Angewandte System Technik

MasterForce

Operating Manual

masterforce®

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1. Intended use

The mobile force-measuring devices **MasterForce** serve to indicate forces or weights picked up by strain-gauge sensors (DMS). It is not to be used as the sole measuring device for safety-related measurements.

2. Method of functioning

The battery-operated display device AE 703 provides the strain-gauge full bridge of the sensor with a stabilised supply voltage by means of 3 AA batteries (HR6 Mignon) or four 1.2 V rechargeable batteries. Any change of force acting upon the sensor leads to a change in voltage at its output. The output voltage is digitalised by the display feature and indicated as a force value. The measuring range as well as the display resolution and measurement rate are permanently set and cannot be altered.

masterforce® functions in the **tension and/or compression direction**

2.1. Intended use of the force transducers

The force transducers (sensors) are used for static and dynamic measurement of forces and loads. The force transducers are not safety devices! The safety of machinery, technical facilities and measuring equipment must be implemented by additional security measures! It is the duty of the planning engineer, supplier or user of the machinery and facilities to minimize risks posing hazards to safety, to document potential hazards and to communicate these to the operating personnel. In doing so, the data sheet of the sensor and applicable safety standards need to be observed in addition to the contents of this Operating Manual.

2.2. Protection against dangerous environmental influences

Force transducers are measuring instruments. Depending on the protection class of the sensor, it need to be protected from moisture and dirt. It is important to prevent high mechanical stress from occurring caused by sudden jolts or falls, etc. Storage of the sensors is possible within a temperature range of -40°C to +70°C.

2.3. Maintenance instructions

The force measuring device contains no parts requiring maintenance. Repairs may only be carried out by the manufacturer.

3. Power supply

The device is supplied with power from:

- 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)

Charging of the rechargeable batteries is only possible outside the device. The device leaves the factory with the batteries inserted. To replace the batteries, the battery compartment is opened using a Phillips screwdriver after which the used batteries can be removed and the new ones installed. It is advisable to remove the batteries if you do not intend to use the device over a longer period of time. The battery status is indicated by a flashing battery icon.

4. Installation and application

- The forces or loads due to be measured must be introduced as closely as possible in the measuring direction using suitable accessories. Torsional and bending moments, off-centre loads and transverse loading may lead to measuring errors.
- When in operation, force transducers are slightly deflected to the measuring direction on the force/load introduction side. Accordingly, installation should proceed in such a way that deflection is not restricted or blocked in any way.

- When being assembled or while measurement is in progress, the force transducers need to be protected by suitable means from mechanical as well as dynamic overloading. Special attention must also be paid to prevent overloading from occurring through acting forces or moments that are not in the measuring direction.
- Optimum measurement results are only attained if the nominal temperature range is adhered to. The speed of ambient temperature change should not be allowed to exceed 5K/h. Heating or cooling of the force transducers or weighing cells on one side should be prevented by suitable means.
- It is of paramount importance to ensure that the encapsulation of the sensitive measuring elements remains preserved inside the housing. Existing cable connection boxes must never be opened!
- Components bordering on force transducers may have a strong influence on measuring accuracy. If uncertain, check with the manufacturer with regard to specific requirements governing the types to be installed.

5. Operation

	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
		Unit	Scroll between units (if available)
		Backlight	Switch on the display backlight for a defined time
		On/Off (***)	Switching the device on and off
		Switch measuring range	Measuring range changeover if more than one measuring range is set up
		Gross / net	Toggle between not zeroed and zeroed display

Notes for the operator

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. Error messages

"ADC error"	The input signal exceeds the input range of the ADC	- 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 (-)	- Sensor overloaded/under loaded
Display of current value is flashing	The unit tries to display more than 99999 parts.	- new adjustment of selective digits in setup.
- - - - -	The calculation result in incomputable values (mathematic overflow).	- Sensitivity exceeds the computable range - - other causes see ADC error
"T" (flashing)	A TEDS sensor with invalid data has been detected.	- Check TEDS data from sensor
"usb" (not in capital letters)	Error in PC connection	- Retry by re-connection the USB-cable!

7. Technical data

Accuracy Class	**% F_{nom}**	**0.1***
Force transducer Nominal force (F_{nom}) Maximum operating force (F_G) Breaking force (F_B) Lateral limit force (F_Q)	 kN % F_{nom} % F_{nom} % F_{nom}	 0.1/ 0.2/ 0.5/ 1/ 2/ 5/ 10/ 20/ 50/ 100/ 200 150 > 300 50
Relative linearity deviation (d_{lin}) Relative reversibility error (v) Temperature effect on zero signal (TK_0) Temperature effect on sensitivity (TK_C) Relative creep over 30 minutes ($d_{cr, F+E}$)	% % / 10K % / 10K % / 10K %	≤ 0.1* ≤ 0.1* ≤ 0.1* ≤ 0.1* ≤ 0.1*
Reference temperature (T_{ref}) Nominal temperature range ($B_{T, nom}$) Service temperature range ($B_{T, G}$) Storage temperature range ($B_{T, S}$) Protection class (EN 60529)	°C °C °C °C	+23 -25 ... +60 -30 ... +70 -40 ... +70 IP 67
Instrument		
Digit height Display range Display modes Measurement rate (averaging) Power supply Dimensions (W x H x D) Protection class (EN 60529)	mm 1/s mm	14 5-digit range instantaneous, min/max, unit, overload 50 3xAA (inserted) 82,1x 161,7 x 53,8 IP 54

*sensor dependent

8. Settings with the software ASTAS

The software ASTAS is the universal tool for configuration and simple measured value acquisition including evaluation.
You can find the software ASTAS on our website www.ast.de.