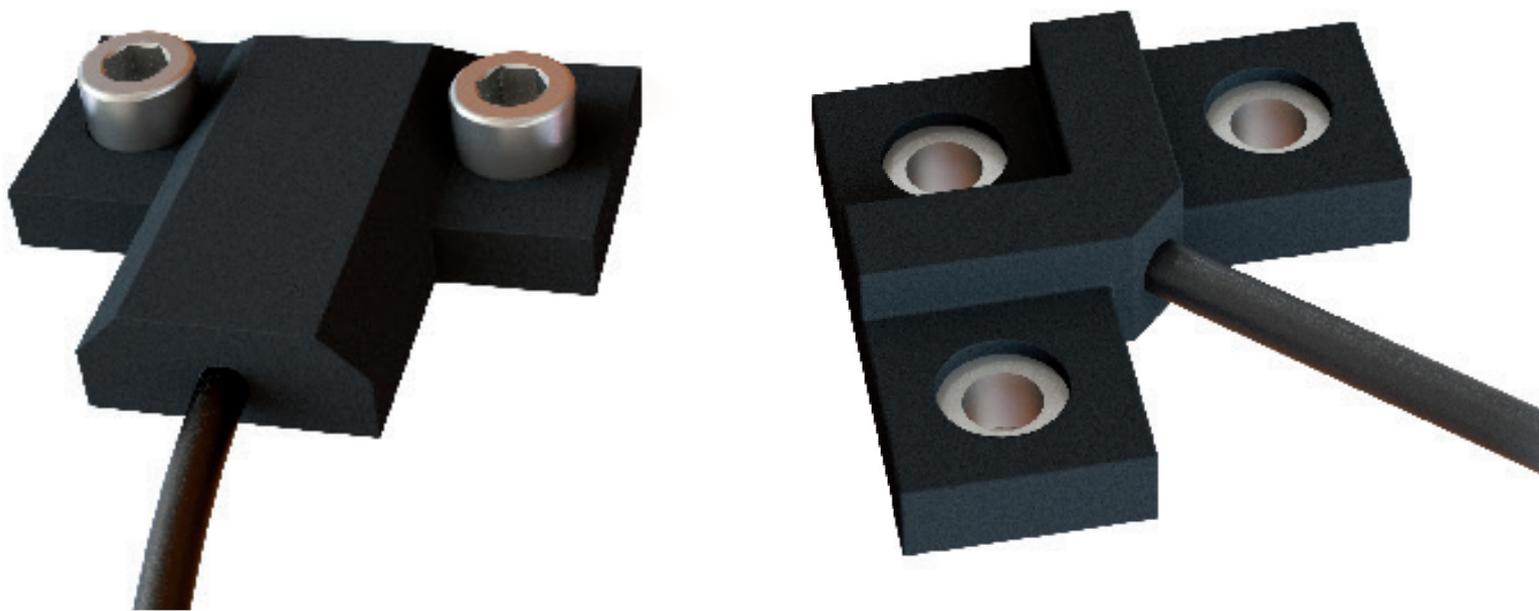# SERIES 460
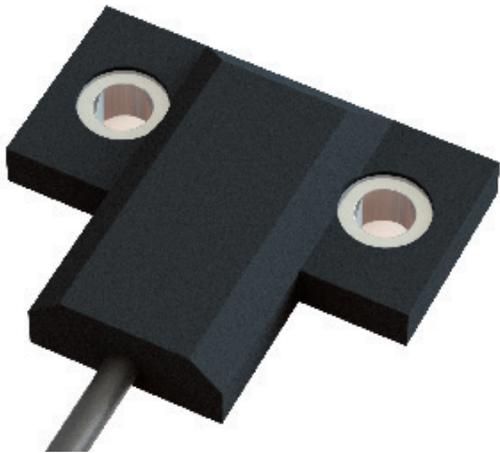# BOLT-ON STRAIN GAUGE SENSORS

vetec

BOLT-ON STRAIN GAUGE

We offer many types of bolt-on strain sensors, which have been developed to provide rugged and robustsolutions for industry.

Designed to measure tensile, compressive and bending stresses, ranging from 50 to 1,100 micro-strain, the bolt-on strain gauge sensors have been designed for use in applications including on:

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

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

We also specialises in volume OEM solutions, for customers who need an application specific product.

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 indications, 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, the bolt-on sensors give you the accurate and reliable data you require, in a number of challenging environments. The sensors are fully compatible with load and strain indicators and amplifiers, allowing you to operate any number of sensors for your application. Options can be a direct serial link to a PC, or an analogue input to a data logger or PLC, talk to our sales team to discuss. 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.

2-HOLE BOLT-ON SENSOR

The standard 2-Hole sensor can be bolted directly to the structure for use in a range of applications and environments. We recommend that the structure, to which sensor is to be bolted, should be at least 10 times larger than the sensor, to ensure accurate and reliable measurement data.
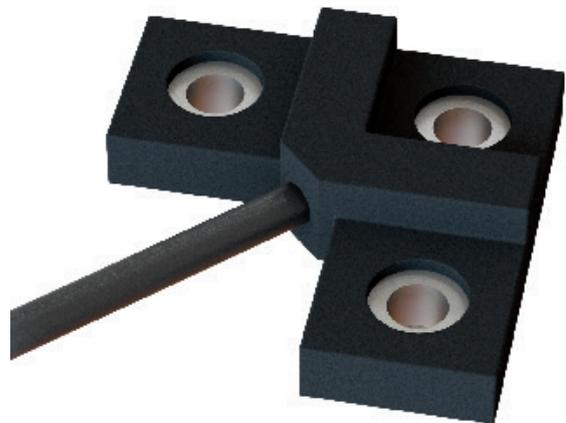
The 2-Hole sensor has a standard hole size of 10.2mm for 2xM10 cap head screws.

3-HOLE BOLT-ON SENSOR

The 3-Hole bolt-on strain sensor is a dual element sensor that corrects any differential temperature between the sensor and the structure. For example, a vehicle axle can be 5 degrees hotter than the sensor, as the axle heats due to braking and drive loads. In this case the surface strain of the axle due to temperature can be 60 micro-strain greater than the sensor. The 3-Hole bolt-on sensor has been designed to eliminate this potential strain difference.

The 3-Hole sensor has a standard hole size of 8.2mm for 3xM8 cap head screws.

Document: 1011   Issue: 4   Date: 05/01/2018

FULL SPECIFICATIONS FOR BASIC STANDARDS

SPECIFICATION	
Rated Strain Range	10 - 1,100 micro-strain *OEM can be catered to your requirements
Maximum Strain (single operation)	1,500 micro-strain
Rated Output	1.5mV/V for 1,000 micro-strain
Linearity & Repeatability	0.1% of rated output (FSD)
Hysteresis	0.1% of rated output (FSD)
Temperature Effect on Output	0.005 of applied load (% per ˚C)
Temperature Effect on Zero	0.005 of rated load (% per ˚C)
Bridge Resistance	350ohm (nominal)
Electrical Connection	3 meter, 4-core screened cable
Excitation Voltage	10VDC
Excitation (max)	15VDC
Environmental Protection	IP68
Operating Temperature	-20˚C to +80 ˚C
Storage Temperature	-40˚C to +100 ˚C
Humidity	0% - 100%
Chemical Splash	Resistant to chemicals including: Dust, Water, Salt Stray, 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)

TYPICAL SENSOR INSTALLATION

SURFACE PREPARATION

The sensor mounting surface should be flat and clean, and may be of a rough finish. The sensor has two or three pads, which are bolted to the structure; if the bolting procedure twists or sretches 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 can be 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 with a clean wipe. The second wipe should be inspected, to assess the level of any residual contamination as 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 or suitable equivalent

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

APPLICATION EXAMPLES

VEHICLES

OIL RIGS

SILOS

HOPPERS

SHIP HULLS

TYPICAL APPLICATION

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

If using adhesives, remove the bolts and 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 loosely tighten the bolt by hand. 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. A typical bolting torque of 40 Nm should be used for M10 bolts of a 10.9 grade or higher. A typical bolting torque of 30 Nm should be used for M8 bolts of a 10.9 grade or higher. Check with the bolt/screw supplier.
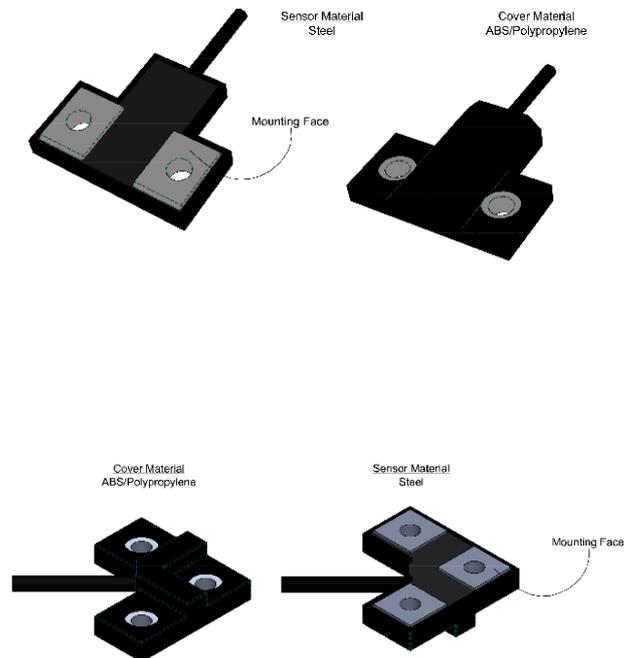
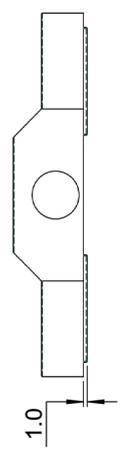If using glue, the glue line should be thin and even, but will vary according to the instructions of the specified adhesive.
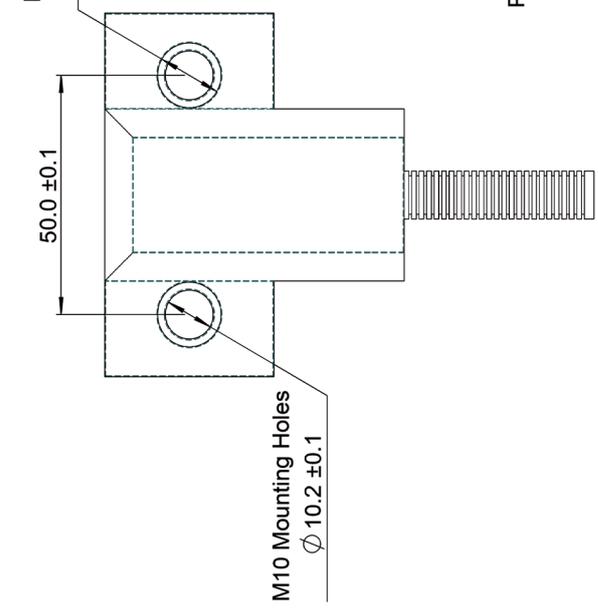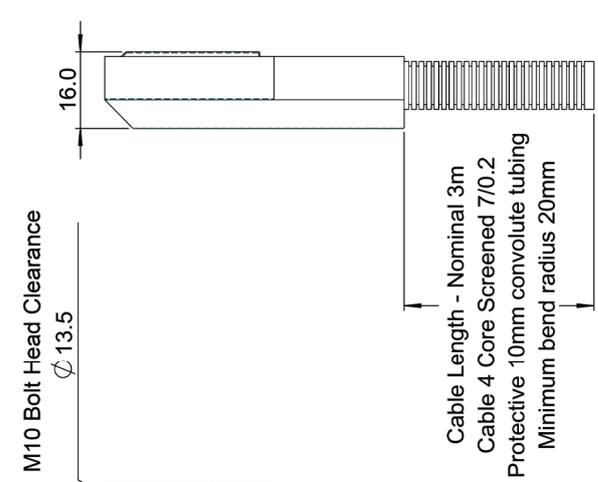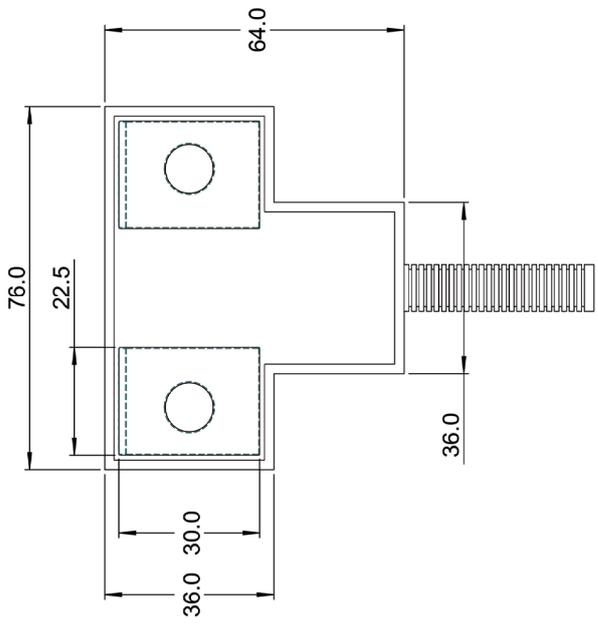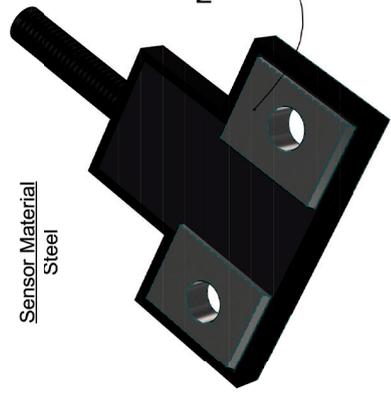
ACCEPTABLE ADHESIVE & FITTINGS

If using adhesive, use:

Loctite Retaining Compound 638 or equivalent
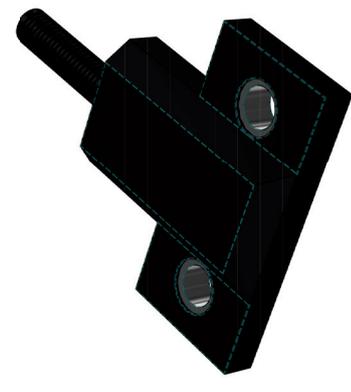
Loctite 330 with 737 activator or equivalent

64.0

76.0

22.5

36.0

36.0 30.0

16.0

M10 Bolt Head Clearance
$\emptyset$ 13.5

Cable Length - Nominal 3m
Cable 4 Core Screened 7/0.2
Protective 10mm convolute tubing
Minimum bend radius 20mm

M10 Mounting Holes
$\emptyset$ 10.2 ±0.1
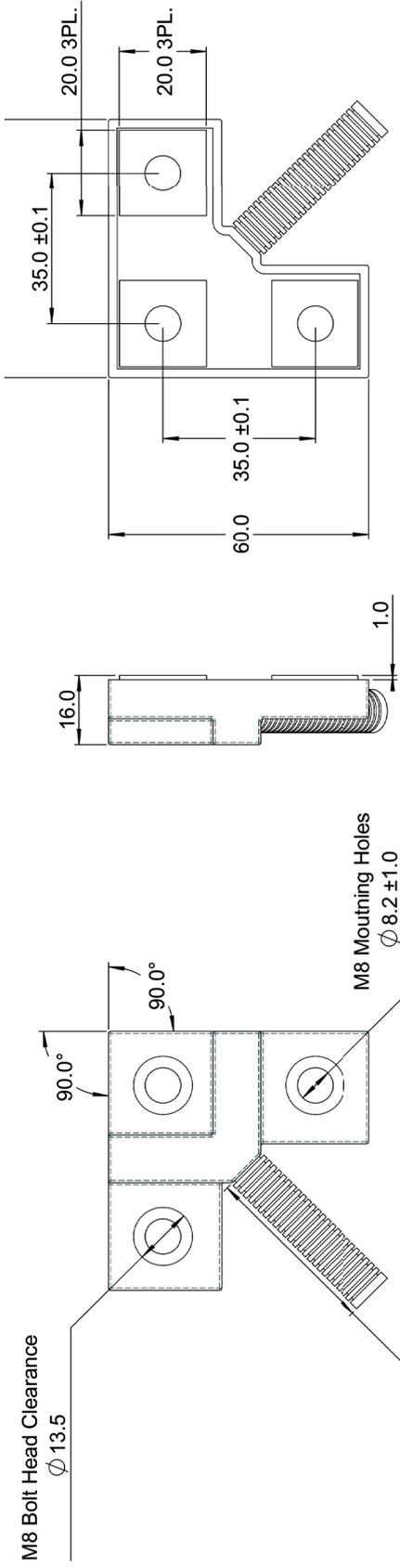
50.0 ±0.1

1.0

Cover Material
ABS/Polypropylene

Mounting Face

Sensor Material
Steel

Sensor should be mounted using 2 x M10 cap head screws, combined with a suitable adhesive between mounting face and surface

The surface being mounted to should be flat, clean, free from paint, grease and any other possible interferences to the sensor. Surface roughness should ideally be between 0.5 & 1.6 µm

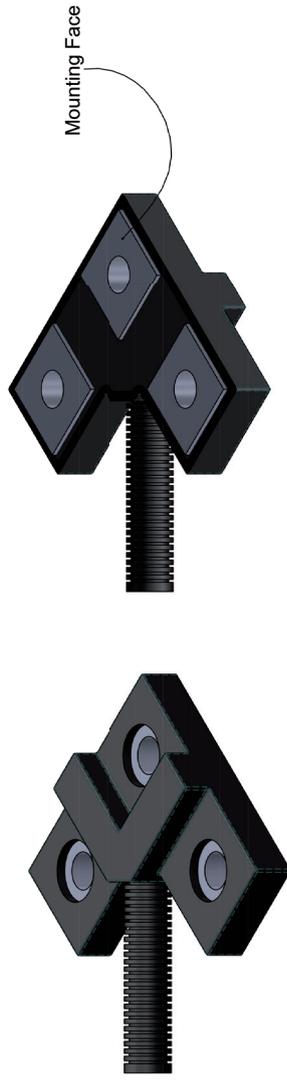Refer to mounting instructions for process details.

20.0 3PL.

20.0 3PL.

35.0 ±0.1

35.0 ±0.1

60.0

16.0

1.0

90.0°

90.0°

M8 Moutning Holes
ϕ 8.2 ±1.0

M8 Bolt Head Clearance
ϕ 13.5

Cable Length - Nominal 3m
Cable 4 Core Screened 7/0.2
Protective 10mm convolute tubing
Minimum bend radius 20mm

Sensor Material
Steel

Cover Material
ABS/Polypropylene

Mounting Face

Sensor should be mounted using 2 x M8 cap head screws, combinedwith a suitable adhesive between mounting face and surface

The surface being mounted to should be flat, clean, free from paint, grease and any other possible interferences to the sensor. Surface roughness should ideally be between 0.5 & 1.6 μm

Refer to mounting instructions for process details.