Time Electronics
Calibration, Test and Measurement

User Manual

7005
Voltage/Current Loop Calibrator

Version 1.3
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Time Electronics Ltd
Unit 5, TON Business Park, 2-8 Morley Road,
Tonbridge, Kent, TN9 1RA, United Kingdom.

T: +44 (0) 1732 355993 | F: +44 (0) 1732 350198
mail@timeelectronics.co.uk | www.timeelectronics.com

This manual provides operating and safety instructions for the Time Electronics product. To ensure correct operation and safety, please follow the instructions in this manual.

Time Electronics reserves the right to change the contents, specifications and other information contained in this manual without notice.

Contents

1 Introduction

A precision instrument primarily used for the calibration and simulation of voltage and current loops. The 7005 is a high accuracy calibrator incorporating source and measure capabilities. With user friendly controls and simple operation the 7005 is an excellent instrument for both process engineers and calibration technicians.

The three operating modes provide a fast and easy solution to process applications;

- Loop current/voltage source for simulating a transmitter and the loop supply
- Sink of loop current for simulating a transmitter
- Measurement of loop current/voltage for simulating a loop indicator

Manual step of the output is possible at five calibration points; 0 %, 25 %, 50 %, 75 % and 100 % of span. Automatic stepping of the output is also available, both up and down with programmable dwell times. Continuous up/down ramping can also be performed, with user programmable ramp rates and dwell time (top and bottom).

In source mode the range can be user programmed to any value between 0 mA and 50 mA, or 0V and 21 V. For example, a low point of 10mA and a high point of 50 mA could be set giving a span of 40 mA.

Measure mode provides both voltage and current measuring capability with 5 digit resolution. Ranges are 0 to ± 5 V and ± 5 to ± 25 V, 0 to ± 25 mA and ± 25 to ± 125 mA.

Alternatively, the signal can be measured as a % of span for the following ranges; 4 to 20 mA, 0 to 20 mA, square root 4 to 20 mA, or square root 0 to 20 mA. For all measurements a Min/Max recording function is available on demand.

An internal NiMH battery powers the unit for typically 9 hours continuous use and an external mains charger is supplied as standard. An automatic power-down feature is incorporated to conserve battery life, which can easily be disabled if not required.

The unit is constructed in an impact resistant ABS case and connections are made via 4 off 4 mm binding terminal posts.

1.1 Summary of Functions

1.1.1 Source mode

- User programmable ranges - any values between 0 and 50 mA or 0 and 21 V.
- Fixed ranges are available: 4 to 20 mA, 0 to 20 mA, sqrt 4 to 20 mA, sqrt 0 to 20 mA.
- Fine adjustment (inching) is available for precise deviation from the calibration point.
- Manual step output - five calibration points 0 %, 25 %, 50 %, 75 %, and 100 %.
- Automatic step output (up/down) - five cal points with programmable dwell period.
- Ramp output - programmable ramp rate (0 to 20 mA/sec or 0 to 20 V/sec). Programmable dwell period (0 to 1000 seconds).

1.1.2 Measure mode

- Voltage and current measuring capability with 5 digit resolution.
- Ranges: 0 to ± 5 V and ± 5 to ± 25 V, 0 to ± 25 mA and ± 25 to ± 125 mA.
- Signal can also be measured as a % of span on ranges: 4 to 20 mA, 0 to 20 mA, square root 4 to 20 mA, square root 0 to 20 mA.
- For all measurements a Min/Max recording function is available on demand.

1.2 Technical Specifications

Voltage Source

Range	Resolution	Accuracy	Output current	Output resistance
0 to 21 V	1 mV	± 0.01 % of setting ± 4 mV	50 mA	< 1 Ω

DC Voltage measure *(0 to ± 25 V, auto-ranging)*

Range	Resolution	Accuracy	Measure load
0 to 5 V	0.1 mV	± 0.01 % of reading ± 0.4 mV	10 MΩ
5 to 25 V	1 mV	± 0.01 % of reading ± 2 mV	10 MΩ

DC Current source

Range	Resolution	Accuracy	Output voltage	Loop resistance
0 to 50 mA	1 µA	± 0.01 % of setting ± 2 µA	22 V Max	1100 Ω @ 20 mA

DC Current measure *(0 to ± 125mA, auto-ranging)*

Range	Resolution	Accuracy	Measure load
0 to 25 mA	1 µA	± 0.01 % of reading ± 2 µA	24.5 Ω
25 to 125 mA	10 µA	± 0.01 % of reading ± 20 µA	24.5 Ω

DC Current source

Range	Resolution	Accuracy	Min external drive	Max external drive
0 to 50 mA	1 µA	± 0.01 % of setting ± 2 µA	4 V	40 V

1.2.1 General Specifications

Operating temperature .....–10 to 50 °C. Storage temperature –30 to 70 °C.

Operating humidity .....0 to 90 % non-condensing at 25 °C.

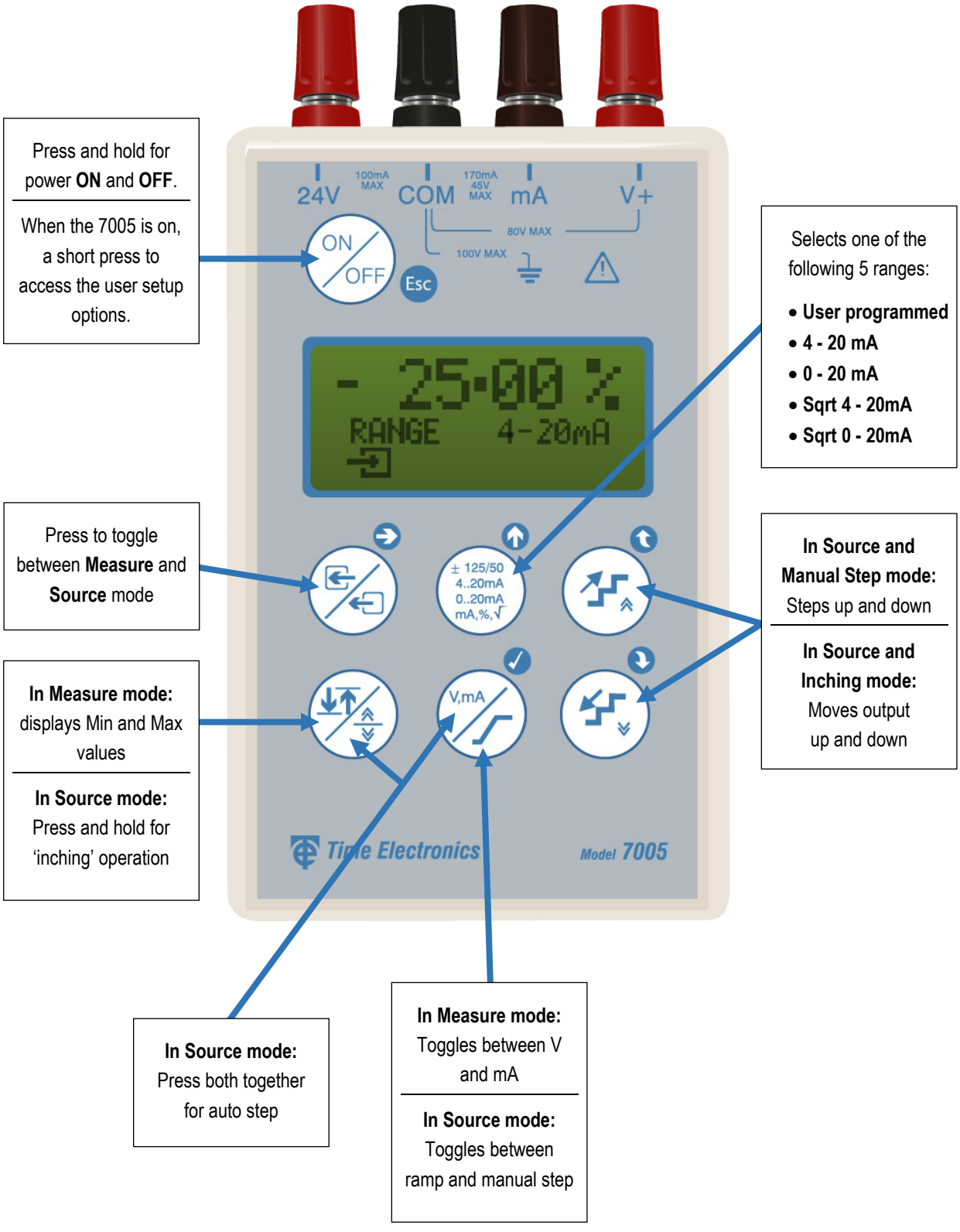
Dimensions/Weight.....H 165 x W 90 x D 45 mm / 0.42 kg.

Power .....Internal rechargeable NiMH battery pack. Battery life typically 9 hours. Auto power-down feature. Full recharge from being exhausted will take approximately 16 hours with the unit switched off.

Optional extras.....Calibration certificates: Traceable & accredited (ISO 17025).

2 Front Panel Controls

2.1 Main Control Buttons

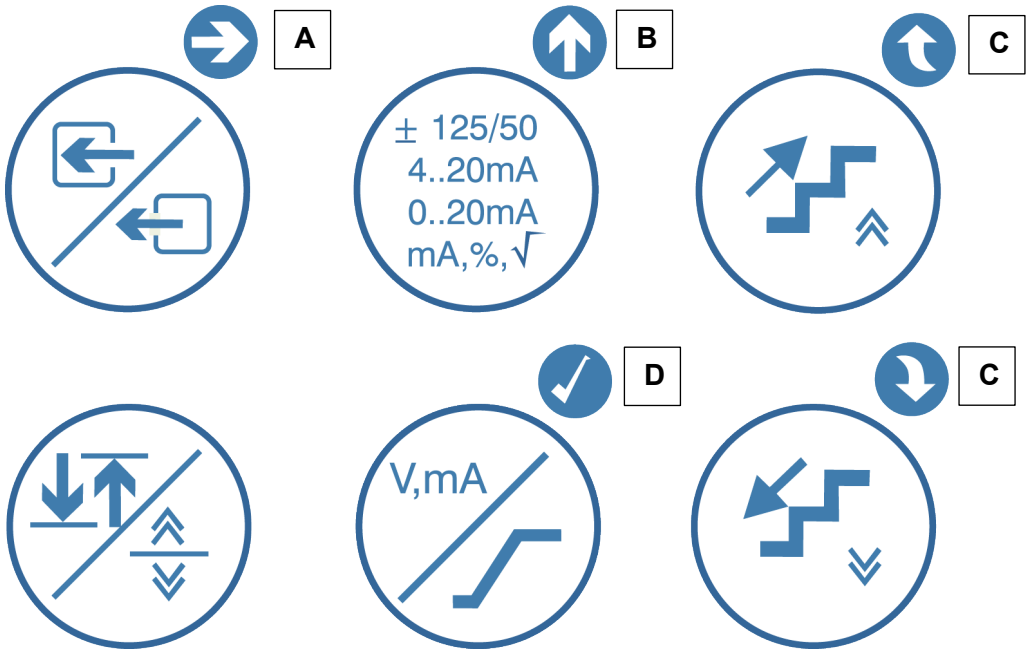


2.2 Setup Option Buttons

When the 7005 is powered on, a short press of the ON/OFF/Esc button accesses the setup options. To use the programmable settings for sourcing, the 7005 must be in the source mode with the range selected prior to pressing the ON/OFF/Esc button (see Operation Section).

In measure mode there are no selectable user setting options, only the automatic power-down can be enabled/disabled.

The controls for setup options are indicated in the bottom left corners of the buttons, and used to navigate and save settings.



A. Move cursor right.

B. Increment digit.

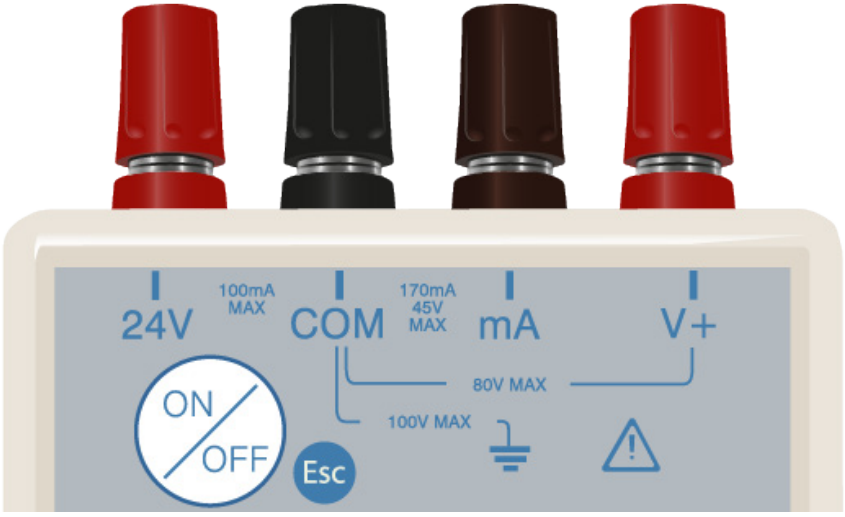
C. Scroll through options.

D. Confirm and Save setting.

The ON/OFF/Esc button is used to exit the setup menus at any time.

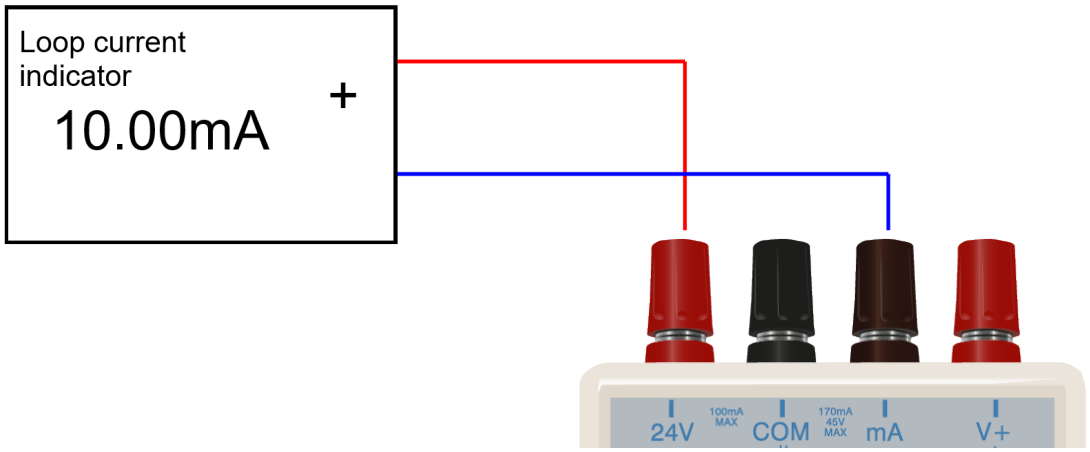
3 Connections

Connections is via 4mm shrouded sockets at the top of the 7005.

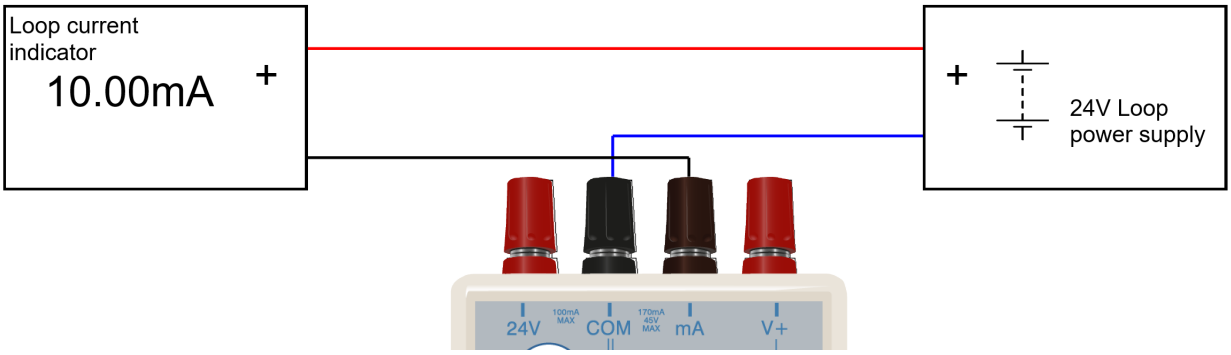


3.1 CURRENT loop connections

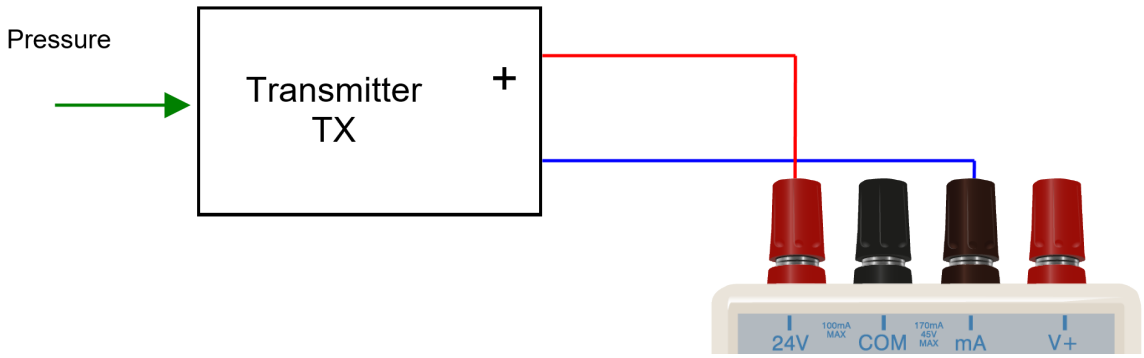
Source: 7005 supplying loop power and setting loop current:



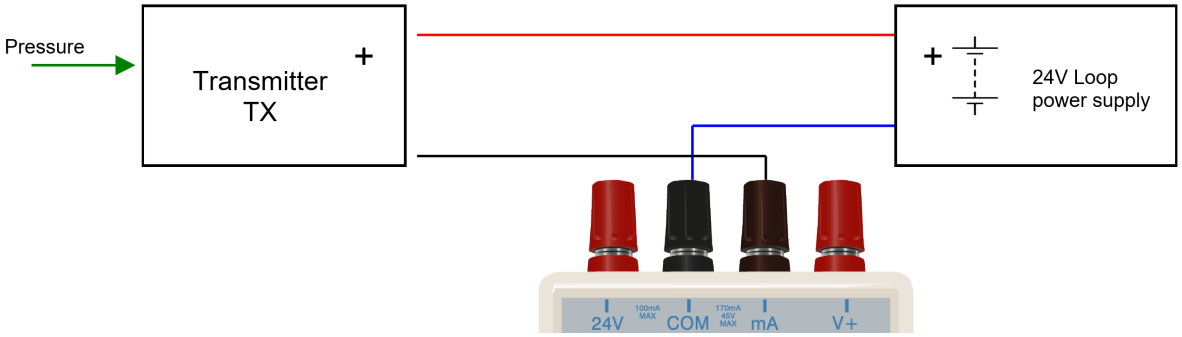
Sink: 7005 setting loop current:



Measure: 7005 supplying loop power while measuring loop current:

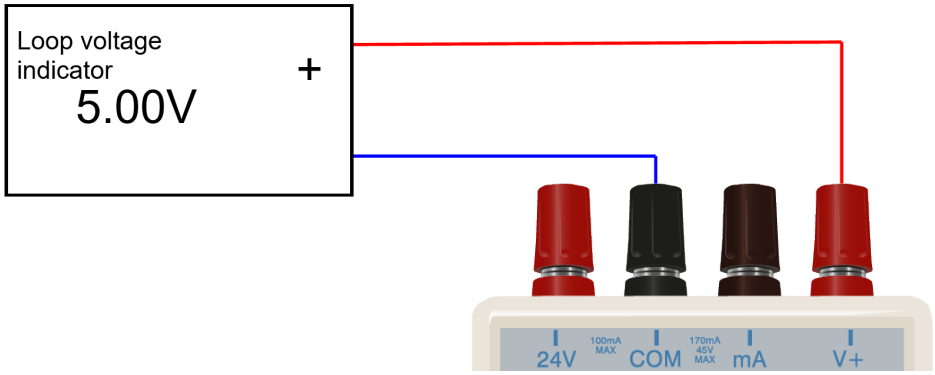


Measure: 7005 measuring loop current, loop power external

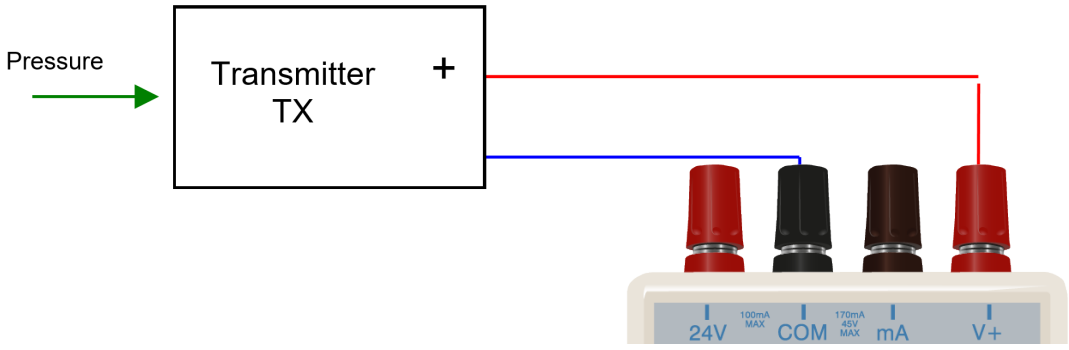


3.2 VOLTAGE loop connections

Source: 7005 setting loop voltage:



Measure: 7005 measuring loop Voltage:



4 Operation

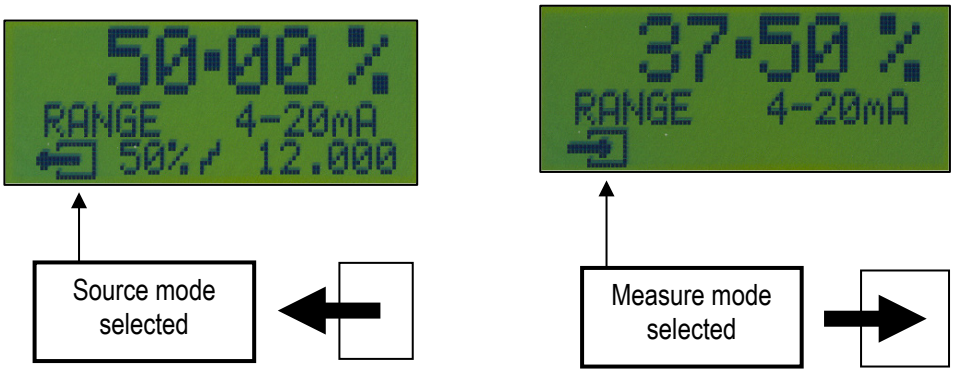
4.1 ON/OFF Control

To turn the 7005 **ON**, press and hold down the ON/OFF/Esc. button until the display powers up.

To turn the 7005 **OFF**, press and hold down the ON/OFF/Esc. button until the display blanks.

4.2 Selecting Source or Measure Mode

By pressing the **Source / Measure** button the 7005 can be toggled between source mode and measure mode.



4.3 Selecting Current or Voltage

Note: Changing between voltage and current can only be done in Measure mode.

Press the **Source / Measure** button to change in to **Measure mode**.

Press the **V / mA** button until V or mA is displayed on the screen.

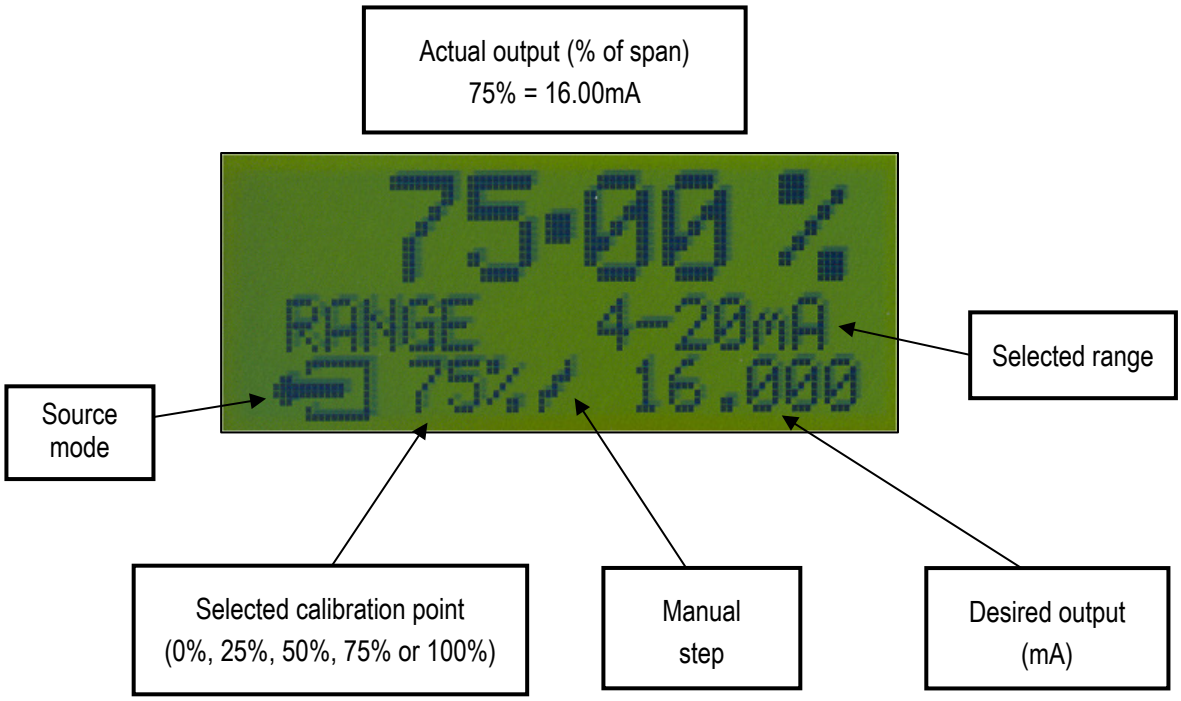
4.4 Source mode

The 7005 can be operated as either a current source or a voltage source.
When calibrating current loops, the internal 24V power supply may be used to provide the drive voltage.

Alternatively, when the loop is externally powered, the 7005 provides a sink function.

Operation of the 7005 in both source and sink is identical. However, the connections made to the terminals differ (see section 3).

Typical source display



4.4.1 Current source

Selection of range

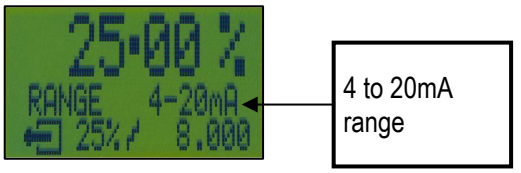
In **Measure Mode**, ensure the 7005 is in mA units by pressing the **V / mA** button until **mA** is displayed on the screen.
Note: When the 7005 powers on it will default to **Measure mode** and the first range mA (4 to 20mA) automatically.

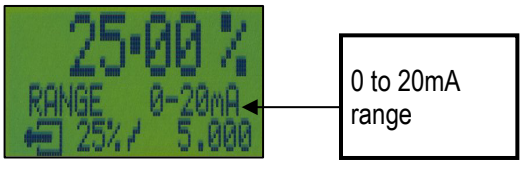
Then press the Source/Measure button to change to **Source mode**.

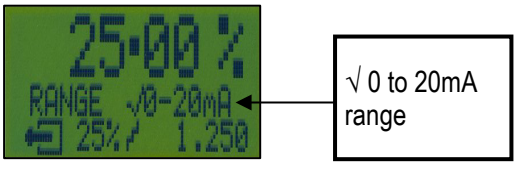
Press the **Range** button to step though the available ranges:

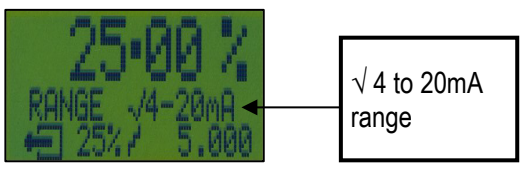
- 4 to 20mA
- 0 to 20mA
- √ 4 to 20mA
- √ 0 to 20mA
- User programmed range

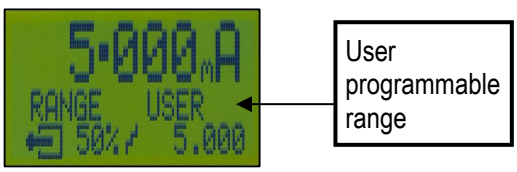
Note that the first four ranges above are indicated on the display to the right of the word RANGE. When the User programmed range is selected, 'USER' is shown on the right of the word RANGE.











4.4.2 Voltage source

The unit can operate as a voltage source up to a maximum of 21V at 20mA.

Connection is made via the COM and V+ terminal.

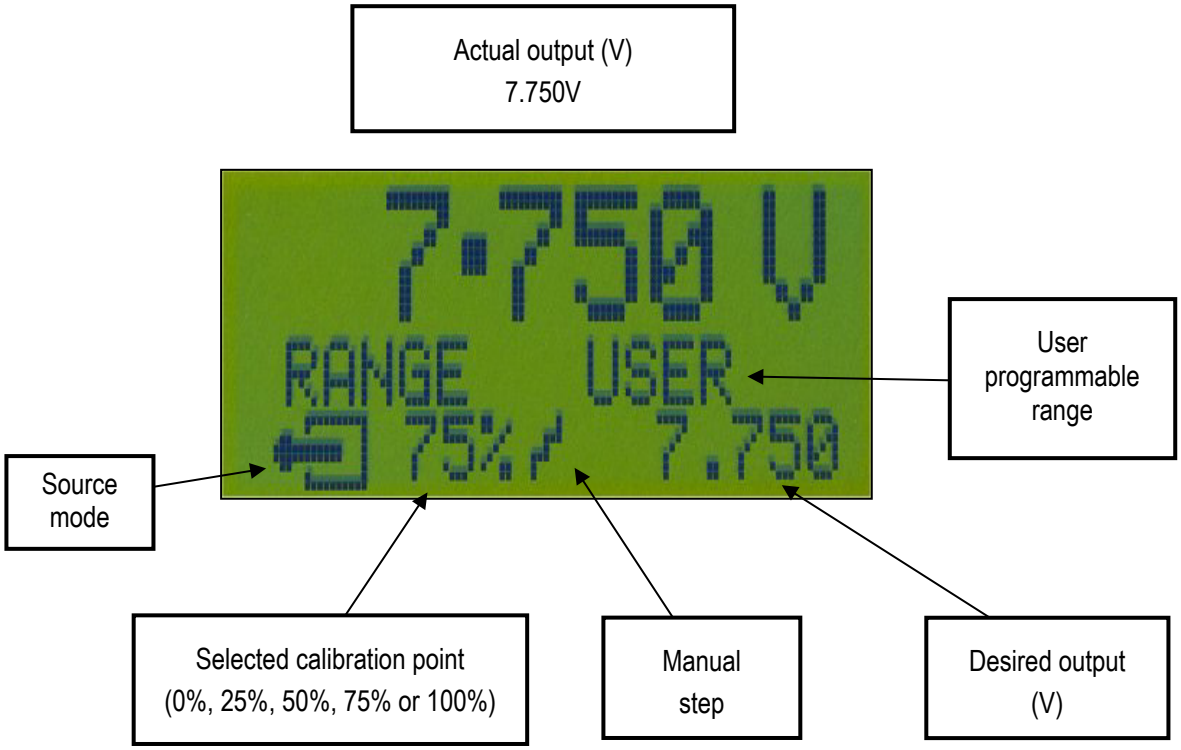
Note: These are the same terminals used for voltage measurement and it is therefore recommended that all leads are disconnected when changing from Source to Measure mode. See Connections Section for details.

In **Measure Mode**, press the **V / mA** button until **V** is displayed on the screen.

Then press the Source/Measure button to change to **Source mode**.

In Voltage Source Mode only the user programmable range (USER) is available.
See the User Setup section for more details on settings.

Typical Voltage Source display



4.4.3 Output Control

The 7005 provides three methods of controlling the output:

1) Manual step

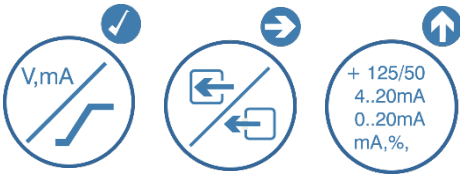
2) Auto-step

3) Ramp

4.4.3.1 MANUAL STEP

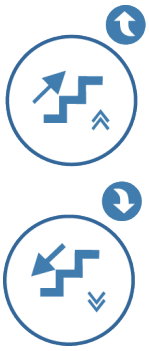
Provides manual control of the 5 preset calibration points: 0%, 25%, 50%, 75% or 100% of span.

The output can also be fine adjusted (inched) to provide an indication of the deviation from the calibration point.

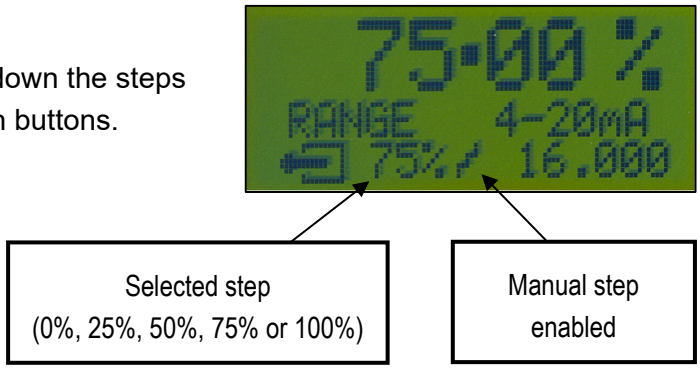


Ensure the unit is in Source mode (V or mA) as required.

Select range as required.



The user can move up and down the steps by pressing the up and down buttons.

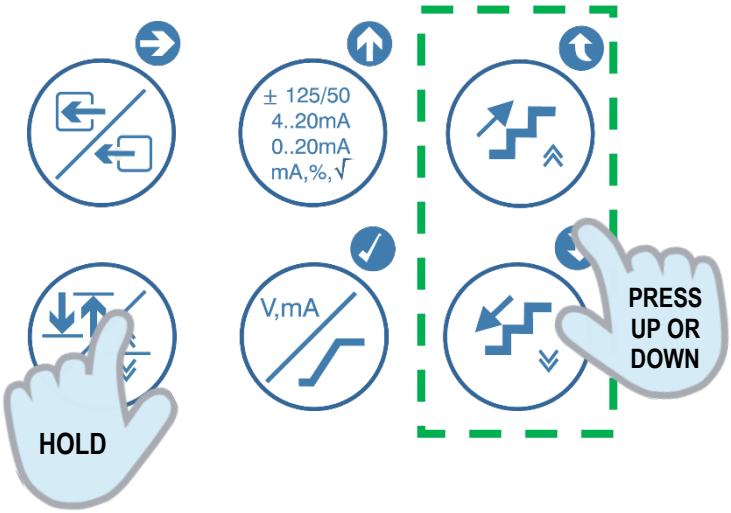


Fine Increment and Decrement (1µA resolution) - Inching

You can use the inching method for finer adjustment of the steps by pressing a combination of buttons.

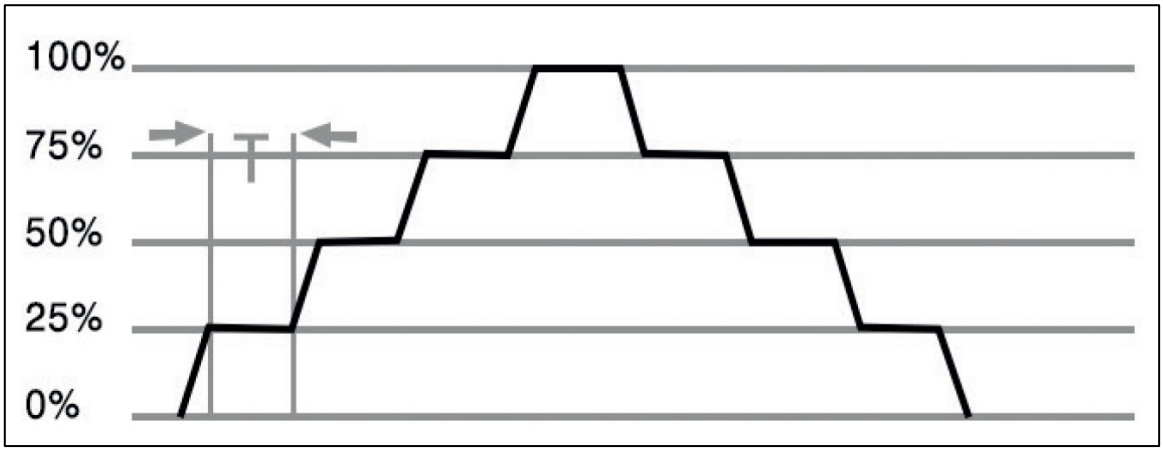
Hold down the '*Min/Max*' button.

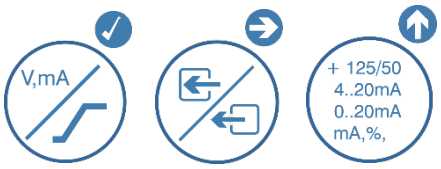
Press the Up/Down buttons to adjust the output in 1µA steps.



4.4.3.2 AUTO-STEP

Provides automatic stepping with a programmable dwell period between each steps.

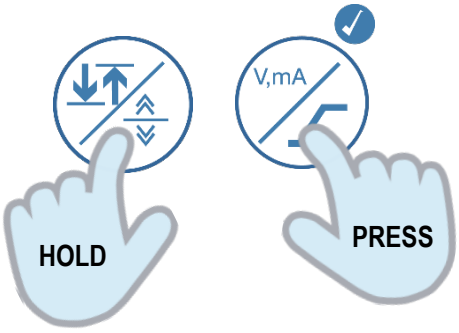


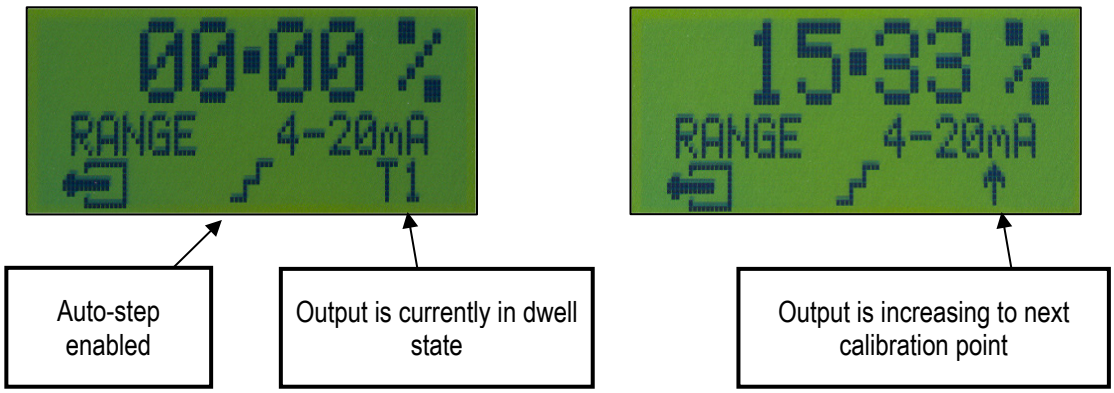


Ensure the unit is in Source mode (V or mA) as required.

Select range as required.

To start the Auto-Step, press and hold the **Inch** button followed by a short press of the **Ramp** button

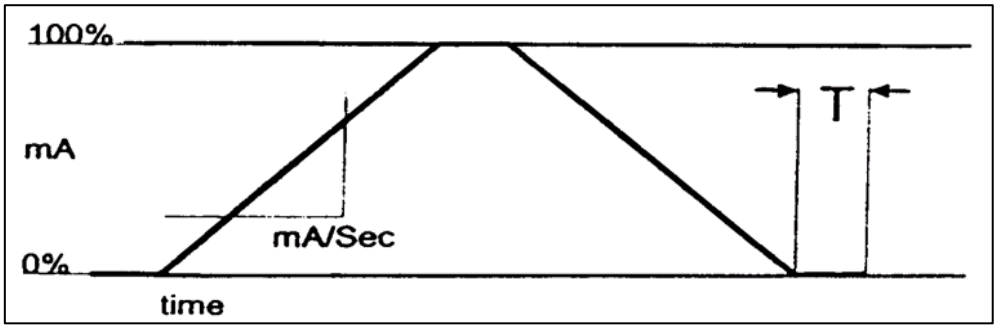


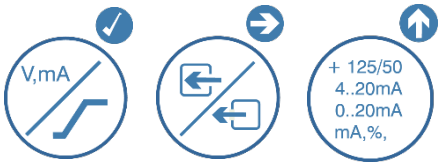


To stop the Auto-Step press the **Ramp** button.

4.4.3.3 RAMP

Provides a continuous ramp, with a programmable dwell period at the top and bottom.



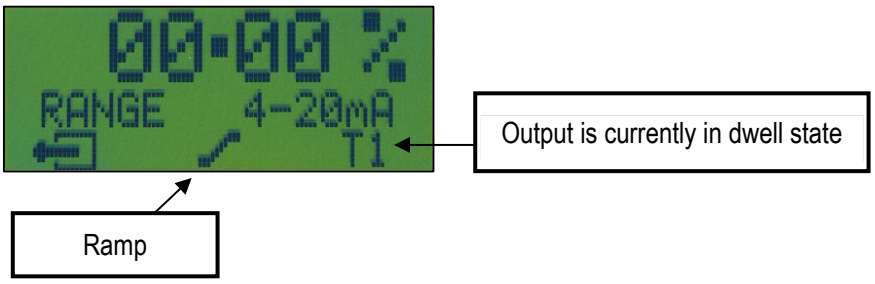


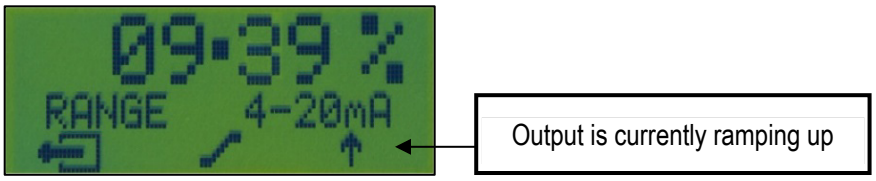
Ensure the unit is in Source mode (V or mA) as required.

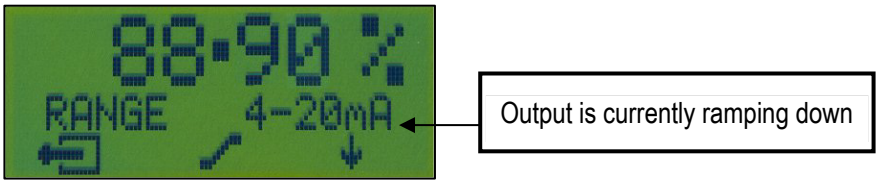
Select range as required.

To start the ramp press the **Ramp** button.

To stop it press the **Ramp** button again.

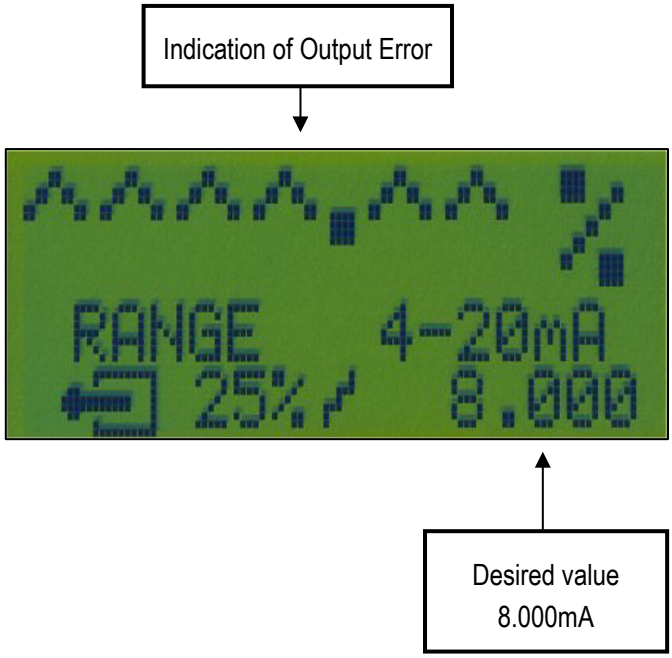






OUTPUT ERRORS

When the unit is unable to provide the desired output due to output error conditions, the display will show up arrows in place of the digits.



Output error conditions are typically:

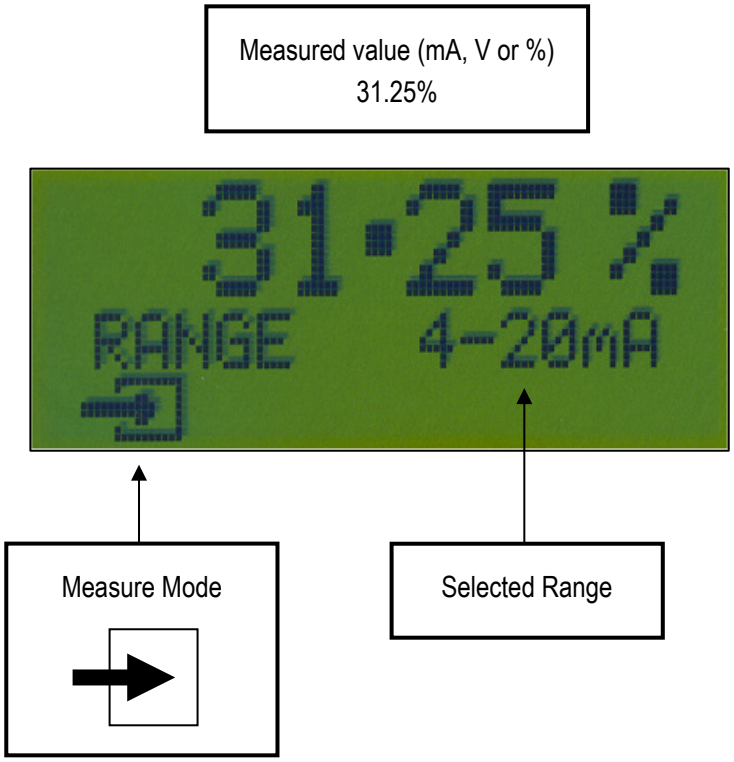
A. Loop resistance too large (current source)
B. Loop resistance too small (voltage source)
C. External loop supply voltage too low (current sink)

4.5 Measure Mode

When in measure mode, current or voltage is displayed in either mA, Volts, or %(of span).

Additionally maximum and minimum readings can be displayed.

Typical Measure display



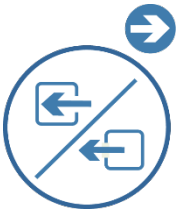
4.5.1 Current Measure

The 7005 can measure current up to 125mA via the COM and mA terminals.

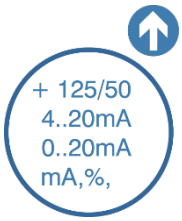
See Connections Section for more details.

Selection of range

In **Measure Mode**, ensure the 7005 is in mA units by pressing the **V / mA** button until **mA** is displayed on the screen.
Note: When the 7005 powers on it will default to **Measure mode** and the first range mA (4 to 20mA) automatically.



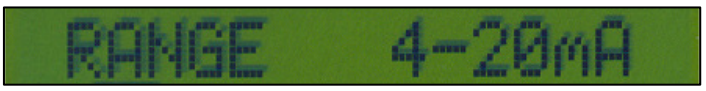
If in source mode from a previous operation, then press the Source/Measure button to change to **Measure mode**.



Press the **Range** button to step though the available ranges:

- 4 to 20mA displayed in %
- 0 to 20mA displayed in %
- √ 4 to 20mA displayed in %
- √ 0 to 20mA displayed in %
- 0 to 125mA displayed in mA's

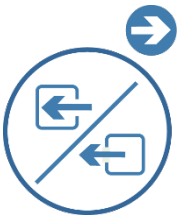
Note that the selected range is indicated on the display to the right of the word RANGE.



4.5.2 Voltage Measure

The unit can measure voltage up to +/-25V.
Auto-ranging allows full resolution (5 digits) for measurements lower then +/- 5V.

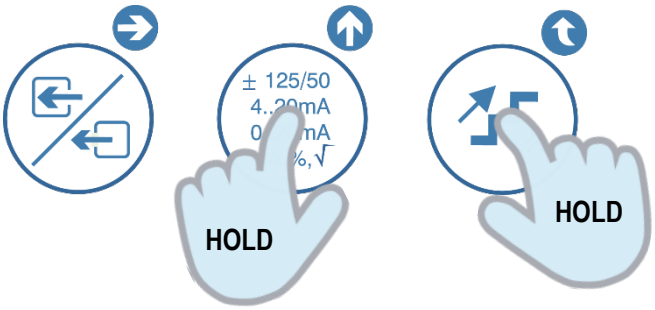
In **Measure Mode**, ensure the 7005 is in V units by pressing the **V / mA** button until **V** is displayed on the screen.



If in source mode from a previous operation, then press the Source/Measure button to change to **Measure mode**. Then press the V / mA button until **V** is displayed on the screen.

Apply a shorting link between V+ and COM terminals.

Press and hold the **Range** and **Step Up** simultaneously to zero the reading.



Remove shorting link and connect signal to be measured, -ve to COM and +ve to V+.
See the Connections Section for details.

4.5.3 Min / Max Readings

To display the minimum and maximum readings in mA, V or %.

Press the '*Min / Max*' button

Please note due to space limitations on the display the min and max values for voltage are shown without decimal points

4.6 User Setup

The 7005 is fitted with non-volatile memory to store user set values.

4.6.1 Automatic power-down

An automatic power-down feature is incorporated and turns the unit off after approximately 7 minutes if no buttons are pressed. If required the automatic power-down feature can be disabled.

When the 7005 powers on it will default to **Measure mode** automatically. If in source mode from a previous operation, then press the Source/Measure button to change to **Measure mode**.

Then press the **Esc** button.

The display will show:

Auto power-down enabled

Auto power-down disabled

To toggle the Auto power-down setting press the **Range** button.

Press the **V / mA** button to confirm and store this setting.

Press the **Esc** button to return to the measure mode.

4.6.2 User programmable range and ramp

In **Measure Mode**, press the **V / mA** button until the desired function is displayed on the screen.

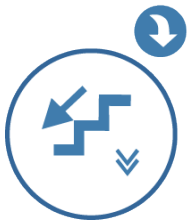
Then press the Source/Measure button to change to **Source mode**.

Note: The user settings stored in mA function are separate to the settings in Voltage function.

Using the **Range** button select the user programmable range.
See the Current and Voltage Source Section for more details.

Press the **Esc** button, to enter user setup

You can step through the user settings by pressing **Up and Down** buttons.

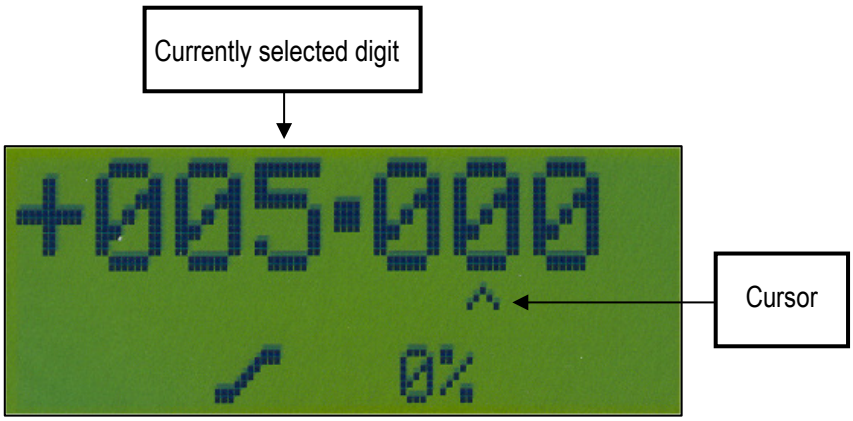


The user settings are displayed as:

0%	Set low end of user range in mA or V.
100%	Set high end of user range in mA or V.
mA.V/S	Set ramp rate in mA or V per second.
T1	Set dwell period for ramp and auto-step in seconds.

To change a user setting move the cursor underneath the digit that you wish to change using the **Source / Measure** button.

Press the **Range** button the scroll though available digits.



Once the digits have been changed to the desired value press the **V / mA** button to confirm and store the setting.
The display will then return to the first user setting (0%)

Select the next user setting and change as required.

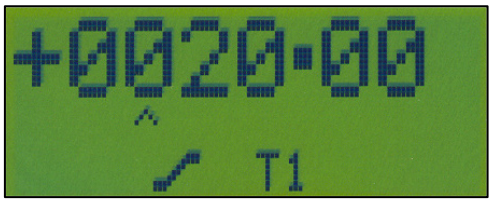
To exit the user setup and return to normal operation press the **Esc** button.

Example - Setting a range of 10 to 40mA with slow ramping:

A low end value of 10.000mA

A high end value of 40.000mA

A ramp rate of 0.5 mA per second



A dwell time of 20 seconds

5 Battery and Re-Charging

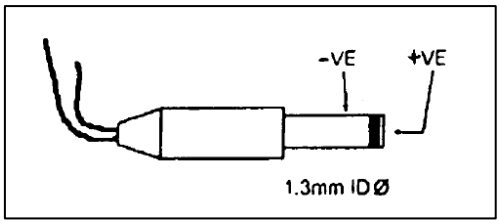
The unit is powered by a internal rechargeable NiMH battery pack.

To recharge the batteries, connect the supplied external battery charger to the unit via the 1.3mm socket located on the left hand case side.

The battery charger should be set to 12V.

Full battery recharge from being exhausted will take approximately 16 hours with the instrument switched off.

Battery charger connector polarity



6 Warranty and Servicing

Warranty

Time Electronics products carry a one-year manufacturer's warranty as standard.

Time Electronics products are designed and manufactured to the highest standards and specifications to assure the quality and performance required by all sectors of industry. Time Electronics products are fully guaranteed against faulty materials and workmanship.

Should this product be found to be defective, please contact us using the below details. Inform us of the product type, serial number, and details of any fault and/or the service required. Please retain the supplier invoice as proof of purchase.

This warranty does not apply to defects resulting from action of the user such as misuse, operation outside of specification, improper maintenance or repair, or unauthorized modification. Time Electronics' total liability is limited to repair or replacement of the product. Note that if Time Electronics determine that the fault on a returned product has been caused by the user, we will contact the customer before proceeding with any repair.

Calibration and Repair Services

Time Electronics offers repair and calibration services for all the products we make and sell. Routine maintenance by the manufacturer ensures optimal performance and condition of the product. Periodic traceable or accredited calibration is available.

Contacting Time Electronics

Online:
Please visit **www.timeelectronics.com** and select Technical Support from the Contact links. From this page you will be able to send information to the Time Electronics service team who will help and support you.

By phone:
+44 (0) 1732 355993

By email:
mail@timeelectronics.co.uk

Returning Instruments

Prior to returning your product please contact Time Electronics. We will issue a return merchandise authorization (RMA) number that is to accompany the goods returning. Further instructions will also be issued prior to shipment. When returning instruments, please ensure that they have been adequately packed, preferably in the original packing supplied. **Time Electronics Ltd will not accept responsibility for units returned damaged.** Please ensure that all units have details of the service required and all relevant paperwork.

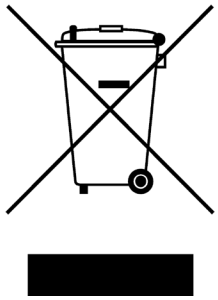
Send the instrument, shipping charges paid to:

Time Electronics Ltd
Unit 5, TON Business Park, 2-8 Morley Road,
Tonbridge, Kent, TN9 1RA.
United Kingdom.

Tel: +44(0)1732 355993
Fax: +44(0)1732 350198

Email: mail@timeelectronics.co.uk
Web Site: www.timeelectronics.com

Disposal of your old equipment



1. When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
2. All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
3. The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health.
4. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or return to Time Electronics.