ŽOLLERN

Solid metals. Fine solutions.

**Drive Technology**

# Gearbox solutions for sugar mills

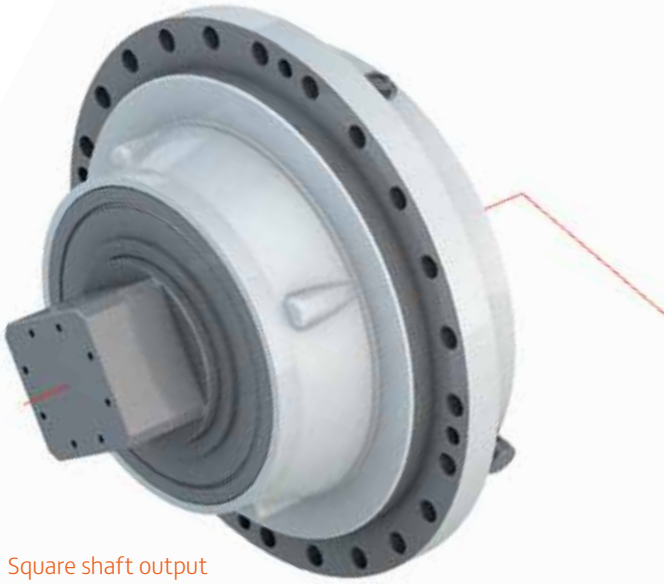
# **Planetary gearbox solutions** for sugar mills

The ZOLLERN group is one of the oldest family owned companies in Germany. Since its foundation in 1708 metal has always been the nucleus and focus point of all developments. Metal, metal alloys, its processing and products or solutions made of metal are ZOLLERN‘s core competency.

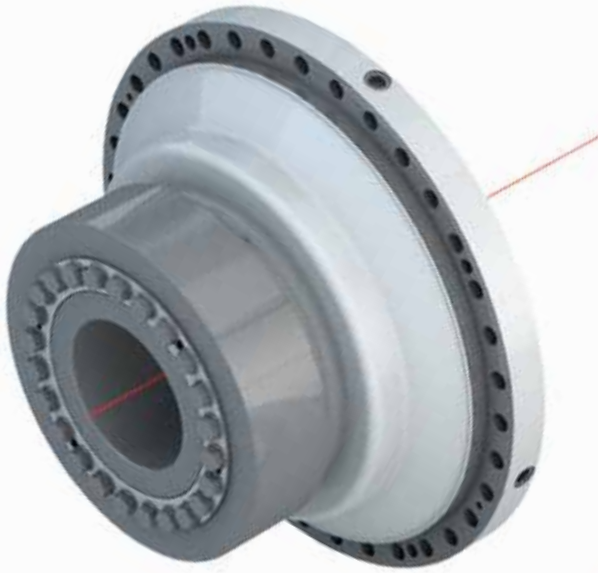
Already in 1972 ZOLLERN started the development and production of gearboxes with a strong focus on planetary gearboxes which can meanwhile be found all over the world and in nearly every application. They are well known for their high quality standard, performance and reliability.

A milestone was the acquisition of the famous DORSTENER brand in 2001. This has brought ZOLLERN in a position to offer its customers the full range of industrial gearbox solutions. DORSTENER gearboxes can be found in sugar mills all over the world. Some of them are working for more than thirty years without any defects.

The trend towards electrically powered sugar mills brought ZOLLERN‘s planetary gearboxes with its high level of efficiency into sugar mills as well.



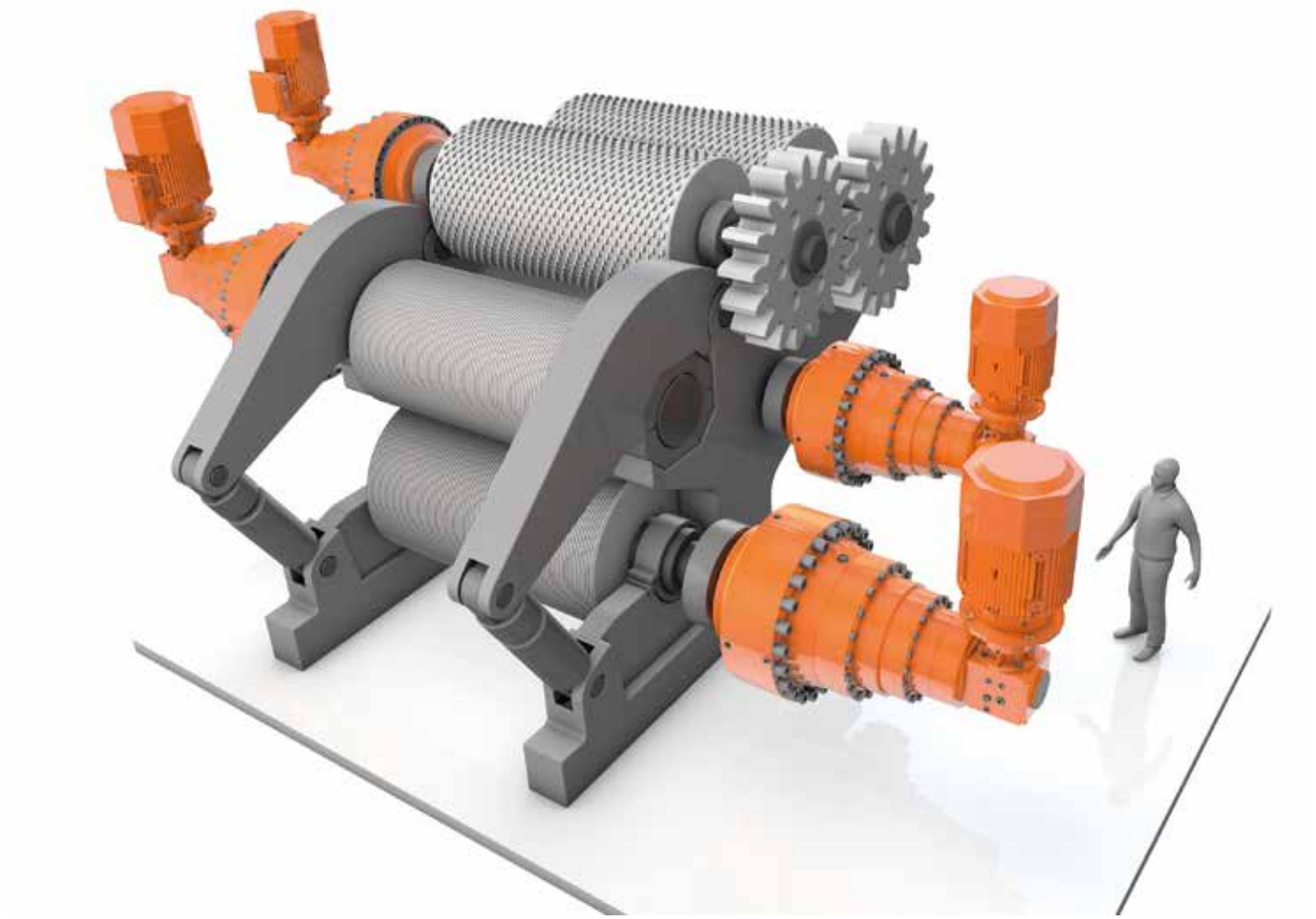
Square shaft output



Shrink disc output


Coaxial input drive
Rectangular input drive
Planetary gearbox
Output flange
Splined hollow shaft output

# **Planetary gearboxes**
# for improved milling and lower costs

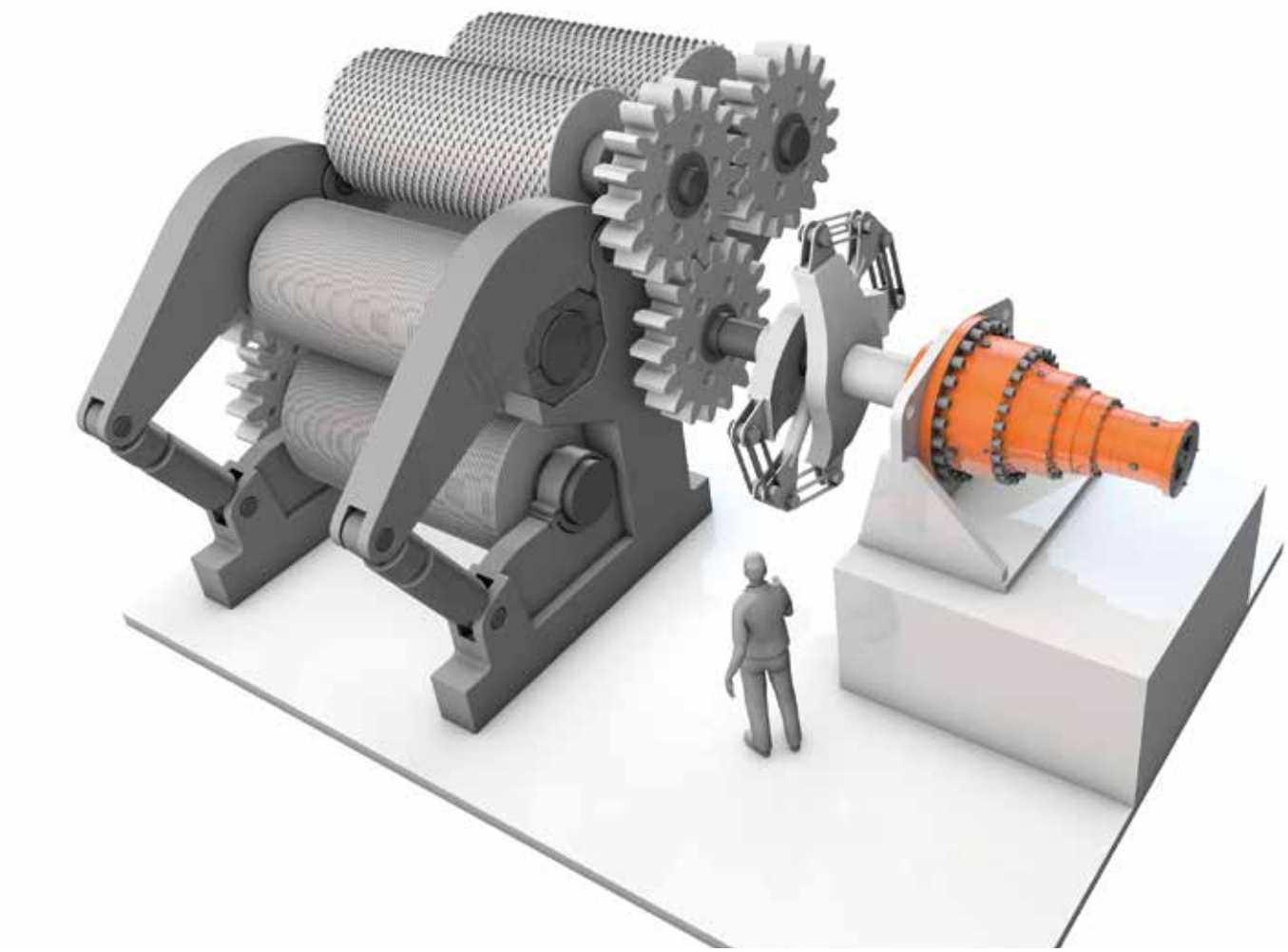


## Multiple and Auxillary Drives

The multiple drive solution for sugar mills is getting more and more popular due to the possibilities to steer the speed of each roller mill individually which improves the milling results significantly. Besides this main advantage there are more benefits of using planetary gearboxes for the multiple drive concept:

- very low installation costs
- no footprint
- modular designed and standardized gearboxes can be easily replaced which reduces plant downtimes and spare parts stock dramatically
- easy and reduced maintenance
- lower total power demand

# **Planetary gearboxes**
# for improved milling and lower costs



## Single Drive

Compared to conventional parallel shaft gearbox solutions for single drive mills the advantages of applying the planetary gearbox concept are:

- significant higher efficiency
- very low installation costs
- reduced footprint
- modular designed and standardized gearboxes can be easily replaced which reduces plant downtimes and spare parts stock dramatically
- easy and reduced maintenance
- lower power demand

# Multiple and Auxillary Drives

## Technical data

| Lifetime Gearbox: min. 50.000 h (calcualted according to DIN 3990) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type** | **Output Speed in rpm** | **Static max. load in Nm** | **Ratio** | **Input Speed in rpm** | **Gearbox [$T_{2\ nom.}$] Max. continuous Output Torque at KA / Service Factor 1,0 in Nm** | **Bearing [$T_{2\ bearing}$] Max. continuos Output Torque at Lh10 - 50.000 h in Nm** | **$P_{1\ nom.}$ at KA / Service Factor 1,0 in kW** |
| 5.34 | 3,0 | 695.000 | 501 | 1.500 | 310.000 | 290.000 | 105 |
| | 3,1 | | 322 | 1.000 | 310.000 | 287.100 | 109 |
| | 3,5 | | 435 | 1.500 | 310.000 | 278.050 | 121 |
| | 3,6 | | 418 | 1.500 | 310.000 | 274.800 | 126 |
| | 3,7 | | 272 | 1.000 | 310.000 | 272.900 | 129 |
| | 4,1 | | 367 | 1.500 | 310.000 | 264.300 | 144 |
| | 4,2 | | 236 | 1.000 | 310.000 | 261.430 | 149 |
| | 4,7 | | 322 | 1.500 | 310.000 | 254.210 | 164 |
| | 5,0 | | 199 | 1.000 | 310.000 | 248.500 | 177 |
| | 5,5 | | 272 | 1.500 | 307.000 | 241.640 | 192 |
| | 5,6 | | 177 | 1.000 | * possible, on request | | |
| | 6,4 | | 236 | 1.500 | 303.000 | 231.480 | 219 |
| | 6,5 | | 154 | 1.000 | * possible, on request | | |
| | 6,8 | | 148 | 1.000 | * possible, on request | | |
| | 7,5 | | 199 | 1.500 | 297.000 | 220.030 | 254 |
| | 7,7 | | 130 | 1.000 | 296.000 | 218.630 | 253 |
| 5.36 | 3,0 | 1.145.400 | 501 | 1.500 | 511.000 | 468.000 | 174 |
| | 3,1 | | 322 | 1.000 | 511.000 | 463.320 | 180 |
| | 3,5 | | 435 | 1.500 | 511.000 | 448.720 | 200 |
| | 3,6 | | 418 | 1.500 | 511.000 | 443.470 | 208 |
| | 3,7 | | 272 | 1.000 | 511.000 | 440.400 | 213 |
| | 4,1 | | 367 | 1.500 | 511.000 | 426.520 | 237 |
| | 4,2 | | 236 | 1.000 | 511.000 | 421.890 | 246 |
| | 4,7 | | 322 | 1.500 | 511.000 | 410.250 | 270 |
| | 5,0 | | 199 | 1.000 | 511.000 | 401.020 | 291 |
| | 5,5 | | 272 | 1.500 | 507.000 | 389.960 | 317 |
| | 5,6 | | 177 | 1.000 | * possible, on request | | |
| | 6,4 | | 236 | 1.500 | 498.000 | 373.570 | 359 |
| | 6,5 | | 154 | 1.000 | * possible, on request | | |
| | 6,8 | | 148 | 1.000 | * possible, on request | | |
| | 7,5 | | 199 | 1.500 | 489.000 | 355.090 | 418 |
| | 7,7 | | 130 | 1.000 | 488.000 | 352.820 | 418 |

How to find the right gearbox size:

1. $T_{2\ rating}$ x KA or Service Factor ≤ $T_{2}$ nom.
2. $T_{2\ rating} \leq T_{2\ bearing}$
3. Safety Factor (included): tooth root ≥ 1,4; tooth flank ≥ 1,0

| Lifetime Gearbox: min. 50.000 h (calcualted according to DIN 3990) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | Output Speed in rpm | Static max. load in Nm | Ratio | Input Speed in rpm | Gearbox [$T_{2\ nom.}$] Max. continuous Output Torque at KA / Service Factor 1,0 in Nm | Bearing [$T_{2\ bearing}$] Max. continuos Output Torque at Lh10 - 50.000 h in Nm | $P_{1\ nom.}$ at KA / Service Factor 1,0 in kW |
| 5.38 | 3,0 | 2.132.500 | 501 | 1.500 | 940.000 | 785.000 | 319 |
| | 3,1 | | 322 | 1.000 | 940.000 | 777.150 | 331 |
| | 3,5 | | 435 | 1.500 | 940.000 | 752.650 | 368 |
| | 3,6 | | 418 | 1.500 | 940.000 | 743.850 | 383 |
| | 3,7 | | 272 | 1.000 | 940.000 | 738.710 | 392 |
| | 4,1 | | 367 | 1.500 | 940.000 | 715.430 | 436 |
| | 4,2 | | 236 | 1.000 | 940.000 | 707.660 | 452 |
| | 4,7 | | 322 | 1.500 | 940.000 | 688.130 | 497 |
| | 5,0 | | 199 | 1.000 | 940.000 | 672.660 | 536 |
| | 5,5 | | 272 | 1.500 | 940.000 | 654.090 | 588 |
| | 5,6 | | 177 | 1.000 | * possible, on request | | |
| | 6,4 | | 236 | 1.500 | 935.000 | 626.600 | 675 |
| | 6,5 | | 154 | 1.000 | * possible, on request | | |
| | 6,8 | | 148 | 1.000 | * possible, on request | | |
| | 7,5 | | 199 | 1.500 | 915.000 | 595.610 | 782 |
| | 7,7 | | 130 | 1.000 | 913.000 | 591.800 | 781 |
| 5.40 | 3,0 | 2.970.800 | 501 | 1.500 | 1.300.000 | 1.050.000 | 441 |
| | 3,1 | | 322 | 1.000 | 1.300.000 | 1.039.490 | 458 |
| | 3,5 | | 435 | 1.500 | 1.300.000 | 1.006.730 | 509 |
| | 3,6 | | 418 | 1.500 | 1.300.000 | 994.960 | 530 |
| | 3,7 | | 272 | 1.000 | 1.300.000 | 988.080 | 542 |
| | 4,1 | | 367 | 1.500 | 1.300.000 | 956.940 | 603 |
| | 4,2 | | 236 | 1.000 | 1.300.000 | 946.550 | 626 |
| | 4,7 | | 322 | 1.500 | 1.300.000 | 920.430 | 687 |
| | 5,0 | | 199 | 1.000 | 1.300.000 | 899.730 | 741 |
| | 5,5 | | 272 | 1.500 | 1.300.000 | 874.900 | 813 |
| | 5,6 | | 177 | 1.000 | * possible, on request | | |
| | 6,4 | | 236 | 1.500 | 1.300.000 | 838.130 | 938 |
| | 6,5 | | 154 | 1.000 | * possible, on request | | |
| | 6,8 | | 148 | 1.000 | * possible, on request | | |
| | 7,5 | | 199 | 1.500 | 1.290.000 | 796.680 | 1.103 |
| | 7,7 | | 130 | 1.000 | 1.285.000 | 791.580 | 1.100 |

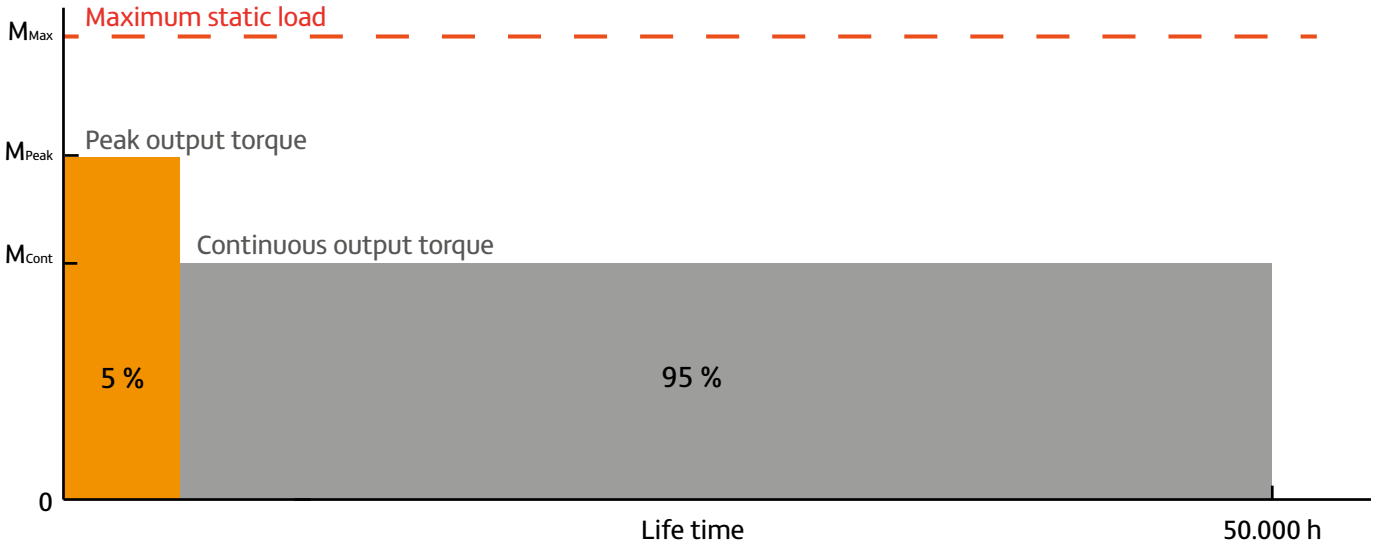
Recomended KA (Application Factor) / SF (Service Factor) for Sugar Mill application ≥ 1,7

# Single Drives
## Technical data

| Type | Ratio | Static max. load in kNm | Motor synchronous speed of 1.000 1/min and 1.500 1/min | | | | |
|---|---|---|---|---|---|---|---|
| | | | Output Speed in 1/min | Continuous Output Torque in Nm | Continuous Motorpower needed in kW | Peak Output Torque in Nm | Peak Motorpower needed in kW |
| 5.42 | (* | 3.190 | (* | 1.350.000 | (* | 2.050.000 | (* |
| 5.44 | (* | 4.250 | (* | 1.800.000 | (* | 2.700.000 | (* |
| 5.46 | (* | 6.230 | (* | 2.640.000 | (* | 4.000.000 | (* |

(* Please get in contact with our technical service for more details.

## Life time calculation




## Additional equipment

Complementary part of the ZOLLERN gearbox solutions is the following equipment which will be customized according to the specific requirements and environemental conditions of each sugar mill.

- Torque arm
- Foot bracket
- Input coupling
- Forced lubrication

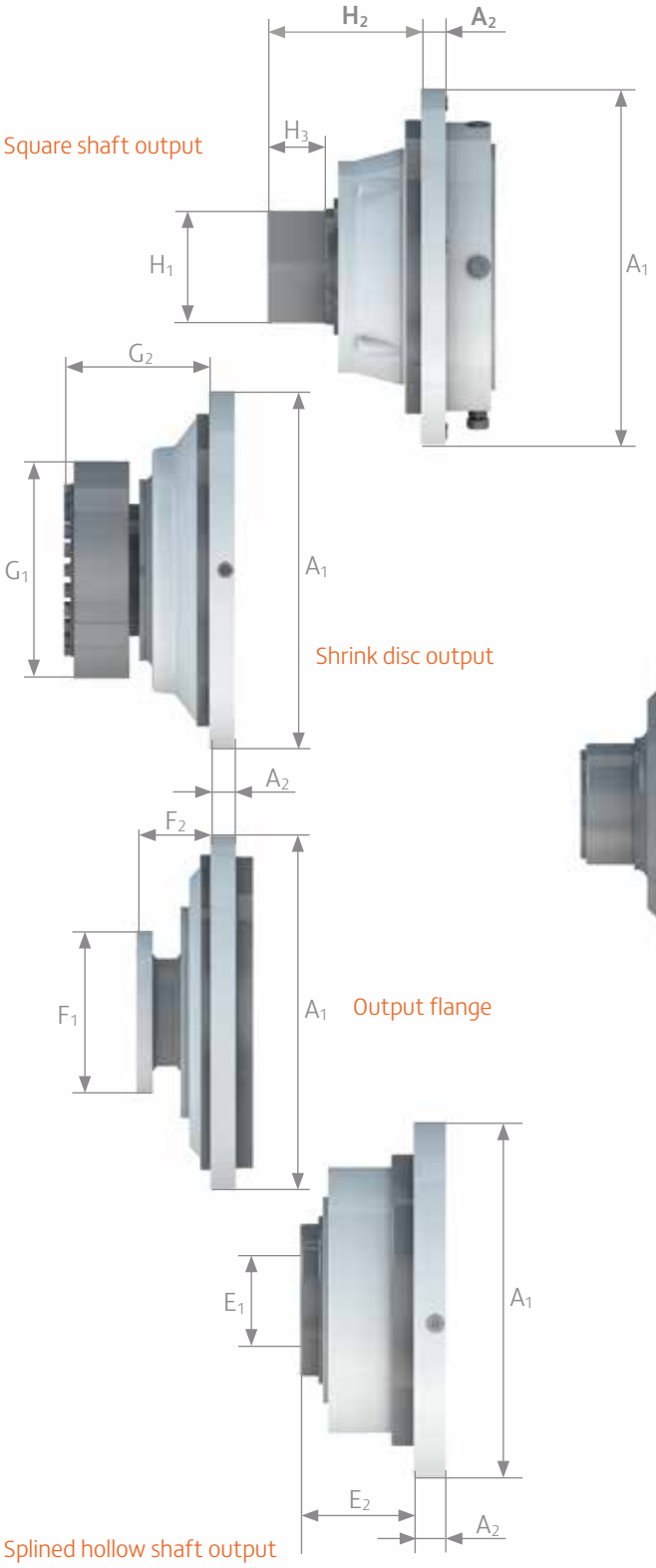
# Gearbox system
## Dimensions

| | | | | | Multiple and auxilliary drives | | | | Single drives | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **5.34** | **5.36** | **5.38** | **5.40** | **5.42** | **5.44** | **5.46** |
| Input Drive | rectangular | $C_1$ | mm | | (* | (* | (* | (* | - | - | - |
| | | $C_2$ | mm | | (* | (* | (* | (* | - | - | - |
| | coaxial | $D_1$ | mm | | (* | (* | (* | (* | (* | (* | (* |
| Planetary gearbox | for rectangular input | $B_1$ | mm | | 655 | 775 | 935 | 1.000 | - | - | - |
| | for coaxial input | $B_1$ | mm | | 825 | 955 | 1.165 | 1.295 | 1.540 | 1.755 | 2.020 |
| Output | flange mountings | $A_1$ | ø in mm | | 985 | 1.170 | 1.430 | 1.575 | 1.725 | 1.865 | 2.145 |
| | | $A_2$ | mm | | 55 | 65 | 80 | 90 | 100 | 110 | 125 |
| | Options: splined hollow shaft | $E_1$ | DIN 5840 | | N280X 5X30X 54X9H | N300X 8X30X 36X9H | N400X 8X30X 48X9H | N450X 8X30X 55X9H | (* | (* | (* |
| | | $E_2$ | mm | | 250 | 300 | 380 | 415 | (* | (* | (* |
| | Options: flange | $F_1$ | ø in mm | | 725 | 800 | 950 | 1.100 | (* | (* | (* |
| | | $F_2$ | mm | | 375 | 450 | 570 | 625 | (* | (* | (* |
| | Options: shrink disk | $G_1$ | ø in mm | | 520 | 650 | 750 | 800 | 940 | 1.020 | 1.220 |
| | | $G_2$ | mm | | 400 | 495 | 575 | 615 | 720 | 785 | 940 |
| | Options: square shaft | $H_1$ | mm | (** | - | 280 | 300 | 340 | 360 | 450 | 500 |
| | | $H_2$ | mm | | - | 620 | 720 | 765 | 900 | 980 | 1.170 |
| | | $H_3$ | mm | | - | 240 | 240 | 280 | 330 | 400 | 450 |

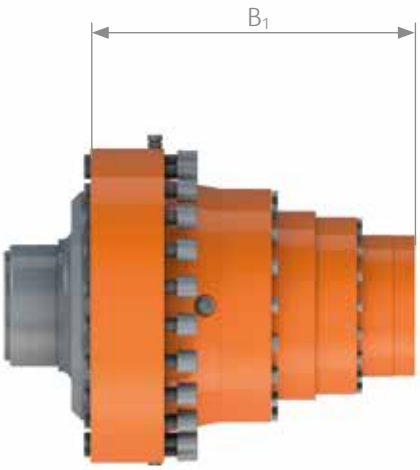
(* Please get in contact with our technical service for more details.

(** over the flats

## Output

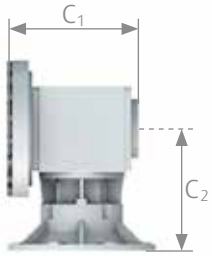



## Planetary gearbox




## Input


Coaxial input drive




Rectangular input drive

# **ZOLLERN Group**
# Product areas

## Metals and shaping

### // Investment casting parts

- Turbine components
  - Vanes / Blades/ Shrouds / Heat Shields
- Structural Castings
  - Gas Turbines / Aero / Engines Defense / Medical / Industrial Components
- Automotive
  - Turbine Wheels / Waste gates / Vanes / Pins / Planet carriers
- Implants
  - Knees (Femur, Tibia) / Hipps
- Alloys
  - Super alloys / Cobalt Chrome alloys

### // Sand casting parts

- Sand casting
- Croningguss / Maskenguss
- Ceramic casting
- Continuous casting
- Centrifugal casting

### // Forgings

- Forgings made of pure copper and copper alloys
- Semi-finished products, open die forged, flat bars, round bar
- Drop forged parts
- Rings, seamlessly rolled
- Bushings, seamlessly forged
- Individual pieces, small series, large series

### // Special profiles and finished parts

- Special profiles, coils, bars
- Customer-specific finished parts
- Profile types hot-rolled, cold-rolled, cold-drawn, induction-hardened

# Drive technology and automation

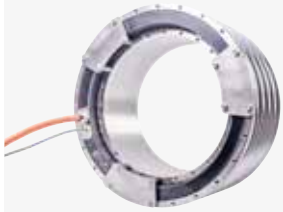
## // Gearboxes

- Travel drives
- Slewing gearboxes
- Winch gearboxes
- Industrial gear units
- Gearboxes for tunnel boring machines
- Sugar mill gearboxes
- Electric drive systems
- Condition Monitoring and Predictive Maintenance

## // Winches

- Hoisting winches
- Free fall winches
- Pull winches
- Rescue boat winches
- Winch systems
- Winch gearboxes

## // Electric motors



- Torque motors kits
- Synchronous motor kits
- Synchronous motor modules

## // Automation, special systems

- Linear units, linear modules, gantry axes, portal units
- Telescoping axes
- Rotary modules, rotary tables
- Line gantries, area gantries
- Robot traverse axes, jig axes
- Storey lifter and lifting columns
- Fast conveyor
- Framing tenter handling / overhead systems
- Storage systems
- Complete systems with steel construction and control
- Special solutions
- Gripper

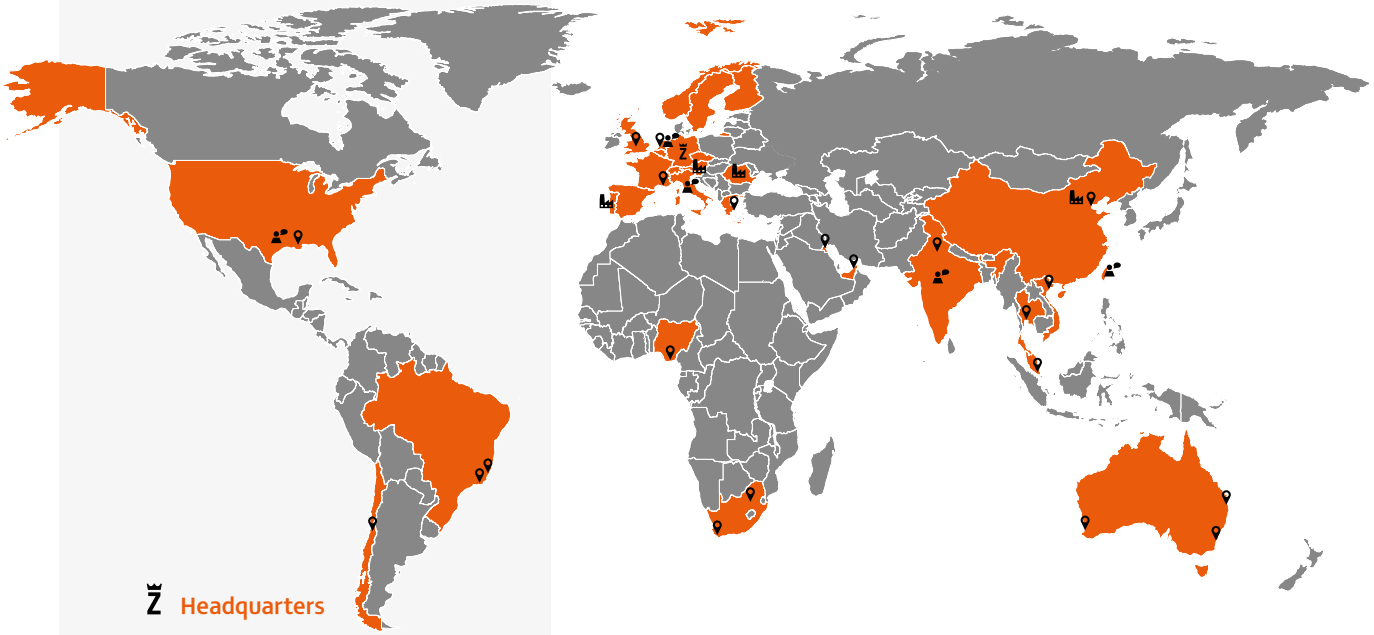
## // Hydrostatic systems

- Hydrostatic spindle units
- Hydrostatic rotary tables
- Aerostatic rotary tables
- Hydrostatic linear guides
- Hydrostatic center drive spindles
- Hydrostatic bearing components
- Hydrostatic special applications and test benches

## // Rotary tables systems

- Roller bearing rotary tables
- Hydrostatic rotary tables
- Automatic pallet changing systems and linear axes
- Swiveling tables
- After sales service for products of ZOLLERN, Rückle and Eimeldingen

# ZOLLERN



## Headquarters

## Subsidiaries

Italy and southern Europe
Netherlands and Northern Europe
USA
India and Southeast Asia
Taiwan, China

## Factories

Germany
Portugal
Romania
Slovenia
China

## Service partner

Australia
Brazil
Chile
Greece
Great Britain
Kuwait
Singapore
South Africa
Thailand
Dubai
USA
Vietnam

ZOLLERN-worldwide

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