

Durco Mark III ANSI Process Pumps



Rotating Equipment Division

ALLOY PUMPS

- ANSI Standard
- Lo-Flo
- Sealmatic
- Unitized Self-Priming
- Recessed Impeller

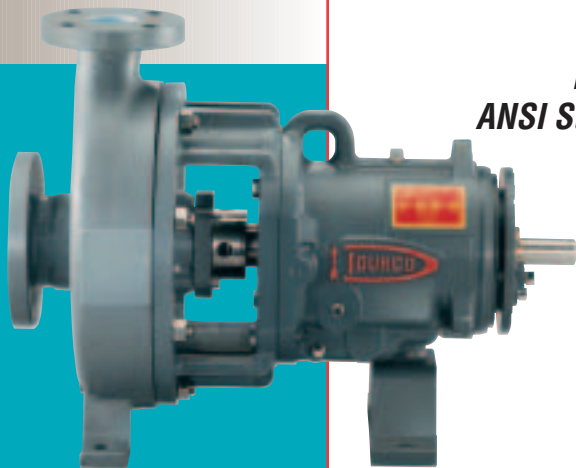


**Durco Mark III
ANSI Process
Pumps**

Pumps delivered worldwide are manufactured in Flowserve facilities, certified either to ISO 9001 or to 9002.



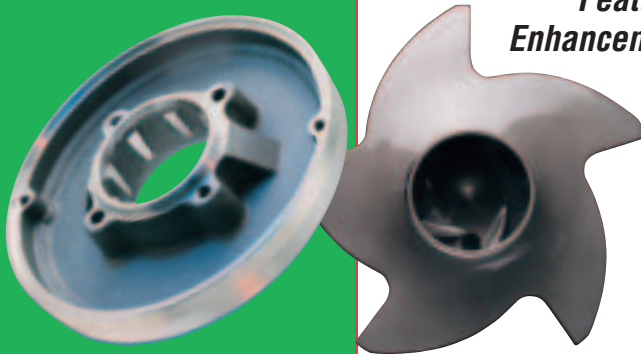
Quality System Certificate



**Mark III
ANSI Standard
Pump**

Heavy-duty chemical service pumps are world renowned for their reliability and durability.

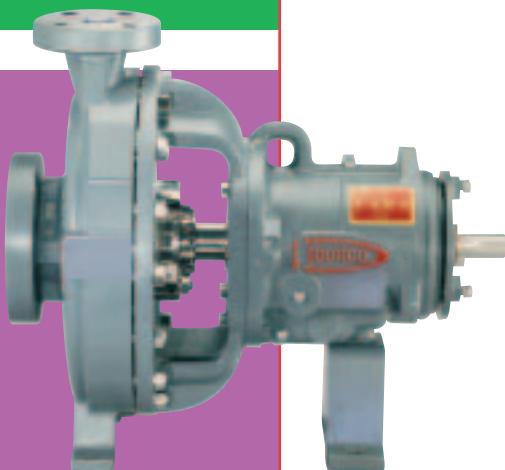
*Mark III Standard/4-5
Performance Curves/6
Interchangeability/7
PumpSel™ Durco
Pump Selection Guide/7*



**Features/
Enhancements**

Improved pump reliability and extended MTBPM are achieved with exclusive features like the unique reverse vane impeller, SealSentry™ seal chambers and many other technological advancements.

*Power Ends/8-9
Seal Chambers/10-11
Impellers/12-13
Shaft Design/14
Baseplates/15-17
C-Flange and
Other Options/18-19
Safety and Inspection
Options/20-21*



**Mark III
Lo-Flo
Pump**

Radial vane impeller with circular concentric casing is specifically designed for high head/low flow applications.

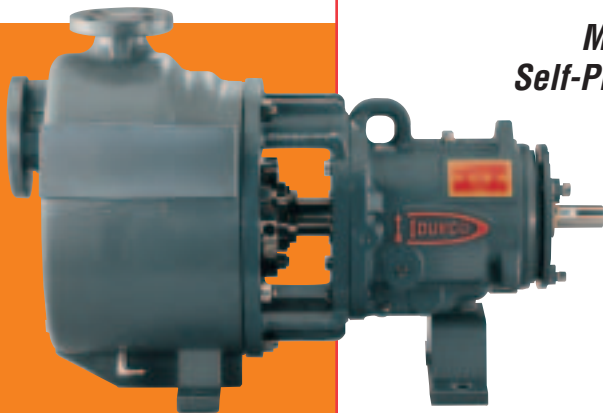
Lo-Flo/22-23



**Mark III
Sealmatic
Pump**

Dynamically sealed pump eliminates the need for conventional mechanical seals.

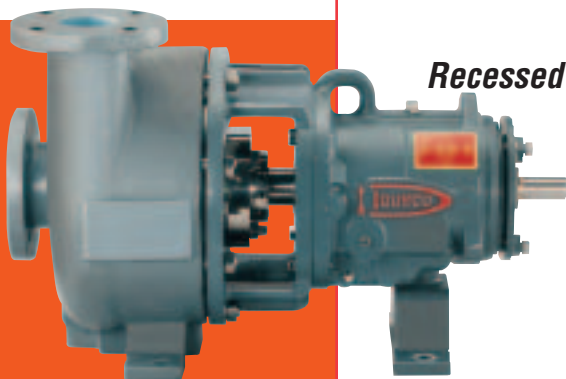
Sealmatic/24-25



**Mark III
Self-Priming
Pump**

Sits high and dry, reduces costs of vertical pump options and simplifies maintenance.

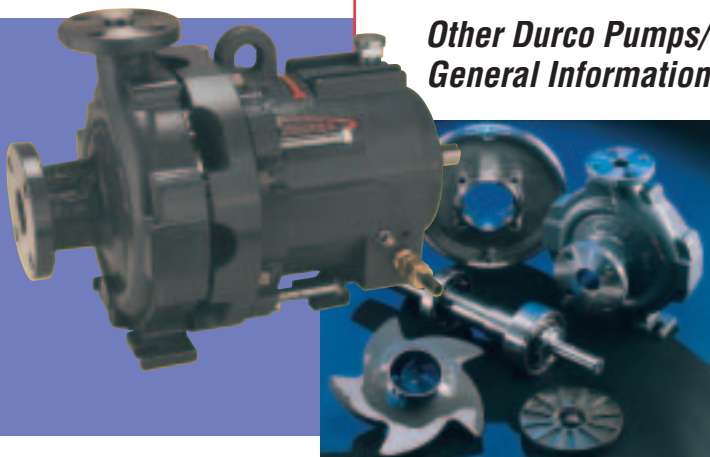
*Pumps and Priming
Tanks/26-27*



**Mark III
Recessed Impeller
Pump**

Vortex action assures trouble-free pumping of large diameter solids and slurry services. Also used to process shear sensitive products.

Recessed Impeller/28-29



**Other Durco Pumps/
General Information**

- In-Line
- High Silicon Iron
- Chemstar® ISO Standard
- Guardian®
- Chemstar® MD
- PolyChem™
- Power Monitor
- Genuine Durco pump parts
- Durco alloy materials

*Other Durco Pumps and
General Information/30-35*

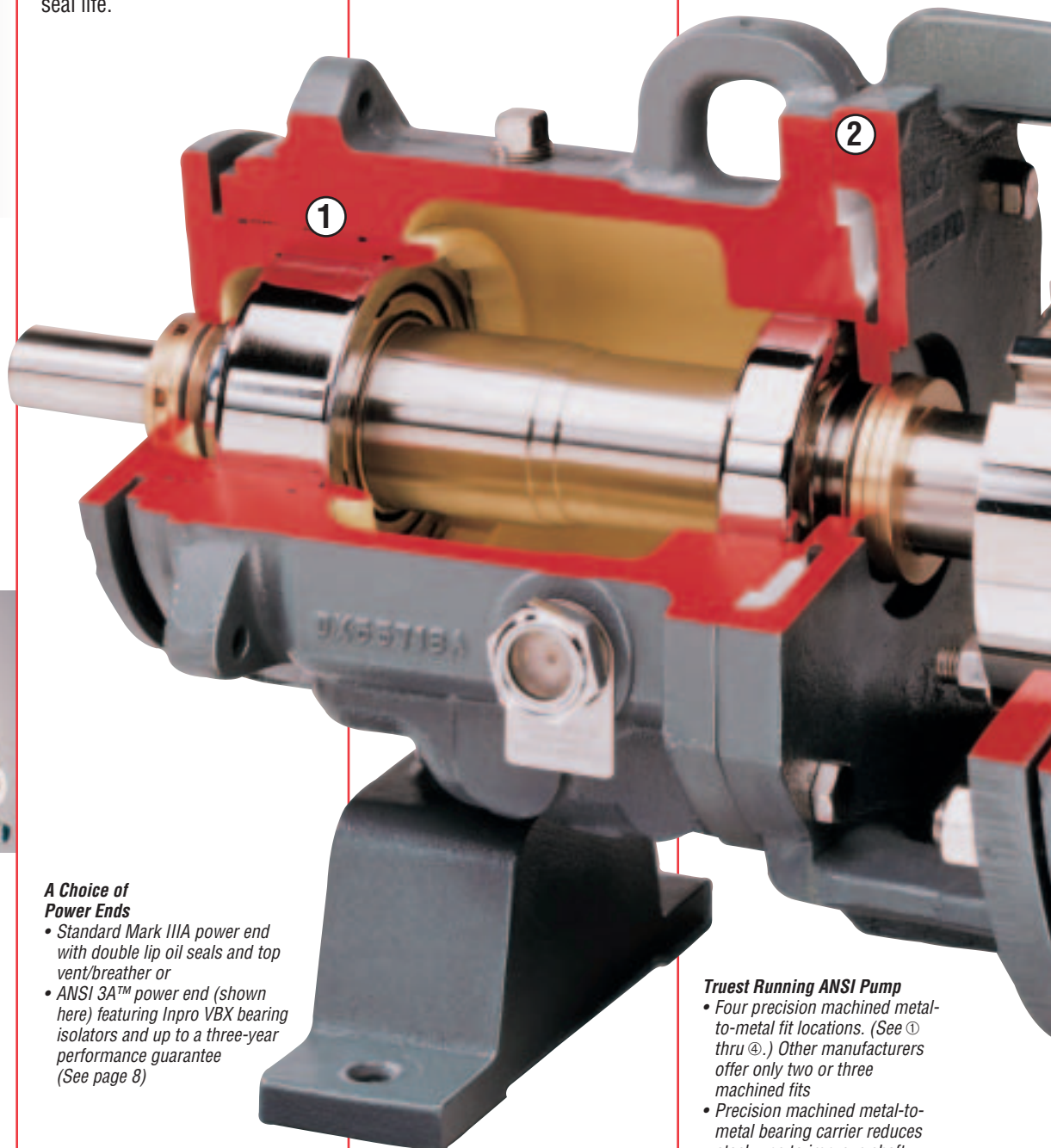
Durco Mark III ANSI Standard

Recognized worldwide as the premier name in ANSI chemical process pumps

The advanced design and precision manufacture of the rugged, heavy-duty Mark III chemical service pump significantly enhance bearing and seal life.

Flowserve is committed to helping users maximize mean time between planned maintenance (MTBPM).

The unique features and enhancements of Durco pumps provide significant performance benefits for pump users.



Fastest Maintenance Turnaround Time

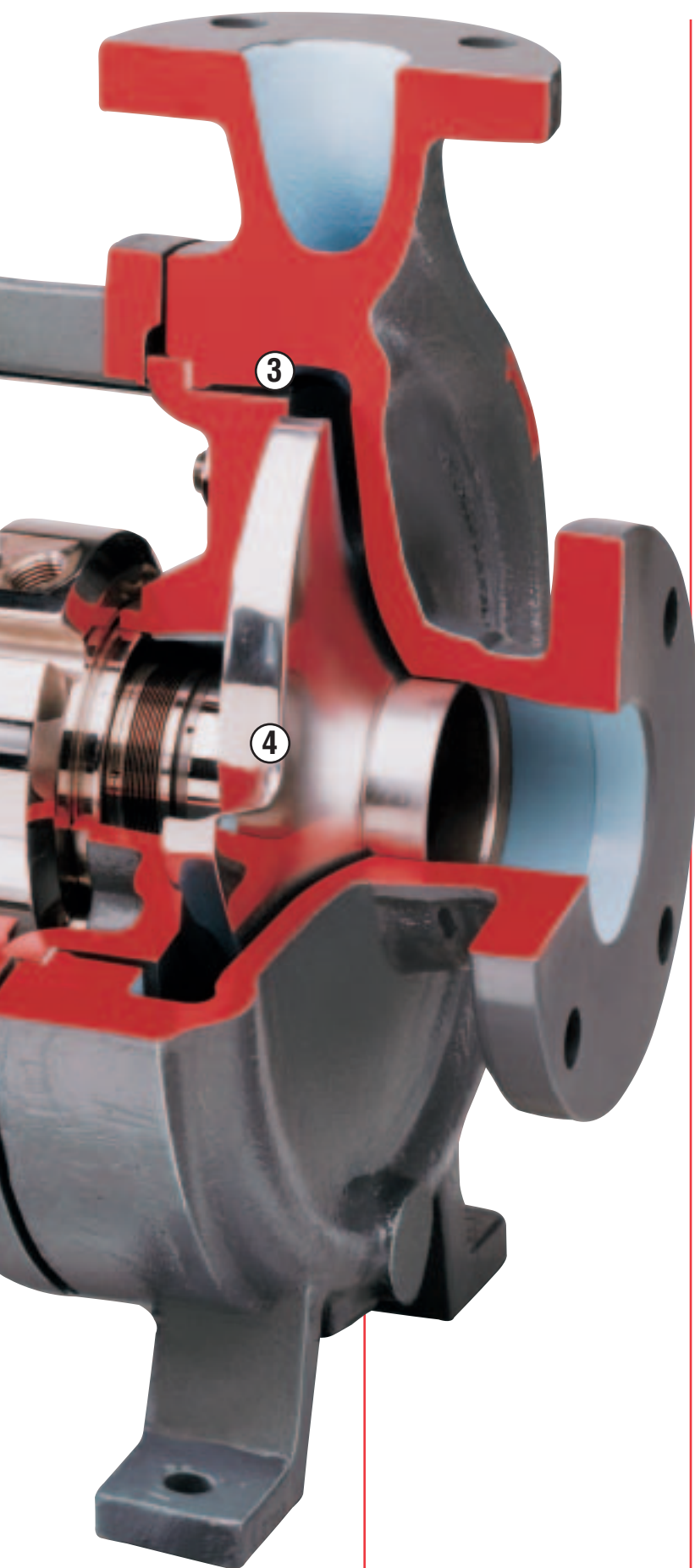
- Micrometer type shaft and impeller adjustment accurately sets impeller clearance to rear cover in 20 seconds...in the shop or field
- Mechanical seals and all critical settings can be accurately set in the shop (See page 9)

A Choice of Power Ends

- Standard Mark IIIA power end with double lip oil seals and top vent/breather or
- ANSI 3A™ power end (shown here) featuring Inpro VBX bearing isolators and up to a three-year performance guarantee (See page 8)

Truest Running ANSI Pump

- Four precision machined metal-to-metal fit locations. (See ① thru ④.) Other manufacturers offer only two or three machined fits
- Precision machined metal-to-metal bearing carrier reduces stack-ups to improve shaft concentricity
- Superior to jackscrew designs which can cause cocking
- Extends bearing and mechanical seal life



The Mark III ANSI Standard process pump covers a broad hydraulic range.

Thirty sizes

- Seven (7) Group I
- Sixteen (16) Group II
- Seven (7) Group III

Capacities

- 60 Hz To 7400 gpm (1680 m³/h)
- 50 Hz To 6120 gpm (1390 m³/h)

Heads

- 60 Hz To 985 ft (300 m)
- 50 Hz To 655 ft (200 m)

(See pages 6-7 for performance data and component interchangeability.)

Enhancements have been developed to offer superior performance and reliability. (See pages 9 thru 21)

An important element of Flowserve quality is a full menu of superior materials cast to the highest quality standards. (See page 7)



SealSentry™ Family of Seal Chambers Featuring Unique Flow Modifiers

The Vaaler Award winning FM design provides advanced self-flushing ability to:

- Extend mechanical seal life
 - Utilize less expensive seal and flush plan options in most cases
 - Improve pump reliability
- (See pages 10 & 11)*

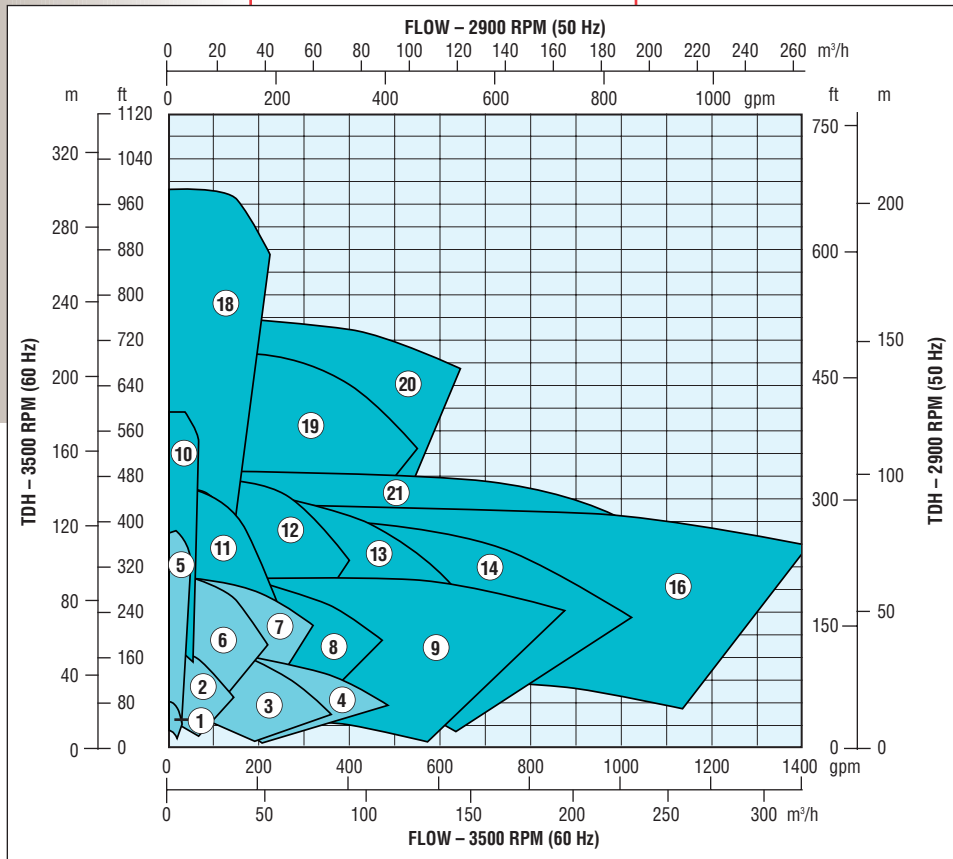


Reverse Vane Impeller

The only ANSI pump impeller design that offers repeatable pump performance throughout the life of the pump.

Front Vane Open Style Impeller is also available as an option. *(See pages 12 & 13)*

Mark III **Performance Curves**



Mark III Standard Group I

- ① 1½x1LF-4
- ② 1½x1-6
- ③ 3x1½-6
- ④ 3x2-6
- ⑤ 1½x1LF-8
- ⑥ 1½x1-8
- ⑦ 3x1½-8

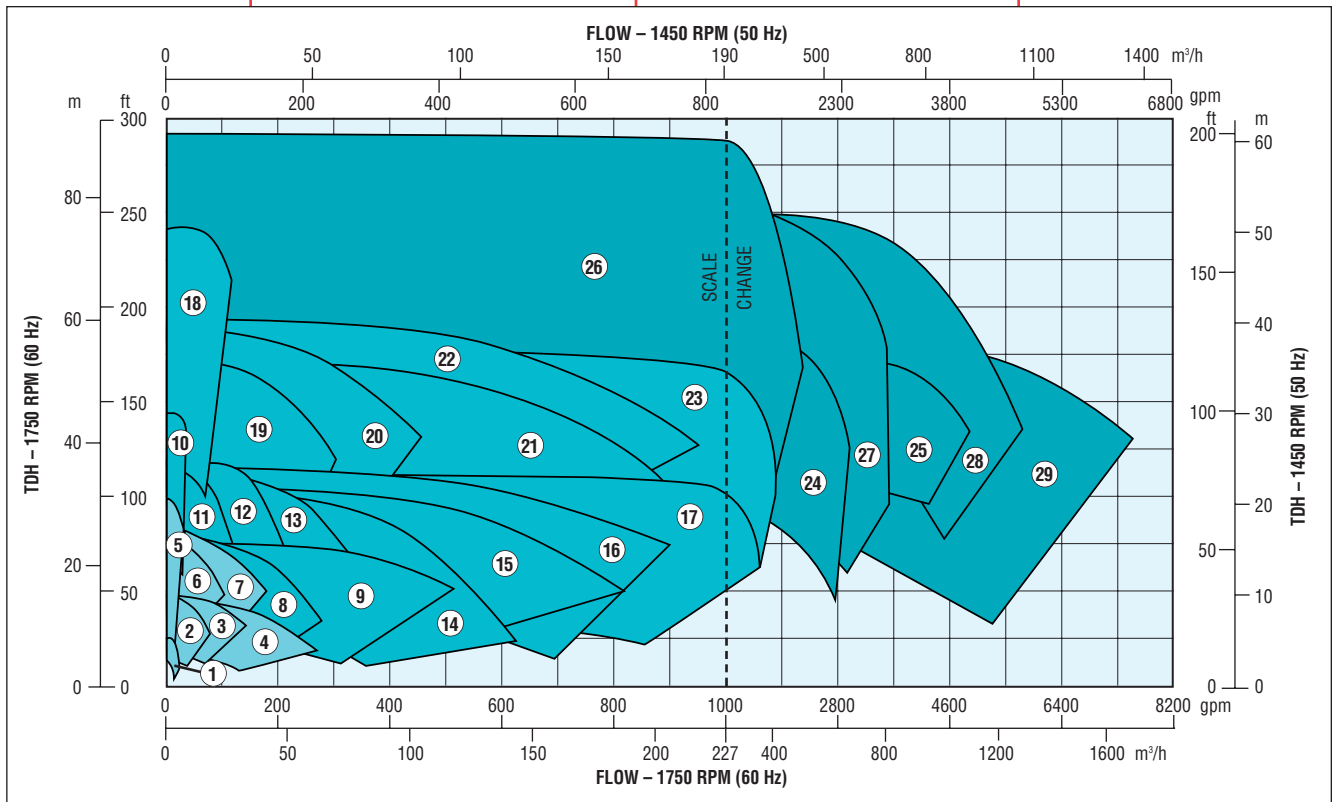
Mark III Standard Group II

- ⑧ 3x2-8
- ⑨ 4x3-8
- ⑩ 2x1LF-10
- ⑪ 2x1-10A
- ⑫ 3x1½-10A
- ⑬ 3x2-10A
- ⑭ 4x3-10
- ⑮ 4x3-10H
- ⑯ 6x4-10
- ⑰ 6x4-10H
- ⑱ 3x1½LF-13
- ⑲ 3x1½-13
- ⑳ 3x2-13
- ㉑ 4x3-13
- ㉒ 4x3-13HH
- ㉓ 6x4-13A

Mark III Standard Group III

- ㉔ 8x6-14A
- ㉕ 10x8-14
- ㉖ 6x4-16
- ㉗ 8x6-16A
- ㉘ 10x8-16
- ㉙ 10x8-16H
- ㉚ 10x8-17*

*Max. speed 1450 RPM

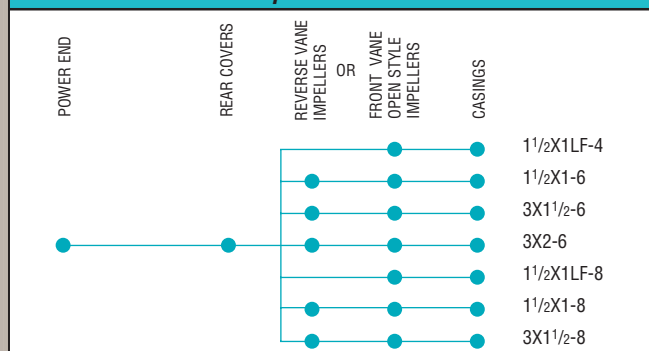


Durco Mark III Interchangeability

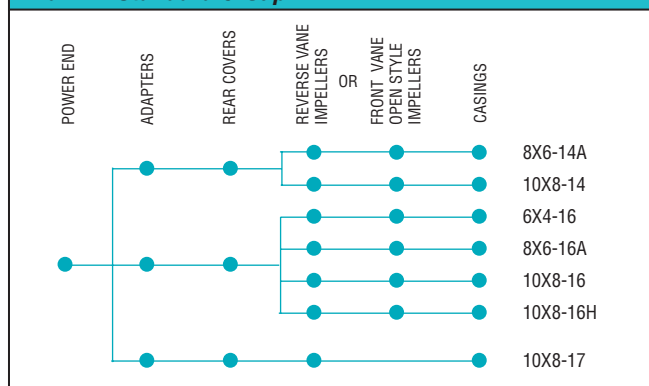
The thirty pumps in the Mark III family are built with only three different power frames.

SealSentry provides a choice of five different seal chamber options to best meet your specific needs.

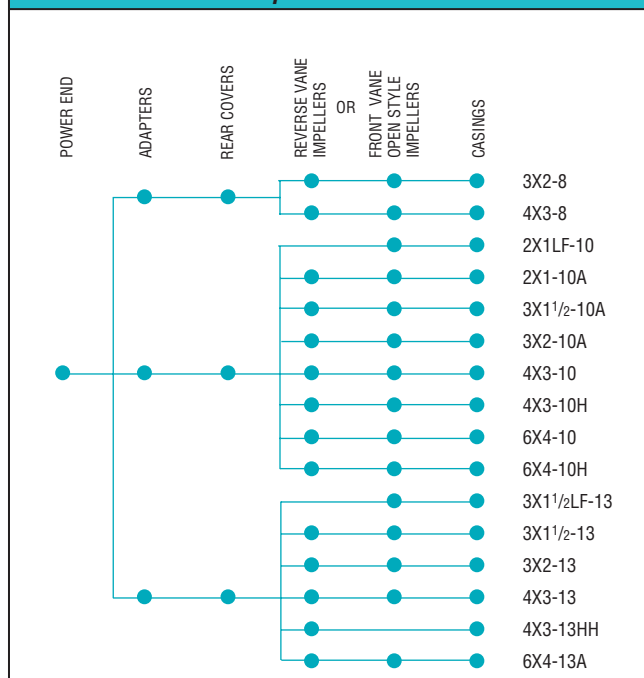
Mark III Standard Group I



Mark III Standard Group III



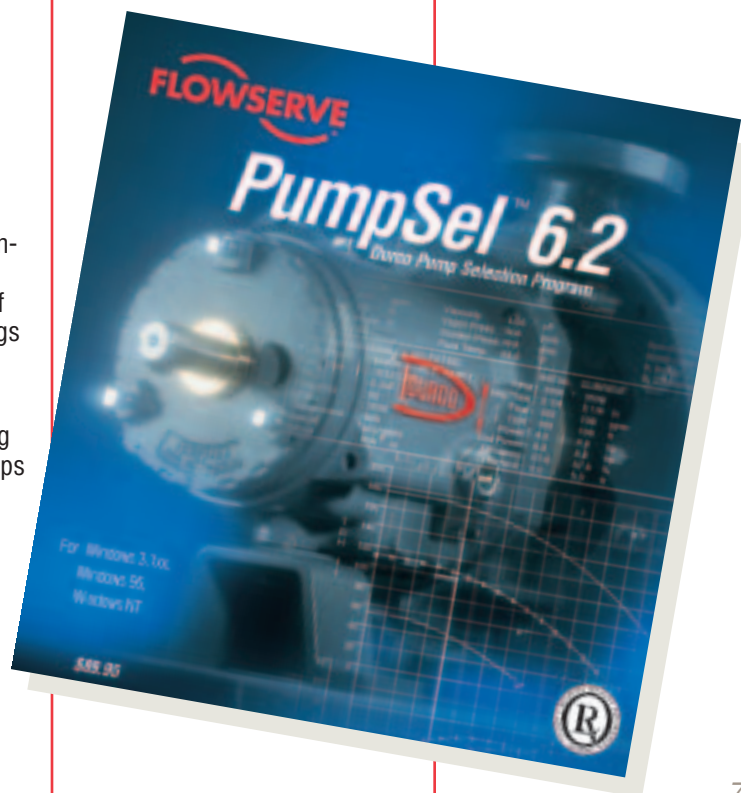
Mark III Standard Group II



PumpSel™...

This accurate pump selection software program is available from your local sales representative. This software assures correct sizing and selection of pumps and magnetic couplings to best suit your process application needs.

PumpSel also aids in checking the suitability of existing pumps when process requirements change.



Durco Mark III Power Ends

Flowserve offers a choice of two power ends: the standard Mark IIIA; or the optional ANSI 3A (shown below).

Standard Mark IIIA power ends feature:

- Double row angular contact outboard/single row, deep groove inboard bearings for excellent axial and radial load support
- Double lip oil seals
- Top mounted vent and oil filler
- Trico oiler
- Large one inch (25 mm) diameter reflective sight glass
- Micrometer adjustment
- Optional oil slinger

Unique, external micrometer shaft adjustment

- Accurate impeller clearance setting in 20 seconds
- Superior to jackscrew designs as perpendicularity is maintained through metal-to-metal fit inherent with machined thread construction
- Threads protected with O-rings

Metal-to-metal construction assures a true running and concentric shaft, extending bearing and mechanical seal life.

Ductile iron frame adapter meets ASME B73.1.

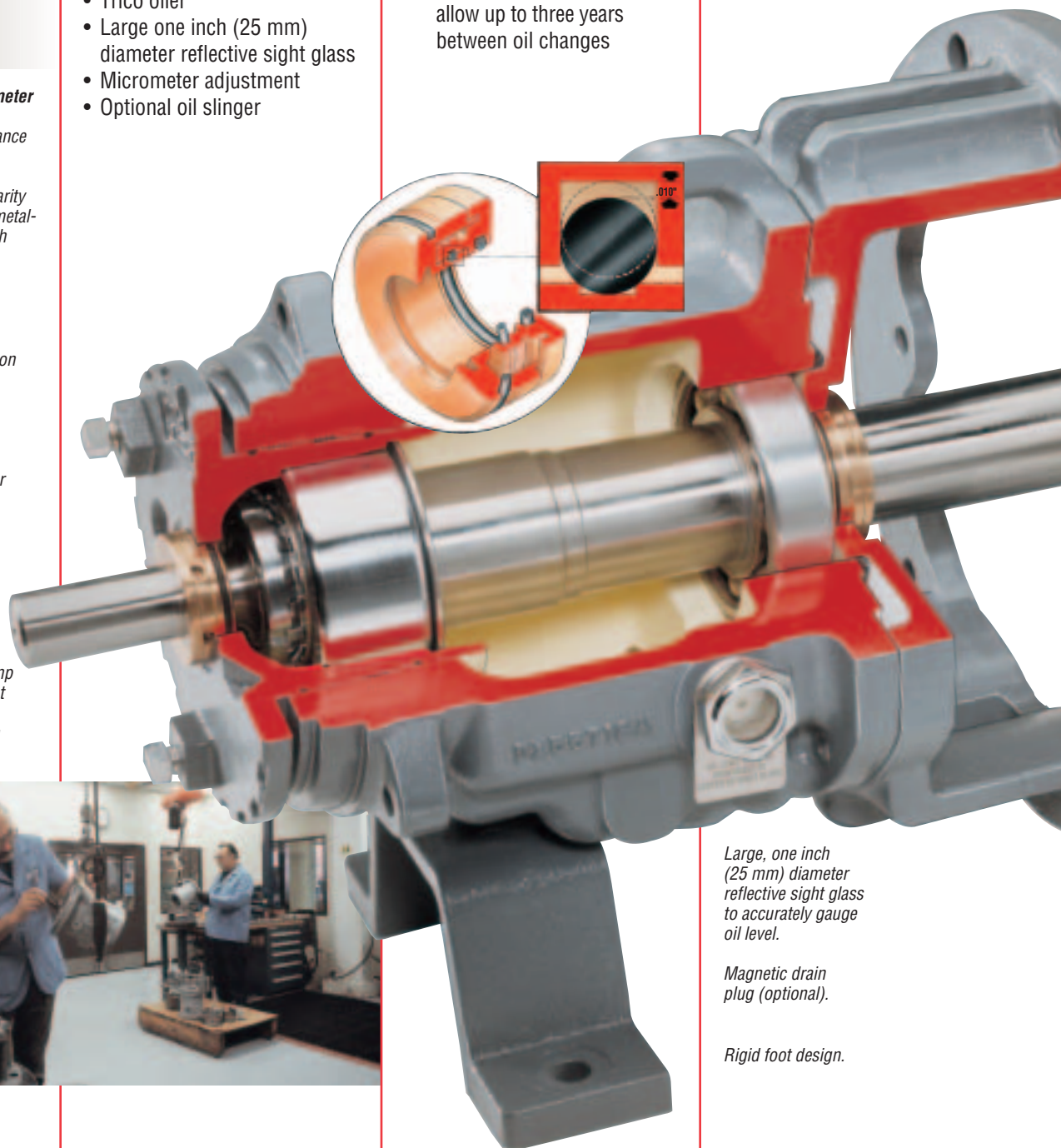
Flowserve is the only pump company in the world that can commit to deliver all power ends assembled in a "clean room."

ANSI 3A™ power end is so advanced it carries a three-year MTBPM guarantee.

- Certified clean room assembly
- Inpro/Seal's "VBX" non-contact Vapor Block Bearing Isolator keeps lubricants in and contaminants out
- Magnetic drain plug collects metallic contaminants
- Top vent replaced with plug
- Lubrication options
 - Synthetic lubricants can allow up to three years between oil changes

- Oil mist systems
- Shielded and grease lubricated bearings (two-year MTBPM guarantee)

Note: Adherence to proper installation, operation and maintenance program is necessary for three-year MTBPM guarantee.



Large, one inch (25 mm) diameter reflective sight glass to accurately gauge oil level.

Magnetic drain plug (optional).

Rigid foot design.



Durco Mark III Heavy Duty Shaft and Bearings

The Heart of the Pump: Shaft and Bearing Design

Flowserve offers the largest shaft and bearing components available in standard ANSI pumps. The following comparison of a Durco Group II power end with that of a major competitor demonstrates the benefits of heavy-duty design.

**Table 1
Bearing Comparison**

Group II	I.B. Bearing	Dynamic Load Rating	O.B. Bearing	Dynamic Load Rating
Flowserve	6310	13,400 lb (6,078 kg)	5310	19,200 lb (8,709 kg)
Major Competitor	6309	11,900 lb (5,398 kg)	5309	16,400 lb (7,439 kg)

Durco bearings are designed to last up to 61% longer.

Bearings (see Table 1)

Greater load handling rating means extended MTBPM.

Extended bearing life comparison is the ratio of the load ratings to the third power, or:

$$I.B. = \frac{13,400^3}{11,900^3} = 1.59 (+59\%)$$

$$O.B. = \frac{19,200^3}{16,400^3} = 1.61 (+61\%)$$

**Table 2
Deflection Comparison**

Group II	Overhang Length	Solid Shaft Diameter	Deflection Index	Shaft w/sleeve	Deflection Index
Flowserve	7 ¹¹ / ₁₆ in (189 mm)	1 ⁷ / ₈ in (48 mm)	37	1 ¹ / ₂ in (38 mm)	90
Major Competitor	8 ³ / ₈ in (213 mm)	1 ³ / ₄ in (45 mm)	63	1 ¹ / ₂ in (38 mm)	116

43-252% greater stiffness, indicated by lower index numbers, results in longer MTBPM.

Shafts (see Table 2)

Solid shafts are recommended over shaft sleeves because they reduce the harmful effects of deflection and vibration. While shaft sleeves may simplify maintenance, solid shafts reduce it.

Proper selection of wet end materials of construction and mechanical seal design offset positive features of the shaft sleeve option.

The formula $I=L^3/D^4$ offers an index of deflection to compare pump designs where:

I = index of deflection

L = length of shaft overhang from bearing

D = rigid shaft diameter

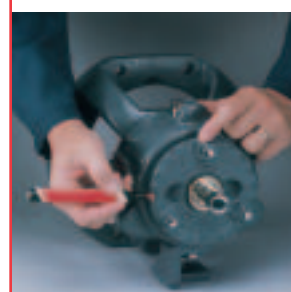
Note: The Deflection Index provides an approximate comparison of shaft stiffness. A detailed analysis should be made to determine actual shaft deflection.

Unique External Micrometer Impeller Adjustment

It reduces maintenance time and, most importantly, is precisely accurate.



Simply loosen the setscrews. Using a wrench rotate the bearing carrier counterclockwise until the impeller lightly touches the rear cover plate.



Select the impeller setting. Each notch on the carrier ring represents exactly 0.004 in (0.10 mm) of clearance. For an impeller setting of 0.020 in (0.5 mm) count five notches counterclockwise.



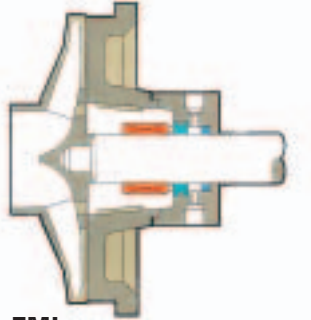
Move the bearing carrier clockwise the selected number of notches. Tighten the setscrews and check the impeller clearance with the feeler gage.

Durco Mark III SealSentry™ Chambers



Winner of the Vaaler Award
for design innovation.

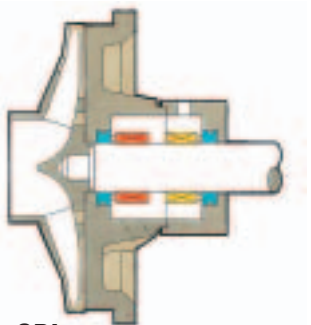
Durco SealSentry™ family of seal chambers offers three FM (flow modifiers) models and two cylindrical bore (CB) options. There is a SealSentry chamber to best meet your application needs.



FML

Preferred selection in most applications. Designed for seals with **large** gland bolt and gasket circles:

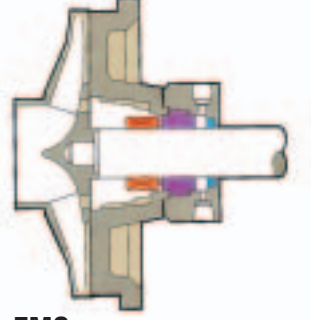
- Single internal cartridge seals
- Dual internal/external cartridge seals
- Single internal component seals with flexibly mounted seats
- Dual internal "true" tandem design cartridge seals



CBL

Oversize, cylindrical step bore designed for seals with **large** gland bolt and gasket circles:

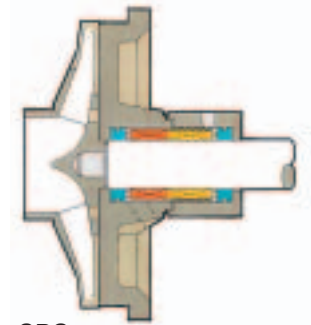
- Dual internal component seals isolate the seal chamber from the process with external source flush
- Single seal with throttle bushing and flush to boost pressure over flash point



FMS

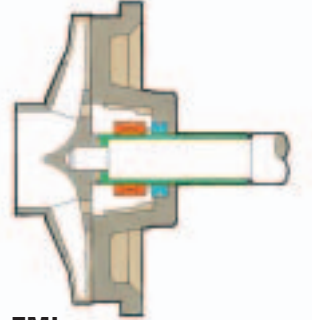
Same as FML but accommodates seals with **small** gland bolt and gasket circles:

- Single seals with all seat mounting configurations can be installed
- This design is our secondary recommendation to the FML



CBS

Cylindrical bore designed for packing arrangements and conventional seals with **small** gland bolt and gasket circles



FMI

Cast-in integral gland is well suited for:

- Single internal, flexibly mounted seals
- "Sanitary-type" applications
- Utilizes sleeve for seal setting and fast installation

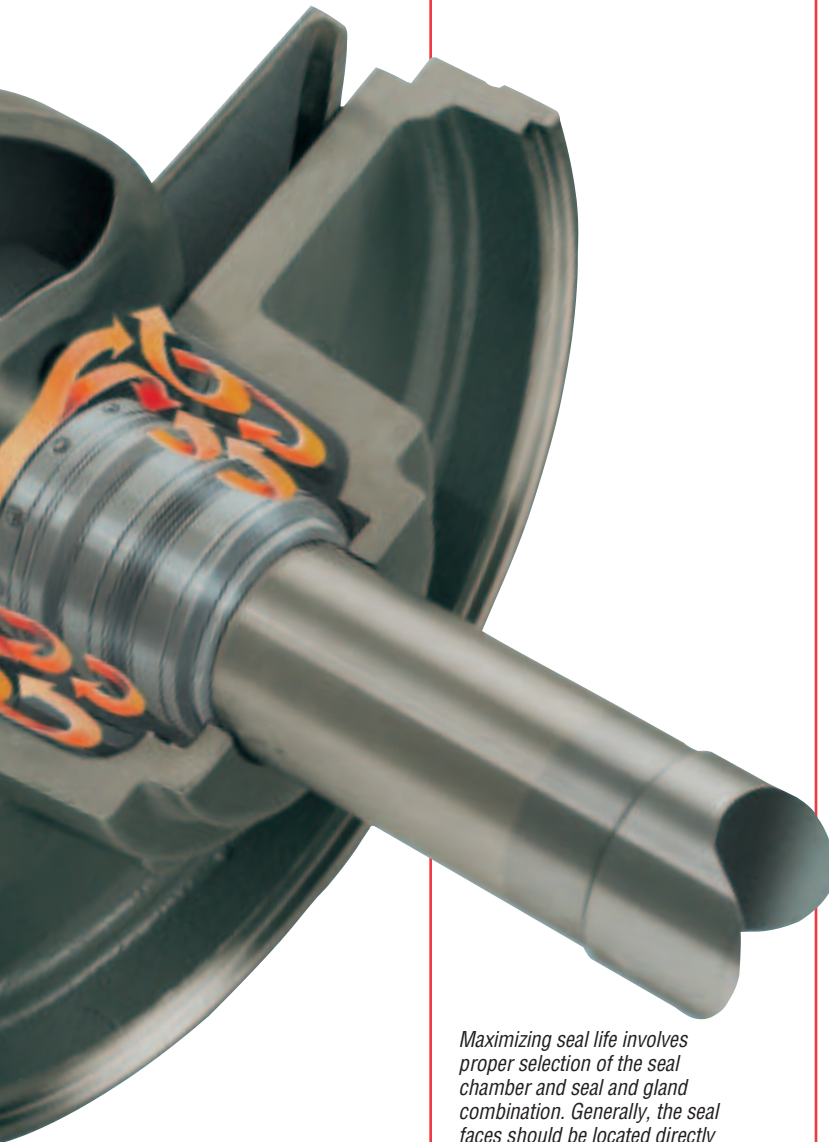


**Durco Mark III
SealSentry™
FM Series
Seal Chambers**

**Advanced FM SealSentry
Design Technology**

- Self-Flushing
- Self-Venting
- Self-Draining

Seal life is extended due to superior purging of heat, solids and vapors. Single seals can often be selected where dual seals or external flush and throat bushing combinations had been used, such as on solids, slurry and liquor services. Flush plans 11, 32, 52, 53, etc. can be eliminated. Costs are reduced. Pump reliability is increased.



Maximizing seal life involves proper selection of the seal chamber and seal and gland combination. Generally, the seal faces should be located directly in the flush path.



**Flow Modifiers Extend
Mechanical Seal MTBPM**

- Flow modifiers redirect flow from circumferential to axial
- Balanced flow with low pressure drop in the chamber helps keep solids in suspension, minimizing erosive characteristics of the process
- A mechanical seal creates a centrifuging action away from its parts and into the returning flow path of the process liquid
- Solids and slurry merge in the returning flow path and are flushed out of the seal chamber

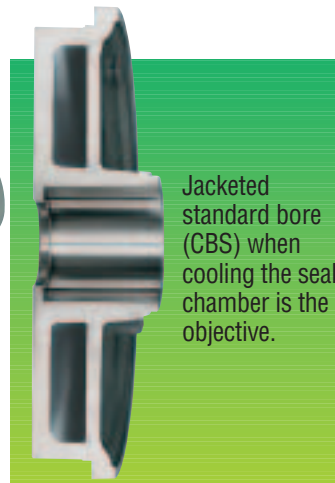
The FM (flow modifiers) series features an enlarged, tapered bore with cast-in flow modifiers.



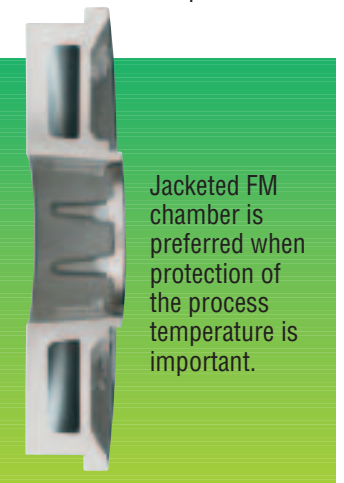
For SealSentry video and proof of performance contact your local Flowserve sales office.

Jacketed Seal Chamber

Designed for effective heat transfer in the seal chamber area or across the entire surface area of the process fluid.



Jacketed standard bore (CBS) when cooling the seal chamber is the objective.



Jacketed FM chamber is preferred when protection of the process temperature is important.

Durco Mark III Impellers

Durco reverse vane impellers deliver unequalled efficiency and performance. This exclusive impeller design extends bearing and seal life.

- **Low, predictable seal chamber pressure and thrust loads** resulting from back vane pumping action and balance holes
- **Low required NPSH**, lowest overall of any standard pump
- **Rear cover plate wear surface** as the flow path exits the rear of the impeller, placing abrasive wear on the rear cover rather than the more expensive casing

- **In-shop impeller adjustment** with the only impeller design that takes full advantage of the back pull out feature. Since the critical running clearance is set between the rear of the impeller and the rear cover plate, both impeller and mechanical seal settings can be done in the shop, "on the bench," instead of under adverse field conditions
- **Repeatable performance assurance** with the only impeller design that offers *repeatability* in seal chamber pressure and bearing thrust loads

Exclusive reverse vane impeller with balance holes offers important performance enhancing, maintenance reducing advantages.



Front vane open style impeller is fully interchangeable with the reverse vane impeller. Excellent choice for stringy and certain applications requiring high shear against the casing.

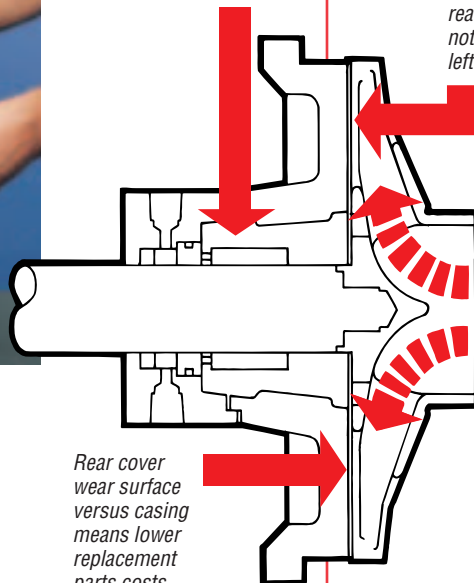
Note: Recessed impeller pumps offer excellent solids handling capabilities. See page 28.



In-shop impeller adjustment...practical as well as productive!

Low predictable seal chamber pressure means longer seal life.

Clearance is set to the rear cover in the shop – not to the casing which is left in the piping.



Lowest overall required NPSH of any standard pump.

Rear cover wear surface versus casing means lower replacement parts costs.

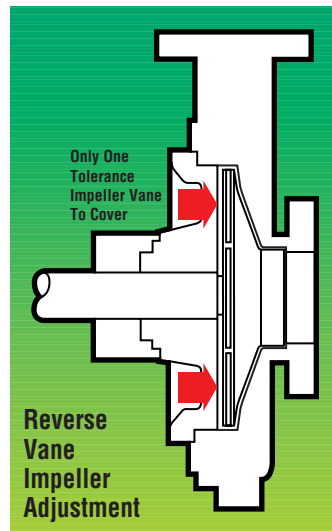


For Low Flow and/or High Head Applications see pages 22 and 23.

The **reverse vane impeller** has only **one** set of pumping vanes and **one** critical tolerance location – between the impeller and rear cover – to establish:

- Performance
- Efficiencies
- Seal chamber pressures (i.e., mechanical seal MTBPM)
- Thrust/axial loads (i.e., bearing life)

Since an impeller can only be set in one direction, the reverse vane impeller has inherent advantages.



Only Durco reverse vane impellers offer repeatable performance after wear and impeller adjustment.

**Performance Life Cycle:
Durco Reverse Vane Impeller
with Balance Holes**

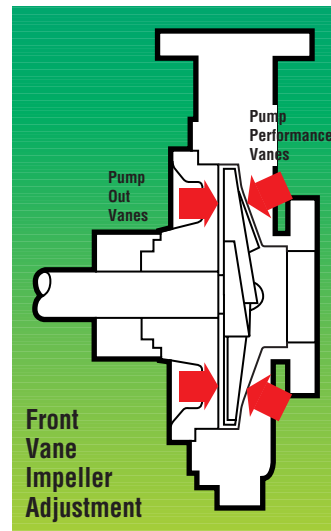
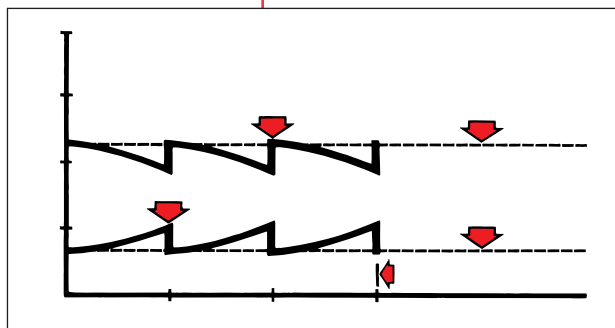
Effects of Wear

- Thrust loads decrease as seal chamber gap widens
- Chamber pressure increases as gap widens

Effects of Impeller Adjustment to Seal Chamber

- Original pressures and loads re-established after adjustment
- Repeatable MTBPM cycle life

Reverse Vane Impeller



An impeller cannot be adjusted to *two* locations.

Seal and bearing life are reduced due to increased loads after wear and maintenance adjustment.

**Performance Life Cycle:
Front Vane Open Style
Impeller with Pump Out Vanes**

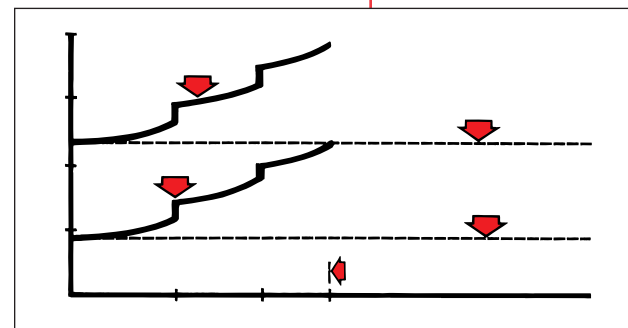
Effects of Wear

- Thrust loads increase as seal chamber gap widens
- Chamber pressure increases as gap widens

Effects of Impeller Adjustment to Casing

- Chamber pressures and bearing loads increase after each adjustment
- Non-repeatable MTBPM cycle life

**Front Vane
Open Style Impeller**



The **front vane open style impeller** has two sets of pumping vanes and two critical tolerance locations:

- The front vane of the impeller clearance to the casing establishes:
 - performance
 - efficiencies
- The impeller pump out vanes clearance to the rear cover establishes:
 - seal chamber pressures and seal life
 - thrust loads and bearing life

Durco Mark III BaseLine Pre-Engineered Baseplate Designs

Extend MTBPM At Reduced Cost

Flowserve's family of pre-engineered baseplate designs further extends MTBPM by reducing internal pump stress and vibrations. That is why Flowserve recommends reinforced rigid baseplates. Plus, customers who know the value of pre-engineered and

reinforced baseplates help avoid potential confusion in specification interpretation, delays in shipments and added costs.

BaseLine offers a broad range of metal and non-metallic, grout and stilt mounted designs and standard options. This provides broad flexibility in choosing the baseplate that best meets application needs and operating budget.



BaseLine offers five (5) standard types (A through E) of baseplate designs. (See pages 16 & 17)

Item No.	Standard Options	Type A Gp I & II	Type A Gp III	Type B	Type C	Type D	Type D with Rim	Type E
1	Machined coplanar mounting surfaces to 0.002 in/ft (0.17 mm/m) with 125µ in (3.2 micron) finish	O	O	O	O	O	O	Y
2	Added structural (cross member) support	N	N	Y	Y	Y	Y	Y
3	Added torsional support with end caps	NR	Y	Y	D	O	O	Y
4	Tapped holes for four (4) motor adjuster bolts	O	O	O	Y	O	O	Y
5	Four (4) - SS transverse jack bolts - motor adjusters	O	O	O	Y	O	O	Y
6	Sloped surface to an integral drain	N	N	C	N	N	N	Y
7	Integral sloped drip rim around base	N	N	N	N	N	Y	Y
8	4 in (102 mm) diameter grout holes - max. 30 in (762 mm) run to vent	Y	Y	Y	N	Y	Y	Y
9	1/2 in (13 mm) vent holes at corner of each chamber	NR	O	NR	NA	Y	Y	Y
10	Lower surface shaped to anchor in grout	N	N	N	NA	Y	Y	Y
11	Integral lifting eyes at four (4) corners	O	Y	O	O	Y	Y	Y
12	Tapped leveling holes four (4) corners	O	O	N	S	Y	Y	Y
13	Continuous seam weld construction	NA	Y	NA	O	Y	Y	Y
14	Welded raised lip around grout hole(s)	NR	NR	NR	NA	NR	NR	O
15	Stilt mounting options with floor cups	NR	NR	O	Y	D	D	D
16	Spring mounted load designs	NA	NA	O	O	D	D	D
17	Catch basin (304SS or other materials)	O	O	O	O	O	NR	Y
18	Option for eight (8) total motor adjusters	D	D	O	D	D	D	D
19	Dimensions to ANSI B73.1M-1991	Y	Y	Y	Y	Y	Y	Y

Y = Standard N = Not available NR = Not recommended

O = Optional NA = Not applicable C = Sloped catch basin with 1 inch (25 mm) drain (option)

D = Needs design time

S = Stilts for leveling

See pages 16-17 for BaseLine model descriptions

Durco Mark III BaseLine™ Baseplate System

Reducing internal stress and vibration extends MTBPM of pump/motor packages.

Pump users specify rigid baseplate designs to:

- Provide torsional lateral and longitudinal rigidity
- Improve vibration dampening through greater mass and design stiffness
- Protect against transit damage
- Resist twisting during installation
- Maintain designed-in shaft alignment
- Reduce installation and shaft alignment time
- Reduce diaphragming or separation from grout
- Improve pump/motor/seal MTBPM
- Reduce total life cycle pump/motor/seal costs

BaseLine can handle the stress. Rigid design begins with thick plate construction.

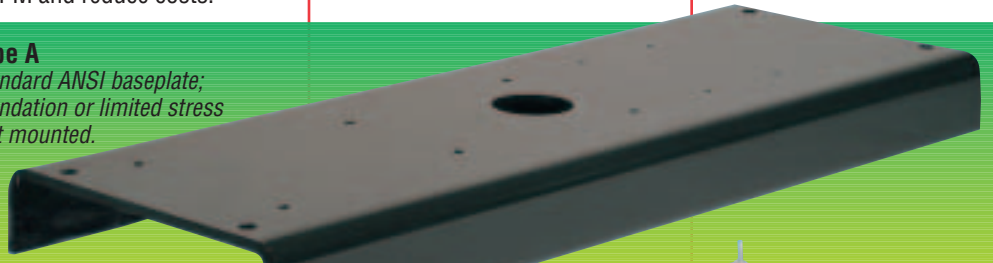
Metal baseplate sizes:

- 139 to 258 feature 1/2 in (13 mm) steel plate construction

Flowserve offers a family of five types of pre-engineered baseplate designs to extend MTBPM and reduce costs.

Type A

Standard ANSI baseplate; foundation or limited stress stilt mounted.



Type B

Polybase™ baseplate; foundation or stilt mounted.



Type C

Reinforced baseplate; stilt mounted.



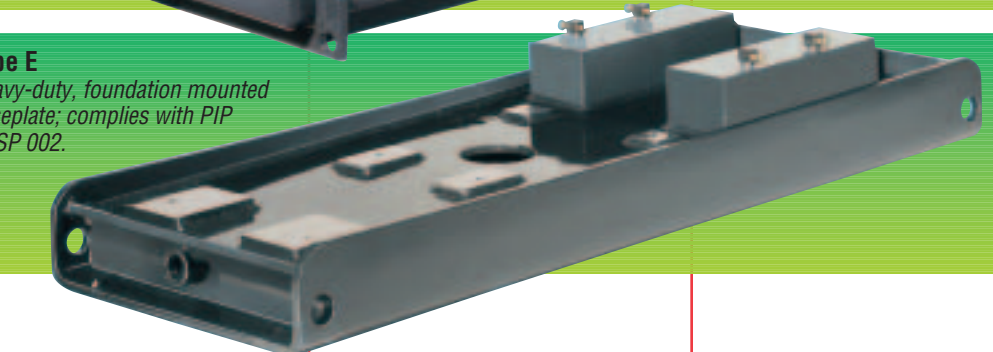
Type D

Reinforced baseplate; foundation mounted; with optional drip rim.



Type E

Heavy-duty, foundation mounted baseplate; complies with PIP RESP 002.

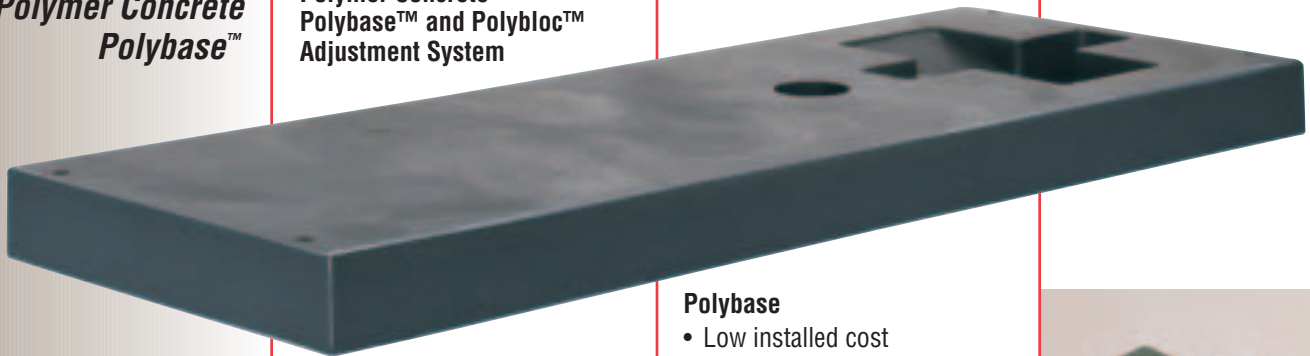


- 264 to 280 feature 5/8 in (16 mm) steel plate construction
- 368 to 398 feature 3/4 in (19 mm) steel plate construction

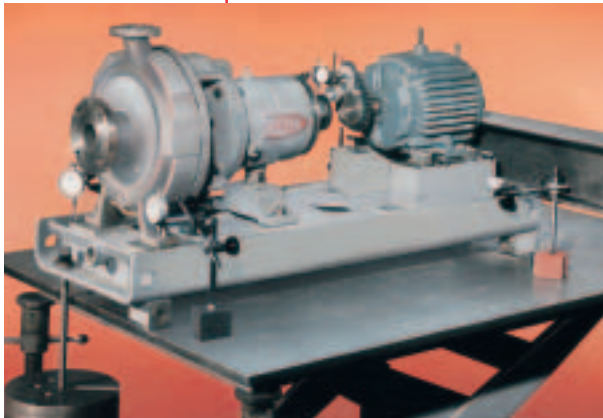
Polybase baseplates are constructed of 3 in (76 mm) to 4 in (102 mm) solid polymer concrete. Baseplate types B, C, D and E are reinforced with added structural support for improved rigidity.

Durco Solid Polymer Concrete Polybase™

Featuring Durco Solid Polymer Concrete Polybase™ and Polybloc™ Adjustment System



Type B – Polybase baseplate



Baseplates Provide The Backbone for Extended MTBPM

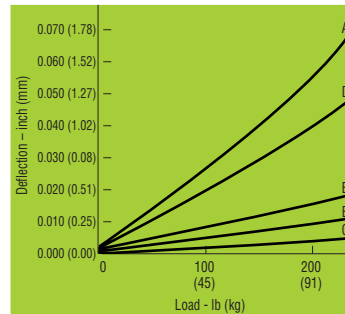
The test stand provided three corner support of the *ungrouted* baseplates. The addition of weights on the unsupported fourth corner caused baseplate distortion. This distortion resulted in measurable shaft movement that can cause problems with field installations and negatively affect MTBPM.

The *twist test* is a means of comparing rigid baseplate designs. Correctly installed rigid baseplates *should not* experience these twist effects. For more information about the results of baseplate testing contact your local Flowserve sales representative.

Polybase

- Low installed cost
- Superior vibration dampening
- Corrosion resistant
- Superior resistance to twisting or diaphragming
- Designed to be flat
- Available with or without catch basins and grout holes
- Inserts can be located to mount alternate equipment configuration requirements

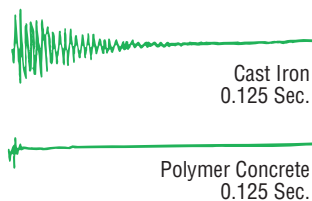
Baseplate Rigidity Test – Twist Mode



Maximum Parallel Shaft Deflection At Applied Force

Type A	0.022 in (0.56 mm)
Type B	0.004 in (0.01 mm)
Type C	0.003 in (0.08 mm)
Type D	0.016 in (0.41 mm)
Type E	0.005 in (0.13 mm)

Vibration damping of polymer concrete versus cast iron.



Polybloc™ – Motor Mounting Block

- Flatter and more repeatable height tolerances than steel
- Corrosion resistant
- Superior vibration dampening
- Full foot support (no overhang)
- Shown with optional bloc-lock and fastener support
- Available for other pump/motor or alternate equipment applications



8-Point™ Adjuster

- Allows precise motor adjustment to reduce alignment time
- Used with recessed bloc-lock device

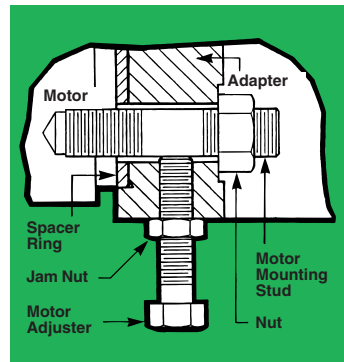
Options to Solve Application Problems

To extend MTBPM, unique design technologies and component options with superior pump application, installation, process and selection know-how are all necessary.

Certain applications need technical advancement in pump design and performance enhancing options to stay reliable.

Ultralign™ Heavy-Duty/ Rigid Design C-Flange Adapter

- Cantilevered motor shaft stays aligned with pump shaft even with undesirable movement caused by piping and temperature induced stress loads
- Eliminates foot mounting of motor and pump power end to the base. This greatly reduces soft foot and problems from undesired baseplate twisting and diaphragming
- 0.007 in (0.18 mm) nominal parallel shaft alignment... 0.002 in (0.05 mm) with C-Plus precision alignment option
- <0.001 in/in (0.001 mm/mm) angular alignment



Flowserve's Unique C-Plus Precision Alignment System (Four Point)

To achieve the best process pump and motor MTBPM requires shaft alignments of less than 0.002 in (0.05 mm). Flowserve's unique C-Plus Precision Alignment System routinely delivers shaft alignments below 0.002 in (0.05 mm) in less than thirty minutes.



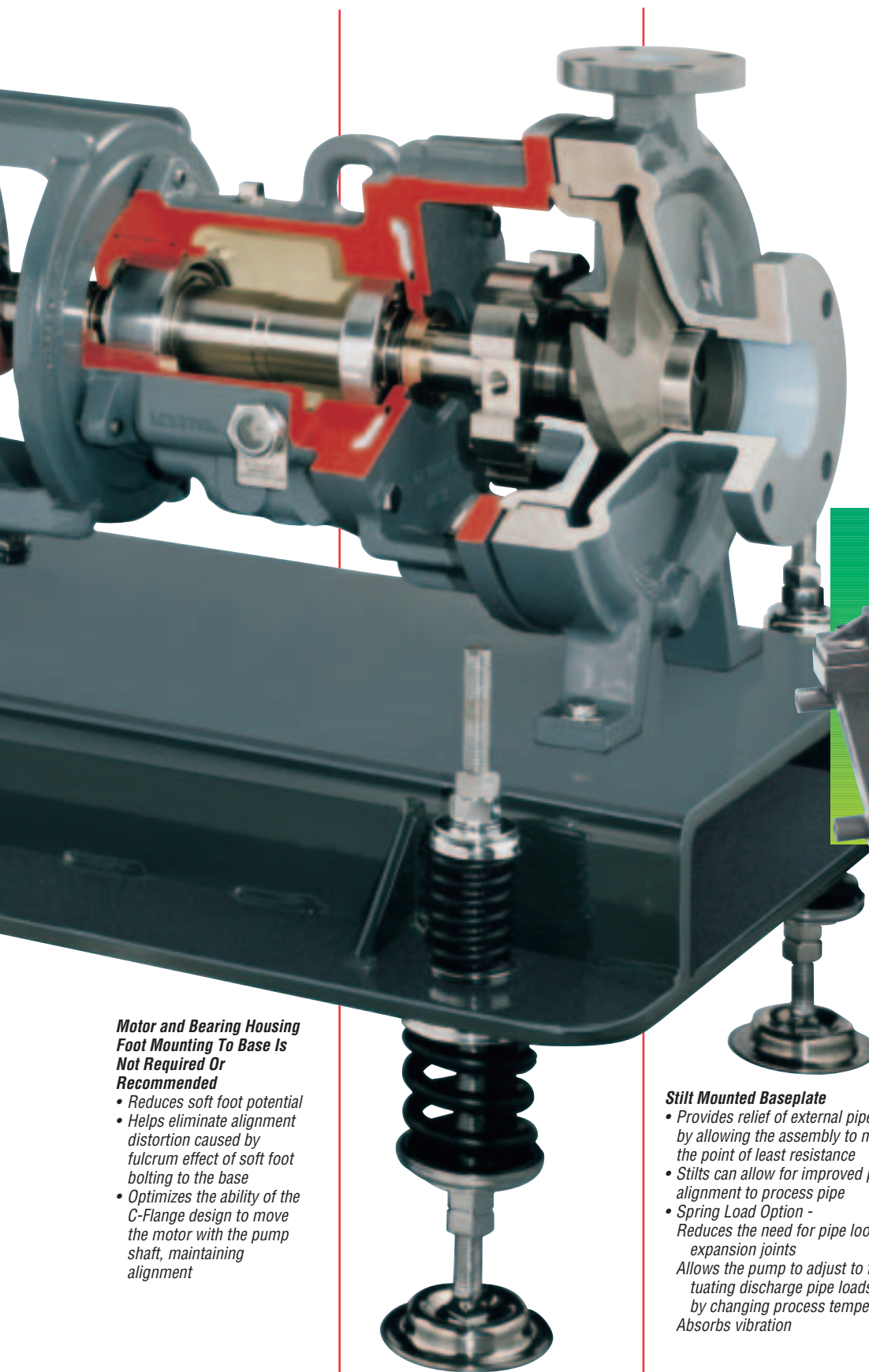
Adjustable Rigid Foot Mount

- Assures accurate alignment to the baseplate and piping
- Designed to support all normal loads

Standard Footed Motors

- Special machine-cut C-Face of assembled unit ensures shaft perpendicularity
- Motor is cantilevered, or free hung (Footed design provides support during shipping.)
- Tested and proven through 405TC frame to 100 hp (75 kW) to ensure rigid assembly and freedom from excessive vibration and deflection



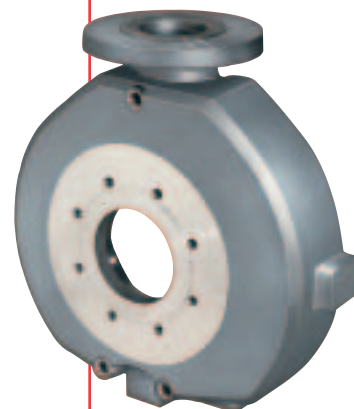


Motor and Bearing Housing Foot Mounting To Base Is Not Required Or Recommended

- Reduces soft foot potential
- Helps eliminate alignment distortion caused by fulcrum effect of soft foot bolting to the base
- Optimizes the ability of the C-Flange design to move the motor with the pump shaft, maintaining alignment

Jacketed Casings

Provide temperature control. Either integral (as shown) or bolt-on jackets available.



Centerline Mounted Casings

May be used to reduce loads caused by thermal expansion. Jacketed feet with inlet/outlet ports further assure effective temperature control.

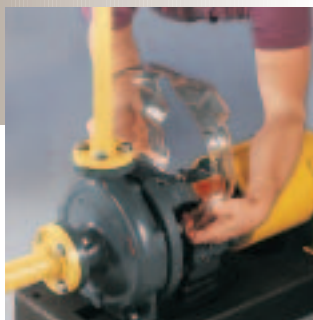
Stilt Mounted Baseplate

- Provides relief of external pipe loads by allowing the assembly to move to the point of least resistance
 - Stilts can allow for improved pump alignment to process pipe
 - Spring Load Option - Reduces the need for pipe loops or expansion joints
- Allows the pump to adjust to fluctuating discharge pipe loads caused by changing process temperatures
- Absorbs vibration



For Low Flow and/or High Head Applications
see pages 22 and 23.

DurcoShield™ **Pump Safety and** **Inspection** **Accessory**



DurcoShield is easy to install or to remove. Simply spread the shield apart...fit around the bearing housing adapter...and snap into place. The spring-like tension holds the shield firmly in place. No tools or fasteners are required.

Note:

DurcoShield is not a containment system, nor a seal backup system. It is a limited protection device. It will reduce, but not eliminate, the probability of injury.

This transparent, polycarbonate shield provides protection from the dangers of:

- Process fluid spray
- Rotating shaft and seal components

This splash and shaft guard is a one-piece shield that envelops the open areas between the bearing housing and the casing.

- Fluid spray from a malfunctioning seal is deflected by the shield
- The shield protects fingers and clothing from exposure to the rotating shaft
- Its transparency permits visual inspection of the seal area
- Constructed of UV-protected polycarbonate
- Optionally available in PVDF
- Applications from -70°F (-57°C) to 300°F (149°C)
- Available for Mark II, Mark III and Chemstar® pumps
- Protected by US patent number 5,807,086



Slots or holes to accommodate seal support piping/tubing can be easily located and drilled or cut.



**Durco
ClearGuard™
Non-Metallic
Coupling Guard**

The Durco ClearGuard™ permits visual inspection of coupling components while protecting personnel from potential safety hazards of rotating parts.

- Constructed of tough, durable, transparent polycarbonate with ultraviolet light inhibitors
- Tinted yellow to alert personnel to potential safety hazard

- Vented for adequate air circulation
- Non-sparking, corrosion resistant and paint-free for enhanced safety, appearance and sanitation
- Available for all Durco Mark III ANSI pumps with NEMA or IEC motors and Chemstar ISO pumps with IEC motors
- Patent pending

Early Warning

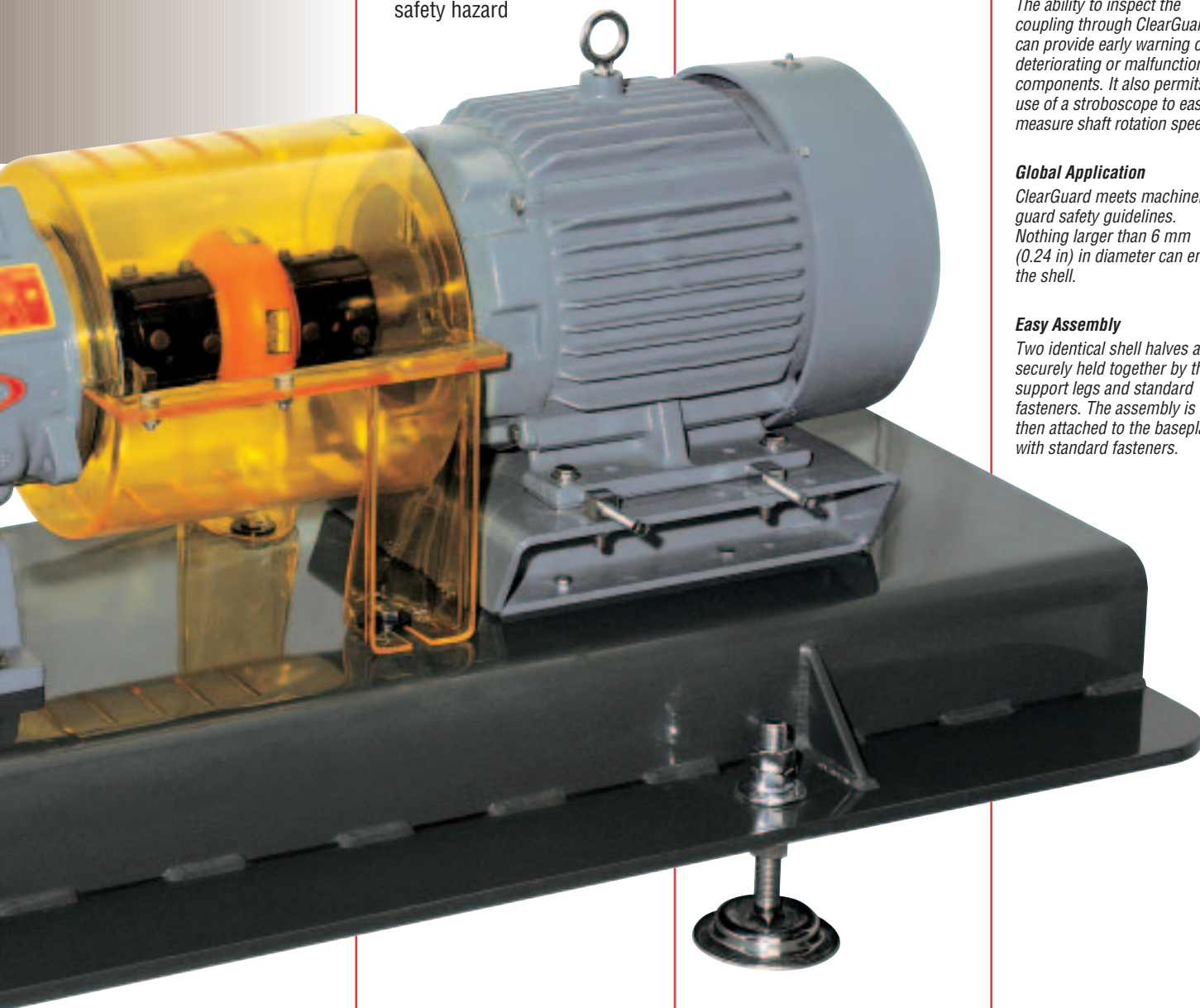
The ability to inspect the coupling through ClearGuard can provide early warning of deteriorating or malfunctioning components. It also permits use of a stroboscope to easily measure shaft rotation speed.

Global Application

ClearGuard meets machinery guard safety guidelines. Nothing larger than 6 mm (0.24 in) in diameter can enter the shell.

Easy Assembly

Two identical shell halves are securely held together by the support legs and standard fasteners. The assembly is then attached to the baseplate with standard fasteners.



**Durco Mark III
Lo-Flo™
Pumps**

Radial vane impeller is specifically designed for high head/low flow applications

The first to introduce an ANSI standard high head/low flow pump, Flowserve has refined its design with a circular concentric casing to complement its radial vane impeller. The result has been improved pump reliability with extended MTBPM at low flow rates.

Applications

Used throughout the process industries for general purpose applications requiring high heads with low flow rates.

Circular concentric casing and radial vane impeller

The unique design of these components further extends MTBPM when compared with standard pumps.

- Radial loads are reduced up to 90% at low flows
- Shaft vibration is reduced up to 50% (see graph)
- Bearing life is extended
- Mechanical seal life is extended

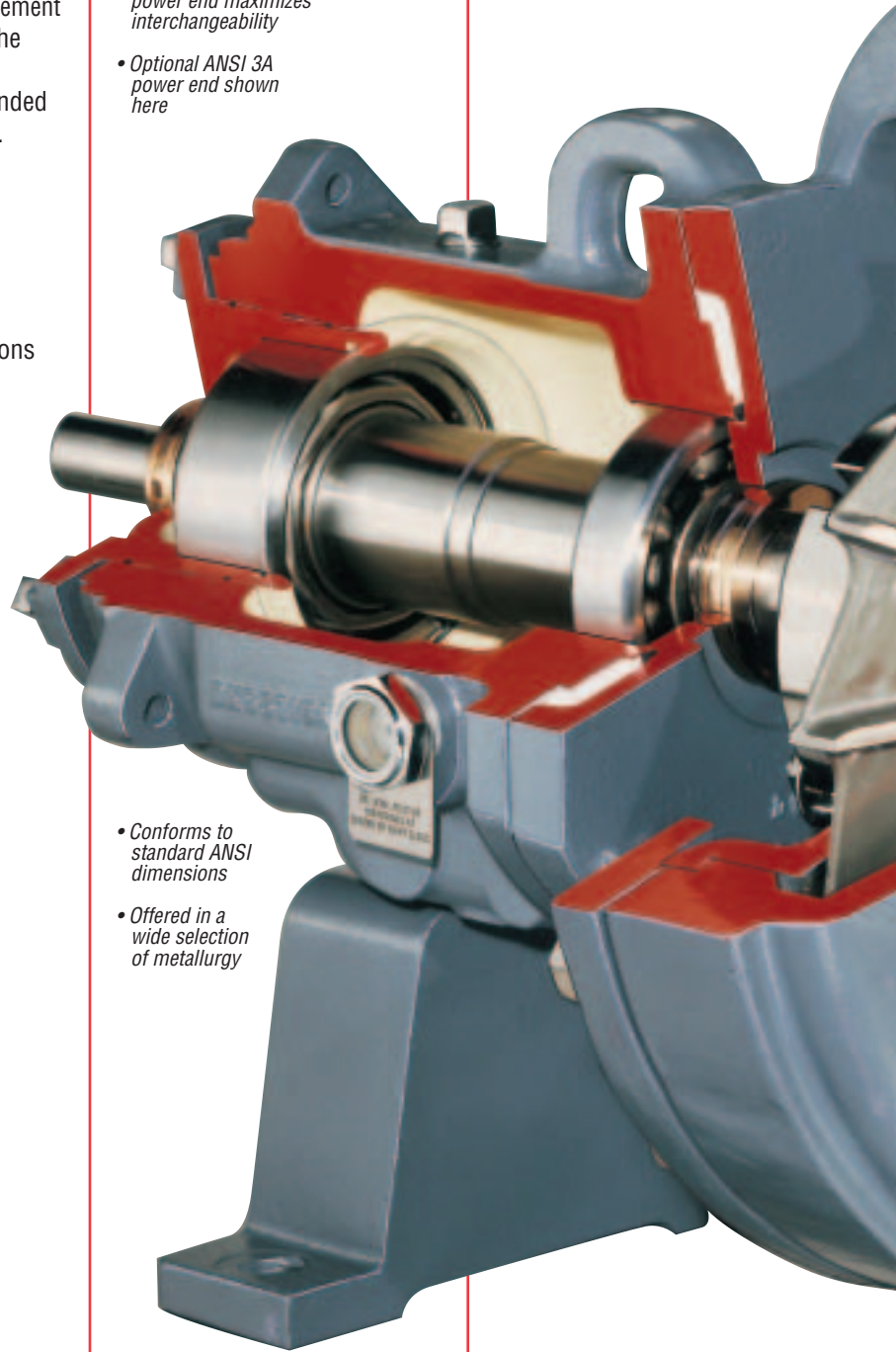


Expanding Volute Casing

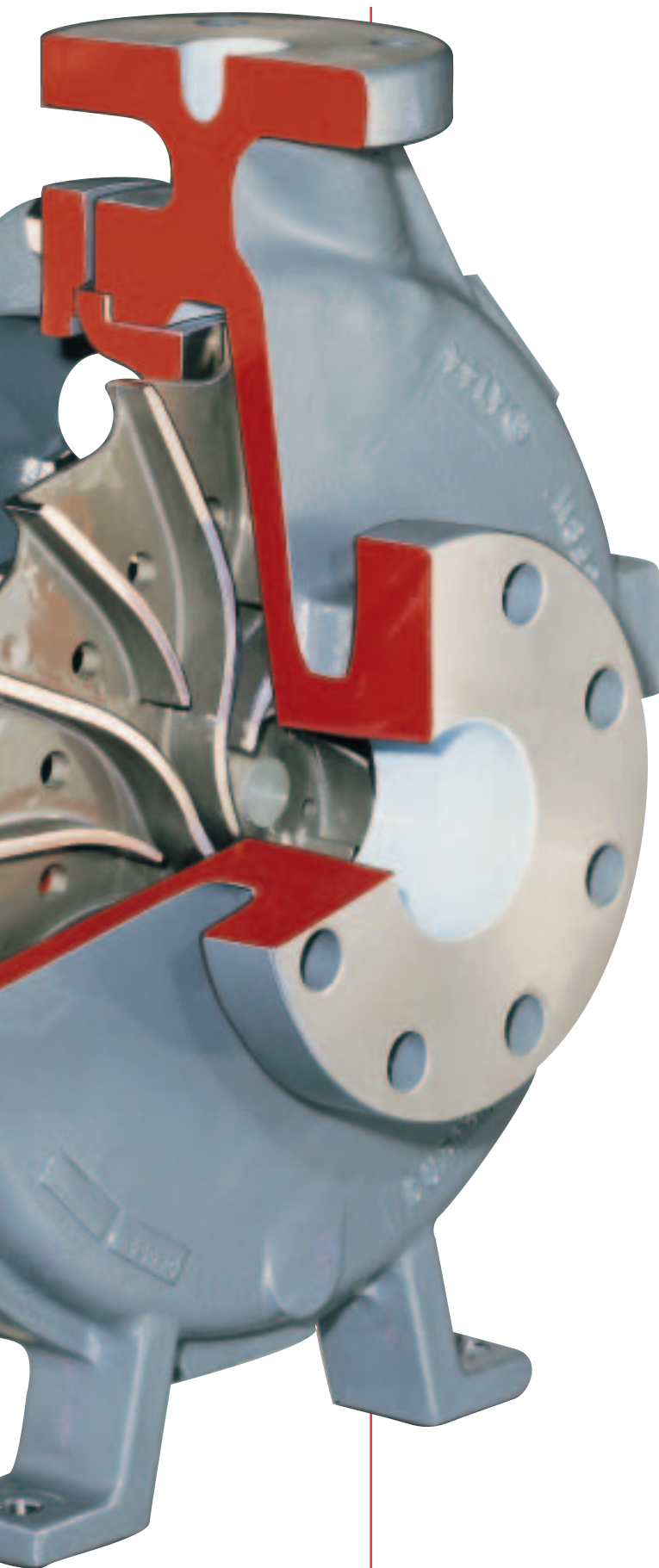


Circular Concentric Casing
Internal bypass is drilled through the discharge without breaching the casing wall or creating a potential leak path

- *Standard Mark IIIA power end maximizes interchangeability*
- *Optional ANSI 3A power end shown here*



- *Conforms to standard ANSI dimensions*
- *Offered in a wide selection of metallurgy*



Offered in a wide selection of metallurgy.

Four sizes

- 1K1.5 x 1LF-4
- 1K1.5 x 1LF-8
- 2K2 x 1LF-10
- 2K3 x 1.5LF-13

Capacities

- 60 Hz
To 220 gpm
(50 m³/h)
- 50 Hz
To 175 gpm
(40 m³/h)

Heads

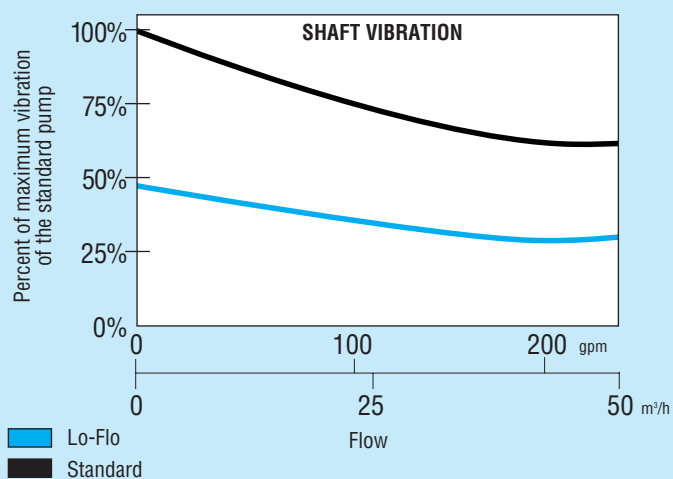
- 60 Hz
To 985 ft
(300 m)
- 50 Hz
To 655 ft
(200 m)

- Pressures to 450 psi
(3100 kPa)
- Temperatures to
700°F (370°C)

(See composite performance curves page 6)

Flowserve's superior radial vane impeller design provides:

- Minimal thrust loads
- Reduced NPSH requirements
- Low seal chamber pressures
- Broader applications range
- Longer seal and bearing life



Durco Mark III Sealmatic

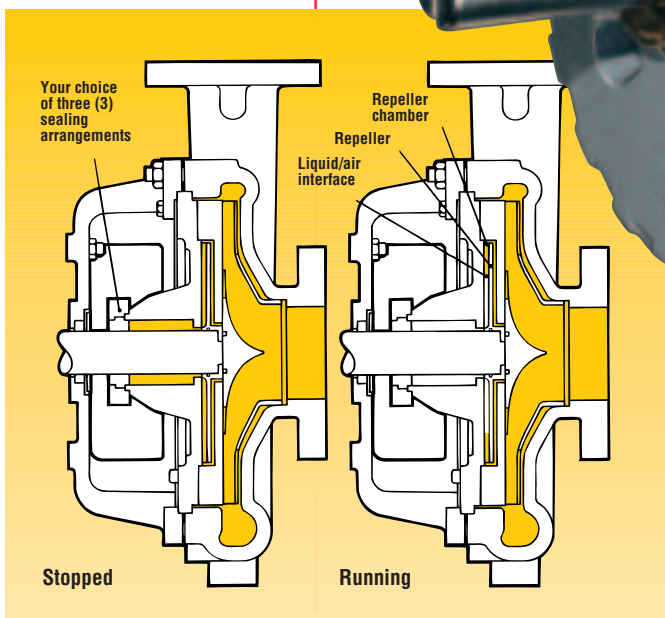
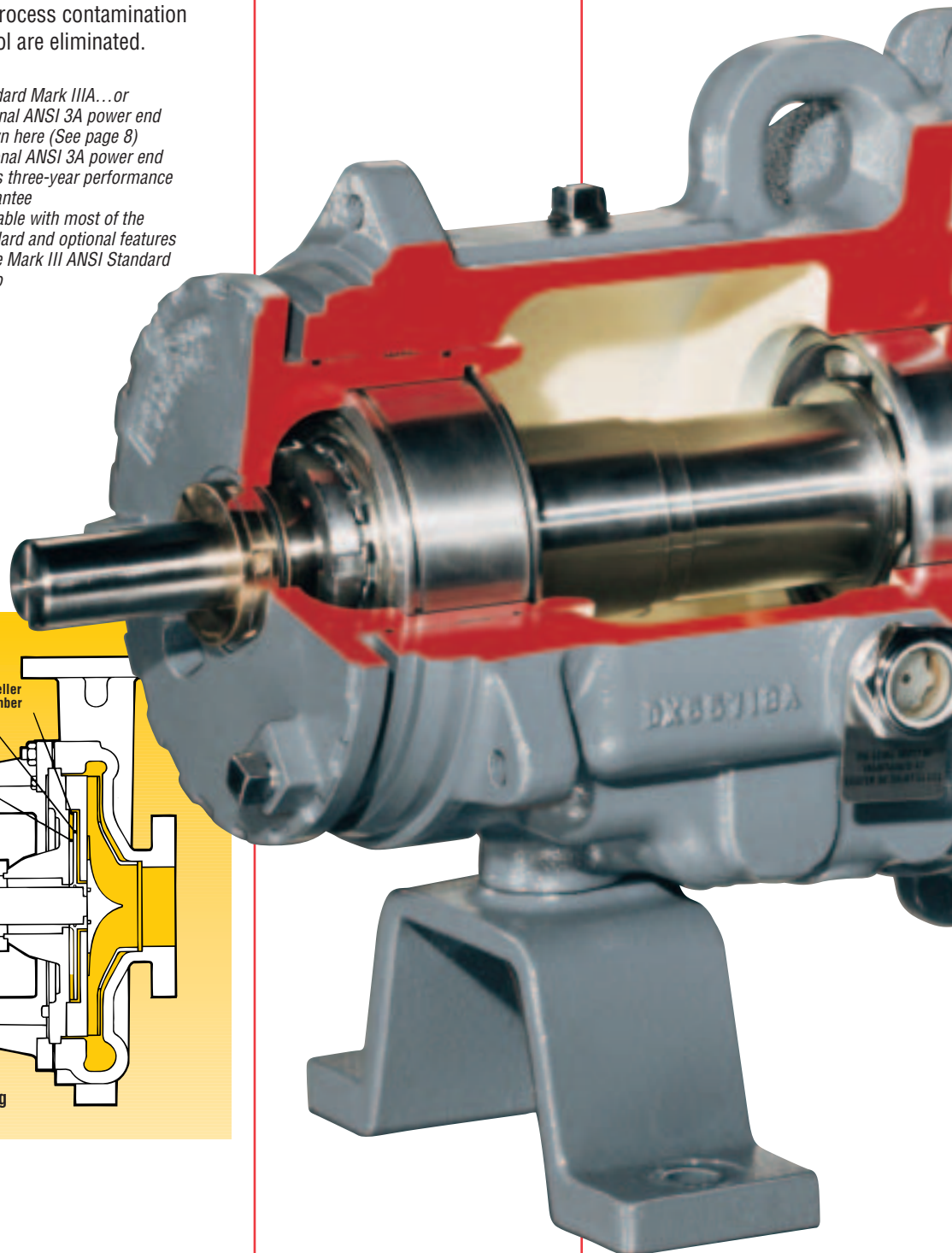
Dynamically sealing repeller eliminates the need for conventional mechanical seals

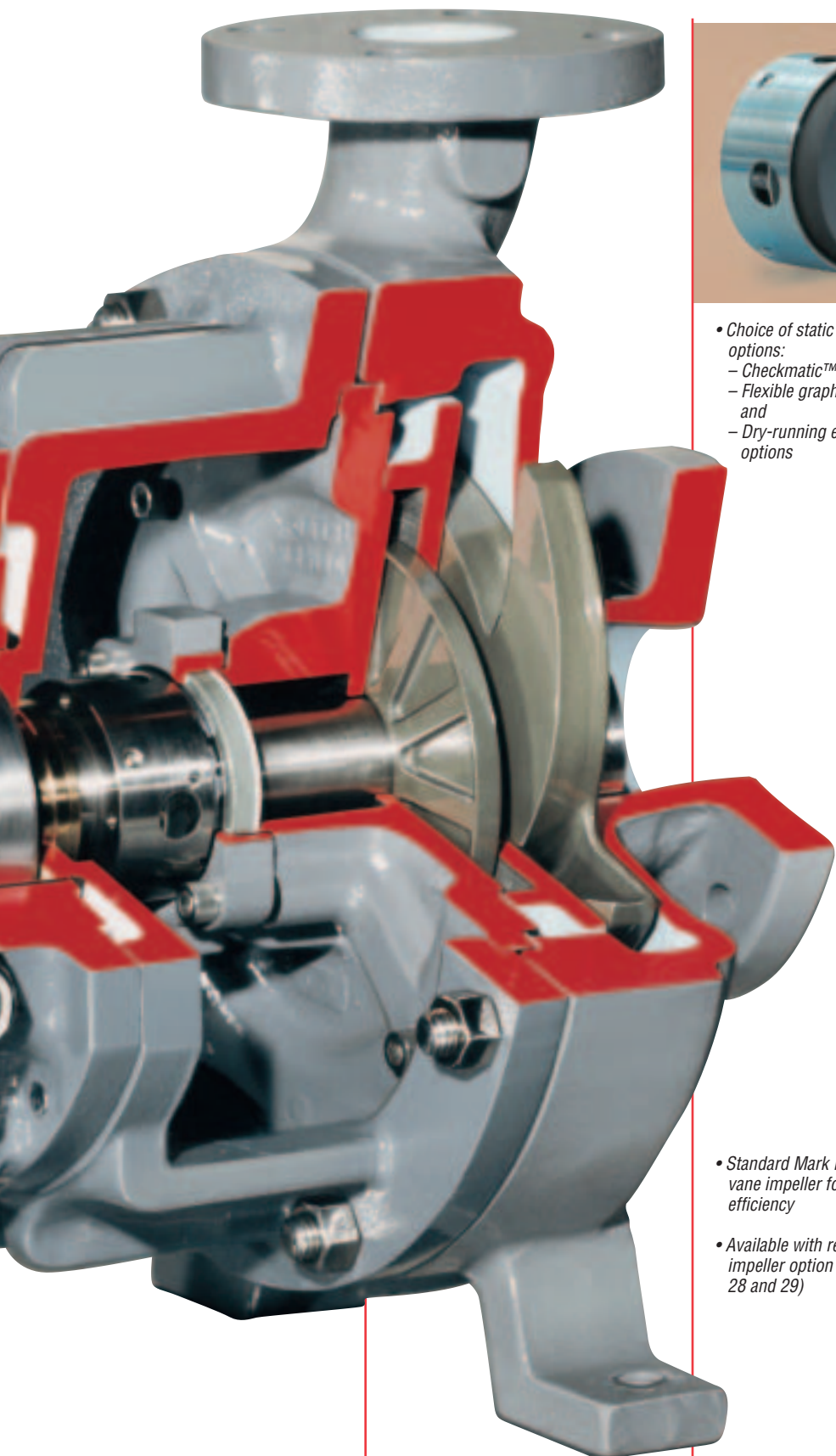
No mechanical seal is needed during operation as centrifugal force created by a spinning repeller (expeller) removes fluid from the seal chamber. When the pump is stopped, a static seal is used to keep it from leaking. The need for external flushing and process contamination control are eliminated.

- Standard Mark IIIA...or optional ANSI 3A power end shown here (See page 8)
- Optional ANSI 3A power end offers three-year performance guarantee
- Available with most of the standard and optional features of the Mark III ANSI Standard pump

Applications

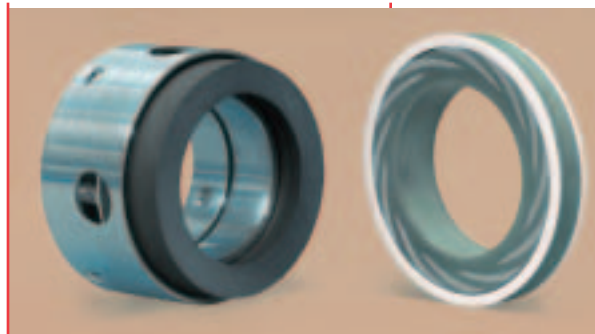
- Tough services where sealing is difficult
- Services where a flush is undesirable (e.g., evaporator feed)
- Continuous, around-the-clock service
- Batch operations where a "run dry" condition might exist





- Choice of static sealing options:
 - Checkmatic™ lip seals
 - Flexible graphite packing and
 - Dry-running end-face seal options

- Standard Mark III reverse vane impeller for peak efficiency
- Available with recessed impeller option (See pages 28 and 29)



Seventeen Sizes

- Eleven Group II
 - 2X1M-10A
 - 3X1½M-10A
 - 3X2M-10A
 - 4X3M-10
 - 4X3M-10H
 - 6X4M-10
 - 6X4M-10H
 - 3X1½M-13
 - 3X2M-13
 - 4X3M-13
 - 6X4M-13
- Six Group III
 - 8X6M-14A
 - 10X8M-14
 - 6X4M-16
 - 8X6M-16A
 - 10X8M-16
 - 10X8M-16H

Capacities

(Performance similar to Mark III Standard ANSI. See page 6.)

- 60 Hz
 - To 7400 gpm (1680 m³/h)
- 50 Hz
 - To 6120 gpm (1390 m³/h)

Heads

- 60 Hz
 - To 750 ft (230 m)
- 50 Hz
 - To 510 ft (155 m)

- Maximum shaft deflection of less than 0.002 in (0.05 mm)

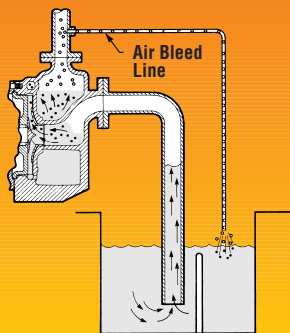
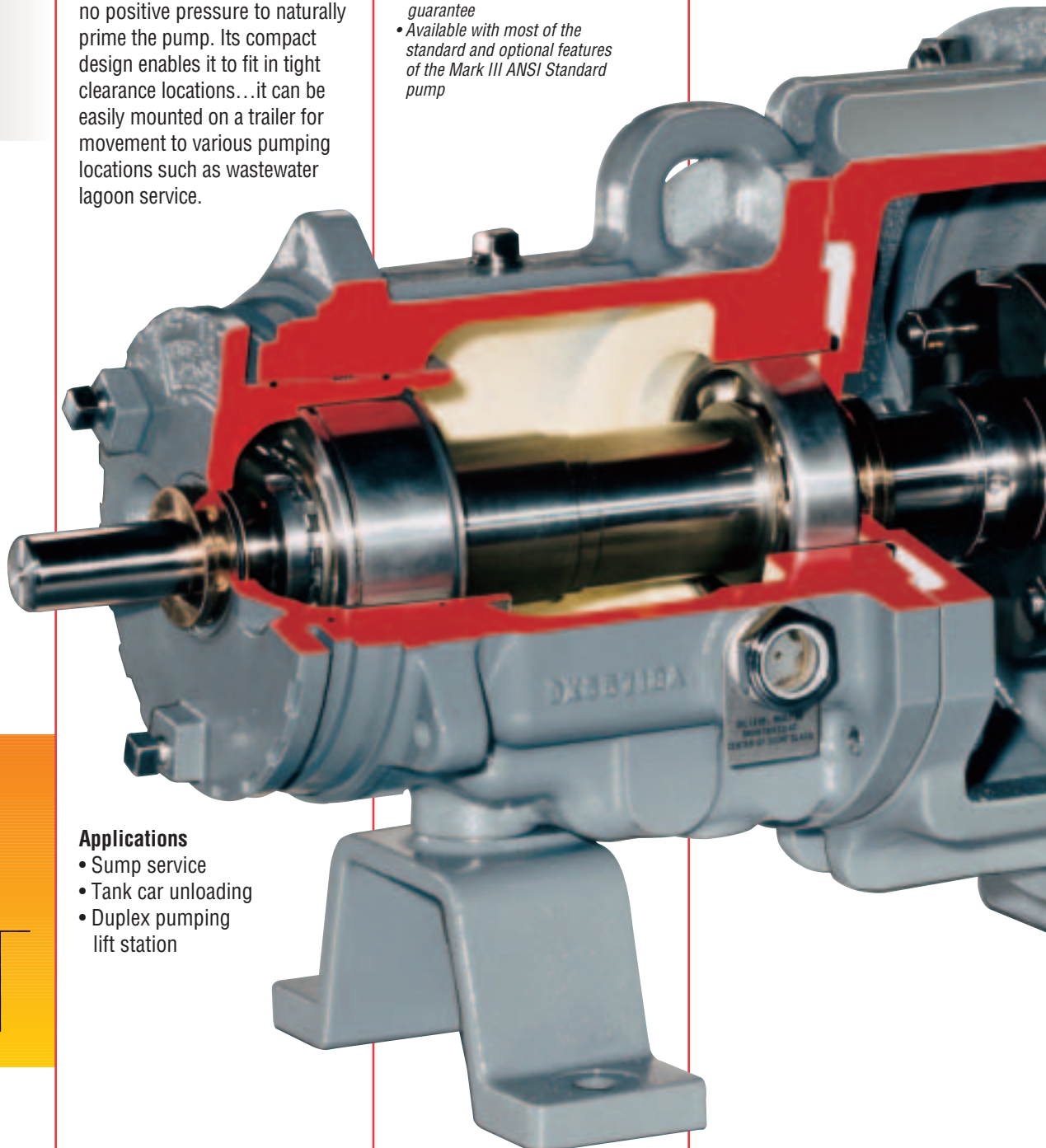
Available in all alloys and all metallic pump designs.

**Durco Mark III
Unitized
Self-Priming**

Conveniently located high and dry at ground level where installation is simple and maintenance more easily and more economically performed

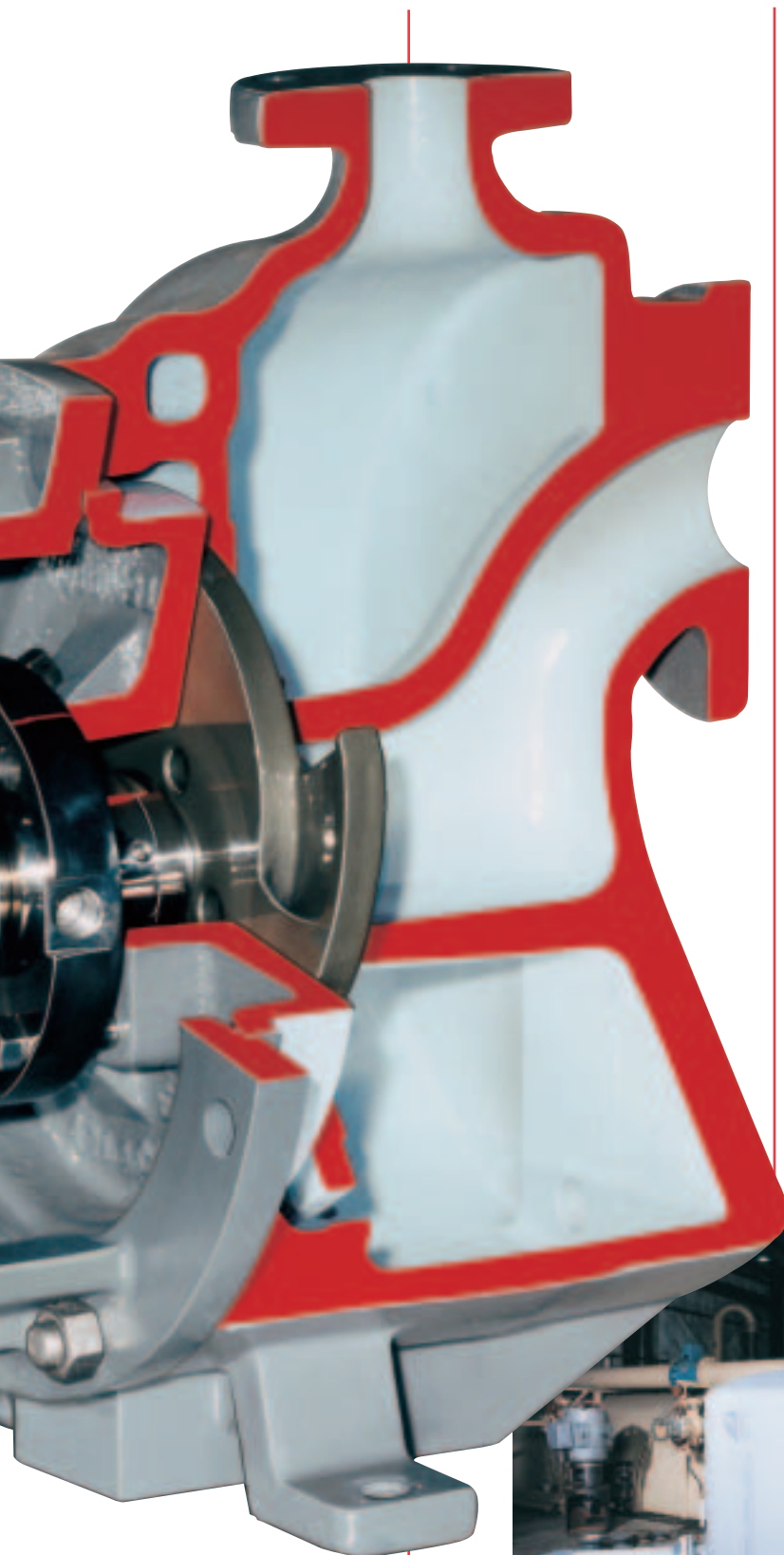
Costing less to buy, install and maintain than submersible pumps, the Mark III self-priming pump is designed to draw from liquid sources below ground level or from sources which have no positive pressure to naturally prime the pump. Its compact design enables it to fit in tight clearance locations...it can be easily mounted on a trailer for movement to various pumping locations such as wastewater lagoon service.

- *Standard Mark IIIA...or optional ANSI 3A power ends shown here (See page 8)*
- *Optional ANSI 3A power end offers three-year performance guarantee*
- *Available with most of the standard and optional features of the Mark III ANSI Standard pump*



Applications

- Sump service
- Tank car unloading
- Duplex pumping lift station



- *Unitized casing has large priming chamber, air separator and volute in one integral piece.*

Durco Self-Priming Tanks

These can be fitted to all Durco pumps to provide self-priming capability.

Priming tank options can be specified for larger capacity and higher heads and special solids handling applications.

- Flows to 30,000 gpm (6820 m³/h)
- Solids to 4 in (100 mm) diameter

Heads

- 60 Hz To 985 ft (300 m)
- 50 Hz To 655 ft (200 m)

Available in alloy and nonmetallic materials.

Eight Sizes

- Two Group I
1J1¹/₂X1US-6
1K1¹/₂X1¹/₂US-82
- Six Group II
2K2X1¹/₂US-10A
2K3X2US-10
2K4X3US-10H
2K3X2US-13
2K4X3US-13
2K6X4US-13A

Capacities

- 60 Hz
To 1400 gpm
(320 m³/h)
- 50 Hz
To 1170 gpm
(265 m³/h)

Heads

- 60 Hz
To 400 ft (120 m)
- 50 Hz
To 280 ft (85 m)

Static Suction Lift

- To 20 ft (6 m)



Durco Mark III Recessed Impeller

Trouble-free pumping of solid, stringy or fibrous slurries

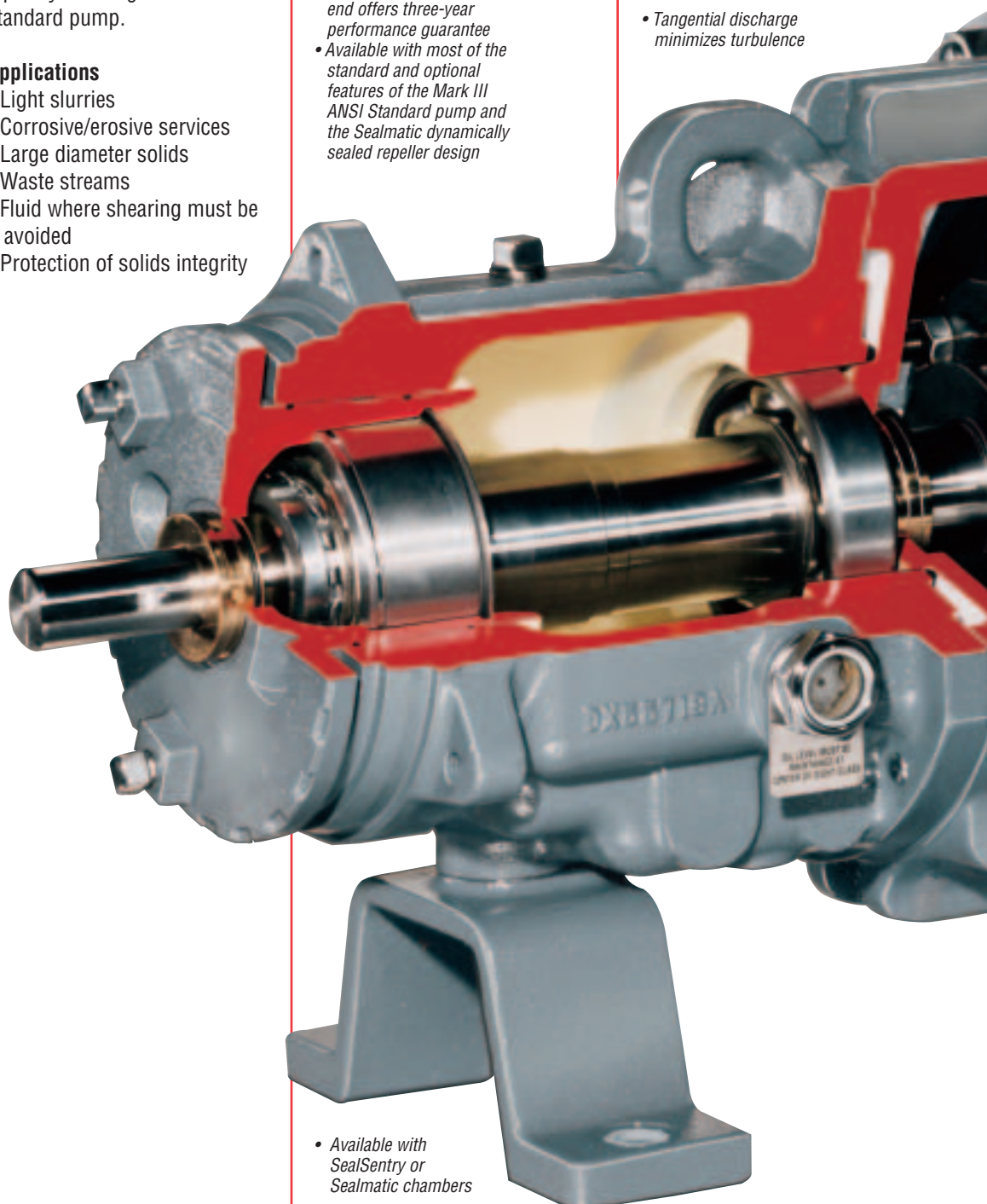
Combines the best design features of the Mark III ANSI Standard pump with the vortex action of a recessed impeller. These specific purpose features along with thick wall, wet end components offer extended service life when handling media typically too tough for an ANSI standard pump.

Applications

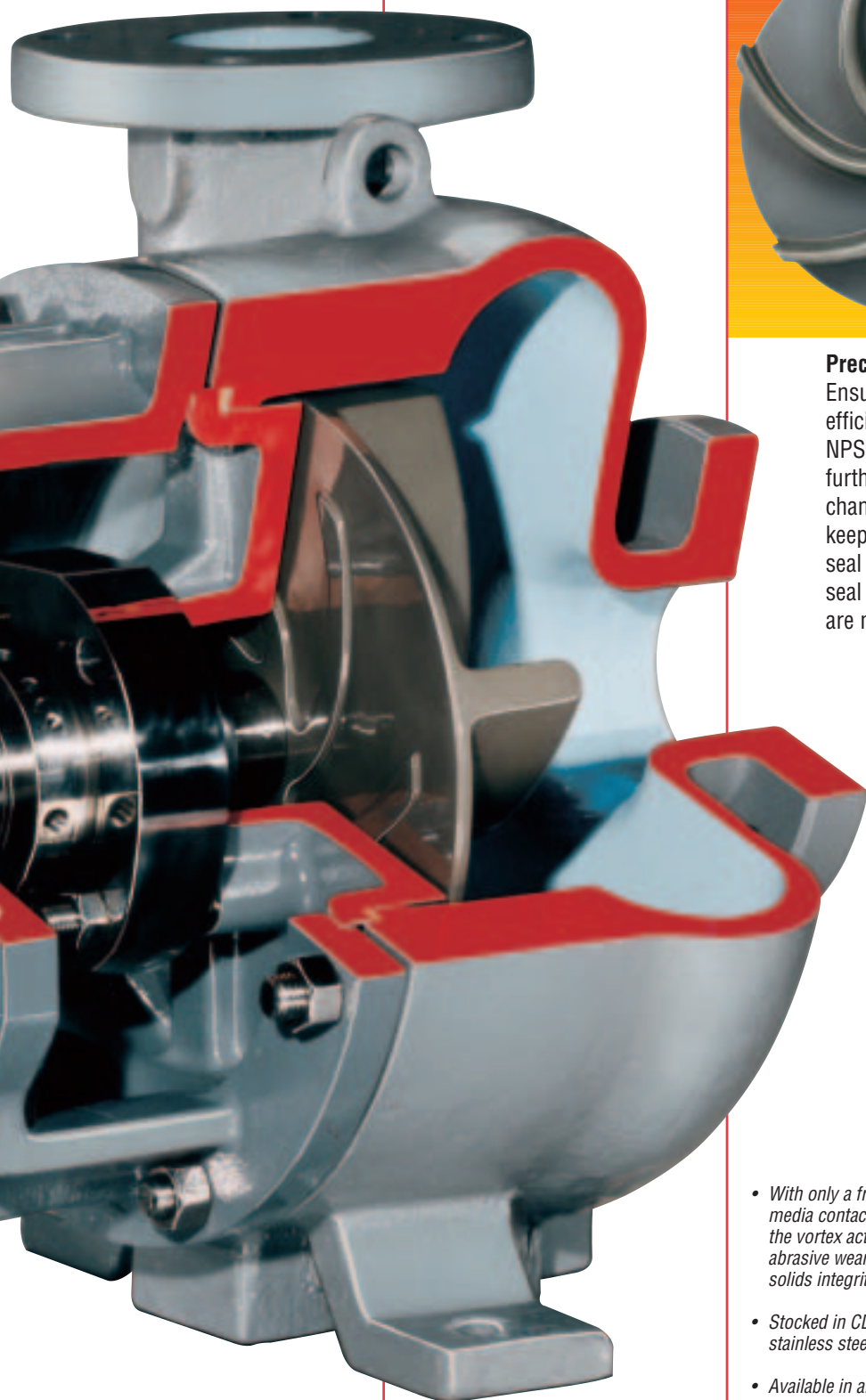
- Light slurries
- Corrosive/erosive services
- Large diameter solids
- Waste streams
- Fluid where shearing must be avoided
- Protection of solids integrity

- *Standard Mark IIIA...or optional ANSI 3A power ends shown here (See page 8)*
- *Optional ANSI 3A power end offers three-year performance guarantee*
- *Available with most of the standard and optional features of the Mark III ANSI Standard pump and the Sealmatic dynamically sealed repeller design*

- *Tangential discharge minimizes turbulence*



- *Available with SealSentry or Sealmatic chambers*



- Like the reverse vane, the recessed impeller sets to the rear cover



Precision cast impeller

Ensures peak energy efficiency and low NPSHR. Pump out vanes further control seal chamber pressure and keep solids from critical seal areas. Mechanical seal and packing life are maximized.

- With only a fraction of the media contacting the impeller, the vortex action minimizes abrasive wear while maintaining solids integrity
- Stocked in CD-4MCu duplex stainless steel
- Available in all standard alloy materials

Five Sizes

- One Group I
1J2X2R-6
- Four Group II
2K2X2R-10
2K3X3R-10
2K4X3R-13
2K6X4R-13

Capacities

- 60 Hz
To 2000 gpm
(455 m³/h)
- 50 Hz
To 1735 gpm
(394 m³/h)

BEP

- 60 Hz
To 1200 gpm
(270 m³/h)
- 50 Hz
To 1135 gpm
(258 m³/h)

Heads

- 60 Hz
To 400 ft (120 m)
- 50 Hz
To 270 (82 m)

Can be specified as self-priming pump with priming tank option. (See page 27)

Durco In-Line and High Silicon Iron Pumps

Durco In-Line

The Durco In-Line ANSI pump, with its own independent bearing housing and rigid C-flange style motor adapter, remains one of the most reliable process pump designs available.

Nine sizes available

Capacities

- 60 Hz
To 1580 gpm (360 m³/h)
- 50 Hz
To 1280 gpm (290 m³/h)

Heads

- 60 Hz
To 460 ft (140 m)
- 50 Hz
To 315 ft (96 m)

Please see Bulletin P-20-100 for more complete information.



High Silicon Iron

Unmatched corrosion resistance of high silicon iron. Exclusive Superchlor® composite shaft provides wear and corrosion resistance. Five sizes are available.

Capacities

- 60 Hz
To 900 gpm (205 m³/h)
- 50 Hz
To 750 gpm (170 m³/h)

Heads

- 60 Hz
To 180 ft (55 m)
- 50 Hz
To 125 ft (38 m)

For more complete information, please see Bulletin P-11-101.

**Durco Chemstar®
ISO Standard**

Recognized worldwide as a premier name in ISO chemical process pumps

Chemstar pumps conform to ISO 2858 dimensional and ISO 5199 design criteria.

Chemstar utilizes the same unique features of the Mark III ANSI pump for maximizing performance and mean time between planned maintenance (MTBPM).

- Reverse vane impeller
- SealSentry family of seal chambers
- Choice of power ends
- Fastest maintenance turnaround time with micrometer type shaft and impeller adjustment

Twenty-seven sizes are available.

Capacities

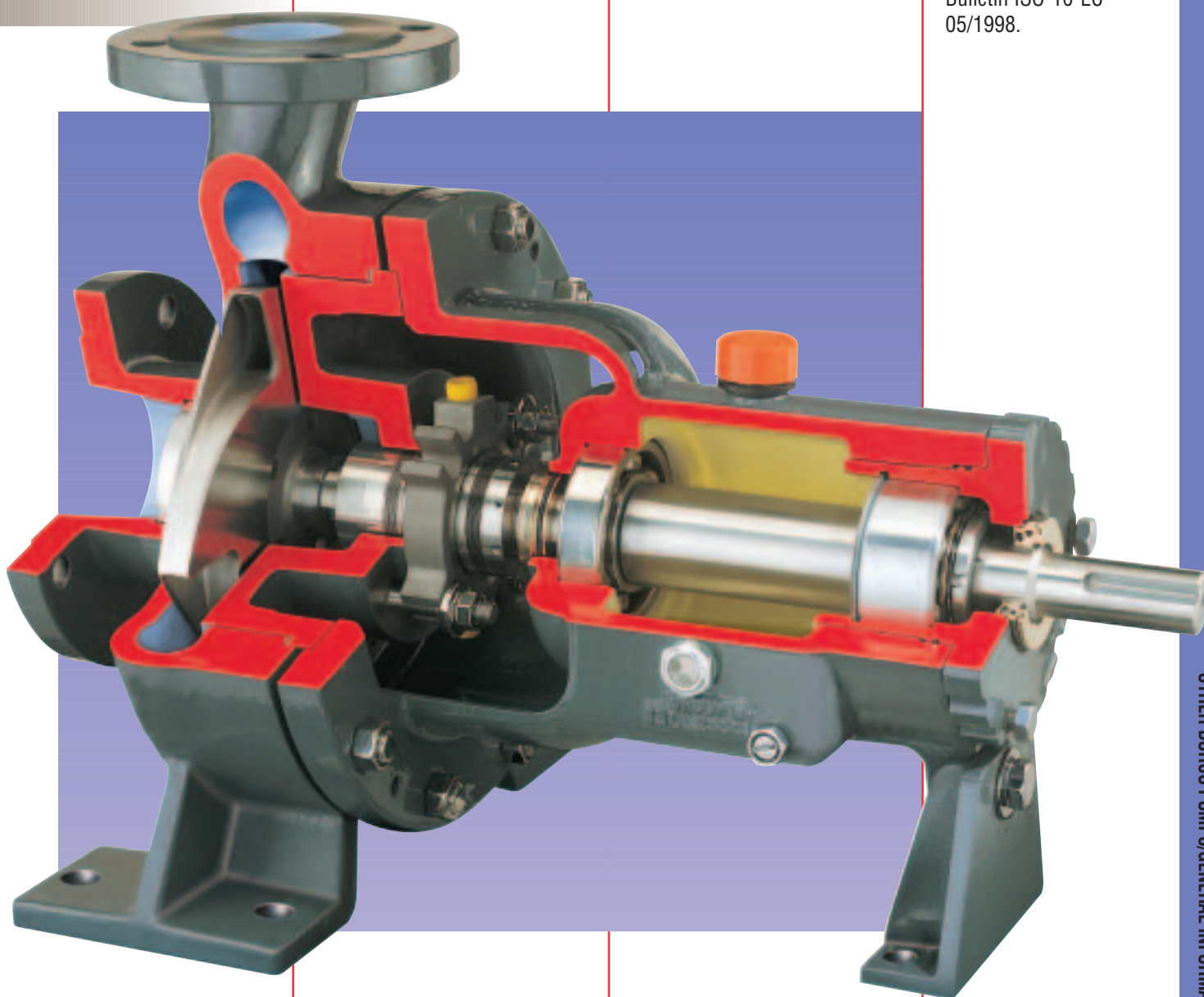
- 50 Hz
To 400 m³/h
(1760 gpm)

Heads

- 50 Hz
To 160 m (525 ft)

Available in most alloy materials.

For complete information request Bulletin ISO-10-EC-05/1998.



***Durco Guardian
and Chemstar MD
Sealless Metallic
Magnetic Drive
Pumps***

Flowserve ANSI and ISO metallic magnetic drive pumps are used wherever process leakage cannot be tolerated. Zero leakage requirements include:

- Emissions reduction
- Toxic services
- Flammable liquids
- Expensive liquids
- Ultrapure services
- Difficult to seal liquids

Guardian®

Durco Guardian pumps conform to the ASME B73.1M (ANSI) dimensional standard.

Chemstar® MD

Durco Chemstar MD pumps conform to ISO 2858 dimensional standards.

Broad Application Range

- Temperatures to 550°F (288°C)
- Wide range of alloys for difficult services

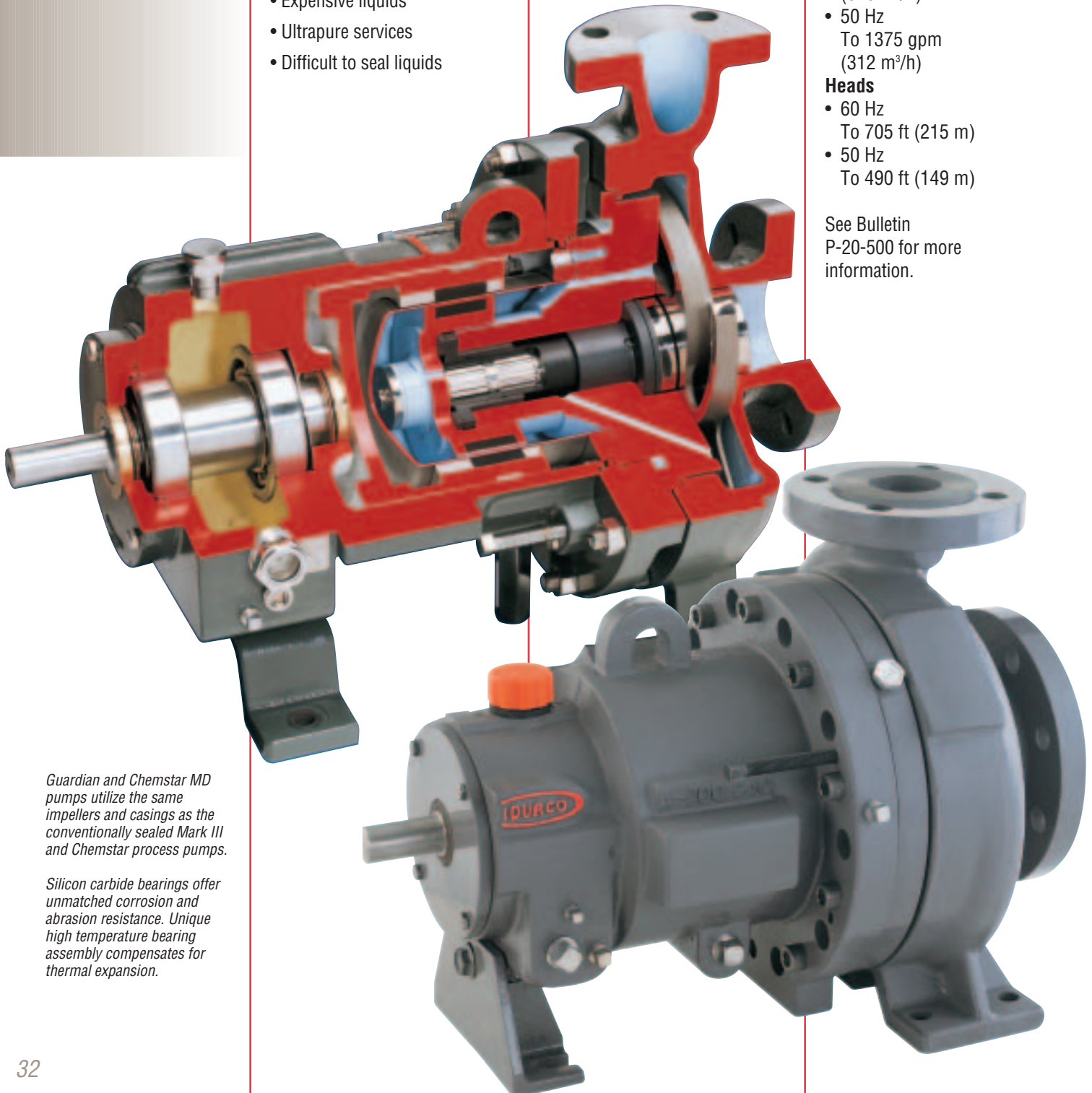
Capacities

- 60 Hz
To 1650 gpm (375 m³/h)
- 50 Hz
To 1375 gpm (312 m³/h)

Heads

- 60 Hz
To 705 ft (215 m)
- 50 Hz
To 490 ft (149 m)

See Bulletin P-20-500 for more information.



Guardian and Chemstar MD pumps utilize the same impellers and casings as the conventionally sealed Mark III and Chemstar process pumps.

Silicon carbide bearings offer unmatched corrosion and abrasion resistance. Unique high temperature bearing assembly compensates for thermal expansion.

**Durco PolyChem
Non-Metallic
Sealed and
Magnetic Drive
Pumps**

Designed to global standards for superior performance and economy in highly corrosive applications.

Available in ANSI, ISO and JIS configurations

- Global application
- Parts continuity

Fluoropolymer PFA lined wet end

- Superior corrosion resistance
- Temperatures to 300°F (150°C)

**M-Series
Magnetic Drive Pump**

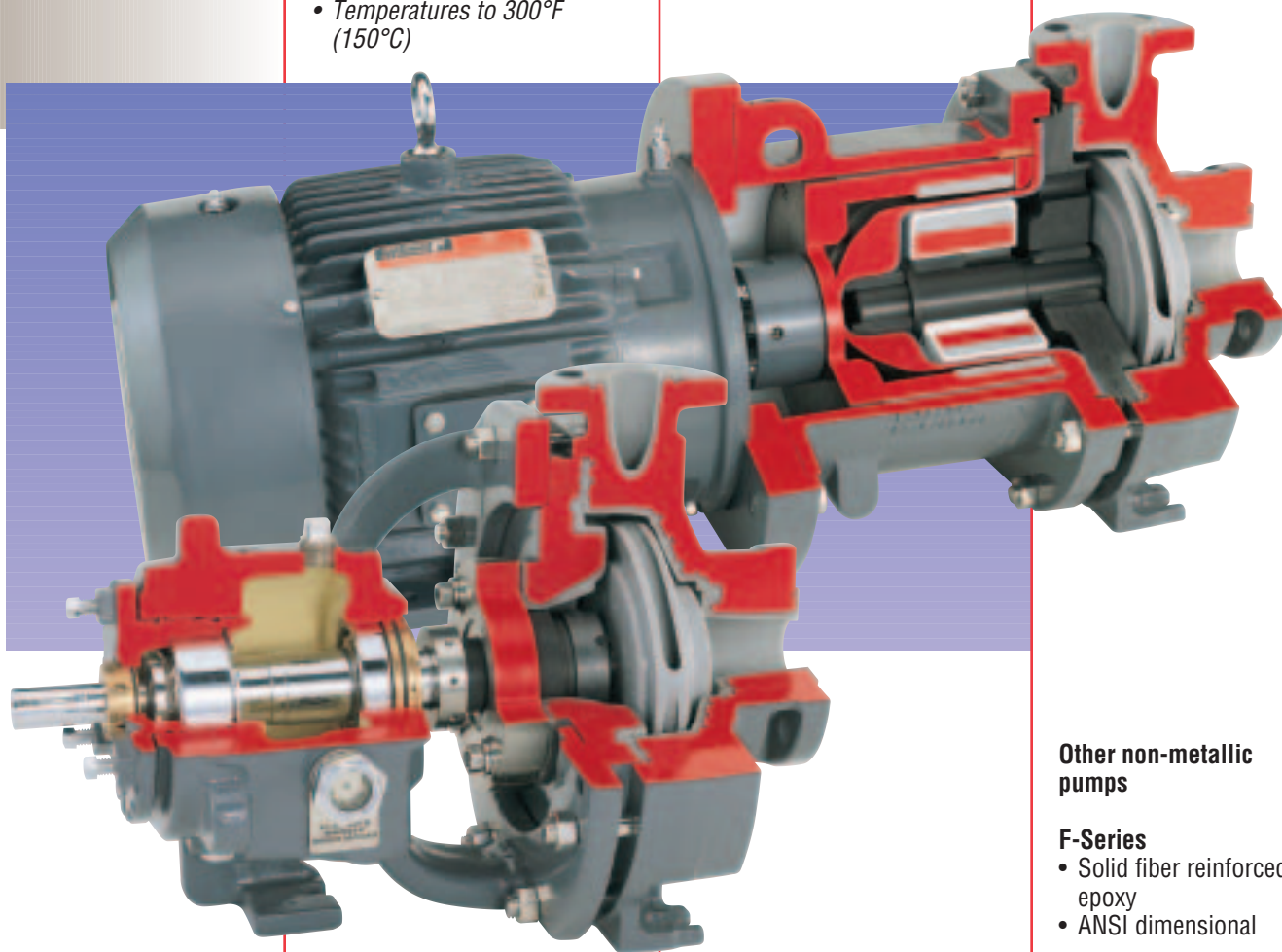
- Close coupled and long coupled models
- Simple design with minimum number of parts
- Separate inner magnet and impeller components

Capacities

- 60 Hz
To 750 gpm (170 m³/h)
- 50 Hz
To 625 gpm (140 m³/h)

Heads

- 60 Hz
To 450 ft (135 m)
- 50 Hz
To 310 ft (95 m)



**S-Series
Sealed Pump**

- Mark III power end features
- Tapered bore seal chamber with flow modifiers for optimum seal performance
- Multiple mechanical sealing options available

Capacities

- 60 Hz
To 1400 gpm (320 m³/h)
- 50 Hz
To 1150 gpm (260 m³/h)

Heads

- 60 Hz
To 760 ft (230 m)
- 50 Hz
To 530 ft (160 m)

Request Bulletin P-30-500 for more information.

Other non-metallic pumps

F-Series

- Solid fiber reinforced epoxy
- ANSI dimensional

L-Series

- Fiber reinforced epoxy/PFA lined
- ANSI dimensional

Durco KW941 Pump Power Monitor

The KW941 Pump Power Monitor monitors and displays actual power to the pump, offering simultaneous protection from underload and overload operating conditions.

The KW941 helps to eliminate costly downtime and expensive pump repairs caused by:

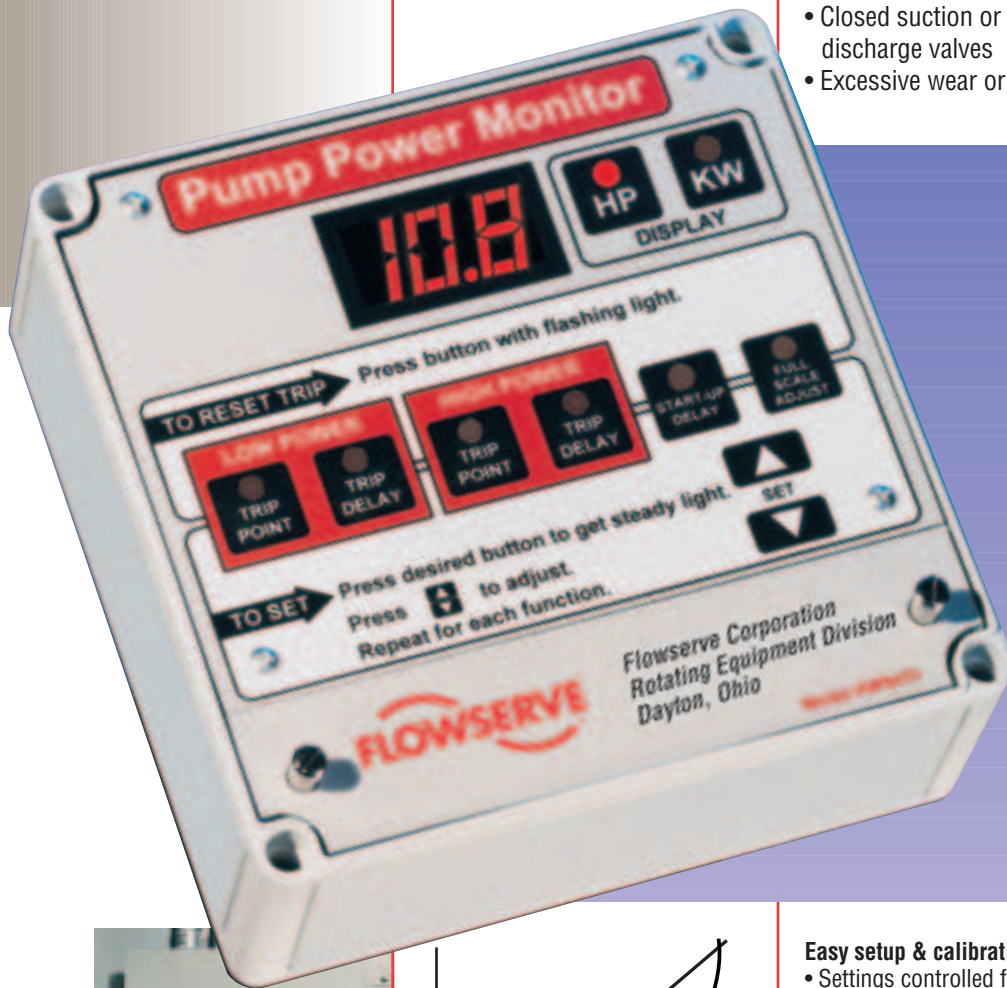
- Dry running
- Pump overloads
- Cavitation
- Blocked lines
- Closed suction or discharge valves
- Excessive wear or rubbing

Broad application range

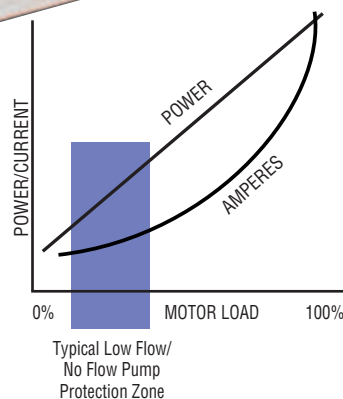
- Works on all pumps having steady (non-pulsating) loads: centrifugal; gear; turbine; ANSI; API; paper stock; sealed; mag drive; canned motor; self-priming
- One model for up to 600 hp (450 kW)

Premium features for reliable protection

- Push buttons display horsepower or kilowatts; automatic conversion when switching displays
- Adjustable low power and high power set points protect pump from underload and overload operation. Alarms can be tripped or pumps shut down before damage occurs
- Adjustable trip delay timers filter out nuisance trips caused by temporary power fluctuations
- Adjustable start-up delay timer is particularly useful in self-priming applications
- 4 to 20 milliamp analog output facilitates remote displays, operator interface and output to PLC or DCS
- Two form C relay outputs for low and high power trips. Outputs can be used to shut down pump or trip alarms
- Automatic, manual and remote reset options for versatile operation



The KW941 Power Monitor is **easy** to install on new or existing pump installations. All connections and controls are located at motor starter electrical enclosure as shown. Costly instrumentation wiring to the pump is eliminated.



By sensing power and not just amperes, linear measurements are provided with the sensitivity to detect improper operation while eliminating unwanted nuisance trips.

Easy setup & calibration

- Settings controlled from front panel push buttons; no internal adjustments, dip switches or potentiometers
- Large digital display for easy viewing and accurate settings
- One step calibration can be performed without operating pump. No need to run pump at off-operating conditions to calibrate power monitor
- Settings can be viewed or adjusted during normal pump operation

Durco Pump Parts and Alloy Materials

Specify genuine Durco parts for your pump maintenance needs.

In addition to sure-bet maintenance savings only Flowserve offers:

- Parts that are guaranteed to fit...to last... and to perform
- Lifetime castings guarantee
- Quality assured safety for operating and maintenance personnel

- Off-the-shelf availability from a computer-linked network
- Machining and modification service for special orders
- 24-hour emergency service
- Application and materials expertise
- Complete analysis of your maintenance needs with recommended parts inventory
- Tungsten carbide hard coated parts are available

To meet the concerns of OSHA 1910 for replacement parts equal to original manufacturer's specifications, it is recommended to use only genuine Durco pump parts.



Flowserve's foundries are widely regarded as among the best in the world pouring alloys from common austenitic stainless steels to light reactive alloys such as titanium. All wet end Durco castings carry a limited lifetime guarantee.

Attesting to the world class quality of its castings, Flowserve was the first high alloy foundry in the United States of America to have earned approval by Germany's Technischer Überwachungs Verein (TUV).

Durco Alloy Materials

Designation	ACI Symbol	Equivalent Wrought Designation	ASTM Designation	Specifications*
Ductile Iron	DCI	None	None	A395
High Chrome Iron	CR29	None	None	None
Carbon Steel	DS	None	Carbon Steel	A216 Gr. WCB
Durco CF-8M	D4	CF-8M	316	A744, Gr. CF-8M
Durcomet 100	CD4M	CD-4MCu	Ferralium®	A744, Gr. CD-4MCu
Durimet 20	D20	CN-7M	Alloy 20	A744, Gr. CN-7M
Durcomet 5	DV	None	None	None
Durco CY-40	DIN	CY-40	Inconel® 600	A744, Gr. CY-40
Durco M-35	DM	M-35-1	Monel® 400	A744, Gr. M-35-1
Nickel	DNI	CZ-100	Nickel 200	A744, Gr. CZ-100
Chlorimet 2	DC2	N-7M	Hastelloy® B	A494, Gr. N-7M
Chlorimet 3	DC3	CW-6M	Hastelloy® C	A494, Gr. CW-6M
Duriron®	D	None	None	A518
Durichlor 51®	D51	None	None	A518
Superchlor®	SD51	None	None	A518
Durco DC-8	DC8	None	None	None
Titanium	Ti	None	Titanium	B367, Gr. C-3
Titanium-Pd	Ti-Pd	None	Titanium-Pd	B367, Gr. C-8A
Zirconium	Zr	None	Zirconium	B752, Gr. 702C

*Durco alloys conform to the chemical and mechanical requirements of the latest edition of the ASTM specification.

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® Ferralium is a registered trademark of Langley Alloys

® Hastelloy is a registered trademark of Haynes International, Inc.

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Hydraulic Engineering

Mechanical Design

Materials Expertise

Smart Technology

Manufacturing Technology



PRESSURE

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2.986E+02

2.785E+02

2.605E+02

2.445E+02

2.305E+02

2.185E+02

2.085E+02

2.005E+02

1.945E+02

1.895E+02

1.865E+02

1.845E+02

1.835E+02

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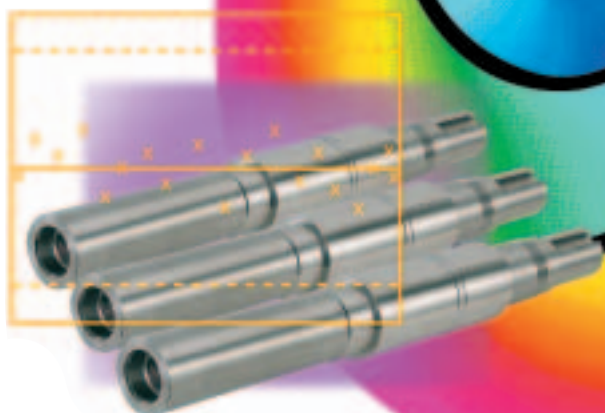
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