History of revisions

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<th>Page</th>
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<td>28, June 2010</td>
<td>-</td>
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<td>24, Feb 2011</td>
<td>1,2,11,32</td>
<td>Covers to blue color, Turolla brand name, Biofluids deleted.</td>
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<td>30, Sept 2013</td>
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Reference documents

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<td>General Aluminum Gear Pumps and Motors</td>
<td>Technical Information</td>
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General information

Overview
The Turolla Group 3 is a range of peak performance fixed-displacement gear pumps. Constructed of a high-strength extruded aluminum body with aluminum cover and flange, all pumps are pressure-balanced for exceptional efficiency.

Group 3 gear pumps’ attributes
- Wide range of displacements from 22 to 90 cm³/rev (from 1.34 to 5.49 in³/rev)
- Continuous pressure rating up to 250 bar (3625 psi)
- Speeds up to 3000 min⁻¹ (rpm)
- SAE, DIN and European standard mounting flanges
- High quality case hardened steel gears
- Multiple pump configurations in combination with SNP1NN, SNP2NN and SNP3NN

Pump displacements

Quick reference chart for pump displacements vs. rated pressure
Pump design

SEP3NN
The SEP3NN gear pump is available in a limited displacement range from 22.0 to 44.1 cm³/rev [from 1.34 to 2.69 in³/rev]. Suitable for applications where the pressure is lower than 210 bar [3045 psi], the SEP3NN range is released into SAE and European configurations. The overall length is reduced by 12 mm [0.47 in] in respect of the SNP3NN.

SNP3NN
The SNP3NN is available in the full displacement range from 22.0 to 88.2 cm³/rev [from 1.34 to 5.38 in³/rev], and with higher pressure ratings than the SEP3NN. This is due to the pressure balance on each side of the gears obtained with pressure-balance plates made in antifriction alloy that contribute to high volumetric efficiency and maximum sealing as well.
Technical data for SEP3NN

<table>
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<th>SEP3NN pump model</th>
<th>Frame size</th>
<th>022</th>
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<td>cm³/rev</td>
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Technical data for SNP3NN

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Caution

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

Use these formula to determine the nominal pump size for a specific application:

**Based on SI units**

**Output flow:**
\[ Q = \frac{V_g \cdot n \cdot \eta_v}{1000} \text{ l/min} \]

**Input torque:**
\[ M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_m} \text{ N•m} \]

**Input power:**
\[ P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ kW} \]

**Based on US units**

**Output flow:**
\[ Q = \frac{V_g \cdot n \cdot \eta_v}{231} \text{ [US gal/min]} \]

**Input torque:**
\[ M = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_m} \text{ [lbf•in]} \]

**Input power:**
\[ P = \frac{M \cdot n}{63.025} = \frac{Q \cdot \Delta p}{1714 \cdot \eta_t} \text{ [hp]} \]

**Variables:**

- \( V_g \): Displacement per rev. \( \text{cm}^3/\text{rev} \) [\( \text{in}^3/\text{rev} \)]
- \( p_{HD} \): Outlet pressure \( \text{bar} \) [\( \text{psi} \)]
- \( p_{ND} \): Inlet pressure \( \text{bar} \) [\( \text{psi} \)]
- \( \Delta p \): \( p_{HD} - p_{ND} \) \( \text{bar} \) [\( \text{psi} \)]
- \( n \): Speed \( \text{min}^{-1} \) (rpm)
- \( \eta_v \): Volumetric efficiency
- \( \eta_m \): Mechanical (torque) efficiency
- \( \eta_t \): Overall efficiency (\( \eta_v \cdot \eta_m \))
### Product code

#### Model code

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#### A  Family

| SEP3NN | Low Cost Gr3 Pump |
| SNP3NN | Std Gr3 Pump       |

#### B  Displacement

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<td>22,1 cc</td>
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#### C  Rotation

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#### D  Project version

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**E  Mounting flange**

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<th>Description (Type of flange • Type of drive gear • Preferred ports for configuration)</th>
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<td>02</td>
<td>European four bolt flange (98,4x137) - Pilot Ø50,8</td>
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<td>03</td>
<td>European four bolt flange (114,3x149,5) - Pilot Ø60,3</td>
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<td>06</td>
<td>German four bolt flange (102,0x145,0) - Pilot Ø105</td>
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<td>07</td>
<td>SAE B-Pilot Ø101,6+2 holes</td>
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<td>08</td>
<td>SAE C-Pilot Ø127+4 holes</td>
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<td>SAE A-Pilot Ø82,55+2 holes</td>
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<td>SAE B-Pilot Ø101,6+2 holes+ special for double shaft seal - Special</td>
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**F  Drive gear**

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<td>Taper 1:8-M16x1,5-Key 4,79</td>
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<td>BD</td>
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<td>DIN 5482 B28x25 L28 (for flange 06)</td>
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**G**  Rear cover

- **P1** Standard cover for pump

**H**  Inlet size  **I**  Outlet size

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<td>25x26,19x52,37x3/8-16UNC</td>
<td>31x30,18x58,72x7/16-14UNC</td>
<td>37.5/27x35,71x69,85x1/2-13UNC</td>
<td>20x40xM6</td>
<td>18x55xM8</td>
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<td>27x51xM10</td>
<td>36x62xM10</td>
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<td>H8</td>
<td>H9</td>
<td>F5</td>
<td>F6</td>
<td>F7</td>
<td>M5</td>
<td>M6</td>
<td>M7</td>
<td>MF</td>
<td>MG</td>
<td>MH</td>
<td>MN</td>
<td>MR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M27x2-ISO6149</td>
<td>M33x2-ISO6149</td>
<td>BSP 3/4 GAS</td>
<td>BSP 1 GAS</td>
<td>BSP 1-1/4 GAS</td>
<td>25x52,37x26,19xM10</td>
<td>31x30,18x58,72xM10</td>
<td>37.5x35,71x69,85xM12</td>
<td>25x52,37x26,19xM8 deep12 Horiz</td>
<td>25/20x52,37x26,19xM10 (=) - Special</td>
<td>31x30,18x58,72xM10 deep18 (=)</td>
<td>31x30,18x58,72xM10 deep12 (=)</td>
<td>37.5x35,71x69,85xM12 deep20 (=)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**J  Ports positions & Special body**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>NN</td>
<td>Std from catalogue</td>
</tr>
<tr>
<td>ZZ</td>
<td>Port type Bx-Bx in the center of the body</td>
</tr>
</tbody>
</table>

**K  Seals**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>Standard NBR seals</td>
</tr>
<tr>
<td>D</td>
<td>NBR seals + VITON shaft seal with dust lip</td>
</tr>
<tr>
<td>I</td>
<td>Two opposite shaft seal</td>
</tr>
</tbody>
</table>

**L  Screws**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Std burnished screws</td>
</tr>
<tr>
<td>B</td>
<td>Anticorrosion screws</td>
</tr>
</tbody>
</table>

**M  Set valve**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NNN</td>
<td>No valve</td>
</tr>
</tbody>
</table>

**N  Type mark**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Standard Turolla Marking</td>
</tr>
<tr>
<td>A</td>
<td>Standard Turolla Marking+Customer Code</td>
</tr>
<tr>
<td>Z</td>
<td>Without Marking</td>
</tr>
</tbody>
</table>

**O  Mark position**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Std Marking position (on top)</td>
</tr>
<tr>
<td>A</td>
<td>Special Marking position on the bottom</td>
</tr>
</tbody>
</table>
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.

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 illustration to the right 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 Turolla 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.

Pressure
- Inlet vacuum
  - Max. continuous vacuum (bar abs.) 0.8 [23.6]
  - Max. intermittent vacuum (in. Hg) 0.6 [17.7]
  - Max. pressure 3.0 [88.5]

Rated pressure
- Reaction time (100 ms max)

Peak pressure
- Time versus pressure

System pressure
- Time versus pressure

Speed
- Operating envelope

Where:
- \( N_1 \) = Minimum speed at 100 bar
- \( N_2 \) = Minimum speed at 180 bar
Hydraulic fluids

Ratings and data for SNP3NN and SEP3NN 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.

Please see Turolla publication Hydraulic Fluids and Lubricants Technical Information, L1021414 for more information.

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.

<table>
<thead>
<tr>
<th>Fluid viscosity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum (cold start)</strong></td>
<td><strong>Minimum (cold start)</strong></td>
</tr>
<tr>
<td>mm²/s [SUS] 1000 [4600]</td>
<td>°C [°F] -20 [-4]</td>
</tr>
<tr>
<td>12-60 [66-290]</td>
<td>80 [176]</td>
</tr>
<tr>
<td>10 [60]</td>
<td>90 [194]</td>
</tr>
<tr>
<td><strong>Recommended range</strong></td>
<td><strong>Maximum continuous</strong></td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td><strong>Peak (intermittent)</strong></td>
</tr>
</tbody>
</table>
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 ($\beta_x$). For:
• suction filtration, with controlled reservoir ingestion, use a $\beta_{35-45} = 75$ filter
• return or pressure filtration, use a pressure filtration with an efficiency of $\beta_{10} = 75$.

$\beta_x$ 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.

<table>
<thead>
<tr>
<th>Fluid cleanliness level (per ISO 4406)</th>
<th>Class 22/18/13 or better</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_x$ ratio (suction filtration)</td>
<td>$\beta_{35-45} = 75$ and $\beta_{10} = 2$</td>
</tr>
<tr>
<td>$\beta_x$ ratio (pressure or return filtration)</td>
<td>$\beta_{10} = 75$</td>
</tr>
<tr>
<td>Recommended inlet screen size</td>
<td>100-125 µm (0.004-0.005 in)</td>
</tr>
</tbody>
</table>

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 for 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.

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:

<table>
<thead>
<tr>
<th></th>
<th>m/s [ft/sec]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>2.5 [8.2]</td>
</tr>
<tr>
<td>Outlet</td>
<td>5.0 [16.4]</td>
</tr>
<tr>
<td>Return</td>
<td>3.0 [9.8]</td>
</tr>
</tbody>
</table>

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 3 gear pumps include tapered, 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.

Caution
In order to avoid spline shaft damages it is recommended to use carburised 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. 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 Turolla if continuously applied external radial or thrust loads occur.

Fill out this page and send the complete form to your Turolla 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**

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump displacement</td>
<td></td>
<td>cm³/rev [in³/rev]</td>
</tr>
<tr>
<td>Rated system pressure</td>
<td></td>
<td>bar [psi]</td>
</tr>
<tr>
<td>Relief valve setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump shaft rotation</td>
<td></td>
<td>left [right]</td>
</tr>
<tr>
<td>Pump minimum speed</td>
<td></td>
<td>min⁻¹ (rpm)</td>
</tr>
<tr>
<td>Pump maximum speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive gear helix angle (gear drive only)</td>
<td></td>
<td>degree</td>
</tr>
<tr>
<td>Belt type (gear drive only)</td>
<td></td>
<td>V [notch]</td>
</tr>
<tr>
<td>Belt tension (gear drive only)</td>
<td>P</td>
<td>N [lbf]</td>
</tr>
<tr>
<td>Angular orientation of gear or belt to inlet port</td>
<td>α</td>
<td>degree</td>
</tr>
<tr>
<td>Pitch diameter of gear or pulley</td>
<td>d_w</td>
<td>mm [in]</td>
</tr>
<tr>
<td>Distance from flange to center of gear or pulley</td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>
Pump life

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

All Turolla 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 effect. 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 SNP3NN 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 Turolla representative for assistance with system noise control.
Pump Performance graphs
The graphs on the next few pages provide typical output flow and input power for Group 3 pumps at various working pressures. Data were taken using ISO VG46 petroleum/mineral based fluid at 50 °C [122 °F] (viscosity = 28 mm²/s [132 SUS]).

SNP3NN/022 pump performance graph

SNP3NN/026 pump performance graph

SNP3NN/033 pump performance graph

SNP3NN/038 pump performance graph
# Product Options

## Shaft, flange, and port configurations

<table>
<thead>
<tr>
<th>Pump</th>
<th>Code</th>
<th>Flange</th>
<th>Shaft</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEP3NN</td>
<td>01BA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>1:8 tapered</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>01BA</td>
<td>European 01, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02BA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>1:8 tapered</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02BA</td>
<td>European 02, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>03BB</td>
<td>pilot Ø 60.3 mm [2.374 in]</td>
<td>1:8 tapered</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>03BB</td>
<td>European 03, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>06AA</td>
<td>pilot Ø 105 mm [4.133 in]</td>
<td>1:5 tapered</td>
<td>German std ports port X pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>06AA</td>
<td>German 01, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>06CA</td>
<td>pilot Ø 105 mm [4.133 in]</td>
<td>Tang 8 x Ø 22.2</td>
<td>German std ports port X pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>06CA</td>
<td>German 01, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEP3NN</td>
<td>01FA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>Ø 20 mm [0.787 in] parallel</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>01FA</td>
<td>European 01, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02FA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>Ø 20 mm [0.787 in] parallel</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02FA</td>
<td>European 02, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>03FB</td>
<td>pilot Ø 60.3 mm [2.374 in]</td>
<td>Ø 22 mm [0.866 in] parallel</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>03FB</td>
<td>European 03, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEP3NN</td>
<td>07GA</td>
<td>pilot Ø 101.6 mm [4.0 in]</td>
<td>Ø 22.225 mm [0.875 in] parallel</td>
<td>Vertical four bolt flanged port</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>07GA</td>
<td>SAE 8, 2-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>01DA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>Splined shaft 13T - m 1.60 DIN 5482-B22x19</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>01DA</td>
<td>European 01, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02DA</td>
<td>pilot Ø 50.8 mm [2.0 in]</td>
<td>Splined shaft 13T - m 1.60 DIN 5482-B22x19</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>02DA</td>
<td>European 02, 4-bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>Type</td>
<td>Description</td>
<td>Technical Details</td>
<td>Port Pattern</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>06DD</td>
<td>Pilot Ø 105 mm [4.0 in] German, 4-bolt</td>
<td>Splined shaft 15T - m 1.75 DIN 5482-828x25</td>
<td>German std ports port X pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>07BC</td>
<td>Pilot Ø 101.6 mm [4.0 in] SAE B, 2-bolt</td>
<td>1:8 tapered - 5/8 - 18 UNF - 2A</td>
<td>Vertical four bolt flanged port</td>
</tr>
<tr>
<td>SEP3NN</td>
<td>07SA</td>
<td>Pilot Ø 101.6 mm [4.0 in] SAE B, 2-bolt</td>
<td>Splined shaft SAE J498 13T - 16/32DP</td>
<td>Vertical four bolt flanged port</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>08RA</td>
<td>Pilot Ø 127 mm [5.0 in] SAE C, 4-bolt</td>
<td>Splined shaft SAE J498 14T - 12/24DP</td>
<td>Vertical four bolt flanged port</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>09SB</td>
<td>Pilot Ø 82.55 mm [3.25 in] SAE A, 2-bolt</td>
<td>Splined shaft SAE J498 13T - 16/32DP</td>
<td>Vertical four bolt flanged port</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>91BA</td>
<td>Outrigger bearing with European four bolt flange</td>
<td>Taper 1:8 M14x1.5 key 4x7.5</td>
<td>European flanged port + pattern</td>
</tr>
<tr>
<td>SNP3NN</td>
<td>D7SA</td>
<td>Pilot Ø 101.6 mm [4.0 in] SAE B, 2-bolt, special for double shaft seal</td>
<td>Splined shaft SAE J498 13T - 16/32DP</td>
<td>Vertical four bolt flanged port</td>
</tr>
</tbody>
</table>
Mounting flanges
Turolla offers many types of industry standard mounting flanges. This table shows order codes for each available mounting flange and its intended use:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>European 50.8 mm [2.0 in] 4-bolt</td>
</tr>
<tr>
<td>02</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>European 60.3 mm [2.374 in] 4-bolt</td>
</tr>
<tr>
<td>06</td>
<td>German 105 mm [4.134 in] 4-bolt</td>
</tr>
<tr>
<td>07</td>
<td>SAE B 2-bolt</td>
</tr>
<tr>
<td>08</td>
<td>SAE C 4-bolt</td>
</tr>
<tr>
<td>09</td>
<td>SAE A 2-bolt</td>
</tr>
</tbody>
</table>
Shaft options
Direction is viewed facing the shaft. Group 3 pumps are available with a variety of splined, parallel, and tapered shaft ends. Not all shaft styles are available with all flange styles.

Shaft availability and nominal torque capability

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>06</th>
<th>07</th>
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<tr>
<td>AA</td>
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<td>GB</td>
<td>Parallel Ø22,225xL25,4-Key 6,375x6,375x25,4+thd hole:1/4-20UNC-28</td>
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<td>SA</td>
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</table>

Turolla recommends mating splines conform to SAE J498 or DIN 5482. Turolla 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.
Port configurations
Various port configurations are available on Group 3 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)
A table of dimensions is on the next page.

Available port configurations

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A2</td>
<td>8,5x22,23x47,63x ³/₈ -16UNC SAE flanged port</td>
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<tr>
<td>A3</td>
<td>25x26,19x52,37x ³/₈ -16UNC</td>
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<tr>
<td>A4</td>
<td>31x30,18x58,72x ⁷/₁₆ -14UNC</td>
</tr>
<tr>
<td>A5</td>
<td>37,5/27x35,7x69,85x ½ -13UNC</td>
</tr>
<tr>
<td>B7</td>
<td>20x40xM6</td>
</tr>
<tr>
<td>BA</td>
<td>18x55xM8</td>
</tr>
<tr>
<td>BB</td>
<td>27x55xM8</td>
</tr>
<tr>
<td>BC</td>
<td>36/27x55xM8</td>
</tr>
<tr>
<td>C3</td>
<td>13,5x30xM6</td>
</tr>
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<td>C7</td>
<td>20x40xM8</td>
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<td>1 ½x-12UN</td>
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<td>E8</td>
<td>1 ¾x-12UN</td>
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<td>E9</td>
<td>1 ¼-12UN</td>
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<td>EA</td>
<td>1 ⁷/₈-12UN</td>
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<tr>
<td>F5</td>
<td>¾ GAS</td>
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<tr>
<td>F6</td>
<td>1 GAS</td>
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<tr>
<td>F7</td>
<td>1 ¼ GAS</td>
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</table>

I  Outlet port

For code letters and descriptions see the table above.
## Porting

### Port dimensions

<table>
<thead>
<tr>
<th>Port type</th>
<th>Dimensions</th>
<th>Type (displacement)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
</table>
The drawing shows the SNP3NN standard porting for 01FA, 01DA and 01BA. The configurations 01FA and 01BA are available for the SEP3NN.

**SNP3NN – 01FA, 01DA, 01BA / SEP3NN – 01BA**

The SEP3NN overall length is 12 mm [0.472 in] less than the SNP3NN for the whole range of displacements (22.1 to 44.1 cm³/rev [1.35 to 2.69 in³/rev]).

**Model code examples and maximum shaft torque**

<table>
<thead>
<tr>
<th>Flange/drive gear</th>
<th>Model code example</th>
<th>Maximum shaft torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>01DA</td>
<td>SNP3NN/075LN01DAP1CDCANNN/NNNNN</td>
<td>290 Nm [2566 lb•in]</td>
</tr>
<tr>
<td>01FA</td>
<td>SNP3NN/033RN01FAP1CAC7NNN/NNNNN</td>
<td>210 Nm [1858 lb•in]</td>
</tr>
<tr>
<td>01BA</td>
<td>SNP3NN/022RN01BAP1C7C7NNN/NNNNN</td>
<td>350 Nm [3097 lb•in]</td>
</tr>
</tbody>
</table>

For further details on ordering, see Model Code, pages 8 - 11.
SNP3NN – 02FA, 02DA and 02BA

This drawing shows the standard porting for 02FA, 02DA and 02BA.

SNP3NN – 02FA, 02DA and 02BA dimensions

<table>
<thead>
<tr>
<th>Frame size</th>
<th>022</th>
<th>026</th>
<th>033</th>
<th>038</th>
<th>044</th>
<th>048</th>
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<th>063</th>
<th>075</th>
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<tbody>
<tr>
<td>Dimension</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
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<td>72.5</td>
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Model code examples and maximum shaft torque

<table>
<thead>
<tr>
<th>Flange/drive gear configuration</th>
<th>Model code example</th>
<th>Maximum shaft torque N•m (lb•in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02FA</td>
<td>SNP3NN/044RN02FAP1C00NNN/NNNN 02FA</td>
<td>210 [1858]</td>
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<td>02DA</td>
<td>SNP3NN/033RN02DAP1CAC7NNNN/NNNN 02DA</td>
<td>290 [2566]</td>
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<tr>
<td>02BA</td>
<td>SNP3NN/026LN02BAP1C077NNNN/NNNN 02BA</td>
<td>350 [3097]</td>
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For further details on ordering, see Model Code, pages 8 - 11.
SNP3NN – 03FB, 03BB
This drawing shows the standard porting for 03FB and 03BB.

### SNP3NN – 03FB and 03BB dimensions

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<th>038</th>
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<th>055</th>
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<th>075</th>
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<tbody>
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<td>E</td>
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<tr>
<td>Outlet c</td>
<td>20 [0.787]</td>
<td>27 [1.063]</td>
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<td>d</td>
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<tr>
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Model code examples and maximum shaft torque

<table>
<thead>
<tr>
<th>Flange/drive gear configuration</th>
<th>Model code example</th>
<th>Maximum shaft torque N•m [lb•in]</th>
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</thead>
<tbody>
<tr>
<td>03FB</td>
<td>SNP3NN/044LN03F8P1CACANNNNN/NNNNNN</td>
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<td>03BB</td>
<td>SNP3NN/090RN03F8P1CDCANNNNN/NNNNNN</td>
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For further details on ordering, see Model Code, pages 8 - 11.
SNP3NN – 06DD, 06AA
This drawing shows the standard porting for 06DD and 06AA.

SNP3NN – 06DD and 06AA dimensions

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<th>063</th>
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<tr>
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<td>Model code example</td>
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<td>SNP3NN/026L06AAP1BBBANNNN/NNNNN</td>
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For further details on ordering, see Model Code, pages 8 - 11.
SNP3NN and SEP3NN – 07SA, 07GA
The drawing shows the SNP3NN standard porting for 07SA and 07GA. The same configurations are available for the SEP3NN.

The SEP3NN overall length is 12 mm [0.472 in] less than the SNP3NN for the whole range of displacements (22.1 to 44.1 cm³/rev [1.35 to 2.69 in³/rev]).

SNP3NN, SEP3NN – 07SA and 07GA dimensions

<table>
<thead>
<tr>
<th>Type (displacement)</th>
<th>022</th>
<th>026</th>
<th>033</th>
<th>038</th>
<th>044</th>
<th>048</th>
<th>055</th>
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</table>

**Inlet**
- C: 25.4 [1.0] 31.8 [1.251] 38.1 [1.5]

**Outlet**
- c: 19.1 [0.751] 25.4 [1.0] 31.8 [1.251]
- d: 22.23 [0.875] 26.19 [1.031] 30.18 [1.188]
- e: 47.63 [1.875] 52.37 [2.061] 58.72 [2.311]
SNP3NN and SEP3NN – 07SA, 07GA (cont.)

Model code examples and maximum shaft torque

<table>
<thead>
<tr>
<th>Flange/drive gear configuration</th>
<th>Model code example</th>
<th>Maximum shaft torque N•m [lb•in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>07SA</td>
<td>SNP3NN/063LN075AP1A5A4NNNN/NNNNN</td>
<td>270 [2389]</td>
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<tr>
<td>07GA</td>
<td>SNP3NN/026LN07GAP1A3A2NNNN/NNNNN</td>
<td>230 [2035]</td>
</tr>
</tbody>
</table>

For further details on ordering, see Model Code, pages 8-11.
Local address

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