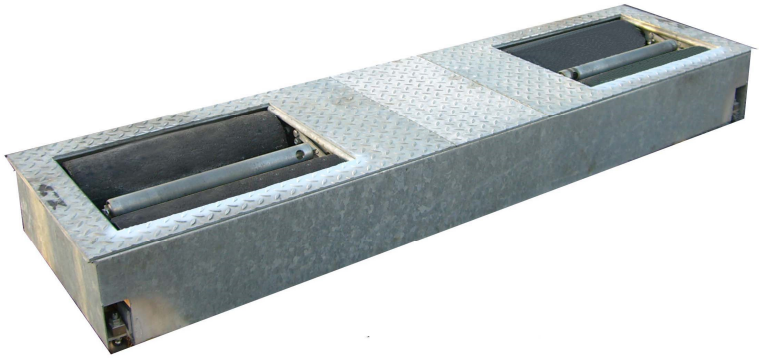
BM TEST EQUIPMENT
www.bmtest.dk

BM4010 Brake tester for Class I, II, III and IV
&
BM9010 Brake tester for Class III, IV, VII and VL



USER MANUAL
MA0206

12-2013 Eprom: 8.00.50 FC: 2.10.68 PDA: 2.6 Manual Version 1.5

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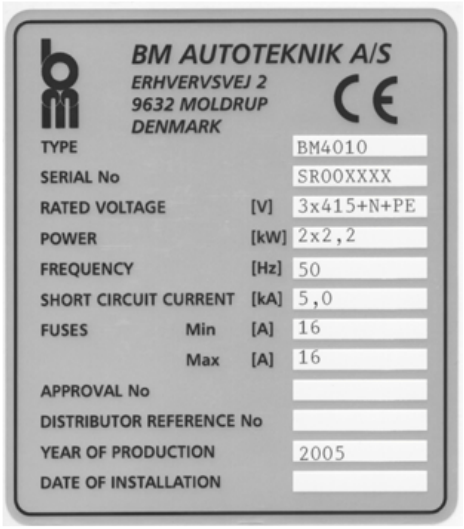
1. General

The BM4010 and BM9010 brake testers are advanced microprocessor based brake testers for test of light vehicles. The brake tester BM4010 is designed for test of IV and BM9010 is designed for test of IV, VII and VL.
The brake tester is marked with following machine label, which shows electrical requirement:



The brake tester is operational within environmental temperature-range from –10 °C to + 50 °C.

The brake testers consist of a rollerset and a display. The roller set consist of an integral motorised gearbox, two main rollers and a spring loaded sensor roller, all placed in a galvanised steel frame.

The main rollers are supplied either with a synthetic coating made of an epoxy/bauxite compound, stretch metal or with a ripped steel cover. The main rollers are connected to the motorised gearboxes by a chain. The brake force is transmitted through the chains and the motorised gearboxes to the brake force transducers.

1.1 Slip system

The brake testers are equipped with a speed sensing system that enables control of wheel lock.

During a brake application, the brake tester determines continuously the slip between wheel and main roller. If the slip value exceeds a reference value the computer automatically stops the gearmotor. The reference value is set during manufacture; slip is defined in range between 20 – 30 %.

1.2 Physical Display

The display is made of aluminum and contains a gauge with a brake force scale from 0 to 620 kgf

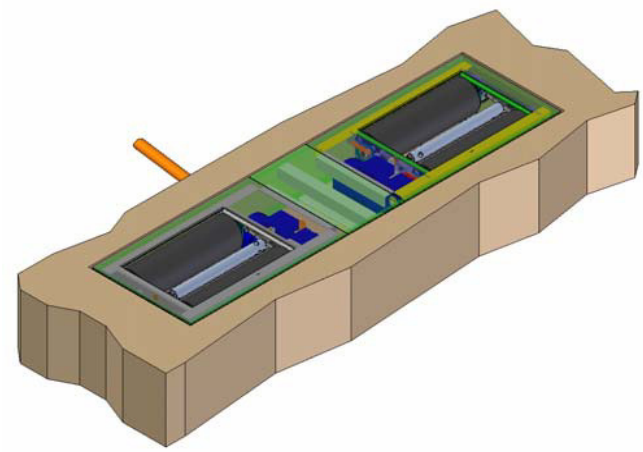
The ARROWS in the digital windows shows when rollers are running, and if one or both wheels have locked. The DOTS in the digital windows shows if brake tester is in manual or automatic mode.

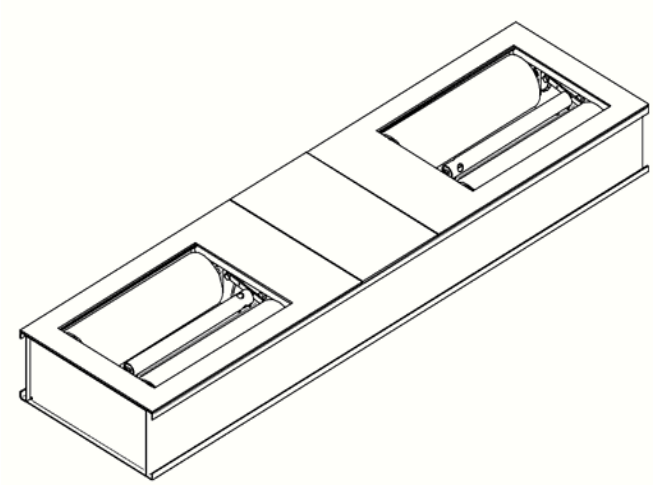
The 2-digit display shows the brake force imbalance between left and right wheel.

On BM9010, the display has a double scale. The outer scale becomes automatically active when brake forces exceed 750 kgf. A lamp between the two gauges illuminates when the high range outer scale is active.

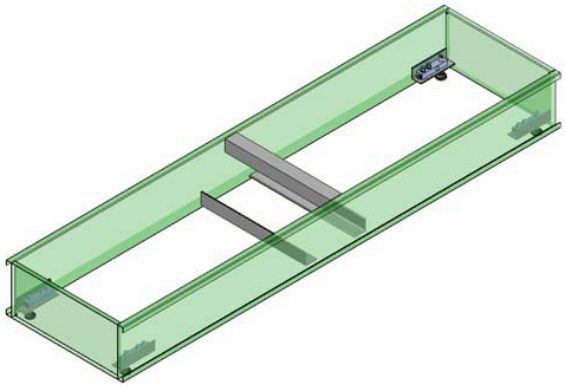
1.3 The BM4010 roller bed.

The roller bed of BM4010 is principally a split bed unit that can be supplied both as a split bed installation or as a single unit installation depending how the roller bed is set up in its subframe.

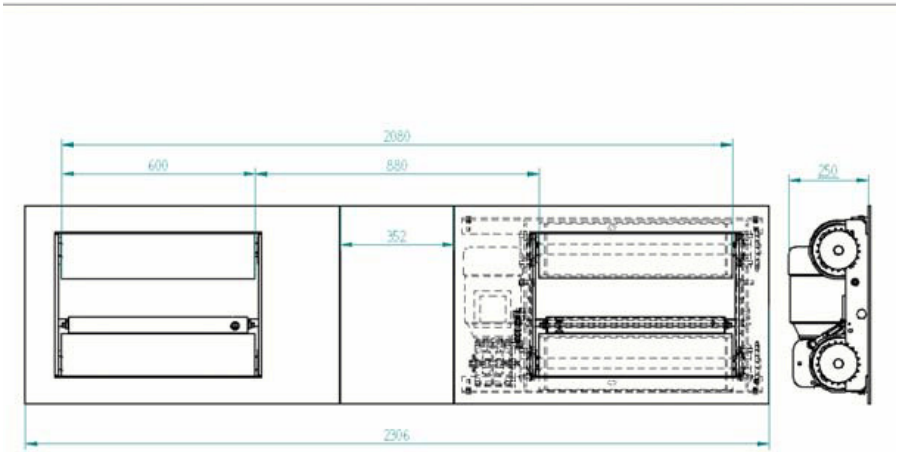




When supplied with automatic weight, a special weight transducer frame is required.



BM4010 Description	Dimension
Single unit Rollerbed Lx W x H	975 x 615 x 250 mm
Hole for single bed installation - Rollerbed Lx W x H	2270 x 565 x 250 mm
Hole for split bed installation – L x W x H * 2	940 x 565 x 250 mm
Automatic weight frame L x W x H	2306 x 615 x 260 mm
Hole for Automatic weight frame L x W x H	2230 x 635 x 270 mm
Roller diameter and length	182 mm, 600 mm
Wheel span	860 to 2100 mm
Distance between roller centers	354 mm
Maximum test axle weight	3.000 kg
Gearmotor size	2.2 kW
Max brake force measurement	0 – 620 kgf
Test speed	2,5 km/h
Display L x W x H	735 x 500 x 140 mm
Display brake force scale	0 – 620 kgf



1.4 The BM9010 roller bed.

The BM9010 rollerbed is a split bed unit:

BM9010 Description	Dimension
Split bed installation - single unit Rollerbed Lx W x H	652 x 1200 x 455 mm
Split bed installation -single unit Subframe L x W x H	790 x 1280 x 495 mm
Roller diameter and length	208 mm; 1000 mm
Wheel span (adjustable)	850 to 2850 mm
Distance between roller centers	400 mm
Maximum test axle weight	5.000 kg
Maximum drive over axle	5.500 kg
Gearmotor size	5.5 kW
Max brake force measurement	0 – 2.200 kgf
Test speed	2,0 km/h
Display L x W x H	735 x 500 x 140 mm
Display brake force scale	0 – 620 kgf / 0 – 1500 kgf

1.5 The PC and Windows program.

Please contact your local supplier for information on PC unit.

The windows program allows for a complete registration of vehicle and customer details, a guided brake test procedure according to DVSA requirement, saving and load of previously completed tests, preview and print of test results.

1.6 The Infra Red and Cable remote control.

The remote control units are illustrated below.
The BM4010 and BM9010 can be supplied with two types of remote control unit:

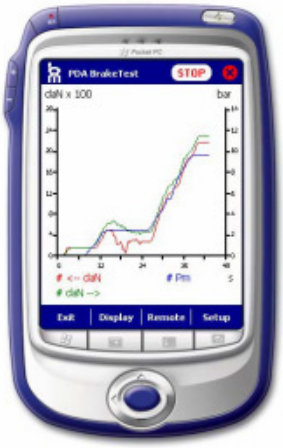
• Infra Red remote control with an operation distance of 15-20 meters, depending on the operation conditions.
DO NOT increase pressure on keys to increase range - it will only brake the key path! Instead make sure that remote control can transmit to the display without physical obstruction.

• Basic Cable remote control with a maximum operation range of 30 meters.

1.7 The PDA unit

Please contact your local supplier for information on PDA unit.

The PDA unit communicate with the PC program via WLAN. The PDA can be used as remote control and provides a virtual display:



As seen from the illustrations above, the PDA unit additionally offers the User the same guided brake test procedure as the PC program.

1.8 System configuration

The BM4010 can be supplied in following variations:

- BM4010 with PC and IR remote control. The PC is installed near the roller bed, so the operator can see the monitor of the PC. Inside the PC cabinet is the control system and IR receiver unit. The PC monitor will provide operator with the guided brake test procedure.

- BM4010 with physical display, PC and PDA. The PC is installed in the office and the physical display near the roller bed. The PDA is used as the remote control, and via WLAN communication with the PC, the guided test procedure is provided to operator on the PDA unit.

- BM4010 with PC and PDA. The PC is installed in the office .The PDA is used as the remote control and display. Via WLAN communication with PC, the guided test procedure is provided to the operator on the PDA unit.

The BM4010 can operate in manual, automatic and guided mode.

In manual mode, the operator controls the brake test procedure using the remote control.

In automatic mode, the brake tester starts 2 seconds after an axle entered the rollerbed, with an axle in the rollerbed the rollers automatically restart 4 seconds each time the rollers are stopped. The restart time period is configurable.

In guided mode, the PC or PDA guides the operator through the brake test. The operator uses the remote control (IR or PDA) to control roller starts, when prompted by the guide. Data is saved by using the remote control, allowing the operator to have the option of retesting the axle before saving the brake test data.

The brake tester can be supplied with options for test of 4x4 driven vehicles and also for bi-directional testing.

2. General test procedures.

This chapter is general introduction to the use of BM4010 and BM9010. For vehicle testing according to DVSA guide lines please refer to next chapter.

2.1 Introduction.

The general brake test procedure is:

- Test first axle and press the **SERVICE BRAKE** registration key
- Test parking brake and press the **PARKING BRAKE** registration key
- Test second axle and press the **SERVICE BRAKE** registration key

If the test of an axle has not been completed to the operator's satisfaction, then the operator can just start the rollers again (before he has pressed **SERVICE BRAKE** or **PARKING BRAKE** registration keys). Only when he is satisfied with the test he presses the **SERVICE BRAKE** or **PARKING BRAKE** registration keys, the data is then recorded by the brake tester computer, (once a registration key is pressed the data for that axle is 'locked' an cannot be amended or retested).

The following describes the general use of the BMX010 brake tester in the 3 modes:

- Guided mode
- Manual mode
- Automatic mode

In some cases where vehicle is very light, vehicle brakes are insufficient and/or floor surface has a low friction coefficient, the vehicle can jump backward when being tested up to maximum brake forces, also when the test for imbalance and fluctuation is conducted. DVSA recommend the use of wheel-chocks to maintain vehicle in the roller bed in such cases. BM recommends strongly, that brake application is done very slowly and in a controlled manner,

2.2 Guided.

From the PDA unit, Infra Red remote control unit or the PC, you can choose guided mode.
On the PC select the vehicle class, press next and enter the vehicle details.
The vehicle will now appear on the queuing list both on PC and PDA unit.

When the operator selects a vehicle from this list on either the PDA or PC, the system automatically switches into Guided mode.
The operator can now follow the instructions on either the PC screen or PDA unit.

In guided mode the operator needs to just follow the on screen prompts to carry out (brake, release, etc.) as well as action the test results (save test, re-start brake tester etc).
If the brake tester is in full automatic mode, it will automatically start and stop the rollers, and save test results, a remote control is not required to conduct the test.
In fully automatic mode the test results are saved automatically, so there is no opportunity to retest individual axles.

To switch between Manual-mode and Auto-mode press the

The BM guided system is designed with the objective of minimising operator errors including his choice of command buttons on the remote control system.

2.3 Manual mode.

The brake test is conducted in the following way:

1. Enter axle number 1 (front axle) into the rollerbed
2. Press the **START** key.
3. Wait approximately 2 seconds while the difference-display flashes indicating that the roller-resistance is being measured.
4. In order to measure fluctuation, increase the brake force up to the value (100kgf) where the ovality is to be measured. Keep the pedal pressure steady approximately 5 seconds. The difference-display flashes once the fluctuation of the brakes has been measured.
5. Increase brake force until a slip condition occurs. If this is not possible then press the **STOP** key at highest obtainable brake force.
6. Press the **SERVICE** registration key to save the test data for the axle.
7. If there is a parking brake on this axle, then press the **START** key; apply the parking brake until lock/stop and press the **PARKING** key.
8. Enter the next axle into the rollerbed If it is a drive axle that has to be removed from the rollerbed then it can assist in getting out of the rollers if you start the brake tester before driving out of the rollerbed.

   Note that BM4010 has an integrated resistance, which helps when driving out of roller bed without starting the rollers.
9. Repeat position 1-10 on next axle.
10. Press **TOTAL** when all axles are tested.
11. Remove the vehicle from the rollerbed.

2.4 Single sided test.

In some cases in can be necessary to test the vehicle one wheel at a time. This often happens when testing the parking brake, since the vehicle often has a tendency to jump out of the rollerset during testing.

Following describes how to do the test of an axle side by side.

1. Start left side by pressing **LEFT START** key.
2. Wait approximately 2 seconds until the difference-display flashes indicating that the roller-resistance has been measured.
3. In order to measure fluctuation, increase the brake force up to the value (100kgf) where the ovality is to be measured. Keep the pedal pressure steady approximately 5 seconds. The difference-display flashes once the fluctuation of the brakes has been measured.
4. Increase brake force until a slip condition occurs. If this is not possible then press the **STOP** key at highest obtainable brake force.
5. Press the **SERVICE** (or **PARKING**) key, which results in storing/printing of the test data for the left side.
6. Start right side by pressing **RIGHT START** key.
7. Repeat position 2-7 for the right side.
8. Press **SERVICE** (or **PARKING**) key.

2.5 Test with reverse rotation of the rollers.

"REVERSE direction of main rollers is only possible in MANUAL and GUIDED mode"

This facility is normally used for testing 4-wheel drive vehicles. Note that during test only one side will reverse.

1. Enter axle number 1 (front axle) into the rollerbed.
2. Press the **START LEFT REVERSE** key to make the left side run in reverse direction. Pressing the **START LEFT REVERSE** key will cause the left side to run in reverse direction and the right side to run in normal direction and therefore right hand side is tested.
3. Wait approximately 2 seconds until the difference-display flashes indicating that the roller-resistance has been measured.

4. In order to measure fluctuation, increase the brake force up to the value (100kgf) where the ovality is to be measured. Keep the pedal pressure steady approximately 5 seconds. The difference-display flashes once the fluctuation of the brakes has been measured

5. Increase brake force until a slip condition occurs. If this is not possible then press the **STOP** key at highest obtainable brake force.

6. Press the **SERVICE** (or **PARKING**) key which results in storing/printing of the test data for the right side.

7. Press the **START RIGHT REVERSE** key to make the right side run in reverse direction. Pressing the Right key will cause the right side to run in reverse direction and the left side to run in normal direction and therefore left hand side is tested.

8. Repeat position 5-8.

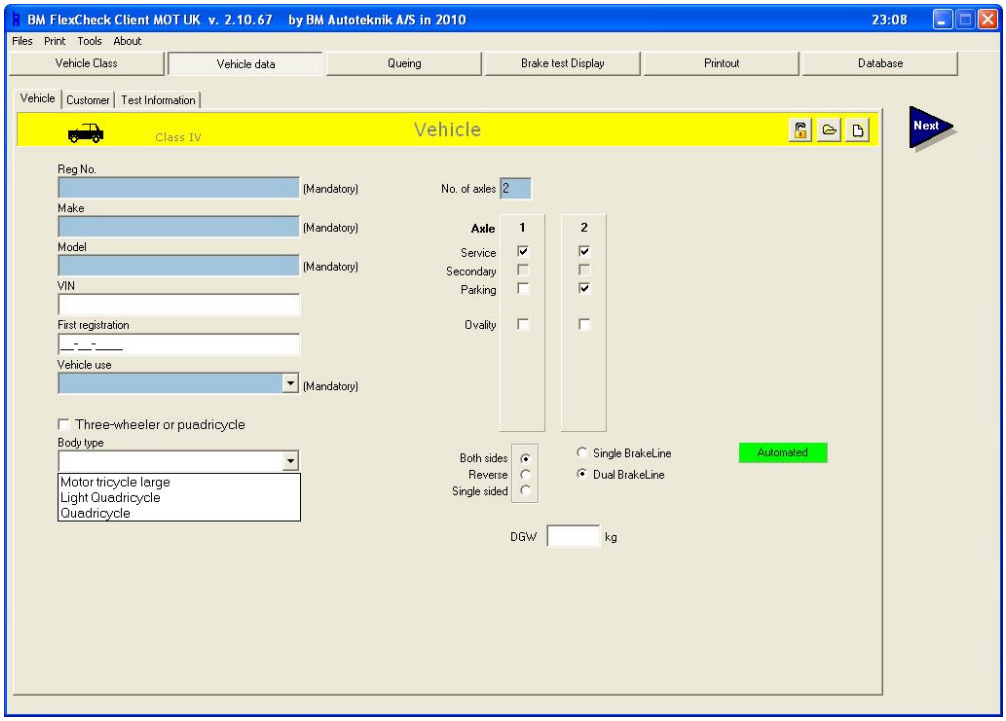
9. Repeat position 4-10 for the parking brake.

10. Repeat position 4-11 for next axle.

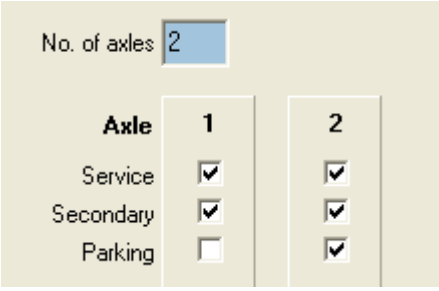
11. Press **TOTAL** when all axles are tested.

2.6 Motor Tricycles and Quadricycles

These vehicles are tested in either ClassIII or ClassIV depending on their specification.
Prior to testing research the vehicle specification and select the appropriate vehicle class, in the vehicle set up screen select the “Three-wheeler or Quadricycle” checkbox, there will now be some extra selections available according to the vehicle weight and engine size.



Vehicles having two service brake systems each with a separate means of operation: The “Secondary” checkbox should be checked for each axle. “Secondary” can only be selected if the “Three-wheeler or Quadricycle” option is selected.

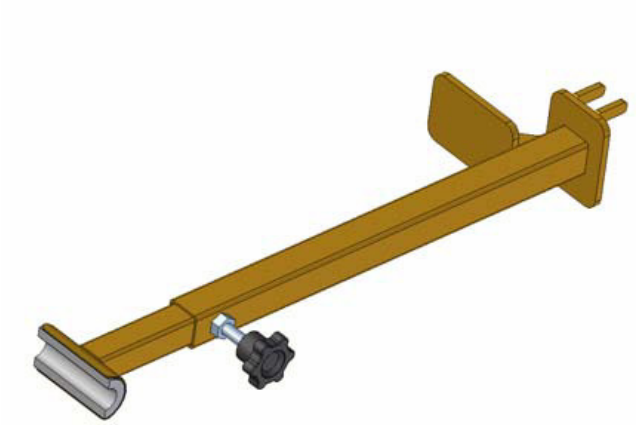


Once set up, select the vehicle and follow the guided instructions on the PDA or PC screen.

2.7 Using the BM01 Brake pedal applicator.

The BM4010 and BM9010 brake tester are supplied with a BM01 Brake pedal applicator, when brake testers are used for ATL. The BM01 shall be used when testing the vehicle for play, using a play detector

The BM01 should not be used when testing the brake performance on a brake tester.



2.7.1 Placing the BM01

1. Release the finger bolt on the side of the BM01 and decrease the length of the unit to minimum.
2. Place the BM01 on the brake pedal.
3. Place your foot on the platform and press the pedal to maximum position and hold pressure.
4. Place the other end to the steering wheel of the vehicle by adjusting the length of the unit.
5. Fix the position by tighten the finger bolt.

2.7.2 Removing the BM01

1. Place your foot on the platform and hold maximum pressure.
2. Release the fingerbolt on the side of the BM01 and reduce the length of unit to minimum.
3. Take your foot away and remove BM01.

3. UK MOT testing procedures

3.1 MOT test procedure.

The MOT test procedure, data evaluation and printout follow the specification issued by DVSA.

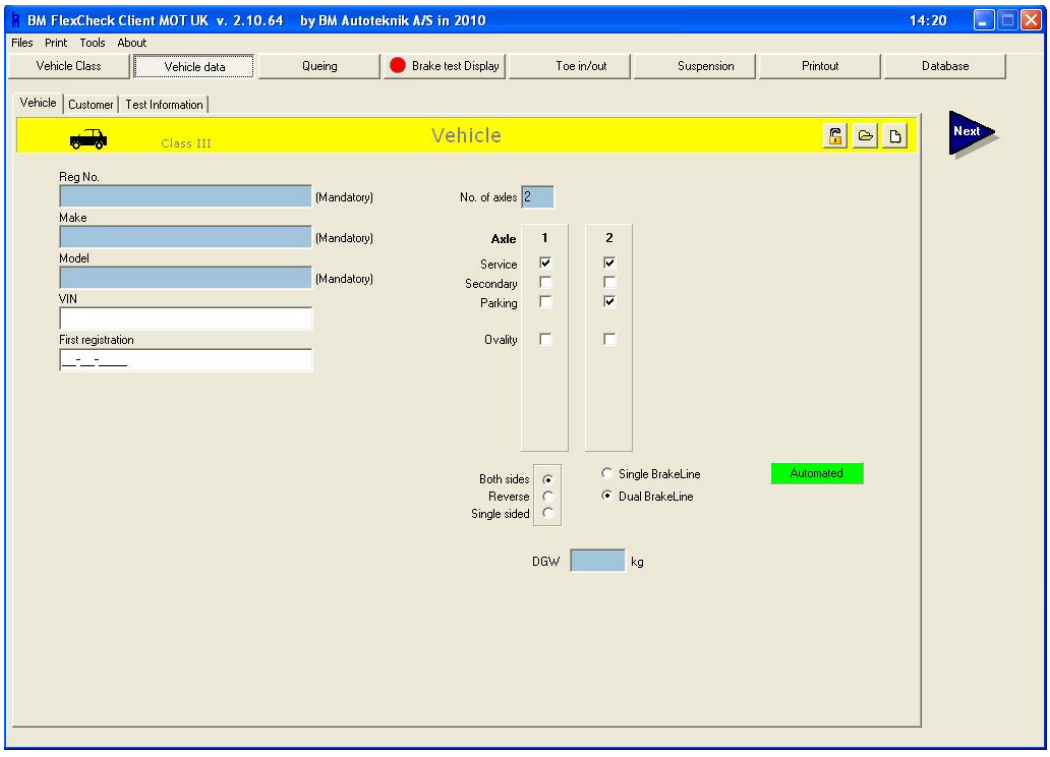
3.2 MOT ATL test procedure.

The test procedure is designed as a guided application, where the operator is prompted from the PC windows program or from the PDA unit.

In order to perform a MOT test the brake tester must:

- Be operated in Guided mode (or fully automatic mode)
- Vehicle particulars registration is done in the PC program prior to commencing the brake test.

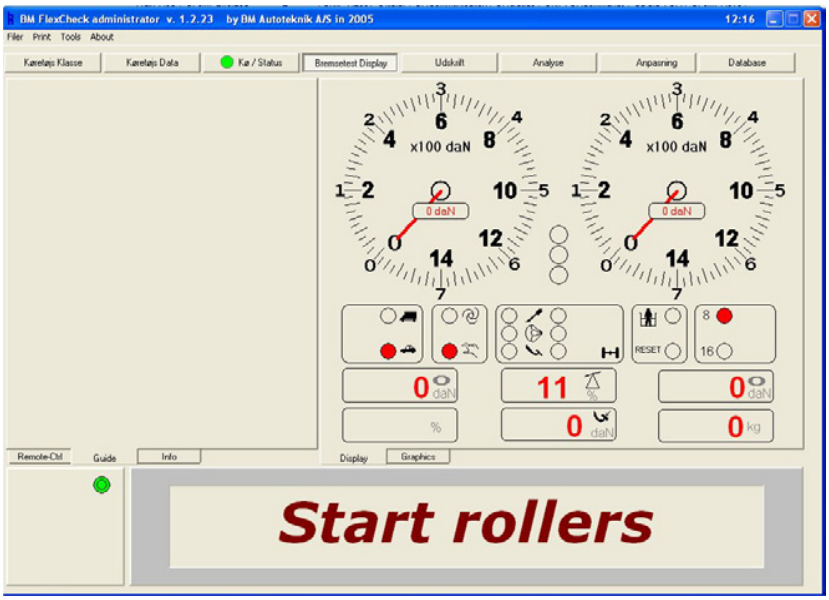
1. Select vehicle class, and then enter the vehicles data on the PC.
   If the vehicle has previously been tested on the braketester, the vehicle details will automatically be filled out once the vehicles registration number is entered, If you wish to edit the automatically registered details press the lock button at the top right of the screen.
2. Select vehicle from the vehicle list on the PDA unit.
3. Follow the guide on the PC program, or on the PDA unit
4. Go to the PC to collect the print out.



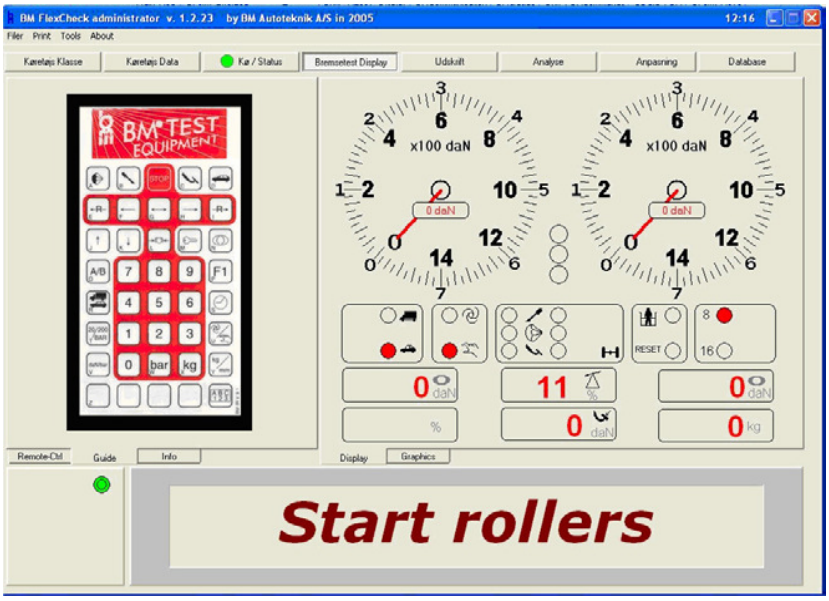
3.2.1 The PC guide.

The PC guide is active after vehicle data is entered. The PC program activates a menu, which shows:

- A virtual display
- Instructions to operator



Additional this menu allows for selecting a backup remote control system:



The brake tester can be operated from this virtual backup remote control unit, the Infra Red remote control unit or from the PDA remote control unit. The virtual backup remote unit will not be available if a PDA unit is communicating with the PC.

On all types of remote control unit, the commands selected by the operator are monitored by an integrated key-protection that only accepts remote control commands defined in the guide for that particular stage of the procedure. An example of the key-protection is that operator cannot accidentally start left side only if he is prompted to start both sides.

3.2.2 The PDA guide:

From the PDA unit, the operator can select a vehicle already defined on the PC.
The operator selects from the queuing list on the PDA unit.

When a vehicle is selected, the PDA changes screen to a virtual display that also contains the guide. This guide follows the PC guide.

As seen from above illustration, the operator can select “Remote” and PDA provides operator with a remote control system.

The guide follows the procedures outlined in DVSA documents:

- ATL Specification - Visio-Copy RBT
- ATL Specification - Visio - RBT Spec 4P

3.3 The Visual inspection.

The visual inspection is where the results of the observed Bind, lead/lag and fluctuations are entered.
On the PDA or PC screen, return to the queuing menu and select visual inspection.
There are check boxes that the results of your observations during the brake test can be entered, either select OK to pass, or enter fail on each section as necessary, comments and detailed explanations can also be added. Save to lock the visual readings.

3.4 Finalising the test.

The test can be completed either from of the PC screen, or on the PDA from the queuing menu.
Select the vehicle (highlight), if the brake test and visual inspection have a Green dot beside them then the test is complete.
(Red dot = test not started, Yellow dot= in progress, Green dot = complete)
The preview of the printout can be observed-if this looks OK, return to the queuing menu and select 'Finalise Test'.
When the test is Finalised, a date and time stamp is added, the test is removed from the queue and stored in a database for future reference, a copy is sent to a printer if required.

3.5 Conducting the Test to DVSA recommendations.

If at any time the vehicle wheels leave the roller bed (this is most likely during the park brake test), The vehicle will not have been given the best opportunity to meet minimum requirements.
There are two reasons for this:

1) The maximum available brakeforce cannot be recorded if an axle 'jumps' out of the rollers.
2) A vehicle wheel 'lock' will not be recorded if the axle jumps out of the rollers, this means that the 'automatic pass on locks' requirement can never be fulfilled, This can result in a vehicle being 'Failed' unnecessarily under DVSA UK regulations.

If a vehicle fails to meet minimum requirements and an axle had left the rollers during testing ('T' (Throwout) printed on the result sheet) BM recommend the following remedies to be tried in this order:
If in fully Automatic mode switch to Manual mode before retesting:

a) Relocate the axle in the rollers, and place wheel chocks behind the wheels of the other axle, if the wheels of the axle resting on the floor are fitted with the park brake, then engage the park brake.

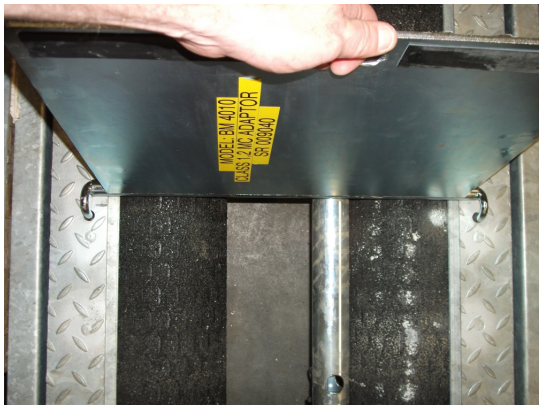
b) If remedy a) fails, then abort the test and restart with single side testing selected, and if necessary also chock the wheels, conduct the test with one wheel running at a time.

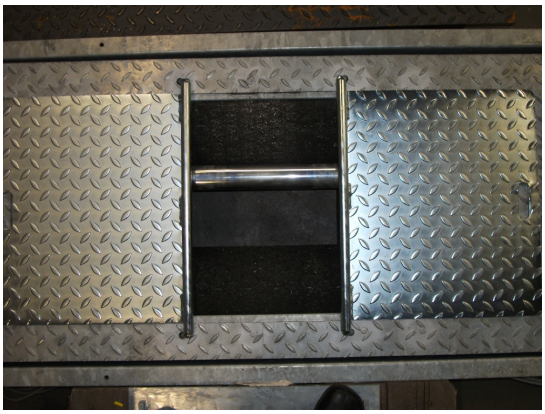
c) If remedies a) and b) fail, then abort the test and test in fully manual mode, with no PC guidance.

d) If remedies a), b) and c) fail, then remove the vehicle from the braketester and conduct a decelerometer brake test (Tapley meter).

3.5.1 Motorcycle Class 1, 2

Overview: The BM4010 for Class 3,4 ATL and BM4010 for Class 3,4,5L,7 ATL, including BM7010/BM9010 ATL can be supplied with a BM Motorcycle adaptor plate/s model “BM adaptor Class 1,2”.



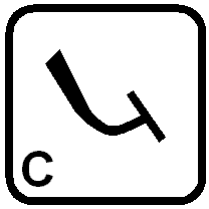


Automatic starting of the rollers is forbidden when testing Class 1, 2, therefore when the operator selects Class 1 or 2 from the PC software only manual start of the test sequence is allowed, furthermore only one side of the roller bed is available for start up at any given time, although both sides are available in case of a side car test.

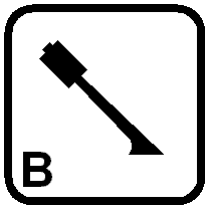
Manual Test.

Note: Class 1, 2 sidecars are tested by stopping and starting of the rollers manually, all readings are taken visually from the PDA/PC, and calculations for efficiency are made manually. In the case of BM7010/BM9010 NON ATL all readings can be read but from the point meters in the display.

Note: The following symbols for registration are as follows for Class 1, 2 ONLY.



Motorcycle **REAR brake system**



Motorcycle **FRONT brake system**

Guided Test (with PASS/FAIL evaluation)

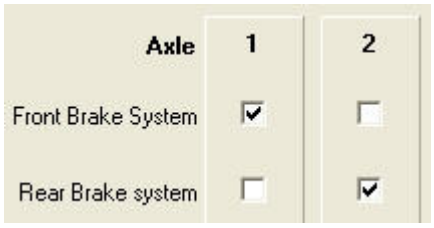
The vehicle test information for Class 1, 2 is a repeat procedure as if a Class 4, 7 vehicle has been tested until the point in which you choose the test map.
From here you must choose which type of brake system the motorcycle has.

- Two independent brake systems.
  - Front brake
  - Rear Brake.
- Dual/Linked brake system.
  - Front brake Linked proportionately to the Rear Brake.
  - Rear brake.

- OR
- Rear brake linked proportionately to the Front Brake.
- Front brake.

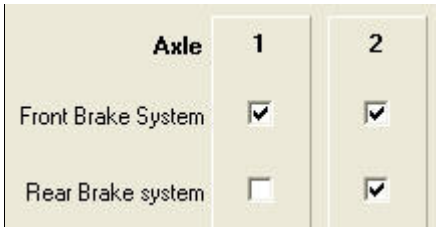
The following are examples of these types of test maps and how you should make the correct entries.
Note: Any other types of brake systems not mentioned above and in the case of ALL side cars, the test is to be made as a manual test.

Choosing the correct brake system.
When testing a 2 control motorcycle, the guide should be setup like this:



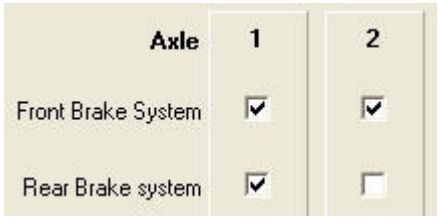
Front brake system.
Drive forward
Rear brake system

When Testing as a Linked or dual system, where the HAND lever operates both wheels, the order will be like this:



Front brake system.
Drive forward
Front linked brake system.
Rear brake system

When Testing as a Linked or dual system, where the FOOT lever operates both wheels, the order will be like this:



Front brake system.
Rear brake system
Drive forward
Front linked brake system.

Click next after vehicle data entry, from here the guide shall prompt the operator the DVSA test sequence from the PC and PDA.

Safe Hands Free Testing.

For safe use whilst testing motorcycles, in order to control the stability of the motorcycle during the test sequence and follow the test guide BM recommends the PDA be safely positioned as follows, which allows for emergency stop of the rollers, and if wheel lock cannot be achieved the stop button can be activated.

Motorcycle Visual Checks.

The following visual checks are pre-registered from within the BM computer software and shall be confirmed by “Status Result” from the PDA or PC, these visual checks shall be associated with the end result PASS/FAIL.

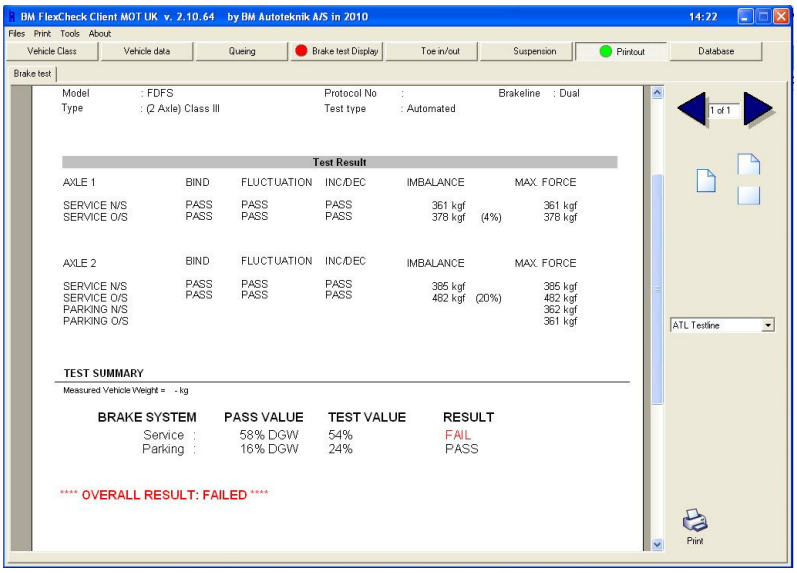
- Binding/Sticking Brake (PASS/FAIL)
- Grab/Judder (PASS/FAIL)
- Lagging Brake (PASS/FAIL)
- Excessive Fluctuation (PASS/FAIL)

The guide follows the procedures outlined in DVSA documents:

- ATL Specification - Visio-Copy RBT
- ATL Specification - Visio - RBT Spec 4P
- DVSA Motorcycle Class 1,2 test Manual

4. The Printout

The printout is generated by the PC program. From the PC program, the operator can preview the test result.



Reg No.	: MOTORCYCLE	Date	: 02-02-2010	Time	: 10:26:24
Vehicle Make	: YAMAHA	DGW	: 500 kg	Operator	: Admin
Model	: XV 1100	Protocol No	:		
Type	: Class II	Test type	: Automated		

Test Result

AXLE 1 - 398 kg	BIND	GRAB/JUD.	LAGGING	FLUCTURATION	MAX. FORCE
FRONT BRAKE SYSTEM	PASS	PASS	PASS	PASS	596 kgf
AXLE 2 - 250 kg	BIND	GRAB/JUD.	LAGGING	FLUCTURATION	MAX. FORCE
FRONT BRAKE SYSTEM	PASS	PASS	PASS	PASS	231 kgf
REAR BRAKE SYSTEM	PASS	PASS	PASS	PASS	279 kgf (L)

TEST SUMMARY

Measured Vehicle Weight = 648 kg

BRAKE SYSTEM	PASS VALUE	TEST VALUE	RESULT
Front System:	30% TW	128%	PASS
Rear System:	25% TW	43%	PASS

****** OVERALL RESULT: PASSED ******

From the database of the PC program, the operator can select, view, and print previous saved test results.

5. Safety aspects and error codes.

The BM4010 brake tester has integrated safety systems which meets the highest safety demands.

The design is made with the objective to reduce the risk of having a foot damaged in the roller set. All gaps are minimized and the gearmotor will only run if pulses are measured from the middle rollers. If middle rollers are stopped during test by a foot, then gearmotors will stop.

The gearmotors will only start when the middle rollers are detected to be in their down position (axle in the roller set). This detection is hardwired, which means that even though the machine was forced out of its normal program, the brake tester will still not start unless middle rollers are physically pressed down.

The Imbalance window display is used to inform operator of various situations:

Code 01:
In Manual and Automatic mode the 2 middle-rollers must be pressed down or released within 2 seconds of each other. The imbalance-display will flash the **ERROR CODE 01** if the middle-rollers are pressed down or released outside this 2 second window. You have to remove the vehicle from the rollerbed in order to remove the **ERROR CODE** from the imbalance-display or press the **STOP** key.

Code 04:
If you start the tester and let it run for 1 minute without using it (the measured brake forces do not change), the brake tester will automatically stop the rollers and the imbalance-display will flash the **ERROR CODE 04**. You have to remove the vehicle from the rollerbed in order to remove the **ERROR CODE** from the imbalance-display or press the **STOP** key.

Code 09:
A Status code indicating that the integrated calibration printout is active. After the calibration is finished, place the **SERVICE SWITCH** in position **N** and press the **PARKING** key. For more details consult the **SERVICE MANUAL**.

6. Maintenance.

In order to ensure a correct operation of the BMX010 brake tester following maintenance procedures are recommended:

EACH DAY:
Ensure that the chain is tightened. Loose chain is likely to cause gear motor failure. If chain is loose then tighten it before use or call for service.

3-MONTHLY:

1. Ensure there is no vehicle placed in the rollerbed.
2. Power off the brake tester.
3. Check the general condition of the brake tester. Remove any mud, grease etc. from the rollers, rollerbed and the pit.
4. Ensure that nothing prevents the middle-rollers from revolving or from being pressed down.
5. Check the bearing bolts on the main rollers for tightness.
6. Check the chains for correct tension.
7. Lubricate the chains.
8. Rubbish beneath the rollers can affect the weight measuring and potentially block the drain. Clean rubbish from the brake tester.

6-MONTHLY:

1. It is recommended to perform a calibration check of the brake force and weight measuring system twice a year. For the purpose of documenting these calibration checks and other services on the brake tester, please consult the SERVICE MANUAL.

Furthermore it is recommended to arrange a service-contract with your supplier of the BM4010 brake tester.

7. Safe operation of the brake tester.

The BM4010 brake tester is designed with safety precautions that comply with demands of greatest possible safety while operating the brake tester. Nevertheless it is recommended that the owner and the operator always are aware of the danger present, while operating the brake tester. The following outlines the general safety precautions that are recommended when operating the brake tester.

7.1 General safety precautions.

1. It is preferable to site the brake tester in an area designated and clearly marked:

BRAKE TESTING AREA - FOR USE BY AUTHORISED PERSONNEL ONLY

2. When the brake tester is **NOT IN USE:**

- A vehicle should never be left standing on the rollers.
- If supplied, separate roller cover plates should always be placed over the rollers.

3. When the brake tester is **IN USE:**

- No unauthorised person should be allowed near the rollers.

- No person should be allowed to examine or work on the wheels or underside of the vehicle for any reason at all.

4. The brake tester should not be left switched on while unattended.

5. Where the test area is indoor, provision should be made to extract the exhaust gasses.

8. Mounting, dismounting and service.

Only authorised personnel trained by BM should perform mounting, dismounting and service of the BM7010 brake tester. Ensure that service engineer is certified by BM Autoteknik Denmark. Please contact your supplier for further information.

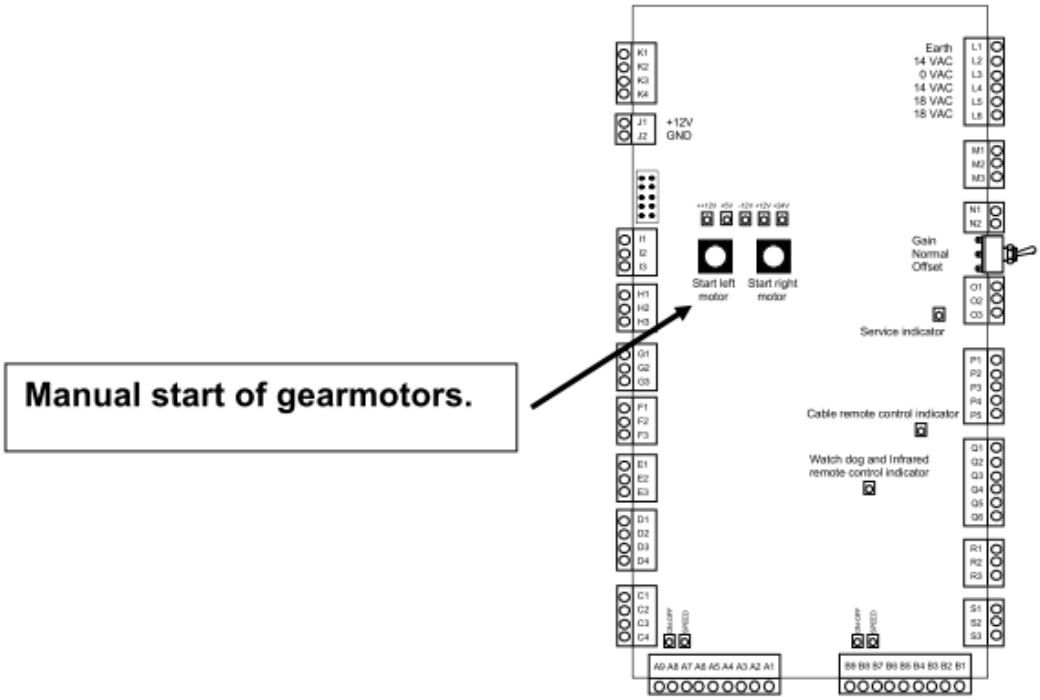
9. Calibration

9.1 Integrated calibration printout.

During the calibration and using the remote control you can receive a complete calibration printout with all calibration values. In order to use this facility simply press the **PARKING** key when the **SERVICE** switch is in position **0** (**ZERO**) or **G** (**GAIN**). For each press you will receive a table of data.
In order to finish the calibration printout you must end the calibration procedure by pressing the **PARKING** key while the **SERVICE** switch is in mode **N** (**NORMAL**).

9.2 Calibration with rolling rollers.

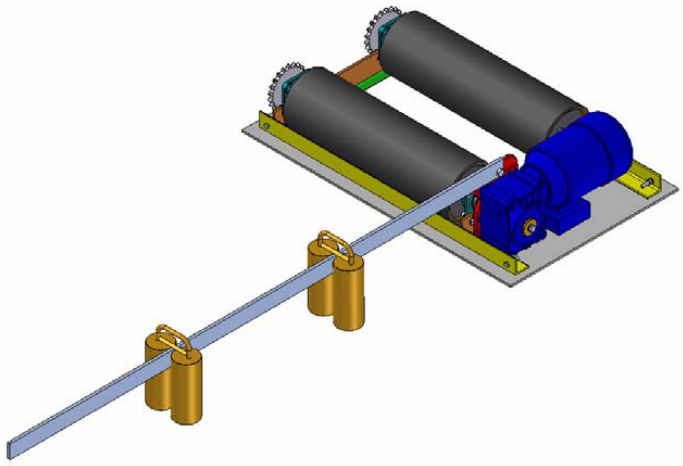
Calibrating the measuring system of the brake tester can be carried out with or without rolling rollers. In order to activate the gearmotors during calibration, the operator must keep **LEFT** or **RIGHT** button on the MCPU circuit board pressed down. When the **LEFT** or **RIGHT** key is released, the gearmotor (rollers) stop immediately.



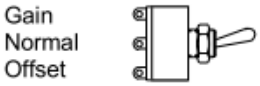
9.3 Brake force calibration procedure.

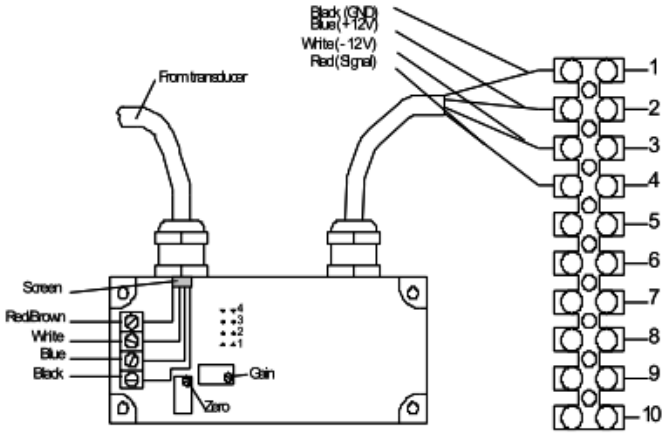
Following procedure describes how the Brake force measurement system is calibrated.

1. Remove vehicle from the rollerbed.
2. Power off the brake tester.
3. Take off the top of the Brake force amplifier-box, which is located just beside the gear motors.
4. Power on the brake tester.
5. In order to do a zero point adjustment, place the **SERVICE SWITCH** in **POSITION** "**0**".
6. Adjust the "**0-POINT**" gain at the left side amplifier board until the readout is **300** kgf +/- **50** kgf.
7. Place the calibration rig in the rollerset.



8. In order to do the calibration of the brake force gain, place the **SERVICE SWITCH** in **POSITION G**. This will auto-zero the force of the rig.





9. Place the loads at required "load marks", which is located on the arm of the calibration rig. Make sure, that both loads and arm is correctly marked for use with BM4010.

10. Adjust the "**GAIN**" of the Brake force amplifier board until the gauges read out a load corresponding to the "load marks" on the calibration rig.

11. Take off the load.

12. Place the **SERVICE SWITCH** in position **N** (**NORMAL**).

13. Repeat position 8-12 until no further adjustment is necessary.

14. Take off calibration rig.

15. Repeat position 5-6.

16. Place the **SERVICE SWITCH** in position **N** (**NORMAL**).

17. Mount the top of the amplifier box again.

9.4 Weight calibration procedure.

Following procedure describes how the weight system of BM4010 is calibrated.

1. Remove vehicle from the rollerbed.

2. Power off the brake tester.

3. Take off the top of the Weight amplifier-box of **LEFT** side roller bed, which is located just beside the gear motors.

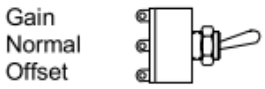
4. Power on the brake tester.

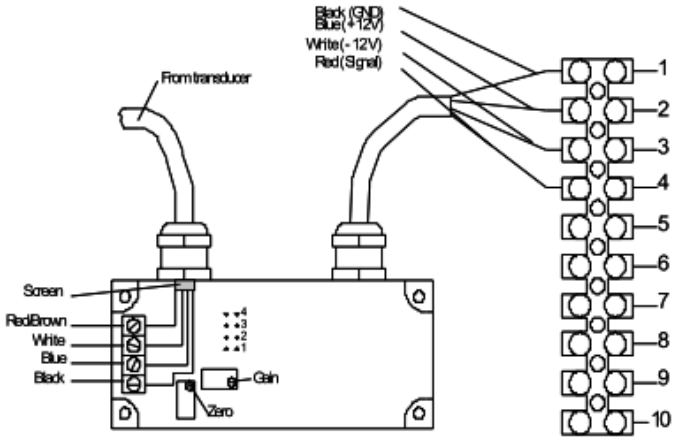
5. In order to do a zero point adjustment, place the **SERVICE SWITCH** in **POSITION** "**0**".

6. Press the **AUTO**/**MANU** key on the remote control unit. The **AUTO**/**MANU** light shall now be flashing!

7. Adjust the "**0**-**POINT**" gain of the Weight amplifier board until the readout is **300** kgf +/- **50** kgf.

8. In order to do the calibration of the Weight gain, place the **SERVICE SWITCH** in position **G** (**GAIN**).





9. Place the required load(s) on the rollerbed.

10. Adjust the "**GAIN**" of the Weight amplifier board until the gauges read out a value corresponding to the load(s).

11. Take off the load(s).

12. Place the **SERVICE SWITCH** in position **N** (**NORMAL**).

13. Repeat position 8-12 until no further adjustment is necessary.

14. Take off calibration rig.

15. Repeat position 5-6.

16. Place the **SERVICE SWITCH** in position **N** (**NORMAL**).

17. Mount the top of the amplifier box again.