

Operating and installation instructions for roller brake tester

Testmaster RT
130-2 / 138-2 / 180-2 / 187-2



Despite careful checking, mistakes in this issue cannot be entirely ruled out.

This manual has been created for users with technical expertise in the field of vehicle test equipment.

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1. Important basic information

1.1 Scope of supply

1.1.1 Basic equipment:

- The basic version of the test system comprises one closed or two split roller sets, an electrical/control box and an operating manual

1.2 Additional equipment:

1.2.1 Displays

- Pointer/analogue displays with various options
- Digital displays
- PC displays and program:

1.2.2 Options:

- Remote controls, pedal force measurement device, printer, weighing device with four force measurement transducers per roller set, switch cabinet heating, roller set heating, radio pressure converter, automatic all-wheel drive detection, PC-connection via USB cable
- And more, see respective valid sales price lists and documentation

1.3 Responsibilities of the manufacturer per:

- Machinery directive 2006 / 42 / EC 17th of May 2006
- EMC directive 2014 / 30 / EU 26th of February 2014
- Low voltage directive 2014 / 35 / EU 12th of April 2016
- Wiring directive 2003 / page 303 for the use, nature and testing of brake test beds
- EC directive for CE labelling
- DIN EN 60204-1 Electrical equipment for machinery
- GS-EM I 04 - 01 and BGR 157 Testing principles for vehicle maintenance devices, vehicle testing machines and devices
- EC Declaration of Conformity

1.4 Responsibilities of the operating company

- The installation of the device must be carried out by competent specialist personnel
- The device may only be used in accordance with its proper intended use
- Prior to starting up the device, read this operating manual carefully. The operating manual must be easily accessible at all times
- Personal injury caused by not adhering to this operating manual is not covered by the German Product Liability Act
- Autop Maschinenbau GmbH accepts no liability for damage to the test bed or the vehicle resulting from non-adherence to this operating manual
- Safety instructions warn of dangers and help prevent damage to personnel and property. Strictly adhere to the safety instructions for your own safety
- The respective valid national and international safety regulations for occupational safety must be respected. Every operator is responsible for compliance with the applicable regulations and must make sure that the relevant current regulations are applied
- The operating manual is a constituent part of the machine
- The operating manual must be kept safely and maintained (i.e. updated) throughout the complete service life of the machine
- The operating manual must be passed on to any subsequent owner of the machine

1.5 Legal note

1.5.1 Limitation of liability

- As a matter of principle, our liability is restricted to foreseeable damages typical for the contract.
- We are only liable for damage caused deliberately or due to gross negligence on our part
- This restriction does not apply to cases where persons are injured
- Claims for damages regularly expire two years after the point in time when the damage is detected and reported or up to two years after the occurrence of the damage

1.5.2 Warranty

- We provide a 24 month warranty to guarantee that our deliveries are free from defects
- This period starts at the time when the goods are delivered to the ordering party. This does not apply to the delivery of used products. All warranty claims are excluded in such cases
- Within the scope of the warranty, our obligation is restricted to repairing and/or substitute delivery at our own discretion
- Liability for secondary damages arising from defects as well as lost earnings is excluded
- The right of the contractual parties to withdraw from the contract after an attempted but unsuccessful repair and/or an inability to provide a substitute, is reserved

1.6 Documentation

1.6.1 Operating manuals: per DIN EN 62079

- Insofar as they are not a constituent part of the operating manual, the following documents are available, amongst others:
- Operating manual: "Automatic all-wheel drive detection" option
- Software Display Basic/Testlane operating instructions
- Installation plan / installation instructions
- Electrical circuit diagram
- Maintenance and servicing instructions (incl. calibration instructions and test report for unit testing)
- Spare parts list

1.7 Conventions

1.7.1 Abbreviations

BPS	Brake test bed	E-Motor	Electrical motor
L / R	Left / right	kW	Kilowatt
kN	Kilonewton	kg	Kilogram
km/h	Kilometres/hour		
LED	Digital illuminated display		

1.7.2 Technical terms

BB	Service brake	FSB	Handbrake
PM	Pneumatic control pressure	PX	Pneumatic brake cylinder pressure
DMS	Strain gauges		

2. Safety

2.1 Conventions for safety instructions

- According to the manufacturer's declaration, the design of the brake test bed is based on the "PRINCIPLES for testing the operational safety of roller brake test beds and dynamometers" (GS-EM I 04-01) as well as the testing principles for vehicle maintenance devices, vehicle testing machines and devices (BGR 157)
- Prior to starting up the device, read this operating manual carefully. The operating manual must be easily accessible at all times
- Personal injury caused by not adhering to this operating manual is not covered by the German Product Liability Act
- Autop Maschinenbau GmbH accepts no liability for damage to the test bed or the vehicle resulting from non-adherence to this operating manual
- Safety instructions warn of dangers and help prevent damage to personnel and property. Strictly adhere to the safety instructions for your own safety
- The respective valid national and international safety regulations for occupational safety must be respected. Every operator is responsible for compliance with the applicable regulations and must make sure that the relevant current regulations are applied

 Gefahr	<p style="text-align: center;">- Danger: A risk to persons can result from not carefully following or complying with the instructions</p>
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 Achtung	<p style="text-align: center;">- Warning: Damage to the device can result from not carefully following or complying with the instructions</p>
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 Hinweis	<p style="text-align: center;">- Note: Additional information is supplied</p>
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2.2 Behaviour in an emergency

- In the event of danger, shut down the test bed via the main switch (emergency stop function) on the electrical/control box

2.3 Intended purpose and use

- The roller brake test bed is to be used for testing the brake systems on one-track and two-track vehicles.
- The test bed must only be operated in accordance with its purpose and within its performance limits
- The brake test bed is not designed particularly with testing all-wheel drive or multi-axle driven vehicles, in mind. However, vehicles with all-wheel drive can be tested

2.4 Requirements for personnel

- The test bed must only be started up by authorised specialist personnel
- The test bed must only be operated by trained specialist personnel

2.5 Occupational health and safety

- **Main switch:** A lockable main switch (emergency stop switch) is provided
- **Sensing rollers:** The test bed will only start if both sensing rollers are pressed downwards within a period of 2 s
- The roller set is equipped with a step protection device underneath the sensing rollers
- The centre cover on the compact test bed can be loaded with max. 500 kg

2.6 Safety-relevant environmental conditions

- The roller prism should be secured with roller covers or raised stepping cover
- When installing in conjunction with inspection pits, no persons are permitted underneath the vehicle whilst the test bed is operational.
- The inspection pit must be covered or secured in accordance with national regulations

2.7 Installation, removal

- See section 7, "Installation, commissioning", "Removal"

2.8 Compliance with the operating manual

- The operating manual must always be complied with in all respects
- The operating manual must be kept safely in the immediate vicinity of the machine and must be available to all persons involved with the machine at all times
- The operating manual must be passed on to any subsequent owner of the machine

2.9 Safety signage on the machine

- The roller sets of the test equipment must be safeguarded with a peripheral warning marking or with a cordon.
- The note for "Automatic all-wheel drive detection" is attached to the electrical/control box

2.10 Residual hazards and protective measures

- There is a prism, in which the sensing roller moves, located between the drive rollers. The test bed must be covered or cordoned off to prevent unauthorised access, depending on the installation location of the test bed
- There is a risk of tripping when the drive rollers are raised
- The test bed is equipped with its own driven rollers. Whilst the rollers are turning, there must be no persons in the immediate vicinity of the turning rollers
- After driving on with the driven vehicle axle, the vehicle drive must be immediately disconnected
- There must be no parts or vehicle wheels parked on or in the running rollers

3. Technical data

3.1 Identification:

- The complete equipment of the brake test bed is identified through a type plate on the electrical/control box, with the following information:
- Manufacturer - Type and version - Serial number - Year of construction - Power in kW - Power supply in V and ACNPE - Current draw in A
- Furthermore, each assembly (roller set, display, etc.) is furnished with its own type plate with serial number

3.2 Complete system

Permissible humidity		Up to 85 %
Operating temperature		-10° to +60°
Zero-point compensation with operational readiness		Every 2 minutes

3.3 Control cabinet

Voltage supply		3 x 400 V (AC)
Permissible nominal voltage fluctuations		± 10 %
Supply line fuses	3 x 32 Amp slow-blow	5 x 6 mm ²

3.4 Roller sets

Version	RT130-2	RT138-2	RT180-2	RT187-2
Two-part frame (each) WxLxD	1200x1045x545 mm			1,390 x 1,145 x 554
Weight (each) ca. kg	420	420	460	460
Roller length	1000 mm			1150
Roller diameter	205 mm		268 mm	
Sensing roller diameter	50 mm			80
Test width variable	x	x	x	x
Roller centre distance mm	420	420	440	465
Test speed (2. Test speed – optionally)	2.6 km/h (5,2 km/h)			
Coefficient of friction dry / wet	0.9 / 0.7			
Measuring system, bending beam with strain gauge	Strain gauge			
Noise emissions LWA	<70 dB (A)			
Welded-on roller surface (L1)	Welding rod			
Option: Plastic roller surface (L2)	Granulate coating			
Testable axle load kg	12,000	15,000	14,000	14,000
Perm. drive-on axle load, max. kg	13,000	18,000	18,000	18,000
Nominal power of the drive motors kW	2 x 7,5	2 x 9	2 x 9	2 x 9
Max. braking power kN	32	36	34	34
Engine connection cable	4 x 2.5 mm ²	x	x	x

3.4.1 Optional more powerful drive motors

Testable axle load kg	-	16,000	16,000	16,000 / 18,000
Nominal power of the drive motors kW	-	2 x 11	2 x 11	2 x 11 / 2 x 15
Max. braking power kN	-	38	40	42 / 44
Fuse A	-	50	50	50
Supply line	-	5x10mm ²	5x10mm ²	5x10mm ²

4. System description

4.1 Area of application

- The roller brake test bed is to be used for testing the brake systems on one-track and two-track vehicles and is approved for vehicle testing per § 29 StVZO in conjunction with annex VIII Main Testing

4.2 Requirements per German guideline 10/2011

- Since 1st October 2011, only roller brake test beds with the following options are approved for use per directive 10/2011 for vehicle testing per § 29 StVZO.
- Roller diameter of the test roller min. 200 mm
- Slip measurement with additional rotational speed sensor on sprockets
- For M1 and N1 vehicles (below 3.5 t perm. total weight) a minimum test speed of 4 km/h is stipulated

4.2.1 PC-connection cable via USB

- If connecting a PC or laptop equipment to our test beds, a "PC-connection cable via USB" is generally required for the connection to the test bed.
- The "PC-connection via USB" is required for the data communication of the software: Display Basic, Display Testlane and Display Office

1480100	PC-connection cable via USB " for PC or laptop with Windows XP/7/8, 12 m connection cable from the computer to the RS485-Bus interface on the test bed. Data transfer	
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4.3 Electronic parking brakes

- Electronic parking brakes that lock suddenly should be tested in manual mode
- If these vehicles are stationary on the roller sets, the respective brake will be actuated. With braked wheels, the test bed will be manually started.
- The test bed has a drive-on detection as standard, which measures any braking forces arising at that time and immediately switches the test bed off again.

4.4 Vehicles with all-wheel drive

4.4.1 Vehicles with all-wheel drive that can be switched off

- Can be tested Vehicles with permanent all-wheel drive
- All all-wheel drive vehicles that allow the wheels to turn in opposite directions on the same axle, can be tested under the following conditions or cannot be tested
- All-wheel drive vehicles with low power transfer or with separated all-wheel drive in test condition can be tested (see also the information from the manufacturer in the operating instructions for test procedures with regard to the integrated automatic drive-on monitoring)

4.4.2 All-wheel drive vehicles with high power transfer rates

- Fixed or "semi-fixed" all-wheel connection during the brake testing can be tested with the "Rotational direction reversal" or "Automatic all-wheel detection" option

4.4.3 Vehicles with completely fixed all-wheel connection

- can be tested with the "Automatic decoupling of rigid all-wheel connection" (e.g. double axle HGVs) option

4.4.4 All-wheel drive vehicles that do not permit rotational direction reversal

- All-wheel drive vehicles that do not permit a common or opposed rotational direction reversal, must be tested in manual mode
- If these vehicles are stationary on the roller sets, the respective brake will be actuated.
- With braked wheels, the test bed will be manually started.
- The test bed has a drive-on detection as standard, which measures any braking forces arising at that time and immediately switches the test bed off again.

4.4.5 Automatic all-wheel detection (option)

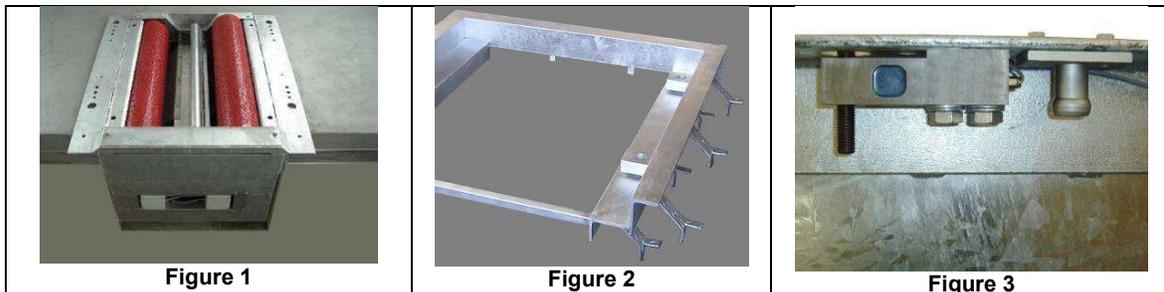
- **With a brake test with multi-axle** vehicles on the roller brake test bed, it is normal to drive onto the test bed rollers with the wheels of one axle and to determine the brake values for the two forwards rotating wheels.
- **With all-wheel drive vehicles with fixed** or semi-fixed drive systems, significant problems can arise with this.
- **Depending on the strength of the all-wheel power transfer**, the vehicle could be pushed off the test rollers by the other drive axles, or there may be an increased rolling resistance on the axle being tested due to the influence of the all-wheel drive system. This increased rolling resistance can falsify the measured values for the brake testing enormously.
- **With vehicles with multi-axle drive**, the brake force of the individual wheel brakes can be transferred to the other wheel brakes via the drive system, depending on the drive system. However, with a brake test of the wheel brakes on cars and HGVs, the braking effect of the individual wheel brakes should be determined, not the brake force transfer throughout the drive system.
- **In order to minimise these forces**, for a long time it has been normal to allow the wheels on the axle to be tested to turn in opposite directions to one another (one side forwards and one side backwards).
- **Due to the quantity of different all-wheel drive systems** it has become very difficult for the professional to determine at the first attempt, the type of testing (forward movement on both sides or mutual reversal of rotation direction) required for the respective drive system.
- **With our new system** the decision is automatically taken out of the operator's hands. At the start of the testing, this system automatically detects whether the drive axles of the vehicle are able to move freely or if they are linked with an all-wheel drive system.
- **With a single axle drive**, the two wheels start on the roller brake test bed in one direction and the Cardan shaft rotates freely when the transmission is in neutral. If the axle shafts of a driven axle are braked by the Cardan shaft, as is the case with all-wheel connection or with a gear selected, the axle differential causes the opposite wheel to turn in the opposite direction.
- **Our test beds generally start up with a slight lateral delay**, whereby the left wheel starts in a forwards motion. With braked Cardan shafts, the right wheel makes a rearwards movement which is detected by the brake force system. Then the right wheel starts in the opposite direction to the other wheel automatically, switching the measured value display around as well
- **Since most "all-wheel drive vehicles" are equipped with disc brakes**, the pedal force measurement device for differential measurement with a change in rotational direction is superfluous. The braking difference is very slight with forwards and rearwards rotating brake discs
- **The test time is the same as with single-axle driven vehicles**, a slightly longer time is only required if the test bed automatically carried out a counter-check.
- **If the brake force difference is too high** a second test step follows automatically in the opposite rotational direction. In this case, the brake force differences of the two test steps are compared. The threshold value for the counter-check can be stored in the program.

5. Main components

- The basic version of the test system comprises one closed or two split roller sets and an electrical/control box
- Pointer, digital and PC displays are available as options for the display of the measured values

5.1 Roller set

- The stipulated drive-over load of the roller sets relates to the running rollers and not to the side or centre covers
- The roller sets are hot-dip galvanised as standard
- The roller sets are available in closed or split versions. The split version is primarily used when installing in conjunction with an inspection pit
- The closed version is a compact unit with four running rollers and a drive and measurement unit located in the centre area with geared motors, sprockets, chain and strain gauge measurement transducer
- The split version comprises two roller sets, each with two running rollers and a side-mounted drive and measurement unit
- The roller pairs are each driven by an electrical motor, which is mounted on pendulum bearings and which passes on the rotational forces arising to a bending bar. The left and right brakes are tested independently from one another
- The bending bar is equipped with a strain gauge measurement transducer, which passes on the measured values to the circuit board in the electrical/control box for electronic measured value processing
- The running rollers are made from steel tubing and have a welded-on roller profile
- Sensing rollers are installed between the running rollers. The sensing rollers are mounted on pendulum bearings and are pressed downwards by the wheel and then pulled back up again by a spring when the vehicle leaves the test bed. The state of "vehicle on" or "no vehicle" is detected with proximity switches and the test bed is started and stopped accordingly when in automatic mode.
- The rotational speed of the wheel is measured with the turning sensing rollers. If the wheel speed differs from the drive speed by more than ca. 25% (slippage), the test bed is switched off for safety reasons



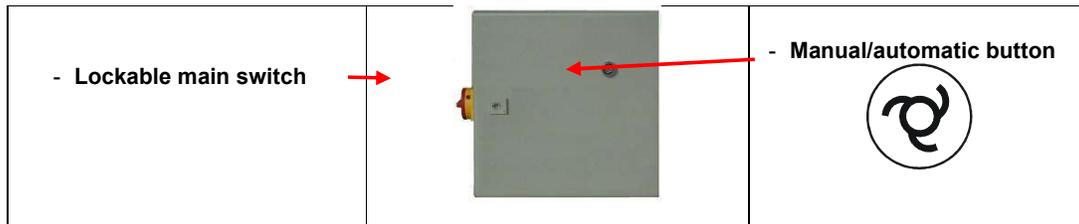
- **The roller sets** are installed floating. Angle irons are welded on in the top area. These lie on the floor and should be attached to the floor using ground anchors (1). The roller set is raised by the thickness of the angle irons.
- A foundation frame (2) is required with installation of or preparation for the weighing device.
- **With the preparation for the weighing unit**, an adapter set is required instead of the measurement transducers
- **With the weighing unit option**, the adapter set is not required and the measurement transducers are installed in its place (3)

5.2 Electrical/control box

- The electrical/control box is the brain of the test system. The electrical circuit boards, fuses, main switch (emergency stop switch) and other operating switches are located in the electrical box
- The electrical/control box should therefore also be installed in the immediate vicinity of the roller set
- All displays and the printbox can be connected to the electrical/control box
- The complete data transfer is implemented in the bus system
- **Self-test / zero adjustment:** There is a permanent self-test of all safety-relevant components (sensor system and electronics) in the operationally ready condition. A temperature drift on the force transducers is compensated out through a dynamic adaptation of the zero point. This compensation is carried out regularly in idle mode every 2 mins.
- **Resonant frequency / damping:** The measurement steps are smaller than 1 % of the measurement range value
- **Functional faults:** Functional faults are detected and displayed by the electronics. These are identifiable by means of the fault checklist (see operating manual)

5.2.1 Controls on the electrical/control box

- There are various different versions and sizes of the electrical/control box depending on the options selected
- **In standard form** the electrical box is equipped with a side-mounted, lockable main switch and a button for manual or automatic mode.



5.3 Display/printout of the measurement results

- See "displays operating manual"

5.3.1 "Remote control" option

- See "Remote control operating manual"

6. Options

6.1 Rotational and measurement direction reversal

- With this option, the drive rollers of each side of the test bed can be instructed to move in forwards or reverse turning direction or can even be switched off. In doing so, not only the direction of rotation, but the measurement direction is also automatically switched around

- | | |
|--|---|
| <ul style="list-style-type: none"> - With the left switch position, the drive roller turns forwards - With the 0 or L/R switch position, the drive roller is switched off - With the right switch position, the drive roller turns in reverse |  |
|--|---|



6.2 Automatic all-wheel detection

- The "Automatic all-wheel detection" comprises "Rotational and measurement direction reversal" and also an activating dongle to activate the software for this option
- The automatic all-wheel detection is active if both switches are in the zero position.
- In any other direction, the automatic all-wheel detection is switched off and the test bed is in manual "Rotational and measurement direction reversal" mode

6.3 Drive-off assistance with electronic rotational direction control of the test rollers

- With vehicles with traction control, driving off the roller brake test bed with the drive axle can lead to problems.
- All of our roller brake test beds are equipped with a so-called "Automatic drive-off aid" as standard. This means, if the test bed is switched on and its power supply is intact and the brake rollers in rest position are externally driven by the vehicle, the brake test bed drive motors automatically switch in thus making driving off easier.
- There is a time delay from the switching signal until the action of the drive motors and this permits a temporarily higher speed than the test bed test speed.
- With vehicles equipped with traction control, this can be detected as the wheels slipping, on snow or ice for example, activating the traction control system automatically.
- With the traction control active, the rotational speed of the drive wheels is partially restricted such that the speed of the vehicle drive wheels is approximately equal to that of the test rollers.
- On some vehicles there is no longer a switch to turn off the traction control from the driver's seat. In these cases it is very difficult to drive off the test bed.
- We have now solved the "traction control" problem with our "Drive-off assistance with electronic rotational direction control" option, which also makes driving off stationary test rollers easier in general.

1480005	Drive-off assistance with electronic rotational direction control (EU patent no. 2594916) only in conjunction with option: "Rotational and measurement direction reversal", from 7.5 kW drive power min. fuse protection 50 A slow-blow
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- If the test bed rollers are stationary and are then driven by the drive axle of a two-track vehicle, whether in automatic or manual mode, the controller detects this and starts the test bed drive in the opposite direction to the vehicle wheels. This ensures that the drive roller is not only braked but moves in the opposite direction thus accelerating the vehicle driving off the test bed.
- The reversal of turning direction runs for ca. 3 sec. (the run time can be changed in the calibration settings). If the vehicle does not drive off the test bed in this time, the test bed switches off and starts with the normal test procedure. If the rollers are driven again by the vehicle before the test bed starts, the drive-off mode repeats
- This saves the need for a laborious and cost-intensive electro-mechanical motor brake as a drive-off aid
- For **test beds** only in conjunction with

14800000	Manual rotational and measurement direction reversal, overall or counter-directional and one-wheel switching (rotary switch on E-box) for BPS cars
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6.4 Selector switch for vehicle pre-selection, motorcycle, car or HGV test

- With this option, the test procedure, the visual presentation on the screen and the appearance of the printout (with the "Printcom" option) are pre-selected



6.5 2 test speeds

- With the "Selector switch for vehicle pre-selection" option, the "2 test speeds" option, HGV 2.6 km/h - car and motorcycle over 4 km/h, is also switched
- The different test speeds are controlled via a frequency converter in the electrical/control box. Any faults that arise can be reset with a reset button.

6.6 Stud switch

- The standard or studded setting is pre-selected with the rotary switch
- When testing vehicles with studded tyres, a different percentage is used for the slippage switch-off
- The slippage value for the studded tyres can be separately set in calibration mode

6.7 Pause button for automatic mode

- The automatic test procedure can be stopped and then started again with the pause button

6.8 Load simulation for weighing unit

- From software version V4.0x there is a **safety shutdown for load simulation** option available for test beds with weighing units.
- This enables a simple load simulation of up to 10 t axle load (in addition to the actual axle load) to be implemented in conjunction with weighing units by means of floor slabs and **standard tightening straps** (2 off, 5 t tensile force each)
- The two floor slabs are fitted on the floor of the inspection pit between the left and right roller set or at the side on the floor outside the test bed and must be fastened such that they can withstand the max. possible tensile force
- The tightening straps are fastened to the floor slabs and to the vehicle at the permitted load points, and pre-tensioned for load simulation. When tightening the straps, care should be taken to ensure that the max. permitted axle/wheel load is not exceeded
- The safety shutdown of the load simulation must be activated when carrying out load simulation with tightening straps. This is done with the rotary switch on the electrical/control box
- Before the start of every test, the test bed detects the axle load present via the weighing unit. If the pre-selected axle load is exceeded by more than 10% during the brake test, the test bed switches off automatically. This prevents the holding points on the vehicle being overloaded. The switch-off point for the overload can be set in the calibration program
- **When testing without tightening straps** the weight monitoring should be switched off as with different axle arrangements there may not be enough weight and so not enough braking force can be achieved

6.9 Lifting rollers

- With vehicles with double axles or multiple axles that are beside each other, the axle in the roller set is often so extensively unburdened by the neighbouring axle that no useful brake values can be achieved. In most cases for these vehicles it is enough to lift the rollers thus avoiding the necessity of time-consuming load simulation with tightening straps or weights
- **With the "Roller lifting" option**, the rollers can be lifted with a lifting force of 6 t per roller set to a height of ca. 15 cm
- The rollers are lifted and lowered with a pushbutton on the electrical/control box or with the buttons on the optional "Radio remote control".
- If the wheels tilt off the roller set whilst the rollers are lifted, the rollers lower automatically thus preventing the vehicle being damaged and enabling driving to be started again with the rollers lowered

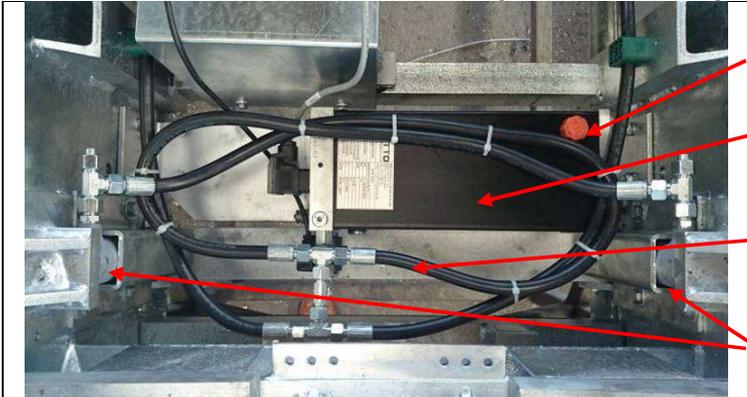
Attention:

- When carrying out load simulation by means of tightening straps, care should be taken to ensure that the rollers are not lifted or lowered after the load simulation
- **After activating the load monitoring** at the rotary switch, actuation of the lifting device is disabled

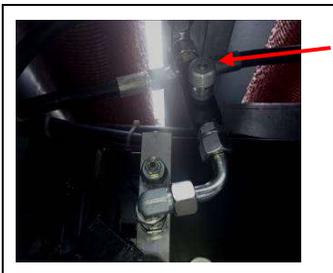
<ul style="list-style-type: none"> - There is a hydraulic power unit with four lifting cylinders in each roller set. The lifting device is fully installed in the roller set and need only be connected to electrical power - The running roller housing moves on maintenance-free plastic slide rails in the outer test bed shell 	
--	---

6.9.1 Hydraulic device in the roller set

- Roller set photo from above, without running rollers and sensing roller unit

	<ul style="list-style-type: none"> - Oil filling port with dipstick - Oil tank with submerged motor - Hydraulic hoses - Hydraulic cylinder
--	--

- The oil filling port is accessible after removing the step protection device underneath the sensing roller (4 screws). There is a dipstick at the oil filling port
- Hydraulic oil HLP 46, tank content 4l

	<p>Throttle valve for lowering speed:</p> <ul style="list-style-type: none"> - On one of the roller sets there is a throttle valve located on the side within the roller set, for balancing the lowering speed - The valve is accessible on the side, on the inside of the test bed - If the rollers lower at different rates, the lowering speed of one roller set can be adapted to match the other side
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7. Installation conditions and installation location

7.1 Installation conditions

7.1.1 Local requirements for delivery and assembly

- There must be good vehicular access to the assembly location for transport vehicles or devices
- The customer must provide a mobile hoist with the load-bearing capacity required for the test bed for unloading, moving and setting up at the assembly location
- The customer must ensure that the assembly location is free of hazardous substances

7.1.2 Foundations and floor

- Requirements on the foundations and the floor's load-bearing capacity are stipulated in the respective foundation/installation plans

7.1.3 Supply connections

- The electrical mains connection must be provided by the customer at the assembly location of the electrical/control box. The connection ratings are stipulated in the respective foundation/installation plans
- A sensitive RCD circuit breaker is required for devices with frequency converters
- An air connection is also required with various options

7.2 Installation location

7.2.1 Environmental conditions

- The test bed is also suitable for operation in outdoor areas and fulfils the requirements of protection class IP 54 (dust and splashed water protected). It is designed for operating temperatures from minus 10°C to plus 60°C. The roller set must not be submerged in water
- For the force transducer, the component manufacturer stipulates a temperature sensitivity of $\leq 0.04\% / K^\circ$ (at a temperature of $> 22^\circ C$) of the calibrated value or the measurement target value
- If used in negative temperatures and a snowy environment, roller heating is required for the roller set

7.3 Roller set

- The roller set comprises two halves. When installing over an inspection pit, a pit safety device may be required depending on national regulations.
- When installing without an inspection pit, a centre cover is required between the roller sets. The centre cover is available in walk-on or drive-on form as an option.
- The stipulated drive-over load of the test bed relates only to the test rollers

7.4 Electrical/control box

- The electrical/control box is equipped with various controls and should be installed in the immediate vicinity of the roller set

7.5 Displays

- One of the displays should be easily visible from the vehicle along the complete test section

7.5.1 Analogue pointer displays and digital displays

- The analogue pointer displays and the LED digital displays can be mounted outdoors but must be protected from wind, water and damaging environmental influences

7.5.2 PC displays

- The instructions of the respective manufacturer are to be observed for PC displays

7.6 Total spatial requirements

- The total spatial requirements are dependent on the vehicles to be tested. The roller set should be positioned such that there should be no problems when driving on or off the test bed and so that it is possible to drive the axles to be tested straight and level

8. Assembly and installation, initial commissioning

8.1 Assembly conditions

- Assembly can only be carried out if the temperature and environmental conditions are tolerable and represent decent working conditions
- The assembly location must allow safe working

8.2 Safety

- Assembly must only be carried out by trained specialist personnel
- The roller set is equipped with a step protection device underneath the sensing rollers
- The centre cover on the compact test bed can be loaded with max. 500 kg

8.3 Assembly and installation

8.3.1 Display cabinet

- Install the analogue pointer display at the position intended
- A canopy must be provided if installed outdoors
- The mains cable should be connected at the 3-pole screw terminal block and routed to the control box
- The bus cable should be connected at the display computer and routed to the control box

8.3.2 Monitor

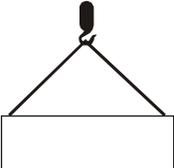
- The test bed can be operated with an analogue pointer display, with a PC and monitor or with both
- If using a PC and monitor, observe the instructions of the PC manufacturer and our **"Software Display Basic" user manual**
- For data transfer from the test bed to the PC, the "PC connection via USB cable" **Option** is required
- The PC converter box is connected on one side to the electrical/control box and on the other side to the serial interface of the PC

8.3.3 Control box

- The control box is installed in the vicinity of the roller set
- Connect the supply line at the main switch in the control box
- Connect the bus cable from the display at the controller
- Connect the main cable from the display at the terminal strip

8.3.4 Roller sets without provision for weighing unit

- Lift the roller sets into the pit, align them and anchor them to the floor

	<ul style="list-style-type: none"> - The hoist must have a load-bearing capacity of at least 1000 kg. The max. incline angle of 60° must be complied with - The safety provisions for hoists must be observed!
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8.3.5 Roller sets with weighing units or with provision for weighing units

- Loosen the screws of the locking pins. Lift the roller sets into the pit. In doing so, the locking pins must slide in the fastening lugs. Align the roller sets in the pit and tighten the screws of the locking pins again. Align the roller sets horizontally in the pit with the threaded rods in the dummy weighing devices or the weighing sensors
- Route the two motor cables to the control box and connect to the power contactors
- Route the two sensor cables to the control box and connect to the controller
- Re-fit the centre cover of the roller set

8.3.6 Electrical power connection

- Route the two motor cables to the control box and connect to the power contactors.
- Route the two sensor cables to the control box and connect to the controller.
- 20 m of cable are pre-fitted on the left and right roller sets to allow the control box to be fitted to the left or right of the test bed
- When installing without an inspection pit, cover the free space between the roller sets

9. Operation

9.1 Safety

9.1.1 Safety devices

- Lockable main switch can be used as emergency stop switch
- Pushbutton switch with operating mode pre-selection for manual or automatic test bed start
- Automatic test bed start: In automatic operating mode, both sensing rollers must be depressed at the same time - within a period of max. 3 seconds - and after that the test bed starts with a time delay of ca. 5 secs. The test bed can be set such that the two rollers start together or that they start with a lateral time delay
- Automatic start-up monitoring: The test bed detects wheels that are difficult to turn or jammed and switches off again automatically after the test bed starts. After ca. 5 sec. the test bed attempts to start again. The cause for wheels being difficult to move or being jammed could be that the vehicle is in gear, a depressed brake pedal, an activated parking brake, all-wheel connection or a fault in the brakes, bearings etc. If the system shuts down again the vehicle must be driven off the test bed and the cause must be investigated
- Automatic inactivity switch-off: If the test bed is started but no brake testing is carried out for a longer period, the test bed switches into manual mode automatically
- Automatic slippage switch-off: The rotation speed difference to the drive rollers is monitored by the sensing rollers. If a defined slippage value is exceeded, the test bed switches off automatically. The slippage threshold is adjustable. The parametrising of this value shall only be undertaken by authorised service personnel.
- The test bed switches off automatically if the drive motors are overloaded and the drive speed drops below the slippage value set
- Automatic restart: In automatic mode the test bed switches on again after ca. 5 sec. if the sensing rollers are depressed
- Automatic switch-off after driving out: If the vehicle is driven out of the test bed and the sensing rollers move upwards, the test bed switches off automatically
- Automatic drive-off aid: If the test bed is driven with the drive wheels of the vehicle and in doing so the speed exceeds the test speed of the test bed, the test bed's electrical motors switch on automatically. This prevents the test bed being over-rotated and makes driving off easier. The motors switch-in in all operating modes so long as the test bed is switched on and its power supply is intact

9.2 Switching on the test bed

- The test bed is switched on with the main switch on the side of the electrical/control. This is indicated on the pointer or PC display with a **green illuminating lamp**. The test bed calibrates itself automatically to its zero point
- After switching on at the main switch, the test bed is in manual mode. The test bed can be switched between manual or automatic start mode with the automatic switch on the control cabinet.
- The changeover to automatic start is only possible if there is no vehicle currently in the roller set and so the sensing rollers are not pressed downwards. In automatic mode, the lamps on the automatic button and an orange lamp on the displays illuminate.
- In manual mode, the automatic lamps extinguish. If there is a vehicle on the roller set and so both sensing rollers are pressed downwards, a start procedure can be initiated by pressing the automatic button or the button on the remote control
- **Attention:** If the brake value displays are not behind zero and the operating lamp or automatic lamp is flashing, there is an active fault message. The faults arising can be analysed by means of the pointer position and the fault code list
- **Attention:** With the "Rotational and measurement direction reversal" option, check the switch position before driving on. Do not switch over abruptly whilst the test bed is running (possible damage to the vehicle or test bed)
- **Attention:** Before driving onto the test bed, check that there is enough ground clearance for the vehicle to be tested

9.2.1 "Rotational and measurement direction reversal" option

- With this option, the turning direction of the rollers can be changed overall or counter-directional. In doing so, not only the direction of rotation, but the measurement direction is also automatically switched around
- Both switches in the top arrow position: Both wheels turn forwards
- Both switches in the bottom arrow position: Both wheels turn backwards
- One switch in the top arrow position and one switch in the bottom arrow position: One wheel turns forwards and one wheel turns backwards
- One switch in the arrow position and one switch in the centre position: Individual wheel switching, one wheel turns in the pre-selected direction and the other wheel is stationary
- With the changeover of the direction of rotation, the measurement direction is also switched around

9.2.2 "Automatic all-wheel drive detection" option

- The "Automatic all-wheel drive detection" is only active if both rotary and measurement direction switches are in the centre position
- As soon as a switch is moved to another position, the automatic all-wheel detection is switched off and the test bed operates in the selected "function"

9.2.3 "Motorcycle testing" option

- The test bed is also suitable for testing single-track vehicles
- The "Roller cover for motorbike testing", "Rotational and measurement direction reversal" and "Remote control" options are required for this
- The test bed can be operated in single-wheel mode with the "Rotational and measurement direction reversal" or the "Remote control" option
- The single wheel testing only works in manual mode
- The test bed can be changed to automatic/manual mode with the pushbutton on the electrical/control box if the sensing rollers are not depressed
- The roller cover for motorcycles, which provides a cut-out of 350 mm for the running rollers, must be installed for the safety of the operating personnel
- With the "**Pre-selection switch for motorcycles/cars/HGVs**" option, it is not necessary to change over the "Rotational and measurement direction reversal" to single-wheel operation, or the test speed and the printout in separate steps. The test procedure will be automatically set to the selected position

1481010	Pre-selection switch for motorbike/car/HGV brake testing (test procedure and PC printout)
1270130	Roller cover for motorbike testing on BPS-Twin, two hot-dip galvanised cover plates with 300 mm cut-out for motorbike wheel, with wheel deflector, bearing load max. 2 t (only in conjunction with remote control)
On request	Roller cover for motorbike testing on BPS-Twin-18.7, two hot-dip galvanised cover plates with 300 mm cut-out for motorbike wheel, with wheel deflector, bearing load max. 2 t (only in conjunction with remote control)

9.3 Operating modes

9.3.1 Manual test bed start

	<ul style="list-style-type: none"> - Automatic button on the control cabinet. - Toggle function "ON or OFF" and STOP
---	--

- Press automatic button on the control cabinet until the orange lamp on the display extinguishes (to change over from automatic/manual start there must be no vehicle present on the test bed)
- Then, drive onto the test bed with the axle to be tested
- A second person can start or stop the test bed by pressing the automatic button. With the "Remote control" option, the test bed can be started and stopped with the buttons on the remote controller

9.3.2 Automatic test bed start

	<ul style="list-style-type: none"> - Press automatic button on the control cabinet until the orange lamp on the display illuminates - Toggle function "Automatic ON or OFF" and STOP
---	--

- There must be no vehicle present on the roller set to activate the automatic test bed start
- The orange lamp for automatic mode must illuminate steadily, then the test bed is in automatic mode and will start automatically after driving the vehicle on

10. General test procedure

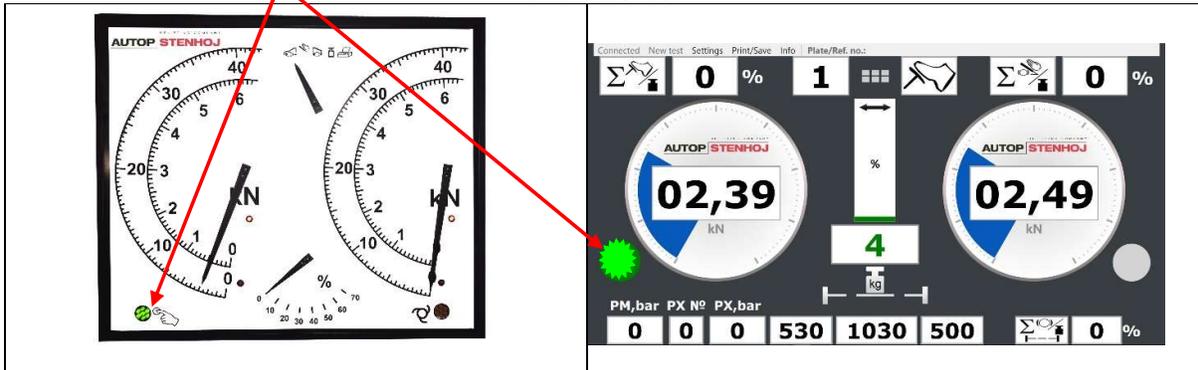
- Drive onto the test bed with the axle to be tested located centrally, release brakes, set transmission to neutral and hold on to the steering wheel. In automatic start mode, the automatic lamp starts to flash and the pointers sit at the zero position. In manual start mode, the start button must be pressed
- After ca. 5 sec., the test bed starts automatically. After the automatic test bed start, the orange lamp extinguishes. Let the steering wheel settle and then grip it firmly
- Depending on the pre-programmed setting, the start may occur simultaneously on both sides or with the preselected lateral delay

- **With excessive rolling resistance (e.g. stresses in the drive train with all-wheel drive vehicles, or wheels deliberately braked, or similar), the automatic start-up monitoring switches the test bed off and attempts to start this anew after ca. 5 secs.**
- **If start-up monitoring switches again despite brakes being released and the transmission being in neutral, the vehicle must be driven off the test bed and the cause of the excessive rolling resistance investigated**

10.1 Automatic all-wheel drive detection test procedure

- So long as the green lamp is flashing, automatic all-wheel drive detection is active. If the difference in the two brake values is too high, the test bed carries out a counter-check with changed turning direction reversal
- If the slippage threshold is reached, the test bed switches off automatically
- If the slippage threshold is not reached, the brake must be released and then the test bed switches itself off after 10 to 15 seconds
- If the vehicle is lifted out of the test bed and the green lamp continues to flash, the test bed must be driven again with the same axle as a counter-check.

Only once the **green operating lamp** stops flashing has the test procedure ended and the vehicle can be driven off the test bed



10.2 Motorcycle testing test procedure

- The motorcycle testing is carried out on one of the two roller sides in manual mode. Only the rollers on the side where the sensing roller is depressed will be started
- The changeover to manual mode is carried out with the automatic button or with the **"Pre-selection switch for motorcycles/cars/HGVs"** whilst the sensing roller is not depressed
- Drive the motorcycle into the roller covering cut-out in the roller prism
- With the sensing roller depressed, the test bed can be started with the remote control or the automatic-manual button. With the sensing rollers running, actuate the brake and read off the brake values
- Then drive off roller set

11. Short operating instructions

11.1 Switch on test bed

- Switch on main switch, green lamp for power supply illuminates.
- Test bed operates in manual mode
- After pressing the automatic button, the orange lamp illuminates, and the test bed is in automatic start mode
- Before driving onto the test bed, check that there is enough ground clearance for the vehicle to be tested

11.2 Drive onto the test bed

- Drive onto the test bed with the axle to be tested located centrally, release brakes, set transmission to neutral and hold on to the steering wheel.
- After driving onto the test bed the weight is displayed before testing starts if the weighing unit is installed.
- In manual mode, press the automatic switching button and the test bed starts once.
- In automatic mode, the test bed starts automatically within ca. 5 sec.
- In both cases, the orange automatic lamp starts to flash indicating that the test bed has started
- After the test bed start, the orange lamp extinguishes. Let the steering wheel settle and then grip it firmly

11.3 Brake testing

- Slowly actuate the brake pedal or the braking device - observe the two brake value indicators with the increasing brake values
- Continue to increase the braking quickly until the test bed switches off via the slippage switch-off system. The brake value display remains at the max. value for ca. 5 sec. During this time the orange light flashes for automatic mode and then the test bed begins to start anew and the orange light extinguishes
- If the slippage switch-off threshold cannot be reached, release the brakes in good time so that no tyre damage can be caused
- Carry out the braking procedure again or drive off the test bed

11.4 Driving off with a driven axle

- In automatic mode, wait until the test bed starts again and then drive out of the rollers whilst the test bed is running
- In manual mode, start the test bed manually or drive off slowly with the drive axle. The test bed electronics detects the external drive from the vehicle and after reaching the test speed switches in the electrical motors automatically

ATTENTION: Do not drive off the test bed whilst the orange light is flashing as the test bed is not yet running and the wheels driving off the test bed will not be able to support themselves on the test rollers. After the orange lamp has extinguished, the electrical motor of the test rollers runs making driving off the test bed easier with their resistance

11.5 Taking out of service

- Switch off main switch and secure with a padlock

12. Fault-finding

12.1 Safety

- In the event of a fault message, switch off the test bed and lock off at the main switch
- Restricted operation possible with warning message

12.2 Service address

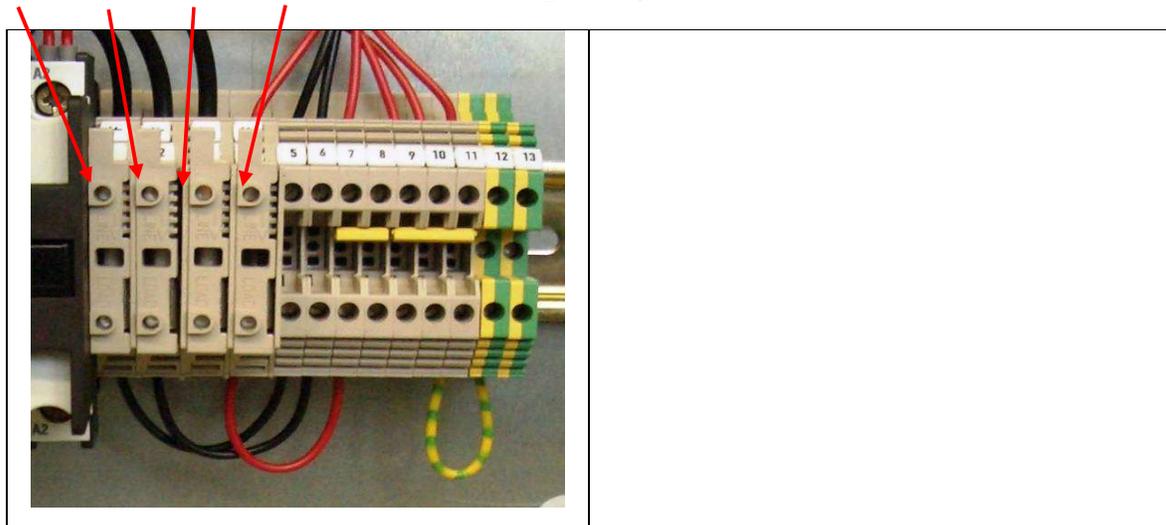
AUTOPSTENHOJ
 D-48432 Rheine, Germany
 Phone: +49 5971 – 8602 02
 Mail: info@autopstenhoj.com
 Web: www.autopstenhoj.com

12.3 Location and identification of fuses

- The power supply must be safeguarded by the customer
- The electronics are safeguarded in the electrical/control box

12.3.1 Fine fuses:

5A	5A	5A	0,5A
F1	F2	F3	F4



12.4 Fault condition identification

12.4.1 Fault message

- Green operating lamp extinguishes, orange automatic lamp flashes
- Right pointer display indicates fault number
- There is a red digital display in the fault field on the PC display

12.4.2 Warning message

- Green operating lamp flashes, orange automatic lamp extinguishes
- Right pointer display indicates warning number
- There is a yellow digital display in the fault field on the PC display

12.5 Fault checklist

12.5.1 From software version V4.0x, the faults are described in the calibration instructions

12.5.2 First measures for fault rectification

12.5.3 Fault

- (It is not possible to operate the test bed. It is possible to scroll through the faults with the automatic button).

Cause	Display (scale 0-40)	Rectification
Possible cause(s)	Fault / fault message	Remedy
No mains voltage	No lamps are illuminated	Check the power supply fuse
Inadequate power supply voltage	Test bed has no power Unusual noise from motor	Check the power supply fuse
Fault in the bus connection Bus subscriber malfunction	All LEDs flash (master display) All LEDs illuminate (simultaneous display)	No operation possible Check the fuse in the control cabinet Contact service department
Left braking force sensor - wire break	Orange LED flashes Right pointer – 1	Check wiring
Right braking force sensor - wire break	Orange LED flashes Right pointer – 2	Check wiring
Left roller slip sensor - wire break	Orange LED flashes Right pointer – 3	Check wiring
Right roller slip sensor - wire break	Orange LED flashes Right pointer – 4	Check wiring
Left contact sensor Wire break	Orange LED flashes Right pointer – 5	Check wiring
Right contact sensor - wire break	Orange LED flashes Right pointer – 6	Check wiring
Left braking force sensor or left roller slip sensor - Amplifier defective	Orange LED flashes Right pointer – 7	Replace sensor
Right braking force sensor or right roller slip sensor - Amplifier defective	Orange LED flashes Right pointer – 8	Replace sensor
Left contact sensor Amplifier defective	Orange LED flashes Right pointer – 9	Replace sensor
Right contact sensor - Amplifier defective	Orange LED flashes Right pointer – 10	Replace sensor
Left motor slip sensor - wire break	Orange LED flashes Right pointer – 11	Check wiring
Right motor slip sensor - wire break	Orange LED flashes Right pointer – 12	Check wiring
Left motor slip sensor - Amplifier defective	Orange LED flashes Right pointer – 13	Replace sensor
Right motor slip sensor - Amplifier defective	Orange LED flashes Right pointer – 14	Replace sensor
Left position sensor - Wire break	Orange LED flashes Right pointer – 15	Check wiring
Right position sensor - wire break	Orange LED flashes Right pointer – 16	Check wiring
Left position sensor - Zero point too low/high	Orange LED flashes Right pointer – 18	Check sensor calibration
Right position sensor - Zero point too low/high	Orange LED flashes Right pointer – 19	Check sensor calibration
Track sensor - Wire break	Orange LED flashes Right pointer – 20	Check wiring
Track sensor - Zero point too low/high	Orange LED flashes Right pointer – 21	Check sensor calibration

12.5.4 Warnings

(Restricted operation is possible after acknowledging the warning with the Automatic button)

Cause	Display (scale 0-40)	Rectification
Possible cause(s)	Fault / fault message	Remedy
Vehicle on the roller set when switched on	Automatic mode cannot be switched on - the test bed starts in manual mode when button is pressed	Drive vehicle off roller set (Automatic drive-off aid if the main switch is switched on)
Left braking force sensor - zero point too high	Green LED flashes Left pointer – 1	Restricted measurement range
Right braking force sensor - zero point too high	Green LED flashes Left pointer – 2	Restricted measurement range

13. Maintenance

13.1 Safety

13.1.1 Safety check

- The operating company must check the safety-relevant equipment on the system at least once per year. (employers' mutual insurance association regulation BGV A1, §39 sections 1 and 3)

13.2 Maintenance

- See maintenance plan for the test system
- Repair work should only be carried out by authorised service personnel

13.3 Checking procedure and test devices

13.3.1 Unit testing

- The unit testing must be carried out by an authorised service technician before the first commissioning
- This should be repeated every 2 years
- The unit testing must be carried out after a repair to the test bed, if any assemblies relevant for the measurement have been replaced
- Before rectifying the defects, it is not permitted to use the test for brake testing per §29 StVZO and annex VIII StVZO in conjunction with §41 StVZO
- The unit testing must be carried out again within 4 weeks of the repair having been carried out
- The deadline for the next unit testing should be attached in a clearly visible location on the test bed by means of a test placard

13.4 Special tools, operating equipment, materials per ISO 17025

- Mechanical calibration devices
- Electronic calibration devices
- Calibration manual
- Unit testing form
- Test book with test reports

13.5 Inspection and maintenance plan

d = daily, w = weekly, m = monthly, a = annual				
Work to be carried out	d	w	m	a
Visual check before use	x			
Cleaning and lubrication in accordance with operating conditions and environmental conditions		x		
Inspection and maintenance work			Every 6	
Unit checking with inspection and maintenance work				Every 2

13.5.1 Description of the inspection and maintenance work

- The two drive chains must be regularly checked to ensure that they have the correct tension (10 mm play at the longest point) and adequate lubrication (standard chain grease) and re-tensioned or re-lubricated if necessary
- Clear away or vacuum away (do not use high pressure cleaners) any contaminants (e.g. stones) from the roller set in order to guarantee flawless operation
- In particular care should be taken to ensure that the water can flow off freely and cannot be blocked
- Lubricate hinges and joints
- Description of the maintenance work
- Repair work should only be carried out by authorised service personnel

14. Disassembly and disposal

- Legal regulations must be taken into account at the time of the disposal

14.1 Basic safety instructions

- Have the supply line for the electrical power supply disconnected by specialist personnel
- Use lifting gear with adequate load-bearing capacity

14.2 Description of the disassembly work

- Remove all line connections between roller sets, electrical/control box and displays
- Unscrew electrical/control box and displays
- Loosen foundation fastening screws from the roller set
- Screw ring irons into the top of the roller set, attach lifting straps and draw the roller set out of the foundation with a hoist

14.3 Disposal

- The gear units of the drive motors are filled with oil that must be disposed of separately
- Electronic circuit boards must be disposed of separately
- Likewise, the remote controller and the printer
- Sheet metal and iron parts are scrap metal

15. Supplementary documents

15.1 Drawings and layouts

- These are available on request

15.2 Foundation plans / installation plans

- These are available on request

15.3 Spare parts and consumables

- These are available on request

15.4 Electrical documentation

- These are available on request

15.5 Operating instructions for options

- Remote control, PC program "Display Basic/Testlane", brake pressure measurement device
- and load simulation are available on request

15.6 Test reports

- These are available on request

15.7 Service address

AUTOPSTENHOJ
D-48432 Rheine, Germany
Phone: +49 5971 – 8602 02
Mail: info@autopstenhoj.com
Web: www.autopstenhoj.com

16. EC Declaration of Conformity

We hereby declare that our testing devices comply with the relevant, essential health and safety requirements of the respective EC Directives as a result of their design and type of construction and in the version marketed by us.

Autop Maschinenbau GmbH
Sandkampstraße 90
D-48432 Rheine, Germany

Phone: +49 5971 – 8602 02
Mail: info@autopstenhoj.com
Web: www.autopstenhoj.com

Machine designation: Brake tester
Type: Testmaster RT
Version 130-2 until 187-2

Machine number: _____

EC Machinery Directive: 2006 / 42 / EC from 17th. May 2006
EMC directive: 2004 / 1 08 / EC from 15th. December 2004
RL electrical operating materials: 2006 / 95 / EC from 12th. December 2006
Certified examinations: Expert assessment by TÜV Nord BP 217.1, dated 04.10.2011 regarding the testing of a brake test bed

This declaration shall become null and void should any alterations be made to the machine without our express approval.
Mühldorf, 2011

i.A. R.Spaans

17. Notes