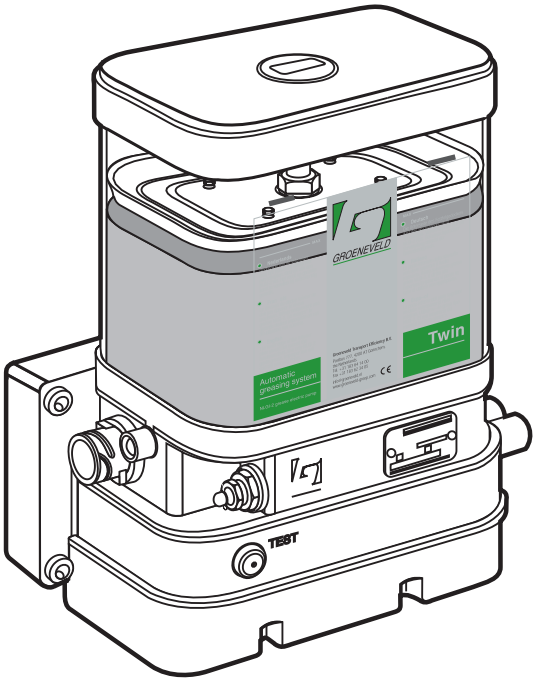
General Manual



TWIN
Automatic TWIN Greasing System

EG1701

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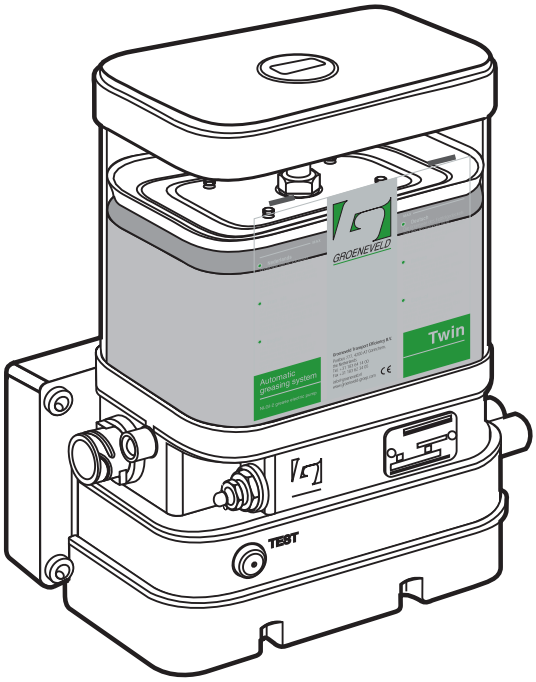
PREFACE



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This system manual is a description of the Twin Automatic Greasing System. The intention is to provide clients with an insight into how the system works, what the possibilities are and, briefly, maintenance aspects. Furthermore, you will find the technical data of the various parts of the greasing system in this manual. The system manual can also be used as a user manual.

This manual is not meant as a reference book when maintenance duties are carried out. For these duties a separate maintenance manual is available at Groeneveld.

There is no extensive description of the GINA in this system manual. For this description, refer to the maintenance manual.

The manual is built up of different sections, indicated by chapter numbers. The numbering of the images re-starts with every new chapter.

Chapter 1, the introduction gives a description of Groeneveld and of greasing systems in general.
Chapter 2 describes the whole Twin greasing system.
Chapter 3 provides an insight into the working of the various parts of the system.
Chapter 4 is the operating instructions for the greasing system.
Chapter 5 is the maintenance instructions of the greasing system.
The manual concludes with some appendices with checklists and technical specifications.
At the back of the system manual you will find a glossary with an explanation of the various technical terms.

In this manual, the following pictograms are used to bring an item to the user's attention or to notify the user.

ATTENTION:

Important supplementary information is brought to the users attention, so trying to prevent problems occurring.

WARNING:

This pictogram notifies the user when the danger of physical injury or severe damage to the apparatus by inadequate operation is threatened.

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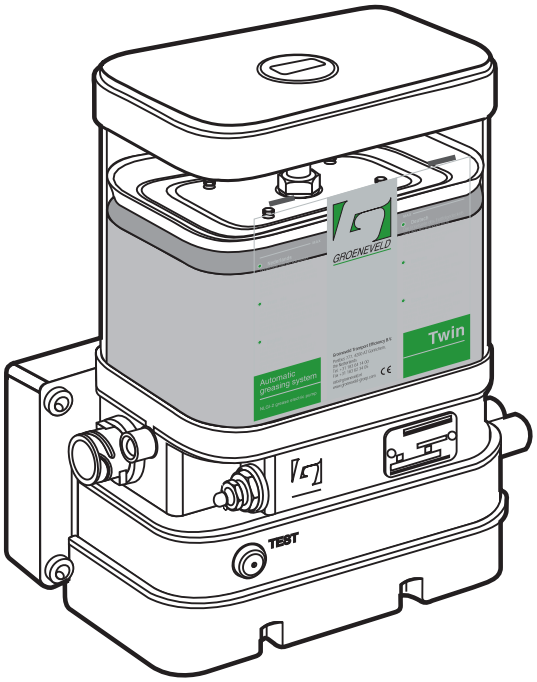
1. INTRODUCTION



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1.1 Introduction

This chapter is a short presentation of Groeneveld Transport Efficiency and its products. The chapter ends with some general remarks about the Twin greasing systems.

1.2 *GROENEVELD* Transport Efficiency B.V.

Investing in operational safety. With this thought in mind, *Groeneveld* was founded in 1971. The present, international network is administered from its headquarters in Gorinchem. *Groeneveld* strives for an expansion of its leading position, achieved by the company's solid image and customer-oriented policy.

Groeneveld employees form a team that daily works with great enthusiasm and dedication for its customers. Extensive automation makes a high working rate possible. The ISO 9001 standard is the basis for the guaranteed quality of *Groeneveld* products. Frequent contact with clients and an extensive dealer network guarantee the good name of *Groeneveld*. We know what the entrepreneur needs today, not a ready-made product, but a custom-made solution for automation.

New technologies offer new applications. Therefore *Groeneveld* has a large budget available for the development of new cost-saving products. Our Research and Development department not only collaborates with leading external organisations, but also with leading manufacturers of vehicles and machinery.

In addition to the Twin automatic greasing system, *Groeneveld* also delivers products such as:

- speed limiters
- board computer systems
- automatic oil level controllers
- reversing protection systems
- temperature recording systems

Groeneveld delivers a complete programme of cost-saving and comfort-enhancing products.

figure 1.1 Groeneveld Head office

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1.3 *GROENEVELD* Greasing Systems

Groeneveld automatic greasing systems ensure the daily maintenance of everything that has moving parts. They avoid unnecessary machinery wear and down-time and thus save cost and prevent exasperation.

Groeneveld greasing systems are used by, for example, production companies, machinery used in service industries, agriculture, ships, the offshore industry and the transport industry.

In the following list are the most important advantages:

- increase of the service intervals, thus less unnecessary down-time;
- less wear of the greased parts because of accurate and constant greasing;
- reduced repair and replacement costs;
- reduced unexpected down-time;
- fewer production losses.

1.4 Twin Automatic Greasing Systems

With a Twin *Groeneveld* automatic greasing system, all greasing points of a vehicle or machine are automatically greased at the correct time with the correct dose. Moreover, optimum grease distribution over the whole greasing surface is achieved, because the greasing takes place while the machinery or vehicle is in operation. Every action is automatically carried out by the system. The user needs only to refill the grease reservoir periodically.

The *Groeneveld* automatic greasing systems are designed with great care and thoroughly tested to guarantee a long and fault-free life span, under the most heavy operational conditions.

A well-functioning system requires:

- correct assembly;
- use of the prescribed type of grease;
- a periodic check of the functionality of the system.

The periodic check can easily be carried out at the same time as the normal maintenance of the machine or vehicle. Moreover, because of the careful choice of materials, the greasing system is nearly maintenance-free.

ATTENTION:

An automatic greasing system avoids the time-consuming manual greasing of important parts. Remember, however, that there can be greasing points that still have to be greased manually.

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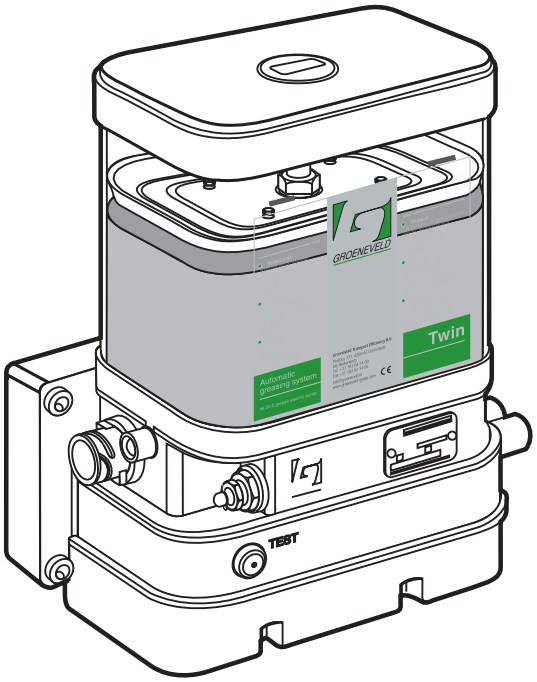
2.

DESCRIPTION OF THE SYSTEM



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2.1 Introduction

Groeneveld has developed a double-line automatic greasing system especially for the use of NLGI class-2 grease. The Twin system ensures that all the disadvantages of the systems currently available for class-2 grease are eliminated.

The Twin system has all advantages of the *Groeneveld* single-line systems. This means, for instance, that the system is expandible trouble-free with greasing points that are installed afterwards. (extra machine equipment).

The advantages of the Twin system:

- ingenuous and fast assembly;
- modular expansion possible;
- parts of the system can (temporarily) be coupled or uncoupled;
- clear malfunction reports;
- registration of possible malfunctions;
- the grease dosage can easily be adjusted per greasing point to the needs of that particular greasing point;
- the grease dosage per greasing point remains constant under all circumstances;
- covering of the grease supply in the reservoir.

2.2 Assembling

A *Groeneveld* Twin greasing system generally consists of the following components (see figure 2.1):

1. Electrically-driven plunger-pump with grease reservoir
2. Control unit (integrated in the pump housing)*
3. Distribution blocks
4. Metering units
5. Secondary grease lines
6. Grease pressure switch
1. Primary grease line A
2. Primary grease line B

* When an automatic greasing system is installed on an apparatus controlled by a PLC (Programmable Logic Controller), the PLC may also control the greasing system. In this case, the ***Twin*** pump unit will be delivered without a control unit.

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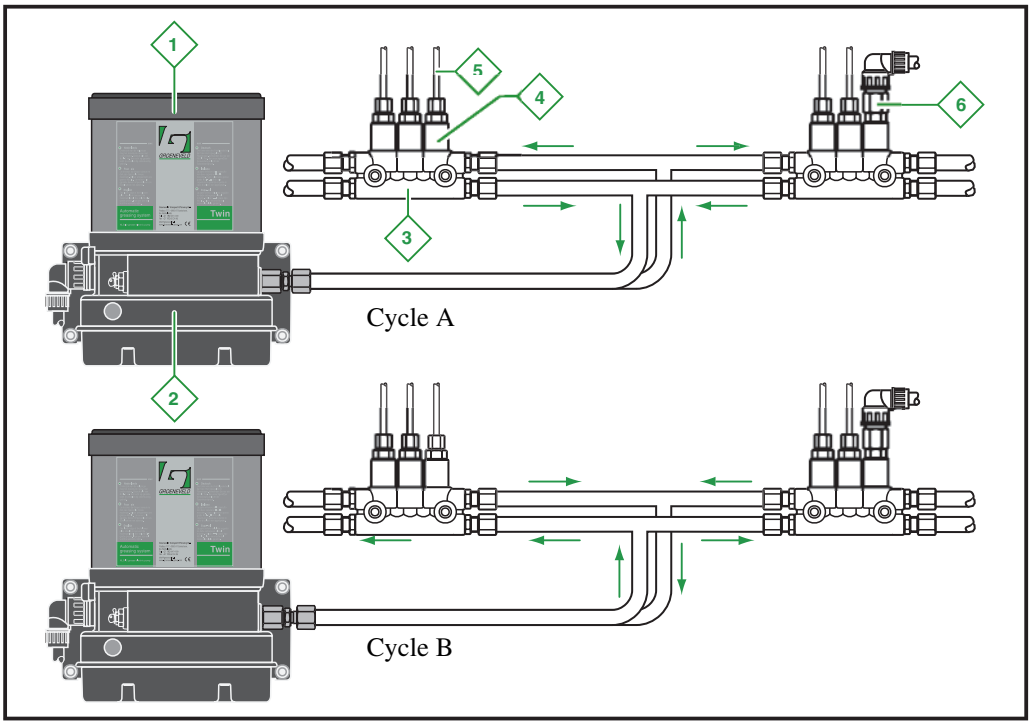

figure 2.1 Overview of the Twin automatic greasing system

2.3 Description of the parts

2.3.1 Grease pump

The relief valve

A relief valve is mounted in the grease line between the plunger-pump and the diverter-valves. When the grease pressure exceeds 250 bar during the pumping phase, the relief valve will redirect the grease to the reservoir.

The maximum grease pressure will be exceeded when:

- a malfunction of the grease pressure switch, which is mounted in the system, occurs;
- a malfunction in the cable of the grease pressure switch occurs.

The grease pressure switch is intended to end the pumping phase, as soon as the minimum required grease pressure is reached.

The minimum-level switch

A level switch maintains the grease level in the reservoir. When the grease reaches the minimum level, the level switch will notify the control unit. At the beginning of every following greasing cycle a signal lamp in the cabin will flash as a warning that the reservoir has to be refilled.

The test push-button

The grease system can be tested by starting one or more test cycles by means of the test push-button on the pump unit. This button also can be used to reset the control unit.

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2.3.2 Control unit

The electronic control unit steers and controls the course of the greasing cycles. All system- and program-parameters are stored in it. The control unit processes malfunction reports, gives possible alarm reports and automatically records a log. All relevant incidents will be stored in the log.

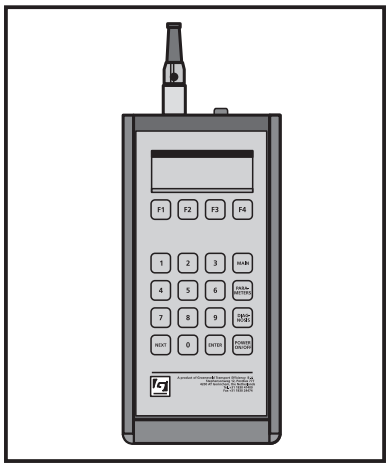


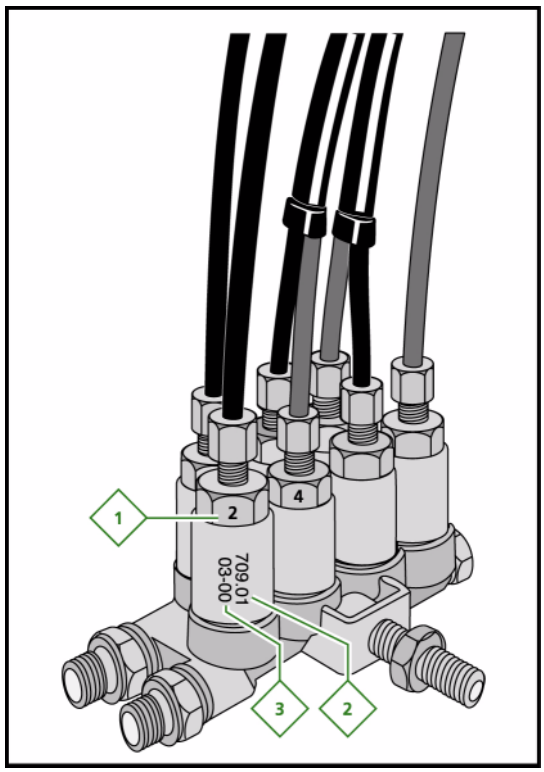
figure 2.2 The GINA

The system- and program-parameters can be viewed and altered using the GINA program unit (**G**roeneveld tester for **IN**stallation and **A**nalysis, (see figure 2.2). The log can also be viewed with the GINA. A GINA is not delivered as standard with a greasing system.

The GINA and the log together make sure that the cause of a malfunction can be discovered both quickly and efficiently, so reducing service- and repair times to a minimum.

2.3.3 Distribution blocks and metering units

Various types of metering units with the Twin greasing system are available, each with a different grease output. Each greasing point can receive the correct dose of grease per greasing cycle by a careful choice of the type of metering unit.



1. metering unit number
2. Part number
3. Production week/-year

figure 2.3 Distribution block with metering units

The metering units are mounted on a stainless steel or brass distribution block per group (see figure 2.3). These priimary grease lines are connected. The blocks are deliverable with 2, 3, 4, 5, 6, 7, 8, 9, 12, 14, 18, 20, 21 or 22 ports (exits). Greasing points are connected to these ports through metering units and secondary grease lines. Unused ports are sealed with a blind plug. A grease pressure switch can also be mounted into one of the exits.

Because of their closed construction the metering units are exceptionally well suitable for use in dirty and dusty environments.

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The metering units and distribution blocks are made of brass or stainless steel. The various metering units are distinguished from each other using numbers (see figure 2.3). The table below is an overview of the various metering unit numbers and their grease capacity.

Metering unit number	*Grease capacity (cm^3) per greasing cycle*
0	0,025
1	0,050
2	0,100
3	0,150
4	0,200
5	0,250
6	0,300
7	0,350
8	0,400
8,5	0,700
9	1,000
10	2,000

2.3.4 Grease pressure switch

The grease pressure switch notifies the control unit that sufficient pressure has been built up during the greasing cycle (in the pumping phase). When the required pressure is not reached in the maximum adjusted pumping time, an alarm follows.

Preferably the grease pressure switch is mounted on the distribution block, located the farthest from the pump. This is done to be sure that the required grease pressure is also reached at the distribution block. When for practical considerations the switch is placed somewhere in the middle or at the beginning of the greasing system, a switch with a higher switch-pressure is applied. pressure switches are delivered with switch pressures of 100, 125, 150 or 175 bar.

2.3.5 The signal lamp

The signal lamp uses flash codes to indicate the status of the greasing system and malfunctions. The signal lamp (possibly combined with the operating mode push-button) is preferably mounted in the field of vision of the driver.

2.3.6 The operating mode push-button

Using the operating mode push-button, the intensity with which greasing takes place can be increased or decreased, depending on the circumstances under which the vehicle or machine is used.

2.3.7 The Twin display

In addition to an operating mode push-button with integrated signal lamp, a Twin display with extra functions is available. The Twin display continuously indicates the adjusted operating mode with green LEDs. A yellow LED lights when the minimum grease level is reached and a red LED lights when a malfunction occurs. The display is also equipped with a push-button with which another operating mode can be chosen at any moment.

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2.4 The greasing cycle

Every greasing cycle consists of four phases. The greasing cycles are carried out alternately by the grease lines A and B (see figure 2.1 and figure 2.4). The 5/2 valve, which is integrated in the pump housing, determines which primary grease line is connected to the pump and which is connected to the grease reservoir. The total greasing cycle has a predetermined time; however, the length of the four phases depend on the circumstances. The different greasing cycles and phases are discussed below.

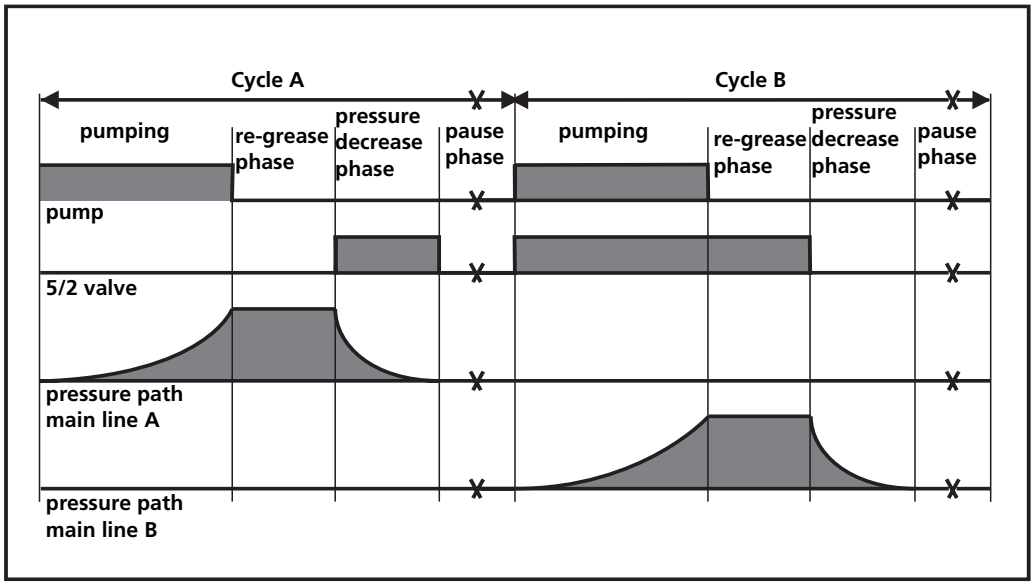

figure 2.4 Overview of the various phases of the greasing cycles

2.4.1 Greasing cycle A

The pumping phase

The greasing cycle begins with a pumping phase. In this phase the grease is pumped from the reservoir, through primary grease line A, to the distribution blocks. The pumping phase ends when the pressure at the pressure switch reaches a predetermined level. The time needed to reach that predetermined pressure depends on various factors as temperature, grease consistency (thickness) and the dimensions of the greasing system. The duration of the pumping phase is therefore not directly adjustable.

During the pumping phase, the metering units press a certain amount of grease (the dosage) through the secondary grease lines to the greasing points.

The re-grease phase

The re-grease phase follows the pumping phase; a period in which the pressure in the primary grease lines is maintained at a certain pressure. During the re-grease phase, the metering units can deliver the grease dosage, which (for various reasons) was not yet delivered during the pumping phase. The duration of the re-grease phase depends on the duration of the pumping phase. This dependency is expressed in the parameter bmf, bleeding multiplication factor.

Example: When the bmf is 1, the re-grease phase is $1/10^{th}$ of the length of the pumping phase. When the bmf is 10, the re-grease phase is $10/10^{th}$ of the length of the pumping phase.

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The pressure decrease phase

The pressure decrease phase follows the re-grease phase. In this phase, the pressure in the primary grease line is decreased through the 5/2 valve. To accomplish this, the control unit energizes the 5/2 valve, so the grease pressure in primary grease line A is decreased and the grease flows back to the reservoir.

The duration of the pressure decrease phase is equal to that of the re-grease phase and therefore proportional to the duration of the pumping phase. When the greasing system needs more time to build up the required grease pressure (because of low temperature or grease with a high viscosity), the system will also need more time to decrease that same pressure.

The pause phase

The pause phase is the period between the pressure decrease phase and the beginning of the next pumping phase. The length of the pause phase is equal to the predetermined cycle-time minus the length of the other phases. When the cycle-time is adjusted too short to carry out a complete greasing cycle, the program will ignore the cycle-time. The pumping-, re-grease- and pressure decrease phase will be carried out completely. However the pause phase will be omitted, because the predetermined cycle-time is exceeded. The greasing system begins directly with the first phase of the next greasing cycle.

2.4.2 Greasing cycle B

Greasing cycle B begins when the control unit restarts the pump. During pumping phase B and re-grease phase B, the control unit still has the 5/2 valve energized, causing the pump to be connected to primary grease line B. Primary grease line A is shut off from the pump during these phases and connected to the reservoir. During the phase B pressure decrease, the control unit de-energizes the 5/2 valve, so the grease pressure in the grease line decreases and the grease flows back to the reservoir.

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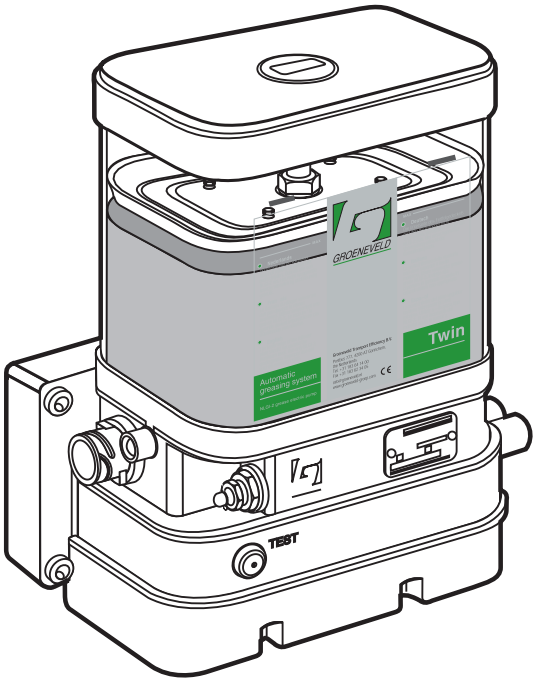
3.

PRINCIPLE OF OPERATION



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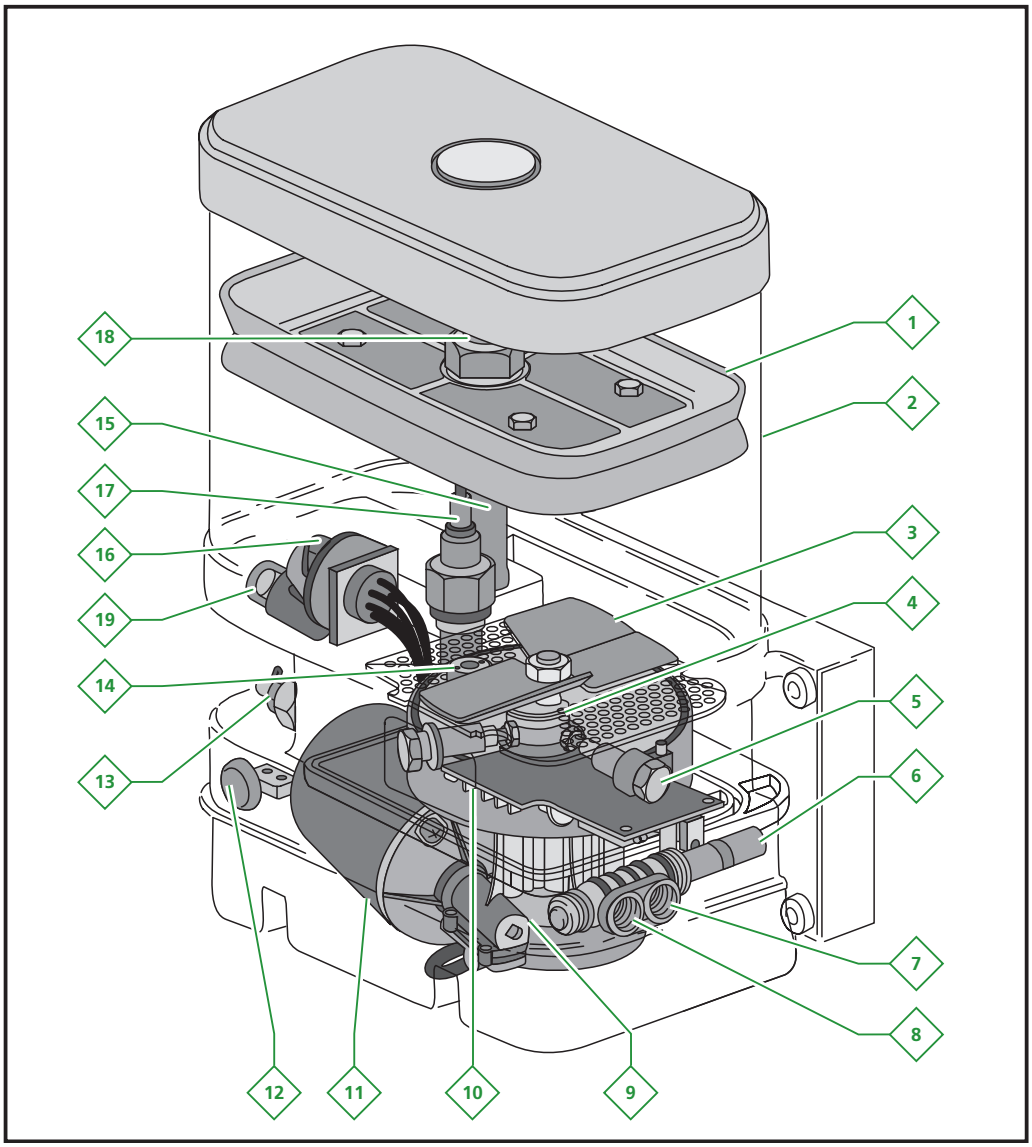
3.1 Introduction

In this chapter the principles of operation of the various parts of the Twin automatic greasing system are discussed. The pump unit, metering units, grease pressure valve, control unit, signal lamp and display are discussed.

3.2 Pump unit

The Twin pump unit consists of various parts. These parts are shown in figure 3.1.



1. grease follower piston
2. grease reservoir
3. stirring gear
4. cam
5. cylinder and plungers (3x)
6. 5/2 magnetic valve
7. primary grease line 'A' coupling
8. primary grease line 'B' coupling
9. mechanical transmission
10. control unit
11. electro-motor
12. test push-button
13. filler coupling with grease filter
14. relief valve
15. follower piston guide
16. electric connector
17. minimum level switch
18. bleeding- and grease overflow channel
19. bleeding- and grease overflow channel at right side of pump, connected to the grease overflow channel in the follower piston guide (nos. 15 and 18)

figure 3.1 pump unit assembly

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The heart of the pump is an electrical-driven plunger-pump. This pump consists of three radially-placed fixed cylinders and plungers (5, see figure 3.1). The electro-motor drives the axle through the mechanical drive. A cam (4) is fixed on the axle that moves the three plungers to and fro, so the grease is pumped to the distribution blocks through the primary grease line. In addition to the cam, the axle drives the stirring gear (3) located at the bottom of the reservoir and pushes the grease downwards. A compression channel is located between the pump and the grease channels to the primary grease lines. A relief valve (14) and a 5/2 valve (6) are located in the compression channel.

The relief valve is a protection that leads the grease back to the reservoir when the grease pressure exceeds 250 bar. The 5/2 valve determines the primary grease line (A or B) through which greasing takes place. It has an important task in fulfilling the four phases of the greasing cycle (see further in this paragraph).

The grease reservoir and the grease follower piston

The reservoir (2, see figure 3.1) is made of a transparent, impact-proof plastic that resists the affect of variable temperatures and other environmental influences. The volume of the reservoir depends on the height of the reservoir. The maximum grease level is indicated on the reservoir. A warning signal in the cabin indicates when the minimum level has been reached.

A grease follower piston (1) is located in the reservoir, above the grease. This piston follows the level of the grease. When the grease level falls, the piston also falls under the influence of a draw spring. The grease follower piston locks out air and condensation, so preventing:

- oxidation of the grease;
- mingling of the grease with the water of condensation;
- saponifying of the grease.

The grease level in the reservoir can always be determined at a glance, because the grease follower piston scrapes the walls of the reservoir. Also the grease follower piston prevents funnel-forming in the grease, so the grease supply can and will be used in its entirety.

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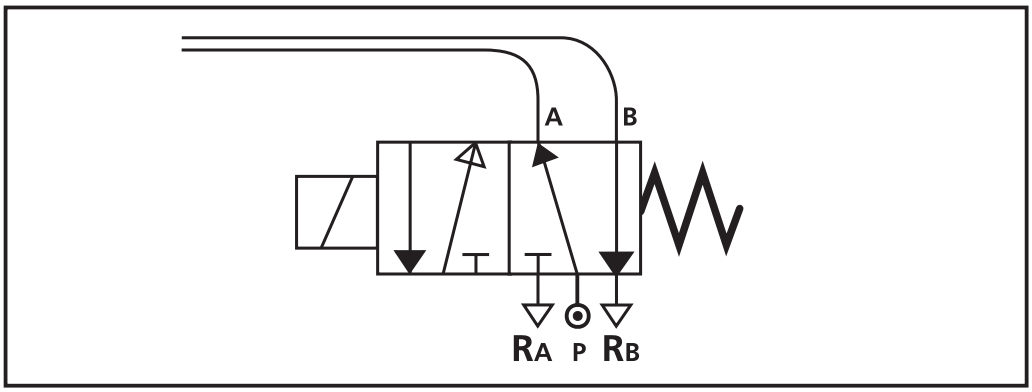
The 5/2 magnetic valve



A	Primary grease line A (port A)
B	Primary grease line B (port B)
P	From pump
RA	Return line A to grease reservoir
RB	Return line B to grease reservoir

figure 3.2 5/2 magnetic valve

When the 5/2 magnetic valve is at stationary (not energized by the control unit, see figure 3.2), greasing will take place through primary grease line A and the pressure in primary grease line B will decrease and the grease will be lead back to the reservoir through return line RB.

When the 5/2 magnetic valve is energized by the control unit, the grease supply channel P will be connected to primary grease line B and primary grease line A will be connected to return line RA in the pump. greasing takes place through primary grease line B, the pressure in primary grease line A will decrease and the grease will be lead back to the reservoir through return line RA.

For an extensive description of the greasing cycle and the influence of the position of the 5/2 magnetic valve on the greasing cycle, see paragraph 2.4.

3.3 Metering units

ATTENTION:

Do not open the metering units. Prevent intrusion of dirt and thus a possible cause of malfunction.

Two grease chambers are located in a metering unit (one for each primary grease line, A and B). These chambers are filled with an exact amount of grease. when the actual greasing takes place through one of both chambers, the grease is pressed from the chambers to the relevant greasing point. The principle of operation of the metering unit is explained in the four phases below.

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Phase 1
In this phase, the metering unit has not yet filled with grease (see figure 3.3).

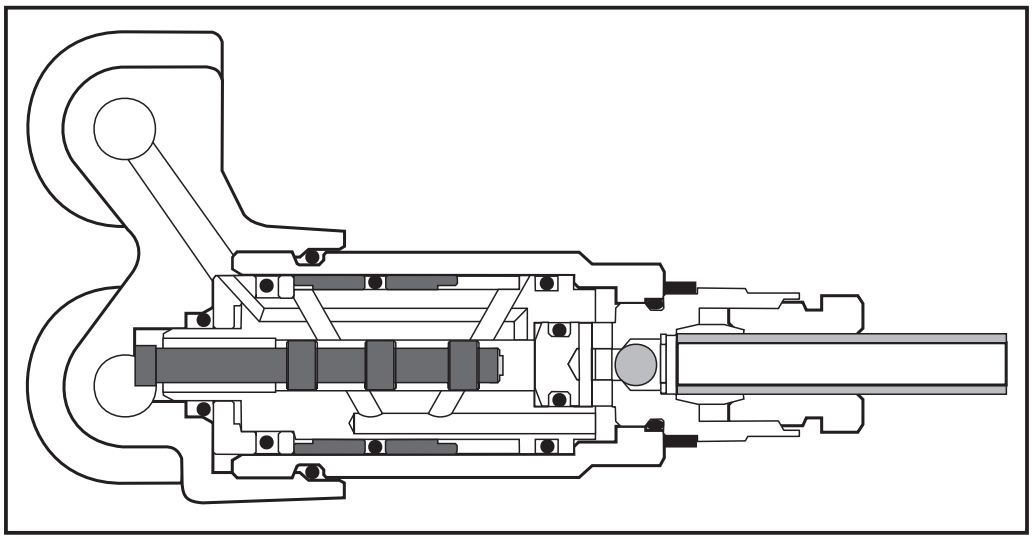

figure 3.3 Principle of operation of the metering unit - first phase

While in operation (system completely filled with grease) phases 3 and 4 will take place alternately.

Phase 2
Grease is pumped into the metering unit (pumping phase A) through primary channel A (see figure 3.4). Because of the grease pressure, plunger (3) is pushed to the right, passed channel (1). The grease fills chamber (2) through channel (1) and presses plunger (4) to the right.

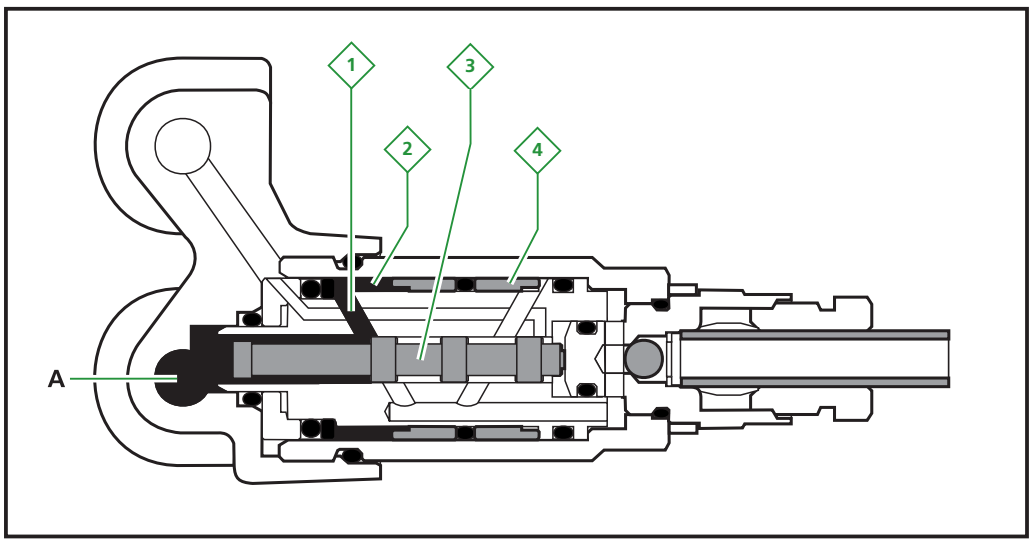

figure 3.4 Principle of operation of the metering unit - second phase

After a while, the pressure drops in primary channel A (during the pressure decrease phase of the greasing cycle). This has no influence on the metering unit.

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Phase 3

Grease is pumped into channel (6) of the metering unit (pumping phase B) through primary channel B (see figure 3.5). Because of the grease pressure, plunger (3) is pushed back leftwards, passed channel (8). The grease fills chamber (7) and pushes plunger (4) back to the left. The complete grease volume of chamber (2), to the left of plunger (4), is pressed through channel (1), plunger (3) and channel (9) and the secondary grease line (5) to the greasing point. Sphere (10) in the non-return valve is pushed back to clear the path to the secondary grease line.

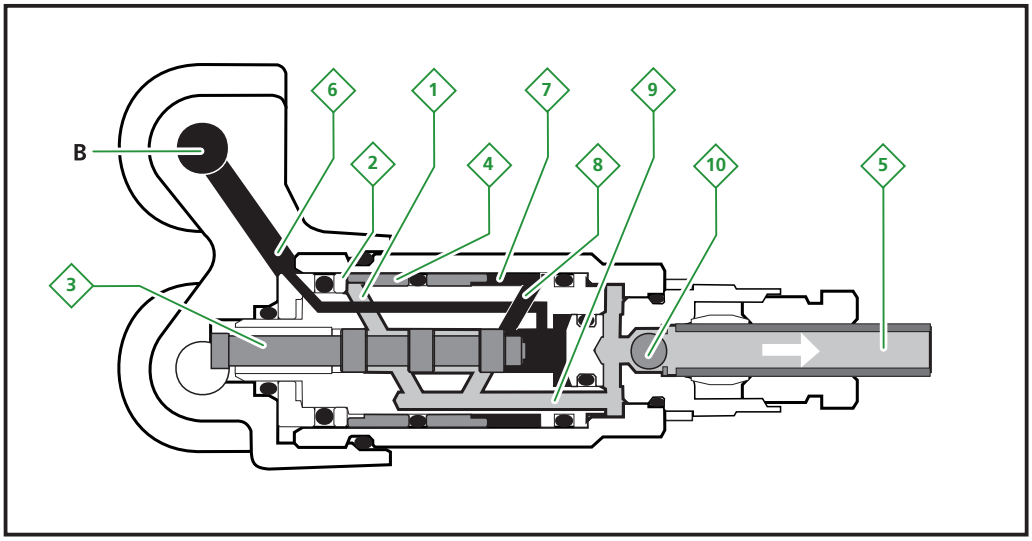

figure 3.5 Principle of operation of the metering unit - third phase

After a while, the pressure drops in primary channel B (during the pressure decrease phase of the greasing cycle). This has no influence on the metering unit.

Phase 4

In this phase the same happens as in phase 2. However chamber (7) (see figure 3.5) is now filled with grease. Plunger (4) is pushed to the right (see figure 3.6) while chamber (2) is filled. The complete grease volume of chamber (7) is pressed through channel (8), plunger (3) and channel (9) and the secondary grease line (5) to the greasing point. Sphere (10) in the non-return valve is pushed back to clear the path to the secondary grease line.

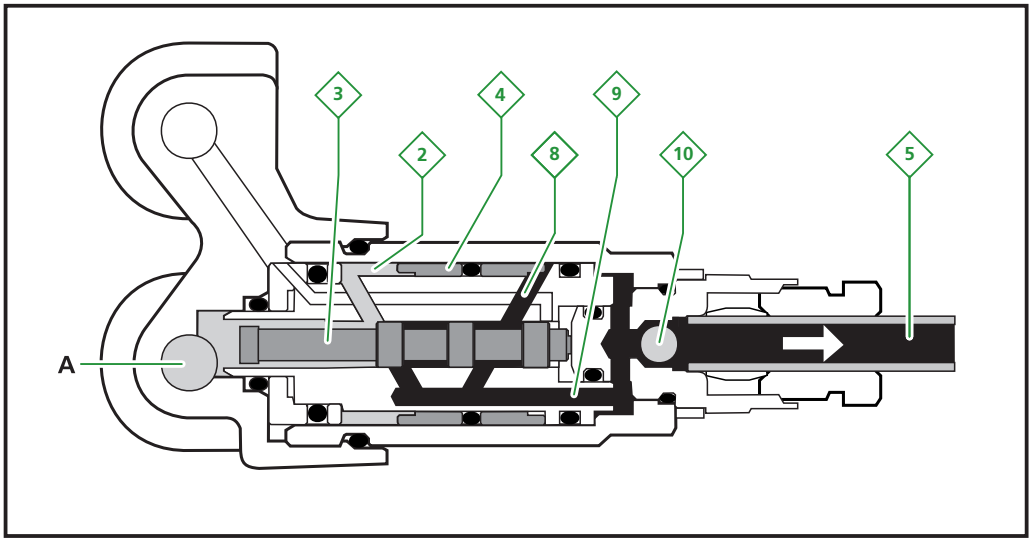

figure 3.6 Principle of the metering unit operation - fourth phase

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3.4 Grease pressure switch

The principle of operation of the grease pressure switch is explained in three phases.

Phase 1

During this phase both channels A and B are not under pressure (see figure 3.7). There is also no pressure in chamber (1). Spring (10) pushes switch plunger (2) to the left. The electrical contact (3 and 4) is open.

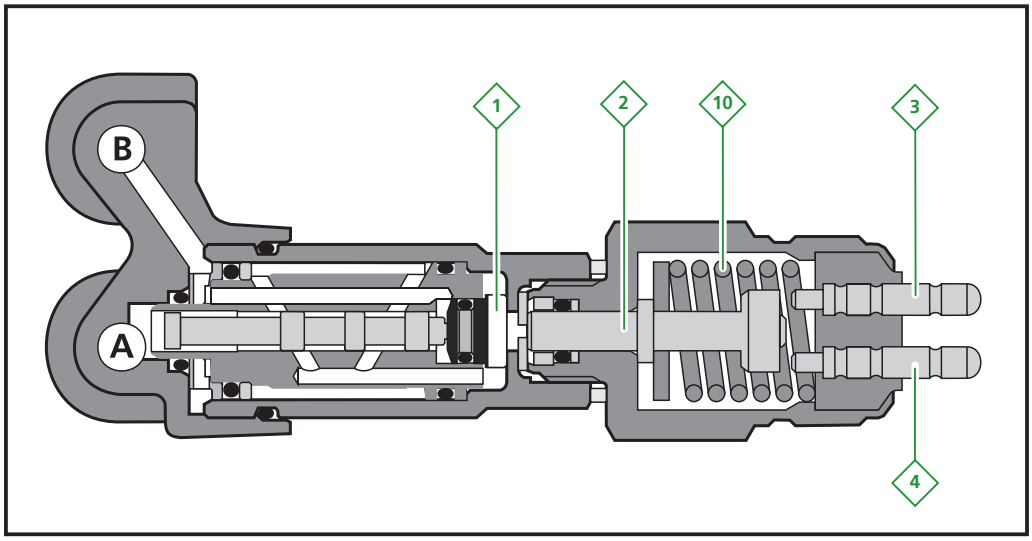

figure 3.7 Principle of operation of grease pressure switch - first phase

Phase 2 (pumping phase A)

During pumping phase A grease is pressed into channel A (see figure 3.8). While the grease pressure is built up, piston (6) is pushed to the right. Chamber (1) is connected to channel A (through the channels 7, 8 and 9). As soon as the pressure in chamber (1) is more than the pressure force of the spring (10), plunger (2) goes to the right. The electrical contact (3 and 4) is closed by the contact plate (5).

During the pressure decrease phase, as soon as the grease pressure in channel A is lower than the pressure force of the spring, the connection of the contacts is broken.

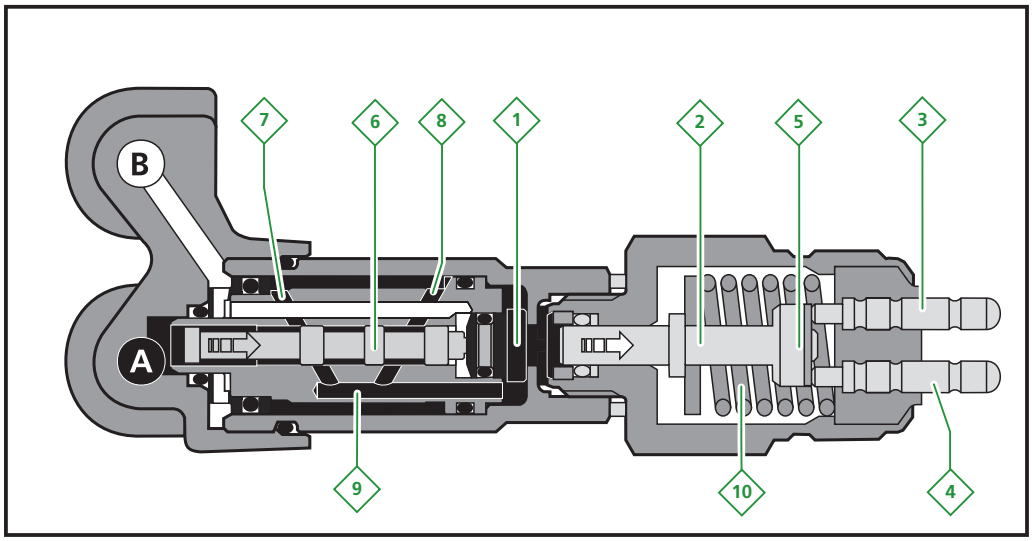

figure 3.8 Principle of operation of grease pressure switch - second phase

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Phase 3 (pumping phase B)
During pumping phase B grease is pressed into channel B (see figure 3.9). While the grease pressure is built up, chamber (11) fills with grease (through channel 12). The grease pressure pushes piston (6) to the left. Because of that the channel (8) is opened, causing the grease to flow to chamber (1) through channel (7) and channel (9).

As soon as the pressure in chamber (1) is greater than the pressure force of the spring (10), the plunger (2) goes to the right. The electrical contact (3 and 4) is closed by the contact plate (5).

As soon as the grease pressure, during the pressure decrease phase, in channel B is lower than the pressure force of the spring, spring (10) pushes plunger (2) back to the left and the connection of the contacts is broken.

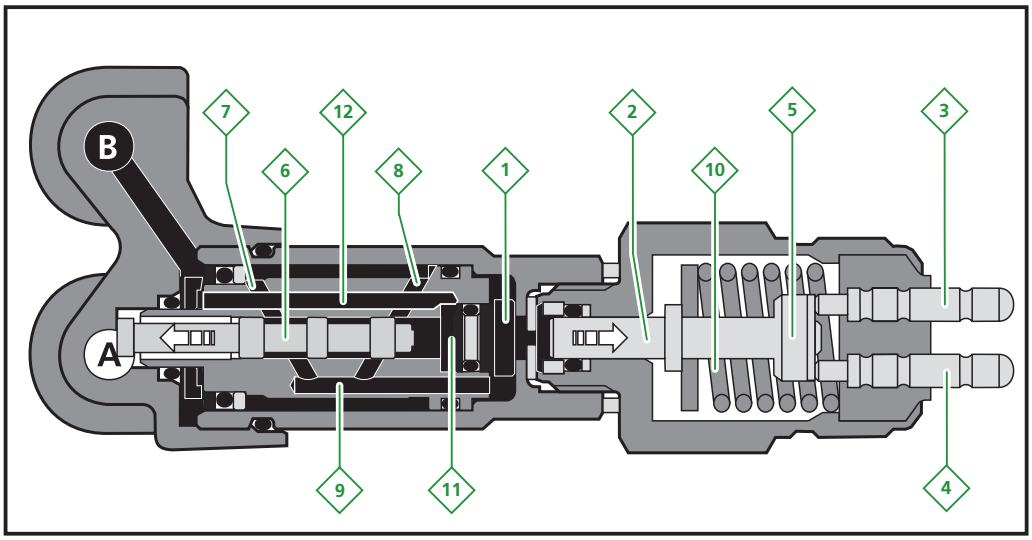

figure 3.9 Principle of operation of grease pressure switch - third phase

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3.5 Control unit

3.5.1 Introduction

The greasing system is controlled by an electronic control unit. The sensors that check specific parts or the complete greasing system for malfunctions are connected to the control unit.

The control unit controls the greasing system by:

- the parameters that are saved in the control unit. To recall or change the system parameters a GINA is necessary;
- the signals that the control unit receives from the various sensors and controls applied in the greasing system; e.g., grease pressure switch, grease level switch, test push-button, push-button with signal lamp in the cabin.

The control unit records an automatic log, in which the relevant events are stored. All data in the control unit will always be retained, even when the power is shut off or when the system is turned off. To view the log a GINA is needed.

In this paragraph the following system parameters are discussed:

- the length of the greasing cycles;
- maximum length of the pumping phase;
- length of the re-grease phase and the pressure phase;
- reaction of the system to grease pressure malfunctions;
- repeating frequency of the flashing code;
- the log.

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3.5.2 The length of the greasing cycles

The meaning of the various phases of the greasing cycle is described in paragraph 2.4. (further see figure 3.10.)

The duration of a greasing cycle (adjustment range: 0 ... 1440 minutes) is defined as the period that expires between two successive pumping phases: beginning from the start of one pumping phase and ending at the start of the next pumping phase. A greasing cycle is divided into a pumping phase, a re-grease phase, a pressure decrease phase and a pause phase. The greasing cycles are alternately taken care of by primary grease lines A and B.

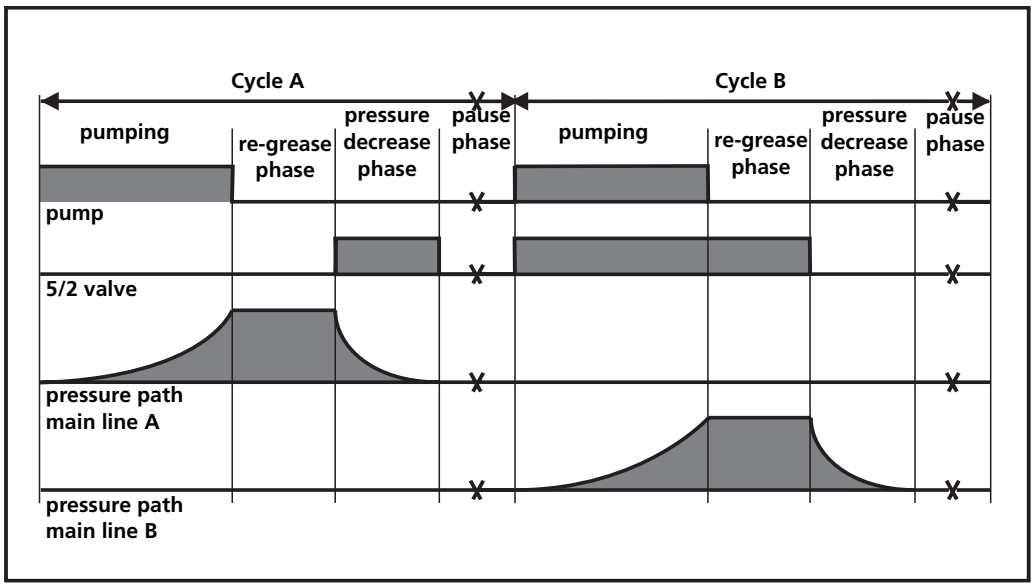

figure 3.10 Overview of the various phases of the greasing cycles

3.5.3 Maximum length of the pumping phase

Normally, the pumping phase will end when the grease pressure switch notifies the control unit that the required pressure in the greasing system has been reached. Prevent the pump from pumping indefinitely when this notification does not occur. A maximum pumping time is therefore stored in the control unit (adjustment range: 1 ... 60 minutes).

At a normal (average) pumping phase, shorter than 5 minutes, the maximum pumping phase is adjusted as follows: multiply the normal pumping time by 2. When the normal pumping phase is longer than 5 minutes, the maximum pumping time is adjusted to: normal duration + 5 minutes.

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3.5.4 Length of the re-grease and pressure decrease phases

The duration of the re-grease phase is equal to the length of the pressure decrease phase. The pressure decrease phase is proportional to the length of the pumping phase. In the control unit a multiplication factor is stored. The duration of the pressure decrease phase is calculated by the control unit by multiplying the duration of the pumping phase with that factor. (adjustment range: 1... 100 - which corresponds to multiplication factors 0,1... 10).

The standard adjustable value is 1 (multiplication factor 0,1), when the duration of the re-grease phase and the pressure decrease phase is one tenth of the duration of the pumping phase. When circumstances require an extended pressure decrease phase, a higher factor is adjusted.

3.5.5 Reaction of the system to grease pressure malfunctions.

When the required grease pressure during several pumping phases is not reached, it indicates e.g., a leak in a primary line. To prevent the contents of the reservoir being pumped into the environment, the greasing system should be shut down. Greasing is stopped, until the cause of the malfunction is repaired and the control unit is reset with the test push-button.

Normally the pump is shut off by the control unit when in 10 successive greasing cycles the required grease pressure has not been reached during the pumping phase. Meaning: the control unit shuts off the pump when the grease pressure has not been reached 10 successively times while greasing alternately through lines A and B, thus 5 times A and 5 times B. But the control unit also shuts off the pump when the grease pressure is not reached 10 times successively when greasing through line B, however through line A the pressure is still reached. And also the other way around.

With parameter 'noa' (number of attempts), a different value for the maximum number of attempts can be adjusted. The adjustment depends on the malfunction sensitivity of the connected greasing points. The adjustment range is 1 to 25 greasing cycles.

3.5.6 Repeating frequency of the flashing code

The signal lamp of the greasing system, which is mounted preferably in the field of vision of the engineer, shows a flashing code when turning on the contact of the vehicle. That flashing code shows in which operating mode the greasing system is (see paragraph 3.6).

The parameter 'bcdc' (blink code duty cycle), which is stored in the control unit (adjustment range: 1 ... 10), determines how many times the flashing code is shown. Normally, the code will be shown 4 times. A different value can be adjusted, depending on the wishes of the user/owner of the vehicle or machine.

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3.5.7 The log

The control unit distinguishes 11 different malfunction reports that are recorded in three groups. Every group has eleven different counters per malfunction report.

The three malfunction groups are:

1. Counters for the total number of times a certain has occurred since the installation of the greasing system.
2. Counters for the amount of times that a certain malfunction has occurred since the last greasing cycle this particular malfunction did not occur. The counter resets after the first complete greasing cycle in which this particular malfunction does not re-occur.
3. Counters that hold the highest value of the counters in group 2. These counters consist of values of the largest series of successive greasing cycles, in which a particular malfunction has occurred (since the installation of the greasing system). When the corresponding counter of group 2 reaches a higher value than the current value of the counter in group 3, the value of the counter in group 3 is overwritten by the value of the counter in group 2.

In addition to malfunction reports, the log records the historical system data. These data contain among other things the total time the pump has 'run' (the sum of all pump phases), the total time the time switch was switched on and the number of greasing cycles that have been finished since the installation of the greasing system.

Finally, the log registers the previous time a GINA communicated with the control unit. and which GINA was used for this communication (every GINA has its own identification code). If parameters are altered during a session it will be registered.

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3.6 Signal lamp

The signal lamp (see figure 3.11) is mounted in the field of vision of the driver and out of direct sunlight, because of the visibility of the signals. Possibly this button can be combined with the operating push-button. The lamp shows the status of the greasing system and malfunction reports by means of flashing codes. In the table below, an overview of normal signals is given. Malfunction signals are in the fault finding table (see paragraph 5.5.3).

figure 3.11 The signal lamp, combined with the operating push-button

Signal	***Explanation***
The signal lamp flashes after the contact switch is switched on (flashing frequency: 1 s): - once - twice - three times The flashing code is repeated every four seconds.	- Operating mode adjusted to 'heavy duty'. - Operating mode adjusted to 'normal duty'. - Operating mode adjusted to 'light duty'.
The signal lamp keeps flashing slowly during the whole greasing cycle (2 s on, 2 s off).	One single test cycle is carried out.
The signal lamp keeps flashing quickly during the whole greasing cycle (0.2 s on, 0.2 s off).	A continuous test cycle is carried out.

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3.7 Twin display

A Twin display is also deliverable instead of the operating mode push-button with integrated signal lamp. On this display green LEDs continuously indicate the adjusted operating mode. In addition, this display is equipped with a yellow warning LED (minimum grease level reached), a red LED (system malfunction) and a push-button to adjust the desired operating mode. The Twin display can be mounted with the mounting bracket either horizontal or vertical on the dashboard or on a door- or window-post. Place it in the field of vision of the driver and as much as possible out of direct sunlight.

In the table below an overview is given of the normal signals. Malfunction signals are in the fault finding table (see paragraph 5.5.3).

figure 3.12 Twin display

Signal	*Explanation*
Top green LED on (one block)	System adjusted in 'light duty' mode.
Middle green LED on (two blocks)	System adjusted in 'normal duty' mode.
Bottom green LED on (three blocks)	System adjusted in 'heavy duty' mode.
Green LED at the adjusted operating mode flashes (2 s on, 2 s off)	One single test cycle is carried out.
Green LED at the adjusted operating mode flashes (0.2 s on / 0.2 s off)	A continuous test cycle is carried out.

Remarks:

1. The display communicates with control unit every 20 s. A started test cycle can only be shown on the display after 20 s.

2. The display is equipped with a light-sensitive cell. Therefore the light intensity of the LEDs is automatically dimmed when the surroundings become darker. Annoying reflections in screens of the cabin are reduced to a minimum.

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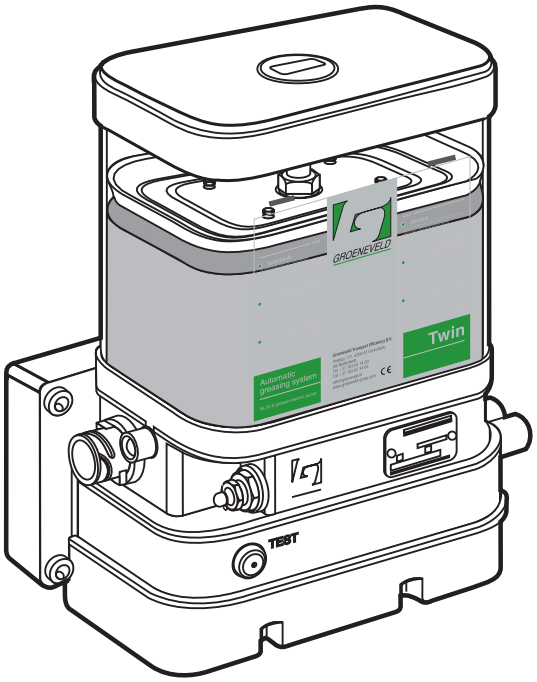
4.

OPERATING INSTRUCTIONS



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4.1 Introduction

This chapter contains a description of how some components of the Twin greasing system are operated. The operating mode push-button, the test push-button and the GINA are also described.

4.2 The operating mode push-button

The operating mode push-button is mounted in the cabin of vehicles that have to operate under very various circumstances (e.g., earth-moving machinery). The button is combined with the signal lamp. The driver can adjust the greasing intensity (greasing frequency), depending on the circumstances in which the vehicle or machine is used. The operating mode of the greasing system can be adjusted for light, normal or heavy duty. The push-button influences the length of the greasing cycle of the greasing system.

Proceed as follows to adjust a particular operating mode:

1. Turn on the contact switch.
2. The signal lamp indicates which operating mode is chosen by means of a flashing signal.
3. Push, within 30 s, once, twice or three times on the operating mode push-button:

Once for the heavy duty operating mode	high greasing frequency / short cycle-time
Twice for the normal duty operating mode	normal greasing frequency / normal cycle-time
3 times for the light duty operating mode	low greasing frequency / long cycle-time

   For pumps, produced from week 37, 2001 (the serial number beginning with 137), the operating mode can be adjusted on every desired moment.
4. Two seconds after the desired operating mode is adjusted, the signal lamp will indicate the adjusted operating mode with a flashing code (the lamp flashes one, two or three times).

ATTENTION:

When the GINA is connected to the control unit, the operating mode push-button on the dashboard cannot be used.

4.3 Twin display

If, instead of a separate operating mode push-button, a Twin display is used, the adjusted operating mode is indicated continuously by a green LED. By pushing the push-button on the display, the operating mode can be switched at every desired moment. Repeat this until the desired operating mode has been reached.

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4.4 The test push-button

4.4.1 Introduction

To test the greasing system two different test cycles can be carried out with the test push-button on the grease pump unit (see figure 4.1):

1. the single-test cycle (through the A- or B-grease line);
2. the continuous-test cycle (some successive greasing cycles through the A- and B-grease line).

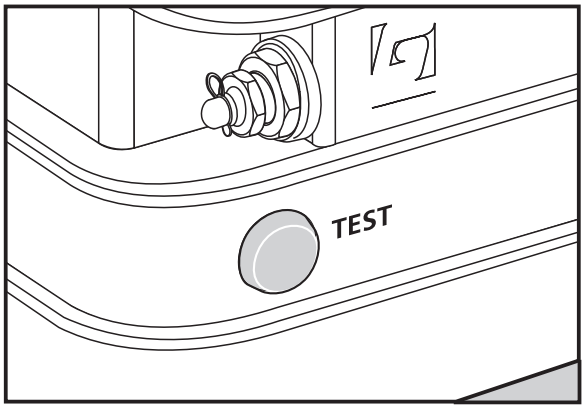

figure 4.1 The test push-button on the grease pump

A test cycle can only be carried out if the greasing system is carrying out the re-grease phase, the pressure decrease pressure decrease phase or the pause phase. When the system is carrying out a pumping phase, the system will not respond when the test push-button is pushed.

When malfunctions occur during a test cycle, the signal lamp will indicate them in the usual manner (see paragraph 5.5).

The test cycles are not accounted for in the statistics that the control unit records. This data is not accounted for because this data distorts the real performance of the greasing system.

ATTENTION:

Only use the test cycles if necessary. Every time a test cycle is carried out, grease is added to the greasing points. This is at the expense of the grease volume and can lead to excessive greasing of the greasing points.

4.4.2 The single-test cycle

Proceed as follows to carry out a single-test cycle:

1. Turn on the contact switch.
2. Push the test push-button on the pump unit for at least 2 s, but no longer than 6 s.

The single-test cycle will now be started. The signal lamp will flash during the whole greasing cycle. When a malfunction occurs, the flashing of the lamp switches to a malfunction report (see paragraph 5.5).

The single-test cycle ends after the pressure decrease phase or when the contact switch is turned off. When the contact switch is turned on again the program will always begin with the pause phase of the cycle that has just been interrupted.

ATTENTION:

Remember that a single-test cycle only tests one of the primary grease lines (pump exits). To test the other primary grease line, a second single-test cycle has to be carried out with the energized 5/2 valve.

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4.4.3 The continuous-test cycle

With a continuous-test cycle extra grease can quickly be added to the greasing points or the grease system can be bled.

ATTENTION:

In extreme weather conditions it is possible that the greasing system fails to carry out the continuous-test cycle correctly. In this case use the single-test cycle.

Proceed as follows to carry out a continuous-test cycle:

1. Turn on the contact switch.
2. Push the test push-button on the pump unit for at least 6 s.

The system will start a pumping phase. After pumping phase A has ended, pumping phase B is started immediately, then again A, then B, etc. The other three phases are skipped entirely every time. The pressure in one primary grease line increases while the pressure in the other grease line is decreases.

The signal lamp flashes during the whole test. When a malfunction occurs, the flashing of the signal lamp will switch to a malfunction report (see paragraph 5.5).

3. Turn off the contact switch to end the continuous-test cycle.

When the contact switch is turned on again the program will always begin with the pause phase of the pumping phase that has just been interrupted.

4.5 The GINA

4.5.1 Introduction

The GINA (**G**roeneveld tester for **IN**stallation and **A**nalysis) is an apparatus with which the digital control unit of the Twin greasing system can be read and adjusted. The GINA is not supplied with the system as standard. A description of how to connect and switch on the GINA follows. A complete overview of all the screens of the GINA is in the Twin maintenance manual.

Remark:

A program for use on a PC (Windows compatible) is available to read and adjust the control unit.

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4.5.2 Operating panel

The GINA consists of a display with 4 lines and an operating panel.
(see figure 4.2).

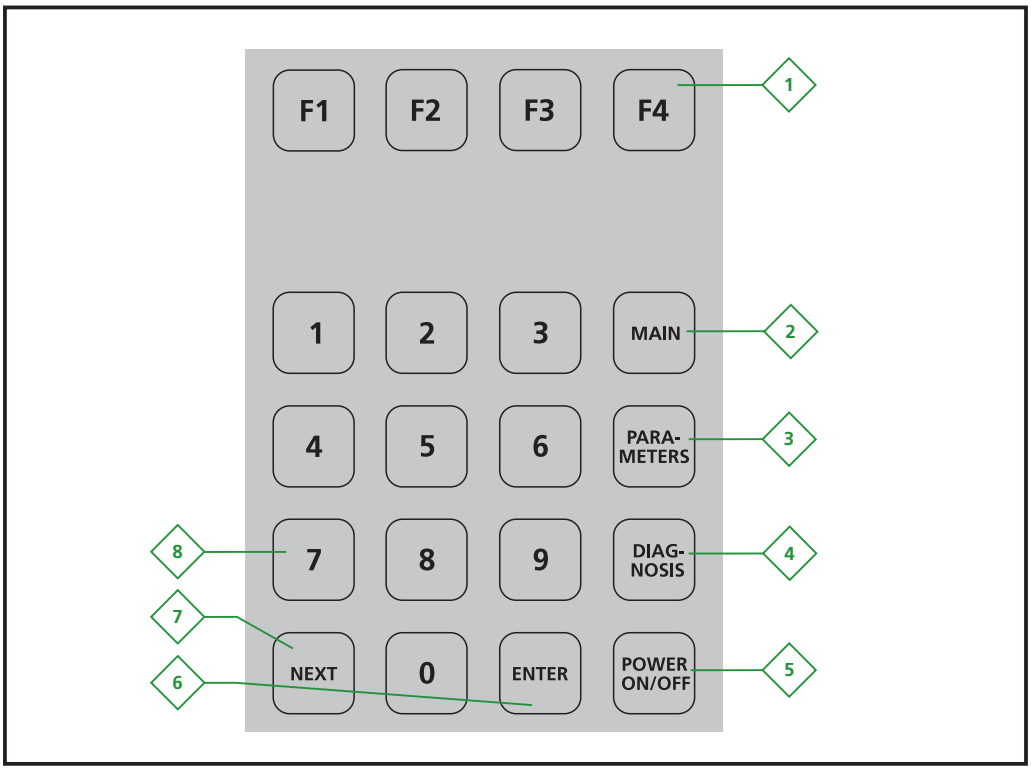

figure 4.2 Operating panel of the GINA

The operating panel contains the following keys:

number in figure	*key*	*function*
1	F1 ... F4	menu option keys
2	main	get the 'main menu' (to view various data)
3	parameters	get the 'parameter timer menu' (to view and import parameters)
4	diagnosis	get the 'diagnosis menu' (to view various system data)
5	power on/off	to turn the GINA on or off
6	enter	confirm the adjusted or changed value in the display
7	next	go to the next item in the current menu
8	0 ... 9	put in numeric data

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4.5.3 Connecting and switching on the GINA

1. Connect the GINA to the Twin pump unit with use of the connecting cables.
2. Switch on the power supply of the control unit (contact switch of the vehicle).
3. Switch on the GINA after 8 s.
4. Push **POWER ON/OFF** and wait 5 s.
   The display is shown here.

INITIALISE...
Please wait

The next screen is the opening screen.

GINA
Press a softkey (F)

The readouts and adjustments are divided into three main groups:

main menu

Parameters timer

diagnosis menu

These groups can be accessed by pressing the keys **MAIN, PARAMETERS** and **DIAGNOSIS.** They can be accessed at any time, regardless of the current screen.

It is possible during switching on that this displayed message is shown on the screen. It appears when a malfunction occurs in the communication between the GINA and the control unit.

COMMUNICATION ERROR

This malfunction can be caused by:

- a bad connection (breaking in a cable, connector)
- pushing a button too quickly after switching on the GINA
- supply voltage being too low

Always try to solve the communication error by turning the GINA off and on or by pressing the function keys (**F1** ...**F4**).

The following message appears on the screen, when the control unit is not recognised by the GINA. A different GINA is needed.

DEVICE NOT SUPPORTED

Displays that can be altered are recognizable by a blinking cursor. There are also displays that only show information. In those displays nothing can be altered or adjusted. In displays for system configuration and to reset malfunction reports, nothing can be altered in the displays.

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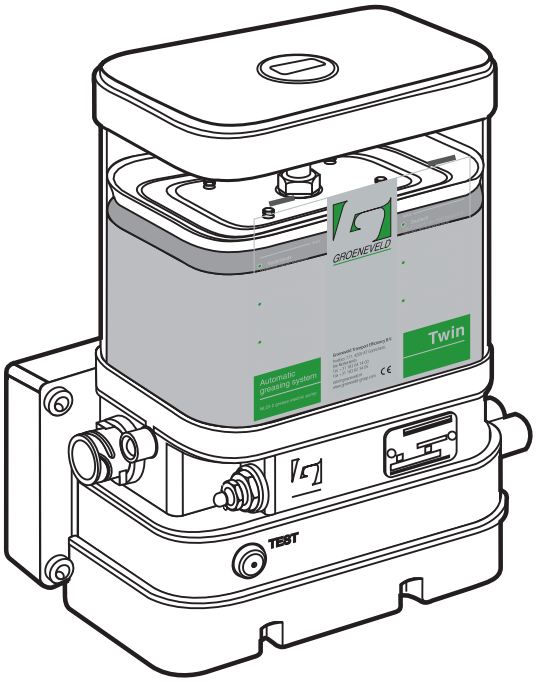
MAINTENANCE INSTRUCTIONS



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5.1 Introduction

In this chapter all important aspects of maintenance of the Twin automatic greasing system are discussed. These aspects are the overhaul (periodic check), bleeding of the system, refilling the grease reservoir and finding the malfunctions.

5.2 Overhaul

The overhaul of the greasing system requires little time and effort and can be combined with the normal service of the vehicle (e.g., during the oil change).

The overhaul consists of the following checks:

- Check the grease supply level (refill in time, see paragraph 5.4);
- Check that the signal lamp on the dashboard functions correctly;
- When a push-button is installed for the adjustment of the operating mode, check if the correct operating mode is adjusted;
- Check the pump unit for leaks and damage;
- Check the grease lines for leakage and damage (visual check);
- Check, as far as possible, the condition of the greasing points provided with grease by the greasing system; sufficient grease should be present;
- Check the system for correct functioning, carry out one test cycle twice; one for line A and one for line B.

ATTENTION:

Every time a test cycle is carried out, grease is supplied to the greasing points.

- Clean the pump and its environment.

WARNING:

When a high pressure (steam) cleaner is used to clean the vehicle, avoid the pumping to prevent water and dirt entering the unit through the bleeding openings.

5.3 Bleeding the system

When the system malfunctions repeatedly after the grease reservoir has been emptied, it is possible that one or both grease lines have to be bled.
Proceed as follows:

1. Make sure that there is enough grease in the reservoir.

WARNING:

Check that the system is pressureless, before the system is opened.

2. Remove the end plugs from the distribution blocks that are at the end of every branch of the greasing system.
3. Turn on the contact switch.
4. Press the test push-button of the pump unit for at least 6 s (continuous-test cycle).
   Because the end plugs are removed, no grease pressure is built up. When the maximum pumping time has past, the system switches automatically to the other primary grease line. This is repeated until the contact switch is turned off.

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5. Turn off the contact switch as soon as only grease and no air bubbles come from the relevant channels.
6. Re-mount the end plugs into the distribution blocks.
7. Repeat steps 4, 5 and 6 until all branches of the greasing system are bled.
8. Carry out a singled-test cycle twice to check that the greasing system functions correctly.

5.4 Re-filling the grease reservoir

5.4.1 Use of the correct grease

WARNING:

It is of the utmost importance that the correct grease is used in the Twin greasing system. Please consult the maintenance manuals of the vehicle, as they are drawn up by the manufacturer of the vehicle. Please consult the grease provider or Groeneveld when a different grease is to be used.

The Twin greasing system is developed for use with grease up to NLGI-class 2. Which NLGI-class has to be used, mainly depends on the temperatures in which the greasing system has to operate:

Lowest operating temperature	*Highest operating temperature*	*Use NLGI class*
-20 °C (-4 °F)	+70 °C (+160 °F)	2
< -20 °C (-4 °F)	+70 °C (+160 °F)	Synthetic 2
< -20 °C (-4 °F)	0 °C (+32 °F)	0 / 1

Solid additives in the grease (e.g., Teflon (PTFE) and graphite) can cause blockages in the greasing system in the long run. Therefore Groeneveld advises against the use of these kinds of grease in the greasing system. Grease with molybdenum disulphide (MoS_2) may only be used when the grease is of top quality and contains no more than 5% MoS_2.

5.4.2 Refilling the reservoir

When the grease level in the reservoir of the pump unit has reached the minimum level, the reservoir has to be refilled. The pump is therefore equipped with a greasing coupling to which a refill unit of a service station can be connected. To refill the system with a movable filling pump a special filling coupling can be mounted.

The filling procedure is as follows:

1. First make sure that the filling hose of a new filling pump (or filling hose) is filled with grease. This prevents air from being pumped into the reservoir.
2. Remove the dust cover of the refill opening.
3. Clean the refill coupling and the coupling of the filling hose carefully.
4. Fix the filling hose to the filling coupling.
5. Refill the reservoir to the maximum level as indicated on the reservoir. During the filling process air escapes over the grease follower piston through the bleeding channel and the bleeding opening.
6. Disconnect the filling hose and replace the dust cover on the filling coupling.
7. Replace the filling hose to the filling coupling, mounted on top of the grease drum cover.

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REMARK:

It is possible that during or directly after the refilling, some grease comes from the bleeding opening of the pump (left side).

When pumping is difficult, it is possible that the filter behind the coupling of the pump unit is clogged. It is also possible that the filling coupling and the coupling of the filling hose are clogged. Remove the clogged parts and clean them.

ATTENTION:

Check and clean the filter in the filling coupling on a regular basis.

When refilling is carried out with a filling installation of a service station, it is recommended to clean or replace the filter behind the filling coupling on a regular basis (at least every 500 operational hours). This is because the pump of the filling installation can easily break a clogged up filter while pumping. Because of this, dirt and pieces of the filter could get into the system and therefore should be absolutely be prevented.

If, during the refilling process, air is pumped into the reservoir and accumulates under the grease follower piston, it can be removed by refilling the reservoir to just above the maximum level. Because of this, the air can escape directly under the grease follower piston through the bleeding channel in the grease follower piston guide. The bleeding channel is opened when refilling of the grease is done above the maximum level.

REMARK:

When refilling is just above the maximum level some grease can come from the bleeding opening of the pump (at the left side), because some grease can enter the bleeding channel in addition to air.

5.5 Finding malfunctions

5.5.1 General

The Twin greasing system is equipped as standard with an electronic control unit with a database. All relevant data concerning the functioning of the greasing system are stored in that database. This data can be read with a GINA (or a PC or laptop).

5.5.2 Recognising malfunctions

Malfunctions are recognisable or discovered as follows:

- The signal lamp no longer lights when the power supply is switched on.
- The signal lamp or the Twin display shows a malfunction report.
- Reading the malfunction reports saved in the database of the control unit.
- The grease level in the pump no longer decreases.
- When visually checking the bearings, it appears that no fresh grease collar is present.

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5.5.3 Malfunction finding table

To make it easier to find malfunctions (when no GINA is available), refer to the malfunction finding table. In this table, probable causes of malfunctions and their solutions are listed. Because malfunction reports through the Twin display varies a little from the reports through the signal lamp, a separate table is inserted.

Malfunction reports of the signal lamp

Malfunction	*Cause*	*Solution*
1.The signal lamp does not respond when the contact switch is switched on.	a. No supply voltage on pin 1. b. No earth (ground) lead connection with control unit or signal lamp (pin 2). c. Signal lamp broken. d. Wiring interruption between power supply and the control unit or between control unit and signal lamp.	a. Check fuse and replace if necessary. b. Check and repair earth (ground) lead connection if necessary. c. Replace lamp if necessary. d. Check and repair wires if necessary.
2. Signal lamp flashes (0.5 s on - 0.5 s off) during 2 minutes at the start of every cycle.	The minimum grease level in the grease reservoir has been reached.	Refill the reservoir. The malfunction report is automatically reset.

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Malfunction	*Cause*	*Solution*
3. Signal lamp lights continuously for 2 minutes at the end of every pumping phase.	The grease pressure switch did not switch. Probable causes:	
	a. The primary grease line leaks. Because of this, no pressure can be built up.	a. Replace or repair the line and vent the relevant line.
	b. Air in the system. Within the maximum pumping time insufficient pressure is built up.	b. Vent both primary lines and carry out the single-test cycle twice.
	c. Broken grease pressure switch.	c. See malfunction finding procedure for the grease pressure switch (paragraph 5.5.4).
	d. O-ring damaged or left out when replacing a metering unit, grease pressure switch or blind plug. Because of this it is possible that grease flows from one line to the other.	d. Check and mount a new O-ring if necessary. Also see malfunction finding procedure of internal system leak, (paragraph 5.5.4)
	e. 5/2 valve broken. Because of this, no pressure can be built up.	e. See malfunction finding procedure pump and 5/2-magnetic valve (paragraph 5.5.4)
	f. Internal leak of metering unit or grease pressure switch.	f. Replace the metering unit or grease pressure switch (see page 51).
	g. Surrounding temperature too low or grease too viscous.	g. Replace the grease.
	h. Wiring defect or bad contacts.	h. Check the wiring and contacts. Replace if necessary.
	i. Other probable cause.	i. Consult the dealer

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Malfunction	*Cause*	*Solution*
4. Signal lamp lights continuously when the contact switch is turned on.	a. A connected series of 11 identical malfunction reports or 11 malfunction reports consecutively in the same primary grease line. The control of the pump and the valve is automatically shut off by the control unit (to prevent damage). b. Minimum-level report in combination with no pressure in the system within the maximum pumping time.	a. Push the test button on the pump for at least 1 s to reset the report. Locate the cause of the malfunction and repair it (see point 3). b. Refill the reservoir and press the test button on the pump for at least 1 s to reset the malfunction report. Perform a system test and bleed the system if necessary.

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Malfunction reports of the Twin display

Malfunction	*Cause*	*Solution*
5. Display still gives no signal after 1 minute.	a. No supply voltage on the display. b. Earth (ground) lead disconnected. c. Display broken.	a. Check the fuses and/or feeder connection (grey wire no. 1), Replace or repair it if necessary. b. Check the earth (ground) wire (grey wire, no. 2). Repair it if necessary. c. Replace the display.
6. Red alarm LED flashes continuously, for 1 minute after turning on the contact switch. No operating mode is indicated.	a. No communication between display and control unit. b. Pump is switched off because the pressure switch did not switch during a sequence of successive cycles.	a. Check the communication wire (grey wire no. 6, connected to wire no. 6 of the pump cable). Red LED is automatically reset after communication is restored. b. See Cause and Solution of point 3 of the signal lamp table. Press the test push-button on the pump for 1 s to reset this malfunction. ATTENTION: Pump remains switched off if this malfunction is not reset.
7. Yellow LED is lit continuously.	Minimum grease level in the reservoir is reached.	Refill the reservoir. The malfunction report is automatically reset after refilling the reservoir.
8. Yellow LED is lit and red LED flashes continuously. No operating mode is indicated.	Pump is switched off because the pressure switch did not switch during a sequence of successive cycles, while the grease level was at the minimum level.	Refill the reservoir, after which the malfunction is automatically reset and the operating mode is indicated again.

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General

Malfunction	*Cause*	*Solution*
9. All grease points contain no grease and no malfunction reports have been given and the signal lamp is not defect.	a. The adjusted greasing interval is too long for the relevant application. b. No supply voltage on pin 3, invert option CSI not switched on (=0) at parameters, causing the time clock of the control unit to stand still and no pause time is counted down. c. Supply voltage on pin 3, invert option CSI switched on (=1) at parameters, causing the time clock of the control unit to stand still and no pause time is counted down.	a. Adjust a shorter greasing time interval with the push-button (if present) or with the GINA. b. Check why no supply voltage is present as soon as the machine is switched on. Check the fuse (if present) and wiring. c. Check why the supply voltage does not drop as soon as the machine is switched on.
10. All greasing points contain an excessive amount of grease.	The adjusted greasing interval for the concerning application is to short.	Adjust a longer greasing time interval with the push-button (if present) or with the GINA.
11. One or more greasing points contain no grease while the other points receive sufficient grease.	a. Squeezed or broken secondary grease lines. b. Metering unit with to little grease output chosen. c. Metering unit defect.	a. Check and replace the relevant secondary line if necessary. b. Mount metering unit with larger grease output. c. Remove and clean the metering unit or mount a new one.
12. One or more greasing points receive excessive amount of grease while the other points do receive the right amount of grease.	a. Metering unit with too much output. b. Metering unit with internal leak.	a. Mount a metering unit with less grease output. b. Remove the metering unit and mount a new one.

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Malfunction	*Cause*	*Solution*
13. The signal lamp flashes (2 s on - 2 s off) during one complete greasing cycle.	A single-test cycle is carried out.	The signal lamp goes out after the test cycle has ended or after turning off the contact switch.
14. The signal lamp flashes (0,2 s on - 0,2 s off) continuously.	A continuous-test cycle is carried out.	The signal lamp goes off after the test. This is after turning off the contact switch.
15. The GINA shows a 'communication error'.	a. Bad connection (breaking in a wire, connector). b. After switching on the GINA pushed a button to quickly. c. Supply voltage too low; e.g., because of bad battery.	a. Check wire and connector. b. Repeat start-up procedure and wait 8 s before switching on GINA. c. Start the engine.
16. The GINA shows 'device not supported'.	The GINA does not recognise the control unit.	A different GINA is needed.

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5.5.4 Malfunction finding procedures

A number of procedures to determine the correct cause of a certain malfunction are described below.

Procedure to check the correct working of the grease pressure switch and cable

1. Disconnect the 2-pole connector from the pressure switch.
2. Measure the resistance between the two contacts using a multimeter.
   When the system is pressureless, the contact of the switch should be open. If required, remove the switch to make sure that no pressure below the pressure switch is present. Remove only the upper part, the diverter valve can be left in place.

When the adjusted pressure (see side of relevant switch) is reached the contact should close.

3. Start a test cycle by pressing the push-button on the pump.
4. If possible, mount a pressure gauge between the diverter valve and the pressure switch to check the switching moment.

ATTENTION:

Use a pressure gauge that is suitable for a grease pressure up to 250 bar.

Because the connector of the grease pressure switch is disconnected, the control unit cannot switch off the pump when the adjusted pressure is reached.

5. Therefore turn off the contact switch, when the switching pressure has been reached. The test cycle is ended.

If the grease pressure switch functions properly, the cable should be checked for breaks (internally) in the cable.

6. Disconnect the pump connector.
7. Connect both contacts of the connector of the grease pressure switch with a separate wire.
8. Measure the resistance between pin 7 and 8 of the pump connector.
   The measured resistance should be nearly zero.
9. Remove the wire between the contacts of the connector of the grease pressure switch.
   The multimeter should read an *open-load*.

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Procedure to check the working of the pump and the 5/2-magnetic valve

1. Disconnect both grease lines (channel A and B) from the pump unit.

ATTENTION:

Some pressure can still be present in the channels.

2. Connect a pressure gauge to each channel of the pump unit. Use pressure gauges that are suitable for a grease pressure of 250 bar.
3. Press the test push-button for about 4 s to start a test cycle. The pump now pumps grease from one of the channels. The pressure reading of the gauge connected to this channel should increase to the maximum attainable pressure of 230 to 250 bar.

ATTENTION:

The pump is not switched off by the pressure switch, because the system is disconnected.

If the pump does not reach the indicated pressure, it has following causes:

- Air lock in the grease (air bubbles). Disconnect the pressure gauge and let the grease flow until no more air bubbles come from the line. If necessary, refill the reservoir with some oil to remove the air around the pumping element.
- Grease is viscous. Therefore it is not sucked in by the pumping piston. Replace the grease in the reservoir and the main lines.
- Pump is faulty. Replace the pump.

4. End the test cycle by turning off the contact switch or by disconnecting the pump connector for a moment.
5. Start another test cycle with the test push-button on the pump.
   The pump should start in the second channel and the pressure gauge will quickly increase to the maximum adjusted grease pressure of 230 to 250 bar. The first channel should become pressureless.

When the pressure in the first channel does not drop and no pressure is built up in the new channel, the 5/2 magnetic valve is faulty. Replace the valve or the entire pump.

6. End the test cycle by turning of the contact switch or by disconnecting the pump connector for a moment.

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Procedure when an internal system leak is suspected

1. Disconnect channel B of the pump unit.

ATTENTION:

Some grease pressure can still be present in the channel.

2. Press the test push-button for about 4 s to start a test cycle.
   The pump is started and pumps grease through one of the grease channels. If this is not channel A, break off the test cycle by turning the contact switch off or by momentarily disconnecting the pump connector. Start another test cycle with the test push-button on the pump. The pump starts automatically in the other channel (A).

While the pressure in channel A builds up some returning grease can come from the other channel. When grease keeps flowing from this channel, there is an open connection between the main line channels. The cause is a missing or damaged O-ring under one (or more) metering units.

When a leak is established in the system, it has to be determined in which distribution block the leak is present.

3. Disconnect the main line from channel B, directly after the first distribution block after the pump.
4. Restart the pump in channel A.

When the grease leaks from channel B of this first distribution block, the leak must be found in this block. When the grease leaks from the disconnected line, the leak must be sought farther down the system. Therefore repeat this procedure every time using the next distribution block until the leak is found.

REMARK:

To determine which main line is connected to channel A and which line to channel B at the distribution blocks, follow the main lines from the pump to the distribution blocks.

When there is only little leak, it may be impossible to establish the leak with the operating pump. Therefore, switch off the pump when the maximum pressure is reached. Turn off the contact switch or momentarily disconnect the pump connector. The pressure should be steady (minimum 200 bar; this procedure only works for channel A). The pressure may only drop when the control unit opens the valve, as soon as a new test cycle is started in channel B.

When there is no pressure drop, but there is also no grease coming back, it indicates a leaking metering unit. Because of this one of the greasing points will be greased excessively. Therefore check all connected greasing points.

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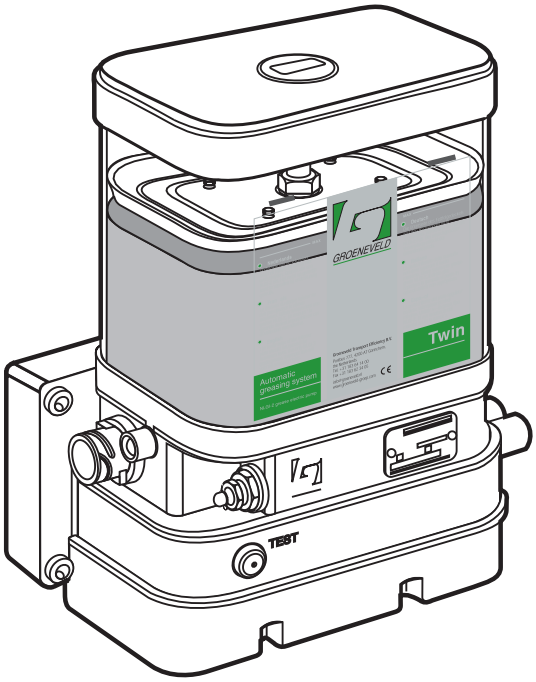
EXPLANATORY WORD LIST



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Automatic greasing system	A system that provides sufficient grease to the connected greasing points of a vehicle or machine automatically, without the assistance of a driver.
Control unit	The 'brain' of the greasing system that steers, regulates and checks the course of the greasing cycles.
Cycle-time	The time that passes from the beginning of one pumping phase to the beginning of the next.
Metering unit	The metering unit determines the amount of grease that is distributed per greasing cycle and per greasing point.
Distribution block	A distribution block on which various metering units can be mounted.
GINA	'**G**roeneveld tester for **IN**stallation and **A**nalysis'. The unit with which the system and program parameters of the TWIN and TriPlus greasing systems can be programmed, adjusted and viewed.
Greasing cycle	Cycle that consists of the following phases: pumping phase, (re-grease phase), pressure decrease phase and pause phase.
Greasing point	A part of the machine or the vehicle supplied with grease by the greasing system.
Pause phase	The period in which the greasing system is at rest. For a Twin greasing system this is the period that follows the pressure decrease phase.
Pressure decrease phase	The period in which the grease pressure decreases.
Primary grease line	A grease line between the grease pump and the distribution blocks or between the distribution blocks themselves.
Pumping phase	The period during which the grease pump brings the pressure in the greasing system to a certain pressure level and grease is brought to the greasing points.
Re-grease phase	The period after the pumping phase in which the system is held at a certain pressure. This phase occurs only in a Twin greasing system.
Reader unit	An apparatus with which the electronic time switch of a single-line system can be programmed and read.
Secondary grease line	A grease line between the metering units and the greasing points.
Twin greasing system	A greasing system, suitable for greases with a higher viscosity (up to NLGI class 2). These systems have two primary grease lines.

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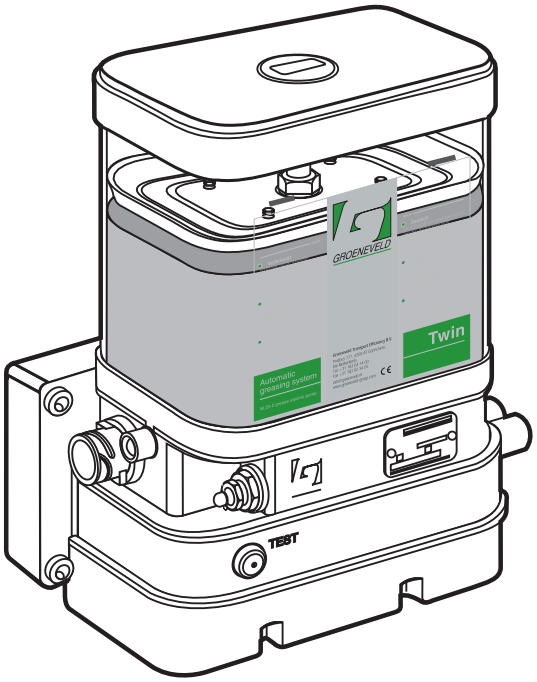
APPENDIX A

TECHNICAL DATA



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Twin pump units

Pump numbers with an F are filled with Greenlube EP-2 grease.

	part number			
	63601 F112589	***63701 F112126***	***63801***	***70001* F112942***
Supply voltage (Vdc)	12	24	24	24
Volume reservoir (litre)	4	4	2	3
Output (cm^3 / min.)	12	12	12	12
Maximum grease pressure (bar)	250	250	250	250
Current absorption (A)	10	5	5	5
Grease follower piston	yes	yes	yes	yes
Minimum level switch	yes	yes	yes	yes
Connector type	bayonet	bayonet	bayonet	bayonet
Mass (kg)	6,4	6,4	6	6,2
Operational temperature (°C)	-20 ... +70	-20 ... +70	-20 ... +70	-20 ... +70
Thread adapter	M16 x 1,5	M16 x 1,5	¼" internal	M16x1,5

* for external control (model without control unit)

	part number			
	83401 F111842	***15711 F116003***	***83501 F111956***	***98601***
Supply voltage (Vdc)	24	24	12	24
Volume reservoir (litre)	3	8	3	2
Output (cm^3 / min.)	12	12	12	12
Maximum grease pressure (bar)	250	250	250	250
Current absorption (A)	5	5	10	5
Grease follower piston	yes	yes	yes	yes
Minimum level switch	yes	yes	yes	yes
Connector type	bayonet	bayonet	bayonet	bayonet
Mass (kg)	6,2	6,2	6,2	6
Operational temperature (°C)	-20 ... +70	-20 ... +70	-20 ... +70	-20 ... +70
Thread adapter	M16 x 1,5	M16 x 1,5	M16 x 1,5	¼" internal

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Signal lamp
Absorbed power: 3 W

Grease pressure switch
The grease pressure switch is mounted with use of a diverter valve on a Twin distribution block. This can be a brass (part number 66601) or stainless steel (part number 91401) valve.

	part number		
	76601	***66401***	***66501***
Switch pressure (bar)	100	125	150
Thread	1/4"	1/4"	1/4"
Connector	M24 x 1	M24 x 1	M24 x 1
Connections	2	2	2
Material	Brass	Brass	Brass

	part number		
	72801	***91301***	***73701****
Switch pressure (bar)	175	100	100
Thread	1/4"	1/4"	M22
Connector	M24 x 1	M24 x 1	M24 x 1
Connections	2	2	2
Material	Brass	Stainless steel	Brass

* including diverter valve

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