

Sealing Integrity for Primary Metals



Garlock
an EnPro Industries family of companies





Meeting and exceeding your most rigorous sealing requirements.

The demands of aluminum and steel processing take their toll on machinery. Extreme temperatures and high levels of contamination, if not properly addressed, will have a negative effect on equipment and productivity.

When down time is not an option, the Garlock family of companies provides sealing products that focus on the extreme requirements of the metals industry. Garlock seals are specifically designed and meticulously constructed to withstand extreme pressures and temperatures. Durable, reliable and high-performing, our products help to improve efficiency, lengthen bearing life and reduce maintenance time and costs. The result is greater productivity, increased efficiency and improved profitability.



*A culture of **safety.***

The Garlock family of companies is acknowledged as the global leader in high-performance fluid sealing products, committed to a culture of safety-- making the world safer, sustainable and more reliable.

Our commitment to safety stems from our workplace culture and dedication to sealing integrity. We embrace safety not only for our employees, but for all of our customers as well. Our sealing products and solutions are tested to meet or exceed industry and regulatory agency standards. That's a standard that defines who we are, and what Garlock stands for.





As a primary metals expert, your mission is to optimize output and cost per ton. Garlock sealing products and solutions help make your operations safer, minimize down time, and comply with industry regulations. Our expertise in design and engineering enable us to become trusted advisors for the aluminum, steel and ancillary equipment sectors.

It is important to have a work force trained and ready to handle any situation. Along with the hundreds of sealing products and options for the primary metals industry, Garlock can provide you and your team the training necessary in order to properly install sealing products and help troubleshoot where necessary.

Sealing products for the *primary metals* industry.

Sealing solutions engineered to withstand extreme temperatures and resist corrosion from contact with aggressive materials. They provide safety and reassurance when working with sensitive, hazardous and unstable chemicals.





MILL-RIGHT[®] N, ES and V materials *keep you running.*

When up-time in your plant is critical, trust the MILL-RIGHT[®] family of elastomer materials to keep you running. Each of the MILL-RIGHT[®] materials has been specifically engineered to have the highest abrasion resistance and lowest wear of any seal in the industry. This translates directly to higher equipment efficiencies, longer bearing life, increased production and less maintenance.



MILL-RIGHT[®] N
(NBR) Black

MILL-RIGHT[®] ES
(HNBR) Blue

MILL-RIGHT[®] V
(Fluoroelastomer) Green

The MILL-RIGHT[®] family of elastomer materials offer breakthrough abrasion and wear properties for extended service life. Also offer improved chemical resistance, low coefficient of friction for less heat generation and lower power consumption. These are available on all elastomeric Garlock Klozure[®] oil seal designs.



23

Model 23

Model 23 is your repair-in-place sealing solution for your primary metals application. It is a split seal that allows for easy installation, and results in a short MTTR. Because of the molded-in finger spring, spring dumping is prevented. Material selection includes MILL-RIGHT® N, ES and V as well as silicone and shaft diameters of 3" (76.2mm) and up.



26

Model 26

Model 26 is a fabric reinforced seal offered in both solid or split design configurations. A reverse bevel lip design prevents lip rollover, and has a reinforced rubber OD. A molded-in finger stainless steel finger spring prevents spring dumping and equipment damage. Material selection includes MILL-RIGHT® N, ES and V and shaft diameters of 0.750" (19 mm) to 60" (1524 mm).



53

Model 53/63

Models 53 and 63 offer a configuration built with MILL-RIGHT® materials to provide the highest abrasion resistance, lowest wear, and exceptional chemical and temperature resistance. Both models offer a heavy-duty metal outer case, with mechanically retained finger spring and are available in single and dual lip configurations. Material selection includes MILL-RIGHT® N, ES and V as well as Silicone and shaft diameters of 0.250" (6.4 mm) to 90" (2286 mm).



57

Model 57

Model 57 is a specialty seal with a metal reinforced outer diameter. A molded in finger spring and reverse bevel lip design that prevents lip rollover. It is available in single and double lip configurations, and is ideal for slow-speed service applications such as continuous casters.



58

Model 58

Model 58 is recommended for high-temperature applications, rotating, reciprocating service, spherical bearings, tapered roller bearings and similar applications. Offering a heavy-duty metal outer case and THERMO-CERAM™ or carbon filament materials make this seal a fit for your application. Shaft diameters offered from 2" (50.8 mm) to 12" (308.4 mm).



59

Model 59

Model 59 is a severe service assembled seal that has a heavy duty metal outer case, a molded-in finger spring and a reverse bevel lip design that prevents lip rollover. The Model 59 has aggressive shaft-to-bore misalignment capability allowing dependability for longer bearing life, increased productivity and less maintenance. Material selection includes MILL-RIGHT® N, ES and V and shaft diameters of 6.000" (152.4 mm) to 90" (2286 mm).



64

Model 64®

Model 64® is an aggressive seal that survives in severe service. Manufactured with a heavy-duty metal outer case and the original carrier/garter spring configuration, Model 64 is ideal for your aggressive application. This seal also offers the industry's highest shaft-to-bore misalignment capability. Material selection includes MILL-RIGHT® N, ES and V as well as Silicone and shaft diameters of 8" (203.2 mm) to 90" (2286 mm).



87

Model 87

Model 87 is an oil seal that you can depend on for longer bearing life, increased productivity and less maintenance. Offering a metal reinforced rubber OD, a reverse bevel lip design that prevents lip rollover, the Model 87 is ideal for your metal application. Material selection includes MILL-RIGHT® N, ES and V and shaft diameters of 6" (152.4 mm) to 48" (1219.2 mm).



143

Model 143

Model 143 is a split face-type excluder seal designed to keep contamination out. It is ideal for high speed service, and has a stainless steel clamp to affix the seal to the shaft. Available in MILL-RIGHT® N, ES, and V configurations. Material selection includes NBR and FKM and shaft diameters of 6" (152.4 mm) to 80" (2032 mm).



145

Model 145

Model 145 is a face-type excluder seal designed to keep contamination out. It has a solid design ideal for high-speed service. Several design configurations are available and offered with materials of NBR and FKM. Shaft sizes ranging from 7" (177.8 mm) to 80" (2032 mm).



P/S-I

P/S®-I Single Lip

The P/S-I seal is manufactured with a GYLON® element that provides excellent chemical resistance. The PS-1 is designed for high-pressure (150 psi) service and can operate in non-lubricated applications up to 800fpm.



GUARDIAN™
 GUARDIAN bearing isolators offer exceptional bearing protection for pumps, motors, and bearing supported industrial equipment under the harshest conditions. The engineered labyrinth design excludes liquid and solid contamination while retaining bearing lubrication. The GUARDIAN extends bearing life by retaining bearing lubrication and excluding contamination to IP56 levels for some designs.



Split GUARDIAN™
 When uptime and mean time to repair (MTTR) are your primary concerns, the Split Isolator is your only real choice. Rigging and maintenance is very costly, the Split GUARDIAN can save thousands of dollars in maintenance due to the unique split design. Non-contact engineered labyrinth designs reduce shaft drag, using 97% - 99% less energy vs. contact lip seals.



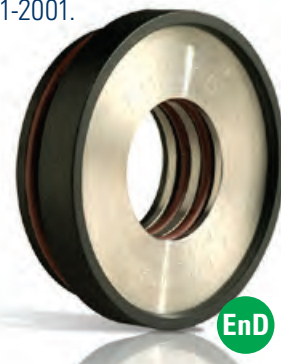
Split GUARDIAN™ for Split Pillow Block Housings
 Solid and split GUARDIANs™ can be used for standard and custom pillow block designs. Offering you the egress protection you are looking for, and a PTFE unitizing ring preventing the seal from metal-to-metal contact between rotor and stator. If mean time to repair (MTTR) is a primary concern, the Split GUARDIAN is the best choice. Bronze construction conforms to API 610, and its performance meets NEMA MG 1-2003 as required in IEEE 841-2001.



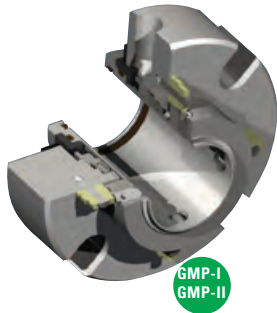
ISO-GARD®
 ISO-GARD bearing isolators provide excellent chemical resistance within a wide temperature range making it suitable for bearing protection in many applications. Its press fit design allows for ease of installation and with no tools required, reducing production downtime and saving maintenance costs.



SGi™
 The Garlock SGi incorporates the proven GUARDIAN™ technology with the only maintenance-free shaft voltage mitigation technology, the AEGIS™ SGR. The SGi protects motor bearings from EDM, electronic discharge machining, caused by VFD, variable frequency drive, induced shaft voltage. Compliant with safety and industry manufacturing standards. Surpasses IEEE 841-2001 Standards. IP 55-56 rating per NEMA MG 1-2003.



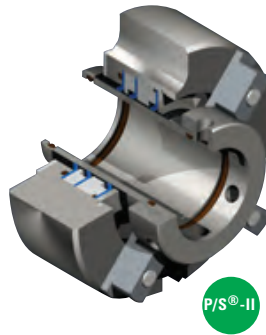
EnDuro™
 EnDuro is the first and only bearing isolator designed for oil mist and flooded conditions. EnDuro handles a range of lubrication conditions including submerged, flooded, oil mist, grease packed, and dry running that may be present in gearboxes, pumps, motors, split pillow block housings, other general bearing supported industrial equipment. The engineered labyrinth design and patent pending internal lip design excludes liquid and solid contamination while retaining bearing lubrication.



GMP-I
GMP-II

GMP-I & II

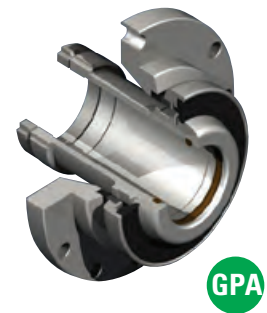
As the GMP-I is a single seal, the GMP-II is a double seal ideal for your primary metal application. The GMP is equipped with multiple stationary springs and is field repairable. It fits shaft diameters of 1.0" (25.4mm) to 4.0" (101.6mm) and can accommodate pressures up to 300 psi (20 bar). GMP-I and II can also withstand temperatures up to 400° F (204°C) and vacuum of 28" (711mm) of Hg.



P/S®-II

P/S®-II Multi-Lip Seal

The P/S®-II Multi-Lip Seal is a high pressure, multi-lip cartridge seal that seals viscous products in primary metals applications. It is field repairable saving time and money. The P/S®-II Multi-Lip Seal is ideal in pressures up to 150psi (10 bar) and vacuums of 28" or 711 mm of Hg. It also can withstand temperatures up to 300°F (149°C).



GPA

GPA

The GPA Slurry Seal is best to handle heavy slurries and has a special disc spring that does not clog as compared to coil springs. The GPA seal requires no flush and is ideal in 300 psi (20 bar) or less pressure applications. It can withstand temperatures ranging from 32°F to 310°F (0°C to 154°C) and is ideal for shaft diameters of 0.788 inches (20mm) to 7.0 inches (178mm).



PK

PK Seal

The PK Seal is a component seal with unitized construction. The single spring rubber bellows will not wear on the shaft or the sleeve and has a flexible rotary face that floats to compensate for misalignment. The PK Seal also fits into shallow stuffing boxes and fits on shafts with diameters of 0.5" (12.7mm) to 3.0" (76.2mm). It is ideal in pressures up to 150 psi (10 bar), vacuums of 28" Hg (711mm) and temperatures to 400°F (204°C).



Syn

Syntron®

Syntron RP Mechanical Shaft Seals are designed to eliminate the leakage of gases and fluids around the rotating shafts of pumps, compressors, mixers and similar equipment. RP Shaft Seals are compact, cartridge-type double seals. All working parts are enclosed within a metal housing. The sealing unit consists of two sets of sealing rings, one located at either end of the housing. The seal can be installed inside the stuffing box or clamped on the outside of the housing, since it seals in either direction. Performs well at 150psi (10 bar), 300°F (149°C) and shaft diameter of 0.5" (12.70mm) to 3.93" (100.10 mm)



THERMO-CERAM™
 THERMO-CERAM™ is a true ceramic material suitable for super-high temperature service to 2,300°F (+1260°C). Available in cloth, tape and tubing, it has excellent resistance to thermal shock, mechanical vibration and stress and has more tensile strength at elevated temperatures. Perfect for furnace door gaskets.



Style 98
 Manufactured from high purity (95+ carbon assay) premium carbon staple yarn. Individual yarns are single-end coated and single-end dried prior to braiding with high temperature non-petroleum based lubricant with graphite dispersion. Ideal for pumps or valves.



Style 1303-FEP
 Style 1303-FEP is manufactured from a proprietary yarn consisting of several strands of high purity GRAPH-LOCK® contained by an INCONEL filament jacket. This INCONEL wire filament is only 0.004" diameter, making the finished braid non-scoring and thermally conductive. Is in compliance with the most stringent VOC and VHAP emissions regulations.



Packmaster 6
 This flexible shock resistant packing has excellent chemical resistance and can stand up in a wide range of rotary applications.



Style 5889 PTFE Packing
 A continuous filament PTFE fiber. Style 5889 is a dimensionally stable yet relatively soft and flexible packing. Treated with PTFE dispersion and an inert ingredient, it's an excellent choice for high speed rotary shaft service in most volatile applications. Pre-shrunk to avoid packing wear and shaft scoring, Style 5889 is also very non-porous. It's often found in sump pumps, chlorinators, alkaline softeners, strong acid situations, coke plant hot oil pumps, reciprocating rods, rams and plungers.



Thermo-Sil™ Silica Braided Rope
 This product is manufactured from high quality amorphous silica filament that is rated to 1,850°F (1,000°C) suitable for static sealing and insulation. Benefits include thermal protection and insulation along with having excellent resistance to chemicals. Available in custom sizes and packaging.



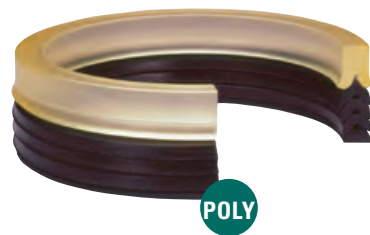
CHEVRON® V-Ring Packing
CHEVRON® V-Ring Packing with a multiple lip, hinged design responds automatically to system pressure for a superior seal. Available in a range of materials.



Style 9220 GARTHANE® U-Seal
Style 9220 GARTHANE® U-seals have high tensile strength and tear resistance to withstand a wide range of temperatures, pressures and chemicals.



Roll Balance
Roll Balance sets combine a GARTHANE® U-seal or CHEVRON® set with a diagonal cut ring to reduce side loading and minimize extrusion.



Polytop Engineered Set
Polytop engineered sets combine CHEVRON® and U-seal packing for ultimate performance.

STATIC SEALS: Gasket Products



3000

BLUE-GARD® Style 3000 Gasket

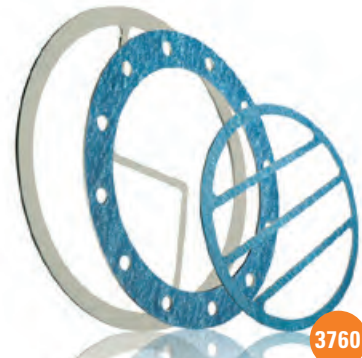
A gasket composed of aramid fibers with NBR binder, style 3000 is ideally suited for a variety of industrial applications. Its unique blend of fibers, fillers, and rubber binders provides excellent sealability with improved torque retention that can drastically reduce emission levels.



3545

GYLON® Style 3545 Gasket

Our innovative Style 3545 offers a tighter seal by highly compressible PTFE outer layers sealing under low bolt load which is suitable for many non-metallic flanges. The pure PTFE makeup withstands a wide range of chemicals and can easily be cut from larger sheets, reducing inventory costs and downtime.



3760

MULTI-SWELL® Style 3760 Gasket

Creating compressive load in light weight flanges in oil and water services, this gasket will seal where most others will not. MULTI-SWELL® performs well in flanges that might crush an elastomer gasket and is easy to cut and handle.



TP

THERMa-PUR™ Style 4122 Gasket

THERMa-PUR™ is a proprietary new gasketing material designed for use in high temperature sealing applications. It is produced using an environmentally friendly solvent-free process and combines a unique formulation with a patent-pending core.



CMG

THERMa-PUR™ Style 4122-FC CMG Gasket

Part of the THERMa-PUR™ family, the Style 4122-FC is a metal gasket offering the same values and benefits of the other THERMa-PUR™ family of products.



Kamm

THERMa-PUR™ Style 4122-KAMM Gasket

The THERMa-PUR™ Kamm profile gasket carries the same properties as the THERMa-PUR™ gasket family, however can match the flange rating for pressure and P_xT. An extreme gasket for extreme applications.



SW

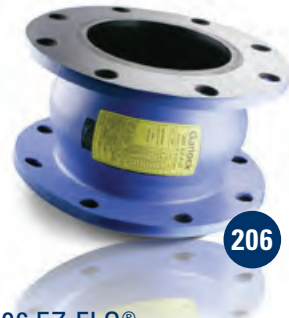
THERMa-PUR™ Spiral Wound

The THERMa-PUR™ spiral wound gasket is designed for use in extreme temperature and aggressive chemical applications. It is manufactured using an environmentally friendly solvent-free process and combines a unique formulation with Garlock's traditional quality.



GARFLEX® Style 8100

GARFLEX® expansion joints feature rugged yet flexible nylon cord reinforcement in a molded, spherical bellows design that ensures an exceptional burst pressure rating. The streamlined flowing arch design reduces turbulence and allows smooth, quiet flow—no need to fill the arch and restrict its movement.



Style 206 EZ-FLO®

EZ-FLO® expansion joints contain a single wide flowing arch, eliminating the need for filled arches on slurry services. Garlock EZ-FLO® expansion joints have successfully served all major industries, including pulp and paper, steel, waste and water, HVAC, power generation, chemical, petrochemical and marine.



Garlock ONE-UP® Diaphragm

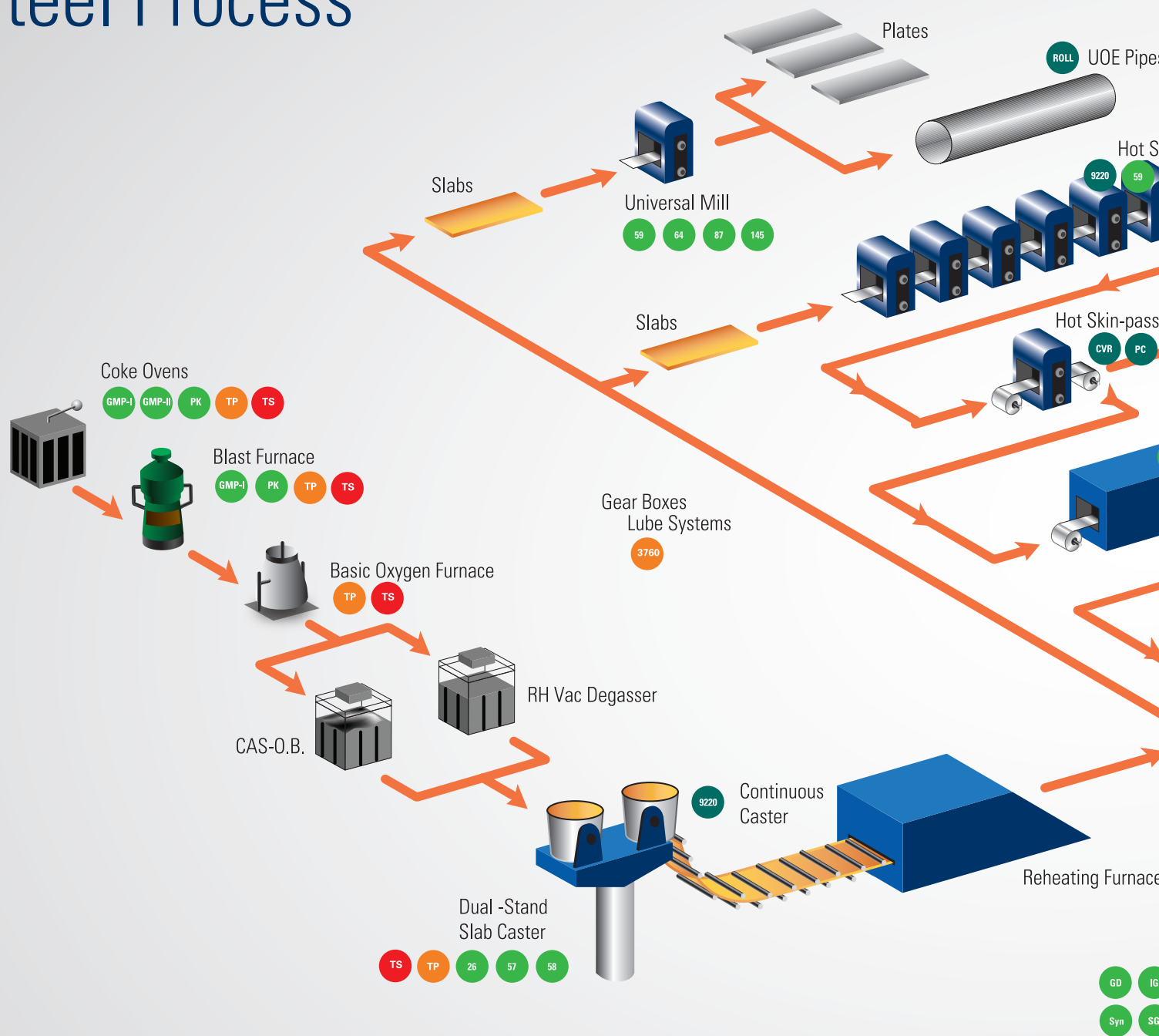
GARLOCK ONE-UP® pump diaphragms, containing high performance PTFE GORE® sheet on the wetted side, are a significant advancement over conventional PTFE diaphragms. Considerably stronger, with greater flex life, they provide a dramatic improvement in service life. Satisfaction guaranteed, or purchase price refunded.



GAR-SEAL Valve

GAR-SEAL valves are used extensively where corrosive, abrasive and toxic media need to be reliably controlled. They are used typically in acute control, throttling and shut-off duties in the chemical, petrochemical, chlorine, paper, electroplating, metals, and other industries.

Steel Process



Hydraulic Seals

- CVR** CHEVRON® V-Ring packing
- 9220** Style 9220 GARTHANE® U-seals
- PC** Piston cups
- POLY** PolyTop engineered sets
- ROLL** Roll balance sets

Gasket Products

- TP** THERMa-PUR™
- Kamm** THERMa-PUR™ Kammprofile
- CMG** THERMa-PUR™ CMG
- SW** THERMa-PUR™ Spiral Wound
- 3000** BLUE-GARD® Style 3000
- 3760** MULTI-SWELL® Style 3760
- SS** STRESS SAVER®
- 3545** GYLON® Style 3545

Expansion Joints

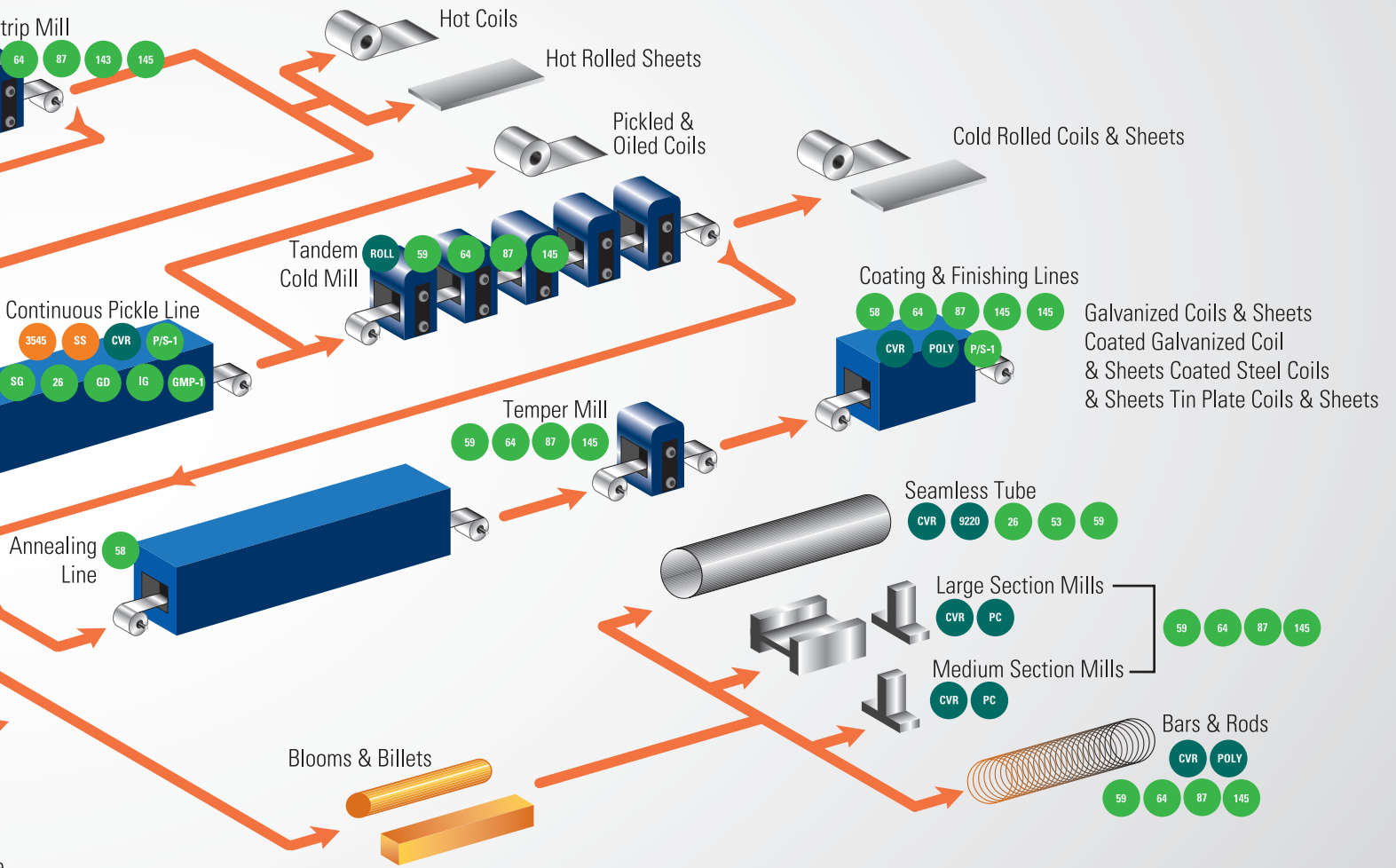
- 8100** Style 8100
- 206** Style 206 EZ-FLO®

Diaphragm Products

- ONE** Garlock ONE-UP® Diaphragm

Valves

- GAR** GAR-SEAL Valve



Ancillary Equipment

- EQ, GMP-I, GMP-II, P/S-I, PK, 26, MT-II, SGi, EnD
- PB, ONE, GAR, TC, 98, 1303, Pac6, 5889, TS



Piping Systems



Klozure® Dynamic Seals

Oil Seal Models

- 23, 64, 26, 87, 57, 145, 58, PS-I, 59

Mechanical Seals

- GMP-I, GMP-II, P/S-II, PK, Syn Syntron®

Bearing Isolators

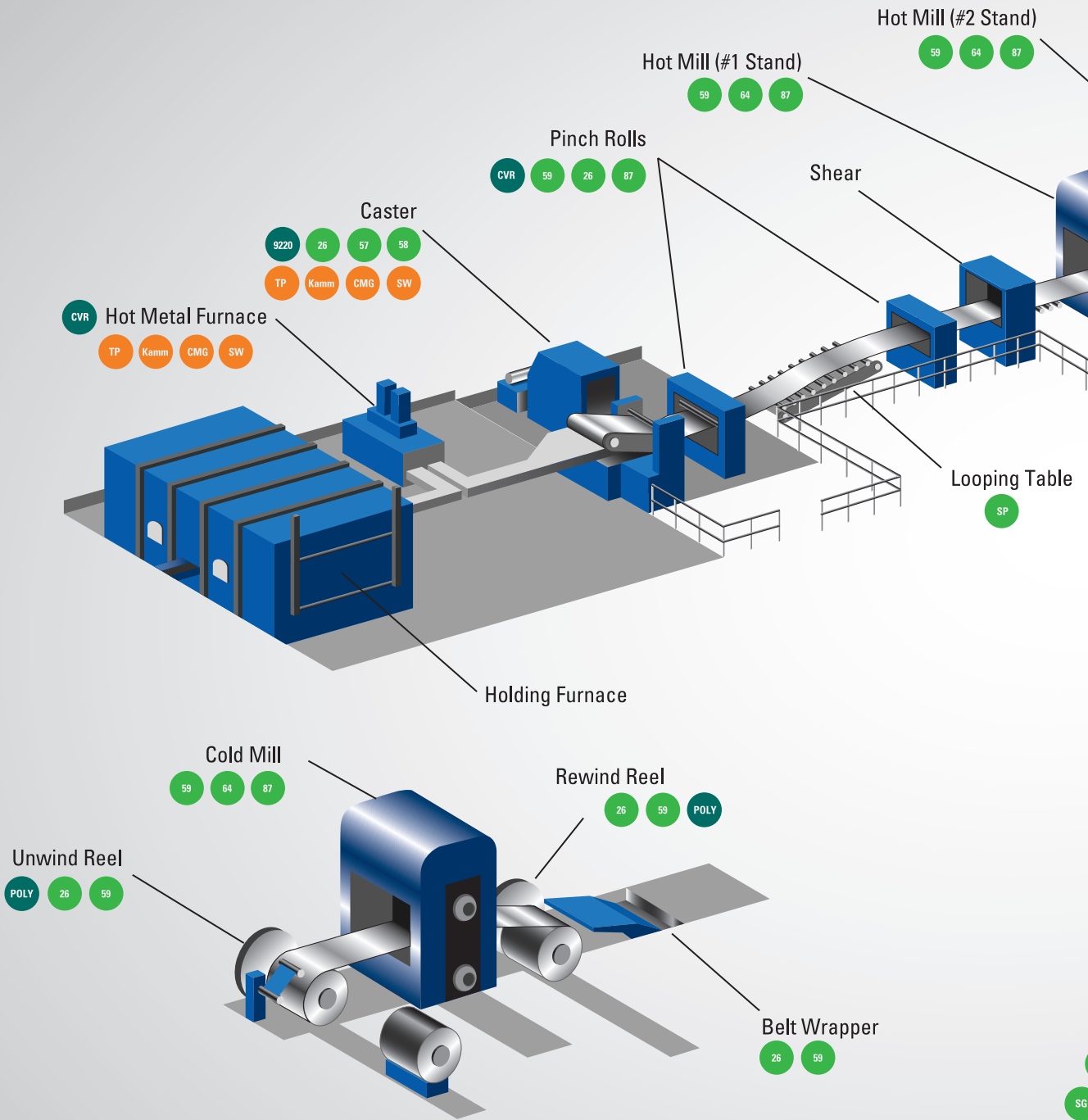
- GD Guardian®, SG Split Guardian®, PB Split Guardian® Pillow Block, IG Iso-Gard®, EQ Equalizer®

- SGi SGi, MT-II Micro-Tec®-II, EnD EnDuro™

Compression Packing

- TC THERMO-CERAM™, 98 Style 98, 1303 Style 1303 FEP, Pac6 Packmaster 6, 5889 Style 5889 PTFE, TS Thermo-Sil™ Silica Braided Rope

Aluminum Process



Hydraulic Seals

- CVR** CHEVRON® V-Ring packing
- POLY** PolyTop engineered sets
- 9220** Style 9220 GARTHANE® U-seals

Valves

- GAR** GAR-SEAL Valve

Klozure® Dynamic Seals

Oil Seal Models

- 23, 59
- 26, 64
- 57, 87
- 58, 145

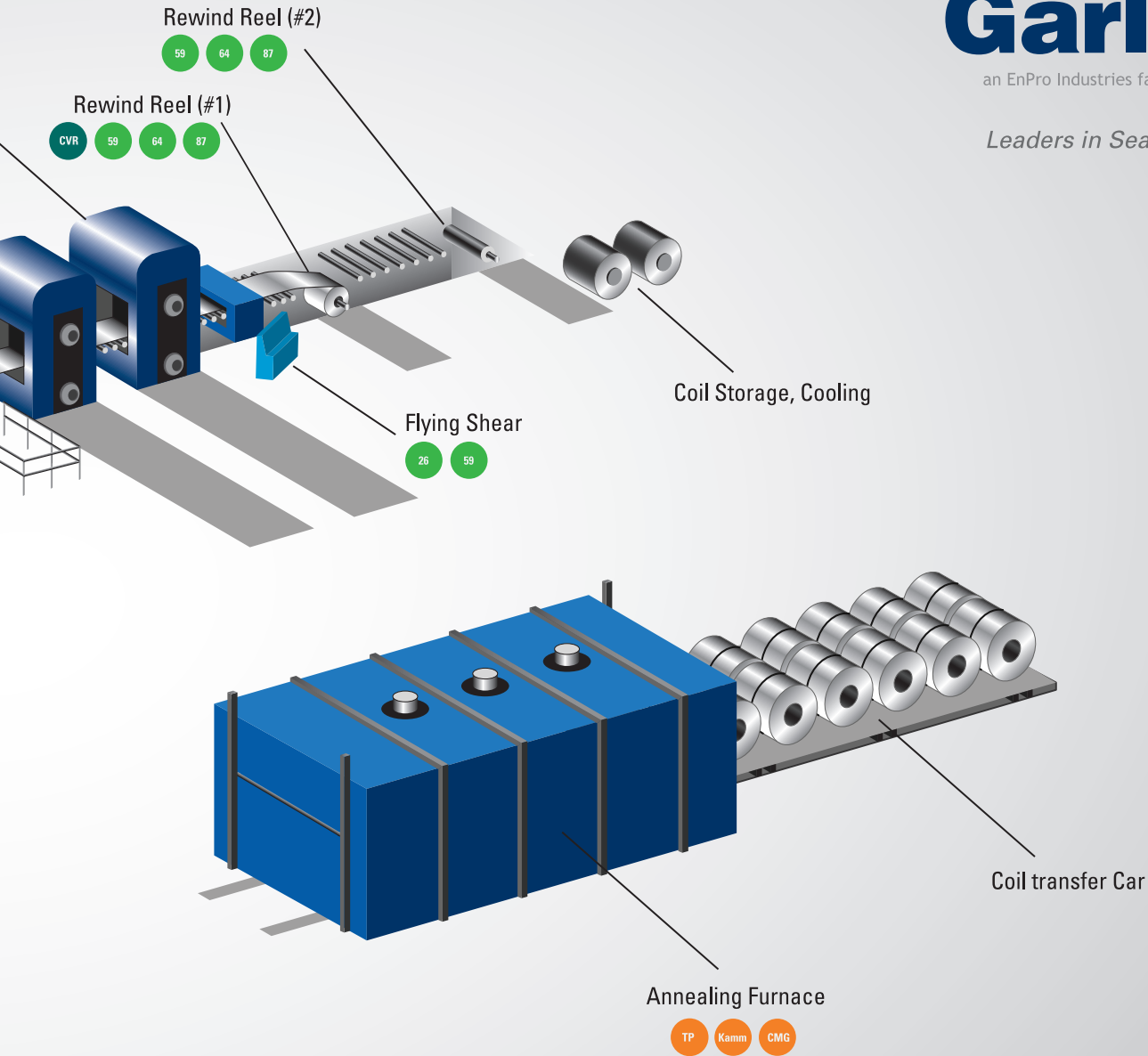
Bearing Isolators

- GD** Guardian®
- SG** Split Guardian®
- PB** Split Guardian® Pillow Block
- IG** Iso-Gard®

- SGi** SGi
- MT-II** Micro-Tec®-II
- EnD** EnDuro™
- EQ** Equalizer®

Mechanical Seals

- GMP-I**, **GMP-II**
- P/S®-II**
- PK**
- Syn** Syntron®



Ancillary Equipment



Piping Systems



Gasket Products

- TP** THERMa-PUR™
- Kamm** THERMa-PUR™ Kammprofile
- CMG** THERMa-PUR™ CMG
- SW** THERMa-PUR™ Spiral Wound
- 3000** BLUE-GARD® Style 3000
- 3545** GYLON® Style 3545
- 3760** MULTI-SWELL® Style 3760

Expansion Joints

- 8100** Style 8100
- 206** Style 206 EZ-FLO®

Diaphragm Products

- ONE** Garlock ONE-UP® Diaphragm

Compression Packing

- TC** THERMO-CERAM™
- 98** Style 98
- 1303** Style 1303 FEP
- Pac6** Packmaster 6
- 5889** Style 5889 PTFE
- TS** Thermo-Sil™ Silica Braided Rope

> *Casters*

PROBLEM: Caster segments guide the high temperature molten steel slabs or strands through the casting process to the withdrawal table rolls. Typical sealing components are designed to minimize water ingress into the bearings and allow grease to be purged from the bearing cavity. Most of these sealing components do a poor job of excluding water and scale contamination. The typical causes of caster bearing failure are water etching and particle denting. The ultimate bearing failure causes the caster segment rolls to setup. The casting process is stopped and the segment rolls need to be replaced before casting can continue. This is very costly due to the process down time, unscheduled maintenance and the effect of production loss throughout the secondary finishing process. Non-water cooled segment rolls utilize a labyrinth sealing device. Water cooled segments typically utilize lip seals.

SOLUTIONS: The Model 26, 26R1, 57 and 58 seal designs effectively extend bearing life and increase bearing yields in caster applications. The withdrawal and table rolls utilize the Model 26 seals to prevent premature bearing failure from contamination ingress increasing product yield.

> *Coil Boxes & Down Coilers*

PROBLEM: Coil boxes and down coilers are subjected to tremendous volumes of water and elevated temperatures. In addition, down coilers are also subjected to very high strip speeds, up to 7000 fpm

through the last finishing stand, and high degrees of radial misalignment. Bearing failure due to water ingress is a major problem.

SOLUTIONS: The Model 64, 87 and 59, due to their radial misalignment values, have proven to be very effective in extending bearing life and bearing yields in coil box and down coiler applications. The Model 23, due to its split, no-downtime design, has been the seal of choice for coilbox applications.

> *Universal Mill*

PROBLEM: Universal mills such as scale breakers, vertical edgers and roughers are utilized to remove scale from the slab, form an edge and start the reduction process. Excessive water spray and slab scale contaminate the bearings. Water ingress degrades the bearing lubrication and the mill scale damages the rolling components. The washed out lubrication contaminates the water, making recycling a more costly process. Lubrication loss also carries serious safety and environmental implications. When bearing failure ultimately occurs, the line must be stopped for immediate roll and bearing chock replacement. The resultant lost production from unscheduled down time is very costly.

SOLUTIONS: The Model 59, 87 and 64 seal designs effectively extend bearing life and increase bearing yields. Scale breakers, vertical edgers, roughers and reversing mills should utilize a sealing system, consisting of one of these seal designs in combination with Model 145 excluder seals, which keep excessive water from ingress to the primary seals and contaminating the bearings.

> *Hot Strip Finishing Mill*

PROBLEM: The finishing mill employs up to seven rolling stands that progressively reduce the slab to the required gauge while operating at progressively higher line speeds. Bearing contamination is a constant problem as is contamination of the automatic gauge controls. Seal integrity can be further compromised by roll bending and pare cross rolling. As in the universal mill, lubrication loss complicates the water recycling process and carries serious environmental and safety implications. Spent lubrication can also contaminate the product. Bearing failure here makes it necessary to shut the hot strip mill down while affecting the cold strip mill and finishing processes.

SOLUTIONS: Model 87, 64, 59 and 145 seal designs are used in both work roll and backup roll bearing assemblies. The product side sealing position typically utilizes more than one seal in the assembly to retain lubrication and exclude water contamination. The Model 145 excluder seals are also used in these assemblies, typically on the bottom backup rolls and work rolls.

> *Ancillary Equipment*

PROBLEM: Ancillary equipment runs the secondary finishing and finishing operations: electric motors; gearboxes; pumps; pillow blocks; fans. Traditional sealing systems are inadequate for extending the service life of ancillary equipment. In most instances, bearing failure from contamination ingress and lubrication egress is the primary cause of ancillary equipment failure. When the equipment that drives the mill shuts down, the downtime costs can be catastrophic.

SOLUTIONS: The Guardian, Iso-Gard, Equalizer, SGI and Model 26 designs have proven themselves to be very effective in extending the life of ancillary equipment in a variety of steel mill applications. Our bearing isolator family has provided the necessary sealing required for electric motors, pump bearing frames, split pillow blocks, and fans. Typical lip seals wear prematurely, degrading the sealing surface. This condition will allow contamination ingress to the bearing assemblies. Klozure bearing isolators eliminate costly surface degradation. The Model 26 seal has proven to be a very effective sealing system for conveyors and gear boxes.

> *Surface Cleaning*

PROBLEM: The surface cleaning or pickling process chemically cleans oxidation from the metal to obtain a surface suitable for cold reduction and coating. The harsh chemicals utilized in the cleaning process can easily contaminate the bearing assembly, requiring reclaiming or replacement. It is also critical that spent lubrication does not contaminate the product. The harsh chemicals may require that special lip seal materials or bearing isolators be used to ensure seal integrity.

SOLUTIONS: The Iso-Gard, PS-1, Model 58, 26 and Guardian sealing devices extend bearing life and increase bearing yields. Bearing isolators have proven to be very effective in this application.

> *Temper Mill*

PROBLEM: The temper mill or skin pass mill removes the Luder lines caused by the cold reduction process and imparts the required finish on the product as well as changing the mechanical properties of the steel. Lubrication loss causes ultimate bearing failure and can also contaminate the product. Rolling solution ingress is also a common cause of bearing failure. Spent lubrication can contaminate the rolling solution, making recycling a costly process. As in the hot strip and cold strip mills, lubrication loss also carries serious environmental and safety implications.

SOLUTIONS: The Model 87, 59 and 64 seal designs effectively extend bearing life and increase bearing yields. Model 145 excluder seals are also used in these assemblies when rolling solution is utilized for greater reduction.

> *Cold Strip Finishing Mill*

PROBLEM: The cold mill employs up to six rolling stands that reduce the coil to a gage thinner than that of which the hot strip mill is capable. Bearing contamination from aggressive rolling solutions is a constant concern. Lubrication loss complicates the rolling solution recycling process and carries serious environmental and safety implications. Spent lubrication can also contaminate the product. Bearing failure here makes it necessary to shut the cold strip mill down while affecting the tempering and coating operations.

SOLUTIONS: Model 87, 59, 64 and 145 seal designs are used in both work roll and backup roll bearing assemblies. The product side sealing position typically utilizes more than one seal in the assembly to retain lubrication and exclude water contamination. Model 145 excluder seals are also used in these assemblies where excessive water and slag exist. Aggressive rolling solutions may not be compatible with traditional elastomers. Special materials and premium elastomeric compounds may be required.

> *Annealing*

PROBLEM: The bearings are subjected to extremely high temperatures that cannot be tolerated by traditional elastomers. Fey rings are typically used as heat shields, but do not provide positive lubrication retention.

SOLUTIONS: The Model 58, while accommodating temperatures up to 1600°F, effectively seals grease-lubricated bearings.

> *Payoff and Take-Up Reels*

PROBLEM: The payoff and take-up reels are utilized to wind or unwind the product for cleaning, cold-rolling, tempering, coating, packaging or post-finishing fabrication. Retaining lubrication in the bearing assembly is critical. Spent lubrication can also contaminate the product requiring costly re-cleaning and re-processing. Spent lubrication also carries serious environmental and safety concerns as well.

SOLUTIONS: The Model 23, 59, 64 and 87 seal designs are used in coiler or reel applications to ensure that the strip remains clean and is suitable for packaging or fabrication. Model 23 split seals are both cost and time effective for applications in which accessibility for seal replacement is difficult and equipment tear-down is required for the use of solid seals.

> *Coating Lines*

PROBLEM: The coating line (aluminizing, galvanizing, painting, tinning) coats the product to meet customer requirements. Bearing contamination from the coating solutions is a constant concern. Spent lubrication can contaminate the coating solutions as well as the product. Contamination of the coating solution requires that the tanks be drained and cleaned. Lubrication loss here carries serious environmental and safety concerns as well.

SOLUTIONS: Model 26, PS-1, 58, Iso-Gard and Guardian sealing devices maintain lubrication within the assembly and process chemicals from contaminating the bearings. Iso-Gard bearing isolators have performed well on galvanizing line hold down rolls. Garlock bearing isolators have eliminated shaft grooving that will contribute to premature bearing failure from lubrication loss and contamination ingress. Model 26 and PS-1 seals have provided the necessary sealing for aluminizing applications minimizing contamination ingress. Some coating and electrolytic compounds may not be compatible with traditional elastomers. Special materials and premium elastomers may be required.

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