

Operation Manual

Roller Brake Tester BDE 1004 K / BDE 2004 K

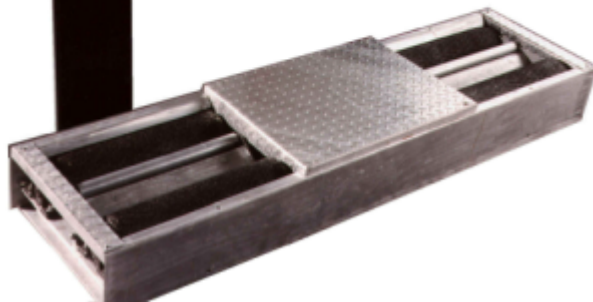
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Operation Manual Roller Brake Tester BDE 1004 K / BDE 2004 K (Ref.-No. 2000 601 919)



BDE 1004 K



BDE 2004 K

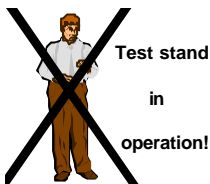


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Operational Safety and Prevention of Accidents

Please, follow the regulations in the Operating Manual to avoid accidents and damage to the equipment.



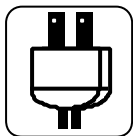
- Please mind that **no one is staying at close range** to the turning rollers during the brake test.

If necessary, put up on the floor railings or colour markings around the test stand or danger signs (CAUTION! BRAKE TEST!) with warning lamps.

The **tester** must remain **inside the vehicle** during the test and make sure that **no one is staying at close range** to the roller set!



- If the Brake Tester is placed at the traffic zone of the workshop or at a place accessible to the public, the test stand must be covered or equipped with railings **if not in use**.

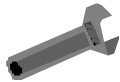


- When not in operation, secure the Brake Tester against any unauthorized usage by locking the main switch.

• Safety Regulations in Operation

- **No** adjustment work with **turning rollers!**
- **No motor start** using the test stand drive!
- **No one is staying at close range** to the turning rollers of vehicles on the roller brake test stand, in particular not with the drive axle, not with engaged gear, not with ignition turned on (**if Diesel engines are concerned, even not without ignition turned on**) as the motor of the vehicle could start without the driver seated in the vehicle when turning on the rollers.
- Use the operating mode „**EMERGENCY OPERATION MODE**“ (key-operated pushbutton) only for the purpose to be able to drive a vehicle off the roller set if the test stand is out of operation.
- Pull off the key for the emergency operation mode from the display cabinet thus securing it against unauthorized use.
- In the "**AUTOMATIC OPERATION MODE**", the rollers start as soon as the vehicle is driven onto the roller set. Hence, it is recommendable always to take the IR transmitter into the vehicle as well in order to be able to switch the test stand off from inside the vehicle in case of emergency.
- Improper handling of the IR transmitter may cause unintentional start of the roller set. Therefore, secure the IR transmitter against unauthorized use if not in operation.

- The Brake Tester may only be operated within the range of power prescribed in the Technical Data Sheet (maximum switch-on time of the nominal power 20%, meaning a 2 minutes´ operating period is followed by an 8 minutes´ rest period) and within the maximum speed stated in the Technical Data Sheet.
- It is important to **slow down speed when driving onto the test stand** thus avoiding unnecessary strain to both the vehicle and the test stand.



- It is important to check the fastening screws of the cover plates on their tightness from time to time for the purpose of avoiding damage to the tyres when driving onto and off the test stand.

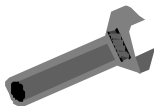
- **Only trained personnel** may gain access to those electrical control devices which cannot be operated from outside, e.g. for exchanging safety fuses.



- Prior to opening the switch cabinet, the system must be disconnected from the electric power supply system.



- Keep dry all parts of the electric system.



- Safety devices of the test stand in particular the initiators and safety rollers **must in regular intervals** be inspected on their correct functioning. Step-in safety devices must be built-in between the testing rollers.

- Check the lamps on the display cabinet in regular intervals on their proper functioning (indication of AUTOMATIC OPERATION MODE).

In case of any failure of the automatic lamps, do not use the test stand until fault is removed. Important! You cannot be certain whether or not the test stand is in the AUTOMATIC OPERATION MODE.

- Test stands mounted above service pits must only be operated if a **pit safety device** is available so that no approach to the rotating cardan shafts and vehicle wheels as well as to the turning rollers of the test stand is possible.

1. Introduction

1.1. Short Information on this Manual




Congratulations on choosing a *CARTEC* Brake Tester manufactured from highly functional material. With the series BDE 1004 or BDE 2004, you have acquired a top grade test equipment

Before leaving our works, each individual test unit has passed through various quality assurance tests to guarantee **perfect functioning of the Brake Tester.**

Should, nevertheless, your *CARTEC* Brake Tester cause unexpected problems, please inform the service station in charge of your area.

This Operating Manual contains all information important for the routine work with your Brake Tester. **CARTEC** products prove themselves by steady further development. However, this could also mean that the Operating Manual is not up to date at any time.

In order to exclude any trouble, please observe the following instructions:

-  **Keep test equipment dry! In particular, protect display cabinet, IR remote control, and printer.**
-  **Avoid excessive solar radiation!**
-  **Connect units to the appropriate power supply system!**

Important:

- **Only authorized personnel is allowed to conduct initial operation and repairs!**
- **Improper handling or sabotage entails the loss of any warranty claim!**
- **Only experts and authorized personnel has to be engaged in electrical work!**
- **Only persons of full legal age are allowed to use and operate the Brake Tester!**

1.2. Abbreviations

Please note the explanation for the following abbreviations used in the *CARTEC* Operating and Instruction Manuals as well as Installation Instructions:

Products:

BDE	= Roller Brake Tester (brake diagnosis unit)
PROFI	= Plate Brake Tester
FWT	= Suspension Tester
SSP	= Side-Slip Tester
SDW	= Steering Geometry Angel Tester
GST	= Joint-Play Detector

General Terms:

VDA	= front axle
HIA	= rear axle
HDB	= hand brake
FSB	= parking brake
BBA	= service brake system
NFZ	= commercial vehicle

1.3. Manufacturer´s Data

Use of Product

CARTEC Brake Testers of the type BDE 1004 or BDE 2004 allow you to perform with ease efficient brake tests for passenger cars and light brries. Applicable for vehicles equipped with one as well as with multi-axle drive. These test stands are particularly designed for the quick diagnosis in workshops.

Simple operation combined with a quick test run makes it possible to perform time-saving and efficient vehicle tests „one after the other“ only after a short training period.

Manufacturer



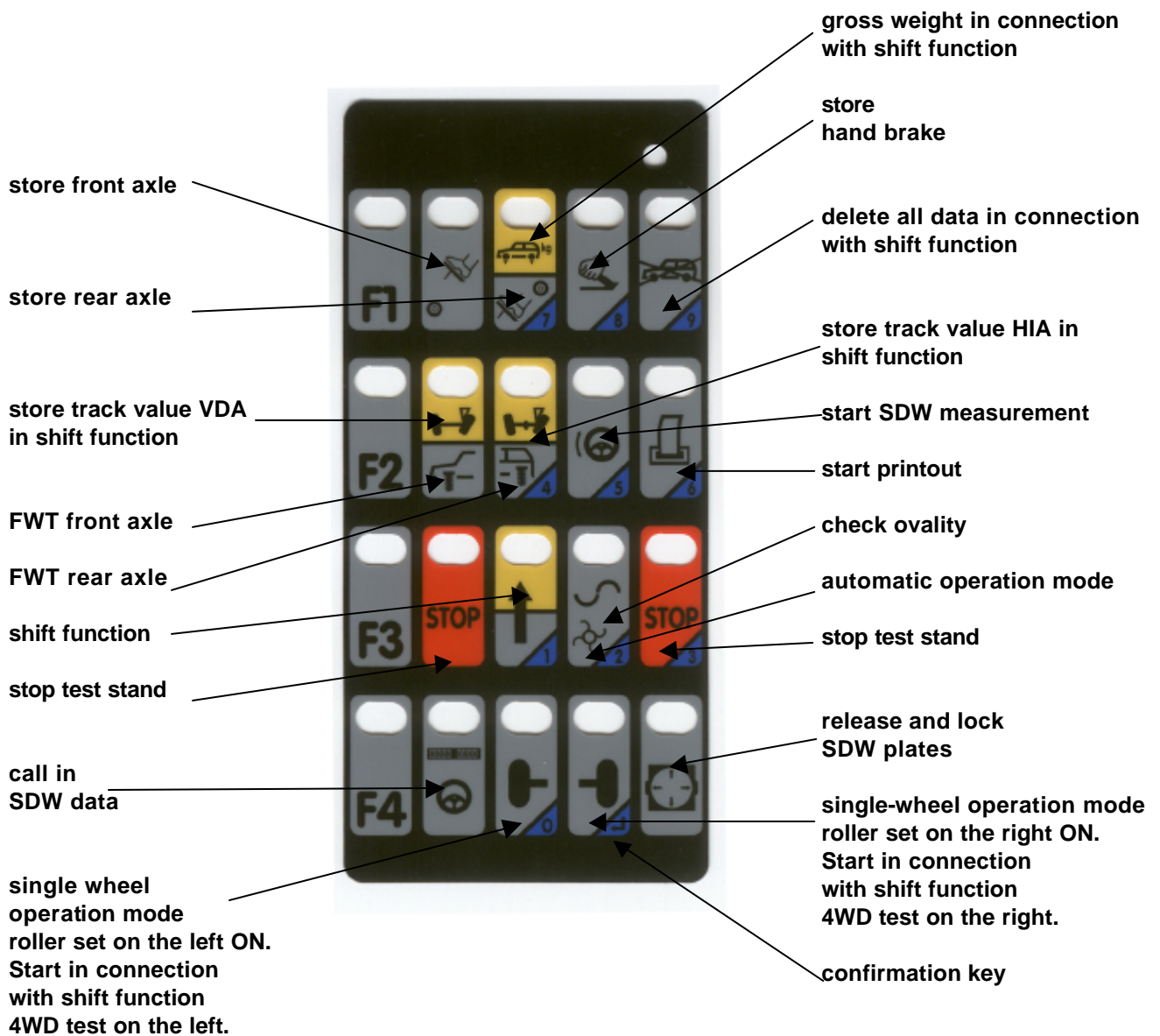
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2. Operating Elements

The BDE 1004 K as well as BDE 2004 K is completely controlled via Infrared Remote Control.

Operating elements of the Infrared Remote Control



3. Test Sequence

Semi-Automatic Operation Mode via IR Remote Control



Before starting a new test sequence, delete the previously received test results using this key combination.



Drive front axle onto the brake tester.



Press this key for starting the roller set. Lamps on the left and on the right are flashing. Wait until lamps cease flashing. Then slowly increase brake pressure. The red lamp keeps on indicating any imbalance between the brake on the left and right.

- lamp is not on if imbalance is < 20%
- lamp flashes if imbalance is > 20%
- lamp lights continuously if imbalance is > 30%

Ovality test requested?



If yes, press this key. The two white lamps are on. Perform the ovality test with approximately 2/3 of the braking power.

Keep brake pressure constant for about 7 seconds. Afterwards, the two lamps go out. Slowly increase brake pressure until one wheel has reached wheel slip or block value.

By means of a white lamp flashing up, it is indicated which wheel has reached wheel slip or block value.



Store obtained brake value by the opposite key, thus allocating, for example, brake values to front axle.

IMPORTANT:

If a driven axle is concerned, motors switch automatically on.



Drive on to test the rear axle.

Ovality Test?



Allocate brake values to rear axle.



Press opposite key.



Roller set starts. Test rear axle same way as front axle.



No it is possible to check parking brake or hand brake respectively.

WARNING:

As far as light lorries are concerned, it may happen that the rear axle does not reach slip or block. In this case, press "STOP" on the infrared remote control.



End of brake test!



Start printout.

4. Weight Input

If the values of the total braking ratio are also requested for printout, enter the vehicle tare weight.

For this purpose, press the following keys within 3 seconds:



Press in turn these two keys on the infrared remote control (all three lamps light up).



Hence, all blue fields on the IR remote control are active. Now enter the weight (lamps flash).

On actuating the blue digit fields each, the left-hand side pointer moves upwards.



Input is being confirmed, lamps do no longer light up.

5. Test Sequence

Automatic Operation Mode via IR Remote Control

Test sequence is the same as described in manual operation mode, but no data storing is possible.



Press opposite key prior to driving the vehicle in the test stand.

In this programme, the roller set switches on again and again as long as a vehicle is on the rollers meaning you have to wait until the lamps cease flashing before going on and testing another axle.



In doing so, the automatic operation mode is out of operation. The equipment switches over to the semi-automatic operation mode.

6. Emergency Operation Mode - Brake Tester

The Brake Tester is equipped with an integrated operation programme under emergency conditions.

That means should one of the safety switches be defective, the roller set can be put in operation by means of a certain key-stroke sequence on the infrared remote control.



Actuate opposite key-stroke sequence and hold last key.



Testing is possible as long as this key is depressed.

Storing the brake values is possible.

WARNING:

The test unit switches on even if no vehicle is on the roller set. Likewise is the slip control out of function.

Caution! Tyre damage!

7. Single Wheel Operation Mode

When testing light lorries, it is often necessary to check the hand brake or parking brake in a single-wheel test. For this purpose, the left and right-hand sides are separately checked.



Running-in onto the roller set.

Depress opposite key.

The roller set on the left operates as long as the test is wished to go on. Slip function is active.



Depress opposite key.

Same function as left-hand side.

After testing the two wheels, store each axle via the infrared remote control.

8. Fourwheel Drive Test

Test on the left: Actuate shift function and press single wheel on the left within 3 seconds.

Test on the right: Actuate shift function and press single wheel on the right within 3 seconds.



Running-in onto the roller set.

Depress opposite key.

The roller set on the left operates as long as the test is wished to go on. Slip function is active.



Depress opposite key.

Same function as left-hand side.

After testing the two wheels, store each axle via the infrared remote control.

9. Delete Function



Delete all obtained data by depressing these two keys.



In order to exclude malfunction tests, it is important to delete the memory prior to each new test sequence, i. e. testing another vehicle.

10. Function Keys on Switch Cabinet

Operation without infrared remote control

- **Key „LEFT ON“ for versions without IR remote control:**
Serves for testing the left-hand side in single wheel operation mode. Control switch need not be kept depressed!
- **Key „RIGHT ON“ for versions without IR remote control:**
Serves for testing the right-hand side in single wheel operation mode. Control switch need not be kept depressed!
- **Key „AUTOMATIC“:**
This key allows to switch to the AUTOMATIC OPERATION MODE provided no vehicle is on the brake tester.
- **Key „STOP“:**
Depress this key to switch off the drive rollers at any time during the brake test. If the automatic test mode of the equipment is actuated, its deletion is possible via the "STOP" key.
- **Key „SEMI AUTOMATIC“:**
Keep this key depressed in order to run the test unit in the EMERGENCY OPERATION MODE. Releasing the key effects the switch-off of the Brake Tester.

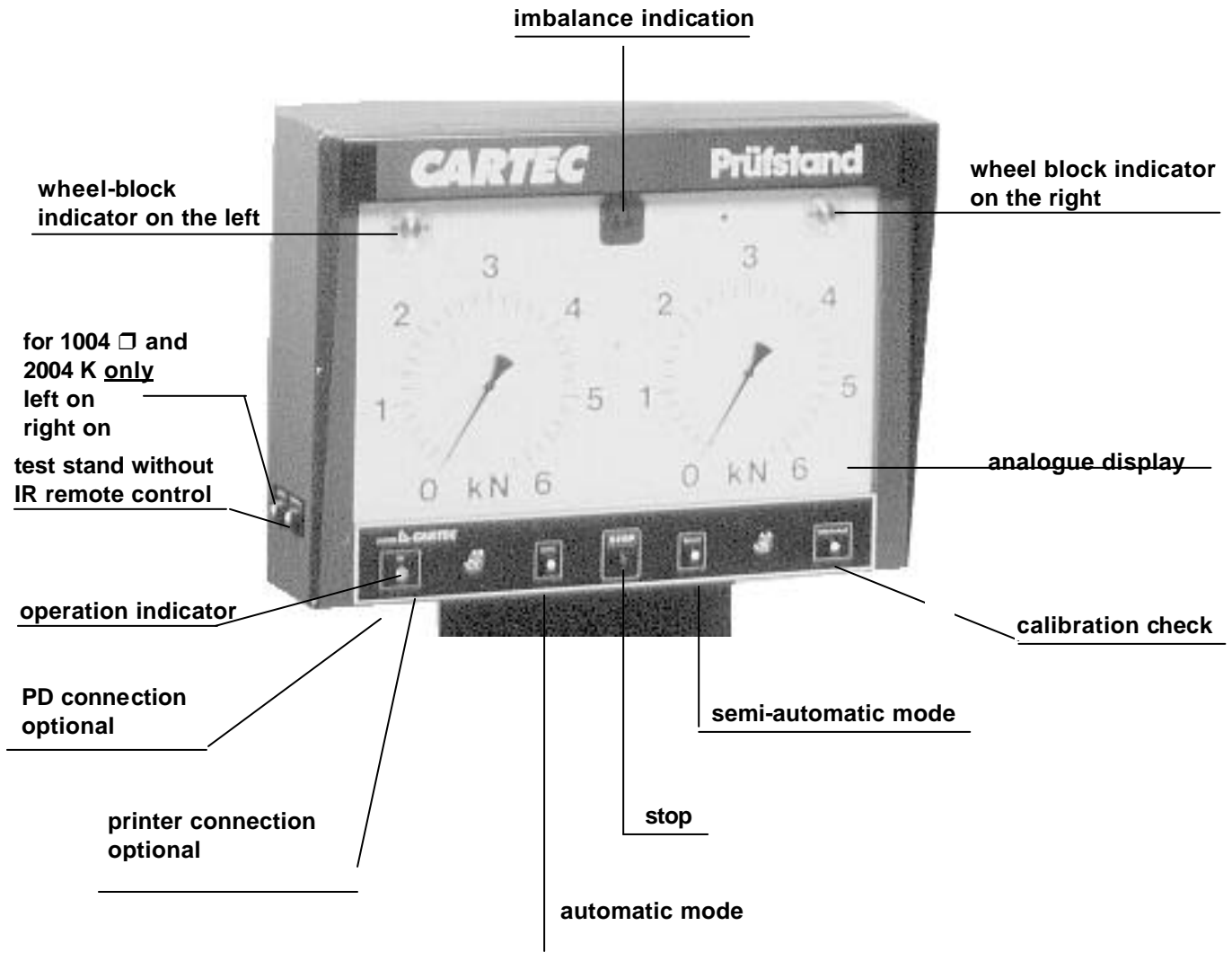
WARNING:

By this function, the test stand starts operating even if no vehicle is on the test stand. Moreover, the drive rollers do not switch off in case of wheel block.

- **Key „CALIBRATION CHECK“:**
If the two drive rollers are in operation, the calibration data of the measuring amplifier, moving to end of scale, is indicated by the pointers.

11. Description of Display Cabinet

Switch Cabinet BDE 1004 K and BDE 2004 K



12. Service Routine

The function of the service routine includes the control of all force transducers and sensors.

Sequence:

- Switch off the brake tester by actuating the main switch.
- Re-start the unit after a few seconds.
- As soon as all lamps are flashing, press key "STOP" on the display cabinet. Keep "STOP" key depressed until only the lamp on the right flashes.
- The lamp on the right shows the first step of the test sequence.

Lamp on the right flashes:

Control of the signal cable on the left and on the right: pointer indication: 200 - 400N.



OPTION:

If available, the opposite key must be actuated for calibrating the track. Now move the track plate to the left or to the right by 5mm and keep hold of it.

Press any key on the IR remote control to have the track correcting factor calculated by the electronic system. After this, track plate calibration is completed. Release track plate.

The track plate must only be calibrated on the following conditions:

- on initial installation
- on exchanging the COSBC
- on exchanging the track plate and the track potentiometer respectively



Actuate „STOP" key on the switch cabinet or any key on the infrared remote control apart from the opposite key!

You are now in the next step of the test sequence.

Lamp on the left flashes:

- Check of the RPM sensors:
Slowly move safety roller on the left and right roller set. Display changes from 200 - 400N to 2800 - 3800N.
- Press "STOP" on the switch cabinet or any key on the infrared remote control.
Now you are in the next step of the test sequence.

Lamps on the left and on the right flash:

- Check of the auto start switches:
display 200-400N, press left or right-hand side safety roller; the corresponding display moves to 2800 - 3800N.
Press "STOP" on the switch cabinet or any key on the infrared remote control.
Now you are in the next step of the test sequence.

Red lamp flashes:

- Pedal force
If a pedal pressure transducer is connected, the left pointer indicates its measured data: 200 - 600N.
Press "STOP" on the switch cabinet or any key on the infrared remote control.
Now you are in the next step of the test sequence.

No flashing lamp:

- Check of the signal cable on the left and on the right:
display 200 - 400N.
Press "STOP" on the switch cabinet or any key on the infrared remote control.
Now you are in the next step of the test sequence.



Press the opposite key on the IR remote control.

Now you are in the clock adjustment routine.

As soon as all three lamps flash, you can correct time, date and year.

The printer issues the message „set clock“ as well as time and date.



If no change in time or date is necessary, simply confirm data by this key.

If any change is required, use the keys, backed in blue, 0 to 9 to enter in turn time, date and year.



Zeroes must also be entered as shown on the next page.

To delete incorrect entries, press the opposite key.














This key confirms the entire input. The subsequent print-out shows the actualized time, date and year.

Now you are again in the initial position of the service routine. To quit the service routine switch the brake tester off via the main switch. Restart the unit after about five seconds.














Example for an input:

Please put in: "13 hours 14 minutes on 28.11.90"

key	printout
	1
	13
	131
	1314
	13142
	131428
	1314281
	13142811
	131428119
	1314281190
	13:14 28.11.90

Example for input with correction:

Please enter: "13 hours 14 minutes on 28.11.90"

key	printout
	1
	13
	131
	1315 (incorrect input)
	erase
	131
	1314
	13142
	131428
	1314281
	13142811
	131428119
	1314281190
	13:14 28.11.90

13. Description of the Test Protocols

The brake tester printout includes the following parts:

13.1 Printout heading

The **printout heading** allows the manual input of information such as complete address of the test station and diverse customer-specific data.

13.2 Brake diagnosis

In the subsequent part of brake diagnosis, all measured values recorded by the brake tester are put out.

13.3 Brake evaluation with government standards

First, a printout is made over each individual axle bloc showing the data placed below each axle, namely:

- BBA-VDA = service brake system of front axle
- BBA-HIA = service brake system of rear axle
- FBA = parking brake

Next follows the division of pages for each axle bloc. In the following lines, the printout on the left-hand side margin shows which measured values this particular line contains.

These are:

1) Rolling resistance:

The force measured during the starting sequence before applying the brakes.

2) Maximum braking forces:

These two values are separately supplied to the left and right-hand side.

Subsequently follow:

3) Imbalance on blocking the wheel:

Imbalance of the max. braking forces between left and right-hand sides, whereas the higher value of the two braking forces is equal to 100%. This value is additionally compared with the government standards and, if necessary, with the appropriate error message printed out.

4) Maximum imbalance:

The maximum imbalance of the braking forces between left and right-hand sides found during the entire test sequence.

These two values are only taken into consideration if a minimum braking force of about 300 N has been registered.

5) Minimum ovality data:

The minimum braking force found during an ovality measurement.

6) Maximum ovality data:

The maximum braking force found during an ovality measurement.

7) Ovality in %:

Also here is the additional printout of an error message possible.

The following data is not determined or printed out for the left and right-hand sides:

8) Maximum pedal pressure force:

The max. pedal force obtained during the brake test provided a pedal pressure transducer has been connected.

9) Pedal force amplification:

Condition is that a pedal pressure transducer has been connected.

Value x pedal force = braking force in N per axle

10) Track values in mm/m:

Is only printed out if the mechanic system of a side-slip tester is connected.

11) Total braking ratio of the service brakes:

The braking ratio is calculated by the sum of the brake forces of the front and rear axle divided by the tare weight. Error message is additionally possible.

12) Total braking ratio of the parking brake:

The braking ratio is calculated by the sum of parking (hand) brake forces divided by the tare weight. Error messages is additionally possible.

The positions 3, 7, 8, 11 and 12 allow to print out additional error messages if this data was determined but is non-conform with the government standards listed in the brake evaluation.

14. Listing Printout



Actuate the opposite key-stroke sequence.

WARNING:

All listing data is stored with reference to the pedal forces, therefore, no printout of listing data is possible if operation has been made without the pedal pressure transducer connected!

Depending on the storing sequence, the axle number is printed first. This means, the first stored axle is printed first.

Next follow the listing data:

- a) pedal force value in 10N
- b) left-hand side braking forces in N
- c) right-hand side braking forces in N
- d) axle deceleration in %

As each line can only hold a maximum of 20 values for printout, the positions a) to d) recur as long as data is available

This applies to each axle.

15. Side-Slip Test via the Test Plate

In this case, a combined indicator or display is required.

Drive straight and without turning the steering wheel over the side-slip test plate. With the front axle run onto the brake tester. The track value is taken, shown by the left-hand side step motor and attributed to the corresponding axle. To ensure correct attribution of the track value to the correct axle, the brake test must also be carried out with the front axle.

Proceed in the same way when testing the rear axle.

The printout shows the track test value with one place after the decimal point.

16. Pedal Pressure Transducer (PD) Operation

It is possible to connect a pedal pressure transducer without constructional changes to each type of display cabinet in retrospect.

Test sequence:

- Drive the vehicle onto the brake tester.
- Connect the pedal force transducer cable to the display cabinet.
- Lead the cable with the pedal force transducer through the side window in the interior of the vehicle.
- Fix the pedal pressure transducer with the brake pedal or with your foot by means of adhesive tape.
- Start brake test.
- Now compare the application force of the brake pedal with the braking power achieved in this way on the list printout.

17. Error Message

17.1 Signal cable fault

If the electronic system recognizes a fault in one of the signal cables for braking force, auto start switch, RPM sensors or weighing units (if integrated), an error code will be printed out.

If one of the signal cables for braking force or weighing unit is disconnected, try first to compensate a possible drop of the zero point by reading anew the zero point. If, as a result, the fault still exists, the error message will automatically be printed out.

Concerning all other signal cables, the printout will only be started on pressing the key „AUTOMATIC“ on the infrared remote control or the key on the display cabinet.

The following messages may be printed out:

„PLEASE INFORM YOUR SERVICE TEAM! THANK YOU!

„LEFT-HAND SIDE AUTO START SWITCH IS IN DOWN POSITION!“;

„RIGHT-HAND SIDE AUTO START SWITCH IS IN DOWN POSITION!“;

„AUTO RESTART OUT OF FUNCTION!“;

„LEFT-HAND SIDE SIGNAL CABLE DEFECTIVE!“;

„RIGHT-HAND SIDE SIGNAL CABLE DEFECTIVE!“;

„LEFT-HAND SIDE AUTO START SWITCH DEFECTIVE!“

„RIGHT-HAND SIDE AUTO START SWITCH DEFECTIVE!“

„LEFT-HAND SIDE RPM SENSOR DEFECTIVE!“;

„RIGHT-HAND SIDE RPM SENSOR DEFECTIVE!“

17.2 Positioning fault of the safety rollers

As another error message the following printout is possible:

„AUTO RESTART OUT OF FUNCTION“

This message appears if:

- at least one of the safety rollers is depressed after the brake tester has been switched on. This can be caused through either a broken spring or a vehicle positioned in the roller set.
- the safety rollers are in unequal position for about 10 seconds, i.e., one roller is in down position and the other one in up position. In this case, the automatic operation mode would also be cancelled.

WARNING:

Regardless of the existing fault, one of the mentioned error messages is always printed out upon each starting command; otherwise the starting command is ignored, i.e., brake testing is no longer possible in this mode, only via the EMERGENCY OPERATION MODE!

18. Technical Data Sheet

18.1. BDE 1004 K

General		
max. test weight / axle	(t)	3
roller coefficient dry / wet		0.9 – 0.7
temperature range without add. heating	(°C)	from 10 to +70
Display Cabinet		
height x width x depth	(mm)	600 x 800 x 200
weight	(kg)	35
measuring range	(kN)	0 – 6
scale diameter	(mm)	230
finish paint	(RAL)	3000
pointer length	(mm)	104
dimension of figures	(mm)	27
Electronics System		
principle of measurement		WSG/wire strain gauge
processing of measured values		microprocessor
Power Supply System		
supply system	(V)	3 x 400
frequency	(Hz)	50
slow-blowing fuse rating	(A)	3 x 25
motor power	(kW)	2 x 3.7
supply lead	(mm ²)	5 x 4.0
Mechanics System		
min. / max. test width	(mm)	820 / 2050
test speed of brake rollers	(km/h)	4.5
length x width x height	(mm)	2200 x 570 x 225
weight	(kg)	300
roller diameter	(mm)	165
roller length	(mm)	600
roller displaced in height	(mm)	20

18.2. BDE 2004 K

General		
max. test weight / axle	(t)	3
roller coefficient dry / wet		0.9 – 0.7
temperature range without add. heating	(°C)	from 10 to +70
Display Cabinet		
height x width x depth	(mm)	600 x 800 x 200
weight	(kg)	35
measuring range	(kN)	0 – 6 / 0 - 7
scale diameter	(mm)	230
finish paint	(RAL)	3000
pointer length	(mm)	104
dimension of figures	(mm)	27
Electronics System		
principle of measurement		WSG/wire strain gauge
processing of measured values		microprocessor
Power Supply System		
power supply system	(V)	3 x 400
frequency	(Hz)	50
slow-blowing fuse rating	(A)	3 x 25
motor power	(kW)	2 x 3.7
supply lead	(mm ²)	5 x 4.0
Mechanics System		
min. / max. test width	(mm)	800 / 2200
test speed of brake rollers	(km/h)	5.2
length x width x height	(mm)	2340 x 700 x 250
weight	(kg)	370
roller diameter	(mm)	204
roller length	(mm)	700
roller displaced in height	(mm)	25

19. Calculation Formula

Calculation of imbalance values:

$$\frac{(\text{maximum value} - \text{minimum value})}{\text{maximum value}} * 100$$

Calculation of ovality:

$$\frac{(\text{maximum} - \text{minimum})}{\text{maximum}} * 100$$

Calculation of axle retardation:

$$\frac{(\text{max. left braking force} + \text{max. right braking force}) * 100}{\text{axle weight} * 9.81}$$

Calculation of total service brake retardation:

$$\frac{(\text{sum of the max. braking forces of all front axles} + \text{sum of the max. braking forces of all rear axles}) * 100}{\text{test weight} * 9.81}$$

Calculation of total parking brake retardation:

$$\frac{(\text{sum of the max. braking forces of all parking brakes}) * 100}{\text{test weight} * 9.81}$$

Calculation of pedal force amplification:

$$\frac{(\text{max. left braking force} + \text{max. right braking force})}{\text{pedal force}}$$