MONOFLO

National Oilwell Varco

E Range Heavy Duty Pumps

Benchmark for Reliability

Monoflo®

E Range Pumps

Models E032 and below

1. Rotors

DURACOAT

- manufactured ‘in-house’ to ensure quality
- standard and exotic materials to suit all applications
- range of coatings to improve wear resistance, including the new Duracoat 3000 coating designed for highly abrasive applications
- over and undersize rotors for differing product temperatures

Duracoat Coatings

- protects the surface from abrasive wear and corrosion
- range of coatings to suit the application
- increases the life of the rotor and reduces maintenance costs

2. Stators

- manufactured ‘in-house’ to ensure quality
- range of natural and various synthetic elastomers are used depending on the application requirements
- stator tube does not come into contact with pumped liquid
- stainless steel stator tubes optional
- product temperatures up to 302°F
- dry run protection probes available

Optimum Pump Performance - Guaranteed

- pump performance is very dependent upon the fit and geometry of both rotor and stator
- by controlling the manufacturing process of the components, Monoflo ensures that the pump performs correctly

3. End Cover (Discharge Port)

- NPT screwed ports standard, including BSP optional
- materials include cast iron, stainless steel, and others to suit the application
- tappings for instrumentation available
- modular design, 8 pumps utilize 3 end covers
- can be rotated through 90° increments

4 & 5. PowerDrive™

MONOFLO® POWERDRIVE PUMP

- 5 Year Warranty
- manufactured ‘in-house’ to ensure quality
- manufactured in titanium and coated with Halar®
- 6 PowerDrives for 13 models
- solid, rigid joint
- no moving/wearing parts
- no dynamic seals

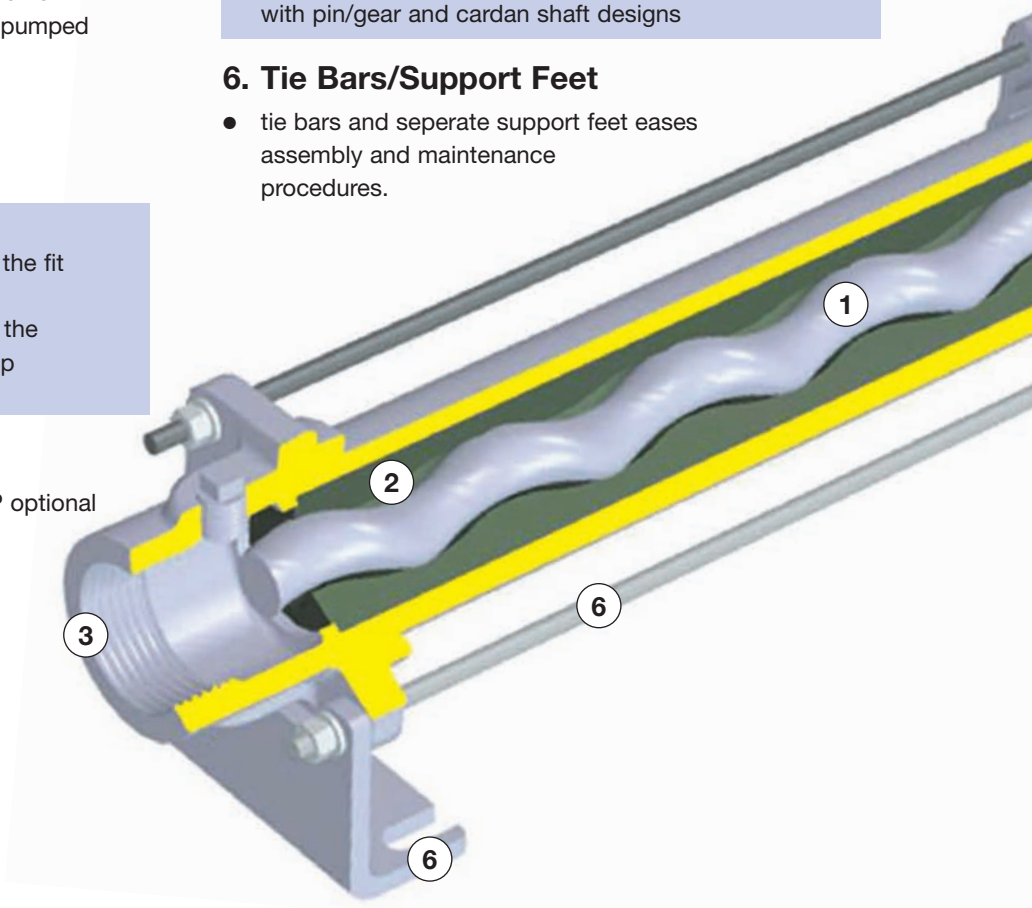
5 YEAR WARRANTY

Lowest Lifetime Cost Option

- this design removes the need for pin/gear/cardan shaft joints as the PowerDrive™ takes up the eccentric motion of the rotor
- eliminates need for joint lubrication so removing any likelihood of product contamination
- significantly reduces operating costs associated with pin/gear and cardan shaft designs

6. Tie Bars/Support Feet

- tie bars and seperate support feet eases assembly and maintenance procedures.



LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS QUALITY MANAGEMENT 001

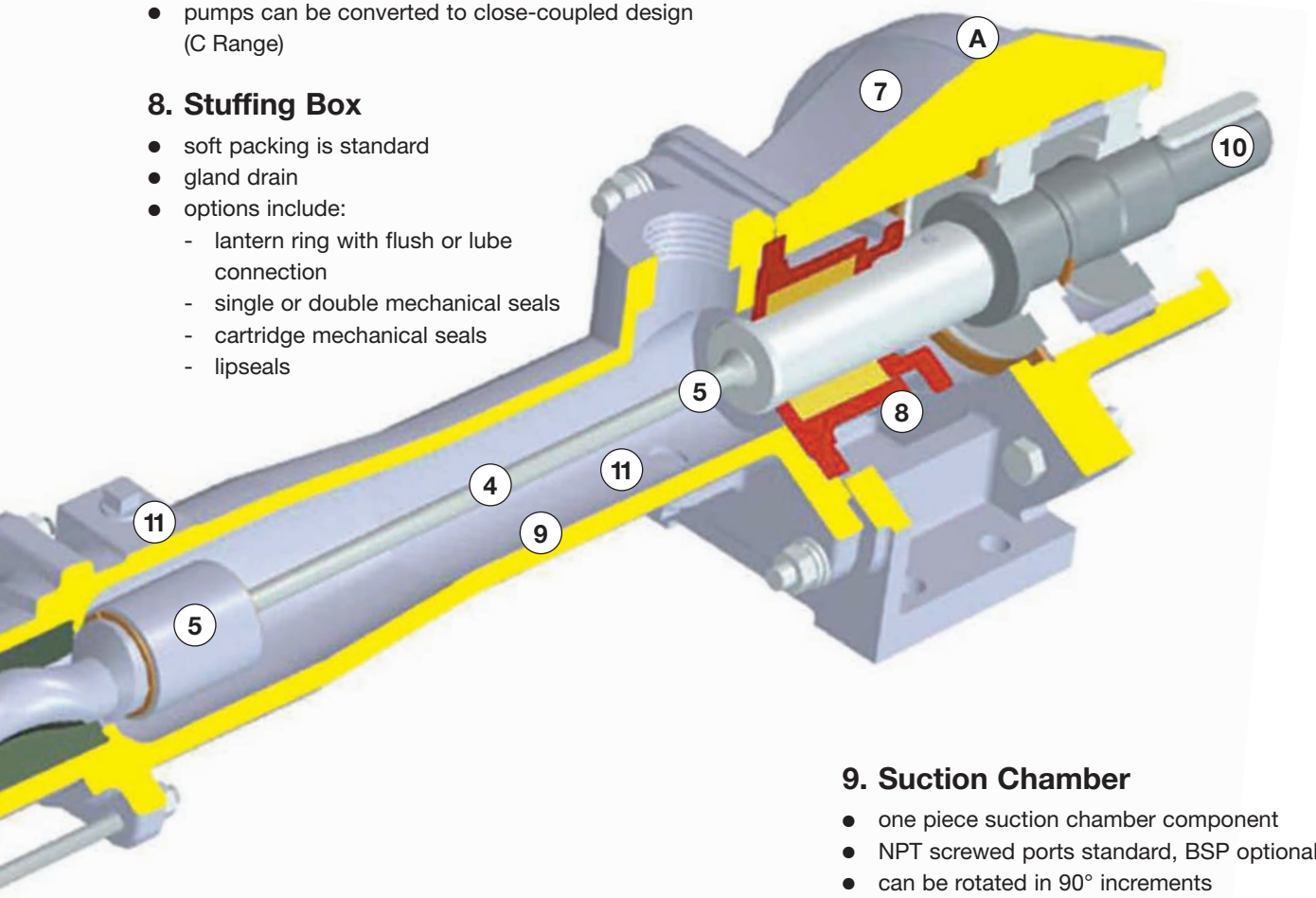
Capacities up to 57gpm - 8 models

7. Body

- 1 bearing housing Ⓐ assembly fits onto 8 sizes (EOX1 and below) for maximum versatility
- pumps can be converted to close-coupled design (C Range)

8. Stuffing Box

- soft packing is standard
- gland drain
- options include:
  - lantern ring with flush or lube connection
  - single or double mechanical seals
  - cartridge mechanical seals
  - lipseals



Operational Versatility

- these small pumps are designed to be as flexible as possible
- single, two and four stage performance can be achieved by changing the rotor/stator only on most sizes
- this modularity has significant operating cost impact for the user by minimizing the number of spare parts needed to support multiple pumps once installed

9. Suction Chamber

- one piece suction chamber component
- NPT screwed ports standard, BSP optional
- can be rotated in 90° increments
- includes 3 plugged tappings
- 8 pumps covered by 3 suction chambers
- materials include cast iron, stainless steel and others to suit the application

10. Drive Shaft

- comprises 2 components; bearing shaft and ‘plug-in’ shaft
- eases maintenance procedures
- plug-in shaft stainless steel or other materials to suit the application, with various coatings also available
- bearing shaft in carbon steel

11. Drain/Filler Tappings (Plugged)

- independent of suction chamber orientation tappings are positioned to fill and drain the suction chamber

E Range Pumps

Models E041 and above

1. Rotors

- manufactured ‘in-house’ to ensure quality
- standard or exotic materials to suit all applications
- range of coatings to improve wear resistance, including the new Duracoat 3000 coating designed for highly abrasive applications
- over and undersize rotors for differing product temperatures

Duracoat Coatings

- protects the surface from abrasive wear and corrosion
- range of coatings to suit the application
- increases the life of the rotor and reduces maintenance costs

2. Stators

- manufactured ‘in-house’ to ensure quality
- natural and synthetic elastomers are used depending on the application requirements
- stator tube does not come into contact with pumped liquid
- stainless steel stator tube optional
- product temperatures up to 302°F
- dry run protection probes available

Optimum Pump Performance - Guaranteed

- pump performance is very dependent upon the fit and geometry of both rotor and stator
- by controlling the manufacturing process of these key components, Monoflo ensures that the pump performs correctly

3. End Cover (Discharge Port)/Suction Chamber

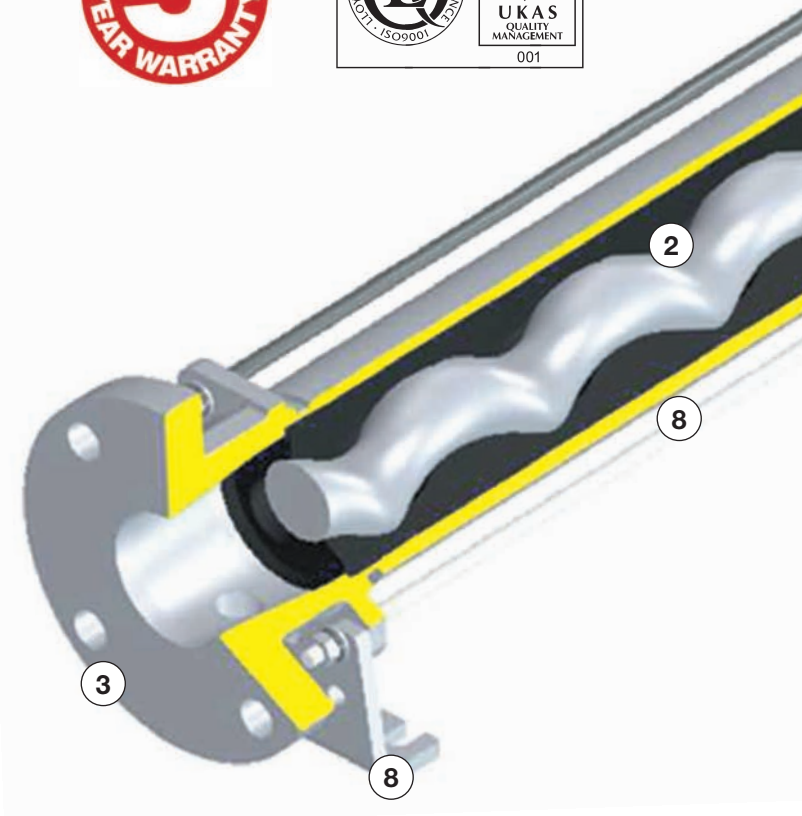
- flanges are drilled to ANSI standards. Available options include UK/European/Japanese specifications DIN, BS, JIS etc
- materials include cast iron, stainless steel, rubber lined, duplex steel and Ni-Resist to suit the application
- tappings available for relief valve, pressure gauge or control instrumentation as necessary
- suction chamber can be rotated through 90° increments
- plugged drain holes provided
- rectangular suction opening, in place of flanges are available

4 & 5. PowerDrive™

- 5 Year Warranty
- manufactured ‘in-house’ to ensure quality
- manufactured in stainless steel or titanium
- coated with Halar®
- solid, rigid joint
- no moving/wearing parts
- no dynamic seals

Lowest Lifetime Cost

- this design removes the need for pin/gear/cardan shaft joints as the PowerDrive™ takes up the eccentric motion of the rotor
- eliminates need for joint lubrication so removing any likelihood of product contamination
- significantly reduces operating costs associated with pin/gear and cardan shaft designs



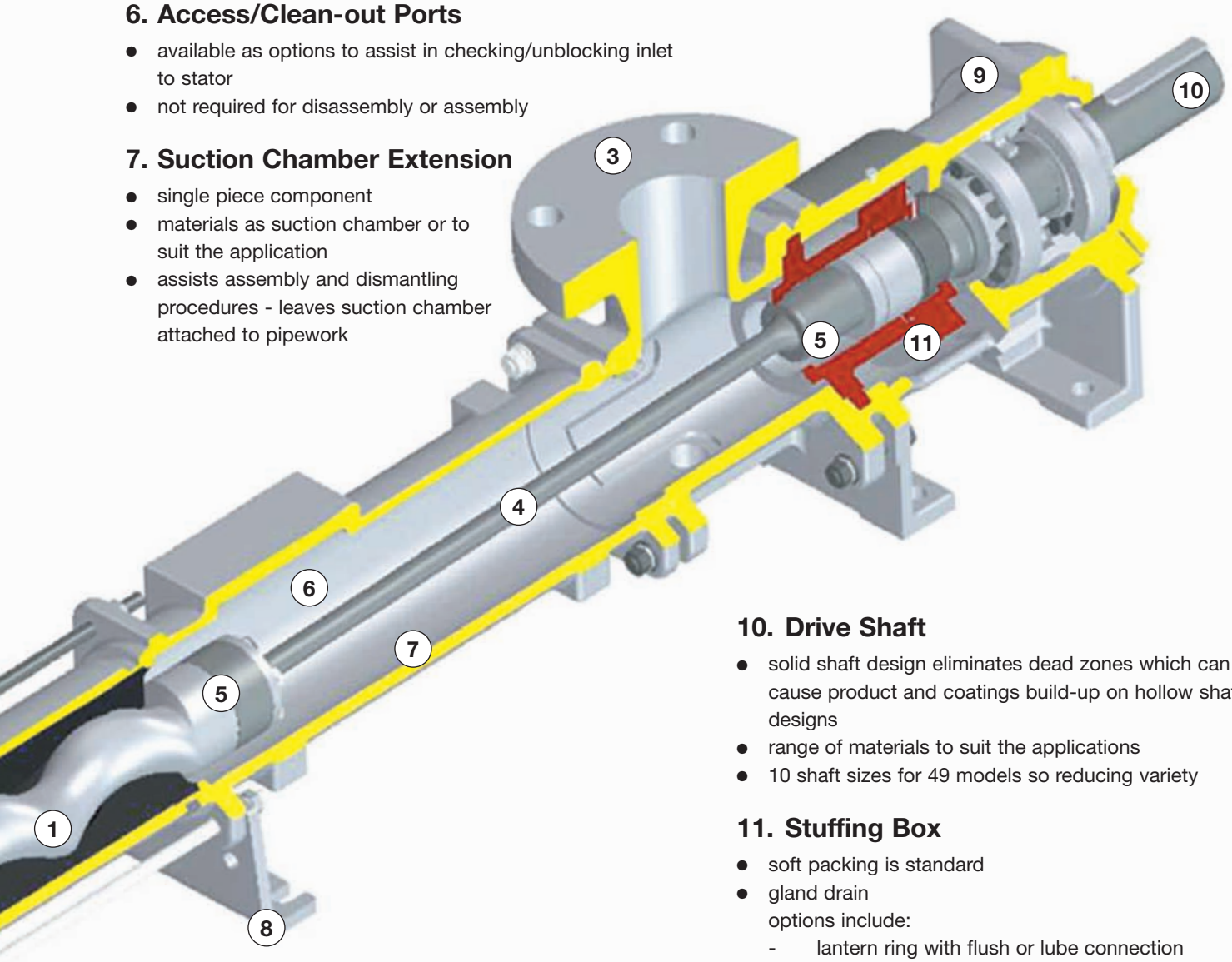
Capacities from 22gpm up to 1850gpm - 56 models

6. Access/Clean-out Ports

- available as options to assist in checking/unblocking inlet to stator
- not required for disassembly or assembly

7. Suction Chamber Extension

- single piece component
- materials as suction chamber or to suit the application
- assists assembly and dismantling procedures - leaves suction chamber attached to pipework



8. Tie Bars/Support Feet

- on majority of pumps the use of tie bars and separate support feet assist in assembly and dismantling procedures

9. Body

- 9 bodies used across 56 pump models, so reducing variety
- standard and other materials available
- bearings are taper roller design with lubrication nipple
- lipseals to prevent moisture ingress to bearings and to retain lubricant
- heavy duty sealing option

10. Drive Shaft

- solid shaft design eliminates dead zones which can cause product and coatings build-up on hollow shaft designs
- range of materials to suit the applications
- 10 shaft sizes for 49 models so reducing variety

11. Stuffing Box

- soft packing is standard
- gland drain
  options include:
  - lantern ring with flush or lube connection
  - single or double mechanical seals
  - cartridge mechanical seals
  - lipseals

All E Range Models

- paint finish from Monoflo standard to customer specific including epoxy
- baseplates and units to suit the application including direct coupled, overhead, side by side and piggy back vee belt configurations
- fixed or variable speed gearboxes with inverter control

E Range Pumps

Waste Water

A Sewage Treatment plant treating up to 1.6mgl/day of effluent, is using E Range pumps to transfer surplus activated sludge from various aeration systems to the dewatering unit. The pumps operate at speeds of 180 rpm and 120 psi pressure with capacities upto 600gpm. The pumps were chosen for the adjustable stators which would allow retensioning of the rotor/stator arrangement to prolong the service life of the pumping elements.

Mining

Monoflo designed and constructed this complete mine de-watering system to cope withhighly abrasive liquid at a uranium mine in Niger, West Africa. The system is built around three cast iron E088 high pressure pumps, capable of transferring water from three 1500 gallon capacity holding tanks at a rate of 175gpm, at 580 psi pressure, 800 feet to the surface and a further 2 miles to a settling lagoon. The scope of supply not only included the pumps, but also three sets of holding tanks, all interconnecting pipework and valve systems assembled onto the appropriate baseplate systems.

Chemicals

A CE102 pump installed at an Environmental Plant passed 14 months of extensive field tests. The pump is installed at the bottom outlet of a clarifier designed to concentrate solids by gravity settlement. Replacing a high capacity centrifugal pump which was unable to provide steady clarifier conditions and extracted too much slurry, the two stage pump was chosen to give variable flow control to match the changing conditions of the clarifier.

The pump handles a 2-5% wastewater slurry of metal hydroxides, clay bentonite and sand at a flow rate of between 66 and 220gpm. The field trials showed the pump to be very reliable in operation combined with low maintenance requirements.

Pulp & Paper

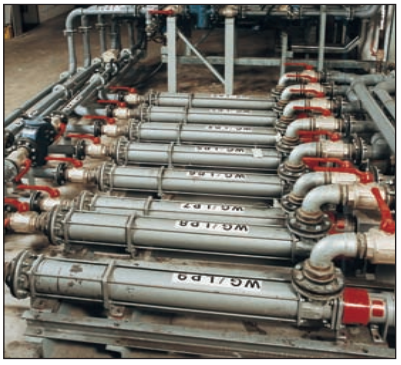
Vertically mounted CE072 pumps are helping one of Europe's leading manufacturers of high quality packaging achieve a smooth latex based coating on its board packaging materials.

The pumps are used to pump the coating mix from the storage tanks to the final station tank which feeds the top layer blade coater. To constantly refill the tanks, the pumps normally operate at 22gpm, however, the variable speed drive enables this to be automatically increased. Monoflo has mounted the pumps vertically to ensure that the seal and gland housing is above the highest possible liquid level in the tank. This prevents the possibility of seal leakage which could have costly quality and environmental implications.

Applications

Food & Drink

Three E Range pumps (together with some W Range pumps) have been installed at a refinery plant that produces a range of glucose and starch ingredients for the food and drink industries.
Operating at 167 rpm to deliver the gluten at 175gpm and 120psi pressure, the E Range models feature Monoflo's PowerDrive™, with 5 year warranty. The reduced number of moving parts in the drive train eliminates wear and makes lubrication unnecessary, reducing the risk of product contamination.



Adhesives

After testing a total of seven competitive pumps, a flooring adhesive manufacturer chose eight SE061 pumps to deliver a variety of raw material from twelve 50 ton storage tanks, 330 feet away, to mixing machines for blending.
As the products this customer works with are quite viscous and are often shear sensitive, the progressing cavity principle of the pump is ideal to give a gentle pumping action and to achieve the steady flow rate of 53gpm. Each pump handles a different product, with one on standby to enable any cleaning or maintenance work to be carried out when necessary.

Oil & Gas

This is part of a $1.2 million pump package, comprising 18 E Range pumps, installed at an oilfield in the Neuquen Province. Transferring a mixture of oil, formation water and solids to the tank separator, the pumps are installed on a first stage upstream process.
Due to the highly corrosive nature of formation water, all rotating parts within the pumps which are wetted by the formation water are manufactured in Duplex stainless steel to increase pump life and reduce maintenance requirements.

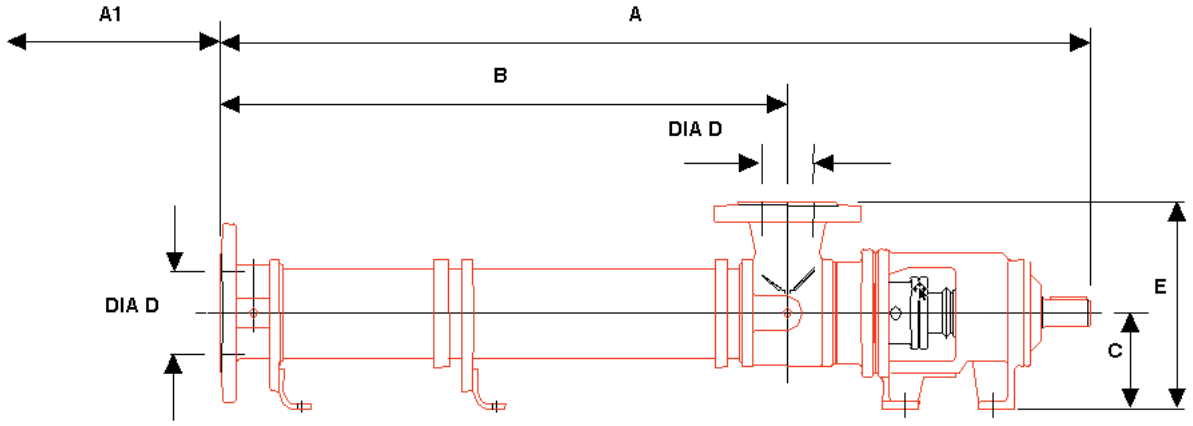
Industrial

CE082 pumps have been incorporated into a cross-flow filtration system specially designed by a company that refits and refuels nuclear submarines.
The pump is required to recirculate slurry for five hours in the crossflow filtration loop, comprising a feed tank and a filter module and also to recirculate a cleaning fluid around the loop once or twice a year. The filter module is designed to operate at an optimum flow rate of 125gpm and a pressure of 65psi.
As these pumps have good suction lift characteristics they do not rely on gravitational head to draw the waste from the storage tanks, thus eliminating the need for further pumping sytems.

Industrial E Range

FEATURES	DESCRIPTION	BASIC PUMP CODE										STANDARD VARIATION				
		1	2	3	4	5	6	7	8	9	10	/	12	13	14	15
BODY MATERIALS	Cast Iron	C														
	Stainless Steel	S														
	Duplex	F														
	Rubber Lined	R														
PUMP DESIGN	E Range		E													
NOMINAL PUMP CAPACITY AT MAXIMUM SPEED AND ZERO PRESSURE	6gpm @ 1750 rev/min			0	1											
	15gpm @ 1750 rev/min			0	2											
	44gpm @ 1500 rev/min			0	3											
	57gpm @ 1500 rev/min			0	X											
	97gpm @ 1000 rev/min			0	4											
	163gpm @ 800 rev/min			0	5											
	251gpm @ 700 rev/min			0	6											
	348gpm @ 600 rev/min			0	7											
	427gpm @ 500 rev/min			0	8											
	550gpm @ 450 rev/min			0	9											
	727gpm @ 400 rev/min			1	0											
	991gpm @ 350 rev/min			1	2											
	925gpm @ 270 rev/min			1	5											
	1277gpm @ 270 rev/min			1	6											
	1850gpm @ 200 rev/min			2	0											
PUMP STAGES	Low Pressure					K										
	One					1										
	Two					2										
	Three					3										
	Four					4										
	Six					6										
	Eight					8										
	Twelve					C										
END COVER AND DRIVE DESIGN	Str thro E/C, Std PowerDrive						M									
	90° E/C, Std PowerDrive						G									
	Str thro E/C, Special PowerDrive						S									
	90° E/C, Special PowerDrive						T									
MECHANICAL SEAL DUTY CONDITIONS	Light duty with Mk 1 rotor							H								
	Standard duty with Mk 1 rotor							J								
	Standard duty with Mk 0 rotor							K								
	Light duty with Mk 0 rotor							N								
PACKED GLAND DUTY CONDITIONS	Light duty with Mk 1 rotor							L								
	Standard duty with Mk 1 rotor							S								
	Standard duty with Mk 0 rotor							X								
	Light duty with Mk 0 rotor							Z								
DESIGN MARK NUMBER	1989 (1994 Sizes 01-0X) (1996 Low Pressure)								1							
	1995								2							
	1996								3							
STATOR MAT'L	RA, RR etc.									A						
ROTATING PARTS	1, 3, 4, 5, 8										3					
TYPICAL BASIC PUMP CODING	Cast Iron E Range pump size 05 single stage. Str thro E/C, Std PowerDrive Std duty conditions, Mk 0 rotor, Design 1, Natural rubber stator, Code 3 rotating parts	C	E	0	5	1	M	K	1	A	3					
MARKET VARIATIONS	'A' - America	C	E	0	5	1	M	K	1	A	3	/	A			
	'E' - Europe															
	'H' - Home															
	'C' - Bareshaft - Mono Australia only															
	'J' - Japan															
FULL PUMP CODING TO BE STAMPED ON PUMP NAMEPLATE																

Coding and Dimensions



	Port Size K, Single, Two Stage Pumps	K					Single Stage							Two Stage						
	D	A	A1	B	C	E	A	A*	A1	B	B*	C	E	A	A*	A1	B	B*	C	E
E01	1¼”													28.0		4.1	17.5		3.3	5.7
E02	1¼”						28.0		4.1	17.5		3.3	5.7	33.7		4.5	23.1		3.3	5.7
E03	1½”	36.3	4.5	25.6	3.3	5.9	30.6		4.1	19.9		3.3	5.9	36.3		4.5	25.6		3.3	5.9
E0X	2”	41.1	4.5	29.6	3.3	7.5	33.9		4.5	22.4		3.3	7.5	44.4		9.1	31.4		3.9	8.1
E04	3”	56.5	6.7	43.5	3.9	8.5	48.5	40.6	6.7	35.5	27.6	3.9	8.5	60.7	50.8	14.8	45.6	35.6	4.4	8.9
E05	3”	69.4	9.1	54.6	4.4	9.1	59.1	48.2	9.1	44.4	33.5	4.4	9.1	74.3	61.7	19.3	56.3	43.7	4.9	9.6
E06	4”	81.5	11.2	65.1	4.9	10.0	69.2	56.9	11.2	52.8	40.5	4.9	10.0	88.2	73.7	23.6	67.3	52.8	5.9	11.0
E07	6”	95.2	13.4	75.8	5.9	12.2	80.7		13.4	61.3		5.9	12.2	101.6		27.8	78.3		6.3	12.6
E08	6”	103.7	15.2	84.3	5.9	12.2	87.6	72.0	15.2	68.2	52.6	5.9	12.2	110.5		31.3	87.2		6.3	12.6
E09	8”	115.8	17.1	94.6	6.3	13.6	97.6		17.1	76.5		6.3	13.6	121.3		35.2	92.2		8.9	16.1
E10	8”	130.6	20.3	109.4	6.3	13.6	109.6	89.9	20.3	88.5	68.7	6.3	13.6	134.8		41.1	105.6		8.9	16.1
E12	10”	154.1	23.4	125.0	8.9	17.7	129.1		23.4	100.0		8.9	17.7	163.8		48.6	133.5		9.8	18.7
E15	◊10”/12”						157.9		28.9	126.1		9.8	19.7	215.9		28.9	175.5		13.0	24.4
E16	10”						169.8		40.8	138.0		9.8	19.7							
E20	12”						227.4		28.9	187.0		13.0	24.4							

	Four Stage						Six Stage						Eight Stage					
	A	A1	B	C	E	D	A	A1	B	C	E	D	A	A1	B	C	E	D
E01	33.7	4.5	23.1	3.3	5.7	1¼”												
E02	47.9	4.5	37.2	3.3	5.9	1½”	65.6	9.1	52.6	3.9	8.1	2”	76.9	9.1	59.7	3.9	8.1	2”
E03	53.7	9.1	40.7	3.9	8.1	2”												
E0X	70.7	10.0	55.6	4.4	8.9	◊ 2”/3”												
E04	82.3	30.7	64.3	4.9	9.6	3”							129.7	50.8	108.8	5.9	11.0	4”
E05	102.2	39.6	81.3	5.9	11.0	4”												
E06	120.4	47.6	97.1	6.3	12.6	6”	158.1	45.0	129.4	8.9	15.2	◊6”/8”	187.5	45.0	158.3	8.9	16.1	8”
E07	139.9	54.5	111.2	8.9	15.2	6”												
E08	151.8	61.2	122.6	8.9	16.1	8”	202.9	61.2	171.1	9.8	17.2	8”	235.0	61.2	203.2	29.8	17.2	8”
E10	201.9	41.1	171.7	9.8	18.3	10”	248.1	122.0	209.1	13.0	21.9	10”						
E12	242.7	47.2	203.1	13.0	24.0	10”												

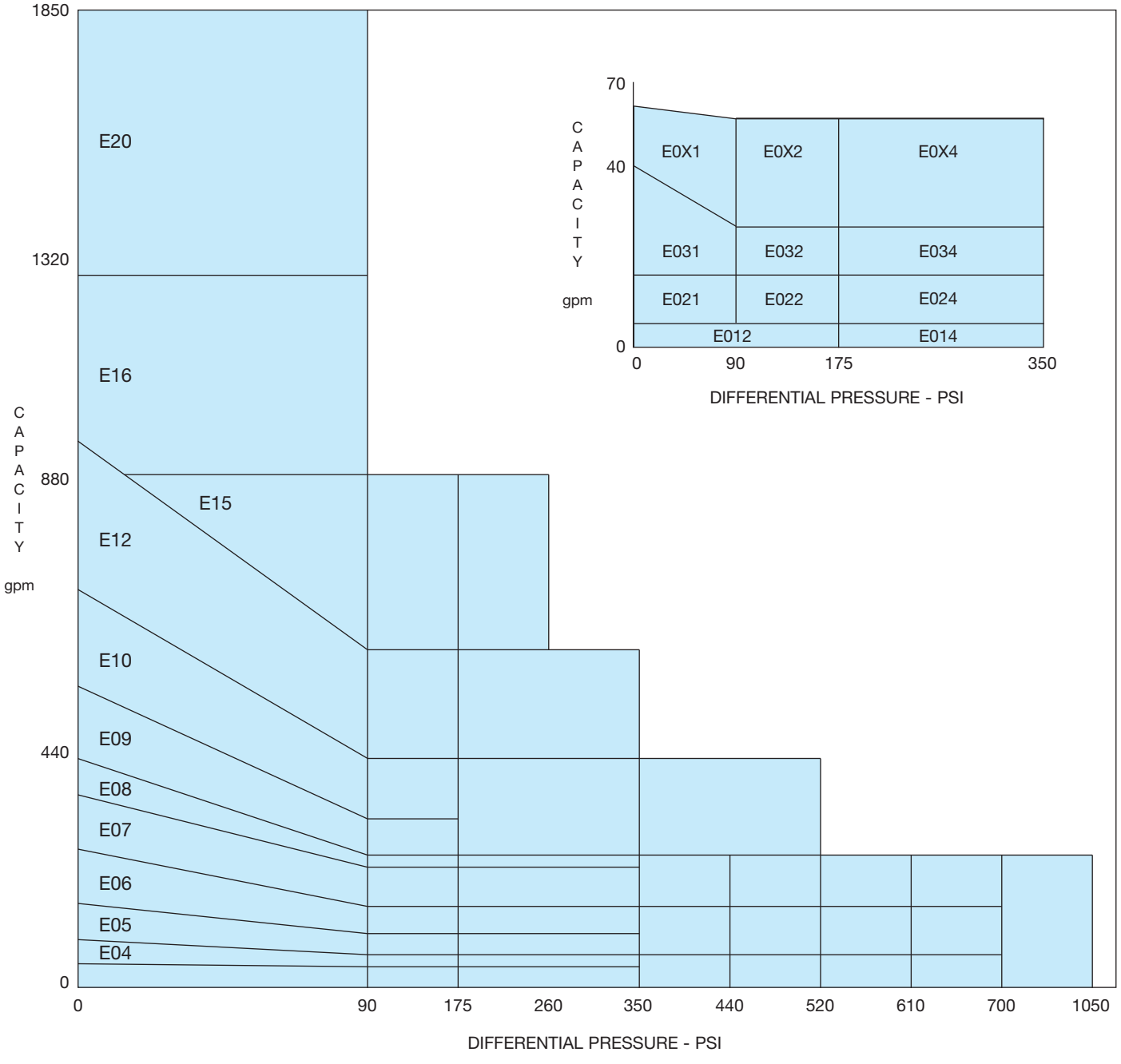
	Three Stage					
	A	A1	B	C	E	D
E15	225.0	13.8	185.7	13.0	24.0	10”

1. All dimensions in inches unless otherwise stated and for guidance only.
2. Shaft diameters are to BS 4506 (1970) and keyways to ISO R773.
3. Flanges to ANSI, B16.1 or B16.5.
4. Dimension A1 is the preferred dismantling space.
5. For full certified drawings refer to Monoflo

* Short pump design with Titanium PowerDrive™

◊ Suction/discharge port dimension.

Industrial E Range



NOTES:

For guidance in selecting a pump, please refer to Monoflo

Performance Data and Benefits

The PowerDrive™

The PowerDrive™ is a unique solution to the problem of connecting the pump drive shaft to the eccentrically orbiting rotor, completely eliminating conventional universal joint designs. This solution has been the subject of patents by Monoflo over the past 30 years and has a 5 year warranty.

Because there are no wearing parts in the joints, the E Range does not incur the cost of maintenance associated with other forms of rotor/coupling rod joints. Lubrication is unnecessary, therefore product contamination caused by oil/grease is eliminated.
Further enhancements in design and the use of new materials has enabled us to reduce the PowerDrive™ dimensions, making the pump comparable in length to other traditional designs of progressing cavity pumps on the market. The benefit to the user is a pump which can be easily retrofitted onto existing pump foundations coupled with the significant reduction in operating costs as a result of the elimination of wearing, universal joint designs.

Service and Technology

At Monoflo, our philosophy is to provide full product and technical support that meets with your exact requirements, including quality, availability and price.

The latest technology is used, such as computer based flexible manufacturing systems, computerised bar stores and information systems. Monoflo is unique in having three stator manufacturing operations worldwide to ensure that we produce pumps and parts to a consistently high standard in each market.

Attention to detail, combined with a wealth of technical advice and CAPS (Computer Aided Pump Selection) ensures you will receive a product that is quality assured. Monoflo is approved to ISO 9001 and manufactures products within a Quality Management System which is independently measured against industry recognised standards throughout the world.

With over 700 authorized outlets located throughout the world to provide the local support you need, Monoflo can offer you the following services:

- Pre sales assistance
- Quotations for applications
- Pump availability
- Spares availability
- Trouble shooting
- Warranty and after sales service
- Installation
- Pump refurbishment and service exchange facilities

Monoflo Around the World

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Monoflo products include:

- Monoflo® — Progressing cavity pumps for surface and sub-surface
- Monoflo® — Progressing cavity motors for drilling
- Muncher® — Twin Shaft Grinders
- Discreen® — Dynamic Screens
- Macerator — Centrifugal Macerators
- Extraction Systems

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