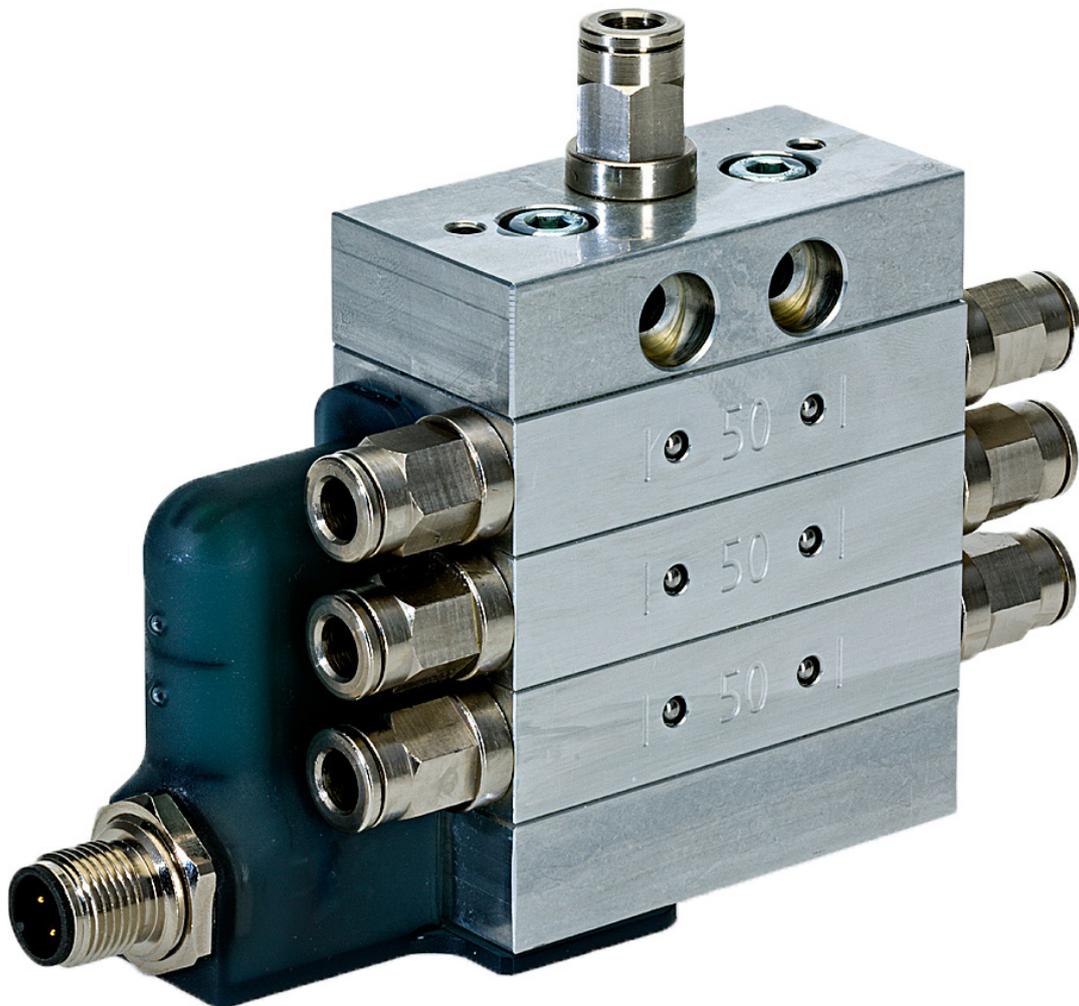


# DLS

## SCHMIERSYSTEME

DIRECT LUBRICATION SYSTEMS

### User Manual Progressive Distributor with monitoring



## I. Revision history & Imprint

### I.I Revision history

The present user manual is the original user manual.

This user manual is only valid for

**Product:**

Product designation: Progressive Distributor with monitoring (PVN)

Product revision: ---

**User manual:**

date of creation: 02.2021

revision of the user manual: 1.1

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The content and technical specifications are subject to change without notice.

### I.II Imprint of the manufacturer, distribution and service

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## 1. General information about this manual

This user manual contains all necessary information to use the Progressive Distributor with monitoring, hereinafter referred to as PVN, safely and as intended. In the event that supplementary sheets are attached to these instructions, the information and data contained in the supplementary sheets are valid and replace the corresponding information in this user manual. Any contradictory information contained in this user manual thus becomes invalid.

If you have any questions regarding special applications, please contact DLS Schmier-systeme GmbH (chapter I.II).

The actual and factual operator must ensure and guarantee that these instructions, including any supplementary sheets, have been read and understood by all persons responsible for the installation, operation or maintenance of the PVN. Therefore, keep these instructions in a suitable place, ideally in an easily accessible place, in the surrounding area of the PVN.

Inform your colleagues who work in the local area of the machine about safety instructions so that nobody gets hurt.

This manual was written in German, all other language versions are translations of this manual.

### 1.1 Signal words

The following signal words are used in this manual to draw your attention to possible dangers, prohibitions and other important information:

#### **DANGER**

This signal word points you to an immediate and threatening risk of serious injury or death.

#### **WARNING**

This signal word indicates a potentially imminent danger which can result in serious injury or even death.

#### **CAUTION**

This signal word indicates a potentially imminent danger that can result in minor to severe injuries.

#### **NOTICE**

This signal word indicates a potentially imminent danger which can result in damage to property.

#### **INFORMATION**

This signal word refers to practical application tips or particularly important information when using the PVN.

## 1.2 Warning symbols

The following warning symbols are used in this user manual to alert you to hazards, prohibitions and important information:

		
General warning sign	Electricity hazard	Flammable material

## 1.3 Structure of the safety instructions

The safety instructions in this user manual are structured according to the following system:

	<b>CAUTION</b>
	<p>The text explains the consequences of disregarding the reference.</p> <ul style="list-style-type: none"> <li>▪ The text shows what to do as an instruction.</li> </ul>

## 1.4 Symbols for information

The following information symbols are used in the text and instructions in this manual:

- Requests you to take action
- ➡ Shows the consequences of an action
- ⓘ Additional information about the action

## **2. Safety**

All persons working with the PVN must follow these operating instructions, in particular the safety instructions and the rules and regulations applicable at the place of use. Generally applicable legal regulations and other rules as well as the relevant rules and regulations for accident prevention (e.g. Personal Protective Equipment (PPE)) and environmental protection must be observed.

### **2.1 Hazards**

In order to avoid danger to the user or damage to the machine on which the PVN is used, the PVN may only be used for its intended purpose (chapter 2.4) and in a technically safe condition.

Always inform yourself about the general safety instructions (chapter 2.6) before starting to work.

### **2.2 Staff**

Only qualified staff who has read and understood this manual may work with the PVN. Local and/or company regulations apply accordingly.

### **2.3 Reasonably predictable misuse**

Any use of the PVN which exceeds the maximum permissible technical data is generally considered to be improper and therefore prohibited.

## 2.4 Usage for the intended purpose

The following points must be observed for the intended purpose of using the PVN:

- + The PVN is exclusively approved for industrial use.
- + The PVN may be used exclusively in accordance with the technical data (chapter 3.4).
- + Unauthorized structural alterations to the PVN are not permitted.
- + Read the user manual and act accordingly.
- + During operation of the PVN, a visual inspection of the PVN as well as of the lubrication point must be carried out regularly. Any anomalies must be eliminated immediately and the cause rectified.
- + The PVN may not be opened or disassembled.
- + Only lubricants approved by the manufacturer may be used.
- + Relevant regulations and rules on work safety, accident prevention and environmental protection must be observed.
- + Work and activities with and on the PVN are only permitted with appropriate authorisation (chapter 2.2).

All other uses than the aforementioned intended usage or the disregard of one of the above points shall be deemed improper usage. In this case no liability and/or warranty is assumed.

## 2.5 Warranty and Liability

If the following items are disregarded, all warranty and liability claims for personal injury and/or damage to property are excluded:

- + Non-observance of the instructions for transport and storage;
- + misuse;
- + Improper or unperformed maintenance or repair work;
- + Improper assembly / disassembly or improper operation;
- + Operation of the PVN with defective protective devices and devices;
- + Operation of the PVN without lubricant;
- + Operation of the PVN with non-approved lubricant;
- + Operation of heavily contaminated PVN;
- + Modifications or alterations which may be carried out without the written permission of DLS Schmiersysteme GmbH have taken place;
- + Opening and/or partial or complete disassembly of the PVN.

## 2.6 General safety instructions

The following safety instructions are given for the PVN:

	<p style="text-align: center;"><b>DANGER</b></p> <p><b>Damaged or incorrect electrical connections or unauthorized live components lead to serious injuries or even death.</b></p> <ul style="list-style-type: none"><li>▪ Have all electrical connection work carried out by qualified personnel only.</li><li>▪ Replace damaged cables or plugs immediately.</li></ul>
	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Loose or overloaded screw connections can cause damage to the PVN.</b></p> <ul style="list-style-type: none"><li>▪ Mount and check all screw connections with the permissible torques specified for this purpose. Use a calibrated torque wrench.</li></ul>
	<p style="text-align: center;"><b>WARNING</b></p> <p><b>Lubricants are flammable.</b></p> <ul style="list-style-type: none"><li>▪ In case of fire, do not use a water jet to extinguish the fire.</li><li>▪ In case of fire, use only suitable extinguishing agents such as powder, foam and carbon dioxide.</li><li>▪ Observe the relevant safety instructions of the lubricant manufacturer on the safety data sheet of the lubricant used.</li></ul>
	<p style="text-align: center;"><b>CAUTION</b></p> <p><b>Lubricants can cause skin irritations.</b></p> <ul style="list-style-type: none"><li>▪ Avoid direct skin contact.</li></ul>
	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Lubricants can contaminate soil and water.</b></p> <ul style="list-style-type: none"><li>▪ Use and dispose lubricants properly.</li></ul>

### **3. Description of function**

#### **3.1 General information**

The Progressive distributor with monitoring (abbreviated as PVN) is used to reliably supply multiple lubrication points in machines and systems with oil or grease. The lubricant supplied by a pump is divided in subsets from the PVN according to the number of outlets and is delivered to the lubrication points.

Non-return valves are integrated into the distributor outlets as standard to improve the dosing accuracy. External non-return valves at the connected lubricant lines are therefore unnecessary. These distributors therefore allow largely counter-pressure-independent division of the lubricant between 2 to 14 outlets. Pressure differences between the individual outlets of > 15 bar must be avoided in the interests of dosing accuracy.

The number of outlets, their delivery rates and the arrangements of the lubricant outlets are defined by design for the PVN standard distributors described below. On request, various special distributors are available.

The PVN is a progressive lubricant distributor for a maximum working pressure of 100bar. It is therefore particularly suitable for use with the lubricant pumps of the DLS FlexxPump series.

The PVN offers the possibility for functional remote monitoring. A signal transmitted to a sensor by a delivery piston at each cycle generates an analyzable return signal that can be picked up at the plug. A yellow flashing LED on the housing indicates the switching condition. A continuous green light indicates the presence of operating voltage.

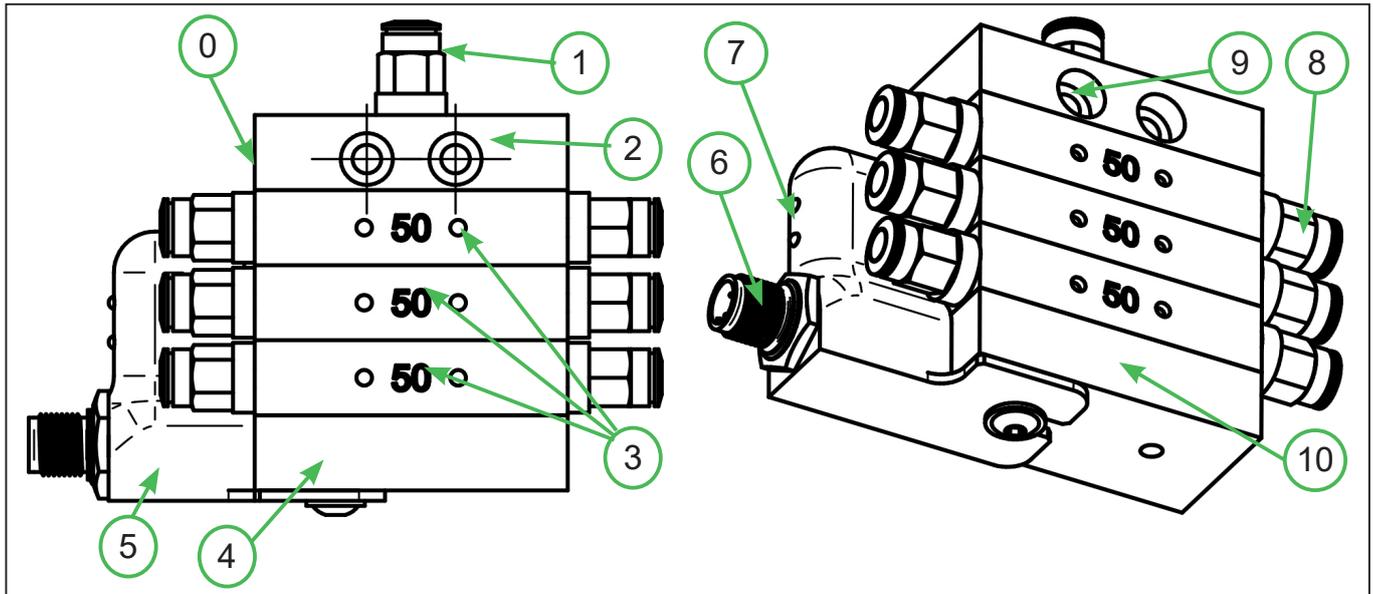


Fig. 1: Overview PVN (238-010-006)

Nr.	Description
0	PVN
1	Lubricant inlet
2	Initial element
3	Dispensing elements
4	Final element
5	Monitoring unit
6	M12x1 electrical interface
7	LEDs for monitoring
8	Lubricant outlets
9	Through hole for mounting
10	Serialnumber

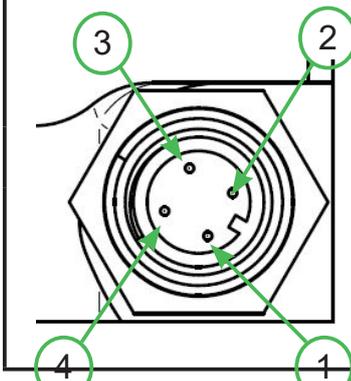
### 3.2 Identification

A sticker, which serves the traceability of the PVN, is visibly attached to the PVN itself. There the serial number of the PVN is visible. For the position of the sticker and the serial number, please refer to Chapter 3, Fig.1.

### 3.3 Scope of delivery

The PVN is available in several different versions. They differ in the number of outlets and by the characteristics of the dispensing elements. All versions of the PVN are prefilled with a neutral, food-grade (H1) lubricant, which can be mixed with the lubricants approved by DLS Schmiersysteme GmbH, to simplify the initial commissioning. The manufacturer's designation is Addinol Foodproof XHF 150 S. Further data and documentation on the lubricant Addinol Foodproof XHF 150 S are available on request from DLS Schmiersysteme GmbH.

### 3.4 Technical data

<b>General</b>			
Tube connector grease inlet/outlet		straight/angled for tube D = 4/6/8mm special tube connectors on request	
Mounting options		2 blind holes in the Anfangselement für Zylinder-schraube M5 (DIN 912)	
max. torque mounting		3	Nm
Mounting position		horizontal movement direction of the delivery pistons	
Material main body		aluminum 3.3547	
Material grease inlet/outlet		CuZn39Pb3	
Operating temperature		-20 ... +70*	°C
<b>Lubricant and hydraulic</b>			
Lubricant characteristics**	Grease	up to NLGI class 2	
	Oil	minimal viscosity ISO 68 VG	
Number of outlets		2 to 14	
Hydraulic connection		directly or via PA-tube	
max. pressure		100	bar
max. inlet volume flow		0,5	ml/s
Grease delivery per piston stroke	Dispensing element 25	0,025	ml
	Dispensing element 50	0,050	ml
	Dispensing element 100	0,100	ml
<b>Electrics</b>			
Connector		M12x1 female connector, 4-pin, A-coded	
	PIN 1	Input voltage $U_B$ +24V DC $\pm$ 10% Current consumption: max. 0,04A	
	PIN 2	Not engaged	
	PIN 3	Ground	
	PIN 4	Current rating: max. 0,03A Short-circuit strength: ca. 5min Output level: >+22,5V DC (with +24V DC $U_B$ )	

Electrical version	PNP
Output function	turnkey
max. switch frequency DC	10 Hz
IP Protection class	IP65
Circuit configuration	

\* Please note, however, that in individual cases the operating temperature may depend on other factors (e.g. lubricant).

\*\* Please note that a warranty is only given when using lubricants with DLS Schmiersysteme GmbH approval.

The particular drawings and STP-files for each progressive Distributor are available at our website at [www.DLS-Schmiersysteme.de](http://www.DLS-Schmiersysteme.de) or on request.

The following sketch shows the outer dimensions of the PVN. The length L of each standard distributor can be found in table 1.

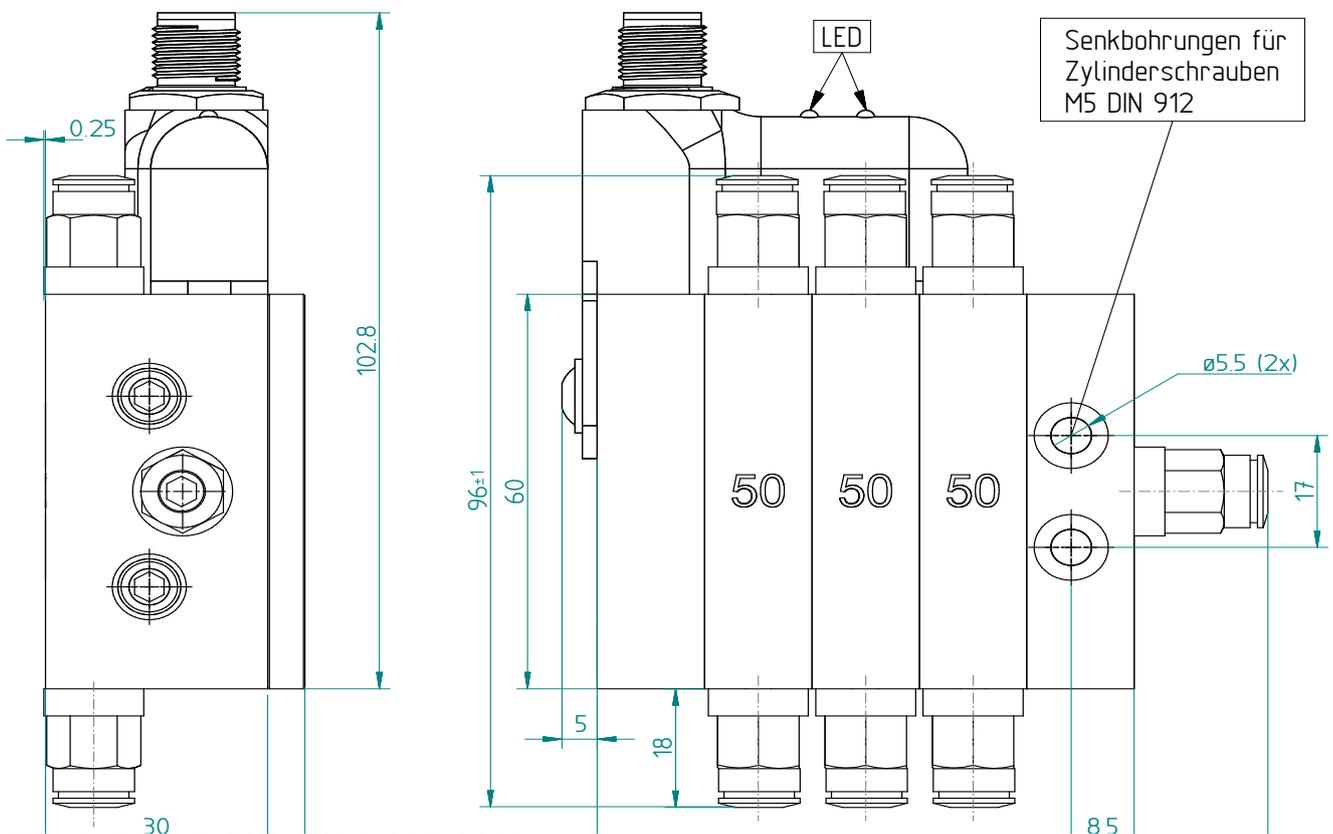


Fig. 1: Sketch PVN (238-010-006)

Designation	Item-Nr.	Width (mm)	Length (mm)	Weight (g)	Number of outlets	Position of outlets R = right L = left
PVN	238-010-002	121	95	476	2	1xL, 1xR
PVN	238-010-003	121	95	476	3	3xR
PVN	238-010-004	121	95	476	3	1xL, 3xR
PVN	238-010-005	121	95	476	4	2xL, 3xR
PVN	238-010-006	121	95	476	4	3xL, 3xR
PVN	238-010-007	121	95	476	5	3xL, 4xR
PVN	238-010-008	121	95	476	5	4xL, 4xR
PVN	238-010-009	121	95	476	6	4xL, 5xR
PVN	238-010-010	121	109,5	567	7	5xL, 5xR

Table 1

### 3.5 Special distributors

Any PVN that has been developed in direct consultation with the customer and is not documented in Table 1 is considered a special distributor.

Special distributors are PVNs whose output quantities per outlet are different from each other, or which enable higher output quantities than the standard distributors or whose hose connectors contradict the standard.

When commissioning special PVNs, it is essential to observe the safety instructions in chapter 5.3.

## 4. Transport and storage

### 4.1 Packaging

The PVN is delivered in an outer packaging (cardboard box). To protect them from moisture and dirt, they are also packed in PE films. As a preventive measure to stop the prefilled lubricant escaping from the PVN, a dowel pin is inserted in the inlet hose connector.

Dispose the packaging materials at the designated disposal points in compliance with the relevant national and company regulations.

After receiving the PVN, check the delivery note for completeness and correctness. Any missing parts or damage must be reported immediately to the forwarding agent, the insurance company or DLS Schmiersysteme GmbH in writing.

### 4.2 Transport

	<b>HINWEIS</b>
	<p><b>Hard shocks, e.g. due to falling or setting down too hard, can damage the PVN.</b></p> <ul style="list-style-type: none"><li>▪ Do not throw the PVN.</li><li>▪ When using lifting equipment, only use hoists and load handling attachments in perfect condition and with sufficient load capacity.</li><li>▪ The permissible lifting weight of the lifting device must not be exceeded.</li></ul>

### 4.3 Storage

Store the PVN in its original packaging in a vertical position in a dry, frost-free environment at an ambient temperature of +5°C to +30°C. The maximum storage time in unopened condition is 2 years.

The so-called "First-In-First-Out-Principle" (FiFo) is recommended for storage logistics.

## 5. Mounting / Commissioning / Operating

### 5.1 Preparations

Before starting to work, inform yourself in detail about the PVN using this user manual; in particular about the general safety instructions (section 2.6). Prepare the installation site carefully.



#### NOTICE

**Pressurised air can damage the seals of the PVN and can transport dirt and foreign matter into the PVN or the lubricant.**

- Do not use pressurised air.
- Make sure that there is no coarse dirt in the mounting area.

### 5.2 Mounting

#### 1. Condition as delivered

The PVN is delivered sealed in PE film in a cardboard box.

#### 2. Pull out the sealing dowel pin.

● Pull the dowel pin out of the top of the PVN lubricant inlet.

① Make sure that no dirt, water or foreign bodies enters the lubricant inlet.

① As soon as the dowel pin is removed from the lubricant inlet, lubricant can leak out. Do not turn the distributor!

### 3. Mount the progressive distributor.

- ① Mount the PVN carefully according to the steps described in chapter 3.4.
- ① Ensure a flat support surface when mounting the PVN.

### 4. Hydraulic connection inlet

- Connect the lubricant supply you use to the inlet of the progressive distributor.
- ① Pay attention to cleanliness when carrying out the work. It is imperative that dirt and foreign bodies do not enter the pipes or the distributor.
- ① Ideally, use tubes prefilled with the appropriate lubricant!

### 5. Connect the electrical interface

- Connect the PVN to the external power supply or controller via the M12x1 interface on the side of the PVN using a suitable connecting cable.
- ① Depending on the application, both connection cables with straight or angled sockets can be used.
- ① Please refer to chapter 3.4 for the condition of the connection cable.



## GEFAHR

**Defective or faulty electrical connections or unauthorized live components can lead to serious injuries or even death.**

- Have all electrical connection work carried out by qualified personnel only.
- Replace damaged cables or plugs immediately.
- Before carrying out any electrical installation work, observe the five safety rules of electrical engineering:
  - Unlocking
  - Secure against unintentional restarting.
  - Check that there is no voltage.
  - Ground and short-circuit.
  - Cover adjacent live parts.

### 6. Flushing the distributor

● Activate the lubricant supply you are using until the lubricant you are using emerges from all outlets of the progressive distributor.

**Attention:** maximum inlet pressure 100 bar otherwise damage to the PVN will occur

① Dispose the lubricant that has escaped from the distributor.

### 7. Hydraulic connection outlet

● Connect the outlets of the distributor to the respective connecting lines.

Pay attention to cleanliness when carrying out the work. It is imperative that dirt and foreign bodies do not enter the pipes or the distributor.

① Ideally, use tubes prefilled with the appropriate lubricant!

① Use connecting lines with the same cross section at each outlet.

## 8. Flush again

- Activate the lubricant supply you are using until the lubricant you are using emerges from all connecting lines.

**Attention:** maximum inlet pressure 100 bar otherwise damage to the PVN will occur

① If you have used connecting lines that are prefilled with the lubricant you are using, this step is not necessary.

## 9. Hydraulic connection lubrication point

- Fit the connecting lines to the lubrication points.

① For distributors with dosage volume differences of the outlets, it must be observed to which outlet which lubrication point is connected.

### 5.3 Installation position

Pay attention to the installation/mounting position of the distributor in order to ensure a trouble-free operating condition. The pumping pistons in the middle elements should always run in horizontal direction (see the double arrow in figure 3) and never in vertical direction (see figure 5). An incorrect installation position can lead in the worst case to the distributor not starting and therefore to lack of lubrication. The following installation/mounting positions are recommended:

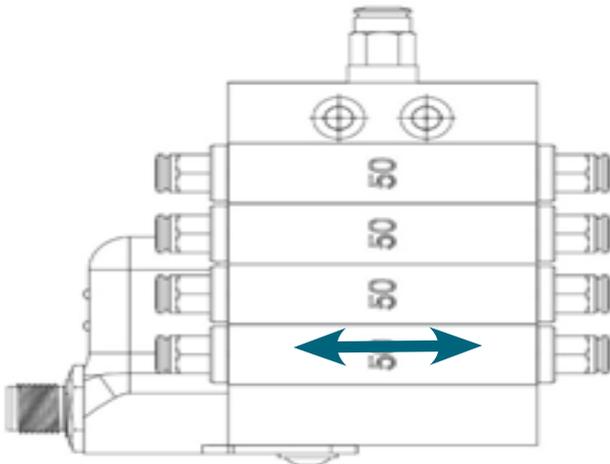


Figure 3: Hanging installation position, horizontal piston

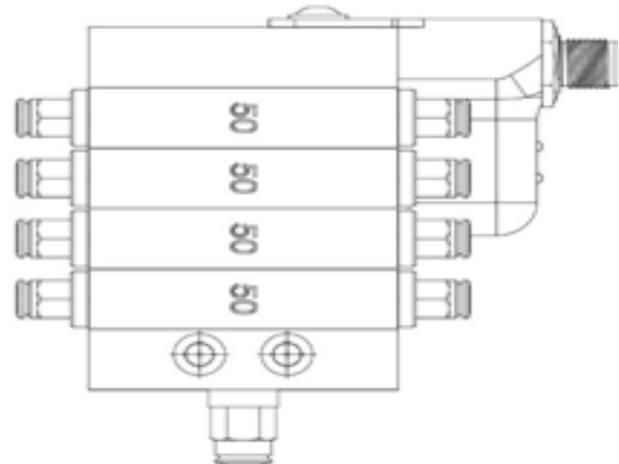


Figure 4: Hanging installation position, turned by 180°

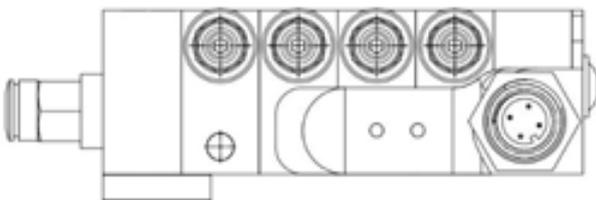


Figure 5: Lying installation position

The following installation/mounting positions should be avoided:

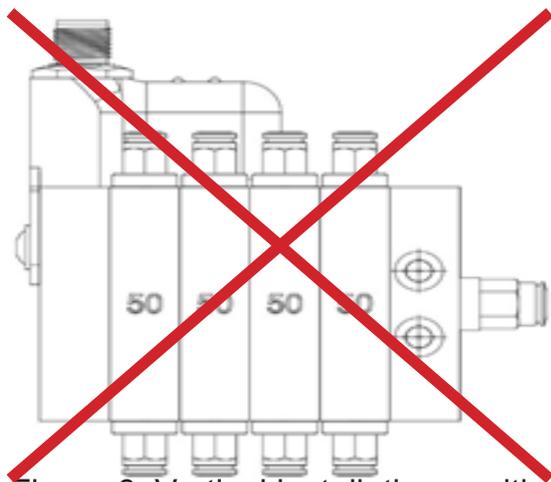


Figure 6: Vertical installation position, vertical piston

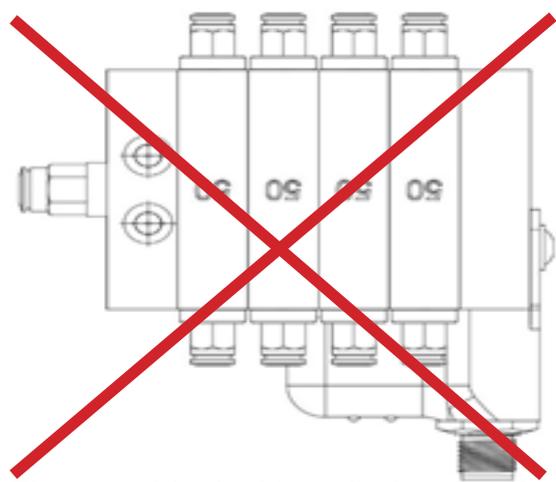


Figure 7: Vertical installation position, turned by 180°

## 5.4 Commissioning

Mount the PVN carefully according to the steps described in chapter 5.2. Depending on the scope of delivery, you must also carry out the following additional measures for the first-time commissioning:

### 1. Check the assembly

Ensure that the PVN is properly and completely assembled. In particular, the connections between the pump and the distributor or between the distributor and the lubrication points must be properly connected.

### 2. Check the output of the pump used

Make sure that the set output of the lubricant supply used matches the lubrication requirements of the individual lubrication points. If this is not the case, adjust the delivery rate accordingly.

	<b>CAUTION</b>
	<p><b>If special PVNs are connected incorrectly, lubrication points can be under-lubricated or over-lubricated and thus cause damage to machine elements.</b></p> <ul style="list-style-type: none"> <li>▪ Ensure that the connecting cables are connected correctly before commissioning. Mark them if necessary.</li> </ul>

## 5.5 Operating

In the interest of dispensing accuracy, it must be ensured that the delivery pistons make at least two complete circulations during each lubrication process.

When using the PVN with the lubricant pumps of the DLS FlexxPump series, it is therefore recommended to either program the DLS FlexxPump or to control it from the connected PLC in such a way that the number of delivery cycles mentioned in the following table are executed.

Number of dispensing elements	Recommended minimum number of strokes c of a FlexxPump
3	5
4	6
5	7
6	8
7	10

Please note the following when operating the progressive distributor:

⚠ Because of the forced delivery of the lubricant by the delivery pistons of the progressive distributor, the blockage of a single lubrication point leads in blocking the entire progressive distributor. Controlled lubrication of the lubrication points is no longer guaranteed.

The following applies to the lubricant supply to the lubrication points connected to the PVNs when using the standard PVNs mentioned in Table 1, section 3.4:

Each outlet is supplied with the same lubricant and the same quantity of lubricant during a lubrication interval (=introducing enough lubricant into the PVN that theoretically each outlet delivers lubricant once).

The PVN offers the possibility of local or remote monitoring of the function of the distributor. If you have successfully installed the distributor as described in chapter 5.2, either the yellow LED or the yellow and green LED will light up on the monitoring unit, depending on the piston position (positioning of the LEDs, see chapter 3.1, fig. 1).

If the green LED lights up, an output signal is also set on PIN 4 which can be monitored remotely (e.g. via a PLC).

The colours of the LEDs have the following meaning:

Colour of the LED	Description
yellow (permanently illuminated)	Voltage is applied to PIN 1, distributor monitoring is ready for operation
green (alternating, frequency depending on the volume flow applied)	Status monitoring of the piston movement within a monitored dispensing element

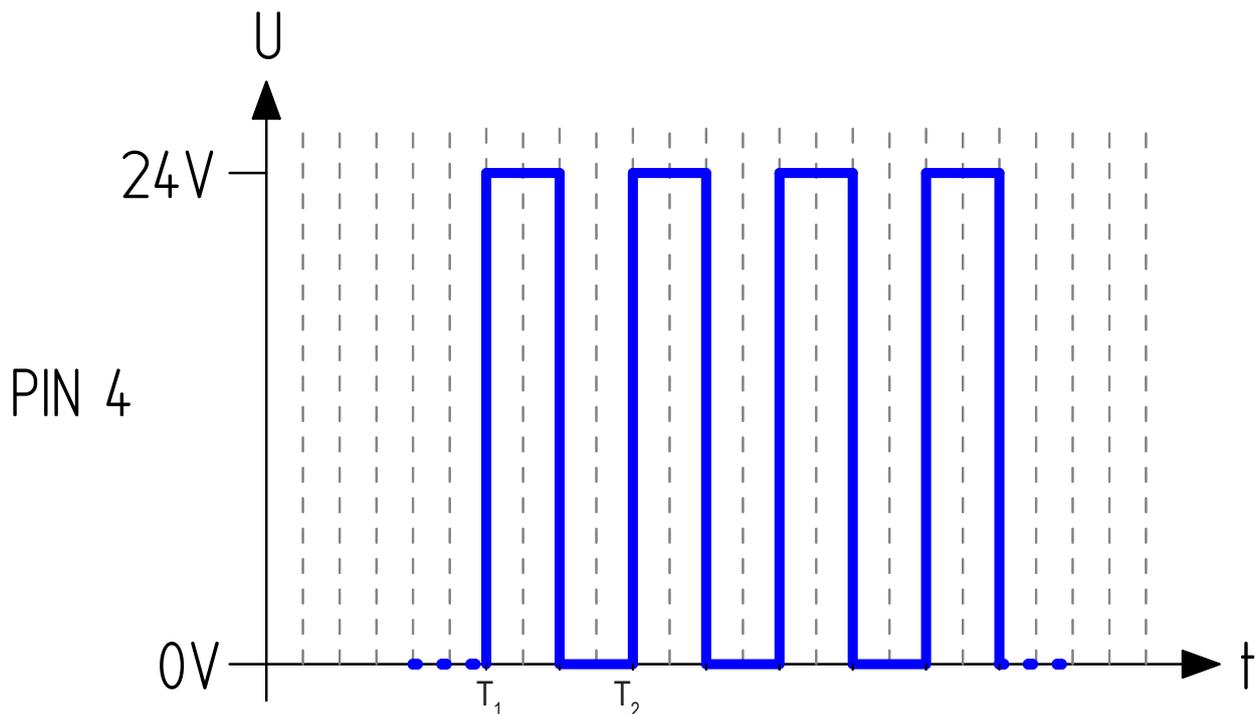
If one or more strokes are carried out from the lubricant supply connected to the PVN and each outlet of the PVN is supplied with lubricant, it can be determined visually on the distributor or remotely monitored on the PLC or similar, whether the function of the distributor is guaranteed. If the green LED (or the signal on PIN 4) changes from on to off and back again (or from  $\pm 0V$  to  $\pm 24V$  and back again), a dispensing process has taken place and lubricant has passed through the distributor. The yellow LED lights up continuously and provides information as to whether the distributor circulation monitoring system is ready for operation.

When the pump process of the lubricant supply connected to the PVN is completed and no further pumping is performed, the PVN can stop in two different states:

Condition of the green LED	Meaning
off (permanently)	The piston of the monitored dispensing element has stopped in the <u>most distant</u> position to the monitoring device, the switch within the monitoring device is not activated.
on (permanently)	The piston of the monitored dispensing element has stopped in the <u>nearest</u> position to the monitoring device, the switch within the monitoring device is activated.

## 5.6 Signalling for Remote Monitoring

The integrated microelectronics of the PVN is equipped with a sensor that detects the position of the delivery piston on the monitored dispensing element without contact. A typical output signal is therefore formed at PIN 4 of the M12x1 interface of the monitoring device during operation, which can be monitored by an external control (e.g. PLC). If the delivery piston is in the nearest position to the sensor, a +24V DC output signal can be detected at PIN 4, if the delivery piston is in the most distant position to the sensor, a 0V DC output signal can be detected at PIN 4.



The frequency of the signal depends on the flow rate at which the lubricant supply connected to the PVN operates. The higher the flow rate, the higher the frequency of the return signal.

A complete circulation and thus a single dispensing of each outlet of the PVN is achieved when a rising edge is followed by the next rising edge or a falling edge by the next falling edge. The example in the diagram shows that a complete cycle was performed between time  $T_1$  and time  $T_2$ . Each outlet was supplied with lubricant once.

## 5.7 Troubleshooting

If there is no signal change and/or no delivery of lubricant to the lubrication point in spite of lubricant being fed into the inlet of the PVN, the following scenarios may have occurred:

Possible Error	Remedy
Blockage of one or more lubrication points	Check the lubrication points, disconnect the hoses
Internal blockage of the PVN	Check the function of the distributor, disconnect the hoses
Leak in a connecting line	Check the connecting lines from the lubricant supply to the PVN and from the PVN to the lubrication points
Defect in the monitoring device	Check the lubrication points, remove the hoses

If you cannot detect a blockage at a lubrication point and ensure that lubricant is delivered from the lubrication supply to the PVN, but still no signal change occurs, send the distributor to the manufacturer for inspection.

## 6. Maintenance and disposal

- Before starting any maintenance work, inform yourself about the general safety instructions (see Chapter 2) and observe the relevant local and operational safety regulations.
- Do not deactivate any protective device without authorization!

### 6.1 Maintenance schedule

The following maintenance schedule must be observed for the PVN:

Maintenance	Commis- sioning	After 500 hours or after 3 months	Every year	If required
Cleaning	x	x	x	x*
Visual check	x	x	x	x*

\* Depending on operating conditions and lubricant consumption

#### 6.1.1 Visual check

- Check the entire lubrication system for external damage (e.g. loose or loosened tubes) by a thorough and conscientious visual inspection.
- Check the condition of the lubrication point for correct supply of lubricant.
- Replace damaged or defective parts immediately to ensure permanent lubrication.

#### 6.1.2 Cleaning

- Clean the PVN from dirt using suitable cleaning agents (e.g. absorbent towels, cloths).

	<b>NOTICE</b>
	<p><b>Compressed air can damage the seals of the PVN as well as transport dirt and foreign bodies into the PVN or the lubricant.</b></p> <ul style="list-style-type: none"> <li>■ Do not use compressed air to clean the PVN.</li> </ul>

#### 6.1.3 Recommissioning after maintenance

- Reinstall all safety devices and make sure that no tools remain in the danger area.

## 6.2 Disposal

- When disposing the PVN, observe the relevant national regulations in force.
- When disposing the PVN, observe the relevant safety data sheets and disposal instructions for the individual components.

## 7. Released accessories

part-no.	Bezeichnung
134-002-003	Cable M12x1; straight plug; 4-pin; open end; 5m
134-002-007	Cable M12x1; straight plug; 4-pin; open end; 10m

## 7.1 Lubricants

Only use lubricants approved by the manufacturer DLS Schmiersysteme GmbH.

## 7.2 Tube lengths

In principle, the recommendation is to mount the PVN as close as possible to the lubricant supply and to keep the distance between the PVN and the lubrication points as small as possible.

If the case arises that you cannot mount the PVN directly or at the specified distance (chapter 3.4) to the lubricant supply, contact the manufacturer to verify your application. The influence of temperature, the grease used, the hoses and accessories used does not allow a general statement to be made about the possible hose length on the PVN.



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