



Metro™

P3010  
Los Angeles LRV

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## COUPLER



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## Section 0300 RUNNING MAINTENANCE & SERVICING MANUAL



## LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line.

Total number of pages in this section (0300) is **144** consisting of the following:

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## SAFETY SUMMARY

Some of the procedures in this section are preceded by warnings/cautions regarding potential hazards in handling this equipment. These warnings/cautions should be carefully read and understood before proceeding. Failure to observe these precautions may result in serious injury to personnel performing the work and/or bystanders. The key warnings for this equipment are as follows:

**Electrical** - The electrical equipment described in this section operates at voltages and currents that are extremely dangerous to life. Personnel should closely observe all generally prescribed cautions and warnings before performing any work on the LRV.

**Chemicals** – Follow safety precautions for handling hazardous chemicals as provided by the manufacturer. The manufacturer's warnings should be closely heeded to avoid personal injury.

**Location** – Special caution should be taken when accessing or servicing equipment located on the roof and under the car.

**Weight** – To prevent possible personal injury when attempting to remove or install equipment on the vehicle, adequate support of a lifting device must be used to prevent the equipment from falling. Personnel's failure to heed these warnings could result in severe injury or death and or damage to the equipment.

**Contact** – Some components in this equipment attain temperatures that can cause severe burns. Closely follow all warnings and recommended procedures for handling these components.

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## CHAPTER 1.0

### GENERAL DESCRIPTION

#### **1.1 Introduction**

The Dellner Coupler is designed to enable rail vehicles to couple automatically. This coupling is accomplished at low speed without manual assistance and resulting in a rigid, slack free and fully latched connection. In addition, with the designed centering arrangement it allows for both horizontal and vertical track variations. See Figure 1-1.

Uncoupling of the mechanism head can be accomplished either remotely from driver's cab or at the coupler itself using manual release. Once the rail vehicles have moved apart, the couplers are automatically reset and ready to be coupled again.

Automatic coupling of the electrical head, which carry the train line electrical requirements, will automatically occur when mechanical coupling is affected.

#### **1.2 Reference Data**

Table 1-1. Reference Data

Distance from front of coupler mating face to mounting face in car underframe	1610 mm
Max. horizontal pivoting angle	34°
Max. vertical pivoting and centering angle	8°
Total weight	382 kg
Compressive Yield Strength	445 kN
Tensile Yield Strength	445 kN
Coupler Height	510 mm TOR to coupler centerline

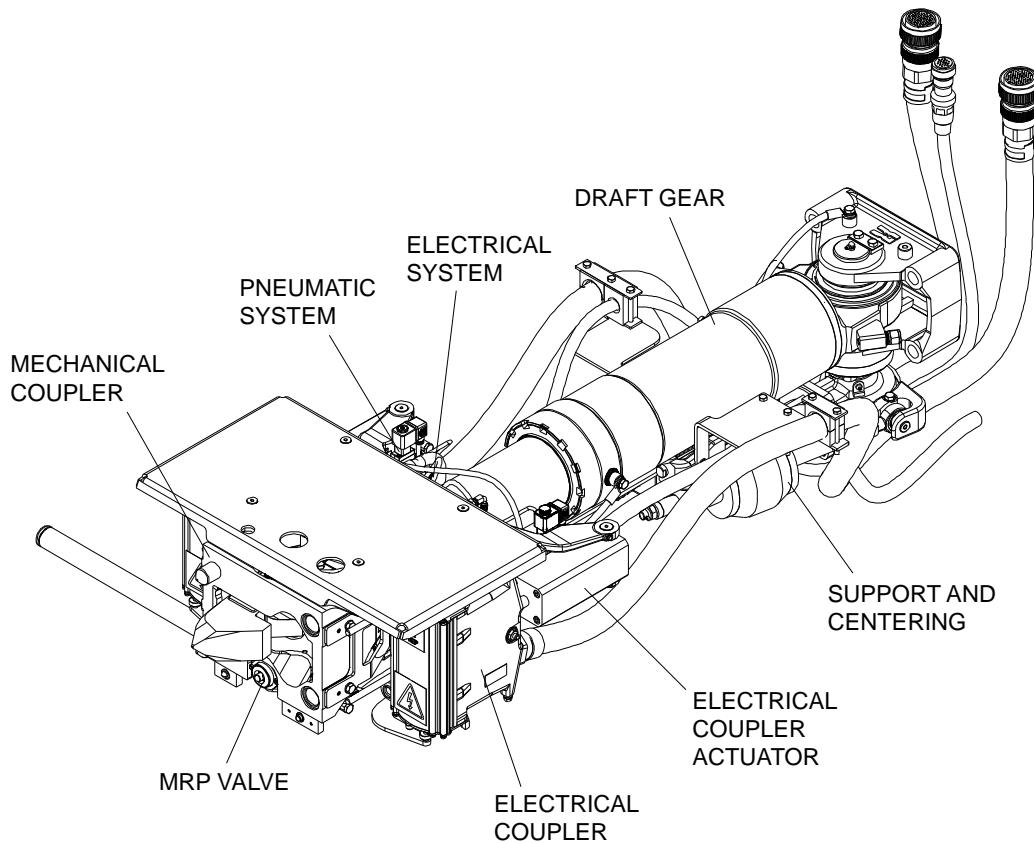


Figure 1-1: Automatic Coupler

### 1.3 Acronyms

ECR	Electrical Coupler Retract
ECS	Electric Coupler Switch
ft.	Feet
ft-lbs.	Foot-Pounds
kg	Kilogram
kN	Kilo Newton
LACMTA	Los Angeles County Metropolitan Transportation Authority
lb.	Pound
LRV	Light Rail Vehicle
mm	Millimeter
MRP	Main Reservoir Pipe
Nm	Newton Meter
psig	Pressure per Square Inch, Gauge
SAE	Society of Automotive Engineers
UCPB	Uncouple Pushbutton

## CHAPTER 2.0

### FUNCTIONAL DESCRIPTION

#### **2.1 Introduction**

The automatic coupler provides fully automatic mechanical, electrical, and pneumatic connections between married pairs.

#### **2.2 Equipment Description**

##### **2.2.1 Mechanical Coupler**

The coupling mechanism inside the mechanical coupler consists of the hook, uncoupling cam, and coil spring. The hook rotates around the main pin and the uncoupling cam rotates around the uncoupling shaft. See Figure 2-1.

The mechanical coupler head has two guide pins and two guide bushings on its front face. This serves for automatically aligning and centering when they are brought together.

On its front face, the mechanical coupler is provided with a broad plane edge for taking up compressive loads and impacts. Tractive loads are transmitted through hook to the buffer. These items are encased when coupled for protection from the environment.

The actuator attachment on the left and right sides are for mounting the electrical coupler actuators.

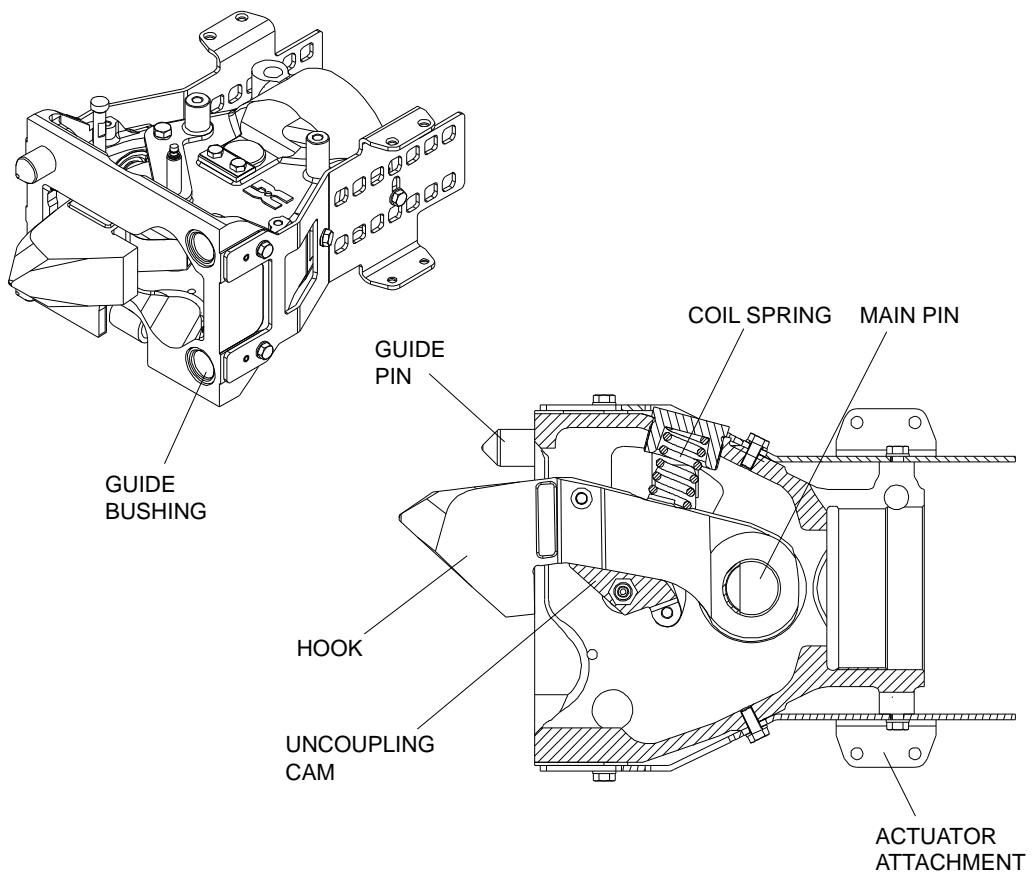


Figure 2-1: Mechanical Coupler

### 2.2.1.1 Coupling

The mechanical couplers are ready to couple. This is the normal condition for an uncoupled coupler. See Figure 2-2.

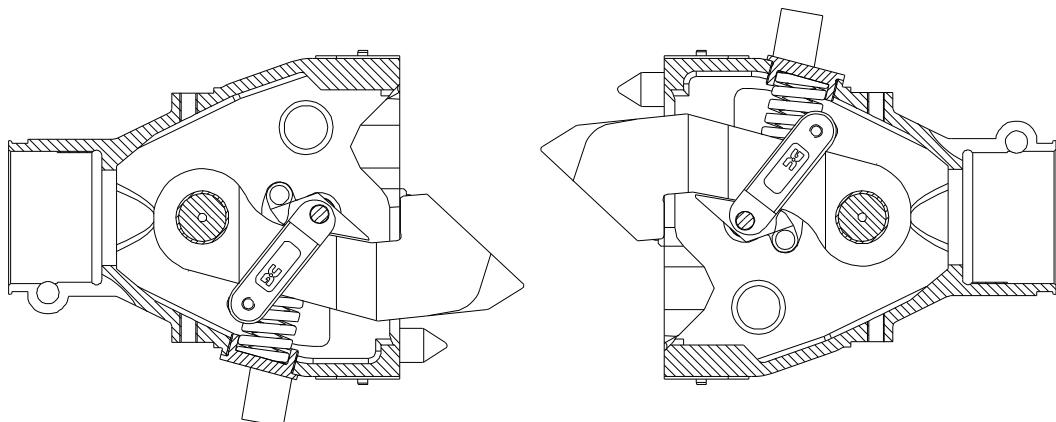


Figure 2-2: Ready To Be Coupled

The mechanical couplers are in coupled position. When two couplers meet, hooks engage each other. The coil spring serves to push the hook towards the coupled position, thereby forcing hook to maintain its position. See Figure 2-3.

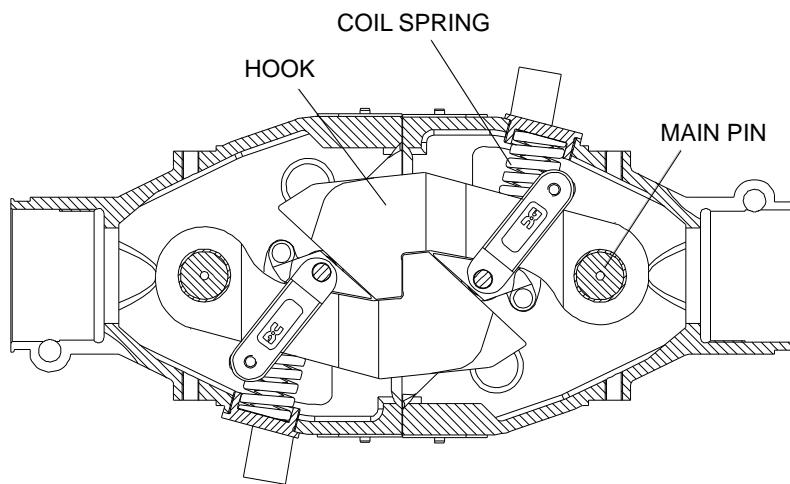


Figure 2-3: Coupled

Once coupling has been completed the forces in tension is transferred to main coupler body through main pin. In this position two coupler heads form a rigid and safe connection.

### 2.2.1.2 Uncoupling

Mechanical uncoupling can be accomplished in two ways, automatically (remotely) or manually (locally). In either case the function is as follows.

It is essential that any residual loads between cars be removed prior to uncoupling.

The uncoupling shaft is turned and thereby turns the uncoupling cam which pushes both hooks to uncoupled position. The cars can now be separated. See Figure 2-4.

To be able to manually uncouple, couplers have to be relaxed or buffed, otherwise excessive force will be required to rotate the uncoupling handle. Once vehicles have moved apart, couplers automatically reset and are ready to be coupled.

#### Automatic (Remote) Uncoupling

Automatic uncoupling is initiated by activating uncoupling cylinder located on top of the mechanical coupler. The cylinder piston causes uncoupling cam to rotate when activated.

This Uncouple Magnet Valve is energized by the Uncouple Pushbutton (UCPB) on the Upper Control Panel. However the electric portions must first be retracted before uncoupling. The electric portions are retracted by moving the Electric Coupler Switch (ECS) on the Upper Control Panel to the Isolate position.

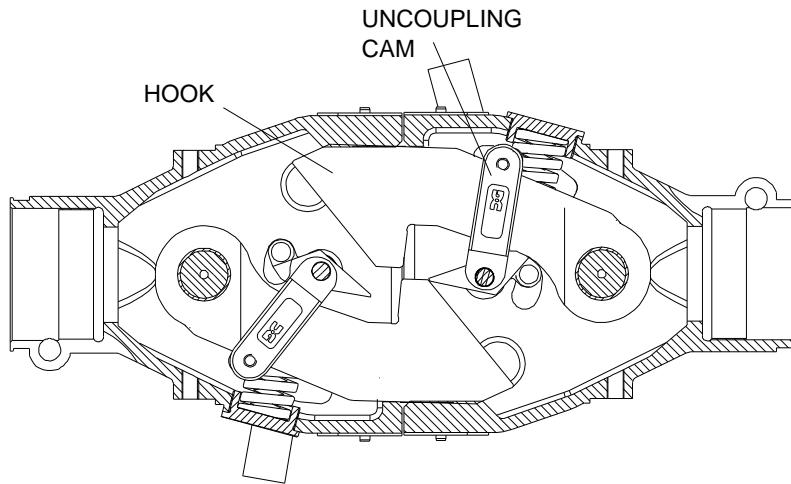


Figure 2-4: Uncoupled, Ready To Separate (Manual Uncoupling Shown)

### Manual (Local) Uncoupling

To be able to manually uncouple, couplers have to be relaxed or buffed, otherwise excessive force will be required to rotate the uncoupling handle.

Manual uncoupling is completed using uncoupling arm on the bottom, right side of mechanical coupler. Use the manual uncoupling handle stored in each cab to achieve enough force for uncoupling. When pulling handle, the uncoupling cam is turned. See Figure 2-5.

Uncoupling handle on either coupler must be pulled to rotate coupling mechanisms to uncoupled position.

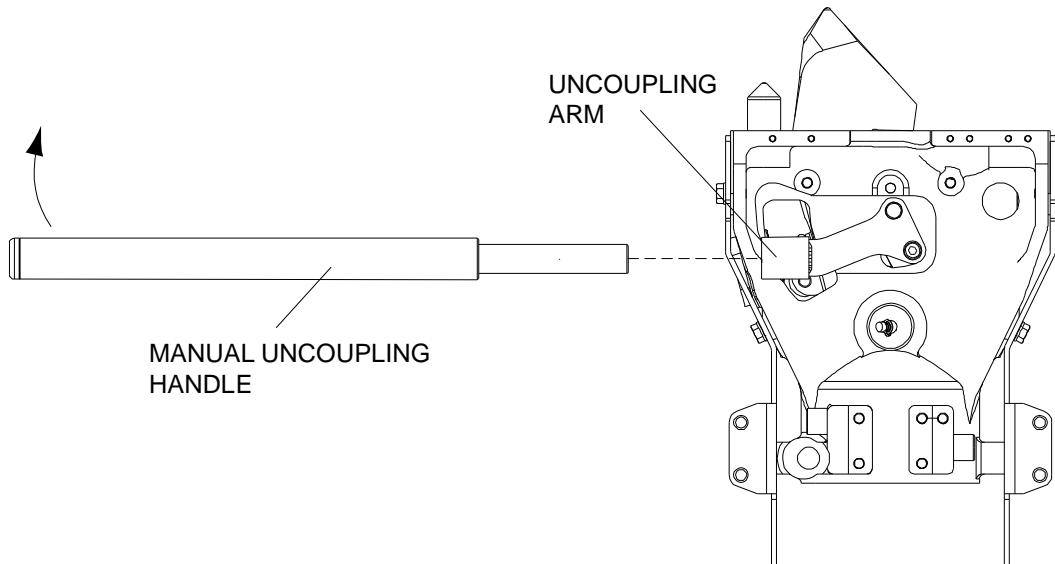


Figure 2-5: Manual Uncoupling (View From Bottom)

## 2.2.2 Draft Gear

The automatic coupler is equipped with a draft gear, which consists of a buffer, bearing bracket and a pivot shaft. The pivot shaft connects the buffer and bearing bracket. See Figure 2-6.

The draft gear utilizes the horizontal and vertical articulation as well as considerable resilience for buff and draft forces. The draft gear also allows for semi-automatic coupler installation to the mounting kit.

The buffer gives increased comfort and protects the coupler and the vehicle in an emergency situation. The buffer restores automatically to normal position after a loading.

The bearing bracket in the rear end of the draft gear allows the coupler to move horizontally, vertically and around its centerline. To prevent the coupler to move outside the horizontal limits end stops are mounted to each side of the buffer.

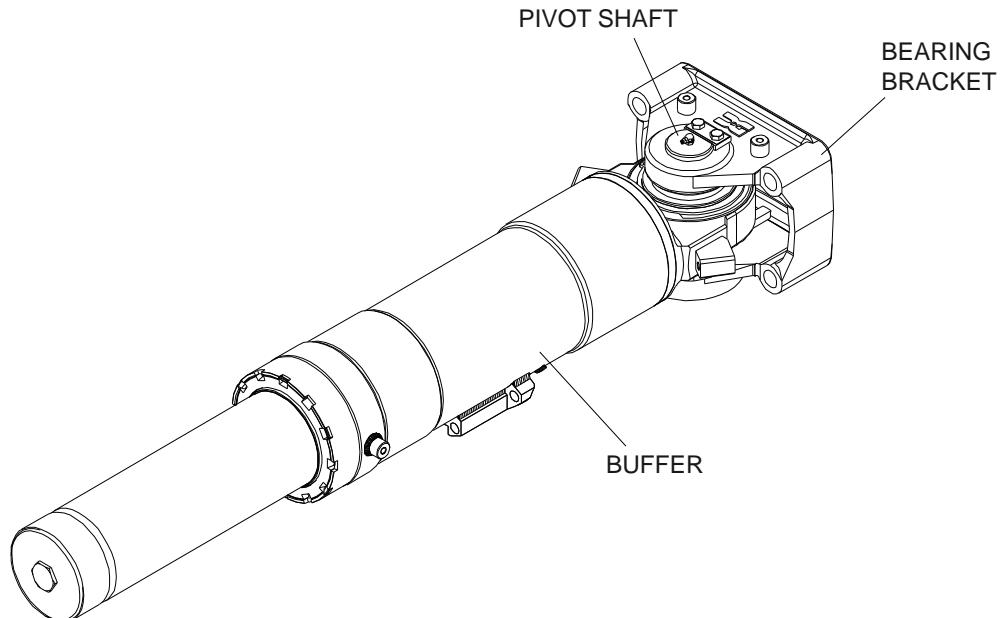


Figure 2-6: Draft Gear

### 2.2.2.1 Buffer

The loads are transmitted to the vehicle from the coupler mechanical head connection through the ring spring and the hydraulic buffer to the bearing bracket, which is fixed to the vehicle underframe. The purpose of the buffer is to absorb as much of these loads as possible. See Figure 2-7.

A guide rail, mounted underneath the buffer, prevents the hydraulic buffer from rotating inside the buffer tube and thereby rotating the mechanical coupler.

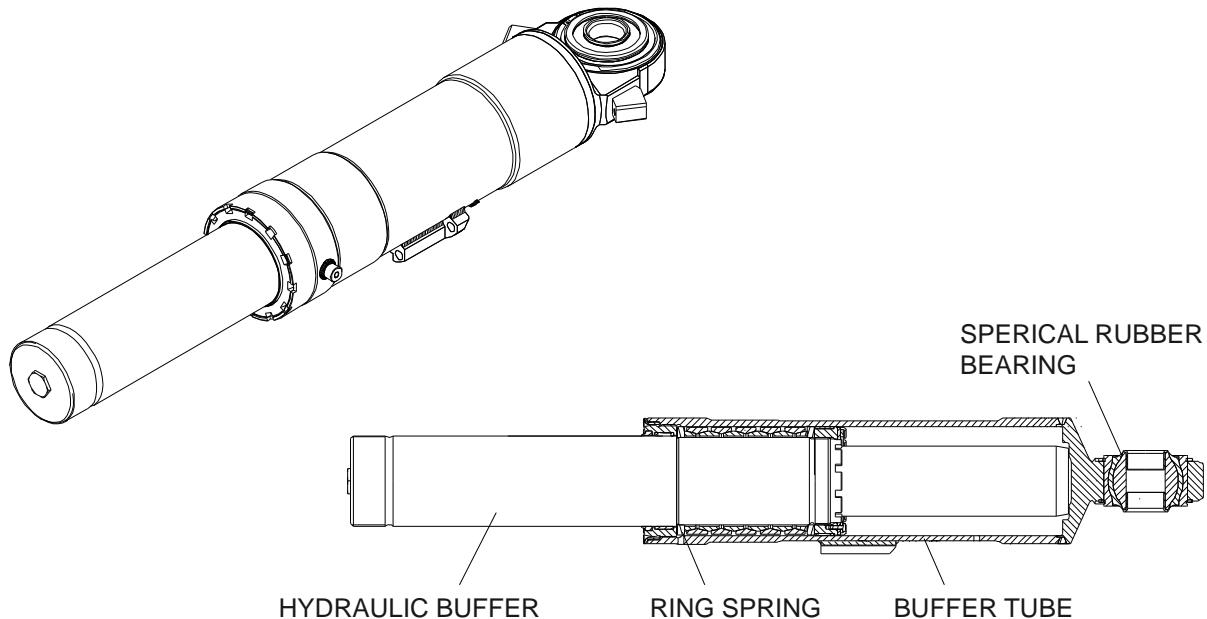


Figure 2-7: Buffer

### Working Principle

The buff loads are absorbed by the hydraulic buffer. The hydraulic buffer is basically a large gas-hydraulic shock absorber and works by transferring oil between two internal chambers. This provides for smooth operation during the complete absorption process. The buffer operates over a maximum stroke of 330 mm. See Figure 2-8.

The draft loads are absorbed by the ring spring. The ring spring consists of outer and inner rings acting together as a spring. The outer rings expand and the inner rings are compressed as the ring spring is compressed, thereby providing a spring force. The ring spring operates over a maximum stroke of 30 mm.

Smaller draft and buff loads can be absorbed by the spherical rubber bearing. Its main function, however, is to greatly extend the life of the pivot by reducing the effects of the shifts between draft and buff forces during normal operation.

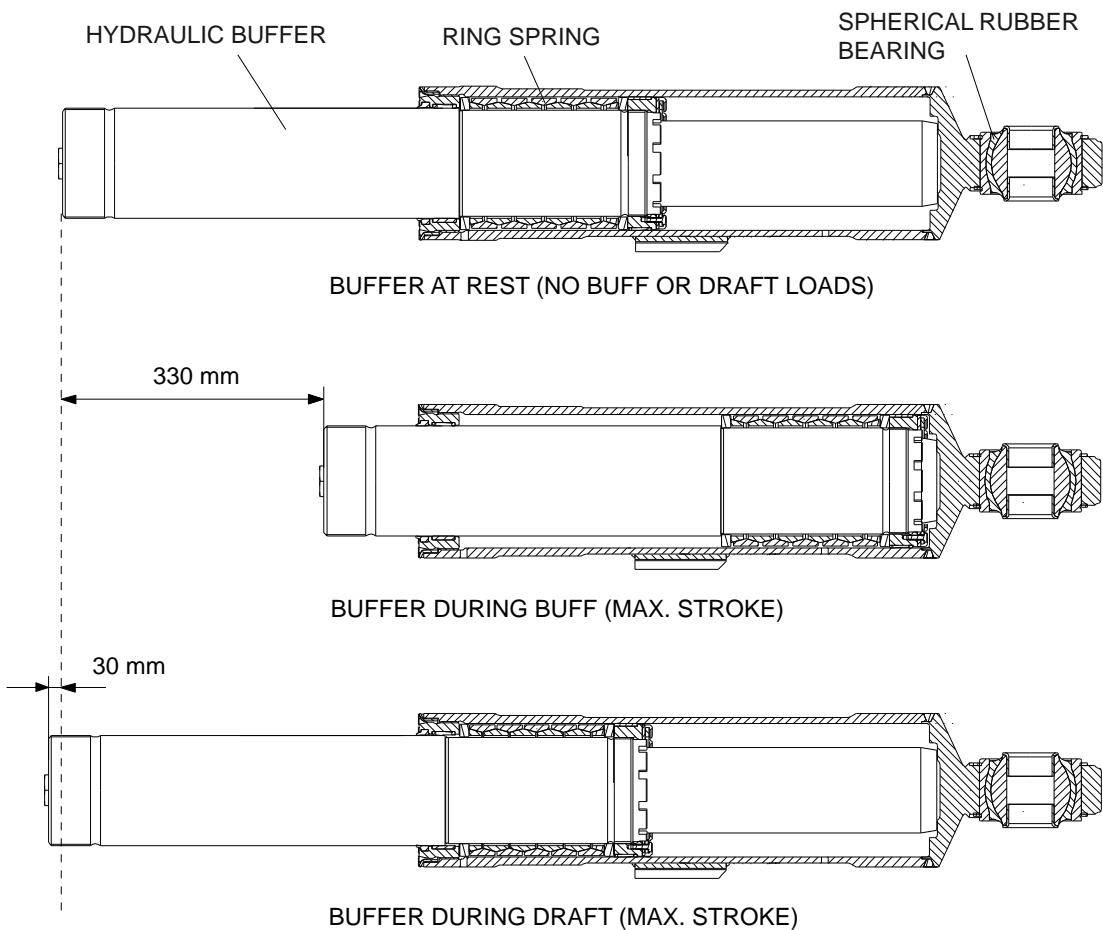


Figure 2-8: Buffer, Working Principle

### 2.2.3 Support and Centering

The support and centering supports and centers the automatic coupler vertically and laterally, and consists of spring assemblies, a centering house, a centering insert, a bracket complete and cable clamps.

The support and centering is mounted to the bearing bracket by the centering house and to the buffer by the bracket complete.

The support and centering has a feature called the active centering range ( $\pm 15$  degrees) for centering. A coupler positioned inside the active centering range will automatically center. A coupler positioned outside the active centering range will not automatically center, it will remain where it has been positioned. This will provide easy access to other components otherwise blocked by the coupler or enable coupling in curved tracks. Placing the coupler outside the active centering range will not prevent the coupler from swinging, which must be kept in mind when operating the coupler outside the active centering range. The coupler vertical position is adjusted by changing the length of the spring assemblies.

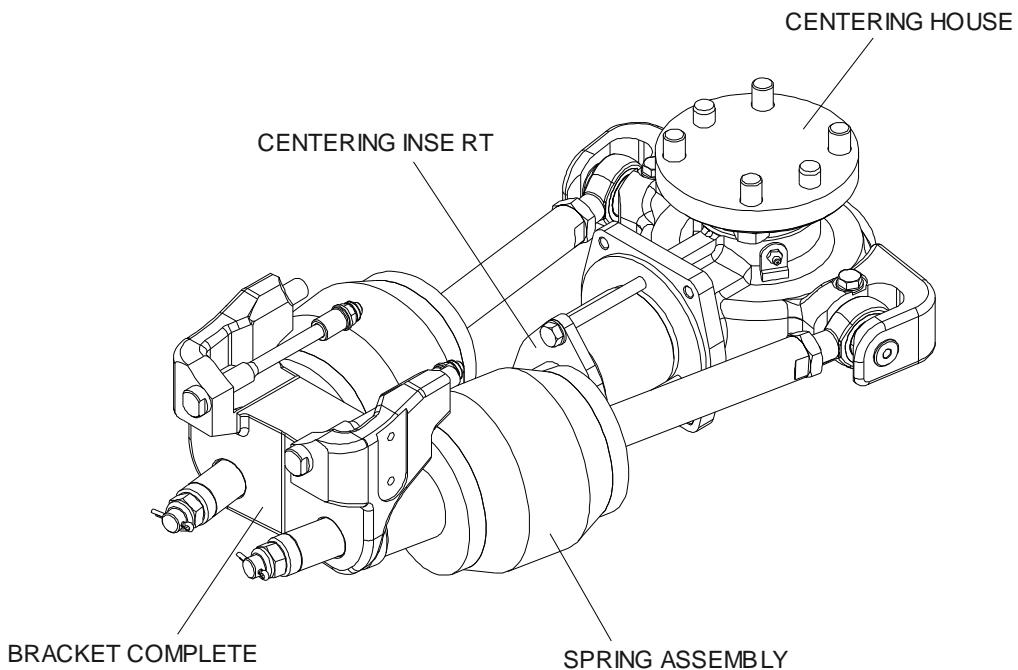


Figure 2-9: Support and Centering

### 2.2.3.1 Centering Insert and Centering House

The centering insert is a device whose purpose is to ensure that the coupler remains horizontally aligned with the vehicle centerline in order that coupling can be accomplished. At the same time the device stops an uncoupled coupler from swinging during transit and thereby avoids damage in the underframe of the car. See Figure 2-10.

The centering insert is a disc spring loaded piston fitted with a roller. The centering insert is mounted to the housing with its roller inserted into the recess of the cam disc.

The cam disc is mounted to the shaft, which is mounted to the underside of the bearing bracket. This allows the housing and centering insert to rotate around the shaft.

There are two flanged bearing mounted between the shaft and housing. The bearings are grease through a grease fitting.

Turning the coupler will transmit forces through the spring assemblies to the centering house. When the housing and centering insert rotates around the cam disc the roller is forced to roll in the cam disc recess, thus causing the disc springs to be compressed. The disc springs force the roller back to its resting position in the recess – automatic centering has been accomplished.

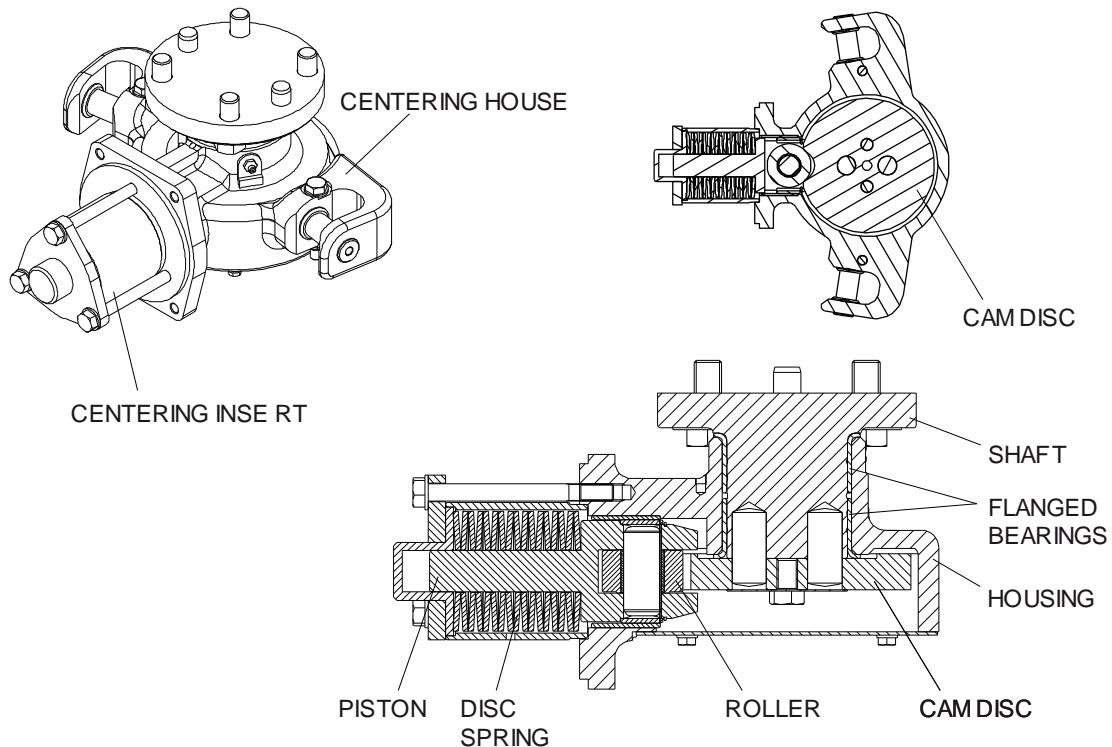


Figure 2-10: Centering Insert and Centering House

## 2.2.4 Electrical Coupler Left/Right

Moving electrical couplers on each side of the mechanical coupler provides for coupling of electrical signals. Each electrical coupler is mounted to an electrical coupler actuator and is extended/retracted by means of a pneumatic cylinder. See Figure 2-11.

The right electrical coupler has 84 silver pin contacts and the left electrical coupler has 84 silver sleeve contacts. The contacts are removable from the front without disassembly of the electrical coupler and wiring. The contacts are held in a non-conductive insulating block by a contact connection screw. Broken or worn contacts are replaceable if the insulating block is unbroken. The insulating block is fitted with a gasket around its perimeter.

When coupled, the mated electrical coupler gaskets seal and protect the contact areas. When uncoupled, the gasket mates with the electrical coupler cover and form a weather-resistant seal over the contact area. The cover is opened automatically by the arms as the electrical coupler extends. The cover also closes automatically by means of a spring mechanism.

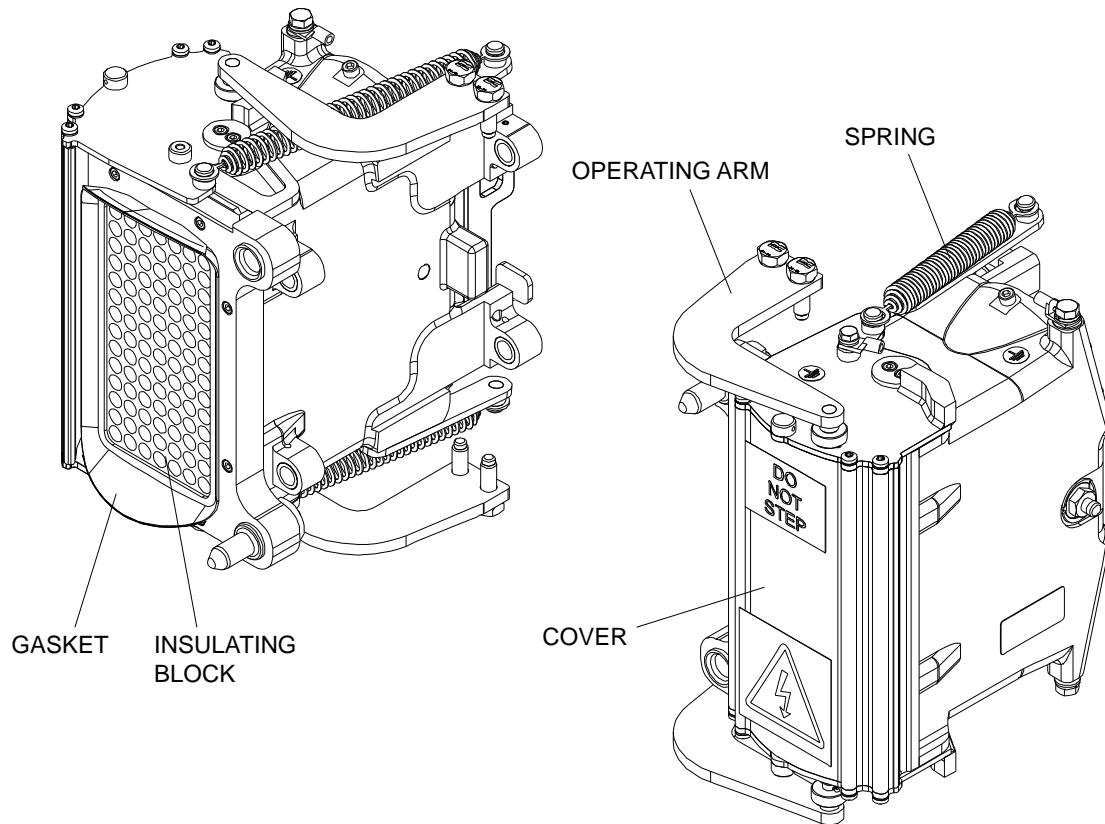


Figure 2-11: Electrical Coupler Left/Right

## 2.2.5 Electrical Coupler Actuator Left/Right

Electrical actuators are mounted to the actuator attachment, one on each side of the mechanical coupler. See Figure 2-12.

The actuator consists of a pneumatic cylinder, bracket and guide pins. The electrical coupler is mounted to the pneumatic cylinder and slides on the guide pins during coupling/uncoupling operation.

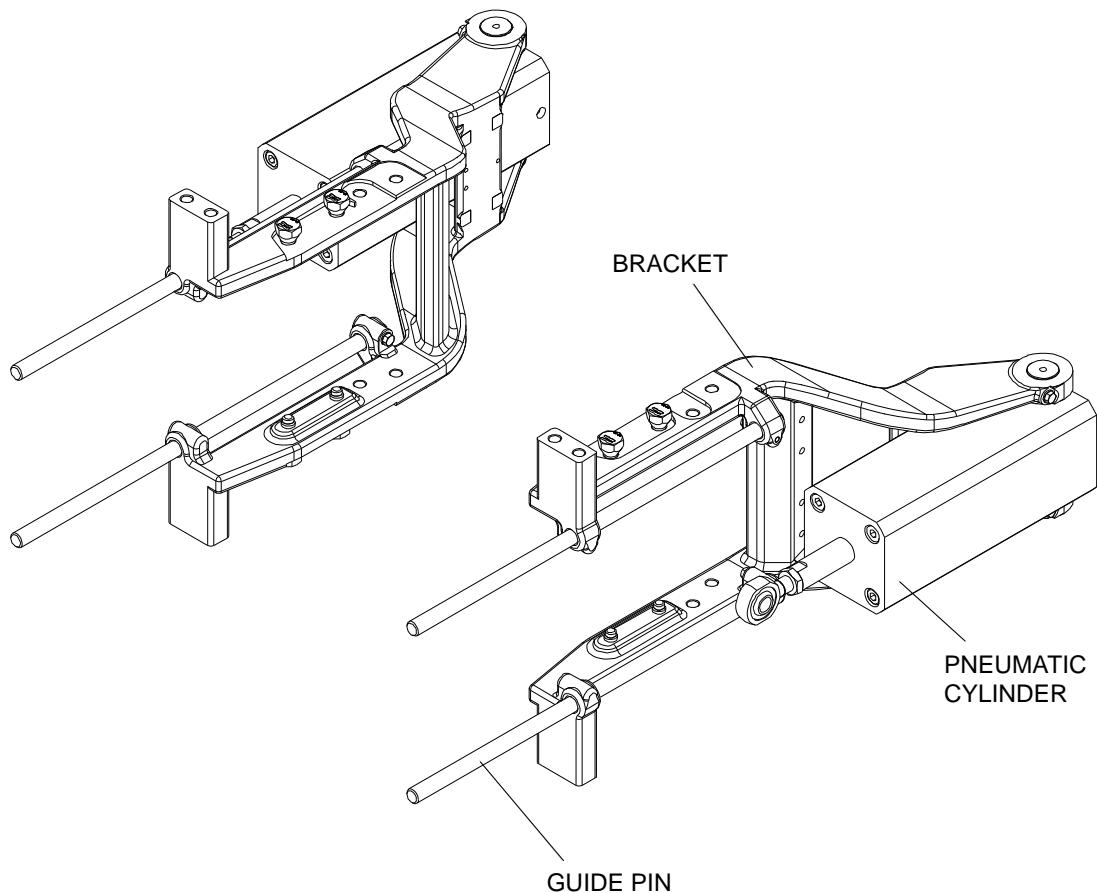


Figure 2-12: Electrical Coupler Actuator Left/Right

## 2.2.6 Electrical System

The electrical system consists of a terminal box, limit switches, an inductive sensor and connectors. See Figure 2-13.

The terminal box is mounted to an attachment plate which is mounted on top of the automatic coupler. Connected to the terminal box are the two Electrical Coupler Retract (ECR) switches, inductive sensor, three connectors and cabling from the vehicle.

The ECR switches (S3.1 and S3.2) are mounted to the electrical coupler actuators and indicate the position of the electrical couplers. Trigger plates mounted to the back of the electrical couplers will activate the switches when the electrical couplers are fully retracted.

The inductive sensor (S8) is mounted into the mechanical coupler. The sensor magnetically senses the presence of the hook in the mechanical coupler to verify proper coupling.

The three connectors are connected to the solenoid valves (V11, V12 and V13) for controlling the pressurized air to operate the operating cylinders, and uncoupling cylinder.

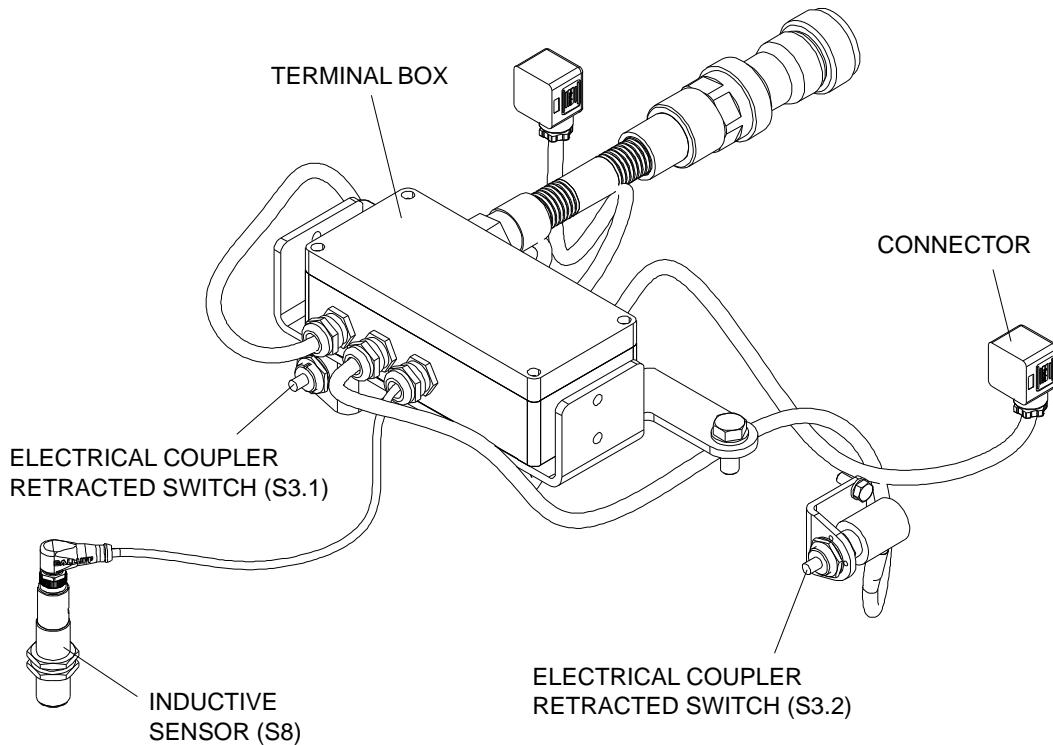


Figure 2-13: Electrical System

## 2.2.7 Pneumatic System

The pneumatic system includes hoses, two solenoid operated valves, key indicator valve, ball valve, air filter and two connection blocks. See Figure 2-14.

The air filter prevents foreign particles to reach the valves and cylinders. The ball valve (HV5) can be used to manually close the air supply to coupler. The ball valve is mounted to a bracket which is mounted to a bracket on the underside of the mechanical coupler.

Air is distributed by the connection blocks (CBL and CBR) to the different components in the pneumatic system. The solenoid operated valves (V11, V12 and V13) control the air flow to the uncoupling cylinder and operating cylinders.

The solenoid operated valves are mounted to the electrical coupler actuators. The connection blocks are mounted to the terminal box attachment plate.

The key indicator valve (V5) is mounted to an attachment which is fixed to the left bottom edge of the mechanical coupler front face. An indication plate is mounted to the right bottom edge. The indication plate activates the key indicator valve when coupled to the correct fleet vehicles only. When coupling to other fleet vehicles the key indicator valve is not activated. As a result the electrical couplers will not be extended.

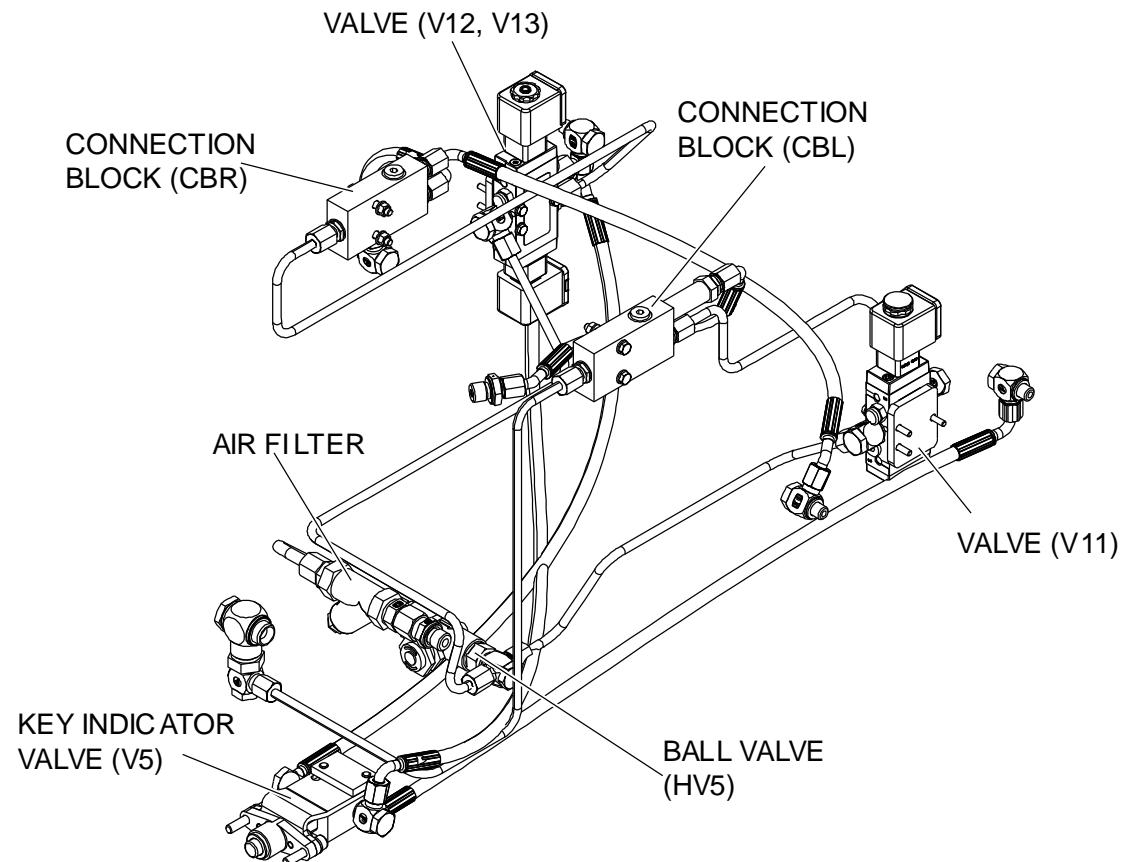


Figure 2-14: Pneumatic System

### 2.2.7.1 Coupling Sequence

During mechanical coupling of two couplers, the MRP valve V1 is opened and the MRP line is pressurized. The coupler pneumatic system is pressurized through the MRP line via the air filter. If coupling is performed with the same fleet vehicles, the key indicator valve V5 opens as the front faces meet. This allows the air to reach the electrical coupler control valve in preparation of electrical coupler extension. See Figure 2-15.

Once the couplers are fully mechanically coupled the inductive sensor S8 will activate by the mechanical coupler hook being in the correct position. This in turn activates the electrical coupler extend valve V12 allowing the air from the key indicator valve V5 to reach the electrical coupler operating cylinders. The electrical couplers extend and coupling is completed.

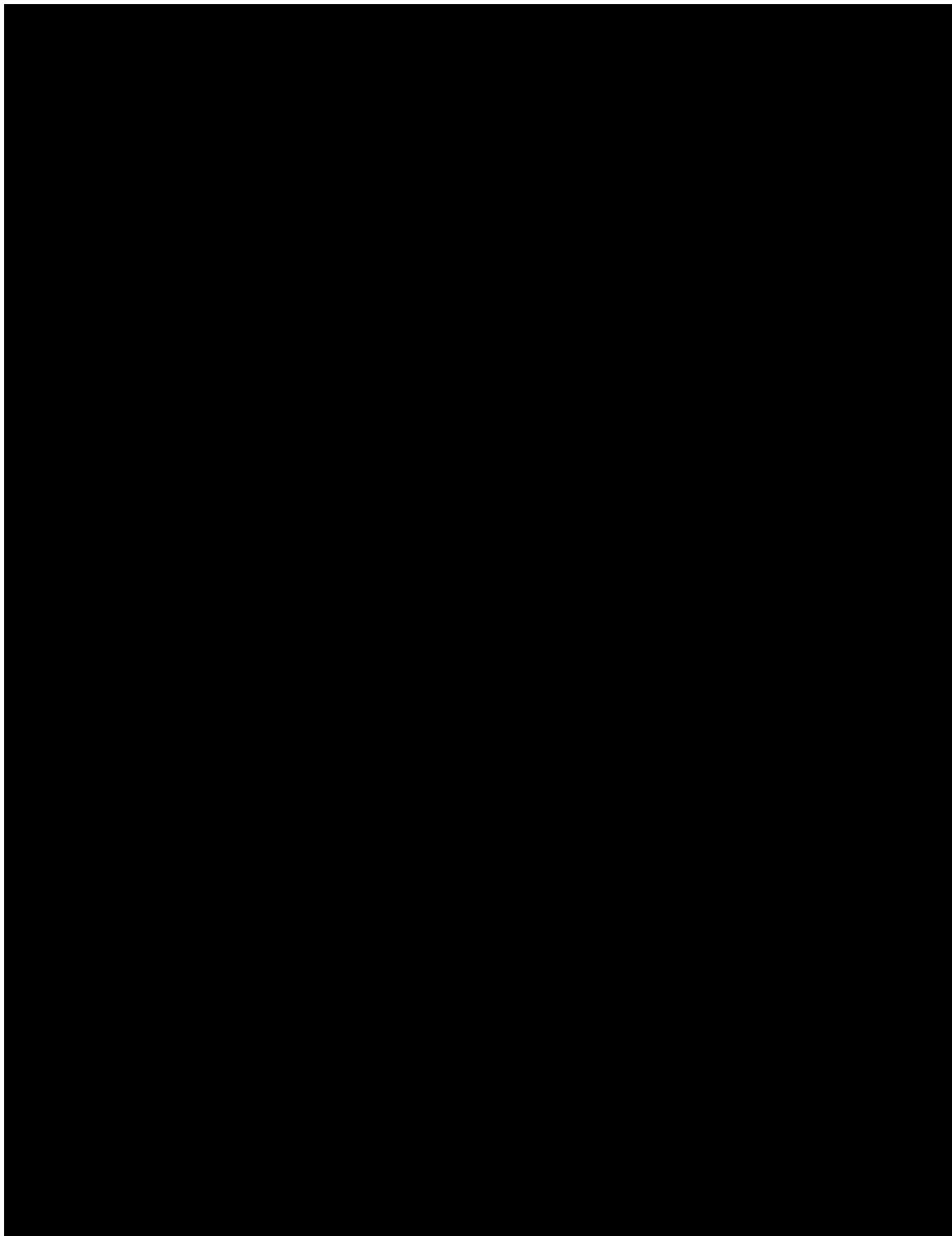


Figure 2-15: Pneumatic Diagram (Shown in Uncoupled Position)

### 2.2.7.2 Uncoupling Sequence

When the uncoupling command is given the electrical coupler retract valve V13 is activated. The air from the key indicator valve V5 will now instead retract the electrical coupler operating cylinders, uncoupling the electrical couplers. See Figure 2-15.

Once the two electrical couplers are fully retracted the electrical coupler retracted switches S3.1 and S3.2 are activated. This in its turn activates the uncoupling valve V11 allowing MRP air to reach the uncoupling cylinder C1 as well as a built in tappet valve in the MRP valve V1. The uncoupling cylinder will extend and mechanically uncouple the vehicles so they are ready to be separated. The air reaching the tappet valve in the MRP valve V1 will serve to close the MRP valve V1 in the operated vehicle while forcing the MRP valve V1 on the uncoupled vehicle to remain open for a short period during vehicle separation. This allows the MRP line in the uncoupled vehicle to be vented before the MRP valve closes.

### 2.2.8 MRP Valve

The Main Reservoir Pipe (MRP) valve is located in the lower part of the mechanical coupler. See Figure 2-16.

When two vehicles are coupled the valve rod is pressed back thus opening the airflow through the valve. The seal provides for an airtight connection between the couplers. When uncoupling the vehicles the spring pushes the valve rod and closes the airflow.

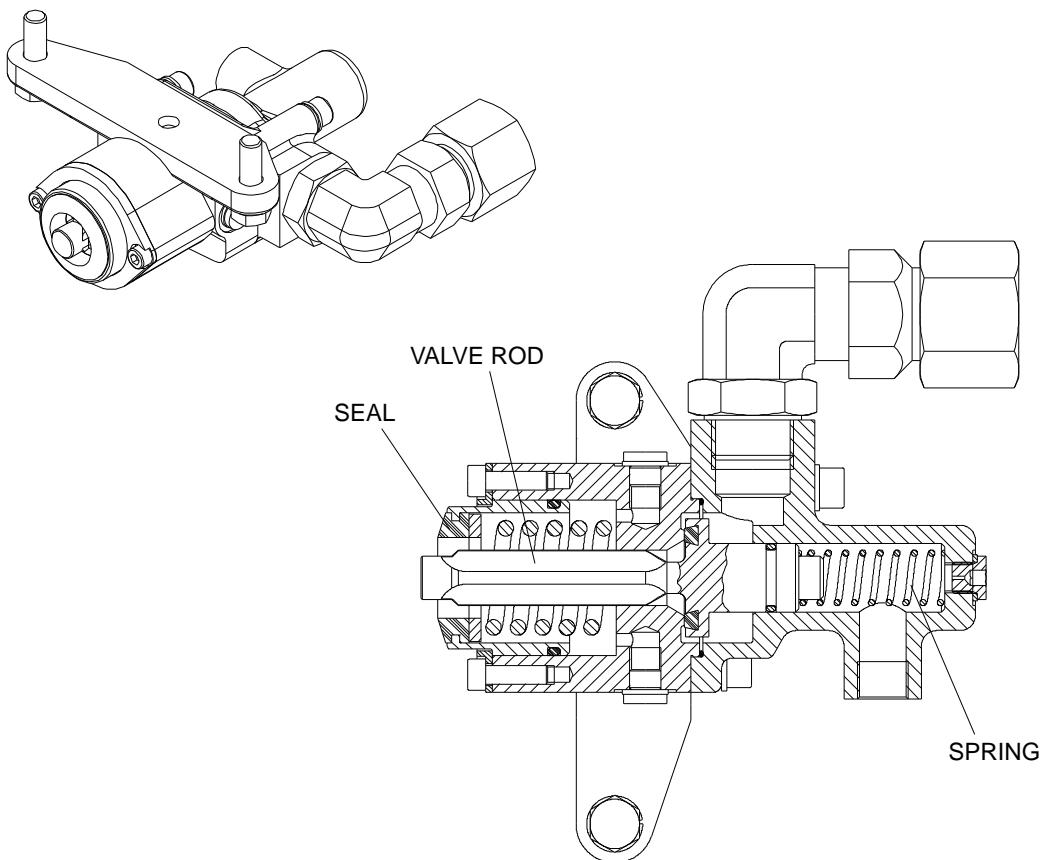


Figure 2-16: MRP Valve

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## CHAPTER 3.0

### SPECIAL TOOLS AND MATERIALS

#### **3.1 Introduction**

Table 3-1 lists the special tools or materials required for servicing the coupler. Suitable equivalents, if available, may be substituted.

Table 3-1. Special Tools & Materials

Special Tools & Materials	Specification
Standard toolkit	
Low aromatic white spirit	
Leak-seeking fluid	i.e soapy water
Grease	Gleitmo/Fuchs Lagermeister 3000+
Digital spirit level	
Lint free cloth	
Contact cleaner	CRC 2-26
Rust protecting agent	Decordyn 350 (CTP 350)
Hook to face "GO" gauge	Dellner part no.: 163701
Hook to face "NO-GO" gauge	Dellner part no.: 163702
Hook gauge	Dellner part no.: 167379
Throat gauge	Dellner part no.: 183135
Grease gun	
Brush	
Primer	Temacoat GPL-S, Color: TTV 4002 Grey
Top coat	Duasolid 50, Color: RAL 9005 Black
Thread paste	Molykote 1000
Lifting straps	
Torque wrench (el. contacts)	Dellner part no.: 1007269
Shaft (el. contacts)	Dellner part no.: 1007270
Socket (el. contacts)	Dellner part no.: 1007272
Mounting tool	Dellner part no.: 1044989
Mounting tool	Dellner part no.: 1032916
Drifter	Dellner part no.: 1032915
Soapy water	
Loctite 545	Thread sealant for pipe connections

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## CHAPTER 4.0

### SCHEDULED MAINTENANCE TASKS

#### **4.1 Introduction**

This chapter lists the scope of maintenance and service that is necessary in order to maintain performance and reliability of the coupler. The following schedule and its listed procedures must be properly accomplished for equipment warranty conditions to apply. This scheduled maintenance shall also assist in maintaining product performance over an extended period of time.

#### **4.2 Scheduled Maintenance Index**

Table 4-1 is a scheduled maintenance index, which lists frequency and each maintenance task. The schedule describes the minimum recommended maintenance to be regularly performed on the couplers. More frequent maintenance of the coupler may be required if environmental or other conditions so dictate. The reference column indicates the section that details the procedures.

Consider the Preventive Maintenance interval that comes first, either in time or in distance (if applicable). Time intervals are based on calendar time.

Table 4-1. Scheduled Maintenance Index

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0300, Coupler Running Maintenance Manual Section Reference
10,000 miles	Support and Centering	Inspect Support and Centering	Section 5.7
30,000 miles	Mechanical Coupler	Inspect Mechanical Coupler	Section 5.4
		Lubricate Mechanical Coupler	Section 6.4
30,000 miles	Manual Uncoupling	Test Manual Uncoupling	Section 5.5
30,000 miles	Uncoupling	Test Uncoupling	Section 5.6
30,000 miles	Support and Centering	Inspect Support and Centering	Section 5.7
		Lubricate Support and Centering	Section 6.5
30,000 miles	Pivot Pin	Lubricate Pivot Pin	Section 6.6
30,000 miles	Electrical Coupler	Inspect Electrical Coupler	Section 5.8
		Inspect Electrical Coupler Actuator	Section 5.9
60,000 miles	Pneumatic System	Inspect Pneumatic System	Section 5.10
60,000 miles	Buffer	Inspect Buffer	Section 5.11
60,000 miles	Support and Centering	Test Support and Centering	Section 5.12
60,000 miles	Mounting Bolts	Inspect Mounting Bolts	Section 5.13

Table 4-1. Scheduled Maintenance Index (cont'd.)

Maintenance Interval	Part Description	Scheduled Maintenance Task	Section 0300, Coupler Running Maintenance Manual Section Reference
60,000 miles	Cables and Grounding	Inspect Cables and Grounding	Section 5.14
60,000 miles	Automatic Coupler	Test Automatic Coupler	Section 5.15
60,000 miles	Electrical Coupler	Inspect Electrical Coupler Contacts	Section 5.16
120,000 miles	Automatic Coupler	Inspect Automatic Coupler	Section 5.17
120,000 miles	MRP Valve	Inspect MRP Valve	Section 5.18
120,000 miles	Ball Valve	Inspect Ball Valve	Section 5.19
120,000 miles	Air Filter	Clean Air Filter	Section 5.20
720,000 miles / 96 months	Coupler Overhaul	Replacement for Overhaul	Refer to HRMM, Section 3.24
720,000 miles / 96 months	Automatic Coupler	Overhaul	Refer to HRMM Section 3.25

## CHAPTER 5.0

### SCHEDULED MAINTENANCE

#### **5.1 Introduction**

This chapter describes the scope of maintenance and service that is necessary in order to maintain performance and reliability of the coupler.

#### **5.2 Safety Information**

The following statements of warning and caution apply to the handling of the coupler and appear as appropriate throughout this manual.

#### **WARNING**

**ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THE COUPLER AND/OR TO ANY COMPONENT PART MUST BE CUT-OFF BEFORE THE COUPLER AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT.**

#### **WARNING**

**TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TESTS, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.**

#### **WARNING**

**WHEN PERFORMING ANY TEST OR WORK ON COUPLER OR EQUIPMENT WHILE THEY ARE ON THE VEHICLE (ON CAR TEST ETC.) SPECIAL PRECAUTIONS MUST BE TAKEN TO ENSURE THAT VEHICLE MOVEMENT WILL NOT OCCUR WHICH COULD RESULT IN SEVERE INJURY OR DEATH AND/OR DAMAGE EQUIPMENT. PLACE CHOCKS AT EACH CAR WHEEL AND ENGAGE THE PARKING BRAKE.**

#### **WARNING**

**THE USE OF SOLVENTS AS CLEANING AGENTS AND THE USE OF LUBRICANTS CAN INVOLVE HEALTH AND/OR SAFETY HAZARDS. THE MANUFACTURERS OF THE SOLVENTS AND LUBRICANTS SHOULD BE CONTACTED FOR SAFETY DATA. THE RECOMMENDED PRECAUTIONS AND PROCEDURES OF THE MANUFACTURERS SHOULD BE FOLLOWED.**

**WARNING**

ASSEMBLY MAY BE UNDER A SPRING LOAD. EXERCISE CAUTION DURING DISASSEMBLY SO THAT NO PARTS FLY OUT AND CAUSE BODILY INJURY.

**WARNING**

THE COUPLER IS VERY HEAVY. AN ADEQUATE SUPPORT OR LIFTING DEVICE MUST BE AVAILABLE TO SUPPORT THE DEVICE DURING REMOVAL, INSTALLATION AND MAINTENANCE PROCEDURES. MAKE SURE THAT THE COUPLER IS SUPPORTED ONLY IN SOLID AREAS IN THE LIFTING DEVICE OR ON A WORKBENCH.

**WARNING**

THE USE OF AN AIR JET, WHICH MUST BE LESS THAN 4.8 BAR (70 PSIG), TO BLOW PARTS CLEAN OR TO BLOW THEM DRY AFTER BEING CLEANED WITH A SOLVENT WILL CAUSE PARTICLES OF DIRT AND/OR DROPLETS OF THE CLEANING SOLVENT TO BE AIRBORNE. THESE CONDITIONS MAY CAUSE SKIN AND/OR EYE IRRITATION.

**WARNING**

WHEN USING AN AIR JET DO NOT DIRECT IT TOWARD ANOTHER PERSON. IMPROPER USE OF AIR JET COULD RESULT IN BODILY INJURY.

**WARNING**

PERSONAL EYE PROTECTION MUST BE WORN WHEN PERFORMING ANY WORK ON THIS DEVICE ITS COMPONENT PARTS TO AVOID ANY POSSIBLE INJURY TO THE EYES. THIS IS ESPECIALLY IMPORTANT AT DISMOUNTING OF THE BUFFER SINCE LOOSE PARTS AND SPRINGS CAN FLY OUT.

**WARNING**

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THIS DEVICE AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THIS DEVICE AND/OR COMPONENT PART.

## **WARNING**

**WHEN OPERATED, SOME COUPLER PARTS ARE MOVING. MOVING PARTS CAN CAUSE PERSONAL INJURY.**

**TO AVOID ACCIDENTS, DO FOLLOWING:**

- 1. KEEP HANDS ETC. AWAY FROM ANY MOVING PARTS WHEN OPERATING COUPLER.**
- 2. MOVE AWAY FROM THE COUPLER AFTER PULLING UNCOUPLING HANDLE DURING MANUAL UNCOUPLING. THE PNEUMATIC CENTERING IS NOT ACTIVATED AND THE COUPLER CAN MOVE BOTH VERTICALLY AND HORIZONTALLY.**

### **5.3 Maintenance Supplies**

Lubricants and solvents to be used during maintenance and servicing are described in respective section. Do not use any other lubricants and solvents than the ones described in this manual, and on no other places on the coupler than the ones described. Manufacturer instructions for applying the lubricants, as well as safety instructions, are to be followed without exceptions.

## **WARNING**

**MANY LUBRICANTS AND SOLVENTS PRODUCE AGGRESSIVE FUMES WHEN EXPOSED TO OPEN AIR, AND MAY HAVE A CORROSIVE EFFECT ON HUMAN SKIN, EYES ETC. READ AND FOLLOW WARNING LABELS ON CONTAINERS.**

### **5.4 Inspect Mechanical Coupler**

#### **5.4.1 Special Tools**

- Standard Toolkit

#### **5.4.2 Products**

- Low aromatic white spirit or equivalent

#### **5.4.3 Procedure**

1. Clean mechanical coupler (1) front face using low aromatic white spirit or equivalent. See Figure 5-1.
2. Make a general inspection of the mechanical coupler (1). Check for signs of deformation, rust or other damage. Rust has to be removed and the surface repainted. Repair of deformation is not allowed unless sanctioned by Dellner Couplers.
3. Inspect hook (3), guide pins (4), and bushings (2) for wear or damage. Replace parts as necessary.

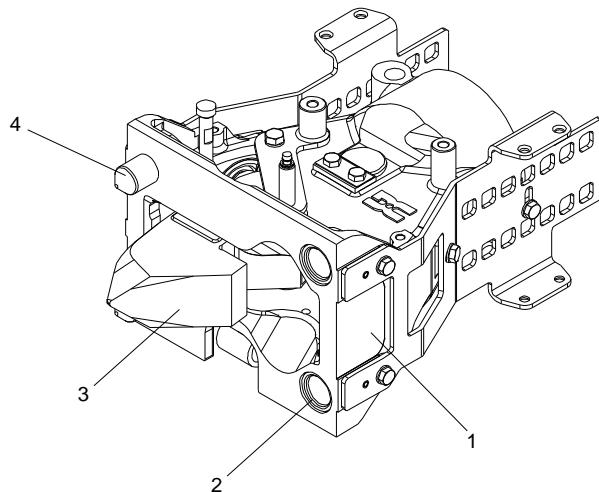


Figure 5-1: Inspect Mechanical Coupler

## 5.5 Test Manual Uncoupling

### 5.5.1 Special Tools

- Standard Toolkit
- Uncoupling Handle

### 5.5.2 Products

- N/A

### 5.5.3 Procedure

1. Fit the uncoupling handle (2) to the uncoupling arm (1). Operate the coupling mechanism by pulling the handle. The movement of the coupling mechanism can be seen from the front of the coupler. The mechanism should move freely without slack or obstruction. See Figure 5-2.

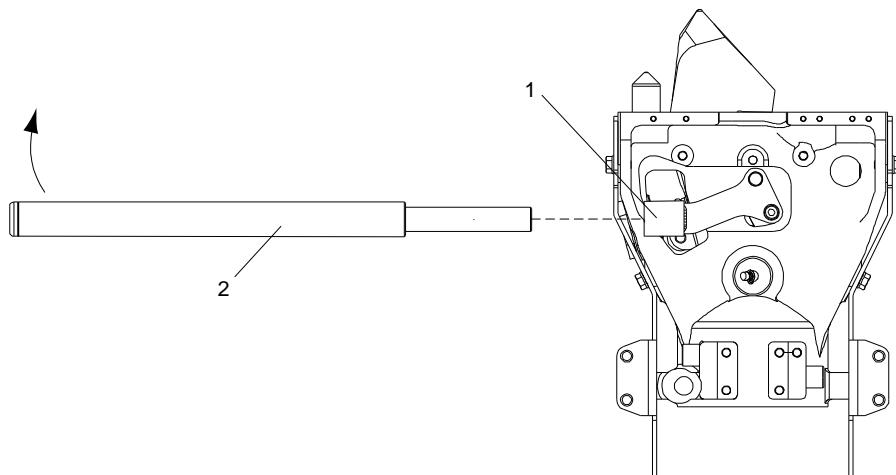


Figure 5-2: Test Manual Uncoupling

## 5.6 Test Uncoupling

### 5.6.1 Special Tools

- Standard Toolkit

### 5.6.2 Products

- N/A

### 5.6.3 Procedure

1. Refer to Figure 2-15. Make sure that the ball valve (HV-5) on automatic coupler is opened.
2. Pressurize and energize the coupler.
3. Order uncoupling from the driver's cab. The coupling mechanism should be brought to uncoupled position by the uncoupling cylinder. If the uncoupling cylinder is not activated, one or both of the electrical coupler retracted switches (S3.1/S3.2), the solenoid operating valve (V11) or the uncoupling cylinder (C1) is faulty.

## 5.7 Inspect Support and Centering

### 5.7.1 Special Tools

- Standard Toolkit

### 5.7.2 Products

- N/A

### 5.7.3 Procedure at First 10,000 Miles

At the beginning of the rubber springs (2) life under load it can experience set. This is normal. Because of the potential set in the rubber spring (2), a gap (A) can be formed at the nut (4) and bushing (3). The load on the nut is negligible so the presence of a gap is not considered a failure and can be remedied.

1. Check if there is a gap at the nut (4) and bushing (3). If a gap is present, snug the nut (4) until the gap is removed. Do not torque because this is not a traditional clamping joint. Snugging the nut should allow it and the bushing to bottom out on the shoulder of the rod (5). See Figure 5-3.
2. After re-snugging, check the level of the coupler according to Section 5.12.

### 5.7.4 Procedure Every 30,000 Miles

1. Perform a general visual inspection of the nuts, bolts and spring pins of the support and centering device (1) for damage, deformation and loose or missing parts. See Figure 5-3.

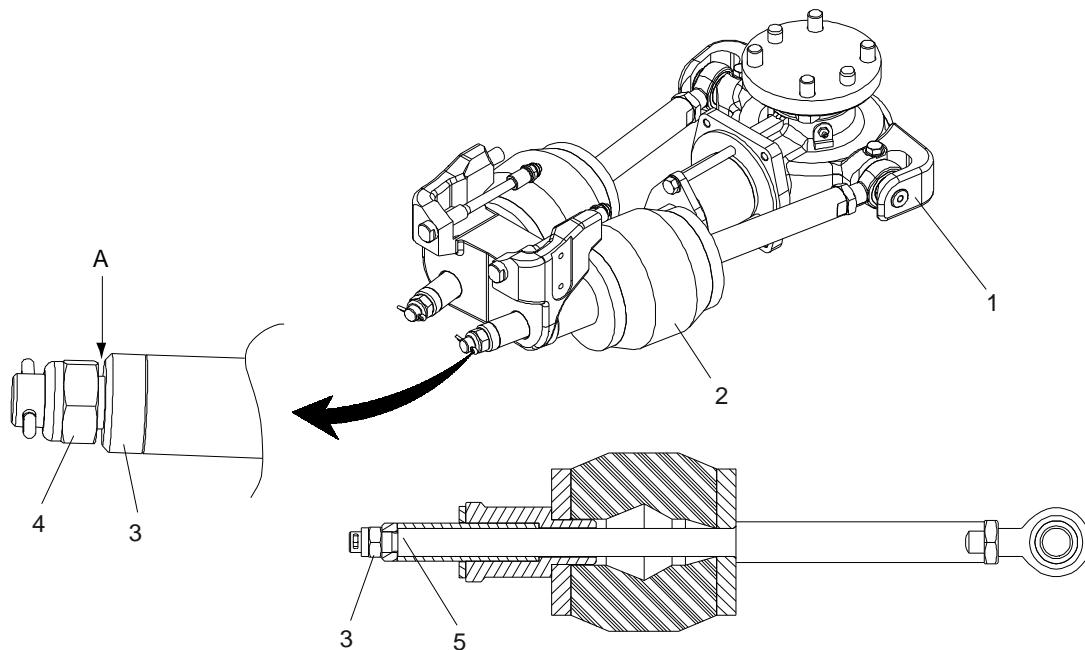


Figure 5-3: Inspect Support and Centering

## 5.8 Inspect Electrical Coupler

### 5.8.1 Special Tools

- Standard Toolkit

### 5.8.2 Products

- N/A

### 5.8.3 Procedure

1. Move electrical couplers (1 and 2) to their front (extended) position. See Figure 5-4.
2. Loosen nut (4) on operating cylinder (3).
3. Adjust electric coupler until electric coupler front face is aligned with the mechanical coupler front face by turning piston rod (5), (A=0).
4. Inspect electrical coupler components general condition. If necessary clean the electrical coupler using clean cloths. Replace parts as required.
5. Tighten nut (4) and move electrical couplers to their rear (retracted) position.

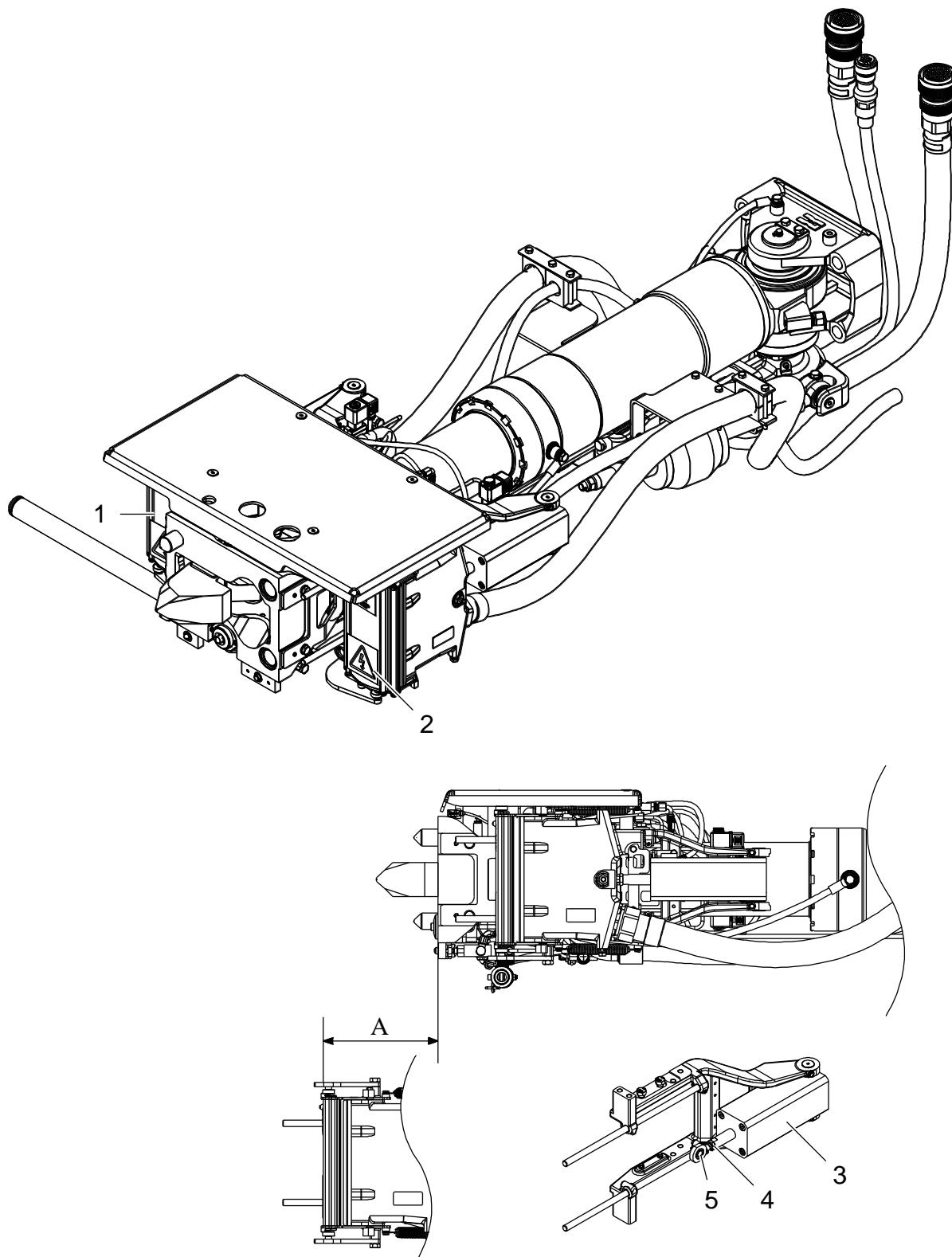


Figure 5-4: Inspect Electrical Coupler

## 5.9 Inspect Electrical Coupler Actuator

### 5.9.1 Special Tools

- Standard Toolkit

### 5.9.2 Products

- N/A

### 5.9.3 Procedure

1. Move electrical couplers backward and forward, check for missing parts and that electrical coupler actuators (1 and 2) operates smoothly. See Figure 5-5.

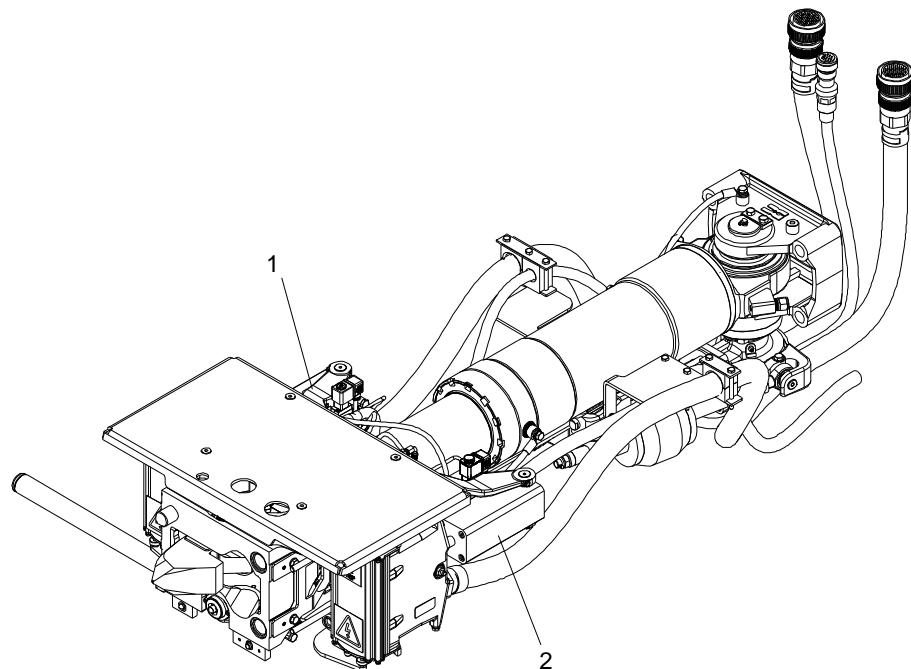


Figure 5-5: Inspect Electrical Coupler Actuator

## 5.10 Inspect Pneumatic System

### 5.10.1 Special Tools

- Standard Toolkit

### 5.10.2 Products

- Leak-seeking fluid (i.e. soapy water)

### 5.10.3 Procedure

1. Inspect all hoses and connections of pneumatic system with regards to damaged, loose, or missing parts.
2. Pressurize the coupler and check all pneumatic components and air lines for leaks. Use leak-seeking fluid (i.e. soapy water) if leaks are suspected.

## 5.11 Inspect Buffer

### 5.11.1 Special Tools

- Standard Toolkit

### 5.11.2 Products

- Gleitmo/Fuchs Lagermeister 3000+

### 5.11.3 Procedure

1. Inspect the buffer (4) and front collar (2) for damages and general condition. Ensure the front collar (2) has not moved and that the lock ring (1) is bent flush with outer diameter of buffer casing (3) in all six positions. Any damage found requires overhaul to be performed on the buffer by a Dellner authorized workshop. See Figure 5-6.
2. Inspect for signs of oil leakage.
3. Clean the sliding surface (5) on damper if necessary. Lubricate with Lagermeister 3000+for corrosion protection after cleaning.

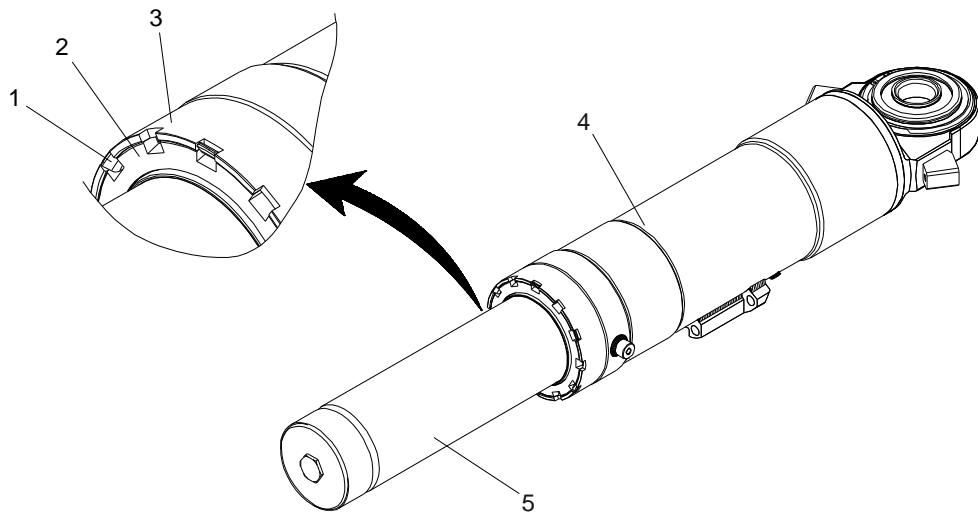


Figure 5-6: Inspect Buffer

## 5.12 Test Support and Centering

### 5.12.1 Special Tools

- Standard Toolkit,
- Digital Spirit Level

### 5.12.2 Products

- N/A

### 5.12.3 Testing

1. Check that the coupler is vertically levelled within  $\pm 0.5^\circ$  by placing a digital spirit level against the flat surface on the mechanical coupler front face. If not level adjust according to following instructions.

### 5.12.4 Adjustment

#### **WARNING**

**EXCEEDING THE ADJUSTMENT LIMIT OF THE DAMPER COULD RESULT IN SEVERE INJURY OR DEATH. IF PROPER FUNCTION IS NOT ACHIEVED WITHIN THE ADJUSTMENT LIMIT, THE DAMPER SHOULD BE REPLACED.**

**THE DISTANCE X IN FIGURE 5-7 MUST UNDER NO CIRCUMSTANCES EXCEED 70 MM.**

1. Loosen the nut (1) on both dampers.
2. Turn the key handle (2) on both dampers the same number of turns. Clockwise to raise the coupler and counter clockwise to lower it.
3. Tighten the nut (1) after adjustment.

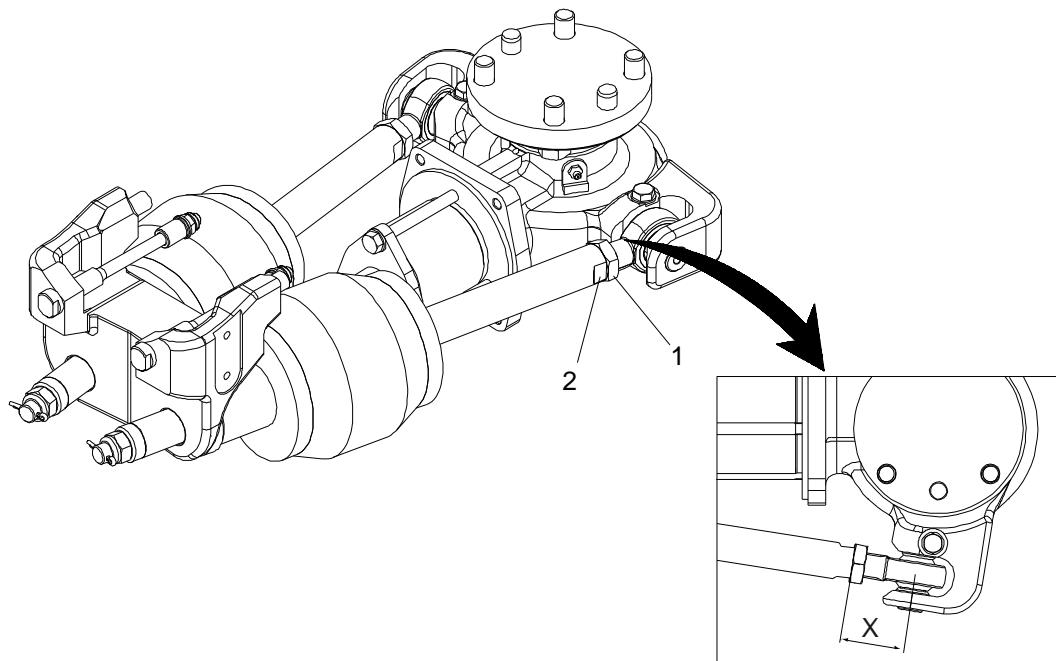


Figure 5-7: Test Support and Centering

## 5.13 Inspect Mounting Bolts

### 5.13.1 Special Tools

- Standard Toolkit

### 5.13.2 Products

- N/A

### 5.13.3 Procedure

1. Inspect coupler mounting bolts (1), check for damages and that the red torque seal is unbroken. Broken torque seal indicates movement of screw. If torque seal is broken, inspect for damage and replace bolts. See Figure 5-8.

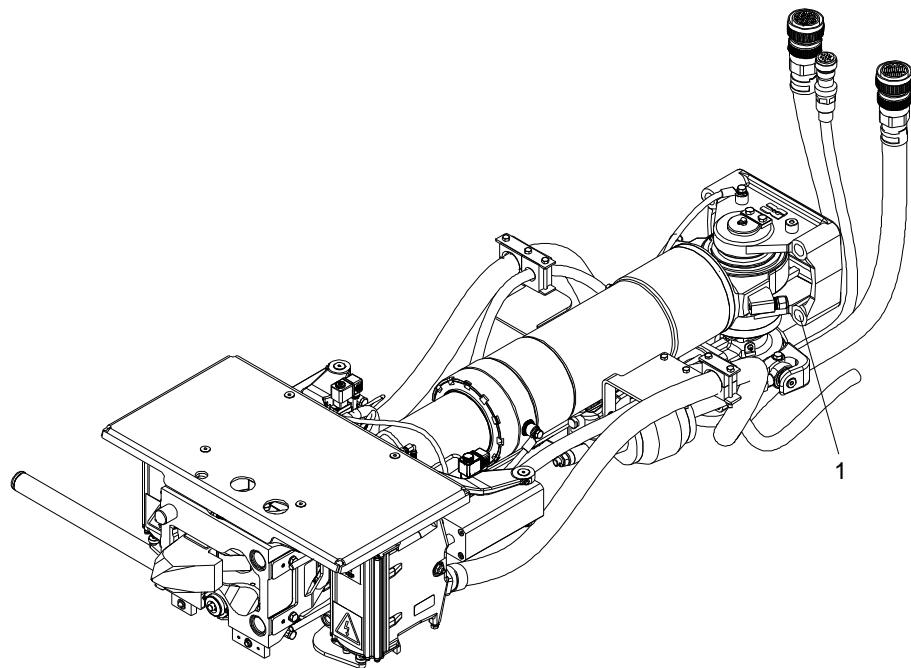


Figure 5-8: Inspect Mounting Bolts

## 5.14 Inspect Cables and Grounding

### 5.14.1 Special Tools

- Standard Toolkit

### 5.14.2 Products

- N/A

### 5.14.3 Procedure

1. Check that cables and ground cables are in good condition (check for example spiral wrap and shrink tubing for damage) and are properly secured.

## 5.15 Test Automatic Coupler

### 5.15.1 Special Tools

- Standard Toolkit

### 5.15.2 Products

- Leak-seeking fluid

### 5.15.3 Procedure

1. Simulate coupling to an incompatible coupler by energizing the solenoid operating valve (V12). This is accomplished by moving the Electric Coupler Switch (ECS) on the Upper Control Panel to the Normal position. The electrical couplers (3) should not extend. If the electrical couplers extend, the key indicator valve (V5) needs adjustment or needs replacement. See Figure 5-9.
2. Simulate coupling to a compatible coupler by energizing the solenoid operating valve (V12) as well as pressing in the plunger (4) to activate the key indicator valve (V5). The electrical couplers (3) should now extend. If the electrical couplers do not extend, the mechanism indicator valve needs adjustment, needs replacement or the electrical coupler actuator (2) is faulty.
3. Test all hose fittings for tightness. Use leak-seeking fluid.
4. Order uncoupling from the driver's cab. This is accomplished by moving the Electric Coupler Switch (ECS) on the Upper Control Panel to the Isolate position. The electrical couplers (3) should retract and the coupling mechanism should be brought to uncoupled position by the uncoupling cylinder (1). If the electrical couplers do not retract, the solenoid operating valve (V13) needs replacement or the electrical coupler actuator is faulty. If the uncoupling cylinder is not activated, one or both of the electrical coupler retracted switches (ECR), the solenoid operating valve (V11) or the uncoupling cylinder is faulty.

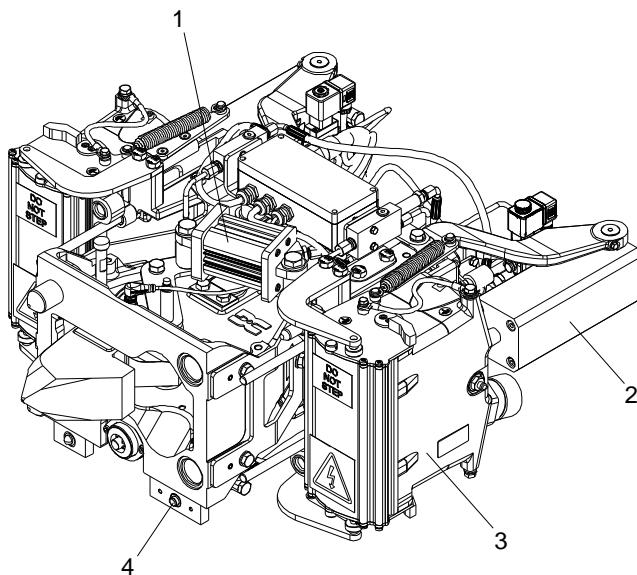


Figure 5-9: Test Automatic Coupler

## 5.16 Inspect Electrical Coupler Contacts

### 5.16.1 Special Tools

- Standard Toolkit,
- Lint Free Cloth

### 5.16.2 Products

- CRC 2-26

### 5.16.3 Inspection

1. Move electrical couplers (1 and 2) to their front position to open cover. Alternatively, unhook the bottom spring from the electrical coupler cover to open the cover more easily. See Figure 5-10.
2. Inspect pin and sleeve contacts. Check for dirt or oxidation, the silver surface should be visible. Clean when dirty or oxidized according to the instructions procedure below. Replace broken or damaged contacts.
3. Re-hook, the bottom spring to the electrical coupler cover if it was removed.

### 5.16.4 Cleaning

#### CAUTION

DO NOT PUT ANYTHING EXCEPT CRC 2-26 INTO SLEEVES TO CLEAN THEM. ALSO WIPE OFF EXCESS CRC 2-26 FROM INSULATING BLOCK AND ELECTRICAL COUPLER FRONT SEAL, WITH A SOFT, CLEAN AND LINT FREE CLOTH.

1. Clean pin and sleeve contacts by applying CRC 2-26 and blow excess cleaner/lubricant from contacts using low pressure air. Gently wipe tip of pin contacts, with soft, clean and lint free cloth until clean surface appears.

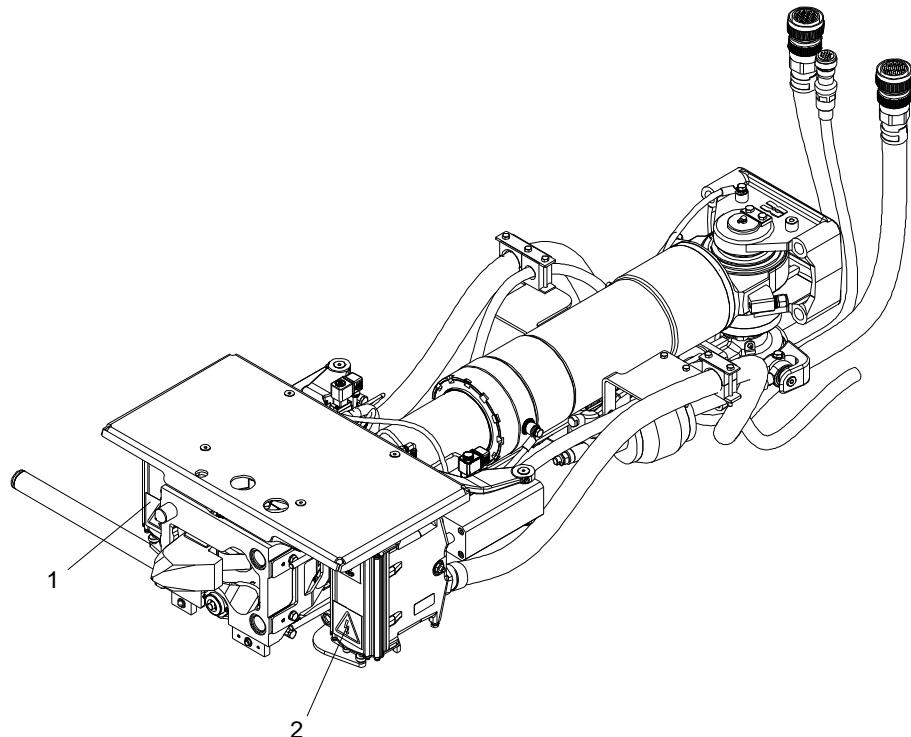


Figure 5-10: Inspect Electrical Coupler Contacts

## 5.17 Inspect Automatic Coupler

### 5.17.1 Special Tools

- Standard Toolkit,
- Lint Free Cloth,
- Hook to Face "GO" Gauge (163701)
- Hook to Face "NO GO" Gauge (163702)
- Hook Gauge (167379)
- Throat Gauge (183135)

### 5.17.2 Products

- Low aromatic white spirit,
- Decordyn 350 (CTP D 350)

### 5.17.3 Cleaning

1. Clean automatic coupler thoroughly with water. Dry the coupler with lint free cloths.
2. Use low aromatic white spirit to remove excessive grease from coupler.
3. Lubricate coupler (refer to Chapter 6.0).

#### 5.17.4 Inspection

1. Perform a general visual inspection of the complete automatic coupler. Look for signs of damage and loose or missing parts. Rusty parts have to be cleaned and protected with a thin layer of Decordyn 350 (CTP D 350).

#### 5.17.5 Measure of Wear

1. Use the hook to face "GO" gauge (A) to check the distance between the coupler buff face and the hook pull face. If OK the surface (2) must fit behind the hook pulling face and surface (1) rest flat against the coupler buffering face. Failure of the gauge to be flat against the coupler buffering face indicates bent hook or damage to coupler face. See Figure 5-11.
2. Use the hook to face "NO GO" gauge (B) to check the distance between the coupler buff face and the hook pull face. The surface (3) must not fit behind the hook and surface (4) rest flat on the coupler face. If gauge does, that indicates the hook or face is worn and should be replaced.
3. Use hook gauge (C) to check if hook height and width is within tolerance. If the gauge can pass over the surfaces, replacement of the hook is required.
4. Use the throat gauge (D) to check width and height of the coupler head throat opening. If width is OK the pins (5) should not enter the throat. If height is OK the surface (6) should not enter the throat. If not OK in either case this indicates distortion or wear and the coupler should be replaced.

### 5.18 Inspect MRP Valve

#### 5.18.1 Special Tools

- Standard Toolkit

#### 5.18.2 Products

- N/A

#### 5.18.3 Procedure

1. Clean MRP valve (1) using water. Dry valve with lint free cloth. See Figure 5-12.
2. Inspect MRP valve (1) for damage and missing parts. Replace parts as required.
3. Check the MRP valve front seal (2) for deterioration. Also check that front seal is moving correctly by pushing it, seal should align with the coupler front face. Replace front seal if necessary.
4. Pressurize the coupler and check MRP valve for leaks.

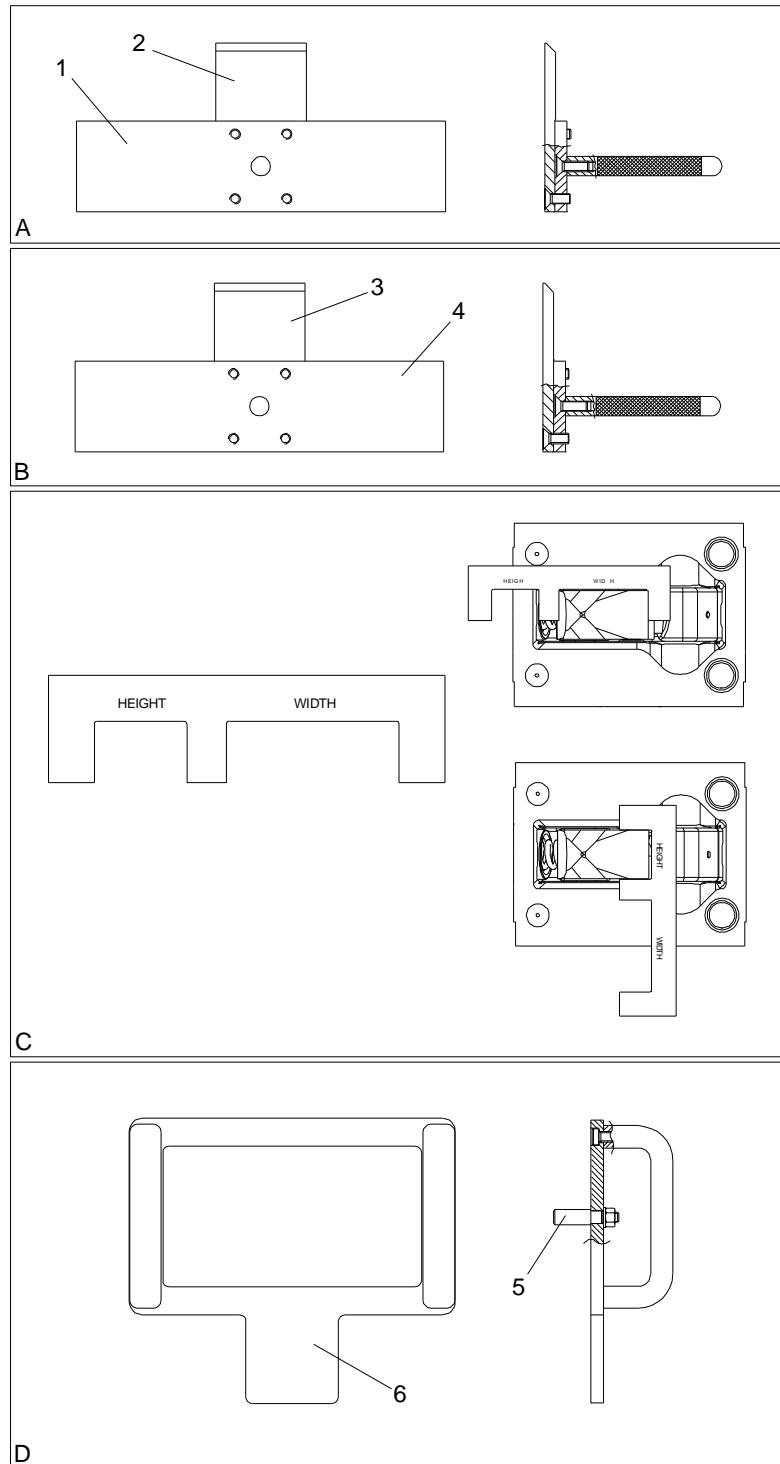


Figure 5-11: Automatic Coupler, Measure of Wear

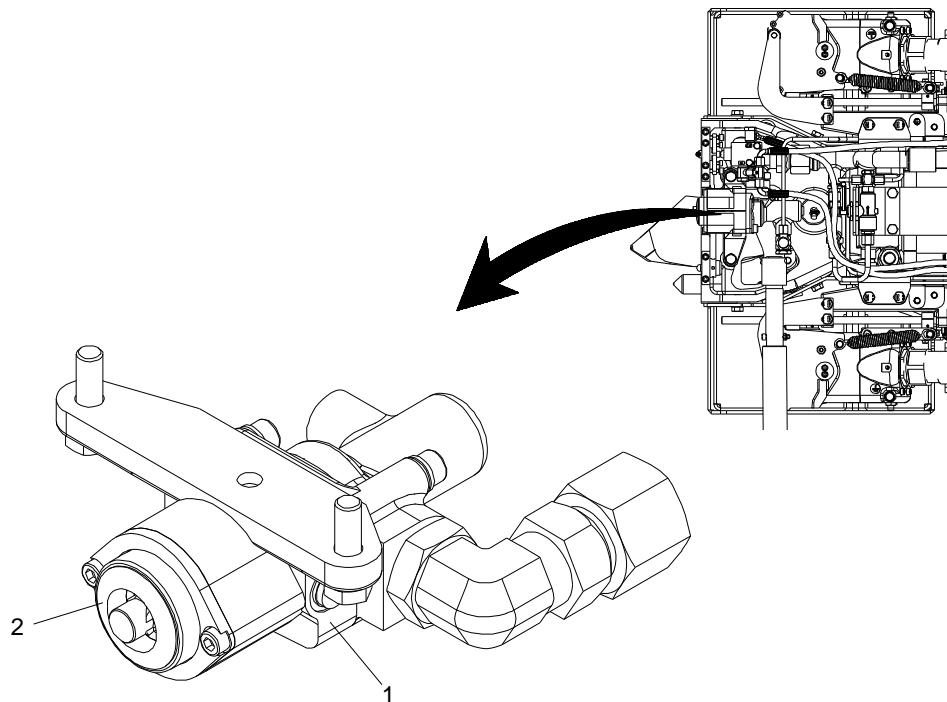


Figure 5-12: Inspect MRP Valve

## 5.19 Inspect Ball Valve

### 5.19.1 Special Tools

- Standard Toolkit

### 5.19.2 Products

- N/A

### 5.19.3 Procedure

1. Inspect ball valve (1) for damage and missing parts. See Figure 5-13.
2. Pressurize the coupler and check ball valve for leaks.
3. Operate the ball valve to verify it cuts off the air supply to the coupler controls.

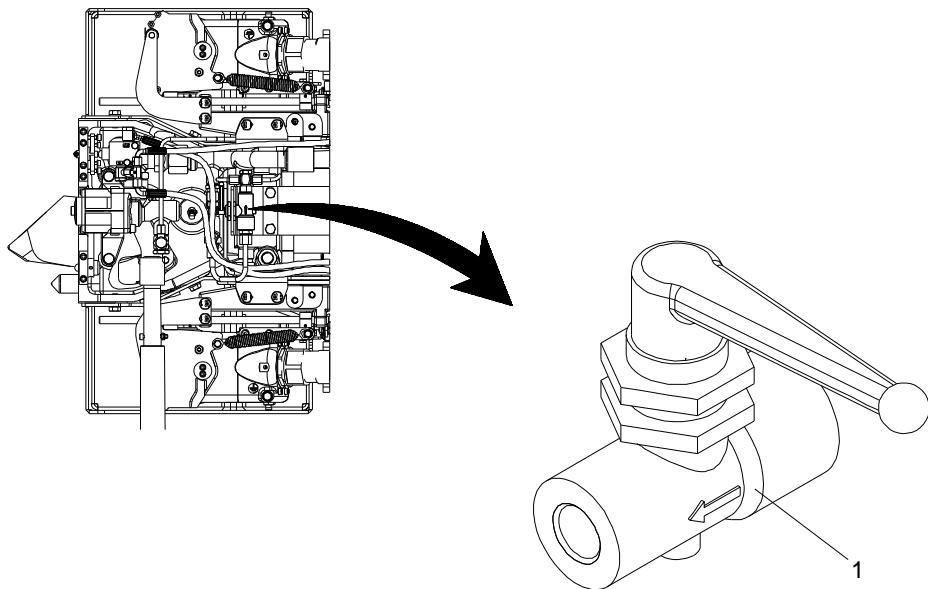


Figure 5-13: Inspect Ball Valve

## 5.20 Clean Air Filter

### 5.20.1 Special Tools

- Standard Toolkit

### 5.20.2 Products

- N/A

### 5.20.3 Procedure

1. Unscrew the caps (2) on the filter housing (1) and remove the filter insert. See Figure 5-14.
2. Clean the filter inserts using compressed air.
3. Install the filter insert into the filter housing (1) and mount the cap.

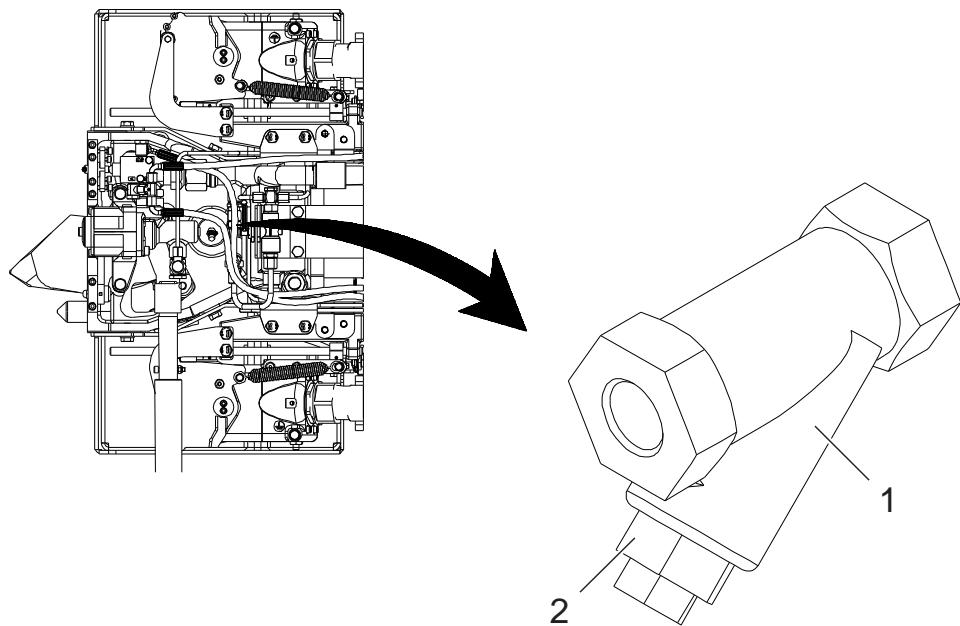


Figure 5-14: Inspect Air Filter

## CHAPTER 6.0

### LUBRICATION

#### **6.1 Introduction**

This chapter describes the scope of lubrication that is necessary in order to maintain performance and reliability of the coupler.

#### **6.2 Safety Information**

The following statements of warning and caution apply to the handling of the coupler and appear as appropriate throughout this manual.

#### **WARNING**

**ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THE COUPLER AND/OR TO ANY COMPONENT PART MUST BE CUT-OFF BEFORE THE COUPLER AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT.**

#### **WARNING**

**TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TESTS, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.**

#### **WARNING**

**WHEN PERFORMING ANY TEST OR WORK ON COUPLER OR EQUIPMENT WHILE THEY ARE ON THE VEHICLE (ON CAR TEST ETC.) SPECIAL PRECAUTIONS MUST BE TAKEN TO ENSURE THAT VEHICLE MOVEMENT WILL NOT OCCUR WHICH COULD RESULT IN SEVERE INJURY OR DEATH AND/OR DAMAGE EQUIPMENT. PLACE CHOCKS AT EACH CAR WHEEL AND ENGAGE THE PARKING BRAKE.**

#### **WARNING**

**THE USE OF SOLVENTS AS CLEANING AGENTS AND THE USE OF LUBRICANTS CAN INVOLVE HEALTH AND/OR SAFETY HAZARDS. THE MANUFACTURERS OF THE SOLVENTS AND LUBRICANTS SHOULD BE CONTACTED FOR SAFETY DATA. THE RECOMMENDED PRECAUTIONS AND PROCEDURES OF THE MANUFACTURERS SHOULD BE FOLLOWED.**

**WARNING**

ASSEMBLY MAY BE UNDER A SPRING LOAD. EXERCISE CAUTION DURING DISASSEMBLY SO THAT NO PARTS FLY OUT AND CAUSE BODILY INJURY.

**WARNING**

THE COUPLER IS VERY HEAVY. AN ADEQUATE SUPPORT OR LIFTING DEVICE MUST BE AVAILABLE TO SUPPORT THE DEVICE DURING REMOVAL, INSTALLATION AND MAINTENANCE PROCEDURES. MAKE SURE THAT THE COUPLER IS SUPPORTED ONLY IN SOLID AREAS IN THE LIFTING DEVICE OR ON A WORKBENCH.

**WARNING**

THE USE OF AN AIR JET, WHICH MUST BE LESS THAN 4.8 BAR (70 PSIG), TO BLOW PARTS CLEAN OR TO BLOW THEM DRY AFTER BEING CLEANED WITH A SOLVENT WILL CAUSE PARTICLES OF DIRT AND/OR DROPLETS OF THE CLEANING SOLVENT TO BE AIRBORNE. THESE CONDITIONS MAY CAUSE SKIN AND/OR EYE IRRITATION.

**WARNING**

WHEN USING AN AIR JET DO NOT DIRECT IT TOWARD ANOTHER PERSON. IMPROPER USE OF AIR JET COULD RESULT IN BODILY INJURY.

**WARNING**

PERSONAL EYE PROTECTION MUST BE WORN WHEN PERFORMING ANY WORK ON THIS DEVICE ITS COMPONENT PARTS TO AVOID ANY POSSIBLE INJURY TO THE EYES. THIS IS ESPECIALLY IMPORTANT AT DISMOUNTING OF THE BUFFER SINCE LOOSE PARTS AND SPRINGS CAN FLY OUT.

**WARNING**

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THIS DEVICE AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THIS DEVICE AND/OR COMPONENT PART.

## 6.3 Maintenance Supplies

Lubricants and solvents to be used during maintenance and servicing are described in respective section. Do not use any other lubricants and solvents than the ones described in this manual, and on no other places on the coupler than the ones described. Manufacturer instructions for applying the lubricants, as well as safety instructions, are to be followed without exceptions.

## **WARNING**

**MANY LUBRICANTS AND SOLVENTS PRODUCE AGGRESSIVE FUMES WHEN EXPOSED TO OPEN AIR, AND MAY HAVE A CORROSIVE EFFECT ON HUMAN SKIN, EYES ETC. READ AND FOLLOW WARNING LABELS ON CONTAINERS.**

## 6.4 Lubricate Mechanical Coupler

### 6.4.1 Special Tools

- Grease gun,
- Brush

### 6.4.2 Products

- Gleitmo/Fuchs Lagermeister 3000+

### 6.4.3 Procedure

1. Grease with Lagermeister 3000+ through grease fitting (3) and main pin grease fitting (4). The main pin grease fitting is located on the underside. Use grease gun and apply until fresh grease is pressed out of the bearings. Wipe off excess grease. See Figure 6-1.
2. Pull the manual uncoupling handle repeatedly 5 times to spread the lubricant. Grease through grease fittings once more until fresh grease is pressed out of the bearings. Wipe off excess grease.
3. Perform external greasing with Lagermeister 3000+ on hook "inside" (2) and flat front (7), uncoupling cam (6), guide pin (1) and guide bushing (5).

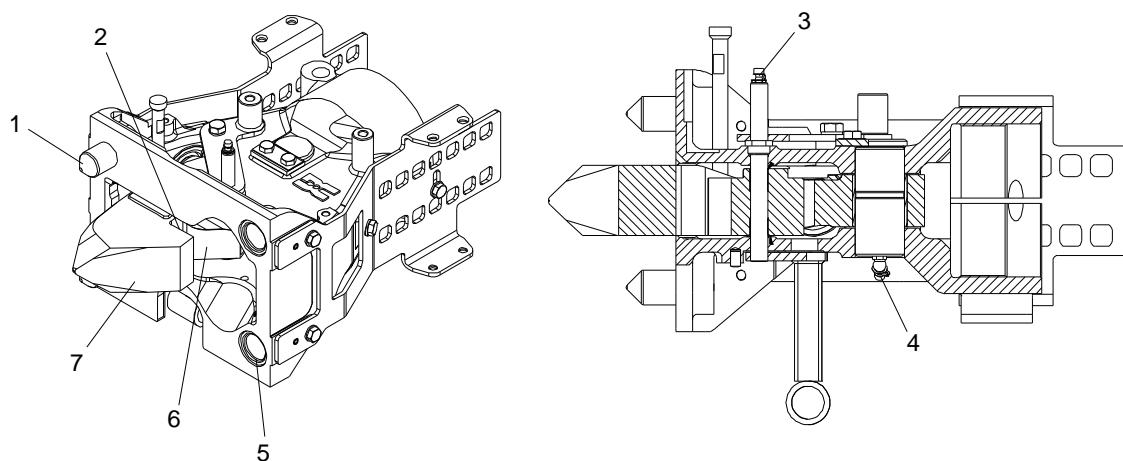


Figure 6-1: Lubricate Mechanical Coupler

## 6.5 Lubricate Support and Centering

### 6.5.1 Special Tools

- Grease gun

### 6.5.2 Products

- Gleitmo/Fuchs Lagermeister 3000+

### 6.5.3 Procedure

1. Grease with Lagermeister 3000+ through grease fittings (1). Use grease gun and apply until fresh grease is pressed out. Wipe off excess grease. See Figure 6-2.

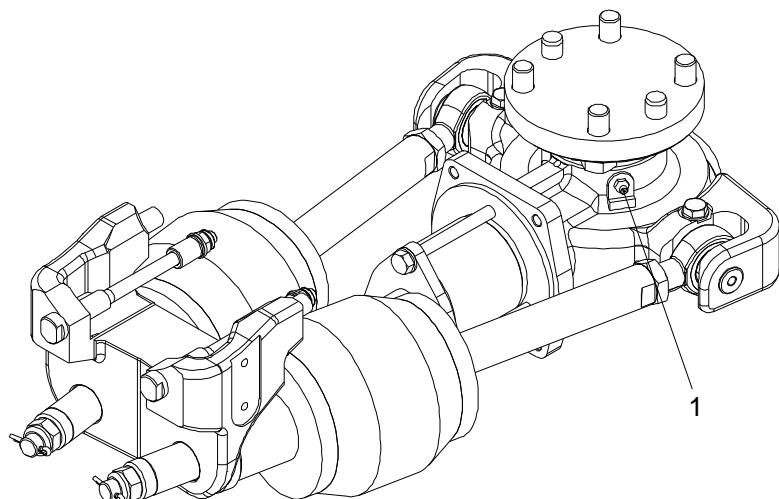


Figure 6-2: Lubricate Support and Centering

## 6.6 Lubricate Pivot Pin

### 6.6.1 Special Tools

- Grease gun

### 6.6.2 Products

- Gleitmo/Fuchs Lagermeister 3000+

### 6.6.3 Procedure

1. Grease with Lagermeister 3000+ through grease fittings (1). Use grease gun and apply until fresh grease is pressed out. Wipe off excess grease. See Figure 6-3.

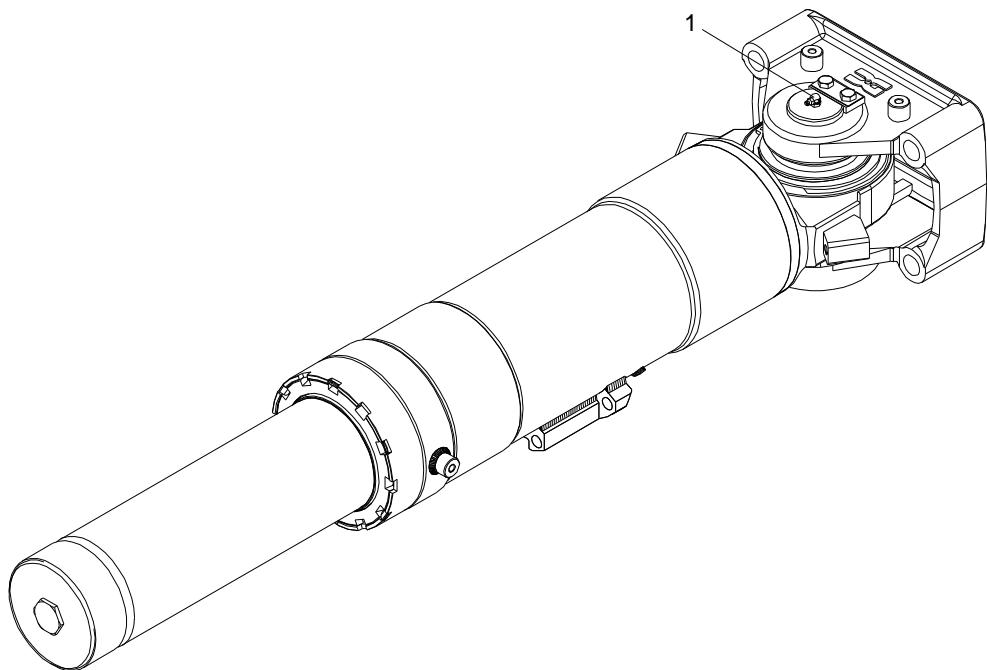


Figure 6-3: Lubricate Pivot Anchor

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## CHAPTER 7.0

### COMPONENT REMOVAL AND INSTALLATION

#### **7.1 Introduction**

The following paragraphs provide standard practices applicable to all installation and removal work.

#### **7.2 Safety Information**

The following statements of warning and caution apply to the handling of the coupler and appear as appropriate throughout this manual.

#### **WARNING**

**ALL AIR SUPPLY AND/OR ELECTRIC CURRENT TO THE COUPLER AND/OR TO ANY COMPONENT PART MUST BE CUT-OFF BEFORE THE COUPLER AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT.**

#### **WARNING**

**TO PREVENT RECEIVING ELECTRICAL SHOCK WHEN PERFORMING ELECTRICAL TESTS, HANDS MUST BE CLEAR OF ELECTRICAL COMPONENTS, CONTACTS AND HOUSING AND THERE MUST BE NO BODILY CONTACT WITH THE WORK BENCH. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE INJURY OR DEATH.**

#### **WARNING**

**WHEN PERFORMING ANY TEST OR WORK ON COUPLER OR EQUIPMENT WHILE THEY ARE ON THE VEHICLE (ON CAR TEST ETC.) SPECIAL PRECAUTIONS MUST BE TAKEN TO ENSURE THAT VEHICLE MOVEMENT WILL NOT OCCUR WHICH COULD RESULT IN SEVERE INJURY OR DEATH AND/OR DAMAGE EQUIPMENT. PLACE CHOCKS AT EACH CAR WHEEL AND ENGAGE THE PARKING BRAKE.**

#### **WARNING**

**THE USE OF SOLVENTS AS CLEANING AGENTS AND THE USE OF LUBRICANTS CAN INVOLVE HEALTH AND/OR SAFETY HAZARDS. THE MANUFACTURERS OF THE SOLVENTS AND LUBRICANTS SHOULD BE CONTACTED FOR SAFETY DATA. THE RECOMMENDED PRECAUTIONS AND PROCEDURES OF THE MANUFACTURERS SHOULD BE FOLLOWED.**

**WARNING**

ASSEMBLY MAY BE UNDER A SPRING LOAD. EXERCISE CAUTION DURING DISASSEMBLY SO THAT NO PARTS FLY OUT AND CAUSE BODILY INJURY.

**WARNING**

THE COUPLER IS VERY HEAVY. AN ADEQUATE SUPPORT OR LIFTING DEVICE MUST BE AVAILABLE TO SUPPORT THE DEVICE DURING REMOVAL, INSTALLATION AND MAINTENANCE PROCEDURES. MAKE SURE THAT THE COUPLER IS SUPPORTED ONLY IN SOLID AREAS IN THE LIFTING DEVICE OR ON A WORKBENCH.

**WARNING**

THE USE OF AN AIR JET, WHICH MUST BE LESS THAN 4.8 BAR (70 PSIG), TO BLOW PARTS CLEAN OR TO BLOW THEM DRY AFTER BEING CLEANED WITH A SOLVENT WILL CAUSE PARTICLES OF DIRT AND/OR DROPLETS OF THE CLEANING SOLVENT TO BE AIRBORNE. THESE CONDITIONS MAY CAUSE SKIN AND/OR EYE IRRITATION.

**WARNING**

WHEN USING AN AIR JET DO NOT DIRECT IT TOWARD ANOTHER PERSON. IMPROPER USE OF AIR JET COULD RESULT IN BODILY INJURY.

**WARNING**

PERSONAL EYE PROTECTION MUST BE WORN WHEN PERFORMING ANY WORK ON THIS DEVICE ITS COMPONENT PARTS TO AVOID ANY POSSIBLE INJURY TO THE EYES. THIS IS ESPECIALLY IMPORTANT AT DISMOUNTING OF THE BUFFER SINCE LOOSE PARTS AND SPRINGS CAN FLY OUT.

**WARNING**

BOTTLED UP AIR UNDER PRESSURE (EVEN THOUGH AIR SUPPLY IS CUT-OFF) MAY CAUSE GASKETS AND/OR PARTICLES OF DIRT TO BECOME AIRBORNE AND AN INCREASE IN SOUND LEVEL WHEN THIS DEVICE AND/OR ANY COMPONENT PART IS REMOVED FROM THE EQUIPMENT ARRANGEMENT. PERSONAL EYE AND EAR PROTECTION MUST BE WORN AND CARE TAKEN TO AVOID POSSIBLE INJURY WHEN PERFORMING ANY WORK ON THIS DEVICE AND/OR COMPONENT PART.

### 7.3 Maintenance Supplies

Lubricants and solvents to be used during maintenance and servicing are described in respective section. Do not use any other lubricants and solvents than the ones described in this manual, and on no other places on the coupler than the ones described. Manufacturer instructions for applying the lubricants, as well as safety instructions, are to be followed without exceptions.

## **WARNING**

**MANY LUBRICANTS AND SOLVENTS PRODUCE AGGRESSIVE FUMES WHEN EXPOSED TO OPEN AIR, AND MAY HAVE A CORROSIVE EFFECT ON HUMAN SKIN, EYES ETC. READ AND FOLLOW WARNING LABELS ON CONTAINERS.**

### 7.4 Cleaning

Make sure the coupler is thoroughly cleaned before any work is performed on it. Thus preventing contamination to reach internal parts of the coupler that could be damaged due to increased wear. Prior to assembling parts and mounting those on the coupler make sure that all parts and aligning surfaces on the coupler have been thoroughly cleaned in order to prevent malfunctions due to incorrect assembly and to assure correct pre-tension in screws.

When cleaning off grease, use low aromatic white spirit. After cleaning the coupler should be dried, but not with pressurized air.

NOTE: Do not use pressurized air, high pressure water or steam cleaners.

Always lubricate with proper lubricants after cleaning.

NOTE: Untreated surfaces and damaged surfaces shall be cleaned from rust and treated with Decordyn 350 (CTP D 350) or equivalent.

### 7.5 Painting

Damaged painted areas on the coupler must be repaired to prevent further deterioration.

Components of steel, which are corroded, or in some other way unsuitable for painting, shall be blasted or grinded as a preliminary treatment before painting. All blasting is to be in accordance with ISO 8501. Preparation grade Sa 2 ½. Surfaces that might be damaged during blasting, e.g., threads, surfaces with high finish/close tolerances etc. must be adequately protected before blasting.

Smaller damages that may have occurred during assembly or in traffic can be retouched with normal synthetic paint (Type Temalack).

If the primer paint on the mechanical coupler front face is damaged, the front face shall be cleaned from dirt and rust, dried and protected with a thin layer of Decordyn 350 (CTP D 350) or equivalent.

**NOTE:** Always read and follow instructions on warning label on cans.

The following surfaces shall be primer painted only, with a coat thickness of 30 –60 µm:

- Machined surfaces for screws and nuts.
- Socket joint conical surfaces and root diameter.

**NOTE:** Stainless steel parts, chrome plated, nickel plated surfaces or grounding connections shall not be painted.

Table 7-1: Paint Specification

Primer	Top Coat
Primer: Temacoat GPL-S Primer Thickness: 60 µm Color: TTV 4002 Grey	Top coat: Duasolid 50 Thickness: 100 µm Color: RAL 7011 (grey)

Technical data and specifications according to paint supplier's data sheet.

## 7.6 Tightening Torques

### 7.6.1 Remounting/Assembling

Remount/assemble parts of the coupler in opposite order of dismounting/disassembling unless otherwise stated in any of the relevant sections. Use only new fasteners as described in this chapter. Lubricate all parts during and after remounting with proper lubricant.

### 7.6.2 Fasteners

When assembling parts and when mounting parts on coupler always use new fasteners, such as screws, nuts, washers, roll pins, securing plates etc. Make sure - and confirm with the Parts List - that all fasteners are of the same dimension and quality as the ones previously used on the device being replaced, overhauled or mounted on the coupler. Make sure that there are at least two threads from the screw protruding through the nut in screw/ nut applications. Tighten screws to correct torque (if not specified, follow the screw suppliers recommendations). Recommended tightening torque's are listed below.

### 7.6.3 Tightening Torques

In the table below the tightening torques ( $\pm 5\%$ ) for lubricated fasteners are listed. Always lubricate with Molykote 1000 or equal unless Loctite should be applied. Zinc plated fasteners tensile strength 8.8 (ISO) grade 5 (SAE). Stainless steel fasteners tensile strength Class 70 and 80.

These tightening torques apply for all fasteners unless otherwise specified within the instructions.

Table 7-2: Tightening Torques, Dimension Metric

	TORQUE			
	8.8 and A4-80	A2-70	10.9	12.9
Dimension Metric	Nm	Nm	Nm	Nm
M6	8	6	10	12
M8	20	16	30	35
M10	40	30	60	70
M12	70	55	100	120
M16	170	130	250	300
M20	330	260	480	580
M24	580	450	800	1000
M30	1130	900	1500	1800

Table 7-3: Tightening Torques, Dimension UNC

	TORQUE	
	8.8 and A4-80	A2-70
Dimension UNC	Nm	Nm
1/4"	10	8
5/16"	20	15
3/8"	35	25
7/16"	55	40
1/2"	80	60
9/16"	120	90
5/8"	160	125
3/4"	280	220
7/8"	450	340
1"	660	500

## 7.7 Replacement of Automatic Coupler / Mounting Kit

### 7.7.1 Special Tools

- Standard Toolkit,
- Suitable Lifting Equipment

### 7.7.2 Products

- Molykote 1000

### 7.7.3 Removal

1. Disconnect cables and ground cables between the coupler and vehicle.
2. Support the coupler properly. Make sure it cannot fall down when disconnected from the car.
3. Remove the screws (1), nuts (3) and washers (2). Then carefully remove the coupler. See Figure 7-1.

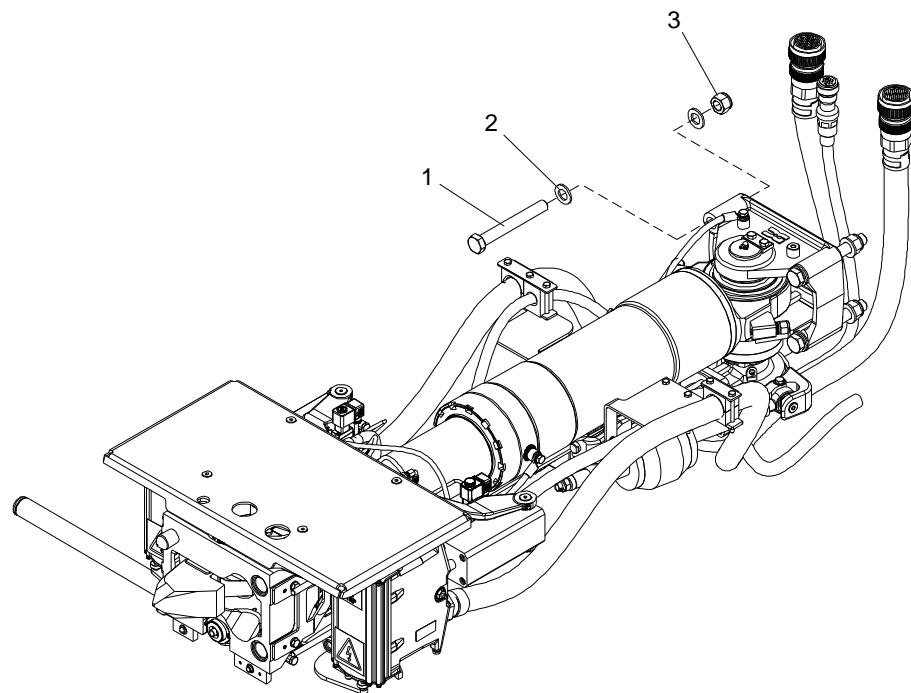


Figure 7-1: Replacement of Automatic Coupler / Mounting Kit

#### **7.7.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Check the coupler for structural damage or damaged painted areas. Paint damage has to be repaired by touch-up painting.
3. Apply Molykote 1000 or similar to the screws (1). See Figure 7-1.
4. Lift the coupler with a suitable lifting device. Take care not to damage the coupler.
5. Fit the coupler to the vehicle and mount the screws (1), washers (2) and nuts (3). Torque to the required tightening torque.
6. Connect the cables and ground cables between the coupler and vehicle.

### **7.8 Replacement of Cover Plate**

#### **7.8.1 Special Tools**

- Standard Toolkit

#### **7.8.2 Products**

- Molykote 1000

#### **7.8.3 Removal**

1. Remove the cover plate (1) by removing the four screws (2) and lifting it off of the coupler. See Figure 7-2.

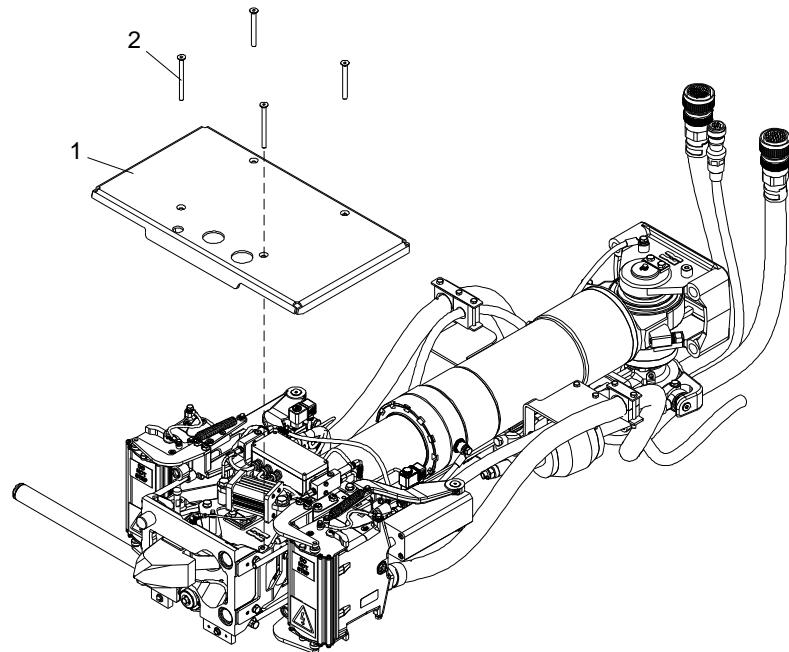


Figure 7-2: Replacement of Cover Plate

#### 7.8.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the cover plate (1) to the coupler and mount the four screws (2). See Figure 7-2.

### 7.9 Replacement of Uncoupling Arm

#### 7.9.1 Special Tools

- Standard Toolkit

#### 7.9.2 Products

- Molykote 1000

#### 7.9.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Remove the bolt (1) and washer (2) and disconnect the uncoupling arm (6) from the uncoupling cylinder (3). See Figure 7-3.
3. Remove the screw (4) and washer (5).
4. Remove the uncoupling arm (6).

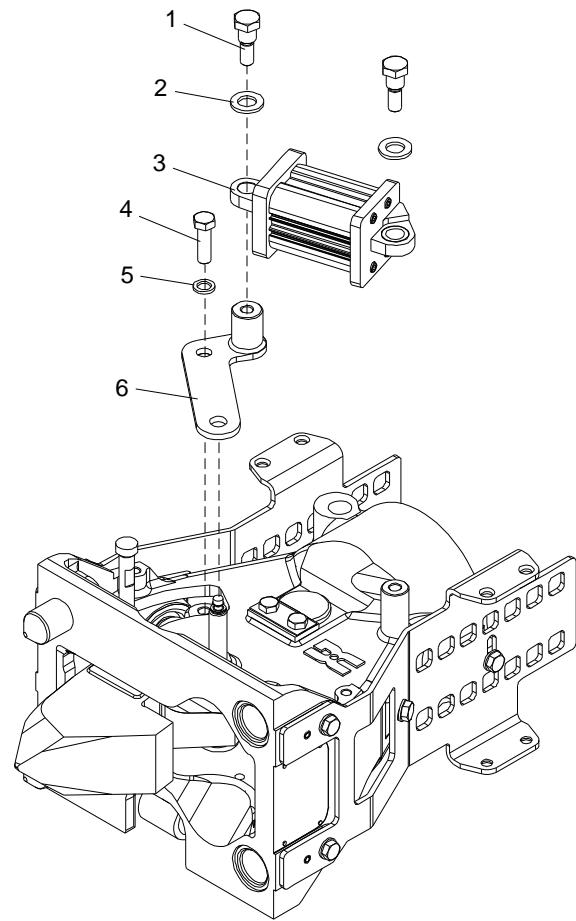


Figure 7-3: Replacement of Uncoupling Arm

#### 7.9.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the uncoupling arm (6). See Figure 7-3.
3. Mount the screw (4) and washer (5).
4. Position the uncoupling cylinder (3) on the uncoupling arm (6). Secure with bolt (1) and washer (2).
5. Mount the cover plate according to Section 7.8.

## 7.10 Replacement of Uncoupling Cylinder

### 7.10.1 Special Tools

- Standard Toolkit

### 7.10.2 Products

- Molykote 1000

### 7.10.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Disconnect the pneumatic connection from the uncoupling cylinder (3). See Figure 7-4.
3. Remove the two bolts (1) and washers (2) and the uncoupling cylinder (3).

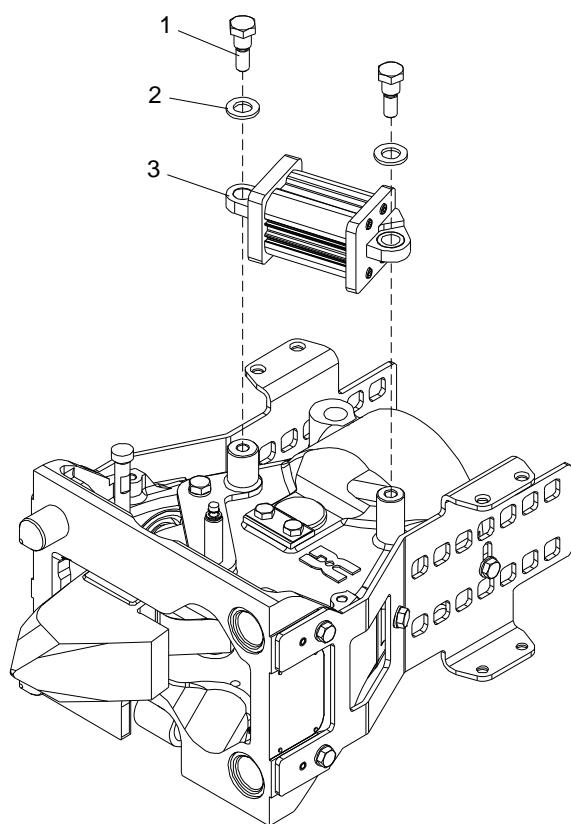


Figure 7-4: Replacement of Uncoupling Cylinder

#### **7.10.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Position the uncoupling cylinder (3) on the coupler head. Secure with two bolts (1) and washers (2). See Figure 7-4.
3. Connect the pneumatic connection to the uncoupling cylinder (3).
4. Mount the cover plate according to Section 7.8.

### **7.11 Replacement of Guide Rail**

#### **7.11.1 Special Tools**

- Standard Toolkit

#### **7.11.2 Products**

- Molykote 1000,
- Gleitmo/Fuchs Lagermeister 3000+

#### **7.11.3 Removal**

1. Remove the ball valve according to Section 7.40.
2. Remove the screws (4), locking plates (3) and ball valve attachment plate (2). See Figure 7-5.
3. Pull out the guide rail (1).

#### **7.11.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Grease the guide rail interface on the bracket and the buffer with Lagermeister 3000+.
3. Fit the guide rail (1) into the bracket and mount the ball valve attachment plate (2), locking plates (3) and screws (4). Bend two corners of the locking plates up against the screw heads to secure the screws. See Figure 7-5.
4. Mount the ball valve according to Section 7.40.

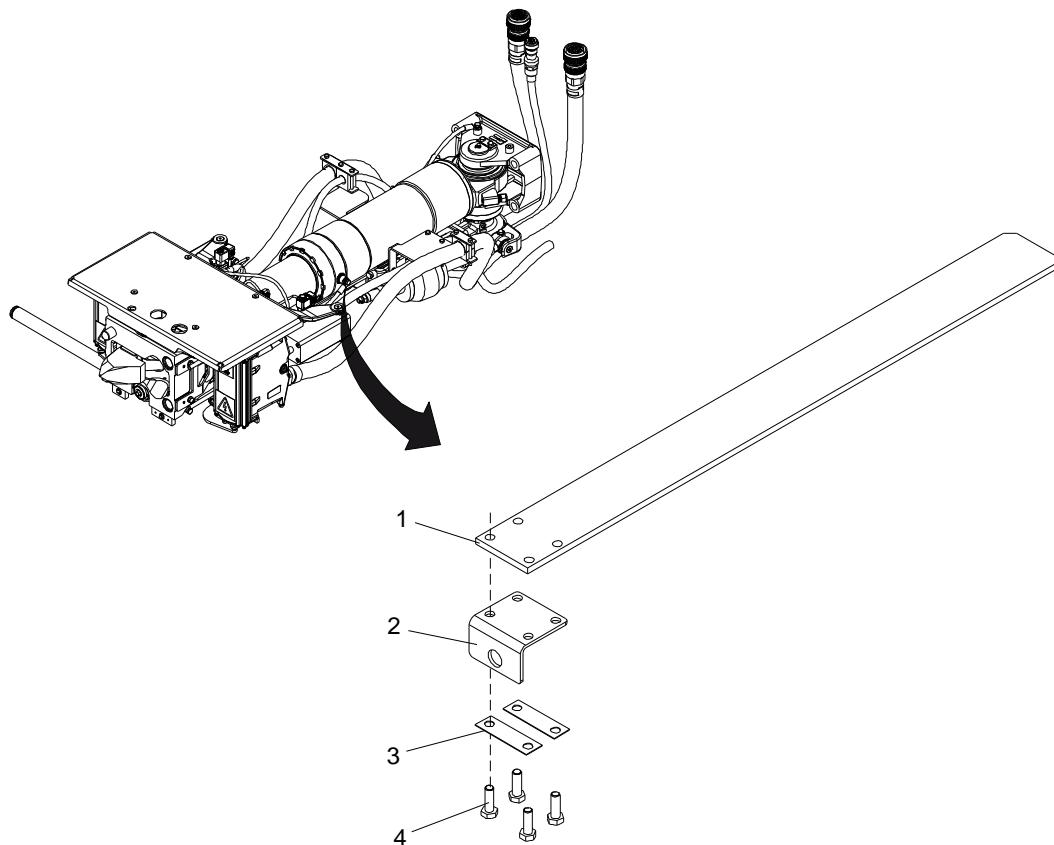


Figure 7-5: Replacement of Guide Rail

## 7.12 Replacement of Bracket Complete

### 7.12.1 Special Tools

- Standard Toolkit,
- Lifting Straps or Similar

### 7.12.2 Products

- Molykote 1000

### 7.12.3 Removal

#### **WARNING**

**WITH THE SUPPORT REMOVED THE COUPLER IS TOTALLY UNSUPPORTED AND THIS COULD RESULT IN DAMAGE. MAKE SURE TO SUPPORT THE COUPLER BY OTHER MEANS WHILE PERFORMING THIS PROCEDURE.**

1. Remove the cable support according to Section 7.16.
2. Lift front of the coupler with a lifting strap or similar to unload the spring assemblies (7). See Figure 7-6.
3. Remove the screws (11), washers (10), nuts (2), pins (9) and spacers (8).
4. Remove the spring assemblies (7) from the bracket complete (3).
5. Remove the bracket complete (3) by removing nuts (13), washers (12) and screws (6).
6. Dismount bracket (3) and remove sleeves (4) and parallel pins (5) from bracket.

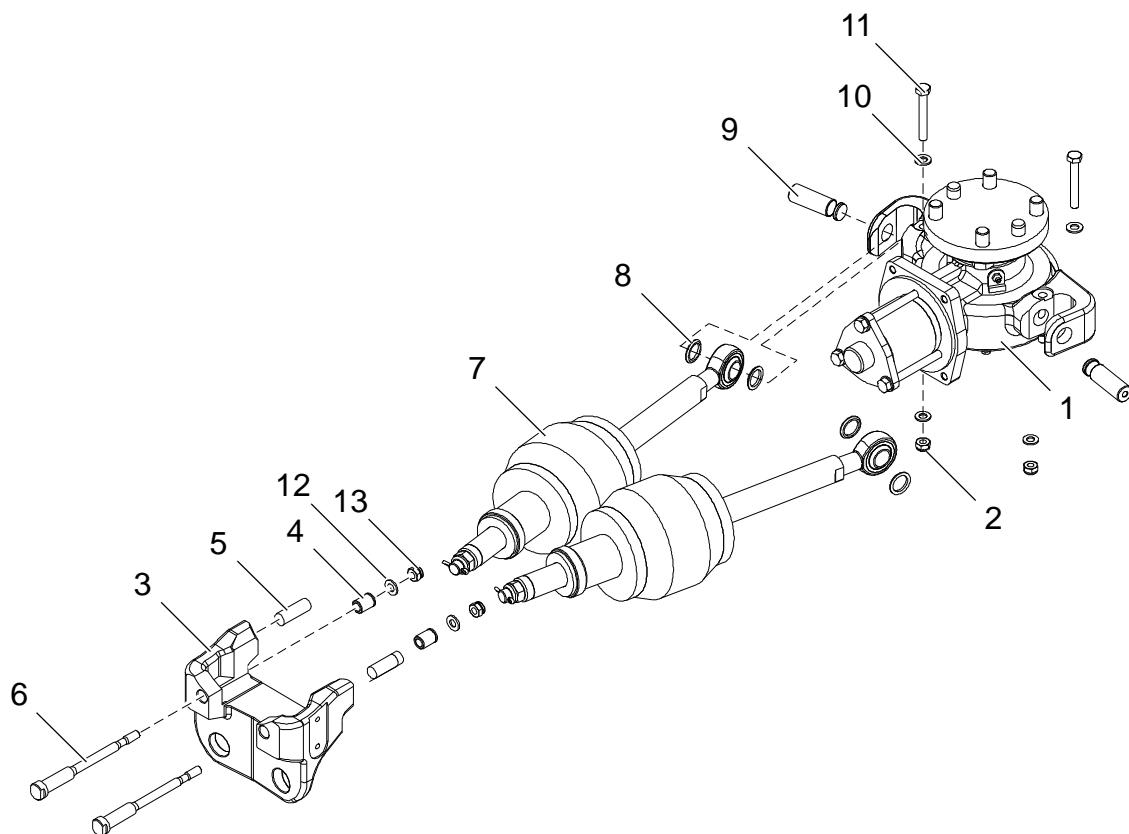


Figure 7-6: Replacement of Bracket Complete

#### 7.12.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the parallel pins (5) and bracket complete (3) to the coupler. See Figure 7-6.
3. Mount the screws (6), sleeve (4), washer (12) and nut (13).
4. Fit the spring assemblies (7) to the bracket (3) and centering house (1).
5. Mount the spacers (8), pins (9), nuts (2), washers (10) and screws (11).
6. Lower the coupler and remove the lifting straps.
7. Mount the ball valve according to Section 7.16.
8. Adjust coupler position according to Section 7.44.

#### 7.13 Replacement of Spring Assembly

##### **WARNING**

**WITH THE SUPPORT REMOVED THE COUPLER IS TOTALLY UNSUPPORTED AND THIS COULD RESULT IN DAMAGE. MAKE SURE TO SUPPORT THE COUPLER BY OTHER MEANS WHILE PERFORMING THIS PROCEDURE.**

##### 7.13.1 Special Tools

- Standard Toolkit,
- Lifting Straps or Similar

##### 7.13.2 Products

- Molykote 1000

##### 7.13.3 Removal

1. Lift front of the coupler with a lifting strap or similar to unload the spring assemblies (4). See Figure 7-7.
2. Remove the screws (8), washers (7), nuts (2), pins (6) and spacers (5).
3. Remove the spring assemblies (4) from bracket complete (3).

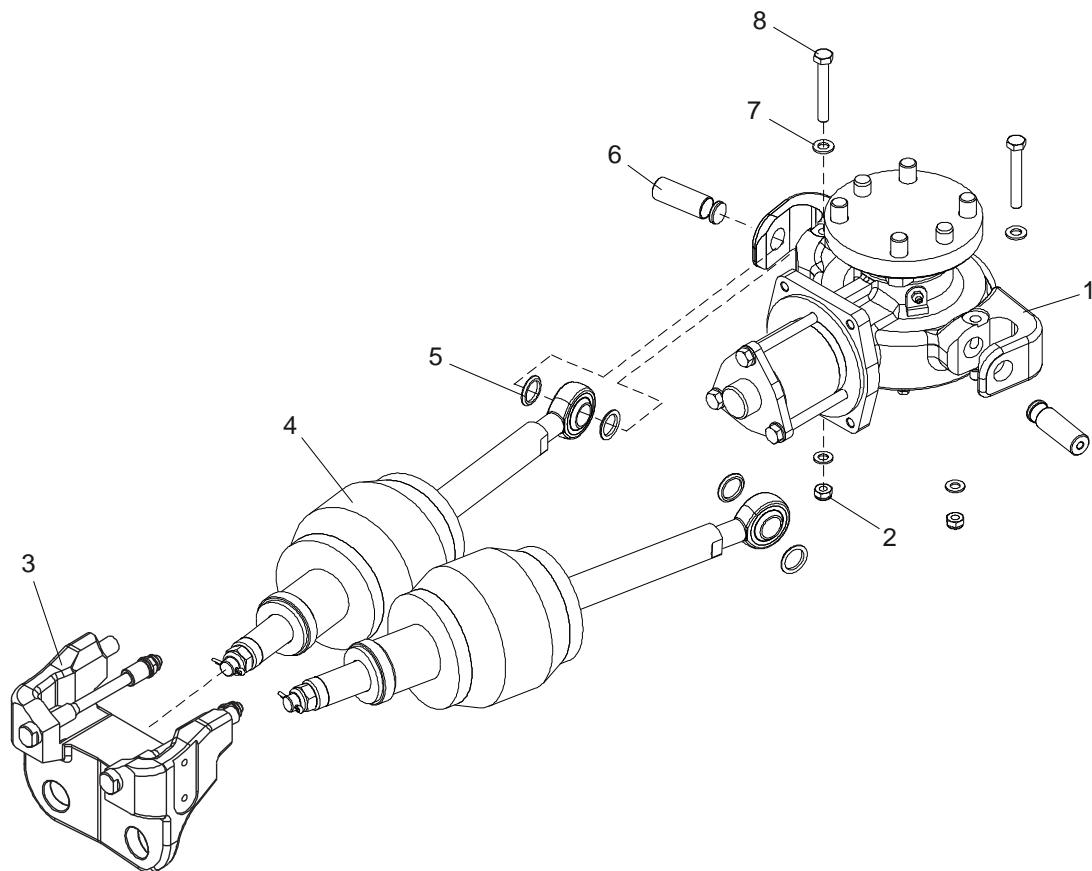


Figure 7-7: Replacement of Spring Assembly

#### 7.13.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the spring assemblies (4) to the bracket complete (3) and centering house (1). See Figure 7-7.
3. Mount the spacers (5), pins (6), nuts (2), washers (7) and screws (8).
4. Lower the coupler and remove the lifting straps.
5. Adjust coupler position according to Section 7.44.

## 7.14 Replacement of Centering House

### **WARNING**

**WITH THE SUPPORT REMOVED THE COUPLER IS TOTALLY UNSUPPORTED AND THIS COULD RESULT IN DAMAGE. MAKE SURE TO SUPPORT THE COUPLER BY OTHER MEANS WHILE PERFORMING THIS PROCEDURE.**

#### 7.14.1 Special Tools

- Standard Toolkit,
- Lifting Straps or Similar

#### 7.14.2 Products

- Molykote 1000

#### 7.14.3 Removal

1. Lift front of the coupler with a lifting strap or similar to unload the spring assemblies (9). See Figure 7-8.
2. Remove the screws (13), washers (12), nuts (5), pins (11) and spacers (10).
3. Remove the spring assemblies (9) from the coupler.
4. Remove the centering house (2) by removing the screws (4), securing plates (3) and parallel pins (1).
5. Remove the screws (8), washers (7) and centering insert (6) from the centering house (2).

#### 7.14.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the centering insert (6) to the centering house (2) and mount the washers (7) and screws (8). See Figure 7-8.
3. Fit the centering house (2) and parallel pins (1) to the coupler and mount the securing plates (3), screws (4).
4. Fit the spring assemblies (9) and mount the spacers (10), pins (11), nuts (5), washers (12) and screws (13).
5. Lower the coupler and remove the lifting straps.
6. Adjust coupler position according to Section 7.44.

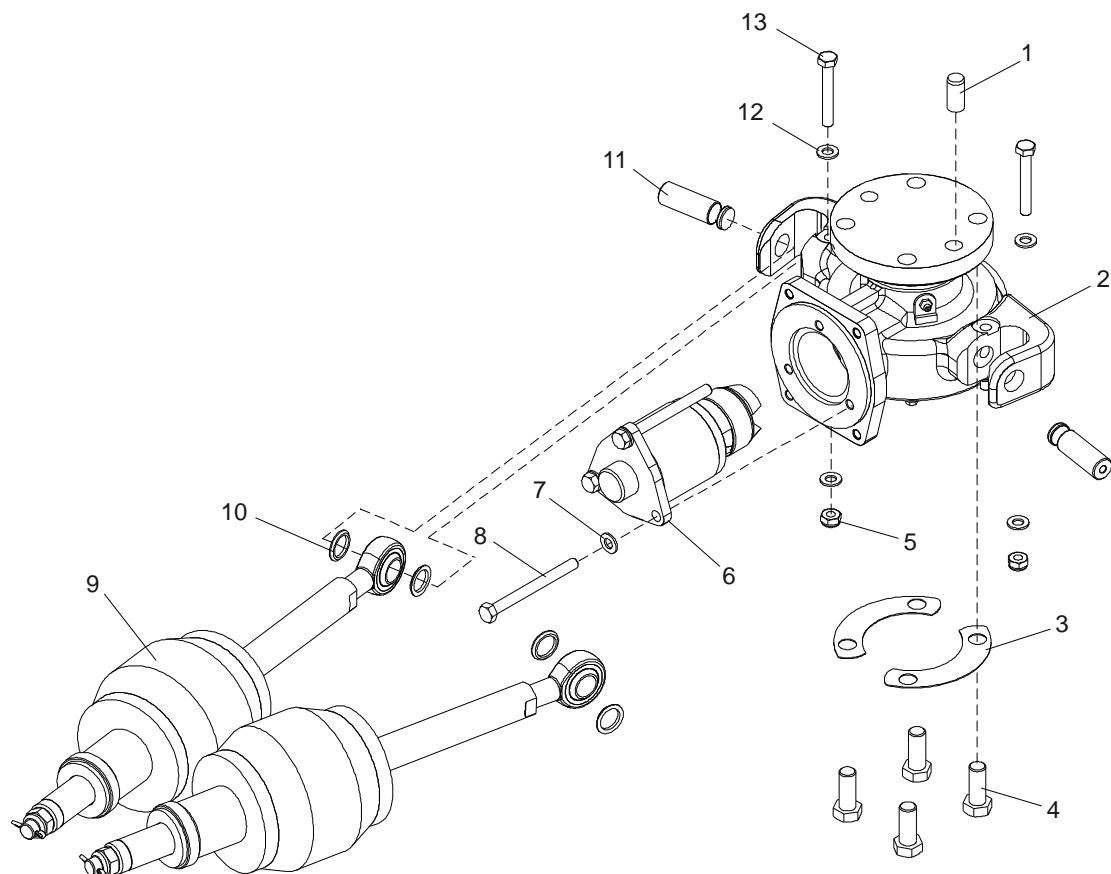


Figure 7-8: Replacement of Centering House

## 7.15 Replacement of Centering Insert

### 7.15.1 Special Tools

- Standard Toolkit

### 7.15.2 Products

- Molykote 1000

### 7.15.3 Removal

1. Remove the centering insert (4) from the centering housing (1) by removing the screws (3) and washers (2). See Figure 7-9.

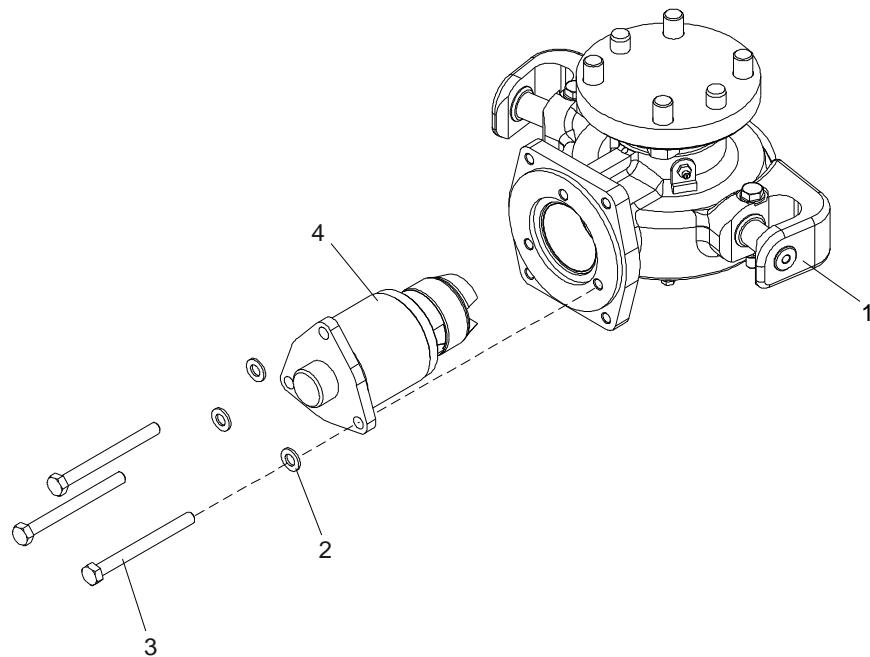


Figure 7-9: Replacement of Centering Insert

#### 7.15.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the centering insert (4) to the centering housing (1) and mount the washers (2) and screws (3). See Figure 7-9.

### 7.16 Replacement of Cable Support Left/Right

#### 7.16.1 Special Tools

- Standard Toolkit

#### 7.16.2 Products

- Molykote 1000

#### 7.16.3 Removal

1. Loosen the cabling from the cable support by removing the screws (2), nuts (6), washers (7), plates (3) and clamps (4) and (5). See Figure 7-10.
2. Remove the bracket (1) from the coupler by removing the screws (8) and washers (9).

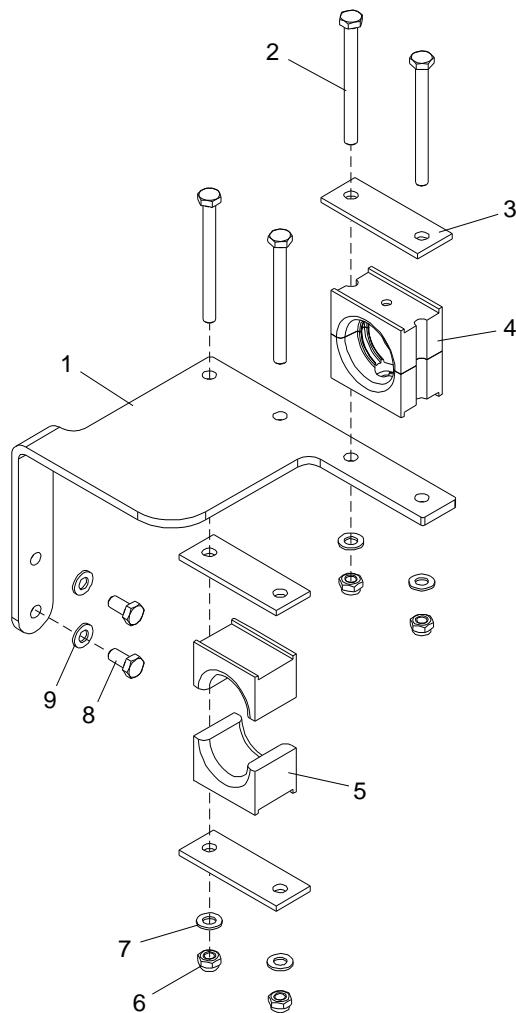


Figure 7-10: Replacement of Cable Support (Left Illustrated)

#### 7.16.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the bracket (1) to the coupler and mount the washers (9) and screws (2). See Figure 7-10.
3. Fit the cabling to the clamps (4) and (5). Fit the clamps (4) and (5) and plates (3) to the bracket (1) and mount the screws (2), washers (7) and nuts (5).

## 7.17 Replacement of Ground Cables

### 7.17.1 Special Tools

- Standard Toolkit

### 7.17.2 Products

- Molykote 1000

### 7.17.3 Removal

1. Remove a ground cable (4) by removing screws (1), lock washers (2) and washers (3). See Figure 7-11.

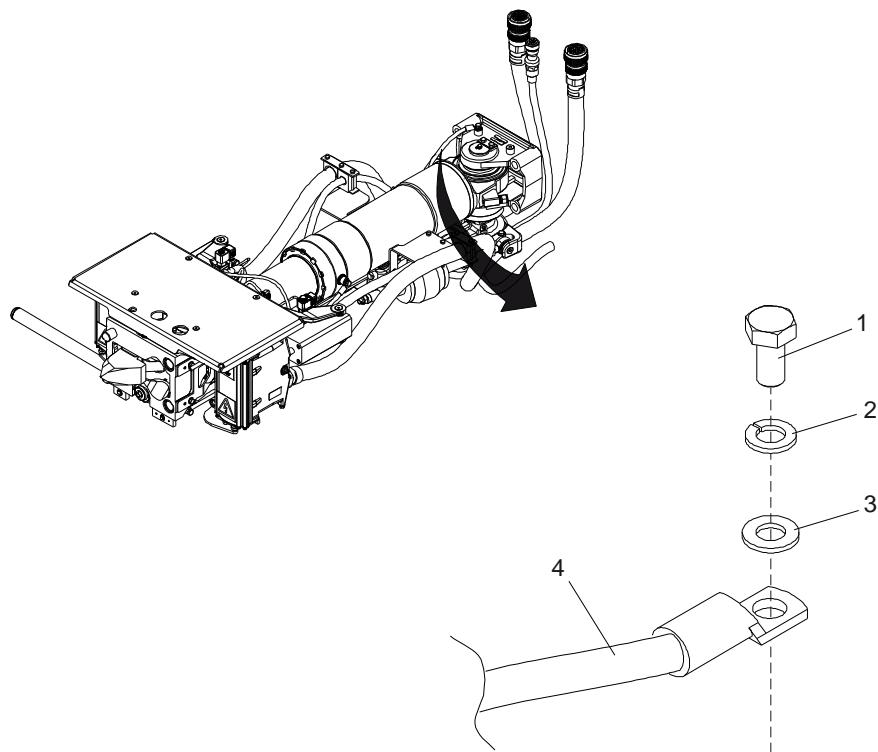


Figure 7-11: Replacement of Ground Cables

### 7.17.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Mount a ground cable (4) by mounting washers (3), lock washers (4) and screws (1). See Figure 7-11.

## 7.18 Replacement of Electrical Coupler Left / Right

### 7.18.1 Special Tools

- Standard Toolkit

### 7.18.2 Products

- Molykote 1000

### 7.18.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Disconnect the electric coupler cables from the vehicle and loosen them from the cable support.
3. Disconnect the ground cable by removing the screw (10), lock washer (9), washer (8), and bi-metallic washer (7). See Figure 7-12.
4. Remove the screws (13) and arms (14).
5. Bend down the corner of the locking washer (5).
6. Remove the connection screw (6) and locking washer (5) to disconnect the electrical coupler (11) from the piston rod (4).
7. Support the electrical coupler to prevent damage when removed.
8. Remove the two screws (1) and washers (2). Pull the two guide pins (12) out of the electrical coupler actuator (3) and remove the electrical coupler (11).

### 7.18.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Carefully position the electrical coupler (11) to the electrical coupler actuator (3) and mount the two guide pins (12). See Figure 7-12.
3. Install the two washers (2) and screws (1).
4. Connect the piston rod (4) to the electrical coupler (11) and mount the locking washer (5) and connection screw (6). Bend corner of the locking washer (5) up against the connection screw (6).
5. Mount the arms (14) and mount the screws (13). Tighten the screws (13) to 30 Nm (22 ft-lbs).
6. Fit the bi-metallic washer (7) and ground cable and mount the washer (8), lock washer (9) and screw (10).
7. Connect the electric coupler cables to the vehicle and attach them to the cable support.
8. Mount the cover plate according to Section 7.8.

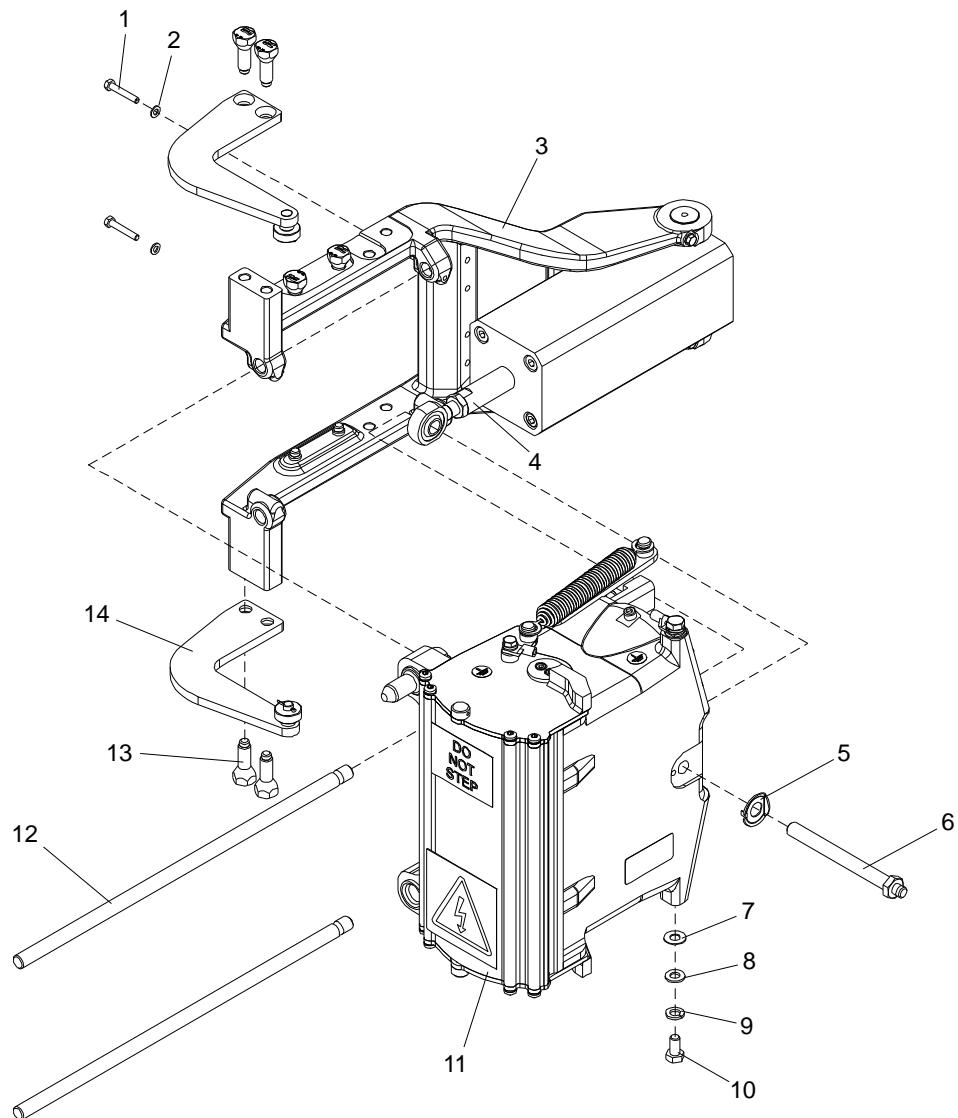


Figure 7-12: Replacement of Electrical Coupler Left / Right

## 7.19 Replacement of Electrical Coupler Contacts

### 7.19.1 Special Tools

- Standard Toolkit,
- Shaft, 1007270,
- Socket, 1007272,
- Torque wrench, 1007269

### 7.19.2 Products

- Molykote 1000

### 7.19.3 Removal

1. Close the ball valve on the pneumatic system.
2. Pull the electrical coupler to its front position to open the cover.
3. Fit the shaft 1007270 and socket 1007272 to the torque wrench 1007269 and remove the contact (1) including O-ring (3) and washer (2). See Figure 7-13.

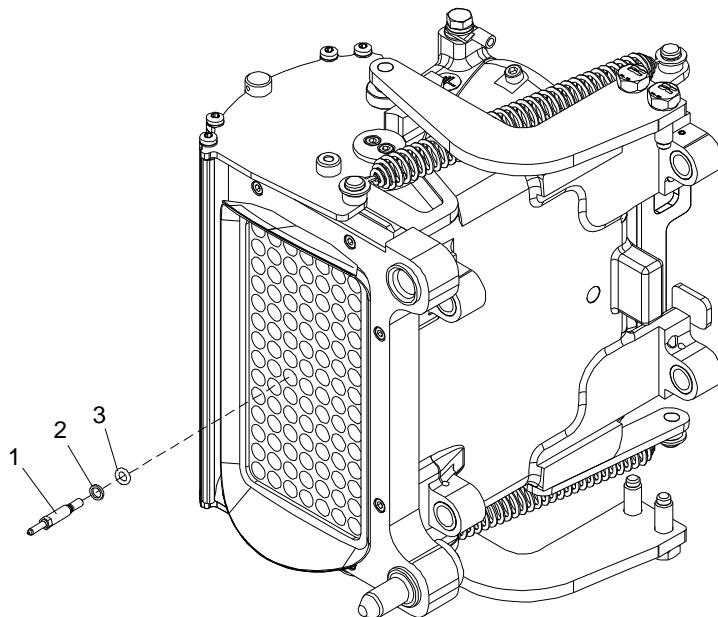


Figure 7-13: Replacement of Electrical Coupler Contacts

#### 7.19.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Mount new washer (2) and O-ring (3) on the contact (1). Fit the shaft 1007270 and socket 1007272 to the torque wrench 1007269 and screw the contact into connection screw. Tighten the contacts to  $2.8 \pm 0.6$  Nm (2.06 ft-lbs +/- 0.44 ft-lbs). See Figure 7-13.
3. Push the electrical coupler to its rear position to close the cover.
4. Open the ball valve on the pneumatic system.

### 7.20 Replacement of Guide Pin Bearing

#### 7.20.1 Special Tools

- Standard Toolkit,
- Mounting Tool, 1044989

#### 7.20.2 Products

- Molykote 1000

#### 7.20.3 Removal

1. Remove the electrical coupler according to Section 7.18.
2. Remove the spring pin (1). See Figure 7-14.
3. Press the guide bearing (2) out of the bracket.

#### 7.20.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Check that the guide bearing (2) is dry and free from grease. See Figure 7-14.
3. Fit the guiding bearing (2) to the Mounting Tool, 1044989.
4. Fit guide bearing (2) into the bracket using Mounting Tool, 1044989. Ensure that the groove in guide bearing aligns with hole for the spring pin (1).
5. Fit the spring pin (1) making sure the slit in the spring pin is faced away from the guide bearing.
6. Mount the electrical coupler according to Section 7.18.

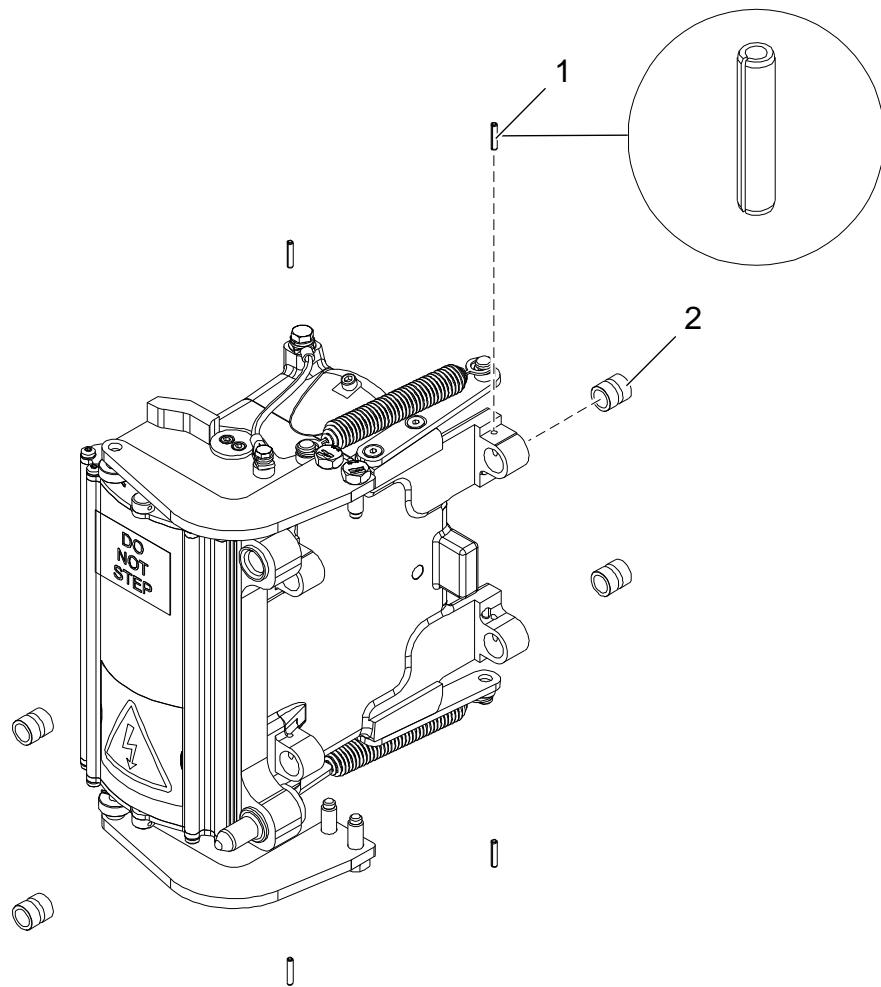


Figure 7-14: Replacement of Guide Pin Bearing

## 7.21 Replacement of Sealing Strip

### 7.21.1 Special Tools

- Standard Toolkit

### 7.21.2 Products

- Molykote 1000

### 7.21.3 Removal

1. Close the ball valve on the pneumatic system.
2. Pull the electrical coupler to its front position to open the cover.
3. Remove the frame (2) and sealing strips (3) by removing screws (1). See Figure 7-15.

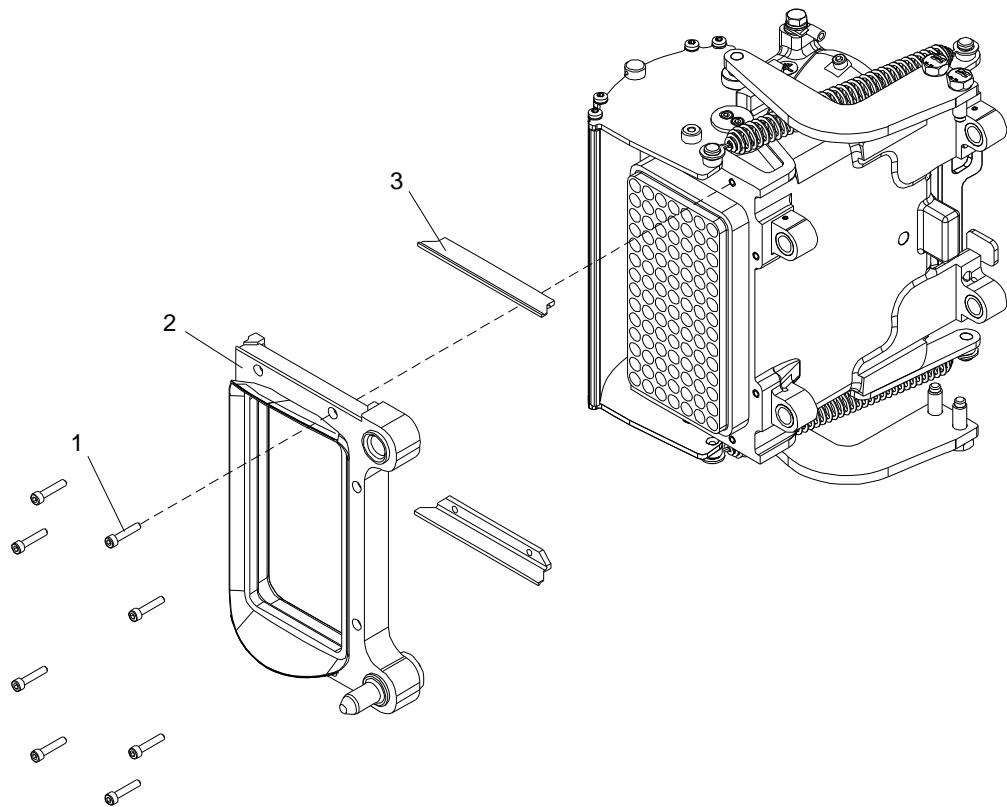


Figure 7-15: Replacement of Sealing Strip

#### 7.21.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the sealing strips (3) and frame (2) and mount screws (1). See Figure 7-15.
3. Push the electrical coupler to its rear position to close the cover.
4. Open the ball valve on the pneumatic system.

## 7.22 Replacement of Frame incl Guiding Pin and Guide Bushing

### 7.22.1 Special Tools

- Standard Toolkit

### 7.22.2 Products

- Molykote 1000

### 7.22.3 Removal

1. Close the ball valve on the pneumatic system.
2. Pull the electrical coupler to its front position to open the cover.
3. Remove the frame (3) and sealing strips (4) by removing screws (1). See Figure 7-16.
4. Remove the seal (2) from the frame (3).

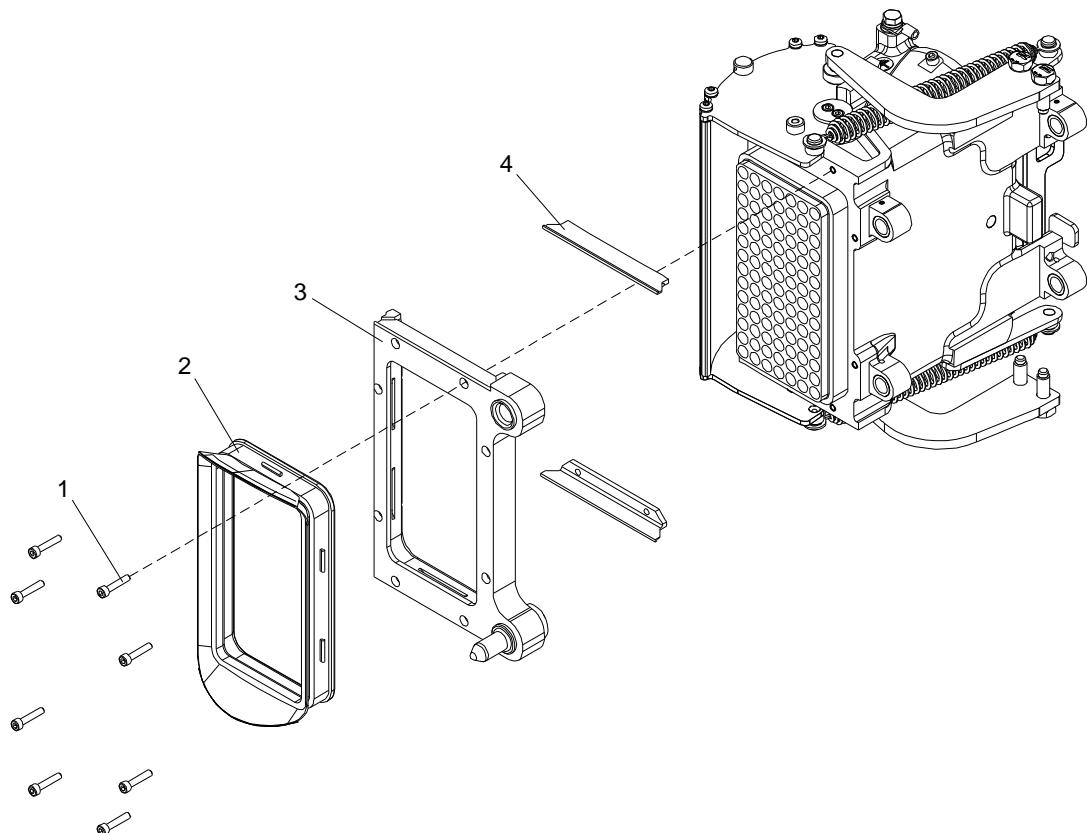


Figure 7-16: Replacement of Frame Including Guiding Pin and Guide Bushing

#### **7.22.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the seal (2) to the frame (3). See Figure 7-16.
3. Fit the sealing strips (4) and frame (2) and mount screws (1).
4. Push the electrical coupler to its rear position to close the cover.
5. Open the ball valve on the pneumatic system.

### **7.23 Replacement of Seal**

#### **7.23.1 Special Tools**

- Standard Toolkit

#### **7.23.2 Products**

- Molykote 1000

#### **7.23.3 Removal**

1. Close the ball valve on the pneumatic system.
2. Pull the electrical coupler to its front position to open the cover.
3. Remove the frame (3) and sealing strips (4) by removing screws (1). See Figure 7-17.
4. Remove the seal (2) from the frame (3).

#### **7.23.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the seal (2) to the frame (3). See Figure 7-17.
3. Fit the sealing strips (4) and frame (3) and mount screws (1).
4. Push the electrical coupler to its rear position to close the cover.
5. Open the ball valve on the pneumatic system.

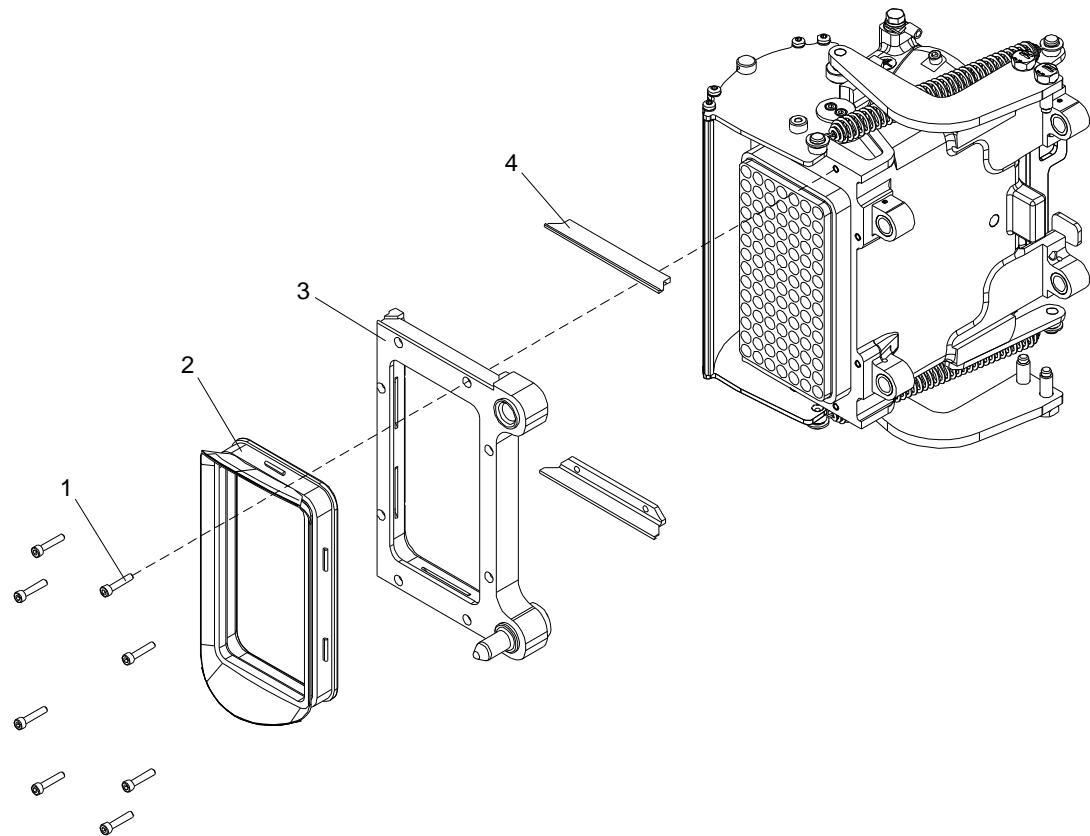


Figure 7-17: Replacement of Seal

## 7.24 Replacement of Cover Complete

### 7.24.1 Special Tools

- Standard Toolkit

### 7.24.2 Products

- Molykote 1000

### 7.24.3 Removal

1. Remove the arms according to Section 7.25.
2. Remove the two springs (1). See Figure 7-18.
3. Remove the ground cable (5) by removing screw (8), lock washer (7) and washer (6).
4. Remove the cover (4) by removing screws (2) and pins (3).

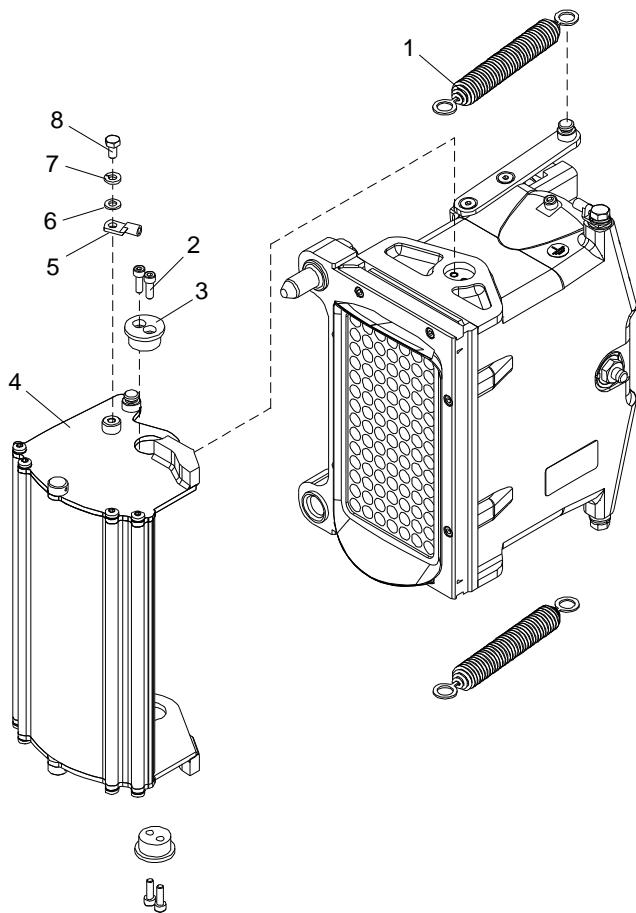


Figure 7-18: Replacement of Cover Complete

#### 7.24.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the cover (4) and mount pins (3) and screws (2). See Figure 7-18.
3. Fit the springs (1).
4. Fit the ground cable (5) and mount washer (6), lock washer (7) and screw (8).
5. Mount the arms according to Section 7.25.

## 7.25 Replacement of Arm Complete Left / Right

### 7.25.1 Special Tools

- Standard Toolkit

### 7.25.2 Products

- Molykote 1000

### 7.25.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Remove the arms (1) from the electrical coupler actuator (3) by removing screws (2). See Figure 7-19.

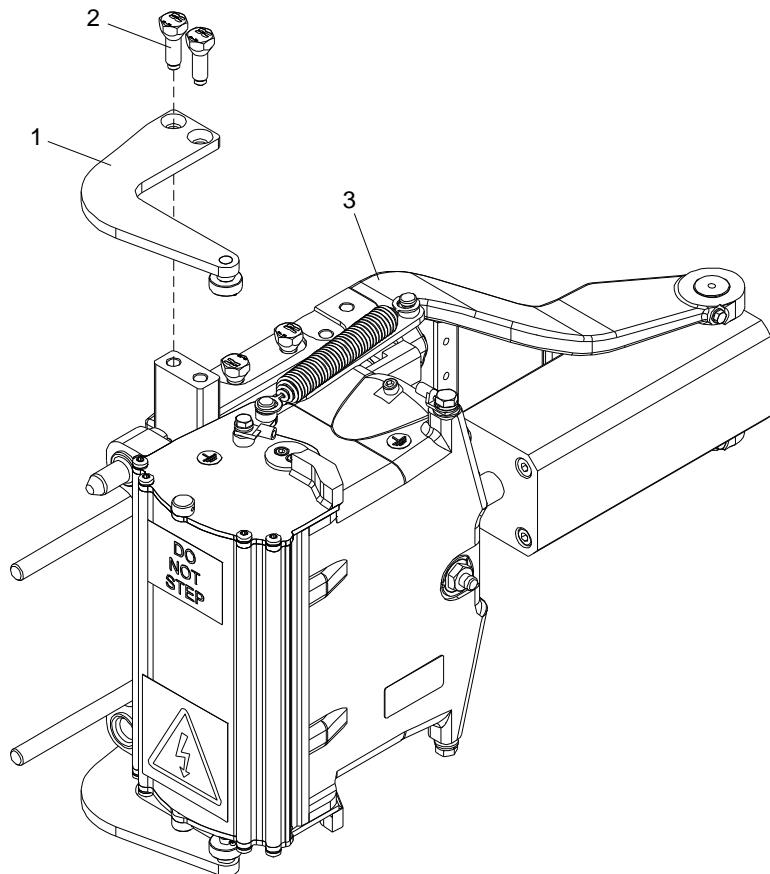


Figure 7-19: Replacement of Arm Complete Left / Right

#### **7.25.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the arms (1) to the electrical coupler actuator (3) and mount the screws (2). Tighten the screws (2) to 30 Nm (22 ft-lbs). See Figure 7-19.
3. Mount the cover plate according to Section 7.8.

### **7.26 Replacement of Spring Bracket**

#### **7.26.1 Special Tools**

- Standard Toolkit

#### **7.26.2 Products**

- Molykote 1000

#### **7.26.3 Removal**

1. Remove the cover plate according to Section 7.8.
2. Unhook the spring (2) from the spring bracket (3). See Figure 7-20
3. Remove the spring bracket (3) by removing the screws (1).

#### **7.26.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the spring bracket (3) and mount the screws (1). See Figure 7-20.
3. Fit the spring (2) to the spring bracket (3).
4. Mount the cover plate according to Section 7.8.

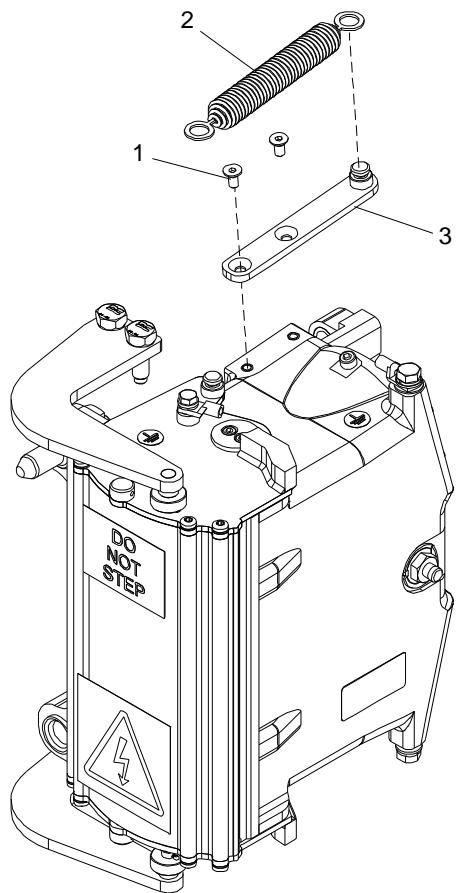


Figure 7-20: Replacement of Spring Bracket

## 7.27 Replacement of Guiding Pin

### 7.27.1 Special Tools

- Standard Toolkit
- Mounting Tool, 1032916

### 7.27.2 Products

- Molykote 1000

### 7.27.3 Removal

1. Remove the frame according to Section 7.22.
2. Remove the screw (1), washers (2) and (3) and press the guiding pin (5) out of the frame (4). See Figure 7-21.

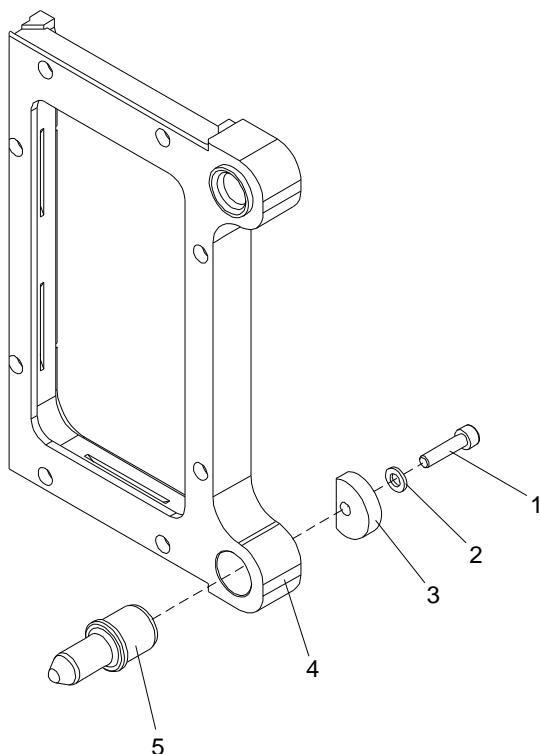


Figure 7-21: Replacement of Guiding Pin

#### 7.27.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the guiding pin (5) to the Mounting Tool, 1032916. See Figure 7-21.
3. Press the guiding pin (5) into the frame (4) using the Mounting Tool, 1032916. Gently tap the mounting tool with a hammer until the guiding pin is fully pressed into the frame.
4. Mount the washers (3) and (2) and screw (1).
5. Mount the frame according to Section 7.22.

## 7.28 Replacement of Guide Bushing

### 7.28.1 Special Tools

- Standard Toolkit
- Drifter, 1032915

### 7.28.2 Products

- Molykote 1000

### 7.28.3 Removal

1. Remove the frame according to Section 7.22.
2. Press the guide bushing (1) out of the frame (2). See Figure 7-22.

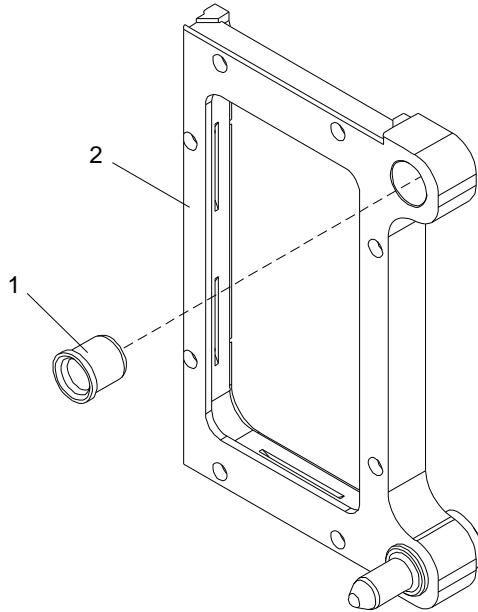


Figure 7-22: Replacement of Guide Bushing

### 7.28.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the guide bushing (1) to the Drifter, 1032915. See Figure 7-22.
3. Press the guide bushing (1) into the frame (2) using the Drifter, 1032915. Gently tap the drifter with a hammer until the guide bushing is fully pressed into the frame.
4. Mount the frame according to Section 7.22.

## 7.29 Replacement of Extension Spring

### 7.29.1 Special Tools

- Standard Toolkit

### 7.29.2 Products

- Molykote 1000

### 7.29.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Unhook the spring (1) from the spring bracket (2). See Figure 7-23.

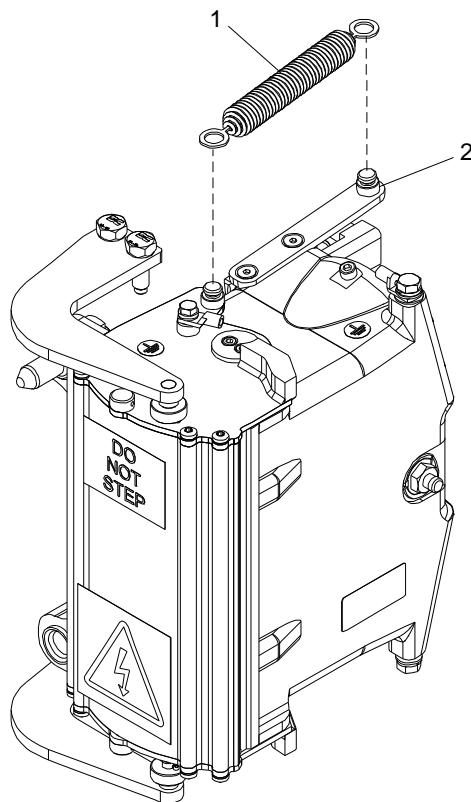


Figure 7-23: Replacement of Extension Spring

### 7.29.4 Replacement

1. Fit the spring (1) to the spring bracket (2). See Figure 7-23.
2. Mount the cover plate according to Section 7.8.

## 7.30 Replacement of Electrical Coupler Ground Cable

### 7.30.1 Special Tools

- Standard Toolkit

### 7.30.2 Products

- Molykote 1000

### 7.30.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Remove the ground cable (1) by removing screws (2), lock washers (3), washers (4) and bi-metallic washer (5). See Figure 7-24.

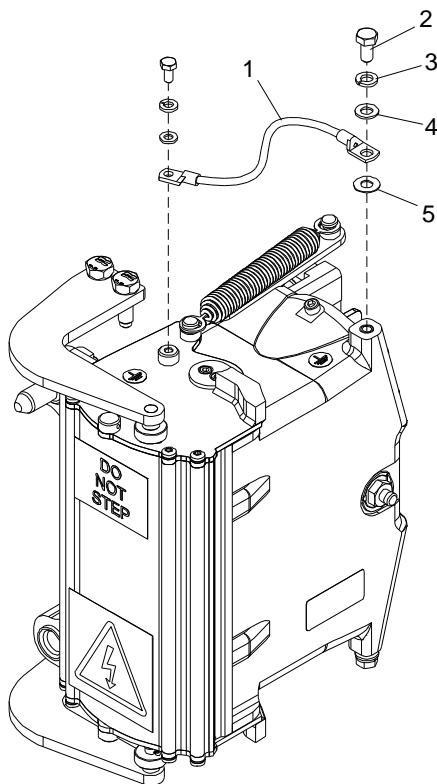


Figure 7-24: Replacement of Electrical Coupler Ground Cable

### 7.30.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the ground cable (1) and mount bi-metallic washer (5), washers (4), lock washers (3) and screws (2). See Figure 7-24.
3. Mount the cover plate according to Section 7.8.

## 7.31 Replacement of Operating Cylinder

### 7.31.1 Special Tools

- Standard Toolkit

### 7.31.2 Products

- Molykote 1000

### 7.31.3 Removal

1. Take notes how the pneumatic connections are connected to the operating cylinder (3) and loosen the connections.
2. Bend down the corner of the lock washer (7). See Figure 7-25.
3. Loosen the electrical coupler (8) from the operating cylinder (3) by removing connection screw (6).
4. Remove the screws (4), washers (5) and sleeves (2) and remove the operating cylinder (3) from the electric coupler actuator (1).

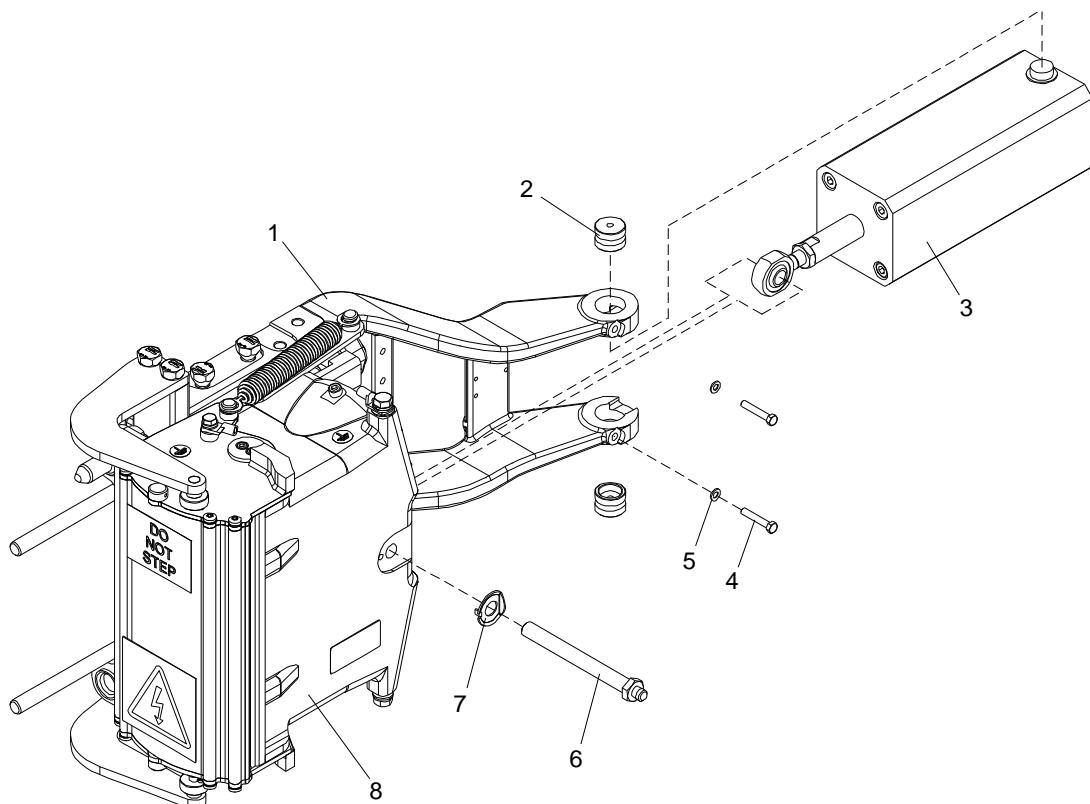


Figure 7-25: Replacement of Operating Cylinder

### 7.31.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the operating cylinder (3) and sleeves (2) to the electrical coupler actuator (1) and mount the washers (5) and screws (4). See Figure 7-25.
3. Fit the operating cylinder (3) to the electrical coupler (8) and mount the lock washer (7) and connection screw (6). Bend corner of the lock washer (7) up against the connection screw (6).
4. Connect pneumatic connections to the operating cylinder (3) according to previous notes.

## 7.32 Replacement of Guide Pin

### 7.32.1 Special Tools

- Standard Toolkit

### 7.32.2 Products

- Molykote 1000

### 7.32.3 Removal

#### **WARNING**

**ONLY REMOVE ONE GUIDE PIN AT A TIME. SUPPORT THE ELECTRICAL COUPLER BEFORE REMOVING ANY GUIDE PIN.**

1. Remove the screw (3) and washer (2). See Figure 7-26.
2. Pull out the guide pin (1).

### 7.32.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Push the guide pin (1) in position and mount the washer (2) and screw (3). See Figure 7-26.

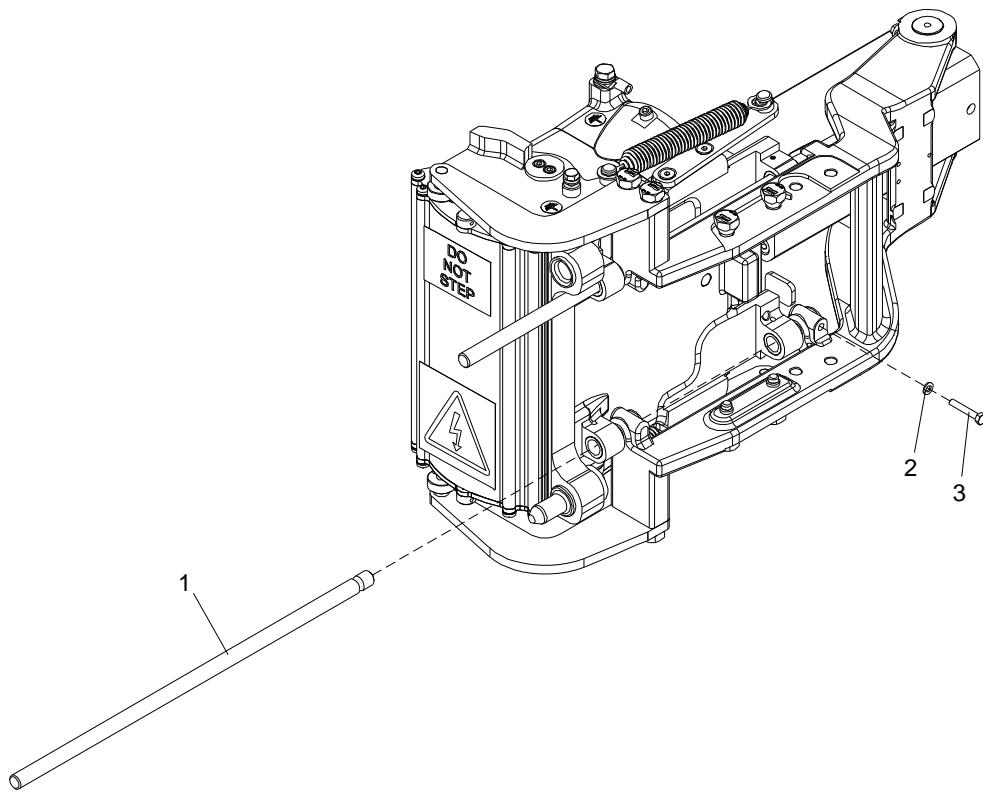


Figure 7-26: Replacement of Guide Pin

### 7.33 Replacement of MRP Valve

#### 7.33.1 Special Tools

- Standard Toolkit

#### 7.33.2 Products

- Molykote 1000

#### 7.33.3 Removal

1. Remove the MRP connection tube according to Section 7.35.
2. Remove the key indicator valve assembly according to Section 7.36.
3. Take notes how the pneumatic connections are connected to the MRP valve (1) and loosen the connections. See Figure 7-27.
4. Remove the MRP valve (1) by removing the screws (3) and washers (2).

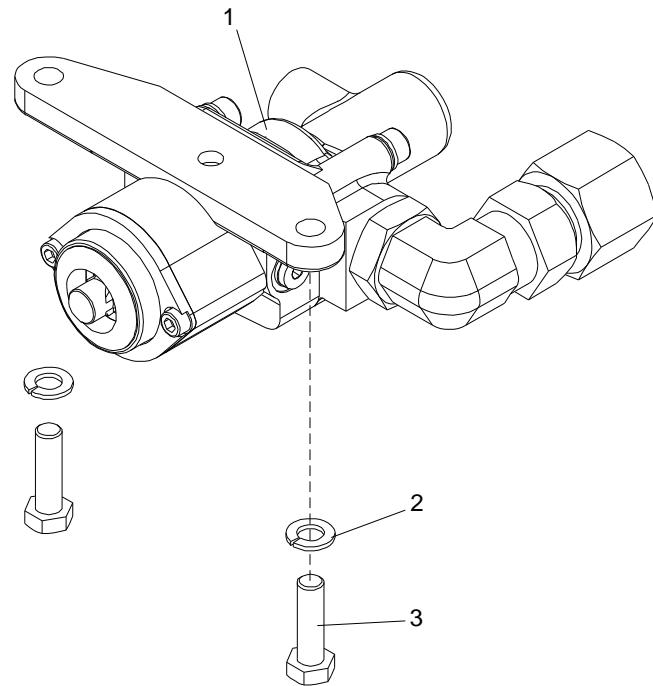


Figure 7-27: Replacement of MRP Valve

#### 7.33.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the MRP valve (1) and mount the washers (2) and screws (3). See Figure 7-27.
3. Connect pneumatic connections to the MRP valve (1) according to previous notes.
4. Mount the key indicator valve assembly according to Section 7.36.
5. Mount the MRP connection tube according to Section 7.35.

## 7.34 Replacement of MRP Front Seal Parts

### 7.34.1 Special Tools

- Standard Toolkit

### 7.34.2 Products

- Molykote 1000,
- Soapy Water

### 7.34.3 Removal

1. Remove the screws (7) and securing washer (8). See Figure 7-28.
2. Pull out the seal holder (5), spring (2) and lock ring (3).
3. Remove the seal (6) and O-ring (4) from the seal holder (5).

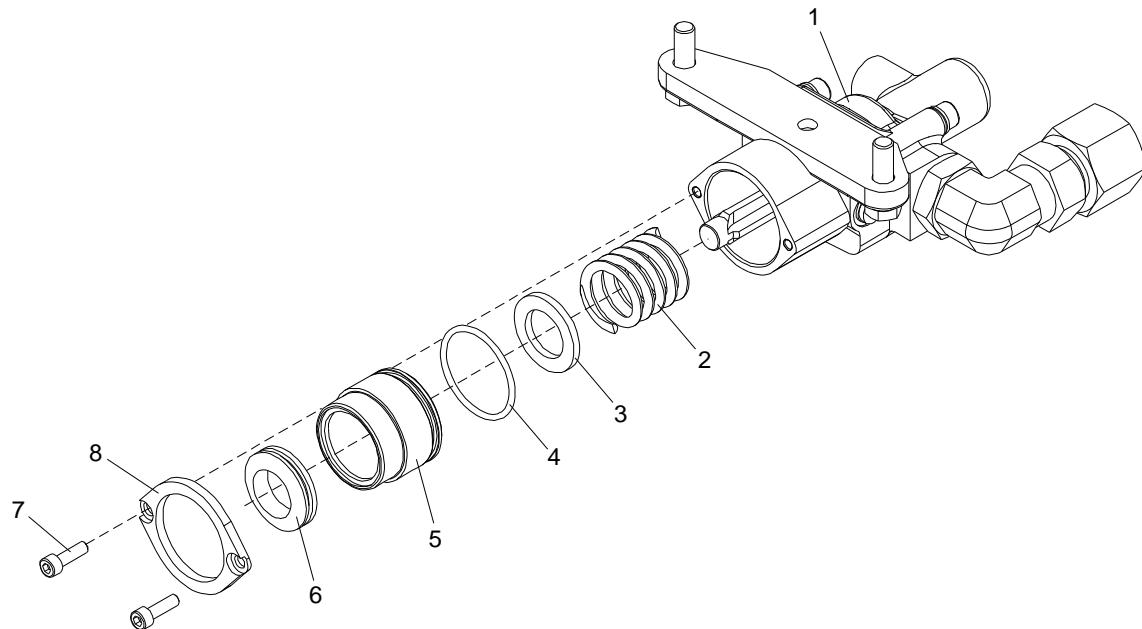


Figure 7-28: Replacement of MRP Front Seal Parts

### 7.34.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the seal (6) and O-ring (4) to the seal holder (5). Fitting can be made easier with soapy water. See Figure 7-28.
3. Fit the lock ring (3) and spring (2) to the seal holder (5) and fit it to the MRP valve (1).
4. Mount the securing washer (8) and screws (7).

## 7.35 Replacement of MRP Connection Pipe

### 7.35.1 Special Tools

- Standard Toolkit

### 7.35.2 Products

- Molykote 1000
- Loctite 545

### 7.35.3 Removal

1. Take notes how the pneumatic connections are connected to the MRP connection pipe (3) and loosen the connections. See Figure 7-29.
2. Unscrew the pipe connection (2) on the MRP valve (1).
3. Remove the MRP connection pipe (3) by removing the screw (5) and washer (4).

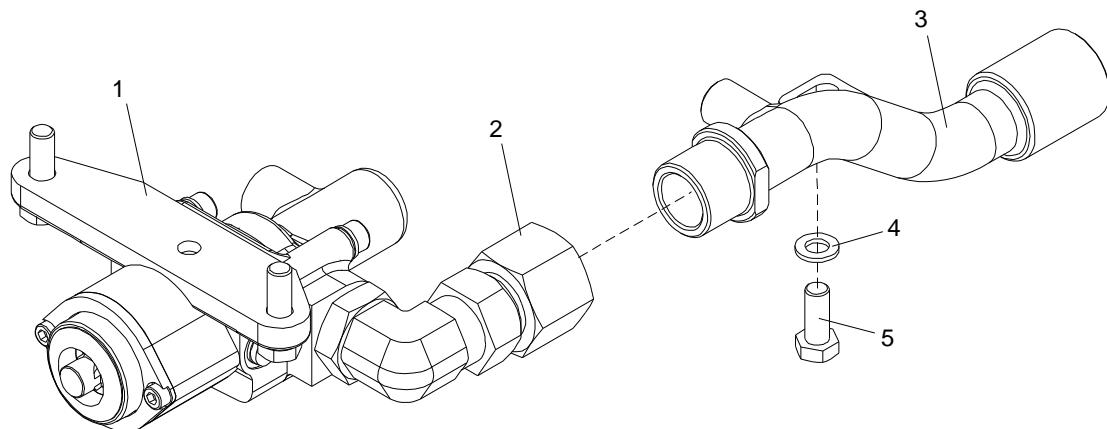


Figure 7-29: Replacement of MRP Connection Pipe

### 7.35.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Apply Loctite 545 to the pipe connection threads and fit the MRP connection pipe (3) to the MRP valve (1) and tighten the pipe connection (2). See Figure 7-29.
3. Mount the washer (4) and screw (5).
4. Connect pneumatic connections to the MRP connection pipe (3) according to previous notes.

## 7.36 Replacement of Key Indicator Valve Assembly (V5)

### 7.36.1 Special Tools

- Standard Toolkit

### 7.36.2 Products

- Molykote 1000

### 7.36.3 Removal

1. Take notes how the pneumatic connections are connected to the key indicator valve assembly (1) and loosen the connections. See Figure 7-30.
2. Remove the key indicator valve assembly (1) from the attachment (4) by removing the screws (2) and washers (3).

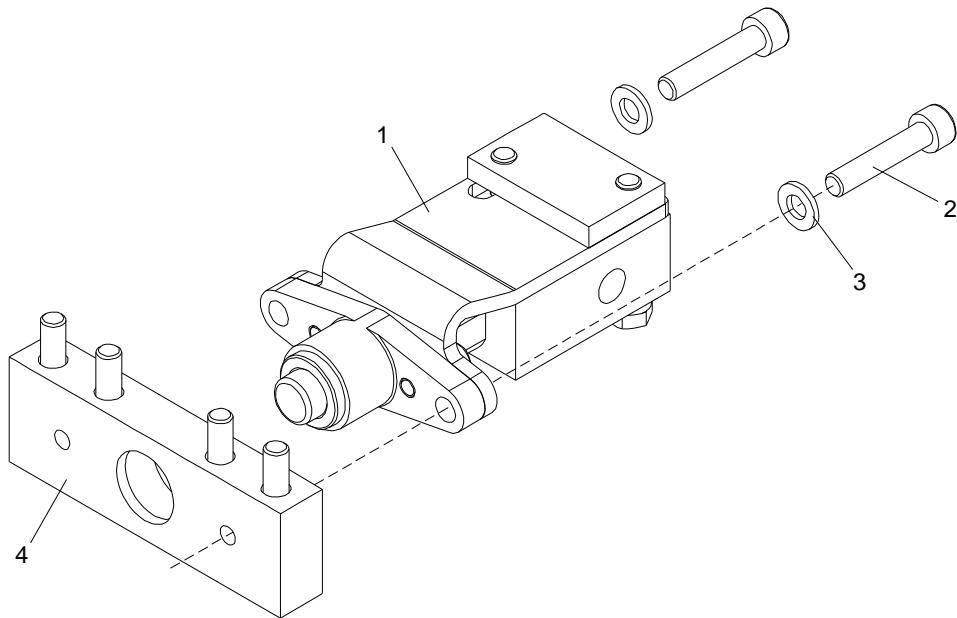


Figure 7-30: Replacement of Key Indicator Valve Assembly (V5)

### 7.36.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the key indicator valve assembly (1) to the attachment (4) and mount the washers (3) and screws (2). See Figure 7-30.
3. Connect pneumatic connections to the key indicator valve assembly (1) according to previous notes.
4. Adjust the key indicator valve according to Section 7.46.

## 7.37 Replacement of Uncoupling Valve (V11)

### 7.37.1 Special Tools

- Standard Toolkit

### 7.37.2 Products

- Molykote 1000

### 7.37.3 Removal

1. Take notes how the pneumatic connections are connected to the uncoupling valve (1) and loosen the connections. See Figure 7-31.
2. Remove the uncoupling valve (1) and distance plate (2) from the left electrical coupler actuator by removing the screws (4) and washers (3).

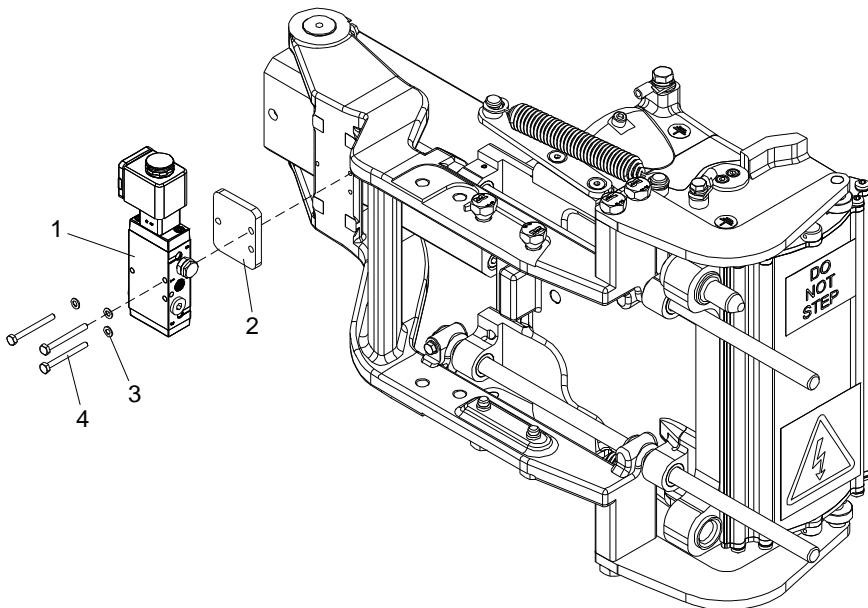


Figure 7-31: Replacement of Uncoupling Valve (V11)

### 7.37.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the distance plate (2) and uncoupling valve (1) to the left electrical coupler actuator and mount the washers (3) and screws (4). See Figure 7-31.
3. Connect pneumatic connections to the uncoupling valve (1) according to previous notes.

## 7.38 Replacement of Electrical Coupler Control Valve (V12 / V13)

### 7.38.1 Special Tools

- Standard Toolkit

### 7.38.2 Products

- Molykote 1000

### 7.38.3 Removal

1. Take notes how the pneumatic connections are connected to the electrical coupler control valve (1) and loosen the connections. See Figure 7-32.
2. Remove the electrical coupler control valve (1) and distance plate (4) from the right electrical coupler actuator by removing the screws (2) and washers (3).

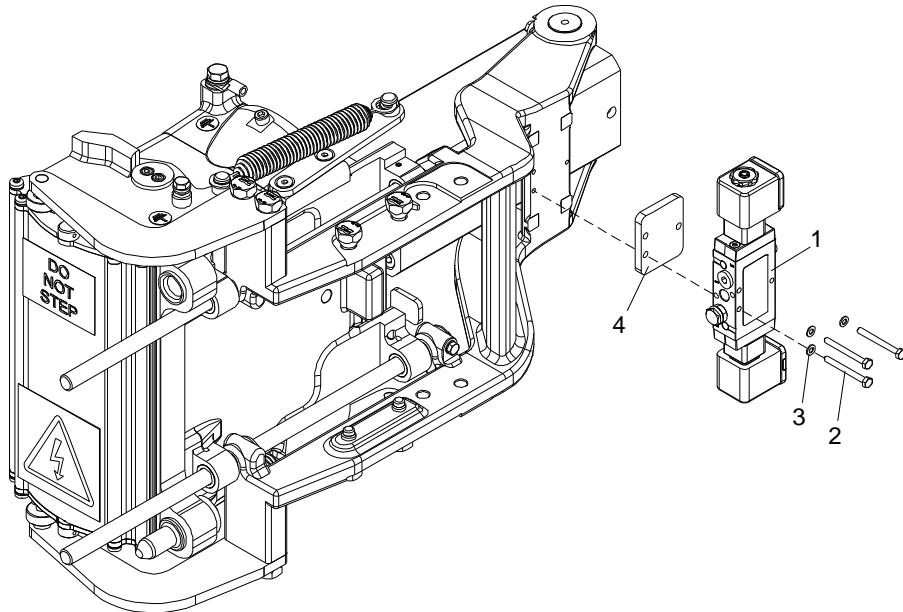


Figure 7-32: Replacement of Electrical Coupler Control Valve (V12 / V13)

### 7.38.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the distance plate (4) and electrical coupler control valve (1) to the right electrical coupler actuator and mount the washers (3) and screws (2). See Figure 7-32.
3. Connect pneumatic connections to the electrical coupler control valve (1) according to previous notes.

## 7.39 Replacement of Air Filter Unit

### 7.39.1 Special Tools

- Standard Toolkit

### 7.39.2 Products

- Molykote 1000

### 7.39.3 Removal

1. Remove the air filter unit (1) by removing the pipe connections (2). See Figure 7-33.

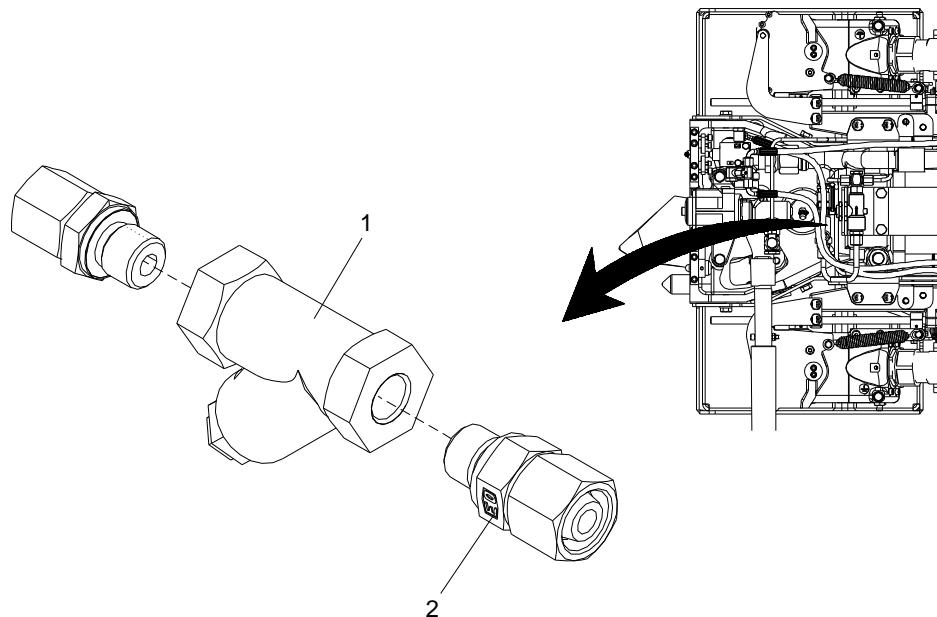


Figure 7-33: Replacement of Air Filter Unit

### 7.39.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Install the air filter unit (1) by attaching the pipe connections (2). See Figure 7-33.

## 7.40 Replacement of Ball Valve

### 7.40.1 Special Tools

- Standard Toolkit

### 7.40.2 Products

- Molykote 1000

### 7.40.3 Removal

1. Remove the handle (5) and front nut (2) to loosen the ball valve (3) from the attachment plate (6). See Figure 7-34.
2. Remove the ball valve (3) by removing the pipe connections (1) and washer (4).

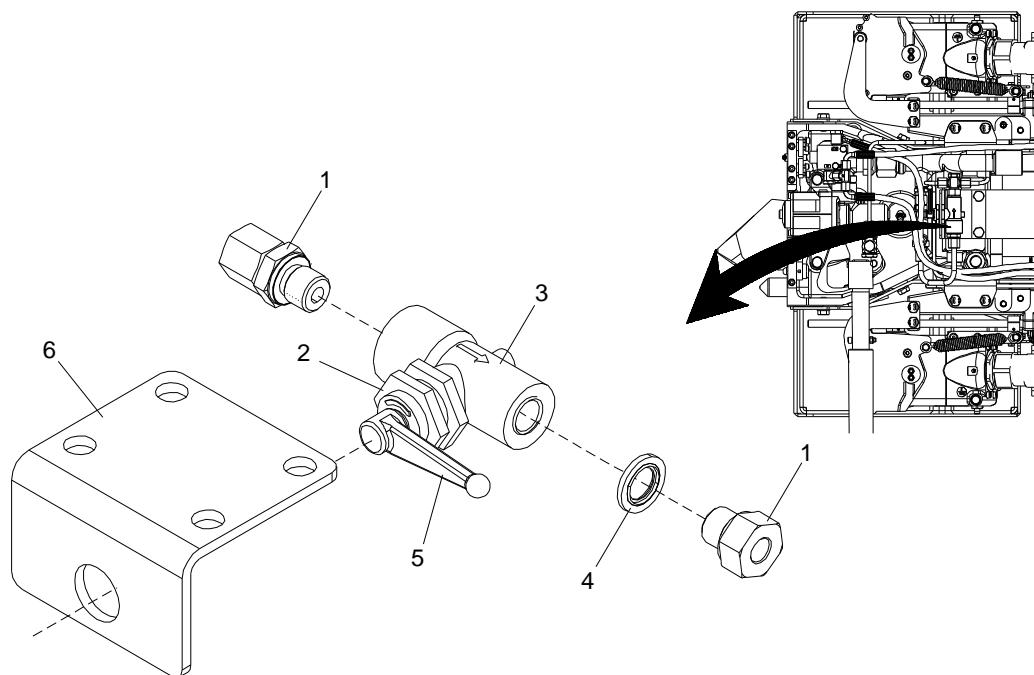


Figure 7-34: Replacement of Ball Valve

### 7.40.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the ball valve (3) to the attachment plate (6) and attach the washer (4) and pipe connections (1). See Figure 7-34.
3. Fit the front nut (2) and handle (5).

## 7.41 Replacement of Terminal Box Complete

### 7.41.1 Special Tools

- Standard Toolkit,

### 7.41.2 Products

- Molykote 1000

### 7.41.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Open the cover of the terminal box (4). See Figure 7-35.
3. Take notes how the wiring is connected to the terminal block inside the terminal box (4).
4. Disconnect the wiring from the terminal block.
5. Remove the terminal box complete (4) by removing the screws (1), washers (2) and nuts (3).

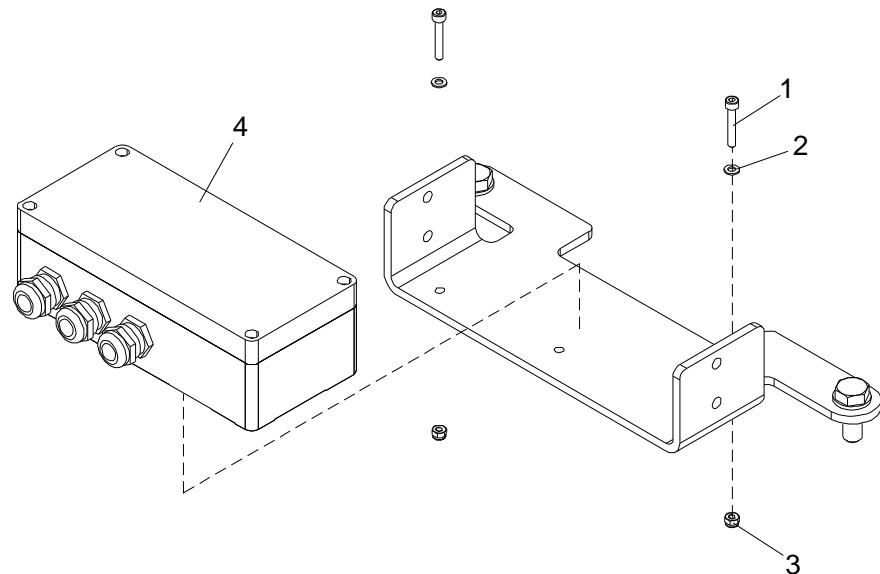


Figure 7-35: Replacement of Terminal Box Complete

#### **7.41.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the terminal box complete (4) and mount the screws (1), washers (2) and nuts (3). See Figure 7-35.
3. Connect the wiring to the terminal block inside the terminal box (4) according to previous notes and circuit diagram in Section 7.49.
4. Close the cover of the terminal box (4).
5. Mount the cover plate according to Section 7.8.

### **7.42 Replacement of Inductive Sensor (S8)**

#### **7.42.1 Special Tools**

- Standard Toolkit

#### **7.42.2 Products**

- Molykote 1000

#### **7.42.3 Removal**

1. Remove the cover plate according to Section 7.8.
2. Open the cover of the terminal box (1). See Figure 7-36.
3. Take notes how the inductive sensor wiring is connected to the terminal block inside the terminal box (1).
4. Disconnect the wiring from the terminal block.
5. Remove the inductive sensor (2) from the mechanical coupler.

#### **7.42.4 Replacement**

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the inductive sensor (2) to the mechanical coupler. See Figure 7-36.
3. Connect the inductive sensor wiring to the terminal block inside the terminal box (1) according to previous notes and circuit diagram in Section 7.49.
4. Close the cover of the terminal box (1).
5. Adjust the inductive sensor according to Section 7.47.
6. Mount the cover plate according to Section 7.8.

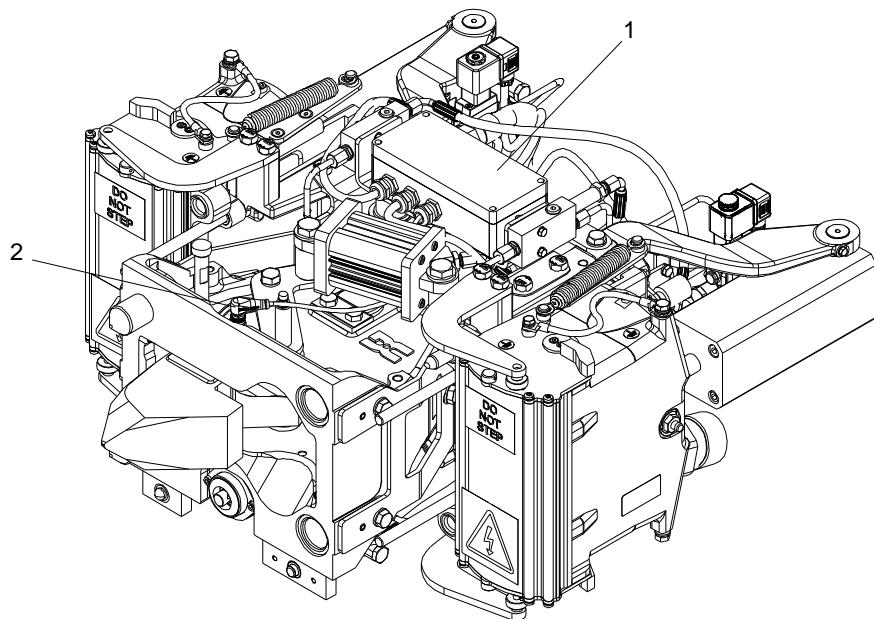


Figure 7-36: Replacement of Inductive Sensor (S8)

## 7.43 Replacement of Electrical Coupler Retracted Switch (S3.1 / S3.2)

### 7.43.1 Special Tools

- Standard Toolkit

### 7.43.2 Products

- Molykote 1000

### 7.43.3 Removal

1. Remove the cover plate according to Section 7.8.
2. Open the cover of the terminal box (1). See Figure 7-37.
3. Take notes how switch wiring is connected to the terminal block inside the terminal box (1).
4. Disconnect the wiring from the terminal block.
5. Remove the electrical coupler retracted switch (3) from the bracket (2) by removing its front nut.

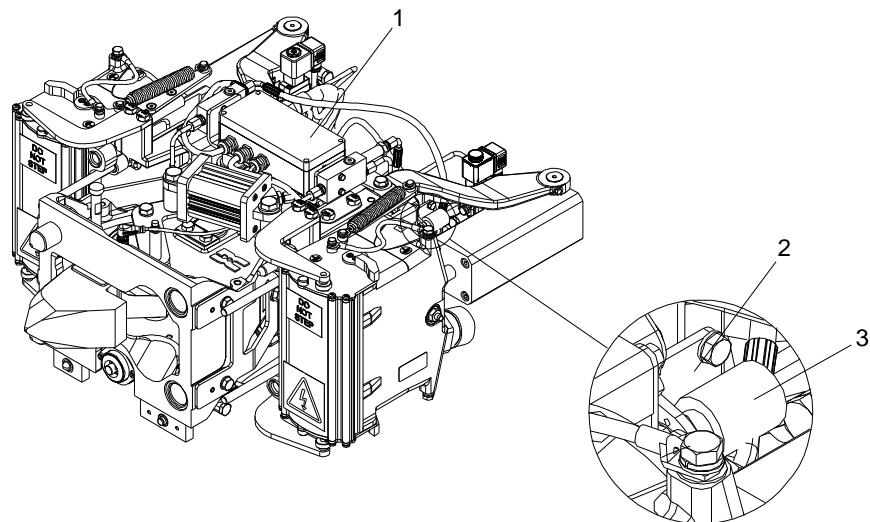


Figure 7-37: Replacement of Electrical Coupler Retracted Switch (S3.1 / S3.2)

#### 7.43.4 Replacement

1. Replace all fasteners. Apply Molykote 1000 to all screws.
2. Fit the electrical coupler retracted switch (3) to the bracket (2) and mount its front nut. See Figure 7-37.
3. Connect the switch wiring to the terminal block inside the terminal box (1) according to previous notes and circuit diagram in Section 7.49.
4. Close the cover of the terminal box (1).
5. Adjust the electrical coupler retracted switch according to Section 7.48.
6. Mount the cover plate according to Section 7.8.

## 7.44 Adjustment of Centering

### 7.44.1 Special Tools

- Standard Toolkit
- Digital Spirit Level

### 7.44.2 Products

- Molykote 1000

### 7.44.3 Procedure

Check that the coupler is vertically levelled within  $\pm 0.5^\circ$  by placing a digital spirit level against the flat surface on the mechanical coupler front face and that coupler height top of rail to centerline is 510mm +/- 10mm. If not level adjust according to following instructions.

#### **WARNING**

**EXCEEDING THE ADJUSTMENT LIMIT OF THE DAMPER COULD RESULT IN SEVERE INJURY OR DEATH. IF PROPER FUNCTION IS NOT ACHIEVED WITHIN THE ADJUSTMENT LIMIT, THE DAMPER SHOULD BE REPLACED.**

**THE DISTANCE X IN FIGURE 7-38 MUST UNDER NO CIRCUMSTANCES EXCEED 70 MM.**

1. Loosen the nut (1) on both dampers. See Figure 7-38.
2. Turn the key handle (2) on both dampers the same number of turns. Clockwise to raise the coupler and counter clockwise to lower it.
3. Tighten the nut (1) after adjustment.

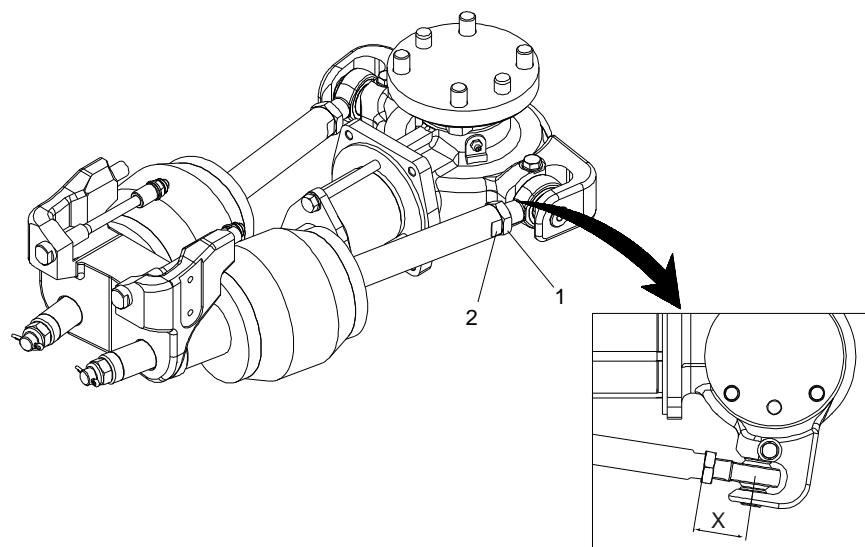


Figure 7-38: Adjustment of Centering

## 7.45 Adjustment of Indication Plate

### 7.45.1 Special Tools

- Standard Toolkit

### 7.45.2 Products

- Molykote 1000

### 7.45.3 Procedure

1. Adjust the indication plate (2) by turning the nut (1) until the spring plunger (3) protrudes 5 mm from the mechanical coupler front face. See Figure 7-39.

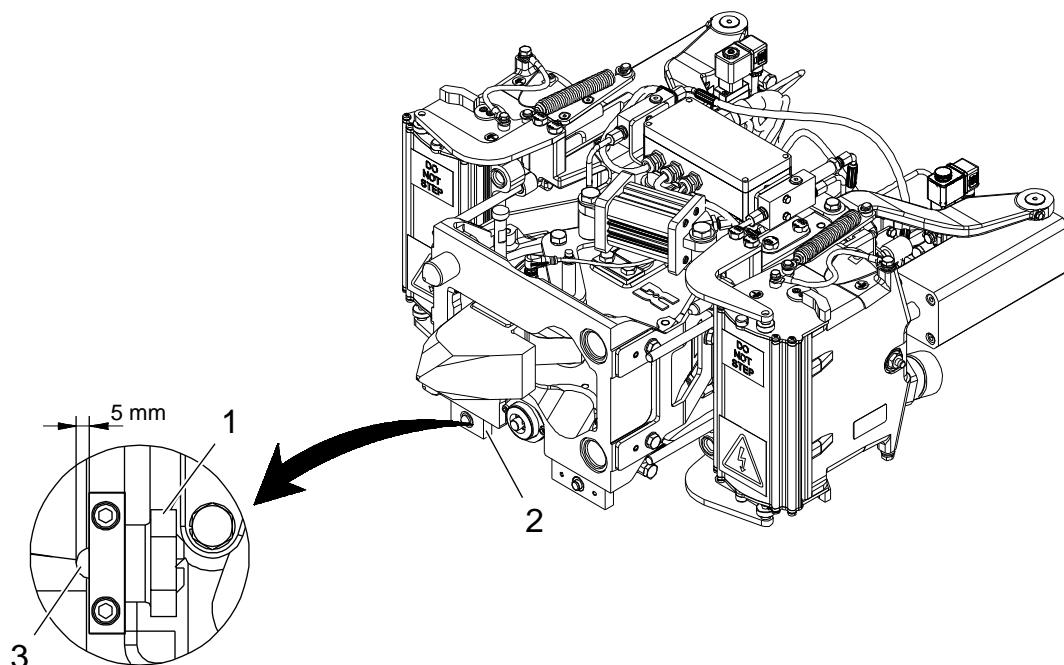


Figure 7-39: Adjustment of Indication Plate

## 7.46 Adjustment of Key Indicator Valve (V5)

### 7.46.1 Special Tools

- Standard Toolkit

### 7.46.2 Products

- Molykote 1000

### 7.46.3 Procedure

1. Loosen the screws (3). See Figure 7-40.
2. Press the plunger (1) and position the key indicator valve (2) so that it opens when the plunger (1) is flush with the mechanical coupler front face.
3. Tighten the screws (3) and recheck the adjustment.

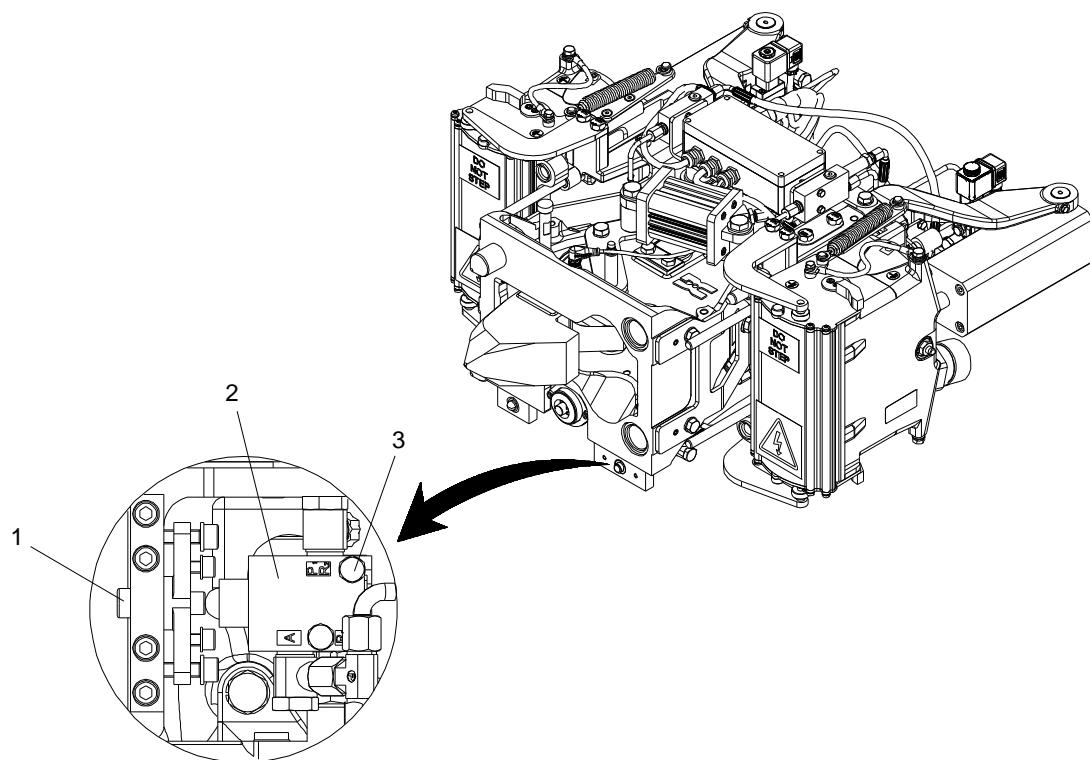


Figure 7-40: Adjustment of Key Indicator Valve (V5)

## 7.47 Adjustment of Inductive Sensor (S8)

### 7.47.1 Special Tools

- Standard Toolkit

### 7.47.2 Products

- Molykote 1000

### 7.47.3 Procedure

1. Loosen the two nuts (1). See Figure 7-41.
2. Adjust the sensor by turning it. The bottom surface of the sensor head (3) shall align with the inner casing wall (2) of the coupler head.
3. Secure the sensor with the two nuts (1).

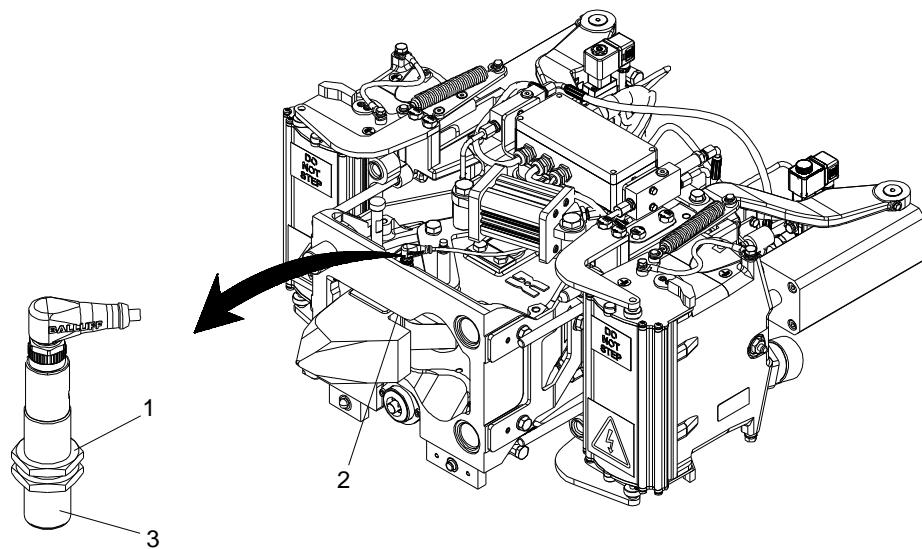


Figure 7-41: Adjustment of Inductive Sensor (S8)

## 7.48 Adjustment of Electrical Coupler Retracted Switch (S3.1 / S3.2)

### 7.48.1 Special Tools

- Standard Toolkit

### 7.48.2 Products

- Molykote 1000

### 7.48.3 Procedure

1. Adjust the position of the switch (3) by means of the nuts (1) and (2), until the switch activates 2 mm before the electrical coupler reaches its mechanical rear end stop. See Figure 7-42.
2. Secure the switch (3) with the nuts (1) and (2) after adjustment.

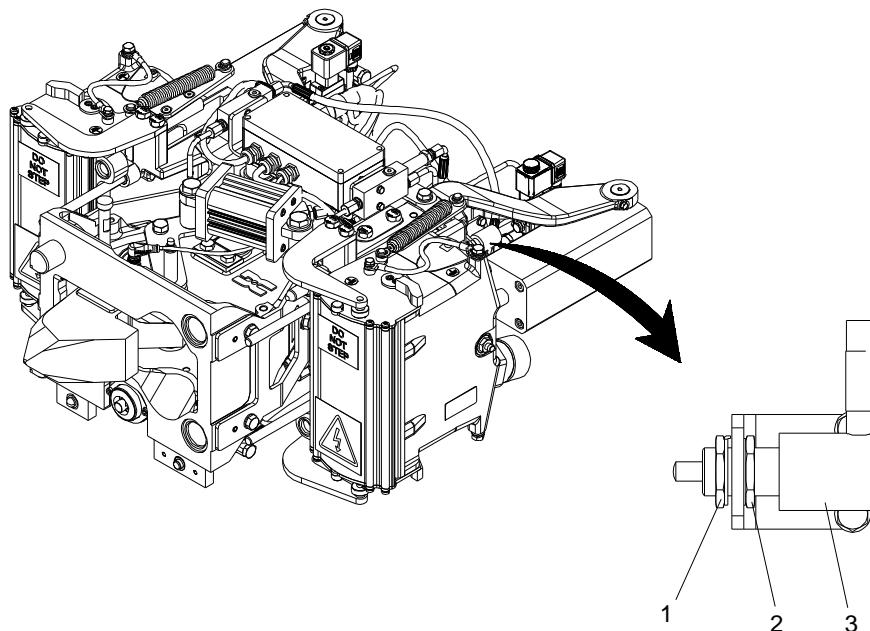
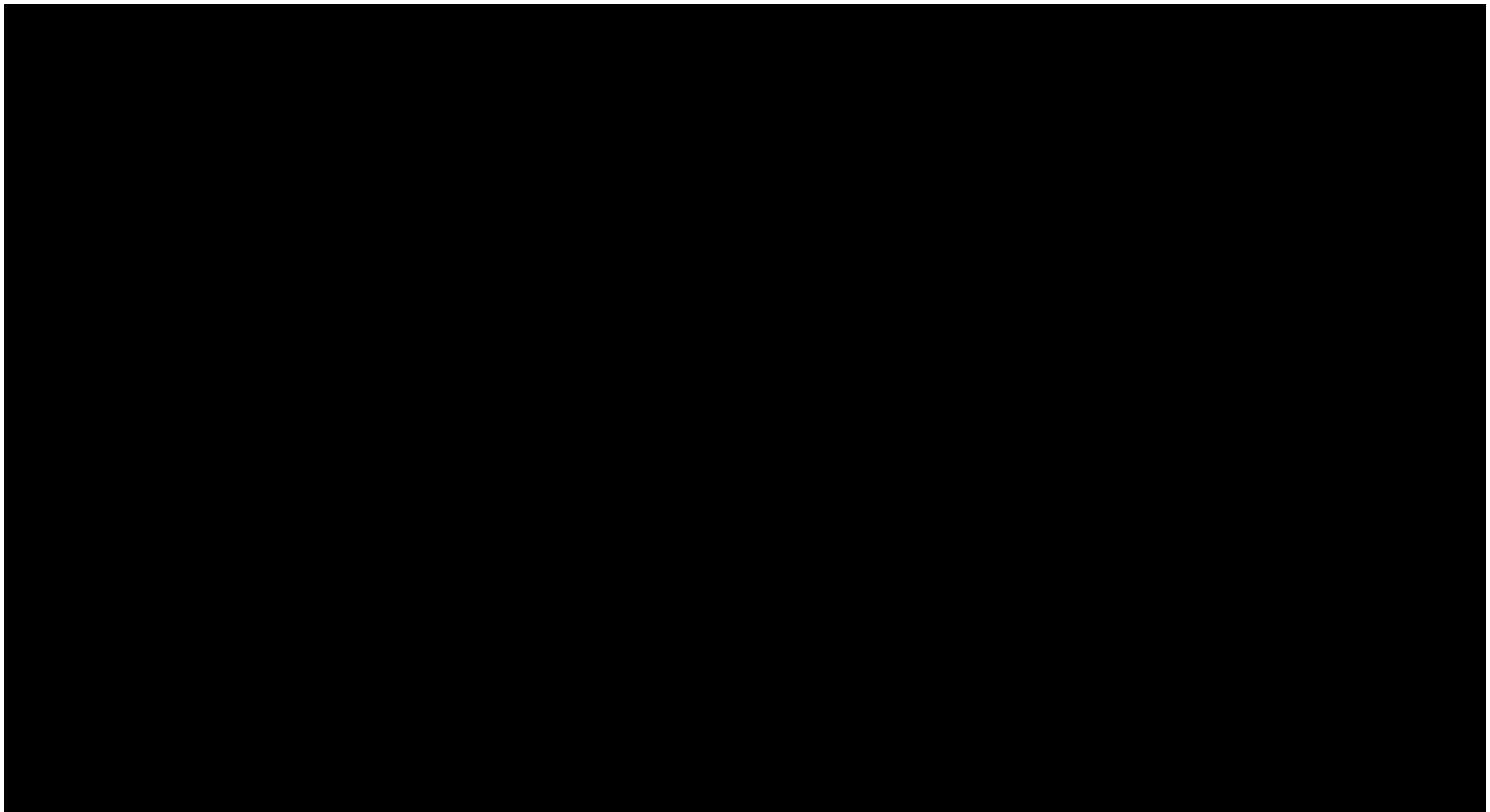


Figure 7-42: Adjustment of Electrical Coupler Retracted Switch (S3.1 / S3.2)

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## 7.49 Schematics



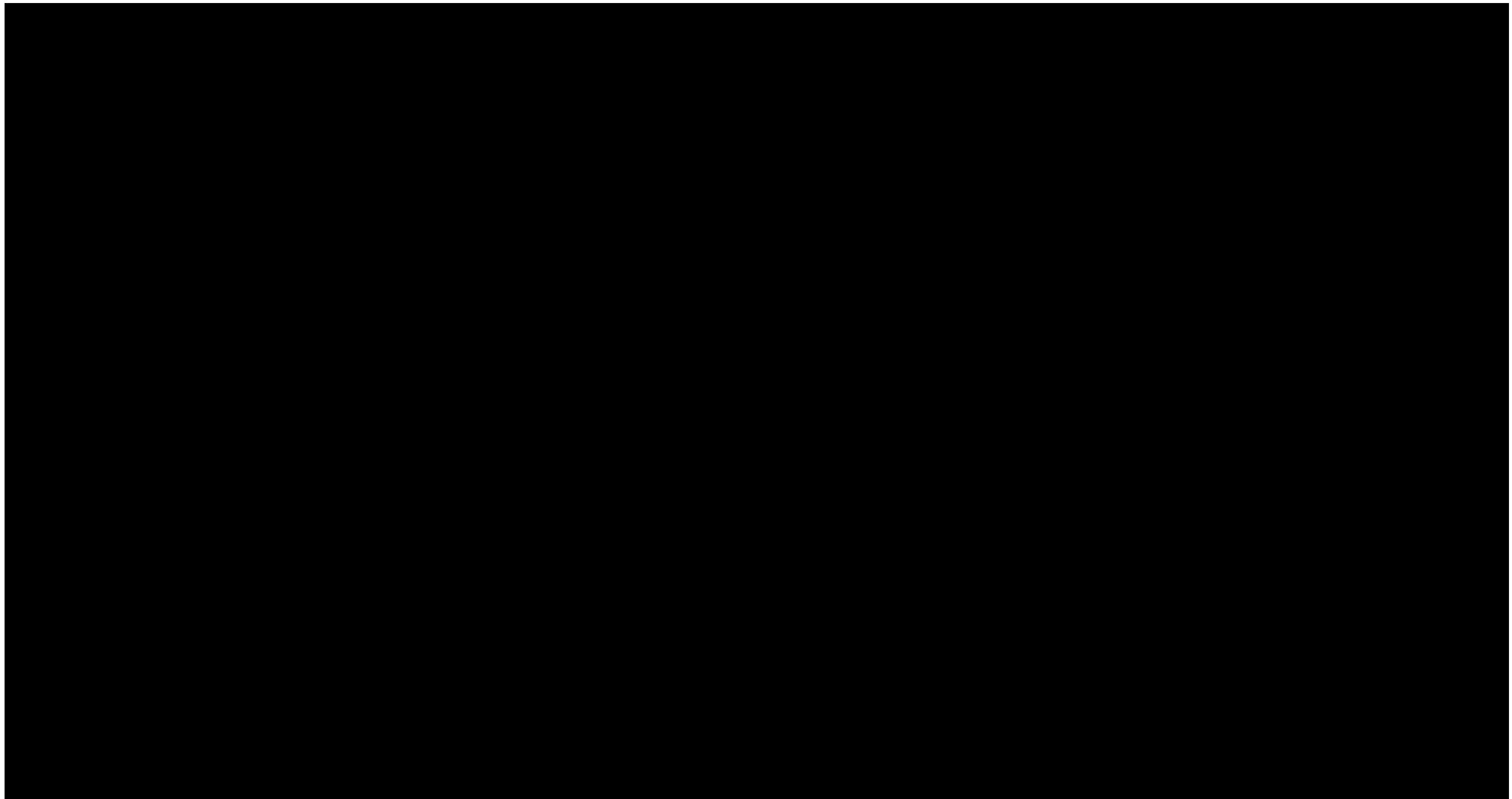


Figure 7-44: Coupler Pin Locations and Trainlines

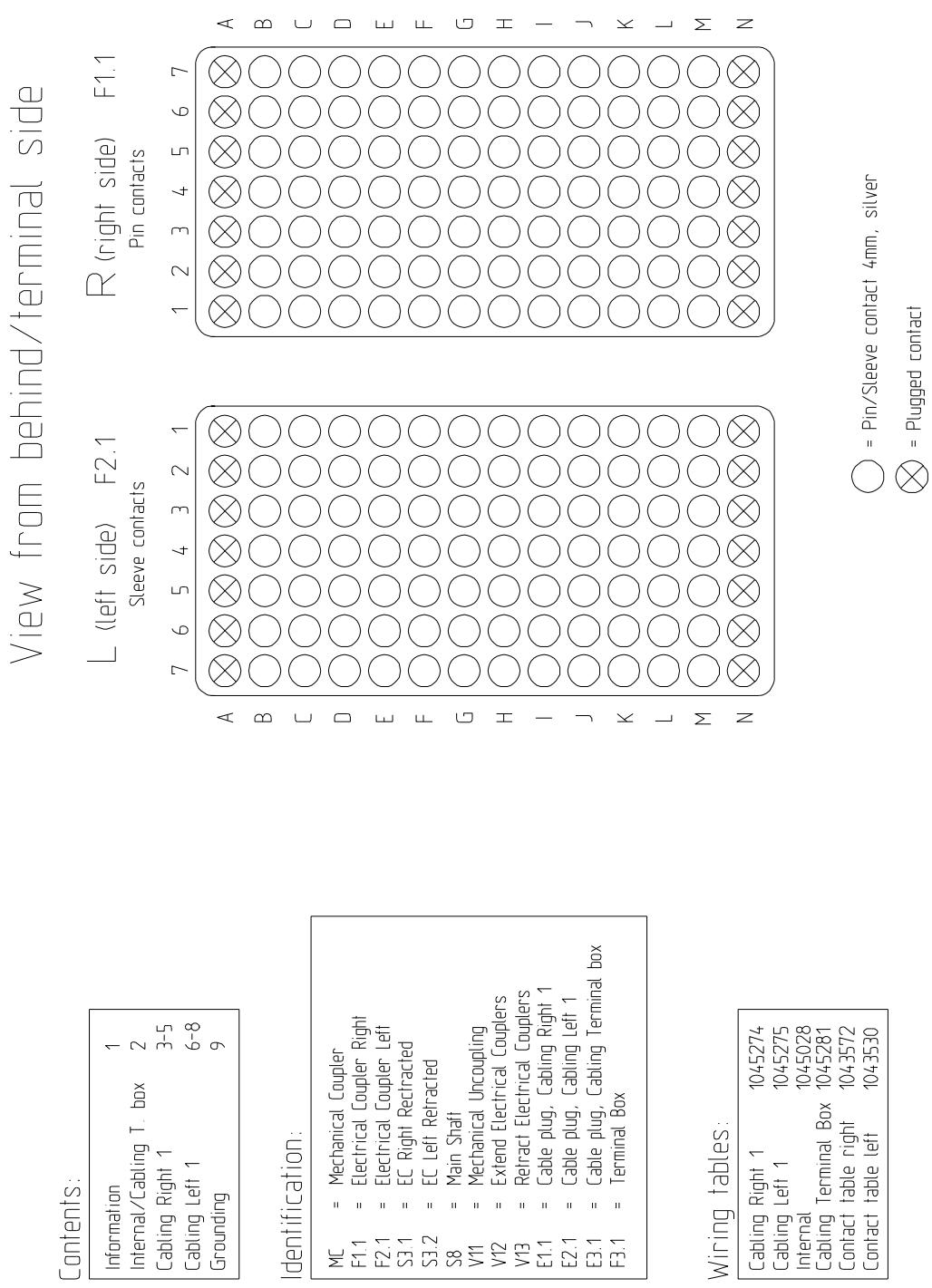
Wiring Legend:

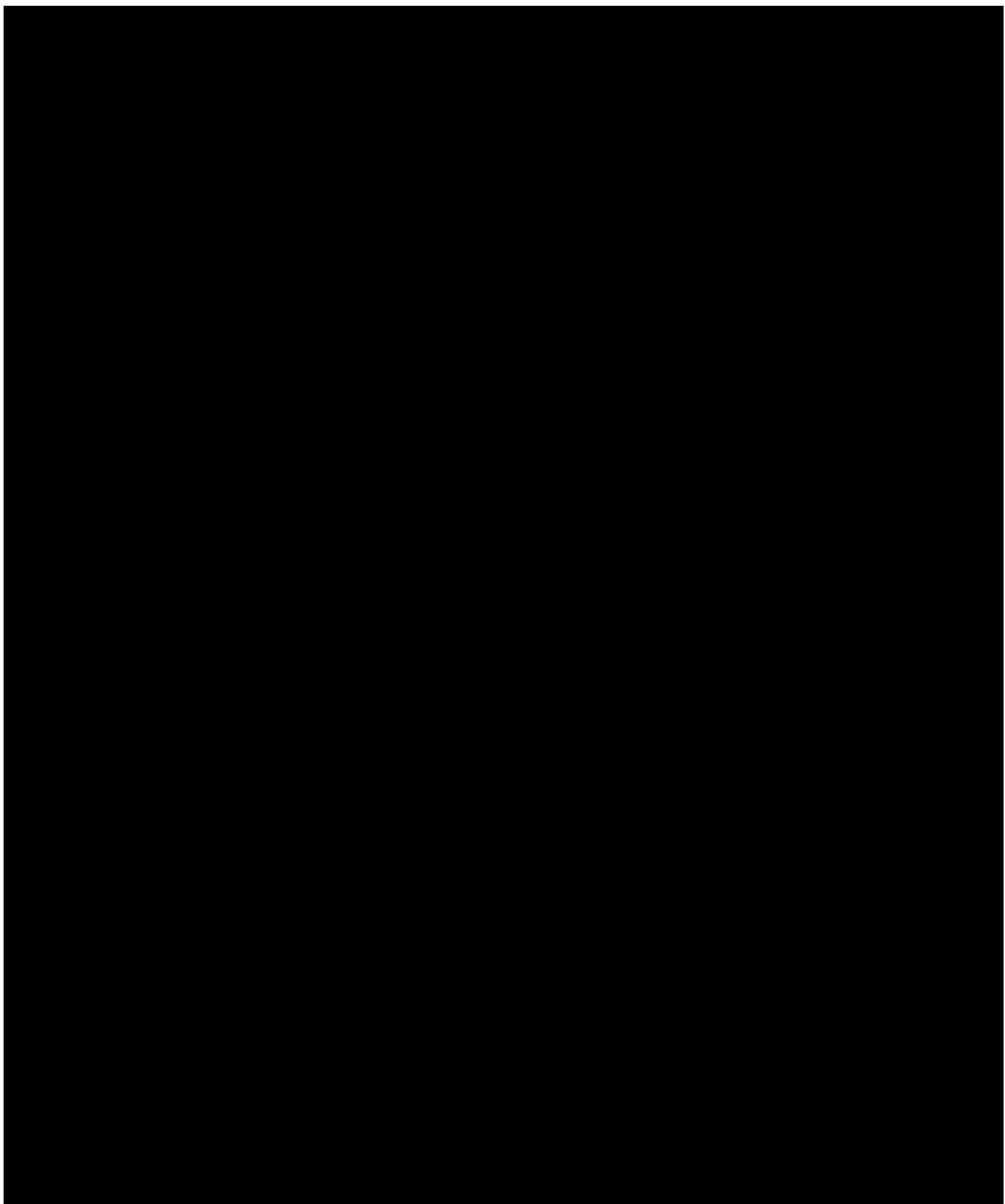
Number	Type of Cable
1045753	14 AWG
1045754	2 x 16 AWG w shield
1045755	12 AWG
14-51819	Limit (Retract) Switch wiring
1008459	Magnet Valve Cable
1041390	3 x 0.34 mm <sup>2</sup>

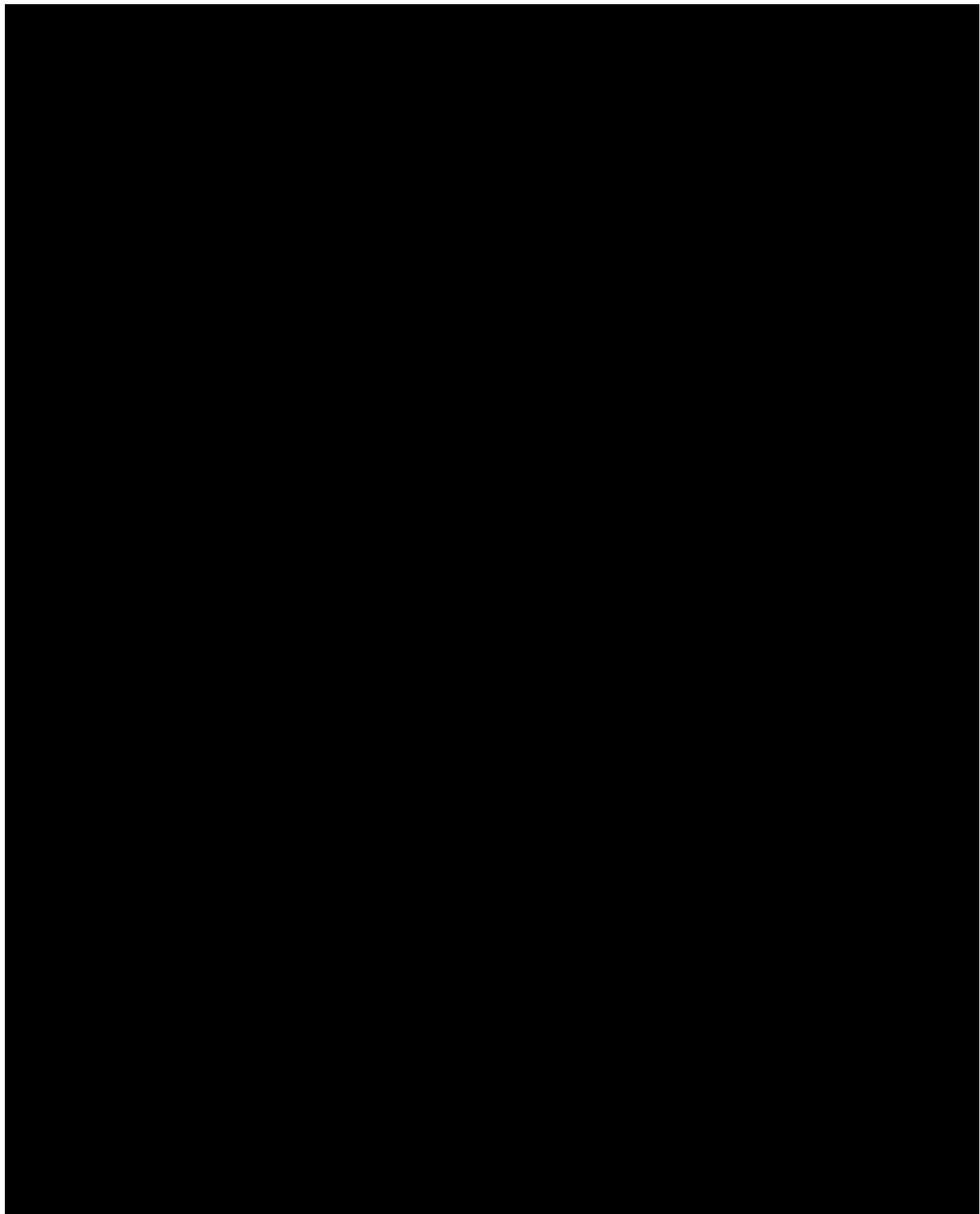
All wires are identified with unique wire designations. W201 is a wire in the cabling to the mechanical coupler. WRC5 is wiring to the right side coupler contact C5. Note that wire WLC5 goes to the left side coupler contact C5.

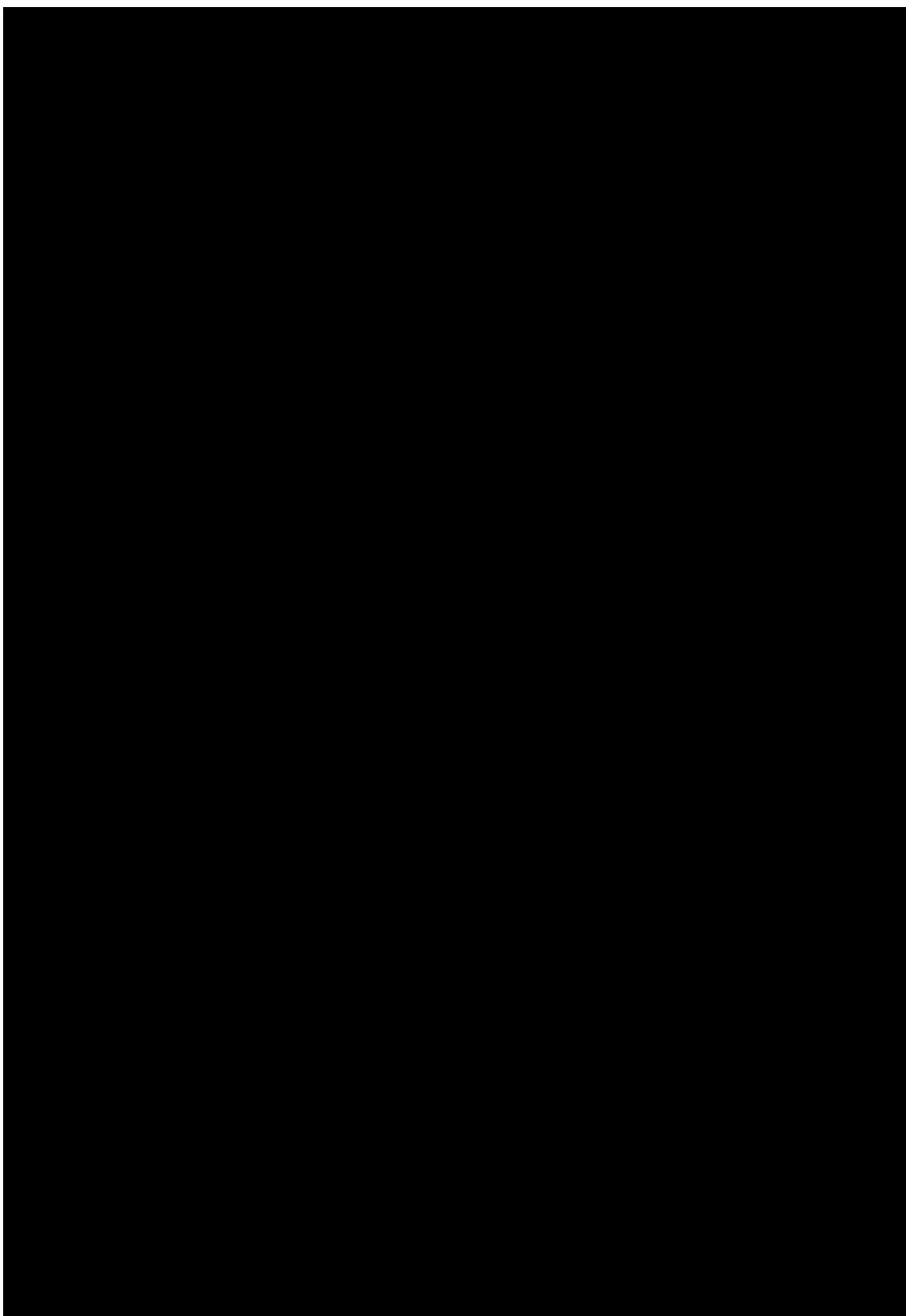
Connector Legend:

Dellner Drawings	KI Circuit Diagrams
E1.1	J1
E2.1	J2
E3.1	J3

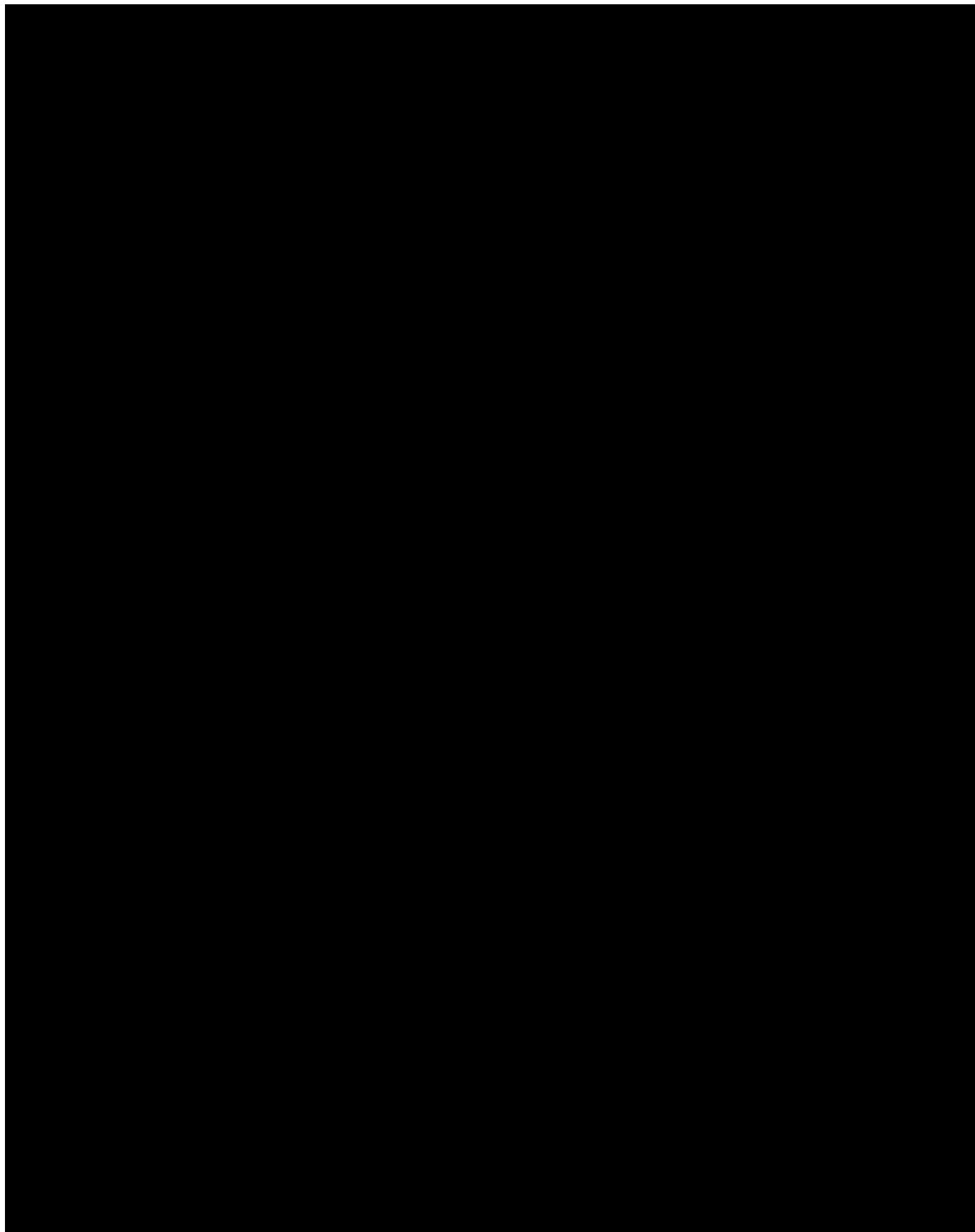


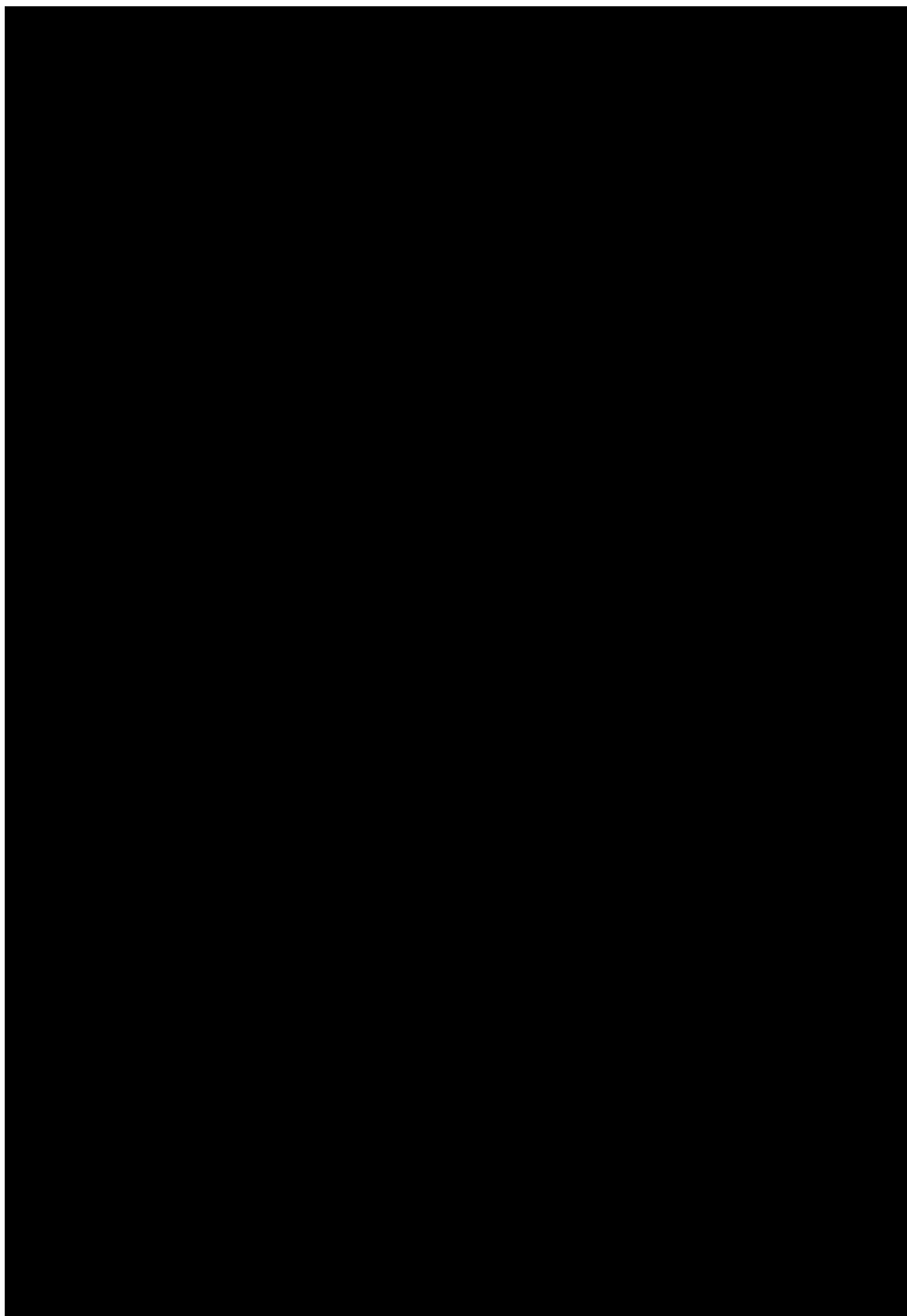












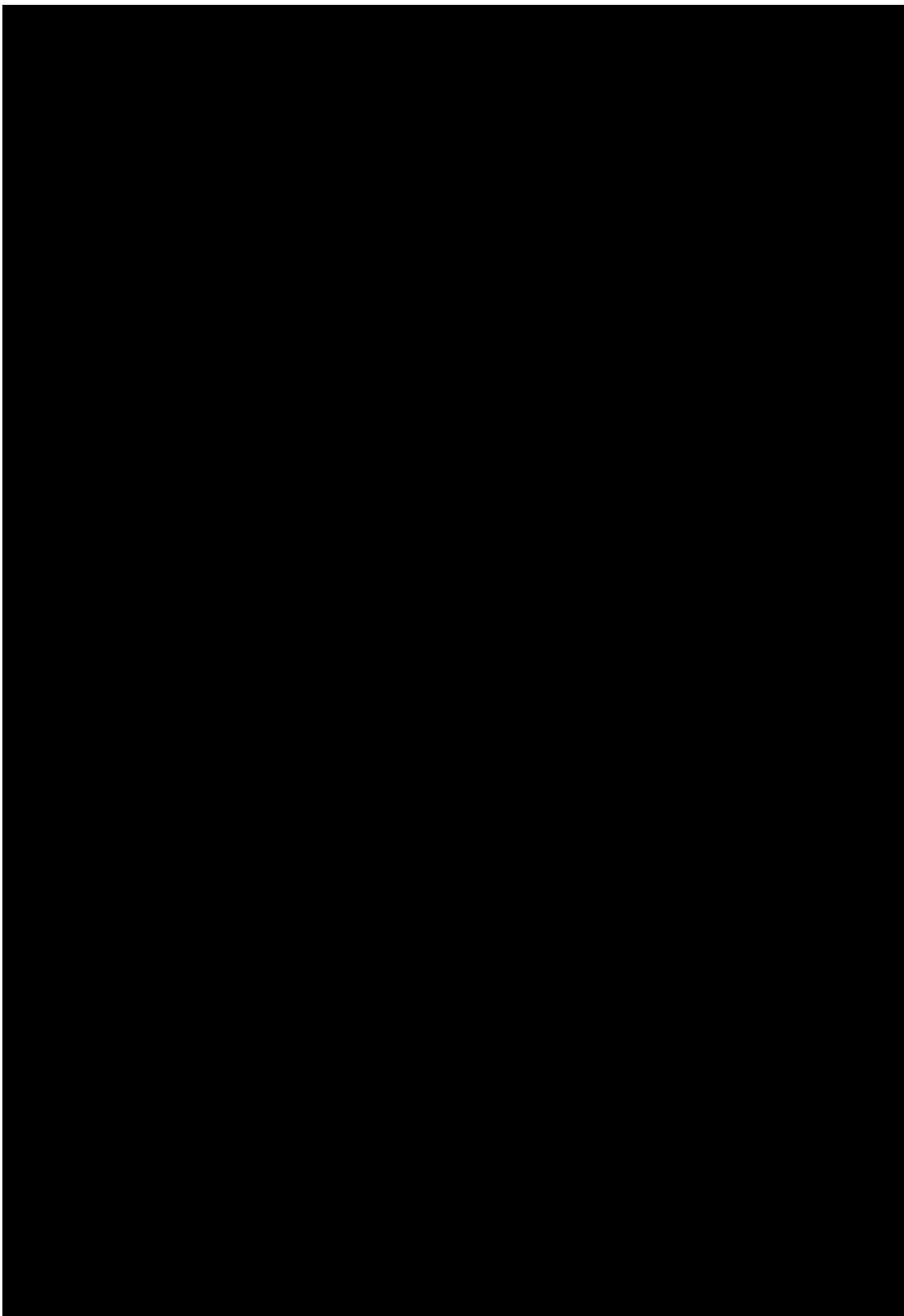


Figure 7-52: Circuit Diagram 1043531, Sheet 8/9 (Cabling Left 1)

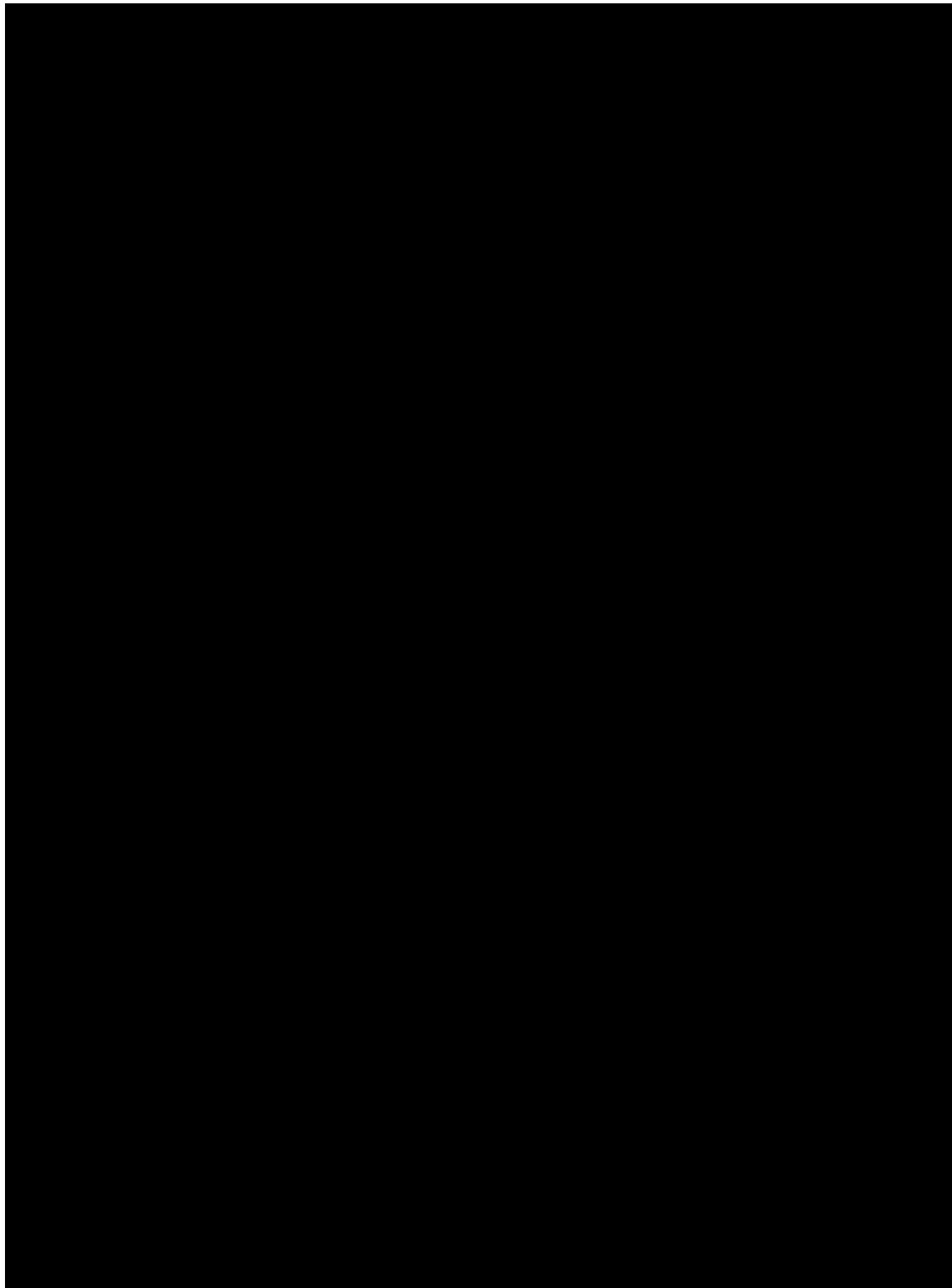


Figure 7-53: Circuit Diagram 1043531, Sheet 9/9 (Grounding)

## CHAPTER 8.0

### TROUBLESHOOTING

#### **8.1 Introduction**

This chapter contains the information that is to be used as a guide in troubleshooting the coupler.

#### **8.2 Troubleshooting**

Table 8-1 contains the troubleshooting procedures for the coupler. The symptoms listed are the most common malfunctions. The probable cause and remedy are also listed.

The troubleshooting table is divided into four columns:

- Column 1, Step - assigns the step and sub-step numbers,
- Column 2, Symptom - lists the symptoms (indications) of the trouble,
- Column 3, Cause - indicates the probable fault(s) which may cause the trouble,
- Column 4, Remedy - indicates the remedy (corrective section) to repair the cause of the trouble.

Table 8-1: Troubleshooting

Step	Symptom	Cause	Remedy
1	Automatic coupler will not couple.		
1.2		Foreign material in coupling mechanism.	Remove foreign material.
1.3		Uncoupling cylinder pressurized.	Check for air line obstruction.
1.4		Hook(s) jammed.	Remove road dirt from coupler face. Lubricate mechanical coupler. Repair mechanical coupler if required.
1.5		Hook worn.	Measure coupling mechanism for wear. Repair mechanical coupler if required.
1.6		Coupler head throat opening worn.	Measure coupling mechanism for wear. Repair mechanical coupler if required.
1.7		Weak or broken hook spring(s).	Repair mechanical coupler if required.
1.8		Internal corrosion of the uncoupling cylinder.	Clean and lubricate. Replace uncoupling cylinder if required.

Table 8-1: Troubleshooting (continued)

Step	Symptom	Cause	Remedy
2	Automatic coupler will not center horizontally.		
2.1		Automatic coupler pulled out of centering range.	Manually push coupler into centering range.
2.2		Support and centering malfunctioning.	Repair support and centering.
3	Automatic coupler will not center vertically.		
3.1		Spring assembly needs adjustment.	Adjust spring assembly.
3.2		Rubber spring worn.	Repair support and centering.
4	Automatic coupler cannot automatically uncouple.		
4.1		Couplers under draft load.	Buff cars (drive cars together).
4.2		Uncoupling cylinder malfunctioning.	Perform manual uncoupling or order uncoupling from opposite vehicle. Replace uncoupling cylinder.
4.3		Electrical coupler retracted switches (ECR) malfunctioning or are out of adjustment.	Adjust electrical coupler retracted switches. Replace electrical coupler retracted switches if required.
4.4		Electrical coupler actuator malfunctioning.	Perform manual uncoupling of electrical couplers and check electrical coupler actuator. Replace parts as necessary.
5	Automatic coupler cannot manually uncouple.	Couplers under draft load.	Buff cars (drive cars together).
6	Buffer cannot absorb buff loads and/ or remains in stretched position.	Exhaustion of ring spring caused by repeated overloading.	Replace buffer if necessary.
7	Buffer cannot absorb buff loads.	Leakage in hydraulic buffer.	Visually inspect for oil leakage. Replace buffer.
8	Ground not continuous between cars.	Ground cable loose.	Fasten ground cable.
9	Electrical coupler protecting lid remains open/closed.		
9.1		Deformed or broken protecting lid.	Replace protecting lid.
9.2		Guiding arms defect or misadjusted.	Adjust or replace arm.

Table 8-1: Troubleshooting (continued)

Step	Symptom	Cause	Remedy
10	Loss of electrical contact between couplers.		
10.1		Defective contact.	Replace contact.
10.2		Contamination of contact tips.	Clean and lubricate contacts.
11	Electrical coupler will not extend/retract.	Electrical coupler actuator malfunctioning.	Perform manual uncoupling of electrical couplers and check electrical coupler actuator. Replace parts as necessary.
12	MRP Valve will not close when couplers are uncoupled.		
12.1		Contamination in valve housing is preventing valve rod from closing.	Clean thoroughly.
12.3		Internal seals worn.	Repair MRP valve.
12.4		Valve spring broken.	Repair MRP valve.
13	MRP Valve will not open when couplers are coupled.	Contamination in valve housing is preventing valve rod to open.	Clean thoroughly.
14	MRP Connection leaks air when coupled.	Front seal malfunctioning.	Replace front seal.
15	MRP valve leaks air when pressurised.	Internal seals worn.	Repair MRP valve.

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