CONNECT SERIES

Roller Brake Testers for Cars, Vans and Commercial Vehicles

Extract from the Original Operating Instructions

BA023001_101-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

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This document is only an excerpt from the original operating instructions.

After receipt of the delivery, the complete version of the original operating instructions must be downloaded from the MAHA website or a printout requested from MAHA.

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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 instructions.
- Adhering to the procedures, sequences and corresponding safety instructions is essential.
- A printed copy of the operating instructions must always be kept by the equipment.
- 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 section "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 stand.

- 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 stand, 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 Safety Requirements for Roller Brake Testers

Note on classification

The section 'Requirements of EN 17003' contains exclusively the safety requirements derived from the EN 17003 standard.

The section 'Additional Requirements from the Manufacturer' contains supplementary, product-specific requirements from the manufacturer, as well as the resulting specifications for planning, installation, operation and maintenance. Product-specific values are not designated as general requirements of EN 17003.

2.1 Requirements of EN 17003

The roller brake tester must fulfil the following protection objectives and safety requirements in accordance with its design and intended use.

2.1.1 Protection against Mechanical Hazards

- Protection against access to rollers, drives, shafts and other moving parts.
- Prevention or adequate mitigation of entanglement, crushing and shearing hazards.
- Ensuring a controlled test procedure
- In addition, EN 17003 requires measures that cannot be fully implemented by the machine itself, but must be ensured by the structural environment.

2.1.2 Safety-Related Control Functions

- Provision of suitable emergency stop devices
- Safe state upon activation of a protective device
- Defined operating, fault and restart states

2.1.3 Access Protection and Installation Configuration

- The specified danger zone must not be entered while a test sequence is active.

- Safety-related protective devices must be effective and trigger a safe state when entered.
- When installed in a test pit, access to the hazardous roller and drive area must be prevented by a suitable protective measure.
- The specific safety solution may consist of covers, interlocked access points or suitable non-contact safety devices.

2.1.4 User Information and Documentation

- Description of the intended use, the operating limits and foreseeable misuse
- Provision of the necessary information for assembly, commissioning, operation, maintenance and troubleshooting
- Details of residual risks and the protective measures to be implemented prior to commissioning

2.1.5 Residual Risks

- Despite design-based and supplementary protective measures, the following residual risks in particular may remain:
- Risk of entanglement and crushing in the vicinity of the rollers if protective devices are ineffective, have been removed or have been bypassed
- Hazards arising from incorrect vehicle positioning, overloading or improper operation
- Hazards during maintenance, cleaning and fault rectification

2.2 Additional Requirements from the Manufacturer

The following requirements are product-specific specifications for the relevant version of the roller brake tester. They supplement the requirements of EN 17003 and must be complied with in accordance with the order, foundation, installation and operating documentation.

2.2.1 Subgrade and Installation Area

- The subgrade must be constructed in accordance with the approved foundation and installation plans: it must have sufficient load-bearing capacity, be compacted, permanently stable and designed to prevent unacceptable settlement
- Account must be taken of additional dynamic loads during the test procedure
- Maximum slope of the installation surface of 1%, unless otherwise specified for the specific design

2.2.2 Test Pit and Structural Design

- Pit dimensions in accordance with the approved manufacturer’s and project documentation
- Sufficient and safe working space for maintenance and inspection
- Safe access to the pit, e.g. via suitable stairs or other approved access solutions
- Adequate lighting of the work and maintenance areas

- Implementation of suitable fall protection measures in open pit areas in accordance with the local risk assessment

2.2.3 Access Protection and Operational Integration

- Coordination of the safety solution with the machine design, the installation situation and the locally applicable regulations
- Use of covers, mechanical barriers, interlocked access devices or suitable non-contact safety devices, where required for the specific installation
- Ensuring that, upon opening or entry, a safe condition is established, the rollers are stopped and restart is prevented
- A guardrail alone is not automatically considered sufficient protection against access to the roller or drive area. The risk of access from the front and rear must be managed (at a minimum) by marking the restricted area, using suitable visual elements such as strips on the floor, warning lights and similar measures.
- The restricted area must be at least the area demarcated by the physical barriers.
- Verification of the effectiveness of the overall safety solution for the specific installation

2.2.4 Operator Obligations Specified by the Manufacturer

- To ensure intended and safe use, the operator or client must, in particular, carry out the following tasks:
- Implementation of the approved foundation, pit and installation plans
- Ensuring the load-bearing capacity of the subsoil and compliance with the product-specific installation conditions
- Implementation of the necessary fall protection and access control measures
- Carrying out the risk assessment required under applicable law and drawing up operating instructions
- Training and authorisation of suitable operating and maintenance personnel
- Preventing unauthorised access to the hazard zone
- Compliance with the manufacturer’s operating, testing and maintenance specifications, as well as regular inspection of safety devices
- Operation only when the equipment is in a proper and safe condition

2.2.5 Interfaces and Responsibilities

The following allocation is typical but not exhaustive. The specific scope of supply, the contractual documents, the installation situation and the applicable law in each case are decisive.

Area	Manufacturer’s responsibility	Responsibility of the operator/building owner

Area	Manufacturer's responsibility	Responsibility of the operator/building owner
Machine: rollers, drive, control system	Yes	Intended use
Internal machine safety functions	Yes	Functional checks during operation
Operating instructions and documentation	Yes	Implementation of specifications
Excavation, foundations and structure	No	Implementation by operator/ building owner
Fall protection and access control	Only if included in the scope of supply	Implementation by operator/ building owner
Risk assessment and operating instructions	Provision of the necessary machine information	Workplace-specific risk assessment and operating instructions to be provided by the operator/ building owner in accordance with applicable law

2.2.6 Note on CE Conformity and Modifications

CE conformity of the roller brake tester is conditional upon

- all installation and environmental conditions specified by the manufacturer are complied with.
- in particular, that all safety-related structural measures are fully implemented.

Any deviation from these requirements may compromise safe use and falls within the operator's area of responsibility.

3 Transport, Handling and Storage

3.1 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 stand so that the emergency stop function according to DIN EN ISO 13850 is fulfilled.

3.2 Scope of Delivery

Each test stand 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.

3.3 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.

	C_MBT C 3.5 W220	**C_MBT S 3.5 W220**	**C_MBT C 3.5 W250**	**C_MBT S 3.5 W250**
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			

	C_MBT C 4.0 W220	**C_MBT S 4.0 W220**	**C_MBT C 4.0 W250**	**C_MBT S 4.0 W250**
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			

	C_MBT C 5.0 W280	C_MBT S 5.0 W280	C_MBT C 13.0 W280
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

	C_MBT S 13.0 R100 MU	C_MBT S 15.0 R100 MU
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	

	C_MBT S 18.0 R115 MS	C_MBT S 18.0 R115 MU	C_MBT S 18.0 R115 MI
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		

	C_MBT S 18.0 R160 MS	C_MBT S 18.0 R160 MU
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	

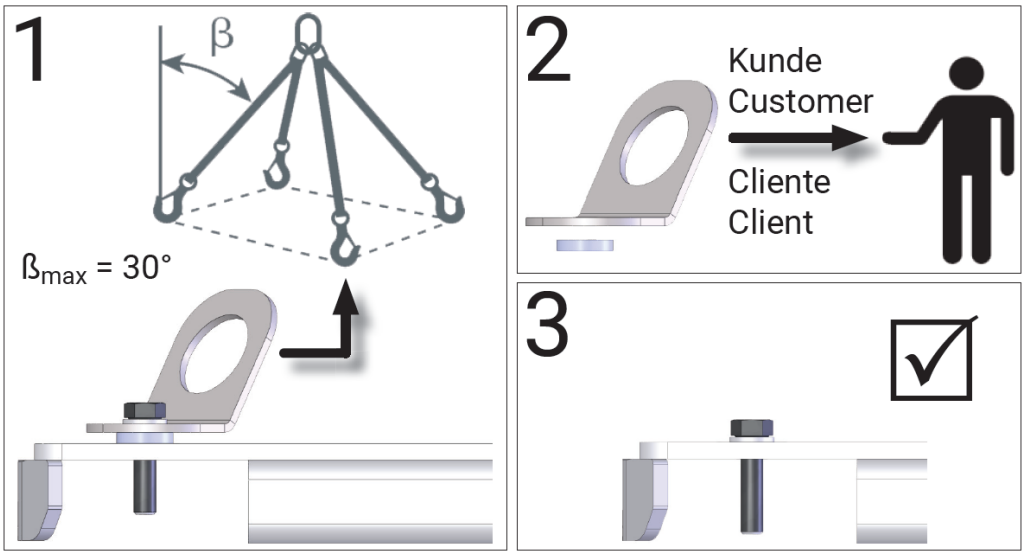
	C_MBT S 20.0 R115 MU	C_MBT S 20.0 R115 MI	C_MBT S 20.0 R160 MU
Dimensions Package Roller set (L x W x H)	2x 150 x 115 x 100 cm	2x 150 x 150 x 75 cm	2x 195 x 115 x 98 cm
Weight Package Roller set	2x 1000...1350 kg	2x 900...1200 kg	2x 1100...1400 kg
Dimensions Package “Control cabinet Series” (L x W x 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		

	C_MBT M 18.0 W301	C_MBT T 18.0 W360
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	

3.4 Transport and Handling

Transport and handling of the test stand is only permitted in the original packaging. On the pallet the packaged test stand 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 stand are shown in section “Packaging Information”.



Pick-up points of the packaged test stand

3.5 Storage

The packages must be stored in a covered location and protected from direct sunlight. Storage must take place at a temperature between -10 °C and +60 °C.

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

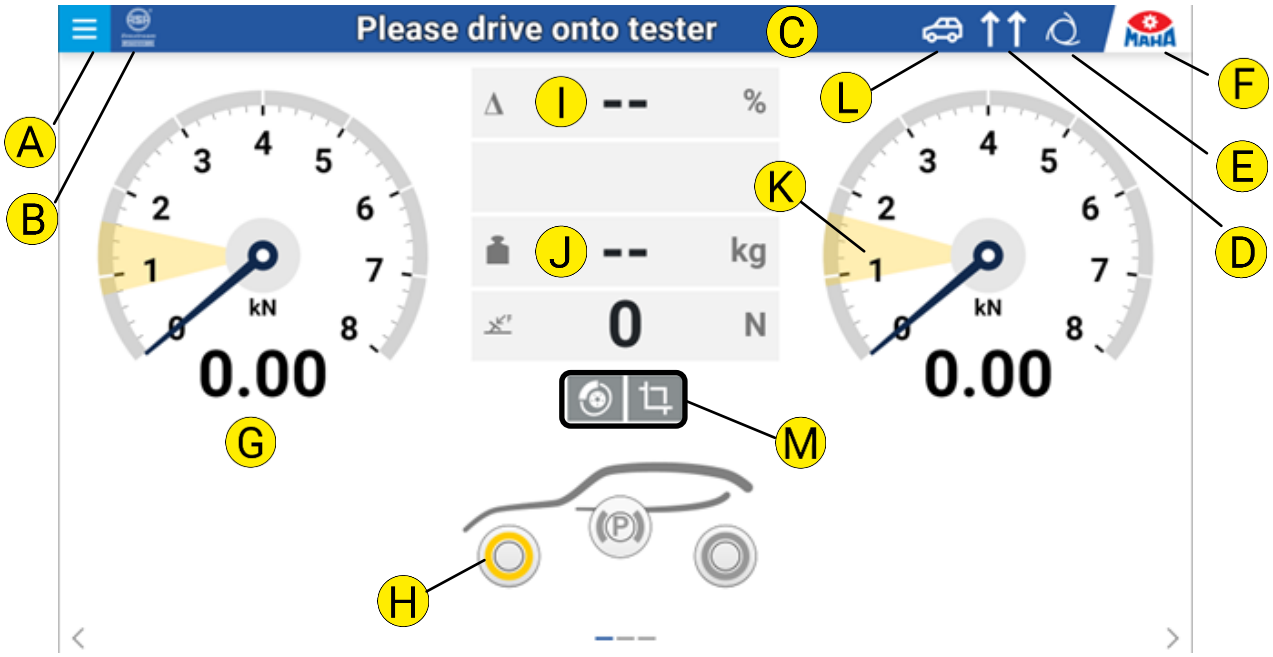
4 Description of the Software User Interface

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.

4.1 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).

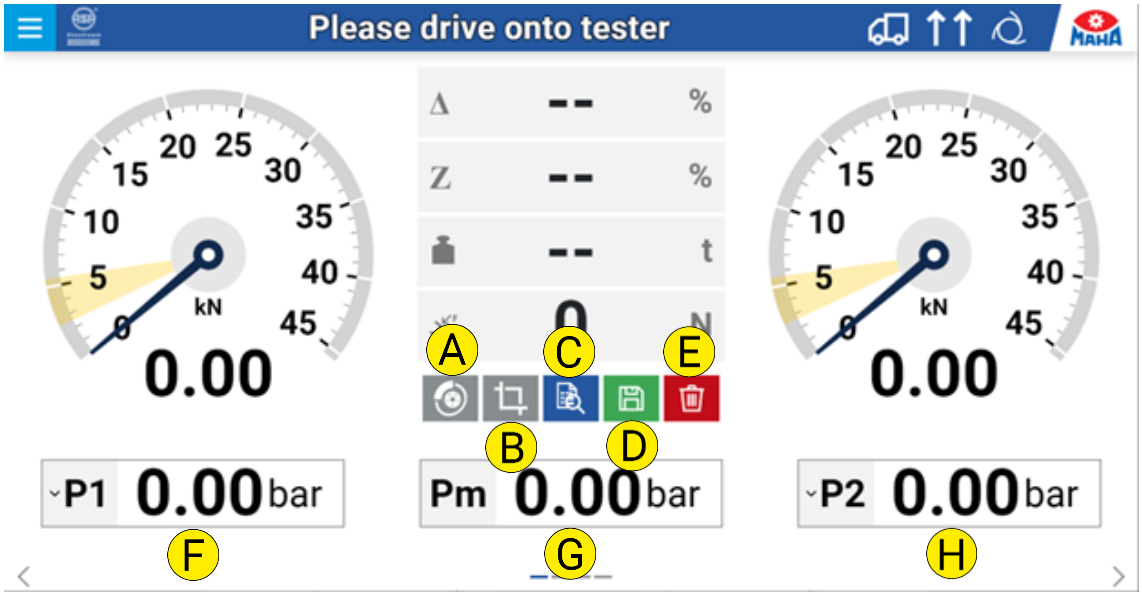


A	Burger menu	Opens a list of functions (see below).
B	ASA Livestream	Display whether ASA Livestream is activated; active = light blue
C	Status line	The status line serves as a user prompt.
D	Direction arrows	Indicates the set direction of rotation of the test rollers (both forward/backward or counter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

E	Manual	Displays whether manual mode with C_RECO S or cable remote control is active.
F	Settings	Click on gear wheel opens system settings.
G	Brake force	Display of brake forces left/right in kN, as digital value and with pointer
H	Brake type indicator	The brake to which the current measurement value is saved is always displayed highlighted in yellow.
I	Differential display	Displays the brake force differential in %
J	Weight display	Display of weight measurement (static: weight symbol filled, dynamic: weight symbol as outline)
K	Ovality segment	Ovality is measured in preset brake force area (marked yellow).
L	Vehicle type	Display of vehicle type currently active.
M	For button assignment see section “Measurement Screen in Truck Mode”	

4.2 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.

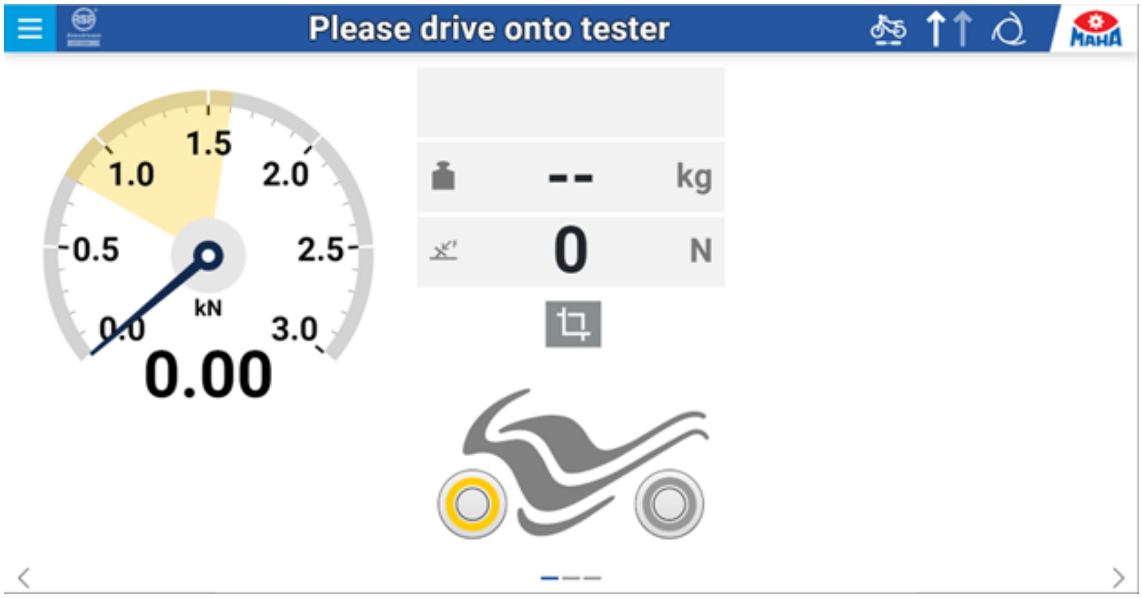


A	Manual ovality measurement	Ovality is measured immediately at current pointer position; segment size and time from settings are used
B	Manual end of measurement	Intermediate storage of the current measurement value
C	Last measurement result	Re-displays
D	Save	with axle assignment and brake type
E	Delete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

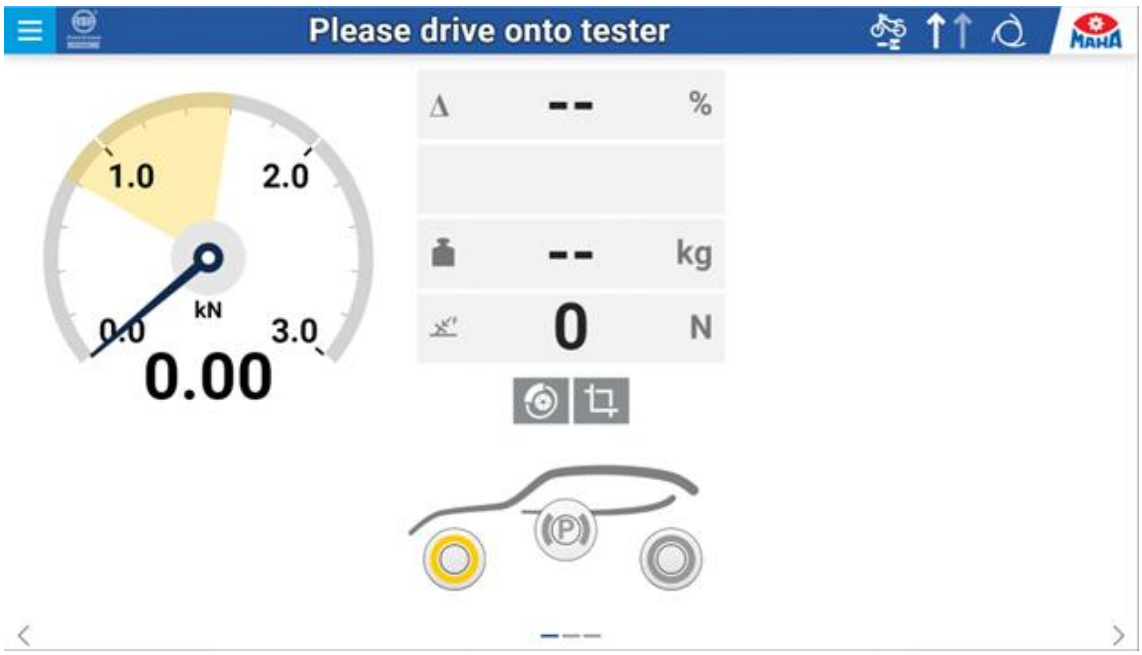
4.3 Measurement Screen in Motorcycle Mode

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 stand side selected. The functions correspond to those in the semi-automatic car mode.



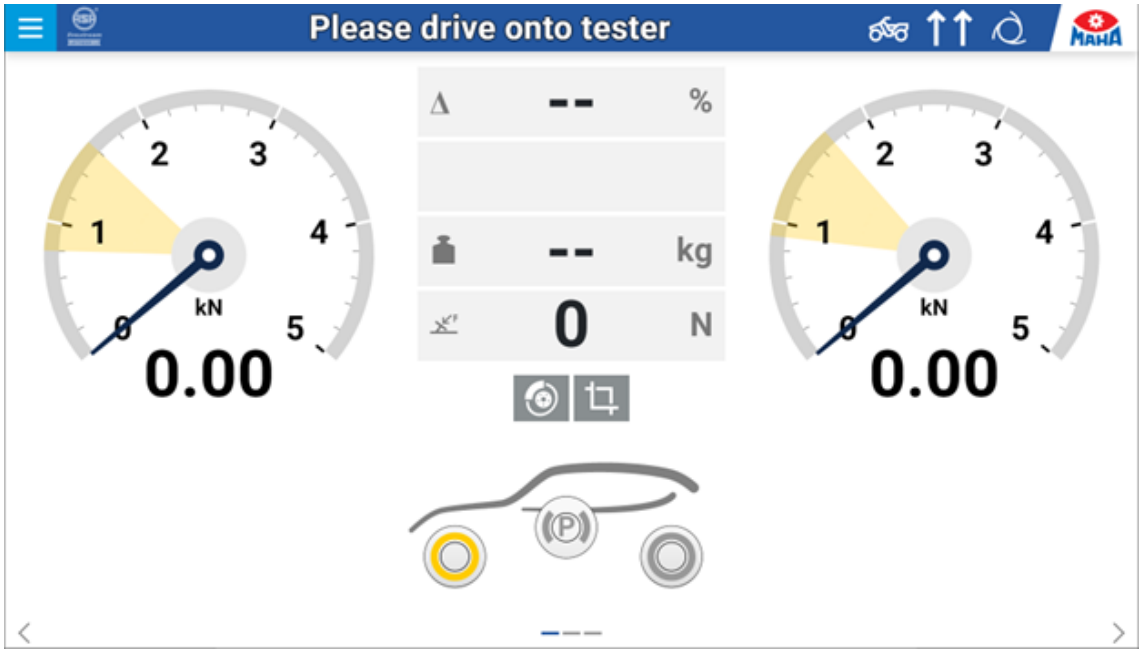
4.4 Measurement Screen in Tricycle Mode

The measured value display in tricycle mode consists of one or two dial gauge(s), depending on whether the axle selected has one or two wheel(s).



4.5 Measurement Screen in Quad Mode

The measured value display in quad mode corresponds to that in car mode, only the measurement range is dimensioned smaller by default.



4.6 Special Features of 4WD (MOREG)

4.6.1 Page Selection

In the 4WD-Rigid / 4WD-Visco operating mode, the following page selection screen appears after the motor start command. The side to be tested is selected using C_RECO S (via the arrow keys).

4.6.2 Adjustment

After selecting the side, the MOREG adjustment screen appears. Follow the instructions on the screen during the process, e.g. do not brake.

4.6.3 Readjustment

Readjustment may also be necessary during the measurement, which is indicated in the status bar. Readjustment is similar to pausing the current measurement; the user is responsible for the further procedure.

4.7 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):

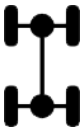
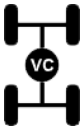
Brake tester

Shock absorber tester (optional)

Side-slip tester (optional)

4.7.1 Functions of Brake Tester

	Car mode	
	Truck mode	
	Motorcycle mode	
	Tricycle mode, single wheel front	
	Tricycle mode, single wheel rear	
	Quad mode	
	Car multi-axle mode	
	Weight-dependent Car-Truck switchover	(below the preset weight threshold Car mode, above Truck mode

	Main direction of rotation	(default)
	4WD-Rigid	
	4WD-Visco	
	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 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)

4.7.2 Functions of Shock Absorber Tester (optional)

	Shock Absorber Tester	(enables the shock absorber tester)
	Shock absorber tester Weighing mode	(enables weight measurement via shock absorber tester, no shock absorber test; only available if there is no weighing device in the brake tester!)
	Switch off shock absorber tester	(disables the shock absorber test)

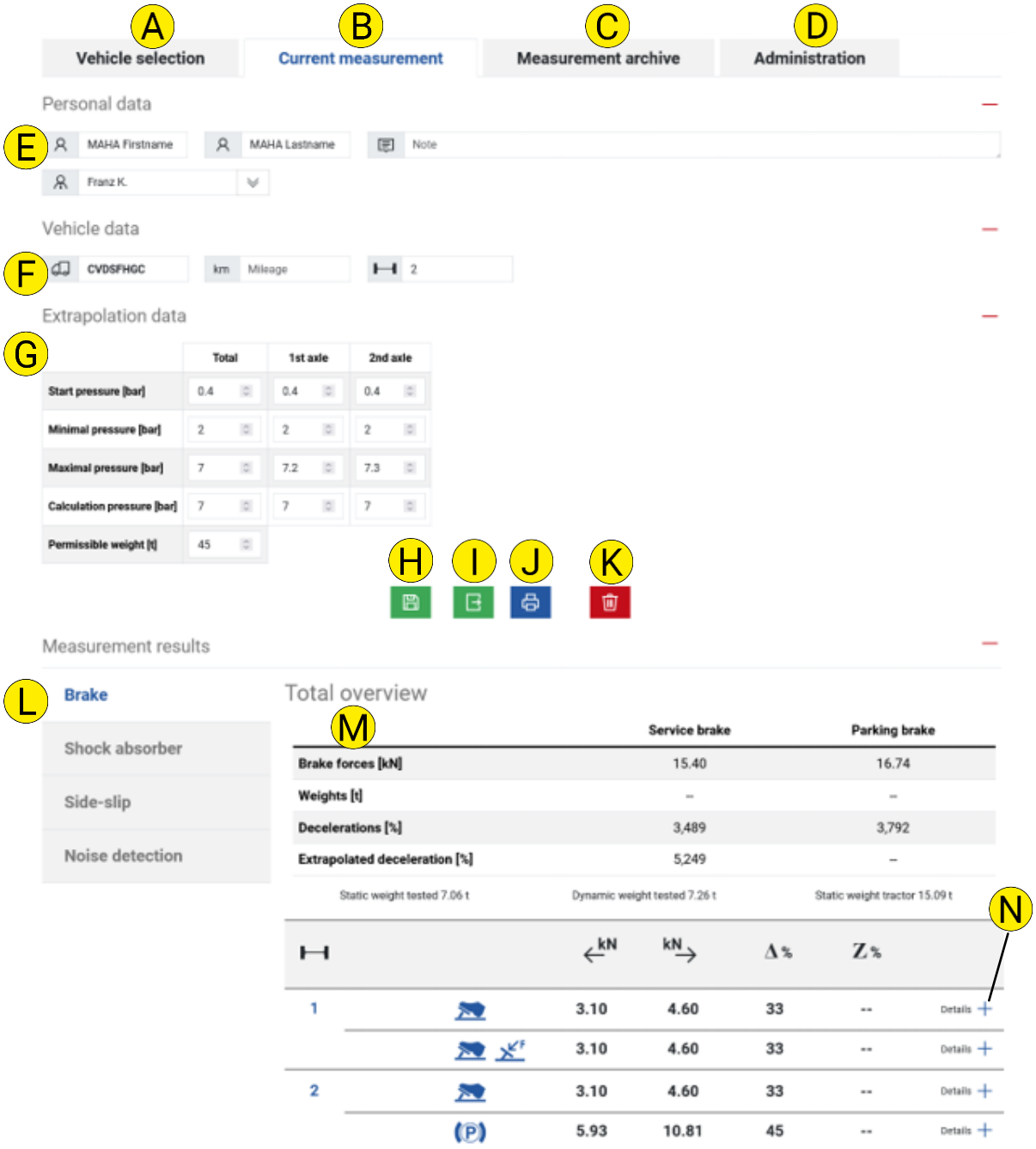
4.7.3 Functions of Side-Slip Tester (optional)

	Switch off side-slip tester	(disables the side-slip test)

4.8 Results Display

- In the results display, the customer name and the vehicle license plate number or VIN can be entered for the current measurement, as well as the current mileage and the maximum permissible weight of the vehicle.
- The last stored measurements can be redisplayed (up to 10).
- If the ES_IN/OUT protocol is activated (optional), a vehicle can be selected from a test list.
- 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).

4.8.1 Current Measurement



A	Vehicle selection (opt.)	Opens a list with test orders (ES_IN)
B	Current measurement	Results display for the current measurement
C	Measurement archive	Overview of the last (10) stored measurements
D	Administration (opt.)	Vehicle administration

E	Personal data:		
	First, last name		Entry of customer name
	Note		Entry of additional information (opt.)
	Selection		Dropdown menu for registered inspectors
F	Vehicle data:		
	License plate/VIN		Entry of license plate number / VIN
	Mileage		Entry of mileage
	Number of axles		Entry of number of axles
G	Extrapolation data:		
	Start pressure		[bar]; calculation basis (standard 0.4)
	Minimum pressure		[bar]; no extrapolation below this value
	Maximum pressure		[bar]; no extrapolation above this value
	Calculation pressure		[bar]; extrapolation to this value
	Permissible weight		[t]; entry of GVW
H		Save	Saves the current measurement results. Optional ES/IN: ES_OUT can also be generated, depending on the setting in the ES service
I		Forward (opt.)	Writes back the measurement results (ES_OUT), depending on the setting in the ES service
J		Print	Prints the measurement result
K		Delete	Deletes the measurement results
L			Selection of required test device
M			Overview of current measurement
N			Expands to detail view (see below)

Detail view

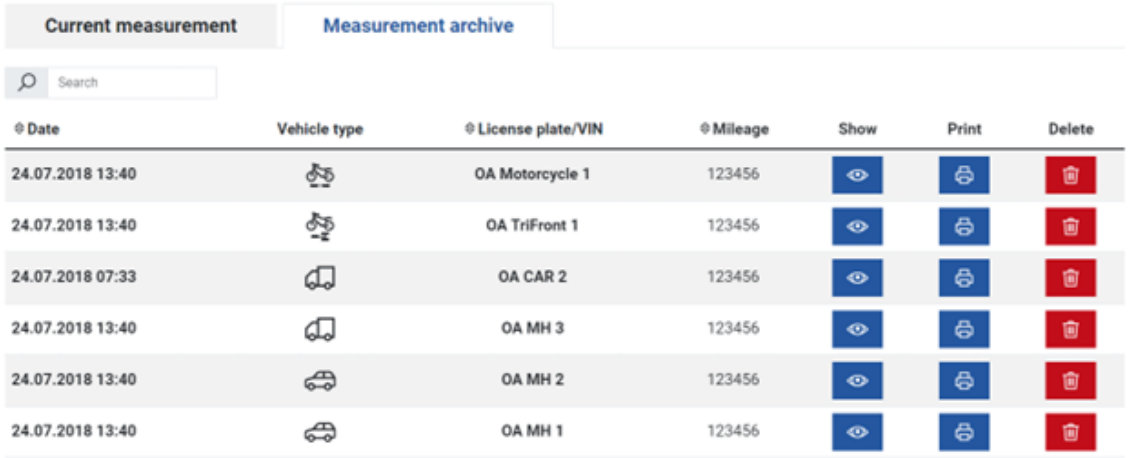
If the detail view is expanded with <+>, further measurement results can be seen, such as brake force sum, pedal forces, pressure values, weight, ovality and extrapolation.

		kN ←	kN →	Δ %	Z %	
1		4.83	3.69	24	25	Details +
		3.76	3.69	2	21	Details +
2		7.49	8.22	9	45	Details —
	Σ	15.71 kN				
		--	--			
		Px: 1.80 bar	Px: 1.90 bar	Pm: 1.95 bar		
		--	--		3.53 t	
		20 %	20 %			
	Factor i	5.07	4.73			
	F * i	66.04 kN				
		5.93	10.81	46	48	Details +

4.8.2 Measurement Archive

In the measurement archive, the stored measurements are listed (10 vehicles max.) in order to redisplay them if required (by clicking “Show” button) or to print them in the form of a test report.

Use the arrows ⇳ to sort the corresponding column. Vehicle measurements that are no longer required can be deleted.

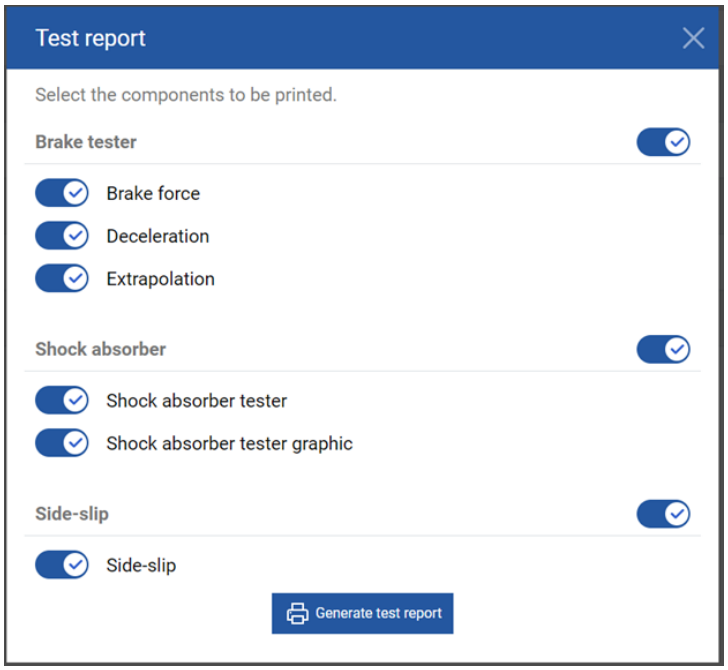


Print

If “Print” is selected, a window opens. Here the components can be selected that are to appear on the test report.

The displayed contact address can be edited in the system settings in section “General/Test report”.

When generating the test report, a PDF file is created, which can 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.

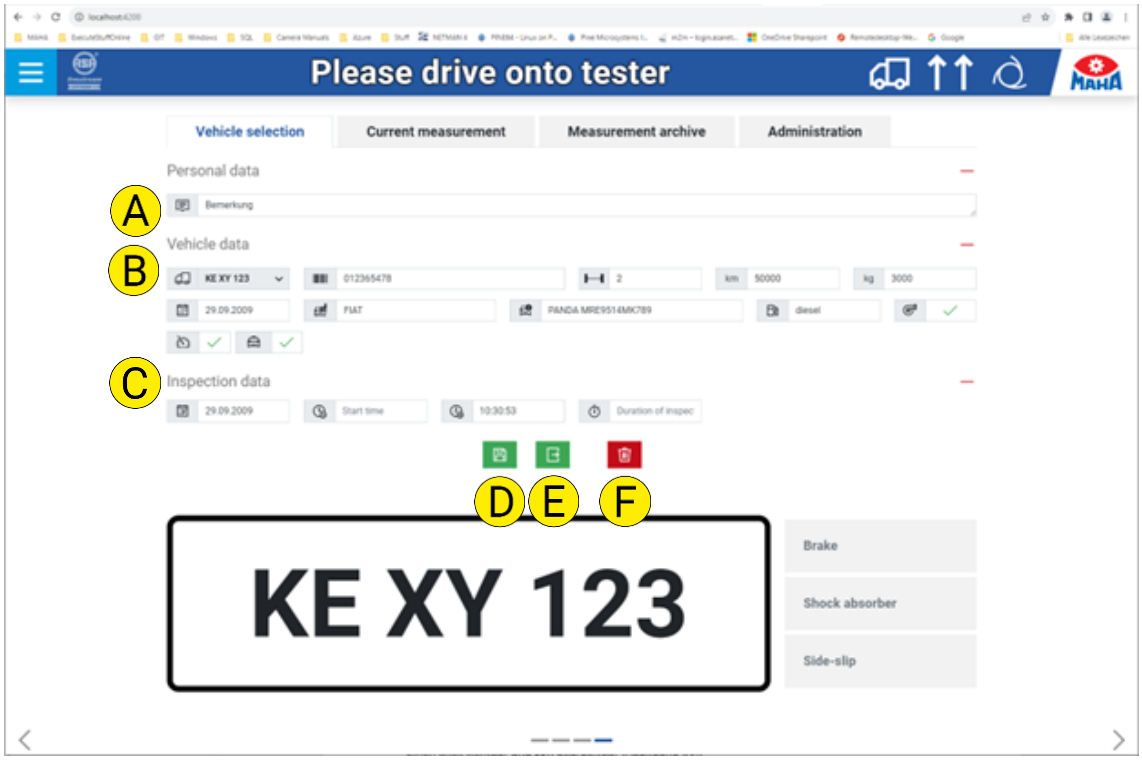


4.8.3 Vehicle Selection (optional)

As soon as the “Order Interface (ES_IN/OUT)” option is activated under “Settings”, a new view "Vehicle selection" appears.

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 the IT system of a car dealership or an inspection station). Manual license plate entry is not possible.

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



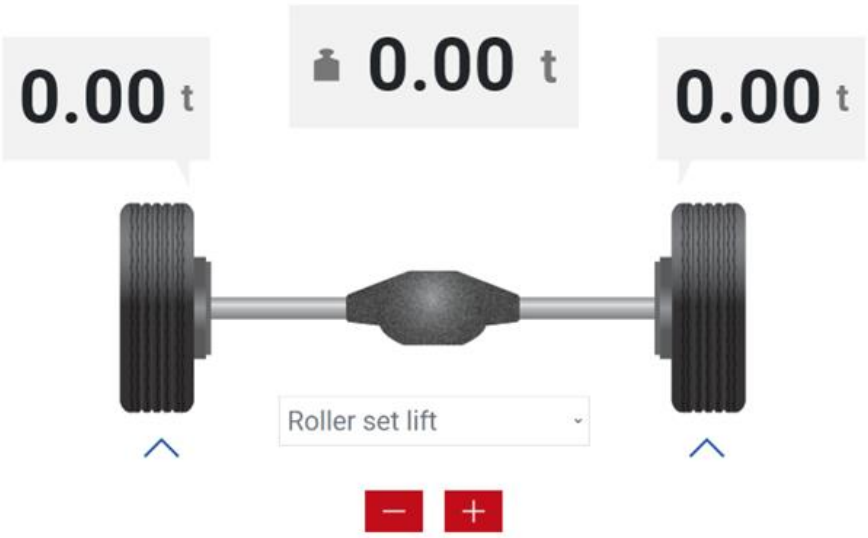
A	Personal data:	
	Note	Entry of additional information (opt.)
B	Vehicle data:	
	License plate	Vehicle selection via license plate number
	VIN	Vehicle identity number
	Number of axles	
	Mileage	
	Weight	Maximum permissible weight
	First registration	
	Manufacturer	
	Vehicle type	Type 1 and Type 2 of vehicle
	Fuel type	
	Turbo	Turbo present
	Speed limiter	Speed limiter present
	Taximeter	Taximeter present

C	Inspection data:		
	Inspection date		
	Start time		
	End time		
	Duration		
D		Save	Save (transfer measured values to measurement archive)
E		Forward	Forward (close test order and transfer measured values to IT system)
F		Delete	Delete measured values

4.9 Optional Display Screens

4.9.1 Scale Screen (optional)

As soon as a weighing device is installed in the test stand, 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 below the axle:

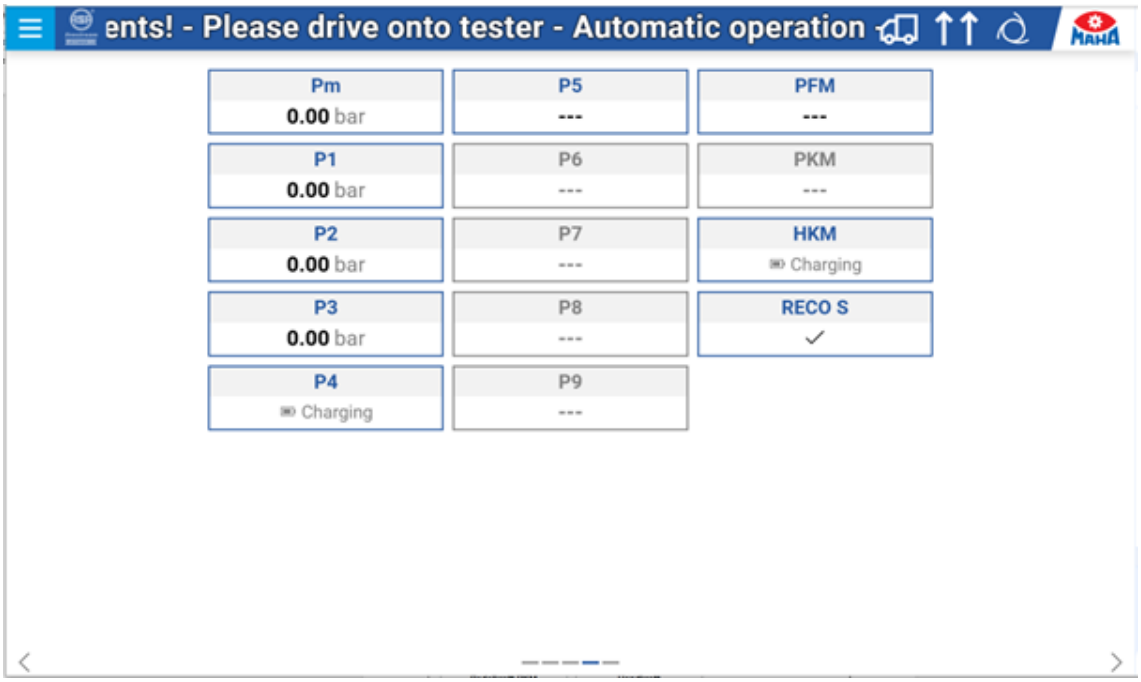
- Plus increases the load
- Minus reduces the load

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

In the case that pull-down device as well as roller set lift are installed, the pull-down menu can be used to switch between both options.

4.9.2 Display of Radio Participants (optional)

If a radio receiver is installed in the test stand and the optional radio pressure converters are enabled, another view appears:



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

In addition, the measurement values are displayed:

- “---“ means that no measured values are available.
- “---“ blue bordered 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 measurement value.

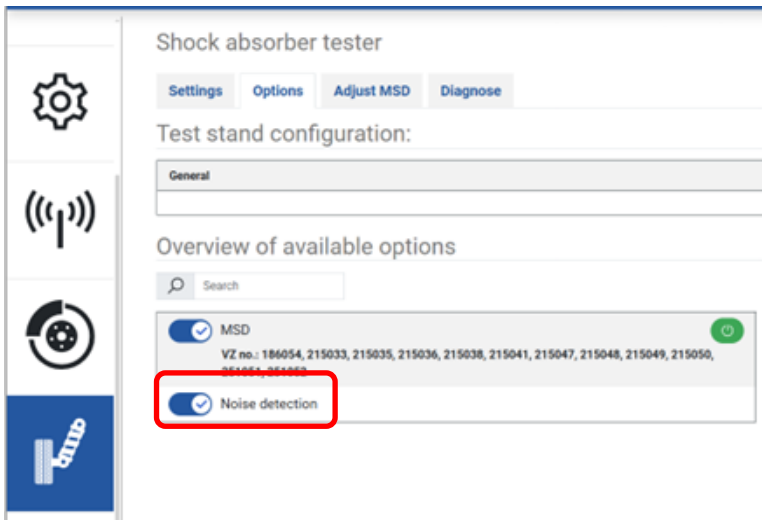
Adding/removing a participant is done under Settings/Radio/Radio diagnostics.

4.9.3 Noise Detection

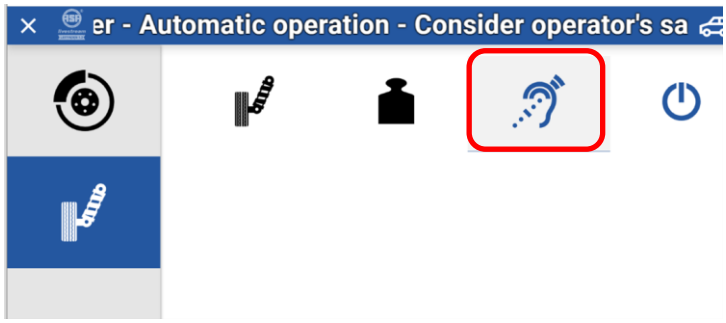
1 Activate Noise Detection in the options.

INFO

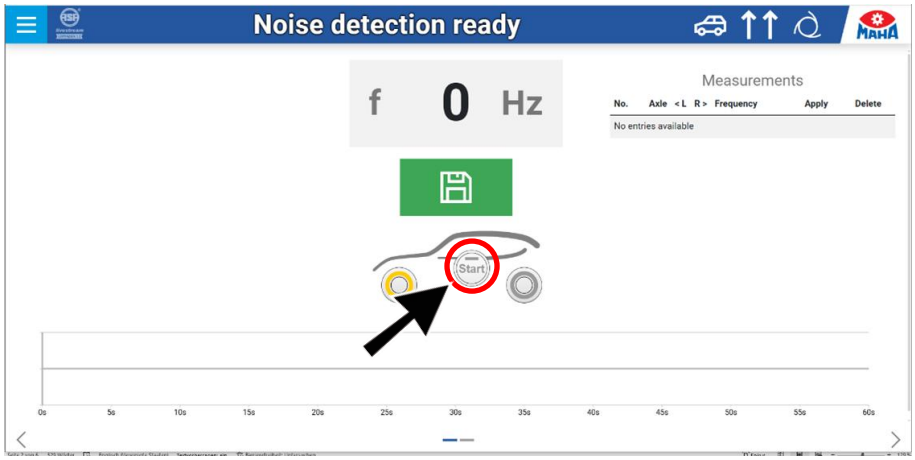
The Noise Detection option is currently available for C_MSD test stands only.



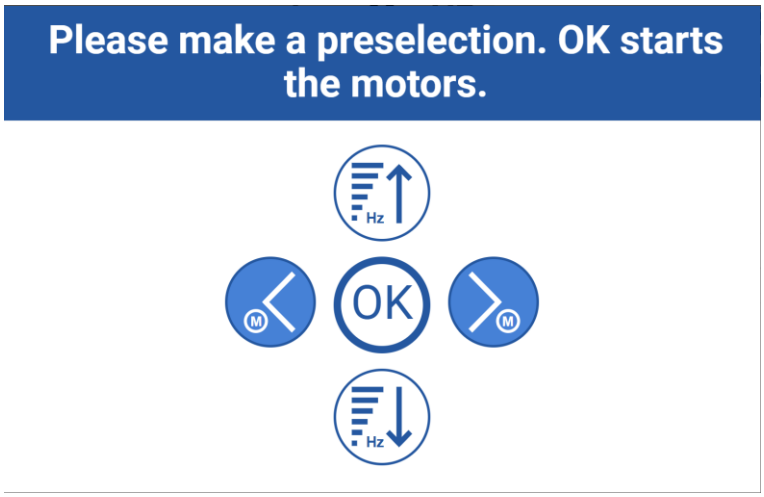
2 The selection is made via the burger menu.



3 After driving onto the test stand, the start screen appears. Clicking on the Start button in the car icon...



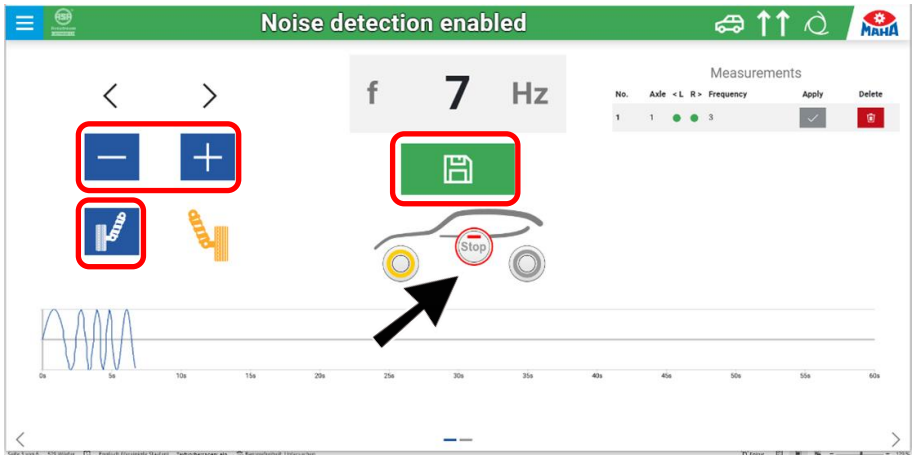
…opens a preselection dialogue box for the desired measurement.



The blue arrow keys can be used to select the right and left motors separately. By default, both motor sides are active.
The white arrow keys can be used to select predefined ramp functions, ascending or descending.

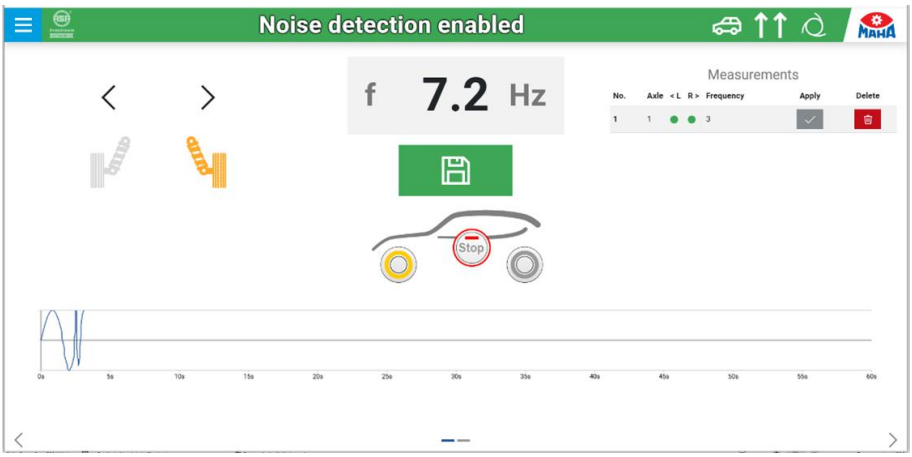
4 Clicking on OK starts the measurement.

5a. **Manual measurement**
Manual measurement starts the selected motors at 7 Hz. Control buttons appear on the left side of the screen.



– The plus and minus buttons can be used to set frequencies between 3 Hz and 16.2 Hz.
– Inactive motors (in this example, the left side) can be switched on using the shock absorber buttons if the current frequency is at least 7 Hz.
– Clicking on the green Save button saves the current frequency.
– Clicking on the Stop button in the car icon ends the measurement.

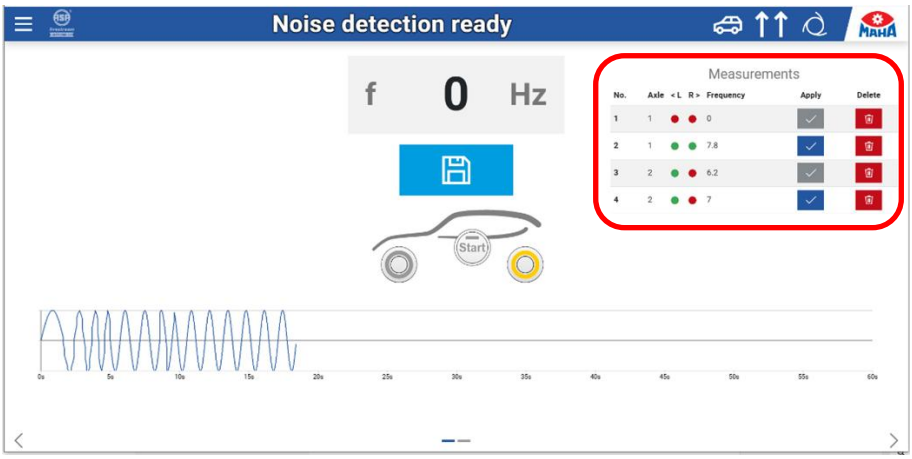
5b. **Automatic Measurement with Ramp**



Automatic measurement with ramp differs from Manual measurement in the following ways:
– The frequency cannot be changed and inactive motors cannot be switched on. Therefore, there are no p lus and minus buttons in this view, and the inactive motor is displayed with a greyed-out icon.
– Saving and ending the measurement is done as in manual mode.

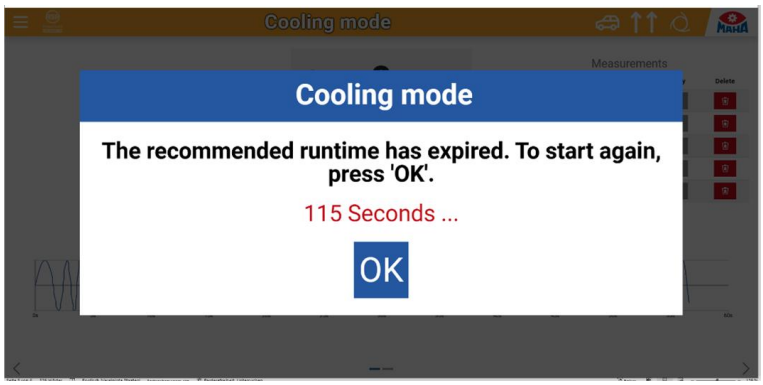
5c. **Manual Measurement Using Stored Frequencies**

Frequencies saved in previous measurement runs are displayed in the table on the right-hand side of the screen.



– Frequencies ≥ 7 Hz can be displayed immediately before starting the measurement or during a manual measurement. Afterwards, as in manual mode, the frequency can be changed and inactive motors can be switched on.
– **IMPORTANT:** The buttons in the table can only be operated by clicking/ touching them, not via the remote control.

6 After 60 seconds of operation, the motors switch off automatically to prevent overload.



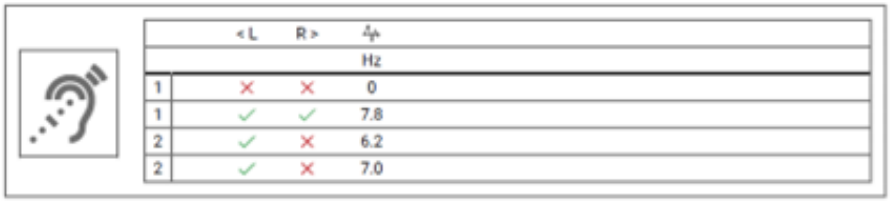
The 120-second cooling phase can be ended prematurely by clicking on the OK button.

NOTICE

Risk of damage! In this case, it is no longer possible to prevent the motors from overheating.

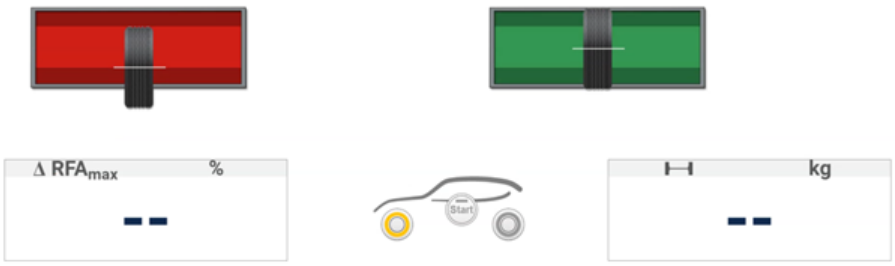
7 The stored frequencies are displayed in the results screen under “Noise detection”.

The measurement values can also be output in the test report.

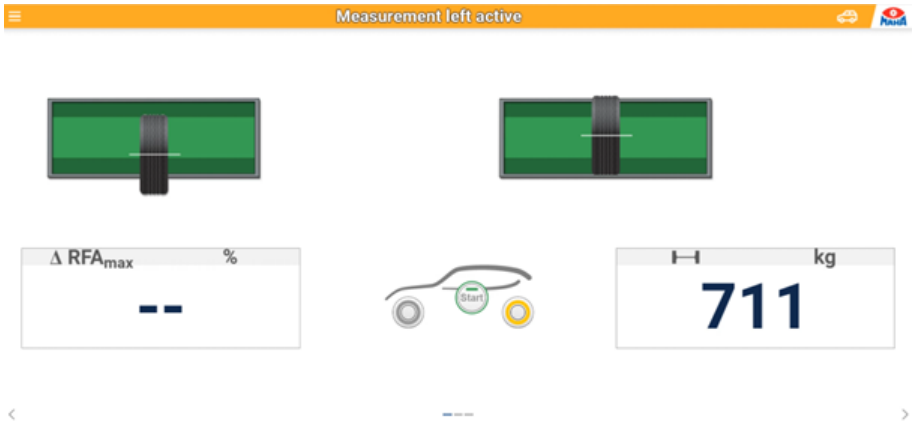


4.9.4 EUSAMA (Phase Shift)

1 If an EUSAMA or EUSAMA Phase Shift shock absorber tester is installed, the following positioning aid appears when driving over it (Δ RFA_{max} is only available with EUSAMA Phase Shift).

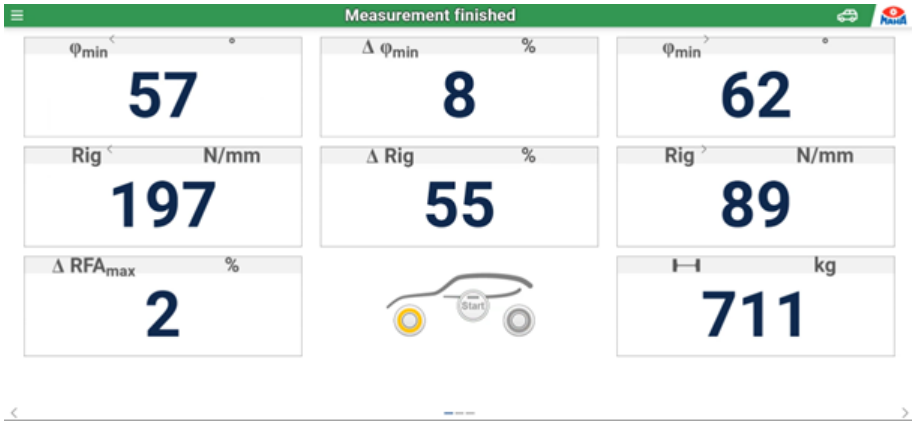


2 Once the vehicle has been positioned correctly, the countdown for the measurement begins. Once the countdown has expired, both sides are tested one after the other.



3 Once completed, the measurement result is displayed.

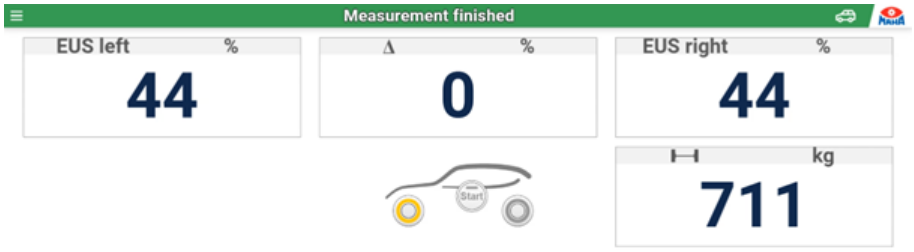
EUSAMA Phase Shift



φmin ..... min. Phase shift left
Δφmin ..... Delta of phase shift
φmin ..... min. Phase shift right

Rig..... Rigidity left
ΔRig ..... Delta of rigidity
Rig..... Rigidity right
ΔRFA_{max}..... Delta of relative max. force amplitude
Dumbbell symbol..... Axle weight

EUSAMA



EUS left..... EUSAMA value left
Δ ..... Delta left/right
EUS right..... EUSAMA value right
Dumbbell symbol..... Axle weight

4.10 Settings

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

INFO: The “System settings“ menu is locked if the test stand is occupied and no error is present. The menu is unlocked when the vehicle exits the test stand.

Here the following submenus are available in the left column:

General

Languages

Settings, extended (only for logged in users)

Radio (opt.)

Brake tester

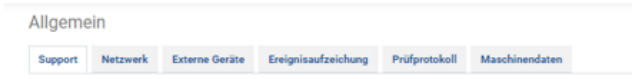
Axle damping tester (opt.)

Side-slip tester (opt.)

Technician menu login

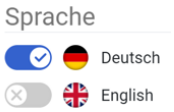
4.10.1 Description of the Submenus

General



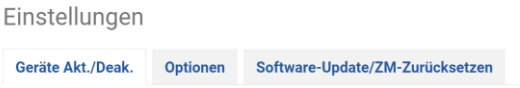
Support:	Contact and test stand information
Network:	IP settings, network name
External devices:	Connected analog displays, C_Box etc.
Event recording:	Display of events (EventLog)
Test protocol:	Configuration protocol, address header
Machine data:	Operating hours etc.

Languages



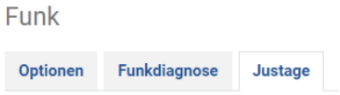
Setting the language of the test stand

Settings



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



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

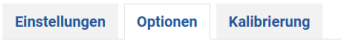
Options:	Activated devices and settings
Adjust brake force:	Display of values (force and digits)
Adjust weighing device (opt.):	Display of values (weight and digits)
Diagnostics:	Sensor diagnostics (range spring and proximity switch)

Additionally for logged-in users:

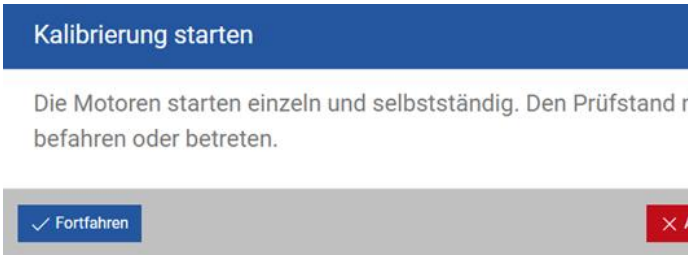
Settings:	Parameters for car, truck, motorcycle, general, customer variables
Adjust brake force:	Set zero point, range spring settings etc.
Adjust weighing device (opt.):	Set zero point etc.
Diagnostics:	Motor can be switched in star/delta or fast/ slow mode (*service technician button required*)
Input/output test:	Activate outputs (*service technician button required*), readout inputs

Shock absorber tester

Achsdämpfungsprüfstand



Settings:	Adjust measurement parameters of shock absorber tester (for logged-in users only)
Options:	Activate booked options
Calibration:	depending on shock absorber tester installed. – MSD: calibration currently only possible via external „LON-Manager“ tool – EUSAMA (Phase Shift): choose menu item “Calibration”



Side-slip tester	Radlauftester Einstellungen Optionen Justierung	
	Settings:	Adjust measurement parameters of side-slip tester
	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!

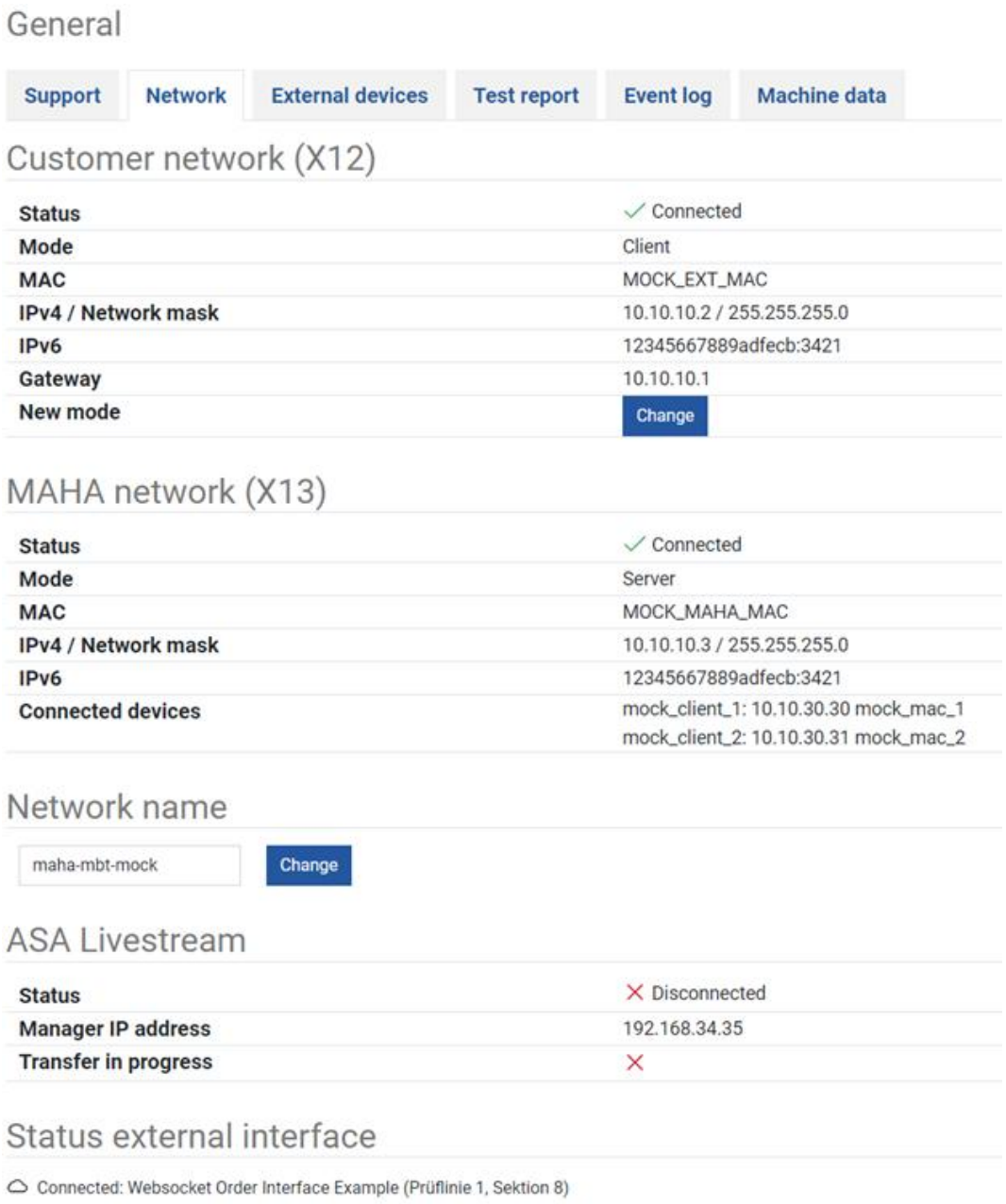
4.10.2 General/Network

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 customised.

Below, information about the ASA Livestream and the external interface (both optional) is shown.



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.

a. Client

This is the default setting and the recommended method for integration into a customer network. The connected network should have a DHCP server and, where applicable, a DNS server that assigns the appropriate address to the central module. The following ports should be enabled on the customer's network:

- Client -> ZM, Port 80, mandatory, URL depending on ZM network name or IP: user interface of central module becomes accessible
- Client -> ZM, Port 22, optional, URL depending on ZM network name or IP: developer access via SSH with public/private key login
- ZM -> external, https://iot.maha-group.com:14000, optional: online login for technicians
- ZM -> external, https://iot.maha-group.com/Images:443, optional: online login for technicians
- ZM <-> Client, Port 5353, mandatory for MAHA accessory equipment: C_BOX and C_MSA require this port to find the ZM. Alternatively, connect accessory equipment via X13.
- ZM -> external, Port 123, optional: automatic time synchronisation. If not available, time will be synchronised with the Client device, as soon as the menu is entered.
- ZM <-> Client, Port 23232 (TCP + UDP), optional: required if ASA option is enabled
- ZM -> Client, Port 1900+8300, optional: UpnP

b. 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.
If the ZM acts as a server, name resolution (DNS) is also possible within the established network.

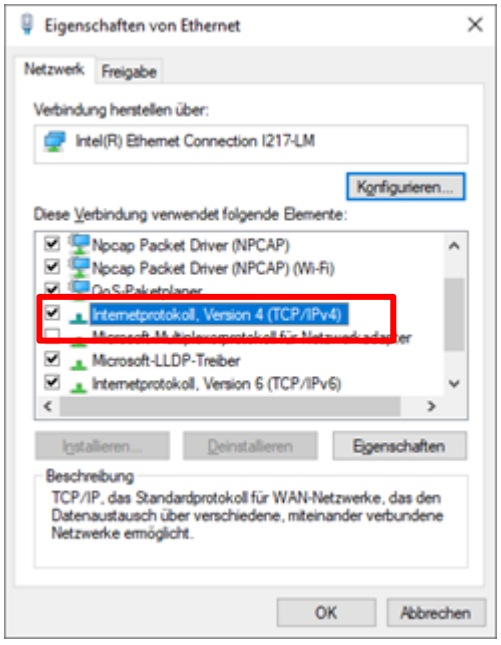
INFO: In Germany, this interface must be used as an ASA interface and is configured accordingly ex works (as a DHCP client).

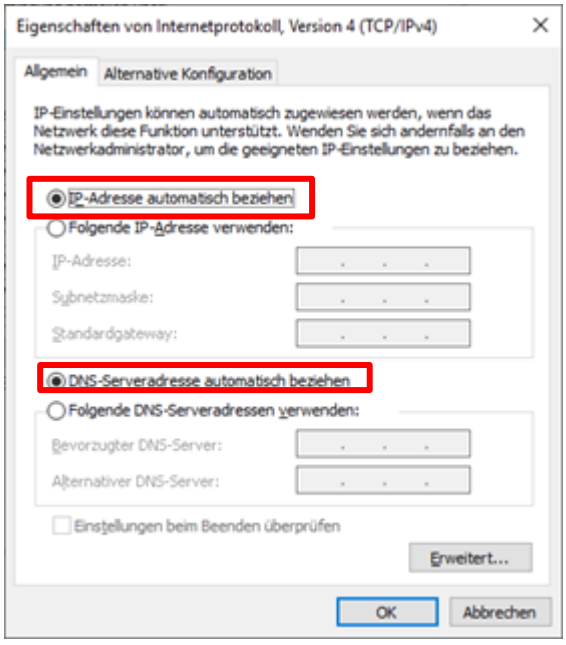
c. Static IP

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.

d. 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.

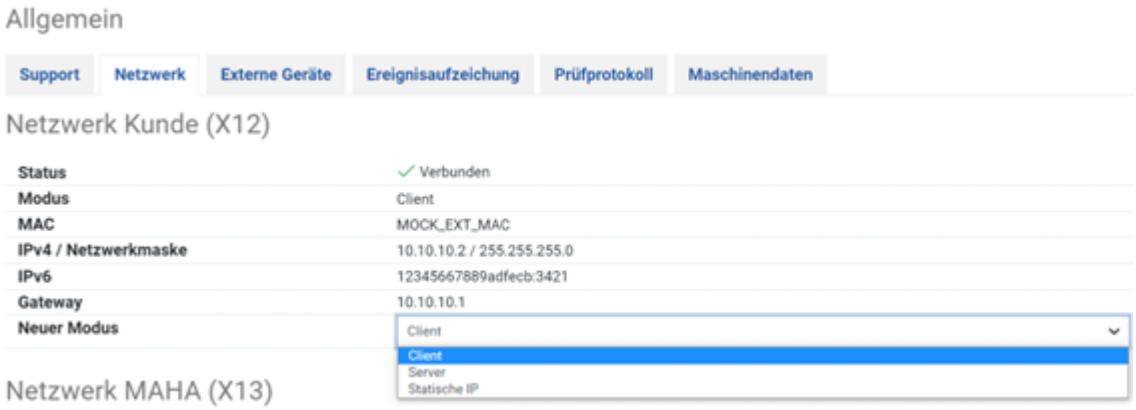




2 Call up the WebApp of the central module via a web browser. The central module can be reached either via the IP 192.168.201.1 or via the name of the ZM + .maha (in the delivery state this would be e.g. http://maha-mbt.maha).

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.



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.

4.10.3 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)!

5 Operation

5.1 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 stand 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 stand 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 stand 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 stand 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 stand 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 stand.
- 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.

5.2 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 stand must not be operated with defective safety devices!*

5.2.1 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.

5.2.2 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!)

5.2.3 Indicator Light “Control ON”

The indicator light warns of a test stand 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).

5.2.4 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.

5.2.5 Sensor Rollers

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

5.2.6 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 stand must be taken out of service until the device is fully functional once again.

5.2.7 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.

5.2.8 Yellow and Black Marker Tape

The yellow and black marker tape around the roller set and pit serves to cordon off the test stand and must be replaced if defective.
Item no. 4000193 (38 mm) / 1208972 (50 mm)

5.2.9 Warning and Information Signs

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

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5.3 Preparations

5.3.1 Switching on the Test stand

Set main switch -Q1 to position "I".

5.3.2 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) (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.

5.3.3 Variant 2: Establishing a WiFi Connection

If the test stand 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).

5.3.4 Variant 3: Integration of the Test stand into Company Network

Alternatively, the ZM of the test stand 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 stand 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 stand is available in the company network, it is visible and also accessible for all other network participants!

5.4 Test Procedure

5.4.1 Drive on Test stand

NOTICE

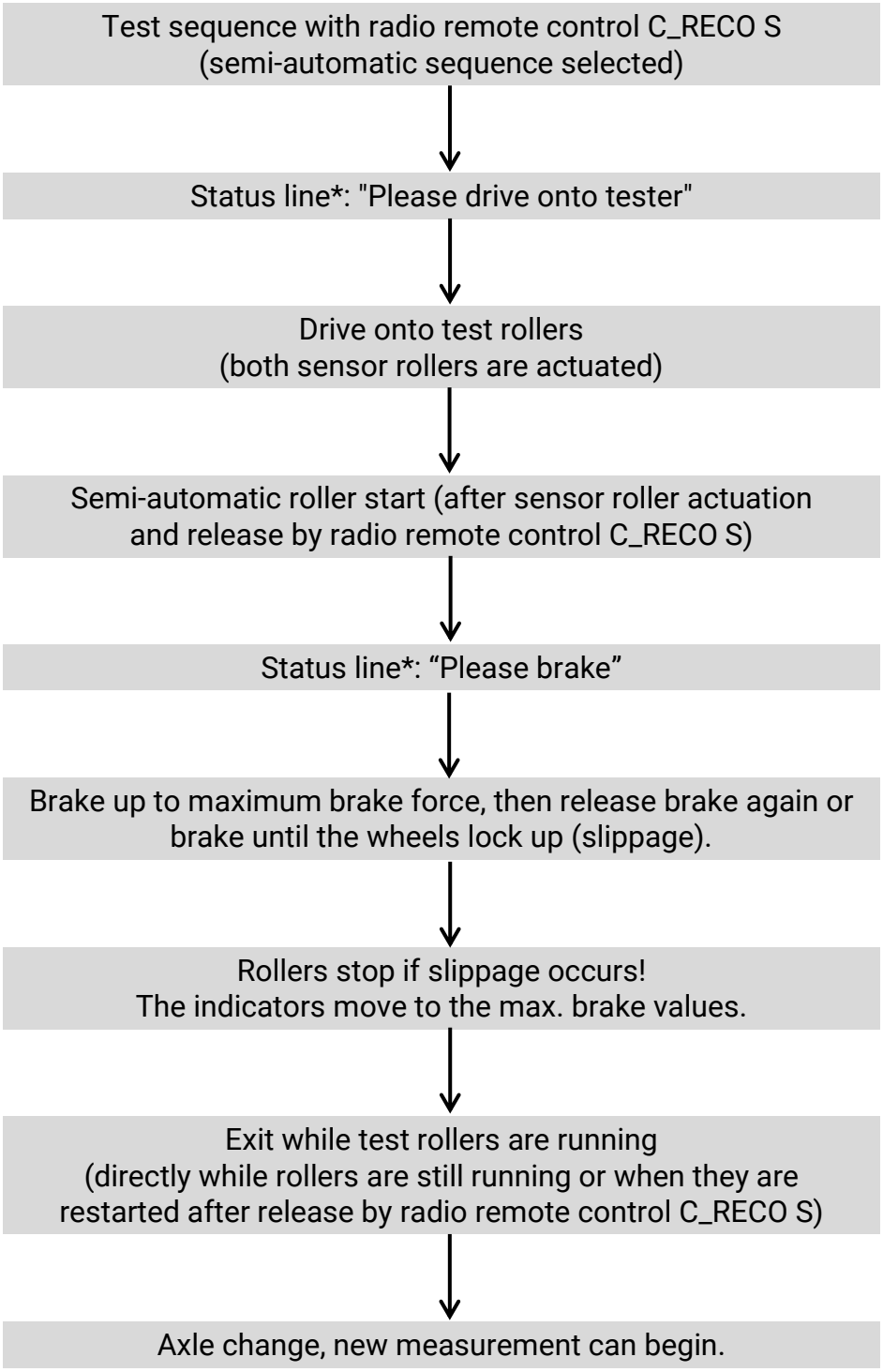
Drive slowly (walking speed), centrally and straight on the test stand. The left and right sensor rollers must be actuated simultaneously.

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

5.4.2 Carry out Brake Test in Semi-Automatic Sequence

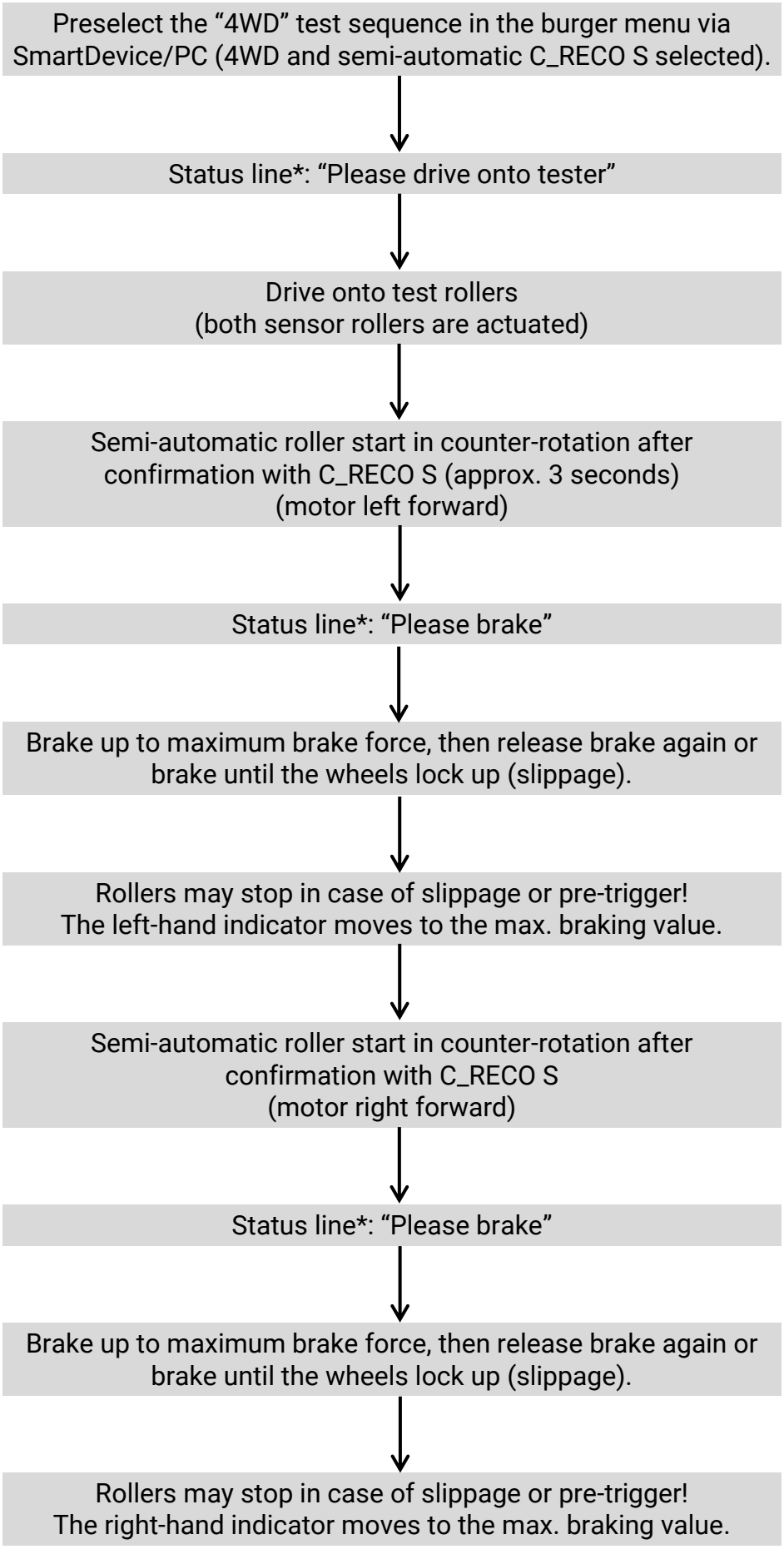
INFO

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



*In conjunction with monitor display

5.4.3 Carry out Manual 4WD Brake Test with C_RECO S in Counter-Rotation Mode



Status bar*: "Please exit"

Slowly drive out of the test stand.

*In conjunction with monitor display

5.4.4 Carry out Manual Single-Wheel Brake Test with C_RECO S

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

Drive onto test rollers
(both sensor rollers are actuated)

Semi-automatic roller start of left motor after confirmation with C_RECO S (exemplary, if left preselected)
(approx. 3 seconds)

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.

Semi-automatic roller start of right motor after confirmation with C_RECO S (approx. 3 seconds)

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 stand is in use.

5.4.5 Carry out Truck Brake Test in Semi-Automatic Sequence with C_RECO S

Test procedure Truck with axle assignment
(semi-automatic procedure preselected with C_RECO S)

↓

Status line*: "Please drive onto tester”

↓

Drive onto test rollers
(both sensor rollers are actuated)

↓

Semi-automatic roller start after confirmation with C_RECO S
(approx. 3 seconds)

↓

Change/preselect pressure converter Px if required

↓

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

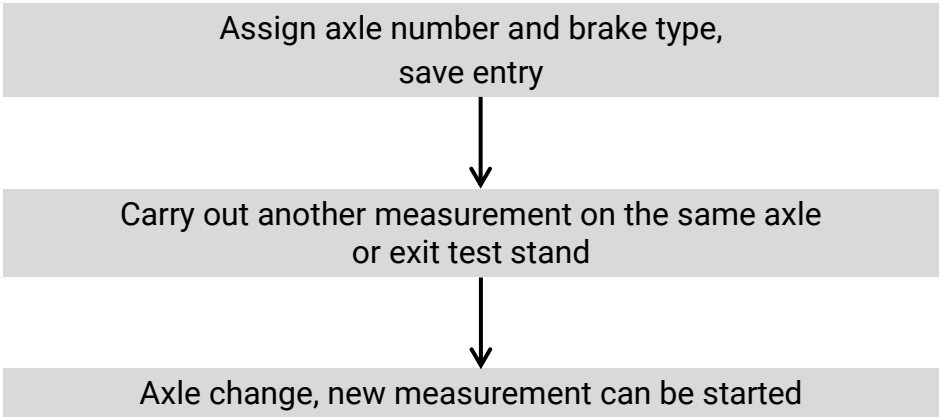
↓

Rollers may stop in case of slippage! Indicators move to max. braking value (not in the case of pre-trigger!)

↓

Save measurement values

↓



5.4.6 Exit the Test Stand

Thanks to the Static exit aid (DC barke or electromechanical motor brake), the vehicle can also be driven off the test stand with the rollers stationary.

NOTICE

In case of malfunction or failure of the motor brake, it is possible to enable the emergency exit aid with the drive axle of the vehicle:

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

ATTENTION
The test stand starts automatically via the vehicle drive! Excessive acceleration can cause damage to the test stand.

5.5 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 %

5.6 Ovality Measurement

Ovality measurement records the uniformity of braking efficiency over a configurable measurement period. An out-of-round brake disc or drum results in periodically fluctuating braking force – the ovality measurement quantifies this range of fluctuation.

INFO: Ovality measurement is only available if the feature is enabled in the technician menu. This function is not available for motorbikes or the parking brake of cars.

5.6.1 Configuring the Ovality Segment

The area marked in yellow on the speedometer display shows the configured braking force range within which automatic detection is triggered. It is defined by two parameters:

– Lower limit: the minimum braking force value at which the range begins

– Window size: the width of the range above the lower limit

Speedometer display with the ovality segment marked (yellow area on the outer ring), before starting a measurement

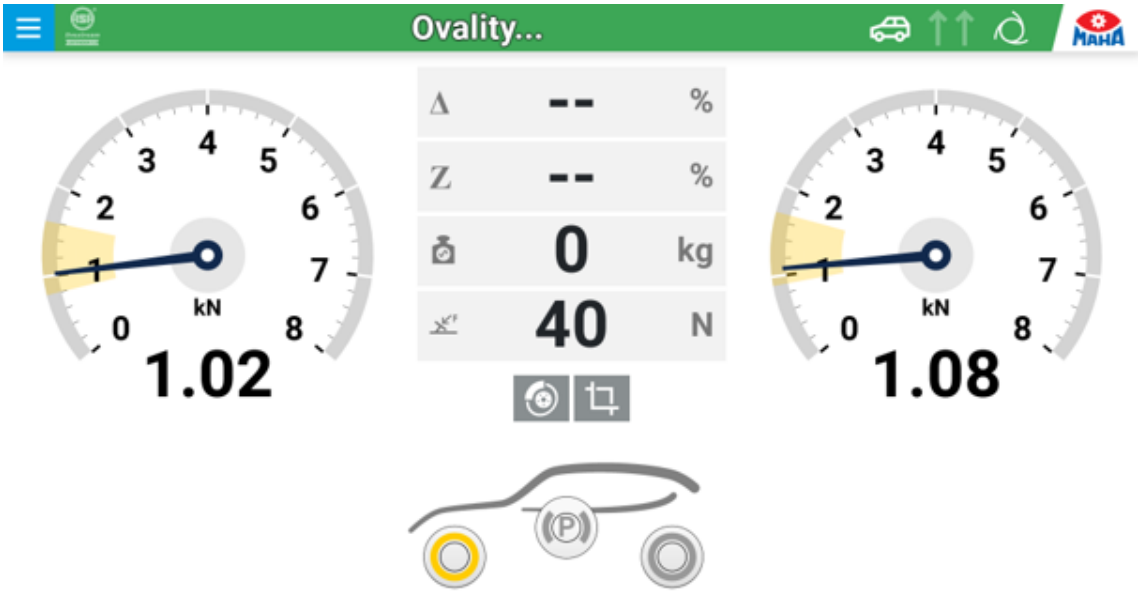
INFO: When the *'Dynamic lower limit'* option is enabled, the test stand automatically calculates the lower limit as 25% of the static wheel weight. Manual input is not possible in this case. The *'Dynamic lower limit'* option requires a weighing device to be installed.

5.6.2 Performing an Ovality Measurement

a. Automatic mode (default setting):
The ovality measurement starts automatically as soon as the braking force falls within the ovality segment for the set detection time.

INFO: If, in automatic mode, the braking force leaves the measurement range before the measurement time has elapsed, the measurement is cancelled and must be restarted.

b. Manual mode:
The measurement can be started manually at any time using the 'Start Ovality' button, regardless of the current braking force.



Measurement screen during an ongoing ovality measurement; the ovality segment in the speedometer display shrinks as the measurement time progresses

5.6.3 Results Display

The result is displayed separately for the left and right sides.

a. When using the absolute calculation method, the measured variation range is displayed as a segment framed in yellow on the speedometer display.

b. When using the percentage calculation method, the result is visible only on the results screen.
On the results screen, the ovality values appear in the detailed view on a separate line, marked by the ovality symbol:

	36 N	20 N

In the test report (PDF), the ovality values are shown in separate columns for the left and right sides.

5.6.4 Calculation Methods and Units

Depending on the configuration, the result is calculated using one of the following methods. Methods 1, 2, 3 and 5 relate to the braking force values recorded during the ovality measurement.

Method	Description
1 – Absolute	Difference between maximum and minimum
2 – Relative (Max)	Difference relative to the maximum
3 – Relative (Mean)	Difference relative to the mean
4 – Relative (Max braking force)	Difference relative to the maximum braking force of the entire axle measurement
5 – Segment	Measurement time divided into equal segments; difference between segment mean values, relative to the maximum

Recommended methods by vehicle type

Cars / Trucks	Relative (methods 2–5)
Cars	Absolute (method 1)
Trucks	Absolute (method 1)

6 Troubleshooting

6.1 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 stand at a height of 0.6...1.7 m above the stand level and can be assigned to the correct test stand 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.

6.2 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.

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

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

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

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

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

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

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

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

7 Declaration of Conformity

See following page(s).

Original-EG-Konformitätserklärung
Original EC Declaration of Conformity

CE023001-de-en

MAHA SE & 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/S 3.5 W220/W250
C_MBT C/S 4.0 W220/W250
C_MBT C/S 5.0 W280
C_MBT C 13.0 W280
C_MBT S 13.0 R100 MS/MU
C_MBT S 15.0 R100 MS/MU
C_MBT S 18.0 R115 MS/MU/MI
C_MBT S 18.0 R160 MS/MU
C_MBT M 18.0 W301
C_MBT T 18.0 W360
C_MBT S 20.0 R115 MU/MI
C_MBT S 20.0 R160 MU

Serialnummer | Serial Number

Bezeichnung | Designation

Rollen-Bremsprüfstand

Optionen: Achsdämpfungsprüfstand
C_ESD-PS C/S 3.5 W220
C_MSD C/S 2.5 W220/W250
C_MSD C/S 13.0 W220/W250

Radlauftester
C_MINC 2.5/4.0/18.0

Roller Brake Tester

Options: Shock Absorber Tester
C_ESD-PS C/S 3.5 W220
C_MSD C/S 2.5 W220/W250
C_MSD C/S 13.0 W220/W250

Side-Slip Tester
C_MINC 2.5/4.0/18.0

Richtlinien | Directives

2006/42/EG; 2014/30/EU; 2011/65/EU
2014/35/EU (Option); 2014/53/EU (Option)

2006/42/EC; 2014/30/EU; 2011/65/EU
2014/35/EU (Option); 2014/53/EU (Option)

Normen | Standards

EN 60204-1:2018; EN ISO 13849-1:2016-06; EN ISO 12100:2010; EN 17003:2021

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen
Person Authorised to Compile the Technical File

Ralf Kerkmeier • MAHA SE & Co. KG • Hoyen 20 • 87490 Haldenwang • Germany

Haldenwang, 2026-09-01

Dr. Peter Geigle
Geschäftsführer | Managing Director

Muster | Sample