JANUS PUMPS

BRACKISH WATER AXIAL PISTON PUMPS

The Water Hydraulics Co. Ltd.

PUTTING WATER TO WORK



CONTENTS

1. INTRODUCTION 3

1.1 Overview 3
1.2 Benefits 3
2. DESIGN OVERVIEW 4
2.1 Porting Options 4
2.2 Inlet Conditions – 2 Port Design (Un-boosted) 5
2.3 Inlet Conditions - 3 Port Design (Boosted) 6
2.4 Direction of Rotation 6
2.5 Pump Ordering Code 7
2.6 Pump Specifications 7
2.7 Filtration & Flushing Requirements 8

3. BRACKISH WATER PUMP RANGE 9

3.1 P6 9
3.1.1 Specification 9
3.1.2 General Assembly Drawing – Un-boosted 9
3.1.3 Un-boosted Port Dimensions (ACW Configuration) 9
3.1.4 General Assembly Drawing - Boosted 10
3.1.5 Boosted Port Dimensions (ACW Configuration) 10
3.1.6 P6 Performance Data 11
3.2 P15 13
3.2.1 Specification 13
3.2.2 General Assembly Drawing – Un-boosted 13
3.2.3 Un-boosted Port Dimensions (ACW Configuration) 13
3.2.4 General Assembly Drawing – Boosted 14
3.2.5 Boosted Port Dimensions (ACW Configuration) 14
3.2.6 P15 Performance Data 15
3.3 P30 17
3.3.1 Specification 17
3.3.2 General Assembly Drawing – Un-boosted 17
3.3.3 Unboosted Port Dimensions (ACW Configuration) 17
3.3.4 General Assembly Drawing - Boosted 18
3.3.5 Boosted Port Dimensions (ACW Configuration) 18
3.3.6 P30 Performance Data 19
3.4 P60 21
3.4.1 Specification 21
3.4.2 General Assembly Drawing – Un-boosted 21
3.4.3 Un-boosted Port Dimensions (ACW Configuration) 21
3.4.4 General Assembly Drawing - Boosted 22
3.4.5 Boosted Port Dimensions (ACW Configuration) 22
3.4.6 P60 Performance Data 23
3.5 P180 25
3.5.1 Specifications 25
3.5.2 General Assembly Drawing 25
3.5.3 Port Dimensions (ACW Configuration) 25
3.5.4 P180 Performance Data 26
3.6 P300 28
3.6.1 Specification 28
3.6.2 General Assembly Drawing 28
3.6.3 Port Dimensions (ACW Configuration) 28
3.6.4 P300 Performance Data 29
3.7 P600 31
3.7.1 Specification 31
3.7.2 General Assembly Drawing 31
3.7.3 Port Dimensions (ACW Configuration) 31
3.7.4 P600 Performance Data 32
4. SYSTEM DESIGN 34
4.1 Circuit Examples 34
4.1.1 Boosted Circuit 34
4.1.2 Un-boosted Circuit 35
4.2 Electric Motor 36
4.3 Installation 36

5. SERVICING 37

5.1 Service Schedule 37

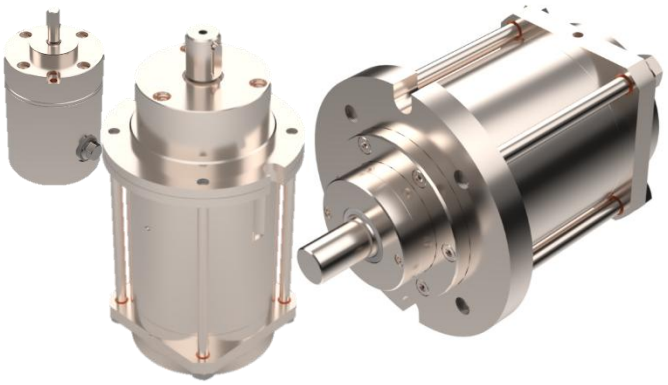
6. DISCLAIMER 38

7. CONTACT DETAILS 38

1. INTRODUCTION

1.1 Overview

The high-pressure Janus brackish water axial piston pump range is optimised for reverse osmosis systems, with a design versatile enough to support numerous additional high-pressure applications.



The Janus brackish water pumps operate as positive-displacement units, moving a defined volume of water with each piston cycle. As a result, the pump's output flow is directly proportional to the motor's rotational speed.

1.2 Benefits

- ✓ **No Risk of Contamination**

Our Janus axial piston pumps are totally oil free. As a result of employing advanced materials, high velocity and loaded sliding surfaces, the range of pumps can operate effectively with brackish water as their only coolant/lubricant therefore, this removes the potential for cross contamination of the system fluid or lubricating oil.

- ✓ **Safe & Efficient**

The pumps utilise technologies that suppress vibration and deliver low-noise, high-efficiency performance. Their multi-piston configuration, combined with high rotational speeds, produces exceptionally low pulsation. This enables a compact, lightweight design that offers safe operation and reduced operating costs. For even more long-term cost-effective solutions, please refer to our integral energy-recovery models, the *Janus Power Centre* catalogues, or consult TWHC.

- ✓ **Easy Installation, Operation & Maintenance**

Standardised porting and mounting solutions ensure straightforward installation, and the accompanying detailed manual & service guide helps maintain reliable, high-level performance. Accurate flow metering is simply achieved with the control of the output shaft speed.

- ✓ **Reliability**

All units are manufactured and tested on-site to the published performance data, ensuring high quality is kept consistent. All materials used for the brackish water pumps are selected to provide excellent corrosion resistance while remaining cost-effective. Components are produced in 316L stainless steel, with strategically selected internal parts—such as bearing surfaces—manufactured from bar-stock Duplex 2205.

2. DESIGN OVERVIEW

2.1 Porting Options

The Janus brackish water pump range is available in two porting configurations to suit the feed supply:

2-Port Un-boosted

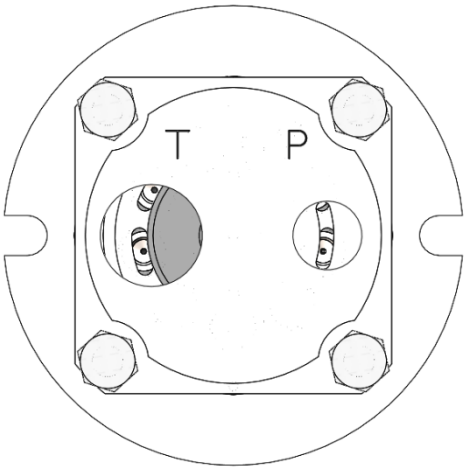
For applications where the pump is fed from a local tank or low-pressure source. Available on P6 to P60 models, up to and including 70cc/rev. (Above 70cc/rev (P60 80cc/rev, P180, P300 and P600), only the 3-port boosted inlet is offered.

3-Port Boosted

For applications with a pressurised feed supply, such as a boost pump, a high-pressure main or a pre-filtration system. Available across the full range.

	2-Port Un-boosted	3-Port Boosted
Available Sizes	P6 – P60 (up to 70cc/rev)	P6 – P600 (full range)
Feed Source	Local tank / low-pressure supply	Pressurised feed (boost pump, pre-filtration)
Inlet Pressure	Positive (flooded suction), max 2.5 Bar	See section 2.3
Leakage Drain Line	Not required	Required to low-pressure drain or sump
Shaft Rotation	Uni-directional (specify on order)	Anticlockwise as standard
Pressure Generated	Full system pressure	Differential pressure only

2.2 Inlet Conditions – 2 Port Design (Un-boosted)



Our 2-port un-boosted pumps are designed for applications where the feed water is supplied from a local tank or a low-pressure source. They are well suited to compact, self-contained brackish water systems where a separate boost pump is not practical. The 2-port design is available on P6 to P60 models up to and including 70cc/rev. Larger displacements are supplied with a 3-port boosted inlet only.

The pump cannot lift water. A flooded suction must be provided so that the inlet pressure stays positive at all times. The tank must be positioned above the pump inlet. The maximum inlet pressure is 2.5 Bar. Where a feed above 2.5 Bar is available, the 3-port boosted design should be selected.

In the 2-port design, the internal leakage flow is returned within the pump to the inlet (“T”) side, so no external drain line is required. This offers several advantages:

1. **Simplified installation:** Only a supply line and a pressure line are needed, with no separate drain or boost pump.
2. **Compact power pack design:** The tank, pump and motor can be packaged as a single self-contained unit, which reduces footprint and system cost.

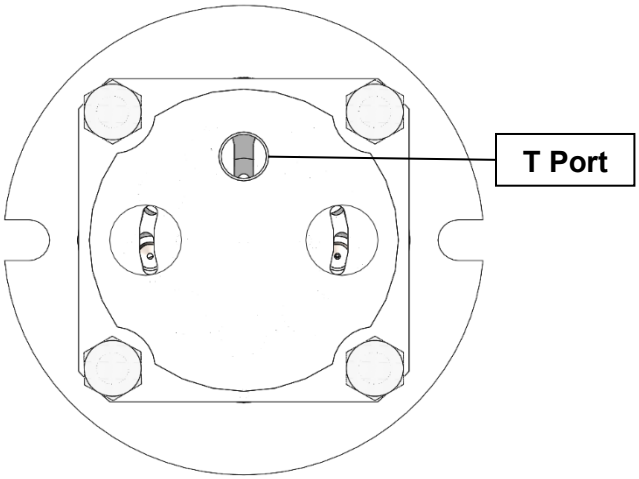
Because the casing sees the inlet pressure, the supply line must be designed carefully:

1. **Supply pipework:** We advise that the supply pipework is sized to deliver at least 20% above the pump's maximum flow rate, even with the tank at its lowest level. This ensures the inlet stays at positive pressure under dynamic conditions. Pipework should be as short as possible, with minimal bends and restrictions.
2. **Inlet flow check:** To confirm the supply is adequate, disconnect the pump inlet hose with the tank at its lowest level and measure the free flow. It should be at least 20% greater than the pump's maximum delivery flow.
3. **Filtration:** All water must be filtered to the required standard (see section 2.5) before it enters the tank, and the tank should be covered to prevent re-contamination. Do not place a filter between the tank and the pump unless an inlet pressure switch is fitted to protect against negative pressure.
4. **Direction of rotation:** The ports are clearly marked P (pressure) and T (tank). Un-boosted pumps are uni-directional, so the required rotation must be specified when ordering. Do not reverse the ports or turn the shaft in the wrong direction, or failure will result.

As the feed is at low pressure, the pump must generate the full system pressure. Motor sizing (section 4.2) should be based on the full outlet pressure.

A flooded suction with positive inlet pressure must be maintained at all times.

2.3 Inlet Conditions - 3 Port Design (Boosted)



Our 3-port boosted pumps are designed for operation with a pressurised feed supply. The minimum inlet pressure is determined by pump shaft speed. As a guide:

- P6 – P300 models: Minimum inlet pressure 3.0 – 3.6 Bar
- P600 models: Minimum inlet pressure 3.5 – 4.1 Bar

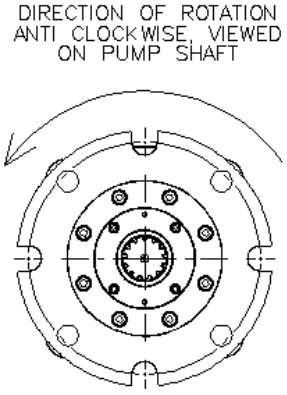
The 3-port design isolates the feed water from the internal leakage flow, which must be routed to a low-pressure drain or sump. This offers several performance advantages:

1. **Reduced power requirement:** The pump only needs to generate the differential pressure. For example, with a 5 Bar feed and 60 Bar discharge, the pump produces only the remaining 55 Bar.
2. **Improved mechanical seal life:** Because the feed pressure and casing (leakage) pressure are separated, the shaft seal operates at a significantly lower pressure. This reduces wear, minimises maintenance, and prevents low-pressure cavitation.

A constant positive inlet pressure must be maintained, of at least 2.5 Bar above the casing ("T") pressure always.

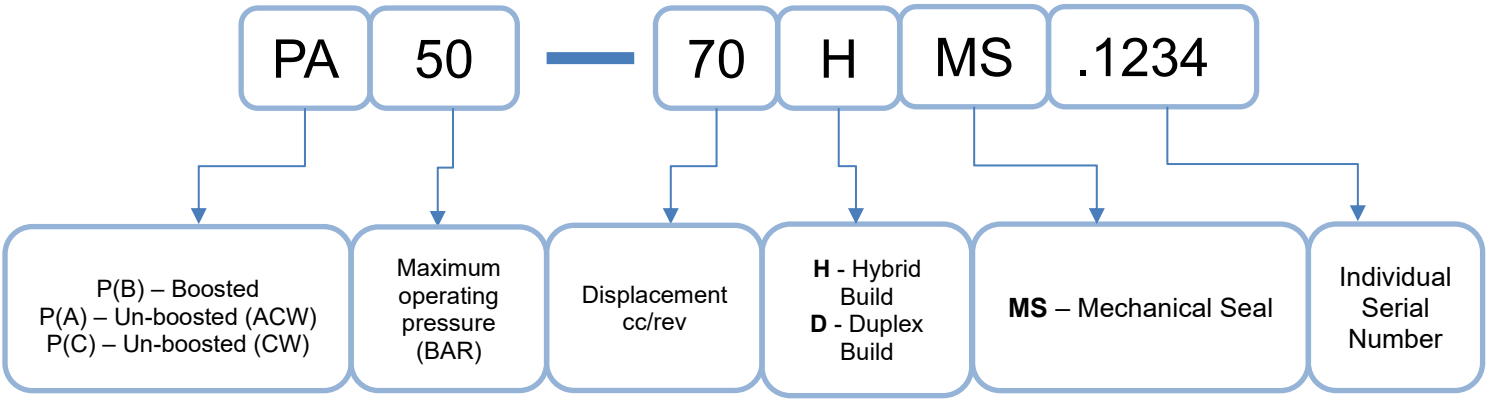
2.4 Direction of Rotation

All brackish water pumps are designed to be operated anticlockwise unless specifically stated or requested. Direction of rotation is based on looking at the shaft of the pump, see the diagram below.



2.5 Pump Ordering Code

All Water Hydraulics products each have their own individual identification number. Below is a diagram which explains how to read the number. A typical brackish water pump part number would look like the following:



Example: An un-boosted pump (ACW) operating at 50 Bar on brackish water with a displacement of 70cc/Rev, hybrid build & mechanical seal:

Ordering code: PA50-70HMS

2.6 Pump Specifications

The table below outlines specifications for the brackish water pumps. For more information and performance characteristics, see the relevant pump catalogue on The Water Hydraulics Company website where a catalogue can be downloaded.

SPECIFICATION								
Pumps		**P6**	**P15**	**P30**	**P60**	**P180**	**P300**	**P600**
Displacement (cc/rev)	**Max:**	6.0	19.0	35.0	80.0	225	286	625
	Min:	4.6	12.0	23.0	51.0	135	-	390
Max. RPM		1800	1800	1800	1800	-	-	-
	Boosted: *	2000	2200	2000	2000	2000	2000	1250
Max. Input Power (kW)		1.5	4.0	6.5	15	42	53	72.5
Max. Water Flow (m^3/hr)		0.72	2.51	4.2	9.6	27	34.3	46.8
Max. Cont. Pressure (Barg)		50	50	50	50	50	50	50
Weight (kg)		2.2	6	10	19	82	82	120
Temperature (°C)	**Max: ****	50	50	50	50	50	50	50
	Min: ***	2	2	2	2	2	2	2

Pump speeds above 2000 rpm are possible under higher boost conditions, consult TWHC for details. ** Higher temperature operation is possible, consult TWHC for details. * Consult TWHC for antifreeze option and lower temperature conditions.*

2.7 Filtration & Flushing Requirements

All incoming water to the pump must be pre-filtered to achieve warranty and the service intervals stated, the pump requires filter to an absolute rating of 10 micron (10 µ) with a Beta Ratio > 5000.

Beta Ratio	How Many Particles of a Given Size Will Pass Through the Filter?	Filter Efficiency
2	1 out of every 2 particles	50%
10	1 out of every 10 particles	90%
20	1 out of every 20 particles	95%
75	1 out of every 75 particles	98.7%
100	1 out of every 100 particles	99%
200	1 out of every 200 particles	99.5%
1,000	1 out of every 1,000 particles	99.9%
2,000	1 out of every 2,000 particles	99.95%
5,000	**1 out of every 5,000 particles**	**99.98%**
10,000	1 out of every 10,000 particles	99.99%

The Beta Ratio is a measure of the filter's efficiency; the pump requires a Beta Ratio > 5000. This ensures the filtration removes 99.98% of the particles 10µ or larger with only 1 out of every 5,000 particles will pass though the filter ensuring the maximum life of the assembly.

We would advise all desalination pumps are flushed on a routine basis. Any period of non-operation (short or long) the system must run on permeate to ensure the brackish water is flushed from the system. Even with the adoption of such high-grade corrosion material, we would advise a weekly (if not sooner) fresh water flushing regime is undertaken especially if the system will be non-operational for any period.

3. BRACKISH WATER PUMP RANGE

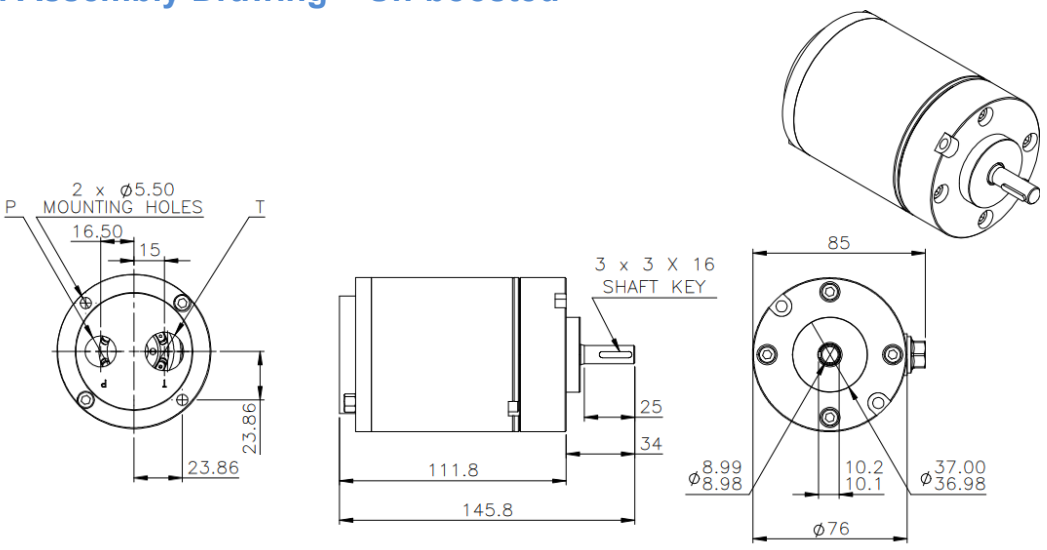
3.1 P6

3.1.1 Specification

SPECIFICATION			
Displacement (cc/rev)		4.6	6.0
Max. RPM	Un-Boosted	1800	1800
	Boosted: *	2000	2000
Max. Input Power (kW)		1.0	1.5
Max. Water Flow (m^3/hr)		0.55	0.72
Max. Cont. Pressure (Barg)		50	50
Weight (kg)		2.2	2.2
Temperature (°C)	Max: **	50	50
	Min: ***	2	2

Pump speeds above 2000 rpm are possible under higher boost conditions, consult TWHC for details. ** Higher temperature operation is possible, consult TWHC for details. * Consult TWHC for antifreeze option and lower temperature conditions.*

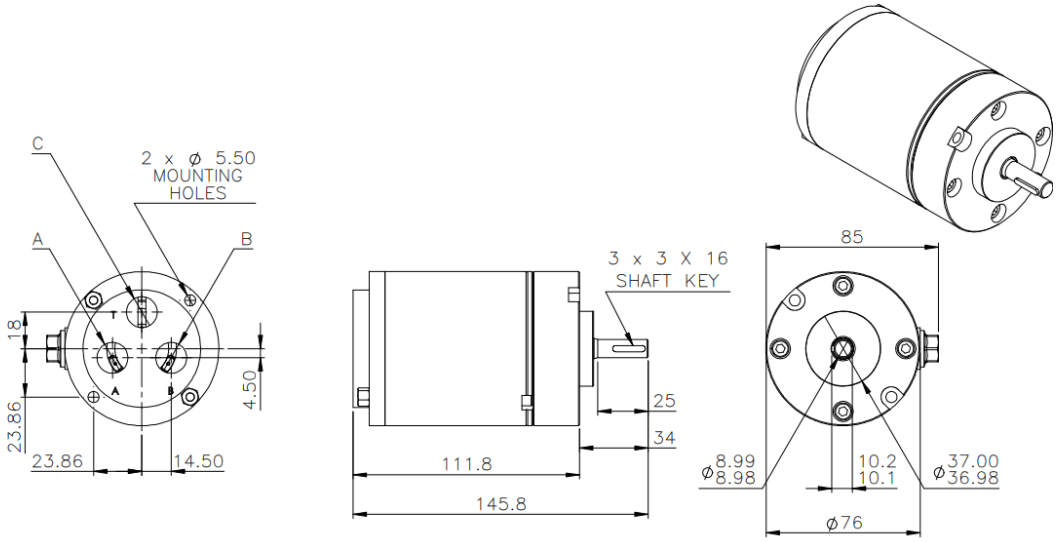
3.1.2 General Assembly Drawing – Un-boosted



3.1.3 Un-boosted Port Dimensions (ACW Configuration)

Position	Description	Size
P	Low Pressure In	3/8" BSPP
T	High Pressure Out	1/2" BSPP

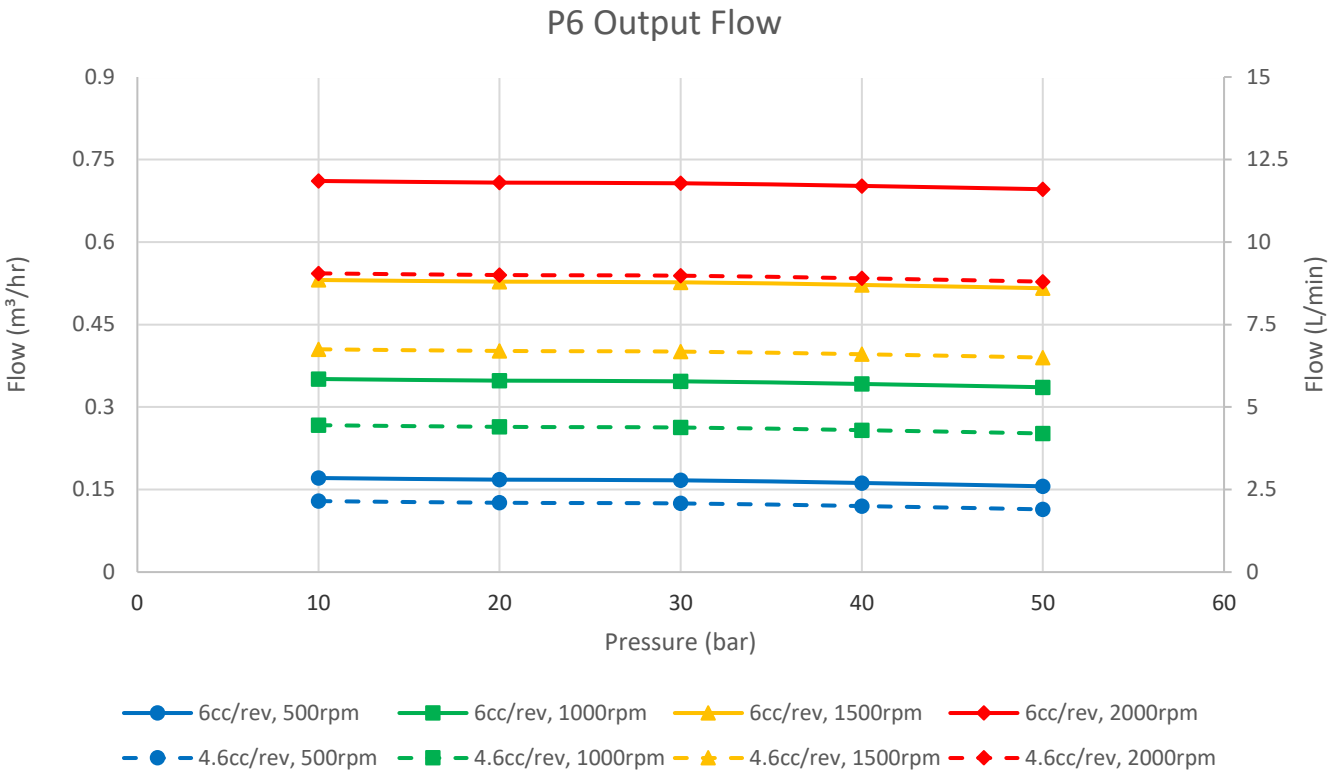
3.1.4 General Assembly Drawing - Boosted

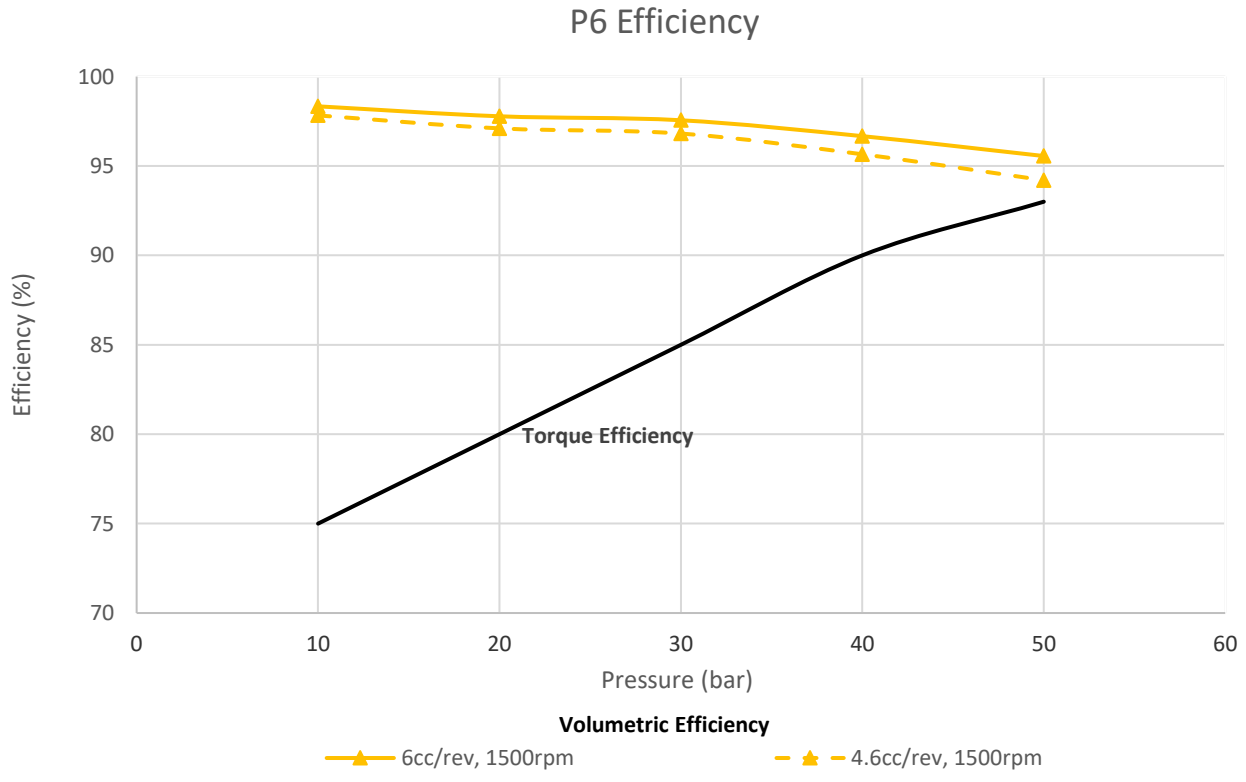


3.1.5 Boosted Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	3/8” BSPP
B	High Pressure Out	3/8” BSPP
C	Tank Return Line	3/8” BSPP

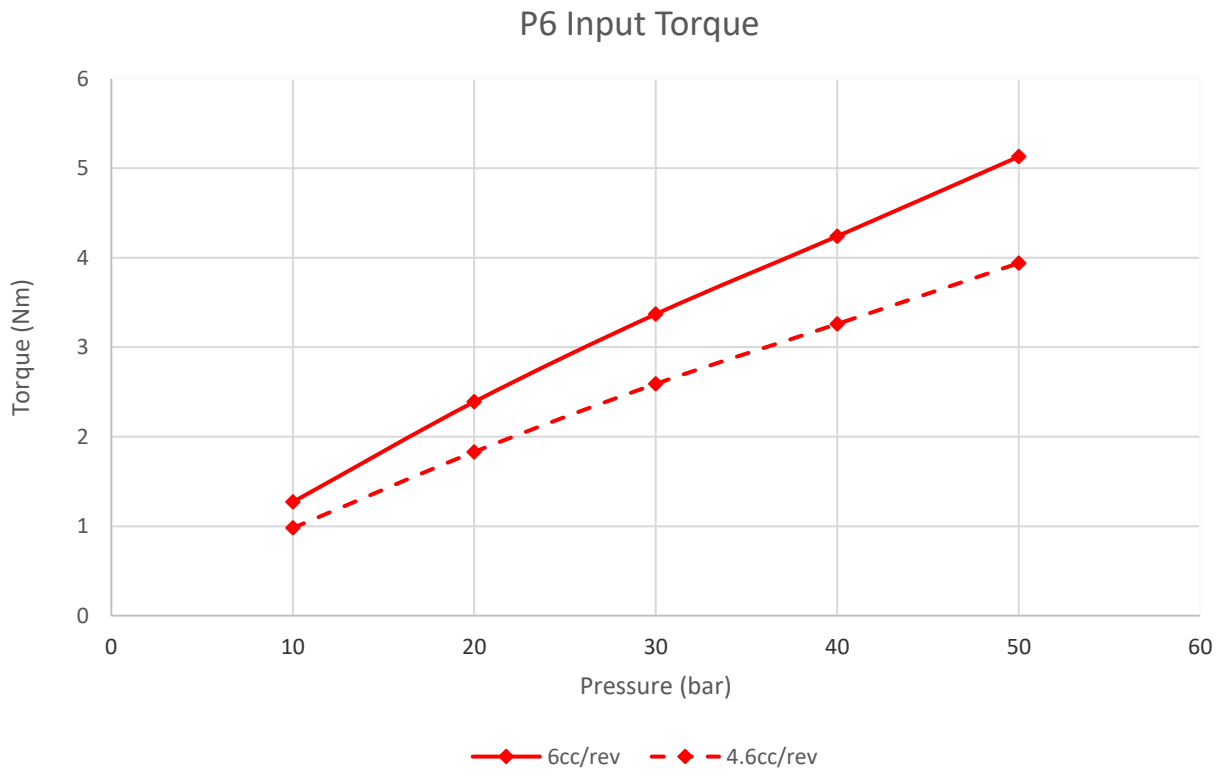
3.1.6 P6 Performance Data

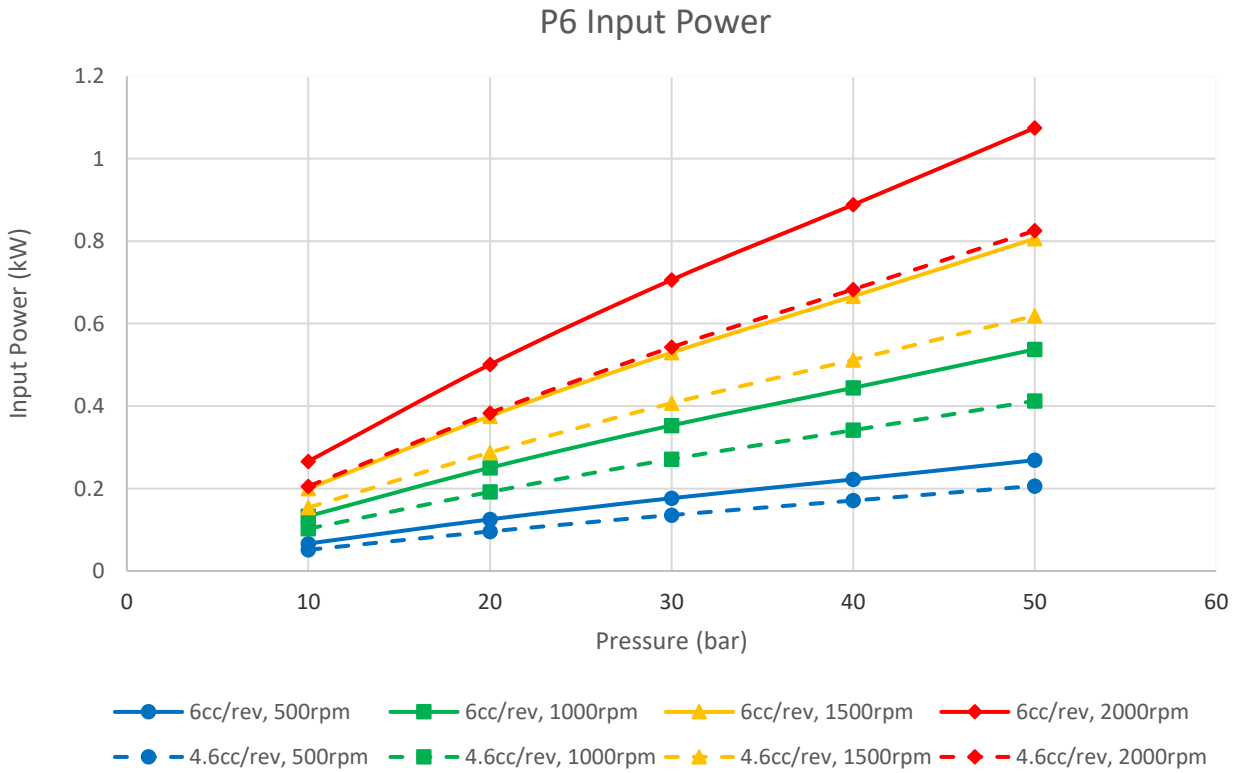




Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.

BRACKISH WATER AXIAL PISTON



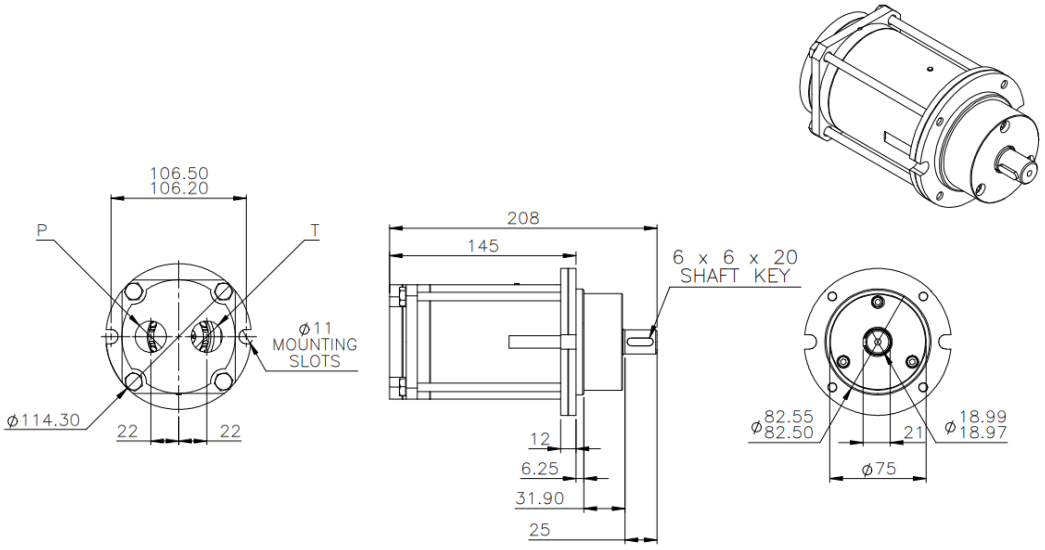


3.2 P15

3.2.1 Specification

SPECIFICATION				
Displacement (cc/rev)		12	15	19
Max. RPM	Boosted: *	2200	2200	2200
Max. Input Power (kW)		2.5	3.5	4.0
Max. Water Flow (m³/hr)		1.58	1.98	2.51
Max. Cont. Pressure (Barg)		50	50	50
Weight (kg)		6	6	6
Temperature (°C)	Max: **	50	50	50
	Min: ***	2	2	2

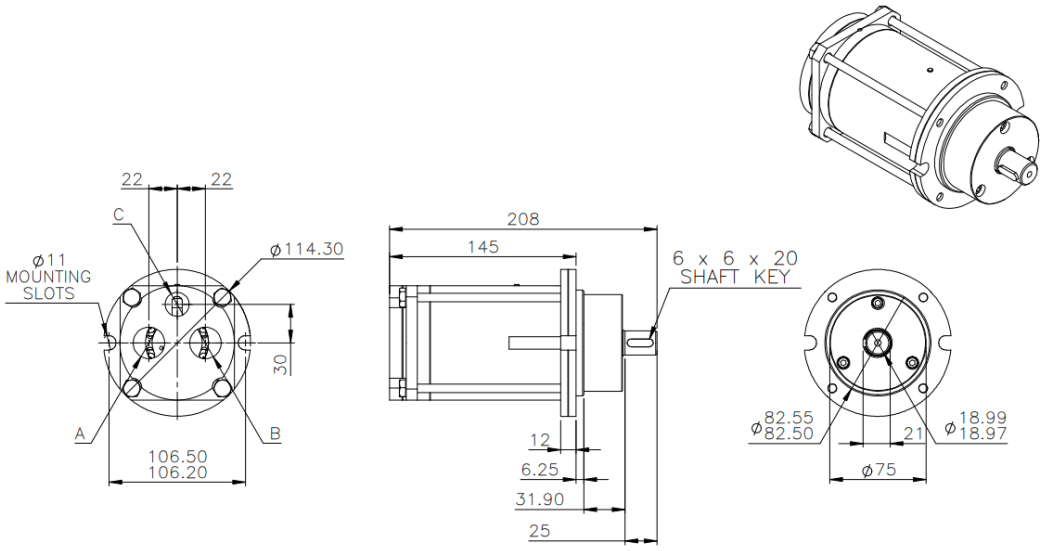
3.2.2 General Assembly Drawing – Un-boosted



3.2.3 Un-boosted Port Dimensions (ACW Configuration)

Position	Description	Size
P	Low Pressure In	3/4" BSPP
T	High Pressure Out	3/4" BSPP

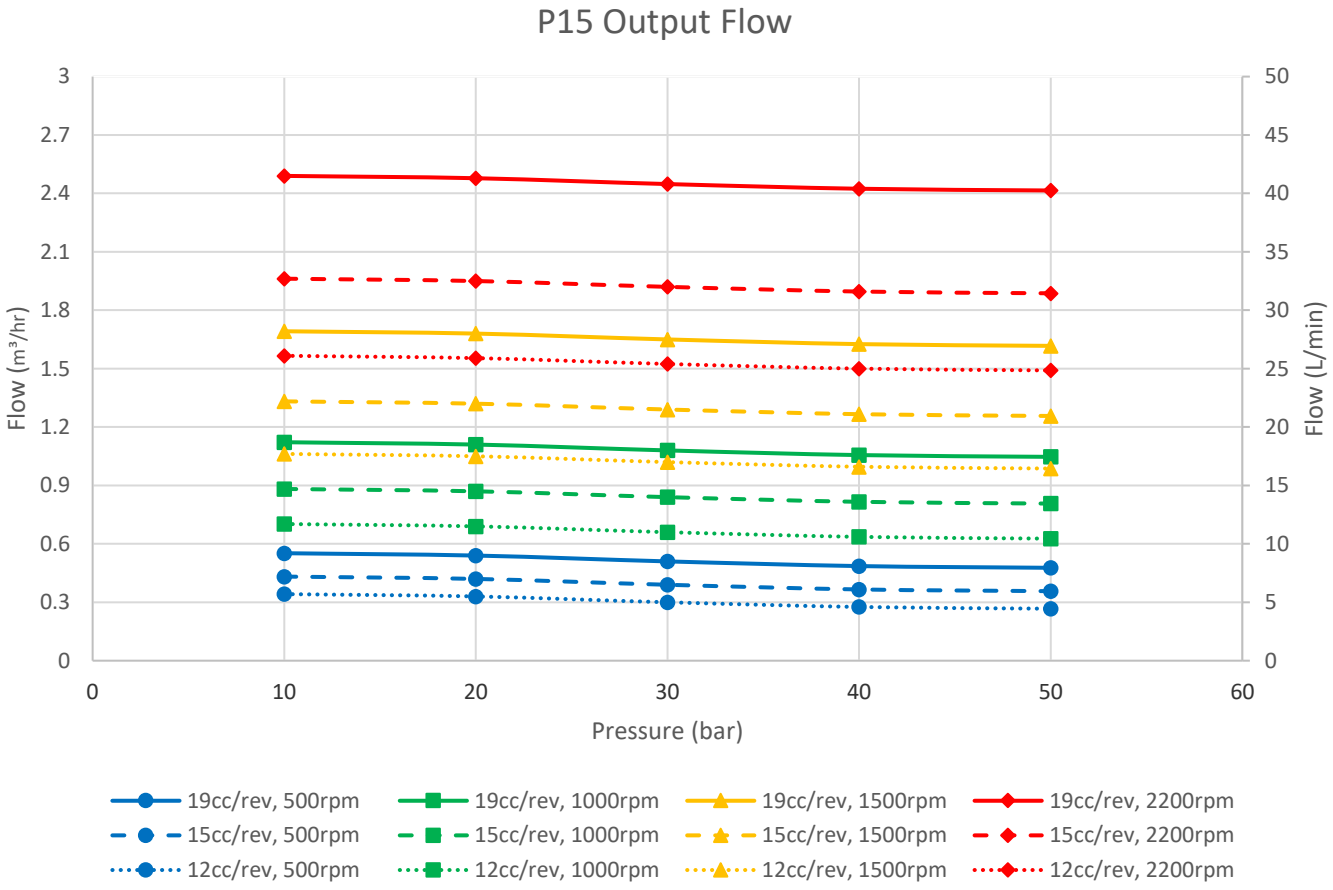
3.2.4 General Assembly Drawing – Boosted

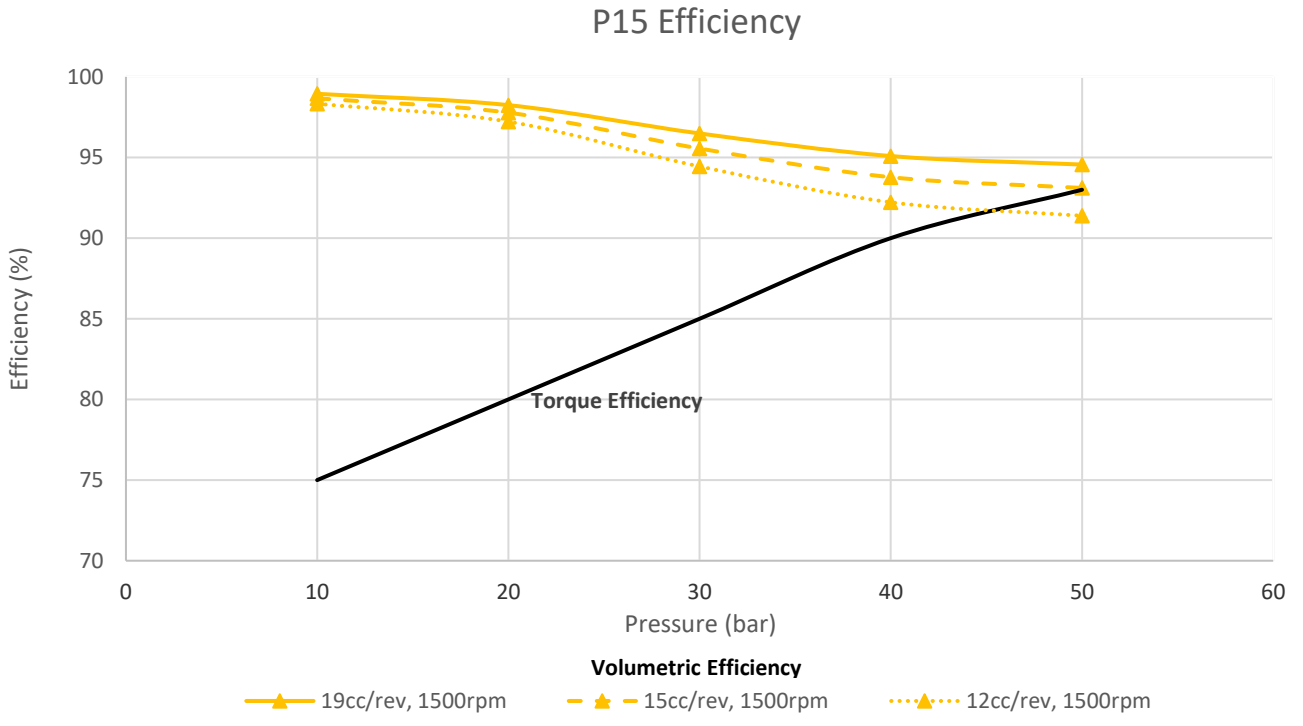


3.2.5 Boosted Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	3/4” BSPP
B	High Pressure Out	3/4” BSPP
C	Tank Return Line	1/2” BSPP

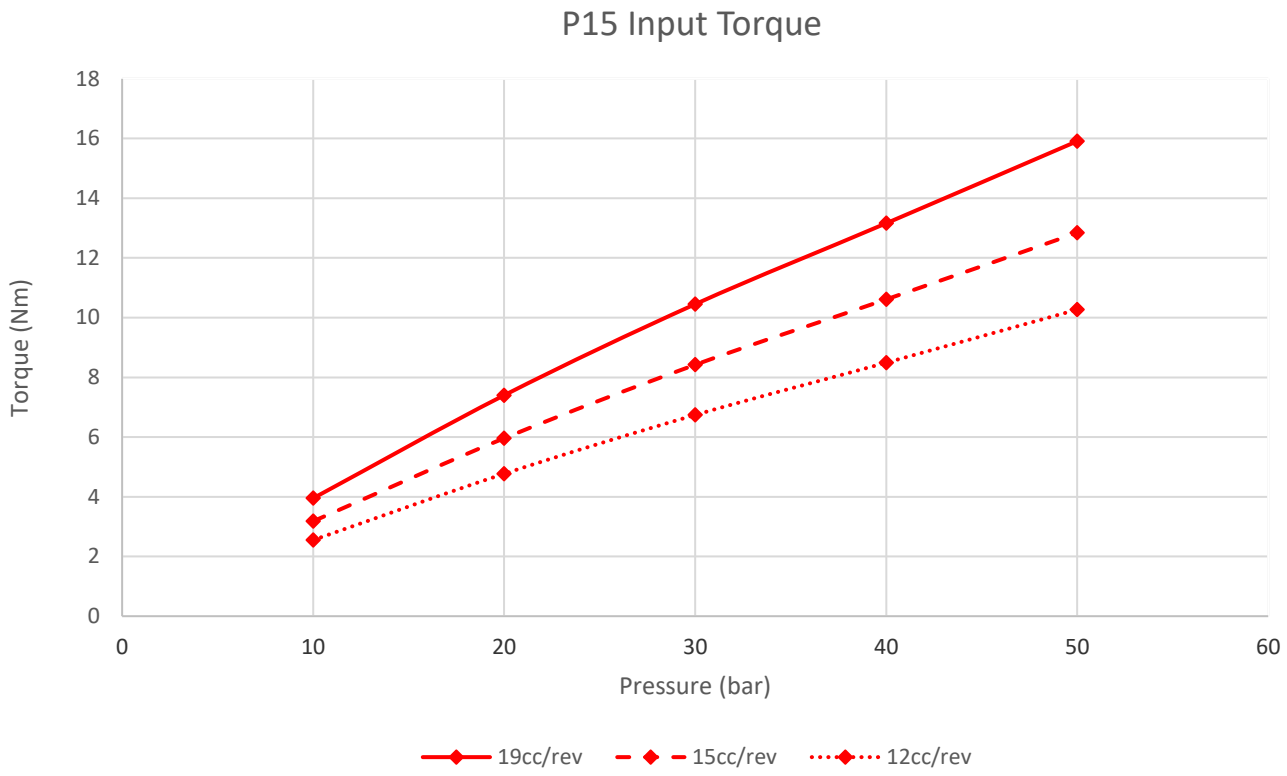
3.2.6 P15 Performance Data

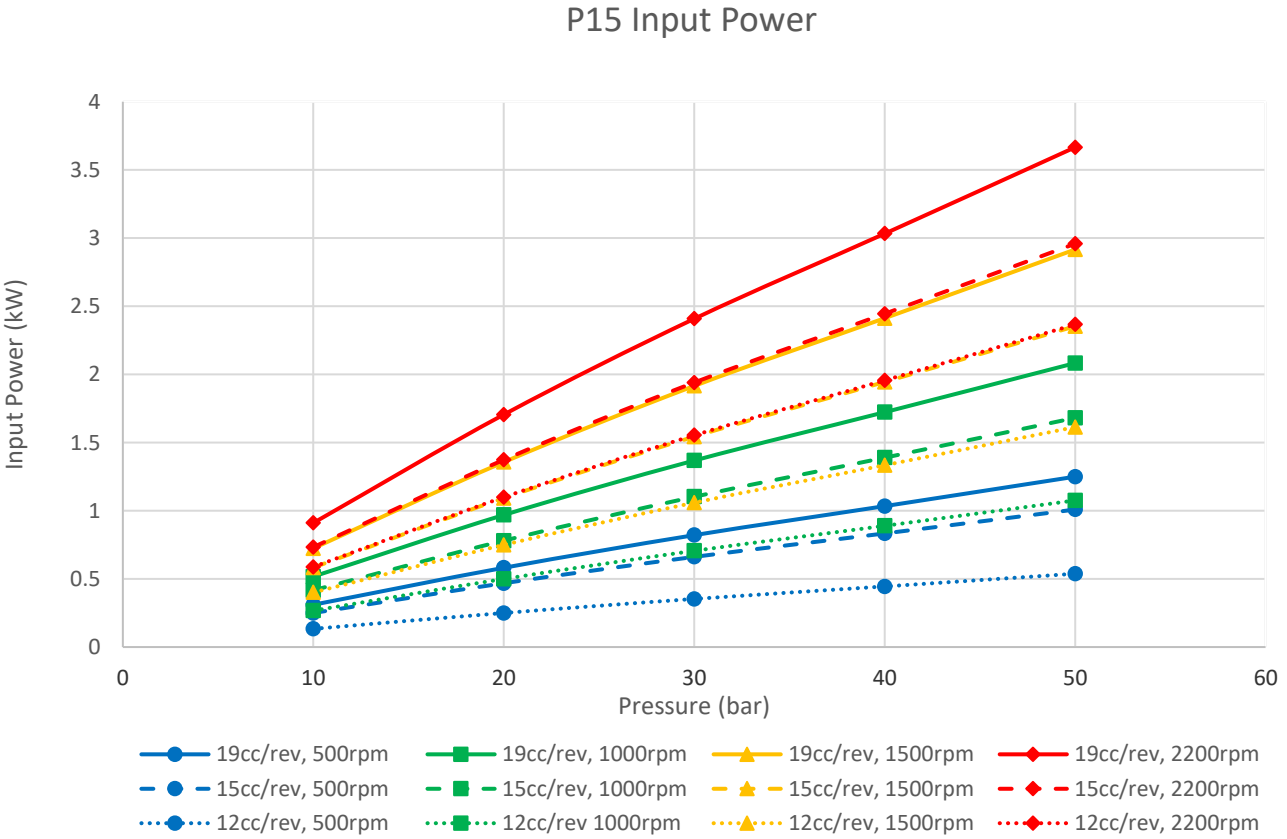




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BRACKISH WATER AXIAL PISTON



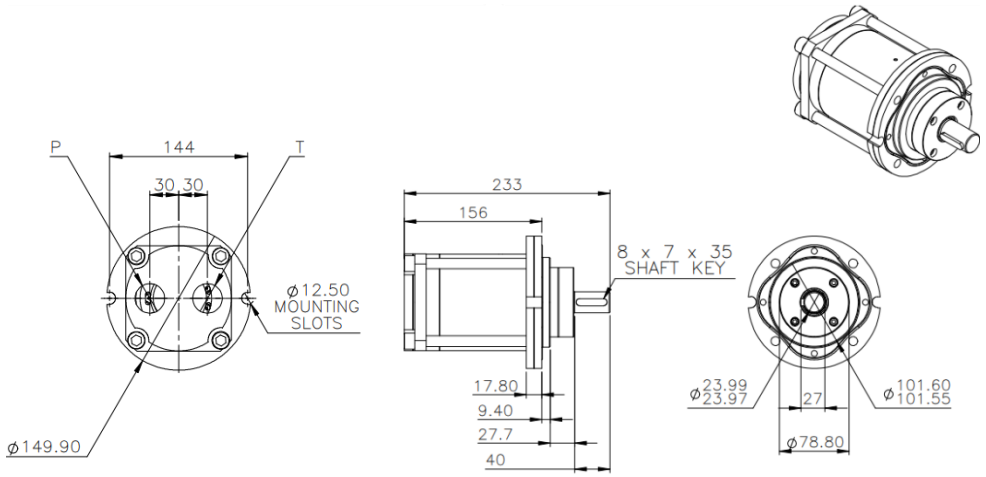


3.3 P30

3.3.1 Specification

SPECIFICATION				
Displacement (cc/rev)		23	30	35
Max. RPM	Boosted: *	2000	2000	2000
Max. Input Power (kW)		4.5	5.5	6.5
Max. Water Flow (m³/hr)		2.76	3.6	4.2
Max. Cont. Pressure (Barg)		50	50	50
Weight (kg)		10	10	10
Temperature (°C)	Max: **	50	50	50
	Min: ***	2	2	2

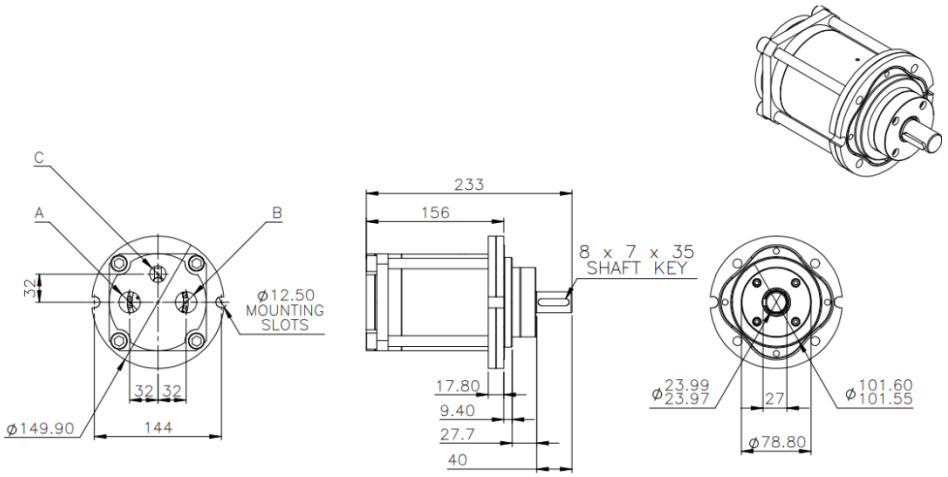
3.3.2 General Assembly Drawing – Un-boosted



3.3.3 Unboosted Port Dimensions (ACW Configuration)

Position	Description	Size
P	Low Pressure In	1” BSPP
T	High Pressure Out	1” BSPP

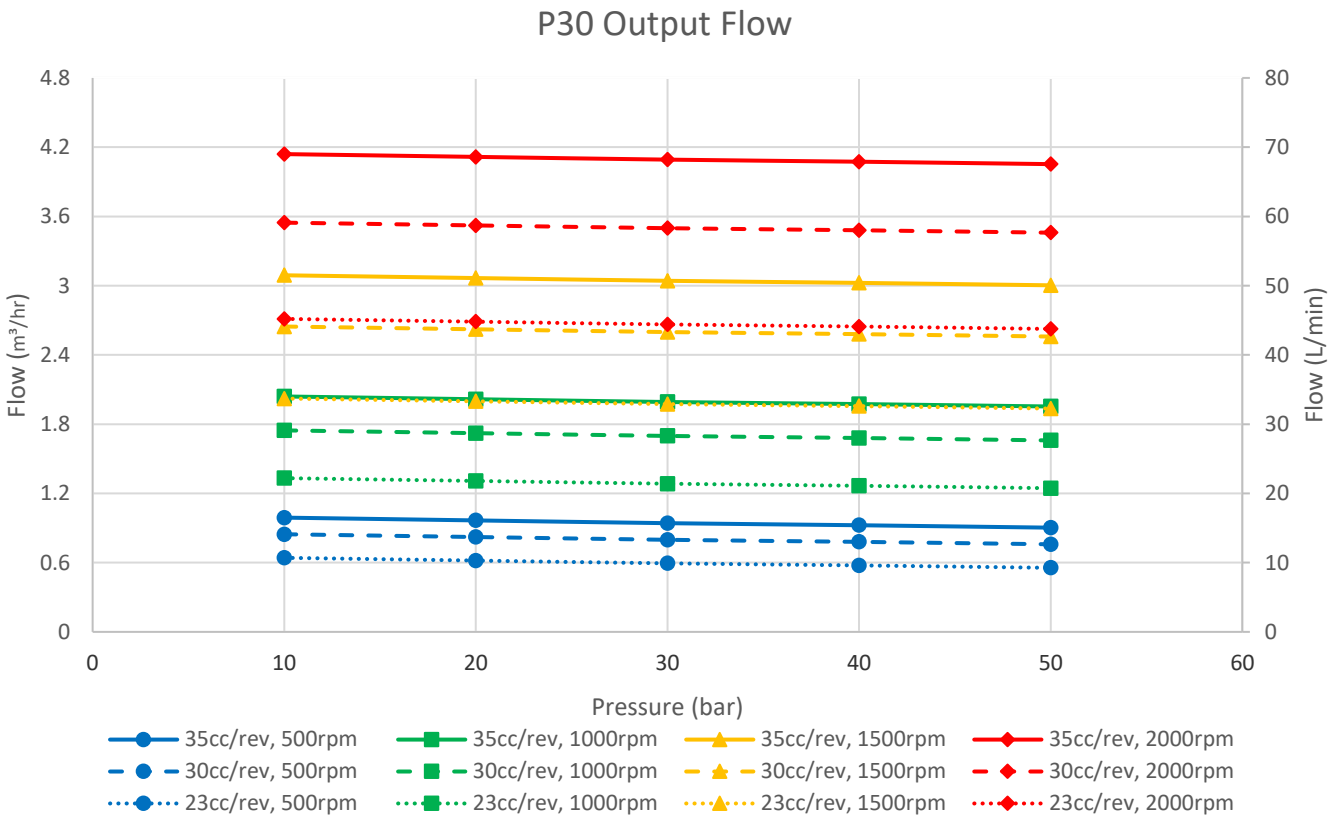
3.3.4 General Assembly Drawing - Boosted

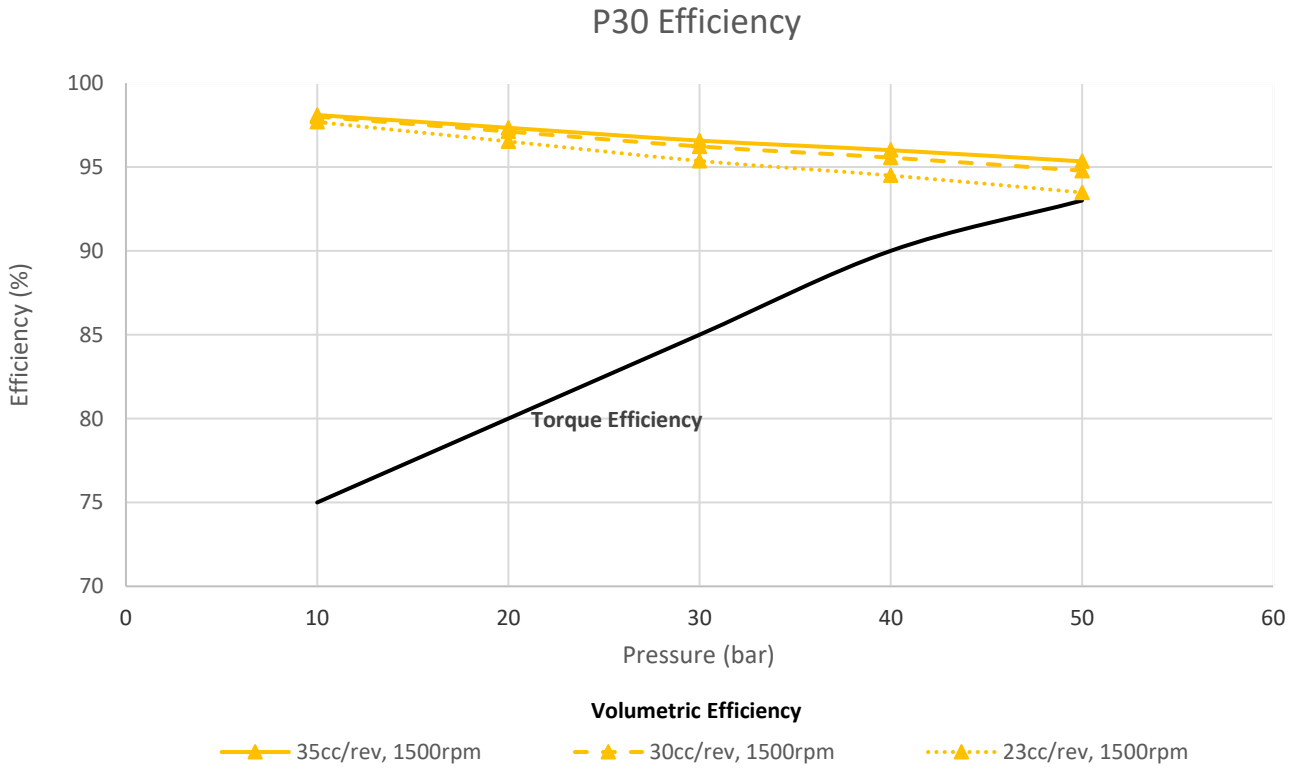


3.3.5 Boosted Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	3/4” BSPP
B	High Pressure Out	3/4” BSPP
C	Tank Return Line	1/2” BSPP

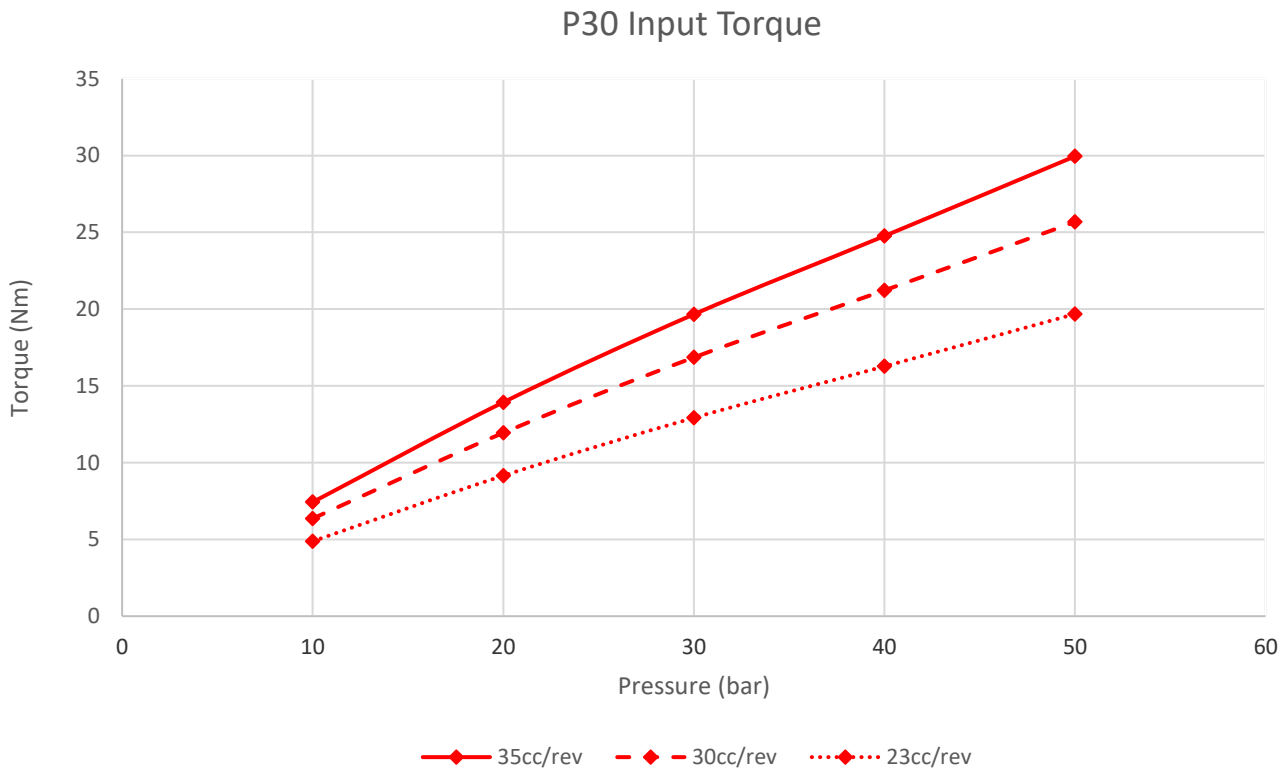
3.3.6 P30 Performance Data

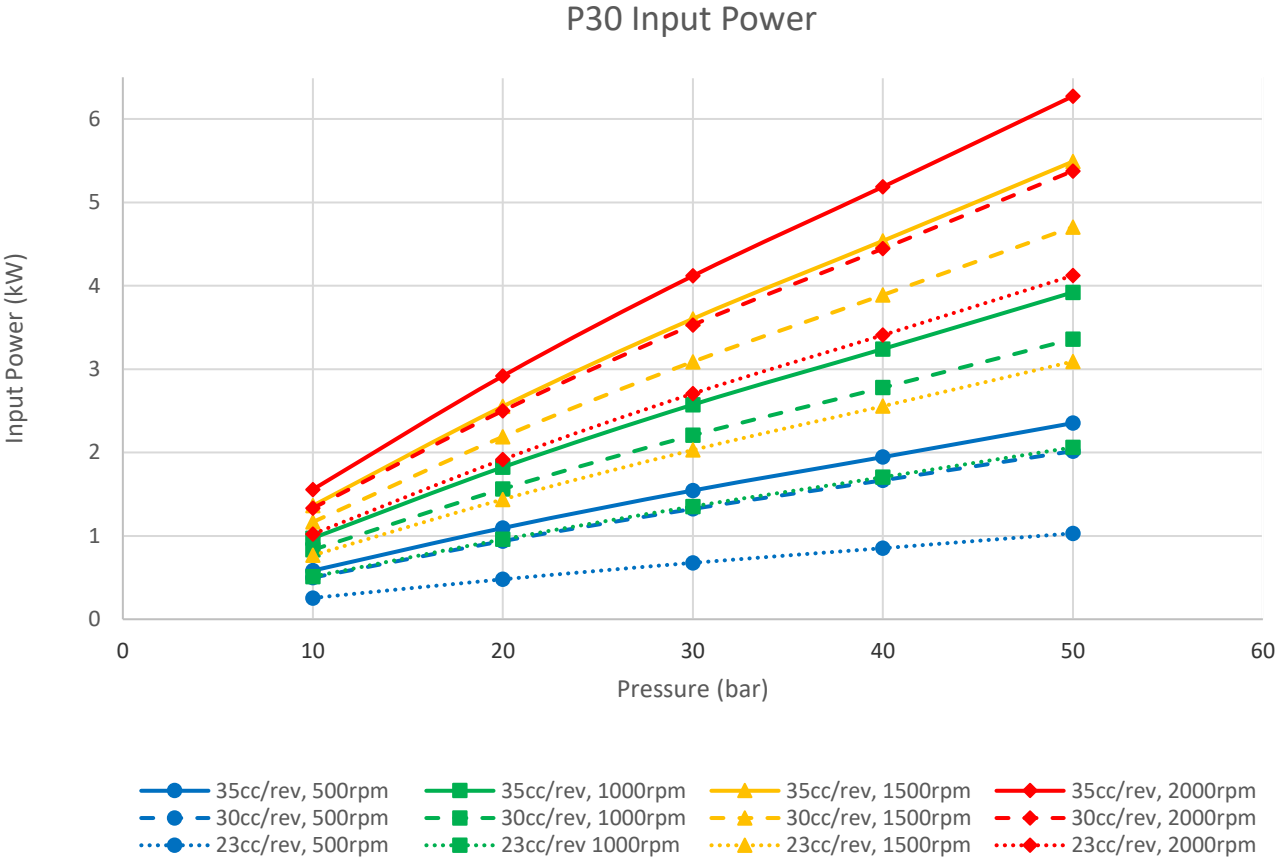




Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.

BRACKISH WATER AXIAL PISTON



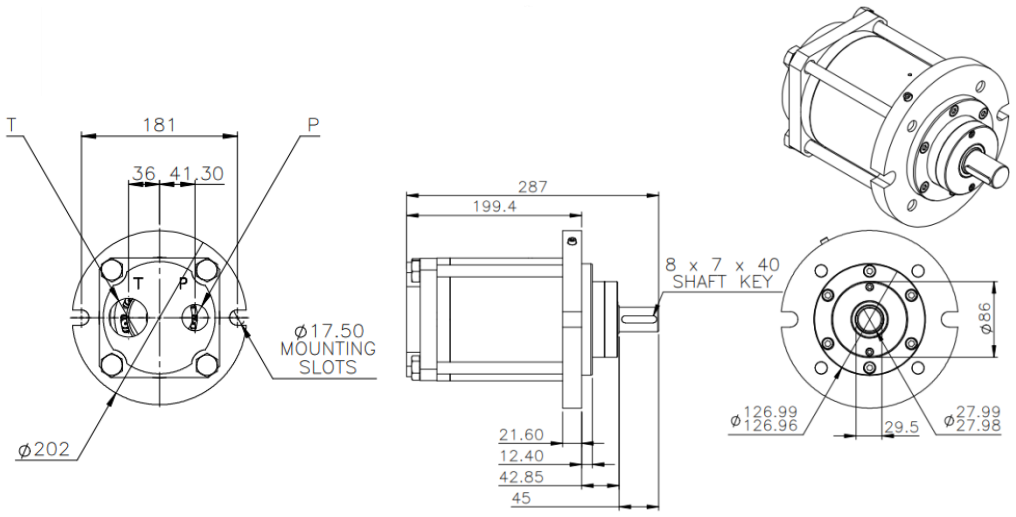


3.4 P60

3.4.1 Specification

SPECIFICATION					
Displacement (cc/rev)		51	63	70	80
Max. RPM	Boosted: *	2000	2000	2000	2000
Max. Input Power (kW)		9.5	12.0	13.0	15.0
Max. Water Flow (m³/hr)		6.1	7.5	8.4	9.6
Max. Cont. Pressure (Barg)		50	50	50	50
Weight (kg)		19	19	19	19
Temperature (°C)	Max: **	50	50	50	50
	Min: ***	2	2	2	2

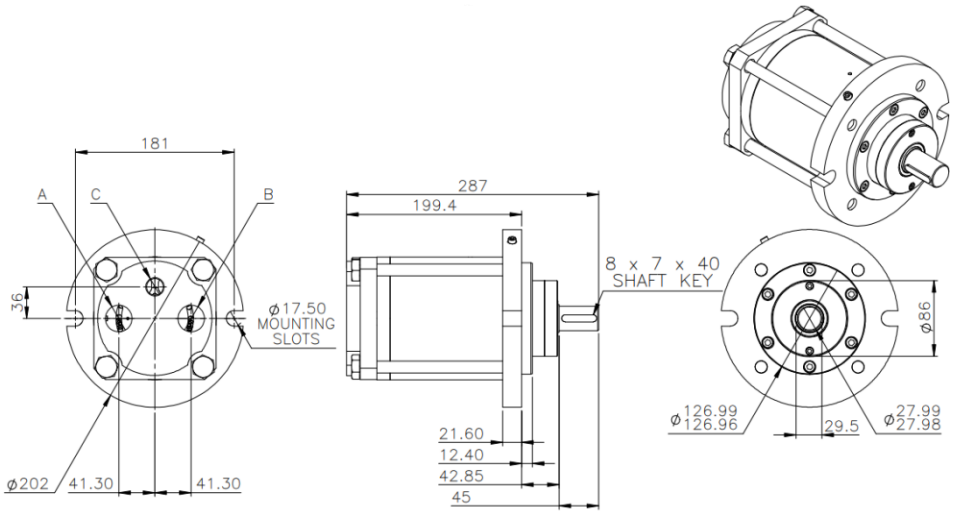
3.4.2 General Assembly Drawing – Un-boosted



3.4.3 Un-boosted Port Dimensions (ACW Configuration)

Position	Description	Size
P	Low Pressure In	1” BSPP
T	High Pressure Out	1 1/2” BSPP

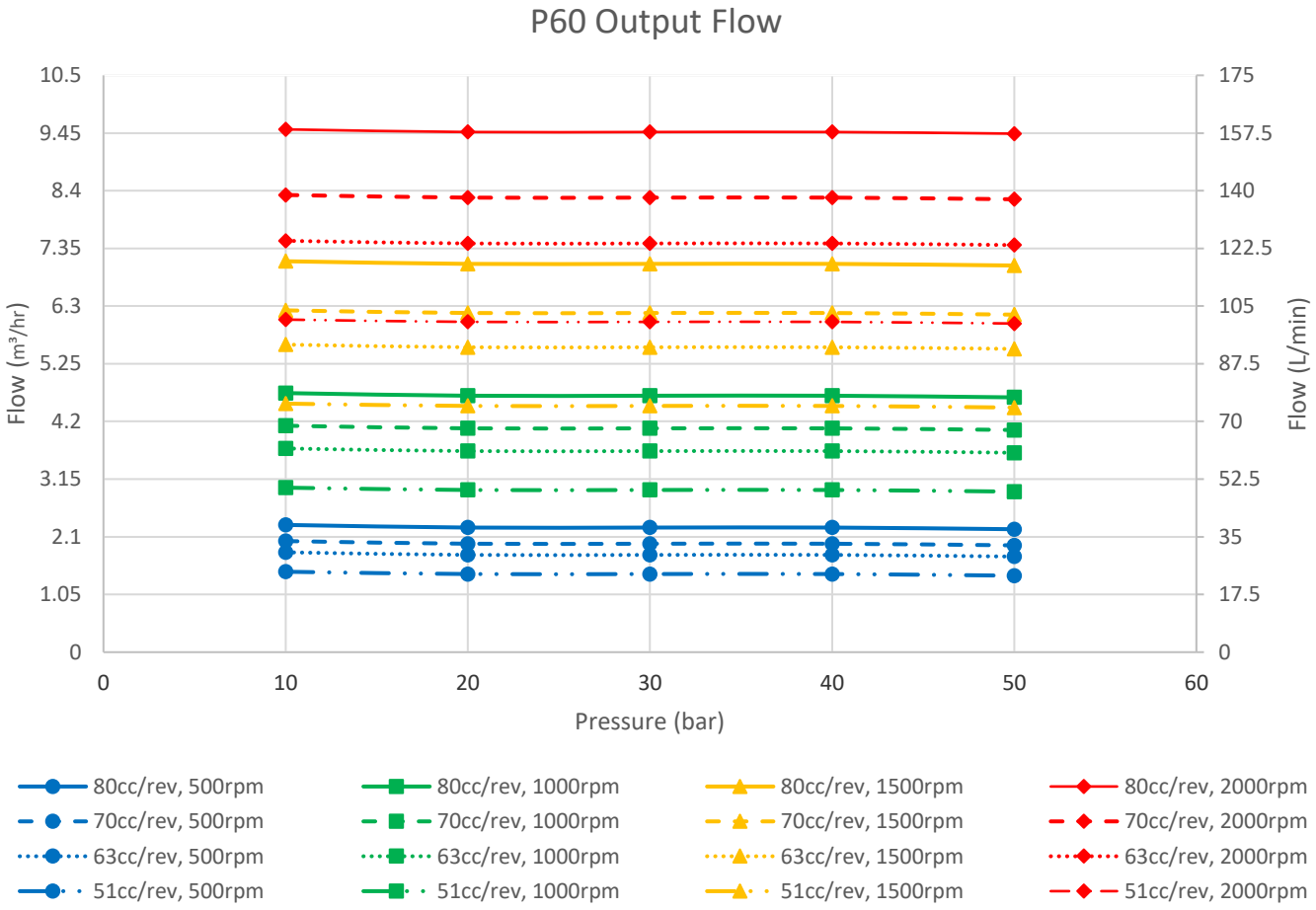
3.4.4 General Assembly Drawing - Boosted

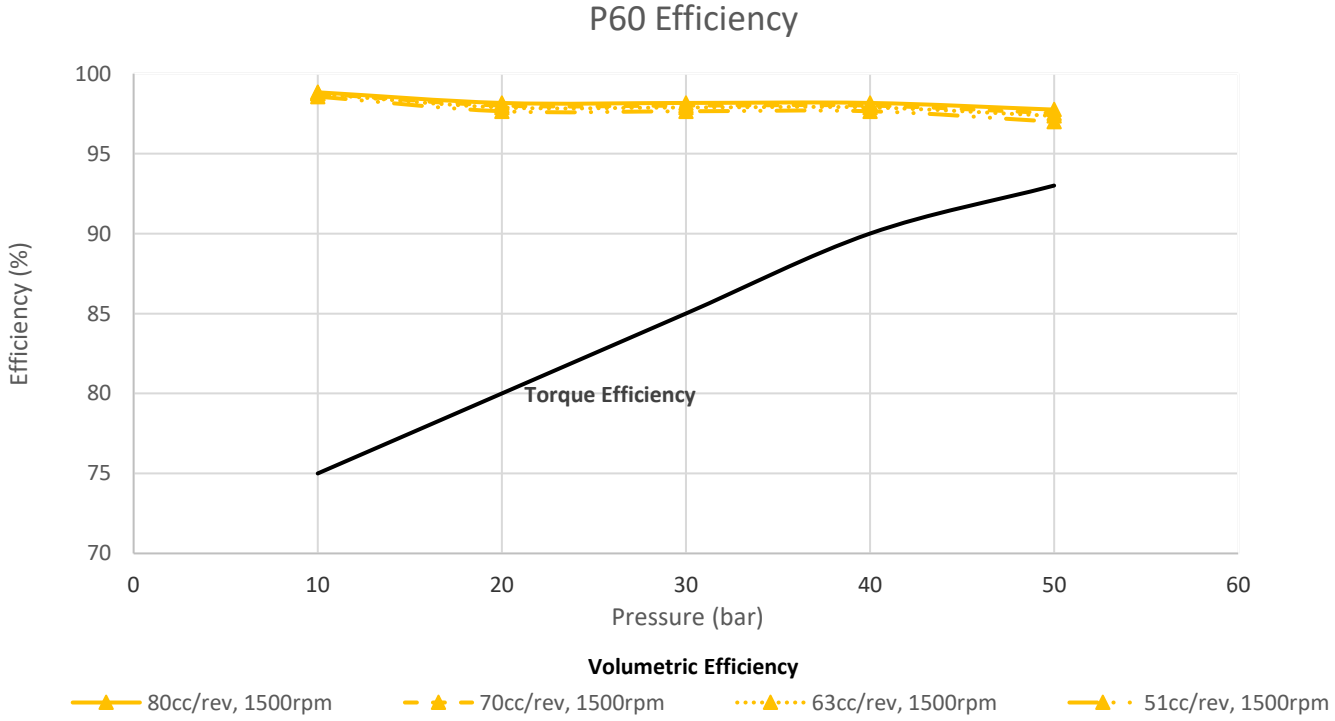


3.4.5 Boosted Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	1” BSPP
B	High Pressure Out	1” BSPP
C	Tank Return Line	1/2” BSPP

3.4.6 P60 Performance Data

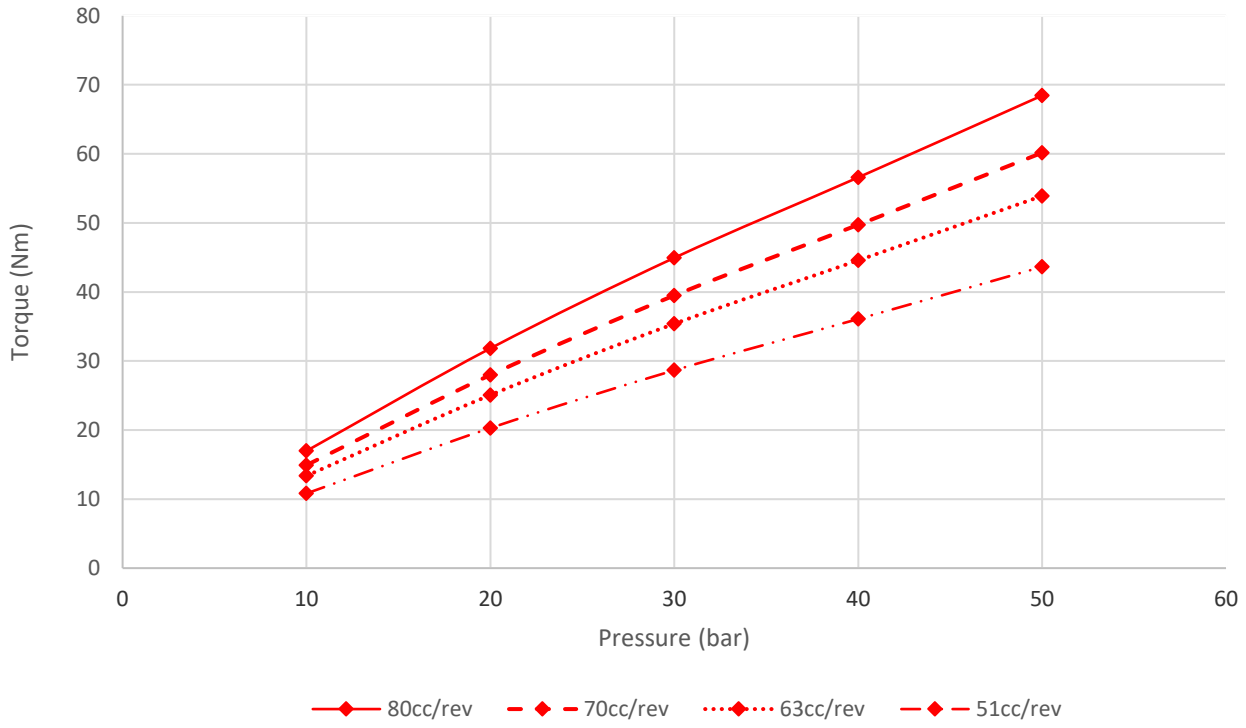




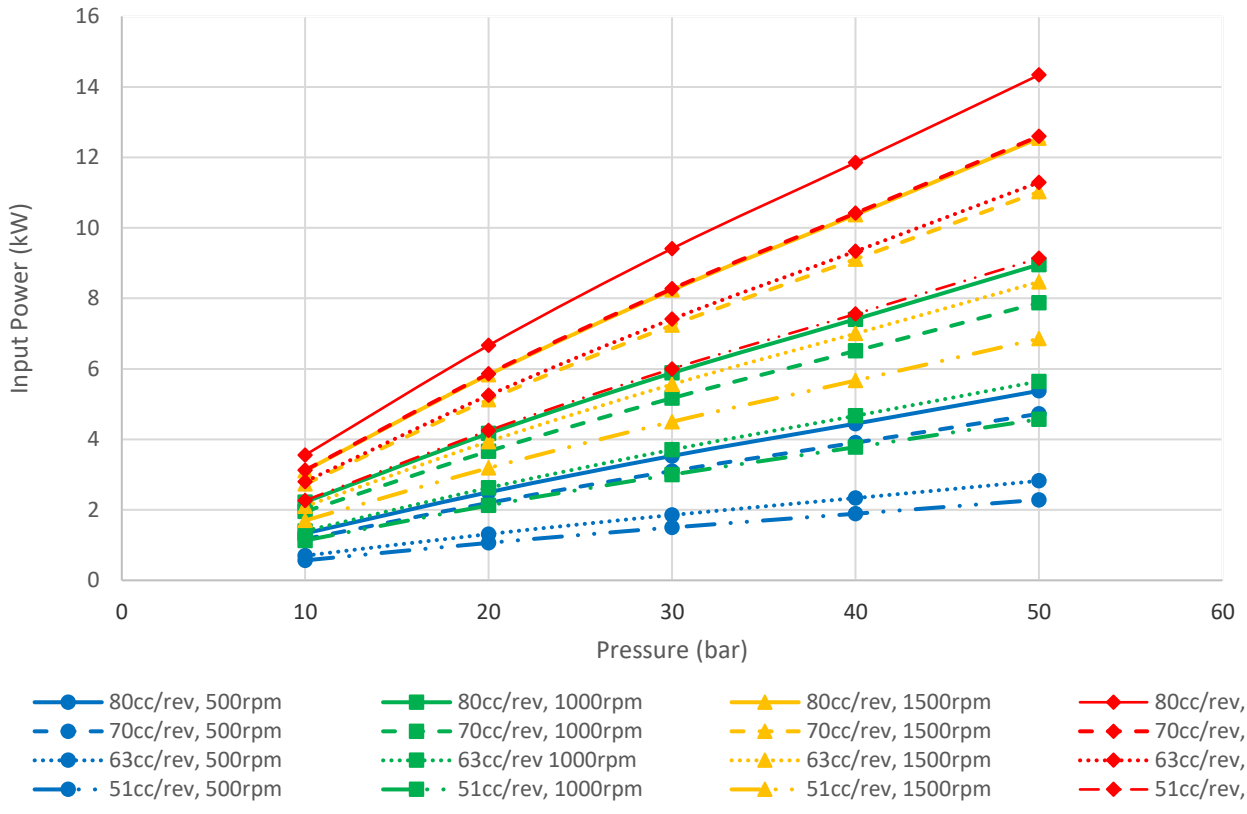
Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.

BRACKISH WATER AXIAL PISTON

P60 Input Torque



P60 Input Power

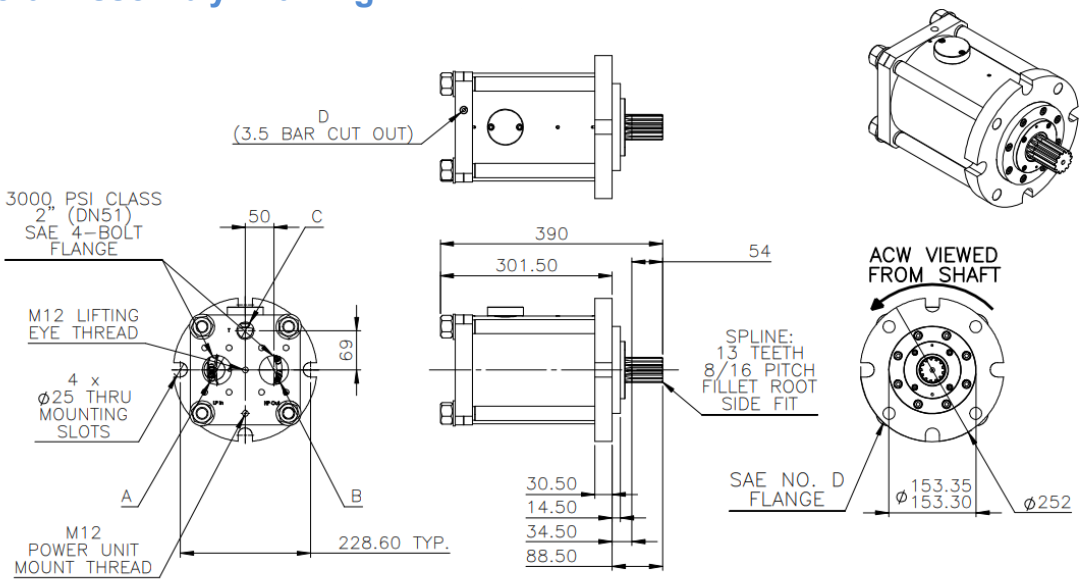


3.5 P180

3.5.1 Specifications

SPECIFICATION				
Displacement (cc/rev)		135	180	225
Max. RPM	Boosted: *	2000	2000	2000
Max. Input Power (kW)		25.0	33.5	42.0
Max. Water Flow (m³/hr)		16.2	21.6	27.0
Max. Cont. Pressure (Barg)		50	50	50
Weight (kg)		82	82	82
Temperature (°C)	Max: **	50	50	50
	Min: ***	2	2	2

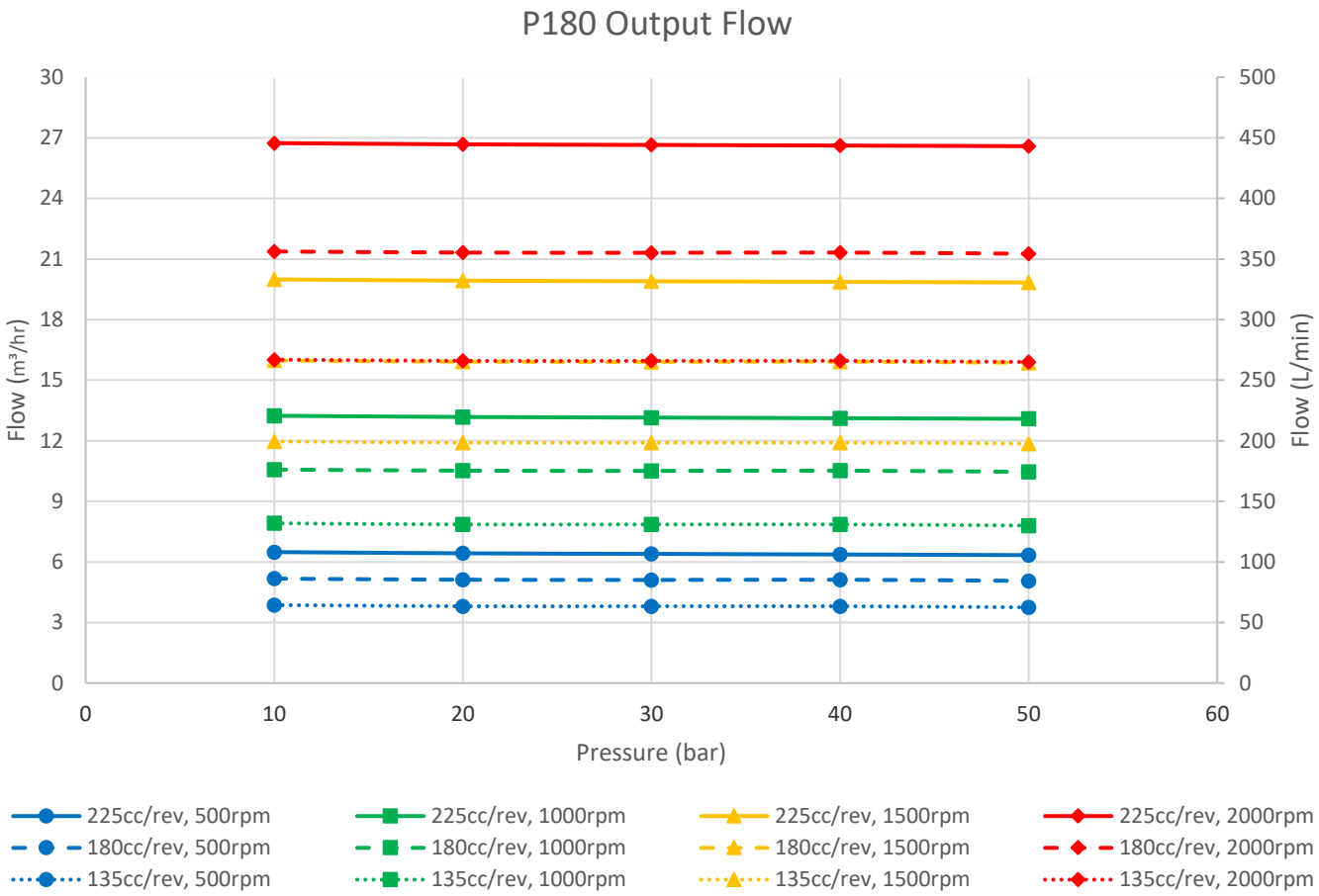
3.5.2 General Assembly Drawing

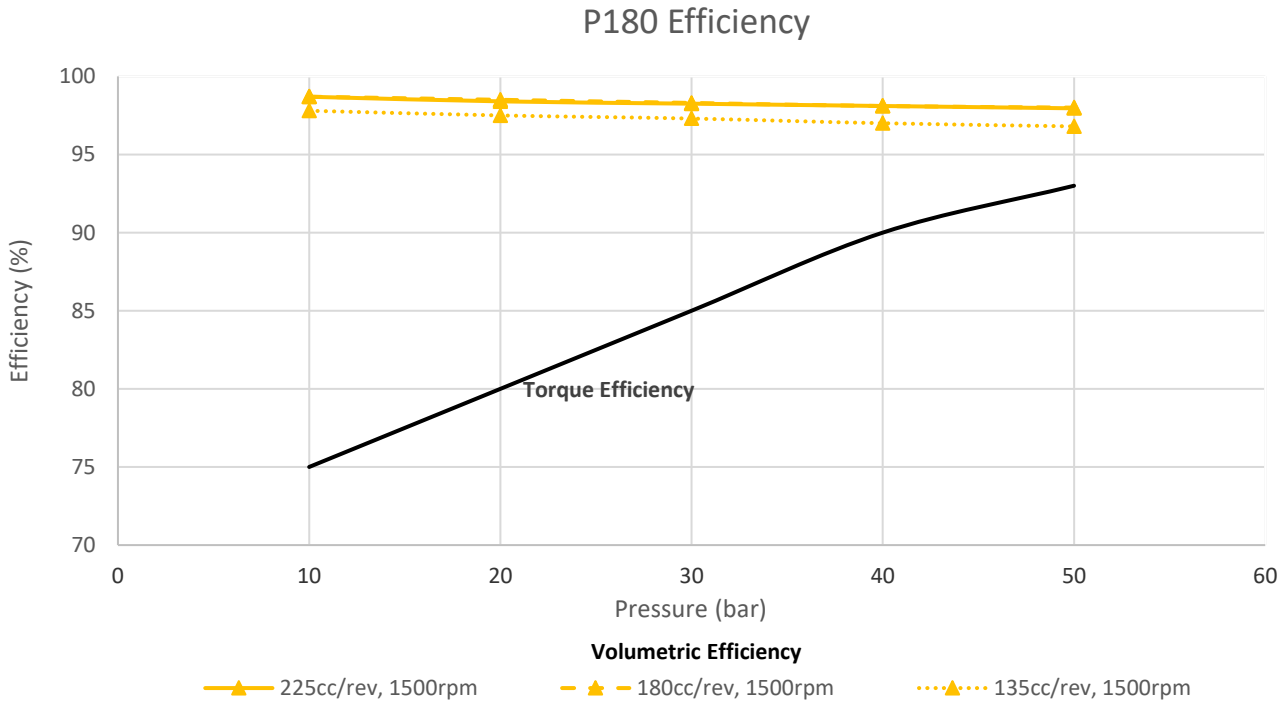


3.5.3 Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
B	High Pressure Out	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
C	Case Drain	1" BSPP FEMALE
D	Inlet Pressure Switch Port	1/4" BSPP FEMALE

3.5.4 P180 Performance Data

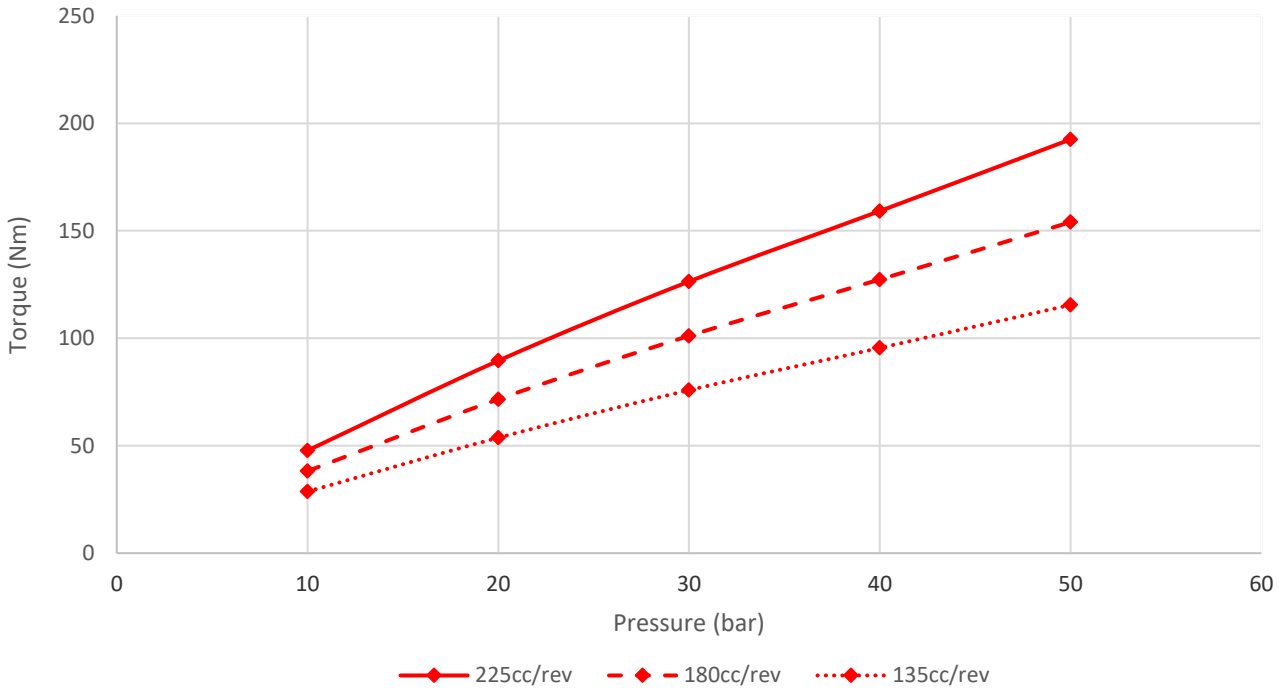




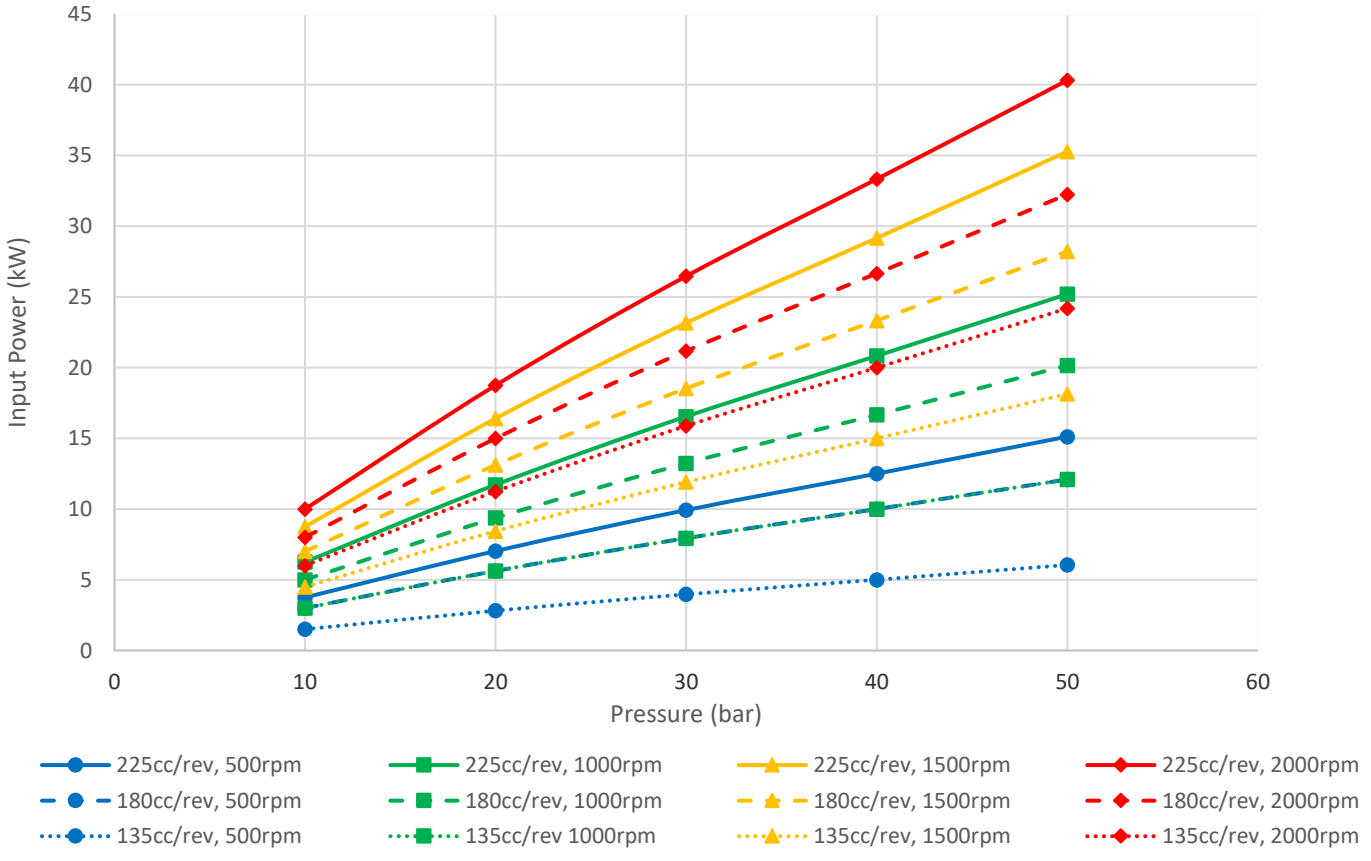
Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.

BRACKISH WATER AXIAL PISTON

P180 Input Torque



P180 Input Power

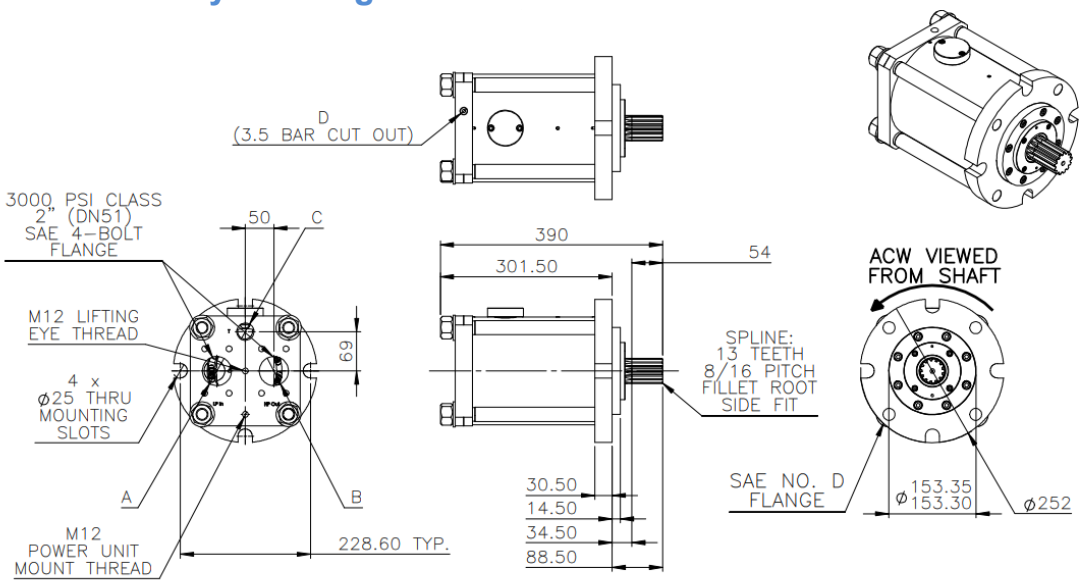


3.6 P300

3.6.1 Specification

SPECIFICATION		
Displacement (cc/rev)		286
Max. RPM	Boosted: *	2000
Max. Input Power (kW)		53.0
Max. Water Flow (m³/hr)		34.3
Max. Cont. Pressure (Barg)		50
Weight (kg)		82
Temperature (°C)	Max: **	50
	Min: ***	2

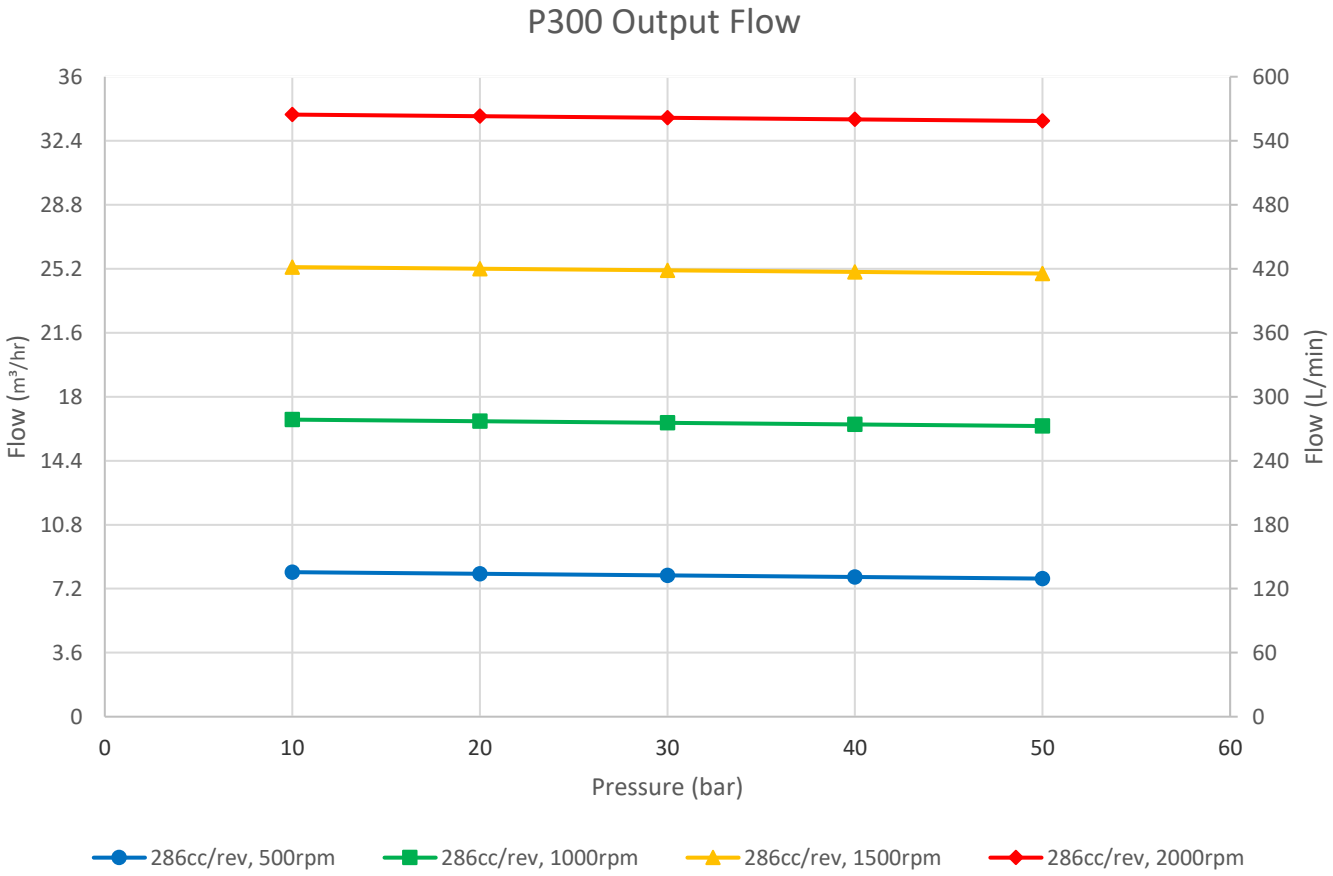
3.6.2 General Assembly Drawing

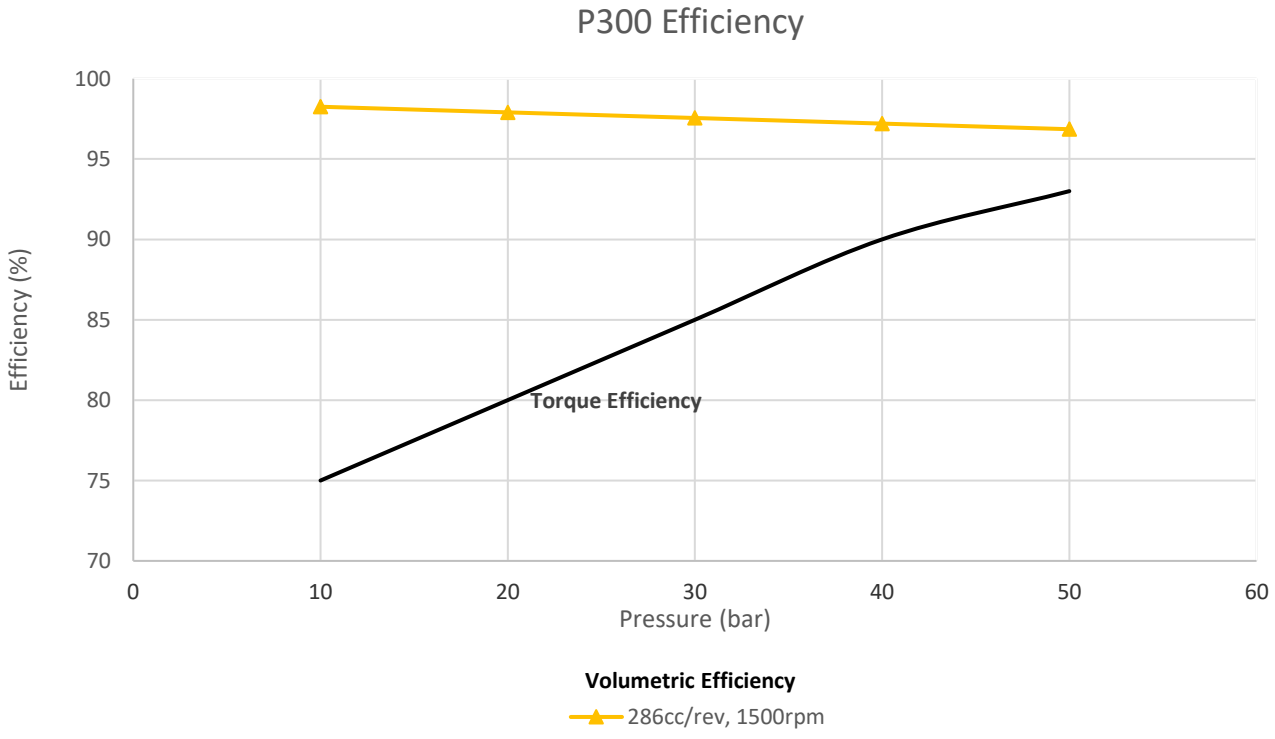


3.6.3 Port Dimensions (ACW Configuration)

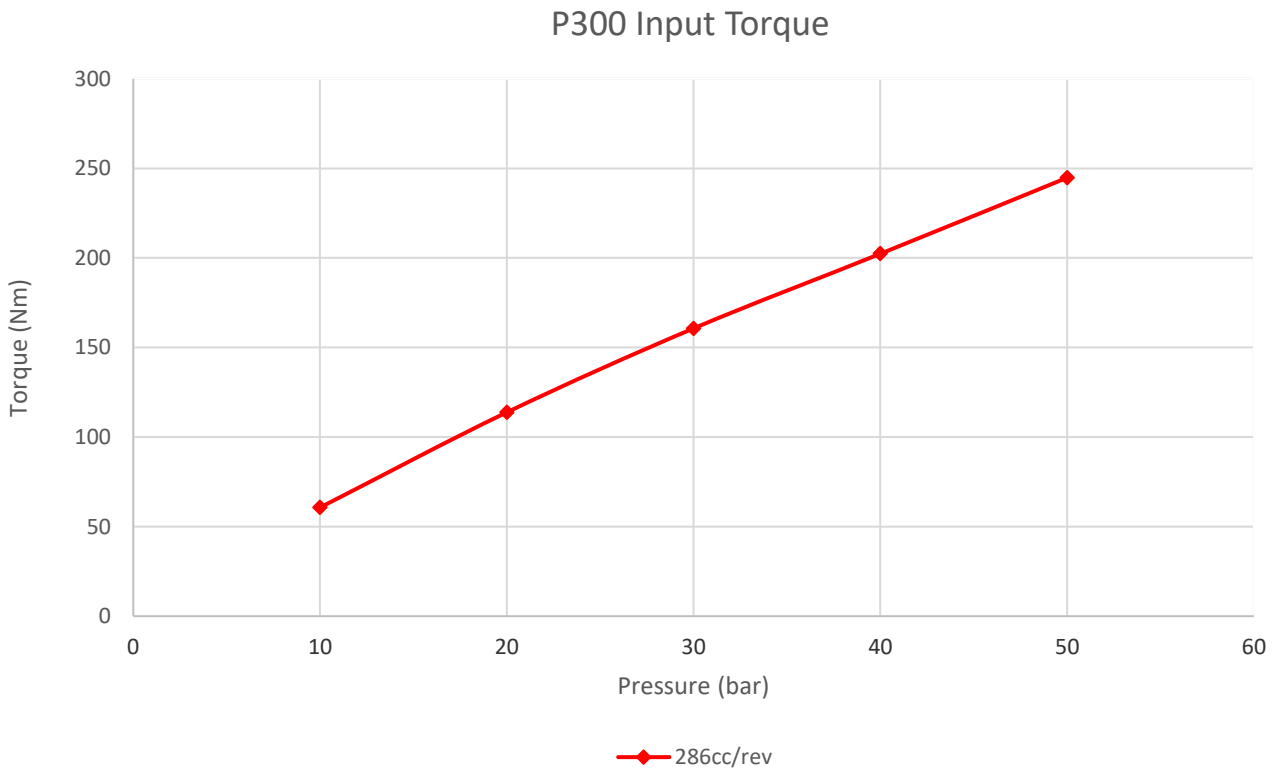
Position	Description	Size
A	Low Pressure In	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
B	High Pressure Out	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
C	Case Drain	1" BSPP FEMALE
D	Inlet Pressure Switch Port	1/4" BSPP FEMALE

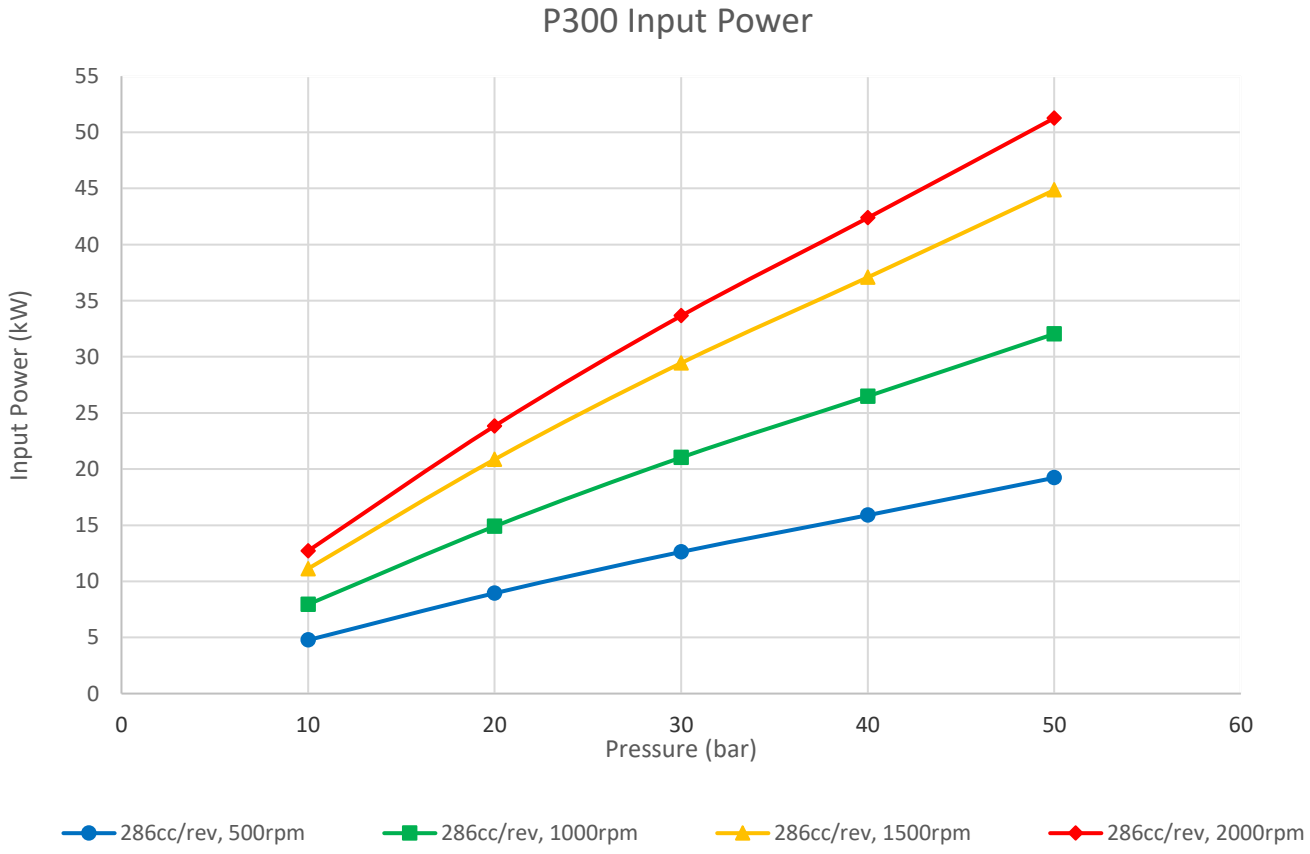
3.6.4 P300 Performance Data





Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.


P300 Input Torque
Torque (Nm)
300
250
200
150
100
50
0
0
10
20
30
40
50
60
Pressure (bar)
286cc/rev

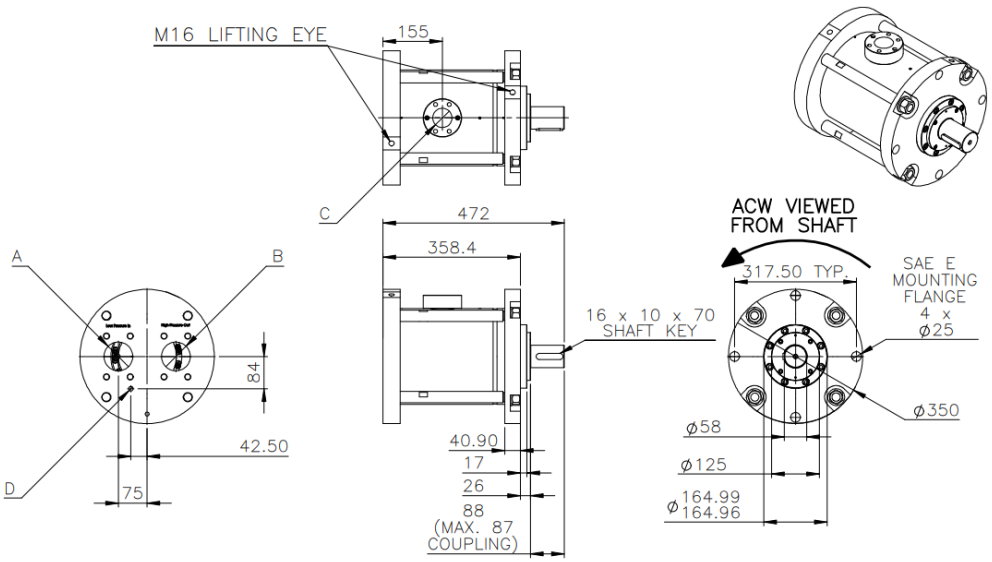

P300 Input Power
Input Power (kW)
55
50
45
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Pressure (bar)
286cc/rev, 500rpm
286cc/rev, 1000rpm
286cc/rev, 1500rpm
286cc/rev, 2000rpm

3.7 P600

3.7.1 Specification

SPECIFICATION				
Displacement (cc/rev)		390	445	625
Max. RPM	Boosted: *	1250	1250	1250
Max. Input Power (kW)		45.0	51.5	72.5
Max. Water Flow (m³/hr)		29.2	33.3	46.8
Max. Cont. Pressure (Barg)		50	50	50
Weight (kg)		120	120	120
Temperature (°C)	Max: **	50	50	50
	Min: ***	2	2	2

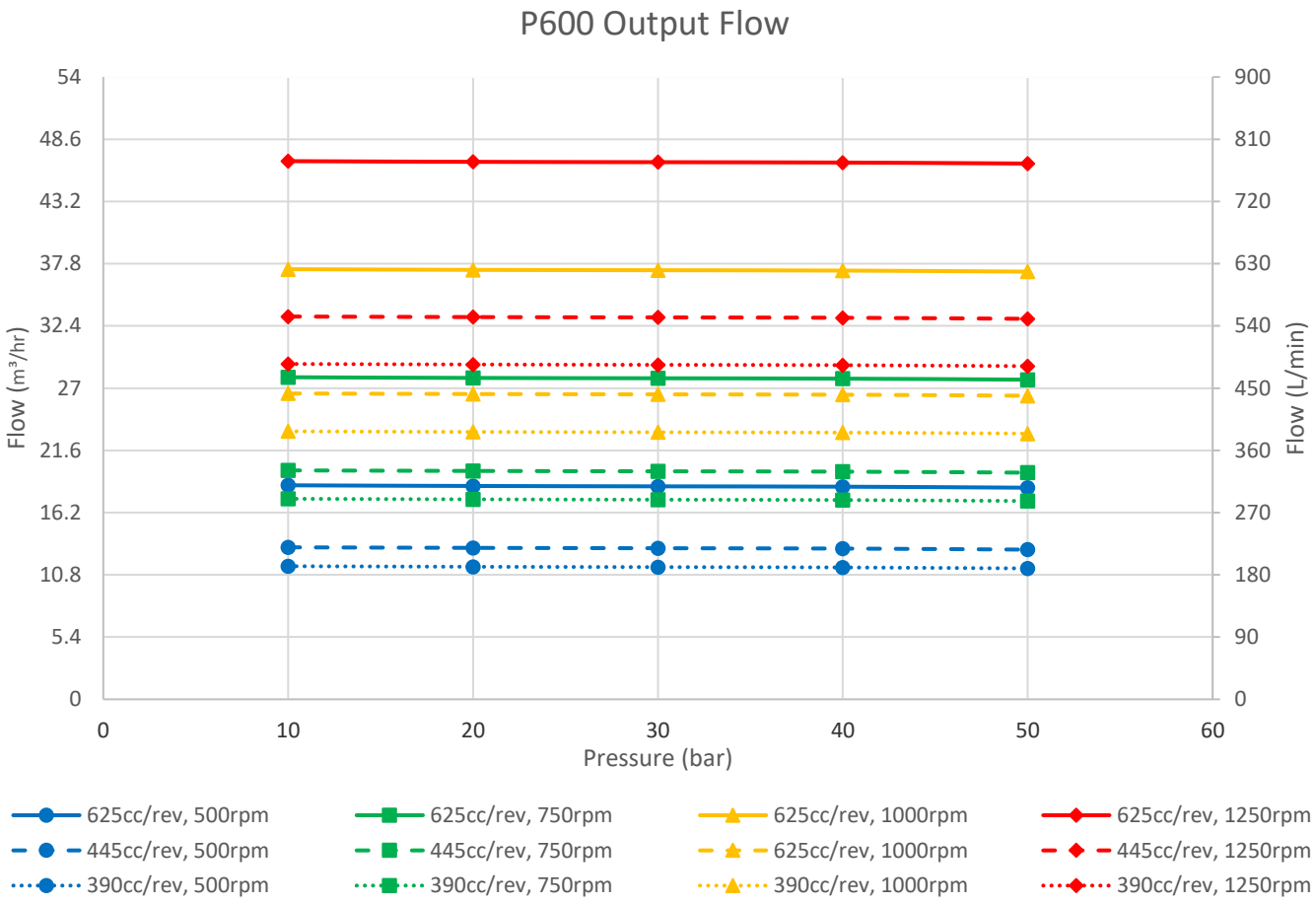
3.7.2 General Assembly Drawing

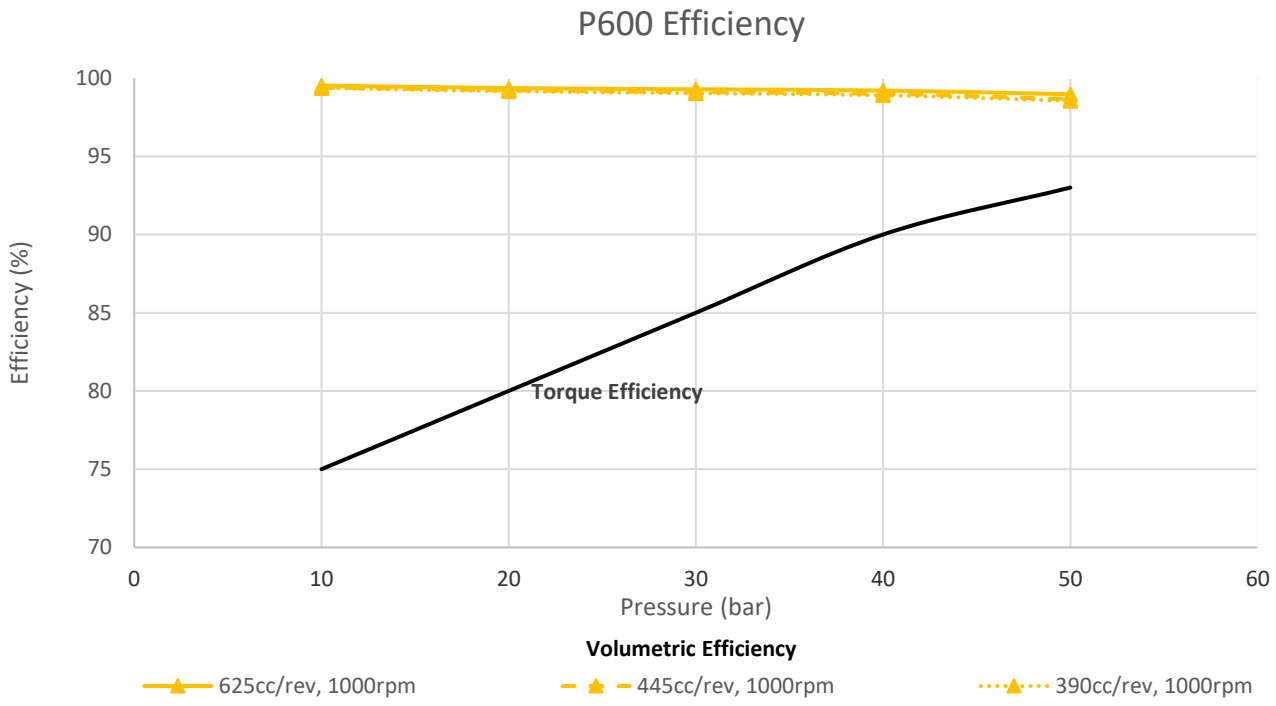


3.7.3 Port Dimensions (ACW Configuration)

Position	Description	Size
A	Low Pressure In	3" 3000 PSI CLASS SAE 4-BOLT FLANGE
B	High Pressure Out	3" 3000 PSI CLASS SAE 4-BOLT FLANGE
C	Case Drain	1 1/2" 3000 PSI CLASS SAE 4-BOLT FLANGE
D	Inlet Pressure Switch Port	1/4" BSPP FEMALE

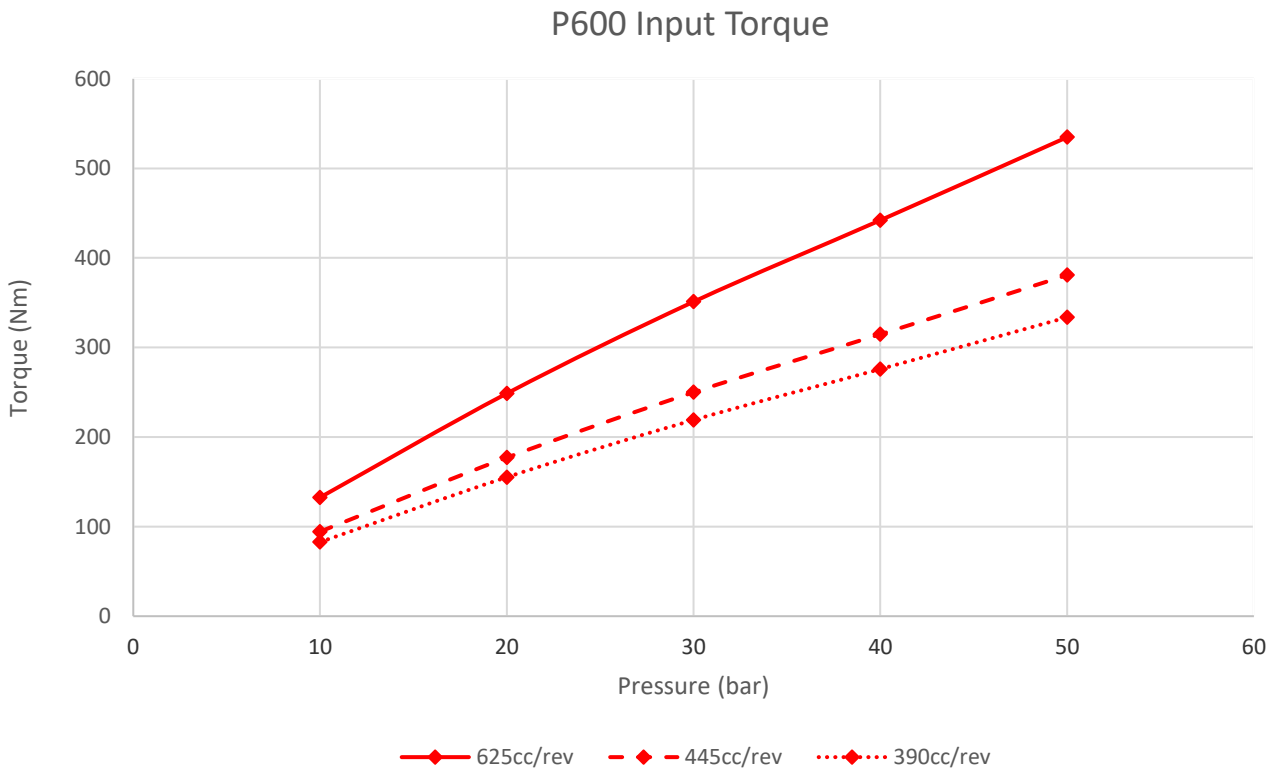
3.7.4 P600 Performance Data

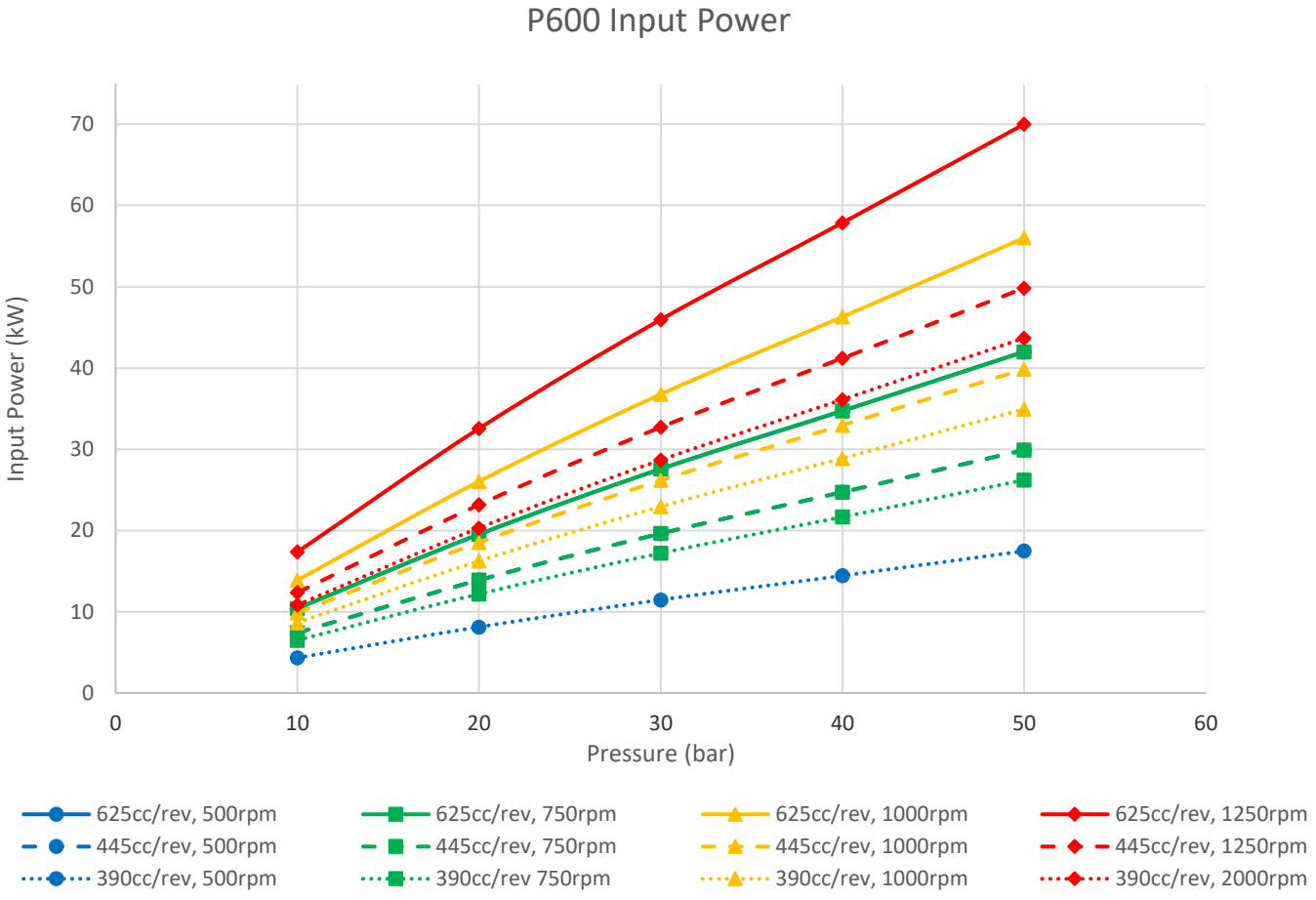




Performance data shown is after 1,000 hours of operation. Performance at first start-up will be lower; minimum guaranteed values are available on request.

BRACKISH WATER AXIAL PISTON



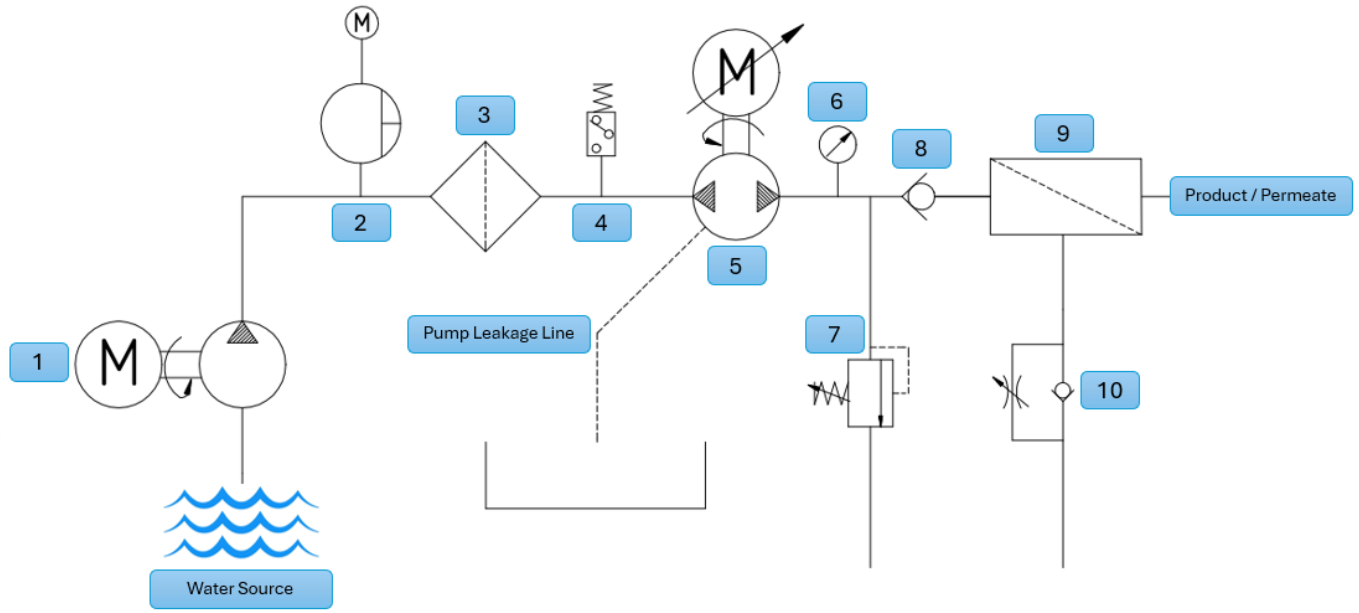


4. SYSTEM DESIGN

4.1 Circuit Examples

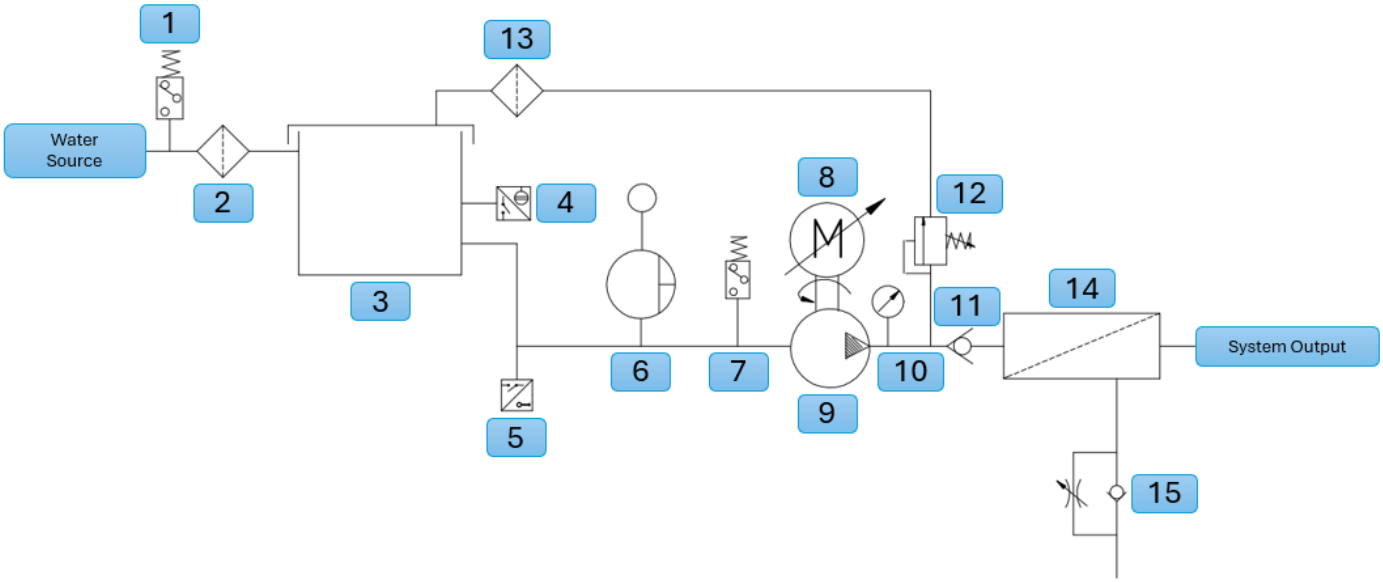
4.1.1 Boosted Circuit

Below is a typical circuit diagram detailing how the boosted pumps should be set up.



Item	Component	Function
1	Feed / Boost Pump	Ensure water is fed to the pump inlet at required inlet pressure.
2	Dosing Pump	Deliver chemicals such as Antiscalant, coagulants, pH adjusters, biocides, or chlorine neutralizers into the feedwater stream.
3	Filter	Ensure pumps minimum filtration requirements are met. (Beta Ratio > 5000)
4	Inlet Protection Pressure Switch	Ensures a continuous minimum pressure at the pump's inlet. If the minimum is not achieved the system must shut down to avoid pump damage.
5	Axial Piston Pump	The Water Hydraulics Axial Piston Pump and variable frequency speed driven electric motor, 50 bar maximum working pressure.
6	Pressure Gauge	Used to measure and display the operating pressure after the pump within the system.
7	Pressure Relief Valve	Ensure the system pressure does not exceed the maximum working pressure (50 Bar).
8	Check Valve	A high-pressure check valve must be installed to prevent back driving of the axial piston pump.
9	RO Membrane	Separating the useful product water from the unwanted brine solution.
10	Flow Control Valve	Sets the system pressure desired.

4.1.2 Un-boosted Circuit



Item	Component	Function
1	Clogging Switch	Ensures incoming water filtration is maintained. Clogging switch indicates when filter element needs replacing.
2	Inlet Filter	Ensures pumps minimum filtration requirements are met. (Beta Ratio > 5000).
3	Reservoir	Stores filtered incoming water, providing a positive head to pump inlet (Reservoir must be stored higher than pump).
4	Level / Float Switch	Ensures the tank is filled with enough water to supply the pump inlet with > 0.1 bar inlet pressure.
5	Temperature Switch	Prevents damage to the pump from excessively low / high temperatures of incoming water.
6	Dosing Pump	Deliver chemicals such as Antiscalant, coagulants, pH adjusters, biocides, or chlorine neutralizers into the feedwater stream.
7	Inlet Protection Pressure Switch	Ensures a maximum pressure at the pump's inlet is set. If the maximum is exceeded, the system must shut down to avoid pump damage.
8	Electric Motor	Drives the system. Converts electrical energy input to mechanical rotational energy.
9	Axial Piston Pump	The Water Hydraulics Axial Piston Pump. Converts the mechanical rotational energy delivered from the motor into useable hydraulic power.
10	Pressure Gauge	Used to measure and display the operating pressure after the pump within the system.
11	Check Valve	A high-pressure check valve must be installed to prevent back driving of the axial piston pump.
12	Pressure Relief Valve	Ensure the system pressure does not exceed the maximum working pressure (50 Bar). Returns to tank.
13	Return Filter	Returns unused water from the system before the membrane to the reservoir at the minimum filtration requirements. (Beta Ratio > 5000).
14	RO Membrane	Separating the useful product water from the unwanted brine solution.
15	Flow Control Valve	Sets the system pressure desired.

4.2 Electric Motor

A standard range of bell housings and couplings are available for connecting the pumps to the B35 electric motor flange. See our Desalination Motor Pump Assembly datasheet for further information on potential combinations. The pumps cannot operate with induced axial or radial loads on the output shaft; always adopt the use of a 3-part gear style flexible coupling where possible. If the drive shaft/spigot location is within 0.05mm concentricity, direct inline drive assemblies are permissible.

Symbol	Description	Unit
P	Shaft Power	kW
Q	Flow Rate	L/min
Δp	Change in Pressure	Bar

Use the calculation below to determine the motor power requirement depending on the maximum operating pressure and flow rate.

$$P = \frac{Q \times \Delta p}{600} \div 0.9$$

Example:

A P60 pump with an output flow of 140 L/min at a maximum working pressure of 50 Bar.

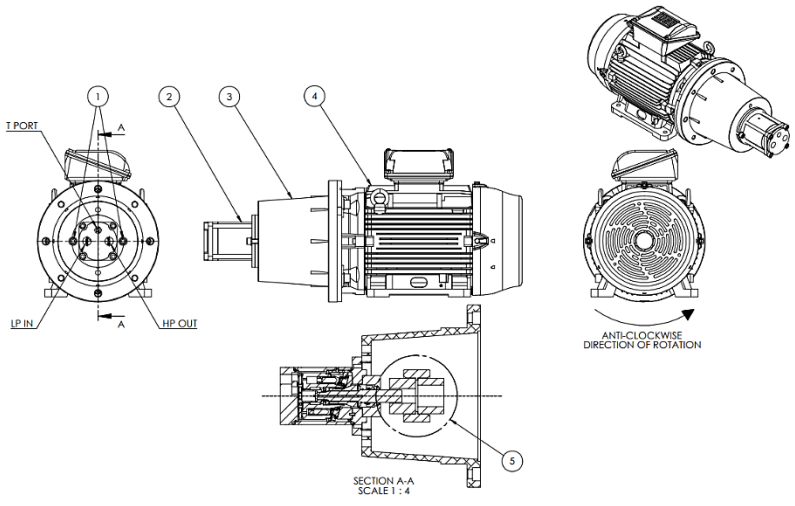
$$P = \frac{140 \times 50}{600} \div 0.9 = 12.96\ kW \approx 13.0\ kW$$

4.3 Installation

The adjacent diagram illustrates the correct method for installing the pump onto an electric motor using a three-part, gear-type flexible coupling.

Ensure that no axial or radial loads are applied to the pump during installation.

For further guidance on installation components or assembly requirements, please contact TWHC.



Item No.	Description
1	Mounting Bolts & Washers
2	TWHC Pump Unit
3	Bellhousing
4	Electric Motor
5	3-Part Gear Style Flexible Coupling

5. SERVICING

5.1 Service Schedule

Servicing at the recommended intervals will prolong unit life and guarantee optimal performance from your TWHC product. See the table below for service intervals.

Interval	Service Type	Work Required
5 Years	O-Ring Replacement	- Replace all O-rings - Clean & Re-assemble - Check Performance
8000 hrs.	Inspection Service	- As above - Inspection to ensure condition with checks for corrosion, wear rate and contamination. - Mechanical seal inspection (replace if necessary)
20000 hrs.	Major Service	- As above - Rotating assembly replacement - Re-working or replacement port plate - Bearing surfaces re-finished - Bearing replacement if required - Mechanical seal replacement

TWHC offer a service exchange scheme where a direct replacement can be offered in exchange for a unit which requires a service. Please consult with TWHC beforehand to check availability.

6. DISCLAIMER

Whilst every endeavor has been made to ensure accuracy, this publication cannot be considered to represent part of any contract, whether expressed or implied. The publishers reserve the right to amend specifications at their discretion.

7. CONTACT DETAILS

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