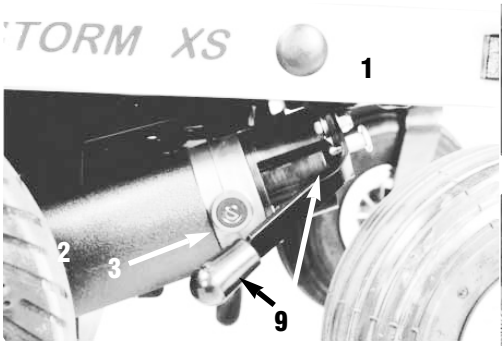
13.0 Check and Repair Work on Drive Motors

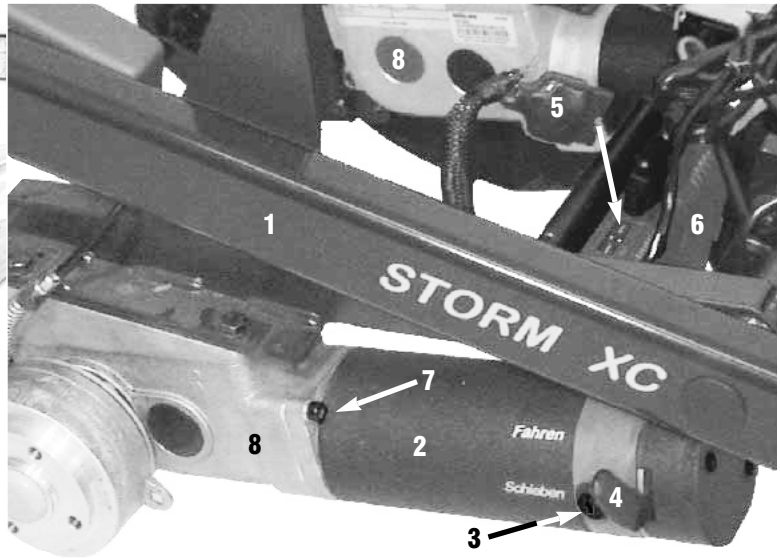
13.1 General

Drive motor, assembled



1 Chassis
2 Drive motor
3 2x Stopper for carbon brush
4 2x Coupling lever
5 Motor plug
6 Main module
7 2x Allen screw M6x30 with lock washer
8 Gear
9 Coupling mechanism

Drive unit, assembled



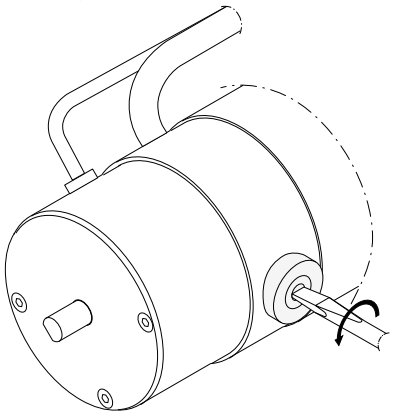
✓ **NOTE:**
- Depending on type, the motors can be equipped with a coupling mechanism or with separate coupling levers.

Inspection	Remedy
• Motor vibrating, emitting running noises?	> Test motor, replace if necessary.
• Motor won't start?	> Test motor, replace if necessary.
• Power brake not reacting?	> Test brake, replace motor, if necessary.
• Gear emitting running noises or being blocked?	> Replace drive unit or gear. See chapter 11.6.

13.2 Testing or replacing carbon brushes

✓ **NOTE:**
- Worn-out carbon brushes lead to a deterioration of the motor performance.
- Each motor is equipped with two carbon brushes. They are-located behind the lateral stoppers (4) of the motors.

Removing carbon brushes



Removing carbon brushes

- Remove the stopper (4).

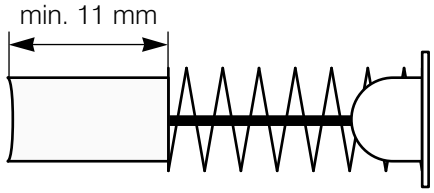
✓ **NOTE:**
Make sure that, while you loosen the stopper, same is being subjected to a slight spring pressure.

- Pull carbon brush from its guide.

Testing carbon brushes

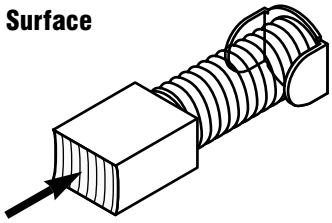
- Testing length:
  Measure the length of the carbon brush.
  Orginal length = 13 mm.
  Wear limit = 11 mm
  Once the carbon brush has reached the wear limit of 11 mm, it must be replaced.

Wear Limit



- Testing the bearing surface:
  Perform a visual inspection of the running surface.
  It must show only slight running traces.
  If the running surface shows deep grooves, the motor collector is damaged.
  Any further repair of the motor can only be performed by the INVACARE-Service Department.

Running Surface



Installing carbon brushes

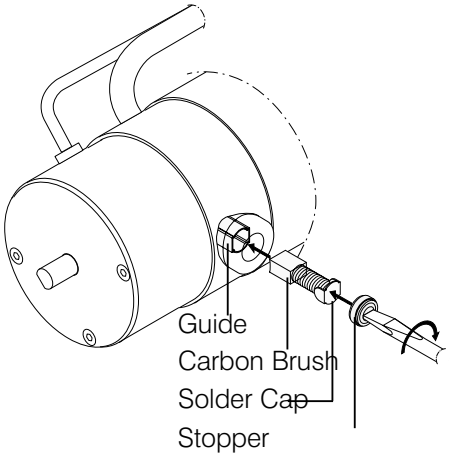
- Place carbon brush into its guide (see drawing).

✓ **NOTE:**
Make sure that the carbon brush is not canted when introduced. It must be able to move smoothly within the guide.

- Introduce the solder cap of the carbon brush into the guide as shown in the drawing.
- Screw in the stopper.

✓ **NOTE:**
Do not fasten too tightly, it would destroy the stopper.

Installing Carbon Brushes



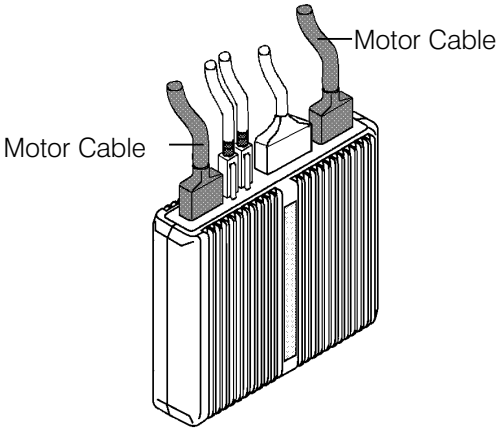
13.3 Testing motor, magnetic brake and free-wheel switch

Testing preparations / replacing drive motors

- Remove battery boxes.
- Remove splash protection.
- Remove cable binders.
- Remove the connection plug of the motor to be tested or replaced from the socket board.

✓ **NOTE:**
Press down plug lock as otherwise the plugs would be damaged.

Remove BUS plus



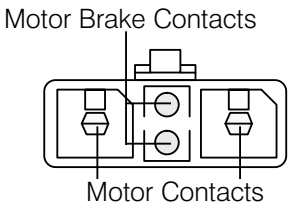
Testing drive motors
Only basic tests can be performed on the drive motors. Any further tests are only possible with special testing instruments.

The following components of the drive motors can be tested by means of a multimeter:
– Motor coils for continuity
– Motor brakes for resistance

Testing hints:
If the following tests show no results, the drive motor should be sent in for testing. Any further measurements can only be performed by the INVACARE Service Department.

Visual test of the plug contacts:
Test whether the contacts of the plug are not unduly bent up, pushed back or oxidized.

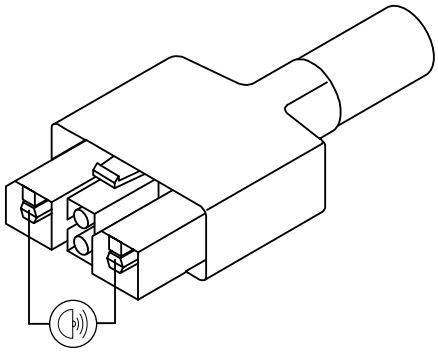
Plug Contacts



Testing the electric circuit of the motor
- Set multimeter to continuity check.
- Measure the continuity of the motor's electric circuit at the plug contacts shown in the drawing to the right.

✓ **NOTE:**
Instructions on the use of the multimeters can be found in the User's Manual.

Testing the Electric Circuit of the Motor

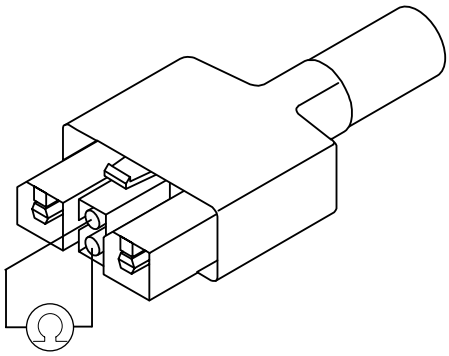


Testing the magnetic brake
- Engage the motors.
- Set the multimeter to resistance measuring.
- Measure the resistance of the brake coils at the plug contacts shown in the drawing to the right.
  It must amount to between 20 ohms and 200 ohms.

Testing the free-wheel switch:
The free-wheel switch switches the motors to pushing operation, putting the magnetic brake out of function.

- Disengage motors.
- Set multimeter to resistance measuring.
- Measure the resistance of the brake coils at the plug contacts shown in the drawing to the right.
  The resistance measured must amount to infinite.

Testing Magnetic Brake



Resistance = 20 ohms - 200 ohms

Malfunction	Cause	Solution	Chapter
No continuity of the electric circuit of the motor.	Parted cable in the motor. Carbon brushes worn out.	Replace motor. Check / replace carbon brushes.	13.4 13.2
Resistance being 0 ohms.	Short circuit in magnetic brake.	Replace motor.	13.4
Resistance clearly > 200 ohms, but not infinite.	Defective contact in the magnetic brake. -	Replace motor.	15.4

13.4 Disasembly / Assembly of Drive Motor

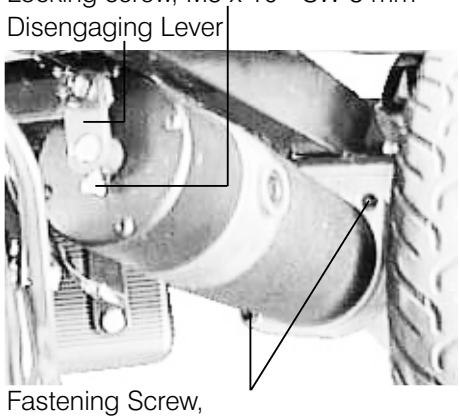
Disassembly of drive motor

✓ **NOTE:**
- The first two steps apply only to motors with a coupling mechanism.

- Loosen locking screw (SW 8 mm) at the disengaging lever of the motor to be replaced.
- Remove the disengaging lever.
- Support drive motor with your hand, loosen completely two - fastening screws (hexagon socket, SW 5 mm) with lock washers and detach drive motor.

✓ **NOTE:**
- Do not damage / lose plastic bushing and starting damper.

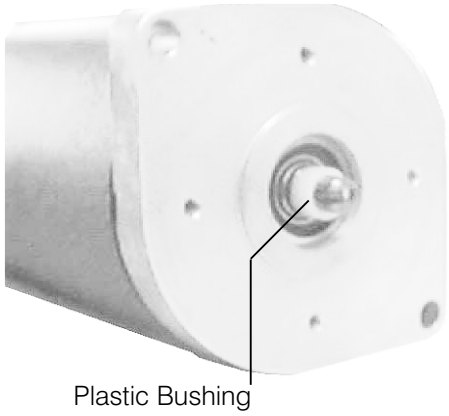
Motor fastening



Assembly drive motor

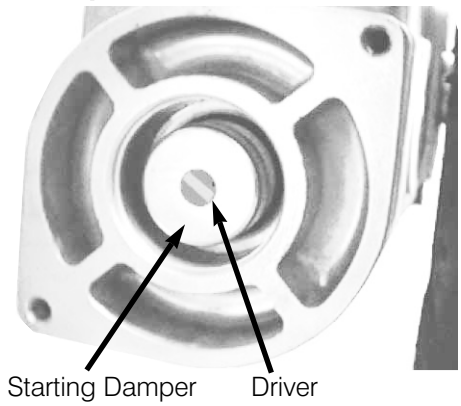
- Push plastic bushing on the motor output shaft.

Motor Output Shaft



- Place starting damper on the gear input shaft.
  Make sure that the driver of the starting damper interlocks with the gear input shaft.

Gear Input Shaft



- Fasten the motor to the gear by means of the two fastening screws (hexagon socket SW 5mm) and the two lock washers.
  The following is to be observed:
  – The motor cables must point upwards to the frame of the chassis.
  – The slot of the motor output shaft must be in alignment with the driver of the starting damper.

✓ **NOTE:**
- If key and slot are not aligned exactly, turn the driving wheel (gear output shaft) until the slot locks into place and the motor is located exactly in front of the gear.
- Fasten screws hand-tight. Do not overturn.

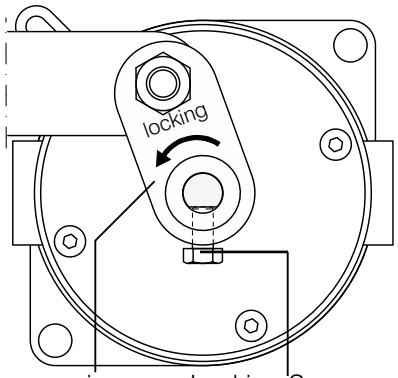
✓ **NOTE:**
- The following two steps apply only to motors with a coupling mechanism.

- Lock the motor by turning the shaft left by means of a suitable tool (e.g., a pipe wrench) = driving position.

- Now mount the disengaging lever and fasten it by tightening the locking screw (SW 8 mm).
  The locking screw (M 5 x 10) must contact exactly the flattened part of the shaft (see drawing).

✓ **NOTE:**
Following the assembly, make sure that no moving parts such as rods or screw connections are sliding against the motor casing. Conduct a performance test.

Position of Disengaging Lever

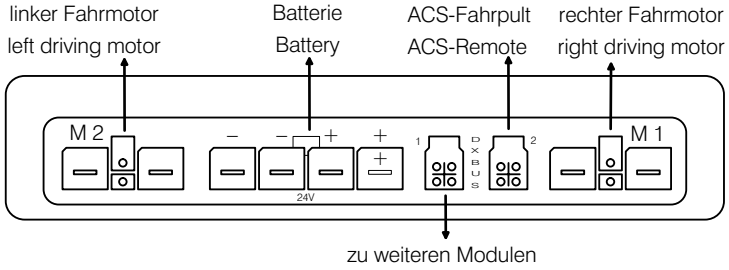


Disengaging Lever

Locking Screw M5 x 10 - SW 8 mm

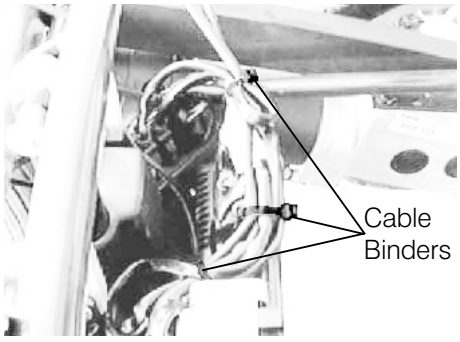
- Lead the motor cable to the main module and plug the connection plug into the socket board.

Connection Plan: Motor Plug



- Secure the cables by means of cable binders
- Mount the splash protection.

Position of the Cable Binders



⚠ **CAUTION:**
Following the assembly, the correct operating of the disengaging lever as well as the driving functions must be tested.

>Make a test drive!<