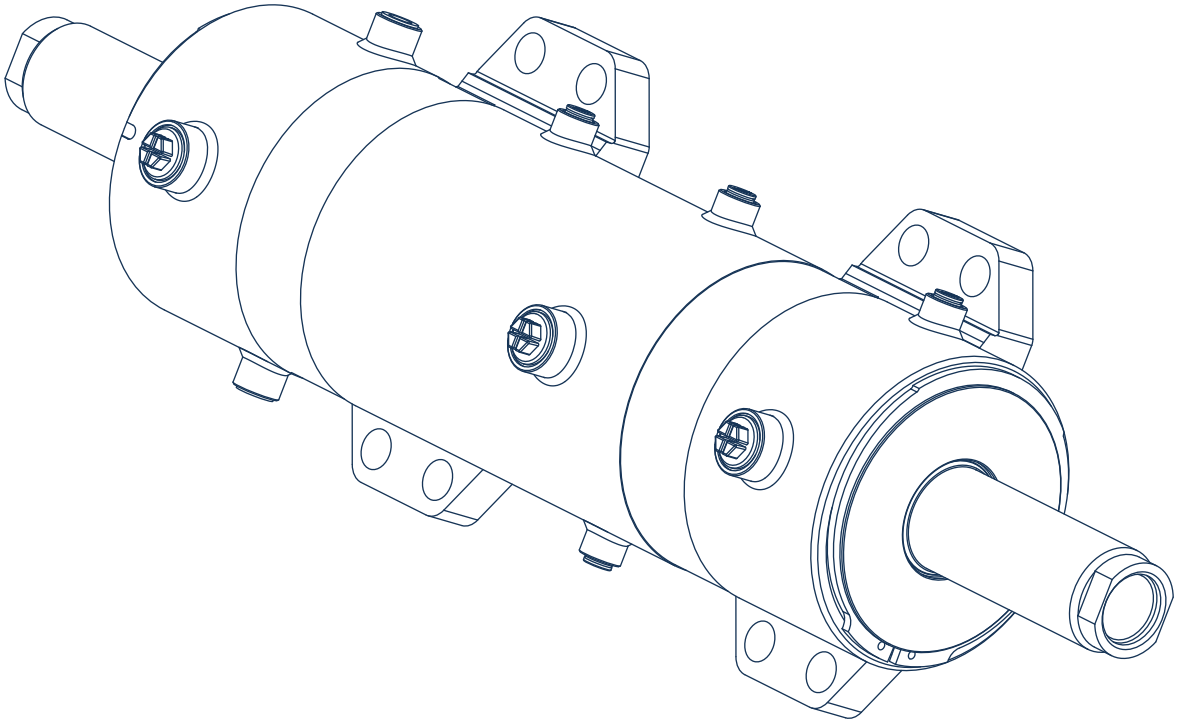


# Workshop Manual

## Seals Replacement for 05.444.50.73.0 Cylinder

BPW-WH-SR 55201901e

we think transport

# Introduction

- The purpose of this manual is to familiarize yourself with the disassembly,- assembly as well as seals replacement of the steering cylinder 05.444.50.73.0

- This repair guide based on the technological instruction document of manufacturer of steering cylinder.

- The new technical solution, came into effect from **June 2018**.

- **Study this manual carefully before you perform any maintenance procedures.**

As of January 2019.
2nd edition

Subject to change without notice.
Current versions and additional information can be found online at **www.bpwagrar.com**



# Table of Contents

# 1 Safety regulations, safety information

## 1.1 Safety regulations

- All work must be performed by trained mechanics at competent repair facilities or authorised specialised workshops who have access to all relevant tools and have acquired the know-how required for this work. Anyone who performs maintenance and repair work must have been trained as an automotive mechanic and already have experience in repairing trailers.
- Comply with local safety regulations.
- The relevant operations and service regulations as well as safety regulations of the vehicle manufacturer and of the manufacturers of the vehicle parts must be adhered to.
- Ensure adequate ventilation at the workplace.
- The vehicle must be prevented from moving during repair work. Please observe the relevant safety regulations for repair work on commercial vehicles, in particular the safety regulations for jacking up and securing the vehicle.
- Do not perform repair work unless wearing protective clothing (gloves, safety boots, safety goggles, etc.) and using the recommended tools.
- Work on steering cylinder removed from the vehicle must be carried out with the components fixed in place such as in a screw vise.
- Only use recommended tools.
- A second mechanic must provide assistance when working with heavy component(s) (steering cylinder removal/installation).
- The entire hydraulic system and components must be depressurised before being removed.
- Following each repair, perform a function check or a test drive in order to make sure that the hydraulic system and steering cylinder are functioning correctly.
- All exchanged components must be reused or disposed of in accordance with the applicable environmental regulations, laws and directives.



## Safety information 1.2

- This workshop manual contains different types of safety instructions, each of which is designated by an icon and a signal word. The signal word describes the severity of the potential danger.

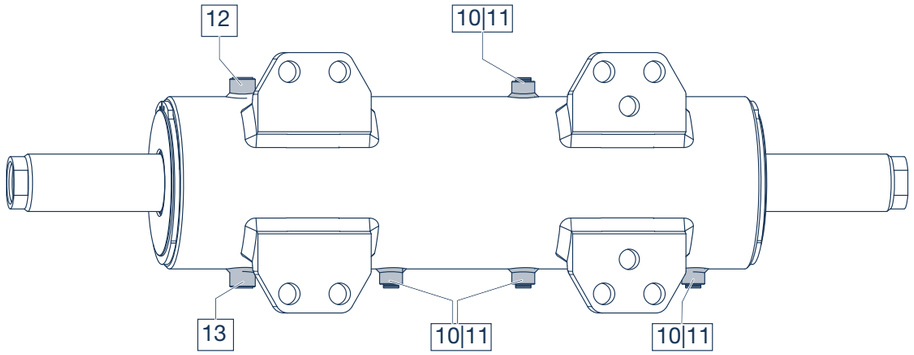
| | |
|---|---|
| Danger ! | **Immediate** potential danger of serious or fatal injury (severe injury or death). |
| Warning ! | **Possible** potential danger of serious or fatal injury (severe injury or death). |
| Caution ! | **Possible** dangerous situation (slight injury or damage to property). |

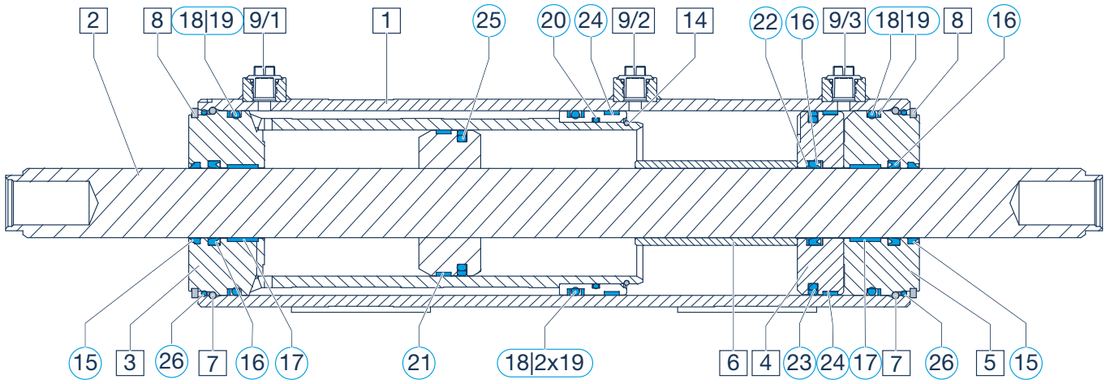
Repair Guide: Risk of damage to property or consequential damage if this information is not observed.

Note: Application hints and especially useful information

# 2 Identification of components

## 2.1 Technical design for steering cylinder to June 2018.



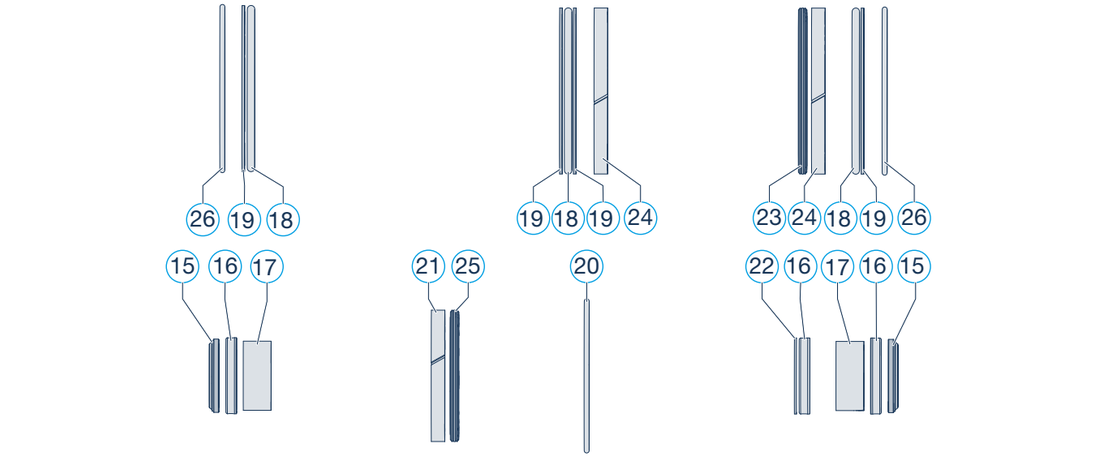



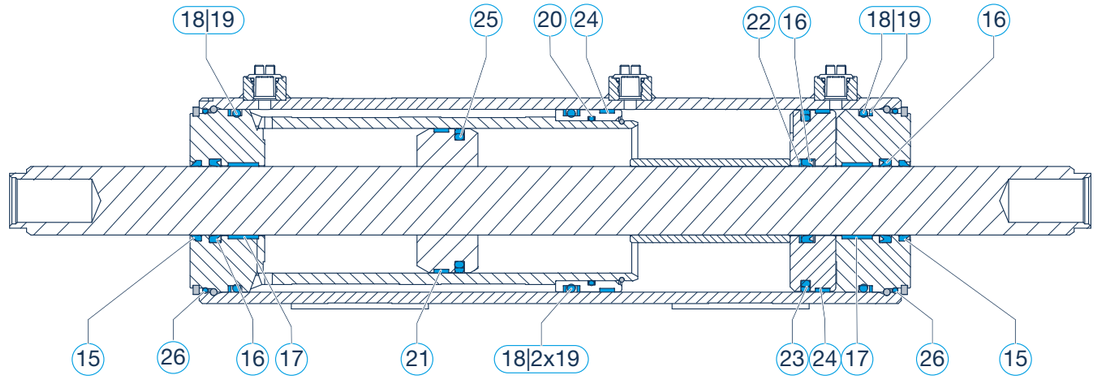

| Item | Description |
|---|---|
| 1 | Cylinder body |
| 2 | Rod unit |
| 3 | Guide bushing complete |
| 4 | Piston |
| 5 | Guide bushing |
| 6 | Spacer sleeve |
| 7 | Steel wire ring |
| 8 | Retaining ring |
| 9/x | Hose coupling (M16 x 1,5) |
| 10 | Bleed coupling (M8 x 1) |
| 11 | Bleed screw (M8 x 1) |
| 12 | Threaded connection M12 (upper) |
| 13 | Threaded connection M12 (bottom) |

| Item | Description |
|---|---|
| 14 | Steel wire ring |
| 15 | Wiper seal ring |
| 16 | Rod seal |
| 17 | Guide ring |
| 18 | O-ring |
| 19 | Back-up ring |
| 20 | O-ring |
| 21 | Guide ring |
| 22 | Back-up ring |
| 23 | Piston seal |
| 24 | Guide ring |
| 25 | Piston seal |
| 26 | O-ring |



## Seal kit 2.2

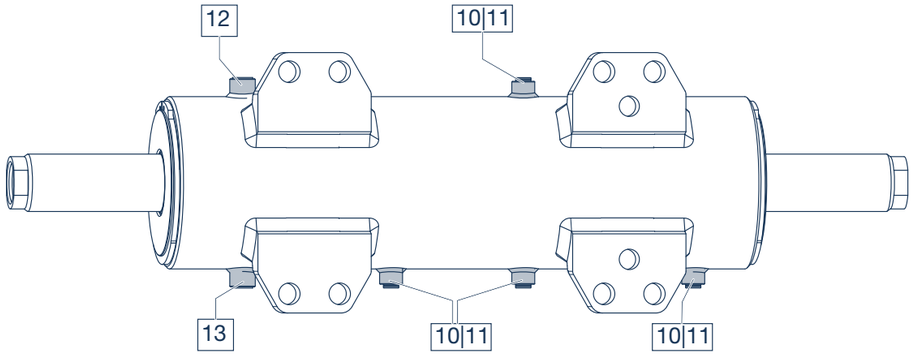


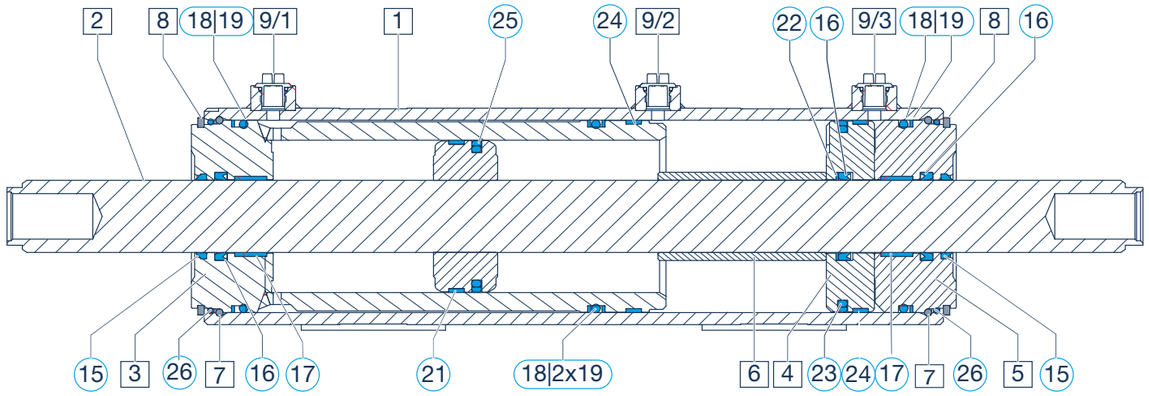




| Item No. | Pcs | Description | Size |
|---|---|---|---|
| 15 | 2 | Wiper seal ring | 45 - 53 - 4/7 |
| 16 | 3 | Rod seal | 45 - 55 - 8/7 |
| 17 | 2 | Guide ring | 45 - 50 - 20 (Depending on the structural design.) |
| 18 | 3 | O-ring | 109,5 x 5,33 |
| 19 | 4 | Back-up ring | 120 -111,4 -1,9 |
| 20 | 1 | O-ring | 104,37 x 3,53 |
| 21 | 1 | Guide ring | 95 - 90 - 9,7 |
| 22 | 1 | Back-up ring | 45 - 55 - 1,5 |
| 23 | 1 | Piston seal | 120 - 104,5 - 6,3 |
| 24 | 2 | Guide ring | 120 - 115 - 9,7 |
| 25 | 1 | Piston seal | 95 - 79,5 - 6,3 |
| 26 | 2 | O-ring | 103, 3, 5 (Depending on the structural design.) |

# 2 Identification of components

## 2.3 Technical design for steering cylinder from June 2018.



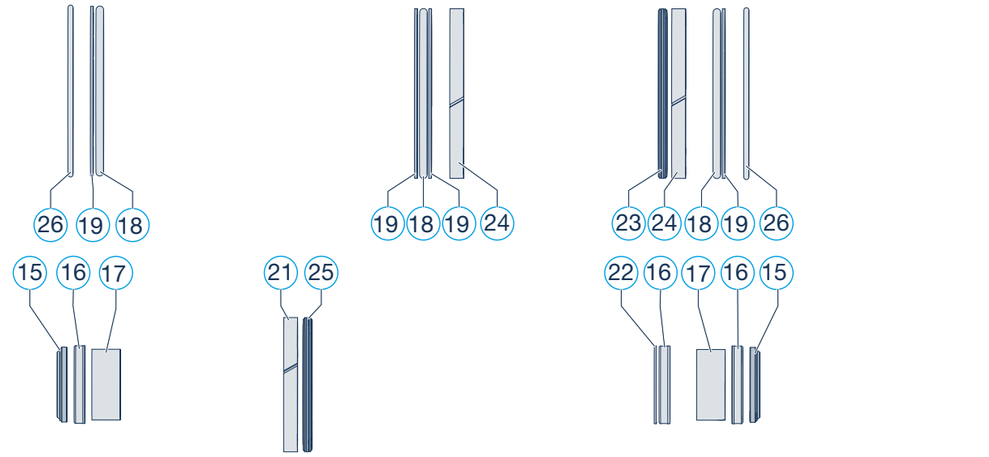



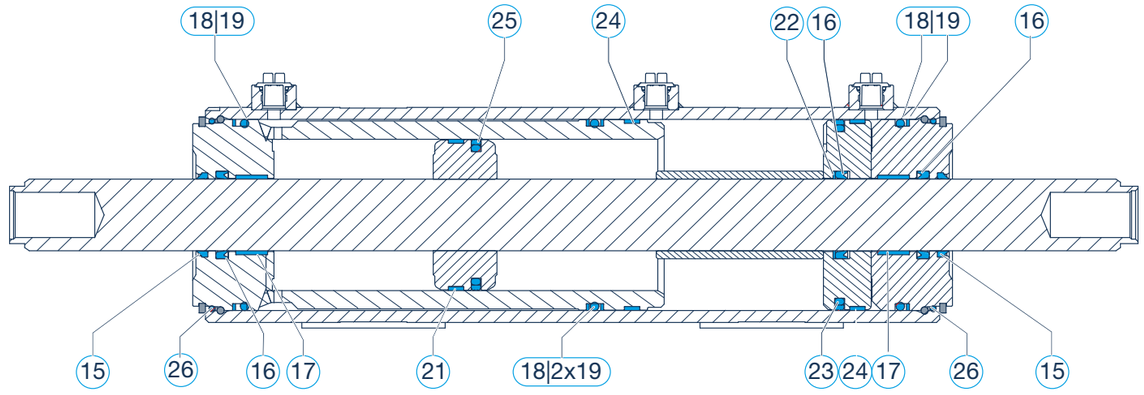

| Item | Description |
|---|---|
| 1 | Cylinder body |
| 2 | Rod unit |
| 3 | Guide bushing complete |
| 4 | Piston |
| 5 | Guide bushing |
| 6 | Spacer sleeve |
| 7 | Steel wire ring |
| 8 | Retaining ring |
| 9/x | Hose coupling (M16 x 1,5) |
| 10 | Bleed coupling (M8 x 1) |
| 11 | Bleed screw (M8 x 1) |
| 12 | Threaded connection M12 (upper) |
| 13 | Threaded connection M12 (bottom) |

| Item | Description |
|---|---|
| 14 | Steel wire ring / Not included in the new version / |
| 15 | Wiper seal ring |
| 16 | Rod seal |
| 17 | Guide ring |
| 18 | O-ring |
| 19 | Back-up ring |
| 20 | O-ring / Not included in the new version / |
| 21 | Guide ring |
| 22 | Back-up ring |
| 23 | Piston seal |
| 24 | Guide ring |
| 25 | Piston seal |
| 26 | O-ring |



## Seal kit 2.4




| Item No. | Pcs | Description | Size |
|---|---|---|---|
| 15 | 2 | Wiper seal ring | 45 - 53 - 4/7 |
| 16 | 3 | Rod seal | 45 - 55 - 8/7 |
| 17 | 2 | Guide ring | 45 - 50 - 20 (Depending on the structural design.) |
| 18 | 3 | O-ring | 109,5 x 5,33 |
| 19 | 4 | Back-up ring | 120 -111,4 -1,9 |
| 20 | 1 | O-ring | 104,37 x 3,53 **/ Not included in the new version /** |
| 21 | 1 | Guide ring | 95 - 90 - 9,7 |
| 22 | 1 | Back-up ring | 45 - 55 - 1,5 |
| 23 | 1 | Piston seal | 120 - 104,5 - 6,3 |
| 24 | 2 | Guide ring | 120 - 115 - 9,7 |
| 25 | 1 | Piston seal | 95 - 79,5 - 6,3 |
| 26 | 2 | O-ring | 103, 3, 5 (Depending on the structural design.) |

# 3 Preparation of disassembly

**Note:**

**The repair work is done with the steering cylinder removed from vehicle. Workshop manual for Agrar Steering Axle - BPW-WH-Agrar 55011601d- includes the required information for steering cylinder dismounting.**

[1] Remove all contaminants from cylinder outer surface, thoroughly clean it.

[2] Remove the remaining oil out of the cylinder into an oil catcher bucket, to do this remove the bleed screw (11) from the venting bores (10, M8 x 1) and remove the connection elements, out of the hose couplings (9/1, 9/2, 9/3).

[3] After washing and oil removing fasten the cylinder in assembly position shown in the picture. ( Fig.2) The hose couplings (9/2, 9/3) always be on right hand.

**Repair Guide:**

**The hose couplings are asymmetrically placed on the cylinder, so they can help with proper positioning of the cylinder on the workbench. See Figure 2.**

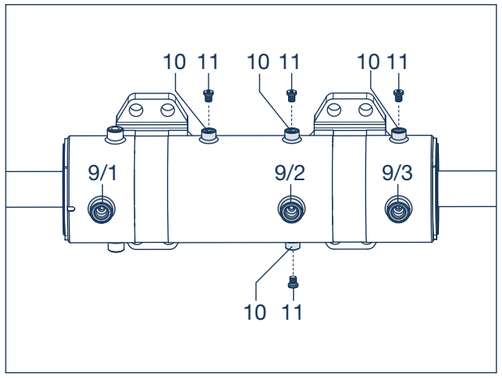



*Figure 1*

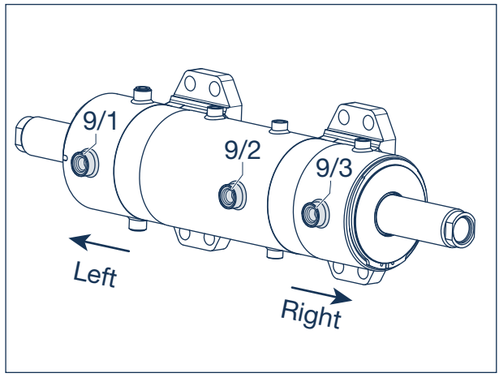



*Figure 2*



# Disassembly 4

[1] Remove the retaining ring (8) from the guide bushing (5) side.

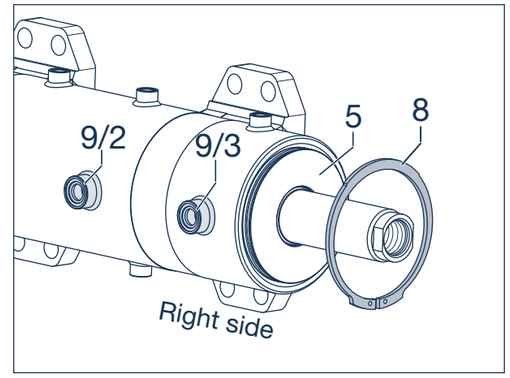



*Figure 3*

[2] Push in the guide bushing (5) until the O-Ring (26) will be in the groove of the retaining ring.

**Repair Guide:**

**If the structural design do not includes this O-ring (26), please continue with the mounting step [4].**

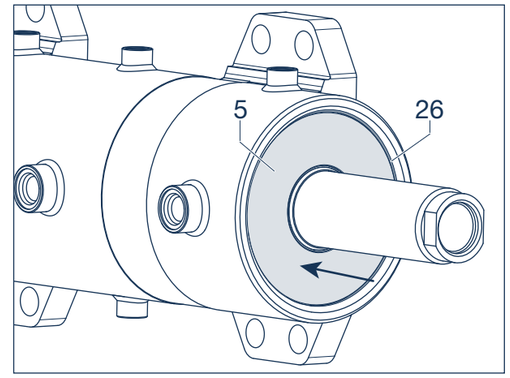



*Figure 4*

[3/a] Use compressed air via middle hose coupling (9/2), which is push out the guide bushing (5) until it stops at the inner steel wire ring (7), then remove the O-Ring (26).

[3/b] If there is no compressed air available push away the rod unit (2) towards the guide bushing (5) until it stops at the steel wire ring (7), then remove the O-Ring (26).

**Warning!**

**If using compressed air, the rod unit (2) can moves quickly and with high force. Ensure the necessary free space for the moving rod unit to avoid injuries.**

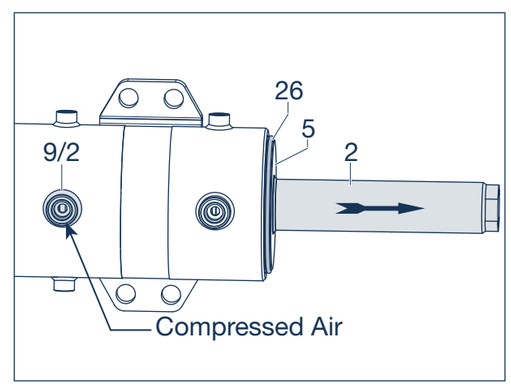



*Figure 5*

# 4 Disassembly

[4] Push the guide bushing (5) into the cylinder tube, until the internal steel wire ring (7) is fully exposed, then remove it.

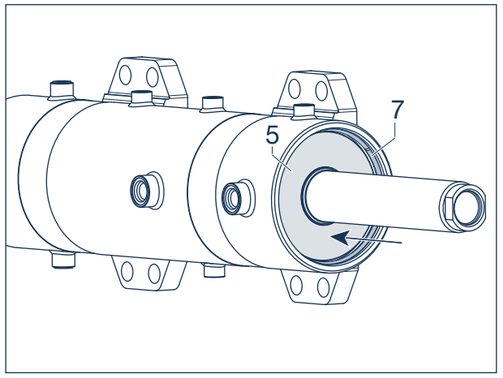



*Figure 6*

[5] Remove the retaining ring (8) from the guide bushing complete (3) side of the cylinder.

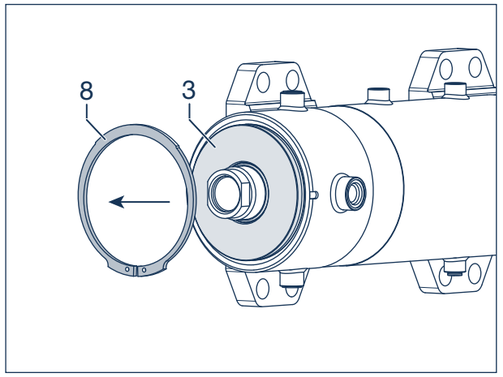



*Figure 7*

[6] Push in the guide bushing complete (3) until the O-Ring (26) will be in the groove of the retaining ring (8).

**Repair Guide:**

**If the structural design do not includes this O-ring (26), please continue with the mounting step [8].**

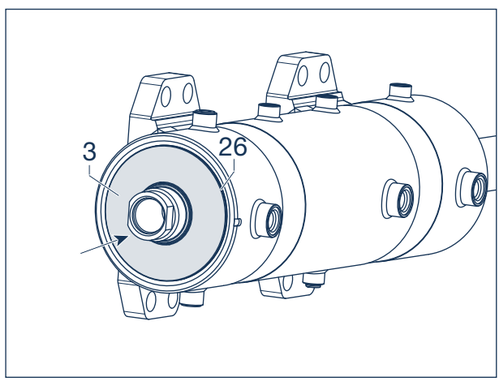



*Figure 8*



[7a] Apply compressed air via left hand side hose coupling (9/1), which is move the guide bushing complete (3), until it stops at the inner steel wire ring (7), then in this position can be remove the O-Ring (26).

[7b] If there is no compressed air available push the rod unit (2) towards the guide bushing complete (3) until it get stuck at the inner steel wire ring (7), then in this position can be remove the O-Ring (26).

**Warning!**

**If using compressed air, the rod unit (2) can moves quickly and with high force. Ensure the necessary free space for the moving rod unit to avoid injuries.**

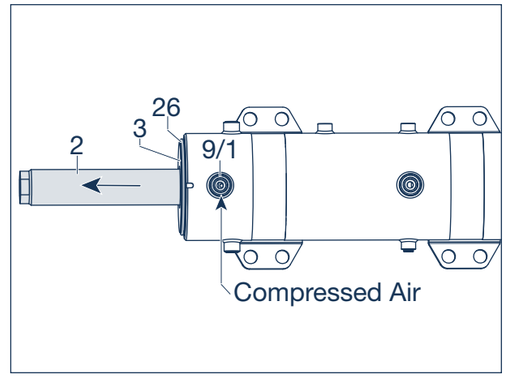



*Figure 9*

[8] Move the rod unit (2) towards to the guide bushing (5) then pull out the rod unit (2), spacer (6), piston (4) and the guide bushing (5) out of the cylinder tube (1).

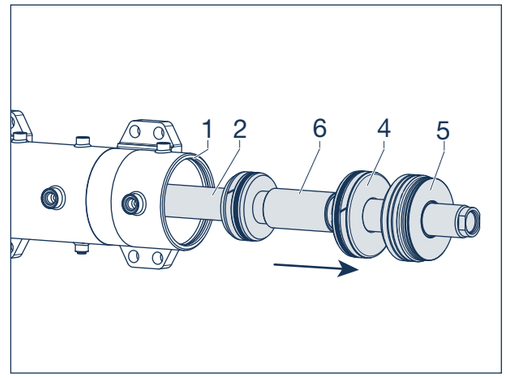



*Figure 10*

[9] Push the guide bushing complete (3) into the cylinder tube, until the inner steel wire ring (7) is fully exposed, then remove it.

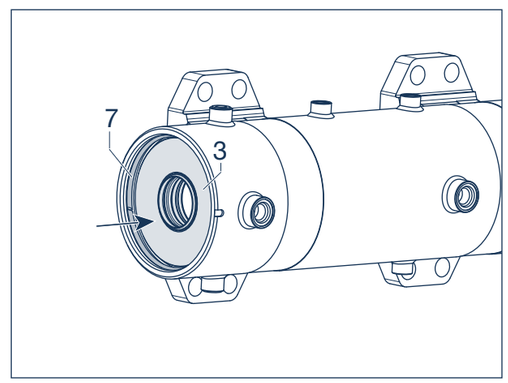



*Figure 11*

# 4 Disassembly

[10] Push the guide bushing complete (3) out of the cylinder tube (1).

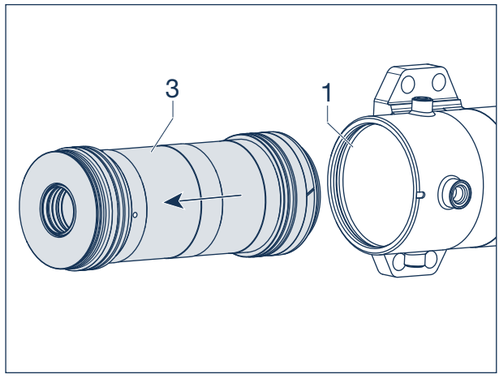



*Figure 12*

**Repair Guide:**

**For the new version, the next disassembly step [11] does not need to be performed.**

[11] Fasten the guide bushing complete (3) in the workbench, first remove the external steel wire ring (14) then pull off the ring from the guide bushing complete.

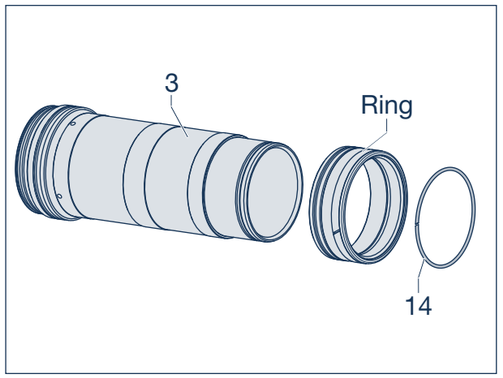



*Figure 13*

**Repair Guide:**

**The new version is machining of one piece, so the ring is not removable.**

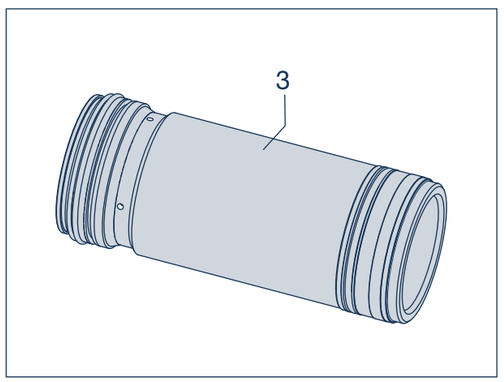



*Figure 14*



# Seals Replacement 5

## Seals replacement on the guide bushing 5.1

[1] Slide down the guide bushing (5) from the rod unit (2).

[2] Remove seals and inspect guide bushing (5) for burrs and scratches.

**Note:**

**After removing the old seals carefully clean the components and perform a visual inspection.**
**Only free of damage parts can be re-assembled.**

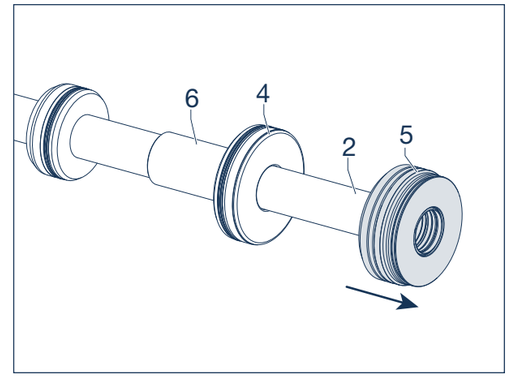



*Figure 15*

[3] Replace the following seals from guide bushing:
- O-Ring (18)
- Back-up ring (19)
- Rod wiper seal (15)
- Rod seal (16)
- Guide ring (17)

**Repair Guide:**

**Replace of the guide ring (17) depend on the structural design.**

**Repair Guide:**

**Please note! During installation of the rod seal (16) the lips of seal should be facing O-ring (18).**

**Repair Guide:**

**Please note! During installation of the wiper seal (15), the lips of seal should be pointing outwards from the guide bushing (5).**

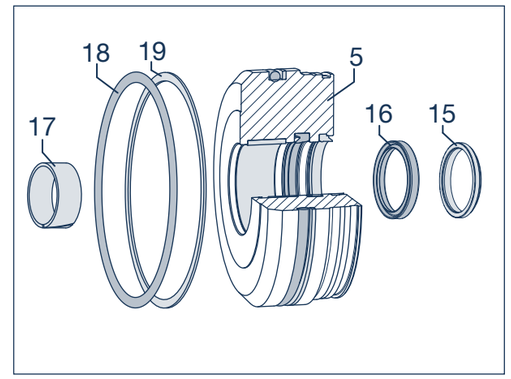



*Figure 16*

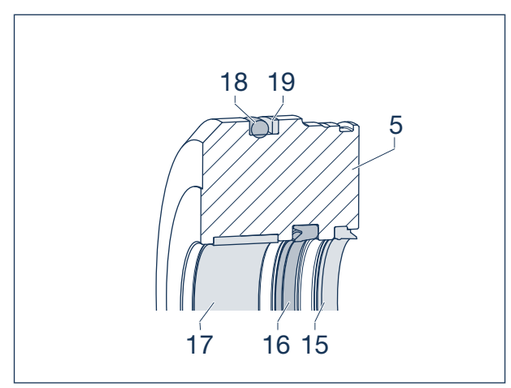



*Figure 17*

# 5 Seals replacement

## 5.2 Seals replacement on the piston

[4] Slide down the piston (4) from the rod unit (2).

[5] Remove seals and inspect piston (4) for burrs and scratches.

**Note:**

**After removing the old seals carefully clean the components and perform a visual inspection.**
**Only free of damage parts can be re-assembled.**

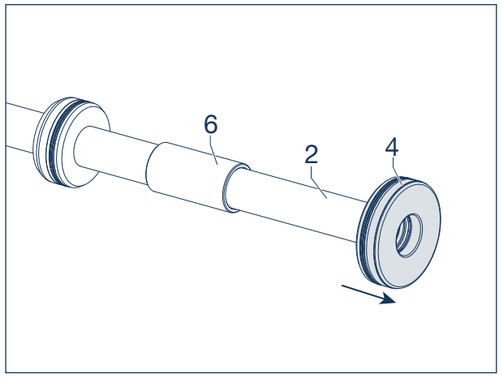



*Figure 17*

[6] Replace the following seals from piston (4):
- Piston seal (23)
- Guide ring (24)
- Back-up ring (22)
- Rod seal (16)

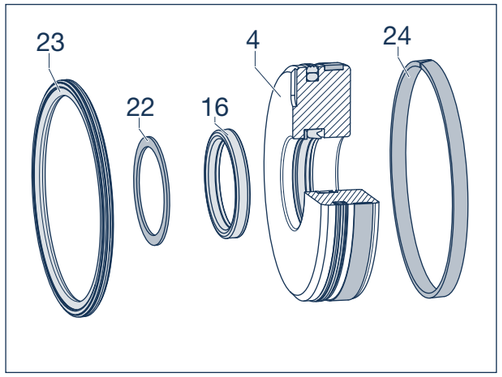



*Figure 18*

**Repair Guide:**

**Pay attention to the correct installation position of rod seal (16). See Figure 19.**

**Warning!**

**Improper installation of seals can cause damage during operation.**

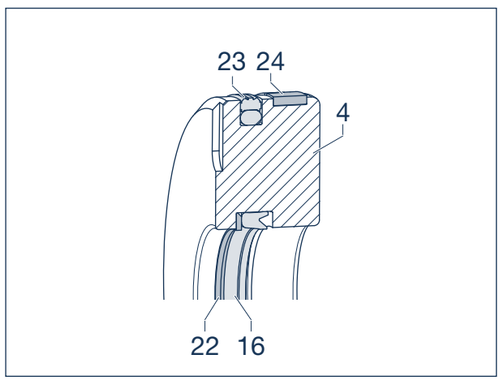



*Figure 19*



## 5.3 Seals replacement on the rod unit and guide bushing-ring

[7] Remove seals and inspect rod unit (2) for burrs and scratches.

**Note:**

**After removing the old seals carefully clean the components and perform a visual inspection.**
**Only free of damage parts can be re-assembled.**

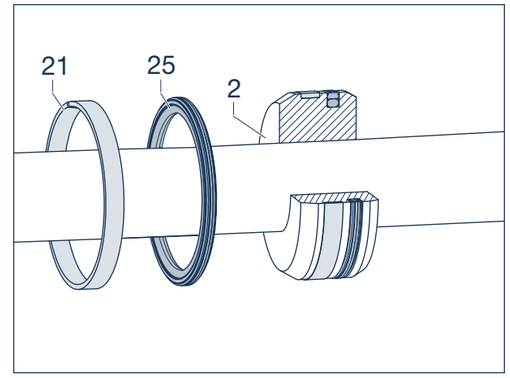



*Figure 20*

[8] Replace the following seals from rod unit (2):
- Piston seal (25)
- Guide ring (21)

**Repair Guide:**

**For the new version, the next disassembly steps [9] - [10] does not need to be performed.**

[9] Remove seals and inspect ring for burrs and scratches.

[10] Replace the following seals from ring :
- Guide ring (24)
- O-ring (20)
- Back-up ring (19)
- O-ring (18)
- Back-up ring (19)

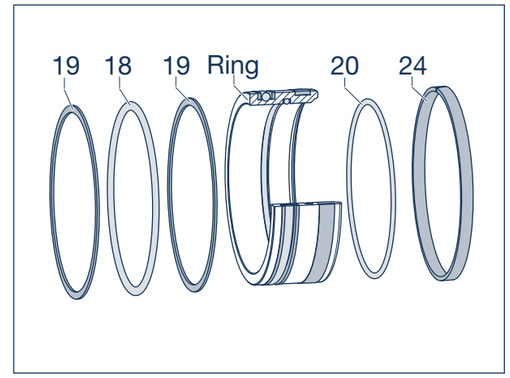



*Figure 21*

**Repair Guide:**

**Pay attention to the correct installation position, See Figure 22.**

**Warning!**

**Improper installation of seals can cause damage during operation.**

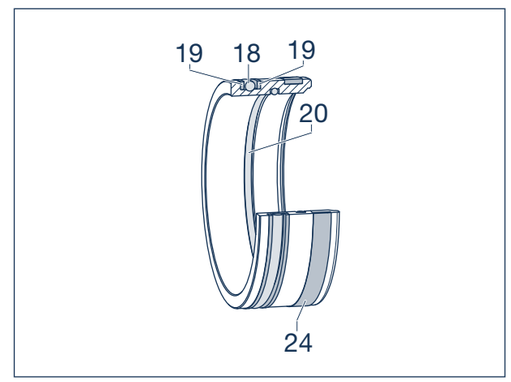



*Figure 22*

# 5 Seals replacement

## 5.4 Seals replacement on the guide-bushing complete

[11] Remove seals guide-bushing complete from outer side (3) and inspect for burrs and scratches.

**Note:**

**After removing the old seals carefully clean the components and perform a visual inspection.**
**Only free of damage parts can be re-assembled.**

[12] Replace the following seals from outer side of guide-bushing complete (3) :
- Back-up ring (19)
- O-Ring (18)
- Rod wiper seal (15)
- Rod seal (16)
- Guide ring (17)

**Repair Guide:**

**Replace of the guide ring (17) depend on the structural design.**

**Repair Guide:**

**Pay attention to the correct installation position of rod seal (16) and rod wiper seal (15), See Figure 24.**

**Warning!**

**Improper installation of seals can cause damage during operation.**

**Repair Guide:**

**For the new version, the next assembly step [13] need to be performed.**

[13] Replace the following seals from inner side of guide-bushing complete (3) :
- Guide ring (24)
- Back-up ring (19)
- O-ring (18)
- Back-up ring (19)

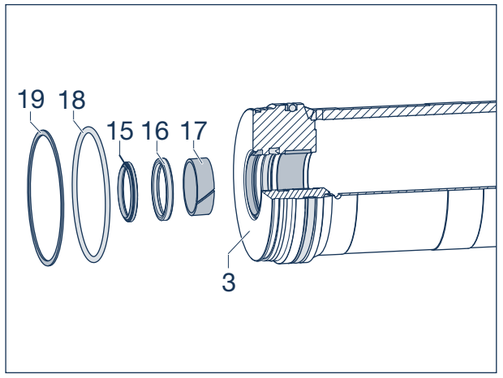



*Figure 23*

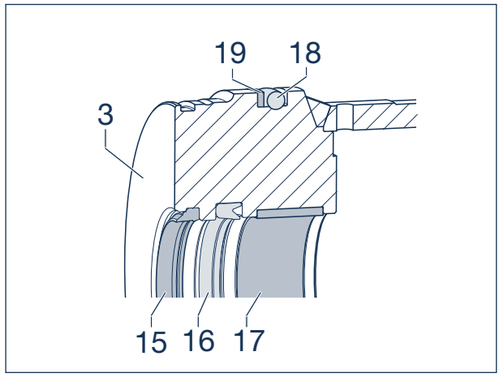



*Figure 24*

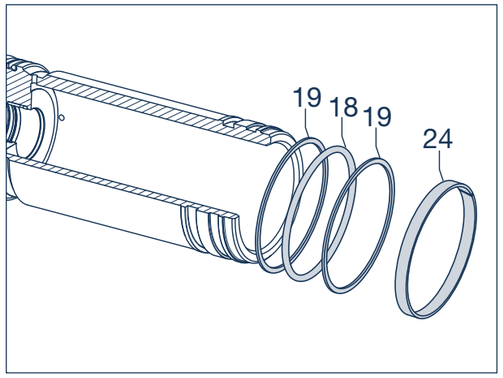



*Figure 25*



# Reassembly of the cylinder 6

**Repair Guide:**

**For the new version, the next assembly step [1] does not need to be performed.**

[1] Push up the Ring onto the guide bushing complete (3) and fasten it with steel wire ring (14).

**Repair Guide:**

**Check for cylinder inner surface. The cylinder tube inner surface have to be free from burrs and scratches.**

[2] Lubricate the cylinder tube inner surface with hydraulic oil.

[3] Lubricate the guide bushing complete (3) outer surface and its bore with hydraulic oil. Lubricate the seals too.

[4] Place the guide bushing complete (3) into the cylinder tube, until the inner steel wire ring (7) groove became completely visible, then insert the steel wire ring .

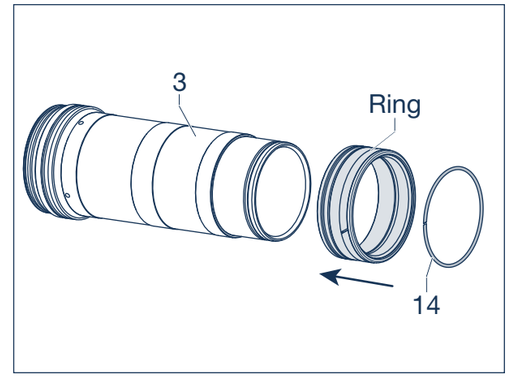



*Figure 26*

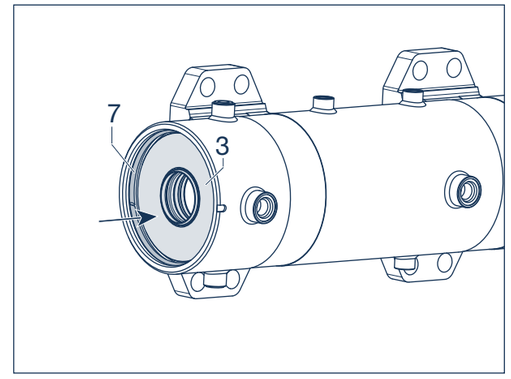



*Figure 27*

**Repair Guide:**

**Inspect for rod unit (2) chromed surface. The surface have to be free from burrs and scratches.**

[5] Slide up the spacer (6), piston (4) and guide bushing (5) onto the rod unit (2).

[6] Lubricate the fixed piston on the rod unit (2), the spacer (6), the piston (4) and guide bushing (5) with hydraulic oil. Lubricate the seals too.

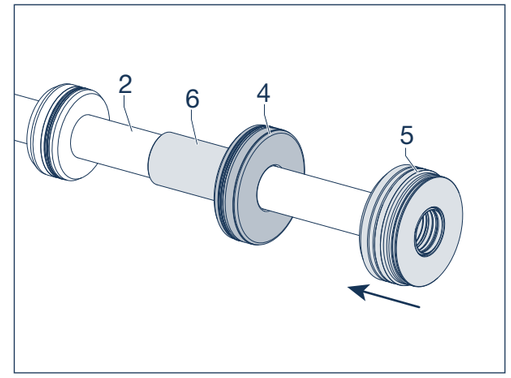



*Figure 28*

# 6 Reassembly of the cylinder

[7] Place this assembled unit [assembly step 6] into the cylinder tube, until the inner steel wire ring (7) groove is fully exposed, then insert the steel wire ring.

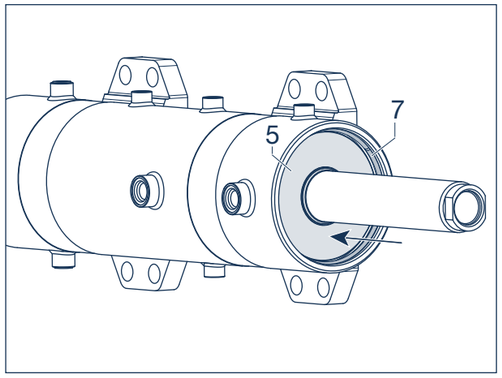



*Figure 29*

[8a] Use compressed air via middle hose coupling (9/2), with which you can to move the guide bushing complete (3) and guide bushing (5), until they will stop at the inner steel wire ring (7).

**Warning!**

**If using compressed air, the rod unit (2) can move quickly and with high force. Ensure the necessary free space to avoid injuries.**

[8b] If there is no compressed air available push the rod unit (2) towards the guide bushing (5) or guide bushing complete (3) (depends on, left or right side of the cylinder), until they will stop at the inner steel wire rings (7).

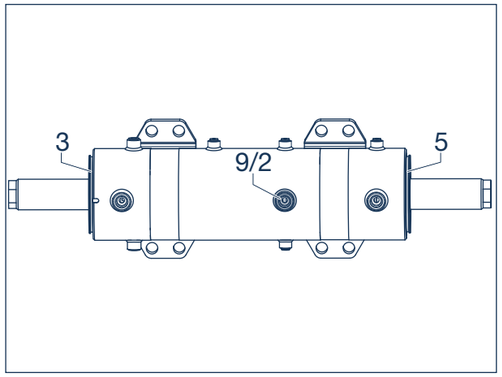



*Figure 30*

[9] From direction of the guide bushing complete (3) use an mounting aid (e.g. old O-ring, cyan colour on the Fig.30) to fill the groove of the retaining ring (8), thereafter insert the new O-ring (26).

**Repair Guide:**

**If the structural design do not includes this O-ring (26), please continue with the next mounting step.**

**Repair Guide:**

**In a some case the structural design do not include this O-ring (26), please continue with the next mounting step.**

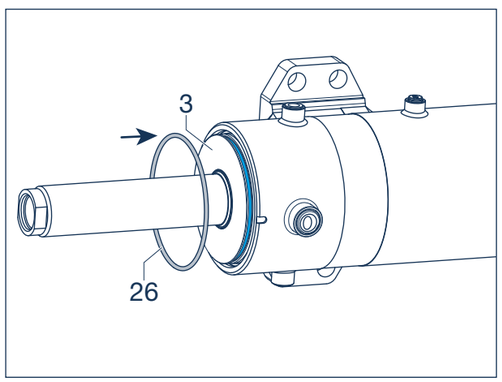



*Figure 31*



[10] Remove the mounting aid accessory and insert the retaining ring (8).

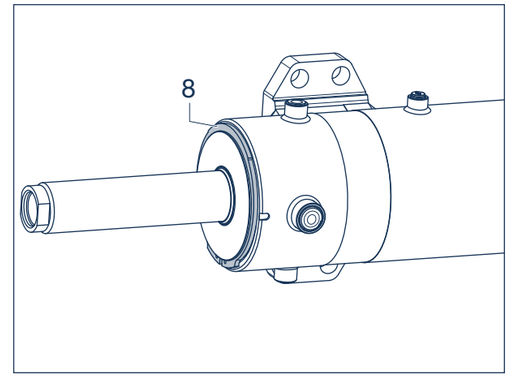



*Figure 32*

[11] From direction of the guide bushing (5) use an mounting aid (e.g. old O-ring, cyan colour on the Fig.32) to fill the groove of the retaining ring (8), thereafter insert the new O-ring (26).

**Repair Guide:**

**If the structural design do not includes this O-ring (26), please continue with the next mounting step.**

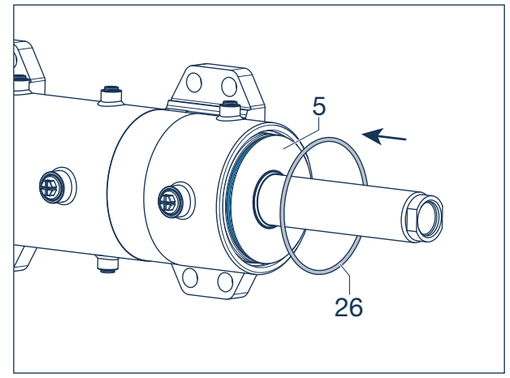



*Figure 33*

[12] Remove the mounting aid accessory and insert the retaining ring (8).

[13] Perform a leak test, connect the hose couplings, thereafter apply 250 bar pressure oil.

**Note:**

**Workshop manual for Agrar Steering Axle - BPW-WH-Agrar 55011601d- includes the required information for steering cylinder build-in and setting.**

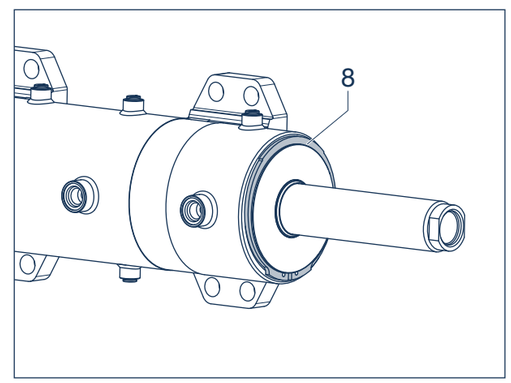



*Figure 34*

# Notes



Notes

BPW-WH-SR 55201901e

**BPW is a globally leading manufacturer of intelligent running gear systems for trailers and semi-trailers. As an international mobility and system partner, we offer a wide range of solutions for the transport industry from a single source, from axle to suspension and brake to user-friendly telematics applications. We thereby ensure outstanding transparency in loading and transport processes and facilitate efficient fleet management. Today, the well-established brand represents an international corporation with a wide product and service portfolio for the commercial vehicle industry. Offering running gear systems, telematics, lighting systems, composite solutions and trailer superstructures, BPW is the right system partner for automotive manufacturers.**

**BPW, the owner-operated company, consistently pursues one target: To always give you exactly the solution which will pay off. To this end, we focus our attention on uncompromising quality for high reliability and service life, weight and time-saving concepts for low operating and maintenance costs as well as personal customer service and a close-knit service network for quick and direct support. You can be sure that with your international mobility partner BPW, you always use the most efficient method.**

# Your partner on the path to economic viability

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