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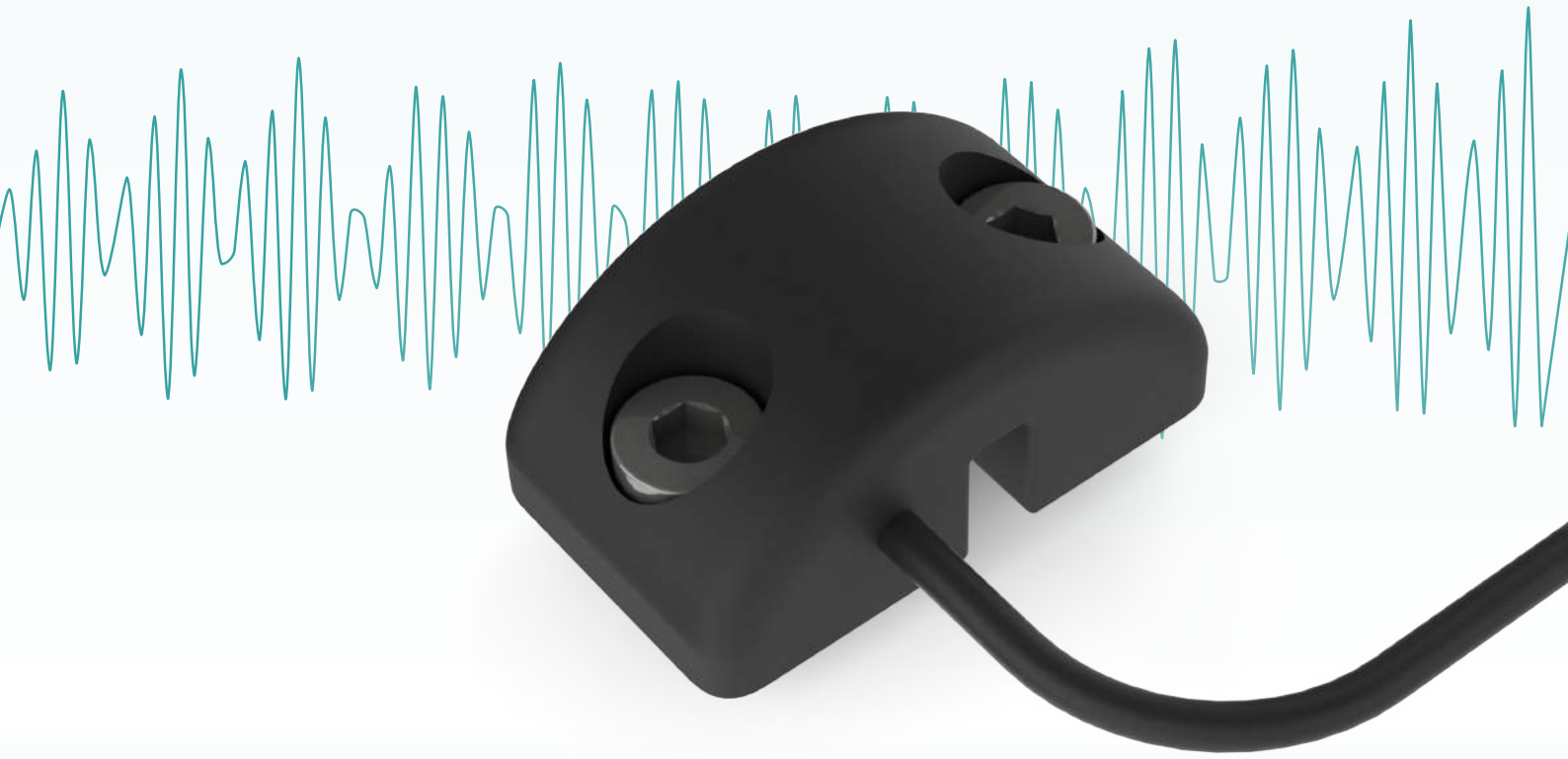
DATUM ELECTRONICS

SERIES 469
BOLT-ON STRAIN GAUGE SENSORS



datum electronics

DATUM ELECTRONICS LIMITED GLOBAL HQ, CASTLE STREET, EAST COWES, UNITED KINGDOM, PO32 6SF

THE DATUM BOLT-ON STRAIN GAUGE

Datum Electronics offer many types of bolt-on strain sensors, which have been developed to provide rugged and robust solutions for industry.

Designed to accommodate for higher stress levels experienced in dynamic applications, our series 469 range of bolt on strain sensors can accommodate for stress values from 0 to 2,000 micro strain as standard. Upon request we are able to extend this range to 10,000 micro strain. Applications for this sensor include:

- 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.

Datum Electronics also specialises in volume OEM solutions, for customers who need an application specific product. Contact our sales team to discuss at web@datum-electronics.co.uk or call +44 (0) 1983 282834.

SPECIFICATIONS

The 469 Series Bolt-on Compliant 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, including dynamic strain applications. 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 469 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.

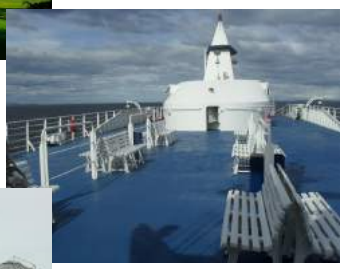
APPLICATION EXAMPLES

VEHICLES

OIL RIGS

SILOS

SHIP HULLS



HOPPERS

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FULL SPECIFICATIONS FOR BASIC STANDARDS

SPECIFICATION	
Standard Strain Range	0 - 2,000 micro-strain *OEM can be catered to your requirements
Exended Strain Range	up to 10,000 micro-strain
Default Output (nominal)	1.0mV/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
Temperature Effect on Zero	0.005 of rated load
Bridge Resistance	1000 ohm (nominal)
Electrical Connection	3 meter, 4-core screened cable
Excitation Voltage	10VDC
Excitation (max)	15VDC
Environmental Protection	IP68
Operating Temperature	-40 °C to +100 °C
Storage Temperature	-40 °C to +100 °C
Humidity	0% - 100%
Chemical Splash	Resistant to chemicals including: Dust, Water, Salt Stray, 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 surface to which the sensor is bolted should be flat and parallel. If the surface is not flat this will induce a strain into the sensor and this strain will be seen on the output as an offset signal.

When bolting the sensor down you will in most cases see a bolt down offset. To keep this to a minimum the surfaces should be flat and parallel and the bolts should be torqued down in even steps from hand tight to a holding torque and then a final torque.

The bolt-on sensor is held in position by the bolt tension and the friction between the two surfaces. The coefficient of friction between two steel surfaces that have been cleaned and abraded will be in the order of 0.5 and 0.9.

In most cases, we also recommend the use of an adhesive. The use of an adhesive will improve the long term stability of the sensor.

BOLTING PROCESS

Ensure the Bolt on strain gauge is properly aligned with the fixing holes. Once properly aligned insert the bolts and continue to evenly finger tighten the bolts until the bolt on strain gauge can stay in place unassisted. At this stage check the bolt on sensor is not pre-stressed by the bolts. If not, proceed to use a torque wrench (set to the correct torque) to alternately tighten each bolt. This should be done in no less than 3 steps, tightening no more than a quarter of a turn at one time. This process should be repeated until the intended torque value has been met.

Before tightening, verify that any shank portion of a screw does not bottom out in the hole.

GLUEING PROCESS

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.

TYPICAL INSTALLATION

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 torque of 40 Nm should be used for tightening bolts. 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.

QUALITY OF BOLTS

If using bolts, we recommend:

M8 course thread (grade either 10.9 or 12.9)

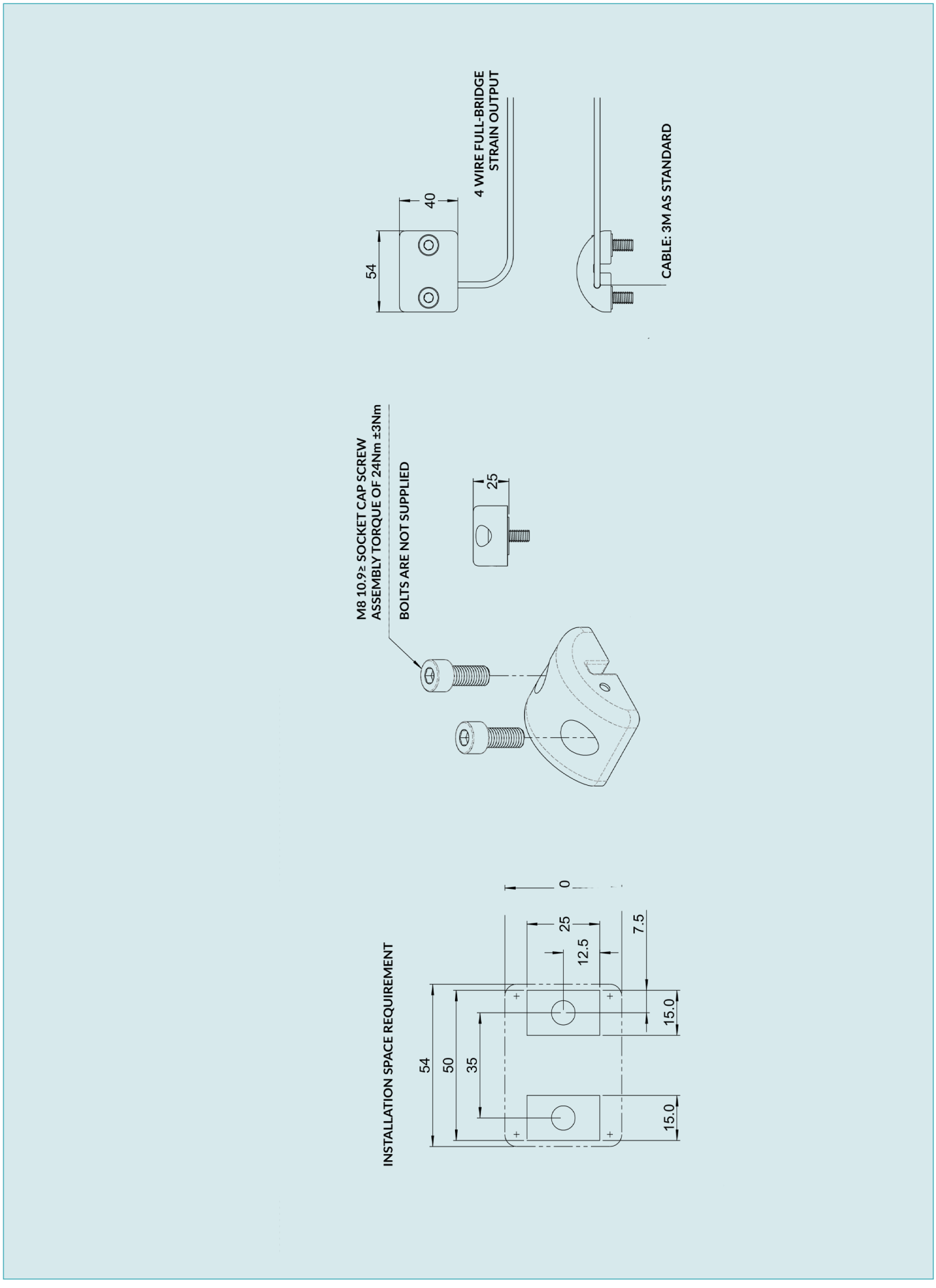
- (M8 Grade 10.9 bolting torque max 35Nm max tension 22000N)
- (M8 Grade 12.9 bolting torque max 42Nm max tension 27000N)

ACCEPTABLE ADHESIVE & FITTINGS

If using adhesive, use:

Loctite Retaining Compound 638 or equivalent

Loctite 330 with 737 activator or equivalent


4 WIRE FULL-BRIDGE
STRAIN OUTPUT
40
54
CABLE: 3M AS STANDARD
M8 10.9≥ SOCKET CAP SCREW
ASSEMBLY TORQUE OF 24Nm ±3Nm
BOLTS ARE NOT SUPPLIED
25
INSTALLATION SPACE REQUIREMENT
0
25
12.5
7.5
54
50
35
15.0
15.0

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