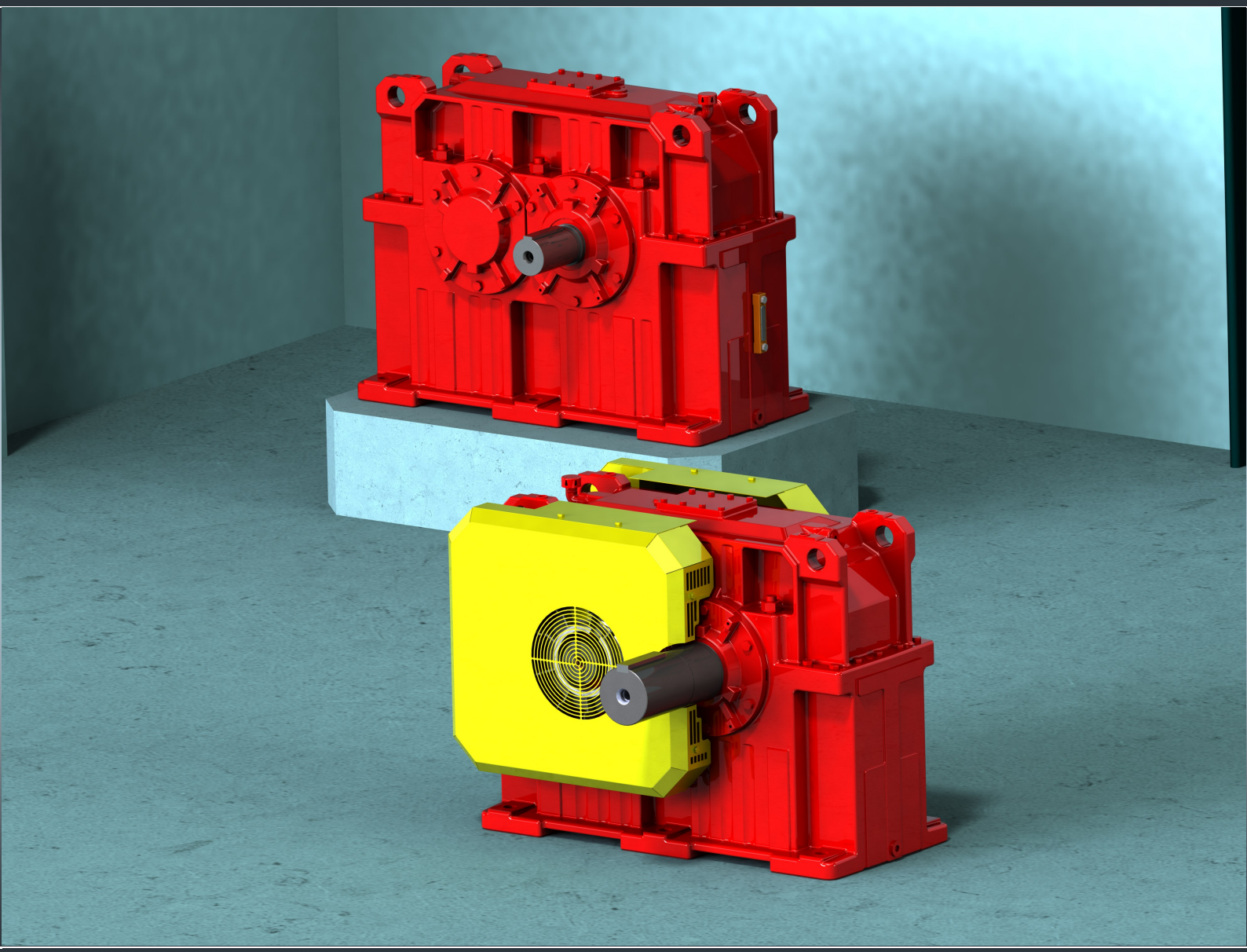
SEW EURODRIVE

Catalog



Industrial Gear Units
Single Stage Helical Gear Units
M1..N Series
Torque classes from 1.4 kNm - 189 kNm

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1. Introduction

1.1 The SEW-EURODRIVE group of companies

Global presence

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

We are represented in the most important branches of industry all over the world: with 13 manufacturing plants ,66 assembly plants in 47 countries and our comprehensive range of services, which we consider an integrative service that continues our commitment to outstanding quality.

Your ideal partner

Its 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 branches of industries and applications.

1.2 Products and systems from SEW-EURODRIVE

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

The following table shows industrial gear units

Industrial gear units		
Helical and bevel-helical gear units • X series • MC series • ML series • ML..V..N series • M1..N series	Helical and bevel-helical planetary gear units • P series (also as planetary gearmotors) • PMC series	Drive packages • Application solutions 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

In addition to 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

Visit our homepage at

www.sew-eurodrive.com

The website provides comprehensive information and services.

1.3 Copyright

1.4 Structure of the notes

The notes in this catalog are designed as follows:

Pictogram	Meaning
	Useful information or tip.

1.5 Important information

Note the following points:

- The illustrations in the catalog are examples and are not binding.
- The specified fill quantities are non-binding guidelines. Use the marks on the oil dipstick or oil level glass to determine the oil level.
- The gear units are ready for operation when delivered, but are not filled with oil.
- Oil viscosity and grade must comply with those specified on the nameplate.
- The weights shown are non-binding average values.
- The buyer must provide protection against unintentional contact with moving parts. The applicable safety regulations of the country in which the unit will be used are to be followed.

2. Product Description and Overview of Types

2.1 Design features and advantages

- Independent industrial gear unit platform
- Helical gear units
- Extremely robust gear unit housing
- Reliable sealing and dust-proof systems
- Effective cooling systems
- Short delivery times for standard designs
- Worldwide service

2.2 Application areas

The M1..N series can be used in the following application areas:

- Pulp and paper industry
- Pumps
- Rubber and plastic industry
- Food industry

...

2.3 General information

The subsequent chapters provide general information of the M1..N series gear units.

2.3.1 Nominal power, torques and input speeds

The nominal power and torques mentioned in the catalog depend on the input speed and are valid for a service factor of F_S = 1.0 and constant, unidirectional load. Only 70% of these values apply in the case of changing load directions.

The values in parameter table show nominal powers for input speeds of 1000 rpm to 1800 rpm, and nominal torques for input speeds of 1000 rpm. The nominal torque classes also apply to input speeds of 3% less than the synchronous speed.
Consult SEW-EURODRIVE for speeds >1800 rpm.

2.3.2 Housing

The gear unit housings are made of sturdy cast iron from M1PSF10N to M1PSF100N and steel from M1PSF110N to M1PSF120N.
The housing is a two-piece housing with horizontal parting line.

2.3.3 Gearing and shafts

The gearing with edge corrections is made of high-quality, tempered and ground case hardened steels. The output shafts are made of tough quenched and tempered steel.

2.3.4 Shaft bearing

Self-aligning roller bearings from well-known manufacturers are used.

2.3.5 Lubrication

Splash lubrication is used depending on the gear unit type and design. Bath and pressure lubrication can be used as option for the gear unit.

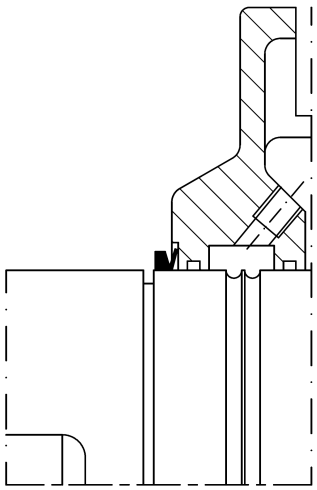
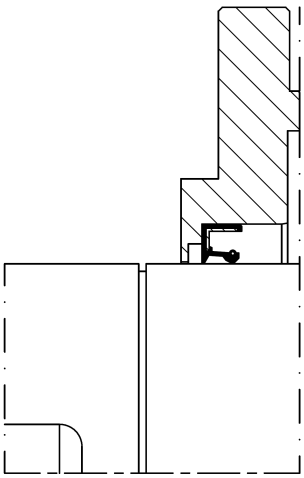
An oil level glass is used to visually check the oil level.

Instead of the oil drain plug, an oil drain valve can be provided. This ball valve allows for a drain line to be easily attached when changing the gear unit oil.

An oil heater might be necessary when ambient temperatures are low. The oil heater ensures that the oil is sufficiently liquid when starting up the gear unit in cold environments. SEW-EURODRIVE provides the oil heater with a preset thermostat that is attached to the gear unit.

2.3.6 Sealing system

Following sealing system can be used for input shaft and output shaft:

Labyrinth seal (M1PSF20N and above)	Single oil lip seal (M1PSF10N)
Labyrinth seal with V-Ring	Single lip seal with dust protection lip
	

The sealing system can be as option:
- Double lip seal with grease nipple
- Radial labyrinth seal with grease nipple

If need the sealing system above, please consult SEW-EURODRIVE.

2.3.7 Modular accessories

Several optional accessories are available for industrial gear units.

- Fan
  A cooling fan is used when the thermal rating of the gear unit is insufficient. Radial fan is bi-directional.

- Cooling coil system
  Cooling coil system is used if the thermal rating of the gear unit is insufficient.

- 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 if a fan can not be used or is not sufficient.

- Shaft end pump
  If condition is permitted, shaft end pump can be used, when adequate space must be allowed for it.

- Oil dipstick
  Oil dipstick can be as optional equipment to check the oil level in gear housing.

- 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.

- Thermostatic water valve
  The thermostatic water valve is used to regulate the water flow into cooler or cooling coil of the gear unit.

- Temperature sensor PT100
  The PT100 temperature sensor can be used for measuring the oil 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.

2.3.8 Thermal rating

The thermal rating needs to be checked for every gear unit. The relevant values are listed in the selection tables on chapter 4.4.

2.3.9 Cooling

If the thermal rating of the gear unit is insufficient with natural cooling, you can choose one of the following cooling types:

- Fan (independent of direction of rotation) on the drive shaft.
- Water cooling coil in housing
- Oil supply system with oil-water heat exchanger or oil-air heat exchanger.

2.3.10 Surface and corrosion protection

On request, all gear units can be supplied with special surface protection for applications in extremely humid and chemically aggressive environments.

2.3.11 Weight data/oil quantities

Please note that all weights shown for the gear units in this catalog are guide values and do not include the lubricant. Refer to the dimension drawings for recommended oil quantities for the respective gear unit types. You find the exact gear unit weight in the order-specific dimension drawing.

2.3.12 International markets

SEW-EURODRIVE gear units conform to ISO and DIN specifications.

SEW-EURODRIVE is a member of the AGMA (American Gear Manufacturers' Association), if need gear units conform to AGMA specifications, please consult SEW-EURODRIVE.

2.3.13 Packaging

Standard packaging

The gear unit is delivered on a pallet without cover.
Application: Land transport

Long-term packaging

The gear unit is delivered in a wooden box that is also appropriate for sea transport.
Application: Sea transport and /or long-term storage

2.4 Definition of icons used in dimension drawings

The following icons are possible to be used in dimension drawings:


Visual inspection cover


Oil drainage

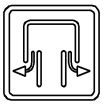

Oil filler


Oil level glass


Oil sight glass


Oil stick

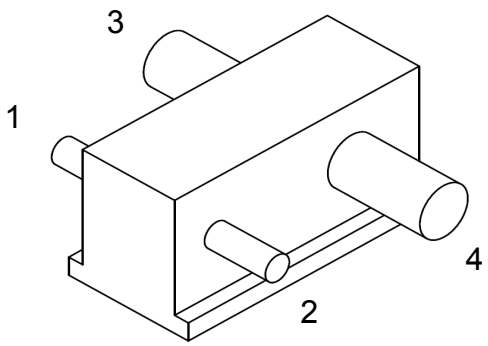

Lifting attachment


Breather plug


Oil heater

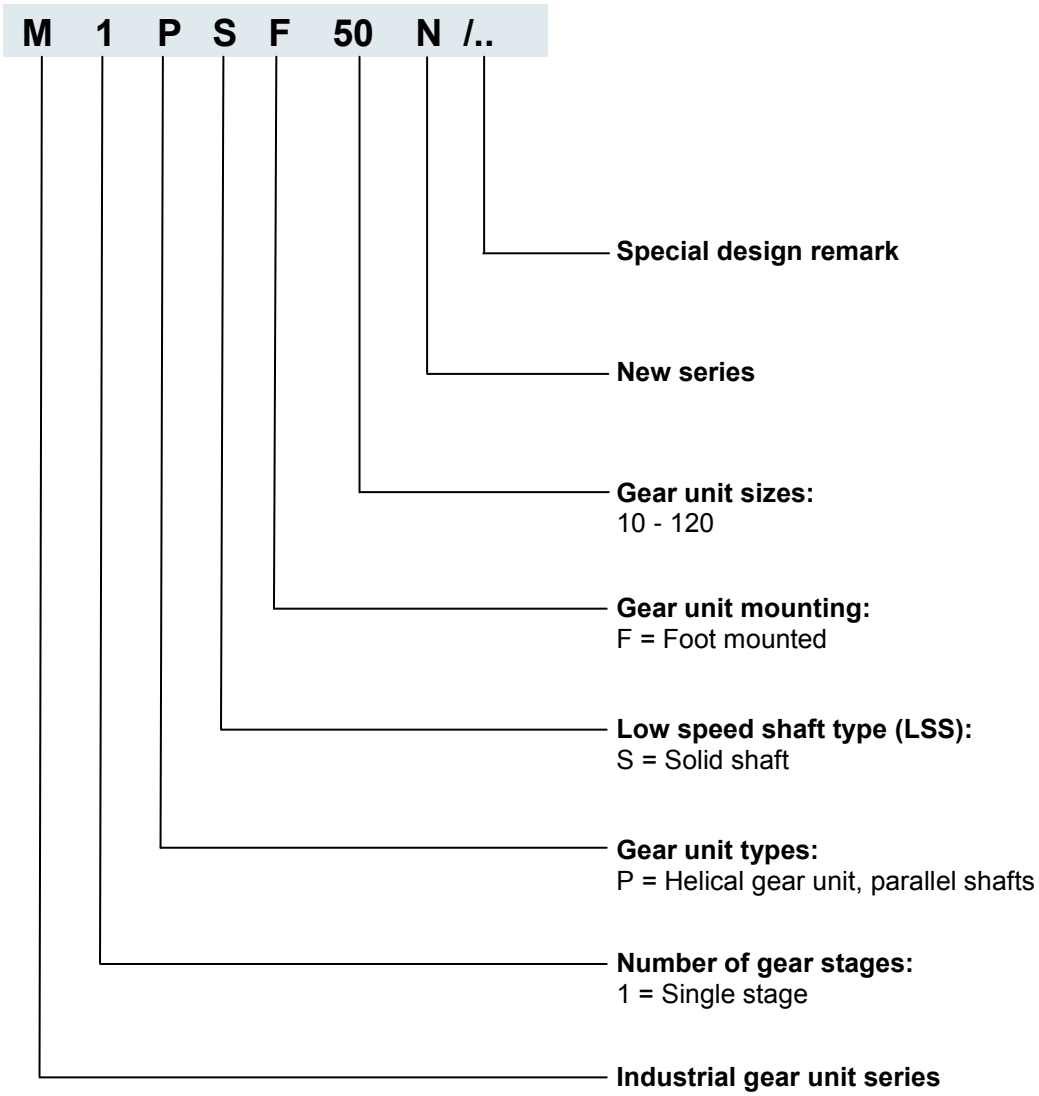
2.5 Shaft positions

The following shaft positions are possible for gear unit:



2.6 Gear unit type designation

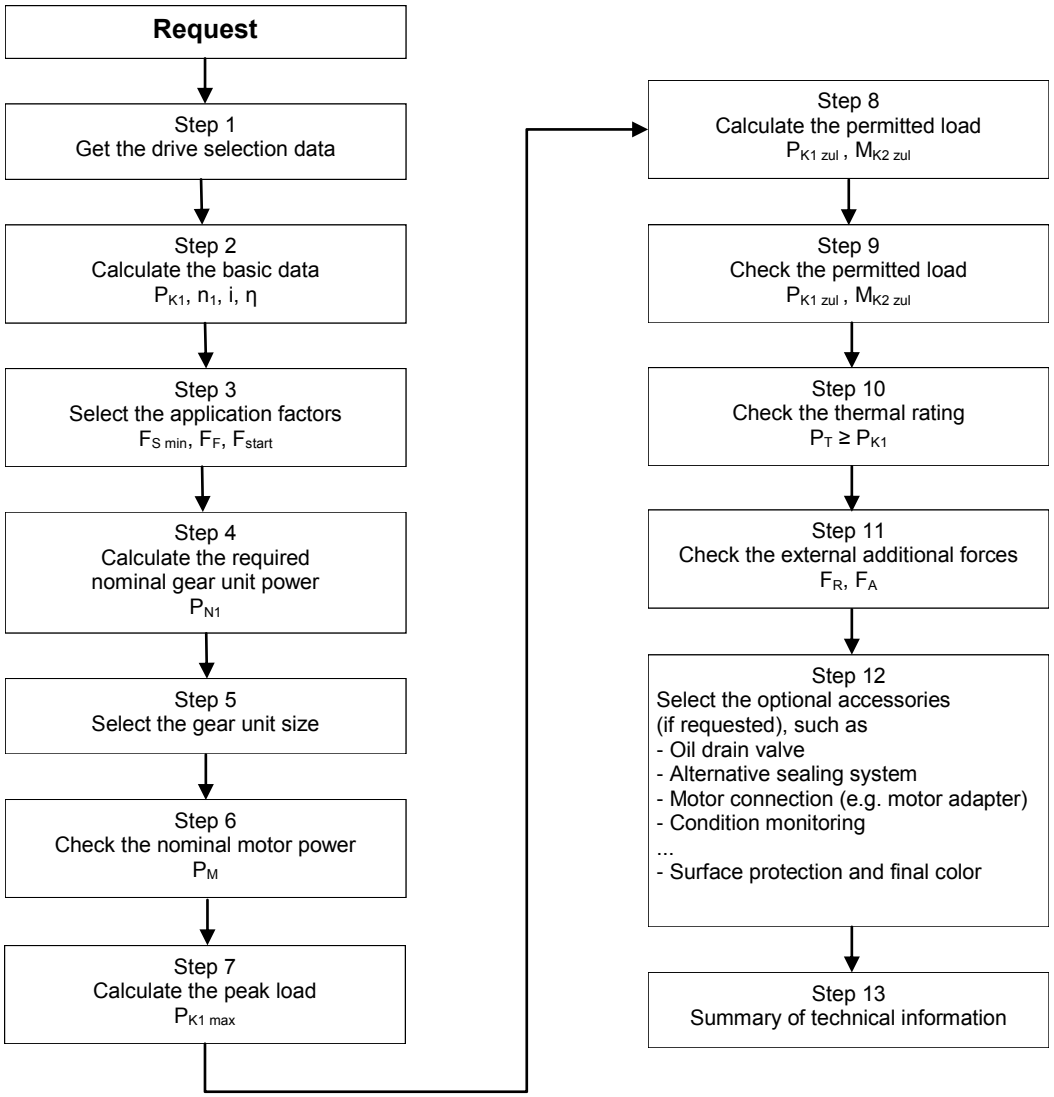
The designation of the gear unit is set up as follows:



3. Project Planning for Drives

3.1 Project planning procedure

The following flow diagram illustrates the process for the project planning of M1..N series industrial gear units.



Step 1: Drive selection data

Get the drive selection data from customer:

- Machine on LSS (usually driven machine)
- Load characteristics
- Machine on HSS (usually driving machine)
- Gear unit requirement
  - Type and design
  - Service factor
  - Mounting and connection to machine on LSS
  - Loads on LSS and HSS

Step 2: Calculating the basic data – P_{K1}, n_1, i, η

Gear ratio i

$$i = \frac{n_1}{n_2}$$

n_1 = Input speed (HSS) [rpm]
n_2 = Output speed (LSS) [rpm]

Operating power

$$P_{K1} = \frac{M_{K2} \times n_2}{9.550 \times \eta} \quad [kW]$$

P_{K1} = Operating power on HSS [kW]
M_{K2} = Output torque on LSS [kNm]
n_2 = Output speed (LSS) [rpm]
η = Efficiency

The following efficiency levels apply to gear units – η

The efficiency of the gear unit is mainly determined by the gearing and bearing friction as well by churning losses. The following **guide values** apply for M1..N series:

- M1PSF10 - 120N η = 0.985

Step 3: Selecting the application factors

Application service factor	$F_{S\ min}$
Peak load factor	F_F
Startup factor	F_{start}

Application-specific service factor $F_{S\ min}$

The application-specific service factor $F_{S\ min}$ takes account of the typical load behavior with regard to the driven machine.

Recommended values with reference to

- Field of application
- Type of driven machine
- Operating period / day

are given in the following table.

These tables apply only to gear units driven by electric motors. For other types of drive motors, the following correction values apply:

- Combustion engines with four or more cylinders:
  $F_{S\ min}$ (selection table) + 0.25
- Combustion engines with one to three cylinders:
  $F_{S\ min}$ (selection table) + 0.5

In the event of deviations from the typical load behavior, please consult SEW-EURODRIVE.

Field of application/ industry	Driven machine	Service factor operating period /day		
		< 3 h	3 - 10 h	> 10 h
Food industry	Crushers and mills	-	-	1.75
	Beet slicers	-	1.25	1.50
	Drying Drums	-	1.25	1.50
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
	Screw pump	-	1.25	1.50
	Rotary pumps (gear type, vane)	-	-	1.25
Pulp and paper industry	Debarking Drums and machines	1.55	1.8	-
	Rolls (pick-up, wire drive, wire suction)	-	1.8	2.00
	Drying cylinders (anti-friction bearings)	-	1.8	2.00
	Calenders (anti-friction bearings)	-	1.8	2.00
	Filters (pressure and vacuum)	-	1.8	2.00
	Beaters and chippers	1.55	1.75	2.00
	Jordan mills	-	1.50	1.75
	Presses (bark, felt, glue, 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 (two in a row)	1.55	1.75	2.00
	Rubber mills (three in a row)	-	1.50	1.75
	Warming mills	1.35	1.50	1.75
	Calenders	-	1.65	1.65
	Mills	1.55	1.75	2.00
	Mixing mills	1)	1)	1)
	Slab rollers	1.55	1.75	2.00
	Refiners	1.55	1.75	2.00
	Tire machines	1)	1)	1)

1) Consult SEW-EURODRIVE

Peak load factor F_F

The peak load factor F_F takes account of the overload capacity of the gearing and the rotating parts.

Peak load factor	Frequency of peak load per hour					
	1 ... 5	6 ... 20	21 ... 40	41 ... 80	81 ... 160	> 160
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.

Startup factor F_{start}

The startup factor F_{start} takes account of the overload caused by startup.

Startup mode	Startup factor Fstart
Direct	3.0
Soft start	1.8
Frequency inverter	1.5 … 2.0[1)]
Star / delta	1.3
Hydraulic coupling without delay chamber	2.0
Hydraulic coupling with delay chamber	1.6

1) Dependent on setting

Step 4: Calculating the required nominal gear unit power P_{N1}

Constant load direction – nominal power:

$$P_{N1} \geq P_{K1} \times F_{S\,min} \qquad [kW]$$

Reversing direction of load – nominal power:

$$P_{N1} \geq P_{K1} \times F_{S\,min} \times 1.43 \qquad [kW]$$

P_{N1} = Nominal gear unit power on HSS [kW]
P_{K1} = Operating power on HSS [kW]
$F_{S\,min}$ = Application service factor

Step 5: Selecting the gear unit size

The selection of the gear unit size is based on the nominal gear unit power P_{N1} according to the tables showing the overview of speed and nominal gear ratio in section 4.

For input speeds n_1 **>** 1800 rpm, please consult SEW-EURODRIVE.

Step 6: Checking the nominal motor power P_M

$$P_M \geqslant P_{K1} = \frac{P_{K2}}{\eta} \qquad [kW]$$

P_M = Nominal motor power [kW]
P_{K1} = Operating power on HSS [kW]
P_{K2} = Operating power on LSS [kW]
η = Efficiency

Step 7: Calculating the peak load $P_{K1\,max}$

Calculate the peak operating power $P_{K1\,max}$:

$$P_{K1\,max} = P_M \times F_{start} \qquad [kW]$$

$P_{K1\,max}$ = Peak operating power on HSS [kW]
P_M = Nominal motor power [kW]
F_{start} = Startup factor

Step 8: Calculating the permitted peak load $P_{K1\ zul}$; $M_{K2\ zul}$

Permitted peak operating power $P_{K1\ zul}$:
Constant load direction

$$P_{K1\ zul} = \frac{2 \times P_{N1}}{F_F} \qquad [kW]$$

Reversing load direction

$$P_{K1\ zul} = \frac{2 \times P_{N1}}{F_F} \times 0.7 \qquad [kW]$$

$P_{K1\ zul}$ = Permitted peak operating power on HSS [kW]
P_{N1} = Nominal gear unit power on HSS [kW]
F_F = Peak load factor

Permitted peak output torque $M_{K2\ zul}$:
Constant load direction

$$M_{K2\ zul} = \frac{2 \times M_{N2}}{F_F} \qquad [kNm]$$

Reversing load direction

$$M_{K2\ zul} = \frac{2 \times M_{N2}}{F_F} \times 0.7 \qquad [kNm]$$

$M_{K2\ zul}$ = Permitted peak output torque [kNm]
M_{N2} = Nominal gear unit torque [kNm]
F_F = Peak load factor

Step 9: Checking the peak load $P_{K1\ zul}$; $M_{K2\ zul}$

The peak operating power $P_{K1\ max}$ must not exceed the permitted peak operating power $P_{K1\ zul}$.

Check the gear unit selection:

$$P_{K1\ max} \leq P_{K1\ zul} \qquad [kW]$$

The peak output torque $M_{K2\ max}$ must not exceed the permitted peak output torque $M_{K2\ zul}$.

$$M_{K2\ max} \leq M_{K2\ zul} \qquad [kNm]$$

$P_{K1\ max}$ = Peak operating power on HSS [kW]
$P_{K1\ zul}$ = Permitted peak operating power on HSS [kW]
$M_{K2\ max}$ = Peak output torque [kNm]
$M_{K2\ zul}$ = Permitted peak output torque [kNm]

Step 10: Checking the thermal rating P_T

The thermal rating P_T of a gear unit is the power that a gear unit can transmit continuously without exceeding a certain oil temperature.

The thermal rating P_T depends on the following factors:
- Ambient temperature
- Air circulation and sunlight exposure at the installation site
- Installation altitude
- Heat conduction to the foundation at the installation site
- Gear unit type, size and gear ratio
- Type of gear unit external cooling
- Type of gear unit lubrication
- Lubricant type
- Cyclic duration factor

You can calculate the thermal rating P_T using the factors. The resulting calculation results are approximate values. Please consult SEW-EURODRIVE to determine the exact values.

$$P_T = P_{TH} \times f_1 \times f_4 \times f_L \times f_T \quad [kW]$$

P_T = Thermal rating of the gear unit at existing ambient conditions [kW]
P_{TH} = Thermal rating of the gear unit at define ambient conditions [kW]. See selection table on chapter 4.4.
f_1 = Altitude factor
f_4 = Operating cycle factor
f_L = Lubrication factor
f_T = Ambient temperature factor

Altitude factor f_1

The following table shows the altitude factor f_1

Altitude factor	Altitude H [m above sea level]				
	Up to 999	1000 … 2000	2000 ... 3000	3000 ... 4000	4000 ... 5000
f_1	1.0	0.95	0.91	0.87	0.83

Operating cycle factor f_4

The following table shows the operating cycle factor f_4

Operating cycle factor	Time under load per hour in %				
	100	80	60	40	20
f_4	1.00	1.06	1.16	1.35	1.78

Lubrication factor f_L

The following table shows the lubrication factor f_L

Lubrication factor	Type of lubrication	
	Pressure	Bath or splash
f_L	1.10	1.00

Ambient temperature factor f_T

The following table shows the ambient temperature factor f_T

Ambient temperature factor	Ambient temperature [°C]				
	10	20	30	40	50
f_T	1.32	1.18	1.00	0.79	0.60

The gear unit's thermal rating must be at least as large as the operating power on the input shaft (HSS).

$$P_T \geq P_{K1} \qquad [kW]$$

P_T = Thermal rating of the gear unit at existing ambient conditions [kW]
P_{K1} = Operating power on HSS [kW]

Selecting the cooling system

If the thermal rating P_T of a gear unit is not sufficient , then you can use a cooling system with circulation cooling.
The proper size of the cooling system can be determined by approximation by means of the power loss P_L of the gear unit.

$$P_L = \left(P_{k1} - \frac{P_T}{2} \right) x \, (1 - \eta) \qquad [kW]$$

P_L = Power loss to be cooled [kW]
P_{K1} = Operating power on HSS [kW]
P_T = Thermal rating of the gear unit at existing ambient conditions [kW]
η = Efficiency

The cooling requirements are determined by means of this power loss P_L. The required cooling system is selected by using the tables (see catalog of pressure lubrication unit) of the various circulation cooling types.

The power loss P_L of the gear unit must be smaller than the cooling capacity of the cooling system.

$$P_L < \text{cooling capacity of cooling system} \qquad [kW]$$

In addition, the selection of an appropriate cooling system depends on the following factors:

- Actual power loss to be cooled
- Present cooling water temperature and volume flow
- Ambient temperature
- Ratio of oil quantity in the gear unit and oil volume flow of cooling system > 2

Please consult SEW-EURODRIVE for selecting the appropriate cooling system based on the ambient conditions of your system.

Step 11: Checking the external additional forces F_R, F_A:

If external additional forces load are present, please consult SEW-EURODRIVE.

Step 12: Selecting the optional equipment

Step 13: Summary of all the technical information

3.2 Project planning example: Sugar cane chipper drive

The following example shows the project planning for 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
- Peak output torque on output shaft $M_{K2\ max}$=30 kNm
- Input speed n_1 = 1180 rpm
- Motor power P_M = 1200 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
- Motor control via frequency inverter
- Installation at sea level.
- Customer requirement: Service factor ≥ 2.0

Step 1: Getting drive selection data

Step 2: Calculating the basic data

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

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

i = Gear ratio
n_1 = Input speed (HSS) [rpm]
n_2 = Output speed (LSS) [rpm]

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

Operating power P_{K1}:

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

P_{K1} = Operating power on HSS [kW]
M_{K2} = Operating torque on LSS [kNm]
n_2 = Output speed LSS [rpm]
η = Efficiency =0.985 (See page 12)

Step 3: Selecting the application factors

Application-specific service factor (Chipper drive, t > 10 h/day)	$F_{S\ min}$ = 2.0
Peak load factor (81…160 peak loads per hour)	F_F = 1.75
Startup factor (Frequency inverter)	F_{start} = 2.0

Step 4: Calculating the required nominal gear unit power

The required nominal gear unit power P_{N1}:

$P_{N1} \geq P_{K1} \times F_{S\,min} = 1180\ kW \times 2.0 = 2360\ kW$

P_{N1} = Nominal gear unit power on HSS [kW]
P_{K1} = Operating power on HSS [kW]
$F_{S\,min}$ = Application service factor

Step 5: Selecting the gear unit size

Select a gear unit of the next larger power class according to the nominal power P_{N1} tables showing in chapters 4.1.

- Nominal gear unit power P_{N1} = 2798 kW, see selection table on page 24.
- Gear unit type **M1PSF60N**
- Nominal gear ratio i_N = 1.6, Exact gear ratio i_{ex} =1.579, see selection table on page 25.
- Nominal gear unit torque $M_{N2} = \frac{P_{N1} \times 9.550 \times \eta}{n_2} = \frac{2798\,kW \times 9.550 \times 0.985}{1180\ rpm\ /\ 1.579} \approx 35.2\,kNm$
- Thermal rating P_{TH} = 328 kW without additional cooling, see selection table on page 27.

Step 6: Checking the nominal motor power P_M

$P_M = 1200 > P_{K1} = 1180\ kW$

P_M = Nominal motor power [kW]
P_{K1} = Operating power on HSS [kW]

Step 7: Calculating the peak load $P_{K1\ max}$

$P_{K1\,max} = P_M \times F_{start} = 1200\ kW \times 2 = 2400\ kW$

$P_{K1\,max}$ = Peak operating power based on motor [kW]
P_M = Nominal motor power [kW]
F_{start} = Startup factor

Step 8: Calculating the permitted peak load $P_{K1\ zul}$ & $M_{K2\ zul}$

$$P_{K1\,zul} = \frac{2 \times P_{N1}}{F_F} = \frac{2 \times 2798\,kW}{1.75} = 3198\,kW$$

$P_{K1\,zul}$ = Permitted peak operating power [kW]
P_{N1} = Nominal gear unit power [kW]
F_F = Peak load factor

$$M_{K2\,zul} = \frac{2 \times M_{N2}}{F_F} = \frac{2 \times 35.2\,kNm}{1.75} = 40.2\,kNm$$

M_{N2} = Nominal gear unit torque [kNm]
$M_{K2\,zul}$ = Permitted peak output torque [kNm]
F_F = Peak load factor

Step 9: Checking the permitted peak load $P_{K1\ zul}$ & $M_{K2\ zul}$

The peak operating power $P_{K1\ max}$ must not exceed the permitted peak operating power $P_{K1\ zul}$.

$$P_{K1\ max} = 2400\ kW < P_{K1\ zul} = 3198\ kW$$

The peak output torque $M_{K2\ max}$ must not exceed the permitted peak output torque $M_{K2\ zul}$.

$$M_{K2\ max} = 30\ kNm < M_{K2\ zul} = 40.2\ kNm$$

$P_{K1\ max}$ = Peak operating power based on motor [kW]
$P_{K1\ zul}$ = Permitted peak operating power [kW]
$M_{K2\ max}$ = Peak output torque [kNm]
$M_{K2\ zul}$ = Permitted peak output torque [kNm]

→ This means you can use the selected gear unit size.

Step 10: Checking the thermal rating

$$P_T = P_{TH} \times f_1 \times f_4 \times f_L \times f_T = 328\ kW \times 1.0 \times 1.35 \times 1.1 \times 0.79 = 384.8\ kW$$

P_T = Thermal rating of the gear unit at existing ambient conditions [kW]
P_{TH} = Thermal rating of the gear unit at define ambient conditions [kW]
f_1 = Altitude factor (see page 16)
f_4 = Operating cycle factor (see page 16)
f_L = Lubrication factor (see page 16)
f_T = Ambient temperature factor (see page 16)

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

$$1180\ kW > 384.8\ kW$$

→ Thermal rating is not sufficient at 40 °C without additional cooling.

→ Oil/water cooler or oil/air cooler is needed.

Please consult SEW-EURODRIVE for selecting the appropriate pressure lubrication with cooler based on the ambient conditions of your system.

Step 11: Checking the external additional forces

There are no external additional forces.

Step 12: Selecting the optional equipment

- Standard labyrinth seal on the input and output shafts.
- Pressure lubrication with cooler and internal piping

Step 13: Summary of all the technical information

- Gear unit type M1PSF60N
- Gear ratio i_{ex} = 1.579
- Final output speed: 747 rpm
- Nominal power P_{N1} = 2798kW
- Motor P_M = 1200 kW
- Final $F_S = P_{N1}/P_{K1}$ = 2798 kW/1180 kW = 2.37
- Standard labyrinth seal the input and output shafts
- Pressure lubrication with cooler and internal piping

3.3 Lubricant selection/lubricant table

The oil viscosity and type (mineral/synthetic) to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate. Any deviation from these conditions requires consultation with SEW-EURODRIVE.

3.3.1 General information on selecting the oil

Unless a special arrangement is made, SEW-EURODRIVE delivers the drives without oil fill. This does not apply to auxiliary drives and primary gear units.

This means the gear unit must be filled with the correct oil grade and quantity before startup. You find the corresponding information on the nameplate of the gear unit.

The following tables provide an overview of mineral and synthetic oils.

Mineral oil

Standard

Lubrication oils are divided into ISO VG viscosity classes according to ISO 3448 and DIN 51519.

ISO class	ISO 6743-6 designation	DIN 51517-3 designation	AGMA 9005-D94 designation
220	ISO-L-CKC 220	DIN 51517-CLP 220	AGMA 5 EP
320	ISO-L-CKC 320	DIN 51517-CLP 320	AGMA 6 EP
460	ISO-L-CKC 460	DIN 51517-CLP 460	AGMA 7 EP

Synthetic oil

Standard

Lubrication oils are divided into ISO VG viscosity classes according to ISO 3448 and DIN 51519.

ISO class	ISO 6743-6 designation	DIN 51519 designation	AGMA 9005-D94 designation
220	ISO-L-CKT 220	CLP HC 220	AGMA 5 EP
320	ISO-L-CKT 320	CLP HC 320	AGMA 6 EP
460	ISO-L-CKT 460	CLP HC 460	AGMA 7 EP

In addition to the required viscosity, the oil must fulfill the following criteria:

- CLP oils according to DIN 51517-3
- Micro-pitting test according to FVA, FV no. 54/ I-IV, GFT class high, damage force level >10

If synthetic oil is used, SEW-EURODRIVE recommends polyalphaolefin-based oil (CLP HC).

3.3.2 Permitted lubricants

- The standard for viscosity and oil grade is the type of oil that is specified by SEW-EURODRIVE in the order (see order confirmation and nameplate).
- Please consult SEW-EURODRIVE if you use bio and food grade lubricants or polyglycol oils.
- Check the compatibility of the greases and oils used.

Key to the lubricant table

The lubricant table shows the permitted lubricants for SEW-EURODRIVE gear units. Please note the abbreviations, meaning of shading and notes.

CLP = Mineral oil
CLP HC = Synthetic polyalphaolefin
E = Ester oil (water hazard classification 1)

= Mineral lubricant
= Synthetic lubricant

3) = Use lubricants only when service factor $F_S \geq 1.3$
4) = Take into account critical startup behavior at low ambient temperatures
6) = Ambient temperature

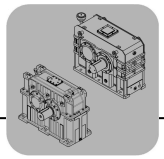
 = Lubricant for the food industry (food grade oil)

 = Biodegradable oil (lubricant for agriculture, forestry, and water management)

Lubricant table

470490305

6) °C	DIN (ISO)	ISO,NLGI	Mobil®	Shell	bp	KLÜBER LUBRICATION	ARAL	TEXACO	Castrol Tribol	Castrol Optimol	FUCHS	Q8	TOTAL
Standard -10 ... +40	CLP CC	VG 320	Mobilgear XMP 320 Mobilgear 600XP 320	Shell Omala F 320	BP Energol GR-XP-320	Klüberoil GEM 1-320 N	Aral Degol BG 320	Meropa 320	Alpha SP 320 Tribol 1100/320	Optigear BM 320	Renolin CLP 320 Plus Renolin High Gear 320	Goya NT 320	Carter EP 320
-20 ... +20	CLP CC	VG 150 3)	Mobilgear XMP 150 Mobilgear 600XP 150		BP Energol GR-XP-150	Klüberoil GEM 1-150 N	Aral Degol BG 150	Meropa 150	Alpha SP 150 Tribol 1100/150	Optigear BM 150	Renolin CLP 150 Plus Renolin High Gear 150	Goya NT 150	
-15 ... +30	CLPCC	VG 220	Mobilgear XMP 220 Mobilgear 600XP 220	Shell Omala F 220	BP Energol GR-XP-220	Klüberoil GEM 1-220 N	Aral Degol BG 220	Meropa 220	Alpha SP 220 Tribol 1100/220	Optigear BM 220	Renolin CLP 220 Plus Renolin High Gear 320	Goya NT 3220	Carter EP 220
-5 ... +45	CLP CC	VG 460	Mobilgear XMP 460 Mobilgear 600XP 460	Shell Omala F 460	BP Energol GR-XP-460	Klüberoil GEM 1-460 N	Aral Degol BG 460	Meropa 460	Alpha SP 460 Tribol 1100/460	Optigear BM 460	Renolin CLP 460 Plus Renolin High Gear 460	Goya NT 460	Carter EP 460
0 ... +50	CLP CC	VG 680	Mobilgear XMP 680 Mobilgear 600XP 680	Shell Omala F 680	BP Energol GR-XP-680	Klüberoil GEM 1-680 N		Meropa 680	Alpha SP 680 Tribol 1100/680	Optigear BM 680	Renolin CLP 680 Plus Renolin High Gear 680	Goya NT 680	Carter EP 680
Standard -25 ... +40	CLP HC	VG 320	Mobilgear SHC XMP 320 Mobil SHC 632	Shell Omala HD 320	BP Enersyn EP-XF-320	Klübersynth GEM 4-320 N		Pinnacle EP 320	Alphasyn EP 320	Optigear Synthetic X 320	Renolin CLP 320 Plus Renolin High Gear Synth 320	El Greco 320	Carter SH 320
4) -40 ... +10	CLP HC	VG 68 3)	Mobil SHC 626	Shell Omala HD 68	BP Enersyn EP-XF-68	Klübersynth GEM 4-68 N				Optigear Synthetic X 68	Reolin Unisyn CLP 68		
4) -35 ... +20	CLP HC	VG 150	Mobilgear SHC XMP 150 Mobil SHC 629	Shell Omala HD 150	BP Enersyn EP-XF-150	Klübersynth GEM 4-150 N		Pinnacle EP 150	Alphasyn EP 150	Optigear Synthetic X 150	Reolin Unisyn CLP 150	El Greco 150	Carter SH 150
-30 ... +30	CLP HC	VG 220	Mobilgear SHC XMP 220 Mobil SHC 630	Shell Omala HD 220	BP Enersyn EP-XF-220	Klübersynth GEM 4-220 N		Pinnacle EP 220	Alphasyn EP 220	Optigear Synthetic X 220	Renolin CLP 320 Plus Renolin High Gear Synth 220	El Greco 220	Carter SH 220
-20 ... +50	CLP HC	VG 460	Mobilgear SHC XMP 460 Mobil SHC 634	Shell Omala HD 460	BP Enersyn EP-XF-460	Klübersynth GEM 4-460 N		Pinnacle EP 460	Alphasyn EP 460	Optigear Synthetic X 460	Renolin CLP 320 Plus Renolin High Gear Synth 460	El Greco 460	Carter SH 460
-10 ... +60	CLP HC	VG 680	Mobilgear SHC XMP 680 Mobil SHC 636	Shell Omala HD 680	BP Enersyn EP-XF-680	Klübersynth GEM 4-680 N		Pinnacle EP 680		Optigear Synthetic X 680	Reolin Unisyn CLP 680	El Greco 680	Carter SH 680
-10 ... +30	CLP HC	VG 68 3)		Shell Cassida Fluid GL 68		Klüberöl 4UH1-68 N				Optileb HY 68	Geralyn SF 460		
-20 ... +20	NSF H1	VG 220 3)		Shell Cassida Fluid GL 220		Klüberöl 4UH1-220 N				Optileb GT 220			
4) -40 ... -10		VG 460 3)		Shell Cassida Fluid GL 460		Klüberöl 4UH1-460N				Optileb GT 460			
-20 ... +40	E	VG 460				Klüberbio CA2-460			Tribol BIO TOP 1418/460		Plantogear 460 S		



4. Technical Data

4.1 Nominal mechanical power ratings P_{N1}

M1..N	n_1 [rpm]	P_{N1} [kW] Nominal Ratios i_N																	
		1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
10	1800	243	227	225	208	184	179	156	129+	112+	102+	88+	69+	58+	47+	34+	23+	21+	13+
	1500	204	191	189	175	154	150+	131+	108+	94+	86+	74+	58+	49+	40+	29+	19+	17+	11+
	1200	165	154+	152+	141+	124+	121+	106+	87+	75+	70+	60+	46+	40+	32+	23+	15+	14+	9+
	1000	138+	129+	128+	118+	104+	101+	88+	73+	63+	58+	50+	39+	33+	27+	20+	13+	12+	8+
20	1800	1025*	964	903	840	745	684	670	581	512	446	381	313	257	211+	164+	123+	89+	64+
	1500	864	812	760	707	627	575	562	488	431	375	320	263+	216+	177+	138+	103+	75+	54+
	1200	699	656	614	570	506	464	453	393	348+	303+	259+	213+	174+	143+	111+	83+	61+	44+
	1000	587	551	515	478	424	389	379+	329+	292+	254+	218+	179+	147+	120+	94+	70+	51+	37+
30	1800	1752*	1701*	1627*	1516*	1413	1331	1226	1145	936	870	774	608	501	421	307	261+	213+	171+
	1500	1542*	1497	1432	1335	1244	1172	1079	1008	785	731	650	511	421	353+	258+	219+	180+	144+
	1200	1319	1272	1225	1142	1032	1002	878	830	633	591	525	413+	340+	285+	208+	177+	146+	116+
	1000	1145	1069	1058	978	866	844	736	697	530+	496+	441+	347+	285+	240+	175+	149+	123+	98+
40	1800	2486*	2335*	2223*	2072*	1931*	1819*	1676	1564	1419	1253	1069	901	742	601	477	402	328+	256+
	1500	2188*	2056*	1957*	1824	1700	1601	1475	1377	1192	1053	898	757	623	505	401+	339+	275+	215+
	1200	1872	1758	1674	1560	1454	1370	1254	1178	960	851	725	611	503+	407+	323+	274+	222+	174+
	1000	1633	1526	1473	1373	1237	1205	1052	1003	804	714	609+	513+	422+	342+	272+	231+	187+	146+
50	1800	3271*	3177*	3109*	2997*	2847*	2683*	2471*	2307	2034	1736	1512	1277	995	810	635	572	453	348+
	1500	2880*	2796*	2736*	2638*	2499*	2361	2134	2031	1708	1459	1270	1072	835	680	533	481+	380+	292+
	1200	2463*	2392	2341	2256	2023	1975	1724	1654	1377	1179	1025	865	674	549+	430+	389+	307+	236+
	1000	2168	2095	2060	1919	1699	1657	1446	1389	1153	990	861	726+	566+	461+	361+	327+	258+	198+
60	1800	4733*	4474*	4263*	3980*	3716*	3429*	3220*	2949*	2755*	2542	2164	1777	1464	1151	1007	732	634	505
	1500	4166*	3938*	3753*	3503*	3271*	3018*	2834	2595	2425	2136	1818	1492	1229	967	846	614	532+	424+
	1200	3563*	3369*	3210*	2997	2798	2582	2424	2172	2005	1725	1467	1204	992	780	683+	493+	429+	342+
	1000	3111	2912	2825	2638	2375	2170	2107	1822	1681	1448	1232	1011	832+	655+	574+	413+	361+	287+
70	1800	6353*	6209*	5833*	5455*	5100*	4821*	4439*	4076*	3798*	3540*	2967	2471	2029	1640	1417	1177	944	730
	1500	5671*	5465*	5134*	4801*	4489*	4244*	3907*	3588*	3343	3116	2493	2076	1703	1377	1188	987	793	613
	1200	4851*	4675*	4391*	4107*	3840*	3630	3342	2984	2859	2528	2014	1676	1374	1111	955	797+	641+	495+
	1000	4270*	4115*	3865	3615	3236	3172	2884	2504	2397	2122	1690	1406	1153	932+	799+	669+	538+	415+
80	1800	-	-	7639*	7133*	6658*	6146*	5803*	5286*	4940*	4568*	4222*	3748	3009	2606	2179	1733	1379	1019
	1500	7196*	6993*	6724*	6279*	5861*	5409*	5107*	4653*	4348*	4021	3716	3148	2526	2189	1829	1454	1157	857
	1200	6156*	5982*	5752*	5371*	5013*	4627*	4369*	3980	3719	3440	3051	2540	2038	1766	1475	1173	933	693+
	1000	5418*	5265*	5063*	4727*	4412	4073	3845	3503	3274	3008	2560	2131	1710	1482	1237	984+	783+	582+
90	1800	-	-	-	-	8405*	7920*	7295*	6811*	6176*	5727*	5276*	4816*	4283*	3680	2791	2404	1967	-
	1500	-	8944*	8517*	7939*	7398*	6971*	6421*	5995*	5436*	5041*	4644*	4239	3598	3090	2456	2017	1651	-
	1200	8142*	7651*	7285*	6791*	6328*	5963*	5492*	5128*	4650	4312	3972	3520	2904	2493	1997	1627	1331	-
	1000	7167*	6734*	6412*	5977*	5570*	5248*	4834	4514	4093	3795	3496	2954	2437	2091	1675	1365	1117+	-
100	1800	-	-	-	-	-	-	9702*	9058*	8214*	7616*	7016*	6481*	5948*	5413*	4211	3621	2743	-
	1500	-	-	-	10558*	9838*	9270*	8539*	7972*	7230*	6704*	6176*	5705*	5235	4590	3706	3038	2301	-
	1200	10829*	10175*	9688*	9031*	8416*	7929*	7304*	6820*	6184*	5734	5282	4880	4312	3703	3078	2450	1856	-
	1000	9532*	8956*	8527*	7949*	7407*	6979*	6429*	6002	5443	5047	4650	4295	3617	3106	2581	2054	1556	-
110	1800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5037*	4538	3930	-
	1500	-	-	-	-	-	12675*	11675*	10901*	9885*	9165*	8444*	7883*	7234*	6441	4434	3994	3296	-
	1200	-	13912*	13246*	12348*	11506*	10842*	9987*	9325*	8456*	7840*	7223*	6743	6188	5201	3793	3222	2657	-
	1000	13032*	12245*	11659*	10869*	10127*	9543*	8790*	8207*	7443	6901	6357	5935	5361	4364	3338	2702	2228	-
120	1800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1500	-	-	-	-	-	-	-	-	-	-	-	9433*	8656*	7878*	6359	5811	-	-
	1200	-	-	-	16598*	15318*	14032*	13172*	12309*	11444*	10577*	9707*	8069*	7404	6738	5440	4971	-	-
	1000	-	-	-	14609*	13482*	12351*	11593*	10834*	10073*	9309*	8544	7102	6517	5931	4788	4202	-	-

- Power ratings: The ratings are nominal, Service Factor F_S = 1.0.
- Lubrication: Splash lubrication is used, except in those cases if pressure lubrication or bath lubrication is necessary dependent on the pitch line velocity of gears.
  + Bath lubrication is possible
  * Pressure lubrication is required.
- Additional cooling is required if the mechanical power actually transmitted, is higher than the thermal rating.
- Check the thermal ratings on page 26 to 29.

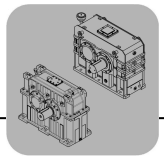
4.2 Exact ratios i_{ex}

M1..N	i_{ex}																	
	Nominal Ratio i_N																	
	1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
10	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.265	2.548	2.828	3.111	3.607	3.962	4.417	5.095	5.690	6.222	7.158
20	1.000	1.122	1.261	1.419	1.575	1.784	1.971	2.219	2.552	2.815	3.120	3.522	3.960	4.391	4.952	5.579	6.381	7.158
30	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.548	2.840	3.111	3.583	4.000	4.417	5.095	5.500	6.222	7.158
40	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.516	2.840	3.192	3.542	3.955	4.435	4.952	5.579	6.300	7.056
50	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.484	2.840	3.154	3.500	4.042	4.500	5.050	5.619	6.316	7.118
60	1.000	1.130	1.250	1.415	1.579	1.800	2.000	2.267	2.500	2.808	3.125	3.542	3.955	4.500	5.000	5.704	6.381	7.000
70	1.000	1.125	1.267	1.429	1.590	1.757	2.000	2.258	2.517	2.778	3.208	3.591	4.046	4.500	5.080	5.652	6.286	7.000
80	1.000	1.130	1.250	1.415	1.579	1.800	1.970	2.267	2.500	2.808	3.125	3.500	4.000	4.476	4.952	5.579	6.263	7.118
90	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.556	2.840	3.174	3.583	4.000	4.500	5.095	5.714	6.222	-
100	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.556	2.840	3.174	3.542	3.955	4.450	4.952	5.579	6.353	-
110	1.000	1.133	1.256	1.425	1.595	1.771	2.000	2.233	2.556	2.840	3.174	3.500	3.909	4.400	5.050	5.722	6.316	-
120	-	-	-	1.368	1.571	1.813	2.000	2.214	2.462	2.750	3.091	3.500	3.909	4.400	4.913	5.476	-	-

4.3 Nominal output torque M_{N2}

M1..N	M_{N2} [kNm]																	
	Nominal Ratio i_N																	
	1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
10	1.3	1.4	1.5	1.6	1.6	1.7	1.7	1.5	1.5	1.6	1.5	1.3	1.2	1.1	0.9	0.7	0.7	0.5
20	5.5	5.8	6.1	6.4	6.3	6.5	7.0	6.9	7.0	6.7	6.4	5.9	5.5	5.0	4.4	3.7	3.1	2.5
30	10.8	11.4	12.5	13.1	13.0	14.1	13.9	14.6	12.7	13.3	12.9	11.7	10.7	10.0	8.4	7.7	7.2	6.6
40	15.4	16.3	17.4	18.4	18.6	20.1	19.8	21.1	19.0	19.1	18.3	17.1	15.7	14.3	12.7	12.1	11.1	9.7
50	20.4	22.3	24.3	25.7	25.5	27.6	27.2	29.2	27.0	26.4	25.5	23.9	21.5	19.5	17.2	17.3	15.3	13.2
60	29.3	31.0	33.2	35.1	35.3	36.7	39.6	38.8	39.5	38.2	36.2	33.7	31.0	27.7	27.0	22.1	21.6	18.9
70	40.2	43.5	46.1	48.6	48.4	52.4	54.3	53.2	56.8	55.4	51.0	47.5	43.9	39.5	38.2	35.6	31.8	27.3
80	51.0	56.0	59.5	62.9	65.5	69.0	71.2	74.7	77.0	79.4	75.2	70.2	64.3	62.4	57.6	51.6	46.1	38.9
90	67.4	71.8	75.7	80.1	83.5	87.5	90.9	94.8	98.4	101.4	104.4	99.6	91.7	88.5	80.3	73.3	65.4	-
100	89.7	95.5	100.7	106.6	111.1	116.3	121.0	126.1	130.9	134.8	138.8	143.1	134.6	130.0	120.3	107.8	93.0	-
110	122.6	130.5	137.7	145.7	151.9	159.0	165.4	172.4	178.9	184.4	189.8	195.4	197.1	180.6	158.6	145.4	132.4	-
120	-	-	-	188.1	199.3	210.6	218.1	225.7	233.2	240.8	248.4	233.8	239.6	245.5	221.3	216.5	-	-

Calculation with n_1=1000 rpm.

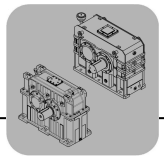


4.4 Thermal rating P_{TH}

4.4.1 Thermal rating P_{TH}—M1PSF10 - 50N (Oil surface temperature in the oil sump is 90℃)

M1..N	n_1 [rpm]	Cooling device	P_{TH} [kW]																	
			Nominal Ratio i_N																	
			1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
10	1800	-	41	43	45	46	48	50	51	53	54	55	57	58	59	60	61	62	63	64
		1 Fan*	95	97	99	100	102	104	105	106	108	109	110	112	113	114	115	116	117	118
		2 Fans	123	125	127	128	130	132	133	135	136	137	139	140	141	142	143	144	145	146
	1500	-	44	46	47	49	51	52	53	55	56	57	58	60	61	62	63	64	65	66
		1 Fan*	88	89	91	92	94	96	97	98	99	101	102	103	104	105	106	107	108	109
		2 Fans	114	115	117	119	120	122	123	124	126	127	128	129	130	131	132	133	134	135
	1200	-	47	49	50	52	53	55	56	57	58	59	61	62	63	64	65	65	66	67
		1 Fan*	79	81	82	84	85	87	88	89	90	91	93	94	95	96	97	97	98	99
		2 Fans	103	105	106	108	109	111	112	113	114	115	116	118	119	120	120	121	122	123
	1000	-	50	51	53	54	56	57	58	59	60	61	62	63	64	65	66	67	68	68
		1 Fan*	73	75	76	78	79	80	82	83	84	85	86	87	88	89	90	90	91	92
		2 Fans	96	97	98	100	101	103	104	105	106	107	108	109	110	111	112	113	113	114
20	1800	-	99	103	107	111	115	119	122	126	129	132	135	138	141	143	146	148	151	153
		1 Fan*	227	231	235	239	243	247	250	254	257	260	263	266	269	272	274	276	279	281
		2 Fans	294	298	302	306	311	315	318	321	324	327	330	333	336	339	341	344	346	349
	1500	-	105	109	113	117	121	124	127	131	134	136	139	142	145	147	150	152	154	156
		1 Fan*	209	213	217	220	225	228	231	234	237	240	243	246	248	251	253	255	258	260
		2 Fans	271	275	279	283	287	290	293	297	300	302	305	308	311	313	316	318	320	322
	1200	-	113	117	120	124	127	131	134	137	139	142	145	147	150	152	154	156	158	160
		1 Fan*	189	193	197	200	204	207	210	213	215	218	221	223	226	228	230	232	235	237
		2 Fans	246	250	253	257	261	264	267	270	272	275	278	280	283	285	287	289	291	293
	1000	-	119	122	126	129	132	136	138	141	143	146	148	151	153	155	157	159	161	163
		1 Fan*	175	179	182	185	189	192	194	197	200	202	205	207	209	212	214	216	217	219
		2 Fans	228	231	235	238	242	245	247	250	252	255	257	260	262	264	266	268	270	272
30	1800	-	147	154	160	165	172	178	183	188	192	197	201	206	210	214	218	221	225	229
		1 Fan*	339	345	351	357	364	369	374	379	384	388	393	398	402	406	409	413	417	420
		2 Fans	439	446	452	458	464	470	475	480	484	489	494	498	502	506	510	514	517	521
	1500	-	157	163	169	174	181	186	190	195	200	204	208	212	216	220	224	227	230	234
		1 Fan*	312	318	324	329	336	341	345	350	354	359	363	367	371	375	378	382	385	388
		2 Fans	405	411	417	422	429	434	438	443	447	452	456	460	464	468	471	475	478	482
	1200	-	169	174	180	185	190	195	200	204	208	212	216	220	224	227	230	233	236	239
		1 Fan*	283	289	294	299	305	309	314	318	322	326	330	334	338	341	344	347	350	353
		2 Fans	368	374	379	384	390	394	399	403	407	411	415	419	423	426	429	432	435	438
	1000	-	178	183	188	193	198	203	206	211	214	218	222	225	229	232	235	238	241	244
		1 Fan*	262	267	272	276	282	286	290	295	298	302	306	309	313	316	319	322	325	328
		2 Fans	341	346	351	355	361	365	369	374	377	381	385	388	392	395	398	401	404	407
40	1800	-	184	192	200	207	215	222	228	235	241	246	252	258	263	268	273	277	282	286
		1 Fan*	403	411	419	426	434	441	447	454	459	465	471	477	482	487	491	496	500	505
		2 Fans	466	474	481	489	497	504	510	517	522	528	534	539	545	550	554	559	563	568
	1500	-	197	204	211	218	226	233	238	244	250	255	261	266	271	276	280	284	288	292
		1 Fan*	371	379	386	393	400	407	413	419	424	429	435	440	445	450	454	458	463	467
		2 Fans	430	437	444	451	459	465	471	477	482	488	493	498	503	508	512	517	521	525
	1200	-	211	218	225	231	238	244	250	255	260	265	270	275	280	284	288	292	296	300
		1 Fan*	336	343	350	356	363	369	375	380	385	390	395	400	405	409	413	417	421	425
		2 Fans	390	396	403	409	417	423	428	433	438	443	448	453	458	462	466	470	474	478
	1000	-	222	229	235	241	248	253	258	264	268	273	278	282	286	291	294	298	302	305
		1 Fan*	311	317	324	329	336	342	347	352	357	361	366	371	375	379	383	386	390	394
		2 Fans	360	367	373	379	386	391	396	402	406	411	416	420	424	429	432	436	440	443
50	1800	-	207	216	225	233	242	250	257	264	270	277	283	290	296	301	306	311	317	322
		1 Fan*	430	439	447	455	465	473	479	487	493	499	506	512	518	524	529	534	539	544
		2 Fans	500	509	518	526	535	543	550	557	564	570	577	583	589	595	600	605	610	615
	1500	-	221	230	238	245	254	262	268	275	281	287	293	299	304	310	314	319	324	329
		1 Fan*	396	404	412	420	428	436	442	449	455	461	467	473	479	484	489	493	498	503
		2 Fans	461	469	477	485	494	501	508	514	520	526	533	538	544	549	554	559	564	568
	1200	-	238	245	253	260	268	275	281	287	292	298	304	309	314	319	324	328	333	337
		1 Fan*	358	366	373	380	389	395	401	408	413	419	424	430	435	440	444	449	453	457
		2 Fans	418	426	433	440	448	455	461	467	473	479	484	490	495	500	504	509	513	517
	1000	-	250	257	264	271	278	285	290	296	301	307	312	317	322	327	331	335	339	343
		1 Fan*	331	338	345	352	360	366	371	377	383	388	393	398	403	408	412	416	420	424
		2 Fans	387	394	401	407	415	422	427	433	438	443	449	454	459	463	467	472	476	480

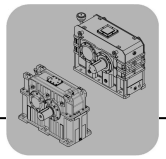
- Ambient temperature 30°C.
- Thermal rating values (with fan) are based on radial fan option.
  * Fan on opposite of HSS end.
- Additional cooling is required if the mechanical power actually transmitted is higher than the thermal rating.



4.4.2 Thermal rating P_{TH}—M1PSF60 - 120N (Oil surface temperature in the oil sump is 90℃)

M1..N	n_1 [rpm]	Cooling device	P_{TH} [kW] Nominal Ratio i_N																	
			1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
60	1800	-	253	264	275	285	296	306	314	323	331	339	347	354	362	369	375	381	387	393
		1 Fan*	525	536	547	557	568	578	586	595	603	611	619	626	634	641	647	653	659	665
		2 Fans	612	623	633	643	655	664	673	681	689	697	705	713	720	727	733	739	746	752
	1500	-	271	281	291	300	311	320	328	336	343	351	358	365	372	379	385	390	396	402
		1 Fan*	484	494	504	513	524	533	541	549	556	564	571	578	585	592	597	603	609	615
		2 Fans	564	574	584	593	604	613	621	629	636	644	651	658	665	672	678	683	689	695
	1200	-	291	300	309	318	328	336	343	351	358	365	371	378	385	391	396	401	407	412
		1 Fan*	438	448	456	465	475	483	491	498	505	512	519	526	532	538	543	549	554	559
		2 Fans	511	521	530	538	548	557	564	572	578	585	592	599	605	611	616	622	627	632
	1000	-	306	315	323	331	340	348	355	362	369	375	382	388	394	400	404	410	415	419
		1 Fan*	405	414	422	430	440	447	454	461	468	474	481	487	493	499	504	509	514	519
		2 Fans	473	482	490	498	508	515	522	529	536	542	549	555	561	567	571	577	582	587
70	1800	-	297	310	322	333	347	358	368	378	387	397	406	415	424	432	439	446	453	460
		1 Fan*	568	581	593	605	618	629	639	650	659	668	677	686	695	703	710	717	725	732
		2 Fans	649	662	674	686	699	711	720	731	740	749	758	767	776	784	791	799	806	813
	1500	-	317	329	340	352	364	375	384	394	402	411	419	428	436	444	450	457	464	471
		1 Fan*	523	535	546	557	570	580	589	599	608	616	625	634	642	649	656	663	670	676
		2 Fans	598	610	621	632	645	655	664	674	683	691	700	709	717	724	731	738	745	751
	1200	-	340	352	362	372	384	394	402	411	419	427	435	443	450	458	464	470	476	482
		1 Fan*	473	484	495	505	517	526	535	544	552	560	568	576	583	590	596	603	609	615
		2 Fans	542	553	563	573	585	595	603	612	620	628	636	644	652	659	665	671	678	684
	1000	-	358	369	378	388	399	408	416	424	432	439	447	454	461	468	474	480	486	491
		1 Fan*	437	448	457	467	478	487	495	503	511	518	526	533	540	547	553	559	565	570
		2 Fans	501	511	521	531	541	551	559	567	574	582	590	597	604	611	616	622	628	634
80	1800	-	-	-	386	400	416	430	442	454	465	476	487	498	509	518	527	536	544	553
		1 Fan*	-	-	704	718	734	748	759	772	783	794	805	816	826	836	845	853	862	871
		2 Fans	-	-	785	799	815	829	840	853	864	875	886	897	907	917	926	934	943	952
	1500	-	381	395	409	422	437	450	461	473	483	493	504	514	524	533	541	549	557	565
		1 Fan*	620	635	648	661	676	689	700	712	722	732	743	753	763	772	780	788	796	804
		2 Fans	695	710	723	736	752	764	775	787	797	808	818	828	838	847	855	863	872	880
	1200	-	409	422	435	447	461	473	483	494	503	513	522	532	541	549	557	564	572	579
		1 Fan*	561	575	587	599	613	625	635	646	655	665	675	684	693	702	709	717	724	732
		2 Fans	630	643	656	668	682	694	704	715	724	734	743	753	762	770	778	785	793	800
	1000	-	430	442	454	466	479	490	499	510	518	527	537	545	554	562	569	576	583	590
		1 Fan*	518	531	543	554	567	578	588	598	607	616	625	634	642	650	657	664	671	678
		2 Fans	582	595	606	618	631	642	651	662	670	680	689	697	706	714	721	728	735	742
90	1800	-	-	-	-	-	469	485	498	512	524	537	549	561	573	584	594	604	614	-
		1 Fan*	-	-	-	-	809	824	838	852	864	877	889	901	913	924	934	944	953	-
		2 Fans	-	-	-	-	901	916	929	943	955	968	980	993	1004	1016	1025	1035	1045	-
	1500	-	-	446	461	476	493	507	519	533	544	556	568	579	590	601	610	619	628	-
		1 Fan*	-	698	713	729	746	760	772	785	797	809	820	832	843	853	862	872	881	-
		2 Fans	-	783	798	813	830	845	857	870	882	893	905	917	928	938	947	956	965	-
	1200	-	461	476	490	504	519	533	544	556	567	578	589	599	610	619	627	636	645	-
		1 Fan*	617	632	646	660	676	689	701	713	723	734	745	756	766	776	784	792	801	-
		2 Fans	694	709	723	737	753	766	778	790	801	812	822	833	843	853	861	870	878	-
	1000	-	485	499	512	525	540	552	563	574	584	595	605	615	624	633	641	649	657	-
		1 Fan*	570	584	597	610	625	638	648	660	670	680	690	700	710	719	726	734	742	-
		2 Fans	642	656	669	682	697	709	720	731	741	752	762	772	781	790	798	806	814	-
100	1800	-	-	-	-	-	-	-	-	622	640	655	671	687	702	716	730	742	755	767	-
	1500	-	-	-	-	-	595	616	634	649	666	680	695	710	724	738	751	762	773	785	-
	1200	-	576	595	612	630	649	666	680	695	709	722	736	749	762	774	784	795	806	-
	1000	-	606	623	640	656	675	690	704	718	730	743	756	768	780	792	801	811	821	-
110	1800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	903	918	-
	1500	-	-	-	-	-	-	758	777	797	814	831	849	866	883	898	912	926	939	-
	1200	-	689	712	733	753	777	797	814	832	848	864	881	896	912	926	938	951	964	-
	1000	-	725	746	766	785	807	826	842	859	874	889	905	919	934	947	959	971	983	-
120	1800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1500	-	-	-	-	-	-	-	-	-	-	-	-	1091	1112	1131	1148	1166	-	-
	1200	-	-	-	-	949	979	1004	1025	1048	1068	1089	1109	1129	1148	1166	1182	1198	-	-
	1000	-	-	-	-	989	1017	1040	1060	1082	1101	1120	1139	1158	1176	1193	1208	1223	-	-

- Ambient temperature 30°C.
- Thermal rating values (with fan) are based on radial fan option.
  * Fan on opposite of HSS end.
- Fan is not recommended if gear unit type is M1PSF100N and above.
- Additional cooling is required if the mechanical power actually transmitted is higher than the thermal rating.



Technical Data
Thermal rating P_{TH}

4.4.3 Thermal rating P_{TH} (Oil surface temperature in the oil sump is 80℃)

M1..N	n_1 [rpm]	Cooling device	P_{TH} [kW] Nominal Ratio i_N																	
			1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
20	1800	Cooling Coil	203	202	200	199	198	197	195	194	193	192	191	190	189	189	188	187	186	185
		Cooling Coil+2Fans	363	362	360	359	358	357	355	354	353	352	351	350	349	349	348	347	346	345
	1500	Cooling Coil	201	200	198	197	196	195	194	193	192	191	190	189	188	187	186	186	185	184
		Cooling Coil+2Fans	337	335	334	333	332	331	330	328	328	327	326	325	324	323	322	322	321	320
	1200	Cooling Coil	198	197	196	195	194	193	192	191	190	189	188	187	186	186	185	184	184	183
		Cooling Coil+2Fans	307	306	305	304	303	302	301	300	299	298	297	296	295	295	294	293	293	292
	1000	Cooling Coil	197	195	194	193	192	191	190	189	189	188	187	186	185	185	184	183	183	182
		Cooling Coil+2Fans	286	285	284	283	281	280	279	279	278	277	276	275	275	274	273	272	272	271
30	1800	Cooling Coil	310	308	306	304	301	299	298	296	294	292	291	289	287	286	285	283	282	281
		Cooling Coil+2Fans	549	547	545	543	540	538	537	535	533	531	530	528	526	525	524	522	521	520
	1500	Cooling Coil	306	304	302	300	298	296	295	293	291	290	288	287	285	284	282	281	280	279
		Cooling Coil+2Fans	509	507	505	503	501	499	498	496	494	493	491	489	488	487	485	484	483	482
	1200	Cooling Coil	302	300	299	297	295	293	291	290	288	287	285	284	282	281	280	279	278	277
		Cooling Coil+2Fans	465	463	461	460	458	456	454	453	451	450	448	447	445	444	443	442	441	439
	1000	Cooling Coil	299	297	296	294	292	290	289	287	286	285	283	282	280	279	278	277	276	275
		Cooling Coil+2Fans	433	431	429	427	425	424	422	421	419	418	416	415	414	413	411	410	409	408
40	1800	Cooling Coil	452	446	442	437	431	427	423	418	415	411	407	403	399	396	393	389	386	383
		Cooling Coil+2Fans	682	677	672	667	662	657	653	649	645	641	637	633	630	626	623	620	617	614
	1500	Cooling Coil	443	439	434	429	424	420	416	412	408	405	401	397	394	390	388	385	382	379
		Cooling Coil+2Fans	634	629	624	620	614	610	606	602	599	595	591	587	584	581	578	575	572	569
	1200	Cooling Coil	434	429	425	421	416	412	408	404	401	398	394	391	388	385	382	379	376	374
		Cooling Coil+2Fans	580	575	571	567	562	558	554	550	547	543	540	537	533	530	528	525	522	520
	1000	Cooling Coil	427	422	418	414	410	406	402	399	396	392	389	386	383	380	378	375	372	370
		Cooling Coil+2Fans	540	535	531	527	523	519	515	512	508	505	502	499	496	493	490	488	485	483
50	1800	Cooling Coil	559	551	544	537	528	521	515	509	503	497	492	486	480	475	471	466	461	457
		Cooling Coil+2Fans	817	810	803	796	788	782	776	770	765	759	754	748	743	738	734	729	725	721
	1500	Cooling Coil	547	539	532	526	518	511	505	499	494	488	483	477	472	467	463	459	454	450
		Cooling Coil+2Fans	759	753	746	740	732	726	721	715	710	705	699	694	689	685	681	677	672	668
	1200	Cooling Coil	532	526	519	513	505	499	494	488	483	478	473	468	463	459	455	451	446	442
		Cooling Coil+2Fans	695	689	683	677	670	664	659	654	649	644	639	634	630	625	622	618	614	610
	1000	Cooling Coil	521	515	509	503	496	490	485	480	475	470	465	461	456	452	448	444	440	437
		Cooling Coil+2Fans	647	641	636	630	623	618	613	608	604	599	594	590	586	582	578	574	571	567
60	1800	Cooling Coil	602	596	590	585	578	572	567	562	557	552	548	543	538	534	530	526	522	519
		Cooling Coil+2Fans	918	913	907	902	896	891	886	881	877	872	868	864	859	855	852	848	845	841
	1500	Cooling Coil	593	587	581	575	569	564	559	554	549	545	540	536	532	527	524	520	517	513
		Cooling Coil+2Fans	853	848	842	837	831	827	822	818	814	809	805	801	797	793	790	787	783	780
	1200	Cooling Coil	581	575	570	565	559	554	549	545	541	536	532	528	524	520	517	513	510	507
		Cooling Coil+2Fans	780	775	770	765	760	755	751	747	743	739	735	731	728	724	721	718	715	712
	1000	Cooling Coil	572	567	562	557	551	546	542	538	534	530	526	522	518	515	511	508	505	502
		Cooling Coil+2Fans	726	721	717	712	707	702	699	695	691	687	684	680	676	673	670	667	664	662
70	1800	Cooling Coil	792	781	771	761	750	741	732	723	715	707	699	691	684	676	670	664	657	651
		Cooling Coil+2Fans	1103	1094	1084	1075	1064	1055	1048	1039	1032	1024	1017	1009	1002	995	989	983	977	971
	1500	Cooling Coil	775	765	755	746	735	726	718	710	703	695	687	680	673	666	660	654	648	642
		Cooling Coil+2Fans	1026	1017	1008	999	989	980	973	965	958	951	944	937	930	923	918	912	906	901
	1200	Cooling Coil	755	746	737	728	718	710	703	695	688	681	674	667	660	653	648	642	637	631
		Cooling Coil+2Fans	940	931	923	914	905	897	890	882	876	869	862	856	850	844	838	833	828	822
	1000	Cooling Coil	741	732	723	715	705	697	690	683	676	670	663	656	650	644	639	634	628	623
		Cooling Coil+2Fans	875	867	859	851	842	835	828	821	815	809	802	796	790	784	780	774	769	765
80	1800	Cooling Coil	-	-	829	821	811	804	797	789	783	776	770	763	757	751	746	740	735	729
		Cooling Coil+2Fans	-	-	1155	1147	1138	1130	1123	1116	1109	1103	1096	1089	1083	1077	1072	1066	1061	1056
	1500	Cooling Coil	832	823	816	808	799	792	786	779	772	766	760	754	748	742	737	732	727	722
		Cooling Coil+2Fans	1089	1081	1073	1065	1057	1049	1043	1036	1030	1023	1017	1011	1005	999	994	989	984	979
	1200	Cooling Coil	816	808	801	794	786	779	772	766	760	754	748	743	737	732	727	722	718	713
		Cooling Coil+2Fans	997	989	982	975	966	959	953	947	941	935	929	923	918	913	908	903	898	894
	1000	Cooling Coil	804	796	789	783	775	768	762	756	751	745	740	734	729	724	720	715	711	706
		Cooling Coil+2Fans	928	921	914	907	899	893	887	881	875	870	864	859	853	848	844	840	835	831
90	1800	Cooling Coil	-	-	-	-	871	864	858	852	846	840	834	828	822	817	812	807	802	-
		Cooling Coil+2Fans	-	-	-	-	1224	1217	1211	1205	1199	1193	1187	1181	1175	1170	1165	1160	1155	-
	1500	Cooling Coil	-	882	875	869	861	854	848	842	836	831	825	819	814	809	804	799	795	-
		Cooling Coil+2Fans	-	1158	1151	1145	1137	1130	1124	1118	1112	1107	1101	1095	1090	1085	1080	1076	1071	-
	1200	Cooling Coil	875	869	862	856	848	842	836	830	825	820	815	809	804	799	795	791	786	-
		Cooling Coil+2Fans	1067	1060	1053	1047	1039	1033	1028	1022	1016	1011	1006	1000	995	991	986	982	978	-
	1000	Cooling Coil	864	858	852	846	838	832	827	822	817	812	807	802	797	792	788	784	780	-
		Cooling Coil+2Fans	993	986	980	974	967	961	956	950	945	940	935	930	925	921	917	913	909	-

- Ambient temperature 30°C.
- Thermal rating values (with fan) are based on radial fan option.
- Additional cooling is required if the mechanical power actually transmitted is higher than the thermal rating.

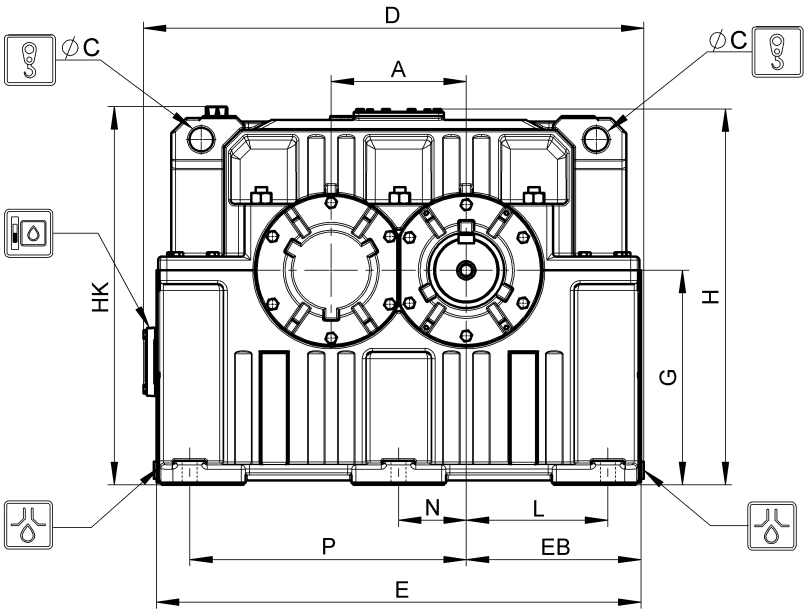
4.4.4 Thermal rating P_{TH} (Oil surface temperature in the oil sump is 90℃)

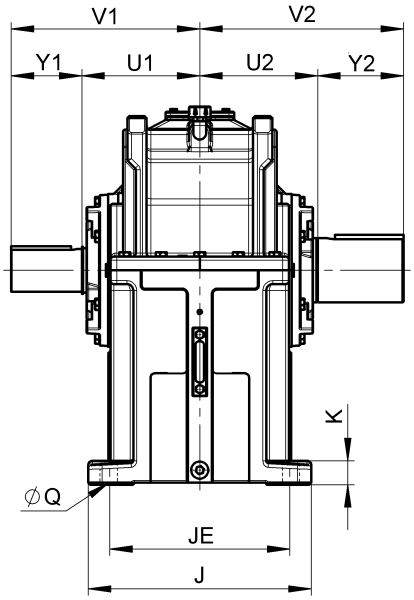
M1..N	n_1 [rpm]	Cooling device	P_{TH} [kW] Nominal Ratio i_N																	
			1	1.12	1.25	1.4	1.6	1.8	2	2.25	2.5	2.8	3.15	3.55	4	4.5	5	5.6	6.3	7.1
20	1800	Cooling Coil	267	264	262	260	257	255	254	252	250	248	246	245	243	241	240	239	237	236
		Cooling Coil+2Fans	462	460	458	455	453	451	449	447	445	444	442	440	439	437	436	434	433	432
	1500	Cooling Coil	263	261	259	257	254	252	251	249	247	245	244	242	241	239	238	237	235	234
		Cooling Coil+2Fans	429	427	425	423	420	418	416	415	413	411	410	408	407	405	404	403	401	400
	1200	Cooling Coil	259	257	255	253	251	249	247	245	244	242	241	239	238	237	235	234	233	232
		Cooling Coil+2Fans	392	390	388	386	384	382	380	379	377	376	374	373	371	370	369	367	366	365
	1000	Cooling Coil	255	253	252	250	248	246	244	243	241	240	239	237	236	235	233	232	231	230
		Cooling Coil+2Fans	364	362	361	359	357	355	354	352	351	349	348	346	345	344	343	341	340	339
30	1800	Cooling Coil	406	402	399	395	391	388	385	382	379	377	374	371	368	366	364	361	359	357
		Cooling Coil+2Fans	698	695	691	688	684	680	677	674	672	669	666	663	660	658	656	654	651	649
	1500	Cooling Coil	400	397	393	390	386	383	380	377	375	372	370	367	364	362	360	358	356	354
		Cooling Coil+2Fans	648	645	641	638	634	631	628	625	623	620	617	615	612	610	608	606	604	602
	1200	Cooling Coil	393	390	387	384	380	377	375	372	370	367	365	362	360	358	356	354	352	350
		Cooling Coil+2Fans	592	589	586	583	579	576	574	571	569	566	564	561	559	557	555	553	551	549
	1000	Cooling Coil	388	385	382	379	376	373	371	368	366	363	361	359	357	355	353	351	349	347
		Cooling Coil+2Fans	551	548	545	542	539	536	534	531	529	526	524	522	520	518	516	514	512	510
40	1800	Cooling Coil	584	576	569	562	554	547	542	535	530	524	518	513	507	502	498	493	489	485
		Cooling Coil+2Fans	866	858	851	844	836	829	823	817	812	806	800	795	789	784	780	775	771	766
	1500	Cooling Coil	572	565	558	551	544	537	532	526	521	515	510	505	500	495	491	487	482	478
		Cooling Coil+2Fans	804	797	791	784	776	770	764	758	753	748	743	737	732	727	723	719	715	711
	1200	Cooling Coil	558	551	545	539	532	526	521	515	510	505	500	495	491	486	483	479	475	471
		Cooling Coil+2Fans	736	730	723	717	710	704	699	693	688	683	678	674	669	665	661	657	653	649
	1000	Cooling Coil	547	541	535	529	523	517	512	507	502	498	493	488	484	480	476	473	469	465
		Cooling Coil+2Fans	685	679	673	667	661	655	650	645	640	636	631	626	622	618	614	611	607	603
50	1800	Cooling Coil	717	706	696	686	675	665	656	647	640	632	623	615	608	601	594	588	581	575
		Cooling Coil+2Fans	1035	1025	1015	1005	994	985	977	969	961	953	945	938	930	924	918	911	905	899
	1500	Cooling Coil	700	689	680	670	660	651	643	634	627	619	611	604	597	590	584	578	572	566
		Cooling Coil+2Fans	962	953	943	934	924	915	908	899	892	885	878	870	864	857	851	846	840	834
	1200	Cooling Coil	680	670	662	653	643	634	627	619	612	605	598	591	584	578	572	567	561	556
		Cooling Coil+2Fans	881	872	864	855	845	837	830	823	816	809	802	796	789	783	778	773	767	762
	1000	Cooling Coil	665	656	647	639	630	622	615	607	601	594	587	581	574	569	563	558	553	548
		Cooling Coil+2Fans	821	812	804	796	787	779	773	765	759	753	746	740	734	728	723	718	713	708
60	1800	Cooling Coil	781	772	763	754	744	736	728	720	713	706	699	692	685	679	673	668	662	656
		Cooling Coil+2Fans	1170	1161	1153	1145	1135	1127	1120	1113	1106	1100	1093	1086	1080	1074	1068	1063	1058	1052
	1500	Cooling Coil	766	757	749	740	731	723	716	708	702	695	688	682	675	669	664	659	653	648
		Cooling Coil+2Fans	1087	1079	1071	1063	1054	1047	1040	1033	1027	1020	1014	1008	1002	996	991	986	981	976
	1200	Cooling Coil	749	740	733	725	716	708	702	695	689	683	676	670	664	659	654	649	644	639
		Cooling Coil+2Fans	995	987	980	972	964	957	951	944	938	932	926	921	915	910	905	900	896	891
	1000	Cooling Coil	736	728	720	713	704	697	691	685	679	673	667	661	656	650	646	641	636	632
		Cooling Coil+2Fans	926	919	912	905	897	890	884	878	873	867	861	856	851	846	841	837	833	828
70	1800	Cooling Coil	1016	1001	988	974	958	945	933	921	910	899	887	876	866	856	847	838	829	820
		Cooling Coil+2Fans	1401	1387	1374	1360	1345	1333	1321	1310	1299	1288	1278	1267	1257	1247	1239	1230	1222	1213
	1500	Cooling Coil	993	979	966	952	938	925	914	902	892	881	871	860	850	841	833	824	816	807
		Cooling Coil+2Fans	1303	1290	1277	1265	1250	1238	1228	1216	1207	1196	1186	1176	1167	1158	1150	1142	1133	1126
	1200	Cooling Coil	966	952	940	928	914	902	892	881	871	861	851	842	833	824	816	808	800	793
		Cooling Coil+2Fans	1194	1181	1170	1158	1144	1133	1123	1113	1104	1094	1085	1075	1066	1058	1051	1043	1036	1028
	1000	Cooling Coil	945	932	921	909	896	885	875	865	856	846	837	828	819	811	804	796	789	782
		Cooling Coil+2Fans	1112	1100	1089	1078	1065	1055	1045	1036	1027	1018	1009	1000	992	984	977	970	963	956
80	1800	Cooling Coil	-	-	1071	1059	1045	1033	1023	1012	1003	993	983	973	964	955	947	939	931	923
		Cooling Coil+2Fans	-	-	1469	1457	1444	1432	1422	1411	1401	1391	1381	1372	1362	1353	1346	1338	1330	1322
	1500	Cooling Coil	1075	1063	1051	1040	1027	1016	1006	996	987	977	968	959	950	942	934	927	919	912
		Cooling Coil+2Fans	1390	1377	1366	1354	1341	1330	1321	1310	1301	1292	1282	1273	1264	1256	1249	1241	1234	1226
	1200	Cooling Coil	1051	1040	1029	1018	1006	996	987	977	969	960	951	942	934	926	920	913	906	899
		Cooling Coil+2Fans	1273	1261	1250	1239	1227	1217	1208	1198	1190	1181	1172	1164	1155	1147	1141	1134	1127	1120
	1000	Cooling Coil	1033	1022	1012	1002	990	980	972	963	955	946	938	930	922	915	909	902	896	889
		Cooling Coil+2Fans	1185	1174	1164	1154	1142	1132	1124	1115	1107	1099	1090	1082	1074	1067	1061	1054	1048	1041
90	1800	Cooling Coil	-	-	-	-	1127	1116	1106	1096	1087	1077	1068	1059	1050	1041	1034	1026	1019	-
		Cooling Coil+2Fans	-	-	-	-	1558	1547	1537	1527	1518	1508	1499	1490	1481	1472	1465	1457	1450	-
	1500	Cooling Coil	-	1144	1133	1122	1110	1099	1090	1080	1072	1063	1054	1045	1037	1029	1022	1015	1007	-
		Cooling Coil+2Fans	-	1481	1470	1460	1447	1437	1428	1418	1409	1400	1391	1383	1374	1366	1359	1352	1345	-
	1200	Cooling Coil	1133	1122	1112	1102	1090	1080	1072	1062	1054	1046	1038	1030	1022	1014	1008	1001	994	-
		Cooling Coil+2Fans	1367	1356	1346	1335	1324	1314	1305	1296	1288	1280	1271	1263	1255	1248	1242	1235	1228	-
	1000	Cooling Coil	1116	1105	1096	1086	1075	1066	1057	1049	1041	1033	1025	1018	1010	1003	997	991	985	-
		Cooling Coil+2Fans	1273	1262	1253	1243	1232	1223	1215	1206	1198	1190	1183	1175	1167	1160	1154	1148	1142	-

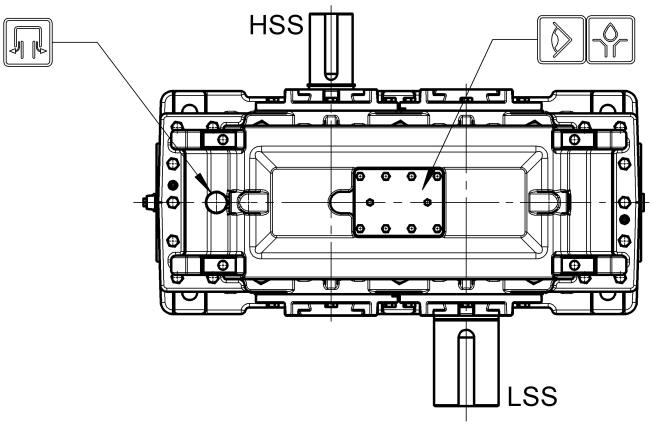
- Ambient temperature 30°C.
- Thermal rating values (with fan) are based on radial fan option.
- Additional cooling is required if the mechanical power actually transmitted is higher than the thermal rating.

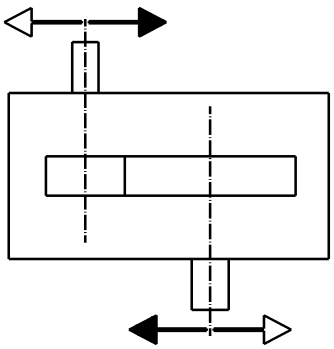
5. Gear Unit Dimensions

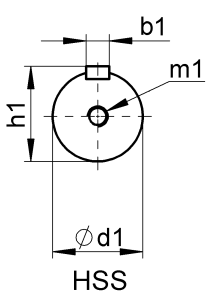
5.1 M1PSF10 - 100N

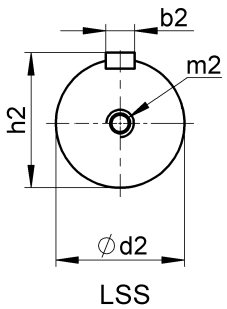


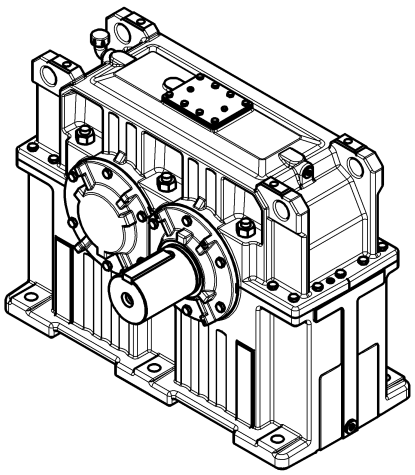




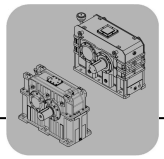








- Keys: ISO773/2491, DIN6885.
- Material of gear housing is cast iron.
- Oil drain valve can be as option.



5.1 M1PSF10 - 100N

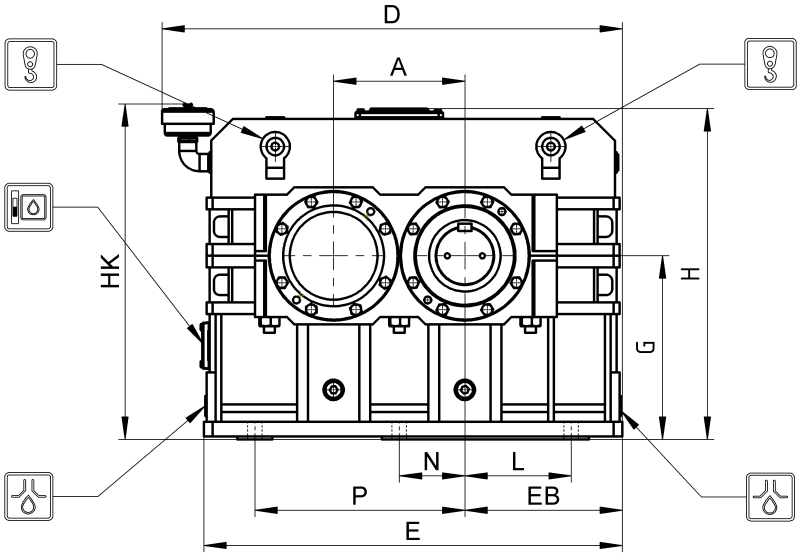
Size	Housing Dimensions [mm]									Foot Mounting [mm]					
	A	C	D	E	EB	G	H	HK	J	JE	K	L	N	P	Q
10	100	20	374	357	128.5	160	275	379	170	130	22	100	-	200	14.5
20	160	30	602	566	203	250	451	464	260	200	32	165	-	325	18.5
30	200	45	752	716	258	315	561	577	340	270	40	210	-	410	24
40	225	45	841	805	290	355	626	637	380	310	45	230	-	460	24
50	250	45	944	910	330	400	701	712	420	340	50	265	125	515	28
60	280	55	1047	1010	365	450	786	793	460	370	50	295	140	575	28
70	315	55	1167	1130	407.5	500	876	882	520	420	56	330	158	645	35
80	355	65	1294	1258	451.5	560	981	992	560	460	63	370	178	725	35
90	400	65	1368	1335	467.5	560	991	1002	570	470	63	410	200	810	42
100	450	65	1474	1445	545	630	1106	1151	590	480	60	365	225	720	42

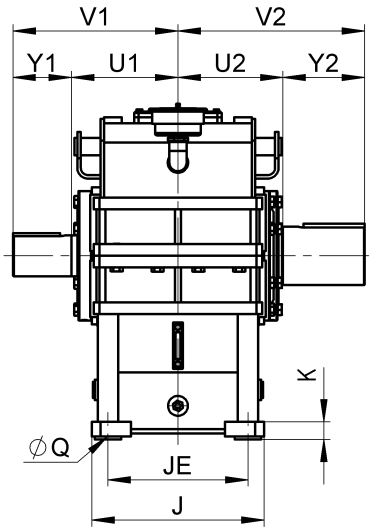
Size	i_N	HSS Dimensions [mm]							LSS Dimensions [mm]							Weight [kg]	Oil Quantity [l]	
		U1	Y1	V1	d1	b1	h1	m1	U2	Y2	V2	d2	b2	h2	m2			
10	1.0 ≤ i ≤ 3.3	120	82	202	40k6	12h9	43	M16x36	120	82	202	40k6	12h9	43	M16x36	55	3.5 [1]	
	3.3 < i ≤ 4.8		58	178	30k6	8h9	33	M10x22										
	4.8 < i ≤ 7.1		42	162	25k6	8h9	28	M10x22										
20	1.0 ≤ i ≤ 3.3	155	105	260	65m6	18h9	69	M20x42	155	105	260	65m6	18h9	69	M20x42	175	14 [2]	
	3.3 < i ≤ 4.8		82	237	50k6	14h9	53.5	M16x36										
	4.8 < i ≤ 7.1		82	237	40k6	12h9	43	M16x36										
30	1.0 ≤ i ≤ 3.3	185	130	315	80m6	22h9	85	M20x42	185	165	350	100m6	28h9	106	M24x50	335	28 [2]	
	3.3 < i ≤ 4.8		105	290	65m6	18h9	69	M20x42										
	4.8 < i ≤ 7.1		82	267	50k6	14h9	53.5	M16x36										
40	1.0 ≤ i ≤ 3.3	205	130	335	90m6	25h9	95	M24x50	205	165	370	110m6	28h9	116	M24x50	470	41 [2]	33 [3]
	3.3 < i ≤ 4.8		105	310	70m6	20h9	74.5	M20x42										
	4.8 < i ≤ 7.1		82	287	55m6	16h9	59	M20x42										
50	1.0 ≤ i ≤ 3.3	225	165	390	100m6	28h9	106	M24x50	225	165	390	120m6	32h9	127	M24x50	635	57 [2]	52 [3]
	3.3 < i ≤ 4.8		130	355	80m6	22h9	85	M20x42										
	4.8 < i ≤ 7.1		105	330	60m6	18h9	64	M20x42										
60	1.0 ≤ i ≤ 3.3	250	165	415	110m6	28h9	116	M24x50	250	200	450	140m6	36h9	148	M30x60	870	80 [2]	52 [3]
	3.3 < i ≤ 4.8		130	380	90m6	25h9	95	M24x50										
	4.8 < i ≤ 7.1		105	355	65m6	18h9	69	M20x42										
70	1.0 ≤ i ≤ 3.3	275	200	475	130m6	32h9	137	M24x50	275	200	475	150m6	36h9	158	M30x60	1195	113 [2]	81 [3]
	3.3 < i ≤ 4.8		165	440	100m6	28h9	106	M24x50										
	4.8 < i ≤ 7.1		105	380	75m6	20h9	79.5	M20x42										
80	1.0 ≤ i ≤ 3.3	300	200	500	140m6	36h9	148	M30x60	300	240	540	160m6	40h9	169	M30x60	1600	162 [2]	120 [3]
	3.3 < i ≤ 4.8		165	465	110m6	28h9	116	M24x50										
	4.8 < i ≤ 7.1		130	430	85m6	22h9	90	M20x42										
90	1.0 ≤ i ≤ 3.3	330	200	530	150m6	36h9	158	M30x60	330	240	570	180m6	45h9	190	M30x60	2090	177 [2]	152 [3]
	3.3 < i ≤ 4.8		165	495	120m6	32h9	127	M24x50										
	4.8 < i < 7.1		165	495	100m6	28h9	106	M24x50										
100	1.0 ≤ i ≤ 3.3	365	240	605	170m6	40h9	179	M30x60	365	280	645	200m6	45h9	210	2-M20x36 +)	2925	164[3]	
	3.3 < i ≤ 4.8		200	565	140m6	36h9	148	M30x60										
	4.8 < i < 7.1		165	530	110m6	28h9	116	M24x50										

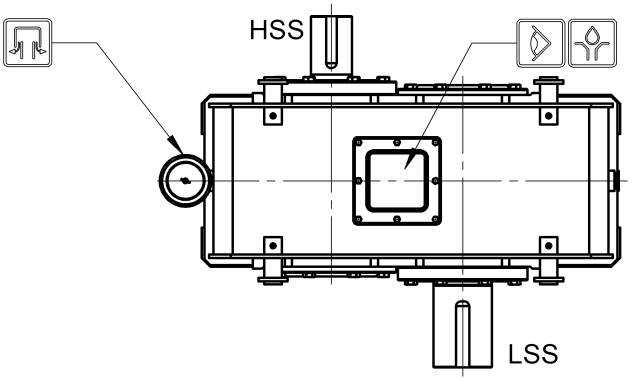
- The weight data listed above do not include the lubricant.
- The weight and oil quantity data listed above are guide values.

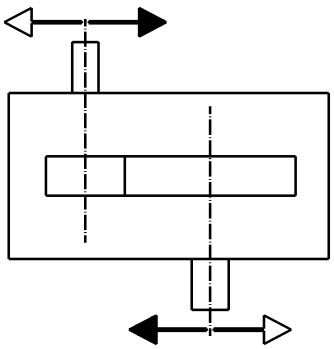
1) Bath lubrication is used for the gear unit.
2) Splash lubrication is used for the gear unit.
3) Pressure lubrication is used for the gear unit.
+) Please consult SEW-EURODRIVE.

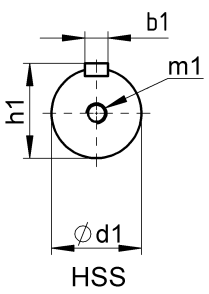
5.2 M1PSF110 - 120N

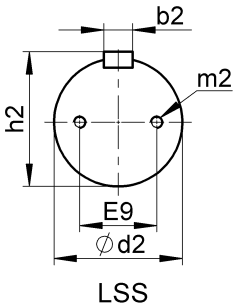


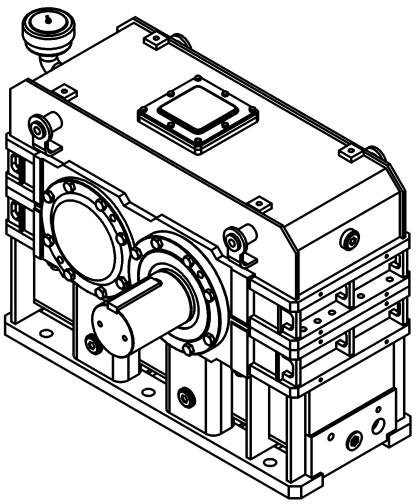




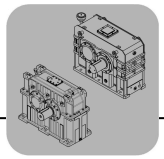








- Keys: ISO773/2491, DIN6885.
- Material of gear housing is steel.
- Oil drain valve can be as option.



5.2 M1PSF110 - 120N

Size	Housing Dimensions [mm]								Foot Mounting [mm]					
	A	D	E	EB	G	H	HK	J	JE	K	L	N	P	Q
110	500	1724	1580	590	710	1270	1288	660	540	70	405	250	805	42
120	560	1904	1760	650	760	1370	1388	768	600	80	450	280	890	42

Size	i_N	HSS Dimensions [mm]							LSS Dimensions [mm]								Weight [kg]	Oil Quantity [l]
		U1	Y1	V1	d1	b1	h1	m1	U2	Y2	V2	d2	b2	h2	m2	E9		
110	1.0 ≤ i ≤ 3.3	400	240	640	180m6	45h9	190	M30x60	400	280	680	220m6	50h9	231	2-M20x36	132	3760	185 [3]
	3.3 < i ≤ 4.8		200	600	150m6	36h9	158	M30x60										
	4.8 < i < 7.1		165	565	120m6	32h9	127	M24x50										
120	1.0 ≤ i ≤ 3.3	463	280	743	200m6	45h9	210	+)	468	330	798	260m6	56h9	272	2-M24x45	156	5630	185 [3]
	3.3 < i ≤ 4.5		240	703	180m6	45h9	190	M30x60										
	4.5 < I < 7.1		200	663	150m6	36h9	158	M30x60										

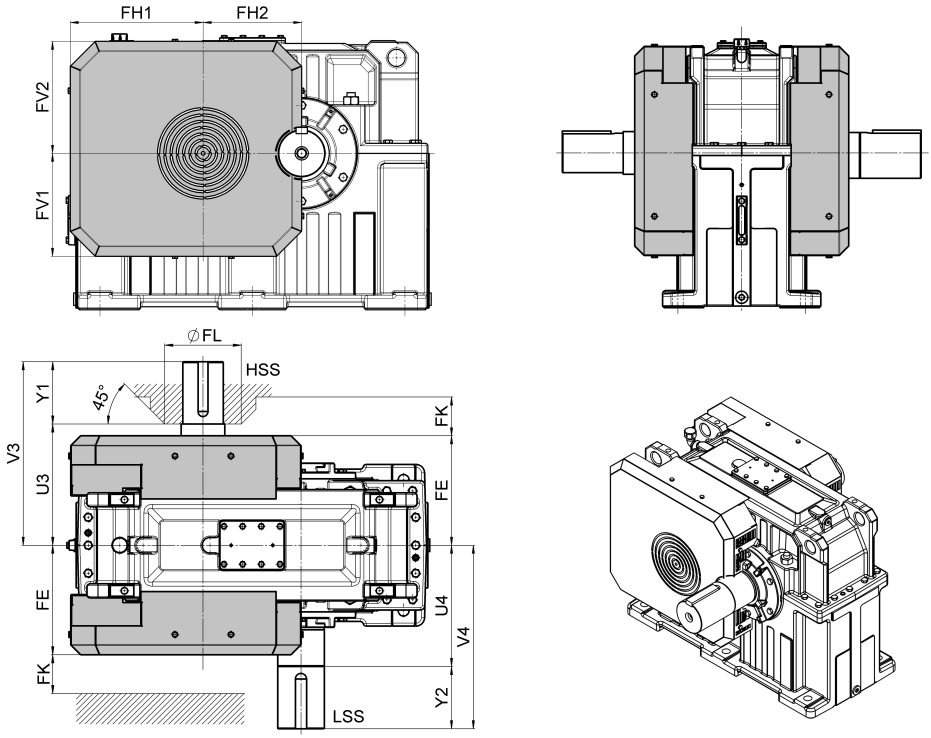
- The weight data listed above do not include the lubricant.
- The weight and oil quantity data listed above are guide values.

3) Pressure lubrication is used for the gear unit.
+) Please consult SEW-EURODRIVE.

6. Optional Accessories

6.1 Fan

Fan with optimized noise and flow engineering geometry are used. The direction of rotation of the gear unit does not influence the operation of the fan.

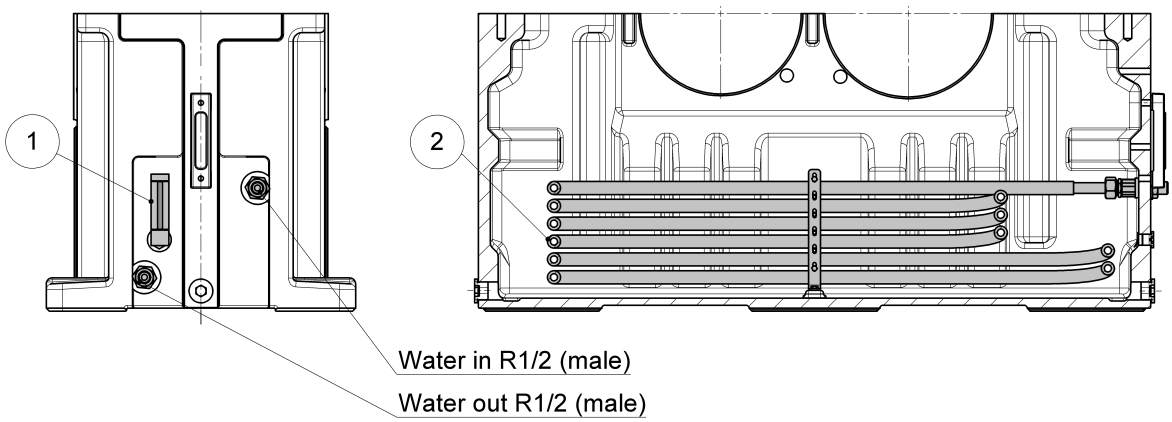


M1..N	i_N	HSS Dimensions [mm]		LSS Dimensions [mm]		Dimensions [mm]							Fan *) [mm]
		U3	V3	U4	V4	FH1	FH2	FV1	FV2	FE	FK_{min}	FL_{max}	
10	$1.0 < i_N \le 3.3$	165	247	165	247	144	100	103	118	161	25	70	Ø156
	$3.3 < i_N \le 4.8$		223										
	$4.8 < i_N \le 7.1$		207										
20	$1.0 < i_N \le 3.3$	210	315	210	315	218	160	168	190	205	30	95	Ø240
	$3.3 < i_N \le 4.8$		292										
	$4.8 < i_N \le 7.1$		292										
30	$1.0 < i_N \le 3.3$	260	390	260	425	273	200	210	235	243	53	110	Ø280
	$3.3 < i_N \le 4.8$		365										
	$4.8 < i_N \le 7.1$		342										
40	$1.0 < i_N \le 3.3$	300	430	300	465	305	225	230	260	274	73	140	Ø315
	$3.3 < i_N \le 4.8$		405										
	$4.8 < i_N \le 7.1$		382										
50	$1.0 < i_N \le 3.3$	320	485	320	485	345	250	265	290	297	73	140	Ø350
	$3.3 < i_N \le 4.8$		450										
	$4.8 < i_N \le 7.1$		425										
60	$1.0 < i_N \le 3.3$	365	530	365	565	380	280	310	320	327	95	170	Ø405
	$3.3 < i_N \le 4.8$		495										
	$4.8 < i_N \le 7.1$		470										
70	$1.0 < i_N \le 3.3$	390	590	390	590	422	315	329	358	352	95	170	Ø405
	$3.3 < i_N \le 4.8$		555										
	$4.8 < i_N \le 7.1$		495										
80	$1.0 < i_N \le 3.3$	415	615	415	655	472	355	382	403	382	100	245	Ø495
	$3.3 < i_N \le 4.8$		580										
	$4.8 < i_N \le 7.1$		545										
90	$1.0 < i_N \le 3.3$	460	660	460	700	488	400	382	403	425	100	245	Ø590
	$3.3 < i_N \le 4.8$		625										
	$4.8 < i_N \le 7.1$		625										

- No fan options for M1PSF100N and above.
- The fan is radial fan. No axial fan option for M1..N series.
- *) Outer diameter of fan.

6.2 Cooling coil system

Cooling coil is used with bath and splash lubrication if the thermal rating of the gear unit is insufficient..



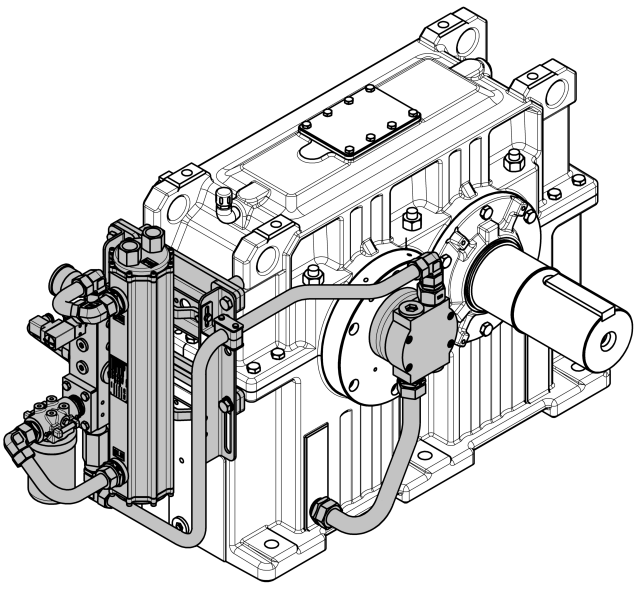
Components:

1. Thermometer scale 0 ... 100°C (+32 ... +212°F)
2. Cooling pipe

- Cooling coil is not available for M1PSF10N, M1PSF100N and above.
- Thermostatic water valve can be as option.

6.3 Shaft end pump

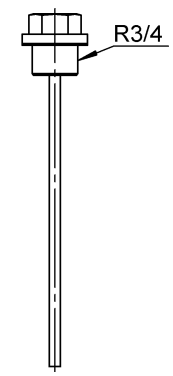
If condition is permitted, shaft end pump can be used from M1PSF20N to M1PSF120N, when adequate space must be allowed for it. Available pump outputs Q_P: 18, 28, 44, 65 dm^3/min at 1500 rpm.



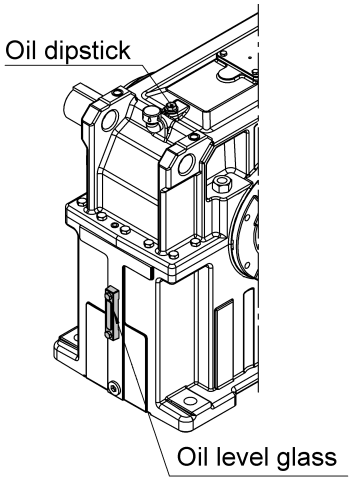
- The shaft end pump is used when pressure lubrication is needed and a motor pump is not desirable.
- A minimum input speed is required for the shaft end pump to operate properly.
- Gear unit continuous running is required if using shaft end pump.
- If using variable input speeds (e.g. inverter-controlled drives) or if intending to change the input speed of gear unit equipped with a shaft end pump, please be sure to consult SEW-EURODRIVE.

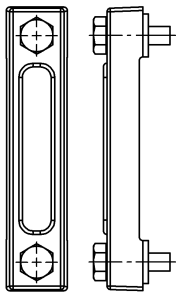
6.4 Oil dipstick

Oil dipstick can be as optional equipment to check the oil level.
Oil level glass is as an standard equipment for M1..N series gear units.



Oil dipstick



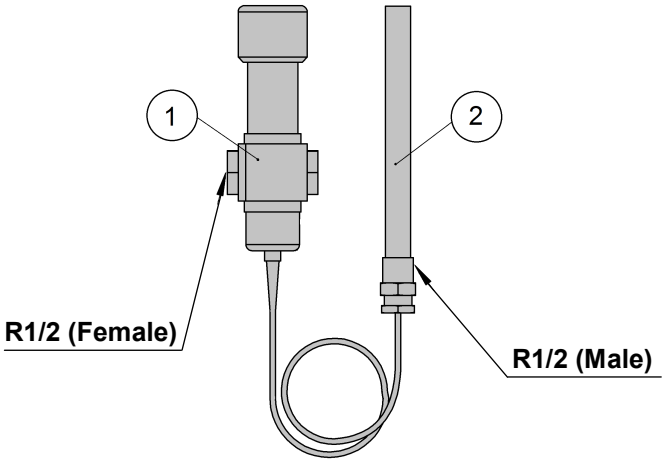


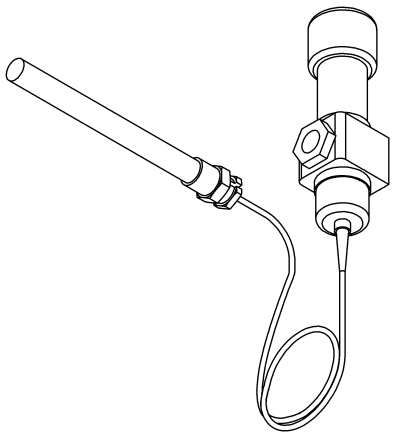
Oil level glass

- Oil level can be checked only when the gear unit is not running.
- Water and dirt penetration into the gear unit must be prevented while checking the oil level.

6.5 Thermostatic water valve

The thermostatic water valve is used to regulate the water flow into cooler (lubrication unit) or cooling coil of the gear unit and so adjust the amount of cooling.





Components:

1. Thermostatic valve
2. Sensor

Technical data:

- Maximum working pressure*) 10 bar
- Minimum working pressure *) 2 bar
- Maximum differential pressure 7 bar
- Maximum water temperature *) 25°C (40°C)

*) when using the water valve for lubrication unit or cooling coil.

6.6 Oil heater

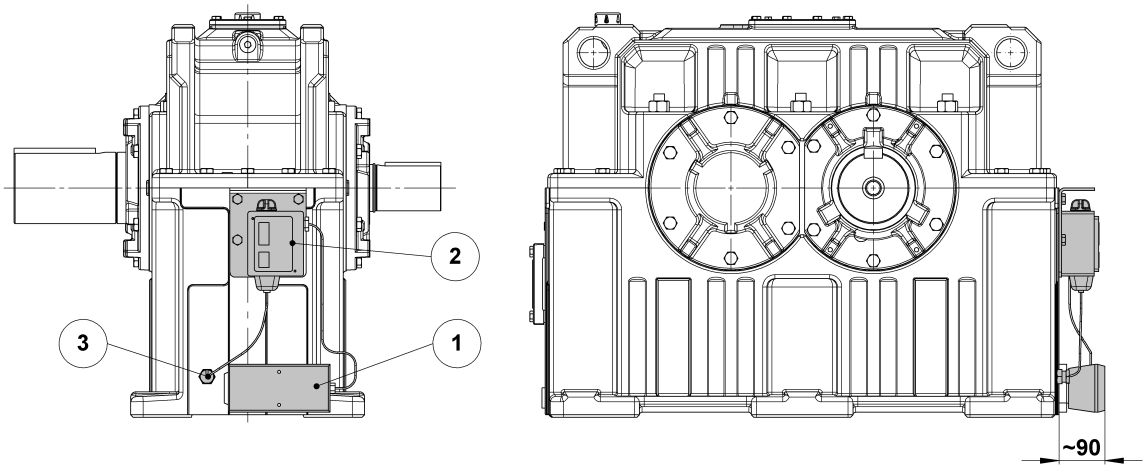
An oil heater is required to ensure lubrication during a cold gear unit startup when the ambient temperature is low.

The minimum starting temperature in splash and bath lubricated gear:

- ISO VG220 (Mineral oil): Minimum starting temperature -16°C
- ISO VG320 (Mineral oil): Minimum starting temperature -12°C
- ISO VG460 (Mineral oil): Minimum starting temperature -8°C

In pressure lubricated gear units the oil viscosity in minimum starting temperature must be lower than 2000 cSt.

- ISO VG220 (Mineral oil): Minimum starting temperature 10°C
- ISO VG320 (Mineral oil): Minimum starting temperature 15°C
- ISO VG460 (Mineral oil): Minimum starting temperature 20°C



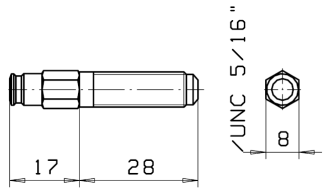
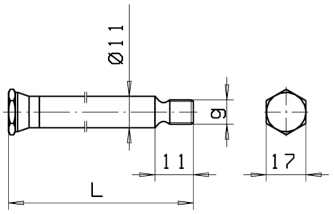
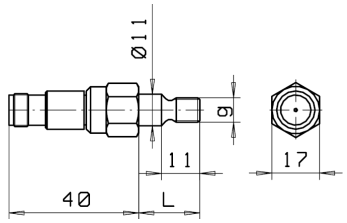
Components:

1. Oil heater
2. Thermometer
3. Sensor

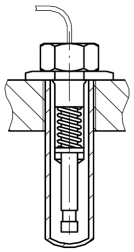
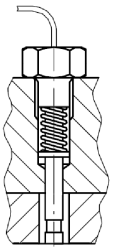
M1..N	Frequency 50Hz		Frequency 60Hz	
	Power [W]	Voltage [V]	Power [W]	Voltage [V]
10	-	-	-	-
20	330	230	330	230
30	670	230	670	230
40	670	230	670	230
50	1000	400Y/230Δ	1000	400Y/230Δ
60	1000	400Y/230Δ	1000	400Y/230Δ
70	1500	400Y/230Δ	1500	400Y/230Δ
80	1500	400Y/230Δ	1500	400Y/230Δ
90	2000	400Y/230Δ	2000	400Y/230Δ
100	2000	400Y/230Δ	2000	400Y/230Δ
110	2330	400Y/230Δ	2330	400Y/230Δ
120	3000	400Y/230Δ	3000	400Y/230Δ

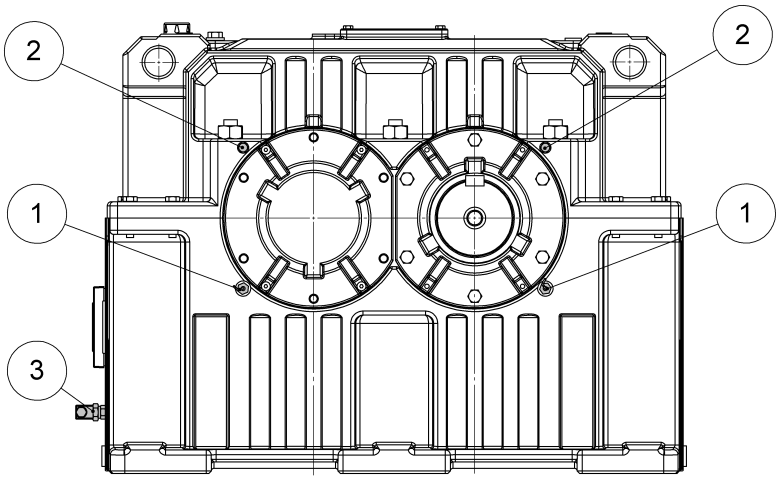
6.7 Coupled equipment - Sensors

6.7.1 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

6.7.2 Temperature sensor

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



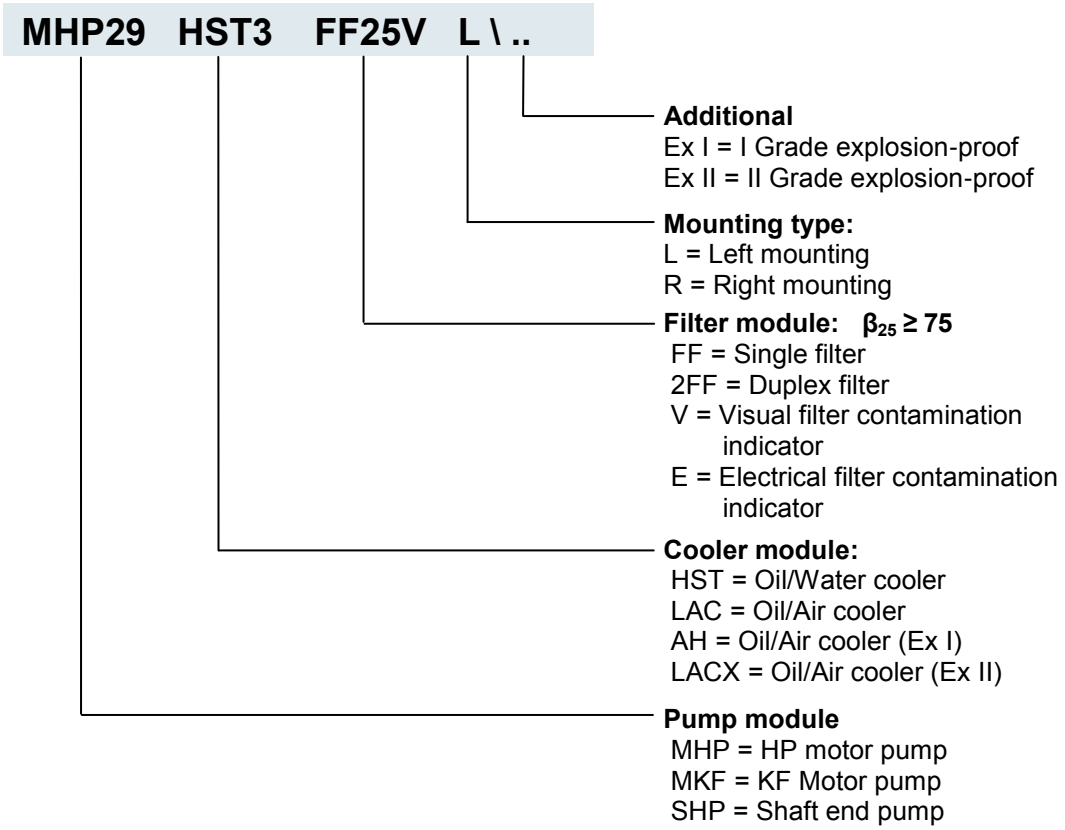
1. Bearing temperature sensor position
2. Shock impulse sensor position
3. Oil temperature sensor position

Annex A

Lubrication unit

For a detailed description, please refer to the separate manual.

The designation of lubrication unit is set up as follows:



If the pressure lubrication unit with duplex filter, only left mounting is available.

See selection tables for the list of lubrication unit modules.

Information to be given in order:

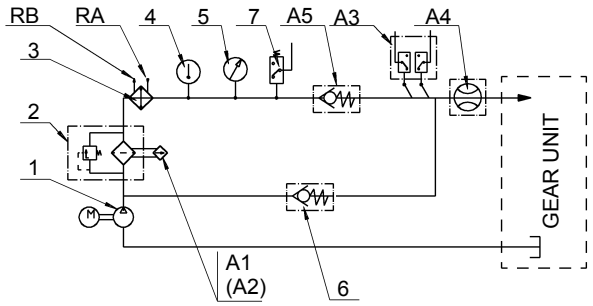
- Type of the unit
- Motor main voltage and frequency
- Instrument voltage and frequency
- Ambient temperature range
- Water temperature range (for oil/water coolers)
- Mounting position and location of the unit.

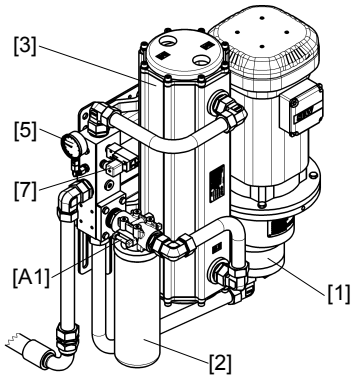
The mounting position is recommended to place the lubrication unit on the low speed shaft side. Other mounting position, please consult SEW-EURODRIVE.

Annex A

Lubrication unit

Flow diagram for lubrication unit with pipe cooler





Standard equipment:
[1] Pump
[2] Filter
[3] Oil/Water cooler
[5] Pressure gauge
[6] Pressure relief valve
[7] Pressure switch
[A1] Visual filter contamination indicator
[RA] Water inlet
[RB] Water outlet

Optional equipment:
[4] Thermometer
[A2] Electrical filter contamination indicator
[A3] Temperature monitors
[A4] Flow indicator
[A5] Check valve

Technical data for lubrication unit with oil/water cooler module (Frequency 50Hz)

Cooling rating P_C [kW]	Pump output Q_P [L/min]	Water supply Qw (5-25°C) [L/min]	Water supply Q_w (25-40°C) [L/min]	Pump Module	Cooler Module	Motor Rating (50Hz 1500 rpm)		Water connections female		Unit weight [kg]
						IEC	[kW]	RA	RB	
5.3	18	8..12	12..25	MHP-12	HST1	24FF165	1.1	R3/4	R3/4	68
8.5	18	11..18	18..25	MHP-12	HST2	24FF165	1.1	R1	R1	70
10.5	28	14..25	25..40	MHP-18	HST2	24FF165	1.5	R1	R1	74
15	28	25..40	40..65	MHP-18	HST2	24FF165	1.5	R1	R1	74
19	44	35..45	45..85	MHP-29	HST3	28FF215	3	R1	R1	103
24	44	40..65	65..85	MHP-29	HST3	28FF215	3	R1	R1	103
25	65	35..60	60..80	MHP-47	HST3	28FF215	4	R1	R1	128
29	65	42..75	75..125	MHP-47	HST3	28FF215	4	R1	R1	128
36	81	50..75	75..130	MKF-63	HST4	38FF265	7.5	G1 1/2	G1 1/2	168
43	107	60..95	95..160	MKF-80	HST4	38FF265	7.5	G1 1/2	G1 1/2	167
48	107	75..100	100..175	MKF-80	HST5	38FF265	7.5	G2	G2	170
59	131	89..135	135..245	MKF-100	HST5	42FF300	11	G2	G2	222

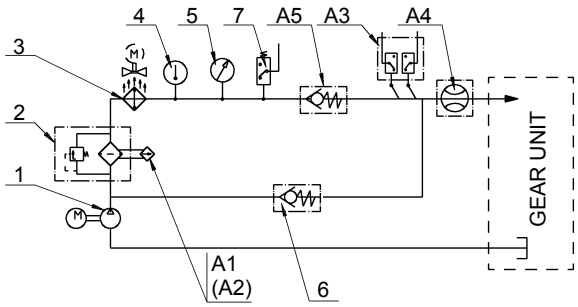
Technical data for lubrication unit with oil/water cooler module (Frequency 60Hz)

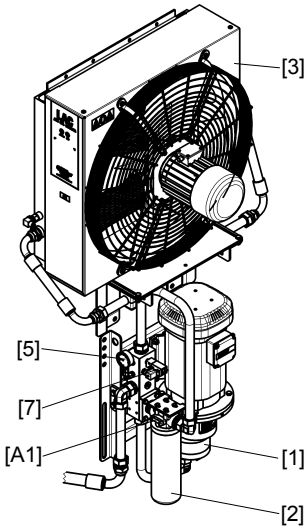
Cooling rating P_C [kW]	Pump output Q_P [L/min]	Water supply Qw (5-25°C) [L/min]	Water supply Q_w (25-40°C) [L/min]	Pump Module	Cooler Module	Motor Rating (60Hz 1800 rpm)		Water connections female		Unit weight [kg]
						IEC	[kW]	RA	RB	
6.4	21.6	9..14	14..50	MHP-12	HST1	24FF165	1.5	R3/4	R3/4	73
9.5	21.6	15..35	35..80	MHP-12	HST2	24FF165	1.5	R1	R1	75
11	33.6	23..30	30..90	MHP-18	HST2	28FF215	2.2	R1	R1	85
16	33.6	30..65	65..90	MHP-18	HST2	28FF215	2.2	R1	R1	85
20	53	40..50	50..110	MHP-29	HST3	28FF215	3.7	R1	R1	105
26	53	45..80	80..110	MHP-29	HST3	28FF215	3.7	R1	R1	105
28	78	40..65	65..110	MHP-47	HST3	38FF265	5.5	R1	R1	147
32	78	45..92	92..130	MHP-47	HST3	38FF265	5.5	R1	R1	147
41	97	55..90	90..150	MKF-63	HST4	38FF265	9	R1 1/2	R1 1/2	205
46	128	65..100	100..170	MKF-80	HST4	38FF265	9	R1 1/2	R1 1/2	207
52	128	80..110	110..185	MKF-80	HST5	38FF265	9	R2	R2	211
63	157	95..145	145..255	MKF-100	HST5	42FF300	15	R2	R2	300

Annex A

Lubrication unit

Flow diagram for lubrication unit with air cooler





Standard equipment:
[1] Pump
[2] Filter
[3] Oil/Air cooler
[5] Pressure gauge
[6] Pressure relief valve
[7] Pressure switch
[A1] Visual filter contamination indicator

Optional equipment:
[4] Thermometer
[A2] Electrical filter contamination indicator
[A3] Temperature monitors
[A4] Flow indicator
[A5] Check valve

Technical data for lubrication unit with oil/air cooler module (Frequency 50Hz)

Cooling rating P_C [kW]	Pump output Q_P [L/min]	Pump Module	Cooler Module	Motor Rating (50Hz 1500rpm)		Fan Motor (50Hz)			Unit weight [kg]
				IEC	[kW]	[rpm]	[kW]	Noise level (1m) [dB (A)]	
5.3	18	MHP-12	LAC2 007-2-D	24FF165	1.1	3000	0.55	79	85
8.5	18	MHP-12	LAC2-011-2-D	24FF165	1.1	3000	1.1	82	95
10.5	28	MHP-18	LAC2 016-4-D	24FF165	1.5	1500	0.37	70	97
15	28	MHP-18	LAC2 023-4-D	24FF165	1.5	1500	0.75	76	109
19	44	MHP-29	LAC 033-6-A	28FF215	3	1000	0.55	74	144
24	44	MHP-29	LAC 033-4-A	28FF215	3	1500	2.2	84	151
25	65	MHP-47	LAC 033-4-A	28FF215	4	1500	2.2	84	175
29	65	MHP-47	LAC 044-4-A	28FF215	4	1500	2.2	85	188
36	81	MKF-63	LAC 056-6	38FF265	7.5	1000	1.5	81	217
43	107	MKF-80	LAC 056-6	38FF265	7.5	1000	1.5	81	228
48	107	MKF-80	LAC 056-4	38FF265	7.5	1500	2.2	84	228
59	131	MKF-100	LAC 078-6	42FF300	11	1000	2.2	87	345

Technical data for lubrication unit with oil/air cooler module (Frequency 60Hz)

Cooling rating P_C [kW]	Pump output Q_P [L/min]	Pump Module	Cooler Module	Motor Rating (60Hz 1800rpm)		Fan Motor (60Hz)			Unit weight [kg]
				IEC	[kW]	[rpm]	[kW]	Noise level (1m) [dB (A)]	
6.4	21.6	MHP-12	LAC2 007-2	24FF165	1.5	3600	0.66	86	90
9.5	21.6	MHP-12	LAC2-011-2	24FF165	1.5	3600	1.3	89	98
11	33.6	MHP-18	LAC2 016-4	28FF215	2.2	1800	1.3	89	109
16	33.6	MHP-18	LAC2 023-4	28FF215	2.2	1800	0.9	78	120
20	53	MHP-29	LAC 033-6	28FF215	3.7	1200	0.9	78	133
26	53	MHP-29	LAC 033-4	28FF215	3.7	1800	2.6	86	149
28	78	MHP-47	LAC 033-4	38FF265	5.5	1800	0.66	83	199
32	78	MHP-47	LAC 044-4	38FF265	5.5	1800	1.8	88	211
41	97	MKF-63	LAC 056-6	38FF265	9.2	1200	2.6	91	248
46	128	MKF-80	LAC 056-6	38FF265	9.2	1200	2.6	91	249
52	128	MKF-80	LAC 056-4	38FF265	9.2	1800	2.6	91	257
63	157	MKF-100	LAC 078-6	42FF300	15	1200	2.6	94	416

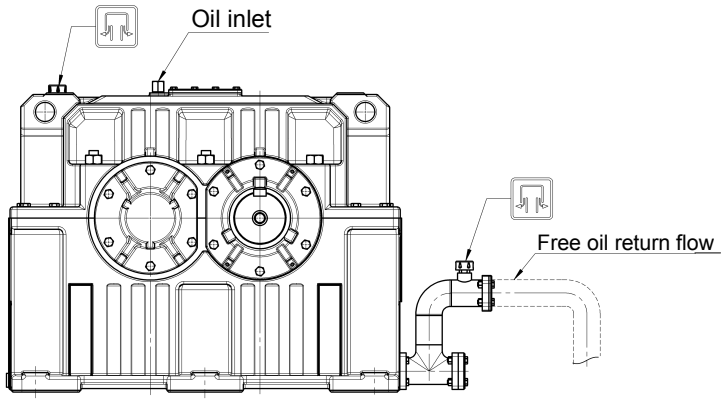
Maximum air temperature 35°C.

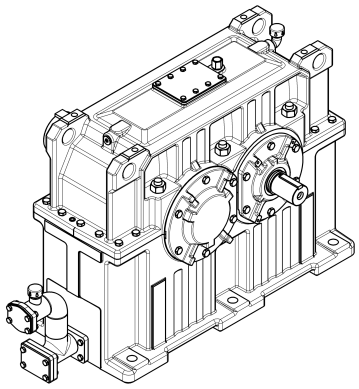
Annex B

Central lubrication system connections

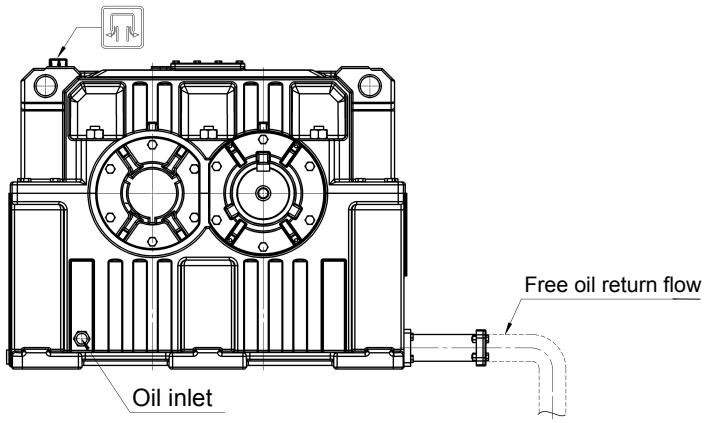
Equipment to connect the gear unit to the centralized oil filtering and cooling system.

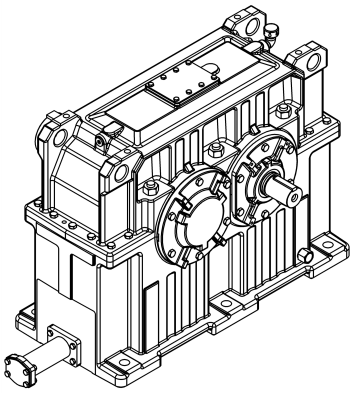
Splash Lubrication





Pressure Lubrication





The diameter and height of the oil outlet pipe vary according to the gear unit size, lubrication method, oil viscosity and oil amount. SEW-EURODRIVE can deliver a visual or electrical flow meter to ensure the right oil flow into the gear unit.
Dimensions of the attachment flange depend on the pipe diameter and are according to the standard DIN 2642.

Annex C

Abbreviation key

f_1	Altitude 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_T	Ambient temperature 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_A	Axial load	kN
F_F	Peak load factor	-
F_R	Radial load	kN
F_S	Service factor = M_{N2} / M_{K2} = P_{N1} / P_{K1}	-
$F_{S\ min}$	Application service factor	-
F_{start}	Startup factor	-
η	Efficiency	-
HSS	High speed shaft of the gear unit (usually input shaft)	-
i	Gear ratio	-
i_{ex}	Exact gear unit reduction ratio	-
i_N	Nominal gear unit (reduction) ratio	-
LSS	Low speed shaft of the gear unit (usually output shaft)	-
M_{K2}	Output torque (= operating torque on LSS)	kNm
$M_{K2\ max}$	Peak output torque (= peak operating torque on LSS)	kNm
$M_{K2\ ZUL}$	Permitted peak output torque	kNm
M_{N2}	Nominal gear unit torque	kNm
n_1	Input speed (HSS)	rpm
n_2	Output speed (LSS)	rpm
P_{K1}	Operating power on HSS	kW
$P_{K1\ max}$	Peak operating power on HSS	kW
$P_{K1\ ZUL}$	Permitted peak operating power on HSS	kW
P_{K2}	Operating power on LSS	kW
P_M	Nominal motor power	kW
P_{N1}	Nominal gear unit power (with reference to HSS)	kW
P_T	Thermal rating of the gear unit at existing ambient conditions	kW
P_{TH}	Thermal rating of the gear unit at defined ambient conditions	kW
P_L	Power loss to be cooled	kW

DET NORSKE VERITAS

ACKNOWLEDGEMENT OF RECEIPT - EC

ACKNOWLEDGEMENT NO. 114660-2012-CE-RGC-DNV Rev.1

This Acknowledgement consists of 2 pages

This is to confirm that the Technical File for the following product(s):

Gear Units

with type designation(s)

See page 2

Manufactured by

SEW Industrial Gears (Tianjin) Co., Ltd.
No. 46, 7th Avenue, Tianjin Economic Technological Development Area,
Tianjin City, P.R.C

has been received and stored according to

the conformity assessment procedure described in Article 8.1.(b).(ii), of Council Directive 94/9/EC (ATEX) of 23 March 1994, category 2 non-electrical equipment.

Further details are given overleaf.

Place and date
Høvik, 2015-05-22
for DET NORSKE VERITAS AS

Ståle Sandstad
Certification Manager

NORSK AKKREDITERING
PROD 019

This Acknowledgement is valid until
2018-04-27

Notice: The acknowledgement is subject to terms and conditions overleaf. Any significant changes in design or construction may render this acknowledgement invalid.
The digitally signed and electronically distributed document is the original and valid acknowledgement. Ref.: www.dnv.com/digitalsignatures

Det Norske Veritas AS
Veritasveien 1, , 1322 Høvik, Norway, +4767579900, +4767579911

Ack. No.: 114660-2012-CE-RGC-DNV, Rev.1
Project No.: PRJC-377408-2012-PRC-CHN

Jurisdiction
DNV is appointed by the Directorate for Civil Protection and Emergency Planning as Notified Body (No. 0575) under the terms of the Norwegian regulation "Forskrift om utstyr og sikkerhetssystem til bruk i eksplosjonsfarlig område", dated 1996-12-09 and Article 9 of Council Directive 94/9/EC (ATEX), as amended.

Acknowledgement history:

Revision	Description	Issue date
-	original Acknowledgement	2012-04-27
1.0	Renewal of acknowledgement	2015-05-22

Product description
The following types are covered by the Acknowledgement:

Product Description	Type Designations	Category	Product Group	Product Sub Group
Gear Units	M, M1,ML series	2	Ex equipment	Non-electrical

Technical documentation:
The following documentation has been received and stored:

Document No	Document Name
TCF- M&ML&M1 Series001, 04/2015	TCF-Industrial Gear Units of the M&ML&M1 Series

Terms and conditions
The product liability rests with the manufacturer, his representative or, in the absence of a representative, the importer, in accordance with the General Product Safety Directive 2001/95/EC
The following conditions may render this acknowledgement invalid:

- Changes in the design or construction of the product.
- Changes or amendments to the referenced directive(s).
- Changes or amendments in the standards which form the basis for documenting compliance with the essential requirements of the directive(s).

Conformity declaration and marking of product
In order to fully meet with the requirements of the Directive and legally affix the CE mark, the manufacturer must take all measures necessary to ensure that the manufactured product comply with the technical documentation and with the requirements of the Directive and finally draw up an EC declaration of conformity.

END OF ACKNOWLEDGEMENT

Det Norske Veritas AS Veritasveien 1, , 1322 Høvik, Norway, +4767579900, +4767579911

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 4039-1998-AQ-RGC-RvA

This is to certify that

SEW Industrial Gears (Tianjin) Co., Ltd.

No. 46, 7th Avenue, TEDA, Tianjin, P.R. China

has been found to conform to the Management System Standard:

ISO 9001:2008

This Certificate is valid for the following product or service ranges:

Sales, Design, Manufacture and Service of Gear Units and Segmented Girth Gears.

Initial Certification date:
December 11th, 1998

This Certificate is valid until:
December 11th, 2016

Place and date:
Shanghai, November 29th, 2013

for the Accredited Unit:
DNV CERTIFICATION B.V.,
THE NETHERLANDS

MGMT. SYS.
RvA C 024

The audit has been performed under the supervision of
Zhang Fu Wei
Lead Auditor

Chen Yi
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

ACCREDITED UNIT: DET NORSKE VERITAS CERTIFICATION B.V., ZWOLSEWEG 1, 2994 LB, BARENDRECHT, THE NETHERLANDS, TEL: +31 (0) 10 2922600 , WWW.DNVBA.COM

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No:
127565-2012-AE-RGC-RvA

Initial certification date:
04 January, 2013

Valid:
28 December, 2015 - 14 September, 2018

This is to certify that the management system of

SEW Industrial Gears (Tianjin) Co., Ltd.

No. 46, 7th Avenue, TEDA, Tianjin, 300457, P.R. China

has been found to conform to the Environmental management system standard:

ISO 14001:2004

This certificate is valid for the following Scope:

Sales, Design, Manufacture and Service of Gear Units and Segmented Girth Gears

Place and date:
Shanghai, 29 December, 2015

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF
MGMT. SYS.
RvA C 024

The RvA is a signatory to the IAF MLA

For the issuing office:
DNV GL – Business Assurance
Suite A, Building 9, No.1591
Hongqiao Road, Changning District,
Shanghai 200336, P.R. China
TEL: +86 21 32084518

Chen Yi
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV GL BUSINESS ASSURANCE B.V., ZWOLSEWEG 1, 2994 LB, BARENDRECHT, THE NETHERLANDS. TEL:+31102922689.
www.dnvba.com

DNV BUSINESS ASSURANCE

STATEMENT OF RECOGNITION

STATEMENT NO. 639 -15 - LAB30
The statement consists of 3 pages

This is to confirm that the

SEW Industrial Gears (Tianjin) Co., Ltd.

No.46, 7th Avenue, TEDA, Tianjin, China

has been found to comply with the requirements of DNV towards subcontractors of

Quality Management of Testing Laboratory

The acceptance is based on a formal Quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors.

Place and date
Shanghai, 30 September, 2015
for DNV GL Business Assurance
(China) Co., Ltd.

This Statement is valid until
29 September, 2018

Zhang Qing Ping
Product Compliance Manager

DNV *local office:*
DNV Shanghai

Sean Lee
Technical Reviewer

Notice: This Statement is subject to terms and conditions overleaf. Any significant change in the laboratory facilities or in the quality system may render this Statement invalid.

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

DET NORSKE VERITAS AS SHANGHAI BRANCH HOUSE NO.9,1591 HONG QIAO ROAD,SHANGHAI 200336,P.R.CHINA TEL: 86(0) 21 3208 4518

Page 1 of 3

Annex D

Certificate

Statement No.: 639- 15- LAB30

Project No.: PRJC-506436-2014-PRC-CHN

Audit information

Initial audit:

- Date of Audit: 2015-06-11-12
- Initial Certification Audit Report: 2015-08-31/final
- Closing of Non-conformities: 2015-08-31

Scope of recognition

JB/T 8555 2008
GB/T 7232 2012
GB/T 9452 2012
GB/T 2828.1 2012
JB/T 6050 2006
GB/T 230.1 2009
GB/T 231.1 2009
GB/T 4340.1 2009
GB/T 4342 1991
GB/T 1818 1994
GB/T 13298 1991
GB/T 13299 1991
GB/T 2975 1998
GB/T 228.1 2010
GB/T 229 2007
GB/T 232 2010
GB/T 225 2006
GB/T 8539 2000
ISO 6336-5 2003
DIN EN 10083-1 2006
DIN EN 10083-2 2006
DIN EN 10083-3 2006
DIN EN 10084 2008
GB/T 3077 1999
GB/T 222 2006
GB/T 14203 1993
GB/T 4336 2002
SEW-SAT 1900E 6.3.2012
GB/T 5617 2005
JB/T 9204 2008
GB/T 9450 2005
GB/T 9451 2005
QC/T 262 1999
JB/T 3999 2007
GB/T 18177 2008
GB 11354 1989
GB/T 13320 2007

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Statement No.: 639- 15- LAB30

Project No.: PRJC-506436-2014-PRC-CHN

GB/T 10561 2005
GB/T 1979 2001
GB/T 6394 2002
GB/T 226 1991
GB/T 3098.1 2010

Application/Limitations

Related light/heavy industry field.

Documentation

LAB/SIG-QM for the QM-quality manual; LAB/SIG-xx-xx for procedure and for daily operation working instruction as well.

END OF STATEMENT

DET NORSKE VERITAS AS SHANGHAI BRANCH HOUSE NO.9,1591 HONG QIAO ROAD,SHANGHAI 200336,P.R.CHINA · TEL: 86(0) 21 3208 4518




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