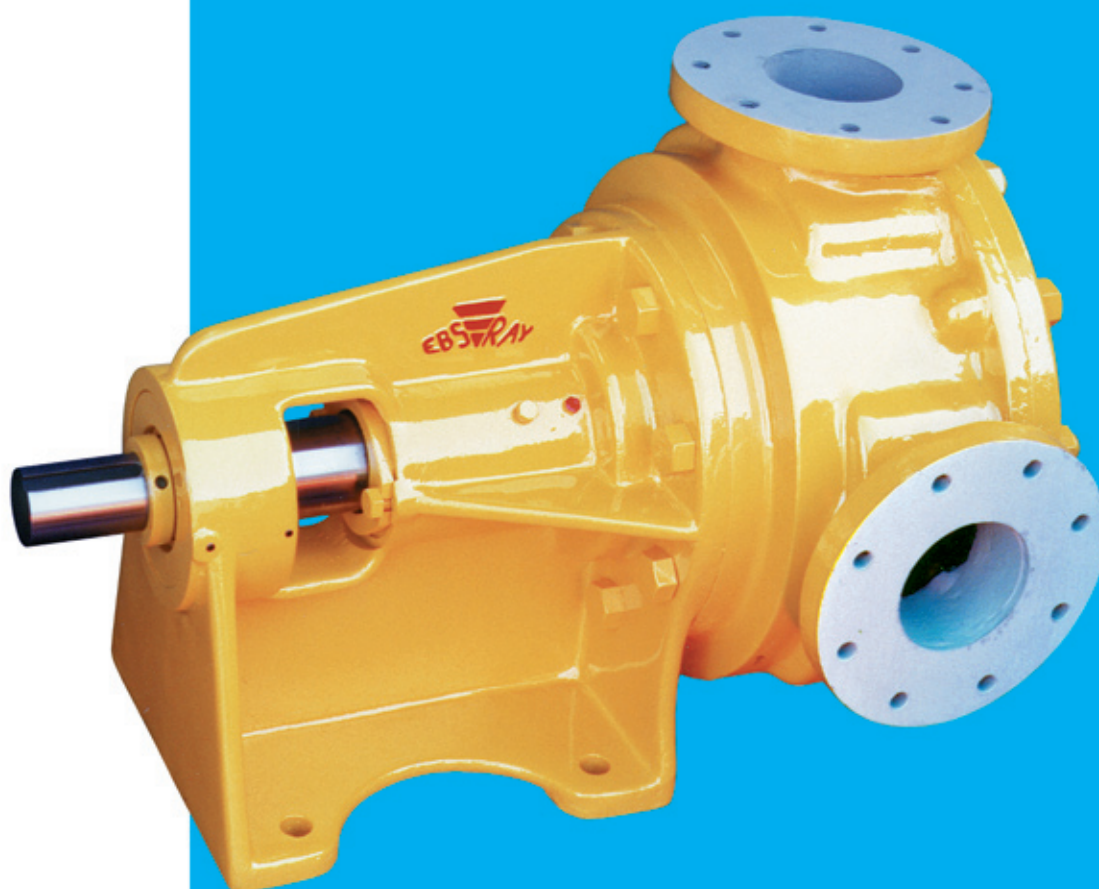


# EBSRAY PUMPS



## ***MD & HD Series***

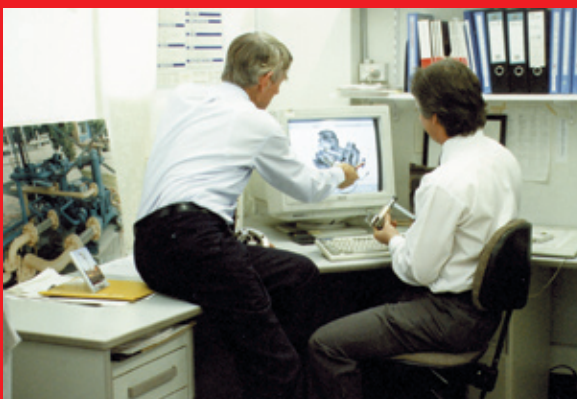
***All Models***

***.....for Industrial Applications***

Quality System  
Quality  
Endorsed  
Company  
ISO 9001  
Lic 3332  
Standards Australia  
HEAD OFFICE AND WORKS















# MD & HD Series - Internal Gear Pumps



The EBSRAY MD & HD Series of Internal Gear Pumps are a range of medium and heavy duty, positive displacement pumps suitable for handling a diverse variety of products covering a wide range of viscosities, temperatures, flows and pressures.

## Fields of Application

EBSRAY Internal Gear Pumps are widely used and preferred in numerous and diverse industrial pumping applications including:

- |  |  |
|--|--|
|  Petroleum/fuel oil industry.   |  Defence.           |
|  Plastics manufacture.          |  Heavy industry.    |
|  Paint manufacturing.           |  Power stations.    |
|  Chemical industry.             |  Food processing.   |
|  Road tanker liquids transfer. |  Public utilities. |
|  Bitumen road sealing.        |  Mining Industry. |

## Features

- ✓ Reliable operation – time proven principle
- ✓ Rugged Heavy Duty construction.
- ✓ Ease of maintenance - only two major moving pumping elements.
- ✓ Optional standard configurations and builds available to suit a wide range of applications.
- ✓ Quiet operation.
- ✓ Integral and In-Line Relief/Bypass Valves.
- ✓ Low NPSH<sub>R</sub> capability.

## Special Constructions

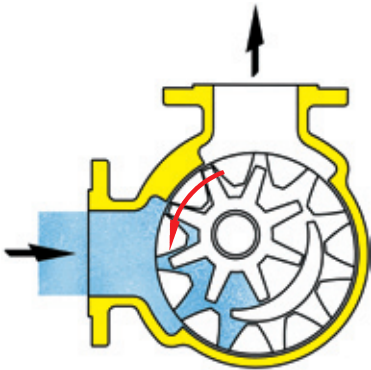
Contact EBSRAY or your local Representative for advice on alternate arrangements to meet applications not outlined in this publication.

## Assured Quality and Performance

EBSRAY's ISO 9001 Quality System assures compliance with high safety and quality standards. All Ebsray MD & HD Series pumps & pumpsets are manufactured under strict guidelines and procedures. Quality inspections and tests during production guarantee pump integrity and pumping performance in accordance with the specifications.

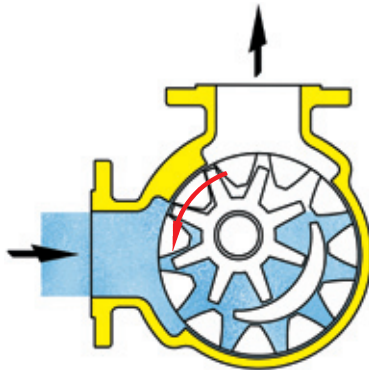
**Engineered in Australia**

# Pumping Principle



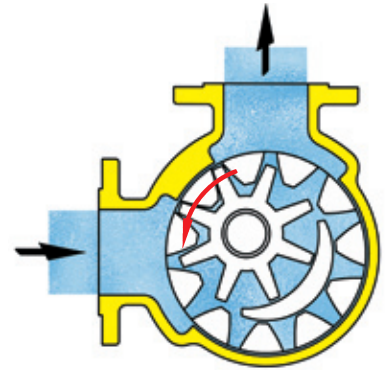
### 1. Induction (Inlet)

As the Outer Rotor rotates, the Inner Rotor is driven in the same direction. The volume between the teeth increases as the rotor teeth move out of mesh, creating a partial vacuum. The resultant reduction in differential pressure causes the liquid to enter through the inlet port, filling the space between the teeth of the two rotors.



### 2. Transfer

While rotation continues, the liquid between the rotor teeth is carried towards the discharge port. During this transfer stage, the inside of the Outer Rotor teeth and the outside of the Inner Rotor teeth are sealed by the Crescent. The Rotors are also sealed between the bore of the pump Body (Casing) and the Cover.



### 3. Discharge

Once past the Crescent, the teeth begin to move into mesh again, reducing the volume between the two rotors and thereby forcing the liquid from the tooth cell and out of the pump via the discharge port. Flow is smooth and continuous.

## Major Benefits of EBSRAY MD & HD Series Pumps

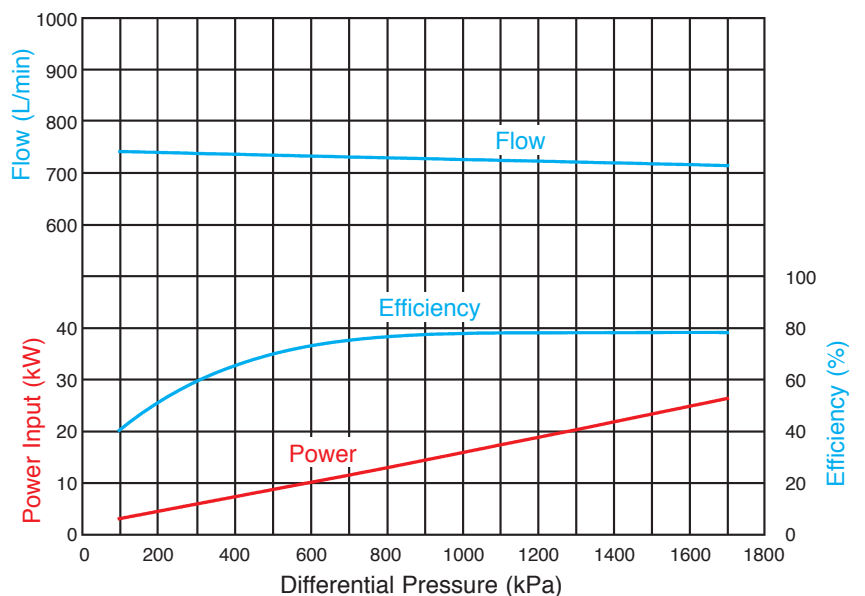
- ✓ Only two major moving pumping elements.
- ✓ Excellent self priming and vapour-clearing ability.
- ✓ Smooth even flow without pulsation or surging.
- ✓ Ideal pumping principle for either viscous or non-viscous liquids.
- ✓ High overall efficiency.
- ✓ Reversible operation.
- ✓ Negligible axial thrust due to hydraulic balance.
- ✓ High pressure capability.
- ✓ Cushioned positive flow movement of liquids.
- ✓ The principle tends to be self compensating for wear, allowing for normal predictable operation over an extended service life.

## Pump Efficiency

Being of the "Internal Gear Principle", all EBSRAY MD & HD Series pumps will operate efficiently over a wide range of pressures, viscosities and speeds.

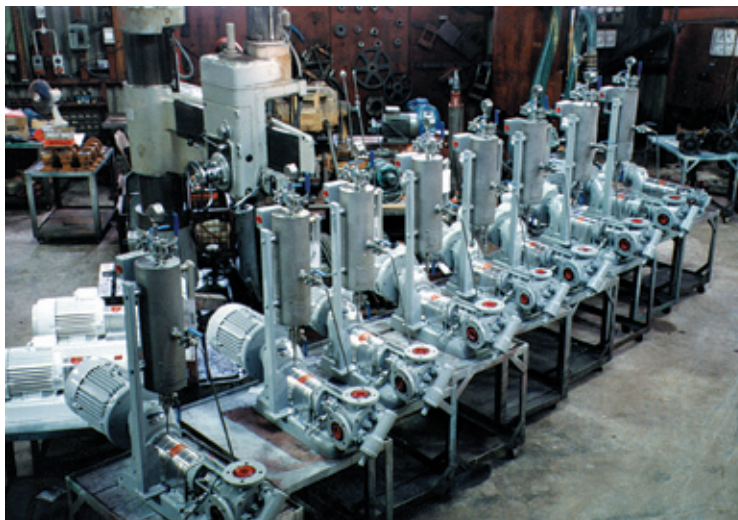
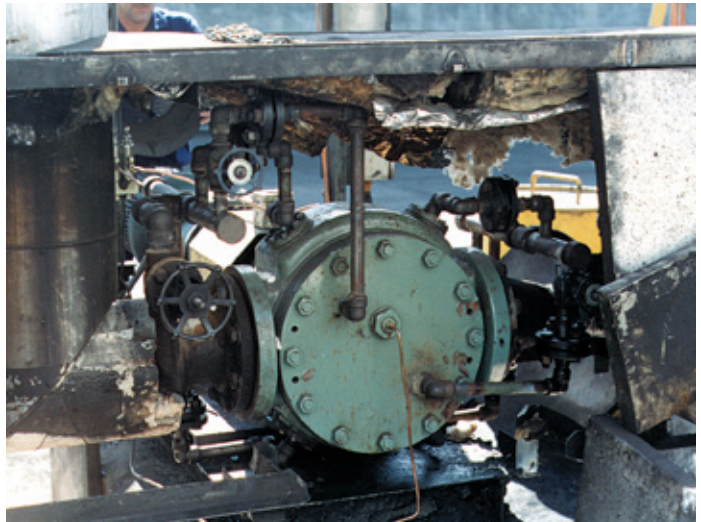
A typical illustration is shown in the graph opposite. The graph shows typical performance of HD Series pump model HD300.

Speed = 300 RPM  
Kinematic Viscosity = 63 cSt.



# Applications

Fully jacketed HD Series pump fitted with cartridge mount mechanical seal on 24 hour pitch recirculation service in Aluminium smelter. These pumps replaced opposition manufactured pumps running at identical speeds which needed complete reconditioning every 6 months. The Ebsray replacement pumps have needed only minor maintenance every three years!



Special MD Series Stainless Steel API 676 compliant pumpsets fitted with double cartridge mount mechanical seals and pressurised barrier liquid tanks for ABS/SAN chemical process plant.



Model MD 200 pumpsets installed in a modern environmentally friendly, high efficiency oil and solvent transfer installation.



Heavy Duty Grease transfer pump in a major lubricant blending plant where all pumps were designed, manufactured and supplied by EBSRAY.

# Applications



Heat traced crude oil pumps for rail tanker unloading service fitted with cartridge style mechanical seals and spacer couplings for ease of maintenance. These pumps discharge 1,000,000 litres per day through 2.5 kilometres of heat traced discharge line. The system also incorporates EBSRAY In-Line type Bypass Valves for protection from excessive pressure rise.

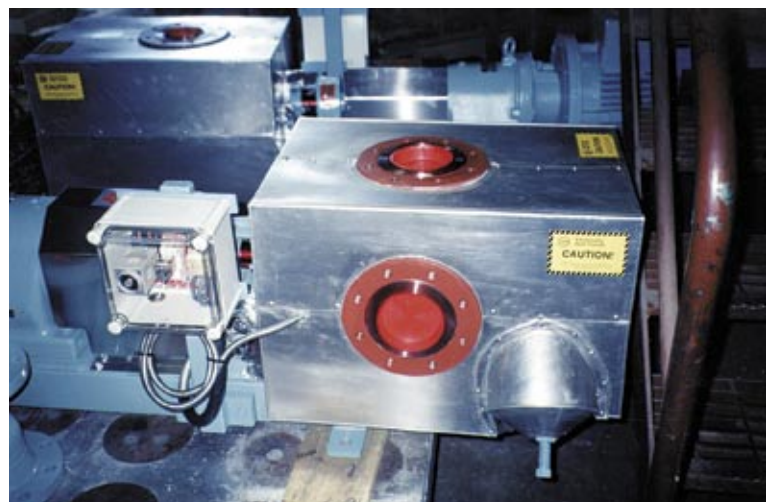


Two of six crude palm oil transfer pumps for tanker unloading in palm oil refinery. These pumps have been in continuous service for 15 years with virtually no maintenance required.

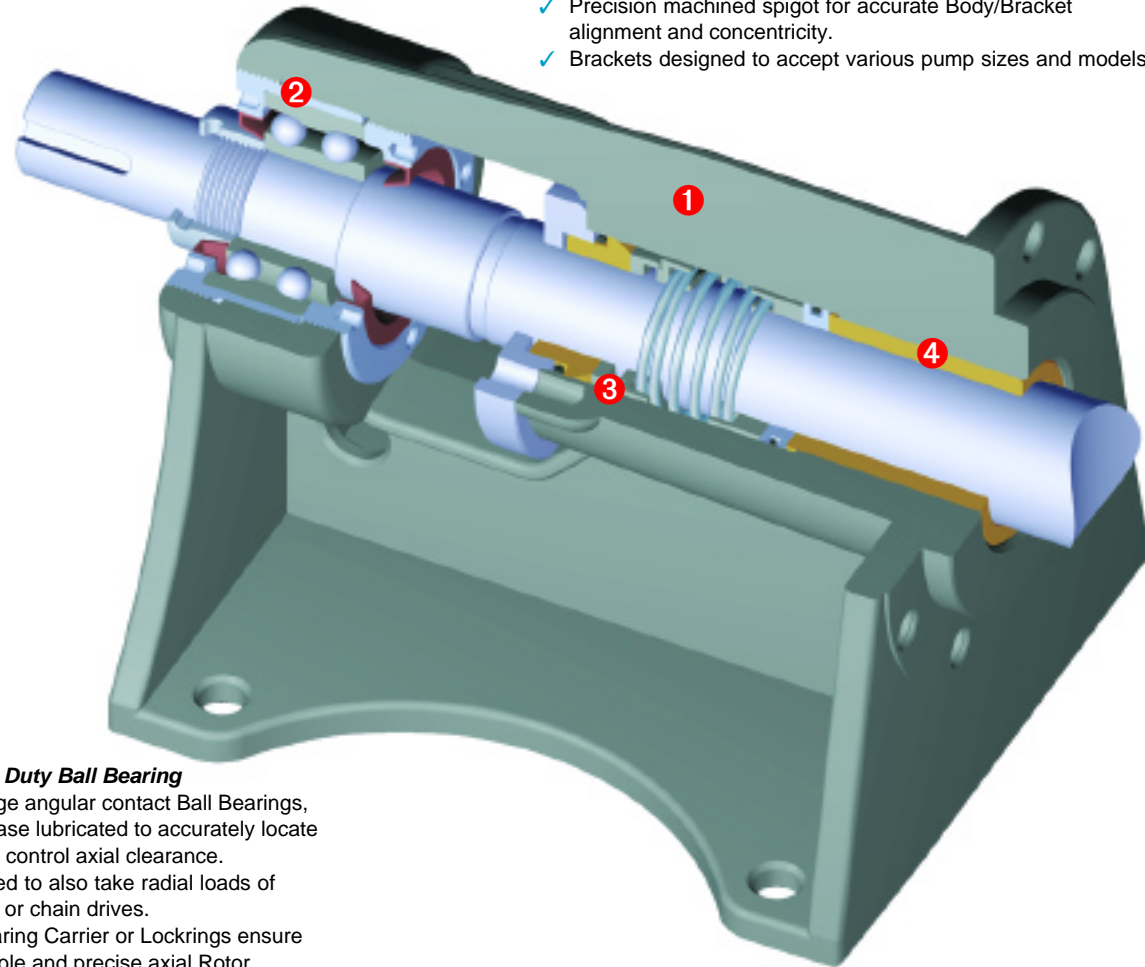


Oil recirculating pump for critical lubrication duty on a rock crusher. Hundred of EBSRAY pumps are used in this application throughout the Mining and Quarrying industries where reliability, low noise level, and long service life are the prime selection criteria.

Factory fitted fully electric heat traced and lagged Model MD 300 bitumen pumps with automatic temperature sensing and control.



- 1 Bracket - Standard Type**
- ✓ Robust construction for accurate alignment and rigidity.
  - ✓ Jacketing for heating or cooling available as standard option.
  - ✓ Precision machined spigot for accurate Body/Bracket alignment and concentricity.
  - ✓ Brackets designed to accept various pump sizes and models.



- 2 Heavy Duty Ball Bearing**
- ✓ Large angular contact Ball Bearings, grease lubricated to accurately locate and control axial clearance. Sized to also take radial loads of belt or chain drives.
  - ✓ Bearing Carrier or Lockrings ensure simple and precise axial Rotor clearance adjustment. No special tools or measurement equipment required for adjustment.

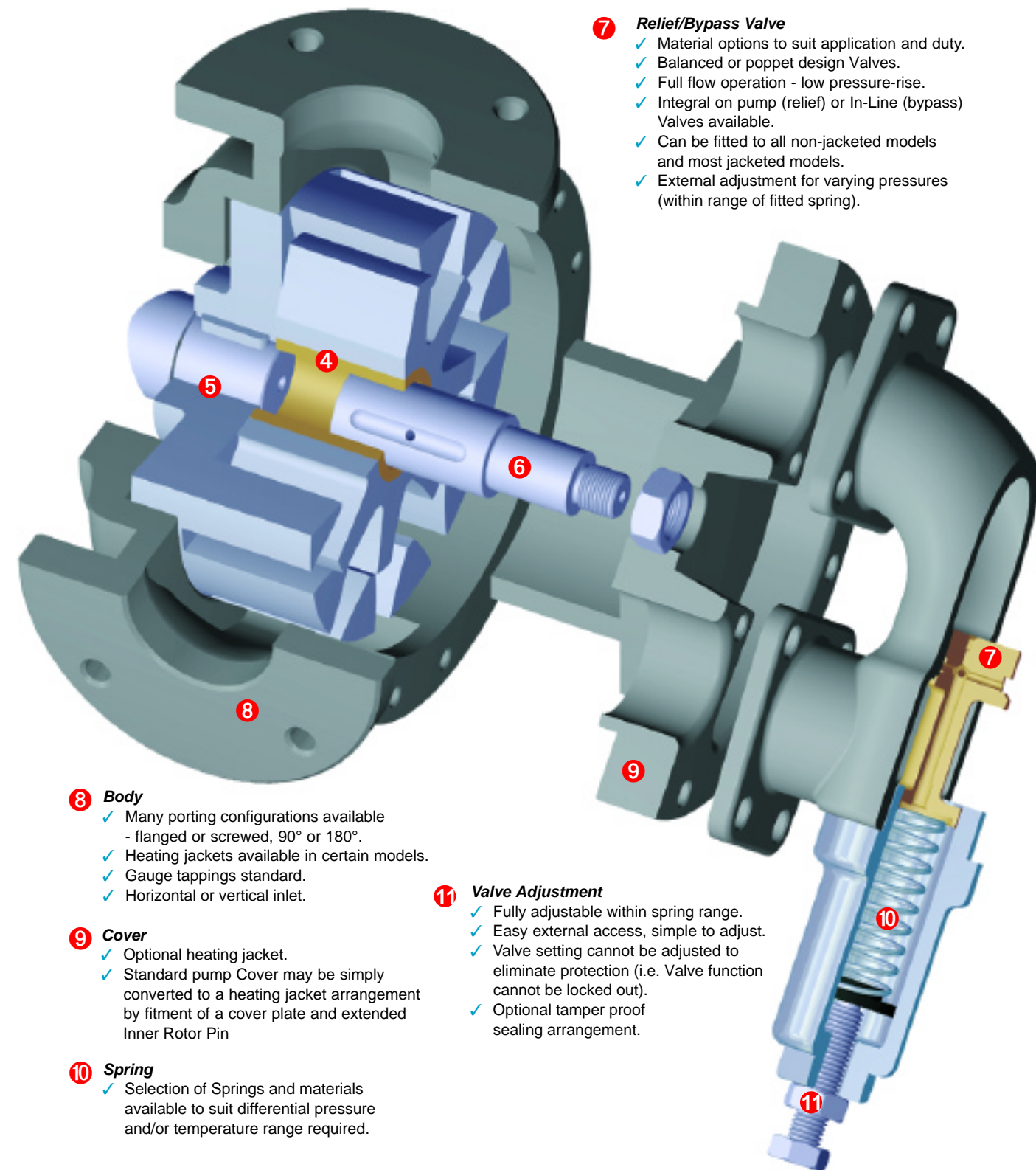
- 3 Shaft Sealing**
- ✓ Mechanical Seal either EBSRAY or commercial, shaft mount or cartridge mount available.
  - ✓ Seal scavenge/flushing available, removes heat from seal faces and induces flow of fresh liquid through Rotor Bearing. Refer API Plans.
  - ✓ Packed Gland optional with Lantern Ring.
  - ✓ API plans for optimum Shaft Seal performance.

- 4 Rotor Bearings**
- ✓ Material options to suit application and duty.
  - ✓ Large journal diameter for extended life.
  - ✓ Induced product flow through bearing with optional Flush Plan for additional lubrication and cooling.

- 5 Rotor on Shaft Assembly**
- ✓ Precision machined for concentricity.
  - ✓ Large diameter Shaft - low deflection, high torque capacity.
  - ✓ Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
  - ✓ Material options to suit application and duty.

- 6 Inner Rotor Pin**
- ✓ Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
  - ✓ Optional pressure-fed product lubrication or from external source for arduous applications.
  - ✓ Easily fitted.
  - ✓ Positively located and can be drawn into position by Inner Rotor Pin locking nut.
  - ✓ Material Options to suit application and duty.

- 7 Relief/Bypass Valve**
- ✓ Material options to suit application and duty.
  - ✓ Balanced or poppet design Valves.
  - ✓ Full flow operation - low pressure-rise.
  - ✓ Integral on pump (relief) or In-Line (bypass) Valves available.
  - ✓ Can be fitted to all non-jacketed models and most jacketed models.
  - ✓ External adjustment for varying pressures (within range of fitted spring).



- 8 Body**
- ✓ Many porting configurations available - flanged or screwed, 90° or 180°.
  - ✓ Heating jackets available in certain models.
  - ✓ Gauge tappings standard.
  - ✓ Horizontal or vertical inlet.

- 9 Cover**
- ✓ Optional heating jacket.
  - ✓ Standard pump Cover may be simply converted to a heating jacket arrangement by fitment of a cover plate and extended Inner Rotor Pin

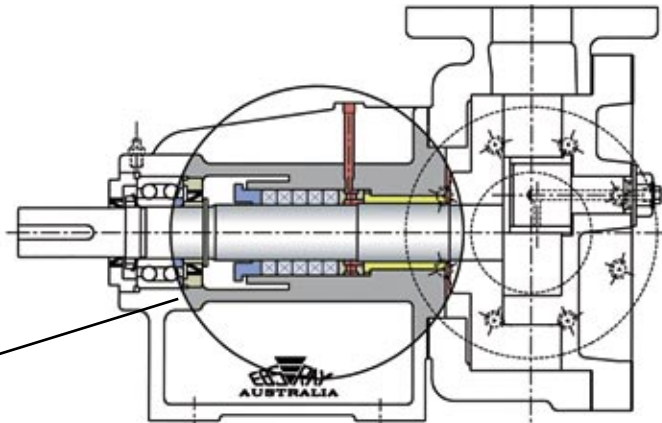
- 10 Spring**
- ✓ Selection of Springs and materials available to suit differential pressure and/or temperature range required.

- 11 Valve Adjustment**
- ✓ Fully adjustable within spring range.
  - ✓ Easy external access, simple to adjust.
  - ✓ Valve setting cannot be adjusted to eliminate protection (i.e. Valve function cannot be locked out).
  - ✓ Optional tamper proof sealing arrangement.

## General Description

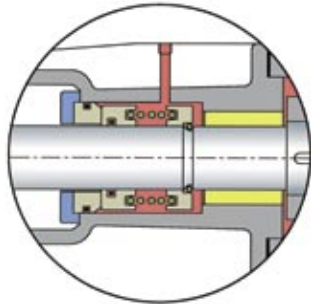
Throughout the MD & HD Series, all models follow a similar build arrangement. The Bracket is strongly constructed and serves the purpose of rigidly supporting and maintaining the alignment of the Rotor on Shaft assembly, the Rotor Bearing, the Shaft Seal and the Ball Bearing with its associated axial clearance adjustment mechanism. The design of this adjustment mechanism allows simple, positive and precise setting of the axial clearance between the Rotors and the Cover. The Bracket is normally of the same material as the Casing and Cover assuring maximum compatibility and strength for pumps made from special materials. The Bracket has fully machined mounting feet with precision drilled holes for ease of accurate and repeatable alignment and secure pump location. The Body and Cover which encase the rotating pumping elements may be fitted with a number of standard options including various porting arrangements, bolt-on Relief Valves and Heating/Cooling Jackets etc. The EBSRAY MD & HD Series of pumps are a truly universal design for many standard and specialised duties.

# Shaft Sealing Options

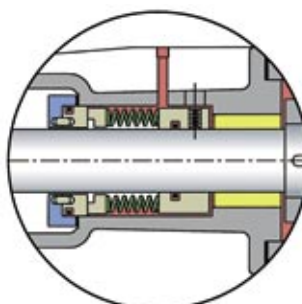


Standard Packed Gland with Lantern Ring fitted

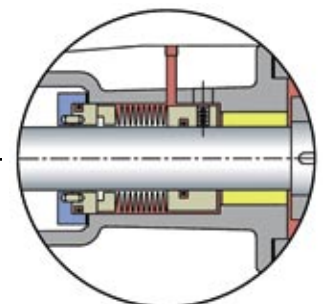
API seal flush plans available: 02, 11, 13, 32, 51, 52, 53, 54, 61 & 62. For other flush plans please contact EBSRAY or your local Representative.



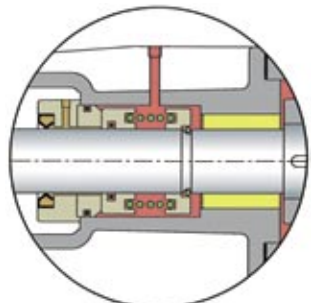
Single Mechanical Seal



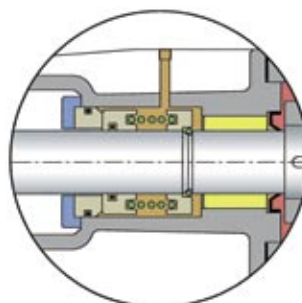
Multi Spring Mechanical Seal



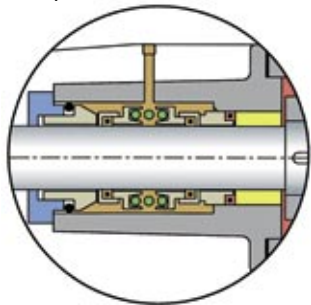
Bellows type Mechanical Seal



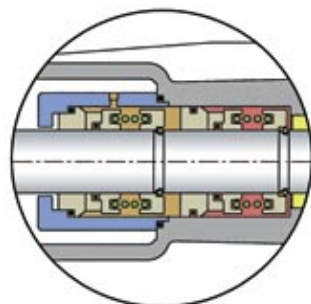
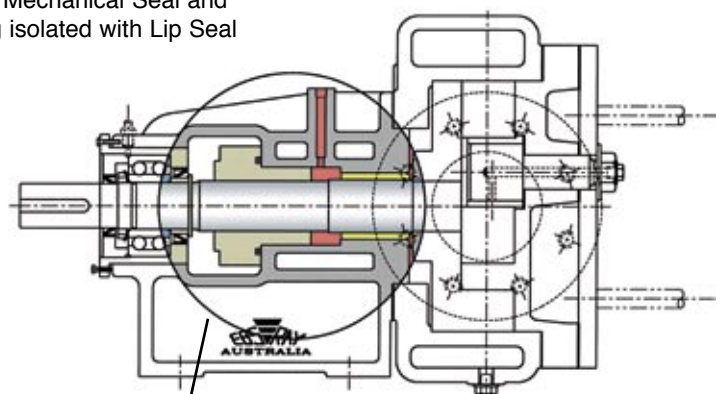
Single Mechanical Seal with Lip Seal for barrier fluid



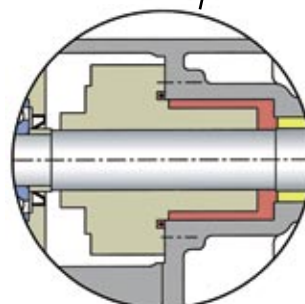
Single Mechanical Seal and Bearing isolated with Lip Seal



Double Mechanical Seal



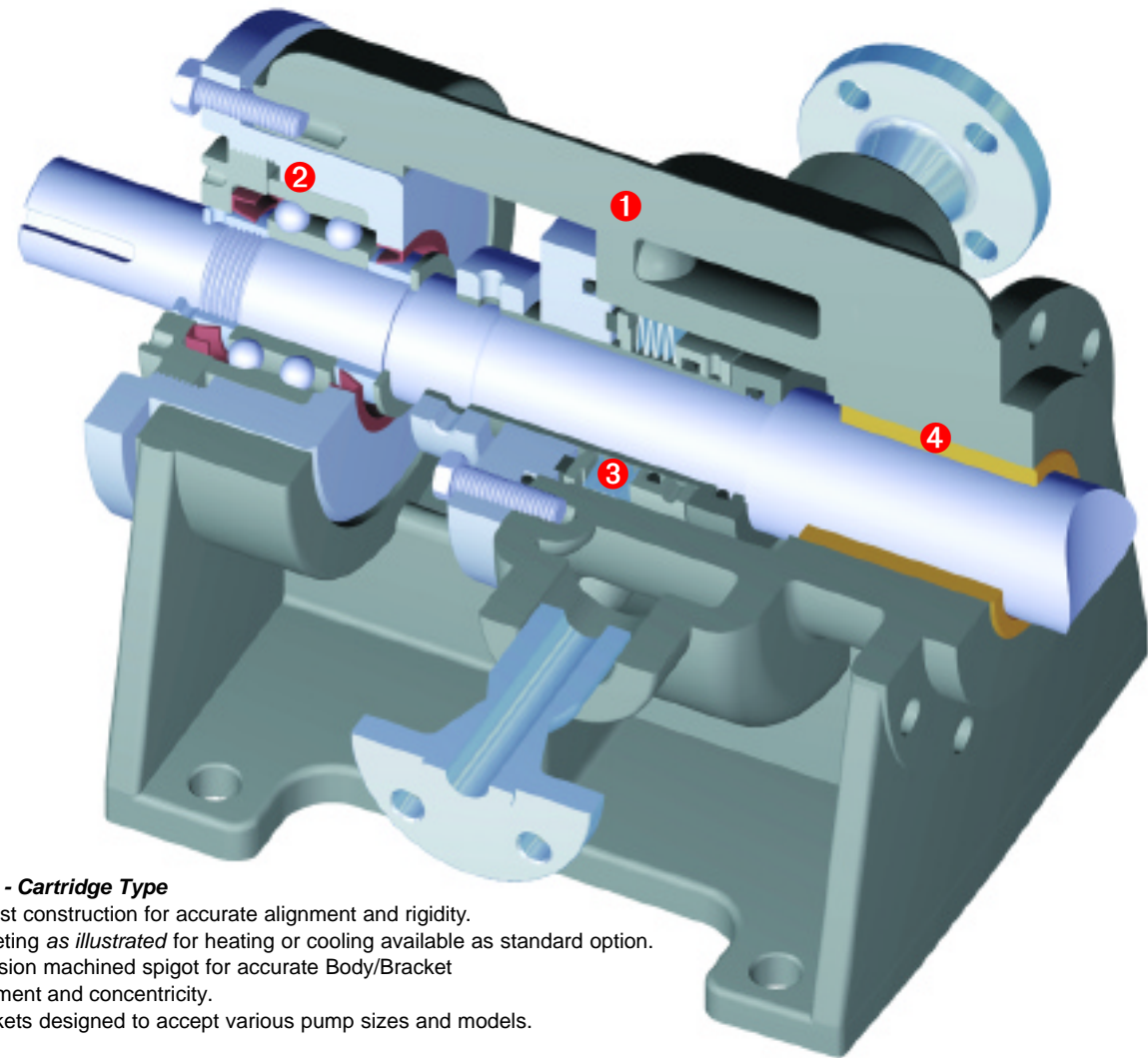
Tandem Mechanical Seal



Cartridge Mechanical Seal

Cartridge Type Mechanical Seal arrangement. Available as: Single, Double, Tandem, Steam Quenched, Throttle bush type etc.

# Features



- 1 Bracket - Cartridge Type**
- ✓ Robust construction for accurate alignment and rigidity.
  - ✓ Jacketing as *illustrated* for heating or cooling available as standard option.
  - ✓ Precision machined spigot for accurate Body/Bracket alignment and concentricity.
  - ✓ Brackets designed to accept various pump sizes and models.

- 2 Heavy Duty Ball Bearing**
- ✓ Large angular contact Ball Bearings, grease lubricated to accurately locate and control axial clearance. Sized to also take radial loads of belt or chain drives.
  - ✓ Bearing Carrier or Lockrings ensure simple and precise axial Rotor clearance adjustment. No special tools or measurement equipment required for adjustment.

- 3 Shaft Sealing**
- ✓ Mechanical Seal either EBSRAY or commercial, shaft mount or cartridge mount available.
  - ✓ Seal scavenge/flushing available, removes heat from seal faces and induces flow of fresh liquid through Rotor Bearing.
  - ✓ Packed Gland optional with Lantern Ring.
  - ✓ API plans for optimum Shaft Seal performance.

- 4 Rotor Bearings**
- ✓ Material options to suit application and duty.
  - ✓ Large journal diameter for extended life.
  - ✓ Induced product flow through bearing with optional Flush Plan for additional lubrication and cooling.

## Bracket for Cartridge Mechanical Seal

Optional Cartridge Type Bracket for insertion and removal of the Mechanical Seal through the rear of the Bracket. A spacer type coupling allows the Mechanical Seal to be serviced without removal of the pump or driver from the installation. A heavy duty Double Row Ball Bearing accurately controls axial location of Outer Rotor.

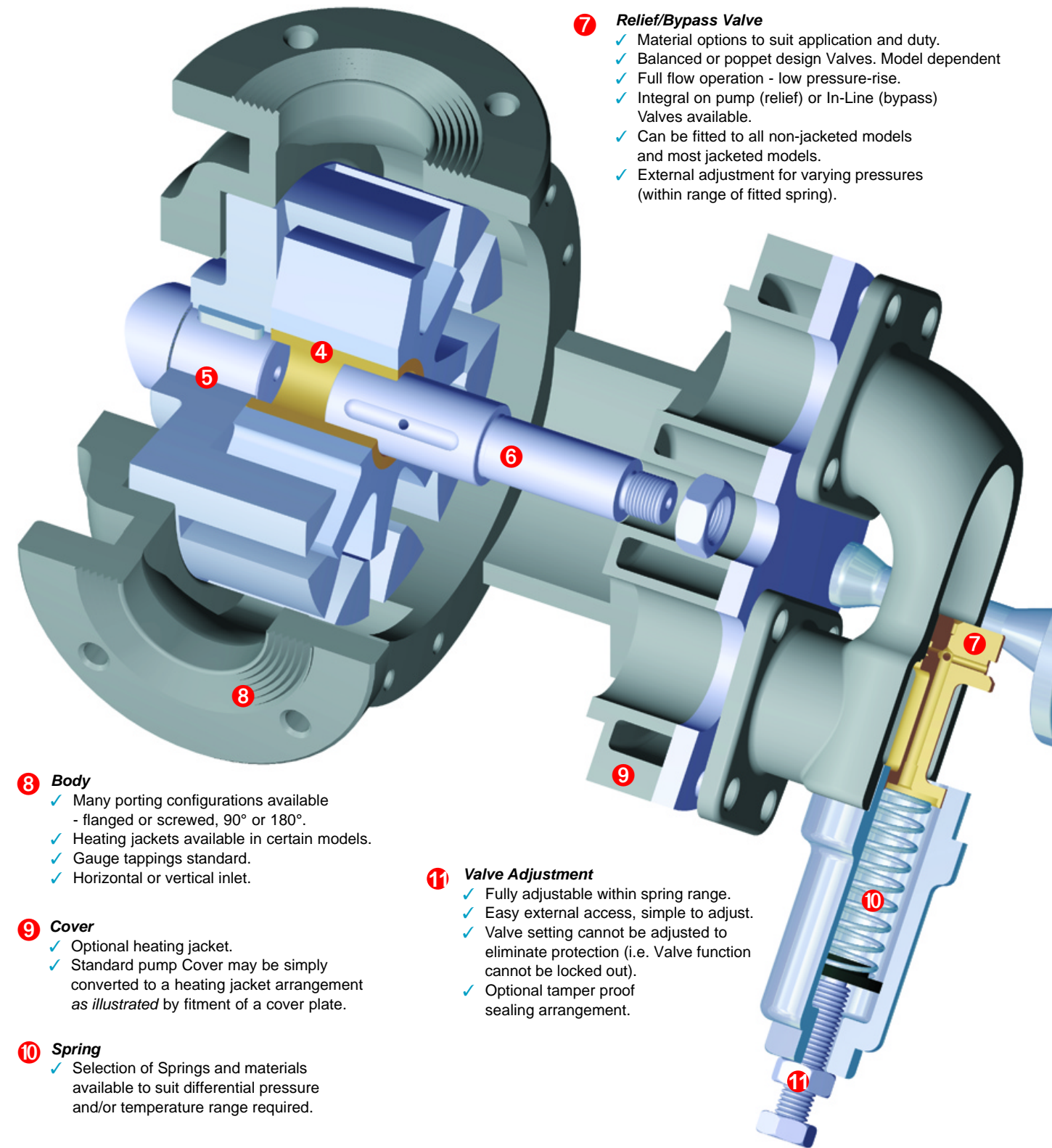
Bracket and/or Body may be cast with integral jacketing for efficient heat transfer using oil, steam etc. Special connections can be provided for heating (or cooling) jackets to suit the plant system requirements.

# Features

- 5 Rotor on Shaft Assembly**
- ✓ Precision machined for concentricity.
  - ✓ Large diameter Shaft - low deflection, high torque capacity.
  - ✓ Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
  - ✓ Material options to suit application and duty.

- 6 Inner Rotor Pin**
- ✓ Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
  - ✓ Optional pressure-fed product lubrication or from external source for arduous applications.
  - ✓ Easily fitted.
  - ✓ Positively located and can be drawn into position by Inner Rotor Pin locking nut.
  - ✓ Material Options to suit application and duty.

- 7 Relief/Bypass Valve**
- ✓ Material options to suit application and duty.
  - ✓ Balanced or poppet design Valves. Model dependent
  - ✓ Full flow operation - low pressure-rise.
  - ✓ Integral on pump (relief) or In-Line (bypass) Valves available.
  - ✓ Can be fitted to all non-jacketed models and most jacketed models.
  - ✓ External adjustment for varying pressures (within range of fitted spring).



- 8 Body**
- ✓ Many porting configurations available - flanged or screwed, 90° or 180°.
  - ✓ Heating jackets available in certain models.
  - ✓ Gauge tappings standard.
  - ✓ Horizontal or vertical inlet.

- 9 Cover**
- ✓ Optional heating jacket.
  - ✓ Standard pump Cover may be simply converted to a heating jacket arrangement as *illustrated* by fitment of a cover plate.

- 10 Spring**
- ✓ Selection of Springs and materials available to suit differential pressure and/or temperature range required.

- 11 Valve Adjustment**
- ✓ Fully adjustable within spring range.
  - ✓ Easy external access, simple to adjust.
  - ✓ Valve setting cannot be adjusted to eliminate protection (i.e. Valve function cannot be locked out).
  - ✓ Optional tamper proof sealing arrangement.



# Relief Valves & Baseplates

Ebsray manufacture a large range of Integral (bolt-on) Relief Valves for pump or system protection to suit all pumps in the MD & HD range. Ebsray also manufacture In-Line Bypass Valves and special purpose valves to suit many different pumping applications.

## Integral Relief Valves

Designed for direct mounting (bolt-on) to the pump Cover providing protection against excessive differential pressure rise in the pump and system. These fully adjustable Relief Valves are designed to handle full flow capacity of the pump against closed discharge conditions.

Dual Integral Relief Valves may be manifolded for bi-directional pump rotation offering protection in both flow directions.



Ebsray Integral (bolt-on) Relief Valve



Ebsray RV Series In-line Bypass Valve

## In-Line Bypass Valves

Ebsray In-Line Bypass Valves are ideally suited for return-to-tank applications and where Integral Relief Valves would be unsuitable e.g. to reduce heat build up due to short circuit recirculation within the pump on high pressure high flow applications.

## Special Purpose In-Line Valves

Ebsray In-Line PFM (Pressure and Flow Modulating) Valves are ideal for applications where constant pressure, flow control or remote operation is required e.g. filling line/package applications.

PFM Valves may be hydraulically or pneumatically actuated to maintain preset system conditions responding to manual or automatic external control.



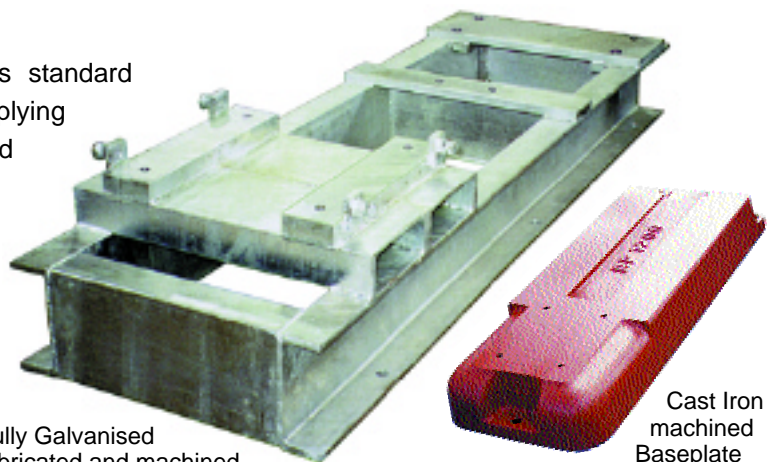
Ebsray RV Series In-line PFM (Pressure and Flow Modulating) Valve

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## Baseplates

Ebsray designs and manufactures standard Baseplates and Baseplates complying with API 676 or other standards and specifications as required.

Ebsray engineered Baseplates are fabricated to exacting requirements and machined to precise tolerances ensuring accurate alignment of pump, driver, transmission etc.



Fully Galvanised fabricated and machined Baseplate with adjusting screws for ease of drive alignment

Cast Iron machined Baseplate

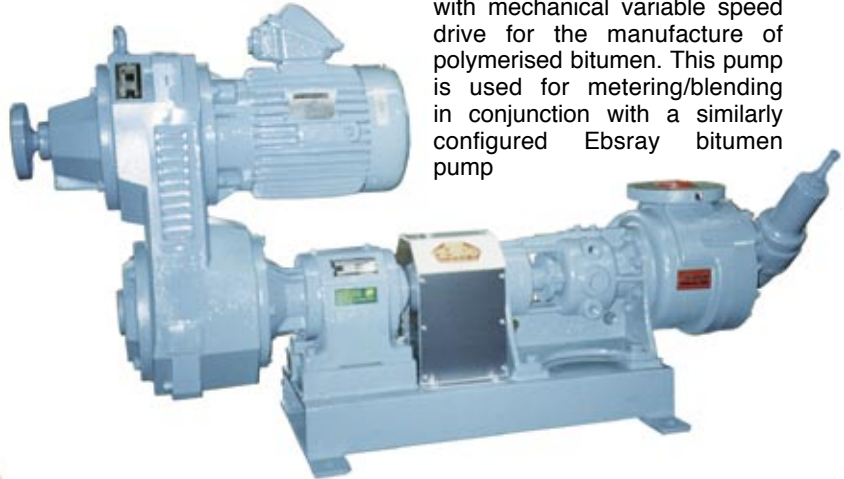
# Arrangements

**Customised Pumps and Pumpset arrangements designed and manufactured by Ebsray to suit customer and system requirements.**

Special API 676 compliant jacketed pumpset for refinery service. Fitted with special drive arrangement for minimal "footprint".



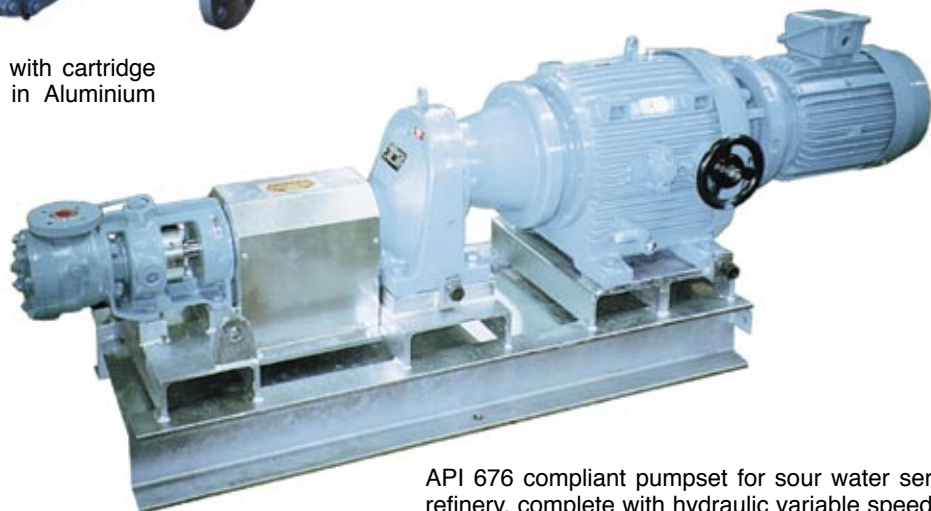
Jacketed vertical inlet pumpset with mechanical variable speed drive for the manufacture of polymerised bitumen. This pump is used for metering/blending in conjunction with a similarly configured Ebsray bitumen pump



Twin (left and right hand) HD 600 (150mm) Pumpsets V-belt driven for pumping molasses in a sugar refinery. Optimal space utilisation with pipework.



Fully jacketed pitch pump fitted with cartridge style mechanical seal for use in Aluminium smelter.

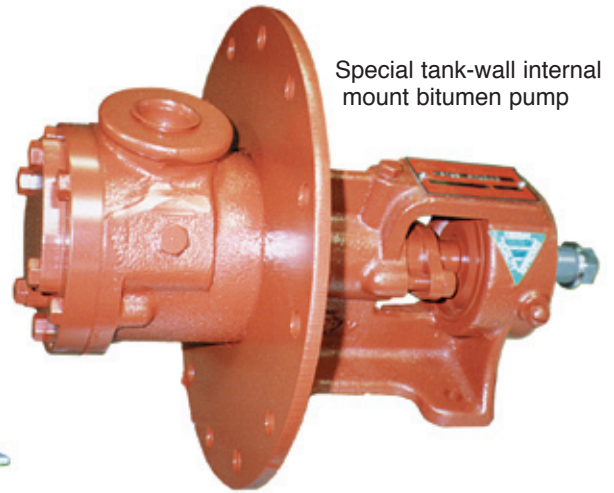


API 676 compliant pumpset for sour water service in refinery, complete with hydraulic variable speed drive

# Arrangements



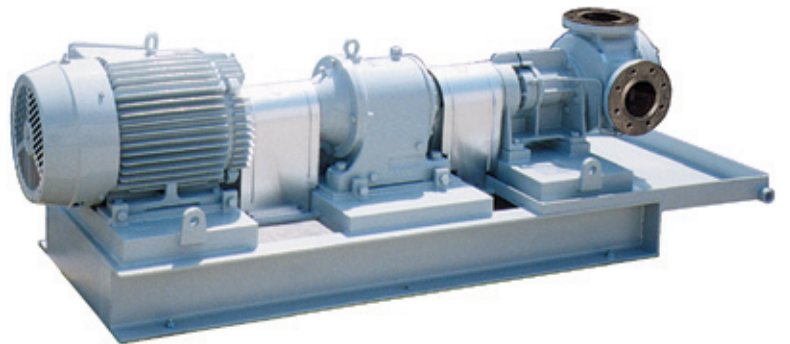
API 676 compliant steam turbine driven hydraulic variable speed drive pumpset for refinery service.



Special tank-wall internal mount bitumen pump



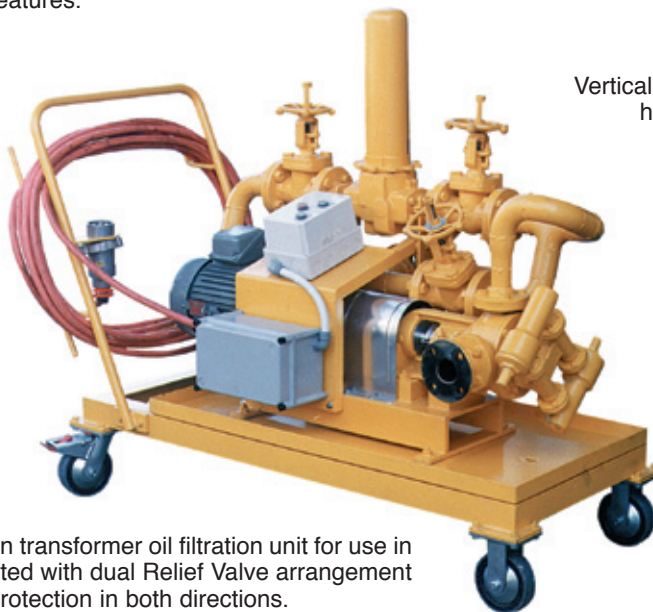
Hot water Jacketed Chocolate Pump fitted with special isolated Rotor Bearing together with integral lubrication system and other special features.



API 676 compliant oil additive transfer/circulation pumpset for blend plant service

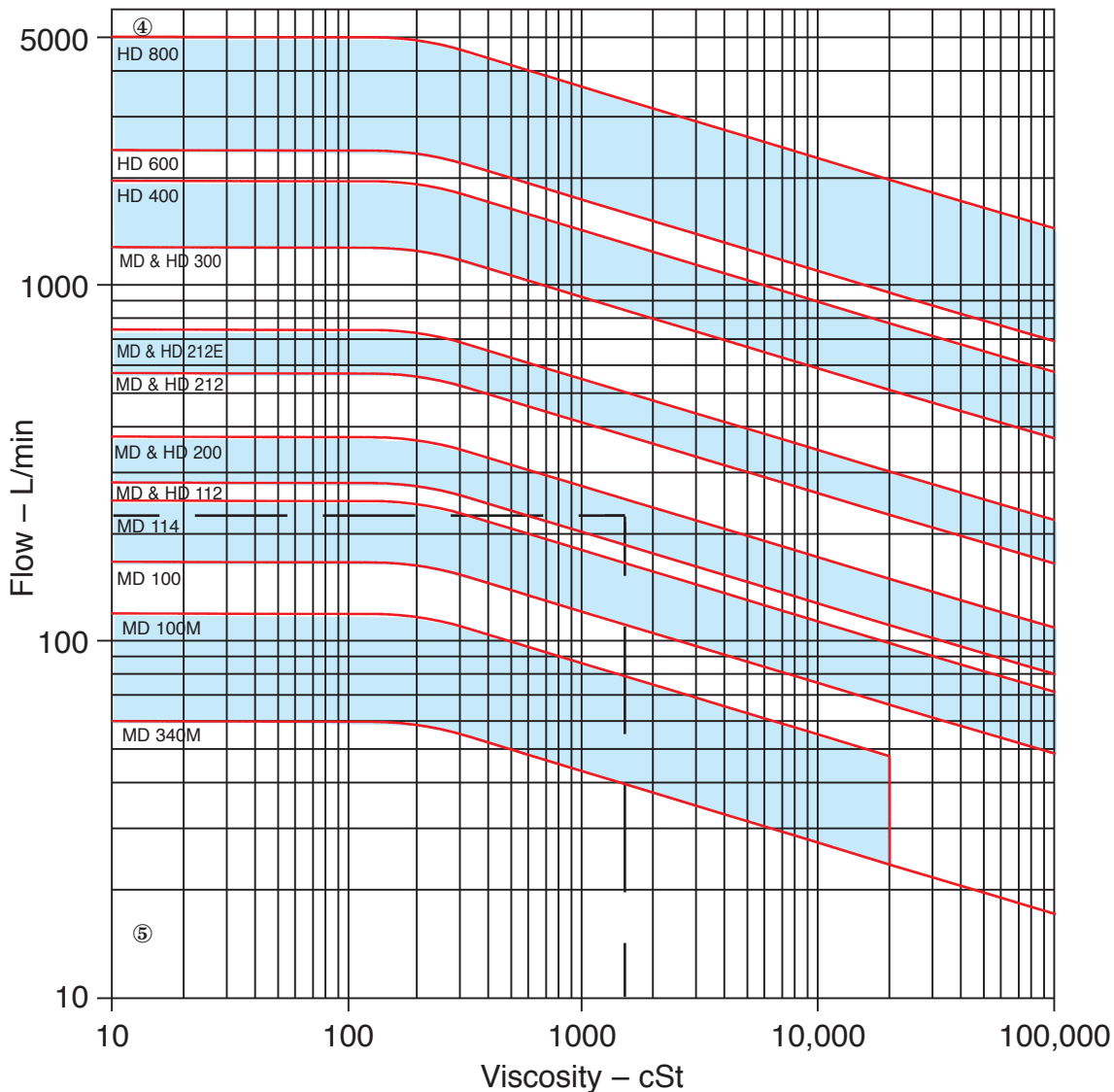


Vertical column mount submersible hydrocarbon pump for use in chemical plant.



Special dual rotation transformer oil filtration unit for use in a power station. Fitted with dual Relief Valve arrangement for over pressure protection in both directions.

# Pump Size Selection



For quick selection of the most economical size MD or HD Series pump, knowing the flow (L/min) and the Kinematic Viscosity (cSt), refer to the pump size selection graph above.

**Example:** (Follow dotted line above)

To find the ideal pump size for:  
 Flow = 220 L/min  
 Kinematic Viscosity = 1500 cSt.

The intersection of the two dotted lines occurs in the area of the Model MD & HD 200 pump.

### Pump Duty Power/Speed Determination

To determine the duty power and speed, refer to the chart/graph of the specific pump Model selected.

The following Notes **must** be considered for correct determination:

- Notes:**
1. Model selection may be affected by discharge pressure (Casing pressure), Differential pressure (Bearing loading), Viscosity of product (Shaft size/torque limitations). Check with technical data, EBSRAY or your local Representative as required.
  2. All pump models selected are dependant upon adequate NPSH<sub>A</sub> for correct, optimum performance and operation.
  3. For Kinematic Viscosity greater than 10,000 cSt we recommend conferring directly with EBSRAY or a local Representative.
  4. For Flows Greater than 5000 L/min, refer to EBSRAY or a local Representative.
  5. For flows less than 10 L/min, refer to EBSRAY Z Series selection graph.
  6. Internal pump clearances will affect Hydraulic Slip. Therefore, Slip must be considered for final pump speed determination in **every** selection. Clearances will be determined by: a) pump casing/rotor materials selected, and/or, b) product temperature, and/or, c) product viscosity.
  7. For applications involving Abrasive or Shear-Sensitive Liquids, refer to EBSRAY or a local Representative.

# Materials of Construction

This table of major components is general and some materials may only be available in specific models.

For special materials not outlined, or not shown as available, please contact EBSRAY or your local Representative.

Integral Relief Valves are supplied in materials suited to the pump construction and pumpage compatibility requirements. (For In-Line type Bypass Valves refer to EBSRAY)

■ = MATERIALS AVAILABLE.

MATERIAL	COMPONENT									
	PRESSURE RETAINING CASINGS		SHAFT		INNER ROTOR PIN	ROTORS		ROTOR BEARINGS		
	MD	HD	MD	HD		OUTER	INNER	MD	HD	
CAST IRON	■	■					■	■	■	■
STEEL	■	■					■	■		
DUCTILE IRON	■	■					■	■		
NICKEL IRON	■	■					■	■		
HARDENED ALLOY STEEL			■	■	■	■	■	■		
STAINLESS STEEL	■	■					■	■		
HARDENED OR HARD FACED STAINLESS STEEL			■	■	■	■	■	■		
BRONZE									■	■
CARBON									■	■
SYNTHETIC								■	■	■
CARBIDE									■	■

## Dimensions - Weights

PUMP MODEL	PORT DIMENSIONS (millimetres)							APPROXIMATE BARE SHAFT PUMP WEIGHT (WITH INTEGRAL RELIEF VALVE FITTED) kg
	NOMINAL PIPE SIZE (DN) mm - inches	SCREWED PORTS (See note 1)			FLANGED PORTS (See note 2)			
		V	W	THREAD	X	Y	FLANGE TYPE	
MD340M	20 - 3/4"	76	-	RP 3/4 / 20	-	-	-	12
MD340M	25 - 1"	76	-	RP 1/25	-	-	-	12
MD100M	25 - 1"	76	-	RP 1/25	79	-	ANSI CL 125	14
MD100M	32 - 1 1/4"	76	-	RP 1 1/4 / 32	-	-	-	14
MD100	25 - 1"	102	102	RP 1/25	105	105	ANSI CL 125	29
MD114	32 - 1 1/4"	105	105	RP 1 1/4 / 32	108	-	TABLE H	30
MD112	40 - 1 1/2"	124	124	RP 1 1/2 / 40	133	133	ANSI CL 125	41
HD112	40 - 1 1/2"	-	-	-	124	-	TABLE H	65
MD200	50 - 2"	124	124	RP 2 / 50	133	-	ANSI CL 125	41
HD200	50 - 2"	-	-	-	124	-	TABLE H	67
MD212	65 - 2 1/2"	162	162	RP 2 1/2 / 65	167	-	ANSI CL 125	62
HD212	65 - 2 1/2"	-	-	-	156	-	TABLE H	85
MD212E	80 - 3"	-	-	-	168	-	ANSI CL 125	120
HD212E	80 - 3"	-	-	-	168	-	ANSI CL 125	120
MD300	100 - 4"	-	-	-	205	-	ANSI CL 125	172
HD300	100 - 4"	-	-	-	235	235	ANSI CL 125	249
HD400-4	100 - 4"	-	-	-	267	267	ANSI CL 125	278
HD400-6	150 - 6"	-	-	-	-	275	ANSI CL 125	305
HD600	150 - 6"	-	-	-	286	-	ANSI CL 125	390
HD800	200 - 8"	Refer to EBSRAY or Representative for HD800 details.						

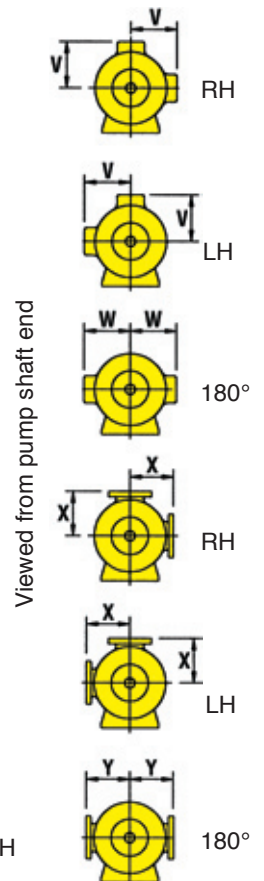
NOTE: Dimensions are subject to revision without notice. Certified data available on request

Note 1: Screwed Ports: Port Threads to AS 1722.1 All port threads female.

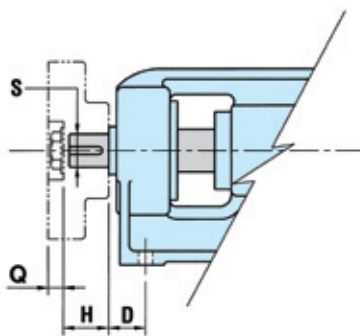
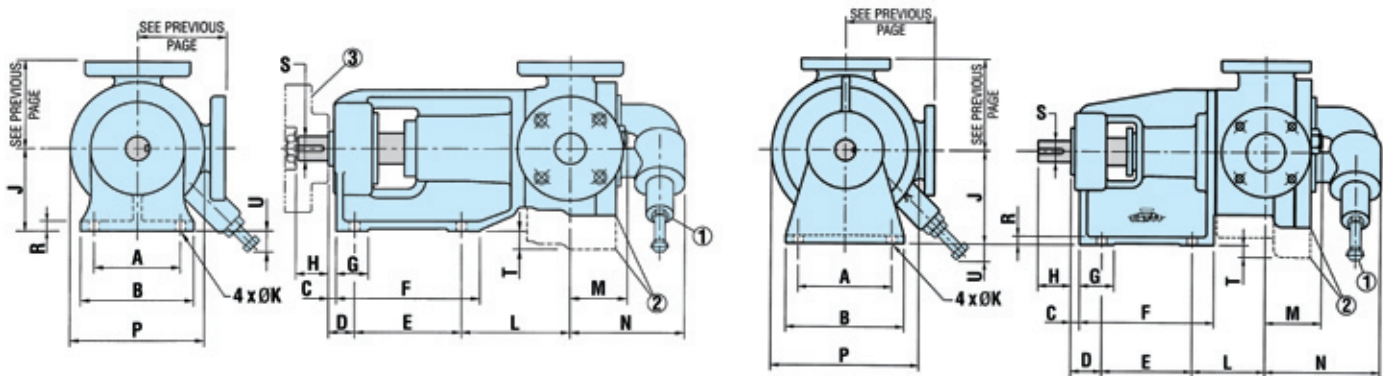
e.g. RP 1 1/4 / 32 = 1 1/4" BSP RP (parallel) 32mm DN

Note 2: Flanged Ports: ANSI CL125 to ANSI B16.1 or Table H to AS 2129 e.g. HD200 AS2129 / DN 50/ H

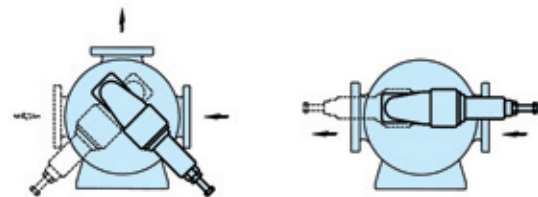
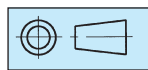
Flanged ports listed are to suit designated standard for Cast Iron Flanges. When Models listed above with CL125 ANSI flanges are made from Ductile Iron, Steel or Stainless Steel, they will have raised face flanges to suit CL150 ANSI B16.42 Standard. Port dimensions above may vary - check with EBSRAY for details. For other flange standards or alternative screwed port standards refer to EBSRAY.



# Dimensions (continued)



③ In the Pump Models marked ③ the coupling forms an integral part of the bearing locking mechanism, therefore, dimensions shown are critical for correct operation.



① In some pump models with 90° ports, the Relief Valve adjusting screw end may be below the pump mounting feet. (Dimension U)

② In some models, the underside of the pump Body may project below the pump mounting feet. (Dimension T)

PUMP MODEL	MAJOR PUMP DIMENSIONS (millimetres)																			
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	KEY
MD340M③	82.6	114	20.8	42.9	108	152	38	32	79.4	11	74	47	95	120	16	10	19.05	-	-	No 7 Woodruff
MD340M③											83	54	102					-	-	
MD100M③																		-	-	
MD100M③																		-	-	
MD100③	102	133	11	33	127	171		35	98.4		128	65	130	160	13	12	28.56	-	-	1/4" x 1/4"
MD114③											136							-	-	
MD112③											127	80	175	215				10	25	
HD112	203	240	20	55	219	290	54	63	152.4	17	110			200	-	16	38.09	-	-	3/8" x 1/4"
MD200③	102	133	11	33	127	171	38	35	98.4	11	140			215	13	12	28.56	10	25	1/4" x 1/4"
HD200	203	240	20	55	219	290	54	63	152.4	17	123			200	-	16	38.09	-	-	3/8" x 1/4"
MD212③	102	133	11	33	127	171	38	35	98.4	11	138	90	185	275	13	12	28.56	40	20	1/4" x 1/4"
HD212	203	240	20	55	219	290	54	63	152.4	17	121	92			-	16	38.09	-	-	3/8" x 1/4"
MD212E											138	98	238					-	90	
HD212E																		-		
MD300											148	128	295	350	-			25	127	
HD300	241	305	26	83	235	350	90	82	238	27	190.5	130	320	380	-	22	53.97	-	37	1/2" x 3/8"
HD400-4													365	450	-			-	27	
HD400-6															-			-		
HD600			50	108				115			235	170	405		-		62.00	-	12	18 x 11mm
HD800	Refer to EBSRAY or Representative for HD800 dimensions																			

NOTE: All specifications and illustrations are typical only and subject to revision without notice. Certified data available on request

DISTRIBUTED BY:

## EBS-RAY PUMPS PTY. LIMITED

ACN 000 061 003

Head Office and Works  
628 Pittwater Road  
Brookvale NSW 2100  
Australia.

Telephone: (61 2) 9905 0234  
Fax: (61 2) 9938 3825  
www.ebsraypumps.com.au

Branch Office Victoria  
Phone: (03) 9706 7263  
Fax: (03) 9706 7312

Branch Office Queensland  
Phone: (07) 3260 7411  
Fax: (07) 3260 7422



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