



TERWIN INSTRUMENTS LIMITED

INSTALLATION & OPERATION MANUAL

2000 SERIES PRESSURE / TEMPERATURE TRANSDUCER



**BEFORE INSTALLING OR USING YOUR SENSOR
PLEASE READ THIS MANUAL.**

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1 GENERAL INFORMATION

The Terwin 2000 Series range of Melt Pressure Transducers described in this manual have been designed and manufactured using state-of-the-art technology.

Melt pressure transducers are precision measuring instruments which obtain their measuring accuracy and long-life span only if they are handled properly. This user manual contains important information on handling, commissioning and operation of your sensor. Anyone involved with its installation, operation or maintenance should read and understand it.

This manual should be studied carefully before installing the sensor, thus ensuring trouble-free operation. If you encounter any difficulties, please contact Terwin Instruments Ltd. who will be pleased to help.

1.1 EXPLANATION OF SYMBOLS



WARNING! – Indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.



CAUTION! – Indicates a potentially dangerous situation that can result in light injuries or damage to equipment or the environment, if not avoided.



INFORMATION! – Points out useful tips, recommendations, and information for efficient and trouble-free operation.

1.2 COMPANY CONTACT INFORMATION

For sales, accessories, service, or warranty information please contact Terwin Instruments using the information below: -

Registered Office: Terwin Instruments Ltd
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Orston Lane
BOTTESFORD
Nottinghamshire
NG13 0AU
United Kingdom

Telephone: +44 (0)1949 842000

Fax: +44 (0)1949 842004

Email: info@terwin.com

Internet: www.terwin.com

1.3 OPERATING RANGE & SCOPE OF APPLICATION

Terwin melt pressure transducers have been exclusively designed for pressure measurement and monitoring of extrudate formed through the process of melt pressure extrusion at its associated high temperatures.

1.4 GENERAL SPECIFICATIONS

General Specifications	
Standard Pressure Ranges	0 – 1,500 through 0 – 15,000 psi 0 – 100 through 0 – 1,000 bar
Available Pressure Ranges	0 – 500 through 0 – 30,000 psi 0 – 35 through 0 – 2,000 bar
Repeatability	Within $\pm 0.1\%$ F.R.O.
Supply Voltage	5 – 12 V DC
Zero Balance	$\pm 5\%$ F.R.O.
Output	3.00mV/V DC $\pm 10\%$
Resolution	Infinite
Configuration	Four-arm foil bonded Wheatstone bridge strain gauge
Bridge Resistance	350 Ω $\pm 10\%$ Wheatstone Bridge
Process Connection	½"-20UNF
Calibration Point	80% $\pm 0.1\%$
Combined Error	Within $\pm 0.5\%$ F.R.O (Standard Ranges) Within $\pm 1.0\%$ F.R.O (Non-Standard Ranges)
Maximum Diaphragm Temperature	450°C or 842°F
Maximum Electronics Temperature	200°C or 392°F
Maximum Pressure	2 x full range or 25,000psi (1,700bar) whichever is less On 30,000psi (2,000bar) sensors, the maximum pressure is 35,000psi (2,400bar)
Diaphragm Material	Terwin Di-Hard™ Diaphragm
Construction	17-4PH Stainless Steel
Torque Settings	20 ft. lbs or 27Nm

When in use the temperature of the sensing diaphragm (the tip of the sensor) and the electronics housing (directly below the electrical connector) must not exceed the temperature indicated in the technical specification. Even short-term exposure to temperatures beyond the technical specification could impair the safety function of your sensor and/or damage the electronic components in the electronic housing. If you suspect the sensor has been exposed to temperatures beyond those listed in the technical specification, the sensor must be taken out of operation and returned to Terwin Instruments Ltd for service evaluation.

Any use beyond the above-mentioned application area does not conform to regulations.

Working safely requires that safety, and work instructions/procedures are always observed and adhered to during operation.

This user manual is part of the product and must be kept in the immediate vicinity of the sensor and be readily accessible to any user involved in its use and operation.

Terwin Instruments' warranty is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, assignment of insufficiently qualified skilled personnel or unauthorised modifications.

Terwin Instruments reserve the right to change the contents or form of this user manual at any time without prior notice having been given.

1.5 END OF LIFE & DISPOSAL

There are no toxic substances within this product. It can be disposed of and recycled as general waste metal.

It is a core value of Terwin Instruments that everybody takes responsibility for the environment. The safe and correct disposal of this sensor at the end of its useful working life is important not just today, but for a sustainable future. Incorrect disposal will put the environment at risk. **Please think about the environment.**



The disposal marking on this sensor indicates that it must not be disposed of in domestic/household waste. Disposal can be carried out by returning this product to Terwin Instruments for recycling, or by prior arrangement your corresponding municipal authorities (see EU directive 2002/96/EC if applicable).

2 SAFETY



WARNING! – Before installation, commissioning and operating this sensor, ensure that the sensor you are installing is suitable for the specification and pressure range of the extruder you are fitting it to. Non-compliance could result in death or serious injury and/or damage to the sensor and the extruder it is fitted to.



INFORMATION! – Further important safety instructions can be found in the individual chapters of this user's manual.

2.1 INTENDED USE

The instrument has been designed and built solely for the intended use described here and should only be used for measuring melt pressure/temperature*

The technical specifications contained in these operating instructions must be observed. Improper handling or operation of the instrument outside of its technical specifications requires the instrument to be taken out of service immediately and inspected by Terwin Instruments' Service Department.

* If an optional thermocouple is fitted.

2.2 SKILLED PERSONNEL

Skilled personnel are understood to be personnel who, based on their technical training, knowledge of measurement and control technology and on their experience and knowledge of country-specific regulations, current standards, and directives and can carry out the work described whilst independently recognising potential hazards associated with such work.

2.3 PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)

Personal protective equipment is designed to protect skilled personnel from hazards that could impair their safety or health during the operation of the equipment. When carrying out various tasks on and with the equipment, the skilled personnel must wear the correct personal protective equipment.

FOLLOW THE INSTRUCTIONS DISPLAYED IN YOUR WORK AREA REGARDING PERSONAL PROTECTIVE EQUIPMENT!



WEAR SAFETY GOGGLES! – Always protect your eyes.

2.3.1 SPECIAL HAZARDS

WARNING! – Improper handling can result in injury, death and damage to people and equipment.



- ❖ The activities described in these operating instructions should only be carried out by skilled personnel who have the qualifications described in Section 2.2
- ❖ Unqualified personnel should not install, maintain, or operate an extruder.

2.4 HANDLING

The Terwin 2000 Series range of transducers are both mechanical and electronic precision measuring instruments. Treat them with the required care, protect them from humidity, impacts, strong magnetic fields, static electricity, and extremes of temperature. Lastly do not attempt to insert the sensor into a port not specifically designed to hold it.

If the sensor is moved from a cool to a warm environment, the formation of condensation may result in instrument malfunction. Before putting the sensor into operation allow sufficient time for it to acclimatise to its new environment.

The sensor is supplied with a green protective cap fitted to cover the sensing diaphragm and protect it from damage. Please retain the cap and use it as intended if the sensor is ever removed from the machine.



INFORMATION! – Remember to allow the sensor to cool before fitting the protective cap.

If possible, please retain the packaging the sensor was supplied in. If for any reason the sensor needs to be returned, please re-use the packaging.

Terwin Instruments Ltd shall not be liable for claims of any type based on operation contrary to the sensor's intended use.

2.5 LABELLING & SAFETY MARKS

2.5.1 PRODUCT LABEL & IDENTIFICATION

The Product Label can be found in 2 locations: -

1. On the electronics housing of the sensor.
2. On the packaging the sensor was supplied with.

The product label contains all the pertinent information applicable to the sensor.

As a secondary measure the model number and serial number of the sensor are laser engraved onto the electronics housing.

There are markings on the stem of the sensor, these allow Terwin Instruments to batch trace the material the sensor was manufactured from.

2.5.2 EXPLANATION OF OTHER MARKINGS & SYMBOLS



CE, Communauté Européenne

Instruments bearing this mark comply with the relevant European Union directives.



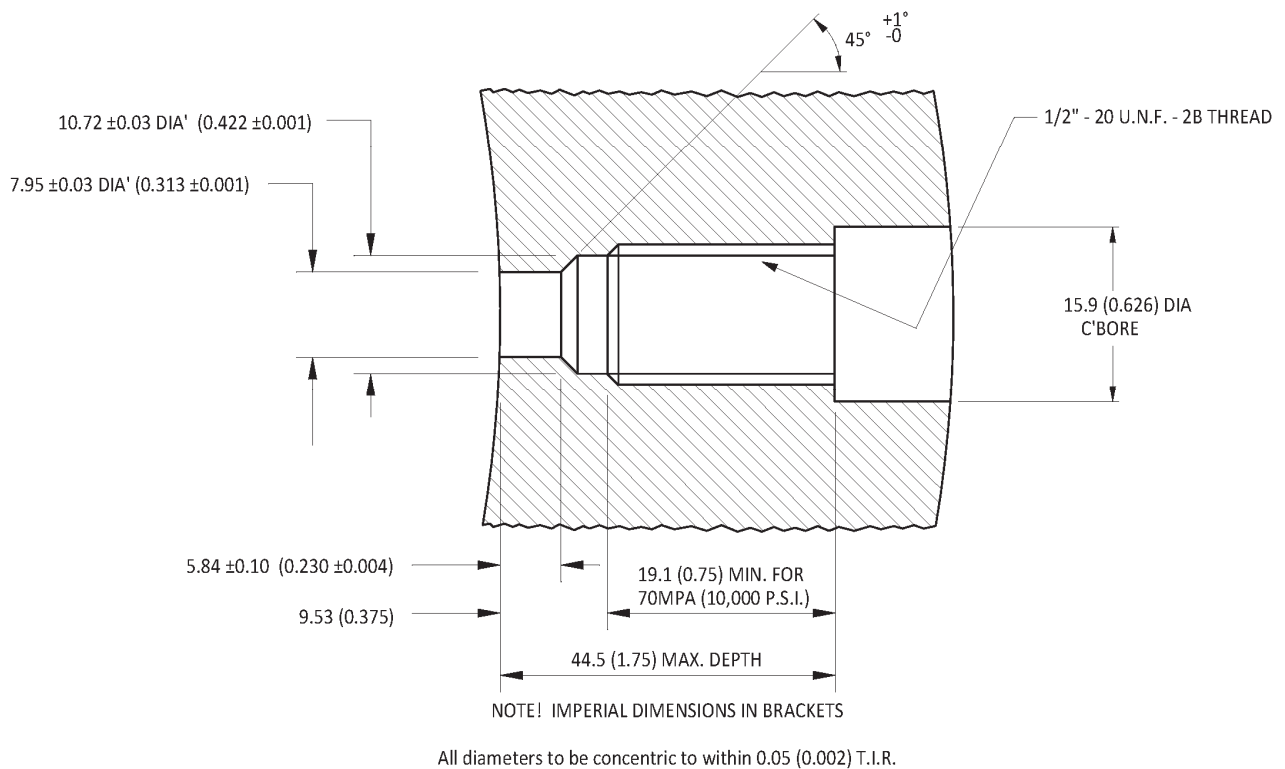
UK CA, United Kingdom Conformity Assessed

Instruments bearing this mark comply with the relevant directives in England, Scotland & Wales.

3 INSTALLATION

Prior to installation of the sensor, it is important to ensure the port you are fitting the sensor into meets the dimensions listed in the section below:

3.1 1/2"-20UNF PORT DIMENSIONS



3.2 PRE-INSTALLATION

It is recommended that the fitting accuracy and port condition be checked prior to installation of the sensor by using a suitable blanking bolt. A dirty or damaged port may cause irreparable damage to your new pressure transducer.

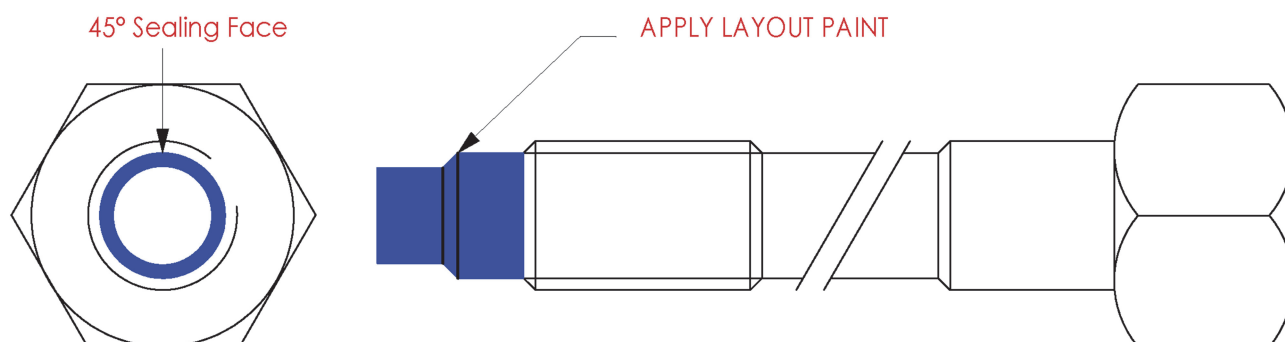
Blanking Bolt Part Number	Description
BB-92.5MM	Terwin 1/2"-20UNF-2A blanking bolt. Effective length: 92.5mm (3.64 inch). Fitted with 22mm A/F x 15mm high hex for fastening purposes. Material 17-4PH stainless steel.
BB-152.4MM	Terwin 1/2"-20UNF-2A blanking bolt. Effective length: 152.4mm (6 inch). Fitted with 22mm A/F x 15mm high hex for fastening purposes. Material 17-4PH stainless steel.
BB-228.6MM	Terwin 1/2"-20UNF-2A blanking bolt. Effective length: 228.6mm (9 inch). Fitted with 22mm A/F x 15mm high hex for fastening purposes. Material 17-4PH stainless steel.
BB-305.0MM	Terwin 1/2"-20UNF-2A blanking bolt. Effective length: 305.0mm (12 inch). Fitted with 22mm A/F x 15mm high hex for fastening purposes. Material 17-4PH stainless steel.

3.2.1 CHECKING & CLEANING THE PORT



INFORMATION! – Remember before performing the task listed in this section to ensure that the extruder is at ambient temperature.

1. Apply Layout Ink/Paint (Terwin recommend DYKEM Steel Blue®) to the Blanking Bolt as highlighted in the drawing below (up to the base of the thread).



2. Insert the bolt into the port and turn until the sealing faces make contact.
3. Remove and examine the blanking bolt.
4. The only acceptable abrasion on the marking ink is on the sealing face (45°)
5. If the ink/paint has been rubbed off in any other places the port should be cleaned/re-worked with a suitable Port Cleaning Kit.

3.3 INSTALLATION



INFORMATION! – Remember before performing the task listed in this section to ensure that the extruder is at ambient temperature.



INFORMATION! – A torque wrench with suitable adaptor and a 22mm open-ended crows-foot fitting should be used to tighten the sensor to the correct torque.



INFORMATION! – Only use the hexagon (hex) directly below the electronics housing to torque the sensor into the port. Do not apply any force to any other part of the sensor.

Assuming that the extruder is at ambient temperature and the port to be used is clean and undamaged, after following the port cleaning process in the previous section, the transducer can now be installed into the extruder.

1. Ensure the extruder is at ambient temperature.
2. Apply a suitable anti-seize paste to the threads of the transducer.
3. Insert the transducer into the port and turn the sensor clockwise until the sealing faces make contact. Ensure no cross-threading occurs.
4. Complete the installation by tightening the transducer using a suitable torque wrench to 20 ft lbs. or 27Nm.

3.4 REMOVAL

The removal of the sensor should be completed with the extruder at process temperature. During removal, please ensure that the diaphragm is not brought into contact with any other parts of the port.

It is important that the force for uninstalling the sensor must only be applied at the shaft (hex) located at the top of the rigid stem, below the electronics housing.



INFORMATION! – Remember to disconnect the electrical/thermocouple connection from the sensor prior to unscrewing it from the extruder.



INFORMATION! – A 22mm open-ended spanner should be used for removing the sensor.



INFORMATION! – Use gauntlets/gloves to protect hands from burns during transducer removal.

The most common cause of failure to this kind of pressure transducer is damage to the diaphragm during installation/uninstallation. Do not use a wire brush to remove product from the sensing diaphragm. Even minor damage to the diaphragm can impair the transducer's function rendering it unserviceable. In case of visible damage to the sensor's diaphragm, please return the sensor to Terwin Instruments for evaluation, prior to any further use.

1. Remove pressure from the barrel of the extruder by stopping the extruder screw, ensure operating pressure is at zero psi/bar.
2. Double check there is no pressure in the barrel, use the relevant instrumentation or the HMI display.
3. Leave the barrel heaters on the extruder at process temperature.
4. Disconnect the electrical connection and thermocouple connection (if fitted) from the transducer.
5. Using a 22mm open ended spanner unscrew the transducer from the extruder by turning anticlockwise and remove it from the extruder.
6. Use a suitable cloth/paper towel to remove any product from the tip/threads of the sensor.
7. Place the sensor on a suitable flat surface and allow it to cool. Ensure the sensor can't roll and fall. If available use the anti-roll fitting the transducer was supplied with.
8. When the transducer has cooled fit the green cap (supplied) over the sensing diaphragm to protect it.

4 ELECTRICAL CONNECTION



WARNING! – Ensure a multi-skilled maintenance person with relevant electrical qualifications carries out the necessary electrical connections. Failure to do so could result in death or serious injury and/or damage to the sensor and the extruder it is fitted to.

After the sensor has been installed, as described in Section 3, the electrical connections must be applied according to the connections as described in this Section. Terwin pressure transducers are equipped with high quality and robust plug connections. The connecting wire should be soldered with great care as transmission errors of signals can otherwise occur. We recommend using Terwin prefabricated connecting cable. Please call or email info@terwin.com for further information or a quotation.

Please refer to the calibration data sheet which accompanies each 2000 series pressure transducer when shipped. The electrical connection, wiring colours and transducer specific information are detailed on this data sheet.

5 CALIBRATION



INFORMATION! – The calibration process must be carried out when the sensor is fitted to the extruder and both the extruder and sensor are heated and stabilised to the relevant process temperature and at zero pressure.



INFORMATION! – The calibration process must also be carried out whenever any maintenance is performed, or a process/temperature change occurs on the extruder.

5.1.1 CALIBRATION: TERWIN μ X00 RANGE OF INSTRUMENTS

1. If you are using any of the Terwin μ X00 Series of instruments, please follow the connection & calibration instructions manual relevant to the instrument you are using.

5.1.2 CALIBRATION: GENERAL INSTRUCTIONS FOR OTHER INSTRUMENTS

1. NOTE – All adjustments are to be made at zero pressure.
2. Ensure the extruder and sensor are heated and stabilised to the relevant process temperature and at zero pressure.
3. Confirm that the cable connecting the instrument to the transducer is wired correctly.
4. Apply power to the measuring instrument.
5. Adjust the ZERO screw on the measuring instrument until a true zero reading is achieved. (For auto zero and calibration instruments, see their specific instruction manuals.)
6. Press the "SPAN" or "CALIBRATION" switch on the measuring instrument and adjust the SPAN or CAL screw so the instrument display matches the calibration figure that is printed on the pressure transducer. This value is stated in both percentage of full-scale range and in psi, bar etc., for example if a 10,000psi transducer has a calibration value of 80%, this calibration will also be expressed as 8,000psi.
7. Re-check the zero reading and adjust again if necessary and then repeat the SPAN/CALIBRATION adjustment as detailed above in point 5).



CAUTION – DO NOT make ANY adjustments when there is pressure on the transducer. This could cause the pressure reading to be low, resulting in the extruder being over pressurised.



COLD STARTS – Always ensure that the product in the barrel of the extruder is at the correct process temperature before the extruder is run. Cold starting the extruder is likely to cause permanent damage to the transducer sensing diaphragm rendering it beyond economic repair.

6 TERWIN INSTRUMENTS WARRANTY

Terwin Instruments Limited warrants equipment of its manufacture against defects in materials and workmanship for a period of one year from date of despatch. Terwin Instruments Limited's obligation under the terms of our warranty is expressly limited to the repairing or replacing at its factory, or at any authorised representatives repair station, providing that:

- a. Terwin Instruments Limited is promptly notified by the buyer upon his/her discovery of a defect.
- b. The defective equipment is returned, with transportation charges paid by the buyer.
- c. Providing the defective unit has not been damaged by negligence, improper use or unauthorised repair or alteration.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose whether to the original purchaser or to any other person. Terwin instruments limited shall not be liable for consequential damage of any kind.

The aforementioned provisions do not extend the original warranty period of any item, which has been either repaired, or replaced by Terwin Instruments Limited.

Terwin Instruments Limited shall not be bound by any terms, conditions, representations, or warranties, expressed or implied, which are not stated herein.