7 Lubrication, Cooling and Instrumentation

The type of lubrication depends on the following factors:
- Gear unit design and mounting position
- Operating conditions
- Ambient conditions

There are three different types of lubrication:
- Splash lubrication
- Bath lubrication
- Pressure lubrication

Additional cooling methods may be required depending on the required thermal rating of the gear unit.

The following cooling methods are possible as standard:
- Cooling fan on HSS
- 2 cooling fans on through going HSS (only for MC2P units)
- Pressure lubrication system with oil/water cooler
- Pressure lubrication system with oil/air cooler

The following table gives an overview of possible lubrication and cooling combinations:

<table>
<thead>
<tr>
<th>Lubrication</th>
<th>Splash lubrication</th>
<th>Bath lubrication</th>
<th>Pressure lubrication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- with cooling fan(s)</td>
<td>- with cooling fan(s)</td>
<td>- with cooling fan(s)</td>
</tr>
<tr>
<td></td>
<td>- without cooling fan(s)</td>
<td>- without cooling fan(s)</td>
<td>- without cooling fan(s)</td>
</tr>
<tr>
<td></td>
<td>with shaft end pump</td>
<td>with motor pump</td>
<td></td>
</tr>
<tr>
<td></td>
<td>without external cooler</td>
<td>with external cooler</td>
<td>without external cooler</td>
</tr>
<tr>
<td></td>
<td>- with cooling fan(s)</td>
<td>- oil/air cooler</td>
<td>- with cooling fan(s)</td>
</tr>
<tr>
<td></td>
<td>- without cooling fan(s)</td>
<td>- oil/water cooler</td>
<td>- without cooling fan(s)</td>
</tr>
<tr>
<td></td>
<td>- with cooling fan(s)</td>
<td>- oil/air cooler</td>
<td>- with cooling fan(s)</td>
</tr>
<tr>
<td></td>
<td>- without cooling fan(s)</td>
<td>- oil/water cooler</td>
<td>- without cooling fan(s)</td>
</tr>
</tbody>
</table>

The most common lubrication and cooling systems are described in the next chapters.
7.1 Splash lubrication

Splash lubrication is used for industrial gear units of the MC.. series with horizontal LSS (unit designation MC..L..). With splash lubrication, the oil level is low. The oil is splashed onto the bearings and gearing components.

If additional cooling is required, fans can be used.

7.2 Bath lubrication

Oil bath lubrication

Oil bath lubrication is used for industrial gear units of the MC.. series with vertical LSS (unit designation MC..V..) and upright mounting position (unit designation MC..E..). With oil bath lubrication, the oil level is so high that the bearings and gearing components are completely submerged in the lubricant.

Oil expansion tanks are always used for industrial gear units of the MC.PV.., MC.RV.. and MC.RE.. series with oil bath lubrication. Oil expansion tanks allow the lubricant to expand when the gear unit heats up during operation.

A steel oil expansion tank is used disregarding the gear unit design if the unit is installed outdoors and ambient conditions are very humid. The oil expansion tank can be used both for the version with solid shaft and hollow shaft. A membrane in the oil expansion tank separates the oil in the gear unit from the humid ambient air and this way ensures that no humidity can build up in the gear unit.

If additional cooling is required, fan cooling can be used.

Symbols used

The following table shows which symbols are used in the subsequent figures and what they mean.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Breather plug" /></td>
<td>Breather plug</td>
</tr>
<tr>
<td><img src="image2" alt="Inspection opening" /></td>
<td>Inspection opening</td>
</tr>
<tr>
<td><img src="image3" alt="Oil dipstick" /></td>
<td>Oil dipstick</td>
</tr>
<tr>
<td><img src="image4" alt="Oil drain plug" /></td>
<td>Oil drain plug</td>
</tr>
<tr>
<td><img src="image5" alt="Oil filling plug" /></td>
<td>Oil filling plug</td>
</tr>
<tr>
<td><img src="image6" alt="Oil sight glass" /></td>
<td>Oil sight glass</td>
</tr>
<tr>
<td><img src="image7" alt="Air outlet screw" /></td>
<td>Air outlet screw</td>
</tr>
</tbody>
</table>
Oil bath lubrication, upright mounted

The steel oil expansion tank [6] is used for industrial gear units of the **MC series with upright mounting position** (unit designation **MC..RE..**).

1. Breather
2. Oil dipstick
3. Oil drain plug
4. Oil sight glass
5. Air outlet screw
6. Steel oil expansion tank
**Oil bath lubrication**

The steel oil expansion tank [6] for industrial gear units of the **MC series with vertical LSS** (unit designation **MC.PV..** / **MC.RV..**) is located on the side of the assembly cover.

In **dry environmental conditions**, a **cast iron oil expansion tank** [1] is used. This oil expansion tank is only used for the vertical mounting position with the **solid output shaft pointing downwards** (unit designation **MC.PVSF..** or **MC.RVSF..**).

---

**Diagram labels**:

- [1] Breather
- [2] Oil dipstick
- [3] Oil drain plug
- [4] Oil sight glass
- [5] Air outlet screw
- [6] Steel oil expansion tank

**Diagram labels**:

- [1] Cast iron oil expansion tank
- [2] Breather plug
- [3] Oil dipstick
- [4] Oil drain plug
7.3 Cooling fan

**Fan**

A fan can be mounted if the projected thermal rating of the gear unit is not sufficient. A fan can be retrofitted if ambient conditions have changed after having installed the gear unit. The direction of rotation of the gear unit does not influence the operation of the fan.

Ensure that air intake vents are not blocked or covered!

The position of the fan(s) is shown in the dimension drawings.

7.4 Pressure lubrication

If requested, pressure lubrication is possible as lubrication method **disregarding the mounting position**.

With pressure lubrication, the oil level is low. For sizes 04 to 09, the gearing components and bearings that are not submerged in the oil bath are lubricated through a shaft end pump (→ Sec. "Shaft end pump"), or, with sizes 02 to 09, through a motor pump (→ Sec. "Motor pump").

The lubrication method “pressure lubrication” is used if

- oil bath lubrication is not desired for upright mounting position or vertical LSS
- input speeds are very high
- the gear unit must be cooled by an external oil/water system (→ section "Oil/water cooling system") or an oil/air cooling system (→ section "Oil/air cooling system")
7.5 **Shaft end pump**

**Usage**
If pressure lubrication is required (→ section "Lubrication"), the maintenance-free shaft end pump SHP with external piping is the preferred solution for gear unit sizes 04…09.

**Selection**
Five pump sizes can be combined with each gear unit size. The correct pump size for the application is selected depending on the
- required oil flow of the gear unit
- position of the pump (connected with HSS or intermediate shaft)
- gear unit ratio
- speed range of the gear unit

For correct pump size selection, contact SEW-EURODRIVE or use the GEAR selection program, which is available from your nearest SEW office.

A minimum input speed is required for correct functioning of the shaft end pump. It is therefore absolutely mandatory to contact SEW in case of variable input speeds (e.g. with inverter controlled drives) or when changing the input speed range of an already delivered gear unit with shaft end pump.

**Pump position**
The pump is mounted externally to the gear unit and is directly driven by the input shaft (HSS) or intermediate shaft of the gear unit. A high reliability of the pump function is ensured in this way. The pump position depends on the
- number of gear unit stages
- gear unit type (helical or bevel-helical)
- shaft position of the gear unit
- LSS type

Check for interference of the shaft end pump with other surrounding structures → section "Dimension drawings", "/SEP" option.

The following tables indicate the position of the pump:
### Shaft End Pump

#### Shaft Positions

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC2P</td>
<td>Solid shaft, Hollow shaft with keyway, Hollow shaft with shrink disc</td>
</tr>
<tr>
<td>MC3P</td>
<td>Solid shaft, Hollow shaft with keyway, Hollow shaft with shrink disc</td>
</tr>
<tr>
<td>MC2R</td>
<td>Solid shaft</td>
</tr>
<tr>
<td>MC2R</td>
<td>Hollow shaft with keyway</td>
</tr>
<tr>
<td>MC2R</td>
<td>Hollow shaft with shrink disc</td>
</tr>
<tr>
<td>MC3R</td>
<td>Solid shaft, Hollow shaft with keyway, Hollow shaft with shrink disc</td>
</tr>
</tbody>
</table>

**Table 1:** The maximum permitted external loads on the LSS are lower.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC2R</td>
<td>Solid shaft</td>
</tr>
<tr>
<td>MC2R</td>
<td>Hollow shaft with keyway</td>
</tr>
<tr>
<td>MC2R</td>
<td>Hollow shaft with shrink disc</td>
</tr>
<tr>
<td>MC3R</td>
<td>Solid shaft, Hollow shaft with keyway, Hollow shaft with shrink disc</td>
</tr>
</tbody>
</table>

**Table 2:** The maximum permitted external loads on the LSS are lower.
7.6 Flow switch

Usage

The flow switch is an electrical switch used for controlling the correct functioning of a pressure lubrication system (Shaft end pump; Motor pump) by checking the oil flow.

In deliveries since March 1st 2005, the flow switch is a standard feature for all gear units supplied with

- a motor pump
- a shaft end pump with a flow rate of 8.5 l/min or higher.

Shaft end pumps with a flow rate below 8.5 l/min are equipped with a visual flow control device (Visual flow indicator) as standard.

Selection

SEW-EURODRIVE selects the flow switch. As standard, a flow switch of the type DW-R-20 is used. All the following technical data refer to this type.

Function

The flow pushes against a circular plate attached to a pendulum. The pendulum, which is regulated by a spring, moves on its pivot. A magnet attached to the end of the pendulum operates a movable reed contact. The switch unit itself is separated from the oil.

The flow switch has two switching points:

1. Switching point HIGH (upper limit of flow rate) → contact closed - ON
2. Switching point LOW (lower limit of flow rate) → contact open - OFF
**Dimensions**

<table>
<thead>
<tr>
<th>Material abbreviations:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A = Brass</td>
<td></td>
</tr>
<tr>
<td>B = Nickel-plated brass</td>
<td></td>
</tr>
<tr>
<td>C = Stainless steel</td>
<td></td>
</tr>
<tr>
<td>D = Stainless steel / PVC</td>
<td></td>
</tr>
</tbody>
</table>

For determining the exact position of the flow switch, refer to the order-specific dimension drawing.

**Electrical connection**

1. Brown
2. Blue
3. Yellow/green
Flow switch

Power supply: 230 V; 1.5 A; 80 W, 90 V_{Amax}

Enclosure: IP 65

Maximum temperature of medium: 110°C

Maximum ambient temperature: 70°C

Maximum working pressure: 25 bar

Length of connecting cable: 1.5 m

Switch: You can use the switch as normally closed or normally open contact; SPDT switch available on request

Switch hysteresis: approx. 5%

<table>
<thead>
<tr>
<th>Type</th>
<th>Switching point range ON</th>
<th>Switching point range OFF [l/min]</th>
<th>Maximum flow rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW-R-20</td>
<td>8.5 - 12.0</td>
<td>6.6 - 11.0</td>
<td>80</td>
</tr>
</tbody>
</table>
7.7 Visual flow indicator

**Usage**

The visual flow indicator is a simplified method of controlling the functioning of a pressure lubrication system by visually checking the oil flow. In deliveries since March 1st 2005, the visual flow indicator is a standard feature of all gear units supplied with a shaft end pump and a flow rate below 8.5 l/min.

Shaft end pumps with a flow rate above 8.5 l/min are equipped with an electrical flow switch (→ Flow switch) as standard.

**Function**

The oil flow in the system moves a rotating element, which is visible from outside. If the rotating element does not move, the shaft end pump needs to be checked.

For determining the exact position of the visual flow indicator, refer to the order-specific dimension drawing.

7.8 Oil/water cooler with shaft end pump

**Usage**

An external oil/water cooling system can be used if the thermal rating of the naturally cooled gear unit or cooling with a cooling fan on the HSS is insufficient. Preconditions for using an external oil/water cooling system:

- Availability of suitable cooling water on site
- Sufficient input speed for the shaft end pump

**Selection**

The shaft end pump described in chapter 7.5 is completed by an oil/water plate heat exchanger.

Five heat exchanger sizes with the following cooling capacities are standardized:

\[(\text{Valid for } T_{\text{water}} = 20^\circ\text{C}, T_{\text{oil}} = 60^\circ\text{C}, V_{\text{water}} = 0.25 \times V_{\text{oil}})\]

<table>
<thead>
<tr>
<th>Type</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>P820</td>
<td>3.6 kW (with V_{oil} = 10.5 l/min)</td>
</tr>
<tr>
<td>P830</td>
<td>4.6 kW (with V_{oil} = 10.5 l/min)</td>
</tr>
<tr>
<td>P1540</td>
<td>10 kW (with V_{oil} = 18 l/min)</td>
</tr>
<tr>
<td>P2540</td>
<td>16 kW (with V_{oil} = 27 l/min)</td>
</tr>
<tr>
<td>P2560</td>
<td>26 kW (with V_{oil} = 43 l/min)</td>
</tr>
</tbody>
</table>

The correct cooler type and size for the application is selected depending on the

- required oil flow of the gear unit
- gear unit size
- power losses to be cooled (if additional cooling is required)
- cooling water temperature and available flow

Contact SEW-EURODRIVE for selecting the correct oil/water cooler type.
Scope of delivery
The cooling group consists of
- shaft end pump
- oil/water plate heat exchanger
- flow switch

The following instrumentation can be added as option:
- Oil filter (20 µm) with internal bypass valve for filter and optical contamination indicator.
- Thermo switch with fixed or adjustable switching point: Serves to control the cooler

Flow diagram

Cooling system position
The cooling system is delivered as assembled system attached to the gear unit. The position depends on
- gear unit type (MC..R.., MC..P) and number of stages
- gear unit design (MC..L, MC..V..., MC..E..)

For the exact position of the cooling system, refer to the order-specific dimension drawing; the outline drawings on the following pages can be used as a guideline.
Gear unit design "MC...L..."

<table>
<thead>
<tr>
<th>Gear unit size</th>
<th>X</th>
<th>X2</th>
<th>X3</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>312</td>
<td>200</td>
<td>466</td>
<td>562</td>
</tr>
<tr>
<td>05</td>
<td>320</td>
<td>210</td>
<td>524</td>
<td>637</td>
</tr>
<tr>
<td>06</td>
<td>333</td>
<td>240</td>
<td>524</td>
<td>677</td>
</tr>
<tr>
<td>07</td>
<td>345</td>
<td>265</td>
<td>524</td>
<td>737</td>
</tr>
<tr>
<td>08</td>
<td>371</td>
<td>292</td>
<td>524</td>
<td>807</td>
</tr>
<tr>
<td>09</td>
<td>381</td>
<td>305</td>
<td>524</td>
<td>877</td>
</tr>
</tbody>
</table>

Size | Thread
---|---
P8.. | R 1/2
P15.. | R 1/2
P25.. | R1

[1] Water inlet

Lubrication, Cooling and Instrumentation
Oil/water cooler with shaft end pump
Gear unit design "MC...V."

<table>
<thead>
<tr>
<th>Gear unit size</th>
<th>X</th>
<th>X2</th>
<th>X3</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>362</td>
<td>200</td>
<td>466</td>
<td>155</td>
</tr>
<tr>
<td>05</td>
<td>422</td>
<td>210</td>
<td>524</td>
<td>155</td>
</tr>
<tr>
<td>06</td>
<td>422</td>
<td>240</td>
<td>524</td>
<td>155</td>
</tr>
<tr>
<td>07</td>
<td>472</td>
<td>264</td>
<td>524</td>
<td>155</td>
</tr>
<tr>
<td>08</td>
<td>507</td>
<td>292</td>
<td>524</td>
<td>155</td>
</tr>
<tr>
<td>09</td>
<td>542</td>
<td>305</td>
<td>524</td>
<td>155</td>
</tr>
</tbody>
</table>

Dimensions / max. [mm]

Size | Thread
---|---
P8.. | R 1/2
P15.. | R 1/2
P25.. | R1

[1] Water inlet
**Gear unit design “MC...E..”**

<table>
<thead>
<tr>
<th>Gear unit size</th>
<th>Dimensions / max. [mm]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>X: 312, X2: 362, Y: 496</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>X: 320, X2: 422, Y: 554</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>X: 333, X2: 442, Y: 554</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>X: 345, X2: 472, Y: 554</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>X: 371, X2: 507, Y: 554</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>X: 381, X2: 542, Y: 554</td>
<td></td>
</tr>
</tbody>
</table>

[1] Water inlet

<table>
<thead>
<tr>
<th>Size</th>
<th>Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>P8..</td>
<td>R 1/2</td>
</tr>
<tr>
<td>P15..</td>
<td>R 1/2</td>
</tr>
<tr>
<td>P25..</td>
<td>R1</td>
</tr>
</tbody>
</table>
7.9 Motor pump

Usage
If pressure lubrication is required (→ section "Lubrication") and a shaft end pump does not supply sufficient oil because the input speed is too low, then a motor pump can be used for sizes 04…09.

Selection
As standard, there are three standard pump types that can be combined with each gear unit size.

<table>
<thead>
<tr>
<th>Type</th>
<th>Oil flow [l/min]</th>
<th>Nominal power [kW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFZP-1</td>
<td>5</td>
<td>0.37</td>
</tr>
<tr>
<td>UF size 1</td>
<td>10</td>
<td>0.37</td>
</tr>
<tr>
<td>UF size 2</td>
<td>40</td>
<td>2.2</td>
</tr>
</tbody>
</table>

The correct pump type for the application is selected depending on the required oil flow of the gear unit. The oil flow depends on the
- gear unit size
- power losses to be cooled (if additional cooling is necessary)

Contact SEW-EURODRIVE for selecting the correct pump type.

Pump position
The motor pump is delivered as assembled motor pump group, that can optionally be delivered
- attached to the gear unit, or
- separately for mounting on a customer-supplied base frame.

Scope of delivery
The scope of delivery of the motor pump group includes:
- Vane pump
- Directly mounted asynchronous motor, 3-phase, B5 mounting, voltage 230/400 V - 50 Hz or 440/480 V - 60 Hz
- Internal pressure switch
- Flow switch
If a UK type pump is used, the delivery will also include the following:
- Oil filter (20 µm) with internal bypass valve and optical contamination indicator
Flow diagram

Flow diagram showing components labeled as follows:

- [1] Pump
- [3] Internal pressure valve
- [4a] Oil filter (only UK type)
- [4b] Internal bypass valves
- [5] Electrical contamination indicator (difference-pressure control) [optional]

Diagram shows the flow of components with various symbols and labels.
For the exact position of the motor pump, refer to the order-specific drawing. Examples are shown in the following drawings.

Example:
MC..RV. gear unit

![Diagram of MC..RV. gear unit with labels]

[1] UF motor pump size 1

Example:
MC..RV. gear unit

![Diagram of MC..RV. gear unit with labels]

[1] Motor pump MFZP-1
Connection dimensions
MFZP-1

Lengths "K" of motor/pump units:

MFZP-1 with elec. motor size 71/0.37 kW/B34 small flange: approx. 320 mm

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFZP-1/1.1/X/71</td>
<td>120</td>
<td>90</td>
<td>7</td>
<td>112</td>
<td>71</td>
<td>G 1/2</td>
<td>G 3/4</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
Lubrication, Cooling and Instrumentation

Motor pump

Connection
dimensions UF1

Connections
dimensions UF2
Example of MC..RL unit with UKF-1 oil/water cooler

Example of MC..RV unit with UKF-1 oil/water cooler

[1] UKF-1 oil/water cooler
7.10 Oil/water cooler with motor pump

**Usage**
If the thermal rating of the naturally cooled gear unit or cooling with a cooling fan on the HSS is insufficient, then an external oil/water cooling system can be used. The precondition for using an oil/water cooling system is the availability of suitable cooling water on site.

**Selection**
Normally, the motor pump groups described in chapter 7.9 are completed by an oil/water plate heat exchanger.

Two heat exchanger sizes with the following cooling capacity are standard:

(Valid for \( T_{\text{water}} = 20^\circ\text{C},\ T_{\text{oil}} = 60^\circ\text{C},\ V_{\text{water}} = 0.25 \times V_{\text{oil}} \))

<table>
<thead>
<tr>
<th>Type</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP415-20</td>
<td>7 kW (with ( V_{\text{oil}} = 10 \text{ l/min} ))</td>
</tr>
<tr>
<td>CP415-60</td>
<td>20 kW (with ( V_{\text{oil}} = 40 \text{ l/min} ))</td>
</tr>
</tbody>
</table>

The correct cooler type and size for the application is selected depending on the
- required oil flow of the gear unit
- gear unit size
- power losses to be cooled
- cooling water temperature and available flow

Contact SEW-EURODRIVE for selecting the correct oil/water cooler type.

**Cooling system position**
The cooling system is delivered as assembled system, that can optionally be delivered
- attached to the gear unit, or
- separately for mounting on a customer-supplied base frame.
Scope of delivery

The cooling group consists of

- Vane pump
- Directly mounted asynchronous motor, 3-phase, B5 mounting, voltage 230/400 V - 50 Hz or 440/480 V - 60 Hz
- Internal pressure-limiting valve
- Oil filter (20 µm) with internal bypass valve for filter and optical contamination indicator
- Oil/water plate heat exchanger

The following instrumentation can be added as option:

- Flow switch:
  Serves to control the pump function via control of the oil flow. The flow switch trips if the flow falls below a certain value.

- Thermo switch with fixed or adjustable switching point:
  Serves to control the cooler

- Thermostatic valve in the oil circuit:
  Stabilizes the oil temperature (cooled and heated oil is mixed depending on the oil temperature).

- Thermostatic valve in the water circuit:
  Regulates the cooling water flow depending on the oil temperature

- Filter in the water circuit
Flow diagram

1. Pump
2. Motor
3. Internal pressure valve
4a. Oil filter (only UK type)
4b. Internal bypass valves
5. Electrical contamination indicator (difference-pressure control) [optional]
6. External bypass valve [optional]
7. Oil/water heat exchanger

Flow diagram:

- [1] Pump
- [3] Internal pressure valve
- [4a] Oil filter (only UK type)
- [4b] Internal bypass valves
- [5] Electrical contamination indicator (difference-pressure control) [optional]
- [7] Oil/water heat exchanger
It is important that cooling water specifications and other operating details are observed.

- **Medium:**
  - Water glycol (coolants)
  - HFC operating liquids
  - Water
  - Oil

- **Contamination:**
  The quantity of particles in the suspension should be less than 10 mg/l. The particle size should be < 0.6 mm (spherical). Thread-like particles cause a rapid rise in pressure drops.

- **Temperature range:**
  \(-10^\circ\text{C} \text{ to } +225^\circ\text{C}\) (freezing point and boiling point must be taken into consideration!)

- **Pressure:**
  Max. 27 bar (static)

- **Corrosion:**
  The following critical values refer to a pH value of
  - free chlorine, \( \text{Cl}_2 < 0.5 \text{ ppm} \)
  - chloride ions \( \text{Cl}^- \)
    - \(< 700 \text{ ppm at } 20^\circ\text{C} \)
    - \(< 200 \text{ ppm at } 50^\circ\text{C} \)

- **Other critical values:**
  - \( \text{pH} \text{ } 7 \ldots 10 \)
  - sulphate \( \text{SO}_4^{2-} \)
    - \(< 100 \text{ ppm} \)
  - \( [\text{HCO}_3^-] / [\text{SO}_4^{2-}] > 1 \)
  - ammonia, \( \text{NH}_3 < 10 \text{ ppm} \)
  - free CO \(< 10 \text{ ppm} \)

- **The following ions are not corrosive under normal conditions:**
  - phosphate
  - nitrate
  - nitrite
  - iron
  - manganese
  - sodium
  - potassium
For the exact position of the cooling system, refer to the order-specific dimension drawing. Examples are shown in the following drawings.

**Example of MC..RL unit with UKF-1 oil/water cooler**

![Diagram of MC..RL unit with UKF-1 oil/water cooler]

[1] UKF-1 oil/water cooler

**Example of MC..PL unit with UKF-1 oil/water cooler**

![Diagram of MC..PL unit with UKF-1 oil/water cooler]

[1] UKF-1 oil/water cooler
Lubrication, Cooling and Instrumentation

Oil/water cooler with motor pump

Connection dimensions for heat exchanger

With H =
CP415-20: 58 mm (m = 6.5 kg)
CP415-60: 154 mm (m = 15.7 kg)

Connection dimensions for UKF1

[1] Water
[2] Oil
Connection dimensions for UKF2

Oil/water cooler with motor pump

Lubrication, Cooling and Instrumentation

Connection dimensions for UKF2

Connection dimensions for UKF2

Oil/water cooler with motor pump

Lubrication, Cooling and Instrumentation

Connection dimensions for UKF2

Connection dimensions for UKF2

Oil/water cooler with motor pump

Lubrication, Cooling and Instrumentation

Connection dimensions for UKF2

Connection dimensions for UKF2

Oil/water cooler with motor pump

Lubrication, Cooling and Instrumentation
7.11 Oil/air cooler with motor pump

Usage
If the thermal rating of the naturally cooled gear unit or cooling with a cooling fan on the HSS is insufficient, then an external oil/air cooling system can be used.

Selection
Normally, the motor pump groups described in chapter 7.9 are completed by a fan-driven oil/air heat exchanger.

Two heat exchanger sizes with the following cooling capacity are standardized.
(Valid for $T_{air} = 20^\circ C$, $T_{oil} = 60^\circ C$)

<table>
<thead>
<tr>
<th>Type</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK-EL4s</td>
<td>$\approx 8$ kW (with $V_{oil} = 10$ l/min)</td>
</tr>
<tr>
<td>OK-EL6s</td>
<td>$\approx 20$ kW (with $V_{oil} = 40$ l/min)</td>
</tr>
</tbody>
</table>

The correct cooler type and size for the application is selected depending on the
• required oil flow of the gear unit
• gear unit size
• power losses to be cooled
• temperature difference between oil and environment

Contact SEW-EURODRIVE for selecting the correct oil/air cooler type.

Cooling system position
The cooling system is delivered as assembled system, that can optionally be delivered
• attached to the gear unit, or
• separately for mounting on a customer-supplied base frame.

For the exact position of the cooling system, refer to the order-specific dimension drawing.
**Scope of delivery**

The cooling group consists of

- Vane pump
- Directly mounted asynchronous motor, 3-phase, B5 mounting
  Voltage 230 V / 400 V - 50 Hz or 440 V / 480 V - 60 Hz
- Internal pressure-limiting valve
- Oil filter (20 µm) with internal bypass valve for filter and optical contamination indicator
- Fan driven oil/air heat exchanger

The following features can be added as option:

- **Flow switch:**
  Serves to control the pump function via control of the oil flow; The flow switch trips if the flow falls below a certain value

- **Thermo switch with fixed or adjustable switching point:**
  Serves to control the cooler

- **Thermostatic valve in the oil circuit:**
  Stabilizes the oil temperature (cooled and heated oil is mixed depending on the oil temperature)

- **"LFM":**
  Air filter grid on the air suction element (Attention: Even with clean filter, the cooling power decreases by $\approx 8\%$)

- **"LFG":**
  Air filter grid on the air suction element (Attention: Even with clean filter, the cooling power decreases by $\approx 5\%$)

- **"GP":**
  Vibration absorber
Lubrication, Cooling and Instrumentation
Oil/air cooler with motor pump

Flow diagram

[Diagram showing the components and flow of a lubrication system]

- [1] Pump
- [3] Internal pressure valve
- [4a] Oil filter (only UK type)
- [4b] Internal bypass valves
- [5] Electrical contamination indicator (difference-pressure control) [optional]
- [7] Oil/air heat exchanger

Operating details

It is important to observe the other operating details:

<table>
<thead>
<tr>
<th>Cooler type</th>
<th>Displacement [cm³/U]</th>
<th>Oil flow [l/min]</th>
<th>No. of poles [-]/size [-]</th>
<th>Motor capacity [kW] at 50 Hz</th>
<th>Noise level (1 m distance) [dB (A)] at 50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK-EL4S</td>
<td>-</td>
<td>150</td>
<td>4 / 71</td>
<td>0.37</td>
<td>74</td>
</tr>
<tr>
<td>OK-EL6S</td>
<td>-</td>
<td>225</td>
<td>4 / 90</td>
<td>1.1</td>
<td>75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooler type</th>
<th>Max. operating pressure [bar]</th>
<th>Max. oil temperature [°C]</th>
<th>Max. viscosity [mm²/s]</th>
<th>Size of filter</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK-EL4S</td>
<td>16</td>
<td>130</td>
<td>2000</td>
<td>-</td>
<td>31</td>
</tr>
<tr>
<td>OK-EL6S</td>
<td>16</td>
<td>130</td>
<td>2000</td>
<td>-</td>
<td>43</td>
</tr>
</tbody>
</table>
Structure of a heat exchanger


Connection dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A1</th>
<th>B</th>
<th>C1</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>E1</th>
<th>E2</th>
<th>E3</th>
<th>F</th>
<th>W1</th>
<th>W2</th>
<th>Z1</th>
<th>Z3</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK-EL4LS</td>
<td>520</td>
<td>502</td>
<td>485</td>
<td>410</td>
<td>425</td>
<td>450</td>
<td>439</td>
<td>51</td>
<td>104</td>
<td>9</td>
<td>1200</td>
<td>400</td>
<td>G 1&quot;</td>
<td>-</td>
</tr>
<tr>
<td>OK-EL6LS</td>
<td>640</td>
<td>600</td>
<td>550</td>
<td>410</td>
<td>482</td>
<td>450</td>
<td>500</td>
<td>80</td>
<td>74</td>
<td>9</td>
<td>1800</td>
<td>600</td>
<td>G 1 1/4&quot;</td>
<td>M22x1.5</td>
</tr>
</tbody>
</table>

1) for smaller distances please contact our sales support
### 7.12 Pressure lubrication – Important selection data

If pressure lubrication with additional cooling is required, it is recommended to fill out the following form:

<table>
<thead>
<tr>
<th>Electrical supply</th>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auxiliary voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection class</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Explosion proof requirement | No | Yes |

**Additional cooling (if required)**

<table>
<thead>
<tr>
<th>Cooling device</th>
<th>Allowed</th>
<th>Not allowed</th>
<th>Cooling water available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil/air cooler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil/water cooler</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mounting of pressure lubrication system**

- [ ] directly attached to gear unit
- [ ] own foundation (customer’s own construction)

**Equipment for pressure lubrication systems with or without cooler**

- [ ] Oil filter (20 µm) with internal bypass valve
  - [ ] With optical contamination indicator (manual release)
  - [ ] With electrical and optical contamination indicator

**Pressure control**

- [ ] Visual pressure gauge
- [ ] Pressure switch
- [ ] Pressure transducer

**Flow control**

- [ ] Visual
- [ ] Electrical
- [ ] Visual and electrical

**Wiring for all instruments on common terminal box**

**Special requirements concerning the mechanical connection of lubrication systems**

- [ ] No
- [ ] Yes

**Special requirements concerning piping / hose system**

- [ ] No
- [ ] Yes
Pressure lubrication systems with oil/water cooler

Selection data:

Desired oil running temperature: °C

Ambient temperature:

- Normal (average): °C
- Min: °C
- Max: °C

Cooling water supply:

- Temperature: °C
- Permitted temperature increase of cooling water δT: K

Available water flow rate Q_{Water}:

- l/h
- l/min
- l/s

Required equipment:

- Visual thermometer
- Thermo switch with fixed switching point
- Thermo switch with adjustable switching point
- Thermostatic valve in oil circuit
- Filter in water circuit

Pressure lubrication systems with oil/air cooler

Selection data:

Desired oil running temperature: °C

Ambient temperature:

- Normal (average): °C
- Min: °C
- Max: °C

Noise limitations

Max. permitted sound pressure level in 1 m distance dB(A)

Required equipment:

- Visual thermometer
- Thermo switch with fixed switching point
- Thermo switch with adjustable switching point
- Thermostatic valve in oil circuit
- Air filter grid on the air suction
7.13 Oil heater

Oil heating is required to ensure lubrication at startup when the ambient temperature is low (e.g. cold start of the gear unit).

The oil heater

- is activated when the temperature set at the factory is reached
- is deactivated when the set temperature is exceeded by 8°C to 10°C

---

**Activation / deactivation behaviour**

---

[1] Oil heater
[2] Temperature sensor
[3] Thermostat

---

[1] Oil heater
[2] Temperature sensor
[3] Thermostat
7.14 Temperature sensor

The temperature sensor PT100 can be used to measure the temperature of the oil in the gear unit.

**Dimensions**

![Dimensions diagram]

**Electrical connection**

![Connection diagram]

**Technical data**

- Sensor tolerance $\pm (0.3 + 0.005 \times t)$, (corresponds to DIN IEC 751 class B), $t =$ oil temperature
- Plug connector DIN 43650 PG9 (IP65)
- The tightening torque for the retaining screw on the back of the plug connector for electrical connection is 25 Nm.
7.15 **SPM adapter**

SPM adapters are available for measuring the shock pulses of the gear unit bearings. Shock pulses are measured using shock pulse sensors attached to the SPM adapter.

### Mounting position

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram 1" /></td>
<td><img src="image2.png" alt="Diagram 2" /></td>
<td><img src="image3.png" alt="Diagram 3" /></td>
</tr>
</tbody>
</table>

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