

# TRIRO PUMP RANGE

TRIPLE SCREW PUMPS  
T-RANGE, C-RANGE, E-RANGE, H-RANGE

PLENTY®



Plenty is a well established and universally respected brand. The Plenty product range consists of high-quality pumps, filters, separators, and strainers that cover a diverse range of different application scenarios. Our products are all well suited for use in the highly demanding power, chemical, oil/gas, marine, food/beverage, pharmaceutical, pulp/paper processing and water treatment sectors.

Our wide product range consists of positive displacement, fixed and variable flow rotary vane pumps, plus a multitude of triple and twin-screw pumps all under the one brand. Plenty filters, are suitable for both gases and liquids (across a broad spectrum of different pressures), with backflush, self-cleaning and coalescer options available. Filter separators and cyclone separators are also included. Our strong European manufacturing bases are backed up by an extensive range of related support services - covering maintenance, refurbishment, repair and parts replacement.

#### PUMP FEATURES & USER BENEFITS

##### Silent running

Environmentally acceptable for site operators

##### Pulse free flow

Ensures no emulsification of liquid, ideal for shear sensitive liquids

##### Vibration free

No costly foundations required nor transmitted vibration through system to downstream equipment

##### Compact design

Lower capital cost and space saving installation

##### Large range of frame sizes

Wide flow range with close matching to required capacity

##### High operational speed

No intermediate speed reducers required, can run directly from high speed power take-off e.g. gearboxes

##### High volumetric efficiency

Low running costs

##### Low npsh required

High static lifts can be achieved with no cavitation

##### Designs to api, din, etc.

Most international and client specifications can be accommodated

##### Custom designs

To meet specific client requirements or dimensions

# TRIRO PUMP RANGE TRIPLE SCREW PUMPS

## THE TRIRO PRINCIPLE

The TRIRO pump is of the positive displacement axial flow screw type with only three moving parts - a power rotor and two idler rotors. These three rotors (hence the brand name TRIRO) have accurately machined precisely intermeshing threads which enfold the liquid being pumped and act as seals in relation to each other and to the pump body or sleeve in which they rotate.

Designed for pumping oils the Triro pump has an axial pulse free flow and silent operation for sensitive forced lubrication, seal oil circulation and oil firing systems. Pumps are available in 17 frame sizes with various pitch angles and lengths offering a wide flow and pressure range.

Units are available from a low cost cast iron pedestal mounted version to high pressure steel cased pumps for API 614 systems. Pumps are also available in the popular tank top mounting arrangement for space saving on lube oil consoles, and vertical deck mounting for marine and other space saving transfer duties



## TYPICAL PRODUCT APPLICATIONS

The Triro range is designed for medium pressure high flow applications on clean liquids.

### Forced Lubrication

major rotating machine bearings

### Seal Oil Circulation

compressor labyrinth seals

### Fuel Oil Firing

boilers, kilns etc

### Lube Oil Transfer

### Fuel Oil Transfer

### Orimulsion Transfer and Firing

### Scavenging

### Fuel Oil Pumping and Heating Sets

### Duplex Pump and Filter Sets

### Rail/Road Car Loading and Unloading

### Hydraulic Power Packs

### Watertight Door Operation

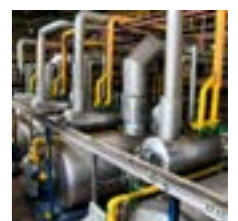
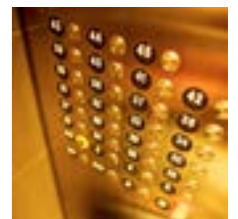
### Elevator / Lift Pumps

### Variable Pitch Propeller Control

### Bitumen Production and Loading

### Fats Transfer

### Viscose Production



## LIQUIDS

Triro pumps can be used on any clean lubricating liquid chemically compatible with the materials of construction.

- Lubricating Oil
- Hydraulic Oil
- Orimulsion
- Distillate Fuel Oil
- Residual Fuel Oil
- Crude Oil
- Grease
- Bitumen / Asphalt
- Viscose
- Fats
- Plasticizers
- Printing Inks

The lower viscosity limit is 2 cSt (gas oil at ambient temperature). This limit ensures that there is sufficient film strength for hydrodynamic support. The upper viscosity limit of 1750 cSt is determined by the operating limit of the standard mechanical seals used. At reduced speed and with alternative mechanical seal, viscosities up to 5000 cSt can be accommodated.



# THE TRIRO PRINCIPLE OF OPERATION

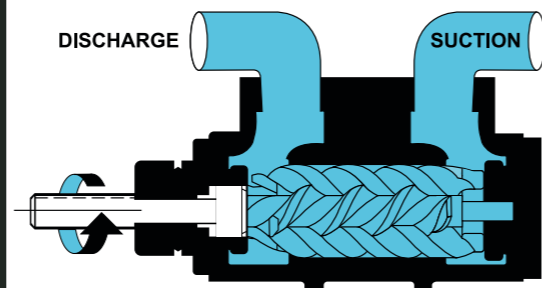
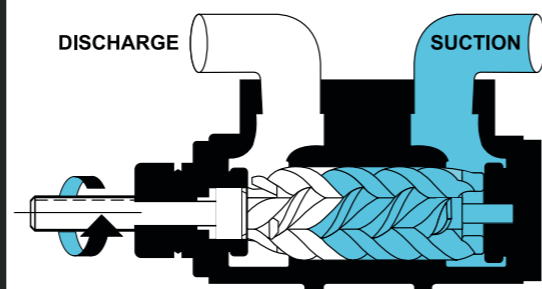
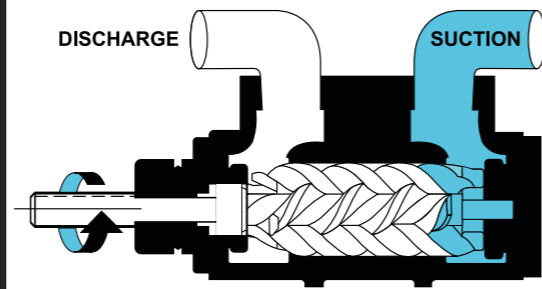
The Triro pump is of the positive displacement axial flow screw type with only three moving parts - a power rotor and two idler rotors. These three rotors have accurately machined precisely intermeshing threads which enfold the liquid being pumped and act as seals in relation to each other and to the pump body or sleeve in which they rotate.

The power rotor is connected directly to the the prime mover (electric motor, diesel engine, steam turbine etc) and as it rotates, the idlers turn due to the action of the pumped liquid. This action is in effect, that of a piston moving continuously in one direction, producing a smooth uniform flow without pulsations.

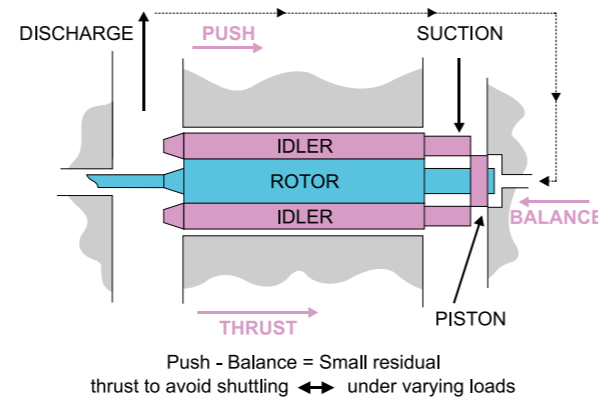
As the idlers perform no work, no gears are required to transmit power between the screws. As radial forces on the idlers are taken up by the surrounding cylindrical surfaces, no other bearings are required. Axial forces on the screwset caused by the pressure differential between inlet and outlet, are balanced hydraulically within the pump.

The chamber formed between two adjacent threads and the bore is known as a 'closure'. It is the closure which contains the liquid as it moves through the pump. As the screwset rotates, the unfolding closures in the suction chamber creates a low pressure (partial vacuum) area into which liquid is forced to flow by the pressure differential between this low pressure area and and the absolute pressure on the liquid at the pump inlet. At the discharge end, the folding closures force the liquid into the discharge pipe against the natural resistance (known as discharge pressure) created by the static head and discharge pipe system frictional losses.

The discharge, or back pressure forces a certain portion of liquid to pass back along the internal clearances from discharge to suction. This is a characteristic of all rotary positive displacement pumps. The very fine working clearances of a Triro pump reduces this 'leakage' or 'slip' to a minimum, thus maximising volumetric efficiency.

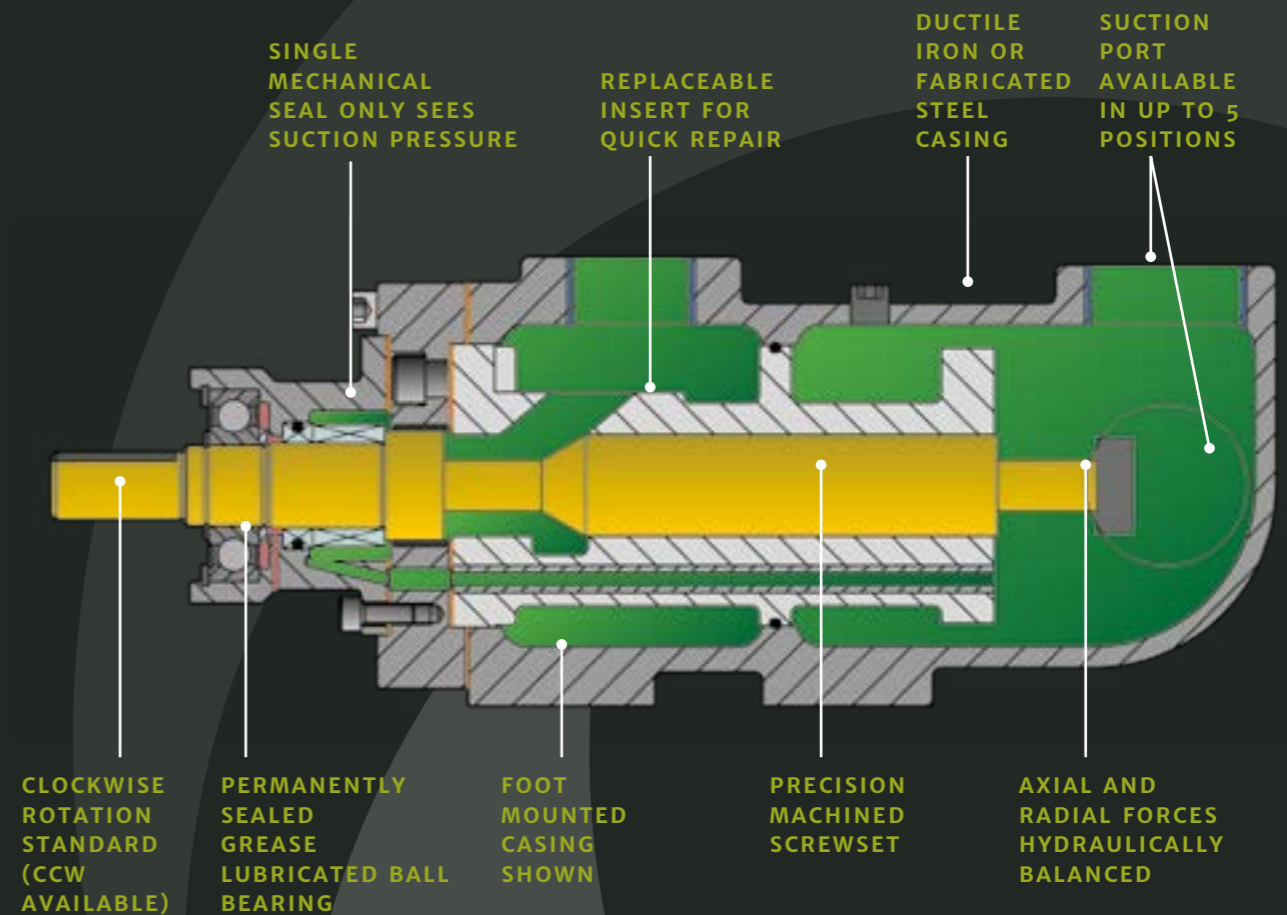


TRIRO FLOW PRINCIPLE



HYDRAULIC BALANCE

## TYPICAL SECTIONAL ARRANGEMENT OF THE TRIRO (C-RANGE) AND CASING.



# TRIRO SERIES - MARINE

January 2010 saw the implementation of the EU directive 2005/33/EC on Emissions from Shipping in European Coastal Waters and Ports. Celeros FLOW's Plenty Mirrlees TRIRO pumps have for many years successfully served the marketplace in pumping the Heavy Fuel Oils that powered the world's shipping. With the requirements to use fuels that have an extremely low sulphur content, the marine gas oils of tomorrow have brought considerable challenges to pump manufacturers.

After extensive research and development Celeros FLOW Plenty brand pumps have been installed on vessels belonging to the major shipping companies of the world. Our Marine TRIRO Pump, not only handles the low viscosities of the industry's current fuels DMA, DMB & DMX but is built and tested to operate with sulphur contents as low as the requirements demand in a future generation of fuel.



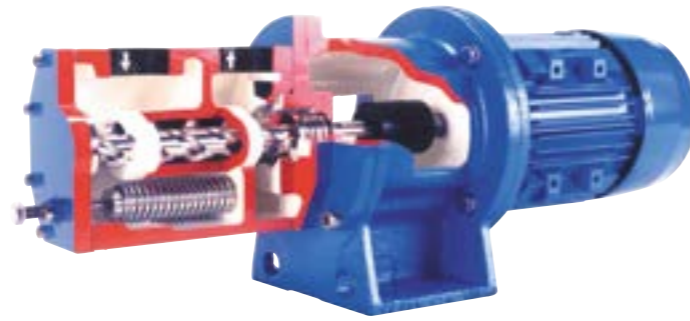
## T-RANGE

This range is designed as a low cost general industrial pump unit for clean liquids. It is constructed in high grade cast iron and features mechanical seal and integral relief valve as standard.

Smaller T-Range pumps are generally available ex stock with the larger units available on very short leads times.

Free standing horizontal, vertical and tank top mounted units are available, close

coupled to electric motors



### OPERATING PARAMETERS

CAPACITY	0.2 TO 68.0 M <sup>3</sup> /HR	1 TO 300 USGM
DISCHARGE PRESSURE	UP TO 20.0 BAR	UP TO 290 PSI
SUCTION PRESSURE	UP TO 2.5 BAR	UP TO 35 PSI
VISCOSITY	2 TO 1750 CST	33 TO 8100 SSU
TEMPERATURE	-20 TO +200°C	-4 TO +390°F

### API 676 AND OTHER SPECIFICATIONS

Pumps from all our ranges can be supplied in accordance with the requirements of API 676. Other international pump standards or client specifications can be accommodated.

## C-RANGE

This range is designed for medium pressure applications on clean liquids. It is produced as a cartridge design. The cartridge has an aluminium alloy or SG iron construction and features mechanical seal and optional integral relief valve as standard. The cartridge doubles as a renewable sleeve and can be inserted into a fabricated steel casing to meet the requirements of API specifications. Custom casing designs can be accommodated to meet client dimensions and specifications.

This range can be manufactured in accordance with most oil company and turbomechanical specifications including

**API676 / 614 / 610 (WHERE RELEVANT TO PD PUMPS).**

Horizontal free standing, base mounted and tank top mounted units are available, close coupled to electric motors.



### OPERATING PARAMETERS

CAPACITY	0.6 TO 68.0 M <sup>3</sup> /HR	3 TO 300 USGM
DISCHARGE PRESSURE	UP TO 50.0 BAR	UP TO 725 PSI
SUCTION PRESSURE	TO MEET MOST REQUIREMENTS	
VISCOSITY	2 TO 1750 CST	33 TO 8100 SSU



### OPERATING PARAMETERS

CAPACITY	0.6 TO 750.0 M <sup>3</sup> /HR	3 TO 3300 USGM
DISCHARGE PRESSURE	UP TO 50.0 BAR	UP TO 725 PSI
SUCTION PRESSURE	TO MEET MOST REQUIREMENTS	
VISCOSITY	2 TO 1750 CST	33 TO 8100 SSU
TEMPERATURE	-20 TO +200°C	-4 TO +390°F

## E-RANGE

This range is designed for medium pressure, high flow applications on clean liquids. It is constructed with a renewable sleeve and fabricated steel casing and features mechanical seal and optional integral relief valve as standard. Custom casing designs can be accommodated to meet client dimensions and specifications.

This range can be manufactured in accordance with most oil company and turbomechanical specifications including API676 / 614 / 610 (where relevant to PD pumps).

Horizontal base mounted, vertical free standing and tank top mounted units are available, close coupled to electric motors.



### OPERATING PARAMETERS

CAPACITY	0.6 TO 87.0 M <sup>3</sup> /HR	3 TO 380 USGM
DISCHARGE PRESSURE	UP TO 138.0 BAR	UP TO 2000 PSI
SUCTION PRESSURE	TO MEET MOST REQUIREMENTS	
VISCOSITY	2 TO 1750 CST	33 TO 8100 SSU
TEMPERATURE	-20 TO +200°C	-4 TO +390°F

## H-RANGE

This range is designed for high pressure applications on clean liquids. It is constructed with a renewable sleeve and fabricated steel casing and features mechanical seal and optional integral relief valve as standard. Custom casing designs can be accommodated to meet client dimensions and specifications.

This range can be manufactured in accordance with most oil company and turbomechanical specifications including API 676 / 614 / 610 (where relevant to PD pumps).

Horizontal free standing, base mounted and tank top mounted units are available, close coupled to electric motors.

### NON STANDARD PUMPS

Triro T, C, E and H-Ranges can be factory modified for special applications and higher viscosities.

### UNITISATION

Pumps can be supplied bare shaft or assembled with driver in various arrangements including vertical, tanktop, pedestal and baseplate options, with spacer or

# TRIRO PUMP RANGE TRIPLE SCREW PUMPS

| SPEED  
| EXCELLENCE  
| PARTNERSHIP



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