

Druck TRX-II and TRX-II IS Multi-function Calibrator

User manual - K319

[EN]	English	1 ... 50
[FR]	French	1 ... 50
[DE]	German	1 ... 52
[IT]	Italian	1 ... 50
[ES]	Spanish	1 ... 50
[PT]	Portuguese	1 ... 52

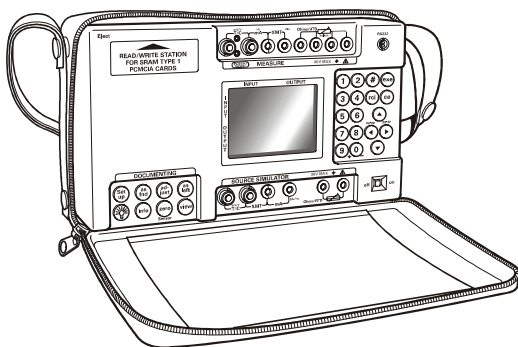


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IMPORTANT NOTE

Unless otherwise indicated in the text, the operating instructions contained in this publication apply to both the TRXII Multi-Calibrator instruments and the TRXII IS Multi-Calibrator instruments.

Only the intrinsically safe version of this Multi-Calibrator instrument (TRX II IS) may be used in hazardous areas and the following general warnings and conditions of use summarized below are applicable. Pages 36 to 38 provide supplementary information for the intrinsically safe variants

Before using TRXII IS, intrinsically safe versions of this Multi-Calibrator, read the following warnings and read and fully understand the special conditions of use detailed in the attached certificate of compliance. **IF UNSURE, CHECK BEFORE USE.**

WARNINGS

1. DO NOT exceed the maximum measurement ratings given on page 2 of the Certificate of Compliance.
2. DO NOT open the instrument case in a hazardous area.
3. Batteries must ONLY be fitted in a SAFE AREA.
4. If fitted with rechargeable batteries, the batteries must ONLY be charged in a safe area and only with the charger Type 13603 supplied for use with the Multi-Calibrator.
5. The RS232 communication circuit may only be used outside the hazardous area.
6. When the Multi-Calibrator, Type TRXII IS, is used as a source for intrinsically safe apparatus, that apparatus may not be connected to any other intrinsically safe circuit simultaneously. The parameters of the apparatus must comply with the output parameters of the Multi-Calibrator.
7. To prevent electrical shocks or damage to the instrument, do not connect more than 30 V between the terminals, or between the terminals and the ground (earth).

(1) **EC-TYPE EXAMINATION CERTIFICATE**

- (2) Equipment or protective system intended for use in potentially explosive atmospheres – Directive 94/9/EC
- (3) EC-Type Examination Certificate Number: **KEMA 03ATEX1037 X**
- (4) Equipment or protective system: **Multi-Calibrator Model TRX II IS**
- (5) Manufacturer: **GE Druck Limited**
- (6) Address: **Fir Tree Lane, Groby, Leicester LE6 0FH, United Kingdom**
- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report no. 2024986.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
- EN 50014 : 1997 EN 50020 : 2002 EN 50284 : 1999**
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment or protective system according to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
- (12) The marking of the equipment or protective system shall include the following:



II 2 (1) G EEx ia IIC T5

Arnhem, 24 June 2003
KEMA Quality B.V.

T. Pijker
Certification Manager

* This Certificate may only be reproduced in its entirety and without any change



(13)

SCHEDULE

(14)

to EC-Type Examination Certificate KEMA 03ATEX1037 X

(15) Description

The Portable Multi-Calibrator TRX II iS is a battery powered apparatus included in an antistatic plastic case with a membrane keyboard and an LCD display. It is intended to be used for testing and calibration of process instrumentation and portable test equipment. It can measure and source analogue and digital signals, used in an industrial environment, and simulate a wide variety of temperature sensors. The Multi-Calibrator is category II 2 G apparatus, the intrinsically safe input and output circuits may be connected to apparatus in a hazardous area, caused by the presence of air/gas mixtures, where the use of category II 1 G equipment is required.

Ambient temperature range -20 °C ... +40 °C.

Electrical data

Supply encapsulated rechargeable battery, assembly no. 208, rated 7,8 V dc, 1,2 Ah, may only be recharged outside the hazardous area; max. recharge current 75 mA; $U_m = 250$ V

Measurement inputs in type of explosion protection intrinsic safety EEx ia IIC, only for connection to a certified intrinsically safe circuit, with the following maximum values:

$$\begin{aligned} U_i &= 30 \text{ V} \\ I_i &= 215 \text{ mA} \\ P_i &= 0,75 \text{ W} \\ C_i &= 5 \text{ nF} \\ L_i &= 0 \text{ mH} \end{aligned}$$

Source outputs in type of explosion protection intrinsic safety EEx ia IIC with the following maximum values:

$$\begin{aligned} U_o &= 17,5 \text{ V} \\ I_o &= 75 \text{ mA} \\ P_o &= 0,32 \text{ W} \\ C_o &= 339 \text{ nF} \\ L_o &= 6,5 \text{ mH} \end{aligned}$$

Pressure sensor input in type of explosion protection intrinsic safety EEx ia IIC with following maximum values:

$$\begin{aligned} U_o &= 5,9 \text{ V} \\ I_o &= 8 \text{ mA} \\ P_o &= 12 \text{ mW} \\ C_o &= 3 \text{ } \mu\text{F} \\ L_o &= 3 \text{ mH} \end{aligned}$$

(16) Report

KEMA No. 2024986.

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(13)

SCHEDULE

(14)

to EC-Type Examination Certificate KEMA 03ATEX1037 X

(17) **Special conditions for safe use**

1. When the Multi-Calibrator Type TRX II iS is used as a source for intrinsically safe apparatus, that apparatus may not be connected to any other intrinsically safe circuit simultaneously. The parameters of the apparatus must comply with the output parameters of the Multi-Calibrator.
2. The battery may only be recharged outside the hazardous area, with the battery charger no. 13603, supplied with the Multi-Calibrator.
3. The RS 232 communication circuit may only be used outside the hazardous area.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

1. Certificate of Conformity CESI EX-99.E.035X, including the documents, mentioned therein.

dated

2. Drawing No. X-A3-0202

01.07.2003



GE Druck

EC Declaration of Conformity

Product: TRX-II IS MULTIFUNCTION CALIBRATOR

The above products meet the protection requirements of the relevant EC Directives.

Supplier: Druck Ltd, Fir Tree Lane, Groby, Leicester, LE6 0FH, England

Tel: +44 (0) 116 231 7100, Fax: +44 (0) 116 231 7101

Conformity support file: CS0078

Signed:

Date:

15/09/04

For and on behalf of Druck Limited

Name: H S Mankia MSc BEd BSc **Position:** Global Instruments Hardware Manager

Relevant European Directives	
Directive Name	Directives
Equipment and Protective Systems for Use in Potentially Explosive Atmospheres (ATEX)	94/9/EC *
Electromagnetic Compatibility	89/336/EEC as amended by 92/31/EEC and 93/68/EEC
Pressure Equipment Directive	97/23/EC (Category SEP)

*The ATEX directive only applies to instruments marked with the type examination certificate KEMA03ATEX1037X from KEMA Quality B.V.

Standards	
Standard Name	Standard
Special requirements for construction, test and marking of electrical apparatus of equipment group CE 0312 II 2 (1) G, EEx ia IIC T5	EN50284: 1999
Electrical apparatus for potentially explosive atmospheres - General requirements	EN50014: 1997
Electrical apparatus for potentially explosive atmospheres - Intrinsic safety "i"	EN50020: 2002
Safety requirements for electrical equipment for measurement, control and laboratory use.	BS EN 61010-1:2001
Electrical equipment for measurements, control and laboratory use - EMC requirements	BS EN 50081-1:1992 and BS EN 50082-1:1992

Special conditions:

- When the Multi-Calibrator type TRX-II IS is used as a source for intrinsically safe apparatus, that apparatus may not be connected to any other intrinsically safe circuit simultaneously. The parameters of the apparatus must comply with the output parameters of the Multi-Calibrator.
- The battery may only be recharged outside the hazardous area, with the battery charger no. 13603, supplied with the Multi-Calibrator.
- The RS232 communication circuit may only be used outside the hazardous area.

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INTRODUCTION

The TRX-II Calibrator

The Multi-Calibrator model TRX-II has been designed for testing and calibration of process instrumentation and portable test equipment. The unit provides data to comply with the ISO 9000 requirements for calibration. The TRX-II can be used to measure and source analogue and digital signals often used in an industrial environment. It can also be used to simulate a wide variety of temperature sensors. Measurement and source/simulation functions can be operated and read simultaneously.

Model TRX-II IS marked with label "Ex" has been built in accordance with European Norm II 2 (1) G EEx ia IIC T5 and may be used in IEC defined zones 0,1 and 2. for special precautions for use deviations to the standard unit see the chapter "SUPPLEMENT FOR INTRINSICALLY SAFE CALIBRATOR TRX-II iS".

Pressure Measurements and Calibrations

A range of pressure sensors is optionally available for pressure measurements and calibration.

Automatic Calibration

To automate calibration routines and to store calibration data the unit has been provided with a memory card slot. For the same purpose the unit has a RS232 cable connector to interface directly with a Personal Computer. To perform automatic calibration, in the field or in the workshop, the TRX-II is supported by a Druck Calibration Management software. The software package and Memory Cards are optionally available from your local Druck Sales Office or Distributor.

Standard Accessories

The standard TRX-II Calibrator is packed together with the following parts:

- Operating Manual
- Test leads (5x)
- Carrying Case
- Alkaline Batteries LR14 or C (4x)
- Spare fuses 400 mA (3x)
- Calibration certificate

Optional Accessories

- | | |
|---------------------------------|---------------|
| Line Adaptor/Charger 230 V | #13603/230 |
| Line Adaptor/Charger 115 V | #13603/115 |
| Line Charger 230 V | #13603/230 iS |
| Line Charger 115 V | #13603/115 iS |
| Pressure Sensors | |
| Calibration Management Software | |

FUNCTIONALITY

Parts Identification (1)

1. POWER switch

Switch the calibrator "ON" and "OFF".

2. EXT. POWER MEASURE

Connector for external power source.

Only suitable for optional line adaptor/charger #13603.

3.* Battery compartment cover

Release screws to get access to batteries.

4.* Battery selector switch 2

To select Alkaline or Rechargeable batteries.

IMPORTANT:

Switch position must comply with the installed battery type.

5.* Spare fuse 2

For replacement of a blown fuse.

6.* Fuse mA, Fuse holder

Protects the milliamps measurement circuit.

7. Fuse ohms, Fuse holder

Protects the ohms/RTD measurement circuit.

8. Source terminals for 4 mm plugs

Suitable for standard test leads.

9. Source terminals for wire leads and 4 mm plugs

Suitable for compensation wire leads and standard test leads.

10. Measure terminals for 4 mm plugs

Suitable for standard supplied test leads.

11. Measure terminals for wire leads and 4 mm plugs

Suitable for compensation wire leads and standard test leads.

12. RS232 Connector

To interface directly with Personal Computers.

[Use is optional with compatible software]

13.*Memory card slot *

(PCMCIA)

To interface indirectly with Personal Computers.

[Use is optional with compatible software]

14. Auxiliary Connectors

For use with pressure sensors.

[Do not make any other connections to these terminals]

15. Key-pad numeric

Contains numeric and operating keys.

16. Display

17. Key-pad documenting

Contains keys dedicated for data storage.

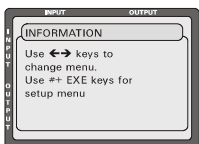
* Not Applicable for Model TRX-II IS

[contact your local agent for a list of compatible software]

Screens to work with

The TRX-II has four types of screen display to work with:

- **Menu Selection Screen (2)**
Offers selection of choices. Move cursor with arrow keys to your choice.
- **Set-up Screen (3)**
Move cursor with arrow keys to fill in the blanks.
- **Working Screen (4)**
Displays readings of measured and generated values. Source or simulated temperatures are set with the numerical key-pad or can be ramped up and down in different ways.
- **Help Screen**
Your guide, available in many operational situations. Press INFO to call a Help screen.



Note:

After switching the calibrator on, the display screen will be as shown (left)

- Battery type
- Battery voltage
- TRX-II Serial No
- EPROM versions installed
- DATE / TIME
- Days left to next calibration

Keys to work with (5)

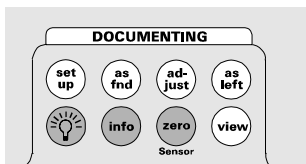
- **The EXE key**
Pressing this key will execute choices or source level adjustments.
- **The CE key**
Press to cancel your previous key operation or to correct a typing error.
- **The NUMERICAL key-pad**
Used to dial source levels or simulated temperatures. Also used to fill out levels and time settings for special functions.
- **The ARROW keys**
Moves the cursor position and ramps source levels up or down.
- **The # key**
Used in combination with other keys for special functions. Press # first and hold, while pressing the next key:
 # + **Numerical key 1-9**
Stores key-pad operations (Keystroking).
 # + **CE**
Returns directly to the Main Menu.


+ EXE

Opens set-up menu.

Opens signal converter set-up screen.

- **The RCL key + Numerical key 1-9**
Recalls stored key-pad operations (Keystroking). Press RCL first and hold, while pressing the next key.
- **The 0 key**
Changes the sign when display reads all zeros.



- **The zero key**
To reset the pressure sensor reading at zero. To reset counter/totalizer function to zero.
- **The info key**
Give additional information at various menus. Calls the Help screen.
- **The  key***
Press the light key to switch the back light ON or OFF.
** not applicable for Model TRX-II IS.*

The following functions are only available with Software option.

- **The Set-up key**
Used to access the recording set-up.
- **The As Fnd key**
To start As Found calibration procedure.
- **The Adjust key**
To start adjust procedure.
- **The As Left key**
To start As Left calibration procedure.
- **The View key**
To view recorded calibration results.

Functional Modes

- **Reading measure signals only**
Leave the cursor at NONE in the source menu and select the required measure function.
- **Reading source signals only**
Leave the cursor at NONE in the measure menu and select the required source function.
- **Simultaneous reading of measure and source signals**
Select required measure and source functions. Menu selections for both measure and source functions are made after each other. After finishing all the selections for one function, the menu prompts to proceed to the other function.

Keystroking

Keystroking is a solution to eliminate time consuming key-pad operations for frequently used functions. It can store 9 different sequences of key-pad operations. Recalling a sequence immediately returns to the function as stored. A sequence from any operational situation can be recalled.

- **Storing a key-pad operation sequence**

Perform all key-pad operations for the function required to "keystroke" up to working screen. Press # and hold while pressing the numerical key under which required to store the sequence. To store a new function under a "used" key, repeat above procedure to overwrite the old function.

- **Recalling a key-pad operation sequence**

Press RCL and hold, while pressing the appropriate numerical key. To clear all keystroke memories, press # and EXE to open the set-up menu.

Select SYSTEM and press EXE. Select CLEAR KEYSTROKE MEMORY and press EXE again. Press CE to leave the set-up menu.

POWER SOURCES

Power from internal batteries

Internal power is obtained from 4x 1.5 V Alkaline batteries or four 1.2V, rechargeable batteries, Model R14, Baby or C size.

Note: *Not applicable for Model TRX-II IS.*

Installation of the batteries

Switch the calibrator off before installing new batteries.

Note: *Not applicable for Model TRX-II IS.*

Release both mounting screws retaining the battery compartment cover. Remove the old batteries and check that the contact plates are clean. Place the new batteries in position observing polarity as indicated.

Use of Alkaline batteries (supplied as standard)

The calibrator is supplied with one set of 4 Alkaline batteries. Check that the Battery Selector Switch is in the "Alkaline" position before replacing the batteries. Battery switch position will be confirmed on the screen during start-up of the calibrator. Replace batteries when the screen shows the battery symbol.

IMPORTANT:

- Be sure that batteries are inserted so that they are placed correctly with respect to the (+) and (-) indications in the battery compartment. If the batteries are not inserted correctly, they may leak and damage the calibrator.
- Do not mix old and new batteries, or batteries of different types (such as carbon and alkaline.)
- If the calibrator is not to be used for a long period of time, take out the batteries.
- Remove and dispose of worn-out batteries.
- Never attempt to recharge or short-circuit the batteries.

Changing from Alkaline to Rechargeable batteries

Remove the Alkaline batteries. Slide the battery type switch to the "Ni-Cd" position.

Install 4 rechargeable batteries (purchased locally). Battery switch position will be confirmed on the screen during start-up of the calibrator. Recharge batteries when the screen shows the battery symbol.

WARNING:

Never place Alkaline or other non-rechargeable batteries after setting the switch position to "Ni-Cd".

Recharging batteries

Use the Line Adaptor/Charger #13603 only; other equipment may cause damage to the calibrator. Check the indicated Line Voltage and turn the charger switch on. Connect the appropriate Adaptor/Charger plugs to the line and to the calibrator.

As the adaptor and charger functions are fully independent from each other, the calibrator can be used while charging.

Recharging time from fully discharged to fully charged is 14 hours. You may charge for periods longer than 14 hours. Note that at lower ambient temperatures, the capacity of Ni-Cd batteries is significantly

lowered. If the batteries do not reach their normal capacity after a 14 hour charging period, cycle complete discharging and charging at least twice. If the batteries remain weak they should be replaced. No particular brand of Ni-Cd is recommended although cells rated at 2.0 Ah have preference over the more generally available 1.8 Ah cells.

Operating from 115 V or 230 V line voltage (50 or 60 Hz)

Use the Line Adaptor/Charger #13603 only. Other equipment may cause damage to the calibrator. Check the indicated line voltage. Connect the appropriate Line Adaptor/Charger plugs to the line and to the calibrator.

Note: *Not applicable for Model TRX-II iS.*

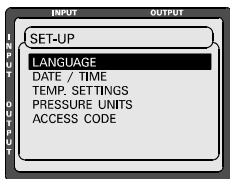
SET-UP

Language Setting

The TRX-II has multilingual software. The factory setting is ENGLISH.

Setting the Language

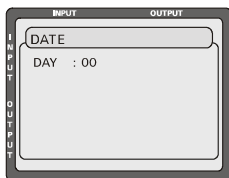
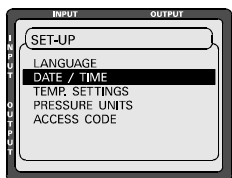
Leave the cursor at NONE at the measure and source menu and press # and EXE keys simultaneously to open the Set-up menu. Select LANGUAGE and press EXE. Select required language and press EXE. Press CE to leave the set-up menu.



Date and Time Settings

The TRX-II is equipped with a real time clock. At calibration, the clock is set to Central European Time.

- To record Date and Time on the memory card when using compatible software;
- To indicate how many days are left before last calibration expires.



Setting the clock to local date and time

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select DATE/TIME. Press EXE again. Select date and enter new date. Press EXE to accept new date. Repeat the above for time settings. Press CE to leave the set-up menu.

Temperature Setting

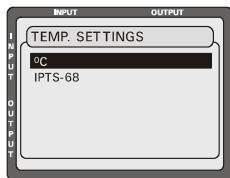
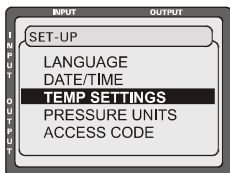
Temperature simulations and measurements can be shown in either degrees Celsius or degrees Fahrenheit. Factory setting is Celsius. Readings are based on either IPTS 68 or ITS 90 temperature scales. Factory setting is IPTS 68.

Changing the temperature units

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select temp. settings and press EXE. Select °C and press EXE to change from °C to °F or vice versa. Press CE to leave the set-up menu.

Changing the temperature scale

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select Temp. settings and press EXE. Select °C and press EXE to change from °C to °F or vice versa. Press CE to quit the set-up menu.



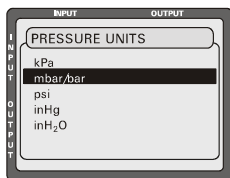
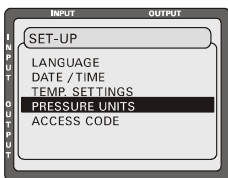
Pressure Units Setting

Pressure readings can be shown in different pressure units. The selection can be made via the Set-up menu.

Changing the pressure units

Leave the cursor at NONE at the measure and source menu and press # and EXE keys simultaneously to open the set-up menu.

Select PRESSURE UNITS and press EXE. Select one of the 10 different pressure units and press EXE to change. Press CE to leave the set-up menu.



Note: The reference temperature for in H₂O or mH₂O automatically changes according to the defined temperature setting °C or °F. °C refers to water temperature at 4°C and °F to 68°F.

Access Code Settings

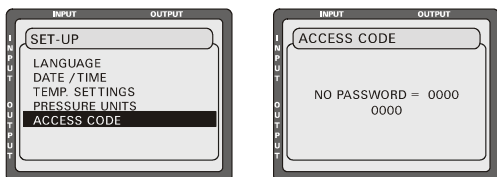
The ACCESS CODE is programmable by the customer. The following menus are protected by this code;

- ACCESS CODE.
- Calibration menu (Electrical).
- Add pressure sensors.
- Delete pressure sensors.
- Calibration pressure sensors.

Access Code **9410** is the standard factory setting.

Changing the ACCESS CODE

Leave the cursor at NONE at the measure and source menu and press # and EXE simultaneously to open the set-up menu. Select ACCESS CODE and press EXE.

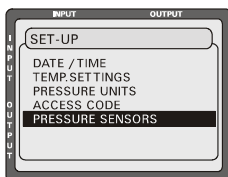


Type in the access code and press EXE to confirm. You are now in a mode where you can change the code. If applicable, the new code can be typed in and confirmed by EXE. 0000 as code is considered as no existing ACCESS CODE.

Note: Registration of the ACCESS CODE is essential.

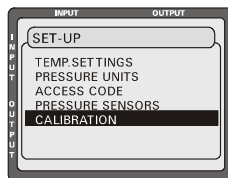
Pressure Sensors

This menu enables the user to install and calibrate pressure sensors. At the end of this manual, a special chapter describes the sensor installation routine.



Calibration

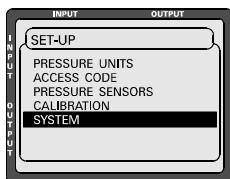
This menu enables the user to calibrate and adjust the TRX-II. At the end of this manual a special chapter describes the recalibration routine. CALIBRATION menu is ACCESS CODE protected.



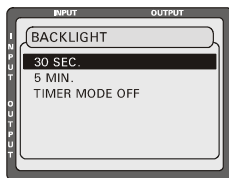
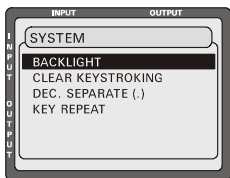
System Setting

Setting the backlight automatic mode

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select system and press EXE.



Select BACKLIGHT and press EXE. Select required time or backlight timer MODE OFF and press EXE. Press CE to leave the set-up screen.



Note: Not applicable to Model TRX-II iS.

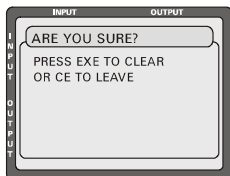
Backlight on/off operation

Press the Light key to switch the backlight on. When e.g. 30 seconds is selected the light will remain ON for maximum 30 seconds. Each key-pad operation will postpone shut-off for another 30 seconds time period. Timer Mode Off enables manual operation of the backlight.

Note: It is recommended to select 30 seconds to save batteries if the unit is mainly used in the field.

Clear keystroking

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select CLEAR KEYSTROKING and press EXE. EXE will clean the KEYSTROKE memory. Press CE to leave the set-up menu.

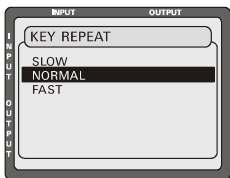


Dec. Separate

Leave the cursor at NONE at the measure and source menu and press the # and EXE keys simultaneously to open the set-up menu. Select DEC.SEPARATE and press EXE to change the settings from/ to, or vice versa. Press CE to leave the set-up menu.

Key repeat

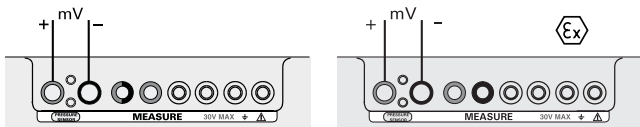
Leave the cursor at NONE at the measure and source menu and press # and EXE keys simultaneously to open the set-up menu. Select KEY REPEAT and press EXE. KEY REPEAT stands for key response time. Select SLOW, NORMAL or FAST and press EXE to confirm. Press CE to leave the set-up menu.



TO MEASURE ELECTRICAL SIGNALS

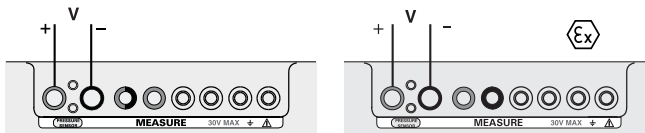
Millivolts

Select mV and DIRECT in the measure menu and press EXE to open the working screen. The upper window in the working screen indicates the measured millivolts reading. The range is 0-600 mV split into two (auto) ranges of 0 to 100 mV and 100 to 600 mV. Read the section “Scaled Readings” to use the SCALE option.



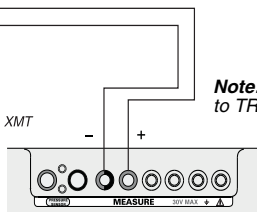
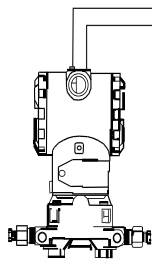
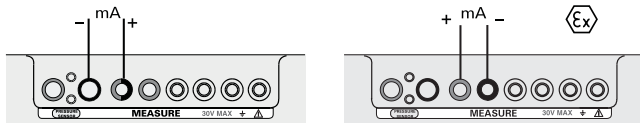
Volts

Select Volts and DIRECT in the measure menu and press EXE to open the working screen. The upper window in the working screen indicates the measured Volts reading. The range is 0-30 Volts split into two (auto) ranges of 0 to 6 Volts and 6 to 30 Volts. Read the section “Scaled Readings” to use the SCALE option.



Milliamps/XMT

Select mA and DIRECT in the measure menu and press EXE to open the working screen. The upper window in the working screen indicates the measured milliamps reading. The percentage of 4-20 mA is indicated in small size digits to facilitate easy alarm switch adjustments. The range is 0-52 mA. Read the section “Scaled Readings” to use the option for FLOW and LINEAR scaling.

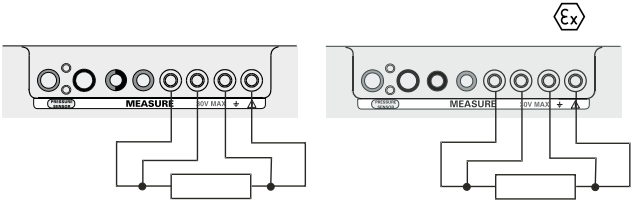


Note: XMT not applicable to TRX-II iS

Ohms

Select OHMS and DIRECT in the measure menu and press EXE to open the working screen. The upper window in the working screen indicates the measured ohms reading. The range is 0-2000 Ohms split into two (auto) ranges of 0 to 400 Ohms and 400 to 2000 Ohms. The excitation current is 0.9 mA.

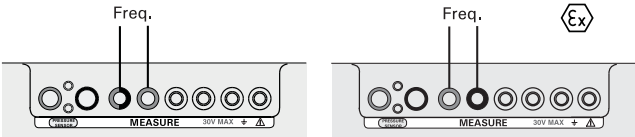
The wiring can be 2, 3, or 4 wire. The 4 wire method provides a true measurement of voltage drop across unknown resistance at a constant excitation current.



Frequency

Select FREQ in the measure menu and press EXE. Select FREQ and DIRECT in the freq. menu and enter a trigger level between 10 mV and 5V. Press EXE to open the working screen.

The upper window of the working screen indicates the measured frequency reading. The range is 0-20.000 Hz split into three (auto) ranges of 0-655 Hz, 655-1310 Hz and 1310-20.000 Hz.



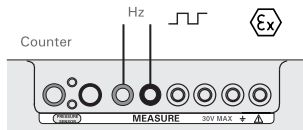
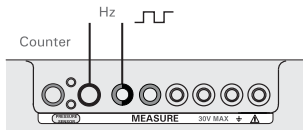
Press # and ← simultaneously to increase the trigger level.

Press # and → simultaneously to decrease the trigger level.

Read section "Scaled Readings" to use the SCALE option.



Pulse Counter Mode



Two different pulse count modes are available:

- Counts the pulses received in one minute.
- Counts the pulses received in one hour.

Select **FREQ.** in the measure menu and press **EXE**. Select **P/MIN.** of **P/HOUR** and press **EXE**. Enter a trigger level between 10 mV and 5.0 Volts and press **EXE** to open the working screen. The upper window of the working screen indicates the counted number of pulses.

Press **#** and ← simultaneously to increase the trigger level.
Press **#** and → simultaneously to decrease the trigger level.
Zero will reset the screen.

Counter

Select **COUNTER** in the measure menu and press **EXE**. Enter a trigger level between 10 mV and 5.0 Volts and press **EXE** to open the working screen:

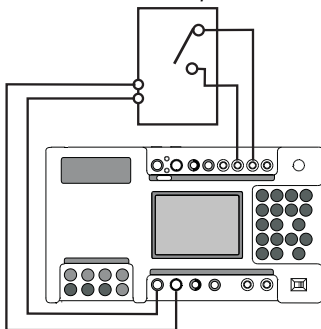
Press **#** and ← simultaneously to increase the trigger level.
Press **#** and → simultaneously to decrease the trigger level.
Zero will reset the screen.

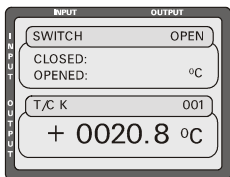
The pulse counter starts on the first (positive) rising edge.

Switch Contact Position Test

Connect the switch as indicated. Select **SWITCH** in the measure menu. Generate or simulate the appropriate source signal from the TRX-II to activate the switch. The measure (upper) reading tracks the source (lower) reading until the switch contacts change state. This change immediately "freezes" the measure reading indicating the actual switch operating point. Press the **#** button to reset. The measure reading will then track the source reading again.

Note: The switch contacts **MUST** be potential free.



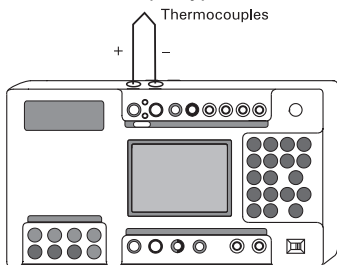


Circuit Continuity Tester

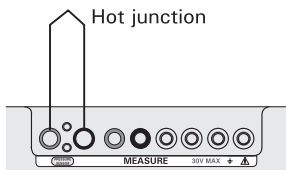
To check wiring continuity use the RTD measure terminals identified with Switch. If NONE has been selected in the source menu and SWITCH has been selected in the measure menu, press EXE to enter the continuity check mode. Closing the test loop will activate the built-in buzzer to prove that the wiring loop has a resistance of 2200 Ohms or less. Press INFO to calculate switch resistance.

THERMOCOUPLE MEASUREMENTS

Scroll through the thermocouple measure menu, making the required selections required. Press EXE to open the working screen; the measurement reading is shown in the upper window. Resolution is 0.1 degrees for most thermocouple types.



Using compensation wires

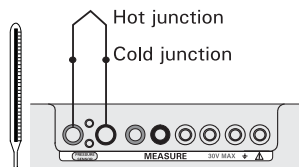


It is strongly recommended to use compensation wires for thermocouple simulations and measurements. Insert the compensation wire lead ends into the wire holes as indicated. Turn hand tight each terminal screw to fix the wires and make the proper connections at the

instrument side. Make sure that you use the right type of wires and that polarities are not accidentally reversed. Select INTERNAL to compensate the cold junction microvolts automatically.

Using standard test leads (copper wires)

Turn hand tight the terminal screws before plugging the test leads in. Compensation in this case is required to offset the cold junction compensation microvolts generated by the instrument under calibration. For this we need to measure the temperature at the instrument terminals. Instrument terminal temperatures can be measured by either a hand held thermometer or a remote temperature probe.



Copper wires

Remote temperature probe (not supplied by GE)

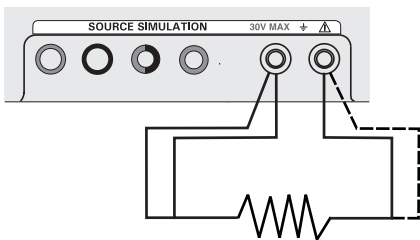
With a Pt100 sensor you can measure cold junction temperatures from -200°C to 850°C ($-328 \dots 1562^{\circ}\text{F}$). Select EXTERNAL in the cold junction menu (CJ) and press EXE, to compensate the external cold junction microvolts automatically. For wiring methods read the section "TO MEASURE A RTD"

Hand held thermometer (not supplied by GE)

Read the thermometer while holding it close to the instrument terminals. Select MANUAL and open the screen to fill out the obtained reading. Press EXE to enter. Note that in this mode temperature changes at the instrument terminals can easily create calibration errors.

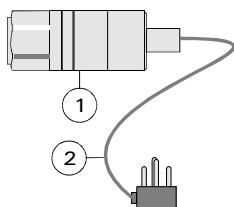
TO MEASURE A RTD

Go through the RTD measure menu and make the selections as required. Press EXE to open the working screen; the measurement reading is shown in the upper window. Resolution is 0.1 or 0.01 degree depending on selected RTD type. The excitation current is 0.9 mA. Wiring can be 2, 3 or 4 wire. The 4-wire method provides a true measurement of the voltage drop across the unknown resistance at a constant excitation current.



TO MEASURE PRESSURE

The TRX-II Pressure Sensor Option



The pressure sensor has been designed to calibrate pressure instruments in conjunction with the TRX-II multi-calibrator. The pressure sensor is powered from the TRX-II calibrator. It allows pressure instrument calibrations with ranges from:

- -15 psi up to 10 000 psi
- -1 bar up to 700 bar).

Pressure Sensor Identification

1. Sensor.
2. Cable 1,5 metres.

All sensors carry s/n pressure range in psi/bar.

Preparation

To change the pressure unit see the section "Pressure Units Setting". When using a sensor for the first time with a TRX-II, specific data must be entered in the TRX-II memory and the sensor calibrated. Refer to the section "Pressure Sensor" on page 40.

General

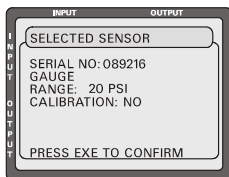
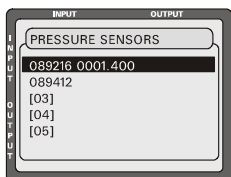
Important notes:

1. To reset each pressure sensor reading to zero, press zero key.
2. Make sure that tubing or hose is used within manufacturer's pressure and temperature limits.
3. For pressures over 150 psi (10 bar) use a special small inner diameter hose to limit the fluid flow and expansion in case a connection starts leaking.
4. Do not use the plastic tubing connector for pressures over 150 psi (10 bar).
5. To prevent damage to the sensor, applied pressure should not exceed the specified containment pressure.
6. Make sure that the connector and sensor materials are compatible with the fluid.
7. To avoid leakage and excessive force on the sensor, use sealing tape and two (2) wrenches.
8. Perform calibration in accordance to your company standard procedures.

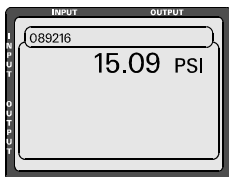
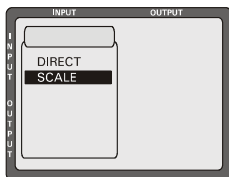
Operating the TRX-II with Pressure Sensor

Plug in connector into the TRX-II. Switch the TRX-II calibrator on after you have made the proper preparations. Select PRESSURE in the measure menu and none in the source menu.

Select the connected sensor from the available sensors with the ↑ and ↓ key, and press EXE. Press CE to leave menu.



The next menu gives you all the details of the selected sensor. This information should be checked with the sensor information on the connector. If both sets of information do not match, proceeding may cause serious problems. In the case of a mismatch press CE to leave. Providing that the information matches, press EXE to confirm. Choose direct or scale to open the working screen.

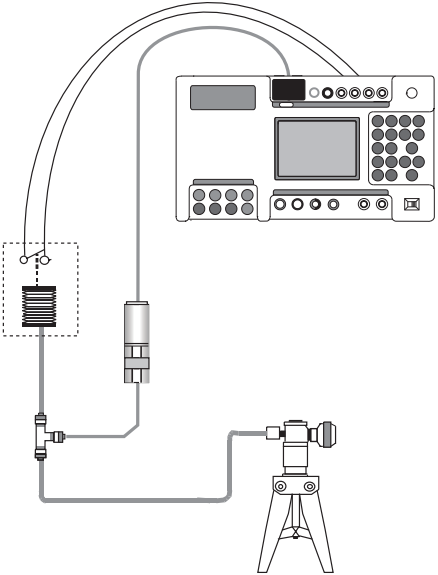


The working screen shows the pressure measurement. Also during working mode, the serial number of the connected sensor is shown in the display.

Pressure Switch

Make a calibration hook-up as indicated and switch the calibrator on. Select SWITCH in the measure menu and PRESSURE in the source menu. Select the applicable sensor to open the working screen. Press # to unlock the switch display. Increase or decrease the calibration pressure. The switch reading tracks the source reading until the switch position changes. This change will immediately "freeze" the switch (upper) reading indicating the actual switch setting.

Press # to unlock the switch reading. The switch reading will track the source reading again. Make sure that contacts are potential free.



Calibration Hook-up for a Pressure Switch

SPECIAL MEASUREMENT FUNCTIONS

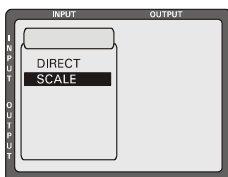
Scaled Readings

Except in temperature measure ranges all readings can be presented in a number of 5 digits and a sign. This number could represent an engineering unit like gallons/hour, revolutions/minute or any other relationship. This facility is available on both measurement and source functions. The original signal reading is still displayed in smaller sized digits.

Setting-up scaled readings (linear relationship)

Select SCALE to open the set up screen. Fill out the high- and low-limits for the span (preset at 4 and 20 mA in the milliamp ranges). Fill out both scale ends for the new scale. Press EXE to show the working screen.

Note: *Scaling in lower ranges only when auto ranging.*



Setting-up scaled readings (flow relationship)

Only available on the mA ranges. Select SCALE and FLOW to open the set-up screen. High- and low-limits for the span are preset at 4 and 20 mA. Change span if necessary. Fill out both scale ends for the new scale. Press EXE to show the working screen.

Note: *Readings are flow related when simulating or reading dP-transmitters measuring across an orifice plate.*

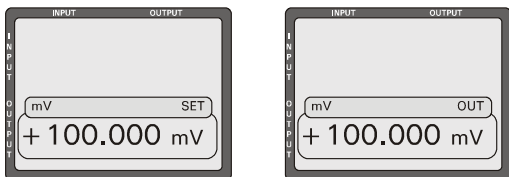
SOURCING OF ELECTRICAL SIGNALS

Menu Selections

Select a source range and select DIRECT from the menu. It puts you right in the source mode. For other modes read section "Special Source Functions". The lower part of the screen shows the window for source functions. Here, you can read the source level labelled with either SET or OUT.

Set mode

In the SET mode you change the source reading without changing the actual source at the terminals. Once you press EXE, the source will change to the new setting.



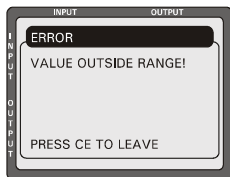
Source mode

In the SOURCE mode you change both the source reading and the actual source at the terminals. Entering a new value through the numerical key-pad brings you back into the SET mode.

Changing the source level

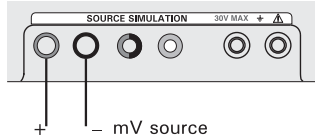
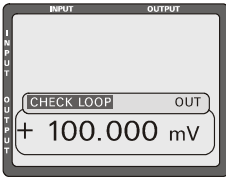
Use the \uparrow and \downarrow keys to ramp the source signal manually. Holding the key down will gradually accelerate the adjustment speed.

Enter a new source value through the numerical key-pad and press EXE to activate the signal at the source terminals. Entered values outside the range will prompt the message OUTSIDE RANGE.



Millivolts

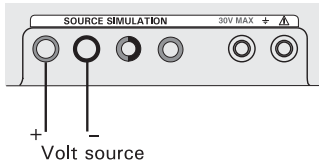
Go to millivolts in the DIRECT mode to source any signal between - 10 mV and 100 mV. Adjustments are made with 1 microvolt resolution. If the adjusted source level can not be maintained the screen will prompt the warning CHECK LOOP.



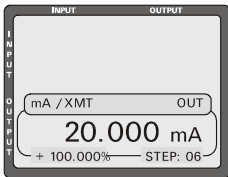
Note: 'Terminal to test lead' junctions may create e.m.f. microvolts causing an offset in the actual source signal.

Volts

Go to Volts in the DIRECT mode to source any signal between zero and 12 Volts. Adjustments are made with 100 microvolts. If the adjusted source level cannot be maintained the screen prompts the warning CHECK LOOP.

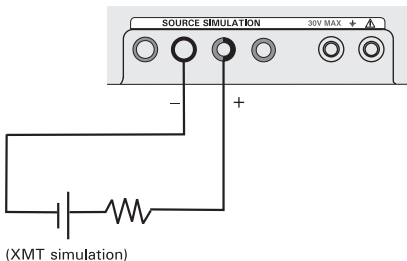
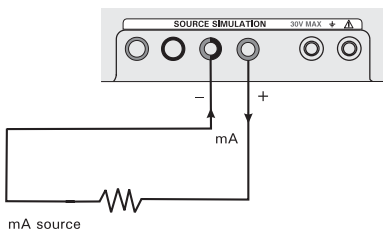


Milliamps/XMT



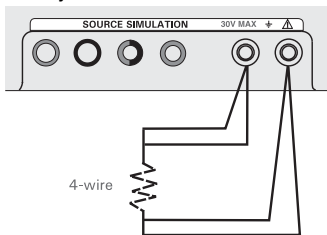
Use mA terminals to source a current into a resistor (active mode). Use XMT terminals to simulate a 2-wire transmitter (passive mode). Go to milliamps in the DIRECT mode to source any signal between 0 and 24 mA. Adjustments are made with 1 microamps resolution. If the adjusted source level cannot be maintained the screen prompts the

warning CHECK LOOP. To source fixed 0, 4, 8, 12, 16 and 20 mA levels, press → key to change to fixed steps. Use ↑ and ↓ keys to adjust the source current. Press ← key to return to normal source mode.

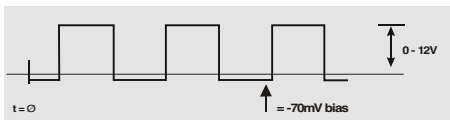


Ohms

Go through the OHM menu and select either the 0 to 400 or the 0 to 2000 Ohms range and enter the DIRECT mode. Resistance is simulated across the two terminals as shown. Connecting a third or fourth wire adapts the simulation to 3 or 4 wire input. Adjustment resolution is respectively 0.01 Ohms and 0.1 Ohms.

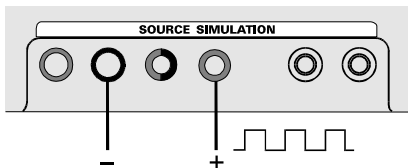


Frequency



Frequencies are symmetrical square waves and -70 mV zero based. Frequency is set by the \uparrow and \downarrow keys or numerical key-pad. Amplitude can be adjusted with the \leftarrow and \rightarrow keys between 0 and 24 Volts. Resolution is 0.1 Volt and amplitude is default set to 5.0 Volts. With frequency set at 0 Hz this function becomes available

as a voltage adjustable and regulated DC supply. Frequency source can take loads up to 32 mA at 24 Volts maximum.



Frequency source range 0-100 Hz

Go to frequency DIRECT mode to source any frequency signal between zero and 100 Hz. Adjustments are made with 0.01 Hz resolution.

Frequency source range 0-20 kHz

Go to frequency DIRECT mode to source any frequency signal between zero and 20.000 Hz. Adjustments are made with 1 Hz resolution.

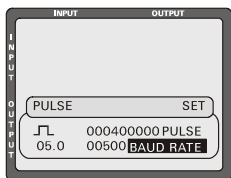
Pulse source range 0-6000 P/Min.

Same as 0-100 Hz but reads in Pulses/Minute.

Pulse source range 0 - 99 999 P/Hour

Same as 0-100 Hz but reads in Pulses/Hour.

Counter



Pulse source, preset number 999 999 999 max. Go to the pulse PRESET mode and set the amplitude*. Press EXE to proceed to the working screen. Use the \uparrow and \downarrow keys to move the cursor from upper to lower line and vice versa. Fill out the number of pulses to be transmitted as well as the Baud rate (max. 20 000 pulses/sec). Press EXE to start pulse transmission.

*Amplitude

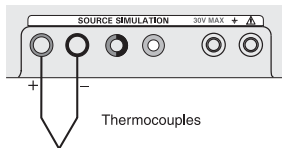
24V maximum



12V maximum

TO SIMULATE A THERMOCOUPLE

Work through the thermocouple menu and make the selections as required. Select the DIRECT mode to simulate any temperature within the range of the chosen thermocouple type. Adjustment resolution is 0.1 degree. For Cold Junction compensation considerations and different wiring methods read section "To simulate thermocouples" in this book.



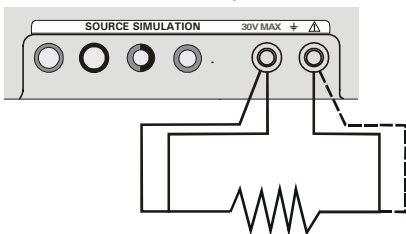
TO SIMULATE A RTD

The excitation current to source a resistance should be between 0.18 and 5 mA. Excitation currents may be intermittent as with some smart temperature transmitters.

RTD Simulation

Go through the RTD menu and make the selections as required. Select DIRECT mode to simulate any temperature within the range of the chosen RTD type. Adjustment resolution is 0.1 or 0.01 degree depending on RTD type. See the chapter "SPECIFICATIONS - TRX-II" for details.

Resistances representing temperatures are really simulated across the two terminals as shown. Connecting a third or a fourth wire adapts the simulation to 3 or 4 wire inputs.



SPECIAL SOURCE/SIMULATION FUNCTIONS

Step Mode

In the step mode the TRX-II can generate preset source levels in four different ways;

- **Free programmable, Select PROGR**

Number of steps (2 to 10) and levels are free programmable.

- **10% Divisions, Select 10%**

Free programmable span is automatically divided in 10 steps of 10% each.

- **20% Divisions, Select 20%**

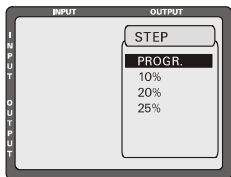
Free programmable span is automatically divided in 5 steps of 20% of 20% each.

- **25% Divisions, Select 25%**

Free programmable span is automatically divided in 4 steps of 25% each.

Stepping through the fixed levels can either be performed manually or automatically.

Setting-up programmable steps

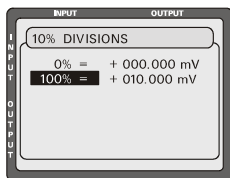


Select STEP and PROGR from the menu and press EXE. Select the desired number of steps and press EXE again.

Set the source level for each step. Scroll the step numbers with the \uparrow and \downarrow keys to change or enter new levels. Press EXE when ready. The step mode working screen is shown.

Setting-up 10%, 20% or 25% division steps

Select STEP and 10%, 20% or 25% from the menu and press EXE. Set the desired 100% span and press EXE again. The step mode working screen is shown.



To source fixed steps manually

Initially the TRX-II sources the preset value of step number 1 or 0%. Press the \uparrow key to source the next step. Press the \downarrow key to source the previous step. Press \rightarrow key to switch to the DIRECT mode to allow fine adjustments with the \uparrow and \downarrow keys. Press \leftarrow to return to the MANUAL mode.

To source fixed steps automatically

To switch from MANUAL to AUTO press the numerical key with the first digit of the timer setting you want. This will open the screen to dial the dwell timer setting in seconds. The dwell timer sets the time that a source level is maintained before it changes to the next step. Press EXE to start the automatic stepping. Press \uparrow or \downarrow to return to the MANUAL mode.



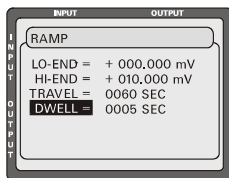
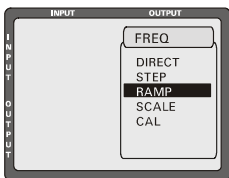
Automatic Ramp Mode

The TRX-II can generate automatically a time linear increasing or decreasing source signal. Signal limits are free to set within any of the available source ranges. Time scales can be set between 1 and 9999 seconds.

Note: The automatic ramp mode cannot be used together with sourcing 0- 100 Hz or sourcing P./min and P/Hour.

Setting-up the ramp mode

Select RAMP and fill out the set up screen. The high-end value sets the maximum source. The low-end value sets the minimum source. Fill out the required travel and dwell time in seconds and press EXE.



To start/stop ramp cycling

Press \uparrow and \downarrow direct after each other to start a continuous up and down ramp cycling with dwelling at the high and low ends. The first arrow key hit determines the take-off direction. Press \uparrow and \downarrow simultaneously to 'freeze' the ramp action. To restart press \leftarrow or \rightarrow . Press CE to cancel the ramping operation.

Source in scaled readings

Dial directly in scaled readings to SET a related source signal as set-up. Press EXE to actually source the signal. The \uparrow and \downarrow key functions are available for fine adjustment of the source. For details see the chapter "SPECIAL MEASUREMENT FUNCTIONS" section "Scaled Readings".

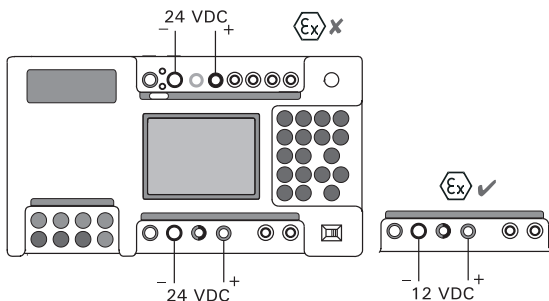
User Power Supplies

Power supplies available for the user are designed to power transmitters, control and transducer Wheatstone bridges. The following power supplies are available at the terminals as indicated:

24 VDC fixed, combined with the **mA measure** terminals, current limited at 32 mA.

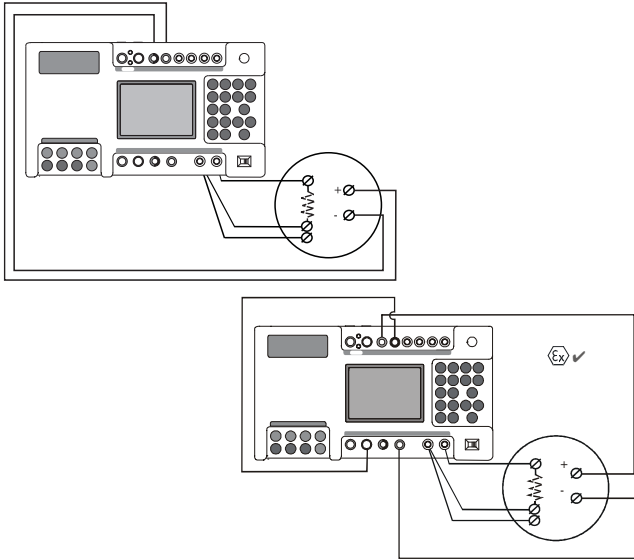
OR

24 VDC fixed, combined with the **mA source** terminals, current limited at 32 mA.



TRANSMITTER CALIBRATION

In this function transmitter source and measure readings are both scaled in engineering units for quick comparison. Transmitter may be a linearized, non-linearized, 4-20 or 0-20 mA model for thermocouples or RTD.

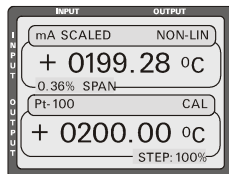


Setting-up a Calibration

Leave the cursor at NONE in the measure menu and select the required source function. Go through the menu and make the necessary selections. In the mode screen, select CAL to calibrate a transmitter. Proceed to select all transmitter characteristics.

To Check or Calibrate a Transmitter

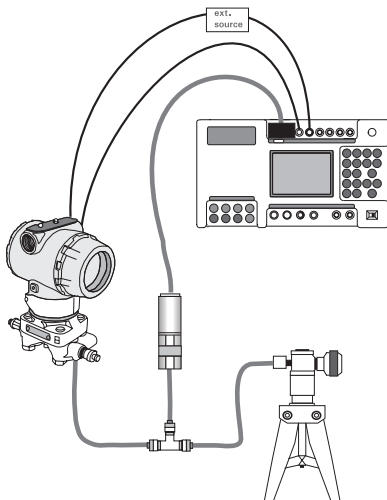
All normal key-pad functions are available to change the source. Use the \rightarrow key to change to fixed steps. Use \uparrow and \downarrow keys to step through 0%, 25%, 50%, 75% and 100% of the span as set-up. Press \leftarrow to return to the normal key-pad functions. An ideal transmitter will show equal readings. The difference of both readings is expressed in % of the transmitter span or reading and is shown in the upper window in small size digits.



Pressure Transmitter Calibrations

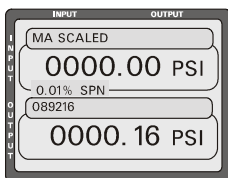
2-Wire transmitter; calibrator powered

Make a calibration hook-up as indicated. Switch the TRX-II calibrator on to power the transmitter with 24 VDC.



Select PRESSURE in the source menu and mA/XMT in the measure menu. Select the appropriate SENSOR in the source menu to read your calibration pressure. Select DIRECT in the measure menu if you want to read mA. Select CAL if you want to read the transmitter source scaled in pressure units. Fill out the transmitter span and select if the error between transmitter MEASURE and SOURCE has to be displayed as a % of reading or as a % of span. Press EXE to open the working screen. Use the → key to prompt the pressure to pump for 25% calibration points. Press the ↓ and ↑ keys to step through these points.

The upper screen shows the milliamps signal converted into pressure units. It also shows the error in percentage of the transmitter span in smaller digits.

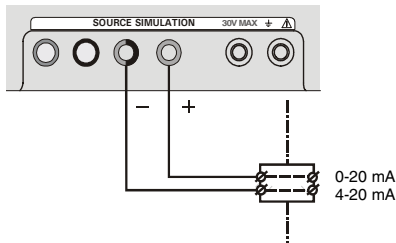


TRANSMITTER SIMULATION

User can dial a temperature in degrees to source a 4-20 mA or 0-20 mA signal. This signal can be used to simulate transmitters at control system measure terminals.

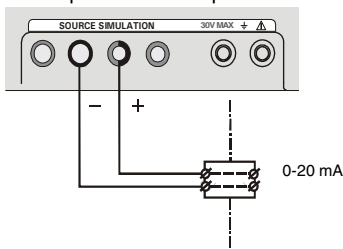
The simulated transmitter may be linearized or non-linearized.

Function is available for all types of temperature sensors supplied as standard in the TRX-II.

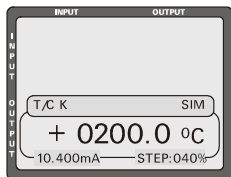


Setting-up a Simulation

Select SIM and proceed to select all appropriate transmitter characteristics. Ignore the CJ compensation menu. Fill out the transmitter span and press EXE to open the working screen.



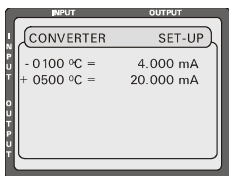
To Simulate a Transmitter



All normal key-pad functions are available to change the (mA) source. Use the \rightarrow key to move to fixed steps. Use \uparrow and \downarrow keys to step through 0%, 25%, 50%, 75% and 100% of the span as set-up. Press \leftarrow to return to the normal key-pad functions. Next to the simulated temperature the lower window shows the TRX-II source milliamps in small size digits.

PROGRAMMABLE SIGNAL CONVERTER

With this unique feature any measure signal can be converted into any on the TRX-II available source signals with full galvanic isolation. Zero and span settings for both measure and source are fully programmable.



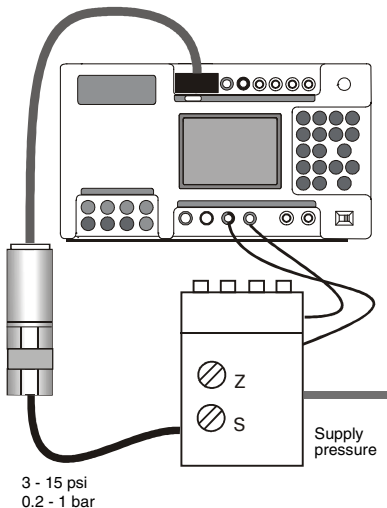
Setting-up a signal converter

Make all measure and source selections as you would do when you use measure and source functions separately in the DIRECT source mode. When the normal working screen is displayed press # and EXE to open the set-up screen for filling out the measure and source span. Press EXE again to proceed to the signal converter working screen. Actual measure and source signals are now displayed.

Note: The signal converter function cannot be used in pulse counting modes.

I/P Convertor

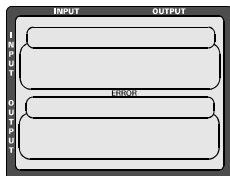
Make a calibration hook-up as indicated and switch the calibrator on. Select PRESSURE in the measure menu and mA/XMT in the source menu. Select the applicable sensor and the desired milliamps source mode to open the working screen. Read the section "SOURCING OF ELECTRICAL SIGNALS" on how to adjust the milliamps source.



CE REMARKS

The TRX-II prompts "ERROR" or "CHECK LOOP" whenever the functionality is influenced by electromagnetic disturbances. The results obtained during this state are unreliable.

Error message



The TRX-II is protected against failures by fast transient / burst. It restarts itself whenever this situation occurs and returns to the main screen. In this way a save state of operation can be assumed.

SUPPLEMENT FOR INTRINSICALLY SAFE CALIBRATOR TRX-II iS

Instructions for use

Model TRX-II iS marked with label "Ex" has been built in accordance with European Norm II 2 (1) G EEx-ia IIC T5 and may be used in IEC defined zones 0,1 and 2.

Special precautions for use in hazardous areas

1. Do not connect the output terminals to external powered circuits when calibrator sources Volts or milliamps.
2. Make sure that the parameters of both the calibrator and the instrument match.
3. Do not exceed parameters nameplate data.
4. Do not open battery enclosure in a potentially explosive atmosphere.
5. Do not charge or attempt to charge the batteries.
6. Do not use the serial port.
7. Do not open the calibrator housing when an explosive gas atmosphere may be present.

Recharging the batteries

Use the charger supplied as standard only. Switch the calibrator "OFF" before connecting the charger. Recharging time period is 16 hours from empty to full charge. Occasional charging over more than 16 hours is permitted. Charging current is set at 75 mA.

Battery maintenance

Do not store the calibrator with discharged or partial discharged batteries. Always recharge the batteries after you have finished your job. The batteries are fully charged at 7.2 Volt (NiMH) batteries are nearly discharged at 6.8 Volt. Voltage can be checked if you select "BATTERY" in the calibrator "MEASURE" menu. If batteries can not be fully recharged, discharge the batteries by transmitting 20 mA and recharge again and repeat this procedure one more time. If this does not give satisfactory results, replace the battery pack.

Battery pack replacement

The batteries are a part of the instrument housing. Order assy.#208 for replacement parts. Open the calibrator (ONLY IN SAFE AREAS) by releasing all visible hexagon screws at the back and inside the battery compartment. Lift gently the housing lower half off and disconnect the cable with the white plug. Proceed reverse to install the new pack. Battery pack replacement must be carried out by qualified technicians only. Ask your distributor. No recalibration is required.

Specifications

For unit performances see TRX-II data sheet for the standard version.

Deviations from the standard unit

0 ... 21 mA Rmax. 600Ω

Transmitter Supply:

12 VDC at the output terminals of the unit

PCMCIA card:

NOT supported, non removable COMPACTFLASH inside.

Backlight:

NOT supported.

Power Supply:

Integrally mounted battery pack with rechargeable cells and power limiting elements.

Charger:

Suitable for 115/230 V, 50/60 Hz

Recharging time:

Discharged to fully charged, 16 hours at max 75 mA

Battery life:

4 hours in read mode

2.5 hours at 20 mA source mode

Storage temperature:

-20 to +45 degrees Celsius

(+60 permitted for 24 hours)

Operating temperature:

-20 to +40 degrees Celsius

Transmitter supply/Frequency output:

12 V at 25 mA

Milliamps input:

isolated

Drive capacity:

20 mA into 600 Ohm

Input safety parameters:

$U_i = 30$ V max

$I_i = 215$ mA max

$P_i = 0.75$ max

$C_i = 5$ nF

$L_i = 0$ mH

Output safety parameters:

$U_o = 17.5$ max

$I_o = 75$ mA max

$P_o = 0.32$ W max

$C_o = 339$ nF max

$L_o = 6.5$ mH max

Pressure sensor excitation output safety parameters:

$$U_o = 5.9 \text{ Volt}$$

Output safety parameters:

$$I_o = 8.0 \text{ mA max}$$

$$P_o = 12.0 \text{ mW}$$

$$C_o = 3.0 \mu\text{F}$$

$$L_o = 3.0 \text{ mH}$$

SERVICE, REPAIR AND PARTS

Recalibration of the TRX-II

Leave the cursor at NONE in the MEASURE and SOURCE menu and press the # and EXE keys simultaneously to open the set-up menu. Select CALIBRATION and press EXE. Fill out the access code and press EXE to open the calibration menu. The access code is programmable and works as a barrier to prevent accidental access to TRX-II calibration ranges.

The calibration menu shows all relevant ranges to calibrate. Each range can be recalibrated independent of any other range. Only the cold junction compensation system is influenced by millivolts recalibration. Select the ranges to be calibrated and press EXE. Follow the instructions on the next screens. Fill out the calibration readings and press EXE to confirm or to return to the calibration menu. Select another range to continue recalibration or press CE to leave the calibration menu.

Cold Junction Compensation Calibration

To recalibrate or check the cold junction measurement system for both measure and source, use an electronic thermometer with a maximum error of $\pm 0.07^{\circ}\text{C}$ (0.13°F). Remove the compensation wire fixation screws from the T/C terminals. Insert the thermometer probe in the appropriate T/C terminal hole and make sure a good thermal contact is made down at the bottom of the terminal. Take measurements samples of both terminals and calculate the average temperature. Enter this temperature to recalibrate. Do not use thermal conductivity gel as this cannot easily be removed from the terminal.

Note:

1. Calibration standards should have a valid calibration certification and should be at least 3 times more accurate than the published accuracies for the TRX-II for each range.
2. As derived from electrical parameters, temperature sensor ranges do not require any individual recalibration.
3. Be sure that you use the test leads, as standard supplied with the TRX-II or other low e.m.f. test leads.
4. The TRX-II should be powered from the on board batteries during recalibration.
5. Recalibration must be carried out at reference ambient temperature and humidity. TRX-II must be exposed to this condition for at least 2 hours before the actual recalibration starts.
6. Recalibrate mV ranges before starting recalibration of the Cold Junction Compensation system.
7. When accessing the calibration menu the temperature unit is set to $^{\circ}\text{C}$ and the temperature scale is set to IPTS 68.
8. Calibration is recommended between 12 and 14 months.

Pressure Sensor

Installation of a new pressure sensor

To add a new sensor specific data must be entered in the TRX-II memory. This is to correct the sensor linearity and hysteresis in the TRX-II calibrator. Each new sensor is delivered with the following data;

- Serial No.
- Range in mbar.
- Correction factor # A (C1).
- Correction factor # B (C2).
- Correction factor # C (C3).
- Correction factor # D (C4).
- *Correction factor # A (C1) negative.
- *Correction factor # B (C2) negative.
- *Correction factor # C (C3) negative.
- *Correction factor # D (C4) negative.

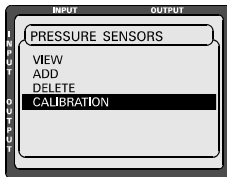
** Only applies for ranges up to 500 psi*

Plug the connector in the calibrator and switch the unit on. Leave the cursor at NONE at the measure and source menu and press # and EXE simultaneously to open the set-up menu. Select Pressure Sensors and press EXE. Select ADD and press EXE. Select free memory spot and press EXE. The menu will lead you through the different screens to be filled in. The required data is sent standard with every pressure sensor from the factory. Before you can enter the new sensor data, the TRX-II screen shows you the data text lines as it is. Press CE to leave the installation setup or press EXE to change the actual data by filling out each line. After you have entered the new data in the EEPROM the screen will return to the sensor selection menu. To verify the new entered data, select the applicable sensor again and press EXE. Press CE to leave the installation menu.

Calibration of a new sensor

The calibration procedure should always be done after adding a new sensor. The CALIBRATION menu is part of the pressure sensor menu.

The menu driven software leads the operator through the procedure which requires actual pressures to be applied.



Sensor recalibration

To recalibrate a sensor you need a sufficient accurate pressure calibrator. Accuracy should be 3 times better than for the 100%

range of the sensor. In general a dead weight tester is recommended.

Calibration is performed at zero, 50% and full span only. Best straight line fit is established by the polynomial factors as entered during installation.

Plug the sensor in the calibrator and switch the unit on. Wait 15 minutes to allow the unit to stabilize. Press # and EXE simultaneously to open the setup menu. Select Pressure Sensors and press EXE. Select Calibration and press EXE. Select the applicable sensor and press EXE. Expose the sensor to atmospheric pressure and press EXE again to perform the zero calibration. Apply the pressure for full range calibration. Dial on the TRX-II the total weight stacked on the tester or the standard pressure calibrator reading. Press EXE again. Do the same for half range calibration. Verify the pressure reading on your next screen.

If calibration polynomials are entered for the negative range, this has to be calibrated using the same procedure as for the positive range. Press EXE to open the calibration date screen. Fill out the calibration date questions and press EXE. Verify the date and press EXE again to return to the sensor selection menu. Press CE to leave the calibration mode.

Cleaning the pressure chamber

Use a water hand soap solution or a compatible solvent and flush the pressure chamber. Do not use needles or other mechanical tools as you may damage the isolation diaphragms.

Fault Finding Procedures

Opening and closing the calibrator housing

Remove the batteries and disconnect the unit from other equipment. Take the four T/C wire screws out and release all visible Philips head screws at the back and inside the battery compartment. Lift gently the housing upper half off and put it aside.

To close the calibrator housing in reverse order the following must be considered:

1. Put the three printed circuit board spacers in place. Upper hand and lower hand spacers have brass wire guide tubes; make sure they fit into the mV terminals correctly.
2. Check the "battery type" selector switch position before turning the unit on.

Fault location procedures

When the TRX-II does not work or does not work at all, it is recommended to return the unit to one of the Druck Service Centres or to your local distributor after you have checked the following;

Most of the problems associated with portable instruments are usually related to power supply defects, blown fuses or displaced connectors.

If the unit does not work at all:

1. When normally line powered, change to battery operation to check the line adaptor.

2. When normally battery powered, check the contact springs for corrosion and spring tension.
3. Check total battery voltage with a voltmeter. Alkaline should read around 6 Volts and NiCd should read around 5 Volts when new or fully charged.
4. Open the TRX-II as described in the previous paragraph and check whether the PCB interconnecting plugs are still in position.

If the unit does not measure milliamps:

5. Check the fuse (accessible from the back). Replace fuse only by Part No. 13119 or Little fuse, Part No. 217.400.

If the unit does not measure Ohms or RTD:

6. Check the fuse accessible from the back. Replace fuse only by p/n 13119 or little fuse No.217.400

Most other fault symptoms are not logically related to just one possible defect.

If spare printed circuit boards are available, you could replace board by board to find the faulty board. Note that a board replacement requires a recalibration. Note that this procedure may also create a problem in a new healthy board by specific defects in an original board.

The following boards are accommodated in the TRX-II:

Power supply board (Assy 201)

Processor board (Assy 200)

Measure board (Assy 202)

Source board (Assy 203)

IMPORTANT:

Always place the EMI shielding back in the original position.

Spare Parts List TRX-II

	Part No.
Power board	Assy 201
Processor board	Assy 200
Measure board	Assy 202
Source board	Assy 203
LCD display	22500/T
Board spacers (3X)	25234
T/C terminal screws (4X)	25301
6x Test leads, 6x clips	Assy 206
Operating Manual	25506
Line adaptor/charger 115 VAC	13603/115
Line adaptor/charger 230 VAC	13603/230
Battery compartment cover	25232
Set of battery contact springs	13013/16/T
LCD display window	25125
Set of fuses (10X)	13119
Fuse holder	13118
Carrying case	24030
Lithium cell	13183
Mating cable for TRX-II pressure sensors	Assy 230

Note: *Not applicable for Model TRX-II iS.*

SPECIFICATIONS - TRX-II

Standard Specification

Electrical Functions	Range	Resolution	Accuracy	Remarks
Measure DC voltage	0 ... 100 mV	0.001 mV	0.02% rdg. +0.01% range	R - measure > 20 M Ω
Measure DC voltage auto.ranging	100 ... 600 mV	0.01 mV	0.025% rdg. +0.005% range	R - measure > 20 M Ω
Measure DC voltage	0 ... 6 V	0.0001 V	0.025% rdg. +0.005% range	R - measure > 1 M Ω
Measure DC voltage auto.ranging	6 V ... 30 V	0.001 V	0.05% rdg. +0.005% range	R - measure > 1 M Ω
Source DC voltage	-10 mV ... 100 mV	0.001 mV	0.01% rdg. +0.005% range	R - source < 0.2 Ω
Source DC voltage	0 ... 12 V	0.0001 V	0.01% rdg. +0.005% range	R - source < 0.2 Ω
Measure DC current	0 ... 52 mA	0.001 mA	0.01% rdg. +0.01% range	R - measure 2.5 Ω fused
Source DC current	0 ... 24 mA	0.001 mA	0.01% rdg. +0.02% range	R - max. 900 Ω
Source 2-wire XMT	4 ... 24 mA	0.001 mA	0.01% rdg. +0.02% range	V - max. 56 V
Measure resistance	0 ... 400 Ω	0.01 Ω	0.005% rdg. +0.02% range	at 0.9 mA excitation
Measure resistance auto.ranging	400 Ω ... 2000 Ω	0.1 Ω	0.02% rdg. +0.015% range	at 0.9 mA excitation
Source resistance	0 ... 400 Ω	0.1 Ω	0.005% rdg. +0.02% range	at 1 mA excitation
Source resistance	0 ... 2000 Ω	0.1 Ω	0.02% rdg. +0.015% range	at 1 mA excitation
Measure frequency auto.ranging	0 ... 655 Hz	0.01 Hz	0.006% rdg.	R - measure > 300 k Ω
Measure frequency auto.ranging	655 Hz ... 1310 Hz	0.1 Hz	0.1 Hz	R - measure > 300 k Ω
Measure frequency auto.ranging	1310 Hz ... 20,000 Hz	0.1 Hz	1 Hz	R - measure > 300 k Ω
Totalizing counter	0 ... 10 ⁸ -1	1 count	Infinite	R - measure > 300 k Ω
Counts/minute	0 ... 6 x 10 ⁵	1 c/min	0.08% rdg	R - measure > 300 k Ω
Counts/hour	0 ... 10 ⁷ -1	1 c/h	0.08% rdg	R - measure > 300 k Ω
Pulse source preset	0 ... 10 ⁸ -1	1 count	Infinite	R - measure > 300 k Ω
Pulse sourcing	0 ... 100 Hz	0.01 Hz	0.01 Hz \pm 1LSD	0 - 24 V / 34 mA max.
Pulse sourcing	0 ... 6000 p/min	1 p/min	1 p/min	0 - 24 V / 34 mA max.
Pulse sourcing	0 ... 20,000 Hz	1 Hz	1 Hz	0 - 24 V / 34 mA max.
Pulse sourcing	0 ... 99,999 p/hour	1 p/hour	36 p/hour	0 - 24 V / 34 mA max.

Temperature Functions	Range	Resolution	Accuracy Measure and Source
RTD's			
Pt150 (385)	(-200 ... 850) °C (-328 ... 1562) °F	0.06 °C 0.11 °F	0.5 °C 0.9 °F
Pt100 (385)	(-200 ... 850) °C (-328 ... 1562) °F	0.03 °C 0.05 °F	0.25 °C 0.45 °F
Pt200 (385)	(-200 ... 850) °C (-328 ... 1562) °F	0.1 °C 0.2 °F	0.6 °C 1.1 °F
Pt500 (385)	(-200 ... 850) °C (-328 ... 1562) °F	0.1 °C 0.2 °F	0.4 °C 0.7 °F
Pt1000 (385)	(-200 ... 400) °C (-328 ... 752) °F	0.1 °C 0.2 °F	0.4 °C 0.4 °F
D-100 (392)	(-200 ... 510) °C (-328 ... 950) °F	0.03 °C 0.05 °F	0.25 °C 0.45 °F
D-100 (392)	(510 ... 645) °C (950 ... 1193) °F	0.03 °C 0.05 °F	0.25 °C 0.45 °F
Ni100	(-60 ... 250) °C (-76 ... 482) °F	0.1 °C 0.2 °F	0.2 °C 0.4 °F
Ni120	(-80 ... 260) °C (-112 ... 500) °F	0.1 °C 0.2 °F	0.2 °C 0.4 °F
Cu10	(-200 ... 260) °C (-328 ... 500) °F	0.3 °C 0.5 °F	2.0 °C 3.6 °F

Temperature Functions	Range	Resolution	Accuracy	Remarks
Thermocouples			Measure	Source
K IEC 584	(-270 ... -200) °C (-454 ... -328) °F	0.2 °C	2.0 °C	1.0 °C
K IEC 584	(-200 ... 1370) °C (-328 ... 2498) °F	0.1 °C	0.6 °C	1.1 °F
J IEC 584	(-210 ... 1200) °C (-346 ... 2192) °F	0.1 °C	0.5 °C	0.3 °C
T IEC 584	(-270 ... -180) °C (-454 ... -292) °F	0.1 °C	1.4 °C	0.7 °C
T IEC 584	(-180 ... -70) °C (-292 ... -94) °F	0.2 °C	0.5 °C	0.3 °C
T IEC 584	(-70 ... 400) °C (-94 ... 752) °F	0.1 °C	0.3 °C	0.2 °C
B IEC 584	(50 ... 500) °C (122 ... 932) °F	0.3 °C	4.0 °C	2.0 °C
B IEC 584	(500 ... 1200) °C (932 ... 2192) °F	0.2 °C	2.0 °C	1.0 °C
B IEC 584	(1200 ... 1820) °C (2192 ... 3308) °F	0.1 °C	1.0 °C	0.6 °C
R IEC 584	(-50 ... 0) °C (-58 ... 32) °F	0.2 °C	3.0 °C	1.5 °C
R IEC 584	(0 ... 300) °C (32 ... 572) °F	0.2 °C	2.0 °C	1.0 °C
R IEC 584	(300 ... 1769) °C (572 ... 3216) °F	0.1 °C	1.0 °C	0.6 °C
S IEC 584	(-50 ... 0) °C (-58 ... 32) °F	0.2 °C	2.5 °C	1.3 °C
S IEC 584	(0 ... 100) °C (32 ... 212) °F	0.2 °C	1.9 °C	1.0 °C
S IEC 584	(100 ... 1769) °C (212 ... 3216) °F	0.1 °C	1.4 °C	0.7 °C
E IEC 584	(-270 ... -150) °C (-454 ... -238) °F	0.1 °C	0.9 °C	0.5 °C
E IEC 584	(-150 ... 1000) °C (-328 ... 1832) °F	0.1 °C	0.4 °C	0.2 °C
N IEC 584	(-270 ... -20) °C (-454 ... -4) °F	0.2 °C	1.0 °C	0.5 °C
N IEC 584	(-20 ... 1300) °C (-4 ... 2372) °F	0.1 °C	0.6 °C	0.3 °C
L DIN 43710	(-200 ... 900) °C (-328 ... 1652) °F	0.1 °C	0.3 °C	0.2 °C
J DIN 43710	(-200 ... -100) °C (-328 ... -148) °F	0.1 °C	0.3 °C	0.2 °C
U DIN 43710	(-100 ... 600) °C (-148 ... 1112) °F	0.1 °C	0.3 °C	0.2 °C
C	(0 ... 1500) °C (32 ... 2732) °F	0.1 °C	1.0 °C	0.5 °C
C	(1500 ... 2000) °C (2732 ... 3632) °F	0.1 °C	1.4 °C	0.7 °C
C	(2000 ... 2320) °C (3632 ... 4208) °F	0.2 °C	1.9 °C	1.0 °C
D	(0 ... 1700) °C (32 ... 3092) °F	0.1 °C	1.0 °C	0.5 °C
D	(1700 ... 2200) °C (3092 ... 3992) °F	0.1 °C	1.6 °C	0.8 °C
D	(2200 ... 2495) °C (3992 ... 4523) °F	0.2 °C	3.6 °C	1.8 °C

Special functions

- Steps;** 10 programmable, 10%, 20%, 25% div. stepping by key or adj. timer
- Ramp;** programmable travel time for up/down and dwell
- Scaling;** in 5 digits and sign on all electrical ranges
- Temp. XMT cal.;** both measure and source readings in temp. units. Cal.function extended for all output functions
- Temp. XMT sim.;** mA source reads in temperature units
- Signal converter;** any measure into any source, fully isolated

Note:

Reference Accuracies	Thermocouple accuracies do not include cold junction compensation errors 22 °C 1, RH 45% ±15
Cold Junction error	1 year for 17 °C to 27 °C; outside these limits 0.0005% / °C typical on mV ±0.4 °C (0.8 °F) max. in transient +0.2 °C (0.4 °F) max. when steady
Resolution error	Included in range error
Long term drift after 1 year	0.005% / year or 1000 hours operating
Cold Junction modes	Internal, Manual, External
Temperature scale	Selectable IPTS 68 or ITS 90
Operating temp.	-10 °C to 50 °C (14 °F to 122 °F)
Storage temp.	-20 °C to 70 °C (-4 °F to 158 °F)
Relative humidity	0 - 90% non-condensing
Electrical protection	50 V, 30 sec. max. Ohms source to mV-ground terminal; 5 V max.
Readings	Multilingual. Temp. °C or °F
Batteries (LR14 or C)	4x 1.5 V alkaline or 1.2 V NiCd
Battery life	Alkaline; ;10 hours at 20 °C (68 °F) Ni-Cd; ;8 hours at 20 °C (68 °F)
Battery life 12 mA sourcing	Alkaline; 5.5 hours at 20 °C (68 °F)
12 mA sourcing	Ni-Cd; 5 hours at 20 °C (68 °F)
Low battery warning	Shows a battery symbol
Line power	With optional adaptor 115 - or 230 VAC
Recharge NiCd'	With optional adaptor 115 - or 230 VAC
User terminals	Gold plated, standard 4 mm plugs
T/C comp.wire terminals	Screw fixable, 2 mm diameter max.
Protection	IP 53
Size	210 x 120 x 50 mm without case (8.4 x 4.8 x 2 inch)
Carrying case	Cordura
Weight	1.2 kg (2.7 lbs) with batteries
Keystroking	9 operation sequences storage
Contact change detect.	Reading freezes on open or close
Switch resistance	Switch resistance measurement during switch test.
PCMCIA station	PCMCIA card type 1 or 2
Detect. level freq.in	Adjustable; 10 mV to 5.0 V
Pulse source level	Adjustable; 0 - 24 V, 0.1 V resolution, 2% accuracy
Pulse source form	Symmetrical square, zero based - 70 mV
Pulse source speed	Adjustable in Hz or Baud rate
LCD display	Full graphic, with contrast control and backlight timer
Ohms simulation	0.18 to 5.0 mA excitation current either polarity
Ohms input terminals	2, 3 or 4 wire automatic mode select. True 4 - wire system

Specifications subject to change without notice

Pressure Sensors (optional)

Gauge:				Part No:
0 -	1	psi /	70	mbar #800
0 -	2.5	psi /	175	mbar #801
0 -	3	psi /	200	mbar #802
0 -	5	psi /	350	mbar #803
0 -	10	psi /	700	mbar #804
0 -	15	psi /	1	bar #805
0 -	20	psi /	1.4	bar #806
0 -	30	psi /	2	bar #807
0 -	50	psi /	3.5	bar #809
0 -	75	psi /	5	bar #810
0 -	100	psi /	7	bar #811
0 -	150	psi /	10	bar #813
0 -	300	psi /	20	bar #814
0 -	450	psi /	30	bar #815
0 -	500	psi /	35	bar #816
0 -	600	psi /	40	bar #817
0 -	1000	psi /	70	bar #818
0 -	1750	psi /	120	bar #819
0 -	2000	psi /	140	bar #820
0 -	2300	psi /	160	bar #821
0 -	3000	psi /	200	bar #822
0 -	5000	psi /	350	bar #823
0 -	6000	psi /	400	bar #824
0 -	7000	psi /	500	bar #825
0 -	10000	psi /	700	bar #826

Note: All pressure sensors from 10 psi up to 500 psi are able to measure negative pressure down to -1 bar.

Absolute:				Part No.
0 -	5	psi /	350	mbar #853
0 -	10	psi /	700	mbar #854
0 -	15	psi /	1	bar #855
0 -	20	psi /	2	bar #856
0 -	30	psi /	3	bar #857
0 -	50	psi /	3.5	bar #859
0 -	75	psi /	5	bar #860
0 -	100	psi /	7	bar #861
0 -	150	psi /	10	bar #862
0 -	200	psi /	14	bar #863
0 -	300	psi /	20	bar #864
0 -	450	psi /	30	bar #865
0 -	500	psi /	35	bar #866
0 -	600	psi /	40	bar #867
0 -	10000	psi /	70	bar #868

Differential:				Part No.
0 -	5	psi /	350	mbar #900
0 -	10	psi /	700	mbar #901
0 -	15	psi /	1	bar #902
0 -	30	psi /	2	bar #903
0 -	45	psi /	3	bar #904
0 -	50	psi /	3.5	bar #905
0 -	75	psi /	5	bar #906
0 -	100	psi /	7	bar #907
0 -	150	psi /	10	bar #908
0 -	220	psi /	15	bar #909
0 -	300	psi /	20	bar #910
0 -	500	psi /	35	bar #911

Note: Maximum line pressure 35 bar Differential ranges uni-directional use only.

Pressure sensors

Standard specification

Reference	Horizontal positioned sensor(s) 22 °C $\pm 1^{\circ}\text{C}$ (72 °F $\pm 2^{\circ}\text{F}$), RH 45% ± 15 (absolute sensors vertically positioned)
Calibration	Traceable to National Standards
Temperature effects	$\pm 0.5\%$ F.S. T.E.B. over 0-50 °C, typically 0.015% F.S./°C
Zero error compensation	Manual reset on TRX-II calibrator
Overpressure	2x pressure range up to 140 bar max. for ranges 120 bar & lower 3x pressure range up to 200 bar max. for ranges 120 bar & above
Pressure containment	2x pressure range up to 1000 bar max. for ranges 120 bar & lower, 3x pressure range up to 1400 bar max for ranges 120 bar & above
Recalibration	Recommended for each 12 to 14 months
Warm-up time	15 minutes for rated accuracies
Operating temperature range	-10 °C to 40 °C (-14 °F to 104 °F)
Relative Humidity	0-90% non-condensing
User terminals (electrical)	Gold plated for standard 4 mm plugs
Interconnecting plugs	Gold plated 2 mm and 4 mm plugs
Protection	IP 66
Size	70 x 25 mm (2.8 x 1 inch)
Pressure readings (selectable)	kPa, mbar, psi, inHg, inH ₂ O, mmH ₂ O, ftH ₂ O, mmHg, kgf/cm ² and atm
Selectable TRX-II source readings	Pressure sensor + all standard TRX-II source functions
Selectable TRX-II measure readings	Pressure Milliamps Switch
Media compatibility	Fluids compatible with stainless steel 316L and Hastelloy C276
Electrical interface	LEMO connector (4 pin)
Pressure connection	G $\frac{1}{4}$ female with $\frac{1}{4}$ NPT male and G $\frac{1}{4}$ 13 flat male adaptor and bonded seal

Specifications subject to change without notice.

Protocol for RS232 System Integration

Serial port settings

Baud Rate:	9600
Parity:	none
Bits:	8
Stop:	1
Hardware handshake:	none

