

## alpha Premium Line Product catalog

Unique  
Individual  
Highly efficient



© 2025 by WITTENSTEIN alpha GmbH

All technical specifications were correct at the time of going to print. We are continually developing our products and therefore reserve the right to make modifications. This documentation is subject to occasional errors. Please appreciate that legal claims cannot be asserted as a result of incorrect specifications, illustrations or descriptions. The text, photos, technical drawings and any other illustrations printed in this publication are protected property of WITTENSTEIN alpha GmbH.

Further use of this material in printed or electronic format requires express approval from WITTENSTEIN alpha GmbH.

Any form of duplication, translation, editing, transfer to microfilm or storage on electronic systems is not permitted without express permission from WITTENSTEIN alpha GmbH.

# Contents

|                                     |     |
|-------------------------------------|-----|
| Foreword by company management      | 6   |
| WITTENSTEIN alpha                   | 8   |
| More than 40 years of innovation    | 8   |
| Engineering tools                   | 12  |
| alpha Premium Line                  | 16  |
| Product range and applications      | 16  |
| Planetary gearboxes                 | 22  |
| XP <sup>+</sup>                     | 24  |
| RP <sup>+</sup>                     | 38  |
| Hypoid gearboxes                    | 54  |
| XPK <sup>+</sup> / RPK <sup>+</sup> | 56  |
| Bevel gearboxes                     | 66  |
| XPC <sup>+</sup> / RPC <sup>+</sup> | 68  |
| Product portfolio & company         | 78  |
| Gearbox overview                    | 78  |
| alpha Linear Systems                | 88  |
| Digital product feature - cynapse®  | 90  |
| premo® servo actuators              | 92  |
| Galaxie® drive systems              | 94  |
| Accessories                         | 96  |
| Services                            | 100 |
| WITTENSTEIN Group                   | 106 |
| Information                         | 108 |
| Design strategy                     | 108 |
| Glossary                            | 110 |
| Order codes                         | 118 |



Dear Business Associates,

Even though we are extremely passionate about technology and innovation, the success of our customers is our top priority. We have designed our products and services to help you achieve a competitive advantage – through consistently high quality, permanent availability and the best service worldwide.

The product portfolio is divided into four product segments, which have already been successfully established on the market. The alpha Premium Line offers unique, individual solutions. Our alpha Advanced Line provides maximum power density, compact precision and outstanding positioning accuracy. Gearboxes of the alpha Basic and alpha Value Line are especially suitable for applications requiring cost-oriented, particularly flexible yet efficient solutions.

You are sure to find the right solution quickly and easily from our product range. We offer holistic mechanical and mechatronic drive solutions for all types of axis. We also provide complete solutions from a single source on request. Our range of products and solutions will continue to grow in the future because we never stop developing new ideas to make your work easier.

Take our word for it!

Norbert Pastoors  
Managing Director WITTENSTEIN alpha GmbH



# YOUR WORLD IS OUR DRIVE.

## FOR MORE THAN 40 YEARS.



SP



LP



Linear systems



TPM+



High Performance  
Linear System



alpha Value Line

1983

1994

1996

1999

2002

2004

2006

2007

2011

2013

2015

TP



cymex®  
sizing software



XP+ / TP+ / SP+ / LP+

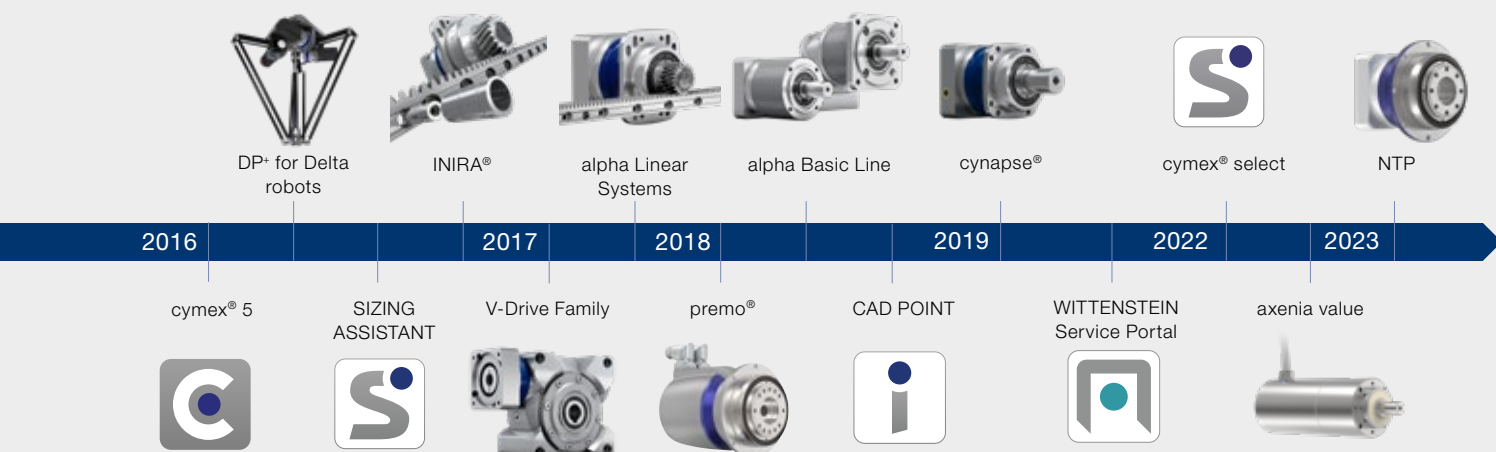
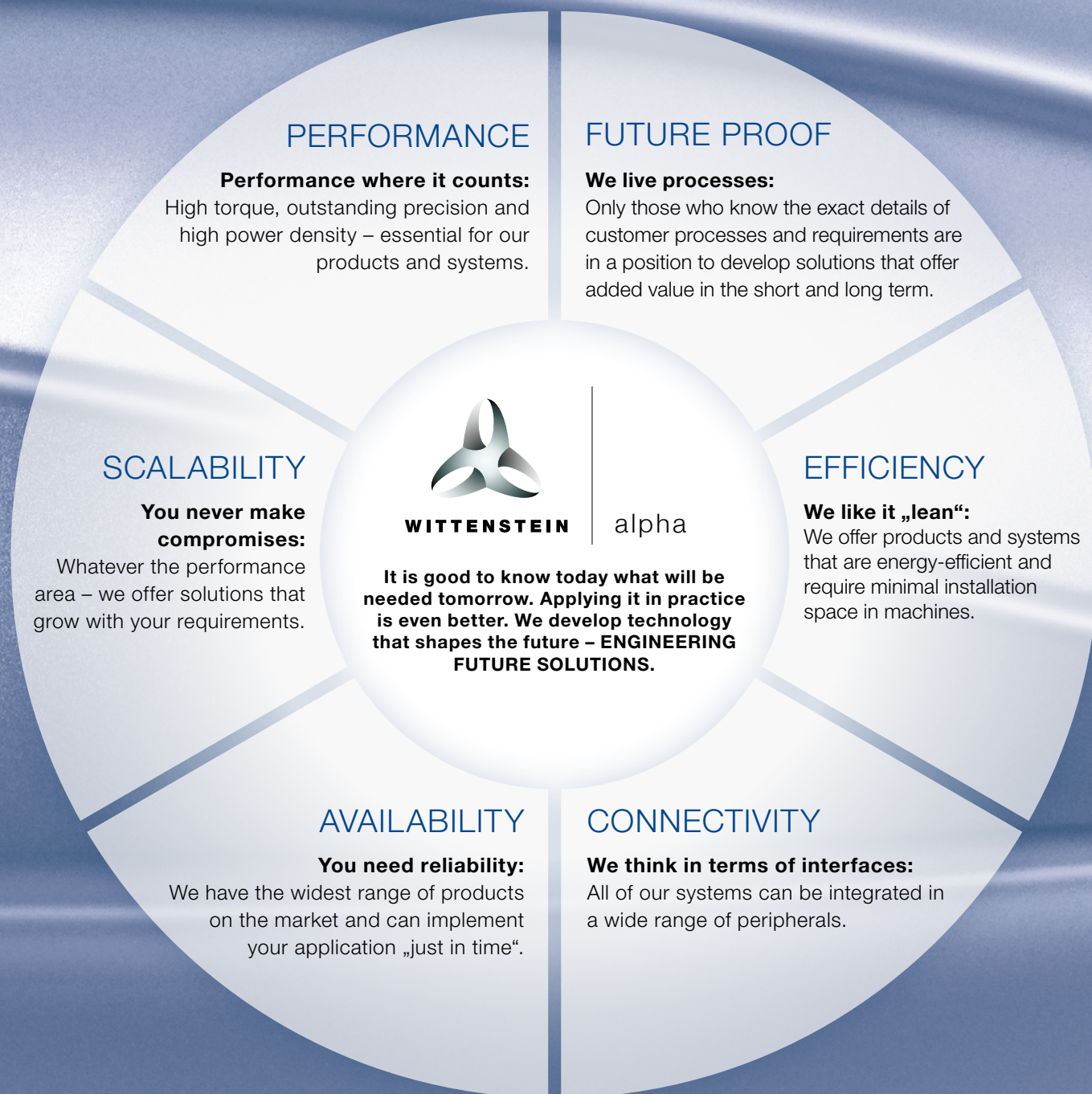


TPK+ / SPK+ /  
HG+ / SK+ / TK+



HDV  
Hygienic Design





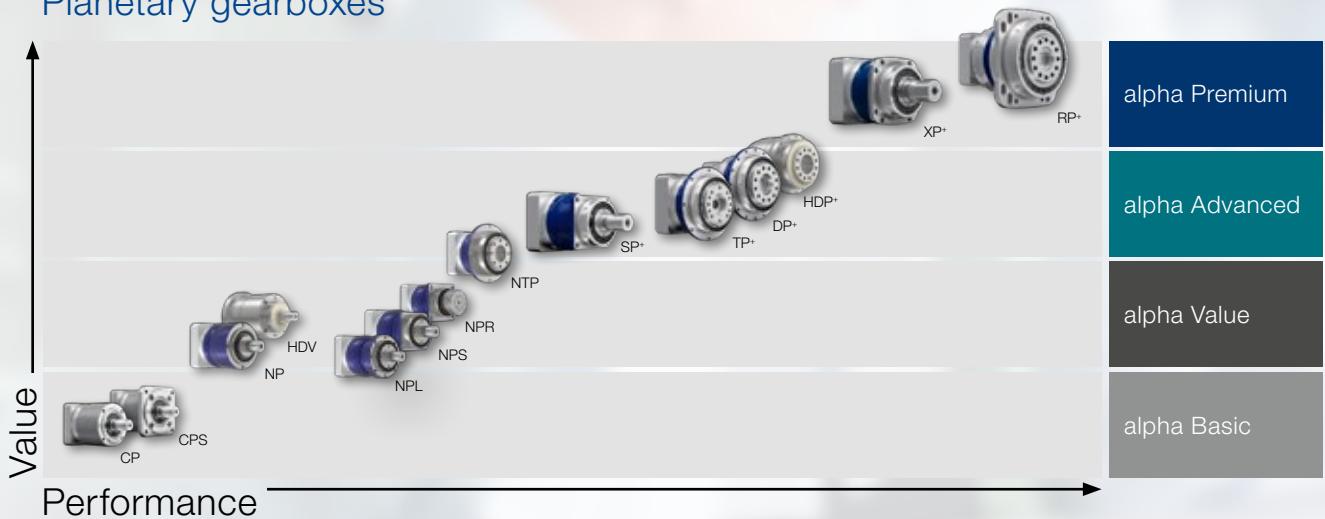
# WITTENSTEIN alpha on all axes

Complete drive solutions under one roof

We offer the best solutions for almost every application. In addition to gearboxes, our product portfolio includes a wide range of drive solutions with linear systems and servo actuators. Adapted accessories such as couplings and shrink disks round off the product portfolio.

The diagrams below provide a quick overview of our product portfolio for a wide variety of requirements and applications:

## Planetary gearboxes



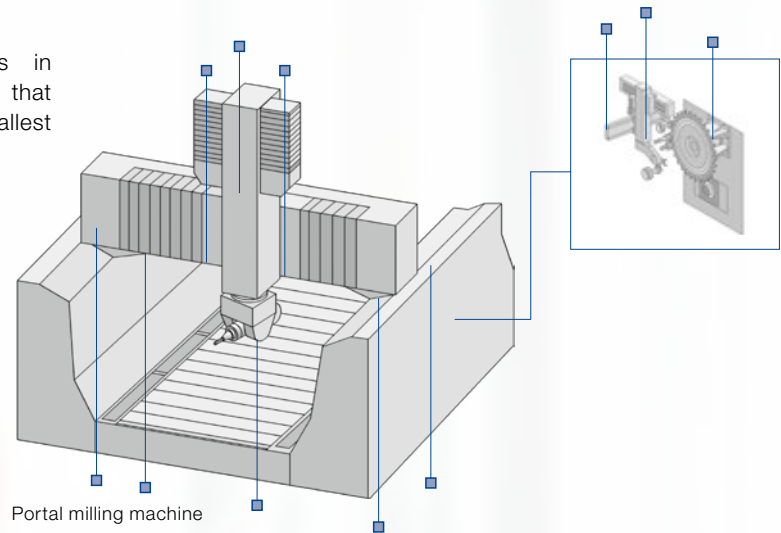
## Hypoid, bevel and worm gearboxes



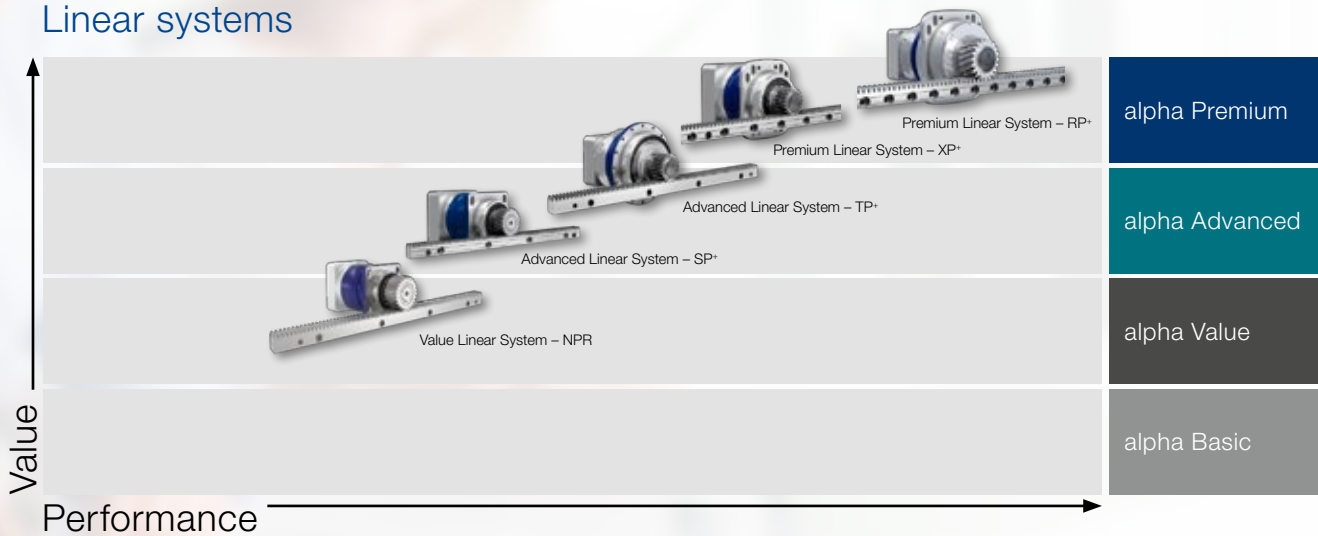
## Know-how in every sector

Our solutions range from high-precision axes in manufacturing systems to packaging machines that must operate with maximum productivity in the smallest installation space. Overview:

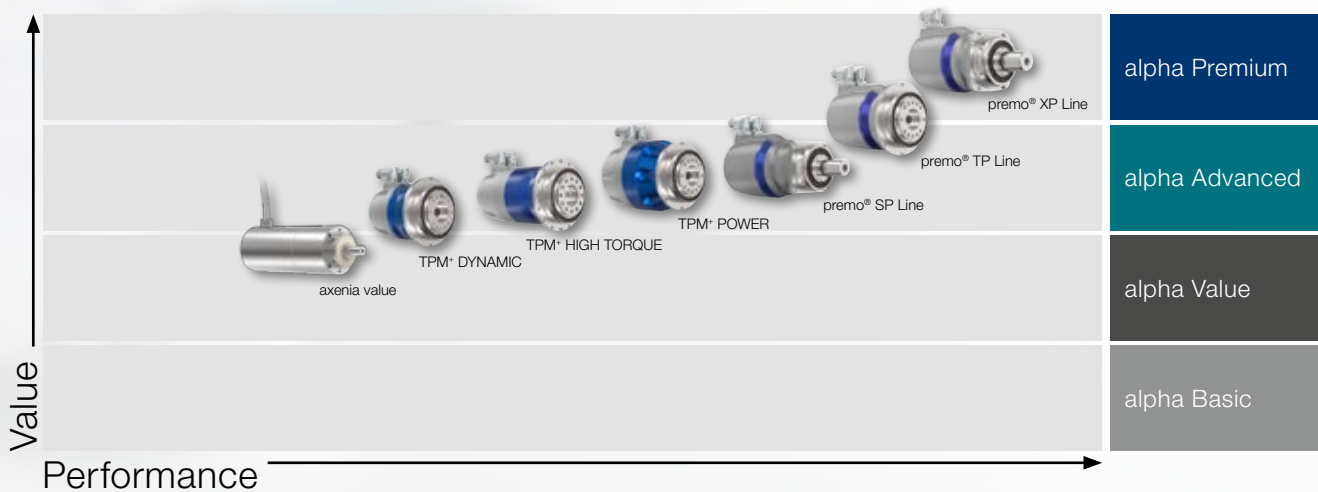
- Machine tools and production technology
- Food and packaging machines
- Wood working machinery
- Printing and paper machines
- Robotics and automation



## Linear systems



## Servo actuators



# WITTENSTEIN alpha Tools – many ways to reach your goals

Our software portfolio helps you choose the optimal drive

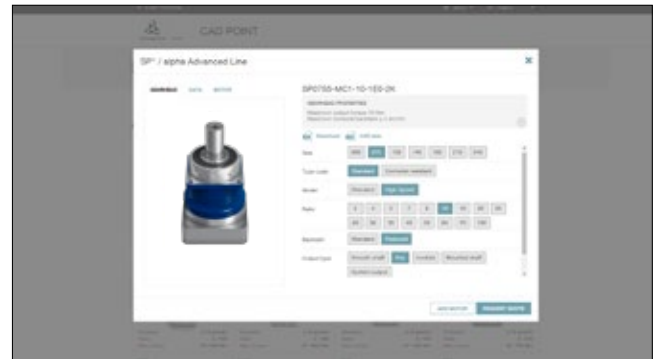
You can conveniently download dimension sheets and CAD data, select the best gearbox quickly and easily design complex kinematic sequences in detail – our software solutions offer various methods of selecting the best, most reliable drive on all axes.



## CAD POINT – Your Smart Catalog

- Performance data, dimension sheets and CAD data for all types of gearboxes
- Comprehensive documentation of the selection
- Available online without logging in

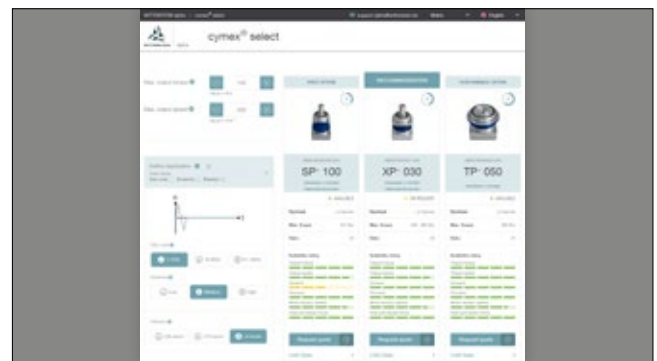
[www.wittenstein-cad-point.com](http://www.wittenstein-cad-point.com)



## cymex® select – Best solution within seconds

- Efficient and customizable product selection in seconds
- Top three product recommendations for your requirements
- Available online without login
- Possibility of requesting quotation quickly and directly

[cymex-select.wittenstein-group.com](http://cymex-select.wittenstein-group.com)



## cymex® 5 – Calculate on the Best

- Detailed calculation of complete drive trains
- Precise simulation of motion and load variables
- Downloadable software for complex designs

[www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)





# cymex® 5 is the current standard

With cymex® 5, the dimensioning and design of complete drive trains (application + transformation + gearbox + motor) is now fast, simple and reliable. Calculation is made much easier through predefined standard applications. Consideration for all major influencing factors guarantees an optimal design and increases the efficiency of your machine.

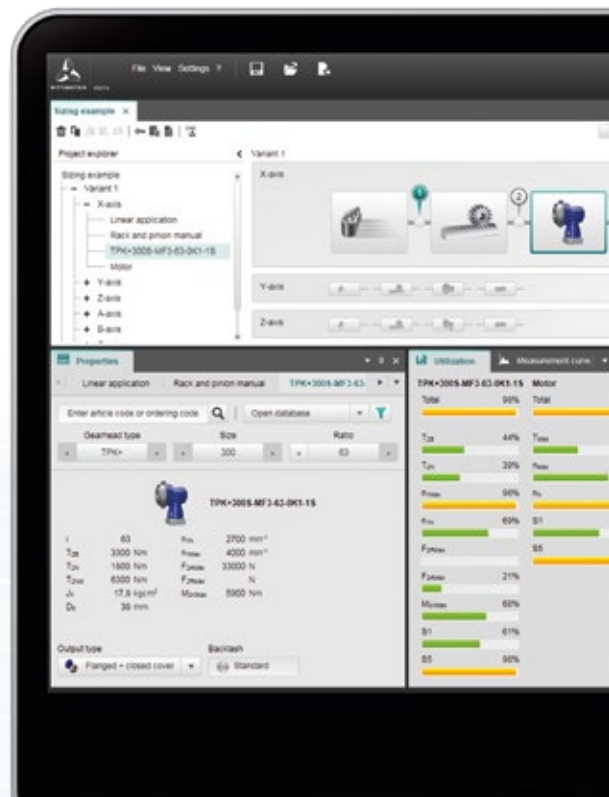
**cymex® 5 can define any number of axes simultaneously**

In contrast to other design tools, cymex® 5 can define any number of axes at the same time. The version calculation is up to 60 % quicker as a result.

| Overhead type | Image | Size | Class | Variant | Motor | Stages | Ratio | Input speed | Output speed | Input torque | Output torque | Input power | Output power | Efficiency | Backlash |
|---------------|-------|------|-------|---------|-------|--------|-------|-------------|--------------|--------------|---------------|-------------|--------------|------------|----------|
| TPK           |       | 500  | S     | 10      | P     | 2      | 20    | 14,28       | 40 000       | 3000 20%     | 2000 20%      | 2000 20%    | 2000 20%     | 90%        | 0.1      |
| TPK           |       | 500  | S     | 10      | P     | 2      | 20    | 14,28       | 40 000       | 3000 20%     | 2000 20%      | 2000 20%    | 2000 20%     | 90%        | 0.1      |
| TPK           |       | 500  | S     | 10      | P     | 2      | 20    | 14,28       | 40 000       | 3000 20%     | 2000 20%      | 2000 20%    | 2000 20%     | 90%        | 0.1      |
| TPK           |       | 500  | S     | 10      | P     | 2      | 20    | 14,28       | 40 000       | 3000 20%     | 2000 20%      | 2000 20%    | 2000 20%     | 90%        | 0.1      |
| TPK           |       | 500  | S     | 10      | P     | 2      | 20    | 14,28       | 40 000       | 3000 20%     | 2000 20%      | 2000 20%    | 2000 20%     | 90%        | 0.1      |

**cymex® 5 has an extremely extensive database**

More than 14,000 motors from the 50 most prominent motor manufacturers are stored in the design tool. Continuously updated, always state-of-the-art. Moreover, more than 8,000 gearbox versions from WITTENSTEIN alpha and over 200 combinations of linear systems with all relevant technical specifications can be found here.

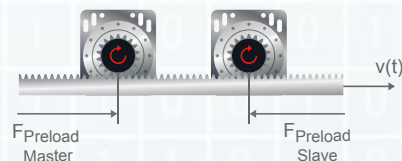


Free download

The basic version of cymex® 5 design software is available as a free download.



[www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)



**cymex® 5 incorporates the completely new Master/Slave function\***

The Master/Slave function enables the electrically clamped configuration of two drives. The mutual tensioning of master and slave eliminates the backlash in the drive train and provides for a high degree of rigidity in the machine.

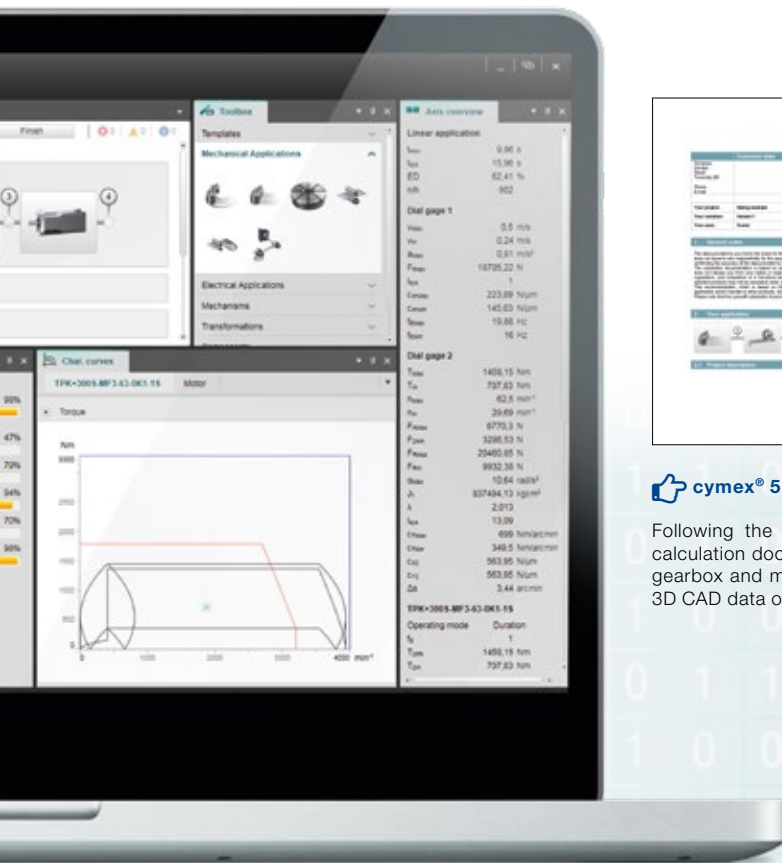
\*Premium function, on request.

# cymex® 5



## ✚ cymex® 5 has a unique optimization calculator\*

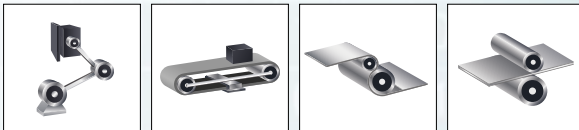
During the design process, cymex® 5 provides optimization suggestions for the selected gearbox, which increase reliability and efficiency while ensuring your gearbox has the perfect dimensions e.g. through downsizing. This saves on costs and reduces the installation space in the machine.



| Linear application |                        | 2D and 3D data |                        |
|--------------------|------------------------|----------------|------------------------|
| Power              | 9.96 kW                | Power          | 9.96 kW                |
| Speed              | 15.96 s                | Speed          | 15.96 s                |
| ED                 | 82.41 %                | ED             | 82.41 %                |
| ED                 | 802                    | ED             | 802                    |
| Power              | 0.0 m/s                | Power          | 0.0 m/s                |
| Power              | 0.24 m/s               | Power          | 0.24 m/s               |
| Power              | 0.81 m/s               | Power          | 0.81 m/s               |
| Power              | 18795.22 N             | Power          | 18795.22 N             |
| Power              | 1                      | Power          | 1                      |
| Power              | 223.89 N/mm            | Power          | 223.89 N/mm            |
| Power              | 145.63 N/mm            | Power          | 145.63 N/mm            |
| Power              | 19.68 Hz               | Power          | 19.68 Hz               |
| Power              | 16 Hz                  | Power          | 16 Hz                  |
| Power              | 1408.15 Nm             | Power          | 1408.15 Nm             |
| Power              | 797.83 Nm              | Power          | 797.83 Nm              |
| Power              | 62.8 mm                | Power          | 62.8 mm                |
| Power              | 29.69 mm               | Power          | 29.69 mm               |
| Power              | 8779.3 N               | Power          | 8779.3 N               |
| Power              | 3266.53 N              | Power          | 3266.53 N              |
| Power              | 20460.85 N             | Power          | 20460.85 N             |
| Power              | 9932.36 N              | Power          | 9932.36 N              |
| Power              | 10.64 rad/s            | Power          | 10.64 rad/s            |
| Power              | 837494.13 kg/m         | Power          | 837494.13 kg/m         |
| Power              | 2.973                  | Power          | 2.973                  |
| Power              | 13.88                  | Power          | 13.88                  |
| Power              | 499 N/mm               | Power          | 499 N/mm               |
| Power              | 348.5 N/mm             | Power          | 348.5 N/mm             |
| Power              | 563.95 N/mm            | Power          | 563.95 N/mm            |
| Power              | 563.95 N/mm            | Power          | 563.95 N/mm            |
| Power              | 3.44 mm                | Power          | 3.44 mm                |
| Power              | TPK-3005-MP3-43-DK1-15 | Power          | TPK-3005-MP3-43-DK1-15 |
| Power              | Operating mode         | Power          | Operating mode         |
| Power              | Duration               | Power          | Duration               |
| Power              | 1                      | Power          | 1                      |
| Power              | 1408.15 Nm             | Power          | 1408.15 Nm             |
| Power              | 797.83 Nm              | Power          | 797.83 Nm              |

## ✚ cymex® 5 offers comprehensive documentation

Following the geometry comparison, cymex® 5 creates calculation documentation and generates data sheets for gearbox and motor on request. Furthermore, the 2D and 3D CAD data of selected components can be retrieved.



## ✚ cymex® 5 enables the precise simulation of motion and load variables

The optimized software offers many options for the individual design of the drive train. These have been integrated to supplement the existing applications already in cymex® 3: the crank, conveyor, center winder and feed roll.



11 languages

## alpha Premium Line – unique, individual solutions that offer unparalleled power density

The requirements for highly complex applications used in machine tools or laser technology, for example, are becoming increasingly demanding and standard products are often unable to meet them. The alpha Premium Line is a completely new product program developed to meet the most demanding requirements. In addition to the products, we primarily focus on offering comprehensive consultancy services to ensure that your requirements are taken into full consideration and maximum machine utilization is achieved. We aim to provide unique "Best in Class" solutions that significantly exceed current standards and help you design your plants more efficiently.

### Maximum power density

We increased the performance of our gearboxes by up to 200 % compared to other commercially available standard gearboxes. Our Premium products therefore make a direct contribution to enhancing the performance of your plant.

### Maximum positioning accuracy

On request, the Premium planetary gearboxes are available with torsional backlash of less than one arc minute. In combination with maximum torsional rigidity, this backlash guarantees outstanding positioning accuracy.

### Easy installation

Specially designed output configurations allow for quick and easy installation.

### Top engineering and expert consultation


We use our extensive engineering expertise to develop unique solutions and produce the perfect design for your drive train. Our highly qualified employees provide support and advice from the initial idea and throughout the entire life cycle of your application.

alpha Premium solutions.  
Tailored precisely to meet your needs.

More performance in less space

- if you require an even more compact drive
- if you wish to enhance the performance of your machine
- if you require high-performance linear systems



A middle-aged man with thinning hair, wearing a dark blue suit, light blue shirt, and blue tie, is smiling and looking towards the right. He is seated at a wooden table. In the foreground, the back of another person's head and shoulders are visible, out of focus. The background is a bright, blurred office interior with large windows.

"We develop pioneering solutions for demanding applications in close dialog with our customers."

Sven Sanitz, Sales

# Reaching new heights: the alpha Premium Line

## Planetary gearboxes

The unique capabilities of planetary gearboxes from the alpha Premium Line are setting new standards on the market. These compact gearboxes are characterized by a power density far above the current industry standard. Your application can benefit directly from this increase in performance.



## Hypoid gearboxes

Maximum power density and high modularity are just two of the special characteristics of our hypoid gearboxes. Furthermore, gearboxes from the alpha Premium Line are characterized by an extremely robust overall design that guarantees a high degree of reliability and a long service life.

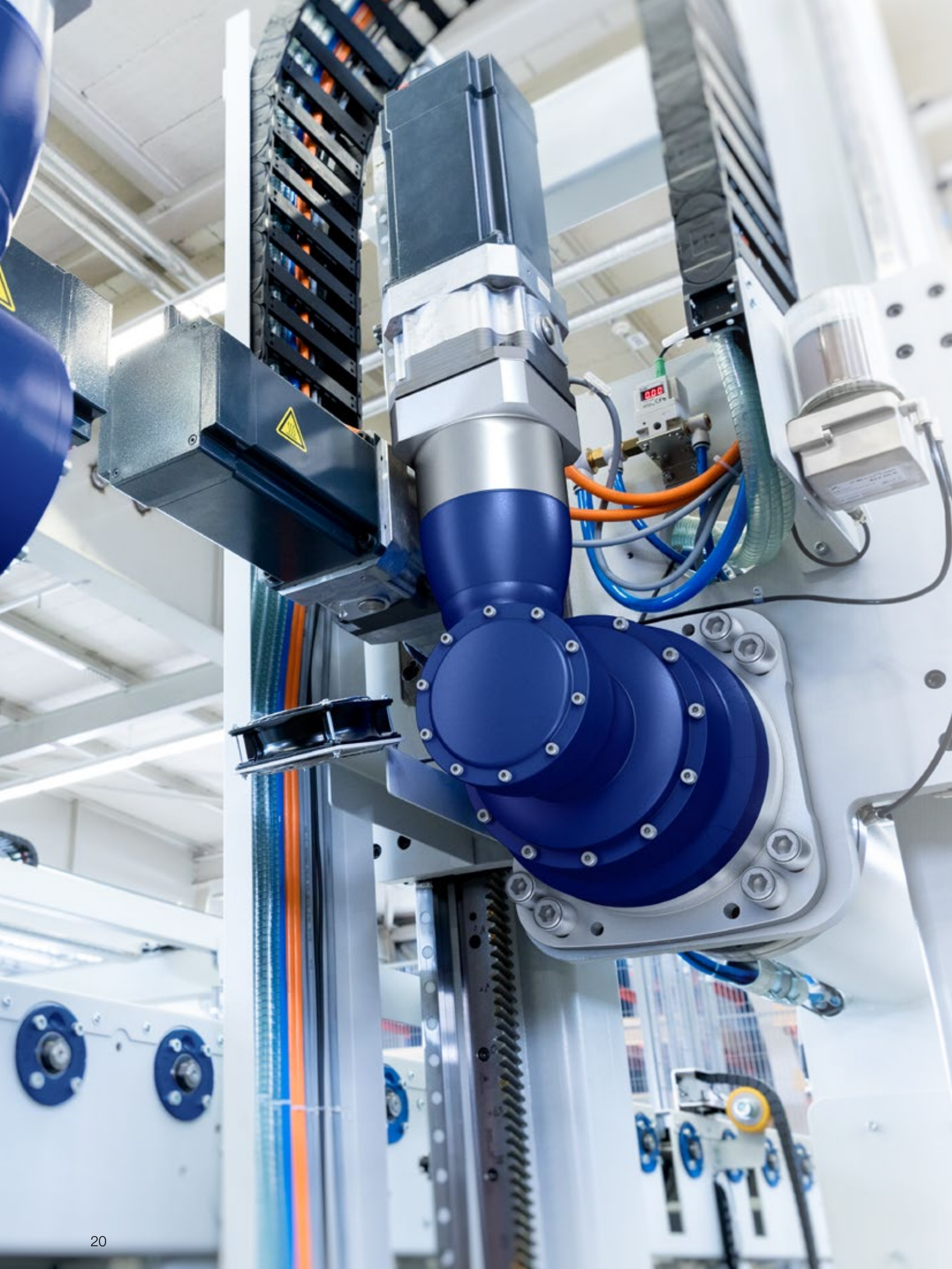


# Premium Line

## Bevel gearboxes

The low backlash bevel drives from our alpha Premium Line offer outstanding performance at low ratios during both cyclic and continuous operation. The perfect solution for dynamic applications with demanding requirements with regard to precision, torque and output speed. Increases in the performance of your plant can easily be achieved with a 97 % degree of efficiency.





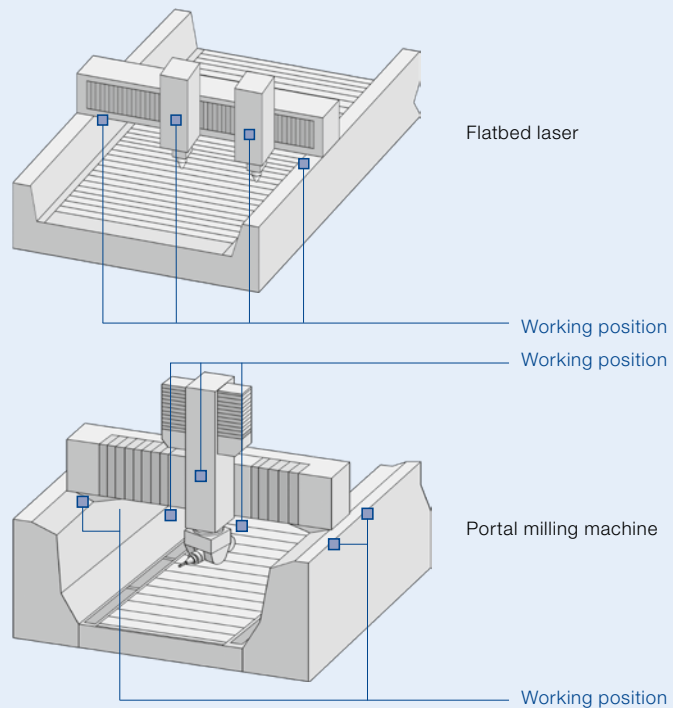
## alpha Premium Line in action

RPK<sup>+</sup> – when high performance is required in a small installation space

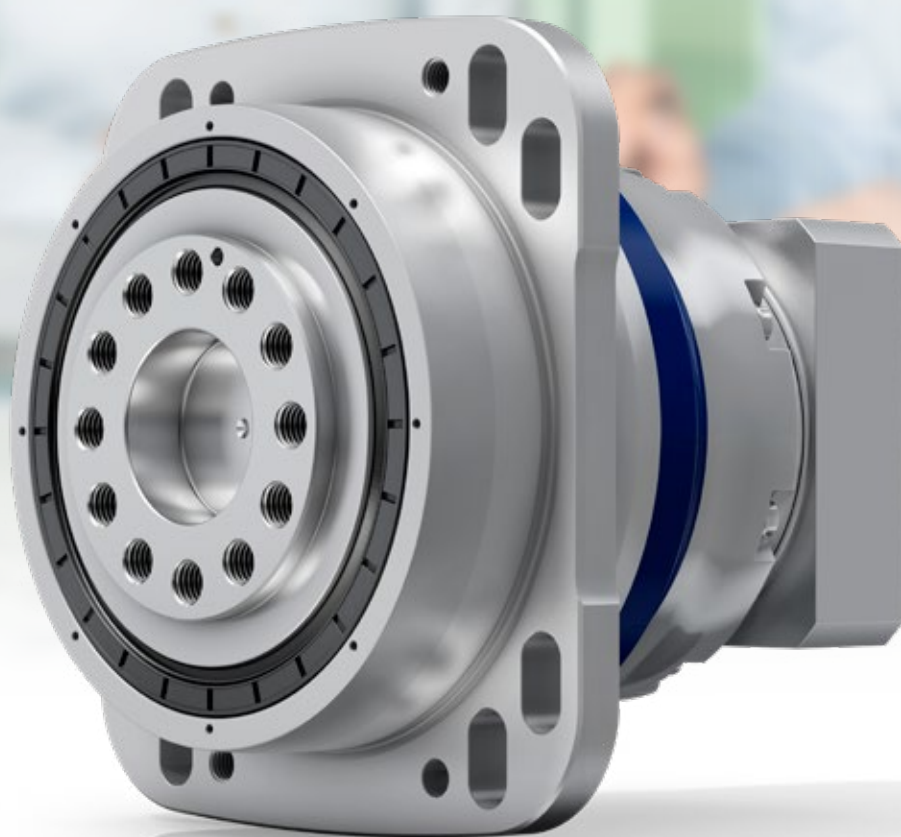
Whether laser cutting machines, turning and milling machines, or pipe bending machines – the use of powerful gearboxes with a high degree of positioning accuracy is essential in rack and pinion applications. The compact RPK<sup>+</sup> combines these characteristics to achieve high feed forces and accurate positioning in the application.



Premium Line products can also be used in machines that generate rotary movements under extreme loads such as flatbed lasers or portal milling machines.







XP<sup>+</sup> and RP<sup>+</sup> planetary gearboxes  
Unique in performance

## XP<sup>+</sup> – the best performing solution for cyclic operation



The XP<sup>+</sup> with specially designed output and extremely compact design offers new dimensions in the power transmission in cyclic operation that far exceed industry standards. The optimized interfaces on the output can generate much higher torques, tilting moments and rigidity that directly benefit your application.

The XP<sup>+</sup> impresses with maximum power density,

- if you require an even more compact drive
- if you wish to enhance the performance of your machine in cyclic operation
- if you require high-performance linear systems

### Produkthighlights

**Max. backlash** [arcmin]  $\leq 1 - 3$

**High power density**

**Very smooth running**

**Multiple output configurations  
for greater flexibility**

Smooth shaft, shaft with key, splined shaft (DIN 5480), blind hollow shaft, System output

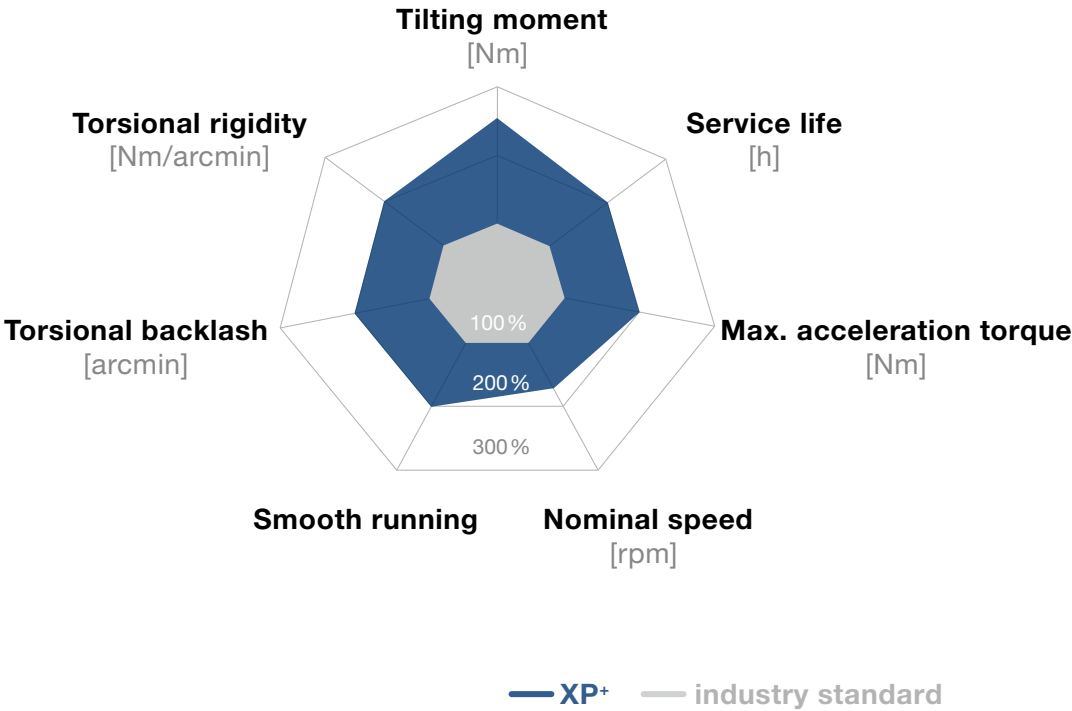


XP<sup>+</sup> with splined shaft

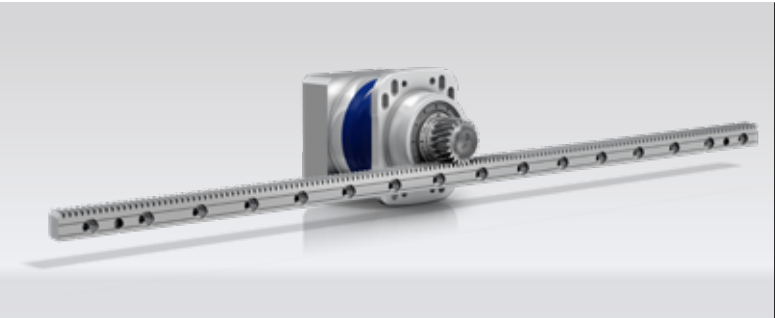


XP<sup>+</sup> with pinion and slots

# XP+ compared to industry standard



Planetary gearboxes



XP+ with pinion, slots and rack



premo® XP Line with pinion

# XP<sup>+</sup> 010 MF 1-/2-stage

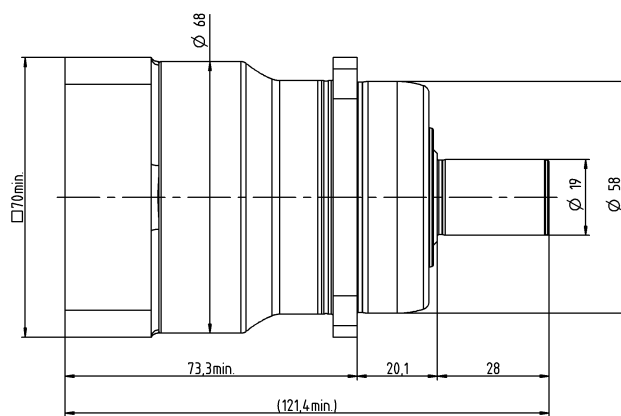
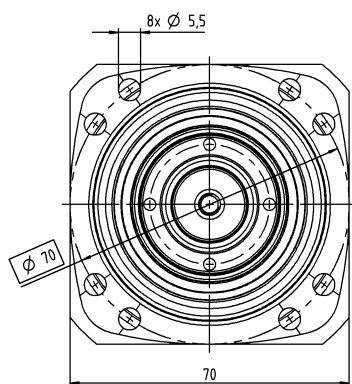
|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 56 – 128                   | 50 – 119  |
|   |             | in.lb        | 496 – 1133                 | 446 – 1051  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 42 – 108                   | 42 – 99   |
|   |             | in.lb        | 372 – 956                  | 372 – 876   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 21 – 27                    | 34 – 53   |
|   |             | in.lb        | 190 – 239                  | 297 – 467   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 110 – 165                  | 110 – 165   |
|   |             | in.lb        | 974 – 1458                 | 974 – 1458  |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 3300 – 4000                | 4400 – 5500   |
| Max. input speed  | $n_{1Max}$  | rpm          | 7500                       | 8500  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 4 / Reduced ≤ 2 | Standard ≤ 5 / Reduced ≤ 3                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 5 – 6.5                    | 5 – 6.5   |
|   |             | in.lb/arcmin | 44 – 58                    | 44 – 58   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 339                        | 339   |
|   |             | in.lb        | 3000                       | 3000  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 55                       | ≤ 53  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 11 – 19                    | 11 – 14   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

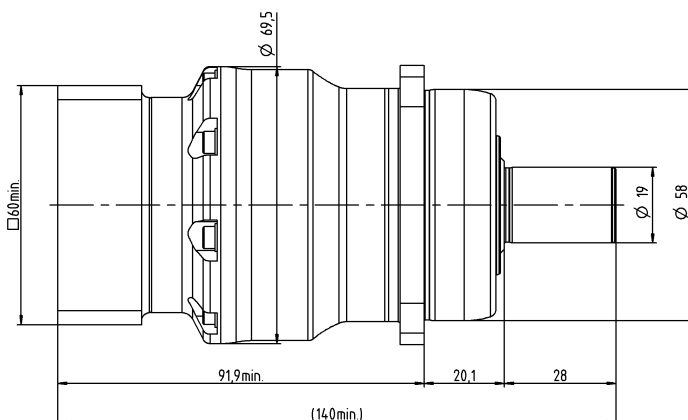
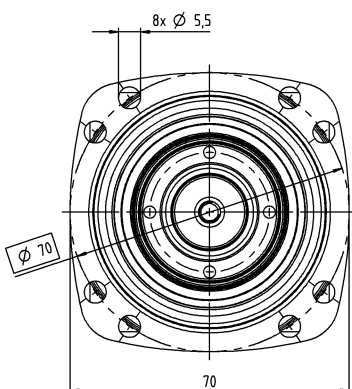
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

1-stage



2-stage

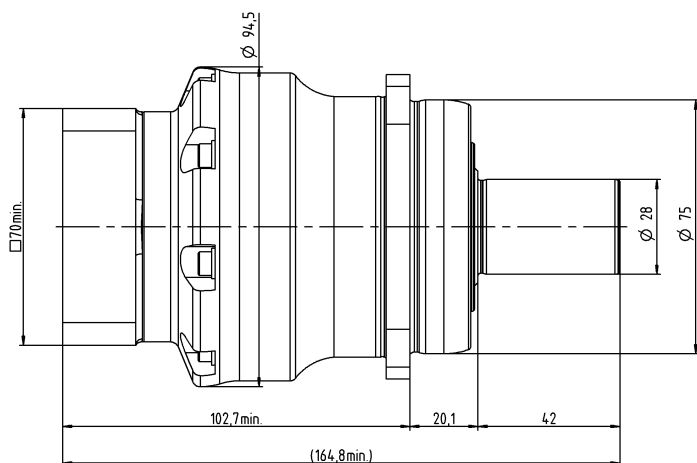
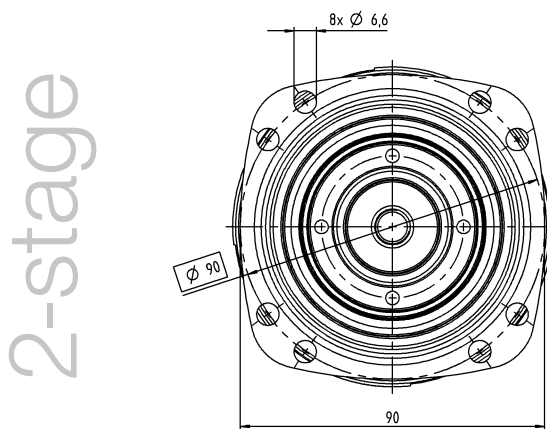
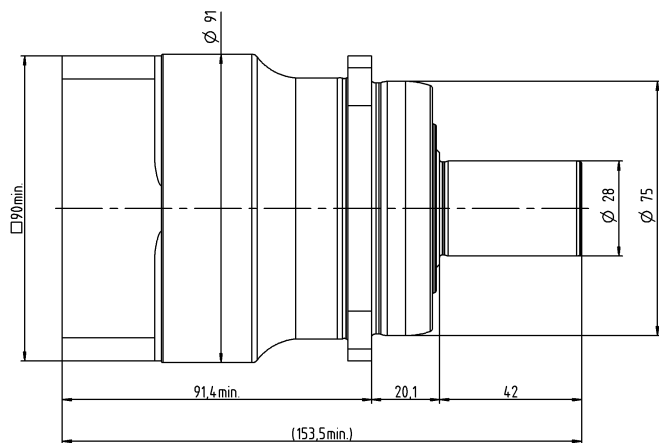
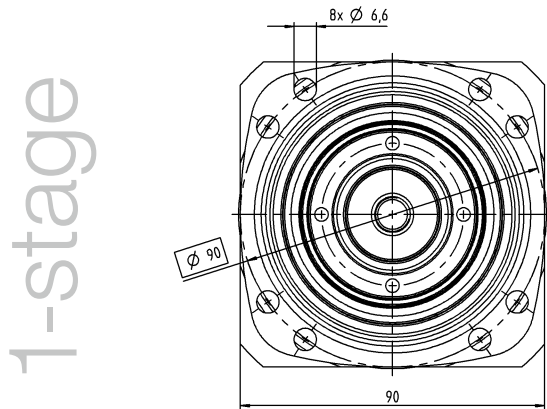


|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 168 – 330                  | 139 – 348   |
|   |             | in.lb        | 1487 – 2921                | 1227 – 3080   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 126 – 275                  | 126 – 303   |
|   |             | in.lb        | 1115 – 2434                | 1115 – 2682   |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | Nm           | 63 – 81                    | 101 – 145   |
|   |             | in.lb        | 558 – 720                  | 101 – 145   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 325 – 390                  | 325 – 418   |
|   |             | in.lb        | 2877 – 3452                | 2877 – 3696   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 2900 – 3100                | 3500 – 4500   |
| Max. input speed  | $n_{1Max}$  | rpm          | 7500                       | 8500  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 3 / Reduced ≤ 1 | Standard ≤ 4 / Reduced ≤ 2                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 14 – 17                    | 15 – 20   |
|   |             | in.lb/arcmin | 124 – 150                  | 133 – 173   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 675                        | 675   |
|   |             | in.lb        | 5974                       | 5974  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 56                       | ≤ 53  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 14 – 24                    | 11 – 19   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



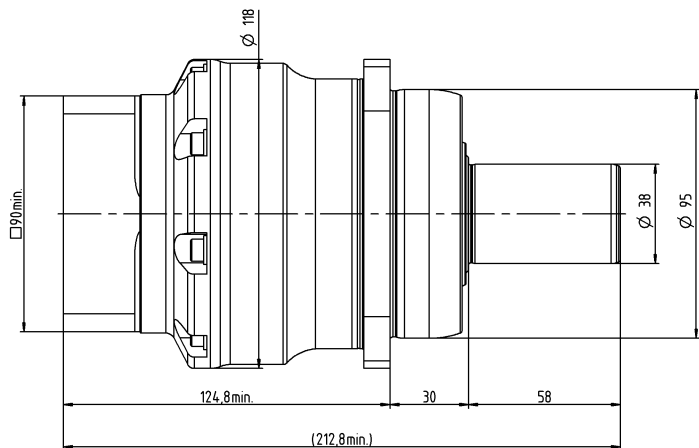
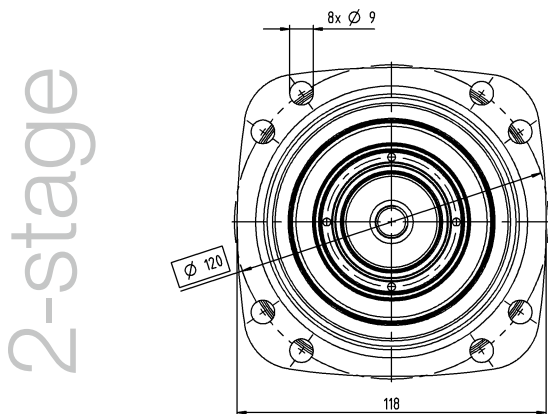
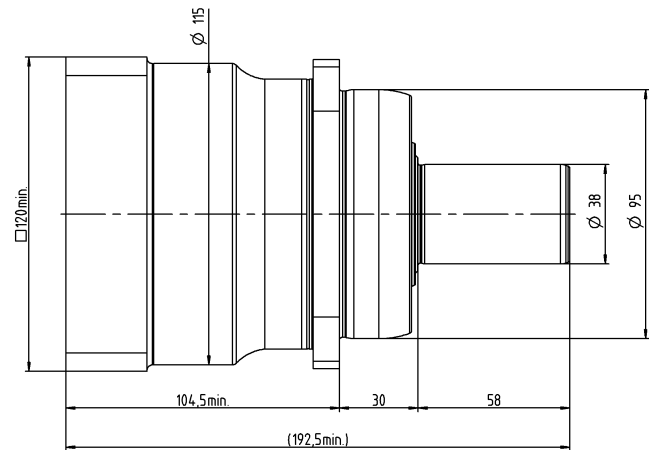
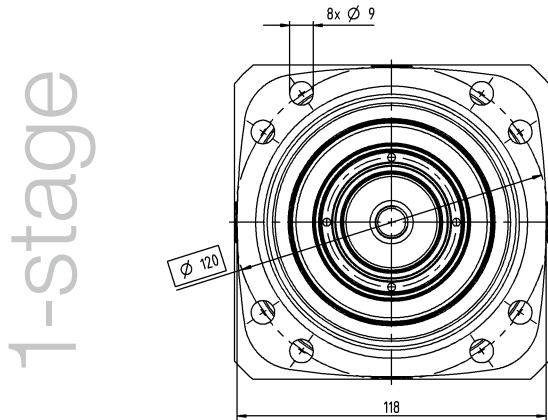
# XP<sup>+</sup> 030 MF 1-/2-stage

|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 388 – 600                  | 363 – 660   |
|   |             | in.lb        | 3434 – 5310                | 3213 – 5842   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 320 – 550                  | 303 – 550   |
|   |             | in.lb        | 2832 – 4868                | 2682 – 4868   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 131 – 174                  | 242 – 319   |
|   |             | in.lb        | 1157 – 1538                | 2142 – 2826   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 650 – 900                  | 750 – 1125  |
|   |             | in.lb        | 5753 – 7966                | 6638 – 9957   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 2500 – 2800                | 3100 – 4200   |
| Max. input speed  | $n_{1Max}$  | rpm          | 5500                       | 6500  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 3 / Reduced ≤ 1 | Standard ≤ 4 / Reduced ≤ 2                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 32 – 40                    | 35 – 45   |
|   |             | in.lb/arcmin | 283 – 354                  | 310 – 398   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 1296                       | 1296  |
|   |             | in.lb        | 11471                      | 11471   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 59                       | ≤ 56  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 19 – 38                    | 14 – 28   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

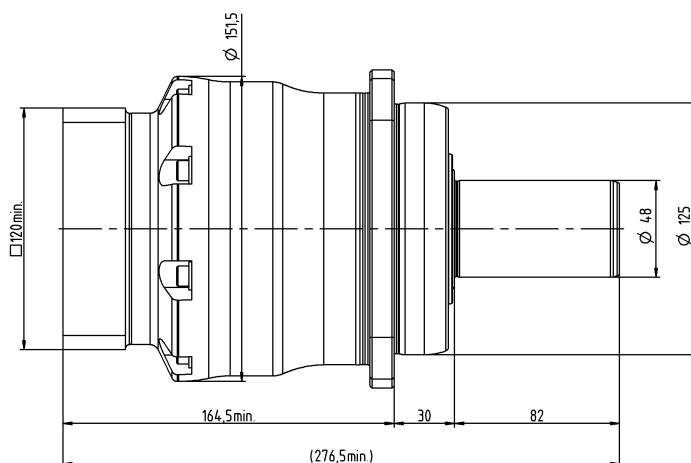
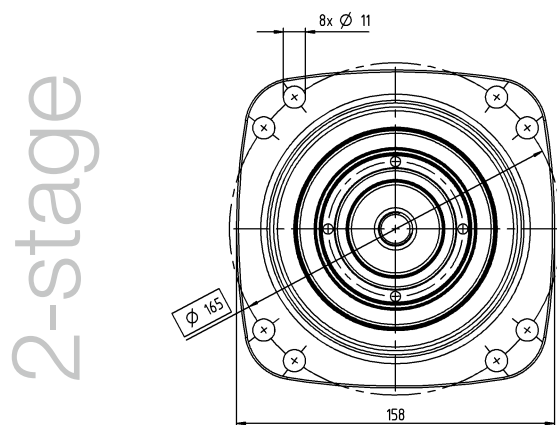
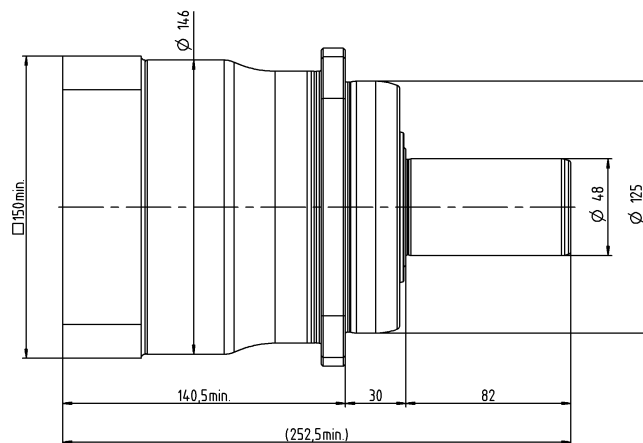
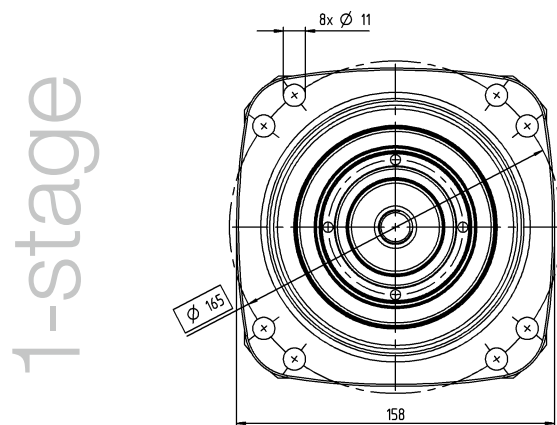


|   |             |                | 1-stage                              | 2-stage   |
|---|-------------|----------------|--------------------------------------|---|
| Ratio   | $i$         |                | 3 / 4 / 5 / 7 / 8 / 10               | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 792 – 1312                           | 792 – 1188  |
|   |             | $in.lb$        | 7010 – 11612                         | 7010 – 10515  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 710 – 1080                           | 660 – 990   |
|   |             | $in.lb$        | 6284 – 9559                          | 5842 – 8762   |
| Nominal torque<br>(at $n_{n1}$ )  | $T_{2N}$    | $Nm$           | 202 – 335                            | 461 – 607   |
|   |             | $in.lb$        | 1786 – 2962                          | 4078 – 5370   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 1375 – 2310                          | 1375 – 2310   |
|   |             | $in.lb$        | 12170 – 20449                        | 12170 – 20449   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2100 – 2600                          | 2900 – 3900   |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 5000                                 | 6000  |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 3$ / Reduced $\leq 1$ | Standard $\leq 4$ / Reduced $\leq 2$                  |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 62 – 85                              | 75 – 95   |
|   |             | $in.lb/arcmin$ | 549 – 752                            | 664 – 841   |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 1635                                 | 1635  |
|   |             | $in.lb$        | 14471                                | 14471   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 60$                            | $\leq 57$   |
| Lubrication   |             |                | Lubricated for life                  | Lubricated for life                                   |
| Clamping hub diameter   |             | $mm$           | 24 – 48                              | 19 – 38   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



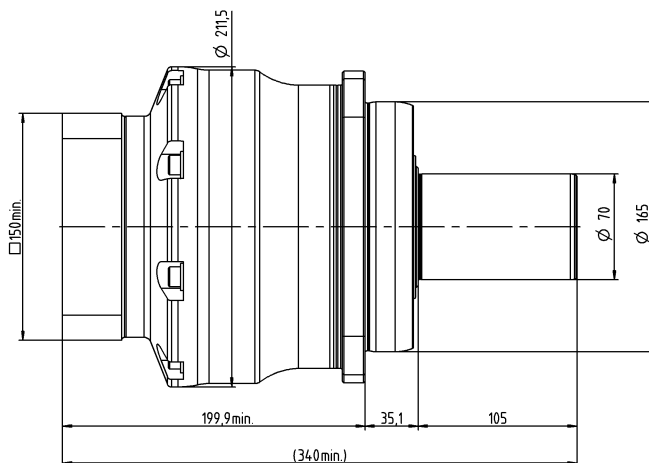
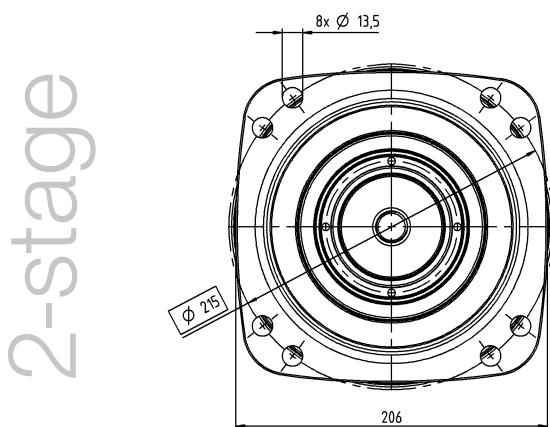
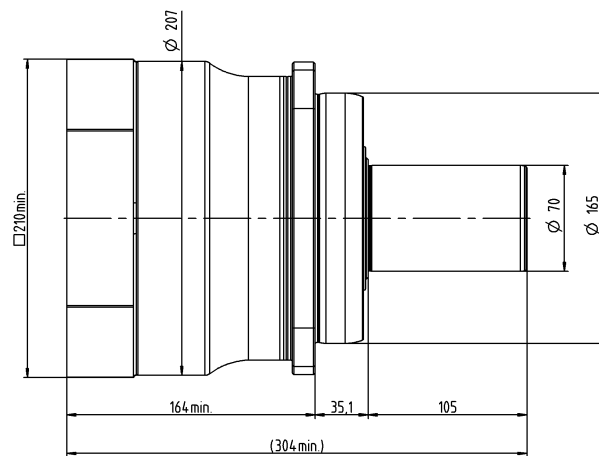
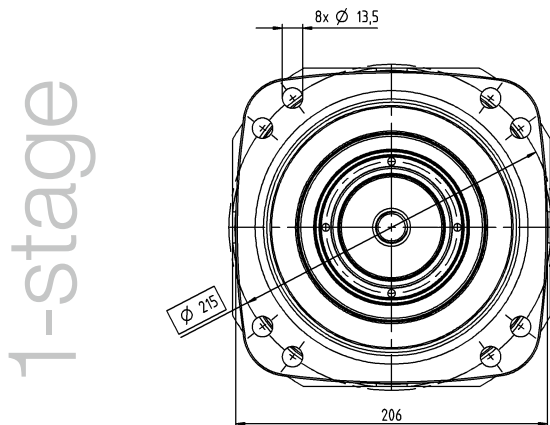
# XP<sup>+</sup> 050 MF 1-/2-stage

|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 2400 – 3840                | 1980 – 3696   |
|   |             | in.lb        | 21242 – 33987              | 17525 – 32713   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 1800 – 3360                | 1650 – 3080   |
|   |             | in.lb        | 15931 – 29739              | 14604 – 27260   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 513 – 927                  | 1179 – 1505   |
|   |             | in.lb        | 4544 – 8203                | 10426 – 13323   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 3445 – 5000                | 3505 – 5000   |
|   |             | in.lb        | 30493 – 44254              | 31022 – 44254   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 1500 – 2300                | 2700 – 3400   |
| Max. input speed  | $n_{1Max}$  | rpm          | 4500                       | 5000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 3 / Reduced ≤ 1 | Standard ≤ 4 / Reduced ≤ 2                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 160 – 250                  | 240 – 290   |
|   |             | in.lb/arcmin | 1416 – 2213                | 2124 – 2567   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 3256                       | 3256  |
|   |             | in.lb        | 28818                      | 28818   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 64                       | ≤ 58  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 38 – 55                    | 24 – 48   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.





Planetary gearboxes

## XP<sup>+</sup> HIGH SPEED – for more performance in continuous operation



The XP<sup>+</sup> HIGH SPEED enables new dimensions in power transmission for applications in continuous operation - in the smallest installation space. An optimized drive and lubrication system enables higher nominal speeds and an increased service life of up to 30,000 hours.

The XP<sup>+</sup> HIGH SPEED impresses with maximum power density

- if you require an even more compact drive
- if you wish to enhance the performance of your machine in continuous operation
- if maximum reliability and service life are required

### Produkthighlights

**Max. backlash** [arcmin]  $\leq 2 - 6$

**Lower temperature development**

**Maximum nominal speeds**

**30,000 h service life**

**Multiple output configurations  
for greater flexibility**

Smooth shaft, shaft with key, splined shaft (DIN 5480), blind hollow shaft,  
System output

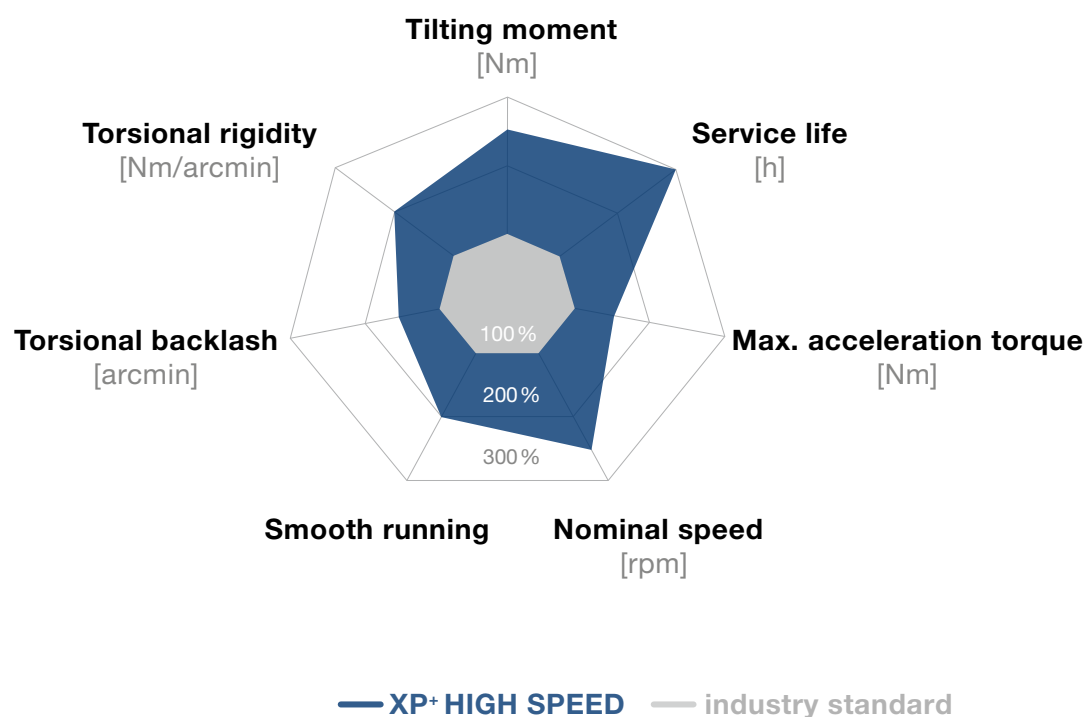


XP<sup>+</sup> HIGH SPEED with cynapse®

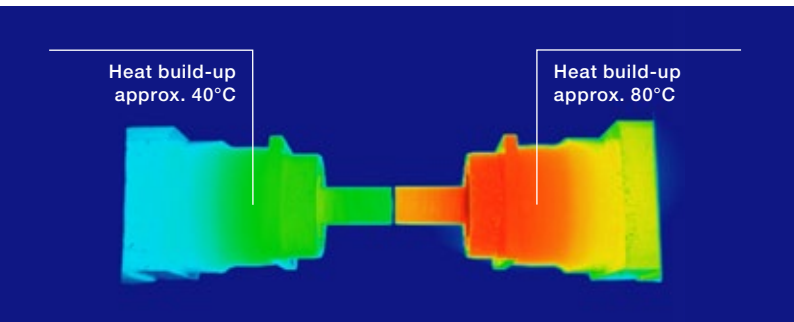


XP<sup>+</sup> HIGH SPEED with splined shaft

# XP+ HIGH SPEED compared to industry standard



Planetary gearboxes



XP+ HIGH SPEED  
MC version

Industry standard



Matched accessories for your XP+ gearbox  
You can find more information in the "Accessories" product catalog

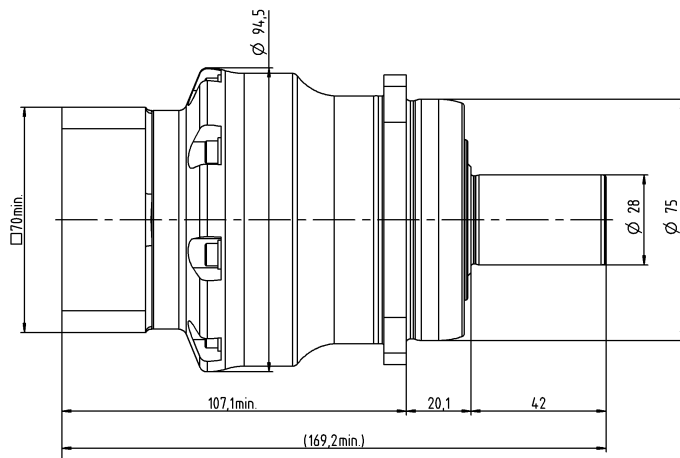
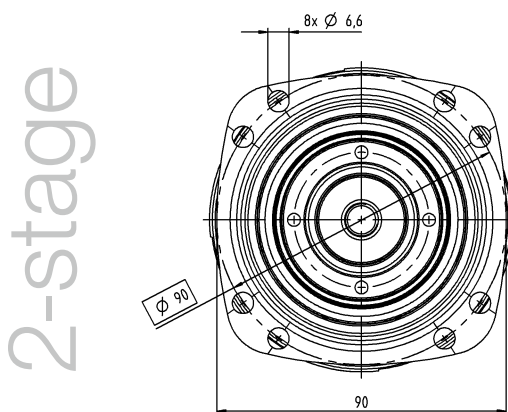
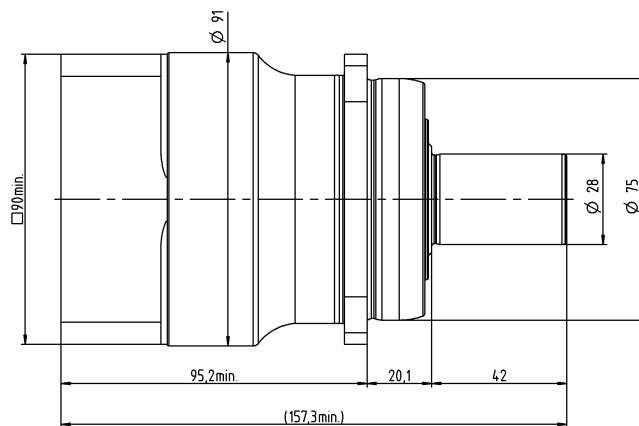
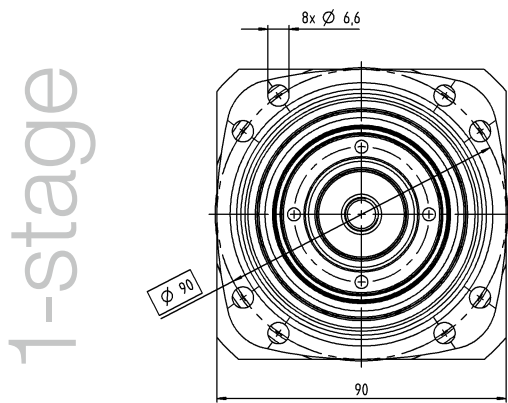
# XP<sup>+</sup> 020 MC 1-/2-stage

|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 68 – 90                    | 70 – 90   |
|   |             | in.lb        | 602 – 797                  | 620 – 797   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 68 – 90                    | 70 – 90   |
|   |             | in.lb        | 602 – 797                  | 620 – 797   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 41 – 53                    | 56 – 72   |
|   |             | in.lb        | 362 – 468                  | 496 – 637   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 325 – 390                  | 325 – 418   |
|   |             | in.lb        | 2877 – 3452                | 2877 – 3696   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 4500                       | 4500  |
| Max. input speed  | $n_{1Max}$  | rpm          | 6000                       | 6000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 6 / Reduced ≤ 4 | Standard ≤ 8 / Reduced ≤ 6                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 14 – 17                    | 15 – 20   |
|   |             | in.lb/arcmin | 124 – 150                  | 133 – 177   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 675                        | 675   |
|   |             | in.lb        | 5974                       | 5974  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 56                       | ≤ 53  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 19 – 24                    | 14 – 19   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



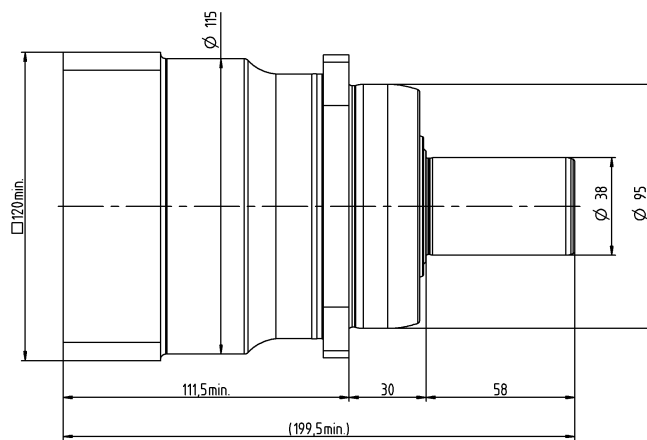
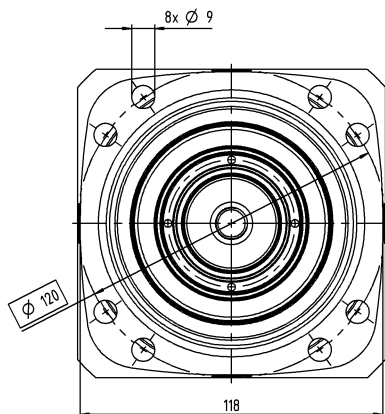
|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | $i$         |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 180 – 240                  | 180 – 240   |
|   |             | in.lb        | 1593 – 2124                | 1593 – 2124   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 180 – 240                  | 180 – 240   |
|   |             | in.lb        | 1593 – 2124                | 1593 – 2124   |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | Nm           | 76 – 97                    | 138 – 189   |
|   |             | in.lb        | 677 – 861                  | 1221 – 1673   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 650 – 900                  | 750 – 1125  |
|   |             | in.lb        | 5753 – 7966                | 6638 – 9957   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 3500 – 4500                | 4500  |
| Max. input speed  | $n_{1Max}$  | rpm          | 6000                       | 6000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 4 / Reduced ≤ 2 | Standard ≤ 6 / Reduced ≤ 4                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 32 – 40                    | 35 – 45   |
|   |             | in.lb/arcmin | 283 – 354                  | 310 – 398   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 1296                       | 1296  |
|   |             | in.lb        | 11471                      | 11471   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 59                       | ≤ 56  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 24 – 38                    | 19 – 24   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

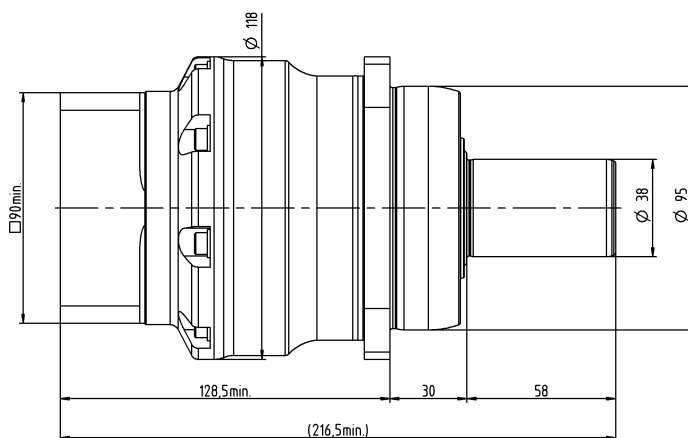
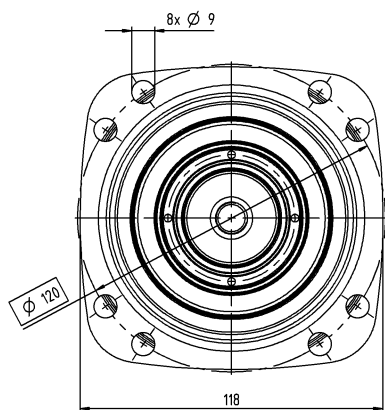
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

1-stage



2-stage



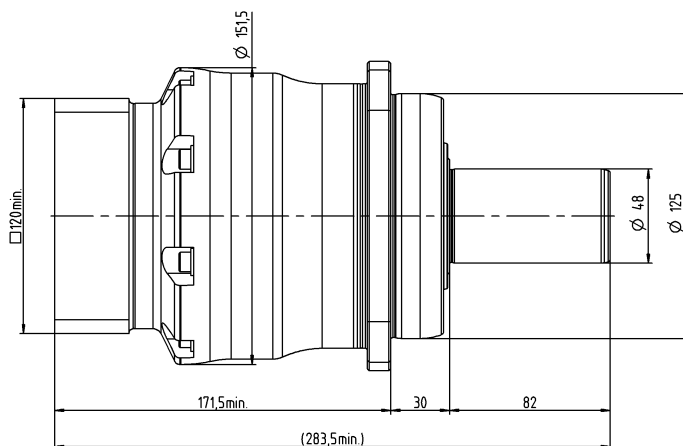
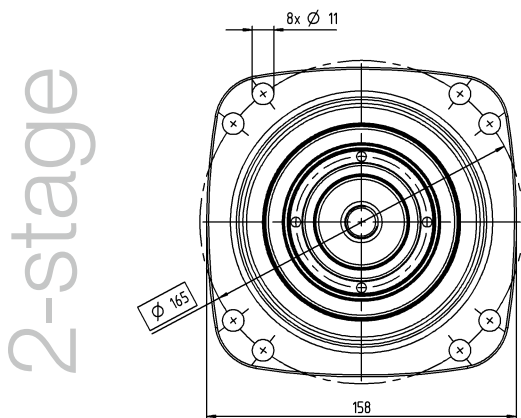
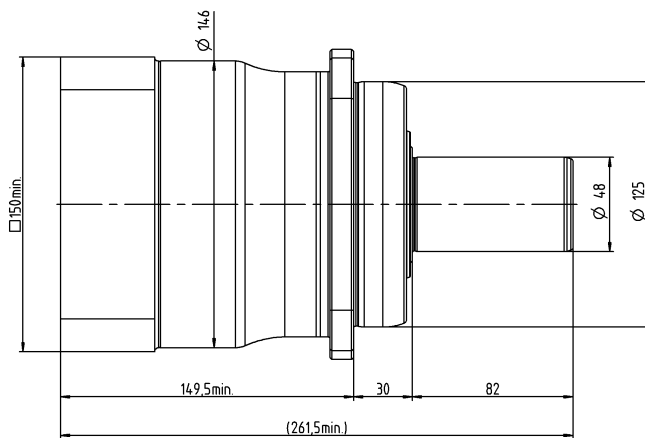
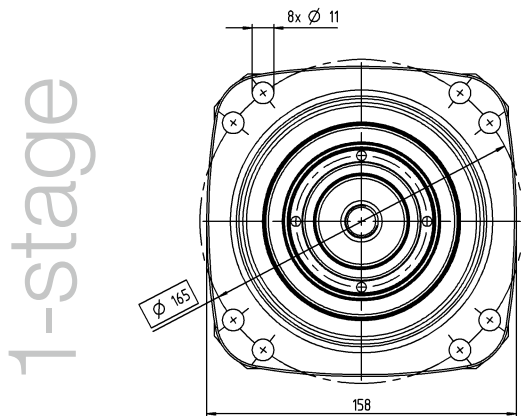
# XP<sup>+</sup> 040 MC 1-/2-stage

|   |             |              | 1-stage                    | 2-stage   |
|---|-------------|--------------|----------------------------|---|
| Ratio   | <i>i</i>    |              | 3 / 4 / 5 / 7 / 8 / 10     | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 310 – 480                  | 380 – 480   |
|   |             | in.lb        | 2744 – 4248                | 3363 – 4248   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 310 – 480                  | 380 – 480   |
|   |             | in.lb        | 2744 – 4248                | 3363 – 4248   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 127 – 195                  | 277 – 367   |
|   |             | in.lb        | 1122 – 1730                | 2447 – 3250   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 1375 – 2310                | 1375 – 2310   |
|   |             | in.lb        | 12170 – 20445              | 12170 – 20445   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 3000 – 4500                | 4500  |
| Max. input speed  | $n_{1Max}$  | rpm          | 6000                       | 6000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 4 / Reduced ≤ 2 | Standard ≤ 6 / Reduced ≤ 4                            |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 62 – 85                    | 75 – 95   |
|   |             | in.lb/arcmin | 549 – 752                  | 664 – 841   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 1635                       | 1635  |
|   |             | in.lb        | 14471                      | 14471   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 60                       | ≤ 57  |
| Lubrication   |             |              | Lubricated for life        | Lubricated for life                                   |
| Clamping hub diameter   |             | mm           | 38 – 48                    | 24 – 38   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



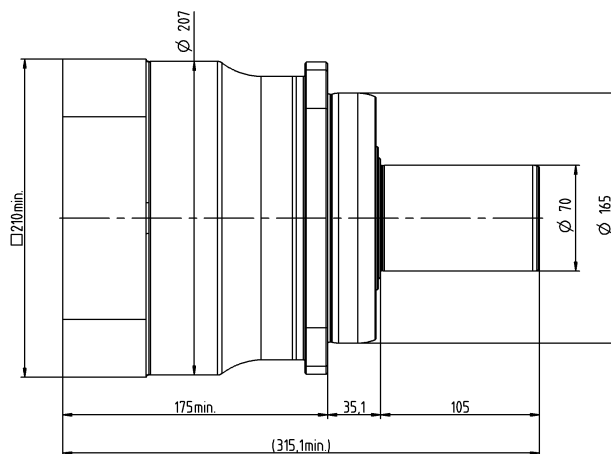
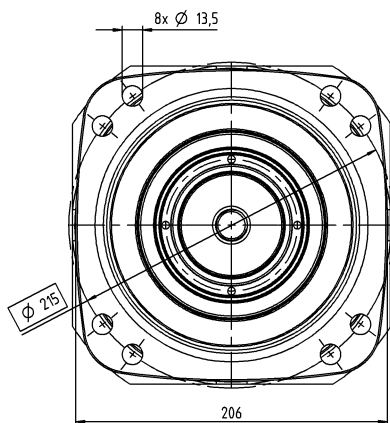
|   |             |                | 1-stage                              | 2-stage   |
|---|-------------|----------------|--------------------------------------|---|
| Ratio   | $i$         |                | 3 / 4 / 5 / 7 / 8 / 10               | 16 / 20 / 25 / 28 / 32 / 35 / 40 / 50 / 64 / 70 / 100 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 700 – 880                            | 700 – 880   |
|   |             | $in.lb$        | 6196 – 7789                          | 6196 – 7789   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 700 – 880                            | 700 – 880   |
|   |             | $in.lb$        | 6196 – 7789                          | 6196 – 7789   |
| Nominal torque<br>(at $n_{n1}$ )  | $T_{2N}$    | $Nm$           | 289 – 492                            | 560 – 704   |
|   |             | $in.lb$        | 2554 – 4355                          | 4956 – 6231   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 3445 – 5000                          | 3505 – 5000   |
|   |             | $in.lb$        | 30493 – 44254                        | 31022 – 44254   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 3000 – 4500                          | 4500  |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4500 – 6000                          | 6000  |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 4$ / Reduced $\leq 2$ | Standard $\leq 6$ / Reduced $\leq 4$                  |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 160 – 250                            | 240 – 290   |
|   |             | $in.lb/arcmin$ | 1416 – 2213                          | 2124 – 2567   |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 3256                                 | 3256  |
|   |             | $in.lb$        | 28818                                | 28818   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 64$                            | $\leq 58$   |
| Lubrication   |             |                | Lubricated for life                  | Lubricated for life                                   |
| Clamping hub diameter   |             | $mm$           | 48                                   | 38  |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

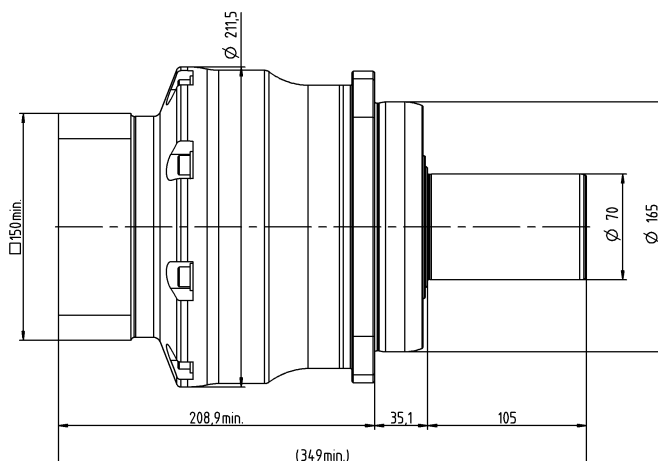
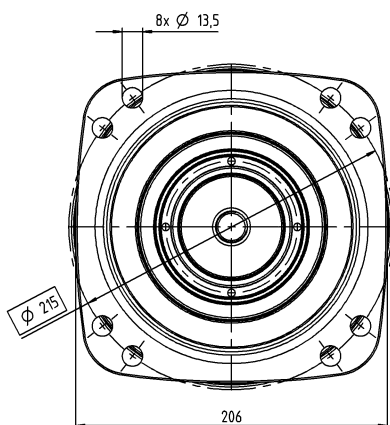
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

1-stage



2-stage



## RP<sup>+</sup> – The high-precision powerhouse



RP<sup>+</sup>

### Product highlights

**Max. torsional backlash [arcmin]  $\leq 1 - 3$**

**High axial and radial forces**

**Easy installation**

**Optimized for rack and pinion applications**

**Available output types**  
Flange, System output

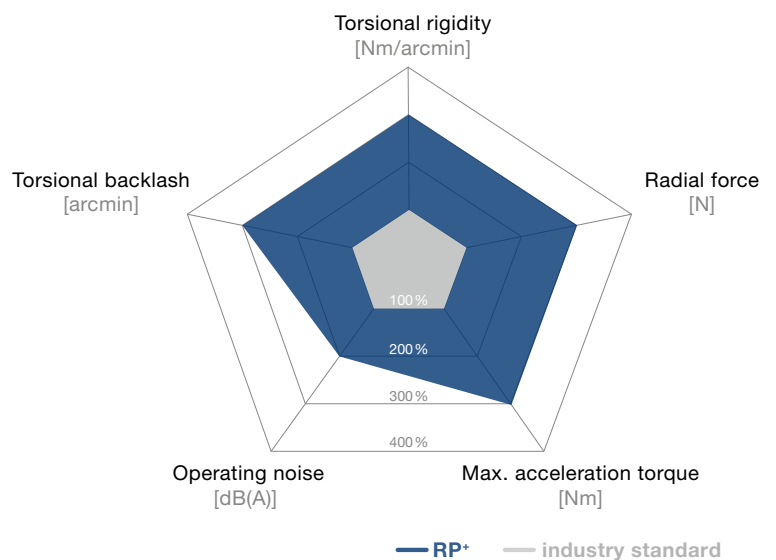
This gearbox series sets standards in terms of power density, modularity and easy installation. It is used in all applications where the individual requirements far exceed what has previously been possible. RP<sup>+</sup> gearboxes combine all the advantages of the familiar gearbox series:

- Reduced backlash of  $\leq 1$  arcmin
- Maximum power density
- Extremely smooth-running thanks to helical toothing
- Maximum positioning accuracy and world-class lifespan

The RP<sup>+</sup> impresses with maximum power density

- if your drive requires maximum performance
- if you value world-class engineering
- if you require an even more compact system

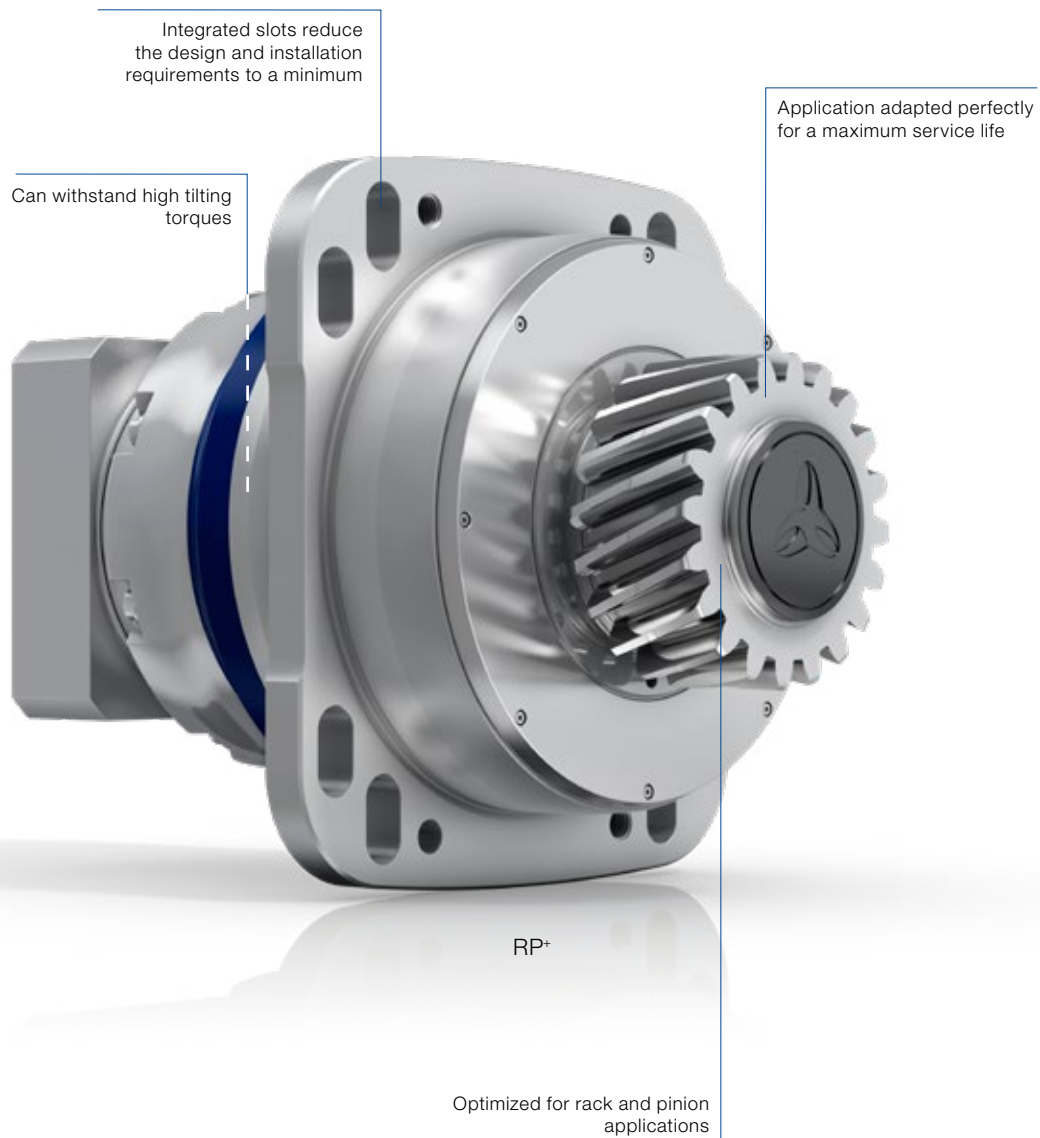
The RP<sup>+</sup> compared to the industry standard



RP<sup>+</sup> with rack and pinion



RPK<sup>+</sup> with hypoid angle section



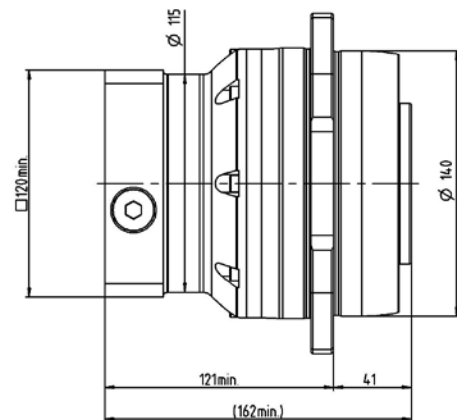
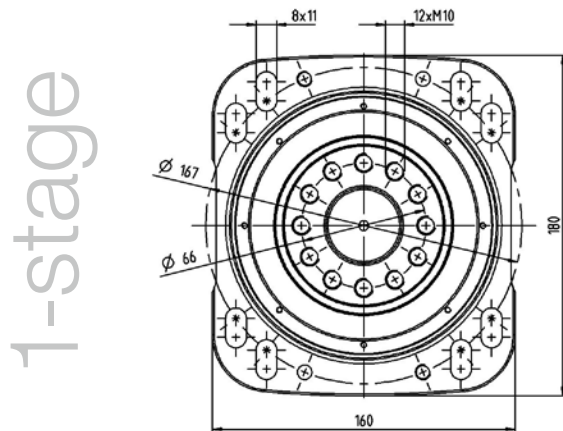
# RP+ 030 MF 1-stage

|   |             |                | 1-stage                              |
|---|-------------|----------------|--------------------------------------|
| Ratio   | $i$         |                | 4 / 5 / 7 / 10                       |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 352 – 380                            |
|   |             | $in.lb$        | 3115 – 3363                          |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 318 – 380                            |
|   |             | $in.lb$        | 2815 – 3363                          |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | $Nm$           | 172 – 182                            |
|   |             | $in.lb$        | 1522 – 1611                          |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 625                                  |
|   |             | $in.lb$        | 5532                                 |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2000 – 2800                          |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 5500                                 |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 3$ / Reduced $\leq 1$ |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 62 – 86                              |
|   |             | $in.lb/arcmin$ | 549 – 761                            |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 1800                                 |
|   |             | $in.lb$        | 15931                                |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 61$                            |
| Lubrication   |             |                | Lubricated for life                  |
| Clamping hub diameter   |             | $mm$           | 19 – 38                              |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

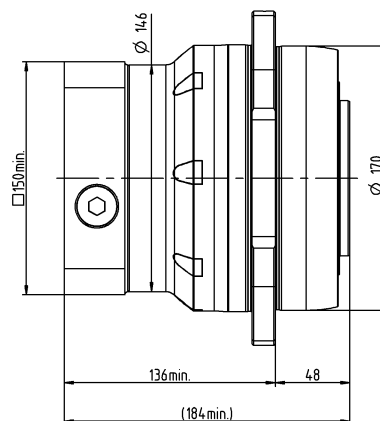
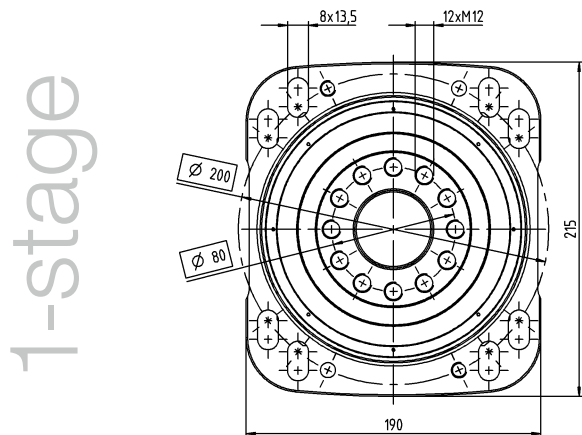


|   |             |                | 1-stage                              |
|---|-------------|----------------|--------------------------------------|
| Ratio   | $i$         |                | 4 / 5 / 7 / 10                       |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 720 – 1120                           |
|   |             | $in.lb$        | 6373 – 9913                          |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 540 – 700                            |
|   |             | $in.lb$        | 4779 – 6196                          |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | $Nm$           | 272 – 318                            |
|   |             | $in.lb$        | 2408 – 2810                          |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 1563                                 |
|   |             | $in.lb$        | 13829                                |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2500 – 3200                          |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 5000                                 |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 3$ / Reduced $\leq 1$ |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 123 – 190                            |
|   |             | $in.lb/arcmin$ | 1089 – 1682                          |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 3600                                 |
|   |             | $in.lb$        | 31863                                |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 61$                            |
| Lubrication   |             |                | Lubricated for life                  |
| Clamping hub diameter   |             | $mm$           | 24 – 48                              |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



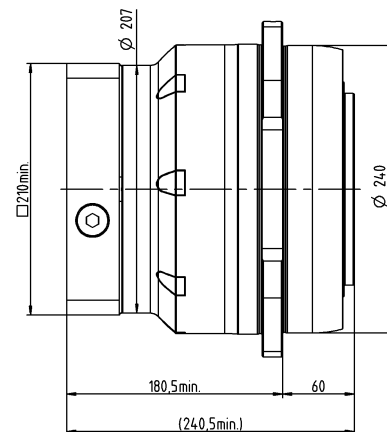
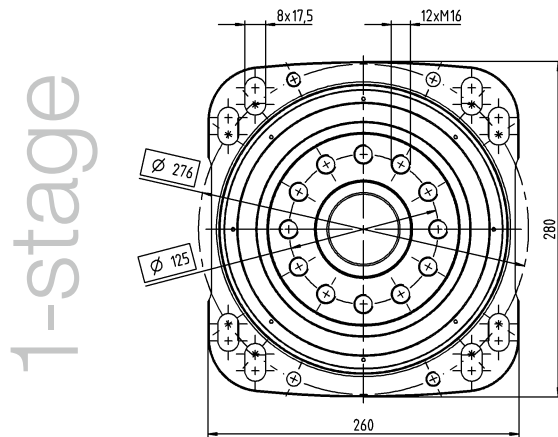
# RP+ 050 MF 1-stage

|   |             |                | 1-stage                              |
|---|-------------|----------------|--------------------------------------|
| Ratio   | $i$         |                | 4 / 5 / 7 / 10                       |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 2240 – 2560                          |
|   |             | $in.lb$        | 19826 – 22658                        |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 1400 – 1600                          |
|   |             | $in.lb$        | 12391 – 14161                        |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | $Nm$           | 725 – 927                            |
|   |             | $in.lb$        | 6419 – 8203                          |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 3204 – 3438                          |
|   |             | $in.lb$        | 28357 – 30425                        |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 1500 – 2300                          |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4500                                 |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 3$ / Reduced $\leq 1$ |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 445 – 610                            |
|   |             | $in.lb/arcmin$ | 3939 – 5399                          |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 11000                                |
|   |             | $in.lb$        | 97359                                |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 66$                            |
| Lubrication   |             |                | Lubricated for life                  |
| Clamping hub diameter   |             | $mm$           | 38 – 48                              |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.





Planetary gearboxes

# RP<sup>+</sup> 030 MA 1- / 2-stage

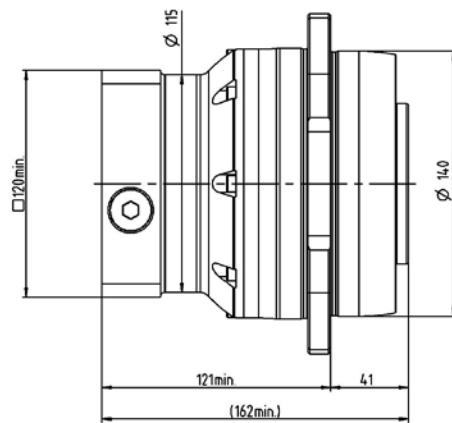
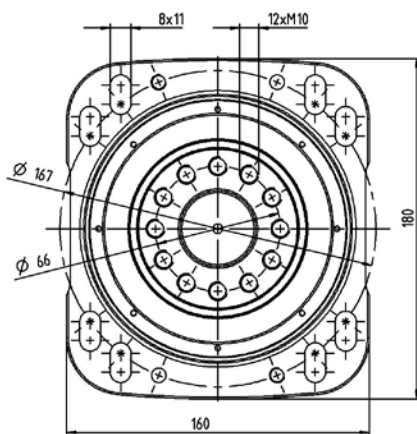
|   |             |                | 1-stage             | 2-stage                           |
|---|-------------|----------------|---------------------|-----------------------------------|
| <b>Ratio</b>  | $i$         |                | <b>5.5</b>          | <b>16 / 22 / 27.5 / 38.5 / 55</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 583                 | 583                               |
|   |             | $in.lb$        | 5160                | 5160                              |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 530                 | 530                               |
|   |             | $in.lb$        | 4691                | 4691                              |
| Nominal torque<br>(at $n_{90}$ )  | $T_{2N}$    | $Nm$           | 243                 | 315 – 432                         |
|   |             | $in.lb$        | 2150                | 2788 – 3823                       |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 1200                | 1200                              |
|   |             | $in.lb$        | 10621               | 10621                             |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2000                | 3000                              |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 5500                | 7500                              |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1$   | Standard $\leq 1$                 |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 105                 | 100 – 105                         |
|   |             | $in.lb/arcmin$ | 929                 | 885 – 929                         |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 1800                | 1800                              |
|   |             | $in.lb$        | 15931               | 15931                             |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 65$           | $\leq 58$                         |
| Lubrication   |             |                | Lubricated for life | Lubricated for life               |
| Clamping hub diameter   |             | $mm$           | 19 – 38             | 19 – 24                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

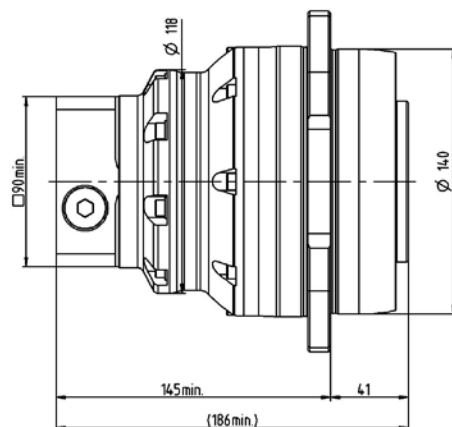
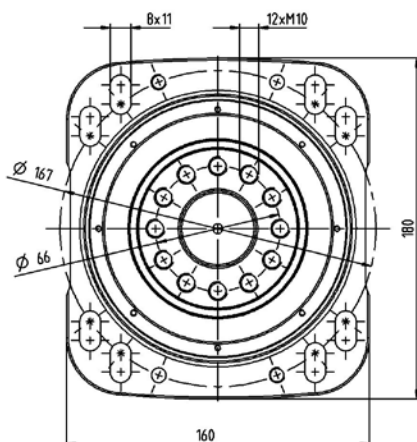
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

1-stage



2-stage

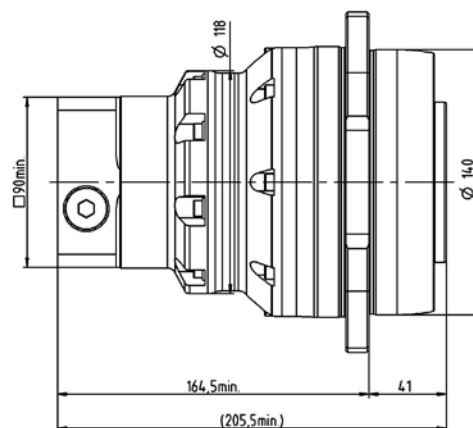
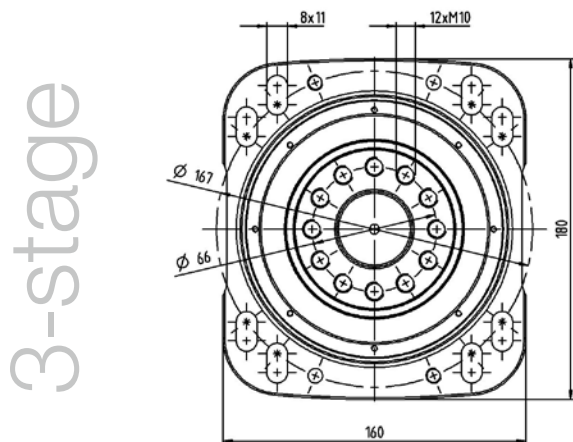


|   |             |              | 3-stage                   |
|---|-------------|--------------|---------------------------|
| Ratio   | $i$         |              | 66 / 88 / 110 / 154 / 220 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 583                       |
|   |             | in.lb        | 5160                      |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 530                       |
|   |             | in.lb        | 4691                      |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 284 – 397                 |
|   |             | in.lb        | 2513 – 3513               |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 1200                      |
|   |             | in.lb        | 10621                     |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 3000                      |
| Max. input speed  | $n_{1Max}$  | rpm          | 7500                      |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1              |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 95                        |
|   |             | in.lb/arcmin | 841                       |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 1800                      |
|   |             | in.lb        | 15931                     |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 56                      |
| Lubrication   |             |              | Lubricated for life       |
| Clamping hub diameter   |             | mm           | 19                        |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



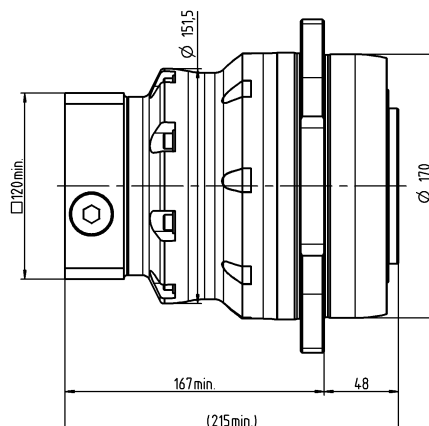
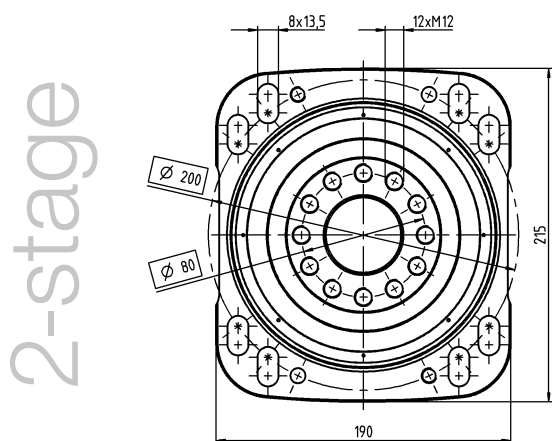
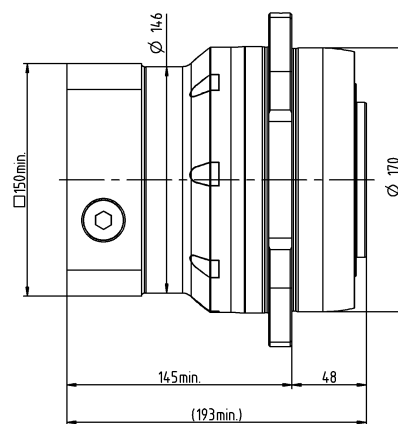
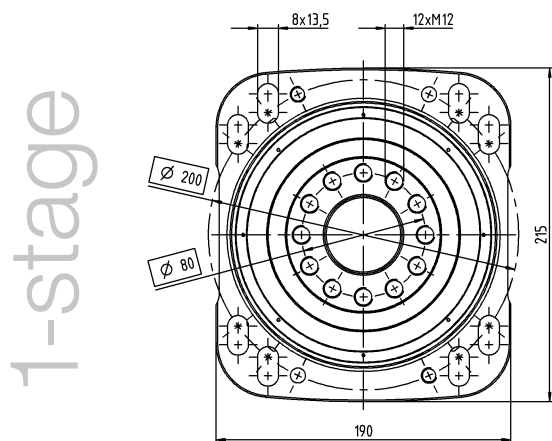
# RP<sup>+</sup> 040 MA 1- / 2-stage

|   |             |                     | 1-stage             | 2-stage                           |
|---|-------------|---------------------|---------------------|-----------------------------------|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>5.5</b>          | <b>16 / 22 / 27.5 / 38.5 / 55</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 1402                | 1270 – 1402                       |
|   |             | <i>in.lb</i>        | 12406               | 11243 – 12406                     |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 950                 | 950                               |
|   |             | <i>in.lb</i>        | 8408                | 8408                              |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | <i>Nm</i>           | 417                 | 476 – 653                         |
|   |             | <i>in.lb</i>        | 3695                | 4217 – 5779                       |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 2865                | 2420 – 2613                       |
|   |             | <i>in.lb</i>        | 25358               | 21416 – 25358                     |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 2500                | 4000 – 4100                       |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 5000                | 6250                              |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 1        | Standard ≤ 1                      |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 220                 | 220                               |
|   |             | <i>in.lb/arcmin</i> | 1947                | 1947                              |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 3600                | 3600                              |
|   |             | <i>in.lb</i>        | 31863               | 31863                             |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 63                | ≤ 61                              |
| Lubrication   |             |                     | Lubricated for life | Lubricated for life               |
| Clamping hub diameter   |             | <i>mm</i>           | 38 – 48             | 24 – 38                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

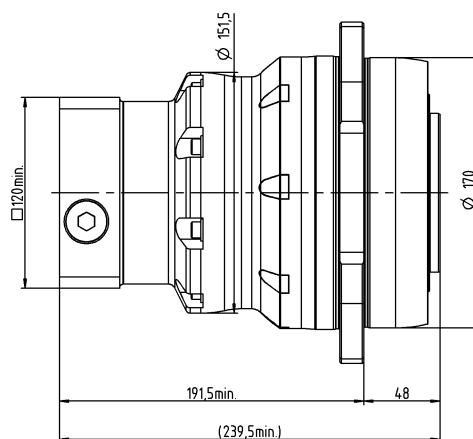
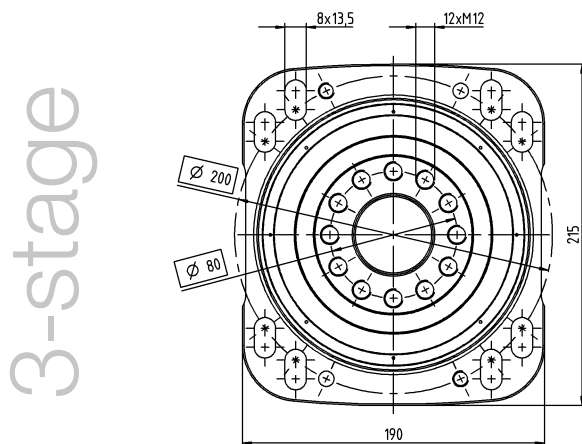


|   |             |                | 3-stage                   |
|---|-------------|----------------|---------------------------|
| Ratio   | $i$         |                | 66 / 88 / 110 / 154 / 220 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 1402                      |
|   |             | $in.lb$        | 12406                     |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 950                       |
|   |             | $in.lb$        | 8408                      |
| Nominal torque<br>(at $n_{90}$ )  | $T_{2N}$    | $Nm$           | 690 – 760                 |
|   |             | $in.lb$        | 6103 – 6727               |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 2865                      |
|   |             | $in.lb$        | 25358                     |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 4100                      |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 6250                      |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1$         |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 205                       |
|   |             | $in.lb/arcmin$ | 1814                      |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 3600                      |
|   |             | $in.lb$        | 31863                     |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 58$                 |
| Lubrication   |             |                | Lubricated for life       |
| Clamping hub diameter   |             | $mm$           | 24                        |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



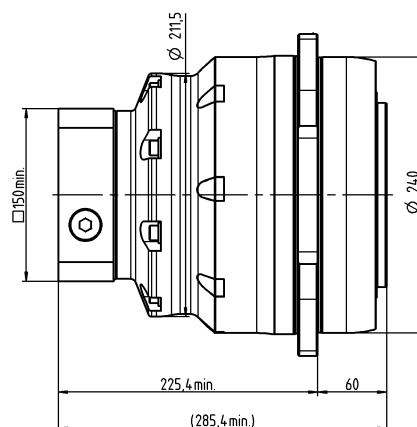
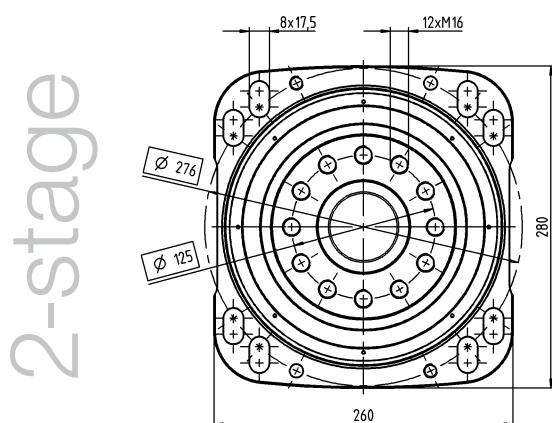
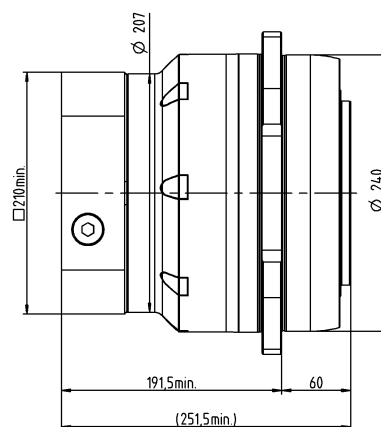
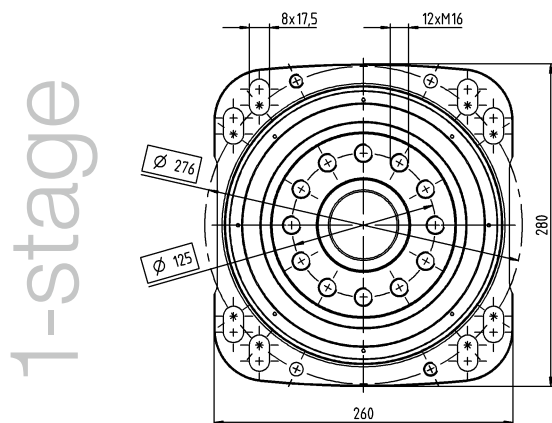
# RP<sup>+</sup> 050 MA 1- / 2-stage

|   |             |              | 1-stage             | 2-stage                           |
|---|-------------|--------------|---------------------|-----------------------------------|
| <b>Ratio</b>  | <i>i</i>    |              | <b>5.5</b>          | <b>16 / 22 / 27.5 / 38.5 / 55</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 3822                | 3518 – 3822                       |
|   |             | in.lb        | 33826               | 28323 – 33826                     |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 3100                | 2000 – 3100                       |
|   |             | in.lb        | 27437               | 17702 – 27437                     |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 1167                | 1174 – 1977                       |
|   |             | in.lb        | 10326               | 10387 – 17501                     |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 6250                | 7150                              |
|   |             | in.lb        | 55318               | 63283                             |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 1500                | 3100 – 3300                       |
| Max. input speed  | $n_{1Max}$  | rpm          | 4500                | 5625                              |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1        | Standard ≤ 1                      |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 730                 | 670 – 730                         |
|   |             | in.lb/arcmin | 6461                | 5930 – 6461                       |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 11000               | 11000                             |
|   |             | in.lb        | 97359               | 97359                             |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 66                | ≤ 64                              |
| Lubrication   |             |              | Lubricated for life | Lubricated for life               |
| Clamping hub diameter   |             | mm           | 48                  | 38 – 48                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

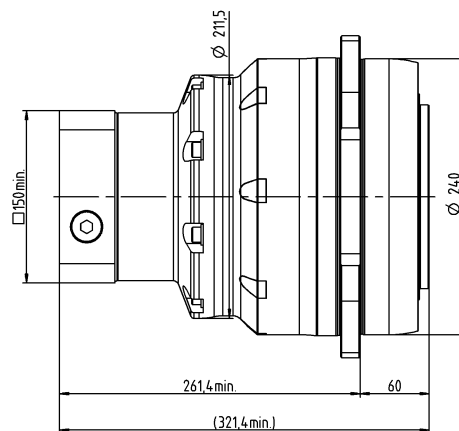
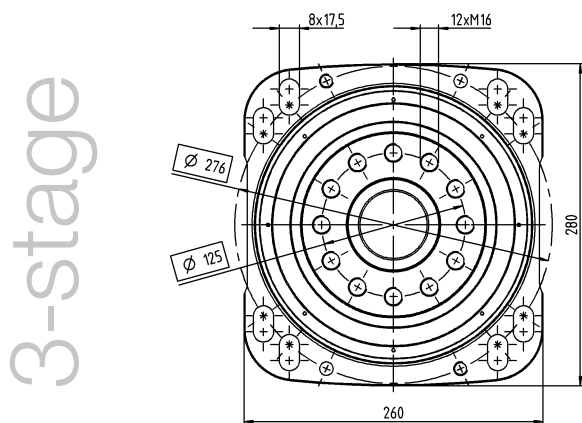


|   |             |                     | 3-stage                          |
|---|-------------|---------------------|----------------------------------|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>66 / 88 / 110 / 154 / 220</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 3023                             |
|   |             | <i>in.lb</i>        | 26757                            |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 2600                             |
|   |             | <i>in.lb</i>        | 23012                            |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | <i>Nm</i>           | 1602 – 2080                      |
|   |             | <i>in.lb</i>        | 14182 – 18410                    |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 8125                             |
|   |             | <i>in.lb</i>        | 71913                            |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 3300                             |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 5625                             |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 1                     |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 650                              |
|   |             | <i>in.lb/arcmin</i> | 5753                             |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 11000                            |
|   |             | <i>in.lb</i>        | 97359                            |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 59                             |
| Lubrication   |             |                     | Lubricated for life              |
| Clamping hub diameter   |             | <i>mm</i>           | 38                               |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



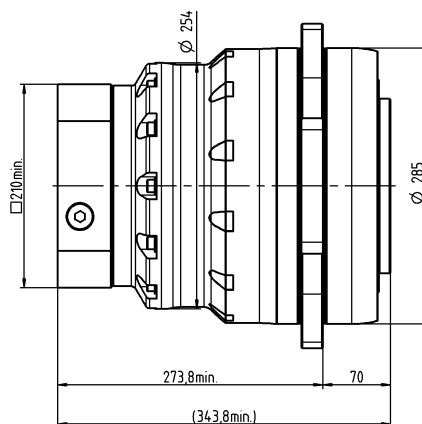
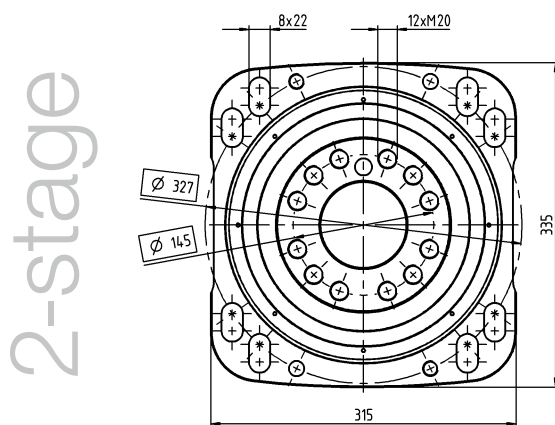
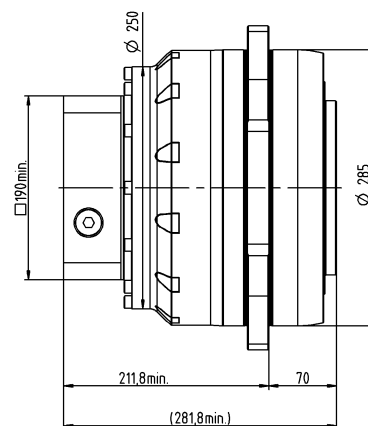
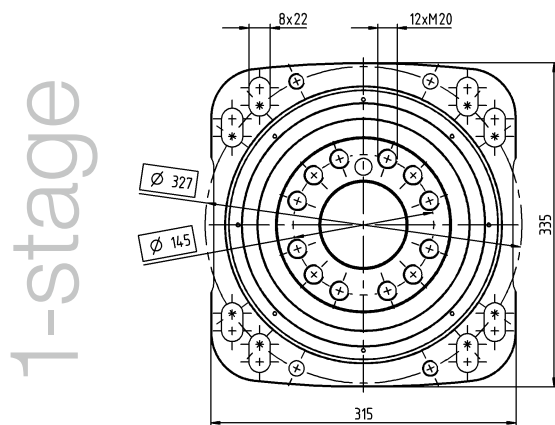
# RP<sup>+</sup> 060 MA 1- / 2-stage

|   |             |              | 1-stage             | 2-stage                      |
|---|-------------|--------------|---------------------|------------------------------|
| <b>Ratio</b>  | <i>i</i>    |              | <b>5.5</b>          | <b>22 / 27.5 / 38.5 / 55</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 7360                | 6240 – 7535                  |
|   |             | in.lb        | 65142               | 55229 – 66691                |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 4600                | 3900 – 5500                  |
|   |             | in.lb        | 40714               | 34518 – 48679                |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 2829                | 3120 – 3530                  |
|   |             | in.lb        | 25035               | 27614 – 31243                |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 10938               | 15296 – 15333                |
|   |             | in.lb        | 96806               | 135377 – 135709              |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 1000                | 2750                         |
| Max. input speed  | $n_{1Max}$  | rpm          | 3125                | 4375                         |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1        | Standard ≤ 1,5               |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 1200                | 1200                         |
|   |             | in.lb/arcmin | 10621               | 10621                        |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 21000               | 21000                        |
|   |             | in.lb        | 185867              | 185867                       |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 68                | ≤ 64                         |
| Lubrication   |             |              | Lubricated for life | Lubricated for life          |
| Clamping hub diameter   |             | mm           | 55                  | 48                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



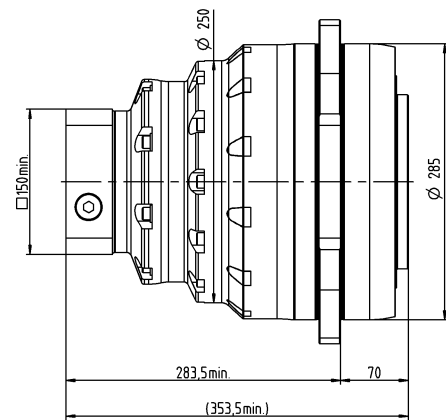
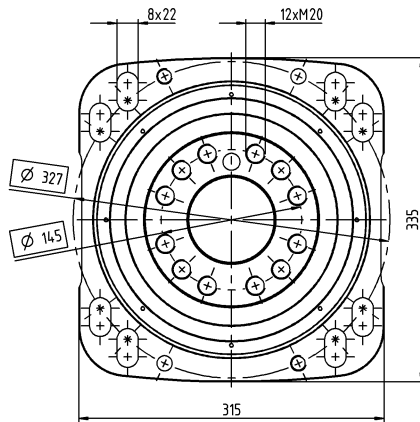
|   |             |                | 3-stage                   |
|---|-------------|----------------|---------------------------|
| Ratio   | $i$         |                | 66 / 88 / 110 / 154 / 220 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 6987                      |
|   |             | $in.lb$        | 61838                     |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 5500                      |
|   |             | $in.lb$        | 48679                     |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | $Nm$           | 2923 – 4196               |
|   |             | $in.lb$        | 25869 – 37136             |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 15333                     |
|   |             | $in.lb$        | 135709                    |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2750                      |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4375                      |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1,5$       |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 1200                      |
|   |             | $in.lb/arcmin$ | 10621                     |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 21000                     |
|   |             | $in.lb$        | 185867                    |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 59$                 |
| Lubrication   |             |                | Lubricated for life       |
| Clamping hub diameter   |             | $mm$           | 38                        |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



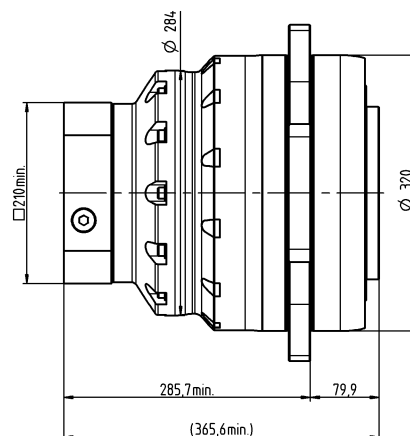
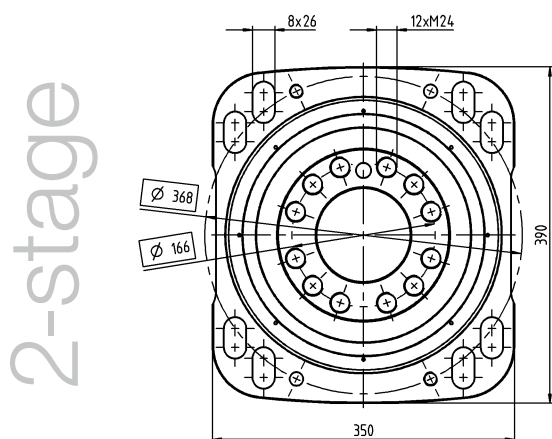
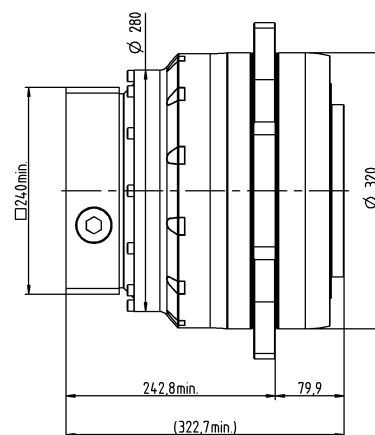
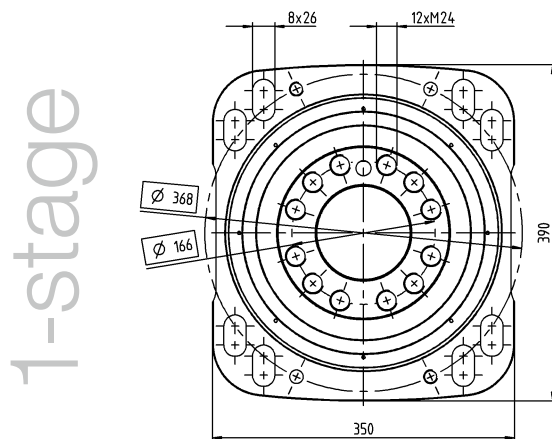
# RP+ 080 MA 1-/2-stage

|   |             |              | 1-stage             | 2-stage                      |
|---|-------------|--------------|---------------------|------------------------------|
| <b>Ratio</b>  | <i>i</i>    |              | <b>5.5</b>          | <b>22 / 27.5 / 38.5 / 55</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 10450               | 10450                        |
|   |             | in.lb        | 92491               | 92491                        |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 8000                | 7200 – 10000                 |
|   |             | in.lb        | 70806               | 63726 – 88508                |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 4313                | 4602 – 4921                  |
|   |             | in.lb        | 38174               | 40736 – 43558                |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 18750               | 25000                        |
|   |             | in.lb        | 165953              | 221270                       |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 900                 | 1950                         |
| Max. input speed  | $n_{1Max}$  | rpm          | 3125                | 4375                         |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1        | Standard ≤ 1,5               |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 2000                | 2000                         |
|   |             | in.lb/arcmin | 17702               | 17702                        |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 34000               | 34000                        |
|   |             | in.lb        | 300927              | 300927                       |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 68                | ≤ 65                         |
| Lubrication   |             |              | Lubricated for life | Lubricated for life          |
| Clamping hub diameter   |             | mm           | 60                  | 48                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

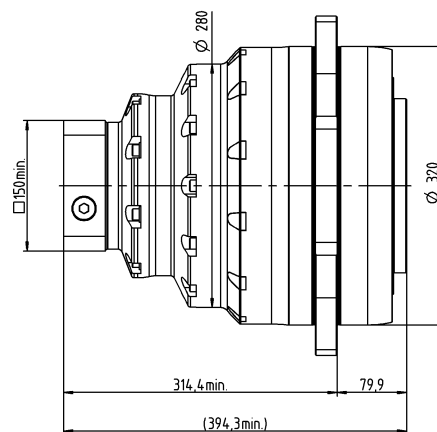
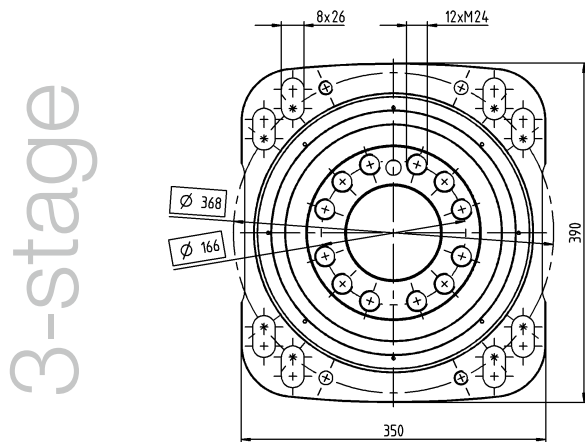


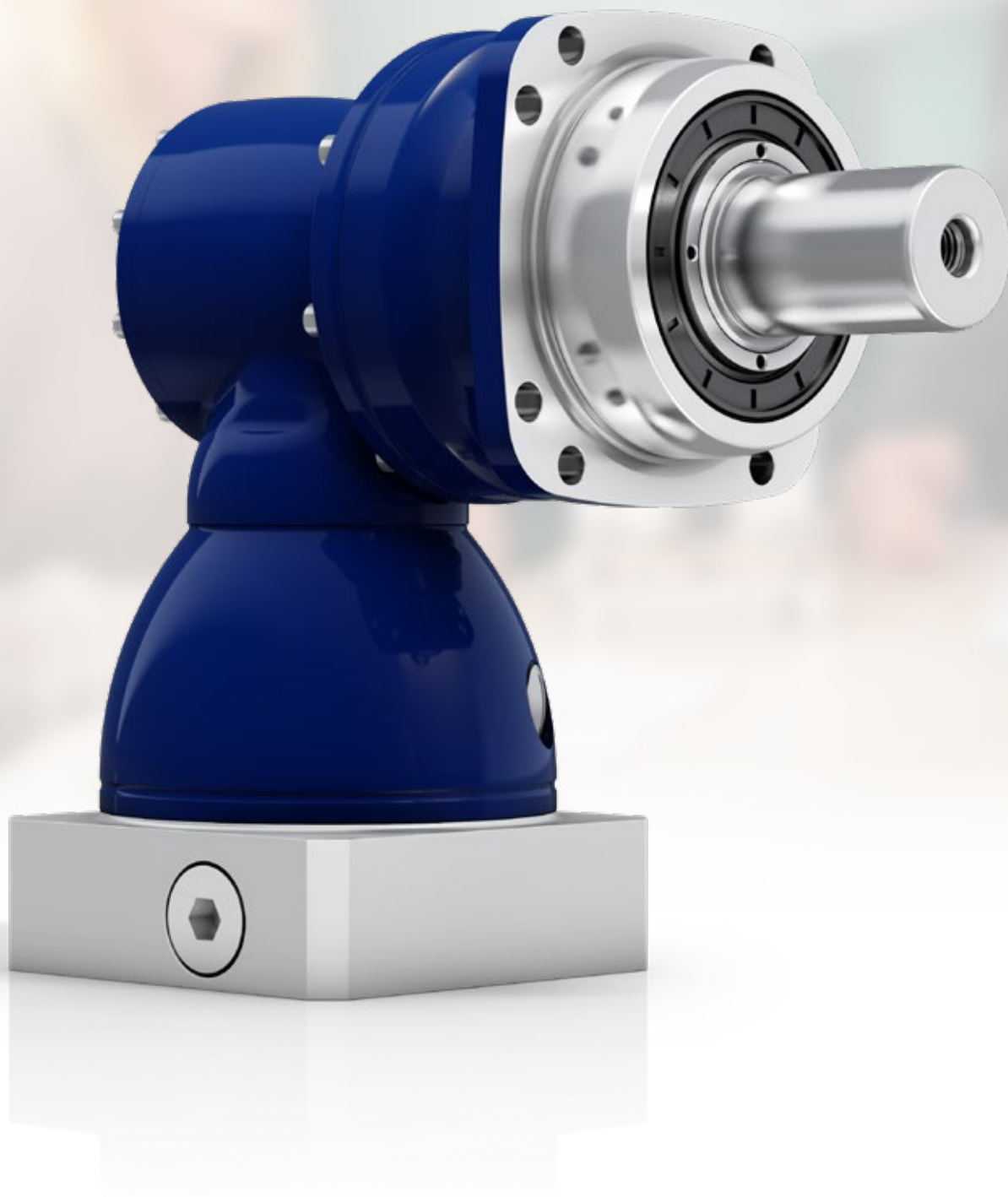
|   |             |                | 3-stage                   |
|---|-------------|----------------|---------------------------|
| Ratio   | $i$         |                | 66 / 88 / 110 / 154 / 220 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 10450                     |
|   |             | $in.lb$        | 92491                     |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 10000                     |
|   |             | $in.lb$        | 88508                     |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | $Nm$           | 4567 – 7308               |
|   |             | $in.lb$        | 40418 – 64684             |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 25000                     |
|   |             | $in.lb$        | 221270                    |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 1950                      |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4375                      |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1,5$       |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 1800                      |
|   |             | $in.lb/arcmin$ | 15931                     |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 34000                     |
|   |             | $in.lb$        | 300927                    |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 62$                 |
| Lubrication   |             |                | Lubricated for life       |
| Clamping hub diameter   |             | $mm$           | 38 – 48                   |

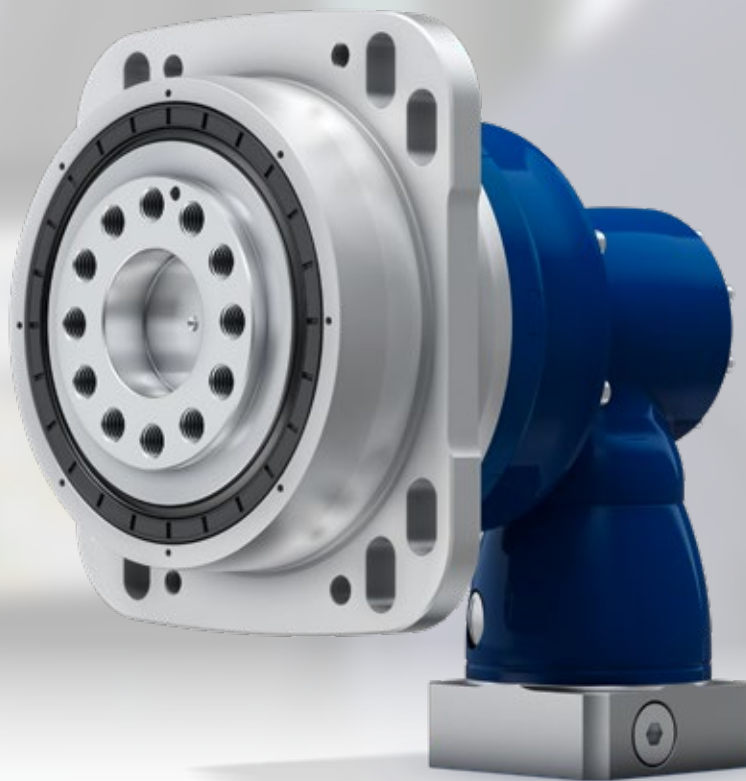
<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.







## XPK<sup>+</sup> and RPK<sup>+</sup> hypoid gearboxes

### A new performance standard

## XPK<sup>+</sup> / RPK<sup>+</sup> – Power and precision in a compact design

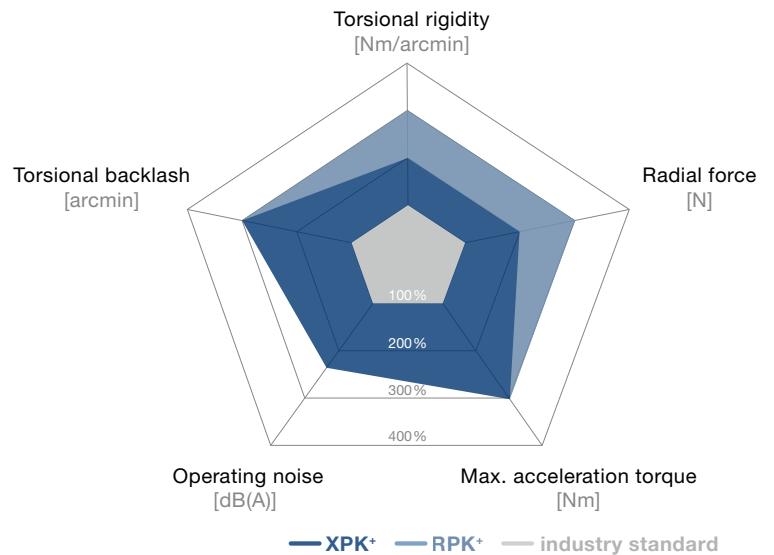


New standard now also available as a hypoid version

Both the XP<sup>+</sup> and RP<sup>+</sup> Premium planetary gearboxes are now available in a right-angle version with hypoid gearing. The axis offset of hypoid gearboxes allows both higher ratios in one section (ratio  $i = 3 - 10$ ) as well as higher torques compared to bevel gearboxes. The high torque density allows for an extremely compact, space-saving design. The mesh frequency and high torsional rigidity of the gearbox are also extremely impressive since they ensure a higher degree of positioning accuracy and extremely smooth operation.

XPK<sup>+</sup> and RPK<sup>+</sup> compared to industry standard

| Product highlights  |   |
|---|---|
| <b>Max. torsional backlash</b>  |   |
| XPK <sup>+</sup>  | ≤ 4 arcmin (Standard)<br>≤ 2 arcmin (Reduced) |
| RPK <sup>+</sup>  | ≤ 1.3 arcmin                                  |
| <b>XPK<sup>+</sup> and RPK<sup>+</sup>:</b>   |   |
| <b>Range of transmission ratios:</b> $i = 12 - 5,500$   |   |
| <b>High axial and radial forces</b>   |   |
| <b>High torsional rigidity</b>  |   |
| <b>Maximum performance in small installation space</b>  |   |
| <b>Optimized for rack and pinion applications</b>   |   |
| <b>Multiple output configurations for greater flexibility</b>                                     |   |
| Smooth shaft, shaft with key, splined shaft (DIN 5480), blind hollow shaft, flange, System output |   |



XPK<sup>+</sup> with pinion and slots



XPK<sup>+</sup> with pinion, slots and rack

## The ideal partnership

Premium Linear Systems with the XPK<sup>+</sup> or RPK<sup>+</sup> are used in all applications where the individual requirements far exceed what has previously been possible. Compared to the industry standard, the values of the RPK<sup>+</sup> have been improved by 150 % on average.

Integrated slots reduce the design and installation requirements to a minimum

High-quality hypoid section with gear ratios of  $i = 3 - 10$  in the angle section

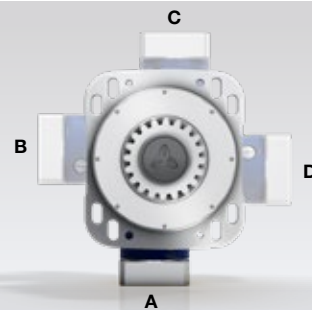
RPK<sup>+</sup> with pinion

Metal bellows coupling incorporated for thermal length compensation and protection of the motor bearing

The pinions are specially adapted to the gearbox and allow the transmission of extremely high feed forces



RPK<sup>+</sup> with rack and pinion



Flexibility during installation

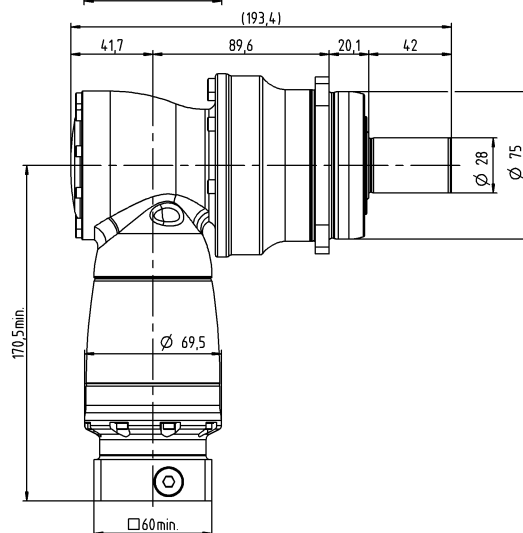
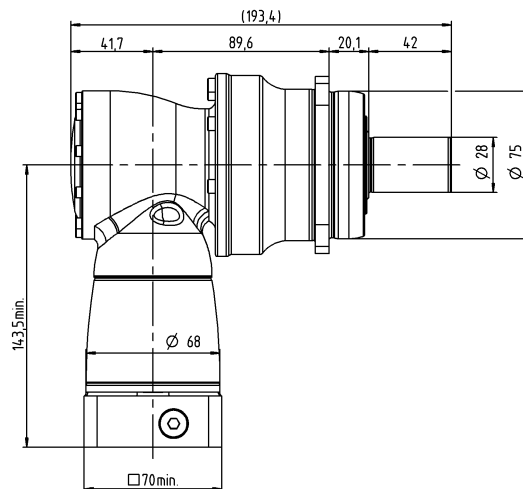
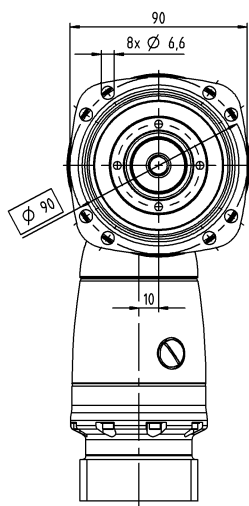
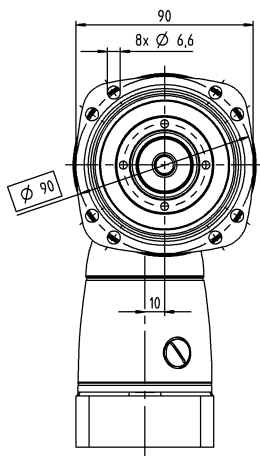
# XPK<sup>+</sup> 020 MF 2-/3-stage

|   |             |                     | 2-stage   | 3-stage   |
|---|-------------|---------------------|---|---|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100</b> | <b>64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 80 – 240  | 80 – 240  |
|   |             | <i>in.lb</i>        | 708 – 2124  | 708 – 2124  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 80 – 180  | 80 – 180  |
|   |             | <i>in.lb</i>        | 708 – 1593  | 708 – 1593  |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | <i>Nm</i>           | 60 – 75   | 60 – 90   |
|   |             | <i>in.lb</i>        | 531 – 664   | 531 – 797   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 160 – 350   | 160 – 350   |
|   |             | <i>in.lb</i>        | 1416 – 3098   | 1416 – 3098   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 3000 – 3800   | 5000 – 5500   |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 7500  | 6000  |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 5 /<br>Reduced ≤ 3                           | Standard ≤ 5 / Reduced ≤ 3  |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 12 – 14   | 11 – 15   |
|   |             | <i>in.lb/arcmin</i> | 106 – 124   | 97 – 133  |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 675   | 675   |
|   |             | <i>in.lb</i>        | 5974  | 5974  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 66  | ≤ 66  |
| Lubrication   |             |                     | Lubricated for life                                     | Lubricated for life   |
| Clamping hub diameter   |             | <i>mm</i>           | 14 – 19   | 11 – 14   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

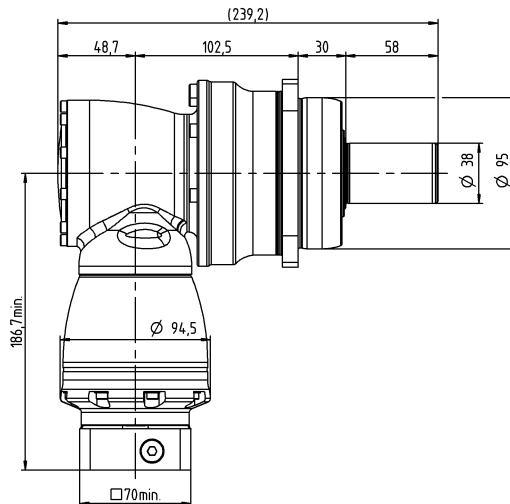
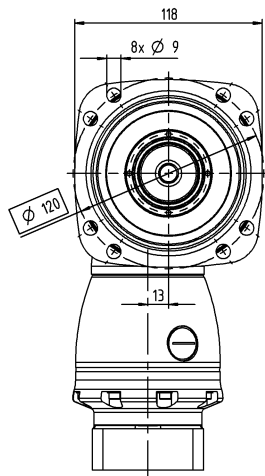
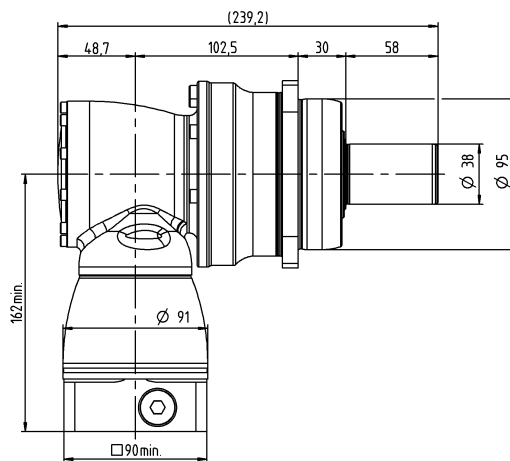
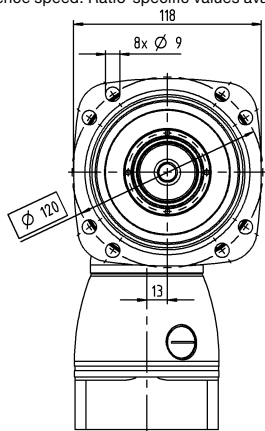


|   |             |                     | 2-stage   | 3-stage   |
|---|-------------|---------------------|---|---|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100</b> | <b>64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 200 – 470   | 200 – 470   |
|   |             | <i>in.lb</i>        | 1770 – 4160   | 1770 – 4160   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 200 – 420   | 200 – 420   |
|   |             | <i>in.lb</i>        | 1770 – 3717   | 1770 – 3717   |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | <i>Nm</i>           | 120 – 170   | 120 – 210   |
|   |             | <i>in.lb</i>        | 1062 – 1505   | 1062 – 1859   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 380 – 781   | 380 – 781   |
|   |             | <i>in.lb</i>        | 3363 – 6912   | 3363 – 6912   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 3000 – 3800   | 4500  |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 7500  | 6000  |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 4 /<br>Reduced ≤ 2                           | Standard ≤ 4 / Reduced ≤ 2  |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 29 – 36   | 29 – 36   |
|   |             | <i>in.lb/arcmin</i> | 257 – 319   | 257 – 319   |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 1296  | 1296  |
|   |             | <i>in.lb</i>        | 11471   | 11471   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 68  | ≤ 68  |
| Lubrication   |             |                     | Lubricated for life                                     | Lubricated for life   |
| Clamping hub diameter   |             | <i>mm</i>           | 19 – 28   | 14 – 19   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



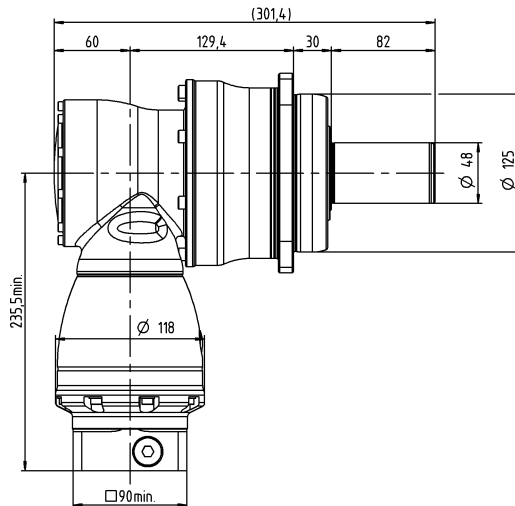
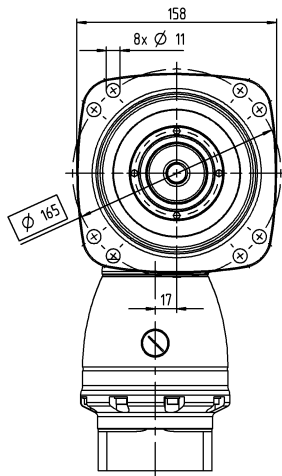
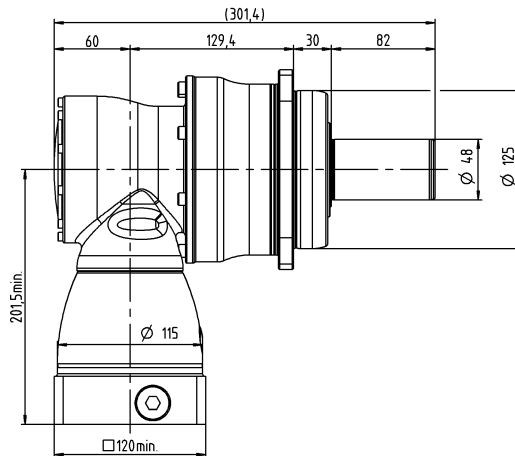
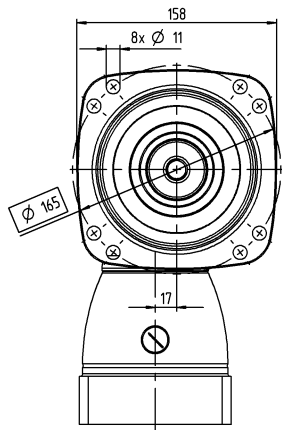
# XPK<sup>+</sup> 040 MF 2-/3-stage

|   |             |              | 2-stage  | 3-stage  |
|---|-------------|--------------|--|--|
| Ratio   | $i$         |              | 12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100 | 64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 500 – 1020                                       | 500 – 1020   |
|   |             | in.lb        | 4425 – 9028                                      | 4425 – 9028  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 500 – 850  | 500 – 850  |
|   |             | in.lb        | 4425 – 7523                                      | 4425 – 7523  |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 240 – 370  | 240 – 400  |
|   |             | in.lb        | 2124 – 3275                                      | 2124 – 3540  |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 880 – 1820                                       | 880 – 1820   |
|   |             | in.lb        | 7789 – 16108                                     | 7789 – 16108   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 2700 – 3500                                      | 4000 – 4200  |
| Max. input speed  | $n_{1Max}$  | rpm          | 5500   | 4500   |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 4 /<br>Reduced ≤ 2                    | Standard ≤ 4 / Reduced ≤ 2   |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 60 – 77  | 60 – 77  |
|   |             | in.lb/arcmin | 531 – 682  | 531 – 682  |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 1635   | 1635   |
|   |             | in.lb        | 14471  | 14471  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 70   | ≤ 70   |
| Lubrication   |             |              | Lubricated for life                              | Lubricated for life  |
| Clamping hub diameter   |             | mm           | 28 – 38  | 19 – 24  |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

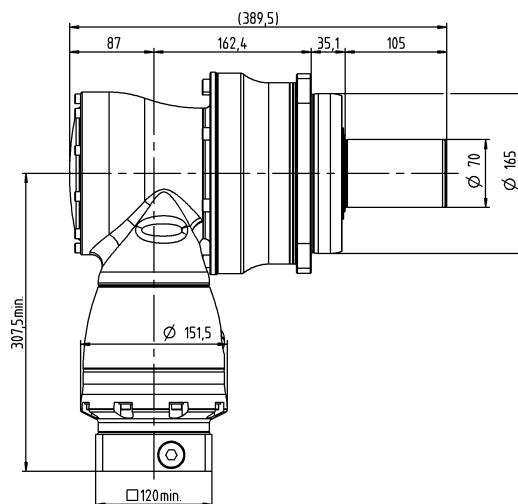
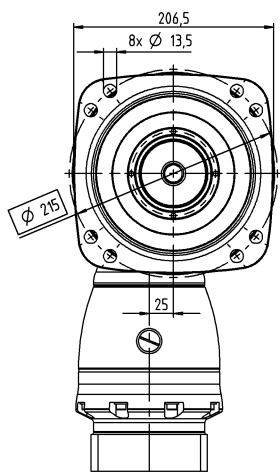
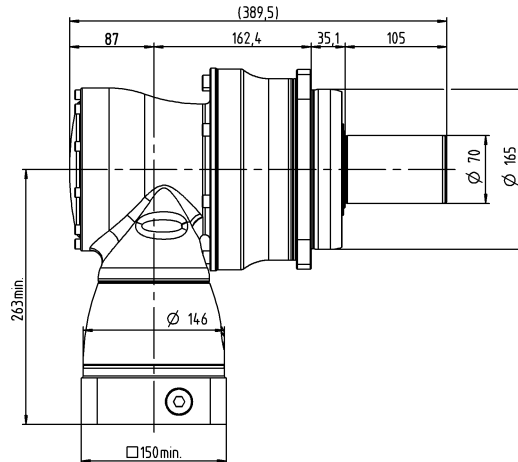
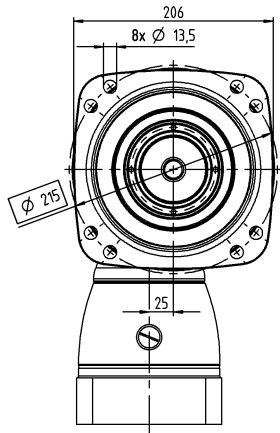


|   |             |                     | 2-stage   | 3-stage   |
|---|-------------|---------------------|---|---|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100</b> | <b>64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 840 – 2520  | 840 – 2520  |
|   |             | <i>in.lb</i>        | 7435 – 22304  | 7435 – 22304  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 840 – 2100  | 840 – 2100  |
|   |             | <i>in.lb</i>        | 7435 – 18587  | 7435 – 18587  |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | <i>Nm</i>           | 640 – 750   | 640 – 1250  |
|   |             | <i>in.lb</i>        | 5665 – 6638   | 5665 – 11064  |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 1600 – 3505   | 1600 – 3505   |
|   |             | <i>in.lb</i>        | 14161 – 31022   | 14161 – 31022   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 2300 – 3000   | 4000 – 4200   |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 5000  | 4500  |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 4 /<br>Reduced ≤ 2                           | Standard ≤ 4 / Reduced ≤ 2  |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 176 – 224   | 176 – 226   |
|   |             | <i>in.lb/arcmin</i> | 1558 – 1983   | 1558 – 2000   |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 3256  | 3256  |
|   |             | <i>in.lb</i>        | 28818   | 28818   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 71  | ≤ 70  |
| Lubrication   |             |                     | Lubricated for life                                     | Lubricated for life   |
| Clamping hub diameter   |             | <i>mm</i>           | 38  | 24 – 38   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



# RPK<sup>+</sup> 040 MA 3- / 4-stage

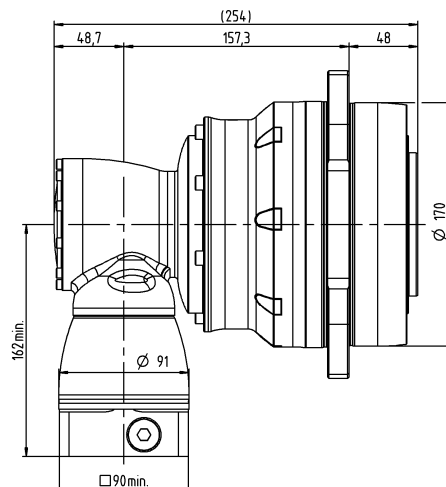
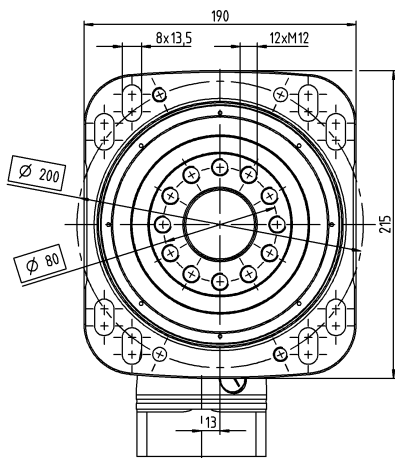
|   |             |              | 3-stage   | 4-stage   |
|---|-------------|--------------|---|---|
| <b>Ratio</b>  | <i>i</i>    |              | <b>48 / 66 / 88 / 110 / 137.5 / 154 / 220 / 385</b> | <b>330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 1100 – 1402   | 1402  |
|   |             | in.lb        | 9736 – 12409  | 12409   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 950   | 950   |
|   |             | in.lb        | 8408  | 8408  |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 675   | 675   |
|   |             | in.lb        | 5974  | 5974  |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 1520 – 2613   | 2090 – 2613   |
|   |             | in.lb        | 13453 – 23127                                       | 18498 – 23127   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 2800 – 3800   | 4300 – 4400   |
| Max. input speed  | $n_{1Max}$  | rpm          | 7500  | 6000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1,3                                      | Standard ≤ 1,3  |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 202 – 215   | 202 – 217   |
|   |             | in.lb/arcmin | 1788 – 1903   | 1788 – 1921   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 3600  | 3600  |
|   |             | in.lb        | 31863   | 31863   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 68  | ≤ 68  |
| Lubrication   |             |              | Lubricated for life                                 | Lubricated for life   |
| Clamping hub diameter   |             | mm           | 19 – 28   | 14 – 19   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

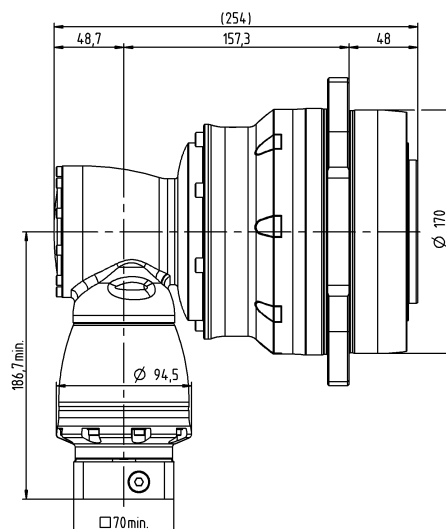
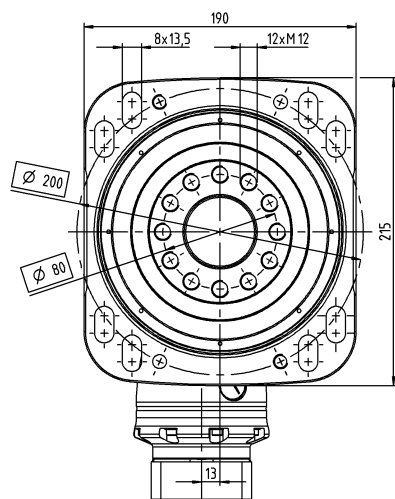
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



4-stage



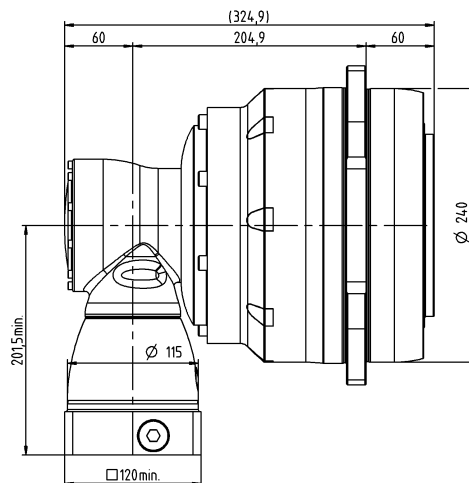
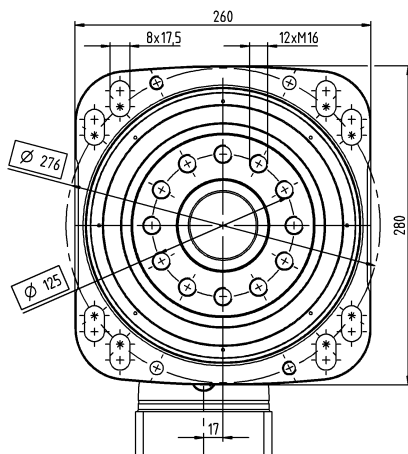
|   |             |              | 3-stage   | 4-stage   |
|---|-------------|--------------|---|---|
| <b>Ratio</b>  | <i>i</i>    |              | <b>48 / 66 / 88 / 110 / 137.5 / 154 / 220 / 385</b> | <b>330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 2750 – 3822   | 3200 – 3822   |
|   |             | in.lb        | 24340 – 33828                                       | 28323 – 33828   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 2720 – 3100   | 2000 – 3100   |
|   |             | in.lb        | 24074 – 27437                                       | 17702 – 27437   |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | Nm           | 1600 – 1650   | 1400 – 1650   |
|   |             | in.lb        | 14161 – 14604                                       | 12391 – 14604   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 3520 – 7150   | 4840 – 7150   |
|   |             | in.lb        | 31155 – 63283                                       | 42838 – 63283   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 2800 – 3600   | 3800 – 4100   |
| Max. input speed  | $n_{1Max}$  | rpm          | 5500  | 4500  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1,3                                      | Standard ≤ 1,3  |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 634 – 687   | 634 – 689   |
|   |             | in.lb/arcmin | 5611 – 6080   | 5611 – 6098   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 11000   | 11000   |
|   |             | in.lb        | 97359   | 97359   |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 70  | ≤ 70  |
| Lubrication   |             |              | Lubricated for life                                 | Lubricated for life   |
| Clamping hub diameter   |             | mm           | 28 – 38   | 19 – 24   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

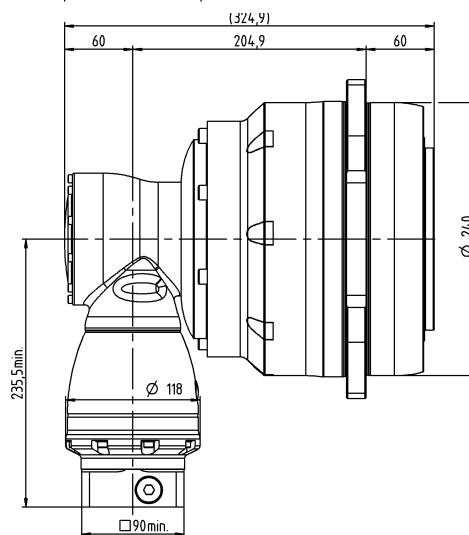
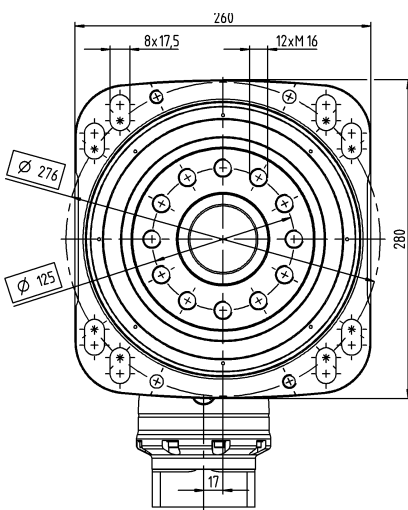
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



4-stage



# RPK<sup>+</sup> 060 MA 3- / 4-stage

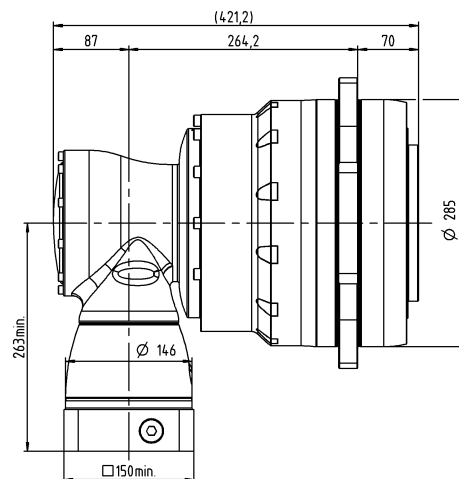
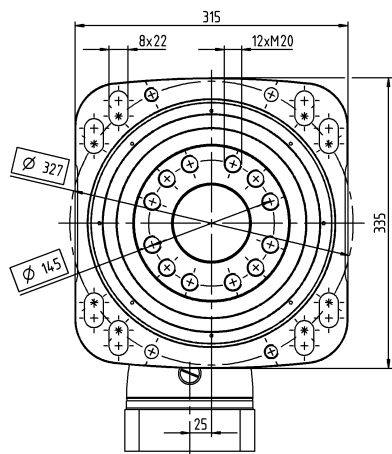
|   |             |                     | 3-stage  | 4-stage   |
|---|-------------|---------------------|--|---|
| <b>Ratio</b>  | <i>i</i>    |                     | <b>66 / 88 / 110 / 137.5 / 154 / 220 / 385</b> | <b>330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 4620 – 7535                                    | 6240 – 7535   |
|   |             | <i>in.lb</i>        | 40891 – 66691                                  | 55229 – 66691   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 4620 – 5500                                    | 3900 – 5500   |
|   |             | <i>in.lb</i>        | 30978 – 48679                                  | 34518 – 48679   |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | <i>Nm</i>           | 3500   | 3500  |
|   |             | <i>in.lb</i>        | 30978  | 30978   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 8800 – 14575                                   | 8800 – 14575  |
|   |             | <i>in.lb</i>        | 77887 – 129000                                 | 77887 – 129000  |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 2300 – 2900                                    | 3800 – 4000   |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 5000   | 4500  |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 1,8                                 | Standard ≤ 1,8  |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 960 – 1114                                     | 953 – 1099  |
|   |             | <i>in.lb/arcmin</i> | 8497 – 9860                                    | 8435 – 9727   |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 21000  | 21000   |
|   |             | <i>in.lb</i>        | 185867   | 185867  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 71   | ≤ 71  |
| Lubrication   |             |                     | Lubricated for life                            | Lubricated for life   |
| Clamping hub diameter   |             | <i>mm</i>           | 38   | 24 – 38   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

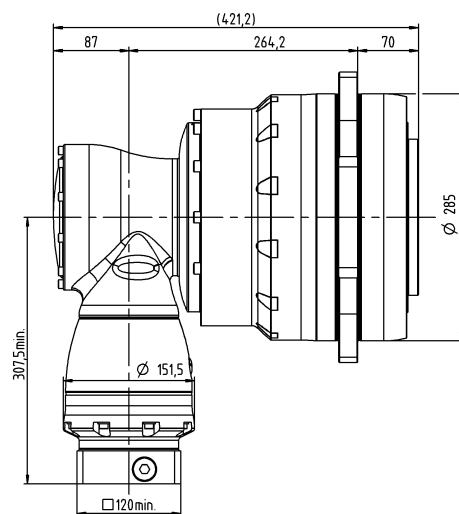
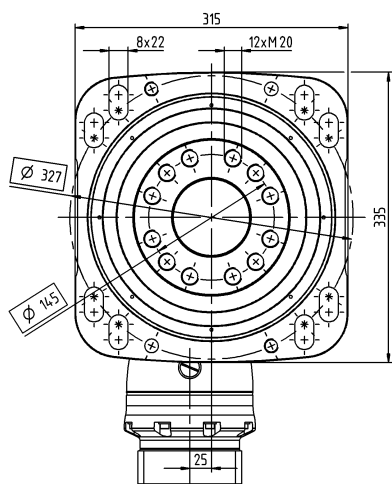
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



4-stage



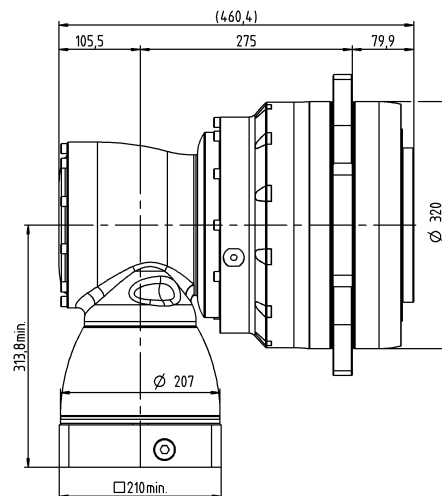
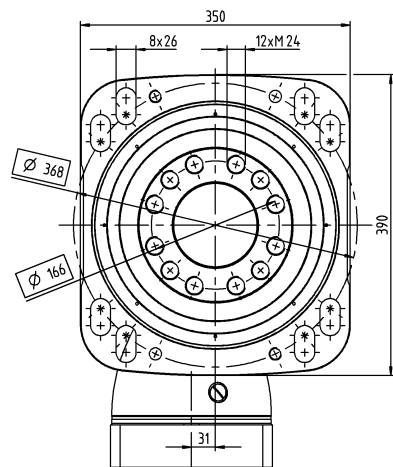
|   |             |              | 3-stage  | 4-stage   |
|---|-------------|--------------|--|---|
| <b>Ratio</b>  | <i>i</i>    |              | <b>66 / 88 / 110 / 137.5 / 154 / 220 / 385</b> | <b>330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500</b> |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 10340 – 10450                                  | 10450   |
|   |             | in.lb        | 91517 – 92491                                  | 92491   |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 10000  | 7200 – 10000  |
|   |             | in.lb        | 88508  | 63726 – 88508   |
| Nominal torque<br>(at $n_{2N}$ )  | $T_{2N}$    | Nm           | 5400   | 5400  |
|   |             | in.lb        | 47794  | 47794   |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 19800 – 25000                                  | 19800 – 25000   |
|   |             | in.lb        | 175246 – 221270                                | 175246 – 221270   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 1800 – 3100                                    | 3300 – 3600   |
| Max. input speed  | $n_{1Max}$  | rpm          | 4500   | 4000  |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1,8                                 | Standard ≤ 1,8  |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 1747 – 1901                                    | 1735 – 1879   |
|   |             | in.lb/arcmin | 15462 – 16825                                  | 15356 – 16631   |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 34000  | 34000   |
|   |             | in.lb        | 300927   | 300927  |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 71   | ≤ 71  |
| Lubrication   |             |              | Lubricated for life                            | Lubricated for life   |
| Clamping hub diameter   |             | mm           | 48   | 38 – 48   |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

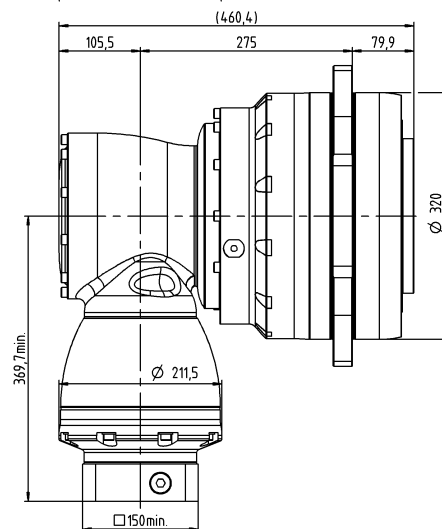
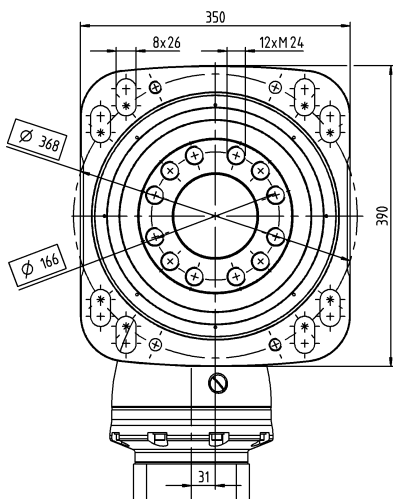
<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



4-stage





Compact and powerful  
XPC<sup>+</sup> and RPC<sup>+</sup>

bevel gearboxes



## XPC<sup>+</sup> / RPC<sup>+</sup> – High precision and low ratios around the corner

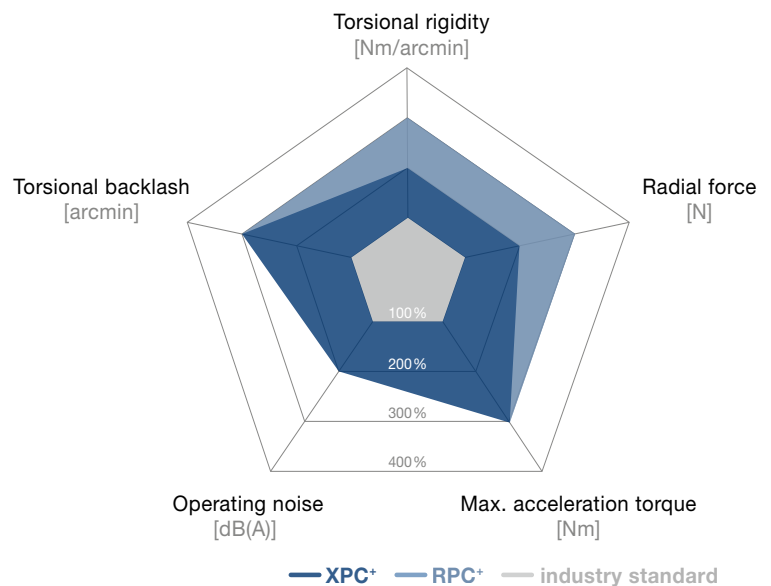


New performance standard, also available in the bevel version

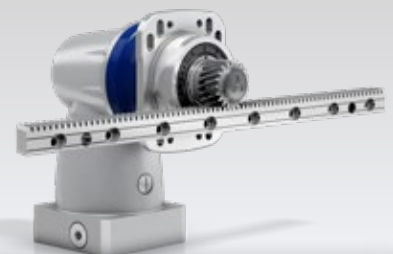
Both the XP<sup>+</sup> and RP<sup>+</sup> Premium planetary gearboxes are now available in a right-angle version with bevel toothing. Bevel gearboxes are primarily characterized by low gear ratios (ratio 1 and 2) in the angle section. Consequently, right-angle and planetary gearbox combinations can achieve the same low ratios as planetary gearboxes. The product design has a positive influence on temperature development in the gearbox and reduces overall heat development in the system as a result. The overall system achieves a higher degree of positioning accuracy as a consequence.

XPC<sup>+</sup> and RPC<sup>+</sup> compared to industry standard

| Product highlights  |   |
|---|---|
| <b>Max. torsional backlash</b>  |   |
| XPC <sup>+</sup>  | ≤ 4 arcmin (Standard)<br>≤ 2 arcmin (Reduced) |
| RPC <sup>+</sup>  | ≤ 1.3 arcmin                                  |
| <b>XPC<sup>+</sup> and RPC<sup>+</sup>:</b>   |   |
| Low ratios of $i = 4 - 88$ possible   |   |
| Optimized temperature distribution, even at high speeds   |   |
| High tilting moments and torsional rigidity   |   |
| Optimized for rack and pinion applications  |   |
| <b>Multiple output configurations for greater flexibility</b>                                     |   |
| Smooth shaft, shaft with key, splined shaft (DIN 5480), blind hollow shaft, flange, System output |   |



XPC<sup>+</sup> with pinion and slots



XPC<sup>+</sup> with pinion, slots and rack

Specially designed output for transmitting extremely high torques

Intelligent design reduces losses to a minimum

High-quality bevel toothing with low gear ratios of  $i = 1 - 2$  in the angle section

Low temperature development, even at high speeds

RPC+

Metal bellows coupling incorporated for thermal length compensation and protection of the motor bearing



RPC+ with pinion and slots



RPC+ with pinion, slots and rack

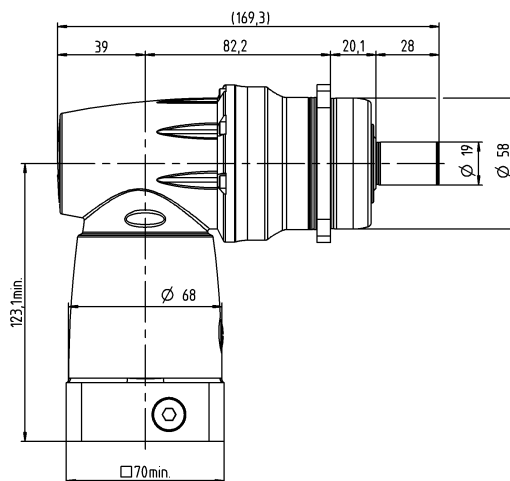
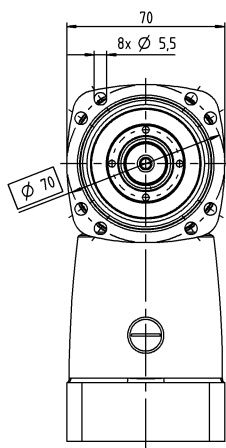
# XPC<sup>+</sup> 010 MF 2-stage

|   |             |                     | 2-stage                      |
|---|-------------|---------------------|------------------------------|
| Ratio   | <i>i</i>    |                     | 4 / 5 / 7 / 8 / 10 / 14 / 20 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 48 – 84                      |
|   |             | <i>in.lb</i>        | 425 – 743                    |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 40 – 70                      |
|   |             | <i>in.lb</i>        | 354 – 620                    |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | <i>Nm</i>           | 27 – 28                      |
|   |             | <i>in.lb</i>        | 239 – 248                    |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 100 – 165                    |
|   |             | <i>in.lb</i>        | 885 – 1460                   |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 3300 – 3750                  |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 6000                         |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 5 / Reduced ≤ 3   |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 3.1 – 5,5                    |
|   |             | <i>in.lb/arcmin</i> | 27 – 49                      |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 339                          |
|   |             | <i>in.lb</i>        | 3000                         |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 68                         |
| Lubrication   |             |                     | Lubricated for life          |
| Clamping hub diameter   |             | <i>mm</i>           | 14 – 19                      |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

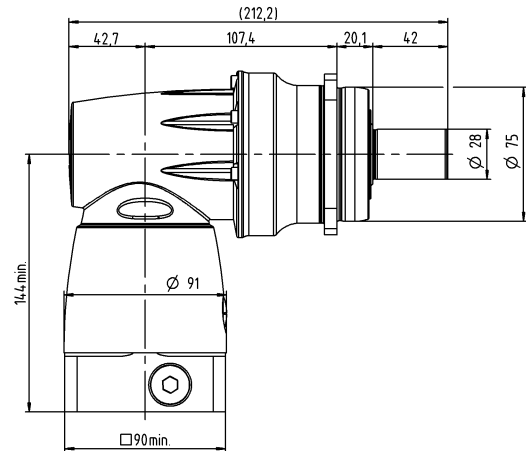
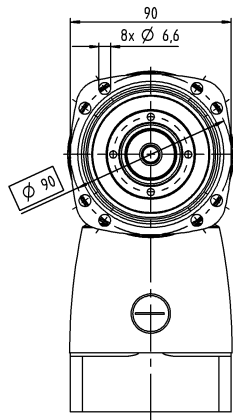


|   |             |                | 2-stage                              |
|---|-------------|----------------|--------------------------------------|
| Ratio   | $i$         |                | 4 / 5 / 7 / 8 / 10 / 14 / 20         |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 144 – 240                            |
|   |             | $in.lb$        | 1275 – 2124                          |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 120 – 180                            |
|   |             | $in.lb$        | 1062 – 1593                          |
| Nominal torque<br>(at $n_{90}$ )  | $T_{2N}$    | $Nm$           | 60 – 75                              |
|   |             | $in.lb$        | 531 – 664                            |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 192 – 418                            |
|   |             | $in.lb$        | 1699 – 3700                          |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2600 – 3050                          |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 6000                                 |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 4$ / Reduced $\leq 2$ |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 9.1 – 14                             |
|   |             | $in.lb/arcmin$ | 81 – 124                             |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 675                                  |
|   |             | $in.lb$        | 5974                                 |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 68$                            |
| Lubrication   |             |                | Lubricated for life                  |
| Clamping hub diameter   |             | $mm$           | 19 – 28                              |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



2-stage

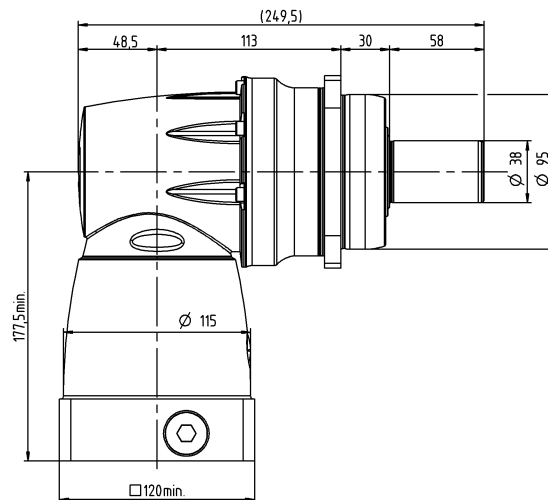
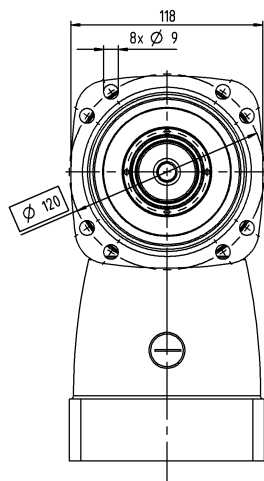
# XPC+ 030 MF 2-stage

|   |             |                | 2-stage                              |
|---|-------------|----------------|--------------------------------------|
| Ratio   | $i$         |                | 4 / 5 / 7 / 8 / 10 / 14 / 20         |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 389 – 486                            |
|   |             | $in.lb$        | 3443 – 4301                          |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 320 – 420                            |
|   |             | $in.lb$        | 2832 – 3717                          |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | $Nm$           | 120 – 180                            |
|   |             | $in.lb$        | 1062 – 1593                          |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 540 – 800                            |
|   |             | $in.lb$        | 4779 – 7081                          |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 2100 – 2750                          |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4500                                 |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 4$ / Reduced $\leq 2$ |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 23 – 36                              |
|   |             | $in.lb/arcmin$ | 204 – 319                            |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 1296                                 |
|   |             | $in.lb$        | 11471                                |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 68$                            |
| Lubrication   |             |                | Lubricated for life                  |
| Clamping hub diameter   |             | $mm$           | 28 – 38                              |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

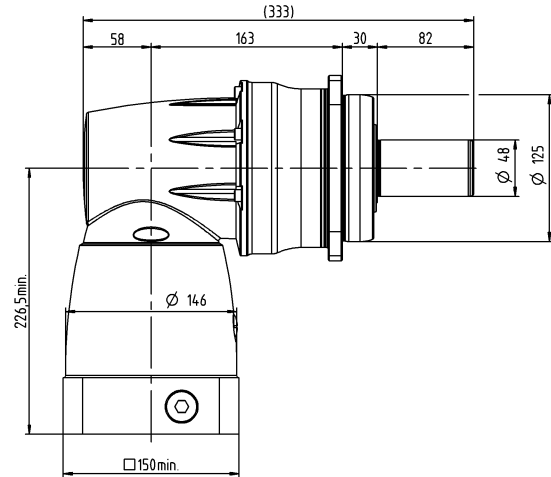
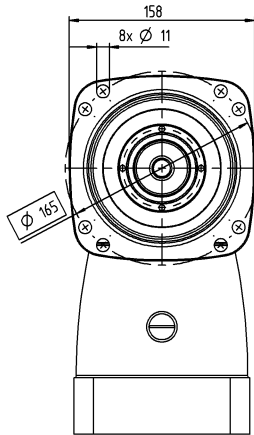


|   |             |                     | 2-stage                      |
|---|-------------|---------------------|------------------------------|
| Ratio   | <i>i</i>    |                     | 4 / 5 / 7 / 8 / 10 / 14 / 20 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 792 – 1050                   |
|   |             | <i>in.lb</i>        | 7010 – 9293                  |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 700 – 875                    |
|   |             | <i>in.lb</i>        | 6196 – 7744                  |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | <i>Nm</i>           | 240 – 370                    |
|   |             | <i>in.lb</i>        | 2124 – 3275                  |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 960 – 2170                   |
|   |             | <i>in.lb</i>        | 8497 – 19206                 |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 1550 – 1900                  |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 4500                         |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 4 / Reduced ≤ 2   |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 50 – 74                      |
|   |             | <i>in.lb/arcmin</i> | 443 – 655                    |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 1635                         |
|   |             | <i>in.lb</i>        | 14471                        |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 70                         |
| Lubrication   |             |                     | Lubricated for life          |
| Clamping hub diameter   |             | <i>mm</i>           | 38                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



2-stage

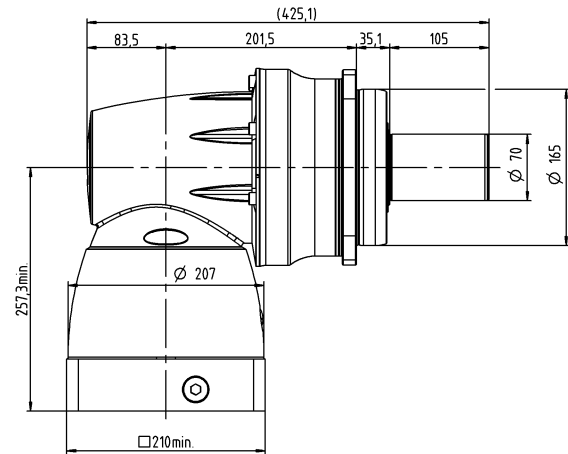
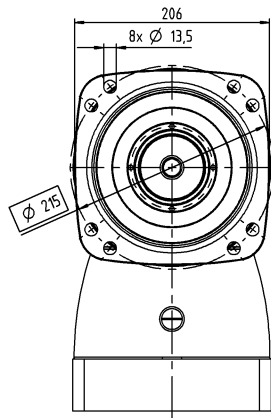
# XPC+ 050 MF 2-stage

|   |             |                     | 2-stage                      |
|---|-------------|---------------------|------------------------------|
| Ratio   | <i>i</i>    |                     | 4 / 5 / 7 / 8 / 10 / 14 / 20 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | <i>Nm</i>           | 1512 – 2646                  |
|   |             | <i>in.lb</i>        | 13382 – 23419                |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | <i>Nm</i>           | 1260 – 2205                  |
|   |             | <i>in.lb</i>        | 11152 – 19516                |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | <i>Nm</i>           | 700 – 750                    |
|   |             | <i>in.lb</i>        | 6196 – 6638                  |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | <i>Nm</i>           | 1560 – 4795                  |
|   |             | <i>in.lb</i>        | 13807 – 42440                |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | <i>rpm</i>          | 1050 – 1550                  |
| Max. input speed  | $n_{1Max}$  | <i>rpm</i>          | 4000                         |
| Max. torsional backlash   | $j_t$       | <i>arcmin</i>       | Standard ≤ 4 / Reduced ≤ 2   |
| Torsional rigidity  | $C_{t21}$   | <i>Nm/arcmin</i>    | 127 – 215                    |
|   |             | <i>in.lb/arcmin</i> | 1124 – 1903                  |
| Max. tilting moment   | $M_{2KMax}$ | <i>Nm</i>           | 3256                         |
|   |             | <i>in.lb</i>        | 28818                        |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | <i>dB(A)</i>        | ≤ 70                         |
| Lubrication   |             |                     | Lubricated for life          |
| Clamping hub diameter   |             | <i>mm</i>           | 48                           |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



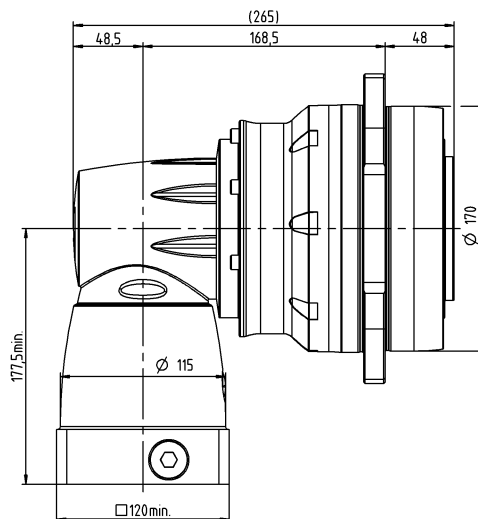
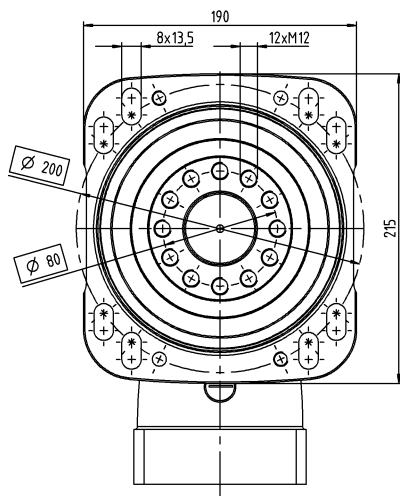
|   |             |                | 3-stage                    |
|---|-------------|----------------|----------------------------|
| Ratio   | $i$         |                | 22 / 27.5 / 38.5 / 44 / 55 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 1402                       |
|   |             | $in.lb$        | 12409                      |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2Not}$  | $Nm$           | 2613                       |
|   |             | $in.lb$        | 23127                      |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2B}$    | $Nm$           | 950                        |
|   |             | $in.lb$        | 8408                       |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2N}$    | $Nm$           | 675                        |
|   |             | $in.lb$        | 5974                       |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 1800 – 2500                |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4500                       |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1,3$        |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 194 – 215                  |
|   |             | $in.lb/arcmin$ | 1717 – 1903                |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 3600                       |
|   |             | $in.lb$        | 31863                      |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 70$                  |
| Lubrication   |             |                | Lubricated for life        |
| Clamping hub diameter   |             | $mm$           | 28 – 38                    |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



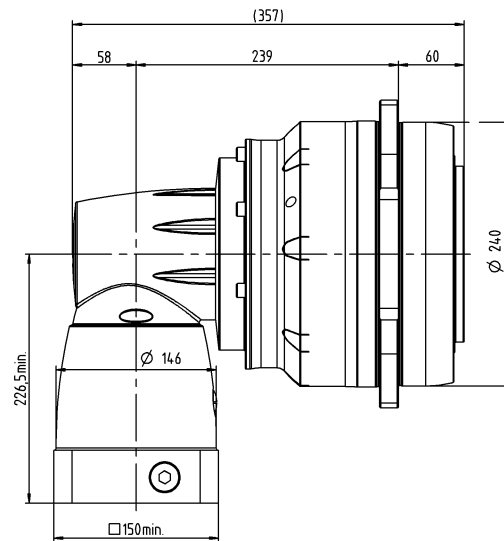
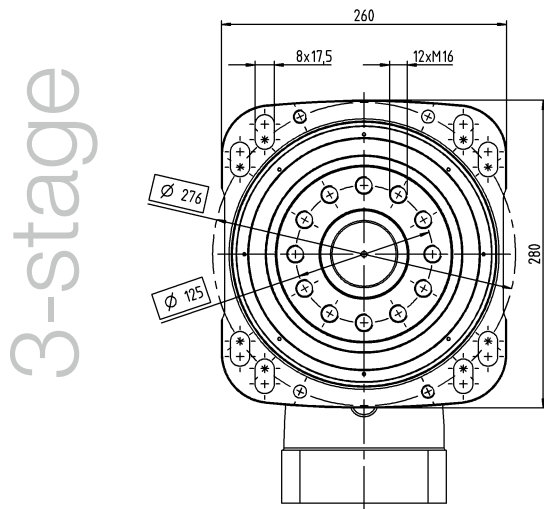
# RPC+ 050 MA 3-stage

|   |             |              | 3-stage                    |
|---|-------------|--------------|----------------------------|
| Ratio   | $i$         |              | 22 / 27.5 / 38.5 / 44 / 55 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | Nm           | 3822                       |
|   |             | in.lb        | 33828                      |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | Nm           | 3100                       |
|   |             | in.lb        | 27437                      |
| Nominal torque<br>(at $n_n$ )   | $T_{2N}$    | Nm           | 1650                       |
|   |             | in.lb        | 14604                      |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | Nm           | 5280 – 7150                |
|   |             | in.lb        | 46732 – 63283              |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | rpm          | 1300 – 1700                |
| Max. input speed  | $n_{1Max}$  | rpm          | 4500                       |
| Max. torsional backlash   | $j_t$       | arcmin       | Standard ≤ 1,3             |
| Torsional rigidity  | $C_{t21}$   | Nm/arcmin    | 607 – 671                  |
|   |             | in.lb/arcmin | 5372 – 5939                |
| Max. tilting moment   | $M_{2KMax}$ | Nm           | 11000                      |
|   |             | in.lb        | 97359                      |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | dB(A)        | ≤ 71                       |
| Lubrication   |             |              | Lubricated for life        |
| Clamping hub diameter   |             | mm           | 38                         |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.



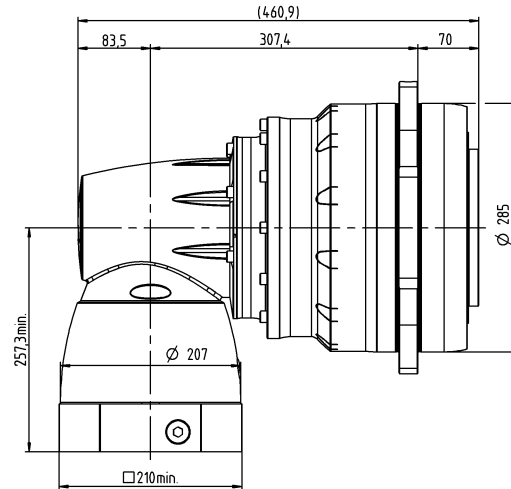
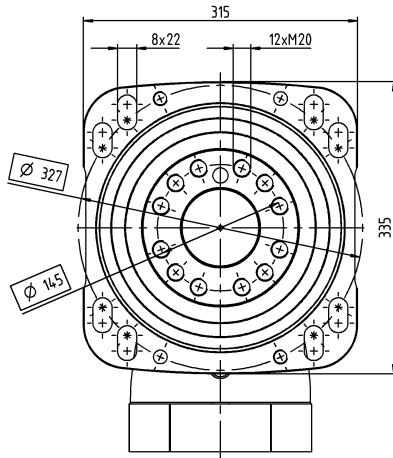
|   |             |                | 3-stage                    |
|---|-------------|----------------|----------------------------|
| Ratio   | $i$         |                | 22 / 27.5 / 38.5 / 44 / 55 |
| Max. torque <sup>a)</sup>   | $T_{2a}$    | $Nm$           | 7535                       |
|   |             | $in.lb$        | 66691                      |
| Max. acceleration torque<br>(max. 1000 cycles per hour)   | $T_{2B}$    | $Nm$           | 5500                       |
|   |             | $in.lb$        | 48679                      |
| Nominal torque<br>(at $n_{n0}$ )  | $T_{2N}$    | $Nm$           | 3500                       |
|   |             | $in.lb$        | 30978                      |
| Emergency stop torque<br>(permitted 1000 times during the service life of the gearbox)          | $T_{2Not}$  | $Nm$           | 8580 – 14575               |
|   |             | $in.lb$        | 75940 – 129000             |
| Thermal speed limit<br>(with 20°C ambient temperature and 10% torque utilization) <sup>b)</sup> | $n_{1T}$    | $rpm$          | 850 – 1350                 |
| Max. input speed  | $n_{1Max}$  | $rpm$          | 4000                       |
| Max. torsional backlash   | $j_t$       | $arcmin$       | Standard $\leq 1,8$        |
| Torsional rigidity  | $C_{t21}$   | $Nm/arcmin$    | 1039 – 1171                |
|   |             | $in.lb/arcmin$ | 9196 – 10364               |
| Max. tilting moment   | $M_{2KMax}$ | $Nm$           | 21000                      |
|   |             | $in.lb$        | 185867                     |
| Operating noise <sup>c)</sup>   | $L_{PA}$    | $dB(A)$        | $\leq 71$                  |
| Lubrication   |             |                | Lubricated for life        |
| Clamping hub diameter   |             | $mm$           | 48                         |

<sup>a)</sup> Application-specific design with cymex® – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

<sup>b)</sup> For higher ambient temperatures, please reduce input speed

<sup>c)</sup> At reference ratio and reference speed. Ratio-specific values available in cymex®.

3-stage



# Basic Line gearbox overview



| Product type  |            | CP   | CPS  | CPK  | CPSK | CVH     | CVS     |
|---|------------|------|------|------|------|---------|---------|
| Version   |            | MF   | MF   | MF   | MF   | MF / MT | MF / MT |
| Ratio <sup>c)</sup>   | min. $i =$ | 3    | 3    | 3    | 3    | 7       | 7       |
|   | max. $i =$ | 100  | 100  | 100  | 100  | 40      | 40      |
| Max. torsional backlash<br>[arcmin] <sup>c)</sup>                             | Standard   | ≤ 12 | ≤ 12 | ≤ 15 | ≤ 15 | ≤ 15    | ≤ 15    |
|   | Reduced    | –    | –    | –    | –    | –       | –       |
| <b>Output type</b>  |            |      |      |      |      |         |         |
| Smooth shaft  |            | x    | x    | x    | x    | –       | x       |
| Shaft with key <sup>d)</sup>  |            | x    | x    | x    | x    | –       | x       |
| Splined shaft (DIN 5480)  |            | –    | –    | –    | –    | –       | –       |
| Blind hollow shaft  |            | –    | –    | –    | –    | –       | –       |
| Hollow shaft interface  |            | –    | –    | –    | –    | x       | –       |
| Keyed hollow shaft  |            | –    | –    | –    | –    | x       | –       |
| Flanged hollow shaft  |            | –    | –    | –    | –    | –       | –       |
| Flange  |            | –    | –    | –    | –    | –       | –       |
| System output   |            | –    | –    | –    | –    | –       | –       |
| Output on both sides  |            | –    | –    | –    | –    | x       | x       |
| <b>Input type</b>   |            |      |      |      |      |         |         |
| Motor-mounted   |            | x    | x    | x    | x    | x       | x       |
| Self-contained version <sup>b)</sup>  |            | –    | –    | –    | –    | –       | –       |
| <b>Characteristic</b>   |            |      |      |      |      |         |         |
| Flange with slotted holes   |            | –    | –    | –    | –    | –       | –       |
| ATEX <sup>a)</sup>  |            | –    | –    | –    | –    | –       | –       |
| Food-grade lubrication <sup>a) b)</sup>                                       |            | x    | x    | x    | x    | x       | x       |
| Corrosion resistant <sup>a) b)</sup>  |            | –    | –    | –    | –    | –       | –       |
| Optimized mass inertia <sup>a)</sup>  |            | –    | –    | –    | –    | –       | –       |
| <b>System solutions</b>   |            |      |      |      |      |         |         |
| Linear system (rack/pinion)   |            | –    | –    | –    | –    | –       | –       |
| Servo actuator  |            | –    | –    | –    | –    | –       | –       |
| <b>Accessories</b><br>(please refer to the product pages for further options) |            |      |      |      |      |         |         |
| Coupling  |            | x    | x    | x    | x    | –       | x       |
| Shrink disc   |            | –    | –    | –    | –    | x       | –       |

<sup>a)</sup> Power reduction: technical data available on request

<sup>b)</sup> Please contact WITTENSTEIN alpha

<sup>c)</sup> In relation to reference sizes

<sup>d)</sup> Power reduction: Please use our sizing software cymex® for a detailed sizing – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

# Value Line gearbox overview



| Product type   |            | NP    | NPL   | NPS   | NPT   | NPR   | NTP | NPK  | NPLK | NPSK | NPTK | NPRK | NVH | NVS | HDV   |
|--|------------|-------|-------|-------|-------|-------|-----|------|------|------|------|------|-----|-----|-------|
| Version  |            | MF/MA | MF/MA | MF/MA | MF/MA | MF/MA | MQ  | MF   | MF   | MF   | MF   | MF   | MF  | MF  | MF/MT |
| Ratio <sup>a)</sup>  | min. $i =$ | 3     | 3     | 3     | 3     | 3     | 4   | 3    | 3    | 3    | 3    | 3    | 4   | 4   | 4     |
|  | max. $i =$ | 100   | 100   | 100   | 100   | 100   | 100 | 100  | 100  | 100  | 100  | 100  | 400 | 400 | 400   |
| Max. torsional backlash [arcmin] <sup>c)</sup>                         | Standard   | ≤ 8   | ≤ 8   | ≤ 8   | ≤ 8   | ≤ 8   | ≤ 5 | ≤ 11 | ≤ 11 | ≤ 11 | ≤ 11 | ≤ 11 | ≤ 6 | ≤ 6 | ≤ 10  |
|  | Reduced    | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Output type  |            |       |       |       |       |       |     |      |      |      |      |      |     |     |       |
| Smooth shaft   |            | x     | x     | x     | –     | x     | –   | x    | x    | x    | –    | x    | –   | x   | x     |
| Shaft with key <sup>d)</sup>   |            | x     | x     | x     | –     | x     | –   | x    | x    | x    | –    | x    | –   | x   | x     |
| Splined shaft (DIN 5480)   |            | –     | x     | x     | –     | x     | –   | –    | x    | x    | –    | x    | –   | –   | –     |
| Blind hollow shaft   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Hollow shaft interface   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | x   | –   | –     |
| Keyed hollow shaft   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | x   | –   | –     |
| Flanged hollow shaft   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Flange   |            | –     | –     | –     | x     | –     | x   | –    | –    | –    | x    | –    | –   | –   | –     |
| System output  |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Output on both sides   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | x   | x   | –     |
| Input type   |            |       |       |       |       |       |     |      |      |      |      |      |     |     |       |
| Motor-mounted  |            | x     | x     | x     | x     | x     | x   | x    | x    | x    | x    | x    | x   | x   | x     |
| Self-contained version <sup>b)</sup>                                   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Characteristic   |            |       |       |       |       |       |     |      |      |      |      |      |     |     |       |
| Flange with slotted holes  |            | –     | –     | –     | –     | x     | –   | –    | –    | –    | –    | x    | –   | –   | –     |
| ATEX <sup>a)</sup>   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| Food-grade lubrication <sup>a) b)</sup>                                |            | x     | x     | x     | x     | x     | x   | x    | x    | x    | x    | x    | x   | x   | x     |
| Corrosion resistant <sup>a) b)</sup>                                   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | x   | x   | x     |
| Optimized mass inertia <sup>a)</sup>                                   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | –     |
| System solutions   |            |       |       |       |       |       |     |      |      |      |      |      |     |     |       |
| Linear system (rack/pinion)  |            | x     | x     | x     | –     | x     | –   | x    | x    | x    | –    | x    | –   | x   | –     |
| Servo actuator   |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | –   | –   | x     |
| Accessories<br>(please refer to the product pages for further options) |            |       |       |       |       |       |     |      |      |      |      |      |     |     |       |
| Coupling   |            | x     | x     | x     | x     | x     | x   | x    | x    | x    | –    | x    | –   | x   | –     |
| Shrink disc  |            | –     | –     | –     | –     | –     | –   | –    | –    | –    | –    | –    | x   | –   | –     |

<sup>a)</sup> Power reduction: technical data available on request

<sup>b)</sup> Please contact WITTENSTEIN alpha

<sup>c)</sup> In relation to reference sizes

<sup>d)</sup> Power reduction: Please use our sizing software cymex® for a detailed sizing – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

# Advanced Line gearbox overview



| Product type  |          | SP+ | SP+<br>HIGH SPEED | SP+<br>HIGH SPEED<br>friction optimized | TP+ | TP+<br>HIGH TORQUE | HG+ | SK+ | SPK+  |
|---|----------|-----|-------------------|---|-----|--------------------|-----|-----|-------|
| Version   |          | MF  | MC                | MC-L                                    | MF  | MA                 | MF  | MF  | MF    |
| Ratio <sup>c)</sup>   | min. i = | 3   | 3                 | 3                                       | 4   | 22                 | 3   | 3   | 12    |
|   | max. i = | 100 | 100               | 10                                      | 100 | 302.5              | 100 | 100 | 10000 |
| Max. torsional backlash<br>[arcmin] <sup>c)</sup>                             | Standard | ≤ 3 | ≤ 4               | ≤ 4                                     | ≤ 3 | ≤ 1                | ≤ 4 | ≤ 4 | ≤ 4   |
|   | Reduced  | ≤ 1 | ≤ 2               | ≤ 2                                     | ≤ 1 | –                  | –   | –   | ≤ 2   |
| <b>Output shape</b>   |          |     |                   |   |     |                    |     |     |       |
| Smooth shaft  |          | x   | x                 | x                                       | –   | –                  | –   | x   | x     |
| Shaft with key <sup>d)</sup>  |          | x   | x                 | x                                       | –   | –                  | –   | x   | x     |
| Splined shaft (DIN 5480)  |          | x   | x                 | x                                       | –   | –                  | –   | x   | x     |
| Blind hollow shaft  |          | x   | x                 | x                                       | –   | –                  | –   | –   | x     |
| Hollow shaft interface  |          | –   | –                 | –                                       | –   | –                  | x   | –   | –     |
| Keyed hollow shaft  |          | –   | –                 | –                                       | –   | –                  | –   | –   | –     |
| Flanged hollow shaft  |          | –   | –                 | –                                       | –   | –                  | –   | –   | –     |
| Flange  |          | –   | –                 | –                                       | x   | x                  | –   | –   | –     |
| System output   |          | –   | –                 | –                                       | x   | x                  | –   | –   | –     |
| Output on both sides  |          | –   | –                 | –                                       | –   | –                  | x   | x   | x     |
| <b>Input type</b>   |          |     |                   |   |     |                    |     |     |       |
| Motor-mounted   |          | x   | x                 | x                                       | x   | x                  | x   | x   | x     |
| Self-contained version <sup>b)</sup>  |          | x   | –                 | –                                       | x   | –                  | –   | –   | –     |
| <b>Characteristic</b>   |          |     |                   |   |     |                    |     |     |       |
| Flange with slotted holes   |          | x   | –                 | –                                       | –   | –                  | –   | –   | –     |
| ATEX <sup>a)</sup>  |          | x   | x                 | –                                       | –   | –                  | x   | x   | –     |
| Food-grade lubrication <sup>a) b)</sup>                                       |          | x   | x                 | x                                       | x   | x                  | x   | x   | x     |
| Corrosion resistant <sup>a) b)</sup>  |          | x   | x                 | x                                       | x   | x                  | x   | x   | x     |
| Optimized mass inertia <sup>a)</sup>  |          | x   | x                 | x                                       | x   | x                  | –   | –   | –     |
| <b>System solutions</b>   |          |     |                   |   |     |                    |     |     |       |
| Linear system (rack / pinion)   |          | x   | x                 | –                                       | x   | x                  | –   | x   | x     |
| Servo actuator  |          | x   | –                 | –                                       | x   | x                  | –   | –   | –     |
| <b>Accessories</b><br>(please refer to the product pages for further options) |          |     |                   |   |     |                    |     |     |       |
| Coupling  |          | x   | x                 | x                                       | x   | x                  | –   | x   | x     |
| Shrink disc   |          | x   | x                 | x                                       | –   | –                  | x   | –   | x     |

<sup>a)</sup> Power reduction: technical data available on request

<sup>b)</sup> Please contact WITTENSTEIN alpha

<sup>c)</sup> In relation to reference sizes

<sup>d)</sup> Power reduction: Please use our sizing software cymex® for a detailed sizing – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)



| TK+ | TPK+  | TPK+<br>HIGH TORQUE | SC+ | SPC+ | TPC+ | VH+ | VS+ | VT+ | DP+     | HDP+ |
|-----|-------|---------------------|-----|------|------|-----|-----|-----|---------|------|
| MF  | MF    | MA                  | MF  | MF   | MF   | MF  | MF  | MF  | MF / MA | MA   |
| 3   | 12    | 66                  | 1   | 4    | 4    | 4   | 4   | 4   | 16      | 22   |
| 100 | 10000 | 5500                | 2   | 20   | 20   | 400 | 400 | 400 | 55      | 55   |
| ≤ 4 | ≤ 4   | ≤ 1.3               | ≤ 4 | ≤ 4  | ≤ 4  | ≤ 3 | ≤ 3 | ≤ 3 | ≤ 3     | ≤ 1  |
| –   | ≤ 2   | –                   | –   | ≤ 2  | ≤ 2  | ≤ 2 | ≤ 2 | ≤ 2 | ≤ 1     | –    |
|     |       |                     |     |      |      |     |     |     |         |      |
| –   | –     | –                   | x   | x    | –    | –   | x   | –   | –       | –    |
| –   | –     | –                   | x   | x    | –    | –   | x   | –   | –       | –    |
| –   | –     | –                   | –   | x    | –    | –   | x   | –   | –       | –    |
| –   | –     | –                   | –   | x    | –    | –   | –   | –   | –       | –    |
| –   | –     | –                   | –   | –    | –    | x   | –   | –   | –       | –    |
| –   | –     | –                   | –   | –    | –    | x   | –   | –   | –       | –    |
| x   | –     | –                   | –   | –    | –    | –   | –   | x   | –       | –    |
| –   | x     | x                   | –   | –    | x    | –   | –   | –   | x       | x    |
| –   | x     | x                   | –   | –    | x    | –   | –   | –   | –       | –    |
| x   | x     | x                   | –   | –    | –    | x   | x   | –   | –       | –    |
|     |       |                     |     |      |      |     |     |     |         |      |
| x   | x     | x                   | x   | x    | x    | x   | x   | x   | x       | x    |
| –   | –     | –                   | –   | –    | –    | –   | –   | –   | –       | –    |
|     |       |                     |     |      |      |     |     |     |         |      |
| –   | –     | –                   | –   | –    | –    | –   | –   | –   | –       | –    |
| x   | –     | –                   | –   | –    | –    | –   | –   | –   | –       | –    |
| x   | x     | x                   | x   | x    | x    | x   | x   | x   | x       | x    |
| x   | x     | x                   | –   | –    | –    | x   | x   | x   | x       | x    |
| –   | –     | –                   | –   | –    | –    | –   | –   | –   | x       | x    |
|     |       |                     |     |      |      |     |     |     |         |      |
| x   | x     | x                   | x   | x    | x    | –   | x   | x   | –       | –    |
| –   | –     | –                   | –   | –    | –    | –   | –   | –   | –       | –    |
|     |       |                     |     |      |      |     |     |     |         |      |
| x   | x     | x                   | x   | x    | x    | –   | x   | x   | –       | –    |
| –   | –     | –                   | –   | x    | –    | x   | –   | –   | –       | –    |

# Premium Line gearbox overview



| Product type  |            | XP+ | XP+<br>HIGH SPEED | RP+ | RP+<br>HIGH TORQUE | XPK+ | RPK+  | XPC+ | RPC+  |
|---|------------|-----|-------------------|-----|--------------------|------|-------|------|-------|
| Version   |            | MF  | MC                | MF  | MA                 | MF   | MA    | MF   | MA    |
| Catalog page  |            | 24  | 32                | 38  | 44                 | 58   | 62    | 68   | 75    |
| Ratio <sup>c)</sup>   | min. $i =$ | 3   | 3                 | 4   | 5.5                | 12   | 48    | 4    | 22    |
|   | max. $i =$ | 100 | 100               | 10  | 220                | 1000 | 5500  | 20   | 55    |
| Max. torsional backlash<br>[arcmin] <sup>c)</sup>                             | Standard   | ≤ 3 | ≤ 4               | ≤ 3 | ≤ 1                | ≤ 4  | ≤ 1.3 | ≤ 4  | ≤ 1.3 |
|   | Reduced    | ≤ 1 | ≤ 2               | ≤ 1 | –                  | ≤ 2  | –     | ≤ 2  | –     |
| <b>Output shape</b>   |            |     |                   |     |                    |      |       |      |       |
| Smooth shaft  |            | x   | x                 | –   | –                  | x    | –     | x    | –     |
| Shaft with key <sup>d)</sup>  |            | x   | x                 | –   | –                  | x    | –     | x    | –     |
| Splined shaft (DIN 5480)  |            | x   | x                 | –   | –                  | x    | –     | x    | –     |
| Blind hollow shaft  |            | x   | x                 | –   | –                  | x    | –     | x    | –     |
| Hollow shaft interface  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| Keyed hollow shaft  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| Flanged hollow shaft  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| Flange  |            | –   | –                 | x   | x                  | –    | x     | –    | x     |
| System output   |            | x   | x                 | x   | x                  | x    | x     | x    | x     |
| Output on both sides  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| <b>Input type</b>   |            |     |                   |     |                    |      |       |      |       |
| Motor-mounted   |            | x   | x                 | x   | x                  | x    | x     | x    | x     |
| Self-contained version <sup>b)</sup>  |            | x   | –                 | –   | –                  | –    | –     | –    | –     |
| <b>Characteristic</b>   |            |     |                   |     |                    |      |       |      |       |
| Flange with slotted holes   |            | x   | x                 | x   | x                  | x    | x     | x    | x     |
| ATEX <sup>a)</sup>  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| Food-grade lubrication <sup>a) b)</sup>                                       |            | x   | x                 | x   | x                  | x    | x     | x    | x     |
| Corrosion resistant <sup>a) b)</sup>  |            | –   | –                 | –   | –                  | –    | –     | –    | –     |
| Optimized mass inertia <sup>a)</sup>  |            | x   | x                 | x   | x                  | –    | –     | –    | –     |
| <b>System solutions</b>   |            |     |                   |     |                    |      |       |      |       |
| Linear system (rack / pinion)   |            | x   | x                 | x   | x                  | x    | x     | x    | x     |
| Servo actuator  |            | x   | –                 | x   | x                  | –    | –     | –    | –     |
| <b>Accessories</b><br>(please refer to the product pages for further options) |            |     |                   |     |                    |      |       |      |       |
| Coupling  |            | x   | x                 | –   | –                  | x    | –     | x    | –     |
| Shrink disc   |            | x   | x                 | –   | –                  | x    | –     | x    | –     |

<sup>a)</sup> Power reduction: technical data available on request

<sup>b)</sup> Please contact WITTENSTEIN alpha

<sup>c)</sup> In relation to reference sizes

<sup>d)</sup> Power reduction: Please use our sizing software cymex® for a detailed sizing – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

# Servo actuator overview



| Product type  |            | PBG      | PAG      | PHG      | RPM+              | TPM+<br>DYNAMIC | TPM+<br>HIGH TORQUE | TPM+<br>POWER | AVF       |
|---|------------|----------|----------|----------|-------------------|-----------------|---------------------|---------------|-----------|
| Version   |            | Standard | Standard | Standard | Customer specific | Standard        | Standard            | Standard      | Standard  |
| Ratio <sup>c)</sup>   | min. $i =$ | 16       | 16       | 16       | 22                | 16              | 22                  | 4             | 10        |
|   | max. $i =$ | 100      | 100      | 100      | 220               | 91              | 220                 | 100           | 25        |
| Max. torsional backlash <sup>c)</sup><br>[arcmin]                             | Standard   | $\leq 5$ | $\leq 3$ | $\leq 4$ | $\leq 1$          | $\leq 3$        | $\leq 1$            | $\leq 3$      | $\leq 10$ |
|   | Reduced    | $\leq 3$ | $\leq 1$ | $\leq 2$ | –                 | $\leq 1$        | $\leq 1$            | $\leq 1$      | –         |
| <b>Output shape</b>   |            |          |          |          |                   |                 |                     |               |           |
| Smooth shaft  |            | x        | –        | x        | –                 | –               | –                   | –             | x         |
| Shaft with key <sup>d)</sup>  |            | x        | –        | x        | –                 | –               | –                   | –             | x         |
| Splined shaft (DIN 5480)  |            | x        | –        | x        | –                 | –               | –                   | –             | –         |
| Blind hollow shaft  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Hollow shaft interface  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Keyed hollow shaft  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Flanged hollow shaft  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Flange  |            | –        | x        | –        | x                 | x               | x                   | x             | –         |
| System output   |            | –        | x        | x        | x                 | x               | x                   | x             | –         |
| Output on both sides  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| <b>Input type</b>   |            |          |          |          |                   |                 |                     |               |           |
| Motor-mounted   |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Self-contained version  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| <b>Characteristic</b>   |            |          |          |          |                   |                 |                     |               |           |
| Flange with slotted holes   |            | –        | –        | x        | x                 | –               | –                   | –             | –         |
| ATEX <sup>a)</sup>  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| Food-grade lubrication <sup>a) b)</sup>                                       |            | x        | x        | x        | x                 | x               | x                   | x             | x         |
| Corrosion resistant <sup>a) b)</sup>  |            | –        | –        | –        | –                 | x               | x                   | x             | x         |
| Optimized mass Inertia <sup>a)</sup>  |            | –        | –        | –        | –                 | –               | –                   | –             | –         |
| <b>System solutions</b>   |            |          |          |          |                   |                 |                     |               |           |
| Linear system (rack / pinion)   |            | x        | x        | x        | x                 | x               | x                   | x             | –         |
| <b>Accessories</b><br>(please refer to the product pages for further options) |            |          |          |          |                   |                 |                     |               |           |
| Coupling  |            | x        | x        | –        | –                 | x               | x                   | x             | –         |
| Shrink disc   |            | x        | –        | x        | –                 | –               | –                   | –             | –         |
| Power cable, signal cable, hybrid cable                                       |            | x        | x        | x        | x                 | x               | x                   | x             | x         |

<sup>a)</sup> Power reduction: technical data available on request

<sup>b)</sup> Please contact WITTENSTEIN alpha

<sup>c)</sup> In relation to reference sizes

<sup>d)</sup> Power reduction: Please use our sizing software cymex® for a detailed sizing – [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

# Overview of output interfaces

## Rotative output interfaces



### Smooth shaft

- Friction contact torque transmission via a clamp connection (e.g. in connection with a coupling)
- Simple connection of the gearbox to the application
- Consistently high transmittable torques even with highly cyclical changing loads
- Classic output interface for the shaft gears in the alpha Advanced Line and alpha Premium Line



### Shaft with key

- Form fit torque transmission via the key in the cylindrical gearbox output<sup>1</sup>
- Easy to assemble and disassemble
- Cost-efficient solution for connecting the gearbox to the application
- Form fit locking of the shaft against slipping
- Danger of deflection with highly cyclical changing loads
- Not suitable for applications with high requirements in terms of repeatability
- Common output interface for the shaft gears in the alpha Basic Line and alpha Value Line



### Splined shaft (DIN 5480)

- Form fit torque transmission via the tooth flanks of the output shaft
- Easy to assemble and disassemble
- Consistently high transmittable torques even with highly cyclical changing loads
- Requires little space
- Higher demands on design and production
- Used for connecting RMS pinions to the gearbox (see the alpha Linear Systems product catalog)



### Flange output

- Friction contact torque transmission by screwing the application to the face of the gearbox output<sup>2</sup>
- Maximum torsional rigidity and torque transmission even with highly cyclical changing loads
- Simple and space-saving mounting base



### Blind hollow shaft <sup>4</sup>

- Friction contact torque transmission via a hollow-shaft-like interface on the gearbox output for connecting the application to a shrink disc <sup>3</sup>
- Reduced space requirement due to elimination of connecting elements (e.g. couplings)



#### System output as the basis for RMW pinions (see alpha Linear Systems product catalog)

- Cohesive connection of the output flange with a pinion
- Highly flexible interface for connecting different pinion variants and geometries
- Maximum linear rigidity through the direct connection of pinions with a small reference pitch diameter
- Maximum safety and reliability
- Compact design



#### Flanged hollow shaft

- Friction contact torque transmission by screwing the application to the face of the gearbox output <sup>2</sup>
- Combination of flange output and hollow shaft for maximum use of space for feeding through e.g. cable harnesses or a shaft
- Maximum torsional rigidity and torque transmission even with highly cyclical changing loads
- Simple and space-saving mounting base



#### Hollow shaft interface <sup>4</sup>

- Friction contact torque transmission via cylindrical shoulder on the gearbox output for connecting the application to a shrink disc
- Hollow shaft for feeding through e.g. cable harnesses or a shaft
- Requires little space
- Complex mechanical calculation in the event of tilting moments or lateral forces



#### Keyed hollow shaft <sup>4</sup>

- Form fit torque transmission via the combination of the hollow shaft and a feather keyway <sup>1</sup>
- Hollow shaft for feeding through e.g. cable harnesses or a shaft
- Easy to assemble and disassemble
- Form fit safeguard of the shaft against slipping
- Requires little space
- Danger of deflection with highly cyclical changing loads
- Not suitable for applications with high requirements in terms of repeatability



#### Output on both sides

- Version of the gearbox with a second, rear output
- Use as input for an additional mounting base
- No reduction in the permitted speeds and torques on both output sides, except in gearboxes with additional planetary output stages (e.g. SPK<sup>+</sup>, TPK<sup>+</sup>); these gearboxes also have higher speeds at the rear output.
- Reduced absorption of axial and lateral forces on the rear output

<sup>1)</sup> The cymex® 5 sizing software performs standard calculations in this regard. Assistance from WITTENSTEIN is possible if required.

<sup>2)</sup> The reliability of the screws depends largely on the screws used, the screw tightening procedure, and the cleaning procedure for the screws during assembly. Recommendations in this regard are included in the operating manual.

<sup>3)</sup> For radial loads, a case-by-case check by WITTENSTEIN is recommended.

<sup>4)</sup> To prevent overdetermination of the system, a torque support is recommended.

# Overview of gearbox variants

XP 010 S - M F 1 - 5 - 0 E 1 - 2 S

**Characteristic:**

F = Food grade lubrication  
G = Grease  
H = Food-grade grease  
K = Output SP+ compatible  
R = Flange with slotted holes  
S = Standard

Explanation of variants  
deviating from the standard:

**F = Food grade lubrication**

These products are available with food-grade lubrication and can therefore be used in the food industry. Please note that the torque ratings in the catalog are reduced by 20 %.

**G = Grease**

This variant allows you to lubricate selected products with grease instead of oil. Please note that the torque ratings in the catalog are reduced by 20 %.

**H = Food-grade grease**

This variant allows you to lubricate selected products with food-safe grease instead of oil. Please note that the torque ratings in the catalog are reduced by 40 %.

**K = Output SP+ compatible**

The XP+ gearboxes are available with an SP+ output compatible housing (square). It is necessary to also choose the SP+ compatible output shaft in order to achieve full output compatibility. The technical data is similar to the SP+. Please contact WITTENSTEIN alpha for detailed information.

**R = Flange with slotted holes**

This output type is designed for linear applications with rack and pinion or belt pulley. Integrated slotted holes enable easy positioning of the pinion or simple tensioning of the belt.

# R-flange with slots for XP<sup>+</sup>, XPK<sup>+</sup> and XPC<sup>+</sup> gearboxes

The R-flange has become indispensable in rack and pinion drive trains: it is the benchmark for modularity and ease of installation. That's why the R-flange is also used in our XP<sup>+</sup> family as both a coaxial and a right-angle version, with a host of design options.

## Your benefits at a glance

Easy mounting and positioning of the gearbox with a mounted pinion in relation to the rack

Lower design costs

Potential saving because no additional design elements are needed, e.g. intermediate plates

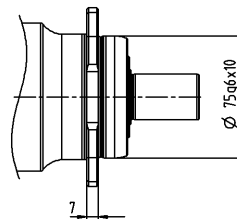
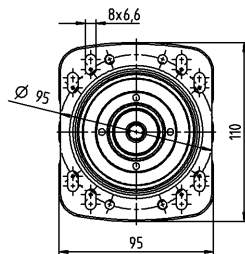
More design freedom due to higher compactness



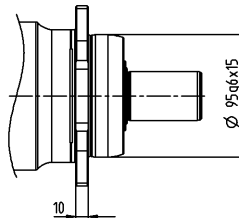
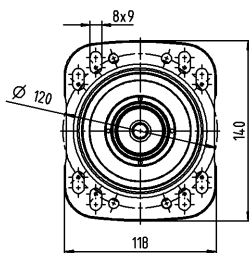
Premium Linear Systems with XP<sup>+</sup> R

## Views

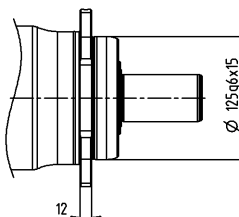
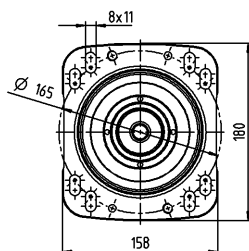
XP<sup>+</sup> 020 R



XP<sup>+</sup> 030 R



XP<sup>+</sup> 040 R



Special assembly washers for the slotted version are included in the scope of delivery.

# alpha Premium Linear Systems

## A new dimension in performance

With the Premium Linear System, the performance of the rack and pinion system enters a new dimension. While others are still busy adapting existing solutions, WITTENSTEIN alpha has stayed several steps ahead by developing the new linear systems. The innovative Premium Linear System is used in all applications where the individual requirements far exceed what has previously been possible. Compared to the industry standard, the values have been improved by 150 % on average.

## The **alpha preferential linear system** – The best from each segment

Our preferential linear systems in the premium segment are always comprised of the perfect combination of gearbox, pinion, rack and lubrication system. The systems have been optimized to achieve the required feed force, feed speed, stiffness and degree of utilization of the individual components.



**For further information, refer to our alpha Linear Systems catalog and our website:**  
**[www.wittenstein-alpha.com/linear-systems](http://www.wittenstein-alpha.com/linear-systems)**

## For a wide range of applications

Linear systems from WITTENSTEIN alpha are suitable for a wide range of applications and industries. New standards and advantages have been achieved in the following areas:

- Smooth operation
- Positioning accuracy
- Feed force
- Power density
- Rigidity
- Easy installation
- Design options
- Scalability

Together with a comprehensive range of services, we pledge to support you from the initial concept to the design, installation and commissioning phase. We will also ensure a consistent supply of spare parts.

## Your benefits at a glance

Perfectly matched components

Maximum efficiency and power density

Exceptional linear system rigidity for even greater dynamics and precision

Simple mounting and maximum integration in the drive train

Available in different sizes, power categories and segments

**Consultation and quality – everything from a single source!**



# INIRA®: The revolution in rack assembly



Simply scan the QR code using your smartphone to see INIRA® in action.

**INIRA® combines our existing innovative concepts for the simple, safe and efficient installation of racks. INIRA® clamping, INIRA® adjusting and INIRA® pinning have already made the assembly process much faster, more accurate and more ergonomic. Available for the Advanced and Premium Linear Systems.**

**INIRA® clamping:** Simply faster and more ergonomic  
Previously, enormous effort was required to clamp racks to the machine bed using screw clamps. INIRA® clamping integrates the clamping device in the rack. The rack incorporates a mounting sleeve which is guided over the head of the fastening screw to ensure quick and ergonomic clamping.

**INIRA® pinning:** Simply better and more efficient  
The previous method used for pinning racks was extremely time-consuming. Precision bores have to be drilled and the chips generated must be carefully removed from the assembly. INIRA® pinning now offers a completely new solution for the chipless pinning of racks, which reduces installation times considerably (time spent on each rack ~ 1 min).

**INIRA® adjusting:** Simply safer and more precise  
In combination with INIRA® clamping, INIRA® adjusting is the ideal solution for perfectly adjusting the transition between two rack segments. The innovative setting tool can adjust the transition extremely reliably and precisely, accurate to the micrometer.



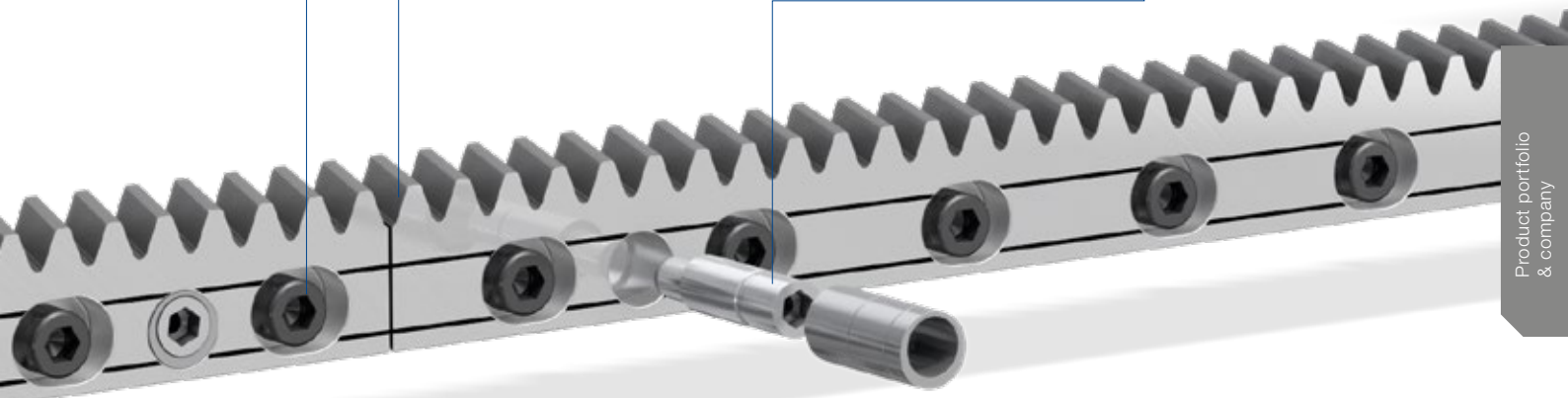
INIRA® clamping



INIRA® adjusting

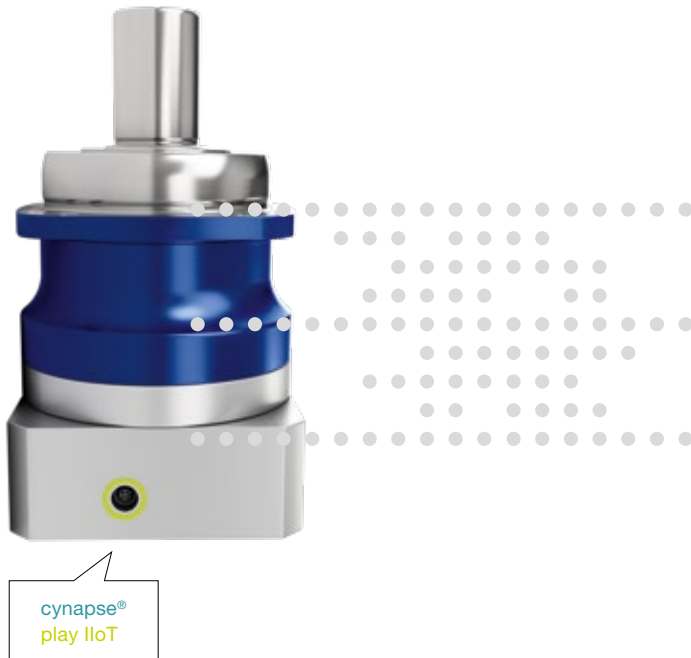


INIRA® pinning



# cynapse® – It's new. It's connective. The smart feature.

Cybertronic drive systems that can independently acquire and communicate information are an essential prerequisite for IIoT. WITTENSTEIN alpha is the first component manufacturer to offer smart gearboxes as standard – gearboxes with cynapse®. They have an integrated sensor module that makes Industry 4.0 connectivity possible.

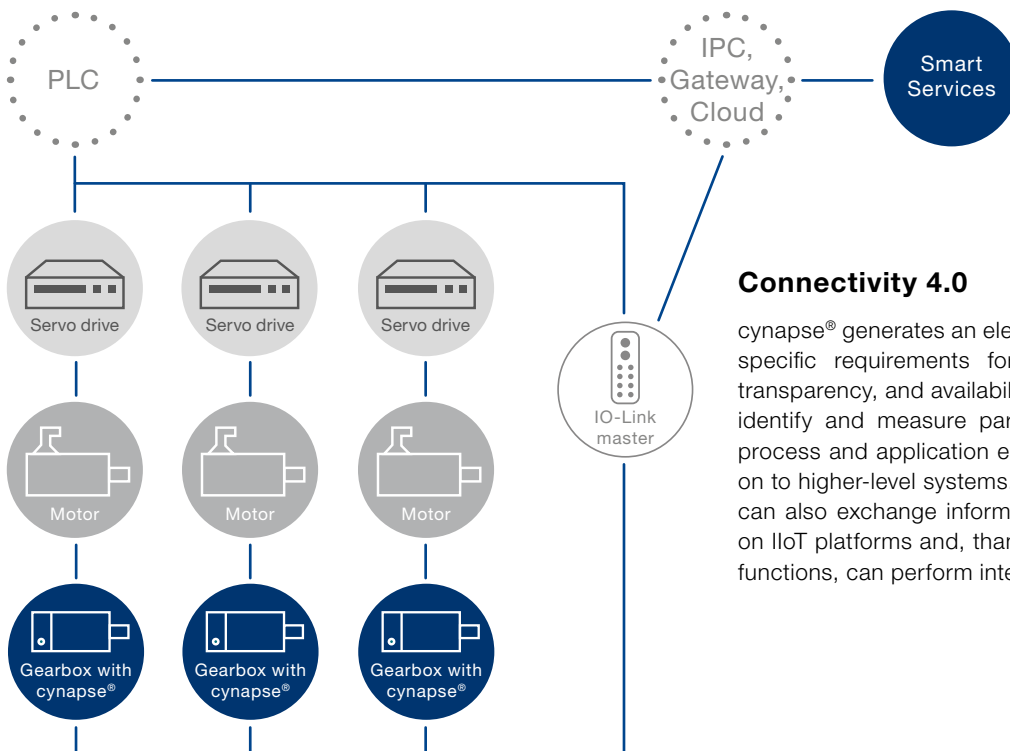


## cynapse® – how it works

cynapse® ensures the gearbox can be easily integrated into the digital world. The cynapse® feature is integrated into the existing installation space and is connected via an IO-Link interface. As a result, measured data such as the gearbox's **temperature, vibration, operating time, acceleration, and product-specific information** can be accessed.

## cynapse® wins customers over with:

- Sensor module integrated into the installation space
- Simple connection by IO-Link interface
- Gearbox threshold monitoring
- Quick product identification thanks to digital name plate



## Connectivity 4.0

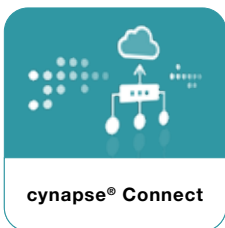
cynapse® generates an electronic “fingerprint” of your specific requirements for performance, efficiency, transparency, and availability. The smart gearbox can identify and measure parameters directly from the process and application environment and pass them on to higher-level systems. Gearboxes with cynapse® can also exchange information with the applications on IIoT platforms and, thanks to their integrated logic functions, can perform intelligent monitoring tasks.

# Smart Services – the perfect complement

The Smart Services expand the functional scope of the cynapse® feature. The basic functions comprise data processing, visualization, and analysis. The specific expertise, which WITTENSTEIN has gathered over more than 40 years of developing low-backlash planetary gearboxes, is used in combination with the operating data to establish and display the status of the gearbox in the Smart Services.

## Your benefits at a glance

- Visualization of the operating data
- Simple and convenient integration
- Determination and monitoring of critical threshold values
- Early identification of problematic statuses
- Avoidance of machine downtimes and associated costs
- Transparency for drive axis



**cynapse® Connect** enables integration and routing of data, which is a fundamental prerequisite for condition monitoring. The Smart Service makes the recorded data available in a structured format. It can obtain this data from various source systems via IO-Link or OPC UA and utilizes it for digital services from WITTENSTEIN. cynapse® Connect thus greatly simplifies the integration of smart gearboxes into the relevant machine infrastructure.



**cynapse® Monitor** builds upon the Smart Service cynapse® Connect and enables straightforward evaluation and visualization of operating data. Since manufacturers and operators do not have to develop their own solutions, development requirements are massively reduced. In addition, the data of the cynapse® Monitor service can be used to monitor threshold values of selected parameters. Deviations and critical states in the behavior of gearboxes or in the relevant process can therefore be identified at an early stage.



**cynapse® Analyze** is a constantly growing portfolio of smart analysis tools that enable real-time analysis of drive train data. The combination of intelligent algorithms with WITTENSTEIN alpha's core expertise in gearbox technology results in a wide range of synergy effects. The analysis tools can simultaneously monitor different points in the machine and be used for different machine applications. This enables recognition of more complex deviations in the machine process or component behavior at an early stage. Machine downtimes can be anticipated in good time, thus preventing high breakdown costs.



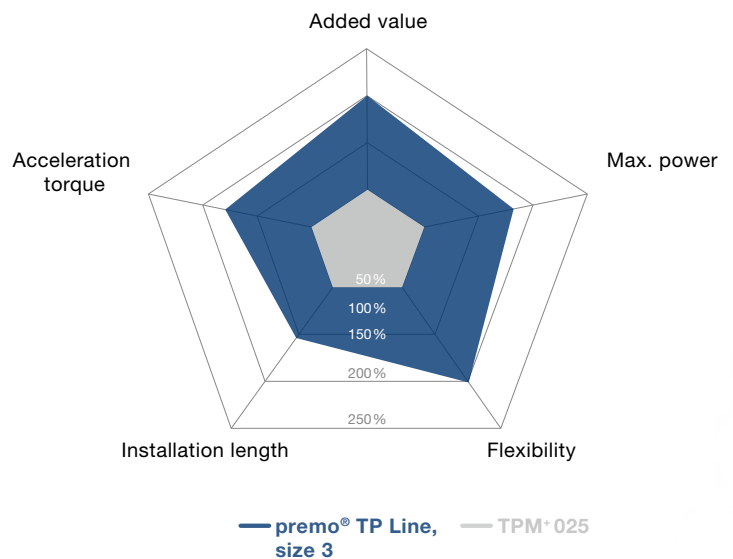
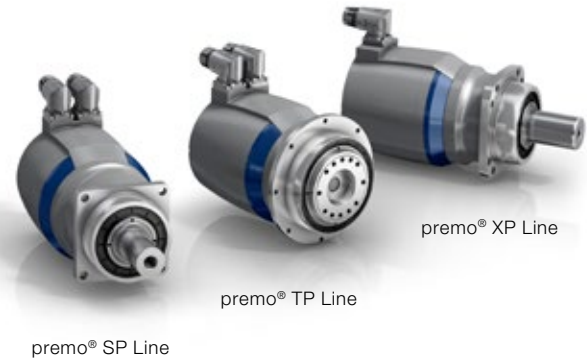
# Precision meets motion = premo® by WITTENSTEIN alpha

premo® is a powerful servo actuator platform that combines absolute precision with perfect movement. The central idea behind this first fully scalable servo actuator platform is uncompromising flexibility from the viewpoint of the user. Motors and gearboxes with application-related graduated performance characteristics can be configured modularly to individual servo actuators. The result is a

highly versatile modular system with customizable power, designed for a wide variety of applications. The core of the servo actuator is a torsionally rigid precision gearbox with low backlash and excellent torque density combined with the equally powerful, permanent magnet servo motor with a split winding that guarantees low cogging and minimal velocity ripple.

## premo® – clearly superior in performance

- Higher machine performance thanks to higher acceleration torque
- High torque density combined with a compact design allow for the realization of higher performance machines with significant space saving
- Improved connectivity to next generation controllers from leading system providers through the use of digital feedback (EnDat 2.2, DSL, HIPERFACE DSL®, DRIVE-CLiQ)
- Compatibility for high bus voltages up to 750 V DC
- Reduced wiring requirement through single-connector technology
- Improved reliability and safety through the use of more powerful brakes and SIL 2 encoders



## Product highlights

**Optimized power density for greater energy efficiency and productivity**

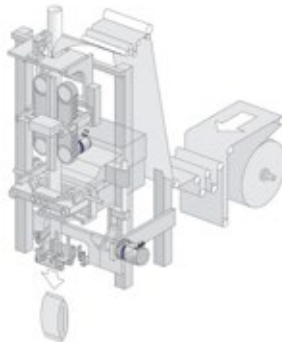
**Flexible mechanical and electrical interfaces for high scalability**

**Variety of options for individually upgrading the basic configuration**

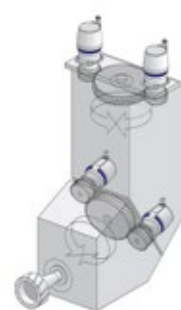
## premo® application examples



Handling portal  
premo® SP Line



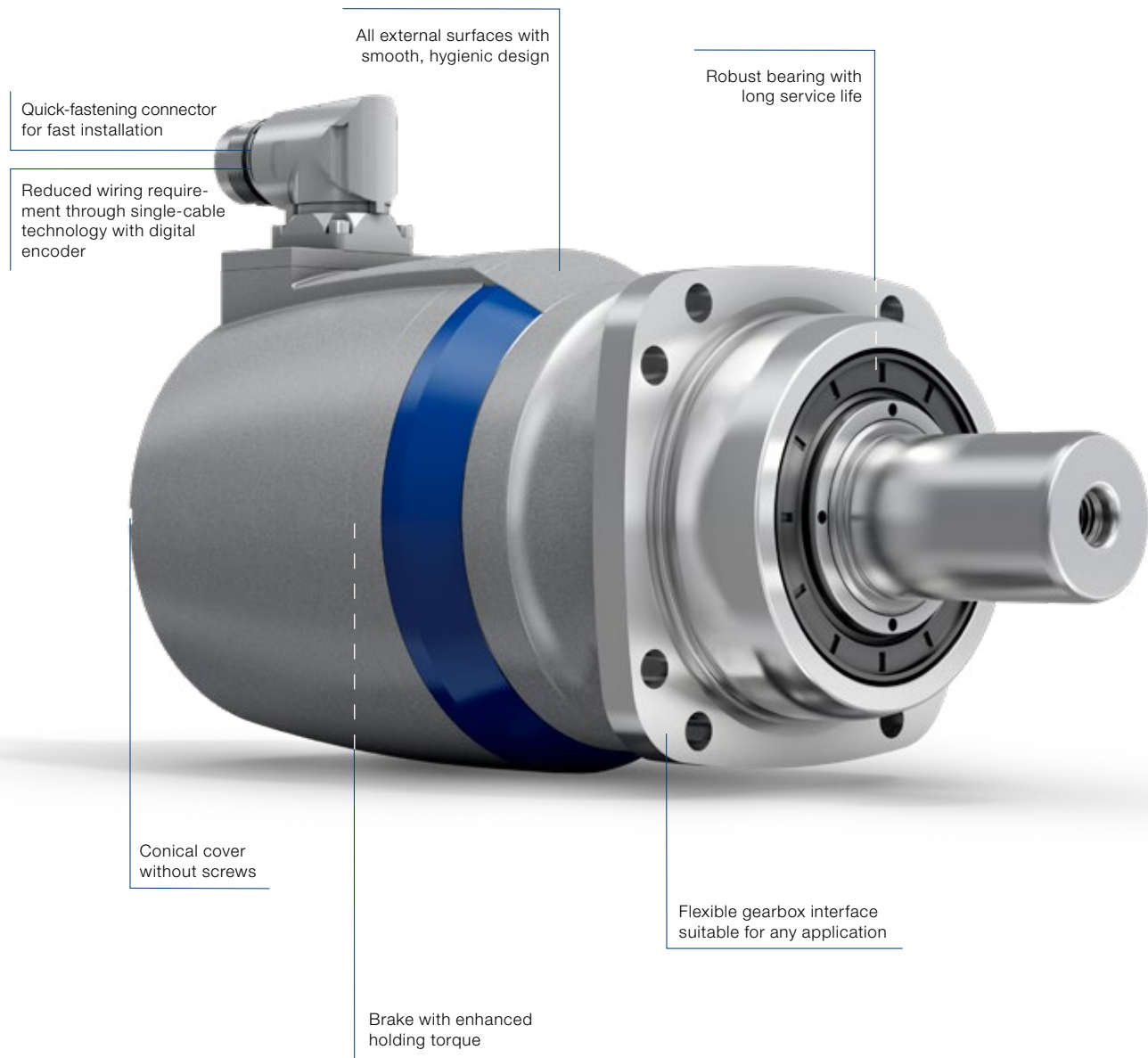
Fill and Seal machine  
premo® TP Line



Milling cutter for a machining center  
premo® XP Line

## Typical fields of application and industry solutions

- Delta robot (axes 1–3, swivel axis)
- Handling portal (Z-axis, swivel/rotating axis)
- Machine tool reaming (rotating axes A–C, tool changer)
- Fill and Seal Machine (incl. jaw stroke, sealing jaw, blade)
- Folding carton packaging (incl. assembly/folding, filling valve)
- Plastic thermoform (tool axis)



# Fundamentally new overall concept

When we developed the Galaxie®, we took it upon ourselves to subject drive concepts to a fundamental reassessment. The result: a brand new type of gearbox. It has been developed a new distinct name to describe the innovation: The term “single tooth sliding gearbox” clearly classifies the Galaxie® in terms of science, research and technology. Its unique kinematics enable virtually full surface contact during power transmission. This means that the compact Galaxie® drive systems and gearboxes with hollow shaft achieve previously inconceivable performance data, including extremely high torque density, torsional rigidity, smooth running, positioning accuracy and zero backlash.

## From linear to surface contact

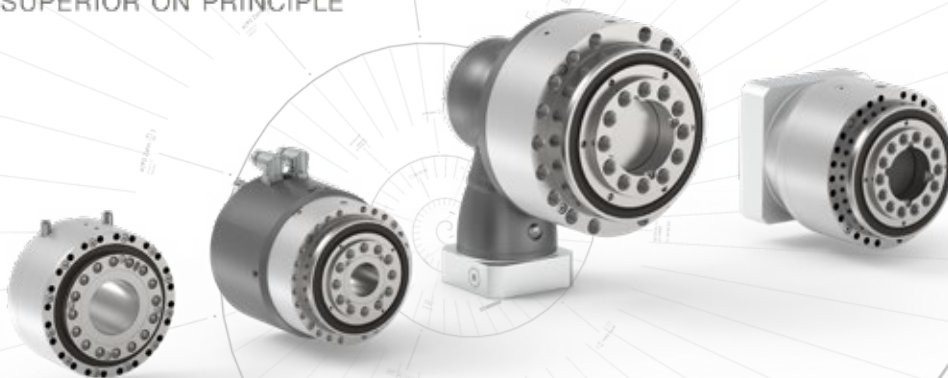
The innovative core of the new Galaxie® drive system is the virtually full surface contact during power transmission. This achieves a tooth contact surface that is six and a half times larger compared to conventional involute teeth with line contact. To achieve this maximum contact, we have implemented a fundamentally new concept: individual teeth are guided simultaneously along an internal ring gear. The tooth surface geometry is based on a logarithmic spiral which allows the teeth to engage with the internal ring gear across the full surface.

## Next technology drive

The Galaxie® drive system achieves a previously unattainable performance level: the gearbox boasts maximum rigidity and zero backlash combined with the highest synchronization values. To achieve this, we have designed the components to ensure continuous smooth movement by shaping them as logarithmic spirals and the resulting contact geometries. The performance features of the single tooth sliding gearbox are all significantly better than those of traditional hollow-shaft drives with the same outer diameter.

# GALAXIE®

SUPERIOR ON PRINCIPLE



**Rigidity**

Positioning with extreme load fluctuations up to 5 times better than the market standard

**TCO**

Up to 40% increase in productivity by using disruptive technology

**Torque density**

Triple the torque compared to geometrically comparable gearboxes

**Damping properties**

Hydrodynamic lubricating film on the teeth provides damping properties

**Energy efficiency**

Up to 50% lower energy consumption through downsizing

**Overload capacity**

Surface contact of the teeth enables triple overload of the maximum torque

**Mass customized**

A drive system tailored perfectly to your application without compromise

**Backlash-free**

Over the entire service life

**Long service life**

Virtually wear-free toothing based on a logarithmic spiral in place of an involute

Find out more about the Galaxie® gearbox

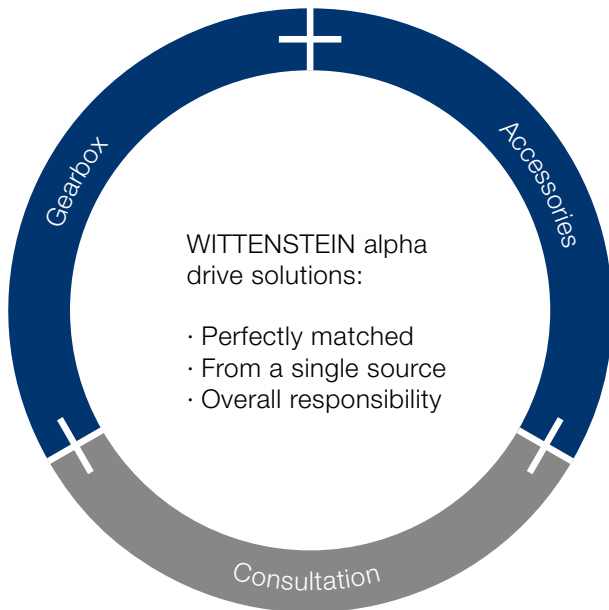


Whitepaper about the Galaxie® gearbox



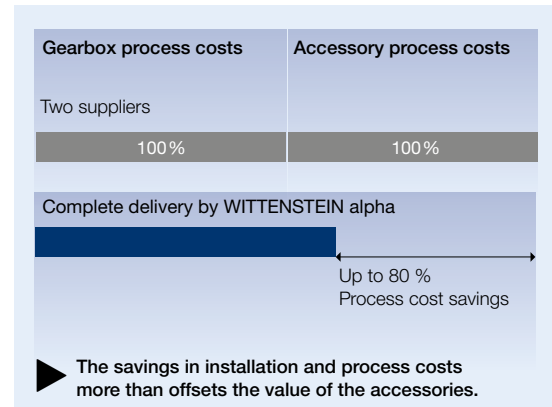
# Accessories – smart additions for intelligent performance

Gearboxes, accessories and consulting from a single source



Optimization of your added value chain

Use the combination of gearbox and accessories in a complete package to streamline your internal processes.



## Quick selection

| PRODUCTS          | COUPLING | SHRINK DISC |
|-------------------|----------|-------------|
| <b>Basic Line</b> |          |             |
| CP / CPK          | ELC      |             |
| CPS / CPSK        | ELC      |             |
| CVH               |          | SD          |
| CVS               | ELC      |             |
| <b>Value Line</b> |          |             |
| NP / NPK          | ELC      |             |
| NPL / NPLK        | ELC      |             |
| NPS / NPSK        | ELC      |             |
| NPT / NPTK / NTP  | ELT      |             |
| NPR / NPRK        | ELC      |             |
| NVH               |          | SD          |
| NVS               | ELC      |             |

| PRODUCTS  | COUPLING | SHRINK DISC |
|---|----------|-------------|
| <b>Advanced Line</b>                                  |          |             |
| SP <sup>+</sup> / SPK <sup>+</sup> / SPC <sup>+</sup> | BC2      | SD          |
| TP <sup>+</sup> / TPK <sup>+</sup> / TPC <sup>+</sup> | BCT      |             |
| TP <sup>+</sup> / TPK <sup>+</sup> HIGH TORQUE        | BCT      |             |
| HG <sup>+</sup>                                       |          | SD          |
| SK <sup>+</sup>                                       | BC2      |             |
| TK <sup>+</sup>                                       | BCT      | SD          |
| SC <sup>+</sup>                                       | BC2      |             |
| VH <sup>+</sup>                                       |          | SD          |
| VS <sup>+</sup>                                       | BC3      |             |
| VT <sup>+</sup>                                       | BCT      |             |
| premo <sup>®</sup> SP Line                            | BC2      |             |
| premo <sup>®</sup> TP Line                            | BCT      |             |
| TPM <sup>+</sup> DYNAMIC                              |          |             |
| TPM <sup>+</sup> HIGH TORQUE                          | BCT      |             |
| TPM <sup>+</sup> POWER                                |          |             |

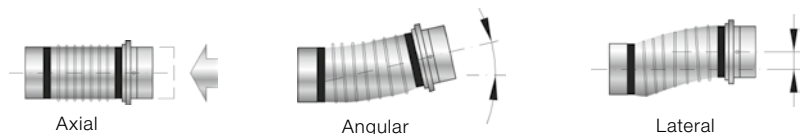
### Premium Line

|   |     |  |
|---|-----|--|
| XP <sup>+</sup> / XPK <sup>+</sup> / XPC <sup>+</sup> | BC3 |  |
| premo <sup>®</sup> XP Line                            | BC3 |  |

# Couplings

Couplings are used for compensating misalignment during assembly and material-related heat expansion

## Compensation for shaft misalignment



### Metal bellows coupling

- Compensation for shaft misalignment
- Completely backlash free
- Corrosion resistant version available as an option (BC2, BC3, BCT)
- High torsional rigidity



### Elastomer coupling

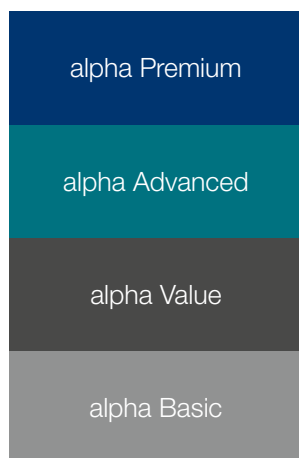
- Compensation for shaft misalignment
- Completely backlash free
- Selectable torsional rigidity / damping
- Compact design
- Extremely simple installation (plug-in)



### Torque limiter

- Compensation for shaft misalignment
- Completely backlash free
- Precise, preset overload protection (switch-off in 1 – 3 ms)
- Precise repeat accuracy
- Just one protection element per axis

## Preferred coupling series



Preferred series are defined for the relevant gearbox segments to make selection easier. Preferred couplings are defined based on the maximum torque that the gearbox can transmit. Standard industrial conditions for the number of cycles (1000/h) and ambient temperature were adopted.

Please note that the coupling load is based on the torque that the gearbox can transmit and not the torque in your application. We recommend using our cymex® 5 design software to create a more detailed design. ([www.wittenstein-cymex.com](http://www.wittenstein-cymex.com))

For more coupling types, please visit [www.wittenstein-alpha.com](http://www.wittenstein-alpha.com)

# Shrink disks

Shrink disks are frictional hub / shaft connections. Together with our hollow shaft or mounted shaft gearboxes for mounting directly on load shafts, machines can be designed to take up a minimal installation space.

The benefits:

- Simple mounting and removal
- Quick selection, easy and convenient
- Optional: corrosion resistant version

## Preferred shrink disk series

To view a wide range of nickel-plated, stainless steel and other shrink disks as well as all the relevant technical data and dimensions, visit our homepage

[www.wittenstein-alpha.com](http://www.wittenstein-alpha.com)



# Quick shrink disc selection

| Gearbox   |                        | Version        |                |                 | Geometry |     |    |    |      |           |
|---|------------------------|----------------|----------------|-----------------|----------|-----|----|----|------|-----------|
|   |                        | Standard       | Nickel-plated  | Stainless steel | d        | D   | A  | H* | H2*  | J [kgcm²] |
| HG <sup>+</sup> / SP <sup>+</sup> / SPC <sup>+</sup> 060                    | Ordering code          | SD 018x044 S2  | SD 018x044 N2  | SD 018x044 E2   | 18       | 44  | 30 | 15 | 19   | 0.252     |
|   | Material number        | 20000744       | 20048496       | 20048491        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 100            | 51             | 51              |          |     |    |    |      |           |
| HG <sup>+</sup> / SP <sup>+</sup> / SPK <sup>+</sup> / SPC <sup>+</sup> 075 | Ordering code          | SD 024x050 S2  | SD 024x050 N2  | SD 024x050 E2   | 24       | 50  | 36 | 18 | 22   | 0.729     |
|   | Material number        | 20001389       | 20047957       | 20043198        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 250            | 136            | 136             |          |     |    |    |      |           |
| HG <sup>+</sup> / SP <sup>+</sup> / SPK <sup>+</sup> / SPC <sup>+</sup> 100 | Ordering code          | SD 036x072 S2  | SD 036x072 N2  | SD 036x072 E2   | 36       | 72  | 52 | 22 | 27.5 | 3.94      |
|   | Material number        | 20001391       | 20048497       | 20035055        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 650            | 575            | 450             |          |     |    |    |      |           |
| HG <sup>+</sup> / SP <sup>+</sup> / SPK <sup>+</sup> / SPC <sup>+</sup> 140 | Ordering code          | SD 050x090 S2  | SD 050x090 N2  | SD 050x090 E2   | 50       | 90  | 68 | 26 | 31.5 | 11.1      |
|   | Material number        | 20001394       | 20048498       | 20047937        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 1320           | 1015           | 770             |          |     |    |    |      |           |
| HG <sup>+</sup> / SP <sup>+</sup> / SPK <sup>+</sup> / SPC <sup>+</sup> 180 | Ordering code          | SD 068x115 S2  | SD 068x115 N2  | SD 068x115 E2   | 68       | 115 | 86 | 29 | 34.5 | 31.1      |
|   | Material number        | 20001396       | 20048499       | 20048492        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 2450           | 1820           | 1500            |          |     |    |    |      |           |
| VH <sup>+</sup> / NVH / CVH 040   | Ordering code          | SD 024x050 S2  | SD 024x050 N2  | SD 024x050 E2   | 24       | 50  | 36 | 18 | 22   | 0.729     |
|   | Material number        | 20001389       | 20047957       | 20043198        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 250            | 136            | 136             |          |     |    |    |      |           |
| VH <sup>+</sup> / NVH / CVH 050   | Ordering code          | SD 030x060 S2V | SD 030x060 N2  | SD 030x060 E2   | 30       | 60  | 44 | 20 | 24   | 1.82      |
|   | Material number        | 20020687       | 20047934       | 20047885        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 550            | 375            | 230             |          |     |    |    |      |           |
| VH <sup>+</sup> / NVH / CVH 063   | Ordering code          | SD 036x072 S2V | SD 036x072 N2V | SD 036x072 E2   | 36       | 72  | 52 | 22 | 27.5 | 3.94      |
|   | Material number        | 20020688       | 20047530       | 20035055        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 640            | 560            | 450             |          |     |    |    |      |           |
| VH <sup>+</sup> 080   | Ordering code          | SD 050x090 S2V | SD 050x090 N2V | SD 050x090 E2   | 50       | 90  | 68 | 26 | 31.5 | 11.1      |
|   | Material number        | 20020689       | 20047935       | 20047937        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 1400           | 950            | 900             |          |     |    |    |      |           |
| VH <sup>+</sup> 100   | Ordering code          | SD 062x110 S2V | SD 062x110 N2  | SD 062x110 E2   | 62       | 110 | 80 | 29 | 34.5 | 27        |
|   | Material number        | 20020690       | 20047927       | 20047860        |          |     |    |    |      |           |
|   | T <sub>2Max</sub> [Nm] | 2300           | 1540           | 1000            |          |     |    |    |      |           |

\*Applicable to the unclamped condition. \*\* Maximum torque without axial forces. Shrink discs suitable for XP<sup>+</sup> gearboxes upon request

One shrink disk per gearhead is sufficient.

Refer to the operating manual for information on correct shrink disc installation and additional cleaning instructions, particularly for stainless steel shrink disks.

The instructions are enclosed with the order.

Mounting/operating manual at [www.wittenstein-alpha.de/en/](http://www.wittenstein-alpha.de/en/)

Recommendation for the load shaft:

Tolerance h6

Surface roughness ≤ Rz 16

Minimum yield strength (standard) Rp 0.2 ≥ 385 N/mm²

Minimum yield strength (nickel-plated) Rp 0.2 ≥ 260 N/mm²

Minimum yield strength (stainless steel) Rp 0.2 ≥ 260 N/mm²

The shrink disc is not included in the scope of delivery of the gearhead. Therefore, it must be ordered separately.

## Support at each interaction stage

With the WITTENSTEIN alpha service concept, we are also setting new standards in the field of customer support.

### Global presence

Our global consultation network will help you overcome your complex challenges through our extensive experience, a variety of design tools and individual engineering services.

### Speed counts

Our speedline® team guarantees fast response times in the area of logistics. We provide on-site support during the installation and commissioning of mechanical systems to give you a sustained competitive edge.

### Personal consultation

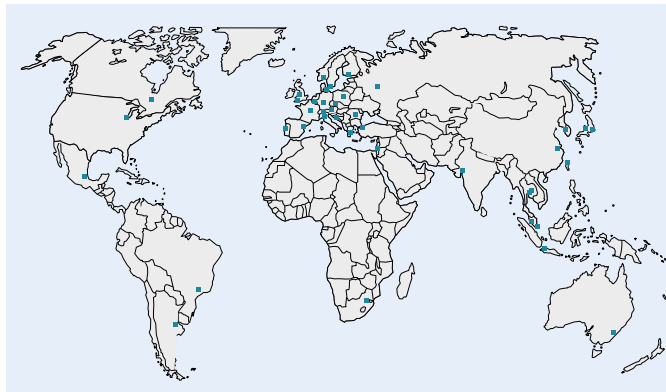
Our highly qualified and committed expert personnel will accompany you throughout the entire product lifecycle - around the clock. When it comes to customer support, you can count on us!

## Design

Consultation  
CAD POINT  
cymex® select  
Sizing software cymex®  
Engineering

## Installation

speedline® delivery  
Installation on-site  
Operating & installation instructions  
Pick-up & return service



We are happy to advise you:

24 h service hotline: +49 7931 493-12900

### No matter where you need us:

A comprehensive sales and service network provides quick availability and competent support worldwide.



## Maintenance

24 h service hotline  
Maintenance and inspection  
Repair  
cymex® statistics  
Modernization

## Training

Product training  
Sizing training  
Installation training  
Service training

# Support at each interaction stage

## Design

Whatever your requirements are: we offer the right design methodology. Use the CAD POINT to gain easy access to CAD files, cymex® select for creating simple designs,

cymex® 5 for precise dimensioning and our engineering service for individual solutions.

### Consultation

- Personal contact on-site
- Professional application calculations and drive design create the best solutions



#### CAD POINT

- 3D data of selected solution
- Online comparison with motor geometry
- Transparent and simple selection of required components

### Engineering

#### Catalog gearboxes:

- Advanced software tools for accurate calculation, simulation and analysis of the drive train
- Optimization of your productivity and reduction in development costs



#### cymex® select

- Efficient and customizable product selection in seconds
- Top three product recommendations for your requirements
- Automatic geometry adjustment

#### Special gearboxes:

- Gearing design and development
- Development and production of special gearboxes
- Send all inquiries to: [sondergetriebe@wittenstein.de](mailto:sondergetriebe@wittenstein.de)



#### cymex® 5 sizing software

- Dimensioning, design and evaluation of the entire drive train
- Reliable, efficient design
- Optimization of drive system



## Installation

All delivered products are perfectly matched to your application environment and fully operational right away.

Our service experts support you in the installation and commissioning of complex mechatronic systems, guaranteeing maximum availability of your plant.

### speedline® delivery

**Tel. +49 7931 493-10444**

- Delivery of standard series in 24 or 48 hours ex works\*
- Outstanding flexibility for fast deliveries at short notice



### WITTENSTEIN Service Portal

- Instant Access to Product Information
- Quick Installation and Commissioning for example Tutorial-Videos

### Installation on-site

- Professional installation
- Optimal integration of the system in your application
- Explanation of the drive function

### Pick-up and return service

- Cost savings through minimization of downtimes
- Professional logistics organization
- Reduction of transport risks through customized, direct pick-up and delivery

### Operating and installation instructions

- Detailed explanations of how to use the product
- Motor installation videos
- Assembly videos on rack and pinion system



\* Non-binding delivery time depending on part availability.

# Support at each interaction stage

## Maintenance

WITTENSTEIN alpha guarantees fast repairs of the highest quality and precision – with short throughput times and intensive support. In addition, we will provide you with information about various measurements, material

analyses and condition monitoring inspections. You can rely on short response times, unbureaucratic processing and individual support.

### 24 h service hotline

**Tel. +49 7931 493-12900**

- Available round the clock
- Personal, prompt service for resolving time-critical maintenance issues

### cymex® statistics

- Systematic field data acquisition
- Reliability calculations (MTBF)
- Customized evaluations

### Maintenance and inspection

- Documentation regarding condition and expected service life
- Maintaining required state
- Customized maintenance schedules



### WITTENSTEIN Service Portal

- Fast Processing of Replacement Products
- The Right Contact for Queries
- Tailor-Made Maintenance Services

### Repair

- Restoring to required state
- Short throughput times
- Immediate response in time-critical situations

### Modernization

- Professional retrofitting
- Reliable compatibility testing of existing solutions



## Training

Discover how our products function and how they can add value to your application. We offer you training courses at our premises or on-site at your plant. Benefit from

practice-oriented learning methods and a highly skilled team of trainers.

### Product training

Greater knowledge enables greater achievement. We will be pleased to share our expert knowledge with you: Profit from our many years of experience and learn more about the product portfolio of WITTENSTEIN alpha.

### Sizing training

Become a design expert! We will provide you with training courses on our design software, adapted to your requirements. Whether for beginners or experts, for occasional or regular users – we adapt our training course to your wishes and requirements.

### Installation training

We offer you individual training courses on-site for your system application of selected linear axes as well as professional installation.

### Service training

Participation in a service training course is a prerequisite for sourcing spare parts at the parts list level. We offer you training courses at our premises or on-site at your plant. Moreover, we regularly host maintenance workshops at which the participants are instructed in safe handling during mounting of the motor to the gearbox as well as the independent replacement of wearing parts and gearbox assemblies.



# The WITTENSTEIN group – The company and its fields of business



**WITTENSTEIN**

With approximately 2,800 employees worldwide, the WITTENSTEIN group stands for innovation, precision and excellence in the world of mechatronic drive technology, both nationally and internationally. The group is active in six innovative fields of business. Furthermore, WITTENSTEIN group is represented by some 60 subsidiaries in around 40 countries in all important technology and sales markets worldwide.



## Our fields of expertise

### We provide know-how for a host of different sectors:

- Machine and plant construction
- Software development
- Aerospace
- Automotive & E-mobility
- Energy
- Oil & Gas Exploration and Production
- Medical technology
- Measurement and testing technology
- Nanotechnology
- Simulation

# The WITTENSTEIN Group



alpha

WITTENSTEIN alpha GmbH  
High-precision servo drives and linear systems



cyber motor

WITTENSTEIN cyber motor GmbH  
Highly dynamic servo motors and drive electronics



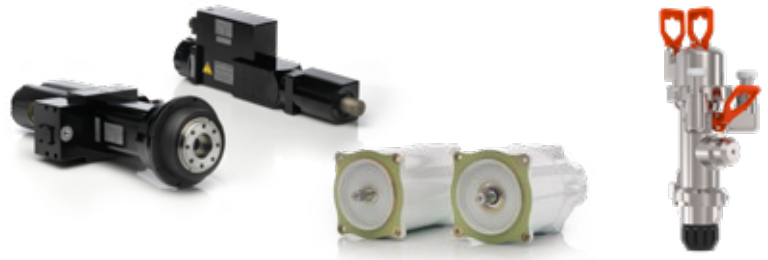
galaxie

WITTENSTEIN galaxie GmbH  
Superior gearboxes and drive systems



motion control

WITTENSTEIN motion control GmbH  
Drive systems for the most extreme environmental requirements



WITTENSTEIN group

attocube systems AG  
Nanoprecision drive and measurement technology solutions



baramundi software GmbH  
Secure management of the IT infrastructure in offices and production



Product portfolio  
& company

**WITTENSTEIN – one with the future**

# alpha Premium Line – Gearbox design

We recommend using **cymex® 5 sizing software** to dimension the complete drive train in detail.



**cymex® 5**  
– Calculate on the Best

- Detailed calculation of complete drive trains
- Precise simulation of motion and load variables
- Downloadable software for complex designs

[www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)



Operating mode:

In order to assess the application in detail, a distinction must be made between two operating modes.

## 1. Cyclic operation S5:

- Number of cycles  $\leq 1000$ /hour
- Duty cycle  $< 60\%$  and  $< 20$  minutes

Recommended gearbox model:  
Standard/HIGH TORQUE version

## 2. Continuous operation S1:

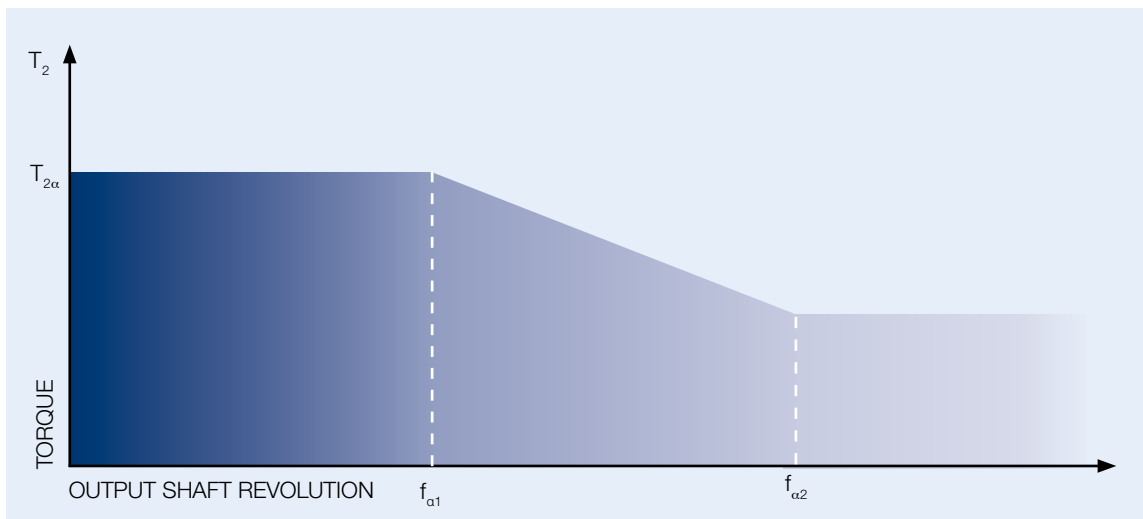
- Duty cycle  $\geq 60\%$  or  $\geq 20$  minutes

Recommended gearbox model:  
HIGH SPEED version

Max. torque  $T_{2\alpha}$ :

$T_{2\alpha}$  represents the maximum torque transmitted by the gearbox. Once the number of cycles and the shock factor have been determined, the maximum acceleration torque can be calculated at the output ( $T_{2b, fs}$ ). The maximum torque  $T_{2\alpha}$  must be reduced in line with the relevant output shaft revolutions ( $f_a$ ).

The calculated torque  $T_{2b, fs}$  must not exceed the maximum torque  $T_{2\alpha}$  of the gearboxes.



Torque in line with the relevant output shaft revolution

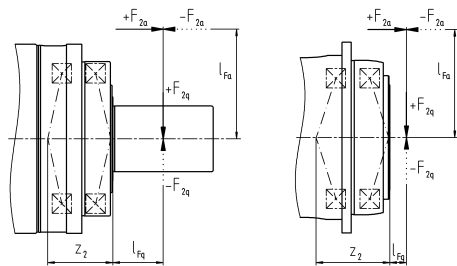
Max. tilting torque  $M_{2kmax}$ :

The maximum tilting moment  $M_{2kmax}$  can be calculated using the following formula:

$$M_{2kmax} = \frac{F_{2aMax} \cdot l_{Fa} + F_{2qMax} \cdot (l_{Fq} + z_2)^a}{W^b}$$

a)  $l_{Fa}$ ,  $l_{Fq}$ ,  $z_2$  in mm  
b)  $W = 1000$  (metric)

Example with output shaft and flange:



One prerequisite of the calculation is that the axial force is applied centrally and does not exceed 37 % in relation to the radial force.

| XP*   |      | 010  | 020  | 030  | 040   | 050   |
|-------|------|------|------|------|-------|-------|
| $z_2$ | [mm] | 75.3 | 91.5 | 115  | 101.2 | 128.4 |
|       | [in] | 2.96 | 3.60 | 4.53 | 3.98  | 5.06  |

| RP*   |      | 030  | 040   | 050   | 060   | 080   |
|-------|------|------|-------|-------|-------|-------|
| $z_2$ | [mm] | 93.5 | 106.1 | 141.9 | 181.9 | 195.6 |
|       | [in] | 3.68 | 4.18  | 5.59  | 7.16  | 7.70  |

Drive options:



Clamping hub with socket (standard)



Optimized mass inertia clamping hub –  
For highly dynamic applications



Clamping hub with keyed socket –  
the form fit connection for even the  
highest safety requirements



# Glossary – the alphabet

## Acceleration torque ( $T_{2B}$ )

The acceleration torque  $T_{2B}$  is the torque that the gearbox toothing can permanently transmit. To calculate the acceleration torque, an **→ coefficient of impact** which is appropriate for the application must also be taken into account.

## Adapter plate

WITTENSTEIN alpha uses a system of standardized adapter plates for connecting the motor and gearbox. This makes it as simple as possible to attach motors from any manufacturer to WITTENSTEIN alpha gearboxes.

## Angle of rotation

Angle by which the connection element of the coupling rotates under the torque load. The admissible angle of rotation for torsionally rigid couplings is  $< 0.05^\circ$  and for vibration-damping couplings  $< 5^\circ$ .

## Angular minute

A degree is subdivided into 60 angular minutes ( $= 60 \text{ arcmin} = 60'$ ).

Example:

If the backlash is  $j_t = 1 \text{ arcmin}$ , the output may rotate by  $1/60^\circ$ . The impacts on the application are determined by the arc length:  $b = 2 \cdot \pi \cdot r \cdot \alpha^\circ / 360^\circ$ .

Example:

A pinion with a radius  $r = 50 \text{ mm}$  mounted on a gearbox with a backlash of  $j_t = 3 \text{ arcmin}$  can be rotated by  $b = 0.04 \text{ mm}$ .

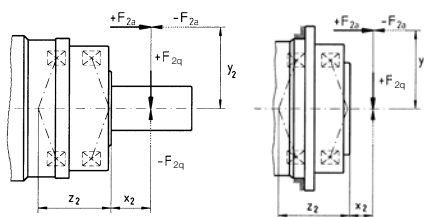
## Angular misalignment

Angular misalignment of drive and output shaft. In most cases due to assembly. Causes an increased strain on the coupling.

## Axial force ( $F_{2AMax}$ )

An axial force on a gearbox runs parallel to its output shaft or perpendicular to its output flange. Under certain circumstances, it acts offset from the axis with a lever arm  $y_2$ . In this case, it also creates a bending moment. If the axial force exceeds the permissible catalog values (max. axial force  $F_{2AMax}$ ), an additional component (e.g. axial bearing) must be provided to absorb these forces.

Example with output shaft and flange:



## Axial misalignment

Length variation along the longitudinal axes of the drive and output shaft. Generally caused by thermal expansion.

## Axial spring rigidity ( $C_a$ )

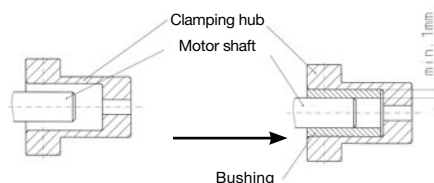
Counter-force of the coupling in the event of axial misalignment [N/mm]. This additional force should be taken into consideration in the sizing of the drive train and bearings.

## Backlash-free

Changes in the rotational speed, direction of rotation or torque do not cause any backlash and thus no shocks in the coupling. However, it should be noted that an **→ angle of rotation** still occurs.

## Bushing

If the diameter of the motor shaft is smaller than the **→ clamping hub**, a bushing is used to compensate for the difference in diameter. A minimum wall thickness of 1 mm and a motor shaft diameter of 2 mm difference are required.



## CAD POINT

Performance data, dimension sheets and CAD data for all gearboxes can be found online in our CAD POINT, including clear documentation of the selection. ([www.wittenstein-cad-point.com](http://www.wittenstein-cad-point.com))

## Clamping hub (couplings)

The clamping hub ensures a friction contact connection between the coupling and the gearbox shaft as well as with the application. Clamping hubs are available in all motor shaft diameters; therefore, a bushing as connection piece is not required and also not recommended. Optionally, a form fit connection via a key is also possible.

## Clamping hub (gearbox)

The clamping hub ensures a friction contact connection between the motor shaft and gearbox. If the diameter of the motor shaft is smaller than the diameter of the clamping hub, a **→ bushing** is used as a connection piece.

For gearboxes in the alpha Advanced Line and the alpha Premium Line, a form fit connection via a key is also possible.

## Connection between the clamping hub and the metal bellows

For metal bellows couplings which transmit torques of up to 500 Nm, the stainless steel bellow is bonded onto the clamping hub. In the event of higher torques, the connection is welded.

## Continuous operation (S1)

In continuous operation, it is particularly important to ensure that the maximum gearbox temperature is maintained (see temperature behavior). For optimum drive behavior in continuous operation, we recommend our HIGH SPEED gearbox model.

## Cyclic operation (S5)

The cyclic operation is defined via the **→ duty cycle**. If the duty cycle is less than 60% and shorter than 20 minutes, it qualifies as cyclic operation (**→ operating modes**).

## cymex®

cymex® is the calculation software developed by our company for dimensioning complete drive trains. The software enables the precise simulation of motion and load variables. The software is available to download from our website ([www.wittenstein-cymex.de](http://www.wittenstein-cymex.de)). We can also provide training to enable you to make full use of all the possibilities provided by the software.

## cymex® select

The cymex® select quick layout tool from WITTENSTEIN alpha allows for efficient and innovative product selection in seconds and is available online.

You get suitable recommendations for your application and your motor in no time based on technical and economic suitability. (cymex-select.wittenstein-group.com)

## Degrees of protection (IP)

The various degrees of protection are defined in DIN EN 60529 "Degrees of protection offered by enclosures (IP code)". The IP degree of protection (International Protection) is represented by two digits. The first digit indicates the protection against the ingress of impurities and the second is the protection against the ingress of water.

Example:

**IP65**

Protection against the ingress of dust (dust-proofness)

Protection against water jets

## Disengagement torque ( $T_{Dis}$ )

Adjustable torque of torque limiters with which the coupling separates the drive and output side of the system.

## Duty cycle (DC)

The cycle determines the duty cycle (DC). The times for acceleration ( $t_b$ ), constant travel if applicable ( $t_c$ ) and deceleration ( $t_d$ ) combined yield the duty cycle in minutes.

The duty cycle is expressed as a percentage with inclusion of the dwell time  $t_e$ .

$$DC [\%] = \frac{t_b + t_c + t_d}{t_b + t_c + t_d + t_e} \cdot 100 \quad \frac{\text{Motion duration}}{\text{Cycle time}}$$

$$DC [\text{min}] = t_b + t_c + t_d$$

## Dynamic torsional rigidity ( $C_{Tdyn}$ )

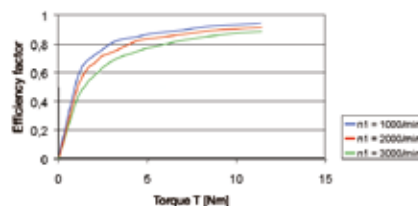
Torsional rigidity with  $T_N$

## Efficiency ( $\eta$ )

The efficiency [%]  $\eta$  is the ratio of output power to input power. Power lost through friction reduces efficiency to less than 1 or 100%.

$$\eta = P_{\text{off}} / P_{\text{on}} = (P_{\text{on}} - P_{\text{loss}}) / P_{\text{on}}$$

Sample curve of the efficiency factor of a planetary gear depending on the torque



WITTENSTEIN alpha always indicates the efficiency of a gearbox during operation at full load. If the input power or torque is lower, the efficiency rating is also lower due to the constant no-load torque. Power losses do not increase as a result. A lower efficiency is also to be expected at high speeds (see figure).

## Emergency stop torque ( $T_{2Emer}$ )

The emergency stop torque  $T_{2Emer}$  is the maximum permissible torque at the gearbox output. It must not be reached more than 1000 times during the service life of the gearbox. It must never be exceeded! The following cases in particular should be checked: controlled emergency stop, power failure, brake application, and crash.



## Ex symbol

Devices bearing the Ex symbol comply with EU Directive 94 / 9 / EC (ATEX) and are approved for use in defined explosion-hazardous zones.

Detailed information on the explosion group and category, as well as further information on the respective gearbox, is available upon request.

## Food-grade lubrication (F)

These products are designed with food-grade lubrication and can therefore be used in the food industry. It is important to note the reduction in torque compared to the standard. (V-Drive excluded). See cymex® 5 or the CAD POINT for the exact torques.

## HIGH SPEED (MC)

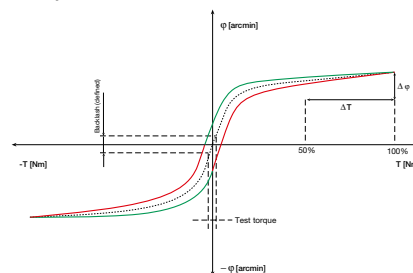
The HIGH SPEED version of our gearbox has been specifically developed for applications in continuous operation at high input speeds. It is used, for example, in the printing and the packaging industry.

## HIGH TORQUE (MA)

WITTENSTEIN alpha gearboxes are also available in a HIGH TORQUE version. These gearboxes are particularly suitable for applications requiring extremely high torques and maximum rigidity.

## Hysteresis curve

The hysteresis is measured to determine the torsional rigidity of a gearbox. The result of this measurement is known as the hysteresis curve.



If the input shaft is locked, the gearbox is continuously loaded and relieved at the output in both directions of rotation up to a defined torque. The angle of rotation is plotted against the torque. This yields a closed curve from which the → **backlash** and → **torsional rigidity** can be calculated.

## Jerk ( $j$ )

The jerk is the derivative of the acceleration with respect to time, that is, the change in acceleration in a unit of time. It is referred to as a shock if the acceleration curve shows a jump, i.e. the jerk is infinitely large.

## Lateral force ( $F_{2QMax}$ )

The maximum lateral force  $F_{2QMax}$  [N] is the force component that acts perpendicular to the output shaft or parallel to the output flange. It acts perpendicular to the → **axial force** and can have an axial distance  $x_2$  to the shaft shoulder or to the shaft flange that acts as a lever arm. The lateral force creates a side load (also see → **axial force**).

# Glossary – the alphabet

## Lateral misalignment

Parallel misalignment of the drive and output shaft. Causes an additional strain on the bearings and other components of the drive train.

## Lateral spring rigidity (C)

Counter-force of the coupling in the event of lateral misalignment [N/mm]. This additional force should be taken into consideration in the sizing of the drive train and bearings.

## Mass moment of inertia (J)

The mass moment of inertia J [kg/cm<sup>2</sup>] is a measurement of the effort applied by an object to maintain its momentary condition (at rest or moving).

## Maximum torque (T<sub>2α</sub>)

T<sub>2α</sub> represents the maximum torque that can be transmitted by the gearbox. Depending on application-specific boundary conditions and the precise evaluation of the motion profile, the gearbox may be operated with a maximum torque T<sub>2b,fs</sub> above the specified maximum acceleration torque T<sub>2B</sub> (See diagram 3.) For detailed sizing, please use cymex cymex®

$$T_{2\alpha} \geq T_{2b,fs} \geq T_{2B}$$

## No-load running torque (T<sub>012</sub>)

The no-load running torque T<sub>012</sub> is the torque which must be applied to a gearbox in order to overcome the internal friction; it is therefore considered lost torque. The WITTENSTEIN alpha catalog values are determined at a speed n<sub>i</sub>=3.000 min<sup>-1</sup> and an ambient temperature of 20°C.

$$T_{012}: \quad 0 \quad \quad 1 \rightarrow 2$$

no load      from input side toward output side

No-load running torques decrease during operation.

## NSF

Lubricants certified as grade H1 by the NSF (National Sanitation Foundation) can be used in the food sector where occasional unavoidable contact with food cannot be excluded.

## Operating modes (continuous operation S1 and cyclic operation S5)

Gearboxes are selected depending on whether the motion profile is characterized by frequent acceleration and deceleration phases in → **cyclic operation** (S5) as well as dwell times, or whether it is designed for → **continuous operation** (S1), i.e. with long phases of constant motion.

## Operating noise (L<sub>PA</sub>)

The gear ratio and speed influence the operating noise. As a general rule, the higher the speed, the higher the operating noise and the higher the gear ratio, the lower the operating noise. Our catalog specifications refer to a reference gear ratio and speed. The reference speed is n<sub>i</sub> = 3000 rpm or n<sub>i</sub> = 2000 rpm, depending on the size of the gearbox. Ratio-specific values can be found in cymex® - [www.wittenstein-cymex.com](http://www.wittenstein-cymex.com)

## Output shaft revolution (f<sub>α</sub>)

The factor f<sub>α</sub> determines the number of service life cycles for the required service life of the gearbox. It describes the number of revolutions at the output to assess the permissible torque at the output.

## Positioning accuracy

The positioning accuracy is determined by the angular deviation from the setpoint and is the sum of the load-dependent → **(torsional rigidity and torsional backlash)** and kinematic → **(synchronization)** angles of rotation that occur simultaneously in practice.

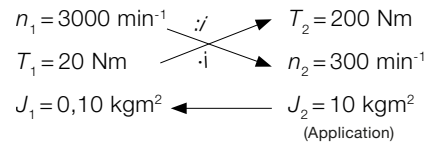
## Quality control

All Premium and Advanced gearboxes at WITTENSTEIN alpha are subjected to an outgoing inspection before they leave the factory. This ensures that every gearbox is delivered within specification.

## Ratio (i)

The ratio i indicates the factor by which the gearbox transforms the three relevant parameters of motion (speed, torque and mass moment of inertia).

The factor is a result of the geometry of the toothing elements (example.: i = 10).



## Ratio of mass moment of inertia (λ = lambda)

The ratio of mass moment of inertia λ is the ratio of external inertia (application side) to internal inertia (motor and gearbox side). It is an important parameter determining the controllability of an application. Accurate control of dynamic processes becomes more difficult with increased differing mass moments of inertia and as λ becomes greater. WITTENSTEIN alpha recommends that a guideline value of λ < 5 is maintained. A gearbox reduces the external mass moment of inertia by a factor of 1/i².

$$\lambda = \frac{J_{\text{external}}}{J_{\text{internal}}}$$

J<sub>external</sub> reduced to input:

$$J'_{\text{external}} = J_{\text{external}} / i^2$$

Simple applications ≤ 10

Dynamic applications ≤ 5

Highly dynamic applications ≤ 1

## Safety instruction

For applications with special safety requirements (e.g. vertical axes, distorted gear inputs) we recommend exclusively employing our Premium and Advanced products (V-Drive excluded).

## Servo actuators

In addition to a high-precision planetary gearbox, the servo actuator is equipped with a powerful, permanent magnet synchronous servo motor, which ensures high power density and a high speed stability thanks to the distributed winding. This enables even more compact and powerful linear drives to be realized. The investment costs for the drive train and the ongoing operating costs can be positively influenced by downsizing. The goal is to achieve a smaller input and therefore a smaller servo controller and lower energy consumption with the same productivity. A low mass moment of inertia combined with higher rigidity is the way to achieve this.

## Shaft misalignment

One main function of the coupling is the compensation of the shaft misalignment which occurs in almost all applications between the drive and the output side. A distinction is made between →axial, →lateral- and →angular misalignment. When complying with the indicated maximum misalignment, the couplings are safe for the duration of their service life.

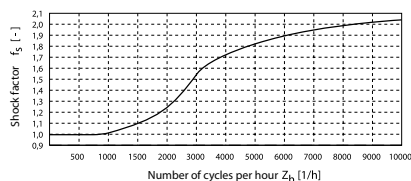
## Load factor ( $f_s$ ) (gearbox)

The maximum admissible acceleration torque ( $T_{2B}$ ) indicated in the catalog in cyclic operation applies to less than 1000 cycles/h. Greater numbers of cycles in connection with shorter acceleration times can lead to oscillations in the drive train. The resulting excessive torque increases are taken into consideration with the load factor  $f_s$  berücksichtigt. WITTENSTEIN alpha suggests taking these unknown overloads into account using the following curve.

This determined value is multiplied by the actual acceleration torque  $T_{2b}$  before it is compared with the maximum permissible acceleration torque  $T_{2B}$ .

$$(T_{2b} \cdot f_s = T_{2b}, f_s < T_{2B})$$

The following applies to gearboxes:



The following applies to couplings:

| Number of cycles<br>$Z_h$ [1/h] | Metal bellow couplings<br>and torque limiters | Elastomer couplings |
|---------------------------------|---|---------------------|
| < 1000                          | 1.0   | 1.0                 |
| < 2000                          | 1.1   | 1.2                 |
| < 3000                          | 1.2   | 1.4                 |
| < 4000                          | 1.8   | 1.8                 |
| > 4000                          | 2.0   | 2.0                 |

## Slipping torque

With a smaller clamping hub diameter, it is possible that the transmittable torque of the shaft-hub connection is lower than the maximum accelerating torque  $T_B$  of the coupling. In particular, this is applicable to the series BC3, BCT Standard, EL6 and ELC. More detailed information is available on request.

## Speed (n)

The permitted maximum speed  $n_{1Max}$  must be compared with the maximum speed  $n_{1max}$  during operation. The maximum permissible speed  $n_{1Max}$  must not be exceeded at any time.

The average speed  $n_{1m}$  is determined as the arithmetic mean of the speeds in the cycle or over a maximum of 20 minutes. It must be below the permitted nominal speed  $n_{1N}$  at all times. This applies to both cyclic and continuous operation.

$$n_{1m} = \frac{|n_{1,0}| \cdot t_0 + \dots + |n_{1,n}| \cdot t_n}{t_0 + \dots + t_n} \text{ incl. pause time} \quad \text{with } \sum_{i=0}^n t_i \leq 20 \text{ min}$$

WITTENSTEIN alpha determines the thermal speed limit or thermal limit of the nominal speed in the laboratory at an ambient temperature of 20°C while maintaining a gearbox temperature of 90°C.

## speedline® delivery

If required, standard series can be delivered within 24 or 48 hours ex works. Fast deliveries at short notice thanks to a high level of flexibility

## Spring rigidity (C)

Counter-force of the coupling in the event of axial or lateral misalignment [N/mm]. A distinction is made between →axial and →lateral spring rigidity.

## Static torsional rigidity ( $C_{Tstat}$ )

Torsional rigidity at 50 %  $T_N$

## Synchronous run

The synchronous run refers to the measurable variation in speed between the input and output during one revolution of the output shaft. It is caused by manufacturing tolerances and results in ratio fluctuations within one revolution.

## Technical data

Further technical data for our complete product portfolio is available to download from our website.

## Temperature factor ( $f_t$ )

With elastomer couplings, the ambient temperature impacts the maximum admissible accelerating torque of the coupling. This is taken into consideration in the coupling design by means of the temperature factor  $f_t$ . The temperature factor depending on the elastomer insert used can be determined by means of the table.

| Temperature °C | Elastomer insert |     |     | Metal bellows |
|----------------|------------------|-----|-----|---------------|
|                | A                | B   | C   |               |
| > -30 to -10   | 1.5              | 1.3 | 1.4 | 1.0           |
| > -10 to +30   | 1.0              | 1.0 | 1.0 | 1.0           |
| > +30 to +40   | 1.2              | 1.1 | 1.3 | 1.0           |
| > +40 to +60   | 1.4              | 1.3 | 1.5 | 1.0           |
| > +60 to +80   | 1.7              | 1.5 | 1.8 | 1.0           |
| > +80 to +100  | 2.0              | 1.8 | 2.1 | 1.0           |
| > +100 to +120 | -                | 2.4 | -   | 1.0           |

# Glossary – the alphabet

## Thermal behavior - temperature

It is necessary to measure the maximum temperature of the gearbox in the application.

The gearbox temperature is significantly influenced by the following application-specific factors:

- Load spectrum with nominal torque and nominal speed
- Motor temperature (e.g. heat input from the motor)
- Heat dissipation to the machine interface (e.g. mounting on a stainless steel structure or very thin mounting plates)
- Convection (e.g. convection prevented by installation location)
- Ambient temperature (e.g. excessively high ambient temperature of the air and the mechanical interface parts)

If the permissible gearbox temperature is exceeded, the service life of the gearbox is reduced considerably.

## Tilting moment ( $M_{2K}$ )

The tilting moment  $M_{2K}$  is a result of the → **axial and lateral forces** applied and their respective force application points in relation to the inner radial bearing on the output side.

## Tilting rigidity

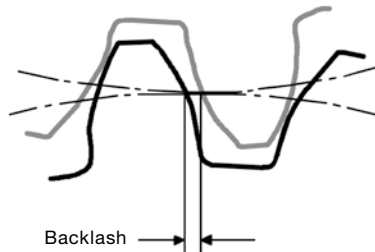
The tilting rigidity  $C_{2K}$  of the gearbox is made up of the bending rigidity of the output or pinion shaft and the bearing stiffness of the output bearing. It is defined as a quotient of the tilting moment  $M_{2K}$  [Nm] and tilting angle  $\Phi$  [arcmin] ( $C_{2K} = M_{2K}/\Phi$ ).

## Tooth engagement frequency ( $f_z$ )

In certain circumstances, the tooth engagement frequency can lead to vibration problems in the application, specifically if the excitation frequency corresponds to a natural frequency of the applications. For planetary gearboxes from WITTENSTEIN alpha (exception: gearboxes with ratio  $i = 8$ ) the tooth engagement frequency can be calculated using the formula  $f_z = 1,8 \cdot n_2$  [min<sup>-1</sup>]. It is independent of the ratio in planetary gearboxes from Wittenstein alpha. If it does prove problematic, either the natural frequency of the system can be changed or a different gearbox (e.g. hypoid gearbox) with a different tooth engagement frequency can be chosen.

## Torsional backlash ( $j_t$ )

Torsional backlash  $j_t$  [arcmin] describes the maximum angle of rotation of the output shaft in relation to the input. In simple terms, the torsional backlash describes the distance between two tooth flanks.

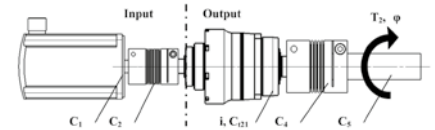


The measurement is taken with the input shaft blocked.

The output is then loaded with a defined test torque in order to overcome the internal gearbox friction. The main influence of the backlash is the flank backlash between the teeth. The low torsional backlash of the WITTENSTEIN alpha gearbox is achieved through high manufacturing precision and selective combination of the toothed wheels.

## Torsional rigidity ( $C_{t21}$ ) (gearbox)

The torsional rigidity [Nm/arcmin]  $C_{t21}$  is defined as the quotient of applied torque and resulting angle of rotation ( $C_{t21} = \Delta T / \Delta \Phi$ ). It indicates the torque required to turn the output shaft by one angular minute. The torsional rigidity can be determined using the → **hysteresis curve** Torsional rigidity  $C$ , angle of rotation  $\Phi$



Reduce all torsional rigidity to the output:

$$C_{(n),ab} = C_{(n),an} \cdot i^2$$

with  $i$  = gearbox ratio [ - ]

$C_{(n)}$  = Individual rigidities [Nm/arcmin]

Note: The torsional rigidity  $C_{t21}$  for the gearbox always relates to the output.

Series connection of torsional rigidities

$$1/C_{ges} = 1/C_{1,ab} + 1/C_{2,ab} + \dots + 1/C_{(n)}$$

Angle of rotation  $\Phi$  [arcmin]

$$\Phi = T_2 \cdot 1/C_{ges}$$

with  $T_2$  = output torque [Nm]

## Torsional rigidity ( $C_t$ ) (couplings)

The torsional rigidity [Nm/arcmin]  $C_t$  is defined as the quotient of applied torque and resulting angle of rotation. It shows the torque required to turn the two clamping hubs against each other by one angular minute. If the maximum value is exceeded, the coupling can no longer transmit the applied torque since the → **angle of rotation** of the coupling becomes too large. A distinction is made between → **static** and → **dynamic torsional rigidity**.

## Torque ( $T_{2\alpha}$ )

$T_{2\alpha}$  represents the maximum torque that can be transmitted by the gearbox. This value may be reduced depending on application-specific boundary conditions and the precise evaluation of the motion profile.



→ Refer to this term for further details.

# Glossary – Formulae

## Formulae

|   |  |   |
|---|--|---|
| <b>Torque [Nm]</b>                            | $T = J \cdot \alpha$                             | $J$ = Mass moment of inertia [kgm <sup>2</sup> ]<br>$\alpha$ = Angular acceleration [1/s <sup>2</sup> ] |
| <b>Torque [Nm]</b>                            | $T = F \cdot l$                                  | $F$ = Force [N]<br>$l$ = Lever, length [m]  |
| <b>Acceleration force [N]</b>                 | $F_b = m \cdot a$                                | $m$ = Mass [kg]<br>$a$ = Linear acceleration [m/s <sup>2</sup> ]  |
| <b>Frictional force [N]</b>                   | $F_{\text{Reib}} = m \cdot g \cdot \mu$          | $g$ = Acceleration due to gravity 9.81 m/s <sup>2</sup><br>$\mu$ = Coefficient of friction              |
| <b>Angular speed [1/s]</b>                    | $\omega = 2 \cdot \pi \cdot n / 60$              | $n$ = Speed [rpm]<br>$\pi$ = PI = 3.14...   |
| <b>Linear speed [m/s]</b>                     | $v = \omega \cdot r$                             | $v$ = Linear speed [m/s]<br>$r$ = Radius [m]  |
| <b>Linear speed [m/s] (spindle)</b>           | $v_{\text{sp}} = \omega \cdot h / (2 \cdot \pi)$ | $h$ = Screw pitch [m]   |
| <b>Linear acceleration [m/s<sup>2</sup>]</b>  | $a = v / t_b$                                    | $t_b$ = Acceleration time [s]   |
| <b>Angular acceleration [1/s<sup>2</sup>]</b> | $\alpha = \omega / t_b$                          |   |
| <b>Pinion path [mm]</b>                       | $s = m_n \cdot z \cdot \pi / \cos \beta$         | $m_n$ = Normal module [mm]<br>$z$ = Number of teeth [-]<br>$\beta$ = Helix angle [°]                    |

## Conversion table

|                           |  |
|---------------------------|--|
| <b>1 mm</b>               | = 0.039 in                                     |
| <b>1 Nm</b>               | = 8.85 in.lb                                   |
| <b>1 kgcm<sup>2</sup></b> | = 8.85 x 10 <sup>-4</sup> in.lb.s <sup>2</sup> |
| <b>1 N</b>                | = 0.225 lb <sub>f</sub>                        |
| <b>1 kg</b>               | = 2.21 lb <sub>m</sub>                         |

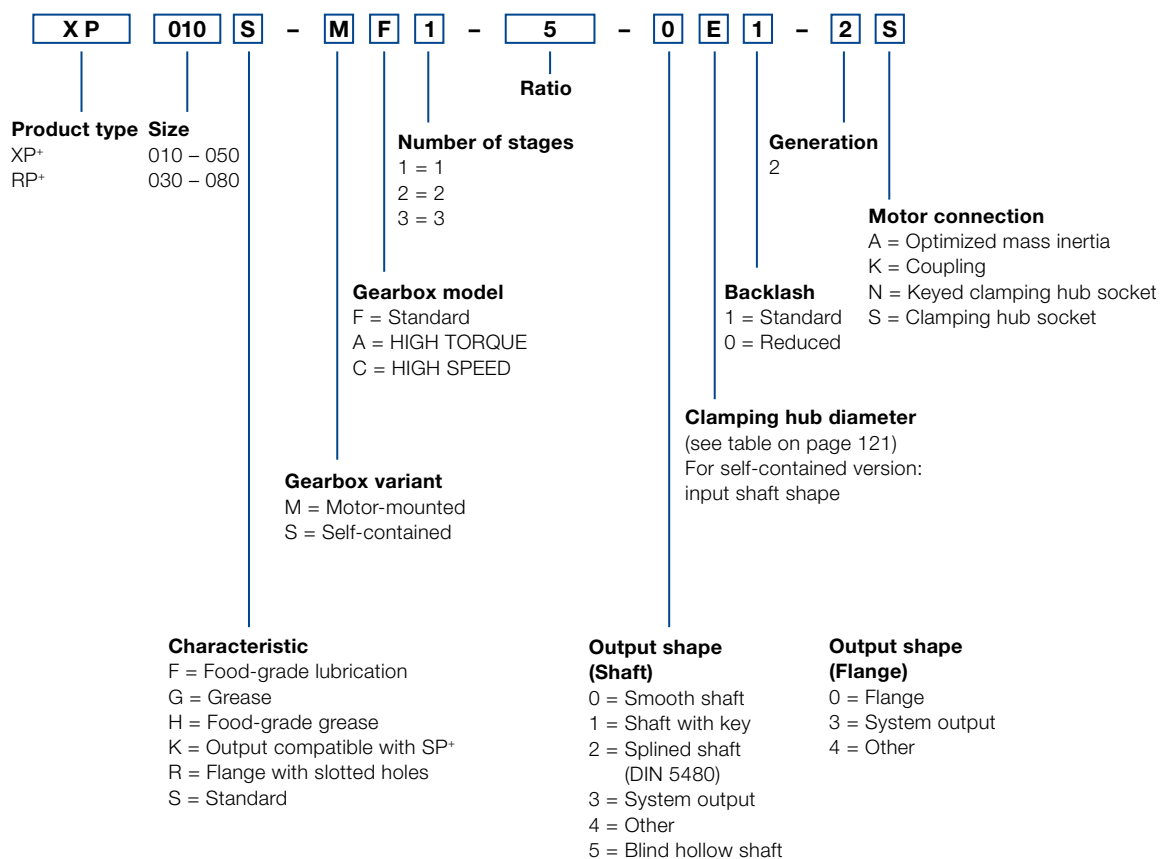
## Symbol

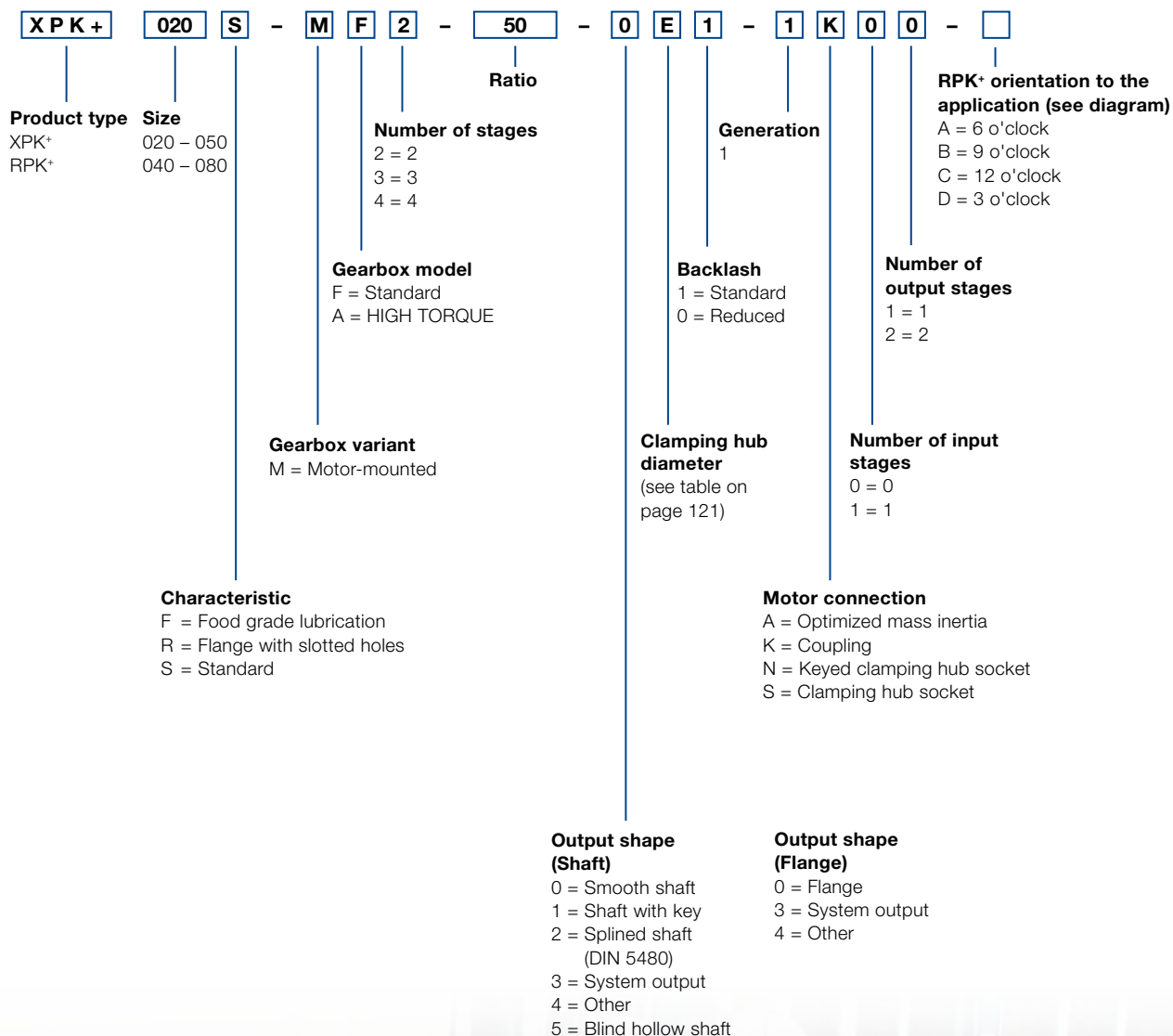
| Symbol   | Unit             | Designation                      |
|----------|------------------|----------------------------------|
| $C$      | Nm/arcmin        | Stiffness                        |
| $ED$     | %, min           | Duty cycle                       |
| $F$      | N                | Force                            |
| $f_s$    | –                | Shock factor                     |
| $f_e$    | –                | Factor for duty cycle            |
| $i$      | –                | Ratio                            |
| $j$      | arcmin           | Backlash                         |
| $J$      | kgm <sup>2</sup> | Mass moment of inertia           |
| $K1$     | Nm               | Factor for bearing calculation   |
| $L$      | h                | Service life                     |
| $L_{PA}$ | dB(A)            | Operating noise                  |
| $m$      | kg               | Mass                             |
| $M$      | Nm               | Torque                           |
| $n$      | rpm              | Speed                            |
| $p$      | –                | Exponent for bearing calculation |
| $\eta$   | %                | Efficiency                       |
| $t$      | s                | Time                             |
| $T$      | Nm               | Torque                           |
| $v$      | m/min            | Linear speed                     |
| $z$      | 1/h              | Number of cycles                 |

## Index

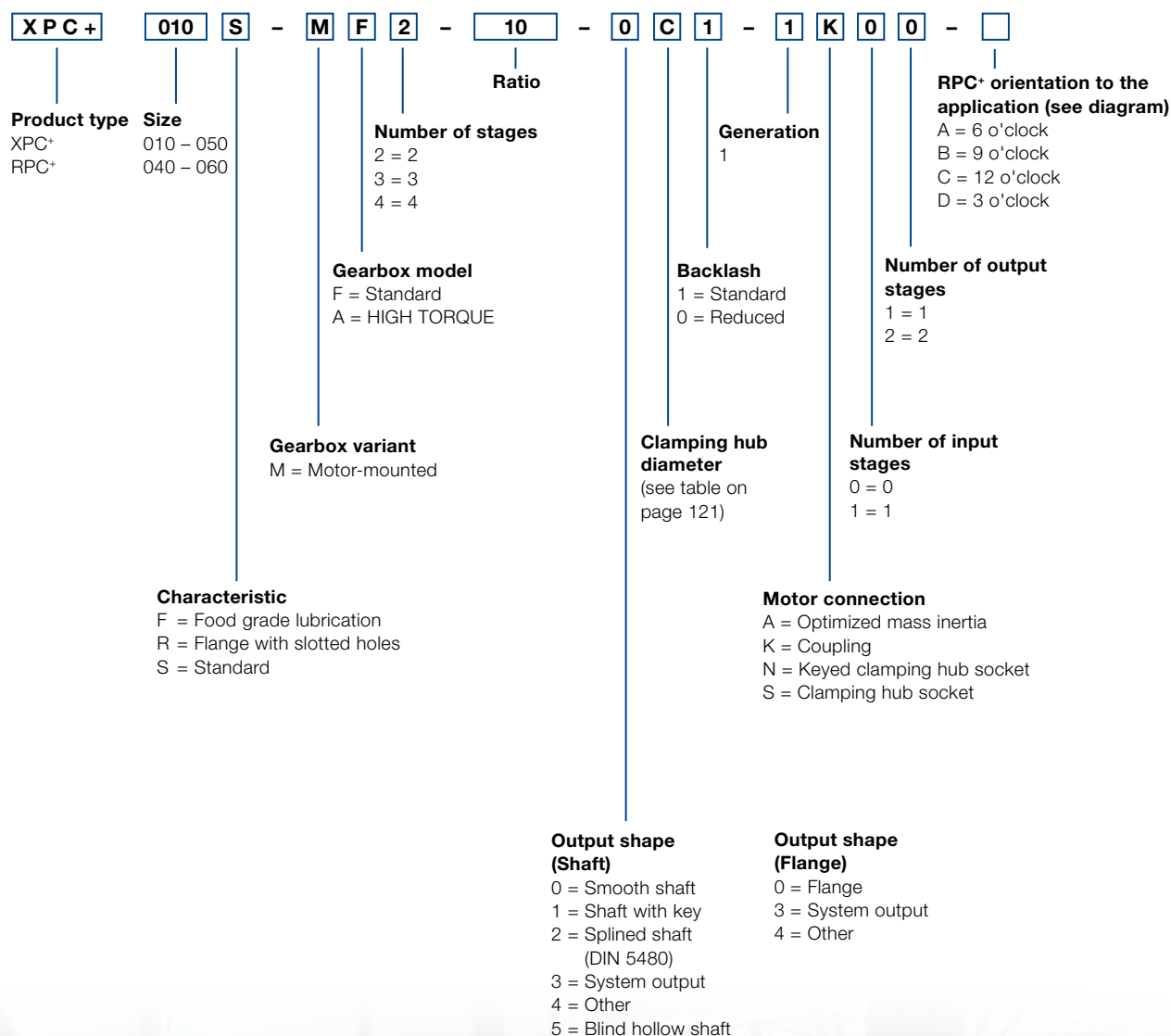
| Index          | Designation        |
|----------------|--------------------|
| Capital letter | Permissible values |
| Small letter   | Actual values      |
| 1              | Input              |
| 2              | Output             |
| A/a            | Axial              |
| B/b            | Acceleration       |
| c              | Constant           |
| d              | Deceleration       |
| e              | Pause              |
| h              | Hours              |
| K/k            | Tilting            |
| m              | Mean               |
| Max/max        | Maximum            |
| Mot            | Motor              |
| N              | Nominal            |
| Not/not        | Emergency stop     |
| 0              | No load            |
| Q/q            | Lateral            |
| t              | Torsional          |
| T              | Tangential         |

## XP<sup>+</sup>/RP<sup>+</sup> – Ordering code



XPK<sup>+</sup> / RPK<sup>+</sup> – Ordering code

# XPC+ / RPC+ – Ordering code

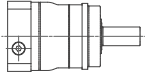


# Mounting positions and clamping hub diameters

## Planetary gearboxes

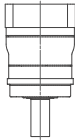
B5

Horizontal



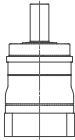
V1

Output vertical downwards



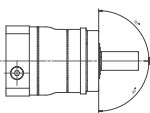
V3

Output vertical upwards



S

Can be tilted  $\pm 90^\circ$  from a horizontal position



### Clamping hub diameter

(see technical data sheet for possible diameters)

| Code letter | mm | Code letter | mm |
|-------------|----|-------------|----|
| B           | 11 | I           | 32 |
| C           | 14 | K           | 38 |
| E           | 19 | M           | 48 |
| G           | 24 | N           | 55 |
| H           | 28 | O           | 60 |

Intermediate sizes possible using bushings with a minimum thickness of 1 mm.

## Hypoid and bevel gearboxes

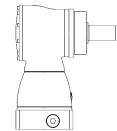
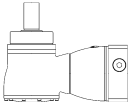
For information purposes only – not required when placing orders!

Permitted standard mounting positions for right-angle gearboxes (see illustrations)

If the mounting position is different, contact WITTENSTEIN alpha without fail

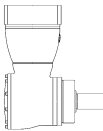
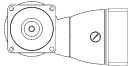
B5 / V3

Output horizontal / motor shaft vertical upwards

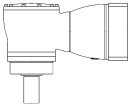
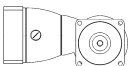
B5 / V1

Output horizontal / motor shaft vertical downwards

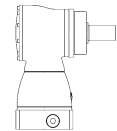
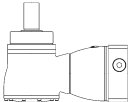
V1 / B5

Output vertical downwards / motor shaft horizontal

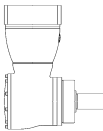
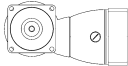
V3 / B5

Output vertical upwards / motor shaft horizontal

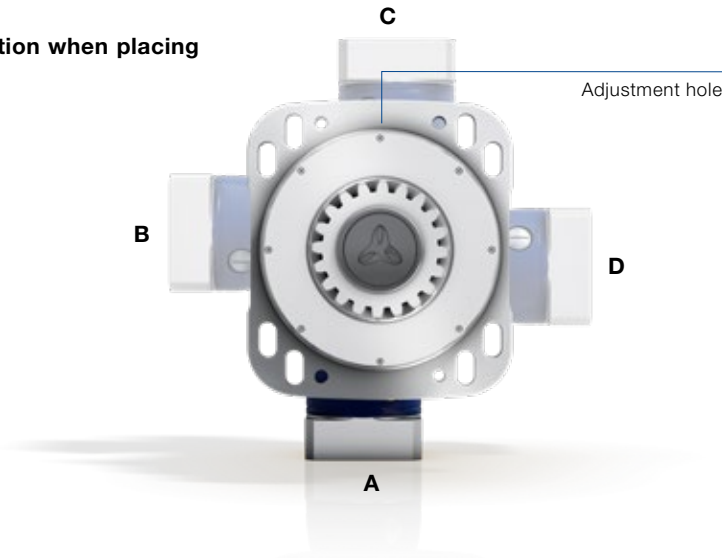
B5 / B5

Output horizontal / motor shaft horizontal

### Orientation to the application

Please note the orientation when placing your order.





alpha

WITTENSTEIN Inc. · 1249 Humbracht Circle · Bartlett, IL 60103 · USA · Phone 1-630-540-5300

Subject to technical changes. alpha Premium Line

## WITTENSTEIN alpha – **Intelligent** drive systems

**[www.wittenstein-us.com](http://www.wittenstein-us.com)**

The entire world of drive technology – Catalogs available on request or online at [www.wittenstein-us.com/catalogs](http://www.wittenstein-us.com/catalogs)



**alpha Premium Line.** Unique, individual solutions that offer unparalleled power density.



**alpha Advanced Line.** Maximum power density and outstanding positioning accuracy for complex applications.



**alpha Basic Line & alpha Value Line.** Reliable, flexible and economical solutions for a wide range of applications.



**alpha Linear Systems.** Precise, dynamic system solutions for every requirement.



**alpha Mechatronic Systems.** Energy-efficient, versatile and flexible mechatronic drive systems.



**alpha Accessories.** Optimally designed and adapted for gearboxes and actuators.