

# Series 460 Bolt-on Strain Gauge

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## Series 460 Bolt-on Strain Gauge

### DESCRIPTION

Datum Electronics offer two types of multi-element bolt-on strain sensor that have been developed to provide a rugged and robust production sensor with the benefits associated with a complex strain gauge installation.

They have been designed to measure tensile and compressive bending stresses ranging from 50 to 1100 micro-strain. The gauges have been designed for use in applications including:

- vehicles, civil engineering structures, silos, hoppers and specialist engineering projects.

They can also be used for other applications including bridges, oil rigs, ship hulls and building roofs to evaluate tensile and compressive strain.

### SPECIFICATIONS

Our 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, in any weather and even underwater if required. Rated to IP68 this is a truly universal product that will give you reliable accurate strain indication whatever the application or environmental condition. All sensors are pre-tested and checked during final assembly ensuring the reliability and quality of all our sensors.

### DIVERSITY

Using the latest strain gauge techniques and technologies it gives you the accurate and reliable data you require in a number of challenging environments. The sensors are fully compatible with our wide range of load and strain indicators and amplifiers allowing you to operate any number of sensors in parallel for your application. A direct serial link to a PC, or an analogue input to a data logger or PLC, is also an option and also very easy to achieve. The Series 460 Bolt-on strain sensor is not only an essential product for measuring micro-strain, but it can also become an integral part of a strain monitoring system.

#### 3-HOLE BOLT-ON SENSOR

The 3-Hole sensor has a unique design eliminating the temperature effect on bending and strain of the application, providing a far more effective strain indication than a standard 2-hole option. As the external temperature of the application fluctuates, the bolt-on sensor compensates for this and distinguishes this change from the measured strain of the application. Highly sensitive with effective temperature compensation built in, this product makes an incredibly useful and cost-effective method of measuring strain.

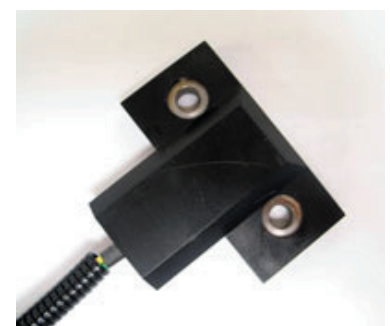
#### series460



#### 2-HOLE BOLT-ON SENSOR

The standard 2-Hole sensor can be bolted direct to the structure for use in a range of applications and environments. We recommend that the structure on to which sensor is to be bolted should be at least 10 times larger than the sensor, for accurate and reliable measurement data.

#### series460



# FULL SPECIFICATION

SPECIFICATION	
Rated Strain Range	50 - 1100 microstrain
Maximum Strain (single operation)	1500 micro-strain
Rated Output	1.5mV/V for 1,000 microstrain
Linearity & Repeatability	0.1% of rated output (FSD)
Hysteresis	0.1% of rated output (FSD)
Temperature Effect on Output	0.005 of applied load
Temperature Effect on Zero	0.005 of rated load
Bridge Resistance	350ohm (nominal)
Electrical connection	3 meter, 4-core integral cable
Excitation Voltage	10VDC
Excitation (max)	15VDC
Environmental Protection	IP68
Operating temperature	-20C to +80C
Storage temperature	-40C to +100C
Humidity	0% - 100%
Chemical Splash	Resistant to chemicals including: Dust, Water, Salt Spray, Urine, Paint, Dilute Acid
	Fuels: Diesel, Gasoline, Bio Diesel Oils: Lubricating, Hydraulic
	Coolant: Ethylene Glycol, Coolant Conditioner, Freon
Acceptable Bolt down error	+/- 40% of scaled measurement range
Connections	Red Excitation    positive (ex +ve) Blue Excitation    negative (ex -ve) Green Signal        positive (sig +ve) Yellow Signal        negative (sig -ve)

## 2-HOLE & 3-HOLE SENSOR

50 - 1100 microstrain  
 1500 micro-strain  
 1.5mV/V for 1,000 microstrain  
 0.1% of rated output (FSD)  
 0.1% of rated output (FSD)  
 0.005 of applied load  
 0.005 of rated load  
 350ohm (nominal)  
 3 meter, 4-core integral cable  
 10VDC  
 15VDC  
 IP68  
 -20C to +80C  
 -40C to +100C  
 0% - 100%  
 Resistant to chemicals including: Dust, Water, Salt Spray, Urine, Paint, Dilute Acid  
 Fuels: Diesel, Gasoline, Bio Diesel Oils: Lubricating, Hydraulic  
 Coolant: Ethylene Glycol, Coolant Conditioner, Freon  
 +/- 40% of scaled measurement range  
 Red Excitation    positive (ex +ve)  
 Blue Excitation    negative (ex -ve)  
 Green Signal        positive (sig +ve)  
 Yellow Signal        negative (sig -ve)

## APPLICATION EXAMPLES



BRIDGE STRUCTURERS

SILO'S



OIL RIGS



SHIP HULLS



HOPPERS

# SENSOR INSTALLATION

## SURFACE PREPERATION

The sensor mounting surface must be flat and clean. The sensor has two pads or three pads, which are bolted to the structure; 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.

## FLATNESS

The sensor is fixed to the structure using an adhesive; the adhesive greatly reduces long term movement of the sensor relative to the structure. The better the bond to the structure the better the systems performance. The adhesives used to bond sensors, will be affected by, dirt, grease or any other contamination on the surface. We strongly recommend that:

The surface is degreased in two phases, phase one would be using a simple degreasing agent to remove obvious debris and the second phase would be to repeat this with a clean application of the degreasing agent and the use of a clean wipe, the second wipe should be inspected, to assess the level of any residual contamination. The degreasing agent itself can contain substances which will reduce adhesion. Therefore the cleaning agent itself should not be flooded on to the surface, and any remaining residue must be cleaned away thoroughly.

Level of Contamination

Clean to the naked eye

Cleaning Agents

Loctite 7063 degreasing agent

The lower faces of the sensor should also be inspected for contamination before application and cleaned if required.

## APPLICATION

Present the sensor to the structure and check alignment of the fixing holes, loose bolt the sensor to the axle to check that the sensor is not pre-stressed by the bolts.

Remove the bolts.

Apply adhesive to either

(a) Both surfaces or

(b) one surface and catalyst to the other as directed.

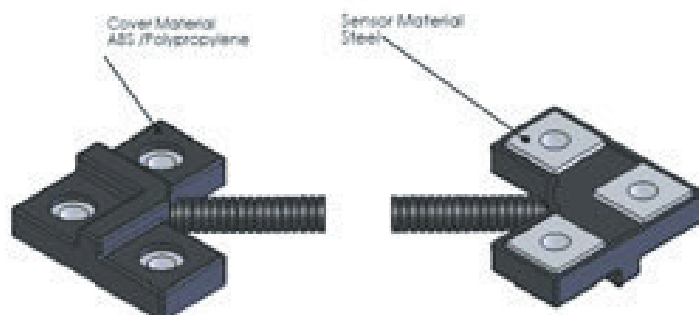
Present the sensor to the structure and loose bolt it. Tighten alternately to achieve an even torque for each of the bolts. The bolt tightening should be carried out in a minimum of three even steps. The glue line should be thin and even but will vary according to the instructions of the specified adhesive.

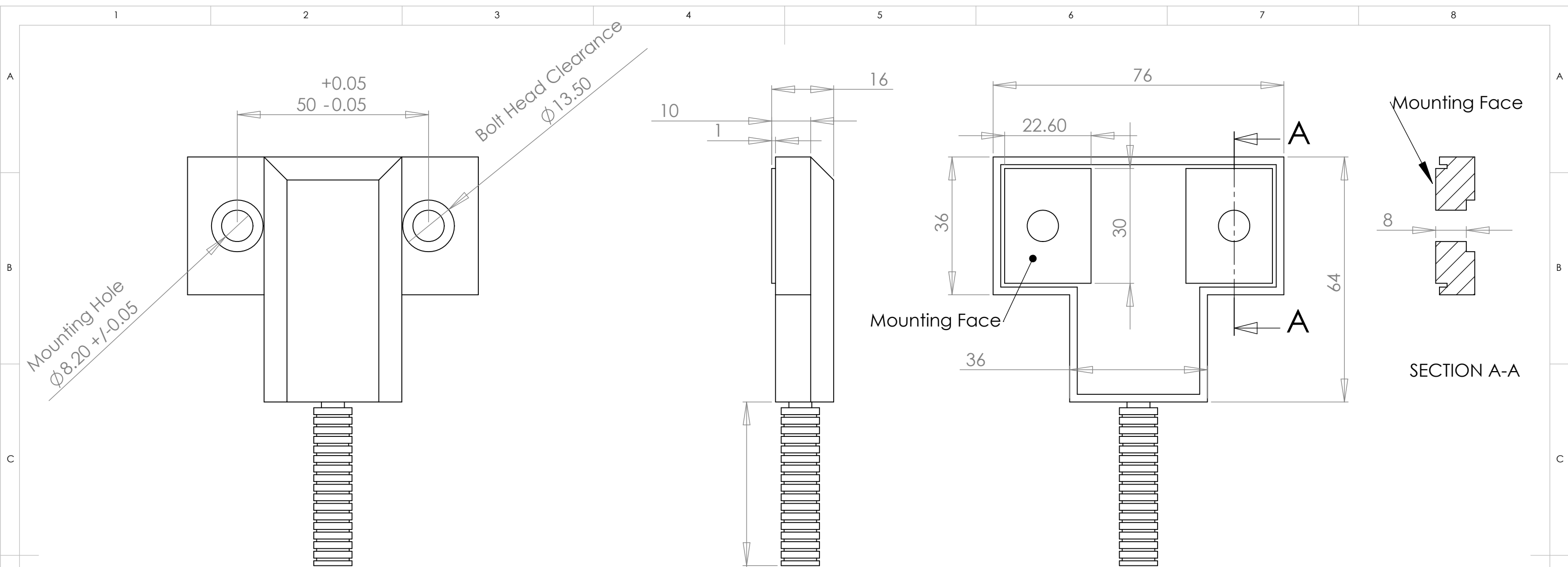
## ACCEPTABLE ADHESIVES & FITTINGS

Loctite Retaining Compound 638 or equivalent

Loctite 330 with 737 activator or equivalent

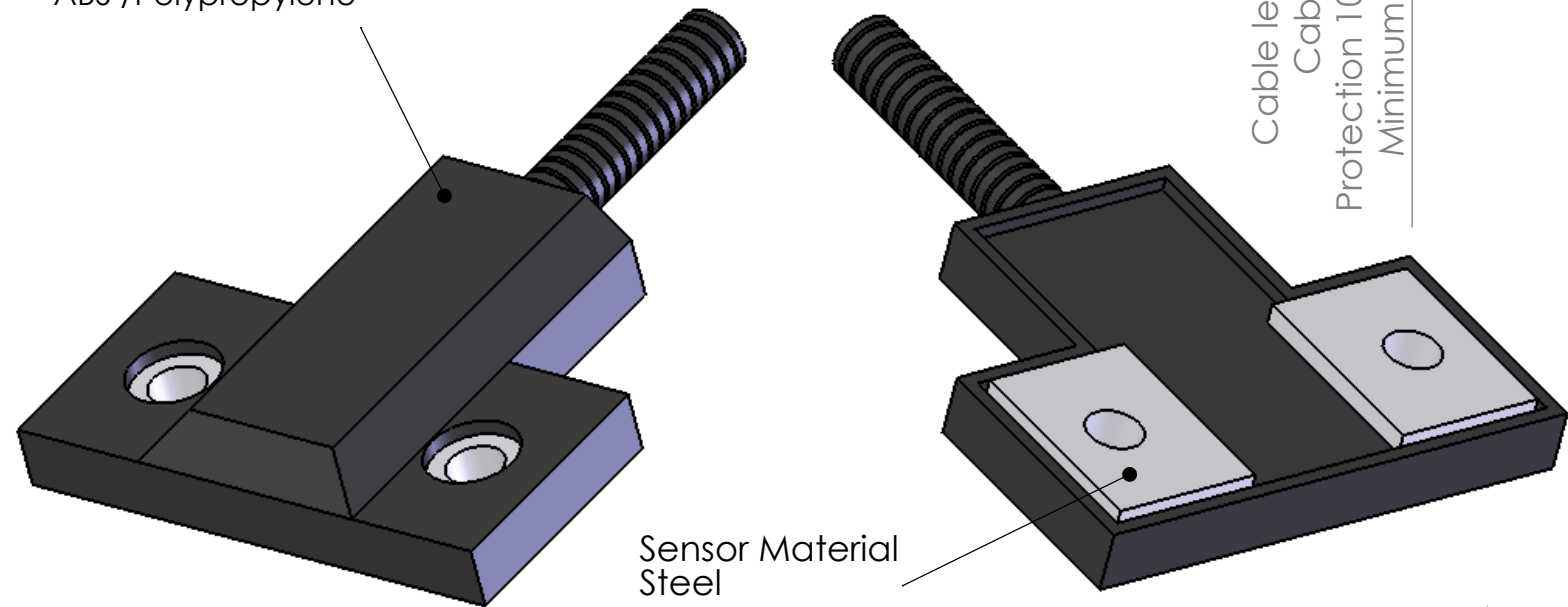
Fixing Bolts must be: M8 Hex Socket Cap Screws





Cable length - Nominal 3m  
 Cable 4 core 7/0.2  
 Protection 10mm convolute tubing  
 Minimum bend radius 20mm

Cover Material  
 ABS /Polypropylene



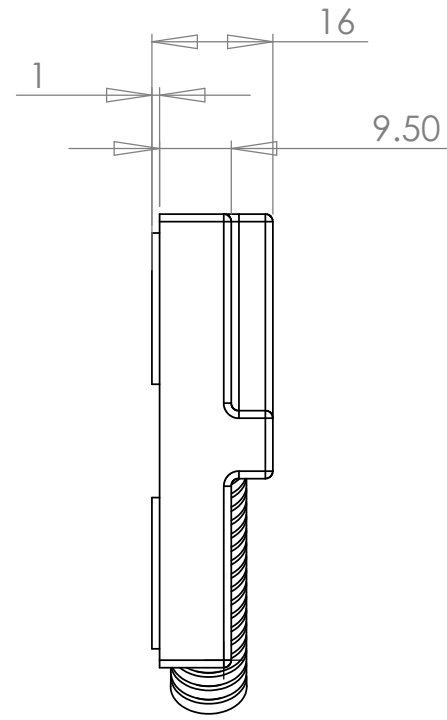
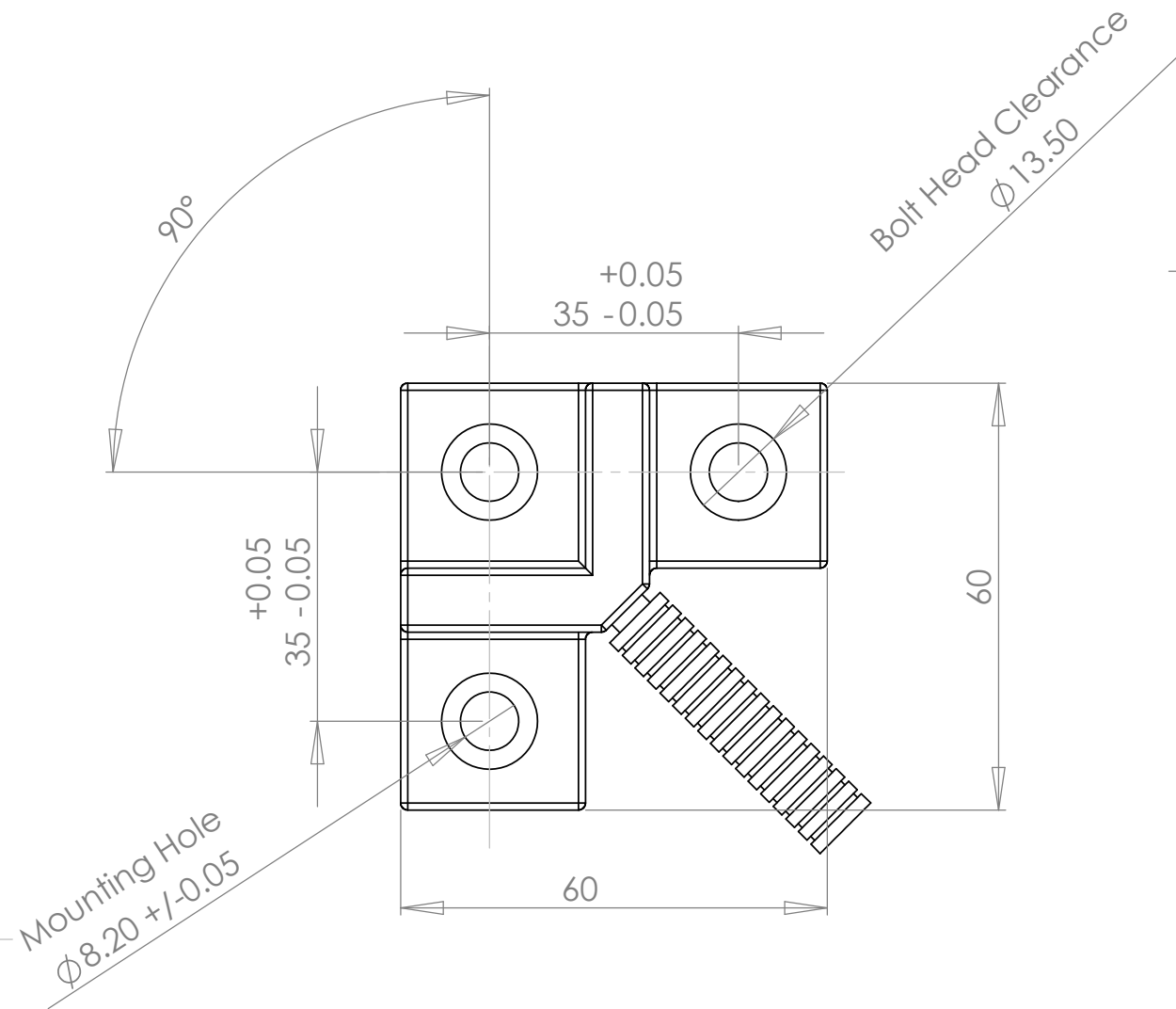
Sensor Material  
 Steel

Sensor should be mounted using 2 off M8 Cap head screws, using a suitable adhesive between mounting face and surface

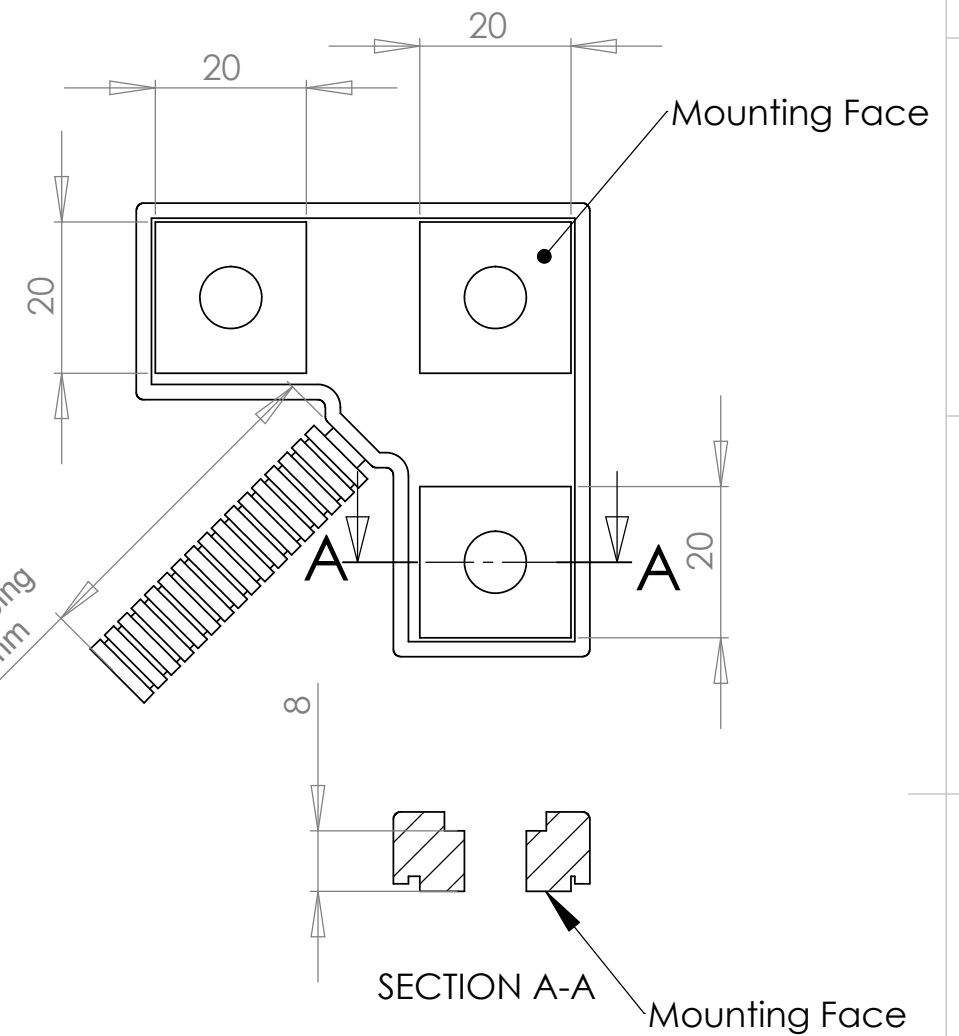
Surface to be mounted to, should be flat, clean and free from paint, grease etc. and should completely cover the mounting surfaces. Surface roughness should ideally be between 0.5 & 1.6  $\mu\text{m}$

Refer to mounting instructions for process details

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: TOLERANCES: LINEAR: +/- 0.5mm		FINISH:	DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
DRAWN P. Yearby				TITLE: <b>Standard 3 Hole Bolt-On Sensor</b>	
CHK'D	SIGNATURE	DATE		DWG NO.	<b>105790</b>
APPVD				SCALE:1:1	SHEET 1 OF 1
MFG					
Q.A			MATERIAL:		A3
			WEIGHT:		



Cable length - Nominal 3m  
 Cable 4 core 7/0.2  
 Protection 10mm convolute tubing  
 Minimum bend radius 20mm



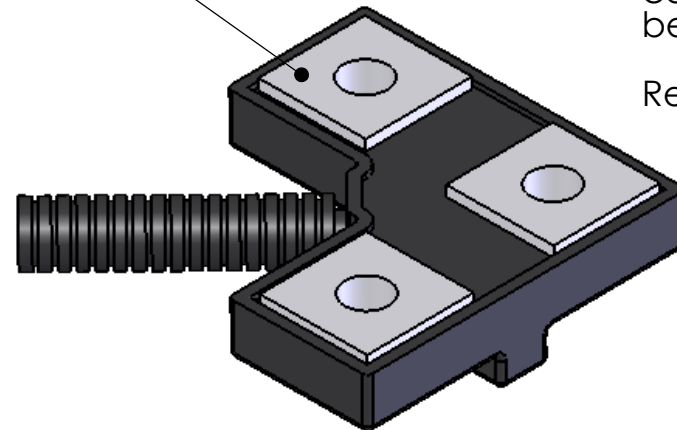
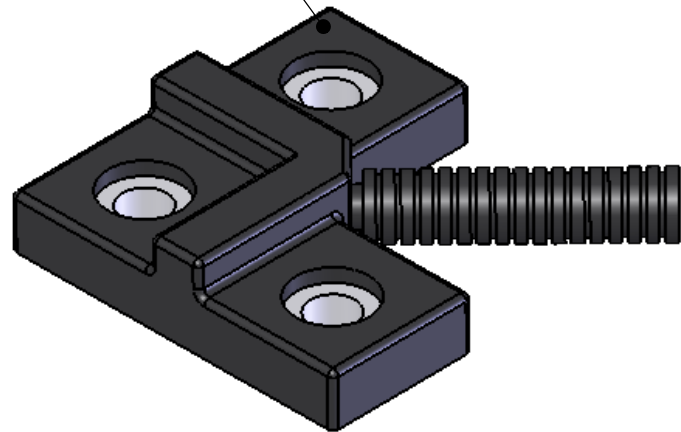
Cover Material  
 ABS /Polypropylene

Sensor Material  
 Steel

Sensor should be mounted using 3 off M8 Cap head screws, using a suitable adhesive between mounting face and surface

Surface to be mounted to, should be flat, clean and free from paint, grease etc. and should completely cover the mounting surfaces. Surface roughness should ideally be between 0.5 & 1.6  $\mu$ m

Refer to mounting instructions for process details



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION	
SURFACE FINISH:						Datum Electronics Ltd		TITLE: Standard 3 Hole Bolt-On Sensor	
TOLERANCES: LINEAR: $\pm$ 0.5mm ANGULAR: $\pm$ 0.1 Deg									
NAME	SIGNATURE	DATE				DWG NO.		105792	
DRAWN	P. Yearby					SCALE:1:1		SHEET 1 OF 1	
CHK'D						WEIGHT:		A3	
APPVD									
MFG									
Q.A									