Danfoss GearMe single-stage hydraulic gear pump 83018293

Manufacturer: Danfoss

Manufacturer part number / published order designation: 83018293

Published model: SNP1NN-/-1,2-R-N-03-CA-03-D5-D5-NN-N-N-/-NNN-N-N

About this compilation

Prepared by Hydmaster from selected manufacturer documentation. Original technical pages follow without cropped drawings, rewritten data or altered units. This cover and index are Hydmaster editorial material, not a manufacturer-issued exact-execution datasheet.

Coverage: applicable family/component reference. Exact execution documentation remains incomplete. Do not treat standard component or stage drawings as approval of the complete custom assembly.

Execution notes and conditions

Exact SNP1NN1.2 03CA D5/D5 manufacturer installation drawing.

The primary article is D5/D5. Standard03CA size1.2 dimension drawingp39 and p33 standard row specify D5/D3 (M18/M14); do not substitute its smaller outlet or call p39 the exact execution drawing.

Source-page index

Source page numbers below are physical pages of each complete original PDF. The original printed page labels and technical content remain unchanged. Compiled page numbers count this cover/index.

Source A: Danfoss Gearme Group One Gear Pumps Technical Information

Original pages	Compiled pages	Relevant content
15-19	2-6	SNP1NN1.2 size row, distinguish nominal1.2 from geometric displacement; Threaded-port pressure derating and applicable standard data caveats; SNP1NN family/size/rotation code; Actual03 flange, CA tang and03 rear-cover code; Actual D5=M18x1.5 inlet/outlet and N seal definition
22-27	7-12	Inlet pressure and pressure definitions; Pressure/speed duty-envelope conditions; Fluid viscosity, temperature and fluid requirements; Reservoir, cleanliness and filtration; Drive/coupling and mounting requirements; Continued shaft-loading/application limits
32	13	03CA torque context and explicit D5 threaded-port definition

General Information

Technical data

		Frame size									
		1,2	1,7	2,2	2,6	3,2	3,8	4,3	6,0	7,8	010	012
Displacement	cm^3/rev [in^3/rev]	1.18 [0.072]	1.57 [0.096]	2.09 [0.128]	2.62 [0.160]	3.14 [0.192]	3.66 [0.223]	4.19 [0.256]	5.89 [0.359]	7.59 [0.463]	9.94 [0.607]	12.00 [0.732]
SNP1NN												
Peak pressure	bar [psi]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	210 [3045]	170 [2465]	–	–
Rated pressure		250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	190 [2760]	150 [2175]		
Minimum speed at 0-150 bar	min^{-1} (rpm)	800	800	600	600	600	600	500	500	500		
Min. speed at 150 bar to rated pressure		1200	1200	1000	1000	1000	1000	800	800	800		
Maximum speed		4000	4000	4000	4000	4000	4000	3000	3000	3000		
SKP1NN*												
Peak pressure	bar [psi]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]	250 [3625]	220 [3190]	170 [2465]	140 [2030]
Rated pressure		250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	230 [3335]	200 [2900]	150 [2175]	120 [1740]
Minimum speed at 0-150 bar	min^{-1} (rpm)	800	800	800	800	800	800	600	600	600	600	600
Min. speed at 150 bar to rated pressure		1200	1200	1000	1000	1000	1000	1000	800	800	800	–
Maximum speed		4000	4000	4000	4000	4000	4000	3000	3000	3000	2000	2000
All (SNP1NN, SKP1NN)												
Weight	kg [lb]	1.02 [2.26]	1.05 [2.31]	1.09 [2.40]	1.11 [2.45]	1.14 [2.51]	1.18 [2.60]	1.20 [2.65]	1.30 [2.87]	1.39 [3.06]	1.55 [3.42]	1.65 [3.64]
Moment of inertia of rotating components	x 10^{-6} $kg•m^2$ [x 10^{-6} $lb•ft^2$]	3.2 [77]	3.7 [89]	4.4 [105]	5.1 [120]	5.7 [136]	6.4 [152]	7.1 [168]	9.3 [220]	11.4 [271]	14.6 [347]	17.1 [407]
Theoretical flow at maximum speed	l/min [US gal/min]	4.72 [1.25]	6.28 [1.66]	8.36 [2.21]	10.48 [2.77]	12.56 [3.32]	14.64 [3.87]	12.57 [3.32]	17.67 [4.67]	22.77 [6.02]	19.88 [5.25]	24 [6.34]

* SKP1NN is a special version of the SNP1NN. It is designed to accommodate an SAE 9T 20/40 DP tooth splined shaft for higher torque applications.

1 $kg•m^2$ = 23.68 $lb•ft^2$

General Information

Caution

The rated and peak pressure mentioned are for pumps with flanged ports only. When threaded ports are required a derated performance has to be considered. To verify the compliance of an 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
•	•	•	•	•	•	/																				/					

SNB1NN	Gear pump with inlet port on cover and outlet port on flange
SNP1NN	Standard gear pump
SNC1NN	Gear pump with inlet and outlet ports on rear cover
SNP1IN	Gear pump with internal drain relief valve
SKP1NN	High torque gear pump
SKP1IN	High torque gear pump with internal drain relief valve

B Displacement

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

1,2	1,18 cc
1,7	1,57 cc
2,2	2,09 cc
2,6	2,62 cc
3,2	3,14 cc
3,8	3,66 cc
4,3	4,19 cc
6,0	5,89 cc
7,8	7,59 cc
010	9,94 cc
012	12,00 cc

C Rotation

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

L	Left rotation
R	Right rotation

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 Ø25,4+4 holes
02	pilot Ø30+4 holes
03	pilot Ø32+O-ring+2 holes through body
04	pilot Ø32+2 holes through body
06	SAE A-A pilot Ø50,8+ 2 holes

F Drive gear

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

AA	Taper 1:5-M6-Key 2
BA	Taper 1:8-M7-Key 2,41
BB	Taper 1:8-M10x1-Key 3
CA	Tang 5x Ø10
CE	Tang 6,63x Ø11 - for SKP1xN
CM	Tang 5x Ø10-type 03 + w/o coupling
DA	SplinedZ15-m0,75-alfa 30°-L14 - for SNP1xx
DB	SplinedZ15-m0,75-alfa 30°-L14 - for SKP1xx
FA	Parallel Ø12-Thread M10x1-Key 3
GA	Parallel Ø12,7-Key 3.2
SA	SAE spline J498-9T-20/40

G Rear cover

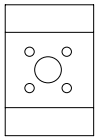
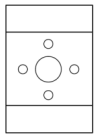
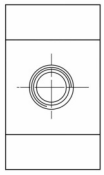
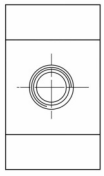
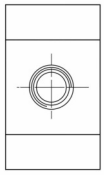
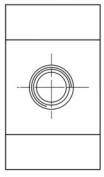
A							B			C	D	E		F		G		H		I		J		K	L		M			N	O
						/										•	•									/					

03	Cover 03 (used with flange 03-04)
08	Cover 08 with Inlet port 3/8" Gas
C1	Cover pump with front GAS Thread Inlet 3/8 ; Outlet 3/8
I1	Cover pump with relief valve
I3	Cover 03 with relief valve (used with flange 03)
P1	Std Cover pump

H Inlet size; I Outlet size

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

Product Code

NN	Without inlet	
B1	8x30xM6	
B2	13x30xM6	
C1	8x26xM5	
C2	12x26xM5	
C3	13, 5x30xM6	
D3	M14x1,5	
D5	M18x1,5	
D7	M22x1,5	
E3	9/16-18UNF	
E4	¾-16UNF	
E5	7/8-14UNF	
F2	¼ GAS	
F3	3/8 GAS	
F4	½ GAS	
H2	10xM12x1,5-ISO6149	
H4	12xM16x1,5-ISO6149	
H5	12xM18x 1, 5-ISO6149	
H7	13, 5xM22x 1, 5-ISO6149	

J Ports positions & Special body

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

NN	Std from catalogue

K Seals

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

N	Standard NBR seal
A	Without shaft seal
B	With VITON seals

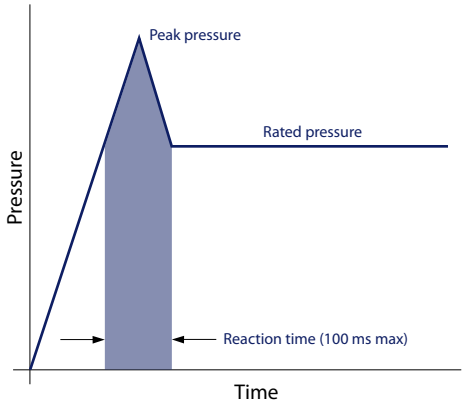
System Requirements

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 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 accompanying illustration shows peak pressure in relation to rated pressure and reaction time (100 ms maximum).



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 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.

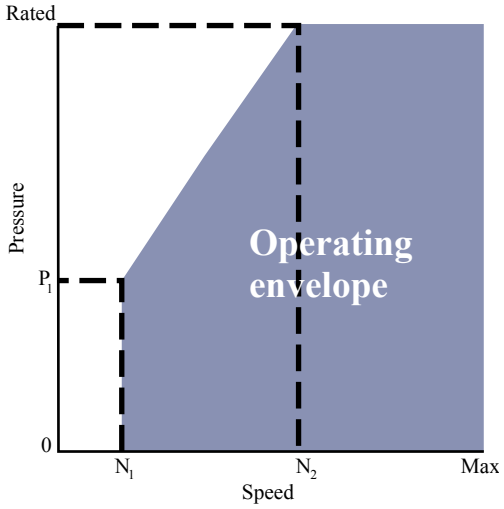
Speed

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 here.

System Requirements

Speed versus pressure



Where:

N_1 = Minimum speed at 100 bar

N_2 = Minimum speed at 180 bar

Hydraulic fluids

Ratings and data for SNP1NN, and SKP1NN 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 (HVLP) 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 viscosity range.

System Requirements

Fluid viscosity

Maximum (cold start)	mm^2/s [SUS]	1000 [1600]
Recommended range		12-60 [66-290]
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 ingression 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 ingression, 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 $\beta_{10} = 2$
β_x ratio (pressure or return filtration)	$\beta_{10} = 75$
Recommended inlet screen size	100-125 µm [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

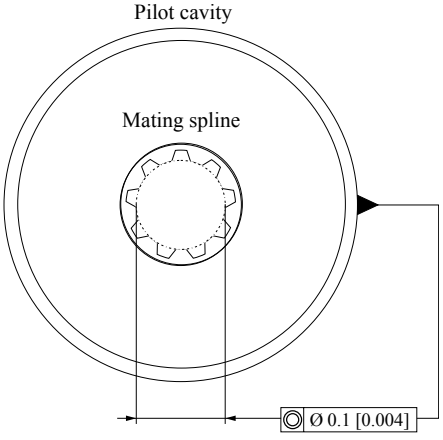
Inlet	m/s [ft/sec]	2.5 [8.2]
Outlet		5.0 [16.4]
Return		3.0 [9.8]

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 1 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.

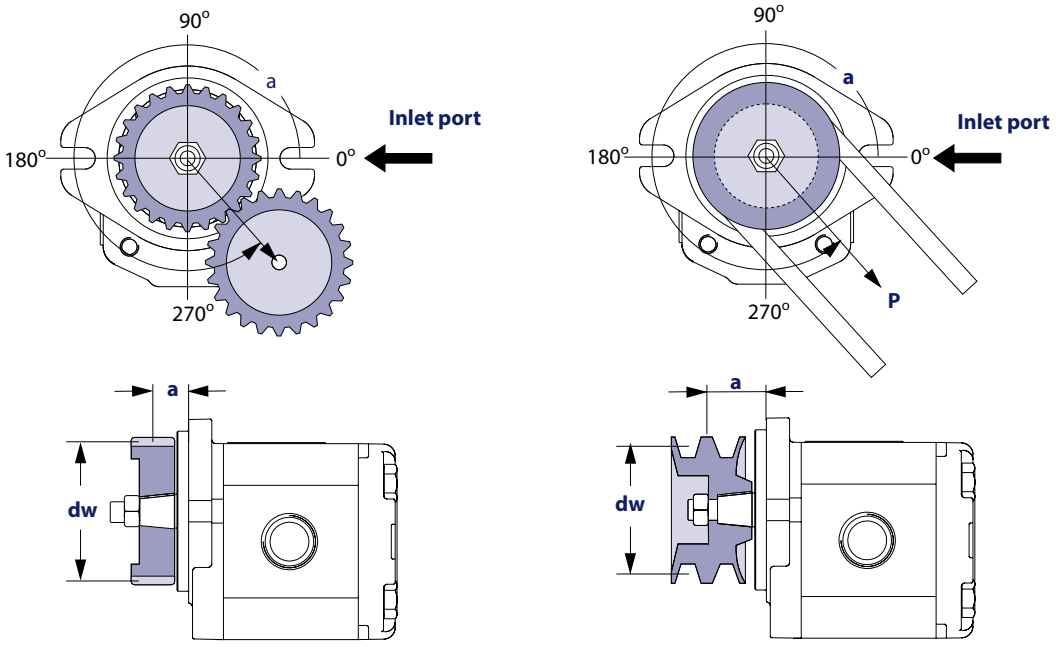
Allowable **radial shaft loads** are a function of the load position, load orientation, and operating pressure of the hydraulic pump. All external shaft loads have an effect on bearing life, and may affect pump performance.

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.

Pump drive data form

Contact Danfoss if continuously applied external radial or thrust loads occur. Fill out this page and send the complete form to your Danfoss representative for an assistance in applying pumps with belt or gear drive. This illustration shows a pump with counterclockwise orientation:

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 lbf

System Requirements

Application data (continued)

Item		Value	Unit
Angular orientation of gear or belt to inlet port	**α**		degree
Pitch diameter of gear or pulley	**dw**		mm in
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.

B_{10} 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

Noise is unwanted sound. Fluid power systems create noise. There are many techniques available to minimize noise. Understanding how it's generated and transmitted is necessary to apply these methods effectively.

Noise energy is transmitted as fluid borne noise (pressure ripple) or 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. Pressure ripple is affected by the compressibility of the oil as each pumping element discharges into the outlet of the pump. Pressure pulsations travel along hydraulic lines at the speed of sound (about 1400 m/s in oil) until there is a change in the system (as with 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 way circuit components respond to excitation depends on their size, form, and mounting. Because of this, a system line may actually have a greater noise level than the pump. To minimize noise, use:

- flexible hoses (if you must use steel plumbing, clamp the lines).
- flexible (rubber) mounts to minimize other structure borne noise.

Product Options

Shaft		Mounting flange code with maximum torque in Nm [lb•in]				
Code	Description	01	02	03	04	06
AA	Taper 1:5-M6				25 [221]	
BA	Taper 1:8-M7	25 [221]				
BB	Taper 1:8-M10		50 [442]			
CA	Tang 5x Ø10			14 [124]		
CE	Tang 6,63x Ø11					21 [186]
CM	Tang 5x Ø10-type 03 + w/o coupling			14 [124]		
DA	Splined Z15-m0,75-alfa 30°-L14	35 [309]				
DB	Splined Z15-m0,75-alfa 30°-L14		35 [309]			
FA	Parallel Ø12-Thread M10x1		24 [212]			
GA	Parallel Ø12,7-Key 3.2					32 [283]
SA	SAE spline J498-9T-20/40					34 [301]

Danfoss recommends mating splines conform to SAE J498 or DIN 5482.

Danfoss external SAE splines have a flat root side fit with circular tooth thickness reduced by 0.127 mm [0.005 in] in respect to class 1 fit. Dimensions are modified to assure a clearance fit with the mating spline.

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.

Various port configurations are available on Group 1 pumps. They include:

- European standard flanged ports
- German standard flanged ports
- Gas threaded ports (BSPP)
- O-Ring boss (following SAE J1926/1 [ISO 11926-1] UNF threads, standard)

For a table of dimensions, see *Ports* on page 33.

Inlet/Outlet port configurations

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

B1	8x30xM6	Flanged port with threaded holes in **X** pattern, in center of body
B2	13x30xM6	
C1	8x26xM5	Flanged port with threaded holes in **+** pattern (European standard ports)
C2	12x26xM5	
C3	13,5x30xM6	
D3	M14x1,5	Threaded metric port
D5	M18x1,5	
D7	M22x1,5	