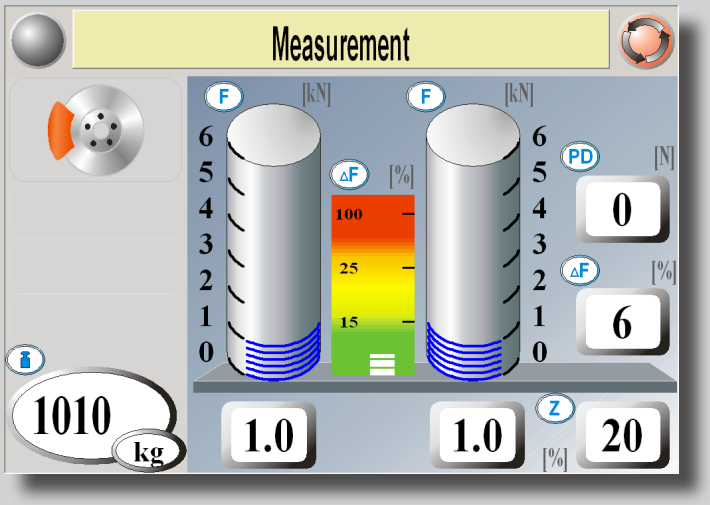
Prüfstraße mit PC - SL 6xx

Test Lane with PC - SL 6xx



de Originalbetriebsanleitung
Prüfstraße mit PC für Pkw

es Manual original
Línea de comprobación con PC para turismos

nl Oorspronkelijke gebruiksaanwijzing
Teststraat met PC voor personenauto's

da Generelle referencer
Testlinie med PC til personbiler

tr Orijinal işletme talimatı
Otomobil için PC'li test hattı

en Original instructions
Test lane with PC for passenger vehicles

it Istruzioni originali
Linea di prova con PC per autovetture

pt Manual original
Linha de teste com PC para veículos de passeio

pl Instrukcją oryginalną
Linia diagnostyczna z komputerem do samochodów osobowych

el Πρωτότυπο εγχειρίδιο χρήσης
Διαδρομή ελέγχου με PC για επιβατικά οχήματα

fr Notice originale
Ligne d'essai avec PC pour VP

sv Bruksanvisning i original
Rullande landsväg med PC för personbilar

fi Alkuperäiset ohjeet
Henkilöautojen testausrata, PC-varustus

cs Původní návod k používání
Zkušební linka s počítačem pro osobní vozy

zh 原始的指南
适用于轿车的装有电脑的测试道

BEISSBARTH

Contents English

These operating instructions describe standard test procedures. These standard test procedures may differ from country-specific test procedures

1. Symbols used

1.1 In the documentation

1.1.1 Warning notices - Structure and meaning

Warning notices warn of dangers to the user or people in the vicinity. Warning notices also indicate the consequences of the hazard as well as preventive action. Warning notices have the following structure:

Warning symbol	**KEY WORD – Nature and source of hazard!** Consequences of hazard in the event of failure to observe action and information given. ➢ Hazard prevention action and information.

The key word indicates the likelihood of occurrence and the severity of the hazard in the event of non-observance:

Key word	Probability of occurrence	Severity of danger if instructions not observed
DANGER	**Immediate** impending **danger**	**Death** or **severe** injury
WARNING	**Possible** impending **danger**	**Death** or **severe** injury
CAUTION	Possible **dangerous situation**	**Minor** injury

1.1.2 Symbols in this documentation

Symbol	Designation	Explanation
!	Attention	Warns about possible property damage.
i	Information	Practical hints and other useful information.
1. 2.	Multi-step operation	Instruction consisting of several steps.
➢	One-step operation	Instruction consisting of one step.
⇨	Intermediate result	An instruction produces a visible intermediate result.
➔	Final result	There is a visible final result on completion of the instruction.

1.2 On the product

! Observe all warning notices on products and ensure they remain legible.

2. User information

2.1 Important notes

Important information on copyright, liability and warranty provisions, as well as on equipment users and company obligations, can be found in the separate manual "Important notes on and safety instructions for Beissbarth Test Equipment". These instructions must be carefully studied prior to start-up, connection and operation of the BSA 4341 CAS[plus] and must always be heeded.

2.2 Safety instructions

All the pertinent safety instructions can be found in the separate manual "Important notes on and safety instructions for Beissbarth Test Equipment" (user information, order number 1 691 696 920). These instructions must be carefully studied prior to start-up, connection and operation of the BSA 4341 CAS[plus] and must always be heeded.

2.3 Configuration

! Only Service personnel are authorized to make all the necessary configuration settings and calibrate the sensors.

2.4 Other applicable documentation

i These operating instructions do not apply to the BD 5xx.

BD 6xx / SL 6xx:

Document	Order number
User information	1 691 696 920
Product descriptions • BD 6xx • SA / SN 6xx • ST 600 • Remote control unit	 1 691 606 220 1 691 626 220 1 691 636 220 1 691 696 225
Test log book ***de / en***	1 691 696 620 / 1 691 696 621
Planning folder ***de / en*** • BD 6xx stand alone (not BD 66x) • BD 66x stand alone • SA / SN 6xx stand alone • Testlane SL 6xx	
EU Declaration of Conformity • BD 6xx • SL 6xx	 1691 696 921 1691 696 921

BD 7xx:

Document	Order number
User information	1 691 696 920
Product descriptions • BD 7xx • Remote control unit	 1 691 876 220 1 691 696 225
Test log book ***de / en***	1 691 696 620 / 1 691 696 621
Planning folder ***de / en***	905 877 000 / 905 877 001
EU Declaration of Conformity	1 691 876 921

3. Product description

3.1 Intended use

Information on the intended use of the 1 691 706 020 can be found in the product descriptions for each of the components.

3.2 Measurement quantities

The SL 6xx can be used to measure the following quantities:

Brake dynamometer series BD 6xx / BD 7xx:
- Braking force in kilonewtons [kN].
- Braking force difference in percent [%].
- Axle weight in kilograms [kg].
- Deceleration in percent [%].
- Out-of-roundness in percent [%].

Suspension tester SA / SN 6xx:
- Road surface adhesion in percent [%].
- Resonant frequency in hertz [Hz].

Noise simulator SN 680:
- Resonant frequency in hertz [Hz].

Side slip tester ST 600:
- Toe measurement in millimeters [mm].

For further information on the measurement quantities, refer to Section 10.2.

The SL 6xx can be equipped with the BD 6xx but not with the BD 7xx.

3.3 Measurement visualization (operation)

3.3.1 General information

The measurement visualization function is started together with the task manager and is designed to assist the user as follows:
- If in the order manager no order was generated and activated, it is generated by the measurement visualization automatically.
  The order and the measurement results are stored automatically in the order manager.
- The user can select a tester and start the test procedure.
- The individual test steps are displayed in the message line and presented on the screen in the form of animated graphics.
- Measurement results are displayed on the screen in numerical or graphical form.
- Where necessary, the user is prompted to take certain action during the test.

3.3.2 Check of calibration and configuration

The following data is displayed at startup (optional):
- Firmware version
- Last calibration date
- Counter for configuration changes of the brake tester

These data are important for customer service and routine testing.

3.3.3 Main window

The following illustration shows the main measurement visualization window.

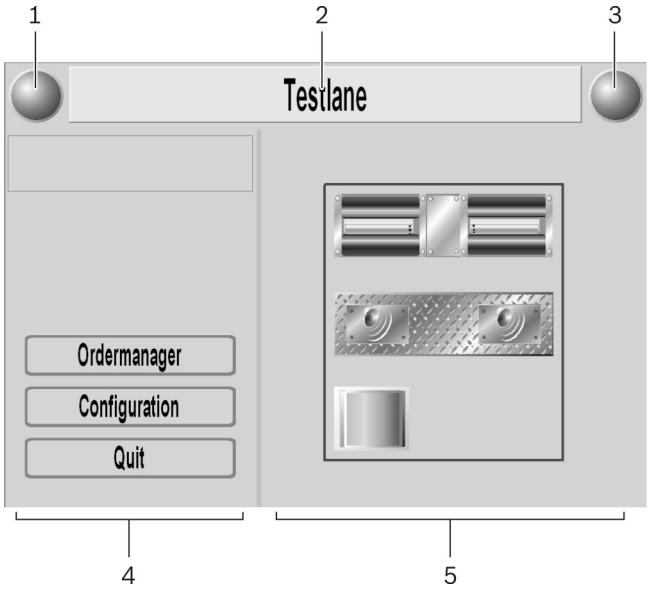


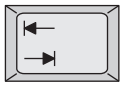
Fig. 1: Main window

1 Remote control indicator
2 Message line
3 Mode indicator
4 Main menu
5 Tester selection zone

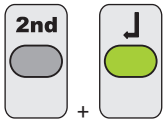
3.3.4 Switching between the two halves of the window

The main window is divided into two areas: Main menu (left) and tester selection zone (right).
It is possible to switch back and forth between the two halves of the window as follows:

➢ With the keypad:
Press the **Tab** key.



➢ With the remote control unit:
Press the buttons **2nd** + **Enter**.



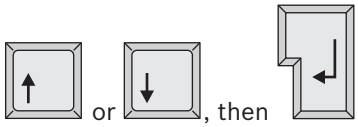
If the measurement visualization function is operated with the mouse, it is not necessary to switch between the different areas. Each control element can be accessed directly on the screen with the mouse.

3.3.5 Selection and actuation of control element

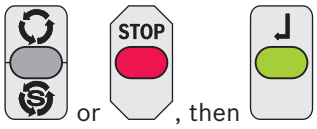
A control element in the main window can be selected and actuated in the following ways:

➢ With the mouse:
Click onto the control element required.

➢ With the keypad:
Select the control element required with the cursor keys and then press the **Enter** key.



➢ With the remote control unit:
Select the control element required with the **Automatic** button or the **STOP** button and then press **Enter**.



3.3.6 Main menu

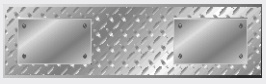
The following buttons are provided in the main menu:

Button	Action
Ordermanager	Opens the task manager.
Configuration	Opens the "BNetConfig" configuration program.
Quit	Ends measurement visualization.

➢ Use the mouse, the keypad or the remote control unit to select and press a button (refer to Section 3.3.4).

3.3.7 Tester selection zone

In this zone it is possible to select a tester and start measurements. The following testers are available:

Icon	Tester	Vehicles	Motorcycle
	Brake dynamometer BD 6xx / BD 7xx		*x*
	Brake dynamometer BD 6xx / BD 7xx	*x*	
	Suspension tester SA / SN 6xx	*x*	
	Noise simulator SN 680	*x*	
	Side slip tester ST 600	*x*	

The tester currently selected is highlighted by a red border.

The "test lane" is made up of all the available testers. Each tester is implemented in succession.

➢ Use the mouse, the keypad or the remote control unit to select a tester and start measurement.

4. Operation

4.1 Switching the SL 6xx on and off

SL 6xx is switched on and off by way of the master switch on the master switch box. The master switch also acts as an EMERGENCY STOP switch.

4.2 Starting software modules

1. Switch on the system at the master switch box.
2. Switch on the PC and log onto the Windows operating system.
3. Double click onto the link on the Desktop.

4. Alternatively the programs can be started by way of the Windows start menu:

Start >> Programs >> BeissbarthNet >> Start

➜ The ordermanager and the measurement visualization function are started.

ⓘ Various background applications are also started depending on installation. These are displayed in the order bar at the bottom right. Refer to the following table.

Icon	Explanation
	Host manager. Responsible for starting and ending all BNet applications. Establishes communication between the BNet applications.
	Data service. Central storage service for all BNet applications.
	Software license manager. Valid for all BNet applications.
	ASA network gateway. Link with ASA network.
	MLD9 gateway. Link with headlight aiming device.
	File gateway. Permits import and export of orders by way of files.
	BEA gateway. Link with exhaust gas tester.
	BEA-ES connector.
	SL gateway.

Tab. 1: Icons in the order bar

4.3 Software module termination

1. Click onto the host manager symbol in the order bar with the right mouse key.

⇨ A context menu appears.

2. Select the menu position **Exit**.
3. Wait until all software modules have been terminated.
4. Close down all programs and shut down Windows in the proper manner.
5. Switch off the system at the master switch box.

➜ The software modules have been terminated.

4.4 Operating modes

The tests and functions vary depending on the mode selected:

Mode	Test sequence	Save	Print	Single wheel	All wheel
Manual mode (normal operation)	M	M	M	M	M
Automatic mode	A	–	–	–	–
Super automatic mode	A	A	A	–	–
All-wheel super automatic mode	A	A	A	A	A

Tab. 1: Operating modes
A Automatic
M Manual
– Not possible

4.5 Brake test sequence

1. Select a test routine (refer to Section 4).

   Selection is only possible if additional test routines have been configured by Service personnel.

2. Select an operating mode and perform the measurements.
   - Manual mode (refer to Section 5).
   - Automatic mode (refer to Section 6).
   - Super automatic mode (refer to Section 7).
   - All-wheel super automatic mode (refer to Section 8).

Factory default settings:
Test routine P1 (brake test) or L1 (test lane) and manual mode (normal operation).

The following brakes can be measured:
- Front axle service brake.
- Rear axle service brake.
- Parking brake.

The brake test sequence can be selected by the operator in manual and automatic mode.
Compliance with the brake test sequence is essential in super automatic and all-wheel super automatic mode (sub-tasks).

4.6 Notes on operation

When performing tests pay attention to the following information on ***correct operation***.

Remaining hazard warning!
The possibility of remaining hazards cannot be excluded when using the brake dynamometer.
- ➢ Heed the safety instructions given in the "User information" manual 1 691 696 900!
- ➢ Wear protective clothing and equipment!

4.6.1 General information

- ➢ Always keep the vehicle straight when driving onto the dynamometer.
- ➢ Ensure compliance with the permissible test and driveover load (refer to technical data).
- ➢ Do not perform testing on single-track vehicles (motorcycles, ...).
- ➢ Check the tire inflation pressure before starting measurement.
- ➢ The vehicle must be unladen when testing.
- ➢ Remain in the vehicle during the test.

4.6.2 Notes on brake testing

- ➢ Make sure tires do not scrape against the frame of the dynamometer.
- ➢ Keep to the maximum speed of 10 km/h when driving onto or over the roller mechanism.
- ➢ Avoid abrupt steering action when checking the front axle.
- ➢ Brake testing can only be performed if both the wheels of one axle press the slip rollers down within 5 seconds.

In the event of an excessive difference between roller and wheel speed (>25%), the frictional force between the wheel and test roller is measured instead of the braking force. This measurement result is of no use for brake testing.

Only drive off the set of rollers whilst the test rollers are turning, i.e. measurement mode must be active (manual operation in axle measuring mode or automatic operation).
Driving off with the test rollers stationary would damage the mounts of the dynamometer motors.

Shut-off criteria:
- If the vehicle runs off the set of rollers during the brake test, causing the slip rollers to move upwards, the drive rollers are automatically deactivated.
- If the braking force exceeds the frictional force between the wheel and the test rollers, the wheel starts to slip (lock up). The drive rollers of the SL 6xx are automatically deactivated to avoid damaging the tires.

4.6.3 Notes on brake testing for four-wheel drive vehicles

- All-wheel measurements are intended for vehicles with permanent four-wheel drive.
- The left and right test rollers are operated in opposite directions to guard against overloading of the vehicle limited slip differential.
- The braking forces are measured on the side turning forwards.

! Also heed the test instructions in the 4WD vehicle operating manual.

4.6.4 Notes on motorcycle brake testing

! Motorcycle brake testing on the car brake tester is only performed on the left roller and only in manual mode.

➢ Use the motorcycle cover on the left side of the rollers.

➢ Use the standard cover (clipped in or hinged) on the right side of the rollers.

! For the „Motorcycle“ test routine, the analogue display must be equipped with LCD.

4.6.5 Notes on suspension tester

SA / SN 6xx
- Refer to the product description for setting the zero point of the axle load scales.
- The left and right sides of the chassis are tested separately.
- Chassis testing cannot be performed until both the wheels of one axle are positioned on the shaker plates.
- If the vehicle runs off the set of shaker plates during the chassis test, the drive motors are automatically deactivated.

➢ Apply the brake during testing.

4.6.6 Notes on noise simulator

- The noise simulation function is only ever to be activated as briefly as possible.
- Heavy vehicles and low frequencies exert the greatest load on the device.
- The noise simulation function is not to be activated for more than 20 minutes per hour, taking care to ensure even distribution of the operating times and intervals (ideally: 3 minutes operation, 6 minutes interval).
- If a motor overheating smell becomes apparent, terminate the application immediately for at least 15 minutes. To permit further operation of the cooling fans, the system should not however be switched off at the master switch.

4.6.7 Notes on side slip tester

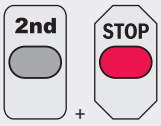
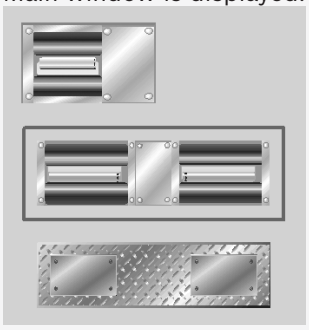
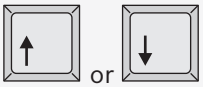
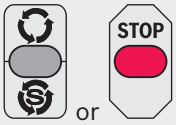
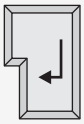
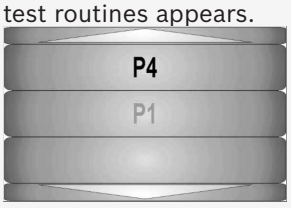
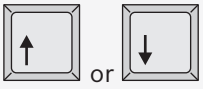
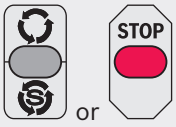
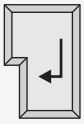
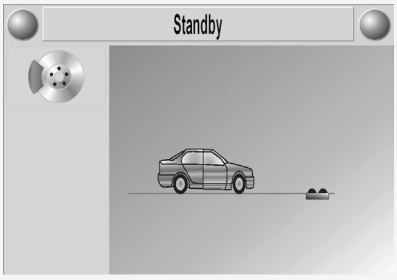
➢ Drive both axles at a constant speed (max. 15 km/h) over the side slip tester, taking care to keep the vehicle straight.

4.7 Selecting test routine

Test routines contain test steps with fixed and configurable parameters (e.g. peak value display time). After switching on the SL 6xx, the test routine P1 (brake test) or L1 (test lane) is selected automatically. If required, additional test routines can be configured by Service personnel.

If only one test routine is available for a particular tester, the corresponding test routine is selected automatically together with the tester.

If several test routines are available for a particular tester, a list of the test routines available is presented after selecting the tester.

Step	Keypad	Remote control unit	Result / Display
1. Exit from test routine.		 + Press one after the other	⇨ Measurement mode is terminated. ⇨ Main window is displayed. 
2. Select tester.	 or	 or	⇨ The tester currently selected is highlighted by a red border.
3. Confirm tester selected. List only appears if several test routines are available for the tester.			⇨ Tester is selected. ⇨ A list of the available test routines appears. 
4. Select test routine.	 or	 or	⇨ The test routine currently selected is highlighted by yellow lettering.
5. Confirm test routine selected.			⇨ Test routine starts. ⇨ Drive-on prompt appears on screen.  ➜ Test routine is selected.

The test routine can be terminated at any time with the **Esc** key or the **2nd + STOP** buttons.

5. Manual mode (normal operation)

Manual mode is required for the performance of single wheel measurements or for noise simulation.

Principal features:
- Test sequence can be selected by user.
- Measurements must be started manually.
- Measurement results can be stored.
- Measurement results can be printed out.
- Single wheel measurements are possible.
- Suitable for four-wheel drive vehicles.
- Suitable for noise simulation

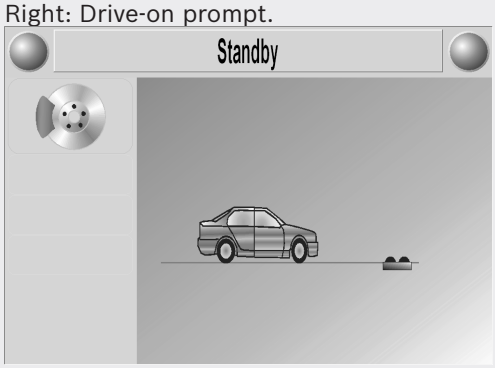
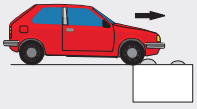
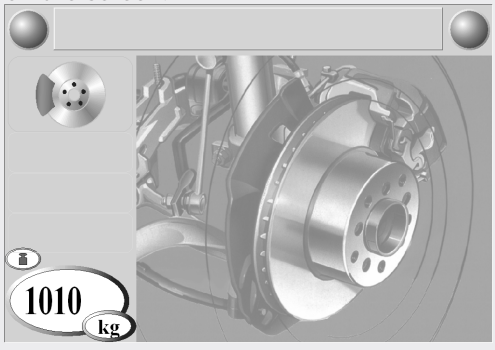
5.1 Mode activation and deactivation

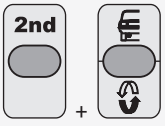
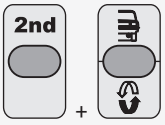
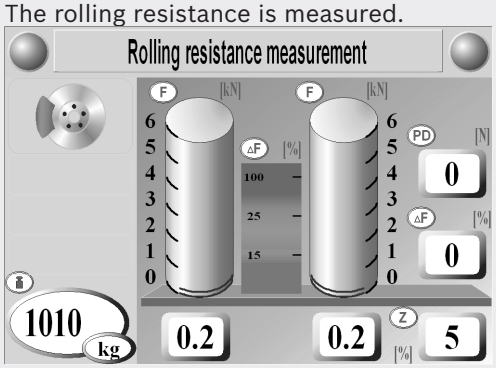
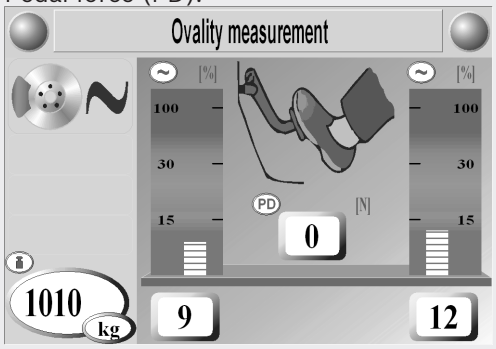
Manual mode is the standard factory default setting. Following termination of other modes, the SL 6xx returns to manual mode.

5.2 Test sequences

5.2.1 Vehicles test routine

The weight is required for calculation of deceleration. The weight can be entered or measured as follows:
- Manual entry using remote control unit (refer to Section 5.3.1).
  Manual weight entries have precedence over measured weight values.
- Axle load scales in brake dynamometer (special accessory).
  Use is automatically made of the measured weight if the weight has not been entered manually.
- Manual transfer of weight from suspension tester (refer to Section 5.2.2, step 3).

Step	Remote control unit	Result / Display
1. Check prerequisites: • No vehicle on brake dynamometer! • Tester/test routine selected.		⇨ Left: "Brake dynamometer" device symbol. ⇨ Right: Drive-on prompt. 
2. Drive onto the brake dynamometer with the axle to be measured first and keeping the vehicle ***straight***. Disengage gear. Release brake pedal.  If the vehicle is not straight on the set of rollers, it will slide off to the side. Counter-steer until the vehicle returns to straight position on the set of rollers. Measurement is not to be started before this has been done. It may be necessary to drive off the set of rollers and then drive the vehicle back on.		⇨ Axle to be measured is positioned on set of rollers. ⇨ If axle load scales are being used (special accessory): The axle load in kilograms appears on the screen. 

Step	Remote control unit	Result / Display
3. Select measurement mode: • Axle measuring. • Left single wheel measurement. • Right single wheel measurement. • Left 4WD single wheel measurement. • Right 4WD single wheel measurement.	 Axle measuring  Left single wheel  Right single wheel  4WD left  4WD right	⇨ Announcement phase: – The dynamometer motors start up, the test rollers turn. – The rolling resistance is measured.  ⇨ Ready for braking force measurement. The measurement can be terminated at any time with the **STOP** button.
4. Measure out-of-roundness (optional): • Press brake pedal and hold steady at a braking force greater than 500 N. • Press out-of-roundness button.	 Out-of-roundness button	⇨ The out-of-roundness of the brakes is measured for 5 seconds. ⇨ The current values are displayed on the screen: – Out-of-roundness (~). – Pedal force (PD).  ➜ Out-of-roundness measurement is over.

5.2.2 Motorcycle test routine

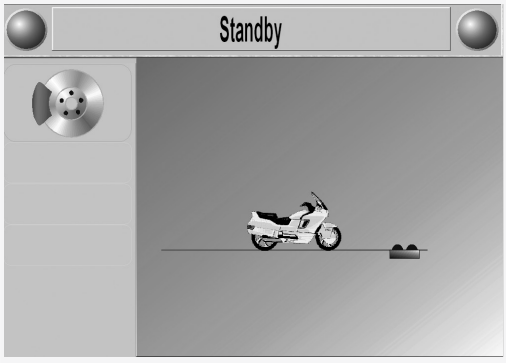
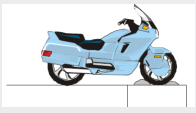
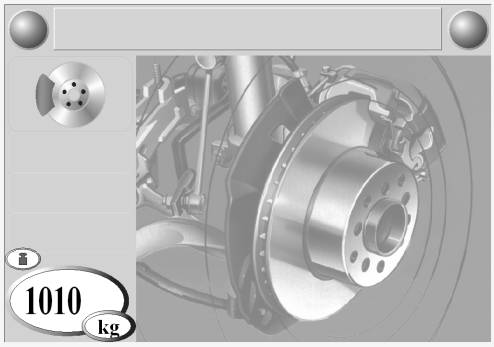
Heed the Motorcycle test procedure safety instructions given in the "User information" manual 1 691 696 920.

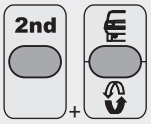
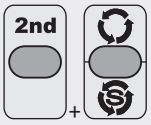
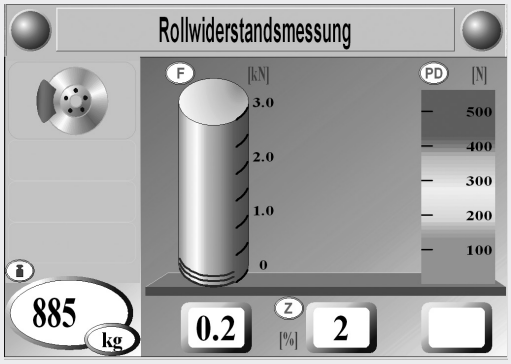
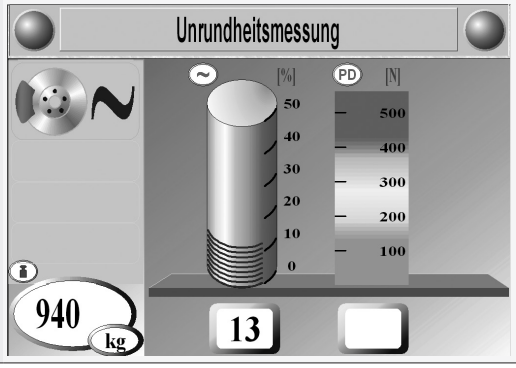
Risk of motorcycle tipping over due to lateral drifting of the front wheel.

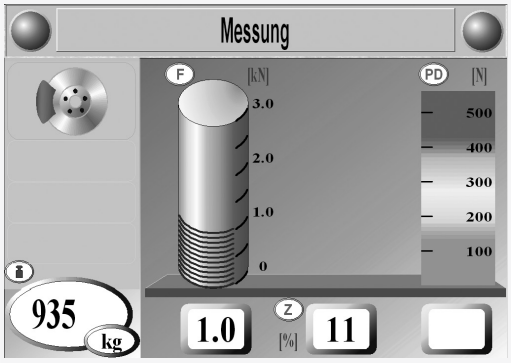
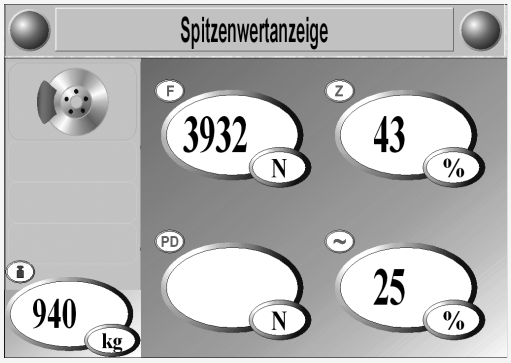
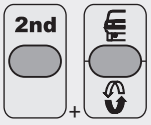
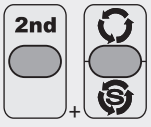
Use the motorcycle cover on the left side of the rollers. Use the standard cover (clipped in or hinged) on the right side of the rollers.

The motorcycle test procedure can only be implemented in manual mode.

The weight is required for calculation of the braking factor. The weight can be entered or measured as follows:
- Manual entry by way of remote control.
  Manual weight entries have precedence over measured weight values.
- Axle load weigher in brake tester (special accessory).
  Use is automatically made of the measured weight if the weight has not been entered manually.

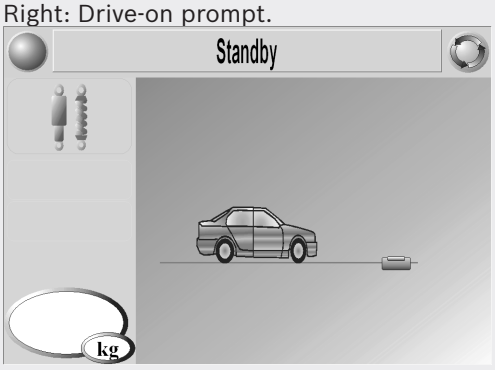
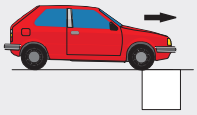
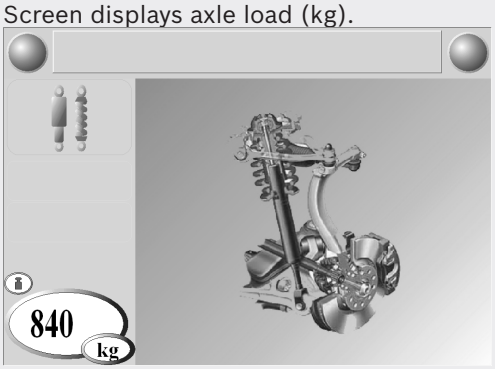
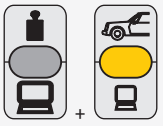
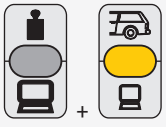
Step	Remote control	Result / Display
1. Check prerequisites: • No motorcycle on brake tester • Test routine selected.		⇨ Left: "Brake tester" device symbol. ⇨ Right: Drive-on prompt. 
2. Drive onto the brake tester with the wheel to be measured first and keeping the motorcycle ***straight***. Disengage gear. Release brake pedal.  If the motorcycle is not straight on the set of rollers, it will slide off to the side. Counter-steer until the motorcycle returns to straight position on the set of rollers. Measurement is not to be started before this has been done. It may be necessary to drive off the set of rollers and then drive the motorcycle back on.		⇨ Wheel to be measured is positioned on set of rollers. ⇨ If axle load weigher is being used (special accessory): The wheel load in kilogrammes appears on the screen. 

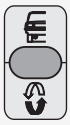
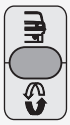
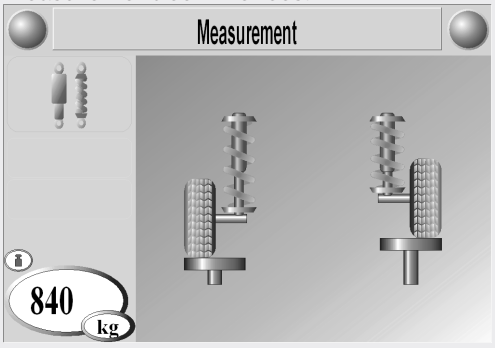
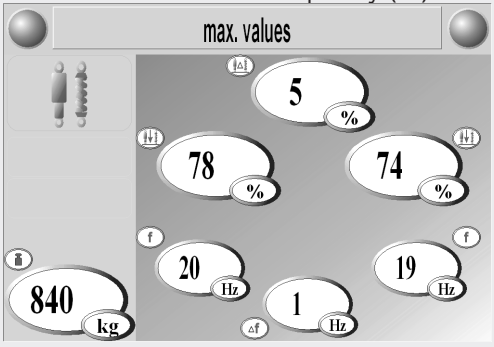
Step	Remote control	Result / Display
3. Start of measurement Measurement is only possible using remote control.	 	⇨ Announcement phase: – The tester motors start up, the test rollers turn. – The rolling resistance is measured.  ⇨ Ready for braking force measurement. The measurement can be terminated at any time with the **STOP** button.
4. Out-of-roundness measurement (optional): ➢ Press brake pedal and hold steady at a braking force greater than 500 N. ➢ Press out-of-roundness button. This measurement is only possible using remote control.	 Out-of-roundness button	⇨ The out-of-roundness of the brakes is measured for 5 seconds. ⇨ The current values are displayed on the screen: – Out-of-roundness (~). – Pedal force (PD). 

Step	Remote control	Result / Display
5. Braking force measurement: ➢ Slowly and steadily depress brake pedal until maximum braking force (slip) is attained. ➢ Release brake pedal again. Shut-off criteria: – Wheel lock-up (slip monitoring). – Motorcycle drift (touch roller no longer pressed). – Maximum braking force (slip) not attained on braking and braking action remains at rolling resistance level for more than six seconds.		⇨ The current values are displayed on the screen: – Braking force (F) – Pedal force (PD) – Braking factor (Z)  ⇨ Peak value display (approx. 5 seconds).  ➜ The measured values can now be stored.
6. End of measurement for tester without motor brake. ➢ Start of measurement ➢ Drive motorcycle off set of rollers.	 	➜ Braking force measurement over.

5.2.3 Suspension tester SA / SN 6xx

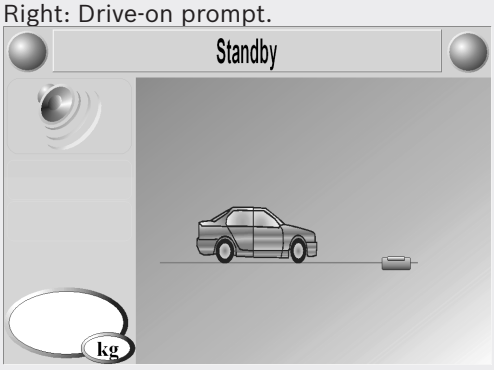
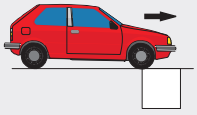
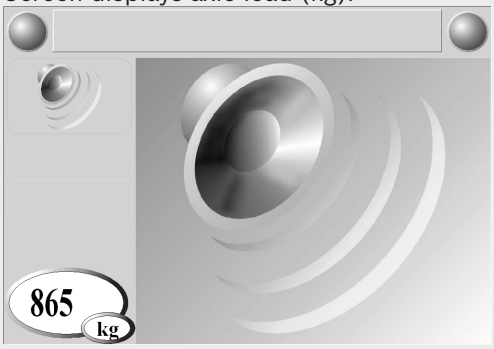
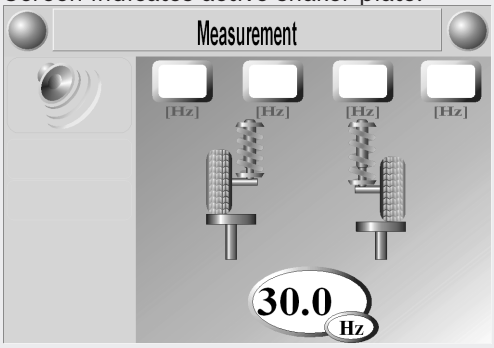
The suspension tester is always provided with axle load scales.

Step	Remote control unit	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected.		⇨ Left: "Suspension tester" device symbol. ⇨ Right: Drive-on prompt. 
2. Drive onto the suspension tester with the axle to be measured first and keeping the vehicle ***straight***. Press the brake to stop the vehicle moving. 		⇨ Axle to be measured is positioned in suspension tester. ⇨ Screen displays axle load (kg).  ⇨ Ready for chassis measurement.
If the suspension tester is only being used to measure the axle weight for a brake test: 3. Store axle weight.	 Store front axle load  Store rear axle load	⇨ Axle weight is stored. ⇨ Continue with step 6.

Step	Remote control unit	Result / Display
4. Select measurement mode: • Axle measuring. • Left single wheel measurement. • Right single wheel measurement.	 Axle measuring  Left single wheel  Right single wheel	⇨ Announcement phase: ⇨ Message line flashes to indicate starting of motor. ℹ The measurement can be terminated at any time with the **STOP** button.
5. Shaker plate motor starts up. ℹ For axle measuring, the left side is measured first and then the right side.		⇨ Screen indicates active shaker plate. ⇨ Vehicle is caused to oscillate. ⇨ Motor stops after approx. 4 seconds. ⇨ Measurement commences.  ⇨ Peak value display (approx. 5 seconds): – Road surface adhesion on left and right side (↓). – Difference in road surface adhesion (Δ) – Resonant frequency on left and right side (f) – Difference in resonant frequency (Δf)  ➜ The measured values can now be stored. Refer to Section 5.6.2.
6. Drive vehicle out of suspension tester.		➜ Chassis measurement is over.

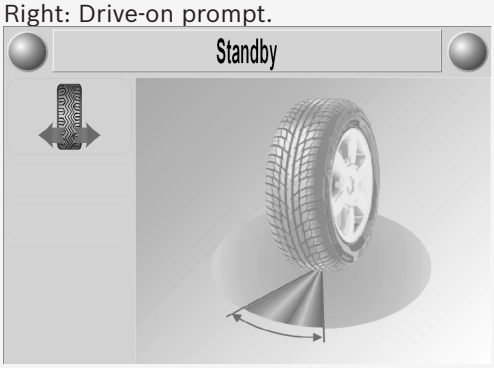
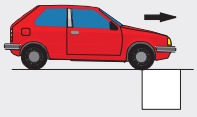
5.2.4 Noise simulator SN 680

The noise simulator can only be used in manual mode.

Step	Remote control unit	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected.		⇨ Left: "Noise simulator" device symbol. ⇨ Right: Drive-on prompt. 
2. Drive onto the suspension tester with the axle to be measured first and keeping the vehicle ***straight***. Press the ***brake*** to stop the vehicle moving. 		⇨ Axle to be measured is positioned in noise simulator. ⇨ Screen displays axle load (kg).  Ready for noise measurement.
3. Select measurement mode: • Left single wheel measurement. • Right single wheel measurement.	 Left single wheel  Right single wheel	⇨ Announcement phase: ⇨ Message line flashes to indicate starting of motor. The measurement can be terminated at any time with the **STOP** button.
4. Motor of selected shaker plate starts up. The motor runs until the maximum test time is completed (standard value 180 seconds).		⇨ Vehicle is caused to oscillate. ⇨ Screen indicates active shaker plate. 

Step	Remote control unit	Result / Display
5. Change the frequency and listen for noise. The frequency can be altered in the range 10-30 Hz.	 0.5 Hz higher  0.5 Hz lower	⇨ The current frequency is displayed on the screen. ➜ The measured values can now be stored. Refer to Section 5.6.2. A maximum of 4 frequencies can be stored per wheel.
6. Drive vehicle out of noise simulator.		➜ Noise measurement is over.

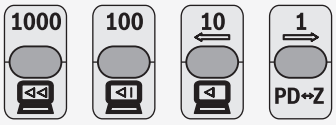
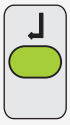
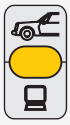
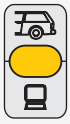
5.2.5 Side slip tester ST 600

Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected.	⇨ Left: "Side slip tester" device symbol. ⇨ Right: Drive-on prompt.  ⇨ Ready for toe measurement.
2. Keeping the vehicle ***straight***, drive both axles at a constant speed over the side slip tester. Speed ***max. 15 km/h***. 	⇨ Front axle toe is measured. ⇨ Peak value display (approx. 5 seconds): – Toe value (<-->).  ➜ The measured values can now be stored. Refer to Section 5.6.2. ➜ Toe measurement is over.

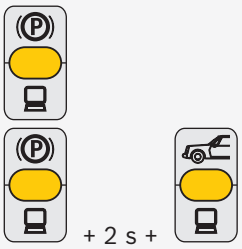
5.3 Remote control options

5.3.1 Manual entry of weights

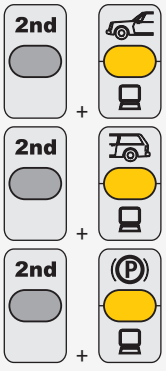
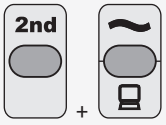
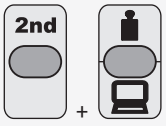
! Manual weight entries have precedence over measured weight values.

Step	Remote control buttons	Result / Display
1. Start weight entry. i Pressing the button again terminates the entry without making any changes.	 Weight entry	⇨ Screen displays "0 kg". 
2. Enter weight. Example: 1235 = 1x1000, 2x100, 3x10, 5x1 i **CL** (Clear Last) button resets the weight to 0 kg.	 Weight buttons  Reset	⇨ Screen shows the weight entered in kg.
3. Store the weight. • Total weight (= vehicle weight + weight of operator). • Axle weight/front axle. • Axle weight/rear axle. • Axle weight/parking brake. i Weight entry: – Weights can be overwritten. – Storing a weight of 0 kg deletes the last entry.	 Total weight  Front axle  Rear axle  Parking brake	➜ Weight entered is stored.

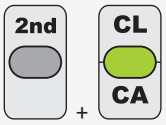
5.3.2 Storing measured values

Step	Remote control unit	Result / Analog display
➢ Assignment and storage of current measured values: • Front axle. • Rear axle.		➜ The current measured values are stored.
• Parking brake: – Default: parking brake rear axle – Assignment of the parking brake to the front axle		ⓘ Assignment of the parking brake to the front axle is only possible within 5 seconds after pressing the button. ➜ The current measured values are stored.

5.3.3 Display repetition

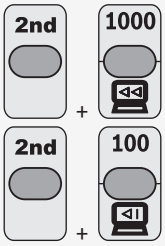
Step	Remote control unit	Result / Analog display
➢ Display measured values stored: • Front axle service brake. • Rear axle service brake. • Parking brake.		➜ The stored brake measured values are displayed.
➢ Display out-of-roundness.		➜ The out-of-roundness is displayed.
➢ Display stored total weight.		➜ The stored total weight is displayed.

5.3.4 Deleting stored values

Step	Remote control unit	Result / Analog display
➢ Deletion of last measured value stored (**CL** = Clear Last).		⇨ The last measured value stored is deleted (e.g. rear axle service brake measured value).
➢ Deletion of all stored values (**CA** = Clear All).		⇨ All the stored values are deleted (weights, measured values).

5.3.5 Displaying total deceleration

The total deceleration is the end result of the brake test.

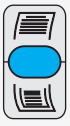
Step	Remote control unit	Result / Analog display
➢ Display total deceleration: • Service brake. • Parking brake.		➜ The calculated total brake deceleration is displayed.

5.3.6 Display switching

Step	Remote control buttons	Result / Display
➢ Switching of display for braking forces: • Measured values in bar chart form. • Measured values as a function of time (curve trace).	 Print button 2	⇨ Display is switched.

5.3.7 Print-out of measurement results

Print-out is only possible if a printer set is available (special accessory).
Only stored values can be printed out.w

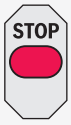
Step	Remote control buttons	Result / Display
1. Make sure the printer is switched on.		⇨ Printer is switched on
2. Start print task.	 Print button 1	⇨ "PrintManager" dialog box is opened.  ➜ Measurement results are printed out.

6. Automatic mode

Automatic mode is recommended for rapid performance of one or more measurements not requiring verification of the measured data.

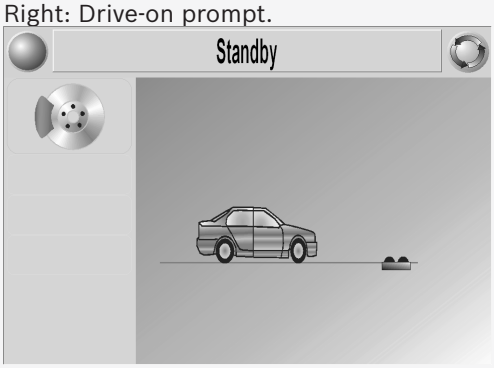
Principal features:
- Test sequence can be selected by user.
- Automatic starting of measurements.
- No storage of measurement results.
- No print-out of measurement results.

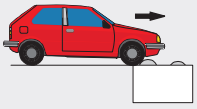
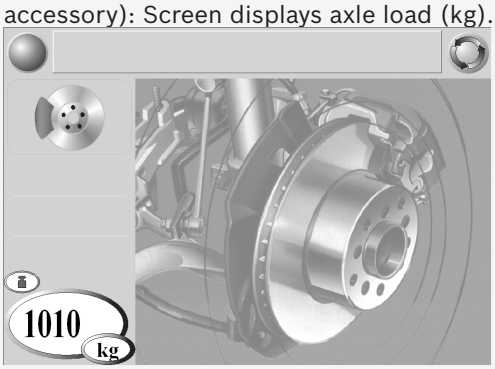
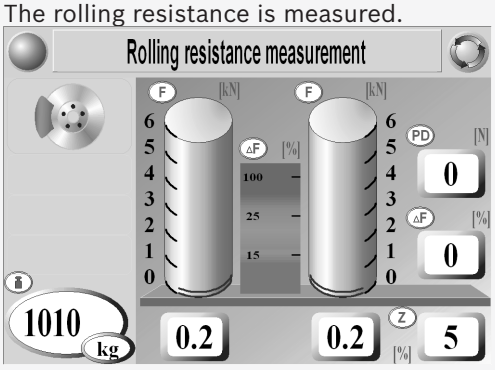
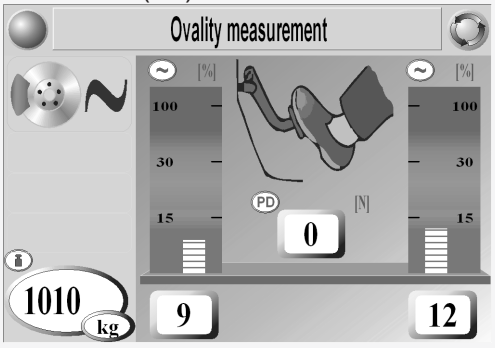
6.1 Mode activation and deactivation

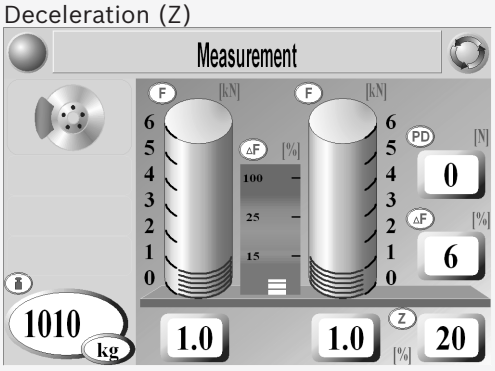
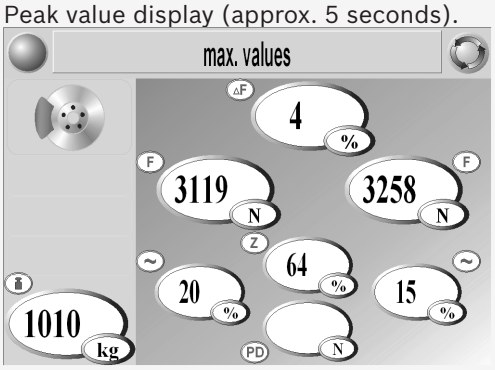
Step	Remote control unit	Result / Display
➢ Acitvate automatic mode.	 Press Automatic	⇨ Mode indicator: "Automatic" symbol 
➢ Deactivate automatic mode.	 Press STOP	⇨ Mode indicator: "Manual mode" symbol 

6.2 Test sequences

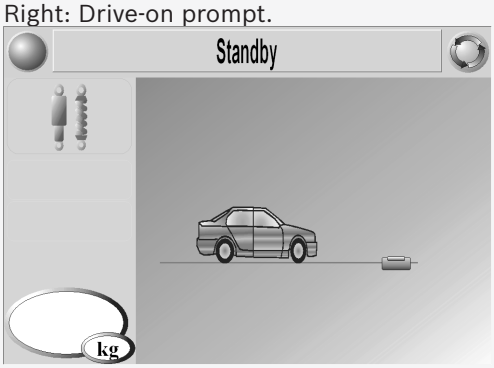
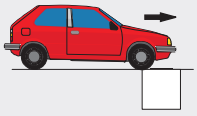
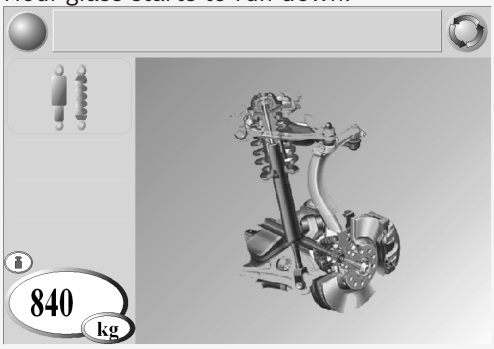
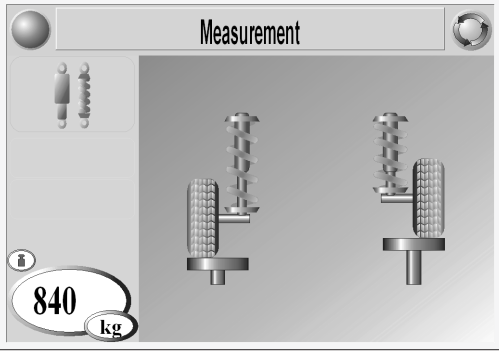
6.2.1 Brake dynamometer BD 6xx / BD 7xx

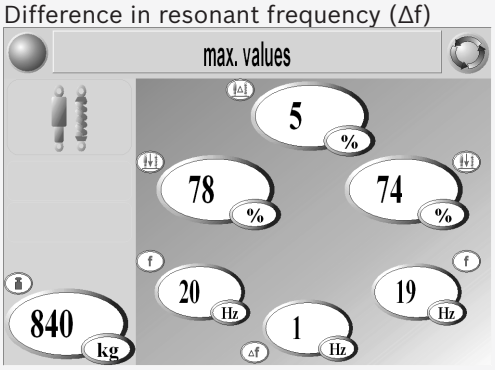
Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected. • "Automatic" mode selected.	⇨ Left: "Brake dynamometer" device symbol. ⇨ Right: Drive-on prompt. 

Step	Result / Display
2. Drive onto the brake dynamometer with the axle to be measured first and keeping the vehicle ***straight***. Disengage gear. Release brake pedal.  **!** If the vehicle is not straight on the set of rollers, it will slide off to the side. Counter-steer until the vehicle returns to straight position on the set of rollers. Measurement is not to be started before this has been done. It may be necessary to drive off the set of rollers and then drive the vehicle back on.	⇨ Axle to be measured is positioned on set of rollers. ⇨ If use is being made of axle load scales (special accessory): Screen displays axle load (kg).  ⇨ Announcement phase: – The dynamometer motors start up, the test rollers turn. – The rolling resistance is measured.  ⇨ Ready for braking force measurement.
3. Automatic brake test commences. **i** Measurements are only possible on an axle basis in Automatic mode.	⇨ "Measurement" message.
4. Measure out-of-roundness (optional): • Slowly press brake pedal until braking forces on left and right are greater than 1000 N. • Reduce braking force back down to rolling resistance.	⇨ The brake dynamometer recognizes this action as the starting signal for measuring out-of-roundness. ⇨ Out-of-roundness measurement starts 3 seconds after releasing brake pedal.
• Press brake pedal and hold steady at a braking force greater than 500 N.	⇨ The out-of-roundness of the brakes is measured for 5 seconds. ⇨ The current values are displayed on the screen: – Out-of-roundness (~). – Pedal force (PD).  ➜ Out-of-roundness measurement is over.

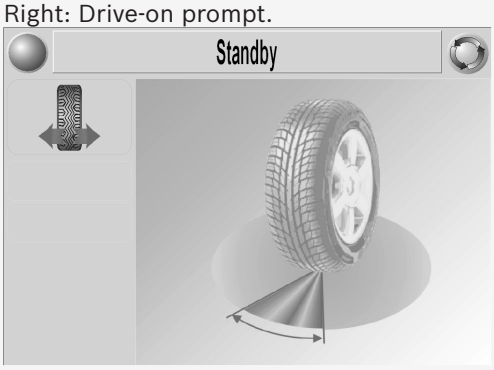
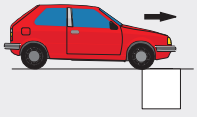
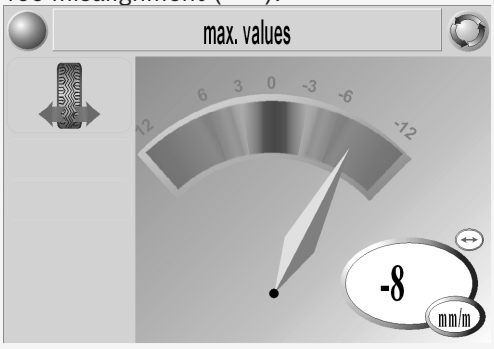
Step	Result / Display
5. Measure braking forces: • Slowly and steadily depress brake pedal until maximum braking force (slip) is attained. • Release brake pedal again. Shut-off criteria: – Wheel lock-up (slip monitoring). – Vehicle out of position (slip rollers no longer pressed). – Maximum braking force (slip) not attained on braking and braking action remains at rolling resistance level for more than six seconds.	⇨ The current values are displayed on the screen: – Braking force (F) – Pedal force (PD) – Braking force difference (ΔF) – Deceleration (Z)  ⇨ Peak value display (approx. 5 seconds). 
6. Wait until set of rollers starts up again automatically. Then drive vehicle off set of rollers.	➜ Braking force measurement is over.

6.2.2 Suspension tester SA / SN 6xx

Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected. • "Automatic" mode selected.	⇨ Left: "Suspension tester" device symbol. ⇨ Right: Drive-on prompt. 
2. Drive onto the suspension tester with the axle to be measured first and keeping the vehicle ***straight***. Press the brake to stop the vehicle moving. 	⇨ Axle to be measured is positioned in suspension tester. ⇨ Screen displays axle load (kg). ⇨ Hour-glass starts to run down.  If the vehicle is removed from the suspension tester before the hour-glass has run down, the axle weight is stored (the suspension tester is only used to measure the axle weight for a brake test). ➜ Ready for chassis measurement.
3. Shaker plate motor starts up. For axle measuring, the left side is measured first and then the right side.	⇨ Screen indicates active shaker plate. ⇨ Vehicle is caused to oscillate. ⇨ Motor stops after approx. 4 seconds. ⇨ Measurement commences. 

Step	Result / Display
	⇨ Peak value display (approx. 5 seconds): – Road surface adhesion on left and right side (↓). – Difference in road surface adhesion (Δ) – Resonant frequency on left and right side (f) – Difference in resonant frequency (Δf) 
4. Drive vehicle out of suspension tester.	➜ Chassis measurement is over.

6.2.3 Side slip tester ST 600

Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected. • "Automatic" mode selected.	⇨ Left: "Side slip tester" device symbol. ⇨ Right: Drive-on prompt.  ⇨ Ready for toe measurement.
2. Keeping the vehicle ***straight***, drive both axles at a constant speed over the side slip tester. Speed ***max. 15 km/h***. 	⇨ Front axle toe is measured. ⇨ Peak value display (approx. 5 seconds): ⇨ Toe misalignment (<-->).  ➜ Toe measurement is over.

7. Super automatic mode

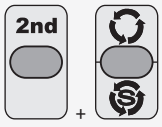
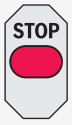
Super automatic mode is recommended for full testing of a vehicle requiring verification of the measured data.

Features of super automatic mode:
- Specified test sequence (sub-tasks).
- Automatic starting of measurements.
- Automatic storage of measurement results.
- Automatic print-out of measurement results.

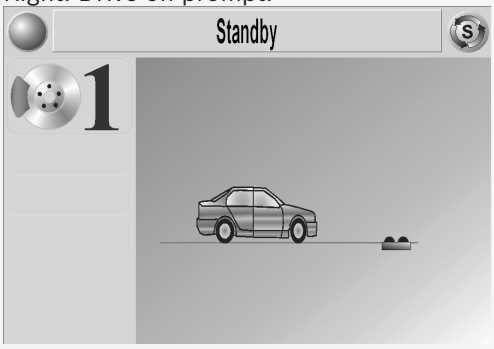
The following applies in super automatic mode:
- Termination of the test sequence (Automatic button or **STOP**) causes all the stored values to be deleted (Clear All).
- If the test sequence is not continued, the SL 6xx returns to manual mode after approx. 5 minutes. The stored values are deleted (Clear All).
- Auto-termination of the order after a pre-configured time period.

Special features of ST 600 test sequence
- Automatic resetting of incorrect measurements: If no subsequent measurement is taken, the first toe measurement is identified as an incorrect measurement and is rejected.

7.1 Mode activation and deactivation

Step	Remote control unit	Result / Display
➢ Activate super automatic mode.	 Press one after the other	⇨ Mode indicator: "Super automatic" symbol 
➢ Deactivate super automatic mode.	 Press STOP	⇨ Mode indicator: "Manual mode" symbol 

7.2 Test sequence

Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Tester/test routine selected. • "Super automatic" mode selected. It is essential to comply with the test sequence (sequence of sub-tasks)!	⇨ Left: Device identifier and current sub-task: 1 = Front axle. 2 = Rear axle. P = Parking brake. ⇨ Right: Drive-on prompt. 

The rest of the test sequence is similar to Automatic mode (Section 6).

7.3 Brake test options

7.3.1 Repetition of sub-task (Clear Last)

This option is deactivated in the standard configuration.

Step	Result / Display
➢ After end of peak value display The Clear-Last-Option is displayed for 3 seconds.	⇨ The dynamometer motors start up, the test rollers turn ⇨ Screen "running hourglass"
➢ Give a brief braking pulse (braking force is configurable).	⇨ Results of the current sub-task (1, 2 or P) are deleted. ➜ The current sub-task is repeated.

7.3.2 Parking brake on front axle

This option is deactivated in the standard configuration.

Step	Result / Display
➢ Option appears after the peak values or the Clear-Last-Option of the front axle (sub-task 1) were displayed. The option "parking brake on front axle" is displayed for 3 seconds.	⇨ The dynamometer motors run, the test rollers turn ⇨ Screen "Parking brake on front axle"
➢ Give a brief braking pulse (braking force is configurable).	⇨ Switching to parking brake. (test procedure 1-2-P ⇒ 1-P-2) ➜ Parking brake measurement commences.

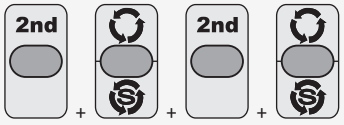
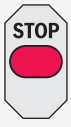
8. All-wheel super automatic mode

All-wheel super automatic mode is recommended for full testing of a four-wheel drive vehicle requiring verification of the measured data.

Principal features:

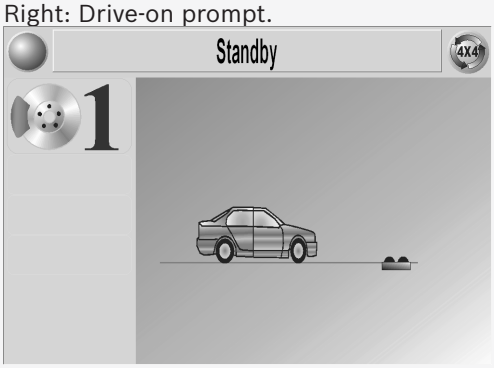
- Specified test sequence (sub-tasks).
- Automatic starting of measurements.
- Automatic storage of measurement results.
- Auto-termination of the order after a pre-configured time period.
- Automatic print-out of measurement results.
- Suitable for four-wheel drive vehicles.

8.1 Mode activation and deactivation

Step	Remote control unit	Result / Display
➢ Activate all-wheel super automatic mode.	 Press one after the other	⇨ Mode indicator: "All-wheel super automatic" symbol 
➢ Deactivate all-wheel super automatic mode.	 Press STOP	⇨ Mode indicator: "Manual mode" symbol 

8.2 Test sequence

Also heed the test instructions in the 4WD vehicle operating manual.

Step	Result / Display
1. Check prerequisites: • No vehicle on dynamometer! • Test routine selected. • "All-wheel super automatic" mode selected. Each sub-task consists of two single wheel measurements with direction reversal. It is essential to comply with the test sequence (sequence of sub-tasks)!	⇨ Left: Device identifier and current sub-task: 1 = Front axle. 2 = Rear axle. P = Parking brake. ⇨ Right: Drive-on prompt. 

The rest of the test sequence is similar to super automatic mode (refer to Section 7).

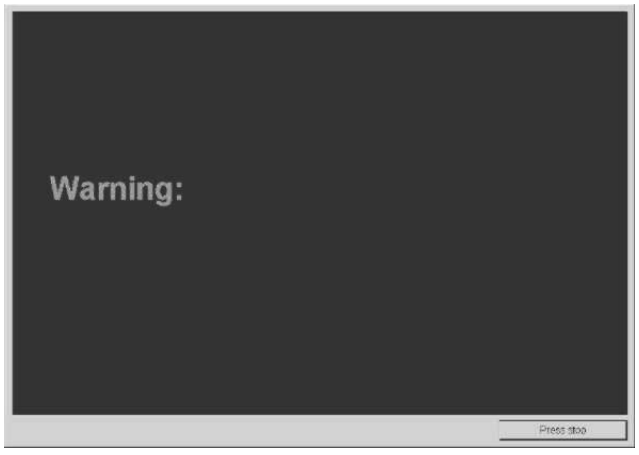
9. Fault procedure

9.1 General information

A warning or fault is displayed in the event of a malfunction in a system component or a problem with the test sequence.

Warnings

Warnings are displayed against a blue screen background.



Warnings can be acknowledged. Restricted SL 6xx operation is still possible
following acknowledgement of the warning.

Fault messages

Faults are displayed against a red screen background.

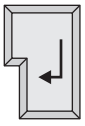
Faults cannot be acknowledged. Operation is no longer possible after a fault.

9.2 Acknowledgement of warnings

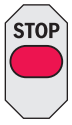
Warnings must be acknowledged by the user to permit further operation of the SL 6xx. The following methods can be used to acknowledge warnings:

➢ With the mouse:
Click onto the button **Press Stop.**

➢ With the keypad:
Press the **Enter** key.



➢ With the remote control unit:
Press the **STOP** button.



BNet Office or SDL is terminated automatically following acknowledgement in the case of serious errors.

9.3 BNet Office and SL 6xx

Error message	Explanation/remedy
Print-out error.	No valid order data available. If this error message occurs with every print-out, end all programs. Switch the system off at the master switch box and back on again. Re-start the PC programs.
Host manager not available! or Data service not available!	***Single-user workstation:*** Check whether the "Host manager" and "Data service" program modules are displayed in the order bar at the bottom right.  If not, end all programs and re-start the software modules. The programs should then be shown as a symbol in the order bar. If not, Data service was probably not selected on installation, so that configurations and order editing were not yet possible. Inform your Service engineer. ***Network:*** The PC or server on which Data service is installed in the network is not running or has not been logged onto your PC.
Driver initialization unsuccessful.	The COM port of the serial interface cannot be opened, as it is being used by another application.
No communication established with field bus users.	Check whether the entire system is running. Is the green LED on the BNet converter box flashing? Check whether all BNet connectors are firmly plugged in. Was the system inadvertently started after the PC software? The PC software must be started last. Check whether the analog display is outputting an error or is still busy. Most messages can be acknowledged with **STOP** or **2nd+STOP**. Re-start the PC program if P1 or L1 is displayed on the upper LCD. If the problem occurs again the next time the system is started, this is probably due to a configuration error. Check whether the upper LCD on the analog display shows the driveon prompt (---|). In this case, automatic test routine starting has probably not been deactivated. Inform your Service engineer.
Field bus error; please check the BNet devices. Re-start.	End all programs. Switch the system off at the master switch box and back on again. Re-start the PC programs. Inform your Service engineer if the error occurs again.
No test lane created. Use the BNet tool to create a test lane!	Test lane measurement not possible as no test lane has been defined. Inform your Service engineer.
Program start error or Program end error or Test lane start error or Test lane end error	End all programs. Switch the system off at the master switch box and back on again. Re-start the PC programs. Inform your Service engineer if the error occurs again.
The settings for the PC interface do not correspond to the type of BNet converter box!	Inform your Service engineer.
No valid copy protection connector available.	Check whether the copy protection connector is plugged in at the parallel port of the PC. It may not be possible to perform this type of measurement with the existing copy protection connector. Consult your Service engineer.
Copy protection connector error: Timeout.	***Single-user workstation:*** This type of error should not really occur in this case. End all programs and then re-start the programs. ***Network:*** The time difference between the storage service computer and the SL 6xx computer is more than 2 hours. Coordinate the times of the two computers. End all programs on both computers and then re-start the programs.

9.4 Brake dynamometer series BD 6xx

9.4.1 Warnings

Error	Explanation
1	Vehicle on set of rollers when switched on
2	Front left scales sensor cable break
3	Rear left scales sensor cable break
4	Front right scales sensor cable break
5	Rear right scales sensor cable break
7	Zero point too high – left braking force sensor
8	Zero point too high – right braking force sensor
9	Zero point too high – front left scales sensor
10	Zero point too high – rear left scales sensor
11	Zero point too high – front right scales sensor
12	Zero point too high – rear right scales sensor
13	Zero point too high – pedal force sensor
14	Different position of slip rollers in automatic / super automatic mode
15	Not possible to store measurement
16	Direction reversal not supported by power box

9.4.2 Faults

Error	Explanation
1	Left braking force sensor cable break
2	Right braking force sensor cable break
3	Left wheel slip roller cable break
4	Right wheel slip roller cable break
5	Left slip roller cable break
6	Right slip roller cable break
7	Amplifier defective – left wheel slip roller
8	Amplifier defective – right wheel slip roller
9	Amplifier defective – left slip roller
10	Amplifier defective – right slip roller
11	Slip roller spring broken
13	Sensor defective – left slip roller
14	Sensor defective – right slip roller
15	Write error in configuration memory (EEPROM) of tester

9.5 Side slip tester ST 600

9.5.1 Warnings

Error	Explanation
1	Zero point invalid – toe sensor

9.5.2 Faults

Error	Explanation
1	Toe sensor cable break
2	Amplifier defective – toe sensor

9.6 Chassis tester SA / SN 6xx

9.6.1 Warnings

Error	Explanation
1	Vehicle on chassis tester when switched on
2	Zero point too high – left scales sensor
3	Zero point too high – right scales sensor
4	Measured values invalid
5	No valid data available
6	No vehicle on chassis tester
10	Measured value buffer overflow
11	Power box temperature exceeded Wait approx. 30 minutes before continuing with measurement. Keep measurement cycles as short as possible.
15	Filing error

With SN 680 additionally:

Error	Explanation
12	Temperature exceeded – left motor
13	Temperature exceeded – right motor
50	Communication problem with frequency converter. Operation no longer possible.
51	Initialization error: No valid baud rate found. Operation no longer possible.

! To protect the motors of the chassis tester against overheating, the software terminates operation of the device as soon as the set running time (standard = 180 sec) is exceeded. Renewed switch-on is possible. Always heed the information in the product description.

! Temperature monitoring SN 680 V2 (optional)
If equipped with temperature monitoring (temperature sensors at motors), the device can no longer be switched on as of a motor temperature of 90 °C. The motors must first be allowed to cool down to 60 °C.

9.6.2 Faults

Error	Explanation
1	Left scales sensor cable break
2	Right scales sensor cable break

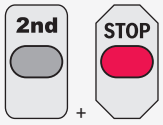
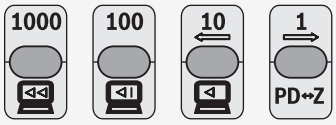
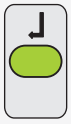
10. Appendix

10.1 Setting the date and time

The date and time must be set in the following situations:

- For print-out.
- After a power cut.
- When switching from summer to winter time.

The date and time can only be set by way of remote control.
Only makes sense if there is a analog display with LCD.

Step	Remote control	Result / Analog display
1. Exit from test routine.		⇨ Indicator lamp flashes. Warning lamp OFF. ⇨ Current test routine is displayed (e.g. P 1).
2. Select configuration mode for time and date.		⇨ Warning lamp ON. ⇨ Hours and minutes are displayed (e.g. 12.10).
3. Enter hours and minutes. Example: 12:35 = 1x1000, 2x100, 3x10, 5x1		⇨ Time is entered (e.g. 12.35).
4. Confirm entry.		⇨ Month and day are displayed (e.g. 10.03).
5. Enter month and day and confirm entry.	See step 3 and 4.	⇨ Month and day are entered. ⇨ Year is displayed (e.g. 2009).
6. Enter year and confirm entry.	See step 3 and 4.	⇨ Year is set.
7. Store all settings.		⇨ Return to operating system. ⇨ Warning lamp OFF. ⇨ Current test routine is displayed (e.g. P 1). ➜ Date and time are set.

10.2 Calculation methods

10.2.1 Deceleration

Deceleration is a measure of the performance of a braking system. It is specified as the percentage ratio of braking force to weight.

Axle deceleration

$$Z = \frac{F_{axis}}{G_{axis} * g} \times 100\ \%$$

Z	Deceleration in percent
F_{axis}	Axle braking force
G_{axis}	Axle weight
g	Acceleration due to gravity

Total deceleration

$$Z = \frac{F_{front} + F_{rear}}{G_{total} * g} \times 100\ \%, \quad G_{total} = G_{vehicle} + G_{test\ person}$$

Z	Deceleration in percent
F_{front}	Front axle braking force
F_{rear}	Rear axle braking force
G_{total}	Total weight
$G_{vehicle}$	Vehicle weight
$G_{test\ person}$	Weight of tester
g	Acceleration due to gravity

Parking brake deceleration

$$Z = \frac{F_{hand}}{G_{total} * g} \times 100\ \%, \quad G_{total} = G_{vehicle} + G_{test\ person}$$

Z	Deceleration in percent
F_{hand}	Braking force of parking brake
G_{total}	Total weight
$G_{vehicle}$	Vehicle weight
$G_{test\ person}$	Weight of tester
g	Acceleration due to gravity

10.2.2 Out-of-roundness

The pedal force is kept constant. The SL 6xx measures the resultant minimum and maximum braking force. The out-of-roundness is calculated as follows:

$$(\sim) = \frac{F_{max} - F_{min}}{F_{max}} \times 100\ \%$$

$(\sim)$	Out-of-roundness in percent
F_{max}	Maximum braking force
F_{min}	Minimum braking force

10.2.3 Road surface adhesion

Road surface adhesion is calculated as the ratio between the minimum dynamic wheel load in the resonant range and the static wheel load.

$$(\downarrow) = \frac{RD}{RS} \times 100\ \%$$

$(\downarrow)$	Road surface adhesion in percent
RD	Minimum dynamic wheel load
RS	Static wheel load (weight)

(↓)	Evaluation	Evaluation display (analog display)
60 – 100 %	Good	Green
40 – 59 %	Adequate	Yellow
20 – 39 %	Critical	Red
0 – 19 %	Inadequate	Red