# XPK+ and RPK+ hypoid gearboxes
## A new performance standard

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

XPK+

## New standard now also available as a hypoid version

Both the XP+ and RP+ 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.

## Product highlights

**Max. torsional backlash**

XPK+ ≤ 4 arcmin (Standard)
≤ 2 arcmin (Reduced)

RPK+ ≤ 1.3 arcmin

**XPK+ and RPK+:**

**Range of transmission ratios:** i = 12 – 5,500

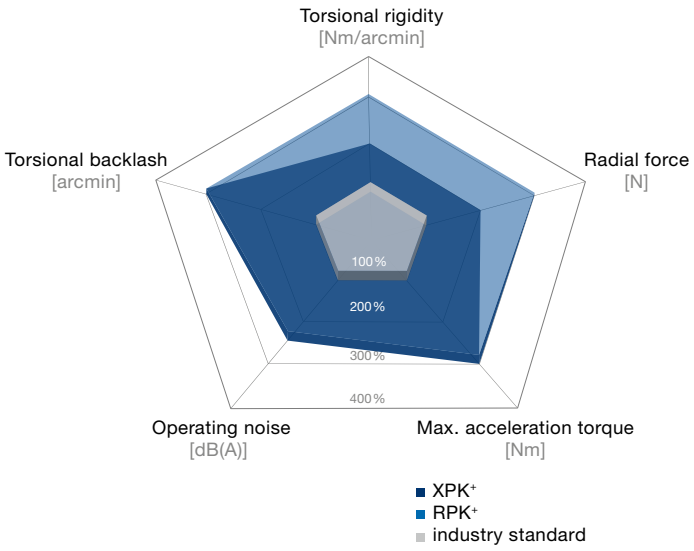
**High axial and radial forces**

**High torsional rigidity**

**Maximum performance in small installation space**

**Optimized for rack and pinion applications**

## XPK+ and RPK+ compared to industry standard



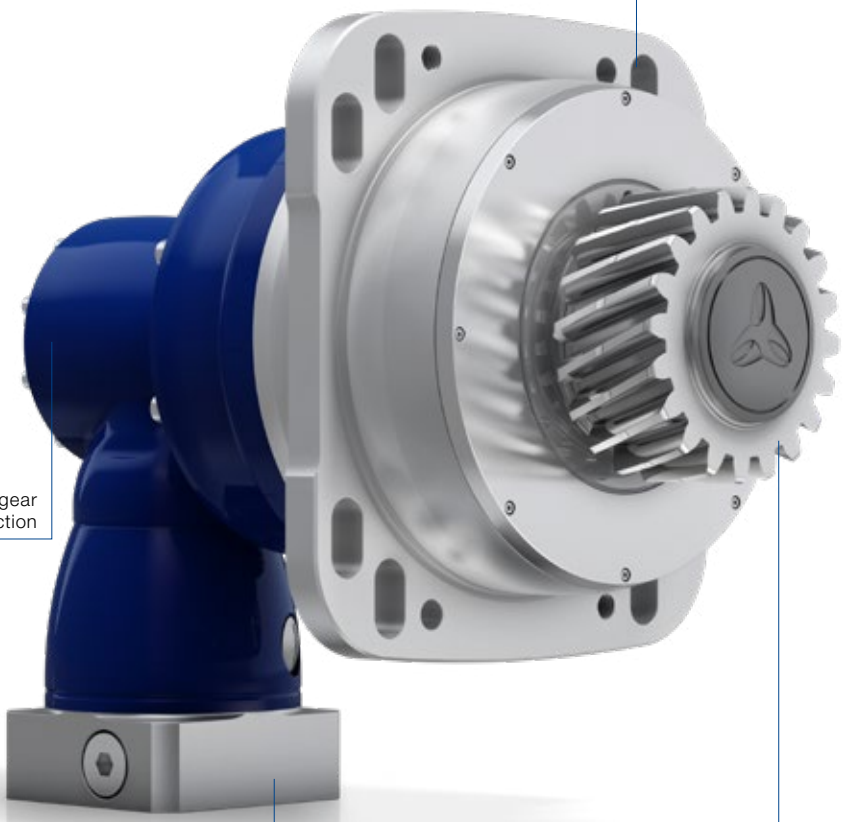
XPK+ with pinion and slots

XPK+ with pinion, slots and rack

## The ideal partnership

Premium Linear Systems with the XPK+ or RPK+ 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+ have been improved by 150 % on average.

Integrated slots reduce the design and installation requirements to a minimum



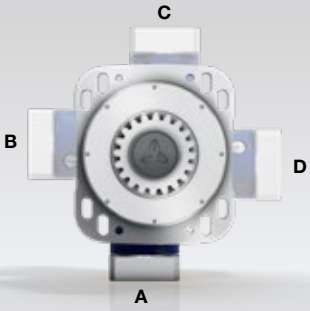
High-quality hypoid section with gear ratios of i = 3 – 10 in the angle section

RPK+ 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+ with rack and pinion

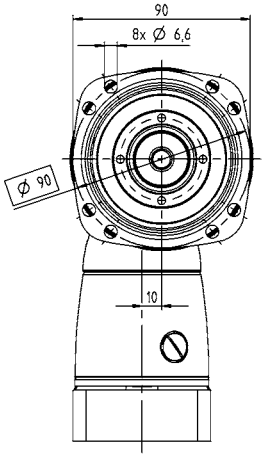


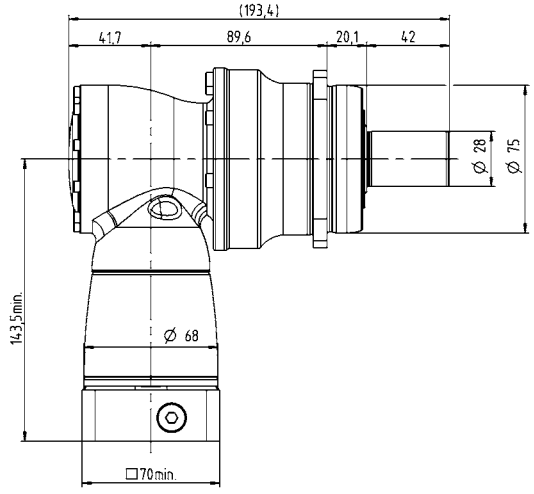

Flexibility during installation

| | | | 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 [a] | $T_{2a}$ | *Nm* | 80 – 240 | 80 – 240 |
| | | *in.lb* | 708 – 2124 | 708 – 2124 |
| Max. acceleration torque (max. 1000 cycles per hour) | $T_{2B}$ | *Nm* | 80 – 180 | 80 – 180 |
| | | *in.lb* | 708 – 1593 | 708 – 1593 |
| Nominal torque (at $n_{1N}$) | $T_{2N}$ | *Nm* | 60 – 75 | 60 – 90 |
| | | *in.lb* | 531 – 664 | 531 – 797 |
| Emergency stop torque (permitted 1000 times during the service life of the gearbox) | $T_{2Not}$ | *Nm* | 160 – 350 | 160 – 350 |
| | | *in.lb* | 1416 – 3098 | 1416 – 3098 |
| Thermal speed limit (with 20°C ambient temperature and 10% torque utilization) [b] | $n_{1T}$ | *rpm* | 3000 – 3800 | 5000 – 5500 |
| Max. input speed | $n_{1Max}$ | *rpm* | 7500 | 6000 |
| Max. torsional backlash | $j_t$ | *arcmin* | Standard ≤ 5 / Reduced ≤ 3 | Standard ≤ 5 / Reduced ≤ 3 |
| Torsional rigidity | $C_{t21}$ | *Nm/arcmin* | 12 – 14 | 11 – 15 |
| | | *in.lb/arcmin* | 106 – 124 | 97 – 133 |
| Max. tilting moment | $M_{2KMax}$ | *Nm* | 675 | 675 |
| | | *in.lb* | 5974 | 5974 |
| Operating noise [c] | $L_{PA}$ | *dB(A)* | ≤ 66 | ≤ 66 |
| Lubrication | | | Lubricated for life | Lubricated for life |
| Clamping hub diameter | | *mm* | 14 – 19 | 11 – 14 |

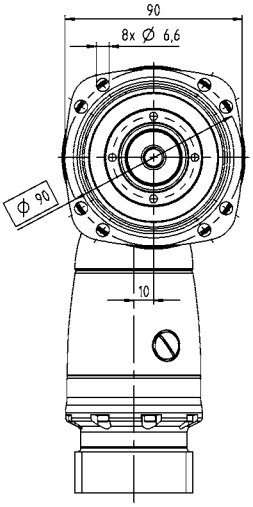
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

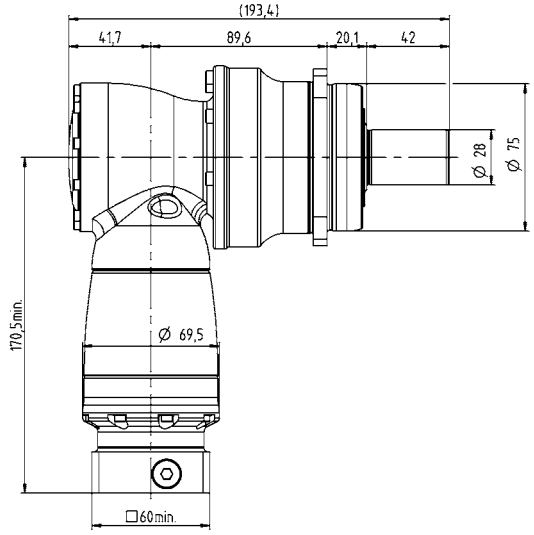
2-stage




3-stage

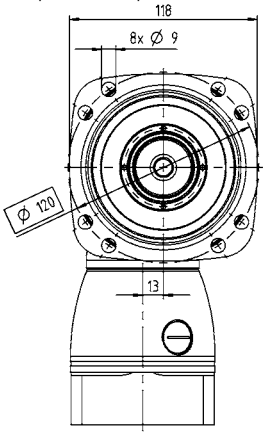


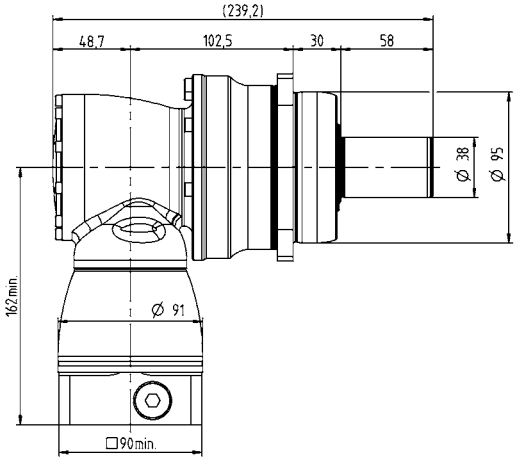



| | | | 2-stage | 3-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100** | **64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 200 – 470 | 200 – 470 |
| | | *in.lb* | 1770 – 4160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

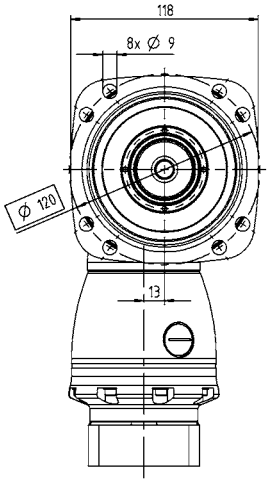
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

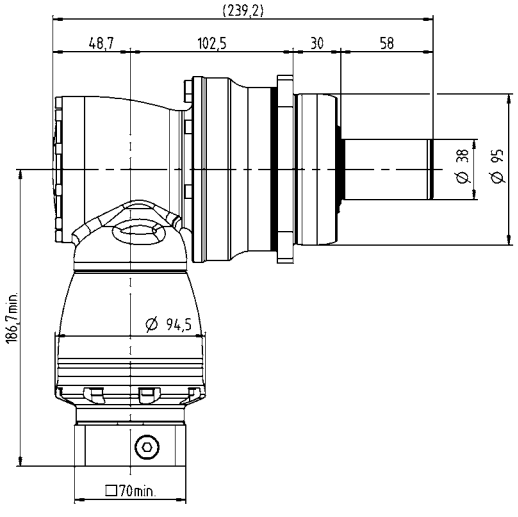
## 2-stage




## 3-stage

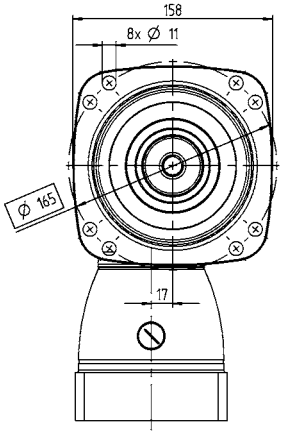


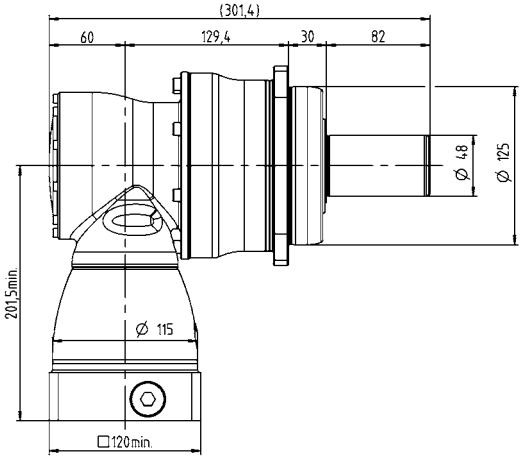



| | | | 2-stage | 3-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100** | **64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 500 – 1020 | 500 – 1020 |
| | | *in.lb* | 4425 – 9028 | 4425 – 9028 |
| Max. acceleration torque (max. 1000 cycles per hour) | $T_{2B}$ | *Nm* | 500 – 850 | 500 – 850 |
| | | *in.lb* | 4425 – 7523 | 4425 – 7523 |
| Nominal torque (at $n_{1N}$) | $T_{2N}$ | *Nm* | 240 – 370 | 240 – 400 |
| | | *in.lb* | 2124 – 3275 | 2124 – 3540 |
| Emergency stop torque (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 (with 20°C ambient temperature and 10% torque utilization) [b] | $n_{1T}$ | *rpm* | 2700 – 3500 | 4000 – 4200 |
| Max. input speed | $n_{1Max}$ | *rpm* | 5500 | 4500 |
| Max. torsional backlash | $j_t$ | *arcmin* | Standard ≤ 4 / 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 [c] | $L_{PA}$ | *dB(A)* | ≤ 70 | ≤ 70 |
| Lubrication | | | Lubricated for life | Lubricated for life |
| Clamping hub diameter | | *mm* | 28 – 38 | 19 – 24 |

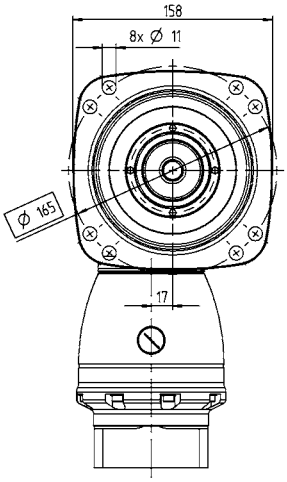
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

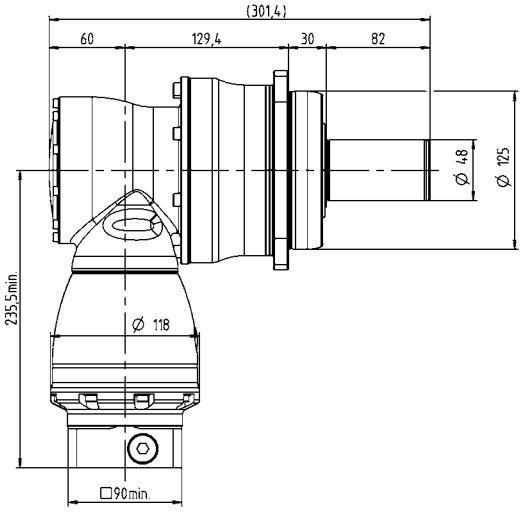
2-stage




3-stage

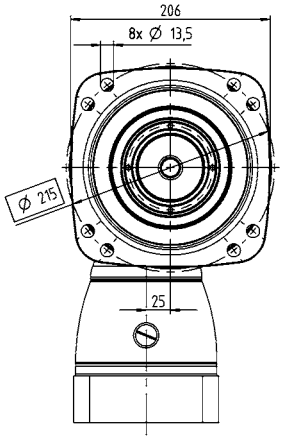


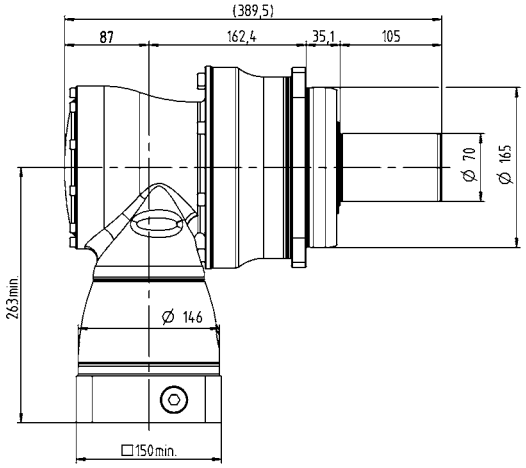



| | | | 2-stage | 3-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100** | **64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1000** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 840 – 2520 | 840 – 2520 |
| | | *in.lb* | 7435 –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

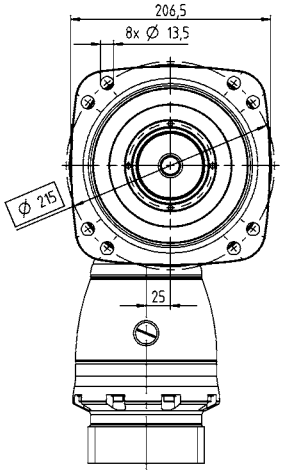
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

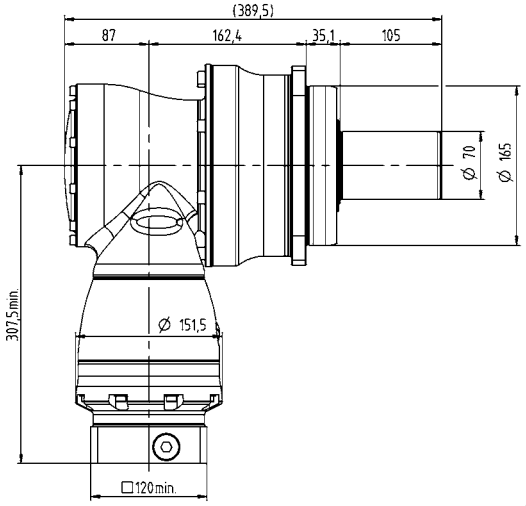
2-stage




3-stage

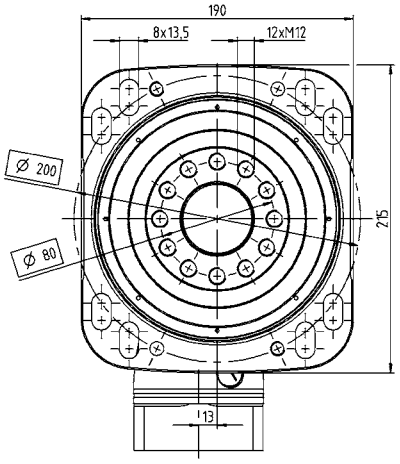


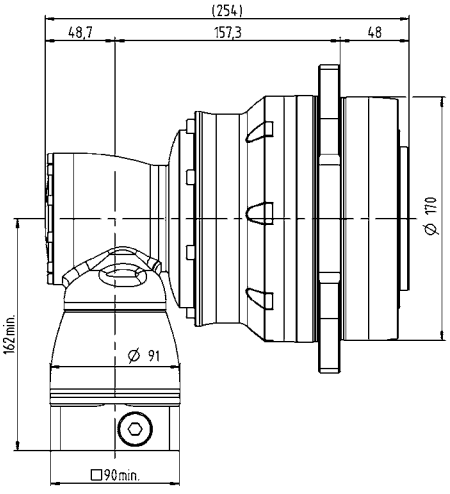



| | | | 3-stage | 4-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **48 / 66 / 88 / 110 / 137.5 / 154 / 220 / 385** | **330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 1100 – 1402 | 1402 |
| | | *in.lb* | 9736 – 12409 | 12409 |
| Max. acceleration torque (max. 1000 cycles per hour) | $T_{2B}$ | *Nm* | 950 | 950 |
| | | *in.lb* | 8408 | 8408 |
| Nominal torque (at $n_{1N}$) | $T_{2N}$ | *Nm* | 675 | 675 |
| | | *in.lb* | 5974 | 5974 |
| Emergency stop torque (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 (with 20°C ambient temperature and 10% torque utilization) [b] | $n_{1T}$ | *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 [c] | $L_{PA}$ | *dB(A)* | ≤ 68 | ≤ 68 |
| Lubrication | | | Lubricated for life | Lubricated for life |
| Clamping hub diameter | | *mm* | 19 – 28 | 14 – 19 |

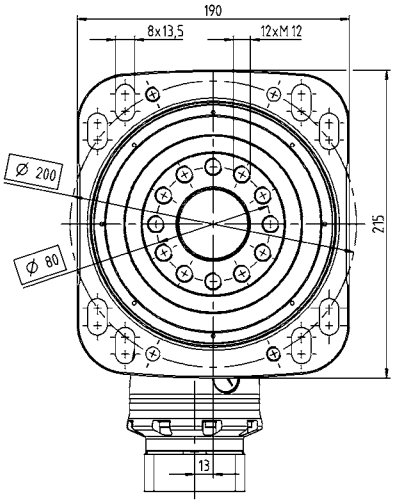
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

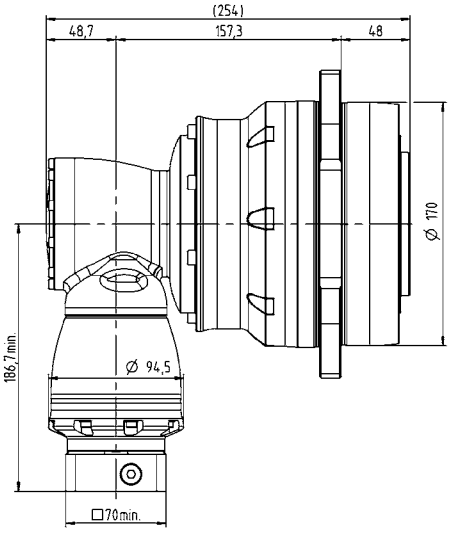
3-stage




4-stage

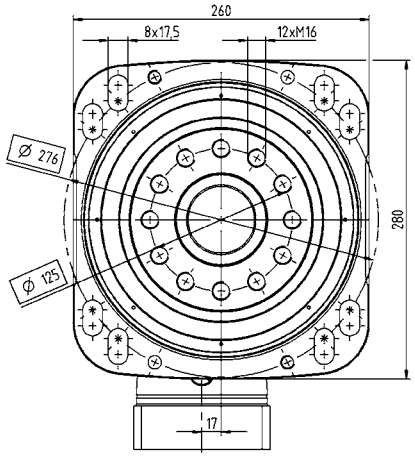


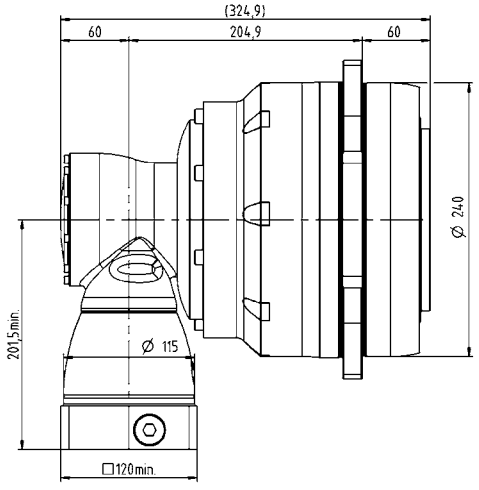



| | | | 3-stage | 4-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **48 / 66 / 88 / 110 / 137.5 / 154 / 220 / 385** | **330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 2750 – 3822 | 3200 – 3822 |
| | | *in.lb* | 24340 – 33828 | 28323 – 33828 |
| Max. acceleration torque (max. 1000 cycles per hour) | $T_{2B}$ | *Nm* | 2720 – 3100 | 2000 – 3100 |
| | | *in.lb* | 24074 – 27437 | 17702 – 27437 |
| Nominal torque (at $n_{1N}$) | $T_{2N}$ | *Nm* | 1600 – 1650 | 1400 – 1650 |
| | | *in.lb* | 14161 – 14604 | 12391 – 14604 |
| Emergency stop torque (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 (with 20°C ambient temperature and 10% torque utilization) [b] | $n_{1T}$ | *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 [c] | $L_{PA}$ | *dB(A)* | ≤ 70 | ≤ 70 |
| Lubrication | | | Lubricated for life | Lubricated for life |
| Clamping hub diameter | | *mm* | 28 – 38 | 19 – 24 |

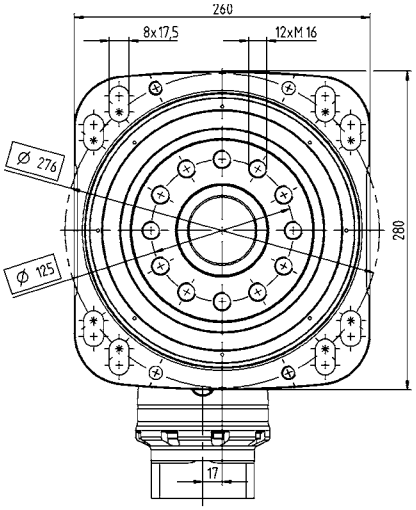
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

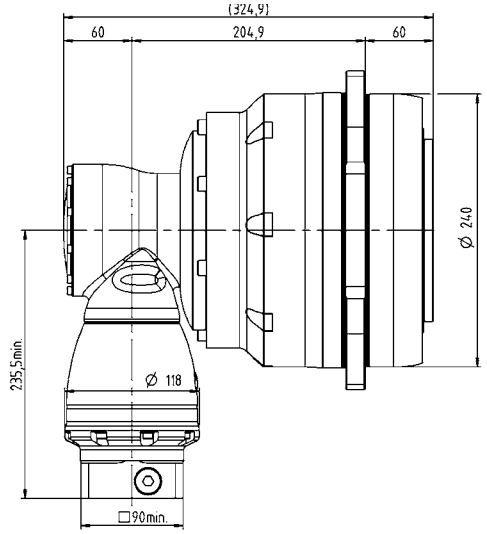
3-stage




4-stage

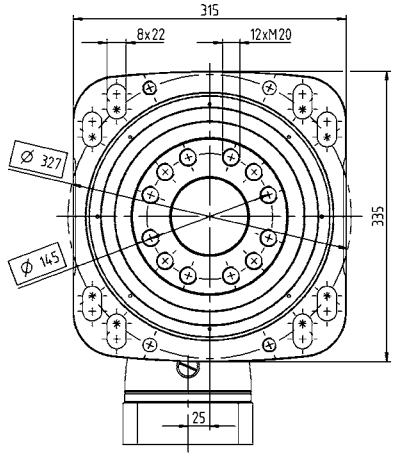


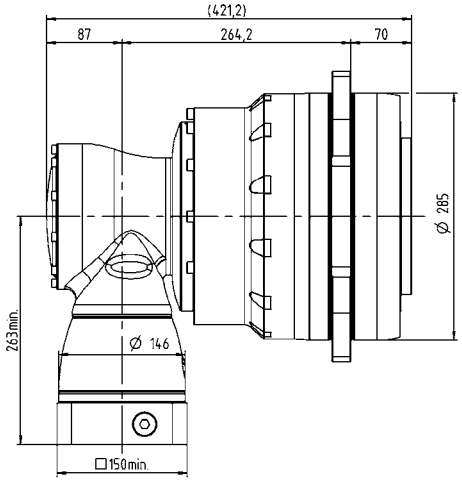



| | | | 3-stage | 4-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **66 / 88 / 110 / 137.5 / 154 / 220 / 385** | **330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 4620 – 7535 | 6240 – 7535 |
| | | *in.lb* | 40891 – 66691 | 55229 – 66691 |
| Max.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

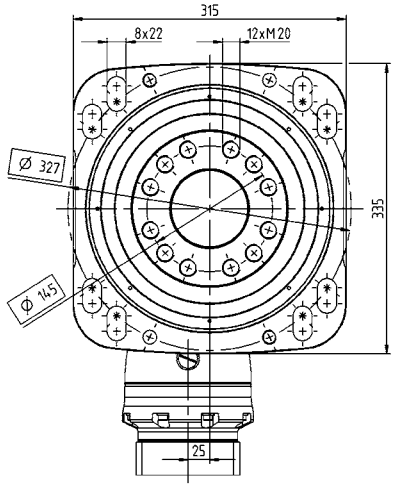
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

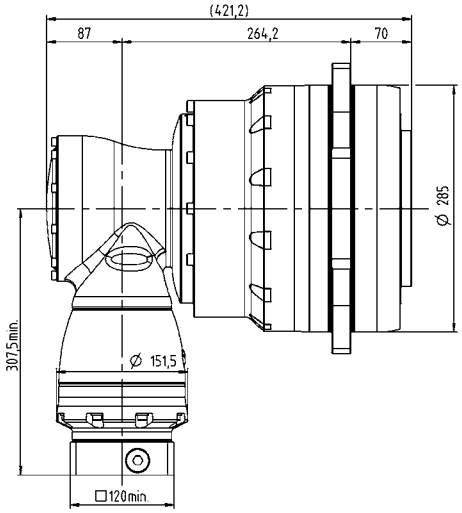
3-stage




4-stage

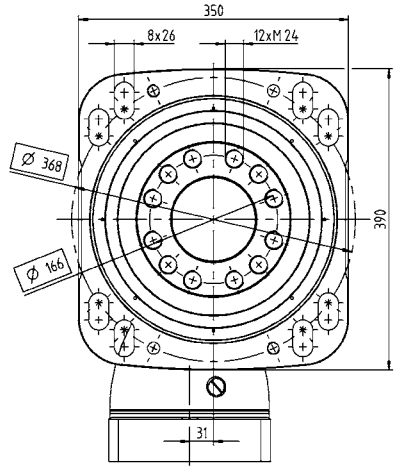


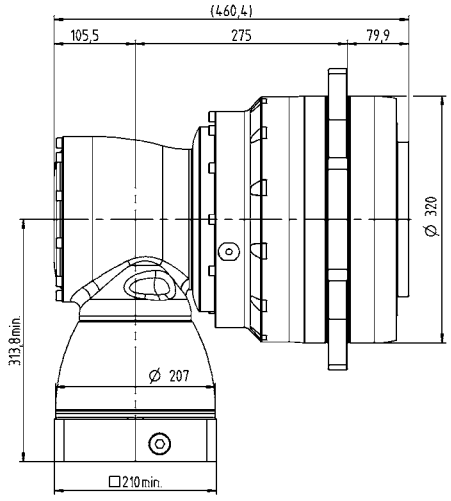



| | | | 3-stage | 4-stage |
|---|---|---|---|---|
| **Ratio** | *i* | | **66 / 88 / 110 / 137.5 / 154 / 220 / 385** | **330 / 462 / 577.5 / 770 / 1078 / 1540 / 2695 / 3850 / 5500** |
| Max. torque [a] | $T_{2a}$ | *Nm* | 10340 – 10450 | 10450 |
| | | *in.lb* | 91517 – 92491 | 92491 |
| Max. acceleration torque (max. 1000 cycles per hour) | $T_{2B}$ | *Nm* | 10000 | 7200 – 10000 |
| | | *in.lb* | 88508 | 63726 – 88508 |
| Nominal torque (at $n_{1N}$) | $T_{2N}$ | *Nm* | 5400 | 5400 |
| | | *in.lb* | 47794 | 47794 |
| Emergency stop torque (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 (with 20°C ambient temperature and 10% torque utilization) [b] | $n_{1T}$ | *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 [c] | $L_{PA}$ | *dB(A)* | ≤ 71 | ≤ 71 |
| Lubrication | | | Lubricated for life | Lubricated for life |
| Clamping hub diameter | | *mm* | 48 | 38 – 48 |

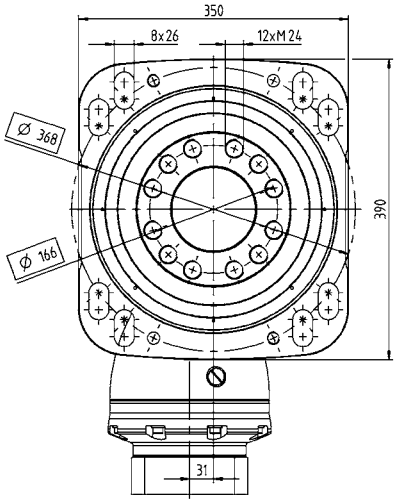
[a] Application-specific design with cymex® – www.wittenstein-cymex.com
[b] For higher ambient temperatures, please reduce input speed
[c] At reference ratio and reference speed. Ratio-specific values available in cymex®.

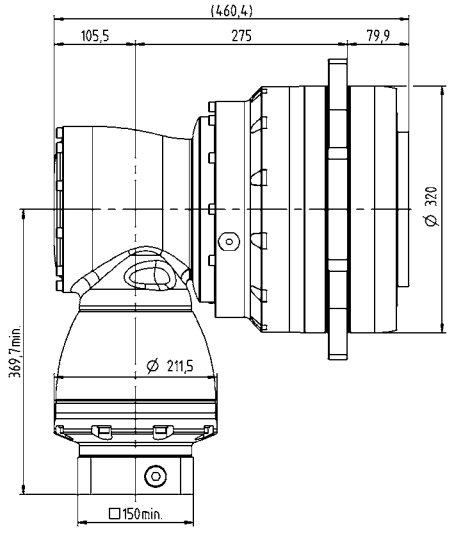
3-stage




4-stage



# Basic Line gearbox overview

| Product type | | CP | CPS | CPK | CPSK | CVH | CVS |
|---|---|---|---|---|---|---|---|
| Version | | MF | MF | MF | MF | MF / MT | MF / MT |
| Ratio [c] | min. *i* = | 3 | 3 | 3 | 3 | 7 | 7 |
| | max. *i* = | 100 | 100 | 100 | 100 | 40 | 40 |
| Max. torsional backlash [arcmin] [c] | Standard | ≤ 12 | ≤ 12 | ≤ 13 | ≤ 15 | ≤ 15 | ≤ 15 |
| | Reduced | – | – | – | – | – | – |
| **Output type** | | | | | | | |
| Smooth shaft | | x | x | x | x | – | x |
| Shaft with key [d] | | 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 |
| **Input type** | | | | | | | |
| Motor-mounted | | x | x | x | x | x | x |
| Self-contained version [b] | | – | – | – | – | – | – |
| **Characteristic** | | | | | | | |
| Flange with slotted holes | | – | – | – | – | – | – |
| ATEX [a] | | – | – | – | – | – | – |
| Food-grade lubrication [a] [b] | | x | x | x | x | x | x |
| Corrosion resistant [a] [b] | | – | – | – | – | – | – |
| Optimized mass inertia [a] | | – | – | – | – | – | – |
| **System solutions** | | | | | | | |
| Linear system (rack/pinion) | | – | – | – | – | – | – |
| Servo actuator | | – | – | – | – | – | – |
| **Accessories** (please refer to the product pages for further options) | | | | | | | |
| Coupling | | x | x | x | x | – | x |
| Shrink disc | | – | – | – | – | x | – |

[a] Power reduction: technical data available on request
[b] Please contact WITTENSTEIN alpha
[c] In relation to reference sizes
[d] Power reduction: Please use our sizing software cymex® for a detailed sizing – **www.wittenstein-cymex.com**

# Value Line gearbox overview

| Product type | | NP | NPL | NPS | NPT | NPR | NPK | NPLK | NPSK | NPTK | NPRK | NVH | NVS | HDV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version | | MF / MA | MF / MA | MF / MA | MF / MA | MF / MA | MF | MF | MF | MF | MF | MF | MF | MF / MT |
| Ratio [c] | min. $i$ = | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| | max. $i$ = | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 400 | 400 | 400 |
| Max. torsional backlash [arcmin] [c] | Standard | ≤ 8 | ≤ 8 | ≤ 8 | ≤ 8 | ≤ 8 | ≤ 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 [d] | | 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 | – | – | – | – |
| 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 |
| Self-contained version [b] | | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Characteristic** | | | | | | | | | | | | | | |
| Flange with slotted holes | | – | – | – | – | x | – | – | – | – | x | – | – | – |
| ATEX [a] | | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Food-grade lubrication [a] [b] | | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Corrosion resistant [a] [b] | | – | – | – | – | – | – | – | – | – | – | x | x | x |
| Optimized mass inertia [a] | | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **System solutions** | | | | | | | | | | | | | | |
| Linear system (rack/pinion) | | x | x | x | – | x | x | x | x | – | x | – | x | – |
| Servo actuator | | – | – | – | – | – | – | – | – | – | – | – | – | x |
| **Accessories** (please refer to the product pages for further options) | | | | | | | | | | | | | | |
| Coupling | | x | x | x | – | x | x | x | x | – | x | – | x | – |
| Shrink disc | | – | – | – | – | – | – | – | – | – | – | x | – | – |

[a] Power reduction: technical data available on request
[b] Please contact WITTENSTEIN alpha
[c] In relation to reference sizes
[d] Power reduction: Please use our sizing software cymex® for a detailed sizing – **www.wittenstein-cymex.com**

# Advanced Line gearbox overview

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

[a] Power reduction: technical data available on request
[b] Please contact WITTENSTEIN alpha
[c] In relation to reference sizes
[d] Power reduction: Please use our sizing software cymex® for a detailed sizing – **www.wittenstein-cymex.com**

| TK+ | TPK+ | TPK+ 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⁺** | **RP⁺** | **XPK⁺** | **RPK⁺** | **XPC⁺** | **RPC⁺** |
|---|---|---|---|---|---|---|---|
| Version | | MF / MC | MF / MA | MF | MA | MF | MA |
| Catalog page | | 24 | 36 | 56 | 60 | 68 | 73 |
| Ratio [c] | min. *i* = | 3 | 22 | 12 | 48 | 4 | 22 |
| | max. *i* = | 100 | 220 | 1000 | 5500 | 20 | 55 |
| Max. torsional backlash [arcmin] [c] | Standard | ≤ 3 | ≤ 1 | ≤ 4 | ≤ 1.3 | ≤ 4 | ≤ 1.3 |
| | Reduced | ≤ 1 | – | ≤ 2 | – | ≤ 2 | – |
| **Output type** | | | | | | | |
| Smooth shaft | | x | – | x | – | x | – |
| Shaft with key [d] | | x | – | x | – | x | – |
| Splined shaft (DIN 5480) | | x | – | x | – | x | – |
| Blind hollow shaft | | x | – | x | – | x | – |
| Hollow shaft interface | | – | – | – | – | – | – |
| Keyed hollow shaft | | – | – | – | – | – | – |
| Flanged hollow shaft | | – | – | – | – | – | – |
| Flange | | – | x | – | x | – | x |
| System output | | x | x | x | x | x | x |
| Output on both sides | | – | – | – | – | – | – |
| **Input type** | | | | | | | |
| Motor-mounted | | x | x | x | x | x | x |
| Self-contained version [b] | | x | – | – | – | – | – |
| **Characteristic** | | | | | | | |
| Flange with slotted holes | | x | x | x | x | x | x |
| ATEX [a] | | – | – | – | – | – | – |
| Food-grade lubrication [a] [b] | | x | x | x | x | x | x |
| Corrosion resistant [a] [b] | | – | – | – | – | – | – |
| Optimized mass inertia [a] | | x | x | – | – | – | – |
| **System solutions** | | | | | | | |
| Linear system (rack / pinion) | | x | x | x | x | x | x |
| Servo actuator | | x | x | – | – | – | – |
| **Accessories** (please refer to the product pages for further options) | | | | | | | |
| Coupling | | x | – | x | – | x | – |
| Shrink disc | | x | – | x | – | x | – |

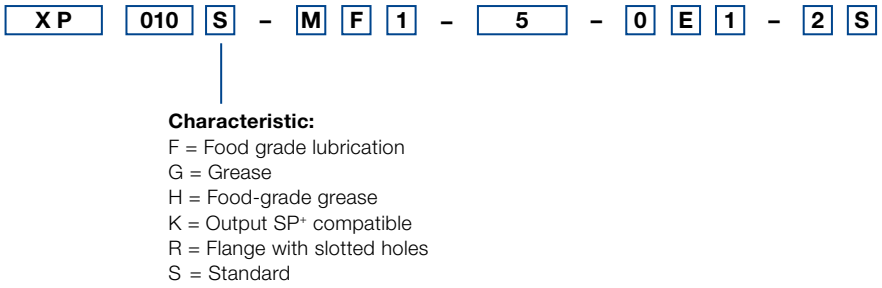
[a] Power reduction: technical data available on request
[b] Please contact WITTENSTEIN alpha
[c] In relation to reference sizes
[d] Power reduction: Please use our sizing software cymex® for a detailed sizing – **www.wittenstein-cymex.com**

# Servo actuator overview

| Product type | | PBG | PAG | PHG | RPM+ | TPM+ DYNAMIC | TPM+ HIGH TORQUE | TPM+ POWER |
|---|---|---|---|---|---|---|---|---|
| Version | | Standard | Standard | Standard | Customer specific | Standard | Standard | Standard |
| Ratio [c] | min. *i* = | 16 | 16 | 16 | 22 | 16 | 22 | 4 |
| | max. *i* = | 100 | 100 | 100 | 220 | 91 | 220 | 100 |
| Max. torsional backlash [c] [arcmin] | Standard | ≤ 5 | ≤ 3 | ≤ 4 | ≤ 1 | ≤ 3 | ≤ 1 | ≤ 3 |
| | Reduced | ≤ 3 | ≤ 1 | ≤ 2 | – | ≤ 1 | ≤ 1 | ≤ 1 |
| **Output shape** | | | | | | | | |
| Smooth shaft | | x | – | x | – | – | – | – |
| Shaft with key [d] | | 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 | | – | – | – | – | – | – | – |
| **Input type** | | | | | | | | |
| Motor-mounted | | – | – | – | – | – | – | – |
| Self-contained version | | – | – | – | – | – | – | – |
| **Characteristic** | | | | | | | | |
| Flange with slotted holes | | – | – | x | x | – | – | – |
| ATEX [a] | | – | – | – | – | – | – | – |
| Food-grade lubrication [a] [b] | | x | x | x | x | x | x | x |
| Corrosion resistant [a] [b] | | – | – | – | – | x | x | x |
| Optimized mass Inertia [a] | | – | – | – | – | – | – | – |
| **System solutions** | | | | | | | | |
| Linear system (rack / pinion) | | x | x | x | x | x | x | x |
| **Accessories** (please refer to the product pages for further options) | | | | | | | | |
| Coupling | | x | x | – | – | x | x | x |
| Shrink disc | | x | – | x | – | – | – | – |
| Power cable, signal cable, hyprid cable | | x | x | x | x | x | x | x |

[a] Power reduction: technical data available on request
[b] Please contact WITTENSTEIN alpha
[c] In relation to reference sizes
[d] Power reduction: Please use our sizing software cymex® for a detailed sizing – **www.wittenstein-cymex.com**

# Overview of gearbox variants




## 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**

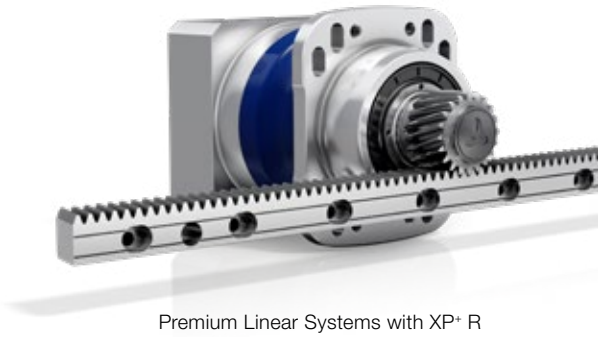
The XP+ gearboxes are available with an SP+ output compatible housing (square). It is necessary to also choose the SP+ compatible output shaft in order to achieve full output compatibility. The technical data is similar to the SP+. Please contact WITTENSTEIN alpha for detailed information.

**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⁺, XPK⁺ and XPC⁺ 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⁺ family as both a coaxial and a right-angle version, with a host of design options.



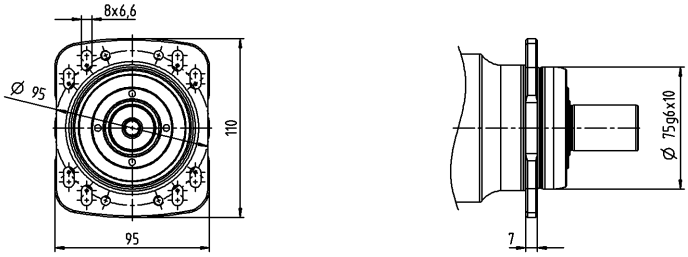
Premium Linear Systems with XP⁺ R

## Benefits compared to the standard version:

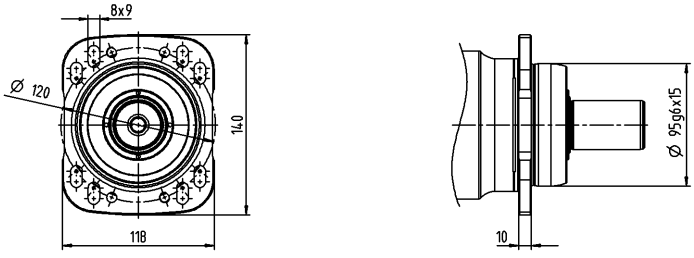
- Easy mounting and positioning of the gearbox with a mounted pinion in relation to the rack
- Lower design costs
- Potential saving because no additional design elements are needed, e.g. intermediate plates
- More design freedom due to higher compactness

## Views

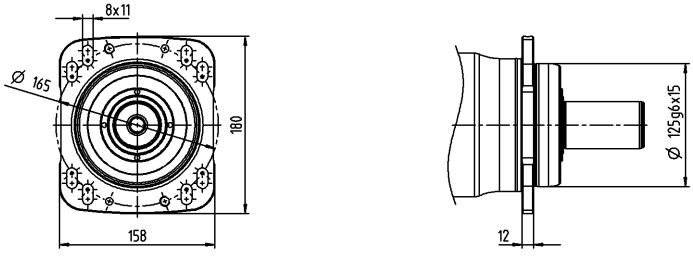
XP⁺ 020 R




XP⁺ 030 R




XP⁺ 040 R




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

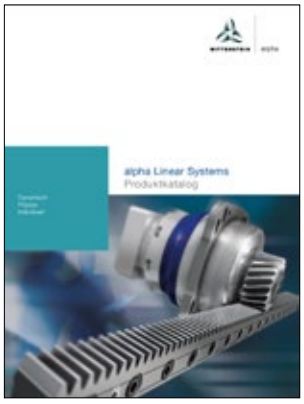
# alpha Premium Linear Systems

## 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**

## 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® 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.

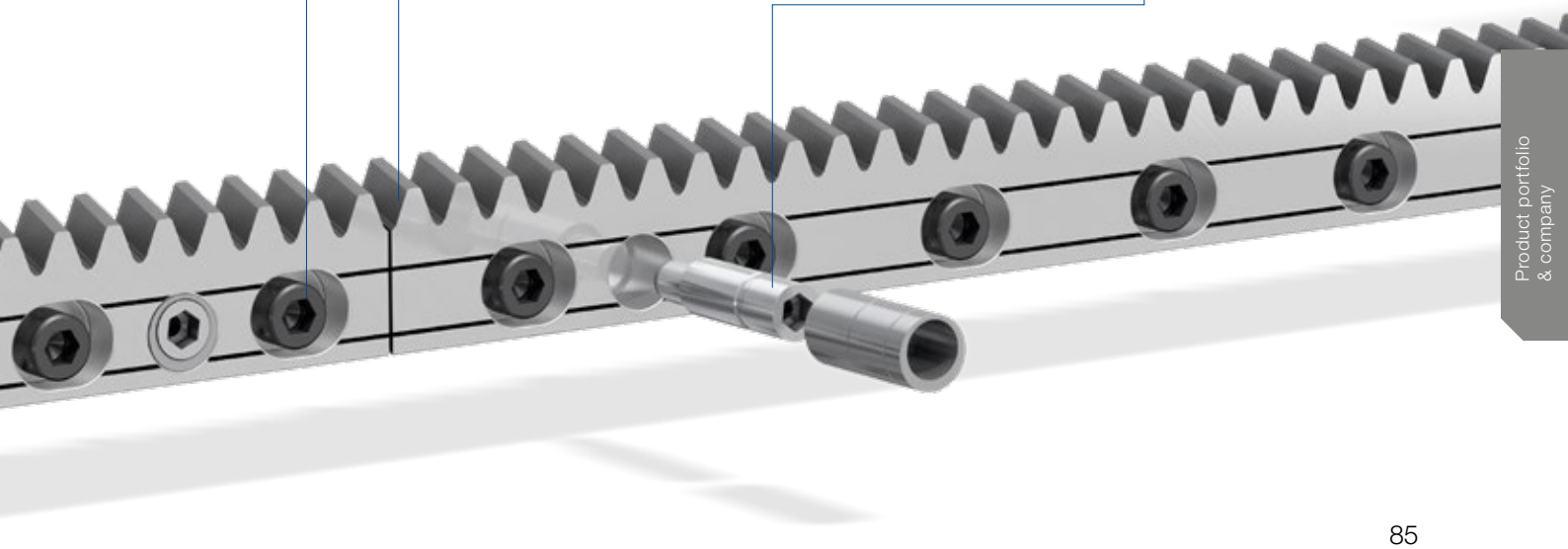
## INIRA® pinning: Simply better and more efficient

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® clamping

INIRA® adjusting

INIRA® pinning



# 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

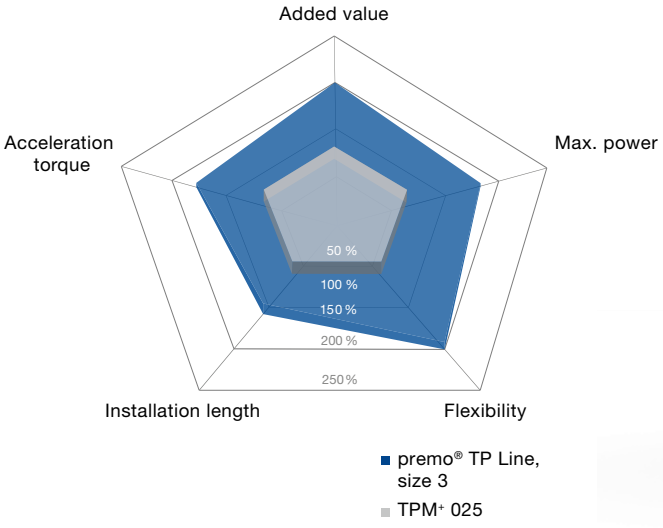
- Higher machine performance thanks to higher acceleration torque
- High torque density combined with a compact design allow for the realization of higher performance machines with significant space saving
- Improved connectivity to next generation controllers from leading system providers through the 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

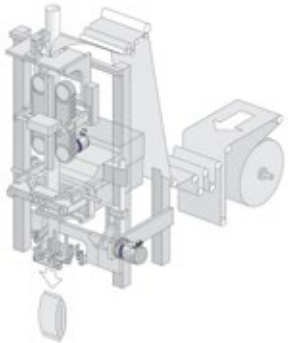
Flexible mechanical and electrical interfaces for high scalability

Variety of options for individually upgrading the basic configuration

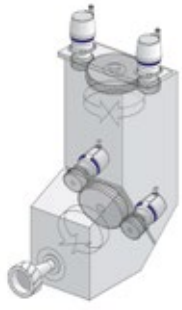



## premo® application examples

Handling portal
premo® SP Line



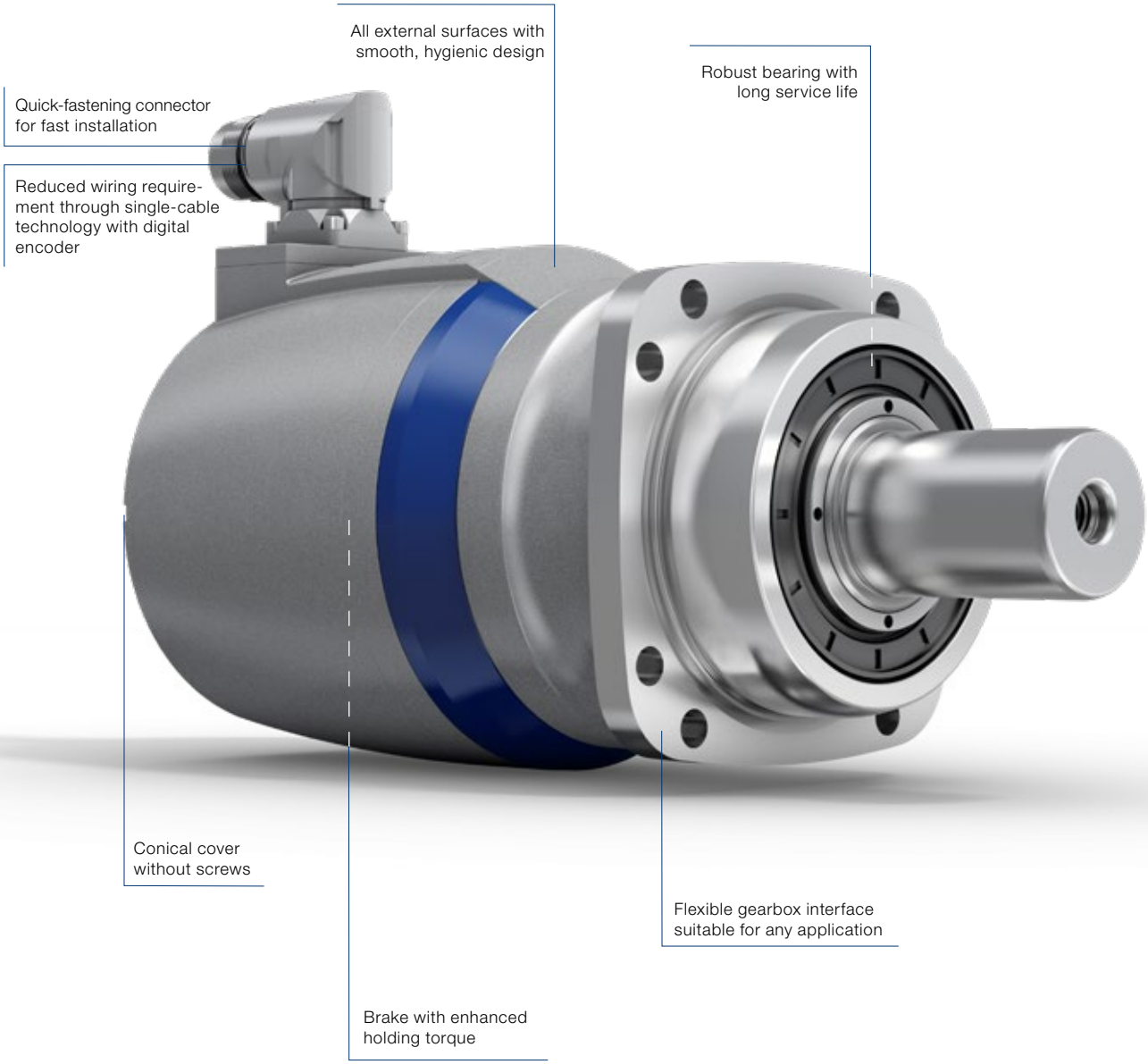
Fill and Seal machine
premo® TP Line



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)



# Galaxie® drive system – Performance in a new dimension

HERMES AWARD 2015

INNOVATIONSPREIS DER DEUTSCHEN WIRTSCHAFT

## Next Technology Drive

This award-winning innovation by WITTENSTEIN surpasses all previous drives in terms of torsional backlash, torque density, stiffness and compactness. The innovative core of the Galaxie® is that the drive makes almost full surface contact during power transmission, which produces a defined torque density as well as exceptional torsional rigidity and zero backlash – even at the zero crossing.

## Product highlights

**Our advantage and your benefit:**

High torsional rigidity

No backlash – even at the zero crossing

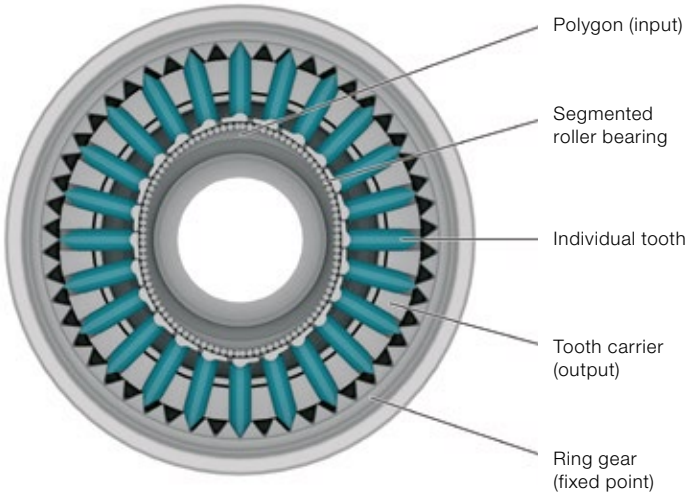
Hydrodynamic surface contact

Maximum torque density

High robustness

Hollow shaft

## Schematic diagram

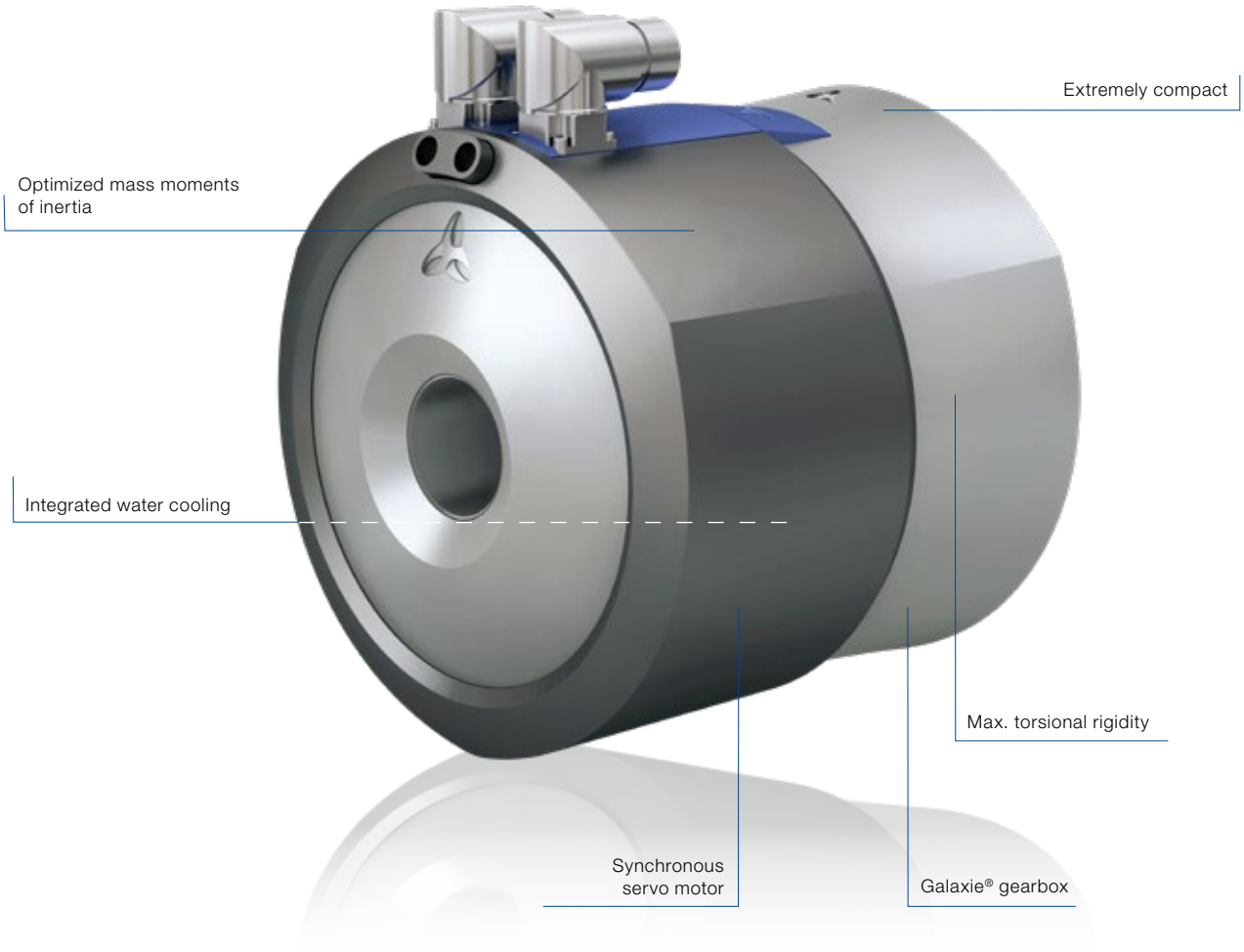


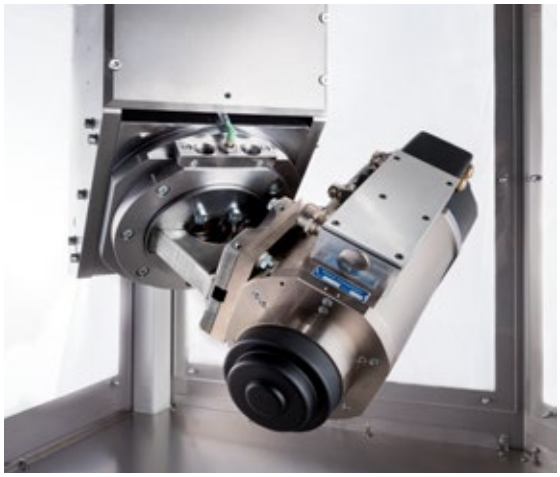

## Complete system under one roof

Options:

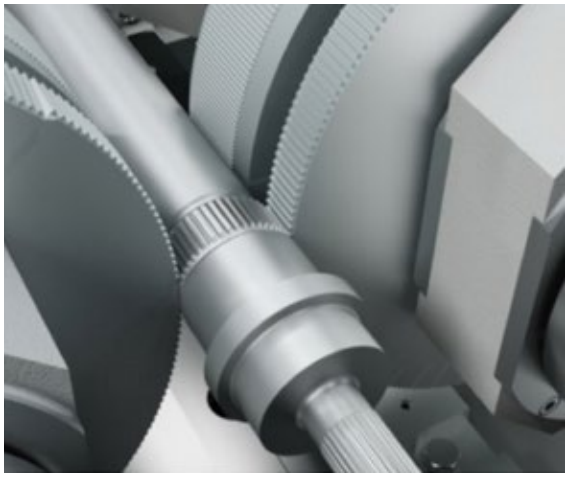
· Integrated holding brake
· Different feedback systems
· Additional encoder system at the input

Find out more about the Galaxie® by simply scanning the QR code using your smartphone.



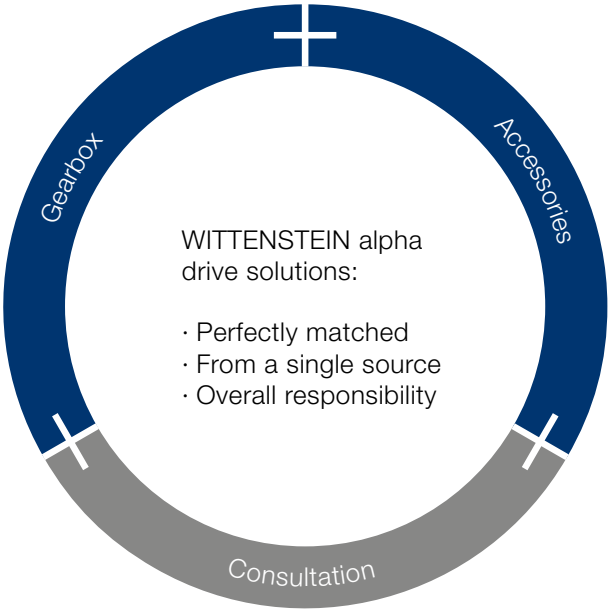
Galaxie® mounted on a milling cutter manufactured by Maka Systems GmbH for processing carbon composite materials – High Speed for maximum component quality



Galaxie® in a spline rolling machine – faster processing speeds increase productivity by 40 %

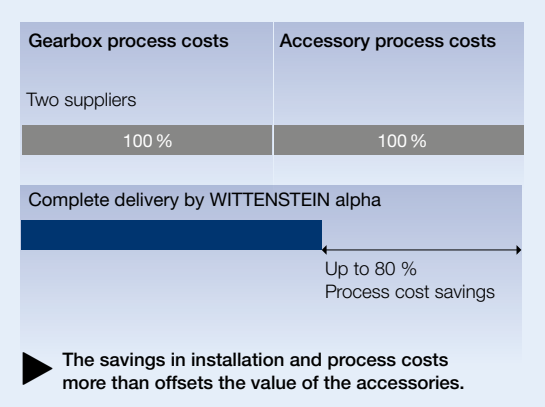
# Accessories – smart additions for intelligent performance

## 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.




## 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

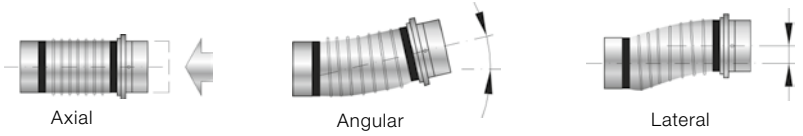
## Preferred shrink disk series

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**

# 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

alpha Premium

alpha Advanced

alpha Value

alpha Basic

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)

For more coupling types, please visit **www.wittenstein-alpha.com**

# 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.

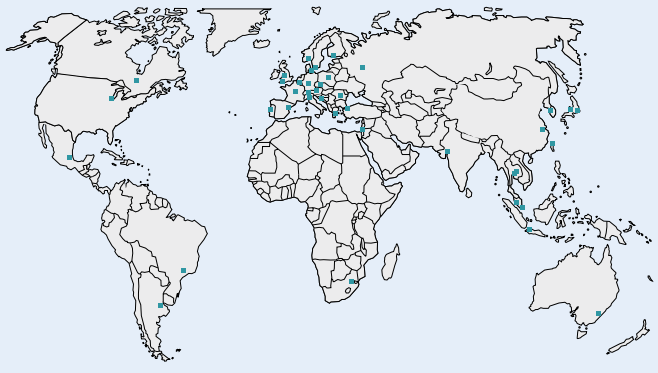
### Personal consultation
Our highly qualified and committed expert personnel will accompany you throughout the entire product lifecycle - around the clock. When it comes to customer support, you can count on us!

## Design

Consultation
CAD POINT
SIZING ASSISTANT
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, the SIZING ASSISTANT 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

### 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

**Special gearboxes:**

- Gearing design and development
- Development and production of special gearboxes
- Send all inquiries to: **sondergetriebe@wittenstein.de**

### CAD POINT

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

### SIZING ASSISTANT

- Efficient online design within seconds
- Convenient comparison function
- Automatic geometry adjustment

### 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

### Maintenance and inspection

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

### Repair

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

### cymex® statistics

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

### WITTENSTEIN Service Portal

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

### 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.

## Installation training

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

## 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.

## 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

With approximately 2,900 employees worldwide, WITTENSTEIN SE stands for innovation, precision and excellence in the world of mechatronic drive technology, both nationally and internationally. The group is active in seven innovative fields of business. Furthermore, WITTENSTEIN SE 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

WITTENSTEIN | alpha

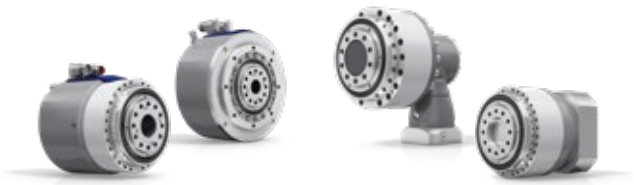
WITTENSTEIN alpha GmbH
High-precision servo drives and linear systems

WITTENSTEIN | cyber motor

WITTENSTEIN cyber motor GmbH
Highly dynamic servo motors and drive electronics

WITTENSTEIN | galaxie

WITTENSTEIN galaxie GmbH
Superior gearboxes and drive systems



WITTENSTEIN | motion control

WITTENSTEIN motion control GmbH
Customized linear and rotary servo systems

WITTENSTEIN | aerospace & simulation

WITTENSTEIN aerospace & simulation GmbH
Mechatronic drive systems for aerospace & simulation

attocube
WITTENSTEIN Group

attocube systems AG
Nanoprecision drive and measurement technology solutions

baramundi

baramundi software AG
Secure management of IT infrastructure in offices and production areas

# 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**

## 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 ≤ 1000 / hour
· Duty cycle < 60 % and < 20 minutes

Recommended gearbox model: MF / MA version

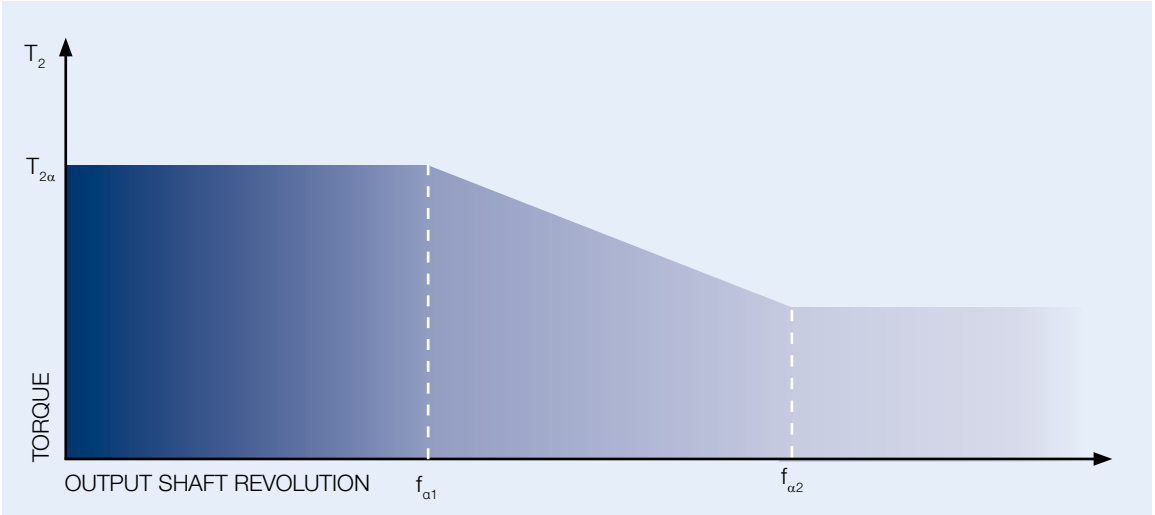
**2. Continuous operation S1:**
· Duty cycle ≥ 60 % or ≥ 20 minutes

Recommended gearbox model: MC 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 ($f_\alpha$).

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 $M_{2kmax}$:

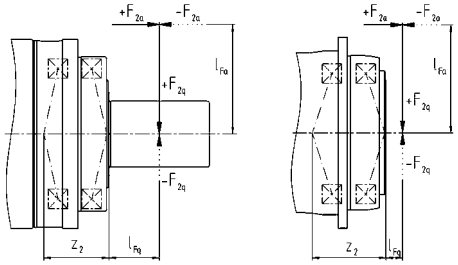
The maximum tilting moment $M_{2kmax}$ can be calculated using the following formula:

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

## Adapter plate

WITTENSTEIN alpha uses a system of standardized adapter plates to connect the motor and the gearbox, making it possible to mount a WITTENSTEIN alpha gearbox to any desired motor without difficulty.

## Angular minute

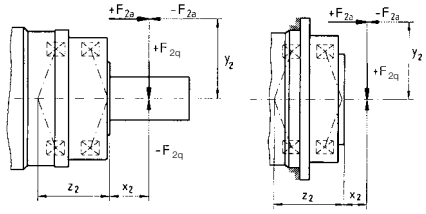
A degree is subdivided into 60 angular minutes (= 60 arcmin = 60‘).

Example:
If the torsional backlash is $j_t = 1$ arcmin, the output can be turned 1/60°. The repercussions for the application are determined by the arc length:
$b = 2 \cdot \pi \cdot r \cdot \alpha° / 360°$.
Example:
A pinion with a radius r = 50 mm mounted on a gearbox with torsional backlash $j_t = 3$ arcmin can be turned b = 0.04 mm.

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

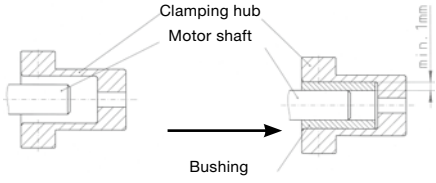
The axial force acting on a gearbox runs parallel to its output shaft or perpendicular to its output shaft. It may be applied with axial offset via a lever arm $y_2$ under certain circumstances, in which case it also generates a bending moment. If the axial force exceeds the permissible catalog values (max. axial force $F_{2AMax}$), additional design features (e.g. axial bearings) must be implemented to absorb these forces.

Example with output shaft and flange:




## Bushing

If the motor shaft diameter is smaller than the **→ clamping hub**, a bushing is used to compensate the difference in diameter. The bushing must have a minimum thickness of 1 mm and a motor shaft diameter of 2 mm.




## CAD POINT

Performance data, dimension sheets and CAD data for all types of gearbox can be found online in our CAD POINT together with comprehensive documentation of the selection.
(www.wittenstein-cad-point.com)

## Clamping hub

The clamping hub ensures a frictional connection between the motor shaft and gearbox. A **→ bushing** is used as the connecting element if the motor shaft diameter is smaller than that of the clamping hub. Optionally, a positive connection via a parallel key is also possible.

## Continuous operation (S1)

Continuous operation is defined by the **→ duty cycle**. If the duty cycle is greater than 60 % and / or longer than 20 minutes, this qualifies as continuous operation. **→ Operating modes**

## Cyclic operation (S5)

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 for download from our website (www.wittenstein-cymex.com). We can also provide training to enable you to make full use of all the possibilities provided by the software.

## Degree of protection (IP)

The various degrees of protection are defined in DIN EN 60529 “Degrees of protection offered by enclosure (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 the protection against the ingress of water.

Example: **IP65**

| | |
|---|---|
| Protection against the ingress of dust (dust-proof) | Protection against spray water |

## 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 pause time $t_e$.

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

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

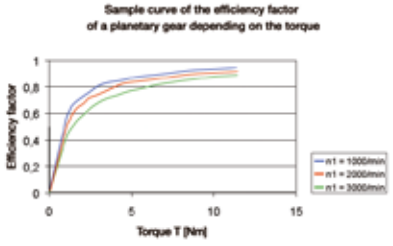
## Emergency stop torque ($T_{2Not}$)

The Emergency stop torque $T_{2Not}$ is the maximum permissible torque at the gearbox output and must not be reached more than 1000 times during the life of the gearbox. It must never be exceeded!

## Efficiency ($\eta$)

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

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




WITTENSTEIN alpha always measures the efficiency of a gearbox during operation at full load. If the input power or torque are 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 expected at high speeds (see illustration).

## 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 explosion groups and categories, as well as further information on the relevant gearbox are available upon request.

## HIGH SPEED (MC)

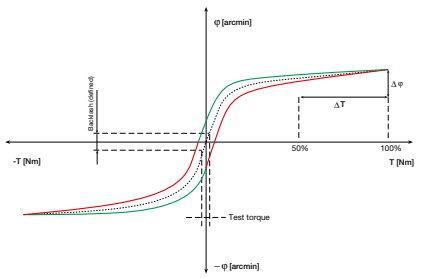
The HIGH SPEED version of our gearbox has been specially developed for applications in continuous operation at high input speeds, e.g. as found in the printing and packaging industries.

## HIGH TORQUE (MA)

WITTENSTEIN alpha gearboxes are also available in a HIGH TORQUE version. These gearboxes are particularly suited to applications requiring extremely high torques and maximum stiffness.

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

## Jerk (*j*)

Jerk is derived from acceleration and is defined as the change in acceleration within a unit of time. The term impact is used if the acceleration curve changes abruptly and the jerk is infinitely large.

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

The max. lateral force $F_{2QMax}$ [N] is the force component acting at right angles to the output shaft or parallel to the output flange. It acts perpendicular to the → axial force and can assume an axial distance of $x_2$ in relation to the shaft nut or shaft flange, which acts as a lever arm. The lateral force produces a bending moment (see also → axial force).

## Mass inertia ratio ($\lambda$ = Lambda)

The mass inertia ratio $\lambda$ 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 differing mass moments of inertia and as $\lambda$ becomes greater. WITTENSTEIN alpha recommends that a guideline value of $\lambda < 5$ is maintained. A gearbox reduces the external mass moment of inertia by a factor of $1/i^2$.

$$\lambda = \frac{J_{extern}}{J_{intern}}$$

$J$ reduced externally at input:

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

Simple applications ≤ 10

Dynamic applications ≤ 5

Highly dynamic applications ≤ 1

## Mass moment of inertia (*J*)

The mass moment of inertia $J$ [kg/cm²] is a measurement of the effort applied by an object to maintain its momentary condition (at rest or moving).

## Mesh frequency ($f_z$)

The mesh frequency may cause problems regarding vibrations in an application, especially if the excitation frequency corresponds to a intrinsic frequency of the application. The mesh frequency can be calculated for planetary gearboxes from WITTENSTEIN alpha (exception: gearboxes with ratio $i$ = 8) using the formula $f_Z = 1.8 \cdot n_2$ [rpm] and on planetary gearboxes from WITTENSTEIN alpha, is independent of the ratio. If it does indeed become problematic, the intrinsic frequency of the system can be changed or another gearbox (e.g. hypoid gearbox) with a different mesh frequency can be selected.

## No-load running torque ($T_{012}$)

The no-load running torque $T_{012}$ is the torque which must be applied to a gearbox in order to overcome the internal friction; it is therefore considered lost torque. The values specified in the catalog are calculated by WITTENSTEIN alpha at a speed of $n_1 = 3000$ rpm and an ambient temperature of 20 °C.

$T_{012}$: 0 1→2

0: without load

1→2: from input side towards output side

Idling 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 pauses, or whether it is designed for → **continuous operation** (S1), i.e. with long phases of constant motion.

## Operating noise ($L_{PA}$)

The gear ratio and speed affect the noise level. As a general rule: A higher speed means a higher noise level, while a higher ratio means a lower noise level. The values specified in our catalog are based on a reference ratio and speed. The reference speed is either n1= 3000 rpm or n1= 2000 rpm depending on the size of the gearbox. You can find ratio-specific values in cymex® – www.wittenstein-cymex.com.

## Output shaft revolution ($f_\alpha$)

Factor $f_\alpha$ determines the number of life time cycles for the required gearbox service life. It describes the number of revolutions at the output used to assess the torque permitted at the output.

→ Refer to this term for further details.

# Glossary – the **alpha**bet

## Positioning accuracy

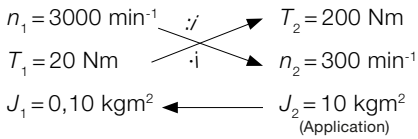
The positioning accuracy is determined by the angular deviation from a setpoint and equals the sum of the torsional angles due to load **→(torsional rigidity and torsional backlash)** and kinetics**→(synchronization error) occurring simultaneously in practise** .

## Quality control

All Premium and Advanced gearboxes are subject to a final inspection before they leave the WITTENSTEIN alpha factory to ensure that they are all delivered within specification.

## Ratio (*i*)

The gear 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 gearing elements (Example: i = 10).




## Safety note

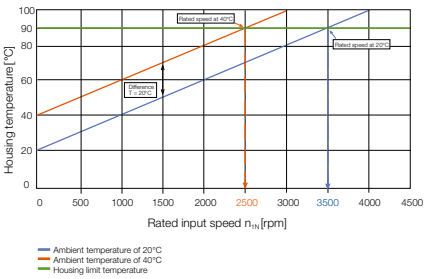
For applications with special safety requirements (e.g. vertical axes, clamped drives), we recommend exclusive use of our Premium and Advanced products (excluding V-Drive).

## SIZING ASSISTANT

The online SIZING ASSISTANT from WITTENSTEIN alpha allows the efficient selection of a gearbox in seconds. You can use various motor or application entry options to select the right gearbox for your application in seconds (www.sizing-assistant.com).

## Speed (*n*)

Two speeds are of relevance when dimensioning a gearbox: the maximum speed and the thermal speed limit at the input. The maximum permissible speed $n_{1Max}$ must not be exceeded because it serves as the basis for dimensioning **→cyclic operation**. The nominal speed $n_{1N}$ must not be exceeded in **→continuous operation**. The thermal speed limit $n_{1T}$ at an ambient temperature of 20° C, is determined by the maximum gearbox temperature of T = 90° C at no-load. As can be seen in the diagram below, the temperature limit is reached more quickly in the presence of an elevated outside temperature. In other words: the nominal input speed must be reduced if the ambient temperature is high.




## Delivery of speedline®

If necessary, you can receive delivery of standard series in 24 or 48 hours ex works. Outstanding flexibility for fast deliveries at short notice

## Synchronization

Synchronization refers to the measurable speed variation between the input and output during one revolution of the output shaft. It is caused by manufacturing tolerances and causes minute angular deviations and ratio fluctuations.

## Technical data

You can download further technical data relating to the entire product portfolio from our website

## Tilting rigidity

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

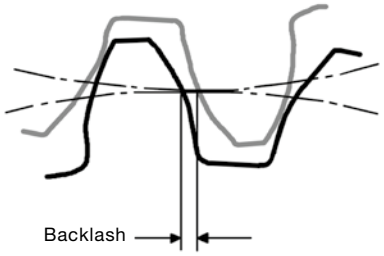
($C_{2K} = M_{2K}/\Phi$).

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

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

## Torsional backlash ($j_t$)

Torsional backlash $j_t$ [arcmin] is the maximum angle of torsion of the output shaft in relation to the input. Simply put, the torsional backlash represents the gap between two tooth flanks.



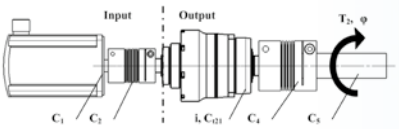

Torsional backlash is measured with the input shaft locked.

The output is then loaded with a defined test torque in order to overcome the internal gearbox friction. The main factor affecting torsional backlash is the face clearance between the gear teeth. The low torsional backlash of WITTENSTEIN alpha gearboxes is due to their high manufacturing accuracy and the specific combination of gear wheels.

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

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

Torsional rigidity $C$, angle of torsion $\Phi$




Reduce all torsional rigidity values at the output:

$$C_{(n),out} = C_{(n),in} * i^2$$

with $i$ = Gearbox ratio [ - ]

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

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

Series connection of torsional rigidity values

$1/C_{tot} = 1/C_{1,out} + 1/C_{2,out} + \ldots + 1/C_{(n)}$

Angle of torsion $\Phi$ [arcmin]

$\Phi = T_2 * 1/C_{tot}$
with $T_2$ = output torque [Nm]

## Torque (*M*)

The torque is the actual driving force of a rotary motion. The force and lever arm combine to produce the torque that acts around the axis of rotation. $M = F \cdot l$

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

$T_{2\alpha}$ represents the maximum torque transmitted by the gearbox. This value may decrease depending on the application-specific conditions and the precise evaluation of the movement profile.

→ Refer to this term for further details.

# Glossary – Formulae

**Formulae**

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

**Conversion table**

| | |
|---|---|
| **1 mm** | = 0.039 in |
| **1 Nm** | = 8.85 in.lb |
| **1 kgcm$^2$** | = 8.85 x 10$^{-4}$ in.lb.s$^2$ |
| **1 N** | = 0.225 lb$_f$ |
| **1 kg** | = 2.21 lb$_m$ |

**Symbol**

| Symbol | Unit | Designation |
|---|---|---|
| *C* | Nm/arcmin | Stiffness |
| *ED* | %, min | Duty cycle |
| *F* | N | Force |
| $f_s$ | – | Load factor |
| $f_e$ | – | Factor for duty cycle |
| *i* | – | Ratio |
| *j* | arcmin | Backlash |
| *J* | $kgm^2$ | 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+ / RP+ – Ordering code

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

**Product type**
XP+
RP+

**Size**
010 – 050
030 – 080

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

**Gearbox variant**
M = Motor-mounted
S = Self-contained

**Gearbox model**
F = Standard
A = HIGH TORQUE
C = HIGH SPEED

**Number of stages**
1 = 1
2 = 2
3 = 3

**Ratio**

**Output shape (Shaft)**
0 = Smooth shaft
1 = Shaft with key
2 = Splined shaft (DIN 5480)
3 = System output
4 = Other
5 = Blind hollow shaft

**Clamping hub diameter**
(see table)
For self-contained version: input shaft shape

**Backlash**
1 = Standard
0 = Reduced

**Output shape (Flange)**
0 = Flange
3 = System output
4 = Other

**Generation**
2

**Motor connection**
A = Optimized mass inertia
K = Coupling
N = Keyed clamping hub socket
S = Clamping hub socket

# XPK+ / RPK+ – Ordering code

| XPK+ | 020 | S | – | M | F | 2 | – | 50 | – | 0 | E | 1 | – | 1 | K | 0 | 0 | – | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Product type**
XPK+
RPK+

**Size**
020 – 050
040 – 080

**Characteristic**
F = Food grade lubrication
R = Flange with slotted holes
S = Standard
W = Corrosion resistant

**Gearbox variant**
M = Motor-mounted

**Gearbox model**
F = Standard
A = HIGH TORQUE

**Number of stages**
2 = 2
3 = 3
4 = 4

**Ratio**

**Output shape (Shaft)**
0 = Smooth shaft
1 = Shaft with key
2 = Splined shaft (DIN 5480)
3 = System output
4 = Other
5 = Blind hollow shaft

**Clamping hub diameter**
(see table)

**Backlash**
1 = Standard
0 = Reduced

**Generation**
1

**Motor connection**
A = Optimized mass inertia
K = Coupling
N = Keyed clamping hub socket
S = Clamping hub socket

**Number of input stages**
0 = 0
1 = 1

**Output shape (Flange)**
0 = Flange
3 = System output
4 = Other

**Number of output stages**
1 = 1
2 = 2

**RPK+ orientation to the application (see diagram)**
A = 6 o'clock
B = 9 o'clock
C = 12 o'clock
D = 3 o'clock

# XPC⁺ / RPC⁺ – Ordering code

| XPC+ | 010 | S | – | M | F | 2 | – | 10 | – | 0 | C | 1 | – | 1 | K | 0 | 0 | – | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Product type**
XPC⁺
RPC⁺

**Size**
010 – 050
040 – 060

**Characteristic**
F = Food grade lubrication
R = Flange with slotted holes
S = Standard
W = Corrosion resistant

**Gearbox variant**
M = Motor-mounted

**Gearbox model**
F = Standard
A = HIGH TORQUE

**Number of stages**
2 = 2
3 = 3
4 = 4

**Ratio**

**Output shape (Shaft)**
0 = Smooth shaft
1 = Shaft with key
2 = Splined shaft (DIN 5480)
3 = System output
4 = Other
5 = Blind hollow shaft

**Output shape (Flange)**
0 = Flange
3 = System output
4 = Other

**Clamping hub diameter**
(see table)

**Backlash**
1 = Standard
0 = Reduced

**Generation**
1

**Motor connection**
A = Optimized mass inertia
K = Coupling
N = Keyed clamping hub socket
S = Clamping hub socket

**Number of input stages**
0 = 0
1 = 1

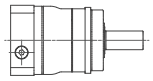
**Number of output stages**
1 = 1
2 = 2

**RPC⁺ orientation to the application (see diagram)**
A = 6 o'clock
B = 9 o'clock
C = 12 o'clock
D = 3 o'clock

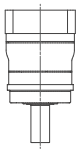
# Mounting positions and clamping hub diameters

## Planetary gearboxes

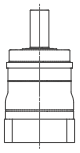
B5
Horizontal



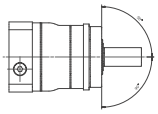
V1
Output vertical downwards



V3
Output vertical upwards



S
Can be tilted ±90° from a horizontal position



### Clamping hub diameter
(see technical data sheet for possible diameters)

| Code letter | mm |
|---|---|
| B | 11 |
| C | 14 |
| E | 19 |
| G | 24 |
| H | 28 |

| Code letter | mm |
|---|---|
| I | 32 |
| K | 38 |
| M | 48 |
| N | 55 |

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

## Hypoid and bevel gearboxes

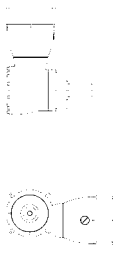
**For information purposes only – not required when placing orders!**

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



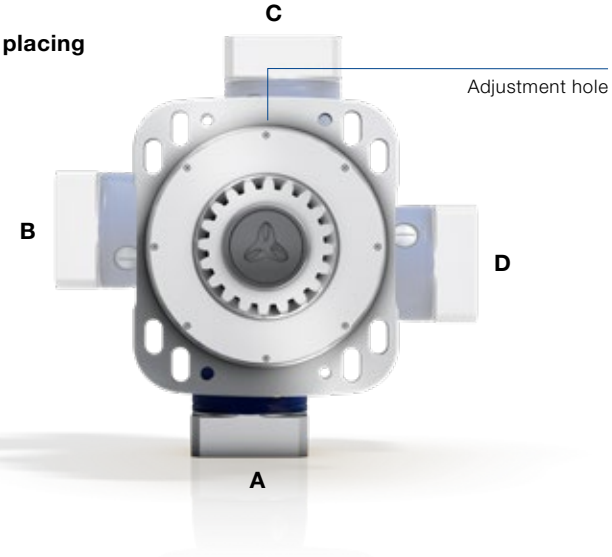
B5 / B5
Output horizontal / motor shaft horizontal





## Orientation to the application

**Please note the orientation when placing your order.**



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