

GEAR PUMPS

D Series and XD Series Gear Pumps | Technical Information





History of Revisions

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Overview

The D Series fixed displacement gear pump has been specifically designed for demanding mobile equipment applications where maximum performance is required at peak power levels and operating temperatures. The design integrates cast iron construction with pressure balanced thrust plates to deliver consistent efficiency across the entire operating range of pressure, speed, and temperature; all in an industry-leading package size that maximizes power density. For technical information on D Series motors, refer to [D Series Hydraulic Gear Motors Technical Information 11044656](#).

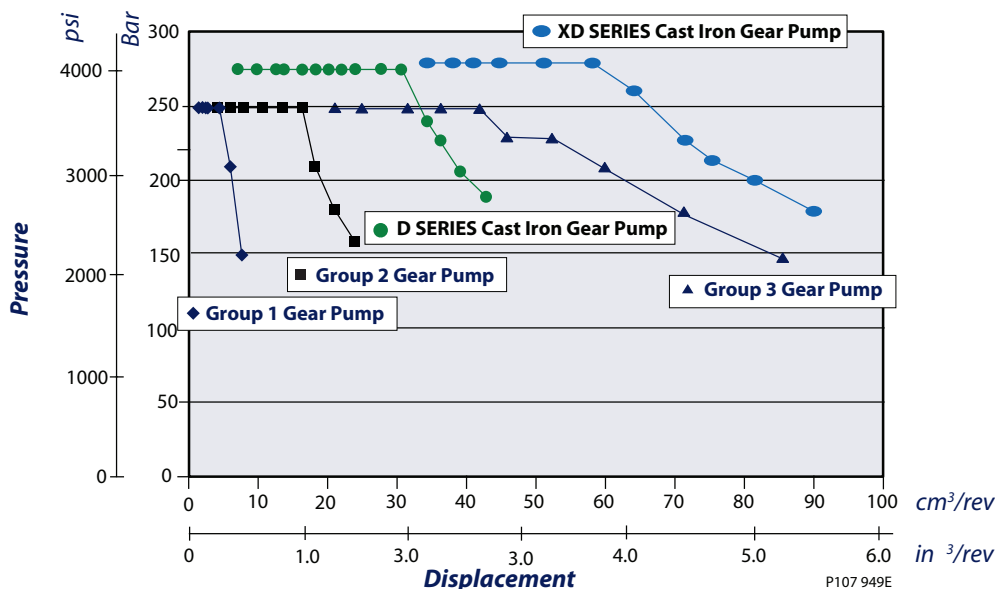
Features and Benefits

- High strength cast iron construction allows consistently efficient performance and long life in continuous operation at 276 bar [4000 psi] and peak conditions of 303 bar [4400 psi].
- Custom engineered bearings, pressure-balanced load plates, and viton seals optimize internal lubrication allowing for long life with intermittent fluid temperatures up to 115 °C [239 °F] and fluid viscosities as low as 8 mm²/sec (cSt) [36 SUS].
- Compact three-piece design maximizes power density and creates one of the shortest multi-section pumps (with up to four pumping sections) in the global marketplace.
- Bearings located in the front flange increase radial/axial load carrying capability and eliminate the need for most bolt-on outrigger bearings.

Quick Reference Chart

The D pump blends the traditional Group 2 (SAE-A) and Group 3 (SAE-B) frame sizes in a single package with displacements from 7 cc to 45 cc [0.43 in³ to 2.75 in³]. These displacements, in addition to a wide variety of shafts, flanges, ports, and integrated valve options can be used in virtually any combination to offer greater design flexibility and meet specific application requirements.

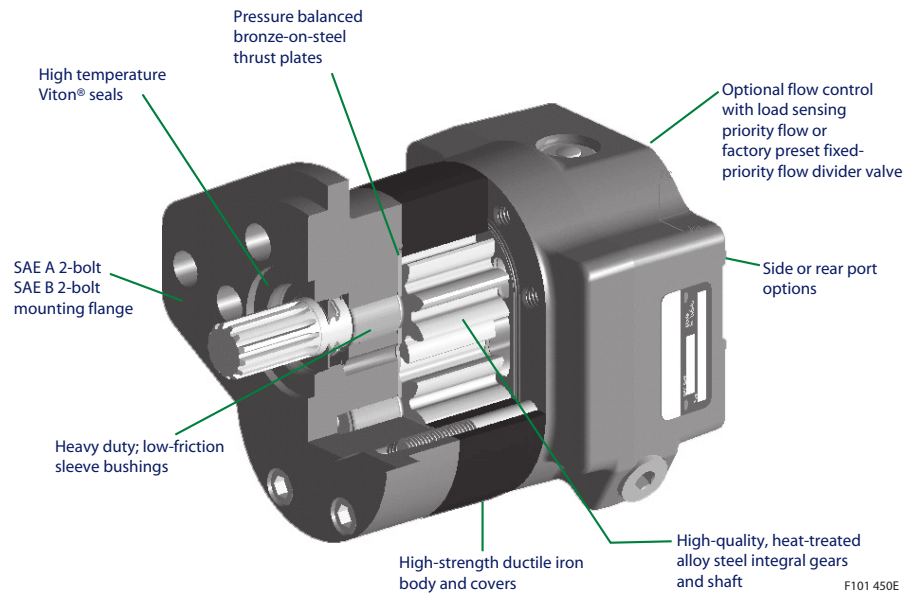
Turolla Gear Pumps





Construction

Quality components and construction



Cast Iron Housings and Bearings

The three piece structural members of the pump are made of high-strength cast ductile iron. Cast iron provides contamination resistance, thermal stability and the strength needed for consistently high levels of performance and durability needed in demanding off highway applications.

Heavy duty, low friction, PTFE-lined sleeve bushings have been optimized to provide long life in low viscosity, high pressure conditions. The bearings are located in the front mounting flange, rear cover, and bearing plate (for multiple section pumps) and allow the D pump to be 20% shorter than a typical bearing block design pump. In addition, the proximity of the front bearing to the mounting flange increases the radial load capacity of the pump, eliminating the need for most bolt-on outrigger requirements.

Pressure Balance and Sealing

The pump incorporates two steel-backed bronze thrust plates seated in depressions in the mounting flange, rear cover, and bearing plate (for multiple section pumps). Underneath the front plate (known as the deflecting plate) is the load seal.

The "E" shaped load seal distributes system pressure underneath the plate and enables the plate to deflect and maintain a tight sealing surface against the side face of the gears.

The tight sealing action allows the pump to maintain very high levels of volumetric efficiency, even when operating in extreme temperature, pressure and speed conditions.



One Piece Gear Construction

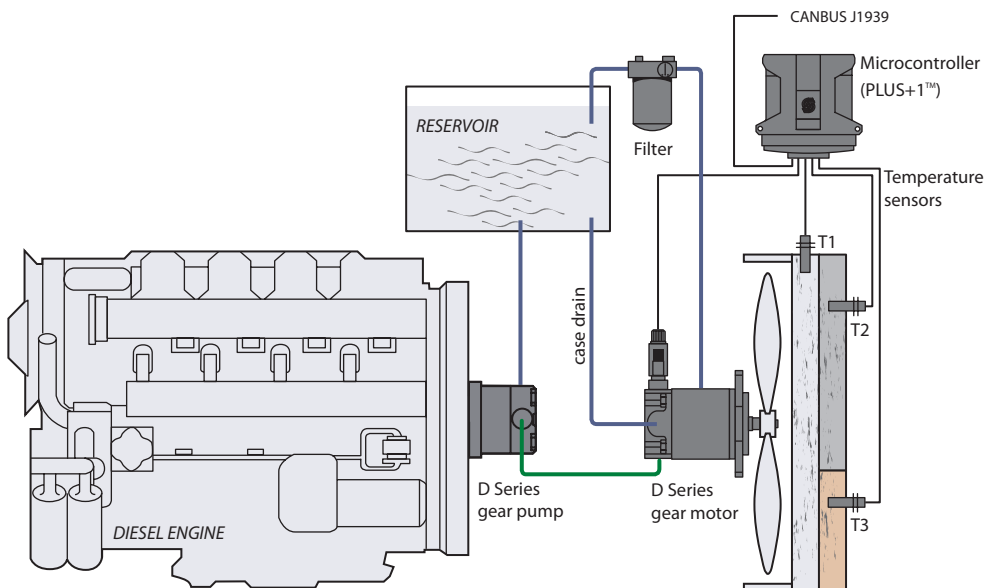
All D Series pump gear shafts are of one-piece construction. This enables the shaft to provide uniform high strength and accurate gear profile relative to the journals for smooth mesh operation. The integral gear shafts are constructed of heat treated AISI 8620 steel, manufactured to precise tolerances and surface finishes, for maximal life and minimal leakage. This integral design eliminates the potential problems of fatigue stress and gear face mismatch often associated with two-piece gear shaft designs.

Multiple Pump Configuration

D Series pumps can be coupled together to produce tandem, triple and even quadruple section units. The interconnecting chambers accommodate fluid flow between sections and allow the number of inlet connections to be minimized. Systems that require operation with different fluids and/or reservoirs can be accommodated with sealed auxiliary covers between sections.

System Schematic

Gear Pump/Gear Motor Fan Drive System with Electronic Control



P107 929E



Typical Applications

The D Series gear pump is commonly applied in the following type of applications:

- Wheel loader - Aggressive duty cycles with continuous working pressures above 250 bar [3600 psi]
- Mining equipment - Increased exposure to system contamination in a corrosive environment
- Skid steer loaders - Multiple pump combinations with short length and common inlets
- Work function attachments - Rapid loading of cylinders/motors in high bulk modulus systems causing pressure rise rates greater than 3000 bar/sec
- Agricultural sprayers - Pumps with integrated valves including priority flow dividers and load sense steering
- Pavers - D pumps integrated with other Turolla components including variable displacement piston pumps, aluminum gear pumps and cartridge valves
- Fan drives - High levels of performance with elevated temperatures and minimal oil viscosities and restrictive envelope dimensions

Product Features

Features	Description
Construction	Heavy duty ductile iron 3-piece construction with pressure balance load plates and viton seals
Displacements	7 to 45 cm ³ [0.43 to 2.75 in ³ /rev]
Continuous Pressure	276 bar [4000 psi] up to 32 cm ³ [1.94 in ³ /rev]
Peak Pressure	303 bar [4400 psi] up to 32 cm ³ [1.94 in ³ /rev]
Speed	600 to 3400 min ⁻¹ (rpm) - up to 25cm ³ [1.55 in ³ /rev]
Mounting	SAE A two bolt, SAE B two bolt, Perkins engine mount
Shaft (types)	Straight keyed, 1:8 tapered keyed, 9T, 11T, 13T and 15T splined
Ports	SAE O-ring boss, SAE split flange, beaded tube inlet (axial and radial)
Fluid viscosity*	8 mm ² /sec (cSt) [36 SUS] minimum, 1600 mm ² /sec (cSt) [7500 SUS] maximum
Filtration requirement	22/18/13 ISO 4406 at motor inlet
Fluids	Petroleum/mineral based
Operating temperature*	-40°C [-40°F] minimum for cold start 110°C [230°F] normal operating conditions 115°C [239°F] peak intermittent
Configurations	Single, tandem, triple, and quadruple multisection pumps available with common inlets. Integrated auxiliary cover for through drive applications.
Integrated valve options	Priority flow divider with priority relief Priority steering with steering relief Load sense priority flow divider

* Temperature and viscosity requirements must be satisfied concurrently.



Technical Specifications

Technical Specifications

Ratings	Units	07	10	11	13	14	17	19	21	23	25	29	32	36	38	41	45
Displacement	cm ³ /rev	7.0	9.5	10.8	12.6	14.3	17.0	19.0	20.5	22.5	25.4	29.0	31.8	36.1	38.0	41.0	45.1
	in ³ /rev	0.43	0.58	0.66	0.77	0.87	1.04	1.16	1.25	1.37	1.55	1.77	1.94	2.20	2.32	2.50	2.75
Rated pressure	bar	276	276	276	276	276	276	276	276	276	276	276	276	241	228	207	190
	psi	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	3500	3300	3000	2750
Peak pressure	bar	303	303	303	303	303	303	303	303	303	303	303	303	265	250	228	209
	psi	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400	3850	3630	3300	3025
Speed min ⁻¹ (rpm)	maximum	3400	3400	3400	3400	3400	3400	3400	3400	3400	3400	3200	3000	2750	2750	2500	2500
	minimum*	1200	900	900	700	700	600	600	600	600	600	600	600	600	600	600	600
Theoretical flow at max speed	l/min	24.0	32.3	36.7	42.9	48.5	57.9	64.6	69.6	76.3	86.4	92.8	95.4	99.0	104.5	102.4	112.7
	US gal/min	6.3	8.5	9.7	11.3	12.8	15.3	17.1	18.4	20.2	22.8	24.5	25.2	26.2	27.6	27.1	29.8
Weight	kg	7.2	7.3	7.4	7.5	7.6	7.8	7.9	7.9	8.1	8.3	8.4	8.6	8.8	9.0	9.1	9.4
	lb	15.8	16.1	16.3	16.5	16.7	17.1	17.4	17.5	17.8	18.2	18.6	19.0	19.6	19.8	20.2	20.7
Mass moment of inertia	x10 ⁻⁶ kg·m ²	60	71	77	85	92	104	105	119	128	141	157	170	188	197	218	228
	x10 ⁻⁶ slug·ft ²	44	53	57	63	68	77	77	88	95	104	116	125	139	145	155	168

* minimum speed at maximum pressure

Fluid Specifications

Parameter	Unit	Minimum	Continuous	Maximum
Viscosity*	mm ² /sec (cSt) [SUS]	8	10 - 100	1600
		[36]	[50 - 212]	[7500]
Temperature*	°C [°F]	-40 [-40]	110 [230]	115 [239]
Cleanliness	ISO 4406 Class 22/18/13 or better			
Filtration efficiency, charge filtration	$\beta_{15-20}=75$ ($\beta_{10} \geq 10$)			

* Temperature and viscosity requirements must be satisfied concurrently.

Ratings are based on operation with premium petroleum-based hydraulic fluids containing oxidation, rust, and foam inhibitors.

Inlet Pressure

Maximum continuous vacuum	bar absolute [inches mercury vacuum]	0.8 [6.3]
Maximum intermittent vacuum		0.6 [12.2]
Maximum charged inlet pressure	bar [psi]	3.0 [44]



Operating parameters

Sizing Equations

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

Based on SI units

$$\text{Input flow } Q = \frac{V_g \cdot n}{1000 \cdot \eta_v} \quad (\text{l/min})$$

$$\text{Output torque } M = \frac{V_g \cdot \Delta p \cdot \eta_m}{20 \cdot \pi} \quad (\text{N}\cdot\text{m})$$

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

$$\text{Motor speed } n = \frac{Q \cdot 1000 \cdot \eta_v}{V_g} \quad (\text{min}^{-1}(\text{rpm}))$$

Based on US units

$$Q = \frac{V_g \cdot n}{231 \cdot \eta_v} \quad (\text{US gal/min})$$

$$M = \frac{V_g \cdot \Delta p \cdot \eta_m}{2 \cdot \pi} \quad (\text{lbf}\cdot\text{in})$$

$$P = \frac{Q \cdot \Delta p \cdot \eta_t}{1714} = \frac{M \cdot n}{63\,025} \quad (\text{hp})$$

$$n = \frac{Q \cdot 231 \cdot \eta_v}{V_g} \quad (\text{min}^{-1}(\text{rpm}))$$

Variables SI units [US units]

V_g	= Displacement per revolution	cm^3/rev [in^3/rev]
p_o	= Outlet pressure	bar [psi]
p_i	= Inlet pressure	bar [psi]
Δp	= $p_o - p_i$ (system pressure)	bar [psi]
n	= Speed	min^{-1} (rpm)
η_v	= Volumetric efficiency	
η_m	= Mechanical efficiency	
η_t	= Overall efficiency ($\eta_v \cdot \eta_m$)	



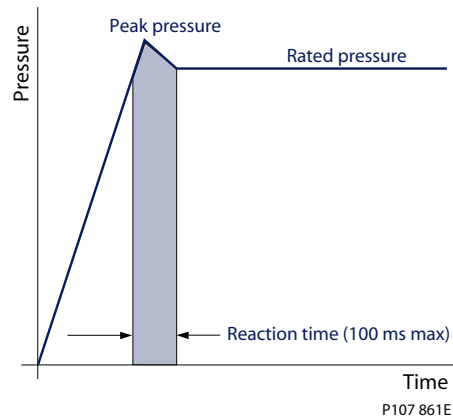
Pressure

Definitions of the D Series operating parameters appear below. Consult Turolla technical support for applications running outside of these parameters.

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

Pressure vs. Time



Rated Pressure

Rated pressure is the average, regularly occurring operating outlet 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 between the inlet and outlet ports. It is a dominant operating variable affecting hydraulic unit life. High system pressure reduces expected pump life. System pressure must remain at, or below, rated pressure during normal operation to achieve expected life.

Inlet Vacuum

Inlet vacuum must be controlled in order to realize expected performance and pump life. System design must meet inlet vacuum requirements during all modes of operation. Expect lower inlet vacuums during cold start situations. Low vacuum condition should improve quickly as fluid warms.

Pressure Rise Rate

The maximum pressure rise rate is the rate of increase in system pressure as measured at the outlet port of the pump. High pressure rise rates are commonly seen on work function applications during motor start-up, completion of cylinder stroke, and during rapid shifting of control valves. The maximum pressure rise rate of the D pump is 11,720 bar/sec [170,000 psi/sec]. During rapid rise rate situations, the system pressure must not exceed the rated pressure of the pump.



Temperature and Viscosity

Temperature

High temperature limits apply at the inlet port of the pump. The pump should run at or below the maximum continuous temperature.

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

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.

Continuous temperature is the temperature at or below the temperature which normal pump life can be expected.

Maximum temperature is the highest temperature that is tolerable by the machine for a transient/limited time (duty cycle 1% or less). At maximum temperature, oil viscosity must not go lower than minimum recommended viscosity.

Viscosity

Continuous viscosity: Recommended viscosity range for maximum efficiency and pump life.

Minimum viscosity occurs only during brief occasions of maximum fluid temperature and severe duty cycle operation. It's the minimum acceptable viscosity to guarantee the pump life. (Duty cycle 1% or less)

Maximum viscosity occurs only during cold start at very low temperatures. It is the upper limit of viscosity that allows the pump to start. During this condition, limit speeds until the system warms up.

Temperature and viscosity requirements must be concurrently satisfied.

Speed

Maximum speed is the limit recommended for operation 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**.



Hydraulic Fluid

Ratings and data for gear pumps are based on operation 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.

Use only clean fluid in the pump and hydraulic circuit.

⚠ Caution

Never mix hydraulic fluids.

For more information on hydraulic fluid selection, see Turolla publications [Hydraulic Fluids and Lubricants, Technical Information L1021414](#), and [Experience with Biodegradable Hydraulic Fluids, Technical Information L1021903](#).

Filtration

Filters

Use a filter that conforms to Class 22/18/13 of ISO 4406 (or better). It may be on the pump outlet (discharge filtration) or inlet (pressure 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 discharge filtration with controlled reservoir ingress rate, use a $\beta_{35-45} = 75$ filter
- for pressure filtration, use a 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.

Every system is unique. Only a thorough testing and evaluation program can fully validate the filtration system. For more information, see Turolla publication, [Design Guidelines for Hydraulic Fluid Cleanliness 520L0467](#).

Fluid cleanliness level and β_x ratio

Fluid cleanliness level (per ISO 4406)	Class 22/18/13 or better
β_x ratio (discharge filtration)	$\beta_{35-45} = 75$ and $\beta_{10} = 2$
$\beta_{35-45} = 75$ and $\beta_{10} = 2$	$\beta_{10} = 75$
Recommended inlet screen size	100 – 125 μm [0.0039 – 0.0049 in]



Reservoir

The **reservoir** provides clean fluid, dissipates heat, removes entrained air, and allows for fluid volume changes associated with fluid expansion and during all system operating modes. A correctly sized reservoir accommodates maximum volume changes during all system operating modes. It promotes de-aeration 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, allowing for expansion due to temperature changes. A fluid volume of one to three times the pump output flow (per minute) is satisfactory. The minimum recommended reservoir capacity is 125% of the fluid volume.

Put the return-line below the lowest expected fluid level to allow discharge into the reservoir for maximum dwell and efficient de-aeration. A baffle (or baffles) between the return and suction lines promotes de-aeration and accommodates fluid surges.

Line Sizing

Choose line sizes that accommodate maximum fluid velocity to reduce system noise, pressure drops, and overheating in order to maximize system life and performance. Line velocities shown in the following table provide a general rule of thumb. Final selection of line sizing and fittings must comply with all pressure ratings.

Maximum line velocity

Inlet	m/sec [ft/sec]	2.4-4.3 [8-14]
Outlet		6-9 [20-30]

Most systems use hydraulic oil containing 10% dissolved air by volume. Over-aeration, or entrained air is the result of flow line restrictions, where the dissolved air comes out of solution, or when air is allowed to leak into the hydraulic circuit. These include inadequate pipe sizes, sharp bends, or elbow fittings, causing reduction of flow-line cross-sectional area. This problem will not occur if these circuit recommendations are followed, rated speed requirements are maintained, and reservoir size and location are adequate.

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 with an oil film between the gear/shaft and bearing surfaces. If the oil film is sufficiently sustained through proper system maintenance and operating within recommended limits, long life can be expected.

β_{10} life expectancy number is generally associated with rolling element bearings. It does not exist for hydrodynamic bearings.

When submitting an application for review, provide machine duty cycle data including percentage 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.



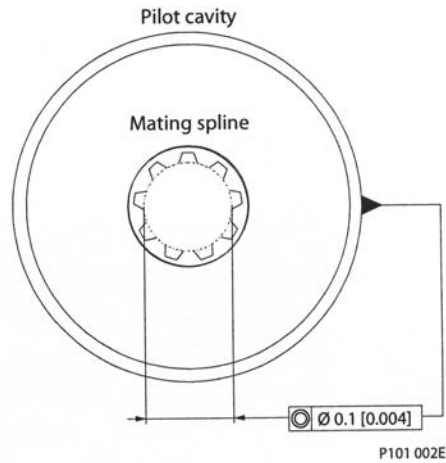
Pump Shaft Connection

Shaft options for gear pumps include tapered, splined or parallel shafts.

Plug-in drives, 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 three-piece coupling minimizes radial or thrust shaft loads.

Pump Shaft Connection



Lubricate all shaft couplings. Failure to do so will result in premature shaft failure.

Caution

To avoid spline shaft damages, use carburized and hardened steel couplings with 80-82 HRA surface hardness.

Radial and Axial Loading

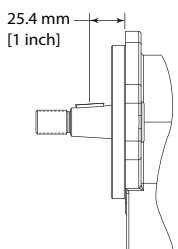
Allowable radial shaft loads are a function of the load position, load orientation, and operating pressure. All external shaft loads have an effect on bearing life, and may affect pump performance.

In applications where external shaft loads cannot be avoided, minimize the impact on the pump by optimizing the orientation and magnitude of the load. Use tapered input shafts for applications with radial shaft loads. The table below shows the preferred orientation for radial loads assuming maximum pressure. For assistance concerning shaft loading, contact your Turolla representative.

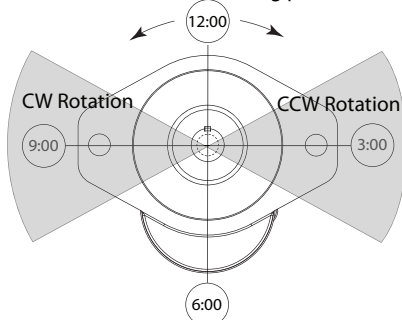
Maximum radial and axial loads

Ratings	Units	7	10	11	13	14	17	19	21	23	25	29	32	36	38	41	45
Maximum radial load	lbf	1430	1430	1430	1430	1430	1430	1360	1300	1210	1070	870	700	420	270	450	620
	N	6361	6361	6361	6361	6361	6361	5943	5783	5382	4760	3870	3114	1868	1201	2002	2758
Push/Pull axial load	lbf	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
	N	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557	1557

Shaft loading



Recommended loading position



- All values measured 25.4 mm [1 inch] from the mounting flange
- For other orientations and distances, higher radial loads at lower pressures contact your S-D representative

P107 928E



D Series Model Code

Single Pump Order Code

Example

The order code below provides an example of a single section pump with integrated priority flow divider

A	B1 B2	C	D	E	F	H	J	K
DE1R	21SH	AC	F09A	15X	172	CZ	AN	NNN

Code	Position	Description
DE1R	A	D Series pump, single section, right hand rotation
21	B1	21 cm ³ displacement
SH	B2	13 tooth spline input shaft
AC	C	SAE A two bolt mounting flange
F09A	D	Integrated priority flow divider with cartridge style priority relief, 1 5/16-12 side inlet, 3/14-16 side priority, 7/8-14 side secondary
15X	E	15.1 l/min[4 US gal/min] priority flow setting
172	F	172 bar [2495 psi] priority relief setting
CZ	H	Assembly screws
AN	J	Standard Nameplate
NNN	K	No special features, black paint

DE1: D Series Cast Iron Gear Pump, Single Section

A	B1 B2	C	D	E	F	H	J	K
DE1								

A Rotation - viewed from drive shaft

Code	Description
L	Left hand (counterclockwise)
R	Right hand (clockwise)

B1 Displacement

Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]

Code	Description
23	22.5 cm ³ /rev [1.37 in ³ /rev]
25	25.4 cm ³ /rev [1.55 in ³ /rev]
29	29.0 cm ³ /rev [1.77 in ³ /rev]
32	31.8 cm ³ /rev [1.94 in ³ /rev]
36	36.1 cm ³ /rev [2.20 in ³ /rev]
38	38.0 cm ³ /rev [2.32 in ³ /rev]
41	41.0 cm ³ /rev [2.50 in ³ /rev]
45	45.1 cm ³ /rev [2.75 in ³ /rev]



B2 Input Shaft

Code	Description
SE*	SAE 9 tooth spline, 31.8 mm [1.25 in] length
SC	SAE 11 tooth spline, 38.1 mm [1.5 in] length
SF	11 tooth spline, 31.8 mm [1.25 in] length (special modified length)
SH	SAE 13 tooth spline, 41 mm [1.62 in] length
SV	15 tooth spline, 46 mm [1.81 in] length (use with mounting flange AR or BR)
PB	22 mm [7/8 in] diameter, 41 mm [1.62 in] length, with 1/4 key
PD	19 mm [3/4 in] diameter, 51 mm [2 in] length, with 3/16 key
PZ	25.4 mm [1 in] diameter, 46 mm [1.81 in] length with 1/4 key
TA	1:5 taper, 25mm [1 in] dia, 58mm [2.30 in] length, 5/8 thread, M5 key with locknut and washer
TG	1:8 taper, 22mm [7/8 in] dia, 50mm [1.95 in] length, 5/8 thread with key, locknut and washer
TH	1:8 taper, 22mm [7/8 in] dia, 49mm [1.94 in] length, 9/16 thread with key, locknut and washer
TX	1:4 taper, 22mm [7/8 in] dia, 50mm [1.98 in] length, 5/16 internal thread with key
WT	Input shaft similar to TH option with 34 tooth helical gear for Perkins engine mount
AB	22mm [7/8 in] diameter, 41mm [1.62] length with 1/4 key with 9T spline through drive
AC	SAE 11 tooth spline, 38.1 mm [1.5 in] length with 9T spline through drive
AH	SAE 13 tooth spline, 41 mm [1.62 in] length with 9T spline through drive

* Contact factory for units with SE (9T spline) to verify torque limits

C Mounting Flange

Code	Description
AA	SAE A 2-bolt
AC	SAE A 2-bolt, use with integral PFD/Steering Cover
AL	SAE A 2-bolt, two shaft seals with weep hole
AM	SAE A 2-bolt, with T seal
AP	SAE A 2-bolt, with T seal, use with integral PFD/Steering cover
AR	SAE A 2-bolt, use with 15 T spline input drive
AS	SAE A 2-bolt, use with integral PFD/Steering cover and 15 T input spline
AT	SAE A 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering cover
BB	SAE B 2-bolt
BC	SAE B 2-bolt, use with integral PFD/Steering cover
BM	SAE B 2-bolt, with T seal
BP	SAE B 2-bolt, with T seal, use with integral PFD/Steering cover
BR	SAE B 2-bolt, use with 15 T spline input drive
BS	SAE B 2-bolt, use with integral PFD/Steering cover and 15 T input spline
BT	SAE B 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering Cover
BW	SAE B 2-bolt, two shaft seals with weep hole
PP	Perkins 6 bolt flange with (2) seals (use with WT input shaft and clockwise rotation)



A	B1	B2	C	D	E	F	H	J	K
D	E	1							

D

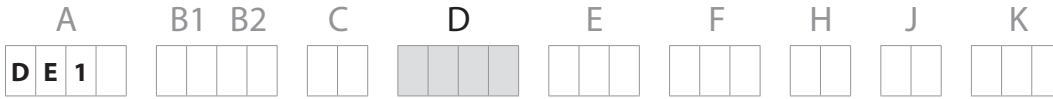
 Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

Code	Inlet	Outlet	Description
N101	1 1/16-12 side inlet	7/8-14 side outlet	SAE O-ring boss ports No integrated valves No auxiliary flange
N103	1 5/16-12 side inlet	7/8-14 side outlet	
N104	1 5/16-12 side inlet	1 1/16-12 side outlet	
N125	1 5/8-12 side inlet	1 1/16-12 side outlet	
N501	1 1/16-12 rear inlet	7/8-14 rear outlet	
N503	1 5/16-12 rear inlet	7/8-14 rear outlet	
N504	1 5/16-12 rear inlet	1 1/16-12 rear outlet	
N252	M33x2-6H rear inlet	M22x1.5-6H side outlet	SAE Metric Ports – No Integrated Valves
N402	3/4-14 side inlet	1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
N403	1-11 side inlet	1/2-14 side outlet	
N404	1 1/4-11 side inlet	1/2-14 side outlet	
N407	1-11 side inlet	3/4-14 side outlet	
N408	1 1/4-11 side inlet	3/4-14 side outlet	
N342	1 1/4 side split flange inlet	3/4 side split flange outlet (SAE code 61)	SAE split flange ports No integrated valves No auxiliary flange
N704	1 1/4 side tube inlet	7/8-14 side ORB outlet	Beaded tube inlet port, SAE O-ring boss outlet port No integrated valves No auxiliary flange
N708	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N715	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N720	1 1/4 side tube inlet	7/8-14 side ORB outlet	
B103*	1 5/16-12 side inlet	7/8-14 side outlet,	SAE-A 2-Bolt Auxiliary Flange SAE O-ring boss ports No integrated valves
B104*	1 5/16-12 side inlet	1 1/16-12 side outlet	
R104	1 5/16-12 side inlet	1 1/16-12 side outlet	Integrated Relief Valve Internally Drained Maximum Displacement 23cc

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP



D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

F09A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)	Integrated Priority Flow Divider, cartridge style relief for settings up to: 221bar and 34.3 l/min [3200 psi and 9 US gal/min]
F09B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)	
F13A**	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)	
F13B***	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)	
F21A**	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)	
F21B***	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)	
F25A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)	
F25B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)	

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP



D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

Code	Inlet / Outlet	Description
D23A*	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE A flange)	Integrated Steering Cover, Priority Relief Valve (Cartridge Style) for settings up to: 221 bar and 34.3 l/min [3200 psi and 9 US gal/min]
D23B**	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE B flange)	
D24A*	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE A flange)	
D24B**	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE B flange)	
L01A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-A flange)	Integrated Load Sense Divider (Dynamic), Priority Relief Valve
L01B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-B flange)	
L08A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-A flange)	
L08B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-B flange)	

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP

A variety of integrated load sense priority flow divider covers are available from Turolla. Please contact your technical representative to determine which hardware best suits specific application needs.



	A	B1	B2	C	D	E	F	H	J	K
D	E	1								

E Flow Control Valve Setting

Code	Description	
NNN	No flow control setting, standard for units without integrated flow control valves	
04X	3.8 l/min [1 US gal/min]	For integrated PFD Steering cover with cartridge style relief valve (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A or F25B)
08X	7.6 l/min [2 US gal/min]	
11X	11.4 l/min [3 US gal/min]	
15X	15.1 l/min [4 US gal/min]	
19X	18.9 l/min [5 US gal/min]	
23X	22.7 l/min [6 US gal/min]	
27X	26.5 l/min [7 US gal/min]	
30X	30.3 l/min [8 US gal/min]	
34X	34.3 l/min [9 US gal/min]	
38A	10 bar standby	For integrated load sense divider (use with L08A or L08B rear ports)
38L	10 bar standby	For integrated load sense divider (use with L01A or L01B side ports)
R1N	Maximum flow not to exceed 75 l/min, pressure range from 7-55 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under
R2N	Maximum flow not to exceed 75 l/min, pressure range from 41-248 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under



A	B1	B2	C	D	E	F	H	J	K
D	E	1							

F Pressure Control Valve Setting

Code	Description
000	No pressure control settings, standard for units without integrated pressure control valves
034	34 bar [500 psi]
041	41 bar [600 psi]
048	48 bar [700 psi]
055	55 bar [800 psi]
062	62 bar [900 psi]
069	69 bar [1000 psi]
076	76 bar [1100 psi]
083	83 bar [1200 psi]
090	90 bar [1300 psi]
097	97 bar [1400 psi]
103	103 bar [1500 psi]
110	110 bar [1600 psi]
117	117 bar [1700 psi]
124	124 bar [1800 psi]
131	131 bar [1900 psi]
138	138 bar [2000 psi]
145	145 bar [2100 psi]
152	152 bar [2200 psi]
159	159 bar [2300 psi]
165	165 bar [2400 psi]
172	172 bar [2500 psi]
179	179 bar [2600 psi]
186	186 bar [2700 psi]
193	193 bar [2800 psi]
200	200 bar [2900 psi]
207	207 bar [3000 psi]
214	214 bar [3100 psi]
221	221 bar [3200 psi]

Change Description to:
 For integrated priority flow divider (PFD) cover with cartridge style relief valve
 (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A, F25B)
 and
 For integrated steering cover with cartridge style relief valve
 (Cover options D23A, D23B, D24A, D24B)
 and
 For integrated load sense (LS) cover with cartridge relief valve
 (Cover options L01A, L01B, L08A, L08B)



H Assembly Screws - depending upon rear cover
(Choose Table 1 or Table 2)

Table 1. Single pumps without auxiliary cover or integrated valves

Displacement (Module B)	Rear Cover - Controls & Ports (Module D)	
	N101, N103, N104, N501, N503, N504, N704, N708	N125
07	AF	AJ
10	AG	AJ
11	AG	AJ
13	AG	AJ
14	AG	AK
17	AH	AK
19	AH	AK
21	AH	AL
23	AJ	AL
25	AJ	AL
29	AK	AM
32	AK	AM
36	AL	AN
38	AL	AN
41	AM	AP
45	AM	AR



Table 2. Single pumps with auxiliary cover or integrated valves, dependent on rotation

Displacement (Module B)	Rear Cover - Controls & Ports (Module D)					
	Right Hand (CW) Rotation			Left Hand (CCW) Rotation		
	F09A F13A, F21A	F09B F13B, F21B	B104	F09A F13A, F21A	F09B F13B, F21B	B104
07	CV	DG	AG	EM	DG	AG
10	CV	DG	AH	EM	DG	AH
11	CV	DG	AH	EM	DG	AH
13	CX	DJ	AH	EP	DJ	AH
14	CX	DJ	AH	EP	DJ	AH
17	CY	DK	AJ	ER	DK	AJ
19	CZ	DL	AJ	ES	DL	AJ
21	CZ	DL	AJ	ES	DL	AJ
23	CZ	DM	AJ	ES	DM	AJ
25	DA	DN	AK	ET	DN	AK
29	DB	DP	AK	EY	DP	AK
32	DC	DR	AL	EU	DR	AL
36	DD	DS	AM	EV	DS	AM
38	DE	DT	AM	EW	DT	AM
41	DE	DT	AM	EW	DT	AM
45	DF	DU	AN	EX	DU	AN



J Nameplate

Code	Description
AN	Standard nameplate

K Special Feature

Code	Description
NNN	No special features, standard black paint



Two Section (Tandem) Pump Order Code

Example

The order code below provides an example of a two section (tandem) pump.

A	B1	B2	C	R	S	D	E	F	H	J	K
D E 2 R	2 3 S H	B B	1 0 4	1 3	N 1 1 3	N N N	0 0 0	A V	A N	N N N	

Code	Position	Description
DE2R	A	D Series pump with two pumping sections, right hand rotation
23	B1	23 cm ³ displacement on first section
SH	B2	13 tooth spline input shaft
BB	C	SAE B two bolt mounting flange
104	R	1 5/16-12 side inlet, 1 1/16 side outlet on first section
13	S	13 cm ³ displacement on second section
N113	D	No inlet and 7/8-14 side outlet on second section
NNN	E	No flow control setting
000	F	No pressure control setting
AV	H	Assembly screws
AN	J	Standard Nameplate
NNN	K	No special features, black paint

A	B1	B2	C	R	S	D	E	F	H	J	K
D E 2 R											

A Rotation - viewed from drive shaft

Code	Description
L	Left hand (counterclockwise)
R	Right hand (clockwise)

B1 Displacement

Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]

Code	Description
23	22.5 cm ³ /rev [1.37 in ³ /rev]
25	25.4 cm ³ /rev [1.55 in ³ /rev]
29	29.0 cm ³ /rev [1.77 in ³ /rev]
32	31.8 cm ³ /rev [1.94 in ³ /rev]
36	36.1 cm ³ /rev [2.20 in ³ /rev]
38	38.0 cm ³ /rev [2.32 in ³ /rev]
41	41.0 cm ³ /rev [2.50 in ³ /rev]
45	45.1 cm ³ /rev [2.75 in ³ /rev]



B2 Input Shaft

Code	Description
SE*	SAE 9 tooth spline, 31.8 mm [1.25 in] length
SC	SAE 11 tooth spline, 38.1 mm [1.50 in] length
SF	11 tooth spline, 31.8 mm [1.25 in] length (special modified length)
SH	SAE 13 tooth spline, 41 mm [1.62 in] length
SV	15 tooth spline, 46 mm [1.81 in] length (requires mounting flange AR or BR)
PB	22 mm [7/8 in] diameter x 41 mm [1.62 in] length, with 1/4 inch key
PD	19 mm [3/4 in] diameter x 51 mm [2.0 in] length, with 3/16 inch key
PZ	25.4 mm [1 inch] diameter x 46 mm [1.81 in] length, with 1/4 inch key
TA	1:5 taper, 25mm [1 in] dia, 58mm [2.30 in] length, 5/8 thread, M5 key with locknut and washer
TG	1:8 taper, 22mm [7/8 in] dia, 50mm [1.95 in] length, 5/8 thread with key, locknut and washer
TH	1:8 taper, 22mm [7/8 in] dia, 49mm [1.94 in] length, 9/16 thread with key, locknut and washer
WT	Input shaft similar to TH option with 34 tooth helical gear for Perkins engine mount

* Contact factory for units with SE (9T spline) to verify torque limits

C Mounting Flange

Code	Description
AA	SAE A 2-bolt
AC	SAE A 2-bolt, use with integral PFD/Steering Cover
AM	SAE A 2-bolt, with T seal
AP	SAE A 2-bolt, with T seal, use with integral PFD/Steering cover
AR	SAE A 2-bolt, use with 15 T spline input drive
AS	SAE A 2-bolt, use with integral PFD/Steering cover and 15 T input spline
AL	SAE A 2-bolt, two shaft seals with weep hole
AT	SAE A 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering cover
BB	SAE B 2-bolt
BC	SAE B 2-bolt, use with integral PFD/Steering cover
BM	SAE B 2-bolt, with T seal
BP	SAE B 2-bolt, with T seal, use with integral PFD/Steering cover
BR	SAE B 2-bolt, use with 15 T spline input drive
BS	SAE B 2-bolt, use with integral PFD/Steering cover and 15 T input spline
BT	SAE B 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering Cover
BW	SAE B 2-bolt, two shaft seals with weep hole
PP	Perkins 6 bolt flange with (2) seals (use with WT input shaft and clockwise rotation)



A				B1 B2		C	R		S	D			E		F		H		J		K	
D	E	2	R																			

R Ports - First Section

Code	Description	
101	1 1/16-12 side inlet, 7/8-14 side outlet	SAE O-ring boss ports No integrated valves
103	1 5/16-12 side inlet, 7/8-14 side outlet	
104	1 5/16-12 side inlet, 1 1/16-12 side outlet	
113	No inlet, 7/8-14 side outlet	
125	1 5/8-12 side inlet, 1 1/16-12 side outlet	
126	No inlet, 1 1/16-12 side outlet	
341	No inlet, 3/4 side split flange outlet (SAE Code 61)	SAE Split Flange Ports - No integrated valves
342	1 1/4 side split flange inlet, 3/4 side split flange outlet (SAE Code 61)	
402	3/4-14 side inlet, 1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
403	1-11 side inlet, 1/2-14 side outlet	
404	1 1/4-11 side inlet, 1/2-14 side outlet	
407	1-11 side inlet, 3/4-14 side outlet	
408	1 1/4-11 side inlet, 3/4-14 side outlet	
704	1 1/4 side tube inlet, 7/8-14 side ORB outlet	Beaded tube inlet port SAE O-ring boss outlet port No integrated valves
708	1 1/4 side tube inlet, 1 1/16-12 side ORB outlet	
716	1 1/2 side tube inlet, 1 1/16-12 side ORB outlet	
717	1 1/2 side tube inlet, 7/8-14 side ORB outlet	

S Displacement - Second Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]



D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

Code	Inlet	Outlet	Description
N101	1 1/16-12 side inlet	7/8-14 side outlet	SAE O-ring boss ports No integrated valves No auxiliary flange
N103	1 5/16-12 side inlet	7/8-14 side outlet	
N104	1 5/16-12 side inlet	1 1/16-12 side outlet	
N113	No inlet	7/8-14 side outlet	
N125	1 5/8-12 side inlet	1 1/16-12 side outlet	
N501	1 1/16-12 rear inlet	7/8-14 rear outlet	
N503	1 5/16-12 rear inlet	7/8-14 rear outlet	
N504	1 5/16-12 rear inlet	1 1/16-12 rear outlet	
N402	3/4-14 side inlet	1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
N403	1-11 side inlet	1/2-14 side outlet	
N404	1 1/4-11 side inlet	1/2-14 side outlet	
N407	1-11 side inlet	3/4-14 side outlet	
N408	1 1/4-11 side inlet	3/4-14 side outlet	
N342	1 1/4 side split flange inlet	3/4 side split flange outlet (SAE code 61)	SAE split flange ports No integrated valves No auxiliary flange
N704	1 1/4 side tube inlet	7/8-14 side ORB outlet	Beaded tube inlet port, SAE O-ring boss outlet port No integrated valves No auxiliary flange
N708	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N715	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N720	1 1/4 side tube inlet	7/8-14 side ORB outlet	
B103*	1 5/16-12 side inlet	7/8-14 side outlet,	SAE-A 2-Bolt Auxiliary Flange SAE O-ring boss ports No integrated valves
B104*	1 5/16-12 side inlet	1 1/16-12 side outlet	Integrated Relief Valve Internally Drained Maximum Displacement 23cc
R104	1 5/16-12 side inlet	1 1/16-12 side outlet	
N252	M33x2-6H rear inlet	M22x1.5-6H side outlet	SAE Metric Ports – No Integrated Valves



D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

F09A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)	Integrated Priority Flow Divider, cartridge style relief for settings up to: 221bar and 34.3 l/min [3200 psi and 9 US gal/min]
F09B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)	
F13A**	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)	
F13B***	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)	
F21A**	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)	
F21B***	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)	
F25A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)	
F25B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)	
D23A*	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE A flange)	Integrated Steering Cover, Priority Relief Valve (Cartridge Style) for settings up to: 221 bar and 34.3 l/min [3200 psi and 9 US gal/min]
D23B**	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE B flange)	
D24A*	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE A flange)	
D24B**	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE B flange)	



A	B1	B2	C	R	S	D	E	F	H	J	K
D	E	2	R								

L01A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-A flange)	Integrated Load Sense Divider (Dynamic), Priority Relief Valve
L01B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-B flange)	
L08A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-A flange)	
L08B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-B flange)	

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP

A variety of integrated valve options including PFD, Steering Covers, and Load sense priority flow dividers covers are available with D Series multiple pumps. Please contact your technical representative to determine which hardware best suits specific application needs.

E Flow Control Valve

Code	Description	
NNN	No flow control setting, standard for units without integrated flow control valves	
04X	3.8 l/min [1 US gal/min]	For integrated PFD Steering cover with cartridge style relief valve (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A or F25B)
08X	7.6 l/min [2 US gal/min]	
11X	11.4 l/min [3 US gal/min]	
15X	15.1 l/min [4 US gal/min]	
19X	18.9 l/min [5 US gal/min]	
23X	22.7 l/min [6 US gal/min]	
27X	26.5 l/min [7 US gal/min]	
30X	30.3 l/min [8 US gal/min]	
34X	34.3 l/min [9 US gal/min]	
38A	10 bar standby	For integrated load sense divider (use with L08A or L08B rear ports)
38L	10 bar standby	For integrated load sense divider (use with L01A or L01B side ports)
R1N	Maximum flow not to exceed 75 l/min, pressure range from 7-55 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under
R2N	Maximum flow not to exceed 75 l/min, pressure range from 41-248 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under



A B1 B2 C R S D E F H J K

D E 2 R

F Pressure Control Valve

Code	Description
000	No pressure control settings
034	34 bar [500 psi]
041	41 bar [600 psi]
048	48 bar [700 psi]
055	55 bar [800 psi]
062	62 bar [900 psi]
069	69 bar [1000 psi]
076	76 bar [1100 psi]
083	83 bar [1200 psi]
090	90 bar [1300 psi]
097	97 bar [1400 psi]
103	103 bar [1500 psi]
110	110 bar [1600 psi]
117	117 bar [1700 psi]
124	124 bar [1800 psi]
131	131 bar [1900 psi]
138	138 bar [2000 psi]
145	145 bar [2100 psi]
152	152 bar [2200 psi]
159	159 bar [2300 psi]
165	165 bar [2400 psi]
172	172 bar [2500 psi]
179	179 bar [2600 psi]
186	186 bar [2700 psi]
193	193 bar [2800 psi]
200	200 bar [2900 psi]
207	207 bar [3000 psi]
214	214 bar [3100 psi]
221	221 bar [3200 psi]

Change Description to:
 For integrated priority flow divider (PFD) cover with cartridge style relief valve
 (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A, F25B)
 and
 For integrated steering cover with cartridge style relief valve
 (Cover options D23A, D23B, D24A, D24B)
 and
 For integrated load sense (LS) cover with cartridge relief valve
 (Cover options L01A, L01B, L08A, L08B)



H Assembly screws

- Step 1 - Select the table corresponding to the port codes of the front and rear pump
- Step 2 - Select the row corresponding to the displacement of the front pump
- Step 3 - Select the column corresponding to the displacement of the rear pump
- Step 4 - Select the 2 letter code where the two displacements meet

Example from Table 1: AW = 21+19 tandem

The following tables are only applicable to port codes shown. For all other port code options (including PFD, LS and auxiliary cover), please consult factory.

Table number	Front pump port code Module R	Rear pump port code Module D
1	101, 103, 104, 113, 126, 704 or 708	N101, N103, N104, N113, N126, N501, N503, N504, N704, or N708
2	125, 716, 717	N101, N103, N104, N113, N126, N501, N503, N504, N704, or N708
3	101, 103, 104, 113, 126, 704 or 708	N125
4	125, 716, 717	N125

Table 1	Front pump port code, Module: R = 101, 103, 104, 113, 126, 704, or 708 Rear pump port code, Module: D = N101, N103, N104, N113, N126, N501, N503, N504, N704, or N708														
	Displacement rear pump, Module: S														
Displacement front pump (Module B)	07	10	13	14	17	19	21	23	25	29	32	36	38	41	45
07	AS	AS	AS	AT	AT	AT	AU	AU	AU	AV	AV	AW	AW	AX	AY
10	AS	AS	AT	AT	AU	AU	AU	AU	AV	AV	AW	AX	AX	AX	AY
13	AS	AT	AT	AU	AU	AU	AV	AV	AV	AW	AW	AX	AX	AY	AY
14	AT	AT	AU	AU	AU	AV	AV	AV	AW	AW	AX	AX	AY	AY	AZ
17	AT	AU	AU	AU	AV	AV	AV	AW	AW	AX	AX	AY	AY	AY	AZ
19	AT	AU	AU	AV	AV	AV	AW	AW	AW	AX	AX	AY	AZ	AZ	AZ
21	AU	AU	AV	AV	AV	AW	AW	AW	AX	AX	AY	AY	AZ	AZ	BA
23	AU	AU	AV	AV	AW	AW	AW	AW	AX	AX	AY	AZ	AZ	AZ	BA
25	AU	AV	AV	AW	AW	AW	AX	AX	AX	AY	AZ	AZ	AZ	BA	BA
29	AV	AV	AW	AW	AX	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BB
32	AV	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB
36	AW	AX	AX	AX	AY	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC
38	AW	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC
41	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD
45	AY	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BE



A B1 B2 C R S D E F H J K

D E 2 R

--	--	--	--	--	--	--	--	--	--	--	--	--	--

H Assembly screws

Table 2	Front pump port code, Module: R = 125, 716, 717 Rear pump port code, Module: D = N101, N103, N104, N113, N126, N501, N503, N504, N704, or N708														
Displacement front pump (Module B)	Displacement rear pump, Module: S														
	07	10	13	14	17	19	21	23	25	29	32	36	38	41	45
07	AT	AT	AU	AU	AV	AV	AV	AV	AW	AW	AX	AY	AY	AY	AZ
10	AT	AU	AU	AV	AV	AV	AV	AW	AW	AX	AX	AY	AY	AZ	AZ
13	AU	AU	AV	AV	AV	AW	AW	AW	AX	AX	AY	AY	AZ	AZ	BA
14	AU	AV	AV	AV	AW	AW	AW	AX	AX	AY	AY	AZ	AZ	AZ	BA
17	AV	AV	AV	AW	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BB
19	AV	AV	AW	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BB
21	AV	AV	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BA	BB
23	AV	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB
25	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC
29	AW	AX	AX	AY	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC	BC
32	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD
36	AY	AY	AY	AZ	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD	BE
38	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE
41	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE	BE
45	AZ	AZ	BA	BA	BB	BB	BB	BB	BC	BC	BD	BE	BE	BE	BF

Table 3	Front pump port code, Module: R = 101, 103, 104, 113, 126, 704, or 708 Rear pump port code, Module: D = N125														
Displacement front pump (Module B)	Displacement rear pump, Module: S														
	07	10	13	14	17	19	21	23	25	29	32	36	38	41	45
07	AU	AU	AV	AV	AW	AW	AW	AW	AX	AX	AY	AZ	AZ	AZ	BA
10	AU	AV	AV	AV	AW	AW	AW	AX	AX	AY	AY	AZ	AZ	AZ	BA
13	AV	AV	AW	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BB
14	AV	AV	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BA	BB
17	AW	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BA	BC
19	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC
21	AW	AW	AX	AX	AY	AY	AY	AY	AZ	BA	BA	BB	BB	BB	BC
23	AW	AX	AX	AY	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BB	BC
25	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD
29	AX	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BC	BD
32	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE
36	AZ	AZ	AZ	BA	BA	BA	BB	BB	BB	BC	BC	BD	BD	BD	BF
38	AZ	AZ	BA	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE	BE	BF
41	AZ	BA	BA	BA	BB	BB	BB	BC	BC	BD	BD	BE	BE	BE	BF
45	BA	BA	BB	BB	BC	BC	BC	BC	BD	BD	BE	BF	BF	BF	BG



H Assembly screws

Table 4	Front pump port code, Module: R = 125, 716, 717 Rear pump port code, Module: D = N125														
	Displacement rear pump, Module: S														
Displacement front pump (Module B)	07	10	13	14	17	19	21	23	25	29	32	36	38	41	45
07	AV	AW	AW	AW	AX	AX	AX	AY	AY	AZ	AZ	BA	BA	BB	BB
10	AW	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC
13	AW	AX	AX	AX	AY	AY	AY	AZ	AZ	BA	BA	BB	BB	BC	BC
14	AX	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC
17	AX	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD
19	AX	AY	AY	AY	AZ	AZ	AZ	BA	BA	BB	BB	BC	BC	BD	BD
21	AY	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD
23	AY	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE
25	AY	AZ	AZ	AZ	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE	BE
29	AZ	AZ	BA	BA	BA	BA	BB	BB	BC	BC	BD	BD	BE	BE	BF
32	AZ	BA	BA	BA	BB	BB	BB	BC	BC	BD	BD	BE	BE	BF	BF
36	BA	BA	BB	BB	BB	BB	BC	BC	BD	BD	BE	BE	BF	BF	BG
38	BA	BB	BB	BB	BC	BC	BC	BD	BD	BE	BE	BF	BF	BG	BG
41	BB	BB	BC	BC	BC	BC	BC	BD	BE	BE	BF	BF	BG	BG	BH
45	BB	BC	BC	BC	BD	BD	BD	BE	BE	BF	BF	BG	BG	BH	BH

J Nameplate

Code	Description
AN	Standard nameplate

K Special Features

Code	Description
NNN	No special features, standard black paint



Three Section (Triple) Pump Order Code

Example

The order code below provides an example of a three section (triple) pump with single inlet.

A
B1 B2
C
L
M
R
S
D
E
F
H
J
K

D
E
3
R
-
2
5
S
H
-
B
B
-
7
1
6
-
2
5
-
1
2
6
-
2
5
-
N
1
2
6
-
N
N
N
-
0
0
0
-
B
M
-
A
N
-
N
N
N

Code	Position	
DE3R	A	D Series pump with three pumping sections, right hand rotation
25	B1	25 cm ³ displacement on first section
SH	B2	13 tooth spline input shaft
BB	C	SAE B two bolt mounting flange
716	L	1 1/2 inch beaded tube inlet, 1 1/16-12 side ORB outlet on first section
25	M	25 cm ³ displacement on second section
126	R	No inlet and 1 1/16-12 side outlet on second section
25	S	25 cm ³ displacement on third section
N126	D	No inlet and 1 1/16-12 side outlet on third section
NNN	E	No flow control setting
000	F	No pressure control setting
BM	G	Assembly screws
AN	H	Standard Nameplate
NNN	J	No special features, black paint



A Rotation - viewed from drive shaft

Code	Description
L	Left hand (counterclockwise)
R	Right hand (clockwise)

B1 Displacement - First Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]

B2 Input Shaft

Code	Description
SE*	SAE 9 tooth spline, 31.8 mm [1.25 in] length
SC	SAE 11 tooth spline, 38.1 mm [1.50 in] length
SF	11 tooth spline, 31.8 mm [1.25 in] length (special modified length)
SH	SAE 13 tooth spline, 41 mm [1.62 in] length
SV	15 tooth spline, 46 mm [1.81 in] length (requires mounting flange AR or BR)
PB	22 mm [7/8 in] diameter x 41 mm [1.62 in] length, with 1/4 inch key
PD	19 mm [3/4 in] diameter x 51 mm [2.0 in] length, with 3/16 inch key
PZ	25.4 mm [1 inch] diameter x 46 mm [1.81 in] length, with 1/4 inch key
TA	1:5 taper, 25mm [1 in] dia, 58mm [2.30 in] length, 5/8 thread, M5 key with locknut and washer
TG	1:8 taper, 22mm [7/8 in] dia, 50mm [1.95 in] length, 5/8 thread with key, locknut and washer
TH	1:8 taper, 22mm [7/8 in] dia, 49mm [1.94 in] length, 9/16 thread with key, locknut and washer
WT	Input shaft similar to TH option with 34 tooth helical gear for Perkins engine mount

* Contact factory for units with SE (9T spline) to verify torque limits



A B1 B2 C L M R S D E F H J K
 D E 3 R - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - []

C Mounting Flange

Code	Description
AA	SAE A 2-bolt
AC	SAE A 2-bolt, use with integral PFD/Steering Cover
AM	SAE A 2-bolt, with T seal
AP	SAE A 2-bolt, with T seal, use with integral PFD/Steering cover
AR	SAE A 2-bolt, use with 15 T spline input drive
AS	SAE A 2-bolt, use with integral PFD/Steering cover and 15 T input spline
AL	SAE A 2-bolt, two shaft seals with weep hole
AT	SAE A 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering cover
BB	SAE B 2-bolt
BC	SAE B 2-bolt, use with integral PFD/Steering cover
BM	SAE B 2-bolt, with T seal
BP	SAE B 2-bolt, with T seal, use with integral PFD/Steering cover
BR	SAE B 2-bolt, use with 15 T spline input drive
BS	SAE B 2-bolt, use with integral PFD/Steering cover and 15 T input spline
BT	SAE B 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering Cover
BW	SAE B 2-bolt, two shaft seals with weep hole
PP	Perkins 6 bolt flange with (2) seals (use with WT input shaft and clockwise rotation)



L Ports - First Section

Code	Description	
101	1 1/16-12 side inlet, 7/8-14 side outlet	SAE O-ring boss ports No integrated valves
103	1 5/16-12 side inlet, 7/8-14 side outlet	
104	1 5/16-12 side inlet, 1 1/16-12 side outlet	
113	No inlet, 7/8-14 side outlet	
125	1 5/8-12 side inlet, 1 1/16-12 side outlet	
126	No inlet, 1 1/16-12 side outlet	
341	No inlet, 3/4 side split flange outlet (SAE Code 61)	SAE Split Flange Ports - No integrated valves
342	1 1/4 side split flange inlet, 3/4 side split flange outlet (SAE Code 61)	
402	3/4-14 side inlet, 1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
403	1-11 side inlet, 1/2-14 side outlet	
404	1 1/4-11 side inlet, 1/2-14 side outlet	
407	1-11 side inlet, 3/4-14 side outlet	
408	1 1/4-11 side inlet, 3/4-14 side outlet	
704	1 1/4 side tube inlet, 7/8-14 side ORB outlet	Beaded tube inlet port SAE O-ring boss outlet port No integrated valves
708	1 1/4 side tube inlet, 1 1/16-12 side ORB outlet	
716	1 1/2 side tube inlet, 1 1/16-12 side ORB outlet	
717	1 1/2 side tube inlet, 7/8-14 side ORB outlet	

M Displacement - Second Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]



A B1 B2 C L M R S D E F H J K
 D E 3 R - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - []

R Ports - Second Section

Code	Description	
101	1 1/16-12 side inlet, 7/8-14 side outlet	SAE O-ring boss ports No integrated valves
103	1 5/16-12 side inlet, 7/8-14 side outlet	
104	1 5/16-12 side inlet, 1 1/16-12 side outlet	
113	No inlet, 7/8-14 side outlet	
125	1 5/8-12 side inlet, 1 1/16-12 side outlet	
126	No inlet, 1 1/16-12 side outlet	
341	No inlet, 3/4 side split flange outlet (SAE Code 61)	SAE Split Flange Ports - No integrated valves
342	1 1/4 side split flange inlet, 3/4 side split flange outlet (SAE Code 61)	
402	3/4-14 side inlet, 1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
403	1-11 side inlet, 1/2-14 side outlet	
404	1 1/4-11 side inlet, 1/2-14 side outlet	
407	1-11 side inlet, 3/4-14 side outlet	
408	1 1/4-11 side inlet, 3/4-14 side outlet	Beaded tube inlet port SAE O-ring boss outlet port No integrated valves
704	1 1/4 side tube inlet, 7/8-14 side ORB outlet	
708	1 1/4 side tube inlet, 1 1/16-12 side ORB outlet	
716	1 1/2 side tube inlet, 1 1/16-12 side ORB outlet	
717	1 1/2 side tube inlet, 7/8-14 side ORB outlet	

S Displacement - Third Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]



A B1 B2 C L M R S **D** E F H J K

D E 3 R - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - []

D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

Code	Inlet	Outlet	Description
N101	1 1/16-12 side inlet	7/8-14 side outlet	SAE O-ring boss ports No integrated valves No auxiliary flange
N103	1 5/16-12 side inlet	7/8-14 side outlet	
N104	1 5/16-12 side inlet	1 1/16-12 side outlet	
N125	1 5/8-12 side inlet	1 1/16-12 side outlet	
N501	1 1/16-12 rear inlet	7/8-14 rear outlet	
N503	1 5/16-12 rear inlet	7/8-14 rear outlet	
N504	1 5/16-12 rear inlet	1 1/16-12 rear outlet	
N252	M33x2-6H rear inlet	M22x1.5-6H side outlet	SAE Metric Ports – No Integrated Valves
N402	3/4-14 side inlet	1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
N403	1-11 side inlet	1/2-14 side outlet	
N404	1 1/4-11 side inlet	1/2-14 side outlet	
N407	1-11 side inlet	3/4-14 side outlet	
N408	1 1/4-11 side inlet	3/4-14 side outlet	
N342	1 1/4 side split flange inlet	3/4 side split flange outlet (SAE code 61)	SAE split flange ports No integrated valves No auxiliary flange
N704	1 1/4 side tube inlet	7/8-14 side ORB outlet	Beaded tube inlet port, SAE O-ring boss outlet port No integrated valves No auxiliary flange
N708	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N715	1 1/4 side tube inlet	1 1/16-12 side ORB outlet	
N720	1 1/4 side tube inlet	7/8-14 side ORB outlet	

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP



D Rear Cover: Port Options, Integrated Valves and Auxiliary Flange

Code	Inlet	Outlet	Description
F09A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)		
F09B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)		
F13A**	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)		
F13B***	1 5/8-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)		
F21A**	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE A flange)		
F21B***	1 5/8-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary (SAE B flange)		
F25A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE A flange)		
F25B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary (SAE B flange)		
D23A*	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE A flange)		
D23B**	1 5/16-12 side inlet, 3/4-16 side priority, no secondary port (SAE B flange)		
D24A*	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE A flange)		
D24B**	1 5/16-12 rear inlet, 3/4-16 rear priority, no secondary port (SAE B flange)		
L01A**	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-A flange)		
L01B***	1 5/16-12 side inlet, 3/4-16 side priority, 7/8-14 side secondary, 7/16-20 side LS (SAE-B flange)		
L08A**	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-A flange)		
L08B***	1 5/16-12 rear inlet, 3/4-16 rear priority, 7/8-14 rear secondary, 7/16-20 rear LS (SAE-B flange)		
		Integrated Priority Flow Divider, cartridge style relief for settings up to: 221bar and 34.3 l/min [3200 psi and 9 US gal/min]	
		Integrated Steering Cover, Priority Relief Valve (Cartridge Style) for settings up to: 221 bar and 34.3 l/min [3200 psi and 9 US gal/min]	
		Integrated Load Sense Divider (Dynamic), Priority Relief Valve	



B103*	1 5/16-12 side inlet	7/8-14 side outlet,	SAE-A 2-Bolt Auxiliary Flange
B104*	1 5/16-12 side inlet	1 1/16-12 side outlet	SAE O-ring boss ports No integrated valves
R104	1 5/16-12 side inlet	1 1/16-12 side outlet	Integrated Relief Valve Internally Drained Maximum Displacement 23cc

* Integrated auxiliary flange requires use of input shaft option AH or AC

** Requires use of mounting flange option AC or AP

*** Requires use of mounting flange option BC or BP

A variety of integrated valve options including PFD, Steering Covers, and Load sense priority flow dividers covers are available with D Series multiple pumps. Please contact your technical representative to determine which hardware best suits specific application needs.

E Flow Control Valve

Code	Description	
NNN	No flow control setting, standard for units without integrated flow control valves	
04X	3.8 l/min [1 US gal/min]	For integrated PFD Steering cover with cartridge style relief valve (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A or F25B)
08X	7.6 l/min [2 US gal/min]	
11X	11.4 l/min [3 US gal/min]	
15X	15.1 l/min [4 US gal/min]	
19X	18.9 l/min [5 US gal/min]	
23X	22.7 l/min [6 US gal/min]	
27X	26.5 l/min [7 US gal/min]	
30X	30.3 l/min [8 US gal/min]	
34X	34.3 l/min [9 US gal/min]	
38A	10 bar standby	For integrated load sense divider (use with L08A or L08B rear ports)
38L	10 bar standby	For integrated load sense divider (use with L01A or L01B side ports)
R1N	Maximum flow not to exceed 75 l/min, pressure range from 7-55 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under
R2N	Maximum flow not to exceed 75 l/min, pressure range from 41-248 bar	For integrated relief valve, internally drained (without flow control) Use with R104 cover option 23cc and under



F Pressure Control Valve

Code	Description
000	No pressure control settings
034	34 bar [500 psi]
041	41 bar [600 psi]
048	48 bar [700 psi]
055	55 bar [800 psi]
062	62 bar [900 psi]
069	69 bar [1000 psi]
076	76 bar [1100 psi]
083	83 bar [1200 psi]
090	90 bar [1300 psi]
097	97 bar [1400 psi]
103	103 bar [1500 psi]
110	110 bar [1600 psi]
117	117 bar [1700 psi]
124	124 bar [1800 psi]
131	131 bar [1900 psi]
138	138 bar [2000 psi]
145	145 bar [2100 psi]
152	152 bar [2200 psi]
159	159 bar [2300 psi]
165	165 bar [2400 psi]
172	172 bar [2500 psi]
179	179 bar [2600 psi]
186	186 bar [2700 psi]
193	193 bar [2800 psi]
200	200 bar [2900 psi]
207	207 bar [3000 psi]
214	214 bar [3100 psi]
221	221 bar [3200 psi]

Change Description to:
 For integrated priority flow divider (PFD) cover with cartridge style relief valve
 (Cover options F09A, F09B, F13A, F13B, F21A, F21B, F25A, F25B)
 and
 For integrated steering cover with cartridge style relief valve
 (Cover options D23A, D23B, D24A, D24B)
 and
 For integrated load sense (LS) cover with cartridge relief valve
 (Cover options L01A, L01B, L08A, L08B)



H Assembly Screws

Code	Description
**	Will be assigned by Turolla upon receipt of order

J Nameplate

Code	Description
AN	Standard nameplate

K Special Feature

Code	Description
NNN	No special features, standard black paint



Four Section (Quad) Pump Order Code

Example

The order code below provides an example of a four section (quad) pump.

A
B1
B2
C
L
M
N
P
R
S
D
E
F
H
J
K

DE4R -
 25SH -
 BB -
 104 -
 23 -
 104
10
126 -
 10 -
 N126 -
 NNN -
 000 -
 BT -
 AN -
 NNN

Code	Position	Description
DE4L	A	D Series pump with four pumping sections, left hand rotation
25	B1	25 cm ³ displacement on first section
SH	B2	13 tooth spline input shaft
BB	C	SAE B two bolt mounting flange
104	L	1 5/16-12 side inlet, 1 1/16-12 side outlet on first section
23	M	23 cm ³ displacement on second section
104	N	1 5/16-12 side inlet, 1 1/16-12 side outlet on second section
10	P	10 cm ³ displacement on third section
126	R	No inlet and 1 1/16-12 side outlet on third section
10	S	10 cm ³ displacement on fourth section
N126	D	No inlet and 1 1/16-12 side outlet on fourth section
NNN	E	No flow control setting
000	F	No pressure control setting
BT	H	Assembly screws
AN	J	Standard Nameplate
NNN	K	No special features, black paint



A B1 B2 C L M N P R S D E F H J K
 DE4R - [] - [] - [] - [] - [] [] [] - [] - [] - [] - [] - [] - [] - []

DE4: D Series Cast Iron Gear Pump, Four Sections (Quad)

A Rotation - viewed from drive shaft

Code	Description
L	Left hand (counterclockwise)
R	Right hand (clockwise)

B1 Displacement - First Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]



A B1 B2 C L M N P R S D E F H J K
 DE4R - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - []

B2 Input Shaft

Code	Description
SE*	SAE 9 tooth spline, 31.8 mm [1.25 in] length
SC	SAE 11 tooth spline, 38.1 mm [1.50 in] length
SF	11 tooth spline, 31.8 mm [1.25 in] length (special modified length)
SH	SAE 13 tooth spline, 41 mm [1.62 in] length
SV	15 tooth spline, 46 mm [1.81 in] length (requires mounting flange AR or BR)
PB	22 mm [7/8 in] diameter x 41 mm [1.62 in] length, with 1/4 inch key
PD	19 mm [3/4 in] diameter x 51 mm [2.0 in] length, with 3/16 inch key
PZ	25.4 mm [1 inch] diameter x 46 mm [1.81 in] length, with 1/4 inch key
TA	1:5 taper, 25mm [1 in] dia, 58mm [2.30 in] length, 5/8 thread, M5 key with locknut and washer
TG	1:8 taper, 22mm [7/8 in] dia, 50mm [1.95 in] length, 5/8 thread with key, locknut and washer
TH	1:8 taper, 22mm [7/8 in] dia, 49mm [1.94 in] length, 9/16 thread with key, locknut and washer
WT	Input shaft similar to TH option with 34 tooth helical gear for Perkins engine mount

* Contact factory for units with SE (9T spline) to verify torque limits

C Mounting Flange

Code	Description
AA	SAE A 2-bolt
AC	SAE A 2-bolt, use with integral PFD/Steering Cover
AM	SAE A 2-bolt, with T seal
AP	SAE A 2-bolt, with T seal, use with integral PFD/Steering cover
AR	SAE A 2-bolt, use with 15 T spline input drive
AS	SAE A 2-bolt, use with integral PFD/Steering cover and 15 T input spline
AL	SAE A 2-bolt, two shaft seals with weep hole
AT	SAE A 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering cover
BB	SAE B 2-bolt
BC	SAE B 2-bolt, use with integral PFD/Steering cover
BM	SAE B 2-bolt, with T seal
BP	SAE B 2-bolt, with T seal, use with integral PFD/Steering cover
BR	SAE B 2-bolt, use with 15 T spline input drive
BS	SAE B 2-bolt, use with integral PFD/Steering cover and 15 T input spline
BT	SAE B 2-bolt, two shaft seals with weep hole, use with integral PFD/Steering Cover
BW	SAE B 2-bolt, two shaft seals with weep hole
PP	Perkins 6 bolt flange with (2) seals (use with WT input shaft and clockwise rotation)



A B1 B2 C L M N P R S D E F H J K
 DE4R - [] - [] - [] - [] - [] - [] [] [] - [] - [] - [] - [] - [] - [] - []

L Ports - First Section

Code	Description	
101	1 1/16-12 side inlet, 7/8-14 side outlet	SAE O-ring boss ports No integrated valves
103	1 5/16-12 side inlet, 7/8-14 side outlet	
104	1 5/16-12 side inlet, 1 1/16-12 side outlet	
113	No inlet, 7/8-14 side outlet	
125	1 5/8-12 side inlet, 1 1/16-12 side outlet	
126	No inlet, 1 1/16-12 side outlet	
341	No inlet, 3/4 side split flange outlet (SAE Code 61)	SAE Split Flange Ports - No integrated valves
342	1 1/4 side split flange inlet, 3/4 side split flange outlet (SAE Code 61)	
402	3/4-14 side inlet, 1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
403	1-11 side inlet, 1/2-14 side outlet	
404	1 1/4-11 side inlet, 1/2-14 side outlet	
407	1-11 side inlet, 3/4-14 side outlet	
408	1 1/4-11 side inlet, 3/4-14 side outlet	Beaded tube inlet port SAE O-ring boss outlet port No integrated valves
704	1 1/4 side tube inlet, 7/8-14 side ORB outlet	
708	1 1/4 side tube inlet, 1 1/16-12 side ORB outlet	
716	1 1/2 side tube inlet, 1 1/16-12 side ORB outlet	
717	1 1/2 side tube inlet, 7/8-14 side ORB outlet	

M Displacement - Second Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]



N Ports - Second Section

Code	Description	
101	1 1/16-12 side inlet, 7/8-14 side outlet	SAE O-ring boss ports No integrated valves
103	1 5/16-12 side inlet, 7/8-14 side outlet	
104	1 5/16-12 side inlet, 1 1/16-12 side outlet	
113	No inlet, 7/8-14 side outlet	
125	1 5/8-12 side inlet, 1 1/16-12 side outlet	
126	No inlet, 1 1/16-12 side outlet	
341	No inlet, 3/4 side split flange outlet (SAE Code 61)	SAE Split Flange Ports - No integrated valves
342	1 1/4 side split flange inlet, 3/4 side split flange outlet (SAE Code 61)	
402	3/4-14 side inlet, 1/2-14 side outlet	British Standard Pipe Parallel (BSPP) threads - No integrated valves
403	1-11 side inlet, 1/2-14 side outlet	
404	1 1/4-11 side inlet, 1/2-14 side outlet	
407	1-11 side inlet, 3/4-14 side outlet	
408	1 1/4-11 side inlet, 3/4-14 side outlet	Beaded tube inlet port SAE O-ring boss outlet port No integrated valves
704	1 1/4 side tube inlet, 7/8-14 side ORB outlet	
708	1 1/4 side tube inlet, 1 1/16-12 side ORB outlet	
716	1 1/2 side tube inlet, 1 1/16-12 side ORB outlet	
717	1 1/2 side tube inlet, 7/8-14 side ORB outlet	

P Displacement - Third Section

Code	Description	Code	Description
07	7.0 cm ³ /rev [0.43 in ³ /rev]	23	22.5 cm ³ /rev [1.37 in ³ /rev]
10	9.5 cm ³ /rev [0.58 in ³ /rev]	25	25.4 cm ³ /rev [1.55 in ³ /rev]
11	10.8 cm ³ /rev [0.66 in ³ /rev]	29	29.0 cm ³ /rev [1.77 in ³ /rev]
13	12.6 cm ³ /rev [0.77 in ³ /rev]	32	31.8 cm ³ /rev [1.94 in ³ /rev]
14	14.3 cm ³ /rev [0.87 in ³ /rev]	36	36.1 cm ³ /rev [2.20 in ³ /rev]
17	17.0 cm ³ /rev [1.04 in ³ /rev]	38	38.0 cm ³ /rev [2.32 in ³ /rev]
19	19.0 cm ³ /rev [1.16 in ³ /rev]	41	41.0 cm ³ /rev [2.50 in ³ /rev]
21	20.5 cm ³ /rev [1.25 in ³ /rev]	45	45.1 cm ³ /rev [2.75 in ³ /rev]