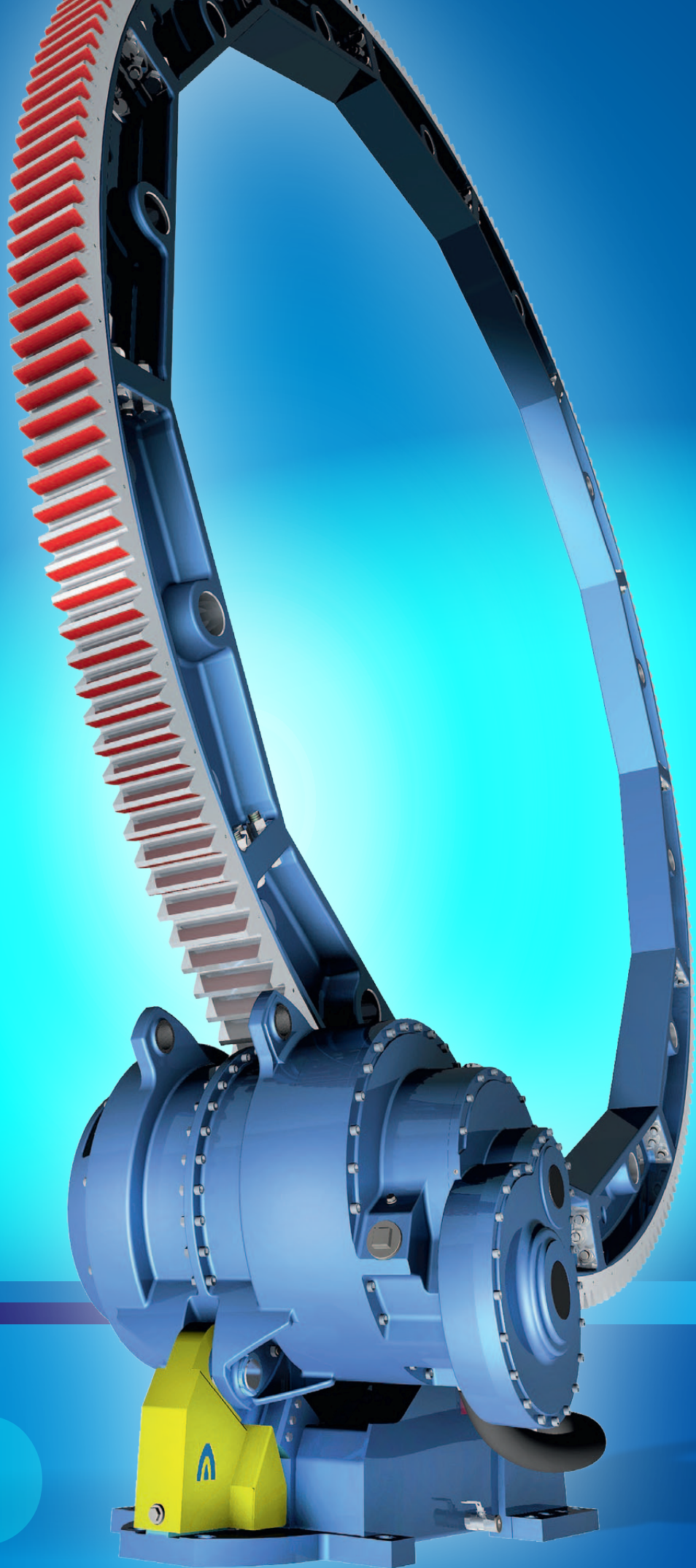




Kumera Active Drive™

Unique efficiency
for all drum drives



KAD



KUMERA Active Drive™ ensures optimal load distribution on girth gear teeth throughout years of operation without a need for high accuracy alignment. This compact solution utilizes the full load capacity of the valuable girth ring while providing maximum usability and serviceability with minimum space requirements.

KUMERA Active Drive™ can be equipped with

- Flange motors up to IEC size 315 (315 kW)
- Disk brake
- Backstop
- Auxiliary drive

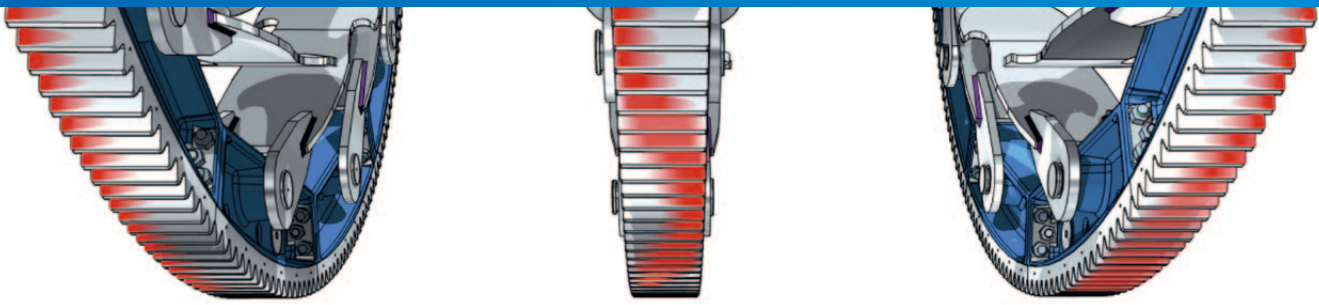
Alignment of the drive unit

Conventional girth gear drives have significantly high demands when it comes to alignment accuracy. When KUMERA Active Drive™ is utilized, the only accurate dimensional requirement needed at installation is the tooth backlash. The lateral alignment tolerance is as rough as 3 mm / 100 mm.

Distribution of tooth contact pressure

Even if the alignment of the conventional drive is performed as well as possible, the result is commonly an unpredictable contact pressure distribution. Runouts and deformations during operation further decrease the load capacity.

KUMERA Active Drive™ independently optimizes the tooth contact by constantly modifying the alignment of the drive unit. This enables girth gear load ratings that are unreachable for conventional drives.



Constant asymmetric contact
 Contact pattern is constantly located at other end of teeth
Misaligned drive unit or pinion shaft

Multiple contact transformations
 Contact pattern changes position multiple times per girth gear revolution
Misalignment in pinion toothing
Misalignment in girth gear segments

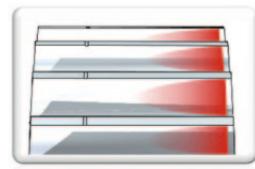
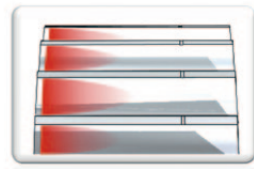
Single contact transformation
 Contact pattern changes position once per girth gear revolution
Misalignment in whole girth gear

Common girth gear drive contact pattern problems ...

Contact pattern leans left
 Only the area at left end of teeth is in contact increasing contact pressure
Load capacity decreases

Misalignment occurs

Contact pattern leans right
 Only the area at right end of teeth is in contact increasing contact pressure
Load capacity decreases



Conventional drive

Reality

Conventional drive

KAD

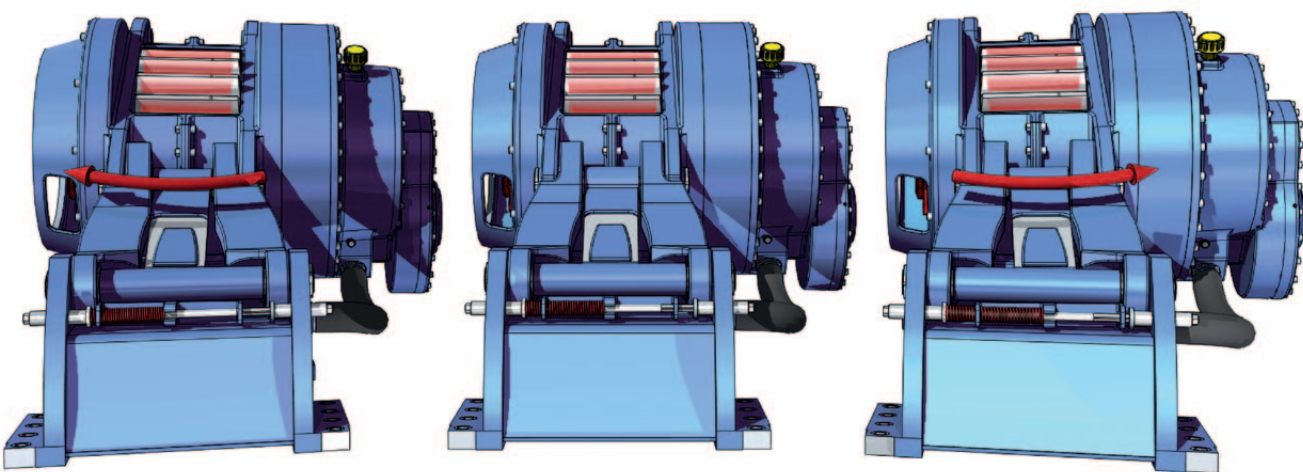
Ideality

KAD

KUMERA Active Drive™ responds
 Pinion is free to tilt clockwise to achieve 100% contact and optimal flank load distribution
Ideal load capacity is maintained

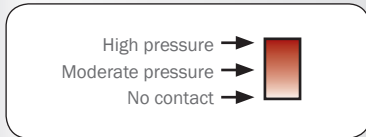
No misalignment
 Girth gear and pinion ideally aligned with respect to geometry and deformations
Ideal load capacity

KUMERA Active Drive™ responds
 Pinion is free to tilt counterclockwise to achieve 100% contact and optimal flank load distribution
Ideal load capacity is maintained



... solved by Kumera Active Drive™.

Flank contact pressure

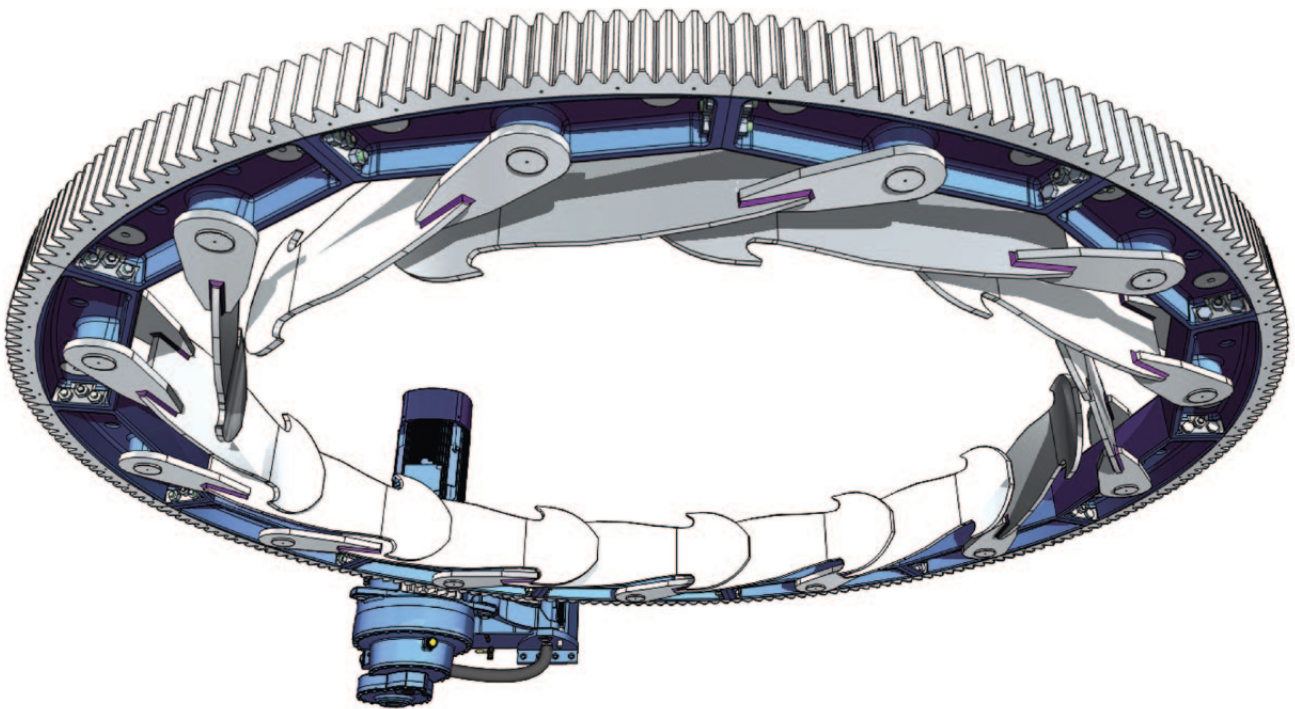


KUMERA Active Drive benefits

- Up to 50 % increase in girth gear load capacity
- No need for load dependent tooth reliefs to compensate deformations
- Alignment accuracy requirements significantly lower
- Mounting hours of the drive unit decreased drastically due to lack of time consuming accurate alignment

KUMERA Active Drive™

Optimal flank load distribution maintained despite misalignment and deformation errors



Tooth Backlash adjustment

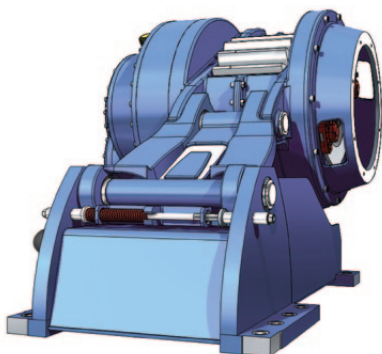
In various girth gear applications, the backlash of the drive must be occasionally adjusted. The adjustment in conventional drives is done by moving the drive unit laterally. As the position is changed, a complete realignment is required.

Allowed by the exquisite structure of KUMERA Active Drive™, a user friendly backlash adjustment system is integrated to the drive unit. Adjustment is performed simply by rotating a single adjustment screw. The resulting backlash can be calculated in relation to revolutions of the adjustment screw.

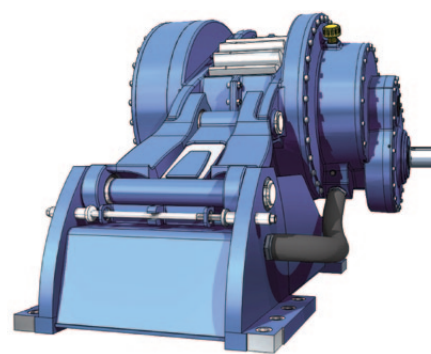
Serviceability

KUMERA Active Drive™ is exclusively designed for girth gear applications resulting in a compact drive unit structure. Low weight components enable convenient on-site maintenance. Integrated speed reducer in the side of the pinion casing is easily dismountable. If more comprehensive overhaul or replacement is relevant, the whole drive unit can be released from the mounting base only by dismantling two axles and the lubrication tubes.

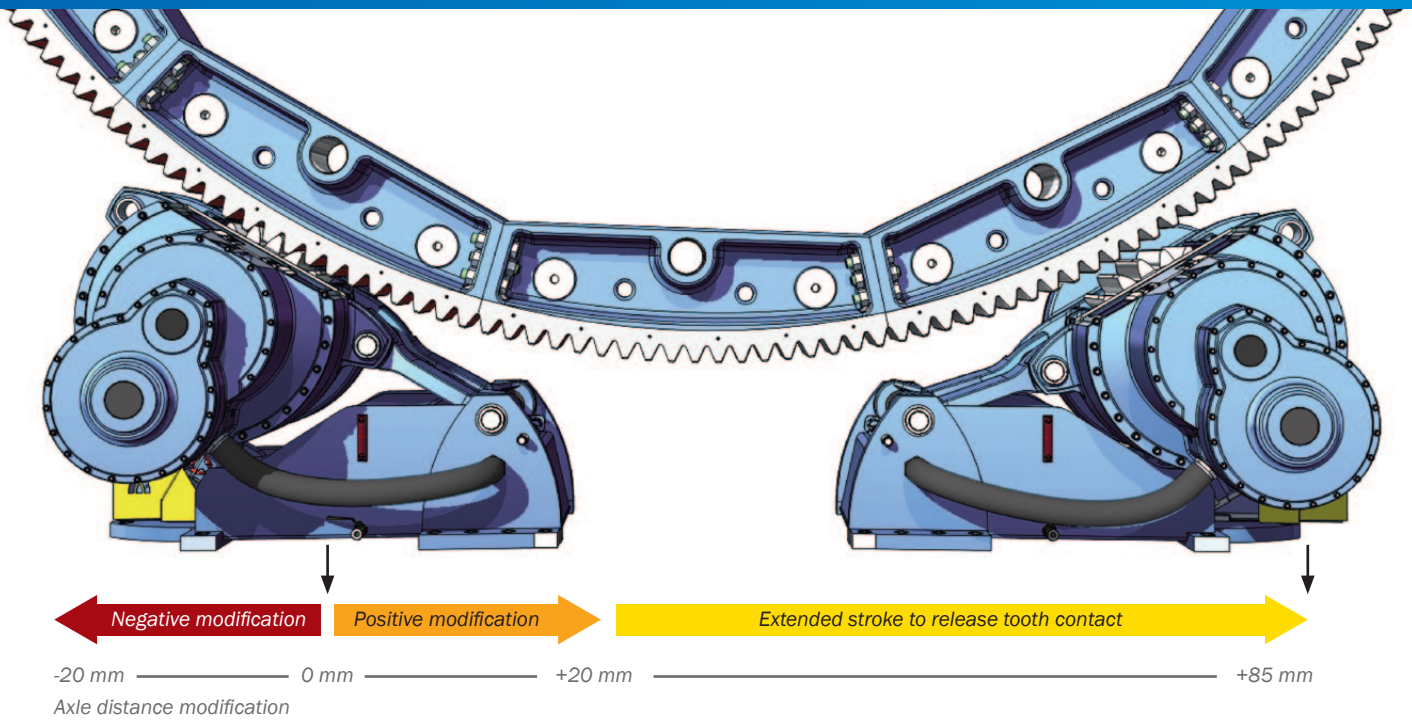
Both of these operations can be carried out with minimum downtime and naturally without realigning the drive unit.



The KAD-3500 drive unit
(3-stage speed reducer with motor adapter)

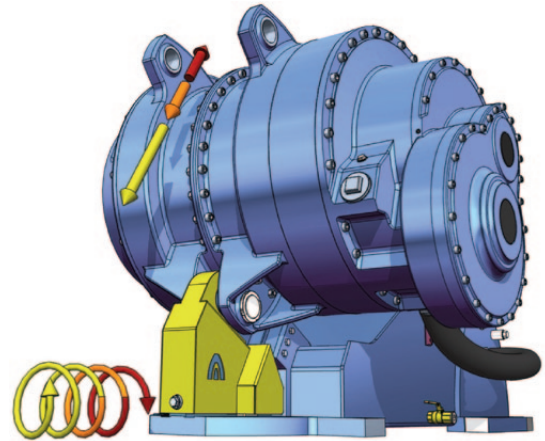


The KAD-2500 drive unit
(2-stage speed reducer)



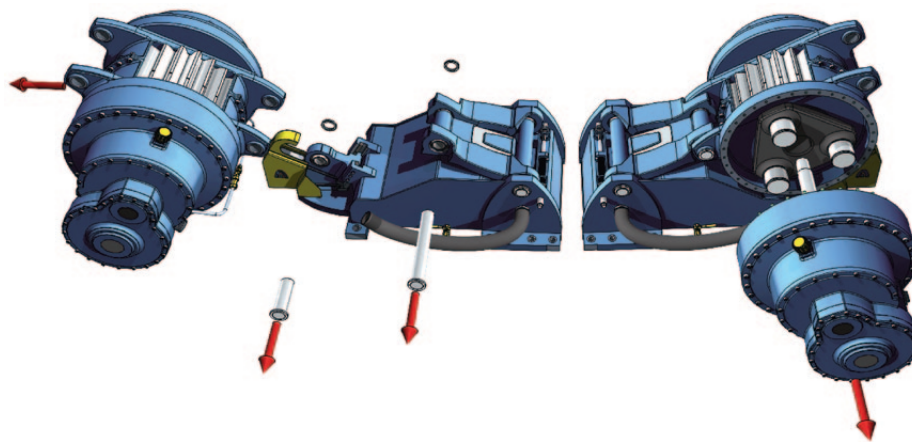
KUMERA Backlash Adjustment System™ benefits

- No dismantling of heavily loaded bolt joints requiring high torque tightening
- No realigning after backlash adjustment
- Backlash can be calculated in relation to revolutions of the adjustment screw
- Releasing the tooth contact with girth gear possible to enable maintenance
- Tooth contact release is a useful feature also while mounting the drive unit



KUMERA Backlash Adjustment System™

User-friendly axle distance modification without dismantling the drive unit



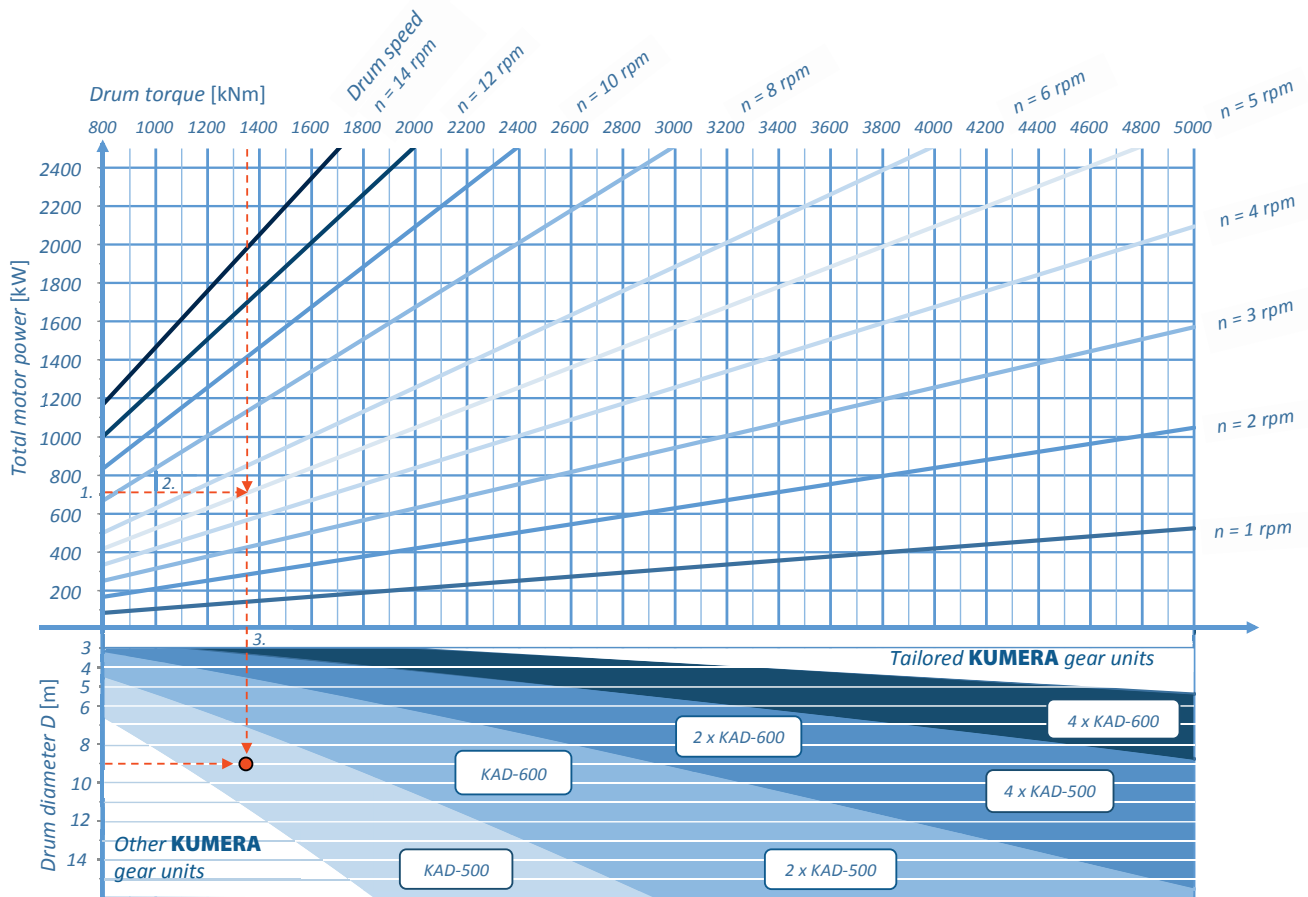
Release whole drive unit

By unmounting shafts of the Active Drive mechanism
Convenient to perform on-site with low downtime

Service operations performable without realigning.

Release only speed reducer

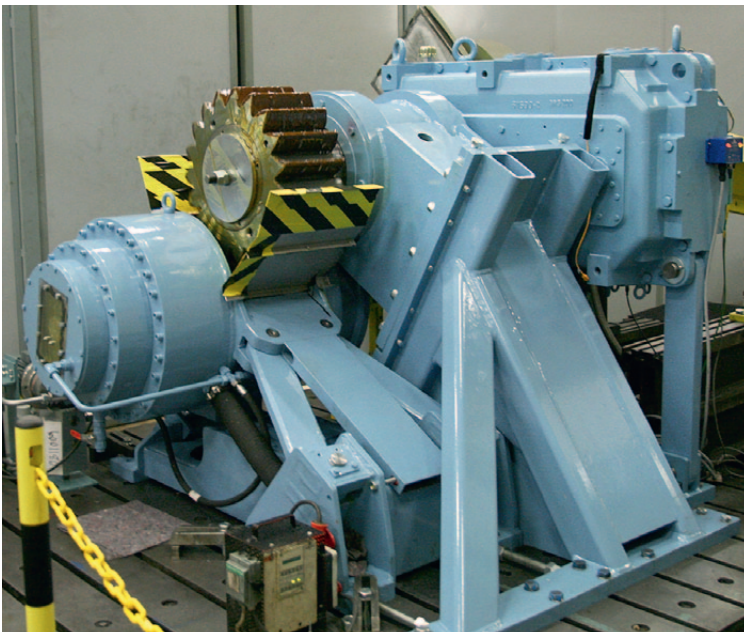
By unmounting annulus gear bolts and releasing the input coupling
Convenient to perform on-site without high-capacity cranes

Selection figure for **KUMERA Active Drive™** unit size

Selection example for total motor power of 700 kW, drum speed of 5 rpm and diameter of 9 meters:

Find total motor power (1.) - proceed horizontally to correct drum speed to select drum torque (2.) - proceed vertically to correct drum diameter (3.) - the selection is a single KAD-500 drive unit (●).

Please note that this figure is for preliminary selection only, always contact Kumera before selecting drive unit.



The design of **KUMERA Active Drive™** has been verified by performing a full-scale loaded test run using a prototype drive unit and a misaligned, wobbling counter gear.

KUMERA Active Drive™ feature	Benefit compared to conventional girth gear drives
Active Drive tooth load distribution mechanism	Enables full utilization of the valuable girth gear's load capacity.
	Girth gear width can be reduced with up to 30 % or load rating can be increased up to 50 %
	Mounting hours can be minimized thanks to low alignment requirements (lateral mounting accuracy 3 mm / 100 mm)
Backlash Adjustment System	No need to realign drive unit after backlash adjustment
	No need to loosen high-torque main fastening bolts to adjust backlash
	In multiple-unit drives one unit can be detached from the girth gear for maintenance while others remain in operation
Separate mounting base	Drive unit can be easily detached from the mounting base for maintenance or replacement
	Base steel structures are lighter due to more direct transfer of girth gear tooth loads compared to shaft end mounted pinion
Planetary gear output stage	Speed reducer's weight is minimized, thus enabling convenient maintenance on-site

KUMERA Active Drive™ Unit size	Nominal pinion torque	Ratios	Approx. weight	Pinion details		
				Facewidth		Girth gear material
KAD-500	180 000 Nm	11 ... 250	3000 kg	320 mm	$m_n = 27$	EN-GJS-800-2
					$z = 23$	EN-GJS-1050-6
KAD-600	360 000 Nm	11 ... 250	5500 kg	480 mm	$m_n = 32$	EN-GJS-800-2
					$z = 19$	EN-GJS-1050-6
					$m_n = 27$	EN-GJS-800-2
					$z = 25$	EN-GJS-1050-6
					$m_n = 32$	EN-GJS-800-2
					$z = 21$	EN-GJS-1050-6

Kumera segmented girth gear benefits

- Machinable with high accuracy (more precise machines and tools)
- No limitation in diameter
- Small dimensions ease transportation
- A segment can be replaced as spare part
- Application of Austempered Ductile Iron EN-GJS-1050-6 (ADI) ensures high load capacity and low wear
- In-house foundry and machining enables full control of the entire manufacturing chain and short delivery time



Kumera Corporation

Kumera Corporation is a worldwide manufacturer of industrial machinery and engineering services. The corporation consists of four major operating divisions:

Power Transmission Group provides a comprehensive range of industrial and marine gearboxes for all major process industries. Kumera has more than 50 years of experience as manufacturer of mechanical power transmissions. There are more than 200.000 Kumera gear units in operation world-wide.

Technology Division specializes in state-of-the-art engineering and heavy process equipment for metallurgical and environmental industries. Kumera has successfully performed several modernization projects for metals industry and is a leading manufacturer of industrial steam dryers for copper and nickel smelters and lignite.

Foundry Division with **Peiron Oy** as the leading company produces all types of steel and iron castings, forming a link in the vertical refining chain of Kumera Corporation.

Marine Division produces propulsion gearboxes and propellers including control systems for any seafaring vessels.

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