

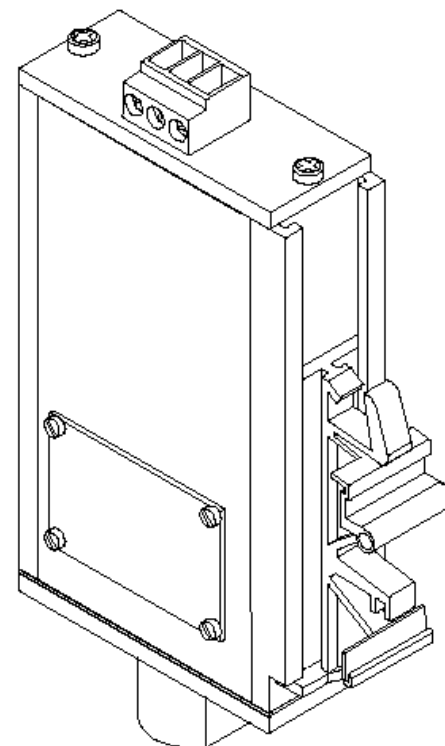


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## INSTRUMENT MANUAL TYPE 68 P/I CONVERTERS



OUR REF: YM00200 (01/07)  
Controlled Doc. 2007-063

## IMPORTANT – SAFETY

Please read these instructions carefully BEFORE this instrument is installed, used or maintained.

To confirm with the Health and Safety at Work Act 1974 our products should be installed, used and maintained in accordance with:

1. Normal safety procedures
2. The installation and operating instructions provided for each instrument.
3. BS6739 for general applications
4. BS5345 for hazardous area applications.

If for any reason local conditions dictate non-compliance with the above, we should be consulted.

These converters are intended for use in industrial compressed air systems only. Ensure that adequate pressure relief provision is installed if application of system supply pressure could cause downstream equipment to malfunction. Installation should be in accordance with local and national compressed air and instrumentation codes. Products certified for use as intrinsically safe or Type 'N' installation, MUST:

- a) Be installed in accordance with local and national codes for hazardous area installations.
- b) Only be used in situations which comply with the certification conditions stated in this handbook.
- c) Only be maintained by qualified personnel with adequate training on hazardous area instrumentation.

Before using these products with fluids other than air, for non-industrial applications, or for life-support systems consult Norgren.

## LIMITED WARRANTY, DISCLAIMER & LIMITATION OF REMEDIES

Items sold by Norgren are warranted to be free from defects in materials and workmanship for a period of two years from the date of manufacture, provided said items are used according to Norgren's recommended usages. Norgren's liability is limited to the repair of, refund of purchase price paid for, or replacement in kind of, at Norgren's sole option, any items proved defective, provided the allegedly defective items are returned to Norgren prepaid. The warranties expressed above are in lieu of and exclusive of all other warranties.

There are no other warranties, expressed or implied, except as stated herein. There are no implied warranties of merchantability or fitness for a particular purpose, which are specifically disclaimed. NORGREN'S liability for breach of warranty as herein stated is the exclusive remedy, and in no event shall NORGREN be liable or responsible for incidental or consequential damages, even if the possibility of such incidental or consequential damages has been made known to NORGREN.

Norgren reserve the right to discontinue manufacture of any product or change product materials, design, or specifications without notice.

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**Our policy is one of continuous research and development. We therefore reserve the right to amend without notice the specifications given in this document. Customers are responsible for ensuring that the product is used only for the purpose of which it is intended. In case of doubt Norgren will be pleased to advise.**

Further details of this handbook can be found on our website [www.norgren.com/watsonsmith](http://www.norgren.com/watsonsmith)

These instruments convert pneumatic pressures into electrical current or voltage signals for use with electronic control systems, computers, microprocessors and data logging systems.

The Type 68 P/I instrument is a two-wire pressure/current converter and requires only non-critical power supply for operation. It is available with screw terminal or DIN connection (weatherproof model) and is suitable for DIN rail or panel mounting

These use a two-wire loop installation as shown. In a current loop maximum value of the load resistance is determined by the power supply voltage, load current, converter characteristics and cable resistance. It can be calculated as follows :-

$$\begin{aligned} &\text{Maximum load resistance } R_{\text{max}} \\ &= \frac{\text{Supply voltage} - 9}{20} \text{ k}\Omega - \text{Cable resistance} \end{aligned}$$

for example, given supply voltage 24V, cable resistance 15Ω

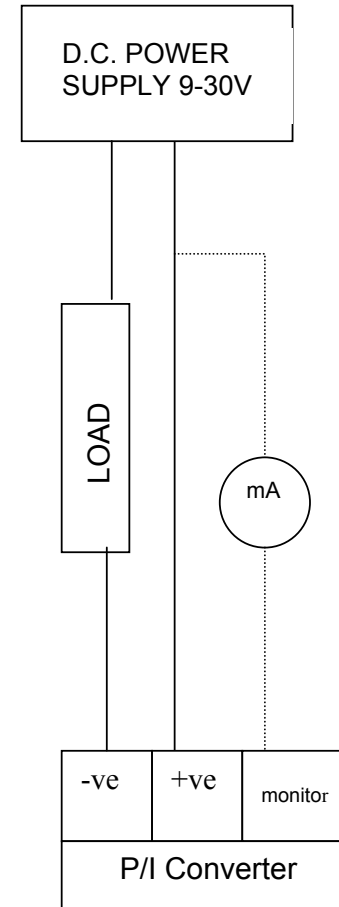
$$\begin{aligned} R_{\text{max}} &= \frac{24 - 9}{20} \times 1000 - 15\Omega \\ &= \mathbf{735\Omega} \end{aligned}$$

The converter will not operate correctly as its maximum current with a higher resistance. However any smaller value of resistance is acceptable down to zero resistance (short circuit load). The converter will not operate unless a load is connected.

The monitor terminal is principally for test purposes and need not be permanently connected. When local current monitoring is necessary for calibration, a milliammeter should be connected between terminals 2 (+ ve) and 3 (monitor). A milliammeter reading up to 20mA with a voltage drop of less than 0.25V should be used. It is important to check the voltage drop as some digital meters may be higher.

Alternatively, current may be monitored anywhere in the loop by a series milliammeter. In this instance the voltage drop may be higher, provided the maximum loop resistance is not exceeded.

**Typical installation**



## DESCRIPTION OF OPERATION

A silicon semi-conductor pressure transducer is used to convert the pressure input to a low level voltage signal which is amplified and modified by precision electronics to produce either a proportional load current or voltage output. Premium grade and stabilised electronic components are used throughout to give high reliability and long life stability. The choice between a voltage or current instrument depends upon system requirements. It also requires electrical energy for operation; this is provided by an external dc power supply.

The P/I converter is particularly suited to installations where long cable runs are involved. Installation is simple and up to a maximum value, performance is independent of cable length. Long cable lengths possess significant resistance which produces a voltage drop when current flows, but current is constant at all points in the circuit. So long as the combined cable resistance plus load resistance limit is not exceeded, and accurate current exists throughout the circuit. This technique does have the disadvantage though that since the converter derives its internal energy from the current flow, a zero current level is not possible and offset zero of 4mA must be used.

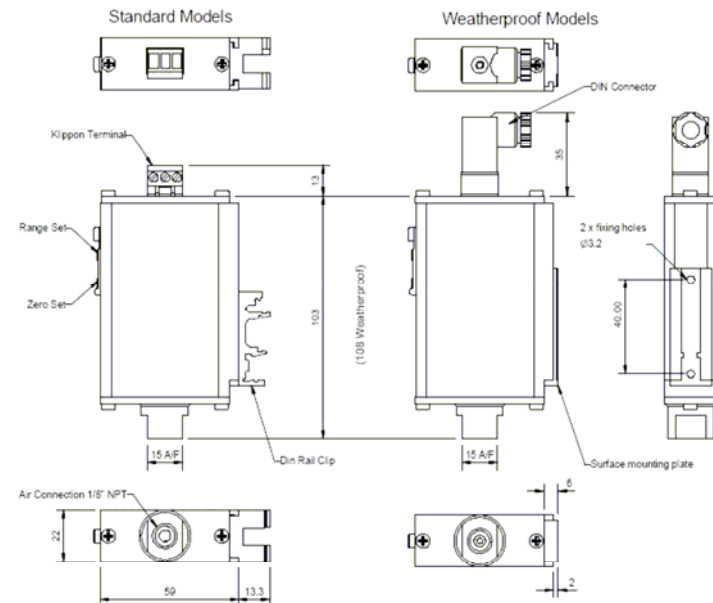
## INSTRUMENT MOUNTING

### Mechanical Installation (Fig 1)

Every instrument is supplied with a DIN rail clip and a surface mounting plate. The Din rail clip may be used with TS32 or TS35 standard rails.

For surface mounting slide the DIN rail clip out of its retaining channel on the rear of the body. The mounting plate should then be fixed at the desired location and the instrument attached by simply sliding it down onto the mounting plate. Although instruments will operate in any attitude, upright mounting is strongly recommended (pressure inlet at bottom). This eliminates any problems which may arise if condensates should collect in the transducer body.

Instruments may also be mounted directly onto pipelines. Use a spanner only on the flats provided (15mm A/F) to avoid straining the instruments body.



## INSTRUMENT MOUNTING

### Pneumatic Installation

Connect the supply pressure to the inlet connection ( $\frac{1}{8}$ " NPT) using an approved thread sealant. When making this connection hold the instrument with a spanner on the flats provided and avoid the application of undue force.

The maximum inlet pressure which may be applied, should not exceed twice the working pressure (see the instrument label). Higher pressures may irreversibly damage the transducer, even if applied momentarily. In no circumstances should the input pressure exceed 200 psig, 14 bar.

Type 68 Converters are been designed for used with clean, dry non-corrosive air or gasses.

Continued exposure to condensed moisture will ultimately damage the transducer if the elastomeric silicone seal is penetrated; occasional exposure to water or water vapour is acceptable. If in doubt fit a suitable air filter. Suitable types can be recommended.

## INSTRUMENT MOUNTING

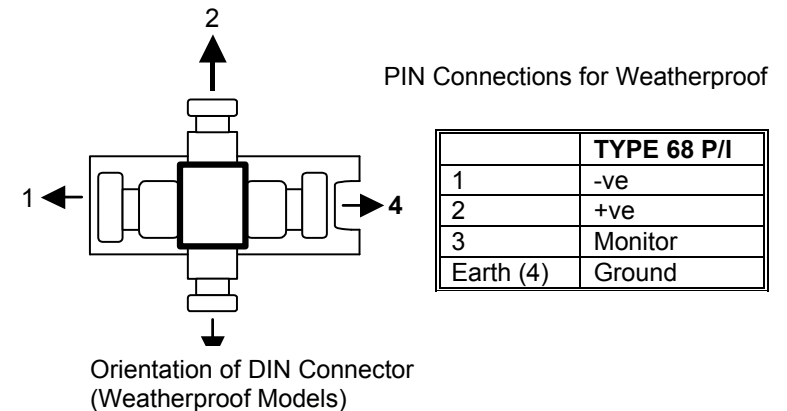
### Electrical Connections

A dc power supply is required and a power source having a nominal 24V dc output will often be used. It will normally be acceptable to power several converters from a single power source provided the total current does not exceed the power supply rating. Ensure that all instruments are correctly connected. Internal circuit protection is provided, but voltages in excess of 30V may permanently destroy some electronic components.

All instruments are fully isolated from ground and tested to 500V insulation resistance.

**Screw terminal** : The terminal block is a two part quick release type to facilitate installation and replacement. It will accept cables up to 2.5mm<sup>2</sup>.

**DIN connector**: This may be fixed in one of four positions by removing the central fixing screw, pushing out the centre piece, making the connection and replacing the body at the desired orientation. A waterproof gland is fitted suitable for cables up to 6mm dia. With conductors of 0.75mm<sup>2</sup>. A protective ground can also be used with this connector



## CALIBRATION

Instruments are pre-set to give 4.00mA and 20.00mA  $\pm$  0.25% at the specified pressure limits as shown on the calibration certificate. If an adjustments is required proceed as follows :

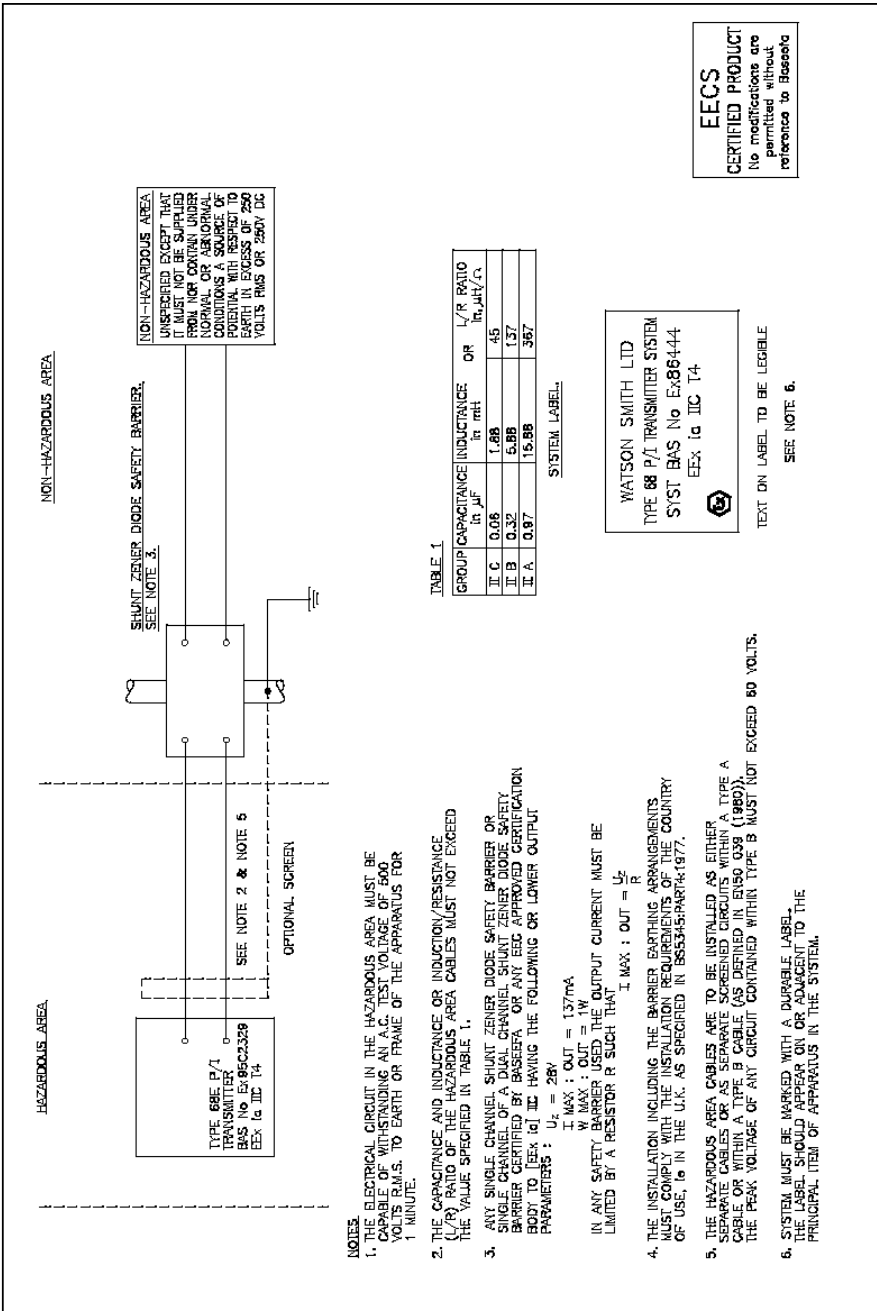
1. Connect a precision pressure supply, e.g. air operated dead weight tester, to the instrument and set to the low pressure limit.
2. Connect a milliammeter to the instrument (refer to section 3.1)
3. Remove the cover for the range and zero trimpots and adjust the zero to give 4.00mA.
4. Set the pressure source to the instruments high pressure level and adjust the range trimpot to give 20.00 mA.
5. Repeat zero and range adjustments until no further adjustment is needed. Ensure cover is replaced over range and zero trimpots

### After Sales Service

We recommend that the repair and recalibration of Type 68 P/I converter should only be carried out by skilled instrument technicians.

## TROUBLESHOOTING GUIDE

SYMPTON	PROBLEM CAUSE	ACTION
No output	Power supply defective	Check supply and rectify
	Open circuit	Check system circuit and rectify
	Polarity	Check connections and rectify
4mA fixed output	No pressure	Check pipework
Maximum output signal too low	Low power supply voltage	Check supply voltage
	Load resistance or cable resistance too high	Check resistance values
Signal output fluctuates	Loose air connections	Check pipework application
	Air supply varying	Check supply source
	Poor electrical connections	Check connections and rectify
	Unstable power supply	Check with oscilloscope
Incorrect calibration	Calibration error	Recalibrate
	Range Incorrect	Check instrument label
Long Term Drift	Moisture in transducer	Check air supply and filter if necessary, before replacing instrument



NON-HAZARDOUS AREA  
UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL HAZARD TO LIFE OR LIMB PLUS OR 250V DC

NON-HAZARDOUS AREA

SHUNT ZENER DIODE SAFETY BARRIER  
SEE NOTE 3.

TYPE 68 P/I TRANSMITTER  
BAS No. Ex 86C2329  
EX ia IIC T4

SEE NOTE 2 & NOTE 5

OPTIONAL SCREEN

TABLE 1

GROUP	CAPACITANCE in $\mu$ F	INDUCTANCE in mH	OR	L/R RATIO in $\mu$ HV/c
II C	0.06	1.68		45
II B	0.32	5.88		137
II A	0.97	15.88		367

SYSTEM LABEL

WATSON SMITH LTD  
TYPE 68 P/I TRANSMITTER SYSTEM  
SYST. BAS No. Ex 86444  
EX ia IIC T4



TEXT ON LABEL TO BE LEGIBLE  
SEE NOTE 6.

EECS  
CERTIFIED PRODUCT  
No modifications are permitted without reference to Basecode

NOTES

1. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING AN A.C. TEST VOLTAGE OF 500 VOLTS R.M.S. TO EARTH OR FRAME OF THE APPARATUS FOR 1 MINUTE.
2. THE CAPACITANCE AND INDUCTANCE OR INDUCTION/PRESISTANCE (L/R) RATIO OF THE HAZARDOUS AREA CABLES MUST NOT EXCEED THE VALUE SPECIFIED IN TABLE 1.
3. ANY SINGLE CHANNEL SHUNT ZENER DIODE SAFETY BARRIER OR SAFETY BARRIER CERTIFIED BY BSI OR AN EEC APPROVED CERTIFICATION BODY TO EXE ia IIC HAVING THE FOLLOWING OR LOWER OUTPUT PARAMETERS:  $U_z = 28V$   
 $I_{MAX} : OUT = 137mA$   
 $I_{MAX} : IN = 10mA$   
IN ANY SAFETY BARRIER USED THE OUTPUT CURRENT MUST BE LIMITED BY A RESISTOR R SUCH THAT  $I_{MAX} : OUT = \frac{U_z}{R}$
4. THE INSTALLATION INCLUDING THE BARRIER EARTHING ARRANGEMENTS MUST COMPLY WITH THE INSTALLATION REQUIREMENTS OF THE COUNTRY OF USE, ie IN THE U.K. AS SPECIFIED IN BS5345PART1:1977.
5. THE HAZARDOUS AREA CABLES ARE TO BE INSTALLED AS EITHER A SEPARATE CABLE OR AS SEPARATE SCREENED CIRCUITS WITHIN A TYPE A CABLE OR WITHIN A TYPE B CABLE (AS DEFINED IN EN50 038 (1980)). THE PEAK VOLTAGE OF ANY CIRCUIT CONTAINED WITHIN TYPE B MUST NOT EXCEED 50 VOLTS.
6. SYSTEM MUST BE MARKED WITH A DURABLE LABEL. THE LABEL SHOULD APPEAR ON OR ADJACENT TO THE PRINCIPAL ITEM OF APPARATUS IN THE SYSTEM.

EC DIRECTIVE 89/336/EEC (EMC)  
DECLARATION OF CONFORMITY

Watson Smith declares under our sole responsibility that the product listed below (and its derivatives listed in the report EMC 06801)

Product: Type 68 P/I Transmitter  
Manufactured by: Watson Smith Instrumentation  
IMI Norgren Ltd.  
Cross Chancellor Street.  
Leeds, LS6 2RT  
England

Conforms with the protection requirements of Council Directive 89/336/EEC (amendments 82/31/EEC and 83/68/EEC) on the approximation of the laws of the Member State relating to electromagnetic compatibility SI 2372 : 1992 (amendment SI 3080 : 1994).

Representative samples of the Type 68 P/I Transmitter have been tested and evaluated (Report EMC 06801) in accordance with:

- BS EN 50081-2 : 1994 Electromagnetic Compatibility  
Generic Emission Standard  
Part 2: Industrial Environment
- BS EN 50082-2 : 1995 Electromagnetic Compatibility  
Generic Immunity Standard  
Part 2: Industrial Environment

to demonstrate compliance with Council Directive 89/336/EEC (amendments 92/31/EEC and 93/68/EEC).

Signed: P. W. Hartley Date: 4/05/05  
Name: P. Hartley  
Position: Managing Director

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