# SGX
## SENSORTECH

**DX600**
**Circular Display and Calibration Board**
**for Infrared Gas Sensors**

## FEATURES

● Compatible with e2v technologies TX600 transmitter board and IR600 Series Infrared Gas Sensor Heads for Hazardous areas.

● Direct link to TX600 for display and calibration.

● Menu driven by calibration pushbuttons.

● Small size and low weight.

## INTRODUCTION

The DX600 circular display board provides a calibration facility for the TX600 Circular Transmitter Board and also provides a loop monitor display. The DX600 is mounted directly above the TX600 and is connected to it by a vertical 8-way double inter-PCB connector. The whole assembly may be installed in an explosion-proof enclosure. Refer also to the TX600 data sheet. Following these specifications, the full calibration procedure is explained.
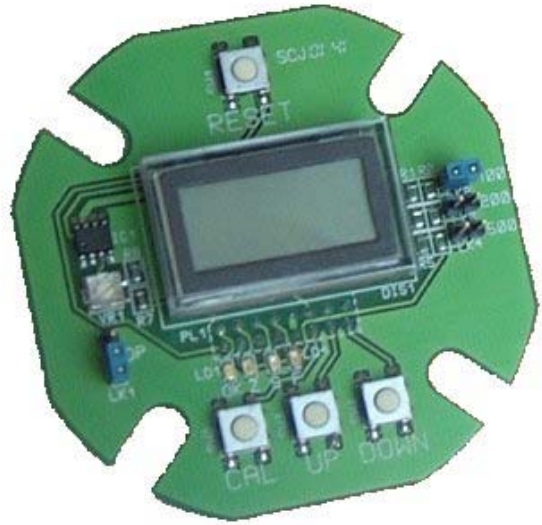
## GENERAL DATA

Dimensions:
| | |
|---|---|
| length . . . . . . . . . . . . . . | 70 mm |
| width . . . . . . . . . . . . . . | 70 mm |
| height . . . . . . . . . . . . . . | 22 mm |
| location slots . . . . . . . . . . | 11.5 x 6 mm |
| Weight . . . . . . . . . . . . . . . . . . | 27 g |

Power input . . . . . . 5.0 $\pm$ 0.25 V at 1 mA nominal
Power consumption . . . . . . . . 5 mW nominal
Signal input (link selectable) . . . 0.4 to 2.0 V loop monitor
0.4 to 2.0 V system monitor
Display type . . . . . . . . . . . . . 3.5 digit LCD
Display ranges (link selectable) . . . . . . . . 0 to 100
0 to 200
0 to 500
Decimal point . . . . . . . . . link selectable DP2
Resolution . . . . . . . . . least significant digit

Indicators:
green flashing . . . . . . . . . . . . . OK
yellow . . . . . . . . . . . . . . . . . zero
yellow . . . . . . . . . . . . . . . . . span
red . . . . . . . . . . . . . . . . . . fault
Switches . . . . . . . . . . . . . . 4 x SPNO
for calibrate, up, down and system reset
Minimum underrange level . . 2.5 mA ($-$9.375% full scale)
Maximum overrange level . . 21.31 mA (108% full scale)
Fault indication . . . . . . . . . . . red fault LED
display reads $-$12.5% full scale
Adjustment . . . . . . 4 mA back-off to zero display
span fine adjust on display
Temperature drift . . . . . . $\pm$0.2 counts/°C nominal
Temperature range:
operating . . . . . . . . . . . $-$10 to $+$50 °C
storage . . . . . . . . . . . . $-$20 to $+$60 °C
Humidity . . . . . . . 15 to 95% RH, non-condensing
Connection . . . . . . . . . . 8 x 2-way DIL socket

## DISPLAY BOARD LAYOUT (Dimensions in millimetres)
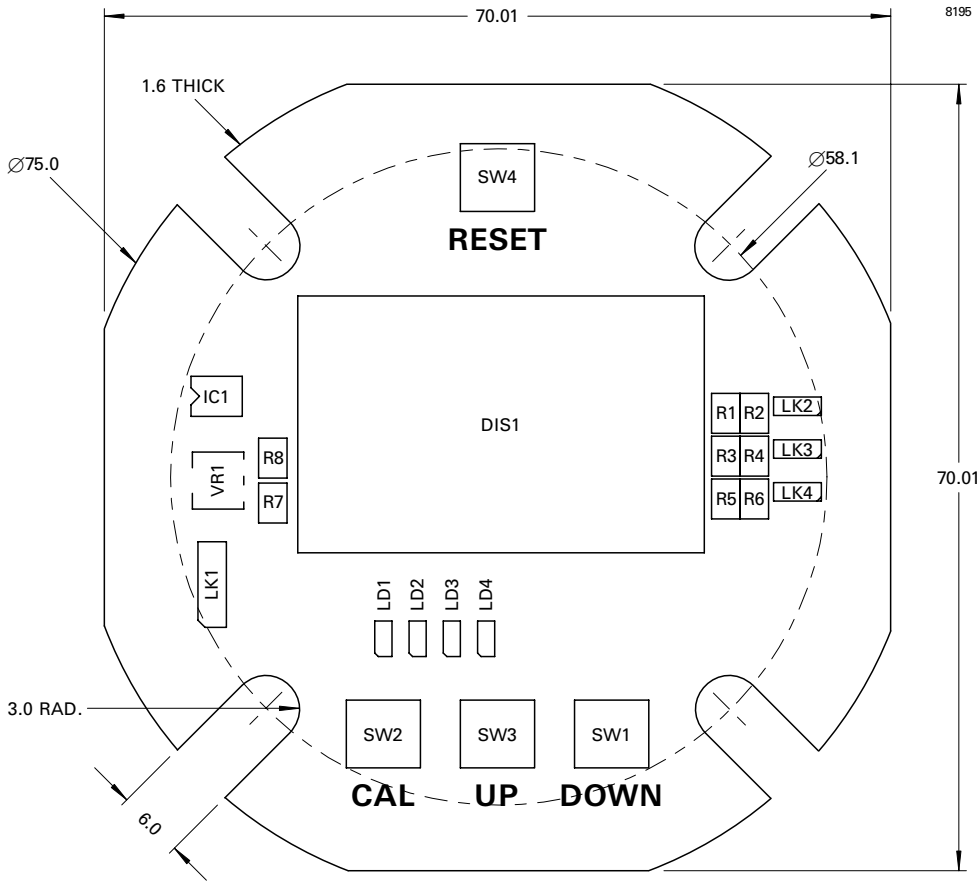


## DX600 OVERVIEW

Calibration is performed using the DX600 and is menu driven and performed by the 3 calibration switches:

CAL    steps through the calibration menu in the order zero, span and sensitivity (SW2).

UP    allows positive adjustment of the displayed value (SW3).

DOWN    allows negative adjustment of the displayed value (SW1).

The menu is entered by pressing the CAL button, the value adjusted by pressing the UP and DOWN buttons and the resulting calibration constants are stored when the CAL button is pressed again to step through the menu. Temperature compensation is automatic and the temperature is measured inside the associated IR600 series head. The sensitivity adjust is used to provide a variable full-scale range, if the default range is not appropriate.

The display/calibration board also contains the following:

● An LCD display to show the output (DIS1).

● A RESET pushbutton, used to clear any fault indications and reset the CPU for a full restart (SW4).

● A decimal point link to show or remove the decimal on the displayed output (LK1).

● A series of 3 links (of which only one is selected), to set the full-scale output value to either 100, 2000 or 500 (LK2, LK3 and LK4).

● Four status LEDs (LD1, LD2, LD3 and LD4)

● A potentiometer for zeroing the display board (VR1).

● An 8 x 2-way connector for attachment to the transmitter board (PL1).

Changing the settings on the sensor select switches forces a reset and erases any existing calibration data. If the RESET button is pressed during the set span or set sensitivity sequence, then the calibration data is erased. Whenever the calibration data is invalid or erased, the transmitter forces a calibration sequence by automatically entering the set zero sequence after a reset or power up.

## LED INDICATOR DESCRIPTION

The green LED indicator, labelled OK, indicates the system condition as follows:

| Green LED | Cause |
|---|---|
| OFF | Non-recoverable fault, system not functioning. |
| FLASHING @ 2 Hz | Initial startup and self-checking in progress. |
| FLASHING @ 4 Hz | Normal functioning. |
| ON | Fault designator when illuminated along with the red F LED (see below). |

The yellow Z LED indicator illuminates when in the set zero mode. It is also used as a fault designator if the red F indicator is also illuminated (see below).

The yellow S LED indicator illuminates when in the set span mode. It is also used as a fault designator if the red F indicator is also illuminated (see below).

The Red F indicator is used as the fault indicator with guidance as to the source of the fault being indicated by the other LEDs as follows:

| Green OK LED | Yellow Z LED | Yellow S LED | Red F LED | Fault diagnostic |
|---|---|---|---|---|
| OFF | OFF | OFF | ON | Input power voltage fault. |
| ON | OFF | OFF | ON | System 4 – 20 mA monitor fault. |
| OFF | ON | OFF | ON | Source current fault. |
| ON | ON | OFF | ON | Maths fault (or underrange fault). |
| OFF | OFF | ON | ON | Spare fault designator. |
| ON | OFF | ON | ON | Spare fault designator. |
| OFF | ON | ON | ON | A/D, RAM, ROM fault. |
| ON | ON | ON | ON | EEPROM fault. |

## CALIBRATION

The TX600 transmitter board is calibrated to provide a linear 4 – 20 mA output for an IR600 Series sensor seeing gas concentrations from zero to full span. **A TX600 transmitter board and IR600 Series sensor are normally supplied as a pair and are calibrated for the default full span gas concentration of the sensor.** Should a different calibration be required, then re-calibration may be performed using a DX600 display board and a supply of calibration gas.

To re-calibrate, perform the following operations:

i) Set up the TX600 transmitter board and sensor:
   a) Connect a 100 W load resistor across the current output (I+) and 0 V terminals of connector PL1.
   b) Connect the power supply leads to the power input (V+) and 0 V terminals of PL1.
   c) Plug the IR600 connector into header PL3.
   d) Plug the DX600 display board into socket PL2.
   e) Apply nitrogen to the sensor at 1 litre per minute (e.g. using a Quick Calibration Hood, e2v product number DPP546618DA).
   f) Preset the power input to 24 V (with a current limit of 250 mA) then switch the power on.

ii) Perform the Zero Calibration Test:
   a) Ensure the green OK LED is flashing, then press the CAL button. The yellow Z LED will illuminate; this indicates that the sensor is in set zero mode. Press the UP and DOWN buttons on the DX600 Display board as required to make the reading show "000". When this reading is stable, press the CAL button on the DX600 board. This stores the sensor zero in the TX600 memory. Check that the yellow Z LED is extinguished, the yellow S LED illuminates and the green OK LED remains flashing.

iii) Perform the Span Calibration Test:
   a) Apply the calibration gas to the IR600 sensor head at a flow rate of 1 litre per minute.
   b) Press the UP and DOWN buttons on the DX600 board as required to make the display show the percentage of the appropriate full scale value, dependent upon the IR600

sensor type, set by the sensor select switches SW1 on the TX600 Transmitter Board (see A1A-TX600 data sheet). Once the reading is stable, press the CAL button on the DX600 board. This stores the span value in the TX600 memory. Check that both the yellow Z LED and the yellow S LED illuminate and that the green OK LED remains flashing.

iv) Set the sensitivity of the sensor:
   As a default, the TX600 is calibrated to read full scale on the DX600 display when the sensor sees full concentration span gas. However, the TX600 may be set up to read full scale for a lesser concentration:
   a) Perform calibration for zero to full span gas concentration (as per ii and iii above). Both yellow LEDs should be lit and the green OK LED should be flashing at the end of this procedure.
   b) Apply the required full scale gas concentration to the sensor at a flow rate of 1 litre per minute and wait for the reading to become stable.
   c) Press the UP and DOWN buttons on the DX600 board as required to make the display show full scale. When the reading is stable, press the CAL button on the DX600 display board to store the sensitivity value in memory and exit the calibration cycle. Check that both the yellow LEDs extinguish and that only the green OK LED remains flashing.

**Example:** IR601 Series sensor with default calibration 0 – 2% vol. $CO_2$. To set up for 0 – 1% vol. $CO_2$:
a) Perform calibration for 0 – 2% vol $CO_2$ (as per ii and iii above).
b) Apply 1% vol. $CO_2$ and wait for the reading to remain constant at 50% full scale.
c) Adjust sensitivity to 100% full scale then press the CAL button to store the sensitivity value in memory and exit the calibration cycle.

Note that for the default calibration, the sensitivity value is the same as the full scale span value.

**Note:** The DX600 displays the output from the TX600 and is normally calibrated to display zero to full scale readings of 1.00, 2.00, 5.00, 100, 200 or 500 (see below) for TX600 outputs of 4 – 20 mA at terminal (I+) or 0.4 – 2.0 V at terminal (V+) when a 100 Ω resistor is placed across the (I+) and 0 V terminals. The full scale reading is set by the configuration of DX600 links LK1, LK2,LK3 and LK4 as follows:

| Full Scale Reading | LK1 | LK2 | LK3 | LK4 |
|---|---|---|---|---|
| 1.00 | Made | Made | Unmade | Unmade |
| 2.00 | Made | Unmade | Made | Unmade |
| 5.00 | Made | Unmade | Unmade | Made |
| 100 | Unmade | Made | Unmade | Unmade |
| 200 | Unmade | Unmade | Made | Unmade |
| 500 | Unmade | Unmade | Unmade | Made |

# HANDLING PRECAUTIONS

## Electrostatic Sensitive Devices

e2v technologies' infrared gas mini sensors and associated electronics contain electrostatic sensitive components. Anti-static handling precautions should be employed when handling these devices.

# ORDERING INFORMATION

IR600 Series Sensors, TX600 Transmitter Boards and DX600 Display Boards may be ordered as individual items or as combinations.

The thread code must be included with a sensor order, e.g. IR601/1 for a carbon dioxide sensor with metric 20 x 1.5 mm mounting thread.

TX600 Transmitter Boards should be calibrated to specific IR600 Series Sensors.

When an IR600 Series Sensor is ordered with a factory calibrated TX600 Transmitter Board, the combination is referred to as a TX600 Series assembly.

For example, a customer requiring a TX600 Transmitter Board calibrated with an IR601/1 sensor should order:

TX601/1 (i.e. IR601/1 + TX600 = TX601/1).