JANUS POWER CENTRE

HIGH PRESSURE DESALINATION PUMP WITH INTEGRATED ENERGY RECOVERY P300 POWER CENTRE

The Water Hydraulics Co. Ltd.

bsi. ISO 9001 Quality Management

FM 87247

V.04.20

The Water Hydraulics Co. Ltd.

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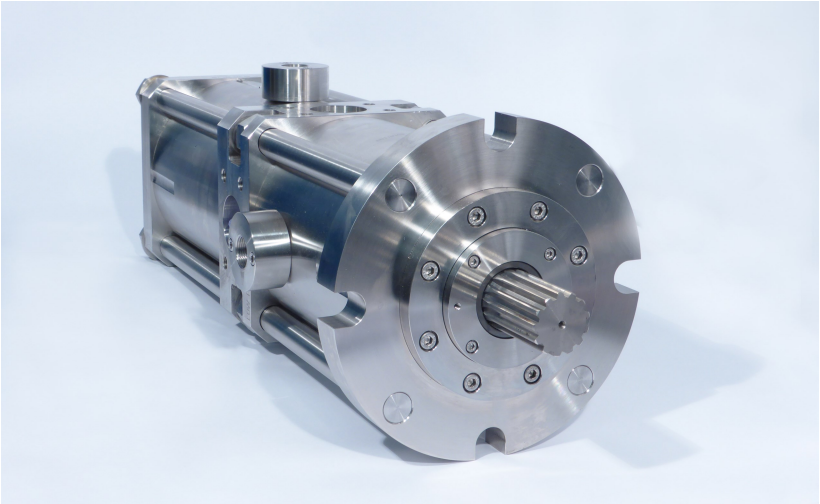
HIGH PRESSURE DESALINATION PUMP WITH INTEGRATED ENERGY RECOVERY

Design

The power centre combines the operation of an axial piston high pressure desalination pump with an axial piston motor utilising the pressure in the waste brine to assist the electric motor in driving the pump therefore, reducing the power requirement to typically less than 3 kW/m³ throughout. The power centre has been purpose designed and built for the RO market.

SPECIFICATION	
Shaft Material	Duplex
Piston Material	Duplex
Housing Material	Duplex
Max. Operating Pressure	85 Bar
Min. Operating Pressure	30 Bar
Min. Inlet Pressure at Inlet Pressure Switch Port	3.5 Bar
Max. Operating Temp.	50°C
Mounting Direction	Horizontal
Operating Medium	Sea/Salt Water
Drinkable Water Production	Up to 390m³/day
Power Rating	See graphs



Simple Design

The power centre is driven via a splined shaft from an electric motor. This turns the pump rotating group which also drives the energy recovery rotating group via a simple splined mechanical coupling. There is no need for a second separate booster pump as in many other energy recovery devices nor an additional electric drive motor.

Compact Design

Due to the integrated nature of the power centre design, the footprint is reduced. There is also no need for additional fluid couplings which makes for a very compact system; ideal for ships and offshore platforms.

Low Maintenance Costs

The simple compact design of the power centre has ensured parts requiring maintenance are easily accessible therefore, reducing maintenance costs. Both the pump and energy recovery motor utilise the same well proven axial piston technology leading to long service intervals without the need for expensive oil changes. No special tools are required, but for extra assurance service exchange units are available.

High Reliability with Low Risk

Our in-house designed axial piston pumps and motors are 100% tested at 160 bar pressure settings or twice the working pressure ensuring the reliability of the power centre. The power centre utilises salt water to lubricate bearing surfaces so there is absolutely no risk of oil contamination to the environment or the working area.

Reduced Operating Costs

The integrated energy recovery device enables high energy efficiency, meaning lower running costs and potential energy savings of up to 70% (compared with systems without energy recovery). This also leads to the use of smaller electric motors and control systems thereby reducing the capital cost.

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Reduction of Capital Costs

There is no need for a separate electric motor to drive the energy recovery device nor a separate pressure boost pump. The power centre may be driven at most synchronous electric motor speeds, both 50hz and 60hz without further speed reduction or the cost of pulleys belts and safety guarding. There is also a reduced requirement for expensive fluid connectors and pulsation attenuation.

Optimum Engineering Design

The power centre is constructed from duplex which is a highly corrosion resistant material to sea water in comparison to other stainless steels. It employs SAE flanged connections, allowing the installer to rotate the hose connections to the unit which reduces noise, vibration and any axial strain on the connecting hoses that might otherwise be present.

Installation

The unit is designed for mounting horizontally using a flexible gear coupling to an electric motor for up to 1250 rpm rotational speed.

Bespoke Design

The power centre can be supplied to match the system flow and recovery percentage based on fluid temperature and salinity levels to ensure that the minimum level of treated water is used in comparison to the potable water produced. This gives increased membrane life coupled to a low power consumption.

Inlet Conditions

The power centre is designed for presurised feed water supply at a minimum of 3.5 bar measured at the inlet pressure switch port. The design separates the feed water from the pump internal leakage water which must be piped away to a low pressure sump or drain.
The advantages of this design are;

- The pump must only produce the differential pressure i.e. for a system with 5 bar feed pressure, 60 bar system pressure the pump drive is only required to produce the equivalent of 55 bar.
- As the feed pressure and internal leakage are separated, the mechanical seal will not see the full feed pressure therefore reducing required maintenance as low casing pressure will prolong the mechanical seals life and prevent low pressure cavitation issues; this minimum casing pressure and maximum inlet pressure is desired.

	Recovery Rates						
	25%	30%	35%	40%	45%	50%	55%
Ordering Codes	-	-	708-001	769-001	762-001	770-001	-

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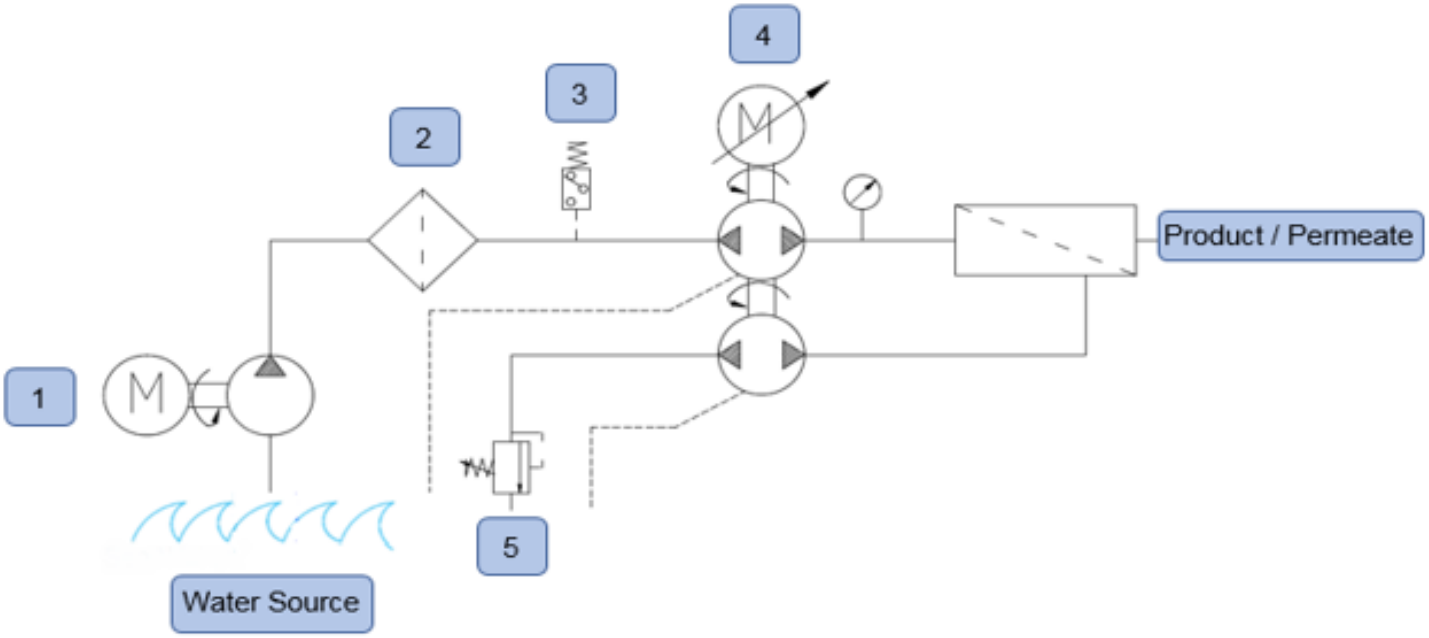
Circuit Diagram Example

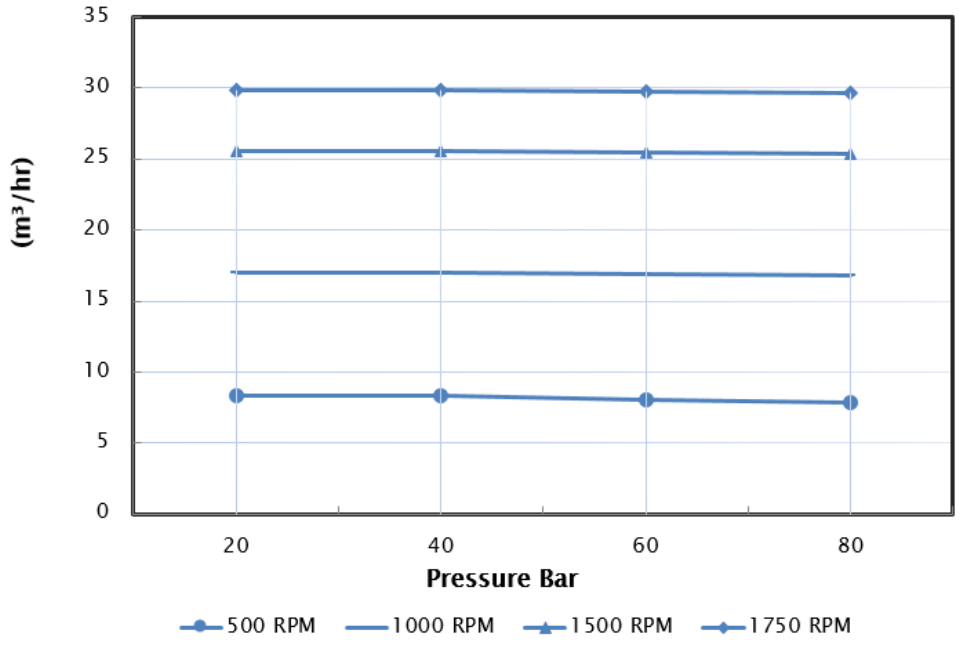


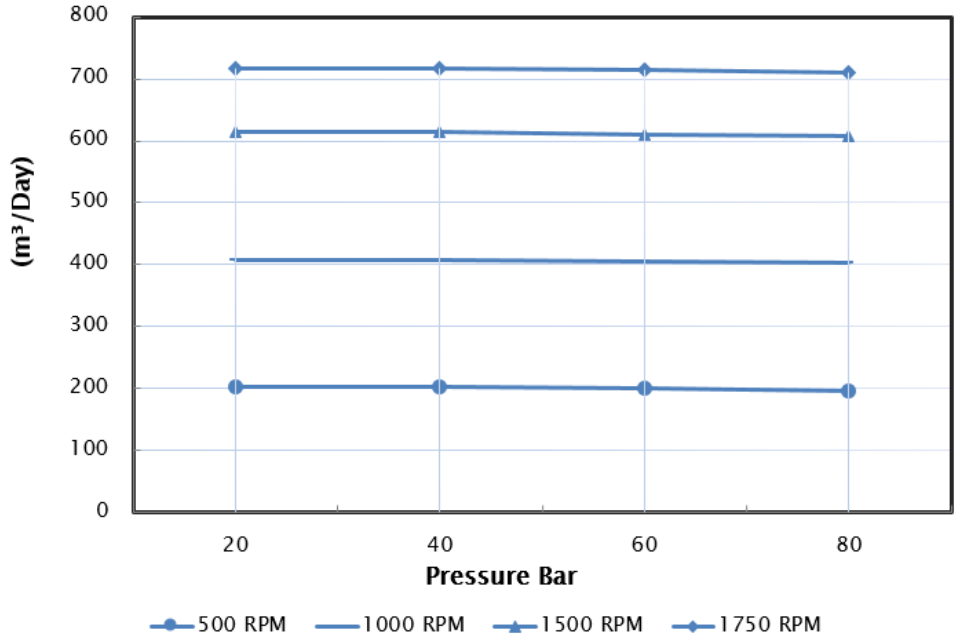
Item	Component	Function
1	Feed / Boost Pump	Ensures the inlet pressure supply to the pump's Low Pressure In connection at a minimum of 3.5 bar.
2	Filter	Ensure pumps minimum filtration requirements are met.
3	Inlet Protection Pressure Switch Set 3.5 bar	Ensures a continuous minimum 3.5 bar pressure at the pumps inlet. If the minimum of 3.5 bar is not achieved system shutdown to avoid pump damage.
4	Power Centre	The Water Hydraulics Power Centre including axial piston pump with integrated axial piston motor (ERD) and electric motor 500-1750 RPM, 80 bar maximum working pressure.
5	Back Pressure Valve	Setting the minimum backpressure on the Power Centre's Low Pressure Out

Performance Data

Pump output Flow

The Janus axial piston pump and power centre will produce the same output flow when operated under the same conditions. Simply change the shaft speed to produce a metered flow to the system demand.





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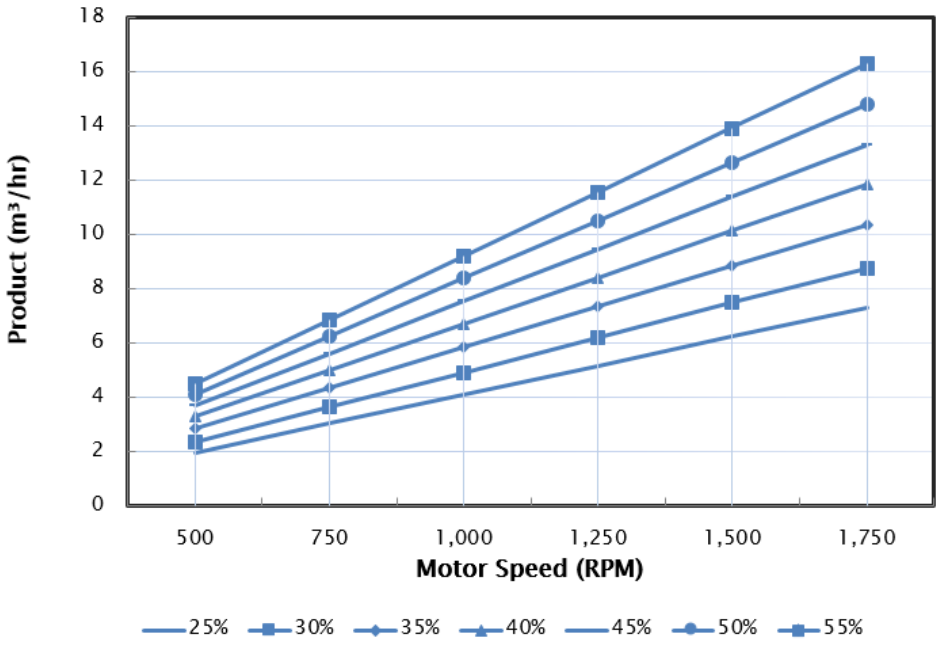
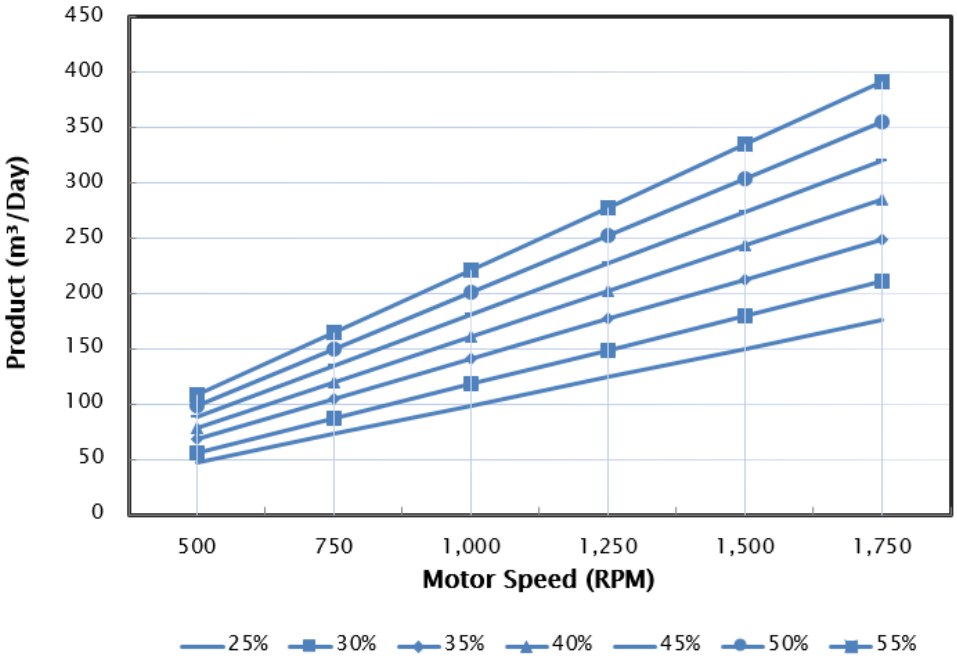
Product

The recovery rate must be set at the order stage. The motors displacement is adjusted to produce the required ratio between output flow and % of water produced, at the same time ensuring the maximum power assistance is generated. No further setting is required other than driving the shaft to produce the output flow optimising the membranes performance. Recovery levels between 25% and 50% are available (see table for ordering codes). Specials are also available on request. Data at 80 bar operating pressure.





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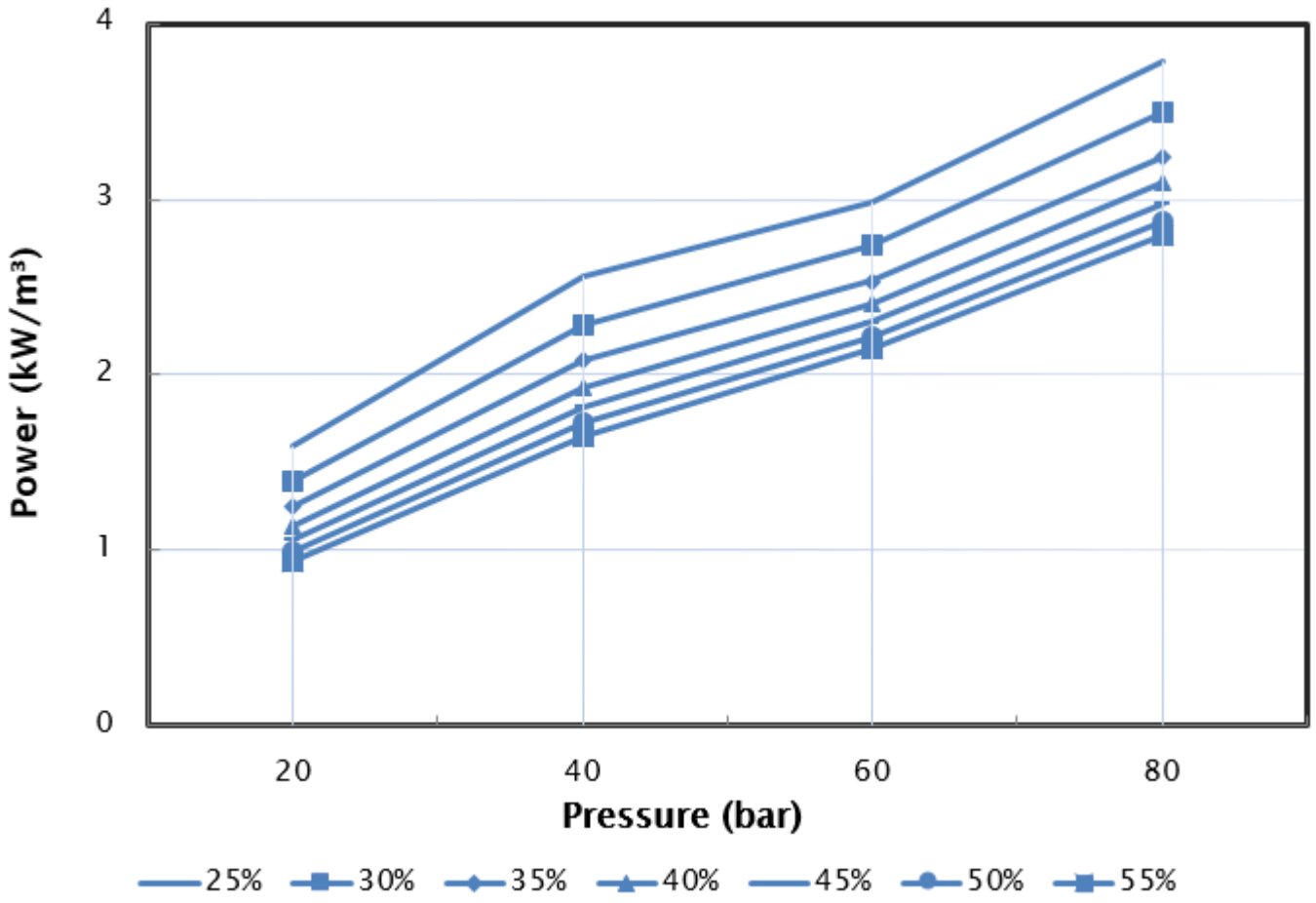
The axial piston design in itself is a high efficiency pump delivering mechanical efficiency over 90% at higher system pressures. By utilising the brine energy to power assist the prime mover even higher system efficiencies are achievable. The ratio of energy recovery to product produced can be set at the order stage and ensure the system delivers the conditions both membrane and water feed dictate without the need for on site adjustment.

Deviation in speed will vary the system pressure and hence product produced but the ratio of flow to product produced is not affected thereby minimising stress and potential fouling of the membrane .

kW/m³ against Pressure @1500 rpm

The axial piston pump in itself has a very high mechanical efficiency delivering over 90%. The energy recovery motor also offers similar performance, resulting in an all usable power in the brine solution assisting the input motor. Changing the recovery levels therefore still yields unrivalled system operating powers. For specific data on the exact input requirements based on your system specification consult TWHC.



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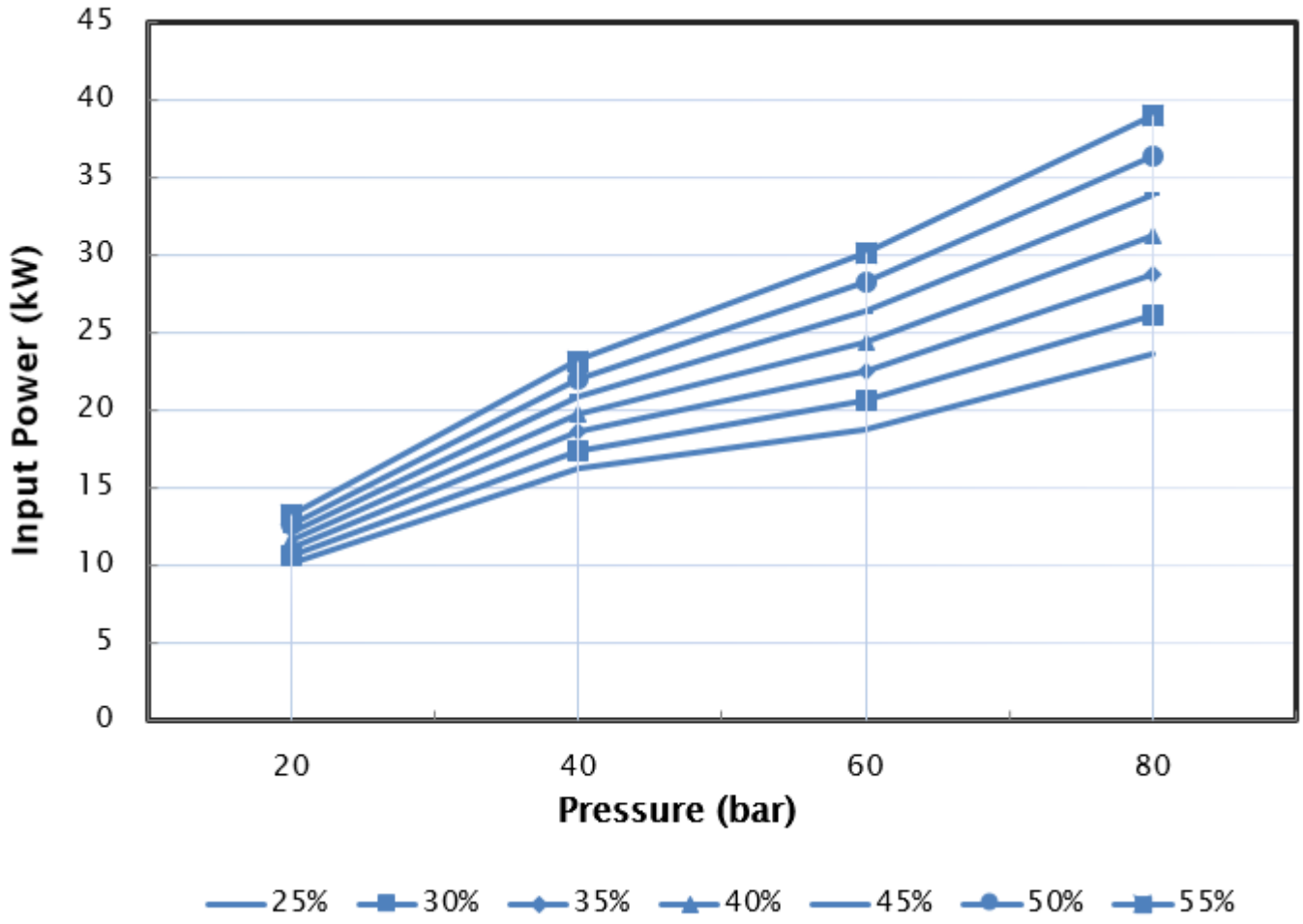
Input Power against Pressure @1500rpm

The high power efficiency delivers the most cost effective method of producing drinking water from a saline solution irrespective of salt conditions or temperature variations. In a world where the cost of energy sees no upper limit to the recent huge increases, operating costs and efficiency improvements can soon yield a return for initial higher capital expenditure. Payback periods of less than 6 months can be expected from the TWHC power centre in comparison to pump only systems.



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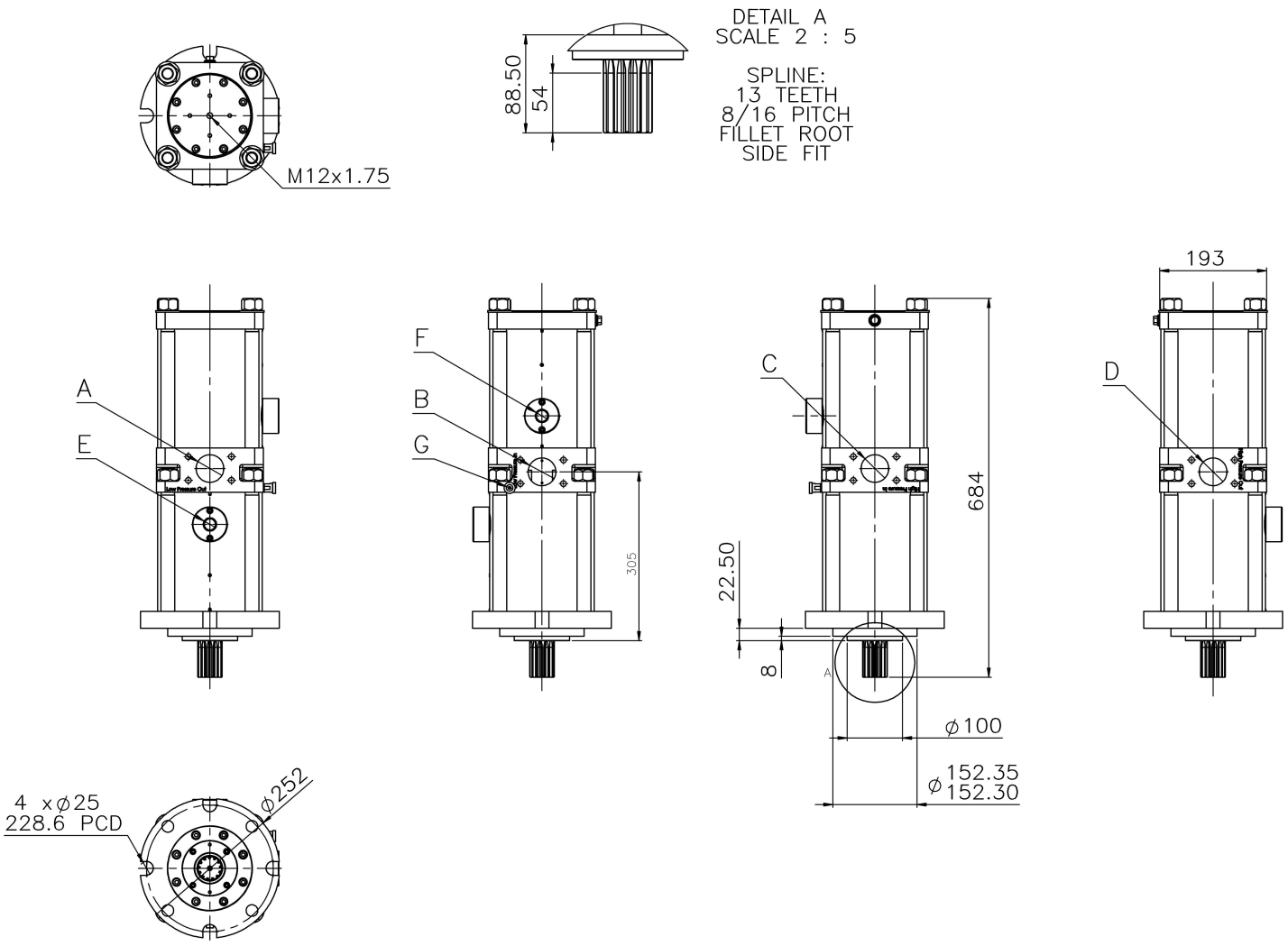
Power Centre



Position	Connection	Port Dimension
A	Low Pressure Out (ERD)	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
B	Low Pressure In (Pump)	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
C	High Pressure In (ERD)	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
D	High Pressure Out (Pump)	2" 3000 PSI CLASS SAE 4-BOLT FLANGE
E	Case Drain (Pump)	3/4" BSPP FEMALE
F	Case Drain (ERD)	3/4" BSPP FEMALE
G	Inlet Pressure Switch Port	G1/4" BSPP FEMALE

Please note: The rear of the Power centre must be supported on installation.

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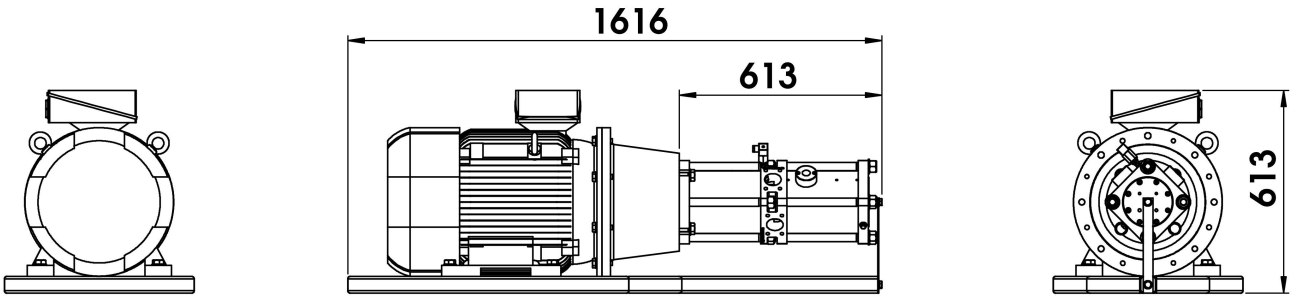
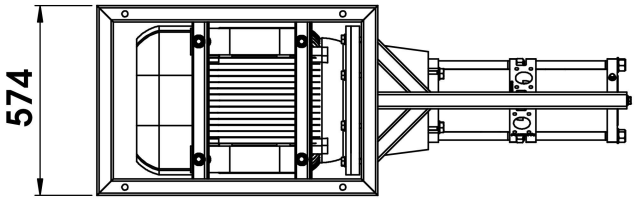
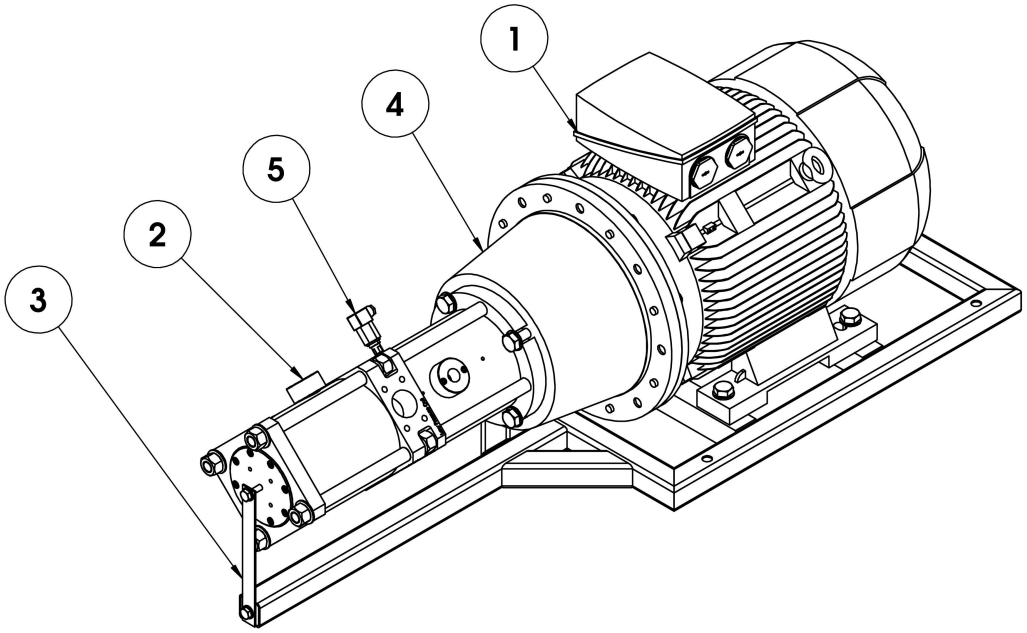
Power Centre Assembly







Item Number	Description	Quantity
1	Electric Motor	1
2	Power Centre	1
3	Mounting Frame	1
4	Bellhousing & Flexible Gear Coupling	1
5	Inlet Protection Pressure Switch Set 3.5 bar	1

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APPLICATIONS

The power centre may be used effectively within any industry where fresh, clean water is required. The benefits of the high energy efficiency from the power centre can have large scale benefits in running costs, profitability and reduced environmental impact.

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