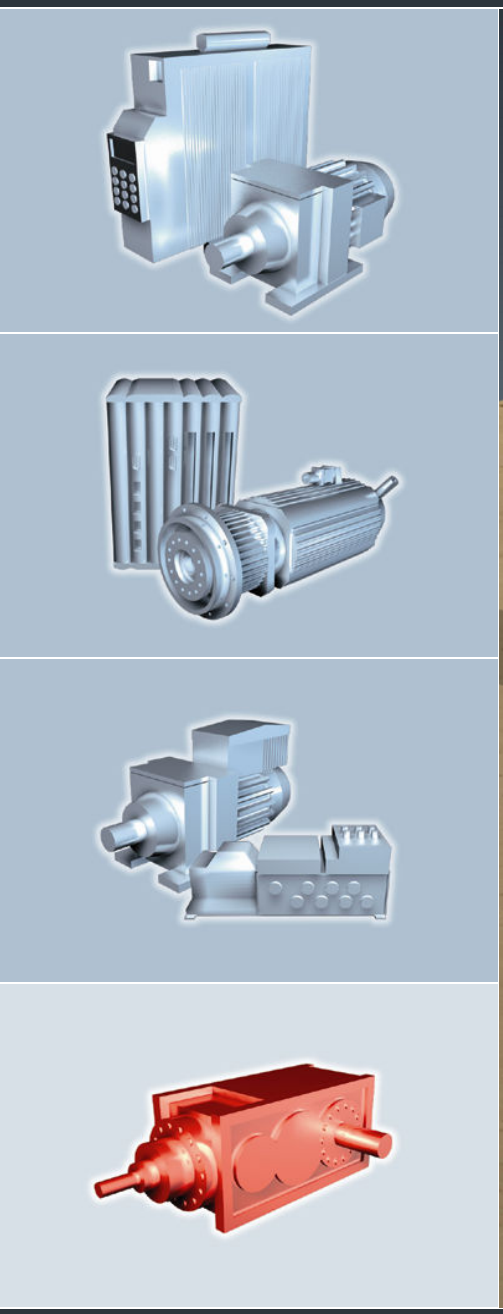
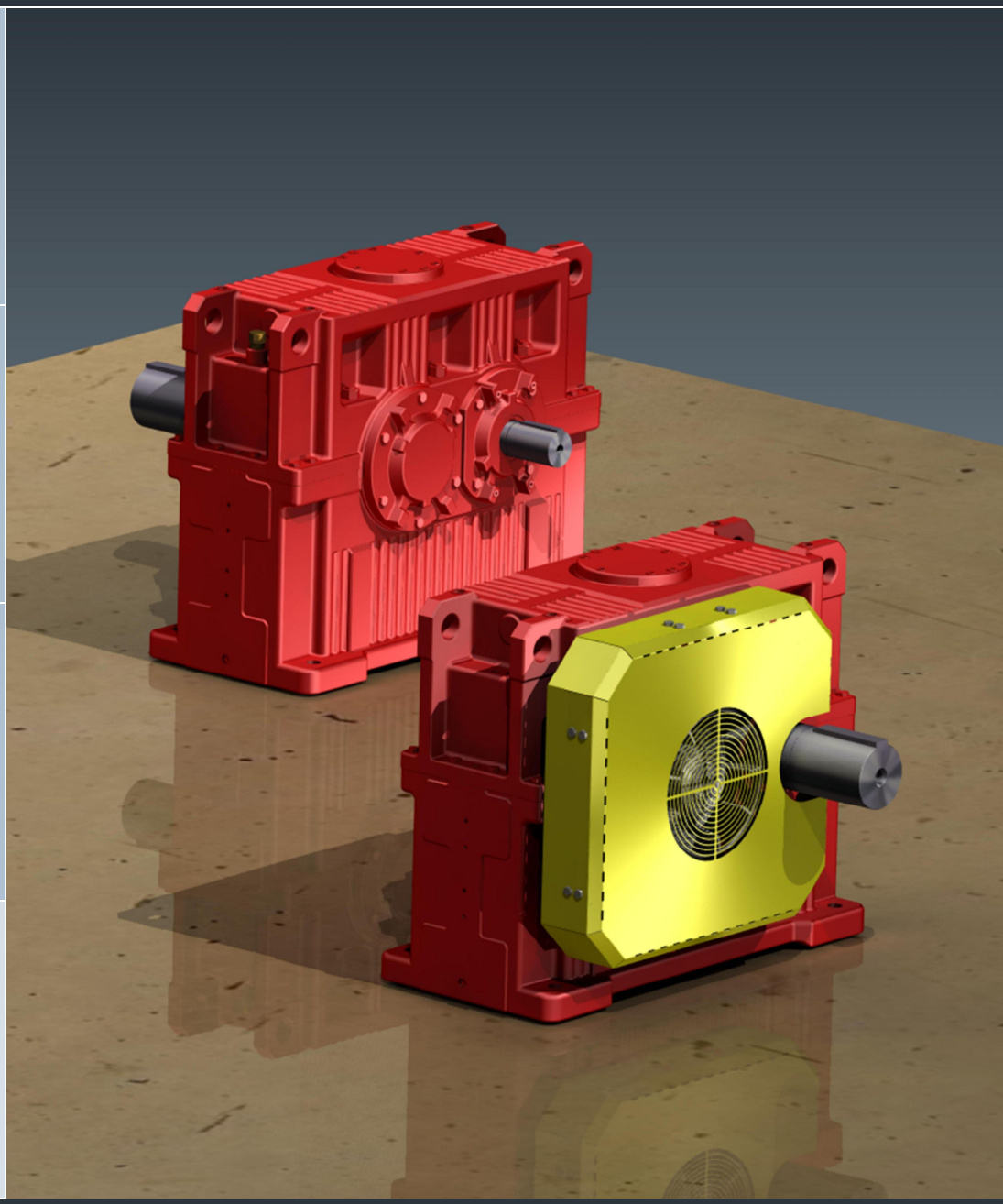
SEW EURODRIVE





Industrial Gear Units of the M1... Series

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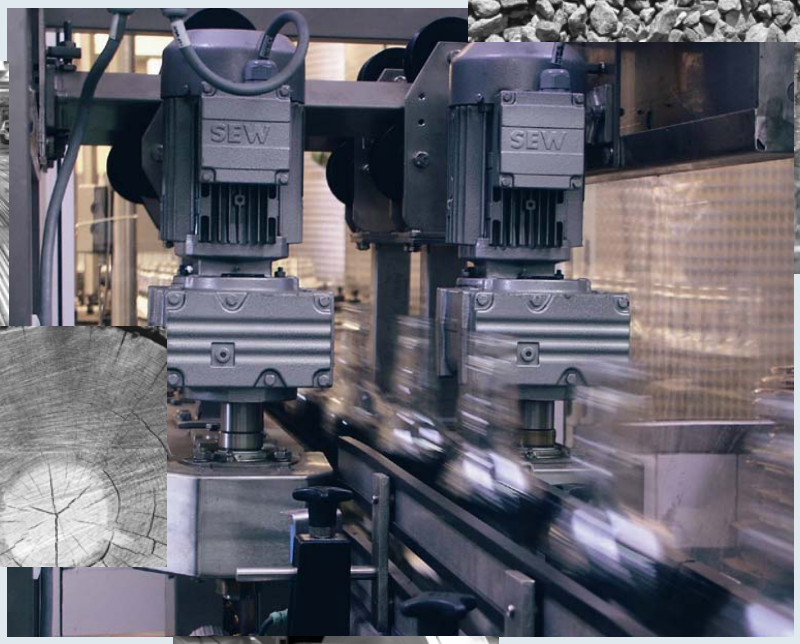
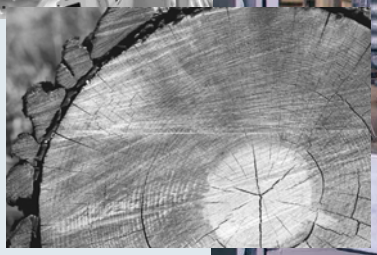
Catalogue





SEW EURODRIVE

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The SEW-EURODRIVE Group of Companies

Global presence

Driving the world with innovative drive solutions for all branches and for every application. Products and systems from SEW-EURODRIVE are used in a multitude of applications - worldwide. These include the automotive, building materials, food and beverage as well as metal-processing industries. The decision to use drive technology made by SEW-EURODRIVE stands for reliability for both functionality and investment.

Not only are we represented in all important branches of industry today we are found all over the world: with twelve manufacturing plants and 63 assembly plants in 46 countries and our comprehensive range of services, which we consider and integrative service adequately continuing our commitment to outstanding quality.

Your ideal partner

Our global presence, extensive product range and broad spectrum of services make SEW-EURODRIVE the ideal partner for the machinery and plant construction industry when it comes to providing drive systems for demanding applications in all applications and branches of industry.

Products and Systems from SEW-EURODRIVE

The products and systems from SEW-EURODRIVE are divided into four product groups. These four product groups are:
1. Gearmotors and frequency inverters
2. Servo drive systems
3. Decentralised drive systems
4. Industrial gear units

Products and systems used in several group applications are listed in a separate group, “Products and systems covering several product groups”. Consult the following tables to locate the products and systems included in the respective product group:

1. Gearmotors and Frequency Inverters		
Gear units / gearmotors	**Motors**	**Frequency inverters**
▪ Helical gear units / Helical gearmotors ▪ Parallel shaft helical gear units / parallel shaft helical gearmotors ▪ Helical-bevel gear units / Helical-bevel gearmotors ▪ Helical-worm gear units / helical-worm gearmotors ▪ Spiroplan® right-angle gearmotors ▪ Drives for electrified monorail systems ▪ Geared torque motors ▪ Pole-changing gearmotors ▪ Variable speed gear units / variable speed gearmotors ▪ Aseptic gearmotors Gear units / gearmotors to ATEX standard ▪ Variable speed gear units / variable speed gearmotors to ATEX standard	▪ Asynchronous AC motors / AC brake motors ▪ Pole-changing AC motors / AC brakemotors ▪ Energy efficient motors ▪ Explosion-proof AC motors / AC brakemotors ▪ Torque motors ▪ Single-phase motors / single-phase brakemotors ▪ Asynchronous linear motors	▪ MOVITRAC® frequency inverters ▪ MOVIDRIVE® inverters ▪ Control, technology and communication options for inverters

2. Servo Drive Systems		
Servo gear units / geared servomotors	**Servomotors**	**Servo drive inverters / servo inverters**
▪ Low backlash servo planetary gear units / planetary gearmotors ▪ Low backlash helical-bevel gear units / helical-bevel gearmotors ▪ Explosion-proof servo gear units / geared servomotors	▪ Asynchronous servomotors / servo brakemotors ▪ Synchronous servomotors / servo brakemotors ▪ Explosion-proof servomotors / servo brakemotors ▪ Synchronous linear motors	▪ MOVIDRIVE® servo inverters ▪ MOVIAXIS® multi-axis servo inverters ▪ Control, technology and communication options for servo drive inverters and servo inverters

3. Decentralised Drive Systems		
Decentralised drives	**Communication and installation**	**Contactless energy transfer**
▪ MOVIMOT® gearmotors with integrated frequency inverter ▪ MOVIMOT® motors / brakemotors with integrated frequency inverter ▪ MOVI-SWITCH® gearmotors with integrated switching and protection function ▪ MOVI-SWITCH® motors / brakemotors with integrated switching and protection function ▪ Explosion-proof MOVIMOT® and MOVI-SWITCH® gearmotors	▪ Fieldbus interfaces ▪ Field distributors for decentralised installation ▪ MOVIFIT® product range – MOVIFIT® MC for controlling MOVIMOT® drives – MOVIFIT® SC with integrated electronic motor switch – MOVIFIT® FC with integrated frequency inverter	▪ MOVITRANS® system – Stationary components for energy supply – Mobile components for energy absorption – Line cables and installation material

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Products and Systems from SEW-EURODRIVE

4. Industrial Gear Units		
Helical and bevel-helical gear units	**Helical and bevel-helical planetary gear units**	**Drive packages**
▪ X series ▪ MC series ▪ M series ▪ ML series ▪ M1 series ▪ CN series	▪ P series (also as planetary gearmotors) ▪ PM.C series	▪ Application solutions connected with – Swing base – Gearmotors – Motors – Couplings – Drum and disk brakes – Lubrication systems for conveyor drives, bucket elevators, crushers, agitators, cooling towers, crane systems and much more

Products and Systems Covering Several Product Groups
▪ Operator terminals ▪ MOVI-PLC® drive-based control system

In addition to its products and systems, SEW-EURODRIVE offers a comprehensive range of services. These include:

- Technical consulting
- Application software
- Seminars and training
- Extensive technical documentation
- International customer service

Market Conformity

M1 series

The M1 series of industrial gear units is the extension of the successful M and ML series that exceeds even the highest demands on quality, reliability and performance. The optimised product range is made of high-quality materials, which translates into increased safety with drive applications that have been operated with conventional gear units so far or economical advantages for new applications.

"M" stands for modular and thus, the series is based on this idea both in terms of design and economy. Customisation to the required characteristics of the drive and the machine design is made easier by simply adding options and mounting parts.

The design features and the wide range of options make the M1 series exceptionally user-friendly. Especially important are easy mounting and installation as well as easy maintenance which is also ensured by the horizontal split housing design.

Content of the catalogue

This catalogue describes the helical gear units of the M1.. series from SEW-EURODRIVE. The catalogue contains technical data, selection tables, dimension sheets and optional accessories. Please refer to the separate catalogues for further information on gear units and AC motors.

General Information

Nominal power, torques and input speeds

The nominal powers and torques mentioned in the catalogue depend on the input speed and are valid for a service factor of F_S = 1.0 and a constant, unidirectional load. If the direction of rotation changes once per minute under full load, then only 70% of these values apply.

The overview shows nominal powers and torques for input speeds of 1800 rpm, 1500 rpm, 1200 rpm, 1000 rpm and 750 rpm. The nominal torque is also valid for input speeds 3% lower than synchronous speeds. For input speeds exceeding 1800 rpm, contact SEW-EURODRIVE.

Thermal rating

The thermal rating needs to be checked for every gear unit. The relevant values are listed in the selection tables in section 3.

Surface and corrosion protection

If required, all gear units can be supplied with a special surface and corrosion protection for applications in extremely humid and/or chemically aggressive environments.

Weights

Note that all weights shown in the catalogue exclude the oil fill for the gear units. You will find the recommended values for oil quantities depending on the gear design and size.

Supply of cooling air

For gear units with cooling fans on the input shaft, it is important that there is enough space in axial and radial direction for a sufficient supply of cooling air.

International markets

SEW-EURODRIVE's gear units conform to ISO and DIN specifications. SEW-EURODRIVE is a member of the AGMA (American Gear Manufacturers' Association), and as such, all its gear units also conform to AGMA specifications.

Steel frame

SEW-EURODRIVE supplies preassembled drive packages on a steel frame (swing base or base frame).

Sealing system

Industrial gear units can be supplied with different seal arrangements for HSS and LSS.

- Lip seal or Labyrinth seal with V-ring (standard)
- Double lip seal with grease nipple
- Radial labyrinth seal with grease nipple
- Contactless seal

Lubrication

Splash lubrication is used depending on the gear unit type and design. Pressure lubrication can be used as option for the gear unit. Pressure lubrication is highly recommended when the mechanical power rating P_{K1} is higher than 500 kW.

Modular accessories

Several optional accessories are available for industrial gear units.

- Cooling fan:
  A cooling fan is used when the thermal rating of the gear unit is insufficient.
- Motor bracket:
  Motor mounting platform for belt driven input.
- V-belt drive:
  Belt driven input. Includes motor bracket, pulleys, V-belt and belt guard.
- High speed shaft (HSS) elastic coupling:
  Preselected HSS couplings are available for mounting to the input motor. Coupling selection depends on motor power and gear unit size.
- Low speed shaft (LSS) gear coupling:
  Preselected LSS gear coupling based on the nominal gear unit torque and output shaft diameter. Couplings are available for vertical and horizontal applications.
- HSS and LSS coupling guard:
  Coupling guard for HSS and LSS. Directly attached to gear unit.
- Torque arm:
  Torque arm for shaft mounted gear units. The torque arm can be mounted to absorb tension or compression.
- Pressure lubrication with cooler:
  A pressure lubrication system with cooler is used when the thermal rating of the basic gear unit is not sufficient. A cooler is used in operating environments where a fan cannot be used or is not sufficient.
- Oil drain valve:
  A ball valve is mounted to the drain plug to allow for easily attaching a drain pipe to the valve when changing the gear unit oil.
- Oil heater:
  The oil heating system ensures that the oil is in a suitable viscosity range when starting up the gear unit in cold environments.
- Sealing systems:
  Optional oil sealing methods are available to protect the gear unit from harsh contaminants in the operating environment.

General Information

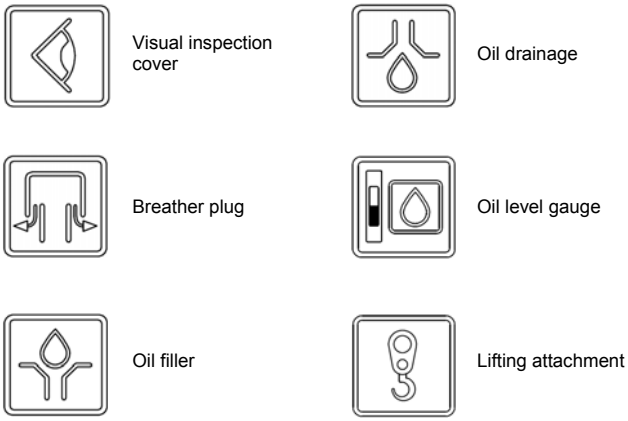
- Temperature sensor PT100:
  The PT100 temperature sensor can be used for measuring the oil bath or bearings temperature in the gear unit.
- SPM adapter (shock pulse adapter):
  Adapters are installed on the gear unit housing for monitoring the vibration at various points on the gear unit.

Drive packages

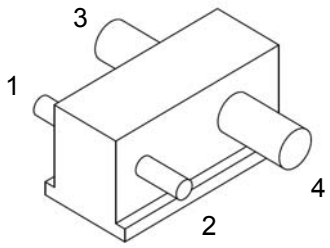
SEW-EURODRIVE can supply ready assembled drive packages consisting of different components, such as gear unit, motor, input and output coupling, brake, etc.

Please consult SEW-EURODRIVE.

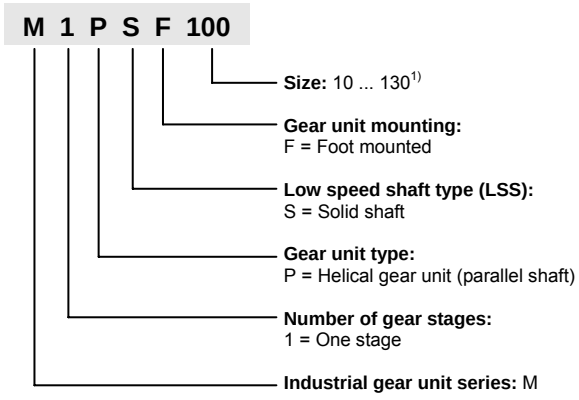
Definition of Icons used in Dimensional Drawings



Shaft Positions



Gear Unit Type Definition



1) Please contact SEW-EURODRIVE for sizes 120 & 130

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Project Planning Procedure

The following flow chart schematically shows the procedure for the project planning of an industrial gear unit.

Drive selection data

- Machine on LSS and ambient conditions
- Load characteristics
- Machine on HSS
- Gear unit requirement:
  - Type and design
  - Service factor
  - Mounting and connection to machine on LSS
  - Loads on LSS and HSS

↓

Gear unit selection*

- Calculate gear ratio: $i = \frac{n_1}{n_2}$
- Calculate input power: $P_{K1} = \frac{M_{K2} \times n_2}{9.550 \times \eta}$
- Specify gear unit size and reduction ratio:
  - For one direction of rotation under load: $P_{N1} \geq P_{K1} \times F_S$
  - For two direction of rotation under load (reversing): $P_{N1} \geq P_{K1} \times F_S \times 1.43$ or $P_{N1,rev} \geq P_{K1} \times F_S$ where $P_{N1,rev} = P_{N1} \times 0.7$
- Calculate permitted peak load: $P_{K1\,zul} = \frac{2 \times P_{N1}}{F_F}$ $M_{K2\,zul} = \frac{2 \times M_{N2}}{F_F}$ or
- Check peak load: $P_{K1\,max} \leq P_{K1\,zul}$ or $M_{K2\,max} \leq M_{K2\,zul}$
- Calculate thermal rating: $P_T = P_{TH} \times f_1 \times f_2 \times f_3 \times f_4 \times f_L \times f_T$ → page 2.07
- Check thermal rating: $P_{K1} \leq P_T$, otherwise external cooling is required
- If external radial and axial shaft loads are present, please consult SEW-EURODRIVE

↓

Select connection to the motor (if required)

↓

Select alternative sealing systems (if required) → page 5.10

↓

Select cooling and pressure lubrication components (if required) → page 5.04

↓

Select monitoring functions and instrumentation (if required) → page 5.10

↓

Check whether all defined requirements are met

* Please refer to **Abbreviations Used** under Appendix in Section 6

Project Planning for Gear Units

Efficiency of gear units

The efficiency of the gear unit is mainly determined by the gearing and bearing friction. Note that the starting efficiency of a gear unit is always less than its efficiency at operating speed.

Based on nominal power, the efficiency η of M1.. gear unit is roughly 0.985.

Service factor F_S

The service factor takes into account the load impacts generated by the driving motor and the driven machine.

Recommended values in respect to
- field of application
- driven machine
- operating period / day

are given in the following table.

These tables are valid for **electric motors** used as driving machine.

For other types of driving machines, the following correction values apply:
- Combustion engines with four or more cylinders: FS (selection table) + 0.25
- Combustion engines with one or three cylinders: FS (selection table) + 0.5

Field of application/industry	Driven machine	Service factor operating period /day		
		< 3 h	3-10 h	> 10 h
Agitators and mixers	Agitators for liquids	1.00	1.25	1.50
	Agitators for liquids (variable density)	1.20	1.50	1.65
	Agitators for solids (non-uniform material)	1.40	1.60	1.70
	Agitators for solids (uniform material)	-	1.35	1.40
	Concrete mixers	-	1.50	1.50
Cableways	Material ropeways	-	1.40	1.50
	Aerial tramways	1)	1)	1)
	Surface lifts	1)	1)	1)
	Continuous aerial tramways	1)	1)	1)
	Funicular railway	1)	1)	1)
Conveyors	Bucket elevators	-	1.40	1.50
	Hoists - other	-	1.50	1.80
	Belt conveyors ≤ 100 kW	1.15	1.25	1.40
	Belt conveyors > 100 kW	1.15	1.30	1.50
	Apron feeders	-	1.25	1.50
	Screw feeders	1.15	1.25	1.50
	Shakers, reciprocating	1.55	1.75	2.00
	Escalators	1.55	1.25	1.50
	Passenger lifts	1)	1)	1)
Compressors	Reciprocating	-	1.80	1.90
	Centrifugal compressor	-	1.40	1.50
	Screw-type	-	1.50	1.75
Cranes and hoists	Cranes and hoists	2)	2)	2)
Energy	Frequency converters	-	1.80	2.00
	Water wheels (low speed)	-	-	1.70
	Water turbines	-	-	1)
Fans	Heat exchangers	1.50	1.50	1.50
	Dry cooling towers	-	-	2.00
	Wet cooling towers	2.00	2.00	2.00
	Blowers (axial and radial)	1.50	1.50	1.50
Food industry	Crushers and mills	-	-	1.75
	Beet slicer	-	1.25	1.50
	Drying Drums	-	1.25	1.50

1) Contact SEW-EURODRIVE
2) Contact SEW-EURODRIVE; dimensioning according to FEM1001

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Project Planning for Gear Units

Field of application/industry	Driven machine	Service factor operating period /day		
		< 3 h	3-10 h	> 10 h
Metal mills	Winders	-	1.60	1.75
	Slitters	1.55	1.75	2.00
	Table conveyors, individual drives	1)	1)	1)
	Table conveyors, group drives	1)	1)	1)
	Table conveyors, reversing	1)	1)	1)
	Wire drawing machines	1.35	1.50	1.75
	Flattening machines	1)	1)	1)
Mills and drums	Dryers and coolers	-	1.50	1.60
	Kilns	-	-	2.00
	Ball mills	-	-	2.00
	Coal mills	-	1.50	1.75
Pumps	Centrifugal pumps	1.15	1.35	1.45
	Reciprocating (single-cylinder)	1.35	1.50	1.80
	Reciprocating (multi-cylinder)	1.20	1.40	1.50
	Spiral pumps	-	1.25	1.50
	Rotary (gear type, vane)	-	-	1.25
Lumber industry	Lumber industry	1)	1)	1)
Mining industry	Crushers	1.55	1.75	2.00
	Screens and shakers	1.55	1.75	2.00
	Slewing drives	-	1.55	1.80
	Dredgers	1)	1)	1)
Pulp and paper industry	Debarking Drums and Barkers	1.55	1.80	2.00
	Rolls (pick-up, wire drive, wire suction)	-	1.80	2.00
	Dryer cylinders (anti-friction bearings)	-	1.80	2.00
	Calenders (anti-friction bearings)	-	1.80	2.00
	Filters (pressure vacuum)	-	1.80	2.00
	Beaters and chippers	1.55	1.75	2.00
	Jordan mills	-	1.50	1.75
	Presses (bark, felt, size, suction)	-	-	1.75
	Reels	-	-	1.75
	Pulpers	1)	1)	1)
	Washer filters	-	-	1.50
	Yankee cylinders (dryers)	1)	1)	1)
Rubber and plastic industry	Extruders (plastic)	-	1.40	1.60
	Extruders (rubber)	-	1.50	1.80
	Rubber mills (2 in a row)	1.55	1.75	2.00
	Rubber mills (3 in a row)	-	1.50	1.75
	Warming mills	1.35	1.50	1.75
	Calenders	-	1.65	1.65
	Grinders	1.55	1.75	2.00
	Mixing mills	1)	1)	1)
	Sheeters	1.55	1.75	2.00
	Refiners	1.55	1.75	2.00
	Tubers	1)	1)	1)
Waste water treatment	Impeller areator	-	1.80	2.00
	Thickeners	1.15	1.25	1.50
	Vacuum filters	1.15	1.30	1.50
	Collectors	1.15	1.25	1.50
	Screw pump	-	1.30	1.50
	Brush areators	-	-	2.00

1) Contact SEW-EURODRIVE

Project Planning for Gear Units

Peak Factor F_F

The peak factor F_F takes into account how often peak loads occur. The permitted peak load depends on the frequency per hour and is calculated according to the following formula:

1. Based on torque

$$M_{K2\ zul} = \frac{2 \times M_{N2}}{F_F}$$

$M_{K2\ zul}$ = permitted peak torque at the gear unit output
M_{N2} = gear unit nominal torque
F_F = peak factor according to the following table

2. Based on power

$$P_{K1\ zul} = \frac{2 \times P_{N1}}{F_F}$$

$P_{K1\ zul}$ = permitted peak power at the gear unit input
P_{N1} = gear unit nominal power
F_F = peak factor according to the following table

	Frequency of peak load per hour					
	1 ... 5	6 ... 20	21 ... 40	41 ... 80	81 ... 160	> 160
Peak factor F_F	1.00	1.20	1.30	1.50	1.75	2.00

The gear units may only be overloaded for a short period of time. Individual peak loads must not last for more than ten seconds.

Thermal rating P_T

Thermal rating P_T is the actual power rating the gear unit can transmit continuously without exceeding the calculated oil temperature of:

90°C (1, 2 & 3 stage gear units)
80°C (4 stage gear units)
70°C (5 stage gear units)

$$P_T = P_{TH} \times f_1 \times f_2 \times f_3 \times f_4 \times f_5 \times f_L \times f_T$$

P_T = actual thermal rating
P_{TH} = gear unit thermal rating (page 3.04)
f_1 = altitude factor (table 2.01)
f_2 = mounting option factor (table 2.02)
f_3 = installation location factor (table 2.03)
f_4 = operating cycle factor (table 2.04)
f_5 = cooling fan factor (table 2.05)
f_L = lubrication factor (table 2.06)
f_T = ambient temperature factor (table 2.07)

Table 2.01 Altitude factor

	Altitude (metres above sea level)				
	0	1000	2000	3000	4000
f_1	1.0	1.0	0.94	0.87	0.83

Table 2.02 Mounting option factor

	Mounting type	
	Shaft mounted with torque arm	All other mounting options
f_2	1.07	1.00

Table 2.03 Installation location factor

	Installation location
	Open area / Large premises, eg. workshop
f_3	1.0

Table 2.04 Operating cycle factor

	Time under load per hour in %				
	100	80	60	40	20
f_4	1.0	1.06	1.16	1.35	1.78

Table 2.05 Cooling fan factor (if applicable)

	Fan type				
	Radial fan	Axial fan, n_1 [rpm]			
		1000	1200	1500	1800
f_5	1.0	1.3	1.4	1.5	1.5

Table 2.06 Lubrication factor

	Type of lubrication	
	Pressure	Bath or splash
f_L	1.1	1.0

Table 2.07 Ambient temperature factor

	Ambient air temperature [°C]				
	10	20	30	40	50
f_T	1.32	1.18	1.0	0.79	0.60

Note that the above thermal rating calculation is meant as a quick estimate. For detail calculation, please consult SEW-EURODRIVE

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Project Planning Example: Sugar cane chipper drive

Technical data and application conditions of gear unit

- Foot-mounted helical gear unit with solid shaft (key connection)
- Output speed n_2 = 740 rpm
- Output torque M_{K2} = 15 kNm
- Maximum output torque $M_{K2\ max}$ = 32 kNm
- Maximum input power $P_{K1\ max}$ = 2517 kW
- Operating time: on average 40% per hour,12 hours per day
- The gear unit is to be started up once per hour and subjected to frequent shock load from the in-feed (frequency of maximum output torque approx 100 per hour)
- The gear unit is to be used in open area under dusty environment, and an ambient temperature of 40°C
- Installation at sea level.
- Min service factor F_S = 2.0

Technical data of AC motors

- Input speed n_1 = 1180 rpm
- Motor power P_m = 1200 kW

Step 1: Calculating the gear ratio

Calculate the gear unit reduction ratio i using the following formula:

$$i = \frac{n_1}{n_2} = \frac{1180\ rpm}{740\ rpm} = 1.595$$

i = ratio
n_1 = input speed
n_2 = required output speed

This value is used to specify the nominal gear ratio i_N = 1.6

Step 2: Calculating the operating power

The input power P_{K1} of the drive is calculated as follows using the output torque M_{K2} or output power P_{K2} as well as output speed n_2 and efficiency η:

$$P_{K1} = \frac{M_{K2} \times n_2}{9.550 \times \eta} = \frac{15\,kNm \times 740\,rpm}{9.550 \times 0.985} = 1180\ kW$$

P_{K1} = input power [kW]
M_{K2} = output torque [kNm]
η = efficiency

(where η = 0.985 for single-stage gear units)

Step 3: Specifying gear unit size and gear unit reduction ratio

The required nominal power of the gear unit P_{N1} is calculated using input power P_{K1} and service factor F_S = 2.0 using the following formula:

$P_{N1} \geq P_{K1} \times F_S$

$P_{K1} \times F_S$ = 1180 kW x 2.0 = 2360 kW

This value is used to select the gear unit size M1PSF70 from the selection tables in page 3.01.

The selection of the gear unit provides the following technical data:

- Nominal power P_{N1} = 3098 kW
- Exact gear ratio i_{ex} = 1.59
- Nominal gear unit torque $M_{N2} = \frac{P_{N1} \times 9.550 \times \eta}{n_2} = \frac{3098\,kW \times 9.550 \times 0.985}{1180/1.59} = 39.3\,kNm$
- Thermal rating P_{TH} = 468 kW

Project Planning Example: Sugar cane chipper drive

Step 4: Calculating the permitted peak load

The permitted peak power $P_{K1\ ZUL}$ is calculated using nominal power P_{N1} and peak factor F_F:

$$P_{K1\ zul} = \frac{2 \times P_{N1}}{F_F} = \frac{2 \times 3098\ kW}{1.75} = 3541\ kW$$

$P_{K1\ ZUL}$ = permitted peak power on gear unit input [kW]
P_{N1} = nominal power [kW]
F_F = peak factor

The permitted peak torque $M_{K2\ ZUL}$ is calculated using nominal torque M_{N2} and peak factor F_F:

$$M_{K2\ zul} = \frac{2 \times M_{N2}}{F_F} = \frac{2 \times 39.3\ kNm}{1.75} = 44.9\ kNm$$

$M_{K2\ ZUL}$ = permitted peak torque on gear unit output [kNm]
M_{N2} = nominal gear unit torque [kNm]
F_F = peak factor

Step 5: Checking the peak load

The maximum operating power $P_{K1\ max}$ must not exceed the permitted peak power $P_{K1\ ZUL}$!

$P_{K1\ max} \leq P_{K1\ ZUL}$

2517 kW ≤ 3541 kW

or

The maximum output torque M_{K2} max must not exceed the permitted peak torque $M_{K2\ ZUL}$!

$M_{K2\ max} \leq M_{K2\ ZUL}$

32 kNm ≤ 44.9 kNm

Step 6: Calculating the thermal rating

$P_T = P_{TH} \times f_1 \times f_2 \times f_3 \times f_4 \times f_L \times f_T = 468\ kW \times 1.0 \times 1.0 \times 1.0 \times 1.35 \times 1.1 \times 0.79 = 549\ kW$

P_T = actual thermal rating
P_{TH} = gear unit thermal rating
f_1 = altitude factor
f_2 = mounting option factor
f_3 = installation location factor
f_4 = operating cycle factor
f_L = lubrication factor
f_T = ambient temperature factor

Higher thermal ratings are possible when using synthetic lubricants and special seals. Please contact SEW-EURODRIVE in such cases.

Step 7: Checking the thermal rating

The input power P_{K1} must not exceed the thermal rating P_T ($P_{K1} \leq P_T$).
Additional cooling is required if $P_{K1} > P_T$

1180 kW > 549 kW

→ Thermal rating not sufficient at 40°C

with two radial fan:
$P_T = P_{TH} \times f_1 \times f_2 \times f_3 \times f_4 \times f_5 \times f_L \times f_T = 1027\ kW \times 1.0 \times 1.0 \times 1.0 \times 1.35 \times 1.0 \times 1.1 \times 0.79 = 1205\ kW$

1180 kW < 1205 kW

→ Thermal rating is sufficient with two radial fan

Conclusion

- Gear unit type: M1PSF70
- Exact ratio: 1.59
- Final output speed: 742 rpm
- Final $F_s = P_{N1}/P_{K1} = 916/498.9 = 2.63$
- with two radial cooling fan
- with standard labyrinth seal

SEW EURODRIVE

Manufacturer reserves the right to alteration

Nominal Mechanical Power Ratings

Size M1P..	n_1 [rpm]	Nominal Mechanical Power Ratings P_{N1} [kW]																
		Nominal Ratio i_N																
		1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	1800	207	197	184	171	162	149	138	119	104	89.5	69.7	58.6	47.4	34.4	25.2	21.1	13.6
	1500	182	174	162	151	142	131	117	99.8	86.7	74.5	58.1	48.8	39.5	28.7	21.1	17.6	11.3
	1200	156	149	138	129	121	108	94.3	79.8	69.3	59.6	46.4	39	31.6	22.9	17	14.1	9.08
	1000	137	131	122	112	105	90.2	78.9	66.4	57.7	49.6	38.7	32.5	26.3	19.1	14.2	11.7	7.58
	750	105	104	96.3	85.2	78.7	67.6	59.2	49.8	43.2	37.2	29	24.4	19.7	14.3	10.7	8.84	5.69
20	1800	745	701	656	615	570	537	494	449	418	388	323	264	217	169	128	92.8	67.2
	1500	656	617	578	541	501	473	435	395	368	329	269	220	180	140	107	77.2	56
	1200	561	528	494	463	429	404	372	338	308	262	215	176	144	112	85.4	61.7	44.8
	1000	494	464	435	407	377	356	327	295	256	218	179	146	120	93.6	71.1	51.4	37.3
	750	404	380	355	333	308	291	266	221	191	163	133	109	89.8	70.1	53.3	38.5	27.9
30	1800	1333	1269	1183	1102	1038	956	893	812	751	706	631	521	436	320	229	200	137
	1500	1173	1117	1041	970	914	842	786	715	661	621	527	433	363	266	192	167	114
	1200	1003	955	890	830	782	720	672	611	556	512	421	346	290	212	154	133	91.4
	1000	883	841	784	730	688	634	576	513	463	426	350	287	241	177	129	111	76.1
	750	722	687	632	577	529	476	432	384	347	320	262	215	180	132	97.6	83.1	57
40	1800	1840	1752	1633	1521	1433	1320	1232	1134	1036	954	881	776	627	499	382	283	206
	1500	1619	1542	1437	1339	1261	1162	1085	998	912	839	776	645	521	415	317	235	172
	1200	1385	1319	1229	1145	1079	994	928	854	780	718	627	515	416	331	253	188	137
	1000	1219	1161	1082	1008	950	875	816	751	686	620	521	428	346	275	211	156	114
	750	997	949	884	824	776	715	652	586	524	464	390	320	259	206	157	117	85.6
50	1800	2703	2574	2399	2235	2106	1940	1811	1685	1523	1417	1309	1044	848	669	528	396	284
	1500	2379	2265	2111	1967	1854	1707	1594	1483	1340	1247	1118	869	705	556	439	329	236
	1200	2035	1938	1806	1683	1586	1460	1363	1268	1146	1060	892	693	563	444	350	262	189
	1000	1791	1705	1590	1481	1396	1285	1200	1116	1009	882	742	576	468	369	291	218	157
	750	1464	1394	1300	1211	1141	1051	981	895	760	659	554	431	350	276	218	163	117
60	1800	3503	3338	3117	2909	2685	2521	2309	2157	1994	1843	1677	1538	1211	970	695	547	421
	1500	3084	2938	2743	2561	2363	2219	2032	1899	1755	1622	1476	1285	1008	806	582	455	350
	1200	2638	2513	2346	2190	2021	1898	1738	1624	1501	1387	1248	1025	804	643	468	363	280
	1000	2322	2212	2065	1928	1779	1670	1530	1429	1302	1179	1037	852	668	535	392	302	232
	750	1898	1809	1688	1576	1452	1325	1187	1086	977	884	775	637	499	400	295	226	174
70	1800	5010	4706	4401	4115	3889	3581	3288	3063	2855	2557	2346	2144	1733	1374	1087	836	620
	1500	4410	4142	3874	3622	3423	3152	2894	2696	2513	2250	2065	1788	1442	1143	904	695	516
	1200	3772	3543	3313	3098	2928	2696	2476	2306	2150	1925	1744	1427	1151	912	721	555	412
	1000	3320	3119	2916	2727	2577	2373	2179	2030	1892	1687	1450	1186	957	758	599	461	342
	750	2714	2550	2384	2230	2107	1940	1744	1582	1446	1265	1084	886	715	567	448	345	256
80	1800	6696*	6383	5960	5563	5135	4848	4416	4127	3816	3527	3237	2912	2585	1774	1606	1235	870
	1500	5894	5618	5246	4897	4519	4267	3887	3632	3359	3104	2849	2563	2150	1561	1353	1027	724
	1200	5041	4805	4487	4188	3866	3650	3325	3107	2873	2655	2437	2127	1716	1335	1079	819	578
	1000	4437	4230	3949	3686	3402	3212	2926	2735	2529	2337	2145	1769	1426	1167	897	681	480
	750	3628	3458	3229	3014	2782	2626	2392	2236	2047	1854	1651	1321	1065	872	670	509	359
90	1800	8404*	8001*	7458*	6950	6548	6032	5632	5123	4735	4362	3982	3654	3326	2249	2051	1807	-
	1500	7397	7042	6565	6117	5764	5309	4957	4509	4168	3839	3505	3216	2927	1979	1805	1503	-
	1200	6327	6024	5615	5233	4930	4541	4240	3857	3565	3284	2998	2751	2446	1693	1484	1199	-
	1000	5569	5302	4942	4606	4339	3997	3732	3395	3138	2890	2639	2421	2033	1490	1234	996	-
	750	4553	4335	4041	3765	3548	3268	3051	2775	2565	2363	2157	1900	1519	1179	922	744	-
100	1800	11653*	11138*	10395*	9670*	9136*	8414	7858	7235	6607	6087	5625	5162	4698	3473	3145	2680	-
	1500	10257*	9803*	9150	8511	8041	7406	6917	6368	5815	5358	4951	4544	4135	3057	2768	2229	-
	1200	8773	8385	7826	7281	6878	6335	5916	5447	4974	4583	4235	3886	3537	2615	2254	1777	-
	1000	7722	7381	6889	6408	6054	5576	5208	4794	4378	4034	3727	3421	3024	2301	1874	1477	-
	750	6313	6034	5632	5239	4950	4559	4258	3920	3580	3298	3047	2797	2258	1829	1400	1103	-
110	1800	15063*	14396*	13436*	12498*	11805*	10872*	10154*	9446*	8536*	7864*	7344*	6553*	6134*	4234	3882	3515	-
	1500	13258*	12671*	11826*	11000*	10390	9569	8937	8315	7514	6922	6464	5767	5399	3726	3417	3094	-
	1200	11340	10839	10115	9410	8887	8185	7644	7112	6427	5921	5529	4933	4618	3187	2922	2507	-
	1000	9982	9540	8903	8282	7823	7204	6728	6260	5657	5212	4867	4342	4065	2805	2561	2084	-
	750	8161	7800	7279	6771	6396	5890	5501	5118	4625	4261	3979	3550	3198	2294	1913	1556	-

* Power ratings may be available with optional seal and bearing arrangement. Please contact SEW-EURODRIVE
Power ratings: The ratings are nominal, Service Factor F_S = 1.0. Higher power ratings are available with modified bearings
For ratios 5.6 and above, 2-stage helical gear units with higher power ratings but with lower thermal ratings are available
Lubrication: Shaded area indicates pressure lubrication is highly recommended when the mechanical power rating P_{K1} is higher than 500 kW
Cooling: Additional cooling is required, when the running power rating P_{K1} is higher than the thermal rating P_T
Check the maximum allowed rotational speed on page 3.03
Check the thermal ratings on page 3.04, 3.05 & 3.06

Exact Ratios

Size M1P..	Exact Ratios i_{ex}																
	Nominal Ratio i_N																
	1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	1.1333	1.2558	1.4250	1.5946	1.7714	2.0000	2.2647	2.5484	2.8276	3.1111	3.6071	3.9615	4.4167	5.0952	5.6896	6.2222	7.1579
20	1.1224	1.2609	1.4186	1.5750	1.7838	1.9714	2.2188	2.5517	2.8148	3.1200	3.5217	3.9600	4.3913	4.9524	5.5789	6.3809	7.1579
30	1.1333	1.2560	1.4250	1.5950	1.7710	2.0000	2.2330	2.5480	2.8400	3.1110	3.5830	4.0000	4.4170	5.0950	5.6900	6.2220	7.1580
40	1.1333	1.2560	1.4250	1.5950	1.7710	2.0000	2.2330	2.5160	2.8400	3.1920	3.5420	3.9545	4.4350	4.9520	5.5790	6.3000	7.0560
50	1.1333	1.2590	1.4250	1.5950	1.7710	2.0000	2.2330	2.4840	2.8400	3.1540	3.5000	4.0420	4.5000	5.0500	5.6190	6.3160	7.1180
60	1.1304	1.2500	1.4150	1.5790	1.8000	2.0000	2.2670	2.5000	2.8080	3.1250	3.5420	3.9550	4.5000	5.0000	5.7040	6.3810	7.0000
70	1.1250	1.2670	1.4290	1.5900	1.7570	2.0000	2.2580	2.5170	2.7780	3.2080	3.5910	4.0450	4.5000	5.0800	5.6520	6.2860	7.0000
80	1.1304	1.2500	1.4150	1.5790	1.8000	1.9700	2.2670	2.5000	2.8080	3.1250	3.5000	4.0000	4.4760	4.9520	5.5790	6.2630	7.1180
90	1.1333	1.2560	1.4250	1.5950	1.7710	2.0000	2.2330	2.5480	2.8400	3.1740	3.5830	4.0000	4.5000	5.0950	5.7140	6.2220	-
100	1.1333	1.2560	1.4250	1.5950	1.7710	2.0000	2.2330	2.5160	2.8400	3.1740	3.5420	3.9550	4.4500	4.9520	5.5790	6.3530	-
110	1.1333	1.2560	1.4250	1.5950	1.7710	2.0000	2.2330	2.4840	2.8400	3.1740	3.5000	4.0420	4.4000	5.0500	5.6190	6.3160	-

Please contact SEW-EURODRIVE for customised ratio options

Moment of Inertia

Size M1P..	Moment of Inertia at Output Shaft J_2 [kgm^2]																
	Nominal Ratio i_N																
	1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	0.0083	0.0092	0.0105	0.0117	0.0131	0.0148	0.0170	0.0192	0.0210	0.0227	0.0242	0.0260	0.0283	0.0311	0.0341	0.0362	0.0408
20	0.0853	0.0957	0.1080	0.1200	0.1360	0.1510	0.1710	0.1970	0.2130	0.2310	0.2420	0.2650	0.2870	0.2880	0.3100	0.3400	0.3660
30	0.2720	0.2990	0.3380	0.3780	0.4190	0.4740	0.5290	0.6070	0.6590	0.7090	0.7570	0.8190	0.8830	0.9050	0.9780	1.0200	1.1200
40	0.4820	0.5320	0.6020	0.6740	0.7490	0.8470	0.9470	1.0700	1.1800	1.1290	1.3400	1.4400	1.5700	1.5900	1.7100	1.8600	1.9900
50	0.8410	0.8990	1.0200	1.1400	1.2700	1.4300	1.6000	1.7900	2.0000	2.1700	2.2400	2.5000	2.7000	2.7300	2.9300	3.1600	3.4000
60	1.4400	1.5800	1.7900	1.9900	2.2700	2.5200	2.8500	3.1500	3.4800	3.7600	3.9800	4.3000	4.7200	4.7800	5.2400	5.5900	5.8900
70	2.5700	2.8900	3.2600	3.6300	4.0200	4.5900	5.2100	5.8000	6.2600	7.0200	7.2700	7.9500	8.6000	8.6300	9.2100	9.8200	10.400
80	4.5500	5.0100	5.6600	6.3200	7.2100	7.9000	9.0900	10.000	11.100	12.000	12.600	13.900	15.100	15.100	16.300	17.400	18.800
90	8.1300	8.9700	10.200	11.300	12.600	14.200	15.800	18.100	20.000	21.600	23.000	24.800	26.800	27.800	29.800	31.200	-
100	14.600	16.100	18.300	20.400	22.700	25.600	28.500	32.200	36.000	39.000	41.100	44.300	48.000	49.200	52.700	56.800	-
110	24.500	27.100	30.700	34.400	38.100	43.100	48.000	53.500	60.400	65.300	68.800	76.100	80.100	83.200	88.800	94.700	-

Nominal Output Torque*

Size M1P..	Nominal Output Torque M_{N2} [kNm]																
	Nominal Ratio i_N																
	1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	1.47	1.55	1.64	1.69	1.75	1.70	1.68	1.59	1.53	1.45	1.31	1.21	1.09	0.92	0.76	0.69	0.51
20	5.22	5.51	5.81	6.04	6.34	6.60	6.84	7.09	6.79	6.42	5.93	5.46	4.96	4.36	3.73	3.09	2.51
30	9.42	9.94	10.5	10.9	11.4	11.9	12.1	12.3	12.3	12.4	11.8	10.8	10.0	8.49	6.93	6.50	5.12
40	13.0	13.7	14.5	15.1	15.8	16.4	17.1	17.8	18.3	18.6	17.3	15.9	14.4	12.8	11.0	9.28	7.59
50	19.1	20.1	21.3	22.2	23.2	24.1	25.2	26.0	26.9	26.1	24.4	21.9	19.8	17.5	15.4	12.9	10.5
60	24.6	26.0	27.4	28.6	30.1	31.4	32.6	33.6	34.4	34.6	34.5	31.7	28.3	25.1	21.0	18.1	15.3
70	35.1	37.1	39.2	40.7	42.6	44.6	46.2	48.0	49.4	50.9	49.0	45.1	40.5	36.2	31.9	27.3	22.5
80	47.1	49.7	52.5	54.7	57.6	59.5	62.4	64.3	66.8	68.7	70.6	66.5	60.0	54.3	47.1	40.1	32.1
90	59.3	62.6	66.2	69.0	72.3	75.2	78.4	81.3	83.8	86.3	88.9	91.1	86.0	71.4	66.3	58.3	-
100	82.3	87.1	92.3	96.1	100	104	109	113	116	120	124	127	126	107	98.3	88.3	-
110	106	112	119	124	130	135	141	146	151	155	160	165	168	133	135	123	-

* Calculated with n_1=1000 rpm

Manufacturer reserves the right to alteration

Allowed Rotational Speed (Splash / Bath Lubrication)

Size M1P..	Allowed Rotational Speed n_{1max} [rpm]																
	Nominal Ratio i_N																
	1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
20	1900	2024	2305	2305	2492	2600	2881	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
30	1527	1615	1736	1858	1984	2148	2315	2541	2750	2944	3000	3000	3000	3000	3000	3000	3000
40	1358	1436	1543	1651	1764	1909	2058	2238	2444	2600	2600	2600	2600	3000	3000	3000	3000
50	1222	1292	1389	1486	1587	1718	1852	1996	2200	2200	2200	2200	2600	2600	2600	2600	2600
60	1089	1151	1235	1319	1432	1534	1671	1790	1900	1900	1900	1900	1900	2200	2200	2200	2200
70	966	1030	1104	1177	1253	1364	1481	1599	1700	1700	1700	1700	1700	1900	1900	1900	1900
80	859	907	974	1040	1129	1198	1318	1412	1536	1600	1600	1600	1600	1800	1800	1800	1800
90	763	807	868	929	992	1074	1157	1270	1375	1494	1500	1500	1500	1700	1700	1700	-
100	679	718	771	825	882	954	1029	1119	1222	1200	1300	1300	1300	1500	1500	1500	-
110	611	646	694	743	793	859	926	998	1100	1100	1100	1100	1100	1400	1400	1400	-

Allowed Rotational Speed (Pressure Lubrication)

Size M1P..	Allowed Rotational Speed n_{1max} [rpm]																
	Nominal Ratio i_N																
	1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20	3800	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
30	3055	3231	3473	3716	3969	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
40	2716	2872	3087	3303	3528	3640	3640	3640	3640	3640	3640	3640	3640	4000	4000	4000	4000
50	2444	2584	2778	2973	3080	3080	3080	3080	3080	3080	3080	3080	3080	3640	3640	3640	3640
60	2179	2302	2470	2638	2660	2660	2660	2660	2660	2660	2660	2660	2660	3080	3080	3080	3080
70	1932	2061	2208	2355	2380	2380	2380	2380	2380	2380	2380	2380	2380	2660	2660	2660	2660
80	1719	1815	1948	2081	2240	2240	2240	2240	2240	2240	2240	2240	2240	2520	2520	2520	2520
90	1527	1615	1736	1858	1984	2100	2100	2100	2100	2100	2100	2100	2100	2380	2380	2380	-
100	1358	1436	1543	1651	1764	1820	1820	1820	1820	1820	1820	1820	1820	2100	2100	2100	-
110	1222	1292	1389	1486	1540	1540	1540	1540	1540	1540	1540	1540	1540	1960	1960	1960	-

Allowed rotational speeds are valid for continuous running conditions with standard labyrinth seal and bearing options
Higher allowed rotational speeds for other seal and bearing options are available according to the running conditions, please consult SEW-EURODRIVE

Thermal Rating*

Ambient Air Temperature 30°C / Oil surface temperature in oil sump 90°C

Size M1P..	n_1 [rpm]	Number of fan/s	Thermal Rating P_{TH} [kW] Nominal Ratio i_N																
			1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
10	1800	-	41	43	44	46	47	49	50	51	52	54	55	56	57	58	59	60	61
		1 Fan+	96	98	100	101	103	104	105	107	108	109	110	111	113	113	114	115	116
		2 Fans	128	129	131	133	134	135	137	138	139	140	142	143	144	145	146	147	148
		Cooling Coil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1500	-	44	45	46	48	50	51	52	53	54	55	57	58	59	60	60	61	62
		1 Fan+	89	90	92	93	95	96	97	99	100	101	102	103	104	105	106	107	108
		2 Fans	118	119	121	122	124	125	126	127	129	130	131	132	133	134	135	136	136
		Cooling Coil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1200	-	46	47	49	51	52	53	54	55	56	58	59	60	60	61	62	63	64
		1 Fan+	81	82	83	85	86	87	88	90	91	92	93	94	95	95	96	97	98
		2 Fans	107	108	110	111	113	114	115	116	117	118	119	120	121	122	123	123	124
		Cooling Coil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1000	-	49	50	51	53	54	55	56	57	58	59	60	61	62	63	63	64	65
		1 Fan+	75	76	77	79	80	81	82	83	84	85	86	87	88	88	89	90	91
		2 Fans	99	100	102	103	104	105	106	107	108	109	110	111	112	113	114	115	115
		Cooling Coil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	750	-	52	53	54	56	57	58	59	60	60	61	62	63	64	65	65	66	67
		1 Fan+	66	67	69	70	71	72	73	74	75	76	77	77	78	79	79	80	81
		2 Fans	88	89	90	92	93	94	95	96	97	98	98	99	100	101	101	102	103
		Cooling Coil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1800	-	107	111	115	119	123	127	130	133	137	140	143	146	149	151	154	156	158
		1 Fan+	251	255	259	264	268	271	275	278	281	284	287	290	293	296	298	301	303
		2 Fans	332	337	341	345	349	352	356	359	362	366	369	372	374	377	379	382	384
		Cooling Coil	203	205	207	209	210	212	213	214	215	216	216	217	217	218	218	218	218
	1500	-	113	117	121	125	129	132	136	138	141	144	147	150	153	155	157	160	162
		1 Fan+	231	235	239	243	247	250	254	257	260	263	265	268	271	273	276	278	280
		2 Fans	307	311	315	319	322	326	329	332	335	338	341	344	346	349	351	353	356
		Cooling Coil	204	206	208	209	211	212	213	214	215	216	216	217	218	217	218	218	218
	1200	-	121	125	128	132	136	138	142	144	147	150	152	155	157	160	162	164	166
		1 Fan+	210	214	217	221	224	227	230	233	236	239	241	244	246	249	251	253	255
		2 Fans	279	282	286	290	293	296	299	302	305	307	310	313	315	317	319	322	324
		Cooling Coil	205	207	208	210	211	212	213	214	215	216	216	217	217	217	218	218	218
	1000	-	127	130	134	137	140	143	146	149	151	154	156	159	161	163	165	167	169
		1 Fan+	194	198	201	205	208	211	213	216	219	221	224	226	228	230	232	235	236
		2 Fans	258	261	265	269	272	274	277	280	282	285	288	290	292	294	296	298	300
		Cooling Coil	205	207	209	210	211	212	213	214	215	216	216	216	216	217	217	218	218
	750	-	135	138	141	145	148	150	153	155	157	160	162	164	166	168	170	172	174
		1 Fan+	172	175	179	182	185	187	190	192	194	197	199	201	203	205	207	209	211
		2 Fans	230	233	236	239	242	244	247	249	252	254	256	258	260	262	264	266	268
		Cooling Coil	207	208	210	211	212	213	214	214	215	215	216	216	217	217	217	217	217
30	1800	-	156	162	168	175	181	185	191	195	200	205	209	214	218	221	225	229	232
		1 Fan+	368	374	380	387	392	397	402	407	412	416	421	425	429	433	437	440	444
		2 Fans	487	493	499	506	511	516	522	526	531	535	540	544	548	552	556	559	563
		Cooling Coil	331	333	335	337	338	340	341	342	342	342	343	344	342	342	342	341	341
	1500	-	166	172	177	184	189	193	198	203	207	211	216	220	224	227	230	234	237
		1 Fan+	339	345	350	357	362	367	371	376	380	384	389	393	397	400	404	407	410
		2 Fans	449	455	461	467	472	477	482	486	490	495	499	503	507	510	514	517	521
		Cooling Coil	330	332	334	336	337	338	339	340	341	341	341	341	341	341	340	340	339
	1200	-	177	182	188	193	198	203	207	211	215	219	223	227	231	234	237	240	243
		1 Fan+	307	313	318	324	329	333	337	341	345	350	354	357	361	364	367	370	373
		2 Fans	408	413	419	424	429	434	438	442	446	450	454	458	462	465	468	471	474
		Cooling Coil	329	331	333	335	336	337	338	338	339	339	339	339	339	339	338	338	338
	1000	-	186	191	196	201	206	210	214	218	221	225	229	233	236	238	242	245	248
		1 Fan+	284	289	294	300	304	308	313	316	320	324	328	331	335	337	340	343	346
		2 Fans	378	383	388	393	398	402	406	410	414	418	421	425	428	431	434	437	440
		Cooling Coil	329	330	332	334	335	336	336	337	338	337	338	338	337	337	337	336	336
	750	-	198	203	207	212	216	220	224	227	231	234	237	241	244	246	249	252	254
		1 Fan+	253	257	261	266	271	274	278	281	285	288	292	295	298	301	303	306	309
		2 Fans	336	341	345	350	354	358	362	365	368	372	375	378	381	384	387	390	392
		Cooling Coil	328	329	331	332	333	334	334	335	335	335	336	335	335	335	335	334	334

* Thermal rating values (with fan) are based on radial fan option. No axial fan option for M1 series
\+ Fan on opposite of HSS end
Pressure lubrication is highly recommended when P_{K1} is higher than 500 kW

SEW EURODRIVE

Manufacturer reserves the right to alteration

Thermal Rating*

Ambient Air Temperature 30°C / Oil surface temperature in oil sump 90°C

Size M1P..	n_1 [rpm]	Number of fan/s	Thermal Rating P_{TH} [kW]																
			Nominal Ratio i_N																
			1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
40	1800	-	192	199	206	215	222	228	234	240	245	251	257	262	267	272	276	281	285
		1 Fan+	451	459	466	475	481	488	494	500	505	511	517	522	527	531	536	540	545
		2 Fans	598	605	612	621	628	634	640	646	652	657	663	668	673	678	682	687	691
		Cooling Coil	485	487	488	488	487	488	487	486	485	484	482	480	477	476	474	471	469
	1500	-	204	211	218	225	232	238	243	249	254	260	265	270	275	279	283	287	291
		1 Fan+	416	423	430	438	444	450	456	461	467	472	477	482	487	491	495	500	504
		2 Fans	552	559	565	573	580	585	591	597	602	607	613	618	623	627	631	635	639
		Cooling Coil	480	481	482	482	482	482	481	480	480	478	476	474	472	470	468	466	464
	1200	-	218	224	230	238	244	249	254	259	264	269	274	279	283	287	291	295	299
		1 Fan+	377	384	390	397	403	409	414	419	424	429	434	439	443	447	451	455	458
		2 Fans	501	507	514	521	527	532	538	543	548	553	558	562	567	570	574	578	582
		Cooling Coil	474	475	476	478	475	475	474	474	473	471	470	468	466	464	462	460	468
	1000	-	228	234	240	247	252	257	263	267	272	277	281	285	290	293	297	300	304
		1 Fan+	349	355	361	368	374	379	384	388	393	398	402	407	411	414	418	422	425
		2 Fans	464	470	476	483	488	493	499	503	508	513	517	521	526	529	533	536	540
		Cooling Coil	469	470	471	470	470	470	469	469	468	466	464	463	461	459	457	455	453
	750	-	243	249	254	260	265	270	275	279	283	287	291	295	299	302	306	309	312
		1 Fan+	310	316	321	327	332	337	341	345	350	354	358	362	366	369	372	376	379
		2 Fans	413	418	423	430	435	439	444	448	452	456	461	465	468	471	475	478	481
		Cooling Coil	462	462	463	463	462	462	461	461	460	459	457	455	454	452	450	449	447
50	1800	-	241	250	260	270	279	286	295	302	309	316	323	330	336	342	347	353	359
		1 Fan+	568	577	587	597	606	613	622	629	636	643	650	657	663	669	674	680	686
		2 Fans	752	761	771	781	790	797	806	813	820	827	834	841	847	853	858	864	870
		Cooling Coil	590	592	594	595	595	596	595	594	594	592	590	589	587	585	582	580	577
	1500	-	256	265	274	284	292	299	307	313	320	327	333	340	346	351	356	361	367
		1 Fan+	524	532	541	551	559	566	574	580	587	594	601	607	613	618	623	629	634
		2 Fans	694	703	712	721	730	737	744	751	758	764	771	777	783	789	794	799	804
		Cooling Coil	585	587	589	589	589	590	589	588	588	586	584	583	581	579	577	574	572
	1200	-	274	282	290	299	307	313	320	326	333	339	345	351	356	361	366	371	376
		1 Fan+	475	483	491	500	508	514	521	527	534	540	546	552	557	562	567	572	577
		2 Fans	631	639	647	656	663	670	677	683	689	696	702	708	713	718	723	728	732
		Cooling Coil	579	580	582	582	582	582	582	581	581	579	577	576	574	572	570	568	565
	1000	-	287	295	302	311	318	324	331	336	342	348	354	359	364	369	374	378	383
		1 Fan+	439	447	455	463	470	476	483	489	495	500	506	512	517	521	526	531	535
		2 Fans	584	592	599	608	615	621	628	633	639	645	651	656	661	666	670	675	680
		Cooling Coil	574	575	576	577	576	577	576	576	575	574	572	570	568	567	565	563	560
	750	-	306	313	320	328	334	340	346	351	356	361	367	372	376	380	385	389	393
		1 Fan+	390	397	404	411	418	424	430	435	440	445	451	455	460	464	468	473	477
		2 Fans	519	526	532	541	547	553	559	564	569	574	580	585	589	593	598	602	606
		Cooling Coil	566	567	568	568	568	569	568	567	567	565	564	562	561	559	557	555	553
60	1800	-	307	319	330	344	355	364	375	384	393	402	411	420	428	435	442	449	456
		1 Fan+	723	735	746	760	771	781	791	800	809	818	827	836	844	851	858	865	872
		2 Fans	957	969	981	994	1005	1015	1025	1034	1043	1052	1061	1070	1078	1085	1092	1099	1106
		Cooling Coil	739	741	744	745	747	747	748	747	746	744	743	740	738	736	733	731	727
	1500	-	326	337	348	361	371	380	390	398	407	416	424	432	440	446	453	460	466
		1 Fan+	666	677	688	701	711	720	730	738	747	756	764	772	780	786	793	800	806
		2 Fans	883	894	905	918	928	937	947	955	964	973	981	989	997	1003	1010	1017	1023
		Cooling Coil	733	735	738	738	740	740	740	740	739	737	736	733	731	729	726	724	721
	1200	-	348	359	369	380	390	398	407	415	423	431	439	446	453	459	466	472	478
		1 Fan+	604	615	625	636	646	654	663	671	679	687	695	702	709	715	722	728	734
		2 Fans	802	813	823	834	844	852	861	869	877	885	893	900	907	913	920	926	932
		Cooling Coil	726	728	730	731	732	732	732	731	731	729	727	725	723	721	719	716	713
	1000	-	365	375	384	395	404	412	421	428	435	443	450	457	464	469	475	481	487
		1 Fan+	559	569	578	589	598	606	614	622	629	637	644	651	658	663	669	675	681
		2 Fans	743	753	762	773	782	790	798	806	813	821	828	835	841	847	853	859	865
		Cooling Coil	720	722	724	724	726	726	726	725	724	722	721	719	717	715	712	710	707
	750	-	390	398	407	417	425	432	440	446	453	460	466	473	479	484	489	495	500
		1 Fan+	496	505	514	524	532	539	546	553	560	567	573	579	585	591	596	601	606
		2 Fans	661	669	678	688	696	703	711	717	724	731	737	744	750	755	760	766	771
		Cooling Coil	711	713	715	715	716	716	716	715	714	713	711	709	707	706	703	701	699

* Thermal rating values (with fan) are based on radial fan option. No axial fan option for M1 series
\+ Fan on opposite of HSS end
Pressure lubrication is highly recommended when P_{K1} is higher than 500 kW

Thermal Rating*

Ambient Air Temperature 30°C / Oil surface temperature in oil sump 90°C

Size M1P..	n_1 [rpm]	Number of fan/s	Thermal Rating P_{TH} [kW] Nominal Ratio i_N															
			1.12	1.25	1.40	1.60	1.80	2.00	2.25	2.50	2.80	3.15	3.55	4.00	4.50	5.00	5.60	6.30	7.10
70	1800	-	378	392	407	423	437	449	462	473	484	495	506	517	527	535	544	553	562
		1 Fan+	890	905	919	936	949	961	974	985	996	1008	1019	1029	1039	1048	1057	1066	1074
		2 Fans	1179	1193	1208	1224	1238	1250	1262	1273	1285	1296	1307	1318	1328	1336	1345	1354	1363
		Cooling Coil	860	865	870	872	874	877	878	879	879	879	878	876	875	873	871	868	866
	1500	-	402	415	429	444	457	468	480	491	501	512	522	532	542	550	558	566	574
		1 Fan+	821	834	848	863	876	887	899	909	920	931	941	951	960	968	977	985	993
		2 Fans	1088	1101	1115	1130	1143	1154	1166	1177	1187	1198	1208	1218	1227	1236	1244	1252	1260
		Cooling Coil	856	861	865	867	868	871	872	873	872	873	871	870	868	866	864	862	859
	1200	-	429	442	454	468	480	491	502	511	521	531	540	550	558	566	573	581	589
		1 Fan+	744	757	769	784	796	806	817	826	836	846	856	865	874	881	889	896	904
		2 Fans	988	1001	1013	1027	1039	1050	1061	1070	1080	1090	1099	1109	1117	1125	1132	1140	1148
		Cooling Coil	851	855	859	860	862	864	865	865	865	865	864	862	861	859	857	855	852
	1000	-	450	462	473	487	498	508	518	527	536	545	554	563	571	578	585	593	600
		1 Fan+	689	700	712	725	737	746	757	766	775	784	793	802	810	817	824	831	838
		2 Fans	915	927	939	952	963	973	983	992	1001	1011	1020	1028	1036	1043	1051	1058	1065
		Cooling Coil	846	850	854	855	856	859	859	860	859	859	858	857	855	853	851	849	847
	750	-	480	491	501	513	523	532	542	550	558	566	574	582	590	596	602	609	615
		1 Fan+	611	622	633	645	655	664	673	681	689	698	706	714	721	727	734	740	747
		2 Fans	814	824	835	847	857	866	875	883	892	900	908	916	923	930	936	943	949
		Cooling Coil	840	843	846	847	848	850	851	851	850	850	849	848	846	845	843	841	839
80	1800	-	453	471	488	508	524	538	554	567	580	594	607	620	632	642	653	664	674
		1 Fan+	1068	1085	1103	1122	1139	1153	1168	1181	1195	1209	1222	1234	1246	1257	1267	1278	1289
		2 Fans	1414	1431	1448	1468	1485	1499	1514	1527	1541	1554	1568	1580	1592	1603	1613	1624	1634
		Cooling Coil	1030	1036	1041	1045	1049	1050	1053	1053	1053	1053	1052	1050	1048	1046	1044	1041	1038
	1500	-	482	498	515	533	548	562	576	588	601	614	626	638	650	659	669	679	689
		1 Fan+	984	1001	1017	1035	1051	1064	1078	1091	1103	1116	1129	1141	1152	1161	1171	1181	1191
		2 Fans	1305	1321	1337	1356	1371	1384	1399	1411	1424	1437	1449	1461	1472	1482	1492	1502	1512
		Cooling Coil	1026	1030	1036	1038	1042	1043	1046	1046	1046	1045	1044	1043	1041	1039	1036	1034	1031
	1200	-	515	530	545	562	576	588	602	613	625	637	648	659	669	679	688	697	706
		1 Fan+	893	908	923	940	954	967	980	991	1003	1015	1026	1037	1048	1057	1066	1075	1084
		2 Fans	1185	1200	1215	1232	1247	1259	1272	1284	1295	1307	1319	1330	1340	1349	1358	1368	1377
		Cooling Coil	1020	1024	1029	1031	1034	1035	1037	1037	1037	1036	1035	1034	1032	1030	1028	1025	1022
	1000	-	539	554	568	584	597	609	621	632	643	654	665	675	685	693	702	711	719
		1 Fan+	829	840	854	870	884	895	908	918	929	940	951	962	971	980	988	997	1005
		2 Fans	1097	1112	1126	1142	1155	1167	1179	1190	1201	1212	1223	1233	1243	1251	1260	1269	1277
		Cooling Coil	1015	1019	1023	1025	1028	1029	1031	1031	1030	1029	1028	1027	1025	1023	1021	1018	1016
	750	-	576	588	601	616	628	638	650	659	669	679	689	698	707	715	723	730	738
		1 Fan+	733	746	759	773	786	796	807	817	827	837	847	856	865	872	880	888	896
		2 Fans	976	989	1002	1016	1028	1039	1050	1060	1070	1080	1089	1099	1107	1115	1123	1131	1138
		Cooling Coil	1007	1010	1014	1016	1018	1019	1020	1020	1020	1019	1018	1016	1015	1013	1011	1008	1006
90	1800	-	513	533	553	575	594	610	627	642	658	673	688	702	716	728	740	752	-
		1 Fan+	1210	1230	1249	1271	1290	1306	1324	1338	1354	1369	1384	1399	1412	1424	1436	1448	-
		2 Fans	1602	1621	1641	1663	1682	1698	1715	1730	1746	1761	1776	1790	1804	1816	1828	1840	-
		Cooling Coil	1140	1147	1154	1159	1162	1166	1168	1171	1172	1172	1171	1170	1169	1167	1165	1162	-
	1500	-	546	565	583	604	621	636	653	667	681	696	710	723	736	747	758	770	-
		1 Fan+	1115	1134	1152	1173	1190	1206	1222	1236	1250	1265	1279	1292	1305	1316	1327	1339	-
		2 Fans	1478	1497	1515	1536	1554	1569	1585	1599	1613	1628	1642	1655	1668	1679	1690	1702	-
		Cooling Coil	1136	1142	1149	1153	1157	1160	1162	1165	1165	1165	1164	1163	1161	1160	1158	1155	-
	1200	-	583	600	617	636	653	667	682	695	708	721	734	747	759	769	779	790	-
		1 Fan+	1011	1028	1046	1065	1081	1095	1110	1123	1136	1150	1163	1175	1187	1197	1208	1218	-
		2 Fans	1343	1360	1377	1396	1412	1426	1441	1454	1468	1481	1494	1507	1518	1528	1539	1549	-
		Cooling Coil	1132	1137	1143	1147	1150	1153	1154	1157	1157	1156	1156	1154	1153	1151	1149	1146	-
	1000	-	611	627	643	661	677	690	704	716	729	741	753	765	776	786	795	805	-
		1 Fan+	936	952	968	986	1001	1014	1028	1040	1053	1066	1078	1089	1100	1110	1120	1130	-
		2 Fans	1243	1260	1276	1294	1309	1322	1336	1348	1361	1373	1386	1397	1408	1418	1428	1438	-
		Cooling Coil	1127	1133	1138	1141	1144	1147	1148	1150	1150	1150	1149	1147	1146	1145	1143	1140	-
	750	-	652	667	681	698	711	723	736	747	758	770	781	791	801	810	819	828	-
		1 Fan+	831	845	860	876	890	902	915	926	937	948	959	970	980	988	997	1006	-
		2 Fans	1106	1120	1135	1151	1165	1177	1189	1200	1212	1223	1234	1245	1255	1263	1272	1281	-
		Cooling Coil	1121	1125	1130	1133	1135	1138	1139	1140	1140	1140	1139	1137	1136	1135	1133	1130	-

* Thermal rating values (with fan) are based on radial fan option. No axial fan option for M1 series
\+ Fan on opposite of HSS end
Pressure lubrication is highly recommended when P_{K1} is higher than 500 kW
Please contact SEW-EURODRIVE for thermal rating above size 90

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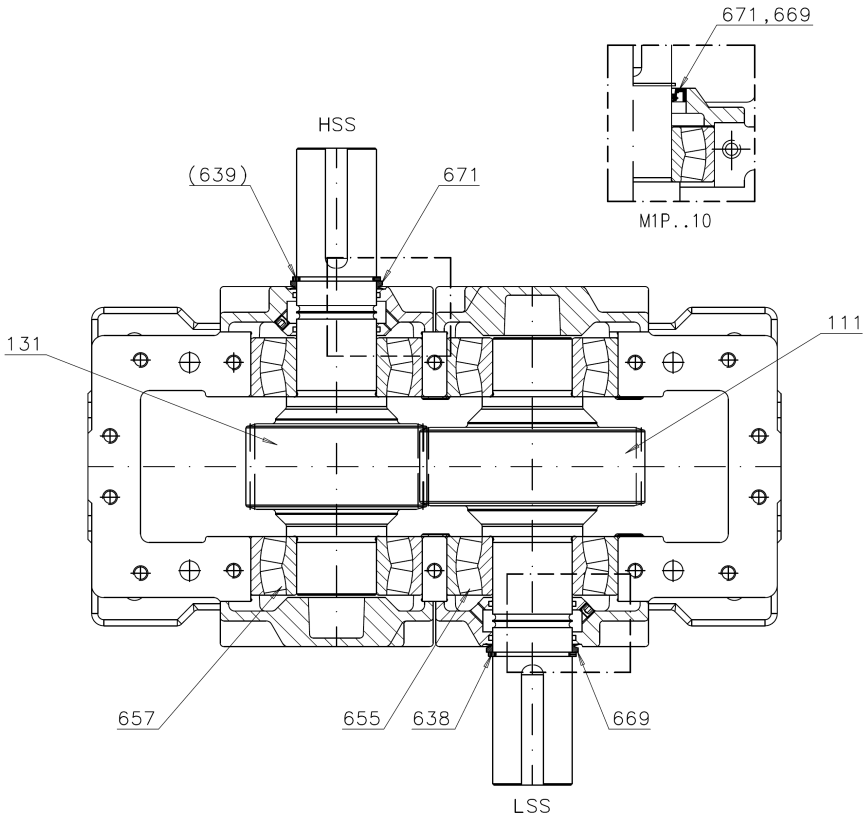
Position Numbers for Main Components

M1P..10 - 20

Size	i_N
10 - 20	1.0 - 1.8



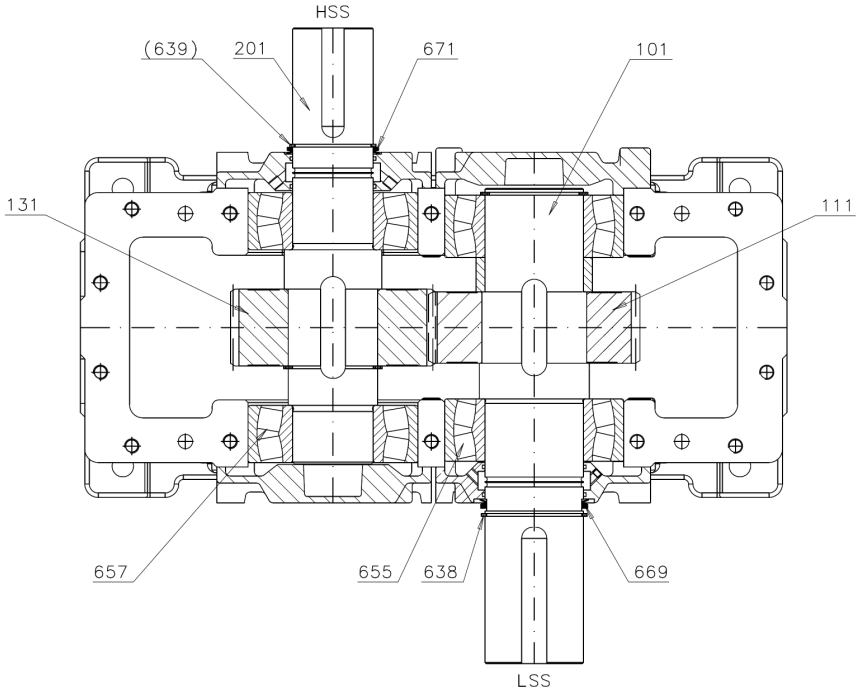
Main Components

Pos No.	Quantity	Description
111	1	Output Shaft with Wheel (LSS)
131	1	Pinion Shaft (HSS)
638	1	Locking Ring
(639)	1	Locking Ring
655	2	Bearing
657	2	Bearing
669	1	Lip Seal (M1P..10)
	1	V-Ring Seal (M1P..20)
671	1	Lip Seal (M1P..10)
	1	V-Ring Seal (M1P..20)

Position Numbers for Main Components

M1P..30 - 90

Size	i_N
30 - 80	1.0 - 1.4
90	1.0 - 1.6



Main Components

Pos No.	Quantity	Description
101	1	Output Shaft (LSS)
111	1	Wheel
131	1	Pinion
201	1	Input Shaft (HSS)
638	1	Locking Ring
(639)	1	Locking Ring
655	2	Bearing
657	2	Bearing
669	1	V-Ring Seal
671	1	V-Ring Seal

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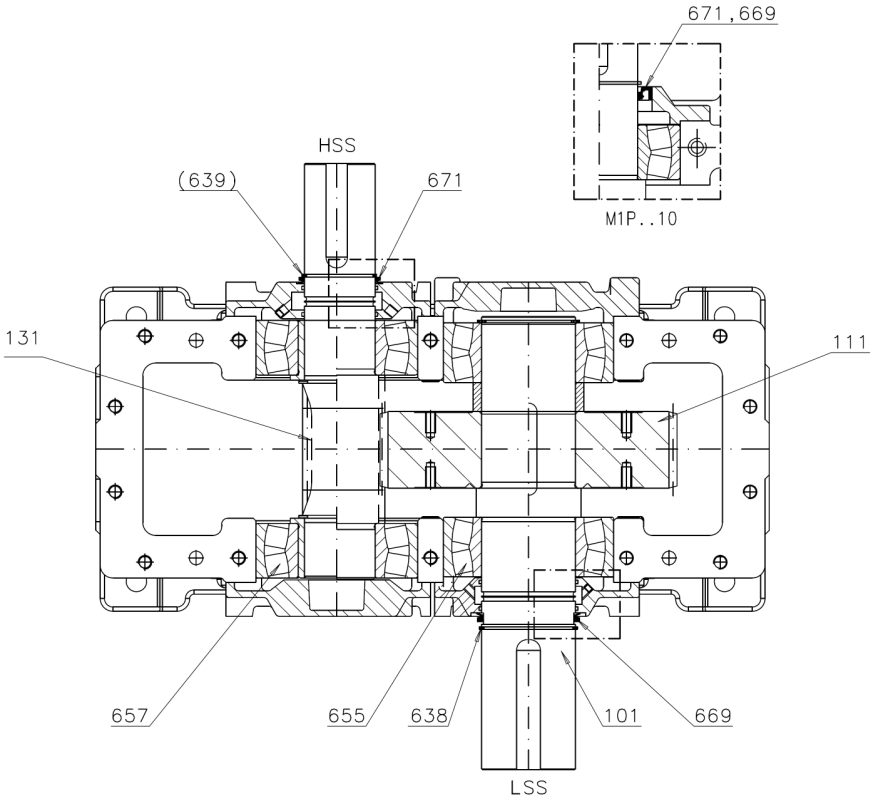
Position Numbers for Main Components

M1P..10 - 90

Size	i_N
10 - 20	2.0 - 7.1
30 - 80	1.6 - 7.1
90	1.8 - 7.1

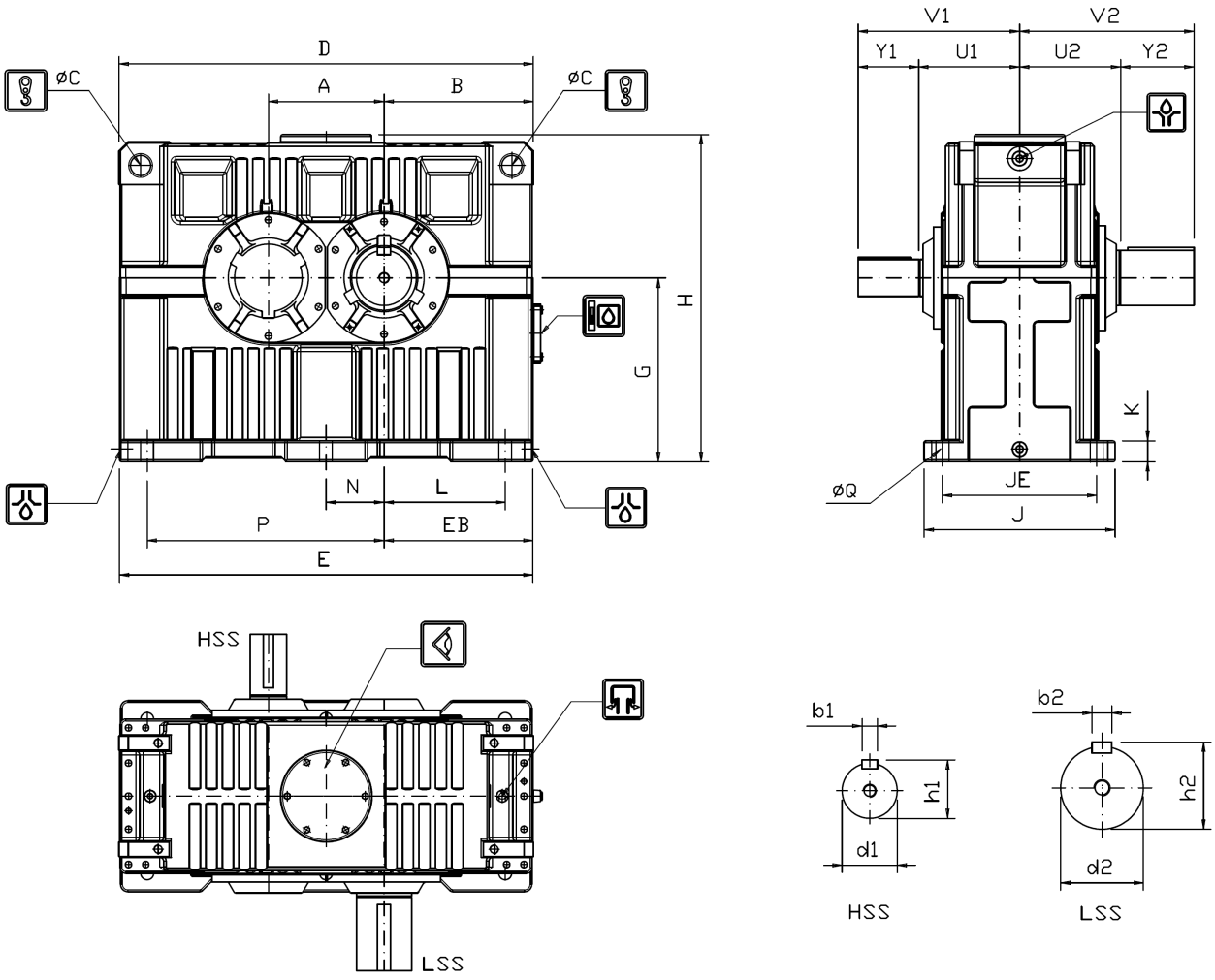


Main Components

Pos No.	Quantity	Description
101	1	Output Shaft (LSS)
111	1	Wheel
131	1	Pinion Shaft (HSS)
638	1	Locking Ring
(639)	1	Locking Ring
655	2	Bearing
657	2	Bearing
669	1	Lip Seal (M1P..10)
	1	V-Ring Seal (M1P..20 - 90)
671	1	Lip Seal (M1P..10)
	1	V-Ring Seal (M1P..20 - 90)

Gear Unit Dimensions

General Dimensions



Shaft ends: ISO/R775-1969
Keys and keyways: ISO/R773-1969
Shaft height deviations: ISO/496-1973

Size	Housing Dimensions [mm]									Foot Mounting [mm]					
	A	B	C	D	E	EB	G	H	J	JE	K	L	N	P	Q
10	100	130.5	25	361	361	130.5	160	306	170	130	23	100	-	200	14.5
20	160	204	35	568	566	203	250	498	260	200	33	165	-	325	18.5
30	200	259	45	718	716	258	315	600	340	270	40	210	-	410	24
40	225	291.5	45	808	806	290.5	355	665	380	310	45	230	-	460	24
50	250	325	45	900	896	323	400	730	420	340	50	265	-	515	28
60	280	364	55	1008	1006	363	450	810	460	370	50	295	140	575	28
70	315	406.5	55	1128	1126	405.5	500	890	520	420	56	330	158	645	35
80	355	453.5	65	1262	1256	450.5	560	985	560	460	65	370	178	725	35
90	400	463.5	65	1327	1327	463.5	560	1020	570	470	65	410	200	810	42
100	450	530	70	1415	1255	450	630	1105	590	480	65	365	225	720	42
110	500	580	70	1560	1400	500	710	1235	660	540	65	405	250	805	42

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General Dimensions

Size	i_N	HSS Dimensions [mm]						LSS Dimensions [mm]						Weight [kg]	Oil Quantity [l]
		U1	Y1	V1	d1	b1	h1	U2	Y2	V2	d2	b2	h2		
10	1.0 .. 3.15	120	82	202	40k6	12h9	43	120	82	202	40k6	12h9	43	65	2.7
	3.55 .. 4.5		58	178	30k6	8h9	33								
	5.0 .. 7.1		42	162	25k6	8h9	28								
20	1.0 .. 3.15	155	105	260	65m6	18h9	69	155	105	260	65m6	18h9	69	223	11
	3.55 .. 4.5		82	237	50k6	14h9	53.5								
	5.0 .. 7.1		82	237	40k6	12h9	43								
30	1.0 .. 3.15	185	130	315	80m6	22h9	85	185	165	350	100m6	28h9	106	425	18
	3.55 .. 4.5		105	290	65m6	18h9	69								
	5.0 .. 7.1		82	267	50k6	14h9	53.5								
40	1.0 .. 3.15	205	130	335	90m6	25h9	95	205	165	370	110m6	28h9	116	563	27
	3.55 .. 4.5		105	310	70m6	20h9	74.5								
	5.0 .. 7.1		82	287	55m6	16h9	59								
50	1.0 .. 3.15	225	165	390	100m6	28h9	106	225	165	390	120m6	32h9	127	740	44
	3.55 .. 4.5		130	355	80m6	22h9	85								
	5.0 .. 7.1		105	330	60m6	18h9	64								
60	1.0 .. 3.15	250	165	415	110m6	28h9	116	250	200	450	140m6	36h9	148	1012	67
	3.55 .. 4.5		130	380	90m6	25h9	95								
	5.0 .. 7.1		105	355	65m6	18h9	69								
70	1.0 .. 3.15	275	200	475	130m6	32h9	137	275	200	475	150m6	36h9	158	1361	87
	3.55 .. 4.5		165	440	100m6	28h9	106								
	5.0 .. 7.1		105	380	75m6	20h9	79.5								
80	1.0 .. 3.15	300	200	500	140m6	36h9	148	300	240	540	160m6	40h9	169	1850	106
	3.55 .. 4.5		165	465	110m6	28h9	116								
	5.0 .. 7.1		130	430	85m6	22h9	90								
90	1.0 .. 3.15	330	200	530	150m6	36h9	158	330	240	570	180m6	45h9	190	2318	120
	3.55 .. 4.5		165	495	120m6	32h9	127								
	5.0 .. 7.1		165	495	100m6	28h9	106								
100	1.0 .. 3.15	365	240	605	170m6	40h9	179	365	280	645	200m6	45h9	210	2280	115
	3.55 .. 4.5		200	565	140m6	36h9	148								
	5.0 .. 7.1		165	530	110m6	28h9	116								
110	1.0 .. 3.15	400	240	640	180m6	45h9	190	400	280	680	220m6	50h9	231	2950	160
	3.55 .. 4.5		200	600	150m6	36h9	158								
	5.0 .. 7.1		165	565	120m6	32h9	127								

Sizes 100 and above are with steel welded housing
Please contact SEW-EURODRIVE for dimensions of gear unit sizes above 110

Optional Accessories

i Cooling

Radial Fan Dimensions 5.02
Cooling Coil System 5.03

ii Lubrication

Lubrication Unit 5.04
Central Lubrication System 5.08
Oil Heating System 5.09

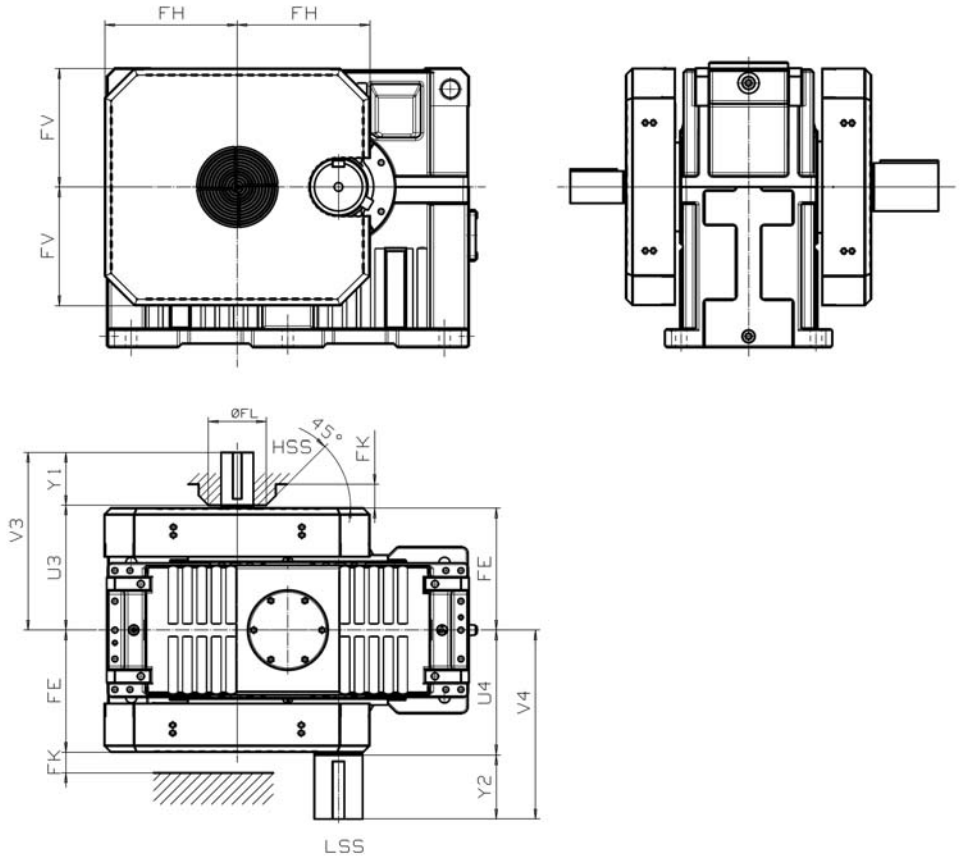
iii Optional Seal Arrangements

Optional Seal Arrangements 5.10

iv Coupled Equipment

Sensors 5.10

Cooling - Radial Fan Dimensions

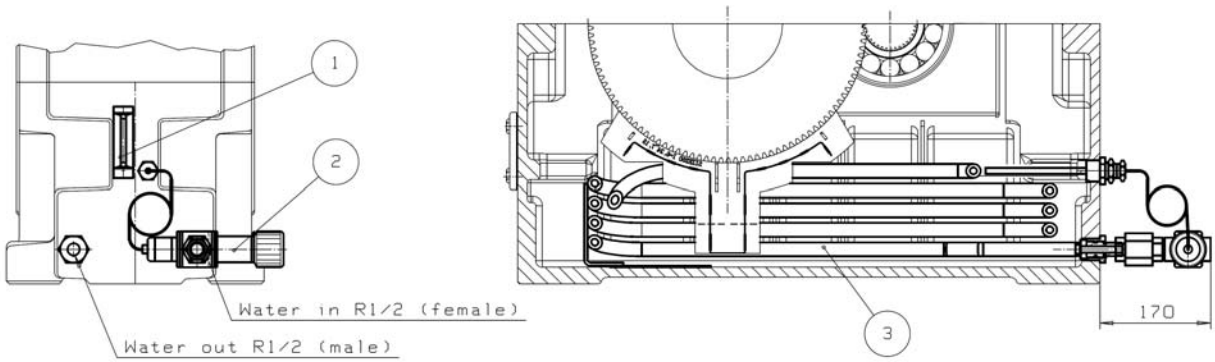


Size	i_N	HSS Dimensions [mm]		LSS Dimensions [mm]		Oil Quantity [l]				
		U3	V3	U4	V4	FH	FV	FE	FK_{min}	FL_{max}
10	1.0 .. 3.15	165	247	165	247	110	105	161	25	70
	3.55 .. 4.5		223							
	5.0 .. 7.1		207							
20	1.0 .. 3.15	210	315	210	315	190	187	205	30	95
	3.55 .. 4.5		292							
	5.0 .. 7.1		292							
30	1.0 .. 3.15	260	390	260	425	255	235	255	40	110
	3.55 .. 4.5		365							
	5.0 .. 7.1		342							
40	1.0 .. 3.15	300	430	300	465	287.5	275	292	55	140
	3.55 .. 4.5		405							
	5.0 .. 7.1		382							
50	1.0 .. 3.15	320	485	320	485	330	295	312	55	140
	3.55 .. 4.5		450							
	5.0 .. 7.1		425							
60	1.0 .. 3.15	365	530	365	565	370	340	357	65	170
	3.55 .. 4.5		495							
	5.0 .. 7.1		470							
70	1.0 .. 3.15	390	590	390	590	412.5	370	381	65	170
	3.55 .. 4.5		555							
	5.0 .. 7.1		495							
80	1.0 .. 3.15	415	615	415	655	457.5	405	410	65	180
	3.55 .. 4.5		580							
	5.0 .. 7.1		545							
90	1.0 .. 3.15	460	660	450	690	467.5	440	440	65	180
	3.55 .. 4.5		625							
	5.0 .. 7.1		625							

No fan options for sizes 100 and above

Optional Accessories

Cooling - Cooling Coil System



Components:

1. Thermometer scale 0 ... 100°C (+32 ... +212°F)
2. Thermostatic water valve
3. Cooling pipe, material: Stainless steel, AISI 316 (Standard Option)
   Copper Nickel, Cu/Ni

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Lubrication - Lubrication Unit

1. Selecting oil flow and cooling rating

Power loss to be cooled

$$P_L = \left(P_{K1} - \frac{P_T}{2} \right)(1 - \eta)$$

Required oil flow for cooling the gear unit:

$$Q_R = 2.3 \times P_L$$

Required oil pump output

$$Q_P \geq \max(Q_R, Q_L)$$

P_L = power loss to be cooled [kW]
P_{K1} = gear unit running load [kW]
P_T = gear unit thermal rating (→ section 3) [kW]
η = efficiency (→ section 2)
Q_R = oil flow required for cooling the gear unit [dm³/min]
Q_L = oil flow required for lubrication of the gear unit [dm³/min] (→ table 5.01)
Q_P = oil pump output [dm³/min]

1.1 Selecting the size of Oil Cooler

Required cooling rating

$$P_C \geq F_L \times P_L$$

P_C = cooling rating [kW]
F_L = safety factor for cooling capacity, clean cooling media F_L = 1.1
dirty cooling media F_L = 1.2

1.2 Water flow required for Water / Oil Coolers

For Plate Cooler, type P

$$Q_W \leq 2 \times P_L$$

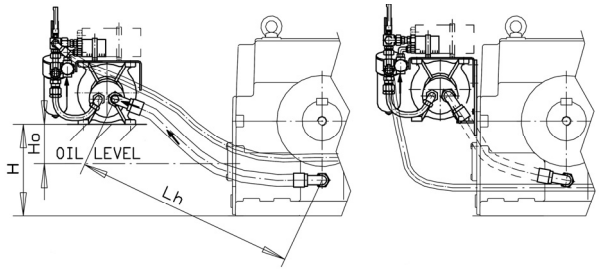
For Pipe Cooler, type B, BS or R

$$Q_W = F_W \times P_L$$

Q_W = water flow [dm³/min]
F_W = safety factor for flow capacity, clean water F_W = 1.5
dirty water F_W = 3

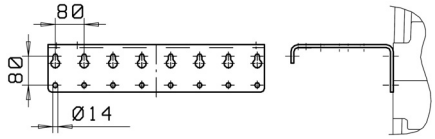
Table 5.01: Oil flow required for lubrication of gear unit

Oil flow for lubrication Q_L [dm³/min]											
Size	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**
Q_L	3.0	4.8	6.0	6.8	7.5	8.4	9.5	10.7	12.0	13.5	15.0



F = Floor mounted W = Wall mounted

Picture 5.01: Lubrication unit mounting position



Picture 5.02: Mounting plate for wall mounting

Selection Example

Data: M1PSF70, i_N = 1.6, n_1 = 1180 rpm, P_{K1} = 1180 kW, P_T = 549 kW (refer to page 2.09, step 6), Recycled water cooling media, Ambient temperature = 40°C, Plate cooler

1) Power loss to be cooled

$$P_L = \left(1180 - \frac{549}{2} \right)(1 - 0.985) = 13.6 \text{ kW}$$

2) Required oil flow for cooling the gear unit:

Q_R = 2.3 x 13.6 = 31.3 dm³/min

3) Required oil flow for lubrication of the gear unit:

Q_L = 9.5 dm³/min (→ table 5.01)

4) Required oil pump output

Q_P ≥ max(31.3, 9.5) dm³/min (→ table 5.02, Q_P = 44 dm³/min ≥ Q_R, OK)

5) Required cooling rating

P_C ≥ 1.2 x 13.6 ≥ 16.3 kW (→ table 5.02, choose P_C = 19 kW and T_W = 25..40°C)

6) Calculate water flow required

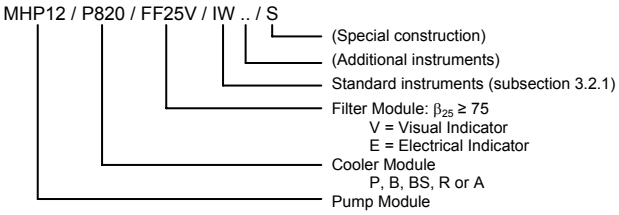
Q_W ≤ 2 x 13.6 = 27.2 dm³/min

Hence, Lubrication Unit selected is **MHP29 / P2560 / FF25V / IW**

Note that the above simplified selection method is meant as a guide for quick selection of the Lubrication Unit. For detail calculation and selection, please consult SEW-EURODRIVE.

Lubrication - Lubrication Unit

2. Specifying the Lubrication Unit Modules



See selection tables 5.02, 5.03 and 5.04 for the list of Lubrication Unit Modules.

Below is the list of information to be given in an order:
- type of the unit (e.g. MHP12 / P820 / FF25V / IW)
- motor main voltage and frequency
- instrument voltage (and frequency)
- ambient temperature range
- water temperature range (for water coolers)
- mounting position and location of the unit (→ picture 5.01)
- installation height H and hose length L_h must be advised to SEW-EURODRIVE when the lubrication unit is installed separate from the gear unit (→ picture 5.01).

It is recommended to place the Lubrication Unit at the low speed shaft end of the gear unit (→ picture 5.01, mounting position W).

The maximum length of the standard suction hose is 1000 mm. The maximum length of the pressure hose is 1500 mm. If hoses of greater length are required, the hose size must be increased and it is recommended to use steel piping between the Gear Unit and the Lubrication Unit (refer to SEW-EURODRIVE for more information).

Order example: MHP12 / P820 / FF25V / IW, at LSS end of the gear unit.

3. Technical data of components

Protection class for all electrical components is at minimum IP54. For other special requirements such as explosion proof, please contact SEW-EURODRIVE. All electrical instruments can be connected according to NC (Normally closed) principle.

3.1 Component modules

(1) Pump, type MHP/KF, Gear Wheel Pump + Motor, nominal pressure 1 MPa (10 bar/145 psi).
(2) Fibre-glass Filter, type FF, standard degree of filtration 25 µm abs; $\beta_{25} \geq 75$ (ISO 4572).
(A1) Standard visual Filter Contamination Indicator, code V.
(A2) Optional Electrical Contamination Indicator (24 VDC or 230 VAC), code E.
(3) Cooler type P, Plate Cooler, material AISI 316/Cu, not for seawater (table 5.02).
Optional:
- type BS, Pipe Cooler, material Cu/Ni, for seawater (→ table 5.03)
- type B, Pipe Cooler, material Cu/Ni, not for seawater (→ table 5.03)
- type R, Pipe Cooler, material AISI 316, not for seawater (→ table 5.03)
- type A, Air/oil Cooler (→ table 5.04).

3.2 Instrument module

3.2.1 Standard instruments
Use code IW for Lubrication Unit with Water Cooler and code IA for Lubrication Unit with Air Cooler.

(4) Cooling Power Regulator
- for Water Coolers, Thermostatic Water Valve, minimum water pressure required is 200 kPa (2 bar/29 psi)
- for Air Coolers, Thermostatic Switch (controls the cooling fan of the Air Cooler).

(5) Thermometer, scale 0 .. 100°C (+32 .. +212°F).
(6) Pressure gauge, scale 0 .. 10 bar (0 .. 145 psi).
(7) Pressure relief valve. Factory pre-adjusted.
(8) Pressure switch (24 VDC or 230 VAC).

3.2.2 Additional Instruments
(A3) Temperature Monitors (2 pcs; 70°C and 80°C, 24 VDC or 230 VAC). Additional code 2T.
(A4) Flow Indicator; visual (FV), electrical (FE).
(A5) Connection Box (CB).

Optional: lubrication unit with shaft end pump
For special instruments please consult SEW-EURODRIVE

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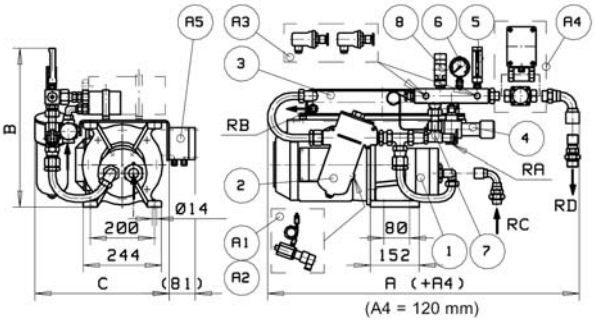
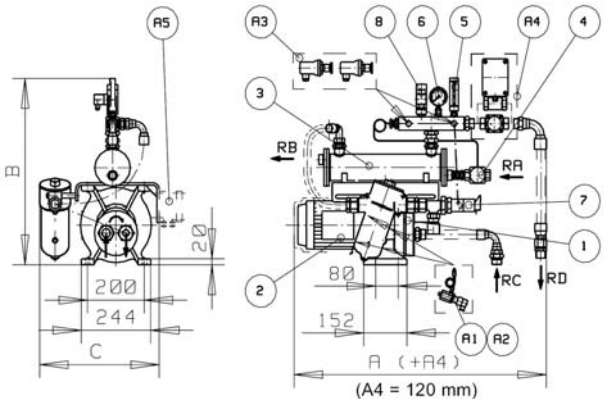
Lubrication - Lubrication Unit

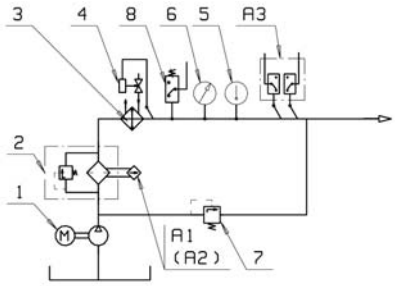
Technical data for Pressure Lubrication Unit with Water / Oil Cooler module



Type MHP/KF with Plate Cooler type P (table 5.01)



Type MHP with Pipe Cooler type B, BS and R (table 5.02)



Flow diagram for Water / Oil Cooler

Standard equipment
1. Pump
2. Filter
3. Cooler
4. Cooling Power Regulator
5. Thermometer
6. Pressure Gauge
7. Pressure Relief Valve

A1. Visual Filter Contamination Indicator

Optional accessories
8. Pressure switch

A2. Electrical Filter Contamination Indicator
A3. Temperature Monitors
A4. Flow Indicator
A5. Connection Box

Table 5.02 Lubrication Unit with Plate Cooler, type P. Not for sea water

Cooling Rating P_c [kW]	Pump Output Q_p [dm³/min]	Water Temperature range T_w [°C]	Water Supply Q_w [dm³/min]	Pump Module	Cooler Module P	Motor Rating 1500rpm		Weight [kg]	Dimensions [mm]			Water Connections female	
						IEC	[kW]		A	B	C	RA	RB
0.75	2.5	5..25	..1	MH-2	P8-10	19FF165	0.75	29	630	500	423	R3/8	R1/2
		25..40	1..2	MH-2	P8-10			29					
2.5	7.5	5..25	3..7	MH-5	P8-20	19FF165	0.75	30	630	500	423	R3/8	R1/2
		25..40	2..11	MH-5	P8-20			30					
3.4	11	5..25	4..10	MHP-7	P8-20	19FF165	0.75	30	630	500	423	R3/8	R1/2
		25..40	2..10	MHP-7	P8-30			32					
5.3	18	5..25	8..16	MHP-12	P8-30	24FF165	1.1	42	630	500	423	R3/8	R1/2
		25..40	6..9	MHP-12	P8-40			43					
8.5	18	5..25	4..16	MHP-12	P15-40	24FF165	1.1	45	790	500	423	R3/8	R1/2
		25..40	4..16	MHP-12	P15-50			47					
10.5	28	5..25	6..12	MHP-18	P15-40	24FF165	1.5	48	787	540	423	R3/4	R1
		25..40	5..24	MHP-18	P15-50			49					
15	28	5..25	5..24	MHP-18	P25-40	24FF165	1.5	55	889	540	423	R3/4	R1
		25..40	7..24	MHP-18	P25-60			62					
19	44	5..25	6..22	MHP-29	P25-40	28FF215	3	68	889	600	452	R3/4	R1
		25..40	9..38	MHP-29	P25-60			75					
24	44	5..25	9..38	MHP-29	P25-60	28FF215	3	68	889	600	452	R3/4	R1
		25..40	10..38	MHP-29	P25-100			88					
25	65	5..25	8..16	MHP-47	P25-60	28FF215	4	71	889	600	452	R3/4	R1
		25..40	12..57	MHP-47	P25-60			71					
29	65	5..25	10..23	MHP-47	P25-70	28FF215	4	72	889	600	452	R3/4	R1
		25..40	12..57	MHP-47	P25-110			93					
43	100	5..25	16..32	MKF3/80	P25-80	38FF265	7.5	*	889	580	500	R3/4	R1
		25..40	28..87	MKF3/80	P25-80			*					
48	100	5..25	16..28	MKF3/80	P25-80	38FF265	7.5	*	889	580	500	R3/4	R1
		25..40	20..87	MKF3/80	P25-100			*					
59	135	5..25	22..43	MKF3/100	P25-80	42FF300	11	*	889	580	500	R3/4	R1
		25..40	38..117	MKF3/100	P25-100			*					
66	152	5..25	24..48	MKF3/112	P25-100	42FF300	11	*	889	580	500	R3/4	R1
		25..40	32..133	MKF3/112	P25-110			*					
72	165	5..25	19..52	MKF4/125	P27-100	42FF300	11	*	889	580	500	R1	R1 1/4
		25..40	30..144	MKF4/125	P25-110			*				R3/4	R1
87	200	5..25	25..63	MKF4/150	P45-60	42FF300	15	*	889	580	624	R1	R1 1/4
		25..40	32..174	MKF4/150	P45-80			*					

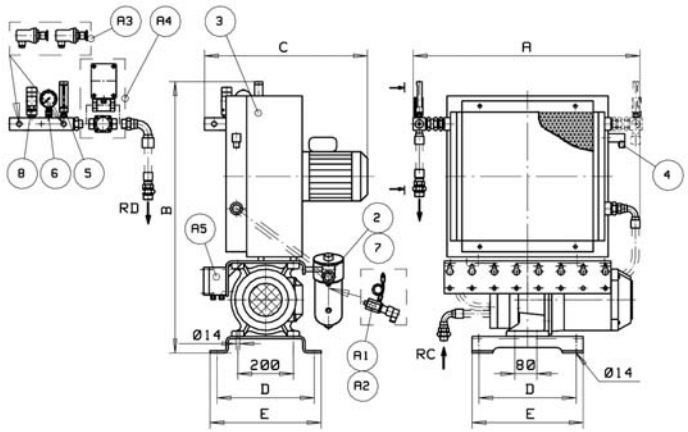
* Please consult SEW-EURODRIVE

Lubrication - Lubrication Unit

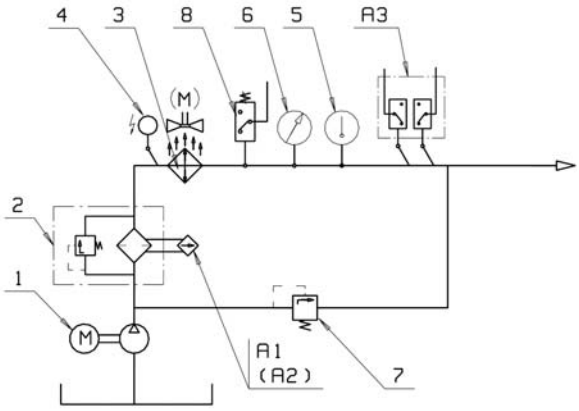
Table 5.03 Lubrication Unit with Pipe Cooler, types B, BS and R (for sea water, choose type BS)

Cooling Rating P_c [kW]	Pump Output Q_p [dm³/min]	Water Supply Q_w [dm³/min]	Pump Module	Cooler Module B, BS, R	Motor Rating 1500 rpm		Weight [kg]	Dimensions [mm]			Water Connections female	
					IEC	[kW]		A	B	C	RA	RB
0.75	2.5	1..2	MHI2	2	19FF165	0.75	50	700	645	390	R1/2	R3/4
2.5	7.5	4..8	MHI5	2	19FF165	0.75	50	700	645	390	R1/2	R3/4
3.4	11	5..10	MHP7	2	19FF165	0.75	52	730	635	390	R1/2	R3/4
5.3	18	8..16	MHP12	2	24FF165	1.1	56	740	635	390	R1	R3/4
8.5	18	13..26	MHP12	3	24FF165	1.1	61	750	695	390	R1	R1 1/4
10.5	28	16..32	MHP18	3	24FF165	1.5	64	760	695	390	R1	R1 1/4
15	28	23..45	MHP18	4	24FF165	1.5	67	840	695	390	R1	R1 1/4
19	44	29..57	MHP29	4	28FF215	3	84	860	755	430	R1	R1 1/4
24	44	32..63	MHP29	5	28FF215	3	87	1010	755	430	R1	R1 1/4
25	65	38..75	MHP47	4	28FF215	4	93	860	755	430	R1	R1 1/4
29	65	44..87	MHP47	5	28FF215	4	96	1010	755	430	R1	R1 1/4

Technical data for Pressure Lubrication Unit with Air / Oil Cooler module



Type MHP/KF with Air / Oil Cooler type A (table 5.03)



Flow diagram for Air / Oil Cooler

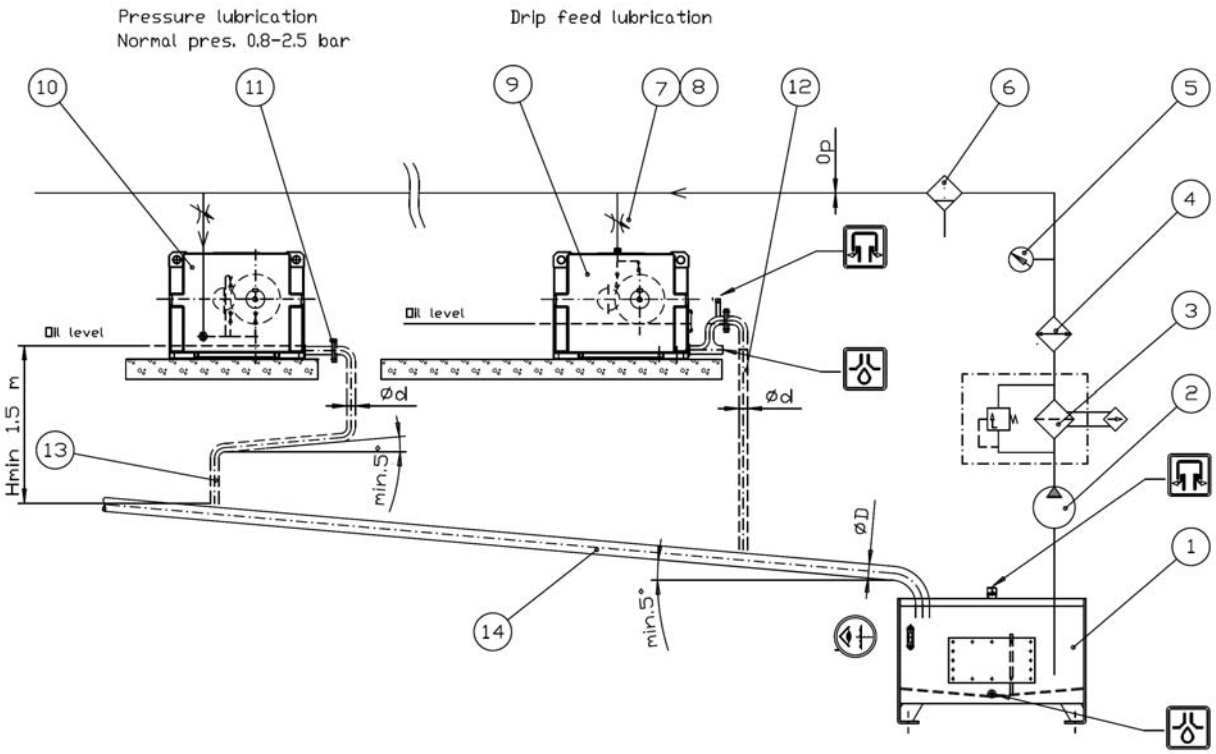
Table 5.04 Lubrication Unit with Air / Oil Cooler, type A

Cooling Rating P_c [kW]	Pump Output Q_p [dm³/min]	Pump Module	Cooler Module	Motor Rating 1500 rpm [kW]	Fan Motor		Noise level (1m) [dB(A)]	Weight [kg]	Dimensions [mm]				
					rpm	power [kW]			A	B	C	D	E
0.75	2.5	MHI2	A042	0.75	3000	0.25	70	40	500	730	530	*	*
2.5	7.5	MHI5	A042	0.75	3000	0.25	70	40	500	730	530	*	*
3.4	11	MHP7	A042	0.75	3000	0.25	70	40	500	730	530	*	*
5.3	18	MHP12	A074	1.1	1500	0.25	64	60	600	800	540	*	*
8.5	18	MHP12	A114	1.1	1500	0.25	71	60	670	870	570	350	400
10.5	28	MHP18	A164	1.5	1500	0.37	74	70	730	930	590	350	400
15	28	MHP18	A234	1.5	1500	0.75	79	80	850	1020	660	350	400
19	44	MHP29	A336	3	1000	0.55	72	100	960	1090	680	350	400
24	44	MHP29	A334	3	1500	2.2	84	110	960	1090	750	350	400
25	65	MHP47	A334	4	1500	2.2	84	110	960	1090	750	350	400
29	65	MHP47	A444	4	1500	2.2	84	130	960	1130	770	350	400
43	100	MKF3/80	A566	7.5	1000	1.5	81	140	1140	^	795	^	^
48	100	MKF3/80	A564	7.5	1500	2.2	84	140	1140	^	795	^	^
59	135	MKF3/100	A564	11	1500	2.2	84	145	1140	^	795	^	^
66	152	MKF3/112	A766	11	1000	2.2	86	210	1290	^	810	^	^
72	165	MKF4/125	A786	11	1000	2.2	87	220	1290	^	830	^	^
87	200	MKF4/150	A1128	15	750	2.2	85	230	1290	^	915	^	^

* Separate foot not included
^ Please consult SEW-EURODRIVE
Maximum air temperature, $T_{air,max}$ = 35°C
SEW-EURODRIVE reserves the right to optimise the Cooling Unit for each application

Manufacturer reserves the right to alteration

Lubrication - Central Lubrication System



Recommended Components and Dimensioning

(1) Oil tank:
- Oil tank must be closed and equipped with an oil draining plug, an oil level indicator, a splash plate and a breather. It is recommended to use a water absorbing breather in case of moisture climate. Splash plate is located between the oil return line and the suction line. An adequate volume of the oil tank is 5 x Q_p, where Q_p is the total oil flow of the system (pump capacity).

(2) Pump.

(3) Filter:
- filtration degree must be at least $\beta_{25} \geq 75$ according to ISO 4572 (25 µm abs.)
- filter is equipped with visual or electrical contamination indicator and a bypass valve.

(4) Cooler:
- recommended max. temperature of oil is 50°C.

(5) Pressure gauge, temperature gauge, pressure alarm switch.

(6) Water separation.

(7) Throttle valve:
- oil flow into gear unit is controlled by throttle valve.

(8) Flow meter:
- the oil flow into each gear unit must be adjusted at least once at startup according to SEW's instructions.

(9) Gear unit with splash / central lubrication:
- the oil level is controlled by central lubrication connection pipe
- lubrication method and oil level are determined by SEW.

(10) Gear unit with pressure / central lubrication:
- no oil level in the gear unit
- lubrication method and oil level are determined by SEW.

(11) Central lubrication connection flange:
- delivered by SEW
- size of the connection flange and oil return pipe depends of the oil flow (see graph below).

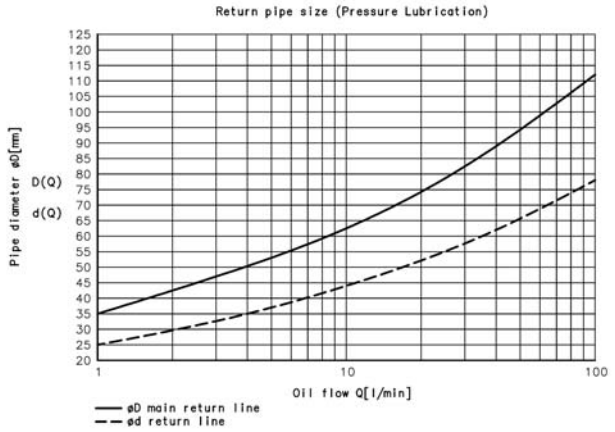
(12) Oil return line 1
- see dimensioning graph below
- Ød is calculated with oil class ISO VG 220 mineral and with startup temperature min. 15°C
- minimum oil level difference is 1.5 m (oil level in the gear unit and main return line).

(13) Oil return line 2.

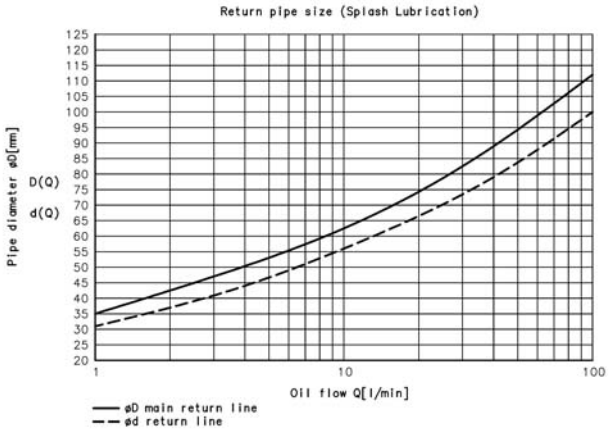
Optional Accessories

Lubrication - Central Lubrication System

(14) Main oil return line:
- see dimensioning graph below
- ØD is calculated with oil class ISO VG 220 mineral, startup temperature min. 15°C and slope 5°.
- length of the main return line is not critical if 5° slope is maintained.



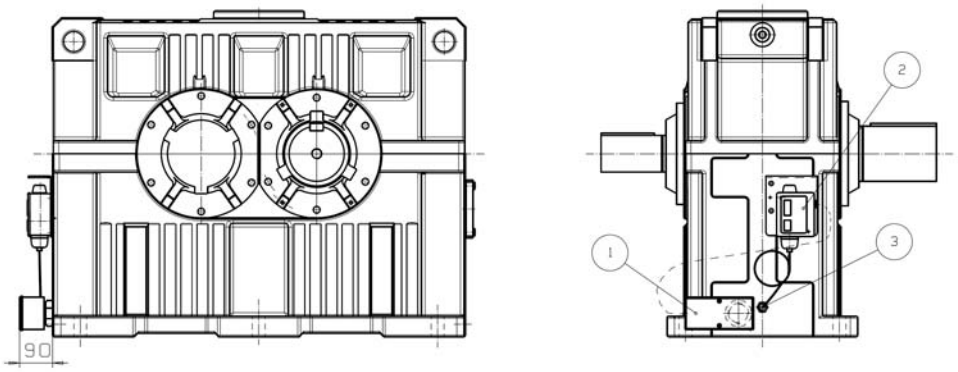
Oil return pipe size for pressure lubrication



Oil return pipe size for splash lubrication

Recommended oil class for central lubrication is minimum ISO VG 220 mineral. If other oil types is used, please contact SEW.

Lubrication - Oil Heating System



Components:

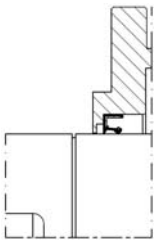
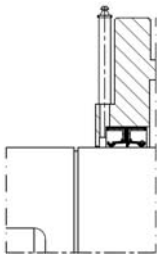
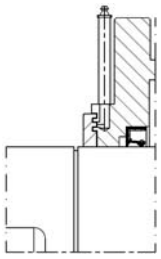
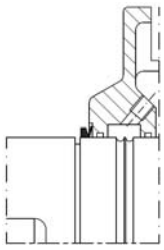
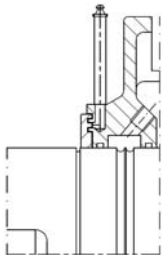
1. Oil heater
2. Thermometer
3. Sensor

Size	Power [W]	Voltage [V]	Frequency [H_Z]
10	-	-	-
20	-	-	-
30	670	230	50
40	670	230	50
50	1000	400/230	50
60	1000	400/230	50
70	1500	400/230	50
80	2000	400/230	50
90	2000	400/230	50
100	2000	400/230	50
110	2000	400/230	50

Manufacturer reserves the right to alteration

Optional Seal Arrangements

Seal arrangement alternatives on high speed shaft (HSS) and low speed shaft (LSS)[1)]

SLS	DLS	RLS	LVS	CLS
Lip seal (Standard) Single lip seal with dust protection cover • Clean environment	Double lip seal with grease nipple Double lip seal with re-greaseable dust protection cover • Dusty environment with abrasive particles	Radial labyrinth seal with grease nipple Single lip seal with radial grease labyrinth (Taconite seals) • Dusty environment with highly abrasive particles	Labyrinth seal Labyrinth seal with V-Ring • High speed or high temperature application in dusty environment	Contactless labyrinth seal Labyrinth seal with radial grease labyrinth • High speed or high temperature application in dusty environment highly abrasive particles
				

Seal material

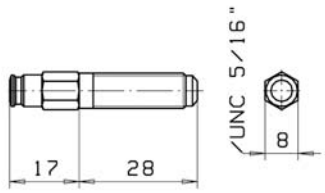
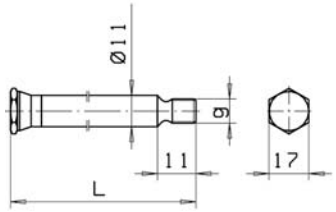
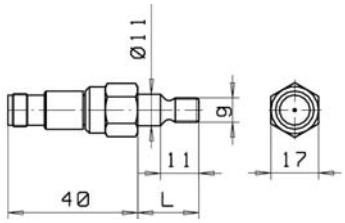
NBR
- when the running temperature of the oil is less than 80°C

VITON[2)]
- when hot media is flowing through the low speed shaft warming up the seal surfaces
- when outside source radiates heat on the seal warming it up
- always on HSS

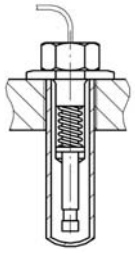
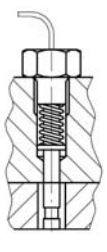
1) Seal arrangement selection does not affect the outer shaft end dimensions
2) VITON is less sensitive to become hard than NBR in high temperatures

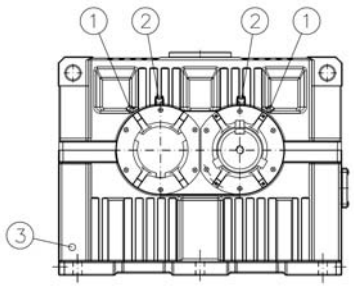
Coupled Equipment - Sensors

Shock Impulse Sensor

SIS1	SIS2	SIS3
Nipple STD-2 UNC5/16 and cover STE-01	Nipple 32000 and cover 81025	Shock pulse transducer 40000 and TNC cable connector 13008
		
	g: M8 (UNC 5/16") — L [mm]: 24, 113, 202, 291	g: M8 (UNC 5/16") — L [mm]: 17, 106, 195, 284

Temperature Sensor

TSO	TSB
Oil temperature sensor (PT100)	Bearing temperature sensor (PT100)
	



1 Example of bearing temperature sensor position
2 Example of shock impulse sensor position
3 Example of oil temperature sensor position

Abbreviations Used

f_1	Altitude factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_2	Mounting option factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_3	Installation location factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_4	Operating cycle factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_5	Cooling fan factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_L	Lubrication factor (= Correction factor for calculating the thermal rating of the gear unit)	-
f_T	Ambient temperature factor (= Correction factor for calculating the thermal rating of the gear unit)	-
F_A	Axial force	kN
F_F	Peak factor	-
F_L	Safety factor for cooling capacity	-
F_R	Allowed actual radial force	kN
F_{RN}	Allowed nominal radial force	kN
F_S	Gear unit service factor = $M_{N2}/M_{K2} = P_{N1}/P_{K1}$	-
F_W	Safety factor for flow capacity	-
η	Efficiency	-
HSS	High speed shaft of the gear unit	-
i_{ex}	Exact gear unit reduction ratio	-
i_N	Nominal gear unit reduction ratio	-
K_Y	Radial force location factor	-
LSS	Low speed shaft of the gear unit	-
M_{K2}	Output torque (= operating torque on LSS)	kNm
$M_{K2\ MAX}$	Peak output torque	kNm
$M_{K2\ ZUL}$	Permitted peak torque on the gear unit output	kNm
M_{N2}	Nominal gear unit torque	kNm
n_1	Input speed (HSS)	rpm
n_2	Output speed (LSS)	rpm
P_C	Cooling rating	kW
P_{K1}	Input power (= operating power on HSS)	kW
$P_{K1\ MAX}$	Peak input power on HSS	kW
$P_{K1\ ZUL}$	Permitted peak power on the gear unit input	kW
P_{K2}	Output power (= operating power on gear unit output)	kW
P_L	Power loss to be cooled	kW
P_M	Nominal motor power	kW
P_{N1}	Nominal gear unit power	kW
$P_{N1,\ rev}$	Nominal gear unit power with reversing load = P_{N1} x 0.7	kW
P_T	Thermal rating of the gear unit at existing ambient conditions	kW
P_{TH}	Nominal thermal rating of the gear unit at defined ambient conditions	kW
Q_L	Oil flow required for lubrication of the gear unit	dm^3/min
Q_P	Oil pump output	dm^3/min
Q_R	Oil flow required for cooling the gear unit	dm^3/min
Q_W	Water flow rate	dm^3/min

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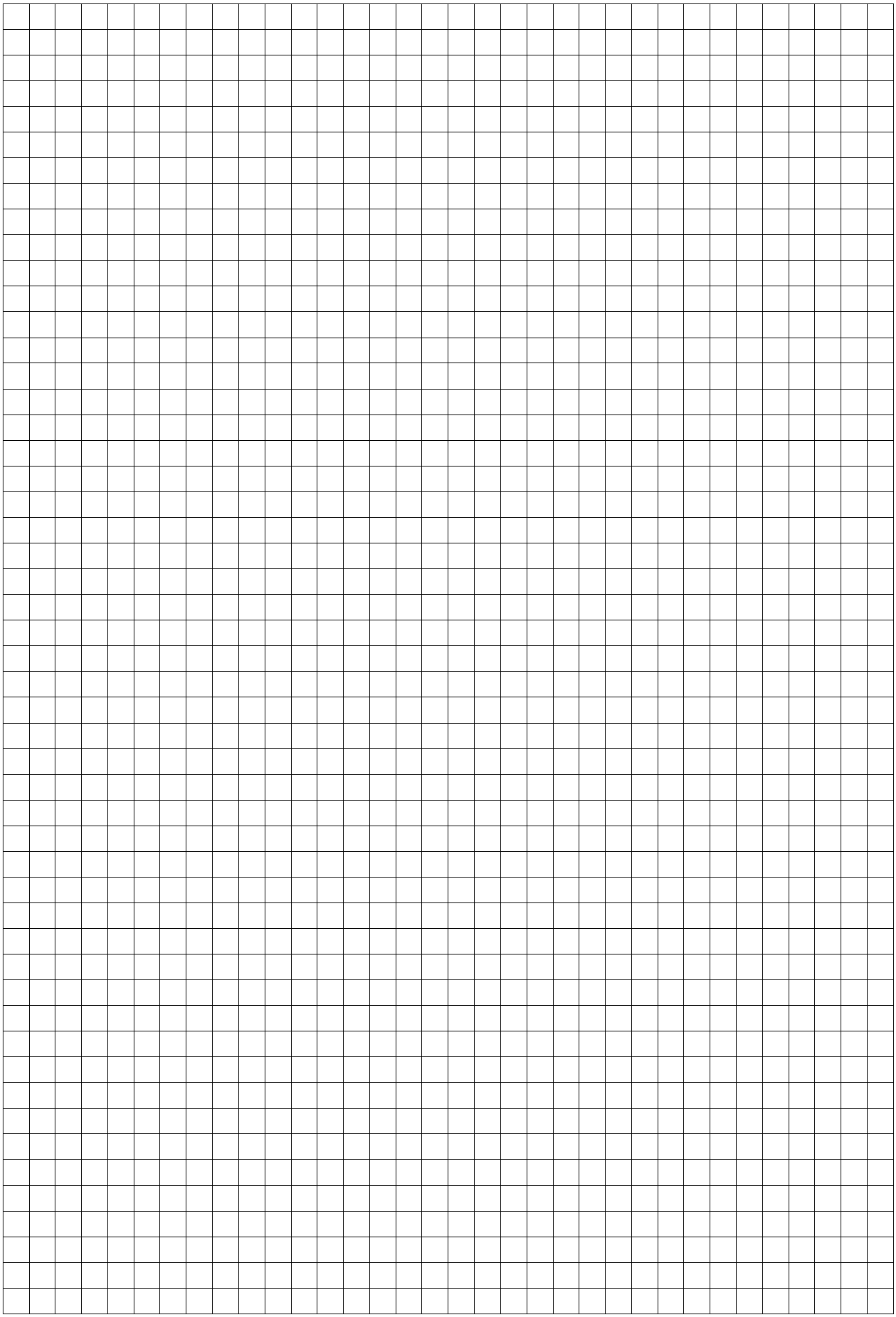
Notes



Notes

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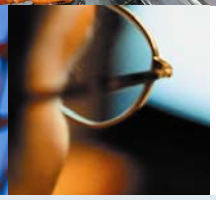

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