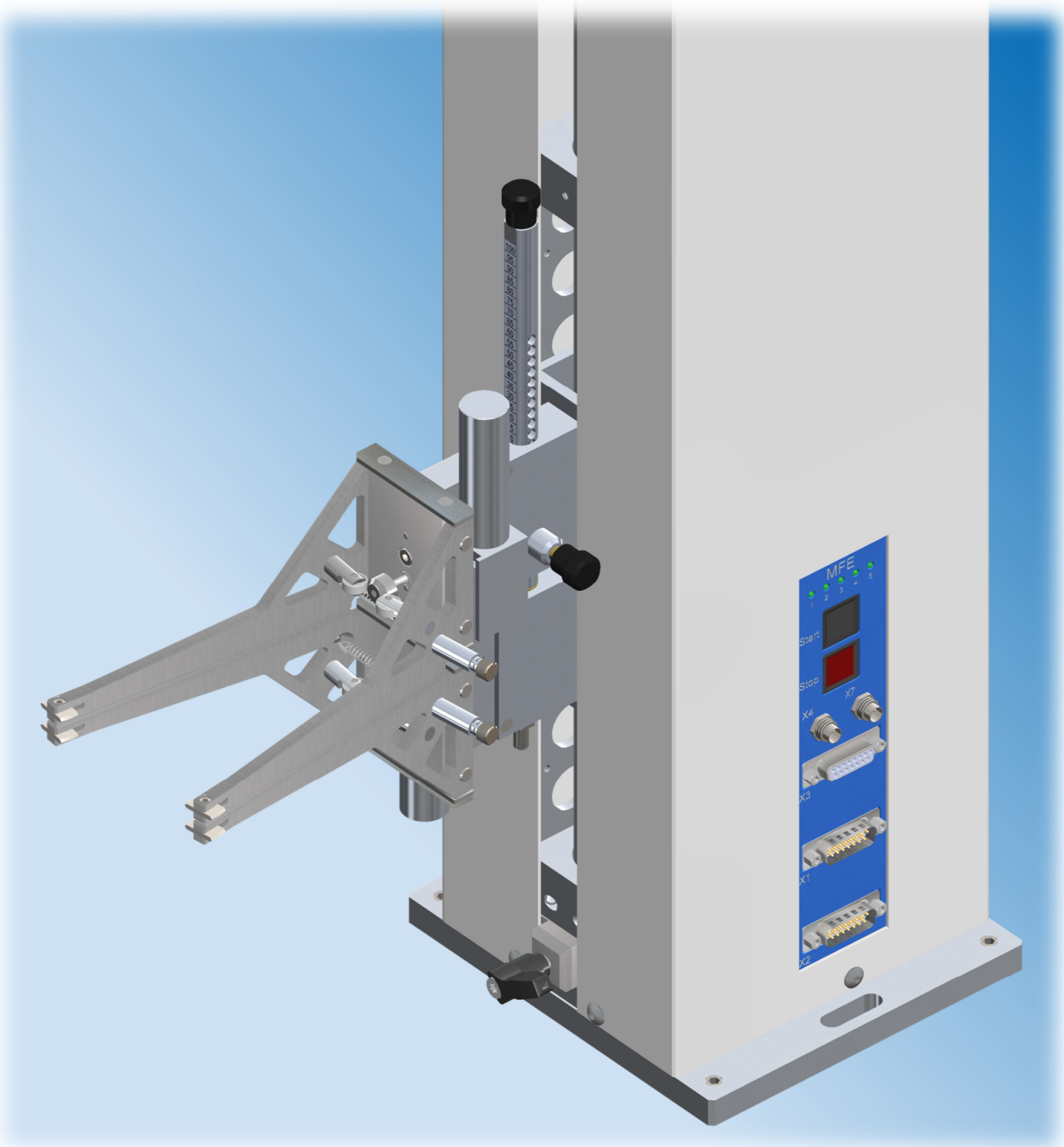
Mess- & Feinwerktechnik GmbH



MFE 910-1

Long travel extensometer with fine measuring system

Area of application

The MFE extensometer is specifically designed for applications with highly lengthening materials such as plastics and rubber, incorporating long travel (up to 900 mm). Due to the inductive fine measuring system of 1 mm, this version of the MFE is suitable for precise measurement of the strain in the initial range and for modulus of elasticity determination.

Design and function

The MFE is used on semi- and fully automated testing machines, preferably in applications where the gauge length does not have to be changed often.

The MFE works semi-automatically, the positioning of the measuring arms on the samples mid-point and the setting of the measuring length is done manually (once at the beginning of the test). The attachment and detachment of the measuring arms and the move to the previously set sample centre or initial measuring length is then operated automatically (by electric motor). As long as the initial measuring length and the position of the samples remains unchanged, no further manual operation takes place on the device. Only when the measuring length is to be changed a manual operation has to be carried out again.

The MFE is suitable for almost all samples (from gauge length of 10 mm) and under ideal conditions for measurements up to specimens fracture.

The measuring direction can be chosen between upwards or downwards. The measuring arms can be easily and quickly removed from the device by means of a plug-in screw system.

The fine measuring system (4) has been integrated into the GL-Scale (1) without the necessary of additional adjustments when the initial measuring length has to be changed. The MFE910-1 has been equipped with a new measuring head which comes with the following features from the factory:

- Adjustable clamping force (3) from ca. 50 to 100 cN
- Carbide-metal double knife edge (2) which can be turned by releasing only one screw.

Calibration of the fine measuring system

The fine measuring system (4) needs to be calibrated after each gauge length adjustment.

Controlling

The MFE is controlled by two potential-free contacts, which switch up to 15 mA (at 24 V DC). Following 3 options could be used.

1. “Start / Stop” button on housing
2. Remote control (may be separately ordered)
3. Computer controllable, by realization of the key function start / stop with help of a suitable hardware (not available at the MF GmbH)

The start pulse at X3/6-7 (pulse length is approx. 100ms) starts the upper measuring head (with measuring direction upwards), it moves downwards.

When the upper measuring head reaches the lower one, it pushes it down until it reaches the adjustable stop.

Now the measuring arms are closed. After the attachment to the sample, the positioning motor is switched off and an internal contact K1 of the MFE is closed.

Via X3/8 and X3/9, this contact K1 can be evaluated and the start of the measuring process can thus be initiated. The stop pulse via X3/4-5 (pulse length approx. 100ms) causes the arms of the MFE to open immediately.

After opening the measuring arms, the upper measuring head moves back down to the starting position. When the initial position is reached, the positioning motor is switched off again and contact K1 is opened.

Meaning of the LEDs

LED 1	green	MFE ready for operation
LED 2	yellow	Upper head moves
LED 3	red	Command open arms
	green	Command close arms
LED 4	red	Measuring arms opening
LED 5	green	Measuring arms closing

Measuring signal

Two different measuring systems are used to detect the elongation. The inductive fine measuring system for the first millimetre and two rotary encoders from 1 to 900 millimetres.

The inductive measuring system is located between the measuring heads, the plunger is attached to the upper measuring head in the GL-scale and the transducer in the lower measuring head, which also serves as a stop for the GL-scale. The measuring signal is provided at the X7 socket.

Each measuring head activates a rotary encoder. The measuring signal is supplied by connector X1 resp. X2. The sinusoidal incremental signals A and B are electrically phase-shifted by 90° and have a signal level of typically 1 Vpp. The output signals of the two encoders must be processed separately at first, then the difference is calculated. The resolution can be less than 1 µm depending on the interpolation and counting method.

Counter cards, measuring amplifiers and cables are not included in the scope of delivery of the MFE!

Delivery scope

1	MFE
2	Gauge head
1	Mounting plate
1	Power supply 24 V, 3-pin connector
2	D-Sub-Plug (female) 15-pol. X1/X2
1	D-Sub-Plug (male) 15-pol. X3
1	3 mm hexagon screwdriver
1	Screwdriver TORX T10
1	Test report

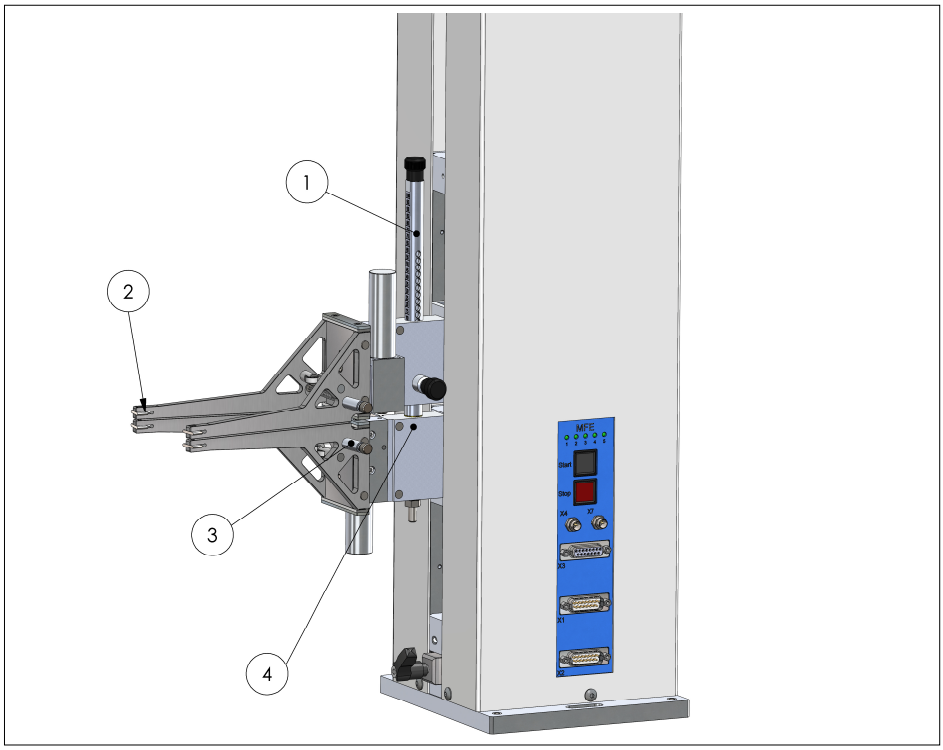
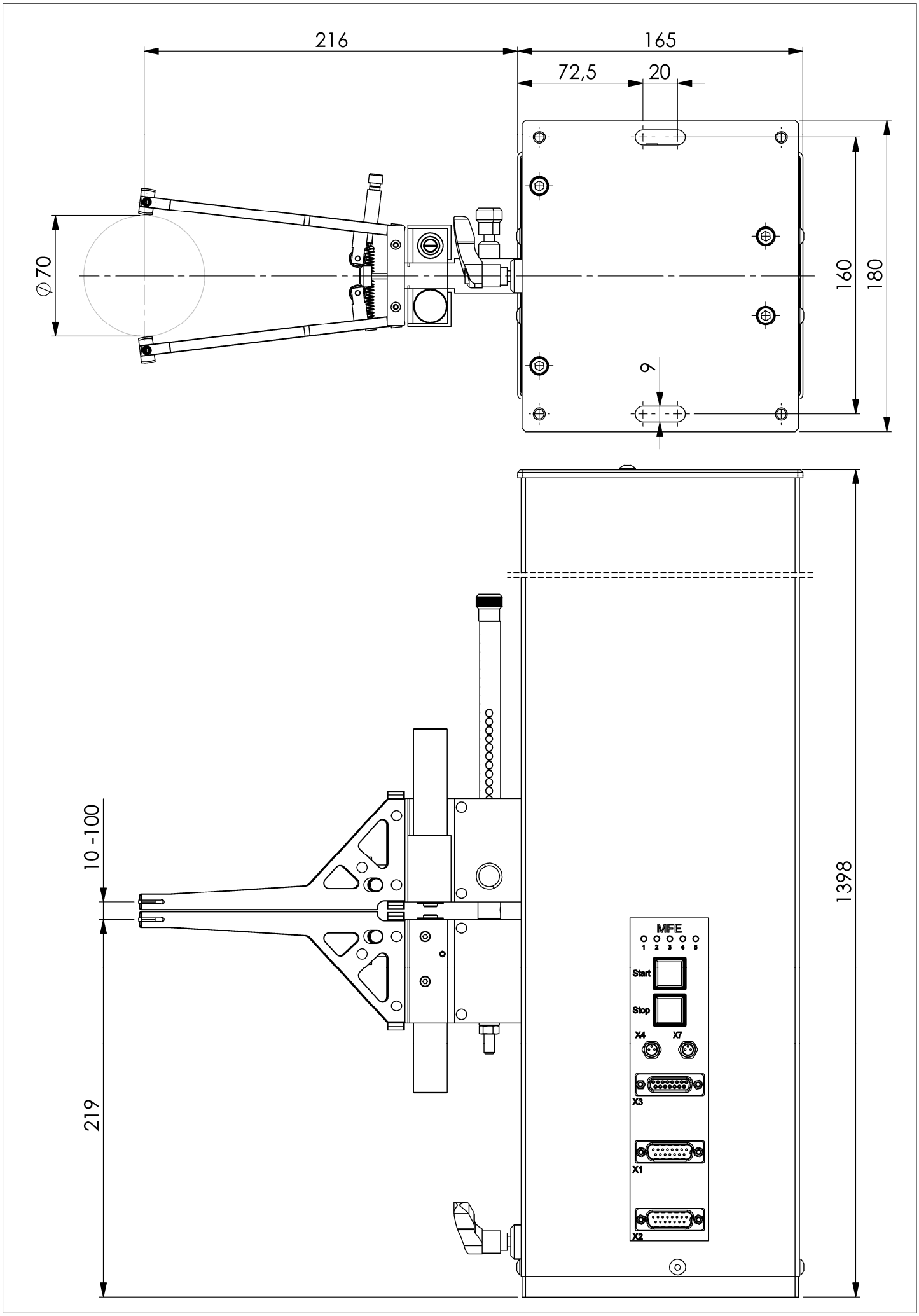


Illustration 1: MFE 910-1 details on the measuring heads

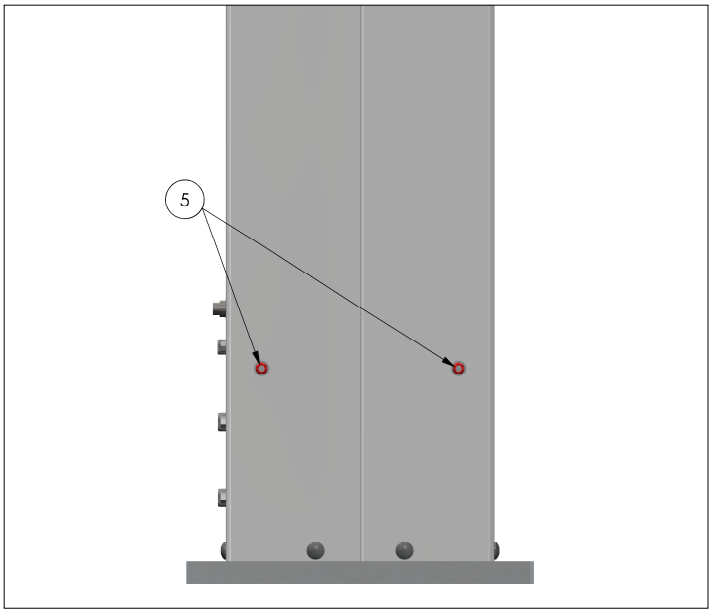


Drawing 1: MFE 910-1 dimensions

Installing

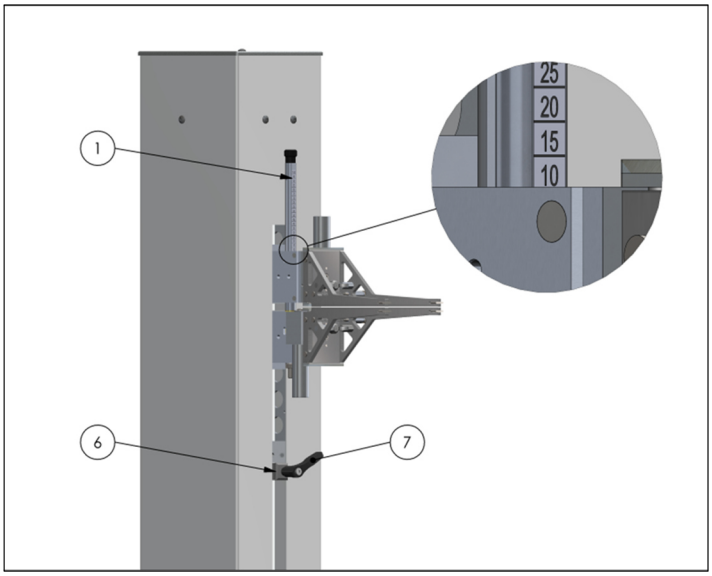
Observe the following points to remove the transport lock:

1. Place the unit upright.
2. Unscrew the two setscrews (5) on the back of the unit with a 3mm hexagon screwdriver and add them to the accessories.
3. Release the stop (6) with the lever (7) (frontside) and move it downwards.
4. Mounting the measuring heads:
    a. Connect the measuring heads in the proper position.
    b. Spread the pair of measuring arms with the index finger and thumb of the left hand and, at the same time, insert and tighten the two supplied socket head screws M4x12 (DIN 912) with the enclosed 3mm hexagon screwdriver with the right hand.



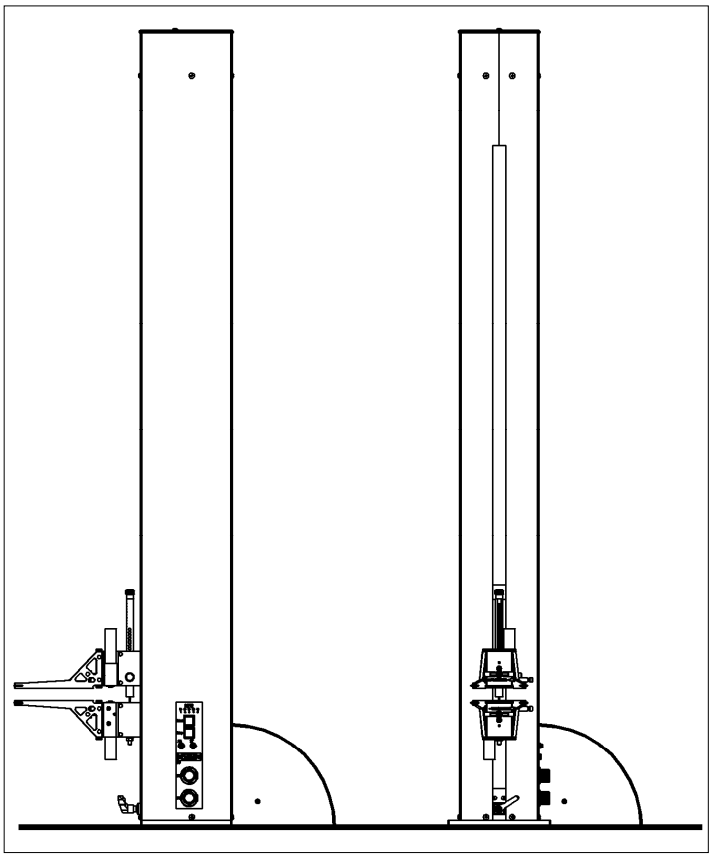
Observe the following to secure the unit again:

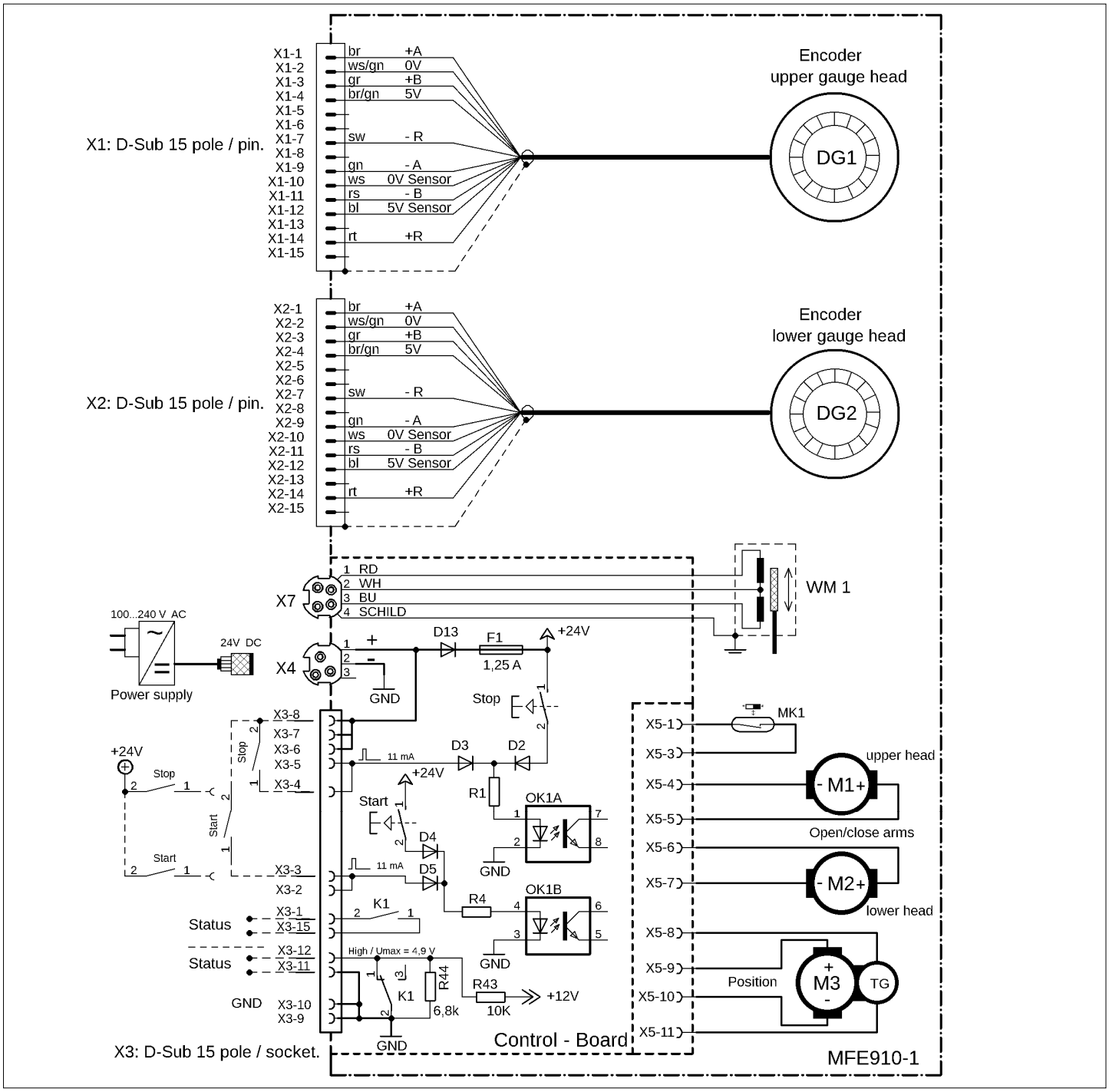
1. Set the gauge length of 10 mm on the GL-scale (1) (detailed view A).
2. Unscrew and remove both measuring heads (Attention! Carriages move upwars on their own).
3. Push the stop (6) upwards, fix it against the carriages without slack and clamp it with the lever (7)
4. Insert the two M6 setscrews at the back of the unit and tighten them carefully.



Attention!

It is essential to align the MFE910-1 vertically with a spirit level when setting it up and attaching it to the testing machine! This is necessary to ensure that the balance weights hang absolutely freely and the measuring heads move smoothly.





Drawing 2: MFE 910-1 block diagram

PIN	X1 / X2	X3	X4	X7
1	+A / BN	Status / Measuring mode "on"	+24 V	Input / RD
2	0 V / WH-GN	Start-Impuls (+UB)	GND	Output / WH
3	+B / GY			Input / BU
4	5 V / BN - GN	Stop-Impuls (+UB)		Schild
5	free			
6	free	+UB of the MFE		
7	–R / BK			
8	free			
9	–A / GN	GND of the MFE		
10	0 V Sensor / WH			
11	-B / PK			
12	5 V Sensor / BU	Status 4.9V / Measuring mode "on"		
13	free	free		
14	+R / RD			
15	free	Status / Measuring mode "on"		
TYP	D-Sub pin connector 15-pole	D-Sub assembly socket; 15-pole	Binder round connector, female 3 pole	Binder round connector, female 4 pole

Table 1: Connection conditions

Technical data	MFE 910-1
Accuracy class according EN ISO 9513	0.5 till 1 mm travel 1 from 1 mm travel
Measuring system 1 (X1+X2)	Optical-incremental 1 Vpp (TTL optional)
Measuring travel	900 mm minus gauge length
Signal period	100 µm
Resolution	≤1 µm (Depending on interpolation)
Accuracy	±3 µm
Measuring system 2 (X7)	Inductive half-bridge
Measuring travel	±0,5 mm
Nominal output signal (circa)	40 mV/V
Sensitivity (circa)	80 mV/V/mm
Input voltage	1 ... 5 V
Carrier frequency	5 ...10 kHz
Accuracy	±1 µm
Initial gauge lengths	10 till 100 mm in 5 mm steps
Activating force	max. 10 cN
Clamping force	Adjustable from 50-100 cN
Opening width (between knife edges)	circa 70 mm
Weight	32 kg

Device option

Measuring system 1 with TTL – Measuring output
and 1 µm resolution (with a 4-fold counting)