

Handheld force display AE 703

Original of
Manual



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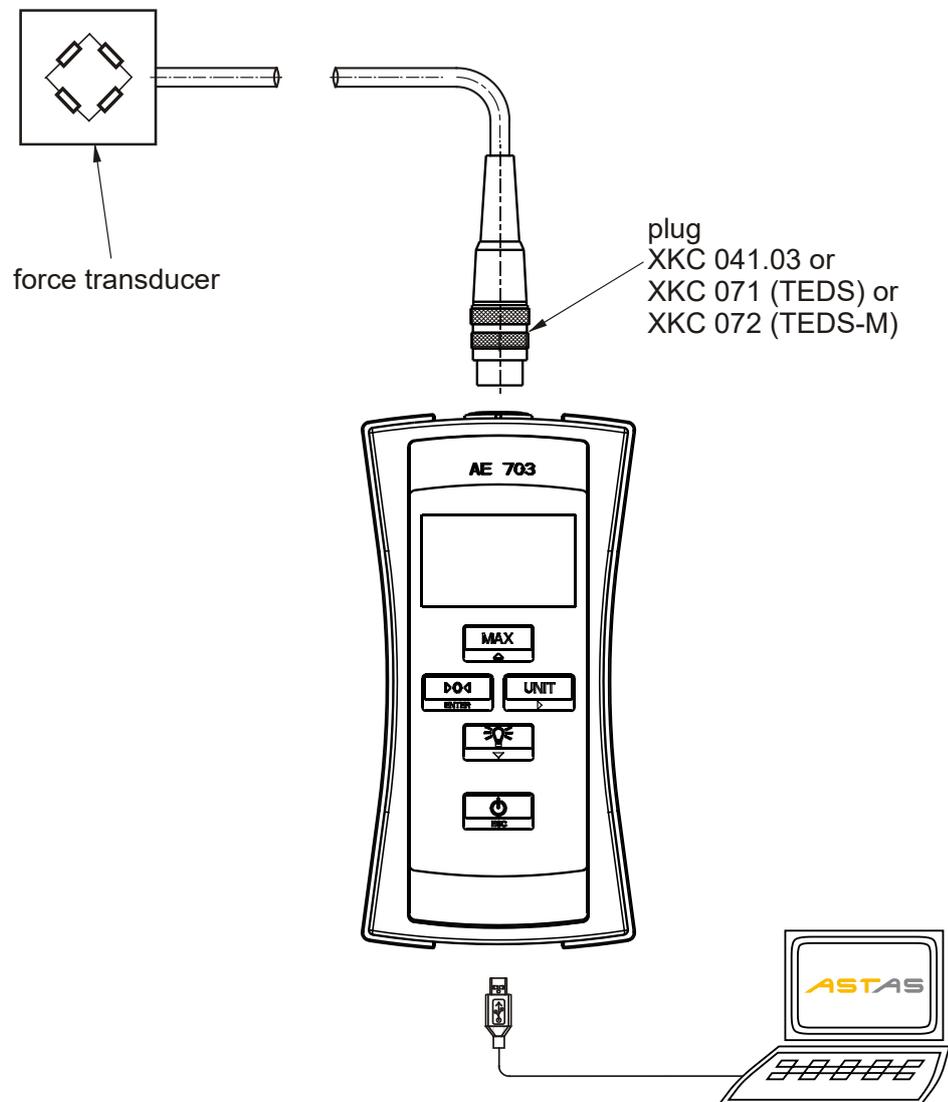
1. Scope of use

The handheld device displays forces or loads sensed by strain gauge load cells. It must not be used as the only device for safety relevant measurements.

2. Operation

The battery operated device supplies a stabilized excitation voltage for a strain gauge full bridge. A load change exposed to the sensor results to a change of his output signal. The device digitizes the signal and compares it to the adc-data stored in the ranges memory. Through this, loads can be displayed and the data transfered via the USB-interface to a PC. The user can store up to 16 ranges. In each of these set of data, the features of a certain sensor and display options can be stored. The setup of ranges and also a load calibration can be carried out also with the PC-software ASTAS delivered together with the device.

When using sensors with TEDS or TEDS-M (masterforce sensor) the instrument will recognize the sensor automatically and it is not necessary to select a range. TEDS-M sensors include up to 6 calibration points, TEDS sensors have 0 and nominal load points stored.



3. Power supply

The display can be powered either by:

- 3 batteries AA (HR6 Mignon) or
- 3 rechargeable batteries of the same size (1,2V) or
- USB power supply (battery display indicates full battery) or
- USB cable to a powered on PC (battery display indicates USB)

If powering via the USB, the mounted batteries are disconnected automatically. The backlight is switched on permanently. If powered by batteries the device is switched off after 2 hours of operation (default setting).

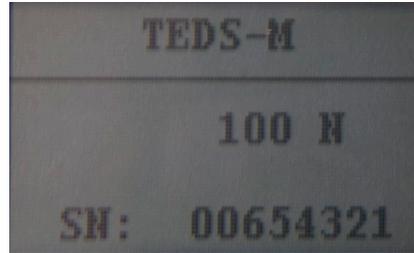


The device will be delivered with batteries mounted. To exchange the batteries open the battery compartment with a Philips screw driver. Remove the batteries if they might not be used for a very long time e.g. than powering by USB only.

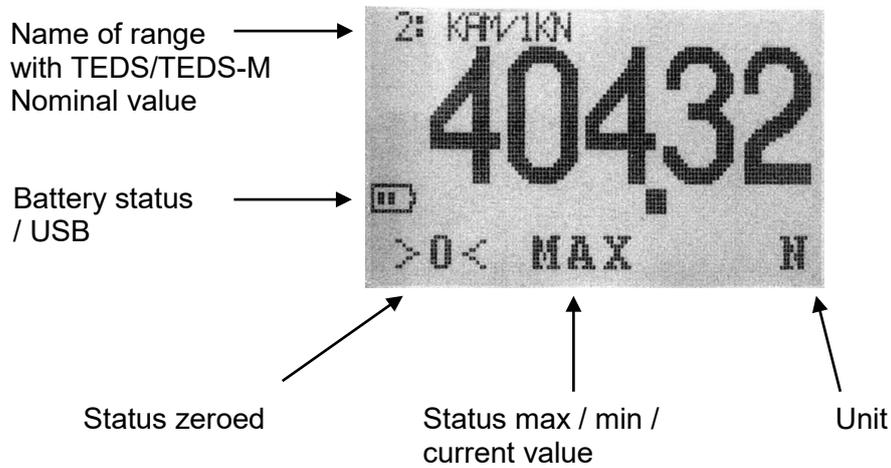
Battery charger, rechargeable batteries and USB power supply can be purchased from your dealer or from the manufacturer.

4. Display

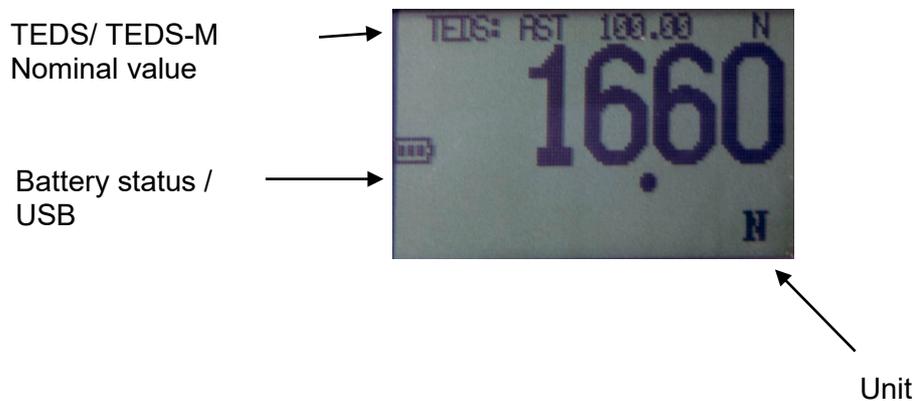
When switching on the instrument, the display will start showing the sensor information (this example shows a TEDS-M sensor with 100N nominal load and its serial number connected)



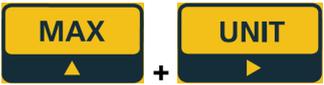
After app. 2 seconds the display will show the measure value (here with a sensor KAM/1kN)



Typical display with masterforce sensor (TEDS-M) connected.



5. Keypad functions

	key	description	function
		Max/min/current value	To switch between the display of max/min/current value
		Zero	To switch between net and gross value To set display (max/min/current value) to zero
		Unit	Scroll between units (if available)
		Backlight	
		On/Off (***)	
		Ranges	Scroll to next range (if available)
		Gross / net	Toggle between not zeroed and zeroed display

***: press for 1 second.

Hints for the operator

Max/Min/Current value: When using tension transducers, tension can be defined as positive direction of force. To do this set the sensitivity value negative e.g.. -2mV/V.

Zero: The zero value will be deleted when leaving a range. To store pre-loads permanently use the function ZeroLoad cal. The function is disabled when the unit mV/V is active.

Auto-Tare: When the device is switched on, the display is set to zero. Pressing the “zero” key will switch between net and gross value in the display.

The Auto-Tare-Function can be turned off by using the PC-Software “ASTAS”. This feature is included in all devices from Firmware-Version 1.5.4..

Unit: Scroll between units that have been enabled in Ranges. If there is only one unit enabled the key has no function. In case the value to be displayed exceeds the possible range, the device switches to the next possible unit.

Example: 99 999g + 15g = 100.01kg

If the value to be displayed is falling, there will be no switching back into the initial unit.

Backlight: The duration can be adjusted in Device setup.

6. Setting up Ranges

General

A range (channel) is stored as a set of parameter per sensor. It can be identified by a name displayed on top of the display. There is no connection between two ranges. If more then one range is defined the user needs to choose the range related to the used sensor. Up to 16 ranges can be stored in the device memory. When using TEDS-sensors or masterforce Sensors (with TEDS-M) all paramters are stored in the sensor, see also chapter 8. Therefore it is no necessary to select a range or channel in the instrument.

Keypad functions for setting up

key	description	function
 + 	Setup(***)	Set up, edit and calibrate a range
	▲ up	One line up or raise value by one
	ENTER	Activate menu or function save value and exit
	▶ right	Move cursor to the right by one digit (loop)
	▼ down	One line down or lower value by one
	Escape	Exit menu or function without saving

***: press long.

Create/edit a measuring range

Press ▲▼ simultaneously to get into the setup mode. Press ENTER to proceed to Ranges. Use the keys ▲▼▶ and ENTER to input the password (default: „0000“).

Move the Cursor to „Create a new range“ and press Enter or choose an existing range. Use the keys ▲▼ to move to the parameter you want to edit and press ENTER to get to the editing mode.

There is always one current range. In the list of ranges it is marked with two #. The range used for the latest measuring is the current range.

Parameters

Base unit: (mandatory input)
This unit is used for calibration. When choosing another unit in measuring mode the value displayed will be computed from the base unit value. The display of the base unit may be deactivated.

Range of values:

N	Newton	
kN	kiloNewton	(1 kN = 1000N)
g	gram	(1 g = 0,009807N)
kg	kilogram	(1 kg = 9,807N)
t	ton	(1 t = 9807N)
lbf	pound (brit.)	(1 lbf = 4.448221615N)
oz	ounce	(1 oz = 0.278013851N)
mV/V	signal of a strain gage	
M300	MN/m ² for plate load tester	300mm plate (1 M300 = 70685N)
M600	MN/m ² for plate load tester	600mm plate (1 M600 = 282743N)
to	long ton (brit.)	(1 long ton = 9964N=1016kg)
Unit	user defined unit	



NOTE: The unit mV/V is calibrated at the manufacturer's site. Re-calibration by the use is disabled. When using mV/V as the base unit other units cannot be activated.

Rated Load	(mandatory input) Nominal load of the sensor in the base unit. Only integer values can be put in
Select digits	(mandatory input) resolution of display or decimal places range of values 10...99 999 steps
Sensitivity	(mandatory input) output at rated load. This value will be overwritten by a more correct value acquired during calibration by load. If a calibration exists this value cannot be edited. Range of values: 0... 5 mV/V, default 2mV/V
Overload (+)	Overload warning in positive force direction in percent of the rated load refers to the gross value The warning "Overload" will be displayed if the measured force exceeds the defined overload limit in positive force direction Range of values 0... 999%, default 120%
Overload (-)	Overload warning in negative force direction in percent of the rated load refers to the gross value The warning "Underload" will be displayed if the measured force exceeds the defined Overload (-) limit in negative force direction Range of values 0... 999%, default -120%

Averaging	output values per second The ADC takes 3200 samples/second. A moving average filter reduces the number of values and improves the accuracy. Use a low value for static measurements and a high value for dynamic measurements. A high value improves the quality of the Min/max value display but also allows more noise and distortions and therefore might lead to a unsteady display. Changing Average has no effect to Sensitivity. range of values: 6,25; 12,5; 25; 50; 100; 200; 400; 800; 1600 / s default: 50 / s
Units	List of enabled units defines the units that can be chosen by the user. No= unit is not accessible by the user Yes= unit is accessible by the user Values: see base unit default = only base unit = Yes
Name	name/description of the measuring range this text is displayed in the head of the display to allow easy assignment of the sensor to a measuring range Values: text, 22 characters default ##: (sequential number of range)
User unit	Characterization of a user defined unit
User text	displayed symbol or text of the unit Values: text, 4 characters Default: „Unit“
User factor	conversion factor of the user unit $1 * \text{base unit} = \text{user factor} * \text{user unit}$ Values: 0...9999 in steps of 0,001... default: 1.0
Delete Range	deletes the measuring range (possible only if no calibration exists on this range and the range to be deleted is not the only range)
Change password:	to define a 4 character password to protect the set up data of this range Change the password with the keys ▲ ▼ ►. Press ENTER to save the new password. Default „0000“ (After calibration at the manufacturer site, a password will be applied)

Conversion of units:

Units will be converted according to the SI-system. Please note that when converting force into weight the gravitational acceleration of 9.8107 m/s^2 (valid for Germany 3) is used. The gravitational acceleration varies according to the position on the globe. To ensure weight display accuracy of better than 0.1%, a load calibration should be carried out at the production site.

Device Setup

T switch off	(Auto off) auto power off of the device after (1...999) minutes (0 min means the device never switches off automatically) Default: 120 min If the device is powered via the USB the function is changed to standby to keep the current values
Duration:	Automatic switch off of the display backlight (1...239) seconds (0 sec means the backlight is never switched off default: 60s
Brightness:	Brightness of the display backlight % (10% steps) default: 80%
Serial-No:	Serial number of the device (entered by the manufacturer), read only
Firmware:	Version of the firmware, read only

7. Calibration by load (Calibration)

(only with force transducers without TEDS/ TEDS-M)

The calibration is carried out by means of a known load for the current range. The calibration with a strain gage simulator is possible too. The calibration always uses the base unit. The first calibration point is zero load, the second point. A former calibration as well as the value Sensitivity will be overwritten by the new calibration. The calibration can be cancelled until the last step to keep the old data.

Calibration means assigning two display values to two sensor signals. All other points will be extrapolated. A calibration of up to five points is possible with the pc-software ASTAS.

Setup – Mode: Press the two buttons simultaneously for longer than 1 second



Display	Key	Function	Hint
>Calibration<	 (ENTER)	Open menu	
>Start calib: No< Delete calib: No	 (ENTER)  (▲)  (▼)	New calibration	
>Start calib: Yes<	 (ENTER)	Confirm Start	
Place zeroload, then ENTER	 (ENTER)	Calibration of zero load: Unload the sensor!	Confirm that the sensor is unloaded
Enter calibration load	 (▲)  (▼)  (▶)  (ENTER)	Input of load display relating to calibration load	Refers to base unit Rated load proposed load
Place Ca.-load, then ENTER	 (ENTER)	Calibration by load, apply a known load!	Load should be at least 50% and max. 150% of the rated load
ENTER=Store / ESC = cancel	 (ENTER)	Confirmation of the calibration	Press ESC to restore old values
>Start calib: No< Delete calib: No	 (ESC)	Back to menu "Ranges"	

Example for a load calibration (5000g scale)

Range setup:

Base Unit: g
 Rated load: 5000
 Sel. Digits: 5000
 Sensitivity 2.0000
 Overload (+): +120%
 Underload (-): -10%
 Conv. Rate: 6.25
 Used units: g, N
 Name: 5000g
 Known calibration load 4993g

Display	Key	Function	Hint
>Calibration<	 (ENTER)	Enter menu	
>Start calib: No< Delete calib: No	 (ENTER)  (▲)  (▼)	Start new calibration	
>Start calib: Yes<	 (ENTER)	Confirm Start	
Place zeroload, then ENTER	 (ENTER)	Unload the scale	Confirm that the scale is free of load
Enter calibration load 5000	Numerical entry: 4993;  (ENTER)	Input of load display relating to calibration load	
Place Ca.-load, then ENTER	 (ENTER)	Press key after applied load has settled	
ENTER=Store / ESC = cancel	 (ENTER)	Confirm calibration	
>Start calib: No< Delete calib: No	 (ESC)  (ESC)  (ESC)  (ESC)	Back to load display	Test your calibration

Delete calibration

To delete a Range the calibration must be deleted beforehand. After deletion of a calibration, zero and Sensitivity stay unaffected. The unit still displays correctly. Potential calibration point in between zero and related load (linearization points) will be removed.

Display	Key	Function	Hint
>Calibration<	 (ENTER)	Enter menu	
>Load calib: No< Delete calib: No	 		
>Delete calib: No< Start calib: No	 (ENTER)		
>Delete calib: No<	 		
>Delete calib: Yes<	 (ENTER)	Delete calibration	
>Delete calib: is deleted< Start calib: No	 (ESC)	Back to menu Ranges	

ZeroLoad cal

Corrects a zero deviation of the sensor itself of/or a dead load.



ATTENTION! The overload indication is moved by the same offset. There is a risk of overload warning failure.

The zero load calibration shifts the zero position of the load curve which slope is defined by Sensitivity. It should be applied after load calibration.

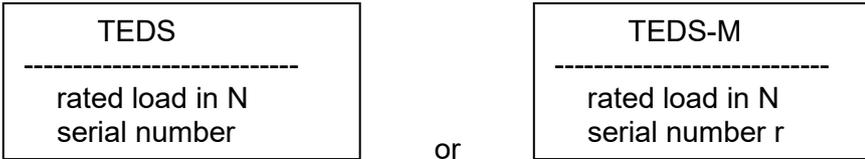


NOTE: The function is not allowed if the load calibration contains more than two points (linearization).

8. Sensor identification TEDS

This function enable a plug and play sensor identification by the AE 703. The assignment of ranges to the respective sensors by the users are omitted and mistakes are avoided. All data regarding a particular sensor and of range are stored in the sensor and not in the display unit. All instruments after S/N 2009023822 (after Dezember 2009, firmware V1.3.05) can be used together with A.S.T.-TEDS-/ TEDS-M sensors. The instrument will automatically select the correct range.

After exchanging the sensor the display unit will restart automatically and displays the following TEDS-/ TEDS-M message:



TEDS/ TEDS-M sensors:

TEDS/ TEDS-M sensors by A.S.T. can be recognized also on the imprint on the plug „AST / TEDS/ TEDS-M“. The TEDS/ TEDS-M plug is an option to a sensor with order code XKC 071 (TEDS) or XKC 072 (TEDS-M). In case a customer prefers to mount the TEDS/TEDS-M plug by himself the order code is XKC 077. The TEDS connector can also be used with non-A.S.T. sensors and is only compatible to specified instruments like the AE 703.

How is TEDS/TEDS-M data displayed in the AE 703

For the user TEDS/ TEDS-M data appears like an ordinary range of the AE 703. Some adjustments can be carried out by the Software ASTAS only.

Please note the following peculiarities:

As long as a TEDS/ TEDS-M sensor is connected to the AE 703 all other ranges of the AE 703 are not accessible.

A TEDS/ TEDS-M sensor can only store a two points calibration, a TEDS-M sensor can store a 6-point calibration

TEDS parameters and range data can be overwritten with the manufacturers default values with the command "TEDSrestore". By this all user generated data gets lost.

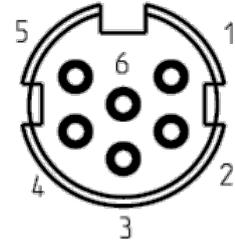
Data in the origin TEDS data range can only be written by the Software ASTAS in conjunction with the AE 703. This refers to Rated load, Base Unit and Sensitivity. That means that a sensor calibration is possible only with ASTAS running on a PC. All other data can be edited by means of the AE 703.

 **ATTENTION!** Never connect a TEDS-Sensor plug into a six wire (sense wires) instrument. The TEDS-chip will be destroyed by the voltage of the sense pins!

9.

9. Sensor plug pin assignment

Pin	assignment
1	Excitation - (-EX)
2	Excitation + (+EX)
3	Not connected (TEDS data)
4	Signal + (+SI)
5	Signal -(-SI)
6	Not connected (TEDS ground)



Assignment for plug types: XKC 041.(03), XKC 047 and XKC071-TEDS, XKC 072-TEDS-M)

Image: View to solder pins

10. Error messages

"ADC error"	The input signal exceeds the input range of the ADC	<ul style="list-style-type: none"> - No sensor connected - Damaged sensor cable - Moisture in or at the sensor connector - Sensor extremely overloaded
"Overload" / "Underload"	The input signal exceeds the span as defined in ranges with the parameters Overload (+) and Overload (-)	<ul style="list-style-type: none"> - Sensor overloaded/under loaded
Display of current value is flashing	The unit tries to display more than 99999 parts.	<ul style="list-style-type: none"> - new adjustment of selective digits in setup.
- - - - -	The calculation result in incomputable values (mathematic overflow).	<ul style="list-style-type: none"> - Sensitivity exceeds the computable range - - other causes see ADC error
"T" (flashing)	A TEDS sensor with invalid data has been detected.	<ul style="list-style-type: none"> - Check TEDS data from sensor
"usb" (not in capital letters)	Error in PC connection	<ul style="list-style-type: none"> - Retry by re-connection the USB-cable!

Application notes

Sensor that have different sensitivities in tension and pressure:

Solution1: Create and calibrate a second range for the same sensor

Solution2: Calibrate more than 2 calibration points with the pc-software ASTAS

Plate load test for soil according to DIN 18134

The device supports load plates with diameters 300mm (unit M300) and 600mm.

Setup a ordinary range for the sensor used (e.g. KAM/100kN) and activate the units M300 and M600 if needed. When the user chooses one the special units the force value in kN is converted to the axial stress unit MN/m² according to the DIN 18134. The display resolution can be adjusted by parameter Select digits. Calibration of the measuring chain can be carried out in kN, but also in M300 if set as base unit. If calibration has been done in KN this unit might be deactivated afterwards to prevent it from being displayed after starting up the AE 703 in the field.

example: KAM/100kN

Base Unit:	kN
Rated load	100
Selected digits:	100,0
Sensitivity	1mV/V
Units:	M300=YES, M600=Yes

Resolution of display

kN	100,0
M300	0,001 (MN/m ²)
M600	0,0001(MN/m ²)

Linearization of nonlinear sensors

Use the pc-software ASTAS to calibrate 5 points plus zero

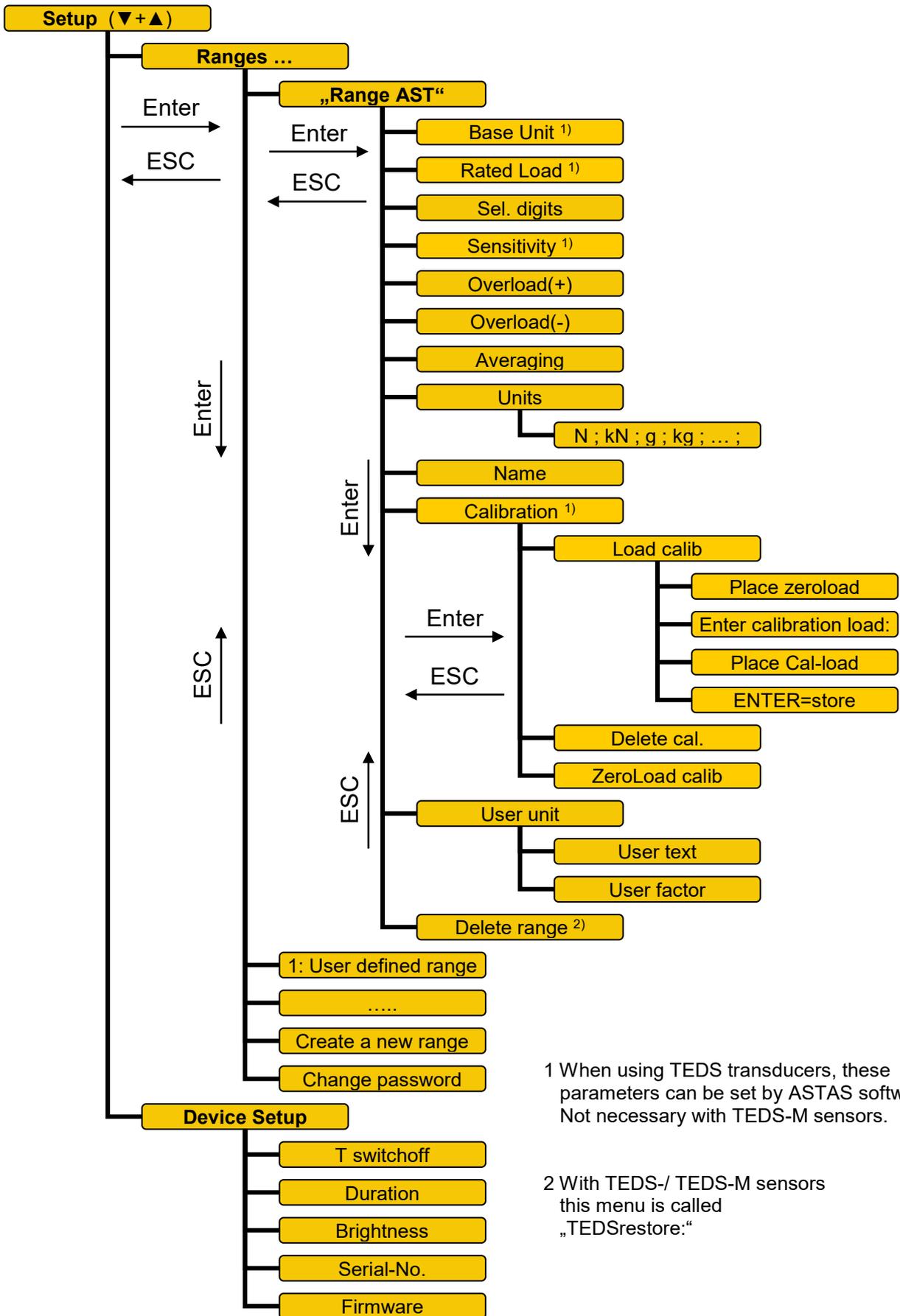
Quick and comfortable edition of ranges

ASTAS allows comfortable calibration and edition of a range. Also setup data of a range can be stored in a pc. The can be helpful for service purposes.

11. Specifications

Accuracy Class	%	0.01
Signal Input		For up to 2 transducers with strain gauge full bridges connected
Input signal range (+Si/-Si) Input impedance range of strain gauge bridge Excitation voltage (+Ex/-Ex)	mV/V Ω VDC	± 0.3 ... 5 > 150 (2 parallel strain gauge full bridges/ 350Ω) up to 2000 5.0
Error by 2mV/V		
Relative linearity error Noise (at measuring rate) Temperature effect on zero signal	% % %/10K	0.0015 0.002 (6.25Hz) ... 0.04 (1600Hz) 0.002
Display		5-digit LCD graphik display, 128x64 pixel, illuminated
Character height Display range Display additional modes Display rate Scaling points for linearization Internal resolution at 2 mV/V Measuring rate (average value) Measured value transmission via USB	mm pieces 1/s	14 -99999 up to 99999 Meas/min/max.value, overload, various units, charge of battery 3 up to 4 22 Bit 6.25 ... 1600 max. 1400 values/s with software ASTAS
TEDS-M		according to IEEE 1451.4
Interface Supported templates		Mixed-Mode interface, class 2 basic, bridge
Power Supply		
Supply voltage Operating time with batteries	VDC h	3.0 ... 4.8 (3 accumulators or primary cells AA) or powering via USB-port approx. 40
Environmental Conditions		
Operating temperature range Storage temperature range	°C °C	-10 ... +50 -20 ... +70
Construction		
USB - interface Dimensions: (W x H x D) Weight without batteries Force transducer connector Environmental protection (EN 60529)	mm g	Mini-USB-B connector, 5 pin 82.1 x 161.7 x 53.8 240 6-pin round connector IP 54 - in use, force transducer connected, USB-port closed

12. Setup diagram



1 When using TEDS transducers, these parameters can be set by ASTAS software. Not necessary with TEDS-M sensors.

2 With TEDS-/ TEDS-M sensors this menu is called „TEDSrestore.“

13. Manual for ASTAS

Load the software **ASTAS** from our website www.ast.de or CD-ROM "Product Information".



TIP: Linearization: If the measured values between zero and rated load should deviate from the real load, up to four additional points can be set to increase the measurement accuracy. These measuring points can be made in any order, similar to the input of the zero point and end point. After entering all of the calibration points, the result must be stored.

14. Declaration of Conformity

A.S.T. - Angewandte System Technik GmbH
Mess- und Regeltechnik



EG-Konformitätserklärung EC Declaration of Conformity

No. 15/16

Hersteller: A.S.T. - Angewandte System Technik GmbH
Manufacturer: Mess- und Regeltechnik

Anschrift: Marschnerstraße 26, 01307 Dresden
Adress: Bundesrepublik Deutschland

Produkt-
bezeichnung: Mobile Anzeige AE 703
Product description: Mobile Display AE 703

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2014/30/EU Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die elektromagnetische Verträglichkeit.
Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Die Konformität mit der Richtlinie 2014/30/EU wird nachgewiesen durch die Einhaltung folgender harmonisierter Normen:

Conformity to the Directive 2014/30/EU is assured through the application of the following harmonised standards:

Störfestigkeit: Interference resistance:	DIN EN 61000-6-2:2006-03
Störaussendung: Emitted interference:	DIN EN 61000-6-3:2011-09

Dresden, den 28.06.2016


gez. Dr.-Ing. Gerd Heinrich
Qualitätssicherung / Quality assurance

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