



MAHAGROUP

# CONNECT SERIES

Roller Brake Testers for Passenger Cars, Vans and Commercial Vehicles

Original Operating Instructions

BA023001-en

C\_MBT C 3.5 W220

C\_MBT C 3.5 W250

C\_MBT S 3.5 W220

C\_MBT S 3.5 W250

C\_MBT C 4.0 W220

C\_MBT C 4.0 W250

C\_MBT S 4.0 W220

C\_MBT S 4.0 W250

C\_MBT C 5.0 W280

C\_MBT S 5.0 W280

C\_MBT C 13.0 W280

C\_MBT S 13.0 R100 MS

C\_MBT S 13.0 R100 MU

C\_MBT S 15.0 R100 MS

C\_MBT S 15.0 R100 MU

C\_MBT S 18.0 R115 MS

C\_MBT S 18.0 R115 MU

C\_MBT S 18.0 R115 MI

C\_MBT S 18.0 R160 MS

C\_MBT S 18.0 R160 MU

C\_MBT M 18.0 W301

C\_MBT T 18.0 W360

C\_MBT S 20.0 R115 MU

C\_MBT S 20.0 R115 MI

C\_MBT S 20.0 R160 MU

© MAHA Maschinenbau Haldenwang GmbH & Co. KG

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without explicit authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

The contents of this edition have been checked with great care. However, errors cannot be fully excluded. Subject to technical change without notice.

**Manufacturer**

MAHA Maschinenbau Haldenwang GmbH & Co. KG  
Hoyen 20  
87490 Haldenwang  
Germany

Phone: +49 8374 585-0  
Fax: +49 8374 585-590  
Mail: maha@maha.de  
Web: www.maha.de

**Service**

MAHA SERVICE CENTER  
Maybachstraße 8  
87437 Kempten  
Germany

Phone: +49 8374 585-100  
Fax: +49 8374 585-491  
Mail: service@maha.de  
Web: www.mahaservicecenter.de

Dear Customer,

MAHA is one of the world's leading manufacturers of testing and lifting technology and places particular emphasis on quality and performance. The company's concept includes the development, manufacture and sale of products for use in automotive workshops, by vehicle manufacturers and testing organisations.

MAHA's claim is to also be a leader in the areas of reliability, safety and sustainability – this can be seen in many details that have been developed with these aspects in mind.

We are convinced that you will be more than satisfied with the quality and performance of our products for many years. With the purchase of our products you will also receive professional assistance in case of need for service and repair.

Please remember to keep these operating instructions in a safe place. Accurately following their contents will significantly extend the life of your product and also increase its resale value. If you sell your product, please also pass on the operating instructions.

MAHA is constantly working on the further development of all products and therefore reserves the right to make changes, e.g. in shape and appearance, without prior notice.

Extensive accessories, useful assembly material and auxiliary materials are available for our products. For further information, please ask your dealer or your MAHA contact person at any time.

Thank you for choosing a MAHA product!

## Contents

1	General Safety Instructions .....	9
1.1	Introduction .....	9
1.2	Symbols and Signal Words .....	9
1.2.1	Personal Injury .....	9
1.2.2	Property Damage .....	9
1.3	What to Do in the Event of Defects or Malfunctions .....	10
1.4	What to Do in the Event of an Accident .....	10
1.5	Requirements on Operating and Service Personnel .....	10
1.6	Product-Specific Safety Instructions .....	11
2	Description of the Test Bench .....	11
2.1	Service Life .....	11
2.2	General Machine Description .....	12
2.2.1	Layout Diagram and Legend C_MBT "C" (Compact) .....	12
2.2.2	Layout Diagram and Legend C_MBT "S" (Split) .....	13
2.2.3	General Description of the Test Benches .....	16
2.2.4	Function of a Roller Brake Tester .....	16
2.2.5	Intended Use .....	17
2.2.6	Brake Test of Vehicles with <i>One</i> Driven Axle .....	17
2.2.7	Brake Test of Four-Wheel Drive Vehicles .....	18
2.2.1	Brake Test of Commercial Vehicles over 3.5 t GVW .....	19
2.2.2	Overall View C_MBT "C" with Components .....	21
2.2.3	Overall View C_MBT "S" with Components .....	21
2.3	Danger Zone .....	22
2.3.1	For Vehicles up to 3.5 t GVW .....	22
2.3.2	For Vehicles over 3.5 t GVW .....	24
2.4	Set-up Diagram .....	26
2.4.1	Set-up Diagram Car Tester .....	26
2.5	Control Description .....	27
2.5.1	Wiring Diagram .....	29
2.5.2	Number Range of the Reference Identifiers .....	30
2.5.3	Control Cabinet Layout, Basic Variant C_MBT Car .....	31
2.5.4	Control Cabinet Layout, Maximum Equipment C_MBT Car .....	32
2.5.5	Control Cabinet Layout C_MBT Light Truck .....	33
2.5.6	Control Cabinet Layout C_MBT Truck .....	34
2.5.7	Connection and Termination of the Central Module (ZM) .....	37
2.5.8	Coding of ZM-OM .....	38
2.5.9	Coding of ZM-IFM .....	41
2.5.10	Control Buttons (Small Control Cabinet) .....	46
2.5.11	Control Buttons (Large Control Cabinet) .....	47
2.5.12	Indicator Light on the Control Cabinet in the Event of a Fault .....	47
2.6	Technical Data .....	48
2.6.1	Technical Data Car/Van Tester .....	48
2.6.2	Technical Data Truck Tester .....	51

2.6.3	Noise Emission.....	55
3	Description of the Software User Interface.....	56
3.1	Measurement Screen in Car Mode.....	56
3.2	Measurement Screen in Truck Mode.....	57
3.3	Measurement Screen in Motorcycle Mode.....	58
3.4	Burger Menu Functions.....	58
3.5	Results Display.....	60
3.5.1	Current Measurement.....	61
3.5.2	Measurement Archive.....	62
3.5.3	Vehicle Selection (opt.).....	63
3.6	Optional Display Screens.....	64
3.6.1	Scale Screen (opt.).....	64
3.6.2	Display Radio Participants (opt.).....	65
3.7	Settings.....	66
3.7.1	General/Network.....	68
3.7.2	Technician Menu Login.....	71
4	Transport, Handling and Storage.....	72
4.1	Safety Instructions.....	72
4.2	Scope of Delivery.....	73
4.3	Packaging Information.....	73
4.4	Transport and Handling.....	77
4.5	Storage.....	77
5	Installation.....	78
5.1	Safety Information.....	78
5.2	Installation Diagrams.....	79
5.3	Mounting the Control Cabinet.....	80
5.3.1	Mechanical Installation.....	80
5.3.2	Electrical Installation.....	81
5.4	Mounting the Roller Set.....	84
5.4.1	Mechanical Installation.....	84
5.4.2	Electrical Installation.....	89
5.5	Function Test.....	101
6	Calibration/Adjustment.....	102
6.1	Adjusting the Brake Force.....	102
6.1.1	Basic Settings.....	102
6.1.2	Adjusting the Zero Point.....	102
6.1.3	Adjusting Brake Forces with Adjusting Device.....	102
6.1.4	Importing a File.....	103
6.1.5	Adjusting Brake Forces with MJV II.....	103
6.2	Adjusting the Weighing Device.....	103
6.2.1	Adjusting the Zero Point.....	104
6.2.2	Adjusting the Weighing Device.....	104
6.2.3	Importing a File.....	104
7	Operation.....	105
7.1	Safety Instructions.....	105

7.2	Safety Devices .....	106
7.3	Preparations.....	108
7.3.1	Switching on the Test Bench .....	108
7.3.2	Variant 1: Establishing a Network Cable Connection .....	108
7.3.3	Variant 2: Establishing a WiFi Connection.....	108
7.3.4	Variant 3: Integration of the Test Bench into Company Network.....	110
7.4	Test Procedure .....	110
7.4.1	Drive on Test Bench .....	110
7.4.2	Carry out Brake Test with Automatic Sequence.....	111
7.4.3	Carry out Brake Test with Semi-Automatic Sequence .....	112
7.4.4	Carry out 4WD Brake Test with SmartDevice/PC in Automatic Mode .....	113
7.4.5	Carry out Manual 4WD Brake Test with SmartDevice/PC in Counter-Rotation Mode .....	114
7.4.6	Carry out 4WD Brake Test in Counter-Rotation Mode with Pushbutton on Control Cabinet.....	116
7.4.7	Carry out Manual Single-Wheel Brake Test with SmartDevice/PC.....	117
7.4.8	Carry out Single-Wheel Brake Test with Pushbutton on Control Cabinet .....	118
7.4.9	Test Procedure Truck with Axle Assignment (Automatic Procedure preselected) .....	120
7.4.10	Drive off Test Bench.....	121
7.5	Deceleration Table.....	122
8	Inspection and Maintenance.....	123
8.1	Safety Instructions.....	123
8.2	Care Instructions .....	124
8.3	Inspection and Maintenance Schedule .....	124
8.4	Maintenance of the Chains .....	124
8.4.1	Cleaning the Chains .....	125
8.4.2	Checking for Chain Wear .....	125
8.4.3	Retensioning the Chains / Replacing the Test Rollers.....	126
8.4.4	Lubricating the Chains .....	128
8.4.5	Lubricating the Sensing Roller Hinges .....	129
9	Troubleshooting.....	130
9.1	Safety Instructions.....	130
9.2	Error Codes .....	131
10	Repairs.....	139
10.1	Safety Instructions.....	139
10.2	Configuring the Control Unit .....	139
10.3	Checking the Sensor Function .....	142
10.4	Adjusting the Switching Distance of the Sensors.....	143
10.5	Releasing Motors with Mechanical Brake.....	143
10.6	Enabling the Test Rollers via the Service Technician Button .....	146
11	Decommissioning, Dismantling and Disposal.....	147
12	Accessories.....	147
12.1	C_MSA (MAHA Universal Analogue Display) .....	147
12.1.1	Description.....	147
12.1.2	Scope of Delivery.....	148
12.1.3	Technical Data.....	148
12.1.4	Installation .....	149

12.1.5	Status-LEDs .....	152
12.1.6	Setup .....	153
12.1.7	Software Update.....	159
12.1.8	Other.....	159
12.2	C_BOX.....	160
12.2.1	Description.....	160
12.2.2	Scope of Delivery.....	161
12.2.3	Technical Data.....	161
12.2.4	Display Requirements .....	162
12.2.5	Installation .....	162
12.2.6	Connecting the C_BOX with the Brake Tester .....	163
12.2.7	Coupling with the Brake Tester .....	164
12.2.8	Error Handling.....	165
12.2.9	Software Update.....	166
12.3	Configuration of WiFi Router.....	169
12.3.1	Requirements .....	169
12.3.2	Purpose.....	169
12.3.3	Carrying out the Configuration .....	169
12.4	Radio Remote Control RECO S.....	176
12.4.1	Description.....	176
12.4.2	Coupling with the Receiver (Pairing).....	176
12.4.3	Operation with RECO S.....	178
12.5	Radio Remote Control MRC 1100.....	181
12.5.1	Description.....	181
12.5.2	Transmitter .....	181
12.5.3	Radio Receiver .....	181
12.5.4	Teaching the Transmitter .....	182
12.5.5	Setting on the Option Module in the Control Cabinet .....	182
12.6	Roller Cover C_MBT C/S 3.5/4.0/5.0 W220/W250/W280.....	183
12.6.1	Technical Data.....	183
12.6.2	Scope of Delivery.....	183
12.6.3	Mounting Pluggable Roller Cover.....	183
12.6.4	Mounting Hinged Roller Cover C(compact).....	184
12.6.5	Mounting Hinged Roller Cover S(split).....	185
12.7	Drive-over and Lowering Threshold C_MBT C/S 3.5/4.0/5.0 W220/W250/W280.....	185
12.7.1	Technical Data.....	186
12.7.2	Light Barrier of the Lowering Threshold .....	186
12.7.3	Settings on the Light Barrier in the Roller Set.....	187
12.7.4	Setting on the Option Module in the Control Cabinet .....	187
12.7.5	Settings in the CONNECT Technician Menu.....	188
12.7.6	Diagnostics in the CONNECT Technician Menu.....	188
12.8	Weighing Device Static/Dynamic for C_MBT C (Compact).....	189
12.8.1	Description.....	189
12.8.2	Scope of Delivery.....	189
12.8.3	Technical Data.....	189

12.8.4	Installation .....	190
12.9	Weighing Device Static/Dynamic for C_MBT S (Split).....	192
12.9.1	Description.....	192
12.9.2	Scope of Delivery.....	193
12.9.3	Technical Data.....	193
12.9.4	Installation .....	193
12.10	Two Test Speeds .....	198
12.10.1	Description.....	198
12.10.2	Setting .....	199
12.10.3	Display .....	199
12.10.4	Procedure .....	199
12.10.5	Function Test.....	199
12.10.6	Malfunction Description .....	200
12.10.7	Troubleshooting .....	200
12.10.8	Reset Malfunction .....	200
12.10.9	Start Frequency .....	201
12.10.10	Two Test Speeds Light Truck.....	201
12.11	Signal Display for Radio Pressure Converter .....	202
12.11.1	Description.....	202
12.11.2	Procedure .....	202
12.11.3	Signal Display of Radio Pressure Converters .....	202
12.11.4	Function Test.....	202
12.12	Weight Simulators .....	203
12.12.1	Pull-down Device .....	203
12.12.2	Roller Set Lift .....	203
12.12.3	Control for Load Simulators .....	203
12.12.4	Multifunction Control .....	203
12.13	Pit Safety GSQ.....	204
12.13.1	Description.....	204
12.13.2	Description of Acknowledgement.....	205
12.13.3	Electrical Connection Diagram .....	207
12.13.4	Installation .....	209
12.13.5	Commissioning/Configuring the GSQ Sensors .....	216
12.14	Brief Instructions for Commissioning .....	216
12.14.1	Error Code List.....	220
12.15	Wiring Harness Extension .....	222
12.16	Drive-out Aid, Static Brake (Mechanical Motor Brake) .....	222
12.16.1	Description.....	222
12.16.2	Structure of Motor Counter Bearing, Compact Test Benches .....	222
12.16.3	Structure of Motor Counter Bearing, Split Test Benches .....	222
12.17	Drive-off Aid, Static Brake (DC brake).....	223
12.17.1	Description.....	223
12.17.2	Configuration .....	224
12.18	Motorcycle Mode (Roller Cover with Sensor) .....	225
12.18.1	Description.....	225

12.18.2	Scope of Delivery.....	225
12.18.3	Technical Data.....	225
12.18.4	Installation / Commissioning .....	226
12.19	Cable Remote Control for Motorcycle Mode .....	227
12.20	Roller Heating.....	227
12.20.1	Description.....	227
12.21	Drive-on Ramp Set for Above-Ground Operation .....	228
12.21.1	Description.....	228
12.21.2	Technical Data.....	228
12.21.3	Installation .....	229
12.22	Drive-over Ramp Set .....	229
12.22.1	Description.....	229
12.22.2	Technical Data.....	230
12.22.3	Installation .....	230
12.23	Universal Console C_MCD.....	231
12.24	Drive-on Aid C_MBT S 13.0/15.0 R100 MU .....	233
12.24.1	Description.....	233
12.24.2	Scope of Delivery.....	233
12.24.3	Technical Data.....	233
12.25	Roller Set Cover C_MBT S 13.0/15.0/18.0/20.0 .....	234
12.25.1	Description.....	234
12.25.2	Scope of Delivery.....	234
12.25.3	Technical Data.....	234
13	Annex .....	235
13.1	Naming convention .....	235
13.2	CE Declarations of Conformity .....	237



# 1 General Safety Instructions

## 1.1 Introduction

- These operating instructions must be read carefully and understood before work commences.
- Please observe the specific safety information provided for the respective sections of the operating manual.
- Adhering to the procedures, sequences and corresponding safety instructions is essential.
- A printed copy of the operating instructions shall be kept permanently available at the test bench.
- The relevant regulations regarding accident prevention and health and safety must be observed.

## 1.2 Symbols and Signal Words

### 1.2.1 Personal Injury



#### **DANGER**

indicates an immediate hazard which, if not avoided, will result in death or severe personal injury.

---



#### **WARNING**

indicates a potential hazard which, if not avoided, could result in death or severe personal injury.

---



#### **CAUTION**

indicates a potential hazard which, if not avoided, could result in moderate or minor personal injury.

---

### 1.2.2 Property Damage

#### **NOTICE**

indicates a potentially harmful situation which, if not avoided, could result in damage to the equipment or surrounding objects.

---

### **1.3 What to Do in the Event of Defects or Malfunctions**

If the fault cannot be rectified using the procedures described in chapter "Troubleshooting", proceed as follows:

- Switch off the main switch and secure it against being switched on again (unauthorised use).
- Contact service team.

### **1.4 What to Do in the Event of an Accident**

- Notify first aiders, the ambulance service and/or immediate care doctor:
  - Where did the accident happen (address, workshop ...)?
  - What happened?
  - How many are injured?
  - What injuries have occurred?
  - Who is reporting the accident?
- Keep calm and answer questions.

### **1.5 Requirements on Operating and Service Personnel**

Only persons qualified for testing in accordance with TRBS 1203 may be used as service personnel.

All persons involved in the operation, maintenance, assembly, dismantling and disposal of the equipment must

- be 18 years of age or older,
- have the mental and physical capacity for their role,
- be demonstrably trained and instructed,
- have read and understood the operating instructions, in particular the instructions on how to behave in the event of a malfunction and on proper use,
- observe the locally applicable regulations on occupational health and safety,
- show knowledge and experience in handling the equipment and the dangers posed.

## 1.6 Product-Specific Safety Instructions

- There is a ban on being in the danger zone during entry, exit, crossing and vehicle inspection.
- The accessibility of the emergency stop switch and emergency stop pushbutton must be ensured.
- Personal protective equipment (safety shoes, gloves) must be worn during all work on the test bench.
- Service work may only be performed by specially authorised and trained personnel. Qualified personnel include authorised, trained specialists of the manufacturer, the authorised dealers and the respective service partners
- Operation is only permitted with safety and protective devices ready for operation.
- The facility, including the work area, must be kept clean.
- Sufficient lighting of the work area must be provided.
- All electrical work may only be carried out by qualified electricians in accordance with the locally applicable regulations, directives and standards.
- For all work on the test bench, it must be ensured that the main switch is switched off and secured against being switched on again.
- When moving heavy components (> 25 kg), use suitable lifting equipment.

## 2 Description of the Test Bench

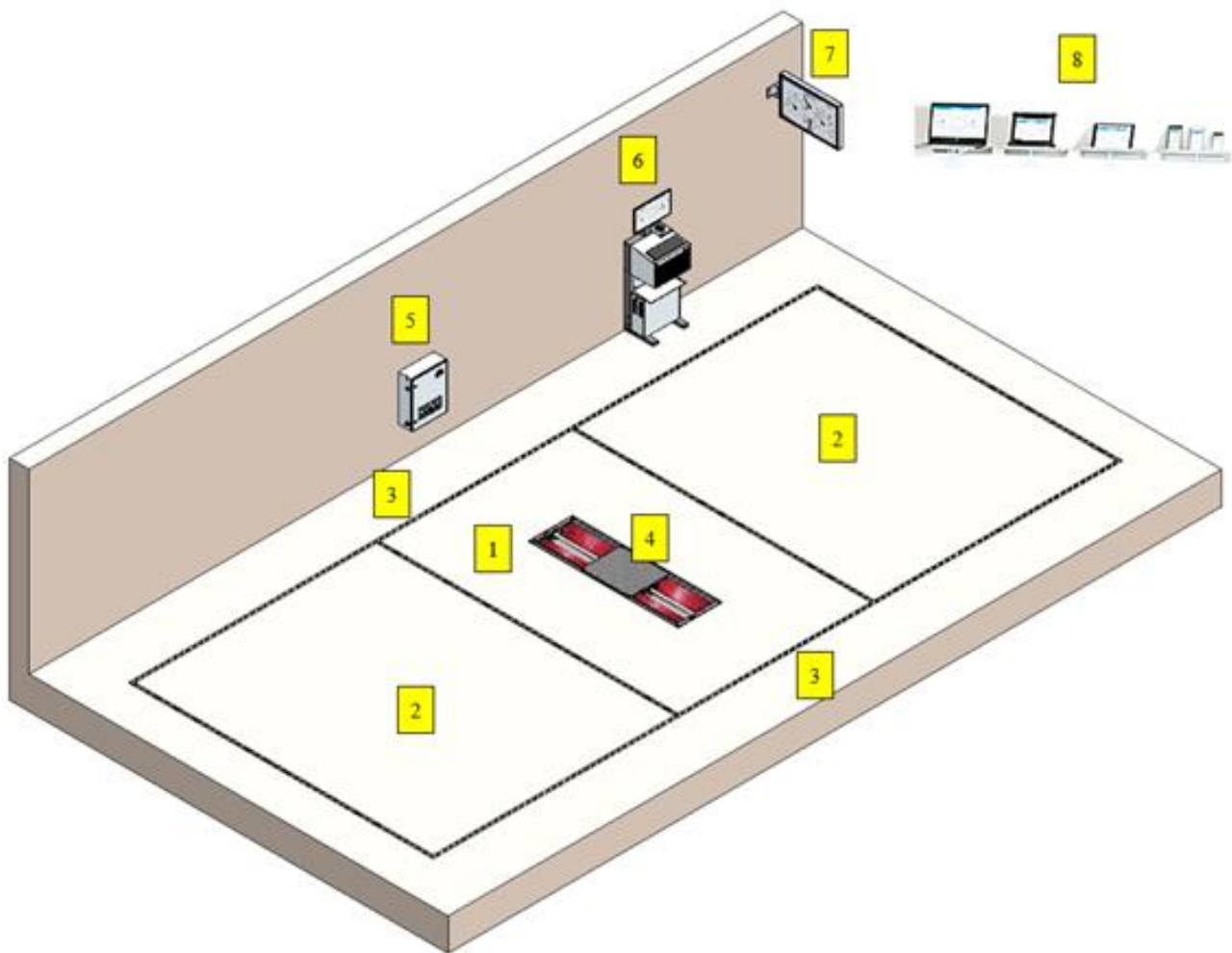
### 2.1 Service Life

The test bench is designed for a service life of approx. 10 years. This depends, among other things, on the existing operating conditions. After this period, the test bench must be replaced with a new product or undergo a general overhaul.

A general overhaul should only be carried out by the manufacturer or persons authorized by them. Among other things, the safety structures are to be inspected and, if necessary, other parts are to be replaced in accordance with the manufacturer's specifications.

## 2.2 General Machine Description

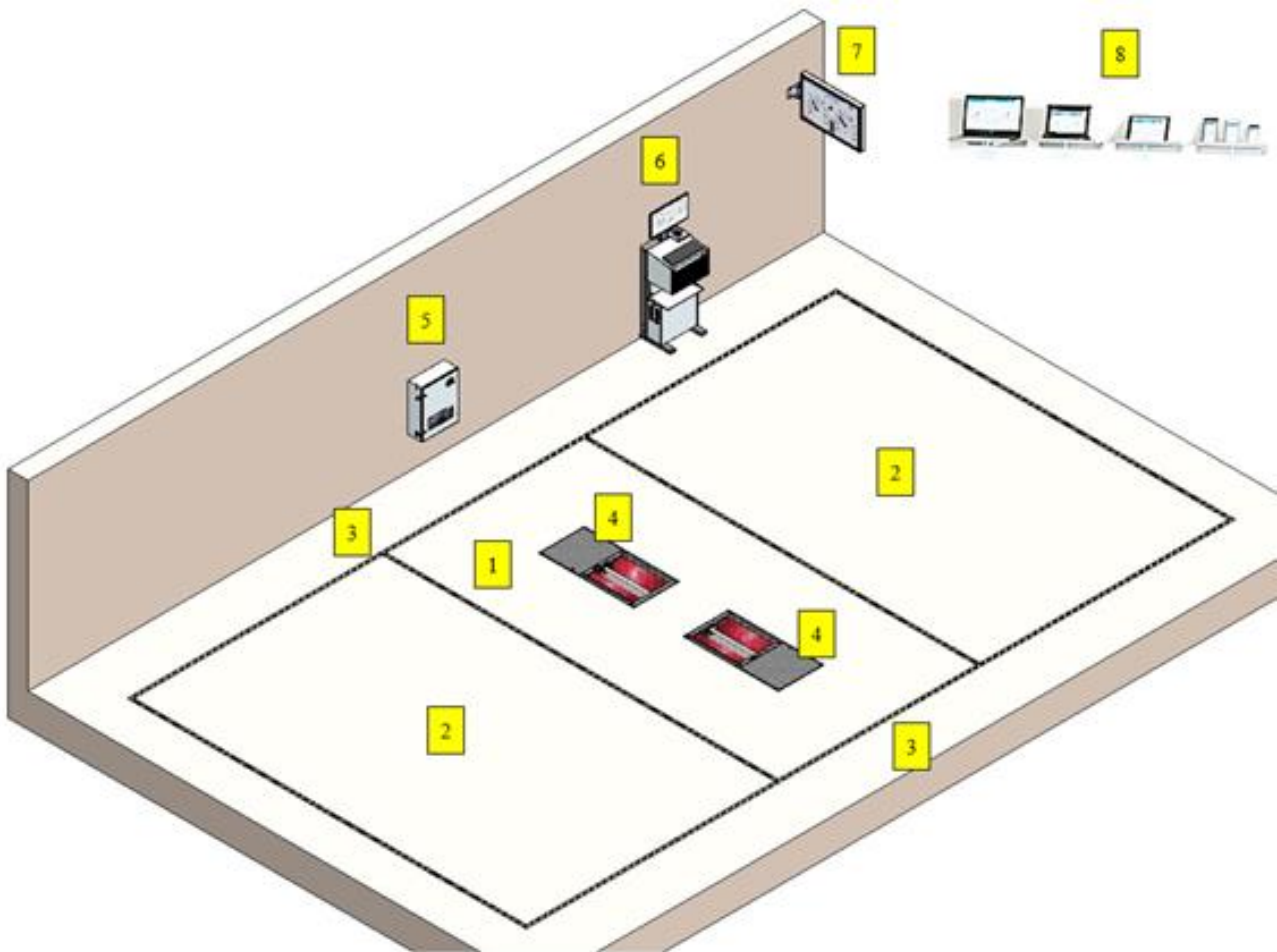
### 2.2.1 Layout Diagram and Legend C\_MBT "C" (Compact)



*Layout of C\_MBT C 3.5/4.0 W220 (compact roller set)*

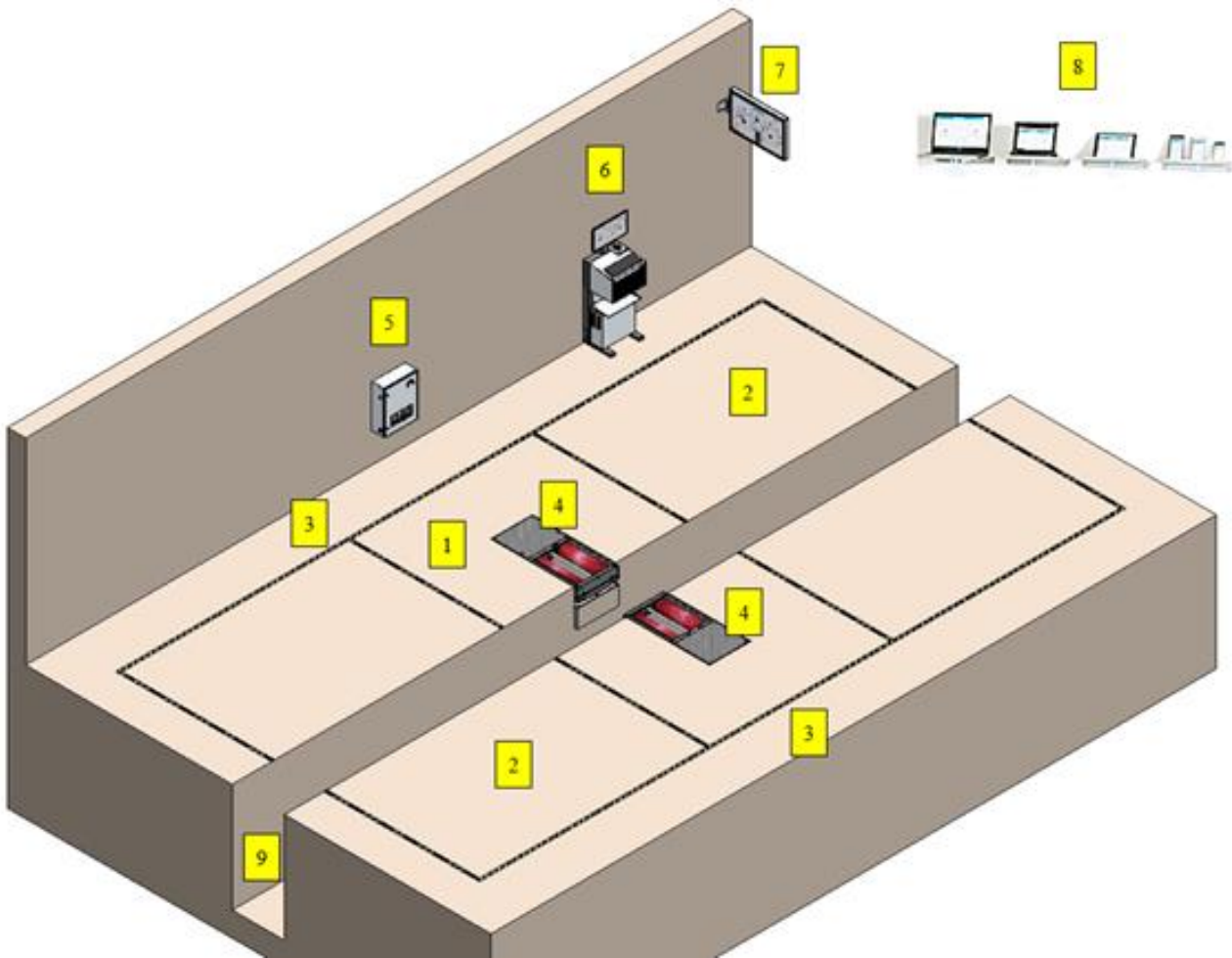
- 1 Immediate danger zone around the test bench (within the inner yellow/black markings)
- 2 Area of the vehicle parking area before and after the test bench
- 3 Side area to the left and right of the test bench
- 4 Brake tester
- 5 Control cabinet
- 6 Universal console
- 7 Simultaneous display, analogue / TV screen
- 8 Mobile devices (browser capable) with touch screen / WiFi router

## 2.2.2 Layout Diagram and Legend C\_MBT "S" (Split)



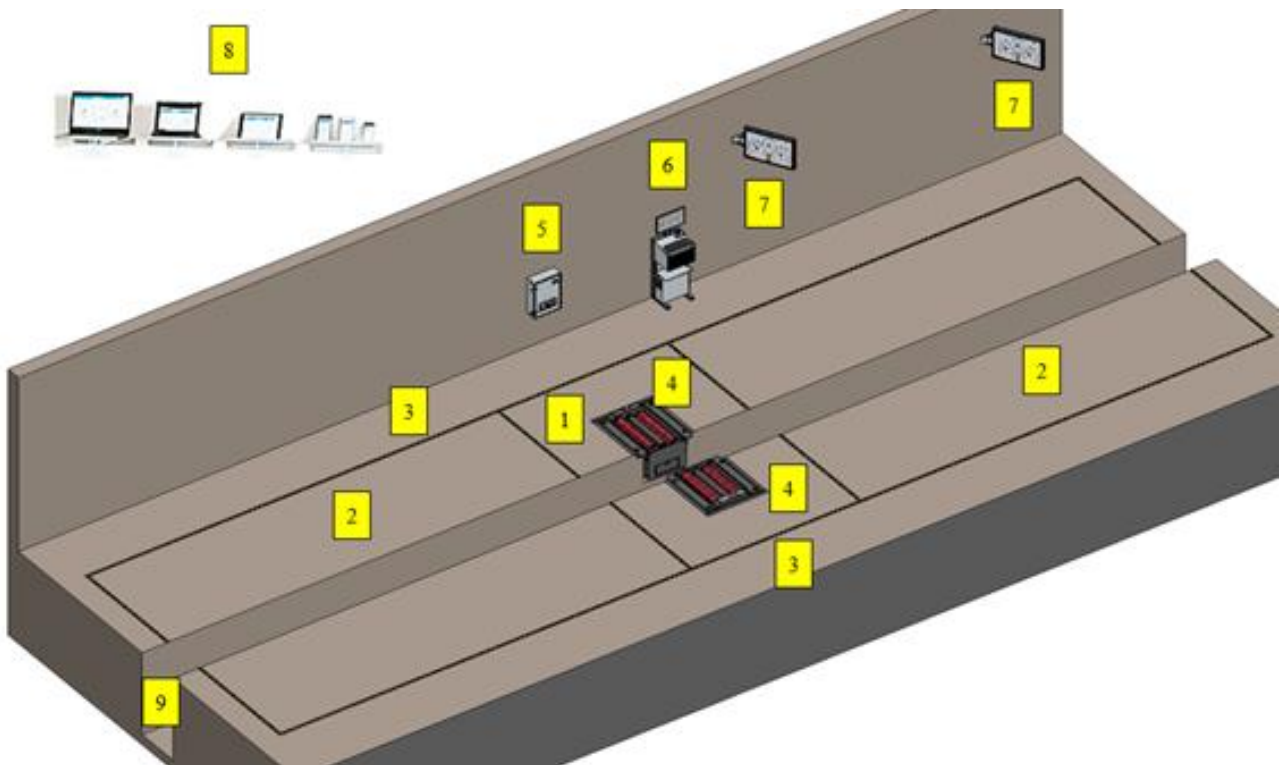
*Layout of C\_MBT S 3.5/4.0 W220 (split roller set)*

- 1 Immediate danger zone around the test bench (within the inner yellow/black markings)
- 2 Area of the vehicle parking area before and after the test bench
- 3 Side area to the left and right of the test bench
- 4 Brake tester
- 5 Control cabinet
- 6 Universal console
- 7 Simultaneous display analog / TV screen
- 8 Mobile devices (browser capable) with touch screen / WiFi router



*Layout of C\_MBT S 3.5/4.0 W220 (split roller set with working pit)*

- 1 Immediate danger zone around the test bench (within the inner yellow/black markings)
- 2 Area of the vehicle parking area before and after the test bench
- 3 Side area to the left and right of the test bench
- 4 Brake tester
- 5 Control cabinet
- 6 Universal console
- 7 Simultaneous display analog / TV screen
- 8 Mobile devices (browser capable) with touch screen / WiFi router
- 9 Working pit between the roller set halves



*Layout of C\_MBT S 13.0/15.0 R100 MU (split roller set with working pit)*

- 1 Immediate danger zone around the test bench (within the inner yellow/black markings)
- 2 Area of the vehicle parking area before and after the test bench
- 3 Side area to the left and right of the test bench
- 4 Brake tester
- 5 Control cabinet
- 6 Universal console
- 7 Simultaneous display analog / TV screen
- 8 Mobile devices (browser capable) with touch screen / WiFi router
- 9 Working pit between the roller set halves

### 2.2.3 General Description of the Test Benches

In order to prevent dangerous situations in road traffic caused by a defective braking system of a vehicle, motor vehicles should be subjected to a brake performance test at regular intervals and e.g. after repairs. This is generally done on a brake tester.

The present **roller brake tester** allows wheel- and axle-wise dynamic **braking** and essentially consists of a **base assembly (compact or divided over a pit)**, a **control unit** and a **display unit**.

Components for driving the rollers and for absorbing the braking forces are installed in the **floor assembly**: Test roller(s), sensing roller(s), drive motors, strain gauge bending beam for measuring the braking force and various sensors. These sensors are plugged into an interface module in the floor assembly, which is connected to the control unit via cable.

The **control unit** consists of a control box with electronic components and a central control board (central module) with firmware and the operating elements required for safe operation.

In the simplest case, the **display unit** is a monitor of an existing PC or a notebook in the immediate vicinity of the test bench and is connected to the control unit via LAN cable or wirelessly via WiFi.

Furthermore, a commercially available TV monitor (together with a MAHA C\_BOX) or the MAHA universal analogue display can be used as a simultaneous display.

If WiFi is available, a browser-capable smart device (mobile phone, tablet PC, etc.) can also be used as a display and operating unit.

On the one hand, the display is used for status indication of the system, user guidance and visualization of the measured values; on the other hand, operating options can be selected or data can be stored with the corresponding input device.

### 2.2.4 Function of a Roller Brake Tester

To measure the braking forces of a motor vehicle, the test bench is driven over with a vehicle axle. The wheel(s) of the motor vehicle is/are brought to a preset speed by motor-driven rollers.

As soon as the set engine speed is reached, the operator is prompted to apply the service or parking brake, slowly increasing the braking force.

The rotatably mounted drive motor would rotate freely during operation. This is prevented by the bending beam (range spring). This connects the housing of the drive motor to the test bench frame and thus forms a torque support.

The range spring now bends according to the torque generated by the motor. An applied strain gauge converts the mechanical deformation of the range spring into electrical signals, which can be converted into a braking torque in the control system and visualized via a display unit.

The sensing roller directly measures the wheel speed. The magnitude of the slip can be determined by comparing the drive speed with the sensing roller speed – both values determined via sensors. To avoid unnecessary tyre wear, MAHA



test benches switch off automatically when the (legally) specified maximum slip is reached.

### 2.2.5 Intended Use

- This test bench is used exclusively for testing the braking efficiency of motor vehicles. The rated axle load must be observed.
- The test bench must not be modified without express written permission from the manufacturer. Non-compliance invalidates the declaration of conformity.
- The operator must carry out a workplace hazard assessment for the test bench including the available options.
- The test bench must not be set up in explosion and fire hazard areas and in damp rooms (e.g. washing halls).
- The test bench is suitable for the temperature range 5...40 °C, for a maximum humidity of 50 % (at 40 °C) and for an altitude of up to 1000 m above mean sea level. For operation under different ambient conditions, please contact the manufacturer.
- Depending on the equipment, the test bench can also be set up outdoors. Please contact the manufacturer.
- For trouble-free operation, a closed, dry and roofed installation site is strongly recommended.

### 2.2.6 Brake Test of Vehicles with *One Driven Axle*

The vehicle is driven into the roller set with the axle to be tested. At the same time, the two sensing rollers that measure the wheel speed are pressed down. A warning message is issued and after approx. 3 seconds the two drive motors of the roller set are started so that both vehicle wheels turn in the forward direction.

As soon as the nominal speed is reached, the "Ready for braking" LED lights up or the corresponding user message appears on the respective display unit. This signals that the inspector can begin the braking process. To test the brakes, increase the force on the brake pedal or parking brake lever quickly but not jerkily. In conjunction with an electronic parking brake, this must be checked in accordance with the manufacturer's specifications, usually by pressing the control button for the electronic parking brake several times in quick succession.

Braking should only be applied until the required deceleration for the vehicle is reached, braking up to slip cut-off is not mandatory. In this way, unnecessary tyre wear can be avoided.

During the braking process, the speed of the drive roller and the sensing roller is constantly compared. If braking is so severe that at least one sensing roller exceeds the maximum permitted slip (e.g. 27 % slip), the drive motors are automatically switched off. This serves both to protect the drive motors from overload and to protect the tyres from excessive tread wear. On light vehicles, even a small amount of slip can cause tyre damage.

## 2.2.7 Brake Test of Four-Wheel Drive Vehicles

### NOTICE

In order to avoid stresses in the drive train and resulting damage, care must be taken with four-wheel drive vehicles to ensure that

- the manufacturer's specifications are fully observed.
- a suitable test mode is selected on the brake tester depending on the vehicle make and model.

Only drive four-wheel drive vehicles out of the test bench when the rollers are stationary!

---

### **Mode 1: Standard brake tester (1-axle), direction of rotation both wheels forward**

This mode is only conditionally suitable for testing four-wheel drive vehicles.

On vehicles where the four-wheel drive system can be deactivated by switching off the ignition, it should be noted that the roller set must not be restarted automatically after the brake efficiency test has been carried out. Exiting the test bench is therefore only possible when the rollers are stationary. The ignition of the vehicle must not be switched on under any circumstances when the test bench rollers are rotating, as otherwise the abrupt frictional connection will put mechanical stress on the differential.

Vehicles in which the four-wheel drive system has been deactivated by removing fuses behave like a conventional two-wheel drive, i.e. the test bench can be left with the rollers rotating. The fuse shall not be reinserted until the brake performance test has been completed and the vehicle has finally exited the test bench.

### **Mode 2: Counter-rotation operation in main and reverse direction for four-wheel drive test, axle-wise left forward / right reverse rotation or vice versa**

If the counter-rotation mode is selected before driving onto the test bench, the test rollers start in counter-rotation and there is no power transmission via the drive train.

In the brake efficiency test, only the forward rotating wheel is measured. Thus, two measuring processes must take place for the testing of an axle, between which the direction of rotation is reversed.

### NOTICE

In the case of counter-rotating operation, it is advisable to test in semi-automatic mode, so that when the rollers are stationary, the test bench can be exited without creating the above-mentioned stresses in the drive train.

An electromechanical motor brake, which is available as an option, further facilitates extension.

---

### **Mode 3: Automatic four-wheel drive detection**

In this mode the starting resistance of the vehicle axle is monitored and evaluated. This detects a vehicle axle that is not freewheeling, and an automatic switchover to reverse operation takes place.

During the braking efficiency test, two measuring processes take place, between which the direction of rotation is automatically reversed. The braking force of the respective wheel turning forwards is measured.

After completion of the two measurements, the test bench rollers remain stationary until the vehicle has exited the test bench.

#### **NOTICE**

In the case of automatic four-wheel drive detection, the vehicle engine must NOT be switched off after driving on the test bench, otherwise correct four-wheel drive detection is not possible.

In the case of counter-rotation operation, it is recommended to use a pedal force meter as a measurement reference to determine the actual brake force difference.

In some vehicles, the power transmission is controlled differently depending on the driving situation. This can lead to the vehicle on the test bench not behaving like a four-wheel drive vehicle during the roller start, but like a front or rear-wheel drive vehicle. Thus, the automatic four-wheel drive detection cannot find an increased starting resistance of the four-wheel drive. In this case, ensure automatic four-wheel drive detection by applying the brake before starting the test rollers.

---

### **2.2.1 Brake Test of Commercial Vehicles over 3.5 t GVW**

By preselecting the vehicle type, the following parameters in the brake tester are adapted to the selected vehicle type:

- automatic/manual roller start, if necessary
- the measurement screen
- automatic storage of measured values for cars and manual storage for trucks
- the start-up monitoring
- the slip cut-off
- the test speed, if necessary

During commissioning or maintenance, the installer can set the vehicle type that is loaded by default from the test bench after the main switch is switched on. This offers the possibility that in a pure truck workshop after "Main switch ON" the vehicle type Truck is preselected. Whereas, for a test station that performs mixed mode passenger car and truck testing on the test bench, it may be advantageous if the test bench has the passenger car preselection. Changing the vehicle type is done for the user in the burger menu.

#### **Two test speeds**

If the truck brake tester has the option "Two test speeds" (VZ 935333/935334), the test speed is automatically adapted to the vehicle type preselected in the burger menu (car = fast / truck = slow).

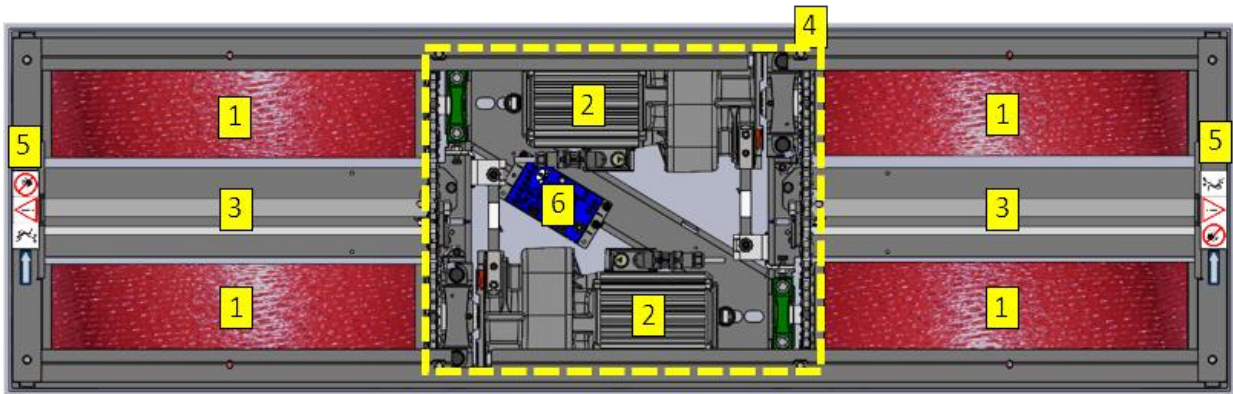
### **Load simulation**

For the truck brake tester, a pull-down device or a roller set lifting device for load simulation are optionally available. The Load Simulation screen can be used to increase or decrease the weight of the axle under test. The screen shows the current wheel loads for left/right and the axle weight. Using the +/- keys on the screen (smartdevice monitor) or on the RECO S remote control, the weight of the axle under test can be increased or decreased.

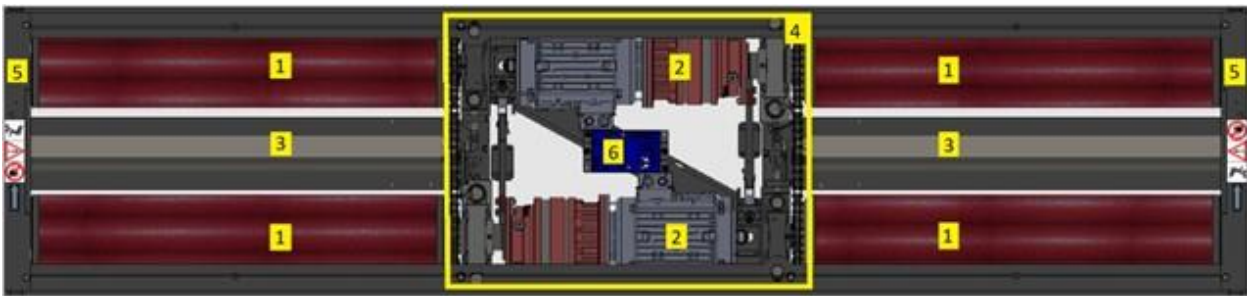
### **Save measured value / pressure sensor and axle assignment**

If measured values are available, they can be saved. Pressing the Save symbol takes you to the axle assignment dialogue. Here it is possible to assign the brake type and the valid pressure sensor to the axle number.

## 2.2.2 Overall View C\_MBT "C" with Components



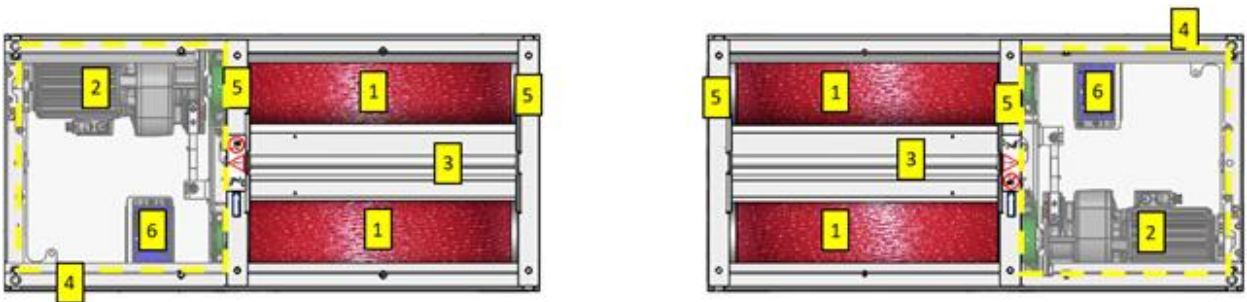
Overall view C\_MBT C 3.5/4.0/5.0 with components (compact roller set)



Overall view C\_MBT C 13.0 W280 with components (compact roller set)

- |   |                          |
|---|--------------------------|
| 1 Test bench rollers                                | 2 Electric motor         |
| 3 Sensing roller with slip and drive sensor (Namur) |                          |
| 4 Middle cover (shown transparent)                  |                          |
| 5 Bearing cover                                     | 6 IFM (Interface module) |

## 2.2.3 Overall View C\_MBT "S" with Components



Overall view C\_MBT S 3.5/4.0/5.0 with components (split roller set)

- |   |                          |
|---|--------------------------|
| 1 Test bench rollers                                | 2 Electric motor         |
| 3 Sensing roller with slip and drive sensor (Namur) |                          |
| 4 Middle cover (shown transparent)                  |                          |
| 5 Bearing cover                                     | 6 IFM (Interface module) |

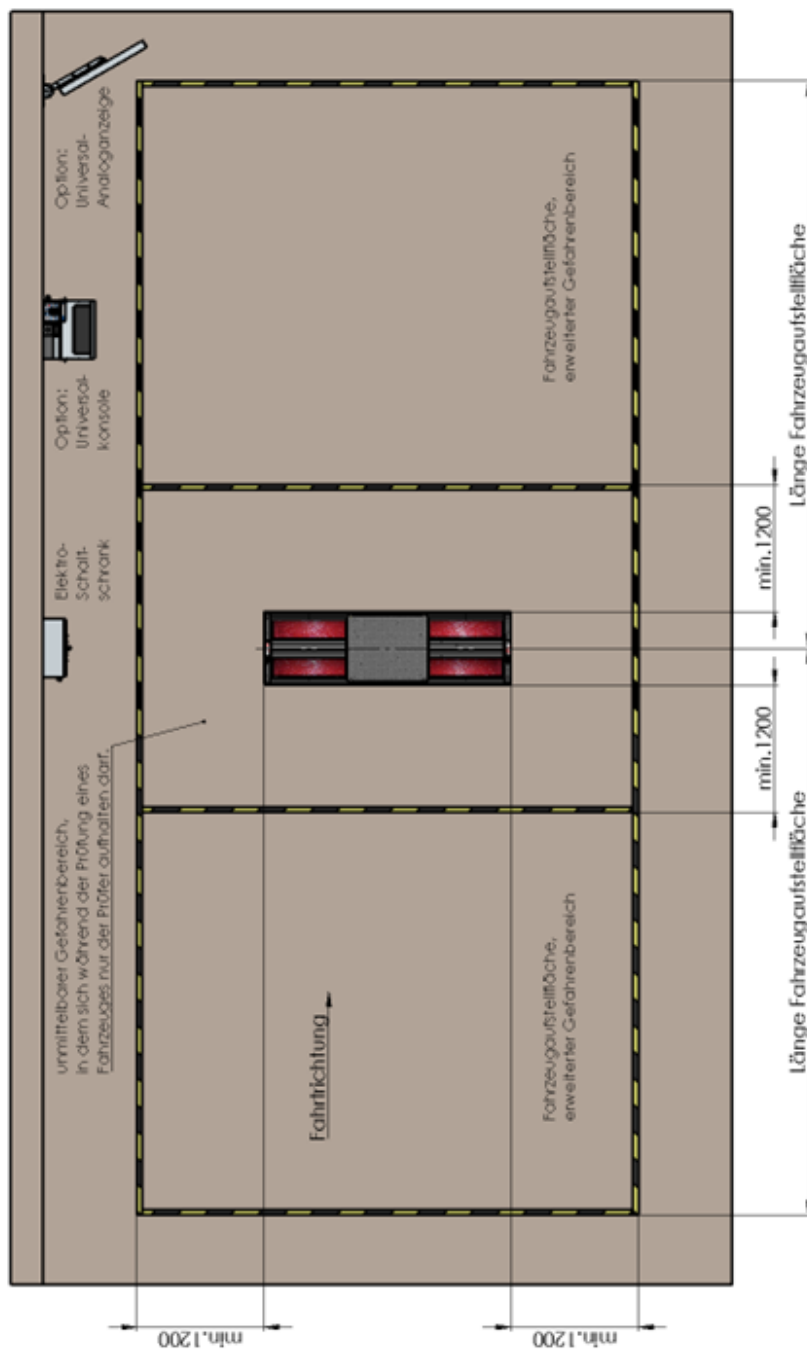
## 2.3 Danger Zone

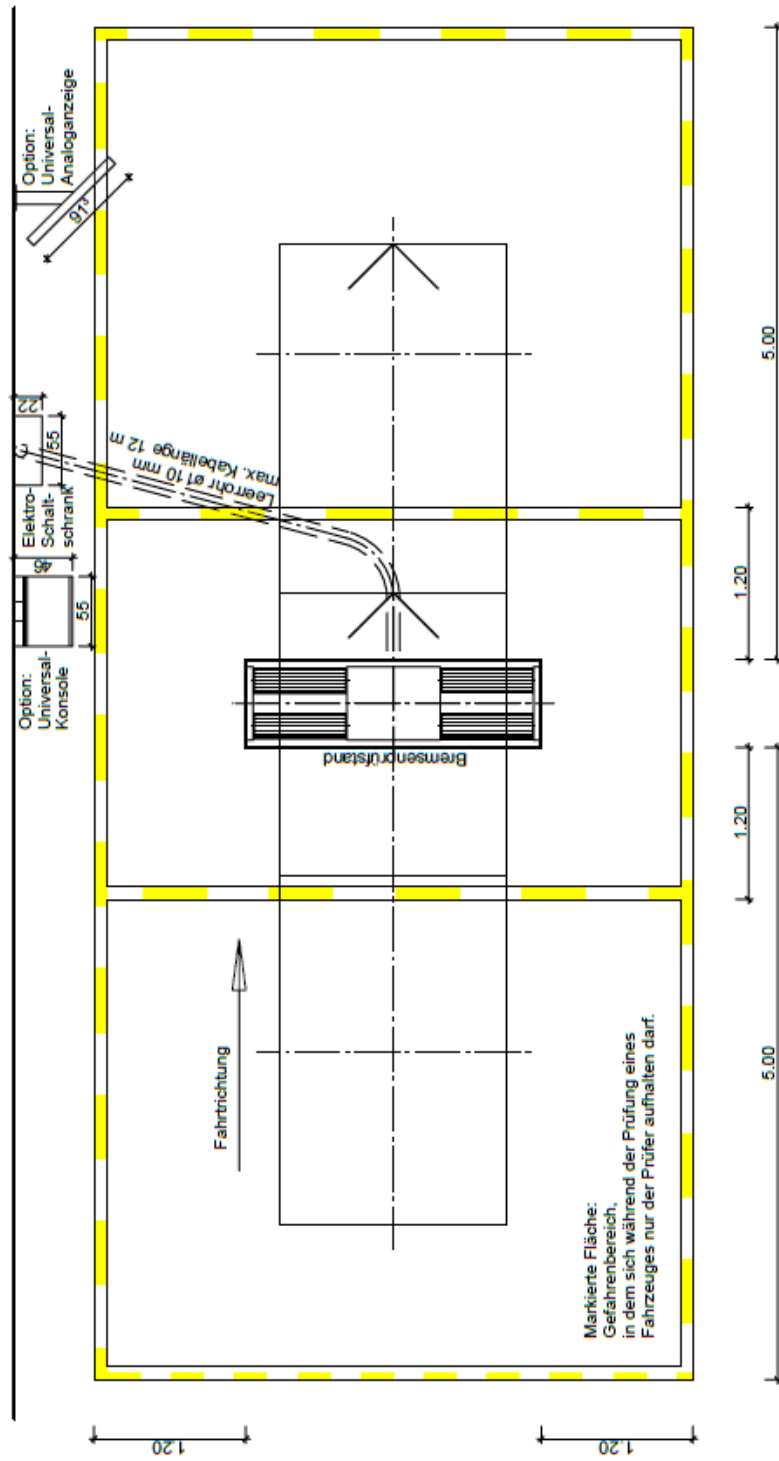
### 2.3.1 For Vehicles up to 3.5 t GVW

When operating the test bench, there must be no persons or obstacles in the danger zone (danger of crushing!). This is to be identified by a yellow and black marking around the test bench.

For trouble-free operation, a closed, dry and roofed installation site is strongly recommended.

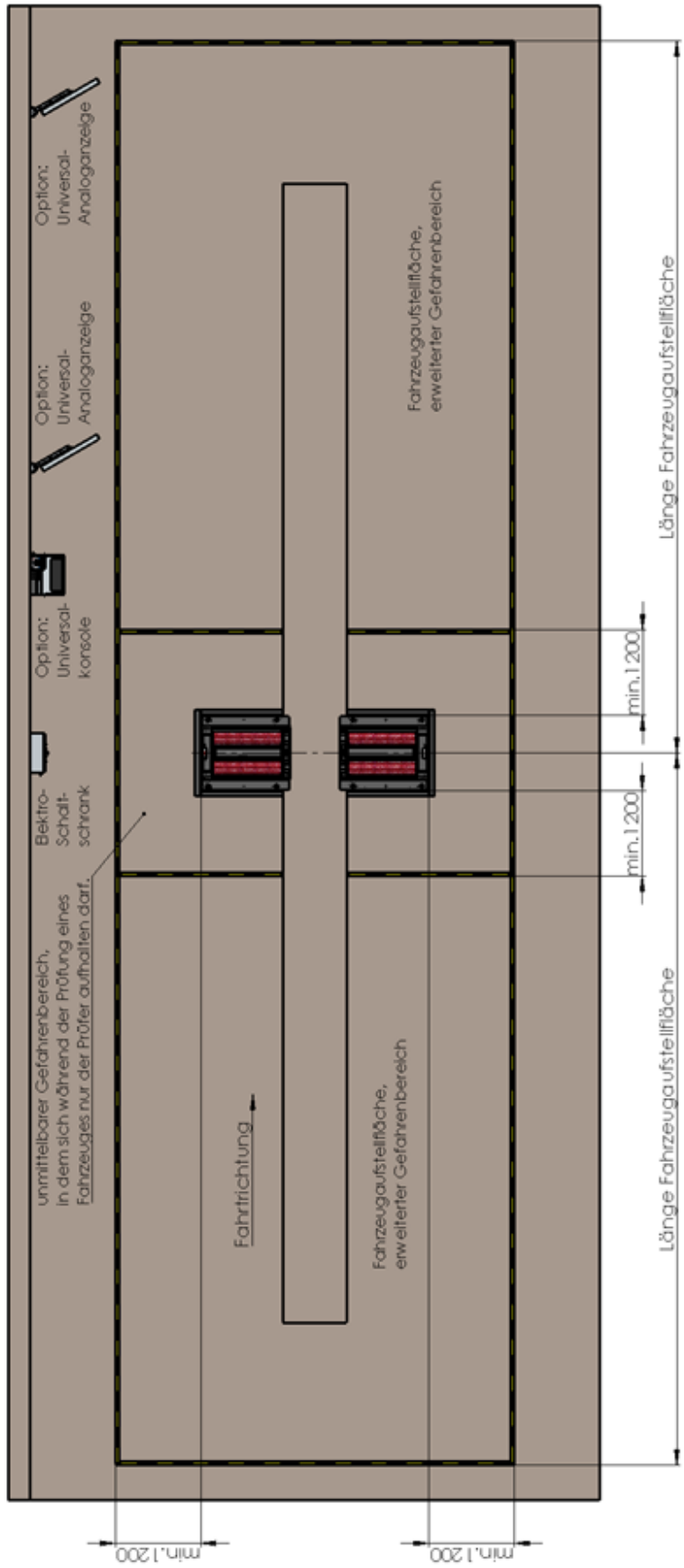
The lengths of the vehicle parking areas must be determined by the operator, depending on the length of the vehicles to be tested. The boundary of the vehicle parking area should be at least 1.2 m longer than the longest vehicle to be tested.





Danger zone

### 2.3.2 For Vehicles over 3.5 t GVW

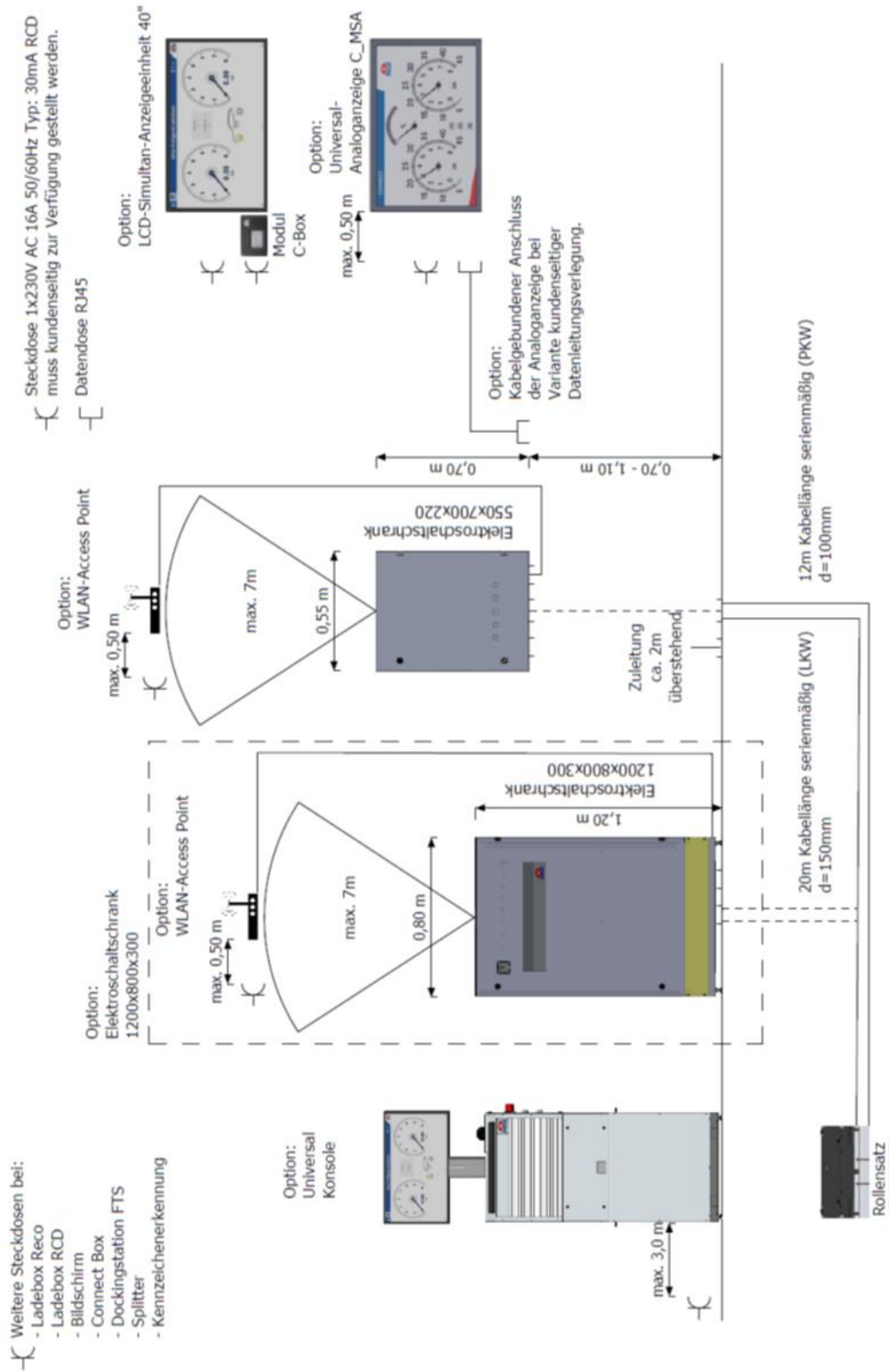






## 2.4 Set-up Diagram

### 2.4.1 Set-up Diagram Car Tester



Set-up diagram

## 2.5 Control Description

The control unit consists of a control box with electrical and electronic components in connection with the corresponding operating, control and monitoring software and the operating elements necessary for safe operation.

The roller set contains most of the sensor technology, the motors and an interface module.

### **Control cabinet 700x550x220 mm (Car equipment & Truck with reduced equipment)**

The door contains most of the controls and the antenna. In the left side panel there is another control element, the main switch and the ASA interface. Cables are fed from below via cable glands and via a protective tube. For passenger car test benches, there is room for all options in the control cabinet; for truck test benches, only a reduced configuration is possible. This means that only a fixed selection of options can be accommodated in this control cabinet, for all other options the control cabinet 1000x800x300 mm is necessary.

Retrofits are also only possible with options from this specified selection. For all other options, the complete control cabinet and the complete mounting plate must be replaced!

### **Control cabinet 1200x800x300 mm (truck equipment)**

The door contains all controls, the antenna, the main switch and the ASA interface. Cables are fed from below via the base. In truck test benches, all options find space in the control cabinet.

### **Control unit**

- ZM (central module) with one CPU module and 2 microprocessors
- µC with logic for evaluating the measured values and controlling the motors
- CPU module for visualisation and user interaction
- Safety µC for monitoring and safe switching of the outputs
- Option-dependent additional OM (option modules), e.g. expansion of I/O, if necessary (additional options of the brake tester) by 3 inputs and outputs each, address switch for setting 32 addresses (to support various options, e.g. roller set lift, pull-down device)
- Motor contactors:
  - depending on the version, min. 1 contactor per motor as well as a motor protection switch
  - optionally further contactors for additional functions such as multi-function control, star/delta starting, 2 test speeds etc.
- Switching power supply 24V DC
  - Supply of the control boards and contactors
  - Fuse protection via circuit breaker
- Optional soft start modules (SA)
  - to reduce the inrush current peak
  - supports the "automatic 4WD detection" option (automatic measurement in counter rotation)

- Optional DC brake or magnetic brake (depending on test bench variant)
- Optional circuit breaker for further options (e.g. MSD)
- Receiver module for radio participants: FFB, RCD, PFM (optional)
- Control GSQ pit protection (optional)
- Control MSE/railing (optional)
- Signal indicator with flashing light and signal horn for RCD (optional)
- Main switch for door installation with door interlock (depending on the test stand variant)
- Control cabinet heating (optional)
- 4WD control (optional)

### **Roller set**

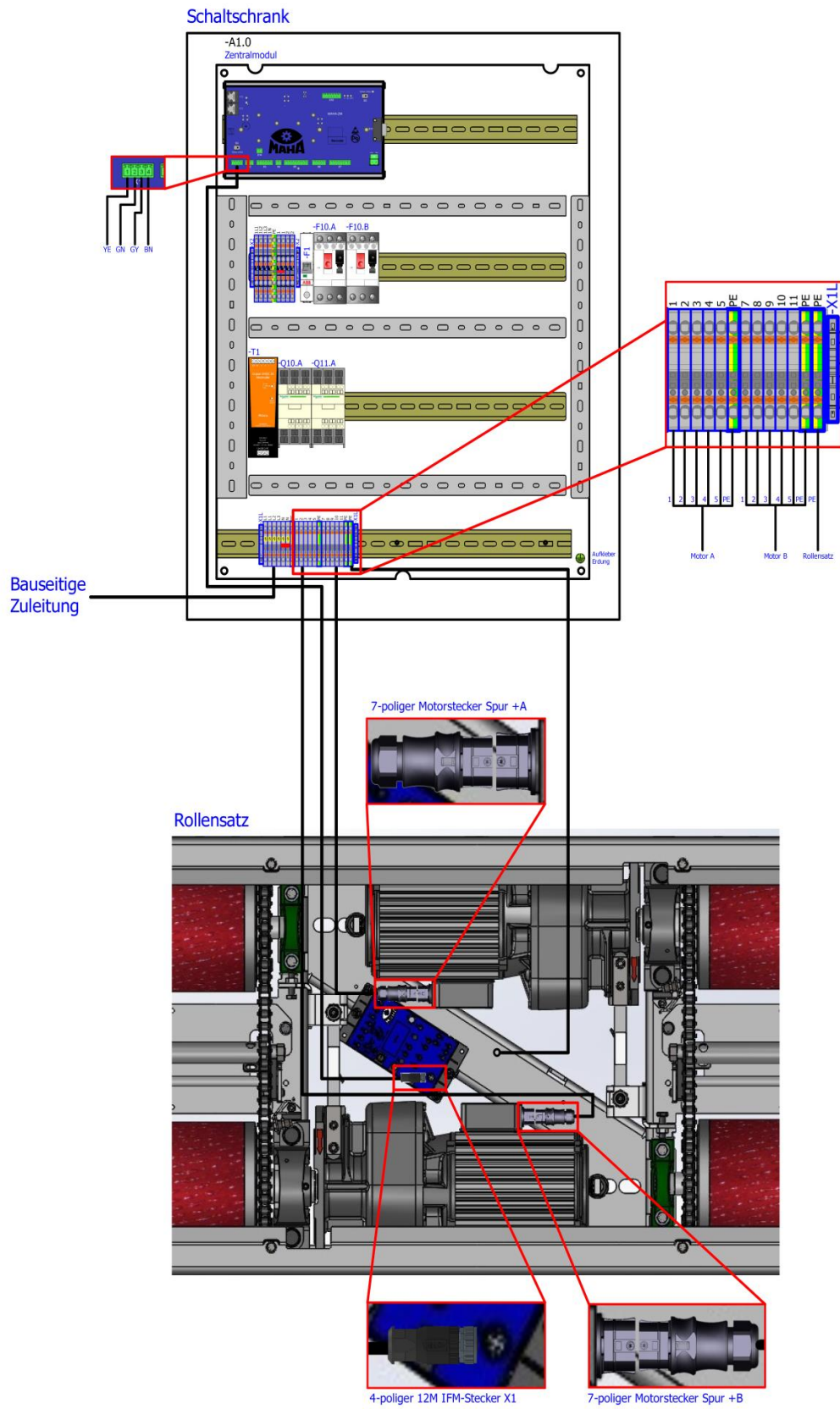
Separated from the control unit in the control cabinet, there is an interface module in each floor group, the so-called interface module (IFM).

This IFM is available in two versions: a basic version (IFM-BA) with the minimum required connections and a comfort version (IFM-CT) with all connections.

The IFM is used for analogue-digital conversion of the signals of all connected sensors (Namur switch, range spring, load cells, etc.) and for forwarding the data via CAN bus to the ZM. In addition, calibration values of the range spring are stored on the IFM.

Forwarding of the data via CAN bus to the ZM. In addition, calibration values of the range spring are stored on the IFM.

## 2.5.1 Wiring Diagram

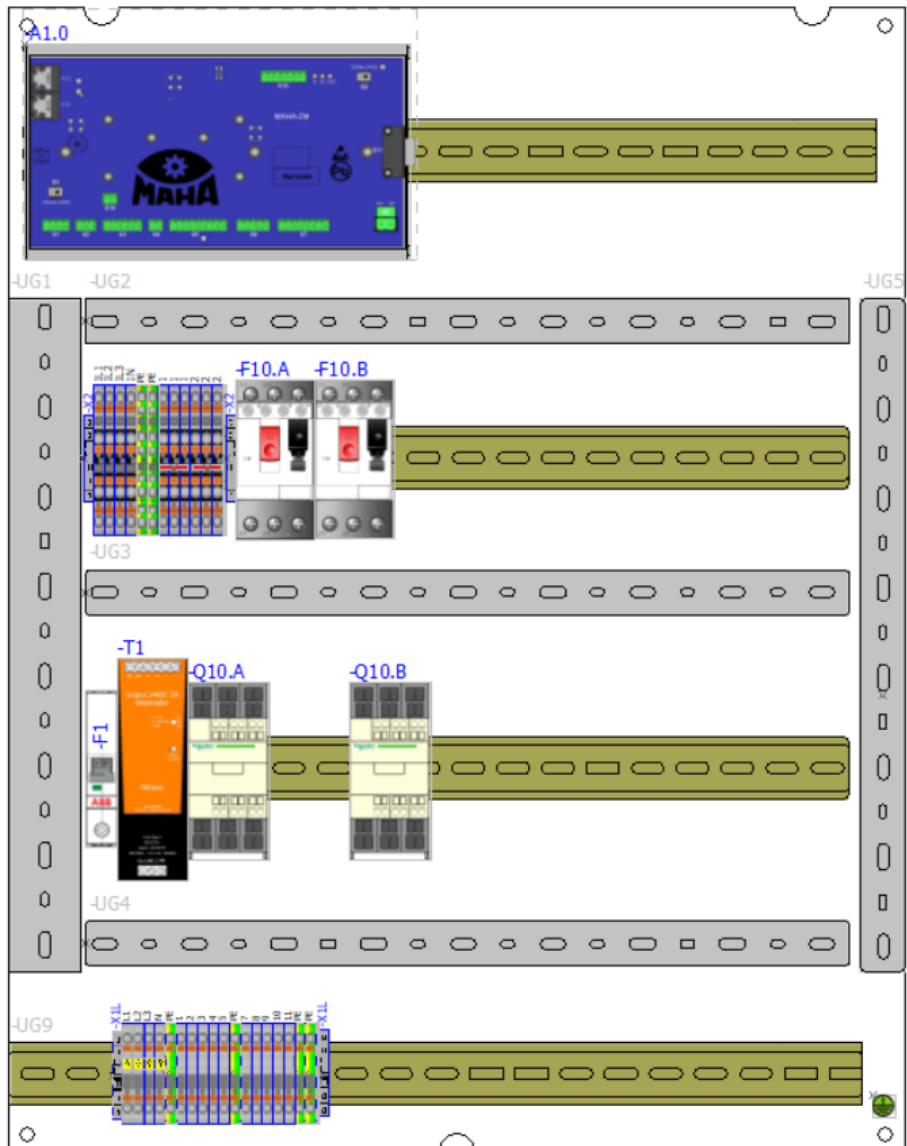


## 2.5.2 Number Range of the Reference Identifiers

The reference identifiers refer to all designations of electrical components inside and outside the control cabinet. A fixed number range is always assigned to a unique function. Likewise, a distinction is made in the labelling of the left (+A) and right (+B) half of the roller set (track). Components that designate a left half of the roller set (track +A) end with the suffix -xxx.A. Components that designate a right half of the roller set (track +B) end with the suffix -xxx.B.

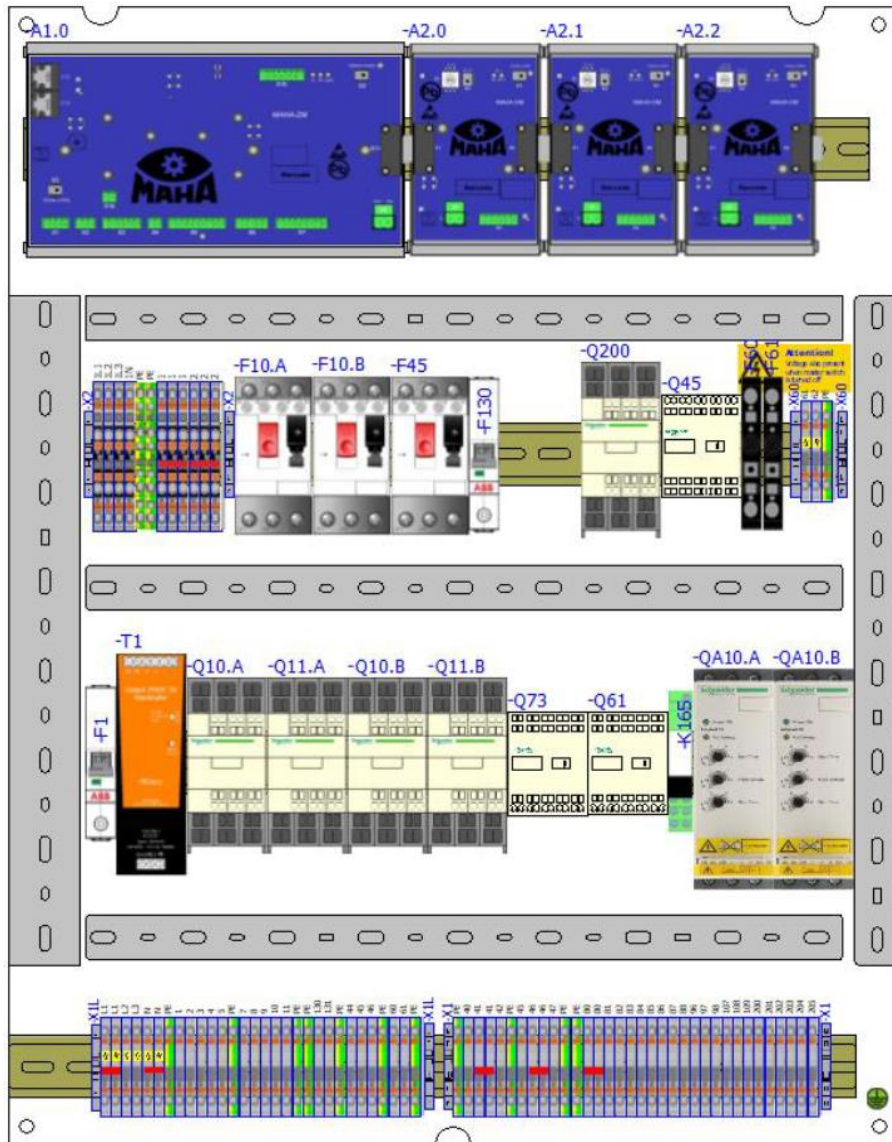
<b>Function</b>	<b>Number range</b>
Basic equipment	1...19
Weighing device	20...24
MINC	25...29
Lowering threshold	40...43
RS lift integrated (car & truck)	44...49
RS lifting angle iron frame (truck)	50...54
Pull down	55...59
Heating	60...64
Multifunction control via push-button	65...69
DC brake	70...74
Ceiling light barrier	75...79
Motorcycle mode	80...89
Signal tower for radio pressure sensor	90...94
License plate recognition	95...99
GSQ I /GSQ II	100...109
Safety railing	110...120
External equipment	121...129
MSD 3000	130...134
Brake Tester Directive 2011 (Germany)	140...149
Pointer display	150...159
Control MLS	160..164
Enable External	165...169
Remote control	190...199
Emergency stop	200...209
Universal console	300...349

### 2.5.3 Control Cabinet Layout, Basic Variant C\_MBT Car

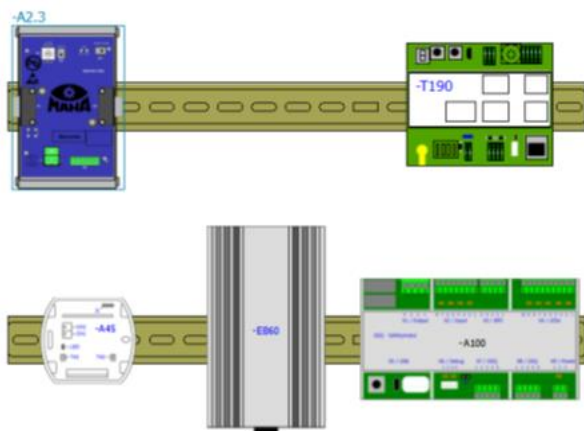


## 2.5.4 Control Cabinet Layout, Maximum Equipment C\_MBT Car

Control cabinet 700x550x220 mm



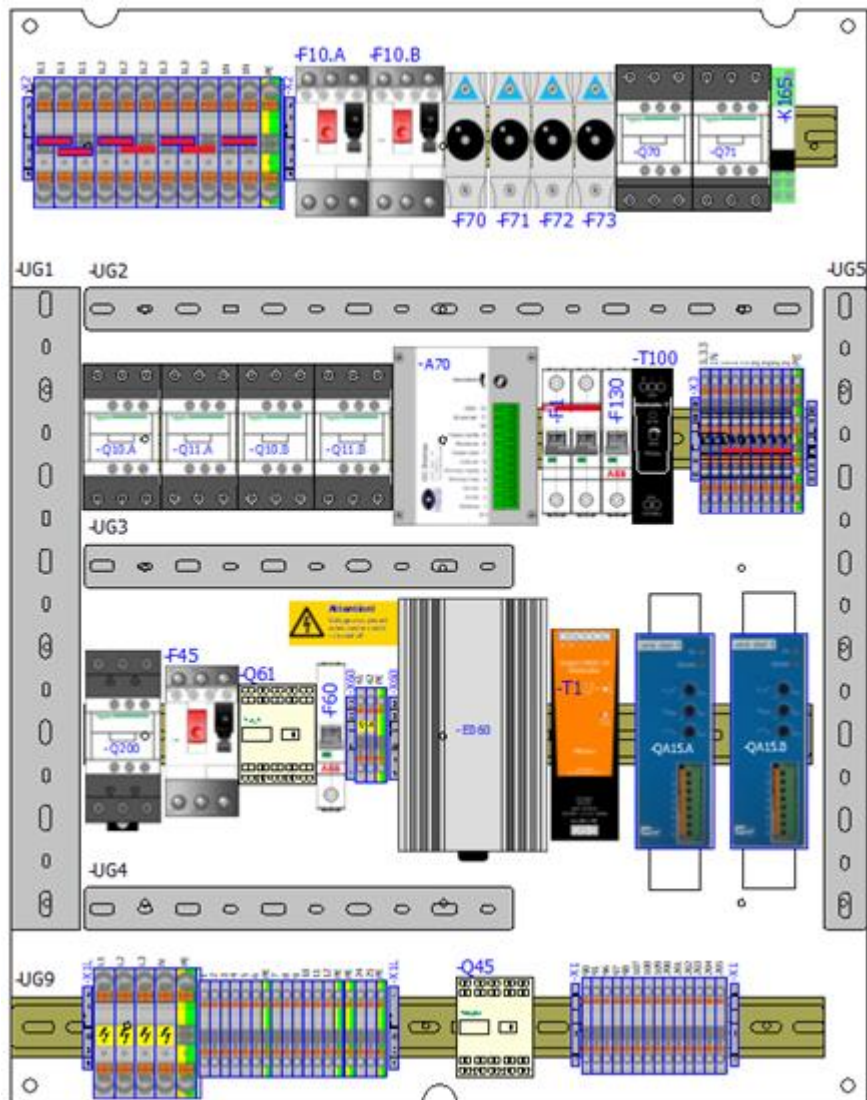
Control cabinet door



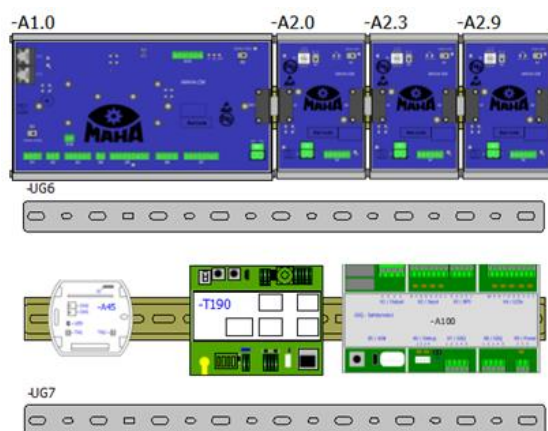


## 2.5.5 Control Cabinet Layout C\_MBT Light Truck

Control cabinet 700x550x220 mm

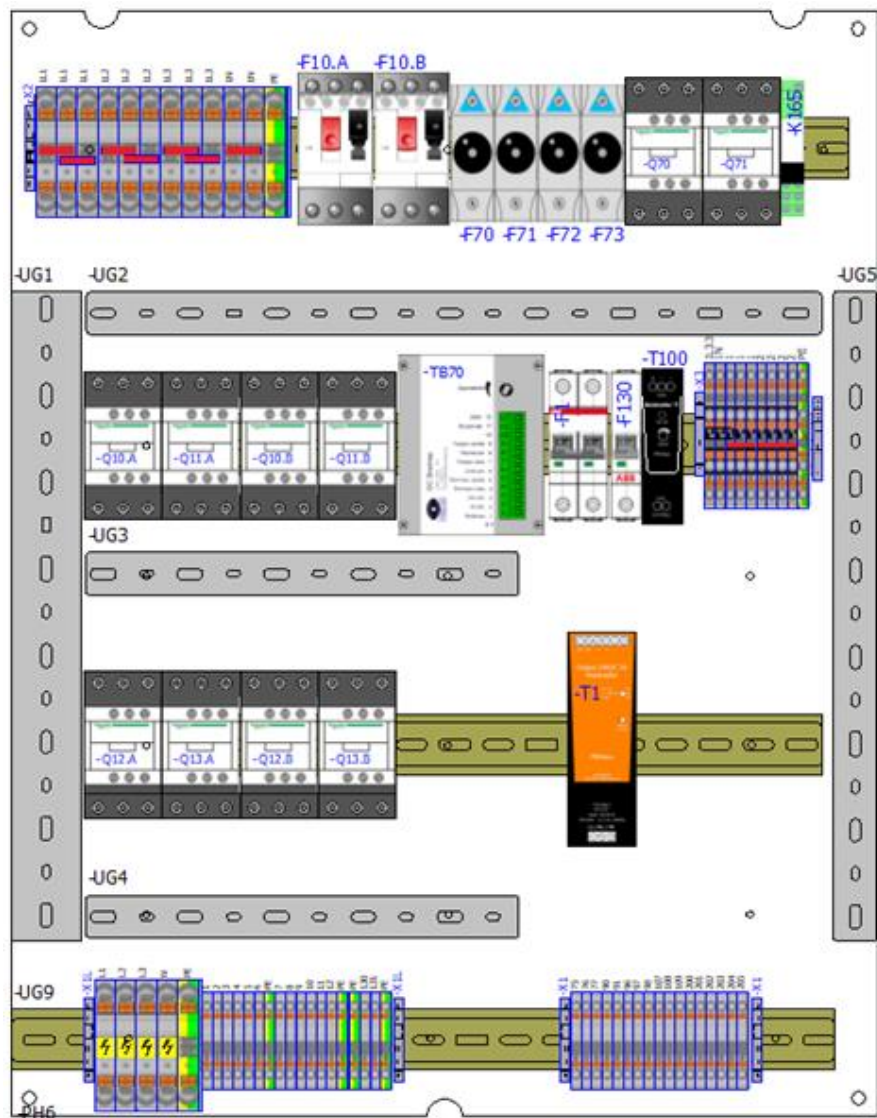


Control cabinet door

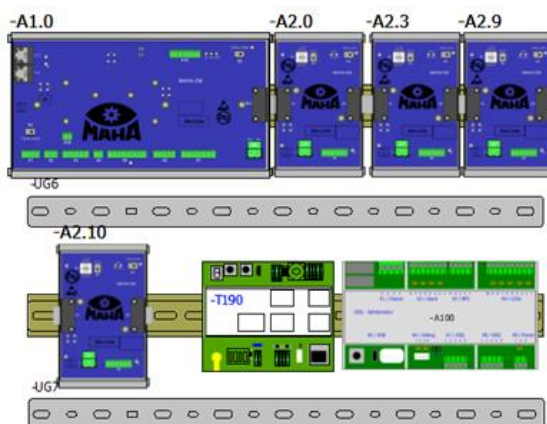


## 2.5.6 Control Cabinet Layout C\_MBT Truck

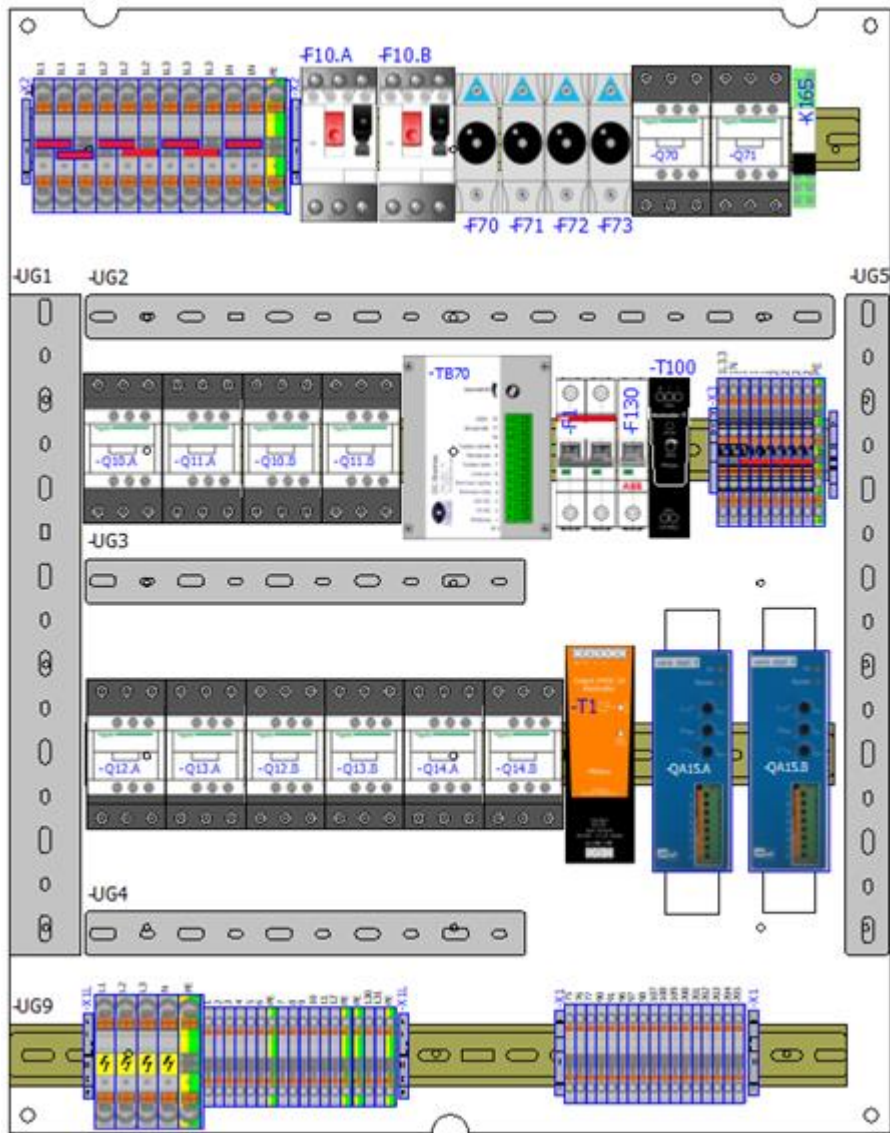
Maximum equipment Control cabinet 700x550x220 mm, star-delta



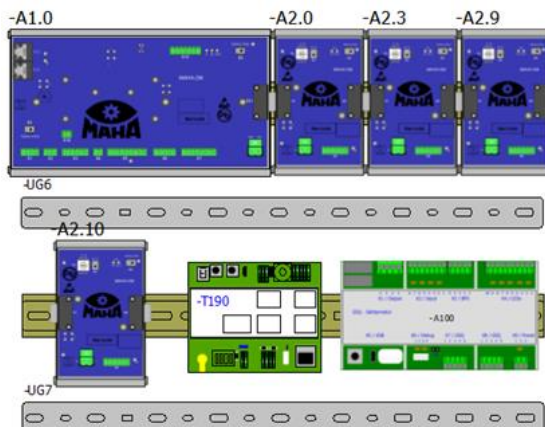
Control cabinet door



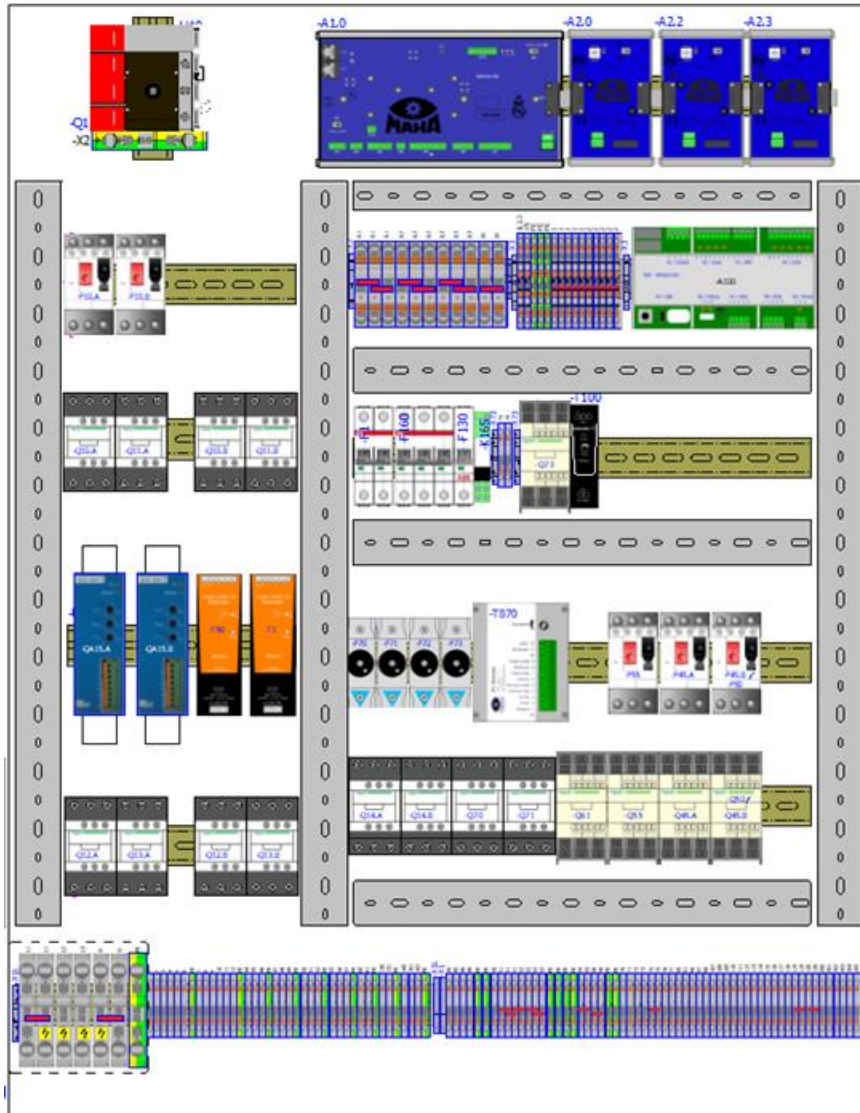
Maximum equipment Control cabinet 700x550x220 mm, two test speeds



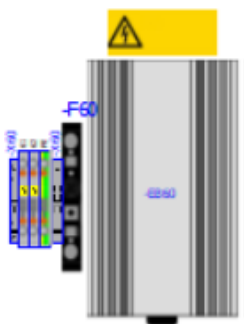
Control cabinet door



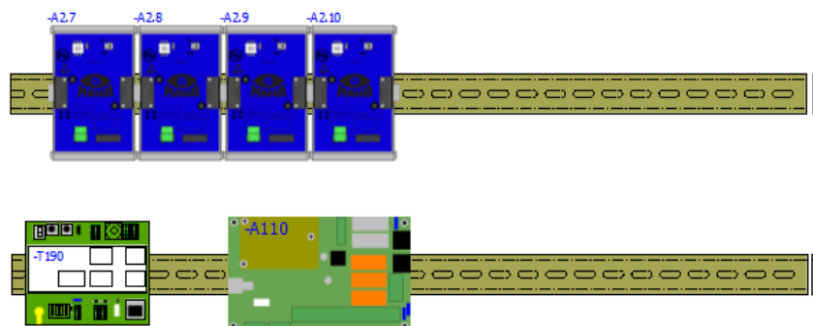
Maximum equipment Control cabinet 1200x800x300 mm



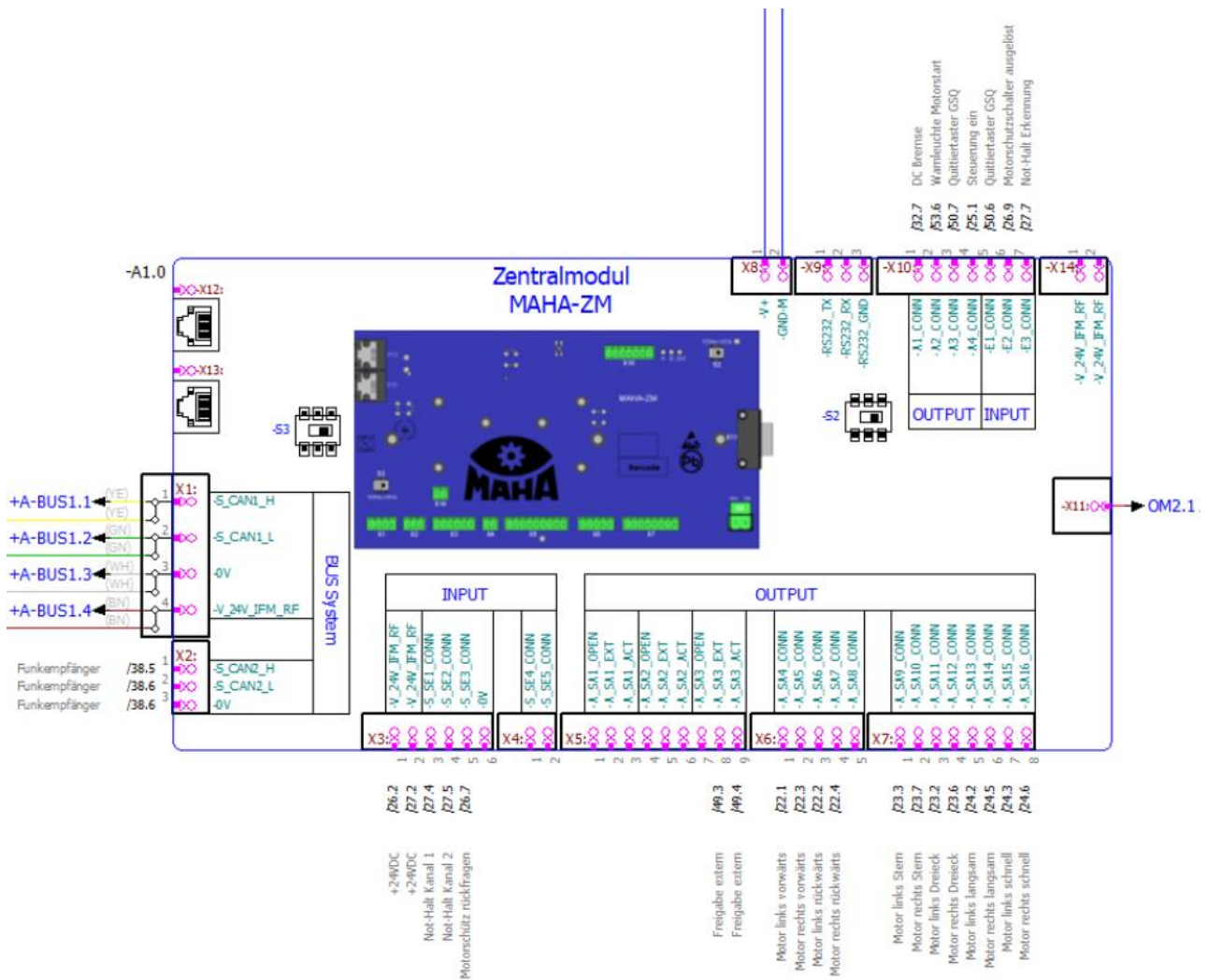
Control cabinet wall,  
left-hand inside



Control cabinet door



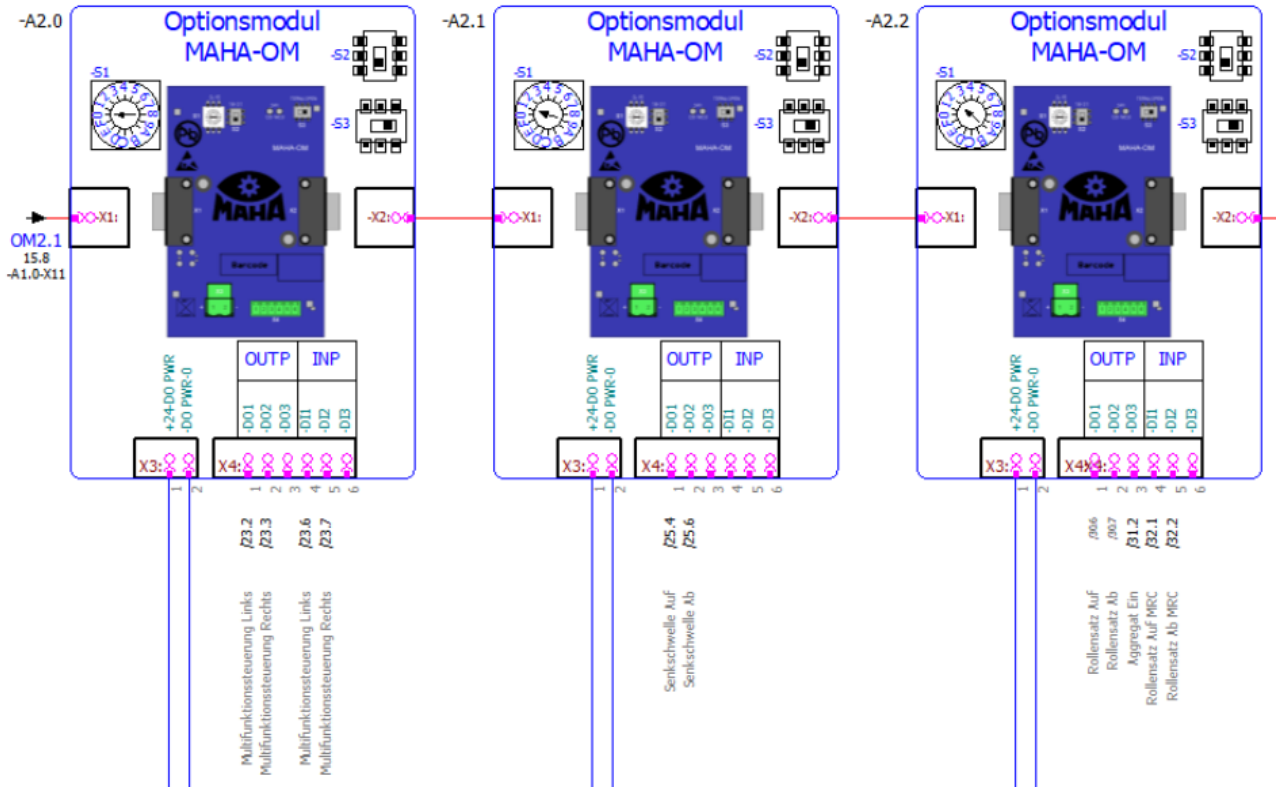
## 2.5.7 Connection and Termination of the Central Module (ZM)



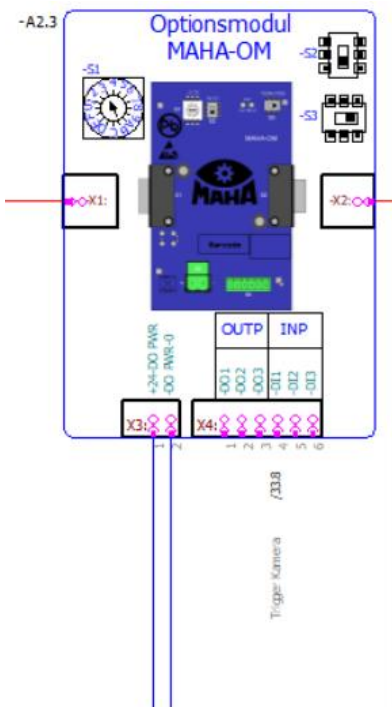
Connection of the central module

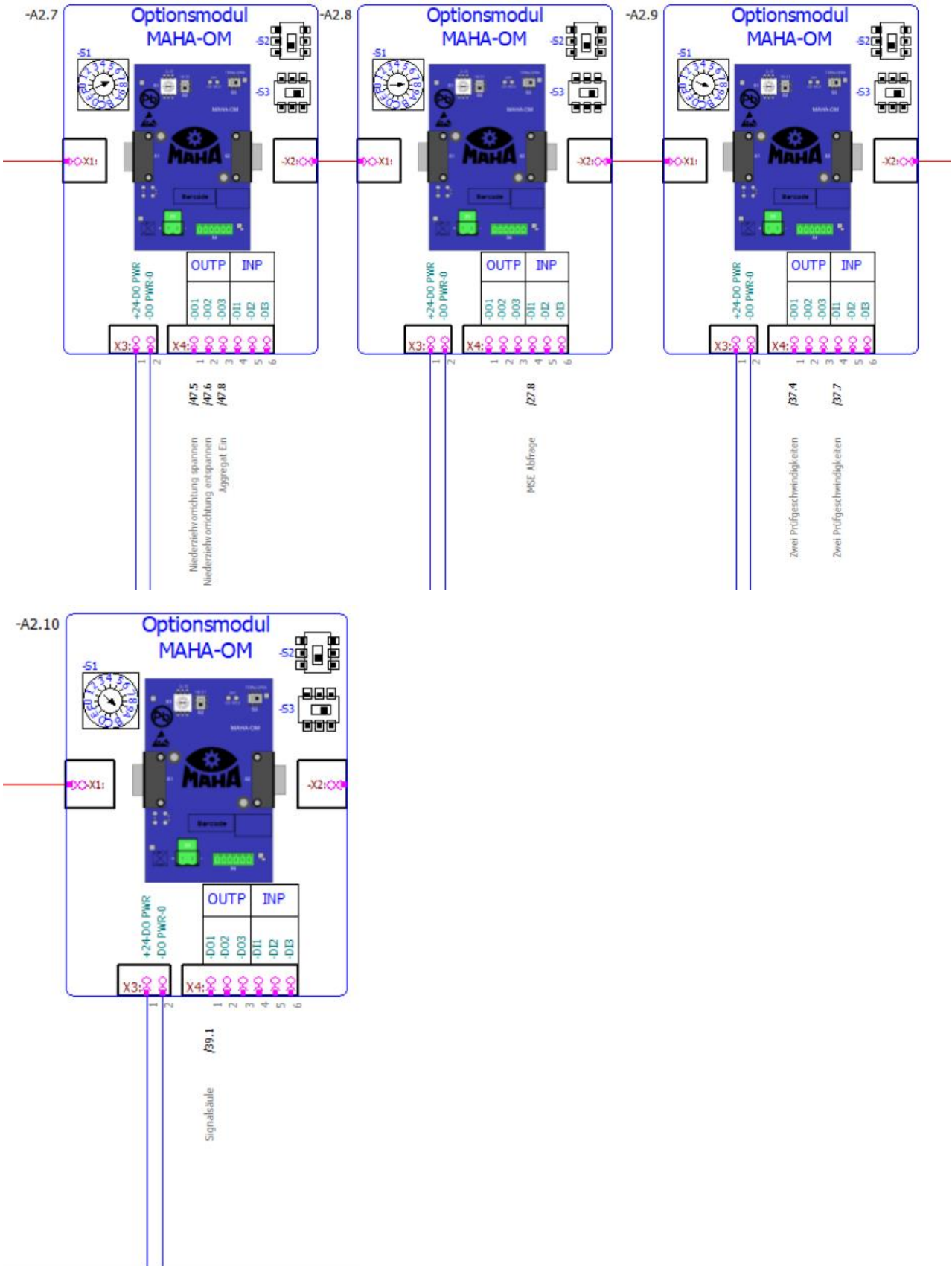
Termination of central module ZM		
-S2	Term	if no OM present
-S2	Open	if any OM present
-S3	Term	if IFM is connected in series (ZM-IFM-IFM)
-S3	Open	if IFM is connected in parallel (IFM-ZM-IFM)

## 2.5.8 Coding of ZM-OM



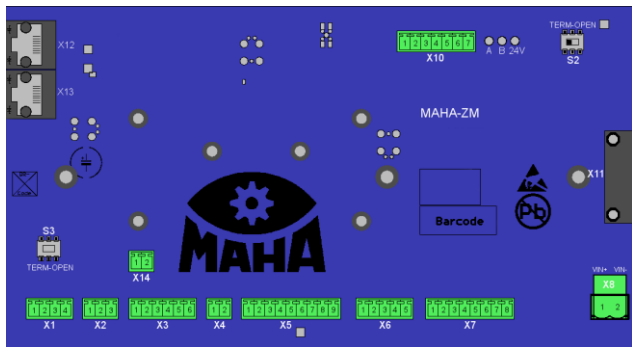
Connection of the option modules





## ZM-OM

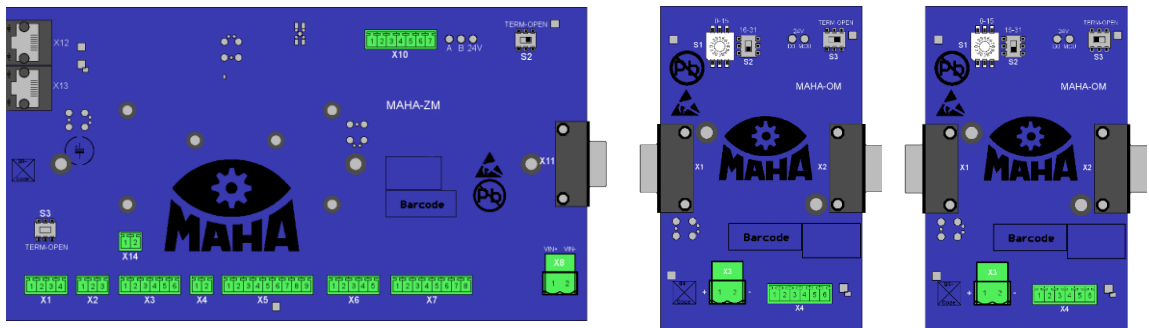
- Possibility 1



(ZM only)

Central module **ZM: S2 (+S-A1.0-S2) – Term ON**

- Possibility 2



(ZM and OM)

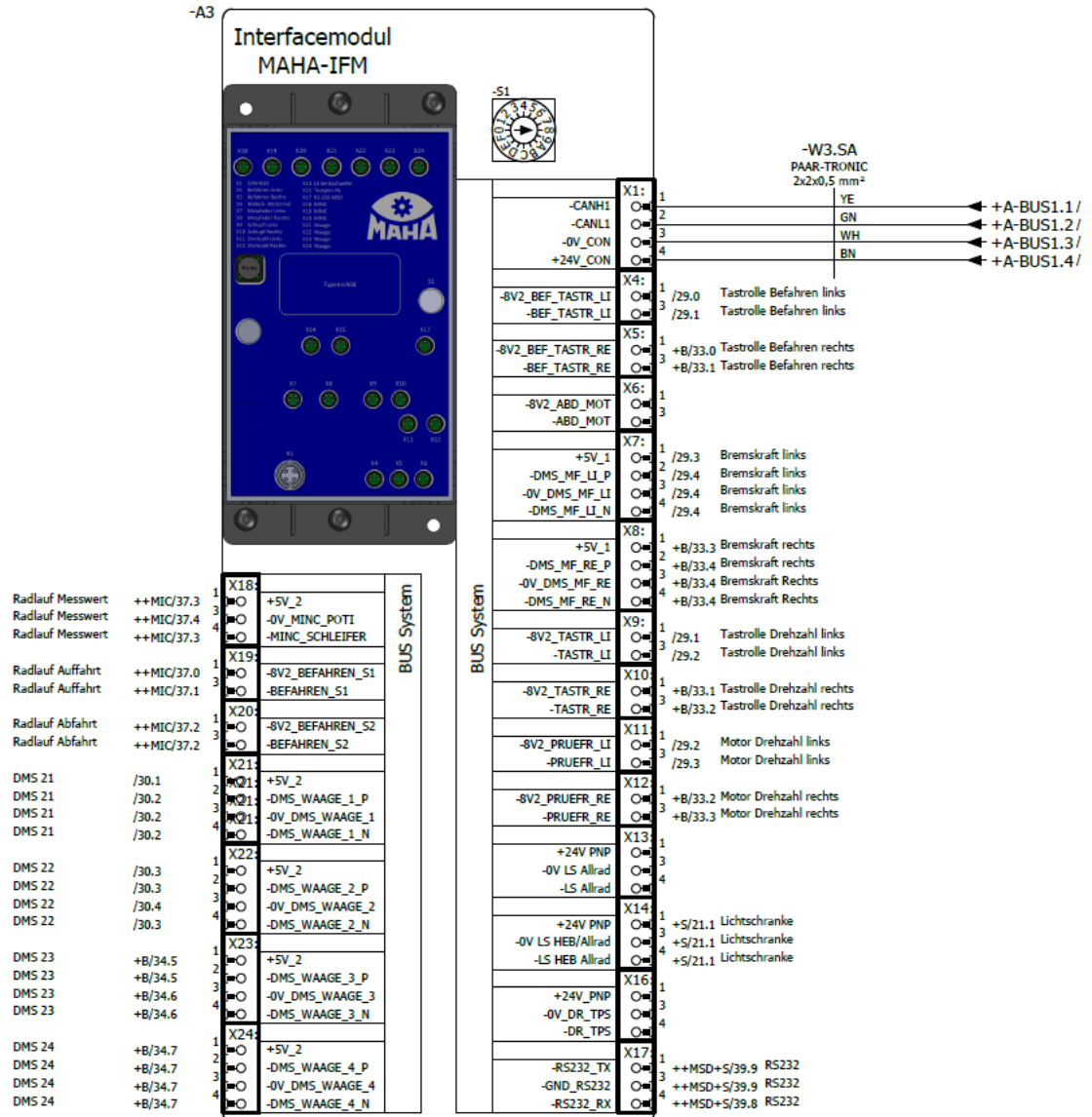
Central module **ZM: S2 (+S-A1.0-S2) – Open (Term OFF)**

Option module OM:

+S option	-S1	-S2	-S3 (Open/Term OFF)
-A2.0 Direction of rotation/ measurement via pushbutton	0	0-15	<b>Term ON</b> only at last module
-A2.1 Lowering threshold	1	0-15	
-A2.2 Roller set lift	2	0-15	
-A2.3 License plate recognition	3	0-15	
-A2.7 Pull-down device	7	0-15	
-A2.8 MSE request	8	0-15	
-A2.9 Two test speeds	9	0-15	
-A2.10 Signal tower	A	0-15	



## 2.5.9 Coding of ZM-IFM



Connection of the interface module

### ZM-IFM

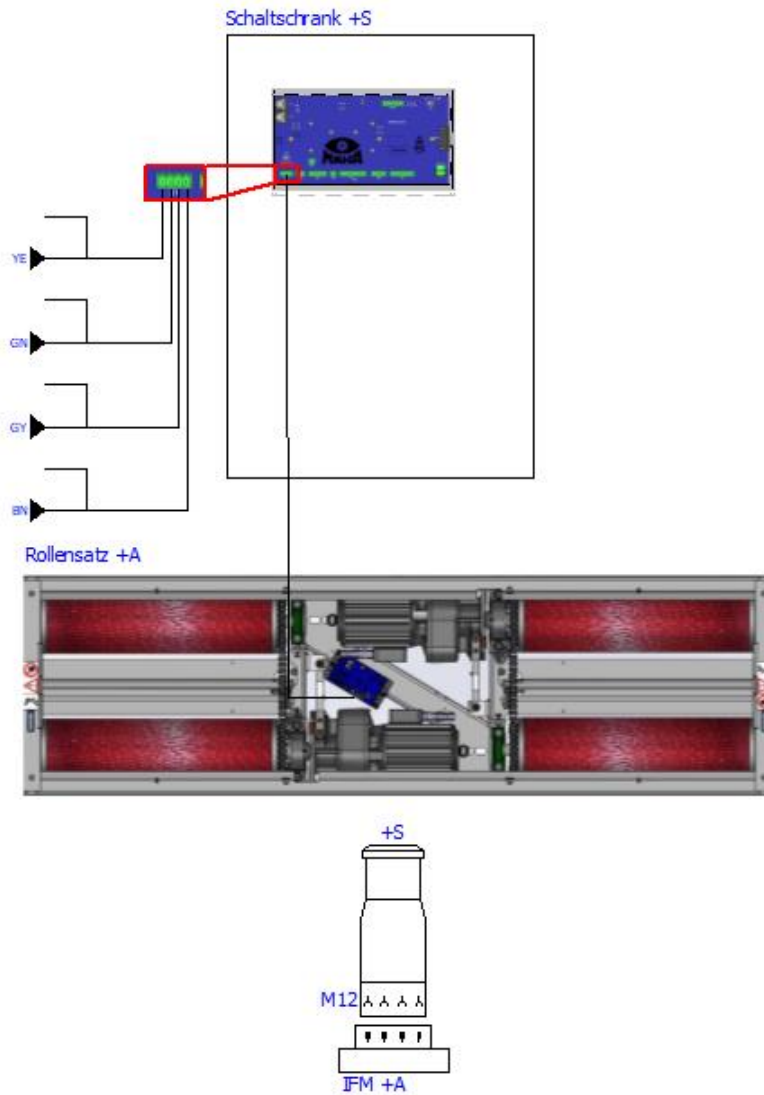
CAN address IFM-CT	S1 – Termination OFF Terminating resistor OFF	S1 – Termination ON Terminating resistor ON
“0”	0	8 (IFM-BA*)
“1”	1	9
“2”	2	A
“3”	3	B
“4”	4	C
“5”	5	D
“6”	6	E

CAN address IFM-CT	S1 – Termination OFF Terminating resistor OFF	S1 – Termination ON Terminating resistor ON
"7"	7	F

\*Interface module Basic (IFM-BA) is always preset with address "0" and term ON. No address switch S1 present.

- Possibility 1

Colours in CAN BUS illustration: YE/GN/WH/BN

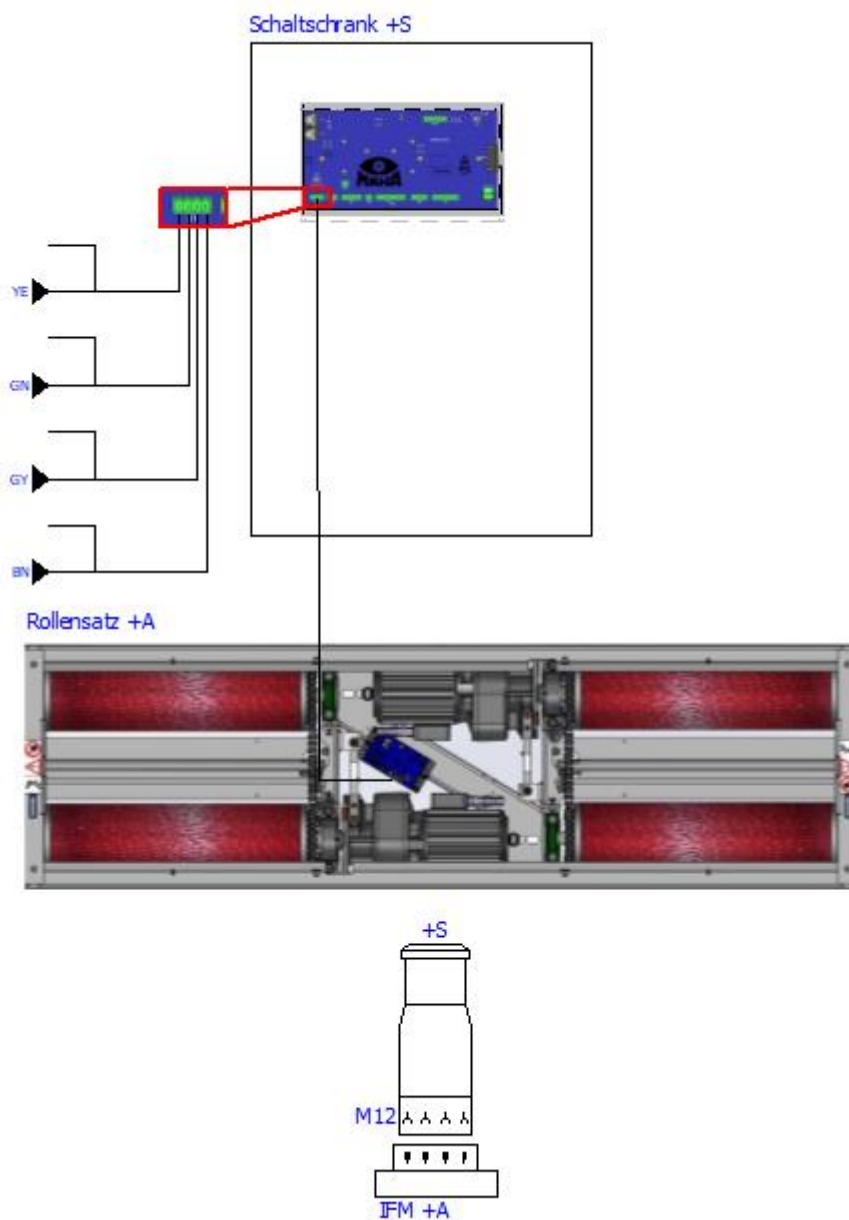


*(Compact roller set)*

Central module ZM: -S3 (+S-A1.0-S3) – Term ON

Interface module Basic IFM-BA: (no rotary switch S1 present)

- Possibility 2

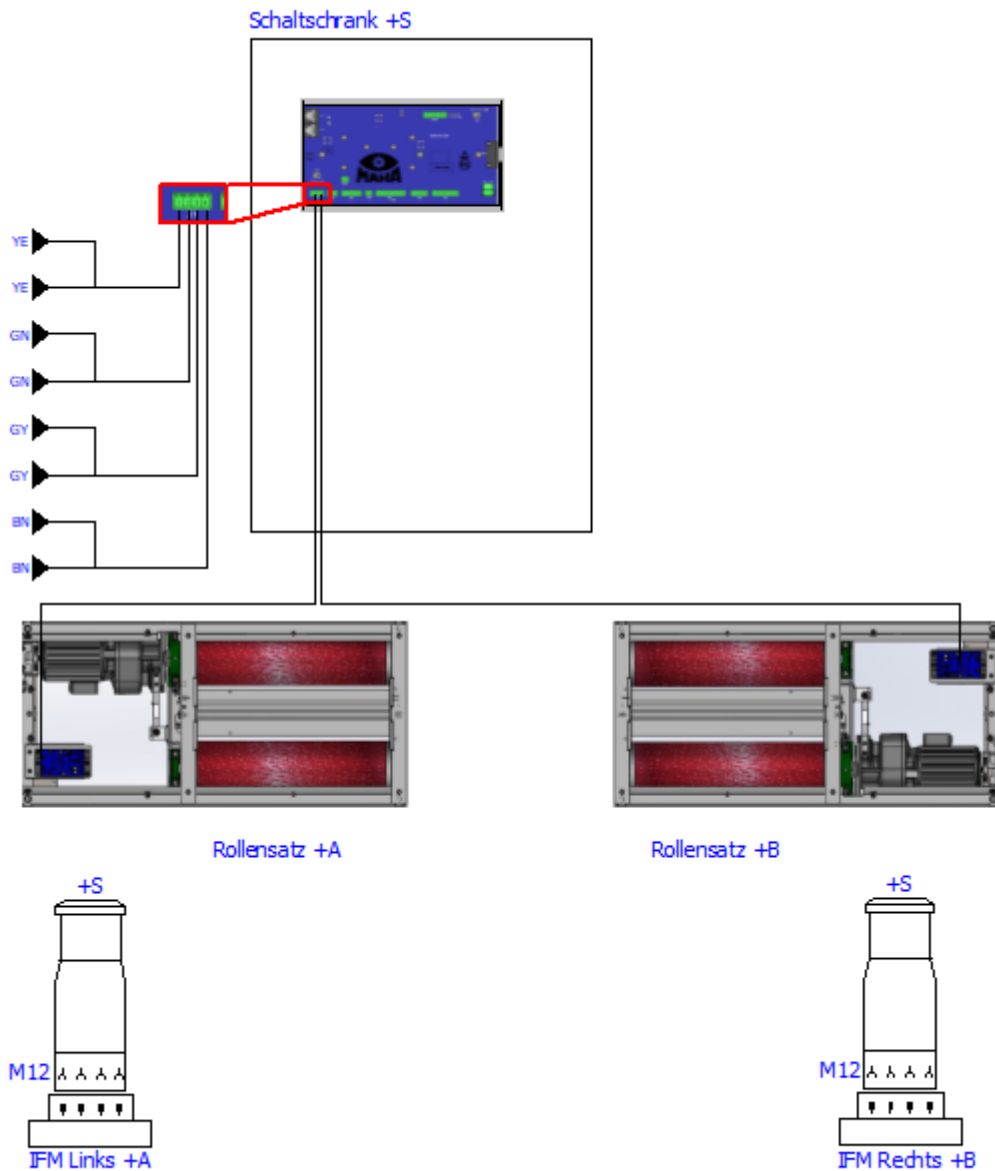


*(Compact roller set)*

Central module **ZM: -S3 (+S-A1.0-S3) – Term ON**

Interface module Comfort **IFM-CT: -S3 (+A-A3-S1) – Term ON: Address "0"**  
 (→ rotary switch S1 to 8)

- Possibility 3



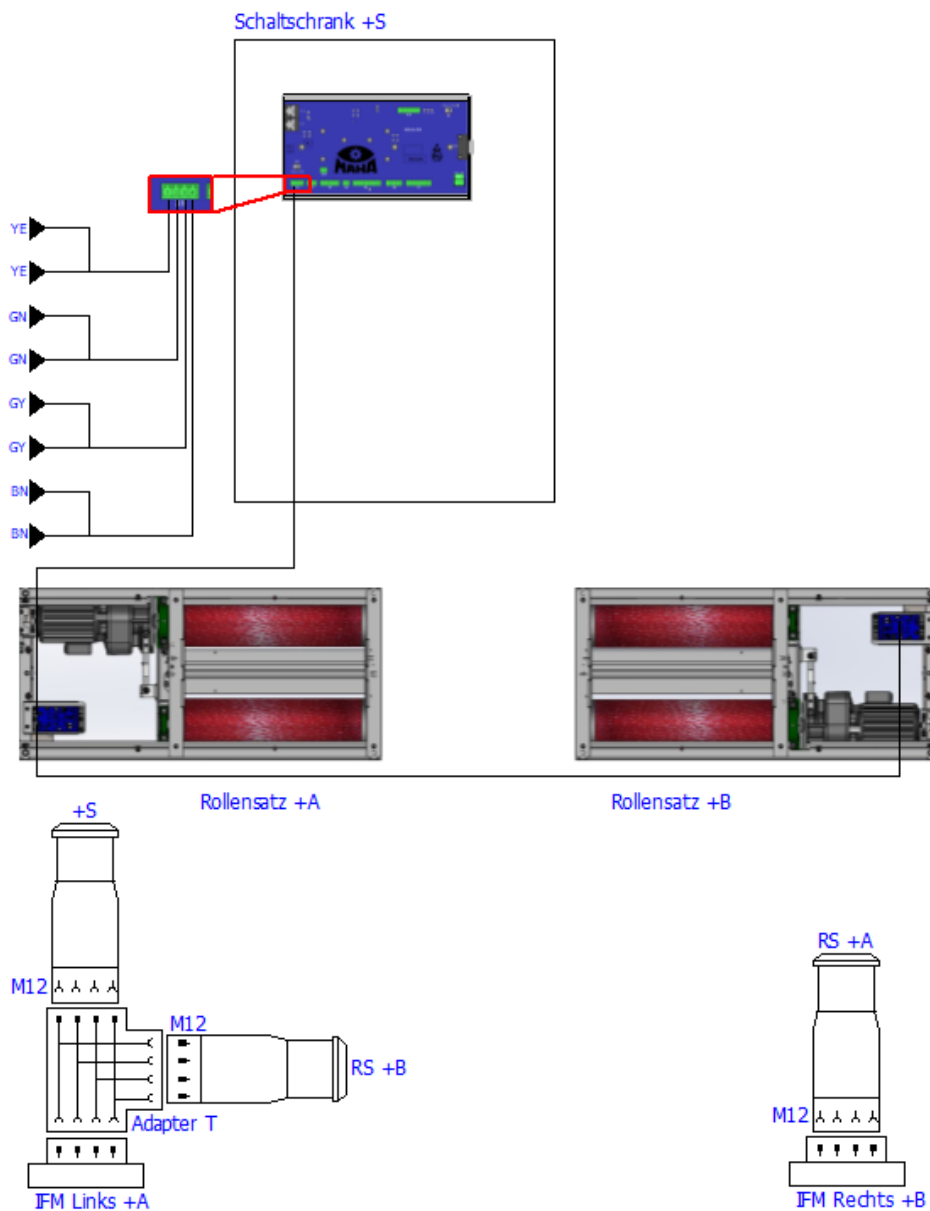
(Split roller set)

Central module **ZM: -S3** (+S-A1.0-S3) – **Open** (Term OFF)

Left interface module Comfort **IFM-CT: S1** (+A-A3-S1) – Term **ON**: Address “1”  
 (→ rotary switch S1 to 9)

Right interface module Comfort **IFM-CT: -S1** (+B-A3-S1) – Term **ON**:  
 Address “2” (→ rotary switch S1 to A)

- Possibility 4



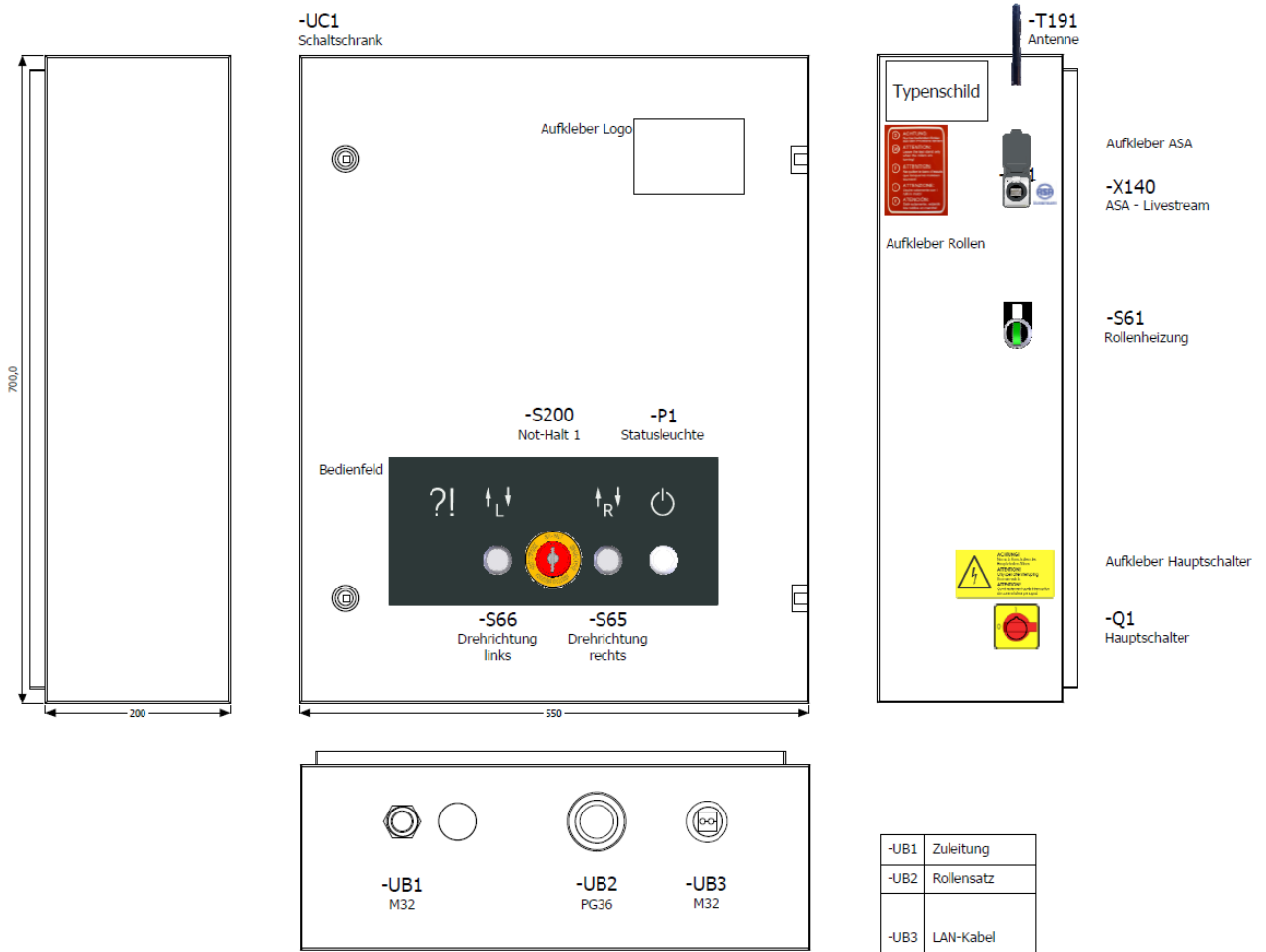
*(Split roller set, in series ZM-IFM-IFM)*

Central module **ZM: -S3 (+S-A1.0-S3) – Term ON**

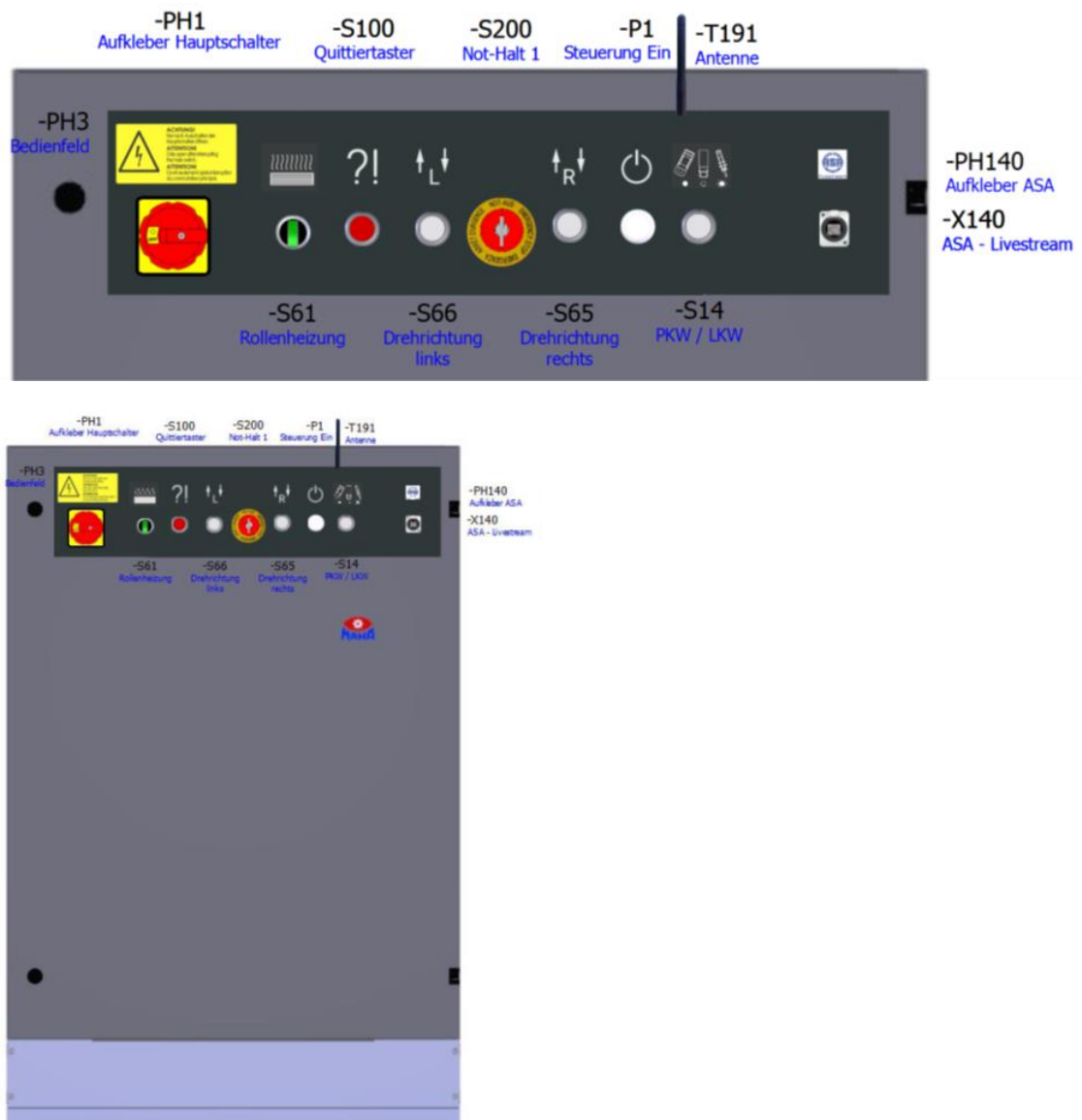
Left interface module Comfort **IFM-CT: -S1 (+A-A3-S1) – Term OFF: Address "1"**  
 (→ rotary switch S1 to 1)

Right interface module Comfort **IFM-CT: -S1 (+B-A3-S1) – Term ON:**  
 Address "2" (→ rotary switch S1 to A)

## 2.5.10 Control Buttons (Small Control Cabinet)



## 2.5.11 Control Buttons (Large Control Cabinet)



## 2.5.12 Indicator Light on the Control Cabinet in the Event of a Fault

The “Control On” indicator light (-P1) in the front cover of the control cabinet lights up as soon as the main switch is switched on and the control is initialised and there is no fault.

In the event of a fault, the mains lamp flashes at a frequency of 1 Hz.

For a detailed error code list, see section “Troubleshooting > Error Codes”.

## 2.6 Technical Data

### 2.6.1 Technical Data Car/Van Tester

	<b>C_MBT C 3.5 W220</b>	<b>C_MBT C 3.5 W250</b>	<b>C_MBT S 3.5 W220</b>	<b>C_MBT S 3.5 W250</b>
	Track 2.20 RS 2	Track 2.50 RS 4	Track 2.20 RS 2	Track 2.50 RS 4
	compact	compact	split	split
Axle load [kg]	3500	3500	3500	3500
Track width min. [mm]	780	780	variable	variable
Track width max. [mm]	2200	2500	variable	variable
Drive power	2x3 kW	2x3 kW	2x4 kW	2x3 kW
Test speed	5 km/h	5 km/h	5 km/h	5 km/h
Roller length [mm]	730	892	730	892
Roller diameter [mm] Rollers welded/plastic	204	204	204	204
Roller diameter [mm] Rollers MIXED	208	208	208	208
Roller axle distance [mm]	400	400	400	400
Test roller with welded textured surface, friction coefficient dry / wet	0.9 / 0.7	0.9 / 0.7	0.9 / 0.7	0.9 / 0.7
Test roller with plastic / granulate coating, friction value dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
MIXED roller, friction coefficient dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
Measuring range	0 - 8 kN	0 - 8 kN	0 - 8 kN	0 - 8 kN
Display accuracy (full scale)	2 %	2 %	2 %	2 %
Fuse	25 A gG	25 A gG	25 A gG	25 A gG
Power supply	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz
Minimum cable cross- section Supply line*	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>
Dimensions H x W x L [mm]	245-300 x 680 x 2320	245-300 x 680 x 2644	245-300 x 680 x 1420	245-300 x 680 x 1582



	<b>C_MBT C 4.0 W220</b>	<b>C_MBT C 4.0 W250</b>	<b>C_MBT S 4.0 W220</b>	<b>C_MBT S 4.0 W250</b>
	Track 2.20 RS 2	Track 2.50 RS 4	Track 2.20 RS 2	Track 2.50 RS 4
	compact	compact	split	split
Axle load [kg]	4000	4000	4000	4000
Track width min. [mm]	780	780	variable	variable
Track width max. [mm]	2200	2500	variable	variable
Drive power	2x4 kW	2x4 kW	2x4 kW	2x4 kW
Test speed	5 km/h	5 km/h	5 km/h	5 km/h
Roller length [mm]	730	892	730	892
Roller diameter [mm] Rollers welded/plastic	204	204	204	204
Roller diameter [mm] Rollers MIXED	208	208	208	208
Roller axle distance [mm]	400	400	400	400
Test roller with welded textured surface, friction coefficient dry / wet	0.9 / 0.7	0.9 / 0,7	0.9 / 0.7	0.9 / 0.7
Test roller with plastic / granulate coating, friction value dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
MIXED roller, friction coefficient dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
Measuring range	0 - 8 kN	0 - 8 kN	0 - 8 kN	0 - 8 kN
Display accuracy (full scale)	2 %	2 %	2 %	2 %
Fuse	25 A gG	25 A gG	25 A gG	25 A gG
Power supply	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz
Minimum cable cross- section Supply line*	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>
Dimensions H x W x L [mm]	245-300 x 680 x 2320	245-300 x 680 x 2644	245-300 x 680 x 1420	245-300 x 680 x 1582

	<b>C_MBT C 5.0 W280</b>	<b>C_MBT S 5.0 W280</b>
	Track 2.80 RS 5	Track 2.80 RS 5
	compact	split
Axle load [kg]	5000	5000
Track width min. [mm]	780	variable
Track width max. [mm]	2800	variable
Drive power	2x4 kW	2x4 kW
Test speed	5 km/h	5 km/h
Roller length [mm]	1.032	1.032
Roller diameter [mm] Rollers welded/plastic	204	204
Roller diameter [mm] Rollers MIXED	208	208
Roller axle distance [mm]	400	400
Test roller with welded textured surface, friction coefficient dry / wet	0.9 / 0.7	0.9 / 0.7
Test roller with plastic / granulate coating, friction value dry / wet	0.9 / 0.8	0.9 / 0.8
MIXED roller, friction coefficient dry / wet	0.9 / 0.8	0.9 / 0.8
Measuring range	0 - 8 kN	0 - 8 kN
Display accuracy (full scale)	2 %	2 %
Fuse	25 A gG	25 A gG
Power supply	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz
Minimum cable cross- section Supply line*	5 x 4.0 mm <sup>2</sup>	5 x 4.0 mm <sup>2</sup>
Dimensions H x W x L [mm]	245-300 x 680 x 2924	245-300 x 680 x 1722

\* Cable cross-section depending on local conditions (e.g. ambient temperature, type of installation, cable length, mains impedance) and local regulations. A flexible connection cable is recommended.

**2.6.2 Technical Data Truck Tester**  
**Light Truck**

	<b>C_MBT C 13.0 W280</b>
	Track 2.80
	compact
Axle load [kg]	13 000
Track width min. [mm]	870
Track width max. [mm]	2800
Drive power	2x 7.5 kW
Test speed	5 km/h
Roll length [mm]	970
Nominal diameter [mm] Rollers welded on/ plastic	204
Nominal diameter [mm] Rollers MIXED	208
Test roll w. welded textured surface, friction coefficient dry / wet	0.9 / 0.7
Test roller w. plastic / granulate coating, friction value dry / wet	0.9 / 0.8
MIXED roll, friction coefficient dry / wet	0.9 / 0.8
Measuring range	0 - 25 kN
Display accuracy (full scale)	2 %
Fuse	50 A gG
Power supply	3x 400 V +N +PE 50 Hz
Minimum cable cross-section supply line*	5 x 4.0 mm <sup>2</sup>
Dimensions H x W x L [mm]	245-300 x 680 x 2924

## Truck

	<b>C_MBT S 13.0 R100 MU</b>	<b>C_MBT S 15.0 R100 MU</b>	<b>C_MBT S 18.0 R115 MU</b>	<b>C_MBT S 18.0 R115 MI</b>
	Motor at bottom			Motor at front
	split			
Axle load [kg]	13 000	15 000	18 000	18 000
Drive power [kW]	2x9		2x11	
Test speed [km/h]	2.3		3	
Roll length [mm]	1000		1150	
Nominal diameter [mm] Rollers welded on/ plastic	204	204	270	270
Nominal diameter [mm] Rollers MIXED	208	208	272	272
Roller centre distance [mm]	430		475	
Test roll w. welded textured surface, friction coefficient dry / wet	0.9 / 0.7	0.9 / 0.7	0.9 / 0.7	0.9 / 0.7
Test roller w. plastic / granulate coating, friction value dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
MIXED roll, friction coefficient dry / wet	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8	0.9 / 0.8
Measuring range	0 – 45.5 kN	0 – 45.5 kN	0 – 45.5 kN	0 – 45.5 kN
Display accuracy (full scale)	2 %	2 %	2 %	2 %
Fuse	50 A gG	50 A gG	63 A gG	63 A gG
Power supply	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz	3x 400 V +N +PE 50 Hz
Minimum cable cross- section Supply cable*	5 x 25 mm <sup>2</sup>	5 x 25 mm <sup>2</sup>	5 x 25 mm <sup>2</sup>	5 x 25 mm <sup>2</sup>
Dimensions roller set half: H x W x L [mm]	620 x 1045 x 1235	280 x 680 x 2924	740 x 1145 x 1430	440 x 1490 x 1505

	<b>C_MBT S 18.0 R160 MS</b>	<b>C_MBT S 18.0 R160 MU</b>	<b>C_MBT S 20.0 R115 MU</b>	<b>C_MBT S 20.0 R115 MI</b>
	Motor at side	Motor at bottom	Motor at bottom	Motor at front
	split			
Axle load [kg]	18 000		20 000	
Drive power	2x 11 kW			
Test speed	3 km/h		2.3 km/h	
Roller length [mm]	1600		1150	
Nominal diameter [mm] Rollers welded on/ plastic	270			
Nominal diameter [mm] Rollers MIXED	272			
Roller centre distance [mm]	475			
Test roll w. welded textured surface, friction coefficient dry / wet	0.9 / 0.7			
Test roller w. plastic / granulate coating, friction value dry / wet	0.9 / 0.8			
MIXED roll, friction coefficient dry / wet	0.9 / 0.8			
Measuring range	0 – 45.5 kN			
Display accuracy (full scale)	2 %			
Fuse protection	63 A gG			
Power supply	3x 400 V +N +PE 50 Hz			
Minimum cable cross- section supply line*	5 x 25 mm <sup>2</sup>			
Dimensions roller set half: H x W x L [mm]	405 x 1145 x 2685	740 x 1145 x 1880	740 x 1145 x 1430	440 x 1490 x 1.505

	<b>C_MBT S 20.0 R160 MU</b>	<b>C_MBT M 18.0 W301</b>	<b>C_MBT T 18.0 W360</b>
	Motor at bottom	Mobile	Agriculture
	split		
Axle load [kg]	20 000	18 000	
Track width min. [mm]	--	750	390
Track gauge max. [mm]	--	3010	3600
Drive power	2x 11 kW		
Test speed	2.3 km/h		
Roll length [mm]	1600		1150
Nominal diameter [mm] Rollers welded on/ plastic	270	154	270
Nominal diameter [mm] Rollers MIXED	272	n/a	
Roller centre distance [mm]	475		685
Test roll w. welded textured surface, friction coefficient dry / wet	0.9 / 0.7		
Test roller w. plastic / granulate coating, friction value dry / wet	0.9 / 0.8		
MIXED roll, friction coefficient dry / wet	0.9 / 0.8		
Measuring range	0 – 45.5 kN		
Display accuracy (full scale)	2 %		
Fuse	63 A gG		
Power supply	3x 400 V +N +PE 50 Hz		
Minimum cable cross- section supply line*	5 x 25 mm <sup>2</sup>		
Dimensions roller set half: H x W x L [mm]	740 x 1145 x 1880	520 x 900 x 2410	5580 x 1340 x 370

### **2.6.3 Noise Emission**

Noise emission during a vehicle test is mainly caused by the vehicle's engine. This noise emission varies from vehicle to vehicle and cannot be attributed to the test bench.

#### **Roller brake tester**

The noise emission value caused by the brake tester (roller drive) is less than 70 dB(A) in the area of the operators' workplaces.

#### **Axle damping tester**

The noise emission value caused by the MSD 3000 tester due to the vibrating test plates is between 75 and 80 dB(A) in the area of the operators' workplaces.

#### **Side-slip tester**

The noise emission value caused by the side-slip tester is less than 70 dB(A) in the area of the operator's workplaces.

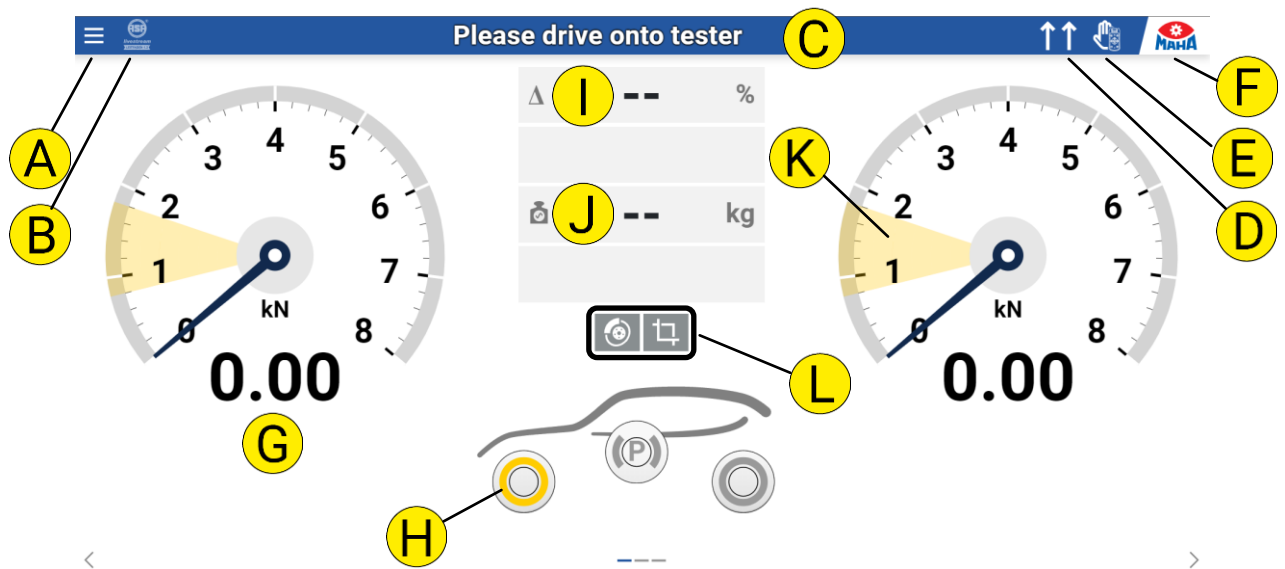
### 3 Description of the Software User Interface

The control board of the brake tester generates a website through which the user guidance and the measured value display takes place. The easiest way to connect to a C\_MBT brake tester is to use a standard computer with an Internet browser.

All common browsers (e.g. Mozilla Firefox, Microsoft Edge, Google Chrome) are supported in their current version.

#### 3.1 Measurement Screen in Car Mode

- Once the test rollers have been driven onto, the display automatically changes to the measurement screen.
- In the measurement screen, the current brake value and the difference in % are shown.
- After slip or pre-trigger (= memory threshold), the maximum brake forces of the measurement are displayed.
- The arrows at the bottom left and right can be used to switch between the measurement screen and the results screen (on touch-enabled devices also by swiping to the side).



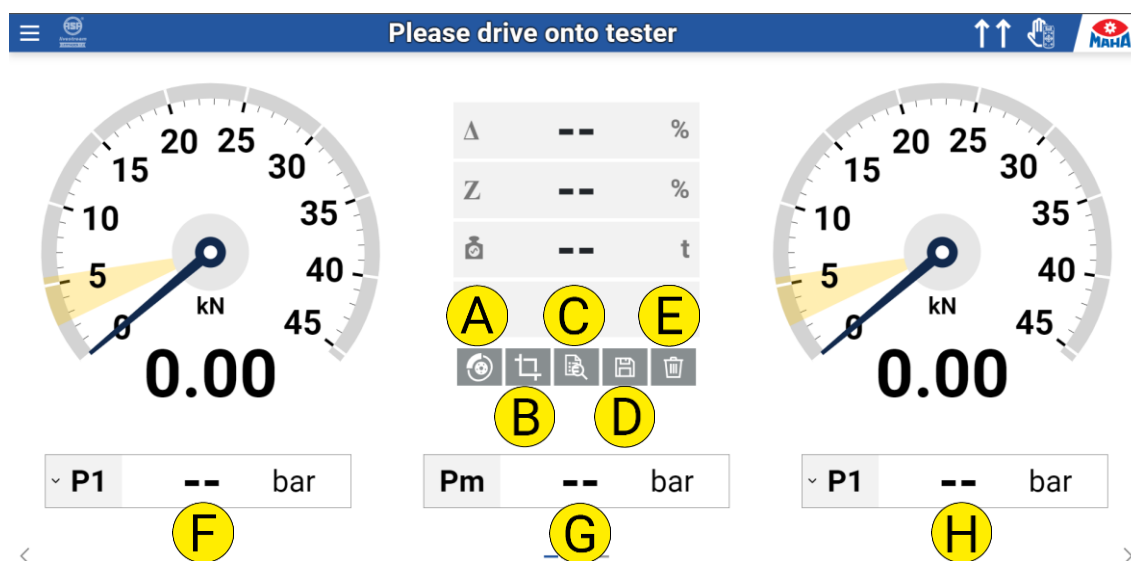
<b>A</b>	Burger menu	Opens a list of functions (see below).
<b>B</b>	ASA Livestream	Display whether ASA Livestream is activated; active = light blue
<b>C</b>	Status line	The status line serves as a user prompt.
<b>D</b>	Direction arrows	Indicates the set direction of rotation of the test rollers (both forward/backward or counter rotation).
<b>E</b>	Automatic/manual	Display whether automatic mode is activated or manual mode (then hand symbol).



<b>F</b>	Settings	Click on gear wheel opens system settings.
<b>G</b>	Brake force	Display of brake forces left/right in kN, as digital value and with pointer
<b>H</b>	Brake type indicator	The brake to which the current measured value is saved is always displayed highlighted in yellow.
<b>I</b>	Differential display	Displays the brake force differential in %
<b>J</b>	Weight display	Display of weight measurement (static: weight symbol filled, dynamic: weight symbol as outline)
<b>K</b>	Ovality segment	Ovality is measured in preset brake force area (marked yellow)
<b>L</b>	For button assignment see section "Measurement Screen in Truck Mode"	

### 3.2 Measurement Screen in Truck Mode

The measured value display for truck testers is similar to that of the passenger car testers, extended by some functions which are described below.



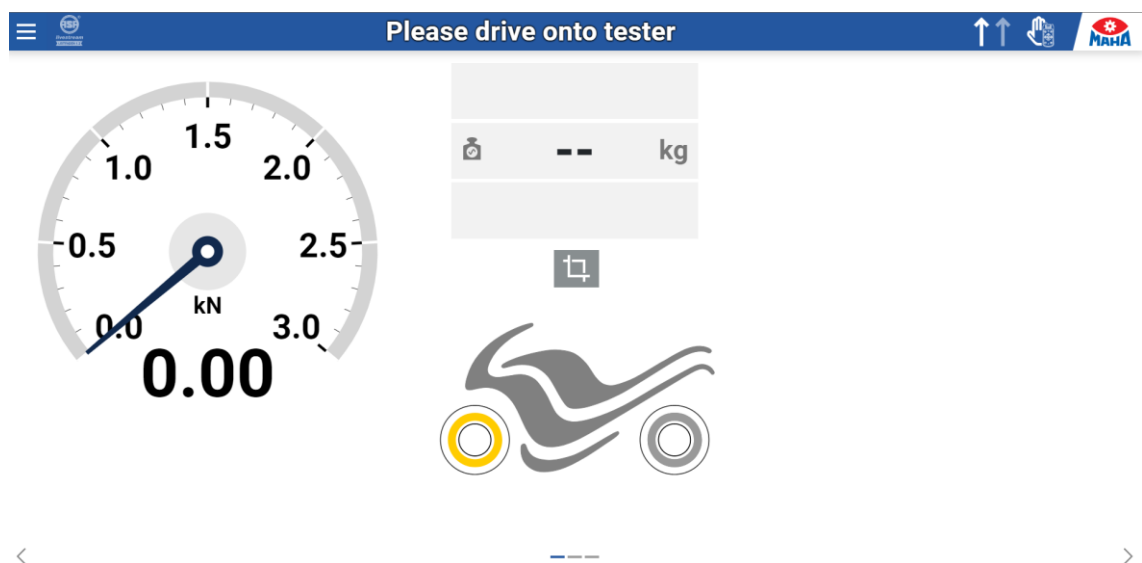
<b>A</b>	Manual ovality measurement	Ovality is measured immediately at current pointer position; segment size and time from settings are used
<b>B</b>	Manual end of measurement	Intermediate storage of the current measured value
<b>C</b>	Last measurement result	Re-displays
<b>D</b>	Save	with axle assignment and brake type
<b>E</b>	Delete	Deletes the current measurement value in

		the temporary memory
F	Pressure converter (opt.)	Brake pressure P1...P9 left wheel
G	Pressure converter (opt.)	Control pressure Pm
H	Pressure converter (opt.)	Brake pressure P1...P9 right wheel

If radio-controlled devices are present, another view is available, which can be accessed via the arrows at the bottom or by swiping to the side.

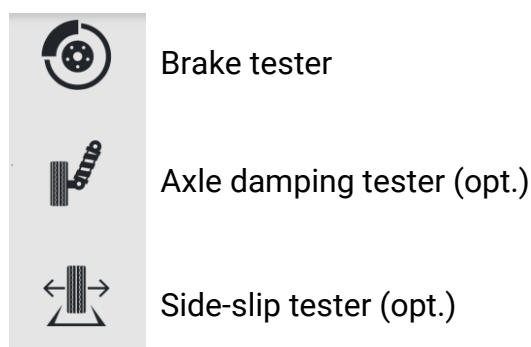
### 3.3 Measurement Screen in Motorcycle Mode

The measured value display in motorcycle mode is reduced to a single dial gauge. It is always located on the left of the user interface, regardless of the test bench side selected. The functions correspond to those in the semi-automatic car mode.
























### 3.4 Burger Menu Functions

In the left column, it is possible to select between the functions for the different test devices (depending on the configuration of the test stand):



## Functions of Brake tester

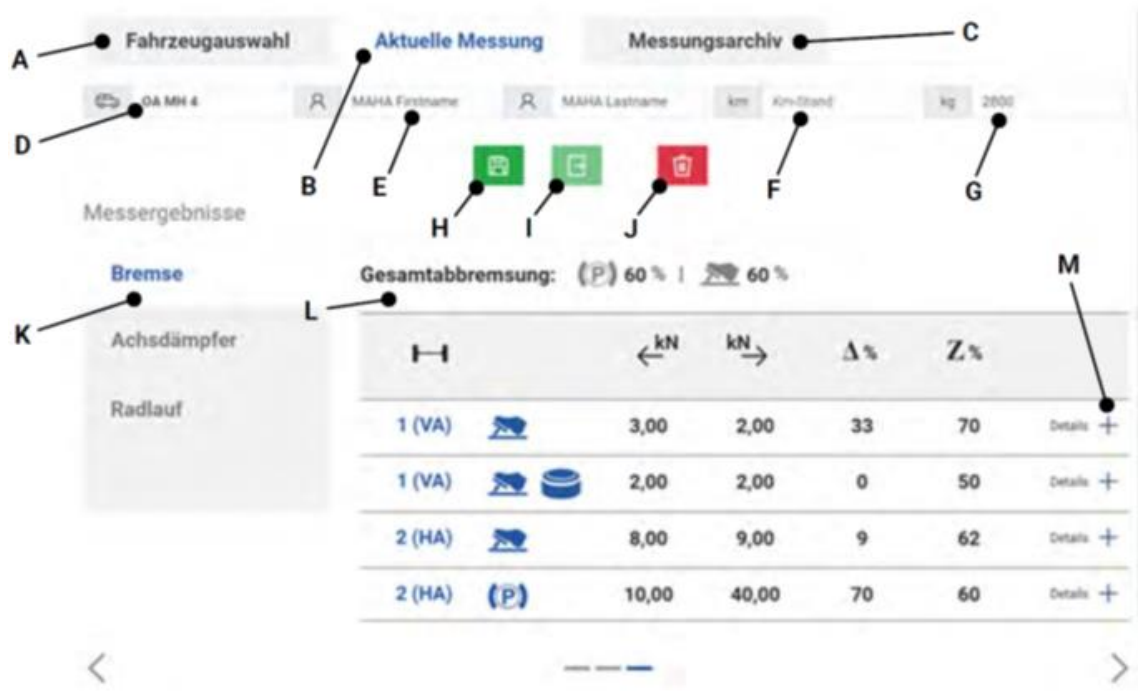
	Car mode	
	Truck mode	
	Motorcycle mode	
	Weight-dependent Car-Truck switchover	(below the preset weight threshold Car mode, above Truck mode)
	Main direction of rotation	(default)
	Four-wheel	(Automatic counter-rotation operation, measurement of the respective forward rotating wheel. First left side, then automatically right side)
	Opposite direction (opt.)	(Measurement in the opposite direction of travel)
	Single wheel left	(Measurement of the left wheel only, right roller is stationary)
	Single wheel right	(Measurement of the right wheel only, left roller is stationary)
	Automatic roller start	(Default setting, automatic start 3 sec. after entering the test stand)
	Manual roller start via SmartDevice	
	Manual roller strat via radio remote control	
	Manual roller start via cable remote control	
	Lowering bar (opt.) automatic	(Lowering bar is controlled via light barrier or button)
	Lowering bar (opt.) manual	(Lowering bar is controlled via button)




	Pre-trigger	(Measurement when threshold value is exceeded)
	Pre-trigger Truck	(Save maximum brake force)
<b>Functions of Axle damping tester (opt.)</b>		
	Axle Damping Tester	(enables the axle damping test)
	Axle damping tester Weighing mode	(enables weight measurement via axle damping tester, no axle damping test) Only available if there is no weighing device in the brake tester!
	Switch off axle damping test stand	(disables the axle damping test)
<b>Functions of Side-slip tester (opt.)</b>		
	Switch off side-slip tester	(disables the side-slip test)

### 3.5 Results Display

- In the results display, the customer name (E) and the vehicle license plate number or VIN (D) can be entered for the current measurement (B), as well as the current mileage (F) and the permissible total weight of the vehicle (G).
- The last stored measurements (C) can be re-displayed (up to 10).
- If the ES\_in/out protocol is activated (opt.), a vehicle can be selected from a test list (A).
- The arrows at the bottom left and right can be used to switch between the results screen and the measurement screen (on touch-enabled devices also by swiping to the side).

### 3.5.1 Current Measurement



<b>A</b>	Vehicle selection (opt.)	Opens a list with test orders (ES_in).
<b>B</b>	Current measurement	Results display for the current measurement.
<b>C</b>	Measurement archive	Overview of the last (10) stored measurements.
<b>D</b>	Licence number/VIN	Entry field for license plate number/VIN
<b>E</b>	Name	Entry field for customer name
<b>F</b>	Mileage	Entry of the vehicle's mileage in km
<b>G</b>	pTW	Entry of the permissible total weight in kg
<b>H</b>	 Save	Saves the current measurement results. Optional ES/IN: ES-OUT can also be generated, depending on the setting in the ES service
<b>I</b>	 Forward (opt.)	Writes back the measurement results (ES_out). Depending on the setting in the ES service
<b>J</b>	 Delete	Deletes the measurement results
<b>K</b>		Selection of the desired test equipment
<b>L</b>		Output of the total deceleration
<b>M</b>		Expand to detail view

### Detail view (M):

If the detail view is expanded with <+>, further measurement results can be seen, e.g. the associated pedal forces or pressures and the weight:

		← kN	kN →	Δ %	Z %	
1		3,00	2,00	33	70	Details
		30 N	20 N			
		P2: 1,3 bar	P3: 1,4 bar	Pm: - bar		
		2,00	2,00	0	50	Details
		2 N				
		P2: 1,3 bar	P3: 1,4 bar	Pm: 1,4 bar		

### 3.5.2 Measurement Archive

In the measurement archive, the stored measurements are listed (max. 10 vehicles) in order to re-display them if required (**fade in**) or to **print** them in the form of a test protocol.

Use the arrows to sort the corresponding column.

Vehicle measurements that are no longer required can be deleted.

Aktuelle Messung		Messungsarchiv				
<input type="text" value="Suche"/>						
Datum	Fahrzeugtyp	Kennzeichen/FIN	km-Stand	Einblenden	Drucken	Löschen
10.05.2021 14:15		ALLRAD				
07.05.2021 09:46		CRAFTER 16108				

## Print

If Print is selected, a window opens in which the desired components can be selected that are to appear on the test report.

In addition, the displayed contact address can be edited.

The image shows two parts of a software interface. On the left is a window titled 'Prüfprotokoll' with a close button (X). Inside, it says 'Wählen Sie die zu druckenden Komponenten aus.' (Select the components to be printed). There are four items with checkboxes: 'Bremskraft' (checked), 'Abbremsung' (checked), 'Achsdämpfungsprüfstand (nicht gemessen)' (unchecked), and 'Achsdämpfungsprüfstand Diagramm (nicht gemessen)' (unchecked). At the bottom is a blue button with a printer icon and the text 'Prüfprotokoll generieren'. On the right is a form titled 'Adresse' with the text: 'Max Mustermann', 'Musterstraße 555', '99999 Musterstadt'.

When generating the test protocol, a PDF file is created, which can then be saved on the computer, e.g. in the local download folder. This file can then be sent by e-mail or printed on paper on a connected printer.

### 3.5.3 Vehicle Selection (opt.)

As soon as the ES\_in/out protocol is activated under Settings (option), a new view "Vehicle selection" appears.


The image shows a software interface for vehicle selection. At the top are three tabs: 'Fahrzeugauswahl' (selected), 'Aktuelle Messung', and 'Messungsarchiv'. Below the tabs is a search bar with a dropdown menu showing 'KE AB 1000' selected. To the right of the search bar are fields for 'km' (25000) and 'kg' (2500). Below the search bar are three icons: a green document icon, a green folder icon, and a red trash icon. Below the search bar is a large black-bordered box containing the text 'KE AB 1000'. To the right of this box is a vertical list of categories: 'Brems', 'Achsdämpfer', 'Radlauf', and 'Geräuschsuche'.


If the pull-down menu is expanded with the down arrow, vehicles can be selected for which inspection orders have already been recorded (e.g. in an IT system of a car dealership or an inspection station).

A manual license plate entry is not possible.

After selection, the fields for which entries have been made are automatically filled in, e.g. vehicle type (car or truck, indicated by the symbol in front of the license plate), number of axles, VIN, mileage or permissible total weight. Measurements can then be taken for this vehicle.

After completing the measurements, the measured values can be transferred to

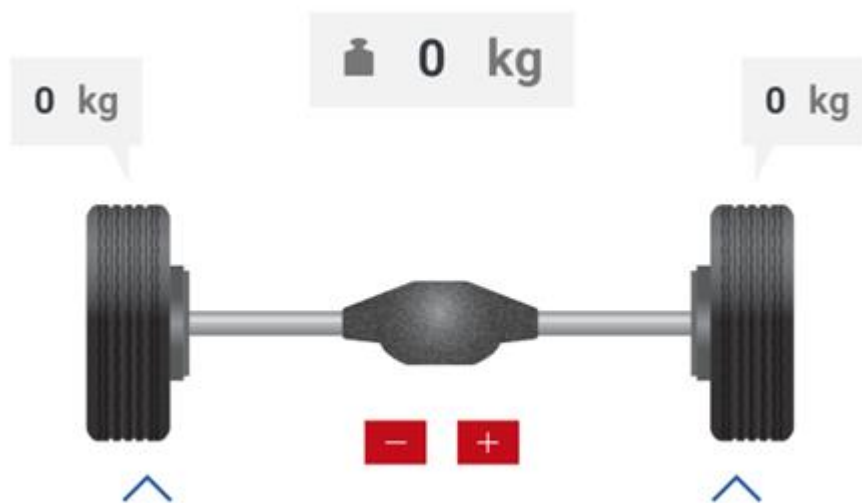
the measurement archive by clicking on "Save"  .

Alternatively, after the measurement, the test job can be closed by clicking on "Forward"  and the measured values are transferred back to the IT system. If the measured values are not to be saved, they can be deleted.

## 3.6 Optional Display Screens

### 3.6.1 Scale Screen (opt.)

As soon as a weighing device is installed in the test bench, another view appears:



Here, the wheel weights are displayed above the wheels, and the axle weight is displayed above the axle.

Below the axle weight, the difference appears when the weight is changed.

#### Load simulation (opt.)

If additional devices for load simulation are installed (pull-down device or roller set lift), the load simulation can be operated via the **+/- buttons** under the axle:

- **Plus** increases the load
- **Minus** reduces the load

The **arrows** under the wheels indicate by movement whether the load simulation is active.



### 3.6.2 Display Radio Participants (opt.)

If a radio receiver is installed in the test bench and the opt. radio pressure converters are activated, another view appears:

Pm ---	P5 ---	<b>PFM</b> <b>0 N</b>
P1 ---	P6 ---	<b>RECO S</b> ✓
P2 ---	P7 ---	
P3 ---	P8 ---	
P4 ---	P9 ---	

The existing radio participants are displayed here, e.g. the RECO S radio remote control, a PFM pedal force meter or RCD 50 radio pressure converter.

In addition, the measured values are displayed:

- "---" means that no measured values are available.
- Blue bordered with "---" means that a sensor is logged in, but not transmitting.
- Blue with values e.g. "0" means a sensor sends value 0.
- Blue with "charging" means sensor is charging its battery.
- "0 N", on the other hand, is a measured value.









Adding/removing a participant is done under Settings/Radio/Radio diagnostics.

## 3.7 Settings



Clicking on the gear wheel in the MAHA logo opens the System settings menu.

Here the following submenus are available in the left column:

	General
	Languages
	Settings, extended (only for logged in users)
	Radio (opt.)
	Brake tester
	Axle damping tester (opt.)
	Side-slip tester (opt.)
	Technician menu login

### Description of the submenus



#### General



Allgemein	
<small>Support   Netzwerk   Externe Geräte   Ereignisaufzeichnung   Prüfprotokoll   Maschinendaten</small>	
Support:	Contact and test bench information
Network:	IP settings, network name
External devices:	Connected analog displays, C_Box etc.
Event recording:	Display of events (EventLog)
Test protocol:	Configuration protocol, address header
Machine data:	Operating hours etc.

#### Languages



Sprache	
<input checked="" type="checkbox"/>  Deutsch	Setting the language of the test bench
<input type="checkbox"/>  English	

---

## Settings



Einstellungen

Geräte Akt./Deak.    Optionen    Software-Update/ZM-Zurücksetzen

Devices Act./Deact.:	Activate/deactivate test equipment
Options:	Activate booked general additional functions
SW Update:	Update option for software
Reset ZM:	Reset ZM to delivery state

---

## Radio



Funk

Optionen    Funkdiagnose    Justage

Options:	Bookable radio options (remote control, pressure converter, pedal/hand force meter)
Radio diagnostics:	Status information on end devices, user guidance for pairing the devices etc.
Adjustment:	Adjust end devices (only for logged-in users)

---

## Brake tester



Bremsprüfstand

Optionen    Kalibrieren Bremskraft    Kalibrieren Wiegeeinrichtung    Diagnose

Options:	Activated devices and settings
Adjust brake force:	Display of values (force and digits)
Adjust weighing device (opt.):	Display of values (weight and digits)
Diagnostics:	Sensor diagnostics (range spring and proximity switch)
<i>Additionally for logged in users:</i>	
Settings:	Parameters for car, truck, motorcycle, general, customer variables
Adjust brake force:	Set zero point, range spring settings etc.
Adjust weighing device (opt.):	Set zero point etc.
Diagnostics:	Motor can be switched in star/delta or fast/slow mode ( <i>service technician button required</i> )
Input/output test:	Activate outputs ( <i>service technician button required</i> ), readout inputs

---

---

## Axle damping tester

Achsdämpfungsprüfstand

[Optionen](#) [Justage](#)



Options: Activate booked options  
Adjustment: Currently only possible via external „LON-Manager“ tool

---

## Side-slip tester

Radlauftester

[Optionen](#) [Justage](#)



Options: Activate booked options (triggers etc.)  
Adjustment: Adjust side-slip tester (only for logged-in users)

---

## Technician menu login

Activation of the technician menu



Online: via internet connection with e-mail address and password, here also password change possible



Offline: via maha-key-file, download from MAHA internet server, here no password change possible;  
Once logged in: change password!

---

### 3.7.1 General/Network

The "Network MAHA (X13)" is permanently configured and cannot be changed! (Ethernet interface X13 on the central module)

On the other hand, the "Customer network (X12)" can be customized according to the requirements. (Ethernet interface X12 "EXT" on the central module).

Likewise, the "network name" under which the test stand reports in a network can be customized.

At the very bottom, information about the ASA Livestream (opt.) is shown.

## Allgemein

Support   Netzwerk   Externe Geräte   Ereignisaufzeichnung   Prüfprotokoll   Maschinendaten

### Netzwerk Kunde (X12)

Status	✓ Verbunden
Modus	Client
MAC	00:1f:b2:0a:00:a1
IPv4 / Netzwerkmaske	10.10.5.22 / 255.255.255.0
IPv6	fe80::9547:b153:e0f2:79e3
Gateway	10.10.5.254
Neuer Modus	<input type="button" value="Ändern"/>

### Netzwerk MAHA (X13)

Status	✓ Verbunden
Modus	Server
MAC	00:1f:b2:0a:10:68
IPv4 / Netzwerkmaske	192.168.201.1 / 255.255.255.0
IPv6	fe80::98d6:4c8d:142a:57c3
Angeschlossene Geräte	

### Netzwerkname

### ASA Livestream

Status	✓ Verbunden
Manager IP-Adresse	10.10.5.23:23232
Übertragung läuft	✗

## X13 MAHA

The X13 MAHA interface is primarily used to connect a MAHA access point so that the test stand can be accessed via the access point's WiFi. The network interface at X13 MAHA tries to obtain IP addresses via DHCPv4/v6 for 30 seconds when the central module is started (or a cable is plugged in). If no DHCP server responds during this time, i.e. obtaining the addresses fails, then the ZM itself acts as a DHCPv4 server, assigns itself the address 192.168.201.1 and distributes IP addresses in the network in which the X13 MAHA interface is located.

### Info:

This configuration cannot be changed. On the one hand, this ensures that the MAHA Access Point functions correctly with this interface, and on the other hand, this allows the network configuration of the X12 EXT interface to be performed via the X13 MAHA port.

## X12 EXT

The X12 EXT network interface is possible for integration of the central module into the customer network. To enable such integration conveniently, the X12 EXT interface can be configured according to customer requirements. It is recommended to perform the configuration of the X12 EXT interface via a device that is directly connected to the X13 MAHA port.

- DHCP server

To configure the X12 EXT interface as a DHCP server, "Server" must be selected as the new mode. After a restart of the central module, the X12 EXT interface then operates as a DHCP server. This means that the X12 EXT interface attempts to obtain IP addresses via DHCPv4/v6 for 30 seconds when the ZM is started (or a cable is plugged in). If no DHCP server responds during this time,

i.e. obtaining the addresses fails, then the ZM itself acts as a DHCPv4 server and assigns itself the address 192.168.202.1.

### Info:

In Germany, this interface must be used as an **ASA interface** and is configured accordingly ex works (as a DHCP client).

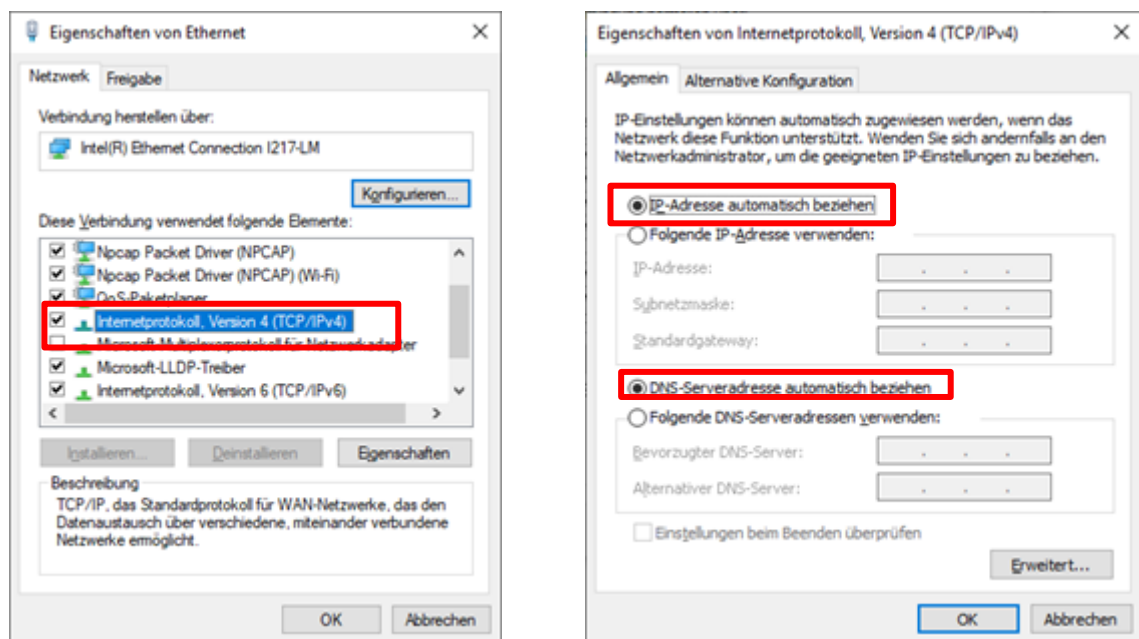
- Static IP

To configure the X12 EXT interface to a static IP, "Static IP" must be selected as the new mode. The IPv4 and Network mask fields are mandatory fields.

Optionally, a gateway can also be entered. After a restart of the central module, the X12 EXT interface then operates with static IP.

### Procedure for configuring the X12 EXT interface

- 1 Connect a laptop or similar to the X13 MAHA socket of the central module via a network cable. The network interface of the laptop must be configured as a DHCP client. This means that in the properties of the corresponding Ethernet connection in the "Internet protocol, version 4" element the "Obtain IP address automatically" and "Obtain DNS server address automatically" options must be enabled.



- 2 Call up the WebApp of the central module via a web browser. The central module can be reached either via the IP 192.168.201.1 or via the name of the ZM + .maha (in the delivery state this would be e.g. <http://maha-mbt.maha>).
- 3 Login to the technician menu, e.g. via a previously downloaded offline key.
- 4 Switch to the network area, select the desired mode and enter the desired configuration.

## Allgemein

Support Netzwerk Externe Geräte Ereignisaufzeichnung Prüfprotokoll Maschinendaten

### Netzwerk Kunde (X12)

Status	✓ Verbunden
Modus	Client
MAC	MOCK_EXT_MAC
IPv4 / Netzwerkmaske	10.10.10.2 / 255.255.255.0
IPv6	12345667889adfecb:3421
Gateway	10.10.10.1
Neuer Modus	<input type="text" value="Client"/>

Netzwerk MAHA (X13)

- Client
- Server
- Statische IP

### Info:

Incorrect configuration of the X12 EXT interface can result in the central module no longer being accessible via the X12 EXT interface. A configuration correction can or must then be made via the X13 MAHA interface.

### 3.7.2 Technician Menu Login

In this sub-menu, the technician menu can be opened. However, this menu is only accessible to persons who are registered with MAHA.

#### Online activation

If the test stand is online, i.e. if it has a direct connection to the Internet, the user can log in with an e-mail address and password. These are usually managed by the MAHA Service Center after MAHA training has been completed.

After successful login, the **password** can also be **changed** here.

#### Offline activation

If the test stand is not online, the user can log in using a software key ("maha-key"). This file must be downloaded to the end device beforehand and is available on the MAHA homepage in the support area under "Software/Connect Downloads" (login with e-mail address and password required):

<https://www.maha.de/de/support/software/connect-downloads>

It can then be imported into the test stand using the "Select" button.

The keys are limited in time (usually four weeks after issuance) and only valid for a specific test stand (S/N related)!

## 4 Transport, Handling and Storage

### 4.1 Safety Instructions



#### WARNING

- For loading, unloading and transport, always use suitable lifting equipment, load handling devices (e.g. crane, forklift truck) and correct load attachment devices and lifting accessories. See also section "Transport and handling".
  - Always ensure that the parts to be transported are suspended or loaded properly and in a fall-proof manner, taking into account their size, weight and centre of gravity. Observe transport regulations!
  - Electrical work must only be performed by a specialist electrician in compliance with the national regulations, directives and standards. An electrical test/measurement must be performed and logged.
  - The system may only be installed and commissioned by service technicians of the manufacturer or by authorised service partners.
  - All parts of the electrical equipment must be protected from moisture and humidity.
  - The system must not be installed or operated in potentially explosive rooms or washing bays.
  - The operator must provide optional safeguards (e.g. warning lamps, barriers, monitoring of the presence of personnel in working pits) in accordance with the on-site conditions.
  - Personal protective equipment (safety boots and gloves) must be worn. The personal protective equipment must meet the safety requirements for the particular work being performed.
  - Secure the roller set with suitable means (e.g. barrier chain or tape). Depending on the country, the roller set must be secured with the optionally available cover when not in use (regulation in Germany). Alternatively, the automatic drive-over lowering bar can be used.
  - The display must be hung up in a safe area and must be folded up against the wall during downtime (wall-mounted hinge can be used as an option).
  - When folding up the display, always hold it on the outside. Crushing hazard!
  - Before connecting the supply line, it must be ensured that a lockable master switch or key switch (optional) is available for the use of the brake tester.
  - The emergency stop main switch, the emergency stop pushbutton (optional) and the signal lamp "Control On" must be positioned in the immediate vicinity of the test bench so that the emergency stop function according to DIN EN ISO 13850 is fulfilled.
-



## 4.2 Scope of Delivery

Each test bench is shipped from the factory with packaging as standard. The delivery contains:

- Roller set (basic equipment)
- Control cabinet (basic equipment)
- Options according to price list

The number of delivered packages and contents must be checked for damage and completeness according to the order confirmation. Any transport damage must be documented immediately and reported to the delivery carrier.

## 4.3 Packaging Information

In the following tables, the package weights are always indicated as approximate values, since they considerably depend on the equipment version and may vary accordingly.

### Centre of gravity of the packed roller set

The centre of gravity is approximately in the centre of the roller set or roller set halves.

	<b>C_MBT C 3.5 W220</b>	<b>C_MBT S 3.5 W220</b>	<b>C_MBT C 3.5 W250</b>	<b>C_MBT S 3.5 W250</b>
Dimensions Package Roller set (L x W x H)	240 x 80 x 50 cm	175 x 80 x 82 cm	295 x 80 x 50 cm	175 x 80 x 82 cm
Weight Package Roller set	350...550 kg	450...650 kg	400...650 kg	500...750 kg
Dimensions Package Control cabinet (L x W x H)	120 x 80 x 50 cm			
Weight Package Control cabinet	70...100 kg			

	<b>C_MBT C 4.0 W220</b>	<b>C_MBT S 4.0 W220</b>	<b>C_MBT C 4.0 W250</b>	<b>C_MBT S 4.0 W250</b>
Dimensions Package Roller set (L x W x H)	240 x 80 x 50 cm	175 x 80 x 82 cm	295 x 80 x 50 cm	175 x 80 x 82 cm
Weight Package Roller set	350...550 kg	450...650 kg	400...650 kg	500...750 kg
Dimensions Package Control cabinet (L x W x H)	120 x 80 x 50 cm			
Weight Package Control cabinet	70...100 kg			

	<b>C_MBT C 5.0 W280</b>	<b>C_MBT S 5.0 W280</b>	<b>C_MBT C 13.0 W280</b>
Dimensions Package Roller set (L x W x H)	295 x 80 x 50 cm	175 x 80 x 82 cm	295 x 80 x 50 cm
Weight Package Roller set	450...750 kg	550...850 kg	450...750 kg
Dimensions Package "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm		
Weight Package "Control cabinet Series"	70...100 kg		
Dimensions Package "Control cabinet Option" (L x W x H)	-		150 x 115 x 90 cm
Weight Package "Control cabinet Option"	-		100...130 kg

	<b>C_MBT S 13.0 R100 MU</b>	<b>C_MBT S 15.0 R100 MU</b>
Dimensions Package Roller set (L x W x H)	2x 150 x 115 x 90 cm	2x 150 x 115 x 90 cm
Weight Package Roller set	2x 600...900 kg	2x 600...900 kg
Dimensions Package "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm	
Weight Package "Control cabinet Series"	70...100 kg	
Dimensions Package "Control cabinet Option" (L x W x H)	150 x 115 x 90 cm	
Weight Package "Control cabinet Option"	100...130 kg	

	<b>C_MBT S 18.0 R115 MS</b>	<b>C_MBT S 18.0 R115 MU</b>	<b>C_MBT S 18.0 R115 MI</b>
Dimensions Package Roller set (L x W x H)	2x 225 x 115 x 65 cm	2x 150 x 115 x 100 cm	2x 150 x 150 x 75 cm
Weight Package Roller set	2x 850...1250 kg	2x 1000...1350 kg	2x 900...1200 kg
Dimensions Pack stück "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm		
Weight Package "Control cabinet Series"	70...100 kg		
Dimensions Pack stück "Control cabinet Option" (L x W x H)	150 x 115 x 90 cm		
Weight Package "Control cabinet Option"	100...130 kg		

	<b>C_MBT S 18.0 R160 MS</b>	<b>C_MBT S 18.0 R160 MU</b>
Dimensions Package Roller set (L x W x H)	2x 280 x 135 x 60 cm	2x 195 x 115 x 98 cm
Weight Package Roller set	2x 1300...1500 kg	2x 1100...1400 kg
Dimensions Package "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm	
Weight Package "Control cabinet Series"	70...100 kg	
Dimensions Pack stück "Control cabinet Option" (L x W x H)	150 x 115 x 90 cm	
Weight Package "Control cabinet Option"	100...130 kg	

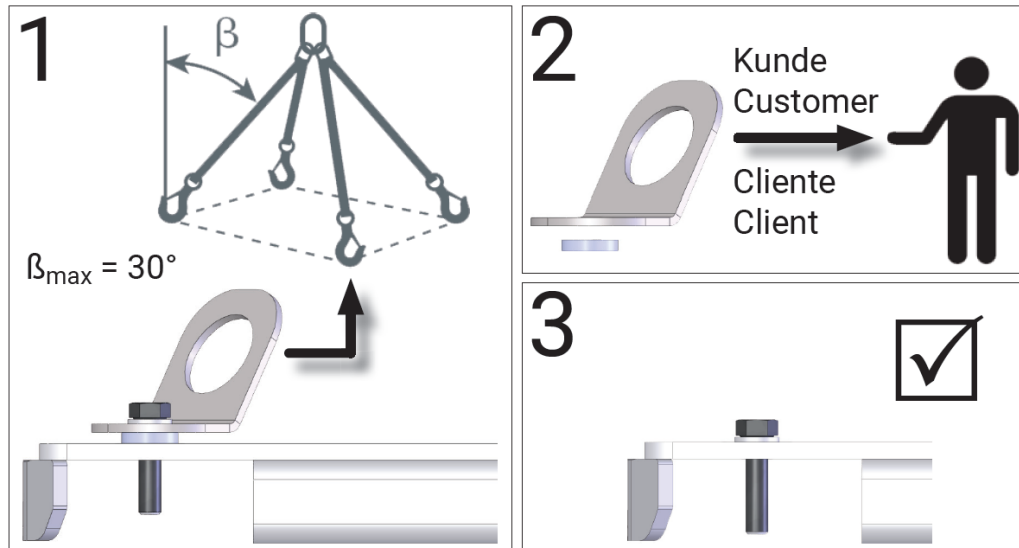
	<b>C_MBT S 20.0 R115 MU</b>	<b>C_MBT S 20.0 R115 MI</b>	<b>C_MBT S 20.0 R160 MU</b>
Dimensions Package Roller set (L x W x H)	2x 150 x 115 x 100 cm	2x 150 x 150 x 75 cm	2x 195 x 115 x 98 cm
Weight Package Roller set	2x 1000...1350 kg	2x 900...1200 kg	2x 1100...1400 kg
Dimensions Package "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm		
Weight Package "Control cabinet Series"	70...100 kg		
Dimensions Package „Control cabinet Option“ (L x W x H)	150 x 115 x 90 cm		
Weight Package „Control cabinet Option“	100...130 kg		

	<b>C_MBT M 18.0 W301</b>	<b>C_MBT T 18.0 W360</b>
Dimensions Package Roller set (L x W x H)	2x 250 x 130 x 93 cm	2x 280 x 115 x 70 cm
Weight Package Roller set	2x 750...950 kg	2x 1400...1600 kg
Dimensions Package "Control cabinet Series" (L x W x H)	120 x 80 x 50 cm	
Weight Package "Control cabinet Series"	70...100 kg	
Dimensions Package "Control cabinet Option" (L x W x H)	150 x 115 x 90 cm	
Weight Package "Control cabinet Option"	100...130 kg	

## 4.4 Transport and Handling

Transport and handling of the test bench is only permitted in the original packaging. On the pallet the packaged test bench can be moved with the forklift truck. For loading, unloading and insertion into the foundation, use the pick-up points shown below. Hand over the load suspension lugs to the operator for reuse (dismantling, repair) after the transport process.

Dimensions and centre of gravity of the packaged test bench are shown in section "Packaging Information".



*Pick-up points of the packaged test bench*

## 4.5 Storage

The packages must be stored in a covered location and protected from direct sunlight. Storage must take place at a temperature between  $-10^\circ\text{C}$  and  $+60^\circ\text{C}$ .

Packaging waste must be disposed of in accordance with applicable environmental regulations.

## 5 Installation

### 5.1 Safety Information



#### WARNING

- Installation and initial commissioning of the device may only be carried out by specially trained personnel. Such specialist staff include authorised, trained specialists employed by the manufacturer, the authorised dealers and the relevant service partners.
  - The control cabinet must be positioned in such a way that the emergency stop main switch or the emergency stop pushbutton (optional) is located in the immediate vicinity of the test bench at a height of 0.6...1.7 m above the stand level and can be assigned to the correct test bench in the case of test halls with several systems. This is necessary in order to fulfil the emergency stop function according to DIN EN ISO 13850. The "Control On" status light shall be fully visible from the test site.
  - Electrical work must only be performed by a specialist electrician in compliance with the national regulations, directives and standards. Accordingly, an electrical test/measurement must also be carried out and recorded.
  - All parts of the electrical equipment must be protected from moisture and humidity.
  - Even when the main switch is switched off, parts of the optional control cabinet heater (components, terminals, cores, cables, etc.) are still live.
  - During service work, the system must be depressurised and de-energised.
  - For all work (including assembly, repair and maintenance work) on the test bench (e.g. control cabinet, roller set, other additional parts), it must be ensured that the main switch is switched off and secured against being switched back on.
  - For work in the control cabinet or on the roller sets, be aware of the (optional) heater or hot parts.
  - Due to the coordination used in accordance with IEC 60947, the switching elements (contactors) in the associated circuit must be replaced after a short-circuit/ housing short-circuit, and also if the B10d value of 1,300,000 switching cycles in accordance with DIN EN ISO 13849-1/-2 is exceeded. Before connecting the supply cable, it must be ensured that it is de-energised and, among other things, that the 5 safety rules are observed.
  - Safety goggles must be worn when working on hydraulic/pneumatic components.
  - Test and measure the protective conductor connection and insulation as part of the overall commissioning.
  - Suitable working scaffolds/platforms must be used when working at height.
-

## 5.2 Installation Diagrams

	C_MBT C 5.0 W280	C_MBT S 5.0 W280
Foundation plan	10022761	
Elec. circuit diagram	202.01.005800	

	C_MBT C 3.5/4.0 W220	C_MBT S 3.5/4.0 W220	C_MBT C 3.5/4.0 W250	C_MBT S 3.5/4.0 W250
Foundation plan	10022761		10022761	
Elec. circuit diagram	202.30.005800			

	C_MBT C 5.0 W280	C_MBT S 5.0 W280
Foundation plan	10022761	
Elec. circuit diagram	202.30.005800	

	C_MBT C 13.0 W280	C_MBT S 13.0 R100 MS	C_MBT S 13.0 R100 MU
Foundation plan	10050232		
Elec. circuit diagram	204.30.005966 204.30.005967	204.30.005950	

	C_MBT S 15.0 R100 MS	C_MBT S 15.0 R100 MU	C_MBT S 18.0 R115 MS	C_MBT S 18.0 R115 MU
Foundation plan				
Elec. circuit diagram	204.30.005950			

	C_MBT S 18.0 R115 MI	C_MBT S 18.0 R160 MS	C_MBT S 18.0 R160 MU	C_MBT S 20.0 R115 MU
Foundation plan				
Elec. circuit diagram	204.30.005950			

	C_MBT S 20.0 R115 MI	C_MBT S 20.0 R160 MU	C_MBT M 18.0 R119 MS	C_MBT M 18.0 W300
Foundation plan				
Elec. circuit diagram	204.30.005950			

	C_MBT T 18.0 R160 MS
Foundation plan	
Elec. circuit diagram	204.30.005950

## 5.3 Mounting the Control Cabinet

### 5.3.1 Mechanical Installation

#### Installation accessories

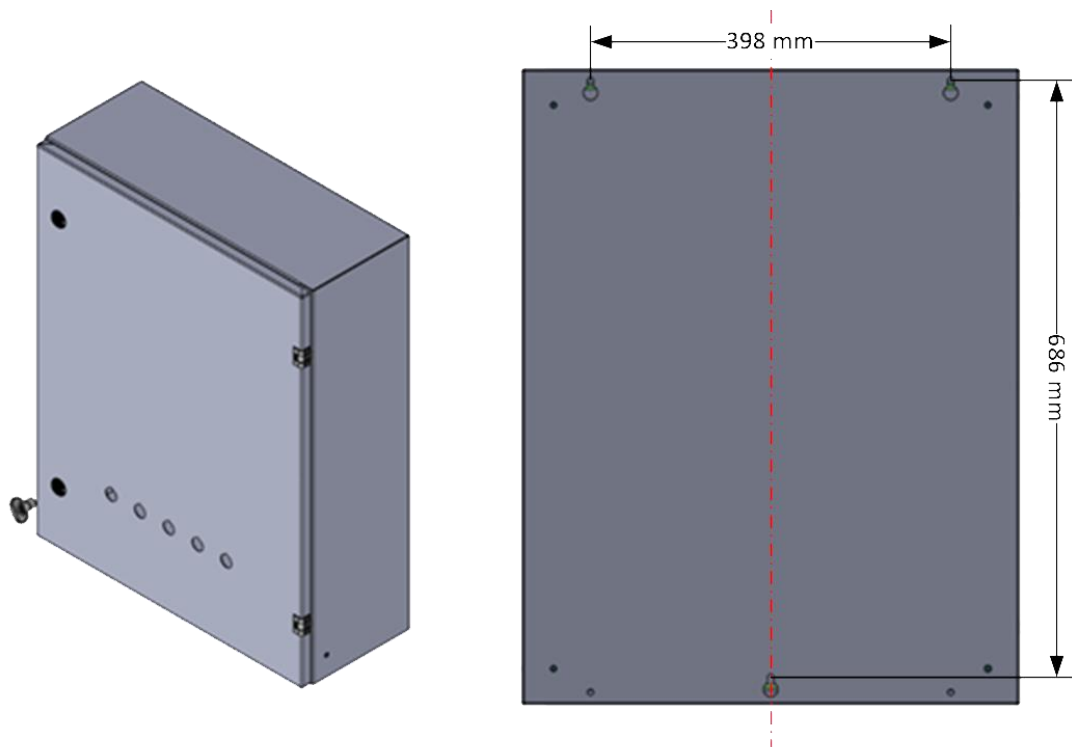
- 3 pcs hexagonal wood screws 6x60 mm, MAHA # 22 0571060 1.
- 3 pcs 6 mm washers, MAHA # 22 0125 06 3.
- 3 pcs 8 mm anchors, MAHA # 23 5008. These anchors are suitable for normal concrete, masonry walls, light weight concrete with a high degree of porosity and aerated concrete. For other materials, suitable fastening systems must be used on site!

#### Installation process

- 1 Mark the drill holes on the selected wall according to the sketch and with the aid of a spirit level and drill to a depth of at least 60 mm using a suitable 8 mm masonry drill bit.
- 2 Insert the anchors and screws into the holes and screw them in at a distance of 10 mm from the wall.
- 3 Hang the control cabinet on the pre-installed screws using the keyholes, align with a spirit level if necessary and tighten the screws.

#### NOTICE

Check control cabinet for tight fit after installation.





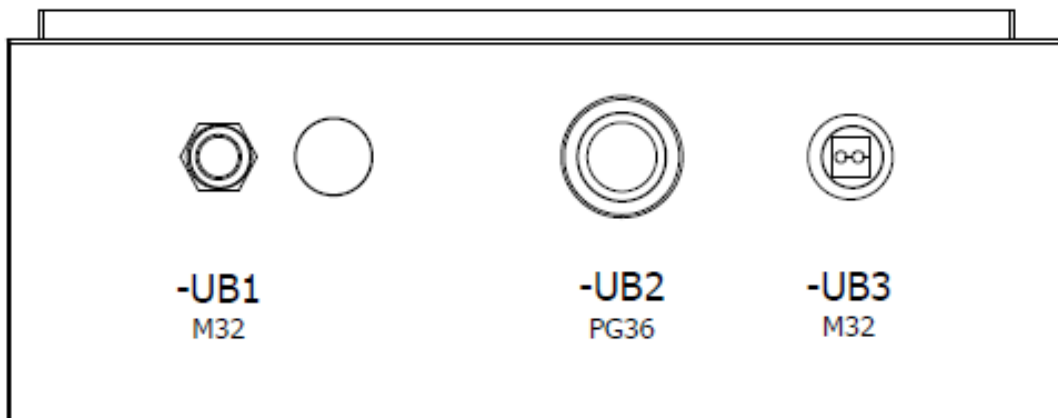
## 5.3.2 Electrical Installation

### NOTICE

- The cable cross-section of the on-site supply cable depends on the local conditions (e.g. ambient temperature, type of installation, cable length, mains impedance) and the local regulations.
- During installation and regular maintenance work, authorised and trained personnel must check that all electrical terminals are firmly seated and re-tighten all electrical screw terminals.

#### Small control cabinet (700x550x220)

- 1 Insert the supply cable via the cable gland -UB1 (M32) on the underside of the control cabinet and tighten the cable gland using an open-end wrench. Tension check on the cable, whether the cable gland closes correctly.
- 2 Fix the supply line to the wall so that there is no tensile load on the screw connection.



- 3 Connect the single wires of the stripped supply cable to the push-in supply cable terminals -X1L without tensile load. To do this, strip the insulation from the individual wires 10...12 mm. Make sure that the spring-loaded terminal does not squeeze on the insulation of the single wire. The maximum possible wire cross-section of the terminal is 6.0 mm<sup>2</sup> for solid or flexible wire (without ferrule).

L1 – Phase 1

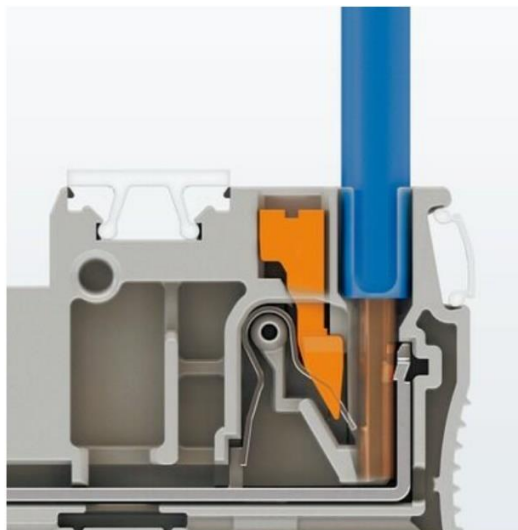
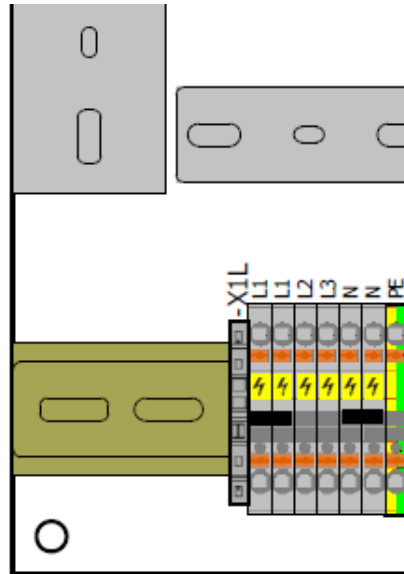
L2 – Phase 2

L3 – Phase 3

N – Neutral conductor

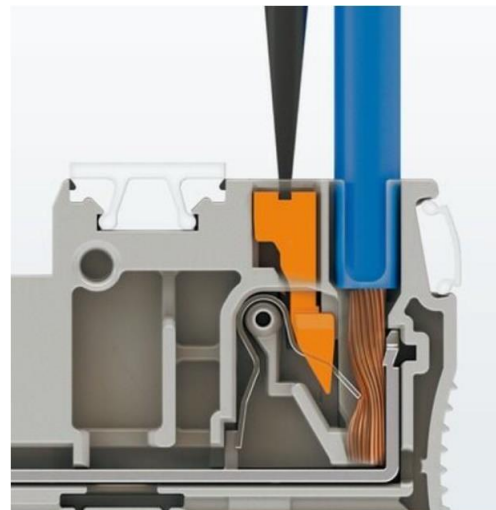
PE – Protective conductor

Image: PHOENIX CONTACT



Starre Leiter lassen sich direkt und werkzeuglos kontaktieren.

Image: PHOENIX CONTACT



Der Anschluss flexibler Leiter ohne Aderendhülse erfolgt mit dem Betätigungsdrücker.

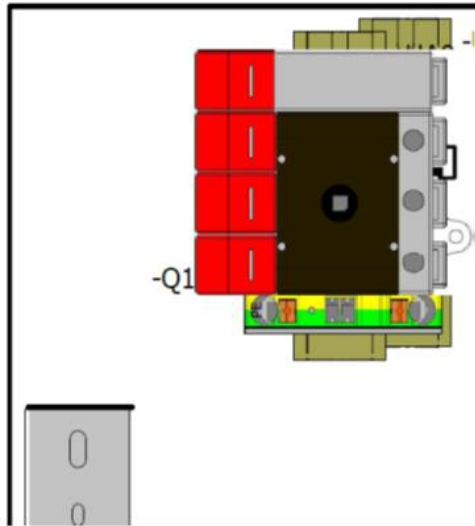
Image: PHOENIX CONTACT

## NOTICE

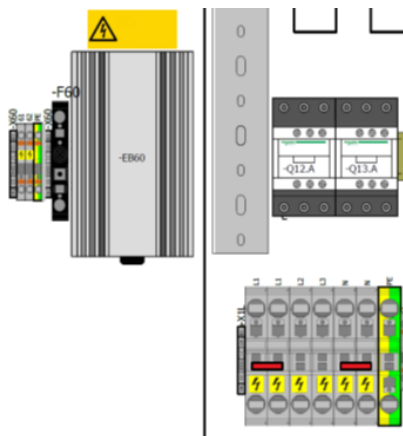
Ensure that the yellow warning covers are then reattached to the terminals. The supply line L1 – L2 – L3 must have a clockwise rotating field.

### Large control cabinet (1200x800x300)

- 1 Feed the supply line from the floor's pipe outlet directly through the control cabinet base into the control cabinet. For easier handling, the front panel of the control cabinet base can be unscrewed for this purpose. Use cable ties to relieve the strain on the cables inserted through the base of the enclosure on the serrated rail.
- 2 The supply cable is led upwards along the left edge of the mounting plate and is only stripped off directly in front of the main switch (-Q1).



- Remove the red protective cover of the main switch (-Q1) and connect the individual wires (L1, L2, L3, N) of the stripped supply cable to the terminals without tensile load and screw tight with 2.5 Nm.  
Strip the 18 mm PE single wire and connect it to the green-yellow PE push-in terminal next to the main switch. Make sure that the spring-loaded clamp does not crush on the insulation of the single wire. The maximum possible wire cross-section of the terminal is 25 mm<sup>2</sup> with solid or flexible wire (without ferrule).  
If the option "control cabinet heating" is available, the supply line is connected to the supply line terminals -X1L instead of the main switch.



- L1 – Phase 1
- L2 – Phase 2
- L3 – Phase 3
- N – Neutral conductor
- PE – Protective conductor

### NOTICE

Make sure that the yellow or red warning covers are put back on the terminals afterwards. The supply line L1 – L2 – L3 must have an electrical clockwise rotating field.

## 5.4 Mounting the Roller Set

### 5.4.1 Mechanical Installation

#### Installation accessories

- 4 pcs. bolt anchors B, M10x90 galvanised, MAHA # 23 5090. These bolt anchors are suitable for non-cracked concrete.

#### Anchor dimensions

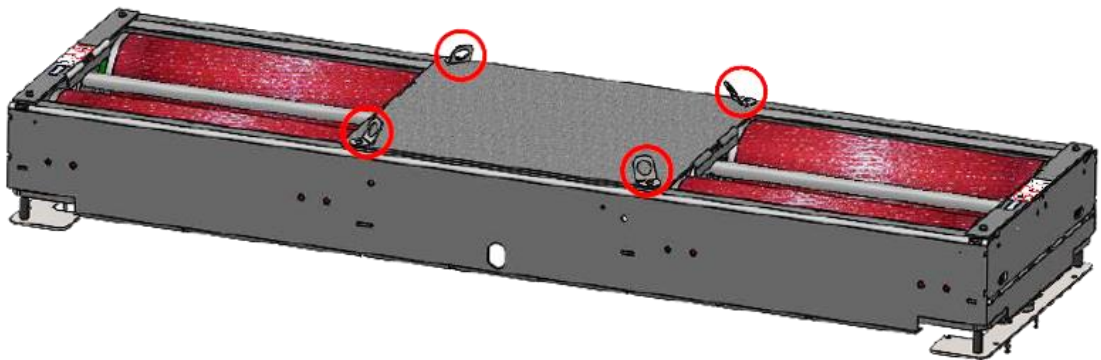
Hole diameter	d0	[mm]	10
Anchoring depth	hef	[mm]	90
Tightening torque	Tinst	[Nm]	35
Width across flats	WAF	[mm]	17

#### Assembly process

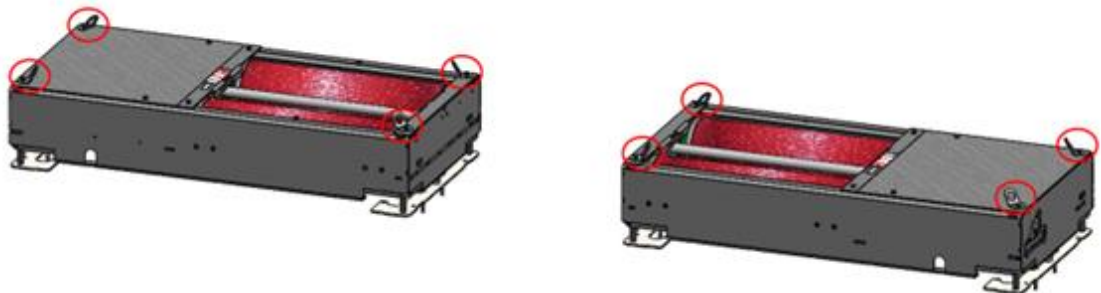
- 1 Lift the roller set into the prefabricated foundation using a suitable four-part chain hanger on the 4 lugs on the middle cover. If the wiring harness is pre-installed, it must be inserted into the empty conduit provided at the same time.

#### NOTICE

Make sure that the cables are not pinched or kinked.

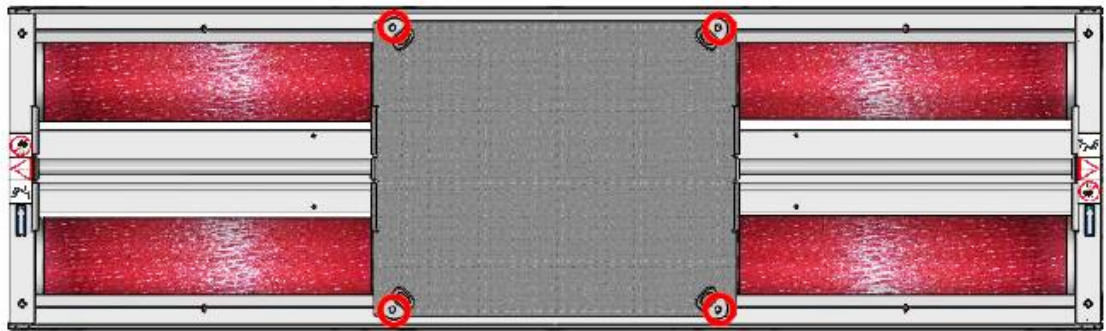


Compact roller set



Split roller set

- 2 After lowering into the foundation, the suspension lugs can be removed as shown below. To do this, remove the 4 M8 screws (marked red) with WAF 13.

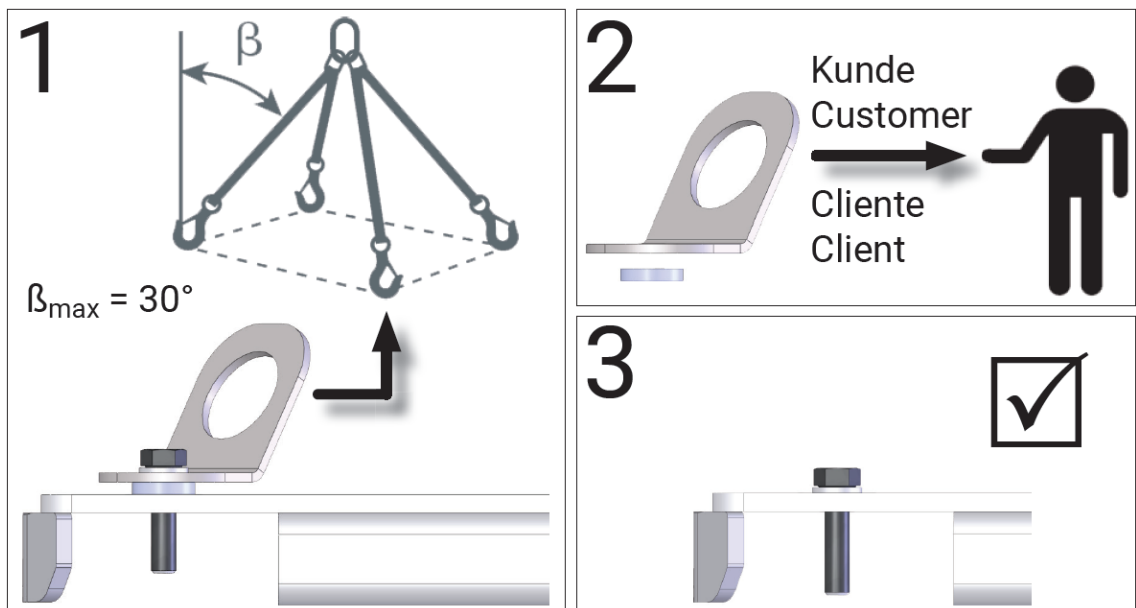


Compact roller set

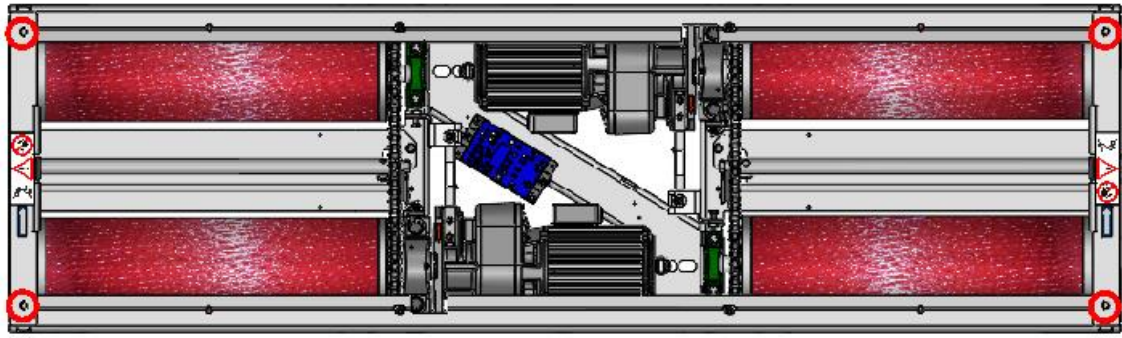


Split roller set

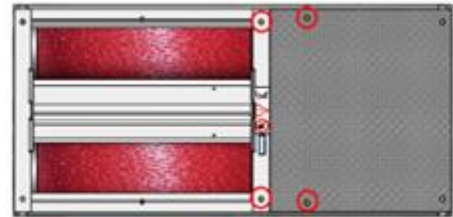
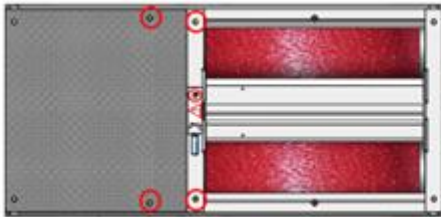
- 3 Remove the middle cover and set aside. Hand over the mounting material to the operator for reuse (disassembly, repair).



- 4 Remove the bearing covers on the left and right so that the test bench can be fixed in the foundation. To do this, remove the 4 M8 screws (marked red) with WAF 13 and remove the bearing covers.

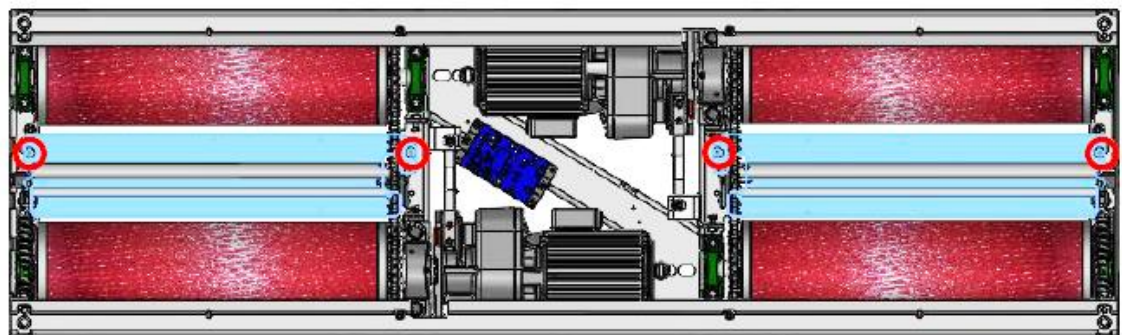


*Compact roller set*

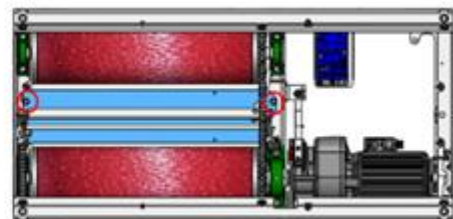
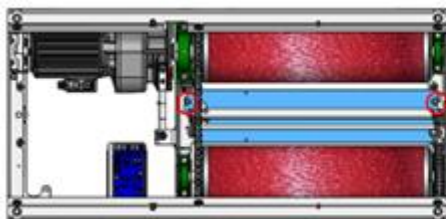


*Split roller set*

- 5 Dismantle the kick plates. To do this, remove the 4 M10 screws (marked red) with WAF 17.

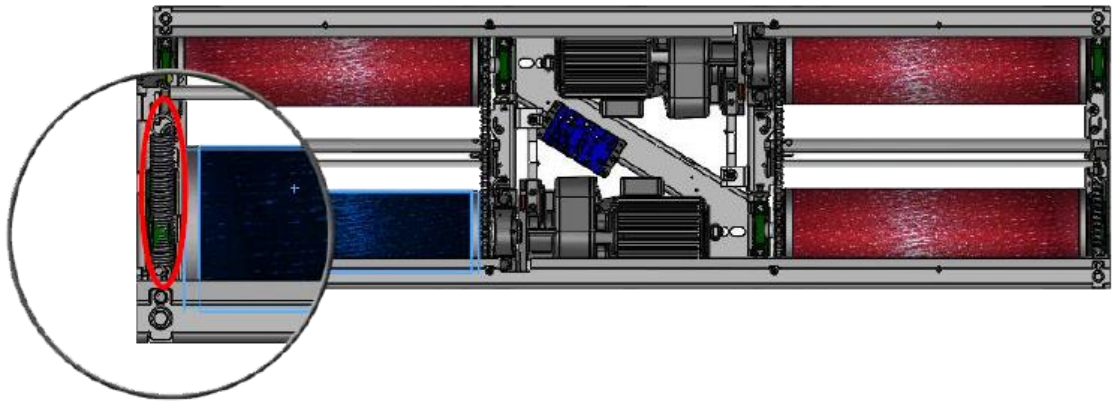


*Compact roller set*



*Split roller set*

- 6 If a drill with sufficient length is not available, remove the sensing roller spiral spring (marked red) if necessary. Dismantling of the spiral spring must be carried out identically on the left and right.

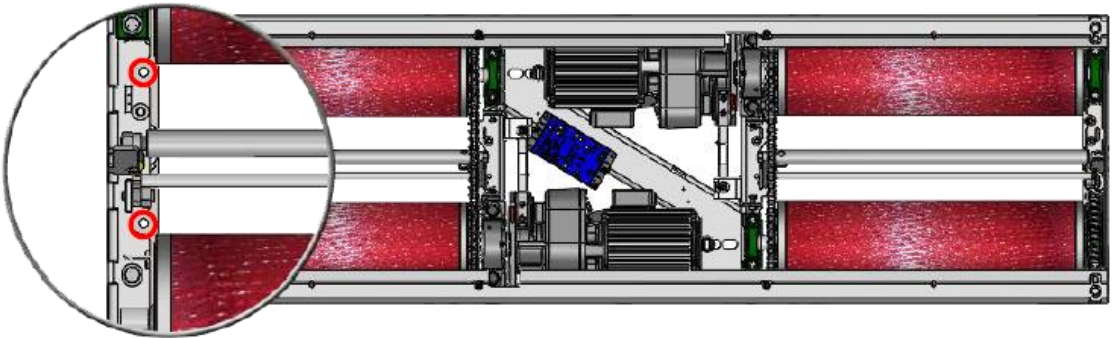


*Compact roller set*



*Split roller set*

- 7 Center the test bench all around in the foundation, then drill a minimum depth of 90 mm at the fixing points (marked red) using a suitable 10 mm masonry drill bit. The fixing holes must be made identically on the left and right.
- 8 Drive in the bolt anchor, check the test bench centering in the foundation again. Tighten bolt anchor with ratchet and extension WAF 17.

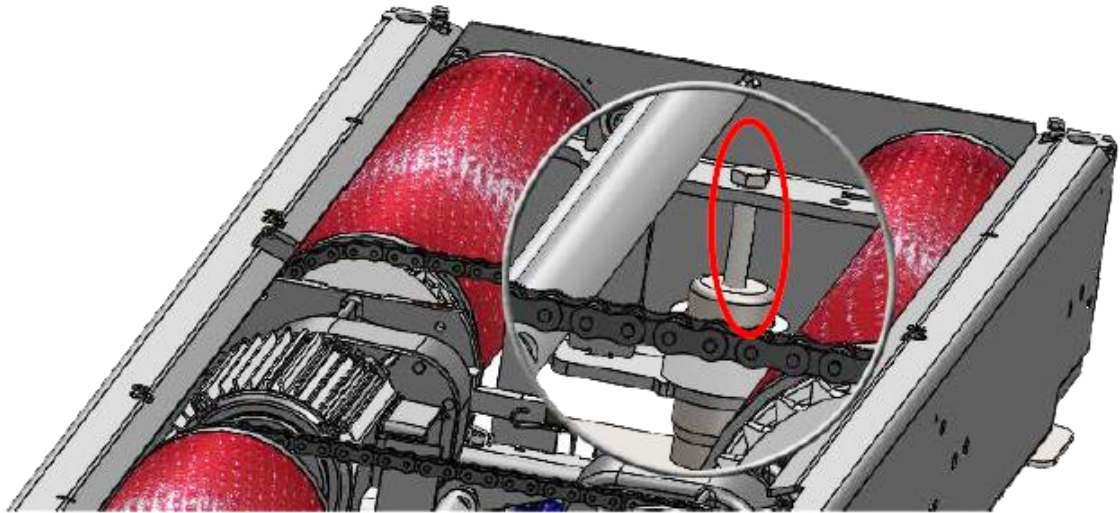


*Compact roller set*



*Split roller set*

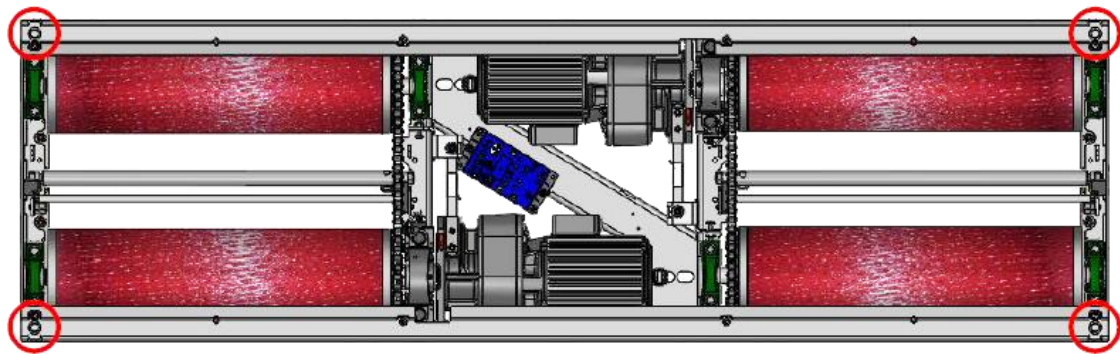
- 9 Remove the transport lock (marked red) with ratchet and extension WAF 17 and dispose of it. The transport lock must be removed on the left and right.



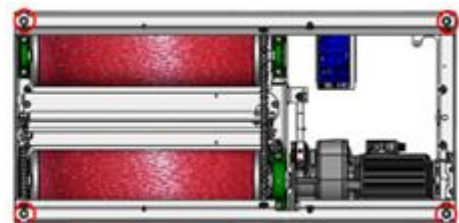
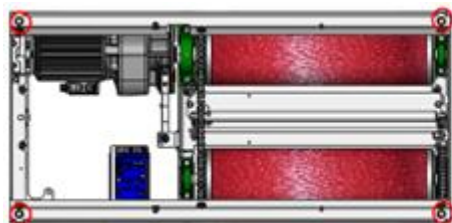
- 10 Adjust the test bench to the desired level (e.g. level with the floor) using the 4 levelling screws (marked red) with ratchet and extension WAF 17. Make sure that the test bench does not jam. It is advisable to gradually adjust the level in a clockwise direction. The level of the upper edge of the frame can be variably adjusted from 245...300 mm.

**NOTICE**

If the test bench is lowered further than 280 mm, make sure that the cables are not pinched or kinked.



*Compact roller set*



*Split roller set*

- 11 Then refit the sensing roller spiral spring, the kick plate, the bearing cover and the middle cover in reverse order.

**Info:**

The split version is mounted per roller set half identically to the unsplit roller set.



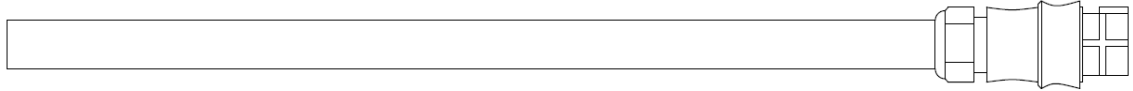
## 5.4.2 Electrical Installation

### Installation accessories Car

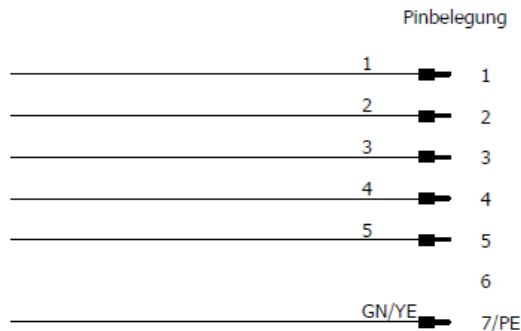
Required cables between roller set and control box (basic variant):

a Motor cable left track +A and right track +B (MAHA # 1404769)

Cable 7G 1.5 mm<sup>2</sup> YSLY-JZ; 15 meters

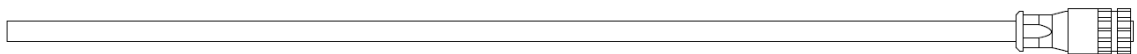


Round plug 7-pin



b CAN data line IFM (MAHA # 1402469)

Cable 2x2x0.5 mm<sup>2</sup> PVC data cable; 15 meters



Connector M12, 4-pin

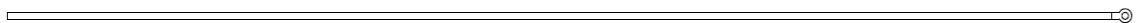
Pinout:

- Pin 1 – YE
- Pin 2 – GN
- Pin 3 – WH
- Pin 4 – BN

c Protective earth conductor (MAHA # 1402470)

Single core GN/YE 4.0 mm<sup>2</sup> PVC-flexible; 15 meters

Cable lug Ø 6.5 mm



### Installation accessories Truck

Required cables between roller set and control box (basic variant):

- a. 1st speed (default): 2 pieces motor cable without plug  
2nd speed: 2 pieces motor cable without plug with shield  
Cable 4G4.0 mm<sup>2</sup> YSLY-JZ
- b. CAN data cable IFM pre-assembled
- c. Protective earth conductor pre-assembled

## Installation accessories Truck (split roller set)

Required cables between roller set and control box (basic version):

- 2 pieces motor cable pre-assembled left roller set half +A and right roller set half +B (MAHA # 1408450)

Cable 7G4.0 mm<sup>2</sup> YSLY-JZ; 24 metres

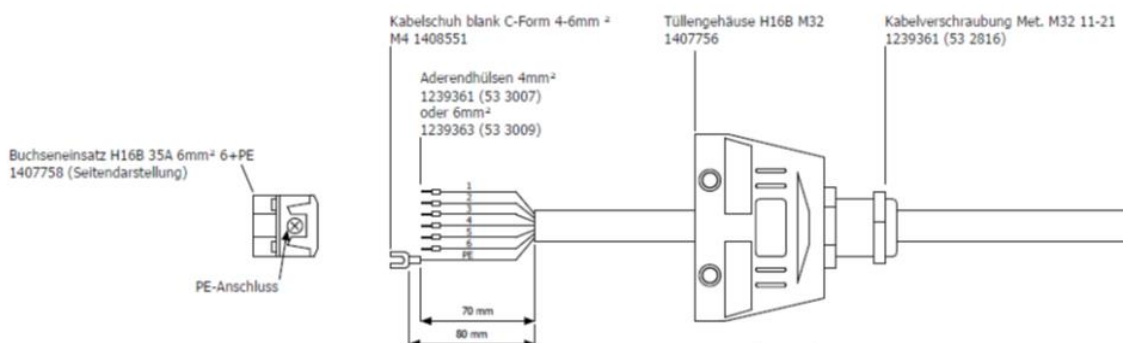


Pin assignment Motor connector

Buchsenanschluss	Adernummer / -farbe
1	1
2	2
3	3
4	4
5	5
6	6
PE	PE

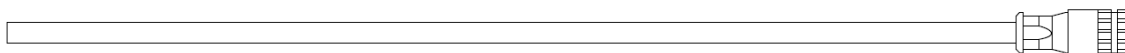
## Mounting the motor connector on the motor cable (if the motor cable is not pre-assembled)

- Push the cable gland and housing onto the cable.
- Strip 80 mm of cable on one side.
- Cut the wires to length and crimp them with wire end ferrules and PE wire with cable lug.
- Connect the wires to the socket insert according to the pin assignment.
- When screwing the socket insert onto the grommet housing, make sure that no wires are crushed.
- Tighten the cable gland.
- Test/measure the protective conductor connection and insulation as part of the overall commissioning.



- b. 2 pieces CAN data cable IFM pre-assembled left roller set half +A and right roller set half +B (MAHA # 1403840)

Cable 2x2x0.5 mm<sup>2</sup> PVC data cable; 25 metres



MAHA material # 1401834

Data line: 2x2x0.5 mm<sup>2</sup>  
unshielded GN, YE, BN, WH

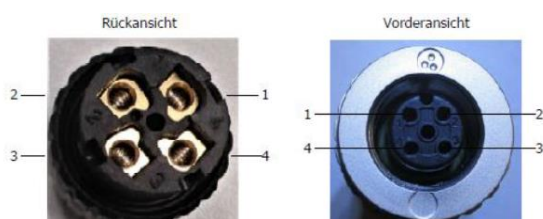
Connector M12, 4-pin

MAHA material # 1401789

M12 coupling 4-pin screwable A-coded

Pinout:

- Pin 1 – YE (yellow)
- Pin 2 – GN (green)
- Pin 3 – WH (white)
- Pin 4 – BN (brown)



- c. 2 pieces of protective earth pre-assembled (MAHA # 1403841)

Single core GN/YE 4.0 mm<sup>2</sup> PVC-flexible; 25 metres with cable lug Ø 6.5 mm



## Installation process

### NOTICE

First, carefully place the connectors on the IFM sockets and turn them until the holes snap onto the pins. Only then push the connector on completely.

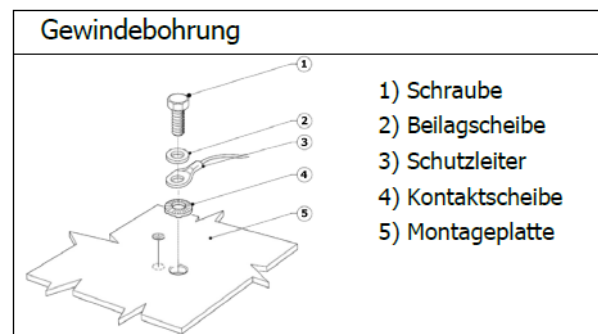
- 1 Pull the required cables from the roller set through the empty conduit provided by the customer with the cable ends cut off in the direction of the control box.
- 2 Connect the two motor cables directly to the couplings provided on the motor until the plug connection engages.



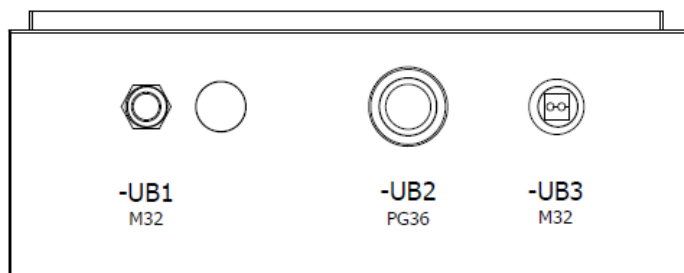
- Pull off the protective cap from X1 on the IFM. Carefully plug the CAN data cable with the M12 connector onto the and tighten the locking ring on the connector by turning it clockwise.



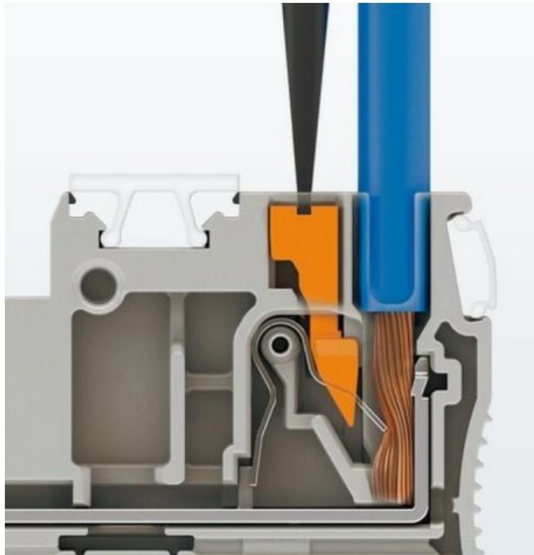
- Attach the cable lug of the protective conductor single wire by means of M6 screw, washer and contact/toothed lock washer to the threaded hole with attached protective conductor marking in the roller set.



- Secure the cable in the reel set using cable ties. Make sure that no cables are under tensile stress.
- On the control cabinet side, shorten the supplied flexible plastic protective conduit with an inner diameter of 36 mm to the required length, push it over the cables protruding from the empty conduit and allow it to protrude several centimetres into the empty conduit in the floor. Insert the cables on the underside of the control cabinet at -UB2 (PG36) of the cable entry. Push the plastic protective hose into the cable entry until it locks into place.



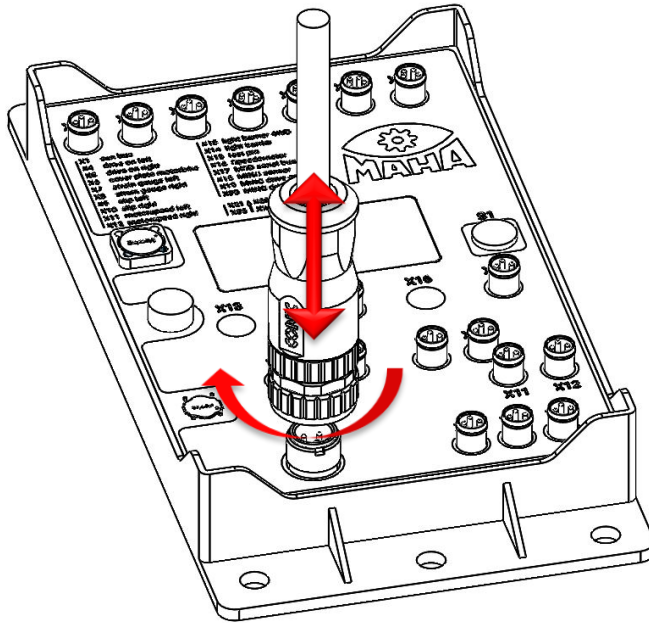
- Inside the control cabinet, relieve the strain on all cables at the existing cable tie (above the cable entry).
- Shorten the two motor cables to the required length, strip them and connect the individual wires to the push-in spring-loaded terminals (motor terminals) -X1L without tensile load. To do this, strip and twist the individual wires 10...12 mm. Make sure that the spring-loaded terminal does not squeeze on the insulation of the single wire.



Der Anschluss flexibler Leiter ohne Aderendhülse erfolgt mit dem Betätigungsdrücker.

- 10 Feed the CAN data line through the cable duct to the ZM connector X1, untwist, strip and connect to the green 4-pin connector X1 without tensile load. To do this, strip 10 mm of insulation from the individual wires and twist them together. While actuating the push-in spring-cage terminal, use a small screwdriver to guide the bare wire into the connector opening. Make sure that the spring-loaded terminal does not squeeze on the insulation of the single wire.
- 11 Shorten the green/yellow protective conductor wire to the required length and clamp it onto the push-in spring-cage terminal (green/yellow) -X1L without tensile load.  
To do this, strip the insulation from the single wire 10...12 mm and twist it. Make sure that the spring-loaded terminal does not squeeze on the insulation of the single wire.

### **Connector mounting/dismounting: detailed views**

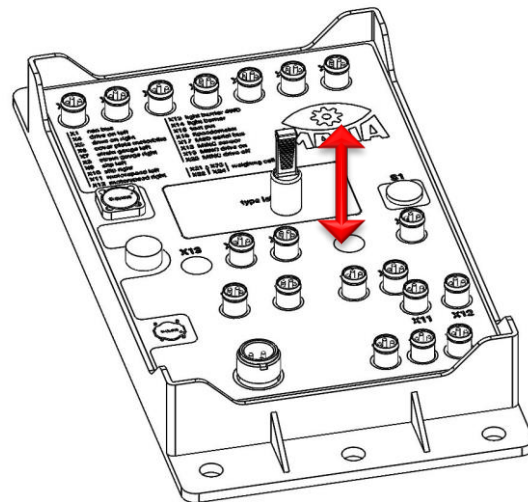
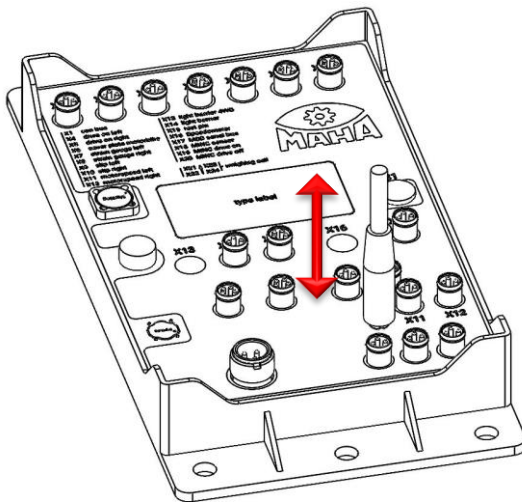


- M12 CAN connector mounting/dismounting on IFM

Mount by carefully inserting the 4-pin plug and slightly turning the locking nut to the right to fix the plug.

- M8 sensor connector mounting/dismounting on IFM

Mount by carefully inserting the 3/4-pin connector. It is locked by lightly snapping into place when plugged in. The connector must not be turned under pressure!



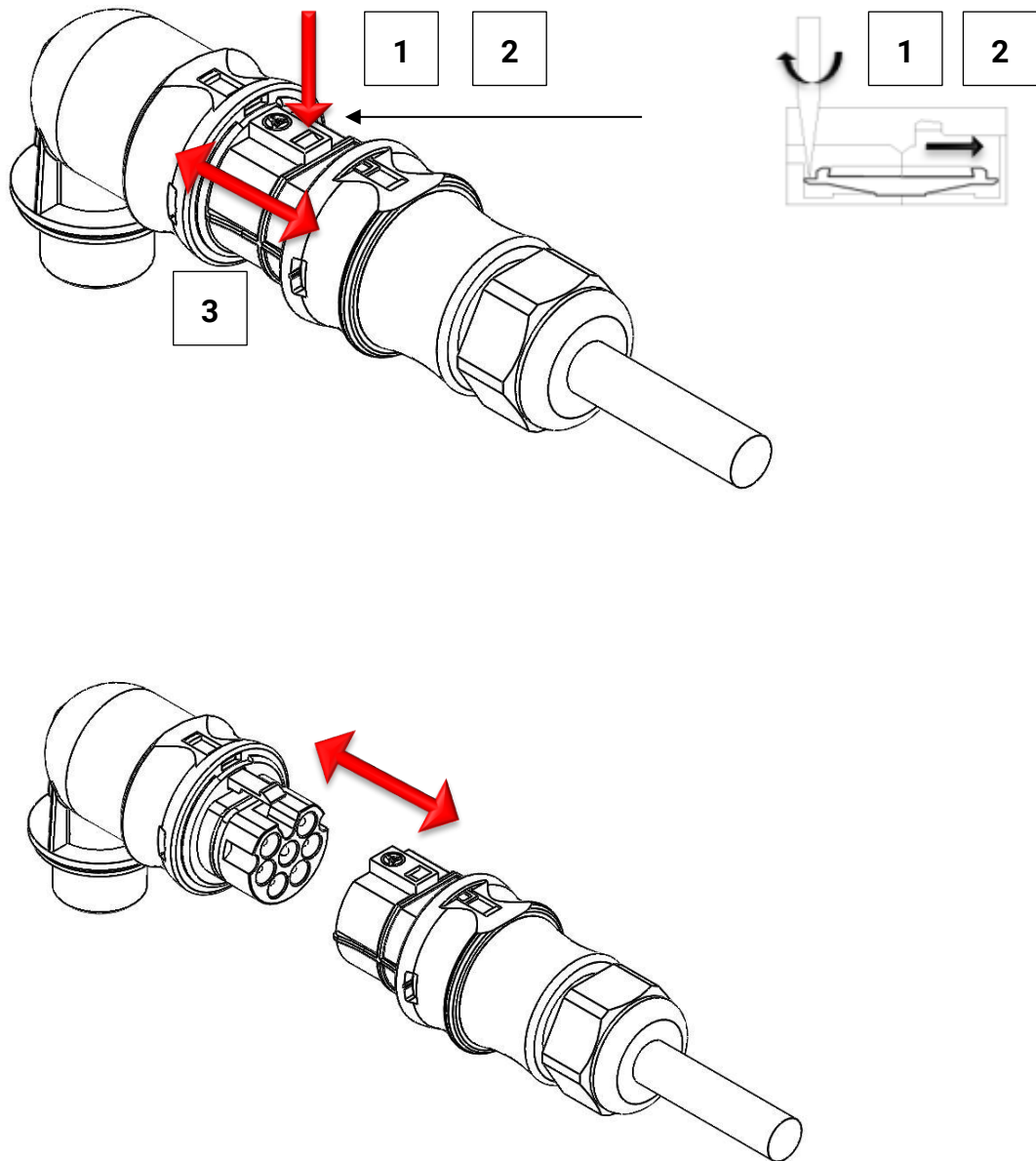
- M8 protective cap mounting/dismounting on IFM

Unused plug-in connections must be fitted with a black rubber protective cap. If necessary, remove these by pulling gently.

- Motor connector mounting/dismounting Car

Mount by carefully plugging in the 7-pin connector. It is locked by lightly snapping into place when plugged in. The connector must not be turned!

For dismounting, use a screwdriver to lightly press the locking lug and pull off the connector while doing so.

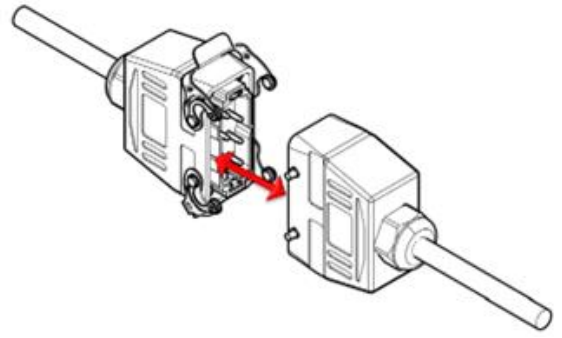
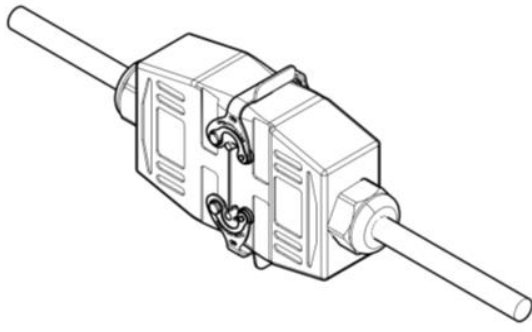


- Motor connector Truck assembly/disassembly

Assembly by carefully plugging in the 7-pin connector. Locking is done by manually closing the side brackets, these must snap over the bolts on the other casing part.

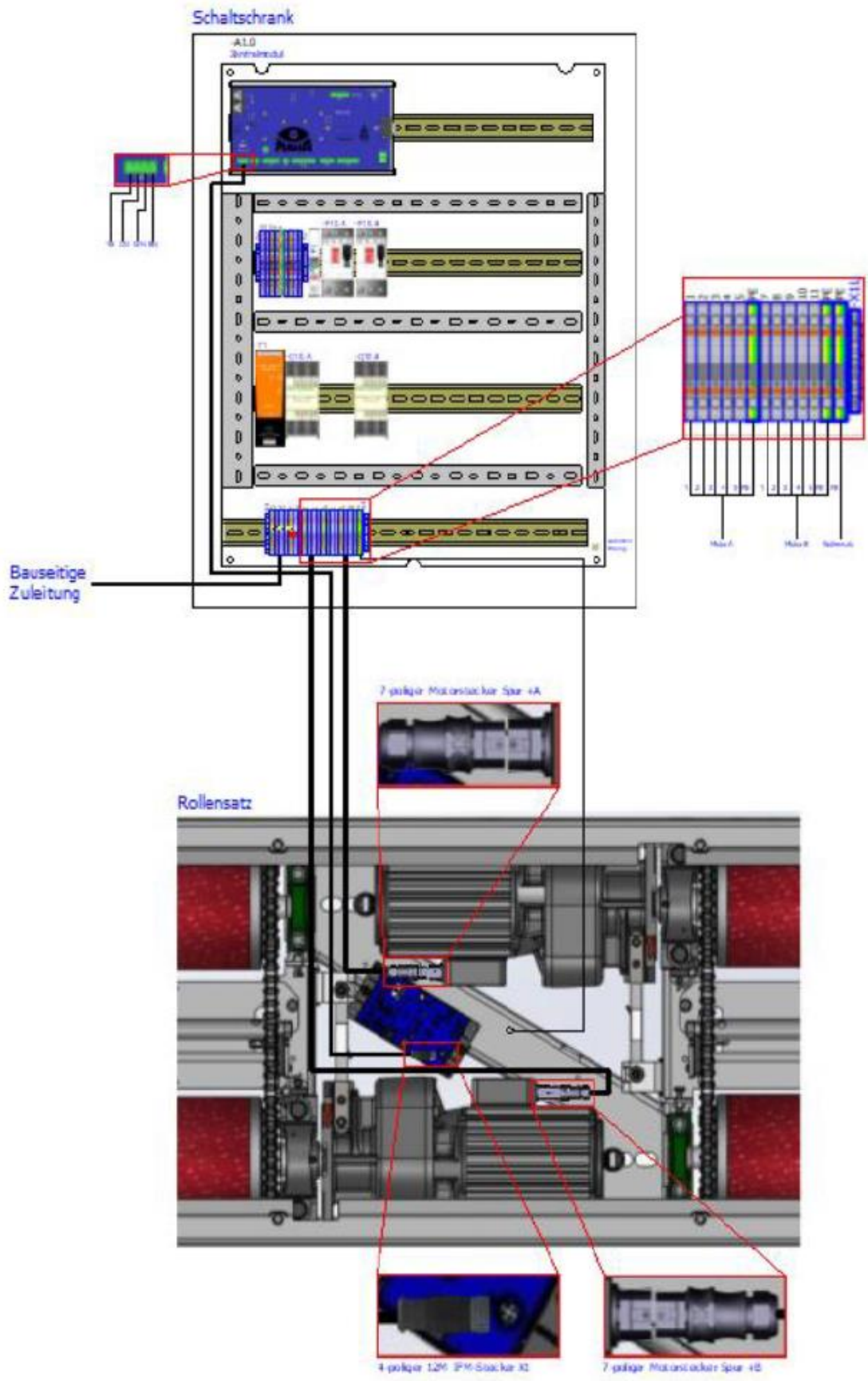
For disassembly, first open the side brackets and then pull the connector apart.

Assemble or disassemble the connector only when disconnected from the power supply!

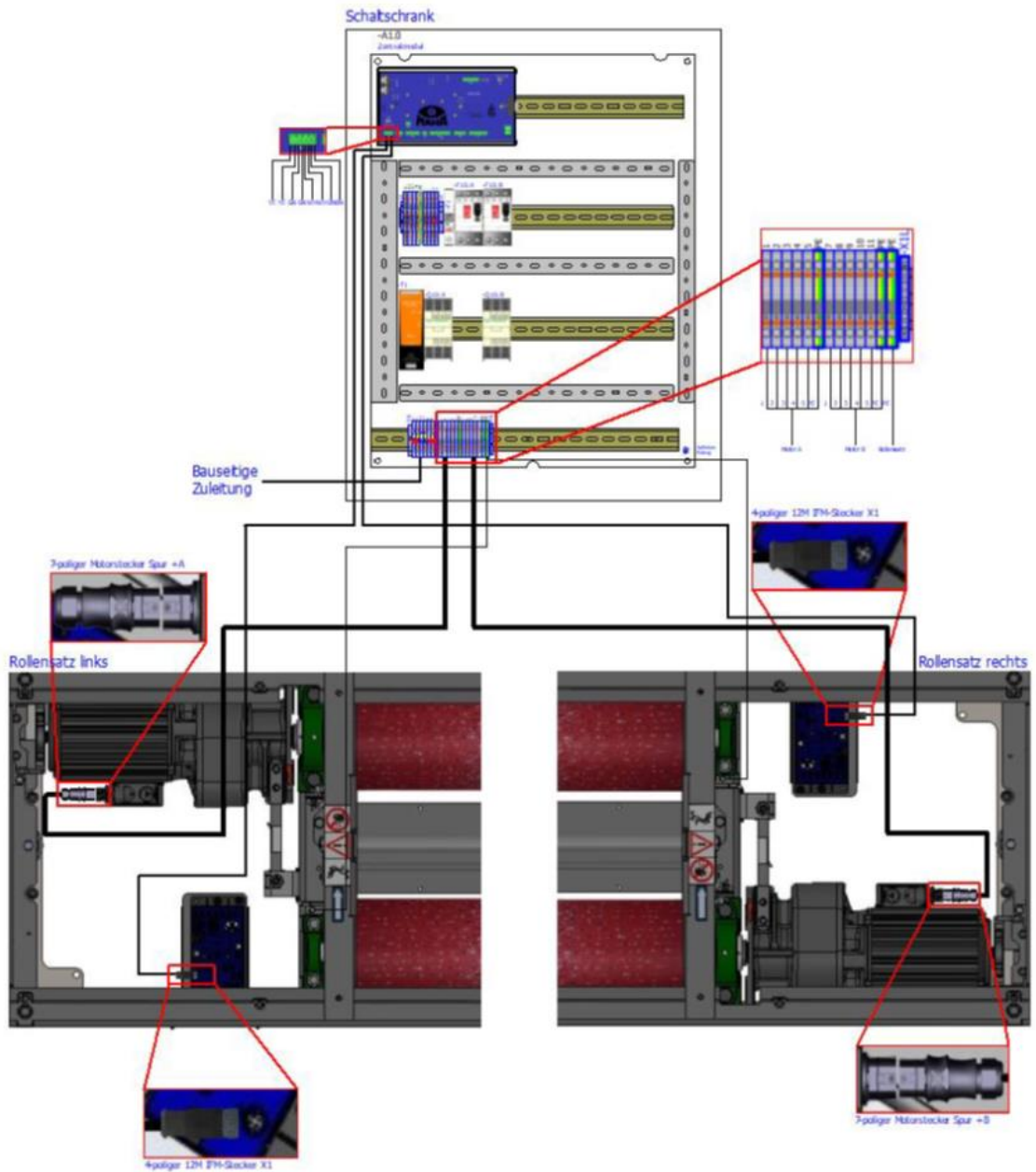




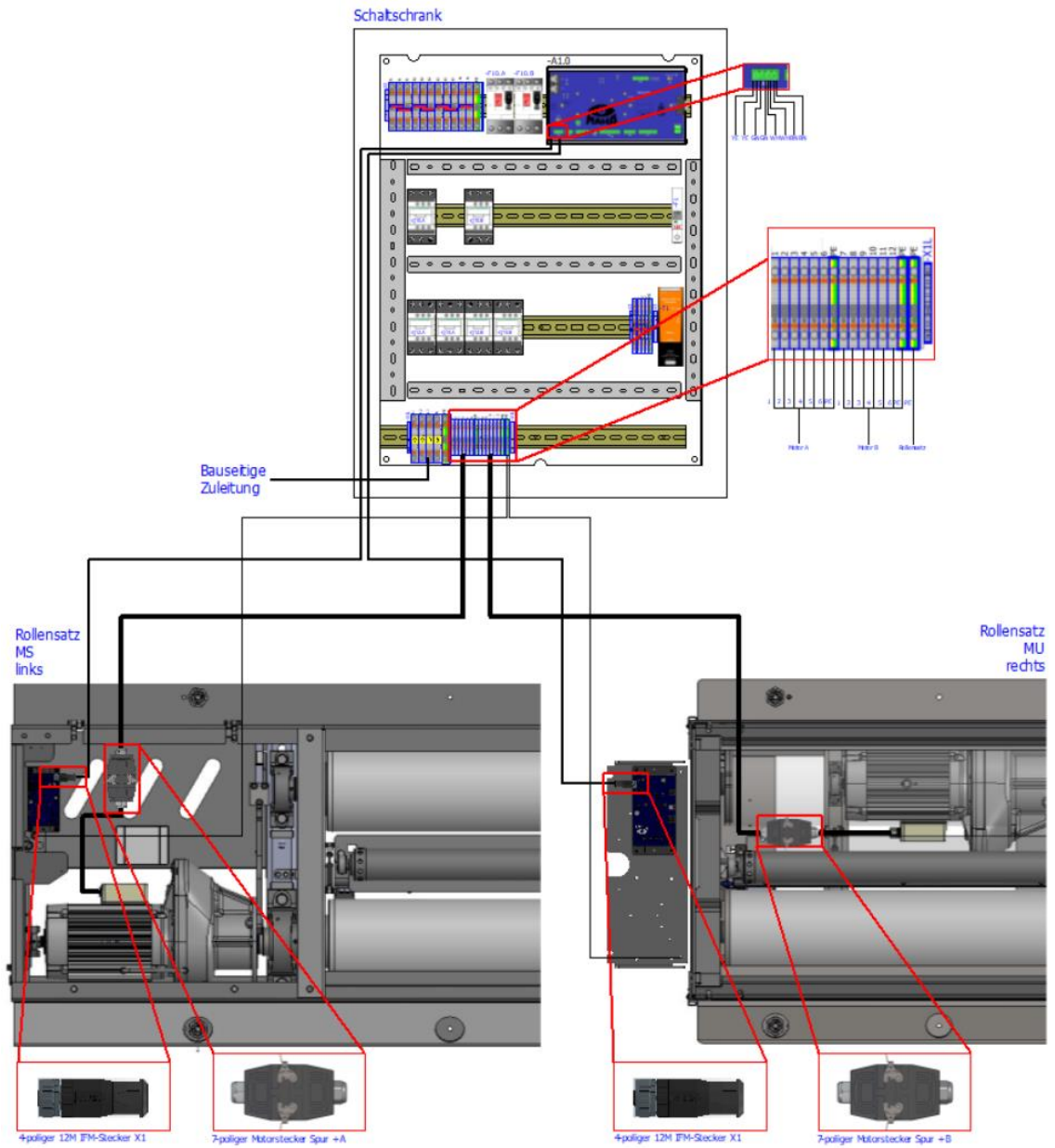
## Connection Roller set Car C\_MBT "C"



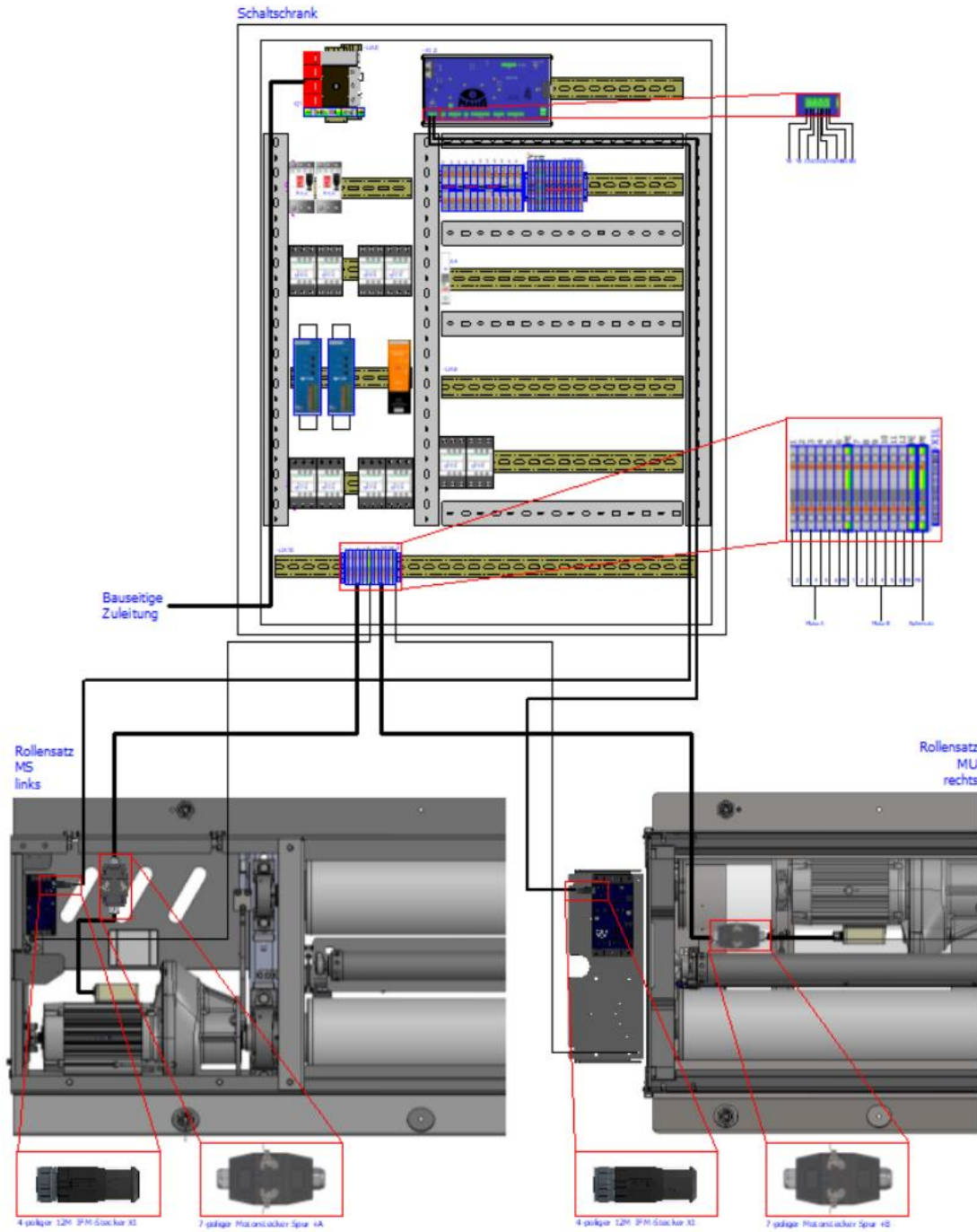
## Connection Roller set Car C\_MBT "S"



# Connection Roller set Truck C\_MBT "S" (control cabinet 700x500x220 mm)



# Connection Roller set Truck C\_MBT "S" (control cabinet 1200x800x300 mm)



## 5.5 Function Test

### Info:

The acceptance of the brake tester is carried out by an expert. He checks all functions and safety devices and confirms the result. In addition, a second sheet enclosed with the operating instructions ("Quality Certificate for Installation and Commissioning") must be completed in full and returned to the manufacturer.

During the acceptance process, the following points must be checked again in particular:

- Free movement of sensing roller holder and sensing roller.
- Electrical connection of the brake tester; acceptance according to country-specific regulations.
- Potential equalisation.
- Correct setting of all Namur sensors (check via Service technician menu).
- Firm fit of control cabinet and brake tester.
- Smooth running of the motors.



### WARNING

Only carry out the function test on the floor assembly with the motor's protective circuit-breakers switched off!

---

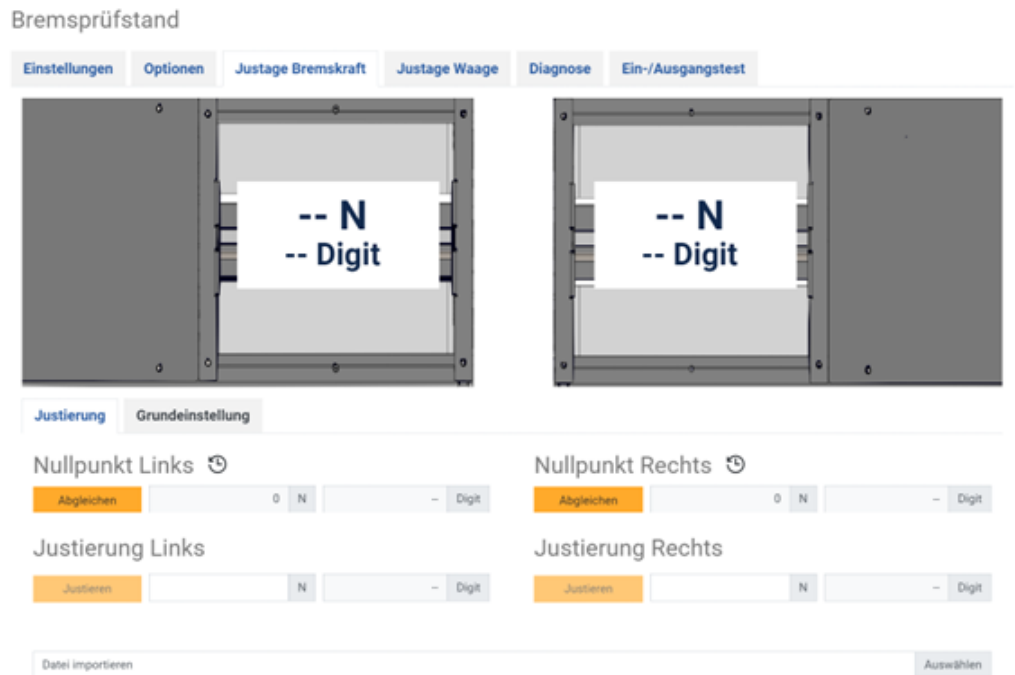
## 6 Calibration/Adjustment

### Info:

Calibration interval: at least every 2 years

### 6.1 Adjusting the Brake Force

- 1 Open "System settings" and select "Brake tester/calibrate brake force".
- 2 Complete the registration via the link. The following screen opens:



- 3 In the control cabinet, set both motor circuit breakers to the "OFF" position.

#### 6.1.1 Basic Settings

Here the specific electrical values of a range spring can be entered, which were determined during production and are engraved on the range spring.

### Info:

These values may only be changed after replacing a range spring.

#### 6.1.2 Adjusting the Zero Point

Perform zero-balance adjustment for the brake force while no vehicle is located on the test bench: press "Adjust" button.

#### 6.1.3 Adjusting Brake Forces with Adjusting Device

- 1 Unscrew the middle cover and mount the adjustment device.
- 2 Measure the roller diameter.
- 3 Fit the adjustment device to the left-hand motor of the roller set (in the direction of travel).

- 4 Attach the counterweight and level the adjustment device. Use the counterweight to bring about balance. Only when the adjustment device is in equilibrium does no force act on the range spring. The counterweight on the left side balances out the additional weight of the calibration bar on the right side. The brake force display shows  $0.00 \text{ kN} \pm 0.01$ .
- 5 Secure the counterweight with the screw. The notches on the adjustment arm are necessary for positioning the weight. The adjustment device can have two notches each for a traction force. The notches for the MBT 2000 are used for the adjustment of all roller sets with  $\varnothing 200$ .
- 6 Place the 30 kg adjustment weight on the 3 kN mark. The adjustment arm must be in balance with the applied weights. The spirit level is used for verification. Depending on the adjustment method, errors are taken into account for inexact alignment.
- 7 Preload the adjustment device 3x with maximum value.
- 8 Perform adjustment: press "Adjust" button.
- 9 Remove the weight and check the zero point. The zero point must not be re-adjusted again. It must therefore be ensured that no force acts on the brake tester's range spring when no weight is applied. If there are excessive deviations, the adjustment must be performed again.
- 10 Repeat the process for the right-hand side.

#### 6.1.4 Importing a File

Application case: Defective IFM must be replaced.

Prerequisite: all settings and parameters of the test bench have been saved beforehand:

- Settings/General: "Backup settings" => file is saved under local downloads. This file also contains the adjustment values.  
Filename: MAHA\_C\_MBT\_Configuration\_S/N\_yyy-mm-dd-hhmm
- After installation of the new IFM, the previously saved file can be selected as an alternative to the adjustment. The adjustment values are read from the file and accepted (stored in the IFM)

#### Info:

A complete adjustment is preferable (component tolerances etc. on PCB).

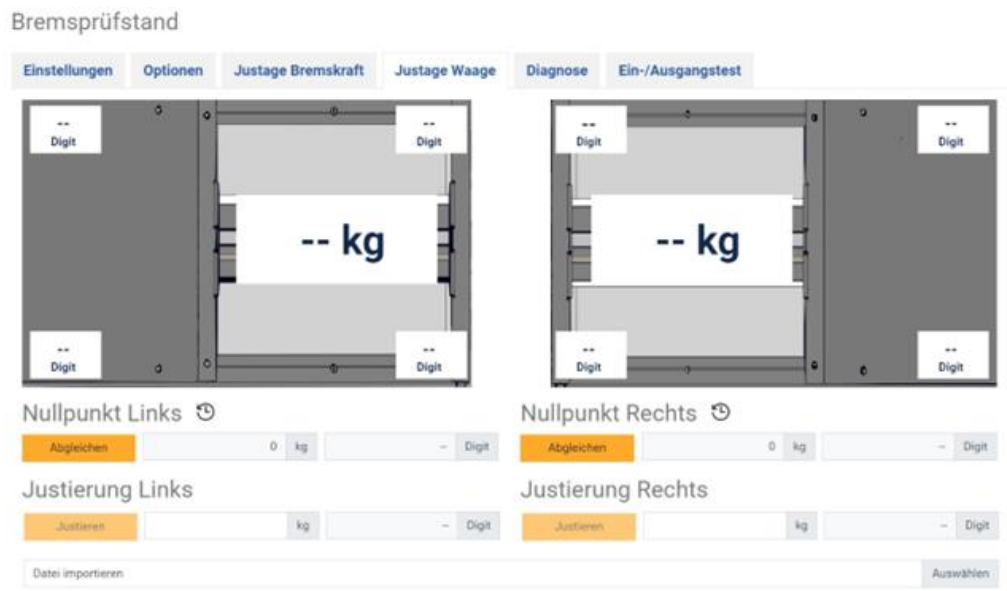
#### 6.1.5 Adjusting Brake Forces with MJV II

See quick reference guide BA020001\_003, available for download on the MAHA homepage [www.maha.de](http://www.maha.de).

## 6.2 Adjusting the Weighing Device

Open "System settings" and select "Brake tester/calibrate scale".

Complete the registration via the link. The following screen opens:



### 6.2.1 Adjusting the Zero Point

Perform a zero adjustment of the weighing device when the test bench is not in motion: press the "Match" button on the respective page.

### 6.2.2 Adjusting the Weighing Device

- 1 Determine the axle weight/wheel weight of a vehicle by means of a calibrated wheel load scale.
- 2 Driving the test bench with the vehicle.
- 3 Enter values left and right according to the wheel load scale (= comparison procedure).
- 4 Save with "Adjust."

### 6.2.3 Importing a File

Application case: Defective IFM must be replaced.

Prerequisite: all settings and parameters of the test bench have been saved beforehand.

- System Settings/General: "Backup settings"  
The file is saved under local downloads. This file also contains the adjustment values.  
Filename: *MAHA\_C\_MBT\_Configuration\_S/N\_yyy-mm-dd-hhmm*
- After installation of the new IFM, the previously saved file can be selected as an alternative to the adjustment. The adjustment values are read from the file and accepted (stored in the IFM)

#### Info:

A complete adjustment is preferable (component tolerances etc. on PCB).



## 7 Operation

### 7.1 Safety Instructions



#### WARNING

- Observe the statutory accident prevention regulations.
- Before the vehicle inspection, remove any foreign particles stuck in the tyre tread.
- Drive the vehicle on/off/over the test bench with the vehicle slowly (walking speed) and centrally.
- The driver must hold an appropriate driving licence for the vehicle to be tested and must not be under the influence of alcohol, drugs or medication that impairs driving ability.
- Perform regular visual inspections for damage in lines, hoses, actuators and sensors. If there are any defects or damage, the test bench must not be operated.
- Replace hydraulic hoses which are installed depending on the option (e.g. roller set lift) according to the specifications of DIN 20066 (or according to the locally applicable regulations, directives and standards) and carry out an assessment of the functional capability at regular intervals.
- The system must only be operated within its performance limits.
- The system must only be operated by instructed staff (qualified persons).
- When the system is not being used, it must be switched off and the main switch must be secured with a padlock to prevent it from being switched back on.
- In emergency situations, switch off the system with the emergency stop main switch or emergency stop pushbutton.
- Rotating or moving parts (e.g. test bench rollers) are dangerous.
- When vehicle engines are running in enclosed spaces, there is a risk of poisoning. The operator must ensure that there is sufficient air exchange.
- Unnecessary stress to the vehicle and test bench must be avoided.
- Once the vehicle is positioned in the roller set with the driven axle, the roller set must only be exited with the roller drive running. To protect the drive motors, an automatic test roller engagement takes place in the event of impermissible acceleration of the axle. In conjunction with an exit aid (electromechanical motor brake or DC brake), it is also possible to drive out of the test bench when the test rollers are stationary.
- Never externally start a vehicle with the system or apply regenerative braking. This may cause damage to the test bench.
- Vehicle doors shall be closed during the test.
- The operator must not leave the vehicle during the inspection.
- Vehicles must never be parked in/on the roller set or on the optional ramps.

Parking in the security area is not allowed.

- The accessibility of the emergency stop switch and emergency stop pushbutton must be ensured.
- 

## 7.2 Safety Devices



### WARNING

The safety devices (some of them optional) must be inspected regularly by an authorised service technician. Statutory requirements must be observed. *The test bench must not be operated with defective safety devices!*

---

- **Lockable main switch**

Used for ordinary switching on and off of the system and as emergency stop switch. The switch can be secured with a padlock to prevent unauthorised activation.

- **Emergency stop pushbutton**

Used for rapid switch-off during operation. It interrupts the movement. (Does not apply in the case of MSD axle damping tester!)

- **Indicator light “Control ON”**

The indicator light warns of a test bench that is ready to start. An independent start-up of the test rollers is also possible without an active display (e.g. TV set, monitor, smart device).

- **Start-up monitoring**

The start-up monitoring prevents the rollers from starting up if the wheels are locked up (bearing jammed, brake pads stuck). This device protects the vehicle/the vehicle’s tyres from damage.

- **Sensing rollers**

The magnitude of the slip is determined from the comparison of the drive speed with the sensing roller speed. To start the test bench, both sensing rollers must be pressed within two seconds.

- **Visual and acoustic warning devices**

The visual and acoustic warning devices must be installed in a suitable position and must be clearly perceptible at all times. In the event of warning device failure, the test bench must be taken out of service until the device is fully functional once again.

- **Pit safety system**

The pit safety system serves to protect a person located in the working pit (in the test roller area) from unexpected start-up of the test rollers. National regulations for contactless protective devices must be observed by the operator.

- **Yellow and black marker tape**

The yellow and black marker tape around the roller set and pit serves to cordon off the test bench and must be replaced if defective.

Item no. 19 6014 (38 mm) / 19 6015 (50 mm).

- **Warning and information signs**

Warning and information signs are affixed to the test bench. They must not be changed or removed. Defective warning and information signs must be replaced (for item no., see below).



54 2132



54 2683

## 7.3 Preparations

### 7.3.1 Switching on the Test Bench

Set main switch -Q1 to position "I".

### 7.3.2 Variant 1: Establishing a Network Cable Connection

- Connect a PC or notebook (NB) to the central module (ZM) via network cable (Ethernet port X13 "MAHA").
- Alternatively, a WiFi access point can be connected to this Ethernet port X13, which usually offers four network interfaces. Then a PC/NB is connected to one of these interfaces. Other terminal devices can be connected to the other interfaces (e.g. analogue display or C\_BOX when using a TV monitor as a simultaneous display).
- Switch on PC/NB, log in after booting, open browser.
- Call the start page in the browser via the address: [http://maha-mbt\(.maha\)](http://maha-mbt(.maha)) (or <http://192.168.201.1>).
- Once the connection is established, the measurement screen is displayed (depending on the configuration for cars or trucks, see section "Description of the Software User Interface").

#### Info:

Alternatively, free QR code generators can be found on the Internet, which can be used to generate a personal QR code for the CONNECT brake tester.

If this is photographed (e.g. on iOS devices) or scanned with a QR code scanner app, the standard browser is automatically opened and the Internet address entered.



### 7.3.3 Variant 2: Establishing a WiFi Connection

If the test bench is to be controlled wirelessly, a WiFi router (e.g. TP-Link) can optionally be connected to the ZM (Ethernet X13 MAHA). This creates a separate WiFi for the brake tester and enables networking with corresponding accessories (e.g. analogue display, C\_BOX). This makes it possible to use browser-capable smart devices (SmartPhone, tablet PC) in addition to the PC/NB to operate the brake tester and display the measured values.

#### Windows PC

#### Info:

On the underside of the router, there is a label that indicates the name next to "SSID" and the wireless password next to "PIN". The router must be configured as an access point according to MAHA specifications (see section "Accessories > Configuration of WiFi Router").

- Connect WiFi router “TP-Link” with power supply and switch on.
- In the Network and Sharing Center, select WiFi router SSID “TP\_LINK\_xxxx” and establish a connection.
- Enter the wireless password “PIN”.



### Mobile devices (Android or iOS)

#### Info:

On the bottom of the optionally available WiFi router there is a label on which the name is printed next to "SSID" and the wireless password next to "PIN".

- Connect WiFi router “TP-Link” with power supply and switch on.
- On the mobile device, open the WiFi menu under “Settings”.

The device will now search for available WiFi devices.

- Select TP\_LINK\_xxxx.
- Enter password.

If no WiFi device is found, the connection must be set up manually using the SSID and the PIN.

#### Info:

Alternatively, free QR code generators can be found on the Internet, which can be used to generate a personal QR code for the CONNECT brake tester.

If this is photographed (e.g. on iOS devices) or scanned with a QR code scanner app, the WiFi menu is automatically opened and the SSID entered (barcode shown is an example only).



### 7.3.4 Variant 3: Integration of the Test Bench into Company Network

Alternatively, the ZM of the test bench can also be integrated into a company network. For this purpose, the Ethernet port X12 "EXT" can be configured analogue to a LAN interface of a PC, see section "General/Network":

This means that the brake tester can be reached within the network by connecting a computer via network cable to a usual network socket of this network. If this network also offers WiFi access, it is possible for the test bench to be operated directly via WiFi-capable terminals:

- Turn on computer/mobile device, log in after booting, open browser.
- Establish the browser connection as described above.

#### **ATTENTION:**

As soon as the test bench is available in the company network, it is visible and also accessible for all other network participants!

## 7.4 Test Procedure

### 7.4.1 Drive on Test Bench

#### **NOTICE**

Drive slowly (walking speed), centrally and straight on the test bench. The left and right sensing rollers must be actuated simultaneously.

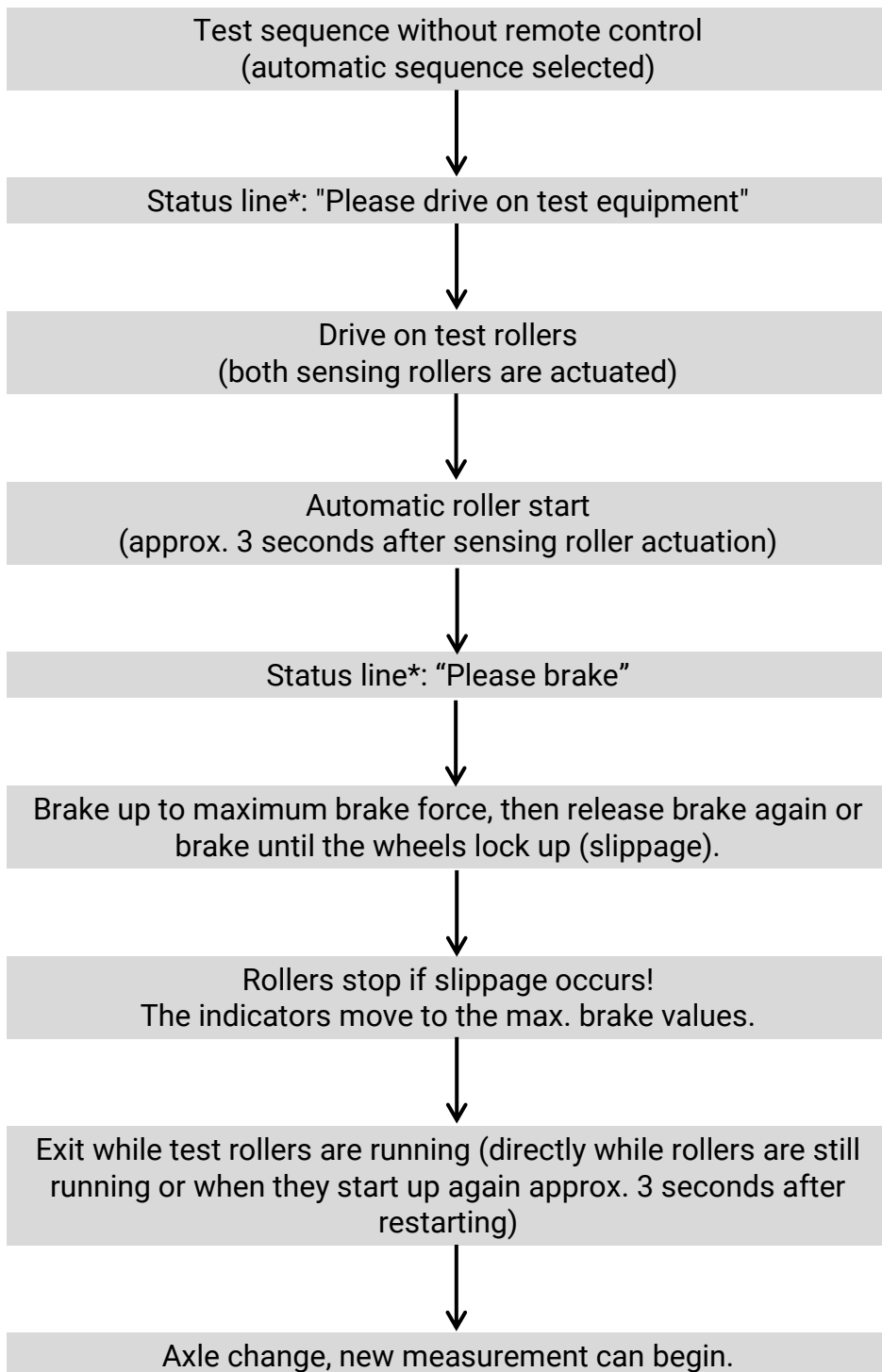
Position vehicles straight on roller set, for front wheel drive vehicles keep steering in straight ahead position during test.

---

## 7.4.2 Carry out Brake Test with Automatic Sequence

### Info:

A computer with monitor, a TV or a SmartDevice is required for operation.

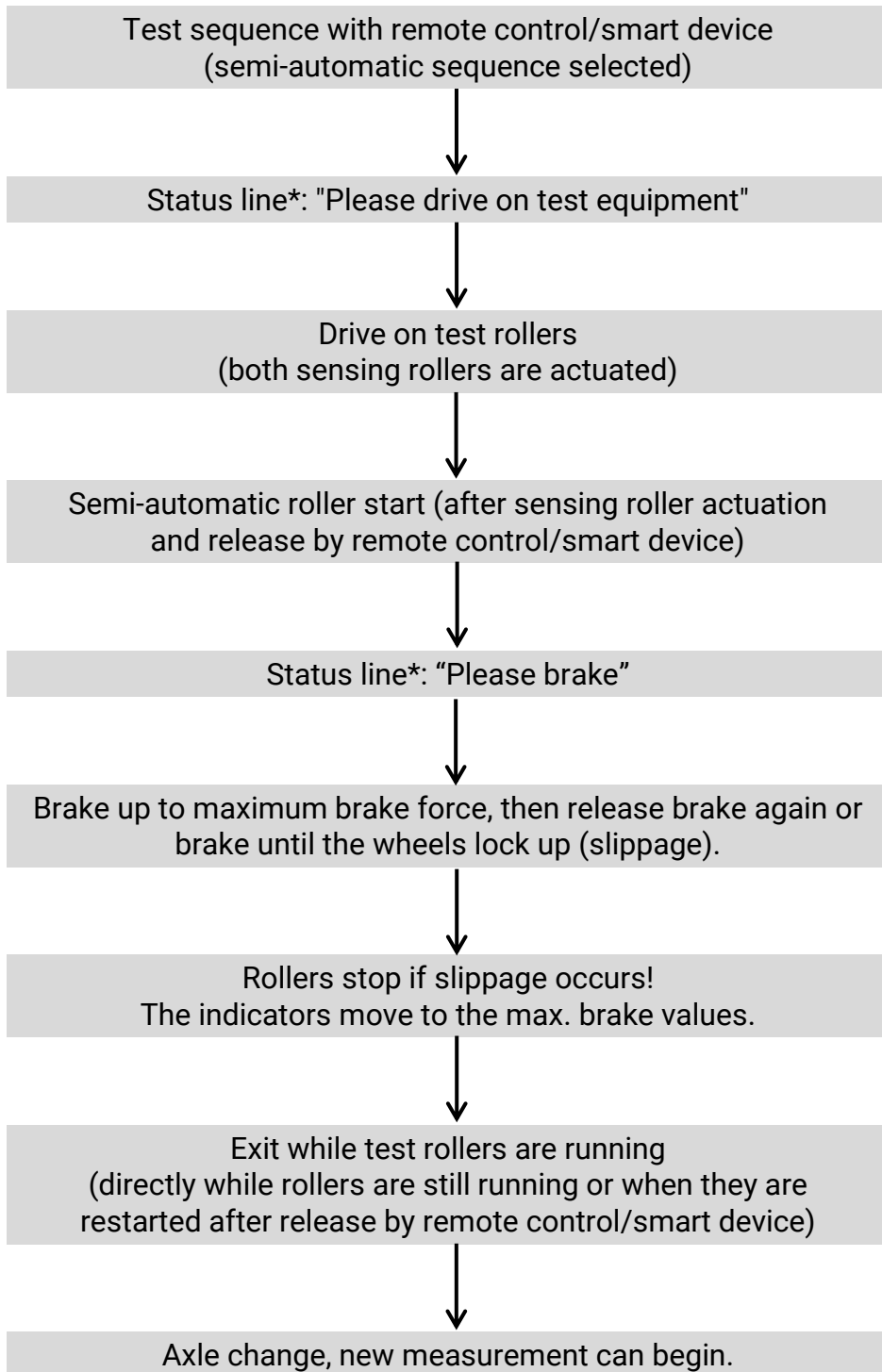


\*In conjunction with monitor display

### 7.4.3 Carry out Brake Test with Semi-Automatic Sequence

**Info:**

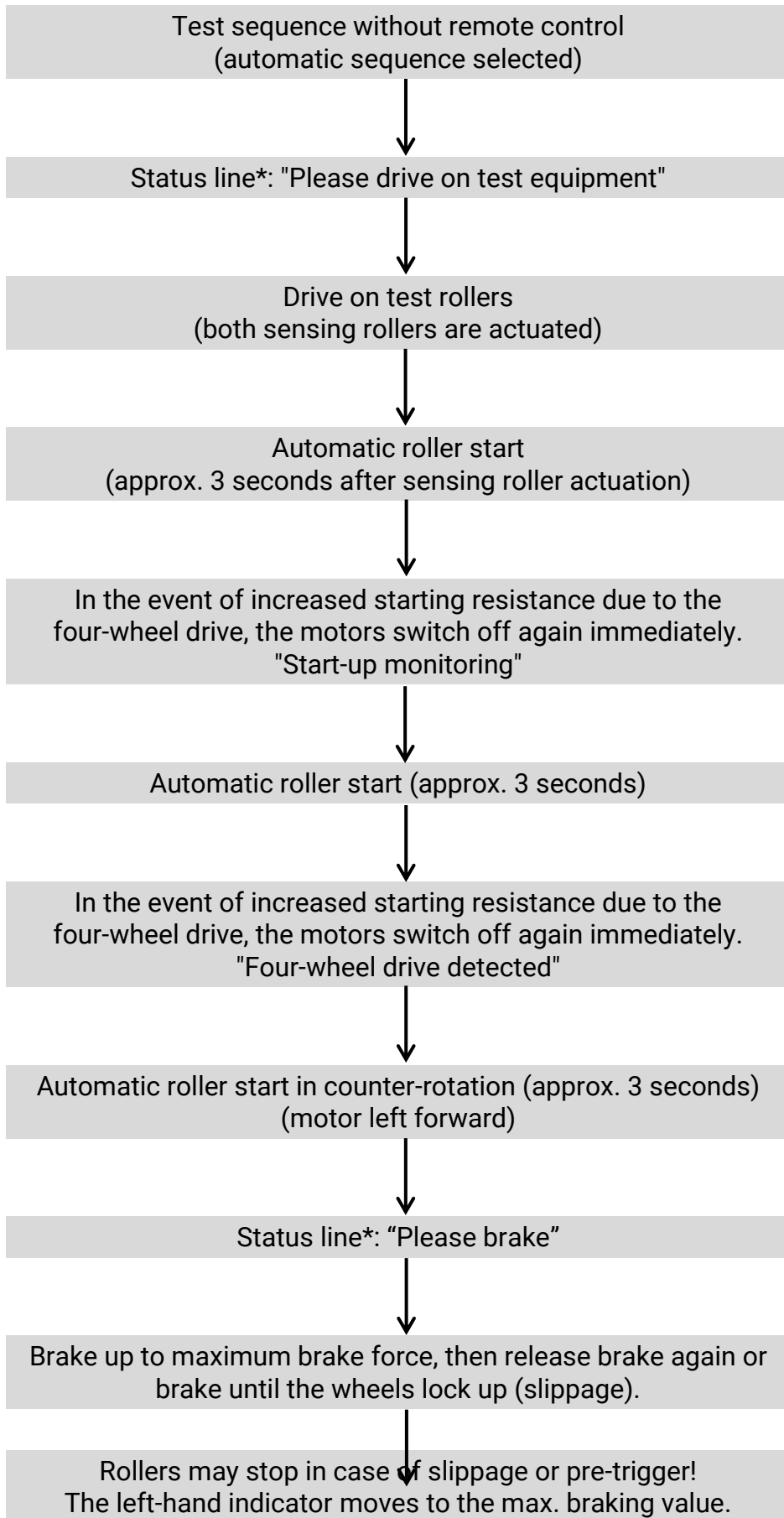
A computer with monitor, a TV or a SmartDevice is required for operation.

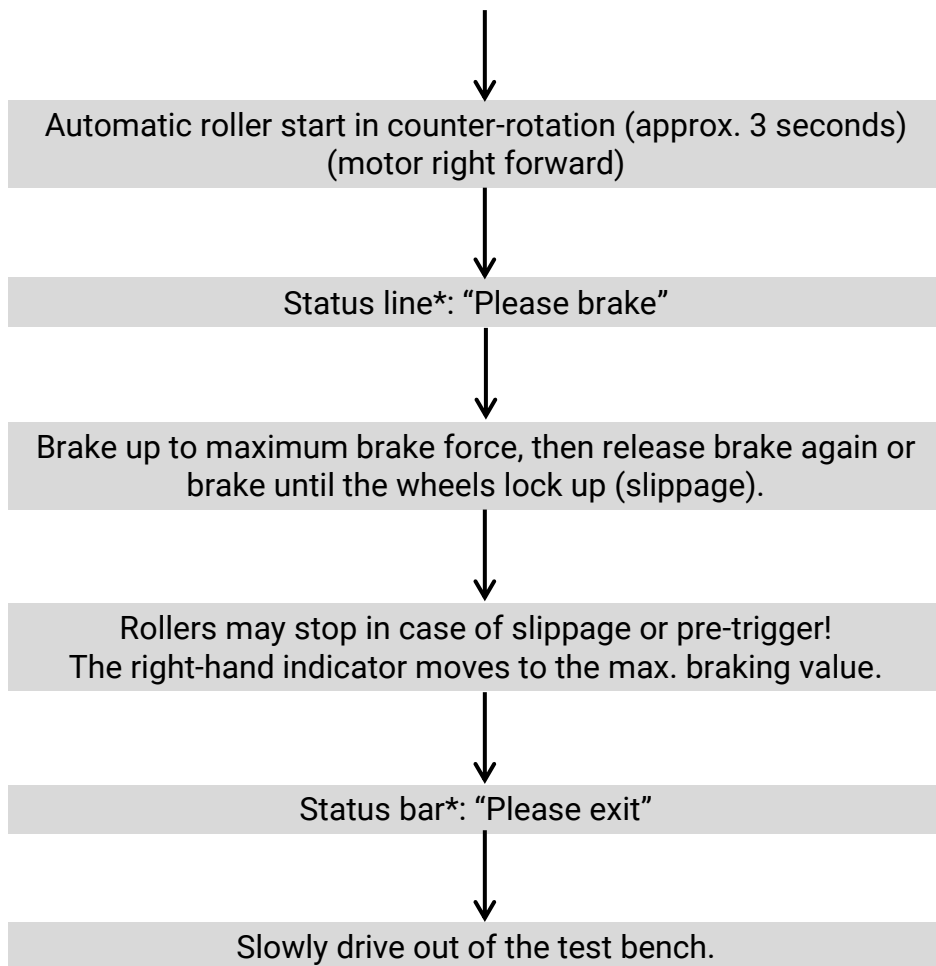


\*In conjunction with monitor display



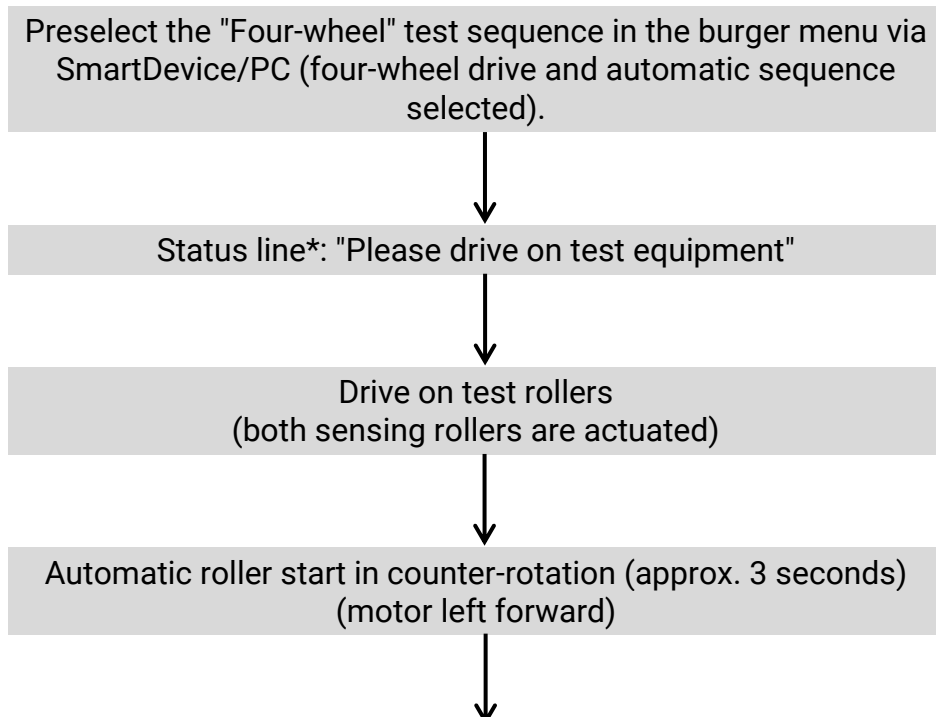
#### 7.4.4 Carry out 4WD Brake Test with SmartDevice/PC in Automatic Mode

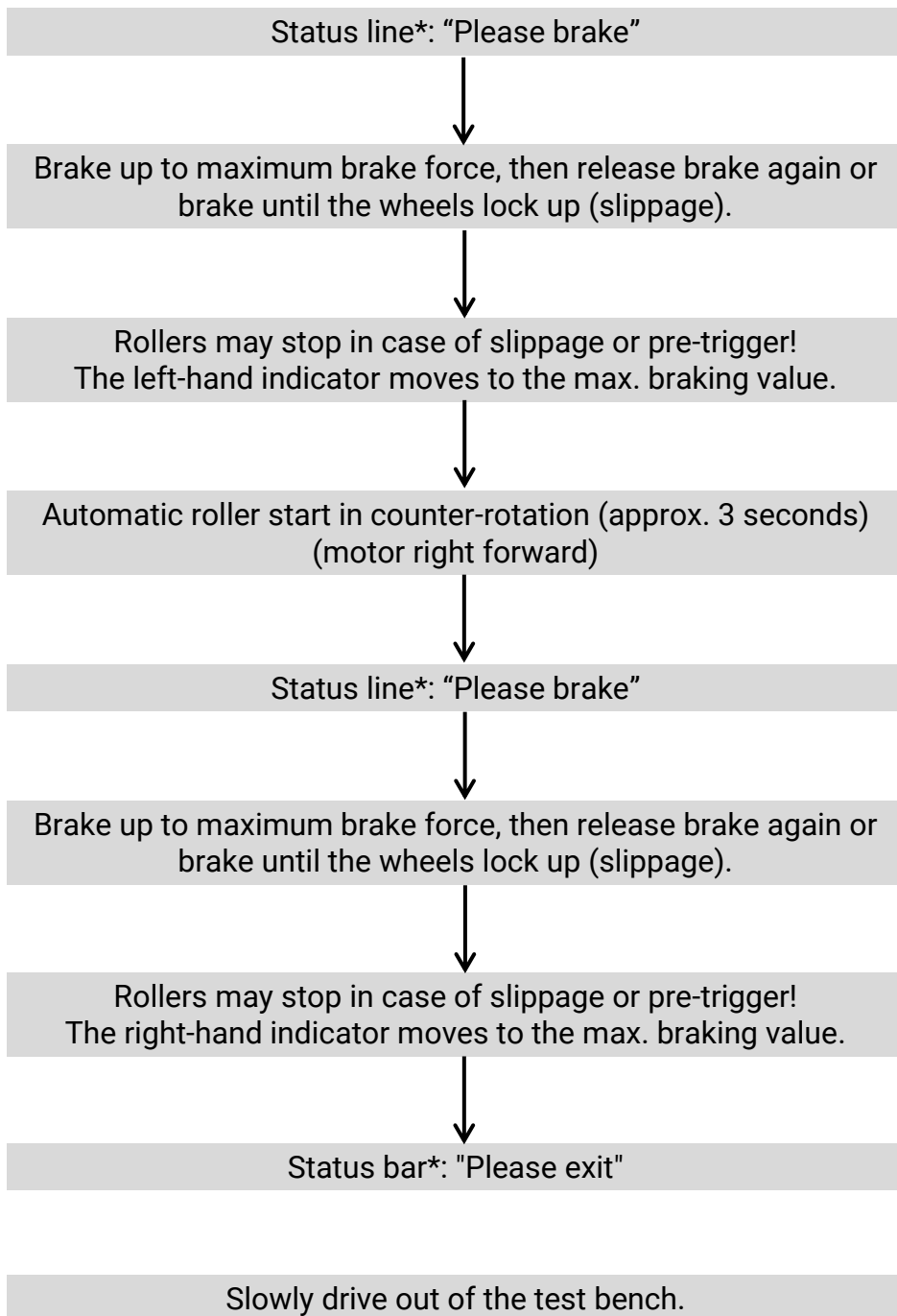




\*In conjunction with monitor display

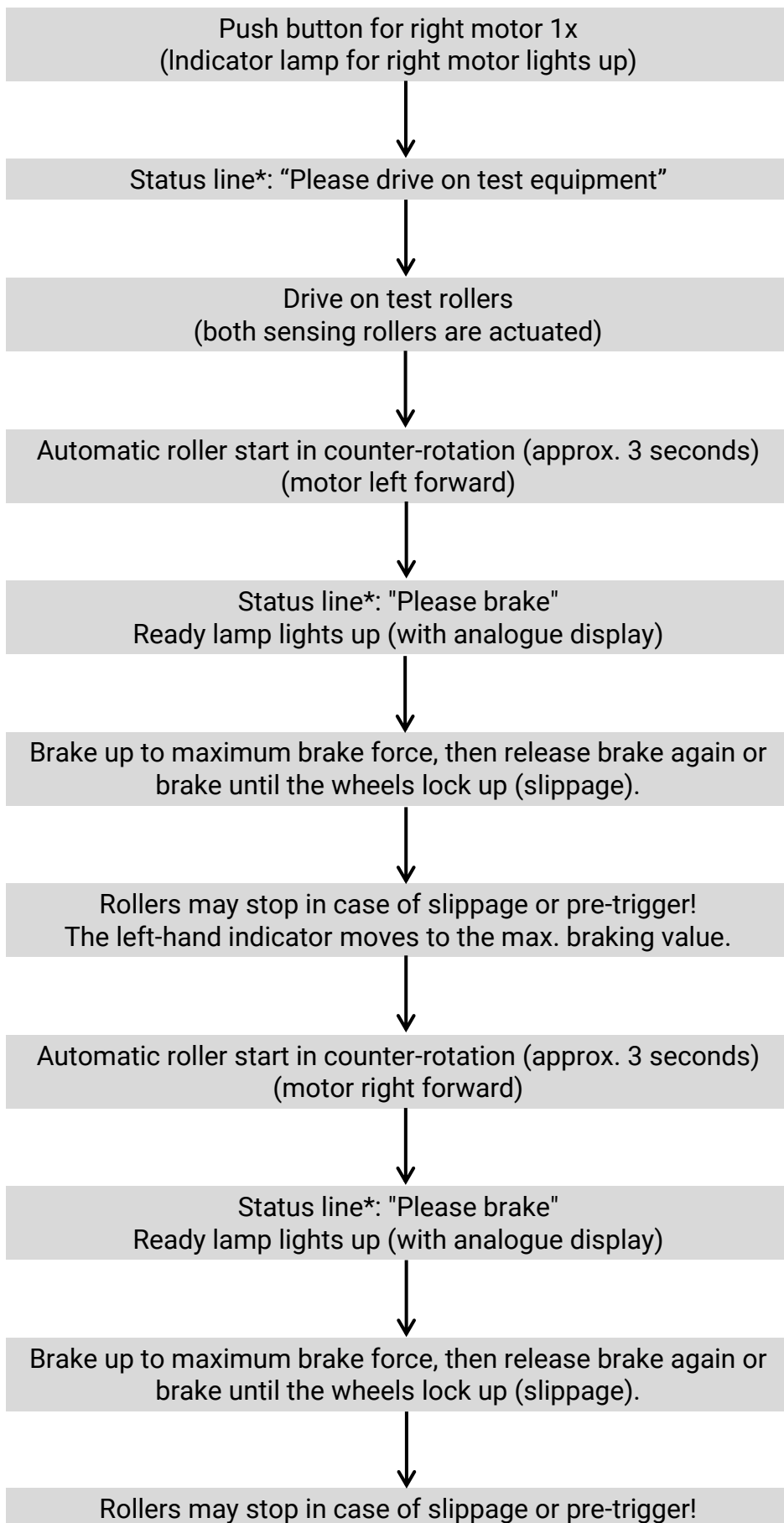
#### 7.4.5 Carry out Manual 4WD Brake Test with SmartDevice/PC in Counter-Rotation Mode





\*In conjunction with monitor display

#### 7.4.6 Carry out 4WD Brake Test in Counter-Rotation Mode with Pushbutton on Control Cabinet



The right-hand indicator moves to the max. braking value.

Status bar\*: "Please exit"

Slowly drive out of the test bench.

\*In conjunction with monitor display

#### 7.4.7 Carry out Manual Single-Wheel Brake Test with SmartDevice/PC

Preselect test sequence "Single wheel left or right" in the burger menu via SmartDevice/PC.

Drive on test rollers  
(both sensing rollers are actuated)

Automatic roller start of left motor (exemplary, if left preselected) (approx. 3 seconds after sensing roller actuation)

Status line\*: "Please brake"  
Ready lamp lights up (with analogue display)

Brake up to maximum brake force, then release brake again or brake until the wheels lock up (slippage).

Rollers may stop in case of slippage or pre-trigger!  
The left-hand indicator moves to the max. braking value.

Automatic roller start (approx. 3 seconds)  
(motor left)

Status line\*: "Please brake"

Brake up to the maximum braking force, then release the brake again or brake until the wheel locks (slippage).



Rollers may stop in case of slippage or pre-trigger!  
The right-hand indicator moves to the max. braking value.

\*In conjunction with monitor display

**Info:**

A change of the wheel side left/right is possible by means of SmartDevice/PC when the test bench is in use.

**7.4.8 Carry out Single-Wheel Brake Test with Pushbutton on Control Cabinet**

Push button for right motor 2x  
(indicator lamp of right-hand motor is flashing)



Status line\*: "Please drive on test equipment"



Drive on test rollers  
(both sensing rollers are actuated)



Automatic roller start of the left motor  
(approx. 3 seconds after sensing roller actuation)



Status line\*: "Please brake"  
Ready lamp lights up (with analogue display)



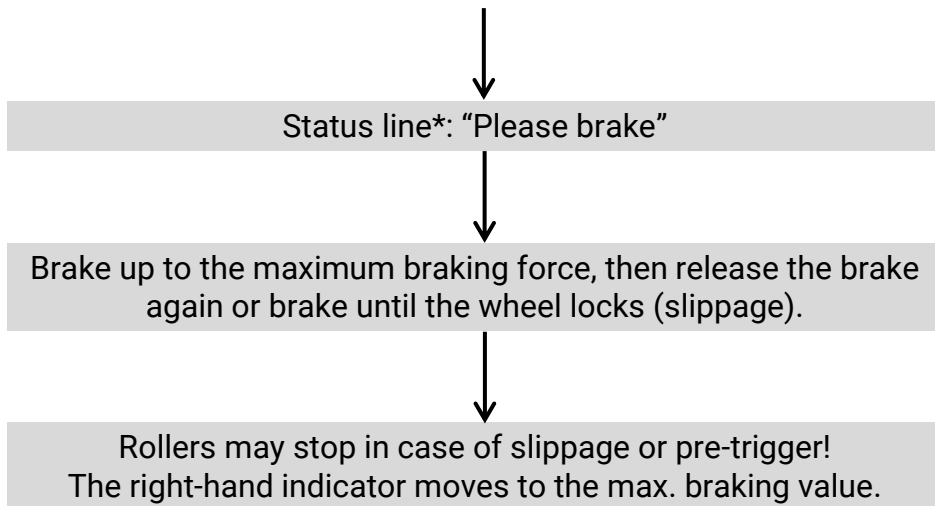
Brake up to the maximum braking force, then release the brake again or brake until the wheel locks (slippage).



Rollers may stop in case of slippage or pre-trigger!  
The left-hand indicator moves to the max. braking value.

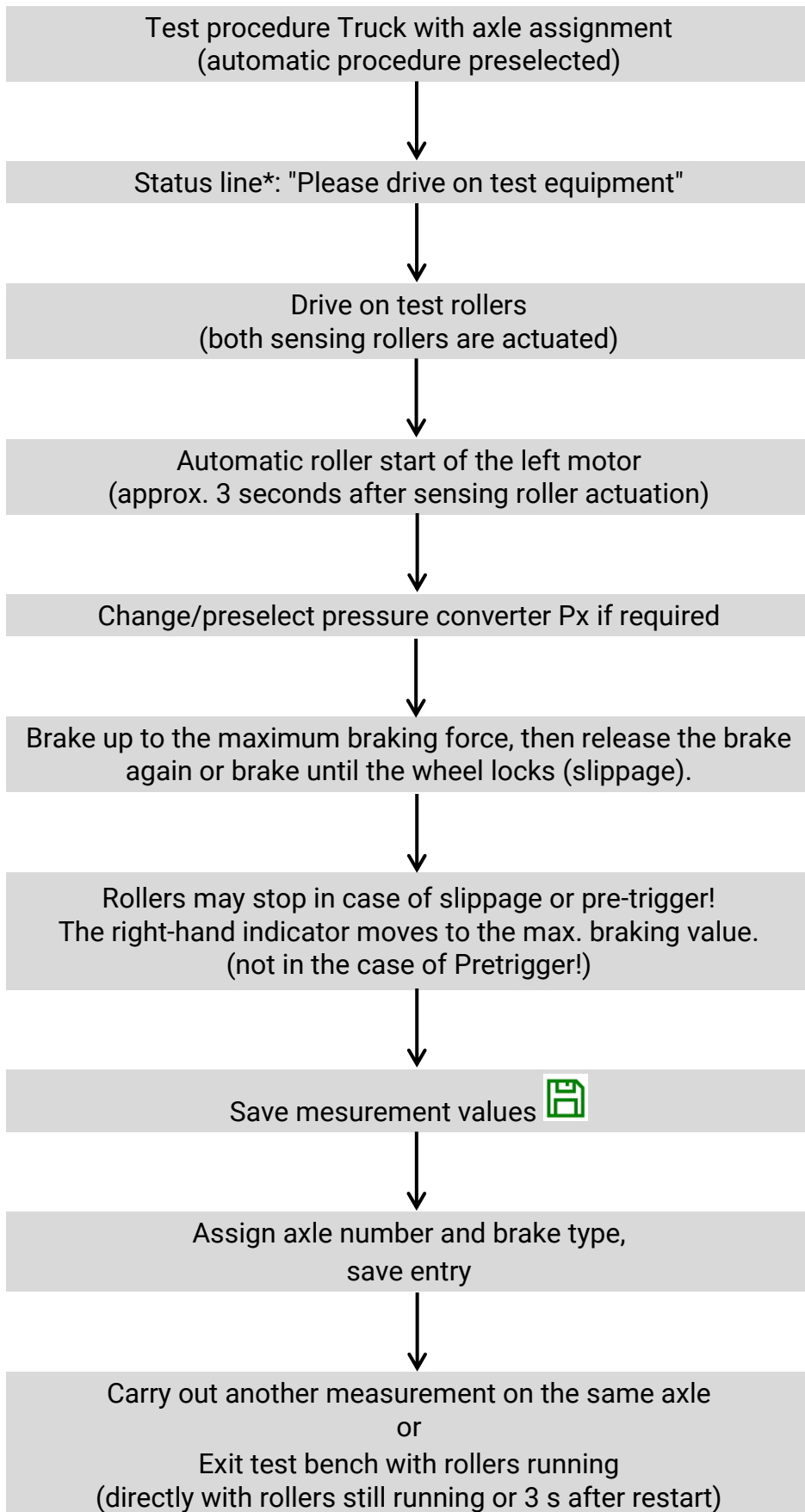


Automatic roller start (approx. 3 seconds)  
(motor left)



\*In conjunction with monitor display

### 7.4.9 Test Procedure Truck with Axle Assignment (Automatic Procedure preselected)







Axle change, new measurement can be started.

#### 7.4.10 Drive off Test Bench

Depending on the equipment, the following must be observed when leaving the test bench:

##### **NOTICE**

Do not drive the vehicle out of the test bench with the rollers stationary.  
Exception: Static extension aid is available.

---

##### **a Dynamic exit aid with automatic start**

Wait until rollers have been automatically restarted. Then drive the vehicle out of the test bench.

##### **b Dynamic exit aid with semi-automatic system**

Start rollers by releasing the semi-automatic. Then drive the vehicle out of the test bench.

##### **c Dynamic exit aid with start via RECO remote control**

Start rollers via RECO remote control. Then drive the vehicle out of the test bench.

##### **d Static exit aid (DC brake or electromechanical motor brake)**

Vehicle may be driven out of the test bench even with the rollers stationary.

##### **NOTICE**

In case of malfunction or failure of the motor brake or the automatic / semi-automatic roller start, it is possible to activate the exit aid with the drive axle of the vehicle:

- Slowly accelerate the vehicle in the test bench in the forward direction of travel.
- At approx. 3 km/h the rollers are switched on automatically by the test bench and the vehicle can be driven out of the test bench by moderate further acceleration.

**Attention:** The test bench starts automatically! Excessive acceleration can cause damage to the test bench.

---

## 7.5 Deceleration Table

Axle load in kg	Axle brake force in kN															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
200	50	100														
300	33	67	100													
400	25	50	75	100												
500	20	40	60	80	100											
600	17	33	50	67	83	100										
700	14	29	43	57	71	86	100									
800	13	25	38	50	63	75	88	100								
900	11	22	33	44	56	67	78	89	100							
1000	10	20	30	40	50	60	70	80	90	100						
1100	9	18	27	36	45	55	64	73	82	91	100					
1200	8	17	25	33	42	50	58	67	75	83	92	100				
1300	8	15	23	31	38	46	54	62	69	77	85	92	100			
1400	7	14	21	29	36	43	50	57	64	71	79	86	93	100		
1500	7	13	20	27	33	40	47	53	60	67	73	80	87	93	100	
1600	6	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100

Deceleration in %

## 8 Inspection and Maintenance

### 8.1 Safety Instructions



#### WARNING

- The control cabinet must be positioned in such a way that the emergency stop main switch or the emergency stop pushbutton (optional) is located in the immediate vicinity of the test bench at a height of 0.6...1.7 m above the stand level and can be assigned to the correct test bench in the case of test halls with several systems. This is necessary in order to fulfil the emergency stop function according to DIN EN ISO 13850. The "Control On" status light shall be fully visible from the test site.
  - Electrical work must only be performed by a specialist electrician in compliance with the national regulations, directives and standards. Accordingly, an electrical test/measurement must also be carried out and recorded.
  - All parts of the electrical equipment must be protected from moisture and humidity.
  - Even when the main switch is switched off, parts of the optional control cabinet heater (components, terminals, cores, cables, etc.) are still live.
  - During service work, the system must be depressurised and de-energised.
  - For all work in the roller set, it must be ensured that the main switch is switched off and secured against being switched back on and, where applicable, that the motor circuit breakers are switched off.
  - For work in the control cabinet or on the roller sets, be aware of the (optional) heater or hot parts.
  - Due to the coordination used in accordance with IEC 60947, the switching elements (contactors) in the associated circuit must be replaced after a short-circuit/ housing short-circuit, and also if the B10d value of 1,300,000 switching cycles in accordance with DIN EN ISO 13849-1/-2 is exceeded. Before connecting the supply cable, it must be ensured that it is de-energised and, among other things, that the 5 safety rules are observed.
  - Safety goggles must be worn when working on hydraulic/pneumatic components.
  - Test and measure the protective conductor connection and insulation as part of the overall commissioning.
  - Do not start a vehicle with the system.
  - Before the vehicle inspection, remove any foreign bodies stuck in the tyre tread.
-

## 8.2 Care Instructions

- The machine should be cleaned at regular intervals and treated with a machine care product.
- Any damage to the paintwork should be repaired immediately to prevent corrosion.
- To prevent damage, cleaning work must not be carried out with harsh cleaners or with high and steam pressure equipment.

### Info:

Regular care is the most important requisite for the unit's functional efficiency and long service life!

## 8.3 Inspection and Maintenance Schedule

### Daily before operating

- Check the function of the sensing roller spring before switching on.

### Weekly

- Visual inspection of the entire test bench for damage.
- Check the test bench for changes in running noise and vibrations.

### Monthly

- Clean, retighten and lubricate chains.
- Lubricate sensing roller hinges.

### Annually

- The maintenance interval prescribed by the manufacturer is **12 (twelve) months**. This maintenance interval refers to normal workshop use. If the device/system is used more frequently or under more difficult operating conditions (e.g. in outdoor areas), the interval must be shortened accordingly.
- Failure to do so will void the manufacturer's warranty.

## 8.4 Maintenance of the Chains

Remove the cover plates from the roller set on the chains and refit them before commissioning.

### 8.4.1 Cleaning the Chains

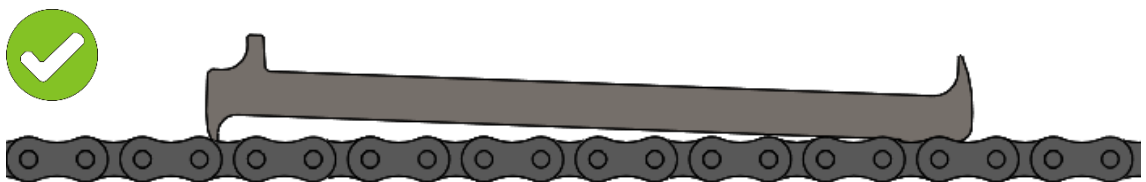
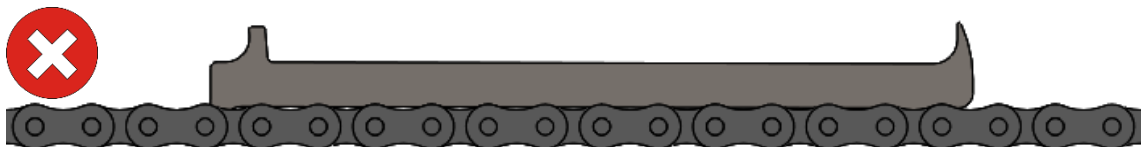
The cleaning of the chains can usually be done with rags or brushes. Stubborn dirt can be dissolved with suitable cleaning agents, never use stains or acids. Immediately after using grease-dissolving media, apply a new, suitable corrosion protection (see section "Lubricating chains").

### 8.4.2 Checking for Chain Wear

Wear check by means of a chain wear gauge 2 % (MAHA order no. 1400079).

- The chain wear gauge is suitable for all chains of the MAHA test benches. It can be used for type 12B 3/4" and type 16B 1" chains.
- If the chain wear gauge dips completely, as can be seen below, it is imperative that the chain is replaced, as otherwise consequential damage can occur, e.g. to the sprockets.

Chain pitch	CONNECT SERIES	MBT SERIES
12B 3/4 "	C_MBT C/S 1.0 Wxxx	MBT 1000
	C_MBT C/S 3.5/4.0/5.0 Wxxx	MBT 2000
	C_MBT C 8.0 W280	MBT 3000
	C_MBT C 13.0 W280	---
	C_MBT M 18.0 W301	MBT 5000
16B 1"	C_MBT S 13.0/15.0 R100 MU	MBT 4000
	C_MBT T 18.0 W360	MBT 6000
	C_MBT S 18.0/20.0 Rxxx	MBT 7000



#### WARNING

The main switch must be switched off and secured against being switched back on.

## NOTICE

The chains must be correctly tensioned before the wear check, otherwise the measurement results may be incorrect.

### 8.4.3 Retensioning the Chains / Replacing the Test Rollers

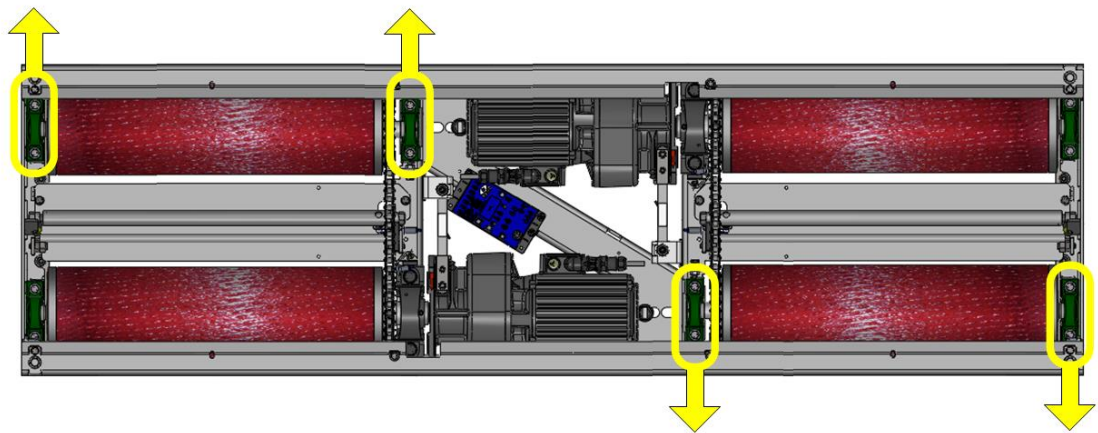
Check chain slack: It should be possible to move the chain up and down by hand by approx. 5 mm. If the chain is too lightly tensioned, proceed as follows:

- 1 Loosen the fastening screws of the pedestal bearings on both sides.
- 2 Adjust the chain to the correct tension using the adjusting screw.
- 3 Move the roller(s) in parallel, not one-sided.
- 4 Retighten the fastening screws (tightening torques: see table).

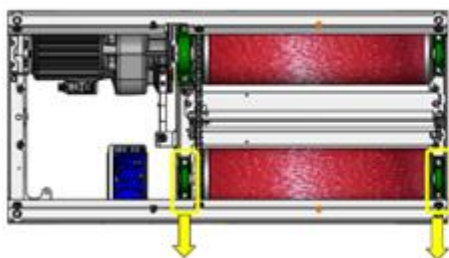
## NOTICE

It is recommended by the manufacturer that the fastening screws be replaced each time an adjustment is made.

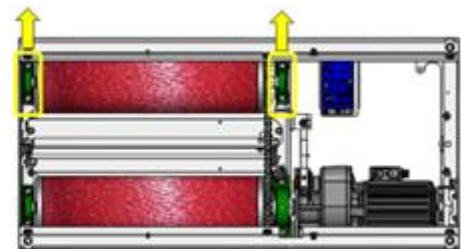
- 5 Use a "medium strength" threadlocker.
- 6 Recheck chain tension.

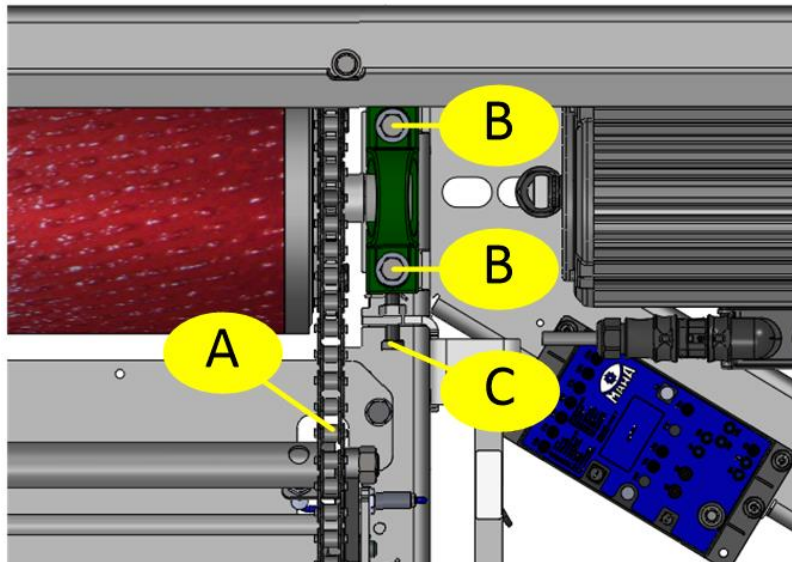


*Compact roller set*



*Split roller set*





**A** Chain

**B** Fastening screws

**C** Adjusting screw

### Tightening torques of the bearing screws



#### CAUTION

Check the strength labelling on the screws before using them.

Test bench type	Thread	Strength	Tightening torque	Position	Required for chain tension
C_MBT 3.5/4.0/5.0	M10	8.8	50 Nm	Roller	Yes
	M16	8.8	120 Nm	Motor bearing	No
C_MBT 13.0	M18x60	10.9	400 Nm	Roller	Yes
	M18x100	12.9	400 Nm	Roller	Yes
	M20x70	8.8	400 Nm	Motorlager	nein

Test bench type	Thread	Strength	Tightening torque	Position
C_MBT 3.5/4.0/5.0	M8	12.9	40 Nm	Range spring
	M10	12.9	85 Nm	Range spring
C_MBT 13.0	M10x60	12.9	70 Nm	Range spring
	M10x40	8.8	50 Nm	Range spring arm

### Tightening torques of the set screws

M6x0.75	SW 3	6 Nm	M10x1,25	SW 5	26 Nm
M8x1	SW 4	14 Nm	M12x1,5	SW 6	42 Nm

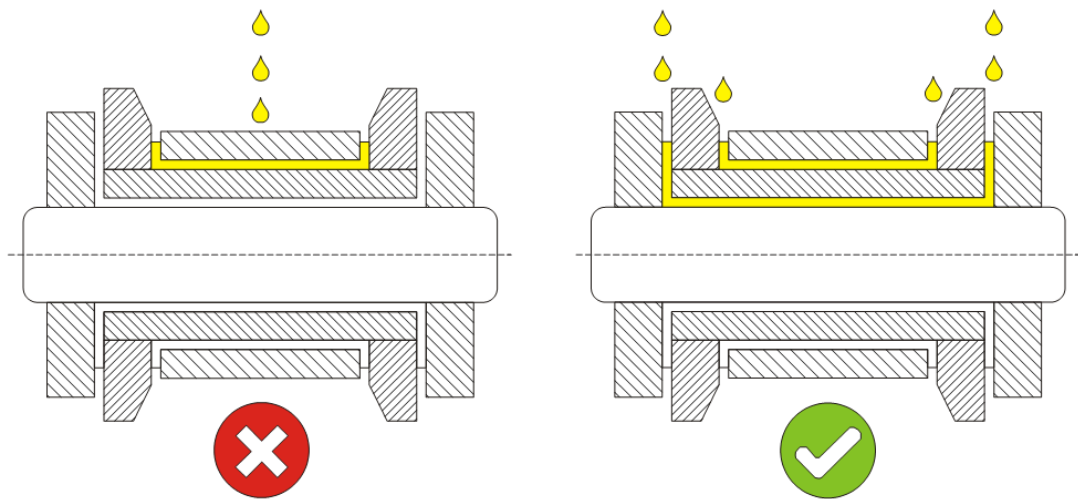
#### 8.4.4 Lubricating the Chains

##### Info:

The service life of the chain is directly dependent on the lubrication. If the lubricating film is permanently maintained, the wear of the chain can be reduced to a minimum.

Suitable lubricant: LongLub adhesive lubricant (MAHA Art. No. 35 1020)

- Lubricate the chain along its entire length, while continuing to turn the rollers by hand. **Important: The lubricant must get into the chain joint!**



**Inadequate lubrication** can be recognised on the basis of the following signs:

- Increased noise
- Stiff joints
- Increased power consumption
- Fretting corrosion in the chain links

In the case of inadequate lubrication, proceed as follows: Clean the chain with a very low-viscosity oil. This will flush fretting corrosion, old lubricant and other dirt out of the joint. After the cleaning, lubricate again with a suitable lubricant.

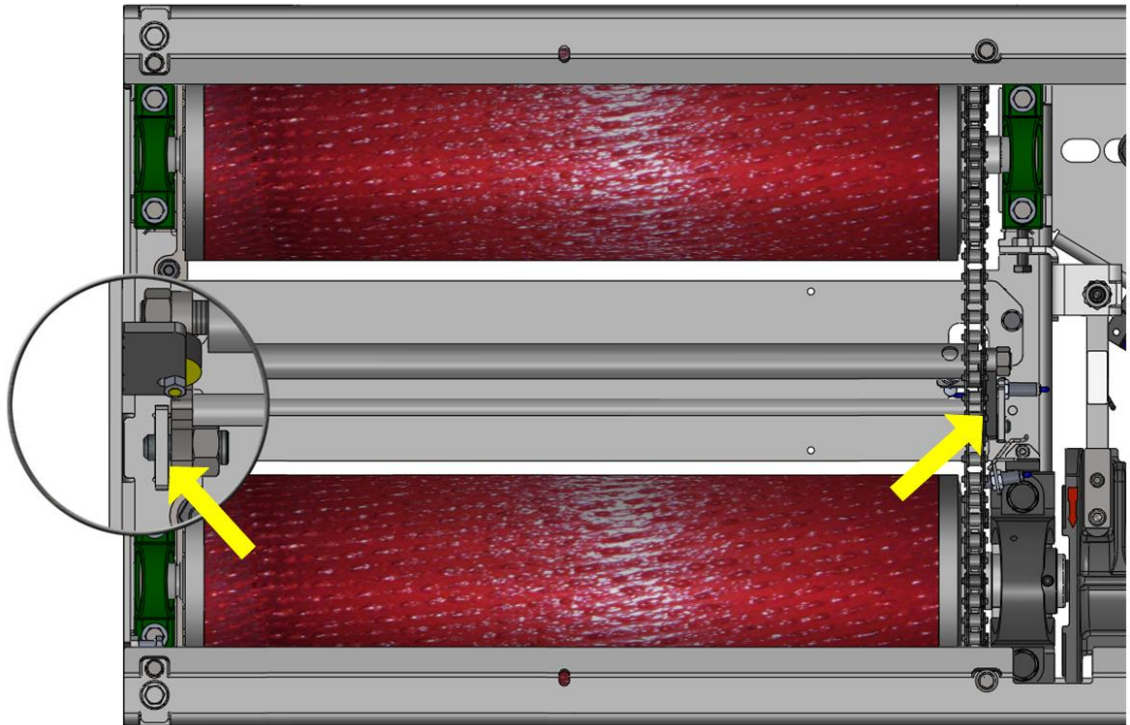


### 8.4.5 Lubricating the Sensing Roller Hinges

**Info:**

Maintenance interval: 200 operating hours / 12 months

- 1 Remove cover plate from roller set.
- 2 Treat lubrication points (arrow) with sprayable lubricant. While doing this, move the sensing roller up and down. Carry out the procedure on both sensing rollers.
- 3 Re-mount the cover plate on the roller set.



## 9 Troubleshooting

### 9.1 Safety Instructions



#### WARNING

- The control cabinet must be positioned in such a way that the emergency stop main switch or the emergency stop pushbutton (optional) is located in the immediate vicinity of the test bench at a height of 0.6...1.7 m above the stand level and can be assigned to the correct test bench in the case of test halls with several systems. This is necessary in order to fulfil the emergency stop function according to DIN EN ISO 13850. The "Control On" status light shall be fully visible from the test site.
  - Electrical work must only be performed by a specialist electrician in compliance with the national regulations, directives and standards. Accordingly, an electrical test/measurement must also be carried out and recorded.
  - All parts of the electrical equipment must be protected from moisture and humidity.
  - Even when the main switch is switched off, parts of the optional control cabinet heater (components, terminals, cores, cables, etc.) are still live.
  - During service work, the system must be depressurised and de-energised.
  - For all work in the roller set, it must be ensured that the main switch is switched off and secured against being switched back on and, where applicable, that the motor circuit breakers are switched off.
  - For work in the control cabinet or on the roller sets, be aware of the (optional) heater or hot parts.
  - Due to the coordination used in accordance with IEC 60947, the switching elements (contactors) in the associated circuit must be replaced after a short-circuit/ housing short-circuit, and also if the B10d value of 1,300,000 switching cycles in accordance with DIN EN ISO 13849-1/-2 is exceeded. Before connecting the supply cable, it must be ensured that it is de-energised and, among other things, that the 5 safety rules are observed.
  - Safety goggles must be worn when working on hydraulic/pneumatic components.
-

## 9.2 Error Codes

Description:

Error codes have a 5-digit notation according to the scheme "YY0XX"

- YY stands for the error code group (e.g. 32 "Speed sensor of the left sensing roller")
- 0 serves here as separator
- XX stands for the subcategory of the respective error code group (e.g. 00 for short circuit, 01 for cable break)
- Complete exemplary error code:  
32001 "Cable break at the speed sensor of the left sensing roller"

**Info:**

- All error codes are written to a log file and can be read out if required, see section "Operation > Settings > Event logging".
- On a C\_MSA analogue display, only the error code group is indicated by the two pointers; the complete 5-digit error code must be taken from the log file.

<i>Error code</i>	<b>01000</b>
<i>Description</i>	Incomplete adjustment of brake force
<i>Possible solution</i>	Carry out adjustment of brake force
<i>Error code</i>	<b>02000</b>
<i>Description</i>	Incomplete adjustment of weighing device
<i>Possible solution</i>	Carry out adjustment of weighing device
<i>Error code</i>	<b>03000</b>
<i>Description</i>	Incomplete adjustment of side-slip tester
<i>Possible solution</i>	Carry out adjustment of side-slip tester
<i>Error code</i>	<b>10002</b>
<i>Description</i>	CAN bus error
<i>Possible solution</i>	Check CAN cable between ZM X1 and IFM X1 Check CAN address at IFM
<i>Error code</i>	<b>10003</b>
<i>Description</i>	CAN bus error
<i>Possible solution</i>	Check CAN cable between ZM X2 and radio receiver X4
<i>Error code</i>	<b>10005</b>
<i>Description</i>	UART error
<i>Possible solution</i>	Check supply voltage at X1 Perform software update
<i>Error code</i>	<b>10006</b>

<i>Description</i>	CAN bus error
<i>Possible solution</i>	Check CAN addresses at the IFM
<i>Error code</i>	<b>10007</b>
<i>Description</i>	CAN bus error
<i>Possible solution</i>	Check configuration "Split roller set" in MBT options Check CAN addresses at the IFM
<i>Error code</i>	<b>10008</b>
<i>Description</i>	IFM error
<i>Possible solution</i>	Check number of connected IFMs
<i>Error code</i>	<b>10009</b>
<i>Description</i>	IFM error
<i>Possible solution</i>	Check CAN cable between ZM X1 and IFM X1
<i>Error code</i>	<b>10011</b>
<i>Description</i>	Adjustment error
<i>Possible solution</i>	Check sensitivity values in Brake force adjustment menu
<i>Error code</i>	<b>10012</b>
<i>Description</i>	Adjustment error
<i>Possible solution</i>	Check sensitivity and offset values in Brake force adjustment menu
<i>Error code</i>	<b>10013</b>
<i>Description</i>	Adjustment menu
<i>Possible solution</i>	Check offset values in Brake force adjustment menu
<i>Error code</i>	<b>10016</b>
<i>Description</i>	MSD communication error X17
<i>Possible solution</i>	Check RS232 connection between MSD and IFM MSD axle damping tester can be disabled in the service menu
<i>Error code</i>	<b>14000</b>
<i>Description</i>	Emergency stop pushbutton
<i>Possible solution</i>	Release emergency stop pushbutton
<i>Error code</i>	<b>14003</b>
<i>Description</i>	Emergency stop
<i>Possible solution</i>	Drive from test bench Perform restart of test bench

<i>Error code</i>	<b>14006</b>
<i>Description</i>	Emergency stop Test bench driven on one side
<i>Possible solution</i>	Drive from test bench and drive on both sides
<i>Error code</i>	<b>14007</b>
<i>Description</i>	Emergency stop Vehicle does not match configuration
<i>Possible solution</i>	Correct vehicle configuration
<i>Error code</i>	<b>14012</b>
<i>Description</i>	Emergency stop Radio remote control
<i>Possible solution</i>	Release emergency stop on radio remote control
<i>Error code</i>	<b>14013</b>
<i>Description</i>	Emergency stop Incorrect IFM configuration
<i>Possible solution</i>	Check number of IFMs and CAN addresses
<i>Error code</i>	<b>14027</b>
<i>Description</i>	Emergency stop Voltage supply IFM and radio receiver
<i>Possible solution</i>	Check CAN connection between ZM X1 and IFM X1 Check voltage supply at radio receiver X7
<i>Error code</i>	<b>14028</b>
<i>Description</i>	Emergency stop Communication error to radio receiver
<i>Possible solution</i>	Check CAN connection to radio receiver
<i>Error code</i>	<b>14035</b>
<i>Description</i>	Emergency stop Initialisation error
<i>Possible solution</i>	Check connectors X4 and X5 on the IFM
<i>Error code</i>	<b>14040</b>
<i>Description</i>	Emergency stop Motor contactor query
<i>Possible solution</i>	Check contactor for defects
<i>Error code</i>	<b>14050</b>
<i>Description</i>	Emergency stop Pit safety device
<i>Possible solution</i>	Acknowledge pit safety
<i>Error code</i>	<b>14051</b>
<i>Description</i>	Emergency stop Overfloor protection
<i>Possible solution</i>	Release overfloor protection
<i>Error code</i>	<b>14060</b>
<i>Description</i>	Emergency stop No radio remote control paired
<i>Possible solution</i>	Pair radio remote control with radio receiver

<i>Error code</i>	<b>22000</b>
<i>Description</i>	Motor circuit breaker has tripped
<i>Possible solution</i>	Drive from test bench Set motor protection switch to "ON"
<i>Error code</i>	<b>32000</b>
<i>Description</i>	Speed sensor left sensing roller X9
<i>Details</i>	Short circuit
<i>Error code</i>	<b>32001</b>
<i>Description</i>	Speed sensor left sensing roller X9
<i>Details</i>	Cable break
<i>Error code</i>	<b>34000</b>
<i>Description</i>	Speed sensor right sensing roller X10
<i>Details</i>	Short circuit
<i>Error code</i>	<b>34001</b>
<i>Description</i>	Speed sensor right sensing roller X10
<i>Details</i>	Cable break
<i>Error code</i>	<b>35000</b>
<i>Description</i>	Speed sensor left test roller X11
<i>Details</i>	Short circuit
<i>Error code</i>	<b>35001</b>
<i>Description</i>	Speed sensor left test roller X11
<i>Details</i>	Cable break
<i>Error code</i>	<b>35002</b>
<i>Description</i>	Speed sensor left test roller X11
<i>Possible solution</i>	Check sensor distance to sprocket (approx. 2 mm)
<i>Error code</i>	<b>37000</b>
<i>Description</i>	Speed sensor right test roller X12
<i>Details</i>	Short circuit
<i>Error code</i>	<b>37001</b>
<i>Description</i>	Speed sensor right test roller X12
<i>Details</i>	Cable break
<i>Error code</i>	<b>37002</b>
<i>Description</i>	Speed sensor right test roller X12
<i>Possible solution</i>	Check sensor distance to sprocket (approx. 2 mm)

<i>Error code</i>	<b>40000</b>
<i>Description</i>	Zero point error Brake force
<i>Possible solution</i>	Restart test bench Check range spring clearance Check connectors X7 and X8 on IFM
<i>Error code</i>	<b>40001</b>
<i>Description</i>	Zero drift brake force left > 5 daN
<i>Possible solution</i>	Check strain gauge play
<i>Error code</i>	<b>40002</b>
<i>Description</i>	Zero drift brake force right > 5 daN
<i>Possible solution</i>	Check strain gauge play
<i>Error code</i>	<b>40003</b>
<i>Description</i>	Zero drift brake force between left and right > 5 daN
<i>Possible solution</i>	Check strain gauge play
<i>Error code</i>	<b>40004</b>
<i>Description</i>	Deviation from adjusted zero point left too large
<i>Possible solution</i>	Check strain gauge play Contact service
<i>Error code</i>	<b>40005</b>
<i>Description</i>	Deviation from adjusted zero point left too large
<i>Possible solution</i>	Check strain gauge play Contact service
<i>Error code</i>	<b>40006</b>
<i>Description</i>	Zero point drift left not normal: Brake tester locked
<i>Possible solution</i>	Check strain gauge play Turn off main switch and back on again Contact service
<i>Error code</i>	<b>40007</b>
<i>Description</i>	Zero point drift right not normal: Brake tester locked
<i>Possible solution</i>	Check strain gauge play Turn off main switch and back on again Contact service
<i>Error code</i>	<b>41000</b>
<i>Description</i>	Drive-on sensor left X4
<i>Details</i>	Short circuit

<i>Error code</i>	<b>41001</b>
<i>Description</i>	Drive-on sensor left X4
<i>Details</i>	Cable break
<i>Error code</i>	<b>41002</b>
<i>Description</i>	One-side drive-on detected on the left
<i>Possible solution</i>	Drive on test bench on both sides Check sensor distance of sensor X4
<i>Error code</i>	<b>42000</b>
<i>Description</i>	Drive-on sensor right X5
<i>Details</i>	Short circuit
<i>Error code</i>	<b>42001</b>
<i>Description</i>	Drive-on sensor right X5
<i>Details</i>	Cable break
<i>Error code</i>	<b>42002</b>
<i>Description</i>	One-side drive-on detected on the right
<i>Possible solution</i>	Drive on test bench on both sides Check sensor distance from sensor X5
<i>Error code</i>	<b>50000</b>
<i>Description</i>	Zero point error Weighing device
<i>Possible solution</i>	Unload the weighing device Perform restart of test bench
<i>Error code</i>	<b>50001</b>
<i>Description</i>	Zero point error Weighing device left
<i>Possible solution</i>	Unload the weighing device Perform restart of test bench
<i>Error code</i>	<b>50002</b>
<i>Description</i>	Zero point error weighing device right
<i>Possible solution</i>	Unload the weighing device Perform restart of test bench
<i>Error code</i>	<b>50003</b>
<i>Description</i>	Zero drift scale left > 10 daN
<i>Possible solution</i>	Unload the weighing device
<i>Error code</i>	<b>50004</b>
<i>Description</i>	Zero drift scale right > 10 daN



<i>Possible solution</i>	Unload the weighing device
<i>Error code</i>	<b>50005</b>
<i>Description</i>	Zero drift scale between left and right > 10 daN
<i>Possible solution</i>	Unload the weighing device
<i>Error code</i>	<b>50006</b>
<i>Description</i>	Deviation from adjusted zero point left too large
<i>Possible solution</i>	Unload the weighing device Contact service
<i>Error code</i>	<b>50007</b>
<i>Description</i>	Deviation from adjusted zero point right too large
<i>Possible solution</i>	Unload the weighing device Contact service
<i>Error code</i>	<b>50008</b>
<i>Description</i>	Zero point drift left not normal: Brake tester locked
<i>Possible solution</i>	Unload the weighing device Turn off main switch and back on again Contact service
<i>Error code</i>	<b>50009</b>
<i>Description</i>	Zero point drift right not normal: Brake tester locked
<i>Possible solution</i>	Unload the weighing device Turn off main switch and back on again Contact service
<i>Error code</i>	<b>51000</b>
<i>Description</i>	Vehicle on test bench when switching on
<i>Possible solution</i>	Drive from test bench (exit aid is enabled 1x)
<i>Error code</i>	<b>60000</b>
<i>Description</i>	Different firmware
<i>Possible solution</i>	Update firmware of ZM safety controller (update cable required) Update firmware of IFM safety controller (update cable required) Restart the entire system
<i>Error code</i>	<b>61000</b>
<i>Description</i>	Different firmware
<i>Possible solution</i>	Update firmware of radio receiver Restart the entire system
<i>Error code</i>	<b>70000</b>

<i>Description</i>	Zero point error Side-slip tester
<i>Possible solution</i>	Test plate must not be driven on Perform restart of test bench
<i>Error code</i>	<b>71000</b>
<i>Description</i>	Collision sensor Side-slip tester X19
<i>Details</i>	Short circuit
<i>Error code</i>	<b>71001</b>
<i>Description</i>	Collision sensor Side-slip tester X19
<i>Details</i>	Cable break
<i>Error code</i>	<b>72000</b>
<i>Description</i>	Drive-off sensor Side-slip tester X20
<i>Details</i>	Short circuit
<i>Error code</i>	<b>72001</b>
<i>Description</i>	Drive-off sensor Side-slip tester X20
<i>Details</i>	Cable break

## 10 Repairs

### 10.1 Safety Instructions

See section "Installation > Safety Instructions".

### 10.2 Configuring the Control Unit

In the spare parts case, the central module is not configured. Configuration is carried out during initial commissioning as described below.

The following is required for replacing the control unit of the central module:

- SN of the test bench
- Replacement control (ZM)
- Software key (technician key/token)
- Software image

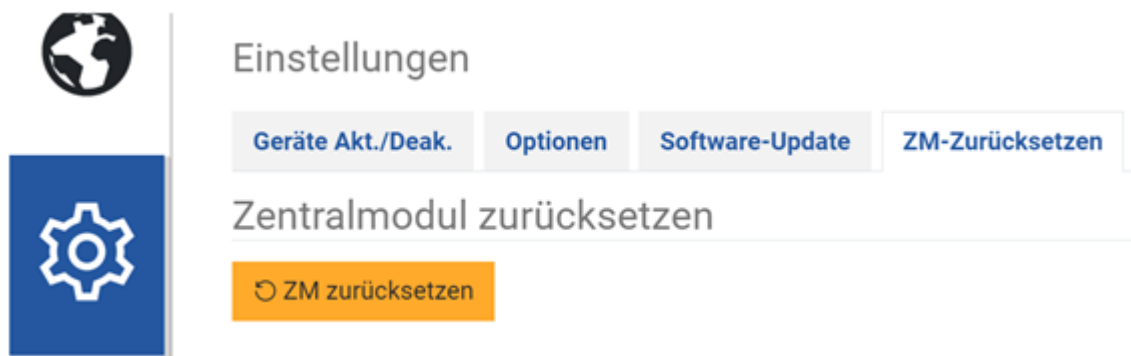
#### NOTICE

The technician key must not be older than the software image! It is recommended to always download key and software at the same time. Both can be downloaded from

<https://www.maha.de/de/software> CONNECT DOWNLOADS.

The following steps must be observed when replacing the control unit:

- 1 If the central module to be replaced is still responsive, save the test stand settings: Settings/General: "Backup settings" The file is saved in the local download folder and contains all set parameters and settings.  
Filename: MAHA\_C\_MBT\_Configuration\_S/N\_yyy-mm-dd-hhmm
- 2 If necessary, reset the old central module to the "delivery status" By resetting to the delivery status, all error entries and the event recording are deleted together with the software installed in the central module.  
To do this, register as a fitter!



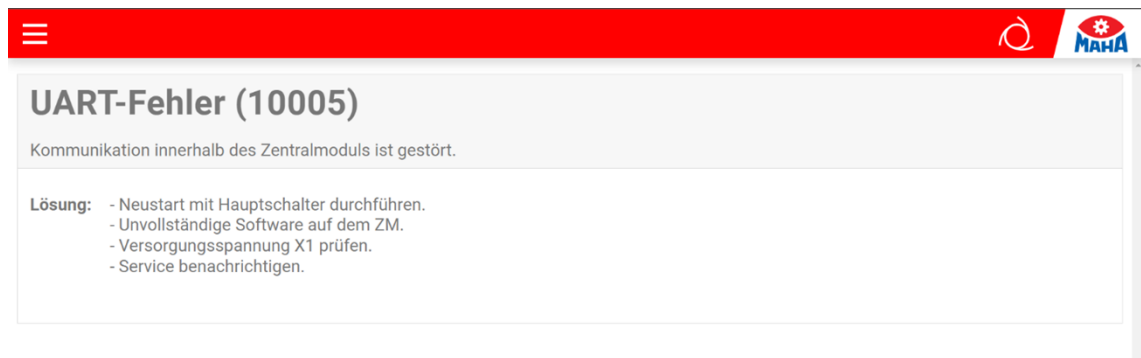
#### Info:

If the central module has never been installed, a reset is not necessary and also not possible.

- 3 Replace the central module with the main switch turned off.

- After replacing the central module, switch the system on again.  
If necessary, reconnect to the test stand ("maha-mbt" or via LAN cable with IP address 192.168.201.1) and log in as a fitter.  
Logging into the fitter menu (see section "Operation > Settings > Login fitter menu") is no longer possible online, but only via a software key (maha-key).

Start screen of a new or reset board:



After opening the Settings (Technician menu):



Service technician login is possible **only with offline activation**.



- Carry out the software update: click on the button "Select" under "Upload update" and navigate to the desired .swu file.  
Upload with "Open".

**Aktuelle Software**

Name	Version
Web-Ansicht	C_MBT_4.2.5
Steuerung	--

**Verfügbare Software**


Keine Verbindung zum Update-Server. Bitte Update hochladen.

**Update hochladen**

Bitte wählen Sie Ihre \'.swu'-Datei aus Auswählen

**Firmware-Update**

Name	CAN ID	Aktuelle Firmware	Verfügbare Firmware	Update
------	--------	-------------------	---------------------	--------

- 6 Click on  to start the update after it has been uploaded.
- 7 After the software update, the test stand must be restarted for the settings to take effect. Afterwards, all further work steps can be carried out in the same way as for commissioning.

**Aktuelle Software**

Name	Version
Web-Ansicht	C_MBT_4.2.5
Steuerung	--

**Update abgeschlossen**

Update anwenden und neu starten

Bitte überprüfen Sie nach dem Neustart, ob unter "Externe Geräte" zusätzlich ein Software-Update für ein externes Gerät durchgeführt werden muss.

- 8 If necessary, the previously exported settings can be adopted again: "Settings/General/Support". For this purpose, registration as a fitter is necessary!

## Einstellungen importieren

Der Import überschreibt alle Optionen und Einstellungen.

Bitte wählen Sie Ihre \'.json' Datei aus Auswählen

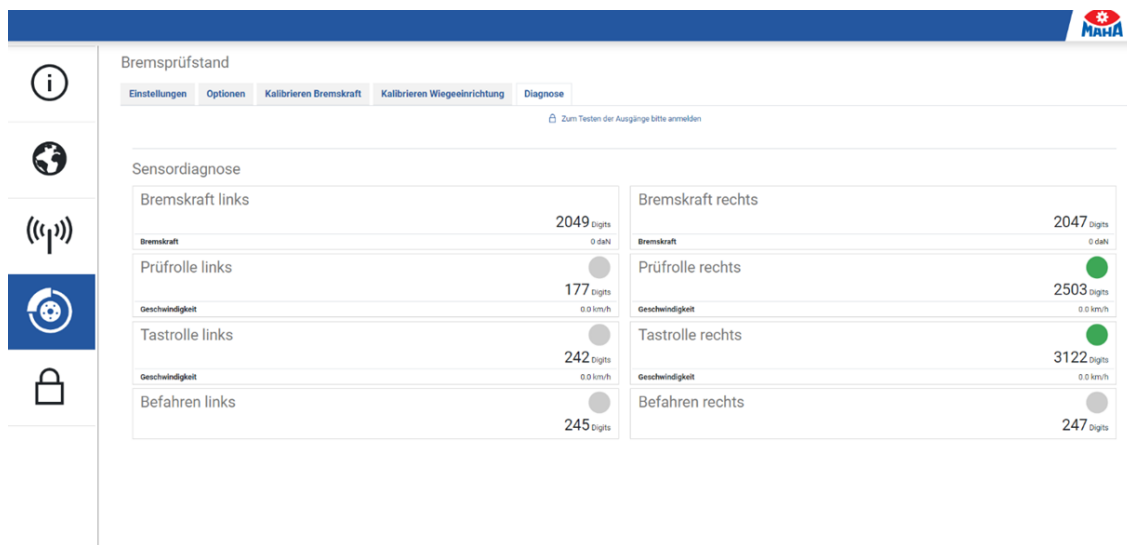
## 10.3 Checking the Sensor Function



### WARNING

- During the test of the sensor functions, the main switch may only be operated by authorised and trained personnel.
- Make sure that there are no other persons in the danger zone.
- Only press the sensing rollers individually, never simultaneously.

**Diagnostic menu:** The mechanical brakes are automatically released when opening the Diagnostic menu.



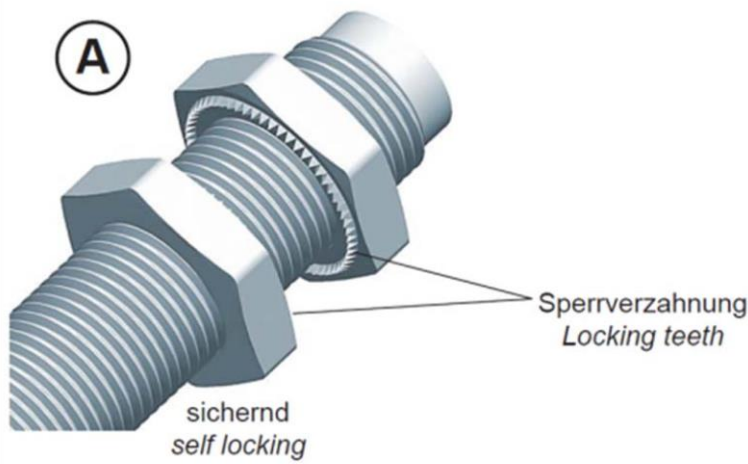
Function	Sensor
Press sensing roller	LED of the Occupied sensor must light up, left + right
Rotate sensing roller	Speed sensor of the sensing roller must flash, left + right
Rotate brake roller	Speed sensor of test roller must be flashing, left + right (also see section „Repairs > Releasing Motors with Mechanical Brake“.)
Check range spring signal	Load the brake roller or motor in one direction and check whether the measured values on the test bench display change. This is only a function check!
Check weighing sensors	Load the test bench at each corner and observe a change in the measured value via the service technician screen. This is only a function check!

## 10.4 Adjusting the Switching Distance of the Sensors

All 6 Namur sensors are identical and have a switching distance of max. 4 mm. To ensure safe operation, it is important that the sensors are correctly adjusted. A switching distance of 2...3 mm is recommended for safe and fault-free operation.

### NOTICE

The locknuts have locking teeth to prevent rotation (see Fig. A). Tighten the locknuts gently, do not overtighten. If at hand, a torque wrench can also be used (tightening torque: 10 Nm).

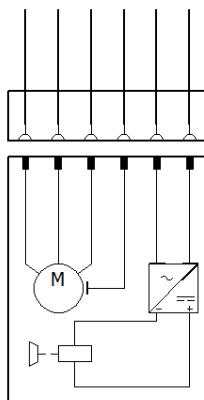


## 10.5 Releasing Motors with Mechanical Brake

The brake motors are equipped with a flange-mounted spring-applied brake. When the voltage is switched off, the motor is blocked. A special motor connection cable can be used to release the brake and allow the motor to be rotated by hand for service purposes.

Installation only in the switched-off state, taking into account the 5 safety rules.

Motor connection with mechanical brake:

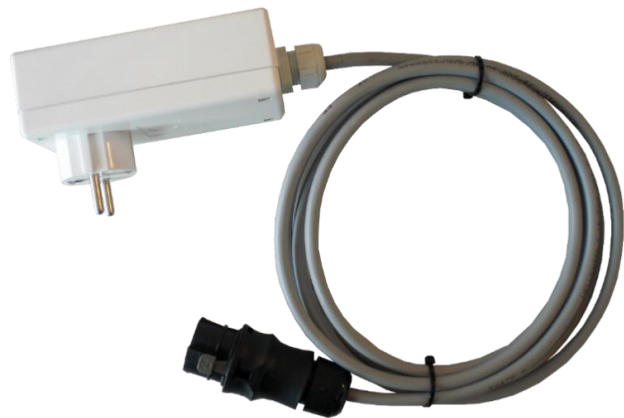
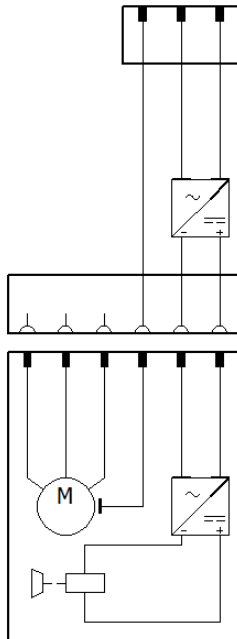


### Option 1 for brake release

Equipment needed: Brake release adapter MAHA # 1404314

Connect as follows:

- 1 Disconnect the motor supply cable plug from the motor in the roller set.
- 2 Connect the motor plug of the brake release adapter to the motor.
- 3 Connect the shockproof plug from the brake release adapter to 230 VAC; 50/60 Hz; L, N, PE shockproof socket (max. B16A, 30 mA RCD).
- 4 Test roller can be rotated by hand.
- 5 Remove the brake release adapter after use.



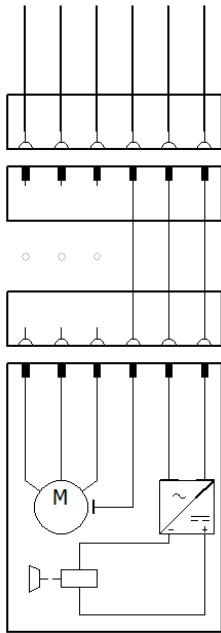
### Option 2 for brake release

Equipment needed: Brake release adapter MAHA # 1403248

Connect as follows:

- 1 Disconnect the motor supply cable plug from the motor in the roller set.
- 2 Connect the motor plug from the brake release adapter (jack) to the motor.
- 3 Connect the motor supply cable plug to the brake release adapter (pins). Intermediate piece in motor supply line.
- 4 Select and enable the required test roller side via the Service technician menu.
- 5 Test roller can be rotated by hand.
- 6 Remove the brake release adapter after use.





### Option 3 for brake release

Unlocking the mechanical brake via software (without fitter key)

- 1 Open installer menu
- 2 When "Calibration Brake Force" or "Diagnosis" is opened, the mechanical brake automatically unlocks (left and right brake) as long as you remain in this menu.  
When leaving the menu, the mechanical brake locks again automatically.

Unlocking the mechanical brake via software (with fitter key)

- 1 Open installer menu
- 2 Log in with fitter key
- 3 When "Brake force adjustment", "Diagnostics" or "Input, output test" is opened, the mechanical brake automatically unlocks (left and right brake) as long as you remain in this menu. When leaving the menu, the mechanical brake locks again automatically.

## 10.6 Enabling the Test Rollers via the Service Technician Button

When selecting and confirming the required test roller side in the Service technician menu, this can be started for service purposes even if the vehicle is not in the roller set. An additional confirmation by means of a Service technician button is necessary for this.



### WARNING

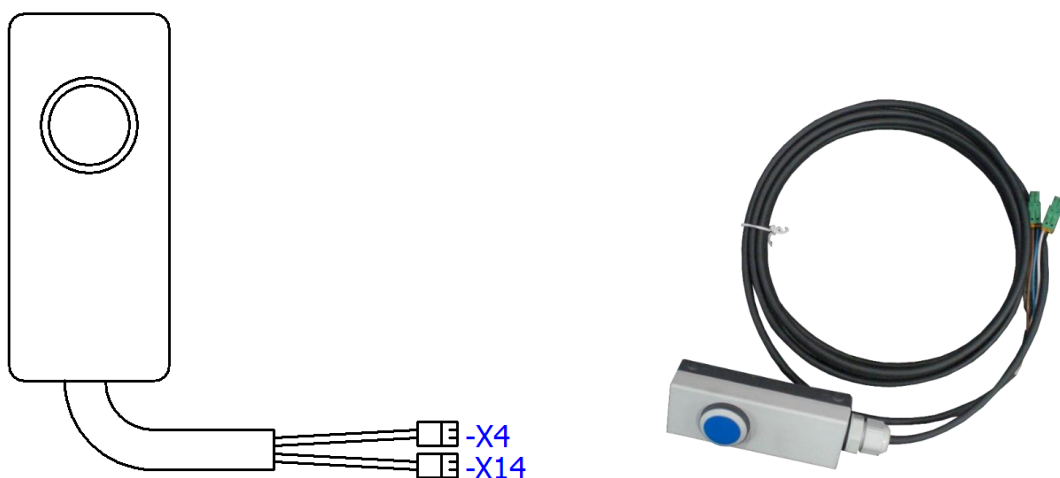
- When switching on the control cabinet with the main switch, make sure that the control cabinet door is closed. Cable feed for Service technician button via dummy screw connection on the underside of the control cabinet.
- Before and during the operation of the Service technician button, make sure that no other persons are present in the danger zone.
- Keep your distance from the roller set while pressing the Service technician button. Danger of being drawn in by rotating test rollers, chains, etc.
- The Service technician button may only be used by authorised and trained technicians for the period of time absolutely necessary. Then unplug again immediately.

---

Equipment needed: Service technician button MAHA # 1402226

Connect as follows:

- 1 If necessary, disconnect the existing plugs at the central module ZM -X4 and -X14.
- 2 Connect the two 2-pin plugs of the Service technician button to the central module ZM -X4 and -X14. Interchanging the two plugs of the Service technician button at -X4 and -X14 does not have a negative effect.
- 3 The Service technician button can be used as specified in the Service technician menu.
- 4 After use, remove the Service technician button.
- 5 If necessary, reconnect the previously existing plugs on the central module ZM -X4 and -X14.



## 11 Decommissioning, Dismantling and Disposal

Observe the product and safety data sheets of the lubricants used. Avoid environmental damage. If the device is to be disposed of, it must be disposed of in an environmentally responsible manner in accordance with local legislation. Sort all dismantled materials according to type and take them to a suitable recycling point. Collect operating materials such as grease, oil, coolant, cleaning fluids containing solvents etc. in suitable containers and dispose of them in an environmentally responsible manner.

Alternatively, you can take your device to a waste management company. They will ensure that all parts and fluids are disposed of properly and ecologically.

Safety goggles must be worn when working on hydraulic/pneumatic components. Suitable working scaffolds/platforms must be used when working at height.

## 12 Accessories

### 12.1 C\_MSA (MAHA Universal Analogue Display)

#### 12.1.1 Description

The C\_MSA (CONNECT\_MAHA simultaneous display) is used to display measured values generated by a brake tester.

The LEDs are used for user guidance and indicate whether the display is in operation and connected, and whether the pointers refer to the small or the large measuring range.

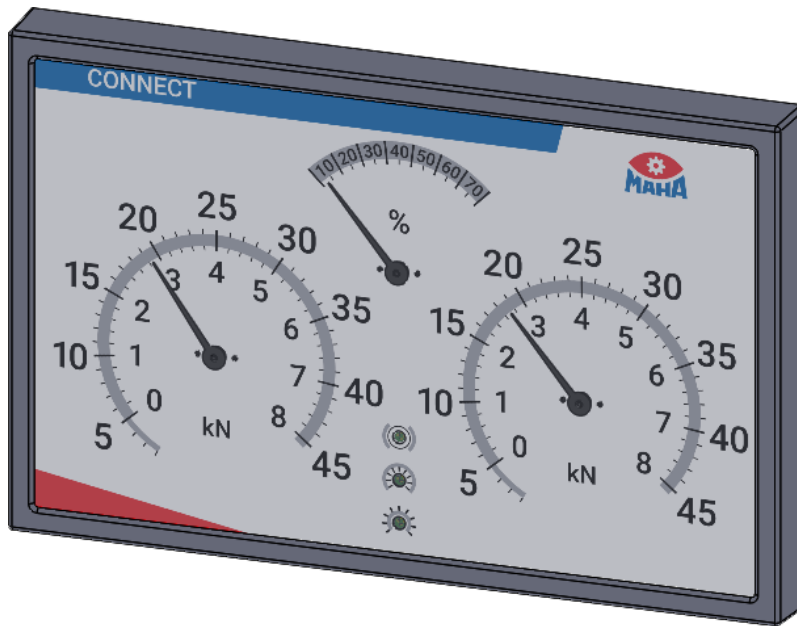
Simultaneous displays are used in workshops or test centres, especially in the truck sector where vehicles are so long that the driver has already passed the primary display while other axles are to be tested.

Some workshops operate the test bench outdoors, here the robustness of the analogue display with regard to humidity and temperature is required as well as the high contrast of the display (e.g. in sunlight) compared to a PC/TV monitor, which is usually the primary display.

The data connection of the C\_MSA to the brake tester can be established either via a network cable or via a WiFi connection.

Inside the C\_MSA is a control board that controls three stepper motors and three LEDs. The board is equipped with interfaces for the power supply (wide range input 12...24 V DC / < 1 A current consumption), an RJ45 network socket and an SMA connector for the WiFi antenna.

Power is supplied via a commercially available plug-in power supply unit with hollow plug (5.5/2.1 mm).



MAHA universal analogue display

### 12.1.2 Scope of Delivery

- Universal analogue display with three hand clocks, model: C\_MSA
- 2 m network patch cable
- 1 plug-in power supply unit 12 V DC / 2 A

### 12.1.3 Technical Data

- W x H x D approx. 910 x 585 x 70 mm
- Splash-proof design for outdoor operation
- Anti-reflective PMMA lens (plastic)
- Mount VESA standard 200 x 100 mm
- Weight without bracket 13 kg
- Display range 0 – 8 kN and 0 – 45.5 kN
- Difference display 0 – 70 %
- 3 LEDs for status, (small measuring range / large measuring range / ready for braking), the LED for small and large measuring range is also the mains ON lamp)
- Power supply via plug-in power supply unit 12 V DC, current consumption < 1 A

#### NOTICE

Only use power supplies with e.g. 12 V DC / 5 W according to IEC 62368-1.

- Data interface LAN or WiFi (2.4 GHz)

#### 12.1.4 Installation

The C\_MSA can be installed either on a wall mount or on a stand.

Suitable working scaffolds/platforms must be used when working at height.

##### Installing the wall mount

The hole pattern for mounting a display unit conforms to the following VESA standard: 100 x 100; 200 x 100; 100 x 200; 200 x 200

##### NOTICE

If a wall mount according to VESA standard is provided by the customer, it must be ensured that the selected mount is suitable for the weight of the analogue display.

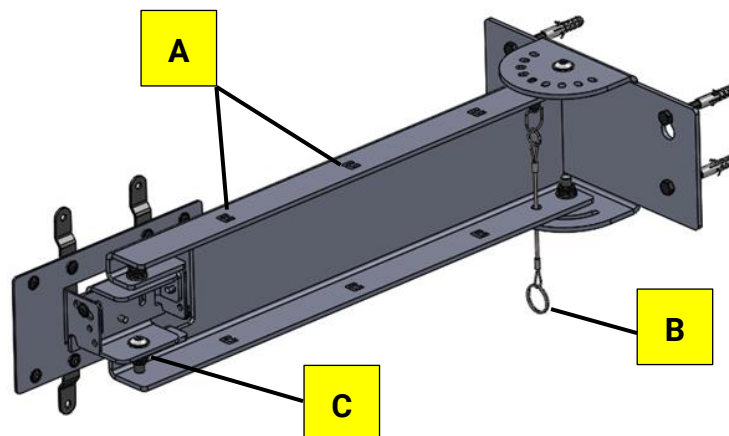
The wall mount is suitable for holding all MAHA-CONNECT display units as well as the most common TV screens/Smart TV according to the specified VESA standard. The swivel arm can be locked to the wall bracket by means of a locking bolt with pull cable. On the VESA mount, two self-locking nuts can be used to adjust the sluggishness of the rotation.

Installation accessories:

- 4 pcs. hex wood screws 8x70 mm, MAHA # 22 0571 08070 1
- 4 pcs. 10 mm anchors, model: Fischer-DUOPOWER 10 x 50, MAHA # 1405584

##### NOTICE

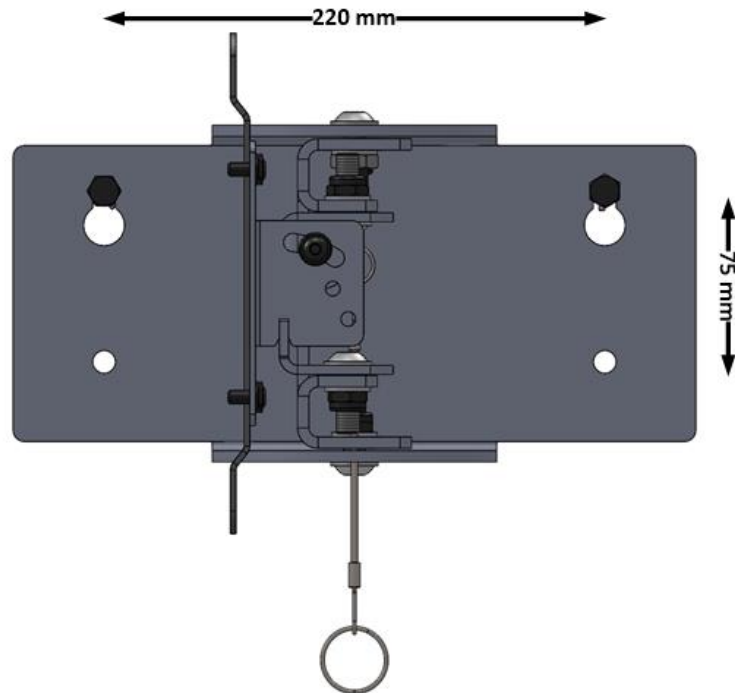
These anchors are suitable for concrete, solid brick, sand-lime brick. For other materials, suitable fastening systems must be used on site!



Cable fastening Cable tie

Locking Swivel arm

Adjustment VESA mount



- 1 Mark the upper drill holes on the selected wall according to the sketch and using a spirit level. Drill to a depth of at least 70 mm using a suitable 10 mm masonry drill bit.
- 2 Insert the upper anchors and screws into the holes and screw them in at a distance of 10 mm from the wall.
- 3 Hang the wall mount on the pre-installed screws via the keyholes, align with a spirit level if necessary and tighten the screws.
- 4 Drill the lower drill holes to a depth of at least 70 mm using a suitable 10 mm masonry drill bit. Insert anchors with screws and tighten.

### NOTICE

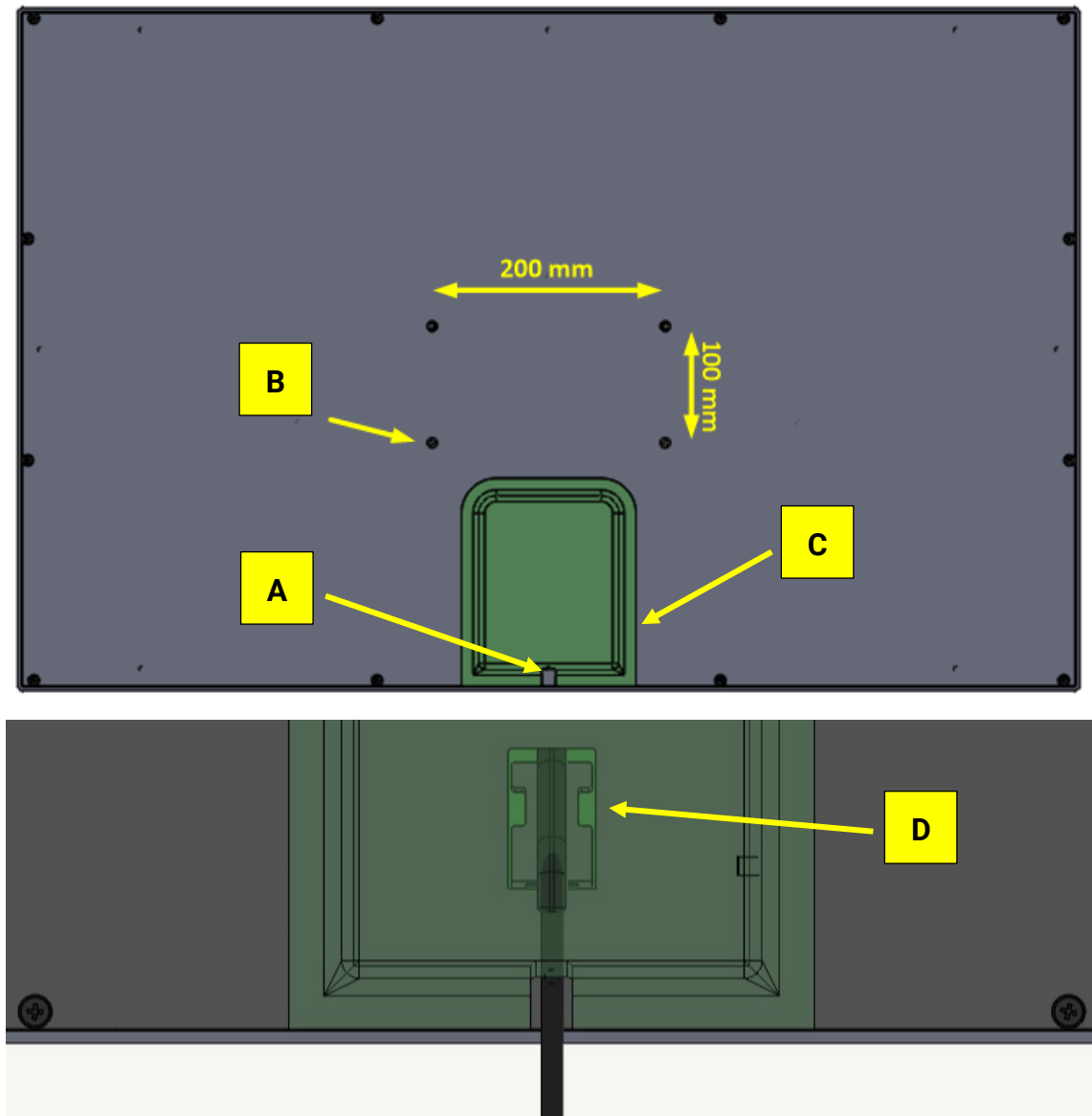
Check wall mount for tight fit after installation! Observe local and country-specific specifications with regard to installation height (e.g. impact protection, escape route).

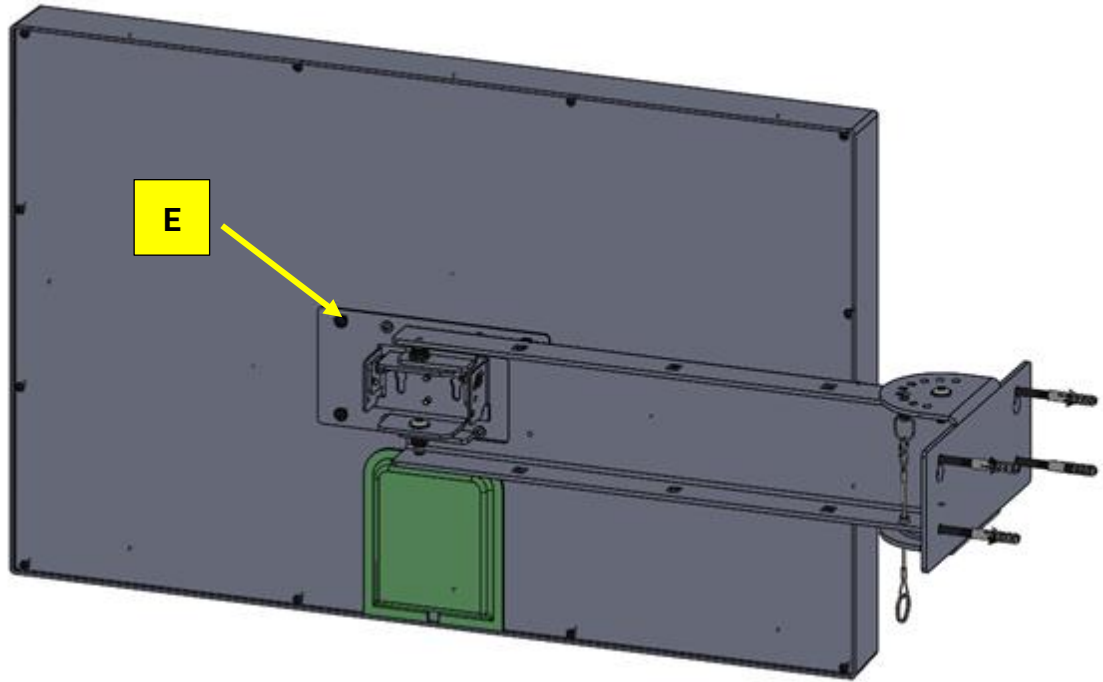
- 5 After installing the wall mount, the pointer display can be installed.

#### Installing the pointer display

- Hole pattern of the pointer display is identical to VESA standard 200 x 100 (VESA = Video Electronics Standards Association).
- 4x fastening holes M6 internal thread, max. 10 mm screw-in depth
- 4 pcs. M6x12 fastening screws are supplied with the optional MAHA wall mount.
- Weight of the display approx. 13 kg
- Display is fixed to the bracket via the 4 threads of the VESA wall mount.

- After completion of commissioning, self-adhesive cover is glued on with the cable gland facing downwards to protect against moisture and dust. Adhesive surface must be free of dust and grease.








- |          |                     |          |                              |
|----------|---------------------|----------|------------------------------|
| <b>A</b> | Cable gland         | <b>B</b> | 4 x Thread closed M6         |
| <b>C</b> | Self adhesive cover | <b>D</b> | Strain relief with cable tie |
| <b>E</b> | 4 x M6 x 12 mm      |          |                              |

### 12.1.5 Status-LEDs

#### Meaning of the LED status display



- |   |  |
|---|--|
|  | Ready to brake                         |
|  | Small measurement range active 0-8 kN  |
|  | Large measurement range active 0-45 kN |



System status	LED Ready for braking	LED Small measuring range	LED Large measuring range
No WiFi connection	Fast flashing	Off	Off
WiFi connection being established	Slow flashing	Off	Off
No connection to central module ZM	Off	Fast flashing	Off
Connection to ZM being established	On	On	On
Initialised	Off	On	Off
Error	Fast flashing	Fast flashing	Fast flashing
Test bench in 4WD mode	Off	On	Fast flashing
If vehicle on side-slip tester or MSD, or System settings active	Off	Slow flashing	Off
Test bench in System settings	Off	Slow flashing	Off

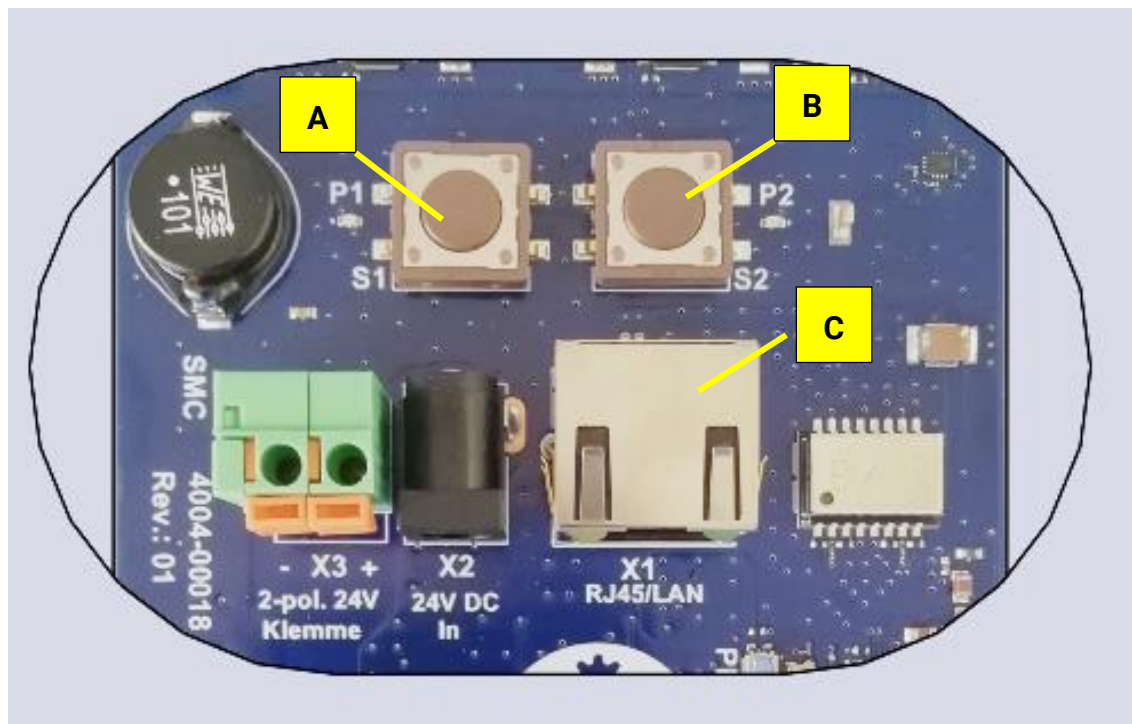
### 12.1.6 Setup

#### Board overview

**A** WPS-Button

**B** Pairing-Button

**C** LAN-Connection



**Establishing a WiFi / LAN connection**

- **Option 1:** Direct LAN connection to the central module

Connect the analogue display to the MAHA port (X13) of the central module using a LAN cable.

**NOTICE**

- A network hub is recommended for commissioning with the "LAN connection" variant. The network hub enables the simultaneous connection of the analogue display and the service PC for coupling with the control board ZM (central module) at the X13 port.
- Alternatively, the RJ45 socket X12 "External" can be used on the control board ZM (central module), if not assigned.
- If a network socket of the control board is connected to the house network, the analogue display can also be connected to the test bench via the house network.

- **Possibility 2:** Connection via a WLAN router connected to the central module.

- **Possibility 2.1: LAN**

Connect the analogue display to the test stand via a WLAN router using a patch cable:

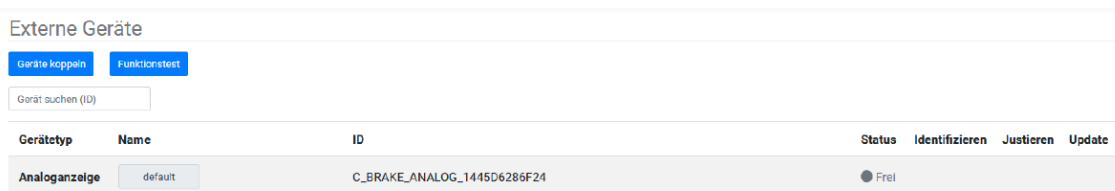
- Plug one end of the network cable into the RJ45 socket (C) of the display.
- Plug the other end into a free RJ45 socket of the router.
- Connect the router to the control board of the test stand (ZM) via the RJ45 socket X13 "MAHA".
- After the successful network connection, the fast flashing LED "Ready to brake" changes to the fast flashing LED "Small measuring range".

This completes the LAN connection.


Continue with **pairing with central module**

**Result**

After successful connection, the "LED small measuring range" stops flashing and the analogue display appears in the "External devices" view with the status "Free".



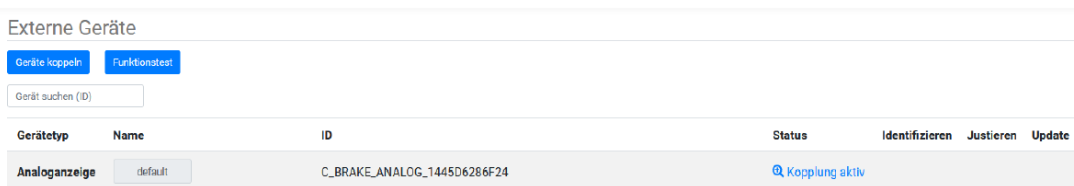
**Coupling (pairing) with central module**

- Call up the test stand website using a smart device, PC or laptop (standard: <http://maha-mbt.maha>, alternative: <http://192.168.201.1>).
- Call up the system settings (click on the MAHA logo). 

- Under "General", select the tab "External devices" (no login required). All accessible analogue displays in the network including **status** are shown there (possible: Connected, Busy, Pairing active or **Free**):

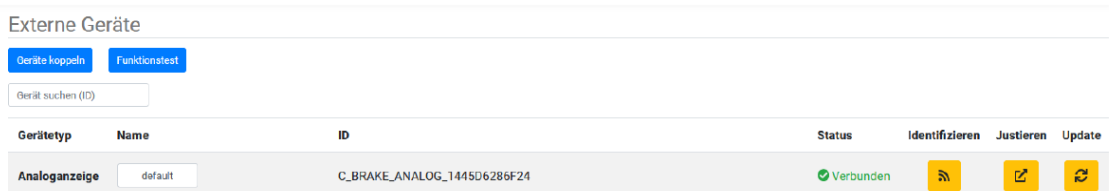


- Activate coupling of the test stand by pressing the button "Couple devices".
- A field appears with a counter showing how long the test stand is still in pairing mode.
- After the countdown has elapsed or when you exit the menu, the pairing is terminated.
- Leave the menu open and go to the analogue display.
- Briefly press the pairing button on the display. To do this, briefly press the button S2 on the circuit board on the back of the display (siehe Abschnitt "....") The connection is established: "Coupling active"



## Result

The analogue display is initialised ("LED small measuring range" is permanently lit) and in the "External devices" view the analogue display has the status "Connected".



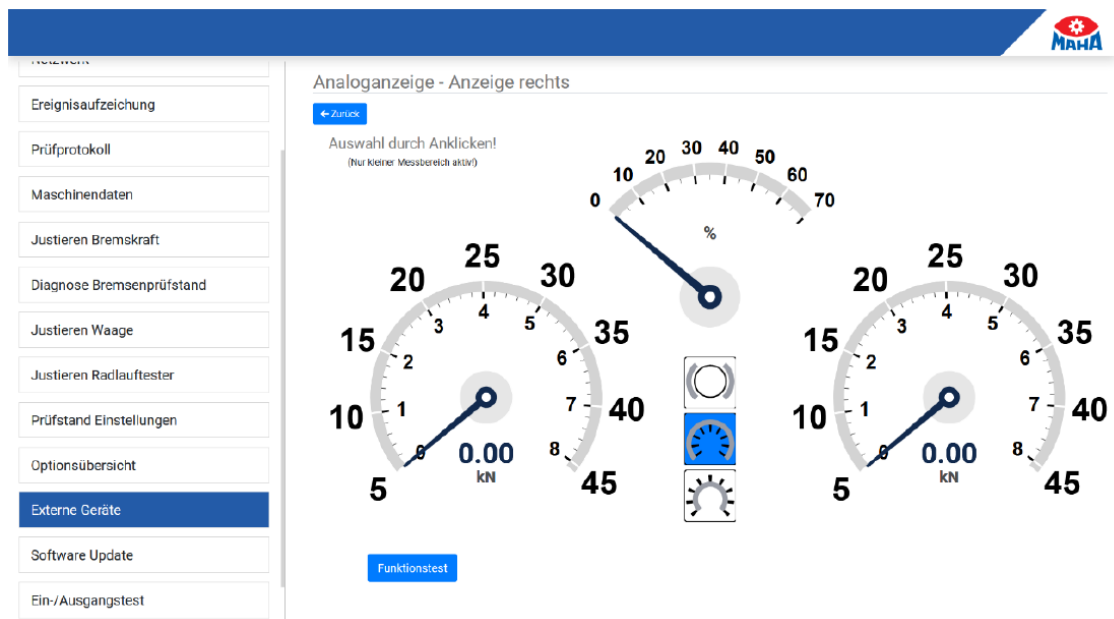
- The pairing can be cancelled/terminated at any time by pressing the button "End pairing" and the system settings can be exited.



- Once a connection has been made to a particular test stand, the display will always reconnect to it.
- After connecting, the name of the analogue display can be changed under "Names". To do this, write any name in the field provided. Press the "Enter" key to accept the changed name.

### Checking the function of the LEDs

- Click on the "Adjust" button in the "External devices" view
- Between the left and right hands are three buttons for the respective LEDs of the analogue display.
- The LEDs can be switched on and off by clicking the buttons:
- If an LED on the analogue display is **on**, the corresponding button is coloured **blue**.
- If an LED is off, the button is **white**.



## Function test

The function of the hands and LEDs of the analogue display can be checked with a function test. The function test can be started either via the "External devices" view or via the adjustment menu of the analogue display.

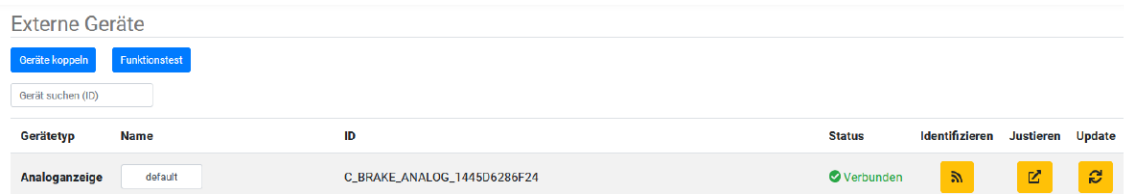
### Sequence of a function test

- All LEDs go out
- Pointer initialisation (pointers move to mechanical zero point and then to 0 kN / 0 %)
- LED small measuring range goes on
- Move pointer to 4 kN / 35 %
- Pointer move to 8 kN / 70 %
- Move pointer to 0 kN / 0 %
- "LED ready to brake" of the analogue display flashes three times

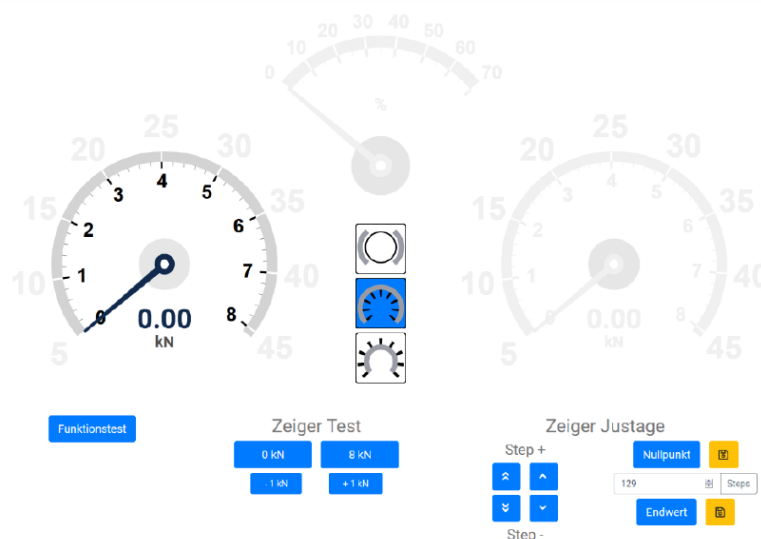
### Adjusting the pointers

- Log in to the fitter menu.

Click on the "Adjust" button in the "External devices" view.



- The analogue display now carries out a pointer initialisation.
- Select the desired pointer by clicking on it.
- The zero point or end value of the right and left pointer corresponds to 0 kN and 8 kN respectively.
- The zero point or end value of the differential display corresponds to 0 % or 70 % respectively.



### Adjusting the zero point

- Click on the "Zero point" button if the pointer in the WebApp is not set to 0 kN/0 %.
- Move the pointer of the analogue display to 0 kN/0 % by repeatedly clicking the "Step +" and "Step –" buttons. Small or large steps can be taken (single or double arrow).  
It is also possible to approach a step position of the motors by entering it in the "Steps" field and then clicking the "Steps" button, in order not to have to click the "Steps" buttons too often in case of large deviations.
- If the pointer of the analogue display is at 0 kN/0 %, this position can be saved by clicking the save symbol to the right of the zero point button.

### Adjusting the end value

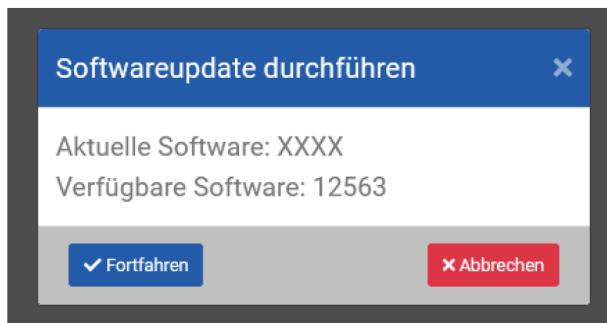
- Click on the "End value" button if the pointer in the WebApp is not set to 8 kN/70 %.
- Move the pointer of the analogue display to 8 kN/70 % by repeatedly clicking the "Step +" and "Step –" buttons. Small or large steps can be taken (single or double arrow).  
It is also possible to approach a step position of the motors by entering it in the "Steps" field and then clicking the "Steps" button, in order not to have to click the "Steps" buttons too often in case of large deviations.
- If the pointer of the analogue display is at 8 kN/70 %, this position can be saved by clicking the save symbol to the right of the end value button.

### Checking zero point and end value

The adjustment can be checked by moving to the zero point and end value by clicking the "Zero point" and "End value" buttons.

### 12.1.7 Software Update

If a software update is available for the analogue display, an update button appears in the "External devices" view. After clicking on this button, a window appears with the currently installed and available software version.



After confirming this window by clicking on "Continue", the update is carried out. After a successful update, the analogue display restarts.

### 12.1.8 Other

#### Reset (delete) WiFi connection

- Press the WPS button (S1) on the analogue display for at least 5 seconds.
- Analogue display then restarts (recognisable by pointer initialisation).

#### Reset (delete) connection to central module

- Press the pairing button (S2) on the analogue display for at least 5 seconds.
- Analogue display then restarts (recognisable by pointer initialisation).

## 12.2 C\_BOX

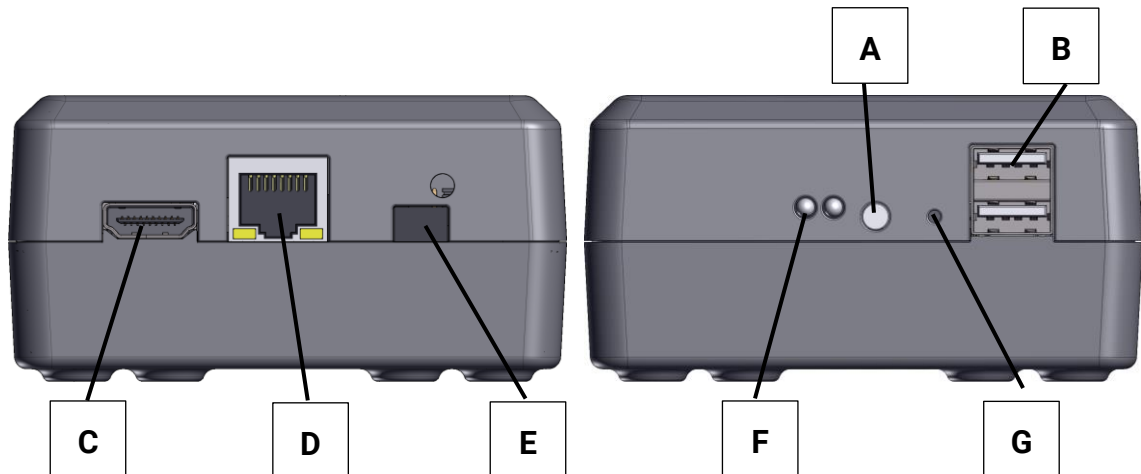
### 12.2.1 Description

The C\_BOX is the digital counterpart to the analogue display. It serves as an interface between a standard TV set or a monitor and a brake tester of the CONNECT series.

The displays can be connected to the C\_BOX via an HDMI cable, which in turn is connected to the test bench via LAN cable or WiFi. In this way, the user interface of the test bench is displayed.



### Side connections

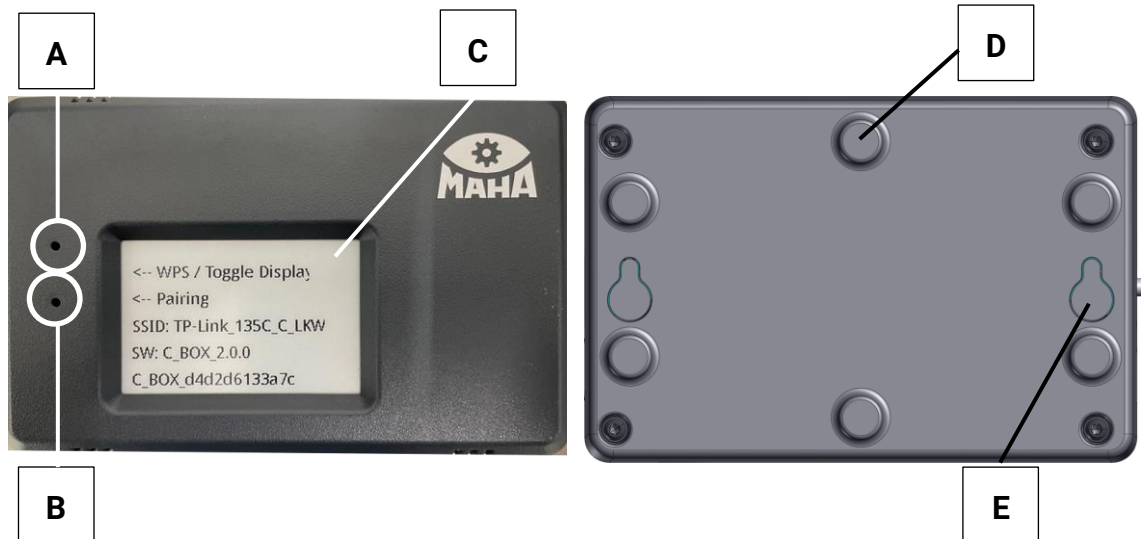


- A Power
- C HDMI-Output
- E BNC (5V)
- G Reset

- B 2 x 2.0 USB
- D RJ45-Ethernet
- F Status LED



## Connections on top side/bottom side



- |          |                                     |          |                             |
|----------|-------------------------------------|----------|-----------------------------|
| <b>A</b> | WPS Button                          | <b>B</b> | Pairing Button              |
| <b>C</b> | E-Paper User Interface              | <b>D</b> | Integrated magnetic holders |
| <b>E</b> | 2 keyholes for alternative mounting |          |                             |

### 12.2.2 Scope of Delivery

- Network module (LAN/WiFi), model: C\_BOX
- 2 m network patch cable
- 1 plug-in power supply unit 5 V DC

### 12.2.3 Technical Data

Operating temperature range .....	+5 °C...+45°C
Operating voltage .....	230 V/0,5 A AC-Input
Current consumption max.....	5 V/0,3 A DC-Output
Plug power supply .....	Hollow plug 5.5/2.1
IP protection class .....	IP 20
Dimensions [W x H x D].....	90 x 135 46 mm
Weight without packaging approx. ....	ca. 350 g
Data interface cable .....	Gigabit Ethernet – RJ45
Data interface radio.....	2.4 GHz WLAN

## 12.2.4 Display Requirements

The TVs or monitors used as displays must have an HDMI input.

### NOTICE

It is recommended

- to use displays with a minimum resolution of 1920\*1080 (Full HD).
- to use a native HDMI cable, as there is no guarantee of correct display when using an adapter.

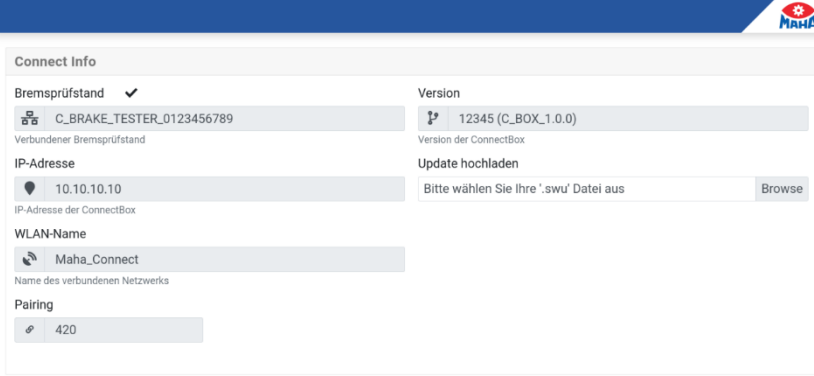
## 12.2.5 Installation

### NOTICE

Observe correct sequence!

- 1 Connect C\_BOX and display using an HDMI cable.
- 2 Switch on the display and, if necessary, select the HDMI port used as the input.
- 3 Plug the power supply unit into the C\_BOX and connect it to a power socket. A green LED on the right side of the C\_BOX starts to light up.
- 4 C\_BOX starts up, please wait. It may take up to 2 minutes for the configuration page to appear on the display.
- 5 The C\_BOX is ready for operation as soon as a blue LED lights up on the left side.

### Configuration page



The screenshot shows the 'Connect Info' page of the C\_BOX configuration interface. It features a blue header with the MAHA logo. The page is divided into several sections: 'Bremsprüfstand' (Brake Test Status) with a dropdown menu and a checkmark, 'Version' (12345 (C\_BOX\_1.0.0)), 'IP-Adresse' (10.10.10.10), 'WLAN-Name' (Maha\_Connect), and 'Pairing' (420). There is also an 'Update hochladen' (Upload Update) section with a 'Browse' button and a text prompt: 'Bitte wählen Sie Ihre '.swu' Datei aus'.

- **Brake tester** displays the name of the brake tester as soon as a coupling was successful (see menu item "External devices"). If there is a connection to the test bench, a check mark is displayed next to "Brake tester".
- **IP address** displays the WiFi IP address of the C\_BOX (default: 192.168.203.1).
- **WiFi name** specifies the SSID of the connected WiFi.

- **Pairing** shows the remaining time in seconds when the C\_BOX is actively searching for a test bench.
- **Version** specifies the version of the C\_BOX.

### 12.2.6 Connecting the C\_BOX with the Brake Tester

To connect a C\_BOX with a brake tester of the CONNECT series, two steps are necessary. These steps are identical for new and already set up devices.

- 1 Integrate the C\_BOX into the network of the test bench.
- 2 Couple the C\_BOX with the test bench.

#### Establishing a network connection

The network connection can be established in two ways:

- wirelessly via WiFi. This requires a WiFi router with WPS functionality connected to the test bench, e.g. the TP-Link of the test bench (see section "Establishing a WiFi connection").
- wired via network cable (min. CAT 5).

#### Establishing a WiFi connection

- 1 Press the WPS button on the WiFi router or activate the WPS function.
  - This varies depending on the router, see the respective product documentation.
  - When using the TP-Link, **briefly** press the "WPS/Reset" button.
- 2 Briefly press the WPS button on the C\_BOX. To do this, press with a thin object into the **upper** opening.
- 3 Please wait (currently no visual feedback in the user interface or on the display).
- 4 After a few minutes, the name of the test bench WiFi (SSID) appears in the "WiFi name" field on the configuration page, and the IP address updates accordingly.


#### Establishing a LAN connection

- 1 Connect the C\_BOX to the test bench via LAN cable.
  - Plug one end of the network cable into the RJ45 socket of the C\_BOX.
  - Plug the other end on the control board ZM preferably into the RJ45 socket X13 "MAHA". If a router with free ports is already connected to this, connect the LAN cable there.
- 2 The C\_BOX is configured as a DHCP client and thus automatically receives an IP address from the control board.

## NOTICE

- A network hub is recommended for commissioning with the "LAN connection" variant. The network hub enables the simultaneous connection of C\_BOX and service PC for coupling with the control board ZM (central module) at the X13 port.
- Alternatively, the RJ45 socket X12 "External" can be used on the control board ZM (central module), if not assigned.
- If a network socket of the control board is connected to the house network, the C\_BOX can also be connected to the test bench via the house network.
- If no DHCP server reports in the connected network (e.g. house network) for 30 seconds, the C\_BOX starts its own DHCP server, assigns itself the IP 192.168.204.1 and distributes IP addresses in the connected network.








### 12.2.7 Coupling with the Brake Tester

- Call up the test stand website using a smart device, PC or laptop (standard: <http://maha-mbt.maha>, alternatively: <http://192.168.201.1>).
- Call up the system settings (click on the MAHA logo). 
- Under "General", select the tab "External devices" (no login required). All accessible C\_Boxes in the network, including their status, are displayed there (possible: Connected, Busy, Pairing active or Free):

Prüfstands ID: C\_MBT\_0123456789

Geräte koppeln Funktionstest

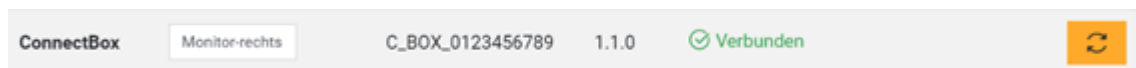
Gerät suchen (ID)

Gerätetyp	Name	ID	Version	Status	Identifizieren	Justieren	Update
Analoganzeige	Wand 1	C_MSA_0123456789	4.2.11	✓ Verbunden			
Analoganzeige	Säule	C_MSA_3265981526	1234	✓ Verbunden			
ConnectBox	Monitor-rechts	C_BOX_0123456789	1.1.0	✓ Verbunden			
ConnectBox	Fernseher-links	C_BOX_70953908317		○ Frei			

## NOTICE

- Each C\_BOX has a unique ID that is displayed on the built-in ePaper display of the C\_BOX
- Activate coupling of the test stand by pressing the button "Couple devices".
  - A field appears with a counter showing how long the test stand is still in pairing mode.
  - After the countdown has elapsed or when you exit the menu, the pairing is terminated.
- Leave the menu open and go to the C\_BOX.

- Briefly press the pairing button on the C\_BOX.
  - To do this, press a thin object into the lower opening.
  - The pairing field of the C\_BOX appears with a counter.  
After the countdown has elapsed, the pairing is automatically terminated.
- The C\_BOX couples with the test stand and loads the test stand website.
- As soon as a connection has been established with a particular test stand, the C\_BOX always connects to it again.
- In the menu item "External devices" of the test stand, the C\_BOX is now displayed as "Connected". The pairing can be completed by pressing the button "End pairing" and leaving the installer menu.



- After connecting, the name of the analogue display can be changed under "Names". To do this, write any name in the field provided.
- Press the "Enter" key to accept the changed name.

## 12.2.8 Error Handling

### Open configuration page

The configuration page is only displayed if no connection to the test bench could be established yet. If the test bench view is already displayed, it is possible to navigate to the configuration page by holding the WPS button on the C\_BOX for at least 7 seconds. By holding the WPS button again for at least 7 seconds, it is possible to switch back to the test bench page. No settings are lost in the process.

### C\_BOX is not displayed in the list of external devices?

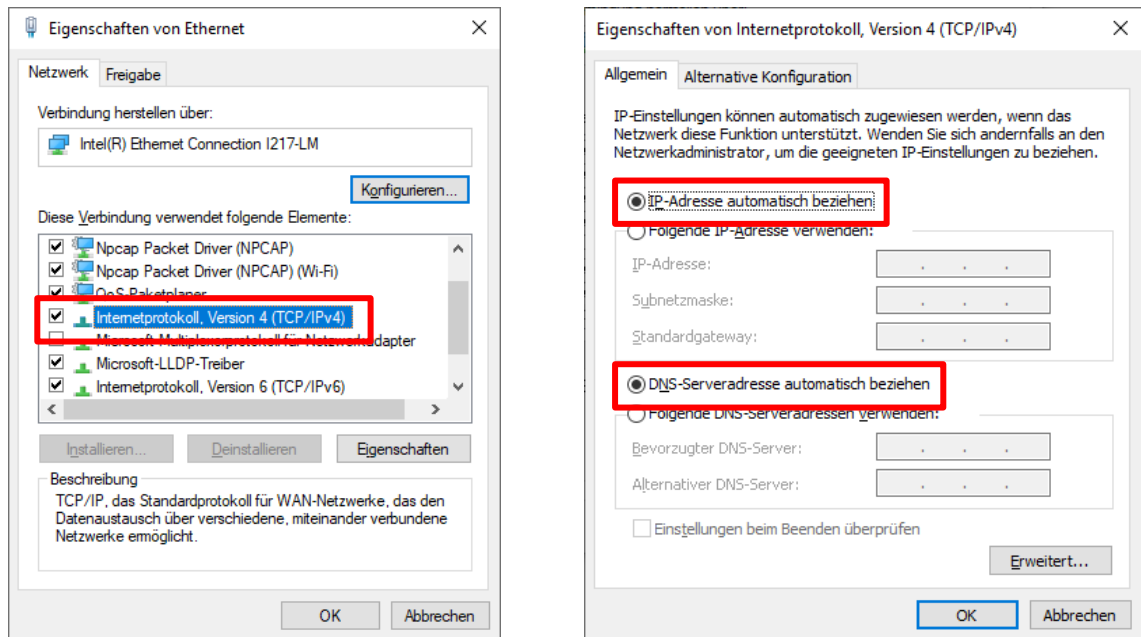
- Check connection (WiFi, LAN).
- Restart C\_BOX (press button on the right side).

### NOTICE

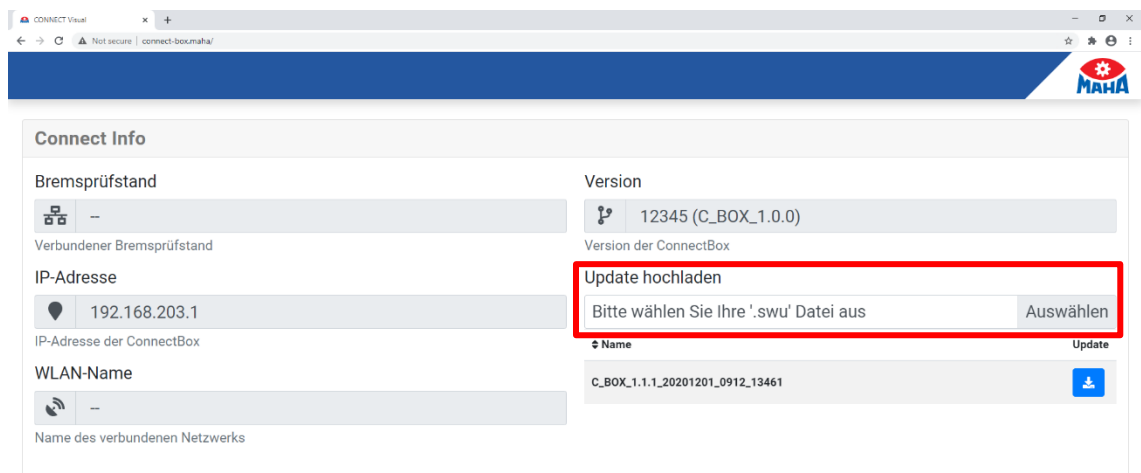
The coupling in the device overview is blocked if another test bench already has an active coupling in the same network. This prevents unwanted coupling.

## 12.2.9 Software Update

- 1 Download update from the support area of the MAHA homepage [www.maha.de](http://www.maha.de).
- 2 Connect C\_BOX to PC/notebook via LAN cable.
  - The network interface of the computer must be configured as a DHCP client. This means that the options "Obtain IP address automatically" and "Obtain DNS server address automatically" must be activated in the properties of the corresponding Ethernet connection in the "Internet protocol, version 4" element.



- 3 In the browser, navigate to <http://connect-box.maha.de>.
- 4 Click the "Select" button in the "Upload update" input field.



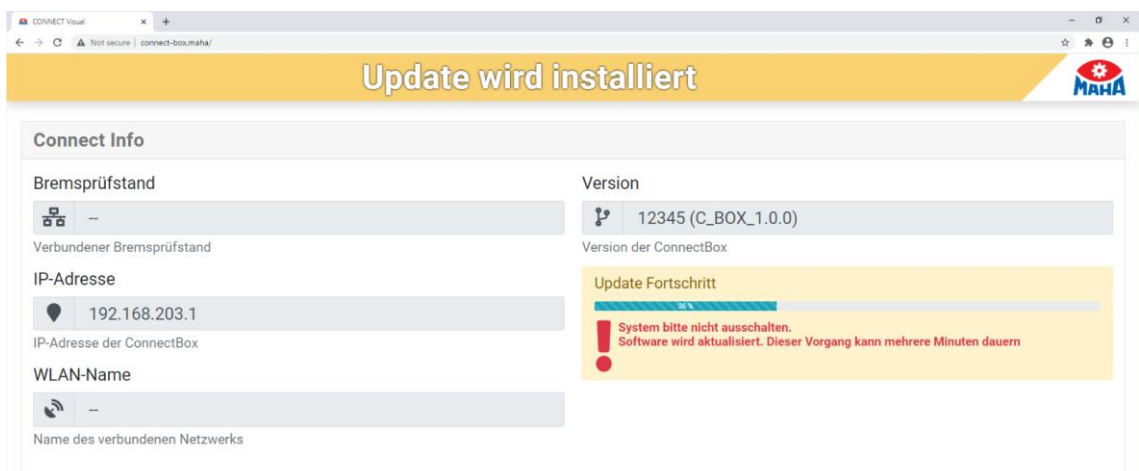
- 5 Select and confirm the update (C\_BOX\_xxx.swu) in the dialogue box that opens.



- 6 The update is uploaded and checked, please wait.
- 7 When the update has finished uploading, the version number is displayed in the "Name" field.
  - If the wrong file has been uploaded, another update can be selected by clicking in the input field again.
  - Once the desired version has been uploaded, click the blue "Update" button.
- 8 Confirm security prompt.



- 9 The update is started, a progress bar appears. Please wait.



- 10 After a successful update, press the button to restart.

**Connect Info**

<b>Bremsprüfstand</b> -- Verbundener Bremsprüfstand	<b>Version</b> 12345 (C_BOX_1.0.0) Version der ConnectBox
<b>IP-Adresse</b> 192.168.203.1 IP-Adresse der ConnectBox	Update abgeschlossen Update anwenden und neu starten
<b>WLAN-Name</b> -- Name des verbundenen Netzwerks	

- 11 The board will now reboot and the update will be applied. This reboot takes a little longer than a normal reboot.

### NOTICE

Do not disconnect the C\_BOX from the power supply during the reboot!

- 12 The update is complete when the configuration page appears in the browser. The version field contains the new version.
- 13 Browser tab can be closed and the LAN connection disconnected.
- 14 Reconnect the C\_BOX to the test bench network:
  - If a WiFi was previously configured, the C\_BOX automatically reconnects to it.
  - If the C\_BOX was connected to the test bench via LAN, plug the LAN cable back in.



## 12.3 Configuration of WiFi Router

### 12.3.1 Requirements

- WiFi router with WPS function
- Example here: TP-Link WR841N with power supply
- MAHA C\_MBT CONNECT
- Ethernet cable (sufficiently long)
- Notebook or tablet

### 12.3.2 Purpose

Correct configuration puts the TP-Link WR841N in a state where it can be operated together with the MAHA C\_MBT CONNECT. After configuration, it is possible to access the MAHA C\_MBT CONNECT with mobile devices such as notebooks, smartphones, tablets, etc. via WiFi using the TP-Link WR841N.

### 12.3.3 Carrying out the Configuration

#### NOTICE

The steps must be carried out exactly in the sequence described here. Otherwise, correct interaction of the TP-Link WR841N with the MAHA C\_MBT CONNECT cannot be guaranteed.

---

#### Connect to TP-Link WR841N

The setup of the connection to the WiFi of the TP-Link WR841N is shown using Windows 10 as an example; the concrete procedure will differ under other operating systems.



- Supply power to the TP-Link WR841N; no network cable should be connected to the TP-Link during this process.



- Turn on the power switch on the back of the router, if present.



- Wait until TP-Link WR841N is started. The two LEDs on the left side of the TP-Link then show green steady light.
- Determine the WiFi name (SSID) of the TP-Link WR841N. This name is indicated on the underside of the device.
- The name of this network usually looks like "TP-Link\_0000", but instead of 0000 there is a combination of numbers and letters.



- determine "Wireless Password/PIN" for network of TP-Link WR841N, this is also indicated on the back panel.



- Open the network overview under Windows, under Windows 10 by clicking on the icon with the red border.
- Click on the network name of the TP-Link WR841N, this is similar to "TP-Link\_0000".



- Remove the check mark from "Connect automatically" and click on "Connect".

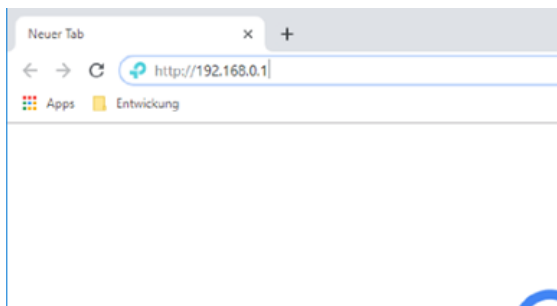


- If necessary, "Wireless Password/PIN" of the TP-Link.
- Enter WR841N as the "Network Key" and click "Next".
- A "network key" is usually at least 8 characters long.
- After this step, the WiFi connection should have been established, otherwise a Windows message will appear stating that the network key is not correct.

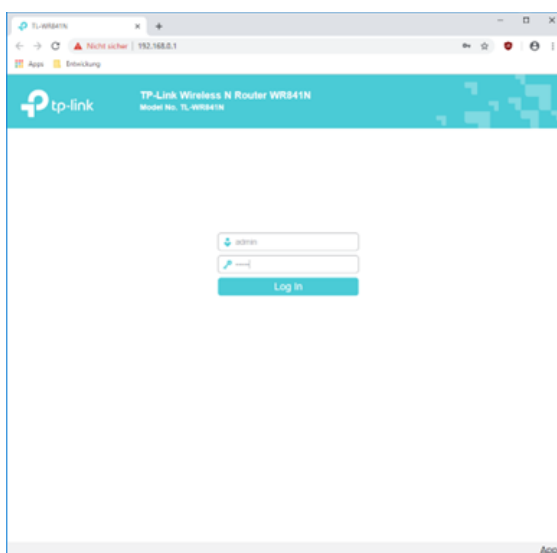
### Logging on to the administration interface

The TP-Link WR841N can be configured using a web browser (such as Microsoft Edge, Google Chrome or Mozilla Firefox). The following steps indicate how to reach the interface for configuration.

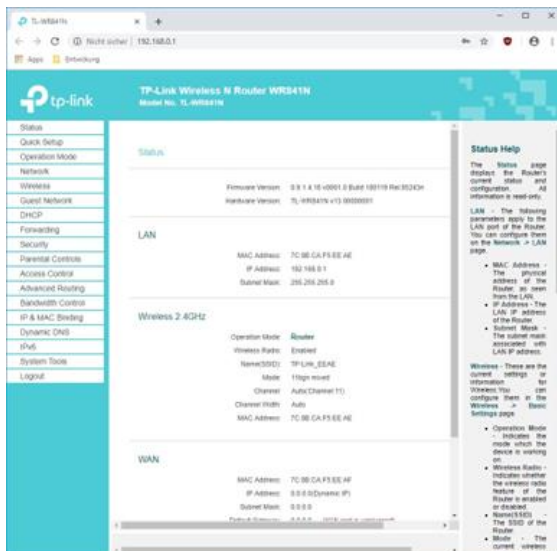
- Open web browser as usual.



- In the browser address bar, type `http://192.168.0.1` and press Enter.
- In the delivery state, the TP-Link WR841N can be reached at this address.



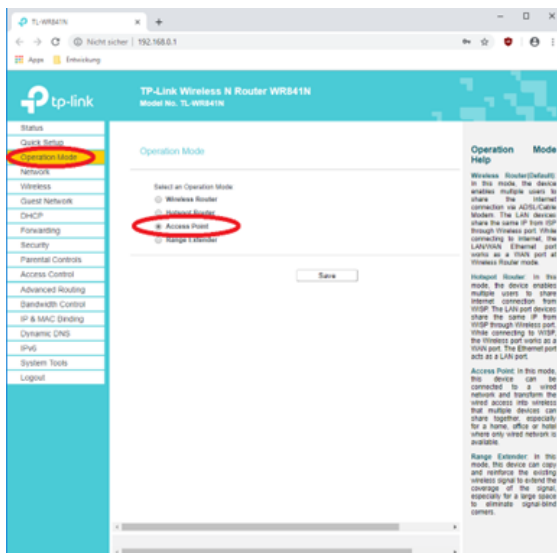
- Enter the user name "admin" on the configuration interface of the TP-Link WR841N.
- Enter password "admin".
- Click on "Log In".



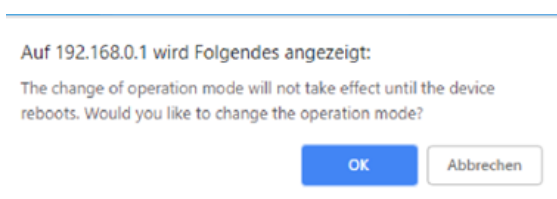
- After successful login the displayed website appears.

## Set Operation Mode

The login to the administration interface of the TP-Link WR841N is done, see section "Login to administration interface".



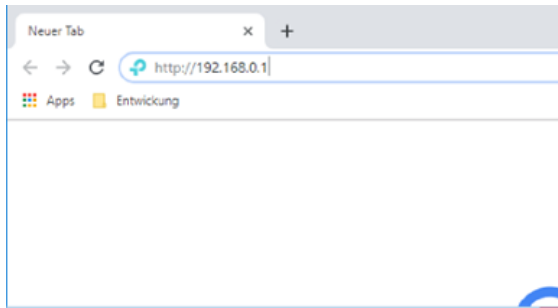
- First click on "Operation Mode" in the left menu bar.
- Then select "Access Point" on the page that opens.
- Click on "Save".



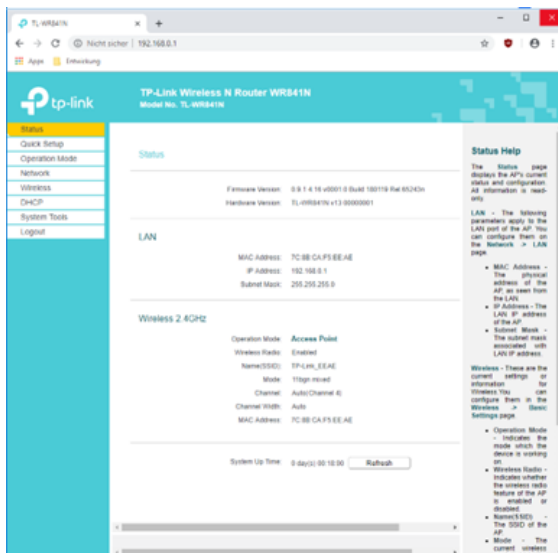
- Now a message appears that the TP-Link WR841N must be restarted.
- Confirm with "OK".

- The system restarts.
- If the computer does not automatically reconnect to the WiFi, repeat the steps in the section "Connecting to TP-Link WR841N".

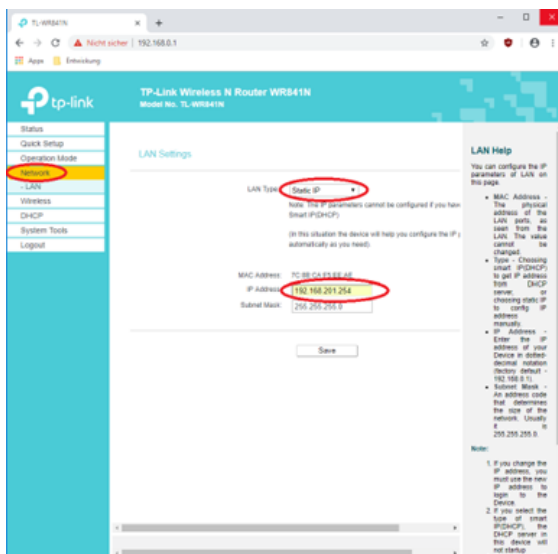
## Set IP address



- In the browser, navigate back to the address `http://192.168.0.1`.
- If necessary, log in again as described in the section "Logging into the administration interface".



- The interface of TP-Link WR841N has become much clearer after performing the steps from section "SetOperation Mode".



- Click on the "Network" menu item.
- After that the "LAN Type" is set to "Static IP".
- Under "IP Address" enter the address `192.168.201.254`.
- Click on "Save"

Auf `192.168.0.1` wird Folgendes angezeigt:

Modification of LAN IP Address or Subnet Mask will take effect after rebooting, click OK to reboot the device now.



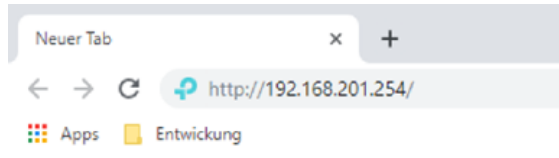
- Confirm message with "OK".
- The TP-Link WR841N restarts.
- After startup, the TP-Link WR841N can be reached at `http://192.168.201.254`.

## Logging on to the administration interface (with changed IP)

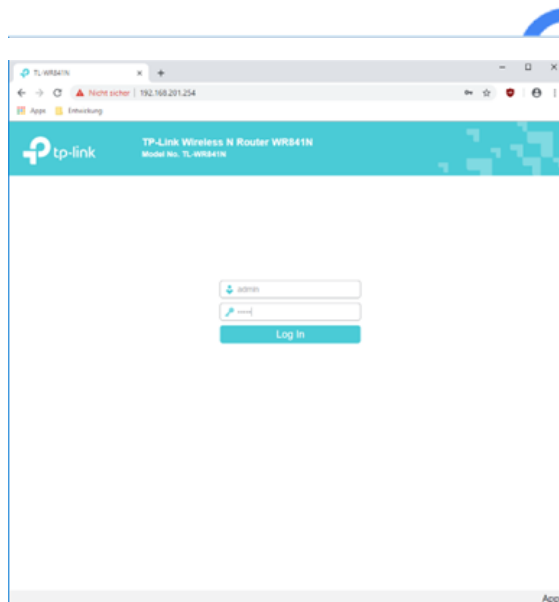
The MAHA C\_MBT CONNECT is supposed to manage its network, so the TP-Link WR841N is not allowed to do so. First, reconnect to the TP-Link WR841N network as described in the "Connecting to TP-Link WR841N" section.

Then log in on the TP-Link WR841N with the changed address:

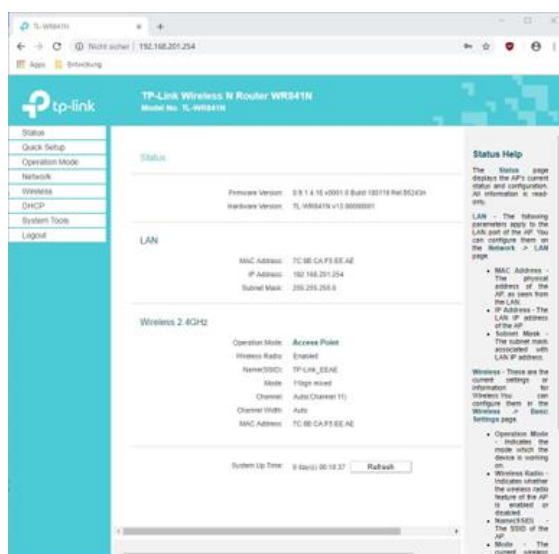
- Open web browser as usual.



- In the browser address bar, type `http://192.168.201.254` and press Enter.  
This is *not* the address that is used in the delivery state.
- Reconnect WiFi if necessary



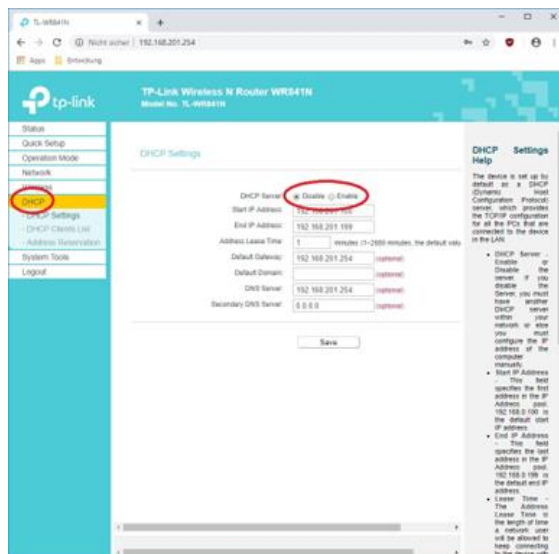
- On the configuration interface of the TP-Link WR841N, enter user name "admin".
- Enter password "admin".
- Click on "Log In".



- After successful login the displayed website appears.

## Disable DHCP server

First, reconnect to the network of the TP-Link WR841N as described in the section "Connecting to TP-Link WR841N".



- In the menu on the left, the entry "DHCP" is selected, then the displayed page appears.
- set "DHCP Server" to "Disable".
- Click on "Save".



- Turn off the TP-Link WR841N on the back panel.

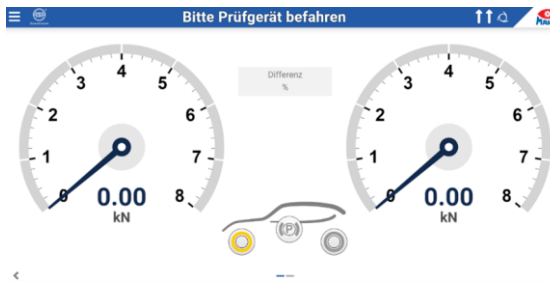
## Connection test with MAHA C\_MBT CONNECT



- Connect TP-Link WR841N to MAHA C\_MBT CONNECT via network cable.
- On the MAHA C\_MBT, plug the cable into the X13 "MAHA" socket.
- On the TP-Link WR841N, use any of the orange jacks.



- Turn on TP-Link WR841N on the back panel.
- Switch on the MAHA C\_MBT CONNECT.
- Connect computer to TP-Link WR841N's WiFi as described in section "Connecting to TP-Link WR841N".
- Open a browser.



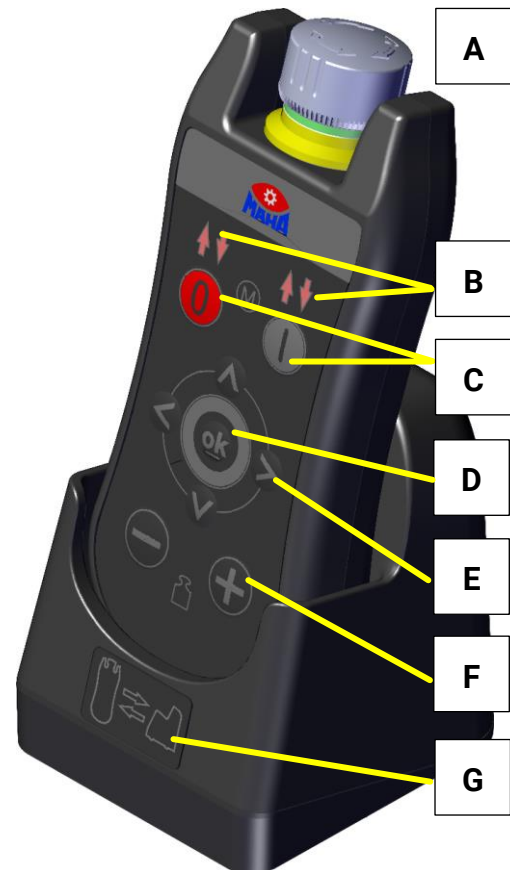
- Enter the name of the C\_MBT CONNECT in the address line of the browser: <http://maha-mbt.maha>
- If the displayed website is shown, the configuration was successful!

## 12.4 Radio Remote Control RECO S

### 12.4.1 Description

The RECO S radio remote control is considered to be an "operator's station" and enables presettings to be made in the test bench. In addition, it can also be used to manually start the test rollers, as is required in some countries, especially for truck brake testers. An emergency stop switch on the remote control ensures that the motors are stopped safely at all times.

- A** Emergency stop switch with light in the head of the switch  
 Switch head lights up red = Emergency stop active  
 Switch head grey = Emerg. stop inactive  
 Switch head flashes red = no connection to receiver
- B** LED indicator light in the shape of an arrow  
 Display of the test direction:  
 "Standard" (↑ ↑) or  
 "Counter-rotation" (↑ ↓ or ↓ ↑)
- C** Motor: I = On, 0 = Off
- D** Confirmation: ok
- E** Navigation:  
 < = Left, > = Right, ^ = Up, v = Down
- F** Load simulation:  
 + = Increase load, - = Reduce load
- G** NFC Reader (Option)



### 12.4.2 Coupling with the Receiver (Pairing)

In order to use a radio remote control, it must first be paired with a receiver. In the process the radio channel to be used is set and the unique ID of the remote control is read out.



Basically there are two possibilities to do this, depending on the existing version of the charging box. This is available in a simple version (without NFC) and optionally in a version with an integrated NFC reader.

NFC stands for "Near Field Communication" and is known from using credit cards by placing them on a reader.


- **Pairing with NFC**



- a. Hold the NFC symbol at the bottom of the back of the remote control against the corresponding symbol on the charging box. A signal tone sounds to indicate that the remote control has been paired.
- b. If the NFC symbol of the remote control is held against the symbol on the charging box again, the pairing is released and another remote control can be paired. Two beeps sound in succession, signalling that the remote control has been uncoupled.
- c. If a remote control is already paired and you hold the NFC symbol of another remote control against the symbol on the charging cradle, three signal tones sound in succession to indicate that a remote control is already paired.

### NOTICE

- As long as a pairing exists, no other remote control can be paired.
  - If the test bench is switched off by main switch, the existing pairing is automatically deleted. After each start the remote control must be paired again.
  - The working channel is set as usual on the radio receiver via DIP switch.
- 

- **Pairing without NFC**

- a. Establish a browser connection to the test stand and open "Radio/radio diagnostics/display unconnected radios" in the system settings
- b. Place the RECO S remote control in the charging cradle and wait until it is in charging mode (LED on the MAHA symbol flashes steadily). The emergency stop LED is off.
- c. Then press the button (0) for at least 3 s until the arrow LEDs change to fast treadmill mode. The pairing mode is then active for 18 s.
- d. Once the remote control is in pairing mode, it must be removed from the charging cradle.
- e. Then press the "Pairing" button  in the line of the radio remote control in the browser on the opened page of point "a".
- f. The status line now displays "Radio is being paired". As long as this is displayed, the radio receiver is in pairing mode.
- g. If the pairing process was successful, "Pairing successful" is displayed in the status bar.  
If "Pairing failed" is displayed, the process must be repeated.

- h. If the pairing process was successful, the complete line of the remote control is automatically moved from "show unconnected radios" to the display of connected radios.
- i. Now the radio remote control must be placed briefly in the charging cradle to activate it. The status of the remote control then changes to .
- j. When the remote control is removed from the charging cradle and "OK" is pressed, the emergency stop lamp on the remote control lights up, indicating that it is ready for use. The status then changes to .

### 12.4.3 Operation with RECO S

If a remote control is registered and paired with the test stand, it must be activated by pressing the <OK> button after removal from the charging box.

- **Burger menu**

The burger menu is automatically highlighted on the display. Pressing the (OK) button opens the burger menu and navigation with the Up(^), Down(v), Left (<) und Rechts (>) buttons is possible.

The burger menu can be exited by pressing the Left (<) buttons.

- a. After opening the Burger menu, the symbol for the brake tester is always highlighted. Use the Up(^), or Up(^), keys to scroll between the tester icons.
- b. Use the Right (>) key to switch to the functions of the desired tester.
- c. Use the Up(^), Down(v), Left (<) und Rechts (>) keys to scroll between functions.
- d. Press the (OK) button to confirm the selected function. Functions that are locked and cannot be selected are greyed out
- e. If a function is selected with the (OK) button, the burger menu closes automatically
- f. The burger menu can be exited by pressing the Left (<) or Right (>) button when the cursor is on one of the tester icons.

- **Load simulation**

- a Pull-down device

The (+) button is used to retract the cylinders, thereby increasing the pull on the vehicle frame.

The (-) button is used to extend the cylinders, thereby reducing the pull on the vehicle frame.

- b Roller set lift

The (+) button is used to extend the cylinders, which in the case of tandem axles increases the weight of the axle under test.

The (-) button is used to retract the cylinders, which in the case of tandem axles reduces the weight of the axle under test.

- **Emergency stop**

Once the active emergency stop switch is actuated, the motors switch off immediately and the head of the emergency stop switch is flashing red.

- a The emergency stop is active, if
  - the remote control is switched on and connected to the receiver (pairing).
- b The emergency stop is inactive, if
  - the remote control is not logged on to the test bench.
  - the remote control is in the charging box.
  - the remote control is out of range of the radio link.
  - the battery of the remote control is discharged.

- **Preselection in the burger menu**

Before entering the brake tester, pre-selections can be made (test direction, single wheel, all wheel, pre-trigger etc.).

The LEDs for the direction of rotation display on the remote control show the same behaviour as the direction of travel arrows in the status line (synchronous)!

- a. Main direction of rotation (= default) Sequence of motor start as standard: first left motor, then right motor.  
By default, the selection in the burger menu is set to "Main direction of rotation".  
If a different setting is desired, it can be selected using the navigation keys Up(^), Down(v), Left (<) und Rechts (>). Confirm with (ok).
- b. Rotation/measurement direction reversal Selection in the burger menu "Rotation/measurement direction reversal" by means of navigation keys and confirmation with (ok).
- c. Single wheel left Selection in the burger menu "Single wheel left" using the navigation keys Confirm with (ok).
- d. Single wheel right Select "Single wheel right" in the burger menu using the navigation keys and confirm with (ok).
- e. All-wheel/counter-rotation Selection in the burger menu "All-wheel" using navigation buttons Up(^), Down(v) and confirmation with (ok).
- f. Automatic roller start (observe national regulations!)  
Select "Automatic roll start" in the burger menu using the navigation keys and confirm with (ok).
- g. Pre-trigger Selection in the burger menu "Pre-trigger" using the navigation keys and confirmation with (ok).

- **Manual motor start when driving on the test bench**

If the roller set is occupied on both sides and the motor start button (I) is pressed on the remote control, a pop-up window "Confirm motor start with (ok)" appears on the screen. If the (ok) button is pressed, the rollers start according to the preselected direction of rotation. The aim is to avoid unintentional starting.

By pressing the motor stop button (0) on the remote control, both motors are switched off immediately. The test stand is then always in the operating mode "manual roller start"

After the motors have stopped, it is possible to restart the motors by pressing the motor start button (I), the pop-up window "Confirm motor start with (ok)" appears again on the screen.

- **Repeat/overwrite Car axle**

Pressing the Up (^) or Down (v) navigation buttons will scroll to the "Car axle/brake assignment" field. The cursor automatically jumps to the active brake type. By means of the Left (<) or Right (>) navigation buttons you can scroll between the three brake types FA, PB, RA.

Pressing the (ok) button switches to the corresponding brake type and assigns the next braking operation to this selection.

Exiting the field is possible by pressing the Up (^) or Down (v) navigation buttons.

- **Repeat/overwrite Car axles**

Pressing the Up(^)or Down(v)navigation buttons scrolls to the "Car Axle/Brake Assignment" field.

The cursor automatically jumps to the brake type VA (front axle). Using the navigation keys left (<) or right (>), you can scroll between the three storage options VA, FSB (parking brake) and HA (rear axle).

Pressing the (OK) button switches to the corresponding axle and assigns the next braking to this selection.

Exiting the field is possible by pressing the navigation keys Up(^)or Down(v).

- **Assign/overwrite truck axle and brake type**

After the brake test has been carried out, the cursor automatically jumps to the

"Save" button 

Confirm with (OK), the dialogue window "Assign braking result" opens

By pressing the navigation keys, the corresponding axis and brake type can be selected and confirmed with (OK).

The cursor automatically jumps to the "Save" button and can be confirmed with (OK).

The window closes and the measurement screen enables the next brake test. The cursor is automatically placed on the burger menu again.

## 12.5 Radio Remote Control MRC 1100

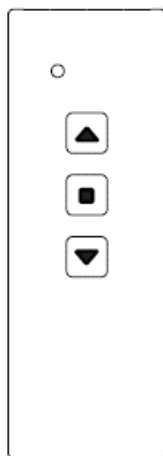
### 12.5.1 Description

The radio remote control is used exclusively to operate the roller set lift for passenger cars, where there may only be one remote control per test stand. Thus, the use of the remote control in combination with C\_RECO is also not permitted.

#### Warnings

- No persons may be present in the danger zone while the roller set lift is being operated.
- The roller set lift can also be operated when the test rollers are rotating. Make sure that the vehicle/trailer is not lifted out of the roller set or falls off.
- Before entering and leaving the roller set, make sure that the roller set lift is in the down position.
- Only lift the roller set when there is a test vehicle/trailer in it.

### 12.5.2 Transmitter



**Open** (relay 1)

**Down** (relay 2)

Channel/  
Frequency: 1 channel /868.30  
MHz

Power supply...: 1x3V battery, type  
CR2032

Operation: Transmitter transmits  
as long as button is  
pressed (max. 36 s)

Protection class: IP54

### 12.5.3 Radio Receiver



Mode of operation: Dead man's control (each  
relay switches as long as  
the corresponding button  
is pressed (max. 36s))

Setting: Jumper J1 in position 1-2

Antenna: Antenna is located inside  
the control cabinet,  
therefore a direct line of  
sight from the vehicle to  
the control cabinet is  
necessary.

#### 12.5.4 Teaching the Transmitter

- Briefly press the programming button TA1 (for relay 1) or TA2 (for relay 2) (< 1.6 s).  
The programming mode is activated as soon as the LED flashes.
- Press a button on the transmitter and keep it pressed. As soon as the code has been saved, the LED lights up for 4 s and then flashes again. Release the transmitter button.
- Switch to operating mode by briefly pressing the programming button TA1 or TA2 again (< 1.6 s).

#### 12.5.5 Setting on the Option Module in the Control Cabinet



- S1: 2
- S2: 0-15
- S3: TERM only on last module

## 12.6 Roller Cover C\_MBT C/S 3.5/4.0/5.0 W220/W250/W280

The roller cover allows the test stand to be driven over gently. The covers can be operated either removably or hinged outwards.



### CAUTION

Wear personal protective equipment when folding or removing the roller cover. When mounting and handling the roller cover, be sure to use the handle holes provided. Danger of pinching and crushing!

---

### 12.6.1 Technical Data

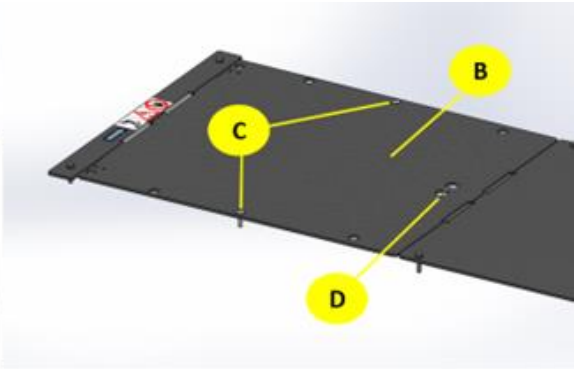
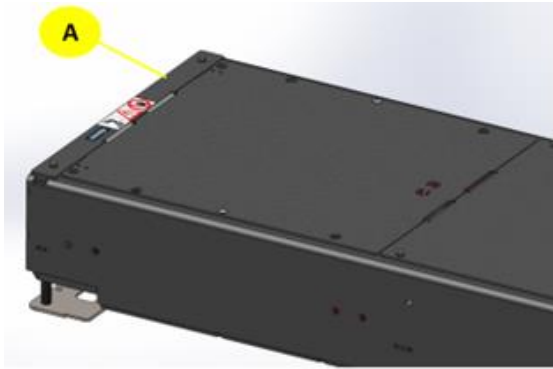
- Roller cover W220 & W250 with 4 t traversable
- Roller cover W280 with 5 t traversable
- Weight of roller cover (W220/W250/W280) approx. 21 / 26 / 30 kg

### 12.6.2 Scope of Delivery

- 2x roller cover
- 2x bearing cover with hinge cutouts
- 4x hinge incl. fixing material (for foldable operation)
- 4x flat head screw (for removable operation)
- 2x tether with key ring
- 2x sticker rolls warnings
- 2x sticker direction arrow
- 1x tap M8

### 12.6.3 Mounting Pluggable Roller Cover

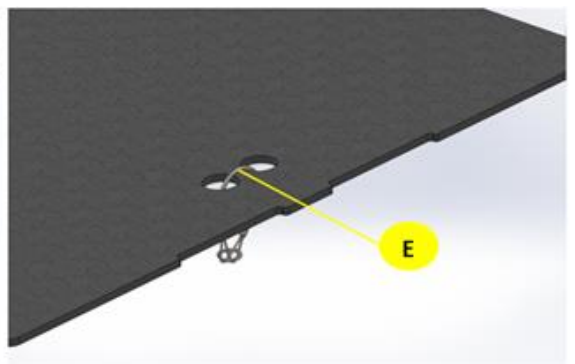
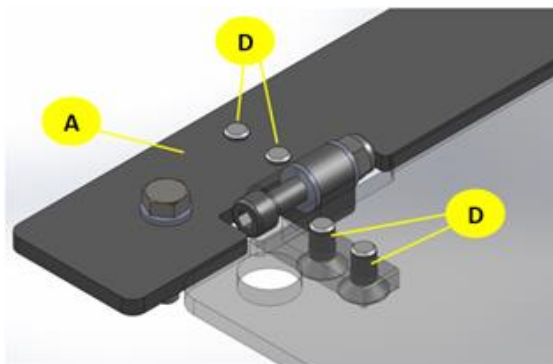
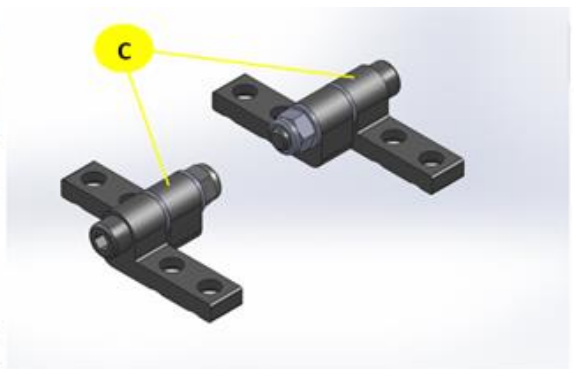
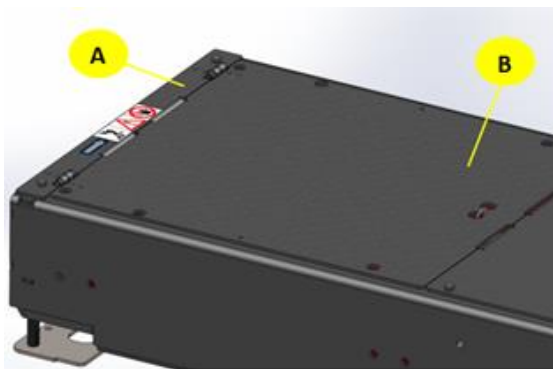
- 1 Leave standard bearing cover (without hinge cutouts) on test bench.
- 2 Cut two M8 threads per roller cover.
- 3 Mount the flat head screw.
- 4 For easier handling, mount the retaining rope and key ring in the double hole of the roller cover.



- A** Standard bearing cover (without hinge cutouts)
- B** Roller cover
- C** LFK screw
- D** Retaining rope with key ring

#### 12.6.4 Mounting Hinged Roller Cover C(ompact)

- 1 Use bearing cover with cutouts for the hinge.
- 2 Cut 4x M8 threads in each of the bearing and roller covers to fasten the hinges.
- 3 Preassemble the left and right variants of the hinge.
- 4 Fasten preassembled hinges to bearing and roller cover with countersunk screws.
- 5 For easier handling, mount the retaining rope and key ring in the double hole of the roller cover.



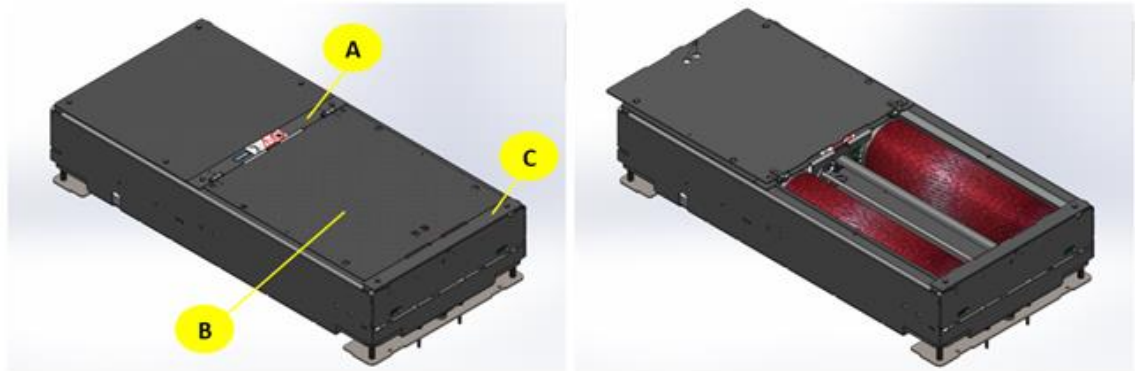
- A** Bearing cover with hinge cutouts
- B** Roller cover
- C** Preassembled hinge
- D** Countersunk screw



E Retaining rope and key ring

### 12.6.5 Mounting Hinged Roller Cover S(plit)

The assembly of the individual components is identical to the Compact variant.



A Bearing cover with cutouts

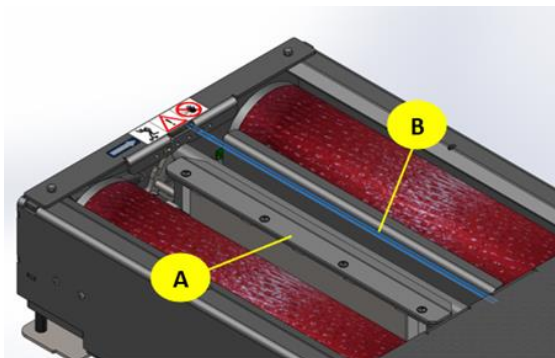
B Roller cover

C Standard bearing cover (without hinge cutouts)

### 12.7 Drive-over and Lowering Threshold C\_MBT C/S 3.5/4.0/5.0 W220/W250/W280

The drive-over and lowering threshold is used for gentle driving over and controlled lowering of the vehicle into the roller set by means of a light barrier.

The overrun and lowering threshold is lowered automatically after an adjustable delay by interrupting the photoelectric barrier, but can also be activated manually.



A Crossing and lowering sleeper

B Beam of the light barrier



## CAUTION

The pneumatic supply line must be depressurized before any work is carried out on the roller set. Risk of jamming!

---

## NOTICE

- Do not use in locations where there is direct exposure of the photosensitive surface to ambient light or outdoor light.
  - Avoid turning the "Operating mode" selection switch (Light-on, Dark-on) as well as the sensitivity control with too much force or even over-tightening it.
  - keep the light-sensitive surface of the light barrier and reflector clean, clean if necessary.
- 

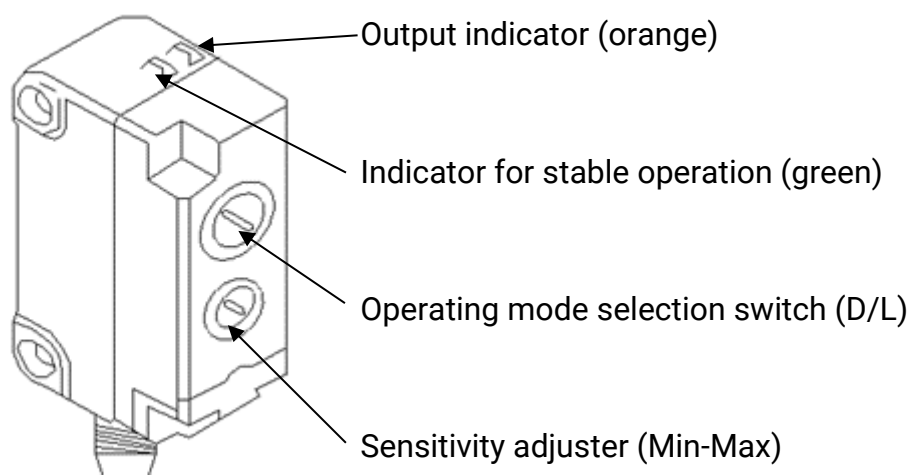
## INFO

In Germany, no roller cover is required according to BG.

### 12.7.1 Technical Data

- Compressed air connection 6 - 10 bar
- For W220 and W250 max. axle load 4000 kg
- For W280 max. axle load 5000 kg

### 12.7.2 Light Barrier of the Lowering Threshold



### 12.7.3 Settings on the Light Barrier in the Roller Set



- Select operating mode L.
  - The operating mode can be set at the D-L rotary switch
  - When the operating mode is changed, the ON/OFF states are reversed: L=Light-on, D=Dark-on
- Select MAX. sensitivity setting.

The Green LED must always be on to ensure stable operation. It lights up as soon as enough reflected light falls back into the lens of the light barrier or (in the case of an interrupted light beam) little to no (scattered) light.

Thus, the green LED lights up only when the received light intensity on the lens differs significantly between the two switching states.

If this is not the case, the light sensitivity must be changed at the "Min-Max" setting control.

The orange LED only lights up if no object is detected and consequently the emitted light is reflected at the reflector and falls back into the lens of the light barrier.

The reflector consists of polarized single cells so that other reflecting surfaces do not trigger a reaction.

### 12.7.4 Setting on the Option Module in the Control Cabinet



Address (CAN ID) of the OM:

**S1:** 0-15, if **S2** is set to 0 (down)

**S1:** 16-31, when **S2** is set to 1 (up)

**S3:** Term only on the last module

**Setting according to specification as per circuit diagram**

### 12.7.5 Settings in the CONNECT Technician Menu

Enable lowering threshold in the options overview of the "Brake tester" (login required)



### 12.7.6 Diagnostics in the CONNECT Technician Menu

- Open diagnosis of the "brake tester".
- Display in diagnostics menu lights up green when object is detected by the light barrier:



- Display in diagnostics menu lights up gray if no object is detected by the light barrier:



-> Light beam interrupted: green LED lights up, diagnostics menu green

-> Light beam reflected: orange & green LED illuminated, diagnostics menu grayed out

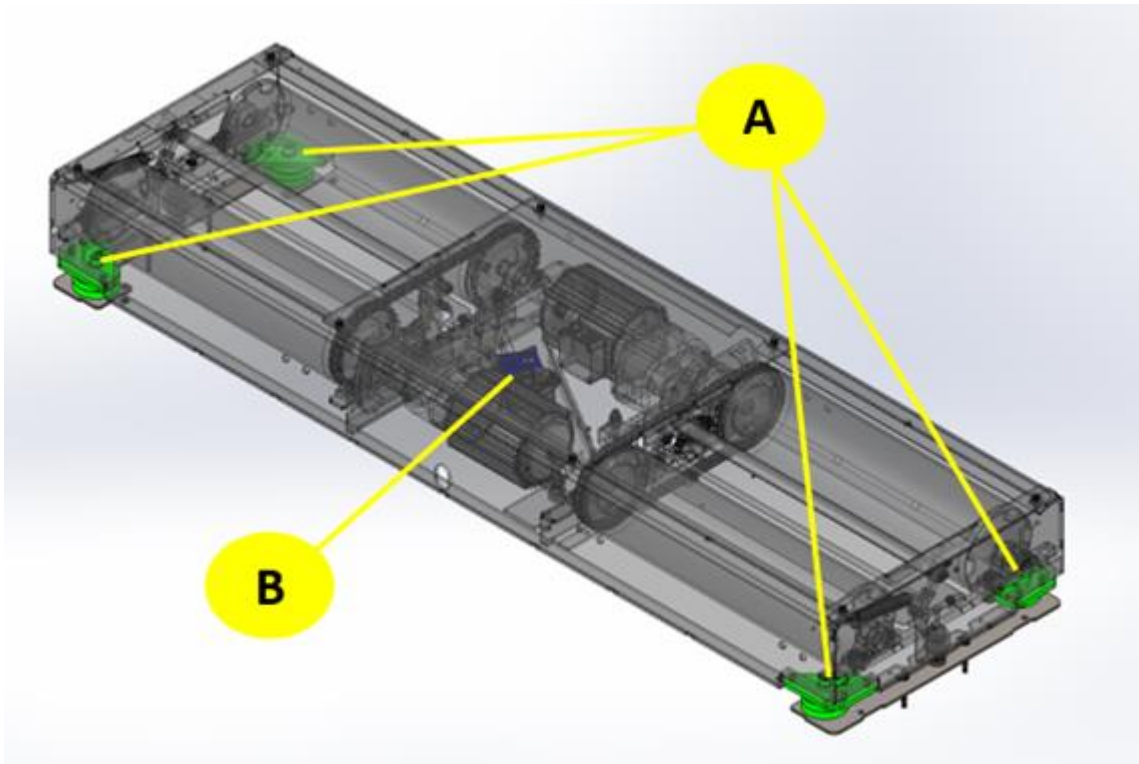
## 12.8 Weighing Device Static/Dynamic for C\_MBT C (Compact)

### 12.8.1 Description

The static/dynamic weighing device can be used to determine the axle weight of the test vehicle. The evaluation can be set statically or dynamically via the service menu.

#### INFO

- The weighing device eliminates the need for stepless height adjustment (245 - 300 mm) for the C\_MBT C/S 3.5/4.0/5.0 test stands. The height of these floor groups with weighing device is always 280 mm!
- The COMFORT interface module is required to operate the weighing device!



**A** Pressure load cell

**B** Interface module COMFORT

### 12.8.2 Scope of Delivery

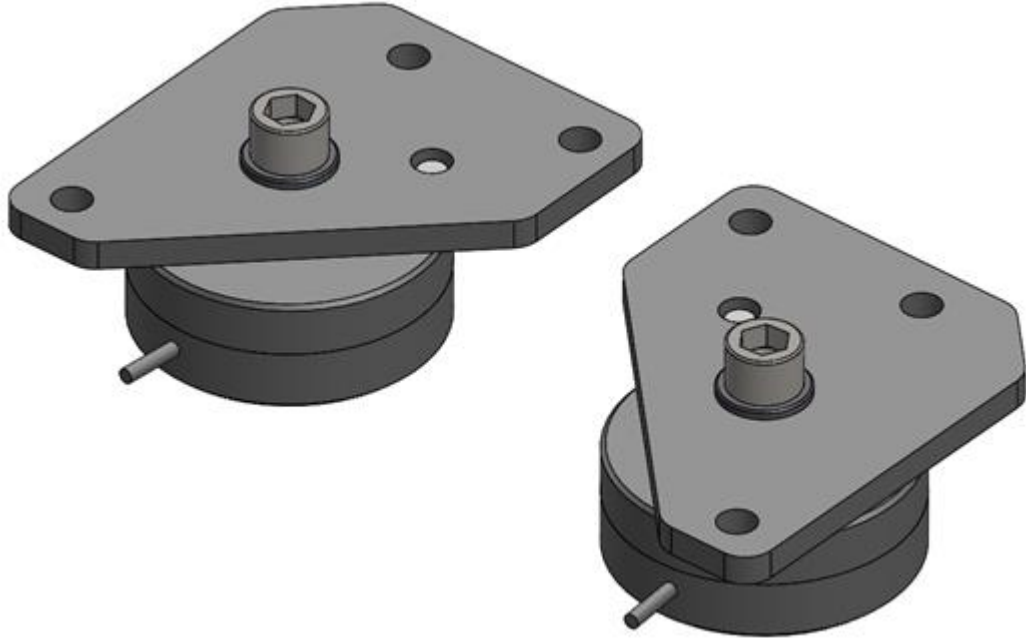
- 4x pressure cell with cable and plug incl. mounting material
- 1x COMFORT interface module (required for retrofitting)

### 12.8.3 Technical Data

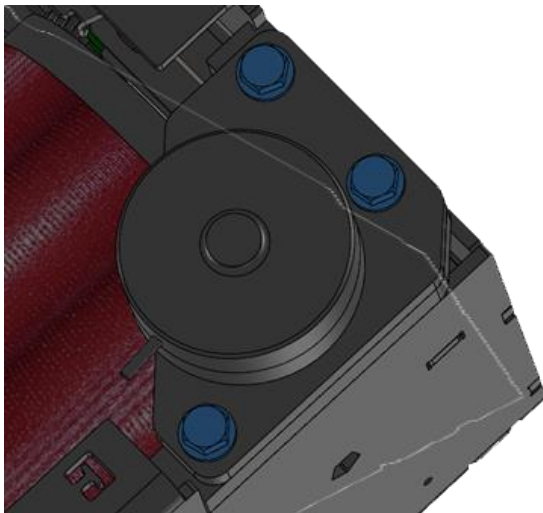
- Cable length pressure cell 3 m

#### 12.8.4 Installation

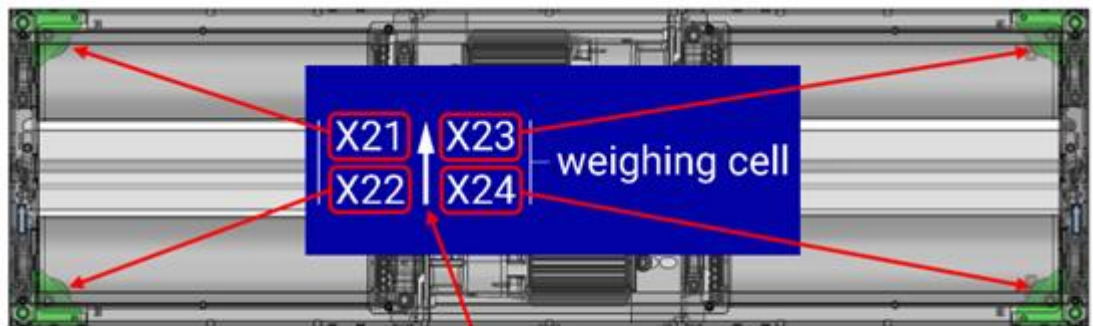
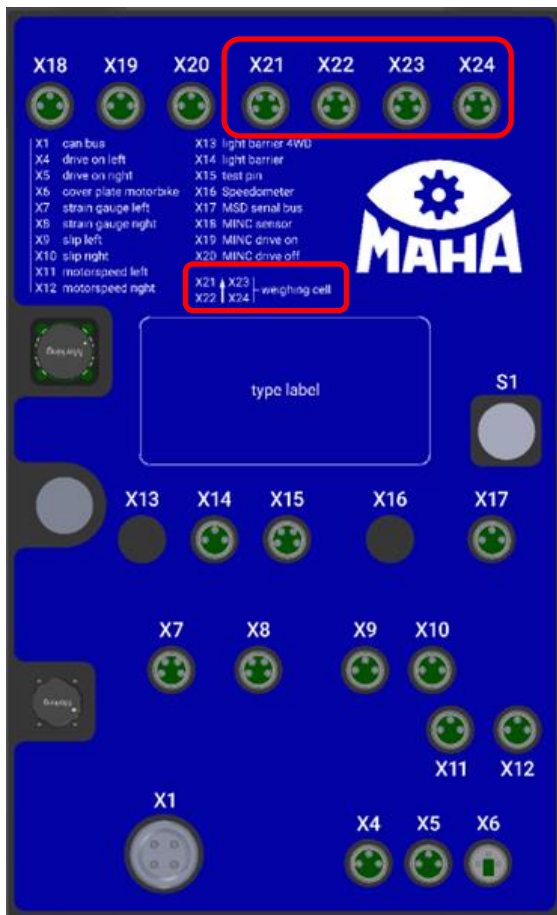
- 1 Screw the pressure cells mechanically to the support plates (1x hexagon socket head screw, M16x30, tightening torque = 206Nm, 1x washer A17). The carrier plate is not symmetrical, so care must be taken on which side the pressure cell is screwed.



- 2 Screw the pre-assembled pressure cells to the test stand frame (3x hexagon head screw M12x30, tightening torque = 84Nm, 3x washer A13).



- 3 Route the cables of the pressure measurement sockets to the interface module and fasten them properly with cable ties. If the cable length is not sufficient, extension cables with plug and socket must be used.
- 4 Plug the connectors of the pressure cells into the terminals X21 - X24 of the interface module. Each pressure cell is assigned to a specific connection.



Driving direction arrow

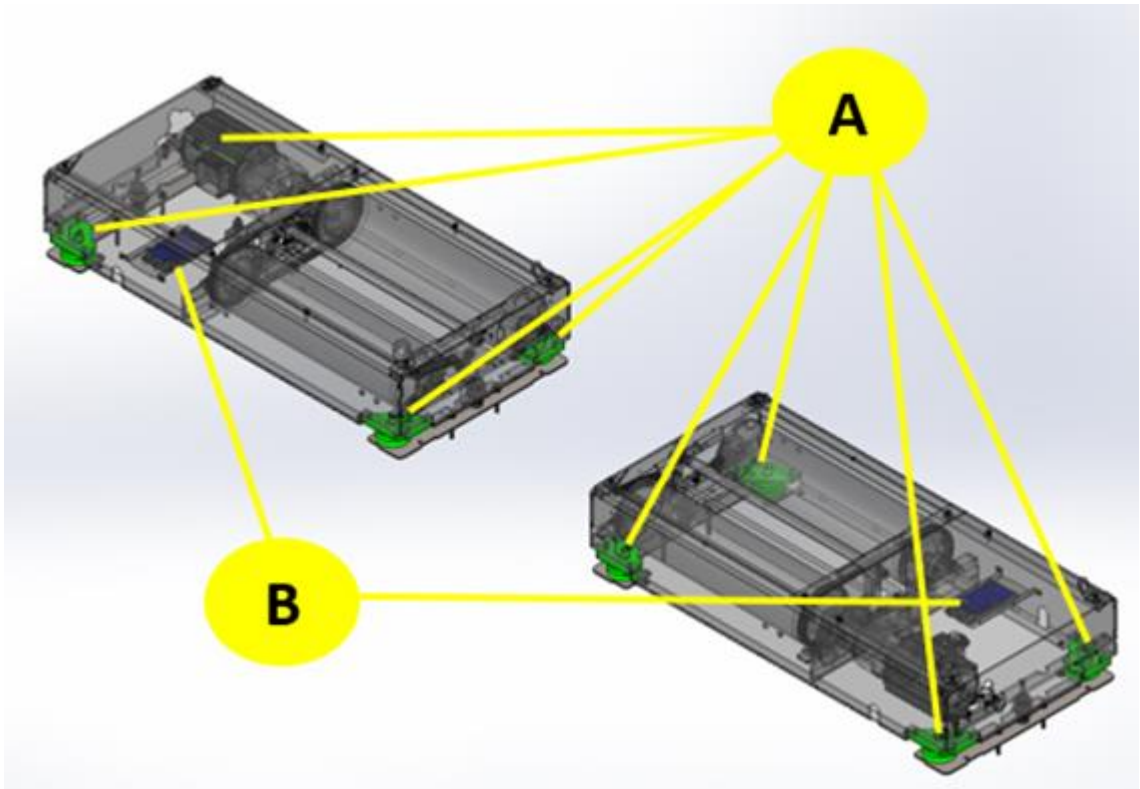
## 12.9 Weighing Device Static/Dynamic for C\_MBT S (Split)

### 12.9.1 Description

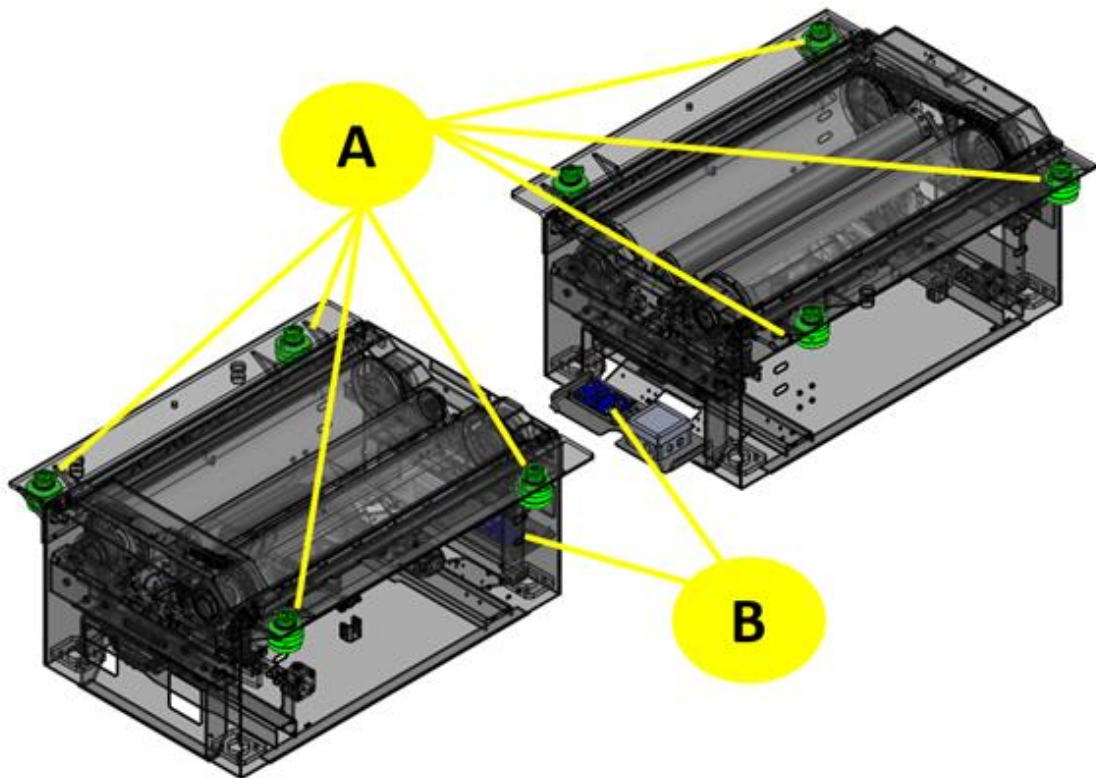
The static/dynamic weighing device can be used to determine the axle weight of the test vehicle. The evaluation can be set statically or dynamically via the service menu.

#### INFO

- The weighing device eliminates the need for stepless height adjustment (245 - 300 mm) for the C\_MBT C/S 3.5/4.0/5.0 test stands. The height of these floor groups with weighing device is always 280 mm!
- The COMFORT interface module is required to operate the weighing device!







**A** Pressure load cell

**B** Interface module COMFORT

### 12.9.2 Scope of Delivery

- 8x pressure cell with cable and plug incl. mounting material
- 2x COMFORT interface module (required for retrofitting)

### 12.9.3 Technical Data

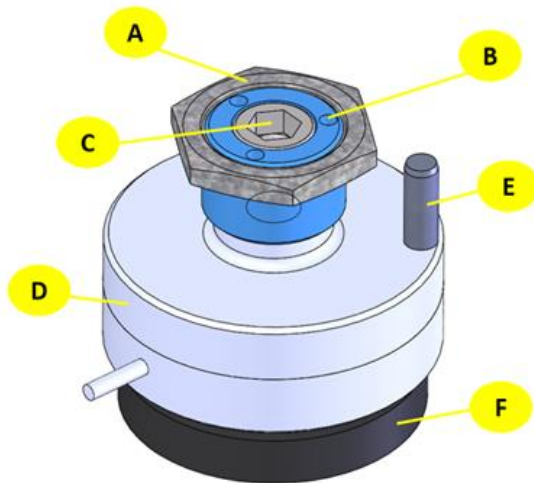
- Cable length pressure load cell 3m

### 12.9.4 Installation

In the static/dynamic weighing system for C\_MBT S (Split), there are two different mechanical versions of the load cells, which is why the assembly is presented in 2 variants.

For the test stands C\_MBT S 3.5/4.0/5.0 the mechanics and also the mounting are identical to the Compact version (see paragraph "Weighing device static/dynamic for C\_MBT C (Compact)"). Only the number of pressure cells (8) and the interface module (2) is doubled.

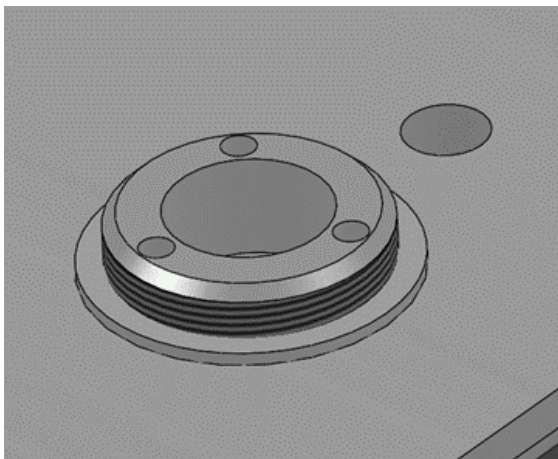
There is a separate mechanical assembly for the C\_MBT S 13.0/15.0/18.0/20.0 test stands. This allows the test stand to be leveled via the pressure cell and thus compensate for unevenness.



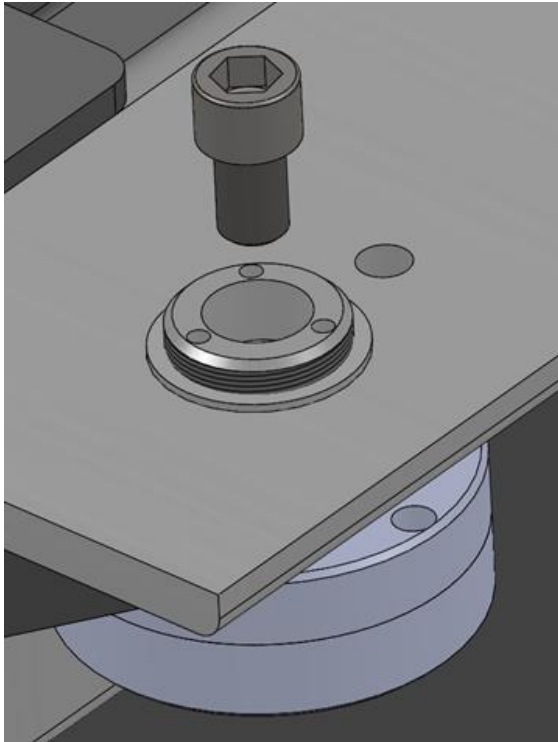
- |          |                                       |          |                        |
|----------|---------------------------------------|----------|------------------------|
| <b>A</b> | Hexagon nut                           | <b>B</b> | Threaded bush          |
| <b>C</b> | Cheese head screw with hexagon socket | <b>D</b> | Pressure load cell     |
| <b>E</b> | Dowel pin                             | <b>F</b> | hardened support plate |

The assembly is carried out in the following steps:

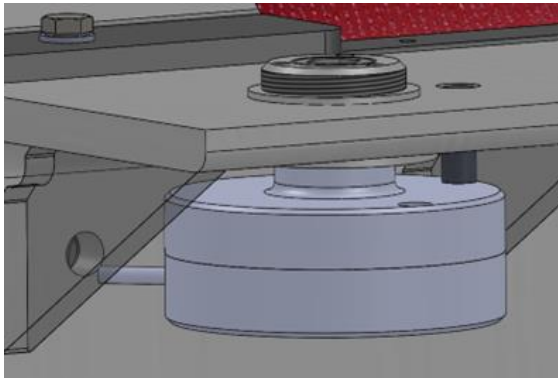
- 1 Screw the threaded bushing into the weighing bracket.



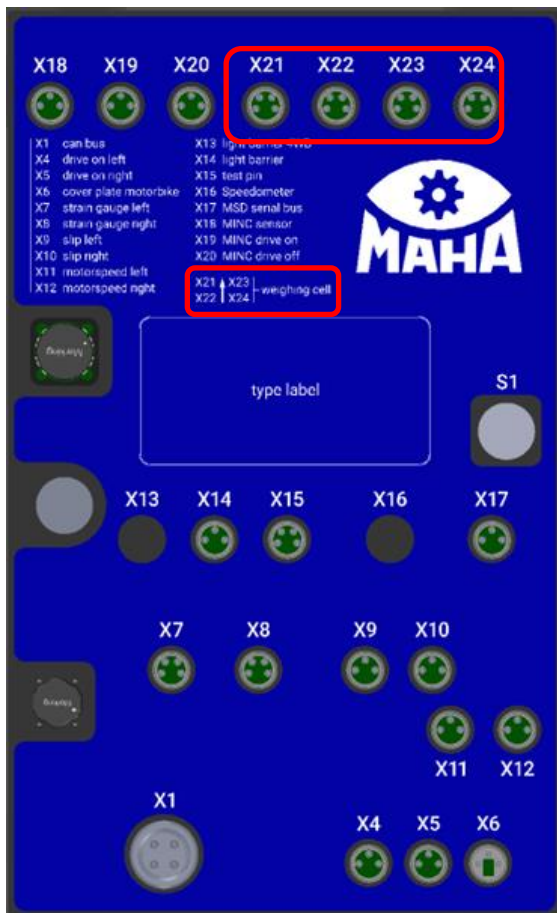
- 2 Place the pressure cell on the underside of the weighing bracket and tighten it slightly with the hexagon socket head screw (M16x25) so that the pressure cell can still be turned.



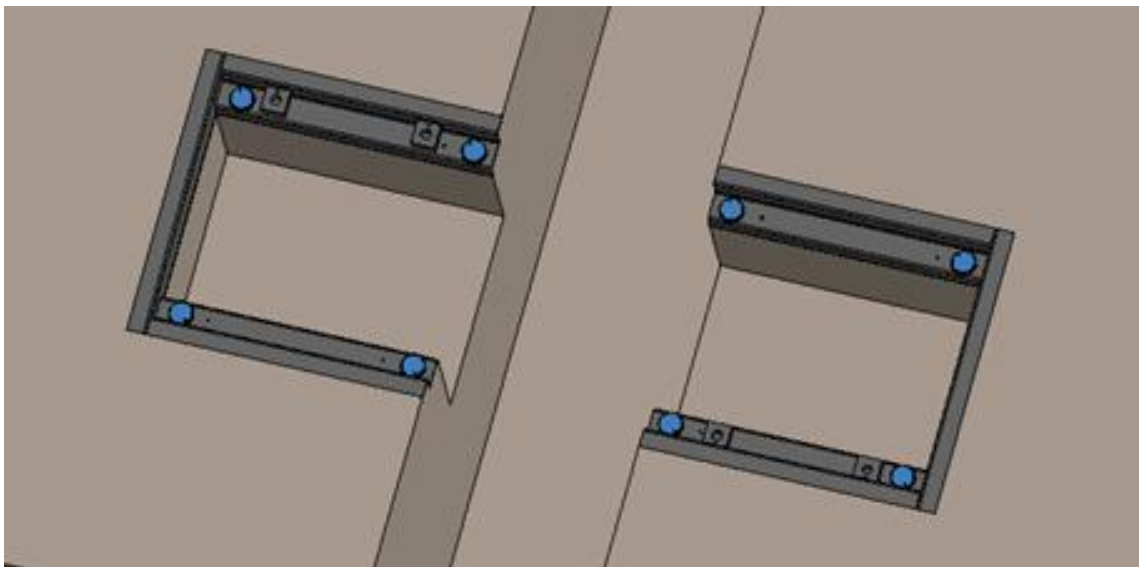
- 3 Align the pressure cell so that the cable can be laid directly in the opening provided in the frame and the cylindrical pin can be mounted to prevent rotation.



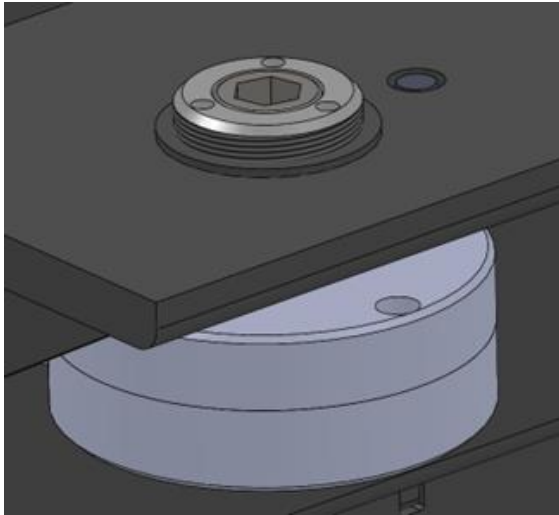
- 4 Route the cables of the load cells to the interface module and fasten them properly with cable ties. If the cable length is not sufficient, extension cables with plug and socket must be used. Plug the connectors of the scale measuring boxes into the connectors X21 - X24 of the interface module. Each load cell is assigned to a specific port.



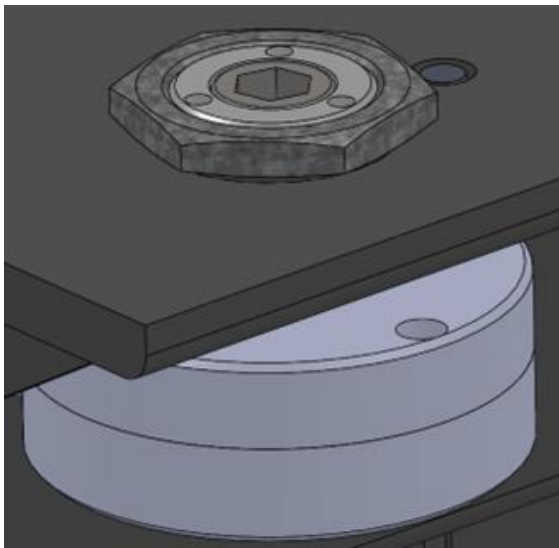
- 5 Place the hardened support plates on the designated position of the lost formwork in the foundation. Lift the two test stand halves into the foundation and place them with the pressure cells on the hardened support plates.



- 6 Adjust the height of the pressure cells via the threaded bushing so that the test stand rests on all four pressure cells.
- 7 Tighten the hexagon socket head screw to 206Nm.



8 Secure the threaded bushing with the hex nut.



## 12.10 Two Test Speeds

### NOTE

- If the ramp-up time is set too short, the internal bypass contacts close before the motor has reached the rated speed. This can cause damage to the bypass relays.
- Make sure that the specified switching frequency is not exceeded! After each start-up, the power semiconductors must be given sufficient time to cool down. Starting processes in a short time sequence can destroy the power semiconductors!  
Operation in the bridged state also allows the power semiconductors to cool down!

### 12.10.1 Description

This option can be executed in two different variants:

**Variant I:** Switchable via smart device, C\_RECO S or PC

**Variant II:** Switchable via illuminated pushbutton on the control cabinet, the status of the setting is indicated via the LED integrated in the pushbutton. To switch, press the button briefly until the LED indicates the desired mode (note that not all modes are always possible/selectable).





- Passenger car: LED lights up permanently
- Truck: LED does not light
- Motorcycle: LED flashes

With the “two test speeds” option, soft start devices are always required.



### 12.10.2 Setting

There are 3 potentiometers on the front panel that can be used to make the following settings:

Parameter	Potentiometer	Setting range
Start-up time		Start-up time adjustable from 0.5 to 10 s
Start voltage	UStart	40 to 80% of the nominal voltage
Run-down time		adjustable from 0.25 to 10 s

Factory preset, see electrical circuit diagram.

### 12.10.3 Display

There are two LEDs on the front of the device which indicate the following operating states:

LED	Operating status
green	Device connected to mains voltage
yellow	Start-up completed, device bridged
yellow - flashes with increasing or decreasing frequency	Soft start / soft stop
yellow - flashes with constant frequency	Malfunction

### 12.10.4 Procedure

Before entering the roller set, the inspector can change the vehicle type. The functionality of the pushbutton switches is identical to the "Car/Truck" switchover in the burger menu. Both switchovers are possible at the same time. This means that all parameters are changed over when pressing the Car/Truck pushbutton in the same way as when selecting Car/Truck in the burger menu.

### 12.10.5 Function Test

With the option preselected, switch from Car to Truck by means of illuminated pushbutton, switch from Truck to Car by means of burger menu, switch back again from Car to Truck by means of illuminated pushbutton (and vice versa).

### 12.10.6 Malfunction Description

<b>Error</b>	<b>LED</b>	<b>Operating status</b>
1	Yellow LED flashes 1x repeatedly with short pause	Supply voltage error or load too low
2	Yellow LED flashes 2x repeatedly with short pause	Heat sink temperature too high/device thermally overloaded,
3	Yellow LED flashes 3x repeatedly with short pause	Electronic error
4	Yellow LED flashes 4x repeatedly with short pause	Phase / ignition fault in phase 1
5	Yellow LED flashes 5x repeatedly with short pause	Phase / ignition fault in phase 3
6	Yellow LED flashes 6x repeatedly with short pause	Motor phase fault / power semiconductor defective in phase 1
7	Yellow LED flashes 7x repeatedly with short pause	Motor phase fault/power semiconductor defective in phase 3
8	Yellow LED flashes 8x repeatedly with short pause	general synchronization error Mains or motor circuit faulty

### 12.10.7 Troubleshooting

Error 1:	Electronics supply or motor too small.
Error 2:	Check the starting frequency and the starting current or max. ambient temperature. Allow the device to cool down.
Error 3:	Defect in the internal control electronics.
Error 4/5:	Power supply failed, motor cable interrupted, power semiconductor defective, motor defective. Check motor and wiring.
Error 6/7:	Power supply failed, power semiconductors do not ignite. Engine power too small. Power semiconductor defective.
Error 8:	Mains or motor wiring interrupted. Power semiconductor defective. Check wiring.

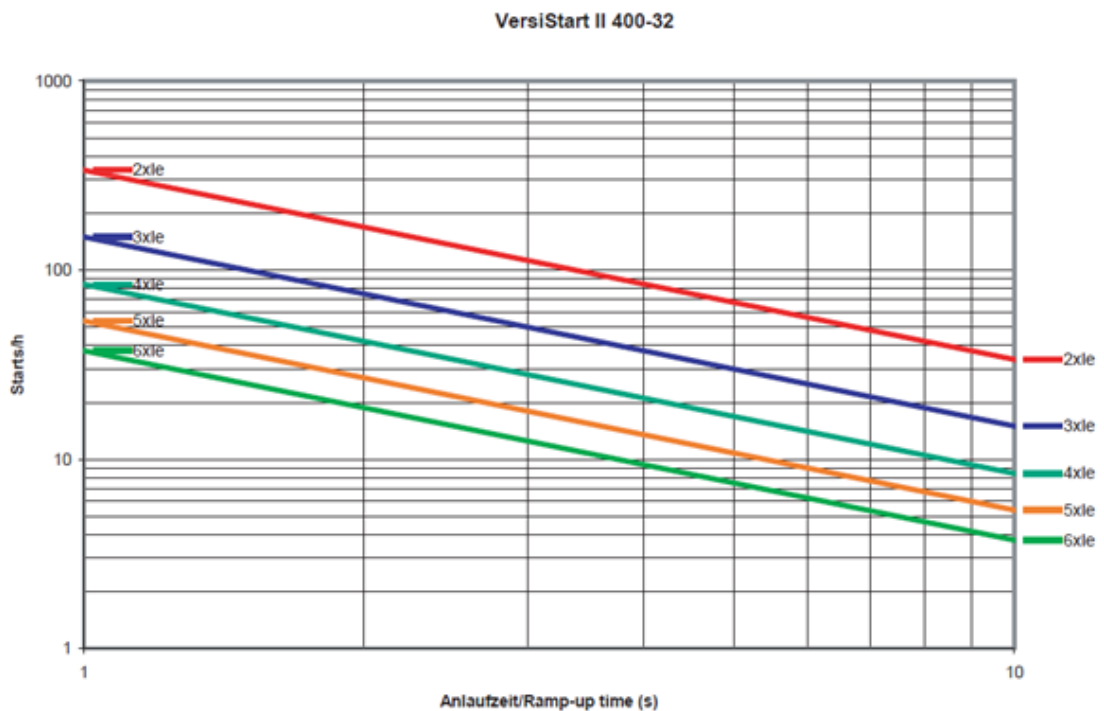
### 12.10.8 Reset Malfunction

Switching the supply voltage off and on again - upstream motor protection switch off/on or main switch off/on.



### 12.10.9 Start Frequency

With factory parameter setting, the start frequency is limited to < 40x per hour. When changing the parameter settings (only by authorised service technicians), the following diagram can serve as an aid.



### 12.10.10 Two Test Speeds Light Truck

With the option “Two test speeds Light Truck” frequency inverters and an additional configuration file are required.



## **12.11 Signal Display for Radio Pressure Converter**

### **12.11.1 Description**

Since it can happen in the course of truck testing that a radio pressure converter is forgotten on the vehicle, the absence of a radio pressure converter should be signaled to the user.

### **12.11.2 Procedure**

Scenario 1: If one (or more) radio pressure converter(s) is/are removed from the charging box, the signal lamp lights up or flashes (depending on the design of the signal tower). Only when all radio pressure converters are back in the charging box does the signal tower switch off.

Scenario 2: If one (or more) radio pressure converter(s) is/are removed from the charging box, monitoring is performed to determine whether all sensors that are outside the charging box are still in the transmission range. If a sensor is no longer in the transmission range and not back in the charging box, the signal tower switches on.

The behaviour of the signal display can be set in the Technician menu and is located under the "Radio" options.

### **12.11.3 Signal Display of Radio Pressure Converters**

Signal tower ON with radio pressure converter out of the charging box.

Signal tower ON when radio pressure converter is out of reception range (= default).

Signal tower is implemented via an option module to which a signal tower is connected.

### **12.11.4 Function Test**

With the radio system logged on, remove the radio pressure converter from the charging box and test scenario 1 or 2, depending on the setting.

For the correct function of the signal light, all radio receivers must be returned to the charging box before the system is switched off. At system startup, it cannot be determined whether the sensor is in the charging box or still on the truck.

## 12.12 Weight Simulators

See operating instructions BA042501 "MLS Weight simulators".

### 12.12.1 Pull-down Device

#### **Hydr. weight simulator, 1-fold HD cylinder (pull-down device)**

Type: MLS 1100; Scope of delivery: Hydraulic power unit etc.

Type: MLS 2100 (VZ 985052) / MLS 2150 (VZ 985018)

Operation via MRC 1100 radio remote control (not for MLS 2300)

### 12.12.2 Roller Set Lift

**Roller set lift** integrated, mechanical-hydraulic

for C\_ MBT 13.0 /15.0

Operation via smart device, C\_RECO S or PC (FFB not included)

**Roller set lift** in angle iron frame mechanical-hydraulic,

for C\_MBT 13.0 - 20.0,

Operation via smart device, C\_RECO S or PC (FFB not included)

### 12.12.3 Control for Load Simulators

For operating the roller set lifting or pull-down device via smart device, C\_RECO S or PC

**Info:** Remote control not included.

VZ xxxxxx, VZ yyyy, VZ zzzzzz Roller set lifting or MLS xxxx required (includes the option module, contactors, etc. in the control cabinet)

### 12.12.4 Multifunction Control

via smart device, C\_RECO S or PC

via illuminated pushbuttons on the electrical control cabinet

includes VZ 935280 multifunction control via smart device or PC

- Synchronous operation in main and opposite direction of travel, both wheels rotating forwards and backwards respectively

- Counter-rotation operation in main and reverse direction for all-wheel drive test axlewise left forward / right reverse rotation or vice versa

- Single wheel operation only in main direction of travel only one wheel rotating forward at a time

**Info:** Remote control not included.

## 12.13 Pit Safety GSQ



### WARNING

- The controller is not active before/when commissioning! Only after commissioning and testing of the safety device by authorized service personnel is a functioning safety function given.
- Before acknowledging the triggered safety function, make sure that no one is present in the danger zone (incl. pit).
- The button for acknowledging the triggered safety function must be installed outside the pit protection.

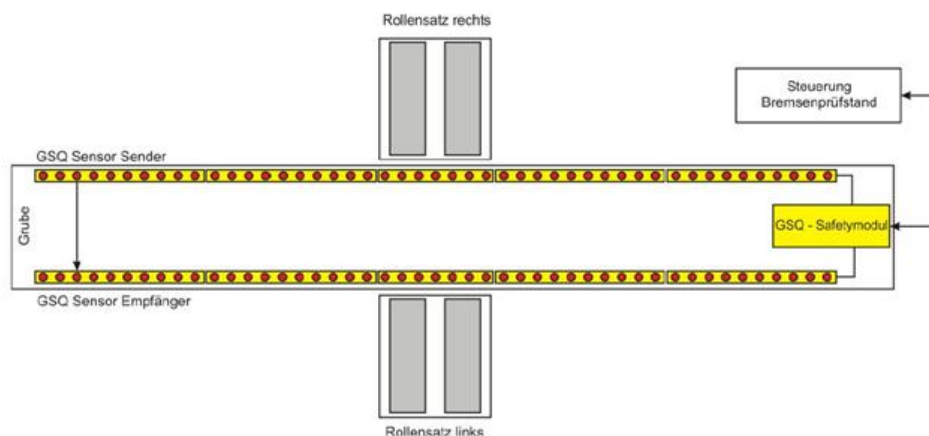
### NOTICE

- Do not place or fasten any objects on the pit safety device!
- Do not step on the housing of the pit safety device!

### 12.13.1 Description

The pit safety device transverse (GSQ) is used to safeguard working pits equipped with a brake tester. The pit safety device consists of a GSQ safety module (control module -A100 in the control cabinet), to which the GSQ sensors (transmitter -A10x.A and receiver -A10x.B) are connected. The GSQ safety module monitors the hazardous area and switches the brake tester to a safe state if a person enters the hazardous area. The GSQ sensors (transmitter and receiver) can be arranged in a row due to their modular design, so that the necessary hazardous area is covered for the various applications.

The sensors monitor the pit in the transverse direction and detect objects larger than 25 cm. This means, for example, that hose lines or the belts of a pull-down device do not trigger the pit safety device. After being triggered, the pit safety device must be acknowledged via an illuminated pushbutton on the control cabinet.



## 12.13.2 Description of Acknowledgement

### Scenario: Test bench is empty, no roller start

- Hazardous area is entered, pit safety device is triggered.
- LED of -S100 lights up red.
- The status bar shows "Pit safety triggered".
- Button -S100 for acknowledgement has no function and does not have to be pressed.
- If the danger zone is left, the LED of -S100 goes out, the test bench switches itself free and the message disappears in the status line.

### Scenario: Test bench is driven on, no roller start

- Hazardous area is entered, pit safety device is triggered.
- LED of -S100 lights up red.
- The status bar shows "Pit safety triggered".
- If an attempt is now made to perform an motor start with the remote control, the following message appears:



- Button -S100 for acknowledgement has no function and does not have to be pressed.
- If the danger zone is left, the LED of -S100 goes out, the test bench switches itself free and the message disappears in the status line.

### Scenario: Test bench is driven on, motors are running

- Perform roll start with remote control.
- When motors are started and the hazardous area is entered, the pit safety system is triggered.
- Motors stop immediately.
- LED of -S100 lights up red.
- The status bar shows "Pit safety triggered".
- If an attempt is now made to perform an motor start with the remote control, the following message appears:

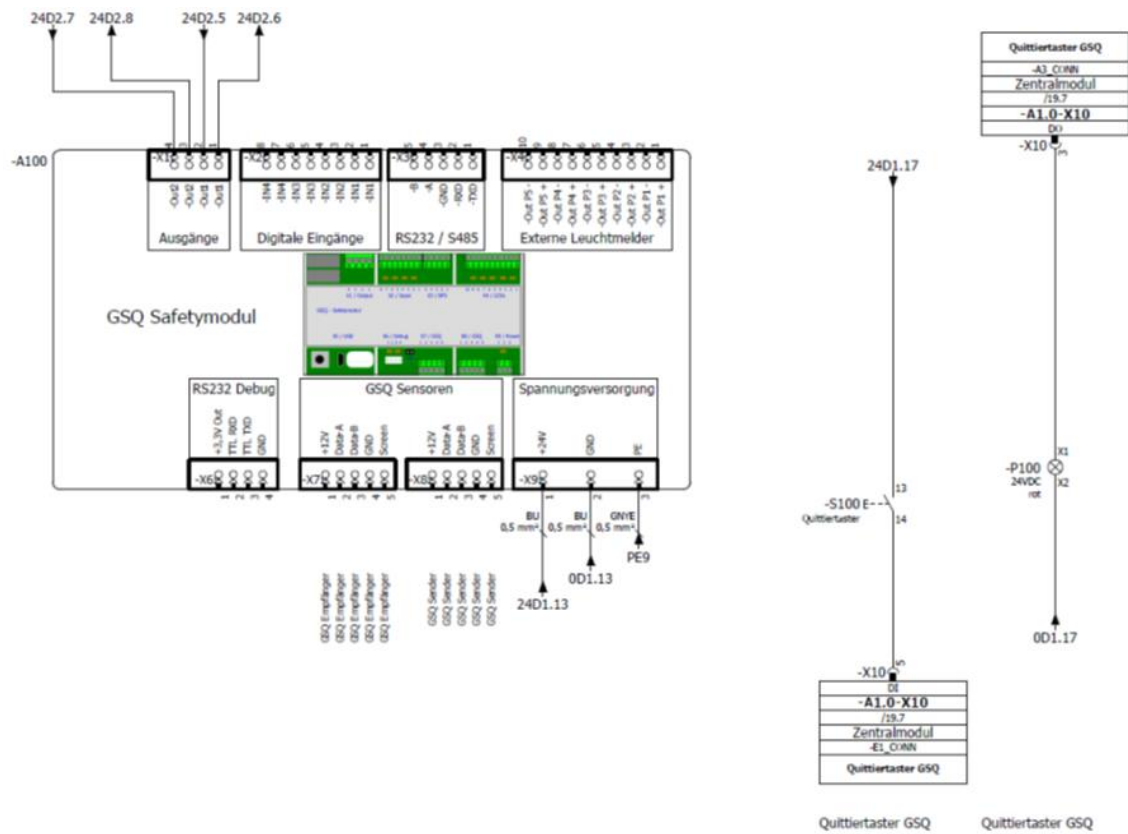
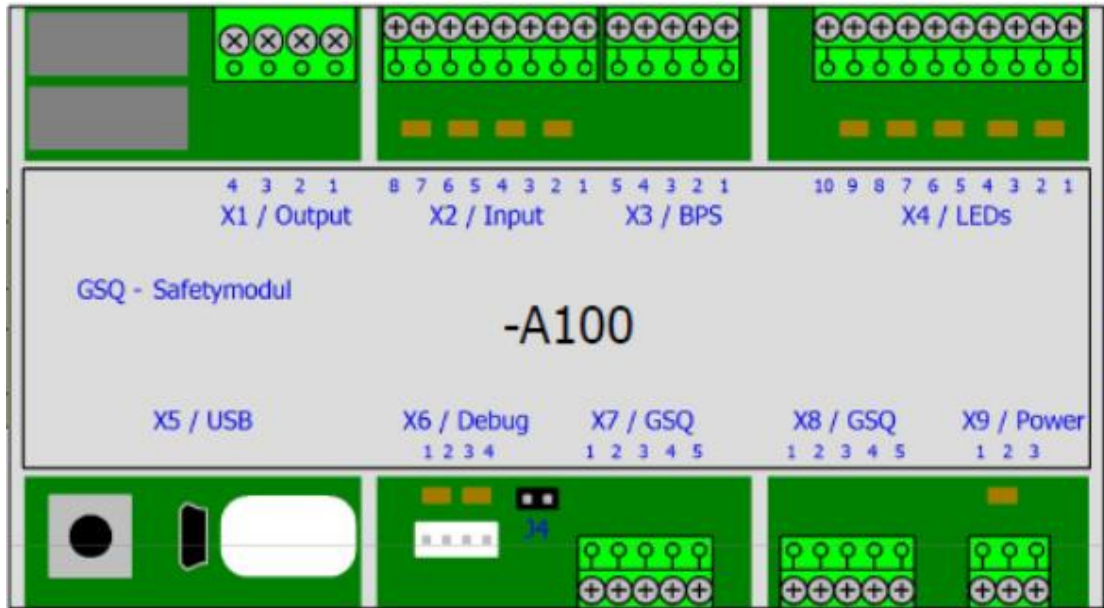


- Button -S100 for acknowledgement has no function as long as the hazardous area is entered.
- If the danger zone is left, LED -S100 starts to flash and "Acknowledge pit safety" is displayed in the status line.
- If an attempt is now made to perform an motor start with the remote control, the following message appears:

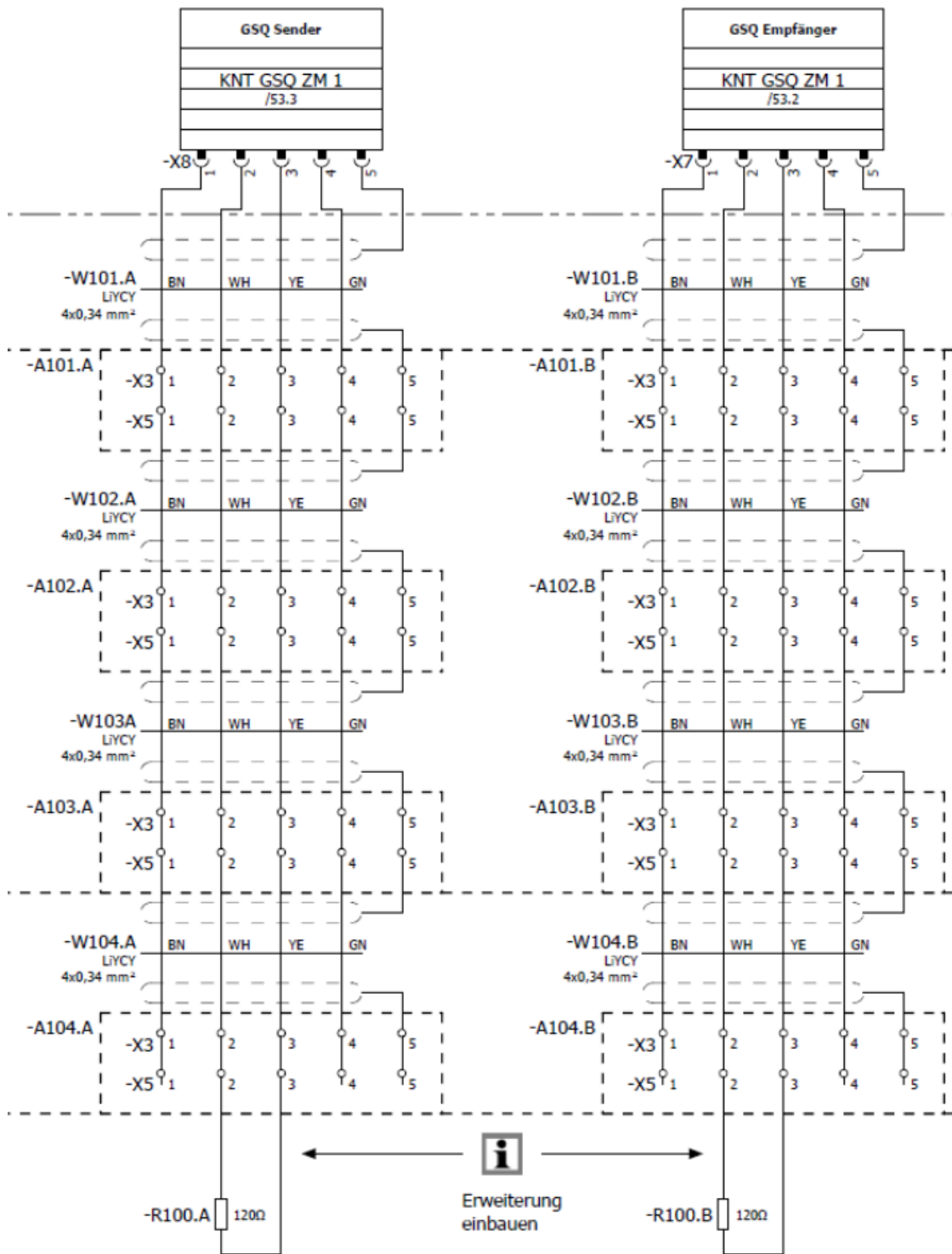


- The pit safety can be acknowledged by pressing button -S100 and the test bench is ready for testing again.
- Alternative: Drive off the test bench.

### 12.13.3 Electrical Connection Diagram



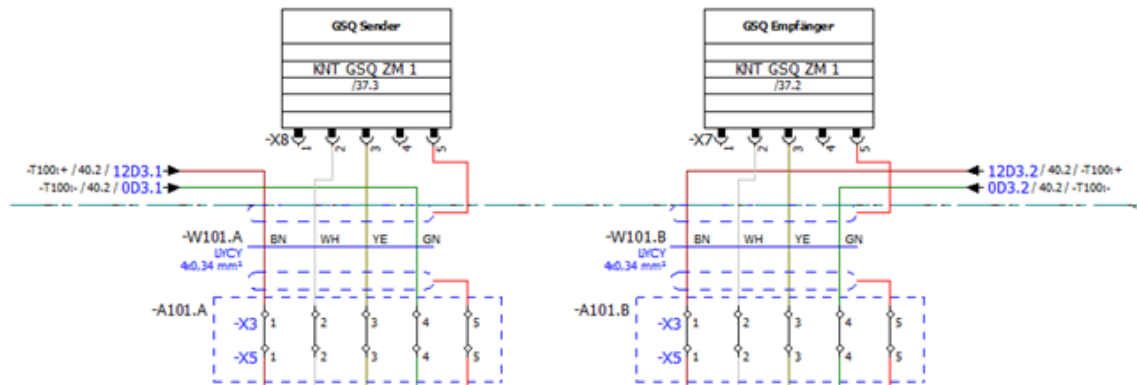
## Connection diagram for a maximum of 7 modules/bars





## Connection diagram for a maximum of 9 modules/bars

Additional power supply necessary to supply the modules/bars!



### 12.13.4 Installation



#### WARNING

The country-specific standards, regulations, directives regarding design/installation/commissioning must be observed.

GSQ sensors (transmitter and receiver) are required for the installation of the pit safety system.

The GSQ sensors are always required in pairs as transmitter and receiver. The aluminum profiles of the sensors can be mounted directly in the pit and must be wired on site. All necessary connectors, connecting cables between the individual sensors and the necessary terminating resistors are included in the sensor package. The connection cables to the GSQ Safety Module are not included in the sensor package.

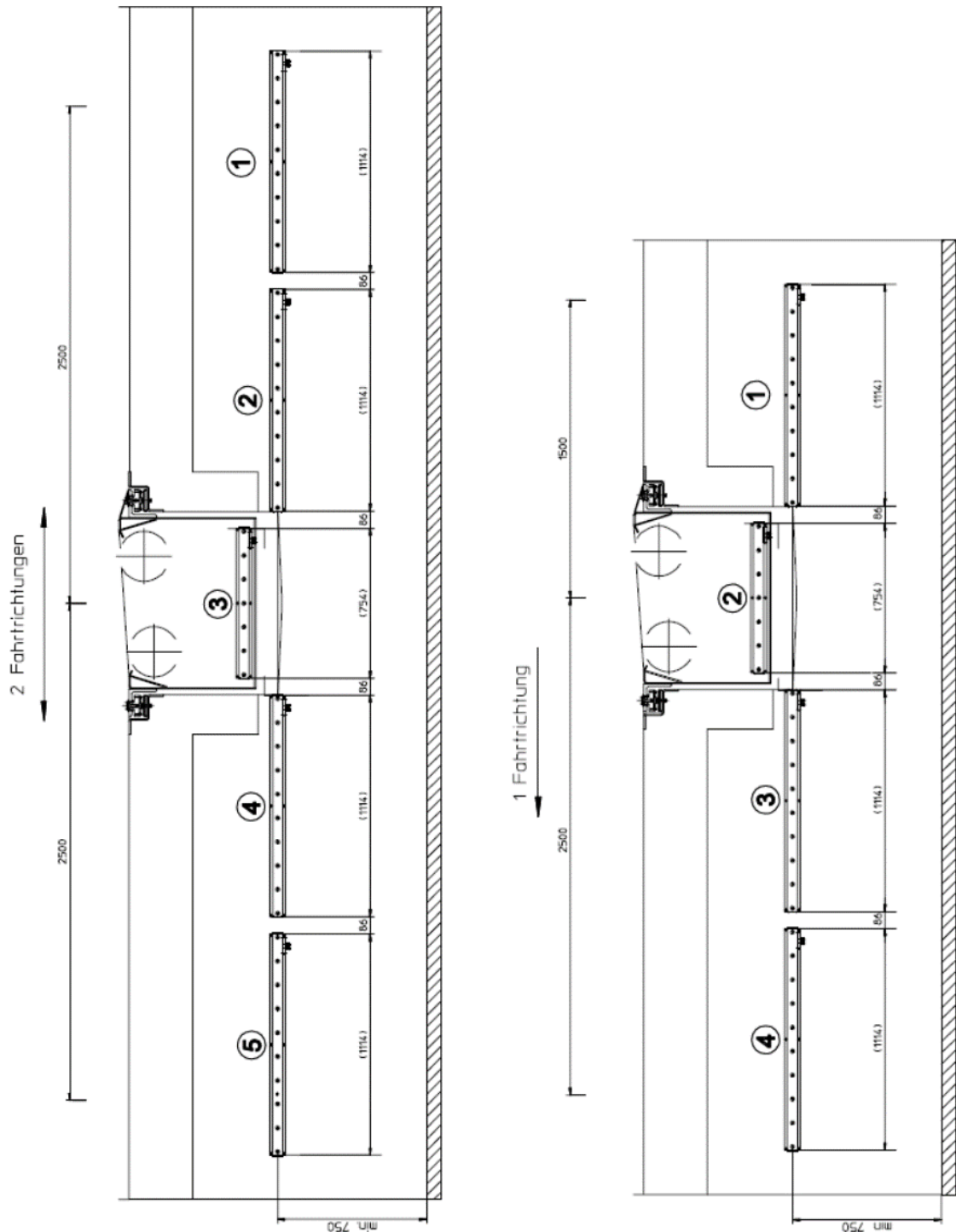
The aluminum profiles of the sensors are available in different lengths. The aluminum profile with 754 mm is mounted in the area of the brake tester roller set. The 1,114 mm long aluminum profiles are mounted accordingly in front of and behind the roller set, depending on the application.

The GSQ I, II and III sensor packages each include 2 matching cable sets that connect the sensors to each other.

The connection cable for connecting the sensor modules to the GSQ Safety Module is not included in the GSQ I, II and III sensor packages, as the length varies depending on the installation. A shielded data cable with 4 x 0.34<sup>mm</sup>² is required for the connection, e.g. Helukabel TRONIC-CY (LiY-CY 4x0.34). The maximum length between GSQ sensor module and GSQ safety module is 50 m. Here in the example the cable set for the GSQ I is shown.

On the left side you can see the cover from the first GSQ sensor module. The unused cable gland is required for the connection cable to the GSQ safety module. On the right side you can see the cover for the last GSQ module (with blind plug). The bag contains the necessary screws, connectors and terminators.





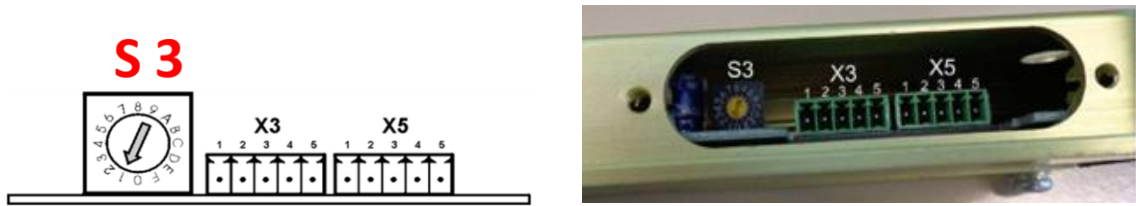
The GSQ sensor elements must always be mounted in pairs (GSQ sensor transmitter with opposite GSQ sensor receiver) in the pit. The addresses of the GSQ sensor elements must always be set to the same value with its opposite transmitter/receiver by means of the **S3** rotary switch. Starting with the address 1. With each following sensor pair the address is always increased by one.

**Exception is address 8, which must not be used! Address 7 must be followed by address 9.**

#### **Setting the address of the transmitter and receiver modules:**

Before mounting the transmitter and receiver modules, an address must be assigned to the individual modules (transoms). The address is set directly on

the circuit board of the GSQ transmitter and receiver module. For this purpose the rotary switch **S3** must be turned to the respective address according to the position of the module.



**Important:**

**Address 8** must not be used!

**Address 7** must be followed by **address 9**!

l f	Sensor pair	Address S3 GSQ transmitter	Address S3 GSQ receiver
1		1	1
2		2	2
3		3	3
4		4	4
5		5	5
6		6	6
7		7	7
g		(8 – do not use)	(8 – do not use)
8		9	9
9		A	A
s			
t			

m is expanded to **8 or 9 transmitter and receiver modules** , an **additional 12V power supply** must be installed in the control cabinet, which then takes over the supply of the GSQ transmitter and receiver modules!

The original power supply from the GSQ satellite module to the GSQ transmitter and receiver modules must then be disconnected!

- For connecting the power supply, see circuit diagram

The GSQ sensor modules must be mounted in the pit as shown below. Depending on whether the cable outlet of the GSQ sensor modules is at the bottom or at the top, make sure on which side the "GSQ SEND xxxx" or "GSQ EMPF xxxx" sensor modules are to be mounted. The individual sensors are connected with the supplied cable sets. Also, the cable outlets of the GSQ

sensors must always be all down or all up. Preferably, all cable outlets should be downwards to ensure the tightness of the sensor modules.

For the connection between the first GSQ sensor modules and the GSQ safety module, a shielded data cable with 4x0.34 mm<sup>2</sup> is required, e.g. Helukabel TRONIC-CY (LiY-CY 4x0.34). The maximum length is 50 m.

The terminating resistor must be attached to each of the last GSQ sensor modules.

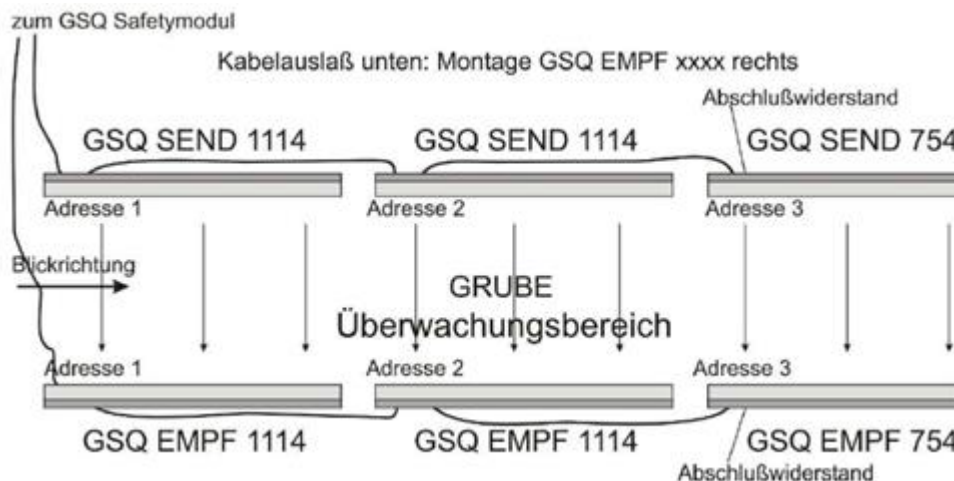
### Determination of the direction of view:

The first thing to do is to determine the direction of view into the pit. This viewpoint results in the left and right assembly pit sides. The cable outlet of the first "GSQ EMPF xxx" module must point in the direction of the viewer.



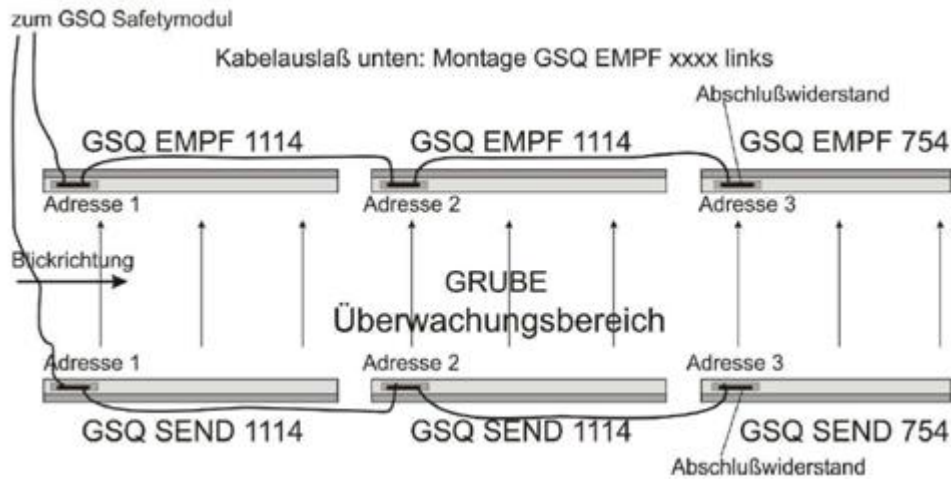
### Cable outlet downwards - "GSQ EMPF xxx" mount on right side

All GSQ EMFP 1114 / GSQ EMFP 854 are to be mounted on the right side of the pit, starting from the viewing direction with GSQ sensor pair 1. All GSQ SEND 1114 / GSQ SEND 754 are to be mounted on the left side of the pit, starting with GSQ sensor pair 1.



### Cable outlet upwards - "GSQ EMPF xxxx" mount on left side

All GSQ EMFP 1114 / GSQ EMFP 854 are to be mounted on the left side of the pit, starting from the viewing direction with GSQ sensor pair 1. All GSQ SEND 1114 / GSQ SEND 754 are to be mounted on the right side of the pit, starting with GSQ sensor pair 1.

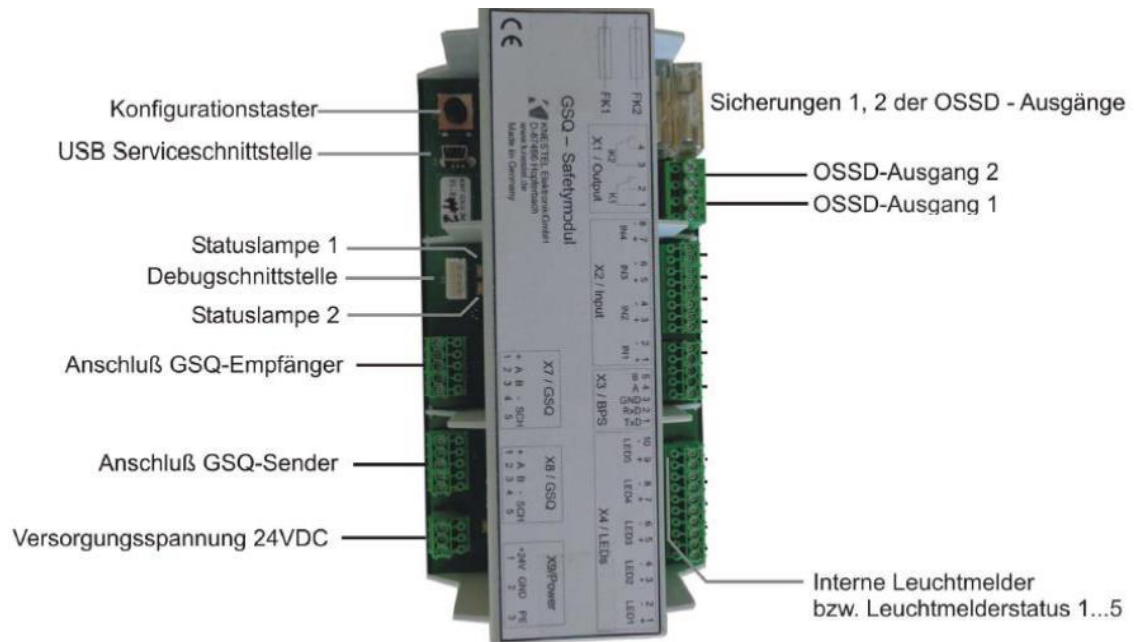


### GSQ sensor terminating resistor

The enclosed plug with the terminating resistor must be connected to the last GSQ sensor element (transmitter and receiver).



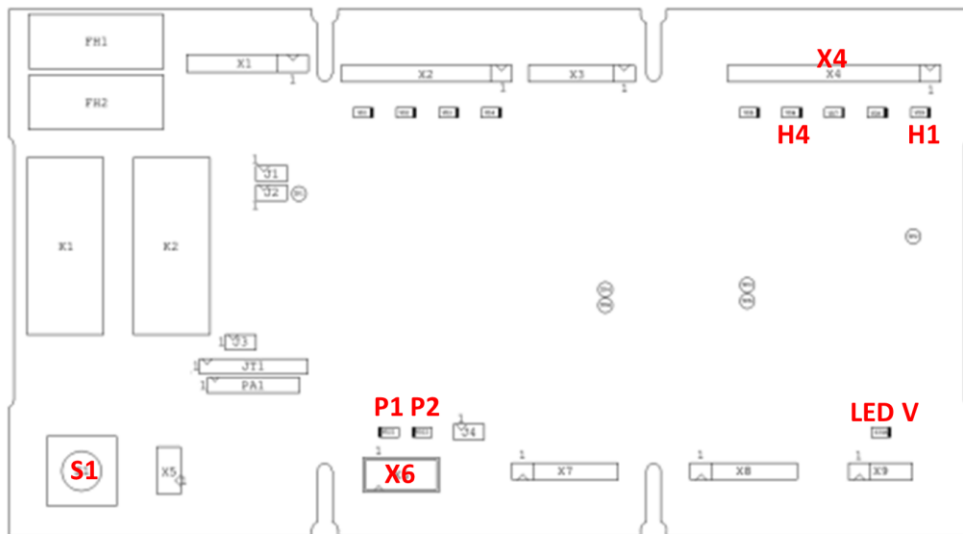
## Connector overview



The GSQ safety module provides two decoupled relay outputs (OSSD) via the two OSSD outputs (Output Signal Switching Device, X1.1-4). Due to the redundant design with positively driven and monitored contacts, a safe shutdown signal is provided by the GSQ safety module. On the brake tester side, these two signals can be used for safe disconnection of the motors. The relays on the GSQ safety module are closed when there is no hazard. In all other cases (body > 25 cm detected, power failure, internal error in the central module) the relay contacts are open. The switching contacts of the relays are protected by the fuses FK1 and FK2. On the side of the brake tester, care must be taken to ensure safe disconnection.

### 12.13.5 Commissioning/Configuring the GSQ Sensors

#### a) Structure of GSQ safety module



#### Info:

- The **V LED** lights up as soon as the supply voltage (24V DC) is applied to the GSQ safety module
- The **H1 LED** at **X4** flashes as soon as the GSQ safety module is in commissioning mode
- The **H1 LED** at **X4** lights up as soon as the GSQ safety module is ready

### 12.14 Brief Instructions for Commissioning

- Initial situation: Test bench is switched off ("Main switch OFF")

Off = ○		An = ●		Flashing = ✱	
Step	Process	LED on X6		Comment	Section
1.	<b>Press and hold S1</b> (approx. 10s), switch on test bench until LED P2 flashes	●	●	Start commissioning program	c)



Off = ○		An = ●		Flashing = ✱	
Step	Process	LED on X6		Comment	Section
①	Automatic check of the bus connection, readout of the participants	○	✱	<b>Error:</b> LED P1 & P2 flash alternately, then continue with "1.9 Faults" <b>Correct:</b> LED P1 & P2 flash simultaneously, then continue with step 2.	d)
2.	Number of transmitter and receiver modules is output (blinking pattern)	✱	✱	<b>Correct:</b> Number of signaled module pairs matches the number of installed module pairs. e.g.: 5x flash, pause = 5 pairs <b>Error:</b> Number does not match; continue with "1.9 Faults"	d)
3.	<b>S1 briefly press</b>	○	✱	Confirms the number of module pairs	d)
4.	<b>Start</b> verification program by <b>interrupting</b> the 1. Pair of eyes on the 1. Module (address 1) -Interrupt all pairs of eyes from the 1st to the last module -cover the last and the first eye simultaneously for 3s when two modules pass.	✱	✱	Checking the order: -P1 indicates by flashing how many modules have been detected  -Complete checking of a module within approx. 30s. If timeout occurs, LED P1 & P2 start flashing alternately, continue with "1.9 Faults"	e)
①	After covering the last pair of eyes, the configuration is finished.	●	●	LED P1 & P2 light up	f)
5.	<b>Press S1 for 5s</b> until LED P1 & P2 are off	○	○	Saving the configuration	f)
6.	After saving, <b>switch off the</b> test bench ("Main switch OFF")				

Off = ○		An = ●		Flashing = ✱	
Step	Process	LED on X6		Comment	Section
7.	Switch the test bench on again for operation ("Main switch ON")	○	○	-LED V lights up as soon as the supply voltage is applied to the GSQ safety module. -LED H1 at X4 lights up and the test bench is ready for operation	
8.	- Cover each individual eye of the transmitter/receiver modules - check whether the pit safety device trips			Checking the configuration	

#### c) Starting the commissioning program

Initial situation: Test bench is switched off "Main switch OFF"

- Press and hold **S1**
- Switch on test bench (LED **P1 & P2** light up)
- after approx. **10s** LED **P2** starts flashing.
- **S1** release

#### d) Checking the GSQ transmitter and receiver modules

- The P2 LED flashes while the bus connection is checked for connected modules.
- If an error is detected, LEDs **P1 & P2** flash **alternately**. Continue with "**g) Faults**"
- After the successful check of the bus connection, the status lamps **P1 & P2** start flashing simultaneously.
- The flashing indicates how many transmitters and receivers have been found.
- e.g.: Status lamp **P1 & P2** flash **5x**, then a pause = 5 module pairs detected.
- If the signaled number (blink code) matches the actual number of transmitter and receiver modules installed, press **S1** briefly to confirm the number.
- If the blink code signals an incorrect number, continue with "**g) Faults**".

#### e) Checking sequence GSQ transmitter and receiver modules

- After confirmation with **S1**, the P2 status lamp flashes, the **P1** status lamp remains off until the start of the verification program.
- The verification program starts automatically as soon as the first eye of the first module is interrupted. The other sensors, starting with the first pair of

eyes of the first module, must now be covered continuously (by your own body or a suitable object) until the last module.

- When transitioning two modules, the last eye of the current module and the first eye of the next module must be covered simultaneously for approx. **3s**.
- LED **P2** flashes continuously and LED **P1** flashes according to the modules passed through:  
**1x** first module, **2x** second module ..
- A module must be run through within approx. **30s**.  
If timeout occurs, LED **P1 & P2** flash alternately, then continue with "**g) Faults**"
- After the last eye has been covered on the last module, the verification program is automatically terminated. The LED **1&2** is lit.

#### **f) Saving the configuration**

- To save, press and hold **S1** for approx. **5s** until the LEDs **P1 & P2** go out.
- After saving, de-energize the GSQ safety module ("main switch OFF").  
⇒ Configuration is finished
- If the test bench is switched on again ("Main switch ON")

**LED V** lights up as soon as the supply voltage is applied to the GSQ safety module

**LED H1** at **X4** lights up and the test bench is ready for operation

#### **Checking the configuration**

- Cover each individual eye of the transmitter/receiver modules and check whether the pit safety device trips.

#### **g) Errors**

If the P1 & P2 LEDs flash alternately, an error has occurred.

The LED H4 at X4 outputs a corresponding error code, see section "Error code list".

Important to b) Step 2.!!!

If 8 or more modules are connected, but one module less is displayed than signaled by the blink code, the setting of all addresses must be checked.

Make sure that address 8 has been omitted, see "**Setting the address of the transmitter-receiver modules**"!

The following things must be checked in case of malfunctions:

#### **ATTENTION:**

Always carry out troubleshooting with the test bench disconnected from the power supply (main switch OFF!)

- Check address setting on rotary switch S3 GSQ transmitter and receiver.
- Check wiring to transmitter and receiver modules.
- Check the terminating resistors.
- Check that the connecting wires are firmly seated.

If the error has been found and corrected, perform the configuration again.

### 12.14.1 Error Code List

Error code	Error description	Solution
Error codes in normal operation		
1 to 15	Error GSQ sensor transmitter and/or GSQ sensor receiver (address)	Check switch setting of S3 in the GSQ sensor transmitter and GSQ sensor receiver, as well as check all cable connections for tight fit and correct wiring or notify service
Error codes in the teach-in program		
16	The address setting is not in order from 1 to the number of GSQ sensor transmitters / GSQ sensor receivers	Check switch settings of S3 in the GSQ sensor transmitters and GSQ sensor receivers, and check all cable connections for tight fit and correct wiring, or notify Service
17	No GSQ sensor receivers were detected	Check all cable connections for tight fit and correct wiring or notify Service
18	The address setting does not start at setting 1	Check switch settings of S3 in the GSQ sensor transmitters and GSQ sensor receivers and check all cable connections for tight fit and correct wiring or notify Service
19	Sensor eye count does not match stored value	Perform installation procedure again or notify Service
20	System error configuration	Notify service
21	System error input 1	Notify service
22	System error input 2	Notify service
23	System error input 3	Notify service
24	System error input 4	Notify service
25	System error relay	Notify service
26	System error contactor monitoring	Notify service
27	System error voltage 24V	Notify service

<b>Error code</b>	<b>Error description</b>	<b>Solution</b>
28	System error voltage 10V	Notify service
29	System error voltage 5V	Notify service
30	System error self test	Notify service
31	System error WDG	Notify service
32	System error CPU	Notify service
33	System error ROM	Notify service
34	System error RAM	Notify service
35	System error stack	Notify service
36	System error WDG manual	Notify service

## 12.15 Wiring Harness Extension

The standard length of the pluggable wiring harness is 14 m for the passenger car test bench (C\_MBT 3.5 - 5.0) and 24 m for the truck test bench (C\_MBT 8.0 - 20.0). The associated empty conduits in the foundation between roller set and control cabinet may be a maximum of 10 m (car test bench) and 20 m (truck test bench).

The cross-section of the motor cable wires is 1.5 mm<sup>2</sup> for the passenger car test bench and 4.0 mm<sup>2</sup> for the truck test bench. The optional cable harness extension for the 24-meter car test bench has a 1.5 mm<sup>2</sup> cross-section.

The maximum length of the CAN data cable should not exceed 35 m.



### WARNING

The loop resistance measurement/assessment must take into account, among other things, the upstream customer electrical protective device and the electrical protective devices installed in the control cabinet for the motor cables by a competent electrician. National standards and regulations must be observed.

## 12.16 Drive-out Aid, Static Brake (Mechanical Motor Brake)

### 12.16.1 Description

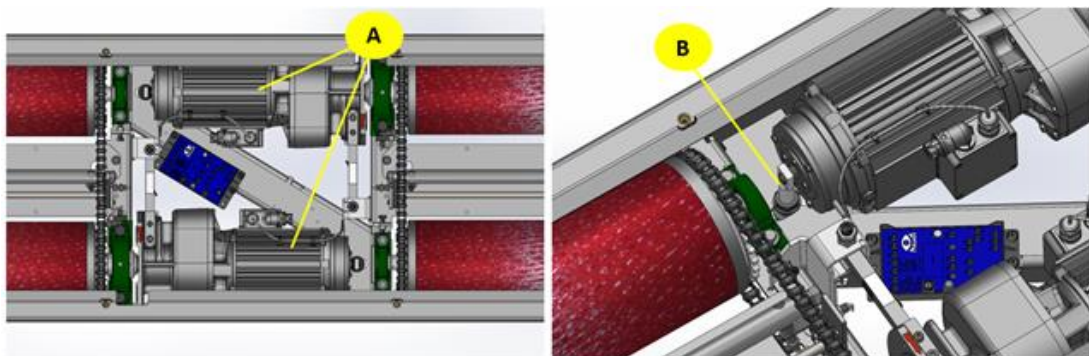
The electromechanical motor brake enables easy and convenient drive-out from the roller set. In the process, the test rollers are held and secured against rotation when the test bench motors are deactivated. This function is also active when the test bench is de-energized and switched off.

### 12.16.2 Structure of Motor Counter Bearing, Compact Test Benches

Since the motor has a longer design in a static brake, the motor counter bearing must be mounted in the second mounting hole.

### NOTICE

The motor counter bearing must be adjusted in height so that no distortions come onto the motor.



A Motor with mechanical brake

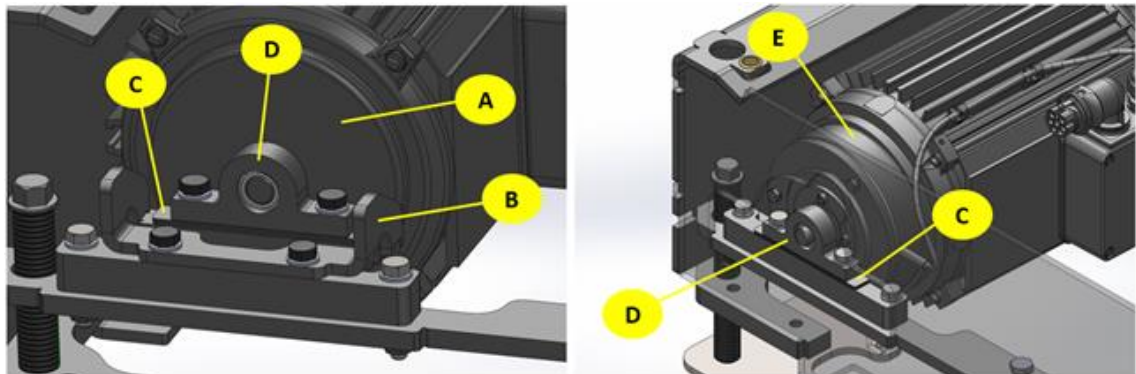
B Motor counter bearing Compact

### 12.16.3 Structure of Motor Counter Bearing, Split Test Benches

The motor counter bearing of standard motor and motor with mechanical brake differs only at the adapter. This is not necessary with the extension aid option due to the longer design of the motor.

**NOTICE**

The motor counter bearing must be adjusted in height so that no distortions come onto the motor. For this purpose, the pedestal bearing is underlaid with shims as required.



A Standard motor      B Adapter      C Bearing plate  
 D Pedestal bearing      E Motor with mech. Brake

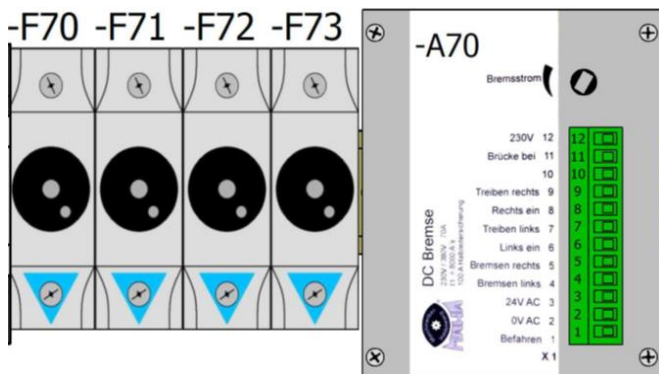
**12.17 Drive-off Aid, Static Brake (DC brake)**

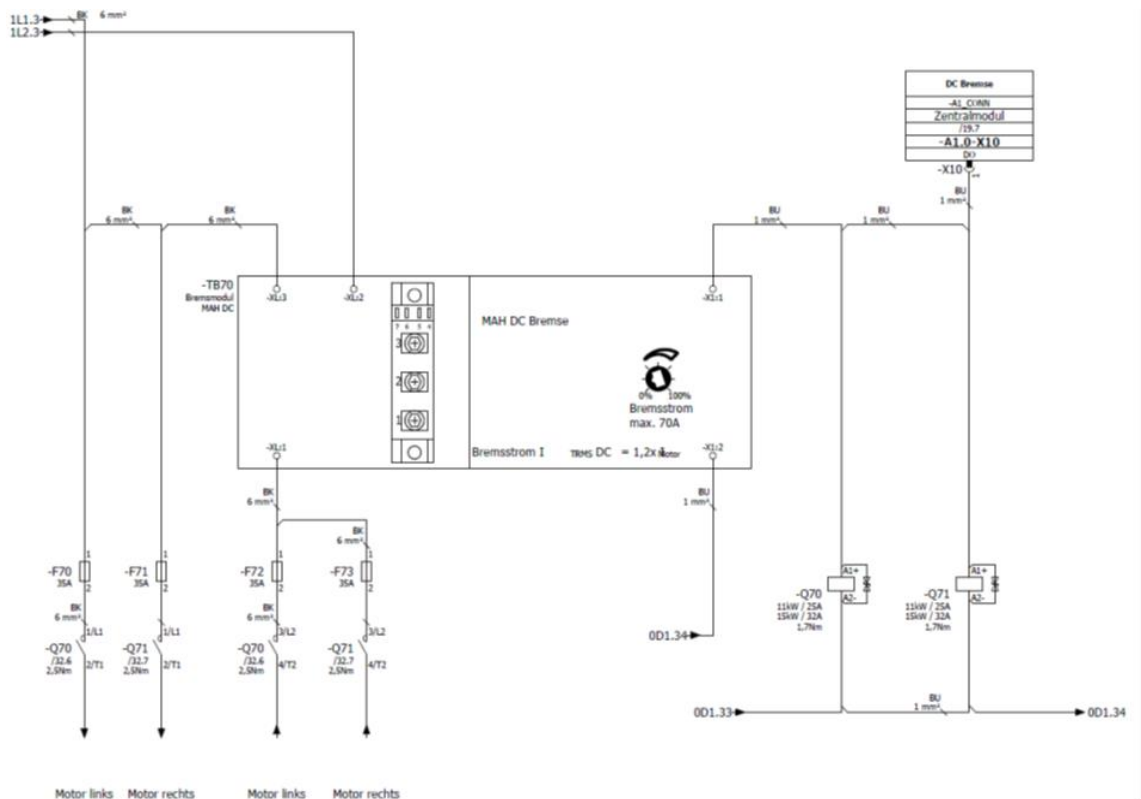
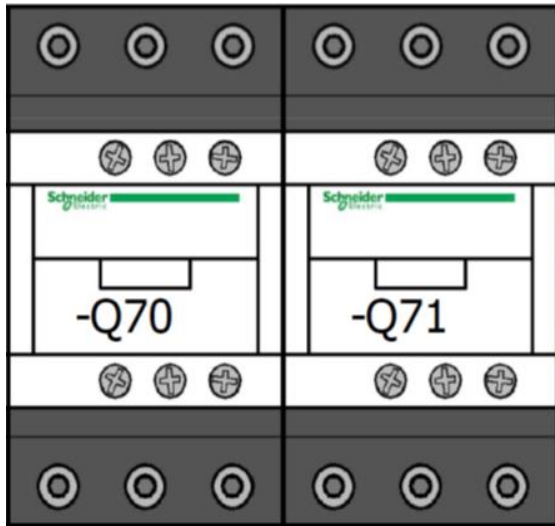
**12.17.1 Description**

The DC brake (-A70) enables easy and convenient drive-off from the roller set. In the process, the test rollers are held against rotation when the test bench motors are deactivated. This is done by phase rectification and thus a restraining DC field in the motor winding.

Output A1 on the central module ZM (-X10:1) controls the brake contactors motor left (-Q70) and motor right (-Q71) as well as the brake module (-A70) when braking is required.

Fuses -F70 to -F73 are used for line protection during DC braking.





### 12.17.2 Configuration



**DANGER**

Risk of injury from electric shock! The braking current may only be adjusted by an authorized electrician. Pay attention to live parts.

A True RMS DC current clamp is required for professional adjustment of the braking current.

Attach the current clamp to a single wire of a motor cable. Use the setting potentiometer on the front panel of the DC brake module to set the required braking current using a screwdriver. Check braking current also at the second motor cable.



The braking current to be set is 1.2 times the rated motor current. The rated motor current is indicated on the nameplate of the installed motor.

## 12.18 Motorcycle Mode (Roller Cover with Sensor)

### 12.18.1 Description

For two-wheel testing, the roller cover provided for this purpose must be firmly mounted on the brake tester for safety reasons. The motorcycle mode can be switched to active via a rotary switch on the operating terminal (in the burger menu). The roller cover is queried via a sensor and the motorcycle mode is enabled. Only one half of the test bench is active during the two-wheel test.

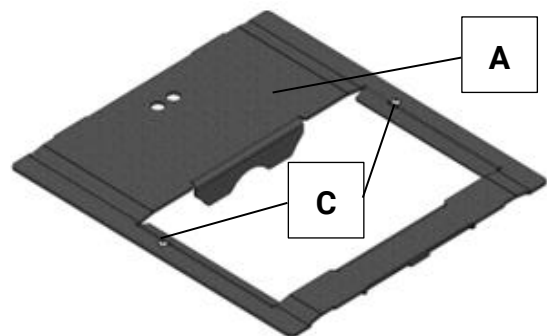
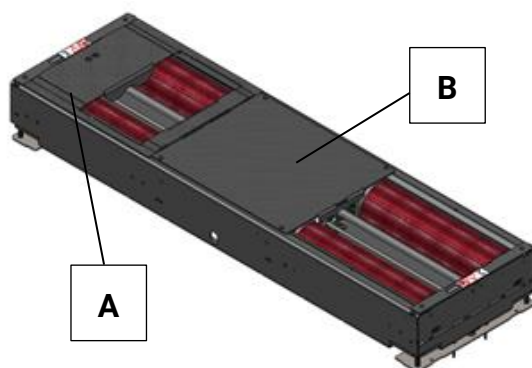
#### NOTICE

- The motorcycle mode is also possible in conjunction with the overrun and lowering threshold.  
With this combination, the light barrier is interrupted by the roller cover and the overrun and lowering threshold remains in the lowered position!
- The COMFORT interface module is required to operate the motorcycle cover!



#### CAUTION

- Before mounting the roller cover, it is imperative that the pneumatic supply line is depressurized. Risk of jamming!
- When handling the roller set cover, be sure to use the grip holes provided. Danger of pinching and crushing!



A Motorcycle cover

B Center cover

C Fixing screw

### 12.18.2 Scope of Delivery

- Motorcycle cover with locking pins

### 12.18.3 Technical Data

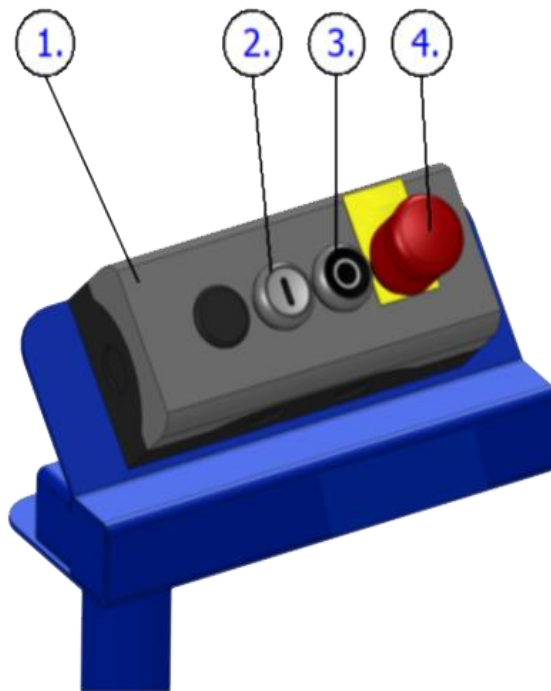
- Dimensions:

- W220: L x W x H approx. 720 x 660 x 60 mm
- W250: L x W x H approx. 885 x 660 x 60 mm
- W280: L x W x H approx. 1025 x 660 x 60 mm
- Width of test opening 350 mm
- Motorcycle cover made of diamond tread plate for anti-slip reasons
- Weight:
  - W220: approx. 15 kg
  - W250: approx. 20 kg
  - W280: approx. 24 kg

#### **12.18.4 Installation / Commissioning**

- 1 Depressurise the drive-over and lowering thresholds.
- 2 Tap threads for fastening the two locking pins into the motorcycle cover (2xM8).
- 3 Screw in and tighten the locking bolts.
- 4 Position motorcycle cover between bearing cover and centre cover with as little play as possible. If necessary, loosen the bearing cover and move it towards the motorcycle cover.
- 5 Re-establish the compressed air supply to the drive-over and lowering thresholds.

## 12.19 Cable Remote Control for Motorcycle Mode



- 1 Cable remote control
- 2 "Motor On" button
- 3 "Motor Off" button
- 4 Emergency stop

## 12.20 Roller Heating

### 12.20.1 Description

The roller heater protects the test and sensing rollers from icing during winter operation.

#### **NOTICE**

- A separate installation plan must be requested in conjunction with a drive-over and lowering threshold!
- The roller heating is not possible in connection with a roller set lifting!



#### **WARNING**

The roller heater provides a source of heat. There is a danger of burns due to direct or indirect contact!



**A** Roller heating

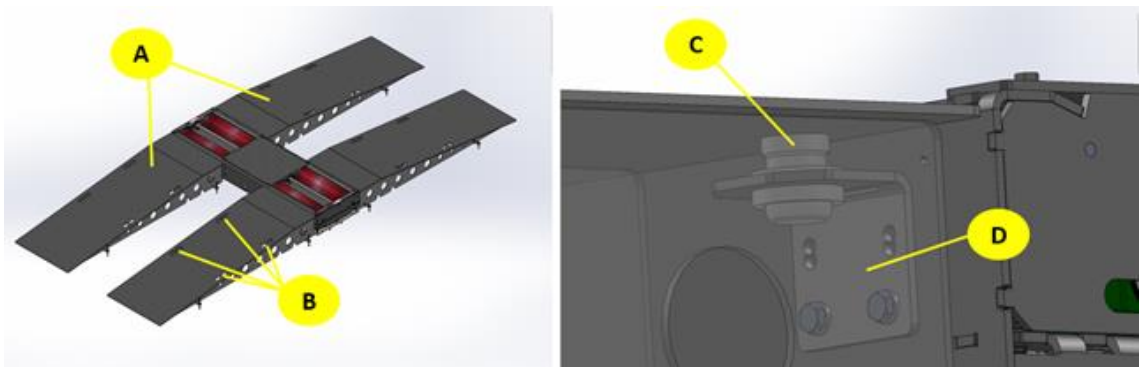
## 12.21 Drive-on Ramp Set for Above-Ground Operation

### 12.21.1 Description

The drive-up ramp set is suitable for above-ground operation and can be used on the drive-up and/or drive-down side.

#### **NOTICE**

- The drive-up ramp set cannot be used in conjunction with the static/dynamic weighing device, the roller heater and the drive-over and lowering threshold.



**A** Access ramp

**B** Transport cutout

**C** Fixing bolt

**D** Bracket

### 12.21.2 Technical Data

- L x W x H 2500 x 850 x 270 mm
- Weight per ramp approx. 170 kg
- Axle load max. 4000 kg

### 12.21.3 Installation

The ramps are fixed by means of fixing bolts and the brackets mounted on the test bench.

If additional drive-over ramps are used, the drive-on ramp is attached to them using the same system.

In addition, the ramps can be fixed to the ground by means of four anchor rods.

#### NOTICE

- When transporting/placing the ramps, it is essential to use a suitable 4-strand chain sling and the cutouts provided in the ramps for this purpose!



#### CAUTION

- Wear personal protective equipment when transporting/placing the ramps!

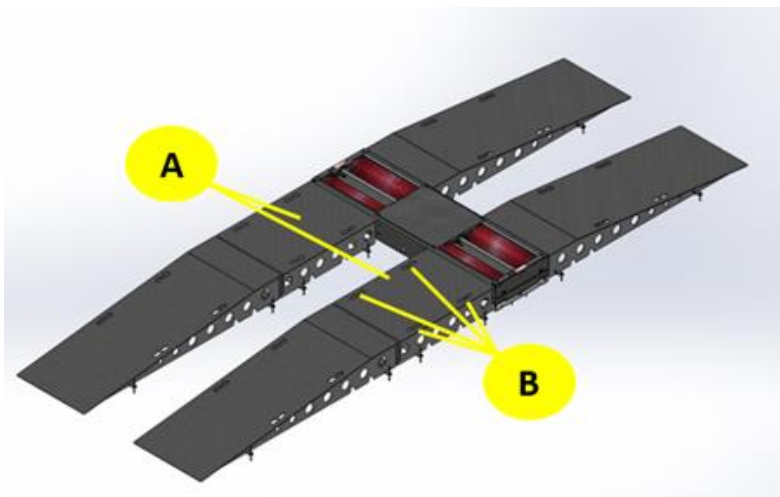
## 12.22 Drive-over Ramp Set

### 12.22.1 Description

The drive-over ramp set is suitable for above-floor operation and can be used on the drive-up and/or drive-down side. The drive-over ramp set has a modular design and can thus be built several times in succession to create a level vehicle parking surface.

#### NOTICE

- The drive-over ramp set cannot be used in conjunction with the static/dynamic weighing device, the roller heater and the drive-over and lowering threshold.



**A** Access ramp

**B** Transport cutout

### 12.22.2 Technical Data

- L x W x H 1200 x 850 x 270 mm
- Weight per ramp approx. 120 Kg
- Axle load max. 4000 Kg

### 12.22.3 Installation

The ramps are fixed by means of fixing bolts and the brackets mounted on the test bench. In addition, the ramps can be fixed to the ground by means of four anchor rods.

#### NOTICE

- When transporting/placing the ramps, it is essential to use a suitable 4-strand chain sling and the cutouts provided in the ramps for this purpose!
- 



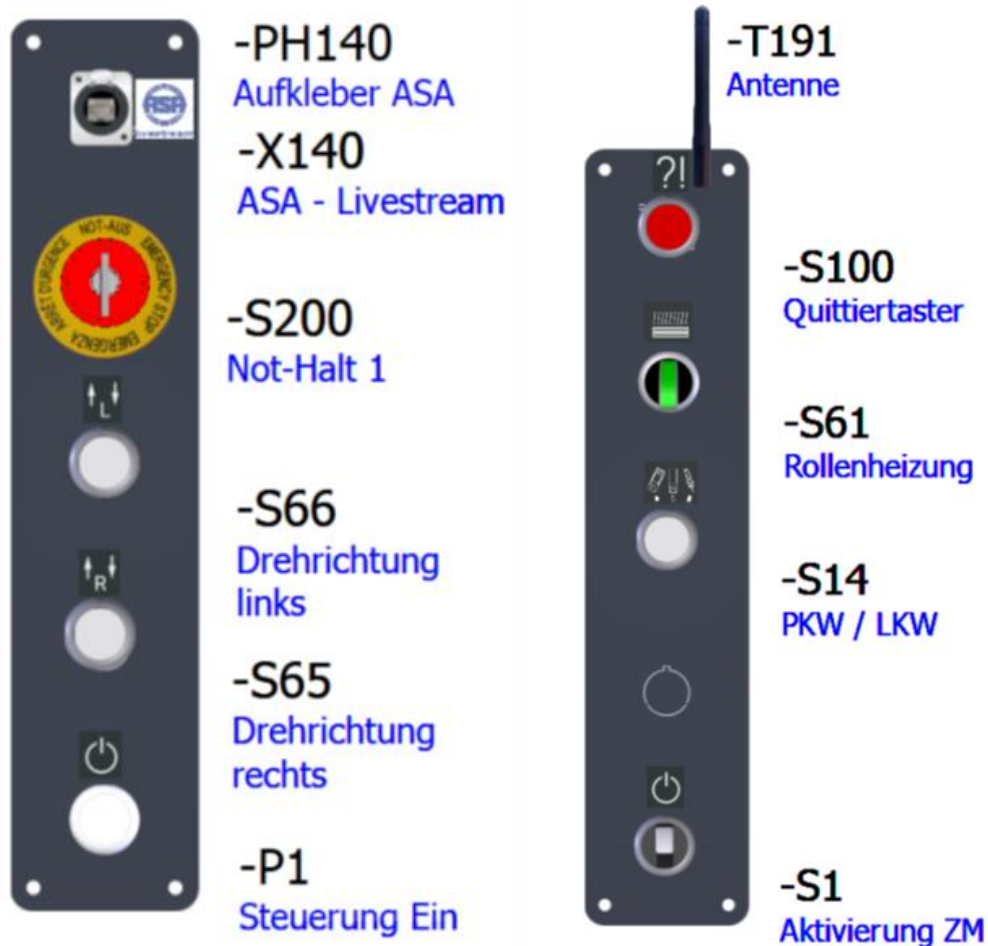
#### CAUTION

- Wear personal protective equipment when transporting/placing the ramps!
-

## 12.23 Universal Console C\_MCD

Controls in the universal console:

In case the control cabinet is located far away from the test bench, the control elements can be dismantled from the control cabinet door and placed laterally according to the following arrangement in the universal console C\_MCD:



The connection to the controls in the universal console corresponds to an extension.

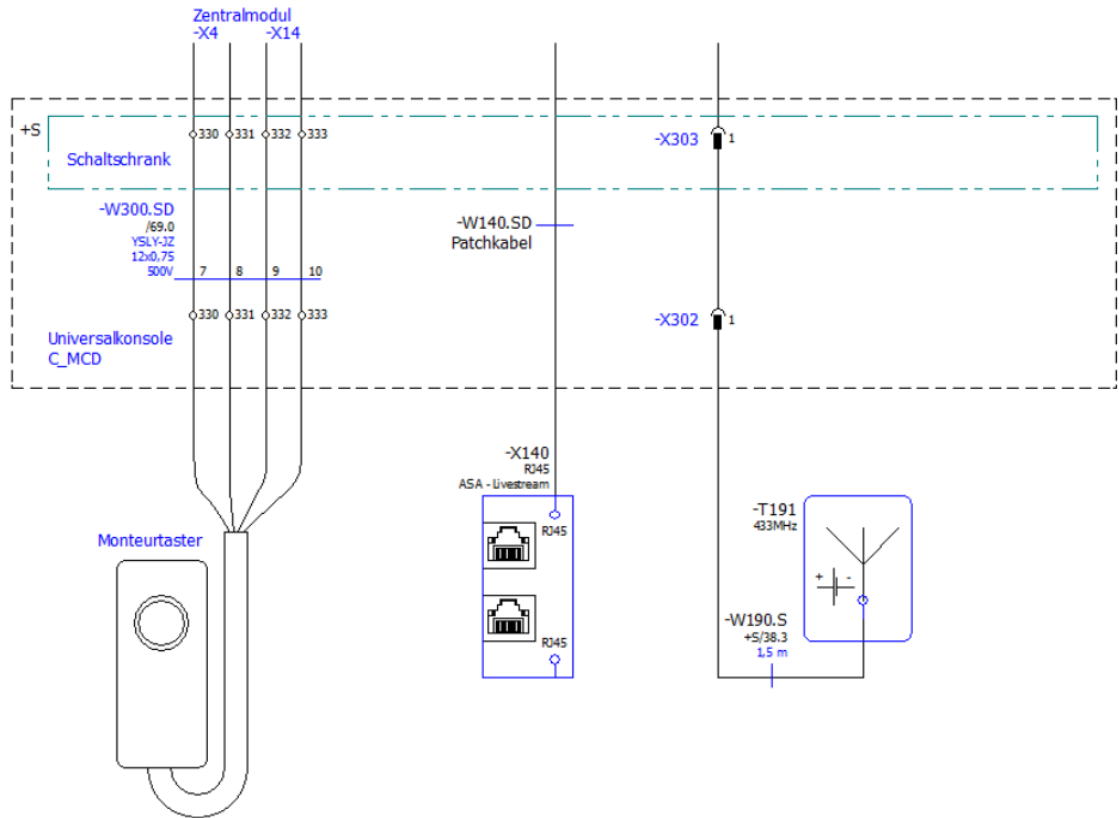
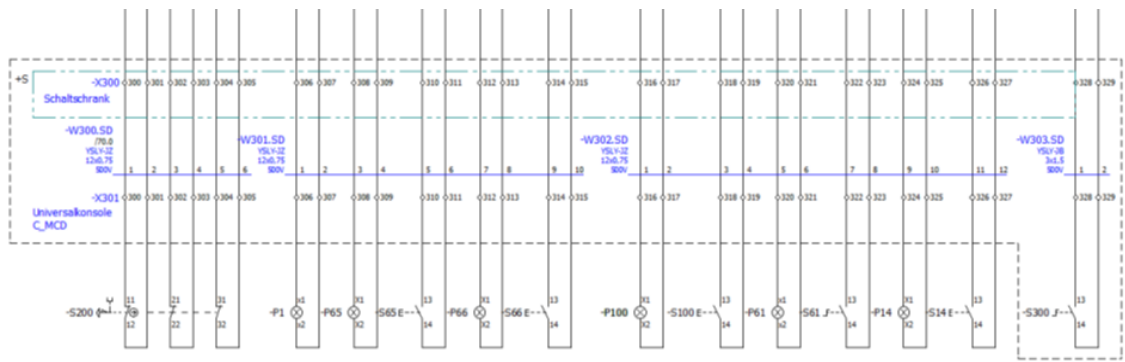
All wires and connections leading to the control elements in the door are placed on an additional terminal strip in the control cabinet door, with cables extended to the universal console. Another terminal strip is placed in the universal console to clamp the incoming cables and connect the controls in the side panels.

The ASA socket is connected with a longer LAN cable, the antenna is extended with its own BNC cable and appropriate adapters.

In addition, the assembly pushbutton must be extended, but the extension ends on the terminals in the universal desk. A key switch must be installed to cut off the power supply to the central module.

The key switch is used exclusively for activating the ZM and must not be used for switching off under load.

The maximum distance between the control cabinet and the universal console is limited to 15 m.





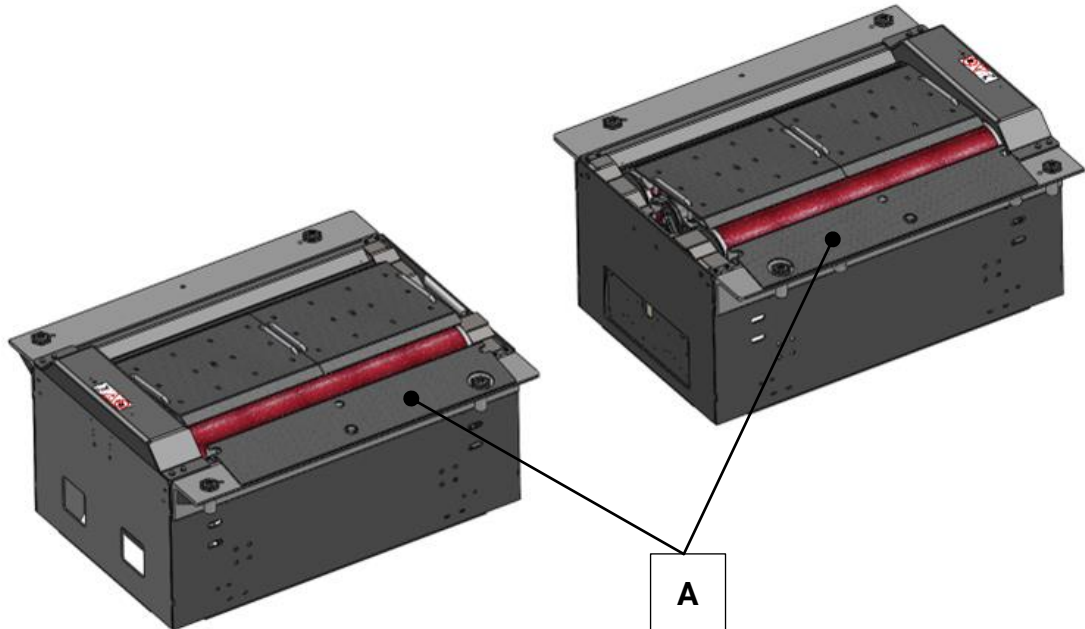
## 12.24 Drive-on Aid C\_MBT S 13.0/15.0 R100 MU

### 12.24.1 Description

For better accessibility of the brake tester, the drive-on aid is optionally available. This must be firmly screwed to the frame.

#### Info:

The drive-on aid is not possible in conjunction with roller set lift VZ 935264.



**A** Drive-on aid

### 12.24.2 Scope of Delivery

- Drive-on aid (2 pieces)
- 6x hexagon bolt M10x16
- 6x washer A10.5
- 2x hexagon head screw M16x25
- 2x washer A17

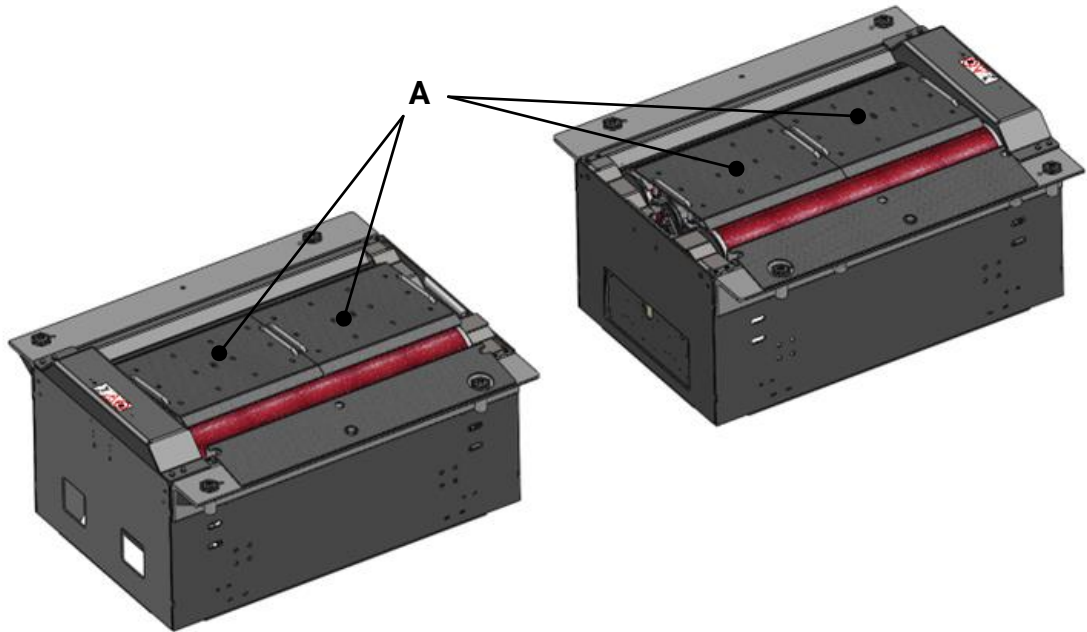
### 12.24.3 Technical Data

- Dimensions: L x W x H approx. 980 x 202 x 40 mm
- Weight: approx. 11.5 kg per drive-on aid

## 12.25 Roller Set Cover C\_MBT S 13.0/15.0/18.0/20.0

### 12.25.1 Description

For better traversability of the brake tester, the roller set cover is optionally available. The individual covers are placed in the roller prism and can be driven over with the respective permissible axle loads.



A Roller set cover

### 12.25.2 Scope of Delivery

- C\_MBT S 13.0/15.0 R100: 4 piece
- C\_MBT S 18.0/20.0 R115: 4 piece
- C\_MBT S 18.0/20.0 R160: 6 piece

### 12.25.3 Technical Data

- Dimensions:

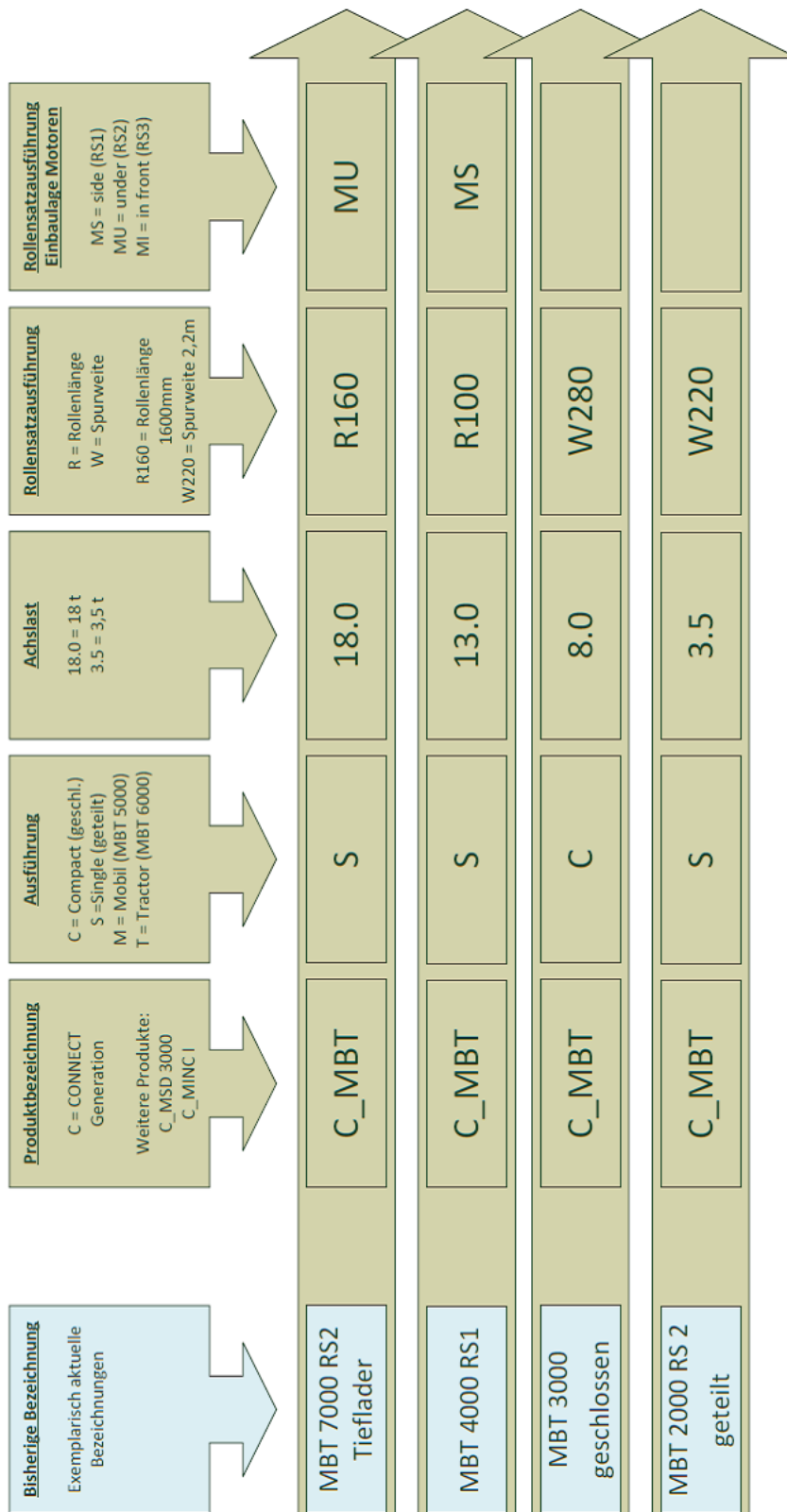
C_MBT S 13.0/15.0 R100	L x W x H approx. 490 x 460 x 130 mm
C_MBT S 18.0/20.0 R115	L x W x H approx. 550 x 500 x 150 mm
C_MBT S 18.0/20.0 R160	L x W x H approx. 550 x 500 x 150 mm / L x W x H approx. 450 x 500 x 150 mm

- Weight:

C_MBT S 13.0/15.0 R100	4x approx. 21 kg
C_MBT S 18.0/20.0 R115	4x approx. 23.5 kg
C_MBT S 18.0/20.0 R160	4x approx. 23.5 kg / 2x approx. 19.5 kg

# 13 Annex

## 13.1 Naming convention





## **13.2 CE Declarations of Conformity**

See following page(s).



# Original-EG-Konformitätserklärung Original EC Declaration of Conformity

CE023001-de-en



## MAHA Maschinenbau Haldenwang GmbH & Co. KG

erklärt hiermit als Hersteller in alleiniger Verantwortung, dass nachstehend bezeichnetes Produkt in Konzeption und Bauart den grundlegenden Sicherheits- und Gesundheitsanforderungen der hier genannten Richtlinien entspricht.

Bei Änderungen am Produkt, die nicht von oben genannter Firma genehmigt wurden, verliert diese Erklärung ihre Gültigkeit.

herewith declares as a manufacturer its sole responsibility to ensure that the product named hereafter meets the safety and health regulations both in design and construction required by the directives stated below.

This declaration becomes void if any change is made to the product that was not approved by named company beforehand.

### Typ | Model

C_MBT C 3.5 W220	C_MBT C 4.0 W220
C_MBT C 3.5 W250	C_MBT C 4.0 W250
C_MBT S 3.5 W220	C_MBT S 4.0 W220
C_MBT S 3.5 W250	C_MBT S 4.0 W250

C\_MBT C 5.0 W280  
C\_MBT S 5.0 W280

### Seriennummer | Serial Number

### Bezeichnung | Designation

Rollen-Bremsprüfstand

Roller Brake Tester

Zulässige Achslast 3500 kg Antriebsleistung 2x3 kW / 2x4 kW	C_MBT C 3.5 W220 C_MBT C 3.5 W250 C_MBT S 3.5 W220 C_MBT S 3.5 W250	Rated Axle Load 3500 kg Drive Power 2x3 kW / 2x4 kW
--	--	--

Zulässige Achslast 4000 kg Antriebsleistung 2x4 kW	C_MBT C 4.0 W220 C_MBT C 4.0 W250 C_MBT S 4.0 W220 C_MBT S 4.0 W250	Rated Axle Load 4000 kg Drive Power 2x4 kW
---	--	---

Zulässige Achslast 5000 kg Antriebsleistung 2x4 kW	C_MBT C 5.0 W280 C_MBT S 5.0 W280	Rated Axle Load 5000 kg Drive Power 2x4 kW
---	--------------------------------------	---

### Richtlinien | Directives

2006/42/EG; 2014/30/EU; 2014/53/EU (Option)

2006/42/EC; 2014/30/EU; 2014/53/EU (Option)

### Normen | Standards

DIN EN 60204-1:2019-06; DIN EN ISO 13849-1:2016-06; DIN EN ISO 12100:2011-03;  
DIN EN 61000-6-3:2011-09; DIN EN 61000-6-2:2019-11; EN 17003:2022

### Bevollmächtigter für die Zusammenstellung der technischen Unterlagen Person Authorised to Compile the Technical File

Ralf Kerkmeier

MAHA Maschinenbau Haldenwang GmbH & Co. KG, Hoyen 20, 87490 Haldenwang, Germany

Haldenwang, 2023-06-01

Andreas Maier

CE-Bevollmächtigter | Authorised CE Representative



**Original-EG-Konformitätserklärung  
Original EC Declaration of Conformity**

CE043001-de-en



MAHA GROUP

**MAHA Maschinenbau Haldenwang GmbH & Co. KG**

erklärt hiermit als Hersteller in alleiniger Verantwortung, dass nachstehend bezeichnetes Produkt in Konzeption und Bauart den grundlegenden Sicherheits- und Gesundheitsanforderungen der hier genannten Richtlinien entspricht.

Bei Änderungen am Produkt, die nicht von oben genannter Firma genehmigt wurden, verliert diese Erklärung ihre Gültigkeit.

herewith declares as a manufacturer its sole responsibility to ensure that the product named hereafter meets the safety and health regulations both in design and construction required by the directives stated below.

This declaration becomes void if any change is made to the product that was not approved by named company beforehand.

**Typ | Model**

C\_MBT C 13.0 W280  
C\_MBT S 13.0 R100 MS  
C\_MBT S 13.0 R100 MU

C\_MBT S 15.0 R100 MS  
C\_MBT S 15.0 R100 MU

C\_MBT S 18.0 R115 MS  
C\_MBT S 18.0 R115 MU  
C\_MBT S 18.0 R115 MI  
C\_MBT S 18.0 R160 MS  
C\_MBT S 18.0 R160 MU

C\_MBT M 18.0 W301  
C\_MBT T 18.0 W360  
C\_MBT S 20.0 R115 MU  
C\_MBT S 20.0 R115 MI  
C\_MBT S 20.0 R160 MU

**Seriennummer | Serial Number**

**Bezeichnung | Designation**

Rollen-Bremsprüfstand

Roller Brake Tester

Zulässige Achslast 13 000 kg  
Antriebsleistung 2x7,5 kW /  
2x9 kW / 2x11 kW

C\_MBT C 13.0 W280  
C\_MBT S 13.0 R100 MS  
C\_MBT S 13.0 R100 MU

Rated Axle Load 13 000 kg  
Drive Power 2x7.5 kW /  
2x9 kW / 2x11 kW

Zulässige Achslast 15 000 kg  
Antriebsleistung 2x9 kW / 2x11 kW

C\_MBT S 15.0 R100 MS  
C\_MBT S 15.0 R100 MU

Rated Axle Load 15 000 kg  
Drive Power 2x9 kW / 2x11 kW

Zulässige Achslast 18 000 kg  
Antriebsleistung 2x11 kW

C\_MBT S 18.0 R115 MS  
C\_MBT S 18.0 R115 MU  
C\_MBT S 18.0 R115 MI  
C\_MBT S 18.0 R160 MS  
C\_MBT S 18.0 R160 MU  
C\_MBT M 18.0 W301  
C\_MBT T 18.0 W360

Rated Axle Load 18 000 kg  
Drive Power 2x11 kW

Zulässige Achslast 20 000 kg  
Antriebsleistung 2x11 kW

C\_MBT S 20.0 R115 MU  
C\_MBT S 20.0 R115 MI  
C\_MBT S 20.0 R160 MU

Rated Axle Load 20 000 kg  
Drive Power 2x11 kW

**Richtlinien | Directives**

2006/42/EG; 2014/30/EU; 2014/53/EU (Option)

2006/42/EC; 2014/30/EU; 2014/53/EU (Option)

**Normen | Standards**

DIN EN 60204-1:2019-06; DIN EN ISO 13849-1:2016-06; DIN EN ISO 12100:2011-03; EN 17003:2022

**Bevollmächtigter für die Zusammenstellung der technischen Unterlagen**

**Person Authorised to Compile the Technical File**

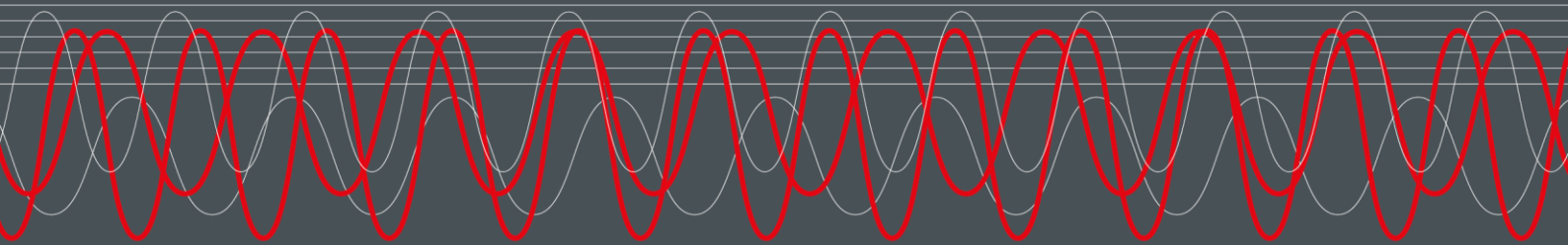
Ralf Kerkmeier

MAHA Maschinenbau Haldenwang GmbH & Co. KG, Hoyen 20, 87490 Haldenwang, Germany

Haldenwang, 2023-06-01

Andreas Maier

CE-Bevollmächtigter | Authorised CE Representative



**MAHA MASCHINENBAU HALDENWANG GMBH & CO. KG**

Hoyen 20  
87490 Haldenwang  
Germany

☎ +49 8374 585 0  
✉ [maha@maha.de](mailto:maha@maha.de)  
🌐 [maha.de](http://maha.de)