User Guide

Series 460 Bolt-On

Revision	TQ / NCR	Notes	Release Date	Approver
C	TQ 336	Bolt torques corrected	10 Feb 26	MD
B	TQ 222	Updated - customer feedback	01 Sep 25	JA
A	1st Rel	1st Release	28 May 25	MD

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1. Warnings

- These instructions should be read thoroughly before attempting any of the steps.
- If any instructions are unclear, do not proceed.
- Ensure all required items are available before undertaking the installation of the bolt-on sensors.

2. Introduction

Datum Electronics offer many types of bolt-on strain sensors, which have been developed to provide rugged and robust solutions for industry. The bolt-on strain sensors are quick and easy to install, without any fine wiring or soldering. Its practical robust design allows the sensor to work in almost any environment.

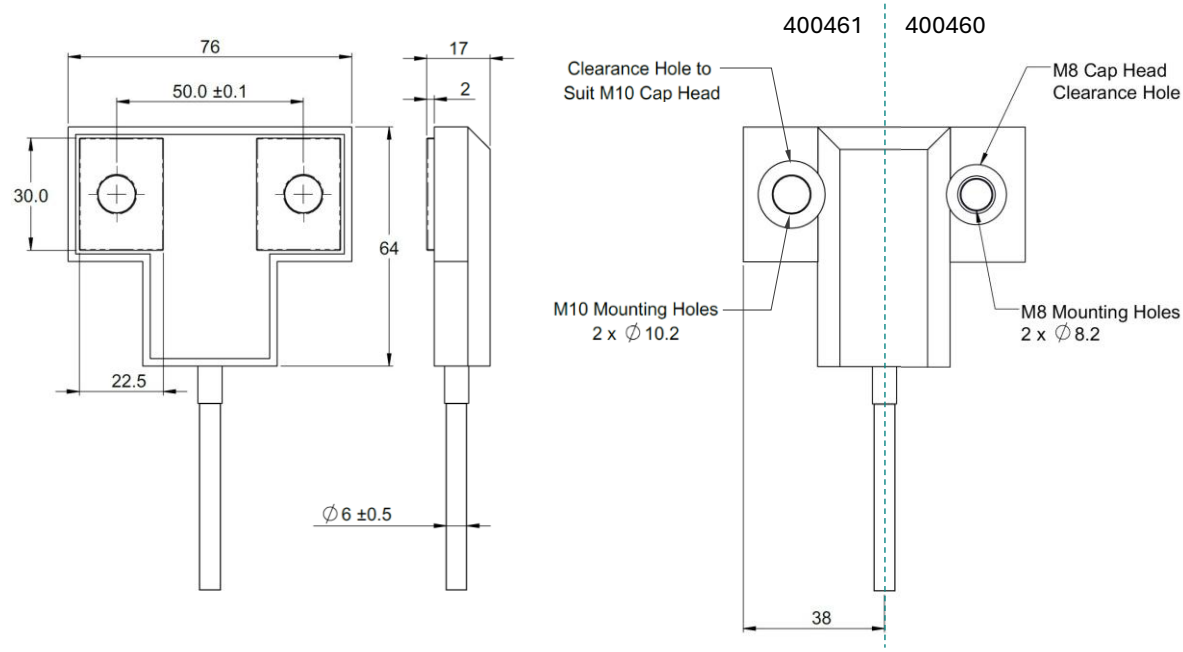
This document describes the requirements and procedures required to successfully install the Series 460 bolt-on strain sensors (2-hole and 3-hole). The 2-hole bolt-on has two different configurations (one using M8 fasteners and the other using M10 fasteners). The 3-hole bolt-on has only one configuration (using M8 fasteners).

The installation process involves welding sets of steel blocks onto the structure providing a secure foundation for bolting the strain sensors.

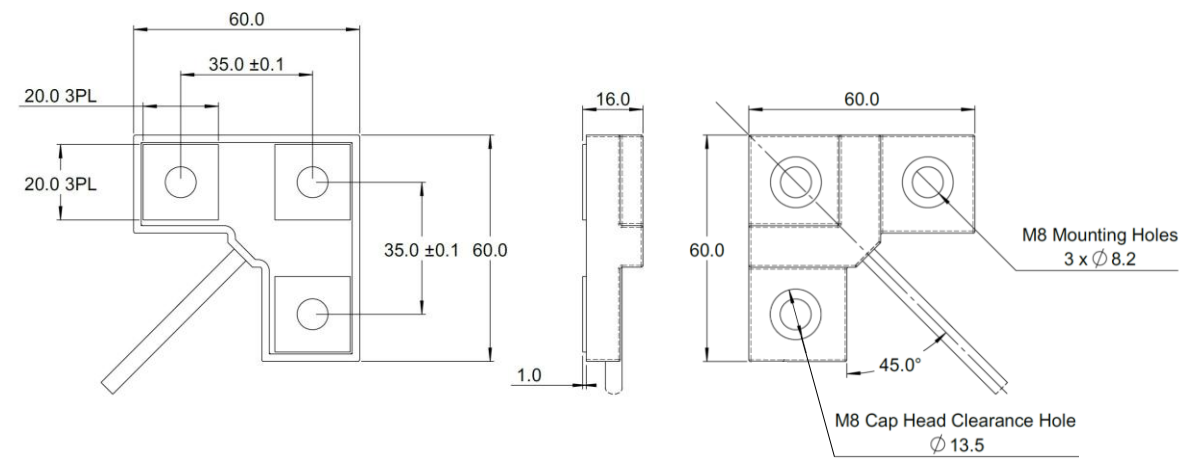
If there is any doubt about where to locate the bolt-on strain sensors please contact Datum Electronics for advice.

3. Dimensions of standard models

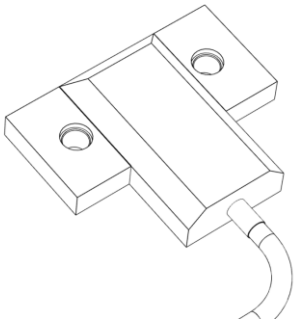
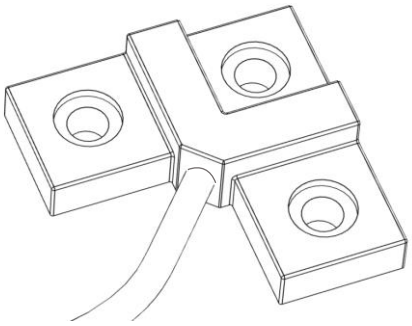
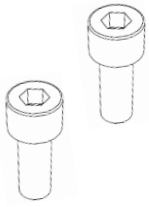
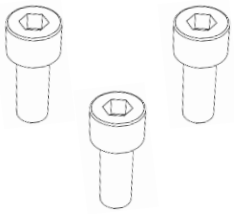
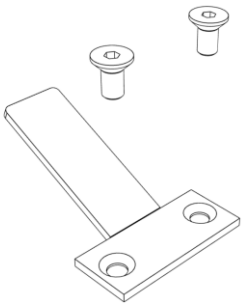
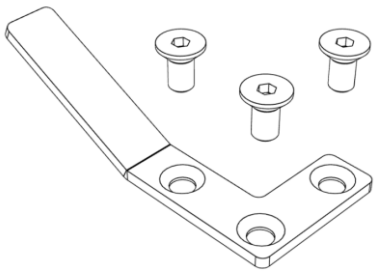
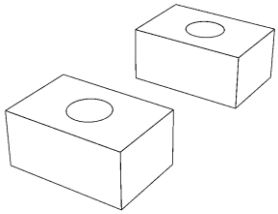
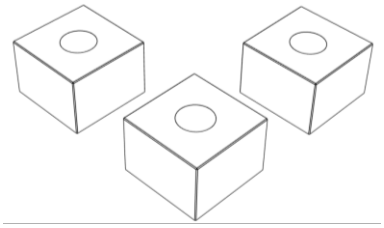
3.1. 2-hole Bolt-on



3.2. 3-hole Bolt-on



4. Items available

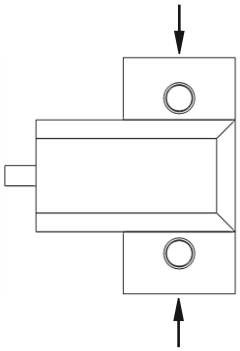
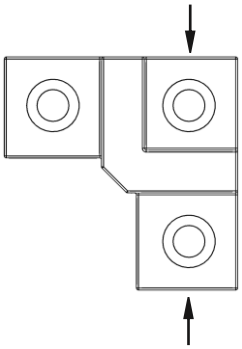
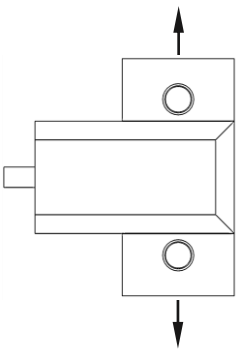
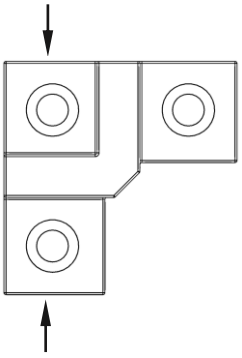
		Series 460 2-hole Bolt-on	Series 460 3-hole Bolt-on
Standard supplied items	Sensor	 **Series 460 2-hole sensor** **400460** - 8.2 mm (M8) **400461** - 10.2 mm (M10)	 **Series 460 3-hole sensor** **400462** - 8.2 mm (M8)
Additional items – contact Datum sales for details	Fasteners	 Hexagon socket cap head screw M8 x 20 M10 x 20	 Hexagon socket cap head screw M8 x 20
	Jig	 2-hole fitment jig kit M8 x 16 hexagon socket countersunk M10 x 16 hexagon socket countersunk	 3-hole fitment jig kit M8 x 16 hexagon socket countersunk
	Welding blocks	 Weldable block 30 mm x 20 mm x 14 mm (M8) 30 mm x 20 mm x 14 mm (M10)	 Weldable block 20 mm x 20 mm x 14 mm (M8)

5. Pre-installation

Prior to installation it is recommended that the bolt-on sensor is connected to the interface on a bench. It is then possible to apply a small amount of compression (or tension) by hand and observe the results on the interface.

2-Hole Sensors give a positive output for a compression strain in the axis of the two holes, and a negative signal for a tensional strain.

3-Hole Sensors have 2 orthogonal active arms, the output is proportional to the difference in strain applied to the two arms. A positive output is given for a compression in one arm and / or a tension in the other. A negative output is given when the direction of the strain is reversed. An equal strain (either both tension, or both compression) in both arms will give a zero output.

	Series 460 2-hole Bolt-on	Series 460 3-hole Bolt-on
Positive output	 Compressive load	 Compressive load
Negative output	 Tensile load	Compressive load 

6. Wiring

The bolt-on strain sensors maybe supplied connected to both ends of system (sensor element and junction box / weighing terminal) or supplied as “bare ends” for connecting into purchaser’s own system. The following wiring convention is used.

Colour	Designation	Colour	Designation	Colour	Designation
Red	Excitation +ve	Green	Signal +ve	Black	Common
Blue	Excitation -ve	Yellow	Signal -ve		

7. Installation overview

7.1. Sensor positioning

The structure to which the strain gauge is bolted becomes the dominant strain measuring element. The strain seen in the strain gauge is the same as that in the structure, therefore, the output from the strain gauge represents the strain in the structure.

Ideally, the structure to which the strain sensor is bolted, should be mechanically dominant to the sensor and have a cross-sectional area of > 500 mm^2.

Use with smaller cross-sectional areas is possible, but output levels may be affected, and care should be taken to ensure the stability of the structure and strain paths under load.

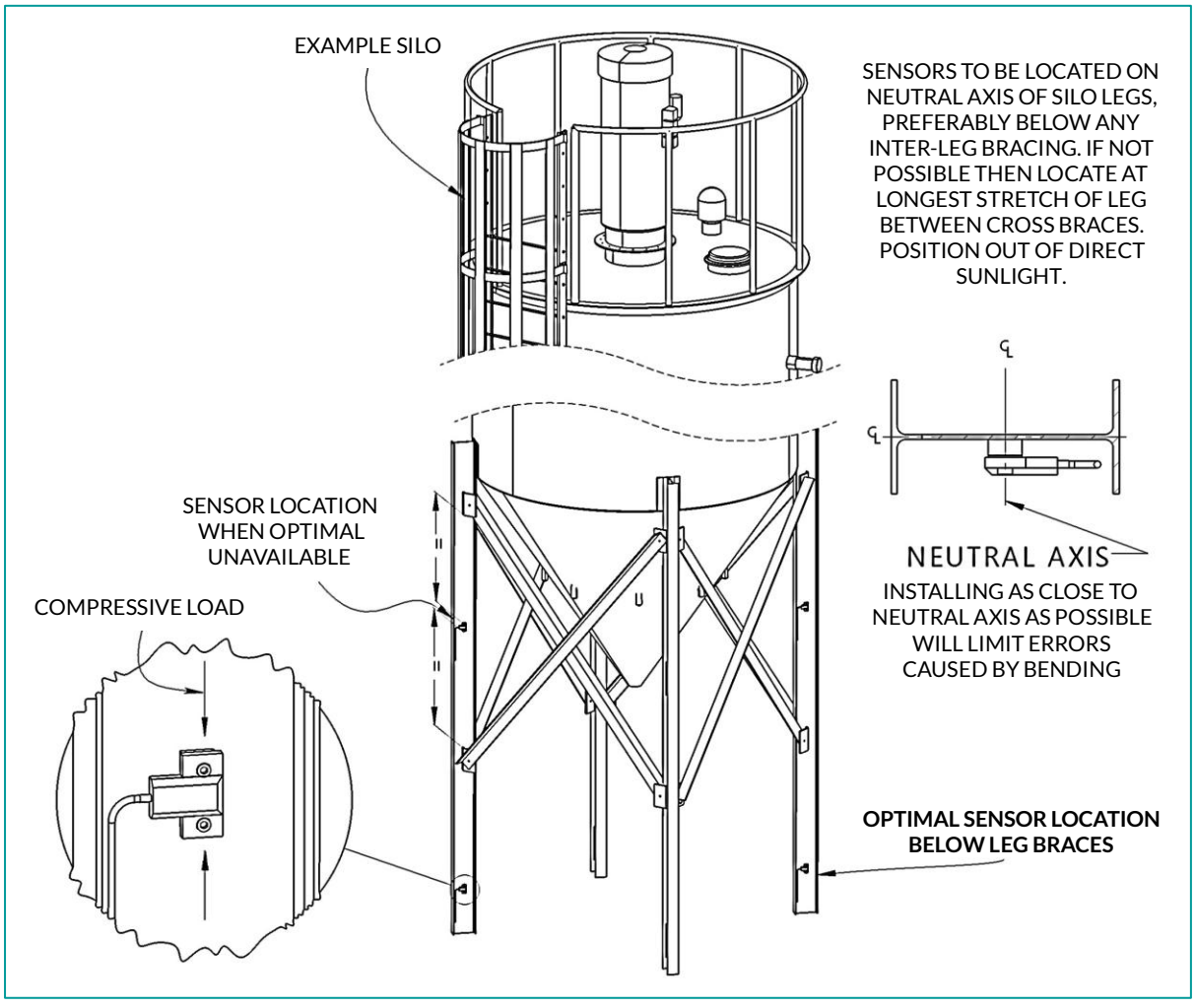


Figure 1 – Sensor positioning

If there is any doubt about where to locate the bolt-on strain sensors please contact Datum Electronics for advice.

7.2. Surface preparation

The sensor-mounting surface must be flat and clean.

The sensor has two (or three) pads, if the bolting procedure twists or stretches the sensor elements due to the machined unevenness of the surface it will apply an offset to the sensor. The system has been designed to accept a small amount of zero offset however this should be kept to a minimum.

If the structure has any paint, coatings, or poor surface condition, abrade this until down to clean and flat.

Use a simple degreasing agent to remove obvious surface debris. This should be repeated with a clean application and clean wipe. The second wipe should be inspected to assess the level of any residual contamination. Repeat the degreasing until the surface is clean.

Inspect the lower face of the sensor for contamination and clean, as above, if required.

Once the surface has been prepared, it is recommended to mask the area designated for the welding blocks and repaint the surrounding region that was previously abraded.

8. Fitting (welding)

Firstly, prior and during fitting the sensor and the structure it will be fitted to should be the same temperature.

Present the sensor to the structure and confirm alignment with the fixing structure.

Attach the welding blocks to the fitment jig using the countersunk bolts supplied, ensuring the blocks are fitted to the jig square.

Once the blocks are securely on the fitment jig, place the jig with the blocks onto the structure in the correct orientation and alignment with the strain path. See Figure 1 for more details on the appropriate locations for the sensor to be attached.

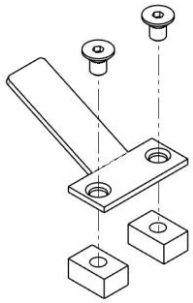
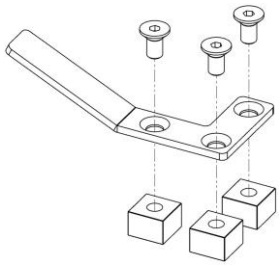
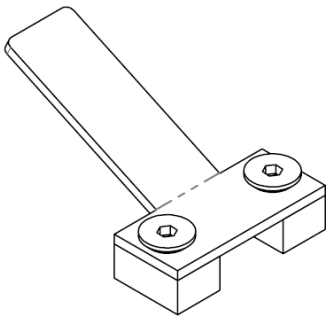
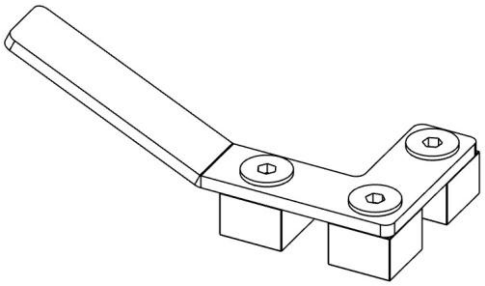
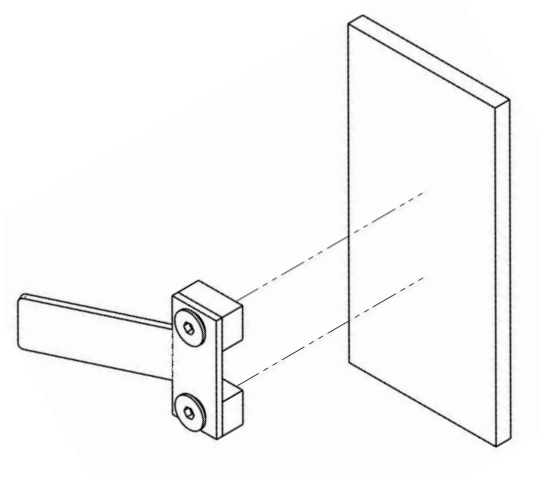
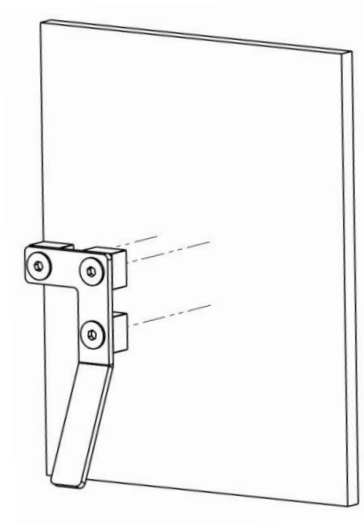
Proceed to then tack weld the blocks to the structure.

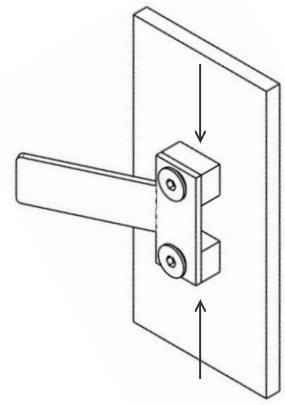
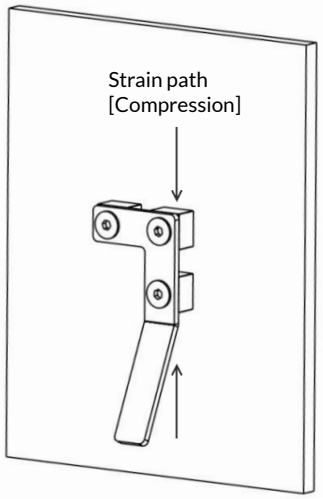
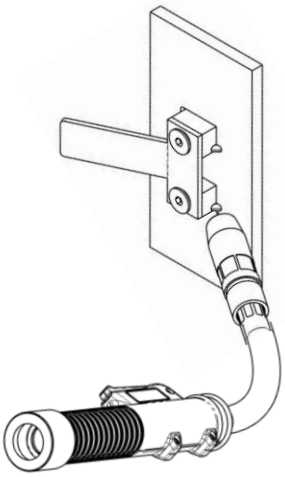
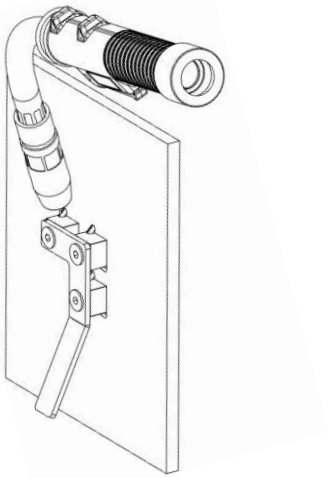
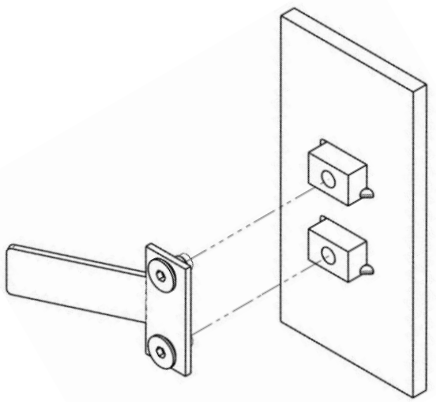
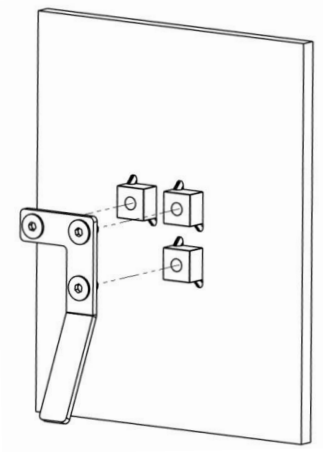
Remove the bolts and the fitment jig, and continue to fully and securely weld the blocks on.

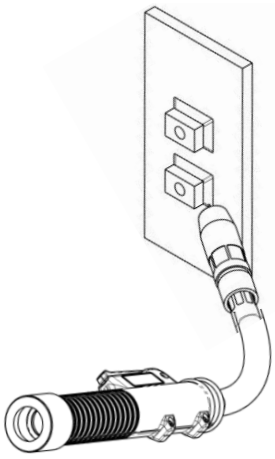
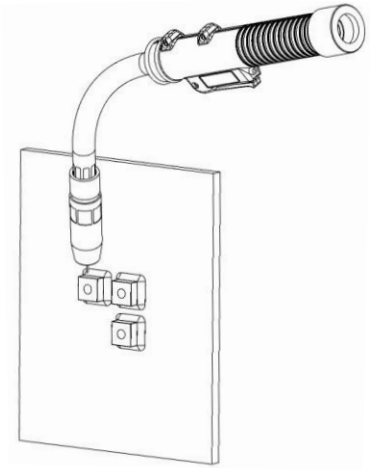
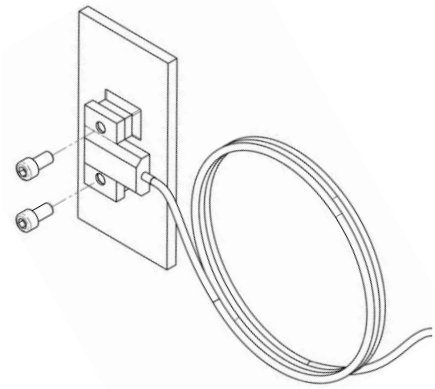
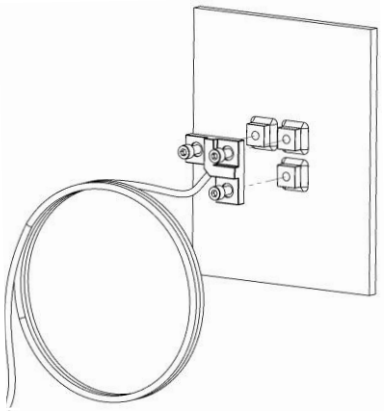
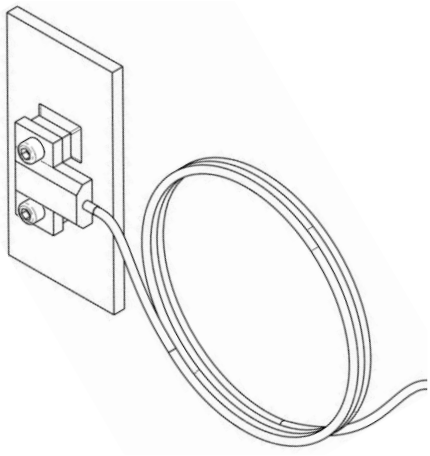
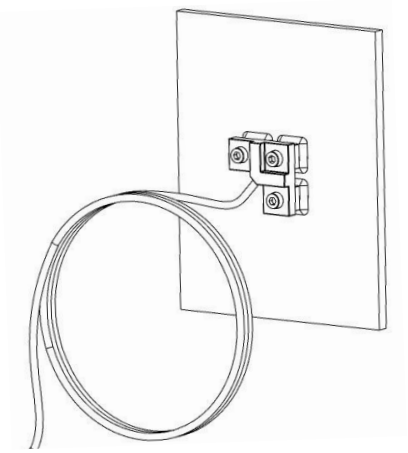
NOTE: Silo / structure should not be under any additional load (i.e. silo is empty) when the sensors are tightened.

Present the sensor to the structure and fit bolts by hand. Tighten alternately to achieve the required torque for each of the bolts. This should be carried out in even steps i.e.: 10, 20 & 30Nm.

8.1. Fitting (welding) illustration

	Series 460 2-hole Bolt-on	Series 460 3-hole Bolt-on
1	Fasten weldable blocks to fitment jig as shown	
	M8 – use 5mm hex key M10 – use 6mm hex key 	M8 – use 5mm hex key 
2	Ensure weldable blocks are aligned with respect to the jig, as shown (all sides flush)	
		
3	Offer up jig to installation point	
		

4	Ensure bolt-on is orientated along strain path as shown [see Figure 1]	
	Strain path [Compression] 	Strain path [Compression] 
5	Tack weld blocks in place	
		
6	Remove fitment jig	
	M8 – use 5mm hex key M10 – use 6mm hex key 	M8 – use 5mm hex key 

7	Fillet weld blocks. Allow to return to ambient temperature.	
		
8	Fit sensor to weldable blocks using bolts supplied to 10 Nm. Allow 30 minutes for bolt-on to normalise in temperature. Finally loosen bolts and re-tighten in 10 Nm increments **M8 tighten to 30 Nm** **M10 tighten to 40 Nm**	
	M8 – use 5mm hex key M10 – use 6mm hex key 	M8 – use 5mm hex key 
9	Completed installation of bolt-on sensor	
		

9. FAQs

What is the black wire for ?

Common / ground.

How long are the cables on the standard bolt-on sensor ?

3 meters.

Are different cable lengths available ?

Yes, please speak to Datum Sales department.

Can I mount the sensor directly to the structure without welding blocks ?

Yes, however, please prepare the surface as described in **7.2 - Surface preparation**, and bolt straight into tapped holes. **DO NOT USE NUTS**.

What bolts should I use and how tight do they need to be ?

For the 2-hole sensor, M8, grade 10.9 or higher. Tighten progressively to 30 Nm.

For the 2-hole sensor, M10, grade 10.9 or higher. Tighten progressively to 40 Nm.

For the 3-hole sensor, M8, grade 10.9 or higher. Tighten progressively to 30 Nm.

Bolting process is described in further detail in **8.1 - Fitting (welding) illustration**.

Can a custom OEM sensor be manufacture upon request ?

Yes, please speak to Datum Sales department.