

# SEALING SOLUTIONS FOR METAL PROCESSING



FREUDENBERG-NOK  
SEALING TECHNOLOGIES

**FREUDENBERG-NOK**  
INNOVATING TOGETHER

# OFTEN INVISIBLE ALWAYS ESSENTIAL



Freudenberg Sealing Technologies is the largest member of the Freudenberg Group, a family-run company with more than 40.000 employees in 60 countries. Starting with the Simmerring® oil seal, which was developed at Freudenberg in 1929, today the specialist technology supplier can call on a broad range of seals and sealing systems that have been rigorously developed to meet customer requirements in a wide variety of applications.

Freudenberg Sealing Technologies has sites in Europe and North and South America. Together with strong partners NOK

Corporation, Japan, Sigma Freudenberg NOK in India and NOK-Freudenberg Group in China, the companies form a worldwide network which aims to supply its customers right around the globe with products of the same high quality.

Our products are often invisible, but always essential. That means you can rely on the ultimate in high-performance products supplied by the global market leader in sealing technology: Freudenberg Sealing Technologies.

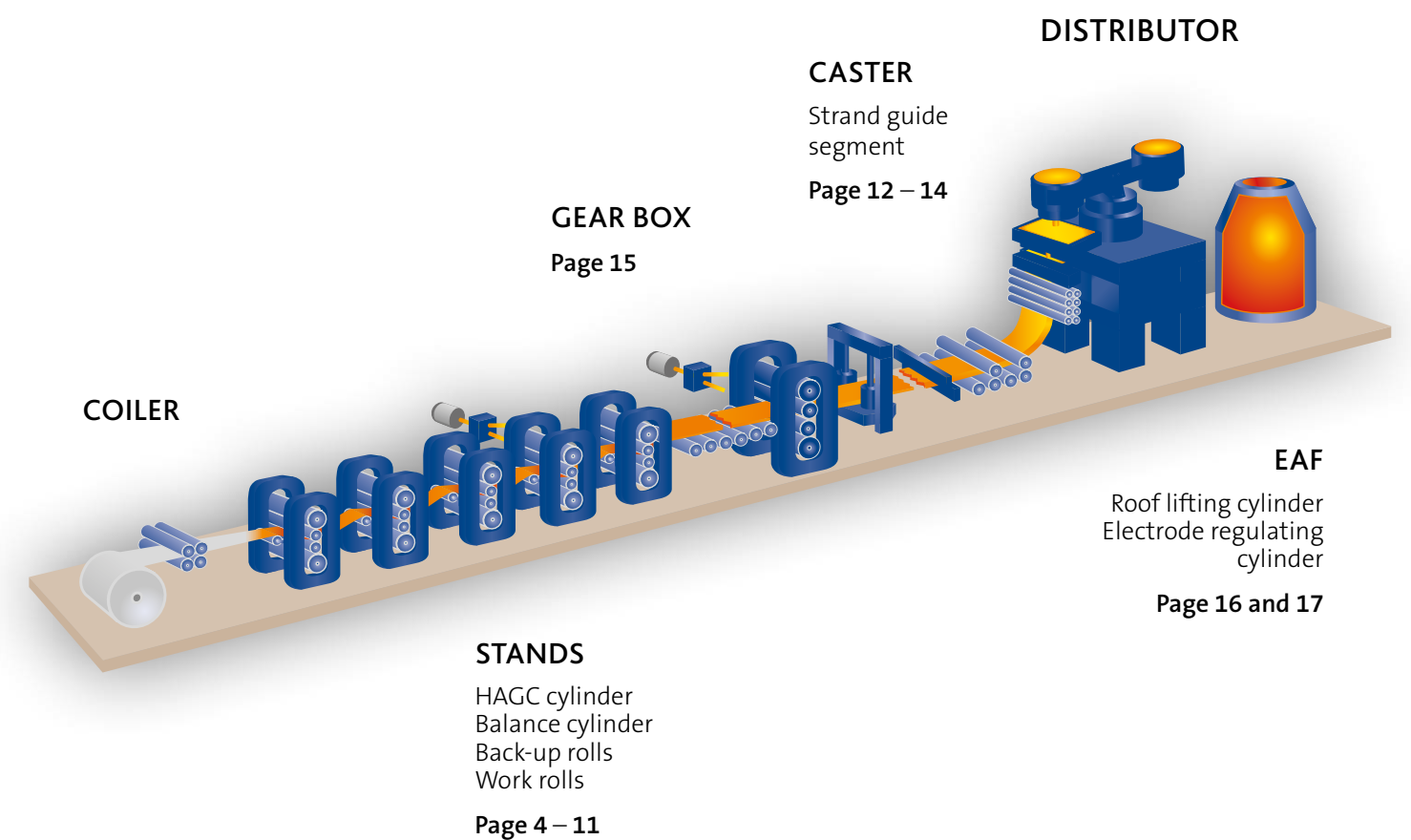
# SEALING SOLUTIONS FOR YOUR PRODUCTION LINES

## TAILOR-MADE, FIELD-PROVEN, WORLD CLASS QUALITY

Our products and services are renowned for their outstanding performance. It's good to know that we can make a valuable contribution to the success of major OEM's and after market customers in various industries.

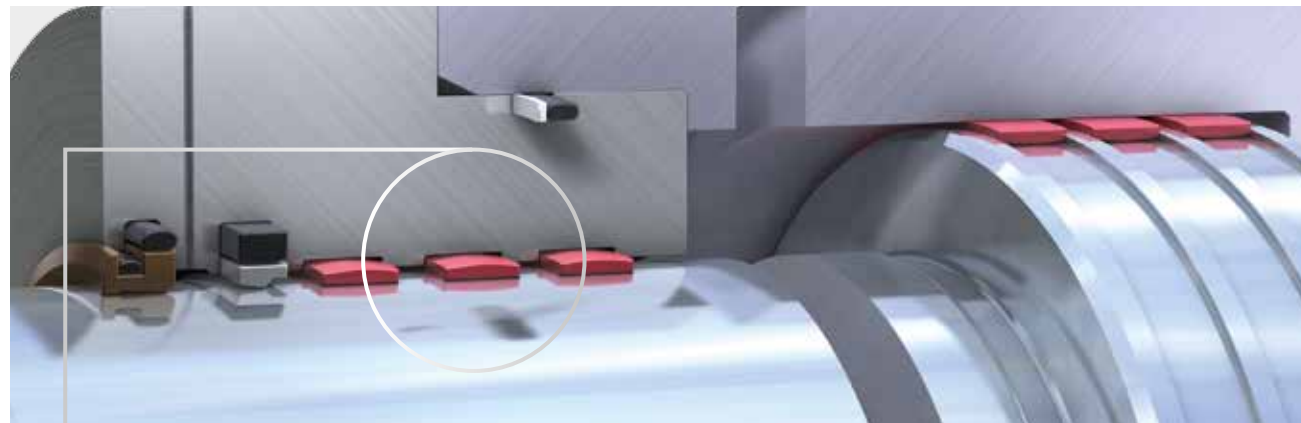
We put much energy into common customer development projects. The target is always the same: we always seek the best sealing solution.

Even under most adverse conditions – like in the challenging environment of the iron and steel industry – customers around the globe rely on our product quality.



# SYSTEMS FOR BALANCE CYLINDERS

## OUR RECOMMENDATION FOR MAXIMUM CONTROL OF A FAST MOVING CYLINDER

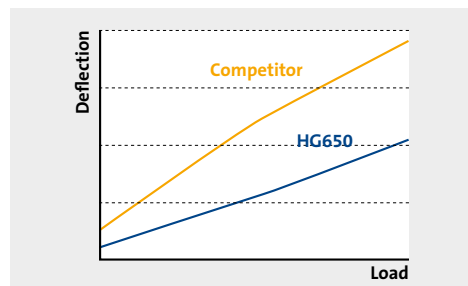


▲ Merkel Omegat OMS-S rod seal in combination with a Merkel wiper PT 2 and triple Merkel Guivex guide bands

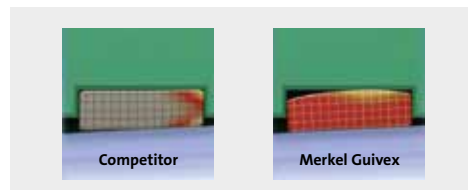
Precise guiding – long service intervals

- Best adjustability and cylinder control due to advanced frictional behavior of Merkel Omegat PTFE seals.
- The patented Merkel Guivex geometry allows smaller gaps without any risk of metal-metal contact
- Our sealing arrangement provides for improved performance while allowing for shorter housings

### MATERIAL



### GEOMETRY



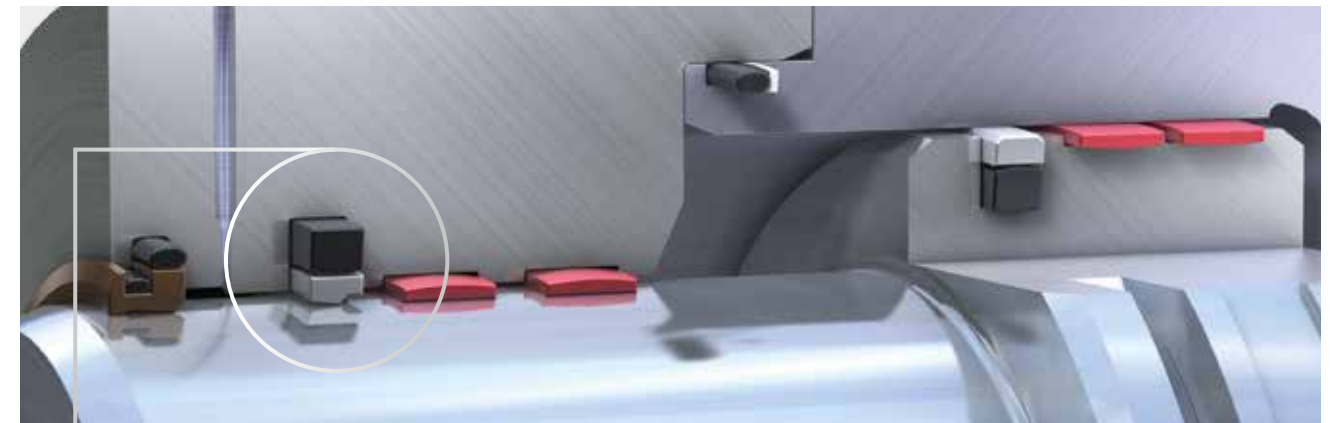
## GUIVEX GUIDE BAND – THE SECRET OF GEOMETRY AND MATERIAL

- The patented geometry prevents edge pressing even at high loads
- Best functional behavior by a balanced handling of surface loads up to 11,600 psi
- No flow of material when overloaded – the laminated fabric HG650 significantly increases functional safety

Above: Stiffness of the guide band material HG650 compared to competitor version  
 Below: No stress peaks at the edges by the Guivex geometry, thus no uneven wear of the guide band

# SYSTEMS FOR HAGC CYLINDERS

## OUR RECOMMENDATION – MAXIMUM PROTECTION OF THE COUNTER SURFACE



▲ Merkel Omegat OMS-S at the rod and Merkel Omegat OMK-S at the piston in combination with a Merkel wiper PT 2 and Merkel Guivex guide bands

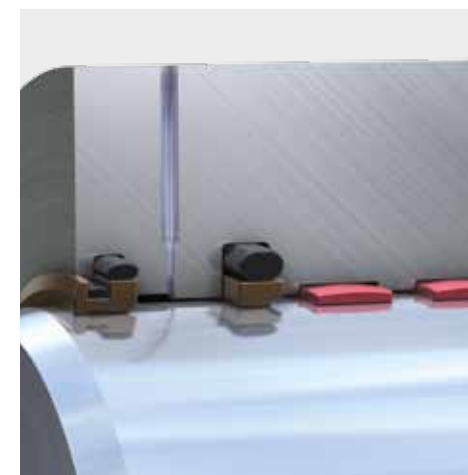
Gentle to the surface – reduced maintenance cost

- Minimum wear is the target. That's the reason why we use a glass molybdenum compound offering self-lubricating behavior, which is ideal for short strokes and high frequencies
- Form follows function – reliable handling of high pressures even above 3,636 psi due to heavy duty design of the Merkel Omegat seal. And, simultaneously, offering maximum service life
- External “protective screen” in extremely dirty environments – Merkel double wiper PT 2 offers the best protection for a long lasting sealing system, even at the static side towards the housing

## STANDARD FOR EXISTING HOUSINGS – STICK SLIP FREE OPERATION INCLUDED

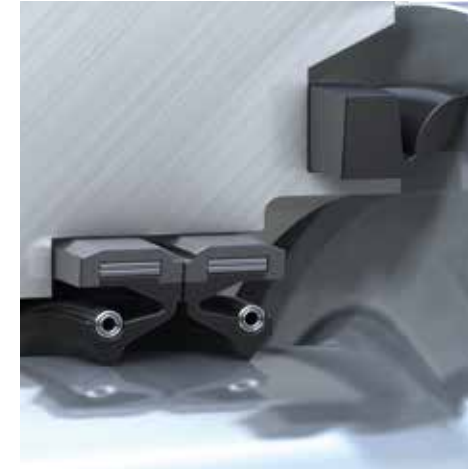
- Precise cylinder adjustment in less than a hundredth of an inch – a matter of course for the functional behavior of our Merkel Omegat seals
- Aggressive coolants in your cold strip mill? The range of our proven sealing materials doesn't let you down.

▲ Merkel Omegat OMS-MR rod seal in combination with a Merkel wiper PT 2 and Merkel Guivex guide bands





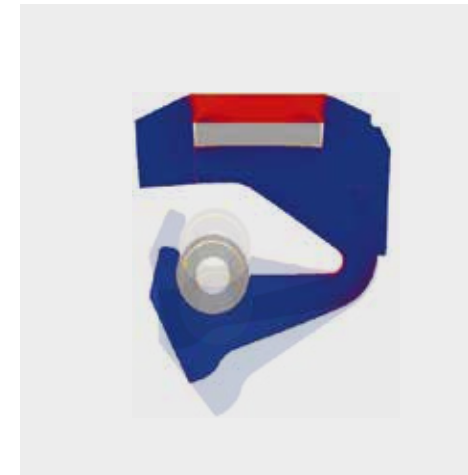
## SEALING SYSTEMS FOR PLAIN BEARINGS IN BACK-UP ROLLS



### IF SPEED IS THE ISSUE – MERKEL RADIAMATIC RHS 51

- Solid performance – even up to  $\pm 0.012$  inch shaft deflection or high speeds up to 115 ft/s, 132 ft/s intermittent
- Self-retaining fit by vulcanized-in steel bands
- Simple, housing friendly installation

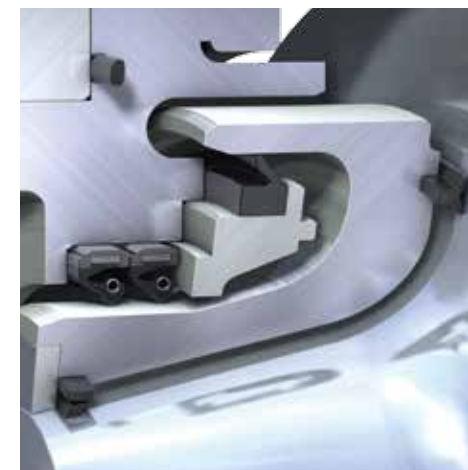
↳ Merkel Radiamatic RHS 51 in combination with a water guard Merkel Enviromatic EA



### THE KEY FOR SUCCESS – EVENLY DISTRIBUTED RADIAL FORCES

- To avoid local stress and to focus on longevity, the Merkel Radiamatic RHS 51 uses a double arranged tension spring, a smoothly sliding coil spring inside a second one
- Low heat generation even at high speeds
- Avoids elevated radial forces compared to standard pre-stressing elements at the sealing lip

↳ Low friction and wear even at high shaft offset – the Merkel Radiamatic RHS 51 offers the right balance



### MODERNIZATION – COMBINING THE BEST

- High permissible shaft offset
- Increased protection for plain bearings

↳ Re-design idea for common plain bearings / oil film bearings, based on two rotary shaft seals Merkel Radiamatic RHS 51

## SEALING SYSTEMS FOR ROLLER BEARINGS IN WORK ROLLS



### IDEAL SOLUTION FOR GREASE LUBRICATED BEARINGS

- Operating speeds up to 66 ft/s
- Space saving design utilizes integrated lubrication grooves in the sealing element
- Precise line forces of the sealing edge offers leak free performance, as well as minimized wear

↳ Merkel Radiamatic R 37 in tandem arrangement and cover plated, in combination with a water guard Merkel Enviromatic EA

# OUR HIGHLIGHT



## MAXIMUM PROTECTION FOR YOUR WORK ROLL BEARINGS

### TAILOR-MADE SEALING COMBINATION: MERKEL RADIAMATIC RPM 41 + MERKEL ENVIROMATIC

If you think in terms of tons produced and do not want to count lost hours. Nowadays, the term workhorse implies an “all-in carefree package”. The Merkel Radiamatic RPM 41 radial shaft seal, specially designed for work rolls, is such a performer: offering secure and reliable sealing over a long period of time. Its installation is pretty unspectacular. The seal is completely coated in rubber, leaves no traces in the installation space and slides effortlessly into place.

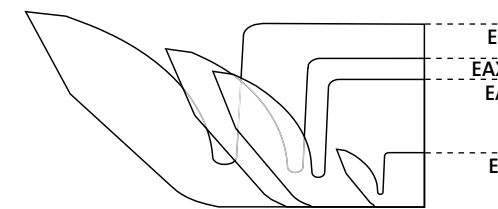
- Readiness of supply – within hours, if needed
- Reliable protection against water ingress into lubricant
- Without tension spring at the sealing lip – any other potentially corrosive or hazardous component is missing as well
- Gentle to the housing – easy to install & remove

## SOLID AS A ROCK

Unlike the usual V-rings, which have a soft, flat sealing lip with a broad contact surface, the new water guard Merkel Enviromatic has a defined, linear sealing edge. This functional, linear contact of the sealing lip remains intact even in the case of axial shaft misalignment of ±0.16 inch up to ±0.47 inch. The result is maximum protection against ingress of water and dirt in the area of roller and plain bearings.



Available Merkel Enviromatic versions Suitable for standard housings



Operating conditions for versions made of NBR\*

Criteria	Maximum values
Temperature	-22 ... +212 °F
Pressure	7.25 psi (Ø D ≤27.6 inch) 4.35 psi (Ø D >27.6 inch)
Sliding speed	48 ft/s

\* further materials, e. g. HNBR, FKM, on request

List of Merkel Radiamatic RPM 41 profiles for diameters D = 7.84 inch up to 41.89 inch

S x L [inch]	7.84–10.24	10.25–11.81	11.82–14.17	14.18–18.50	18.51–26.93	26.94–41.89
0.59 x 0.63	•	•	•			
0.75 x 0.63	•	•	•	•		
0.75 x 0.71	•	•	•	•	•	
0.79 x 0.63	•	•	•	•		
0.79 x 0.71		•	•	•	•	•
0.79 x 0.79		•	•	•	•	•
0.87 x 0.79			•	•	•	
0.98 x 0.63	•	•	•	•	•	
0.98 x 0.71	•	•	•	•	•	•
0.98 x 0.79			•	•	•	
0.98 x 0.87			•	•	•	•
0.98 x 0.98			•	•	•	•
1.18 x 1.18					•	•
1.26 x 0.98					•	•

Further dimensions on request.

IN A FEW STEPS ...



... TO MAXIMUM PROTECTION FOR YOUR WORK ROLL BEARINGS

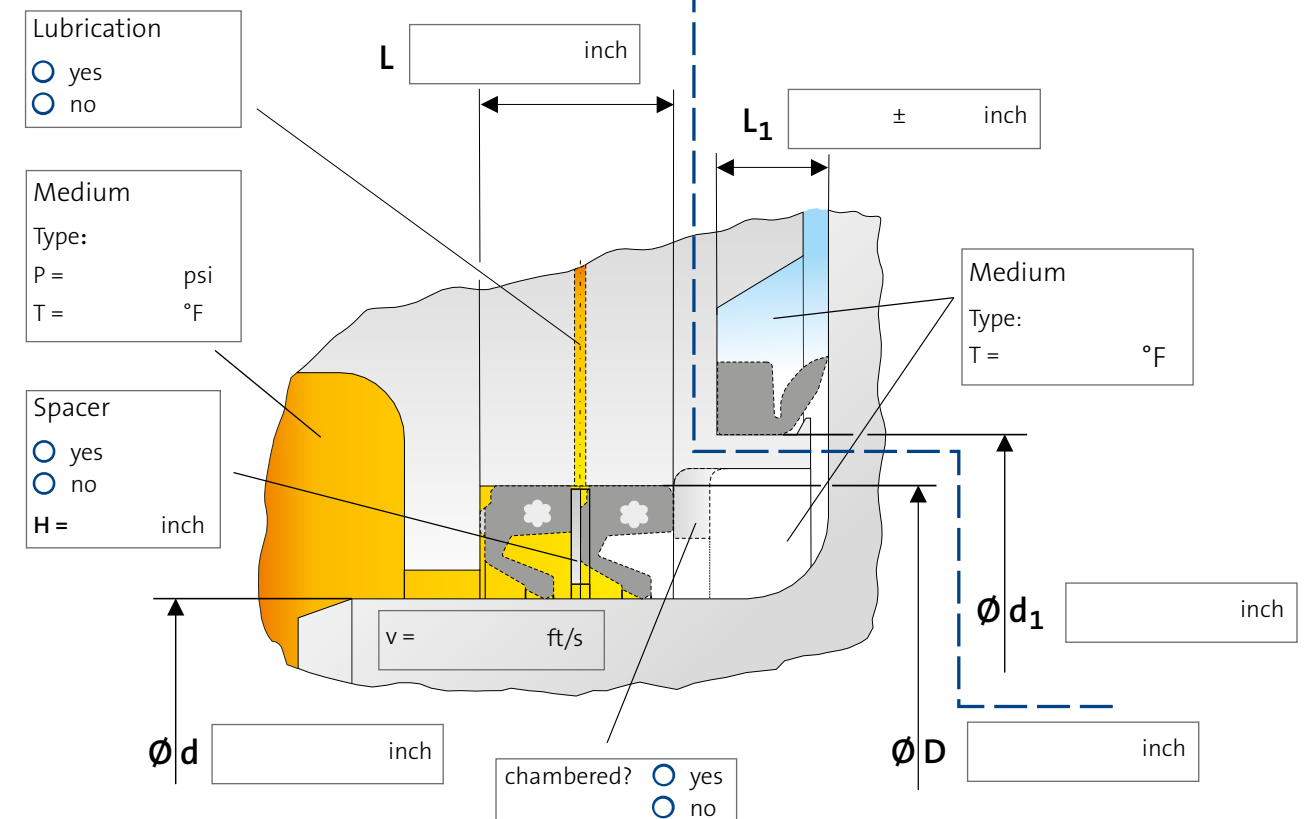
General Information		
YOUR COMPANY NAME	YOUR NAME / E-MAIL-ADDRESS	NAME OF EQUIPMENT MANUFACTURER
<input type="text"/>	<input type="text"/>	<input type="text"/>
MILL TYPE		
<input type="radio"/> Hot flat rolling mill	<input type="radio"/> Cold rolling mill	<input type="radio"/> Plate rolling mill
<input type="radio"/> Steckel mill	<input type="radio"/> Continuous caster	<input type="radio"/> Steelmaking plant
<input type="radio"/> Profil rolling mill	<input type="radio"/> Wire rolling mill	<input type="text"/>
TYPE AND NUMBER OF STANDS		
e. g. 7-stand cold strip mill F1 - F7, or reversing roughing stand <input type="text"/>		
TYPE OF PRODUCT		
<input type="radio"/> Steel	<input type="radio"/> Aluminum	<input type="radio"/> Stainless steel
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TYPE OF WORK ROLL BEARING		
<input type="radio"/> Roller bearing	<input type="radio"/> Oil film bearing	
OPERATION MODE		
<input type="radio"/> CSP	<input type="radio"/> DCR	<input type="radio"/>
Duty cycle: <input type="text"/> hours	Cycle mode: <input type="text"/> (e. g. slow/fast, right/left run)	

SIMPLY FILL-IN AND SCAN ...

... THESE TWO PAGES AND VIA METALPROCESSING@FST.COM YOU WILL RECEIVE YOUR TAILOR-MADE PROPOSAL

MERKEL RADIAMATIC RPM 41

MERKEL ENVIROMATIC



Please note

If a lubricant supply is used, please specify the exact position of the bore.  
In case of a spacer, please share dimensions. The dimension H is the height/thickness of the spacer.

Space for your comments

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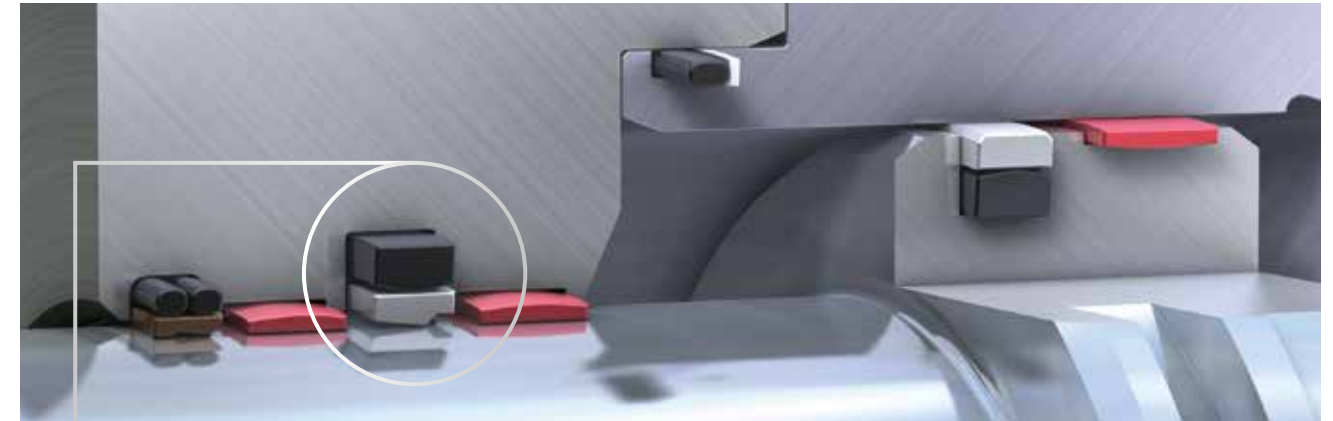
**FREUDENBERG-NOK**  
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## SEALING SYSTEMS FOR CONTINUOUS CASTER

## SEGMENT CYLINDER

### IDEALLY HARMONIZED – OUR RECOMMENDATION

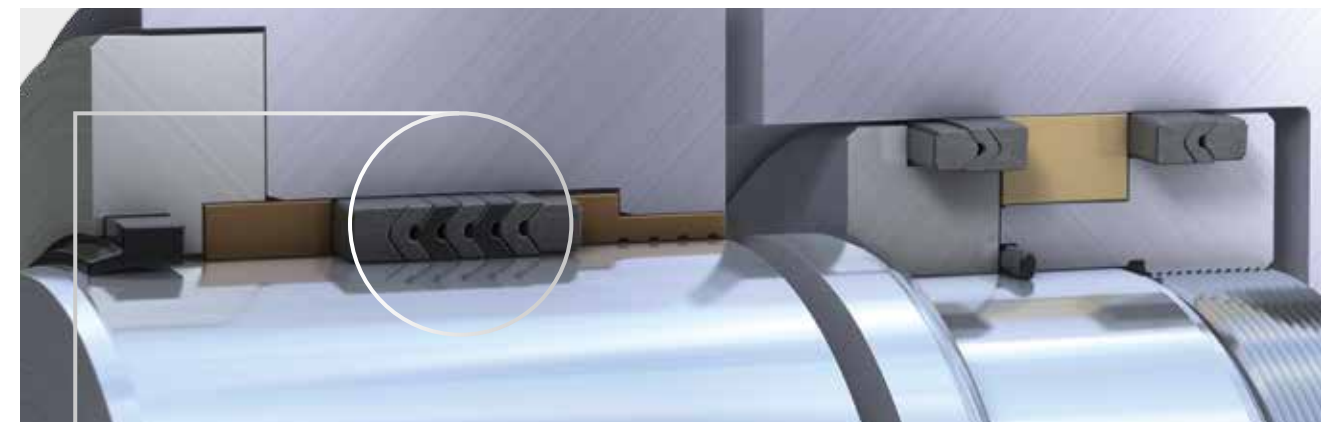


PTFE glass for rod and piston seal offers surface friendly operation

▲ Merkel Omegat OMS-S at the rod and Merkel Omegat OMK-S at the piston in combination with a Merkel wiper PT 1 and Merkel Guivex guide bands

- Low-friction materials allow faster control strokes with high sealing function at the same time
- More compact and simple designed housings reduce the material costs for the entire cylinder
- Optimized PTFE wiper achieves better wiping action and thus increases overall cylinder functionality

### STANDARD FOR EXISTING HOUSINGS



Robustness x Longevity =  
Merkel V-packing sets

▲ Merkel V-packing set EKV at the piston and ESV at the rod combined with a Merkel wiper P 6 and metallic guide elements

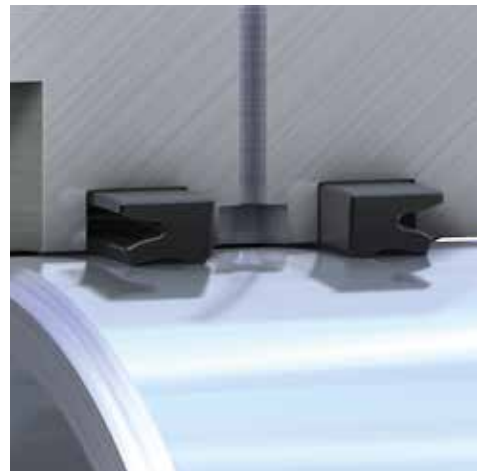
- Reliable sealing function even with heavily stressed rod / surfaces or increased dirt entry
- Split version available for easy installation

# SEALING SYSTEMS FOR CONTINUOUS CASTER SEGMENTS



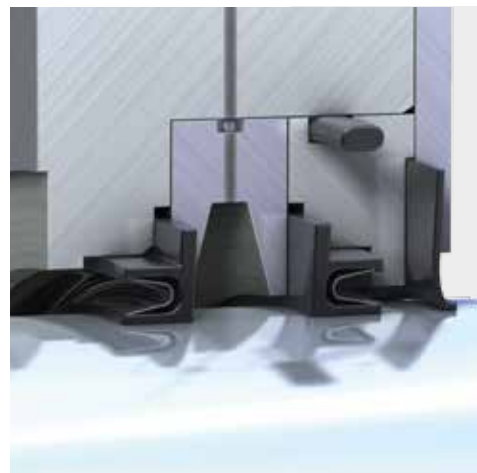
## SIMMERRING TYPE BAUM FOR OPEN HOUSINGS

- High wear resistance for long service life at high temperatures
  - Standard seals are readily available
  - Simple installation for low service cost
- ↳ Simmerring BAUM with self-retaining fit in the housing  
In case of heavy contamination also with protective lip or “filter fleece” available for an optimized life



## VERSATILE U-RING SOLUTION FOR LOW SPEEDS

- Easy to install snap-in function
  - Material mix to meet specific requirements
  - No metallic components = no risk of corrosion
- ↳ Merkel U-ring NRSF made of NBR, HNBR, FKM or Polyurethane



## WHEN IT GETS TOO HOT

- Reliable protection of the bearing against contamination by PTFE wiper
  - Suitable for high speeds and temperatures
  - Low friction and greatly reduced wear due to self-developed, high-quality PTFE compounds which, in addition to the actual sealing function, particularly protect the counter surface
- ↳ Both made of Carbon filled PTFE: Merkel U-ring NRRW in combination with a Merkel water guard WADB-9460

# SEALING SYSTEMS FOR GEAR BOXES



## SIMMERRING – THE ORIGINAL

- Compared to the competition, lower friction / energy loss / wear and thus offering a significantly longer service life
  - Customized adjustments possible
  - High availability of standard articles
- ↳ Everything is included – Simmerring Type B2SL with integrated dust lip and metal insert for increased stiffness



## IF EASY REPLACEMENT IS THE ISSUE – MERKEL BONDING SET RK 15

- Cost and time saving, since complete dismantling of housing and shaft can be avoided
  - Complete, multi-use set with bonding tool, glue, abrasives and cleaning agent
  - Shipping of bonding set within one week, if necessary
- ↳ Assembled bonding device – the individual joining tool guarantees a precise joining of the sealing edge without misalignment



## THE IDEAL COMBINATION FOR DEMANDING TRANSITIONS BETWEEN SPINDLE AND DRIVE

- Floating cartridge for high axial movements
  - No wear issues
  - No leakage issues
- ↳ Merkel Omegat OKDS-0168, Omegat OSDS-0169 in combination with a special guide band made of resin bonded fabric

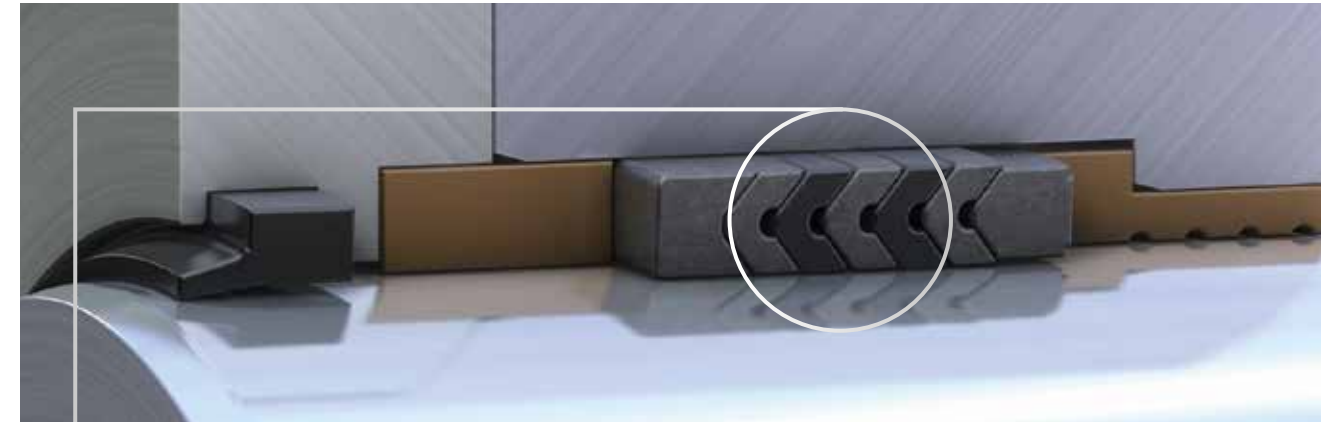




# SEALING SYSTEMS FOR EAF – ELECTRIC ARC FURNACE

## LIFTING CYLINDER AT THE EAF

### FOR EASY REPLACEMENT – OUR TRADITIONAL SOLUTION

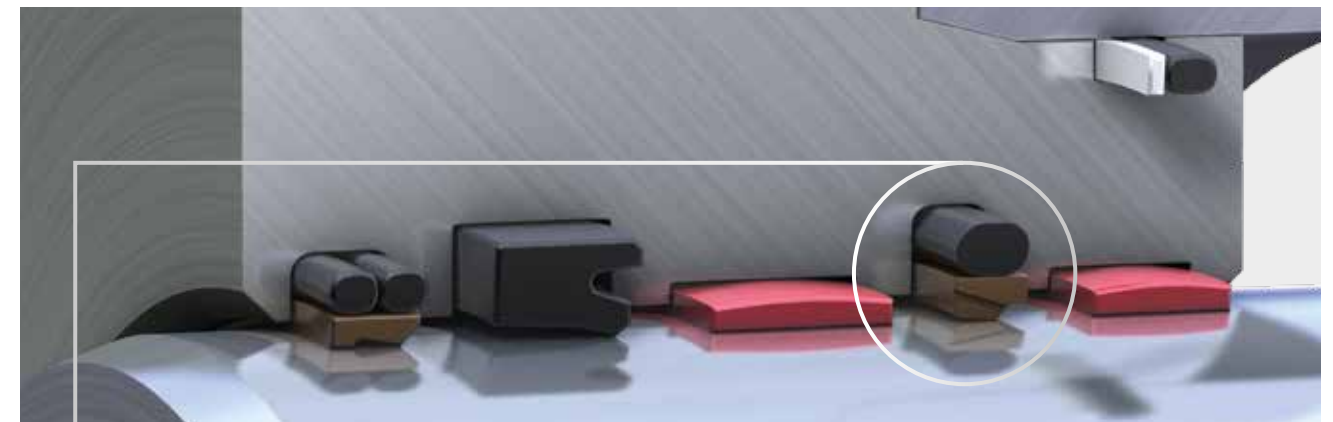


▲ Merkel V-packing set ESV in combination with a Merkel wiper P 6 made of elastomeric material

The robustness of a Merkel V-packing set is unique

- Long lifetime even without bellow protection of the rod
- Reliable sealing function even if rod is highly strained
- Split version for ease of installation and reduced maintenance cost

### LOW FRICTION AND LONG STROKE PERFORMANCE – OUR RECOMMENDATION



▲ Merkel Omegat OMS-MR primary seal and Merkel U-ring L 20 secondary seal, combined with a Merkel wiper PT 1 and Merkel Guivex guide bands

Pressure relief function offers high operational reliability


















- Stick-slip free operation allows exact positioning
- Ideal sealing function for long service intervals without leakage
- Important: the rod must be protected against sparks or the like

# PRODUCT OVERVIEW












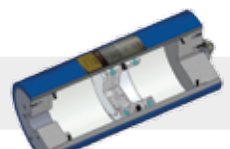





Type	Profile	Material	EAF	Rotary Distributor	Continuous Caster	Gear Box	Mill Stands	Coiler	Xpress: Tailor-made	Xpress: Machined	Technical Data
<b>ROD SEALS</b>											
Merkel Omegat OMS-MR/PR		PTFE	●	●	●	●			●		
Merkel Omegat OMS-S/PR		PTFE	●	●	●				●		
Merkel Omegat OMSU-S/PR		PU				○			●		
Merkel V-packing Set ES/ESV		NBR, FKM	○	○	○				●		
Merkel U-ring L 20		NBR	●	○	●				●		
<b>PISTON SEALS</b>											
Merkel Omegat OMK-MR		PTFE	●	●	●	●			●		
Merkel Omegat OMK-S		PTFE	●	●	●				●		
Merkel Omegat OMKU-S		PU				○			●		
Merkel Omegat OMK-ES		PTFE	○	○	○				●		
Merkel V-packing Set EK/EKV		NBR, FKM	●	●	○				●		
<b>WIPERS</b>											
Merkel Double Wiper PT 1		PTFE	●	●	●	●			●		
Merkel Double Wiper PT 2		PTFE	●	●	●				●		
Merkel Double Wiper PT 3		PTFE			●			●	●		
Merkel Wiper P 6		NBR, FKM	○	○		○			●		
Merkel Wiper Type 0238		PTFE	○	○	○				●		

Type	Profile	Material	EAF	Rotary Distributor	Continuous Caster	Gear Box	Mill Stands	Coiler	Xpress: Tailor-made	Xpress: Machined	Technical Data
<b>GUIDES</b>											
Merkel Guivex SBK		Resin b. fabric	●	●	●	●	●	●	●	●	
Merkel Guide Band SB		Lamin. fabric	○	○	○	○	○	○	●	●	
Merkel Guide Band SF		PTFE	○	○	○	○	○	○	●		
Merkel Guivex KBK		Resin b. fabric	●	●	●	●	●	●	●	●	
Merkel Guide Band KB		Lamin. fabric	○	○	○	○	○	○	●	●	
Merkel Guide Band KF		PTFE	○	○	○	○	○	○	●		
<b>RADIAL SHAFT SEALS</b>											
Merkel Radiamatic R 35		(H)NBR, FKM		○	○	●	●				
Merkel Radiamatic R 36		(H)NBR, FKM		○	○	○	●				
Merkel Radiamatic R 37		(H)NBR, FKM		○	○	●	●				
Merkel Radiamatic R 58		NBR				○	●				
Merkel Radiamatic RS 85		(H)NBR, FKM			○	○	●				
Merkel Radiamatic RHS 51		(H)NBR, FKM				○	●				
NOK Radiamatic SBR		(H)NBR, FKM				○					
Merkel Radiamatic RPM 41		NBR			○	○	○	○	●		
Merkel U-cup NRRW		PTFE			●					●	
Merkel U-cup NRSF 2816		NBR, FKM, PU			●					●	

- our recommendation for new construction or redesign
- Xpress service
- additional products for repair and maintenance

Type	Profile	Material	FAF	Rotary Distributor	Continuous Caster	Gear Box	Mill Stands	Coiler	Xpress: Tailor-made	Xpress: Machined	Technical Data
<b>SIMMERRING OIL SEALS</b>											
BA ...		NBR, FKM			●	●					
BA ... SL		NBR, FKM			●	●					
BA – modified standard		NBR, FKM			○	○					
B1 ...		NBR			○	○					
B1 ... SL		NBR			○	○					
B2 ...		NBR			○	○					
B2 ... SL		NBR			○	○					
Special design		NBR, FKM			○	○					
<b>WATER GUARDS</b>											
Merkel Water Guard WA-A		NBR, FKM		○	○	○	○				
Merkel Water Guard WA-AX		NBR, FKM		○	○	○	○				
Merkel Enviromatic EA		(H)NBR, FKM		●	○	●	●		●	●	
Merkel Enviromatic EAX		(H)NBR, FKM		○	○	●	●		●	●	
Merkel Enviromatic EE		(H)NBR, FKM		○	○	○	●			●	
Merkel Enviromatic EL		(H)NBR, FKM				○				●	
<b>SEALS FOR PIVOTING MOTION</b>											
Merkel Rotomatic M 17		NBR		●							
Merkel Rotomatic M 19		NBR / POM		●							

- our recommendation for new construction or redesign
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- additional products for repair and maintenance

Type	Profile	Material	FAF	Rotary Distributor	Continuous Caster	Gear Box	Mill Stands	Coiler	Xpress: Tailor-made	Xpress: Machined	Technical Data
<b>STATIC SEALS</b>											
Merkel Cover Seal PU 82		PU, NBR, HNBR, FKM		○	○	○	○	○		●	
Merkel Cover Seal PU 83		PU, NBR, HNBR, FKM		○	○	○	○	○		●	
Merkel Stircomatic SRC		PU	○	○	○	○	○	○		●	
Merkel O-Rings		NBR, FKM	○	○	○	○	○	○			
<b>PACKINGS</b>											
Merkel Arochem II 6211		PTFE yarn		●				●			
Merkel Unistat 6303		PTFE yarn		●				●		●	
Merkel Ramilon 4586		Natural fibre			●	●	●	●		●	
Merkel Arolan II 6215		Aramid yarn			●	●	●	●		●	
Merkel Unival 6323		PTFE yarn			●	●	●	●		●	
<b>ACCUMULATORS</b>											
Piston Accumulator											
Bladder Accumulator											
Diaphragm Accumulator											
<b>LUBRICANTS</b>											
Klüber Stabutherm GH 461											
Klübersynth HB 74-401											

- our recommendation for new construction or redesign
- Xpress service
- additional products for repair and maintenance



## SERVICE – DISCOVER A SATISFYING PACKAGE

**Bound by tradition** – as a family owned company we know how important it is to rely on each other. For more than 165 years we've been listening to our customers to help reduce maintenance costs.



### LOCAL SERVICE CENTER – MINIMIZING DOWNTIME, MAXIMIZING YOUR FLEXIBILITY

Our contacts at the service centers are qualified and able to give you competent advice. Their expertise will also be beneficial when it comes to choosing the most suitable sealing system. Here, the right choice is just as important for the best possible performance of the application as the quality of the individual seal.



### DISTRIBUTION NETWORK – A WELL TRAINED STAFF OFFERS BEST SUPPORT

Maintenance, repair and overhaul cannot be avoided, but can be reliably controlled and economically organized by our heavy industry partners. We continuously train our staffs with the aim of successively increasing the efficiency of your production lines.



### FREUDENBERG XPRESS – SEALS WITHIN 24 HOURS, IF NEEDED

The worldwide Freudenberg Xpress service comprises the complete range of machined seals as well as tailor-made elastomeric solutions and guides. It's good to rely on a quality standard that keeps up with serial production.



Editorial Information

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