CONTENTS

SAUER SUNDSTRAND

SNM2 • SEM2

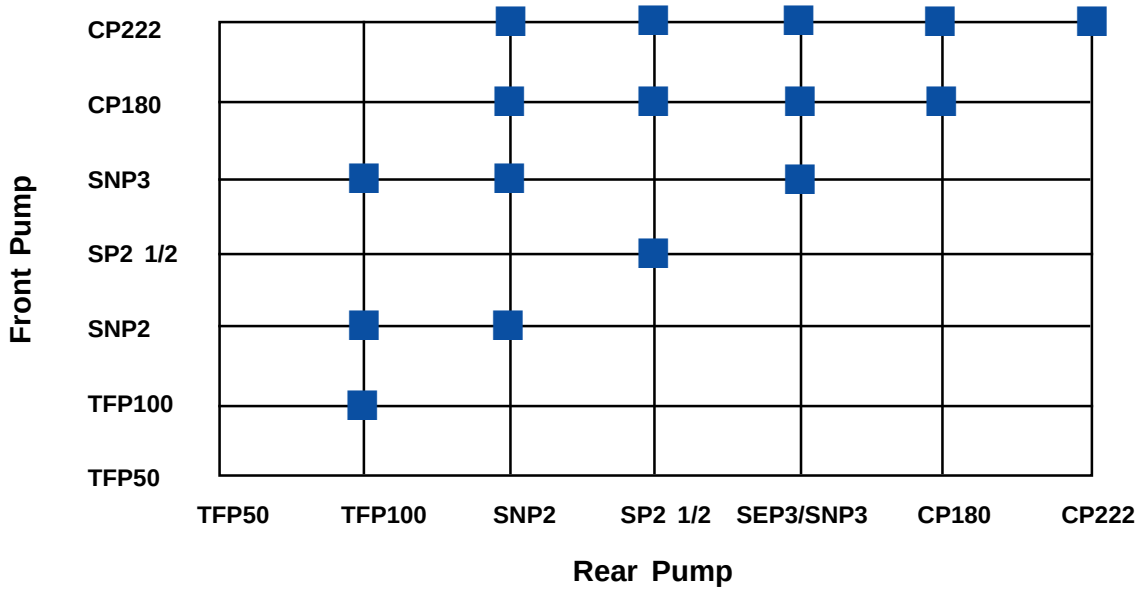
Gear Motors

Technical Information

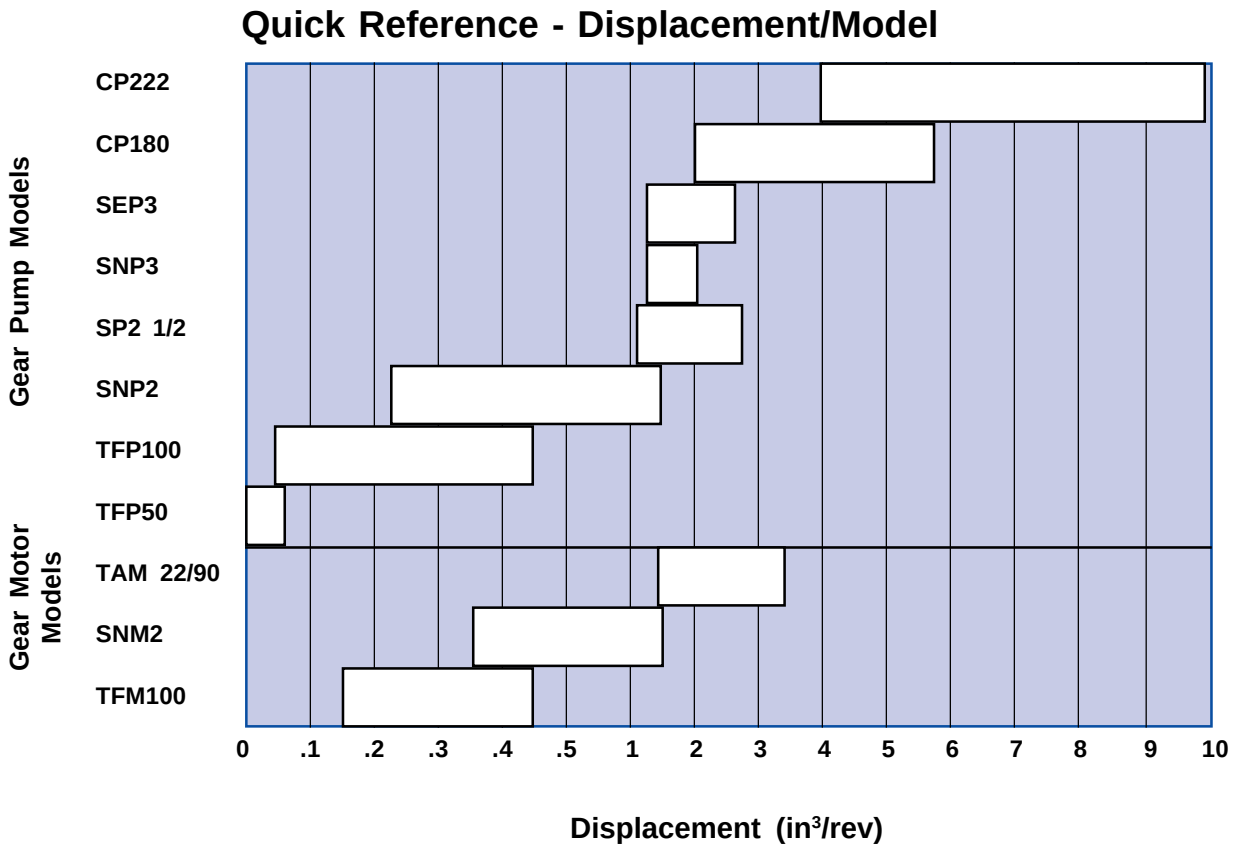
Sauer-Sundstrand Gear Pump and Motor Features

- Worldwide sales and service capabilities from the industry leader is part of the package for every Sauer-Sundstrand gear product customer.
- Proven reliability with over 45 years of experience in gear product design for mobile and industrial applications.
- System pressures to 4000 psi (276 bar) and speeds to 10,000 rpm allow high performance in system design.
- Pressure balanced design for high efficiency and long life.
- Low cost design and manufacturing for the requirements of fixed displacement systems.
- Variety of flexible installation options available:
  - Convenient side or rear porting options
  - Auxiliary through drive SAE mounting pads
  - Integral relief valve, priority flow control, and priority flow divider covers
  - High temperature viton seals
  - Metric and European flanges, shafts and ports
  - Multiple pump configurations (refer to the Quick Reference chart below)

Quick Reference - Multiple Pump Configurations



A Complete Family of Sauer-Sundstrand Gear Pumps and Motors



General Gear Product Specifications

Information in the following pages will help determine which Sauer-Sundstrand components are most appropriate for your application.

General Description

SAUER-SUNDSTRAND High performance gear motors are fixed displacement motors. They consist of motor housing, drive gear, driven gear, DU bushings, motor cover and flange, shaft seal ring and the outer and inner seals, as shown in Figure 1. The pressure balanced design provides high efficiency for the entire series of motors.

Features

Economical through:

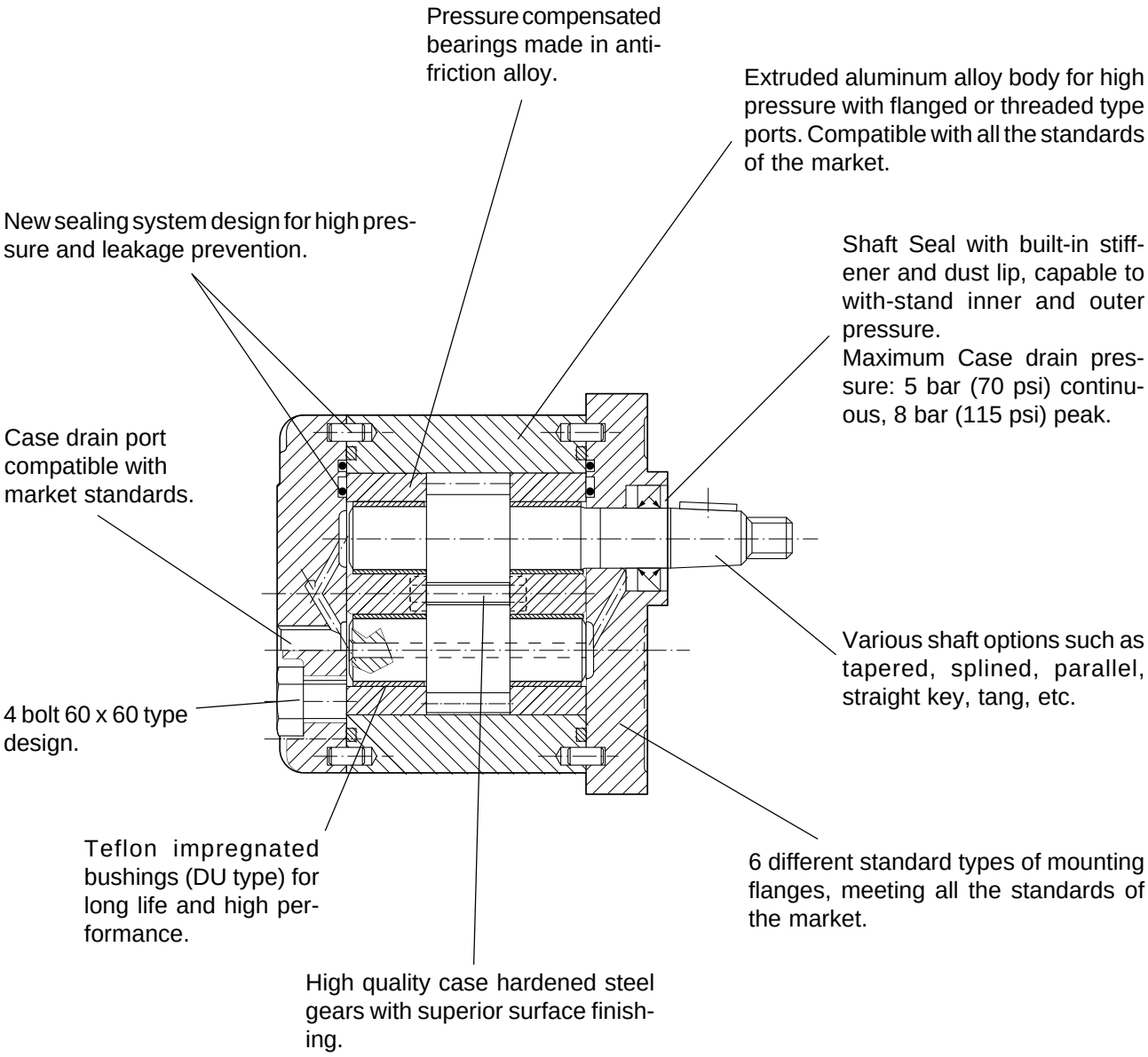
- **high output torque**
- **wide speed range**
- **high efficiency**
- **long life**

Contents

Method of Operation

When a motor is driven by an external flow of oil under pressure, the empty tooth chambers are filled with hydraulic fluid. The hydraulic fluid is transported to the low pressure side via the path of the tooth chambers of the rotating gears. The high and low pressure areas of the motor are separated from each other: radially by the intake path of the gears in the motor housing, and axially by the DU Bushings.

Figure 1



P001139

Technical Data

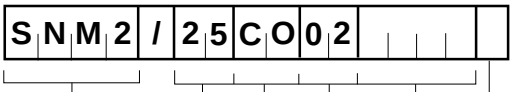
Table 1: SNM 2

SNM 2	Dimension	Frame Size							
		6	8	11	14	17	19	22	25
Displacement	cm^3	6.0	8.4	10.8	14.4	16.8	19.2	22.8	25.2
	in^3/Rev	0.37	0.51	0.66	0.88	1.03	1.17	1.39	1.54
Rated pressure	psi	3600	3600	3600	3600	3300	3000	2600	2300
Max. pressure	psi	4100	4100	4100	4100	3800	3300	2900	2600
Minimum speed at max. pressure	rpm	700	700	700	700	500	500	500	500
Maximum speed at max. pressure	rpm	4000	4000	4000	4000	4000	3500	3500	3500
Maximum speed, running as pump	rpm	3000	3000	3000	2500	2500	2500	2500	2500

Table 2: SEM 2

SEM 2	Dimension	Frame Size							
		6	8	11	14	17	19	22	25
Displacement	cm^3	6.0	8.4	10.8	14.4	16.8	19.2	22.8	25.2
	in^3/Rev	0.37	0.51	0.66	0.88	1.03	1.17	1.39	1.54
Rated pressure	psi	3000	3000	3000	3000	3000	3000	2600	2300
Max. pressure	psi	3300	3300	3300	3300	3300	3300	2900	2600
Min. speed at max. pressure	rpm	700	700	700	700	500	500	500	500
Max. speed at max. pressure	rpm	4000	4000	4000	4000	4000	3500	3500	3500
Max. speed, running as pump	rpm	3000	3000	3000	2500	2500	2500	2500	2500

Type Designation and Order Code



SNM 2 = Design
SEM 2

Frame Size
Displacement

		[cm³] mm³	/	rev (in³)/Rev.
6	=	[6.0]	/	(0.37)
8	=	[8.4]	/	(0.51)
9[1)]	=	[9.5]	/	(0.58)
11	=	[10.8]	/	(0.66)
12[1)]	=	[12.3]	/	(0.75)
14	=	[14.4]	/	(0.88)
17	=	[16.8]	/	(1.03)
19	=	[19.2]	/	(1.17)
22	=	[22.8]	/	(1.39)
25	=	[25.2]	/	(1.54)

[1)]Contact Sauer Sundstrand for Availability

Shaft

CO	=	Tapered shaft with key
SC	=	Splined shaft
CI	=	Parallel shaft with key
FR	=	Tang Shaft for Oldham coupling

Port variant code

B	=	Ports, Bosch
C	=	Ports, DIN Standard
D	=	Metric threads
E	=	SAE O-Ring Boss
F	=	B.S.P. Threaded

Variant Codes

RLY	=	2" Keyed shaft, 1-1/16"-12 SAE Ports
AHH	=	2.31" Keyed shaft, 17.46mm diameter with 2 snap ring grooves..

Configuration (Flange and Ports)

01	=	Standard DIN flange and ports (SEM 2)
02	=	Bosch ports, 80mm pilot on flange
03	=	Bosch ports, 80mm pilot on flange
06	=	SAE "A" Flange and Ports

Order Example: SNM2 / 25 SC 06
Single gear pump SNM 2, displacement = 1.54 in³ (25.2 cm³), mounting flange and drive shaft: splined shaft, SAE "A" 2 bolt flange.

Special Design Option Prefixes:

SNM2F = Check valve/Throttle orifice integral to cover.
SNM2D = Bi-directional check valve for bearing blocks, allows case drain to be plugged. Outlet pressure can not exceed 100 psi (6.8 bar)

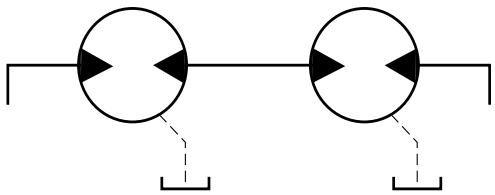
Note: Please contact Sauer-Sundstrand for 9.5 and 12 cc models.

Technical Parameters

Circuit Diagram and Nomenclature

Gear motor

Figure 2



Design

Gear motor

Type of Mounting

Two bolt SAE "A", four bolt DIN, and Bosch mount.

Porting Options

SAE O-ring, DIN Flange, Bosch Flange, and B.S.P Threaded.

Direction of Rotation

Clockwise or counterclockwise.

Speed Range

See tables on page 6.

Weight

Available upon request.

Installation Position

Optional

Flow Direction

Flow direction changes with the direction of rotation.

Hydraulic Parameters

System Pressure, Case Drain / Output p_2

Maximum output pressure = 100 psi (6.8 bar).

Hydraulic Parameters, continued

System Pressure Range, Input p_1

Maximum pressure = 3600 psi (250 bar), see page 6.

Hydraulic Fluid

Hydraulic fluid, refer to SAUER-SUNDSTRAND Bulletin BLN-9887 or Publication SDF (Id.No. 697581).

Temperature Range

T min = - 4°F (- 20 °C), intermittent, cold start.
T max = 180°F (+ 80 °C), maximum, continuous.

Fluid Viscosity Limits

n min = 59 SUS (10 mm^2/s)
n max = 4900 SUS (1000 mm^2/s) intermittent cold start
Recommended viscosity range: 98-233 SUS (20-50 mm^2/s).

Filtration

Required cleanliness level:ISO Code 18/13 or better. Refer to SAUER-SUNDSTRAND Bulletin BLN-9887 or Publication SDF (Id.No. 697581).

Displacement Per Revolution

See tables 1 & 2 on page 6.

Output Power

See performance curves on pages 10 - 13.

Input Flow

See performance curves on pages 10 - 13.

Technical Application Regulations, Recommendations and Explanation

Shaft Load

The drive must not impose axial or radial loads on the pump shaft. When using a coupling make sure that there are no axial or radial loads. When a belt drive, a gear drive or a chain drive has to be used, it may necessary to install a load adapter such as the outrigger option shown on pages 20 and 21. Contact Sauer-Sundstrand for application assistance.

Determination of Nominal Motor Size, SI and English System

Input flow $Q_e = \frac{Vg \cdot n}{1000 \cdot \eta_v}$ l/min

Output torque $M_e = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{20 \cdot \pi}$ Nm

Output Power $P = \frac{M_e \cdot n}{9550} = \frac{Q_e \cdot \Delta p \cdot \eta_t}{600}$ kW

Vg = Displacement per revolution in cm^3
p_{HD} = High pressure, in bar
p_{ND} = Low pressure, in bar
Δp = $p_{HD} - p_{ND}$ bar (System pressure)

n = Speed rpm (min^{-1})
η_v = Volumetric efficiency, (%)
η_{mh} = Mechanical - hydraulic efficiency, (%)
η_t = Overall efficiency, (%)

Input flow $Q_e = \frac{Vg \cdot n}{231 \cdot \eta_v}$ gal/min

Output torque $M_e = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{2 \cdot \pi}$ in • lb

Output Power $P = \frac{M_e \cdot n}{9550} = \frac{Q_e \cdot \Delta p \cdot \eta_t}{1714}$ HP

Vg = Displacement per revolution in in^3
p_{HD} = High pressure, in psi
p_{ND} = Low pressure, in psi
Δp = $p_{HD} - p_{ND}$ psi (System pressure)

n = Speed rpm (min^{-1})
η_v = Volumetric efficiency, (%)
η_{mh} = Mechanical - hydraulic efficiency, (%)
η_t = Overall efficiency, (%)

Performance Curves

[ν = 25 mm²/s (120 SUS), ϑ = 50° C (122°F)]

Figure 3: SNM 2/ 6

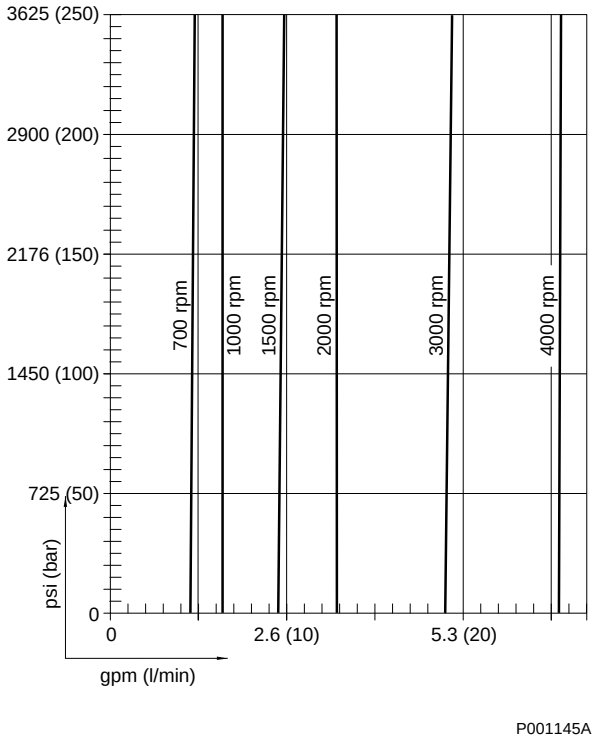


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Figure 4: SNM 2/ 6

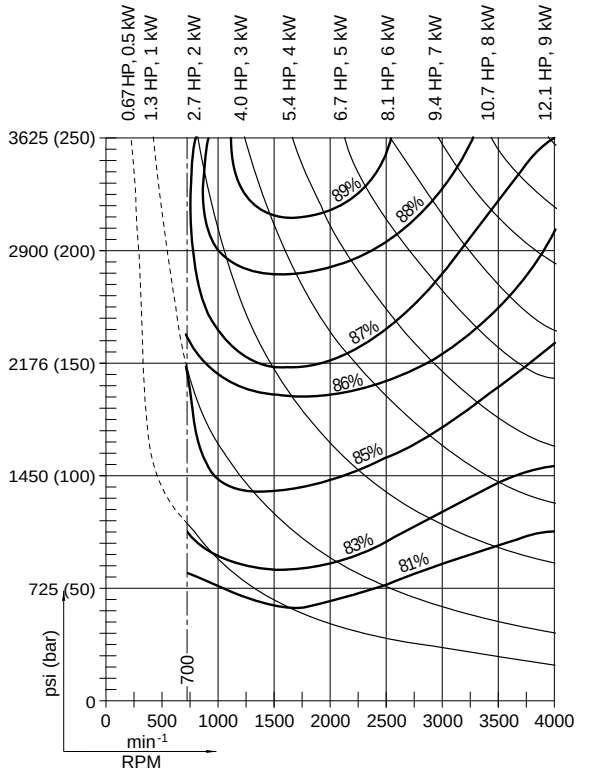

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Figure 5: SNM 2/ 8

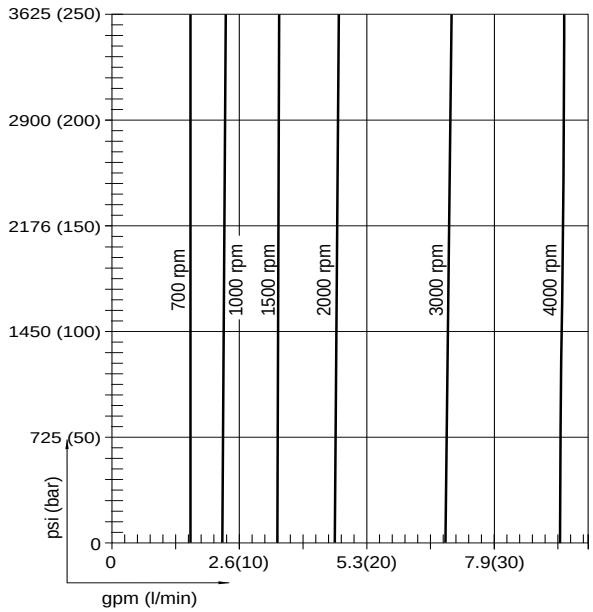

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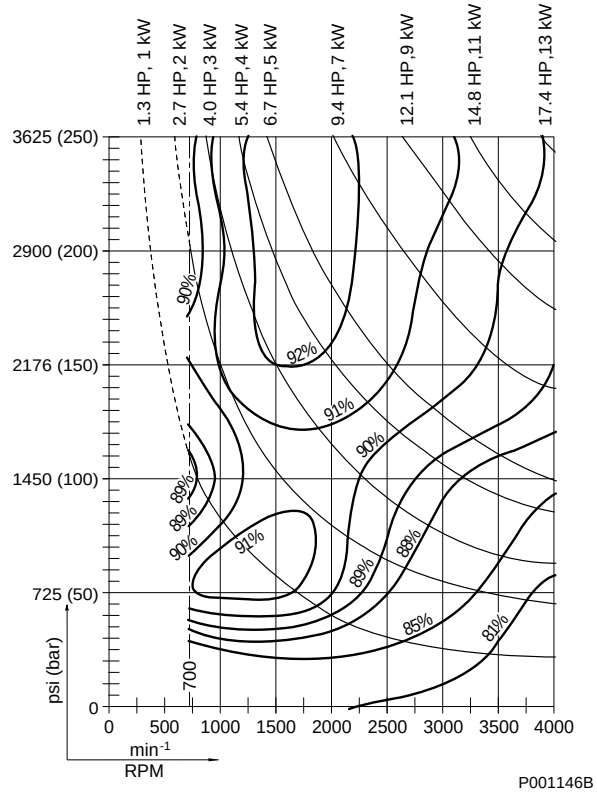
Figure 6: SNM 2/ 8



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Performance Curves (Continued)

[ν = 25 mm²/s (120 SUS), ϑ = 50° C (122°F)]

Figure 7: SNM 2/ 11

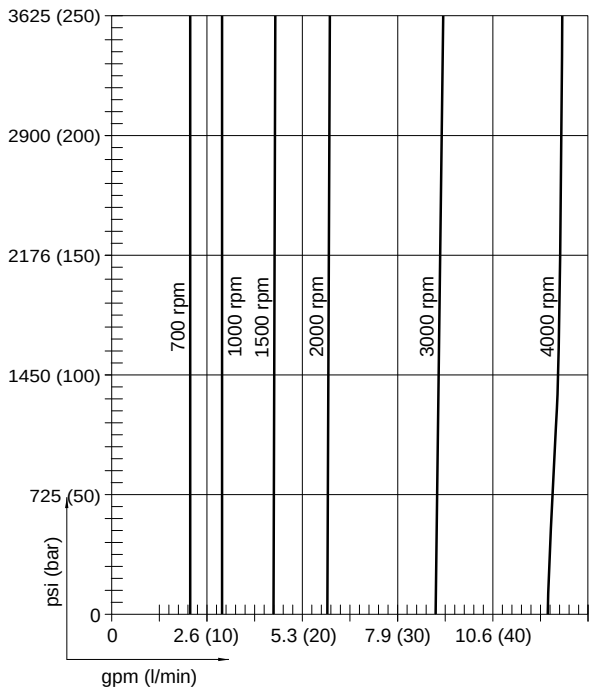

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Figure 8: SNM 2/ 11

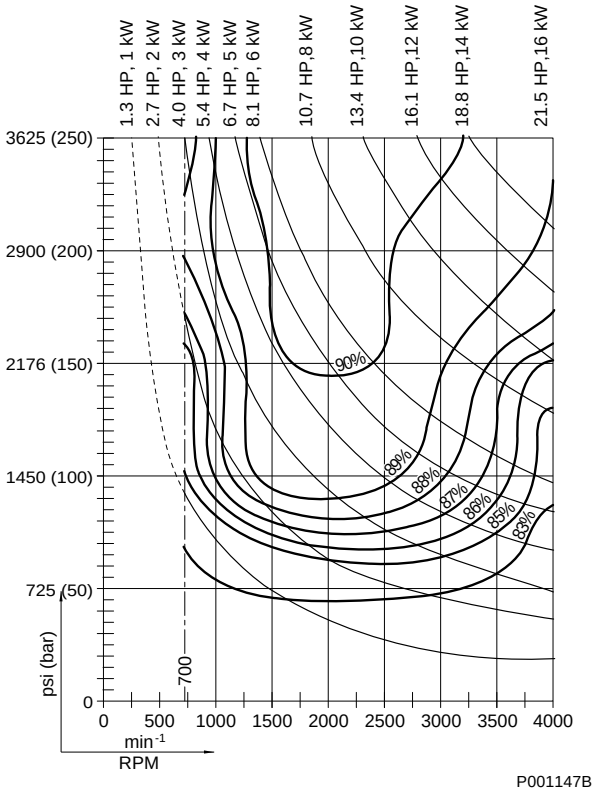

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Figure 9: SNM 2/ 14

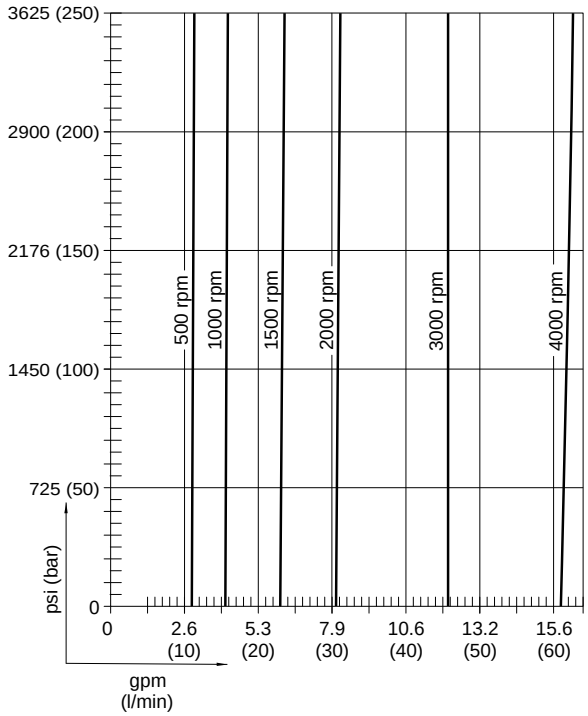

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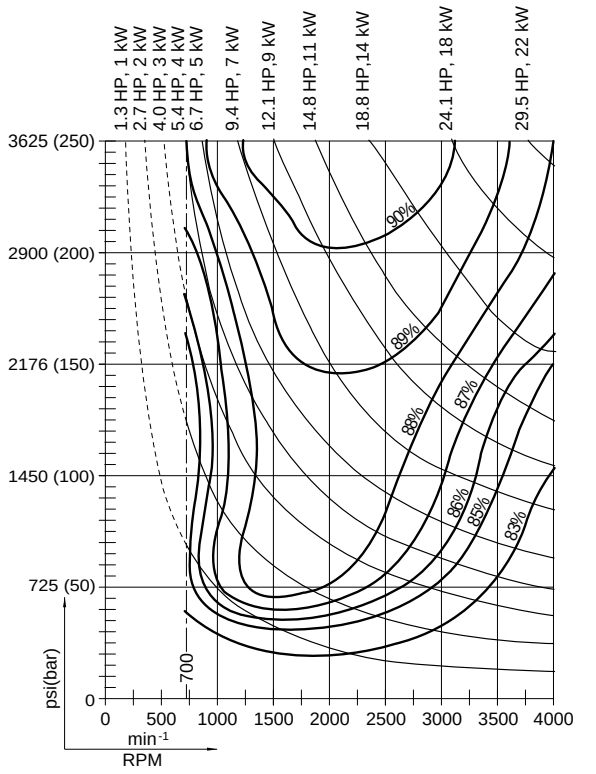
Figure 10: SNM 2/ 14



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Performance Curves (Continued)

[ν = 25 mm²/s (120 SUS), ϑ = 50° C (122°F)]

Figure 11: SNM 2/ 17

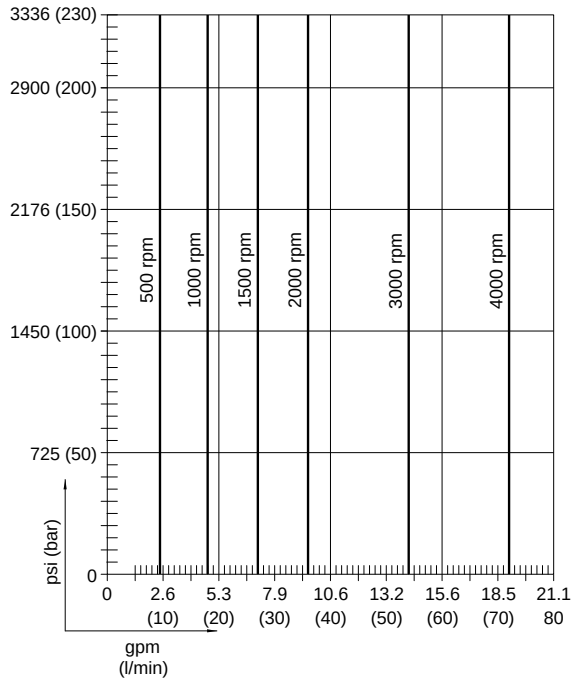

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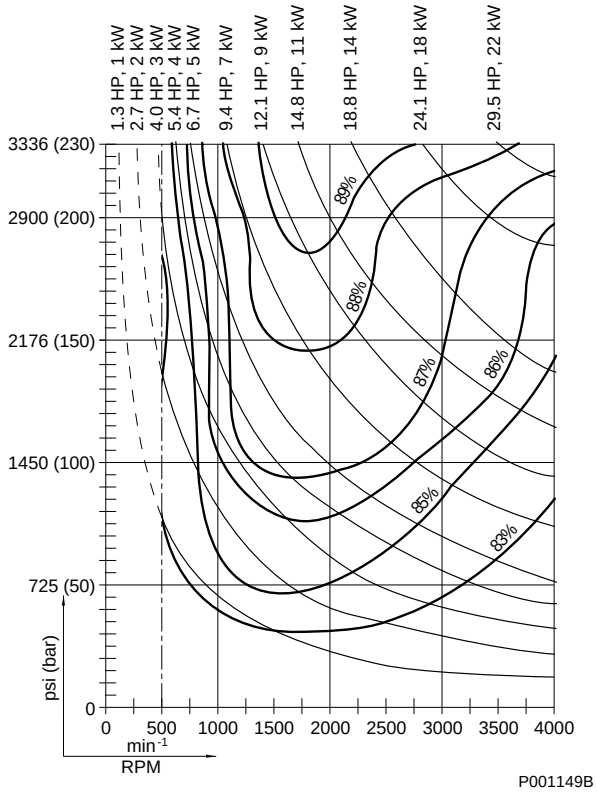
Figure 12: SNM 2/ 17



P001149B

Figure 13: SNM 2/ 19

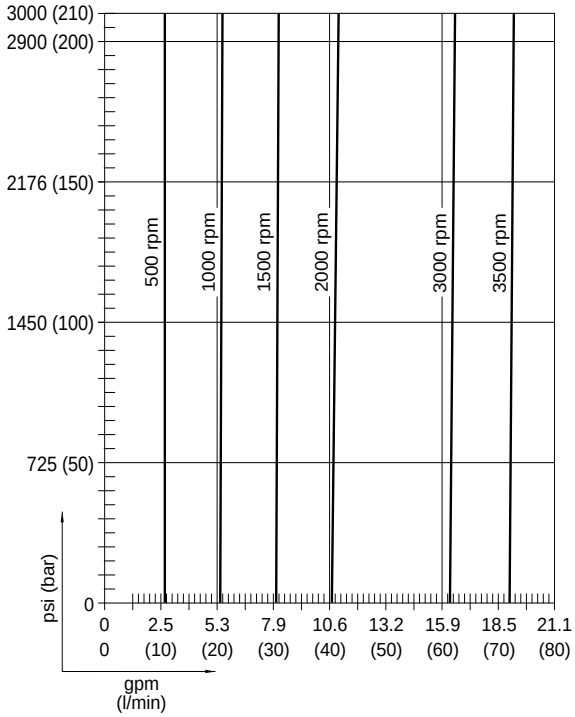


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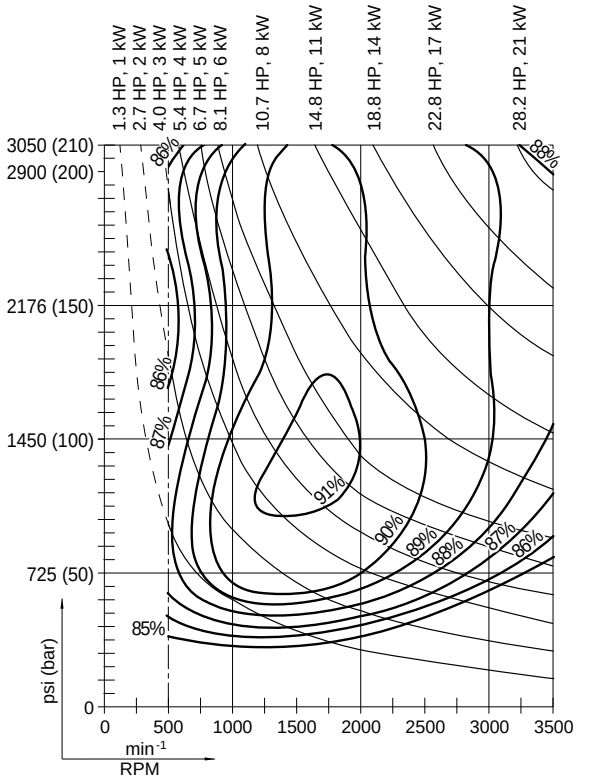
Figure 14: SNM 2/ 19



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Performance Curves (Continued)

[ν = 25 mm²/s (120 SUS), ϑ = 50° C (122°F)]

Figure 15: SNM 2/ 22

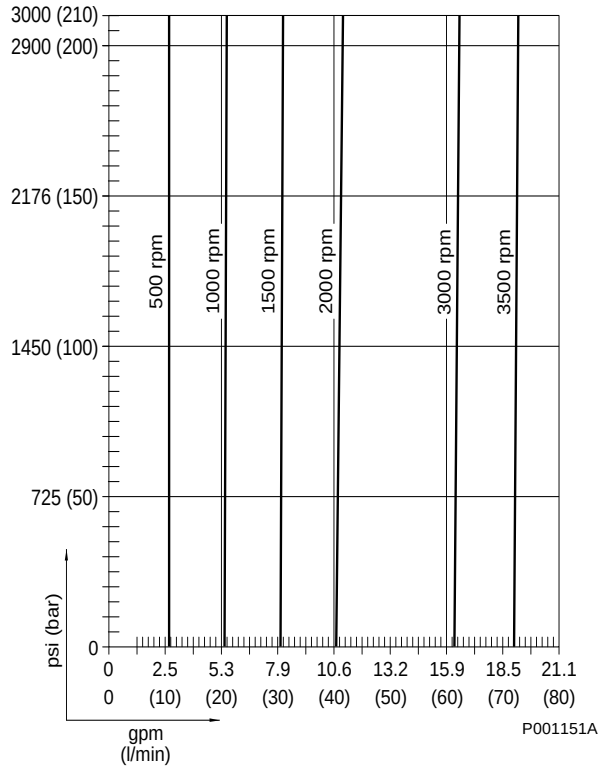


Figure 16: SNM 2/ 22

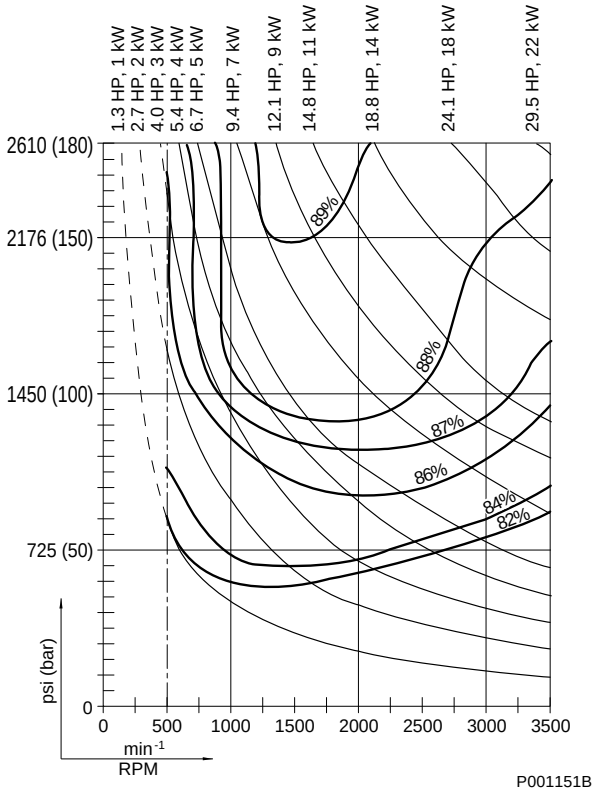


Figure 17: SNM 2/ 25

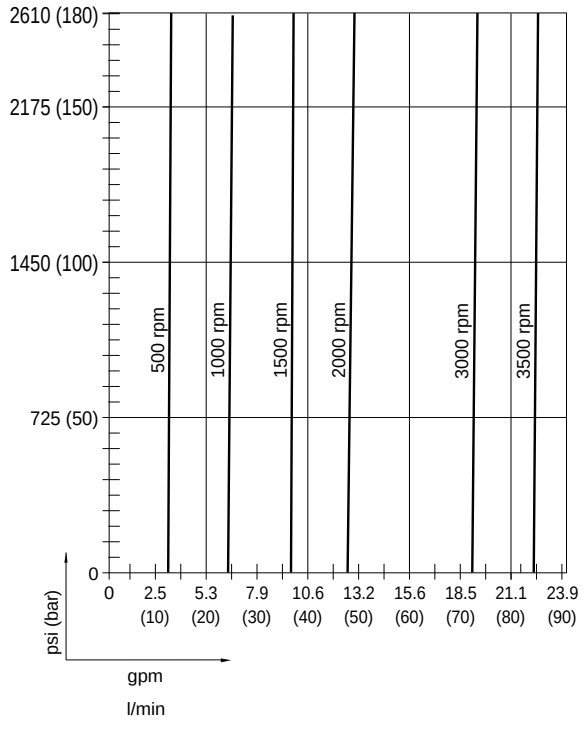
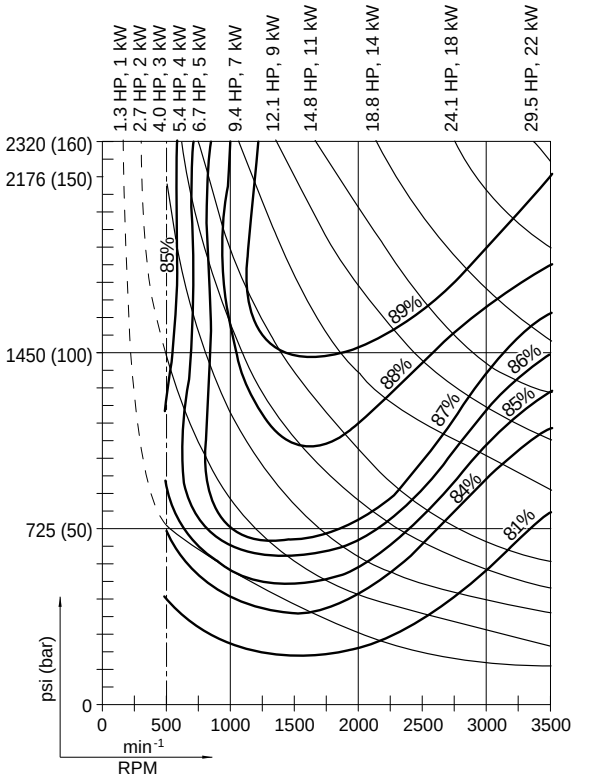


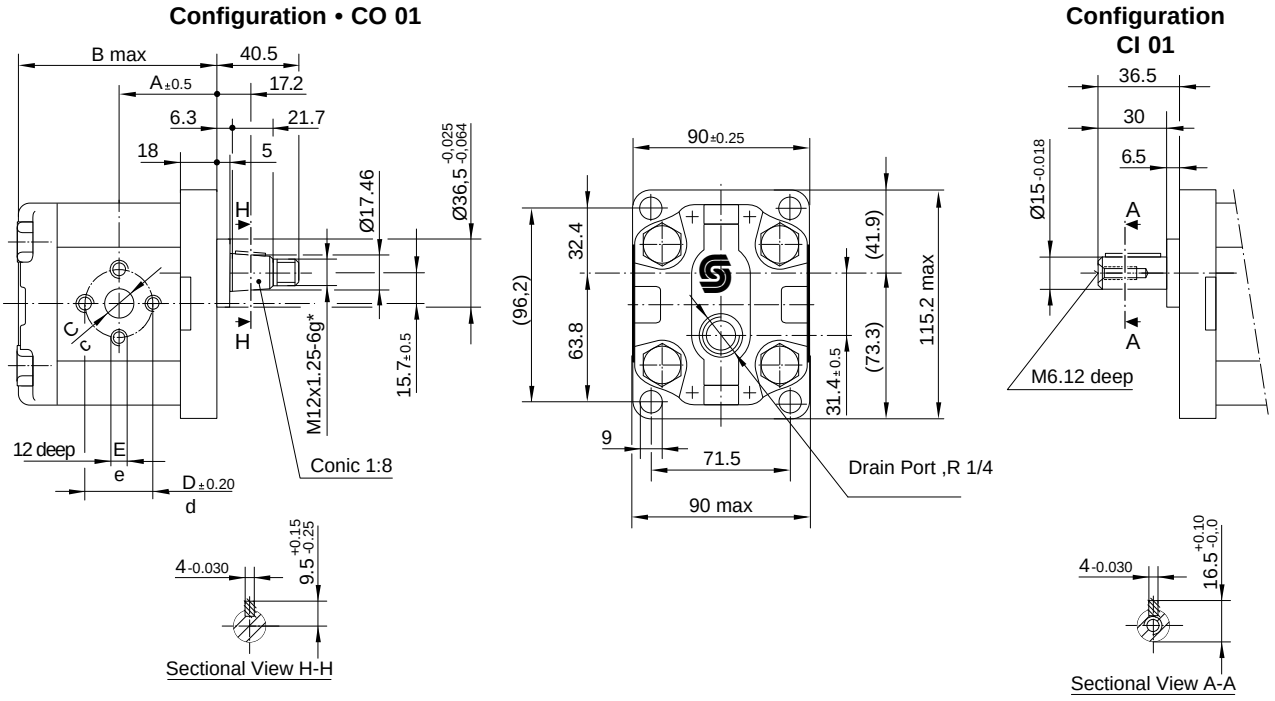
Figure 18: SNM 2/ 25



Dimensions

Configuration • CO 01 / CI 01

Figure 19: Gear Motor SEM 2



* Hex nut and protective cover supplied with motor

P001140

Table 3 : Dimensions

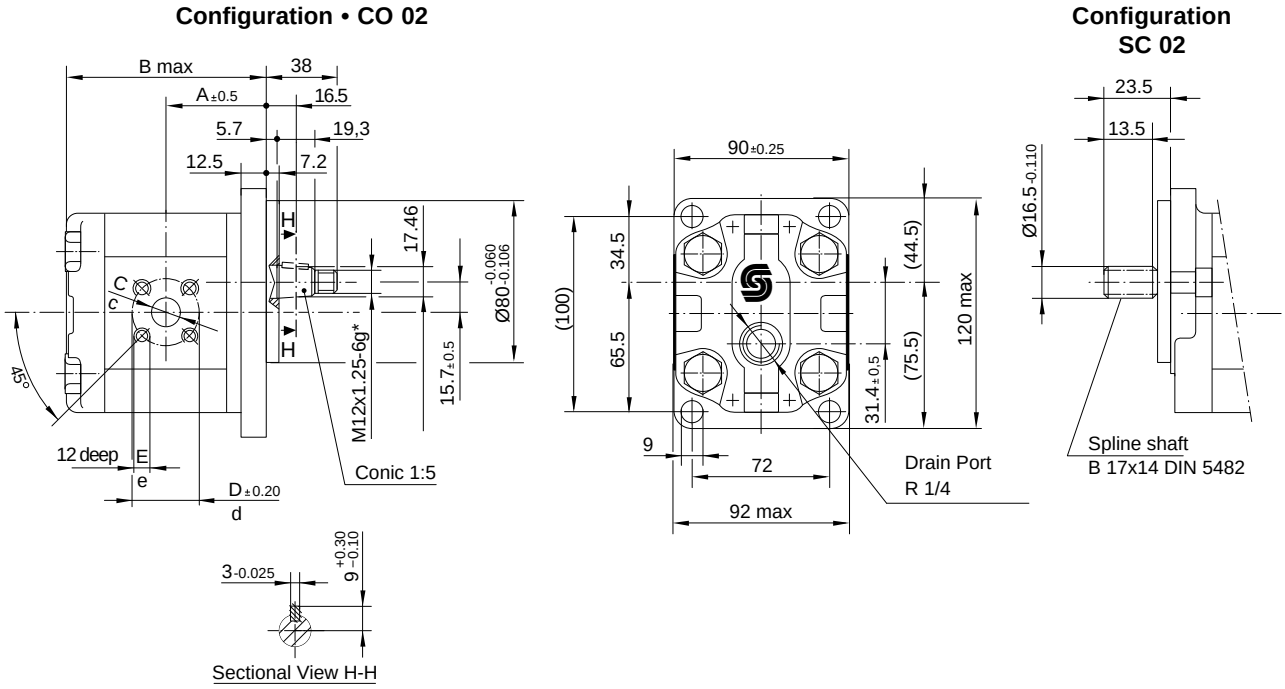
Motor Model	Displacement	Max. Pressure	Dimensions [mm]							
						Inlet			Outlet	
	cm^3 • in^3	bar • psi	A	B	C	D	E	c	d	e
SEM2 / 6	6.0 • 0.37	210 • 3000	45	93.5	13.5	30	M 6	13.5	30	M 6
SEM2 / 8	8.4 • 0.51	210 • 3000	45	97.5	13.5	30	M 6	13.5	30	M 6
SEM2 / 11	10.8 • 0.66	210 • 3000	49	101.5	13.5	30	M 6	13.5	30	M 6
SEM2 / 14	14.4 • 0.88	210 • 3000	52	107.5	20	40	M 8	20	40	M 8
SEM2 / 17	16.8 • 1.03	210 • 3000	52	111.5	20	40	M 8	20	40	M 8
SEM2 / 19	19.2 • 1.17	210 • 3000	56	115.5	20	40	M 8	20	40	M 8
SEM2 / 22	22.8 • 1.39	180 • 2600	59	121.5	20	40	M 8	20	40	M 8
SEM2 / 25	25.2 • 1.54	160 • 2300	59	125.5	23.5	40	M 8	23.5	40	M 8

Max. allowable torque of input shaft, Configurations: **CO 01** = 150 Nm (1300 in•lb)
CI 01 = 90 Nm (790 in•lb)

Dimensions, continued

Configuration • CO 02 / SC 02

Figure 20: Gear Motor SNM 2



* Hex nut and protective cover supplied with motor

P001141

Table 4 : Dimensions

Motor	Displacement	Max. Pressure	Dimensions [mm]							
						Inlet			Outlet	
	cm^3 • in^3	bar • psi	A	B	C	D	E	c	d	e
SNM2 / 6	6.0 • 0.37	250 • 3600	41.1	96	15	35	M 6	15	35	M 6
SNM2 / 8	8.4 • 0.51	250 • 3600	43.1	100	15	35	M 6	15	35	M 6
SNM2 / 11	10.8 • 0.66	250 • 3600	47.5	104	15	35	M 6	15	35	M 6
SNM2 / 14	14.4 • 0.88	250 • 3600	47.5	110	15	35	M 6	15	35	M 6
SNM2 / 17	16.8 • 1.03	230 • 3300	47.5	114	15	35	M 6	15	35	M 6
SNM2 / 19	19.2 • 1.17	210 • 3000	47.5	118	20	40	M 6	20	40	M 6
SNM2 / 22	22.8 • 1.39	180 • 2600	55	124	20	40	M 6	20	40	M 6
SNM2 / 25	25.2 • 1.54	160 • 2300	64.5	128	20	40	M 6	20	40	M 6

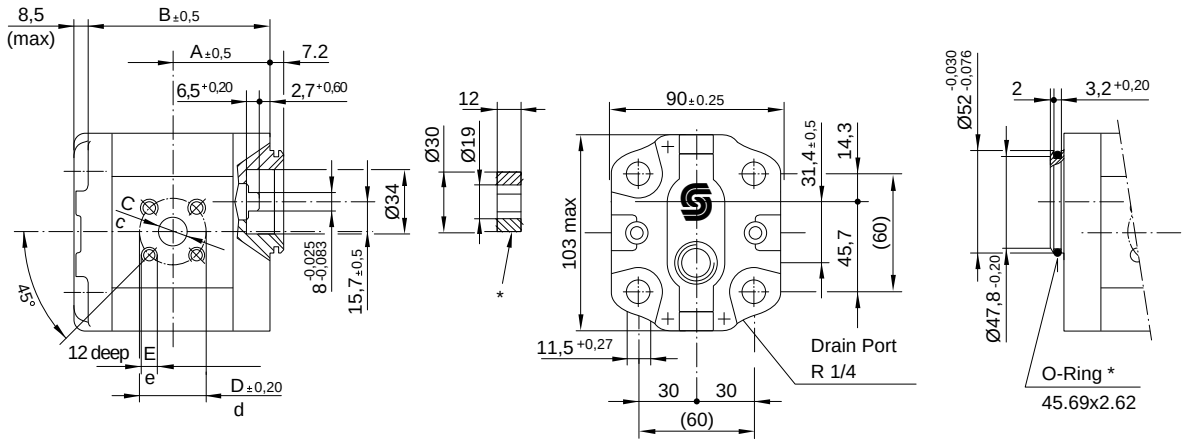
Max. allowable torque of input shaft, Configurations: **CO 02** = 150 Nm (1300 in•lb)
SC 02 = 140 Nm (1200 in•lb)

Dimensions, continued

Configuration • FR 03

Figure 21: Gear Motor SNM 2

Configuration • FR 03



* Oldham coupling ring and O-ring supplied with motor

P001142

Table 5 : Dimensions

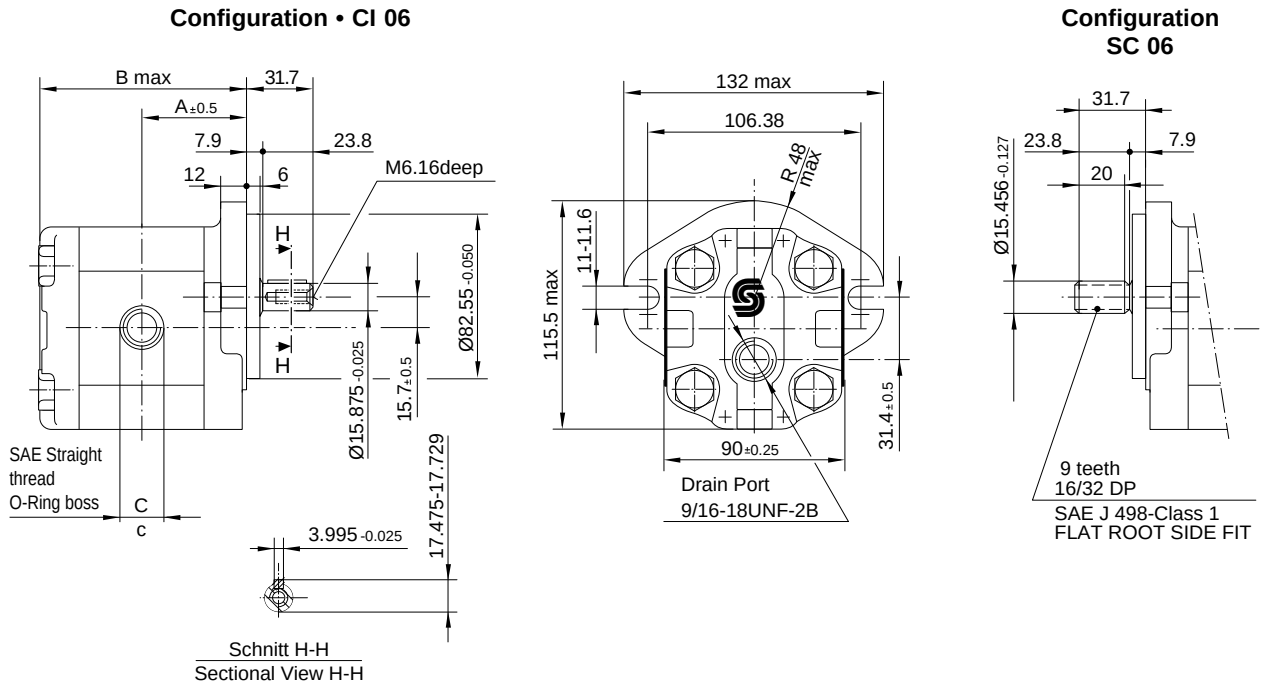
Motor	Displacement	Betriebsdruck Max. Pressure	Dimensions [mm]							
						Inlet			Outlet	
	cm^3 • in^3	bar • psi	A	B	C	D	E	c	d	e
SNM2 / 6	6.0 • 0.37	250 • 3600	38.6	85	15	35	M 6	15	35	M 6
SNM2 / 8	8.4 • 0.51	250 • 3600	40.6	89	15	35	M 6	15	35	M 6
SNM2 / 11	10.8 • 0.66	250 • 3600	45	93	15	35	M 6	15	35	M 6
SNM2 / 14	14.4 • 0.88	250 • 3600	45	99	15	35	M 6	15	35	M 6
SNM2 / 17	16.8 • 1.03	230 • 3300	45	103	15	35	M 6	15	35	M 6
SNM2 / 19	19.2 • 1.17	210 • 3000	45	107	20	40	M 6	20	40	M 6
SNM2 / 22	22.8 • 1.39	180 • 2600	52.5	113	20	40	M 6	20	40	M 6
SNM2 / 25	25.2 • 1.54	160 • 2300	62	117	20	40	M 6	20	40	M 6

Max. allowable torque of input shaft, Configurations: **FR 03** = 70 Nm (620 in•lb)

Dimensions, continued

Configuration • CI 06 / SC 06 (SAE-A Flange)

Figure 22: Gear Motor SNM 2



P001143

Table 6 : Dimensions

Motor	Displacement	Max. Pressure	Dimensions [mm]			
					Inlet	Outlet
	cm^3 • in^3	bar • psi	A	B	C	c
SNM2 / 6	6.0 • 0.37	250 • 3600	45	93.5	7/8 - 14UNF - 2B 16.7mm thread depth	7/8 - 14UNF - 2B 16.7mm thread depth
SNM2 / 8	8.4 • 0.51	250 • 3600	47	97.5		
SNM2 / 11	10.8 • 0.66	250 • 3600	49	101.5		
SNM2 / 14	14.4 • 0.88	250 • 3600	52	107.5		
SNM2 / 17	16.8 • 1.03	230 • 3300	54	111.5		
SNM2 / 19	19.2 • 1.17	210 • 3000	56	115.5	1 1/16 - 12UN - 2B 18 mm thread depth	1 1/16 - 12UN - 2B 18 mm thread depth
SNM2 / 22	22.8 • 1.39	180 • 2600	59	121.5		
SNM2 / 25	25.2 • 1.54	160 • 2300	61	125.5		

Max. allowable torque of input shaft, Configurations: **CI 06** = 90 Nm (790 in•lb)
SC 06 = 100 Nm (880 in•lb)

Outrigger Assembly

For SN Series Pumps and Motors

Loading

Outrigger assemblies are recommended for use when heavy radial loads pose a problem for shaft loads on standard pumps and motors. Maximum radial load is 360 lbs at 1.5" from the mounting flange surface. Maximum axial load is 200 lbs. The maximum continuous torque rating is 620 in lbs (70 Nm), or the same as the FR03 pumps and motors.

Pressure

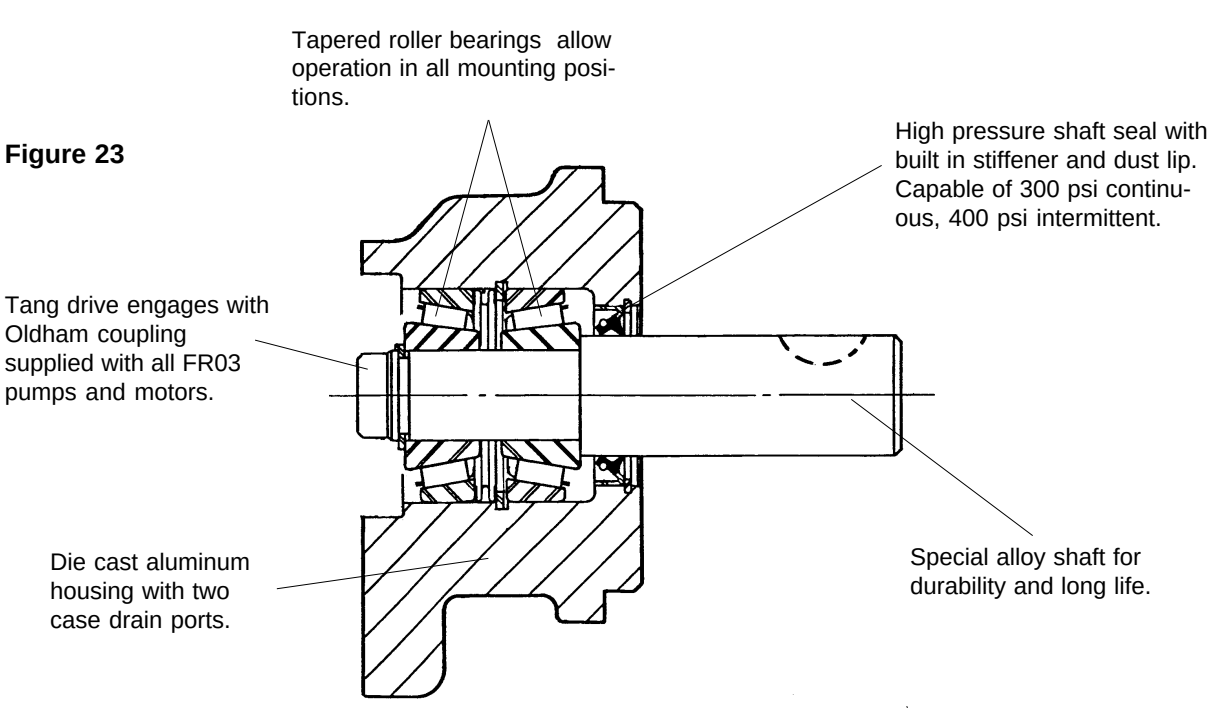
Maximum allowable case drain pressure or return line (if case drain not utilized) is 300 psi continuous and 400 psi peak. Pumps and motors using the outrigger and operating above 2500 rpm must use the outrigger case drain port. See page 19 for reference and port locations. The SNM2 motor must be used for these applications.

Applications

The following bi-directional motor codes will mount directly to the outrigger:

SEM2/...FR03	SNM2/...FR03
SEM2/...FR03 E	SNM2/...FR03 E

Figure 23



Outrigger Assembly (continued)

Figure 24

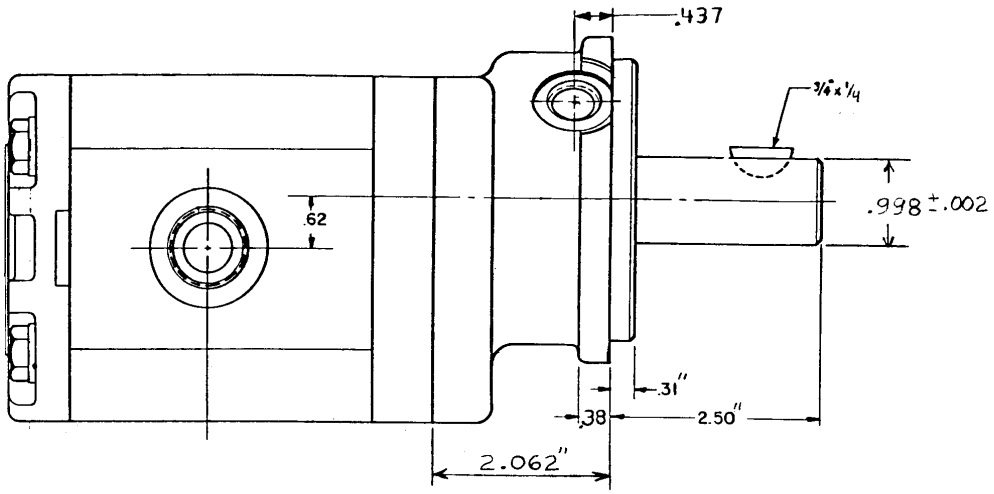
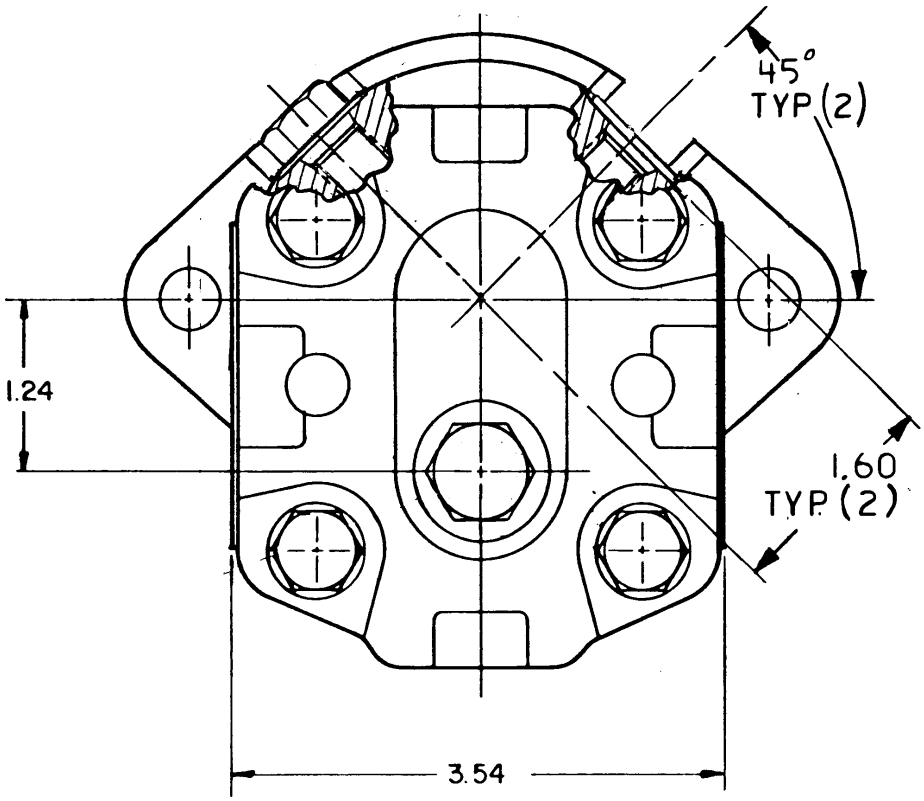


Figure 25



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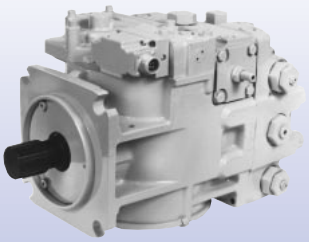
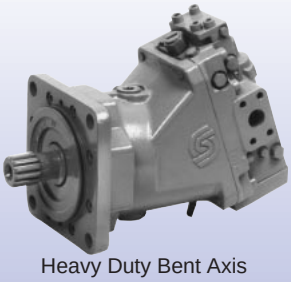
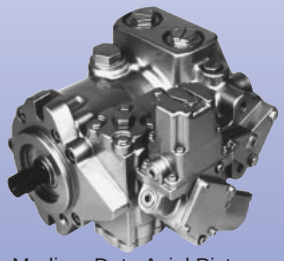


Heavy Duty Axial Piston Pumps and Motors

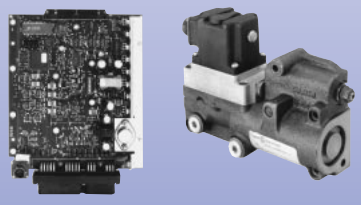


Heavy Duty Bent Axis Variable Motors

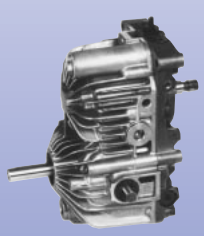
Cartridge Motors/ Compact Wheel Drives



Medium Duty Axial Piston Pumps and Motors

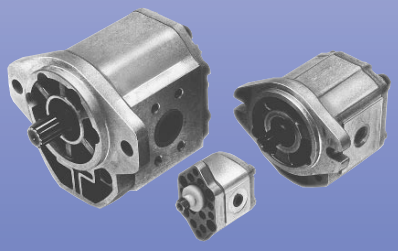


Microcontrollers and Electrohydraulic Controls

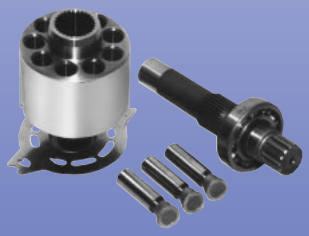


Hydrostatic Transmission Packages

Open Circuit Axial Piston Pumps



Gear Pumps and Motors



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