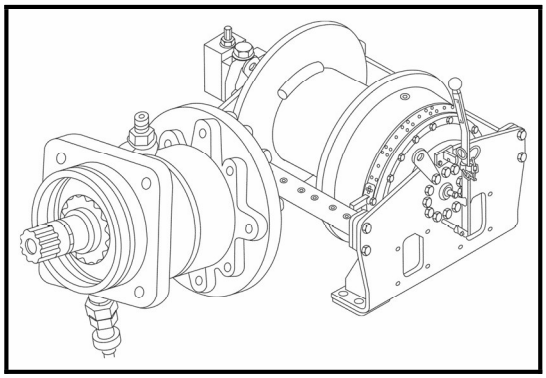


BEML - TATRA 815

26RR36 22 255 6x6.1R/50T, 51T

Workshop manual

Part 17 – WINCH

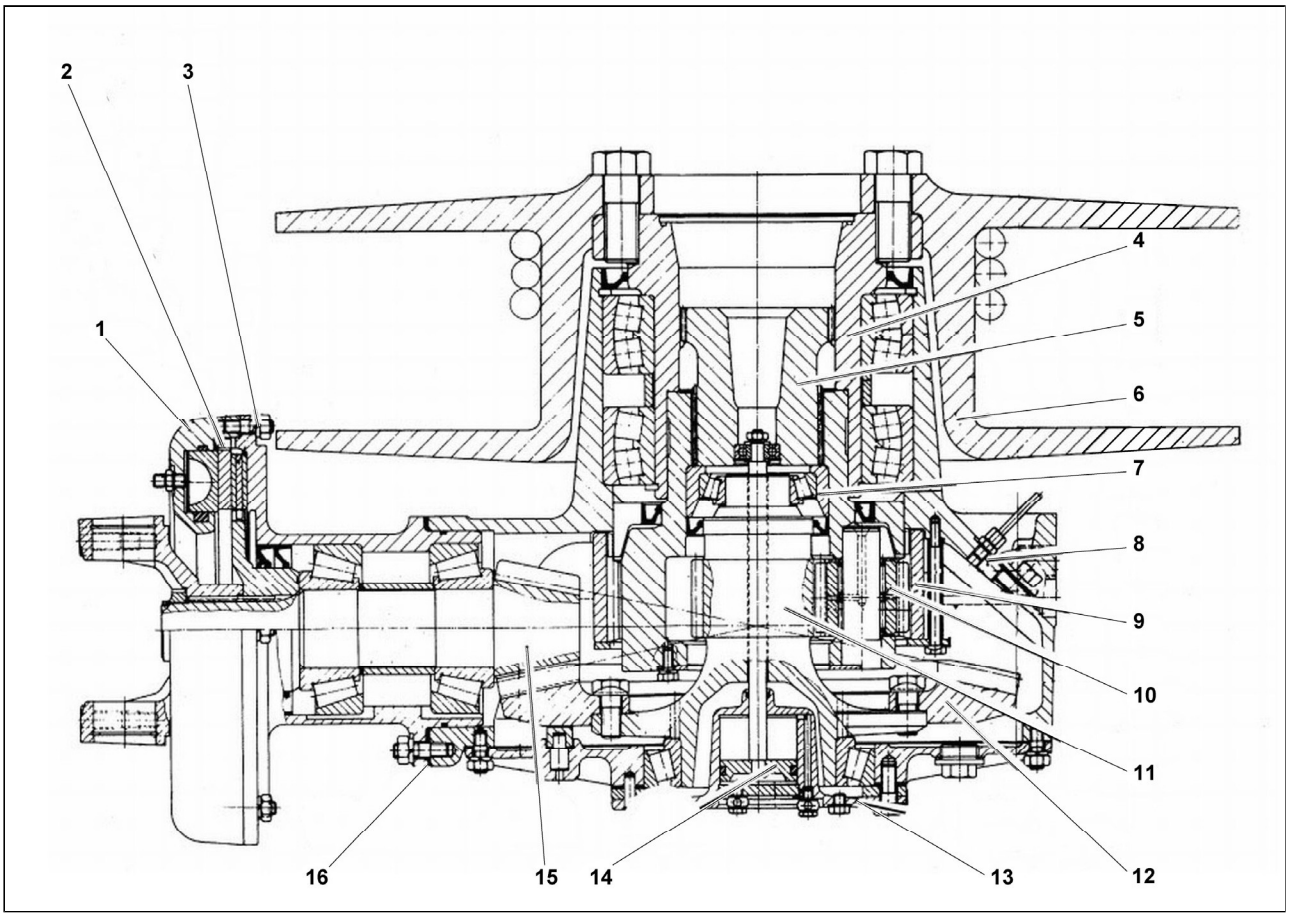
Publication numer: 03-0254-ENG/00

TATRA, a.s. **1-st Edition 28-2-2007**

17 WINCH

17.1 Description and Main Technical Specifications

The vehicle BEML - TATRA **T 815 - 26RR36 22 255 6x6.1R/50T** is fitted with a one-cable winch with epicyclic gear (See Fig. **17.1**).
Instructions for the use of the winch are mentioned in the Driver´s Manual.



Legend: ***1*** *- brake hub;* ***2*** *- pressure plate;* ***3*** *- plate;* ***4*** *- drum shaft;* ***5*** *- engagement shaft;* ***6*** *- winding drum;* ***7*** *- satellite housing;* ***8*** *- winch housing;* ***9*** *- annulus;* ***10*** *- planet wheel;* ***11*** *- crown gear hub;* ***12*** *- crown gear;* ***13*** *- lower cover;* ***14*** *- engagement piston;* ***15*** *- pinion;* ***16*** *- adjusting washer*

Fig. 17.1 Cross-section of winch

The winch is designed to induce the power effect of the vehicle in three directions. It is driven by the shaft of auxiliary gearbox - the winch drive shaft, which comprises a safety element - friction coupling. The drive moment is transmitted via the carrier to the pinion of bevel gearing and via its crown gear and hub to the epicyclic reduction gear of its sun gear. The epicyclic reduction gear transmits the reaction moment to the winch housing by the sun gear and the drive moment via the satellite housing, engagement shaft to the drum shaft. To the shaft is attached the drum complete with cable. By winding up the cable, the force is transmitted to the load to be recovered. The winch transmission gears are located in two-part housing and in pinion hub. The position of the load may be arrested in any position by means of a disc brake controlled electro-pneumatically by the switch.

The switch is placed on the instrument board.

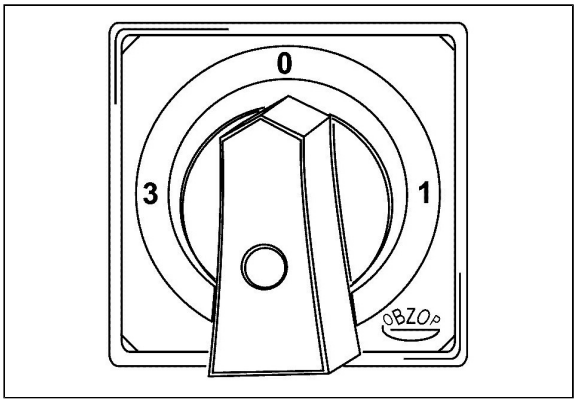


Fig. 17.2 Winch control switch

Epicyclic gear, winch bevel gear

The annulus of the epicyclic gear is located in the upper half of the housing by means of splines. The satellite housing is pivoted in the drum shaft and this is supported on two spherical-roller bearings in the upper half of the housing. The satellite housing is connected with the drum shaft by means of an engagement shaft, which is controlled electro-pneumatically by the switch (See Fig. **17.2**). The teeth of the sun gear are milled in the hub of the bevel gear. The bevel gear hub is supported on two tapered roller bearings, one in the lower half of the satellite housing, the other in the lower part of the winch housing. The wheel of the bevel gearing is fitted on its proper hub and supported by a support for extreme loads. Bevel gear pinion is supported on tapered roller bearings in pinion hub and it carries on its splined end the brake hub and the carrier of the universal joint to couple the winch drive.

The drum shaft is carried in two spherical-roller bearings. To its flange is attached the drum complete with the fastening device of the cable.

The winch housing consists of two parts and it also includes the pinion hub and brake hub. The individual parts are connected by means of bolts.

The winch brake is of single-plate type, controlled pneumatically by the switch (See Fig. **17.2**). The brake plate is carried by the hub connected with the bevel gear pinion and universal joint carrier of the winch drive. The plate is clamped between thrust plates by an annulus-shaped piston operated by the compressed air. After the brake is released, the plate is automatically released.

Winch engagement

The winch drum is disengaged pneumatically by the closing cock situated on bracket of the rear cluster lamp. When position of the engagement shaft is changed, the winch drum shaft is released and this can turn freely.

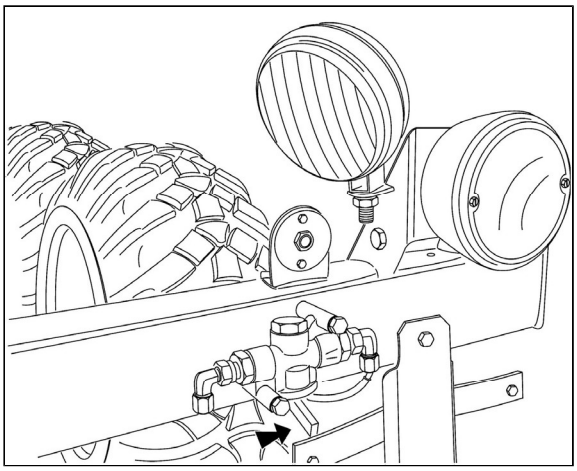


Fig. 17.3 Winch drum disengaging cock

Friction coupling

To ensure the cable cannot rupture, a plate friction coupling **2** is incorporated in the winch drive **1**. Its function consists in the fact that when nominal pull force is exceeded, the coupling slips and the force in the cable drops in proportion to the difference between static and dynamic coefficients of friction and remains on this value until the winch drive stops. When the pull force drops under the nominal value, the coupling stops slipping and the winding goes on, i.e. the function of the winch is reestablished without any intervention. The coupling may continuously slip for 15 seconds max. The adjustment of the nominal load to the slip moment to 2,150 ± 50 Nm also protects other parts of the winch. The coupling is located in a box, which consists of two halves connected by bolts. The coupling proper consists of plates and friction faces, which form a friction couple. The thrust is secured by Belleville washers, whose efficiency may be controlled by means of a nut. The adjustment is locked by means of a pin of one of the plugs provided for filling and checking the oil level.

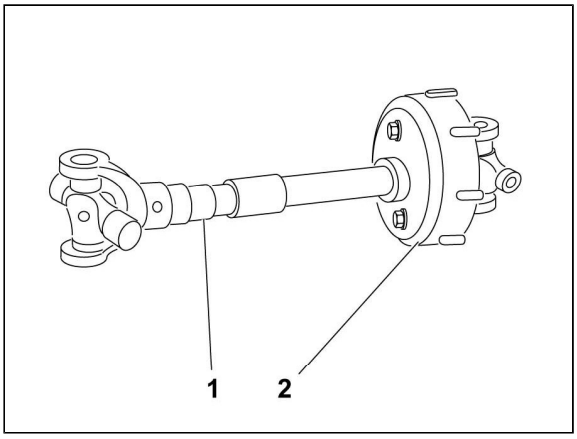


Fig. 17.4 Winch drive

The winch **3** is attached to the auxiliary frame by means of the winch frame **9**, to which is connected by screws **8** c/w spring washers **4**. The winch frame **9** is attached together with the winch to brackets on longitudinal beams of the auxiliary frame by bolts **12**, spring washers **1** and nuts **2**. To the cross girder of the auxiliary frame the winch is attached by means of bolts **7**, spring washers **6**, nuts **5** and screws **10** c/w spring washers.

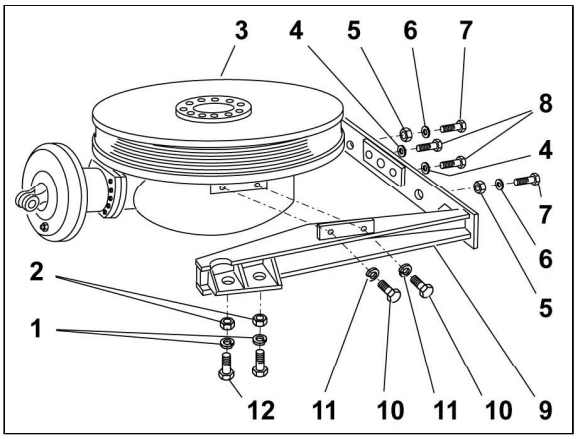


Fig. 17.5 Attachment of the winch

The cable can be uncoiled rearwards behind the vehicle via the sliding block **1** c/w brake mechanism attached to the rear bumper.

Via a big roller with lining **4** fitted on a pin of the big roller **3**, and screwed to the auxiliary frame, the cable can be uncoiled sideward (to the RH vehicle side) and in addition, via the side roller **2**, which is fixed to the vehicle platform, and sliding block **1** c/w brake mechanism, attached to the front bumper, the cable can be uncoiled forwards.

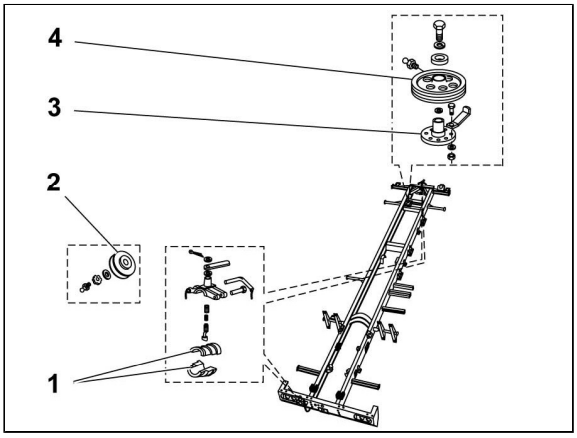
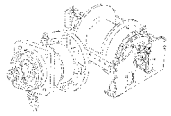
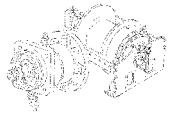


Fig. 17.6 Cable guide rollers



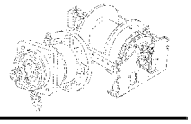
Tab. 17.1 Winch technical specifications

Data		Unit	Value
Maximum force when uncoiling 25 m of cable		Nm	117.7
Cable length		m	87
Cable length (working)		m	83
Cable diameter		mm	23.6
Friction coupling set to the friction moment		Nm	2 150 ± 50
Winch weight (w/o cable and oil charge)		kg	450
Cable weight		kg	175
Angles of cable uncoiling directions:			
Rearwards	- in the vertical plane	°	± 45
	- in the horizontal plane		± 45
Forwards	- in the vertical plane		± 15
	- in the vertical plane		± 20
To right-hand side (90°)	- in the vertical plane		± 15
	- in the vertical plane		± 15



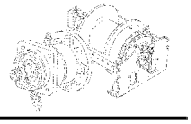
17.2 Faults Causes and Troubleshooting

Fault	Cause	Remedy	Mentioned in:
The cable brake mechanism is not functioning	Damaged part of the cable brake mechanism	Dismount the brake mechanism and replace the damaged part	(See Subchapter **17.5.3**)
Damaged or ruptured cable	Mechanical damage or cable overload	Replace the cable	(See Subchapter **17.5.4**)
Winch is not functioning	Some part of the winch has been damaged	Replace the winch	(See Subchapter **17.5.6**)
Winch frame has been damaged / deformed	Mechanical damage to winch frame	Replace the winch frame	(See Subchapter **17.5.6**)
Winch drive is not functioning	Some part of the winch drive has been damaged	Replace the winch drive	(See Subchapter **17.5.5**)
Winch drive, drum or brake cannot be engaged	Faulty electro-valves	Replace the electro-valves	(See Subchapter **17.5.7**)
Winch drum cannot be disengaged	Faulty closing cock	Replace the closing cock	(See Subchapter **17.5.8**)
Leaky winch pneumatic circuit	Loose screwed connection	Tighten the screwed connection	(See Chapter **17.5**)
	Damaged seal	Replace the damaged seal	
	Damaged manifold	Replace the damaged manifold	



17.3 List of Special Tools

No special tools have been prescribed for the mentioned technological procedures related to the winch BEML - TATRA **T 815 - 26RR36 22 255 6x6.1R/50T.**



17.4 Survey of Torque Specifications

No tightening torques have been prescribed for the mentioned technological procedures related to the winch BEML - TATRA **T 815 - 26RR36 22 255 6x6.1R/50T.**

17.5 Working Procedures

17.5.1 Oil Change in the Winch Housing

a) Reason for Oil Change

1. Regular oil changes according to the TDS classification (see Service Booklet) after three years of operation at the latest.

b) Technical Conditions

1. Replace sealing rings with new ones.
2. Fill with the oil as specified by the manufacturer.
3. No oil leakage through the drain plug is allowed after the oil change.

c) Oil Change Procedure

1. Unscrew the filler plug from the upper part of the winch housing.
2. Dismount the drain plug from the lower part of the winch housing.
3. Drain oil into a pan prepared.
4. After the oil is drained through the drain plug, remount it back together with a new sealing ring.
5. Fill fresh oil up to the lower edge of the filler hole.
6. Mount filler plug c/w new sealing into the winch housing.

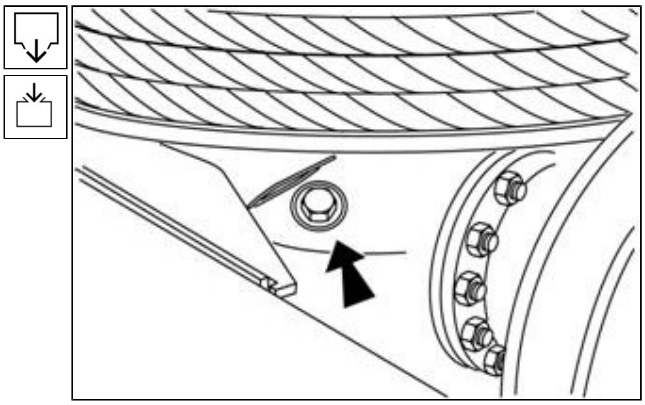


Fig. 17.7 Filler plug of winch housing

17.5.2 Oil Change in the Winch Drive Friction Coupling

a) Reason for Oil Change

1. Regular oil changes according to the TDS classification (see Service Booklet) after three years of operation at the latest.

b) Technical Conditions

1. Replace the sealing ring with a new one.
2. Fill with the oil as specified by the manufacturer.
3. No oil leakage through the drain plug is allowed after the oil change.

c) Oil Change Procedure

1. Turn the friction coupling so that one of plugs is situated in the lower position.
2. Unscrew the plug and drain oil into a pan prepared.
3. Turn the friction coupling so that hole and plug are in the horizontal position.
4. Fill the fresh oil up to the lower edge of the hole and screw the plug c/w new sealing ring.

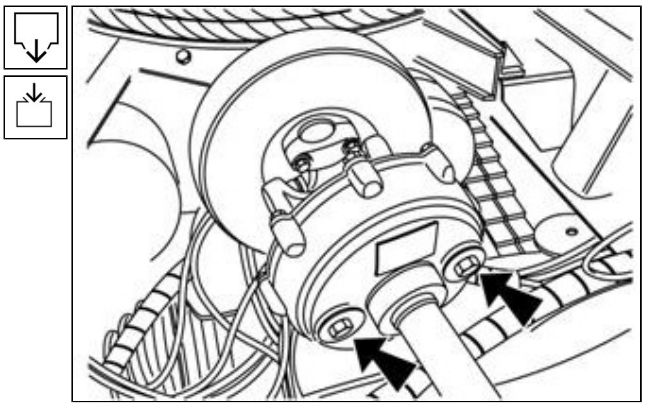


Fig. 17.8 Friction coupling plugs

17.5.3 Removal and Installation of the Cable Brake Mechanism

a) Reason for Removal

1. The cable brake mechanism is not functioning.

b) Technical Conditions

1. No ones have been stipulated.

c) Removal Procedure

1. Turn to unlock and remove the safety pin **8** from sleeve **4** and tilt the sleeve away from the sliding block holder.
2. Remove the split pin **7**.
3. Unscrew the brake mechanism handle **6** from the brake pin **1** and remove washers **5**.
4. Remove brake pin **1** and springs **2** and **3** from the sleeve **4**.

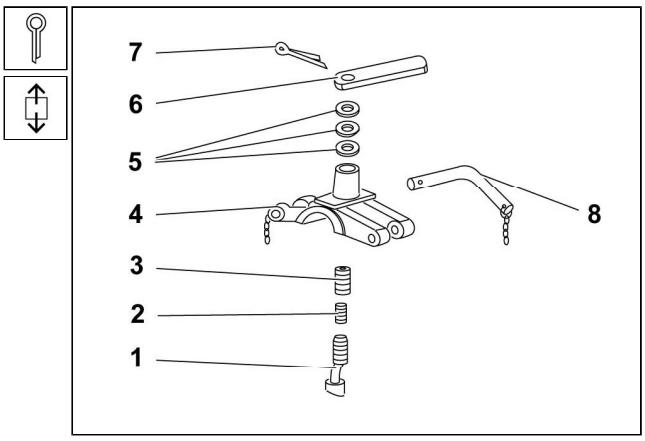


Fig. 17.9 Cable brake mechanism - removal

d) Installation Procedure

1. Fit springs **2** and **3** on the brake pin **1**.
2. Fill the space among coils of springs **2** and **3** with the specified plastic lubricant.
3. Slide the brake pin **1** into sleeve **4**.
4. Press the springs, fit washers **5** (3 pcs) on the brake pin **1**, mount the brake mechanism handle **6** and secure with a split pin **7**.
5. Tilt the sleeve **4** towards the sliding block holder, and insert the safety pin **8** and turn to lock it.

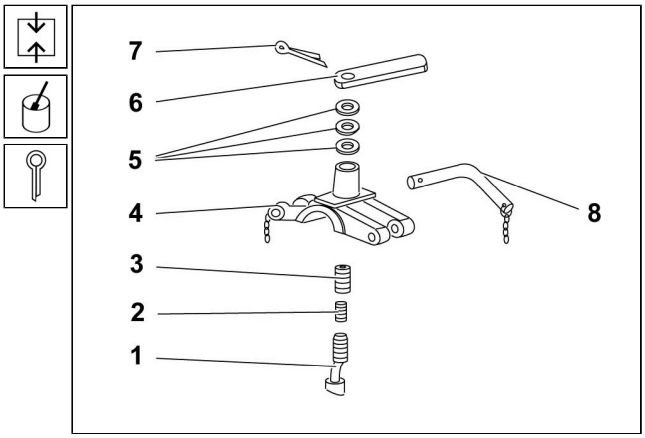


Fig. 17.10 Cable brake mechanism - installation

17.5.4 Removal and Installation of the Cable

a) Reasons for Removal

1. Damaged or worn cable.
2. Broken cable.

b) Technical Conditions

1. Unwind the new cable before winding it on - no loops are allowed.
2. Replace lock washers with new ones.

c) Removal Procedure

1. Unwind the cable from the drum according to a procedure mentioned in the Operation Manual and remove from the sliding block.
2. Unlock lock washers **3** of screws **2**.
3. Dismount screws **2**.
4. Withdraw the lock washers **3** and shim **1** of the cable.
5. Withdraw the cable **4** from hole in the drum.

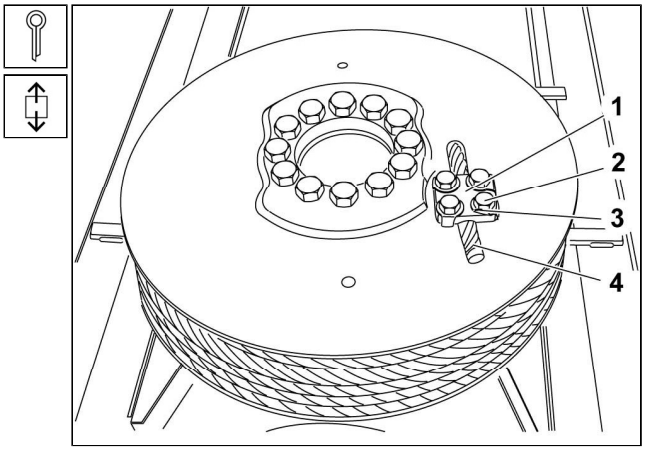


Fig. 17.11 Cable - removal

d) Installation Procedure

1. Slide the cable **4** into a hole in the drum.
2. Use the cable shim **1**, lock washers **3** and screws **2** to secure the cable **4** on the drum in position.
3. Bend off lock washers **3** over screw heads to lock the screws **2**.

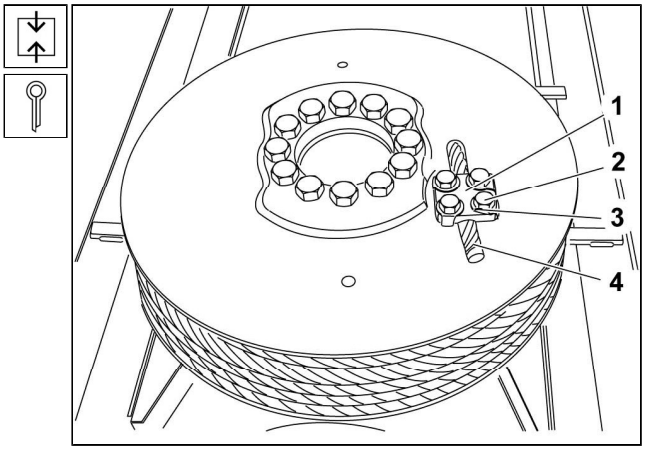


Fig. 17.12 Cable - installation

4. Slide the cable into the sliding block and wind on the drum according to a procedure mentioned in the Operation Manual. Smear the cable with petroleum jelly to preserve it.

   CAUTION:
   Wind up two coils of the cable without any load at least.

17.5.5 Removal and Installation of the Winch Drive

a) Reasons for Removal

1. The winch has been damaged to an extent, which prevents it from a proper function.
2. Removal of auxiliary gearbox.
3. Removal of winch.

b) Technical Conditions

1. The batteries circuit breaker turned off.
2. The winch control switch in position '0'.
3. Friction coupling set to the slip moment of 2,150 ± 50 Nm.
4. The cross pin of the friction coupling must be installed on the winch carrier.

c) Removal Procedure

1. Remove two inner lock rings **7** securing the bearings bushes **5** in position.
2. Unscrew four screws **3** c/w spring washers **4** from the carrier **6**, hold the bearings bushes **5** on the cross pin and remove two yokes **2**.

   CAUTION:
   Mark the yokes 6 and install them in the original place.

3. Secure the bearings bushes **5** on the cross pin in a suitable manner (using wire or string).
4. Remove the winch drive **1** from carrier of the auxiliary gearbox as per points 1 through 3 and remove it.

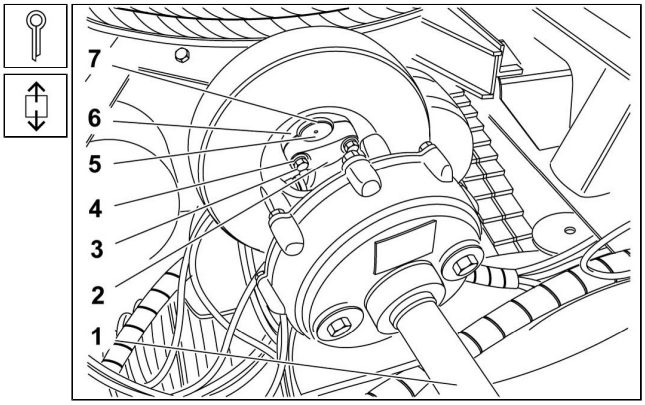


Fig. 17.13 Winch drive - removal

d) Installation Procedure

1. Slide the winch drive **1** into carrier **6**.
2. Fit two yokes **2** and attach these using screws **3** c/w spring washers **4**.

   CAUTION:
   Mount the marked yokes 2 in the original place.

3. Secure the bearings bushes **5** with inner lock rings **7**.
4. Install the winch drive **1** onto carrier of auxiliary gearbox as per points 1 through 3.

   Note:
   Remember to mount the lubricating nipples into bearings bushes **5** on both sides of the winch drive during installation of a new winch drive **1**.

5. Check the winch drive for a correct function.

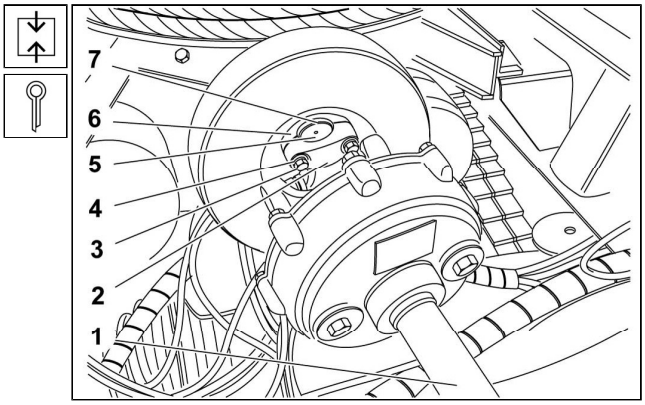


Fig. 17.14 Winch drive - installation

17.5.6 Removal and Installation of the Winch

a) Reasons for Removal

1. Damage to an extent, which prevents it from a proper function.
2. Damaged / deformed winch frame.
3. Removal of auxiliary frame.

b) Technical Conditions

1. The batteries circuit breaker turned off.
2. The winch control switch in position '0'.

c) Removal Procedure

1. Dismount the winch cable according to a procedure mentioned in: (See Subchapter **17.5.4**).
2. Dismount the winch drive from the winch carrier according to a procedure mentioned in: (See Subchapter **17.5.5**).
3. Detach the air manifold from the screwed connection on the winch brake and from two screwed connections on the lower cover of the winch housing.
4. Hang up the winch on a suitable lifting device.

   CAUTION:
   Keep safety precautions valid for the work with a hanging load.

5. Unscrew nuts and withdraw spring washers from bolts **2** fixing the winch frame **1** to brackets on longitudinal beams of the auxiliary frame and remove the bolts.

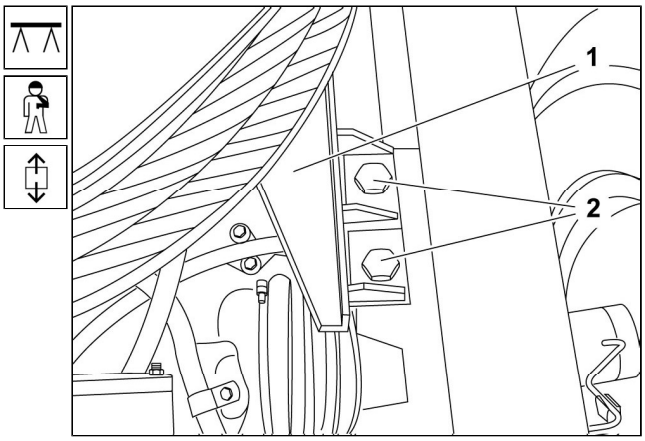


Fig. 17.15 Attachment of the winch frame to the frame longitudinal beam - removal

6. Unscrew nuts and withdraw spring washers from bolts **1** fixing the winch frame **4** to the cross girder of auxiliary frame **3** and remove the bolts.
7. Unscrew bolts **2** c/w spring washers fixing the winch together with the winch frame **4** to the cross girder of auxiliary frame **3**.
8. Move the winch with bolted winch frame **4** away from the auxiliary frame and place on a suitable stand.

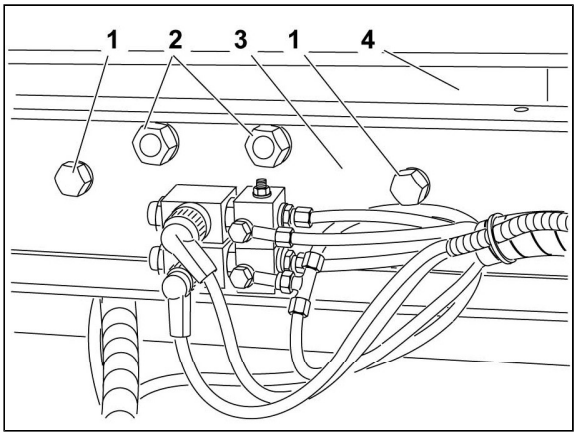


Fig. 17.16 Attachment of the winch to the frame cross girder - removal

9. Unscrew screws **4** c/w spring washers **3** and withdraw the winch frame **2** from winch **1**.

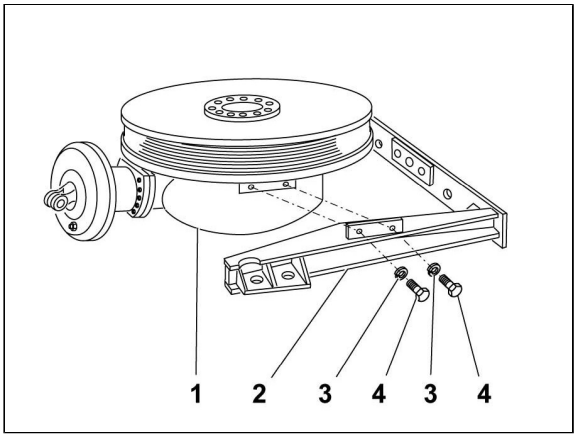


Fig. 17.17 Winch frame - removal

d) Installation Procedure

1. Fit the winch frame **2** to winch **1** and attach using screws **4** c/w spring washers **3**.

   Note:
   Mount the bleeding line on the winch housing when installing a new winch.

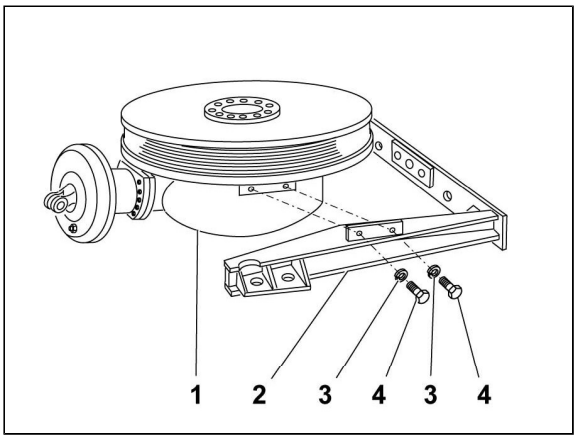


Fig. 17.18 Winch frame - installation

2. Use a suitable lifting device to fit the winch with screwed winch frame **4** into auxiliary frame. **Do not disconnect** the lifting device **!**

   CAUTION:
   Keep safety precautions valid for the work with a hanging load.

3. Screw bolts **2** c/w spring washers fixing the winch together with the winch frame **4** to the cross girder of auxiliary frame **3**.
4. Use bolts **1**, spring washers and nuts to fix the winch frame **4** to the cross girder of auxiliary frame **3.**

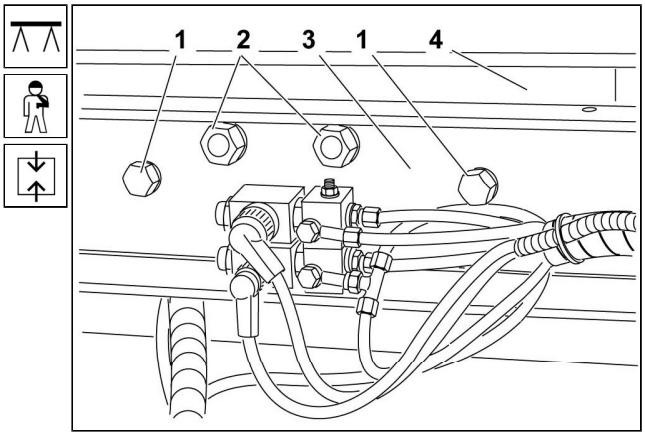


Fig. 17.19 Attachment of the winch to the frame cross girder - installation

5. Use bolts **2**, spring washers and nuts to attach the winch frame **1** to brackets on longitudinal beams of the auxiliary frame.

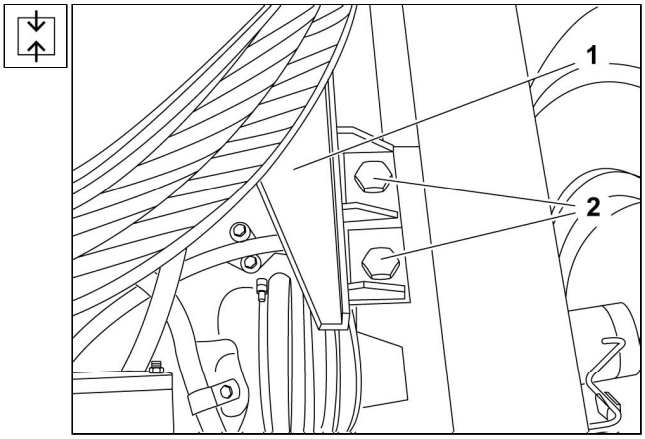


Fig. 17.20 Attachment of the winch frame to the frame longitudinal beam - installation

6. Disconnect the lifting device.
7. Connect the air manifold to the winch brake and two manifolds to the lower cover of the winch housing.
8. Install the winch drive to the winch carrier according to a procedure mentioned in: (See Subchapter **17.5.5**).
9. Install the winch cable according to a procedure mentioned in: (See Subchapter **17.5.4**).
10. Turn on the batteries circuit breaker and check the winch for a correct function.

17.5.7 Removal and Installation of Electro-valves

a) Reasons for Removal (valid for both electro-valves)

1. The winch drive, winch brake and drum engagement cannot be engaged.
2. Mechanical damage to valve.
3. Leaky valve (air section).
4. Damaged electric part of the valve.

b) Technical Conditions

1. Mount electro-valves as mentioned in the Spare Parts Catalogue for the vehicle.
2. Release air from the source air reservoir using a manual drain valve before installation of electro-valves.
3. Mark individual air manifolds and electric leads before installation (to prevent their confusion).
4. The winch control switch in position '0'.
5. Replace all sealing rings with new ones.

c) Removal Procedure

1. Set the vehicle parking brake and switch the batteries circuit breaker off.
2. Disconnect electric leads **1** and **2** from electro-valves.
3. Unscrew the hollow screw **4** of the winch brake manifold and hollow screw **3** of the winch drive and drum engagement manifold from electro-valves.
4. Unscrew the constant air pressure inlet manifold **7** and constant air pressure manifold **8** of the drum disengagement cock from electro-valves.
5. Unscrew nut **6** c/w spring washer and washer from bolt **5**, remove the bolt and withdraw both electro-valves from the cross girder of the auxiliary frame.
6. Remove sealing ring fitted between the electro-valves.

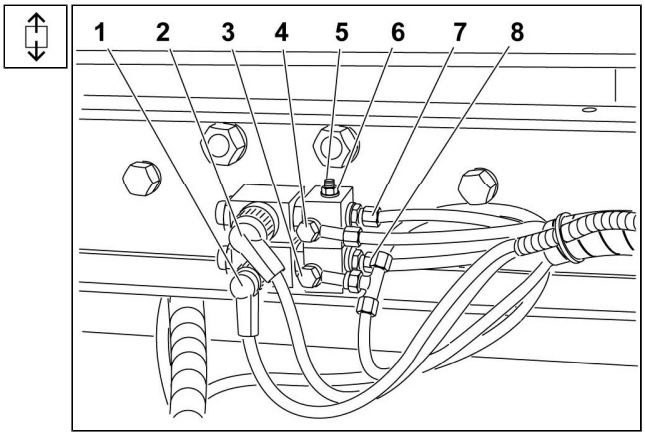


Fig. 17.21 Electro-valves - removal

d) Installation Procedure

1. Insert sealing ring between electro-valves.
2. Use bolt **5**, washer, spring washer and nut **6** to attach the electro-valves to the cross girder of the auxiliary frame.
3. Attach the constant air pressure manifold **8** of the drum disengagement cock and constant air pressure inlet manifold **7** to electro-valves.
4. Use the hollow screw **3** to mount the drum and winch drive engagement manifold and the hollow screw **4** to mount the winch brake manifold to electro-valves.
5. Connect electric leads **1** and **2** to electro-valves.

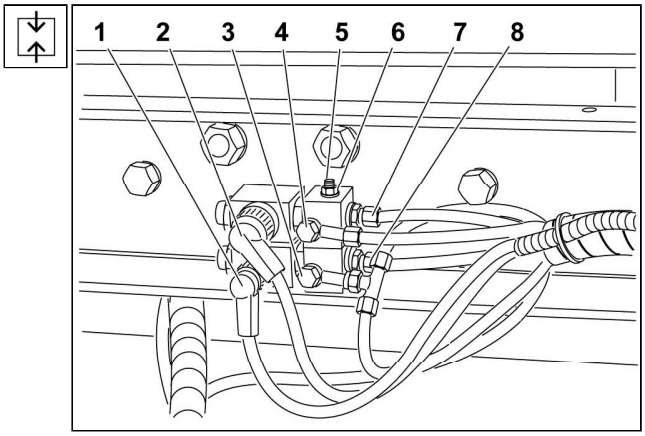


Fig. 17.22 Electro-valves - installation

7. Turn on the batteries circuit breaker and pressurize the vehicle pneumatic system to the operating pressure.
8. Check both electro-valves for leaks and a correct function.

17.5.8 Removal and Installation of the Drum Disengagement Closing Clock

a) Reasons for Removal

1. The cock is not functioning.
2. Mechanical damage to cock.
3. Leaky cock.

b) Technical Conditions

1. Release air from the source air reservoir using the manual drain valve before removal.
2. Mark the individual air manifolds before starting with removal (not to confuse them).
3. The winch control switch in position '0'.

c) Removal Procedure

1. Unscrew manifold **1** (constant pressure) and manifold **6** (drum disengagement) from L-couplings **2**.
2. Disconnect two screwed connections **4** and withdraw the closing cock **5** from bracket of the rear right-hand cluster lamp.
3. Unscrew L-couplings **2** from necks **3**.
4. Unscrew necks **3** from the closing cock **5**.

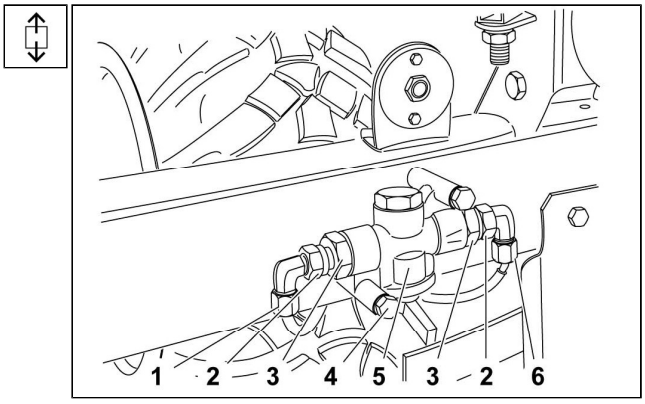


Fig. 17.23 Closing cock - removal

d) Installation Procedure

1. Mount necks **3** into closing cock **5**.
2. MountL-couplings **2** on necks **3**.
3. Use two screwed connections **4** to attach the closing cock **5** to bracket of the rear right-hand cluster lamp.
4. Screw the manifold **1** (constant pressure) and **6** (drum disengagement) on L-couplings **2**.
5. Pressurize the vehicle pneumatic system to the operating pressure.
6. Check the closing cock for leaks and a correct function.

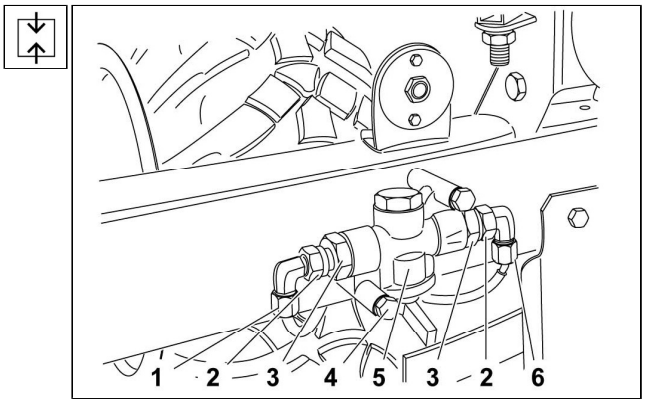


Fig. 17.24 Closing cock - installation