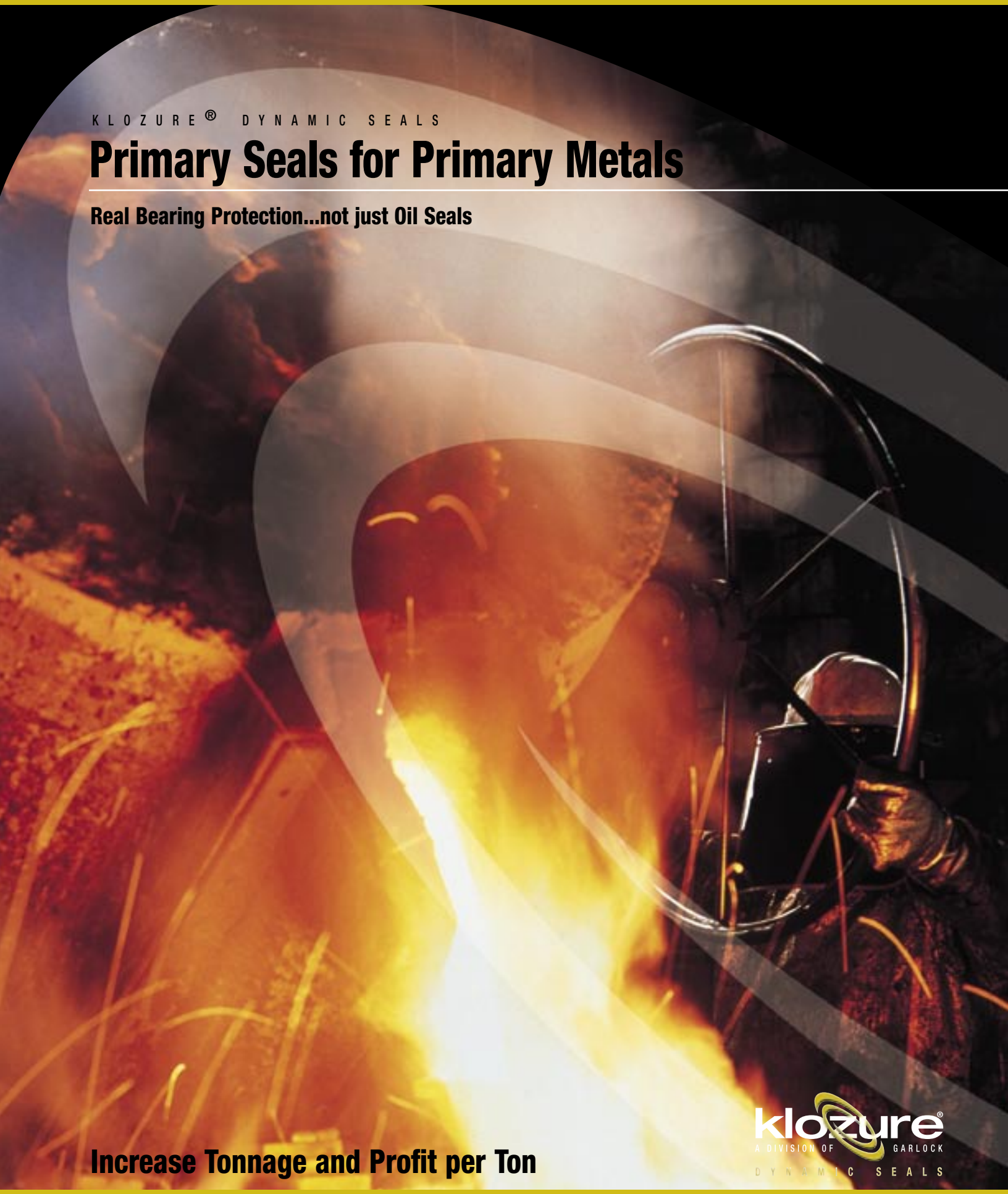
KLOZURE® DYNAMIC SEALS

Primary Seals for Primary Metals

Real Bearing Protection...not just Oil Seals



Increase Tonnage and Profit per Ton

klozure® A DIVISION OF GARLOCK DYNAMIC SEALS

KLOZURE® DYNAMIC SEALS

Oil Seals

Oil Seals	Model	Features	Materials	Temp	Shaft Dia inches (mm)	Surface Speed	Spring Material	Misalign & Runout in.@ fpm (mm @ mps)	Pressure
	23	• General purpose, split seal • Cover plate required • Over 300,000+ sizes, readily available	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V Silicone	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C) -75°F (-59.4°C) to 350°F (176.6°C)	3.000 and up (76.2 and up)	2,000 fpm (10.2 m/s)	Molded-in stainless steel finger	0.010 @ 1,000 (0.25 @ 5.10) 0.005 @ 2,000 (0.13 @ 10.20)	To 7 psi (0.4 bar)
	26	• General purpose seal • Solid or split design • Reverse bevel lip design prevents lip rollover • Reinforced rubber OD • Single and dual lip configurations available	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C)	0.750 to 60.000 (19.0 to 1524.0)	5,000 fpm (25.4 m/s)	Molded-in stainless steel finger	0.015 @ 1,000 (0.38 @ 5.10) 0.010 @ 2,000 (0.25 @ 10.20) 0.008 @ 5,000 (0.20 @ 25.40)	To 7 psi (0.4 bar)
	53/63	• General purpose assembled seal • Heavy-duty metal outer case • Single and dual lip configurations available	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V Silicone	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C) -75°F (-59.4°C) to 350°F (176.6°C)	0.250 to 90.000 (6.4 to 2286.0)	3,000 fpm (15.2 m/s)	Stainless steel finger	0.015 @ 1,000 (0.38 @ 5.10) 0.010 @ 2000 (0.25 @ 10.20) 0.005 @ 3000 (0.13 @ 15.20)	To 7 psi (0.4 bar)
	58	• High-temperature, assembled seal • Heavy-duty metal outer case • THERMO-CERAM™ sealing element • Ideal for abrasive environments • Grease lubricated applications only	THERMO-CERAM™	To 1600°F (871°C)	2.000 to 12.000 (50.8 to 304.8)	500 fpm (2.5 m/s)	N/A	0.015 @ 500 (0.38 @ 2.50)	Ambient
	59	• Severe service assembled seal • Heavy-duty metal outer case • Reverse bevel lip design prevents lip rollover • Aggressive shaft-to-bore misalignment capability	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C)	6.000 to 90.000 (152.4 to 2286.0)	5,000 fpm (25.4 m/s)	Molded-in stainless steel finger	0.093 Max. (2.36)	To 7 psi (0.4 bar)
	64®	• Severe service assembled seal • Heavy-duty metal outer case • Unique carrier/garter spring combination • Industry's highest shaft-to-bore misalignment capability	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V Silicone	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C) -75°F (-59.4°C) to 350°F (176.6°C)	8.000 to 90.000 (203.2 to 2286.0)	7,000 fpm (35.6 m/s)	Combination stainless steel garter & stainless steel finger	0.125 @ 5,000 (3.18 @ 25.40) 0.093 @ 7,000 (2.36 @ 35.60)	To 7 psi (0.4 bar)
	87	• Severe service seal • Metal reinforced rubber OD • Reverse bevel lip design prevents lip roll-over • Agressive shaft-to-bore misalignment capability	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C)	6.000 to 48.000 (152.4 to 1219.2)	5,000 fpm (25.4 m/s)	Molded-in garter	0.100 @ 2,500 (2.54 @ 12.70) 0.050 @ 5,000 (1.27 @ 25.40)	To 7 psi (0.4 bar)
	143	• Face-type, excluder seal • Split design • High-speed service • Stainless steel clamp	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C)	6.000 to 80.000 (152.4 to 2032.0)	5,000 fpm (25.4 m/s)	Stainless steel clamp	N/A	N/A
	145	• Face-type, excluder seal* • Solid design • High-speed service • Several configurations available	MILL-RIGHT® N MILL-RIGHT® ES MILL-RIGHT® V	-40°F (-40°C) to 200°F (93°C) -40°F (-40°C) to 300°F (150°C) -22°F (-30°C) to 400°F (204°C)	7.000 to 80.000 (177.8 to 2032.0)	5,000 fpm (25.4 m/s)	Stainless steel garter	N/A	N/A

* Assembled Width
145 A1= 2.000" ±0.500"
145 A2 = 0.781"±0.156"

KLOZURE® DYNAMIC SEALS

Non-Contact Bearing Isolators & Mechanical Seals

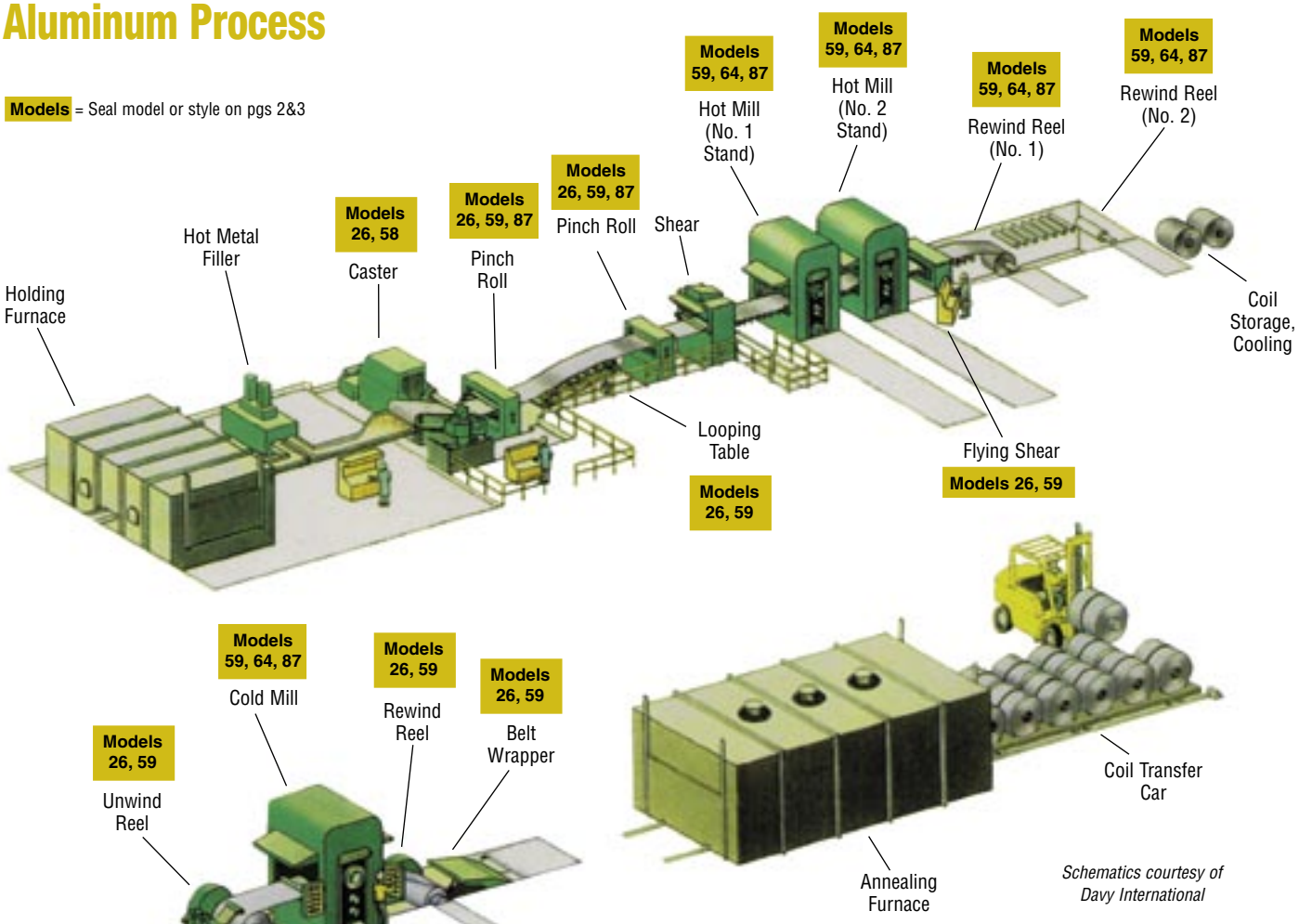
Isolators	Model	Features	Standard Material	Temp	Shaft Dia inches (mm)	Surface Speed	Axial Motion	Misalign & Runout in.@ fpm (mm @ mps)	Pressure
GUARDIAN™ 	GD	• Meets NEMA MG 1-2003 • Surpasses IEEE 841-2001 test standards • Conforms to API 610 • No arbor press required for installation • No internal metal-to-metal contact	• Bronze** construction • Filled PTFE unitizing ring • Fluoroelastomer O-rings standard	-30°F (-34°C) to 400°F (204°C)	0.875 to 10.500* (22.2 to 266.7)	12,000 fpm (60.9 m/s)	± 0.025" (0.64mm)	± 0.020" (0.51mm)	Ambient
ISO-GARD® 	IG	• Excellent chemical resistance • Meets NEMA MG 1-2003 • Meets IEEE 841-2001 test standards • No arbor press required for installation	• FDA-compliant, blue glass-filled PTFE** • Fluoroelastomer O-rings standard	-40°F (-40°C) to 400°F (204°C)	0.875 to 11.000* (22.2 to 279.4)	4,500 fpm (22.9 m/s)	± 0.015" (0.38mm)	± 0.020" (0.51mm)	Ambient
EQUALIZER™ 	EQ	• Excellent chemical resistance • Multi-position capability • No arbor press required for installation • Unique pumping/fanning action	• Graphite-filled PTFE** • Fluoroelastomer O-rings standard	-40°F (-40°C) to 400°F (204°C)	0.875 to 6.000* (22.2 to 152.4)	4,500 fpm (22.9 m/s)	± 0.015" (0.38mm)	± 0.015" (0.38mm)	Ambient
Mechanical Seals		**Features**	**Material**	**Temp**	**Shaft Diam inches (mm)**	**Surface Speed**	**Axial Motion**	**Misalign & Runout In.@ fpm (mm @ mps)**	**Pressure**
GMP-I & II 	GMP-I , GMP-II	• Single or double cartridge seals • Balanced design • Multiple stationary springs • Field repairable	Wide material selection available Consult KLOZURE Mechanical Seals	To 400°F (204°C)	1.000 to 4.000+ (25.4 to 101.6)	To 5,000 fpm (25.4 m/s)	Consult KLOZURE Mechanical Seals	Consult KLOZURE Mechanical Seals	To 300 psi (20 bar) and 28" (711 mm) Hg vacuum
P/S®-II 	P/S-II	• High-pressure, multi-lip cartridge seal • Seals viscous products • Field repairable	Consult KLOZURE Mechanical Seals	To 300°F (148.8°C) Over 300°F consult KLOZURE Mechanical Seals	Consult KLOZURE Mechanical Seals	To 700 fpm (3.5 m/s) dry To 2,500 fpm (12.7 m/s) w/ lubrication	±0.125" (3.2 mm)	Up to 0.005" (0.13 mm) TIR	To 150 psi (10 bar) and 28" (711 mm) Hg vacuum w/ proper design
GPA 	GPA	• Heavy-duty cartridge or component seal • Balanced design • Designed for heavy slurries • Abrasion resistant materials • Special disc spring, no coil spring to clog • Requires no flush	Consult KLOZURE Mechanical Seals	32 to 310°F (0°C to 154°C)	0.788 to 7.000 (20 to 178)	To 3,000 fpm (15 m/s)	Consult KLOZURE Mechanical Seals	Consult KLOZURE Mechanical Seals	To 300 psi (20 bar) and 28" (711 mm) Hg vacuum
3-D Mixer Seal 	3D	• Cartridge design mixer seal • Compensates for extreme shaft movement • Can run dry • Custom designed to fit equipment • Can handle up to 1.000" TIR compression and elongation	Consult KLOZURE Mechanical Seals	To 300°F (148.8°C) Over 300°F consult KLOZURE Mechanical Seals	1.000 to 4.000+ (25.4 to 101.6)	To 700 fpm (3.5 m/s) dry To 2,500 fpm (12.7 m/s) w/ lubrication	To 1.000" (25.4 mm) TAM	Up to 1.000" (25.4 mm) TIR	To 150 psi (10 bar) and 28" (711 mm) Hg vacuum
PK 	PK	• Component seal • Unitized construction • Single spring rubber bellows will not wear shaft or sleeve • Flexible rotary face floats to compensate for misalignment • Fits into shallow stuffing boxes	• 316 stainless steel • Fluoro-elastomer or nitrile bellows	To 400°F (204°C)	0.500 to 3.000 (12.7 to 76.2)	2,500 fpm (12.7 m/s)	Consult KLOZURE Mechanical Seals	Consult KLOZURE Mechanical Seals	150 psi (10 bar) and to 28" (711 mm) Hg vacuum

* For larger sizes, consult KLOZURE Dynamic Seals Engineering ** Other materials available. Please consult KLOZURE Dynamic Seals.

KLOZURE® DYNAMIC SEALS

Aluminum Process

Models = Seal model or style on pgs 2&3



Schematics courtesy of Davy International

Models GD, IG, EQ, GMP-I, GMP-II, P/S-II, PK, 26

Material Recommendations

A wide variety of elastomers are available:

	Usage	Range of Temperature		
		Min. Operating Temp	Max Spike Temp	Max Cont Operating Temp
MILL-RIGHT® N	General purpose	-40ºF (-40ºC)	250ºF (122ºC)	200ºF (95ºC)
MILL-RIGHT® ES	Excellent heat and abrasion resistance	-40ºF (-40ºC)	350ºF (175ºC)	300ºF (150ºC)
MILL-RIGHT® V	Excellent heat and chemical resistance	-22ºF (-30ºC)	450ºF (232ºC)	400ºF (205ºC)
Silicone	Wide temperature range	-75ºF (-60ºC)	400ºF (205ºC)	350ºF (175ºC)
PTFE	Superior chemical resistance	-120ºF (-85ºC)	450ºF (232ºC)	400ºF (205ºC)
THERMO-CERAM™	Ultra high-temp to 1600°F (871°C)			1600ºF (871ºC)

Other Equipment

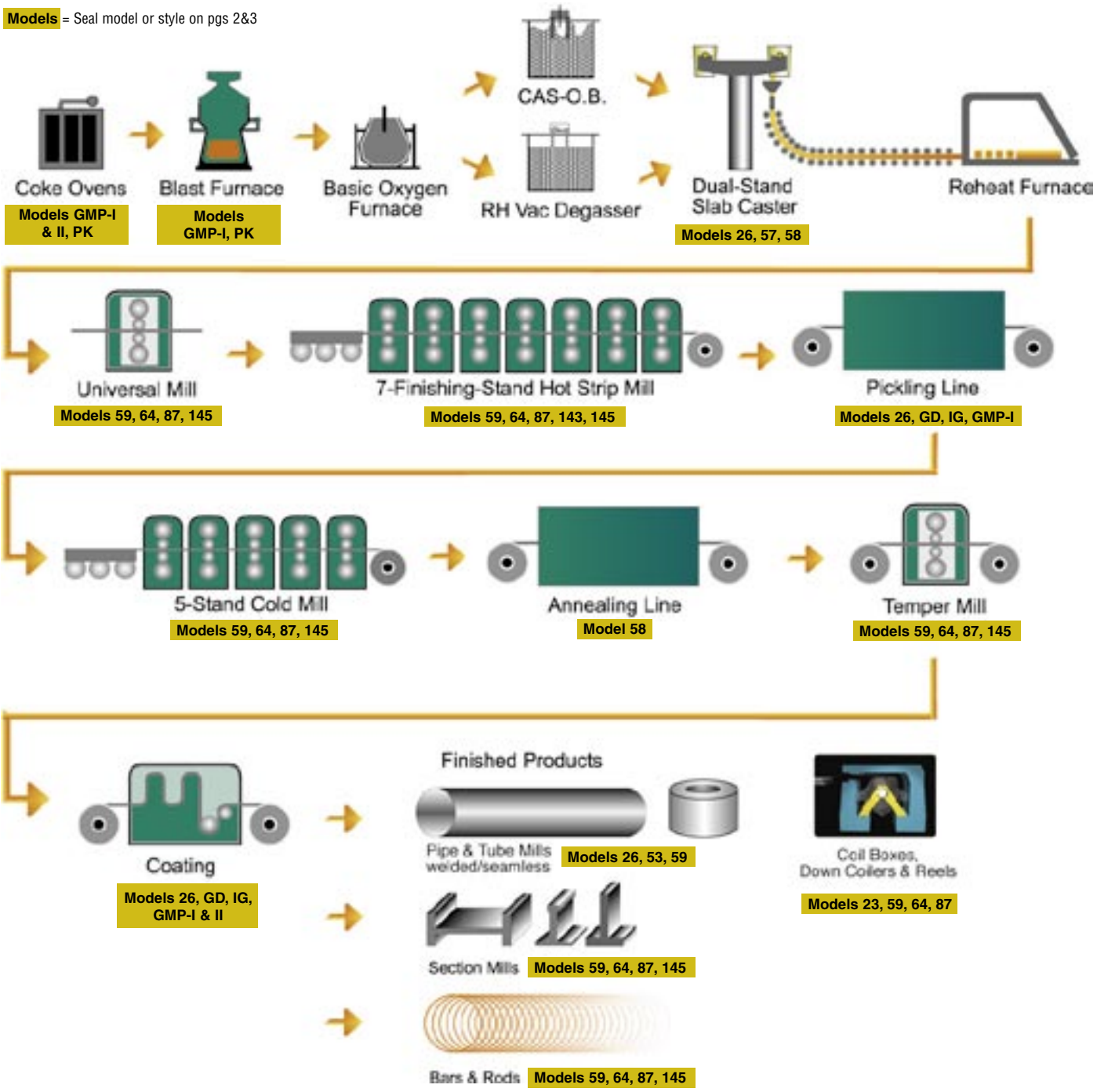
		Seal Materials					
		MILL-RIGHT® Family	SILICONE	PTFE	Filled PTFE	THERMO-CERAM™	Bronze
Furnace Table Rolls	Model 58		N/R			●	
Run Out Table Rolls	Model 26 & GUARDIAN™	●	N/R		●		●
Gearboxes	Model 26	●	N/R				
Motors	ISO-GARD® & GUARDIAN™		N/R	●			●
Pumps	ISO-GARD® & GUARDIAN™		N/R	●			●
Drive Systems	Model 26	●	N/R				

*N/R: Not recommended for service

KLOZURE® DYNAMIC SEALS

Steel Process

Models = Seal model or style on pgs 2&3



Models GD, IG, EQ, GMP-I, GMP-II, P/S-II, PK, 26

KLOZURE® DYNAMIC SEALS

General Engineering Data Tables

Table 1 - Shaft Data

Hardness	Rockwell C 30 to 40 (Rockwell C 45 minimum will provide extra protection against damage during handling or assembly)
Finish (Plunge grind is recommended as most satisfactory)	10-20 μin. RA (0.25-0.50 μm) with no machine lead, scratches, dents, corrosion, pits or other surface defects
Surface speed	Formula: Feet-Per-Min. = Shaft Dia. (in) x RPM x 0.262 Meters-Per-Sec. = Shaft Dia. (mm) x RPM x 0.0000524
Safe speed depends on*	1. Shaft finish 2. Misalignment and runout 3. Amount and kind of lubricant 4. Seal design 5. Pressure

* As shaft speed increases, the factors become more critical.

Table 2 - Operating Pressure Limits

Shaft Speed		Maximum* Pressure	
f/m	m/s	psi	kp (bar)
0 - 1000	0 - 5.1	7	48 (0.48)
1001 - 2000	5.2 - 10.2	5	35 (0.35)
2001 & Up	10.3 & Up	3	21 (0.21)

* Split KLOZURE® Oil Seals are not recommended for applications involving fluid pressure

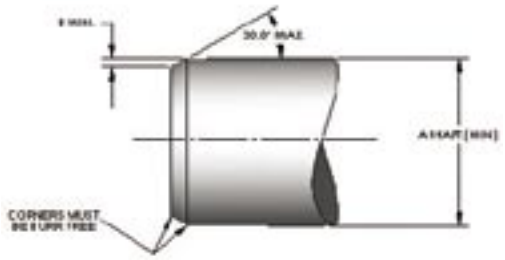
Table 3 - Shaft Diameter Tolerances

Shaft Diameter		Recommended Tolerance	
inch	mm	inch	mm
Up to 4.000	Up thru 101.60	± 0.003	± 0.08
4.001 - 6.000	101.61 - 152.40	± 0.004	± 0.10
6.001 - 10.000	152.41 - 254.00	± 0.005	± 0.13
10.001 & Up	254.01 & Up	± 0.006	± 0.15

Table 4 - Bore Tolerance

Bore Diameter	Bore Tolerances
inches (mm)	inches (mm)
Up to 2.000 (50.8)	± 0.001 (± 0.0254)
2.001 to 3.000 (50.8 to 76.2)	± 0.001 (± 0.0254)
3.001 to 5.000 (76.2 to 127)	± 0.0015 (± 0.0381)
5.001 to 7.000 (127 to 177.8)	± 0.0015 (± 0.0381)
7.001 to 12.000 (177.8 to 304.8)	± 0.002 (± 0.0508)
12.001 to 20.000 (304.8 to 508)	± 0.003 (± 0.0762)
20.001 to 40.000 (508 to 1016)	± 0.004 (± 0.1016)
40.001 to 60.000 (1016 to 1524)	± 0.006 (± 0.1524)

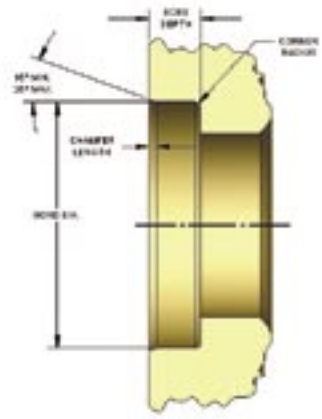
Table 5 - Recommended Shaft Lead Corner



A - Shaft Diameter		B - Minimum*	
inch	mm	inch	mm
Thru 0.394	Thru 10.00	0.030	0.75
0.395 - 0.787	10.01 - 20.00	0.040	1.00
0.788 - 1.181	20.01 - 30.00	0.050	1.25
1.182 - 1.575	30.01 - 40.00	0.060	1.50
1.576 - 1.969	40.01 - 50.00	0.070	1.75
1.970 - 2.756	50.01 - 70.00	0.080	2.00
2.757 - 3.740	70.01 - 95.00	0.090	2.25
3.741 - 5.118	95.01 - 130.00	0.110	2.75
5.119 - 9.449	130.01 - 240.00	0.140	3.50
9.450 & Up	240.01 & Up	0.220	5.50

*If a shaft lead-in radius is used, maintain the diametral difference to no less than indicated value

Table 6 - Housing Bore Dimensions



Nominal Seal Width		Chamfer Length		Max. Housing Corner Radius	
inch	mm	inch	mm	inch	mm
Thru 0.394	Thru 10.00	0.03-0.04	0.7-1.0	0.020	0.50
Over 0.394	Over 10	0.05-0.06	1.2-1.5	0.030	0.75

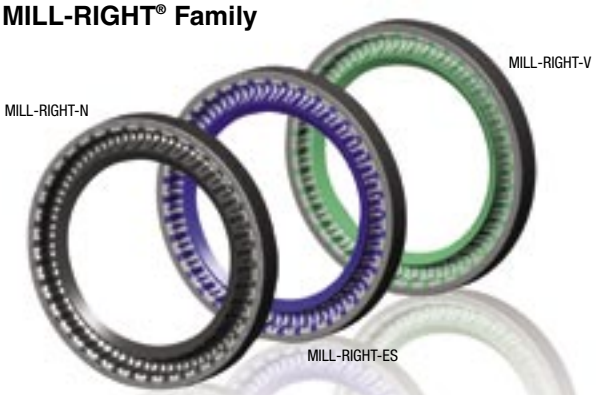
Source: Rubber Manufacturers Association

KLOZURE® DYNAMIC SEALS

New Technology

Oil Seals

MILL-RIGHT® Family



- Better wear resistance
- Longer life
- Wide temperature range
- Color coded materials

Mechanical Seals

Tinning Line Seals

- Hard faces resist abrasion from metal fines
- Engineered to withstand coating line chemicals
- Large single ring accomodates high axial movement
- Various designs available to accomodate different equipment geometries and fluid chemistries
- Designed to work with metal and coated shafts

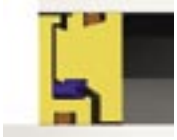
Bearing Isolators

GUARDIAN™ Family Additions

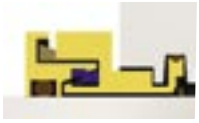
Small Cross Section
29607

Vertical
29620

Narrow Width
29609



Split Pillow Block
29616

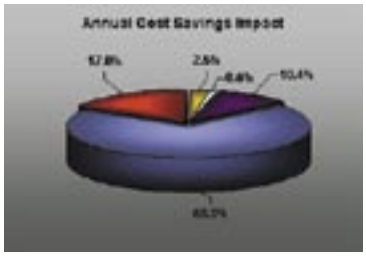


Flangeless
29619

Step Shaft
29697

Documented Value with PROPHET® Software

Garlock elevate your profits Prophet



Utilizes Most Effective Technology to lower:

- Production losses
- Downtime costs
- Equipment repair expenditures
- Spare parts inventories
- Excess labor costs
- Costly power consumption

AUTHORIZED DISTRIBUTOR

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Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability.
For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury.
Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing.
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