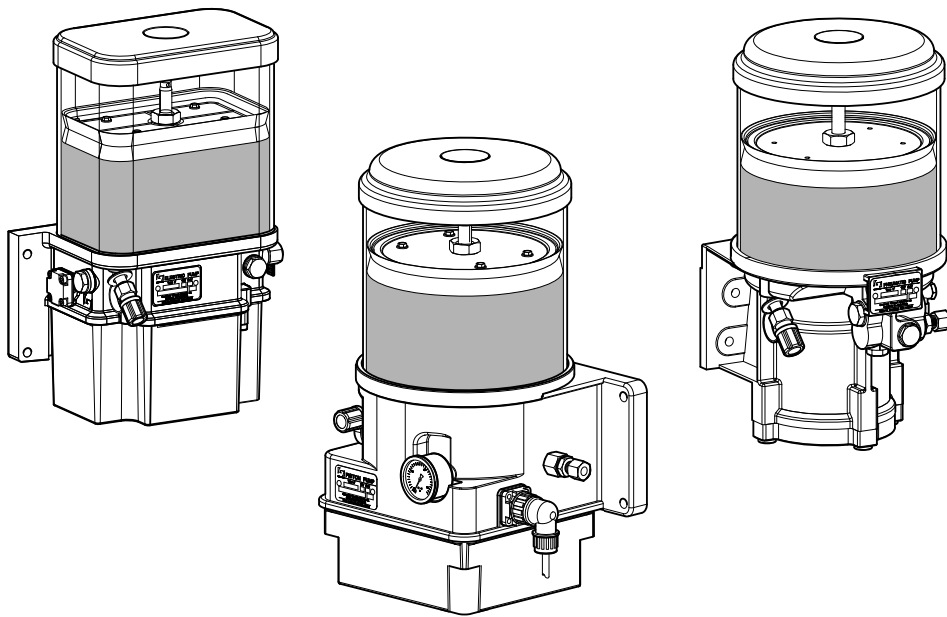


General Manual



Automatic Greasing System SingleLine

F212164R00



Your efficiency is our Challenge!

General information

| | |
|-----------------|--------------------------------------|
| Type of manual | General Manual |
| System | Automatic Greasing System SingleLine |
| Document number | F212164R00 |
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| <i>Rev.</i> | <i>Date</i> | <i>Description</i> |
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Whilst this manual has been prepared with the greatest possible care Groeneveld cannot accept responsibility for any errors or the consequences of such errors.

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Preface

This general manual gives a description of the SingleLine Automatic Greasing System. It aims at giving insight in the system's operation and possibilities. Furthermore, in this manual you will find the technical data on several components of the automatic greasing system.

In this manual the following icons are used to inform or warn the user:



ATTENTION

Draws the user's attention to important information meant to avoid problems.



WARNING

Warns the user for physical injuries or serious damage to the equipment caused by improper actions.

Use of symbols

| <i>Symbol</i> | <i>Explanation</i> |
|---------------|--------------------|
| BK | Black |
| BN | Brown |
| RD | Red |
| YE | Yellow |

1. General information

1.1 Introduction

With an automatic greasing system of Groeneveld all grease points of a vehicle or machine are greased automatically at the correct moment and with the correct amount of grease. Because greasing takes place while the vehicle or machine is in operation, the applied grease is spread optimally over the whole surface to be greased. The greasing system requires no user intervention to operate, apart from periodically replacing the grease in its reservoir.

Groeneveld's automatic greasing systems are designed with the utmost care and tested rigorously. This guarantees an extended operational life and error-free operation, even under the most extreme operating conditions.

Proper installation, using the correct type of grease, and periodic checks are prerequisites for the continual hassle-free operation of the system. The periodic checks, which take little time and effort, can be performed during the normal maintenance of the vehicle or machine (during oil-replacement, for instance). Careful selection of construction materials, makes the greasing system itself nearly maintenance-free.



ATTENTION

The automatic greasing system reduces the time and effort spent on manual greasing significantly. However, do not forget that there may be grease points that are not served by the greasing system and must still be greased by hand.

1.2 The SingleLine automatic greasing system

Each system consists of a pump with an integral reservoir, a timer (SLT), a primary line, one or more distribution blocks, metering units, secondary lines and connectors. Grease is transferred from the reservoir by the pump, via the primary line, to the distribution blocks.

Each metering unit is connected by a secondary line to a grease point. An SLT or a pneumatically operated impulse counter, depending on whether there is a continuous electrical supply available, is used to determine when greasing occurs.

Generally only trailers and semi-trailers are equipped with a pneumatic (brake) impulse counter since they usually do not have a continuous electrical supply.

There are two main types of pump:

- electrically operated pumps (with SLT)
- pneumatically operated pumps (with SLT or pneumatic impulse counter).

The electrically operated pump is used mainly for installations or vehicles without a compressed air supply. The electrically operated pump is also used for installations where a large grease delivery is required. The delivery is larger as the pump operates for longer periods.

2. Systems

2.1 Pneumatic piston pump with SLT

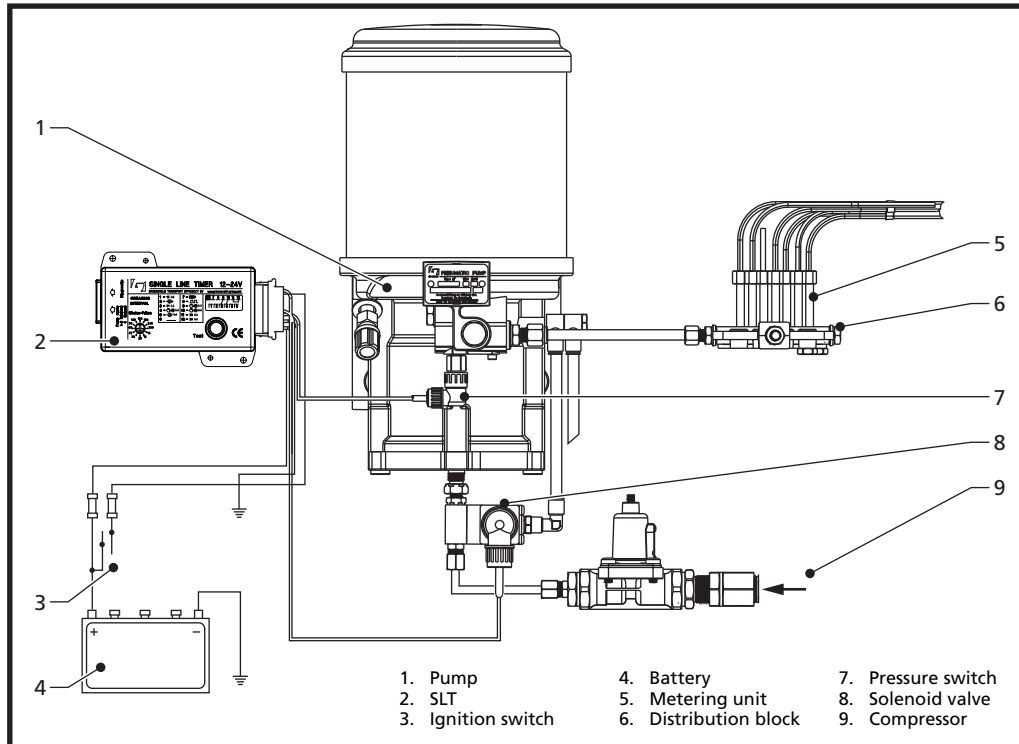


Figure 2.1 Pneumatic piston pump with SLT

At a time, set at the SLT, the circuit to the solenoid valve is closed. The solenoid valve opens and allows compressed air from the compressor to flow to the pump.

The pump piston now rises under compressor pressure and forces grease into the system. The grease pressure is dependent upon the air pressure on the piston (this is the compressor pressure). With a compressor pressure of 8 bar the grease pressure is 72 bar (for a pump with 9:1 ratio).

The metering units then simultaneously pass a fixed, pre-selected metered quantity of grease to the points to be greased.

To end the greasing cycle the SLT opens the electrical circuit closing the solenoid valve. Therefore the compressed air supply to the pump is shut off and the piston reverts to atmospheric pressure. This allows the piston to return to its starting position and the whole system is depressurized.

The metering units are then able to automatically refill themselves and are then (after a minimum delay of 2 minutes) ready for the next greasing cycle.

2.2 System with pneumatic piston pump and impulse counter

As a rule, trailers and semi-trailers are equipped with a pneumatic brake impulse counter and not with an SLT. This is because of a lack of a continuous electrical supply.

The standard version of the brake impulse counter is pneumatically operated and uses the air signal from the service line which is usually connected to the number 4 position of the trailer relay valve.

In certain situations the signal line can be too long, as is the case with extended semi-trailers. Another relay valve is then installed in the fixed part of the semi-trailer.

Alternatively an electrical version of the pneumatic impulse counter can be used, which operates through the brake-light circuit.

2.2.1 System with pneumatic brake impulse counter

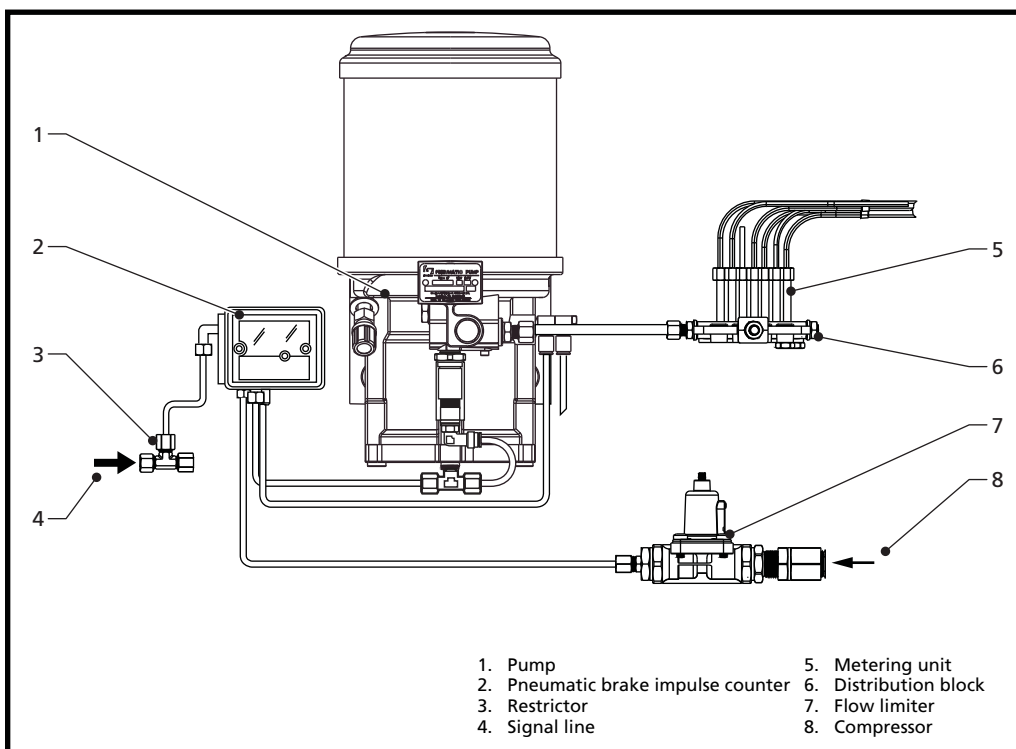


Figure 2.2 System with pneumatic brake impulse counter

The vehicle air tank is connected to input P of the pneumatic impulse counter. Always draw air from the auxiliary tank. If an unprotected air tank is used (because there is no auxiliary tank) a flow limiter (set at 5,5 bar) must always be fitted in the line. When connecting to an auxiliary tank no additional flow limiter is fitted.

Port A on the brake impulse counter is connected to the compressed air connection on the underside of the pump. Port R on the brake impulse counter is connected to the vent above the main piston. The other connection on this couple banjo-union is an open vent.

The operating pulse for the brake impulse counter comes from the signal line. A tee-piece is fitted in the signal line immediately adjacent to the relay valve (or trailer reaction valve) to which the air line to the brake impulse counter is connected. This line is provided with a restrictor (in the tee-piece) with a 1 mm orifice. If the signal line to the brake impulse counter is damaged and/or leaks, the restrictor prevents this leakage causing a malfunction of the vehicle brakes.

2.2.2 System with electric impulse counter

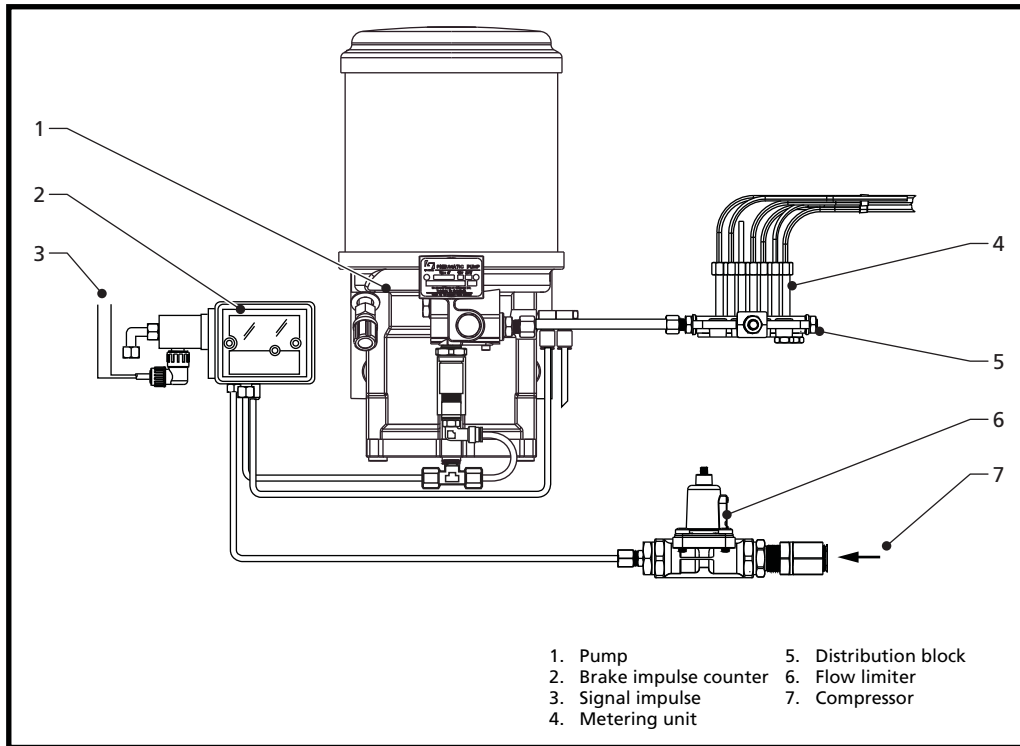


Figure 2.3 System with electric impulse counter

This corresponds broadly with that of a pneumatically operated brake impulse counter. The signal impulse is derived from the brake-light switch. A 2-core cable connected from the brake-light switch and to vehicle earth, is attached to connectors 1 and 2 on the solenoid valve of the brake impulse counter.

2.3 System with electric gear pump

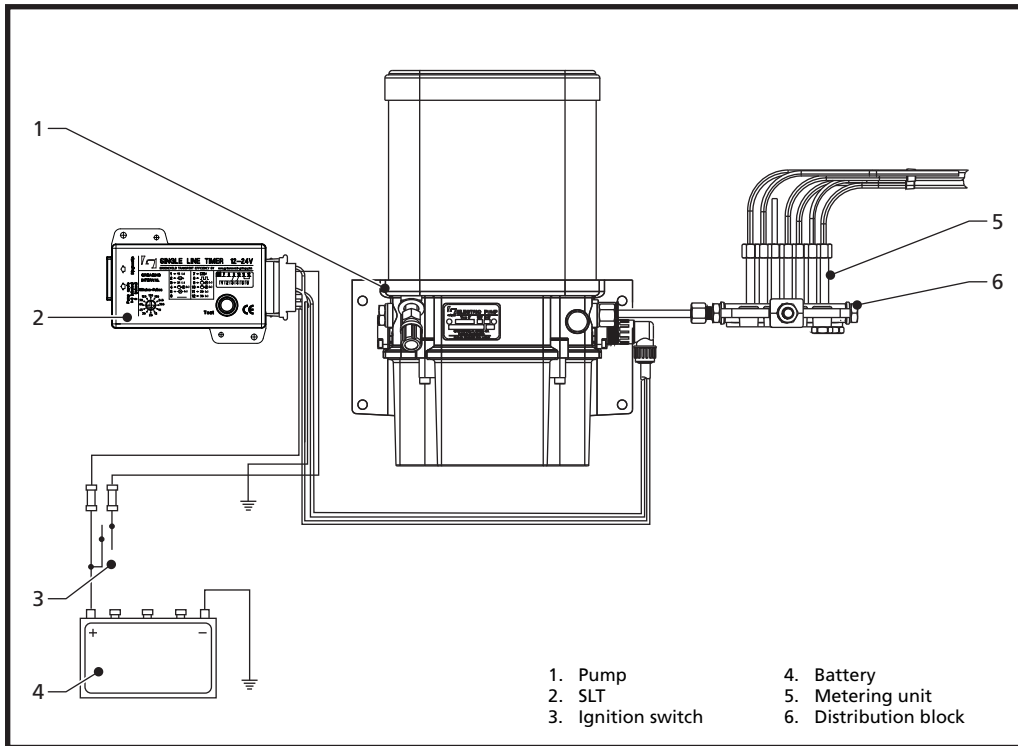


Figure 2.4 System with electric gear pump

The SLT starts the gear pump. The grease in the reservoir is pumped through the primary line, to the distribution blocks.

Simultaneously the metering units press a certain amount of grease (the dosage) through the secondary lines to the grease points. A pressure bypass valve keeps the system at a preset pressure during the pumping cycle.

The greasing cycle ends when the SLT stops the pump. The pressure in the primary line to the metering units then falls by means of a built-in pressure discharge valve. The metering units then automatically refill themselves after which they are ready (after 2 minutes) for the next greasing cycle.

2.4 System with electric axial plunger pump

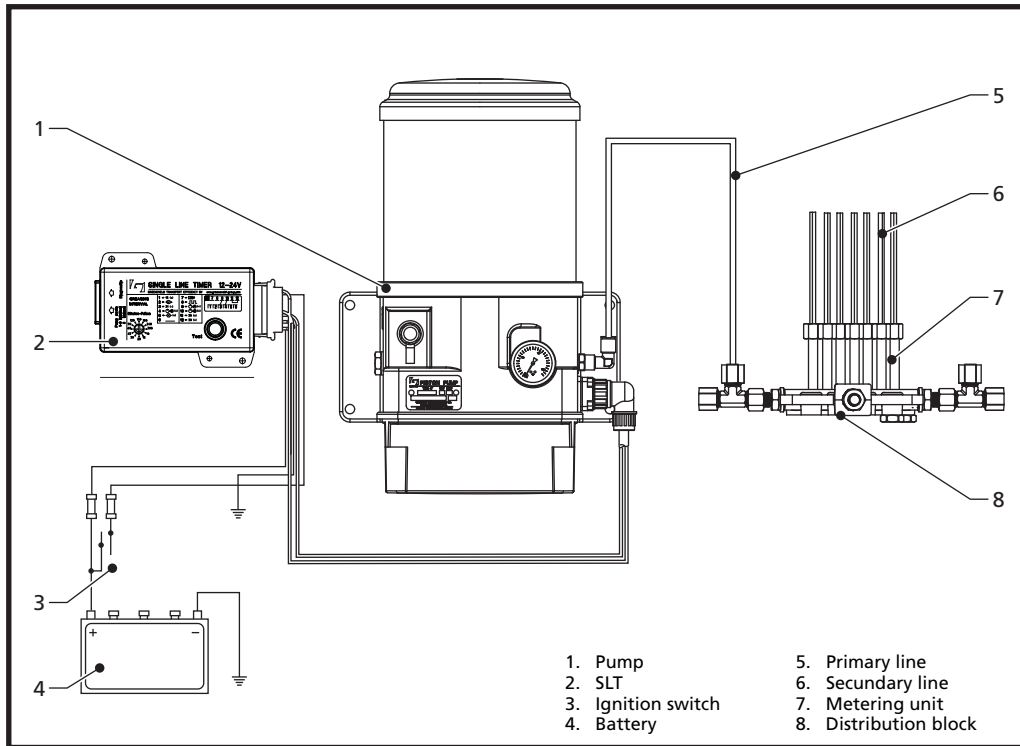


Figure 2.5 System with electric axial plunger pump

The SLT starts the plunger pump. The grease in the reservoir is pumped through the primary line, to the distribution blocks.

Simultaneously the metering units press a certain amount of grease (the dosage) through the secondary lines to the grease points. The amount of grease that goes to each of the grease points depends on the type of metering unit installed.

A pressure control valve - built into the pump unit - maintains a constant pressure of 100 bar in the system during the greasing cycle. If the grease pressure exceeds 100 bar this valve will redirect the grease back toward the reservoir.

During the greasing cycle, the integrated pressure switch must report to the SLT that the minimum required pressure (70 bar) has been attained. If the SLT does not receive this signal it will generate an alarm signal.

The greasing cycle ends when the SLT stops the pump. The pressure in the primary line then slowly drops to zero via an electrically controlled relief valve. The metering units then automatically refill themselves after which they are ready (after 2 minutes) for the next greasing cycle.

3. Pumps

3.1 Pneumatic piston pump

3.1.1 Pump unit

- | | |
|----------------------------------|-------------------------------|
| 1. reservoir with follower plate | 10. compressed air connection |
| 2. air venting channel | 11. main air piston |
| 3. grease channel | 12. spring |
| 4. return channel to reservoir | 13. filler connector |
| 5. primary line connection | 14. small piston |
| 6. pressure channel | 15. chamber |
| 7. return valve | 16. flapper valve |
| 8. non-return valve | 17. connection to reservoir |
| 9. grease pressure indicator | |

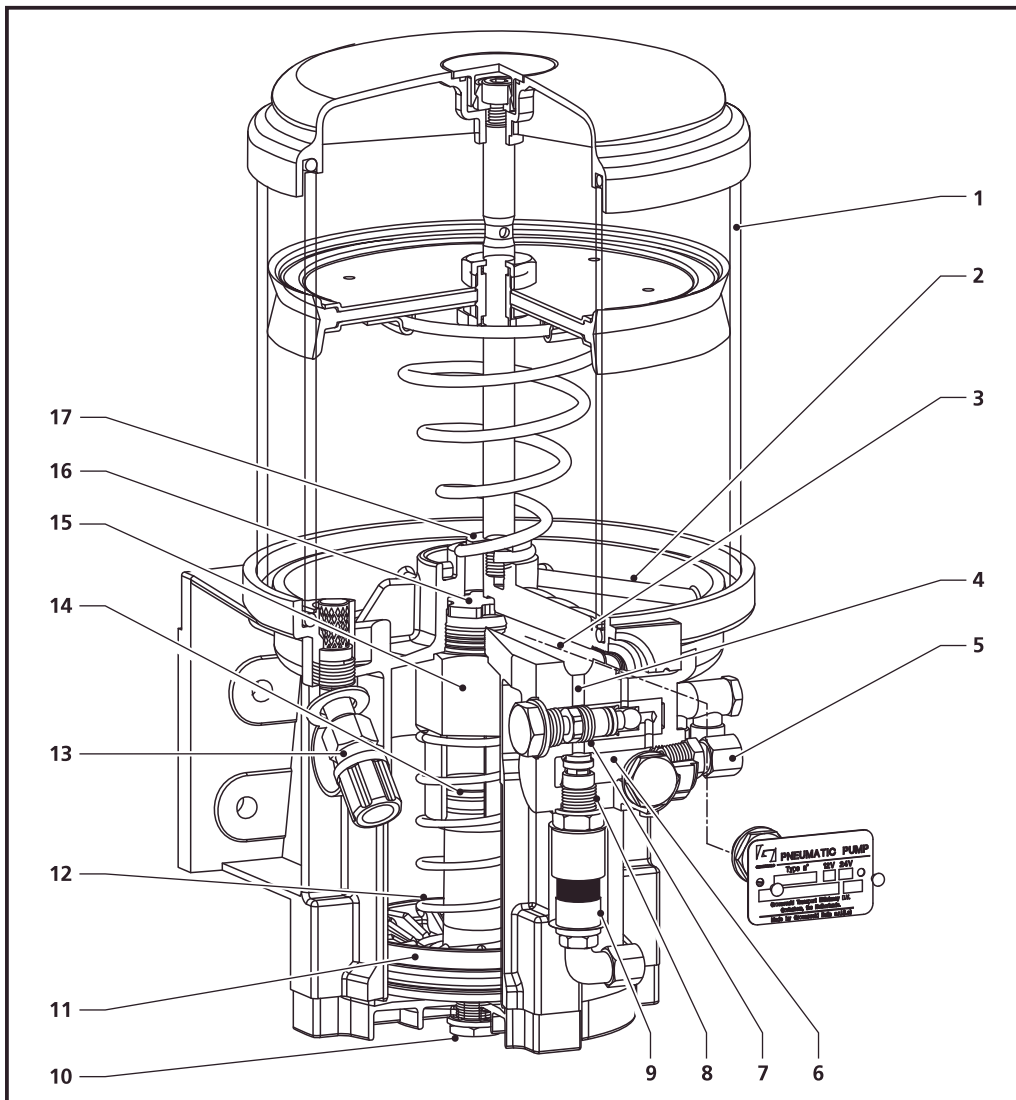


Figure 3.1 Pneumatic piston pump

3.1.2 Principle of operation

If pressure is applied via the compressed air connection (10) the main piston (11) will be forced upwards applying pressure to the grease in chamber (15). The pressure in chamber (15) forces valve (16) against the seat. The connection (17) to the reservoir (1) is thus closed.

The grease leaves the chamber (15) via a channel (3) through the non-return valve (8) into the main or primary line. The metering units are brought under full pump pressure passing their metered quantities of grease into the grease points. As a result of the pressure differential at the return valve (7) the return channel (4) remains closed.

At the end of the complete greasing cycle the air pressure under the main piston (11) falls, allowing the piston to be pushed downward by the spring (12). At the same time flapper valve (16) is released and, because of the reduced pressure in the chamber (15), grease is drawn from the reservoir.

The non-return valve (8) prevents grease from the system piping and metering units from flowing back into the chamber (15).

The pressure in the primary line opens the return valve (7) via the channel (6). This allows the grease pressure to flow via the channel (4) to the reservoir. The metering units, with this pressure drop can now automatically refill themselves following which, they are ready for the next greasing cycle.

A manometer can be connected to the grease channel showing the pressure in the primary line. It is also possible to replace this manometer by a pressure color indicator (9). At the start of the greasing cycle the indicator will be red as a result of the air pressure. At the end of the greasing cycle this will change to (and remain) green due to the grease pressure.

Green thus indicates that the pump has worked and that sufficient pressure has built up in the grease line system. If the color remains red, this means that insufficient pressure has built up in the system. This could be caused by leakage from the primary line.

3.1.3 Technical data**Grease pumps:**

| | <i>part number</i> | | | |
|-------------------------|---------------------------------------|----------------|----------------|----------------|
| | <i>F116479</i> | <i>F103544</i> | <i>F103336</i> | <i>F114016</i> |
| reservoir capacity | 4 liters | 8 liters | 4 liters | 8 liters |
| delivery | 42 cc / stroke | | 60 cc / stroke | |
| ratio | 9:1 | | | |
| grease pressure | 72 bar (for an air pressure of 8 bar) | | | |
| maximum grease pressure | 100 bar | | | |
| temperature range | -25°C to +80°C (NLGI 0 grease) | | | |
| weight | 6.3 kg | 7.2 kg | 7.52 kg | 8.42 kg |

Oil pumps:

| | <i>part number</i> | |
|-------------------------|---------------------------------------|---------------|
| | <i>F116318</i> | <i>116319</i> |
| reservoir capacity | 4 liters | 8 liters |
| delivery | 42 cc / stroke | |
| ratio | 9:1 | |
| oil pressure | 72 bar (for an air pressure of 8 bar) | |
| maximum grease pressure | 100 bar | |
| temperature range | -25°C to +80°C | |
| weight | 5.6 kg | 6.5 kg |

3.2 The electric gear pump

3.2.1 Pump unit

- | | |
|---------------------------|-------------------------------|
| 1. follower plate | 7. pressure switch connection |
| 2. low level switch | 8. electric motor |
| 3. pressure control valve | 9. filler connector |
| 4. connector fitting | 10. gear pump |
| 5. vent opening | 11. reservoir |
| 6. primary line connector | |

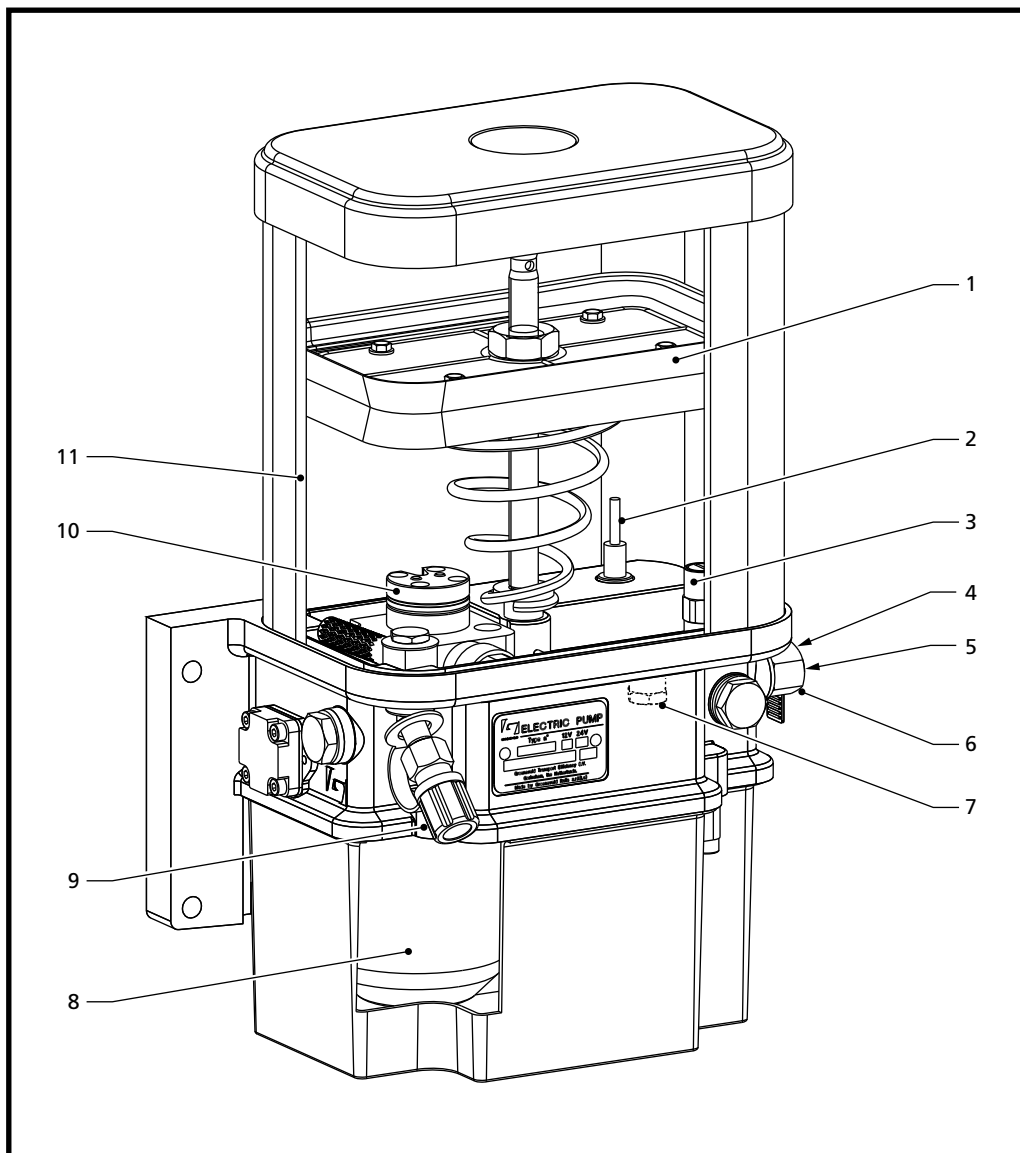


Figure 3.2 Electric gear pump

3.2.2 Principle of operation

The gear pump (10) is activated by the SLT. The grease will now be pumped from the reservoir (11) through the primary line (6) to the distribution blocks. The pump remains in operation throughout the entire cycle period. This cycle or impulse period is 3 minutes. The pump builds up the grease pressure during the cycle. When the pressure reaches 55 bar, the pressure control valve (3) opens, grease is then no longer pumped into the primary line but returns to the reservoir. The grease pressure is thus limited to 55 bar.

The standard version of the electric gear pump is fitted with a pressure switch (7). If, during the greasing cycle, the pressure does not rise above 40 bar the SLT gives an alarm signal. A low level switch (2) (not in all versions) provides an alarm signal if the grease in the reservoir falls below a certain minimum level.

On the right-hand side between the connector for the primary line (6) and the connector fitting (4) there is a right-angle connector for air venting and grease overflow (5). When filling the reservoir with grease the air above the follower plate (1) escapes. This air flows downward through an opening in the piston line and leaves the pump via the right-angle connector (5). The escape of a small quantity of grease via this connector during venting is quite normal.

(A version with the connections for the primary line and for the connector on the left-hand side of the pump can also be supplied if required).

3.2.3 Technical data

Gear pump:

| | <i>part number</i> | |
|----------------------------------|--|--|
| <i>without low level switch:</i> | F103384 (12 V) | F103382 (24 V) |
| <i>with low level switch:</i> | F117676 (12 V) | F103398 (24 V) |
| current consumption | 8 A | 4 A |
| reservoir capacity | 2.7 litres | 2.7 litres |
| delivery | 120 cc/minute (NLGI 0 grease) at 20°C | 120 cc/minute (NLGI 0 grease) at 20°C |
| grease pressure | 55 bar | 55 bar |
| temperature range | -20°C to +70°C (NLGI 0 grease) | -20°C to +70°C (NLGI 0 grease) |
| | at extreme circumstances please consult your local GROENEVELD-organization | |
| weight | 6.7 kg | 6.7 kg |

3.3 The electric axial plunger pump

3.3.1 Pump unit

- | | |
|-------------------------------------|----------------------------|
| 1. follower plate | 8. pressure switch |
| 2. reservoir | 9. electric motor |
| 3. guide rod of follower plate | 10. return valve |
| 4. low level switch | 11. filler port |
| 5. plunger pump | 12. overflow port |
| 6. coupling for primary grease line | 13. filter |
| 7. electric connector | 14. pressure control valve |

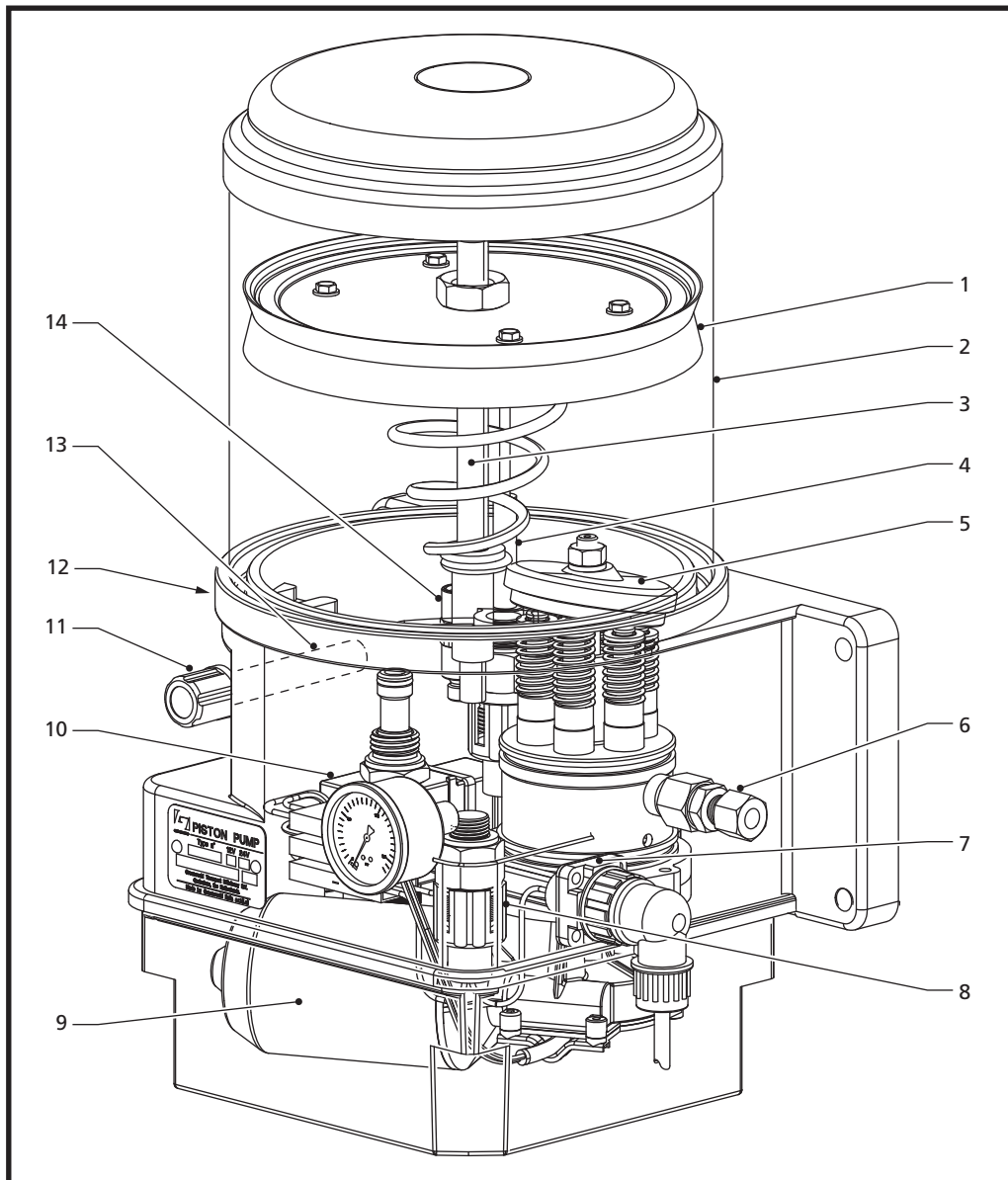


figure 12.1 The electric axial plunger pump

3.3.2 Principle of operation

The plunger pump (5) consists of six fixed plungers amid a ring duct. The six plungers are driven by the electric motor (9) through a mechanical transmission.

In the channel between the ring duct and the outlet (6) of the pump unit, a pressure control valve (14) and an electrically operated return valve (10) have been built-in. The pressure control valve is used to maintain a constant grease pressure during the pump cycle. The return valve allows the grease pressure in the primary line to fade after the pump cycle has ended.

The plunger pump is fitted with a pressure switch (8), which is used to check that the required grease pressure is attained during a pump cycle.

An low level switch (4) in the reservoir will cause the SLT to generate an alarm signal when the level of the grease becomes too low.

The pump is electrically connected with the SLT through the connector (7).

The reservoir (2) is mounted on top of the pump unit. The reservoir is filled via the filler port (11). A filter (13) prevents contamination of the grease in the reservoir.

When filling the reservoir with grease the air above the follower plate (1) escapes. This air flows downward through an opening in the guide rod (3) and leaves the pump via the overflow port (12). The escape of a small quantity of grease via this connector during venting is quite normal.

3.3.3 Technical data**Plunger pump:**

| | <i>part number</i> | | | | | |
|--|--------------------|----------------|----------------|----------------|----------------|----------------|
| | <i>F110082</i> | <i>F110083</i> | <i>F110084</i> | <i>F110712</i> | <i>F111561</i> | <i>F111646</i> |
| grease output ¹ [cc/min] | 50 | 25 | 25 | 50 | 25 | 25 |
| max. grease pressure [bar] | 100 | 100 | 100 | 100 | 100 | 100 |
| content reservoir [litres] | 8 | 8 | 4 | 4 | 4 | 4 |
| supply voltage [V dc] | 12 | 24 | 24 | 12 | 12 | 24 |
| nominal current [A] | 8 | 4 | 4 | 8 | 8 | 4 |
| electrical connection: pin 1: plus pin 2: minus pin 3: pressure switch pin 4: low level switch | 4-pin | 4-pin | 4-pin | 4-pin | 4-pin | 3-pin |
| follower plate in reservoir | yes | yes | yes | yes | yes | yes |
| integrated pressure switch | yes | yes | yes | yes | yes | yes |
| low level switch | standaard | standaard | standaard | standaard | standaard | standaard |
| operating temperatures [°C]: 0-grease 00, 000, or of LT-grease ² | -5..+80°C | -15..+80°C | -15..+80°C | -5..+80°C | -15..+80°C | -15..+80°C |
| weight [kg] | 9.8 | 9.8 | 8.8 | 8.8 | 8.8 | 8.8 |

1. The output of the pump is specified in cubic centimetres (cc) per minute. If the greasing system is to operate properly however, the pump should have supplied the total quantity of grease required by the system before 95% of the greasing cycle has elapsed. The length of the cycle must be set accordingly. This will guarantee that the grease pressure reaches a minimum value of 80 bar and that the pressure switch in the pump will report this fact to the SLT. If the SLT does not receive this signal, it will generate an alarm signal.
2. Operating temperatures below -15°C

Oil pumps:

| | <i>part number</i> | |
|---------------------|--|------------------------|
| | <i>F114705 (24Vdc)</i> | <i>F172672 (24Vdc)</i> |
| current consumption | 4 A | 4 A |
| reservoir capacity | 4 liters | 8 liters |
| delivery | 50 cc/minute at 20°C | 50 cc/minute at 20°C |
| oil pressure | 55 bar | 55 bar |
| temperature range | -20°C to +70°C | -20°C to +70°C |
| | at extreme circumstances please consult your local Groeneveld-organization | |
| weight | 9.2 kg | 10.2 kg |

4. SingleLine Timer

The SingleLine Timer (SLT) is a multifunctional Groeneveld product and is composed with high-grade components to guarantee the control of the Groeneveld SingleLine greasing system.

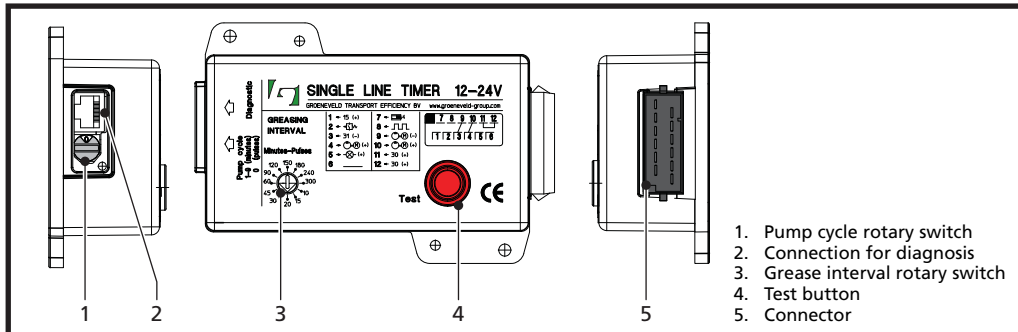


Figure 4.1 SingleLine Timer (SLT)

The SLT contains a grease interval rotary switch (3) with pre-defined time intervals in order to grease a connected greasing system with the correct time interval.

If greasing interval times are not applicable the SLT can be switched to a pulse counter mode with the pump cycle rotary switch (1).

The SLT controls the connected greasing system to a number of received pulses for example from brake lights or pulse switch.

Apart from greasing intervals controlled by time or pulses it is possible to set the pump time to its applicable type of pump, length of the primary line, size/number of metering units and temperature. Essentially, a correct setting is required.

A red test button (4) is situated at the SLT, which can be used for testing and adjusting the greasing system.

The alarms for possible system errors are indicated by an internal alarm buzzer and/or an alarm signal lamp to have optimal control of the Groeneveld SingleLine greasing system.

The SLT contains a memory bank for storing data and malfunctions, which can be diagnosed by its applicable SingleLine PC-GINA program, through the available diagnostic connection (2).

Groeneveld advises to carefully read the PC-GINA user's instruction prior to connecting the PC-GINA software to the SLT.

The following paragraphs explain how to set SLT for your Groeneveld automatic greasing system.

4.1 Adjusting the greasing interval time

The greasing interval time can be adjusted with the grease interval rotary switch (Figure 4.1/3) at the SLT. Rotate the switch by using a suitable screwdriver, to the desirable position. As a confirmation, a short audible beep sounds when rotating the switch in each position. A greasing cycle starts automatically after every completed greasing cycle and set greasing interval time.

Ensure the pump-time-rotary switch, can vary between 1 and 9 minutes, is set correctly. Please refer to paragraph 4.3 Determining and adjusting the pump time.

4.2 Adjusting the greasing interval pulses

The greasing interval pulses can be adjusted with the rotary switch (Figure 4.1/3) at the SLT. Rotate the switch by using a suitable screwdriver to the desirable position. As a confirmation, a short audible beep sounds when rotating the switch in each position. A greasing cycle starts automatically after every completed greasing cycle and the set number of pulses.

Ensure the pump-time-rotary switch is set to 0 in order to operate the SLT as a pulse counter, along with a fixed 3-minute pumping time. Please refer to paragraph 4.3 Determining and adjusting the pump time.

4.3 Determining and adjusting the pump time

After venting the greasing system and a proper installation the pumping time has to be determined and pre-set.

Please follow the next steps in order to determine the pumping time.

1. Remove the rubber plug at the site of the SLT.

Adjustment possibilities of the pump cycle rotary switch (Figure 4.1/1)

- Position 0 = Activated as pulse timer with a pump time of 3 minutes.
- Position 1 = 1 minute pump time
- Position 2 = 2 minutes pump time
- Position 3 = 3 minutes pump time
- Position 4 = 4 minutes pump time
- Position 5 = 5 minutes pump time
- Position 6 = 6 minutes pump time
- Position 7 = 7 minutes pump time
- Position 8 = 8 minutes pump time
- Position 9 = 9 minutes pump time



WARNING

At position 0 the SLT will act as pulse timer. Therefore pin 8 of the SLT connector (Figure 4.1/5) requires to be connected to the brake lights or pulse switch for example. Hereby the pumping time is locked into a fixed value of 3 minutes and not changeable.

2. Turn rotary switch (Figure 4.1/1) to position 9.
If ignition is on when turning this rotary switch a short audible beep will sound in each position.
3. Switch ignition on.



ATTENTION

Ensure, prior to proceed with step 4, that the greasing system functions properly, is filled up with grease, vented and pressureless.

4. Manually operate one greasing cycle, by pushing the red test button (Figure 4.1/4) until a short audible beep will sound, hence release the test button and a greasing cycle starts momentarily.
Record the time between the manually started greasing cycle and the on-pressure signal. The on-pressure signal can be identified when the internal alarm buzzer sounds an 3-second audible-pulsing signal.
The recorded time between the manually started cycle and the on-pressure signal depends on type of pump, length of the primary line, size/number of metering units and temperature. Therefore it is important to set this correctly.

5. Turn the rotary switch of the pump time (Figure 4.1/1) to the correct position after determining the pumping time between the manually started greasing cycle and the on-pressure signal. The correct position: round the determined pumping time to the next full minute and add one minute (see example).
6. Close the sealing plug.

Example:

- Pump starts and the SLT receives an on-pressure signal after 38 seconds for example.
- Add 1 minute.
- The total time becomes 1:38.
- Rotate the pump cycle switch to position 2.
- Close the sealing plug.

4.4 Test button functions

4.4.1 Manually start one greasing cycle with a on-pressure buzzer signal

Push the red test button (Figure 4.1/4). After 1 second a short audible beep will sound. Release the test button and a greasing cycle starts momentarily.

During the greasing cycle, if greasing system functions properly, a 3-second pulsing on-pressure signal will sound. This confirms the SLT received an on-pressure signal.

Possible malfunctions are represented by the alarm buzzer and/or signal lamp.

After switching ignition off or when a current cycle test finished the SLT will revert to an automatic mode.

4.4.2 Manually start 10 greasing cycles

Push the red test button (Figure 4.1/4) for 6 seconds. After the short audible beep sounds a pulsing audible beep follows. Accordingly release the test button and a 10-greasing-cycle program starts momentarily. Only in this mode the interval times between the greasing cycles are equal to pumping time pre-set by the rotary switch.

Possible malfunctions are represented by alarm buzzer and/or signal lamp.



ATTENTION

During the 10-greasing-cycle program no on-pressure signals will sound.

After switching ignition off or when this 10-greasing-cycle program is finished the SLT reverts to the automatic mode.

4.4.3 Switch the alarm buzzer off/on

The SLT is provided with an alarm buzzer and an alarm signal lamp output to warn the operator in case of malfunctioning of the greasing system and a low grease level (if a low level switch is provided in the reservoir).

Both the alarm buzzer and alarm signal lamp are enabled as default setting, the operator can define whether to be warned by the alarm buzzer and/or alarm signal lamp.

If the alarm buzzer is not desirable it can be disabled. Although, it would then be required to install the alarm signal lamp in a visionable area of the operator, to enable the control of the greasing system.

Disabling the buzzer



ATTENTION

In this case installing a alarm signal lamp is necessary!

1. Ensure that the SLT is not powered.
2. Push the red test button.
3. Switch ignition/power on.
4. Release the red test button.
5. A short pulsing audible beep indicates the buzzer is disabled.

Enabling the buzzer

1. Ensure that the SLT is not powered.
2. Push the red test button.
3. Switch ignition/power on.
4. Release the red test button.
5. A short audible beep indicates the buzzer is enabled.

4.5 Alarm signals

The alarm signals are shown during or after the greasing cycle by the alarm buzzer and/or the alarm signal lamp.

Repetitive malfunctions will be represented in succession after detecting the error, by the buzzer and/or the alarm signal lamp.

When parameter of the alarm signal lamp is selected to light continuously by the SingleLine PC-GINA program, the alarm signal lamp will light continuously after detecting an error. If not disabled, the alarm buzzer continues to act with audible beep-function.

4.5.1 Alarm signal lamp

When a alarm signal lamp is installed, dedicated signals are shown during or after the greasing cycle, and will be reset automatically at factory defaults after finishing the greasing cycle. If malfunctions are present on the next greasing cycle they will be represented again to warn the operator for possible malfunctioning.

Optional: It is possible to select the alarm signal lamp to always-on after an alarm signal by the SingleLine PC-GINA program.

This is an option that can be applicable for stationary machines to where the standard lamp function is insufficient or poorly visible.

If this option is selected and alarm signal is continuously shown it can be reset after resolving the malfunction with the red test button as follows:

1. Switch ignition on.
2. Push the red test button (Figure 4.1/4) for 0.5 seconds.
3. Alarm signal lamp will go off.
4. Alarm signal lamp lights up at the next greasing cycle when malfunction has not been resolved.
5. If malfunction has been resolved the alarm lamp remains off.

4.6 Technical data

| | <i>part number</i> |
|-------------------------------------|--|
| | F125639 |
| Supply voltage | 12...24Vdc |
| Pump output | Yes |
| Maximum current pump output | 15 A |
| Alarm lamp output | Yes |
| Maximum current alarm lamp output | 1 A |
| Impulse lamp output | Yes |
| Maximum current impulse lamp output | 1 A |
| Pressure switch input | Yes |
| Low level switch input | Yes |
| Pulse input | Yes |
| Test button | Yes |
| Built-in alarm beeper | Yes |
| Greasing intervals adjustable | 10, 15, 20, 30, 45, 60, 90, 120, 150, 180, 240 and 300 minutes or pulses |
| Pump cycle time adjustable | 1,2,...9 minutes |
| Protection class | IP54 |
| Diagnosis connector | Yes |

4.7 Wiring diagram

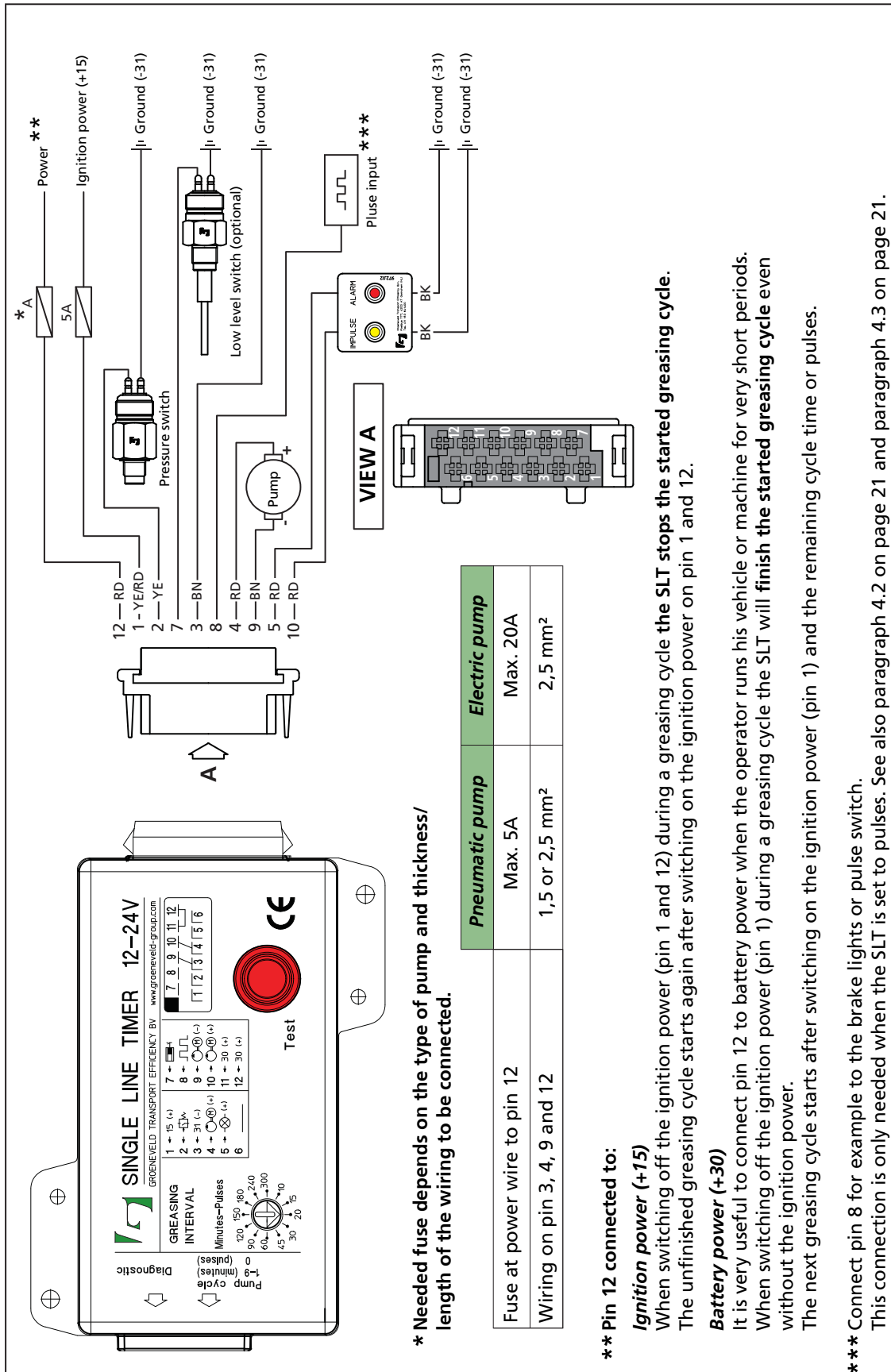


Figure 4.2 Wiring diagram of SLT

5. Impulse counter

As a rule trailers and semi-trailers do not have a continuous electrical supply. For this reason an SLT cannot be used. In its place a brake impulse counter will be used. This may be electrically or pneumatically operated.

5.1 Electric brake impulse counter

- 1 solenoid valve
- 2 screw for manual operation (test)
- P compressed air connection
- A pump connection
- R venting outlet

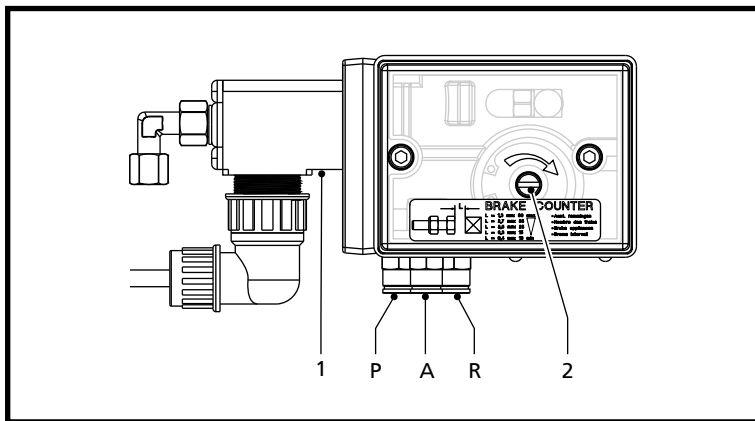


Figure 5.1 Electric brake impulse counter

5.2 Pneumatic brake impulse counter

- 1 signal air
- 2 screw for manual operation (test)
- P compressed air connection
- A pump connection
- R venting outlet

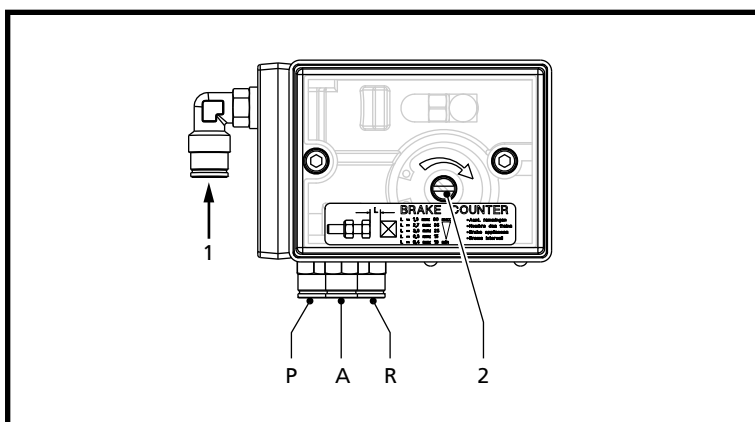


Figure 5.2 Pneumatic brake impulse counter

The pneumatic impulse counter starts the greasing cycle after a set number of pulses. The electrically operated counter (Figure 5.1) is activated by an electric signal. If the brakes of the vehicle are applied the solenoid valve of the pneumatic impulse counter is energized, causing the operating cam to be rotated. With a pneumatically operated impulse counter (Figure 5.2)

activation is through pulses from the pneumatic system before the relay valve (or trailer reaction valve). The compressed air operates a piston, which in turn rotates the operating cam.

After the preset number of pulses the operating cam opens the air valve through which compressed air passes to the pump. The greasing cycle then begins. After a further number of pulses, depending on the setting of the counter, the pump is vented through the venting outlet R.

5.3 Setting the number of brake applications

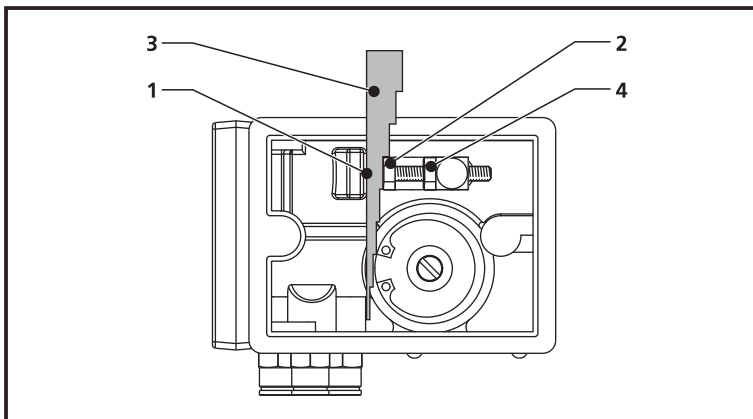


Figure 5.3 Setting the brake impulse

The number of pulses required for the counter to activate the pump, is set as follows:

1. Remove the transparent cover.
2. Set the distance (Figure 5.3/L) between the left-hand side of the striker (1) and the head of the adjusting bolt (2). The distances equivalent to a specific number of pulses are shown on the transparent cover. A feeler-gauge (3) is fixed to the inside of the cover and can be used to set this distance. The tool is marked with the number of pulses related to each thickness.
3. Tighten the lock nut (4) of the adjustment bolt.
4. Replace and secure the cover.

REMARK

Setting the pneumatic impulse counter is easier when the pneumatic line is under pressure. This moves the cam striker to the right so that the distance between the striker and the adjustment bolt can be measured.

5.4 Technical data

| | <i>part number</i> | |
|-----------------|---|--|
| | <i>F100187 pneumatically operated</i> | <i>F100186 electrically operated</i> |
| cycle time | minimum 2 brake impulses | minimum 2 brake impulses |
| cycle intervals | 10 - 80 brake impulses | 10 - 80 brake impulses |

6. Metering units

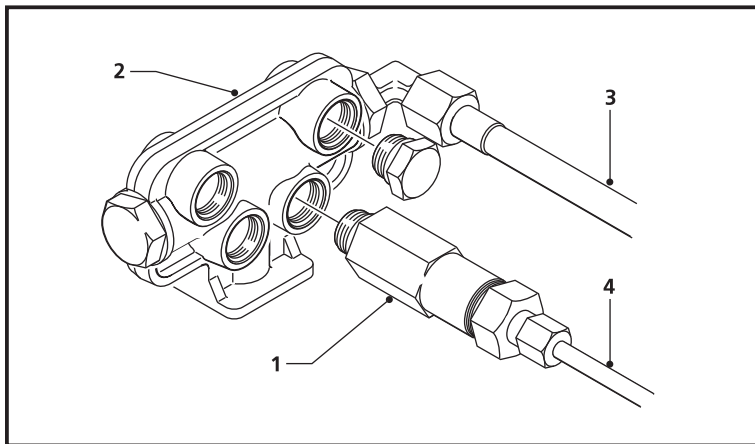


Figure 6.1 Distribution block with metering units

There are 11 metering unit types (1) available for the SingleLine system, each with a differing metered grease quantity. By careful selection of the type of metering unit each grease point can be provided with the right quantity of grease.

The metering units are fitted in groups on a distribution block (2); this is a cast brass distribution block to which the primary line (3) is connected. The blocks are available with several ports or outlets to which metering units can be connected. The unused outlets should be blanked-off.

The metering units are also made of brass and are, because of their enclosed design, exceptionally suitable for use in dirty and dusty conditions. It is not advisable to open the metering units as this allows the entry of dirt, and thus is a potential cause of faults.

6.1 Types of metering units

The delivery (per greasing cycle) of a metering unit is determined by the number and thickness of the spacers mounted between the head and the housing of the metering unit (Figure 6.2).

The following metering units are available:

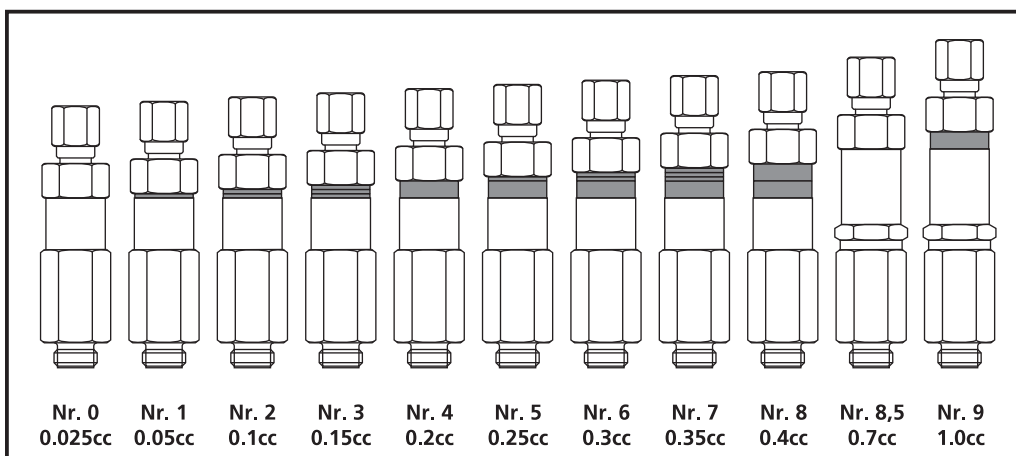


Figure 6.2 Types of metering units

6.2 Operating principle

6.2.1 Point of departure

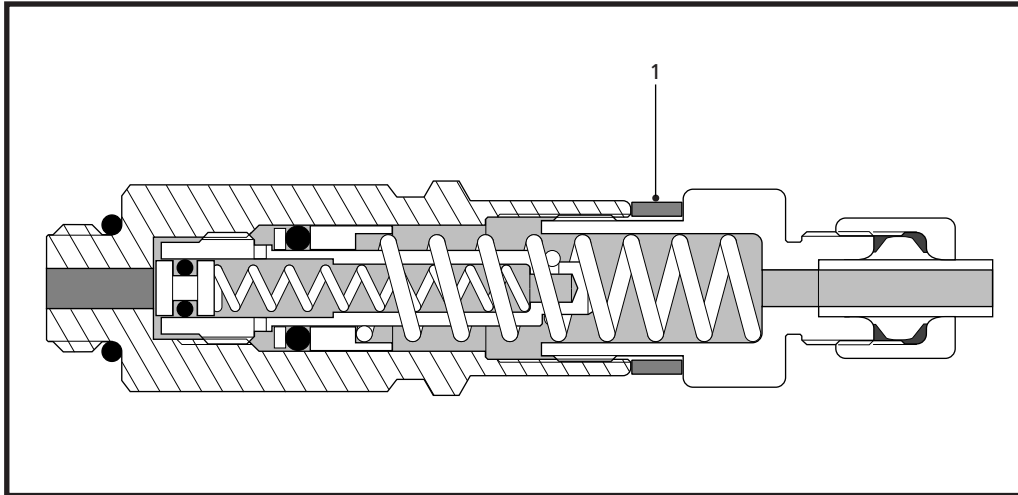


Figure 6.3 Metering unit in initial position

Figure 6.3 illustrates a new metering unit. One that has not yet been filled with grease. Item (1) is the spacer, which determines the delivery of the metering unit (see paragraph 6.1).

The metering units that are used in your greasing system may differ externally, or even internally, from the one illustrated here. However, the operating principle is always the same.

6.2.2 Phase A

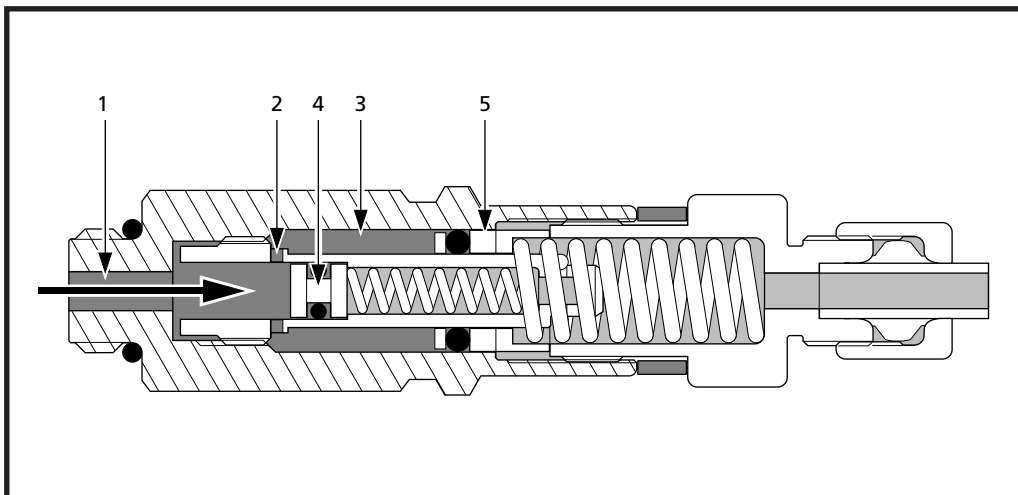


Figure 6.4 Metering unit in phase A

The grease is pumped via the primary line and the distribution block into the channel (1) of the metering unit. The grease pressure pushes plunger (4) past channel (2). The grease now fills chamber (3) and pushes plunger (5) to the right. The stroke length of plunger (5) determines the amount of grease that will be pressed through the secondary line to the grease point. This stroke length, hence the capacity of chamber (3), is determined by the number and thickness of the spacers (Figure 6.3/1).

6.2.3 Phase B

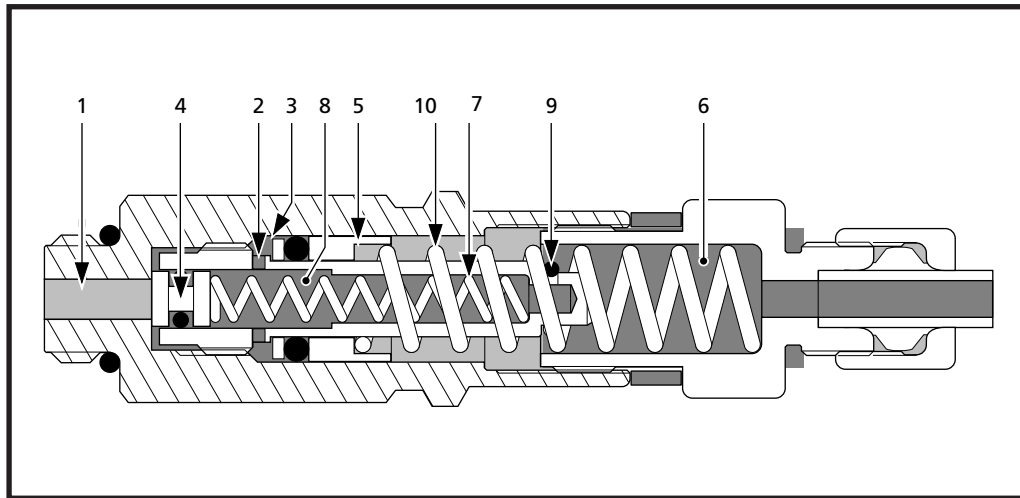


Figure 6.5 Metering unit in phase B

When the pump stops and as the grease pressure in the primary line drops, spring (7) will push plunger (4) back to the left, closing off channel (1). O-ring (9) prevents grease from being sucked back from chamber (6). Plunger (5) is pushed back by spring (10) and presses the grease in chamber (3), via channel (2), to chamber (8).

6.2.4 Phase C

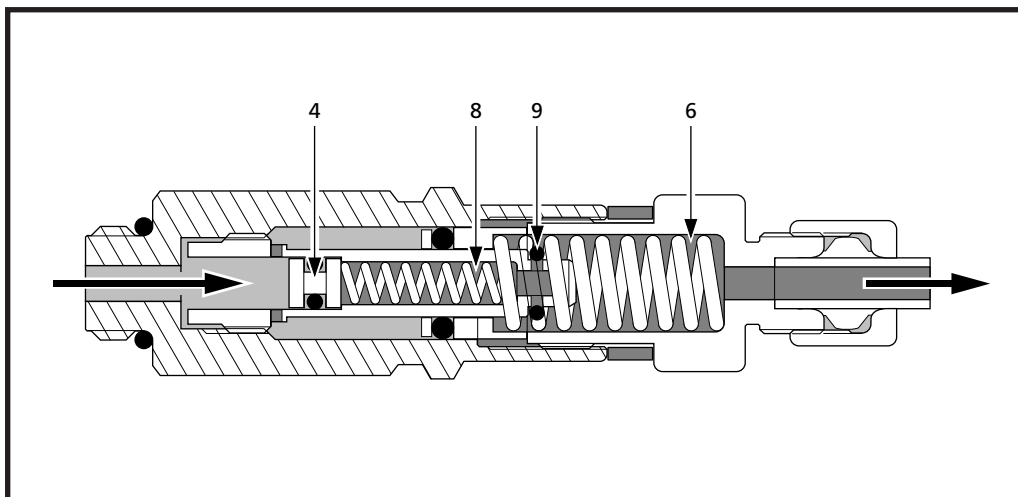


Figure 6.6 Metering unit in phase C

During the next greasing cycle the same happens as in phase A. Chamber (8), however, is now filled with grease. As plunger (4) moves to the right by the grease pressure, the grease in chamber (8) is pressed via chamber (6) and the secondary line to the grease point.

During all this, O-ring (9) is pressed outward to allow the grease to leave chamber (8).

7. Other components

7.1 Solenoid valve

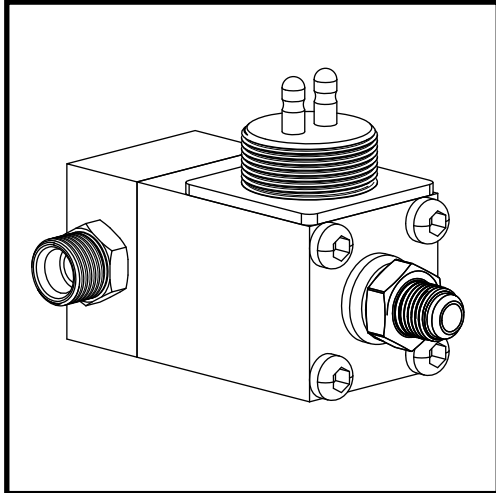


Figure 7.1 Solenoid valve

The solenoid valve (Figure 7.1) between the air tank and the pneumatic pump (usually fitted to the pump) is a normally closed, free venting type. The valve is connected electrically by an M24 screw connector.

7.1.1 Technical data

| | <i>part number</i> | |
|--------------------|-----------------------------------|-----------------------------------|
| | <i>F102816 (12 V)</i> | <i>F102815 (24 V)</i> |
| type | normally-closed with open venting | normally-closed with open venting |
| operating pressure | maximum 10 bar | maximum 10 bar |
| power requirement | maximum 8 W | maximum 8 W |
| screw thread | M24 | M24 |

7.2 Pressure switch

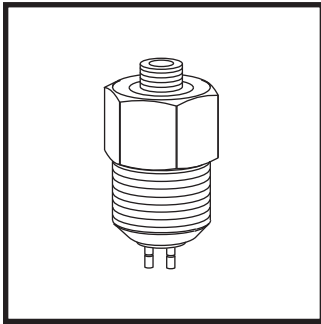


Figure 7.2 Pressure switch

A pressure switch is included in the greasing system (in the primary line) to provide an alarm for too low a pressure in the system during the greasing cycle.

This switch closes at a pressure of 40 bar, making a connection to earth. If this does not happen during the greasing cycle, because insufficient or no grease pressure is generated, an alarm will be given. During the remaining cycle time there will be an intermittent alarm signal. This alarm will be repeated after a preset time if the problem is not corrected.

An M24 screw connector connects the pressure switch electrically.

For a system with a pneumatic pump the pressure switch is fitted to a distribution block. The electrically operated pump is provided with a built-in pressure switch.

7.2.1 Technical data

| | <i>part number</i> |
|--------------------|--------------------|
| | <i>F104809</i> |
| type | normally-open |
| switching pressure | 40 bar |
| connection | 2-wire |
| screw thread | M24 |

7.3 Reservoir

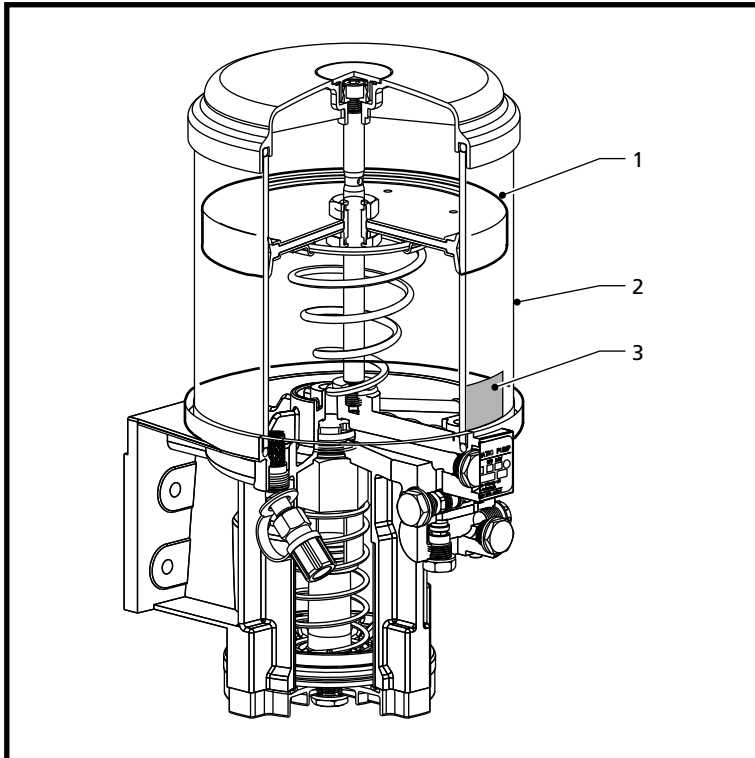


Figure 7.3 Pneumatic pump

The reservoir (2) is made from impact-resistant plastic that can withstand the influences of fluctuating temperatures. The reservoir can hold a quantity of grease that in most cases is sufficient for about 4 months, depending on the number of grease points.

The minimum level (5 cm) is marked by a label (3) on the reservoir.

7.4 Follower plate

In the standard reservoir a follower plate is placed above the level of the grease (Figure 7.3/1). This plate follows the level of the grease; as the level falls the follower plate falls with it under the action of a tension spring. The follower plate prevents the increase of air into the grease and any consequent soaping of the grease. Funneling of grease as the level falls is also prevented. The follower plate also wipes the reservoir wall clean. This allows the level of the grease to be checked easily at a glance.

8. Refilling the reservoir

8.1 Grease recommendations

The use of the correct grease in the Groeneveld Automatic Greasing System is important. The grease to be used must be an NLGI 0-grease of EP quality and moreover must not contain graphite.

Groeneveld has developed an EP grease in the NLGI class 0 especially for use in automatic greasing systems. This grease - Greenlube EP-0 - combines the best qualities of various types of greases. The use of Greenlube grease is recommended for the greasing system. If you use another type of grease or are not sure about the use of your own grease, please consult either the lubricant supplier of Groeneveld.

8.2 Filling the reservoir

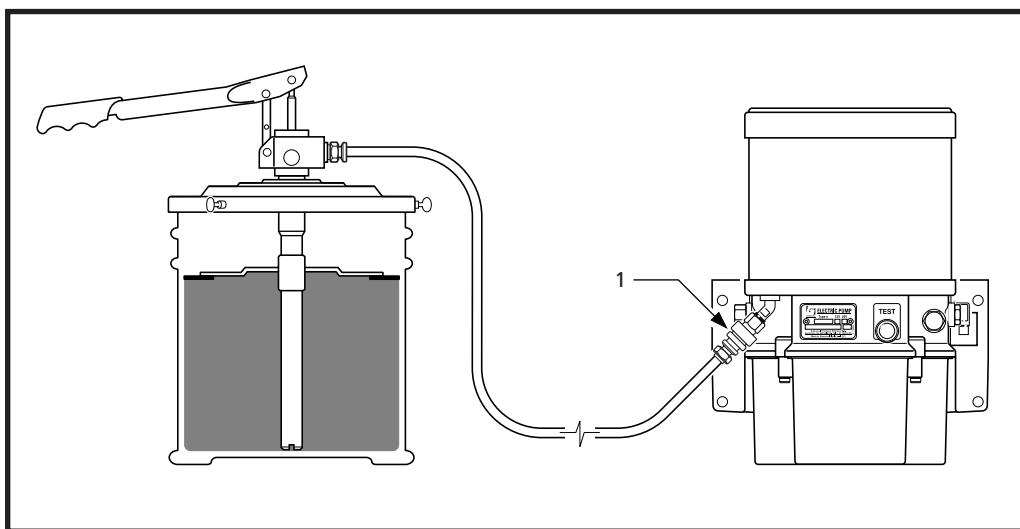


Figure 8.1 Filling the reservoir

When the grease in the reservoir has fallen to the minimum level it must be refilled. Generally a filler pump is used for this purpose (see Figure 8.1). The procedure is as follows:

- With a new filler pump (or filling hose) the hose should first be primed with grease. This avoids the pumping of air into the reservoir. For this the ball (1) in the snap-on connector on the filler hose should be depressed while pumping grease through the hose until it is filled with the grease.
- Remove the dust cap from the filler connector.
- Carefully clean the filler connector and the connector on the filler hose.
- Secure the filler hose to the filler connector.
- Fill the reservoir to not more than the maximum level (2 cm below the top of the reservoir) or until the follower plate meets its stop.
- Remove the filler hose.
- Replace the dust cap on the filler connector.
- There is a filter within the filler connector in the reservoir. If pumping is very difficult the filter could be blocked. In this case, dismantle and clean the filter.

9. Maintenance

9.1 General

The maintenance of Groeneveld's SingleLine greasing systems can be combined with the normal maintenance of the vehicle or machine.



WARNING

When cleaning the vehicle or machine with a high-pressure water/steam jet cleaner, the pump of the greasing system should not be directly exposed to the jet. This to prevent water from entering the pump through its venting opening. During normal operation, however, water will never be able to enter the pump.



ATTENTION

The automatic greasing system reduces the time and effort spent on manual greasing significantly. However, do not forget that there may be grease points that are not served by the greasing system and must still be greased by hand (for example the universal joints of the propeller shaft).

9.2 Periodic checks

1. Check the pump, paying particular attention to the level of the grease (top up in time) and external damage.
2. Check the SLT with particular reference to the correct operation of the various functions. For this an accelerated test should be carried out. See chapter 4.
3. Check the brake impulse counter and pay attention to the manometer on the pump. Operate the brake impulse counter manually by means of the screw.
4. Check the entire system and in particular for damage of lines and operation of the metering units.

10. Fault diagnosis

10.1 General malfunction reports

| <i>Fault</i> | <i>Cause</i> | <i>Action</i> |
|--|---|---|
| 1. All points to be greased are dry. | a. Pump reservoir is empty. b. Reservoir filled with grease that is too thick and unsuitable for the system. c. Primary line leaking. d. SLT or pneumatic impulse counter not set correctly. If there is another cause, please consult your dealer. | a. Fill the reservoir. See chapter 8. b. Remove and clean the reservoir. Refit and fill the reservoir with the correct grease. Remove the end plugs from the distribution blocks and pump the old grease out of the system. c. Repair the line and bleed the system if a new piece of line has been fitted. d. Reset the SLT or brake impulse counter. |
| 2. Pump does not work or does not reach working pressure. | a. Pneumatically operated pump: No or too-low air pressure. b. Piston does not rise. If there is another cause, please consult your dealer. | a. Ensure there is an air pressure of 6 to 8 bar. b. Dismantle the cover of the pump casing and clean the piston. |
| 3. One or more grease points are dry while the others receive sufficient grease. | a. Break in the secondary line. b. Inoperative metering unit. | a. Repair or replace the line. b. Remove the metering unit and fit a new unit. |
| 4. A grease point receives too much grease. | a. Internal leak in the metering unit. | a. Remove and clean the metering unit or fit a new unit. |
| 5. Pneumatically operated pump: Solenoid valve fails to operate or does not operate correctly. | a. Bad or open electrical connections. b. Solenoid valve internally fouled with water and/or rust from the vehicle air system. | a. Check the electrical circuit and connections to the solenoid valve. Check the valve with direct current bypassing the SLT. Watch out for short-circuits! b. Dismantle, clean and refit the valve or fit a new valve. Clean the vehicle air system. |
| 6. SLT does not operate. | a. Fuse blown. | a. Fit new fuse. |
| 7. Too much grease at all grease points. | a. System greasing frequency does not correspond with vehicle operating conditions. | b. Reduce the greasing frequency. Do not be too sparing, it is better to grease too much than too little. |

10.2 Malfunction report of the SLT

| <p>Malfunction</p> | <p>Alarm buzzer / alarm signal lamp</p> | <p>Alarm signal lamp continuously on after alarm signal</p> <p>ATTENTION! Optional, the SLT has to be set to always on after alarm signal via the Groeneveld PC-GINA program.</p> |
|--|---|--|
| <p>Low level measured in reservoir.</p> <p>ATTENTION! Only applicable if a low level switch has been installed in the reservoir.</p> | <p>1 short audible beep and/or alarm lamp signal 30 seconds pulsing.</p> <p>Fill the reservoir as soon as possible. After filling the reservoir the message resets automatically.</p> | <p>Alarm signal lamp continuously on.</p> <p>Fill the reservoir as soon as possible. After filling the reservoir the message resets automatically.</p> |
| <p>Pump aborted an greasing automatically. Reservoir (almost) empty and the SLT reads no pressure signal anymore during a greasing cycle.</p> <p>ATTENTION! Only applicable if a low level switch has been installed in the reservoir.</p> | <p>2 short audible beeps and/or alarm lamp signals 30 seconds pulsing.</p> <p>Fill the reservoir immediately. After filling the reservoir resets the message automatically and the pump starts again with greasing automatically.</p> | <p>Alarm signal lamp continuously on.</p> <p>Fill the reservoir immediately. After filling the reservoir resets the message automatically and the pump starts again with greasing automatically.</p> |
| <p>Non or insufficient measured grease pressure during a greasing cycle.</p> | <p>3 short audible beeps and/or alarm lamp signals 30 seconds pulsing.</p> <p>After resolving the malfunction the alarm signal resets automatically.</p> | <p>Alarm signal lamp continuously on.</p> <p>Push the red test button for 0.5 seconds to reset the alarm signal after resolving the malfunction.</p> |
| <p>Grease pressure measured before cycle.</p> | <p>4 short audible beeps and/or alarm lamp signals 30 seconds pulsing.</p> <p>After resolving the malfunction the alarm signal resets automatically.</p> | <p>Alarm signal lamp continuously on.</p> <p>Push the red test button for 0.5 seconds to reset the alarm signal after resolving the malfunction.</p> |



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