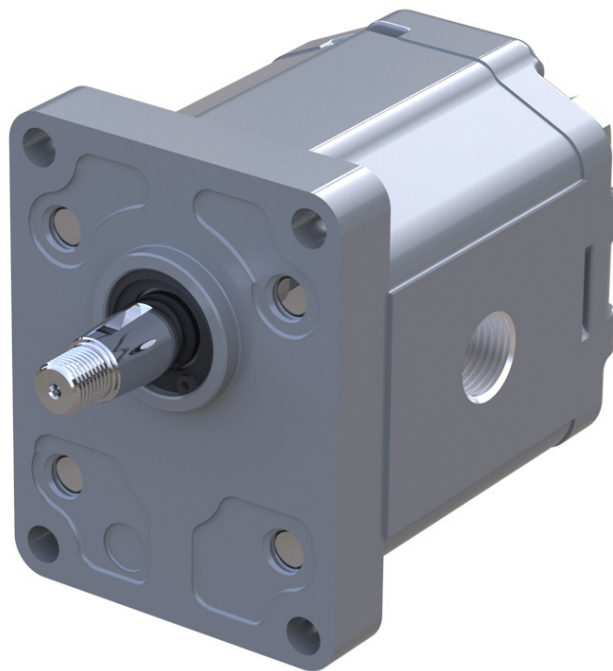


Technical Information

GearMe

Aluminum Group 2 Pump



Revision history

Table of revisions

Date	Changed	Rev
February 2023	Fixed typo	0105
January 2023	Renamed product	0104
April 2021	Minor revisions to product codes, illustrations	0103
November 2019	Corrected Product Codes	0102
October 2019	First edition	0101

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General information**Overview**

Danfoss aluminum gear pumps are ideal for a wide range of applications for:

- Small vehicles, such as aerial lifts, greens and fairway mowers and electric forklifts. These needs are served by the pumps in the SKP2NN range with integral valves and pressure balanced design for high efficiency, and extruded aluminum bodies for high strength.
- Medium and large off-highway vehicles, like tractors, backhoe loaders, dumpers, and telescopic handlers, we offer the SNP2NN.

Many combinations of the pumps mentioned are available as multiple units made to fit any need Danfoss provides standard pumps for use in industrial applications, including power packs.

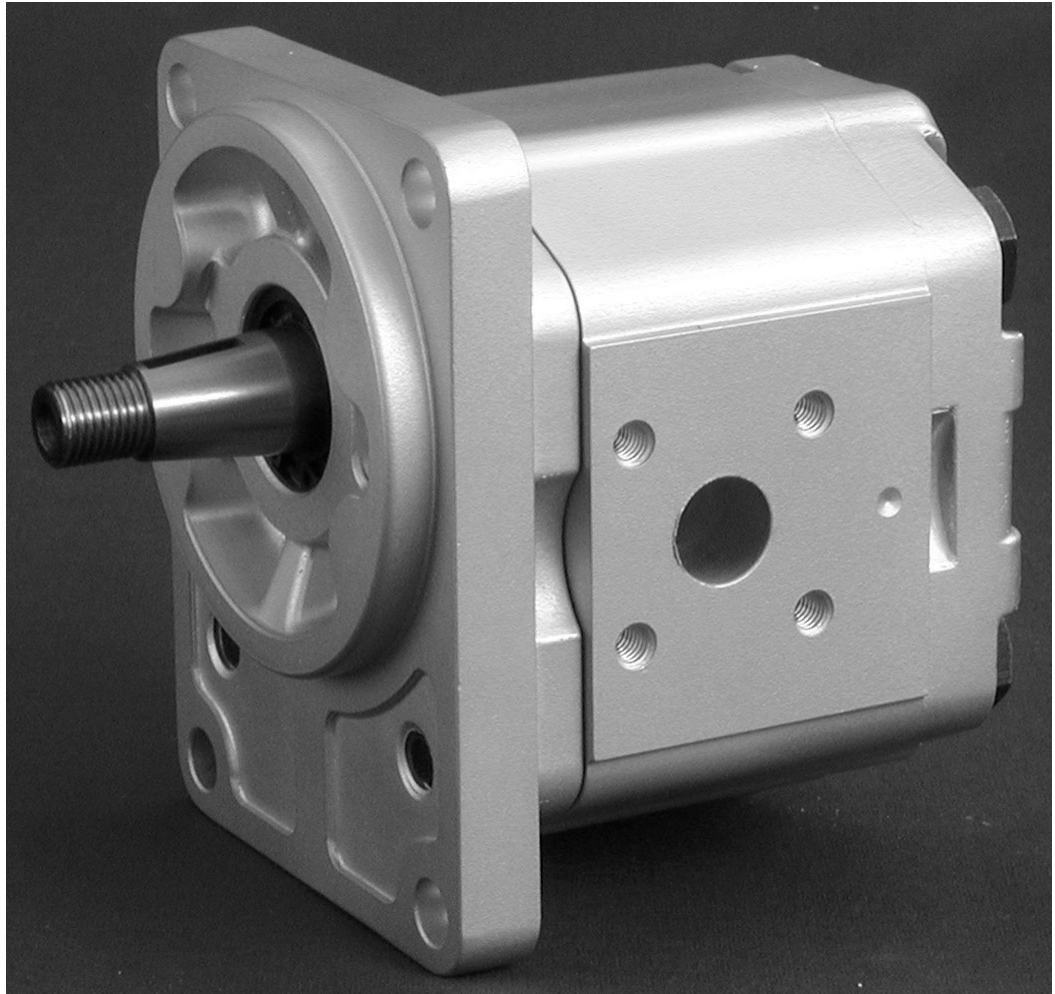
Group 2 gear pumps representatives:

SKP2NN 06SB



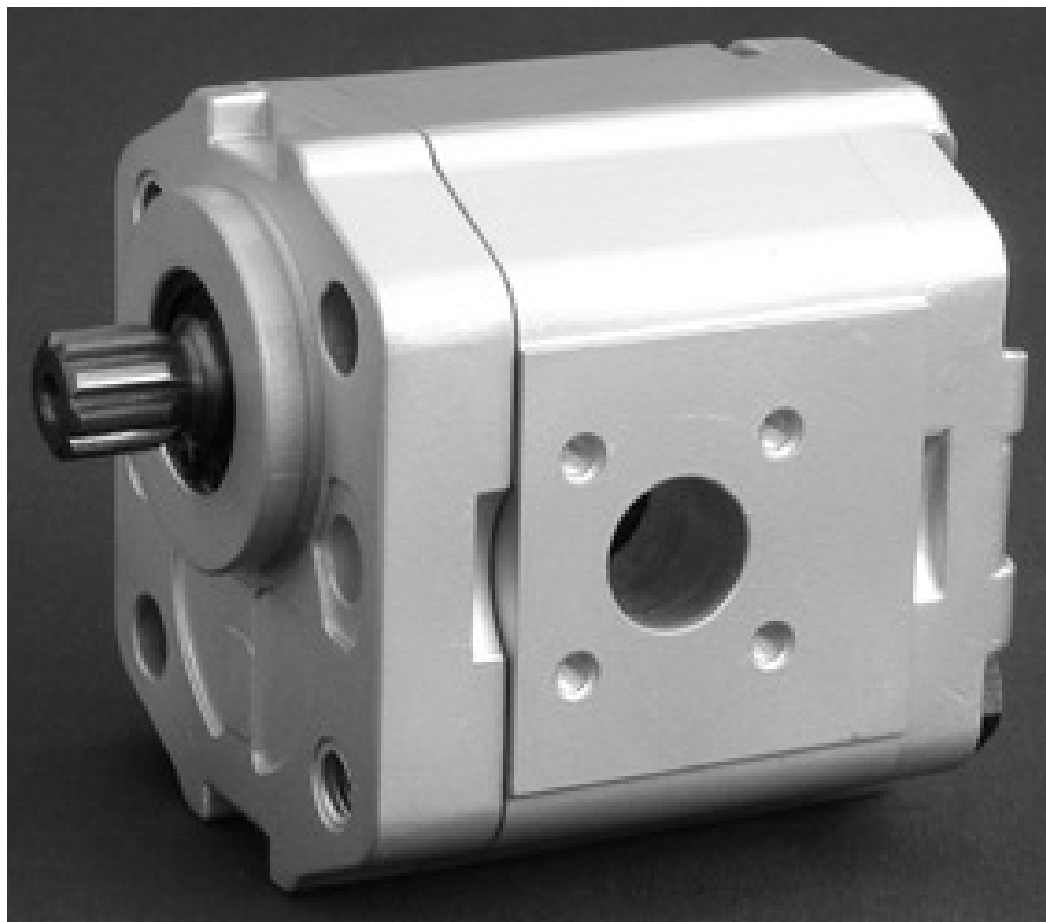
General information

SNP2NN 02AA



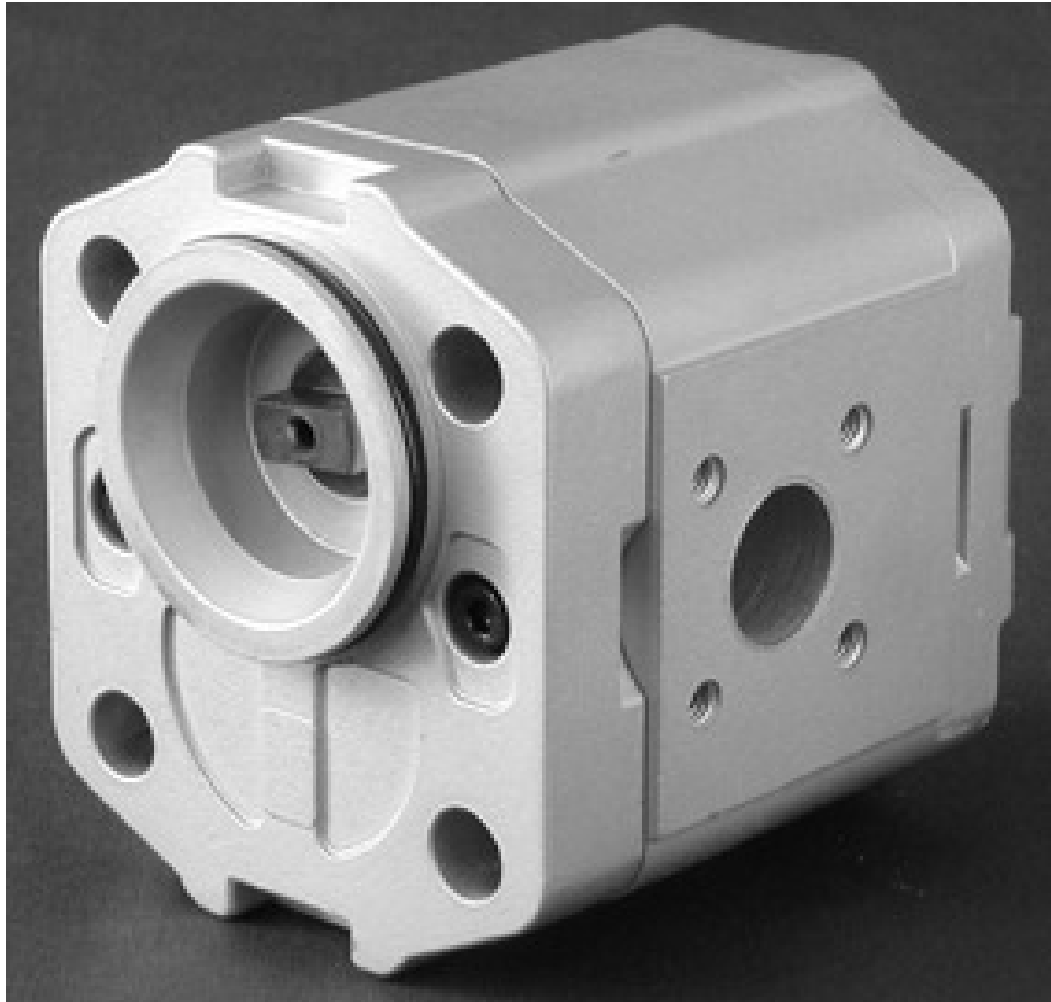
General information

SNP2NN 04DA



General information

SNP2NN 03CA



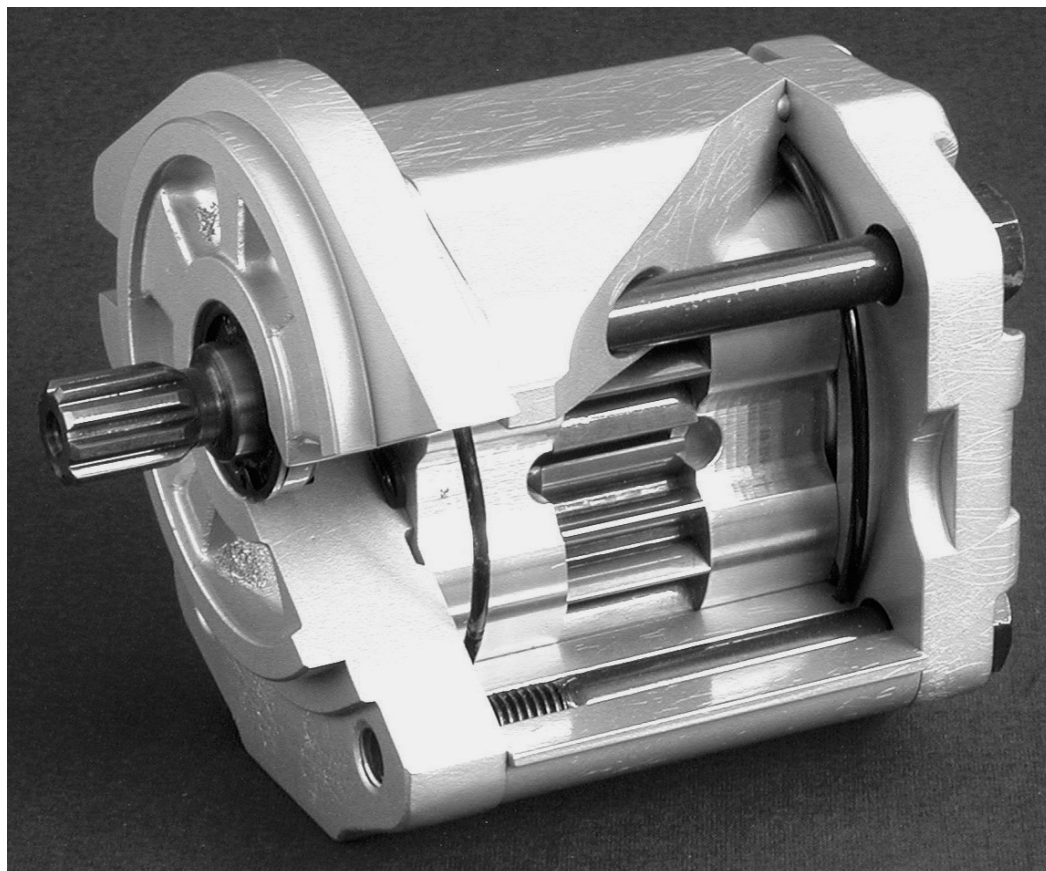
Pump design

Danfoss high performance gear pumps are fixed displacement pumps which consist of the pump housing, drive gear, driven gear, DU bushings, rear cover and front flange, shaft seal and inner/ outer seals, as shown in the following image. The pressure balanced design of the pumps provides high efficiency for the entire series.

The SNP2NN pump accommodates SAE 9-tooth and the SKP2NN is a special version of the SNP2NN. It is designed to accommodate an SAE 11T 16/32 DP tooth splined shaft for higher torque applications.

General information

SNP2NN 06SA cut-away



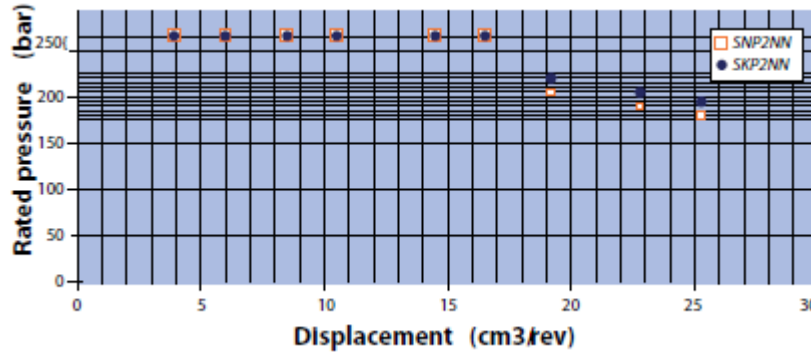
Features and benefits

- Wide range of displacements from 3.9 to 25.2 cm³/rev [from 0.24 to 1.54 in³/rev]
- Continuous pressure rating up to 250 bar [3625 psi]
- Speeds up to 4000 min⁻¹ (rpm)
- SAE, DIN and European standard mounting flanges and shafts
- Compact, lightweight
- Multiple pump configurations in combination with SNP1NN, SNP2NN, SKP2NN and SNP3NN
- Quiet operation
- Available with integral relief valve

General information

Pump displacements

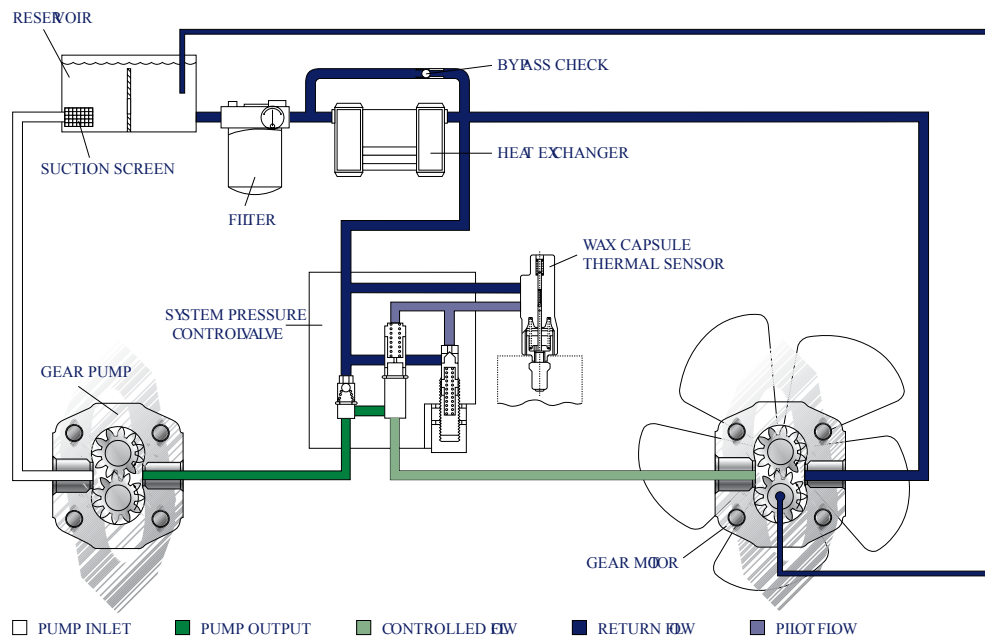
Quick reference chart for pump displacements vs. rated pressure



Gear pump in circuit

This typical circuit shows an SNP2NN gear pump driving an SNM2NN gear motor through a system pressure control valve. The system pressure control valve regulates motor speed based on input from the wax capsule thermal sensor. Discharge from the gear motor is then returned to the reservoir through a heat exchanger, which is equipped with a bypass check valve. Oil in this circuit is cleaned by a return line filter placed between the heat exchanger and the reservoir. A suction screen in the reservoir covers the inlet line. A suction screen in the reservoir covers the inlet line.

Hydraulic schematic example



Technical Data

Technical data

Frame size		4,0	6,0	8,0	011	014	017	019	022	025
Displacement	cm ³ /rev [in ³ /rev]	3.9 [0.24]	6.0 [0.37]	8.4 [0.51]	10.8 [0.66]	14.4 [0.88]	16.8 [1.02]	19.2 [1.17]	22.8 [1.39]	25.2 [1.54]
SNP2NN										
Peak pressure	bar [psi]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	230 [3335]	200 [2900]	175 [2638]
Rated pressure		250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	210 [3045]	180 [2610]	160 [2320]
Minimum speed at 0-100 bar	min ⁻¹ (rpm)	600	600	600	500	500	500	500	500	500
Minimum speed at 100-180 bar		1200	1200	1000	800	750	750	700	700	700
Min. speed at 180 bar to rated pressure		1400	1400	1400	1200	1000	1000	1000	800	–
Maximum speed		4000	4000	4000	4000	3500	3000	3000	3000	3000
SKP2NN										
Peak pressure	bar [psi]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	280 [4060]	260 [3770]	230 [3335]	200 [2900]
Rated pressure		250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	240 [3480]	210 [3045]	190 [2755]
Minimum speed at 0-100 bar	min ⁻¹ (rpm)	600	600	600	500	500	500	500	500	500
Minimum speed at 100-180 bar		1200	1200	1000	800	750	750	700	700	700
Min. speed at 180 bar to rated pressure		1400	1400	1400	1200	1000	1000	1000	800	800
Maximum speed		4000	4000	4000	4000	3500	3000	3000	3000	3000
Both (SNP2NN, SKP2NN)										
Weight	kg [lb]	2.3 [5.1]	2.4 [5.3]	2.5 [5.5]	2.7 [5.8]	2.9 [6.3]	3.0 [6.5]	3.1 [6.7]	3.2 [7.0]	3.3 [7.3]
Moment of inertia of rotating components	x 10 ⁻⁶ kg·m ² [x 10 ⁻⁶ lb·ft ²]	21.3 [505]	26.5 [629]	32.4 [769]	38.4 [911]	47.3 [1122]	53.3 [1265]	59.2 [1405]	68.1 [1616]	74.1 [1758]
Theoretical flow at maximum speed	l/min [US gal/min]	15.6 [4.1]	24.0 [6.3]	33.6 [8.9]	43.2 [11.4]	50.4 [13.3]	50.4 [13.3]	57.6 [15.2]	68.4 [18.0]	75.6 [20.0]

1 kg·m² = 23.68 lb·ft²

! Caution

The rated and peak pressure mentioned are for pumps with flanged ports only. When threaded ports are required a de-rated performance must be considered. To verify the compliance of a high pressure application with a threaded ports pump apply to a Danfoss representative.

Product Code

Model code

A Family

A						B	C	D	E	F	G	H	I	J	K	L	M	N	O	
•	•	•	•	•	•	/														

SNP2NN	Std Group 2 Pump
SNP2EN	Std Group 2 Pump + External Drain RV
SNP2IN	Std Group 2 Pump + Internal Drain RV
SNC2NN	StdGroup 2 Pump Inlet & Outlet in the Cover
SKP2NN	HighTorque Group 2 Pump
SKP2EN	HighTorque Group 2 Pump + Ext.Drain RV
SKP2IN	HighTorque Group 2 Pump + Int.Drain RV
SKC2NN	HighTorque Group 2 Pump Inlet & Outlet on Cover

B Displacement

A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q	R
	•	•	•												

4,0	Displacement 3,9 cc
6,0	Displacement 6,0cc
8,0	Displacement 8,4 cc
011	Displacement 10,8 cc
014	Displacement 14,4 cc
017	Displacement 16,8 cc
019	Displacement 19,2 cc
022	Displacement 22,8 cc
025	Displacement 25,2 cc

[Other frame sizes and displacements are available upon request.](#)

C Rotation

A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q	R
		•													

R	Right (Clockwise)
L	Left (Counterclockwise)

D Project version

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
			•											

N	Standard gear pump
----------	--------------------

Product Code

E Mounting Flange

A				B	C	D	E	F	G	H	I	J	K	L	M	N	O	
				/				•	•						/			

Code	Description(Type of flange • Type of drive gear • Preferred ports for configuration)
01	pilot Ø36,5+4 holes
02	pilot Ø80+4 holes
03	pilot Ø52+O-ring+4 holes through body
04	pilot Ø50+2 holes through body
A4	pilotØ50+2 holes through body+seal on pilot
05	pilot Ø50+2 holes through body
06	SAE A pilot Ø82,55+2 holes
A6	SAE A pilot Ø82,55+2 holes+seal on pilot
09	pilot Ø52,34+2 threaded holes
91	Outrig. Type 01+taper shaft 1:8-M12x1,25-Key4 - Outrigger bearing
94	Outrig. Type 04+taper shaft 1:5-M12x1,25-Key3 - Outrigger bearing
9A	Outrig. Type 01+taper shaft 1:8-M12x1,25-Key3.2 - Outrigger bearing
9F	Outrig. Type 02+taper shaft 1:5-M14x1,5-Key4 - Outrigger bearing
9H	Outrig. Type 06 + taper shaft 1:8-M12x1,25-Key4
9J	Outrig. Type 06 with parallel shaft Ø3/4 (Ø19.05 mm) - Outrigger bearing

F Gear drive

A				B	C	D	E	F	G	H	I	J	K	L	M	N	O	
				/				•	•						/			

AA	Taper 1:5-M12x1,25-Key 3
AB	Taper 1:5-M12x1,5-Key 3
BA	Taper 1:8-M12x1,25-Key 4
BB	Taper 1:8-M12x1,25-Key 4/3,2
CA	Tang 8x17,8xL6,5 FR03
DA	Spline DIN 5482 B17x14-L10
DB	Spline DIN 5482 B17x14-L14
FA	Parallel Ø15-L30+Key 4x25
GA	Parallel SAE Ø15,875-L23,8-Key 4x18
GB	Parallel SAE Ø15,875-L50,8-Key 4x40
SA	Spline SAE J498-9T-16/32
SB	Spline SAE J498-11T-16/32 (Only for SKP2)

G Rear Cover

A				B	C	D	E	F	G	H	I	J	K	L	M	N	O	
				/					•	•					/			

Product Code

C1	Cover pump front BSP ports : Inlet 3/4 Gas ; Outlet 1/2 Gas
C6	Cover pump front SAE Thred ports:In.1-1/16-12UN;Out.7/8-14UNF
C7	Cover pump front SAE Thred ports:In.3/4-16UNF-2B;Out.3/4-16UNF-2B
D1	Cover pump with Outlet port 1/2 Gas
D6	Cover pump with Outlet port 7/8-14UNF-2B
E1	Cover pump with relief valve with external drain 3/8 Gas
E2	Cover pump for RV with ext. drain M12x1.5-CCW rot.idle side;CW rot. drive side
E3	Cover pump for RV with ext. drain 3/8 Gas with M5 Holes
E4	Cover pump for RV with ext. drain 3/4-16UNF-2B with M5 Holes
E6	Cover pump for RV with ext. drain 3/4-16UNF-2B
I1	Cover pump for RV with int. drain
I3	Cover pump for RV with int. drain with M5 Holes
P1	Standard cover for pump
P3	Standard cover for pump with M5 Holes

H Inlet size; I Outlet size

A				B	C	D	E	F	G	H	I	J	K	L	M	N	O	
			/							•	•	•	•			/		

B5	15x35xM6	
B6	15x40xM6	
B7	20x40xM6	
C3	13,5x30xM6	
C5	13,5x40xM8	
C7	20x40xM8	
D5	M18x1,5	
D7	M22x1,5	
E4	3/4-16UNF	
E5	7/8-14UNF	
E6	1-1/16-12UN	
F3	3/8 GAS	
F4	1/2 GAS	
F5	3/4 GAS	
H5	M18x1,5-ISO6149	
H7	M22x1,5-ISO6149	
H8	M27x2-ISO6149	
H9	M33x2-ISO6149	

Product Code

M1	12x17, 48x38, 1xM6	
M2	12x17, 48x38, 1xM8	
M3	18,5x17, 48x38, 1xM8	
MB	12x38, 1x17, 48xM8 (=)	
MC	18,5x47, 63x22, 23xM6 (=)	
MD	18,5x47, 63x22, 23xM8 (=)	
ME	18,5x47, 63x22, 23xM10 (=)	
MG	25/20x52, 37x26, 19xM19 (=)	
NN	Without outlet port	

J Ports positions & Special body

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
									•	•				

NN	Std from catalogue
YY	Port Bx-Bx with flange SAE-A; off-set to rear cover to install fitting screws
ZZ	Port Bx-Bx in the center of the body - Option

K Seals

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
										•				

N	Standard NBR seals
B	VITON seals (Only for SNP2 pumps)
D	VITON shaft seal with dust lip

L Screws

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
											•			

N	Std burnished screws
A	Zinc plated screws
B	Geomet screws

M Set valve

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
												•	•	•

NNN	No valve
V*	Integral relief valve pressure setting

* For details see [Variant codes for ordering integral relief valves](#) on page 30

Product Code

N Type mark

A					B				C	D	E	F	G	H	I	J	K	L		M	N	O	
				/															/				•

N	Standard Danfoss Marking
A	Standard Danfoss Marking+Customer Code
Z	Without Marking

O Position

A					B				C	D	E	F	G	H	I	J	K	L		M	N	O	
				/															/				•

N	Std Marking position (on top)
A	Special Marking position on the bottom

Determination of nominal pump sizes

Based on SI units / Based on US units

Use these formulae to determine the nominal pump size for a specific application.

Based on SI units

Based on US units

Output flow $Q = \frac{Vg \cdot n \cdot \eta_v}{1000} \quad \text{l/min}$

$Q = \frac{Vg \cdot n \cdot \eta_v}{231} \quad \text{[US gal/min]}$

Input torque $M = \frac{Vg \cdot \Delta p}{20 \cdot \pi \cdot \eta_m} \quad \text{N}\cdot\text{m}$

$M = \frac{Vg \cdot \Delta p}{2 \cdot \pi \cdot \eta_m} \quad \text{[lbf}\cdot\text{in]}$

Input power $P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \quad \text{kW}$

$P = \frac{M \cdot n}{63.025} = \frac{Q \cdot \Delta p}{1714 \cdot \eta_t} \quad \text{[hp]}$

Variables: *SI units [US units]*

$Vg =$	Displacement per rev.	cm ³ /rev [in ³ /rev]
$p_{HD} =$	Outlet pressure	bar [psi]
$p_{ND} =$	Inlet pressure	bar [psi]
$\Delta p =$	$p_{HD} - p_{ND}$	bar [psi]
$n =$	Speed	min ⁻¹ (rpm)
$\eta_v =$	Volumetric efficiency	
$\eta_m =$	Mechanical (torque) efficiency	
$\eta_t =$	Overall efficiency ($\eta_v \cdot \eta_m$)	

System Requirements

Pressure

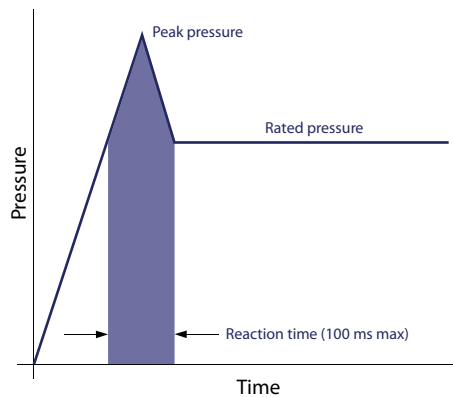
The inlet vacuum must be controlled in order to realize expected pump life and performance. The system design must meet inlet pressure requirements during all modes of operation. Expect lower inlet pressures during cold start. It should improve quickly as the fluid warms.

Max. continuous vacuum	bar abs. [in. Hg]	0.8 [23.6]
Max. intermittent vacuum		0.6 [17.7]
Max. pressure		4.0 [118.1]

Peak pressure

Peak pressure is the highest intermittent pressure allowed. The relief valve overshoot (reaction time) determines peak pressure. It is assumed to occur for less than 100 ms. The following illustration shows peak pressure in relation to rated pressure and reaction time (100 ms maximum).

Time versus pressure



Rated pressure

Rated pressure is the average, regularly occurring, operating pressure that should yield satisfactory product life. The maximum machine load demand determines rated pressure. For all systems, the load should move below this pressure.

System pressure

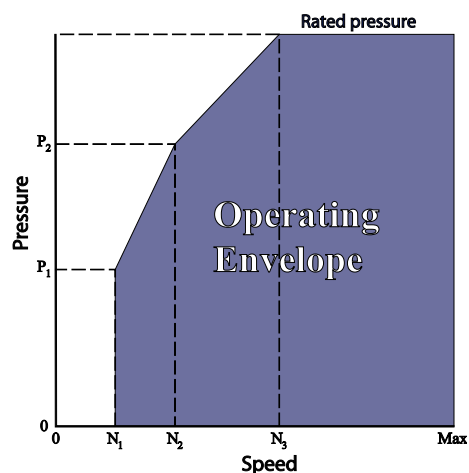
System pressure is the differential of pressure between the outlet and inlet ports. It is a dominant operating variable affecting hydraulic unit life. High system pressure, resulting from high load, reduces expected life. System pressure must remain at, or below, rated pressure during normal operation to achieve expected life.

Speed

Maximum speed is the limit recommended by Danfoss for a particular gear pump when operating at rated pressure. It is the highest speed at which normal life can be expected. The lower limit of operating speed is the minimum speed. It is the lowest speed at which normal life can be expected. The minimum speed increases as operating pressure increases. When operating under higher pressures, a higher minimum speed must be maintained, as illustrated to the right.

System Requirements

Speed versus pressure



Where:
 N_1 = Minimum speed at 100 bar
 N_2 = Minimum speed at 180 bar
 N_3 = Minimum speed at rated pressure

Hydraulic fluids

Ratings and data for SNP2NN and SKP2NN gear pumps are based on operating with premium hydraulic fluids containing oxidation, rust, and foam inhibitors. These fluids must possess good thermal and hydrolytic stability to prevent wear, erosion, and corrosion of internal components. They include:

- Hydraulic fluids following DIN 51524, part 2 (HLP) and part 3 (HVL) specifications
- API CD engine oils conforming to SAE J183
- M2C33F or G automatic transmission fluids
- Certain agricultural tractor fluids

Use only clean fluid in the pump and hydraulic circuit.

Caution

Never mix hydraulic fluids.

Temperature and viscosity

Temperature and viscosity requirements must be concurrently satisfied. Use petroleum / mineral-based fluids.

High temperature limits apply at the inlet port to the pump. The pump should run at or below the maximum continuous temperature. The peak temperature is based on material properties. Don't exceed it.

Cold oil, generally, doesn't affect the durability of pump components. It may affect the ability of oil to flow and transmit power. For this reason, keep the temperature at 16 °C [60 °F] above the pour point of the hydraulic fluid.

Minimum (cold start) temperature relates to the physical properties of component materials.

Minimum viscosity occurs only during brief occasions of maximum ambient temperature and severe duty cycle operation. You will encounter maximum viscosity only at cold start. During this condition, limit speeds until the system warms up. Size heat exchangers to keep the fluid within these limits. Test regularly to verify that these temperatures and viscosity limits aren't exceeded. For maximum unit efficiency and bearing life, keep the fluid viscosity in the recommended

System Requirements

Fluid viscosity

Maximum (cold start)	mm ² /s [SUS]	1600 [7273]
Recommended range		12-100 [66-456]
Minimum		10 [60]

Temperature (with standard NBR seals)

Minimum (cold start)	°C [°F]	-20 [-4]
Maximum continuous		80 [176]
Peak (intermittent)		90 [194]

Filtration

Filters

Use a filter that conforms to Class 22/18/13 of ISO 4406 (or better). It may be on the pump outlet (pressure filtration), inlet (suction filtration), or reservoir return (return-line filtration).

Selecting a filter

When selecting a filter, please consider:

- Contaminant ingress rate (determined by factors such as the number of actuators used in the system)
- Generation of contaminants in the system
- Required fluid cleanliness
- Desired maintenance interval
- Filtration requirements of other system components

Measure filter efficiency with a Beta ratio (β_x). For:

- Suction filtration, with controlled reservoir ingress, use a $\beta_{35-45} = 75$ filter
- Return or pressure filtration, use a pressure filtration with an efficiency of $\beta_{10} = 75$.

β_x ratio is a measure of filter efficiency defined by ISO 4572. It is the ratio of the number of particles greater than a given diameter ("x" in microns) upstream of the filter to the number of these particles downstream of the filter.

Fluid cleanliness level and β_x ratio

Fluid cleanliness level (per ISO 4406)	Class 22/18/13 or better
β_x ratio (suction filtration)	$\beta_{35-45} = 75$ and $b_{10} = 2$
β_x ratio (pressure or return filtration)	$\beta_{10} = 75$
Recommended inlet screen size	100-125 mm [0.004-0.005 in]

The filtration requirements for each system are unique. Evaluate filtration system capacity by monitoring and testing prototypes.

Reservoir

The **reservoir** provides clean fluid, dissipates heat, removes entrained air, and allows fluid volume changes associated with fluid expansion and cylinder differential volumes. A correctly sized reservoir accommodates maximum volume changes during all system operating modes. It promotes deaeration of the fluid as it passes through, and accommodates a fluid dwell-time between 60 and 180 seconds, allowing entrained air to escape.

System Requirements

Minimum reservoir capacity depends on the volume required to cool and hold the oil from all retracted cylinders, allowing for expansion due to temperature changes. A fluid volume of 1 to 3 times the pump output flow (per minute) is satisfactory. The minimum reservoir capacity is 125% of the fluid volume.

Install the suction line above the bottom of the reservoir to take advantage of gravity separation and prevent large foreign particles from entering the line. Cover the line with a 100-125 micron screen. The pump should be below the lowest expected fluid level. Put the return-line below the lowest expected fluid level to allow discharge into the reservoir for maximum dwell and efficient deaeration. A baffle (or baffles) between the return and suction lines promotes deaeration and reduces fluid surges.

Line sizing

Choose pipe sizes that accommodate minimum fluid velocity to reduce system noise, pressure drops, and overheating. This maximizes system life and performance.

Design inlet piping that maintains continuous pump inlet pressure above 0.8 bar absolute during normal operation. The line velocity should not exceed the values in this table:

Maximum line velocity

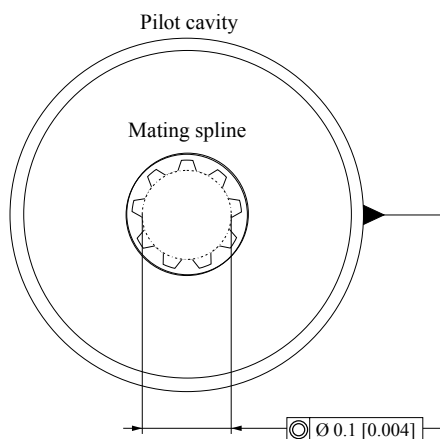
Inlet	m/s [ft/sec]	2.5 [8.2]
Outlet		5.0 [16.4]
Return		3.0 [9.8]

Most systems use hydraulic oil containing 10% dissolved air by volume. Under high inlet vacuum conditions the oil releases bubbles. They collapse when subjected to pressure, resulting in cavitation, causing adjacent metal surfaces to erode. **Over-aeration** is the result of air leaks on the inlet side of the pump, and flow-line restrictions. These include inadequate pipe sizes, sharp bends, or elbow fittings, causing a reduction of flow line cross sectional area. This problem will not occur if inlet vacuum and rated speed requirements are maintained, and reservoir size and location are adequate.

Pump drive

Shaft options for Group 2 gear pumps include tapered, tang, splined, or parallel shafts. They are suitable for a wide range of direct and indirect drive applications for radial and thrust loads.

Plug-in drives, acceptable only with a splined shaft, can impose severe radial loads when the mating spline is rigidly supported. Increasing spline clearance does not alleviate this condition.



Use plug-in drives if the concentricity between the mating spline and pilot diameter is within 0.1 mm [0.004 in]. Lubricate the drive by flooding it with oil. A 3-piece coupling minimizes radial or thrust shaft loads.

System Requirements

⚠ Caution

In order to avoid spline shaft damages it is recommended to use carburized and hardened steel couplings with 80-82 HRA surface hardness.

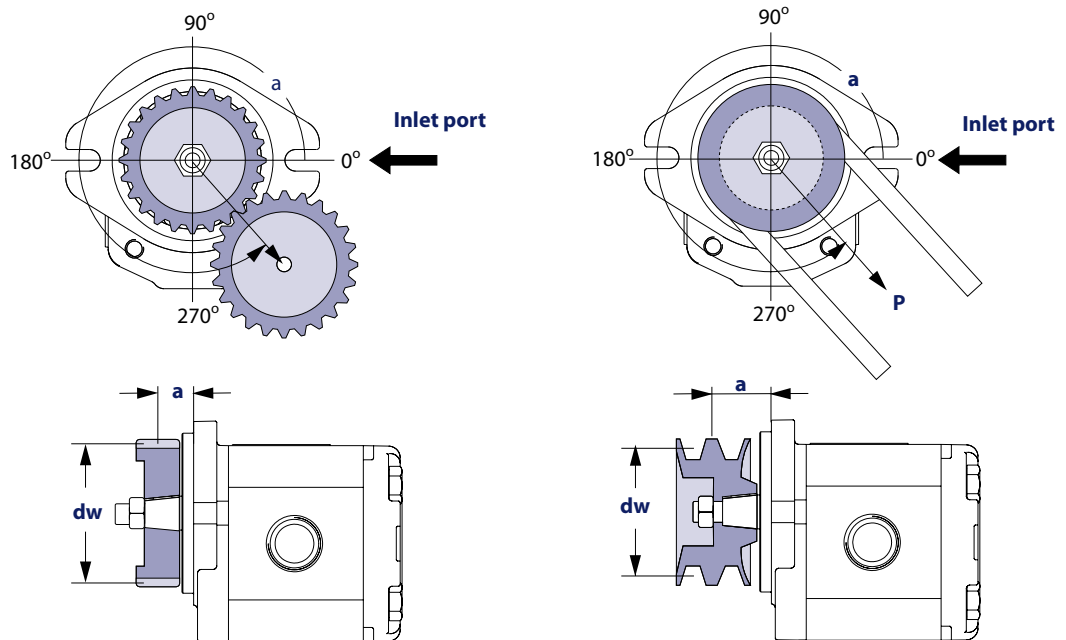
Allowable radial shaft loads are a function of the load position, load orientation, and operating pressure of the hydraulic pump. All external shaft loads have an effect on bearing life, and may affect pump performance.

In applications where external shaft loads can't be avoided, minimize the impact on the pump by optimizing the orientation and magnitude of the load. Use a tapered input shaft; don't use splined shafts for belt or gear drive applications. A spring-loaded belt tension-device is recommended for belt drive applications to avoid excessive tension. Avoid thrust loads in either direction. Contact Danfoss if continuously applied external radial or thrust loads occur.

Photocopy this page and fax the complete form to your Danfoss representative for an assistance in applying pumps with belt or gear drive.

Pump drive data form

Optimal radial load position



Application data

Item	Value	Unit
Pump displacement		cm ³ /rev [in ³ /rev]
Rated system pressure		bar psi
Relief valve setting		
Pump shaft rotation		left right
Pump minimum speed		min-1 (rpm)
Pump maximum speed		
Drive gear helix angle (gear drive only)		degree
Belt type (gear drive only)		V notch
Belt tension (gear drive only)	P	N bf

System Requirements

Application data (continued)

Item	Value	Unit
Angular orientation of gear or belt to inlet port	a	degree
Pitch diameter of gear or pulley	d_w	mm
Distance from flange to center of gear or pulley	a	

Pump life

Pump life is a function of speed, system pressure, and other system parameters (such as fluid quality and cleanliness).

All Danfoss gear pumps use hydrodynamic journal bearings that have an oil film maintained between the gear/shaft and bearing surfaces at all times. If the oil film is sufficiently sustained through proper system maintenance and operating within recommended limits, long life can be expected.

[B₁₀ life expectancy number is generally associated with rolling element bearings. It does not exist for hydrodynamic bearings.](#)

High pressure, resulting from high loads, impacts pump life. When submitting an application for review, provide machine duty cycle data that includes percentages of time at various loads and speeds. We strongly recommend a prototype testing program to verify operating parameters and their impact on life expectancy before finalizing any system design.

Sound levels

Fluid power systems are inherent generators of noise. As with many high power density devices, noise is an unwanted side affect. However, there are many techniques available to minimize noise from fluid power systems. To apply these methods effectively, it is necessary to understand how the noise is generated and how it reaches the listener. The noise energy can be transmitted away from its source as either fluid borne noise (pressure ripple) or as structure borne noise.

Pressure ripple is the result of the number of pumping elements (gear teeth) delivering oil to the outlet and the pump's ability to gradually change the volume of each pumping element from low to high pressure. In addition, the pressure ripple is affected by the compressibility of the oil as each pumping element discharges into the outlet of the pump. Pressure pulsations will travel along the hydraulic lines at the speed of sound (about 1400 m/s in oil) until affected by a change in the system such as an elbow fitting. Thus the pressure pulsation amplitude varies with overall line length and position.

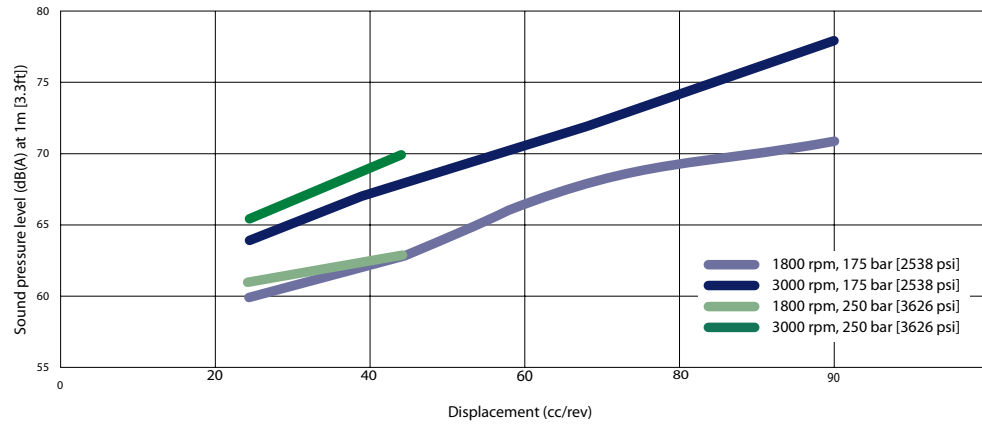
Structure borne noise may be transmitted wherever the pump casing is connected to the rest of the system. The manner in which one circuit component responds to excitation depends on its size, form, and manner in which it is mounted or supported. Because of this excitation, a system line may actually have a greater noise level than the pump. To reduce this excitation, use flexible hoses in place of steel plumbing. If steel plumbing must be used, clamping of lines is recommended. To minimize other structure borne noise, use flexible (rubber) mounts.

The accompanying graph shows typical sound pressure levels for SNP2NN pumps (with SAE A flange, and spline shaft in plug in drive) measured in dB (A) at 1 m [3.28 ft] from the unit in a semi anechoic chamber. Anechoic levels can be estimated by subtracting 3 dB (A) from these values.

[Contact your Danfoss representative for assistance with system noise control.](#)

System Requirements

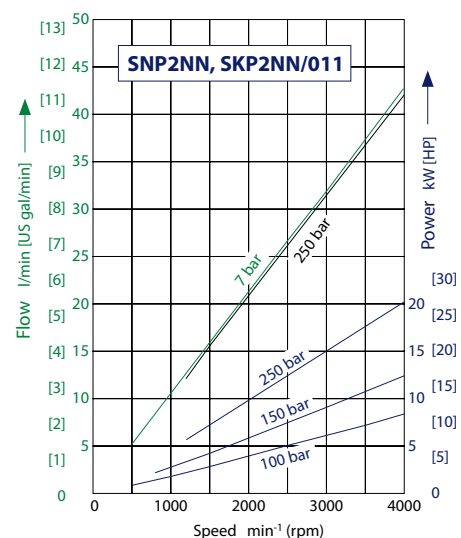
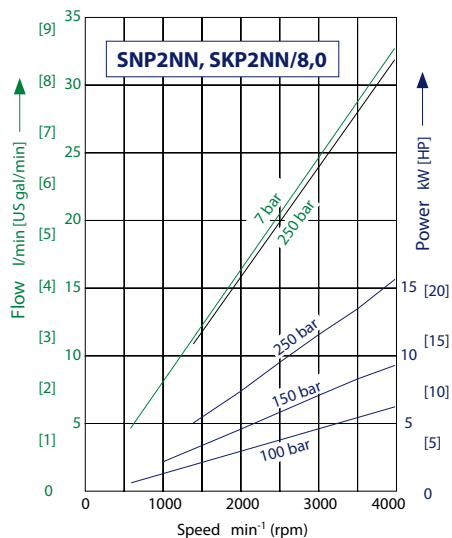
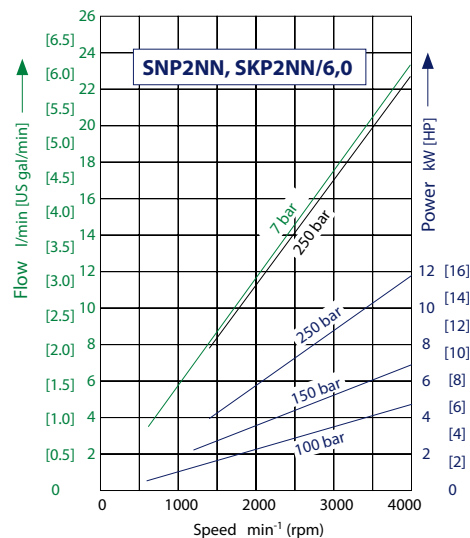
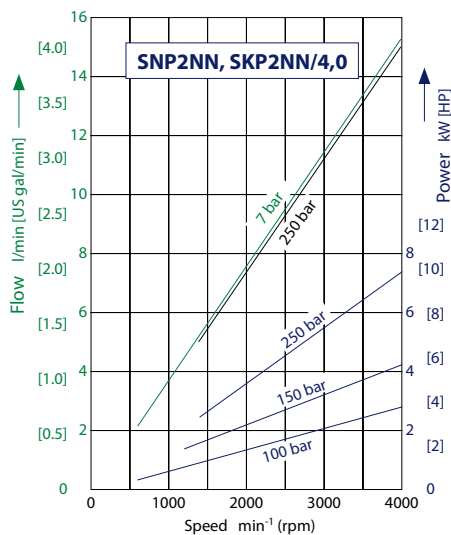
Sound levels graph



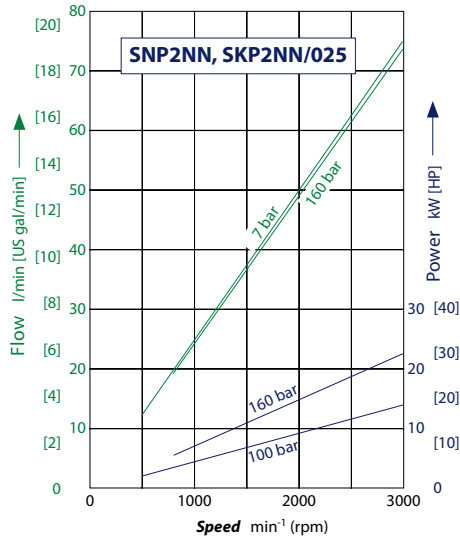
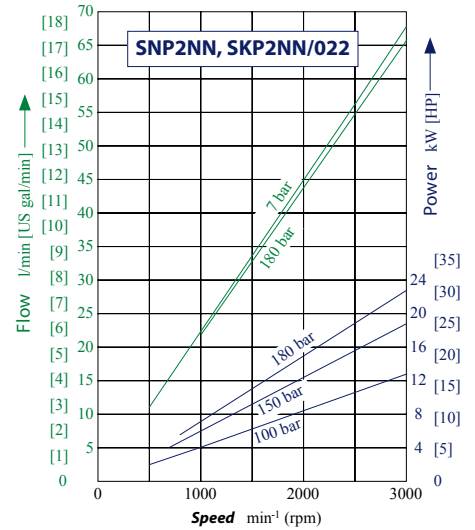
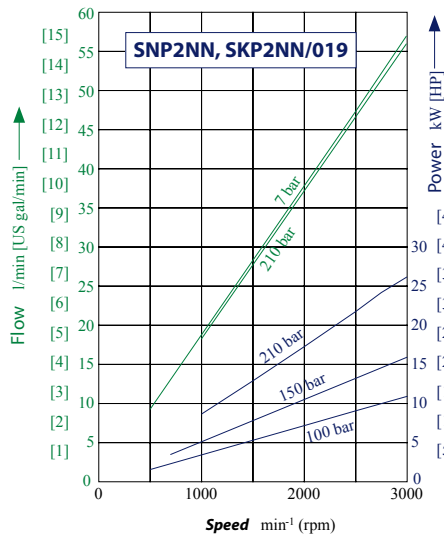
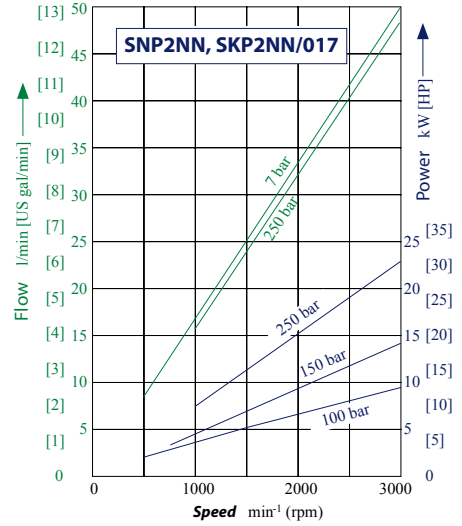
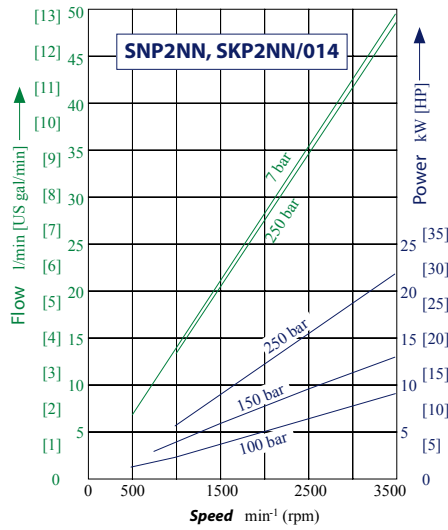
Pump Performance

Performance graphs

The graphs on the next pages provide typical output flow and input power for Group 2 pumps at various working pressures. Data were taken using ISO VG46 petroleum /mineral based fluid at 50 °C (viscosity at 28 mm²/s [cSt]).

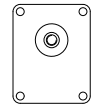
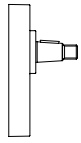
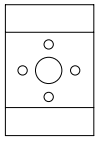
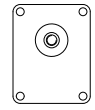
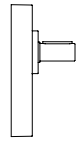
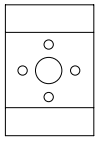
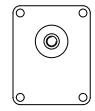
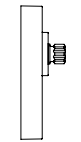
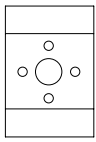
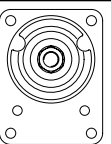
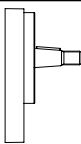
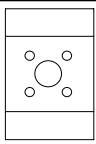
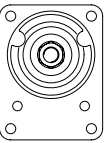
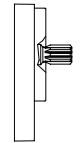
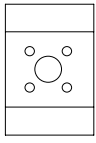
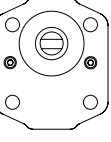
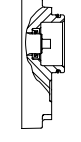
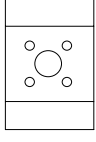
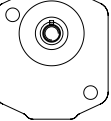
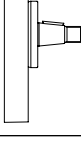
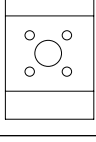

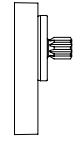
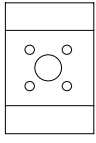

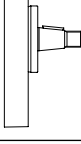
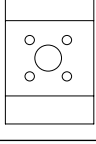
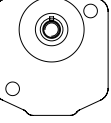
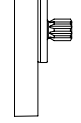
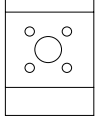


Pump Performance



Product Options

Flange, shaft and ports configurations

Code	Flange	Shaft	Ports
01BA	pilot Ø 36.5 mm [1.438 in] European 01, 4-bolt 	1:8 tapered 	European flanged, + pattern 
01FA	pilot Ø 36.5 mm [1.438 in] European 01, 4-bolt 	Ø 15 mm [0.59 in] parallel 	European flanged, + pattern 
01DA	pilot Ø 36.5 mm [1.438 in] European 01, 4-bolt 	Splined 9T - m 1.60 DIN 5482-B17x14 	European flanged, + pattern 
02AA	pilot Ø 80 mm [3.15 in] German PTO, 4-bolt 	1:5 tapered 	German std, x pattern 
02DB	pilot Ø 80 mm [3.15 in] German PTO, 4-bolt 	Splined 9T - m 1.60 DIN 5482-B17x14 	German std, x pattern 
03CA	Danfoss 03 	Danfoss tang 	German std, x pattern 
04AA	pilot Ø 50 mm [1.969 in] German PTO, 2-bolt 	1:5 tapered 	German std, x pattern 
04DB	pilot Ø 50 mm [1.969 in] German PTO, 2-bolt 	Splined 9T - m 1.60 DIN 5482-B17x14 	German std, x pattern 
05AA	pilot Ø 50 mm [1.969 in] German PTO, 2-bolt 	1:5 tapered 	German std, x pattern 
05DB	pilot Ø 50 mm [1.969 in] German PTO, 2-bolt 	Splined 9T - m 1.60 DIN 5482-B17x14 	German std, x pattern 

Product Options

Code	Flange		Shaft		Ports	
06GA	pilot Ø 82.55 mm [3.25 in] SAE A, 2-bolt		Ø 15.875 mm [0.625 in] parallel		Threaded SAE O-Ring boss	
06SA	pilot Ø 82.55 mm [3.25 in] SAE A, 2-bolt		9-teeth splined SAE spline J 498-9T-16/32D P		Threaded SAE O-Ring boss	
06SB	pilot Ø 82.55 mm [3.25 in] SAE A, 2-bolt		11-teeth splined SAE spline J		Threaded SAE O-Ring boss	

Shaft options

Direction is viewed facing the shaft. Group 2 pumps are available with a variety of tang, splined, parallel, and tapered shaft ends. Not all shaft styles are available with all flange styles.

Shaft versus flange availability and torque capability

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
					•	•								

Shaft	Mounting flange code with maximum torque in N·m [lbf·in]						
Description	Code	01	02	03	04	05	06
Taper 1:5	AA	–	140 [1239]	–	140 [1239]	140 [1239]	–
Taper 1:8	BA	150 [1328]	–	–	–	–	–
DIN spline B17x14	DA	90 [797]	–	–	–	–	–
DIN spline B17x14	DB	–	130 [1151]	–	130 [1151]	130 [1151]	–
SAE spline 9T 16/32p	SA	–	–	–	–	–	75 [646]
SAE spline 11T 16/32p	SB	–	–	–	–	–	150 [1328]
Parallel 15 mm [0.590 in]	FA	90 [797]	–	–	–	–	–
Parallel 15.875 mm [0.625 in]	GA	–	–	–	–	–	80 [708]
Danfoss Tang	CA	–	–	70 [620]	–	–	–

Recommended mating splines for Group 2 splined output shafts should be in accordance with SAE J498 or DIN 5482. Danfoss external SAE splines are flat root side fit with circular tooth thickness reduced by 0.127 mm [0.005 in] in respect to class 1 fit. The external DIN splines have an offset increased by 0.1 mm [0.004 in.] These dimensions are modified in order to assure a clearance fit with the mating spline.

Other shaft options may exist. Contact your Danfoss representative for availability.

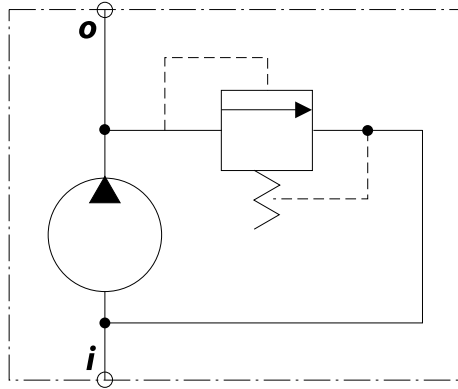
⚠ Caution

Shaft torque capability may limit allowable pressure. Torque ratings assume no external radial loading. Applied torque must not exceed these limits, regardless of stated pressure parameters. Maximum torque ratings are based on shaft torsional fatigue strength.

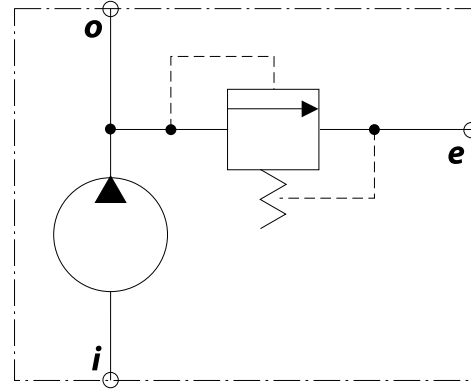
Product Options

Integral relief valve schematics

Integral relief valve (internal drain)



Integral relief valve (external drain)



P101 563E

Where:

i = inlet

o = outlet

e = external drain

Variant codes for ordering integral relief valves

The following tables detail the various codes for ordering integral relief valves in L section of model code.

A							B	C	D	E	F	G	H	I	J	K	L		M	N	O	
S	N	P	2	E	N	/												/	V	•		
S	N	P	2	I	N	/												/	V	•		

Code	Pump speed for RV setting
A	Not defined
C	500 min ⁻¹ (rpm)
E	1000 min ⁻¹ (rpm)
F	1250 min ⁻¹ (rpm)
G	1500 min ⁻¹ (rpm)
K	2000 min ⁻¹ (rpm)
I	2250 min ⁻¹ (rpm)
L	2500 min ⁻¹ (rpm)
M	2800 min ⁻¹ (rpm)
N	3000 min ⁻¹ (rpm)
O	3250 min ⁻¹ (rpm)

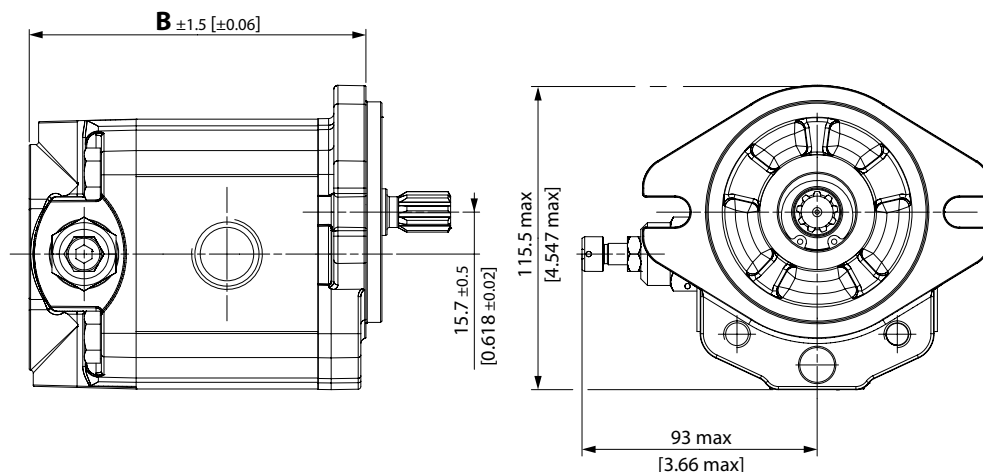
A							B	C	D	E	F	G	H	I	J	K	L		M	N	O	
S	N	P	2	E	N	/												/	V	•		
S	N	P	2	I	N	/												/	V	•		

Product Options

Code	Pressure setting
A	No setting
B	No valve
C	18 bar [261 psi]
D	25 bar [363 psi]
E	30 bar [435 psi]
F	35 bar [508 psi]
G	40 bar [580 psi]
K	50 bar [725 psi]
L	60 bar [870 psi]
M	70 bar [1015 psi]
N	80 bar [1160 psi]
O	90 bar [1305 psi]
P	100 bar [1450 psi]
Q	110 bar [1595 psi]
R	120 bar [1740 psi]
S	130 bar [1885 psi]
T	140 bar [2030 psi]
U	160 bar [2320 psi]
V	170 bar [2465 psi]
W	180 bar [2611 psi]
X	210 bar [3046 psi]
Y	240 bar [3480 psi]
Z	250 bar [3626 psi]

For pressures higher than 210 bar [3046 psi] and lower than 40 bar [580 psi] apply to your Danfoss representative.

Integral relief valve covers SNP2IN



Product Options

Dimensions of integral relief valve cover with SAE flange

Type	4,0	6,0	8,0	011	014	017	019	022	025
B mm [in]	110.0 [4.33]	113.5 [4.47]	117.5 [4.63]	121.5 [4.78]	127.5 [5.02]	131.5 [5.18]	135.5 [5.33]	141.5 [5.57]	145.5 [5.73]

Outrigger bearing

An outrigger bearing is available for applications with high radial or thrust loads on the shaft. This option is used primarily for applications with high shaft loads such as to belt or chain drives. The design utilizes roller bearings in the front mounting flange. These bearings absorb the radial and thrust loads on the shaft so that the life of the pump is not affected. The use of roller bearings allows life to be described in B₁₀ hours.

Available configurations

Codes **9ADB**, **9FDB**, **94DB**, **9HDB** and **9JDB** represent assembly (pump complete with outrigger bearing).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	/			•	•						/			

Code	Shaft	Mounting flange
9A	Taper 1:8	European 4-bolts
9F	Taper 1:5	German PTO
94	Taper 1:5	German 4-bolts
9H	Taper 1:8	SAE A
9J	Parallel	SAE A

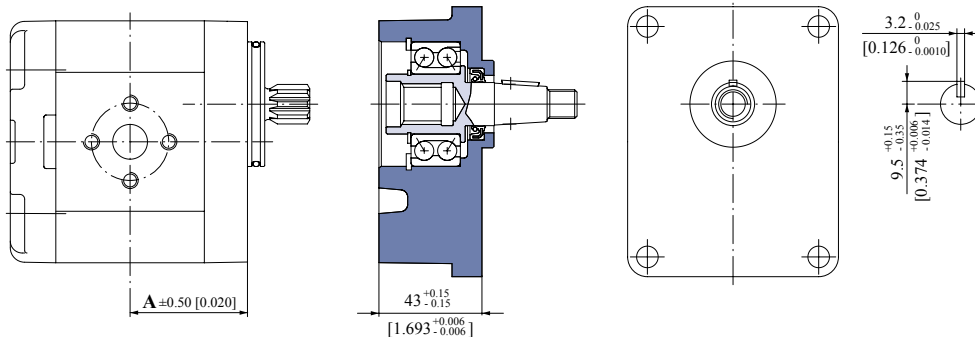
Product Options

Outrigger bearing assembly

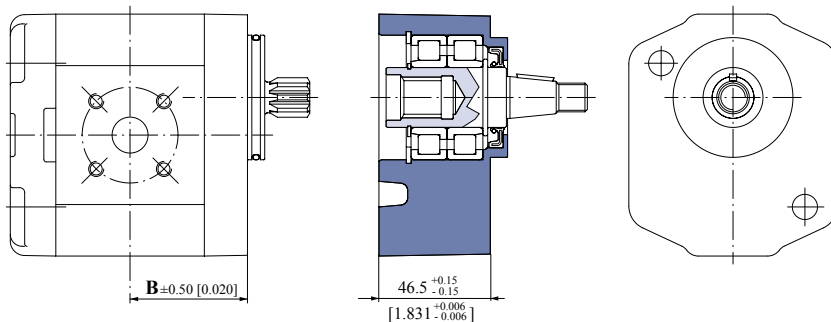
Dimensions

mm [in]

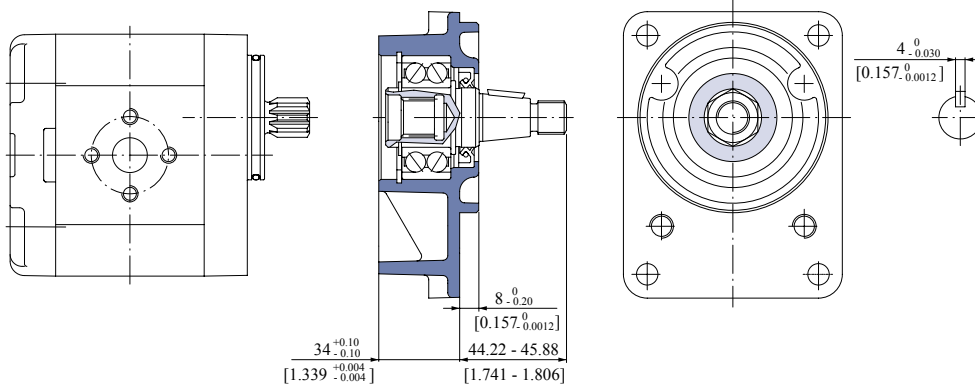
Outrigger bearing type 9A



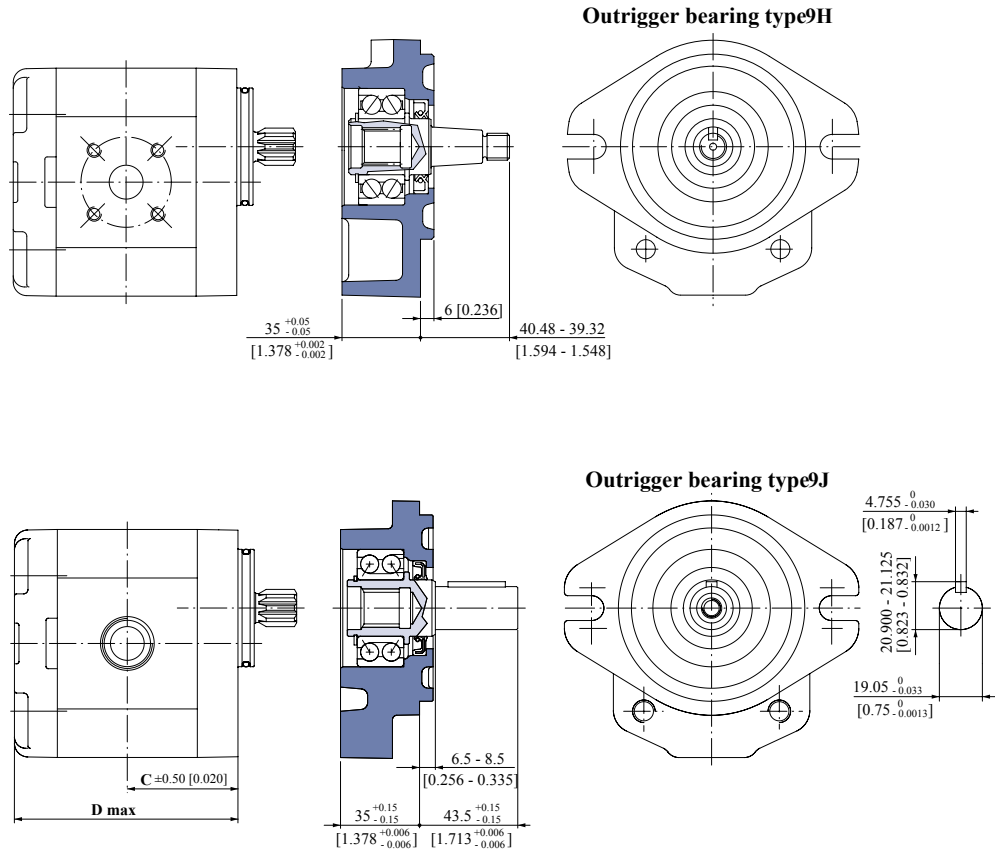
Outrigger bearing type 94



Outrigger bearing type 9F



Product Options



Type (displacement)	4,0	6,0	8,0	011	014	017	019	022	025
A	43.25 [1.703]	45.0 [1.772]	47.0 [1.850]	49.0 [1.929]	52.0 [2.047]	54.0 [2.126]	56.0 [2.205]	59.0 [2.323]	61.0 [2.402]
B	128.5 [5.059]	132 [5.197]	136 [5.354]	140 [5.512]	146 [5.748]	150 [5.906]	154 [6.063]	160 [6.299]	164 [6.457]
Inlet C	1.063 (1 1/16) 12UN - 2B; 18 mm [0.709 in] deep								
Outlet c	0.875 (7/8) - 14UNF - 2B; 16.7 mm [0.658 in] deep								

Auxillary mounting pads

SAE A auxiliary mounting pads are available for all Group 2 pumps with SAE A front flange and coupling 9 teeth 16/32 pitch. These pads are used for mounting auxiliary hydraulic pumps or creating special tandem gear pumps.

To order pumps with SAE A auxiliary mounting flange:

- Specify 06SL in field E of the model code as shown below
- Order the auxiliary mounting pad kit, part number 818.20.079.0K

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
/				0 6 S L							/			

Since the drive coupling is lubricated with oil from the main pump inlet, an O-ring must be used to seal the auxiliary pump-mounting flange to the pad.

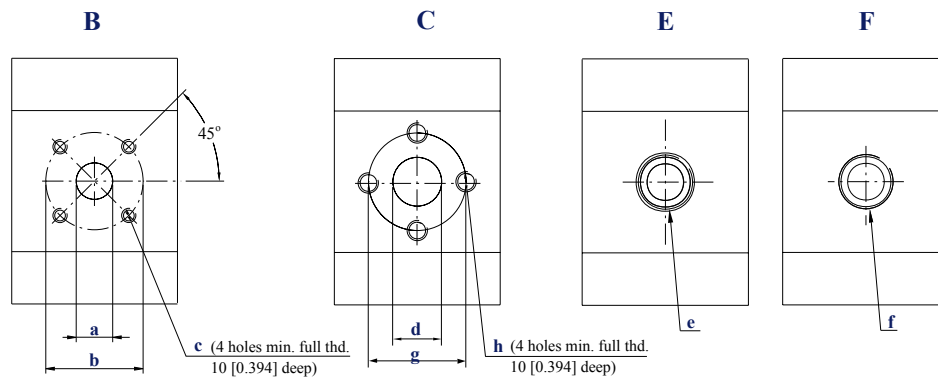
Product Options

Dimensions

Type (displacement)	4,0	6,0	8,0	011	014	017	019	022	025
A	43.25 [1.703]	45.0 [1.772]	47.0 [1.850]	49.0 [1.929]	52.0 [2.047]	54.0 [2.126]	56.0 [2.205]	59.0 [2.323]	61.0 [2.402]
B	128.5 [5.059]	132 [5.197]	136 [5.354]	140 [5.512]	146 [5.748]	150 [5.906]	154 [6.063]	160 [6.299]	164 [6.457]
Inlet C	1.063 (1 1/16) 12UN - 2B; 18 mm [0.709 in] deep								
Outlet c	0.875 (7/8) - 14UNF - 2B; 16.7 mm [0.658 in] deep								

Pump ports

Available pump ports



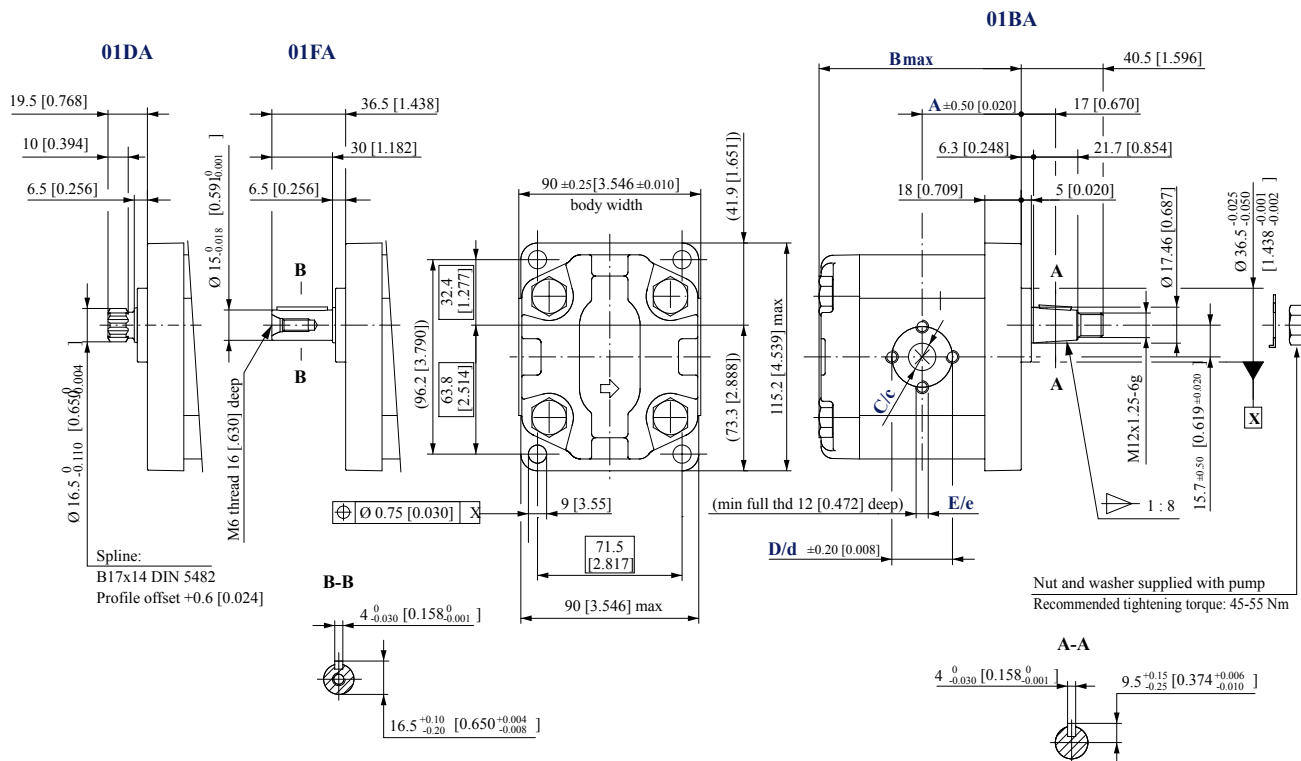
Dimensions of pumps ports

Port type		B Style			C Style			E Style	F Style	
Port dimensions		a	b	c	d	g	h	e	f	
Frame size	4,0	Inlet	15 [0.591]	40 [1.575]	M6	13.5 [0.531]	30 [1.181]	M6	1 1/16-12UNF-2B	½ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	6,0	Inlet	15 [0.591]	40 [1.575]	M6	13.5 [0.531]	30 [1.181]	M6	1 1/16-12UNF-2B	½ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	8,0	Inlet	20 [0.787]	40 [1.575]	M6	13.5 [0.531]	30 [1.181]	M6	1 1/16-12UNF-2B	½ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	011	Inlet	20 [0.787]	40 [1.575]	M6	13.5 [0.531]	30 [1.181]	M6	1 1/16-12UNF-2B	¾ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	014	Inlet	20 [0.787]	40 [1.575]	M6	20.0 [0.787]	40 [1.575]	M8	1 1/16-12UNF-2B	¾ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	017	Inlet	20 [0.787]	40 [1.575]	M6	20.0 [0.787]	40 [1.575]	M8	1 1/16-12UNF-2B	¾ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	019	Inlet	20 [0.787]	40 [1.575]	M6	20.0 [0.787]	40 [1.575]	M8	1 1/16-12UNF-2B	¾ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
	022	Inlet	20 [0.787]	40 [1.575]	M6	20.0 [0.787]	40 [1.575]	M8	1 1/16-12UNF-2B	¾ Gas (BSPP)
		Outlet	15 [0.591]	35 [1.378]	M6	13.5 [0.531]	30 [1.181]	M6	7/8-14UNF-2B	½ Gas (BSPP)
025	Inlet	20 [0.787]	40 [1.575]	M6	23.5 [0.925]	40 [1.575]	M8	1 1/16-12UNF-2B	1 Gas (BSPP)	
	Outlet	15 [0.591]	35 [1.378]	M6	20.0 [0.787]	40 [1.575]	M8	7/8-14UNF-2B	¾ Gas (BSPP)	

Dimensions

SNP2NN - 01DA, 01FA and 01BA

Standard porting for 01DA, 01FA and 01BA



SNP2NN – 01BA, 01FA and 01DA dimensions

Frame size	4,0	6,0	8,0	011	014	017	019	022	025	
Dimension	A	43.25 [1.703]	45 [1.772]	45 [1.772]	49 [1.929]	52 [2.047]	52 [2.047]	56 [2.205]	59 [2.323]	59 [2.323]
	B	90.0 [3.543]	93.0 [3.681]	97.5 [3.839]	101.5 [3.996]	107.5 [4.232]	111.5 [4.390]	115.5 [4.574]	121.5 [4.783]	125.5 [4.941]
Inlet	C	13.5 [0.531]	13.5 [0.531]	13.5 [0.531]	13.5 [0.531]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	23.5 [0.925]
	D	30 [1.181]	30 [1.181]	30 [1.181]	30 [1.181]	40 [1.575]	40 [1.575]	40 [1.575]	40 [1.575]	40 [1.575]
	E	M6				M8				
Outlet	c	13.5 [0.531]							20 [0.787]	
	d	30 [1.181]							40 [1.575]	
	e	M6							M8	

Model code examples and maximum shaft torque

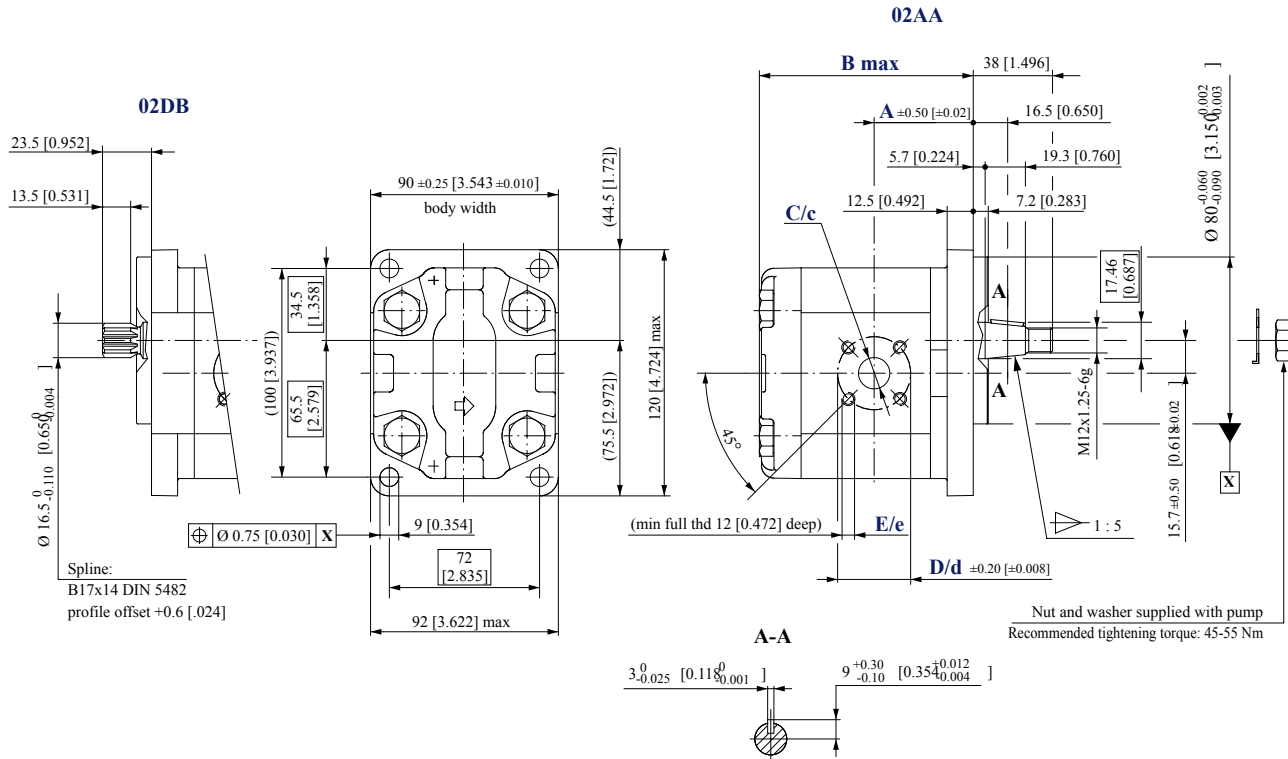
Flange/drive gear	Model code example	Maximum shaft torque
01DA	SNP2NN/014LN01DAP1C7C3NNNN/NNNNN	90 N•m [797 lbf•in]
01FA	SNP2NN/019LN01FAP1C7C3NNNN/NNNNN	90 N•m [797 lbf•in]
01BA	SNP2NN/8,0LN01BAP1C3C3NNNN/NNNNN	150 N•m [1328 lbf•in]

For further details on ordering, please see [Model code](#) on page 12.

Dimensions

SNP2NN - 02DB and 02AA

Standard porting for 02DB and 02AA



SNP2NN – 02DB and 02AA dimensions

Frame size	4,0	6,0	8,0	011	014	017	019	022	025	
Dimension	A	39.8 [1.567]	41.1 [1.618]	43.1 [1.697]	47.5 [1.870]	47.5 [1.870]	47.5 [1.870]	47.5 [1.870]	55 [2.165]	64.5 [2.539]
	B	92.5 [3.642]	96 [3.780]	100 [3.937]	104 [4.094]	110 [4.331]	114 [4.488]	118 [4.646]	124 [4.882]	128 [5.039]
Inlet	C	15 [0.591]	15 [0.591]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]
	D	40 [1.575]								
	E	M6								
Outlet	c	15 [0.591]								
	d	35 [1.378]								
	e	M6								

Model code examples and maximum shaft torque

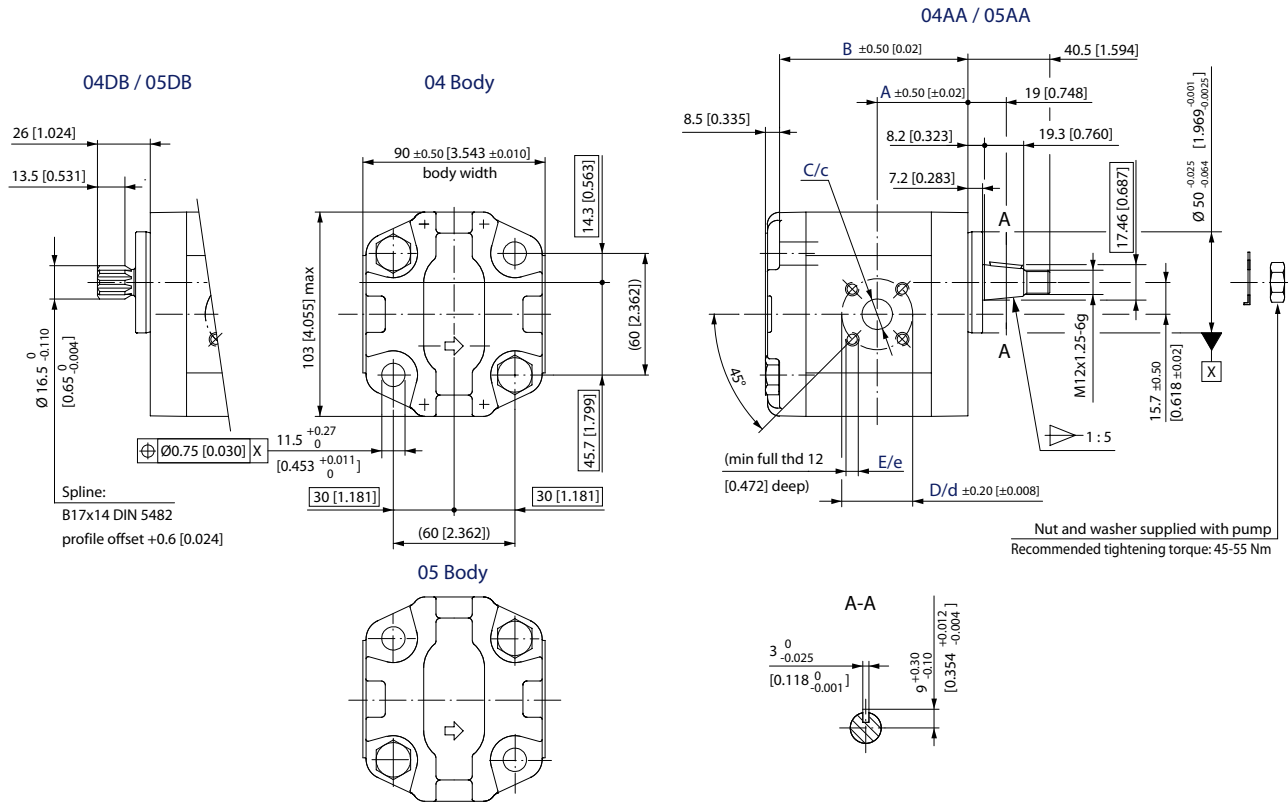
Flange/drive gear	Model code example	Maximum shaft torque
02DB	SNP2NN/017LN02DBP1B7B5NNNN/NNNNN	130 N·m [1151 lbf·in]
02AA	SNP2NN/6,0RN02AAP1B6B5NNNN/NNNNN	140 N·m [1239 lbf·in]

For further details on ordering, please see [Model code](#) on page 12.

Dimensions

SNP2NN - 04/05DB and 04/05AA

Standard porting for 04/05DB and 04/05AA



SNP2NN – 04/05DB and 04/05AA dimensions

Frame size		4,0	6,0	8,0	011	014	017	019	022	025
Dimension	A	37.3 [1.469]	38.6 [1.520]	40.6 [1.598]	45 [1.772]	45 [1.772]	45 [1.772]	45 [1.772]	52.5 [2.067]	62 [2.441]
	B	81.5 [3.208]	85 [3.364]	89 [3.503]	93 [3.661]	99 [3.897]	103 [4.055]	107 [4.212]	113 [4.448]	117 [4.606]
Inlet	C	15 [0.591]	15 [0.591]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]
	D	40 [1.575]								
	E	M6								
Outlet	c	15 [0.591]								
	d	35 [1.378]								
	e	M6								

Model code examples and maximum shaft torque

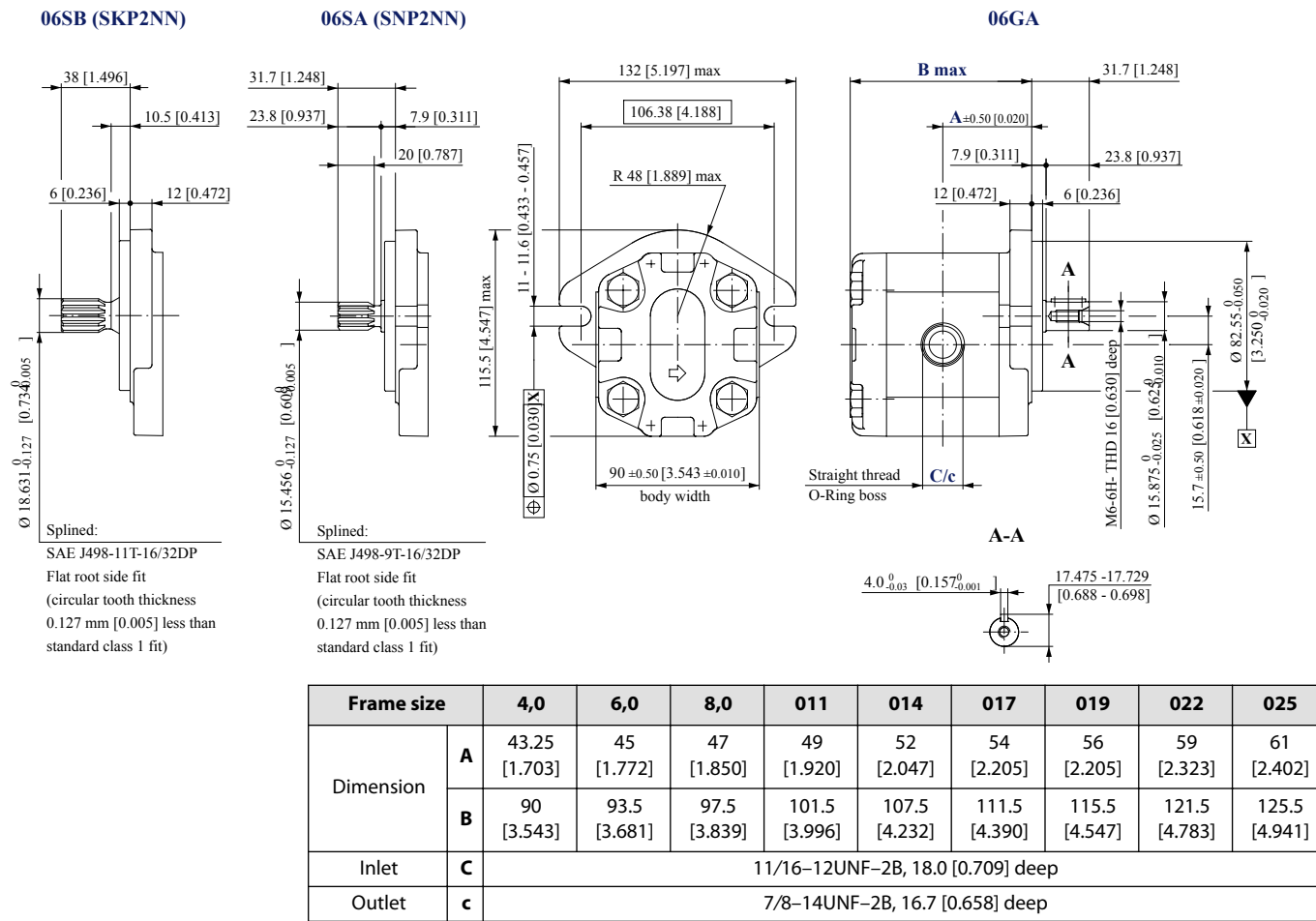
Flange/drive gear	Model code example	Maximum shaft torque
04DB	SNP2NN/8,0LN04DBP1B7B5NNNN/NNNNN	130 N·m [1151 lbf·in]
05DB	SNP2NN/022RN05DBP1B7B5NNNN/NNNNN	
04AA	SNP2NN/6,0LN04AAP1B6B5NNNN/NNNNN	140 N·m [1239 lbf·in]
05AA	SNP2NN/014RN05AAP1B7B5NNNN/NNNNN	

For further details on ordering, please see [Model code](#) on page 12.

Dimensions

SKP2NN - 06SB and SNP2NN - 06SA, 06GA

Standard porting for 06SB (SKP2NN), and 06SA, 06GA (SNP2NN)



Model code examples and maximum shaft torque

Flange/drive gear	Model code example	Maximum shaft torque
06GA	SNP2NN/6,0RN06GAP1E6E5NNNN/NNNNN	80 N·m [708 lbf·in]
06SA (SNP2NN)	SNP2NN/011LN06SAP1E6E5NNNN/NNNNN	75 N·m [664 lbf·in]
06SB (SKP2NN)	SKP2NN/022RN06SBP1E6E5NNNN/NNNNN	150 N·m [1328 lbf·in]

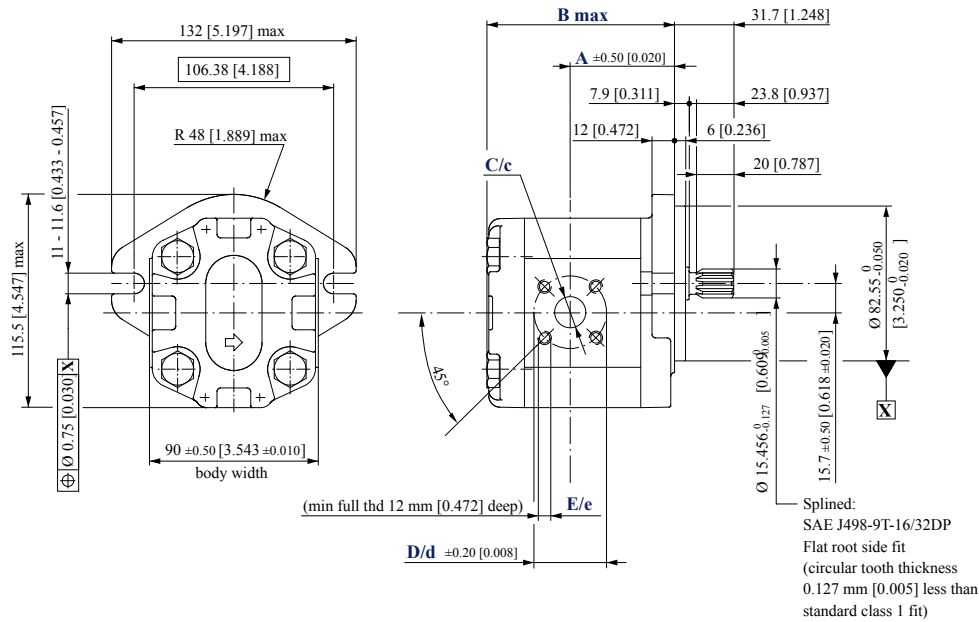
For further details on ordering, please see [Model code](#) on page 12.

Dimensions

SNP2NN - 06SA..BxBxBxYY../....

Standard porting for 06SA with port type Bx offset from center of the body

06SA..BxBxBxYY../....



SNP2NN – 06SA..BxBxBxYY../.... dimensions

Frame size	4,0	6,0	8,0	011	014	017	019	022	025	
Dimension	A	49.2 [1.937]	51.4 [2.023]	53.4 [2.102]	53.0 [2.087]	59.0 [2.322]	63.0 [2.480]	67.0 [2.637]	65.5 [2.579]	60.0 [2.326]
	B	90 [3.543]	93.5 [3.681]	97.5 [3.839]	101.5 [3.996]	107.5 [4.232]	111.5 [4.390]	115.5 [4.547]	121.5 [4.783]	125.5 [4.941]
Inlet	C	15 [0.591]	15 [0.591]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]
	D	40 [1.575]								
	E	M6								
Outlet	c	15 [0.591]								
	d	35 [1.378]								
	e	M6								

Model code examples and maximum shaft torque

Flange/drive gear	Model code example	Maximum shaft torque
06SA..BxBxBxYY../....	SNP2NN/019RN06SAP1B7B5YYNN/NNNNN	75 N·m [646 lbf·in]

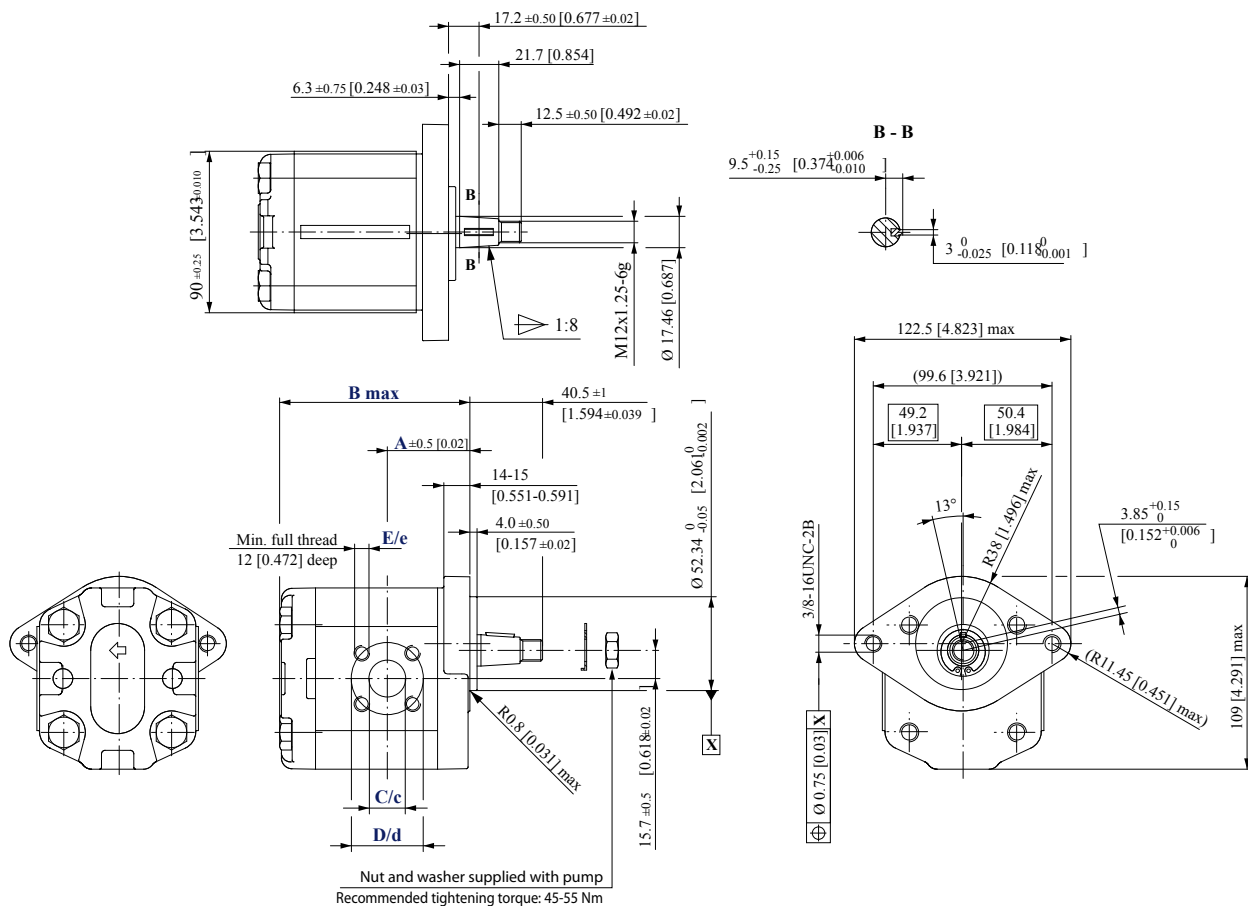
For further details on ordering, please see [Model code](#) on page 12.

Dimensions

SNP2NN - A9BJ

Standard porting for A9BJ

A9BJ



Frame size	4,0	6,0	8,0	011	014	017	019	022	025	
Dimension	A	37.3 [1.469]	38.6 [1.520]	40.6 [1.598]	45.0 [1.772]	45.0 [1.772]	45.0 [1.772]	45.0 [1.772]	52.5 [2.067]	62 [2.441]
	B	90 [3.543]	93.5 [3.681]	97.5 [3.839]	101.5 [3.996]	107.5 [4.232]	111.5 [4.390]	115.5 [4.547]	121.5 [4.783]	125.5 [4.941]
Inlet	C	15 [0.591]	15 [0.591]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]	20 [0.787]
	D	40 [1.575]								
	E	M6								
Outlet	c	15 [0.591]								
	d	35 [1.378]								
	e	M6								

Model code example and maximum shaft torque

Flange/drive gear	Model code example	Maximum shaft torque
A9BJ	SNP2NN/011RNA9BJP1C7C3NNNN/NNNNN	150 N·m [1328 lbf·in]

For further details on ordering, please see [Model code](#) on page 12.

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