression nut. M12 connectors with this feature produce a clicking sound when turning the compression nut.

When the ratchet mechanical device is present, make sure the coupling nut is well tightened, and the connector is correctly seated. A firm finger-tight connection suffice to prevent loosening.

5.2.3 Connection of LIN-300 Series signal conditioning modules in an enclosure with optional power supply



- An optional miniature power supply can be installed inside the enclosure.
- When ordered with this type of power supply, both LIN-300 Series signal conditioning modules and power supply are pre-wired to terminal blocks, to which two cables must then be connected:
  - the power input cable to the **Power In AC/DC** terminals
  - the signal output cable to the **Out1** and **Out2** terminals
- Power input for miniature power supply:

AC Input voltage:	$85V_{AC}$ - $264V_{AC}$, (50 Hz - 60 Hz)
DC Input range:	$90V_{DC}$ - $350V_{DC}$

Figure 62 : LIN-300 Series signal conditioning modules inside an enclosure with optional power supply

5.2.3.1 Connection of power input terminals

Warning - Danger **Caution**

To avoid risk of injuries and prevent damage to the equipment, make sure power is turned off at the source before proceeding.

- AC-input connection to power supply:

  When AC-input to the power supply is present, easily accessible external disconnecting device must also be present. For safety purposes, a 15A circuit breaker should be included in the AC-input wiring. The disconnect and circuit protection functions may be provided by two separate devices (such as a toggle switch, and a circuit breaker), or by a combined circuit breaker interrupter. Several instruments may be connected to a circuit protected by a circuit breaker, but each instrument must have its own disconnect device.

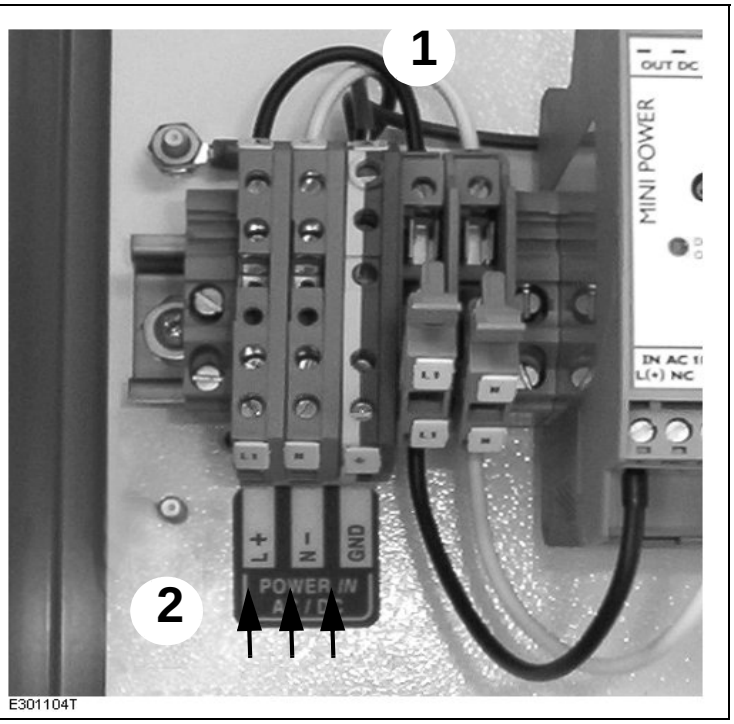


Figure 63 : AC input cable entry

A power source cable must be routed to the enclosure through a distinct protective conduit attached to the enclosure by a liquidtight connector.

1. Open the two fuse-holder terminal blocks

   (holding 2A, 5x20mm slow blow fuses)

2. Connect the power source cable to the **Power In AC/DC** terminals

5.2.3.2 Connection of signal output terminals

⚠ Caution

To prevent damage to the LIN-300 Series signal conditioning modules, make sure power is turned off at the source before proceeding.

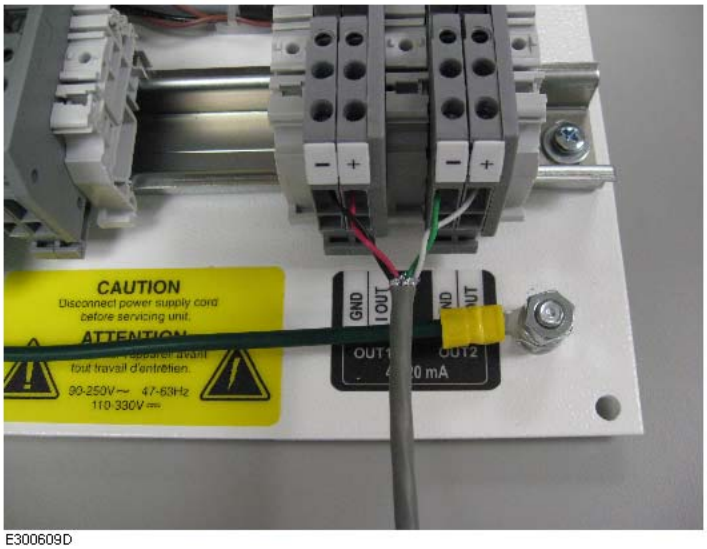


Figure 64 : Signal output cable connected to OUT1 and OUT2 terminal blocks

1. Route the shielded, 4-conductor signal output cable from the LIN-300 enclosure to the receiving instrumentation through a distinct protective conduit attached by a liquidtight connector.
2. Remove the outer sheath of the signal output cable on a length of 4 to 5cm
3. Strip the insulation from the individual conductors on 7 mm (bare wire termination, but each conductor may be fitted with a crimped ferrule if desired).
4. Connect each pair of wires to the proper terminals.

Note: A pair of terminal blocks is assigned to each LIN-300 Series signal conditioning module. To avoid mismatched configurations, identify the conductors corresponding to each module that will be connected to the instrumentation or acquisition/monitoring unit.

- Top LIN-300 Series signal conditioning module = **OUT1** terminals
- Bottom LIN-300 Series signal conditioning module = **OUT2** terminals

Table 2: Signal output cable suggested connection (Belden® 9940)

OUT 1	OUT (+)	Red
	GND (-)	Black
OUT 2	OUT (+)	White
	GND (-)	Green

5.2.4 Verification

Turn on the power to the LIN-300 Series signal conditioning module and verify the two following elements:

a) the sequence at startup is as follows:
   1. an orange flash, followed by
   2. a green flash, followed by
   3. a green or red pulsation.

b) the output signal value of the LIN-300 Series signal conditioning module should be in the range of 3.8 to 20.6 mA. The output is a linear current throughout the measuring range. Refer to the LIN-300 technical specifications for values needed for precise slope-intercept form calculations.

5.3 LED functionality

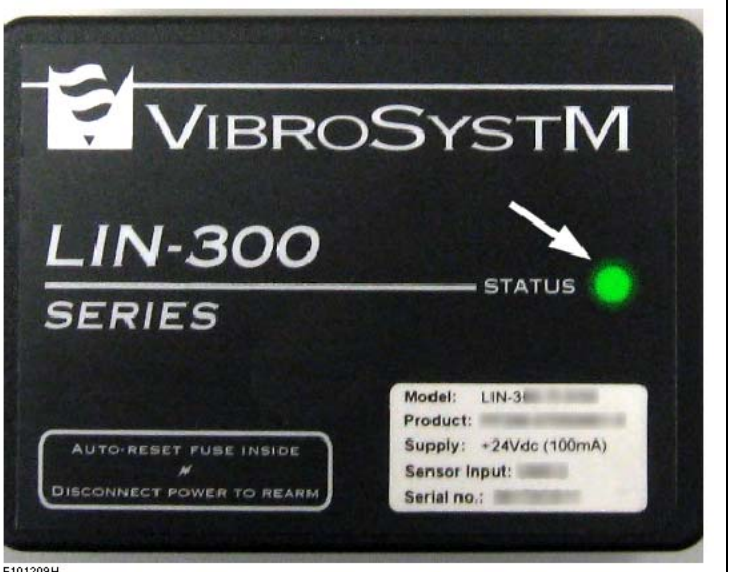


Figure 65 : LED Status Indicator

A colored LED provides a visual clue to the status of the LIN-300 Series signal conditioner.

The sequence at startup is as follows:

1. an orange flash, followed by
2. a green flash, followed by
3. a green or red pulsation.

- A green pulsation (one brief flash per second) indicates normal operation (Status OK).
- The LED turns red and repeats a sequence of pulses to indicate an error condition:

  Error condition # 1: the LED turns on for one second, followed by one brief flash, to indicate that the sensor is either not connected, or the distance to the target is beyond the maximal detection range.

  Error condition # 2: the LED turns on for one second, followed by two brief flashes, to indicate that the distance to the target is below the minimal detection range.

5.4 General specifications of the LIN-340 Series Modules

LIN-340 signal conditioning modules are available in two different models.

5.4.1 LIN-340-10J-0.5/2.5 Signal Conditioning Module

Operation

• Matching sensor	DCS-400	
• Matching cable	10J BNC/SMA	
• Measuring range	0.5 to 2.5 mm	*[19.7 to 98.4 mils]*
• Output	4 to 20 mA	
• Sensitivity	8 mA/mm	*[0.203 mA/mil]*
• Accuracy [1]	< 3% of reading	
• Repeatability	± 0.5% of reading	
• Interchangeability	± 3% of reading	
• Frequency response	DC to 1.2 kHz (-3dB)	
• Output load	500 Ω max.	
• Temperature drift	< 500 ppm/°C	

Power requirement

• Voltage	$+24V_{DC}$ ± 15%
• Consumption	90 mA ($+24V_{DC}$)
• Protection	Auto-reset fuse

Connection

• Cable from sensor	BNC and grounding screw	
• Power & output cable	M12 socket	
- Maximum length	< 300 m	*[< 1000 ft.]*

Environmental

• Temperature:		
- Operation	0° to 55°C	*[32° to 130°F]*
- Storage	0° to 85°C	*[32° to 185°F]*
• Humidity	Up to 95%, non condensing	

Physical characteristics

• Die cast aluminium compact casing body		
Dimensions:		
A - Height	44.5mm	*[1.75 in.]*
B - Width	82.5mm	*[3.25 in.]*
C - Length	139.5mm	*[5.50 in.]*

Note 1: Measurement accuracy improves as gap gets smaller. Better precision is obtained by calibrating the sensor and LIN module together as a set.

5.4.2 LIN-340-10S-0.5/2.5 Signal Conditioning Module

Operation

• Matching sensor	DCS-400	
• Matching cable	10S SMA/SMA	
• Measuring range	0.5 to 2.5 mm	*[19.7 to 98.4 mils]*
• Output	4 to 20 mA	
• Sensitivity	8 mA/mm	*[0.203 mA/mil]*
• Accuracy [1]	< 3% of reading	
• Repeatability	± 0.3% of reading	
• Interchangeability	± 3% of reading	
• Frequency response	DC to 1.2 kHz (-3dB)	
• Output impedance	500 Ω max.	
• Temperature drift	< 500 ppm/°C	

Power requirement

• Voltage	$+24V_{DC} \pm 15\%$
• Consumption	90 mA ($+24V_{DC}$)
• Protection	Auto-reset fuse

Connection

• Cable from sensor	SMA jack (female contact) and grounding screw	
• Power & output cable	M12 socket	
- Maximum length	< 300 m	*[< 1000 ft.]*

Environmental

• Temperature:		
- Operation	0° to 55°C	*[32° to 130°F]*
- Storage	0° to 85°C	*[32° to 185°F]*
• Humidity	Up to 95%, non condensing	

Physical characteristics

• Die cast aluminium compact casing body

Dimensions:

A - Height	44.5mm	*[1.75 in.]*
B - Width	82.5mm	*[3.25 in.]*
C - Length	139.5mm	*[5.50 in.]*

Note 1: Measurement accuracy improves as gap gets smaller. Better precision is obtained by calibrating the sensor and LIN module together as a set.