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<td>55</td>
</tr>
</tbody>
</table>
2 General

2.1 Object of assembly instructions

These assembly instructions are to ensure the safe, intended and efficient use of the module. They contain the relevant information for safety, overview, function, assembly, maintenance and disposal. The required information can be located in the assembly instructions using the contents index, title and marginal columns.

Ignoring the assembly instructions and the safety information can lead to hazards and restrictions for:

- the operator's health,
- the system and material assets of the operating company;
- efficient operation of the module.

**NOTICE**

Ignoring the assembly instructions

DOPAG (hereafter called the manufacturer of the module) shall take no responsibility whatsoever for any damage resulting from not observing the assembly instructions.

► Observe the assembly instructions!

The assembly instructions is part of this module. They must be made available to the operators at all times. The assembly instructions include behavior information which DOPAG as manufacturer of the module hands on to the final consumer, even if this module is part of a machine.

2.2 Keeping the assembly instructions

The assembly instructions including the Declaration of Incorporation must be enclosed with the module until it is installed in the machine. After the installation, the assembly instructions and the included Declaration of Incorporation form part of the machine's technical documentation.

2.3 Target audience

These assembly instructions are intended for the users who can be in charge of the assembly, operation, maintenance or disposal.

**Assembly personnel**

Persons working at and operating the module must possess sufficient training for the operations concerned. It is essential for personnel to have read and understood the assembly instructions.

Persons who service and repair the modules must be skilled and:

- adequately trained to undertake the operations necessary.
- be familiar with and follow the relevant technical regulations and safety instructions.
- have read and understood the assembly instructions.

Skilled persons mean those whose training and experience have provided them with adequate knowledge in the field of the module. This personnel must be familiar with the regulations applicable to occupational safety and accident prevention, directives and generally recognized rules on technology and standards, so that they can evaluate the operational safety of the module.
2.4 **Note on changes**

Text, illustrations and data conform to the technical status of the machine at the time of these operating instructions going to print. The company reserves the right to make changes in the interests of ongoing development.

2.5 **Symbols and pictograms**

The operating instructions contain various symbols and pictograms. They provide warning signs, directions for action, information and indication signs to the operating and maintenance staff.

**Directions for action to be taken**

- The triangle symbol indicates actions that must be carried out in a specific sequence.
- The dot symbol indicates the reaction to an action.

**Help symbols regarding directions for actions to be taken**

Help symbols are found in graphic diagrams only. They support a direction for action to be taken by means of a sequence of numbers directly on the respective part. Help symbols usually consist of a colored circle and a number.

**Warning signs, prohibition signs and mandatory signs.**

Notes on safety, instructions and warnings are indicated by the appropriate ISO Safety Signs. They can be found in the operating instructions and on the machine and it is essential that they are obeyed.

**Pictograms**

Buttons, switches, pressure gauges and functions are designated by pictograms in the operating instructions and on the system itself. The letters A, B, C... in the pictograms identify the components.

**Advice for the user**

Notes for the users and tips for efficient operation of the system are indicated by the light bulb symbol and typeset in bold type. Follow these instructions!

2.6 **Margin column**

The margin column contains additional information (pictograms, keywords and descriptions of illustrations as well as directions for action to be taken). In addition, the margin column points out hazards and makes it easier to find what you search.
2.7 Safety information

There are four types of safety information: Danger, warning, caution, note. They contain: Source of danger, consequences of the risk and avoidance measures to be taken.

**Danger**

Signal word to indicate a danger with a high risk that will lead directly to death or serious physical injury.

![DANGER]

Source of danger

Consequences of the risk

► Avoidance measures to be taken

**Warning**

Signal word to indicate a hazard with a medium risk that could possibly lead to death or serious physical injury.

![WARNING]

Source of danger

Consequences of the risk

► Avoidance measures to be taken

**Caution**

Signal word to indicate a hazard with a low risk that can lead to minor or moderate physical injury.

![CAUTION]

Source of danger

Consequences of the risk

► Avoidance measures to be taken

**Note**

Signal word for a possible damaging situation, were the system or anything in the vicinity could be damaged.

![NOTICE]

Source of danger

Consequences of the risk

► Avoidance measures to be taken
2.8 Mandatory signs

Mandatory signs prescribe specific courses of action. They must be followed, as they help protect against injury.

Wear protective gloves
Wearing protective gloves prevents contact with toxic substances. Caustic burns and poisoning are avoided.

Wear protective goggles
Parts of the machine operate under pressure and spraying substances can cause damage to eyes. Wearing eye protection avoids damage to eyes.

Wear protective mask
Wearing protective masks prevents the inhalation of toxic or caustic substances. Check the material manufacturer’s safety regulations.

2.9 Transportation

The module is packaged and delivered by the manufacturer in a proper manner. It is protected for transport and against weather conditions, and provided with suitable packaging materials.

Transport the module to the application site in packaged condition if possible and only remove package before first use. The packaging protects the module.
3 Safety rules

3.1 Intended use

The DOPAG progressive cavity pump PCP is partly completed machinery as defined in the Directive 2006/42/EC. The PCP is solely intended to for the purpose of metering viscous liquids, adhesives, greases and oils, which may also be abrasive. The materials to be processed must be approved by DOPAG Service. DOPAG products are manufactured according to the state of the art and to the acknowledged safety rules. However, when using them, risks for the health of the user or a third person can remain or damage to the module or other material damage can occur.

- The material must only be applied to the surface intended for the application and never be directed towards people.
- The operation must occur within the specified environmental conditions.
- It is prohibited to meter materials that form explosive vapors. This module is not explosion-proof.
- Metering foodstuff is prohibited. This module has not been designed for processing foodstuff. Toxic substances would contaminate foodstuff.
- The control function is part of the control unit of the superordinate machine and must be assessed by the manufacturer of the superordinate machine.
- The materials to be metered must be approved by DOPAG Service. If the composition changes or a different type of material is to be used, this must be clarified and approved by DOPAG Service.

**NOTICE**

The use of material not approved by DOPAG Service may damage this module. If for example seals cannot withstand the new composition, they will be destroyed.

► Information on your telephone contact can be obtained from www.dopag.com.

3.2 Foreseeable misuse

This module must not be used for:

- Metering reactive (mixed) material.
- Metering air, gas and water.
- Metering foodstuff.
- Metering powder or similar substances.

3.3 Product safety

The module conforms to acknowledged rules of engineering and technology and the relevant safety regulations. The correct operation of the module is required to avoid damage and accidents. Operating it incorrectly or subjecting it to abuse, or ignoring the application limits and the safety instructions, may imperil:

- the operator's health.
- the module and material assets of the operating company.
- efficient operation of the module.
- the environment.

The module may only be operated if it is in perfect condition and if the assembly instructions are observed.
3.4 Responsibilities of the operating company

The following responsibilities are generally applicable to the company operating the module:

- Observe the generally recognized rules that apply to occupational safety (PPE). Moreover, observe the basic regulations and rules on occupational safety and accident prevention applicable on site.
- The operating company is obliged to observe the regulations applicable to the use of equipment, especially those specified in EC Directive 2009/104/EC.
- The module may only be operated in a perfect and clean condition.
- Redesigning or modifying this module is prohibited.
- For repairs, please contact DOPAG Service www.dopag.com. Only genuine DOPAG spare parts may be used.
- Check the module at regular intervals for visible signs of damage and for correct functions.
- The operating company is responsible for the compliance with the safety regulations when dealing with the material used.

3.5 Changes on the module

Basically, changes on the module are prohibited. However, if changes become necessary, please observe the following points:

- Do not undertake changes, add-on or modification to the module without express approval by the manufacturer.
- All redesigning measures require written approval by the manufacturer.
- Only genuine DOPAG spare parts may be used. Safe operation is not guaranteed if parts other than the genuine parts are used.
3.6 Hazardous zones

The hazardous zone denotes the area on a module and/or in its vicinity in which there are dangers to safety or personal health. There are various danger zones around the module. All safety regulations given in the assembly instructions and information signs on the module must be observed. Observe the safety regulations in force for the respective installation site.

Particular sources of danger

Operating this module conforms to the general safety standards. However, hazards can arise in some situations.

• Whenever performing work relating to the assembly, disassembly, commissioning, operation, relocation, adaptation, maintenance and cleaning of the machine, the safety information given in the assembly instructions are to be observed.
• All service and maintenance work on the module must be carried out only after it has been turned off or depressurized.
• In all cases, observe the local regulations applicable to safety and accident prevention when operating the module.

Danger from electric power

Electricity is dangerous in many ways. Adhere to the following points:

• Work on power supply systems may only be performed by qualified electricians.
• Check the module’s electrical equipment regularly. Loose connections and burnt cables should be removed immediately or restored to their proper condition.
• If work is necessary on live parts, a second person, who can turn off the main switch in an emergency, must assist.

Danger from high pressure

Pneumatic and hydraulic modules are pressurized.

• When dealing with the module, you must wear protective goggles and gloves.
• Depressurize the module before beginning the repair works.

Danger from toxic and combustible materials

Depending on the material being processed, special rules and regulations regarding occupational safety and accident prevention must be observed:

• When using solvents or other corrosive chemicals, special precautions must be taken, e.g. eye washing facilities.
• During flushing and cleaning processes, vaporization of solvents may create an explosive zone.
• See the material data sheet provided by the manufacturer.
3.7 Warranty and liability

Claims under the warranty and liability for personal and material damage are excluded if they are due to one or several of the following causes:

- Improper use of the module.
- Improper assembly, commissioning, operation and maintenance.
- Operating the module with faulty safety systems or protective systems that have been incorrectly fitted, or non-functional safety and protection devices.
- Disregarding instructions on safety, transport, storage, assembly, commissioning, maintenance and disposal of the module.
- Unauthorized structural modification to the components.
- Poor monitoring of components subject to wear.
- Repair work carried out improperly.
- Disasters caused by extraneous influences and force majeure.
- Use of spare parts which are not genuine DOPAG parts.
- Damage arising from normal wear and tear.

3.8 Declaration of incorporation

The module complies with the directives listed in the declaration of incorporation (see chapter 10 EC Declaration of incorporation (as per directive 2006/42/EC)).
4 Overview and function

4.1 Basic function

The Progressive Cavity Pump PCP is a compact unit consisting of a drive and a rotor/stator housing.

PCP basic function

The Progressive Cavity Pump is considered to be a rotating displacement pump. The displacement volumetric concept is achieved by the rotating movement of the eccentric rotor in the elastic stator. The discharge amount is proportional to the rotor speed. Thus, the material can be delivered continuously, gently and with low shearing and pulsations. The optimized design of the metering chamber enables metering lubricants and pastes of different viscosities and with different fillers at a metering accuracy of ±1 percent. The PCP is available in different material combinations and sizes especially designed for each application.

Functional diagram

![Functional diagram of PCP](image-url)
4.2 Overview

4.2.1 Structure

The progressive cavity pump (PCP) is an electrically controlled delivering and discharge system for processing lubricants and 1-component materials. A servomotor ensures the eccentric rotating movement of the rotor, which, together with the stator, makes up the metering chamber. The controlled rotation causes the material to be continuously delivered and discharged with low shearing. Additionally, the back suction effect prevents the material from flowing and dripping after the metering is completed. The pump can be de-aerated by using the integrated de-aeration screw in order to discharge material free of bubbles.

Components
1 Motor connector plug
2 Drive
3 De-aeration screw
4 Material inlet (MI)
5 Rotor/stator housing
6 Material outlet, Luer-Lock connection (MO)
7 Mounting bores
Overview and function

4.3 Technical data

4.3.1 PCP dimensions

PCP dimensions

- M4 AO
- 4xM4
- Befestigungsbohrung
- 12 pins
- Männlich / Male
- Luer Lock
- MI
- 1.5
- C
- MO
- B
- M3
- 13.5
- 14.5
- SW / AF 11
- 30
4.3.2 Electrical connection

Motor pin positions

View of the Progressive Cavity Pump connector plug.

Pin assignment

```
DC Motor

+ VDC - 24VDC
- GND
+VCC 5VDC
- GND
A channel
A/ channel
B channel
B/ channel
C channel
C/ channel
```

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<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>77.3</td>
<td>154.7</td>
<td>76.3</td>
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<td>0.45 kg</td>
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<tr>
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<td>0.48 kg</td>
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### 4.3.3 Types

#### Versions

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<td>0.3</td>
<td>0.03</td>
<td>3 - 45</td>
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The maximum speed for all progressive cavity pumps is 150 rpm.

#### Material

<table>
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<tr>
<th>Type</th>
<th>Inlet pressure [bar]</th>
<th>Max. pressure [bar]</th>
<th>Rotor coating</th>
<th>Stator material</th>
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<td>10</td>
<td>hard chrome-plated</td>
<td>FKM</td>
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<tr>
<td>1025907</td>
<td>0 - 6</td>
<td>10</td>
<td>hard chrome-plated</td>
<td>FFKM</td>
</tr>
<tr>
<td>1020346</td>
<td>0 - 6</td>
<td>10</td>
<td>hard chrome-plated</td>
<td>FKM</td>
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<tr>
<td>1021232</td>
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<td>FKM</td>
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<tr>
<td>1025912</td>
<td>0 - 6</td>
<td>10</td>
<td>hard chrome-plated</td>
<td>FFKM</td>
</tr>
</tbody>
</table>

#### Technical data

- **Viscosity range**: up to approx. 150,000 mPas
- **Max. permitted material temperature**: 40°C

#### Maximum speed

<table>
<thead>
<tr>
<th>Viscosity</th>
<th>Maximum speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mPas - 800 mPas</td>
<td>100%</td>
</tr>
<tr>
<td>800 mPas - 10000 mPas</td>
<td>90%</td>
</tr>
<tr>
<td>10000 mPas - 25000 mPas</td>
<td>70%</td>
</tr>
<tr>
<td>25000 mPas - 50000 mPas</td>
<td>50%</td>
</tr>
<tr>
<td>50000 mPas - 150000 mPas</td>
<td>25%</td>
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4.3.4 Ambient conditions

**Operation**

<table>
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<tr>
<th>Operation (without material)</th>
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</thead>
<tbody>
<tr>
<td>Air temperature</td>
</tr>
<tr>
<td>+ 10°C to + 40°C</td>
</tr>
<tr>
<td>Relative humidity</td>
</tr>
<tr>
<td>30% to 70%, no condensation</td>
</tr>
</tbody>
</table>

**Storage**

<table>
<thead>
<tr>
<th>Storage (without material)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature</td>
</tr>
<tr>
<td>Max. 25°C</td>
</tr>
<tr>
<td>Relative humidity</td>
</tr>
<tr>
<td>30% to 80%, no condensation</td>
</tr>
</tbody>
</table>

The Progressive Cavity Pump must be protected against direct sunlight and UV light.

**Material processing temperature**

For all operations, the material must be brought to the correct processing temperature. This temperature is to be considered, if the material is taken out of cold storage.

Observe the temperature information on the data sheet provided by the material manufacturer.

4.3.5 Emissions

<table>
<thead>
<tr>
<th>Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission sound pressure level at workplace</td>
</tr>
<tr>
<td>LpA according to ISO 4871</td>
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</table>
5 Options

In these assembly instructions, additional options are described which are possibly not contained in the assembly supplied to you. These assembly instructions cover all possible versions and variants of this line of products.

5.1 Servo regulator

The Progressive Cavity Pump features a drive unit consisting of connecting cables, supports and the servo regulator. This is parameterized ex works appropriately for the pump.

The servo regulator can be installed in a control unit in any position. It can be snapped on a DIN rail or assembled using the fastening bore.

The adapter with screw terminals connected with the flat ribbon cable can also be snapped on a DIN rail.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cable length</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive unit</td>
<td>5 m</td>
<td>1023415</td>
</tr>
</tbody>
</table>

Servo regulator dimensions

Electrical connection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>10...50 VDC</td>
</tr>
<tr>
<td>Suitable cables</td>
<td>0.14...1.5 mm² single-wire/multi-wire, AWG 28-14</td>
</tr>
</tbody>
</table>
5.2 Cartridge supply

5.2.1 Optional cartridge supply

Structure
1 Air connection
2 Cartridge holder
3 Material connection
4 De-aeration screw
5 Piston
6 Cartridge
7 Cartridge adapter
8 Pressure switch

Cartridge supply 10 cc
Material supply with 10 cc contents and adjustable pressure switch.

<table>
<thead>
<tr>
<th>Item</th>
<th>Nominal size</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridge supply</td>
<td>10 cc</td>
<td>1023641</td>
</tr>
</tbody>
</table>

Cartridge supply 30 cc and 55 cc
Material supply with 30 cc or 55 cc contents and adjustable pressure switch. Attachment to the right or left of the Progressive Cavity Pump.

<table>
<thead>
<tr>
<th>Item</th>
<th>Nominal size</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridge supply right</td>
<td>30 cc</td>
<td>1023482</td>
</tr>
<tr>
<td>Cartridge supply left</td>
<td>30 cc</td>
<td>1025984</td>
</tr>
<tr>
<td>Cartridge supply right</td>
<td>55 cc</td>
<td>1023640</td>
</tr>
<tr>
<td>Cartridge supply left</td>
<td>55 cc</td>
<td>1025985</td>
</tr>
</tbody>
</table>
Dimensions
Cartridge supply 10 cc

Options
Dimensions
Cartridge supply 30 cc

Dimensions
Cartridge supply 30 cc
Dimensions
Cartridge supply 55 cc
5.2.2 Level control for cartridge supply

**Level control for cartridge supply 10 cc**
Level control for cartridge supply with 10 cc contents.

<table>
<thead>
<tr>
<th>Item</th>
<th>Nominal size</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridge level control</td>
<td>10 cc</td>
<td>1026026</td>
</tr>
</tbody>
</table>

**Level control for cartridge supply 30 cc and 55 cc**
Level control for cartridge supply with 30 cc and 55 cc contents.

<table>
<thead>
<tr>
<th>Item</th>
<th>Nominal size</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridge level control</td>
<td>30/55 cc</td>
<td>1026027</td>
</tr>
</tbody>
</table>

**Cable with connector for level control**
*Ready-made cable including connector*

**Technical data**
- **Type**: M8 x 1, 3 pins
- **Nominal voltage**: 24 V AC/DC
- **Connection cable type**: PUR / PP 3x0.25 mm²
- **Connection cable**: Length 10 m, Ø 4.4 mm

**Wiring diagram 29.01.238**
Dimensions
Cartridge supply
Level control 10 cc

Dimensions
Cartridge supply
Level control
30 and 55 cc
5.2.3 Pressure regulator for cartridge supply

Pressure regulator for cartridge supply with manual ball valve for pressure discharge.

<table>
<thead>
<tr>
<th>Item</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball valve iG1/4 with pressure regulator 0.1-7 bar iØ4</td>
<td>1026385</td>
</tr>
</tbody>
</table>

**Technical data**

- **Air connection (PI)**: G 1/4
- **Compressed air**: 5 - 7 bar
- **Outlet pressure control range (PO)**: non-lubricated
- **Condition of the compressed air**: 0.1 - 7 bar

Pressure regulator for cartridge supply with electric solenoid valve for pressure discharge.

<table>
<thead>
<tr>
<th>Item</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/2-way solenoid valve iG1/8 with pressure regulator 0.1-7 bar iØ4</td>
<td>1026386</td>
</tr>
</tbody>
</table>

**Technical data**

- **Air connection (PI)**: G 1/8
- **Compressed air**: 5 - 7 bar
- **Condition of the compressed air**: non-lubricated
- **Outlet pressure control range (PO)**: 0.1 - 7 bar
- **Operating voltage**: 24 V DC
- **Electrical connection**: 3-pin M8x1 connector
Cable with connector for solenoid valve

Ready-made cable including connector

<table>
<thead>
<tr>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Nominal voltage</td>
</tr>
<tr>
<td>Connection cable type</td>
</tr>
<tr>
<td>Connection cable</td>
</tr>
</tbody>
</table>

Wiring diagram 29.01.238

Pressure regulator dimensions for manual cartridge supply
5.3 Luer-Lock metering needles

A metering needle is mounted on the material outlet of the pump. Various disposable needles are available for this purpose.

<table>
<thead>
<tr>
<th>Luer-Lock precision metering needles made of stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Disposable needle Ø 0.58 mm</td>
</tr>
<tr>
<td>Disposable needle Ø 0.84 mm</td>
</tr>
<tr>
<td>Disposable needle Ø 1.60 mm</td>
</tr>
<tr>
<td>Disposable needle Ø 1.80 mm</td>
</tr>
<tr>
<td>Disposable needle Ø 2.00 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conical Luer-Lock metering needles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Disposable needle Ø 1.00 mm</td>
</tr>
</tbody>
</table>
5.4 Spraying adapter

5.4.1 Optional spraying adapter

The spraying adapter is screwed into the material outlet of the PCP. It is used to atomize and discharge the metered quantity. The spray air ZL is turned on prior to the metering process and turned off once metering has been finished. The material flow rate can be adjusted by the pump speed.

**WARNING**

Inhalation of atomized spray!

The material is atomized using the spray air and finds its way into the breathing air.

► Wear a protective mask or install an extraction system.

<table>
<thead>
<tr>
<th>Item</th>
<th>Nozzle</th>
<th>DOPAG item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spraying adapter</td>
<td>Ø1 mm</td>
<td>1027237</td>
</tr>
</tbody>
</table>

Each spraying adapter must be provided either with an air cap or a nozzle extension screwed onto the adapter. Below, please find a table of the available air caps and an overview of the nozzle extensions.
Standard flat-jet air caps

The air caps differ in the type of their use and in their spray pattern. The FS air cap generates a flat spray jet and, depending on the version, a spray cone of 45°-90°.

<table>
<thead>
<tr>
<th>DOPAG item No.</th>
<th>Version</th>
<th>Nozzle Ø (hole)</th>
<th>Nozzle Ø (OD)</th>
<th>Length</th>
<th>Spray cone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1015088 FS</td>
<td>0.2 - 1.0 mm</td>
<td>20 mm</td>
<td>14.5 mm</td>
<td>45°</td>
<td></td>
</tr>
<tr>
<td>1015090 FS</td>
<td>0.2 - 1.0 mm</td>
<td>20 mm</td>
<td>14.5 mm</td>
<td>60°</td>
<td></td>
</tr>
<tr>
<td>1015092 FS</td>
<td>0.2 - 1.0 mm</td>
<td>20 mm</td>
<td>14.5 mm</td>
<td>90°</td>
<td></td>
</tr>
</tbody>
</table>

Standard round-jet air caps

The RS air cap generates a round spray jet and, depending on its design, a spray cone of 15°.

<table>
<thead>
<tr>
<th>DOPAG item No.</th>
<th>Version</th>
<th>Nozzle Ø (hole)</th>
<th>Nozzle Ø (OD)</th>
<th>Length</th>
<th>Spray cone</th>
</tr>
</thead>
<tbody>
<tr>
<td>22036276 RS</td>
<td>0.2 - 1.0 mm</td>
<td>20 mm</td>
<td>11 mm</td>
<td>15°</td>
<td></td>
</tr>
</tbody>
</table>

Nozzle extensions

The extensions have been especially developed for applications in which only very small space is available for installation in machines or robots. Non needle-closing nozzle extensions seal the valve, while for needle-closing valves, the needle is tight on the extension tip. This prevents any dripping. Nozzle extensions can be evaluated and ordered after consulting with DOPAG Service- www.dopag.com.

1 Straight spraying
2 Ring jet
3 Flat jet
4 Angled
Combined with spraying adapters, only non needle-closing nozzle extensions with nozzles of Ø0.2 to Ø1.0 mm can be used.

**5.4.2 Air maintenance unit for spraying adapter**

Air maintenance unit
1029833

1  Spray air pressure controller P2
2  Compressed-air connection P1
3  Water separator
4  Drain plug
5  Air connection P1
6  Spray air P2
Drain water

- Open the compressed-air main valve.
- Hold a collector vessel under the water separator.
- Open the drain plug in counterclockwise direction.
  - Water drains off.

**WARNING**

Risk of splashing!
The water is released under pressure and spraying can occur.
- Wear safety goggles.

- Once the water has drained off completely, close the drain plug by turning it clockwise.

### 5.4.3 Solenoid valve for spraying adapter

**Solenoid valve 1013259**
The solenoid valve is used to control the spray air.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air connection</td>
<td>Ø 6mm i Ø4mm</td>
</tr>
<tr>
<td>Compressed air</td>
<td>-0.9 - 8 bar</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Condition of the compressed air</td>
<td>non-lubricated</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Connector ZC, 10m cable with open ends</td>
</tr>
</tbody>
</table>

**Functional diagram**
6 Assembly

6.1 Transportation

The module is packaged and delivered by the manufacturer in a proper manner. It is protected for transport and against weather conditions, and provided with suitable packaging materials.

Transport the module to the application site in packaged condition if possible and only remove package before first use. The packaging protects the module.

6.2 Removing packaging

Disposal
All packaging material must be removed with care. Packaging material must be disposed of in the correct manner (see chapter 9 Disposal).

Warranty conditions
The module must be checked for damage that may have occurred in transit. If damage is found, then the warranty conditions must be observed. The warranty conditions are described in the sales documents.

6.3 Installation in a system

The module has been designed for operation in spaces that are protected from weather effects. Operation and storage in an environment containing aggressive substances or too high humidity or outdoors will result in corrosion damage, for which the manufacturer does not assume liability.

Progressive cavity pump

The progressive cavity pump PCP can be installed in any position. It can be assembled in a system either guided by hand or with the fastening bores, see 4.3.1 PCP dimensions.

6.4 Connection

6.4.1 Electrical connection

Progressive Cavity Pump
The Progressive Cavity Pump must be connected to a servo regulator. (4.3.2 Electrical connection)

The optional servo regulator is pre-parameterized and is available with all connection cables (5.1 Servo regulator).
6.4.2 Electrical connection of drive set (option)

Servo regulator

The servo regulator of the progressive cavity pump must be connected to an electrical control unit. The connections are related to:

- Regulator power supply.
- PWM signal = rated speed.
- CW rotation = metering, CCW rotation = back suction.
- Evaluation of the metering readiness.
- Acceleration/deceleration specification.

**DANGER**

Danger of electric shock!

Touching parts in this danger zone may result in serious or fatal injury from electric shock.

► Work on power supply systems may only be performed by qualified electricians.

**Rated speed PWM signal**

The PWM (pulse width modulation) signal is a square wave signal with constant period duration that oscillates between two different voltage levels. Basically, the signal is switched on and off in rapid succession. The ratio between pulse (A) and pause (B) can differ and is called pulse duty factor.

The PWM signal may feature a frequency between 10 Hz and 5 kHz.

A pulse duty factor of 10% results in a speed of 0 rpm.

A pulse duty factor of 90% results in a maximum speed of 150 rpm.

---

Rotating direction

The CW (clockwise) rotating direction corresponds to the metering, the CCW (counter clockwise) rotating direction corresponds to the back suction.

Metering readiness

If all the required signals are active and the servo card does not have an error, the "Ready" signal is issued. As soon as this signal has the value "1", the metering process can be started.

Acceleration/deceleration

0 - 10 V signal for acceleration and deceleration of the progressive cavity pump.
The diagram shows the acceleration time depending on the setpoint value in volts up to the maximum speed. The value is also valid for deceleration of the maximum speed to zero.
6.4.3 Circuit diagram of servo regulator

- Power supply: 10...50VDC
- Digital in-/outputs: 2.4...38VDC
- Analog output: 0...10V

ESCON-50/5

- Adapter 10 polig
- Header 10 poles
Pin assignment description of the servo regulator

<table>
<thead>
<tr>
<th>J1 pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Power_GND</td>
<td>Ground for operating voltage</td>
</tr>
<tr>
<td>+</td>
<td>+Vcc</td>
<td>Rated operating voltage (24VDC / 5A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>J2 pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motor winding 1</td>
<td>Motor cable pin 9 rd</td>
</tr>
<tr>
<td>2</td>
<td>Motor winding 2</td>
<td>Motor cable pin 10 vt</td>
</tr>
<tr>
<td>3</td>
<td>Motor winding 3</td>
<td>Not required</td>
</tr>
<tr>
<td>4</td>
<td>Motor shield</td>
<td>Not required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>J3 pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hall sensor 1</td>
<td>Not required</td>
</tr>
<tr>
<td>2</td>
<td>Hall sensor 2</td>
<td>Not required</td>
</tr>
<tr>
<td>3</td>
<td>Hall sensor 3</td>
<td>Not required</td>
</tr>
<tr>
<td>4</td>
<td>+5 VDC</td>
<td>Not required</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Not required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>J4</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10</td>
<td>Encoder</td>
<td>Flat ribbon cable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>J5 pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DigIn 1</td>
<td>PWM signal speed</td>
</tr>
<tr>
<td>2</td>
<td>DigIn 2</td>
<td>CW rotation, metering</td>
</tr>
<tr>
<td>3</td>
<td>DigIn 3</td>
<td>CCW rotation, back suction</td>
</tr>
<tr>
<td>4</td>
<td>DigOut 4</td>
<td>Servo regulator readiness</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>+5 VDC</td>
<td>Not required</td>
</tr>
</tbody>
</table>

The maximum speed depends on the viscosity. **4.3.3 Types**

<table>
<thead>
<tr>
<th>J6 pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AnIN1 +</td>
<td>Acceleration/deceleration</td>
</tr>
<tr>
<td>2</td>
<td>AnIN1 -</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>AnIN2 +</td>
<td>Not required</td>
</tr>
<tr>
<td>4</td>
<td>AnIN2 -</td>
<td>Not required</td>
</tr>
<tr>
<td>5</td>
<td>AnOUT 1</td>
<td>Not required</td>
</tr>
<tr>
<td>6</td>
<td>AnOUT 2</td>
<td>Not required</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>Not required</td>
</tr>
</tbody>
</table>
Please note the pressure and stability of your Progressive Cavity Pump (4.3.3 Types).

6.4.4 Material connection

The Progressive Cavity Pump PCP must be connected to the material supply (4.3.1 PCP dimensions).

Cartridge supply connection diagram

Connect the external material supply or cartridge supply (option).

The cartridge supply must be pressurized with compressed air to max. 6 bar. The adjustable pressure switch must be set approx. 0.5 bar below the supply pressure and can be evaluated.

Cartridge supply level control connection diagram

If the cartridge supply is fitted with a level control (option), both level signals "empty" and "minimum" must be connected to the control unit.

- S1: Empty level
- S2: Minimum level

3-pin M8x1 connector

6.4.5 Connecting the spraying adapter (option)

Preparation

Make sure that the cartridge supply, the pipes or the hoses have been disassembled and the connection to the servo regulator has been disconnected.
Tool

For the assembly of the spraying adapter, the hook wrench supplied with the system is required.

1. Screw off the Luer adapter from the pump housing.
2. Check that the stator is still tight. Retighten it with the open-end wrench if necessary.
3. Screw the spraying adapter onto the pump housing.
4. Install a spray attachment or nozzle extension.

Spray air

The spray air is connected to the push-in port and must be operated with an external pneumatic valve 5.4.3 Solenoid valve for spraying adapter.

6.5 Setup

6.5.1 Basic inspection

Check the Progressive Cavity Pump

- Check the material supply connection.
- Check the servo card power supply.
- Check the servo card connections to the superordinate control unit.
- Check the connections from the servo card to the Progressive Cavity Pump.
- Check the status display of the servo regulator. The LED must illuminate in green.

6.5.2 De-aeration of the progressive cavity pump

6.5.2.1 De-aeration without starting the pump

The progressive cavity pump PCP must be de-aerated during initial commissioning and after maintenance work on the supply lines.

Note the following before starting:

- The control unit must be ON.
- The material supply system has been de-aerated and is ready.

WARNING

Risk of splashing during de-aeration!

The material is released under high pressure and spraying may occur due to entrapped air!

- Always wear eye protection and protective gloves! Observe the material manufacturer’s safety information.
Sequence

1. Place the pump in the shown position.
   - Pressurize the supply.
2. Unscrew the de-aeration screw a few millimeters until the air can escape.
3. Wait until the material is discharged free of bubbles.
4. Depressurize the supply.
5. Close the de-aeration screw and remove the discharged material.
6.5.2.2 De-aeration starting the pump

**Sequence**

1. Place the pump in the shown position.
   - Pressurize the supply.
2. Start the pump until the material is discharged free of bubbles.
3. Depressurize the supply.
6.6 Discharging

The machine must be inspected visually every day before the beginning of the work shift. It should be shut down immediately, if there is any doubt about trouble-free operation. Before starting further operations, the machine must be checked by the maintenance staff.

Operate the progressive cavity pump as shown on the flow diagram.
Spraying adapter (option)  ▶  Turn on the spray air just before the metering process and turn it off once metering has been finished.

6.7 Changing the cartridge

Removal

If the progressive cavity pump is fitted with the optional "cartridge supply", it must be replaced when empty.

Cartridge adapter removal

1. Depressurize the cartridge.
2. Hold the cartridge.
3. Rotate the cartridge adapter 90°.
4. Pull out the cartridge adapter.

The cartridge is inserted in the reverse order.

Cartridge removal

1. Unscrew the cartridge.
2. Remove the cartridge.
De-aeration

1. Pressurize the cartridge.
2. Open the de-aeration screw.
3. Close the de-aeration screw as soon as material free of air or bubbles is discharged.
7 Maintenance

7.1 General

Maintenance work must be undertaken by properly trained maintenance staff (2.3 Target audience).

⚠️ WARNING

Danger arising from maintenance work!
If you undertake maintenance work without having received the necessary training, system safety is no longer guaranteed. This can cause serious physical injury or death.
► Observe all safety instructions and leave maintenance to trained staff.

⚠️ WARNING

Danger from high pressure!
Risk of injuries when working on modules and machine parts which have not been depressurized.
► Material and air pressure must be released when carrying out work. No residual pressure may exist. The compressed-air connection of your superordinate module/system must be removed.

7.1.1 DOPAG Service

Please note the Service Center responsible for your area. For current addresses, go to www.dopag.com.
7.2 Maintenance of the modules

7.2.1 Maintenance schedule

The Progressive Cavity Pump PCP is to a large extent maintenance free. The stator, rotor, seals and bearings are subject to wear and must be replaced at regular intervals.

We recommend to carry out regular inspections of the performance data. If the performance data decrease, maintenance shall be carried out.

To ensure trouble-free operation, the following maintenance intervals must be observed for the module:

<table>
<thead>
<tr>
<th>Maintenance task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection</td>
<td>daily</td>
</tr>
<tr>
<td>Cleaning</td>
<td>daily</td>
</tr>
<tr>
<td>Replace wear parts</td>
<td>if required</td>
</tr>
</tbody>
</table>

7.2.2 Visual inspection

The following points must be checked:

- Are all safety systems present and fully functional?
- Are the whole assembly instructions of the module available?
- Are all safety and danger warnings as well as labels present and clearly legible?
- Are all the couplings tight?

7.2.3 Cleaning

The module should be cleaned daily and immediately if it is contaminated with material. Dried material is very difficult to remove and requires a great effort.

**DANGER**

Danger of explosion when using solvents!

When using solvents based on halogenated hydrocarbons, such as trichloroethane, chemical reactions can be caused on aluminum and on galvanized parts. The parts can oxidize and be destroyed as a result. In extreme cases, the reaction can occur in an explosive manner.

► Do not use any solvents based on halogenated hydrocarbons.

**NOTICE**

Wrong cleaning agent for cleaning the module.

Under no circumstances must the module be sprayed with water.

► Determine which cleaning agent to use from the material used, and clean the module as environmentally friendly and with as much care as possible.
7.2.4 Replace wear parts

Preparation

**CAUTION**

Risk of splashing!
The material is released under high pressure and spraying may occur due to entrapped air.
► Wear eye protection and protective gloves.

Make sure that the cartridge supply, the pipes or the hoses have been disassembled and the connection to the servo regulator has been disconnected.

**NOTICE**

Make sure the pertinent safety regulations for handling the liquid used last are observed.
► The contamination record can be taken from 7.1.1 DOPAG Service.

The progressive cavity pump can still contain fluid.

Tool

Three tools are required to disassemble the progressive cavity pump.
► Assembly tools supplied with the system
► Hook wrench Ø30 mm supplied with the system.
► Hexagon wrench AF 2.5.

Disassembly

1. Screw off the Luer adapter from the pump housing.
2. Carefully screw the stator off the pump housing.
3. Fasten the coupling using the assembly tool.
4. Carefully twist the stator off the rotor.
1. Release the setscrews using the hexagon wrench.

2. Remove the motor assembly.

1. Unscrew the fastening flange.

2. Unscrew the sealing package from the rotor unit.

1. Carefully pull off the sealing package from the rotor unit.
### 7.2.5 Troubleshooting

Malfunctions may occur during daily operation. Most malfunctions are listed here. You can remove them on your own initiative. If the malfunction cannot be remedied, please contact DOPAG Service, [www.dopag.com](http://www.dopag.com).

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material is not discharged.</td>
<td>No start signal active.</td>
<td>Activate the start signal on the relevant input.</td>
</tr>
<tr>
<td></td>
<td>No rotating direction specified.</td>
<td>Activate the CW or CCW signal.</td>
</tr>
<tr>
<td></td>
<td>No acceleration specified.</td>
<td>Set an analog signal for acceleration.</td>
</tr>
<tr>
<td></td>
<td>Servo card faulty.</td>
<td>Identify the error code and troubleshoot following the instructions.</td>
</tr>
<tr>
<td></td>
<td>Motor does not rotate.</td>
<td>Inspect the connections.</td>
</tr>
<tr>
<td></td>
<td>Material outlet clogged.</td>
<td>Replace the nozzle, clean the outlet.</td>
</tr>
<tr>
<td></td>
<td>No material supply.</td>
<td>Connect the material supply.</td>
</tr>
<tr>
<td></td>
<td>Material supply empty.</td>
<td>Replace/refill the material supply.</td>
</tr>
<tr>
<td></td>
<td>Rotor blocked in stator.</td>
<td>Progressive Cavity Pump maintenance required.</td>
</tr>
<tr>
<td></td>
<td>Incorrect speed.</td>
<td>Check the specifications on the superordinate control system (PWM signal).</td>
</tr>
<tr>
<td></td>
<td>No signal from the level control.</td>
<td>Sensor incorrectly set.</td>
</tr>
<tr>
<td></td>
<td>Magnet not installed on the piston.</td>
<td>Install a magnet on the piston.</td>
</tr>
</tbody>
</table>
### 7.2.6 Type code

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty sensor</td>
<td></td>
<td>Replace sensor.</td>
</tr>
</tbody>
</table>

#### Transfer direction
- Drive: PCP
- Connection material outlet: Luer lock adaptor
- Sealing: PTFE
- Stator: Hard chrome plated
- Rotor: Stainless steel
- Housing:
  - Aluminium: H
  - Stainless steel: S

#### Displacements
- 0.01 Capacity 0.01 ml/rev
- 0.05 Capacity 0.05 ml/rev
- 0.15 Capacity 0.15 ml/rev
- 0.30 Capacity 0.3 ml/rev

#### Series
- 1

#### Type
- 1
WARNING

It is dangerous to use incorrect spare parts!

Using spare parts that have not been tested and approved by DOPAG means that system safety is not guaranteed. This can cause serious physical injury or death.

► Use DOPAG spare parts only.

Storing the most important spare parts and parts subject to wear on the installation site is an important prerequisite for continuous operation and operational readiness of the machine or of the module supplied. If you have any question concerning the recommended spare parts, please contact DOPAG Service, www.dopag.com.

Seal set, rotor/stator set

1 Seal set
2 Rotor unit
3 Stator

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal size [ml]</th>
<th>Seal set</th>
<th>Rotor unit</th>
<th>Stator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1020344</td>
<td>0.01</td>
<td>1026098</td>
<td>1026099</td>
<td>1026102</td>
</tr>
<tr>
<td>1025907</td>
<td>0.01</td>
<td>1026098</td>
<td>1026099</td>
<td>1029821</td>
</tr>
<tr>
<td>1020346</td>
<td>0.05</td>
<td>1026098</td>
<td>1026100</td>
<td>1026103</td>
</tr>
<tr>
<td>1021232</td>
<td>0.05</td>
<td>1026098</td>
<td>1026100</td>
<td>1029824</td>
</tr>
<tr>
<td>1020347</td>
<td>0.15</td>
<td>1026098</td>
<td>1026101</td>
<td>1030064</td>
</tr>
<tr>
<td>1025908</td>
<td>0.15</td>
<td>1026098</td>
<td>1026101</td>
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</tr>
<tr>
<td>1025911</td>
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<td>1026098</td>
<td>1029818</td>
<td>1029841</td>
</tr>
<tr>
<td>1025912</td>
<td>0.3</td>
<td>1026098</td>
<td>1029818</td>
<td>1029822</td>
</tr>
</tbody>
</table>
9 Disposal

Check the reusability of materials and system parts prior to disposing of them. Recycle them as far as possible.

Careless or incorrect disposal can result in unforeseen consequences. Materials and system parts should be disposed of in a manner that is proven to be harmless to humans, nature and the environment. Note the details provided by the manufacturers and observe the legislation and regulations of the particular country.

Dispose of elements and module parts separately according to the type of material:
- Dispose of packaging material in an environmental-friendly manner.
- Non-ferrous metal
- Iron
- Electronic systems and components
- Plastics
- Organic substances, such as timber

Send the raw materials for recycling wherever possible.

Hazardous waste

**NOTICE**

Please observe the correct disposal of toxic substances and materials.

**CAUTION**

Observe the disposal!

Improper disposal may cause substantial harm for humans and environment.

► It is mandatory to correctly dispose of the used materials according to the material manufacturer’s instructions.

For an appropriate disposal by the manufacturer, please fill in the Declaration of Contamination correctly. For the Declaration of Contamination, go to [www.dopag.com](http://www.dopag.com).
EC Declaration of incorporation (as per directive 2006/42/EC)

We, the manufacturers of the partly completed machinery, declare that the following machine is in conformity with the directives listed below and that the mentioned standards were referred to.

This partly completed machinery may only be commissioned after assertion that the machine in which it is due to be installed, complies with the provisions of the directive 2006/42/EC.

Manufacturer
DOPAG Dosiertechnik und Pneumatik AG
Langackerstrasse 25
CH-6330 Cham

Authorized person for the compilation of the technical documentation
DOPAG Dosiertechnik und Pneumatik AG
Langackerstrasse 25
CH-6330 Cham

Designation
Progressive Cavity PumpPCP1

Type
PCP1/xx-AHx1L-ML

Directives

<table>
<thead>
<tr>
<th>Designation</th>
<th>Date</th>
</tr>
</thead>
</table>

Standards

<table>
<thead>
<tr>
<th>Applied standards</th>
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<tbody>
<tr>
<td>DIN EN ISO 12100</td>
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<tr>
<td>DIN EN 60204-1</td>
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<tr>
<td>DIN EN ISO 13732-1</td>
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<tr>
<td>DIN EN 82079-1</td>
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</tbody>
</table>

Place and date
Cham, 09/21

Technical Director

Signature