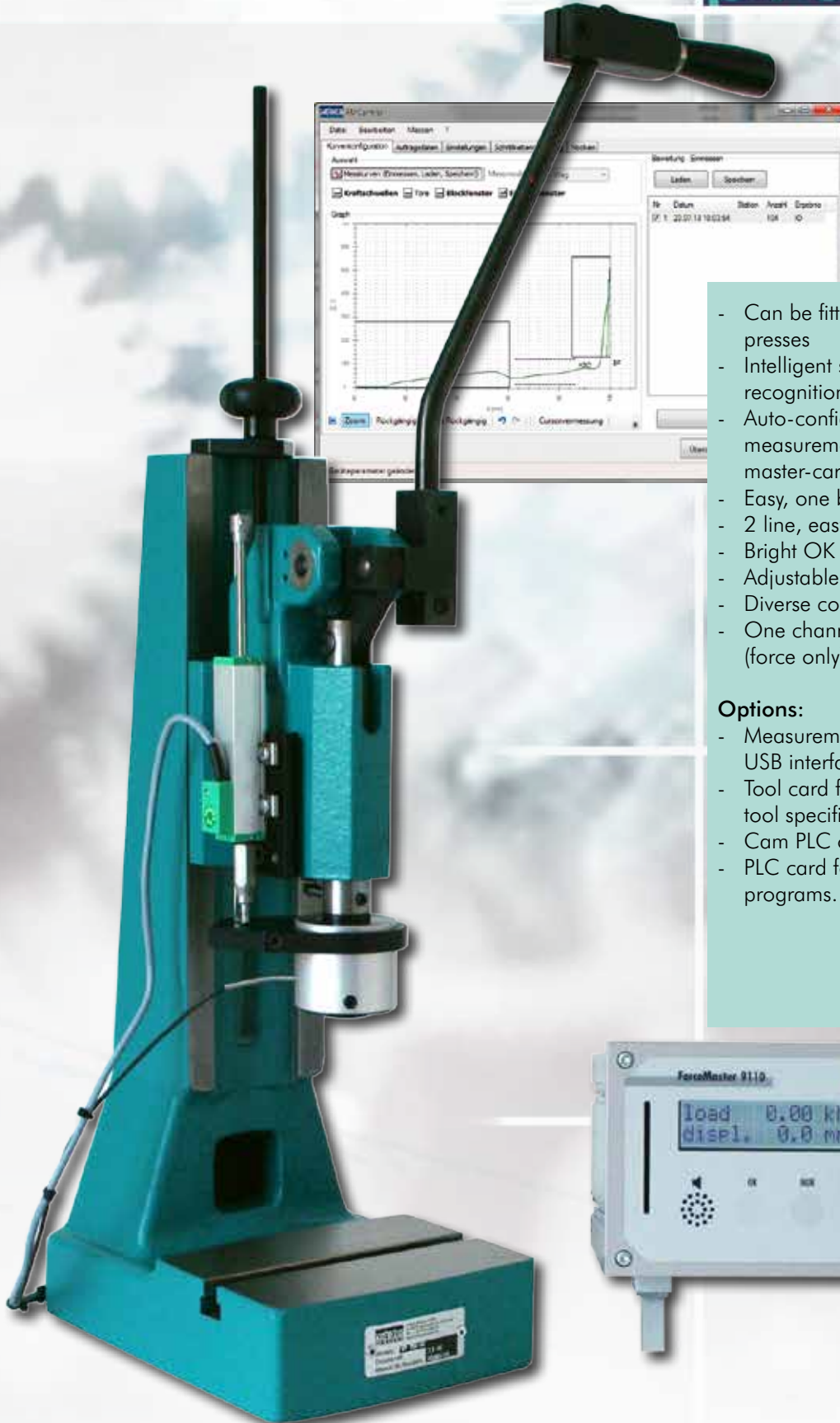


Low-cost monitoring and logging of pressing processes with mäderTM hand presses.



TPC ForceMaster



- Can be fitted to all mäder hand presses
 - Intelligent sensors, automatic recognition of sensor values
 - Auto-configuration of the measurement program with the master-card
 - Easy, one button operation
 - 2 line, easy read display
 - Bright OK /NOK displays
 - Adjustable alarm tone
 - Diverse counter functions
 - One channel measurement (force only) possible
- Options:**
- Measurement logging via USB interface
 - Tool card for storing and setting tool specific measurement data
 - Cam PLC operation
 - PLC card for storing and setting programs.



The TPC ForceMaster can be set up quickly and easily:

Sensor detection

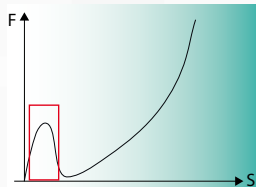
The connectors of the force and displacement sensors are not interchangeable, and are therefore protected from false connections. The characteristics of the sensor are already stored on a printed circuit board in the connector plug. When the TPC ForceMaster is switched on, the sensors are automatically detected and the zero point determined. If the sensors are exchanged, the sensor change will be shown in the display and must be confirmed.

Auto-configuration

The TPC Force Master creates a process monitoring proposal, based on a one-time teach-in process of a good part. This proposal can either be accepted or modified manually on the device or with the help of the supplied software. A good part consists of parts, which were checked before the pressing process, whether they are within the manufacturing tolerances and from which it can therefore be expected that the process will in turn manufacture a good part.

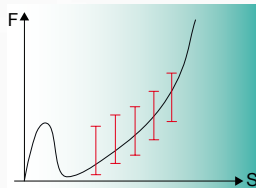
Evaluation variants

Threading



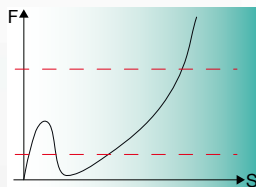
The threading area performs a check to determine whether the maximum force will be exceeded at the start of a joining process. An alarm will notify a warning that parts or the tool could possibly be damaged. The threading area must be activated.

Gates



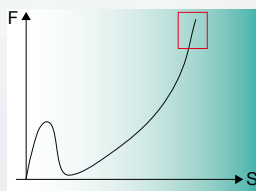
With the auto-configuration, 5 gates will be activated. A gate is defined by a path position and a minimum and maximum force. The forced-displacement curve for good parts must run through all the gates, and no gate may be circumvented. The evaluation is performed when the press stroke has exceeded the path position of all the gates.

Force thresholds



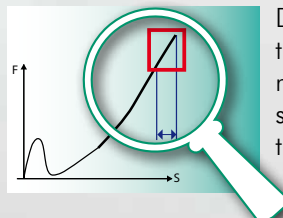
Force thresholds define a minimum force to be achieved and a maximum force threshold, within which the entire force fitting process must be performed once the minimum force has been reached.

Block area End position



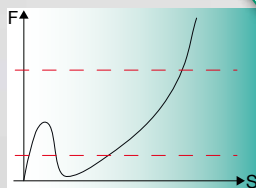
Often the force fitting process is concluded with a high force exertion at the end of the stroke: the block area. It is defined by a force and displacement range which may not be under-run or exceeded. The block area is always inactive after the auto-configuration and must be activated as required.

Press-fit stem path



During the deformation processes which occur at the end of the stroke, the press-fit stem path can also be monitored. The press-fit stem path monitoring can only be activated with an active block area. The press-fit stem path is calculated from the path differential between the reaching of the block area and the beginning of the return stroke.

Force alarm



Force alarms are used to monitor the force sensor and will not lead to an NOK rating. There is a top and bottom force alarm available. Force alarms can, for example, be used to perform switching functions.

OK/NOK notifications

The ForceMaster confirms the manufacturing of an OK part with a green indicator light. A NOK part is notified with a pre-settable signal tone and a red indicator light. By default, the TPC ForceMaster is pre-set in such a manner, that the NOK message can only be acknowledged with a Master-Card. In the manual configuration of the measurement program, this feature can be disabled.

ForceMaster structural layout

From left to right:

- Card slot
- Speaker
- OK / NOK indicator lights
- Rotary push button for programming

Counter

Six different counter types can be set via the configuration menu:

- OK parts
- NOK parts
- Total of all parts
- Count down counter
- R-set (set value for count down counter)
- Total stroke counter



Software

The software for the visualization and correction of the auto-configuration is included in the scope of delivery.

Options:

USB interface for a USB stick

The graphical curve data can be stored on a USB stick for documentation and evaluation purposes. The cycle time should be ≥ 3 seconds.

Cam PLC

The cam PLC functions in the same manner as an electronic, path-controlled step chain controller. When a cam is reached, the movement direction of the press ram is also evaluated. This enables the programming of an action in the cam area, which is dependent on the work or return stroke. This is based on a step chain control, which sequentially performs an array of processes. Only when a condition is fulfilled, will an action be executed and a jump to the next step be performed.

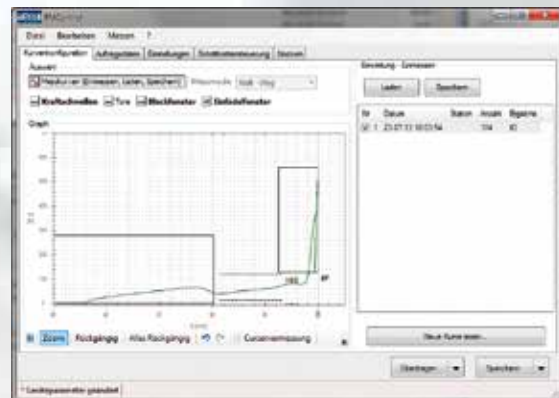
There are 8 inputs and 8 outputs available for programming. The cam PLC can not be used for press-safety purposes.

SmartCards

Tool card
PLC card

Single dimensional operation

It is also possible to operate the TPC ForceMaster with the force sensor only.



Technical Data

TPC ForceMaster Technical Data

General device data

Display: 2-line backlit LCD display
Warning and acknowledgement sounds: type of signal can be set up to 100 dB
Warning sound volume:
Measuring channels: Force/displacement or force/time
Communication interfaces: USB - Type B slave port, on the rear side
RS232 - D-SUB 9, data rate 19.2 kbps
USB, RS232
Interface:
Measurement error: 0.5% from calibration
Electrical connection: 90 ... 240 V AC / 50 ... 60 Hz
Cut-off frequency: 1 kHz
Working temperature range: 0 ... 60 °C
Humidity: 10 ... 80%, non-condensing
Housing: Aluminium profile housing
Protection class: IP20
Connections: coded special connectors
Sampling rate: 10 kHz
Number of I/O: 8 inputs / 8 outputs
Dimensions (W x H x D): 150 x 95 x 260 [mm]
Weight: approx. 3 kg

TPC ForceMaster sensors

Load cell for TPC ForceMaster

The ideal, user-friendly force sensors for hand lever presses.

- The characteristic sensor data is stored on a circuit board in the connector plug and can be recognized by the TPC ForceMaster.
- The sensor is equipped with a clamping pin and ram bore with a cross-thread for the tool attachment.

Overall measurement error: $< \pm 1\%$ from calibration
Maximum usage force: approx. 120% of the rated power according to EN 60529: IP54
Protection class:
Diameter: 50 mm
Height without clamping pin: 50 mm
Clamping pin diameter: $10^{e7} \times 21$ mm
Sensor bore diameter x depth: $10^{H7} \times 25$ mm
The sensor must not be subjected to lateral forces.

Potentiometer

Linearity deviation: from 0.1% from calibration
Resolution: 0.01 mm
Protection class according to EN 60529: IP 40

Retrofit kit for potentiometer

Existing hand lever presses can be retrofitted with a potentiometer with the retrofit kit. An illustration with the drilling pattern is included.



Measuring range	Max. Overload
0 - 0,5 kN	5 kN
0 - 1,0 kN	10 kN
0 - 2,5 kN	25 kN
0 - 5,0 kN	30 kN
0 - 10,0 kN	30 kN
0 - 25,0 kN	30 kN



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