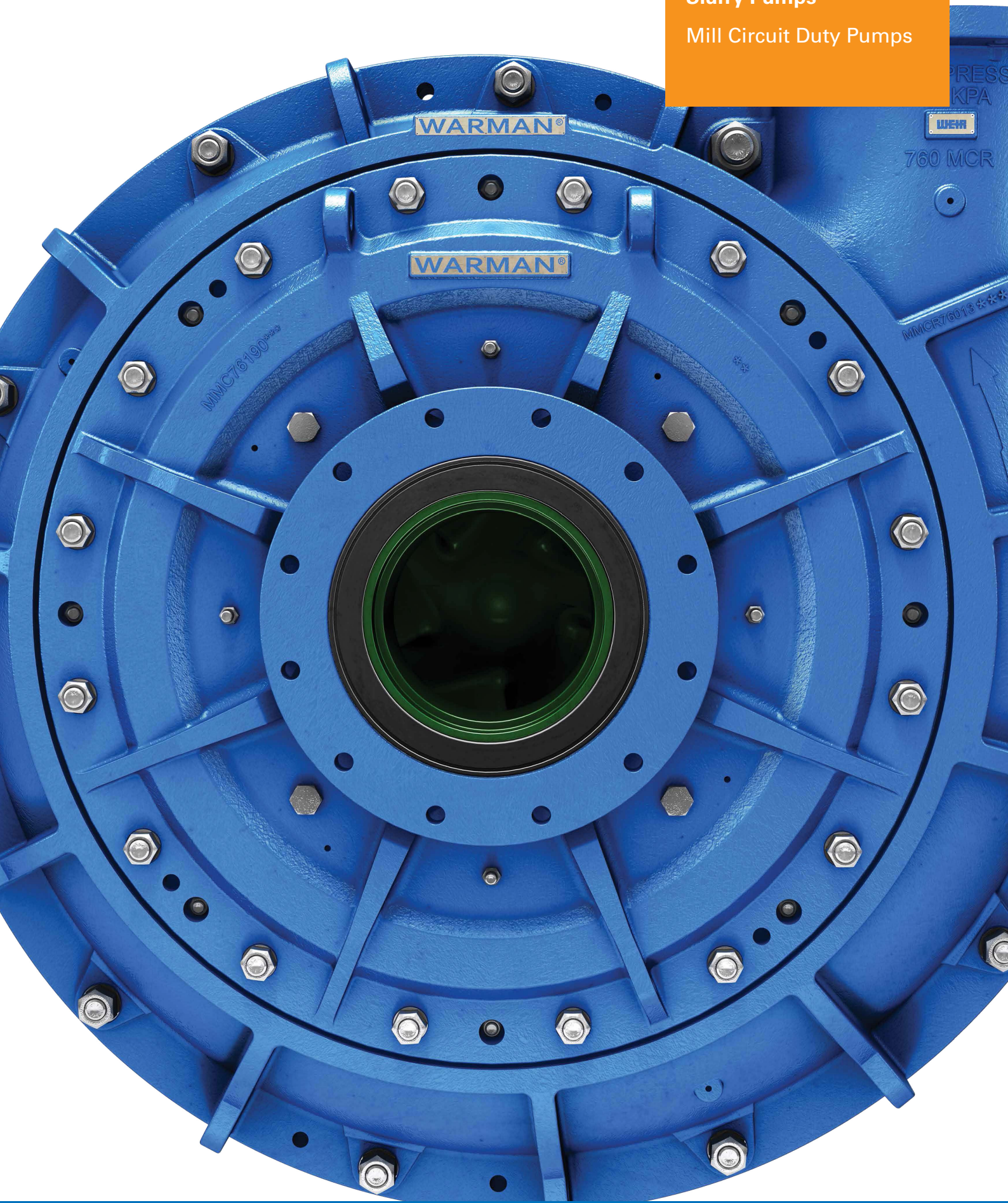
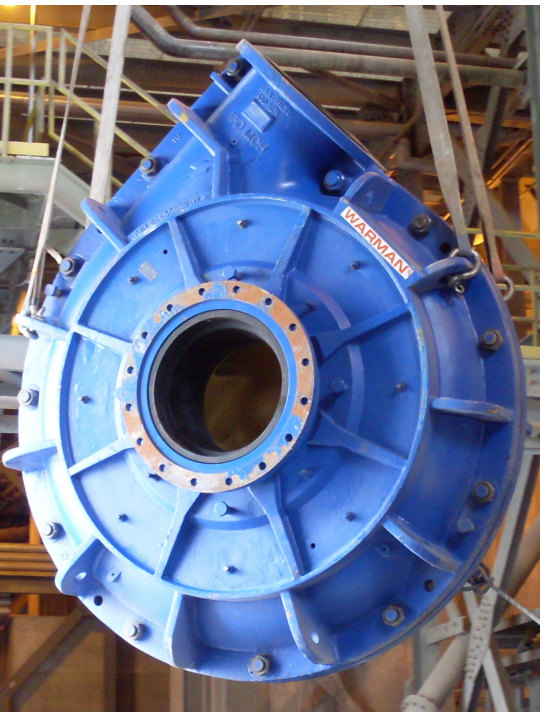
Minerals

WARMAN® Centrifugal Slurry Pumps

Mill Circuit Duty Pumps



Warman® mill circuit duty slurry pumps are designed for the most aggressive duties and provide excellent wear life and reliability.



Warman® MCR® 550 pump with reverse rotation

Hydraulic and wear experience combined with advanced material technology make Warman® mill circuit pumps the best choice for mill circuit applications.

Warman® mill circuit pumps easily manage large size particles in highly abrasive slurries and are specifically designed for the most severe slurry applications such as ball and SAG mill cyclone feed plus water-flush crushing in mineral processing plants.

Warman® mill circuit pump hydraulics are based on more than 30 years of fundamental and applied research and backed up by wear performance field trials. Unique design and wear evaluation software promotes high efficiency and optimum life.

Warman® mill circuit pump designs incorporate the latest in hypereutectic alloy and elastomer technology, extending wear life in highly abrasive and corrosive slurries.

The Warman® mill circuit range is engineered to enable different material combinations

Warman® MCR® pump – thick elastomer liners inside ductile iron outer casing with metal impeller and metal or elastomer throatbush and frame plate liner insert

Warman® MCR-M pump – high chrome iron metal liners inside ductile iron outer casing with metal impeller, throatbush and frame plate liner insert

Warman® MCU® pump – all metal unlined high chrome iron casing with metal impeller, throatbush and frame plate liner insert

So whatever the preference – for a rubber or metal lined pump – the Warman® mill circuit pump can provide exceptional wear life and operational safety.

Unique and all new features of the Warman® mill circuit pump design, include:

- Large diameter, low speed, high efficiency impellers
- Latest wear resistant material technology
- Interchangeable part materials
- Increased throatbush adjustment with the Warman® XA throatbush
- Self-centering and low flow stuffing box design
- Single-point gland adjustment
- Fast “one-piece” wet-end change-out
- Reverse rotation options for special sump orientations

Warman® mill circuit pump features are designed to increase productivity and decrease downtime

Features include:

- Large diameter, low speed, high efficiency impeller manufactured from a range of abrasion resistant alloys provides increased wear life.
- Patented shrouds that extend past the periphery of the impeller and expelling vanes are designed to provide improved flow and reduced wear at the expelling vane tips.
- Large, open internal passages which reduce internal velocities thus reducing wear.
- A large diameter shaft with a short overhang and heavy duty roller bearings housed in a low profile fixed assembly or a removable bearing cartridge.
- Patented casing profile with more material in areas of high particle impingement gives exceptional wear life.
- Reversible casing allows the discharge orientation to be either “right vertical” position (standard) or “left vertical” position, thereby giving greater flexibility to the plant layout designer. The only additional parts required to effect the changeover are the clockwise rotation impeller and shaft.

Engineered for severe duties, the Warman® mill circuit pump draws on years of proven mill circuit application experience

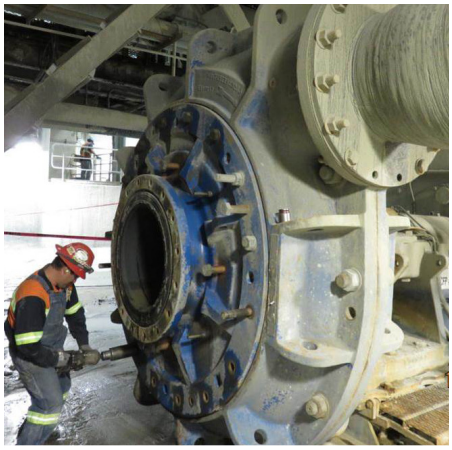
The use of rubber in large mill pumps was pioneered in South American copper mines and a significant number of these plants now use Warman® MCR® elastomer lined pumps for mill discharge (cyclone feed) duties.

Benefits of the elastomer liner in MCR® pumps include:

- High resilience elastomer that will handle coarse particles and ball scats with ease
- A light weight design that is safer for maintenance, compared to heavy metal liners
- A lower cost than heavy metal liners

Lined or unlined mill pump options can offer the optimum cost solution for your application

The outer casing of the lined Warman® MCR-M all-metal pump provides slurry containment and allows a safe shutdown in the event of a liner crack. This provides a lower risk alternative to plants where casing breakage due to mill ball overflow is a concern.



Top: Reinstalling Warman® MCR® 550 pump suction cover after impeller and throatbush inspection.

Bottom: Preparing Warman® MCR® 750 rubber lined wet end for a quick one-piece wet end change-out

The new Warman® mill circuit pump design combined with the unique features of the past make it even more efficient and more reliable than ever before.

Deep expelling vanes

Reduced recirculation is achieved by the deep expelling vanes on the front of the high chrome alloy impellers. Expelling vane tip turbulence is minimised by the patented extended shroud feature that traps tip vortices and prevents localised scouring on the throatbush face.

Heavy duty internal liners

Internal liners can be fully worn before replacement, as the split outer casing provides structural integrity and high operating pressure capability and safety.

Two-piece cover plate

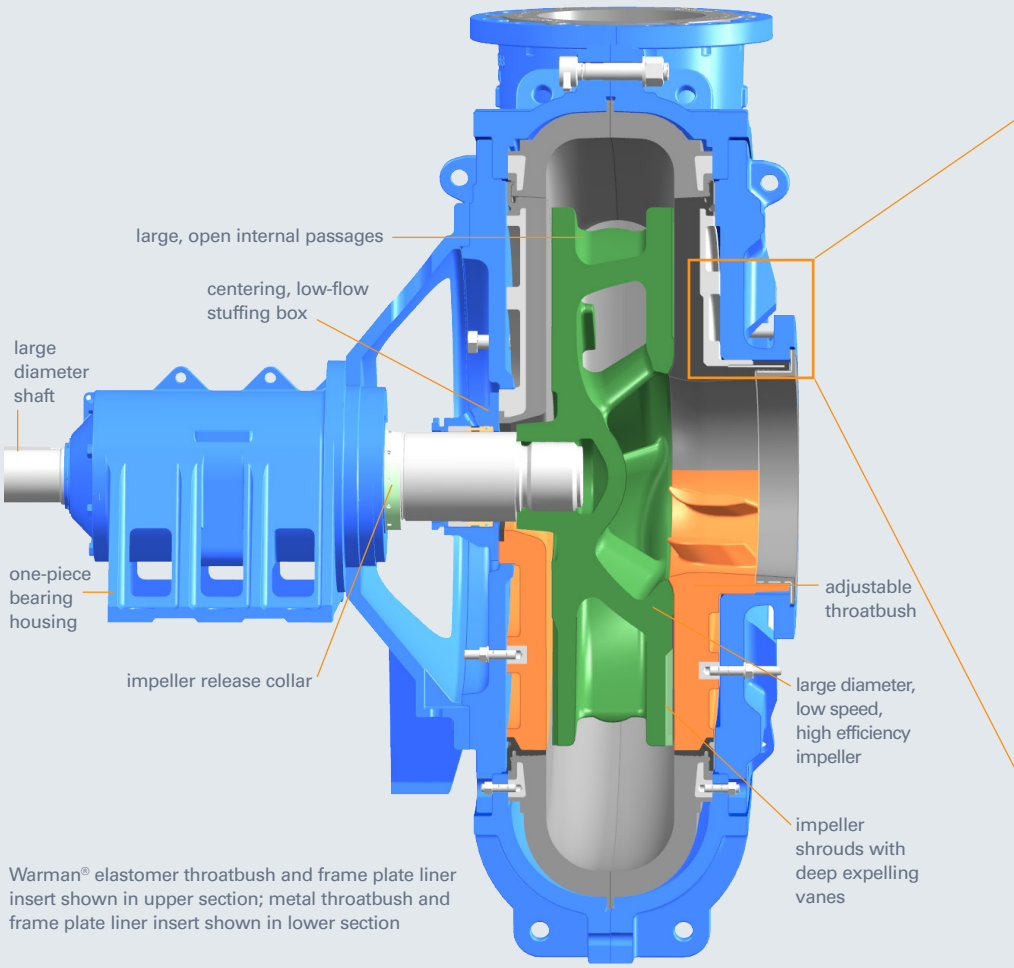
Split cover plate allow easy access for replacement of the impeller and throatbush.

Throatbush with Pre-Swirl vanes

Warman® throatbushes featuring Pre-Swirl vanes take wear life and reliability to the next level. The innovative patent-pending throatbush design was developed to improve wear life of the impeller eye and reduce the re-circulative wear at the impeller-throatbush interface. This is accomplished through a series of guide vanes in the pump inlet which induce a rotational velocity in the slurry.

The Pre-Swirl guide vanes are designed to reduce the relative velocity of the slurry to the rotating impeller, improve the angle of incidence between the slurry flow and the leading edge of the impeller vanes and improve the uniformity of solids distribution in the slurry. This creates a smoother entry for the slurry into the impeller, which is designed to improve wear life, reduce downtime and provide superior reliability.

Warman® MCR® 760 Pump Sectional Drawing



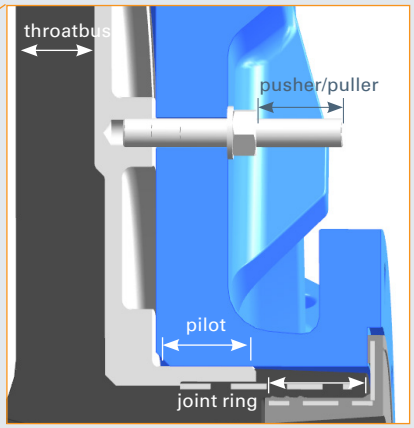
Warman® elastomer throatbush and frame plate liner insert shown in upper section; metal throatbush and frame plate liner insert shown in lower section

Warman® throatbush with Pre-Swirl vanes designed to improve wear life.

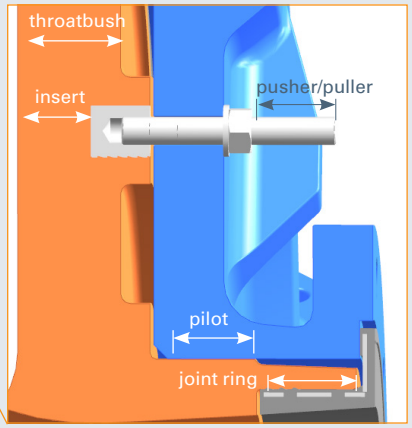
Warman® XA throatbush adjustment

Throatbush adjustment with the Warman® XA (extra adjustment) thoatbush is now available on all Warman® mill circuit pump designs. The XA throatbush adjustment feature offers improved sealing and easier installation of the intake joint ring into both elastomer and metal throatbushes. Using the XA throatbush, the total axial adjustment is up to 80-100% of the throatbush thickness, compared to the previous adjustment which allowed for

The Warman® XA throatbush adjustment feature allows the liner to move closer to the impeller face to minimise the impeller-throatbush gap.



Warman® MCR® elastomer throatbush

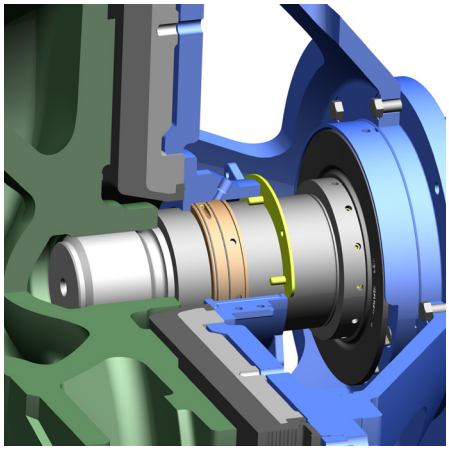


Warman® metal throatbush

Self-centering and new low flow design stuffing box

Adjustable stuffing box allows for centering of the stuffing box and lantern restrictor to the shaft sleeve. This will increase packing life and decrease gland seal water consumption.

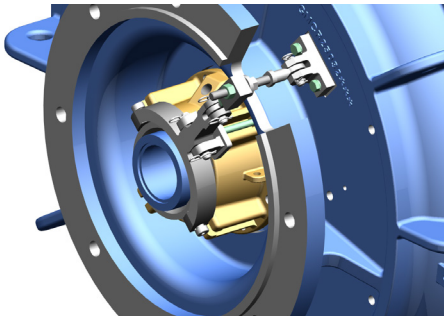
The low flow stuffing box is made with tungsten carbide coated J221 shaft sleeves. The stuffing box additionally features close clearance split lantern restrictors with a harder non-galling coated inside diameter. The upgraded materials and design can reduce gland water consumption up to 50% compared to previous Warman® MCR® pump designs.



Centering tool pins align stuffing box to the sleeve.

Single-point gland adjustment

A new design feature, single-point gland adjustment, allows for safe packing adjustment from outside of the stuffing box guard while the pump is operating.



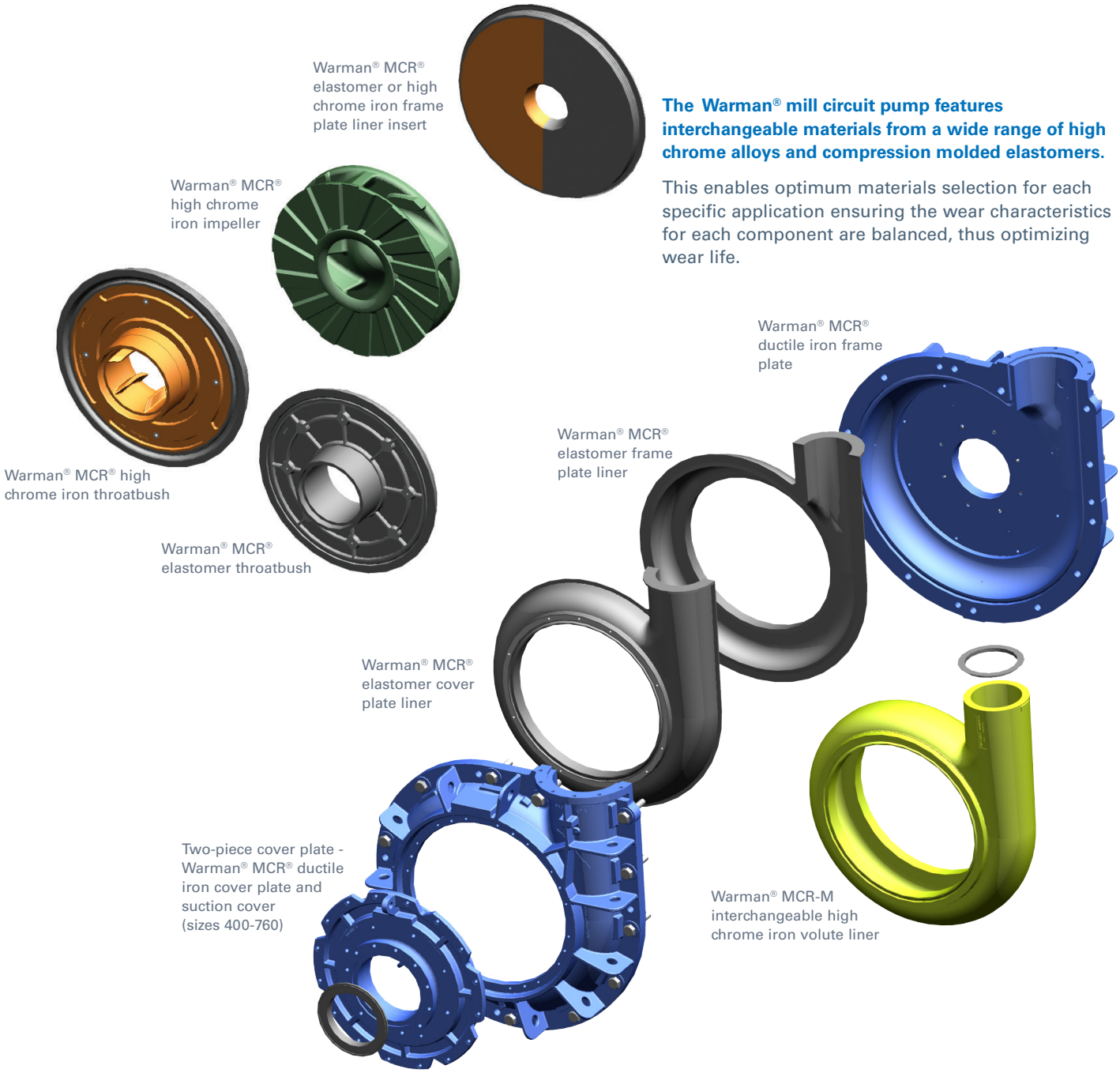
Single-point gland adjustment allows for safe adjustments while pump is operating.

"One-piece" wet end change-out ensures minimum mill downtime

Larger Warman® mill circuit pump wet ends can be quickly changed out and replaced as "one-piece." By adjusting the throatbush to clamp the impeller tight against the frame plate liner insert, the frame plate mounting bolts can be removed, and the wet end with clamped impeller can be unscrewed from the shaft and the outer casing, liners and impeller pulled off as "one-piece." Impeller and liner inspection can then be completed at a more convenient time in the workshop.

Above: A new innovative quick change procedure has been developed for faster removal of the larger mill circuit pump wet ends.

Left: Warman® MCR® 450 pump wet end being removed.

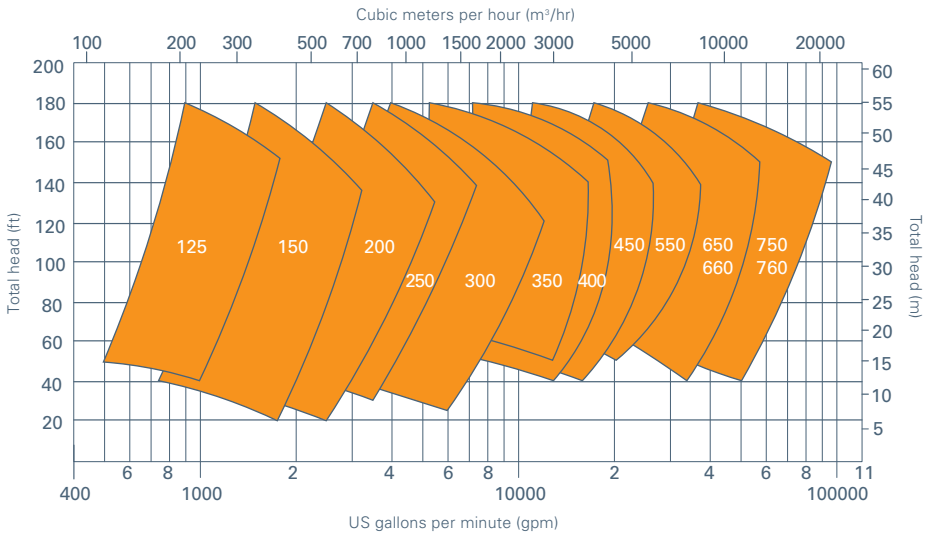


The Warman® mill circuit pump features interchangeable materials from a wide range of high chrome alloys and compression molded elastomers.

This enables optimum materials selection for each specific application ensuring the wear characteristics for each component are balanced, thus optimizing wear life.

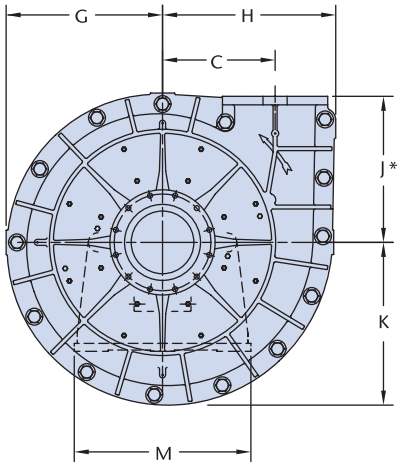
Warman® Mill Circuit slurry pumps – quick selection guide

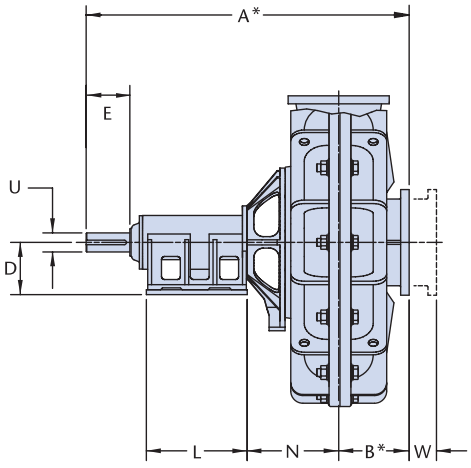
Approximate clear water performance - to be used for preliminary selection only.



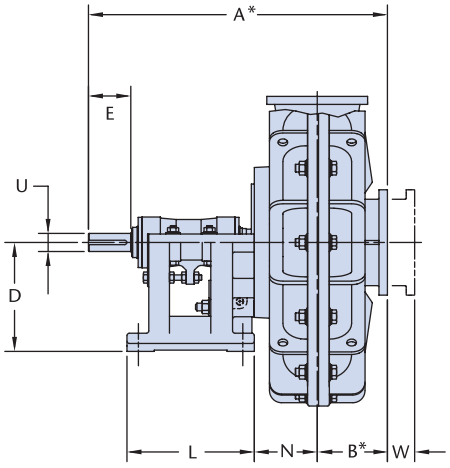
Warman® Mill Circuit slurry pumps - outline dimensions

To be used for preliminary selection only. All measurements in mm unless otherwise noted.





Fixed bearing assembly



Adjustable bearing assembly

Adjustable Bearing Assembly

Pump	Size	Type	Frame	A*	B*	C	D	E	G	H	J*	K	L	M	N	U	Key size	W
	in			mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
125	6x5	MCR®/MCU®	EEAM	1200	206	250	457	205	426	445	425	435	448	622	264	85	22x14	335
150	8x6	MCR®/MCU®	EE	1247	243	351	457	222	533	569	532	554	448	622	265	85	22x14	400
200	10x8	MCR®/MCU®	FF	1670	335	485	610	290	725	752	745	740	705	990	383	120	32x18	460
250	12x10	MCR®/MCU®	FF	1742	390	560	610	290	824	868	850	847	705	990	399	120	32x18	900
300	14x12	MCR®/MCU®	GGAM	2010	381	629	851	357	940	1020	879	980	876	1219	393	150	36x20	700
350	16x14	MCR®/MCU®	TU	2262	404	697	900	350	1030	1123	970	1077	1050	1460	502	150	36x20	650
400	18x16	MCR®	TU	2412	510	801	900	350	1148	1281	1156	1199	1050	1460	520	150	36x20	900
450	20x18	MCR®	TU	2468	580	930	900	350	1293	1431	1207	1345	1050	1460	520	150	36x20	1084
550	26x22	MCR®	U	3180	680	1025	900	455	1406	1550	1322	1479	1375	1440	610	240	56x32	1080
650	30x26	MCR®	U	3343	758	1200	900	455	1645	1853	1554	1755	1375	1440	709	240	56x32	1200
750	36x30	MCR®	V	4106	850	1500	1250	445	1910	2290	2250	2130	1875	2040	765	280	63x32	1500

Fixed Bearing Assembly

Pump	Size	Type	Frame	A*	B*	C	D	E	G	H	J*	K	L	M	N	U	Key size	W
	in			mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
200	10x8	MCR®/MCU®	M100	1670	335	485	255	290	700	728	745	740	453	880	547	100	28x16	460
250	12x10	MCR®/MCU®	M100	1742	390	560	255	290	824	868	850	847	453	880	563	100	28x16	900
300	14x12	MCR®/MCU®	M120	2142	381	629	310	316	940	1020	879	980	699	1048	651	120	32x18	700
350	16x14	MCR®/MCU®	M120	2168	404	697	310	316	1030	1123	970	1077	699	1048	655	120	32x18	650
400	18x16	MCR®	M150	2541	510	801	405	344	1148	1281	1156	1199	770	920	687	150	36x20	900
450	20x18	MCR®	M150	2485	580	930	405	344	1293	1431	1207	1345	770	920	761	150	36x20	1084
550	26x22	MCR®	M180	2870	680	1025	450	349	1406	1550	1322	1479	824	1200	880	180	45x25	1080
650	30x26	MCR®	M200	3323	758	1200	505	455	1645	1853	1554	1755	918	1340	1055	200	45x25	1200
660	30x26	MCR®	M240	3714	871	1375	600	415	1965	2093	1950	2035	1000	1600	1195	240	56x32	1300
750	36x30	MCR®	M240	3678	850	1500	600	415	1918	2258	1850	2062	1000	1600	1180	240	56x32	1500
760	36x30	MCR®	M240	3678	820	1500	600	415	2051	2296	1950	2176	1000	1600	1211	240	56x32	1650

*Includes compression of rubber flange joint.

Consult outline dimension drawings for size and location of mounting holes. Dimensions are for reference only.

Note: Casing dimensions are symmetrical around vertical centerline should the “left vertical” pump orientation be used.

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