OPERATION MANUAL
TRANS CAL
Model 7281

Exclusion of warranty liability for operating manuals

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The measurement solution. **burster**

Konformitätserklärung (nach EN ISO/IEC 17050-1:2010)
Declaration of conformity (in accordance with EN ISO/IEC 17050-1:2010)

Name des Ausstellers: burster präzisionsmesstechnik gmbh & co kg
Issuer's name:

Anschrift des Ausstellers: Talstr. 1-5
Issuer's address: 76593 Gernsbach, Germany

Gegenstand der Erklärung: Mobiles Hochpräzisions-Kalibrier- und Prüfgerät TRANS CAL
Object of the declaration: *Portable high precision calibrator and tester TRANS CAL*

                                     Modellnummer(n) (Typ):   7281-Vxxxx
                                     Model number / type:

                                     Diese Erklärung beinhaltet obengenannte Produkte mit allen Optionen
                                     This declaration covers all options of the above product(s)

Das oben beschriebene Produkt ist konform mit den Anforderungen der folgenden Dokumente:
The object of the declaration described above is in conformity with the requirements of the following documents:

Dokument-Nr / *Documents No.*	Titel / *Title*	Ausgabe/Ausgabedatum / *Edition/Date of issue*
2014/30/EU	Elektromagnetische Verträglichkeit *Electromagnetic Compatibility*	2014
2011/65/EU	ROHS 2 Richtlinie *ROHS 2 directive*	2011
EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen – industrielle Umgebung *Electrical equipment for measurement, control and laboratory use. General requirements*	2013

Gernsbach   20.10.2014   i.V. Christian Karius
Ort / *place*   Datum / *date*   *Quality Manager*

Dieses Dokument ist entsprechend EN ISO/IEC 17050-1:2010 Abs. 6.1g **ohne Unterschrift** gültig
*According EN ISO/IEC 17050 this document **is valid without a signature**.*

Table of contents

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1.   Safety instructions

On the device TRANS CAL model 7281 and in this manual the following symbols warn about risks:

1.1.   Symbols in this manual

1.1.1.   Signal words

The following signal words are used in the operating manual according to the specified hazard classification.

⚠ **DANGER**
DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **WARNING**
WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**
CAUTION indicates a hazard with a low level or risk which, if not avoided, could result in minor or moderate injury.
NOTICE
Property damage to the equipment or the surroundings will result if the hazard is not avoided.

Note: It is important to heed these safety notices in order to ensure correct handling of the TRANS CAL model 7281.

IMPORTANT: Follow the information given in the operating manual.

1.1.2.   Pictograms

⚠	**Danger of electric shock!**
!	**Observe the safety notices for protecting the instrument.**

1.2. Symbols on the device

> ### Richtige Schalterstellung schützt vor Gerätedefekt !
> ### Correct switch position protects device from damages !
>
> ☐ **NiMH rechargeable batteries**   **ACHTUNG**
> ☐ **Alkaline batteries**   **ATTENTION**

Read the text on the label.
In the battery compartment is a sliding switch. It is vital to set this switch correctly to rechargeable or non-rechargeable battery operation.
Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position, to avoid damage to the instrument.

TRANS CAL 7281

2.   Introduction

IMPORTANT: Read the operating manual carefully before using the equipment, and keep for future reference.

2.1.   Intended use

The TRANS CAL model 7281 can be used wherever there is a need to perform high-precision, on-site calibrations of sensing components used in equipment such as presses, torque tools or pressure-regulating systems.

An optional factory calibration certificate or German-accredited DKD/DAkkS calibration certificate can be provided when the TRANS CAL model 7281 needs to be used as a reference. This provides a quick and cost-effective way of assessing a system with traceable documentation of measurement results.

If a reference measurement cannot be made because the sensor location is difficult to access, it is still possible to test the zero point, the input, output and isolation resistance as well as the calibrating offset of the fitted sensor. It is also possible to check the display device by measuring the excitation voltage and simulating the characteristic values (mV/V or V) of the sensor used.

The TRANS CAL model 7281 is used in metrology institutes, calibration laboratories and in industry in the fields of quality assurance, facility commissioning and system monitoring.

Areas of use:

- Checking all kinds of presses
- Reference measurement in assembly lines
- Test of robotic pressing forces
- Calibrating test equipment
- Calibrating high-precision instrumentation

The TRANS CAL model 7281 can be fitted with standard or rechargeable batteries for portable use or can run from an external power supply. Combined with a reference sensor the TRANS CAL model 7281 provides a high-precision reference measurement chain e.g. for force measurements, but is also ideal for service engineers as a tool for locating faults in device and sensor hardware.

The choice of sensors includes strain gauge, normalized signal ± 5 V / ± 10 V and potentiometric sensors. The LCD graphics display shows the live measurement value and the corresponding bar indicator. It also supports display functions such as data-logger, tared value in % and upper/lower limit for the comparator with simultaneous indicator (**< = >**) of the evaluation result.

For routine testing and also fault-locating tasks, the tester makes it really simple to measure isolation resistances and input/output resistances. The device test function is a quick and easy way to verify that the display device complies with the characteristic value, offering strain-gage simulation of up to ± 50 mV/V or output of a normalized signal of up to 10 V. German-accredited DKD/DAkkS calibration certificates or factory calibration certificates are optionally available. The DigiCal configuration and data-acquisition software provides useful display and reporting functions.

The TRANS CAL model 7281 is **not** a substitute for a safety device; for instance it cannot be used as an emergency stop device in a press for when the pressure exceeds a set limit.

2.2. Customer service

2.2.1. Customer service department

If you need to ask about repairs, please telephone our Service department on +49 7224 645-606.

Please have the serial number to hand. The serial number is essential to establishing the definite technical status of the instrument and providing help quickly. You will find the serial number on the type plate of the TRANS CAL model 7281 instrument.

2.2.2. Contact person

If you have any questions relating to the TRANS CAL model 7281, please contact your representative or go directly to burster präzisionsmesstechnik gmbh & co. kg.

Headquarters

burster präzisionsmesstechnik gmbh & co kg
Talstraße 1 - 5
D-76593 Gernsbach
Germany

Telefon: (+49) 07224 645-0
Fax: (+49) 07224 645-88
E-Mail: info@burster.com

2.3. Environmental conditions

2.3.1. Storage conditions

The following requirements must be met when storing the TRANS CAL model 7281:

- Store at a temperature between -20 to +60 °C

- The unit must be packed in clean packaging

- Store in a dry environment

- No condensation

2.3.2. Conditions of use

!	**NOTICE**
	The rated temperature range for the TRANS CAL model 7281 is 0 °C to 40 °C. Do **not** switch on the instrument if it is outside this temperature range as this may damage the instrument. Use the instrument only in an environment that lies within the specified temperature range.

!	Do **not** switch on the instrument if there are signs of moisture or condensation as this may damage the instrument. If necessary, let the instrument dry off in a suitable place and make sure that the instrument has no traces of moisture inside or on the case before switching it on.

Note: The following requirements must be met when operating the TRANS CAL model 7281.

- Use only in enclosed spaces
- Rated temperature range between 0 to 40 °C
- Maximum height above sea level 2000 m
- Air humidity of 80% at up to 31 °C, decreasing linearly above that temperature to 50% at T_{max} (no condensation).
- Class of protection: 1
- Transient overvoltage category: CAT II
- Supply voltage: 4 x AA battery or 10 to 28 VDC (see section "3.2. Voltage supply").

2.3.3.   Restrictions on use

The TRANS CAL model 7281 does not pose a hazard if used within its specification and in accordance with the safety regulations.

The manufacturer does not accept liability for any personal injury or property damage arising from misinterpretation of measurement results.

Note: The TRANS CAL model 7281 is not suitable for use in the medical sector.

2.3.4.   Cleaning

⚠️⚡	⚠️ **DANGER**
	Risk of electric shock.
	Disconnect the TRANS CAL model 7281 from the mains socket before cleaning.

Disconnect the TRANS CAL model 7281 from the mains socket and use a slightly damp cloth for cleaning the unit.

!	**NOTICE**
	Do **not** immerse the TRANS CAL model 7281 in water or hold it under running water. Do not use strong clean agents as these may damage the instrument. Use a slightly damp cloth to clean the instrument.

2.4.   Personnel

Personnel must be familiar with the relevant regulations. They must follow these regulations. Only trained personnel who are familiar with the applicable safety regulations are permitted to operate the TRANS CAL model 7281.

2.5. Scope of delivery

- 1x TRANS CAL model 7281
- 4x Size AA cells (Mignon)
- 1x Operation manual
- 1x Wall mounting bracket

2.6. Unpacking

	⚠ **DANGER**
	Risk of electric shock.
	Never switch on the instrument if it shows signs of damage in transit. Only ever use the instrument under the conditions specified in this operating manual.

Inspect the TRANS CAL model 7281 carefully for damage. If you suspect that the TRANS CAL model 7281 has been damaged during shipping, notify the delivery company within 72 hours.

The packaging should be retained for examination by a representative of the manufacturer and/or the delivery company.

The TRANS CAL model 7281 must be shipped only in its original packaging or in packaging capable of providing an equivalent degree of protection.

	NOTICE
!	**In the battery compartment is a sliding switch. It is vital to set this switch correctly to rechargeable or non-rechargeable battery operation.**
	Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position, to avoid damage to the instrument.

2.7. Warranty

burster präzisionsmesstechnik gmbh & co kg provides a manufacturer's warranty for a period of 24 months after delivery.

Any repairs required during this time will be made without charge. This does not include damage arising from improper use.

Please note the following when sending the instrument in for repair:

- If there is a problem with the device, please attach a note to the instrument case summarizing the fault.
- Technical specifications subject to change at any time without notice.
  We also state explicitly that we do not accept liability for consequential damage.
- The instrument must always be dispatched in suitable packaging.

2.8.   Conversions and modifications

Note: If you open or dismantle the TRANS CAL model 7281 during the warranty period, this will void the warranty **immediately**.

The TRANS CAL model 7281 does not contain any parts that are intended to be serviced by the user. Only the manufacturer's own qualified personnel are permitted to open the TRANS CAL model 7281. This excludes the cover to the battery compartment.

It is forbidden to make any modification to the TRANS CAL model 7281 without our written permission. We cannot accept liability in the event of such action.

3. Device design

General data

Dimensions (L x W x H):	220 x 100 x 52 mm
Weight:	ca. 850 g
Protection type:	IP 40
Supply voltage:	10 ... 28 VDC
Nominal temperature range:	0 ... 40 °C
Storage temperature range:	-20 ... 60 °C

(for further information please see chapter „11. Technical Data")

Diagram 1: Device design

3.1. Versions

The TRANS CAL model 7281 is available in two different versions: the
TRANS CAL model 7281-V0000 and the TRANS CAL model 7281-V0001. These versions have a different range of functions:

Version \ Operation mode	TRANS CAL model 7281-V0000	TRANS CAL model 7281-V0001
Measurement mode	✓	✓
Sensor test		✓
Device test and strain gauge simulator		✓

3.2. Voltage supply

The TRANS CAL model 7281 can be operated using batteries (rechargeable or non-rechargeable) or using a power adapter. Switching between the two supply options for the TRANS CAL model 7281 is done **purely electronically**.

- When a voltage greater than about 10 V is supplied from the power adapter, the battery supply is disconnected. The power is then supplied solely from the power adapter.

- When the voltage from the power adapter is no longer present, the battery supply is reconnected.

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!	**NOTICE**
	In the battery compartment is a sliding switch. It is vital to set this switch correctly to rechargeable or non-rechargeable battery operation. Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position, to avoid damage to the instrument.

3.2.1. Using rechargeable batteries

The TRANS CAL model 7281 has a rear compartment for four AA (Mignon) batteries.

Note: **In the battery compartment is a sliding switch which must be set correctly to rechargeable or non-rechargeable battery operation.**
Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position. If you are using rechargeable batteries and the switch is not in the correct position, the charge controller remains off.

Four identical AA (Mignon) batteries each containing equal charge must be used.

Observe instructions of accumulator manufacturer in order to avoid memory effects or damages of the sensor.

Safety functions

"!! LoBat !!" appears on the display when the supply voltage is less than 4.6 VDC.

The TRANS CAL model 7281 has deep-discharge protection, which switches the battery supply off when the voltage is below 4 VDC. The TRANS CAL model 7281 cannot be switched on again until the supply voltage rises above 4.2 VDC.

Instrument operating periods

When connected to a strain gauge full-bridge sensor with 5 V excitation, the power taken from the rechargeable batteries by TRANS CAL model 7281 is about 0.47 W without backlit display and up to 1.6 W with backlit display.

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Charging the rechargeable batteries

!	**NOTICE**
	Use only NiMH rechargeable batteries with a capacity of > 2Ah. The instrument will be damaged if you ignore these requirements.

The rechargeable batteries can be charged via a power adapter directly from the
TRANS CAL model 7281. Charging does not depend on whether the TRANS CAL model 7281 is on or off.

You can continue to use all the measurement mode functions during the charging process.

Note: Use only NiMH rechargeable batteries with a capacity of > 2Ah.

- The time required to charge rechargeable batteries which can be charged by the TRANS CAL model 7281 is about 2.5 hours (capacity 2700 mAh) when using the power adapter. The charging time depends on the type of battery.
- The power consumption of the TRANS CAL model 7281 during charging is 12 W.
- The charging function is switched off for safety reasons if the temperature lies outside the temperature range between 5 °C and 45 °C.

We recommend using the following batteries:

Battery	Operating time until "!! LoBat !!"	Operating time from "!! LoBat !!" until switch-off
NiMH rechargeable batteries 2700 mAh	about 12 h*	about 1 h*
Alkaline non-rechargeable batteries 2600 mAh	about 6 h*	> 1 h*

* When background illumination is off.

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3.2.2. Using non-rechargeable batteries

!	**NOTICE**
	In the battery compartment is a sliding switch. It is vital to set this switch correctly to rechargeable or non-rechargeable battery operation.
	Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position, to avoid damage to the instrument.

When connected to a strain gauge full-bridge sensor with 5 V excitation, the power taken from the non-rechargeable batteries by TRANS CAL model 7281 is about 0.47 W without backlit display and up to 1.6 W with backlit display.

3.2.3. Mains/charging operation

The instrument can be operated from a DC voltage source (10 VDC to 28 VDC) or using a power adapter.

⚡	**DANGER**
	Risk of electric shock.
	Inspect the power adapter for damage before use. Do not connect the power adapter if damage is suspected.
	To help identify damage to the power adapter in good time, test the it regularly in accordance with German accident prevention regulations BGV A3.

3.3. What the LEDs mean

The LEDs are only active when the power adapter is plugged in.
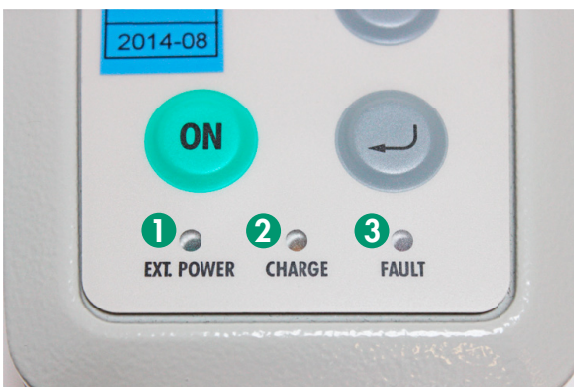
❶ D1 = Ext. Power
❷ D2 = Charge
❸ D3 = Fault

Diagram 2: What the LEDs mean

D1	D2	D3	Meaning
Off	Off	Off	External supply off
X	Off	Off	External supply on
X	X	Off	Charging in progress; yellow LED may also flash
X	X	X	**Rechargeable batteries faulty or inserted incorrectly (deep-discharge)**

!	**NOTICE**

	If LED **D3** shows a red light, switch off the TRANS CAL model 7281 and rectify the problem. Follow the instructions below to rectify the problem:
	
	    • Let the TRANS CAL model 7281 cool down
	
	    • Insert the battery with the terminals the correct way round.
	
	    • Replace the batteries

To reset **D3**, switch off the instrument then unplug the power adapter and plug it back in.

4. Controls and connections

4.1. Controls

❶ **[F1]**, **[F2]** and **[F3]** keys

❷ Cursor block for navigating in the menus (⇧top, ⇩bottom, ⇦left and ⇨right)

❸ **[ON]** key
ON/OFF for switching on and off

❹ **[ESC]** key

❺ **[Enter]** key

Diagram 3: Controls of TRANS CAL model 7281

4.2. Menu navigation

You can use the ⇧, ⇩, ⇦ and ⇨ keys to navigate though each of the menu options. Use the **[Enter]** key to select the highlighted menu option. To change the values, again use the ⇧ or ⇩key. To switch between the configured measurement programs, use the ⇦ or ⇨. The **[ESC]** key always takes you back to the previous menu.

Diagram 4: Menu navigation

4.3. Menu structure
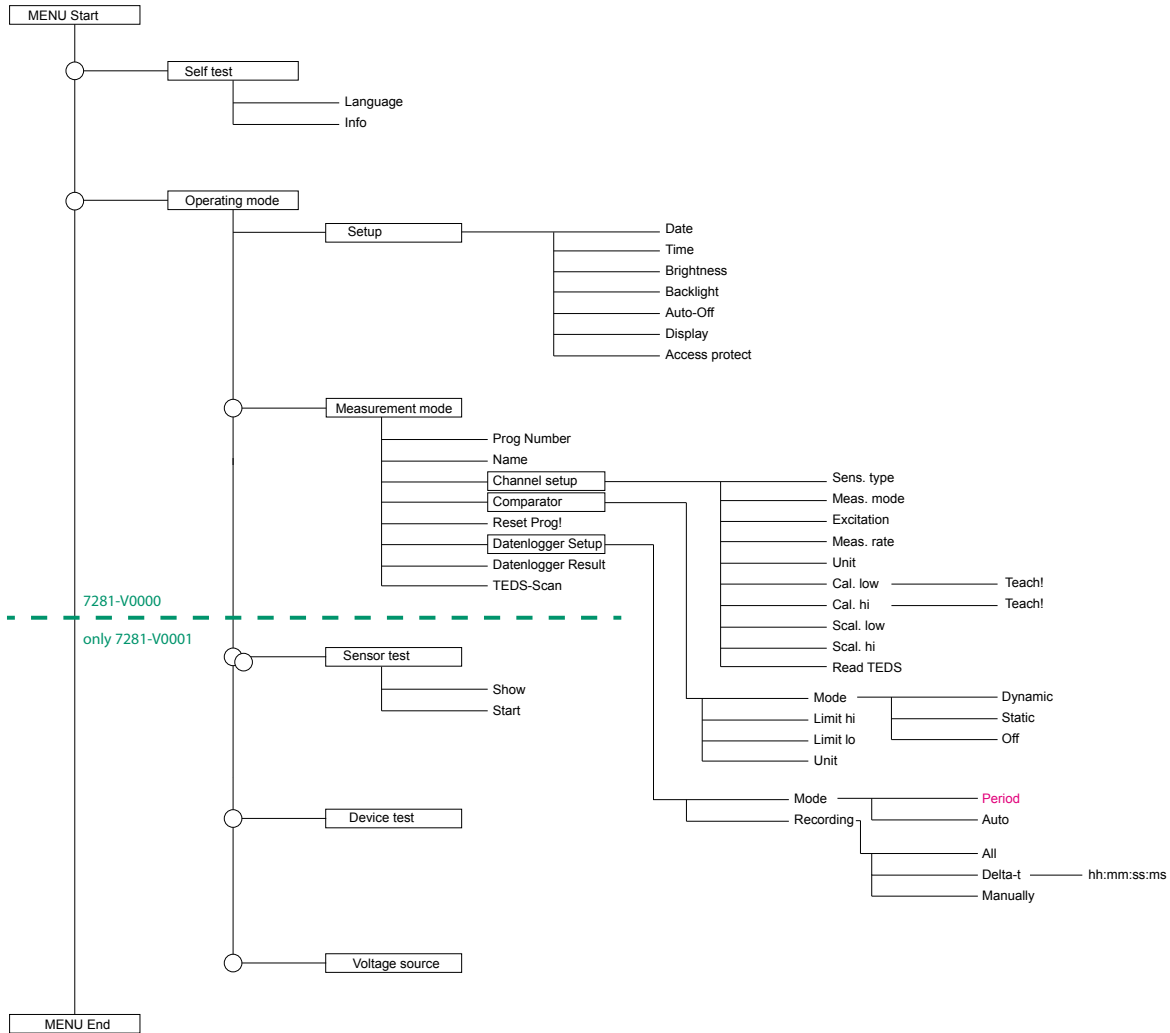
Diagram 5: Menu structure TRANS CAL model 7281

Note: Only the TRANS CAL model 7281-V0001 version offers the full set of functions. The TRANS CAL model 7281-V0000 version only offers the functions between self-test and measurement mode inclusive.

4.4. Connections

4.4.1. Sub-D female connector (measurement, sensor test, voltage source)
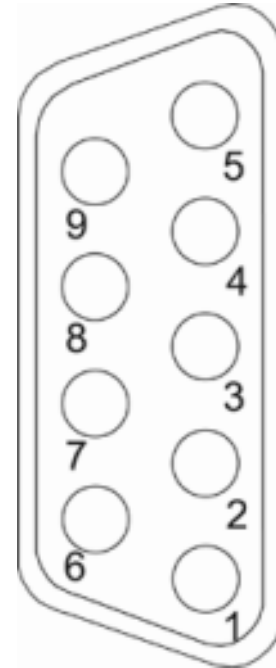
Diagram 6: TRANS CAL model 7281 Sub-D female connector (measurement, sensor test, voltage source)

Meaning	Pin
+ excitation, strain gauge, potentiometer	1
+ sense line, strain gauge, potentiometer	2
+ transmitter excitation (+ 12 VDC)	3
- sense line, strain gauge, potentiometer	4
- excitation, strain gauge, potentiometer	5
+ signal input strain gauge, standard signal, potentiometer	6
burster TEDS	7
- transmitter excitation	8
- signal input strain gauge, standard signal, potentiometer	9

4.4.2. Sub-D male connector (device test, strain gauge simulator)

Diagram 7: TRANS CAL model 7281 Sub-D male connector (device test, strain gauge simulator)

Meaning	Pin
+ excitation, strain gauge, potentiometer	1
+ sense line	2
Empty	3
- sense line	4
- excitation, strain gauge, potentiometer	5
+ signal output	6
Empty	7
Empty	8
- signal output	9

4.4.3. Power adapter

2.1 x 5.5 mm DC power plug.

Meaning	Pin
voltage +	inside
GND	outside

4.4.4. USB interface

USB interface type B male connector.

Meaning	Pin
+ 5 V	1
Data -	2
Data +	3
GND	4

4.5.   Supported sensors

The TRANS CAL model 7281 supports the following types of sensor:

Strain gauge based sensors (tension, compression, pressure and torque)	up to ± 3 mV/V, ± 50 mV/V
Potentiometric sensors (linear or angular displacement)	up to 5 VDC, sensor supply 5 VDC
Transmitters (sensors with built-in instrumentation amp)	up to 0 ... 10 VDC, transmitter supply 12 VDC
Standard signal (voltage measurement)	up to ± 10 VDC

5. Using the instrument for the first time

⚡	⚠️ **DANGER**
	Risk of electric shock.
	Never switch on the instrument if it shows signs of damage in transit. Only ever use the instrument under the conditions specified in this operating manual.

❗	**NOTICE**
	In the battery compartment is a sliding switch. It is vital to set this switch correctly to rechargeable or non-rechargeable battery operation.
	Before switching on, make sure that the rechargeable/non-rechargeable batteries are inserted correctly and that the sliding switch in the battery compartment is set to the correct position, to avoid damage to the instrument.

5.1. Language and device information

Immediately after switching on the TRANS CAL model 7281, you have the option to set the user language and retrieve information about the instrument.

5.1.1. Select user language

The following languages can be set as user language:

- German
- English
- French
- Spanish
- Italian

This is how it works

1. Press the **[ON]** button to start the TRANS CAL model 7281.
   You now have five seconds in which to press the **[F1]** "language" key if you wish to change the user language.
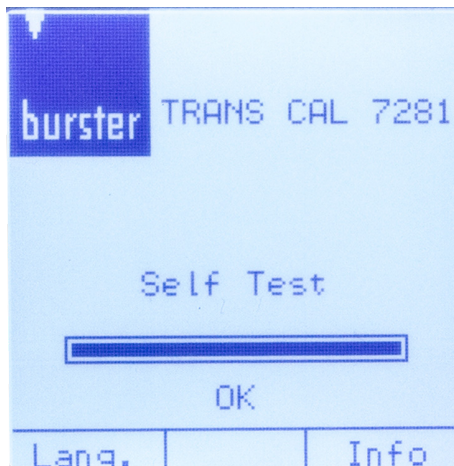
2. Use the ⇧ or ⇩ key to select the user language you require and press the **[Enter]** key to confirm. If you are using the TRANS CAL model 7281-V0000 version then the "Configuration" menu opens directly. Otherwise the TRANS CAL model 7281-V0001 version takes you to the "Operating mode" menu.

5.1.2.   Retrieving instrument information

The following information about the TRANS CAL model 7281 is available:

- Version number
- Serial number
- Date of last calibration
- Serial number of calibration

This is how it works

1. Press the **[ON]** button to start the TRANS CAL model 7281.
   You now have five seconds in which to press the **[F3]** "Info" key in order to retrieve the instrument information.
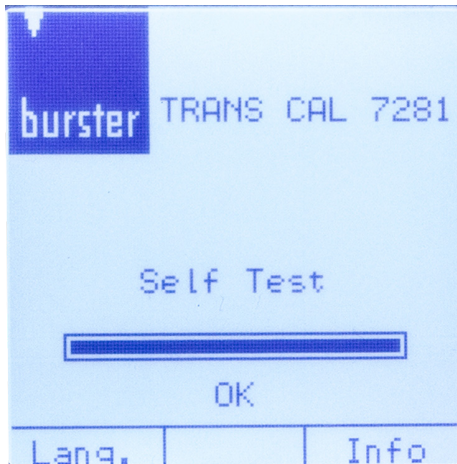
2. The instrument information is shown on the display. If you are using the TRANS CAL model 7281-V0000 version then the **[ESC]** key takes you directly to the "Configuration" menu. Otherwise the TRANS CAL model 7281-V0001 version takes you to the "Operating mode" menu.
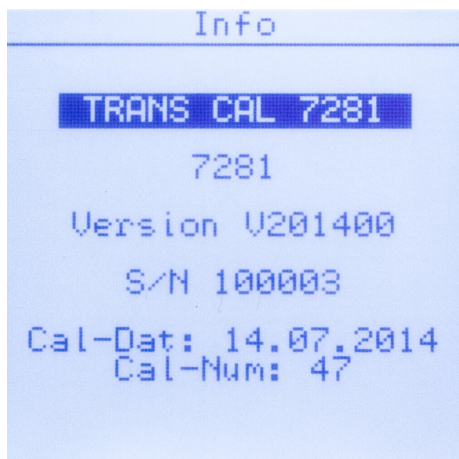
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6. General instrument functions and operation

Note: All device settings can also be implemented via our PC software DigiCal. Check-out the software on www.burster.com.

6.1. TRANS CAL model 7281-V0000

The TRANS CAL model 7281-V0000 version only includes the "Measurement" function. Therefore there is no "Operating mode" menu. After starting up the instrument you are taken directly to the "Configuration" menu. You can open the Basic setup for the TRANS CAL model 7281 by pressing the **[F1]** "setup" key. Pressing the **[ESC]** key always takes you back to the previous menu.
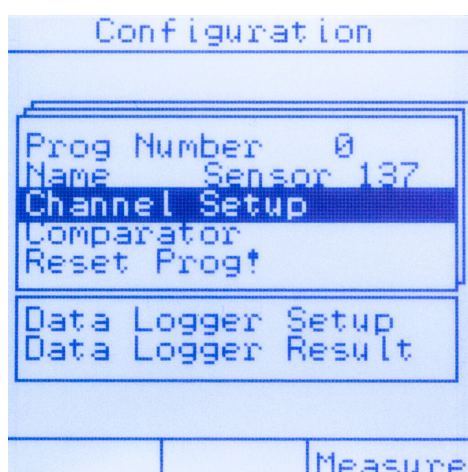
Diagram 8: Startup screen TRANS CAL model 7281-V0000

6.2. TRANS CAL model 7281-V0001

The TRANS CAL model 7281-V0001 version offers the full set of functions described in this operating manual. After starting up the instrument you are taken directly to the "Operating mode" menu. You can open the Basic setup for the TRANS CAL model 7281 by pressing the **[F1]** "setup" key. Pressing the **[ESC]** key always takes you back to the previous menu.
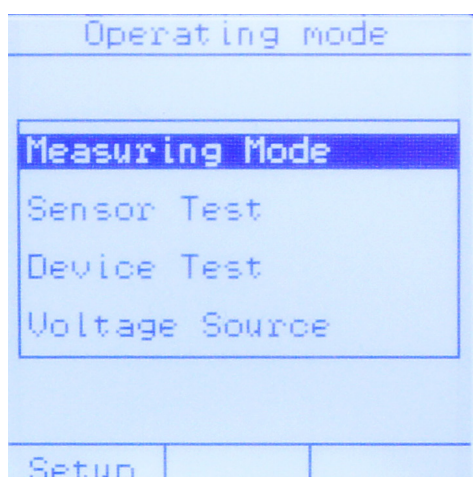
Diagram 9: Startup screen TRANS CAL model 7281-V0001

6.3.   Basic setup

6.3.1.   TRANS CAL model 7281-V0000

To access the "Basic setup" menu, press the [F1] "Setup" key from the "Configuration" menu.

You can make the following settings in the "Basic setup" menu:

Basic setup		
Date	DD.MM.YYYY	Date setting
Time	hh:mm:ss	Time in 24 h format
Brightness	0 ... 10	Brightness in 10 levels (0 = off)
Backlight	Off, On, 10 s, 30 s, 60 s	Display backlight period
Auto-Off	Off, 5 min.	TRANS CAL model 7281 automatic switch-off
Display	XX.XX, XX.XXX, XX.XXXX	Number of digits
Access protect	On, Off	TRANS CAL model 7281 protection from unauthorized use

This is how it works
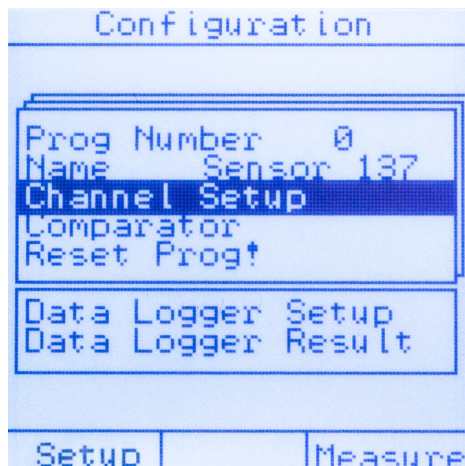
1. Press the [F1] "Setup" key from the "Configuration" menu.

2. Use the ⇧ or ⇩ key to select the setting you require from the "Basic setup" menu.

   Once you have selected the setting you require, press ⇦ or ⇨ key to change the value of the setting.

3. Press **[ESC]** to close the "Basic setup" menu.

6.3.2. TRANS CAL model 7281-V0001

To access the "Basic setup" menu, press the **[F1]** "Setup" key from the "Operating mode" menu.

You can make the following settings in the "Basic setup" menu:

Basic setup		
Date	DD.MM.YYYY	Date setting
Time	hh:mm:ss	Time in 24 h format
Brightness	0 ... 10	Brightness in 10 levels (0 = off)
Backlight	Off, On, 10 s, 30 s, 60 s	Display backlight period
Auto-Off	Off, 5 min.	TRANS CAL model 7281 automatic switch-off
Display	XX.XX, XX.XXX, XX.XXXX	Number of digits
Access protect*	On, Off	TRANS CAL model 7281 protection from unauthorized use

* Access protect:

Unauthorized changes of the measurement programs within TRANS CAL model 7281 can be prevented by activating the access protect. Thus you will protect the device against subsequent manipulation.

The password for the access protect will be set to **7503** upon delivery of device. We strongly recommend to change the password during the initial operation.

Change the password by using our PC software DigiCal.

Note: Store the password at a safe place.

This is how it works
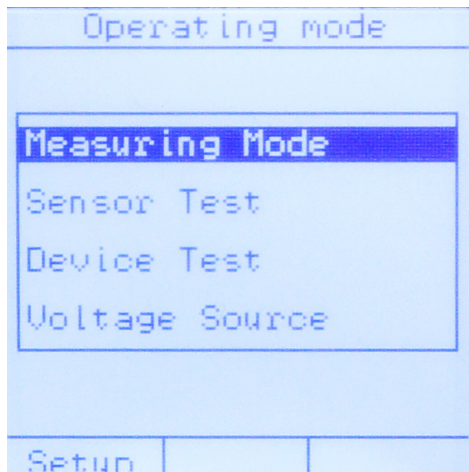
1. Press the **[F1]** "Setup" key from the "Operating mode" menu.

2. Use the ⇧ or ⇩ key to select the setting you require from the "Basic setup" menu.

   Once you have selected the setting you require, press the ⇦ or ⇨ key to change the value of the setting.

3. Press **[ESC]** to close the "Basic setup" menu.

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7. Operation mode "Measurement"

TRANS CAL model 7281-V0000

The TRANS CAL model 7281, opens the "Configuration" menu after being switched on. This menu contains the "Measurement" function. This function lets you use the TRANS CAL model 7281 for various measurement tasks and requirements.

TRANS CAL model 7281-V0001

The TRANS CAL model 7281, opens the "Operating mode" menu after being switched on. Select the "Measurement" function and press the **[Enter]** key to confirm your selection. This function lets you use the TRANS CAL model 7281 for various measurement tasks and requirements.

7.1. Menu "Configuration"

In the "Configuration" menu, use the ⇦ or ⇨ key to select the measurement program you require. Pressing the **[F3]** key then takes you directly into measurement mode.
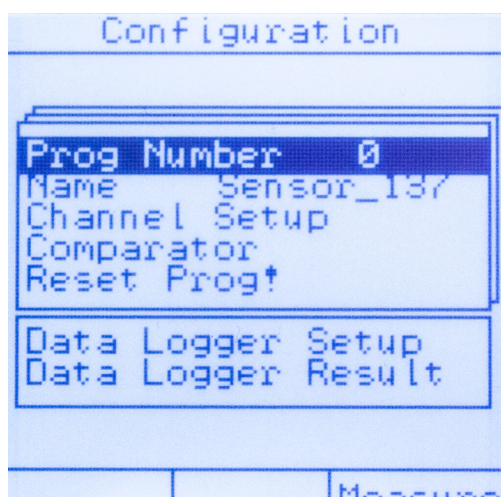
Diagram 10: Menu "Configuration"

7.1.1. Prog Number

The number for the measurement program is allocated automatically and cannot be changed.

Note: There are 16 measurement programs available (numbered program 0 to 15).

7.1.2. Name

Here you can give the measurement programs a name to identify them more clearly, for instance a sensor type or equipment name.

Examples of names:

- 8524_5500 or

- Presse_1

Note: You have 10 characters available for naming a measurement program.
To change the name of a measurement program, select the "Name" menu option and press the **[Enter]** key. You can use the ⇧ and ⇩ keys to edit the selected characters. The ⇦ and ⇨ keys take you to the previous or next character. When you are done, press **[ESC]** to confirm your entry.

7.2. Channel setup

You can use various type of sensor depending on the application. Not all the settings are available for every sensor type.

7.2.1. Strain gauge based sensors (load cells, pressure sensors, etc.)

The following settings can be made for measuring sensors based on a strain gauge:

Strain gauge based sensors		
Meas. mode	15 mV, 30 mV, 250 mV (AC and DC)	Selection of preferred measurement mode (DC = DC voltage, AC = pulsed DC voltage).
Excitation	2,5 V, 5 V	Strain gauge excitation The correct value for the strain gauge excitation voltage is listed on the sensor datasheet or the test certificate.
Meas. rate	0,1; 0,2; 0,5; 1; 2; 5; 10; 20; 50; 100; 200; 400; 600; 1200 readings/s	Number of measurement readings recorded per second. **Caution**: reduced accuracy for 50 or more readings/s.
Units	Any	The user can specify any units required. 6 characters are available.
Scal.low		Lower calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Cal.hi		Upper calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Scal.low		The lower scale value for 2-point scaling (typical value = 0) can be entered here.
Scal.hi		The upper scale value for 2-point scaling (typically 100% of sensor measurement range) can be entered here.

Scaling strain gauge based sensors

Note: 2-point scaling is used to associate the measured electrical signals with the physical measurement quantities. In this process, you assign a **lower** and **upper calibration value** (electrical quantity) to a **lower** and **upper scale value** for the measurement quantity. You can enter the **lower** and **upper calibration value** (electrical quantities) numerically, or you can use the "Teach-in" function (**[F3]** key in the "Channel setup" menu).

The precise relationship is illustrated in diagram 11:

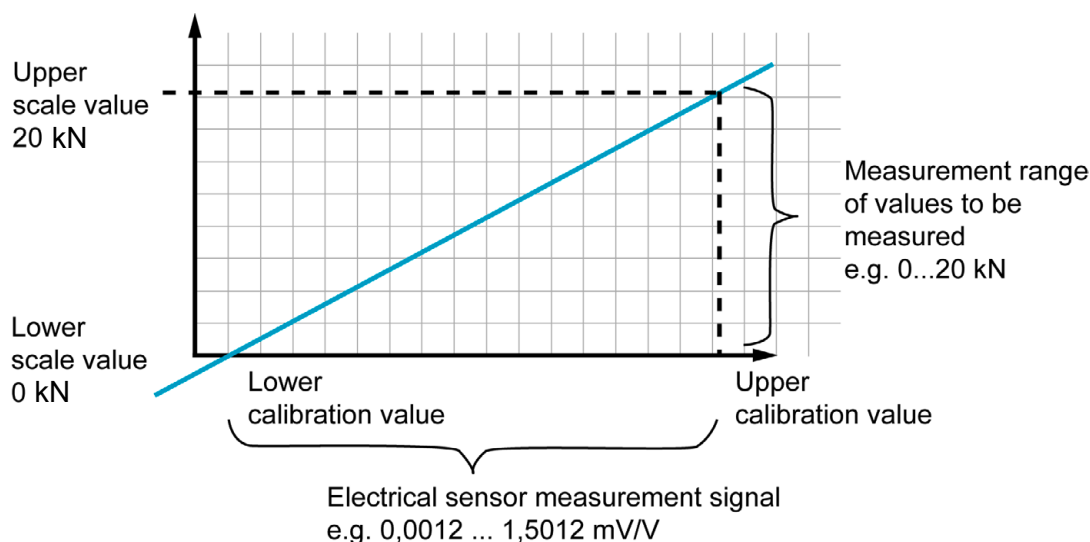Diagram 11:   Scaling and calibration value

You can easily invert the **upper scale value** and **lower scale value** using the sign definition. Press the ⇐ key to move to the place in front of the defined scale value. Use the ⇧ and ⇩ keys to set the sign and then press **[Enter]** to confirm. No sign selected means the scale values are positive. See also diagram 12:
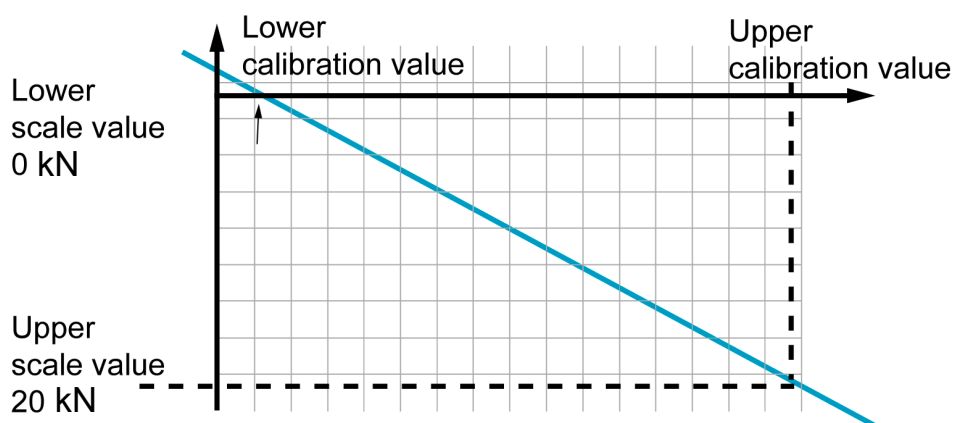

Diagram 12:   Negating the scale values

7.2.2. Potentiometric sensors

The following options can be selected when using potentiometric sensors:

Potentiometric sensors		
Excitation	5 V	Sensor excitation voltage The correct value for the sensor excitation voltage is listed on the sensor datasheet or the test certificate.
Meas. rate	0,1; 0,2; 0,5; 1; 2; 5; 10; 20; 50; 100; 200; 400; 600; 1200 readings/s	Number of measurement readings recorded per second. **Caution**: reduced accuracy for 50 or more readings/s.
Units	Any	The user can specify any units required. 6 characters are available.
Scal.low		Lower calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Cal.hi		Upper calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Scal.low		The lower scale value for 2-point scaling (typical value = 0) can be entered here.
Scal.hi		The upper scale value for 2-point scaling (typically 100% of sensor measurement range) can be entered here.

Note: The mechanical travel of potentiometric displacement sensors may sometimes be greater than the specified measurement travel. Therefore an electrical dead zone usually exists at each end. Within this zone, you cannot measure any change in the electrical output signal despite a movement being made.

The lower and upper calibration values can be found using the "Teach-In" function by pressing the **[F3]** key in the "Channel setup" menu. For the calibration, use a calibrated gauge block that matches the full measurement range of the potentiometric sensor as closely as possible.

IMPORTANT: Make sure that both measurement points lie outside the specified dead zone. There must be a certain gap between the measurement points and the mechanical limits of travel of the sensor.

7.2.3. Voltage 0 ... 10 VDC

When measuring analog voltages of 0 to ± 10 VDC, only the sampling rate can be changed.

Voltage 0 to 10 VDC		
Meas. mode	10 V	Up to ± 10 VDC
Meas. rate	0.1; 0.2; 0.5; 1; 2; 5; 10; 20; 50; 100; 200; 400; 600; 1200 readings/s	Number of measurement readings recorded per second. **Caution**: reduced accuracy for 50 or more readings/s.
Units	V	Units for measuring voltage = V

7.2.4. Transmitters (load cells, pressure sensors, etc.)

The following settings can be made for measuring transmitters:

Voltage source		
Meas. mode	10 VDC	
Excitation	12 VDC	Transmitter excitation
Meas. rate	0,1; 0,2; 0,5; 1; 2; 5; 10; 20; 50; 100; 200; 400; 600; 1200 readings/s	Number of measurement readings recorded per second. **Caution**: reduced accuracy for 50 or more readings/s.
Units	Any	The user can specify any units required. 6 characters are available.
Scal.low		Lower calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Cal.hi		Upper calibration value for 2-point scaling can be entered here or taught (using **[F3]** "teach-in" function). The teach-in function only works if the sensor is connected and the correct channel parameters have been set.
Scal.low		The lower scale value for 2-point scaling (typical value = 0) can be entered here.
Scal.hi		The upper scale value for 2-point scaling (typically 100% of sensor measurement range) can be entered here.

7.2.5. "burster TEDS" sensors

Note: "TEDS" stands for **T**ransducer **E**lectronic **D**ata**S**heet.

The TRANS CAL model 7281 includes the facility to use sensors that have the "burster TEDS" option.

A sensor that has the "burster TEDS" option lets you set up the measurement chain in use easily without having to enter the values manually in the "Channel setup" menu. This lets you operate different sensors on the TRANS CAL model 7281 quickly and easily without having to configure each one manually.

Information from "burster TEDS" data:

- Manufacturer
- Sensor type
- Serial number
- Sensor test date / time
- Rated value (measurement range)
- Zero point
- Output sensitivity
- Excitation
- Calibration shunt used

This is how it works

1. Connect the "burster TEDS" sensor to the TRANS CAL model 7281.

2. In the "Configuration" menu, use the ⇦ and ⇨ keys to select the measurement program that you want to configure using the sensor data.

3. Use the ⇧ or ⇩ key to navigate to the "Channel setup" menu and press the **[Enter]** key to select it.

4. Press the **[F1]** "Read" key to import the data into the selected measurement program.
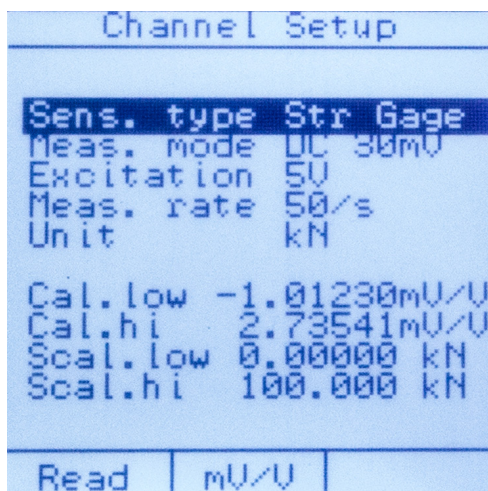
5. If the "burster TEDS" sensor contains two stored calibrations as a result of a special factory calibration for the measurement direction opposite to the preferred measurement direction, then a prompt is displayed asking which output sensitivity you wish to import into the current measurement program. You can use the ⇧, ⇩, ⇦ and ⇨ keys to select the measurement direction. Press **[ESC]** to confirm your selection. If the measurement direction needs to be changed after the configuration, the data must be read again from the "burster TEDS" sensor. You can then select the alternative output sensitivity at this point.
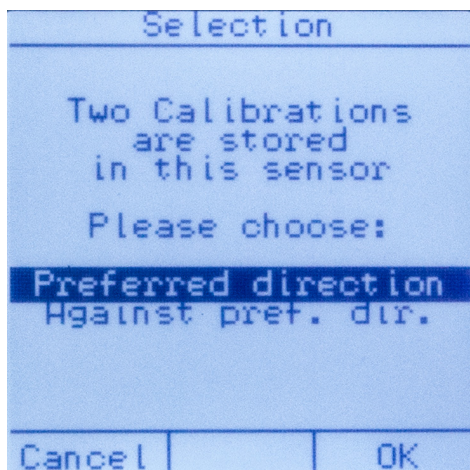
6. The display shows a summary of the "TEDS data" available in the sensor memory. Pressing the **[F3]** key loads the data into the TRANS CAL model 7281 measurement program.

```
TEDS Data

burster
8524-6100
S/N 130712
18.01.2014/08:18:17

Sens. type Str Gage
Nominal    1.5kN
Offset    -0.011mV/V
Sensitivit 1.504mV/V
Excitation 5.000V
Direct.: Preferred
Shunt 2.000mV/V(80k)

Cancel │TEDS-V│  OK
```
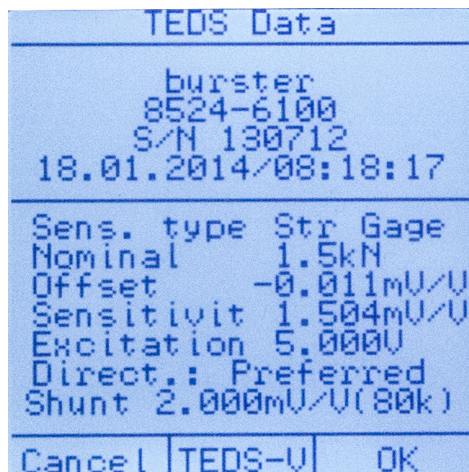
7. The measurement program is now configured. Press the **[ESC]** key to return to the "Configuration" menu. Make any further settings here or start the measurement task.

7.3. Comparator

You can use the comparator to check whether a measured value or series of measured values lies within predefined limits.

You set an upper and lower limit when configuring the comparator. During the measurement process, every live measured value is compared with the specified limits.

If the measured value is higher than the upper limit, the display shows the "**>**" symbol (see also "7.7. Measure" on page 45).

If the measured value is lower than the lower limit, the display shows the "**<**" symbol.

If the measured value or series of measured values lies within the set limits, the display shows the "**=**" symbol.

When saving the measured values using the "Data logger" function, the comparator results are also saved along with each measured value.
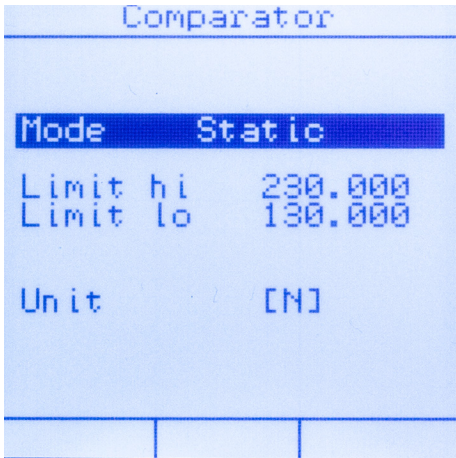
Diagram 13: Comparator

There are two different comparator modes. In the "Comparator" menu, use the ⇦ or ⇨ key to select the comparator mode you require. Once you have made your selection, press **[ESC]** to close the "Comparator" menu.

7.3.1. Statistic comparator mode

In static comparator mode, the comparator is stopped when the measured value goes outside the limit window (above or below limits). The display continues to show the latest evaluation result while also showing a box containing three exclamation marks !!!. In this case you can restart the comparator by pressing the **[F3]** key.

Diagram 14: Measured value above comparator upper limit

7.3.2. Dynamic comparator mode

In dynamic comparator mode, the comparator evaluation continues when the measured value goes outside the limit window (above or below limits). The current evaluation result is always displayed without stopping the comparator.

7.4. Standard settings / factory settings "Prog Reset!"

You can use the "Prog Reset" menu option to reset the selected measurement program to the default settings.

Note: This action permanently deletes the settings for the channel and comparator.

7.5. Data logger
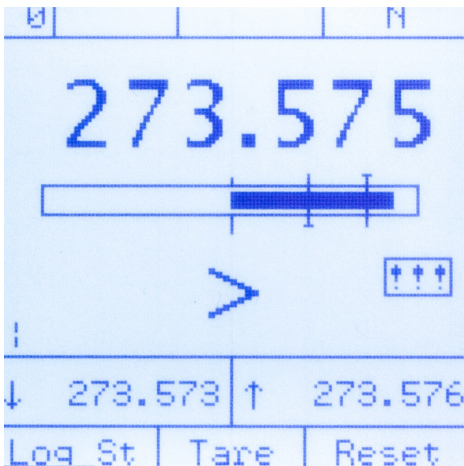
The "Data logger" function gives you option to save the values being measured during the measurement.

The number of measured values per second depends on the set measurement rate. A total of up to 30,000 measured values can be saved.

The "Auto" and "Constant" data logger modes can be set in the "Data logger Setup" menu.

7.5.1. "Auto" data logger mode

In "Auto" mode, a start threshold and a stop threshold are set for starting and stopping the measurement.

The data logger is started when the signal curve crosses the start threshold. The data logger is stopped and the measured values saved after the signal goes above the stop threshold.
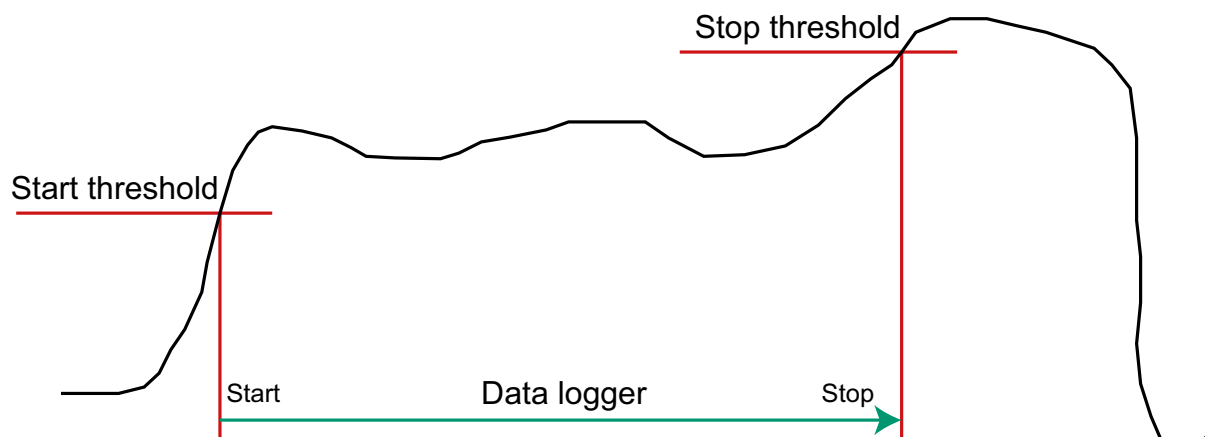
Diagram 15:   "Auto" data logger mode: going above the thresholds

Note: The running data logger is also stopped if the signal drops below the start threshold.

For this reason, a hysteresis of 1 % of full scale is applied to the start threshold. This can prevent a constant start/stop of the data logger if the signal curve is fluctuating about the start threshold.
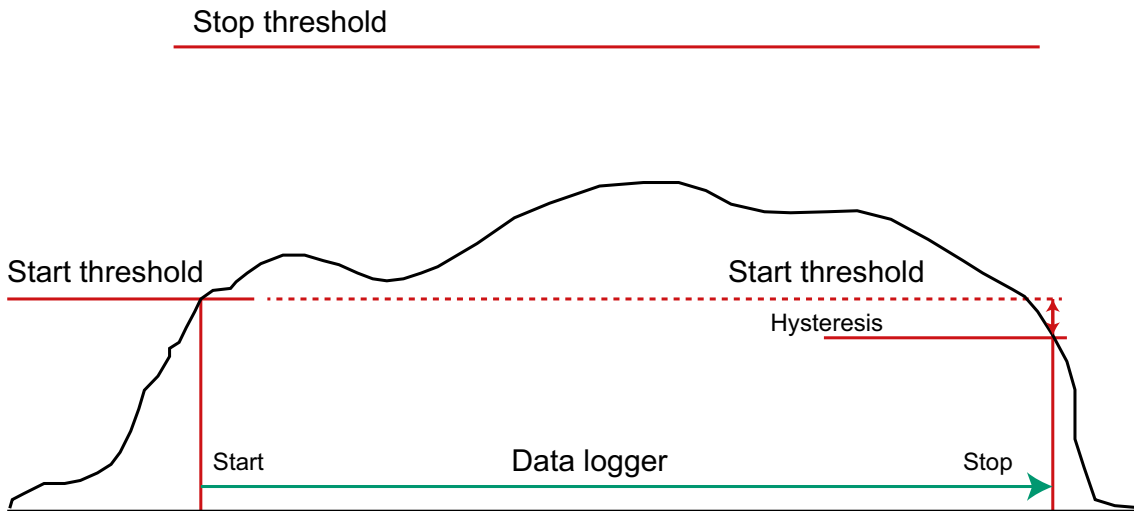
Diagram 16: "Auto" data logger mode: going below the start threshold

7.5.2. "Constant" data logger mode

In "Constant" data logger mode, all every measured value is stored after starting the data logger.

7.5.3. Recording mode

There are three options for recording and saving measured values while the data logger is running.

Note: The recording mode depends on the data logger mode that has been set.

You can set the recording mode in the "Data logger Setup" menu.

Option 1: "All"

After starting the data logger, all the measured values received according to the selected data logger mode "Auto" or "Constant" are saved.

Option 2: "Delta-t"

You can enter a time interval specifying the time period at which a measured value is saved, according to the selected data logger mode "Auto" or "Constant". figure 17 below shows an example for recording values every 10 s.
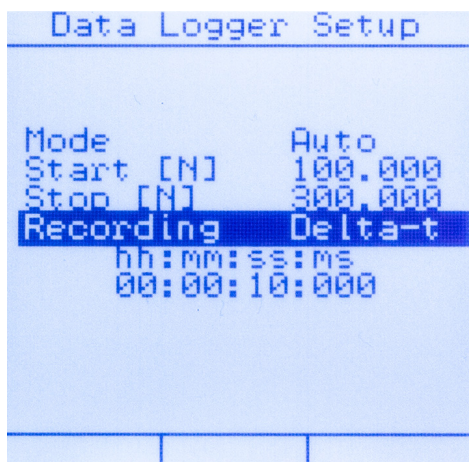
Diagram 17: Data logger setup, "Delta-t". One measured value recorded every 10 seconds

Option 3: "Manual"

With the "Manual" recording mode, the "VALUE" function is assigned to the **[F2]** key in measurement mode. Every time the key is pressed, the measured value is recorded for the time at which the key was pressed.

Note: After pressing the **[F2]** key for the first time, the number of measured valves replaces "VALUE!" in the function field for this key.

Note: The "Manual" recording option is not available in "Auto" data logger mode.

This is how it works

1. Set the data logger mode to "Constant" and the recording mode to "Manual".

2. Press the **[ESC]** key to return to the "Configuration" menu.

3. Press the **[F3]** key to start the "Measure" function.

4. Press **[F1]** "Log_St" to actuate the data logger. "Logger" appears in the top center of the display. This indicates that the data logger is active.
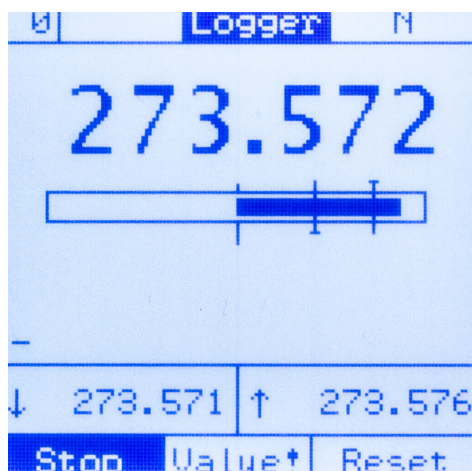
5. Press the **[F2]** key to record measured values manually. The number of measured values that have been recorded is shown in the function field for the **[F2]** key.

7.5.4. "Data Logger Result"

The "Configuration" menu contains the "Data Logger Result" function which lets you read measured values saved in the data logger. After selecting this function and confirming with the **[Enter]** key, you enter the "Data Log Overview".

This views lists all the recorded measurements. You immediately see the name of the measurement, the program number used to record the value and the number of measured values stored in the data record.

You can use the **[F2]** and **[F3]** keys to delete the selected measurement or all the measurements in the TRANS CAL model 7281.

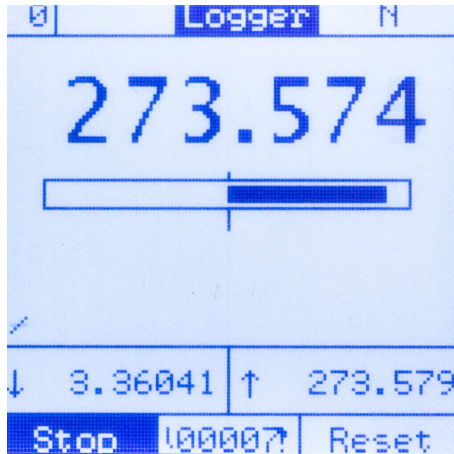Pressing the **[Enter]** key takes you to the "Sequence Info" menu, which displays further details about the selected measurement. In additional to general measurement information, this menu also displays the statistical values such as minimum value, maximum value, mean and standard deviation, and the units.

Pressing the **[F3]** key will display all the measured values recorded in the measurement. The comparator results are also displayed here if the comparator was enabled for the measurement

This is how it works

1. Use the ⇧ or ⇩ key in the "Configuration" menu to select the menu option "Data Logger Result".

2. Press **[Enter]** to open the "Data-Log Overview" menu.
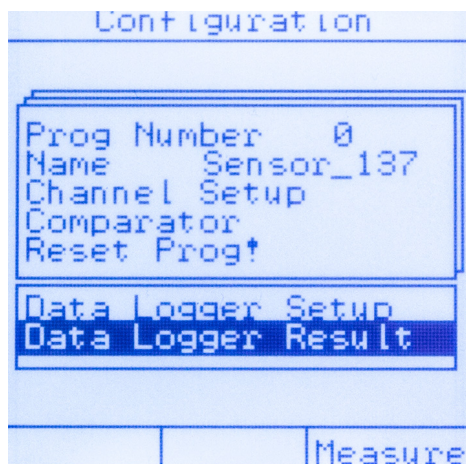
3. The "Data-Log Overview" menu lists all the recorded measurements. In addition it shows the number of measured values in the data record and the measurement program that was used to record these values.
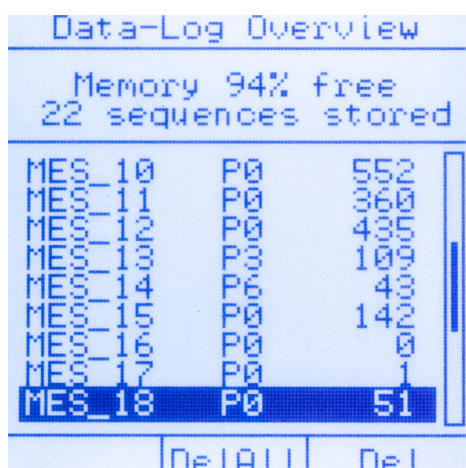
4. Use the ⇧ or ⇩ key to select the measurement you require and press **[Enter]** to confirm your selection. This opens the "Sequence Info" menu for the selected measurement, which shows all the information on the measurement in question.
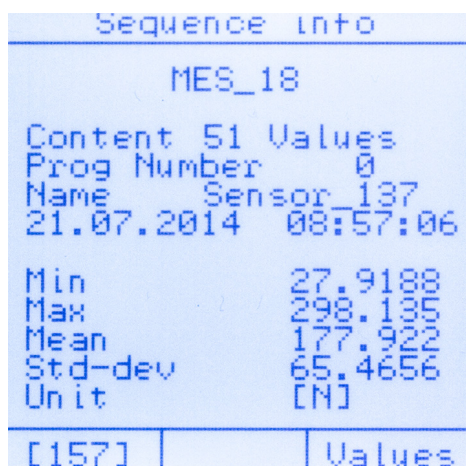
5. Pressing the **[F3]** "Values" key then takes you directly to the list of recorded measured values.

This list contains all the measured values that have been recorded along with the relevant comparator result (if the comparator has been preconfigured).

7.6. "TEDS-Scan"

If you connect a sensor equipped with the "burster TEDS" option to the TRANS CAL model 7281, you have the option to check whether the present sensor has already been used, and if so, in which configured measurement program. Once the "TEDS-Scan" has finished, you can go switch to one of the relevant measurement programs.

This is how it works

1. Connect the sensor with the "burster TEDS" option to the TRANS CAL model 7281.

2. Select the "Measurement" function to open the "Configuration" menu.

3. Select the "TEDS-Scan" function and confirm by pressing **[Enter]**.

4. Once the "TEDS-Scan" has finished, the display lists the measurement programs in which the sensor with the "burster TEDS" option is currently being used. You can use the ⇧, ⇩, ⇦ and ⇨ keys to select the measurement program you require. Pressing the **[Enter]** key opens the relevant "Configuration" menu.
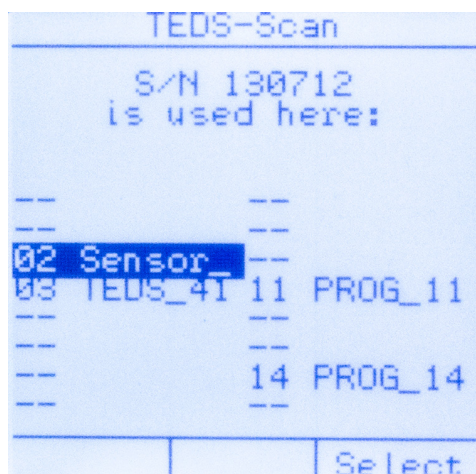
5. Make any additional configuration settings here or start your measurement task.

7.7.   Measure

In the "Configuration" menu, pressing the **[F3]** key "Measure" takes you directly into measurement mode.

If the comparator has been preconfigured (see section "7.3. Comparator" on page 37), evaluation of the comparator result starts immediately.

7.7.1. Display in measurement mode
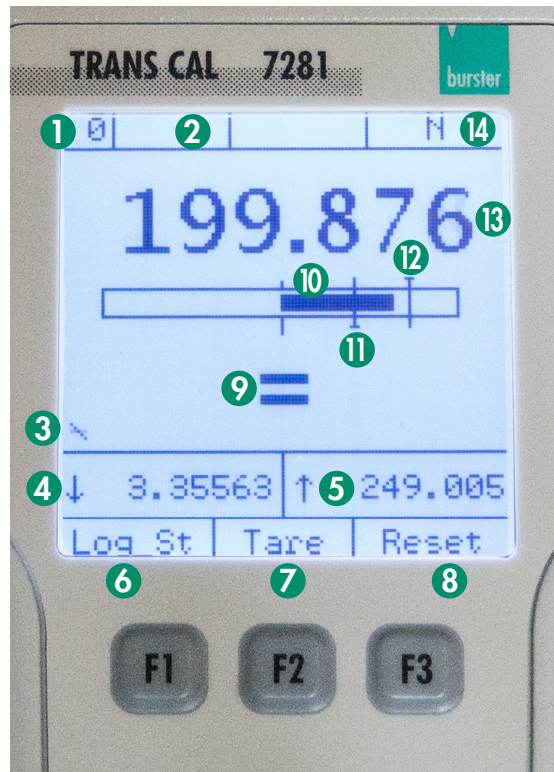
Diagram 18: Measurement mode

❶ Measurement program

Shows the current measurement program.

❷ Low Battery

"!! LoBat !!" is displayed here once the battery only has a small amount of operating time left. Connect the power supply immediately or replace the batteries. It is essential that you read section "3.2. Voltage supply" on page 14.

❸ Activity indicator

Status indicator for measurement in progress.

❹ Minimum value

Displays the minimum value from the current measurement.

❺ Maximalwert

Displays the maximum value from the current measurement.

❻ Start data logger

Use the **[F1]** key to start the data logger. See also section "7.5. Data logger" on page 39.

❼ Tare

Use the **[F2]** key to tare the current measured value to zero. The displayed maximum and minimum values are reset.

Once the tare process is done, the magnitude of the tare value with respect to the upper scale limit is shown as a percentage. Pressing the **[F2]** key again reverts to un-tared mode.

❽ Comparator reset

Press the **[F3]** key to reset the comparator.

❾ Comparator evaluation

The result of the comparator evaluation is shown here if the comparator is active. Possible results are "**<**", "**=**" and "**>**". If the comparator is stopped in static mode as a result of the measured value lying outside the limits, three exclamation marks "!!!" are displayed beside the evaluation symbol.

❿ Output level

The output-level bar is a graphical indicator of the magnitude of the current measured value with respect to the scale value. When comparator mode is active, it is very easy to identify in the region within (or outside) the comparator limits in which the current measured value lies.

⓫ Lower comparator limit

If comparator mode is active, a vertical bar indicates the lower limit of the comparator. Below this threshold, the comparator evaluation result is "**<**" (less than the lower limit). In static comparator mode, the comparator is stopped and can be reset using the **[F3]** key. See also section "7.3. Comparator" on page 37.

⓬ Upper comparator limit

If comparator mode is active, a vertical bar indicates the upper limit of the comparator. Above this threshold, the comparator evaluation result is "**>**" (greater than the upper limit). In static comparator mode, the comparator is stopped and can be reset using the **[F3]** key. See also section "7.3. Comparator" on page 37.

⓭ Current measured value

Shows the live measured value. The measured value depends on the sensor data and the configured scaling factor.

⓮ Current units

Displays the currently selected units.

7.7.2. Data logger display in measurement mode
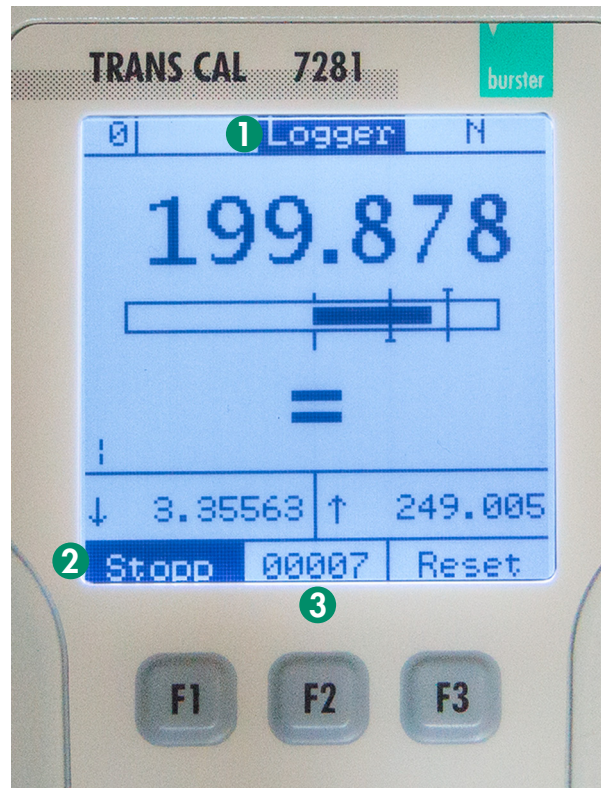

Diagram 19:   Data logger in measurement mode

❶ Data logger status

Shows the current status of the data logger.

Wait: data logger active but trigger condition not met.
Logger: trigger condition met; data logger is recording

❷ Stop data logger

Stops the data logger.

❸ Current number of measured values

Shows the current number of measured values that have been recorded.

8.　　Operation mode "Sensor Test"

Note:　　The "Sensor Test" function is only included in the TRANS CAL model 7281-V0001 version.

If it is not possible to perform a reference measurement because of the situation in which the sensor is installed, the TRANS CAL model 7281 can be used to test the sensor. The "Sensor Test" function is provided for this purpose, and can be used to measure the input, output and isolation resistances and the zero offset of the sensor.

The "Sensor Test" function also connects five shunt resistors across the sensor in turn (59 kΩ, 80 kΩ, 100 kΩ, 150 kΩ and 300 kΩ) in order to perform a shunt calibration. The shunt calibration value tells you whether the output sensitivity of the sensor is correct or lies within the accepted tolerances. Sensors from burster are tested with one of the shunt resistors listed above depending on the sensor type. You can find details of the shunt resistance used on the test certificate supplied with the sensor.

Note:　　During shunt calibration, a precision resistor (the calibration shunt) is connected between the - excitation terminal and the - output-signal terminal of the sensor. The TRANS CAL model 7281 does this automatically as part of the "Sensor Test" function. This precision resistor unbalances the bridge circuit in the same way as a specific degree of strain (i.e. a specific load applied to the sensor). This defined unbalancing of the bridge therefore produces an equally defined shunt calibration value, which is specified on the sensor test certificate along with the associated calibration resistor.

　　The isolation resistance is measured between the measuring element of the connected sensor and the cable shield.

In the "Sensor Test" function, the TRANS CAL model 7281 applies a range of calibration resistances that are used with different sensors. Refer to the test certificate for the sensor you are using to find the relevant shunt calibration value and the corresponding calibration resistor.

8.1. Running the sensor test

This is how it works

1. From the "Operating mode" menu, select the "Sensor Test" function and open it by pressing the **[Enter]** key.
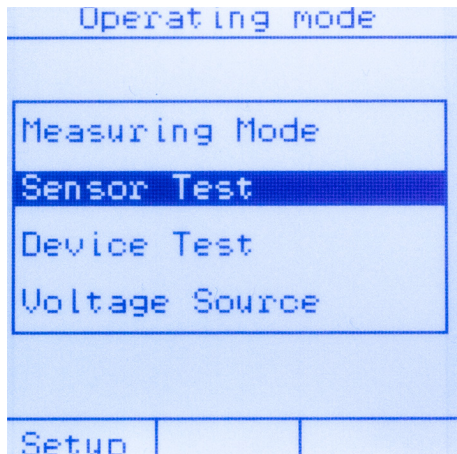
2. You can now run the sensor test from the "Sensor Test" menu by pressing the **[F3]** key. Alternatively, you can display the sensor test performed previously by pressing the **[F1]** key. You can find further information on this in section "8.2. Viewing and managing the sensor test" on page 52.
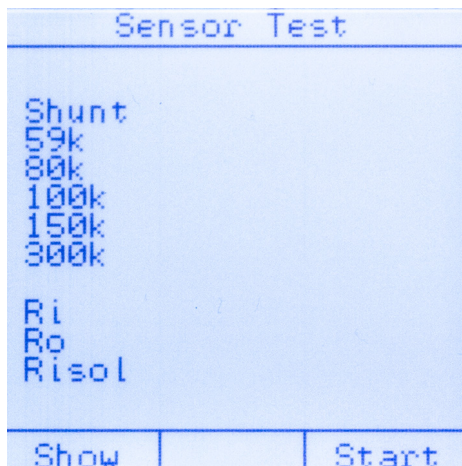
3. Once you have started the sensor test, the zero offset and each of the shunt calibration values are measured using shunt resistors, and the input, output and isolation resistances of the connected sensor are measured.
One the sensor test has finished, you can press **[F2]** to save the test results or press **[F3]** to rerun the test.

```
          Sensor Test

Shunt
59k           1.487 mV/V
80k           1.097 mV/V
100k          0.878 mV/V
150k          0.586 mV/V
300k          0.293 mV/V

Ri            384.5 Ohm
Ro            351.9 Ohm
Risol      > 1 GOhm   OK

         | Save! | Start
```

8.2. Viewing and managing the sensor test

You can open previous sensor tests directly from the "Sensor Test" menu (see section "8.1. Running the sensor test" on page 50). You can display the results as soon as a sensor test has finished and been saved.

Use the ⇦ and ⇨ keys to select the saved sensor tests. Press **[F3]** to delete individual saved sensor tests or **[F2]** to delete all the saved sensor tests.

Diagram 20:   Viewing and managing the sensor test

9. Operation mode "Device Test" with strain gauge simulator

Note: The "Device Test" function is only included in the TRANS CAL model 7281-V0001 version.

The most accurate way to calibrate a measurement chain is a comparison with a high-precision reference. A mechanical quantity whose precise value is known is applied as a load to the sensor. The effect, for instance for strain gauge based sensors, is to unbalance the bridge circuit, resulting in an output signal. This output signal can be used to adjust the measurement chain.

Often, however, this form of active calibration is not possible. There are many reasons for this. One reason, for instance, may be mechanical limits posed by weights of several hundred tons or extremely high pressures. In this case, the measurement quantity must be simulated electrically. This can be done very easily and with unmatched accuracy using the "Device Test" function and the strain gauge simulator in the TRANS CAL model 7281. The TRANS CAL model 7281 is connected in place of the sensor to the measurement chain. The TRANS CAL model 7281 acts as a load across the excitation voltage source typical of that experienced in practice and synthesizes the zero signal and signal under load. This is achieved by a resistance change, just as happens in the strain gauge based sensor.

The TRANS CAL model 7281 can simulate output sensitivities over a continuous range of up to ± 50 mV/V and apply these values to the measurement chain. The sensor excitation voltage "U_{exci}" of 0 ... 10 VDC is measured automatically and shown on the display. The value of the output sensitivity can be varied by pressing the ⇐ and ⇒ keys or using the **[F1]** and **[F3]** keys.

The TRANS CAL model 7281 has two simulation ranges of ± 3 mV/V and ± 50 mV/V. It switches automatically between the ranges when the output value goes above or below ± 3 mV/V.

In the simulation range ± 3 mV/V, the **[F1]** and **[F3]** keys and the ⇐ and ⇒ keys are assigned a step of 0.25 mV/V. In the simulation range ± 50 mV/V, the key assignment is automatically changed to a step of 1 mV/V.
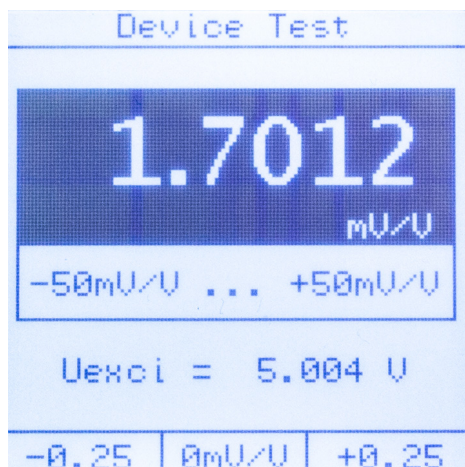
Diagram 21: Operation mode "Device Test", range ± 3 mV/V

Diagram 22: Operation mode "Device Test", range ± 50 mV/V

In addition, it is also possible to enter specific values by pressing **[Enter]** when in the "Device Test" menu. You can use the ⇧ and ⇩ keys to edit the value of the selected number. You can use the ⇐ and ⇒ keys to shift between the different digits in the value. Enter the value your require and confirm with the **[Enter]** key.

10. Operation mode "Voltage Source"

Often external display devices, PLC analog inputs, instrumentation amplifiers etc. need to be calibrated or their output sensitivity tested for compliance with their datasheet and for setup issues.

As already mentioned in chapter "9. Operation mode "Device Test" with strain gauge simulator" on page 53, actively applying a load to sensors is often not possible for a range of reasons. The TRANS CAL model 7281 offers the "Voltage Source" function as a means of providing a high-precision 0 ... 10 VDC output to apply to a relevant instrument.

The output value can be varied continuously by pressing the ⇦ and ⇨ keys or using the **[F1]** and **[F3]** keys.
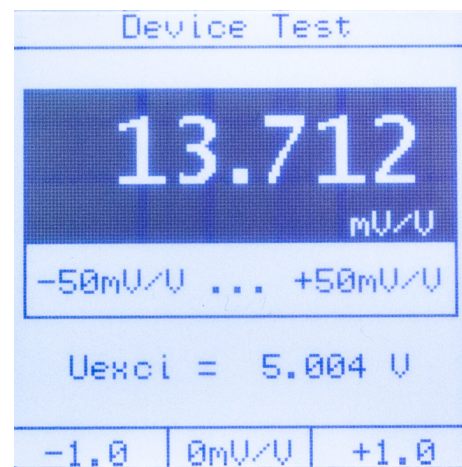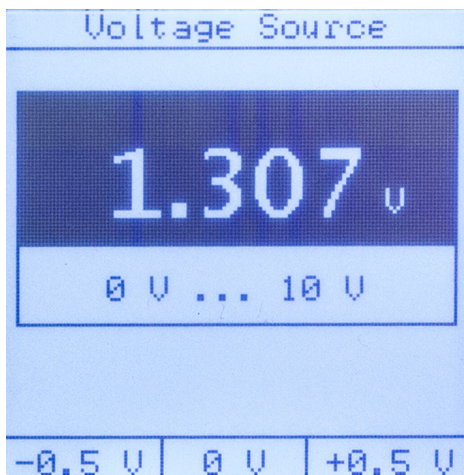

Diagram 23: Operation mode "Voltage Source"

In addition, it is also possible to enter specific values by pressing **[Enter]** when in the "Voltage Source" menu. You can use the ⇧ and ⇩ keys to edit the value of the selected number. You can use the ⇦ and ⇨ keys to shift between the different digits in the value.

Enter the value your require and confirm with the **[Enter]** key.

11. Technical Data

11.1. Electromagnetic compatibility

11.1.1. Interference immunity

Interference immunity to EN 61326-1:2013

Industrial locations

11.1.2. Emitted interference

Emitted interference to EN 61326-1:2013

11.2. Version TRANS CAL model 7281-V0000

This version is a base model for operating directly as a reference measuring instrument.

Its range of use is limited to the following functions:

11.2.1. Strain gauge / potentiometer / transmitter / voltage measurement functions

Properties common to the Measurement operating mode

Non-linearity:	< ± 0.001 %
Measuring rates:	0.1 ... 1200/s (DC); 0.1 ... 2/s (AC) (reduced accuracy at 50/s)
TC gain:	± 0.001 %/K
TC zero point:	< 0.2 µV/K
Cut-off frequency:	10 kHz (- 3 db)

Supported sensors

Strain gauge

Error limit:	± 0.02 F.S.
Bridge resistance (full bridge):	120 Ω ... 10 kΩ.
Connection type:	4 / 6 wire technology
Input voltage ranges (DC):	± 15 mV; ± 30 mV; ± 250 mV
Input voltage ranges (AC):	± 15 mV; ± 30 mV
Sensor excitation voltage (DC):	2.5 V; 5 V (at 120 Ω only 2.5 V)
Sensor excitation voltage (AC):	2.5 V_{eff} / 5 V_{eff} (ab 350 Ω)
Sensor excitation current:	max. 30 mA
Electronic data sheet (TEDS):	read from sensor EEPROMs

Potentiometric sensors

Error limit:	± 0.05 % F.S.
Track resistance:	500 Ω ... 10 kΩ
Connection type:	3 / 5 wire technology
Excitation voltage:	5 VDC
Excitation current:	< 30 mA
Measurement range:	5 VDC

Transmitter

Error limit:	± 0.02 % F.S.
Excitation voltage:	12 VDC ± 5 %
Excitation current:	< 100 mA
Input voltage range:	± 10 V
Units:	freely selectable

Sensors and devices with voltage output

Input voltage range:	± 10 V
Error limit:	± 0.02 F.S.

General device data

A/D converter:	24 Bit
Real-time clock/date	
Interface:	USB 2.0, downwards compatible, opto-isolated
Nominal temperature range:	0 ... 40 °C
Storage temperature range:	-20 ... 60 °C
Display:	LCD with white LED backlighting
Baud rate:	115200
Supply voltage:	4 x Mignon or 10 ... 28 VDC integrated battery charging circuit
Power consumption during battery charging	12 W
Power during battery operation (without/with backlighting):	0.5/1.6 W

Terminals

Measuring, Device Test, Sensor Test:	SUB-D female connector, 9 pin
Strain gauge simulator:	SUB-D male connector, 9 pin
USB interface:	type B male connector

Housing

Material:	Aluminium (light gray, black)
Dimension (L x W x H):	220 x 100 x 52 [mm]
Weight:	approx. 850 g
Protection class:	IP 40

11.3. Version TRANS CAL model 7281-V0001

This version includes the base functions specified in section "11.2.1. Strain gauge / potentiometer / transmitter / voltage measurement functions" plus the additional functions of "Sensor Test", "Device Test" with strain gauge simulator and "Voltage Source".

11.3.1. Operation mode "Sensor Test"

TC:	± 0.005 %/K

Shunt calibration step

Error limit:	± 0.25 % F.S.
Calibration shunt resistors:	59 kΩ; 80 kΩ; 100 kΩ; 150 kΩ; 300 kΩ

Input and output resistance of sensor

Error limit:	± 0.25 % F.S.
Measurement range:	120 Ω ... 10 kΩ

Insulation resistance

Error limit:	± 5 % Rdg.
Measurement range:	20MΩ ... 1GΩ
Resolution:	1 MΩ
TC:	± 0.1 %/K

Note: The resistances of the sensor wires leading to the actual measurement bridge depend on the temperature and sensor construction. Therefore the value measured for the input resistance depends on the temperature. For instance the input resistance of a 350 Ω sensor can actually equal 380 Ω at room temperature. In addition, standardization (calibration of the full scale value) using series resistors may have been performed, which increases the input resistance further. The manufacturer's datasheet usually specifies only the nominal bridge resistance.

The output resistance of the strain gauge full-bridge in the sensor is found by unbalancing the output signal using shunt resistors. In some sensors, the output resistance can be less than the nominal value because of the inherent design. This is caused by some sensor manufacturers using loads across the bridge output voltage for standardization purposes (calibrating the full scale value). In this case, the output resistance measured using the TRANS CAL model 7281 is incorrect. The abovementioned resistances of the wires leading to the actual measurement bridge also have a slight effect on the measurement result.

Since different types of sensors and sensors with differing measurement ranges can be connected to the TRANS CAL model 7281, the above mentioned values only apply up to the device connector. The specific sensor cable is not taken into account.

11.3.2. Operation mode "Device Test" with strain gauge simulator

Error limit:	± 0.01 % F.S.
Excitation voltage:	≤ 10 V (AC/DC)
Characteristics (infinitely adjustable simulation values):	0 ... ± 3 mV/V, 0 ... ± 50 mV/V
Resolution:	± 16 Bit
Bridge resistance:	350 Ω
TC:	± 0.002 %/K
Cut-off frequency:	5 kHz
Measurement of excitation voltage:	0 ... 10 VDC

11.3.3. Operation mode "Voltage Source"

Error limit:	± 0.02 % F.S.
Infinitely adjustable simulation values:	0 ... +10 V
Resolution:	1 mV
TC:	± 0.005 %/K

12.   Accessories

12.1.   Hardware

Power pack, 100 - 240 VAC, 50/60 Hz, 12 VDC, 1.5 A	7281-Z001
Battery set 4 x Mignon AA	7281-Z002
Sub-D male connector, 9 pin	9900-V209
USB connector cable	9900-K349
Adapter cable, length 1 m for TRANS CAL model 7281 and sensors with 12 pin male connector, model 9941	99209-540A-0110010
Adapter cable (e.g. for Device Test 7281), length 1 m, 6 wire, one site 9 pin female connector model 9900-V609, other side open end	99609-000E-0150010
Six-core connection cable, for Device Test 7281 and strain gauge simulation, length 2 m, for indicator with 9 pin Sub-D male connector. Cable shielding not continuously.	99209-609E-0150020
Adapter cable, length 0.2 m for TRANS CAL model 7281 and sensors with 15 pin SUB-D male connector model 9900-V280	99209-580A-0110002
Aluminium case for TRANS CAL model 7281 and accessories	7200-Case

12.2.   burster TEDS

Sub-D 9-pin male connector and memory chip for the electronic datasheet for connecting strain gauge sensors to the TRANS CAL model 7281	9900-V229
Fitting connector 9900-V229 (7281) to a strain gauge sensor and programming the electronic sensor datasheet	99011

12.3.   Software

PC software for TRANS CAL model 7281 - plus version (compatible with 7281-V0001):	7281-P100

• Editing device parameters, configuring the configuration interface, generating reports from data-logger values and sensor test data, data export, processing metadata

PC software for TRANS CAL model 7281 - basic version (compatible with 7281-V0000):	7281-P101

• Editing device parameters, configuring the configuration interface, generating reports from data-logger values, data export, processing metadata

PC software for TRANS CAL model 7281 - Upgrade	7281-P100-UPGRADE

• Upgrade from version 7281-P101 to P100

12.4.   DAkkS calibration certificate

The DAkkS calibration certificate per guideline DKD-R 6-1 contains a minimum of three measuring cycles, each with 21 measuring points in 10 % steps for rising and falling loads across the entire measuring range. For load cells, the measuring cycles are additionally carried out in three different mounting locations, e.g. rotated by 0°, 120° and 240° around the axis of symmetry. The calibration certificate is valid for a maximum of 26 months.

12.5.   Manufacturer calibration certificate

The standard factory calibration certificate for a reference measurement chain consisting of the TRANS CAL model 7281 in conjunction with, for example, a force or pressure sensor, contains 11 points, starting at zero in 20 % steps across the entire measuring range for rising and falling loads. For torque sensors, 11 measurements are taken, starting at zero in 20 % steps for left and right directions of rotation. Special calibration by request. Calculation according to basis price, plus costs per measuring point. We recommend having recalibration carried out after not more than 24 months.

13.   Disposal

Battery disposal

As an end user, you are required by law (battery ordinance) to return all used batteries and rechargeable batteries; the disposal through household waste is prohibited. By buying the herein described device you are concerned by this law. Please dispose of your batteries and rechargeable batteries correctly. Hand them to waste disposal sites either at your premises or at our company or at any place where batteries/rechargeable batteries are sold.

Equipment Disposal

Please fulfill your legal obligations and dispose of unserviceable equipment in accordance with applicable legal requirements. Thus you contribute to environmental protection.