Druck DPI 260 Series
Digital Pressure Indicator
User Manual
K048

Contents

Safety

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. The user must not use this equipment for any other purpose than that stated. Do not apply values greater than the maximum value stated.

This manual contains operating and safety instructions which must be followed to ensure the safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage. Use qualified* personnel and good engineering practice for all procedures in this manual.

*A qualified person must have attended a product training course given by the manufacturer or appointed agent and successfully completed the training course on this equipment.

Symbols and markings

CE This product meets the essential protection requirements of the relevant EEC directives. Further details of applied standards may be found in the product specification.

This symbol, on the instrument, indicates that the user should refer to the user manual.

The following abbreviations are used in this manual.

Note:
Abbreviations are the same in the singular and the plural.

ac	alternating current
BCD	binary coded decimal
°C	degrees Celsius
dc	direct current
DIN	Deutsche Industrie Norm
EOC	end of conversion
FS	full-scale
FSD	full-scale deflection
HBC	high breaking current
Hz	Hertz
LK	link
mA	milli Ampere
max	maximum
min	minimum/minute
mm	millimetre
MΩ	mega Ohm
MSB	most significant bit
mV	millivolt
-ve	negative
Ω	Ohm
PCB	printed circuit board
+ve	positive
rms	root mean square
RV	potentiometer (variable resistor)
sec	second
SW	switch
TTL	transistor/transistor logic
V	Volt
VA	Volt Ampere

1 Introduction

The Druck DPI 260 Series of instruments are general-purpose pressure indicators that measure and display pressure in specific pressure units with accuracies of ±0.1% FS or ±0.04% FS. The pressure sensor can be an internally or externally fitted transducer or an externally fitted transmitter.

Internal switches allow for 10 to 200 mV FSD input, zero adjustment of ±19999 and decimal point selection.

The transducer excitation voltage of either -5 V or -10 V can be selected by links on the bridge supply circuit with a maximum load of 350 Ω. The transmitter supply is also selected by links to an unregulated +20 Volts (17.5 to 30 Volts) with a maximum current of 20 mA. Linearization for square law is incorporated via the supply. An over-range warning can be set to any pressure.

A range of plug-in, retrofit digital and analogue output options are available. The power supply can be 120 or 240 V a.c. (selected by link) or an option of 28 V d.c. or 12 V d.c.

2 Specification

Electrical safety

..... meets EN61010-1 as applicable

Power supply

..... 110 or 240 V
..... 50 to 400 Hz
..... 3 VA (maximum)

Electromagnetic compatibility

..... meets EN50081-1 (emissions)

..... meets EN50082-1 (immunity)

Operating temperature range ..... °0 to 50°C

Combined non-linearity, hysteresis and repeatability

DPI 260 ±0.1% F.S., ±0.5% TEB ..... (to 60 bar)
DPI 261 ±0.04% F.S., ±0.005%/°C/TC ..... (to 35 bar)
DPI 262 ±0.1% F.S. ..... (to 700 bar)
See data sheet for full details

3 Installation

3.1 Panel Cutout

To fit the unit in a panel requires a mounted DIN standard 92 x 45 mm cut-out. Locate the instrument in the panel and secure with the case fixings from the front panel screws.

3.2 Power Supply

WARNING

Voltages in excess of 30 V (RMS) a.c. or 50 V d.c. can, in certain circumstances, be lethal. Care must be taken when working on live, exposed conductors.

CAUTION:

Identify the operating Voltage before connecting the instrument.

AC powered instruments have black 3-core cables that must be connected:

Brown	-	Live
Blue	-	Neutral
Green/Yellow	-	Earth

WARNING

Disconnect the power supply before removing the instrument covers, live Voltages are present.

An internal link selects a nominal 120 or 240 V a.c. the operating limits are:

200-260 V a.c. 50-400Hz (Link P6/P7)

100-130 V a.c. 50-400Hz (Link P4/P7,P5/P6)

Electrical safety

To comply with electrical safety standards, the label showing the operating Voltage **MUST** be changed when the Voltage setting is changed.

An internal 500 mA 20 mm fuse is fitted in the live circuit.

3.3 DC Power Option

DC powered instruments have white 2-core cables that must be connected:

Brown	-	+12V or +28V
Blue	-	0V

The operating limits are:

10 - 14V d.c. at 300 mA (G option)
20 - 32V d.c. at 150 mA (H option)

An internal 500 mA 20 mm fuse is fitted in the positive circuit.

Fuse replacement

Only replace the internal fuse (a.c. or d.c.) with a ceramic HBC, F type fuse.

3.4 Electrical Connection

For DPI 260/261 external transducers are connected to a 6-pole connector (Figure 1).

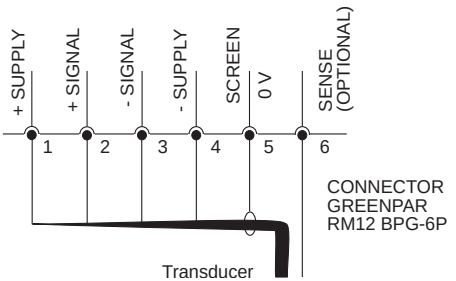

Figure 1 External Connections (DPI 260, 261)

The DPI 262 transmitter circuit terminates at a 6-pole connector (Figure 2).

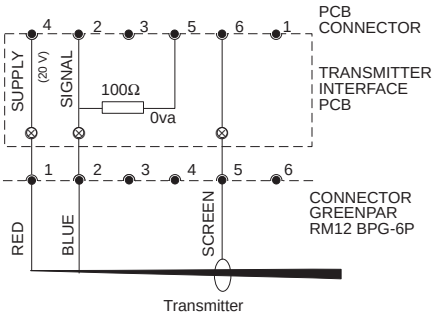

Figure 2 External Transmitter Connections (DPI 262)

3.5 Pressure Connection

- For gauge and absolute transducers a single pressure port is marked "+".

  Various fittings are available,
  (see data sheet).

- For differential transducers the additional port is marked “-”. The maximum line pressure of 2 bar must not be exceeded.

3.6 Cleaning

- Clean the instrument case with a damp cloth and mild detergent.

4 Operation

The display shows the pressure applied to the sensor (transducer or transmitter) in the units of pressure measurement shown on the front panel. The zero pressure setting can adjusted to increase or decrease the reading. If the pressure reading exceeds the preset maximum value (setting from 1999 to 19999) the display shows a flashing 0000.

5 Calibration

Routine calibration adjustments should be made at periods of 6 months, this period may be changed depending on the frequency of use. Use an accurate pressure standard to apply pressure and, if necessary, adjust the instrument. Allow a warm-up time of approximately 1 hour.

5.1 Zero

The zero adjustment is made using the 20-turn potentiometer accessed through the front panel. For gauge instruments make sure no pressure is applied. For absolute instruments, apply a vacuum to the transducer before adjustment. To prevent unauthorised adjustments fit a sealing label over the potentiometer access on the front panel.

5.2 Span

The span adjustment for the full-scale pressure value is made using the 20-turn span potentiometer accessed through the front panel. Connect the pressure standard to the instrument and adjust to the full-scale value. To prevent unauthorised adjustments fit a sealing label over the potentiometer access on the front panel.

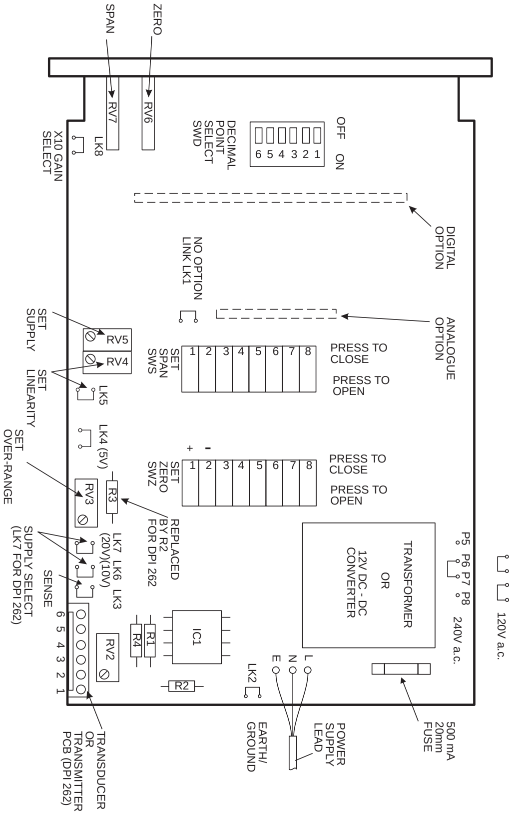

Figure 3 Internal Layout

6 **Setting-up** (Figure 3)

The DPI 260 Series of instruments can be configured for other applications including zero and span settings.

6.1 Coarse Zero Adjustment

If a zero display is required for applied pressure other than zero pressure an offset of ±19999 can be selected by using the set zero switches SWZ on the PCB. Apply the required pressure for zero and when stable select open all the SWZ switches. If the pressure reading is positive close switch 1, if negative close switch 2. Close, in turn, switches 3 to 8 open the switch if the reading overshoots zero. Using the zero calibration procedure adjust the reading to read exactly zero.

The suppression of 4mA in the DPI 262 instrument is achieved by this method by closing switches 1 to 7. Using the zero calibration procedure, adjust the reading to exactly zero.

6.2 Coarse Span Adjustment

The instrument can be set to read a "full-scale" reading value up to 19999 for a transducer input of the range 10 to 200mV. Set the zero adjustment first, then using the span set switches SWS set the required full-scale value. Close all the SWS switches and apply the required full-scale pressure.

If the reading is too high, remove link LK8. Open, in turn, the switches 1 to 8, close a switch again if the reading over-shoots the required reading. Using the routine span procedure, adjust the reading to the exact full-scale value.

6.3 Display Over-Range Setting

The over-range condition (flashing 0000) can be set to occur at any reading in the range 1999 to 19999. To avoid this setting conflicting with the span setting, turn potentiometer RV3 fully anti-clockwise (20 turns). Apply the required over-range pressure or temporarily close switches on SWZ. Adjust the potentiometer RV3 clockwise until the display flashes. Reduce the pressure or reset the switches on SWZ.

6.4 Linearity

RV4 controls feedback between the amplified transducer signal and the bridge excitation supply and affects the correction for square law non-linearity. Removing LK5 stops linearization feedback.

The following procedure only applies to transducers where zero pressure equates to zero nominal output from the transducer.

Note: For other applications refer to Druck.

- Remove LK5, carry out a zero and span calibration.
- Apply half-scale pressure and note the error.
- Apply full-scale pressure and insert LK5.
- Adjust potentiometer RV4 until the reading equals full-scale plus 4 times the error

  (e.g., if the midpoint is 3 counts low then adjust the reading to [full-scale - 12 counts]).

6.5 Decimal Point Selection

SWD is used to select the position of the displayed decimal point

6.6 Bridge Supply

The supply is nominally -10V at zero pressure or -5V if LK4 is inserted. Potentiometer RV5 adjusts the voltage ±5%. In the DPI 262 instrument LK6 is removed and LK7 inserted, this changes the supply to an unregulated +20V (17.5 to 30V) for loop power.

6.7 DPI 262 Pre-amplifier

IC1 and the matched resistors R1, R2, R3 and R4 provide a high-accuracy, differential pre-amplifier with a gain of 50 for transducers. Resistor R3 is replaced by R2 creating a single-ended, unity gain amplifier. A small plug-in PCB in the transducer connector contains a 100Ω sense resistor which is connected between SIGNAL+ and 0V. This provides a signal of 0.4 to 2V for 4 to 20mA. The 0.4V is adjusted by SWZ (see coarse zero adjustment) the span is adjusted by SWS (see coarse span adjustment).

6.8 Remote Power Supply Sense

By removing LK3 the sensing circuit for the bridge supply can be remotely connected via the transducer external connector pin 6. The sense input impedance is 20kΩ.

7 OPTIONS

7.1 12V D.C. Power Supply (option G)

The a.c. power supply circuit is replaced by a DC to DC convertor that generates ±20V, the 12V supply is regulated providing a +5V supply. To identify the option a white supply cable is fitted.

7.2 28V D.C. Power Supply (option H)

The a.c. power supply circuit is replaced by a DC to DC convertor that generates ±28V, the 28V supply is regulated providing a +5V supply. To identify the option a white supply cable is fitted.

7.3 Analogue Output

This option is normally installed at manufacture but can be retro-fitted by Druck or by the user. A plug-in PCB assembly can be configured to produce, via a 25-way connector (Figures 4 and 6) one of the following:

7.4 Buffered Output (option C)

A unity gain buffer produces the instrument reading as a voltage with minimum errors (19999 = 2V).

7.5 Voltage Output (option D)

This amplifies the display voltage to an output voltage 10V max.

7.6 Current Output (option E and F)

The plug-in PCB can be configured so that Pin 13 and Pin 25 on the 25-way connector (Figure 4 or 6) sinks current (option E). The sink current depends on the output voltage established by the buffered or Voltage output options (maximum 16 mA or 80 mA respectively).

Pin 25 can be configured (option F) by links:

- LK6 - 0V for external loop supply.
- LK7 - 15V for power external loop.
- LK8 - unregulated +17 to +30V to power loop.

7.7 Output Offset

The output (voltage or current) can be offset by inserting links and a resistor. RV1 is used to fine adjust the offset. A positive offset is used to generate 4mA at zero pressure reading.

7.8 Multiplexed BCD Output (option B)

The data interface consists of:

- 4 information lines for the BCD data
- 4 address lines to indicate digit
- 1 clock line to indicate new data valid
- 1 signal ground reference

The instrument converts the input analogue signal to a digital format. The conversion cycle is continuously repeated, see Figure 5. All information lines are capable of driving one TTL load.

7.9 Control Input

The HOLD input stops further conversion cycles when connected to signal ground. Conversion starts when the HOLD state is at 5 Volts or is an open circuit. The ENABLE input allows output to take place. The instrument can be configured for the ENABLE input state to become active +5 Volts or at open circuit.

This allows up to ten instruments to transmit data over a shared data bus.

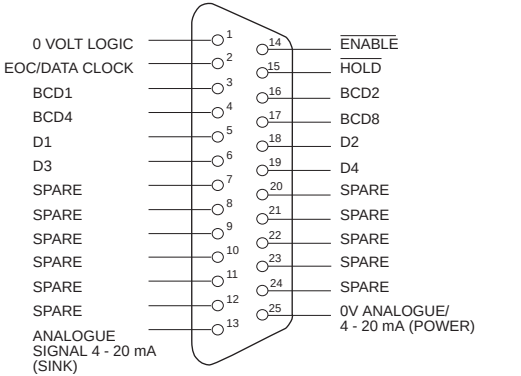

Figure 4 Multiplexed BCD 25-way Connector

7.10 Remote Displays (figure 5)

The digit lines can select the remote display digits and the BCD lines decoded to a seven-segment drive form. The Druck DPI 110 unit is supplied as a remote display.

7.11 Parallel BCD Output (option A)

The BCD information is available on 25-way “D” connector. The information is presented as:

- 4 decades of 4 bits (representing values 8,4,2,1 in positive logic).
- 1 bit for MSD (`1' indicates active MSD).
- 1 bit for POLARITY (`1' indicates negative value).
- 1 bit for OVER RANGE (`1' indicates input signal greater than 19999).

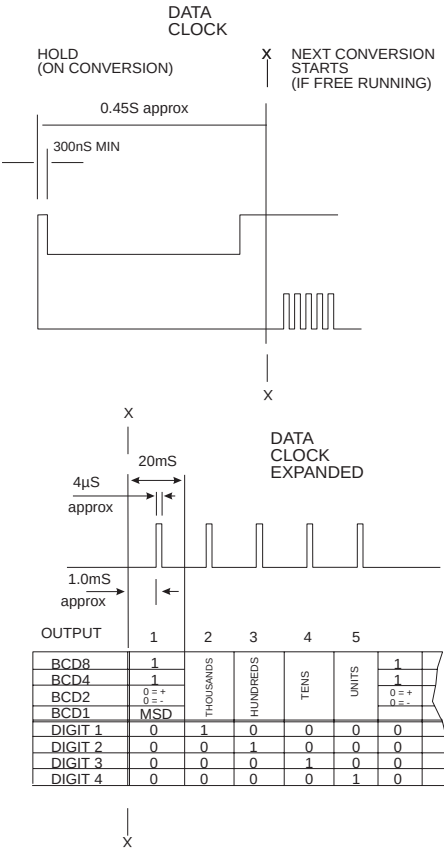

Figure 5 Multiplexed BCD Timing diagram

Each signal is capable of driving up to five TTL loads. The information conversion cycle is approximately 400 milliseconds with a short period, approximately 10 milliseconds at the end of each cycle, when the data output is updated. This update period is indicated by the DATA VALID signal `0'. The updated data is available when the DATA VALID signal returns to `1'.

7.12 Hold Input

The HOLD input stops further conversion cycles when connected to signal ground. Conversion starts when the HOLD state is at `1' or is an open circuit; the data flow is free running, see figure 7. The HOLD input (at `0') latches the data output, the display continues to update each measurement cycle. A short pulse (>300 nano second) starts an update indicated by a pulse of the DATA VALID output.

Note: A single trigger mode is not recommended.

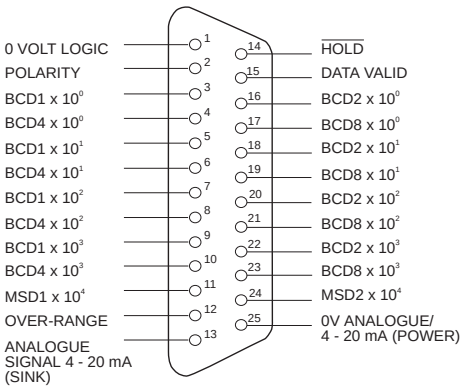

Figure 6 Parallel BCD 25-way Connector

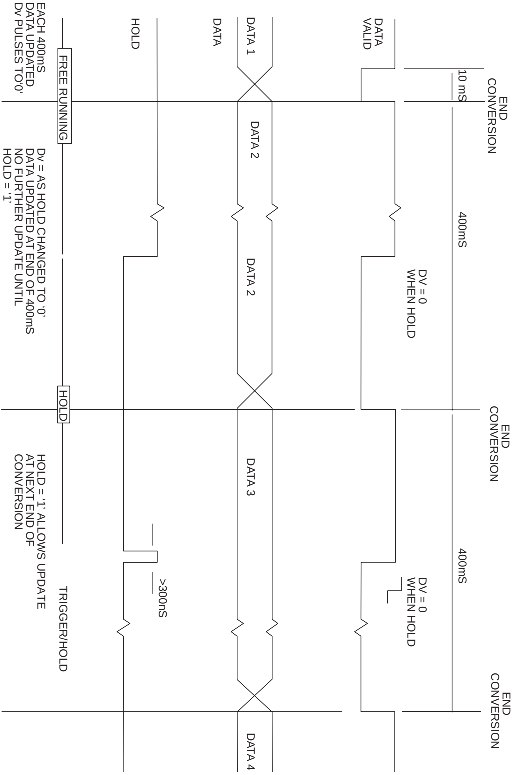

Fig 7 Parallel BCD Data Update Timing

8 FAULT FINDING

In the event of a malfunction instruments can be returned to the Druck Service Department or Druck agent for rectification.

The following fault finding procedures in Table 1 must be carried out by qualified* personnel using good engineering practise. Make sure power supply is disconnected from the instrument before accessing internal components.

* see the safety page (i)

Table 1 Fault Finding

FAULT	ACTION/CAUSE
No display	1. CHECK power supply switched on. 2. CHECK power supply fuse. 3. CHECK power cable. 4. CHECK internal 500mA fuse. 5. REPLACE power supply module. 6. REPLACE display PCB failure.
Flashing display	OVER-RANGE CONDITION 1. REDUCE applied pressure. 2. CHANGE over-range setting.
Unstable display	1. CHECK applied pressure. 2. CHECK stability of power supply. 3. CHECK for electromagnetic interference near the instrument and power supply. 4. CHECK cable on external sensors. 5. CALIBRATE instrument. 6. REPLACE pressure sensor.