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July 2020

# USER MANUAL

**DIGITAL TESTER K154433N50**  
FOR DISC BRAKE WEAR POTENTIOMETER



**KNORR-BREMSE**

## SAFETY AND ENVIRONMENT GUIDELINES

**Note:** The safety advice listed below is applicable to general service and diagnostic work on braking systems. Also observe any recommendations from the axle or vehicle manufacturer concerning towing, jacking-up and securing the vehicle.

**CAUTION:** KNORR-BREMSE IS NOT LIABLE FOR ANY INJURIES OR DAMAGES CAUSED BY IMPROPER USE OF SPECIFIED SERVICE KITS AND/OR SERVICE TOOLS. FURTHERMORE, MISUSE OF TOOLS OR INCORRECT INSTALLATION OR APPLICATION OF SERVICE KITS MAY RESULT IN DAMAGE OR POTENTIALLY UNSAFE VEHICLE OPERATIONS. IN THIS CASE, KNORR-BREMSE DOES NOT HAVE ANY WARRANTY OBLIGATIONS.

Before and whilst working on or around compressed air systems and devices, the following precautions should be observed, along with the many hazard notes contained throughout the document:

- 1 Always wear safety glasses when working with air pressure.
- 2 Never exceed the vehicle manufacturer's recommended air pressures.
- 3 Never look into air jets or direct them at anyone.
- 4 Never connect or disconnect a hose or line containing pressure; it may whip as air escapes.
- 5 When removing or servicing a product, ensure all pressure related to the specific system it is contained in has been depleted to 0 bar. Be aware that if the vehicle is equipped with an air dryer system, it can also contain air pressure along with its purge reservoir, if fitted, even after pressure has been drained from the other reservoirs.
- 6 If it is necessary to drain the air pressure from reservoirs, etc., keep away from brake actuator push rods and levers since they may move as system pressure drops. On vehicles fitted with air suspension, it is advised when undertaking such work, to support the chassis from sudden lowering and therefore prevent any possibility of being trapped between the chassis and axle or ground.
- 7 Park the vehicle on a level surface, apply the parking brakes, and always chock the wheels as depleting vehicle air system pressure may cause the vehicle to roll.
- 8 When working under or around the vehicle, and particularly when working in the engine compartment, the engine should be shut off and the battery disconnected. Where circumstances require that the engine be running, EXTREME CAUTION should be taken to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components. Additionally, it is advisable to place a clear sign on or near the steering wheel advising that there is work in progress on the vehicle.
- 9 When working on vehicles equipped with air suspension, to guard against injury due to unexpected downward movement of the chassis caused by sudden pressure loss in the suspension system, ensure that the vehicle chassis is mechanically supported with a 'prop' between the chassis and the axle or between the chassis and the ground.
- 10 Examine all pipework for signs of kinks, dents, abrasion, drying out or overheating. Be aware that kinks in pipework may result in air pressure being trapped in the pipework and associated equipment. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems. Check the attachment of all pipework; it should be installed so that it cannot abrade or be subjected to excessive heat.
- 11 Components with stripped threads or damaged/corroded parts must be replaced completely. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle or component manufacturer.
- 12 Never attempt to install, remove, disassemble or assemble a device until you have read and thoroughly understood the recommended procedures. Some units contain powerful springs and injury can result if not properly dismantled and reassembled. Use only the correct tools and observe all precautions pertaining to use of those tools.
- 13 Before removing any device note its position and the connections of all pipework so that the replacement/serviced device can be properly installed. Ensure that adequate support or assistance is provided for the removal/installation of heavy items.

- 14 Use only genuine replacement parts, components and kits as supplied by Knorr-Bremse or the vehicle manufacturer. Only use the recommended tools as specified in related Knorr-Bremse instructions.
- 15 The serviced or replaced product must be checked for correct function and effectiveness.
- 16 If products have been dismantled, serviced or replaced, whose performance could affect braking performance or system behaviour, this should be checked on a roller dynamometer. Bear in mind that a lower performance may be experienced during the bedding-in phase if new brake pads/linings and/or brake discs/drums have been fitted.
- 17 The use of impact screwdrivers or impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use. It is likely that the tools or the vehicle will be damaged and there is a serious risk of injury – see Caution above.
- 18 Do not use compressed air to clean the disc brake. Avoid air contamination of brake dust.
- 19 Prior to returning the vehicle to service, make certain that all components and the complete brake systems are leak free and restored to their proper operating condition.

### Welding

To avoid damage to electronic components when carrying out electrical welding, the following precautions should be observed:

- 1 In all cases, before starting any electrical welding, remove all connections from any electronic control units or modules, noting their position and the order in which they are removed.
- 2 When re-inserting the electrical connectors (in reverse order) it is essential that they are fitted to their correct assigned position - if necessary this must be checked by PC Diagnostics.



### Disposal of Waste Equipment by Business Users in the European Union

This symbol on the product, packaging or in user instructions, indicates that this product must not be disposed of with other general waste. Instead, it is your responsibility to dispose of the waste electrical and electronic parts of this product by handing them over to a company or organisation authorised for the recycling of waste electrical and electronic equipment. For more information about arrangements for waste equipment disposal please contact your Knorr-Bremse distributor or local Knorr-Bremse representative.

### Revision Details

|          |           |  |
|----------|-----------|--|
| Rev. 001 | July 2020 | New Layout, values correction on page 10 |
|          |           |  |
|          |           |  |

## WARNING ADVICE / BRAKE IDENTIFICATION

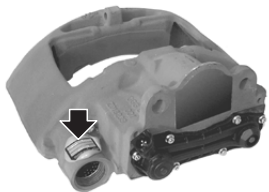
### Warning advice

The potentiometer tester K154433N50 is an electronic measuring device, which must be protected against excessive humidity and heat. The tester must only be connected to brakes which are supplied with a Knorr-Bremse 'continuous' or a 'black/white' sensor (potentiometer). The tester supplies voltage to the brakes being measured and therefore it must only be connected where there is no voltage, either external or from the vehicle. Usage contrary to this specification may damage the device. When fitting the battery ensure the correct polarity (plus and minus). Warranty claims will not be honoured if the device has been opened (except the battery compartment).

**Please also refer to the service manuals for Knorr-Bremse air disc brakes and specifications of the vehicle manufacturers. You will find Knorr-Bremse service manuals on our website [www.knorr-bremseCVS.com](http://www.knorr-bremseCVS.com)**

### Brake Identification and Service Manuals

SB5.../SB6.../SB7.../SN5.../SN6.../SN7.../SK7.../SL7.../SM7.../ST7...



A = Axle or vehicle manufacturer's identification number

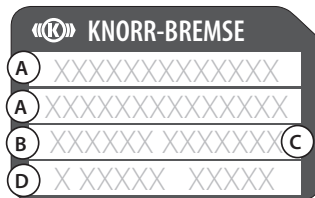
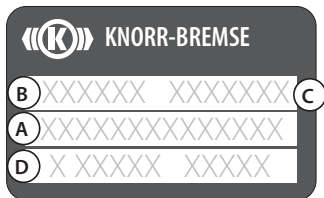
B = Knorr-Bremse brake type number

C = Knorr-Bremse part number

D = Knorr-Bremse date of manufacture

| Brake                  | Service Manual  |
|------------------------|---|
| SB5...                 | No service manual available, refer to manual for SB6/SB7. |
| SB6..., SB7...         | C16352-#  |
| SN5...                 | Y015044-#   |
| SN6..., SN7..., SK7... | Y006471-#   |
| SL7..., SM7...         | Y081564-#   |
| ST7...                 | Y173241-#   |

#- Refer to website for latest revision [www.knorr-bremseCVS.com](http://www.knorr-bremseCVS.com)



## DESCRIPTION / OPERATION

### 1. Description of the potentiometer tester K154433N50

The tester is used to check the potentiometers (wear indicators) in Knorr-Bremse air disc brakes and for the determination of the wear of the brake disc and brake pads.



3-pin plug  
for threaded connection

3-pin plug  
for clamp connection



Battery cover

## 2. Operation of the tester

Before operation of the tester a 9 volt battery must be inserted in the battery compartment on the rear of the device (battery not supplied). If the yellow LED on the front of the device illuminates, the battery must be replaced. Otherwise the accuracy of the indicated values cannot be guaranteed. Switch off the device after use by turning the rotating switch to "Off".



For detailed instructions on the necessary service steps, observe the respective service manual for air disc brakes - refer to section "Brake Identification and Service Manuals".

## CHECKING OF THE POTENTIOMETER FUNCTION

### 3. Check of the potentiometer function

The procedure for checking the potentiometer can be carried out with the caliper installed on the vehicle or with the caliper removed.

In either case, it is necessary to be able to measure the distance between the tappets and the opposite caliper face – see dimension 'X' in section 7.

In the case of disc brakes fitted with two tappets, it is important that the distance between the respective tappets and the opposite face is within  $\pm 0.25\text{mm}$  of each other. A table in section 7 provides the dimensions for each disc brake type.

Setting the dimension is easily achieved with the caliper removed but, if the caliper is installed on the vehicle, it will be necessary to measure 'over' the disc using a vernier caliper or suitable fabricated device.

#### 3.1. Read the Safety Advice Section of this manual.

#### 3.2. Only if caliper is installed on vehicle

Remove wheel.

Disconnect the vehicle cable plugged into the potentiometer on the caliper.

Wind back the tappets using the shear adapter and remove brake pads.

#### 3.3. If caliper installed on vehicle or removed

Adjust tappets using the shear adapter until the tappet to caliper distance is the required value for "Maximum Disc + Pads dimension" – see table in section 7.

Select the measuring cable depending on plug variant (screwed or clamped) and connect it with the tester.

Connect and fix the 3-pin plug to the potentiometer connector of the caliper.

Turn the rotary switch of the tester to the respective vehicle and brake type (see tables in section 5).

Compare the indicated measured value with the value of the reference table (see section 6).



The threaded tubes must not extend more than the "Absolute Minimum dimension" see table in section 7, otherwise synchronization will be lost and the caliper must be replaced.

Re-adjust the tappets using the shear adapter until the tappet to caliper distance is the required value for "Minimum Disc + Pads dimension" – see table in section 7.  
 Compare the indicated measured value with the value on the reference table (see section 6). If the tester always indicates a value 0.00 V the position of the rotary switch and the connection to the potentiometer should be checked.  
 If the measured values correspond with the values in the tables within a range of  $\pm 0.25V$  the potentiometer function is correct.  
 Otherwise the caliper must be replaced.

## CHECKING OF WEAR STATUS OF BRAKE PAD AND DISC

### 4. Checking of wear status of brake pads and disc

Note, this check is only possible for brakes having a 'continuous' sensor (potentiometer) and therefore it is necessary to test if such a potentiometer is fitted:

Depending on accessibility it may be necessary to remove the wheel.

Disconnect the vehicle cable plugged into the potentiometer on the caliper.

Select the measuring cable depending on plug variant (screwed or clamped) and connect it with the tester.

Connect and fix the 3-pin plug to the potentiometer connector of the caliper.

Turn the rotary switch to position "End Wear Display black/white".

If the tester indicates a value  $< 0.2V$  or  $> 4.8V$  then a 'continuous' sensor is not installed and the wear status of brake pads and disc cannot be determined by means of the tester. Carry out an optical check of the wear status - see the respective service manual. For detailed instructions on the necessary service steps - refer to section "Brake Identification and Service Manuals".

#### The following steps therefore assume a 'continuous' wear sensor is fitted.

Turn the rotary switch of the test device to the respective vehicle and brake type (see tables in section 5).

Compare the indicated measured value with the value of the reference table (see section 6).

If the test device always indicates a value 0.00 V check the position of the rotary switch and the connection to the potentiometer connector.

Using the measured voltage you can find the wear status in the tables (see section 6).


If the value is  $< 2.75$  Volt the green LED is illuminated. The wear status of brake pads and disc is OK.

If the value is  $\geq 2.75$  Volt the red LED is illuminated. The wear status of brake pads and disc must be checked with the wheels removed - refer to respective service manual.

A determination of the wear status (brake pads and disc) using the red or green LED requires the proper function of the potentiometer - see also section 3.

## SWITCH POSITION

### 5. Switch position depending on vehicle and axle manufacturer

| Switch position                           | Vehicle or axle manufacturer | Pin coating of potentiometer connector  | Information if function is correct  | Referring disc and brake pad gap and value tables |
|---|------------------------------|---|---|---|
| cont. Daimler, Iveco, Scania, DAF, Others | DAF *)                       | <br>silver | Voltage values increase between maximum gap and minimum gap from 1 Volt to 3.5 Volt linearly    | see section 6.1                                   |
|   | Daimler *)                   |   |   |   |
|   | Dana *)                      |   |   |   |
|   | Evobus                       |   |   |   |
|   | Hendrickson                  |   |   |   |
|   | Hyundai                      |   |   |   |
|   | Iveco                        |   |   |   |
|   | Meritor                      |   |   |   |
|   | SAF *)                       |   |   |   |
|   | Scania                       |   |   |   |
|   | SOR-Libchavy                 |   |   |   |
|   | Voith                        |   |   |   |
|   | ZF *)                        |   |   |   |
|   | Others                       |   |   |   |
| cont. MAN                                 | MAN *)                       | gold  | Voltage values increase between maximum gap and minimum gap from 0.7 Volt to 3.56 Volt linearly | see section 6.2                                   |
|   | DANA *)                      |   |   |   |
|   | LAF                          |   |   |   |
|   | SAF *)                       |   |   |   |
|   | Others                       |   |   |   |
| End Wear Display black/ white             | DAF *)                       | silver  | Voltage switches from approx. 0.15 V to approx. 5 V when the minimum gap is reached             | see section 6.3                                   |
|   | Daimler *)                   |   |   |   |
|   | ERF                          |   |   |   |
|   | ZF *)                        |   |   |   |
|   | MAN *)                       | gold  |   |   |

\*) different potentiometer variants per vehicle or axle manufacturer.



## TABLES FOR DISC AND PAD GAP & MEASURED VOLTAGES

### 6. Reference tables for disc and brake pad gap & measured voltages

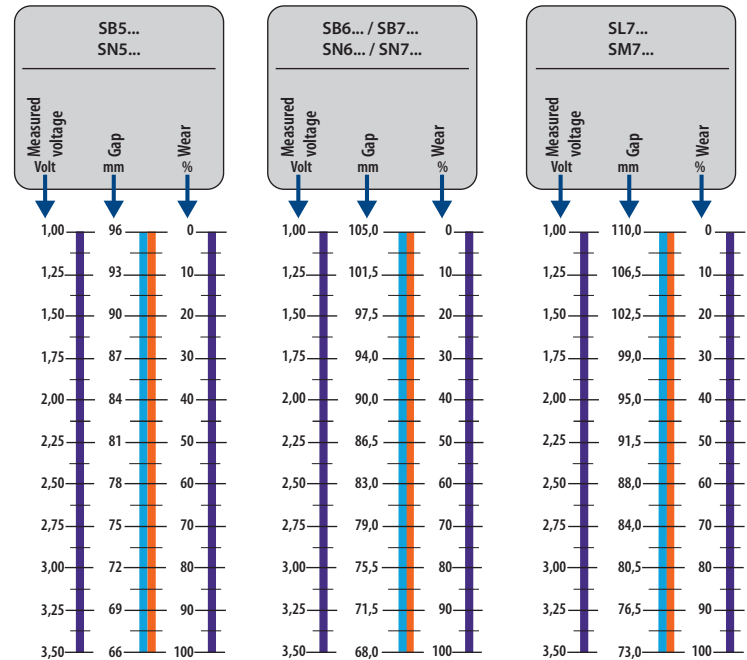
#### 6.1. For switch position "cont. Daimler Iveco, Scania, DAF, Others"

##### Reference Point Values

| Brake type | Maximum disc and brake pad gap (mm) | Measured voltage (V) | Minimum disc and brake pad gap (mm) | Measured voltage (V) | Change of gap per full rotation of the adjuster *) (mm / V) |
|------------|-------------------------------------|----------------------|-------------------------------------|----------------------|---|
| SB5 / SN5  | 96                                  | 1,00                 | 66                                  | 3,5                  | 6 / 0,50  |
| SB6 / SN6  | 105                                 |                      | 68                                  |                      | 6 / 0,41  |
| SB7 / SN7  |                                     |                      | 68                                  |                      | 6 / 0,41  |
| SL7 / SM7  | 110                                 |                      | 73                                  |                      | 6 / 0,41  |



All figures in this table are valid under the condition that the switch position is selected according to the wear indicator used in the brake (see section 5)



\*) Adjuster must only be turned using the shear adapter

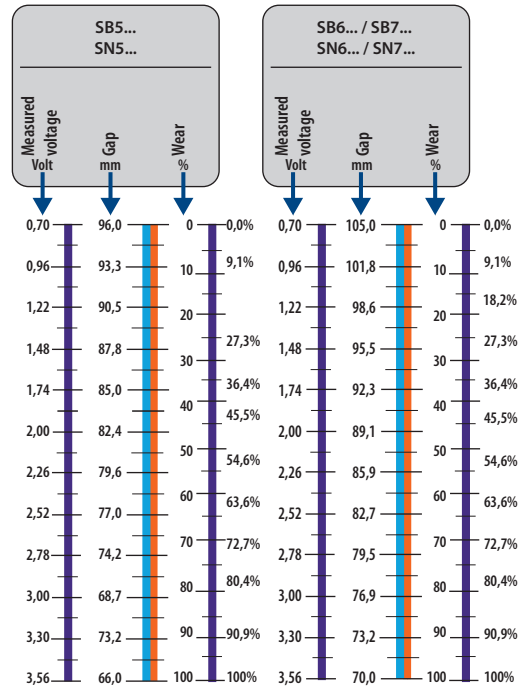
6.2. For switch position “cont. MAN”

Reference Point Values

| Brake type | Maximum disc and brake pad gap (mm) | Measured voltage (V) | Minimum disc and brake pad gap (mm) | Measured voltage (V) | Change of gap per full rotation of the adjuster *) (mm / V) |
|------------|-------------------------------------|----------------------|-------------------------------------|----------------------|---|
| SN5        | 96                                  | 0,70                 | 66                                  | 3,56                 | 6 / 0,57  |
| SB6 / SN6  | 105                                 |                      | 70                                  |                      | 6 / 0,49  |
| SB7 / SN7  |                                     |                      |                                     |                      | 6 / 0,49  |



All figures in this table are valid under the condition that the switch position is selected according to the wear indicator used in the brake (see section 5)



\*) Adjuster must only be turned using the shear adapter

### 6.3. For switch position "End Wear Display black/white"

#### Reference Point Values

| Brake type | Maximum disc and brake pad gap (mm) | Measured voltage (V) | Minimum disc and brake pad gap (mm) | Measured voltage (V) |
|------------|-------------------------------------|----------------------|-------------------------------------|----------------------|
| SBS / SN5  | 96                                  | ≤ 0,15               | 66                                  | 5,00                 |
| SB6 / SN6  | 105                                 |                      | 68                                  |                      |
| SB7 / SN7  |                                     |                      |                                     |                      |

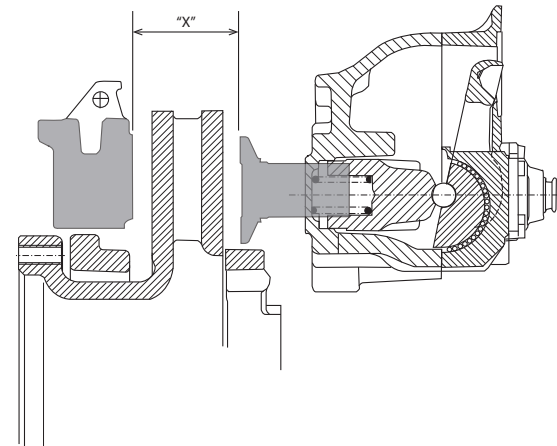


All figures in this table are valid under the condition that the switch position is selected according to the wear indicator used in the brake (see section 5)

## DISC AND BRAKE PAD GAP VOLTAGE CHECK - SETTING DIMENSIONS

### 7. Disc and brake pad gap voltage check - setting dimensions

| Brake type   | Maximum "Disc + Pads" dimension 'X' [mm] | Minimum "Disc + Pads" dimension 'X' [mm] | Absolute Minimum dimension 'X' [mm] |
|--|--|--|-------------------------------------|
| SBS.../SN5...  | 96                                       | 66                                       | 64                                  |
| SB6.../SB7.../SN6.../ SN7... Daimler, Iveco, Scania, DAF | 105                                      | 68                                       | 66                                  |
| SB6.../SB7.../SN6.../ SN7... MAN                         |  | 70                                       | 68                                  |
| SL7.../SM7...  | 110                                      | 73                                       | 71                                  |



**F**

eatures

Test of Knorr-Bremse disc brake potentiometer function

Wear status check of brake pads and disc

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