# 24 Series Lobe Pumps

**02/03**

## User Benefits

**The Jabsco 24 Series range of rotary lobe pumps was originally designed in 1981 and during the following years has been adapted and modified to suit the demands of the hygiene conscious industries eg: Food, Dairy, Beverage, Cosmetic, Pharmaceutical and Chemical. The pump design utilises the industry proven and well-accepted tri-lobe rotor concept.**

The key design concept of the 24 Series pump range is adaptability. The main features of this adaptability are: -

- Interchangeable seal types
- Interchangeable rotor designs
- Interchangeable end cover options
- Adaptable foot mounting

The **RUGGED** bearing frame design utilises large diameter shafts mounted in high specification taper roller bearings, fitted into rigid pillars which form an integral part of the high grade alloy bearing frame. These ensure maximum shaft stiffness and minimum shaft deflection in order to avoid premature pump failure due to over-pressure or other abuse, without the use of internal pump head bearings or bearing surfaces.

**LOW MAINTENANCE** is achieved by immersing the bearing and shaft assemblies in an oil bath to give maximum life even at extremes of operating conditions. The timing gears are easily accessible at the rear of the pump in the unlikely event that re-timing should become necessary. Rotors are fully interchangeable avoiding the need to re-time which is a problem associated with so many other rotary lobe and circumferential piston pumps.

**IMPROVED HYGIENE TECHNOLOGY** has been an integral part of the pump development and is achieved by using a fully swept pump chamber together with sealed rotor splines, accessible seals and approved sealing components. All this ensures that the pump meets the stringent requirements of major international customers.

The pump is designed to meet the requirements of: -

- **US 3A Sanitary Standard for pumps for Milk and milk products number 02-09**
- **US 3A Sanitary Standard for Elastomers number 18-03**
- **US Department of Agriculture (USDA) standards for Poultry**
- **Fluid contact materials conform to US Food & Drugs Administration (FDA) GRAS list (Generally Regarded As Safe) and includes conformance to Title 21, Sections 177.2600 and 177.1550**

# 24 Series Lobe Pumps

**02/03**


Jabsco

ITT Industries

USA

***Jabsco***
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

***Jabsco***
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

***Jabsco GmbH***
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11





43010-0247

# 24 Series Lobe Pumps

**02/03**

## Basic Principles of Design and Operation

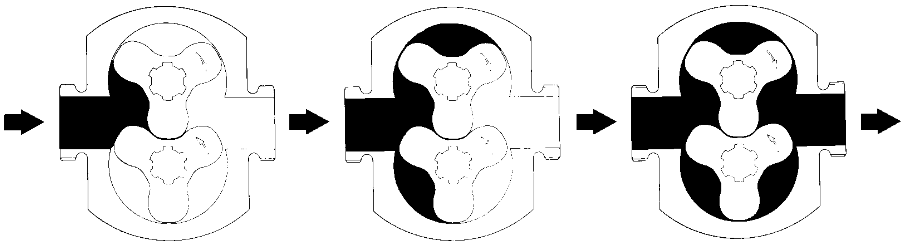


**Fig. 1**

Jabsco 24 Series positive displacement rotary Lobe Pumps are designed to pump delicate, viscous and particle-laden fluids as well as thin liquids which require an all stainless steel pump. The design of Jabsco Lobe Pumps is influenced by some fundamental engineering principles and it is useful to understand these first to ensure their most effective selection and operation.

All 24 Series Lobe Pumps use the same principle of operation. Two rotors turn in opposite directions; fluid enters the pump from the inlet port and fills the space between the rotors. This fluid is carried around the outside of the rotors and is forced out of the discharge port as the rotor lobes mesh together - see Fig 1. The displaced flow rate of the pump is therefore directly proportional to the diameter of the rotors and the speed at which the pump rotates.

### Overhung Rotors

In Jabsco Lobe Pumps, each rotor is supported on its own shaft and there are no bearings inside the pump chamber, so all forces from the fluid pressure are transmitted through the shafts to external bearings. The rotors are therefore overhung, as the shafts are cantilevered and are designed to resist the fluid pressure without excessive bending.

The bearings are permanently lubricated and are sealed from the pump head ensuring that:

- No lubricant contaminates the pumped fluid.
- No bearing material is worn away.
- No pumped fluid (which may be corrosive or abrasive) can enter the bearings.
- No pumped fluid is trapped behind bearings from where it cannot be cleaned out.

### Rotor Lengths

Being a positive displacement pump, flow is related not only to the rotor diameter but also the rotor length. A rotor length increased by 50% will displace 50% more flow. The longer rotor also has a larger surface area on which the fluid pressure acts trying to force the rotor to one side (see Fig 2). Therefore longer rotors put more load on the pump shafts and bearings at any particular pressure, so the maximum working pressure of a pump using a long rotor is lower than that of a short rotor, limited by the clearances provided and ultimately by the shaft strength.

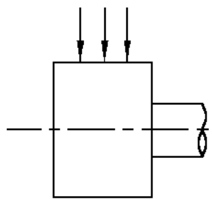


**Fig. 2**

### Rotor Clearances

When the pump is running within its operating limits, the rotors never touch each other and never touch the case in which they rotate.
These clearances are typically only 0.05 to 0.50mm (0.002 to 0.020 inches). This absence of contact ensures that no material contaminates the pumped fluid and also makes Jabsco Lobe Pumps ideal for abrasive fluids.

Separate “timing” gears exactly synchronise the rotation of the two shafts to ensure that the pump head components do not touch, unlike for example gear pumps where one gear drives the other and can wear, resulting in a loss of efficiency.

## Volumetric Efficiency

The clearances within the pump head must be large enough to allow for shaft deflection under pressure and for thermal expansion without rotor contact but must also be kept as small as possible to maintain pump efficiency. Volumetric efficiency is lost when liquid “slips” from the discharge side back to the inlet side through the rotor clearances. The amount of slip is affected by the size of the clearances, the differential pressure generated by the pump and the fluid viscosity: Larger clearances result in higher slip; the fluid can more easily leak back through the larger area (Fig 5). Higher pressure results in higher slip; the pressure forces more liquid back through the clearances (Fig 6). Higher fluid viscosity results in lower slip; high-viscosity liquids flow less easily through the pump head clearances than thin liquids (Fig 7).

Therefore, especially when pumping thinner liquids, rotor clearances are kept as small as possible to maintain efficiency. However, higher pressures force the rotors sideways within the rotor case, towards the inlet port, also slightly tilting the rotors. Therefore for higher pressures, more clearance is necessary to prevent rotor to rotor case contact, up to a maximum allowable for a particular shaft and rotor configuration. Lastly, high operating temperatures and, especially, sudden changes in temperature e.g. during CIP result in different rates of expansion of the pump head components. Therefore sufficient clearance must be provided to allow for this.

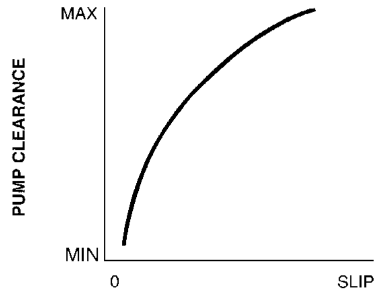



**Fig. 5**

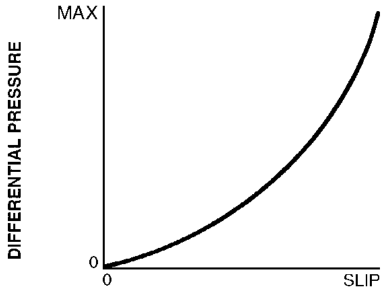



**Fig. 6**

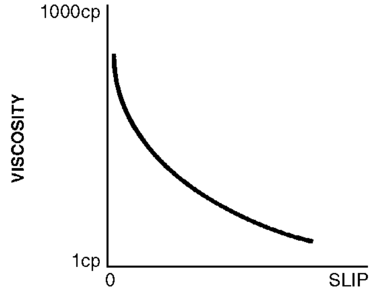



**Fig. 7**

## Pump Output

From the above, it can clearly be seen that the output flow rate from a Lobe Pump is a function of:

- Rotor diameter
- Rotor length
- Speed of rotation
- Lost flow due to slip back through internal clearances

The speed at which the pump runs is calculated to displace the required flow, plus extra displacement to compensate for any slip.

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# 24 Series Lobe Pumps

**02/03**

## Operating Data

| Size | S2 | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Displacement - L/100 revs (Gall/100 revs) | 3.5 (0.9) | 10.4 (2.7) | 18.6 (4.9) | 24.5 (6.5) | 37.7 (10) | 62.3 (16.4) | 93.6 (24.7) | 122 (32.2) | 161 (425) | 350 (92.4) |
| Standard Port Size - mm (inch) | 25 (1) | 25 (1) | 38/40 (1½) | 38/40 (1½) | 50 (2) | 65 (2½) | 76/80 (3) | 76/80 (3) | 100 (4) | 150 (6) |
| Enlarged Port Size - mm (inch) | - | 38/40 (1½) | 50 (2) | 50 (2) | 76/80 (3) | 76/80 (3) | 100 (4) | 100 (4) | - | - |
| Max. diff. Press. - bar (psi) High Pressure | - | 15 (220) | 10 (147) | 15 (220) | 10 (147) | 14 (206) | 10 (147) | 12 (176) | 9 (132) | - |
| Max. diff. Press. - bar (psi) Standard | 7 (103) | 10 (147) | 6 (88) | 10 (147) | 6 (88) | 8 (116) | 6 (88) | 7 (103) | 5 (73) | 7 (103) |
| Max. diff. Press. - bar (psi) High Efficiency | - | 6 (88) | 5 (73) | 6 (88) | 5 (73) | 6 (88) | 5 (73) | 7 (103) | 5 (73) | - |
| Maximum Speed - rpm | 1000 | 1000 | 1000 | 1000 | 1000 | 720 | 700 | 650 | 620 | 600 |
| Maximum Flow - L/min (Gall/min) | 35 (9.2) | 104 (27.5) | 186 (49.1) | 245 (64.7) | 377 (99.5) | 448 (118) | 665 (176) | 793 (209) | 1000 (264) | 2100 (554) |
| **Options Available:** | | | | | | | | | | |
| Single Mechanical Seals | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Flushed Seals | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Single O-ring Seals | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ |
| Packed Gland with Hard Sleeve | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Tri-Lobe Rotors | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Bi-Lobe Rotors | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rubber Covered Rotors | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ |
| End Cover Relief Valve | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Jacketed End Cover | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pump Head Jacket | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Horizontal Port Axis | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Gear Type Rotor | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| Elastomers in 3A Food Grade Nitrile | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Elastomers in FDA EPDM | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Elastomers in FDA Viton | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Elastomers in PTFE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 0.8μ Machined Surfaces | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 0.8μ Electropolished Surfaces | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 0.5μ Polished & Electropolished Surfaces | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **NOTE: All references to Gallons are US Gallons** | | | | | | | | | | |

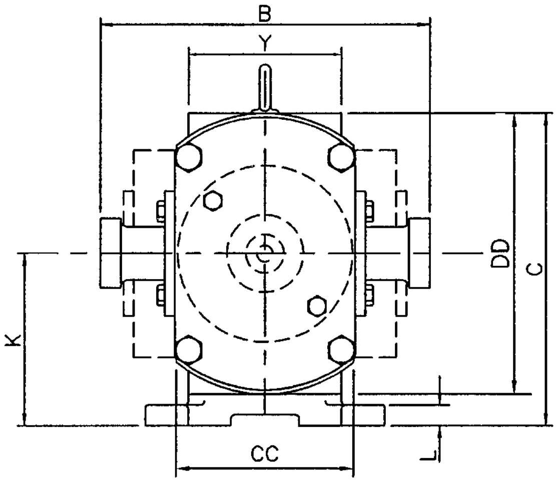
# 24 Series Lobe Pumps

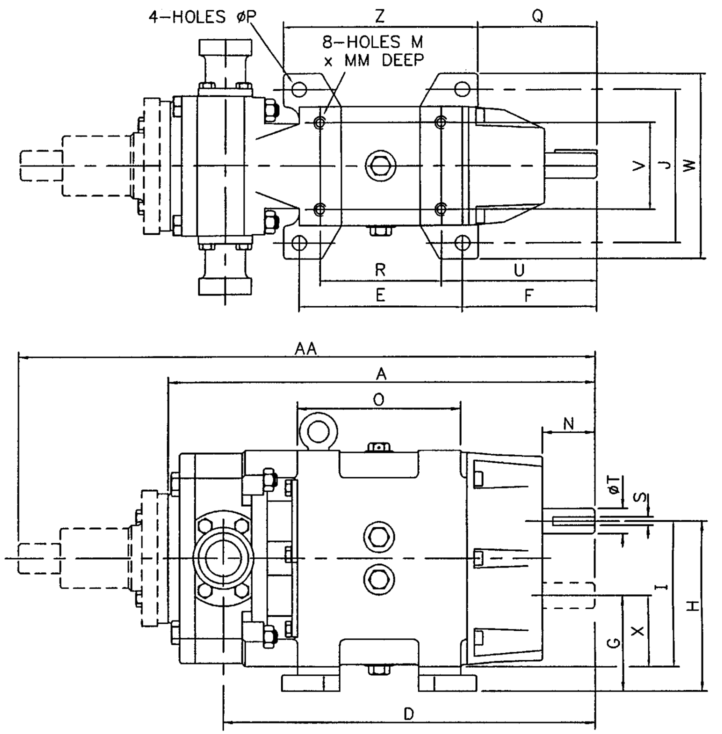
**02/03**

| PUMP | A | | AA | | B | | C | | CC | | D | | DD | | E | | F | | G | | H | | I | | J | | K | | L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch |
| S2 | 261 | 10.3 | N/A | | 146 | 5.7 | 106 | 4.2 | 90 | 3.5 | 217 | 8.5 | - | | 90 | 3.5 | 74 | 2.9 | 36 | 1.4 | 70 | 2.8 | - | | 98 | 3.9 | 53 | 2.1 | 18 | 0.7 |
| A1 | 335 | 13.2 | 455 | 17.9 | 204 | 8.0 | 188 | 7.4 | 110 | 4.3 | 298 | 11.7 | 167 | 6.6 | 135 | 5.3 | 105 | 4.1 | 77 | 3.0 | 132 | 5.2 | 111 | 4.4 | 120 | 4.7 | 105 | 4.1 | 15 | 0.6 |
| A2 | 355 | 14.0 | 475 | 18.7 | 204 | 8.0 | 188 | 7.4 | 110 | 4.3 | 310 | 12.2 | 167 | 6.6 | 135 | 5.3 | 105 | 4.1 | 77 | 3.0 | 132 | 5.2 | 111 | 4.4 | 120 | 4.7 | 105 | 4.1 | 15 | 0.6 |
| B1 | 408 | 16.1 | 550 | 21.7 | 226 | 8.9 | 227 | 8.9 | 132 | 5.2 | 359 | 14.1 | 204 | 8.0 | 155 | 6.1 | 128 | 5.0 | 90 | 3.5 | 160 | 6.3 | 137 | 5.4 | 145 | 5.7 | 125 | 4.9 | 15 | 0.6 |
| B2 | 428 | 16.9 | 570 | 22.4 | 236 | 9.3 | 227 | 8.9 | 132 | 5.2 | 372 | 14.6 | 204 | 8.0 | 155 | 6.1 | 128 | 5.0 | 90 | 3.5 | 160 | 6.3 | 137 | 5.4 | 145 | 5.7 | 125 | 4.9 | 15 | 0.6 |
| C1 | 538 | 21.2 | 739 | 29.1 | 288 | 11.3 | 318 | 12.5 | 184 | 7.2 | 472 | 18.6 | 280 | 11.0 | 195 | 7.7 | 181 | 7.1 | 131 | 5.2 | 225 | 8.9 | 187 | 7.4 | 200 | 7.9 | 178 | 7.0 | 24 | 0.9 |
| C2 | 564 | 22.2 | 765 | 30.1 | 296 | 11.7 | 318 | 12.5 | 184 | 7.2 | 486 | 19.1 | 280 | 11.0 | 195 | 7.7 | 181 | 7.1 | 131 | 5.2 | 225 | 8.9 | 187 | 7.4 | 200 | 7.9 | 178 | 7.0 | 24 | 0.9 |
| D1 | 623 | 24.5 | 866 | 34.1 | 322 | 12.7 | 355 | 14.0 | 210 | 8.3 | 539 | 21.2 | 320 | 12.6 | 220 | 8.7 | 201 | 7.9 | 140 | 5.5 | 250 | 9.8 | 215 | 8.5 | 230 | 9.1 | 195 | 7.7 | 24 | 0.9 |
| D2 | 647 | 25.5 | 890 | 35.0 | 346 | 13.6 | 355 | 14.0 | 210 | 8.3 | 551 | 21.7 | 320 | 12.6 | 220 | 8.7 | 201 | 7.9 | 140 | 5.5 | 250 | 9.8 | 215 | 8.5 | 230 | 9.1 | 195 | 7.7 | 24 | 0.9 |
| E2 | 770 | 30.3 | N/A | | 425 | 16.7 | 438 | 17.2 | 250 | 9.8 | 672 | 26.5 | 400 | 15.7 | 276 | 10.9 | 239 | 9.4 | 166 | 6.5 | 310 | 12.2 | 272 | 10.7 | 280 | 11.0 | 238 | 9.4 | 38 | 1.5 |

| PUMP | M | MM | | N | | O | | P | | Q | | R | | S | | T | | U | | V | | W | | X | | Y | | Z | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch |
| S2 | Ø7 | 18 | 0.7 | 30 | 1.2 | 110 | 4.3 | 8 | 0.3 | 64 | 2.5 | 90 | 3.5 | 4 | 0.2 | 12 | 0.5 | 44 | 1.7 | 98 | 3.9 | 110 | 4.3 | - | | 110 | 4.3 | 110 | 4.3 |
| A1 | M10 | 19 | 0.7 | 40 | 1.6 | 135 | 5.3 | 11 | 0.4 | 90 | 3.5 | 105 | 4.1 | 6 | 0.2 | 19 | 0.7 | 120 | 4.7 | 70 | 2.8 | 144 | 5.7 | 56 | 2.2 | 92 | 3.6 | 165 | 6.5 |
| A2 | M10 | 19 | 0.7 | 40 | 1.6 | 135 | 5.3 | 11 | 0.4 | 90 | 3.5 | 105 | 4.1 | 6 | 0.2 | 19 | 0.7 | 120 | 4.7 | 70 | 2.8 | 144 | 5.7 | 56 | 2.2 | 92 | 3.6 | 165 | 6.5 |
| B1 | M12 | 23 | 0.9 | 50 | 2.0 | 155 | 6.1 | 14 | 0.6 | 113 | 4.4 | 115 | 4.5 | 8 | 0.3 | 24 | 0.9 | 148 | 5.8 | 82 | 3.2 | 175 | 6.9 | 67 | 2.6 | 112 | 4.4 | 185 | 7.3 |
| B2 | M12 | 23 | 0.9 | 50 | 2.0 | 155 | 6.1 | 14 | 0.6 | 113 | 4.4 | 115 | 4.5 | 8 | 0.3 | 24 | 0.9 | 148 | 5.8 | 82 | 3.2 | 175 | 6.9 | 67 | 2.6 | 112 | 4.4 | 185 | 7.3 |
| C1 | M12 | 23 | 0.9 | 82 | 3.2 | 195 | 7.7 | 18 | 0.7 | 161 | 6.3 | 145 | 5.7 | 12 | 0.5 | 42 | 1.7 | 206 | 8.1 | 110 | 4.3 | 240 | 9.4 | 93 | 3.7 | 150 | 5.9 | 235 | 9.3 |
| C2 | M12 | 23 | 0.9 | 82 | 3.2 | 195 | 7.7 | 18 | 0.7 | 161 | 6.3 | 145 | 5.7 | 12 | 0.5 | 42 | 1.7 | 206 | 8.1 | 110 | 4.3 | 240 | 9.4 | 93 | 3.7 | 150 | 5.9 | 235 | 9.3 |
| D1 | M12 | 25 | 1.0 | 82 | 3.2 | 220 | 8.7 | 18 | 0.7 | 178 | 7.0 | 170 | 6.7 | 14 | 0.6 | 48 | 1.9 | 226 | 8.9 | 140 | 5.5 | 270 | 10.6 | 105 | 4.1 | 180 | 7.1 | 266 | 10.5 |
| D2 | M12 | 25 | 1.0 | 82 | 3.2 | 220 | 8.7 | 18 | 0.7 | 178 | 7.0 | 170 | 6.7 | 14 | 0.6 | 48 | 1.9 | 226 | 8.9 | 140 | 5.5 | 270 | 10.6 | 105 | 4.1 | 180 | 7.1 | 266 | 10.5 |
| E2 | M20 | 25 | 1.0 | 86 | 3.4 | 276 | 10.9 | 22 | 0.9 | 209 | 8.2 | 206 | 8.1 | 16 | 0.6 | 55 | 2.2 | 275 | 10.8 | 180 | 7.1 | 320 | 12.6 | 128 | 5.0 | 220 | 8.7 | 336 | 13.2 |

Bare Pump Dimensions in Millimetres & Inches




The dimensions shown here are for guidance purposes only, refer to Jabsco for certified drawings.

Jabsco

ITT Industries


USA

***Jabsco***
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

***Jabsco***
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

***Jabsco GmbH***
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## Model Numbering System

**2 4 1 5 0 - 1 8 9 0 V Y**

| Product | | Size | | Rotor Width | |
|---|---|---|---|---|---|
| 24 Series Standard Ports | 24 | A | 0 | Short | 00 |
| 24 Series Enlarged Ports | 26 | B | 1 | Medium | 50 |
| | | C | 2 | | |
| | | D | 3 | | |
| | | E | 4 | | |
| | | S | 9 | | |

\-

| Ports | | Seals | | Rotors | | End Cover | | Elastomers | | Miscellaneous | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tri-clamp | 1 | Packed Gland - Hard Sleeve | 1 | Hi Efficiency | 0 | Plain | 0 | Nitrile trim | - | Horizontal ports / Bottom shaft | B |
| BSP | 2 | Single TC/TC | 2 | Standard | 1 | Relief Valve | 1 | EPDM trim | E | | |
| IDF | 3 | Single C/SS | 3 | High Press. | 4 | Jacket (endcover) | 4 | PTFE trim | P | Electropolish | Y |
| RJT | 4 | Flushed C/SS | 5 | | | Jacket (pumphead) | 8 | Viton trim | V | To 0.5 Micron polish & Electropolish (20 microinch) | Z |
| 3A | 5 | Single O-Ring | 6 | | | Relief Valve (1) + Jacket (8) | 9 | | | | |
| DIN 11851 | 6 | Flushed TC/TC | 7 | | | | | | | Certification | & |
| SMS | 7 | Single C/SS - Pinned | 8 | | | | | | | | |
| NPT | 9 | Flushed C/SS -Pinned | 9 | | | | | | | Hopper Inlet | H |

| Product Name | Base Model No. |
|---|---|
| S2 | 24950 |
| A1 | 24000, 26000 |
| A2 | 24050, 26050 |
| B1 | 24100, 26100 |
| B2 | 24150, 26150 |
| C1 | 24200, 26200 |
| C2 | 24250, 26250 |
| D1 | 24300, 26300 |
| D2 | 24350 |
| E2 | 24450 |

# 24 Series Lobe Pumps

**02/03**

Jabsco

ITT Industries

USA

***Jabsco***
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

***Jabsco***
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

***Jabsco GmbH***
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11



43010-0250

## Materials and Design

24 Series rotary lobe pumps are designed using the latest technology Computer Aided Design (CAD) and are manufactured from high grade materials to exacting tolerances through the use of Computer Aided Manufacture on multi-axis numerical controlled machining centres and checked using computer controlled tri-co-ordinate inspection equipment. Every pump undergoes stringent testing prior to despatch to ensure that only the highest quality product reaches our demanding customers.

### Standard Pump Features

The following pump features are offered as standard on all 24 Series rotary lobe pumps.

- Traditional tri-lobe rotor design.
- Pump head in AISI 316 Stainless Steel - internally and externally machined.
- Bearing housing and pump head separated to avoid cross contamination of product or gearbox.
- Ease of assembly with spigots and precision dowels.
- Interchangeable key components.
- Comprehensive range of shaft sealing devices.
- Adaptable feet - optional mounting arrangements.
- Externally mounted helical timing gears.
- Dual rotation.
- Range of ports to suit US and European standards.

### Pump Head

**Pump Head** (Rotor case, Rotors, Rotor retainers and End Cover) manufactured from AISI 316 Stainless Steel, whose nearest equivalent is: -

| | |
|---|---|
| U.K. | BS 316 S16 and BS3100 316 C71 |
| U.S.A. | AISI 316 and ASTM A351 CF8M |
| GERMANY | WERKSTOFF No. 1.4401 |
| SWEDEN | SS-2347 & SIS 114.23.33.23.33.12 |
| FRANCE | NFA32-055 Z6 CND 1812-M |

These materials have the following physical properties: -

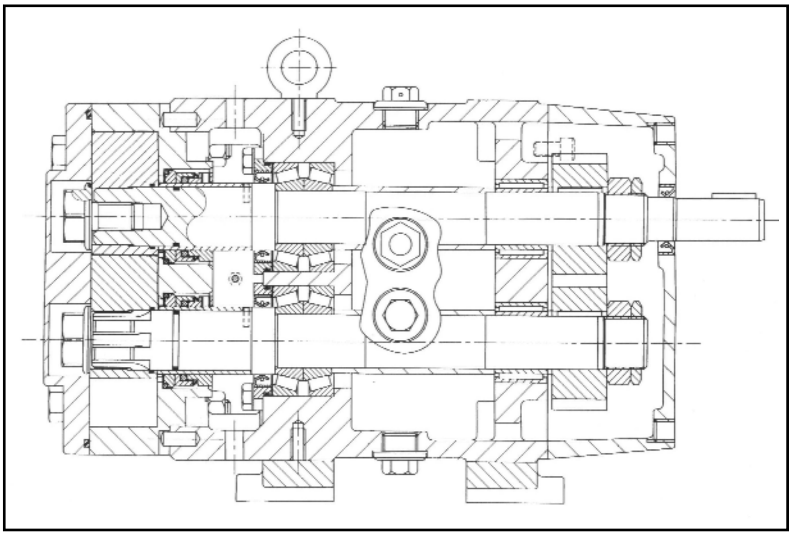
| Physical Properties - percent | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Country Requirements | | C | Ci | Mn | Ni | Cr | Mo | S.max | P.max |
| UK | min | - | - | - | 8.0 | 17 | 2.0 | 0.04 | 0.04 |
| | max | 0.08 | 1.5 | 2 | - | 20 | 3.0 | | |
| USA | min | - | - | - | 9.0 | 18 | 2.0 | 0.04 | 0.04 |
| | max | 0.08 | 1.5 | 1.5 | 12.0 | 21 | 3.0 | | |
| German | min | - | - | - | 9.0 | 17 | 2.0 | 0.03 | 0.045 |
| | max | 0.12 | 2 | 1.5 | 11.0 | 19.5 | 2.5 | | |
| Swedish | min | - | - | - | 10.0 | 17 | 2.5 | 0.03 | 0.045 |
| | max | 0.06 | 1.5 | 2 | 13.5 | 20 | 3.2 | | |
| French | min | - | 0.2 | - | 9.0 | 17 | 2.0 | 0.03 | 0.04 |
| | max | 0.08 | 1 | 1.5 | 13.0 | 20 | 3.0 | | |

The **Rotor case** is a one-piece shell moulded casting which is fully machined internally and externally. The rotor case design allows for fully swept cavities during operation with no crevices for microbial entrapment. The casing internal shape is a 'figure - 8' to ensure maximum volumetric efficiency on low viscosity products. Various options of shaft seal can be accommodated without the need for extra machining to the standard casing.

**Rotors** are manufactured from either extruded bar or from casting and are precision profiled milled on the latest CNC machinery. The standard rotors are tri-lobe profile computer designed for maximum volumetric efficiency and displacement. The accuracy of the profile ensures that rotors can be interchanged during repair, either shaft to shaft or even new rotors without the need to re-time the pump shafts. Jabsco was the first to achieve this and still remains at the forefront in this respect.

**End Covers** are of a heavy duty construction and on larger pump sizes has a stiffening boss on the outside to ensure that it does not deflect under pressure, thus maintaining the volumetric efficiency of the pump on low viscosity products, even at high pressure. There are 4 slots machined into the sides of the cover to aid disassembly of the cover from the rotor case, even after sticky products have been pumped and have been allowed to 'glue' the cover to the casing.

## Bearing Housing Assembly



Bearing Housing Assembly is made up of two AISI 316 stainless steel shafts running in two taper roller bearings at the front and a roller bearing at the rear (S2 size pump uses needle roller bearings at front and rear with the rear one incorporating a thrust race). These bearings are housed in a high grade Aluminium 40E alloy housing (S2 and E2 use a cast iron bearing housing). This grade of aluminium was chosen for its lightness, exceptional strength, machinability, attractive appearance, accurate surfaces and sharply defined detail. It also maintains its positional accuracy and fine tolerances at extremes of temperature. This housing is coated in an electrostatically applied epoxy powder coating for maximum corrosion resistance and durability.

*Aluminium 40E specification -*

**Chemical:**

| | |
|---|---|
| Magnesium | 0.5 to 0.7% |
| Zinc | 4.75 to 6.0% |
| Chromium | 0.4 to 0.6% |
| Titanium | 0.15 to 0.25% |
| Manganese | Not more than 0.1% |

**Physical:**

| | |
|---|---|
| Tensile Strength | 216-247 Mpa (14-16 tonf/in²) |
| 0.1% proof stress | 170-185 Mpa (11-12 tonf/in²) |
| Elongation | 4-5% |

Mounting the two taper roller bearings at the front facing in a back-to-back configuration ensures that the actual load bearing point acts in one position so that the 2 bearings act as one unit. This also ensures that any temperature changes do not affect the rotor clearances within the pump head but are simply transmitted through the rear bearing.

The **Shafts** are again made from AISI 316 Stainless Steel and have the following features-

- All bearing, gear, rotor and drive abutments are precision ground to a 1.6 µm Ra finish with seal areas ground to 0.4 µm Ra.
- Shaft rotor splines are machined to BS2059, Table 2 (bottom fitting, deep) but with a modified spline width to ensure minimum rotor movement thus minimising rotor clearances. S2 size pumps use a tight fitting Woodruff key to drive the rotor.
- All keyways are machined to BS4235, Part

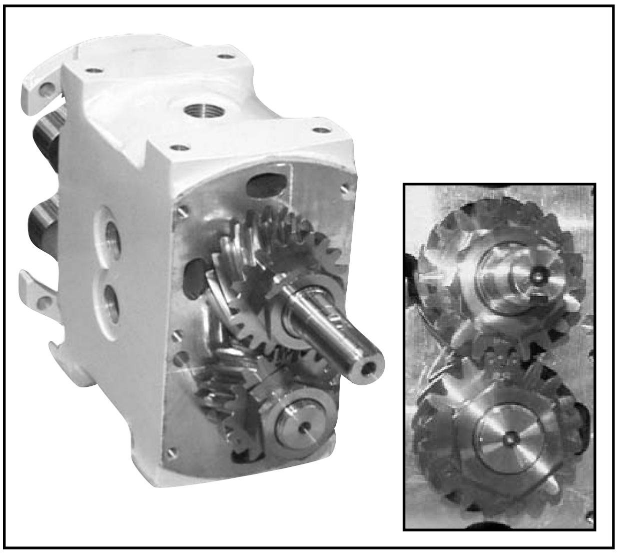
1(1972), similar to ISO R773 and R774.

- Drive shaft ends conform to BS4506 in both length and diameter, approximately equivalent to ISO R775.
- Shaft heights conform to BS5186, roughly equivalent to ISO R496.
- Shaft diameter through the seal conforms to DIN 24960.

**Timing Gears** are of a helical design in order to simplify shaft synchronisation (rotor timing) and also to reduce noise from the gearbox. The gears are manufactured from a 1½% Nickel-Chrome Molybdenum steel conforming to BS970, Part 2 : 1970 Spec 817M40 which has the following properties-

| | |
|---|---|
| Tensile strength | 850-1000 Mpa |
| Yield stress | 650-680 Mpa |
| Hardness | 248-302 Brinell |

The timing gears are situated at the rear of the pump under a separate gear cover which can be easily removed for access to the gears should re-timing ever become necessary. This re-timing is simply carried out by placing shims between the gear and it's abutment with the bearing spacer. The helix angle of approx. 30 degrees means that the ratio of shims to rotor movement is 3:1 and so very accurate rotor



synchronisation can be achieved.

# 24 Series Lobe Pumps

**02/03**


Jabsco

ITT Industries

| USA | UK | GERMANY |
| --- | --- | --- |
| ***Jabsco*** | ***Jabsco*** | ***Jabsco GmbH*** |
| 20 Icon | Bingley Road | Oststrasse 28 |
| Foothill Ranch | Hoddesdon | 22844 Norderstedt |
| CA 92610 | Hertfordshire, EN11 0BU | |
| Tel : +1 949 859 4945 | Tel : +44 (0) 1992 450 145 | Tel : +49 (0) 40 53 53 73 0 |
| Fax : +1 949 859 1153 | Fax : +44 (0) 1992 467 132 | Fax : +49 (0) 40 53 53 73 11 |

## Rotors

The 24 Series Lobe Pump range is designed to use the well-proven TRI-LOBE rotor form.

### Design Features

The advantages of the 'LOBE' type rotor when compared to the 'Scimitar' rotor, often referred to as 'Hammer Head', 'Bow Tie' or 'Bi-Wing' rotor and also the 'Circumferential Piston' type rotor are -

- Fully swept rotor bore.
- No 'carry back' of product.
- Good self priming capability.
- Good viscous product handling.
- Large particulate handling.
- No sharp edges or leading edges which could slice particles.

The Jabsco 24 Series rotor profile is accurately machined on the latest 'state-of-the-art' CNC machinery to exacting tolerances and is checked on computer controlled tri-co-ordinate inspection equipment. This ensures complete interchangeability between similar rotor types and also between different rotor forms. The result is reduced 'down-time' for users and improved volumetric efficiency on low viscosity liquids.

### Rotor Options

Most pumps can also accommodate 4 rotor types. These are-

- **Tri-Lobe (3 lobe) rotors**
- **Bi-Lobe (2 lobe) rotors**
- **Rubber covered Tri-Lobe rotors**
- **Gear form - 8 Lobed - rotors (S2 size pump only)**

### Tri-Lobe Rotors

The Jabsco 24 Series pump Tri-lobe rotor manufactured from AISI 316 Stainless Steel and are available to give 3 different pump head clearances, these are -

- Standard Pressure (Code 1) for most application types.
- High Efficiency (Code 0) for reduced slip on low viscosity products, but with a reduced pressure capability.
- High Pressure (Code 4) for maximum pressure capability on high viscosity products.

These 3 rotor clearance groups are capable of achieving the full temperature capability of every pump, although at higher temperatures the pressure capability is reduced.

- code 0 rotors can achieve their maximum pressure capability at temperatures up to 65ºC (150ºF).
- code 1 & 4 rotors can achieve their maximum pressure capability at temperatures up to 110ºC (230ºF).

(See individual Performance Charts for more detailed information).

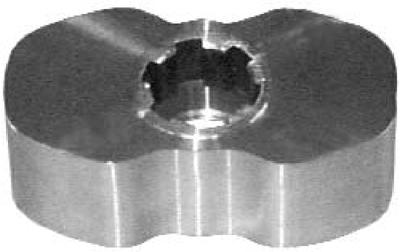
### Bi-Lobe Rotors

These have similar features to the Tri-lobe rotor but having only 2 lobes per rotor they have the following advantages -

- Can handle larger particle size.
- Can handle a higher concentration of solids without damage to the solids.
- Improved NIPR (Net Inlet Pressure Requirement) on very high viscosity products.
- Reduced shear damage to high viscosity products or those containing particulates.

Typical products handled by Bi-Lobe rotors are -

- Yoghurts containing fruit pieces
- Whole fruit conserves
- Cottage cheese
- Pie filling
- Butter and margarine
- Cake and bread mixes
- Meat pastes
- Pet food



## Particulate Handling Properties of Tri-Lobe and Bi-Lobe Rotors:

| Pump Size | Tri-Lobe Rotor | Bi-Lobe Rotor |
|---|---|---|
| S2 | 5mm ( 3/16" ) | Not Available |
| A1 | 18mm ( 11/16" ) | 18mm ( 11/16" ) |
| A2 | 13mm ( 1/2" ) | 15mm ( 9/16" ) |
| B1 | 13mm ( 1/2" ) | 18mm ( 11/16" ) |
| B2 | 18mm ( 11/16" ) | 18mm ( 11/16" ) |
| C1 | 18mm ( 11/16" ) | 32mm ( 1 1/4" ) |
| C2 | 20mm ( 3/4" ) | 32mm ( 1 1/4" ) |
| D1 | 32mm ( 1 1/4" ) | 37mm ( 1 1/2" ) |
| D2 | 32mm ( 1 1/4" ) | 37mm ( 1 1/2" ) |
| E2 | 37mm ( 1 1/2" ) | 48mm ( 1 5/8" ) |

## Rubber Covered Rotors (A & B Size Pumps Only)

These retain all the features of the Stainless Steel Tri-Lobe Rotor but have a thick rubber coating bonded to a Stainless Steel hub. This gives these additional features -

- Allows small hard solids to be handled without causing the rotors to 'block' which would result in rotor and shaft damage.
- Can handle abrasive liquids with reduced wear to the rotor and casing.
- Copes with accidental over-pressure of the pump without causing rotor and casing damage.

Typical products handled are -

- Meat and fish products - containing small bone particles
- Ice cream and fruit concentrates - containing small ice crystals
- Egg products - containing small pieces of egg shell

The technical specifications of this rotor type are -

- Nitrile conforming to the US 3A Sanitary Standard for Elastomers number 18-03.
- US FDA approved bonding agent.
- Equivalent to Stainless Steel rotor code 0 in terms of performance and pressure capability.
- Maximum 65ºC (150ºF) temperature capability for continuous use.
- Maximum 100ºC (212ºF) temperature capability for intermittent use ie CIP.

### Gear Type - 8 Lobe - Rotor (S2 Only)

The advantage of this type of rotor is that it has more sealing points between the suction (low pressure side) and the discharge (high pressure side) and therefore reduces the back flow (slip) of low viscosity product (lower than 100 cP). This is only necessary on very small pumps where the relationship between rotor clearances and pump displacement is high. The downside of this rotor form is its limitation in particulate handling.

## Conversions and Interchangeability

All rotor types can be interchanged without the need for re-shimming of front or rear clearances or the need to re-time the pump except the Rubber Covered Rotor. Rubber covered rotors require 0.3 mm of shim to be removed from behind the rotor case to ensure the correct rotor front and rear clearances. When changing rotors of any type it is always wise to check clearances after reassembly.

## Spare Parts

All rotors are available in pairs, see parts list in the Installation, Operating, Maintenance and Spares Manual supplied with each pump.

# 24 Series Lobe Pumps

**02/03**


Jabsco

ITT Industries

USA

***Jabsco***
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

***Jabsco***
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

***Jabsco GmbH***
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## Single Shaft Seals

24 Series pumps are fitted with high quality mechanical shaft seals to prevent leakage of product from the pump into the atmosphere and to prevent contamination by airborne micro-organisms. All pumps are available with single face seals, and with flushed seals as an option; see separate data sheet.

- Simple cartridge design and set-up.
- Small section gives lower cost.
- Unique 'pistoning' function avoids the need for large spring forces.
- Externally mounted for maximum cleanliness.
- Anti-rotation pin in seal seat allows use on high viscosity products.
- Variety of seal face combinations with same set-up dimensions.
- Uses proprietary O-rings enabling 'off-the-shelf' spares availability.
- Positive drive pins allow bi-directional rotation.

## Seal Position and Design

This seal design is externally mounted into the rear of the rotor case which means that the drive collar, locating screws and wave spring are outside of the product, this ensures that good hygiene levels may be achieved. The rotary seal face is driven by 2 pins that locates in slots in the drive collar. This means that the seal can be run equally well in both directions of rotation. The seal faces are energised by a simple wave spring, which is used to keep the rotary and static seal faces in contact at low pressures. At higher pressures the static seal seat 'pistons' backwards and forces the rotary face, mounted on the shaft, back against the drive collar.

This compresses the wave spring and eliminates fatiguing of the spring. See Fig 1.

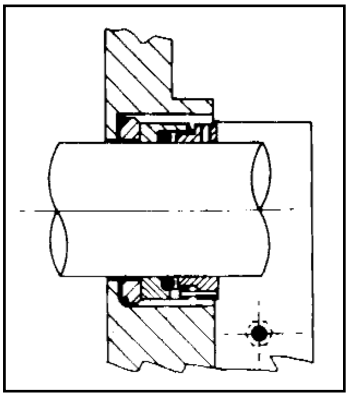


**Fig. 1 Single Mechanical Seal**

## Materials and Applications

Single seals are available in three face material combinations:

Carbon on Stainless Steel - pinned seat code 8
Carbon on Stainless Steel - unpinned seat code 3
Tungsten-Carbide on Tungsten-Carbide code 2

Shafts seals are made from the following materials -

| | Standard Code 8 Seal | Options - Code 2 & 3 Seals |
|---|---|---|
| Static Seal Face | 316 Stainless Steel | Unpinned Carbon<br>Tungsten Carbide<br>Silicon Carbide (special request) |
| Rotary Seal Face | Carbon face inserted into 316 Stainless Steel Carrier | 316 Stainless Steel<br>Tungsten Carbide<br>Silicon Carbide (special request) |
| Drive Collar | 303 Stainless Steel | 303 Stainless Steel |
| Wave Spring | 301 Stainless Steel | Hastelloy (special request) |
| Seal O-Rings | 3A Grade Nitrile | FDA Grade Viton<br>PTFE encapsulated (on Viton core)<br>Perfluroelastomer (Kalrez) |
| Drive Collar Set Screws | 303 Stainless Steel | 303 Stainless Steel |

The **code 8 single carbon on stainless-steel seal** is suitable for many clean fluids which do not require a more sophisticated seal type i.e. those which:

- Are non-toxic and non hazardous
- Have some lubricating properties
- Are not highly abrasive
- Have a viscosity less than 150,000 cp
- Do not require steam or sterile fluid (aseptic) barrier
- Do not change state in contact with air i.e. do not form a film, dry out or precipitate solids
- Are pumped at a temperature less than 180°C (356°F)
- Are not excessively temperature sensitive (do not degrade when heated by the friction of the seal faces)

# 24 Series Lobe Pumps

**02/03**

The **code 3 single carbon on stainless steel seal with unpinned seat** is used in place of the code 8 pinned seat single carbon on stainless steel seal where viscosity is less than 1800 cP and a lower cost option is necessary.

The **code 2 single tungsten-carbide on tungsten-carbide seal** is used where viscosities are higher than 150,000 cP and also where carbon is not acceptable in fluid contact or where face wear would be unacceptable, i.e.

- For abrasive fluids containing crystals, powders or particles which would rapidly wear away the carbon of the standard seal
- Where shedding of particles into the fluid stream must be avoided. The seal faces are the only area in the pump design where rubbing contact is unavoidable. Tungsten-carbide is extremely hard, so the seal does not wear ie, particles are NOT shed into the product

Refer to Pump Selection data sheet for more information on seal selection.

Note that code 2 tungsten-carbide on tungsten-carbide seals are not recommended for steam-purged applications as the seal faces can bind together.

## Installation Procedure

Pumps fitted with single seals require no special installation but pumps must never be run completely dry for more than 30 seconds as this will cause excessive heating of the seal faces. Use flushed seals in pumps that need to run dry. For seal installation and repair, refer to Installation, Operation and Maintenance manual.

## Conversions and Interchangeablity

Pumps built with single seals can be converted as follows:

- To other face materials e.g. from code 8 to code 2, simply by changing seal faces
- To other elastomer materials. See Elastomers data sheet
- To flushed seals. See appropriate data sheet. Conversion kits are available which contain all the parts necessary to convert a single-seal pump to flushed seals

Refer to Installation, Operating and Maintenance Manual for instructions on seal removal and fitting.

If a pump build specification is changed at any time, the model number must be changed on the pump name plate to ensure that correct spare parts will be ordered.

## Spare Parts

Single seal spare parts are supplied as:

- Seal Face kits - 2 kits required per pump
- Trim kits containing all the elastomer parts for the complete seal - 2 kits required per pump
- Wave springs supplied individually
- Housings supplied individually

Refer to Spare Parts data sheets for part numbers.

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# Flushed Single Shaft Seals (not S2)

The flushed seals fitted to 24 Series pumps retain all the features of the single seals, but with the facility to contain a low pressure fluid behind the primary seal. This allows the pump to be used for applications where the single seal alone is unsuitable. This seal type is not available on the S2 size pump.

## Seal Position and Design

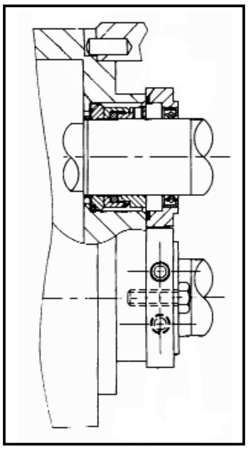


**Fig. 1 - Flushed Mechanical Seal**

The flushed seal uses a lip seal mounted behind the primary seal - Fig 1. This is fitted into the back of the seal housing and runs on the shaft. In use the space between the primary and lip seals is fed with fluid supplied through pipes connected to drilled holes in the seal housing. This seal type utilises a removeable shaft sleeve to avoid wearing of the shaft by the lip seal.

## Materials and Applications

Flushed seals are available in three face material combinations:

| | |
|---|---|
| **Carbon on Stainless Steel - unpinned seat** | **code 5** |
| **Tungsten-carbide on Tungsten-carbide** | **code 7** |
| **Carbon on Stainless steel** | **code 9** |

The lip seals are always nitrile.

Flushed seals are run with a low-pressure liquid flush between the primary seal (mechanical face seal) and a lip seal to form a barrier between the pump and the atmosphere.

They are used when

- Pumped fluid changes state in contact with air, e.g. crystallises, forms a film, dries out or precipitates solids. The flush dissolves and rinses away the small amount of reside which could build up on the edges of the seal faces
- Pumped fluid is hot, i.e. over 80°C (175°F). The flushing fluid is used to cool the seal faces
- Pumped fluid is temperature sensitive and degrades when heated by the shearing action of the seal faces. The flushing fluid is used to cool the seal faces
- Pump must run “dry” for prolonged periods (over 30 seconds), i.e. no liquid in pump chamber
- Pump is under high vacuum
- A low pressure sterile barrier is required

The code 7 flushed Tungsten-carbide on Tungsten-carbide seal is used where face wear would be unacceptable, i.e.

- For abrasive fluids containing crystals, powders or particles which would rapidly wear away the carbon of the code 5 or 9 seal
- Where shedding of particles into the fluid stream must be avoided

Refer to Pump Selection data sheet for more information on seal selection.

## Installation Procedure

A low-pressure flushing fluid system must be installed as follows:-

- Liquid must be compatible with the pumped fluid; water is the most commonly used liquid
- Pressure shall typically be 0.5 bar (7 psi) gauge
- Flush temperature shall be below it’s boiling point, ie maximum of 70°C (160°F) for water.
- Flow rate shall preferably be 2 to 3 litres/min. (0.5 to 0.75 US gal/min) per seal
- Flush fluid should be connected to flow in at the lowest point on the seal housing and out at the highest point to vent air pockets, as shown in Fig. 2 (overleaf).

# 24 Series Lobe Pumps

**02/03**

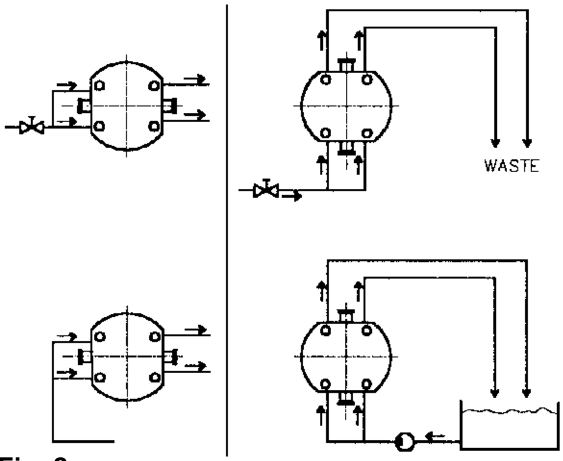



**Fig. 2**

For seal installation and repair, refer to installation, operation and maintenance manual.

## Conversions and Interchangeability

Pumps built with flushed seals can be converted as follows:

- To other face materials e.g. from code 5 to code 7
- To other elastomer materials, see Elastomers data sheet
- To single seals, simply by removing the lip seal

Refer to Installation, Operating and Maintenance Manual for instructions on seal removal and fitting.

If a pump build specification is changed at any time, the model number must be changed on the pump nameplate to ensure that correct spare parts will be ordered.

## Spare Parts

Flushed Single Shaft Seal spare parts are supplied as:

- Seal Face kits - 2 kits required per pump
- Lip Seals - 2 required per pump
- Seal trim kits containing all the elastomer parts for the complete seal - 2 kits required per pump
- Wave springs supplied individually
- Housings supplied individually
- Drive plates supplied individually

When servicing seals, it is not normally necessary to fit new springs and housings. Drive plates should be inspected for wear and replaced as necessary. Ensure that the correct elastomer trim kits are ordered for the application.

Refer to Spare Parts data sheets for part numbers.


Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# Packed Gland

The packed gland is the most economical and versatile sealing arrangement. Compression packing is used when handling a wide variety of products of differing viscosities and other physical properties.

## Design

The function of a packed gland is such that the compression of the packing rings in an axial direction ie reduction in the axial width of each ring causes an increase in the ring sections across their diameter thus causing a sealing effect between the shaft and the housing. The rings remain static in their housing due to a lower torsional effect at their outer diameter ie the shaft rotates within the packing rings. The compression of the rings is effected by the use of a gland follower that is clamped onto the rings by two clamping nuts.

The rotation of the shaft within the packing rings causes frictional heat to build up. It is necessary, therefore, to allow a small leakage of product between the packing rings and the shaft to dissipate this heat ie the product being pumped is used to 'lubricate' the packing. This leakage should be small and can be controlled by adjusting the clamping force from the two nuts. The packing rings on A1 through to E2 size pumps run on a hardened shaft-sleeve that is easily removed and replaced when it becomes excessively worn.

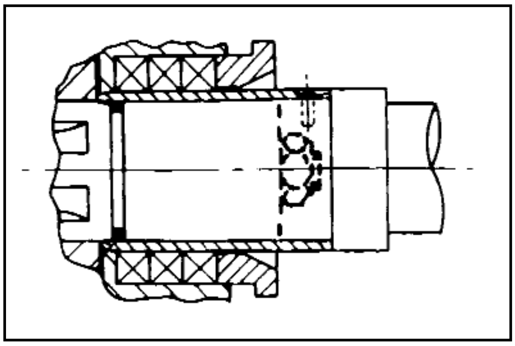


**Fig. 1 - Packed Gland**

**Materials of Construction: -**

| | |
|---|---|
| Packing ring - | Aramid fibre impregnated with food grade grease |
| Number of rings - | S2 pump- 2 rings per shaft<br>A1 to D2 pumps - 3 rings per shaft<br>E2 pump- 4 rings per shaft |
| Gland Follower - | 316 Stainless Steel |
| Shaft Sleeve - | Hard Chrome plated stainless steel (not S2) |

## Applications

Typical products sealed with gland packing are those where the alternative would be an expensive mechanical seal and support systems eg:

- Chocolate - requires double mechanical seal and pressurised food grade oil flushing system
- Chemicals - often requires double mechanical seal and pressurised flushing system
- Chemicals - often requires exotic mechanical seals and elastomer components

Gland packing **SHOULD NOT BE USED WHEN** there are large variations in differential pressure across the pump. This causes excessive leakage when pressures are high which can be countered by increasing the clamping force on the gland follower. However, when the pressure drops the extra compression created by the increased clamping force causes a loss of lubrication of the packing rings and subsequent 'burning up' of the rings (hardening) which itself results in excessive leakage occurring.

## Installation

No special installation or additional services are required.

## Conversions and Interchangeability

It is not possible to easily convert mechanical seal pumps to gland packing because the shafts need to be changed to allow fitment of the shaft sleeves on A1 to E2 size pumps. Removal of the shafts would necessitate a complete strip down of the pump bearing housing, which would be uneconomical to do. Further, on all pump types it is not possible to run the packing directly on stainless steel shafts where a mechanical seal has previously been fitted. This is because the shaft is 'dimpled' for the set-screws in the drive collar used to drive the mechanical shaft seal. This dimple would tear up the packing rings. Pumps fitted with Packed Gland can be converted to mechanical seals provide that the shaft or shaft sleeves are not worn on the area under the packing rings. Simply remove the packed gland housing and 'dimple' the shafts or shaft sleeves (where fitted) in the appropriate place (see instruction leaflet supplied with the mechanical seals for position to 'dimple the shaft/sleeve).

## Spare Parts

- Individual packing rings
- Shaft sleeves (where used)
- Gland housings
- O-rings used to seal the housing to rotor case
- Gland clamp nuts and studs

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# Single 'O' Ring Seals (not for S2 or E2)

This seal is designed as a low cost shaft-sealing device and utilises a single Nitrile O-ring working under dynamic conditions. This seal is not available on S2 or E2 Size Pumps.

## Seal Position and Design

The O-ring is housed in a removable housing mounted to the rear of the rotor case in the same way as the mechanical face type seals. A removable sleeve is fitted onto the shaft and rotates with the shaft. The O-ring remains static in the housing and the sleeve rotates against the inner diameter of the O-ring. See Fig. 1

## Materials and Applications

This type of seal can be used for products that are non-abrasive and have some lubricating properties of their own. e.g. oil based products. Because of the narrow sealing surface that the O-ring presents against the sleeve, it can also be used for products that have a tendency to polymerise (ball up). This polymerisation occurs due to frictional heat generated between the faces of a normal mechanical face type seal and would require a double mechanical seal system with an expensive pressurised flushing system. The O-ring seal does not need this expensive flushing system.

**Maximum Operating Conditions: -**

| PUMP | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| Max. Pres. - bar (psi) | 7.5 (110) | 6.0 (87) | 6.7 (97) | 6.0 (87) | 6.0 (87) | 6.0 (87) | 5.0 (73) | 5.0 (73) |
| Max. Pump Speed - rpm | 650 | 650 | 500 | 500 | 350 | 350 | 350 | 350 |
| Temp. °C (°F) | 0° to 100°C (32° to 212°F) | | | | | | | |

**Typical products are:** -
- Milk
- Yoghurt
- Dairy creams
- Latex

**It has also been found to give excellent results with:-**
- Jams (conserves)
- Glucose solutions

⚠ These seals must be used in conjunction with normal chemical resistance guidelines and should not be allowed to run dry. i.e. without product in the pump.

## Installation Procedure

The single O-ring can be installed very easily without any rotor case modification. (See Installation, Operating and Maintenance manual). Once installed the primary sealing O-ring can be removed from the rear of the pump. If it becomes necessary, the sleeve upon which the O-ring runs can also be removed and replaced.

## Conversion and Interchangeability

The single O-ring seal is fully interchangeable with all mechanical seal types without any modification to other components, e.g. rotor case. See spare parts list for conversion kit. However, if the wear sleeve is required this will neccessitate new shafts being fitted.

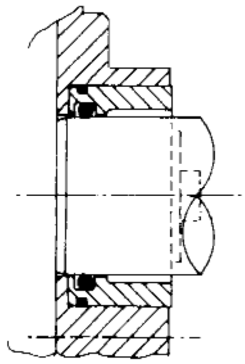


**Fig. 1 - O-ring Seal**

## Spare Parts

It is important to establish O-ring lifetime by trials and a planned O-ring replacement programme initiated. Due to the low costs and ease with which the O-rings can be changed this replacement programme can easily be co-ordinated with regular manual cleaning or inspection. Spare O-rings can be supplied. (See spare parts list).

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# Elastomers

In a 24 Series pump there are 11 sealing O-rings in contact with the pumped fluid (See Fig. 1). Great care is taken in the manufacture of the O-rings to ensure that there are no imperfections on the surfaces which can harbour bacteria and the design of the moulds is such that there is no moulding flash on critical sealing edges.

## Materials and Standards

24 Series pumps can be specified with up to 4 alternative sealing materials:

**Nitrile -** This 3A-grade nitrile has a good balance of properties and is resistant to many chemicals as well as oil and fat-based products.

**EPDM -** This peroxide cured grade of EPDM conforms to the requirements of the US FDA Code of Federal Regulations Title 21 section 177.2600 “Rubber Articles Intended for Repeated Use”. This material is chosen for its excellent resistance to water-based solutions, and particularly to hot water and steam, and also for its acceptability in contact with pharmaceutical products, foods etc. EPDM is not suitable for contact with mineral oils.

**Viton® -** generic name F.P.M. This grade of Viton® conforms to the requirements of the US FDA Code of Federal Regulations Title 21 section 177.2600 “Rubber Articles Intended for Repeated Use”. This Viton® has excellent resistance to many chemicals, oils and solvents and also has a wide operating temperature range.

**PTFE -** often called Teflon®. PTFE has exceptional resistance to chemicals. 24 Series pumps utilise a PTFE encapsulated Viton® O-ring to seal the static seal face to the rotor case and the rotors seal face to the shaft. The end cover joint is a solid O-ring. The shaft sleeve, rotor bolt and rotor O-rings are also made from solid PTFE. Note that PTFE jonts must be replaced regularly especially if subjected to wide temperature variations. All solid PTFE components conform to the US FDA Code of Federal Regulations Title 21 section 177.1550, See Fig. 3 overleaf.

**Perfluoroelastomer** - Often referred to as Kalrez®, this being the original version of this material. Others now available are Chemraz® and Isolast®. Perfluoroelastomer is resistant to virtually all chemicals and is sometimes seen as an “elastomeric version of PTFE”. Due to it’s superior chemical resistance and the difficult manufacturing techniques required to manufacture it, it is also very expensive around 100 times the price of Nitrile and 10 times the price of PTFE. Never-the-less, in some circumstances it is the only alternative. 24 Series pumps fitted with Perfluoroelastomer O-rings have a solid PTFE end cover O-ring due to it’s large size and therefore cost, it is also the most easy to replace. Where absolutely necessary this end cover O-ring can also be supplied in Perfluoroelastomer (by special request).

| Material | Temperature Range | Conformance to Standards | Model Number Suffix |
|---|---|---|---|
| **Nitrile** | -30 to +110°C<br>-22 to +230°F | US 3-A 18-03 | None |
| **EPDM** | -35 to +140°C<br>-31 to +285°F | US FDA CFR 21 177.2600 | E |
| **Viton®** | -25 to +180°C<br>-13 to +355°F | US FDA CFR 21 177.2600 | V |
| **PTFE** | -20 to +180°C<br>-4 to + 355°F | US FDA CFR 21 177.1550 | P |
| **Perfluoroelastomer (Kalrez® or similar)** | - 50 to + 280°C<br>- 58 to + 536°F | None | K |

For full details of material compatibility, refer to Jabsco Liquid Compatibility Guide, publication number SD932.

## Conversions and Interchangeability

Pumps can easily be converted to other elastomer specifications by ordering a complete pump head trim kit. Refer to Installation, Operating and Maintenance Manual for instructions on seal removal and fitting.

If a pump build specification is changed at any time, the model number must be changed on the pump nameplate to ensure that correct spare parts will be ordered.

## Spare Parts

Elastomer spares can be ordered as :
- Pump Head trim kit - consists of all the elastomer parts required for one complete pump.

**All O-rings can be supplied individually.**

Refer to spare parts data sheets for part numbers.

Jabsco
ITT Industries

USA
*Jabsco*
20 Icon
Foothill Ranch
CA 92610
Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK
*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU
Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY
*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt
Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## End Covers

The 24 Series end cover is sealed to the rotor case by an O-ring in a groove precisely-machined in the end-cover which minimises product retention and assists in effective CIP - Fig. 1. The end cover is held in place by bolts and can easily be removed for inspection of the pump head and for servicing. There are 4 slots on the sides of the cover to aid removal especially when sticky products have been pumped.

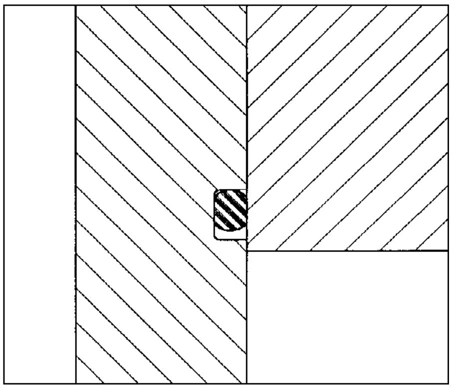


**Fig. 1**

There are 3 other alternative end cover types available, all of which are completely interchangeable with the standard cover

These are :-

- End cover relief valve
- Temperature Control Jackets
    - End cover jacket
    - Pump head jackets

## End Cover Relief Valve

See seperate data sheet - Relief Valve.

## End Cover Temperature Control Jackets

See seperate data sheet - Temperature Control Jackets.

# 24 Series Lobe Pumps

**02/03**

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 989 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## End Cover Relief Valve (not S2 or E2)

24 Series pumps can be fitted with an end cover relief valve which can be set to protect the PUMP ONLY from overpressure. This valve is not designed to protect the system or to provide long term by-pass of liquid. If this is required then an IN-LINE relief valve should be fitted which can by-pass the liquid back to the suction vessel during overpressure situations.
Features of the end cover relief valve include :

- Simple pump protection device
- Easy to fit and to set
- No 'dead leg' or by-pass loops
- 80% 'crack' pressure, no seeping
- Full by-pass of liquids up to 5,000 cP

### Position and Design

The relief valve is simply fitted onto the rotor case (pump body) in place of the standard end cover. In order to achieve the best operating parameters the valve is designed to operate in ONE DIRECTION ONLY.

The function is as follows – a channel is connected between the discharge side of the pump and the centre of the diaphragm. Behind the diaphragm is a spring loaded piston. As the pressure on the discharge side of the pump increases it reaches a point where the spring load is overcome. At this point the diaphragm is lifted off of it's seat. This exposes the full area of the diaphragm to the discharge pressure which in turn increases the load to the piston by a factor 5 or more. Due to this sudden increase in load the valve opens fully and allows the product to by-pass back to the suction side of the pump via another channel. The valve does not close again until the discharge pressure drops to approx 10% of the pressure required to 'crack' open the valve. It may be necessary to stop the pump.

The spring load can be manually adjusted to give different opening pressures of the valve up to the maximum pressure capability of the pump. See Fig. 1.

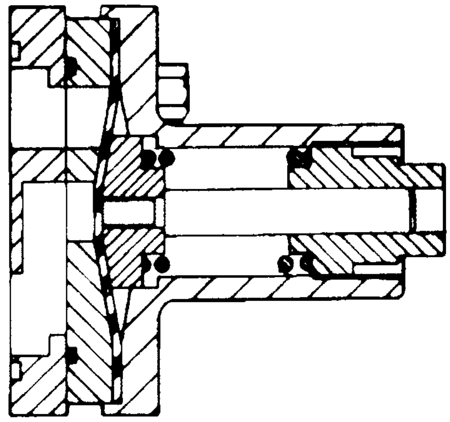


**Fig. 1**

### Materials and Operating Parameters

| | |
|---|---|
| Diaphragm | - Food grade 3A Nitrile<br>- PTFE faced fluoroelastomer |
| Housing | - 316 Stainless Steel |
| Spring | - Stainless Steel |
| Max Temp | - Nitrile +110 ºC<br>- PTFE +200 ºC |
| Max Pressure | - 15 bar (215 PSI) |
| Max Viscosity | - Dependant on flow through pump. Up to 5000 cP if full capacity of pump required. Greater viscosities are possible at lower flow rates or if product is shear thinning. |

### Installation Procedure

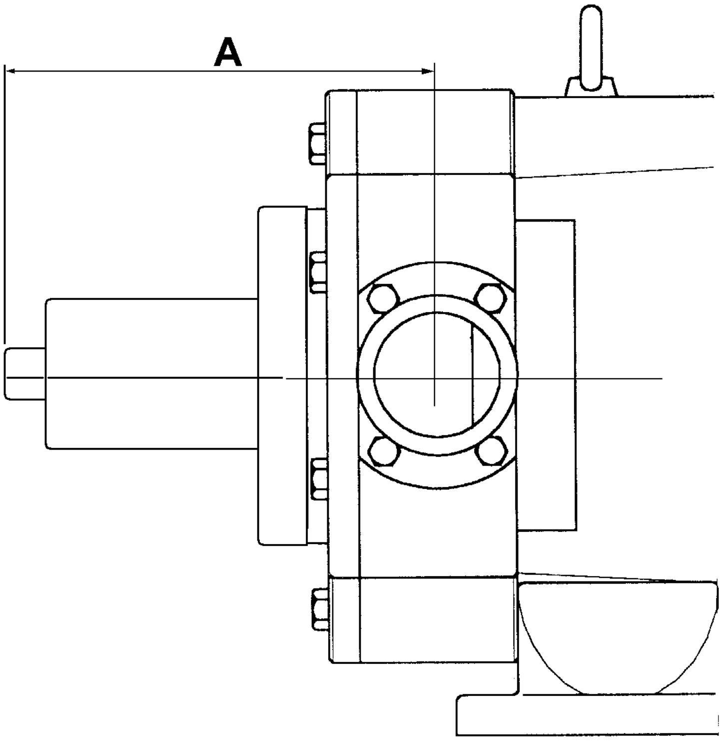
The valve will only work in one direction of flow, a 'Direction of Flow' arrow is attached to the cover. The cover MUST be fitted with this arrow facing in the correct direction. The procedure for setting the opening pressure of the valve is shown in the Installation, Operating and Maintenance Manual.

### Spare Parts

Parts are available as individual items or as a kit of parts (O-ring and Diaphragm)
Refer to Spare Parts data sheets for part numbers.

# 24 Series Lobe Pumps

**02/03**




| Pump | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| Dim A (cm) | 157 | 165 | 191 | 198 | 267 | 276 | 327 | 339 |
| Dim A (inch) | 6.2 | 6.5 | 7.5 | 7.8 | 10.5 | 11 | 12.9 | 13.5 |

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## Port Connections

24 Series are available with a wide variety of port types.

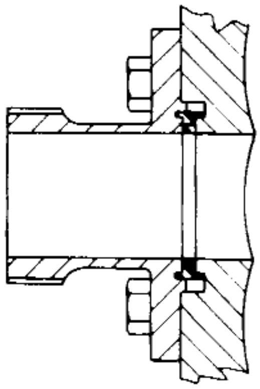


**Fig. 1 - Standard Port**

The S2 pump differs slightly in that the port connection is a BSP INTERNAL THREADED design. Where hygienic connections are required additional port connectors are screwed into this BSP thread. The port connector is sealed at it's base to ensure that no product comes in contact with the BSP thread, thus ensuring maximum cleanliness, See Fig. 2.

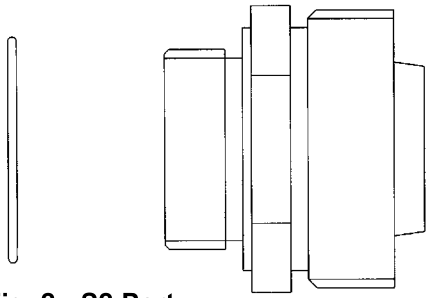


**Fig. 2 - S2 Port**

In many cases (A1 to D1 size pumps) a second size of port is available. This is one size larger than the standard port size and allows the pump to be coupled to larger pipes without the need of adaptor pieces. Thus reducing the installed cost of the pump.

| Port Connection types available for S2 to D2 24 Series Pumps | Ordering Code |
|---|---|
| Tri-Clamp - BS 4825 : Part 3 | 1 |
| Male screwed BS parallel pipe thread to BS 2779 DIN 259, ISO 7/1 : 1982 | 2 |
| ISS/IDF (International Dairy Federation) to ISO 2853 - BS 4825 : Part 4 | 3 |
| RJT ( British Milk) to BS 4825 : Part 5 | 4 |
| 3A Acme Bevel Seat | 5 |
| DIN 11851 | 6 |
| SMS 1146 | 7 |
| NPT male screwed taper pipe thread - ANSI B2.1 | 9 |

For E2 port types see over.

JABSCO

# 24 Series Lobe Pumps

**02/03**

## Port types for S2 to D2 size pumps

| Code | Type | Size | Port Size - Inch or millimetre as appropriate | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | S2 | A1 | A2/B1 | B2/C1 | C2/D1 | D2 |
| 1 | Tri-Clamp | Standard | 1 | 1 | 1½ | 2 | 3 | 4 |
| | | Enlarged | ~ | 1½ | 2 | 3 | 4 | ~ |
| 2 | BSP (male) | Standard | 1 | 1 | 1½ | 2 | 3 | 4 |
| | | Enlarged | ~ | 1½ | 2 | 3 | 4 | ~ |
| 3 | IDF | Standard | 1 (25) | 1 (25) | 1½ (38) | 2 (51) | 3 (76.1) | 4 (101.6) |
| | | Enlarged | ~ | 1½ (38) | 2 (51) | 3 (76.1) | 4 (101.6) | ~ |
| 4 | RJT (British Milk) | Standard | 1 | 1 | 1½ | 2 | 3 | 4 |
| | | Enlarged | ~ | 1½ | 2 | 3 | 4 | ~ |
| 5 | 3A Bevel Seat | Standard | 1 | 1 | 1½ | 2 | 3 | 4 |
| | | Enlarged | ~ | 1½ | 2 | 3 | 4 | ~ |
| 6 | DIN | Standard | 25 | 25 | 40 | 50 | 80 | 4 |
| | | Enlarged | ~ | 40 | 50 | 80 | 100 | ~ |
| 7 | SMS | Standard | 25 | 25 | 38 | 51 | 76 | 4 |
| | | Enlarged | ~ | 38 | 51 | 76 | 108 | ~ |
| 9 | NPT (male) | Standard | 1 | 1 | 1½ | 2 | 3 | 4 |
| | | Enlarged | ~ | 1½ | 2 | 3 | 4 | ~ |

## Port types for E2 pumps only

| Code | Type | Port Size |
|---|---|---|
| 1 | British Standard Flange to B.S 10 Table E | 6 inch |
| 2 | ASA 150lb Raised Face Flange | 6 inch |
| 3 | DIN Flange to DIN 2566 (NP16) | 150 mm |
| 6 | DIN threaded connection to DIN 11851 | 150 mm |

Jabsco

ITT Industries

USA
*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK
*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY
*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

# Temperature-Control Jackets (not E2)

Pumps are available with 2 different types of Temperature Control Jackets. These allow hot water or steam to be piped to the pump to maintain product temperature in the pump or to heat the pump prior to starting. This is used to:

- Prevent product from degrading, separating or crystallising due to cooling in the pump.
- Protect the pump from the risk of starting up full of solidified product.
- Maintain product viscosity in the process to avoid excessive pressures.

Alternatively, cold liquid can be piped through the jacket to counteract heating of product within the pump. This is particularly useful for:

- Steam or hot water aseptic barrier applications where the barrier fluid will add heat to the process.
- Continuous re-circulation applications where the pumping action adds pressure energy to the liquid every time it passes through the pump.

**TYPES OF JACKET :-**

**End Cover Jacket :-**
Use for non critical products

**Pump Head Jackets :-**
Use for products where good temperature control is required

## End Cover Jacket **(Fig. 1)**

The jacket is manufactured from 316 grade stainless steel. It is fitted to the centre of the end cover and offers a low cost option for a moderate control of the pump head temperature. It can be used for products that are of a non-critical nature: i.e. have a wide temperature control band. The jacket does not give good penetration to the shaft seals, this can be accomplished by utilising a flushed seal with a suitable temperature controlled flushing media. Alternatively Pump Head Jackets can be utilised. The jacket liquid never comes into contact with the pumped product, so there is no risk of contamination. The S2 size pump utilises a different variation of end cover jacket. In this case a thicker end cover is used and this cover is drilled through to allow a suitable temperature controlled medium to be passed through these channels.

Application limits are:

Jacket Pressure: 2 bar (30 psi).
Temperature: 130°C (265°F).

| Pump Sizes | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| A | 50 (2") | 58 (2.3") | 62 (2.45") | 69 (2.7") | 84 (3.3") | 96 (3.8") | 102 (4") | 114 (4.5") |
| B | 32 (1.25") | 32 (1.25") | 37 (1.45") | 37 (1.45") | 57 (2.25") | 57 (2.25") | 65 (2.55") | 65 (2.55") |
| (connection size) | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP |

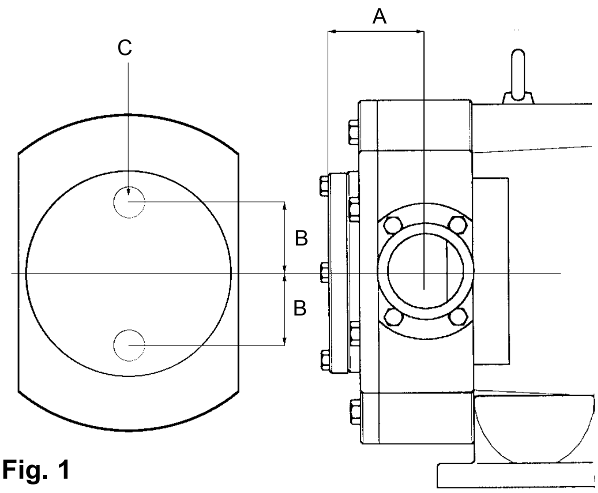



**Fig. 1**

## Pump Head Jackets **(Fig. 2)**

These are fitted to the top and bottom of the end cover and sealed with Viton O-rings. They give good temperature control of the entire pump head. Temperature penetration is superior to conventional ‘saddles’ mounted on the top and the bottom of the rotor case because the temperature is absorbed directly into the rotor case and NOT into the bearing housing (bearing frame). This type of temperature control device can be used for products which require moderately tight control of temperature band. The shaft seal is also temperature controlled to a moderate degree. However, if superior temperature control is required then additional seal flushing with a suitable temperature controlled liquid should be used. The design of the Pump Head Jacket allows installation with an End Cover Relief Valve (if available).

In a similar way to the end cover jackets utilised on the S2 pump, the S2 pump also utilises pump head jackets which are not fitted to the end cover, but are drillings through the rear of the rotor case.

| | |
|---|---|
| Material of Jacket | 316 Stainless Steel |
| Material of O-rings | Viton |
| Temperature | 130ºC (265ºF) |
| Pressure | 2 bar (30psi) |

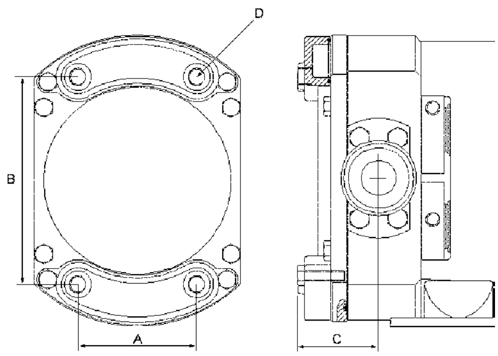



**Fig. 2**

| Pump Size | A1 | A2 | B1 | B2 | C1 | C2 |
|---|---|---|---|---|---|---|
| A | 55 | 55 | 69 | 69 | 81 | 81 |
| B | 148 | 148 | 166.2 | 166.2 | 181.8 | 181.8 |
| C | 53 | 59 | 59 | 67.5 | 74.9 | 95.5 |
| Connection D | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP | ¼ BSP |

* Not available on D & E size pumps

## Installation Procedure

Pumps fitted with any type of jacket should be installed such that air pockets are avoided. This is best achieved by a) individual feed to the lowest point of each jacket, b) feed to the lowest jacket or connection from which feed into the highest jacket should be applied.

Jabsco

ITT Industries

USA

*Jabsco*
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

*Jabsco*
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

*Jabsco GmbH*
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11

## Surface Finishes

24 Series pumps are available with three alternative finishes for all fluid-contact surfaces i.e. rotors, internal surfaces of rotor case and end cover, port bores.

| Finish | Surface Roughness | Approx grit equivalent | Ordering suffix code |
|---|---|---|---|
| Standard Machined | 0.8 $\mu$ Ra (32 microinch) | 150 | none |
| Electropolish | 0.8 $\mu$ Ra (32 microinch) | 180 | Y |
| Mechanical Polish | 0.5 $\mu$ Ra (20 microinch) | 240 | Z |

### Standard Finish

Product contact surfaces are machined to 0.8 micron Ra (32 micro inch). This conforms to the current requirements of US 3A Standard 02-09. This is accepted by many users as adequate for hygienic applications.

### Electropolish Option

Some users, particularly in the pharmaceutical industries, specify electropolish and although the measurable change on surface roughness after electropolishing is small, the effects are:-

a) Rounding and smoothing of surface imperfections - thus reducing the ability of product to adhere to the surface or be damaged by the sharp protrusions on the surface.

b) Cleaning and passivating the surface - improves corrosion resistance and prevents the release of surface impurities into the product.

Components having product-contact surfaces are electropolished all over and therefore give improved external cleanability.

### Mechanical Polish Option

Users requiring the very highest standards of purity can specify mechanical polishing. All product contact surfaces are polished to a surface finish of 0.5 microns Ra, (equivalent to 20 microinches Ra and approximating to 240 grit finish) and then electropolished. The advantages of this are:-

a) Improved cleanability. Due to the virtual elimination of crevices, even micro-biological particles cannot become trapped, i.e. "held up" on the surface during cleaning

b) Less product damage. The removal of the small but sharp surface peaks left by machining operations reduces damage, particularly to cellular products

All product contact surfaces are polished with silicon carbide abrasive. The last grit utilised is 240 grit or finer and results in a surface roughness of 0.5 micron Ra. The polishing process is controlled to remove the minimum amount of material from the component surfaces consistent with achieving the above requirements. Surface contours are maintained and square corners are not rounded thus minimising loss of pump performance. Following mechanical polishing, components are electropolished on all surfaces.

Users should be aware that, although polishing improves the flow through valves, pipes, etc. it reduces the output from a positive-displacement pump when pumping low-viscosity liquids. Polishing increases slippage so the pump needs to be run faster to compensate. This may be undesirable as it can result in greater shear stress and greater shear damage to the liquid. It is possible that the additional shear damage to delicate liquids resulting from the extra slippage can outweigh the benefits of polishing. Also, an unnecessarily large pump may be needed to compensate for the loss of output.

JABSCO®

# 24 Series Lobe Pumps

**02/03**


Jabsco

ITT Industries

USA

***Jabsco***
20 Icon
Foothill Ranch
CA 92610

Tel : +1 949 859 4945
Fax : +1 949 859 1153

UK

***Jabsco***
Bingley Road
Hoddesdon
Hertfordshire, EN11 0BU

Tel : +44 (0) 1992 450 145
Fax : +44 (0) 1992 467 132

GERMANY

***Jabsco GmbH***
Oststrasse 28
22844 Norderstedt

Tel : +49 (0) 40 53 53 73 0
Fax : +49 (0) 40 53 53 73 11





43010-0262

## Manual Cleaning (COP) & Cleaning In Place (CIP)

### Cleaning of Process Equipment

In many applications, not only in the hygienic industries (food, pharmaceutical etc) but also in chemical and industrial duties, fast and effective cleaning is important. Living contaminants such as bacteria and other organisms must not be introduced or allowed to multiply and all traces of fluid must be removed at the end of a batch, process or at product changeover to prevent any intermixing.

### How Clean Is Clean ?

In order to clean a pump or other piece of 'closed' equipment, it must either be dismantled (manual cleaning or Clean Out of Place - COP), or cleaned in place (CIP) as part of the procedure for cleaning the entire process. The higher the standard required, the more sophisticated the cleaning process. The standard (level) of cleaning required depends on the needs of the process. There are four generally recognised levels:

| Level | User's Requirement | Level of Cleaning |
|---|---|---|
| 1 | To prevent intermixing of, for example, paints, dyes, inert chemicals at product change-over. | Visually Clean. Manual cleaning or simple CIP |
| 2 | Food processes for ingredients, pre-pasteurisation,stable foods and short storage life. | Hygienic, with small but acceptable levels of bacteria remaining. Rigourous manual cleaning, or ordinary CIP. |
| 3 | After pasteurisation, medicines, unstable and long shelf-life foods, multi-product chemicals facilities. | Semi (pseudo) sterile. No or almost no micro-organisms remaining in the pump. Can only be achieved with CIP. |
| 4 | Sterile pharmaceuticals manufacture, bio-technology. | Truly sterile. Absolutely no living organisms remaining in the pump, guaranteed every time. CIP followed by SIP (sterilise in place) |

### Cleaning Systems

The type of cleaning system used depends partly on the level of cleaning required but also on what is to be removed. Cleaning, whether mechanical or CIP, depends on a combination of:

| | |
|---|---|
| Chemical Reaction | Detergents, acid, alkalis |
| Scouring Action | Turbulant flow, scrubbing |
| Heat | Hot water |
| Time | Residence time for cleaning liquids in contact |

Organic materials such as oils, fats, proteins need a different system to inorganic materials such as mineral salts. Detergent manufacturers can give advice on the correct use of chemicals and temperature. CIP usually needs a velocity of 1.5 m/sec (5 ft/sec) through the pipeline to achieve the turbulent flow required.

### Choice Of Cleaning Processes

Manual cleaning has the advantage that no special pipework and CIP equipment (tank, heater etc) are needed. But CIP is becoming much more common as there are many advantages of CIP over manual cleaning. The 24 Series range of pumps is designed for manual cleaning and will also achieve Levels 1 & 2 of CIP (see chart opposite).

### Procedure For Manual Cleaning (COP)

See Installation, Operating and Maintenance Manual for procedures to dismantle and re-assemble fluid contact parts. 24 Series pumps are designed to be stripped easily for cleaning manually.

Take care not to scratch or damage pump parts especially seal faces. Do not use steel abrasive wool or brushes on fluid wetted surfaces as particles may become embedded in the surface and cause corrosion.

Use suitable cleaning agents in accordance with their manufacturer's instructions regarding temperatures, dilutions, skin contact precautions and other safety information. Thoroughly clean all fluid contact surfaces and rinse as required. As a minimum it will be necessary to remove the end cover and rotors and stationary seal faces. It should not be necessary to remove the seal rotating seats from the rotors during routine cleaning.

# 24 Series Lobe Pumps

**02/03**

## Procedures For Cleaning In Place (CIP)

Each pump is supplied in a generally clean condition but it is the responsibility of the user to establish suitable cleaning and sterilising regimes appropriate to the fluid and process. These should be implemented before the pump is first used and as often as require thereafter. The following guidelines will help with effective cleaning of 24 Series pumps and minimise risk of damage to the pump.

1. Rinse through system with a suitable liquid, usually water at approximately 50°C (120°F), as soon as possible after completion of process to remove bulk of residues before they dry onto surfaces.

2. If CIP will not be carried out immediately after rinsing, leave pump and system full of rinse liquid.

3. Choose chemical cleaning agents to suit the nature of the contamination to be removed and use them in accordance with manufacturer's recommended dilution, temperature and circulation time but do not exceed 90°C (195°F). Confirm compatibility with pump materials of construction.

4. CIP fluid flow should result in a mean pipeline velocity of at least 1.5 m/sec. (5 ft/sec).

   If using the lobe pump to circulate the CIP fluid, refer to the Performance Data Sheet for pump speed to give required flow, taking account of pressure losses through pipework. Note that all pumps are more susceptible to cavitation when pumping hot liquids. Ensure adequate Net Inlet Pressure available.

   If using a separate pump to circulate CIP fluids, the lobe pump may need to be rotated at a speed sufficiently high to allow the fluid to pass freely through. If sufficient pipe velocity cannot be achieved, fit a by-pass loop to divert excess flow past pump.

   CIP fluid pressures must equal or exceed process pressure at all points in the system to ensure fluid reaches all contact surfaces. It may be necessary to restrict flow in discharge pipework to achieve this but do not exceed differential pressure and temperatures shown on pump Performance Data Sheet. A minimum differential pressure of 1 bar is recommended for effective cleaning.

5. After CIP, rinse through with neutralisers and clean water to remove all traces of cleaning agents. Do not pass cold liquid through pump immediately after hot - allow temperature to change slowly. Failure to observe can result in pump seizure.

This information is provided for guidance only. It is the responsibility of the pump user to satisfy himself that the CIP protocol chosen is adequate to achieve the desired levels of cleanliness and Jabsco cannot accept any responsibility for contamination or loss of pumped fluids.

Jabsco

ITT Industries

| USA | UK | GERMANY |
|---|---|---|
| ***Jabsco***<br>20 Icon<br>Foothill Ranch<br>CA 92610<br><br>Tel : +1 949 859 4945<br>Fax : +1 949 859 1153 | ***Jabsco***<br>Bingley Road<br>Hoddesdon<br>Hertfordshire, EN11 0BU<br><br>Tel : +44 (0) 1992 450 145<br>Fax : +44 (0) 1992 467 132 | ***Jabsco GmbH***<br>Oststrasse 28<br>22844 Norderstedt<br><br>Tel : +49 (0) 40 53 53 73 0<br>Fax : +49 (0) 40 53 53 73 11 |