



PSM INSTRUMENTATION LTD

**iCT 1000 Series**  
**Intelligent Hydrostatic level transmitter**  
**Installation Manual**

Issue C

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## 1.0 Intended Use

The iCT is an hydrostatic level transmitter providing both analogue (4-20mA) and digital (Modbus via RS485) outputs. The construction materials employed, the variety of fittings, and wide measurement range mean the iCT is suitable for most tank level applications in the marine, offshore, food, chemical, water, and processing industries.

## 2.0 Safety Instructions

To prevent any damage to the device or any injury to the user it is essential that you read the information in this document and observe applicable national standards and safety requirements.

This document is provided to help facilitate the safe and efficient operation of the instrument.

### 2.1 Product Liability and warranty

All apparatus is carefully examined and tested before leaving the workshop and is sent out in perfect order and condition. We, therefore, give the following Guarantee which takes the place of any Guarantee by Statute, common law or otherwise. If within 12 months from date of despatch, any defect or fault is discovered in any component of our manufacture, due to faulty material or bad workmanship, we undertake to make good the defect without charge, provided that notice is given to us immediately on the discovery of the defect and the defective components or parts thereof, are forwarded to us carriage paid for inspection. This guarantee does not apply to defects caused by ordinary wear and tear, misuse, neglect, or by circumstances over which we have no control.

**Our full terms and conditions are available from our website  
<http://www.psm-sensors.co.uk/psmterms.htm>**

### 2.2 Symbol Convention

The following symbols are used to highlight information that must be followed to ensure safe and efficient operation.



A hazard indicates actions or procedures which, if not performed correctly may result in personal injury or cause damage to the instrument or associated instruments and invalidate safety certification



A warning indicates actions or procedures which, if not performed correctly may result in damage to the instrument.



A caution indicates actions or procedures if not performed correctly may cause incorrect function or loss of information



Information on Statutory directives and standards

## 2.3 Scope of Delivery

Inspect the cartons and immediately report any signs of damage to your local agent or PSM Instrumentation.

- Check the delivery note to ensure you have received the correct instrument(s).

## 2.4 Storage

- Store the instrument in a dry location
- Storage Temperature range  $-20^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$

## 3.0 Instrument Description

The iCT has a capacitive measurement cell manufactured in a ceramic material. This enables accurate measurement over a wide span, coupled with a powerful onboard micro-controller the unit provides both digital and analogue outputs.

If partnered with PSM's family of RFM units, a simple multi-drop network with intrinsic safety compliance, can be provided.



## 4.0 Instrument Handling

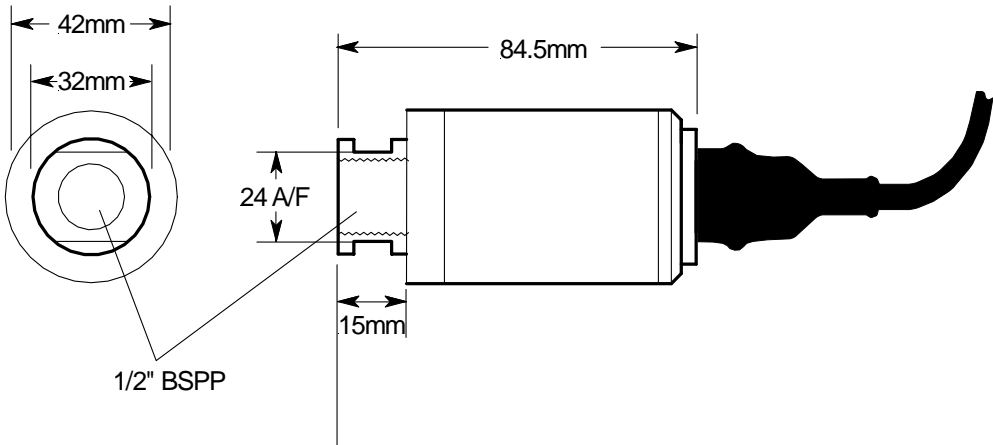
Before and during installation the following precautions should be taken

- Do not touch the measurement cell.
- Do not Apply mains voltage
- Ensure the cable is free from defects
- The cable contains a nylon vent tube which provides an atmospheric reference for the instrument. Ensure the cable is not bent to a radius less than 50mm.  
The end of the vent tube is fitted with a special sintered filter section. This should not be removed or obstructed in any way.

## 5.0 Instrument Identification

Basic Instrument outline, process connections will vary.

**Refer to PSM, local agent or website for specific drawings**



The instrument will be marked with the following information.

### Unit Serial Number

Each instrument can be identified by its own unique serial number.

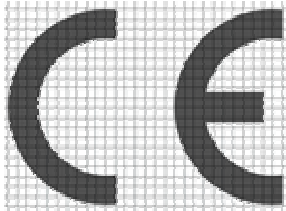
For example            8028901

The first five numbers are PSM Instrumentation's sales order number, followed by the remaining serialised digits. Together they form the unique serial number.



## 6.0 Certification

PSM Instrumentation's continual commitment to customer satisfaction, means the instrument described in this manual has met and exceeds the following requirements



### **EMC Directive 2004/108/EC**

- BS EN 61326-1:2006
- BS EN 61326-2-3:2006
- BS EN 61000-6-2:2005
- BS EN 61000-6-4:2007

### **Low Voltage Directive 2006/95/EC**

- BS EN 61010-1:2001

### **ATEX Directive 94/9/EC**

- EN 60079-0:2006
- EN 60079-11:2007

### **Marine Environment**

Environmental testing as required for Marine Type Approval laid out in IACS Unified requirement E10 and the relevant sections of IEC945.

## 7.0 Installation requirements

Prior to installation it is recommended that the following checks are made.

Ensure that the factory calibration (where applicable) is in accordance with the process parameters and tank height and that the iCT nominal range is suitable for the intended duty.

Check the instrument identification to ensure it is fitted in the correct location.

**Note:** The cable is factory fitted to ensure a pressure tight seal.

**NO ATTEMPT SHOULD BE MADE TO REMOVE THE CABLE GLAND**

### 7.1 Mechanical Installation

#### Sensor cable

The cable that is factory fitted to the transmitter is purpose designed for the application. It contains a nylon vent tube which provides an atmospheric reference for the sensor. The end of the nylon tube has a short section of silicon tube fitted, which carries a sintered filter. This filter provides a pressure path, but prevents any moisture entering the vent tube and **MUST** remain in place. The cable construction is of sufficient strength to enable the sensor to be directly suspended in deep wells and reservoirs. The outer sheathing is a special material suitable for continuous immersion in water, and many oils and chemicals. When handling the cable take particular care not to damage the outer sheathing.

When a transmitter is suspended by its cable use a proprietary suspension cleat or wind three or four turns around a 100mm diameter pipe or drum. Where the cable is to be brought through the tank wall it is recommended that where possible this be done above the maximum fill line using a suitable compression fitting. (Available from **PSM**)

#### Sensor fitting height

when a transmitter is used in tank level or volume applications it is essential to ensure that the sensor is fitted at a known position and height above the bottom of the tank. All calibration data will be related to this fitting position.

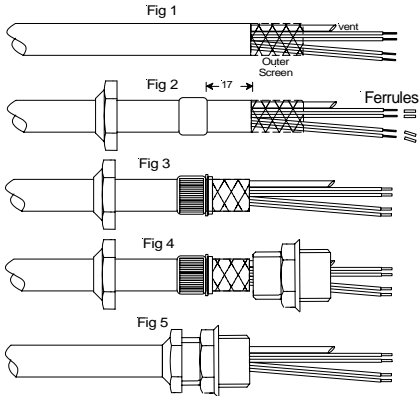
#### Mounting

When mounting the unit ensure that suitable gaskets or sealants are employed to provide pressure tight seals. The sensor should not be mounted where it will be subject to excessive or continuous vibration, extreme temperature fluctuation or risk of mechanical damage.

## 7.1 Electrical Installation

This instrument should be terminated and wired in accordance with the details below.

### Typical cable termination



<b>Red</b>	Positive	Power Supply 4-20mA
<b>Black</b>	Negative	
<b>White</b>	A data +	RS485 Modbus
<b>Green</b>	B data -	

Cable is normally provided to the required length with the ends terminated as depicted above.

The overall braid **MUST** be terminated in the entry gland of the termination enclosure to ensure it is earthed. Particular care should be taken to ensure that the 360 degree screen is maintained to comply with the EMC standards of this unit.

If, exceptionally, the cable has to be shortened, the nylon vent tube should be cut to a free length of approximately 20mm within the enclosure, it must be ensured that this tube is not blocked or otherwise restricted and the silicon tube containing the sintered filter is re-fitted to the shortened length.



The termination enclosure **MUST** be vented.

## 8.0 Electromagnetic Compatibility

To maintain compliance to the EMC standards this instrument has been tested to, the below information should be followed:

- Instrument body to be earthed
- The overall braid **MUST** be terminated in the entry gland
- The termination enclosure material to be metal or RFI screened
- All input/output cables from the termination enclosure to have overall braided screen terminated to entry gland
- The termination enclosure to be earthed

PSM Instrumentation offer a range of simple termination enclosures. The RFM1 provides convenient termination for one ICT and the RFM4 allows connection of up to 4 units.

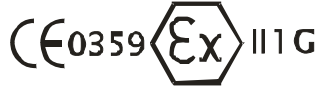


## 9.0 Intrinsically Safe Installations

The optional intrinsically safe version of the iCT is covered by the following certification for use in hazardous areas.

### Approval Certification

**Certificate number** ITS09ATEX26339X



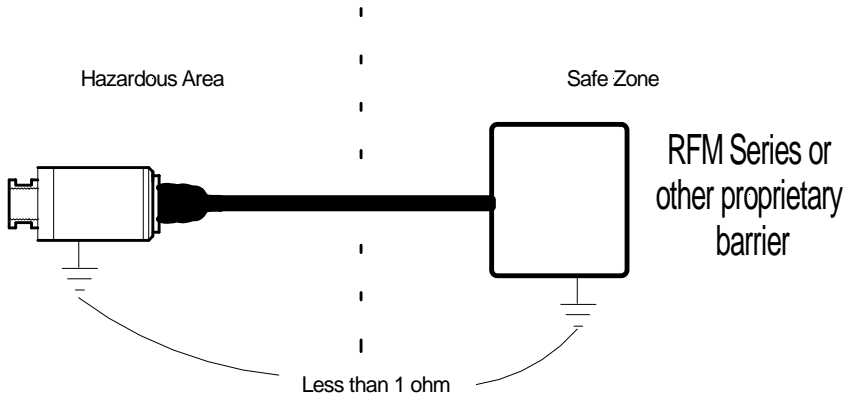
**Ex ia IIC T4**

- ia** Intrinsic Safety
- IIC** Acetylene & Hydrogen (Presence of Flammable/Combustible gas)
- T4** 135°C (Maximum Surface Temperature)

### Installation Requirements



- The following standard should be followed when carrying out a hazardous area installation. **60079 Part 14**
- An equipotential earth bonding system must be used



- U<sub>i</sub> = 28Vdc
- I<sub>i</sub> = 150mA      PSM Instrumentation can provide or advise on appropriate barrier selection
- P<sub>i</sub> = 0.8W
- L<sub>i</sub> = 0
- C<sub>i</sub> = 22nF(28V) and 705nF(11.8V)

Intrinsically safe devices protect lives and property. PSM Instrumentation's Equipment has been designed with **NO** user replaceable parts.

**Strictly No Modifications or user repairs are allowed**

If any problems occur with the equipment please contact PSM Instrumentation or Agent.

## 10.0 Analogue and digital Device

The following diagram shows how to connect the instrument for analogue mode.

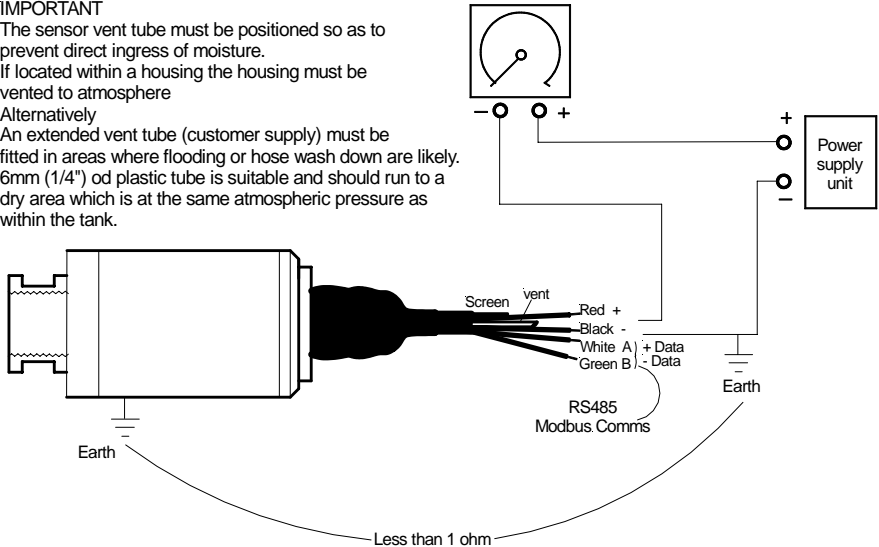
### IMPORTANT

The sensor vent tube must be positioned so as to prevent direct ingress of moisture.

If located within a housing the housing must be vented to atmosphere

### Alternatively

An extended vent tube (customer supply) must be fitted in areas where flooding or hose wash down are likely. 6mm (1/4") od plastic tube is suitable and should run to a dry area which is at the same atmospheric pressure as within the tank.



If ordered as an analogue only device the white and green wires are not required and should be wired to empty terminals or cut back to avoid incorrect connection.

If ordered as an analogue and digital device, the unit will normally be factory configured to your requirements.

PSM also provide a utility, the iSS, that can be used to access and change the iCT's operational parameters. This utility may be downloaded from

**[http://www.psm-sensors.co.uk/ict\\_utility.htm](http://www.psm-sensors.co.uk/ict_utility.htm)**

White and Green are required for RS485 digital communications. To connect to a PC an RS485 converter will normally be required.

We recommend using the following devices

- Adam 4520 - RS232 to RS422/RS485 converter
- Adam 4561 - USB to RS-232/422/485 Converter

With digital mode enabled, further options are available for reading via the RS485 data loop using Modbus protocol.

- Level output / Volumetric output
- Scaled pressure output / Actual Pressure output
- Zero and Span / Percentage Zero and Range Offset
- Force Zero and Span Band / Process temperature reading

For details of the full functionality and supported functions refer to **Manual 053 ICT Functionality & Communications Protocol.**

## 11.0 Digital only Device

The following diagram shows how to connect the instrument for Digital mode.

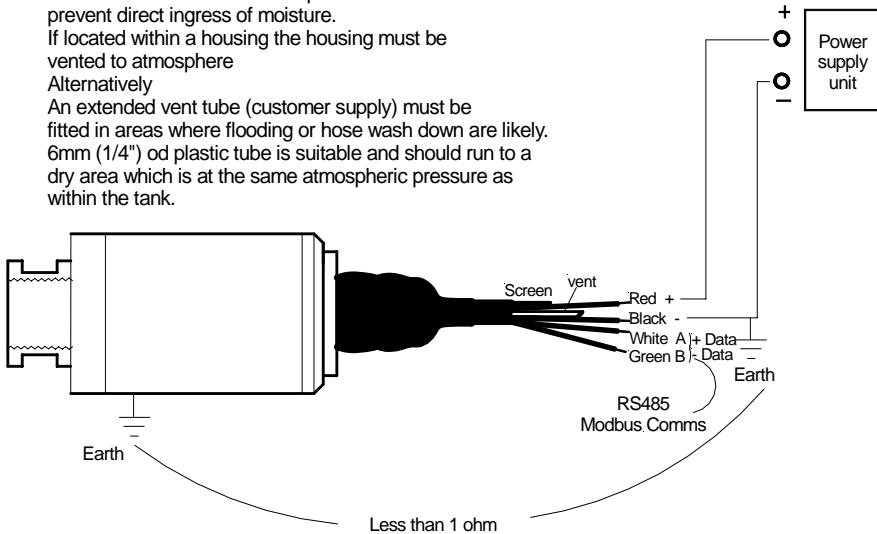
### IMPORTANT

The sensor vent tube must be positioned so as to prevent direct ingress of moisture.

If located within a housing the housing must be vented to atmosphere

Alternatively

An extended vent tube (customer supply) must be fitted in areas where flooding or hose wash down are likely. 6mm (1/4") od plastic tube is suitable and should run to a dry area which is at the same atmospheric pressure as within the tank.



White and Green are required for RS485 digital communications. To connect to a PC an RS485 converter will normally be required.

<b>Red</b>	Positive	Power Supply 4-20mA
<b>Black</b>	Negative	
<b>White</b>	A data +	RS485 Modbus
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We recommend using the following devices

- Adam 4520 - RS232 to RS422/RS485 converter
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For details of the full functionality and supported functions refer to **Manual 053 ICT Functionality & Communications Protocol**.

## 12.0 Networks

If installing a network refer to **Manual 052 ICT & RFM networks**

## 13.0 Instrument Return

All equipment is carefully examined and tested before leaving the workshop and is sent out in perfect order and condition.

Should it prove necessary to return any equipment for inspection, please ensure you follow the below points.

- Please contact PSM for an RVN form and number
- The equipment must be accompanied by an RVN with clear instructions as to the reason for return and what actions are requested.
- An explanation of the apparent fault together with details of the service conditions are also required.
- Health & Safety requirements mean that we must be fully aware of any potential hazards prior to working on returns.

**Our full terms and conditions are available from our website**

<http://www.psm-sensors.co.uk/psmterms.htm>

## 14.0 Technical Data

<b>Power Supply Digital Only Mode</b>	8-30Vdc
<b>Power Supply Including Analogue Mode</b>	12-30Vdc
<b>Accuracy Digital Mode</b>	± 0.1%
<b>Accuracy Analogue Mode</b>	± 0.25%
<b>Accuracy Temperature</b>	± 1°C
<b>Range</b>	-10mBar – 20Bar
<b>Analogue Output</b>	4 – 20mA
<b>Digital Output</b>	RS485 Modbus Communications
<b>Sensing Element</b>	Ceramic Pressure Measurement Cell / Temperature Sensor / Integral Electronics
<b>Body Construction</b>	Fusion Welded 316 Stainless Steel
<b>Operating Temperature</b>	-20°C to +80°C
<b>IP Rating</b>	IP68 (suitable for continuous immersion)
<b>Intrinsic Safety</b>	Request current Intrinsic Safety Certification for Hazardous Areas

**PSM WEEE Producer Registration No WEE/HC0106WW**

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