PCS-202SB Measuring Chains
with LIN-300 Series Signal Conditioner
Front End Installation Manual

(P/N: 9428-25I6A-310)

Applies to measuring chain model #: LIN-302S-6I-0.3/2.3

This manual divides into the following sections:

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1. OVERVIEW OF THE PCS-202SB MEASURING CHAINS WITH LIN-300 SERIES CONDITIONERS

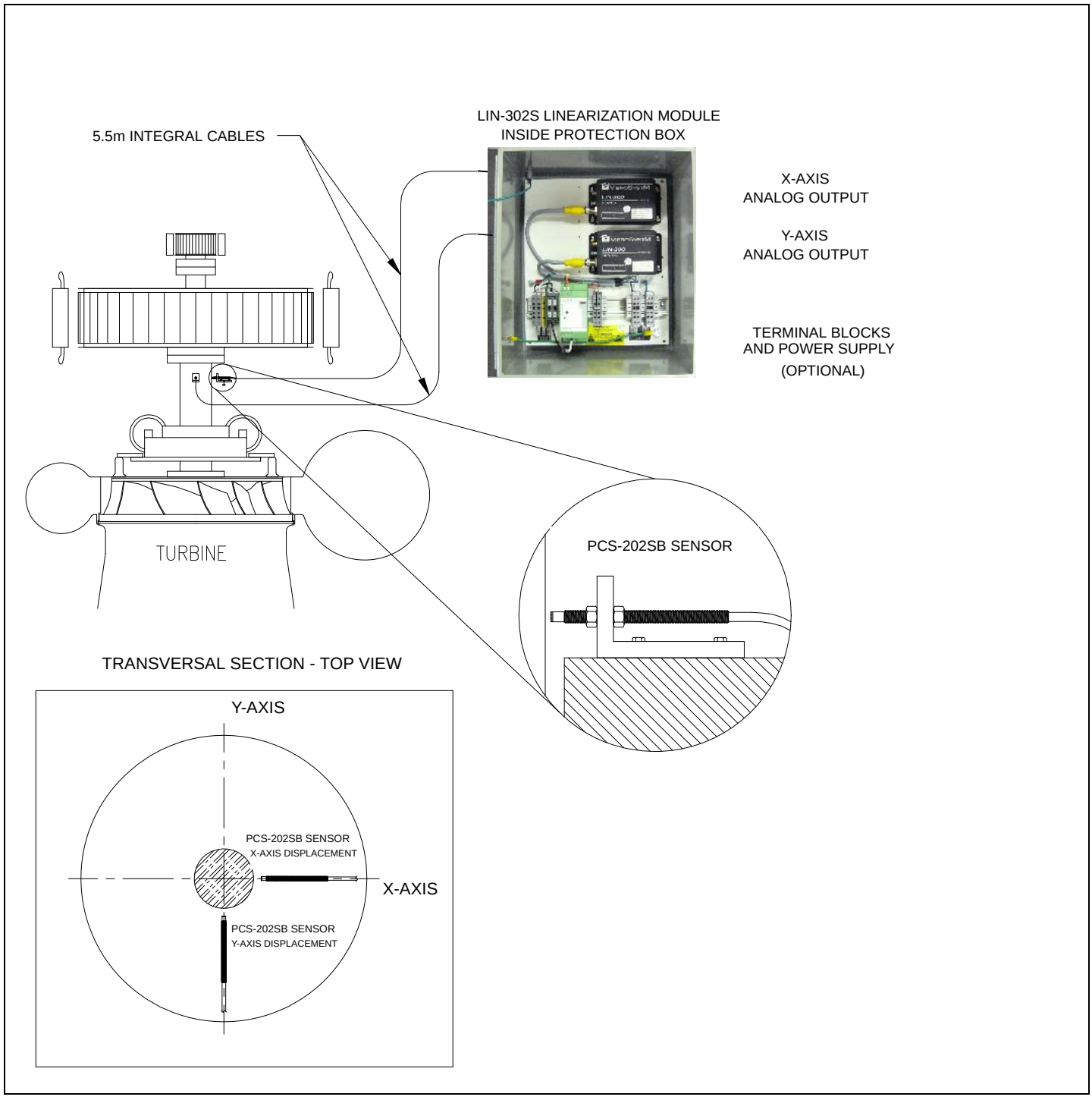

Figure 1 : Typical PCS-202SB / LIN-302S measuring chains installation

The basic measuring chain includes:

Qty	Description
1	PCS-202SB Universal Proximity Probe
1	LIN-302S-6I-0.3/2.3 Linearization Module for a 2mm *[79 mils]* detection range

LIN-300 modules are usually installed in a protection box, either an ABS housing for a single module, or a metal cabinet, which can house two modules, and can also house an optional +24V_{DC} power supply.

Option	Description
A)	10X6X3 ABS Protection Box
B)	14x12x8 Metal Protection Box without power supply
C)	14x12x8 Metal Protection Box with universal +24V_{DC} power supply

1.1 Safety information

This manual contains information and warnings that must be observed to keep instruments 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

- 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:

	emphasizes important information.
	**Caution** - identify conditions or practices that could result in permanent loss of data.
	**Warning - Danger -** 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. Conditions include a risk of electric shock (voltage > 30 V_{DC} or V_{AC} peak might be present).
	Do not apply paint or other coating.
	Earth (ground) terminal.
	Category 1 protective conductor terminal, including grounding and equipotential protection.

1.2 Planning and installation requirements

Respect the following guidelines when planning your equipment configuration:

- The signal linearization module (and power supply module, if present) must be kept away from sources of electrically conductive dust, as well as oil, water or moisture.
- Allow sufficient clearance around the LIN-300 protection box for verification and maintenance of enclosed components.
- Cabling must be kept away from sources of electrical noise, power lines and fluorescent lighting fixtures.

1.3 General specifications of measuring chains

Operation

- Sensor — PCS-202SB
- Matching linearization modules — LIN-302S-6I-0.3/2.3
- Output — 4 to 20 mA linearized signal

Power requirement

- Voltage — $+24V_{DC}$ +/- 15%
- Consumption — 90 mA ($+24V_{DC}$)

2. INSTALLATION OF THE PCS-202SB PROXIMITY SENSOR

2.1 Preliminary considerations

Figure 2 : PCS-202SB Sensor

- The PCS-202SB Universal Proximity Probe is used in applications such as non-contact measurement of relative vibration, axial position, and relative displacement. It is well suited for the detection and monitoring of shaft vibration and runout, rotor imbalance and misalignment, bearing wear, and stator frame displacement. The 4 to 20 mA output from the LIN-300 Series module can be sent to any compatible instrument.
- The surface of the target in front of the PCS-202SB sensor must be of conductive/semi-conductive material.
- The integral cable on the standard PCS-202SB is protected on its full length by flexible stainless steel cable armor.

- Due to the calibration process, the length of the integral cable may vary lightly from one sensor to another. Minimum length is 5.5 m *[18 ft.]*. Protection boxes for the LIN-300 Series signal conditioners must be installed within this range.
- The integral cable is terminated by a male SMA connector on standard sensors, or by a male BNC connector on legacy sensors.

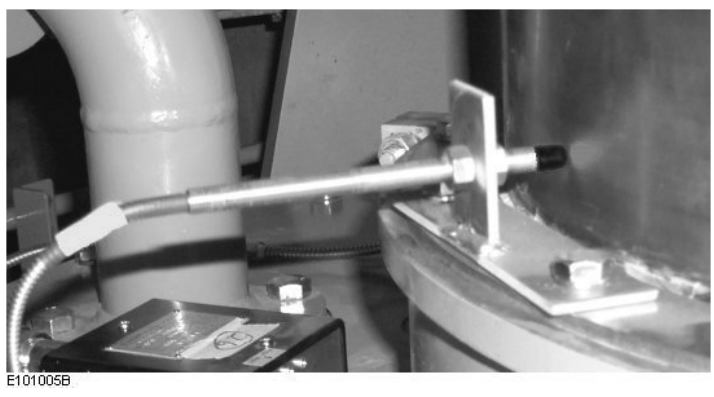

Figure 3 : PCS-202SB Sensor installed on a bracket

- A mounting bracket will have to be machined on site. The assembly must be sufficiently rigid to avoid adding vibrations.

Warning - Danger
• **Never install triaxial cables on high voltage components.**

Caution

- Whenever possible, ABS Protection Box for single LIN-300 module should be preferred for PCS-202SB measuring chains.
- To avoid crosstalk, special care must be taken while routing the integral cables. Two cables should never be inserted in the same conduit. Never install integral cables in parallel close to one another. Keep cables at least one meter apart.
- If the sensor is installed on an insulated bearing, a thin insulating sheet must be placed between the mounting bracket and the insulated bearing to preserve the integrity of the insulation. Insulated screw assembly must also be used.
- **Handle the sensor with great care.**
- **Never pull on the triaxial cable or on the connector.**

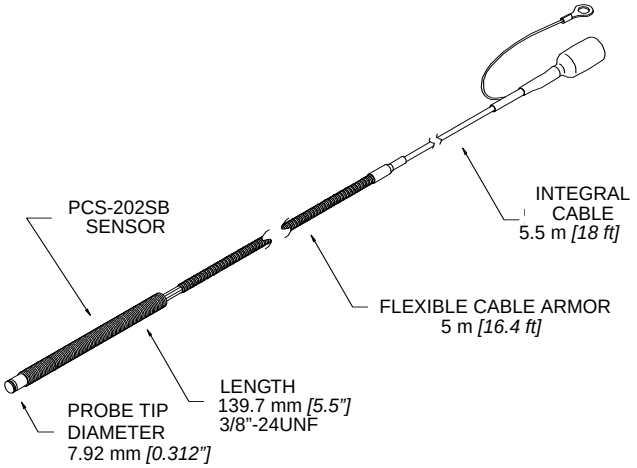

Figure 4 : Legacy PCS-202SB sensor terminated with BNC connector

High-frequency grounding of the sensor body is essential to proper operation of the system. The grounding lug at the end of the integral cable must also be connected to a grounding pin on the LIN-300 Series module.

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

Do not apply paint or silicone on the sensor sensing surface.

Figure 5 : BNC to SMA adapter

Legacy PCS-202SB sensors terminated by a BNC connector can be connected to LIN-300 Series modules by using a special BNC to SMA adapter.

2.1.1 Supplies needed

- PCS-202SB sensor - including two 3/8”-24 UNF nuts
- mounting bracket (fabricated on site)
- cable straps or cable clamps
- nut thread locker compound (such as LocTite®)

2.1.2 Tools needed

- depth gauges
- wrench or pliers
- machining tools to fabricate and install the mounting brackets

2.2 Step by step installation of the PCS-202SB sensor

The installation of PCS-202SB normally includes the following steps:

- choosing the sensors location;
- fabrication of mounting brackets;
- installation of mounting brackets and sensors;
- routing and clamping of integral cable.

2.2.1 Choosing the sensors location

The location for the sensors depends on the type of vibrations that have to be measured.

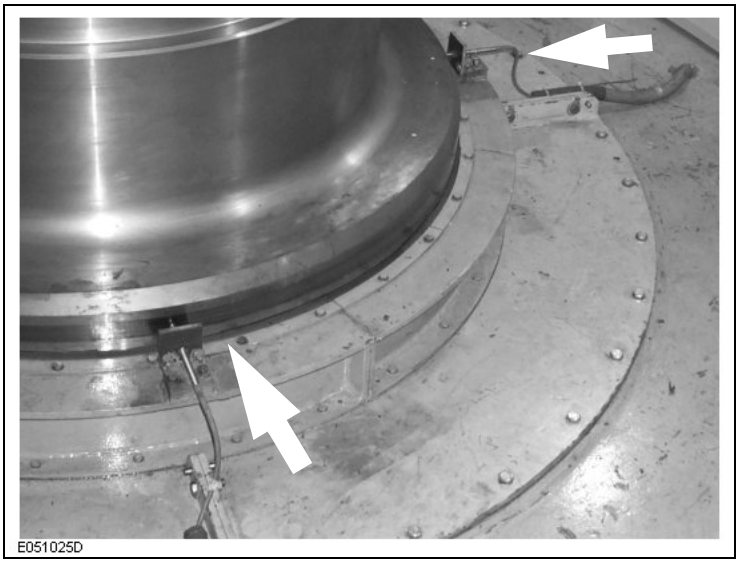

Figure 6 : Two PCS-202SB sensors installed for radial vibration measurement

When measuring radial vibrations, two sensors must be installed at a 90° angle around the shaft.

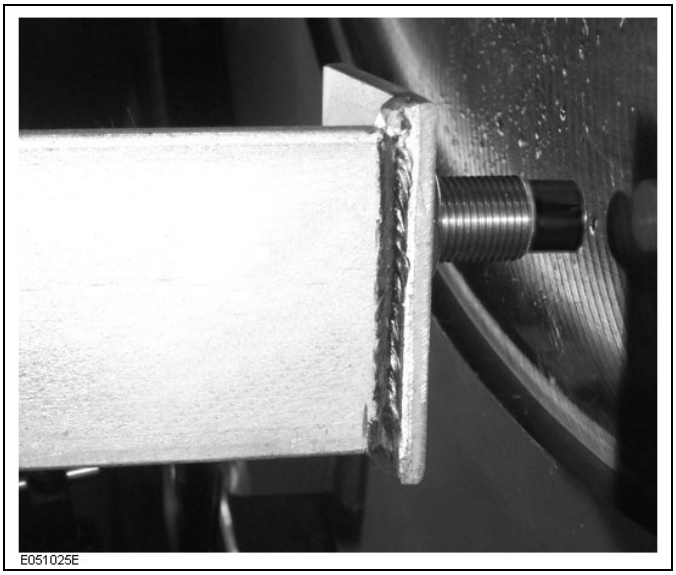

Figure 7 : Sensor installed at mid-range distance from the target

The face of the PCS-202SB sensor must be installed at mid-range distance from the target. The measuring range of the sensor depends on the linearization module used.

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2.2.2 Machining of mounting brackets

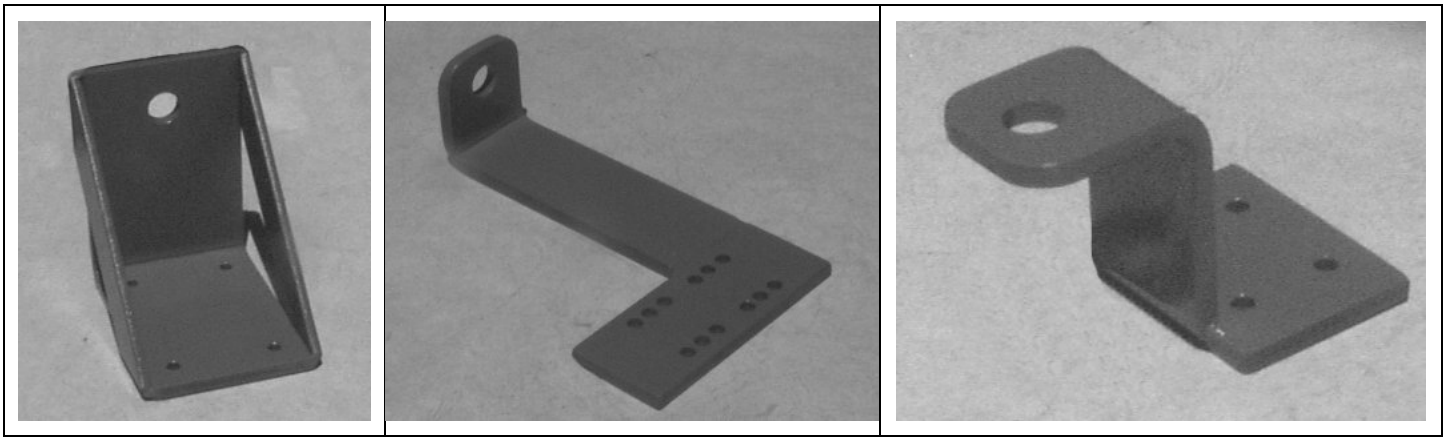


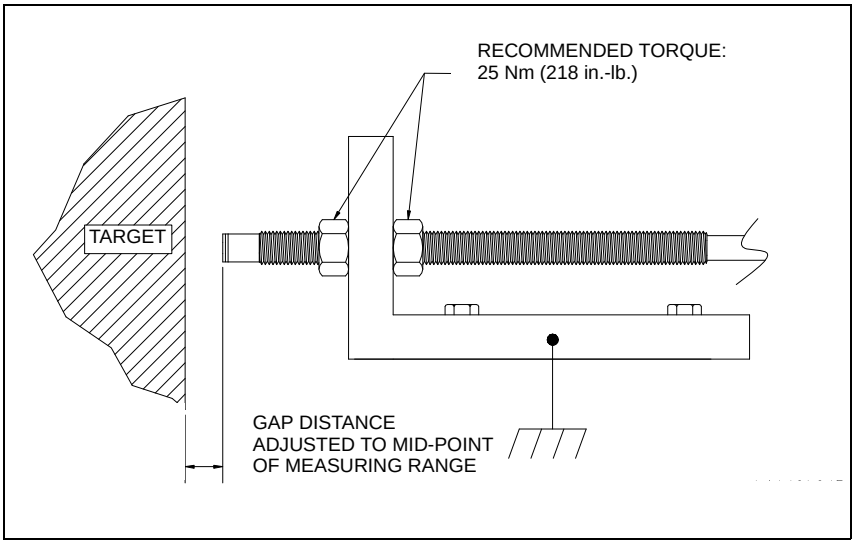
Figure 8 : Various shapes of custom mounting brackets

Factors to be considered when machining the mounting bracket:

- The mounting bracket must be installed at a perfectly stable location;
- The sensor is 3/8” in diameter, with 3/8-24 UNF thread. It can be fitted in a 10 mm (3/8”) unthreaded hole with the two jam nuts supplied with the sensor;
- The mounting bracket must be rigid to avoid vibrations. The use of aluminum plates with a thickness between 10 and 13mm (3/8” and 1/2”) is recommended. If needed, use lateral reinforcement to add rigidity.

It is important to make sure that the bracket does not vibrate, as this would alter the readings from the sensor.

2.2.3 Installation of mounting brackets and sensors



1. Install the mounting bracket on the structure at the chosen location.
2. Adjust the sensor at mid-range distance from the target, using a gauge between sensor face and target. Refer to the specifications of the LIN-300 Series module used
3. Set the sensor in place by tightening jam nuts at recommended torque. When adjustment has been completed and measurements have been validated, thread lock compound must be applied to prevent the nuts from loosening.

Figure 9 : Setting the PCS-202SB sensor in place

Caution

Proceed with gap distance adjustment only after the complete measuring chain, **including grounds**, has been installed. Apply power to the measuring chain, and measure signal output. The distance is correct when the conditioner output reads precisely 12 mA.

Grounding

The principle of operation of the PCS-202SB sensor requires adequate high-frequency grounding. To ensure the permanent conductivity of the ground, some precautions must be taken during installation.

- On a grounded metallic structure, avoid the use of paint or sealant inside and around mounting holes on the mounting bracket. This will ensure electrical contact between the sensor body, the mounting bracket, and the machine.
- When a direct electrical contact between the mounting bracket and the machine cannot be achieved (for instance, when the mounting bracket is installed on concrete), a grounding copper wire must be installed between the metallic mounting bracket and the nearest location of a grounded structure.
- In the presence of insulated bearing, special caution must be used. Refer to the following instructions for installation of the mounting bracket on an insulated bearing.

2.2.3.1 Sensor installation on an insulated bearing

Caution

If the sensor is installed on an insulated bearing, a thin insulation sheet must be placed between the mounting bracket and the insulated bearing. Insulated screw assembly, such as phenolic sleeves and washers, must also be used.

When a sensor is installed on an insulated bearing, special care must be taken while mounting the bracket to preserve the integrity of insulation. Insulation must be added between sensor housing and insulated bearing surface, but low impedance at high frequency must still be achieved. The most widely recommended mounting method consists in placing a mica sheet (1.6 mm *[0.063"]* thick or less) between mounting bracket and bearing, and using either non-metallic bolts, or metallic bolts insulated from the bearing by phenolic sleeves and washers.

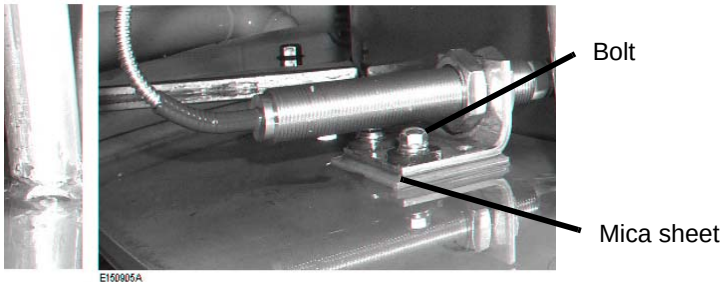


Figure 10 : Installation on an insulated bearing

Verification:

1. Once the bracket is installed, test with a ohmmeter for an open circuit condition between the mounting bracket and insulated bearing.
2. Place a temporary cable between the sensor casing and insulated bearing to create a short-circuit path.
3. Complete the measuring chain by connecting the sensor to its LIN-300 Series conditioner and apply power to the conditioner. Take a measurement of the 4-20 mA output signal.
4. Remove the temporary cable between the sensor casing and insulated bearing.
5. Take a new measurement. The results should be similar to the previous reading, within a +/- 2 mA margin.
6. If the results differ beyond the mentioned margin, the insulating sheet is probably too thick. A thinner sheet should be used before going through the verification procedure again.

2.2.4 Routing and clamping the integral cable

Caution

- To prevent damage to the cable, do not force beyond the minimal bending radius (6 cm *[2.5”]*).
- 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.

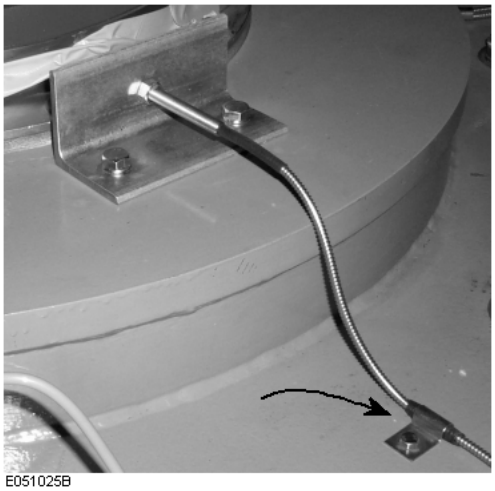


Figure 11 : Cable secured with cable clamps

Complete the installation by strapping all conduits and cables over the whole distance between the PCS-202SB sensors and the LIN-300 Series linearization module.

2.3 General specifications

Operation

• Type of measurement	non-contact proximity, capacitive technology
• Linear measuring range	refer to Linearization Module used
• Frequency response	limited by the Linearization Module used
• Accuracy	< 2.5 % of reading at mid-range
• Repeatability	< 0.3 % of reading at mid-range
• Interchangeability	< 2.5 % of reading at mid-range

Environmental

• Temperature range	-50° to 200°C *[-58° to 392°F]*
• Humidity	Up to 95%, non-condensing

Connection

• Integral Cable	
- Type	Triaxial
- Length	5.5 m *[18 ft.]* minimum
- Connector	Male SMA with ground lug (standard), or male BNC with ground lug (legacy)
- Cable Armor	Integral fexible stainless steel metallic conduit, diam. 5.6 mm *[0.220 in.]*, on 5 m *[16.4 ft.]* standard

Dimensions

• Probe overall dimensions		
- Diameter	9.5 mm	*[0.375 in.]*
- Length	139.70 mm	*[5.50 in.]*
- Tip diameter	7.92 mm	*[0.312 in.]*
• Thread	3/8-24 UNF	

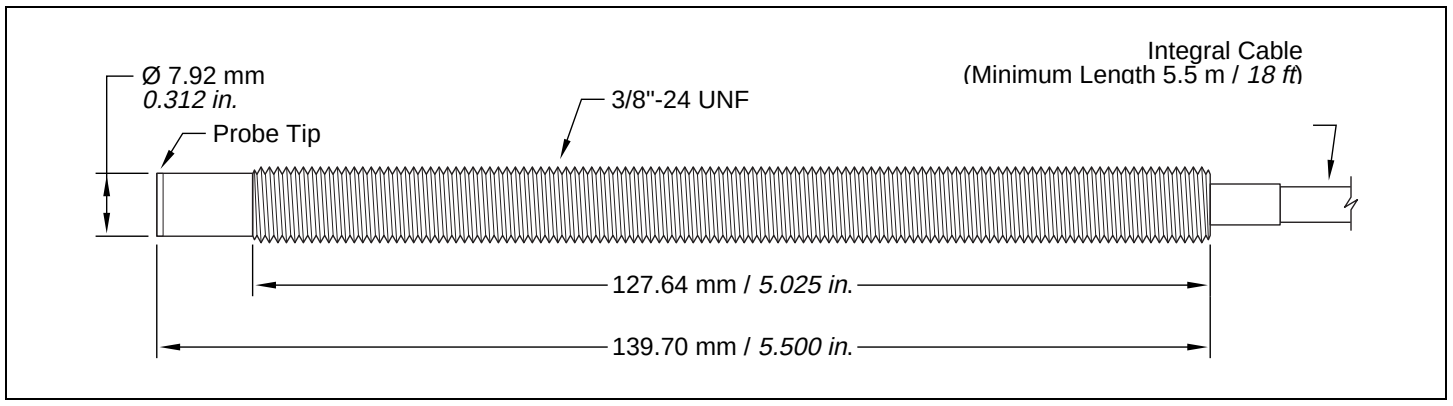


Figure 12 : PCS-202SB dimensions

3. INSTALLATION OF THE LIN-300 PROTECTION BOXES

LIN-300 modules may be protected by an ABS enclosure (single module) or a larger steel enclosure with a mounting plate for two modules and, if desired, a rail-mounted power supply and terminal blocks. The following details the installation procedure for both types of protection boxes.

3.1 Installation of the 10X6X3 ABS Protection Box

3.1.1 Preliminary considerations

The ABS protection box is a plastic enclosure which can house a single LIN-300 Series conditioner. Outer dimensions are 254 x 152 x 76 mm (10 x 6 x 3 in.).

Figure 1: Front view of the ABS protection box

All connected cables must be protected by flexible protective conduits and attached with liquidtight connectors. Prepare the openings on the protection box and set the liquidtight connectors in place before fastening the protection box.

To determine the best location for the protection box, survey all potential locations with respect to the following limitations:

- the optimal location at which the protection box can be installed depends on the length of the triaxial cables used;
- all cables should be placed inside 19mm (3/4") flexible protective conduits or equivalent when possible;
- sufficient space must be allowed around the protection box for the installation of the protective conduits.

Figure 2 : Inside view of the ABS protection box

When routing cables into the protection box for connection to the conditioner, the excess length of cable can be coiled as shown inside the protection box.

Note: Be carefull when handling the cable. Do not kink the cable and avoid forming sharp bends.

3.1.2 Installation of the Protection Box

Figure 3 : Protection Box -Installation kit

3.1.3 Supplies needed

- (2) 3/4” flexible conduit liquid tight connectors
- (4) bolts 1/4-20 x 5/8”
- (4) concrete anchors
- (4) bolts M6 - 1.00 x 16 mm
- (4) spring lockwashers 1/4”
- (4) flat washers 1/4”
- (4) brackets
- (4) spring lockwashers 10-32
- (4) flat washers 10-32
- (4) screws 10-32 x 1/2”

3.1.4 Tools needed

- Drill bits 5mm (13/64’’) and 8mm (5/16’’)
- Tap drill 1/4’’-20
- Hammer drill
- Drill
- Concrete drill bit 8mm (5/16’’)
- Anchor setting punch
- Ratchet set
- 3/4’’ conduit hole saw or knockout punch set for 3/4’’ liquidtight fittings

The installation of the LIN-300 ABS protection box involves two main steps:

1. Preparing the holes for the connectors;
2. Fastening the protection box.

3.1.5 Preparing the holes for the liquidtight connectors

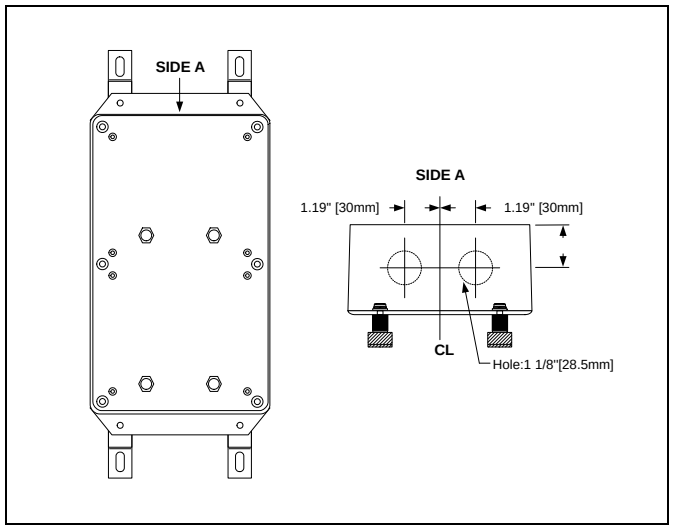


Figure 4 : Suggested location for liquidtight connector holes

1. To prevent damage, remove the LIN conditioner before drilling the protection box. Do not misplace the anti-vibration rubber mounts added to the mounting brackets.

   Before deciding on the location for the holes, make sure that the liquidtight connectors will not be too close to the LIN conditioner once it is reinstalled, and that the cables will not be kinked.

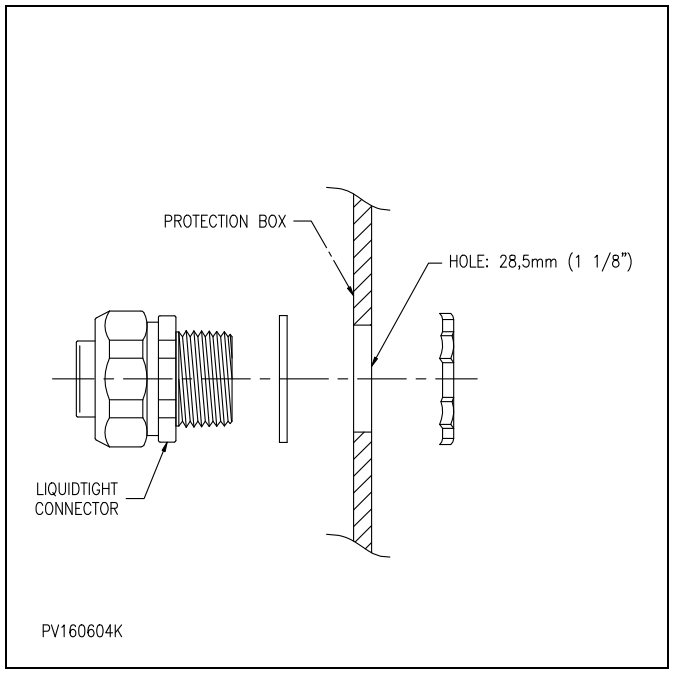


Figure 5 : Mounting the liquidtight connectors on ABS protection box

2. Drill holes and install the the liquidtight connectors. Refer to *Figure 5 : "Mounting the liquidtight connectors on ABS protection box"*.

3.1.6 Fastening the protection box

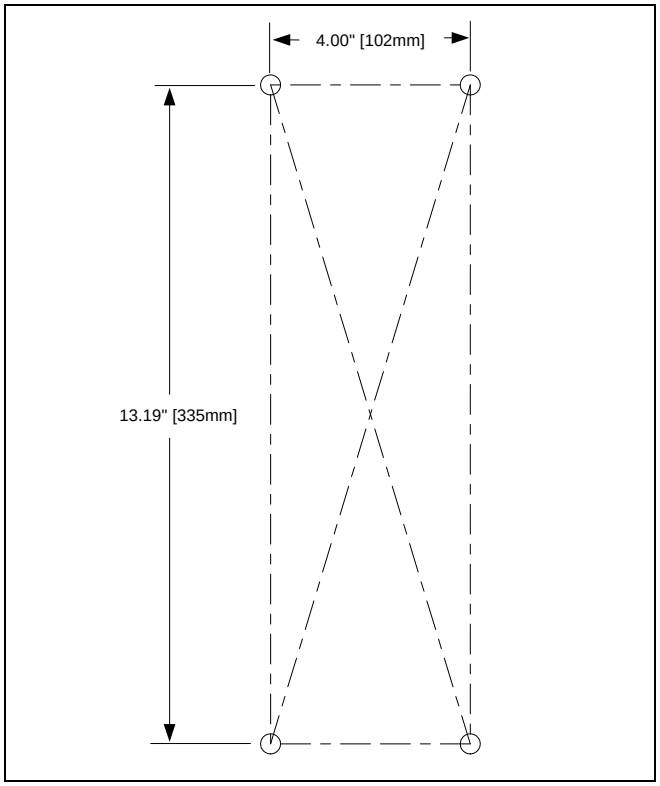


Figure 6 : Mounting holes template

Choose the location for the protection box.

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

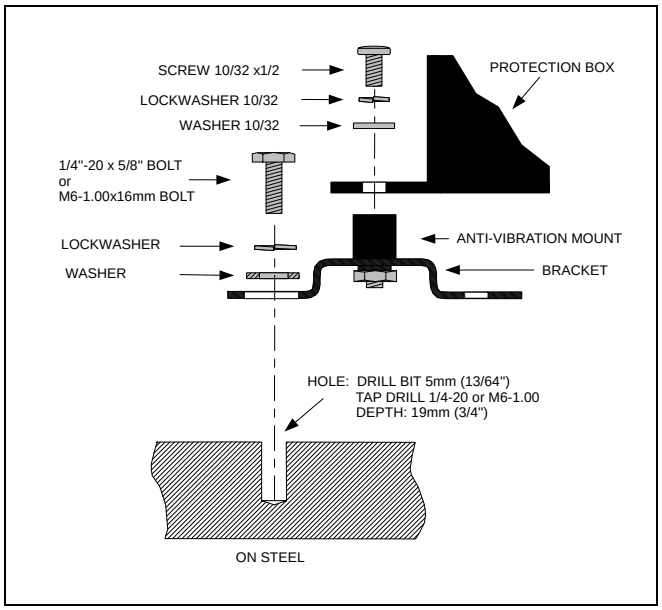


Figure 7 : Fastening the ABS protection box on steel

Mounting a protection box on the stator or machine casing:

1. Drill (refer to *Figure 6 : "Mounting holes template"*) and thread into the structure (refer to *Figure 7 : "Fastening the ABS protection box on steel"*).
2. Fasten the protection box as shown.

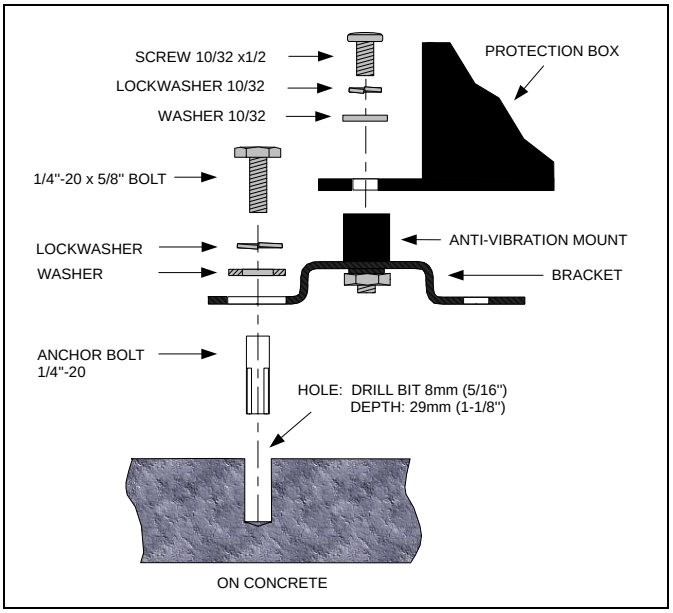


Figure 8 : Fastening the ABS protection box on concrete

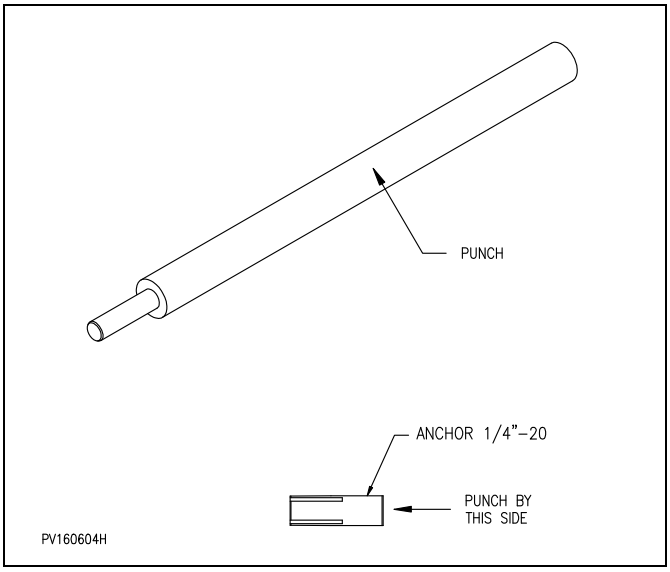


Figure 9 : Anchor setting punch for concrete anchors

Mounting a protection box on concrete:

1. Drill into the concrete wall (refer to *Figure 6 : "Mounting holes template"*) and drive the anchor bolts with the special punch (*Figure 9 : "Anchor setting punch for concrete anchors"*).
2. Fasten the ABS protection box as shown (refer to *Figure 8 : "Fastening the ABS protection box on concrete"*).

3.2 Installation of the 14 x 12 x 8 Metal Protection Box

3.2.1 Preliminary considerations

The standard protection box is a watertight, dust-tight and corrosion-resistant metal enclosure that protects the electronic components of the acquisition units. Outer dimensions are 356 x 305 x 203mm (14 x 12 x 8 in.).

Figure 10 : Front view of the 14x12x8 protection box

- To prevent damage to the electronic components, always remove the mounting panel before working on a protection box.

Note: Except for the ground wire, all connected cables must be protected by flexible protective conduits and attached with liquidtight connectors. Prepare the openings on the protection box and set the liquidtight connectors in place before fastening the protection box.

Figure 11 : Suitable location for a protection box

To determine the best location for the protection box, survey all potential locations with respect to the following limitations:

- The protection box must be installed within the appropriate distance according to the specifications of the components mounted inside;
- All cables should be placed inside 19mm (3/4”) flexible protective conduits or equivalent when possible;
- Sufficient space must be allowed around the protection box for the installation of the protective conduits;
- Sufficient clearance is necessary to open the door for easy access of components.

3.2.2 Installation of the Protection Box

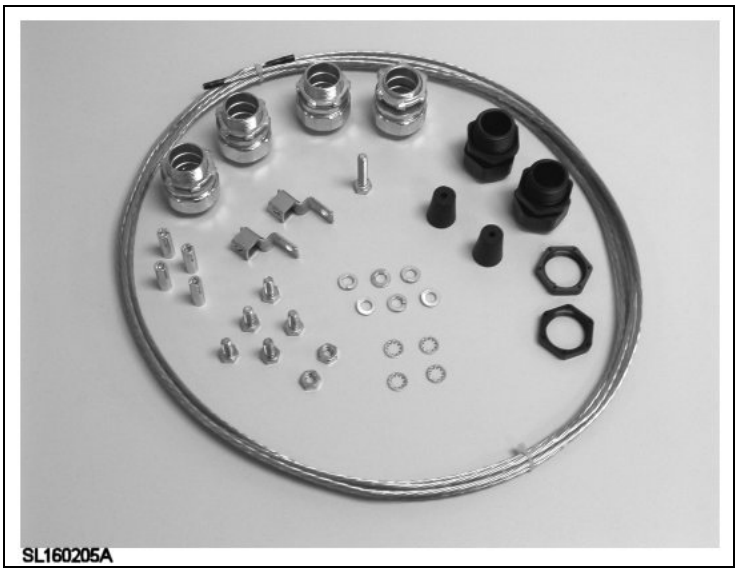


Figure 12 : Protection Box -Installation kit

3.2.3 Supplies needed

- (4) 3/4” flexible conduit liquid tight 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”
- (4) concrete anchors
- (2) copper lugs
- (1) ground copper wire (5m)
- (2) liquidtight strain relief connector
- (2) nylon locknuts 3/4’’
- (2) rubber adapters for liquidtight strain relief connectors

3.2.4 Tools needed

- Drill bits 5mm (13/64’’) and 8mm (5/16’’)
- Tap drill 1/4’’-20
- Hammer drill
- Drill
- Concrete drill bit 8mm (5/16’’)
- Punch
- Ratchet set
- 3/4’’ conduit hole saw or knockout punch set for 3/4’’ liquidtight fittings

The installation of the LIN-300 metal protection box involves three main steps:

1. Preparing the holes for the connectors and grounding assembly;
2. Fastening the protection box;
3. Grounding the protection box.

3.2.5 Preparing the holes for the liquidtight connectors and grounding assembly

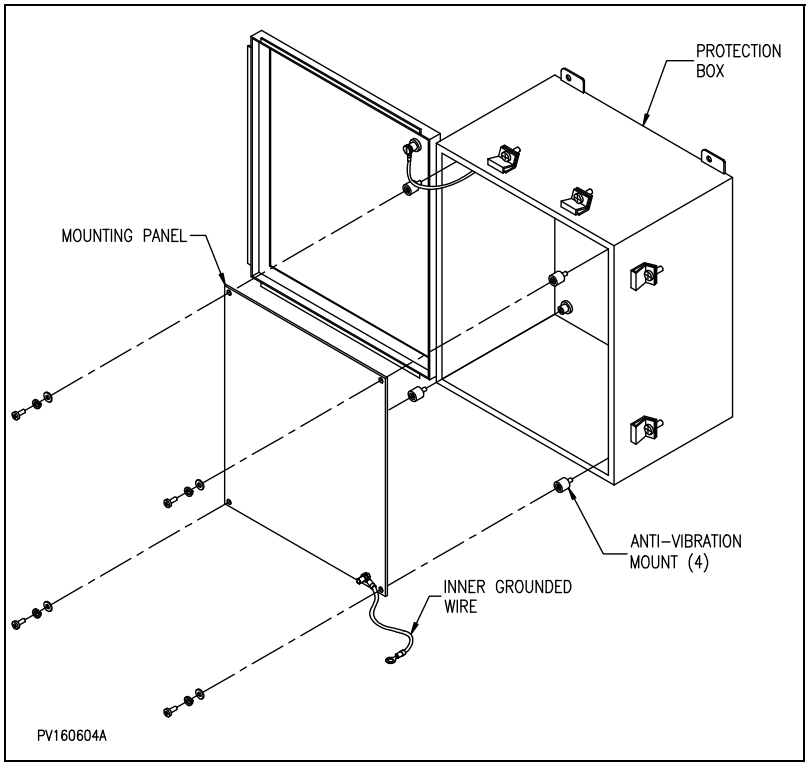


Figure 13 : Removing the mounting panel and anti-vibration mounts

1. As a precaution before drilling the protection box, remove the mounting panel to prevent metal particles infiltration. Do not misplace the anti-vibration rubber mounts added to the mounting panel assembly.

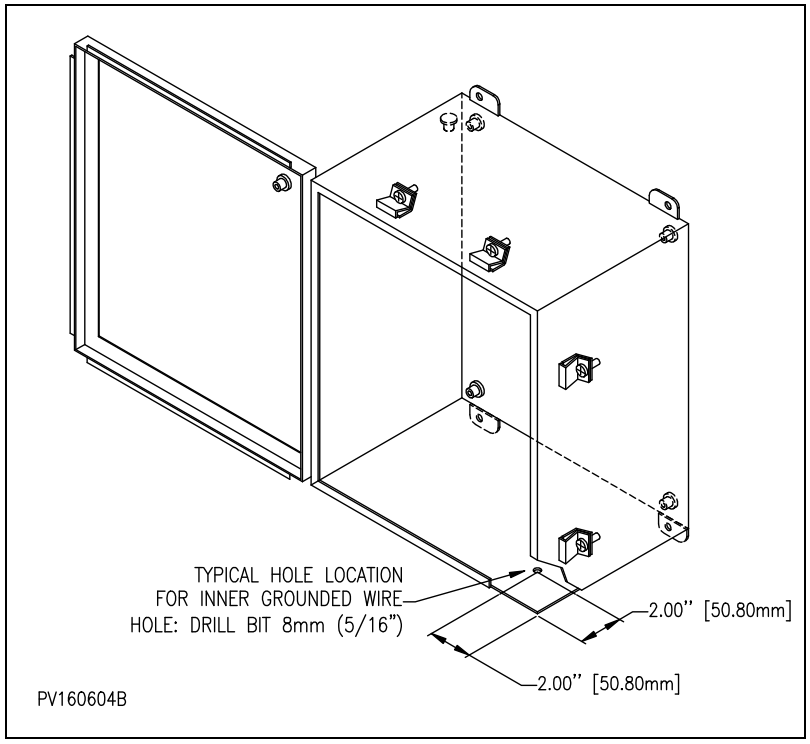


Figure 14 : Typical location for inner grounding wire

2. Drill a grounding hole inside the protection box according to *Figure 14 : "Typical location for inner grounding wire"*.

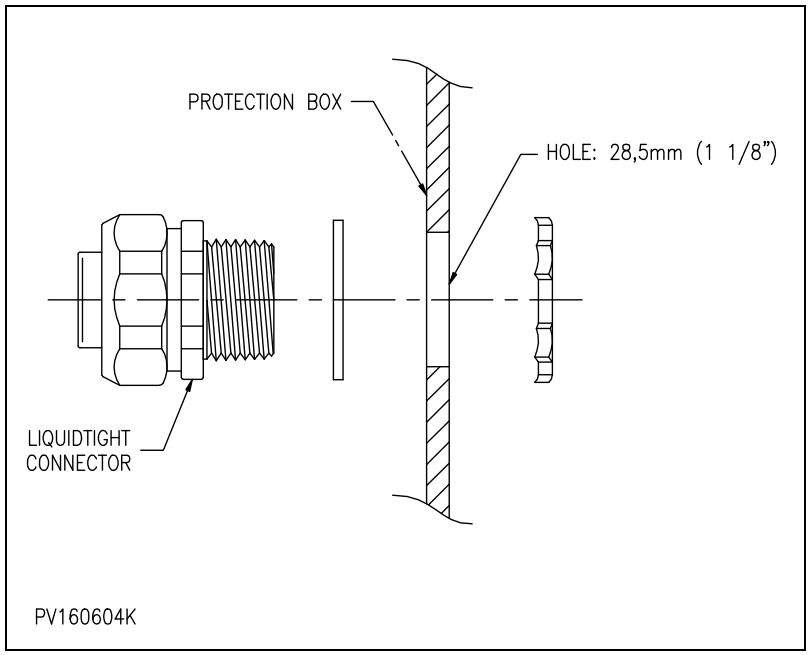


Figure 15 : Mounting the liquidtight connectors

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.

3. After visualizing the routing of all cables, drill holes for the liquidtight connectors. Refer to *Figure 15 : "Mounting the liquidtight connectors"*.
4. Install the connectors.

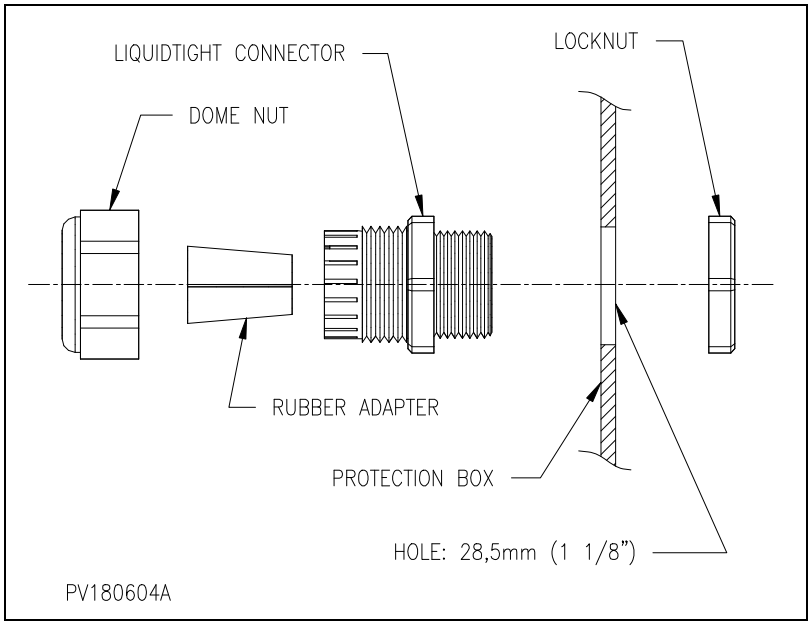


Figure 16 : Mounting the liquidtight strain relief connectors

When using conduit other than the 19mm (3/4'') conduit, use the appropriate liquidtight strain relief connectors according to the size of the cable.

5. Drill holes for the appropriate liquidtight strain relief connectors. Refer to *Figure 16 : "Mounting the liquidtight strain relief connectors"*.
6. Install the connectors.
7. Reinsert the mounting panel.

3.2.6 Fastening the protection box

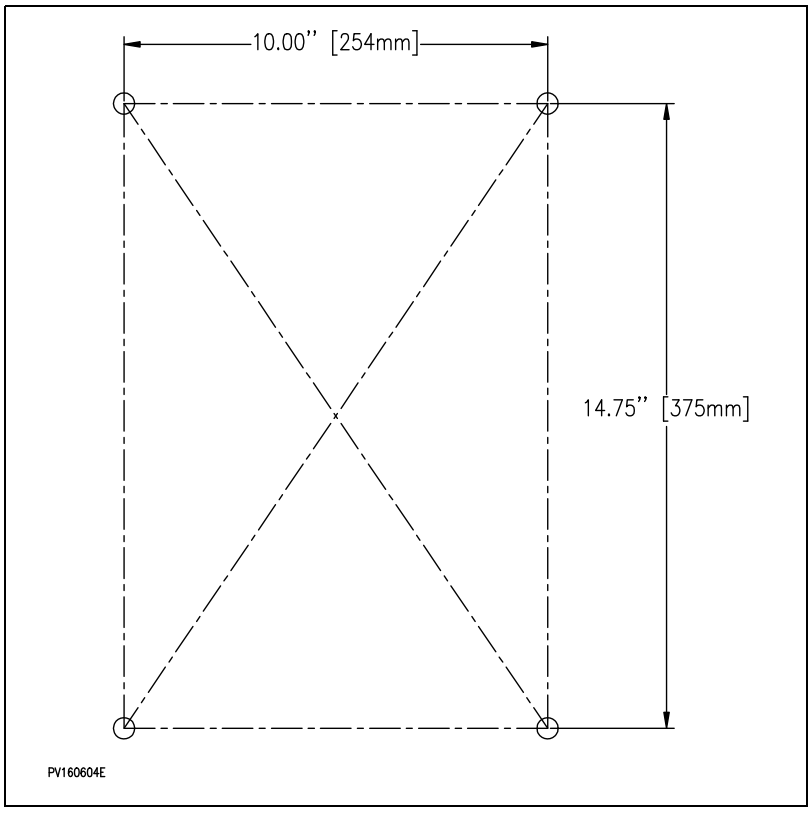


Figure 17 : Mounting holes template

Choose the location for installing the protection box.

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

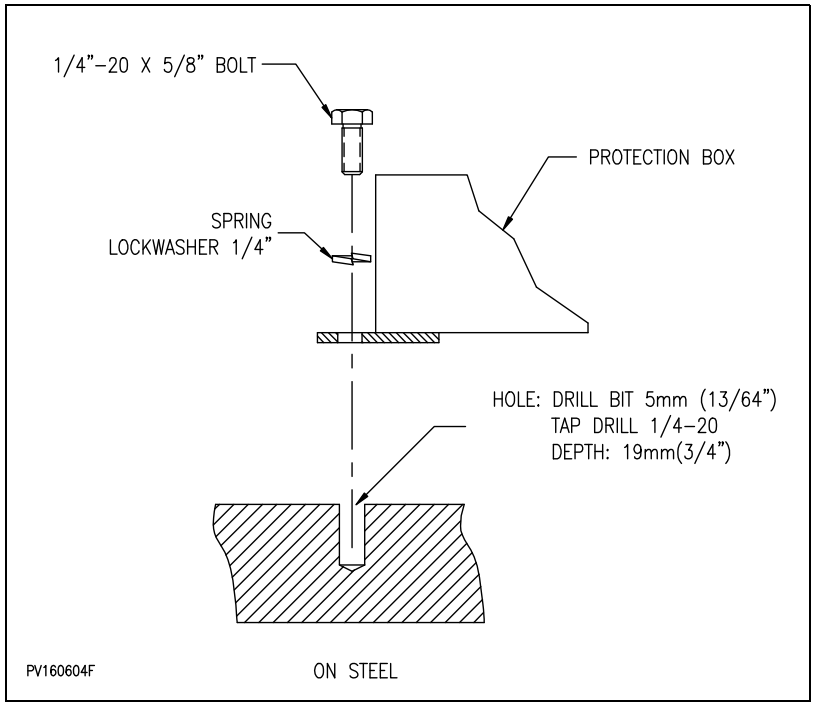


Figure 18 : Fastening the protection box on steel

Mounting a protection box on the stator or machine casing:

1. Drill (refer to *Figure 17 : "Mounting holes template"*) and thread into the structure (refer to *Figure 18 : "Fastening the protection box on steel"*).
2. Fasten the protection box as shown.

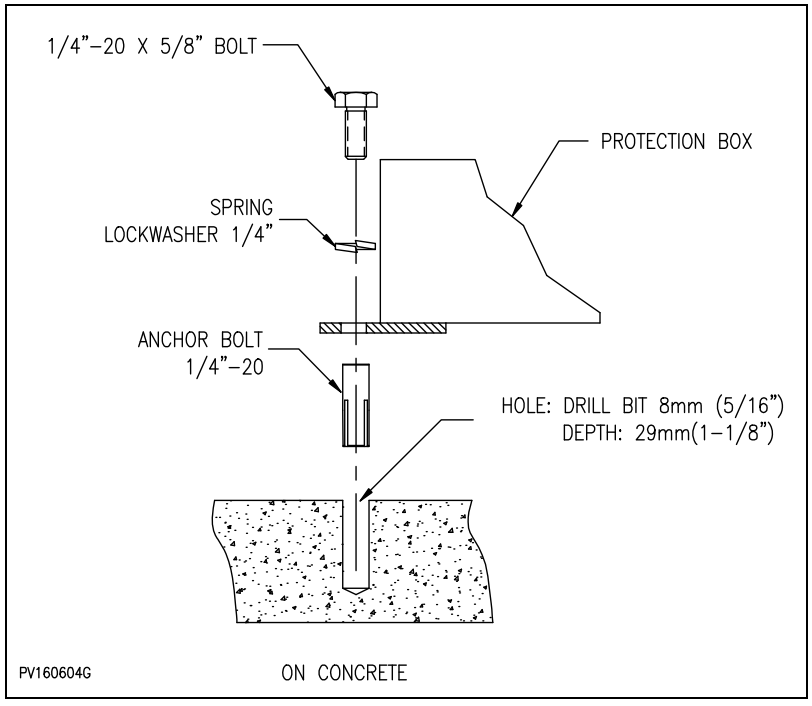


Figure 19 : Fastening the protection box on concrete

Mounting a protection box on concrete:

1. Drill into the concrete wall (refer to *Figure 17 : "Mounting holes template"*) and set the anchor bolts with the special punch (refer to *Figure 20 : "Punch for concrete anchors"*).
2. Fasten the metal protection box as shown (refer to *Figure 19 : "Fastening the protection box on concrete"*).

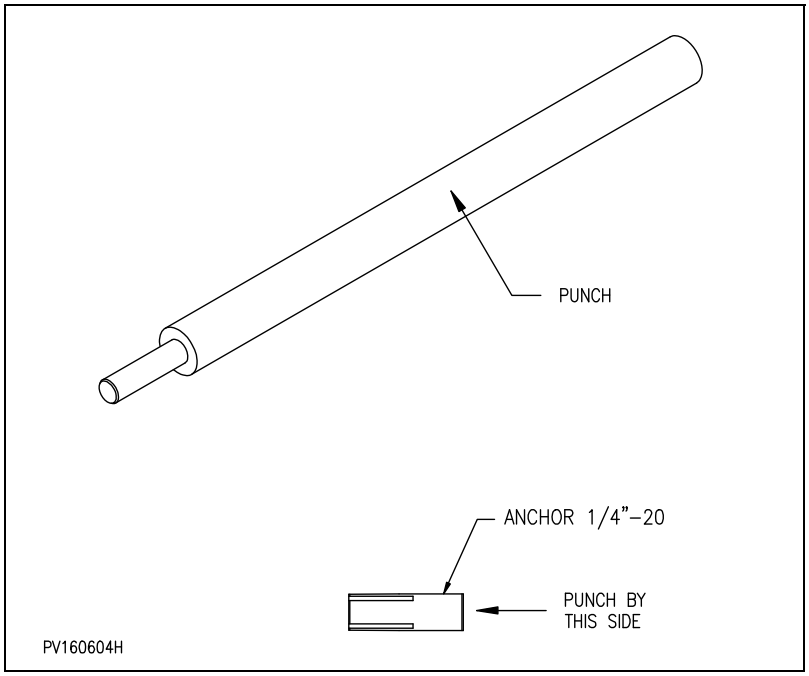


Figure 20 : Punch for concrete anchors

3.2.7 Grounding the protection box

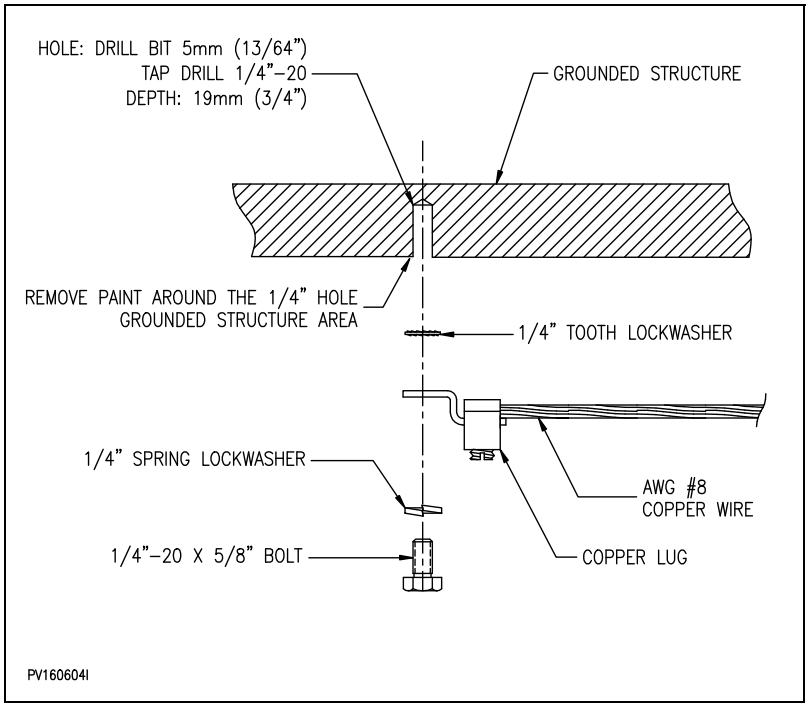


Figure 21 : Fastening the ground wire to grounded structure

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 protection box and the grounded structure.

1. Drill and tap a hole in a grounded structure. Make it as close as possible to the 6mm (1/4'') hole in the bottom of the protection box.
2. Fasten the AWG #8 copper wire to the structure according to *Figure 21 : "Fastening the ground wire to grounded structure"*.

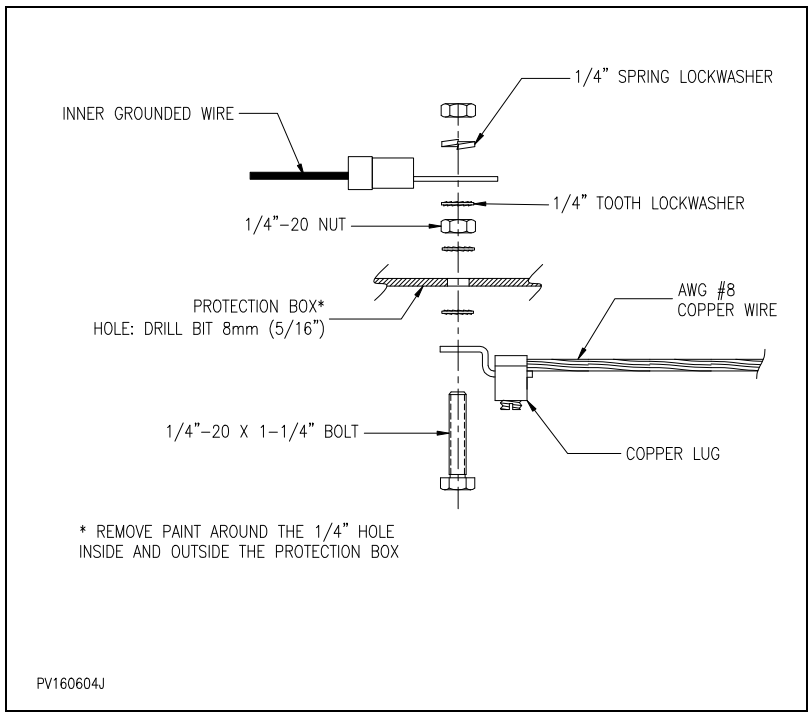


Figure 22 : Fastening the grounding wires to the protection box

3. Cut the copper wire and fasten it to the outside of the protection box as shown in *Figure 22 : "Fastening the grounding wires to the protection box"*.

4. INSTALLATION OF LIN-300 SERIES MODULES

4.1 Preliminary considerations

Figure 23 : LIN-300 Series module

- LIN-300 Series modules are signal conditioning units which, when supplied with 24VDC and paired with matching sensors, deliver a 4 to 20 mA linearized raw output signal representing a distance which can be used by AGMS and ZOOM systems, ZPU-5000, PCU-5000, PCU-100 Programmable Monitor, or third-party instrumentation.
- The sensor is connected to the LIN-300 module through a triaxial cable with an SMA connector, while power input and signal output share an extension cable connected to the LIN-300 M12 socket.

- LIN-300 modules are usually installed in pairs on a mounting plate enclosed in a wall-mounted protection box.
- +24 VDC power input is required to power up the LIN-300 modules. Power can be provided from an external source, such as from an XPSP-224P External Power Supply panel.
- The extension cable can be assembled on site, using 4-conductor shielded cable and an M12 connector, or a standard molded M12 cable assembled can be used. The standard cable offered by VibroSystM is a molded M12 cable, 30m (100 ft.) long, and is rated for a maximum operating temperature of 80°C (176°F). Since this cable is not calibrated, it can be cut.
- Installation of the LIN protection box, protective conduits, and triaxial cables should be completed before proceeding with the installation of the M12 extension cable, and connection of the LIN-300 modules.
- A flexible conduit must be installed between the LIN-300 protection box 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 M12 extension cable.
- Cable length from LIN-300 signal conditioner to instrument should not exceed 300m (1000 ft.) for the 4-20 mA output signal.

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.

4.1.1 Supplies needed

When protection box without optional power supply is used:

- M12 extension cable, supplied either as a:
  a) standard, molded connector M12 extension cable, or
  b) kit for field-assembled M12 extension cable, including:
     - 30 m *[100 ft.]* extension cable (VSM P/N: 6001-11502 *[Belden® #9940]*)
     - M12 connector

When protection box with optional power supply is used:

30 m *[100 ft.]* extension cable (VSM P/N: 6001-11502 *[Belden® #9940]*)

4.1.2 Tools needed

- fish-tape (to pull M12 extension cable inside the protective conduit)
- wire-stripper
- assorted miniature flat screwdriver

4.2 Step by step installation

4.2.1 Connection of the SMA triaxial cable carrying signal input

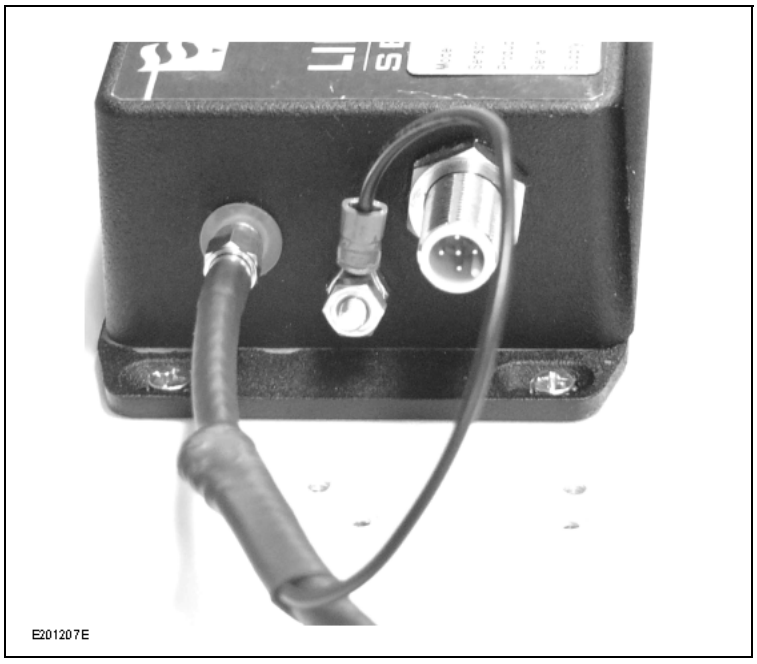


Figure 24 : Triaxial cable connected to a LIN-300 Series module

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.**

4.2.2 Connection of modules fed by an external power source

An extension cable with molded straight M12 female connector is available. An M12 connector kit can also be used with 4-wire extension cable to assemble an M12 extension cable.

4.2.2.1 Field-assembly of an M12 connector onto extension cable

⚠ Caution

To prevent damage to the equipment when the connection has already been completed at the other end of the M12 extension cable, make sure power is turned off at the source before proceeding.

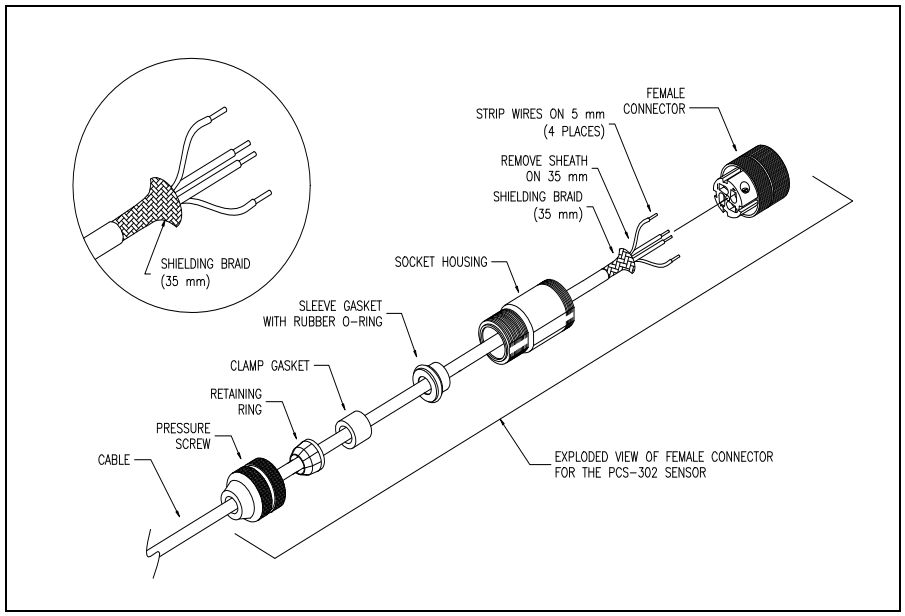


Figure 25 : M12 Connector assembly

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.

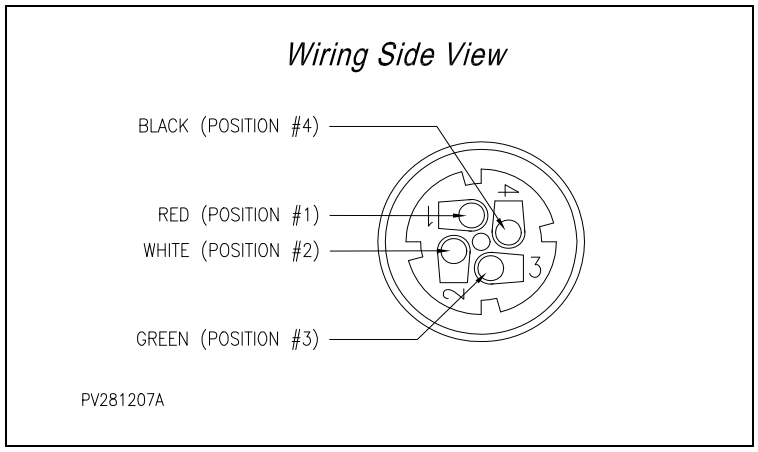


Figure 26 : M12 Female Connector for field assembled extension cable - wiring assignment

Pin-out of the M12 connector using Belden® #9940 cable is shown in *Figure 26 : "M12 Female Connector for field assembled extension cable - wiring assignment"*.

Correspondence with standard molded M12 cable is shown in *Table 1: "Extension cable pin-out"*.

Table 1: Extension cable pin-out

Pin #	Standard 30 m (100 ft.) molded M12 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)*

4.2.2.2 Connection of the M12 extension cable (Power Input and Signal Output)

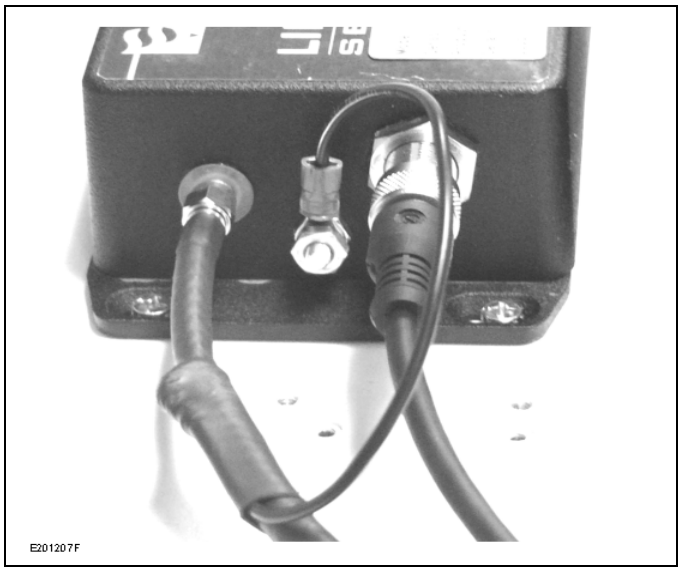


Figure 27 : Power and Signal output cable (right) connected to a LIN-300 Series module

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.

4.2.3 Connection of modules in a protection box with optional power supply

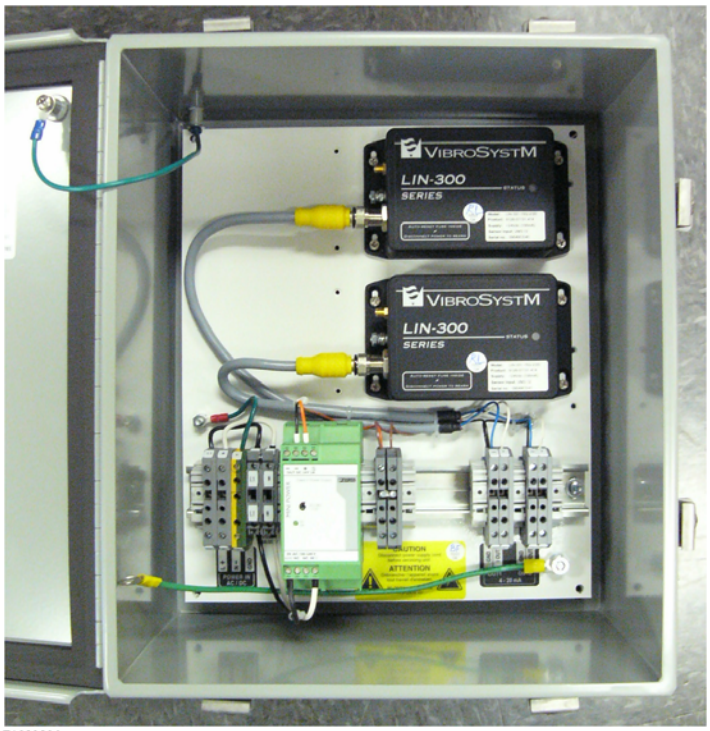


Figure 28 : LIN-300 Series modules inside a protection box with optional power supply

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

  AC Input voltage: $100V_{AC}$ - $240V_{AC}$, (50 Hz - 60 Hz)

  or

  DC Input voltage: $90V_{DC}$ - $350V_{DC}$

⚠ Caution

The protective conductor terminal must be connected to a grounding point in compliance with local regulations. Grounding is essential for safety purposes as well as to provide better efficiency against ESD and EMI perturbations.

4.2.3.1 Connection of the power source cable

Warning - Danger

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.

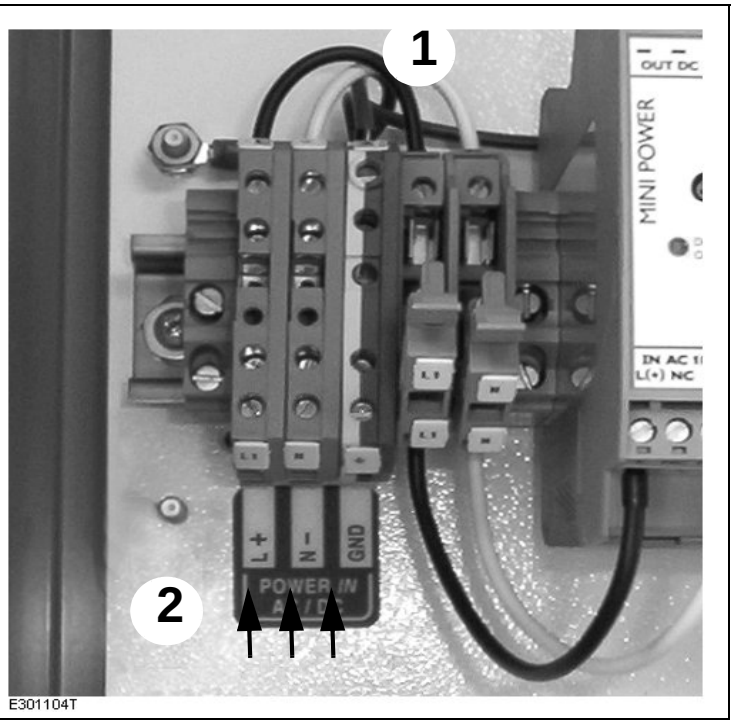


Figure 29 : Triaxial cable connected to a LIN-300 Series module

A power source cable must be routed to the LIN-300 protection box through a distinct protective conduit attached to the box by a liquidtight connector.

1. Open the two fuse-holder terminal blocks
2. Connect the power source cable to the **Power In AC/DC** terminals

   Minimum wire size: 1,5 mm^2 *[16 AWG]* (600V rating).

Caution

The ground wire must be of a gauge equal to, or heavier than, the line and neutral wires.

4.2.3.2 Connection of the Signal Output Extension Cable

⚠ Caution

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

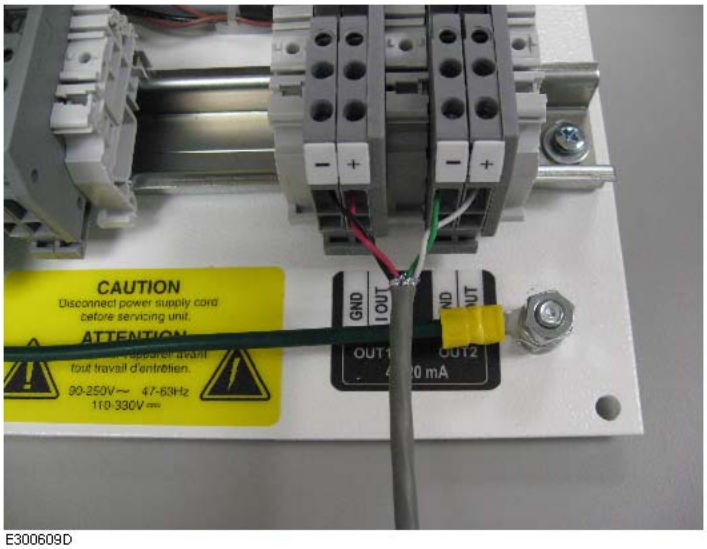


Figure 30 : Signal output cable connected to OUT1 and OUT2 terminal blocks

1. Route the shielded, 4-conductor signal output cable from the LIN-300 protection box 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 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 module = **OUT1** terminals
- Bottom LIN-300 module = **OUT2** terminals

Table 2: Signal output cable suggested connection

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

4.2.4 Verification

Warning - Danger

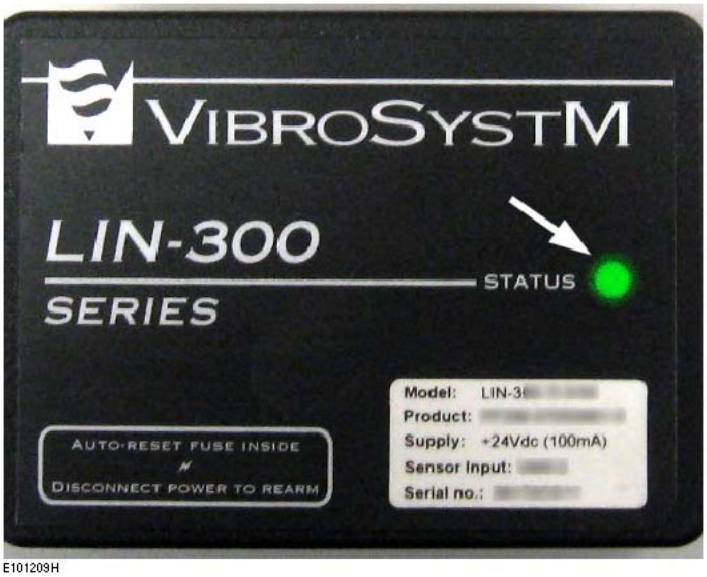
To avoid risk of injuries and prevent damage to the equipment, make sure the ground wire is connected before turning power on.

Turn on the power to the LIN-300 Series 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 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.

4.3 LED functionality



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.

4.4 LIN-300 Series Modules - General specifications

Operation

- Matching sensor — PCS-202SB

LIN-302S-6I-0,3/2,3

- Measuring range — 0.3 to 2.3 mm *[12 to 91 mils]*
- Output — 4 to 20 mA
- Sensitivity — 8 mA/mm *[0.202 mA /mil]*
- Accuracy — < 3% of reading at mid-range
- Repeatability — < 0.3 % of reading at mid-range
- Interchangeability — < 3 % of reading at mid-range
- Frequency response — DC to 1 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 — SMA socket and grounding screw
- Power & output cable — M12 socket

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	*[5.5 in.]*