



**OPERATING & INSTALLATION INSTRUCTIONS**  
**SERIES 9000 - CANbus PRESSURE TRANSDUCER**  
**PLEASE READ CAREFULLY BEFORE INSTALLING**

**PART NUMBER: 560550-0080**

**ISSUE: B**

**IMPORTANT NOTE:** All GEMS Pressure and Level & Flow Products are designed and manufactured in accordance with Sound Engineering Practice as defined by the Pressure Equipment Directive 97/23/EC. Pressure transducer products designed to meet the highest risk category "IV" of the Pressure Equipment Directive are clearly marked on the label by "CE0086". Compliance is achieved through modules "B+D". No other products should be used as "Safety Accessories" as defined by the PED, Article 1, Paragraph 2.1.3.

## **INTRODUCTION**

Series 9000 are fluid pressure measuring transducers in which a four active arm Wheatstone bridge of thin film gauges, integral with a beam structure which in turn is connected to a pressure summing diaphragm, is used to convert fluid pressure into a proportional electrical signal. In built intelligence in the form of micro-controller provides a digital representation of the measured pressure, with all errors due to temperature and non-linearity accurately corrected. The 9000 output signal is in the form of a CANopen communications protocol (see getting started).

Series 9000 conform with the essential protection requirements of the EMC Directive 2004/108/EC amended by certified type testing to EN 61326-1 and EN 61326-2-3.

**Conformity with the requirements of the CE mark only applies when the installation conditions described in these instructions have been met. For units supplied without a cable assembly connection to the transducer must be accomplished using Gems Sensors approved cable. See APPROVED CABLE section.**

All instruments conform to the appropriate specifications and/or drawings applicable and have been subjected to relevant strict quality control procedures.

## **HAZARDOUS PRODUCTS**

The Consumer Protection Act of 1987, Section 6 of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 1988 require that we advise recipients and users of our products of any potential hazards associated with their storage, handling or use.

The products which our Company supplies may be classified as Electrical, Electro-Mechanical and Electronic equipment.

These products are tested and supplied in accordance with our published specifications or individual special requirements that are agreed in writing at time of order. They are constructed so as not to affect adversely the safety of persons and property when properly installed, maintained and used by qualified personnel, in the applications for which they were designed and manufactured



## ACTION ON RECEIPT

- \* Check details on Calibration Certificate agree with data etched on transducer body.
- \* Check accessories supplied include:
  - Calibration Certificate (or QA Certificate)
  - Seal, Dowty Bonded
  - Mating Connector (where applicable)

## GENERAL

- \* Transducer should not be subjected to greater than the maximum allowable pressure range / Temperature (T.S) as defined on the transducer label.
- \* Transducer should not be subjected to mechanical impact.
- \* In the event of fire the end user must ensure that the system pressure is vented to a safe area.
- \* The effects of decomposition of unstable fluids should be considered by the user when placing this device in service.
- \* The pressure transducer has no means of draining or venting, this must be performed by another component in the end users system.
- \* Pressure range must be compatible with the maximum pressure being measured.
- \* Pressure media must be compatible with the transducer wetted parts which are:-
  - Ranges 1 and 1.6 bar, 15 and 30 psi :** 15-7 Mo plus 17-4 PH stainless steels
  - Ranges 2.5 bar and 60 psi and above :** 17-4 PH stainless steel
  - Pressure connection codes K or L :** Inconel alloy 625
- \* Exposed end of cable must be kept free from moisture.
- \* Liquid must not be allowed to freeze in the pressure port.

Full specifications for all products available on request from our Service Department.

## MECHANICAL INSTALLATION

**Pressure Connections:** G<sup>1</sup>/<sub>4</sub> internal pressure connection to BS2779 as standard. Alternative fitted as specified at time of order.

Pressure couplings screwed into G<sup>1</sup>/<sub>4</sub> pressure ports should have a maximum thread engagement 13 mm and **UNDER NO CIRCUMSTANCES** be allowed to touch the pressure sensitive diaphragm. Pressure couplings should be sealed against the outer face at the pressure port entry using bonded seal washer such as:-

<b>Part Number</b>	<b>Description</b>
234646-0002	G <sup>1</sup> / <sub>4</sub> bonded seal up to +100°C operation. Dowty Ref: 400-021-4490-02
499207-0002	G <sup>1</sup> / <sub>4</sub> bonded seal up to +200°C operation. Dowty Ref: 300-021-0967-02



499207-0006

G1/8 bonded seal up to +200°C operation.  
Dowty Ref: 300-020-0967-02

Refer to Dowty for external pressure ratings.

**Mounting:** The pressure transducer is designed to be attached by the coupling thread only. Omni-directional. To fit, use a 22.2 mm (7/8 inch) AF spanner on the hexagon provided and apply maximum torque of 27 Nm (20 lbf-ft). The Customer must ensure that the pressure seal is suitable for the application. If in doubt contact Gems Sensors.

**Effects of Pressure Transients:** If it is suspected that adverse transient pressure pulses are present for any reason, then fit a restrictor such as our part number 466175-0000 (depending upon pressure adaptor).

**Vibration:** Where present, mount in a saddle clamp such as part number 499877-1000 (material: Polypropylene) or 499877-1001 (material: Polyamide). Position the clamp as close to the pressure port as practicable.

**Effects of Heat:** Avoid mounting the transducer near a source of heat which is liable to create a temperature gradient across the instrument. If this is unavoidable, use a heat shield to deflect uneven radiated heat or wrap the transducer in glass fibre insulation so that an even temperature is assumed throughout.

**High Temperature Pressure Measurement:** Possible using a length of piping or a "syphon" to isolate the instrument from the hot media. Since there is no flow, the temperature drop along the tubing is considerable and usually a relatively short length is sufficient to bring the pressure media temperature within acceptable limits for the instrument. Alternatively a temperature isolator, part number 558564-0001, can be fitted (G $\frac{1}{4}$  connection only). Pressure media must not be allowed to solidify in the tube and/or pressure port.

## **ELECTRICAL INSTALLATION**

All types include suppression devices providing transient protection. The 9000 requires a d.c. power supply between 7V and 30V. The maximum current should be limited via a suitable power supply or fuse to 1A.

**For all types conformity with the requirements of the CE mark only applies when connection is made with Gems Sensors approved cable, See APPROVED CABLE section, and the screen of that cable is connected to a reliable earthing point at the instrumentation end.**

**Types 90XXX-XX-M/P2-X:** These types are capable of being immersed to a maximum depth of 200m WG.

**Types 90XXX-XX-L2-X:** These types are fitted with a M12 x 1, 5 pin receptacle.

## **ELECTRICAL REQUIREMENTS**

<b>Electrical Code</b>	<b>Supply Volts</b>	<b>Output</b>	<b>CAN Shield</b>	<b>CAN +ve Supply</b>	<b>CAN -ve Supply</b>	<b>CAN Hi</b>	<b>CAN Lo</b>
L	7 to 30	CANbus	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
M	7 to 30	CANbus	Green	Red	White	Yellow	Blue

## **APPROVED CABLES**

Gems Sensors uses cable comprising 6 colour-coded cores, with a central vent tube, enclosed by an aluminium/polyester screen where the screen is in intimate contact with a separate drain wire. The outer sheath can be of various material, depending upon application and operating temperature, standard Polyurethane (immersion, +50°C). Other cables available on request for operation at higher temperatures or in corrosive media.

## **OPERATION**

Having installed the transducers as instructed they are ready for use. The transducer should not be removed whilst the system is at pressure. Before applying power, check that the correct polarity and excitation levels are being applied. See ELECTRICAL REQUIREMENTS.

**Compensated Temperature Range :** -40°C to +85°C

**Operable Temperature Range:** Electrical Connector Code L -40°C to +85°C  
Electrical Connector Code M -20°C to +50°C (Standard Polyurethane Cable)

## **OPERATIONAL LIFE:**

Limited to 100 million cycles to maximum allowable pressure.

## **CALIBRATION**

Transducers are calibrated to the datum requested at time of order; this can be identified by the fifth entry in the stock numbering code as follows:-

- G** - gauge datum vented to atmosphere via the electrical connection
- A** - absolute datum
- S** - sealed reference; reference side of the instrument is sealed and the output electrically adjusted to zero with 1013.25mbar applied to pressure port

## **GETTING STARTED**

**Obtaining a Pressure and Temperature Reading:** The pressure and temperature are available, via the PDO, in decimalised integer format. The default operation of the 9000 is to reply with the PDO every time a SYNC message is received. Figure 29 shows the sequence of messages necessary to obtain a reading when excitation is applied to the 9000. It can be interpreted as follows:

1. 9000 transmits boot up message to PC on identifier 701.
2. Host application transmits start remote node command.
3. When SYNC command is transmitted, by the host, the 9000 responds with the PDO containing the pressure and temperature.

PC / Host Application									Direction	9000								
ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7		ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Boot up message from 9000									←	701	00							
00	01	00							→	NMT Command – Start Remote Node								
80									→	SYNC								
Process Data Object Bytes 0-1 = Pressure, bytes 2-3 = Temperature									←	181	02	00	E1	00	00	00	00	00
80									→	SYNC								
Process Data Object Bytes 0-1 = Pressure, bytes 2-3 = Temperature									←	181	02	00	E1	00	00	00	00	00

For further information refer to User Manual part number 562293.

The 9000 operates according to the CANOPEN protocols:-

- DS301
- DSP305
- DSP404
- D2P303-2

Alternatively a Starter Kit, including PC Software and a USB-CAN interface is available part number 562321.

## MAINTENANCE

**Routine Inspection:** Not required except for periodic inspection of the cable and moulding to ensure that these are neither damaged nor softened by incompatible liquid.

## CAUTION



**CARE MUST BE TAKEN NOT TO TOUCH THE PRESSURE SENSITIVE DIAPHRAGM WHILST CLEANING THE PRESSURE PORT. FAILURE TO OBSERVE THIS PRECAUTION CAN CAUSE IRREPARABLE DAMAGE.**

## **WARRANTY**

The Company warrants its products to be free from defects in material and workmanship in normal use and service for a period of one year from date of shipment. The Company reserves the right and option to refund the purchase price in lieu of repair or replacement upon evaluation of the returned original part. Modification, misuse, attempted repair by others, improper installation or operation shall render this guarantee null and void. The Company makes no warranty of merchantability or fitness for a part or purpose.

## **SERVICING**

The transducer cannot be repaired locally and if damaged should be returned to ourselves at the address shown below or to accredited dealers when a replacement/repair is required:

Gems Sensors & Controls  
Lennox Road  
Basingstoke  
Hants. RG22 4AW

Gems Sensors Inc  
1 Cowles Road  
Plainville, CT 06062  
U.S.A.

## **RETURN TO FACTORY**

**PLEASE NOTE:** To comply with Health and Safety requirements, the instrument must be clean and safe to handle and accompanied by a formal statement to that effect duly signed by an authorised officer of the Company.

Any instrument returned without certification will be quarantined and no action will occur until cleared. It may ultimately be returned to you and subject to a transportation charge.



**EC DECLARATION OF CONFORMITY**

**Manufacturers Name:** Gems Sensors & Controls  
**Manufacturers Address:** Lennox Road, Basingstoke, Hants, RG22 4AW  
**Product Type:** 9000 Series  
**Description:** CANbus Pressure Transducer  
**Date of Issue:** 15<sup>th</sup> July 2009


**Gems Sensors & Controls hereby declares that the product above conforms with the essential protection requirements of the following EC Directives:**

**EMC:** 2004/108/EC by compliance to EN 61326-1 and EN 61326-2-3.

**SAFETY:** *“For the equipment within which this component is installed to comply with the Low Voltage Directive (73/23/EEC), this product must be powered from a Safety Extra Low Voltage (SELV) source of 42V peak maximum.*

*When the power source is derived from a transformer this must conform to EN 60742 or equivalent, with intrinsic short circuit protection. The power source to this component must also incorporate suitable over-current protection related to the current rating of this component”*

**This apparatus must not be put into service until the equipment into which it is to be incorporated has been declared in conformity with the provisions of the relevant New Approach Directive.**

  
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Signed for and on behalf of  
Gems Sensors & Controls  
N Kettlewell  
Engineering Manager  
England

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