

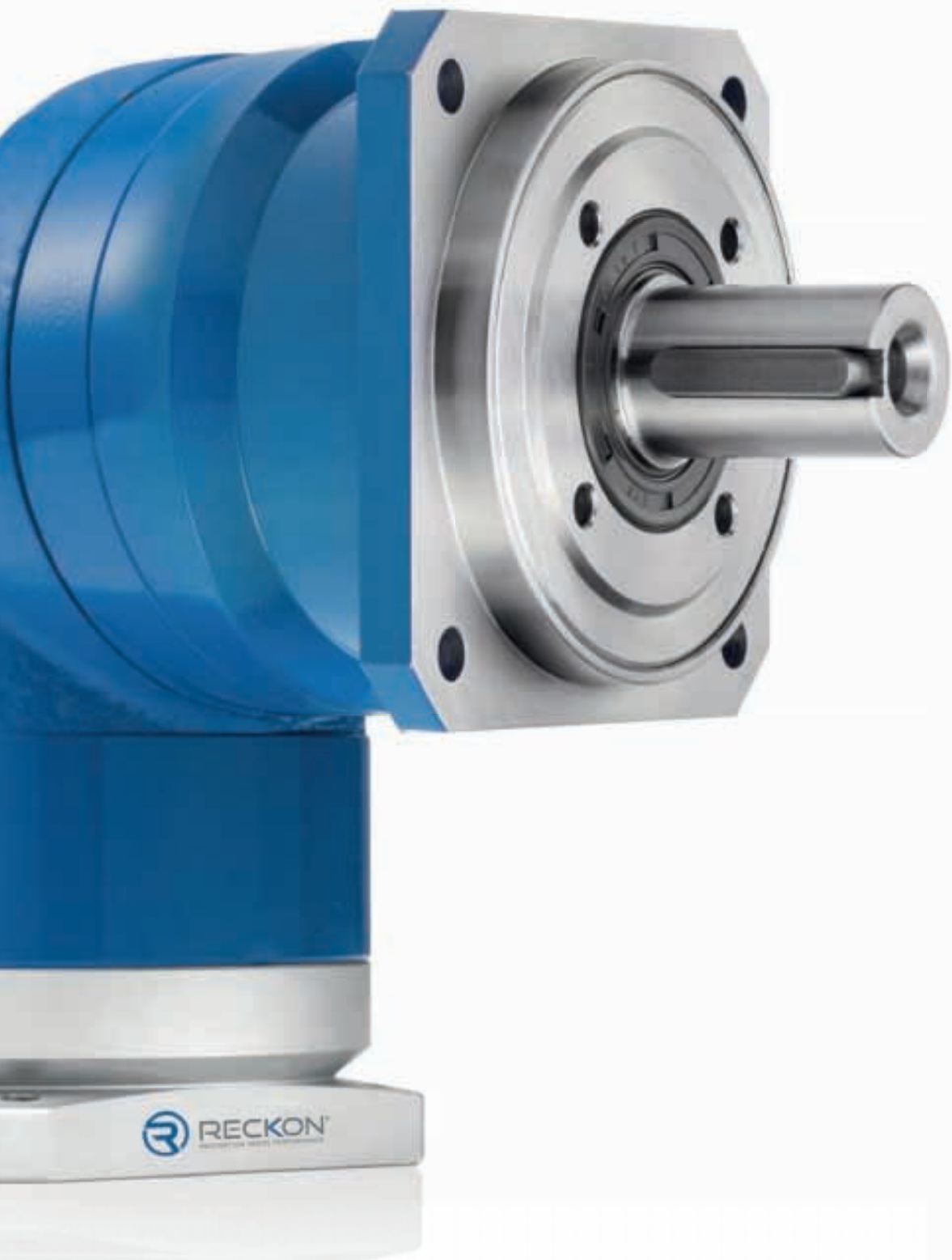


LOW BACKLASH
PLANETARY GEARBOXES



A blue-tinted photograph of a mechanical assembly, possibly a robotic arm or a precision instrument, resting on a perforated metal surface. The assembly consists of several cylindrical and rectangular components, with some wires and connectors visible. The background is a plain, light-colored wall. The overall mood is industrial and precise.

You make every
second count



 RECKON[®]
INDUSTRIAL ACTUATORS

So we make every
arc-second count*

*Reckon offers 1 arc-min backlash
from size 40 mm to size 285 mm

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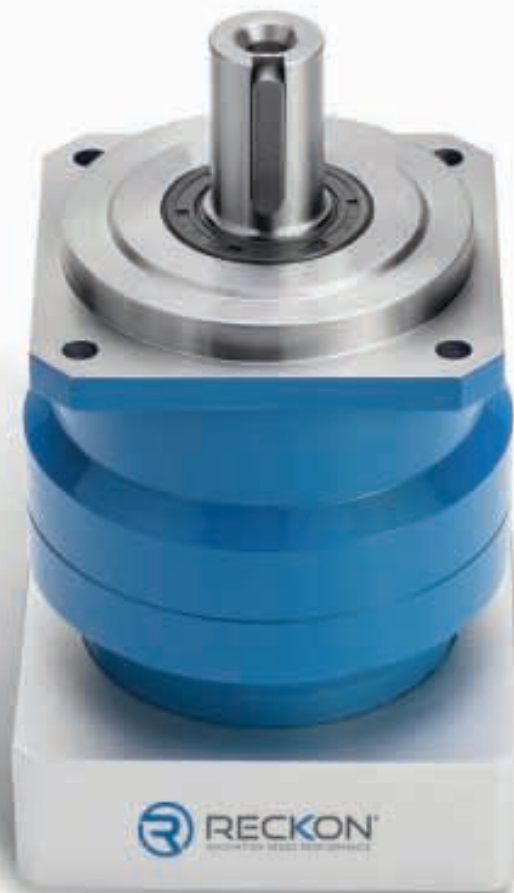
Meeting tomorrow's **health&safety** requirements implies reducing your system's operating noise level now.



Acoustic waves are emitted by most geared systems having their contact ratio (number of teeth being in contact at the same time in a gearbox) below 2 - like most spur geared systems.

Using helical gears allows increasing the contact ratio above 2 to offer quiet operation.

That is why all Reckon® gearboxes
only use helical gears.



Reliability is everything.

Helical gears are recognized for their silent operation, but on the other hand they generate strong axial efforts to the internal elements of the gearbox (such as friction disks, planet carriers or bearings) so using them unconsciously can be prejudicial to a planetary gearbox life.



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So we developed the **PerfectPitch™ Concept.**



PerfectPitch™

The PerfectPitch™ concept is a combination of features that we believe are necessary to provide silent, reliable planetary gearboxes.

- Reckon® gearboxes all use the smallest helix angle possible, in order to provide a silent operation while limiting axial efforts to the minimum.
- We only use carburized and quenched satellite gears, as we considered they allow the toughest operating conditions (sharp acceleration, emergency stops, fast reversals...).
- Every gearbox noise level is tested in our quiet room, at up to 6,000 rpm before shipment.
- All gear calculations were based on a 20,000 hour life with a servomotor, meaning 18,000 hours at maximum rated torque (or 10,000 in case of continuous direction) and 2,000 hours at maximum acceleration torque (1,000 in case of continuous direction movement).
- More importantly, our published data is amongst the most conservative on the market. Our torque ratings might appear pessimistic compared to some competitive data, but Reckon® wants every customer to be satisfied, rather than claiming unlikely product performance and jeopardizing your machine quality.
- We upsized all bearings (like the massive angular contact bearings in the Booster range or the tapered roller bearings featured in the X-TREME and ULTIMATE ranges). RECKON satellite gears only rotate on hand-assembled carburized needles (roller bearings without cages), as they allow more torque and a longer lifetime than caged bearings. Bearing calculation was based on combined maximal axial and radial forces over 20,000 hours.
- We designed our planet carriers as solid cages, so the gears are not free to displace axially. The consequent extra stiffness provided ensures that the gears pitch-lines remain well-aligned during acceleration or high torque phases.
- All our cages (except in the X-TREME range) are held by 2 bearings (one at each side), aimed at immobilizing them axially so they do not generate friction or damage to other internal elements. This construction increases stiffness, thus protecting the gears against breakage at teeth ends. Hertzian stress is better distributed alongside the pitch-line rather than focused at teeth ends.

How do planetary gearboxes work?

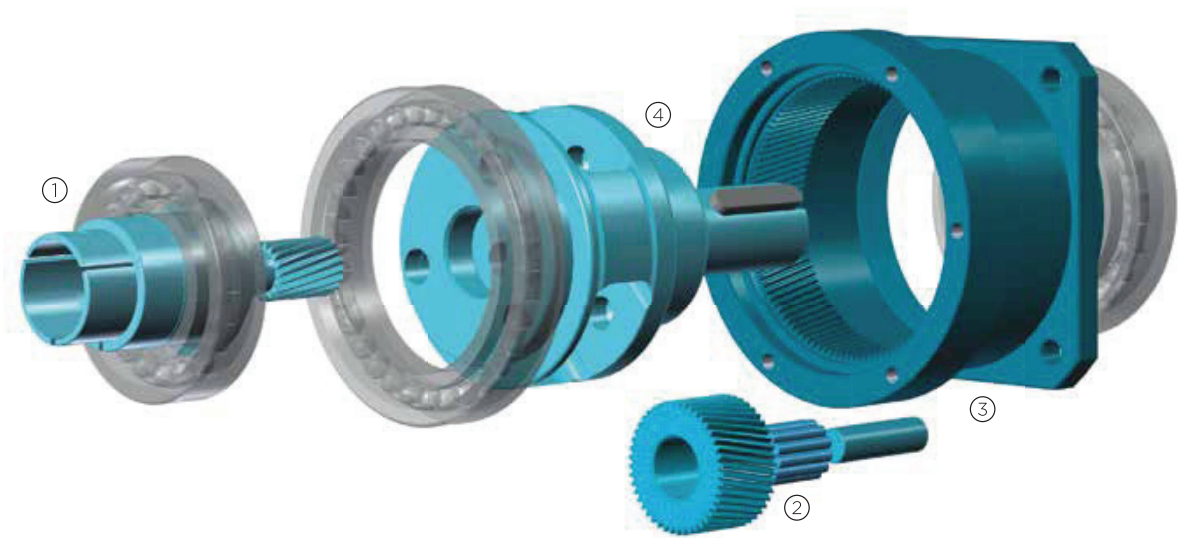
The sun gear (1) rotates together with your motor shaft.

It meshes simultaneously with 3 or more satellite gears (2)

Satellite gears rotate simultaneously around the sun gear and inside the ring gear (3)

- > The reduction ratio between the sun gear and the satellite gears is:
Satellite gears' number of teeth (Z2) / Sun gear's number of teeth (Z1)
- > The reduction ratio between the satellite gears and the ring gear is :
Ring gear's number of teeth (Z3) / satellite gears number of teeth (Z2)

The satellite gears rotate inside the ring gear the same direction your motor does. Since they are inserted in the planet carrier (4), the output shaft rotates the same speed the satellite gears rotate inside the ring gear.



Total reduction ratio between the sun gear and the output shaft is: $Z1/(Z1+Z3)$. It is an exact number.

Considering the need for a minimal number of teeth on the input pinion, it is generally considered that 1-stage gearboxes should not offer ratios above 10. Planetary gearboxes with ratios above 10 usually pile-up stages, so a ratio 25 gearbox is made of 2 ratio 5 stages. The motor speed will be divided by the exact ratio and its torque will be multiplied by ratio and efficiency.

Quality-based performance

All Reckon® planetary gearboxes are helical and feature the following elements:



High-precision, carburized and quenched gears made of premium Japanese steel.

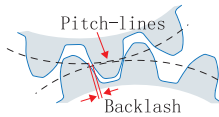
Offering superior performance, long lifetime and everlasting precision even under tough working conditions.



PerfectPitch™

PerfectPitch™ concept

Offering silent operation and high reliability to your gearbox.



Low backlash

<1 arc-min backlash option available on most 1-stage models.



Balanced input coupling

Offers a strong grip, avoiding vibration and preserving your motor shaft bearings against radial efforts.



Double-supported, caged planet carriers

Offering stiffness and ensuring perfect meshing of gears in acceleration phases.



Bearings, seals and lubricants from premium suppliers

We source our components safely from renowned worldclass suppliers.

THE RECKON® RANGE

5 coaxial lines. 4 right-angle lines. 11 configurations
from 6 Nm rated to 2,300 Nm rated.





IN-LINE GEARBOXES



	WISER	LIVELY	X-TREME	BOOSTER	ULTIMATE
Suitable for Servomotors	YES	YES	YES	YES	YES
Number of sizes in the line	3 sizes (60 to120)	7 sizes (40 to220)	6 sizes (60 to 210)	3 sizes (60 to120)	7 sizes (64 to285)
Range of rated torques in the line	25 Nm (size60) to 220Nm (size120)	7Nm (size 40) to 1450Nm (size 220)	25 Nm (size 60) to 1450 Nm (size 210)	25 Nm (size 60) to 265 Nm (size 120)	25 Nm (size 64) to 3717 Nm (size 285)
Angular precision	1 stage : < 5 arc-min 2 stages : < 8 arc-min	1 stage : < 3 arc-min 2 stages : < 5 arc-min	1 stage : < 3 arc-min 2 stages : < 5 arc-min	1 stage : < 3 arc-min 2 stages : < 5 arc-min	1 stage : < 3 arc-min 2 stages : < 5 arc-min
Low-backlash option	Not available	1 stage : 1 arc-min 2 stages: 3 arc-min	1 stage : 1 arc-min 2 stages: 3 arc-min	1 stage : 1 arc-min 2 stages: 3 arc-min	1 stage : 1 arc-min 2 stages: 3 arc-min
Efficiency	96% (1 stage) 93% (2 stages)	96 % (1 stage) 93% (2 stages)	96 % (1 stage) 93% (2 stages)	96 % (1 stage) 93% (2 stages)	96 % (1 stage) 93% (2 stages)
Interface (output side)	Round or square	Round (standard) or square (optional)	Square	Square	Round
Output	Shaft with / without a key	Shaft with / without a key	Shaft with / without a key	Shaft with / without a key	Rotating flange
Acceleration	++	+++	+++	++++	+++++
Fast reversals	++	+++	+++	++++	+++++
Radial efforts	++	++	++++	+++	+++++
Axial efforts	+	+	++++	+++	+++++
Stiffness	++	+++	+++	++++	+++++
Torque density	++	+++	+++	+++++	+++++
Motor shaft connection	Balanced coupling	Balanced coupling	Balanced coupling	Balanced coupling	Balanced coupling
Lubricant	Sumico Japan synthetic grease	Sumico Japan synthetic grease	Sumico Japan synthetic grease	Sumico Japan synthetic grease	Sumico Japan synthetic grease
External finish	Capri blue (RAL 5019)	Capri blue (RAL 5019)	Capri blue (RAL 5019)	Capri blue (RAL 5019)	Capri blue (RAL 5019)

Do not hesitate to contact us if you need help, our R&D dept will be happy to assist you... and do not forget that our standard 12-month warranty get extended to 18 months at no extra charge if you have your product selection checked by our engineers.



WISER

“+” or “X”
position of hole available

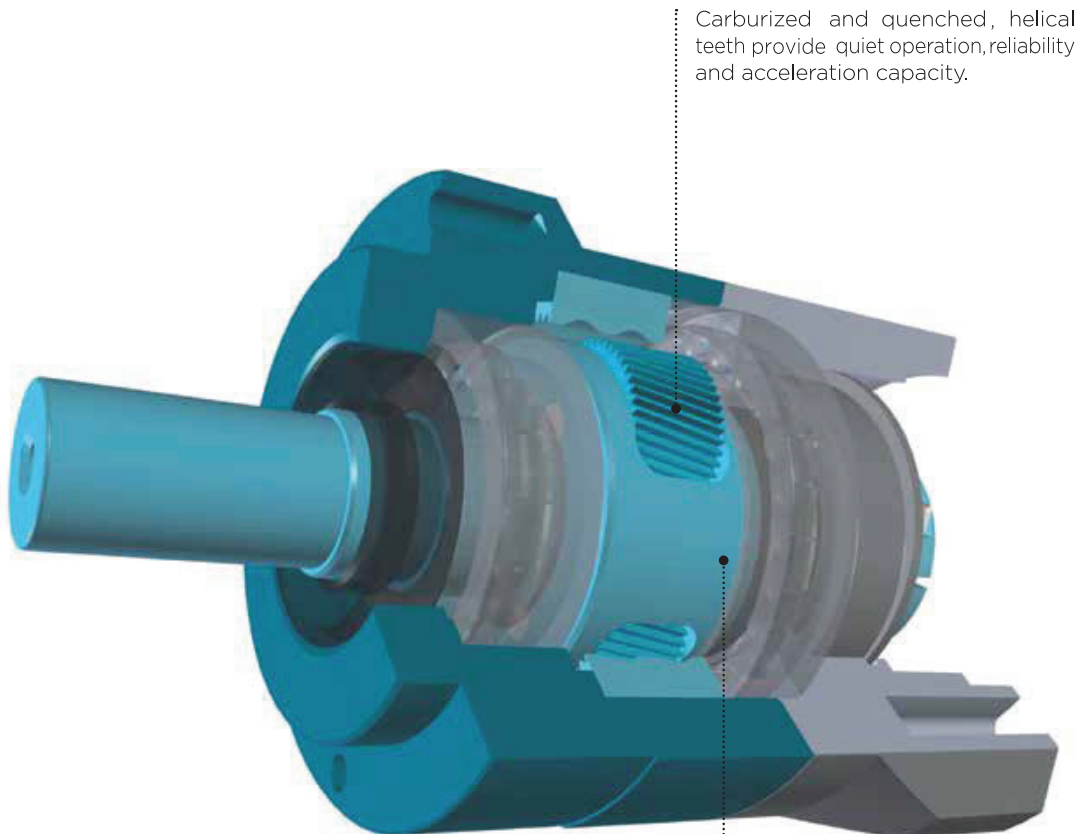


Acceleration capacity	++
Fast reversals	++
Radial efforts	++
Axial efforts	+
Stiffness	++
Precision	++
Economy	++++



WISER_ Internal construction

WISER is our entry-level model. Like all Reckon® gearboxes, it uses helical gears.



Carburized and quenched, helical teeth provide quiet operation, reliability and acceleration capacity.

The caged planet carrier, increases stiffness, reliability and acceleration capacity.

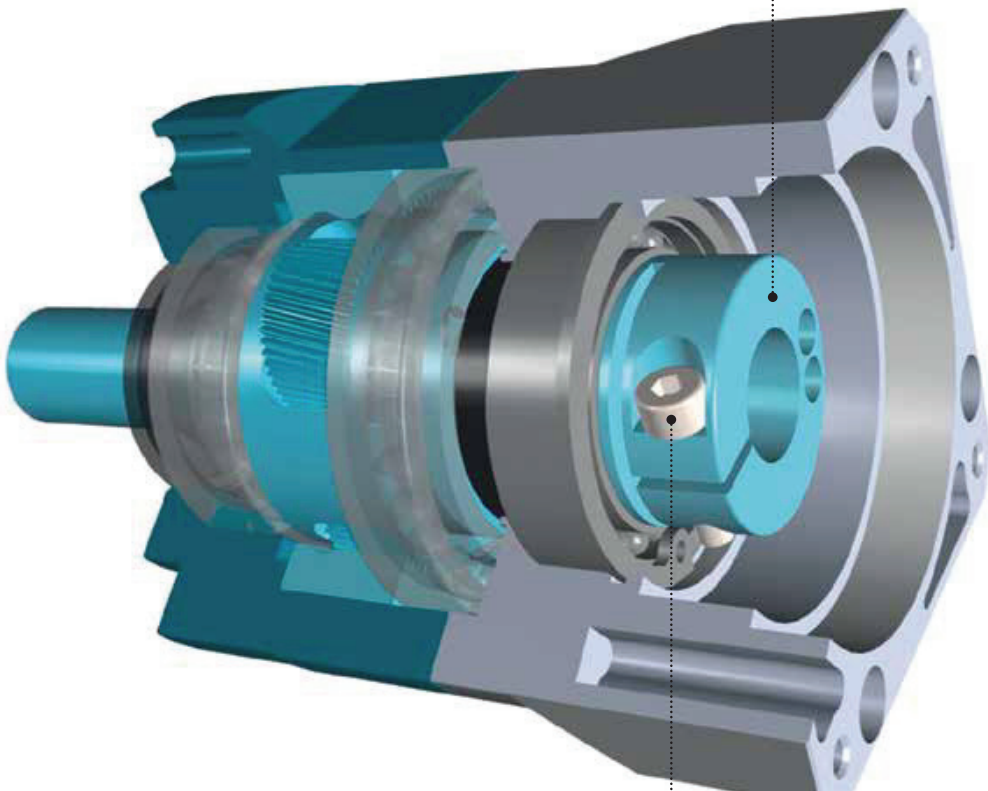
The planet carrier is dual-supported by radial bearings, to guarantee a perfect alignment of gears during operation.





PerfectPitch™

The balanced coupling limits vibrations and reduces efforts on your motor shaft bearings.



Easy and safe, 1-screw installation to your motor shaft.

WISER_Technical data

The WISER line is currently available in sizes 60 to 115 .

	RATIO	WISER-SQ / WISER-CI		
		60	90	120
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	50	120
	1/4	42	70	220
	1/5	43	82	202
	1/6	42	75	212
	1/7	42	75	198
	1/8	39	72	193
	1/9	33	66	151
	1/10	29	65	154
	1/15	25	50	120
	1/20	42	70	220
	1/25	43	82	202
	1/50	43	82	202
	1/80	39	72	193
	1/100	29	65	154
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	62	150
	1/4	52	87	272
	1/5	53	102	248
	1/6	51	91	260
	1/7	52	93	237
	1/8	45	90	227
	1/9	39	81	177
	1/10	37	80	168
	1/15	32	62	150
	1/20	52	87	272
	1/25	53	102	248
	1/50	53	102	248
	1/80	45	90	227
	1/100	37	80	168
Emergency stop torque $T_x^{(3)}$		3*T _{2n}		
Angular backlash (arc-min)	1 stage	standard ≤5		
	2 stages	standard ≤8		
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000
Maximum radial load ⁽⁶⁾ (N)		950	1,980	3,100
Maximum axial load (N)		400	850	1,850
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96		
	2 stages	>93		
Torsional stiffness (Nm / arc-min)		6	10	31
Lifetime ⁽⁸⁾		20,000 hours		
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C		
Max housing temperature (90°)		90°C		
Protection class		IP65		
Noise level (dB)		<65dB	<68dB	<70dB
Lubricant		Sumico grease (lubricated for life)		
Color		Capri blue (RAL 5019)		

(1) : Nominal output torque applicable 20,000 hours at rated speed.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : Emergency stop torque (100 occurrences maximum).

(4) : Speed at which the nominal torque is applicable 20,000 hours.

(5) : Peak speed only.

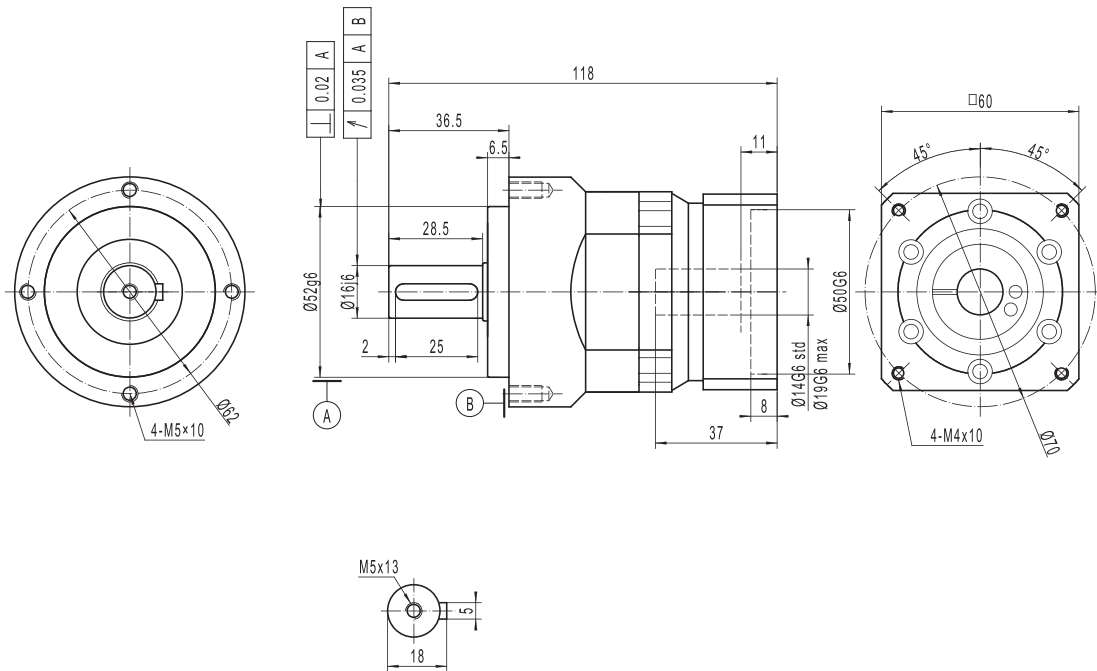
(6) : Applied at the middle of the output shaft at 300 rpm.

(7) : Measured at full load and at 25°C.

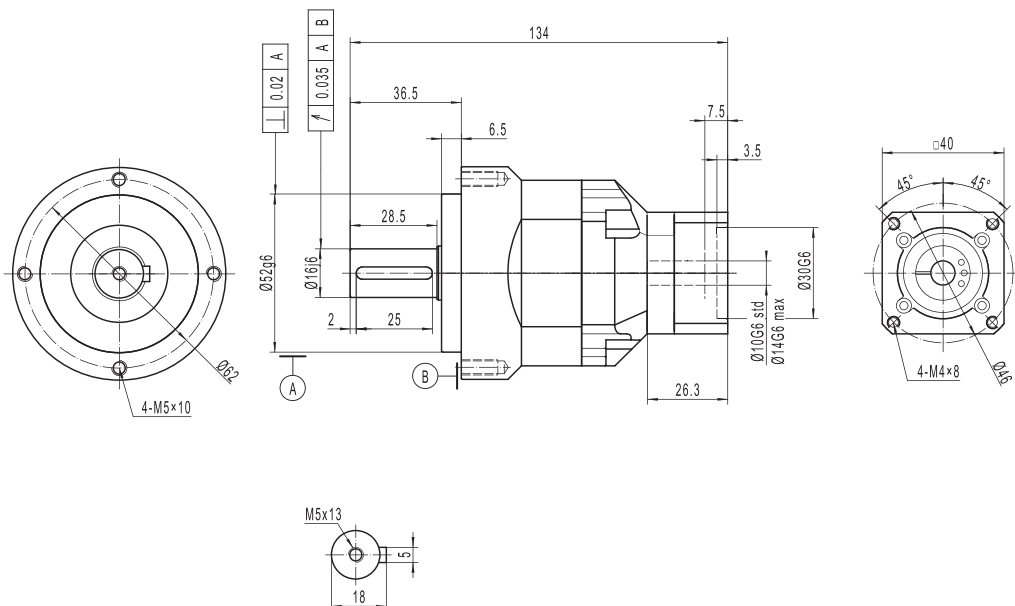
(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

(9) : Room temperature. Refer to temperature factors on page 140.

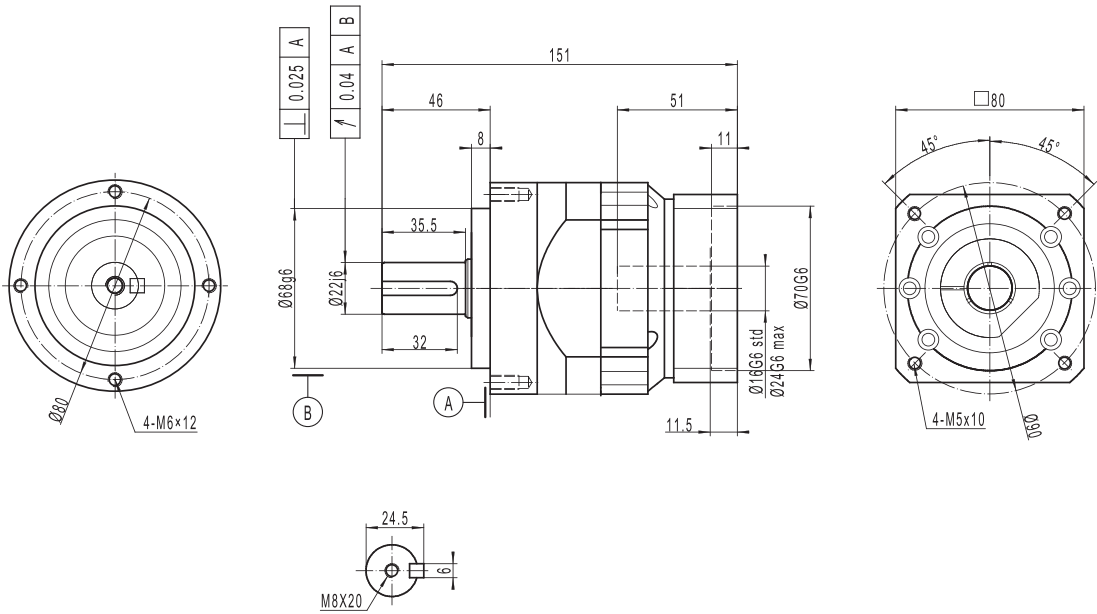
WISER CI-ST-060-1 STAGE - RATIOS 3 TO 10



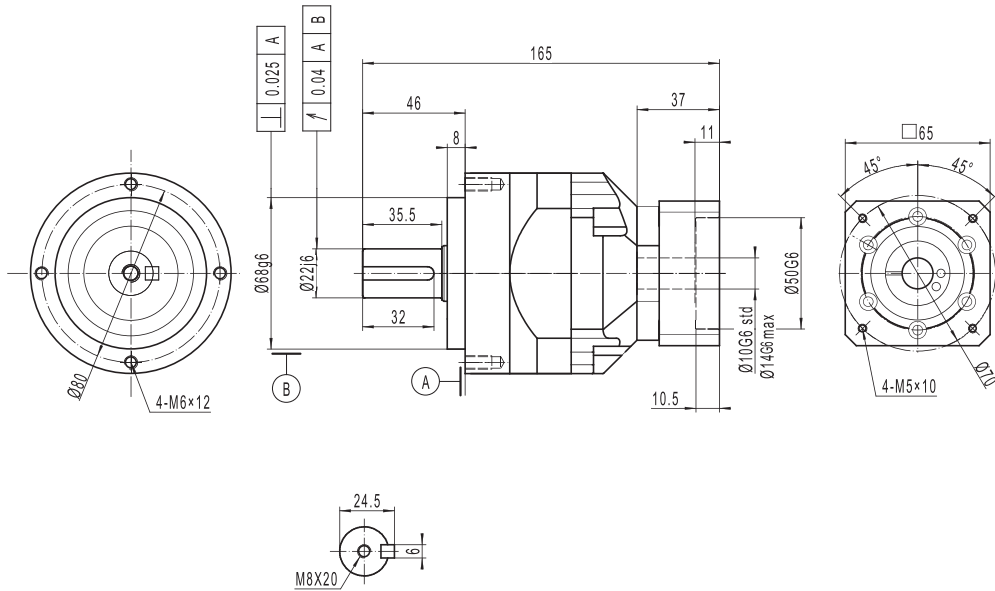
WISER CI-ST-060-2 STAGES - RATIOS 12 TO 100



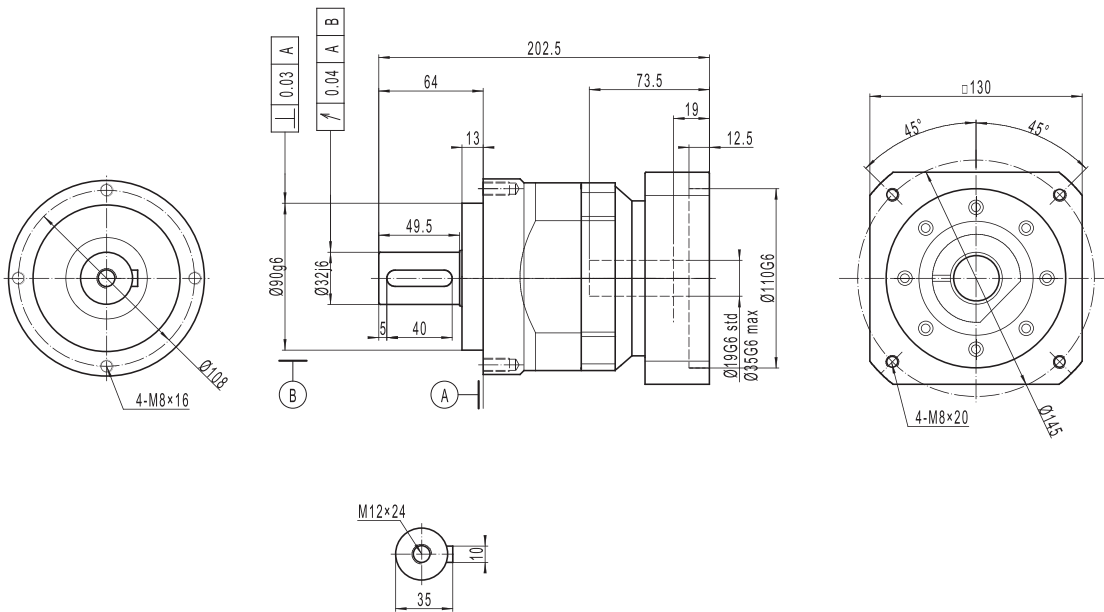
WISER CI-ST-090-1 STAGE - RATIOS 3 TO 10



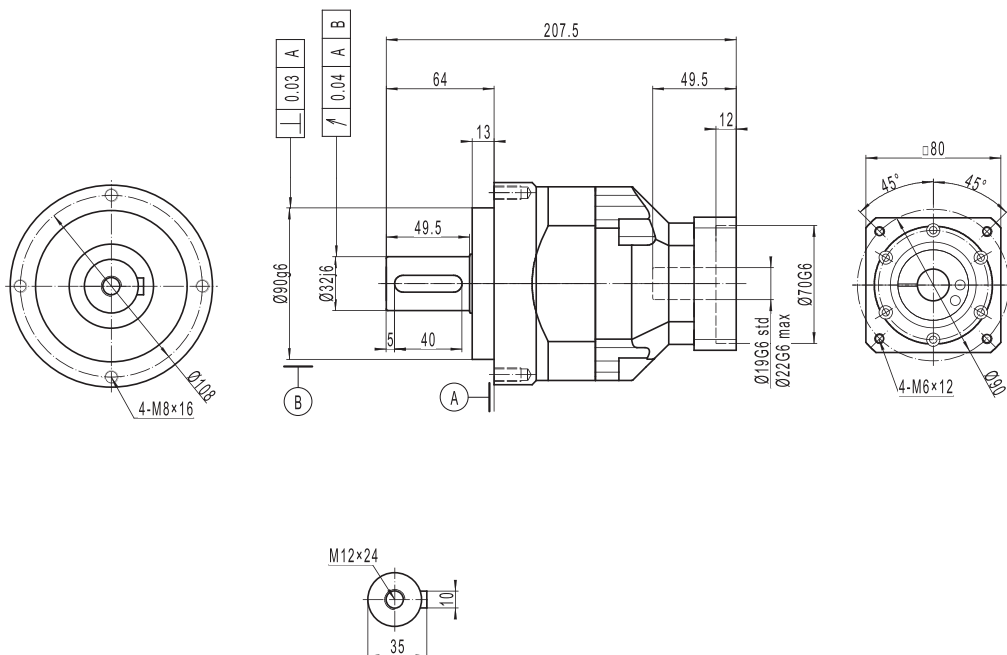
WISER CI-ST-090-2 STAGES - RATIOS 12 TO 100



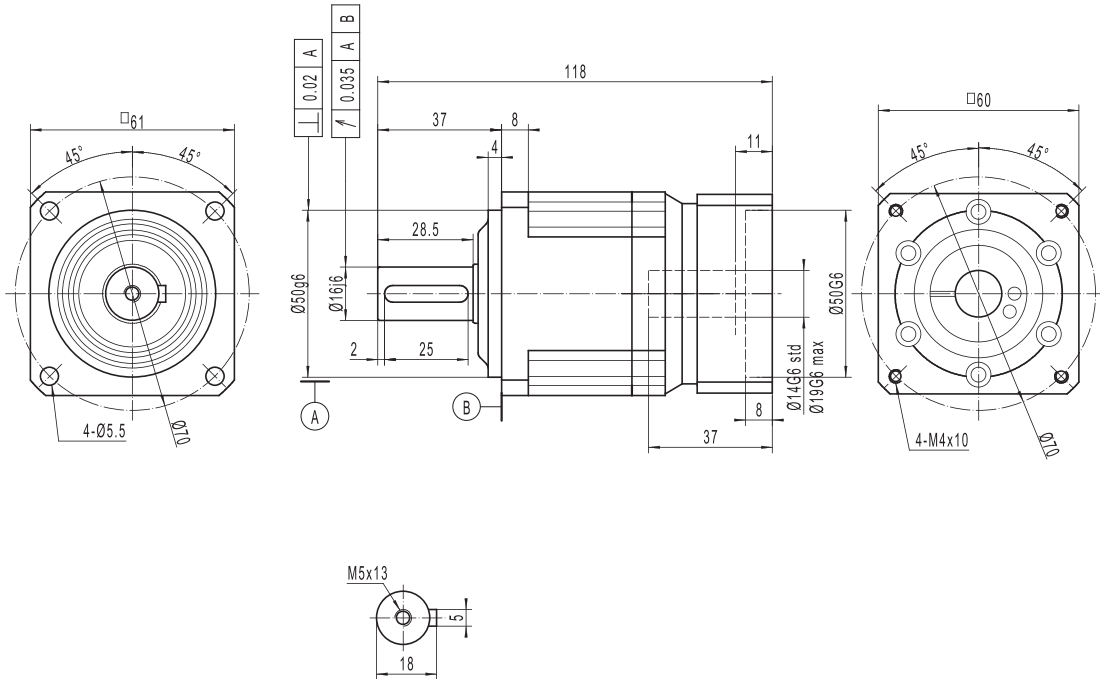
WISER CI-ST-120-1 STAGE - RATIOS 3 TO 10



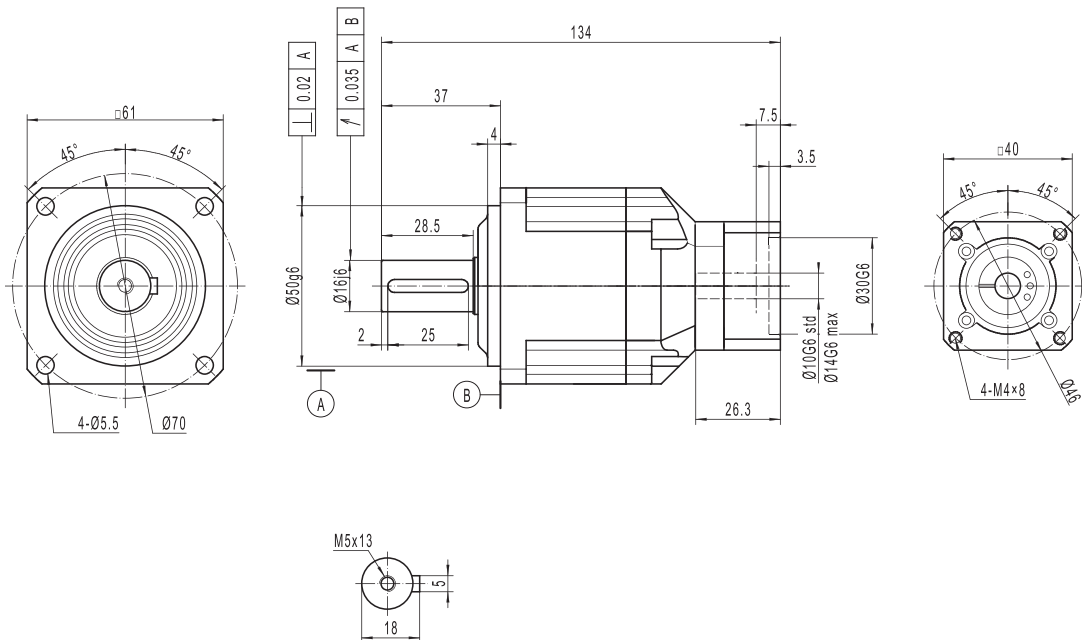
WISER CI-ST-120 -2 STAGES - RATIOS 12 TO 100



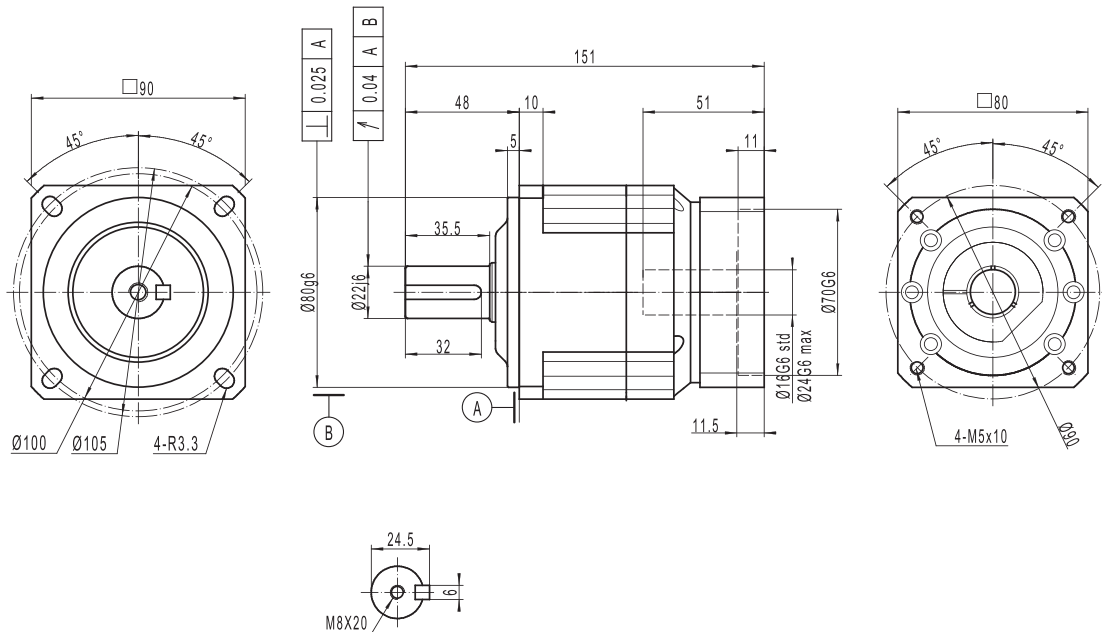
WISER SQ-ST-060-1 STAGE - RATIOS 3 TO 10



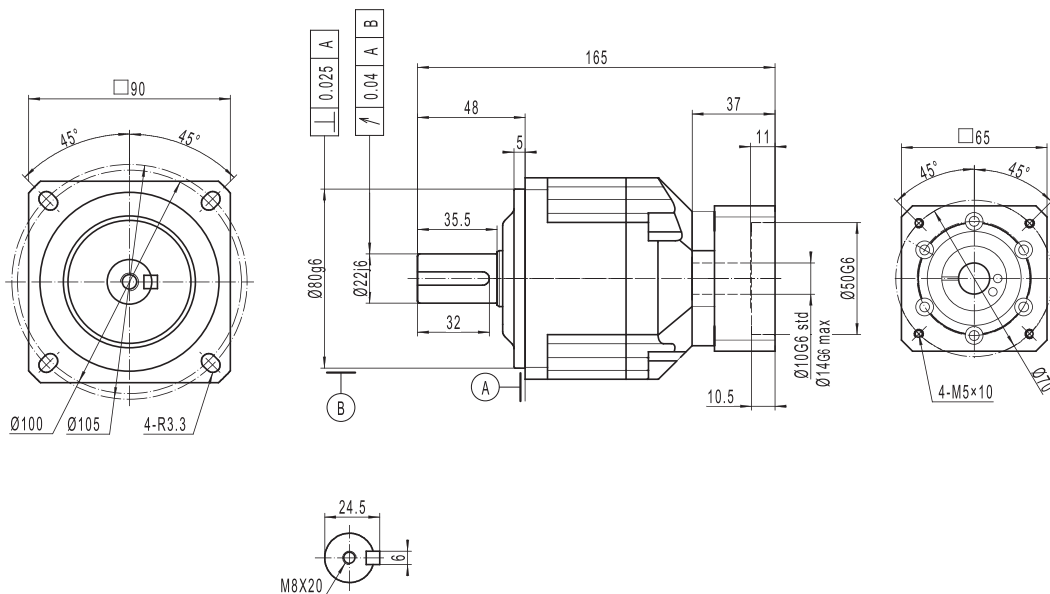
WISER SQ-ST-060-2 STAGES - RATIOS 12 TO 100



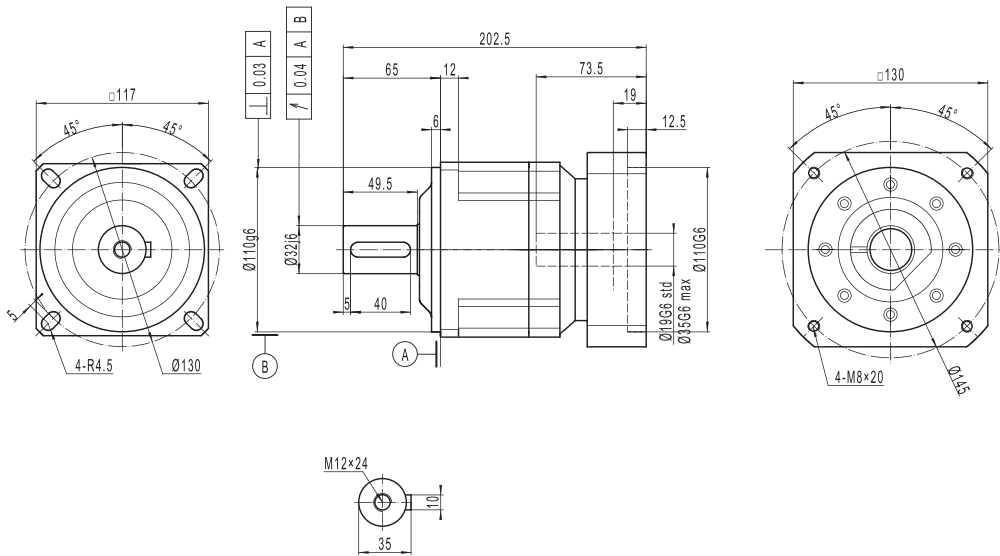
WISER SQ-ST-090-1 STAGE - RATIOS 3 TO 10.



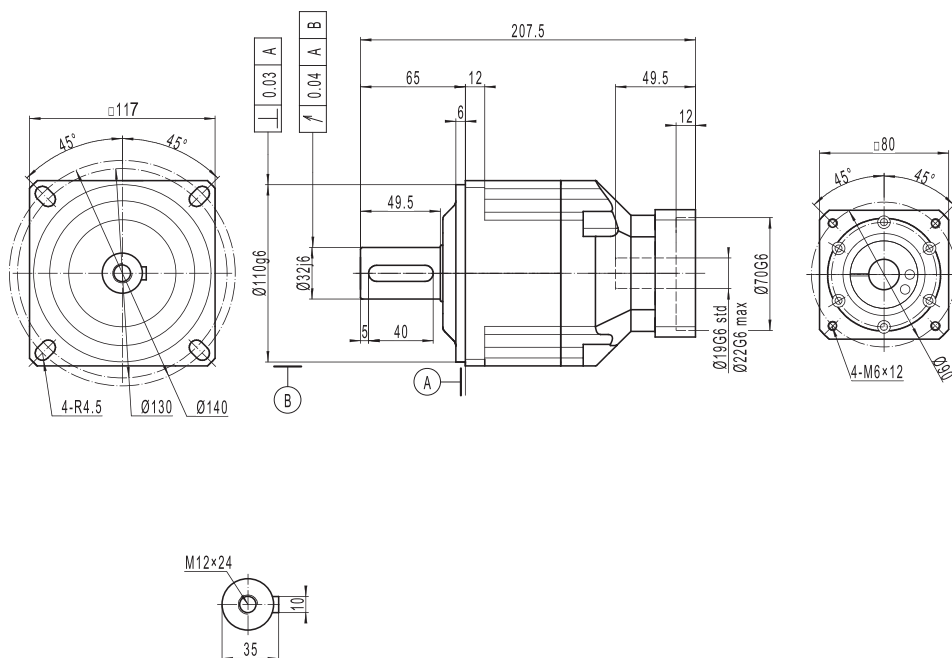
WISER SQ-ST-090-2 STAGES - RATIOS 12 TO 100



WISER SQ-ST-120 -1 STAGE - RATIOS 3 TO 10



WISER SQ-ST-120 -2 STAGES - RATIOS 12 TO 100



LIVELY



Acceleration capacity	+++
Fast reversals	+++
Radial efforts	++
Axial efforts	+
Stiffness	+++
Precision	+++
Economy	+++

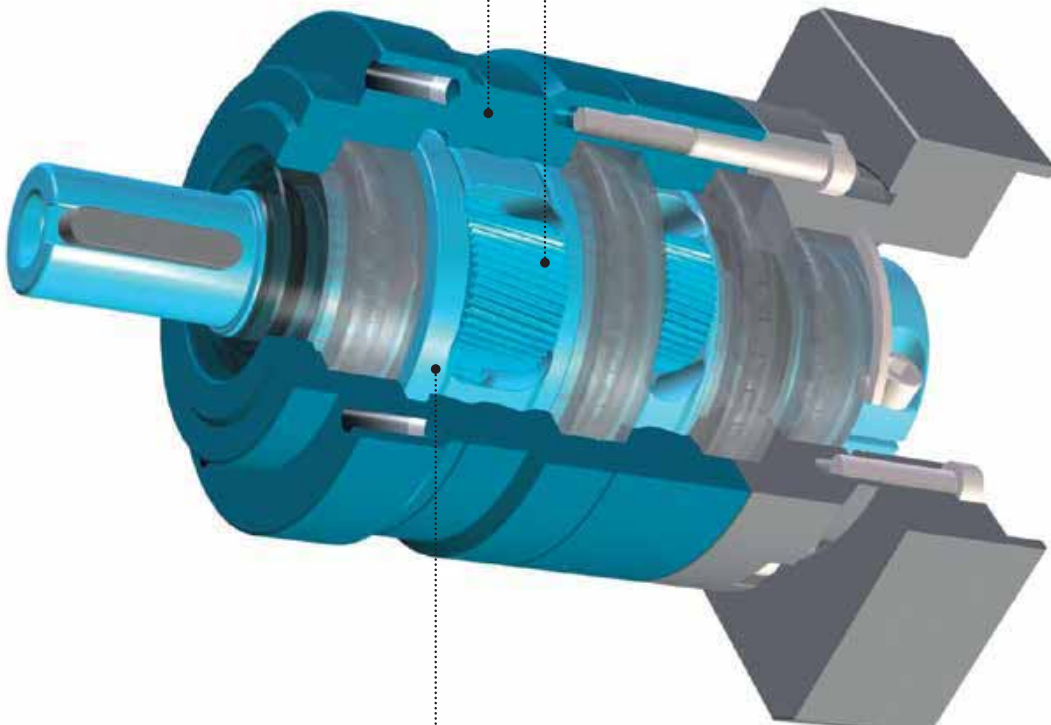


LIVELY_ Internal construction

LIVELY is an economical, yet precise and reliable planetary gearbox designed for moderate acceleration or continuous operation.

Lively's ring gear is monobloc with the external housing, to provide greater rigidity and allow dynamic changes of torque and moderate reversals.

Carburized and quenched helical teeth enable quiet operation, reliability and moderate to strong acceleration capacity.



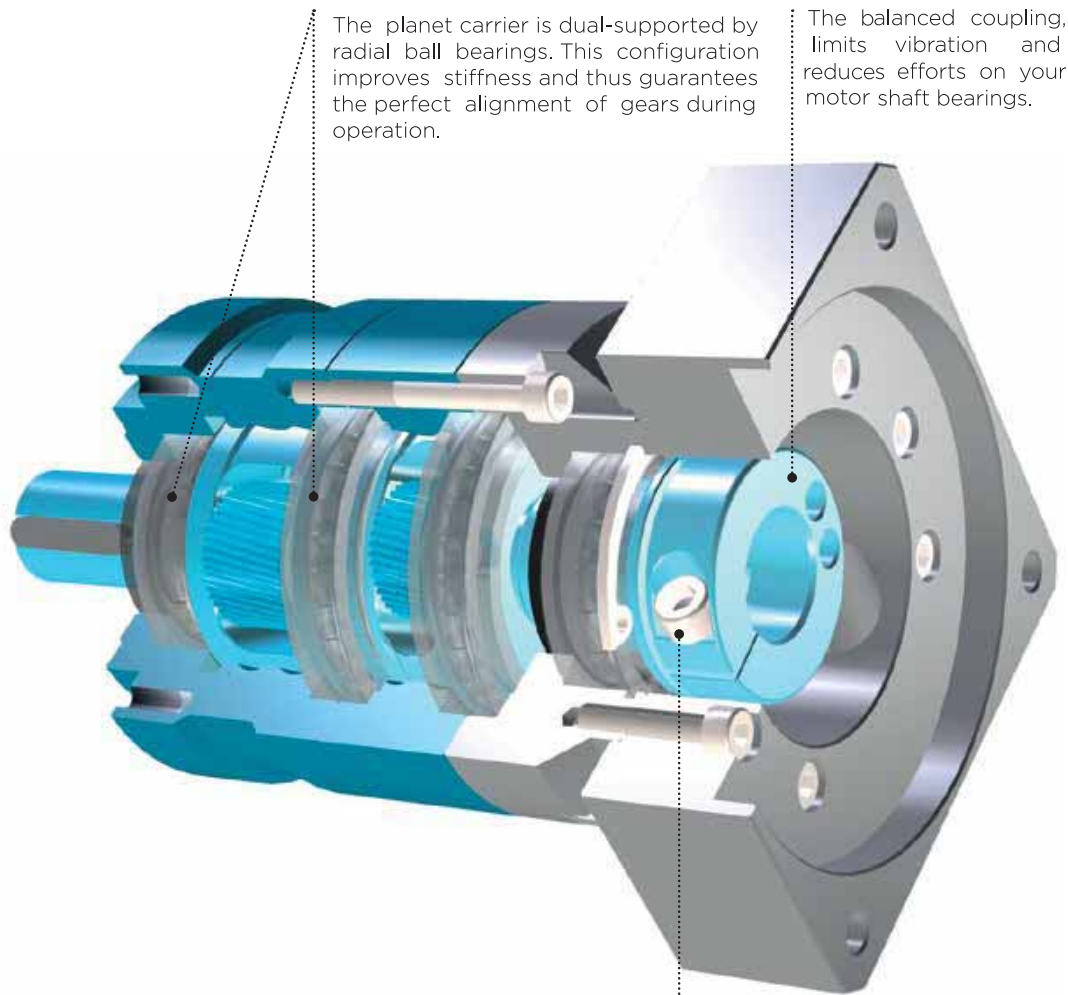
THE ENTIRE RANGE IS
LUBRICATED FOR LIFE BY



The caged planet carrier provides stiffness, reliability and acceleration capacity to the gearbox.



PerfectPitch™



The planet carrier is dual-supported by radial ball bearings. This configuration improves stiffness and thus guarantees the perfect alignment of gears during operation.

The balanced coupling, limits vibration and reduces efforts on your motor shaft bearings.

Easy and safe, 1-screw installation to your motor shaft.

LIVELY_Technical data

All values are common to round (CI) or square (SQ) versions of the LIVELY gearbox.

	RATIO	LIVELY-SQ / LIVELY-CI						
		40	60	90	120	CI-155 SQ-140	CI-205 SQ-180	CI-235 SQ-220
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	7	25	50	120	260	530	800
	1/4	14	42	70	220	386	780	1450
	1/5	12	43	82	202	374	795	1338
	1/6	11	42	75	212	365	791	1212
	1/7	11	42	75	198	368	793	1188
	1/8	10	39	72	193	355	732	1000
	1/9	8	33	66	151	300	608	929
	1/10	8	29	65	154	264	537	714
	1/15	7	25	50	120	260	530	800
	1/20	14	42	70	220	386	780	1450
	1/25	12	43	82	202	374	795	1338
	1/50	12	43	82	202	374	795	1338
	1/80	10	39	72	193	355	732	1000
	1/100	8	29	65	154	264	537	714
	$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	9	32	62	150	340	695
1/4		17	52	87	272	464	960	1767
1/5		15	53	102	248	464	1012	1656
1/6		13	51	91	260	453	979	1494
1/7		13	52	93	237	453	978	1384
1/8		12	45	90	227	430	875	1218
1/9		10	39	81	177	372	758	1124
1/10		10	37	80	168	345	710	870
1/15		9	32	62	150	340	695	974
1/20		17	52	87	272	464	960	1767
1/25		15	53	102	248	464	1012	1656
1/50		15	53	102	248	464	1012	1656
1/80		12	45	90	227	430	875	1218
1/100		10	37	80	168	345	710	870
Emergency stop torque $T_x^{(3)}$		3*T _{2n}						
Angular backlash (arc-min)	1 stage	standard ≤ 3; reduced ≤ 1						
	2 stages	standard ≤ 5; reduced ≤ 3						
Nominal input speed ⁽⁴⁾ (rpm)	4,000	3,000	3,000	3,000	3,000	2,000	1,500	
Maximum input speed ⁽⁵⁾ (rpm)	8,000	6,000	6,000	6,000	6,000	4,000	3,000	
Maximum radial load ⁽⁶⁾ (N)	700	1200	2450	4400	9000	1450	27,000	
Maximum axial load (N)	350	650	1200	3200	5300	6300	14,000	
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96						
	2 stages	>93						
Torsional stiffness (Nm / arc-min)	3	6	10	31	53	175	400	
Lifetime ⁽⁸⁾	20,000 hours							
Nominal / min / max operating temperature ⁽⁹⁾	20°C / -10°C / +45°C							
Max housing temperature (90°)	90°C							
Protection class	IP65							
Noise level (dB)	<58	<60	<63	<66	<68	<73	<78	
Lubricant	Sumico grease (lubricated for life)							
Color	Capri blue (RAL 5019)							
Input flange	Anodized Aluminum							

(1) : Nominal output torque.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : 100 occurrences maximum.

(4) : Speed at which the nominal torque is applicable 20,000 hours.

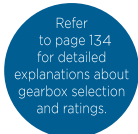
(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

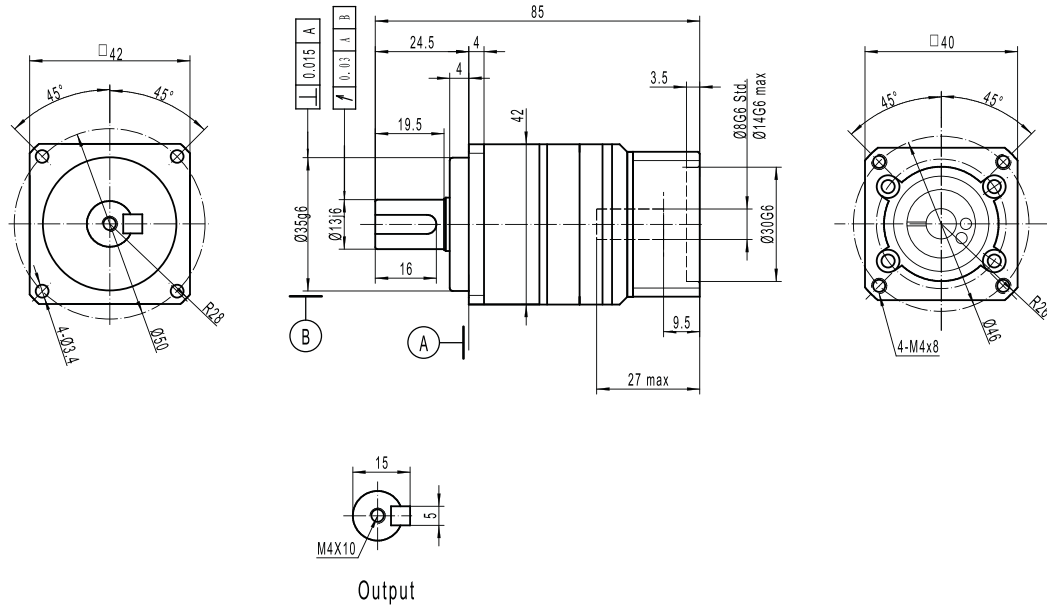
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

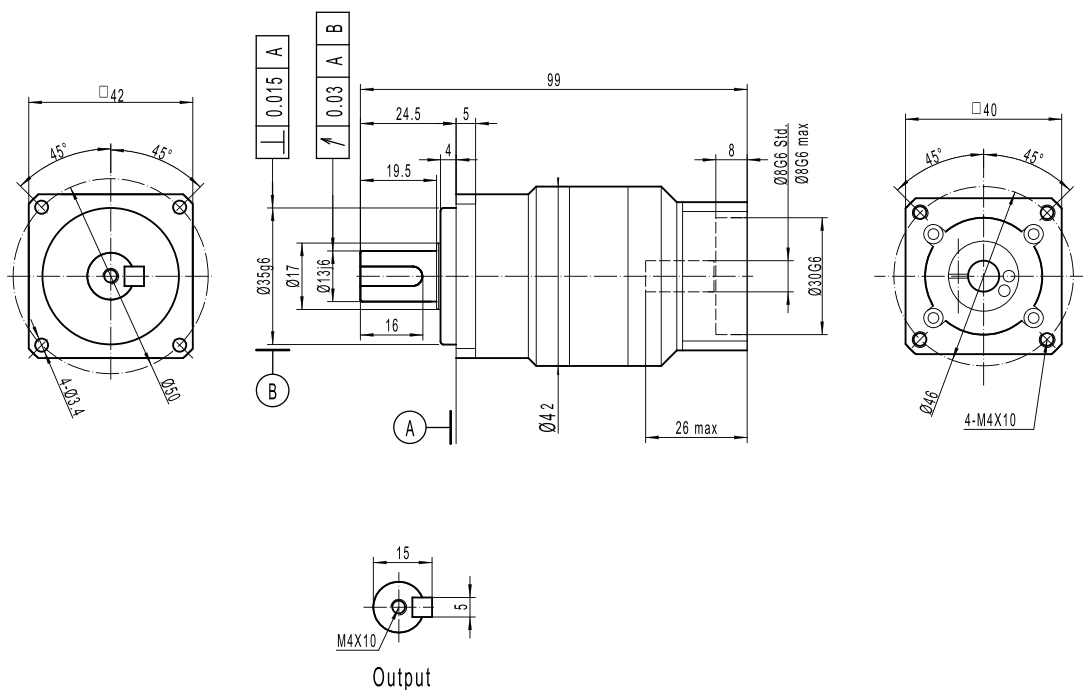
(9) : Room temperature. Refer to temperature factors on page 140.



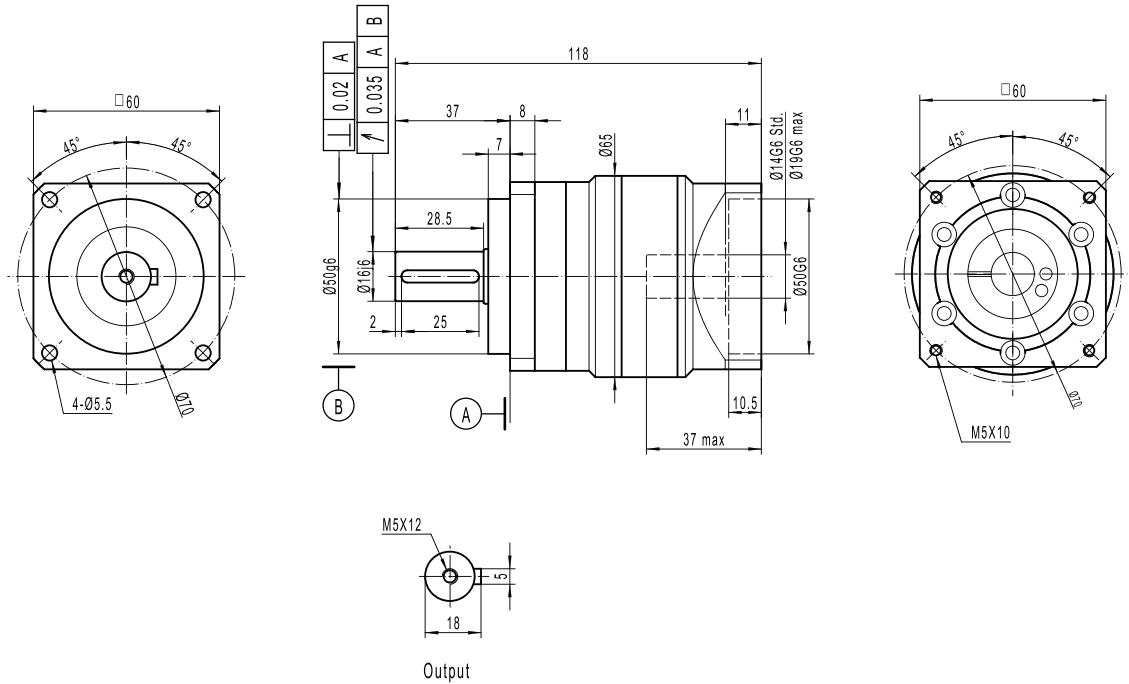
LIVELY SQ-ST-040 - 1 STAGE - RATIOS 3 TO 10



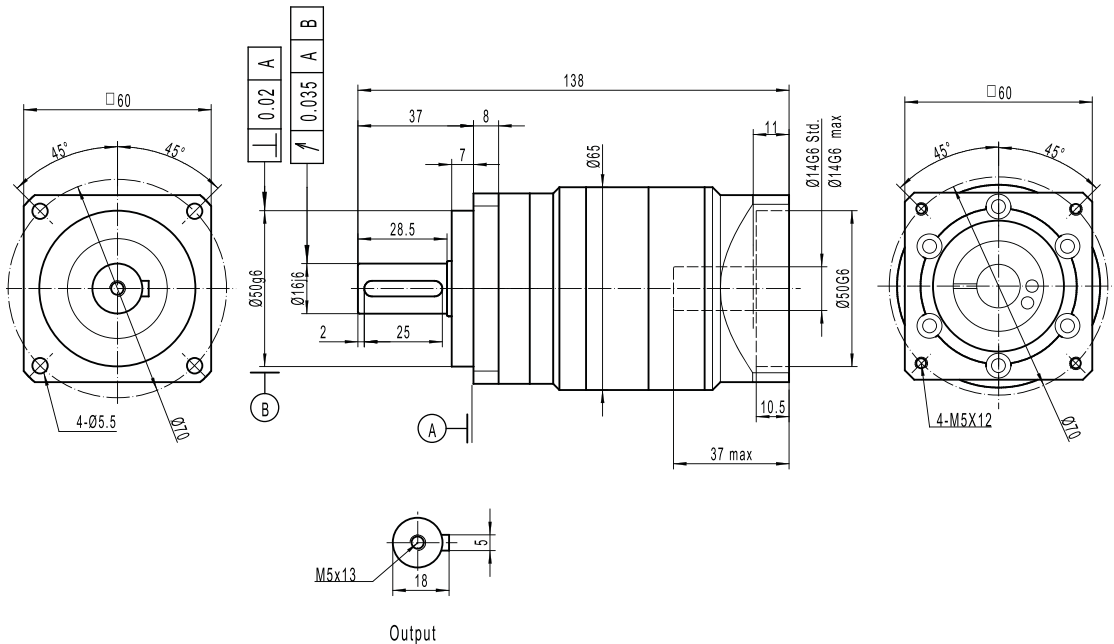
LIVELY SQ-ST-040 - 2 STAGES - RATIOS 12 TO 100



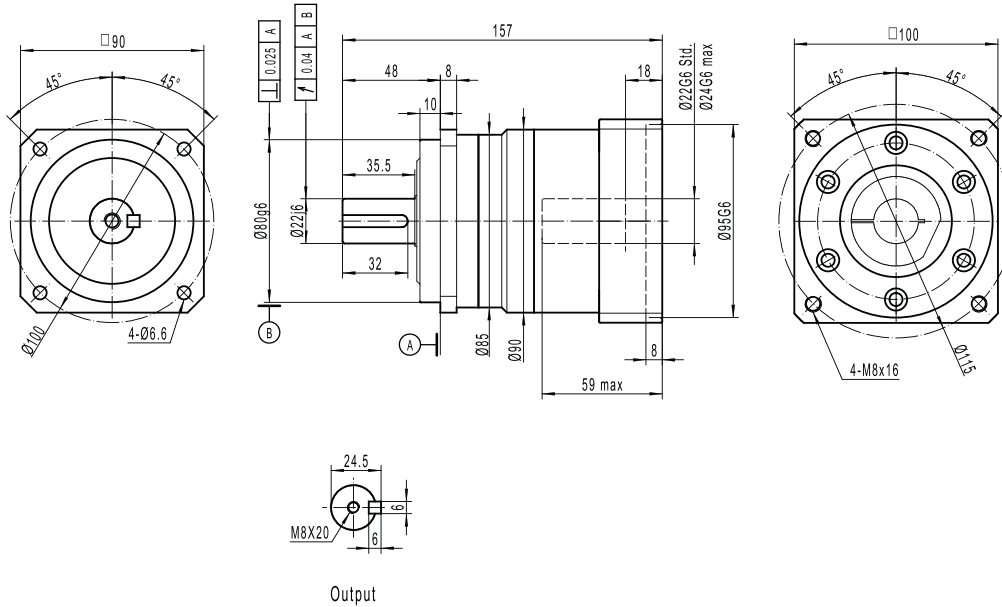
LIVELY SQ-ST-060 - 1 STAGE - RATIOS 3 TO 10



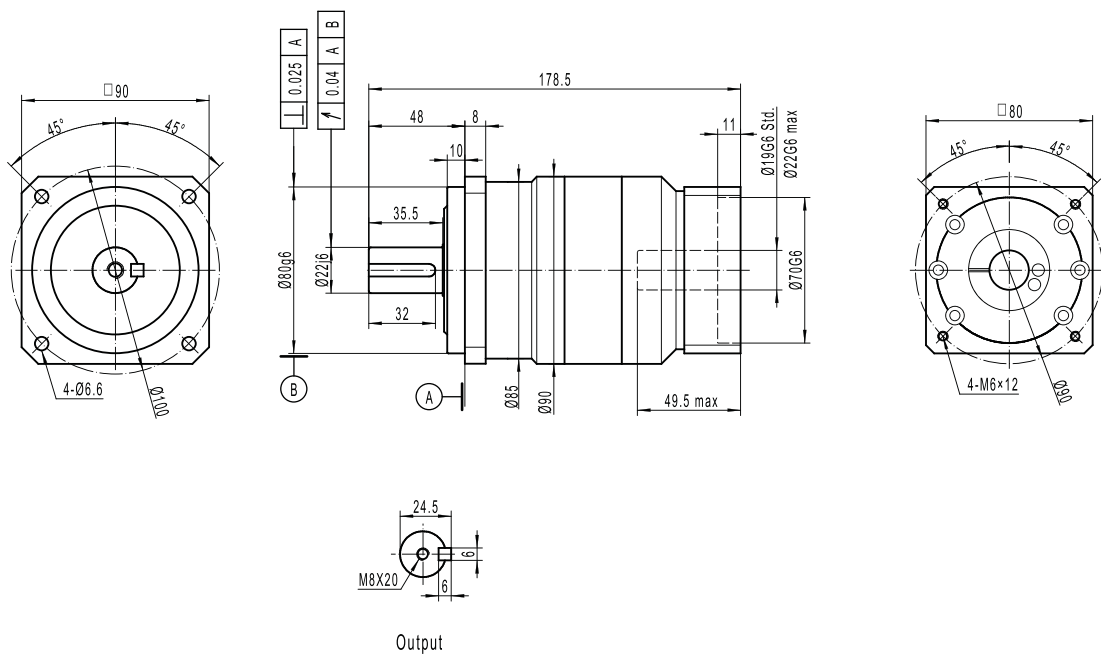
LIVELY SQ-ST-060 - 2 STAGES - RATIOS 12 TO 100



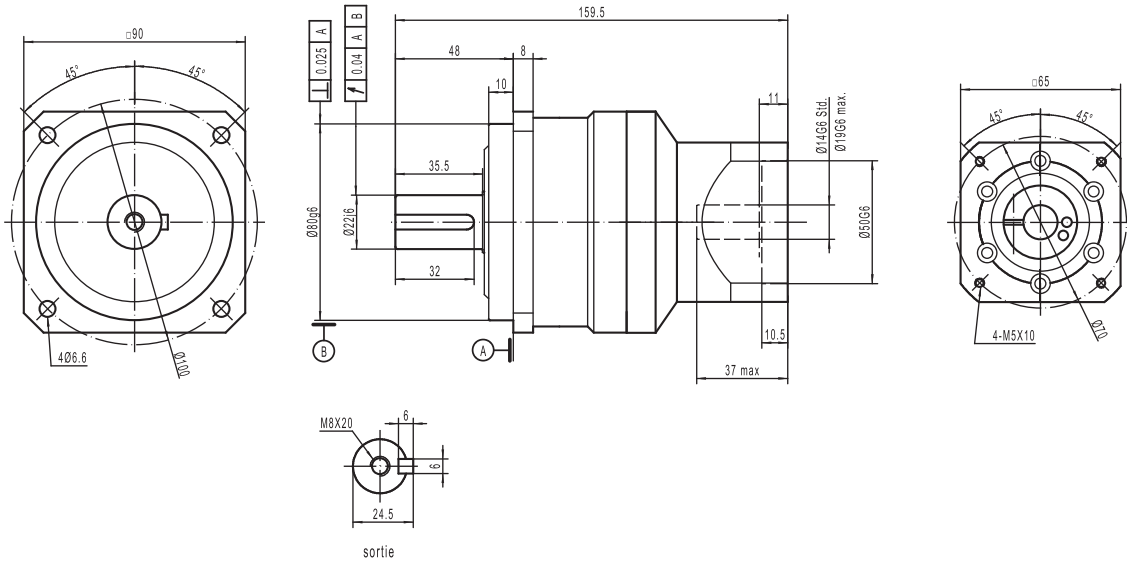
LIVELY SQ-ST-090 - 1 STAGE - RATIOS 3 TO 10



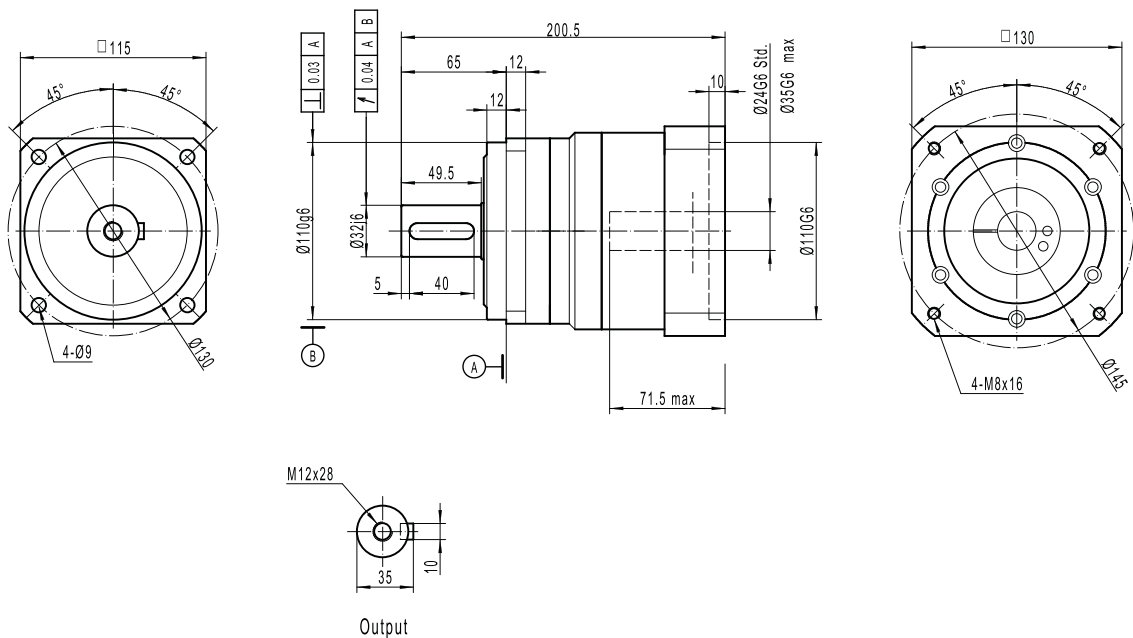
LIVELY SQ-ST-090 - 2 STAGES - RATIOS 12 TO 25



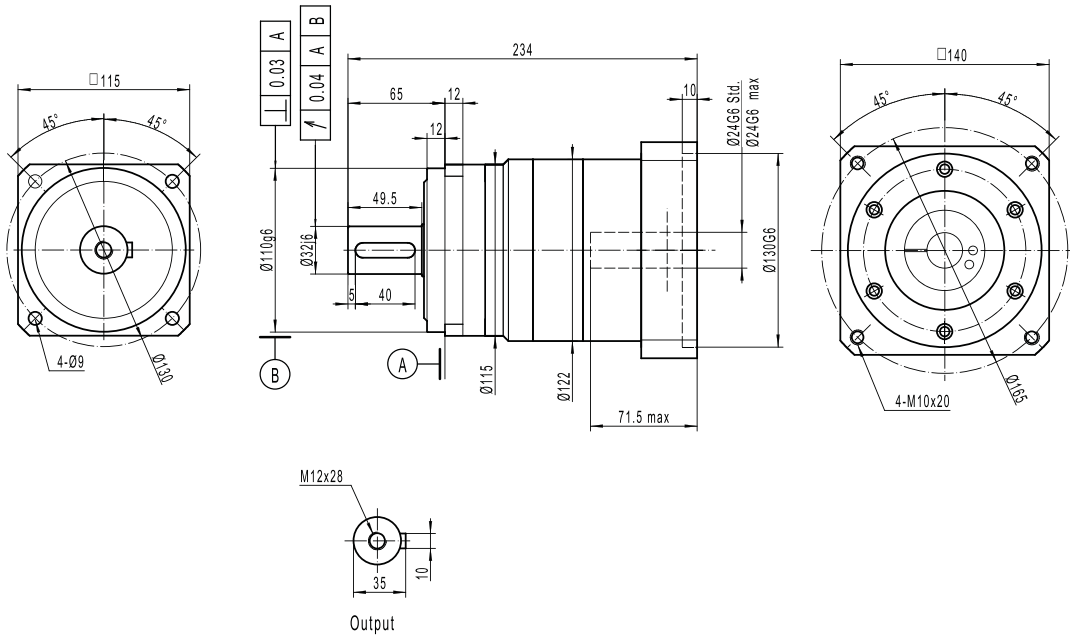
LIVELY SQ-ST-090 - 2 STAGES - RATIOS 30 TO 100



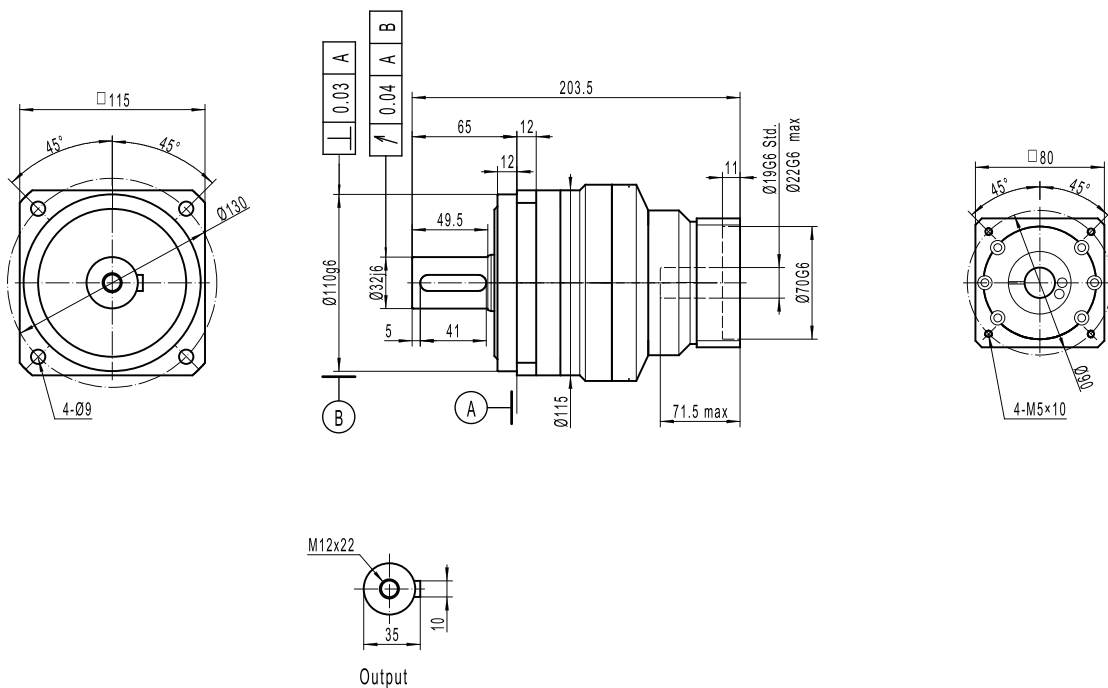
LIVELY SQ-ST-120 - 1 STAGE - RATIOS 3 TO 10



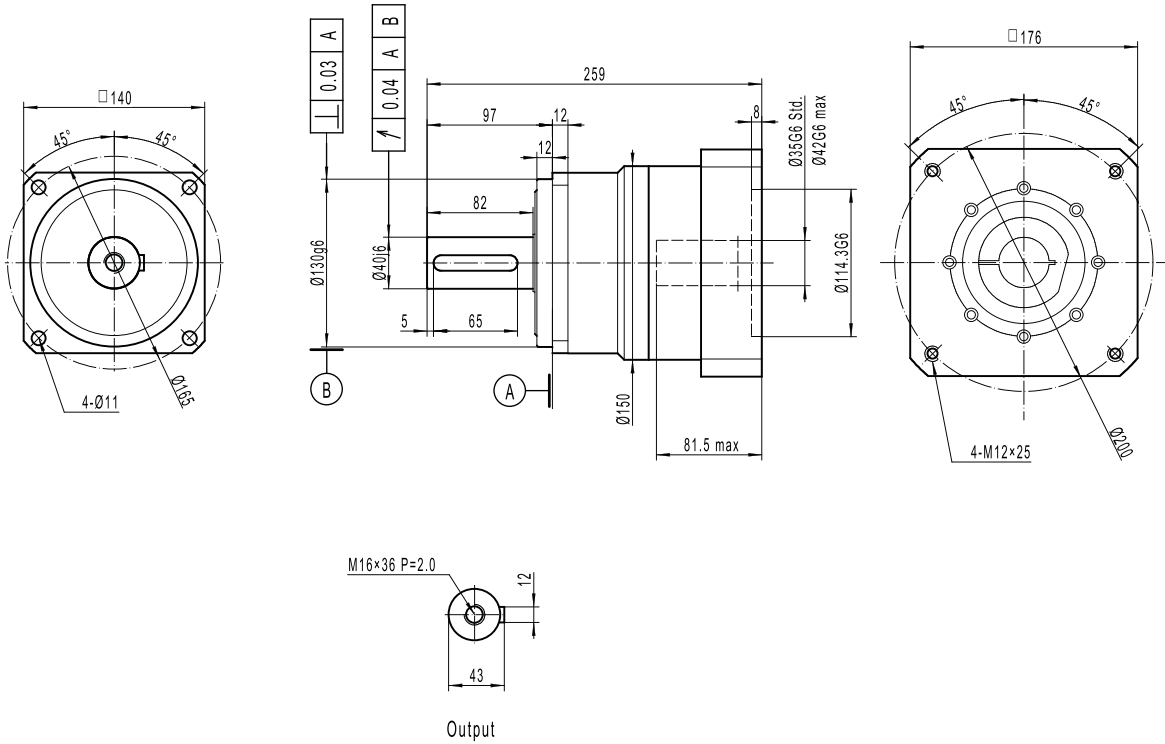
LIVELY SQ-ST-120 - 2 STAGES - RATIOS 12 TO 30



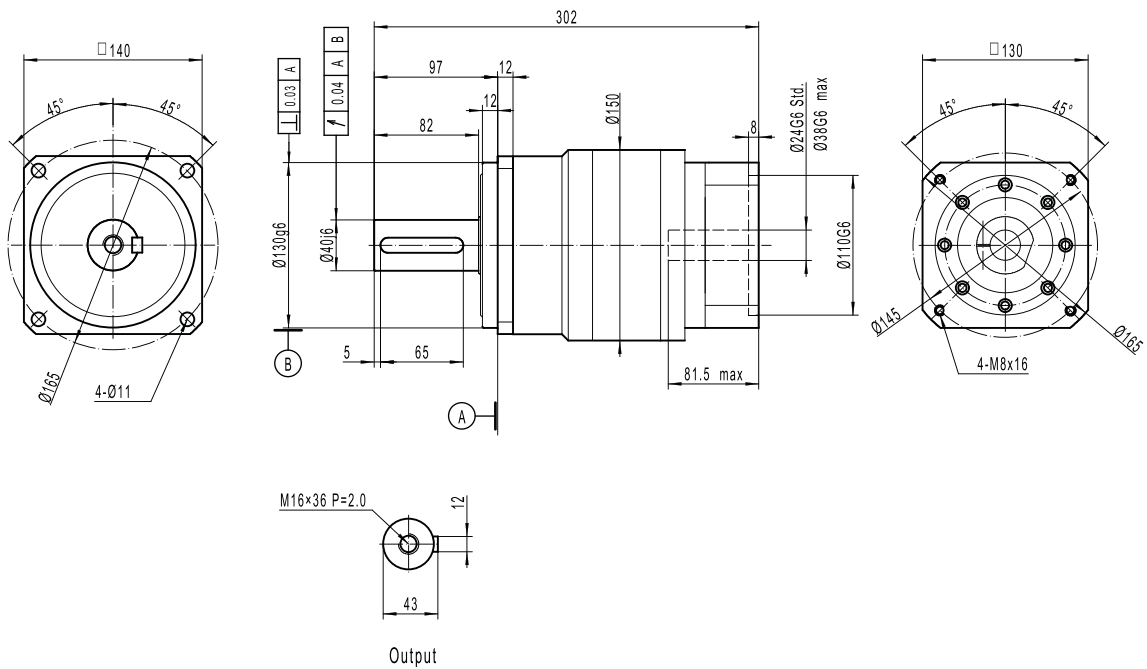
LIVELY SQ-ST-120 - 2 STAGES - RATIOS 35 TO 100



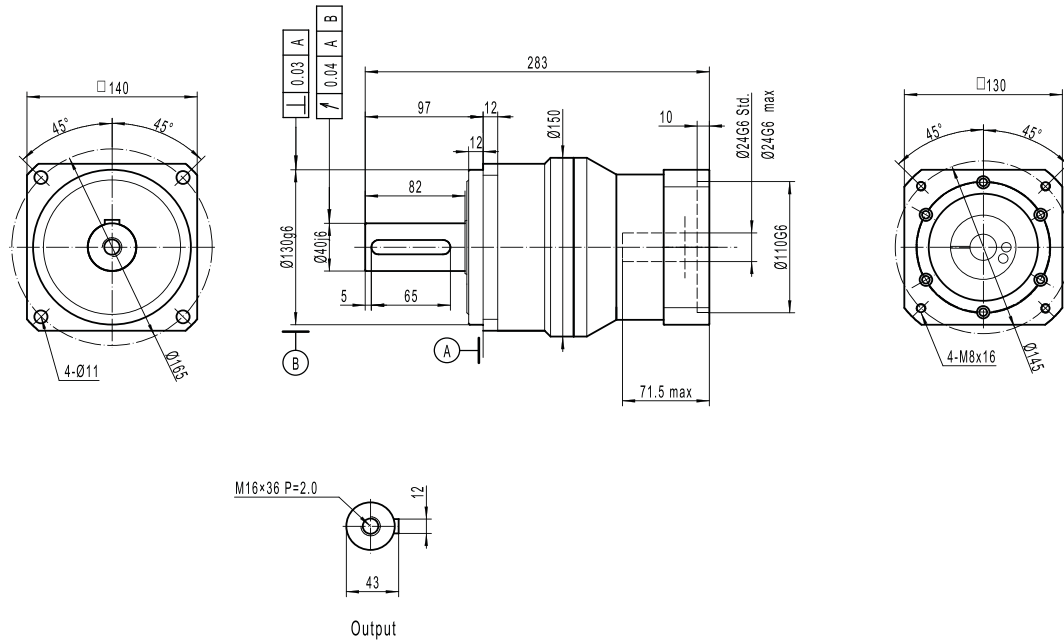
LIVELY SQ-ST-140 - 1 STAGE - RATIOS 3 TO 10



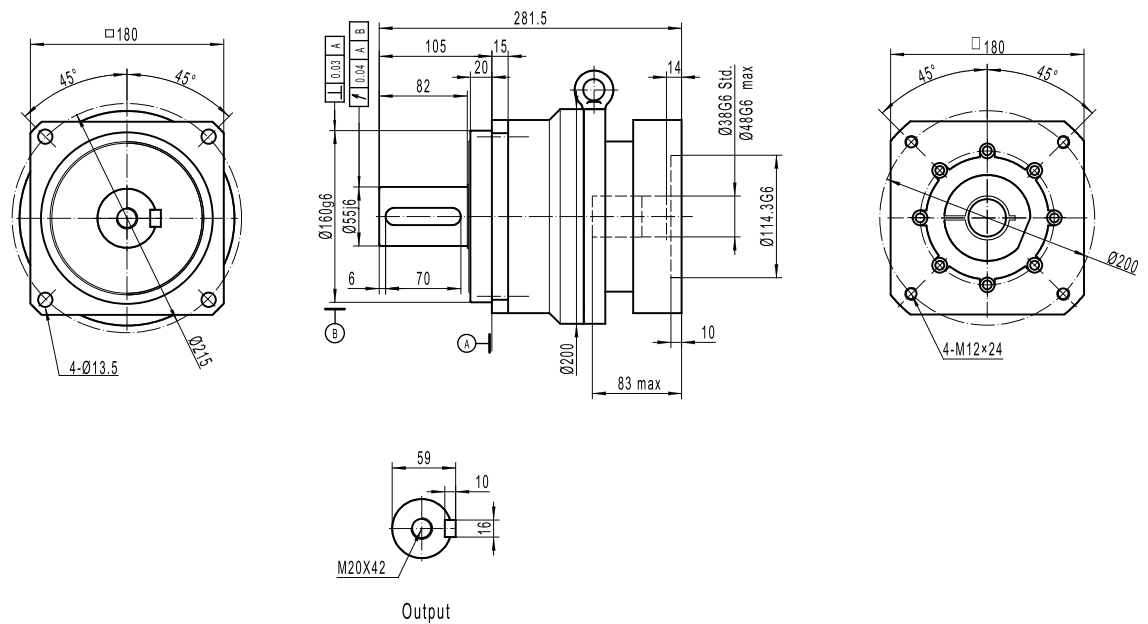
LIVELY SQ-ST-140 - 2 STAGES - RATIOS 12 TO 30



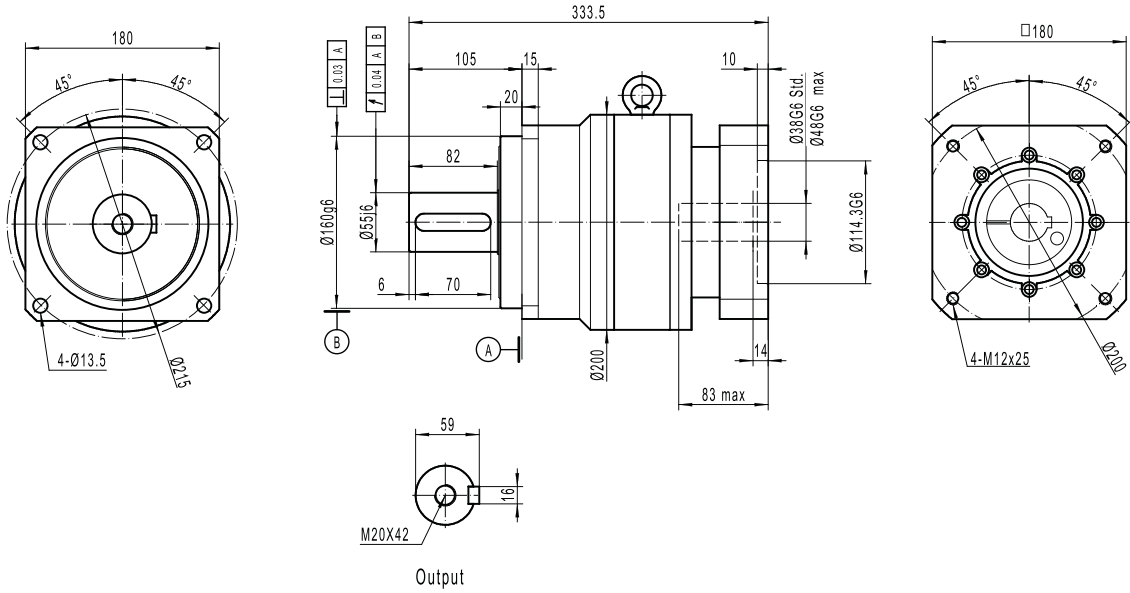
LIVELY SQ-ST-140 - 2 STAGES - RATIOS 35 TO 100



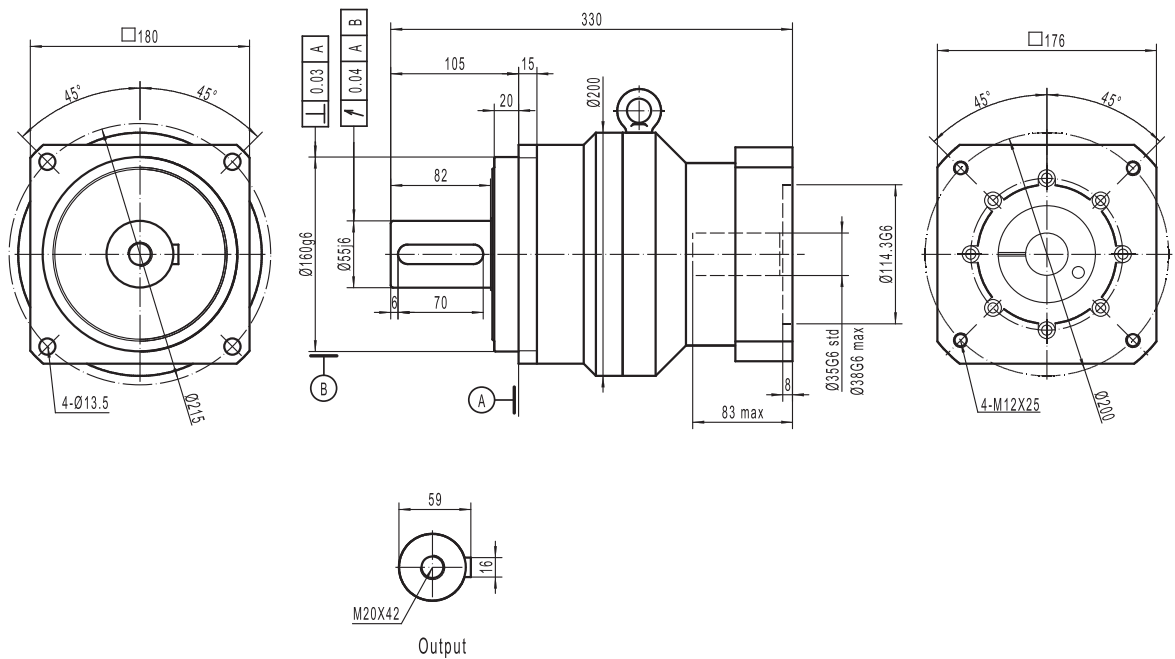
LIVELY SQ-ST-180 - 1 STAGE - RATIOS 3 TO 10



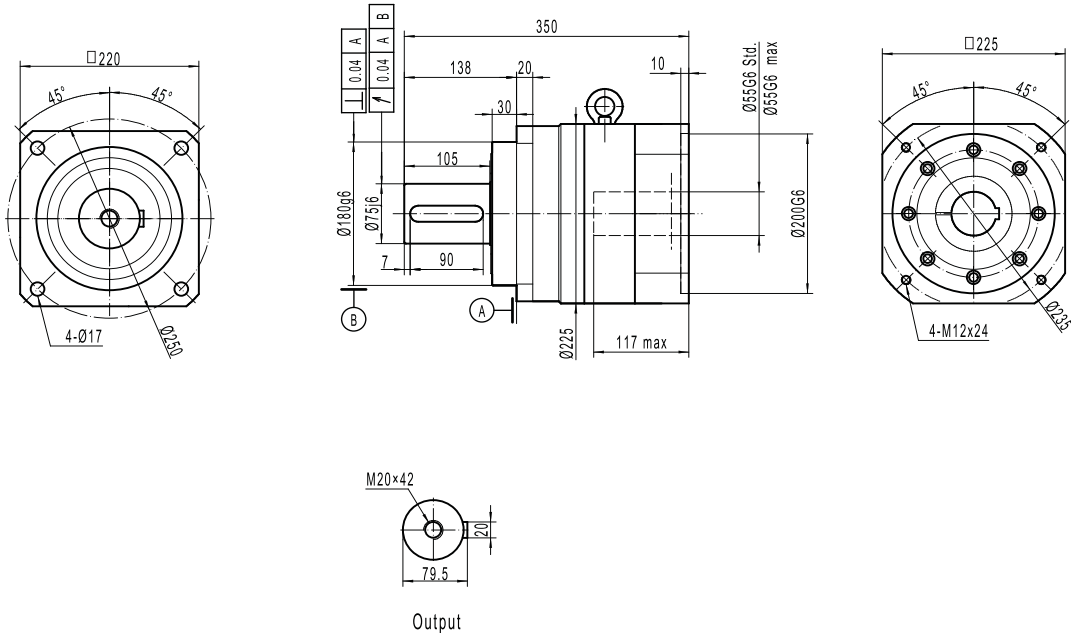
LIVELY SQ-ST-180 - 2 STAGES - RATIOS 12 TO 30



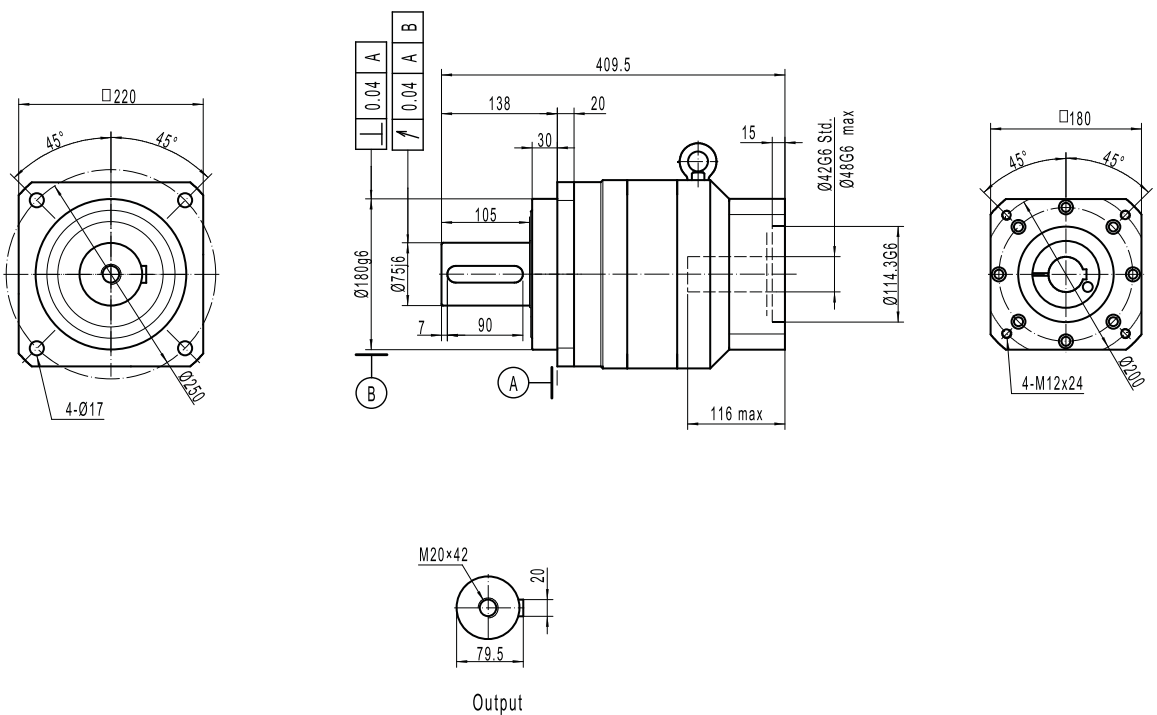
LIVELY SQ-ST-180 - 2 STAGES - RATIOS 35 TO 100



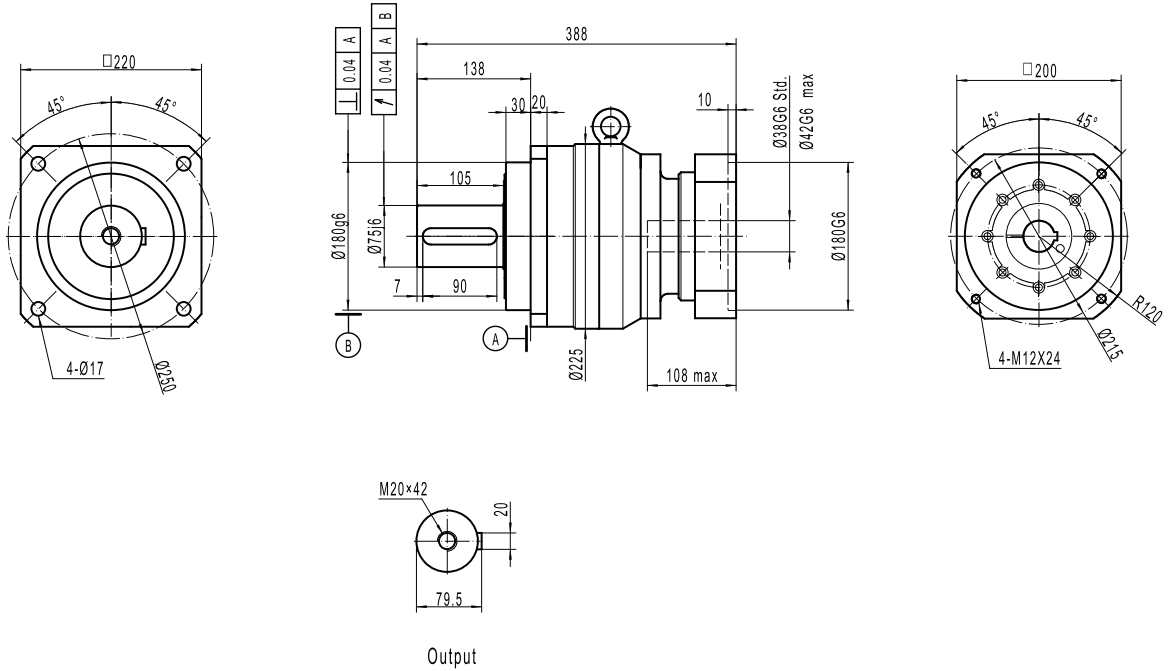
LIVELY SQ-ST-220 - 1 STAGE - RATIOS 3 TO 10



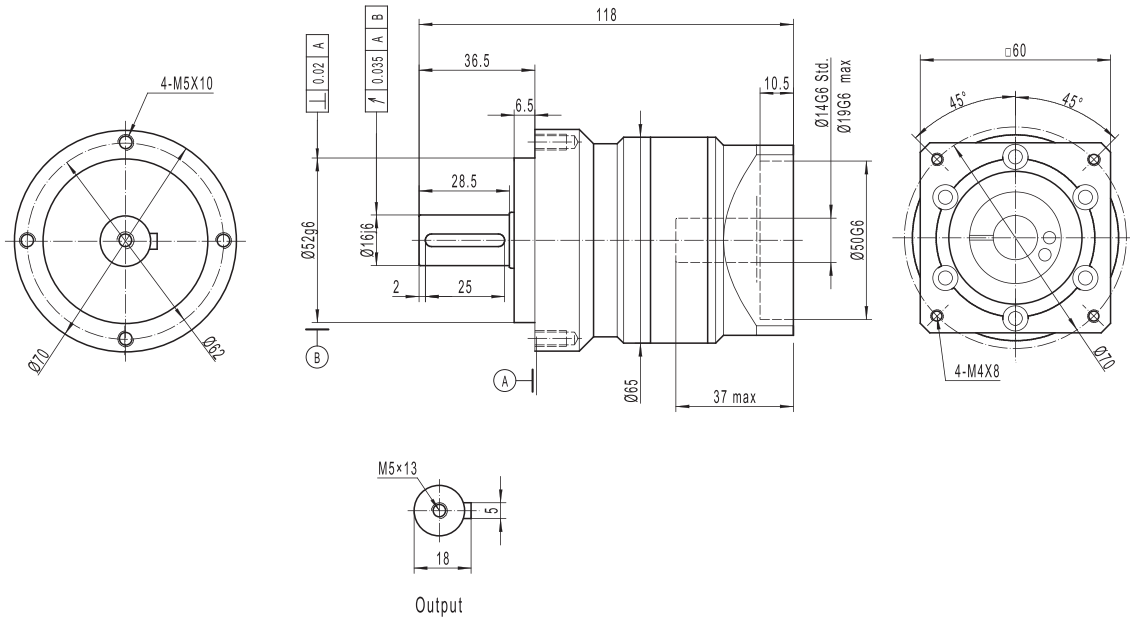
LIVELY SQ-ST-220 - 2 STAGES - RATIOS 12 TO 30



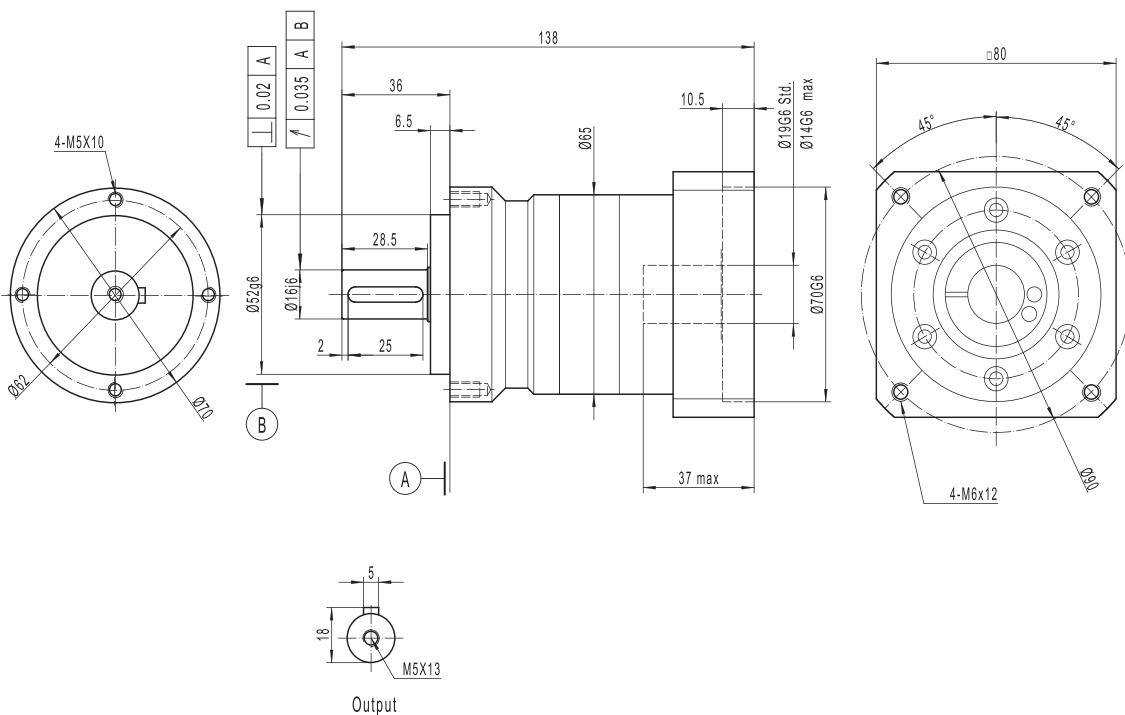
LIVELY SQ-ST-220 - 2 STAGES - RATIOS 35 TO 100



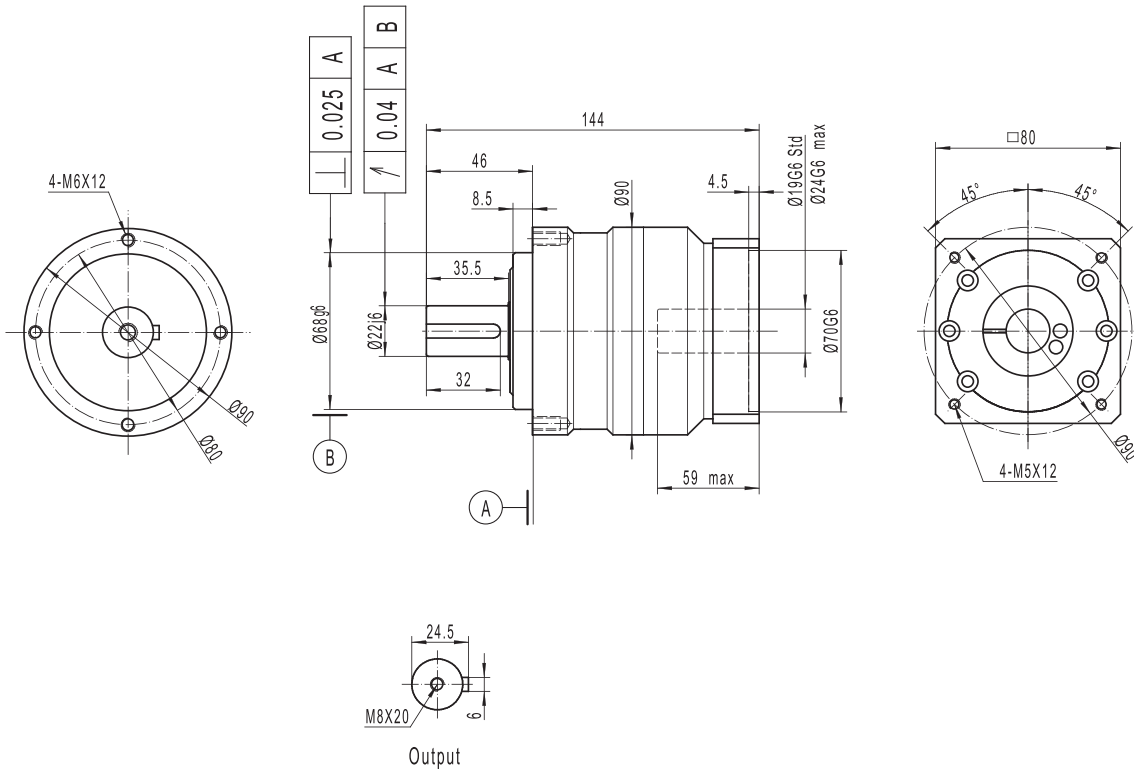
LIVELY CI-ST-060 - 1 STAGES - RATIOS 3 TO 10



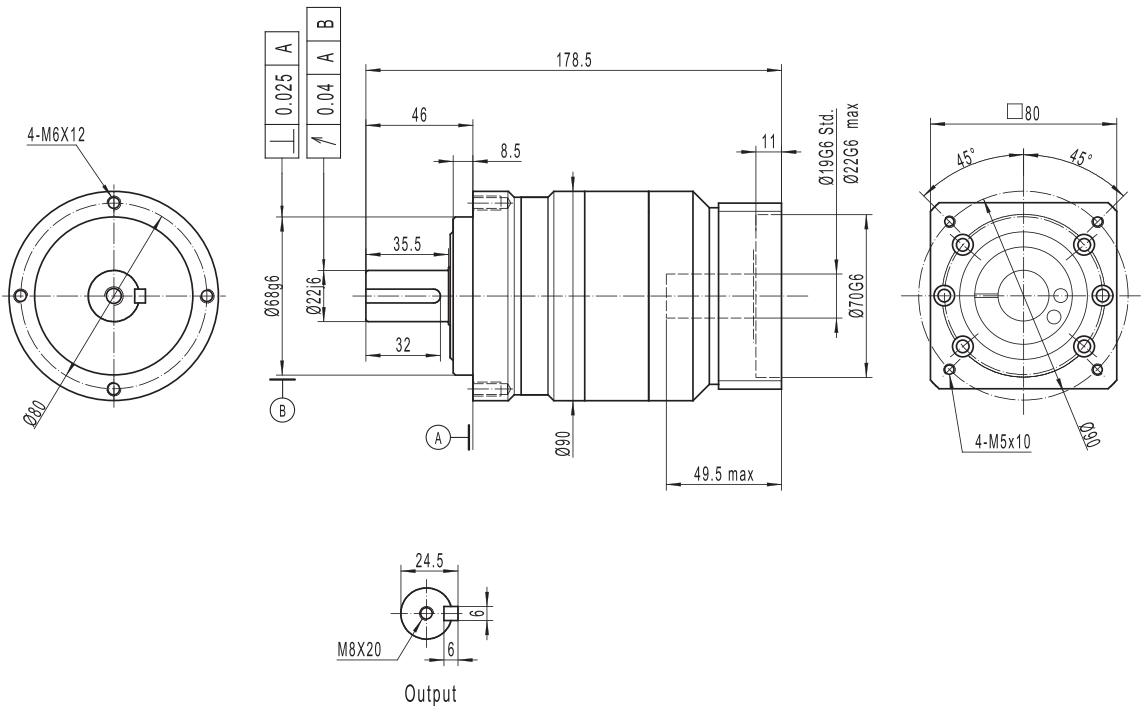
LIVELY CI-ST-060 - 2 STAGES - RATIOS 12 TO 100



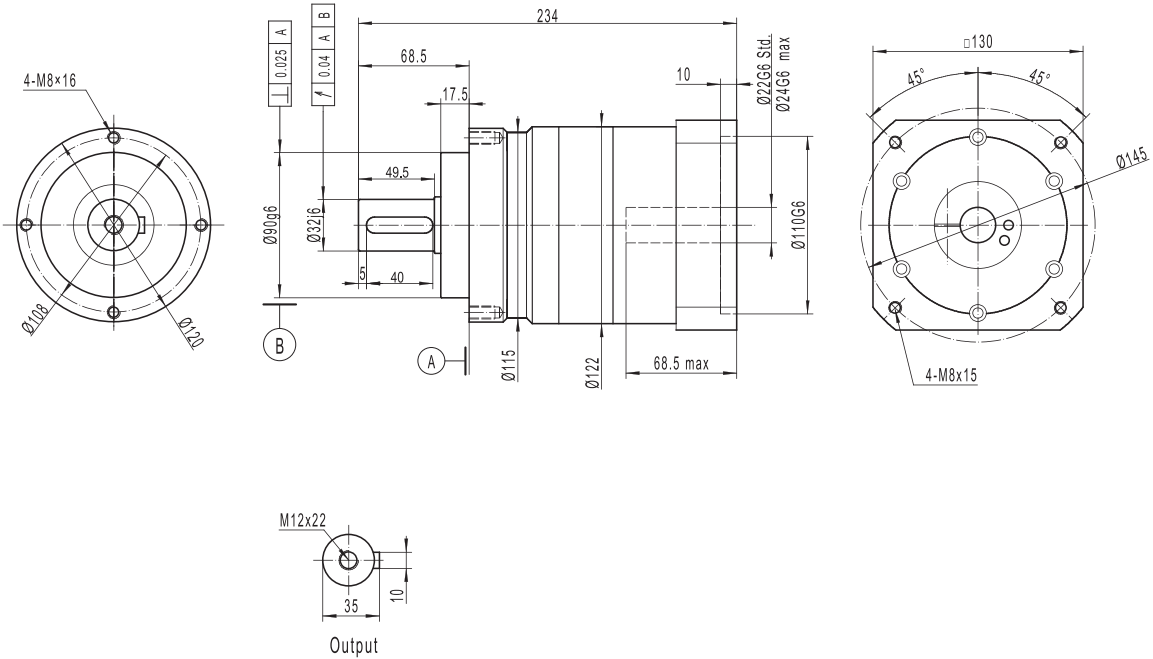
LIVELY CI-ST-090 - 1 STAGES - RATIOS 3 TO 10



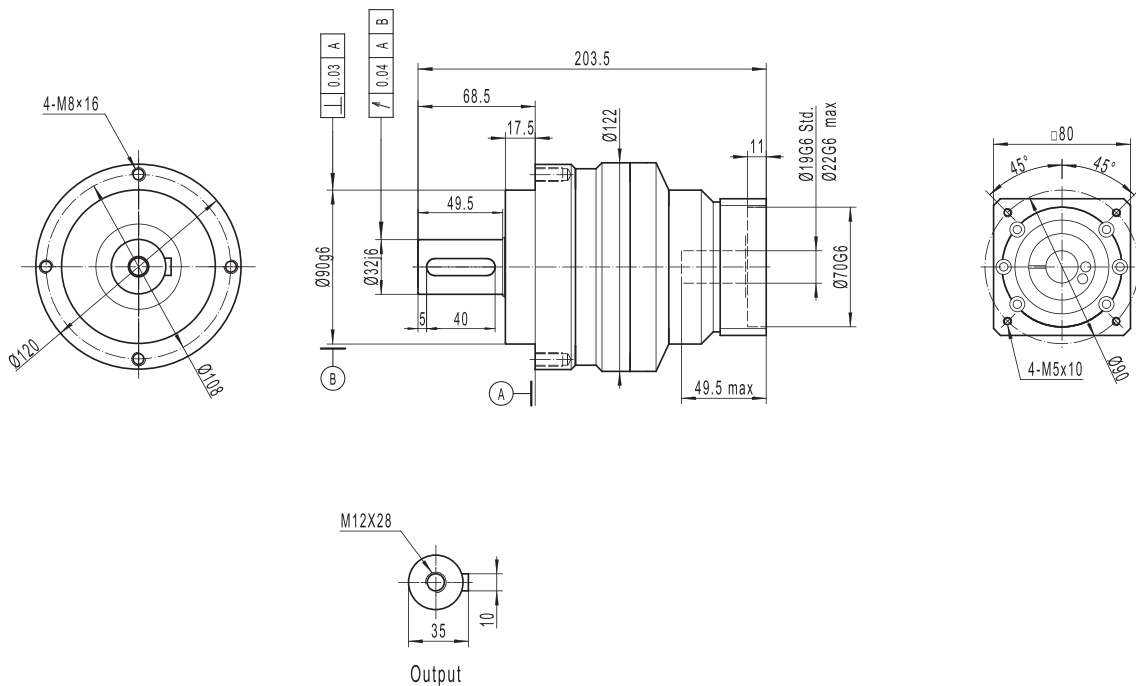
LIVELY CI-ST-090 - 2 STAGES - RATIOS 12 TO 25



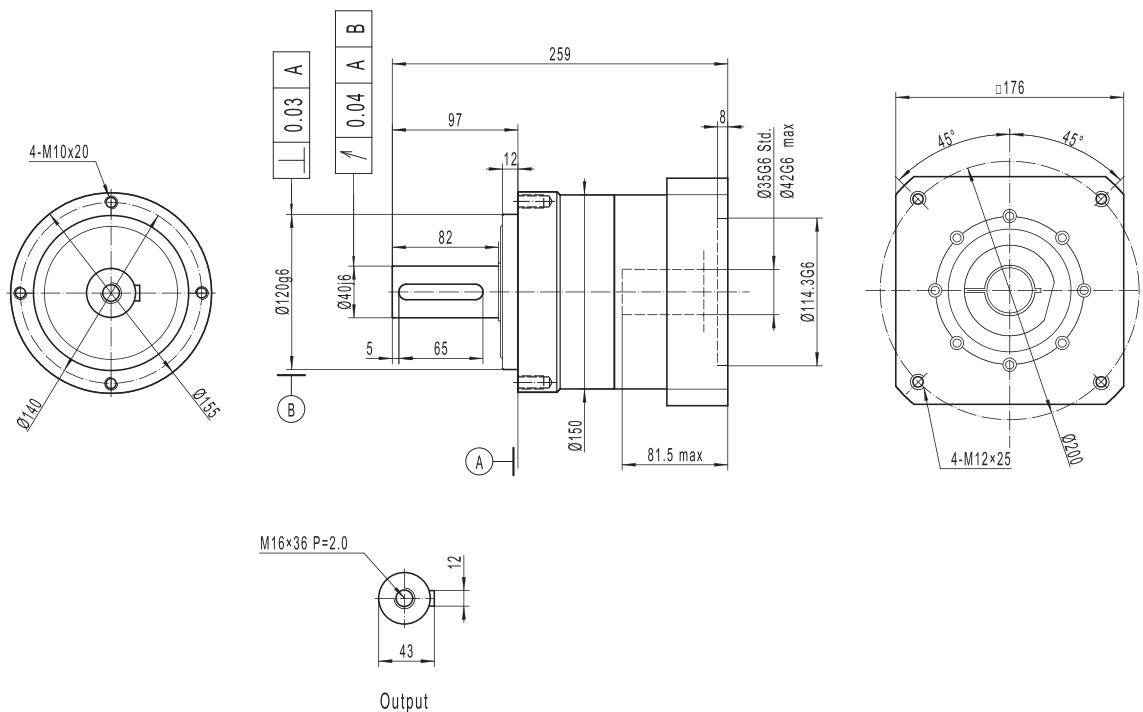
LIVELY CI-ST-120 - 2 STAGES - RATIOS 12 TO 30



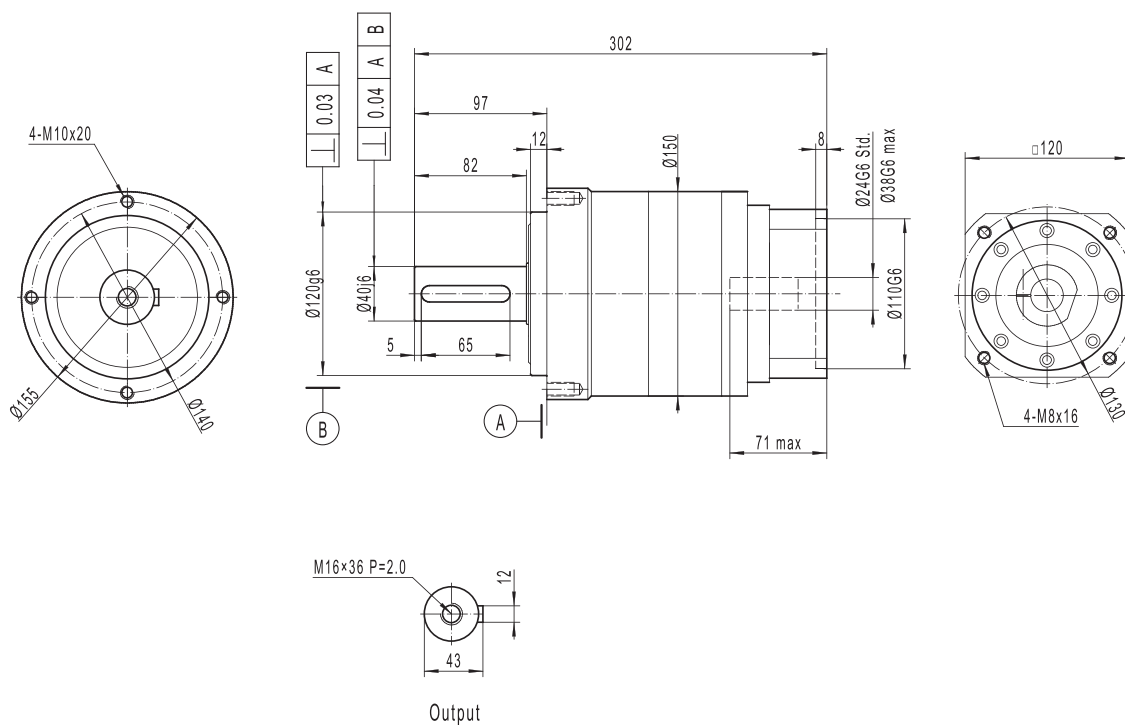
LIVELY CI-ST-120 - 2 STAGES - RATIOS 35 TO 100



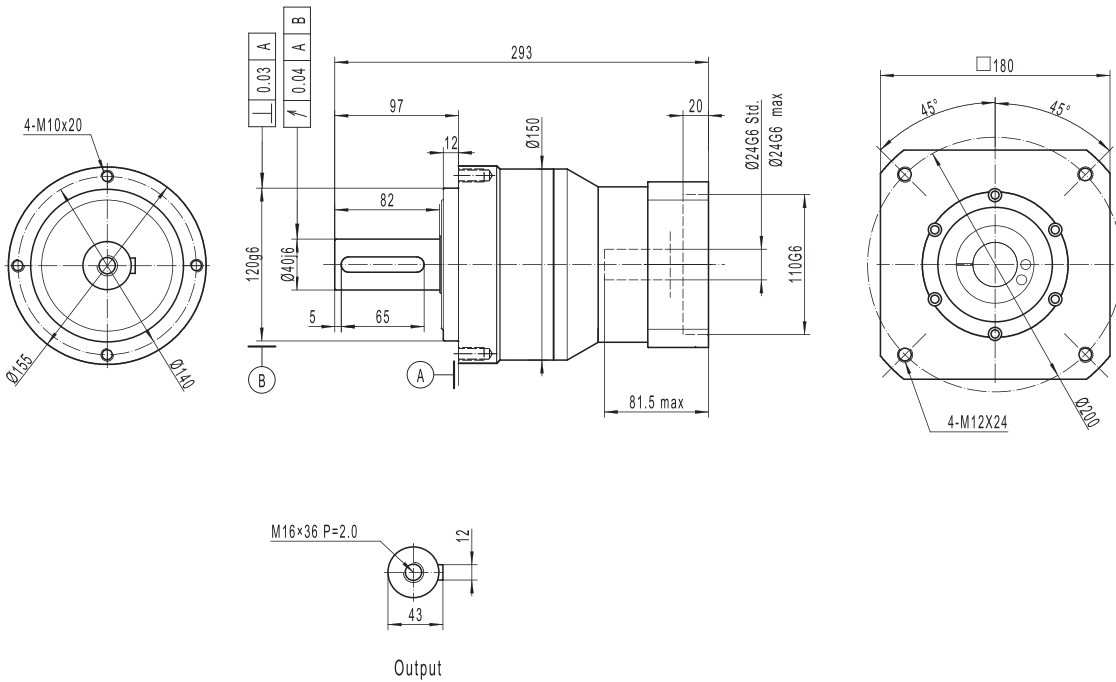
LIVELY CI-ST-155 - 1 STAGES - RATIOS 3 TO 10



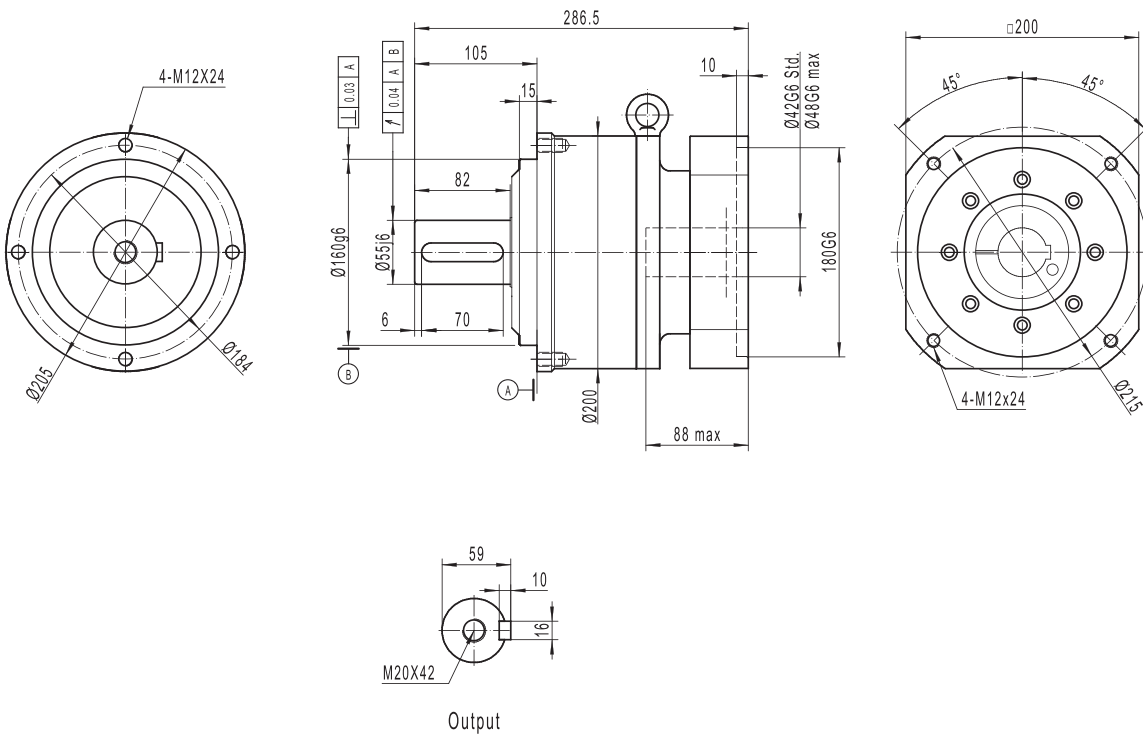
LIVELY CI-ST-155 - 2 STAGES - RATIOS 12 TO 30



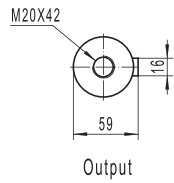
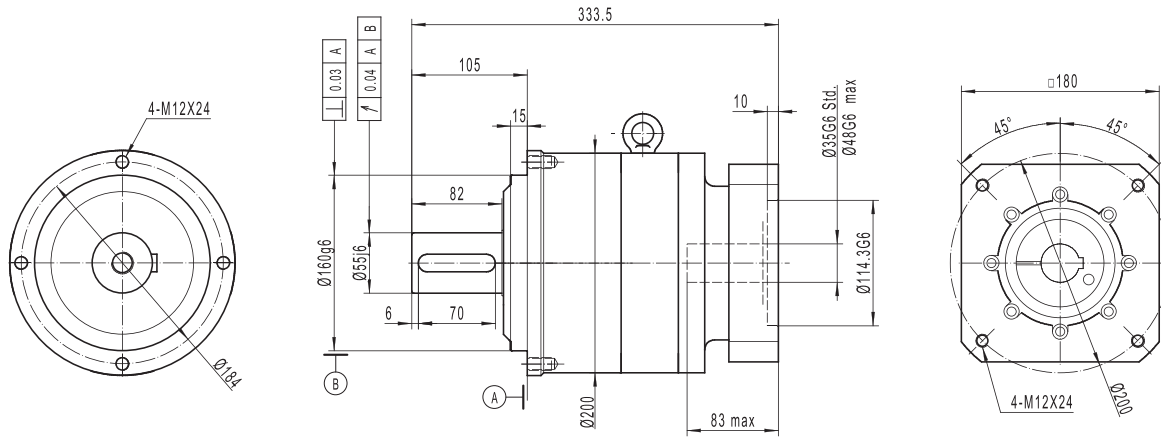
LIVELY CI-ST-155 - 2 STAGES - RATIOS 35 TO 100



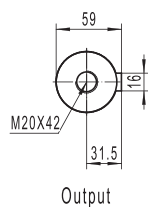
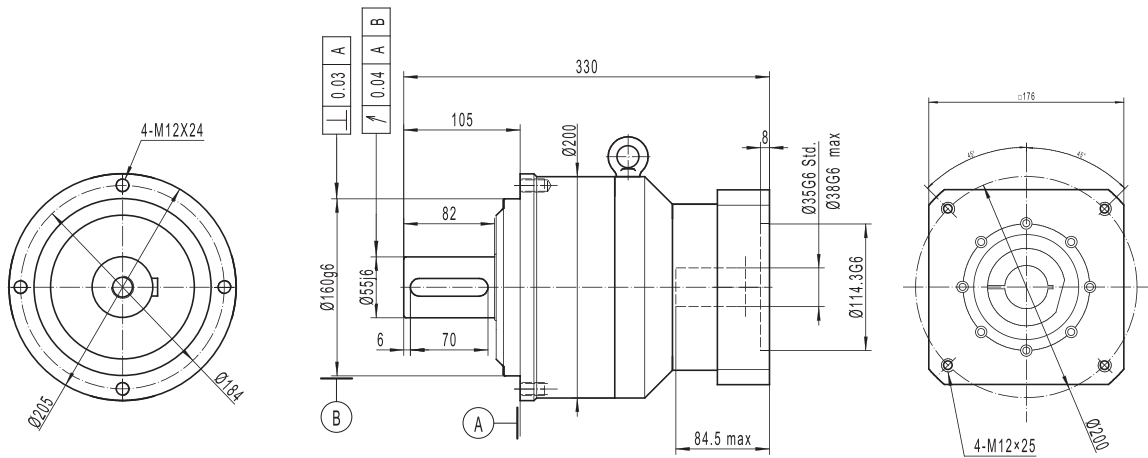
LIVELY CI-ST-205 - 1 STAGES - RATIOS 3 TO 10



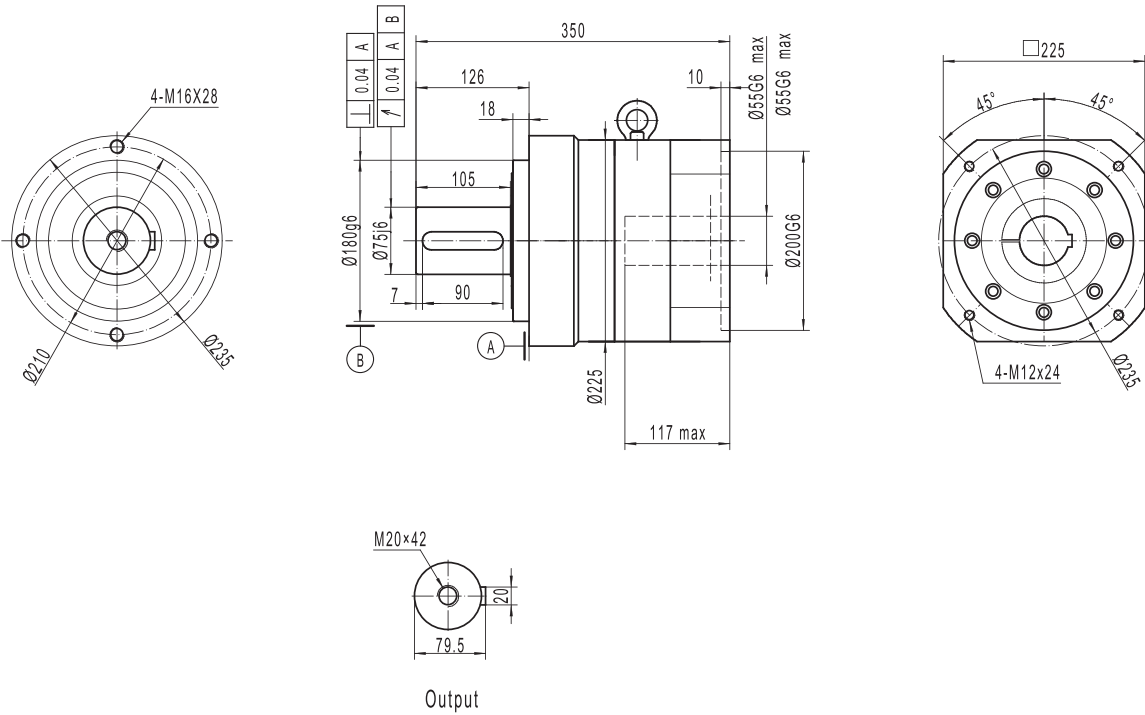
LIVELY CI-ST-205 - 2 STAGES - RATIOS 12 TO 30



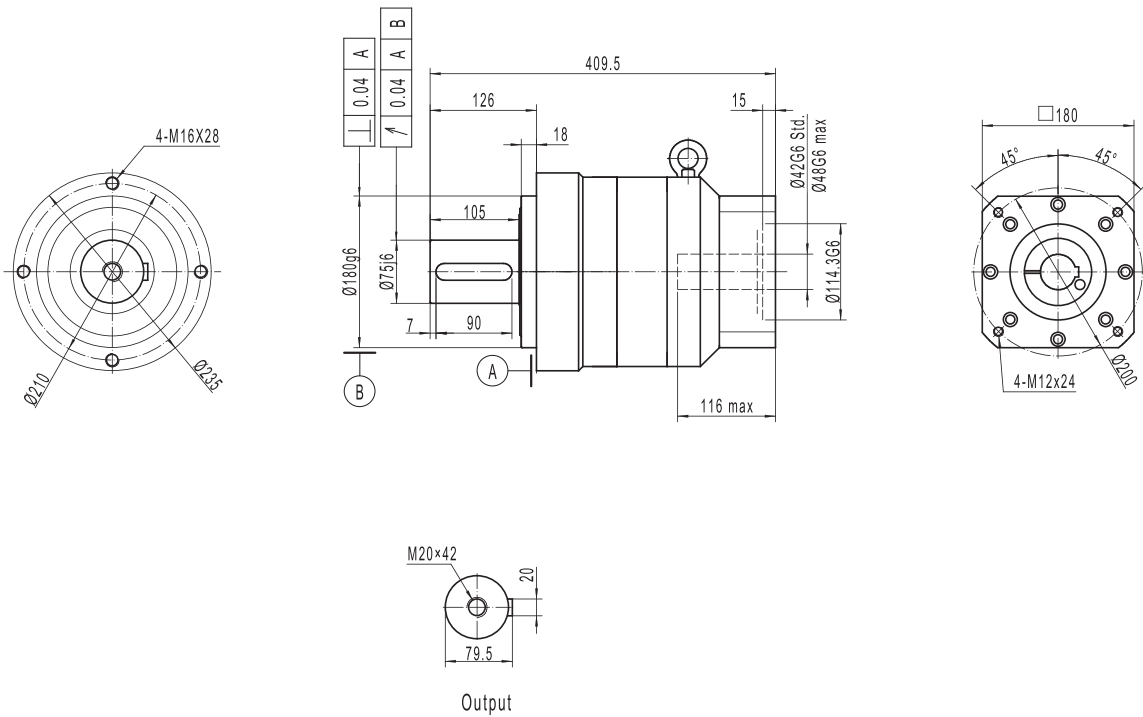
LIVELY CI-ST-205 - 2 STAGES - RATIOS 35 TO 100



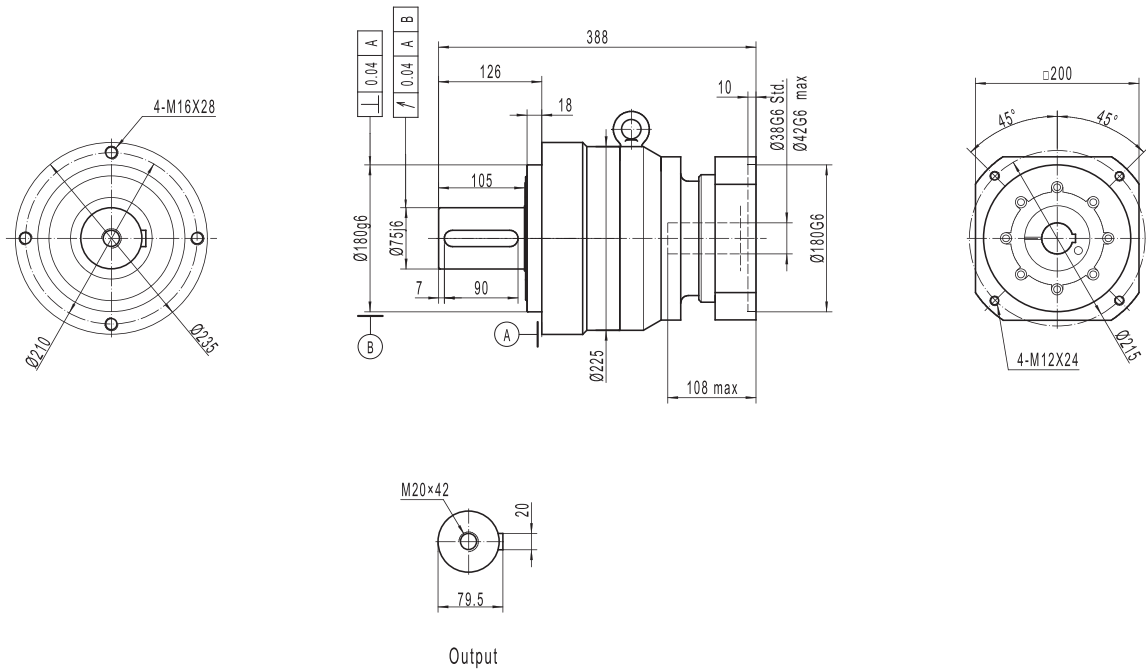
LIVELY CI-ST-235 - 1 STAGES - RATIOS 3 TO 10



LIVELY CI-ST-235 - 2 STAGES - RATIOS 12 TO 30



LIVELY CI-ST-235 - 2 STAGES - RATIOS 35 TO 100





X-TREME

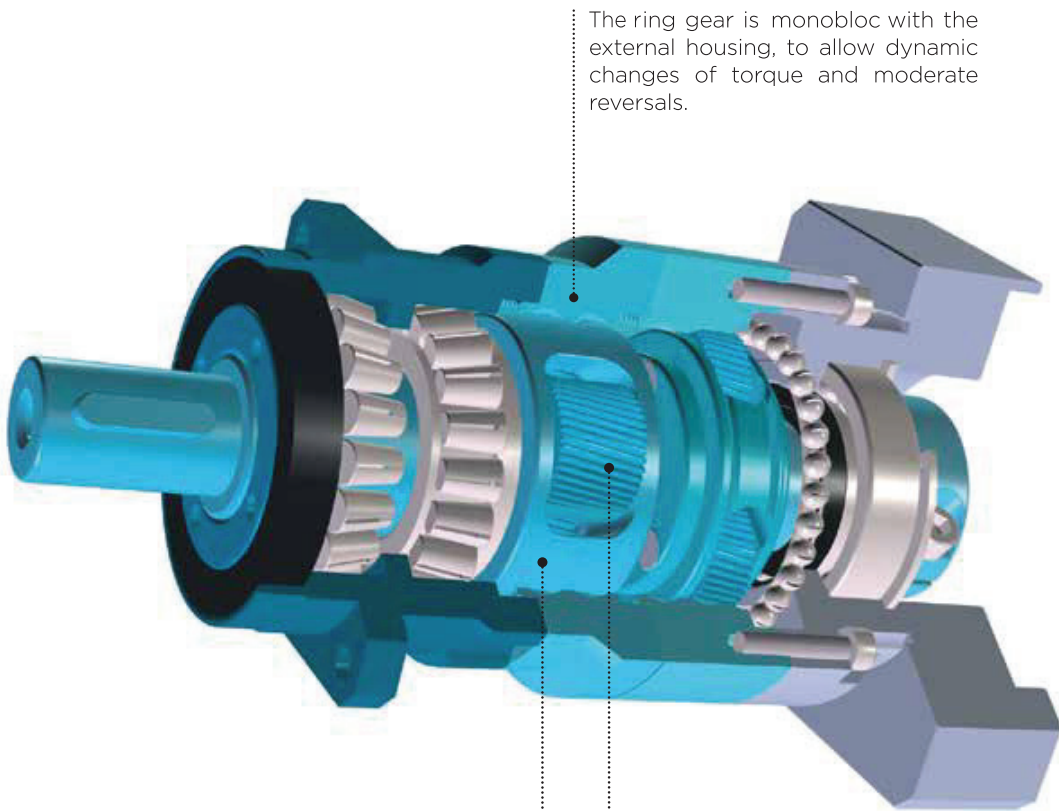


Acceleration capacity	+++
Fast reversals	+++
Radial efforts	+++
Axial efforts	++
Stiffness	++
Precision	++++
Economy	++



X-TREME_ Internal construction

X-TREME is a high-precision planetary gearbox. It was designed for applications requiring high combined radial and axial loads (like high speed helical racks and pinions) with extreme precision.



The ring gear is monobloc with the external housing, to allow dynamic changes of torque and moderate reversals.

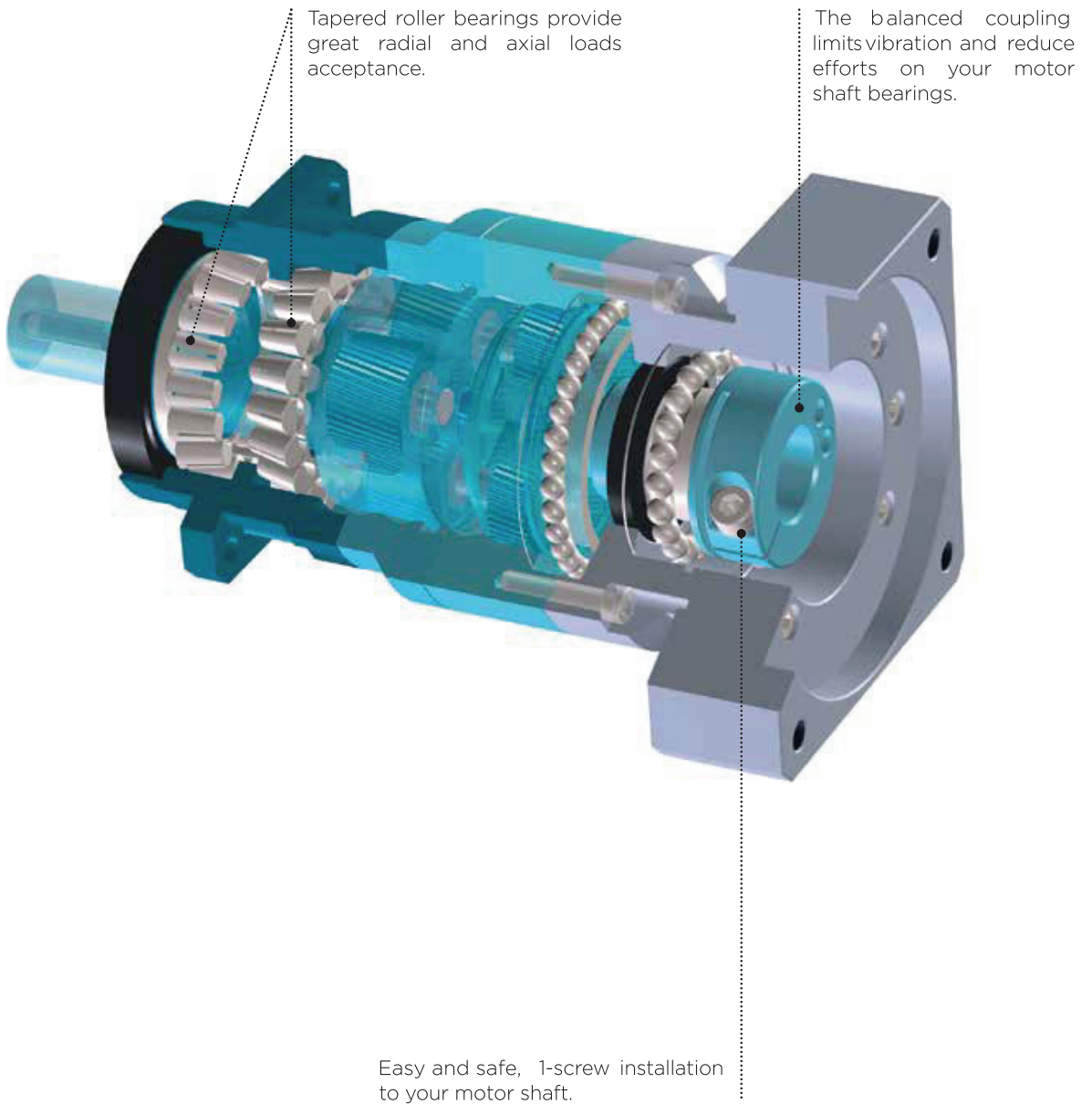
Carburized and quenched helical teeth provide quiet operation, reliability and acceleration capacity.

The caged planet carrier increases stiffness, reliability and acceleration capacity.





PerfectPitch™



X-TREME_Technical data

	RATIO	X-TREME					
		60	75	100	140	180	210
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	50	120	260	530	800
	1/4	42	70	220	386	780	1450
	1/5	43	82	202	374	795	1338
	1/6	42	75	212	365	791	1212
	1/7	42	75	198	368	793	1188
	1/8	39	72	193	355	732	1000
	1/9	33	66	151	300	608	929
	1/10	29	65	154	264	537	714
	1/15	25	50	120	260	530	800
	1/20	42	70	220	386	780	1450
	1/25	43	82	202	374	795	1338
	1/50	43	82	202	374	795	1338
	$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	62	150	340	695
1/4		52	87	272	464	960	1767
1/5		53	102	248	464	1012	1656
1/6		51	91	260	453	979	1494
1/7		52	93	237	453	978	1384
1/8		45	90	227	430	875	1218
1/9		39	81	177	372	758	1124
1/10		37	80	168	345	710	870
1/15		32	62	150	340	695	974
1/20		52	87	272	464	960	1767
1/25		53	102	248	464	1012	1656
1/50		53	102	248	464	1012	1656
1/80		45	90	227	430	875	1218
1/100	37	80	168	345	710	870	
Emergency stop torque $T_x^{(3)}$		3*T _{2n}					
Angular backlash (arc-min)	1 stage	Standard ≤ 3; Reduced ≤ 1					
	2 stages	Standard ≤ 5; Reduced ≤ 3					
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000	3,000	2,000	2,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000	6,000	4,000	4,000
Maximum radial load ⁽⁶⁾ (N)		2,700	4,000	6,300	9,700	18,000	27,000
Maximum axial load (N)		2,400	3,350	5,650	9,800	16,500	22,000
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96					
	2 stages	>93					
Torsional stiffness (Nm / arc-min)		6	10	31	53	175	400
Lifetime ⁽⁸⁾		20,000 hours					
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C					
Max housing temperature (90°)		90°C					
Protection class		IP65					
Noise level (dB)		<60	<63	<66	<68	<73	<78
Lubricant		Sumico grease (lubricated for life)					
Color		Capri blue (RAL 5019)					
Input flange		Anodized Aluminum					

(1) : Nominal output torque.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : 100 occurrences maximum.

(4) : Speed at which the nominal torque is applicable 20,000 hours.

(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

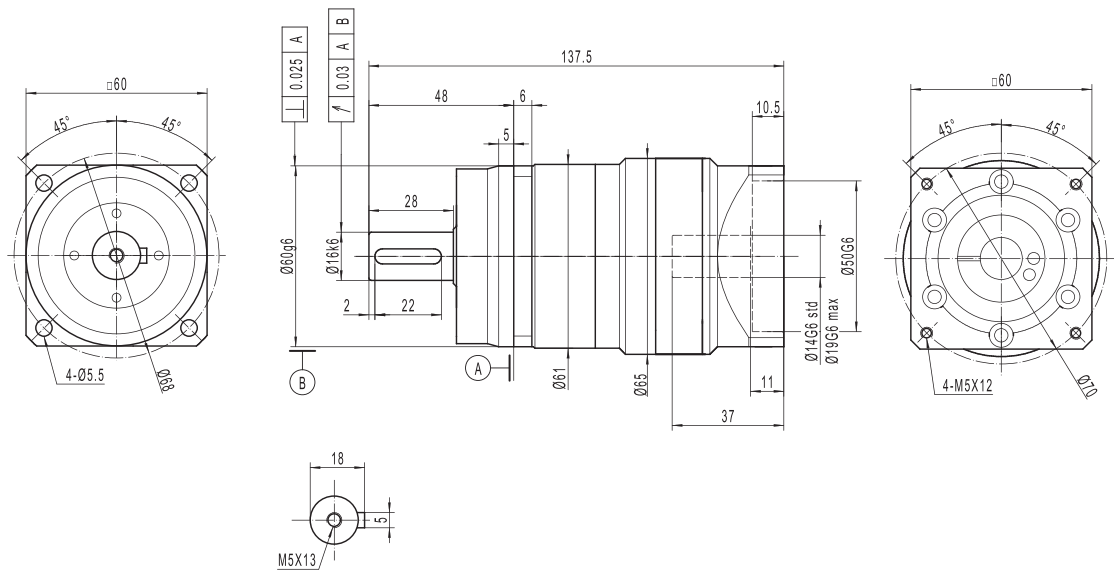
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

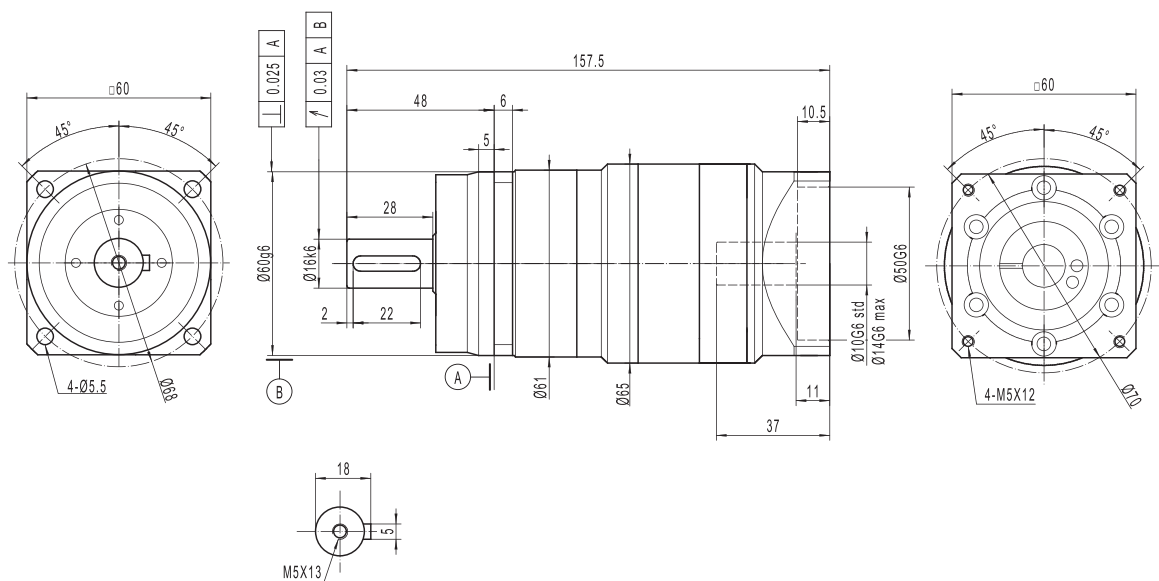
(9) : Room temperature. Refer to temperature factors on page 140.

Refer to page 134 for detailed explanations about gearbox selection and ratings.

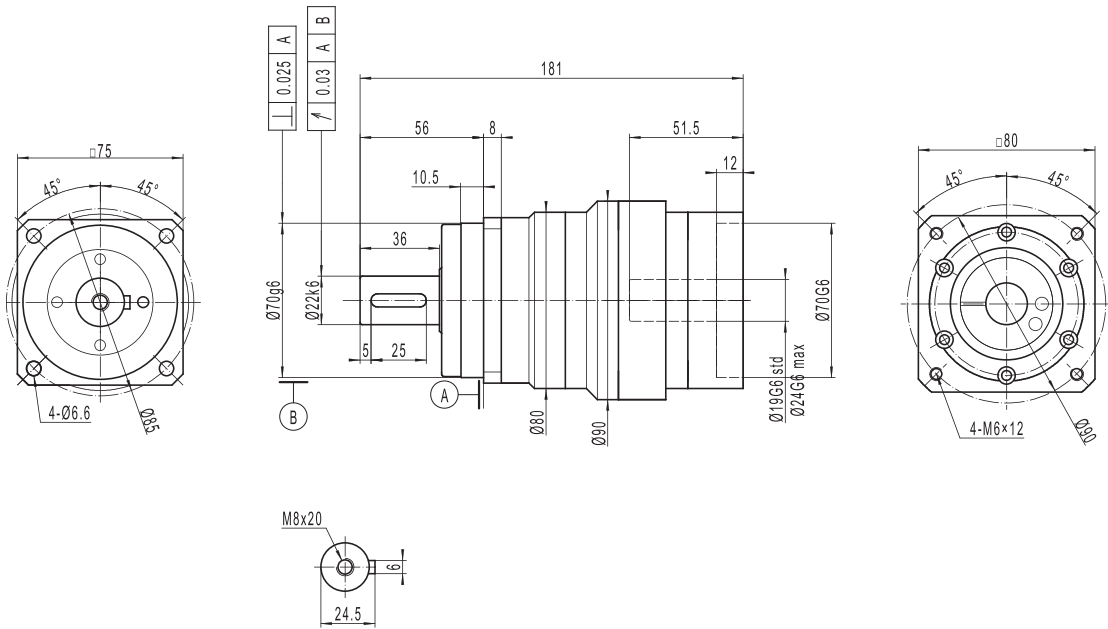
X-TREME SQ-ST-060 -1 STAGE - RATIOS 3 TO 10



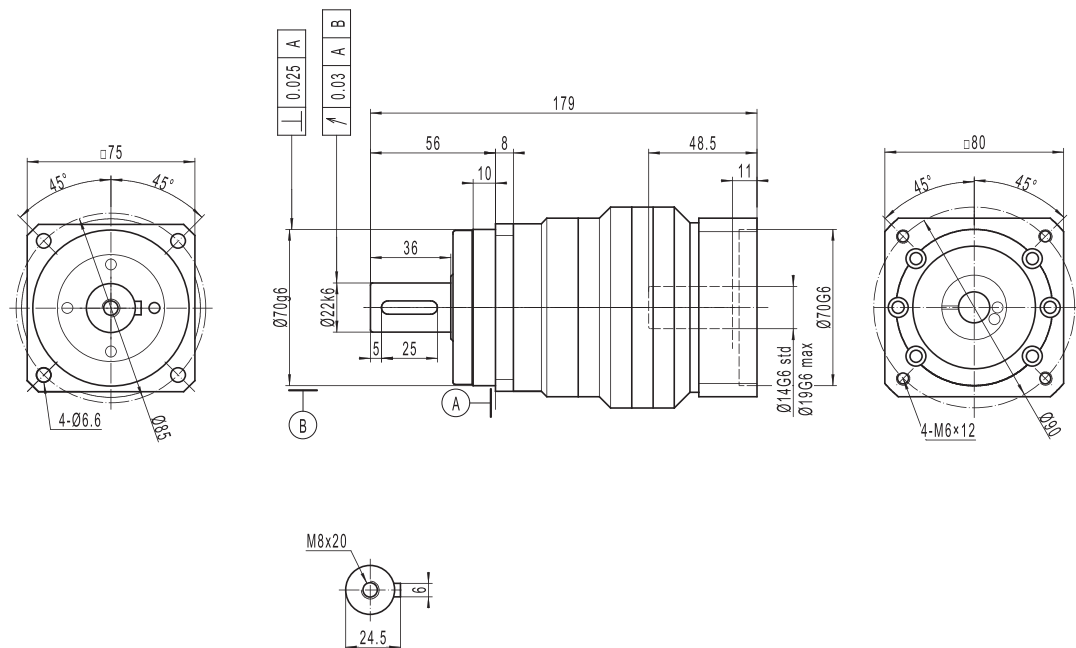
X-TREME SQ-ST-060-2 STAGES - RATIOS 12 TO 100



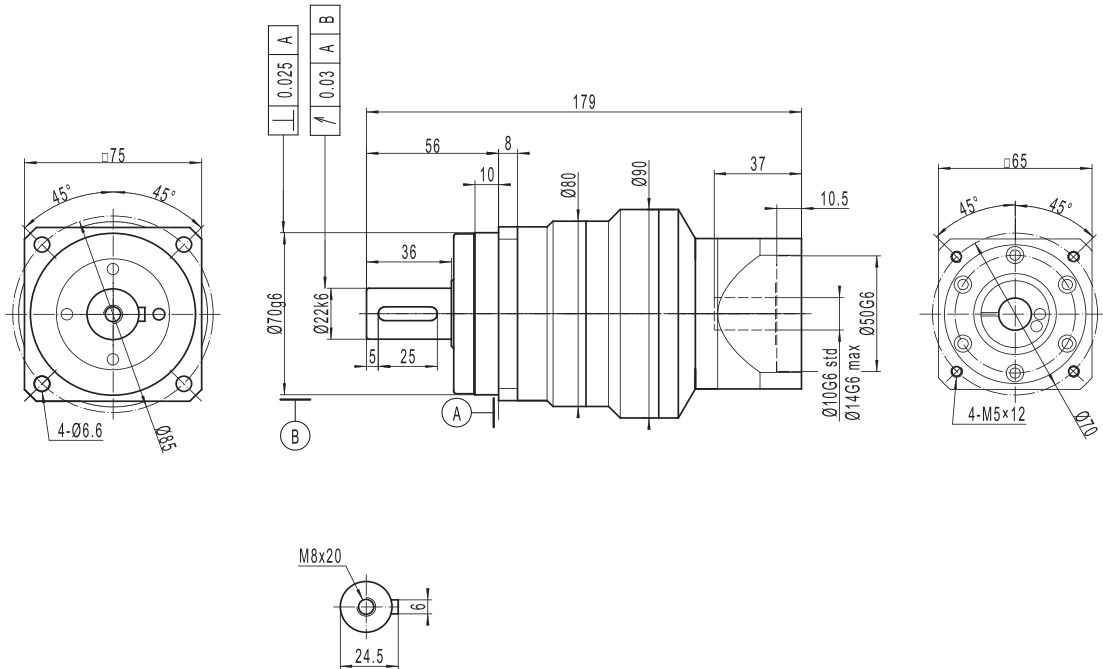
X-TREME SQ-ST-075-1 STAGE - RATIOS 3 TO 10



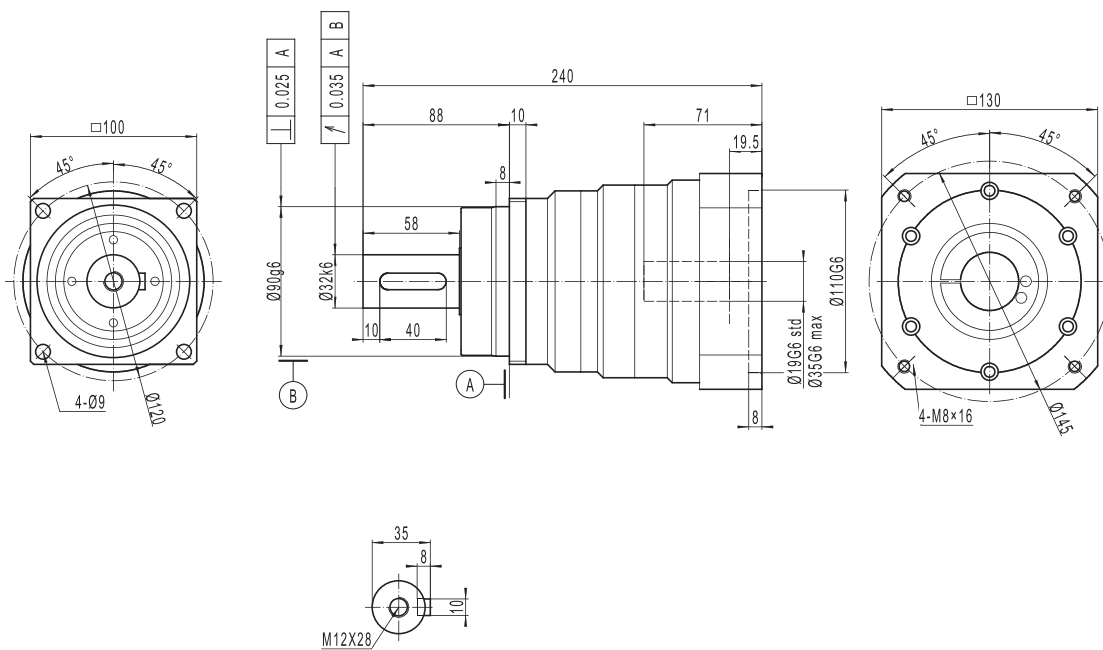
X-TREME SQ-ST-075-2 STAGES - RATIOS 12 TO 28



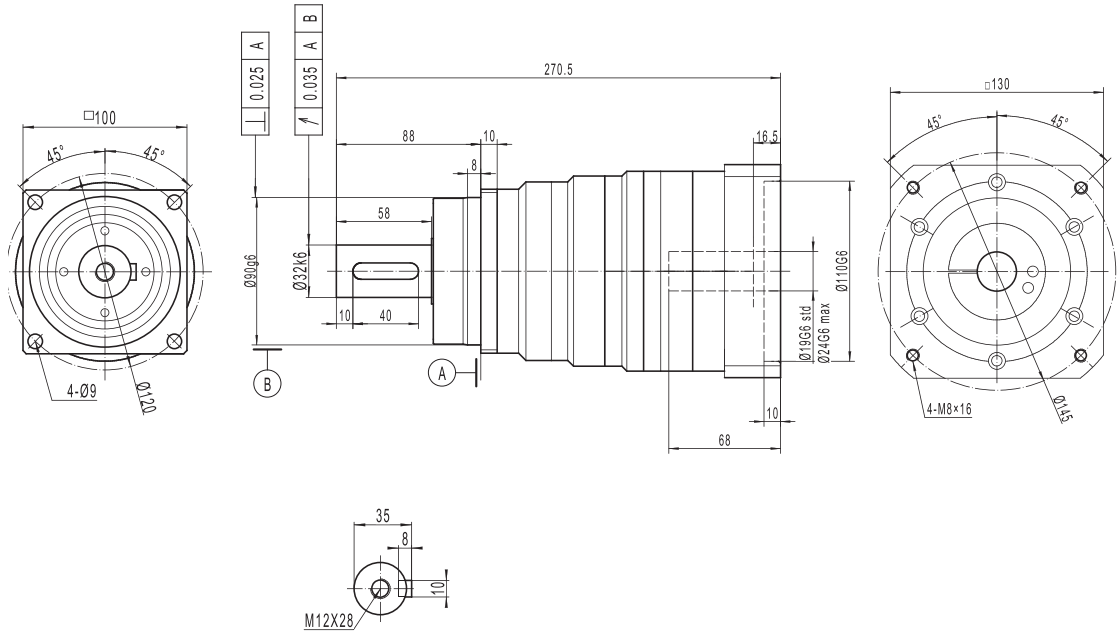
X-TREME SQ-ST-075-2 STAGES - RATIOS 30 TO 100



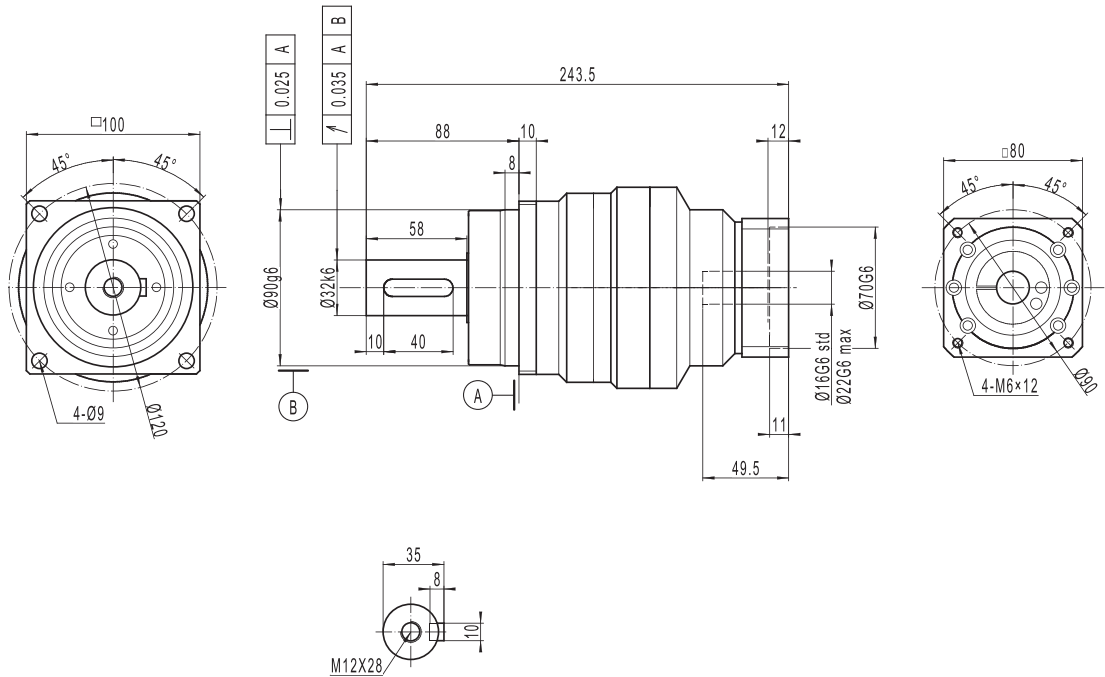
X-TREME SQ-ST-100-1 STAGE - RATIOS 3 TO 10



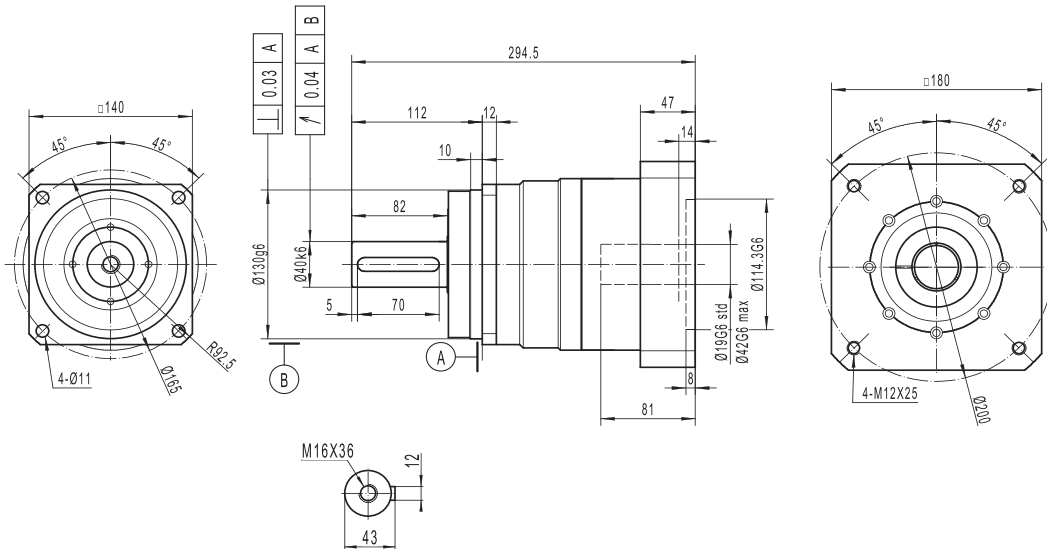
X-TREME SQ-ST-100-2 STAGES - RATIOS 12 TO 32



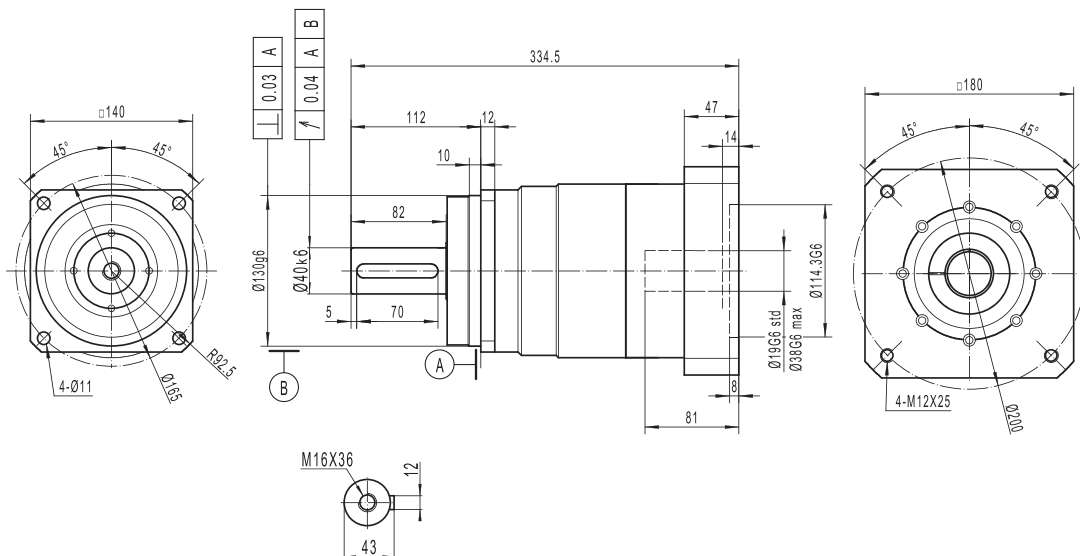
X-TREME SQ-ST-100-2 STAGES-RATIOS 35 TO 100



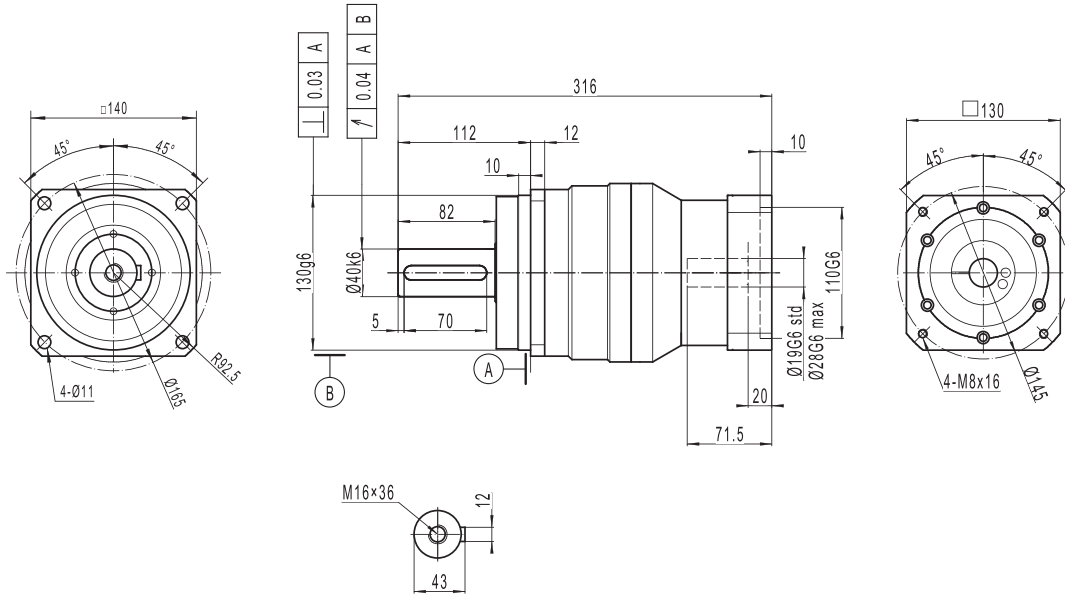
X-TREME SQ-ST-140-1 STAGE - RATIOS 3 TO 10



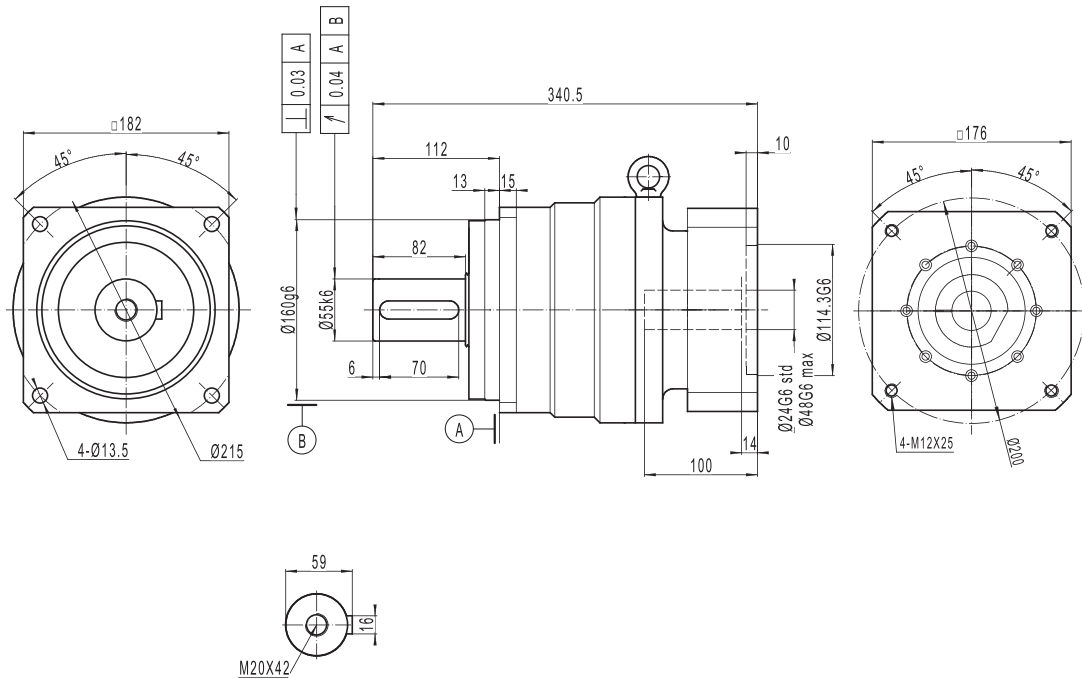
X-TREME SQ-ST-140-2 STAGES - RATIOS 12 TO 32



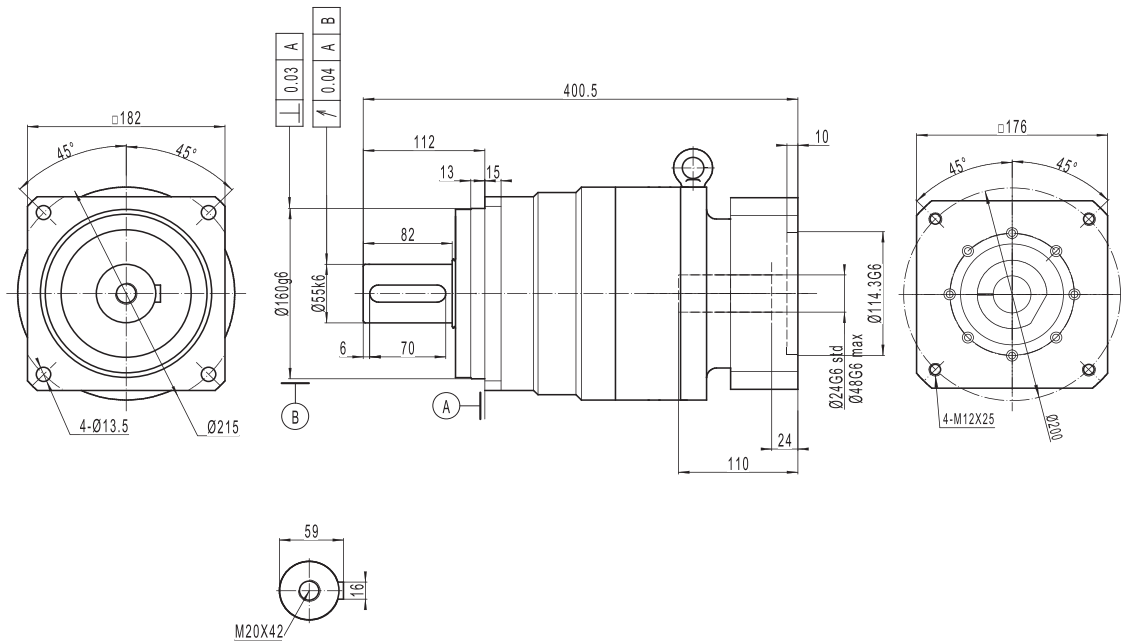
X-TREME SQ-ST-140-2 STAGES - RATIOS 35 TO 100



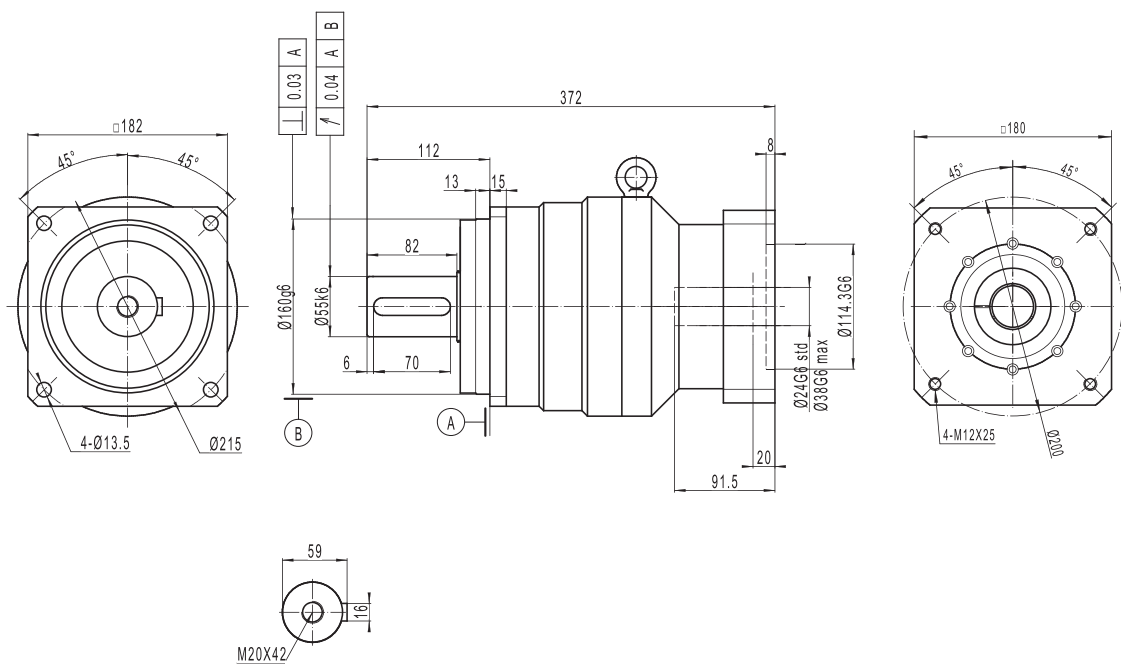
X-TREME SQ-ST-180-1 STAGE - RATIOS 3 TO 10



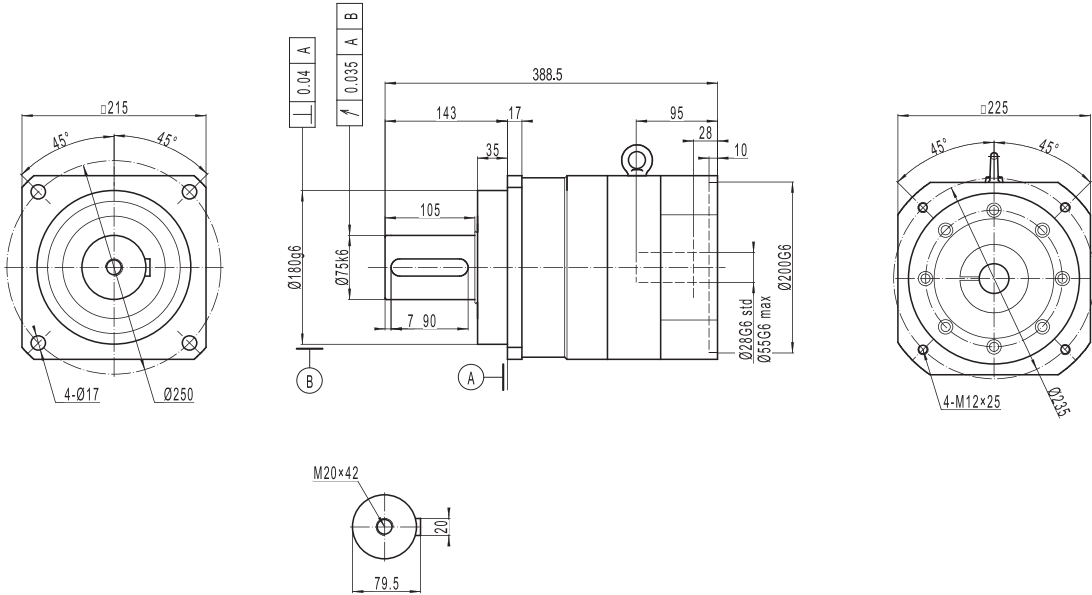
X-TREME SQ-ST-180-2 STAGES - RATIOS 12 TO 32



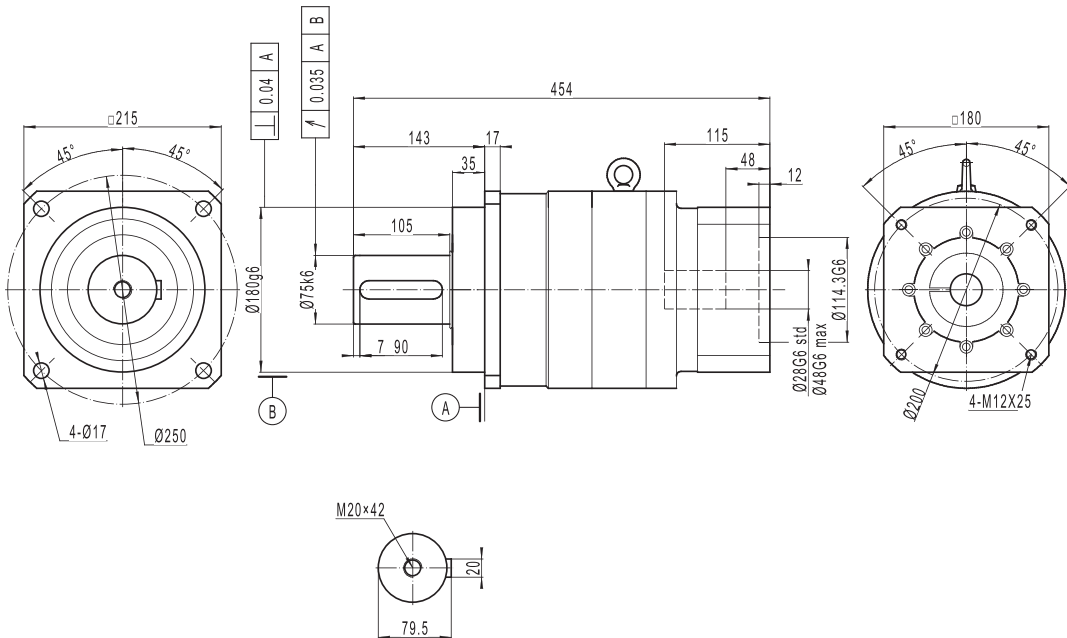
X-TREME SQ-ST-180-2 STAGES - RATIOS 35 TO 100



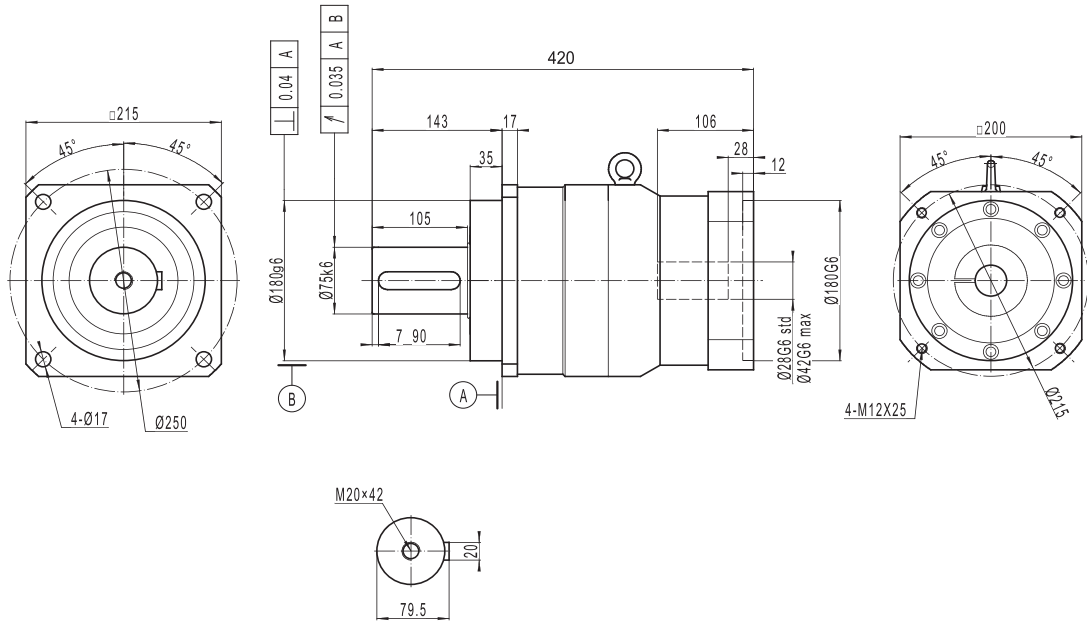
X-TREME SQ-ST-210-1 STAGE - RATIOS 3 TO 10



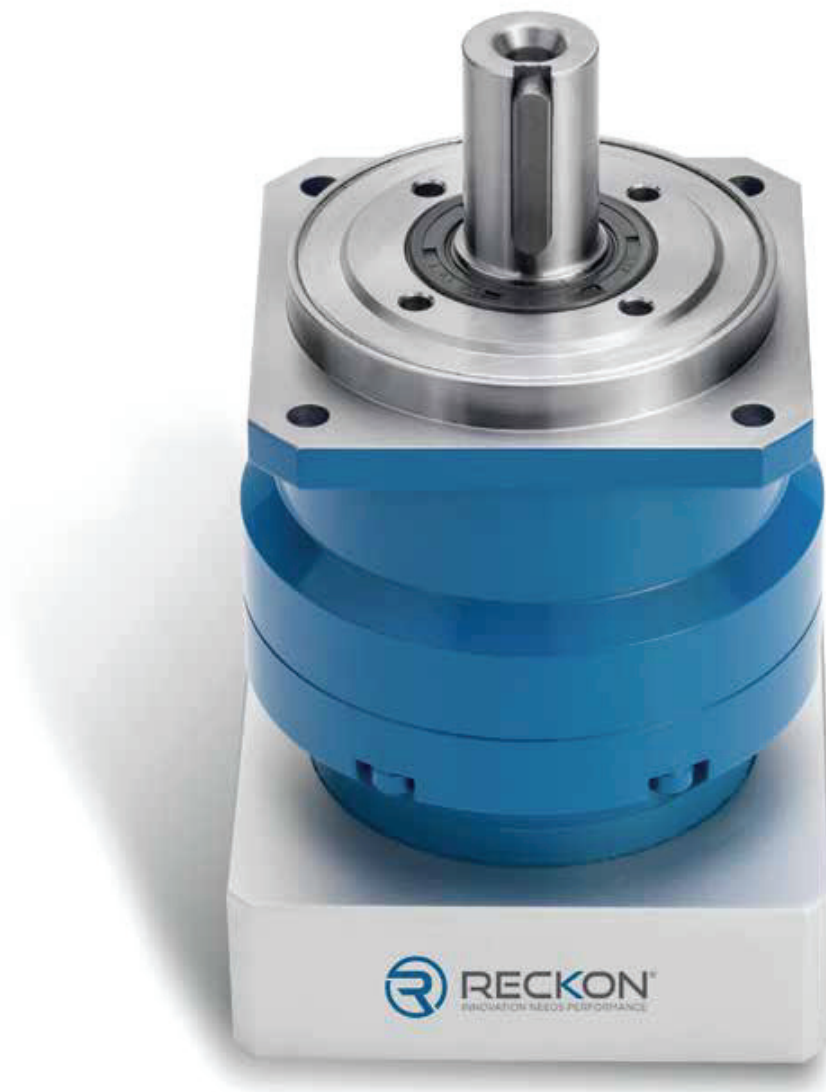
X-TREME SQ-ST-210-2 STAGES - RATIOS 12 TO 32



X-TREME SQ-ST-210-2 STAGES - RATIOS 35 TO 100



BOOSTER

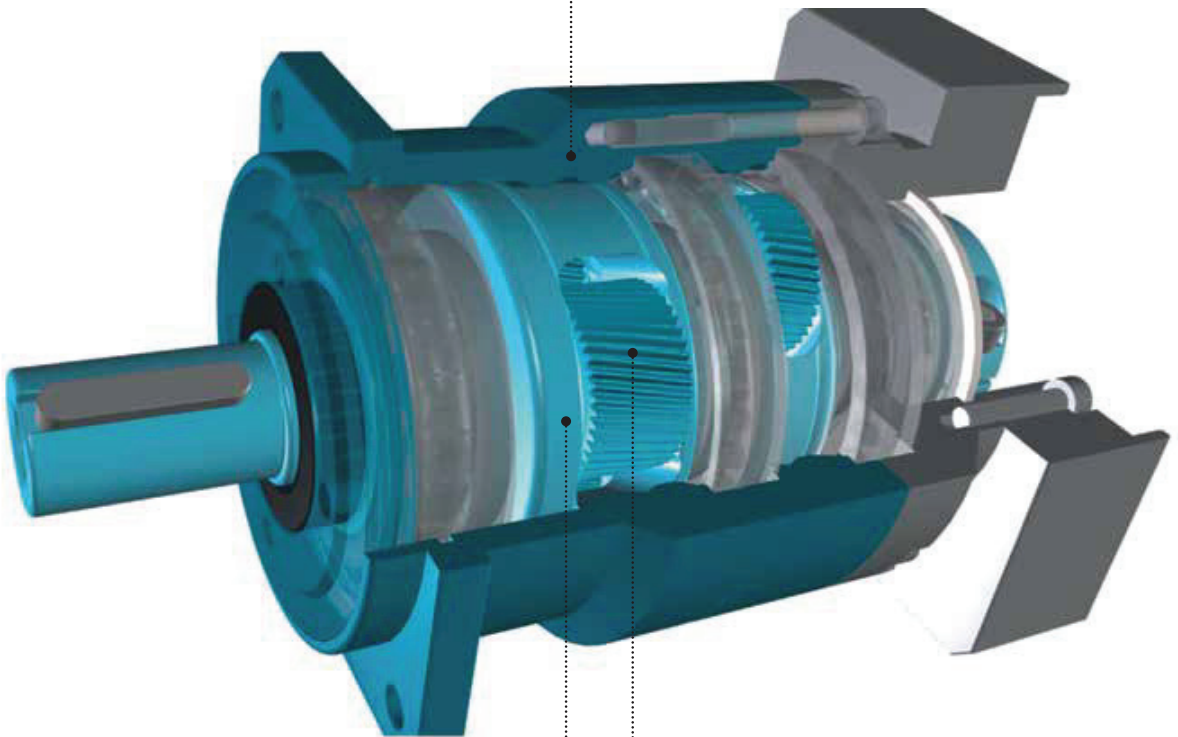


Acceleration capacity	++++
Fast reversals	++++
Radial efforts	+++
Axial efforts	+++
Stiffness	++++
Precision	+++++
Economy	++

BOOSTER _ Internal construction

BOOSTER is a high-performance, high precision planetary gearbox. It delivers strong acceleration and fast reversals to heavy duty servo-applications.

The ring gear is monobloc with the external housing and the output flange, to provide higher stiffness and allow very dynamic reversals.



Carburized and quenched helical teeth provide quiet operation, reliability and acceleration capacity.

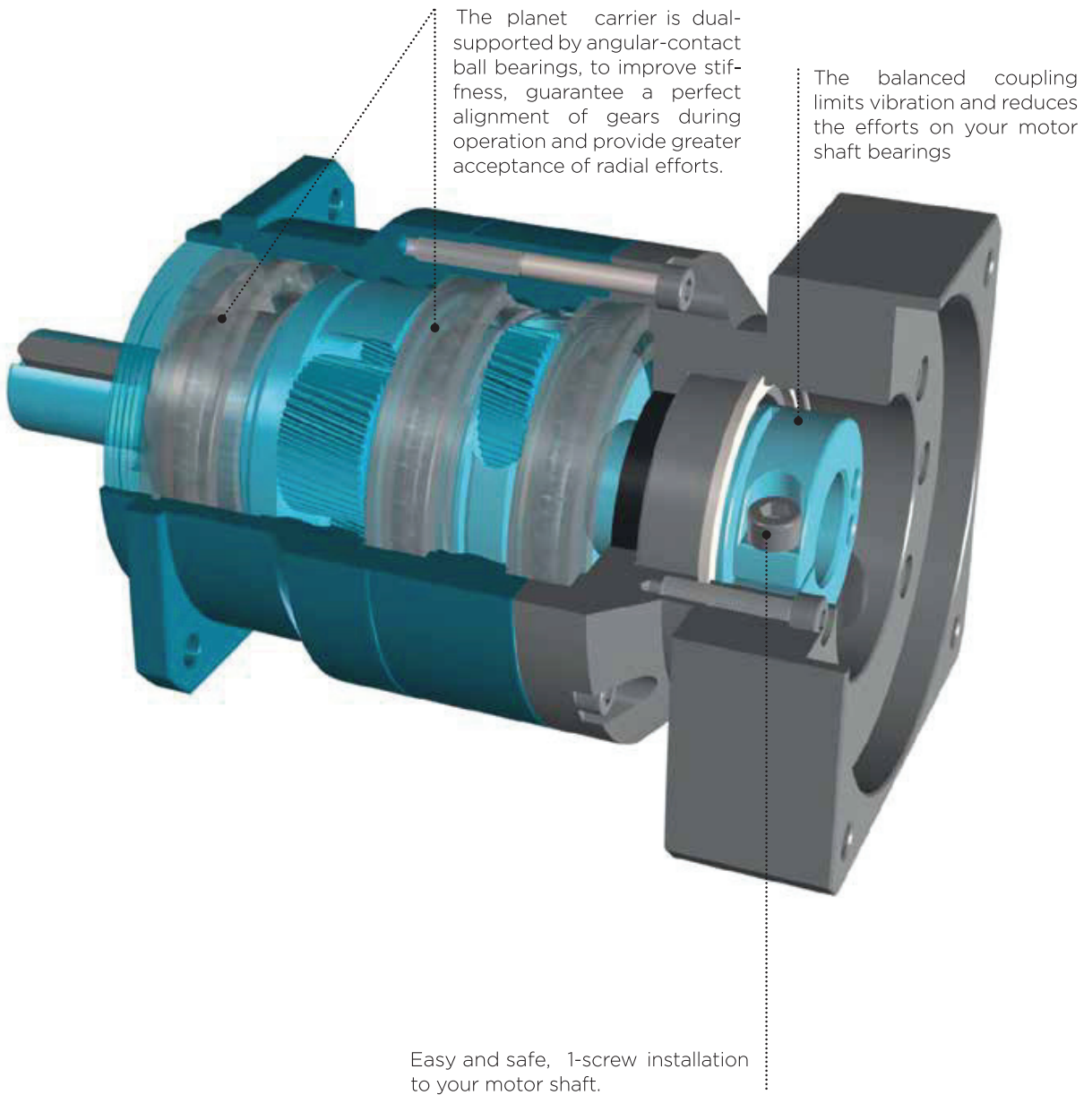
The caged planet carrier provides stiffness, reliability and acceleration capacity to the gearbox.

THE ENTIRE RANGE IS
LUBRICATED FOR LIFE BY





PerfectPitch™



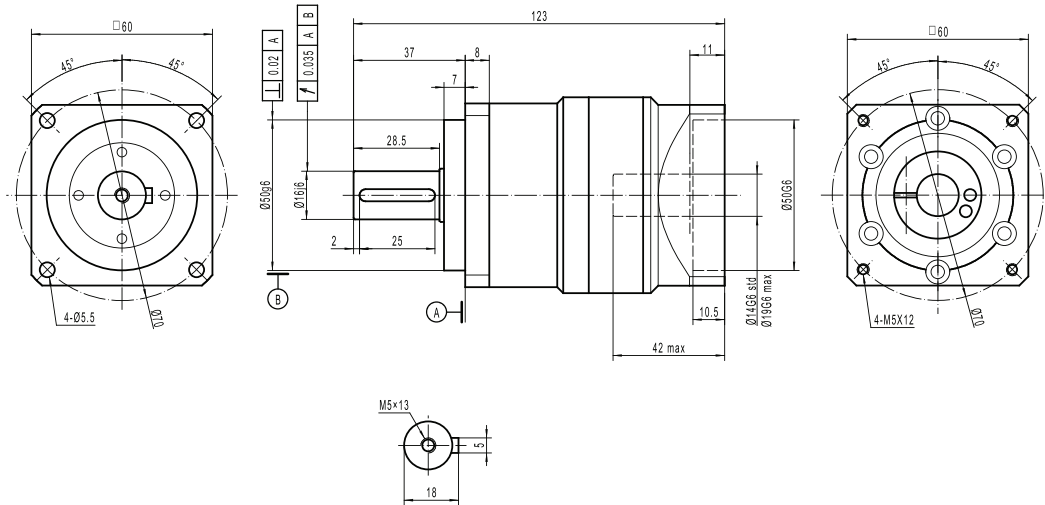
BOOSTER_Technical data

	RATIO	BOOSTER		
		60	90	120
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	60	132
	1/4	42	84	242
	1/5	43	98	222
	1/6	42	90	254
	1/7	42	90	218
	1/8	39	86	212
	1/9	33	79	166
	1/10	29	78	169
	1/15	25	60	132
	1/20	42	84	242
	1/25	43	98	222
	1/50	43	98	222
	1/80	39	86	212
	1/100	29	78	169
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	74	165
	1/4	52	104	299
	1/5	53	122	272
	1/6	51	109	286
	1/7	52	112	260
	1/8	45	108	250
	1/9	39	97	194
	1/10	37	96	184
	1/15	32	74	165
	1/20	52	104	299
	1/25	53	122	272
	1/50	53	122	272
	1/80	45	108	250
	1/100	37	96	184
Emergency stop torque $T_x^{(3)}$		3*T _{2n}		
Angular backlash (arc-min)	1 stage	Standard ≤ 3; Reduced ≤ 1		
	2 stages	Standard ≤ 5; Reduced ≤ 3		
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000
Maximum bending moment ⁽⁶⁾ (N.m)		105	200	380
Maximum axial load (N)		800	2,100	3,300
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96		
	2 stages	>93		
Torsional stiffness (Nm / arc-min)		8	20	41
Lifetime ⁽⁸⁾		20,000 hours		
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C		
Max housing temperature (90°)		90°C		
Protection class		IP65		
Noise level (dB)		<60	<62	<65
Lubricant		Sumico grease (lubricated for life)		
Color		Capri blue (RAL 5019)		
Input flange		Anodized Aluminum		

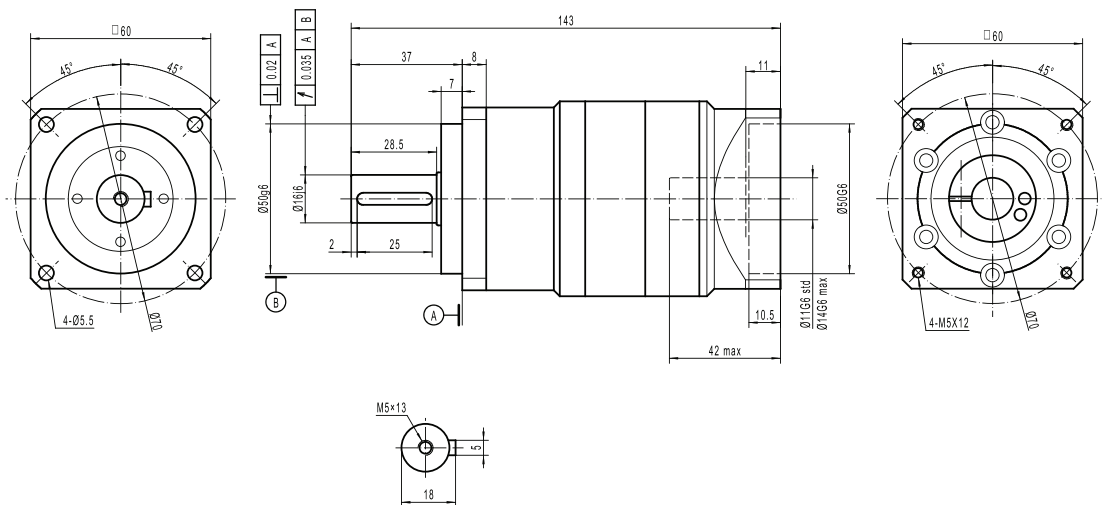
- (1) : Nominal output torque.
 (2) : Torque which is necessary to start the application, applicable 2,000 hours.
 (3) : 100 occurrences maximum.
 (4) : Speed at which the nominal torque is applicable 20,000 hours.
 (5) : Peak speed only.
 (6) : Applied at the middle of the output shaft at 300 rpm.
 (7) : Measured at full load and at 25°C.
 (8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.
 (9) : Room temperature. Refer to temperature factors on page 140.

Refer to page 134 for detailed explanations about gearbox selection and ratings.

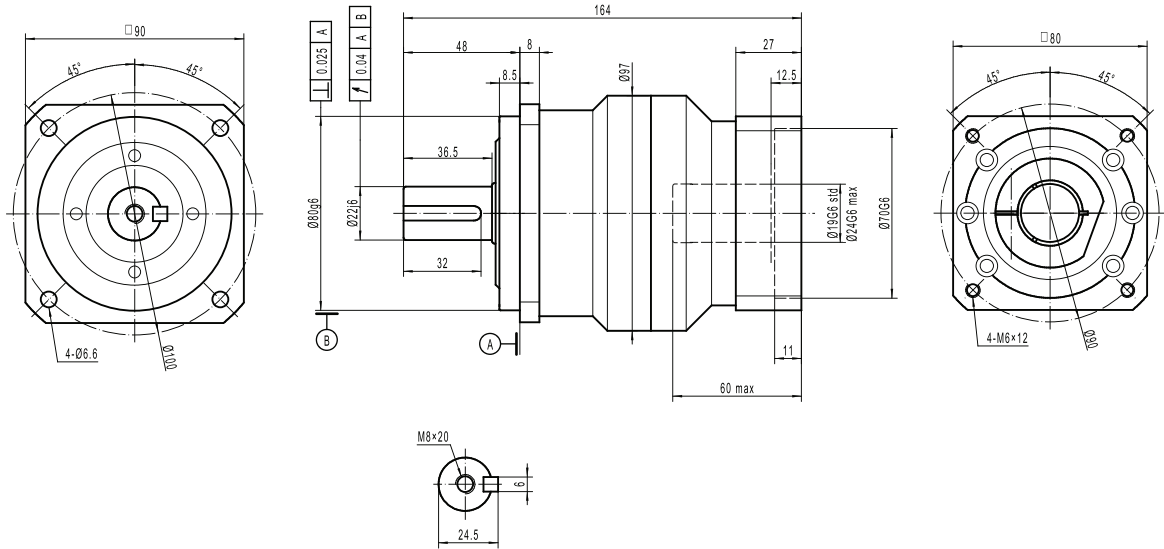
BOOSTER SQ-ST-060-1 STAGE-RATIO 3 TO 10



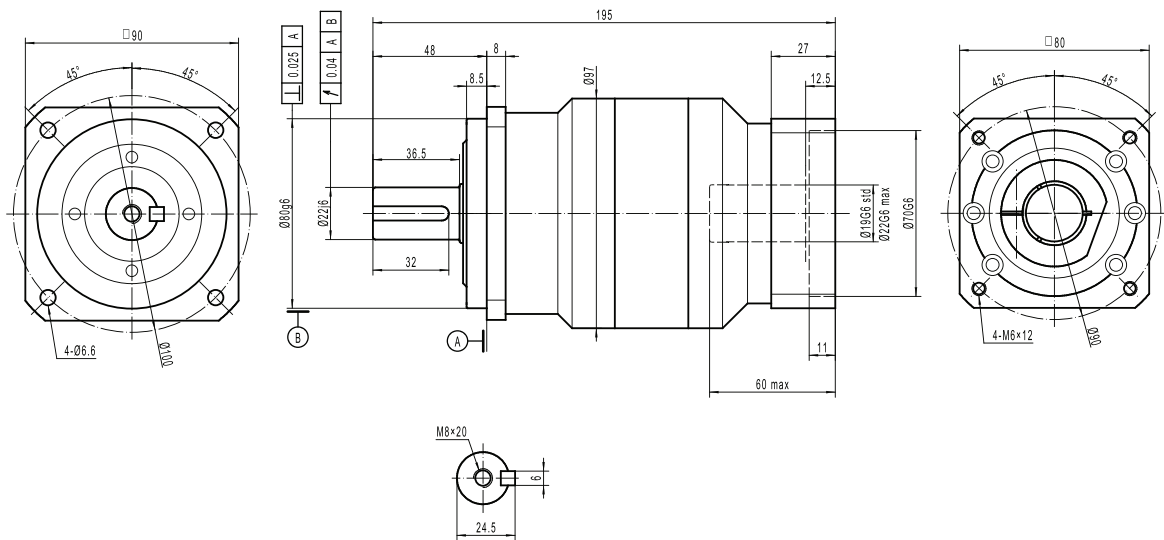
BOOSTER SQ-ST-060-2 STAGES-RATIO 12 TO 100



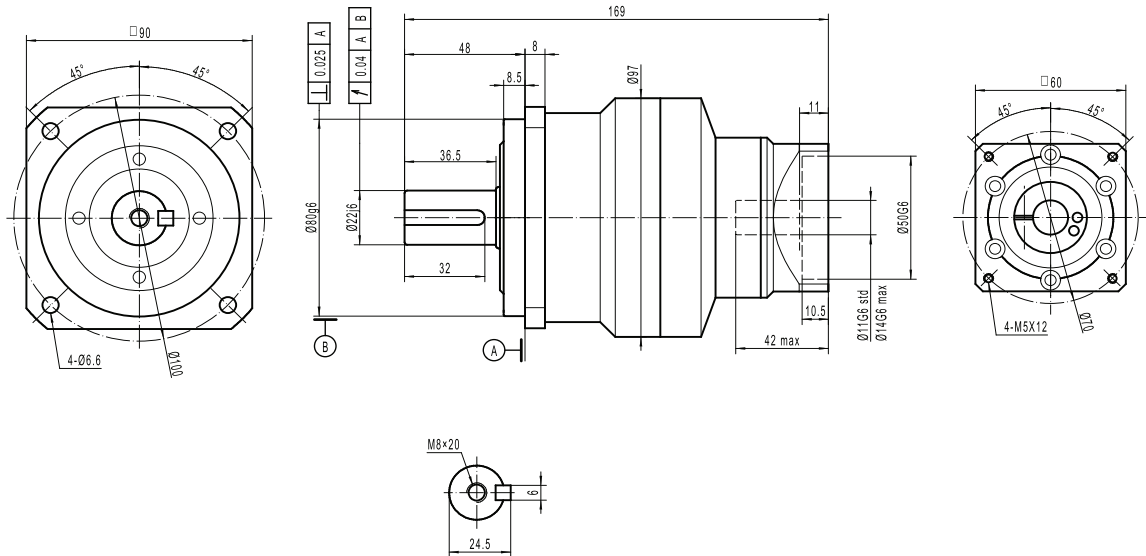
BOOSTER SQ-ST-090-1 STAGE-RATIO 3 TO 10



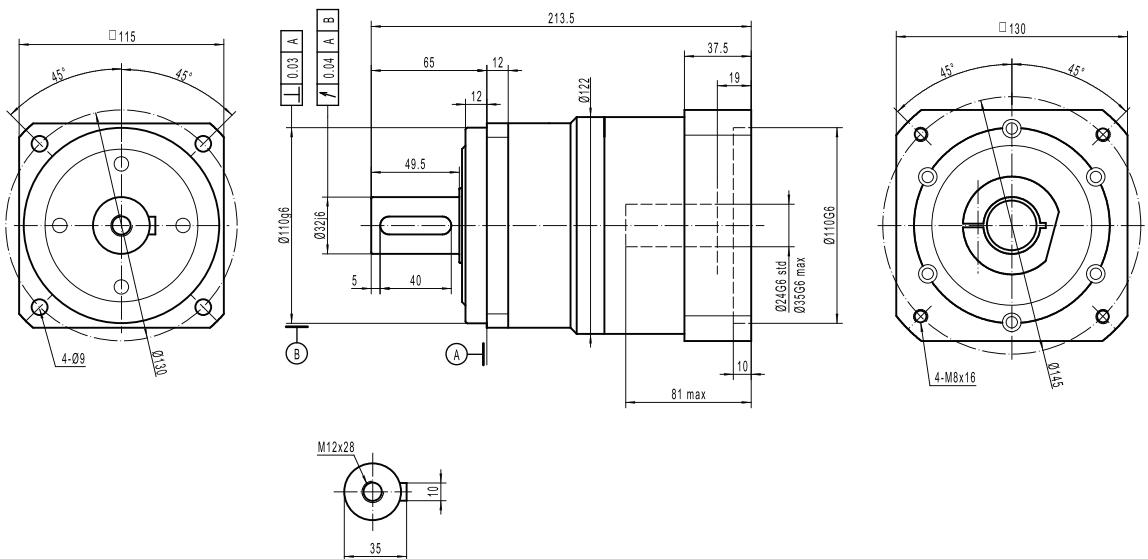
BOOSTER SQ-ST-090-2 STAGES-012-025-RATIO 12 TO 25



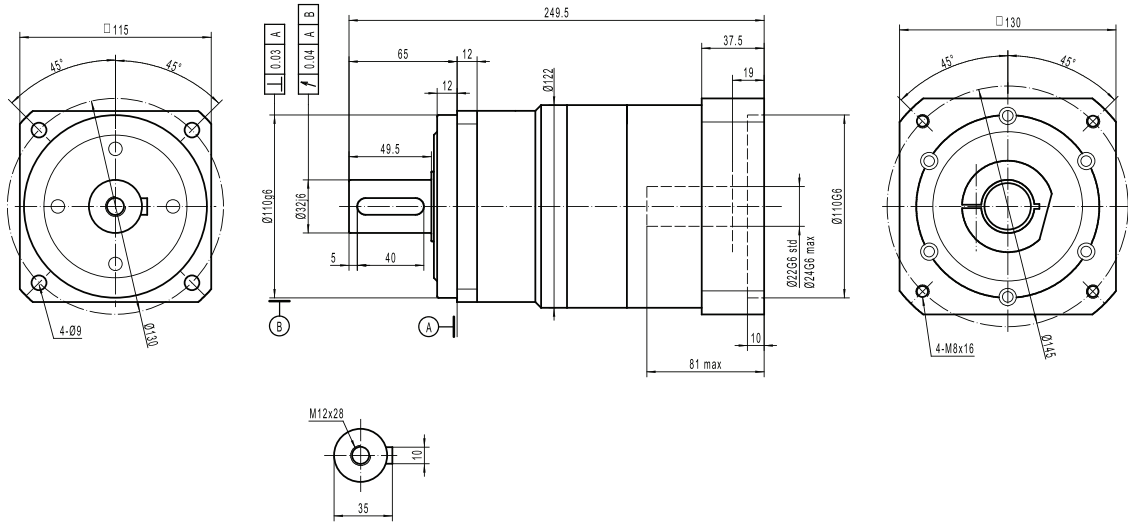
BOOSTER SQ-ST-090-2 STAGES-RATIO 30 TO 100



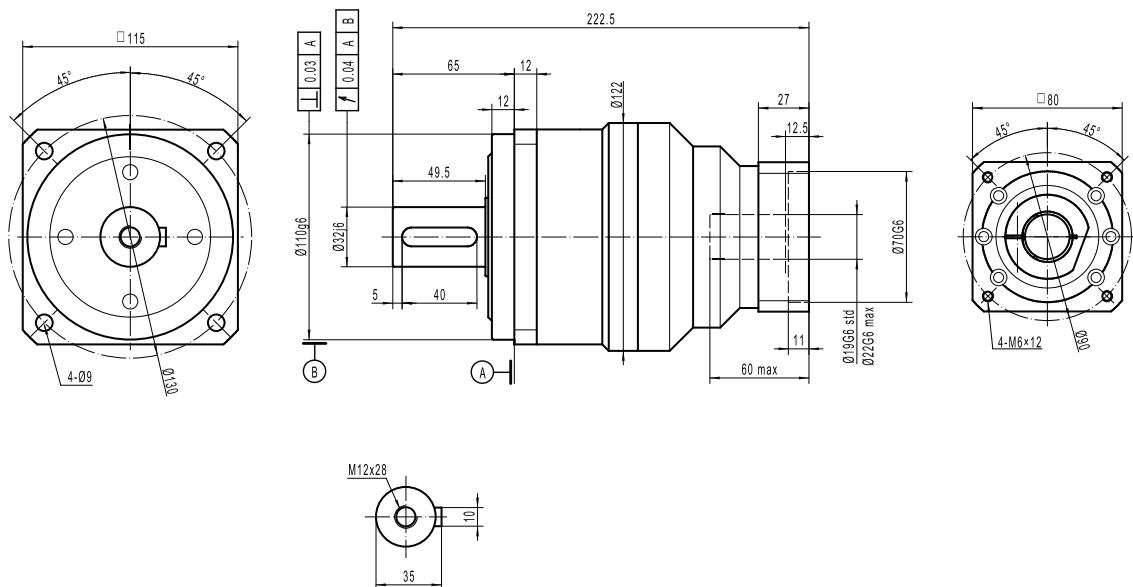
BOOSTER SQ-ST-120 -1 STAGE-RATIO 3 TO 10



BOOSTER SQ-ST-120-2 STAGES-RATIO 12 TO 30



BOOSTER SQ-ST-120-2 STAGES-RATIO 35 TO 100



ULTIMATE



Acceleration capacity	+++++
Fast reversals	+++++
Radial efforts	+++++
Stiffness	+++++
Precision	+++++
Economy	++

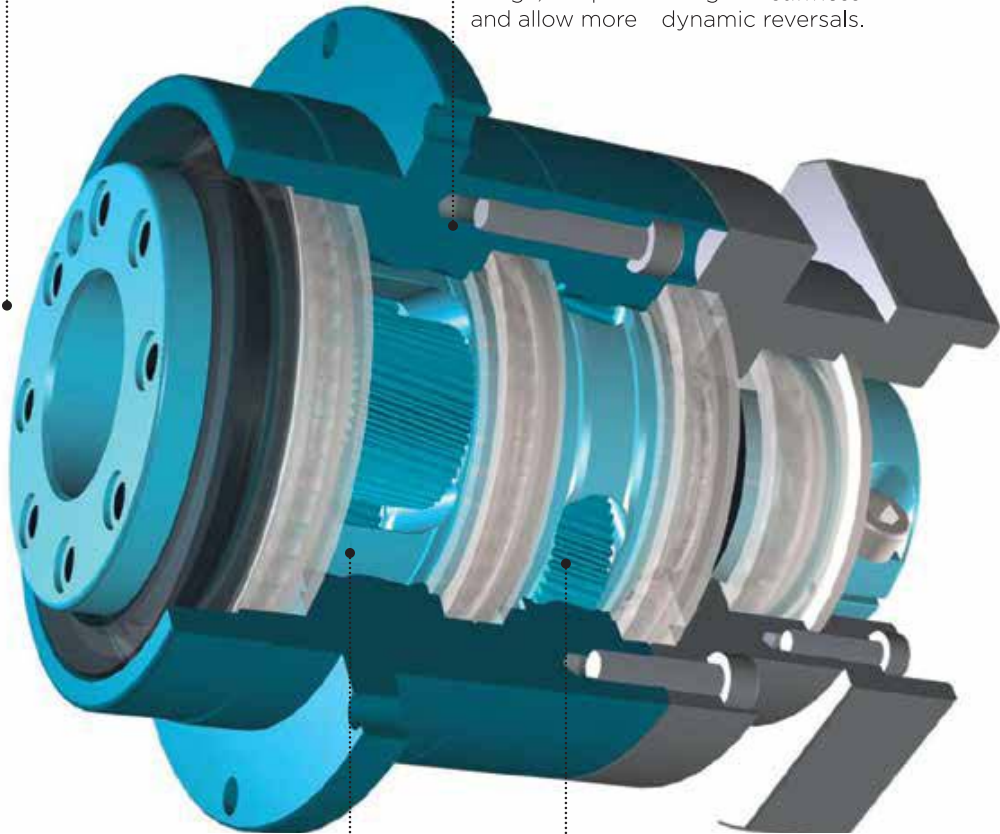
ULTIMATE _ Internal construction

Ultimate is a low-backlash, heavy-duty planetary gearbox.

It provides amazing acceleration capacity to severe applications including new-generation lasercutting machines, delta robots or punching machines, where high precision is needed, together with torsional stiffness.

The output flange is ideal for fast reversals strong acceleration requiring stiffness in heavy-duty applications.

The ring gear is monobloc with the external housing and the output flange, to provide higher stiffness and allow more dynamic reversals.



Carburized and quenched helical teeth allow quiet operation, reliability and acceleration capacity.

The caged planet carrier provides stiffness, reliability and acceleration capacity to the gearbox.

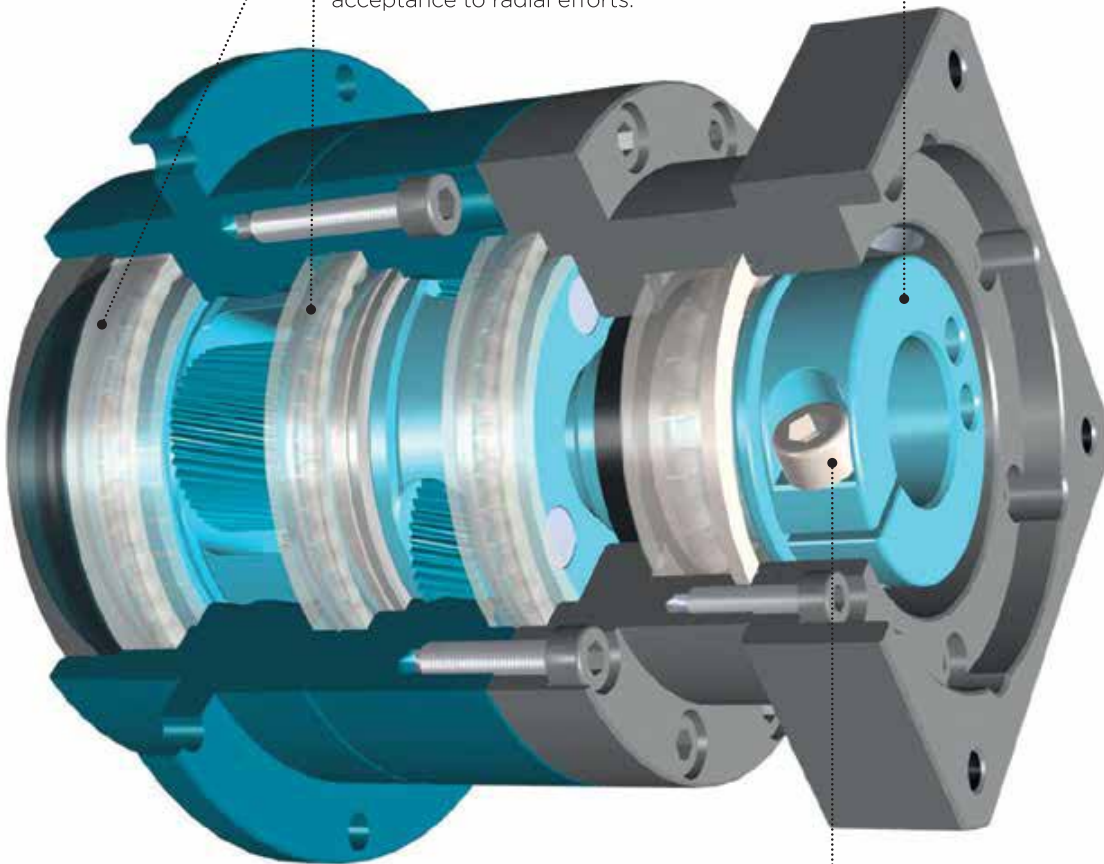




PerfectPitch™

Planet carrier is dual-supported by angular-contact ball bearings (small sizes) or tapered roller bearings (sizes above 140), to improve stiffness, guarantee a perfect alignment of gears during operation and provide greater acceptance to radial efforts.

The balanced coupling limits vibration and reduces the efforts on your motor shaft bearings.



Easy and safe, 1-screw installation to your motor shaft.

ULTIMATE_Technical data

	RATIO	ULTIMATE							
		64	90	110	140	200	255	285	
T _{2n} ⁽¹⁾ 20,000h; KA=1.25	1/4	42	84	242	386	780	2455	3717	
	1/5	43	98	222	374	795	2207	3391	
	1/6	42	90	254	365	791	2030	3040	
	1/7	42	90	218	368	793	1900	2787	
	1/8	39	86	212	355	732	1593	2343	
	1/9	33	79	166	300	608	1277	1885	
	1/10	29	78	169	264	537	1108	1631	
	1/16	25	60	132	260	530	1100	1600	
	1/20	42	84	242	386	780	2455	3717	
	1/25	43	98	222	374	795	2207	3391	
	1/50	43	98	222	374	795	2207	3391	
	1/80	39	86	212	355	732	1593	2343	
	1/100	29	78	169	264	537	1108	1631	
	T _{max} ⁽²⁾ 2,000h; 1,500rpm	1/4	52	104	299	464	960	2929	4323
		1/5	53	122	272	464	1012	2629	3943
1/6		51	109	286	453	979	2413	3475	
1/7		52	112	260	453	978	2211	3186	
1/8		45	108	250	430	875	1850	2678	
1/9		39	97	194	372	758	1573	2299	
1/10		37	96	184	345	710	1425	2064	
1/16		32	74	165	340	695	1410	1950	
1/20		52	104	299	464	960	2929	4323	
1/25		53	122	272	464	1012	2629	3923	
1/50		53	122	272	464	1012	2629	3943	
1/80	45	108	250	430	875	1850	2678		
1/100	37	96	184	345	710	1425	2064		
Emergency stop torque Tx ⁽³⁾		3*T _{2n}							
Angular backlash (arc-min)	1 stage	Standard ≤ 3; Reduced ≤ 1							
	2 stages	Standard ≤ 5; Reduced ≤ 3							
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000	3,000	2,000	2,500	1,500	
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000	6,000	4,000	4,000	2,500	
Maximum bending moment ⁽⁶⁾ (N.m)		115	215	400	1,160	2,700	5,300	7,600	
Maximum axial load (N)		950	2,500	4,000	9,000	15,000	26,000	42,000	
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96							
	2 stages	>93							
Torsional stiffness (Nm / arc-min)		6	10	31	53	175	400	100	
Lifetime ⁽⁸⁾		20,000 hours							
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C							
Max housing temperature (90°)		90°C							
Protection class		IP65							
Noise level (dB)		<65	<67	<70	<72	<75	<77	<79	
Lubricant		Sumico grease (lubricated for life)							
Color		Capri blue (RAL 5019)							
Input flange		Anodized Aluminum							

(1) : Nominal output torque.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : 100 occurrences maximum.

(4) : Speed at which the nominal torque is applicable 20,000 hours.

(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

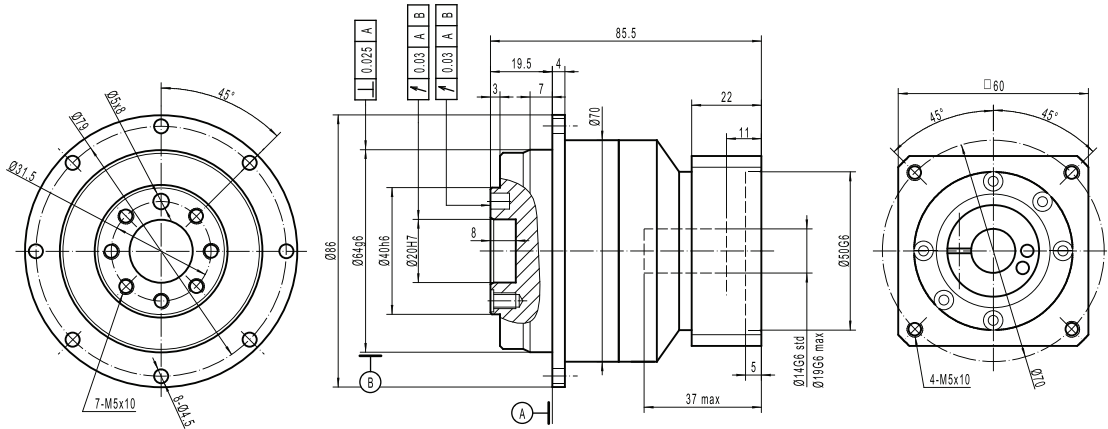
(7) : Measured at full load and at 25°C

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions

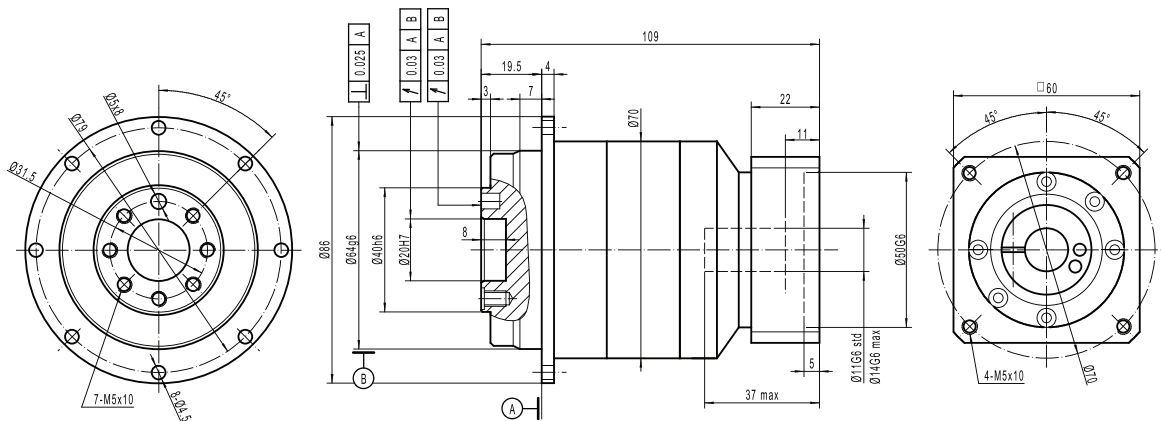
(9) : Room temperature. Refer to temperature factors on page 140.

Refer to page 134 for detailed explanations about gearbox selection and ratings.

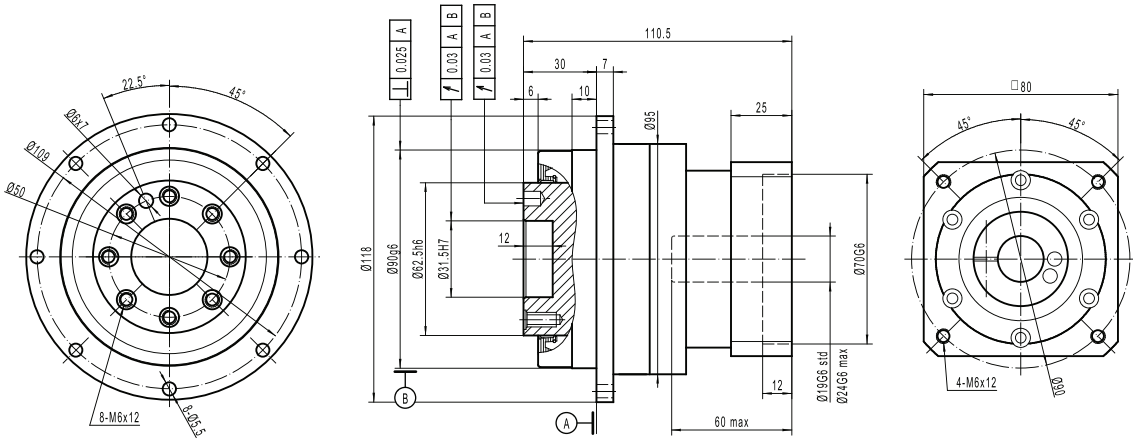
ULTIMATE CI-ST-064 - 1 STAGE - RATIOS 4 TO 10



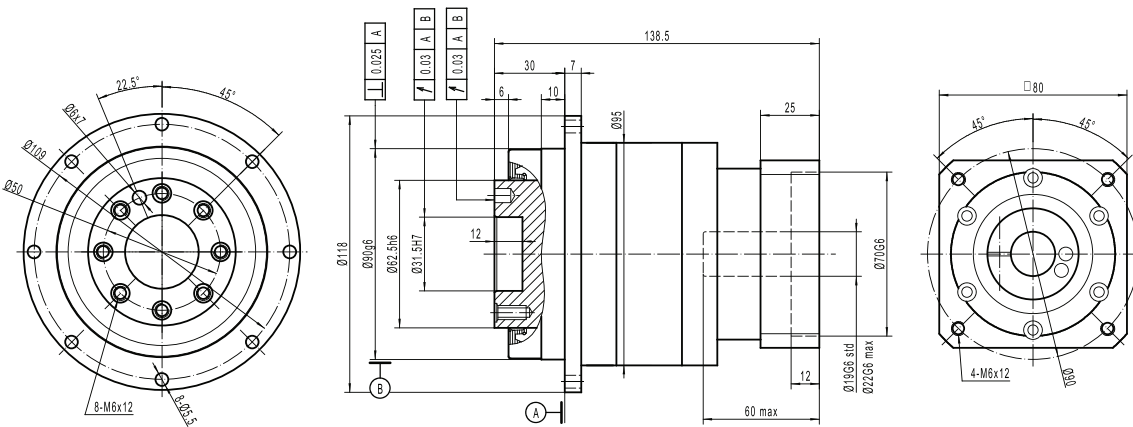
ULTIMATE CI-ST-064 - 2 STAGES - RATIOS 16 TO 100



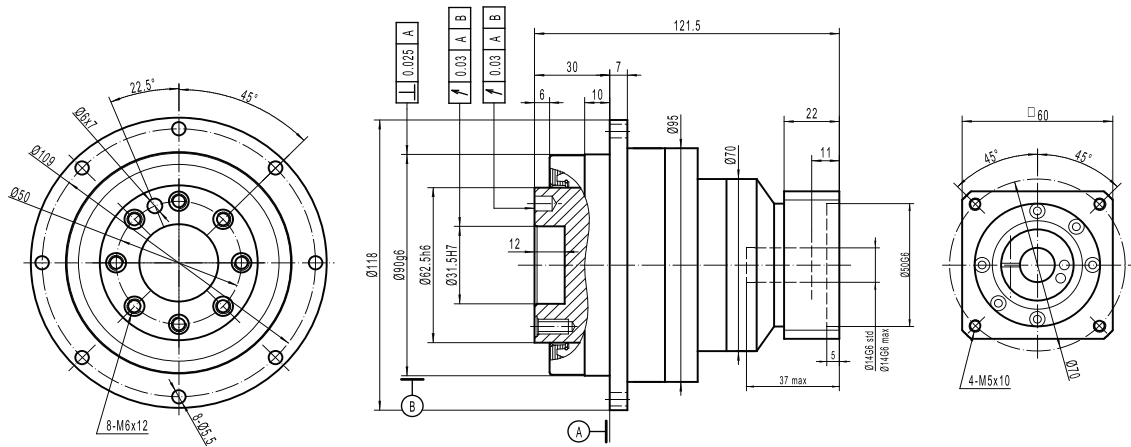
ULTIMATE CI-ST-090 - 1 STAGE - RATIOS 4 TO 10



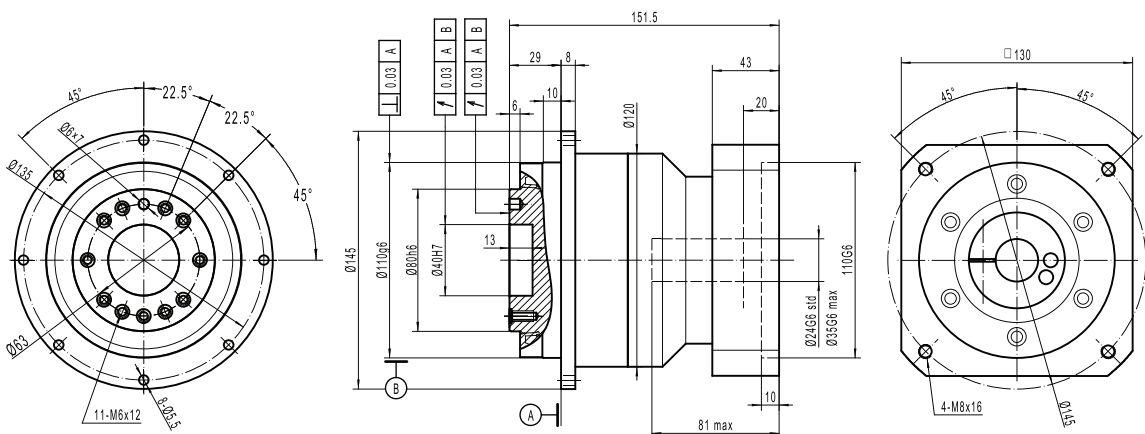
ULTIMATE CI-ST-090 - 2 STAGES - RATIOS 16 TO 25



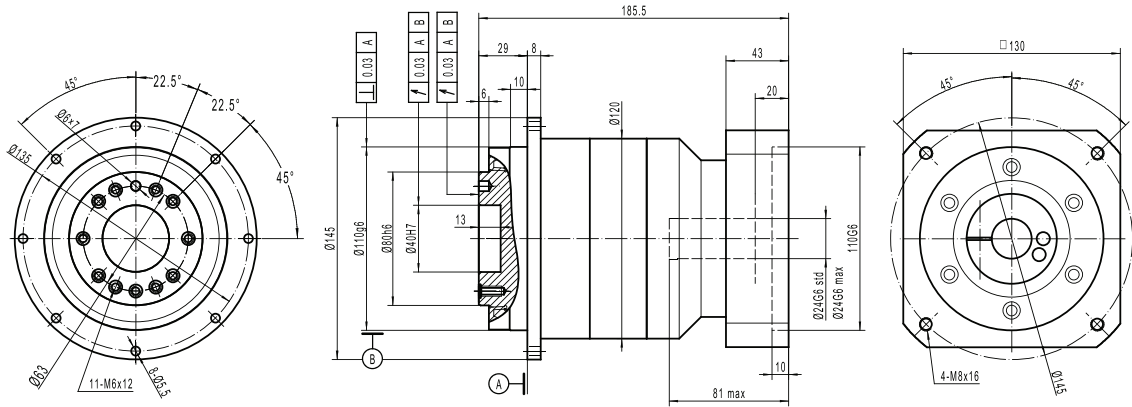
ULTIMATE CI-ST-090 - 2 STAGES - RATIOS 30 TO 100



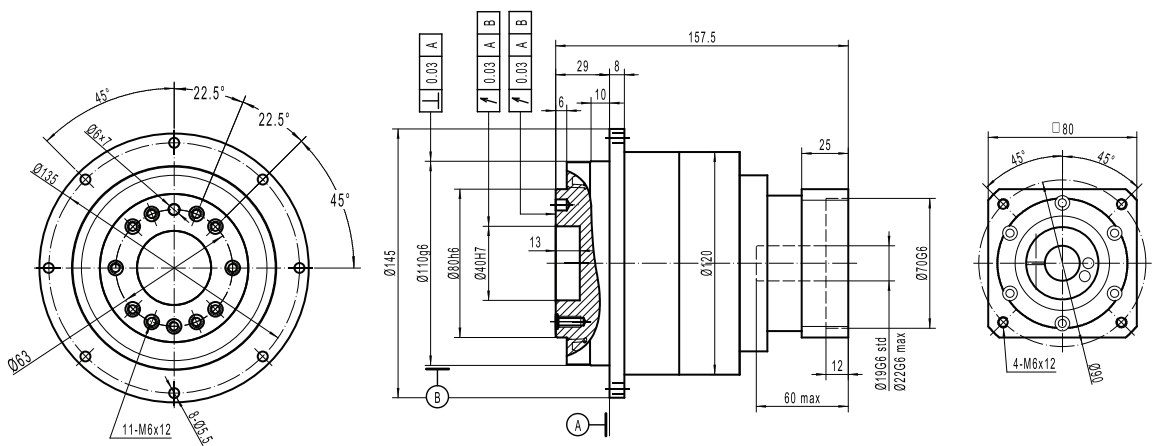
ULTIMATE CI-ST-110 - 1 STAGE - RATIOS 4 TO 10



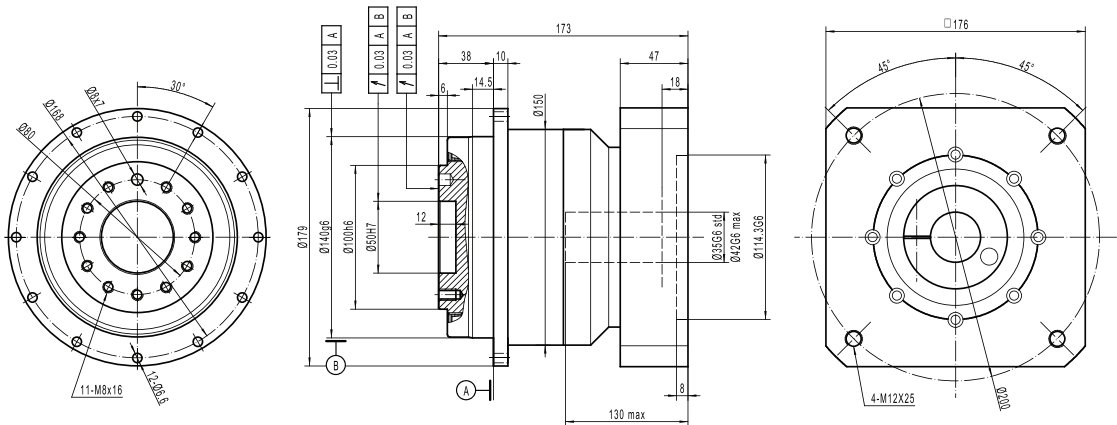
ULTIMATE CI-ST-110 - 2 STAGES - RATIOS 16 TO 30



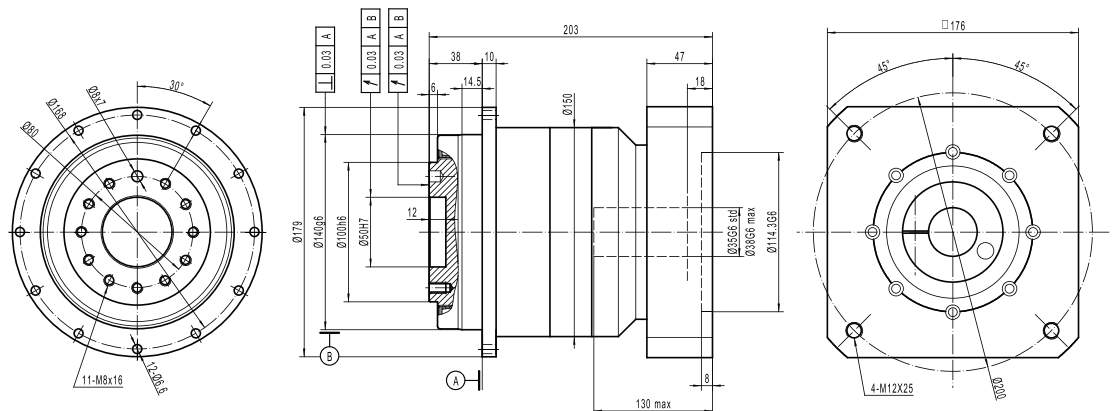
ULTIMATE CI-ST-110 - 2 STAGES - RATIOS 32 TO 100



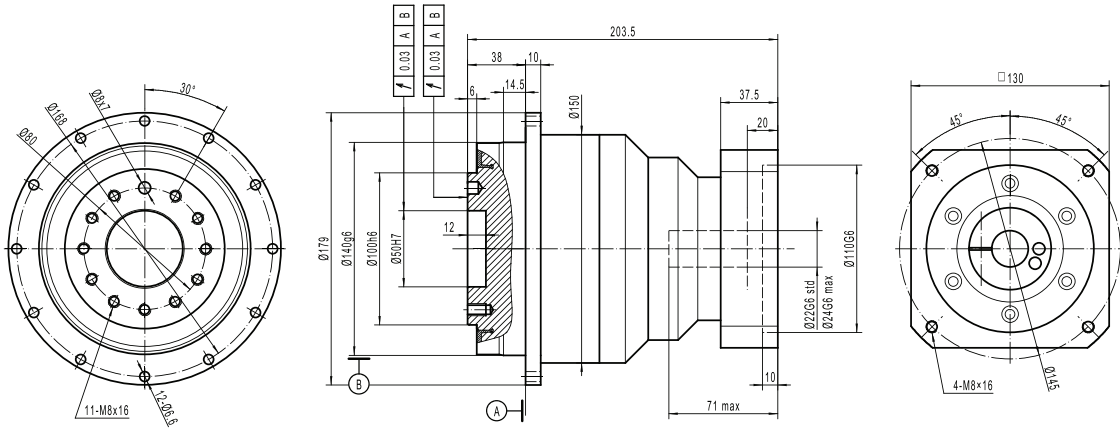
ULTIMATE CI-ST-140 - 1 STAGE - RATIOS 4 TO 10



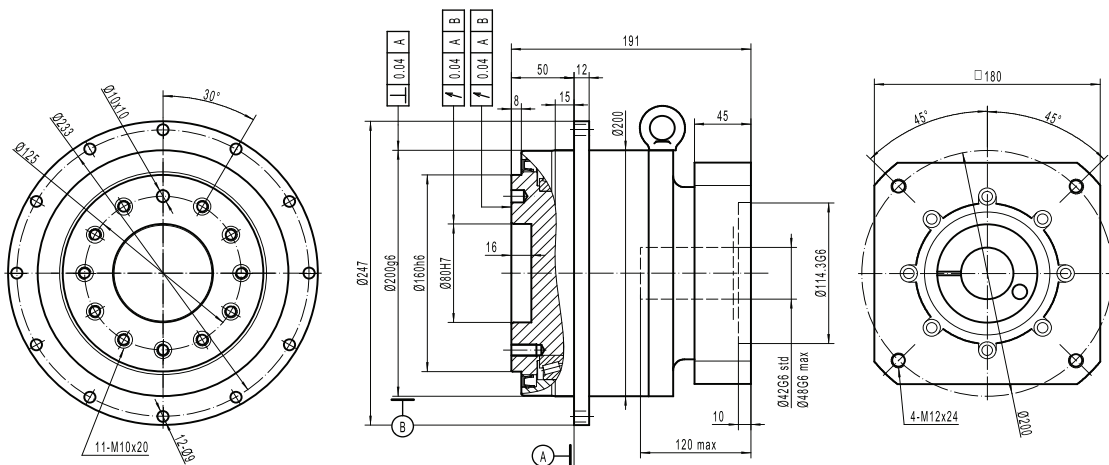
ULTIMATE CI-ST-140 - 2 STAGES - RATIOS 16 TO 30



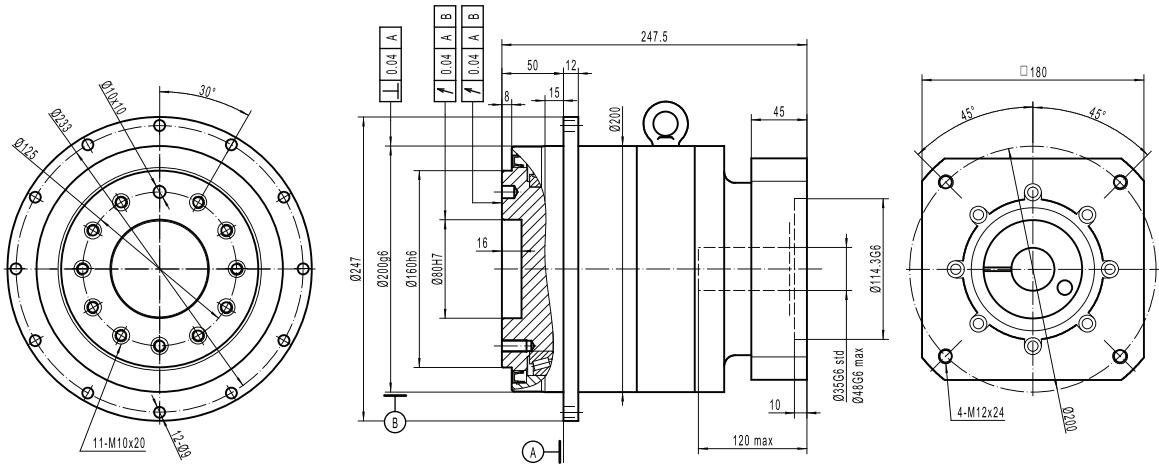
ULTIMATE CI-ST-140 - 2 STAGES - RATIOS 32 TO 100



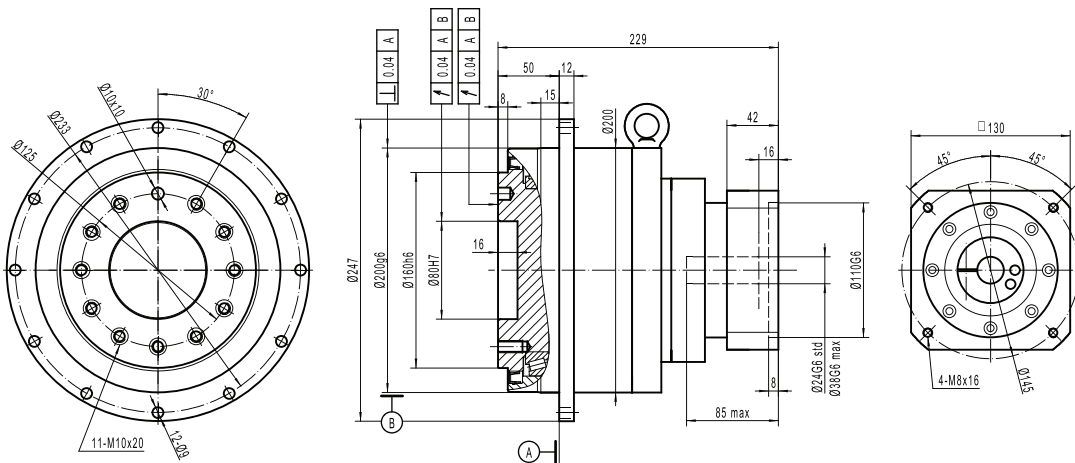
ULTIMATE CI-ST-200-1 STAGE-RATIOS 4 TO 10



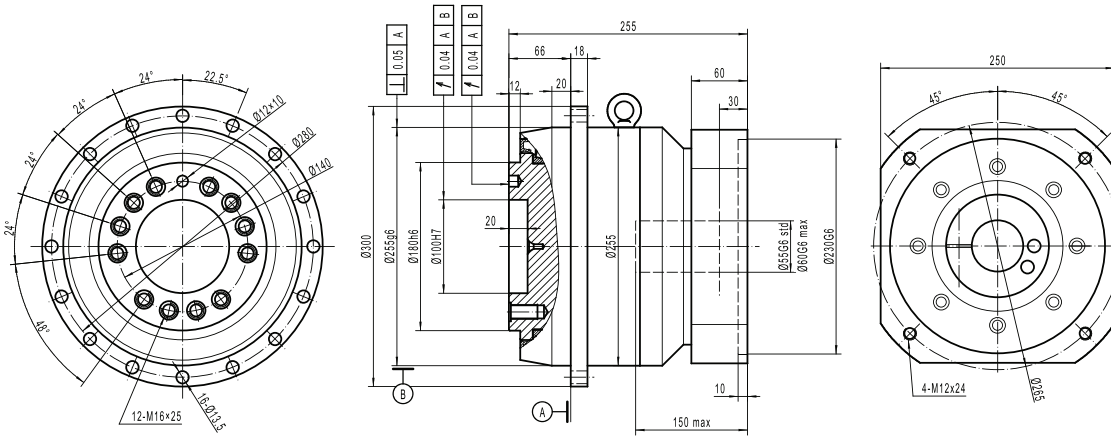
ULTIMATE CI-ST-200-2 STAGE-RATIOS 16 TO 30



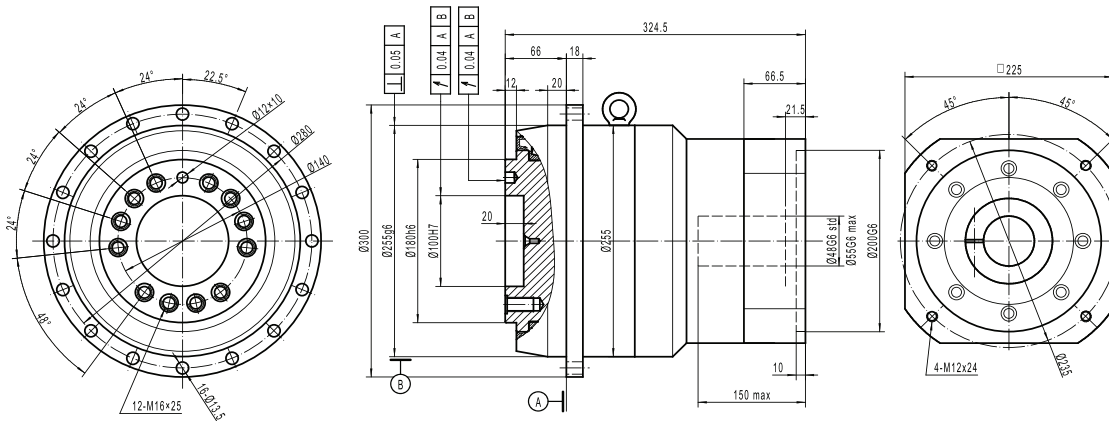
ULTIMATE CI-ST-200-2 STAGE-RATIOS 32 TO 100



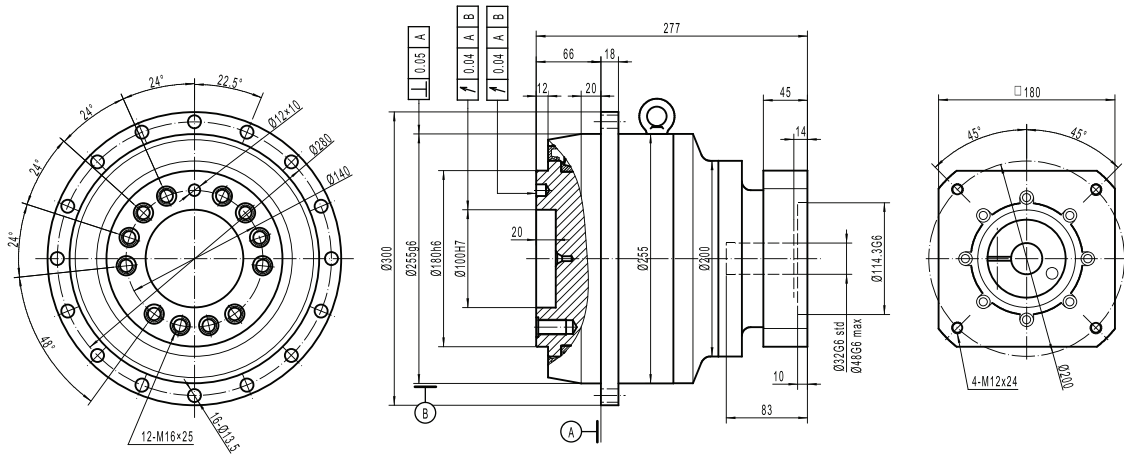
ULTIMATE CI-ST-255-1 STAGE-RATIOS 4 TO 10



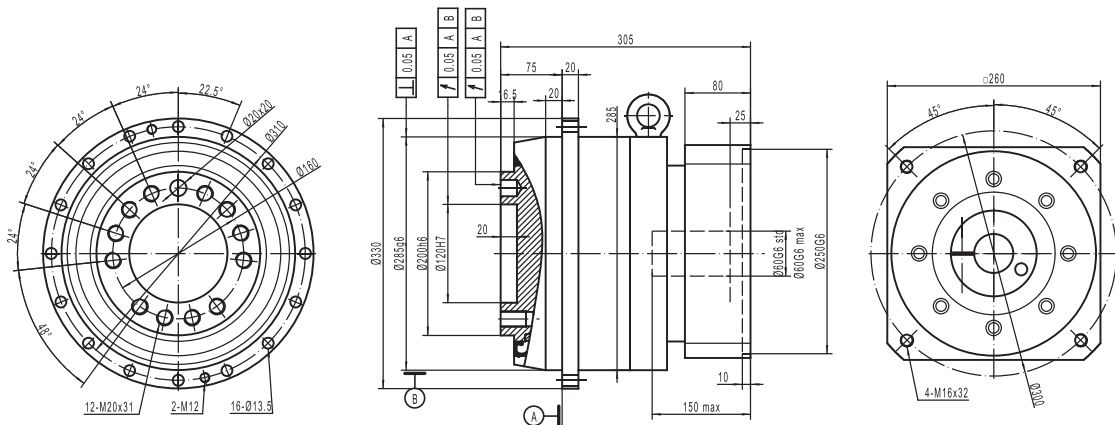
ULTIMATE CI-ST-255-2 STAGE-RATIOS 16 TO 30



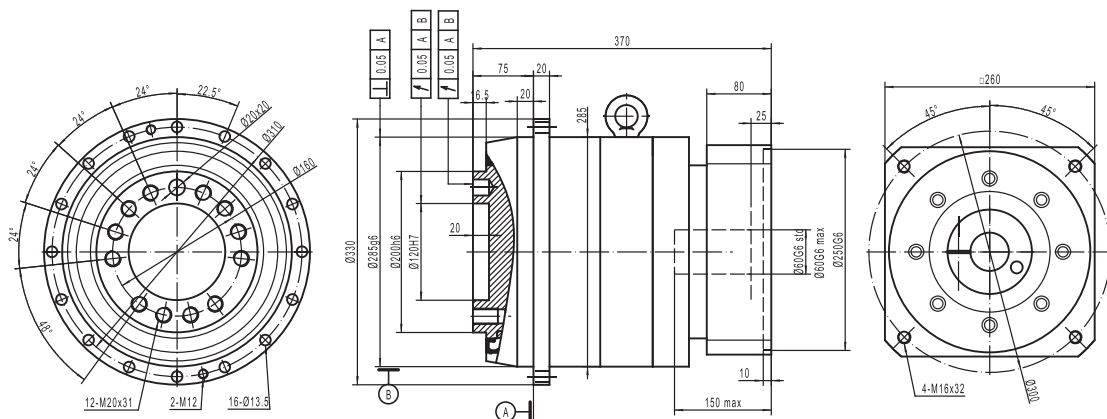
ULTIMATE CI-ST-255-2 STAGE-RATIOS 32 TO 100



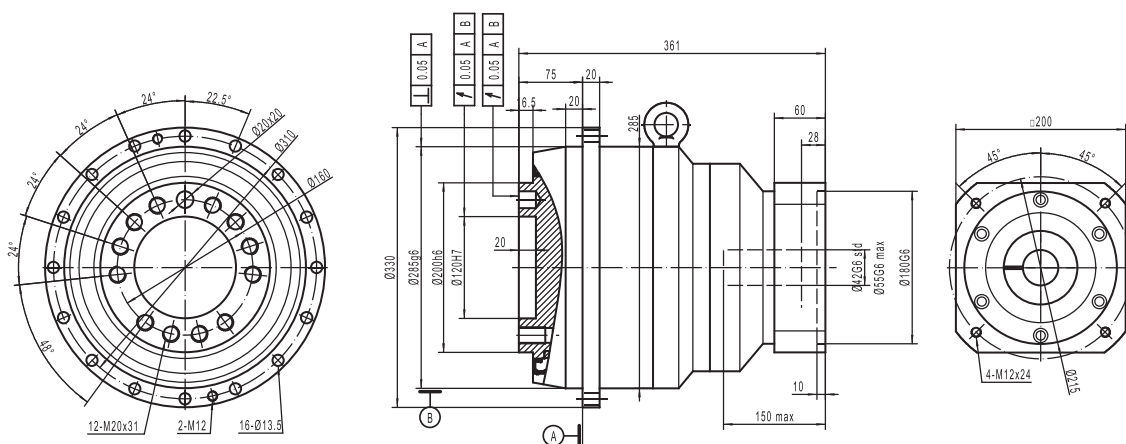
ULTIMATE CI-ST-285-1 STAGE-RATIOS 4 TO 10



ULTIMATE CI-ST-285-2STAGE-RATIOS 16 TO 30



ULTIMATE CI-ST-285-2STAGE-RATIOS 32 TO 100



RIGHT-ANGLE GEARBOXES



	LIVELY RA	X-TREME RA	BOOSTER RA	ULTIMATE RA
Suitable for Servomotors	YES	YES	YES	YES
	(60 to 155)	(60 to 140)	(60 to 120)	(64 to 140)
Max. angular backlash	8 arc-min	8 arc-min	8 arc-min	8 arc-min
Interface (output side)	Round or square	Square	Square	Round
Output	Shaft with key	Shaft with key	Shaft with key	Rotating flange
Acceleration	+++	+++	++++	+++++
Fast reversals	+++	+++	++++	+++++
Radial efforts	++	++++	+++	+++++
Axial efforts	+	++++	+++	+++++
Stiffness	+++	+++	++++	+++++
Torque density	+++	+++	++++	+++++
Coupling	Balanced coupling	Balanced coupling	Balanced coupling	Balanced coupling
Right-angle input	Cantilevered	Cantilevered	Cantilevered	Cantilevered
Lubricant	Sumico Japan synthetic grease	Sumico Japan synthetic grease	Sumico Japan synthetic grease	Sumico Japan synthetic grease
External finish	Capri blue (RAL 5019)	Capri blue (RAL 5019)	Capri blue (RAL 5019)	Capri blue (RAL 5019)

Do not hesitate to contact us if you need help, our R&D dpt will be happy to assist you... and do not forget that our standard 12-month warranty get extended to 18 months at no extra charge if you have your product selection checked by our engineers.

LIVELY RA

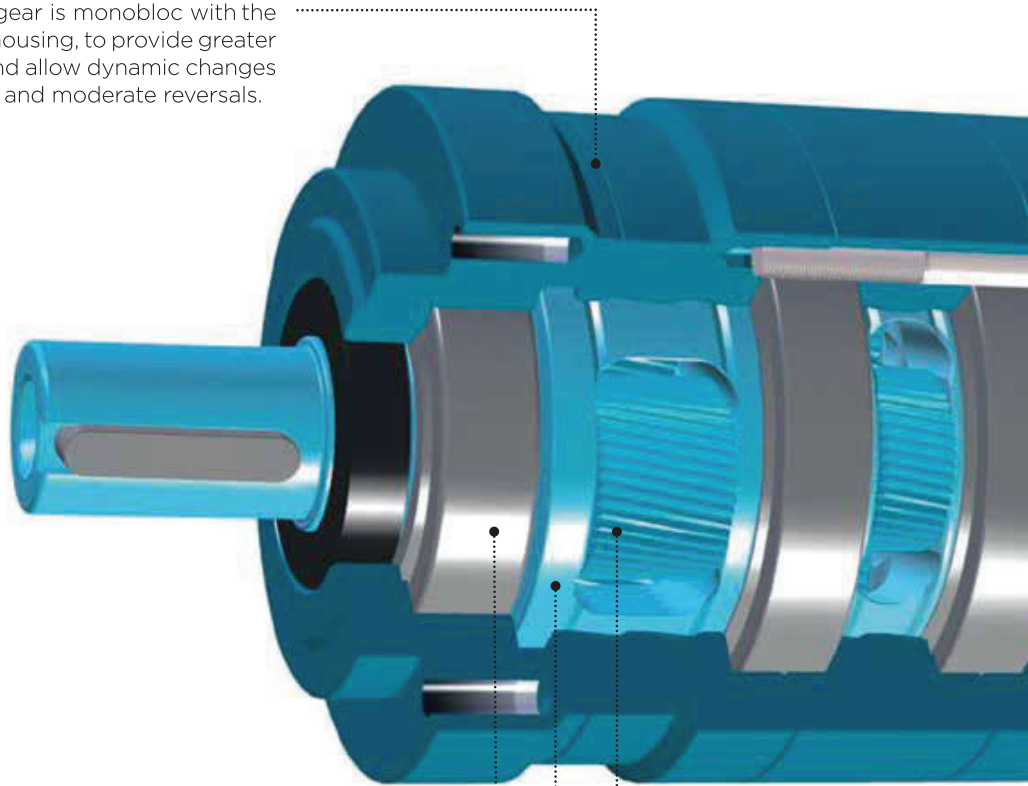


Acceleration capacity	+++
Fast reversals	+++
Radial efforts	++
Axial efforts	+
Stiffness	+++
Precision	+++

LIVELY RA _ Internal construction

LIVELY is an economical, yet precise and reliable planetary gearbox designed for moderate acceleration or continuous operation.

The ring gear is monobloc with the external housing, to provide greater rigidity and allow dynamic changes of torque and moderate reversals.



The planet carrier is dual-supported by radial ball bearings, to improve stiffness and guarantee a perfect alignment of gears during operation.

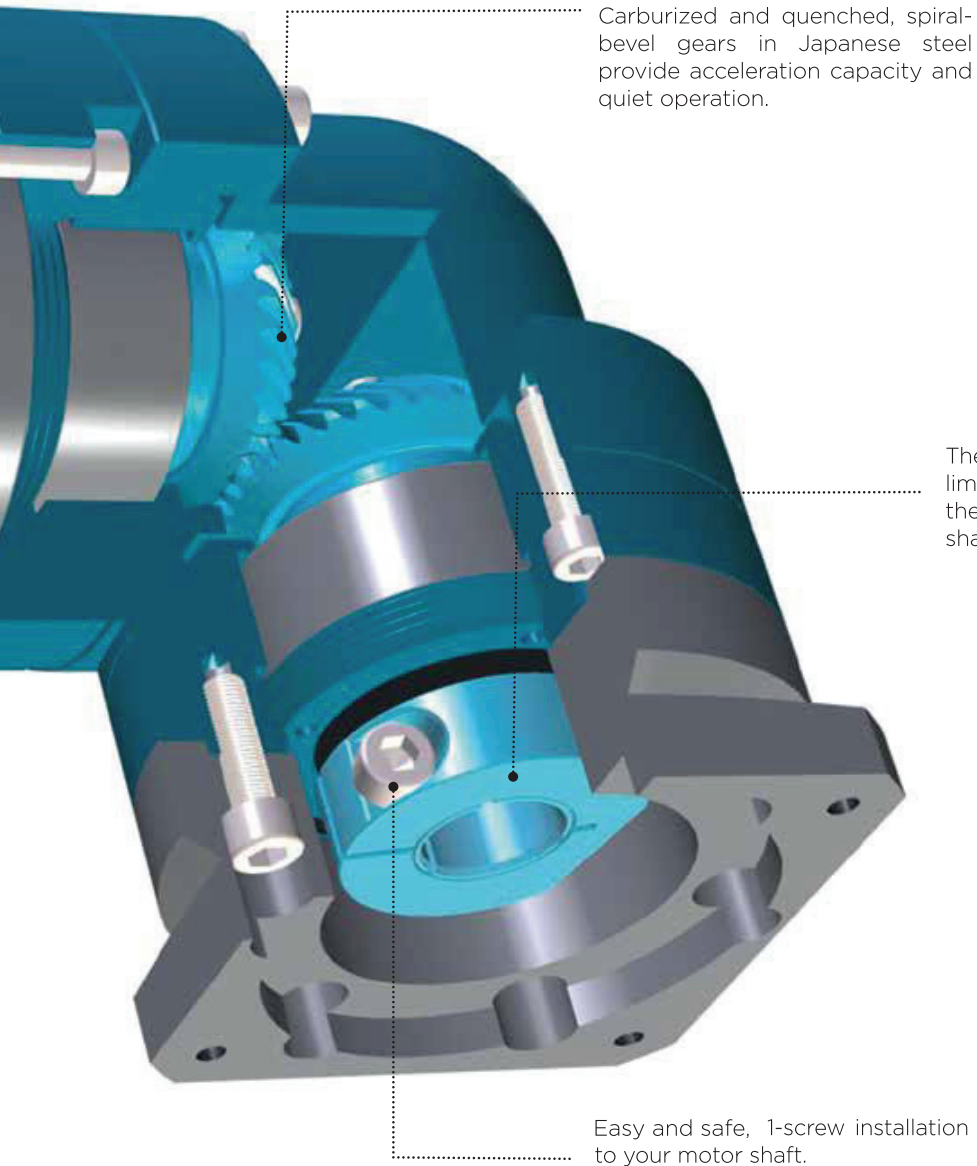
Carburized and quenched helical teeth allow quiet operation, reliability and acceleration capacity.

The caged planet carrier, provides stiffness, reliability and acceleration capacity to the gearbox.





PerfectPitch™



LIVELY RA_Technical data

	RATIO	LIVELY-SQ-RA / LIVELY-CI-RA			
		60	90	120	140
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	50	120	260
	1/4	42	70	220	386
	1/5	43	82	202	374
	1/6	42	75	212	365
	1/7	42	75	198	368
	1/8	39	72	193	355
	1/9	33	66	151	300
	1/10	29	65	154	264
	1/15	25	50	120	260
	1/20	42	70	220	386
	1/25	43	82	202	374
	1/50	43	82	202	374
	1/80	39	72	193	355
	1/100	29	65	154	264
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	62	150	340
	1/4	52	87	272	464
	1/5	53	102	248	464
	1/6	51	91	260	453
	1/7	52	93	237	453
	1/8	45	90	227	430
	1/9	39	81	177	372
	1/10	37	80	168	345
	1/15	32	62	150	340
	1/20	52	87	272	464
	1/25	53	102	248	464
	1/50	53	102	248	464
	1/80	45	90	227	430
	1/100	37	80	168	345
Emergency stop torque $T_x^{(3)}$		3*T _{2n}			
Angular backlash (arc-min)	1 stage	standard ≤ 8			
	2 stages	standard ≤ 8			
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000	6,000
Maximum radial load ⁽⁶⁾ (N)		1,200	2,450	4,400	9,000
Maximum axial load (N)		650	1,200	3,200	5,300
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96			
	2 stages	>93			
Torsional stiffness (Nm / arc-min)		6	10	31	53
Lifetime ⁽⁸⁾		20,000 hours			
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C			
Max housing temperature (90°)		90°C			
Protection class		IP65			
Noise level (dB)		<65	<67	<70	<72
Lubricant		Sumico grease (lubricated for life)			
Color		Capri blue (RAL 5019)			
Input flange		Anodized Aluminum			

(1) : Nominal output torque applicable 20,000 hours at rated speed.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : Emergency stop torque (100 occurrences maximum).

(4) : Speed at which the nominal torque is applicable 20,000 hours.

(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

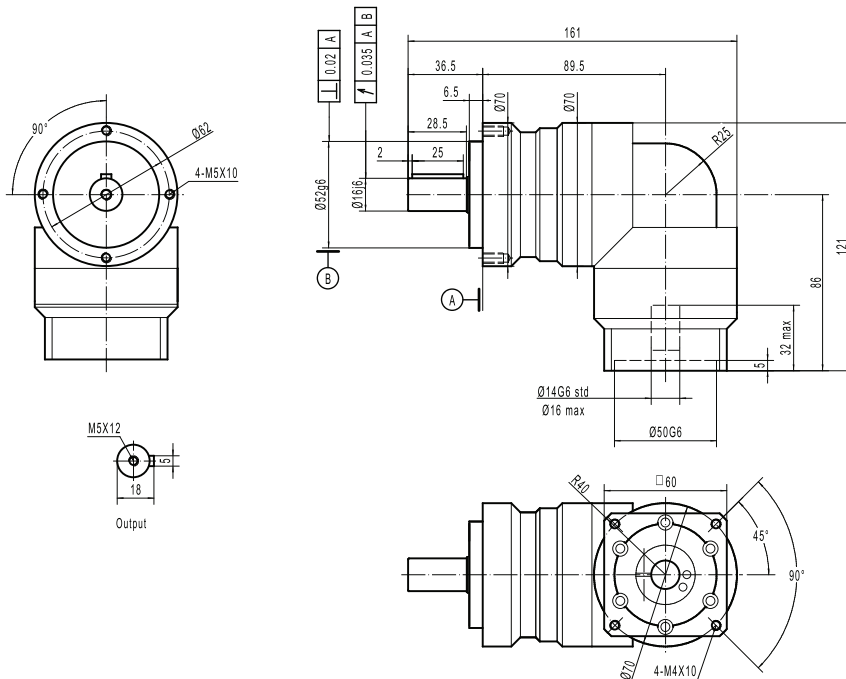
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

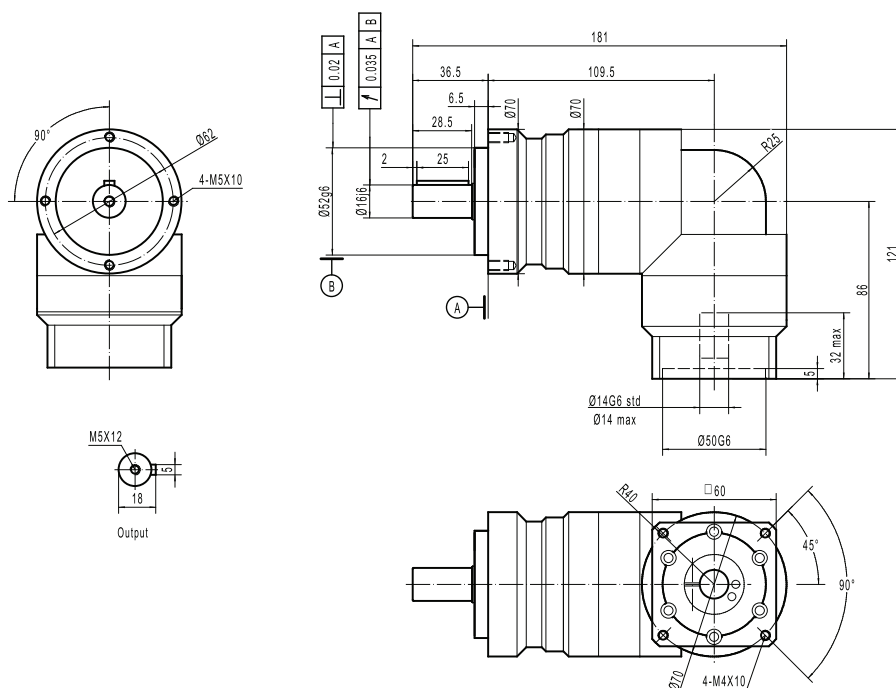
(9) : Room temperature. Refer to temperature factors on page 140.



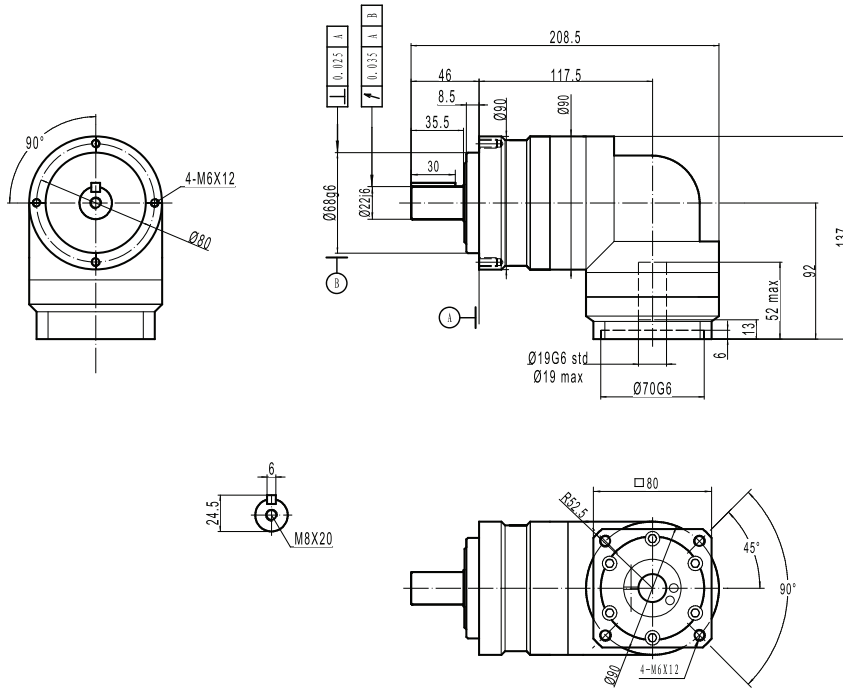
LIVELY CI-RA-060 - 1 STAGE - RATIOS 3 TO 10



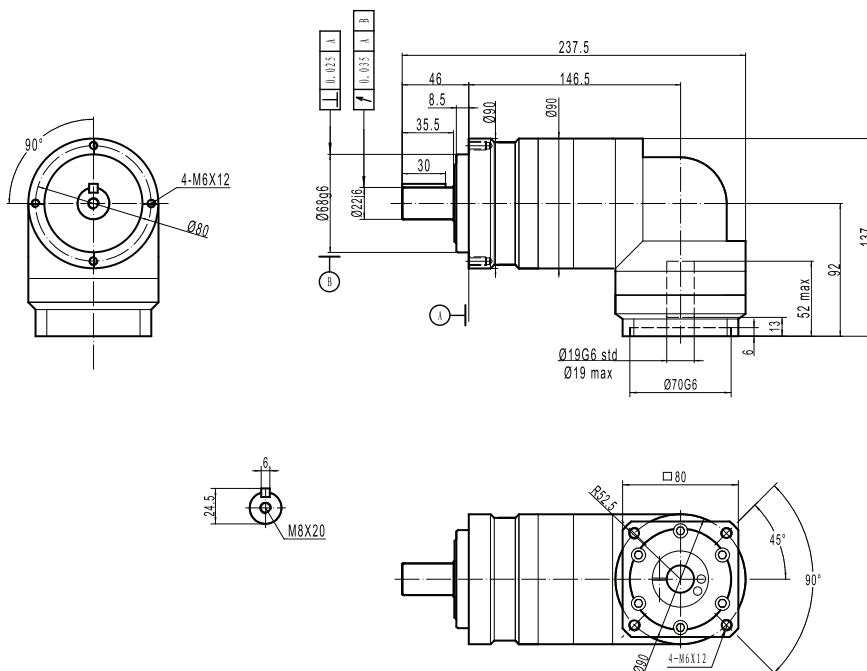
LIVELY CI-RA-060 - 2 STAGES - RATIOS 12 TO 100



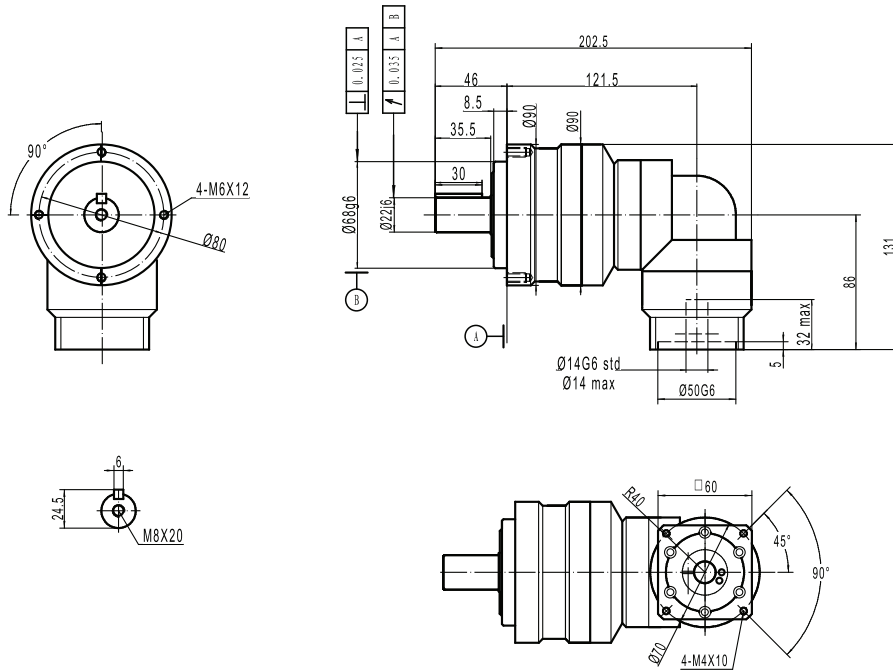
LIVELY CI-RA-090 - 1 STAGE - RATIOS 3 TO 10



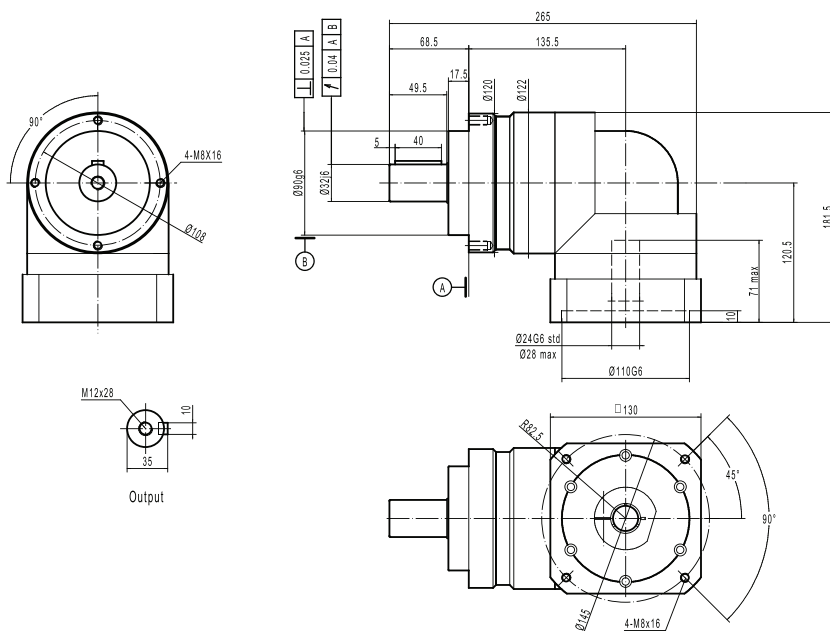
LIVELY CI-RA-090 - 2 STAGES - RATIOS 12 TO 25



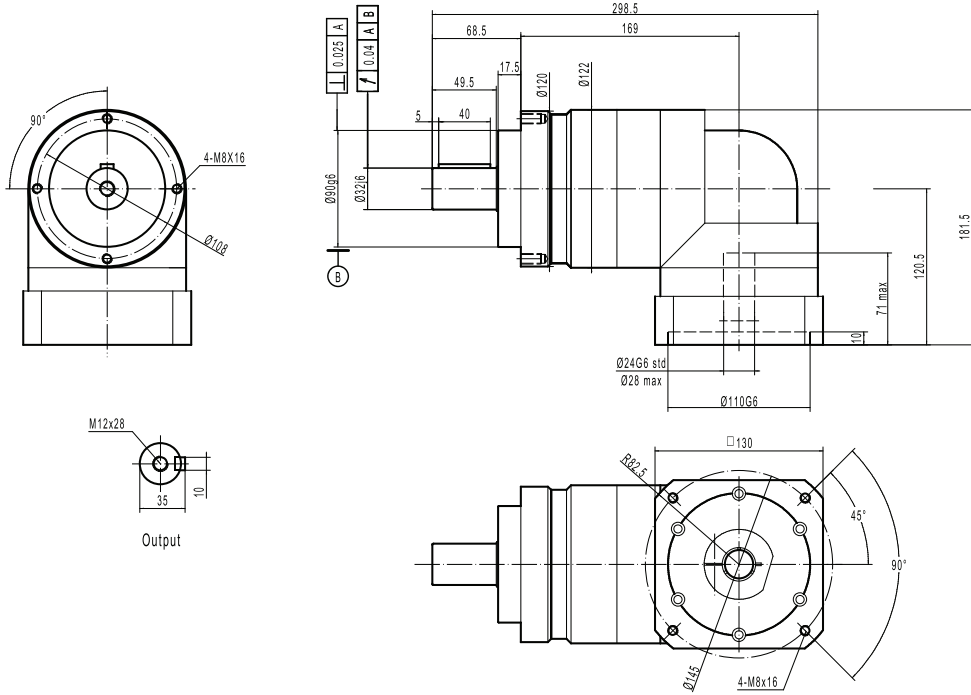
LIVELY CI-RA-090 - 2 STAGES - RATIOS 30 TO 100



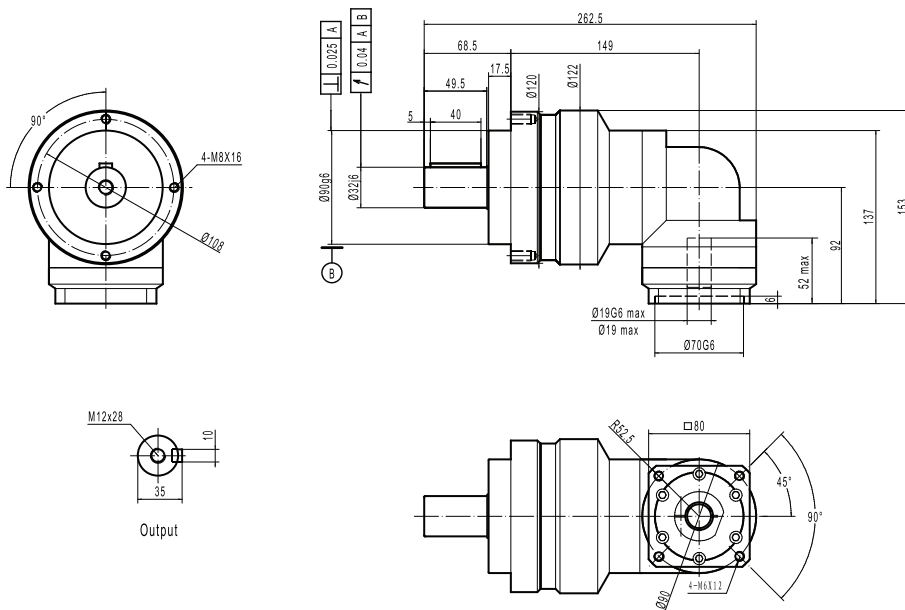
LIVELY CI-RA-120 - 1 STAGE - RATIOS 3 TO 10



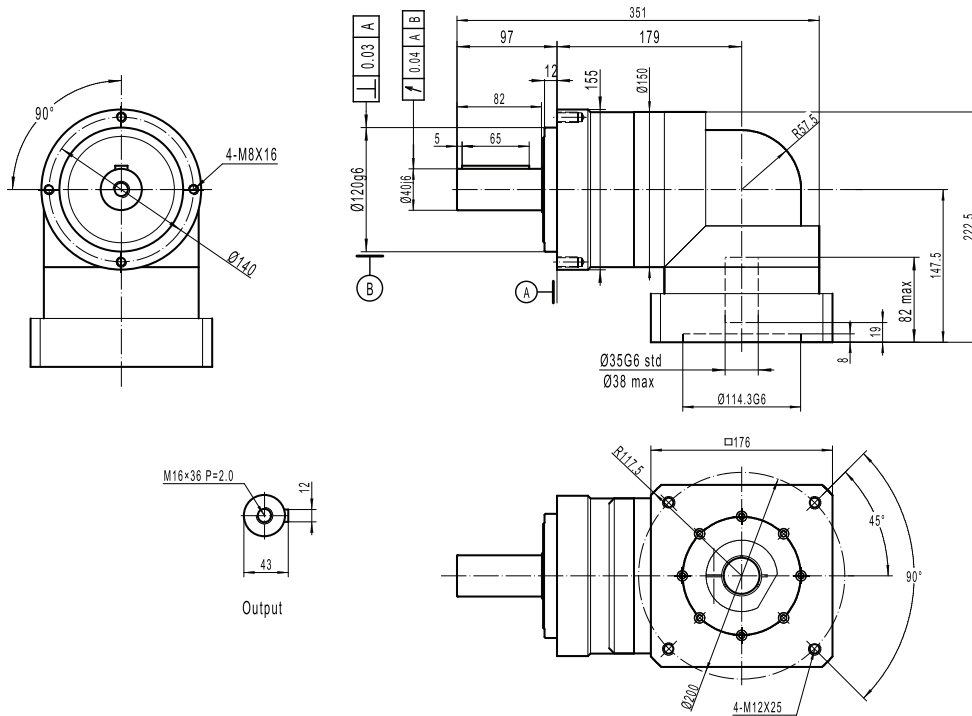
LIVELY CI-RA-120 - 2 STAGES - RATIOS 12 TO 30



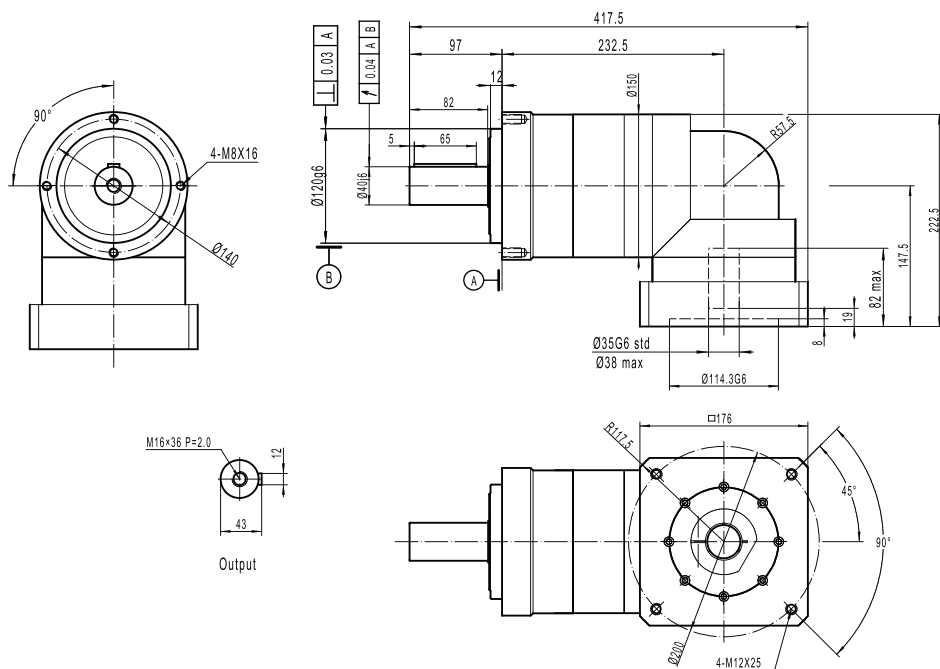
LIVELY CI-RA-120 - 2 STAGES - RATIOS 35 TO 100



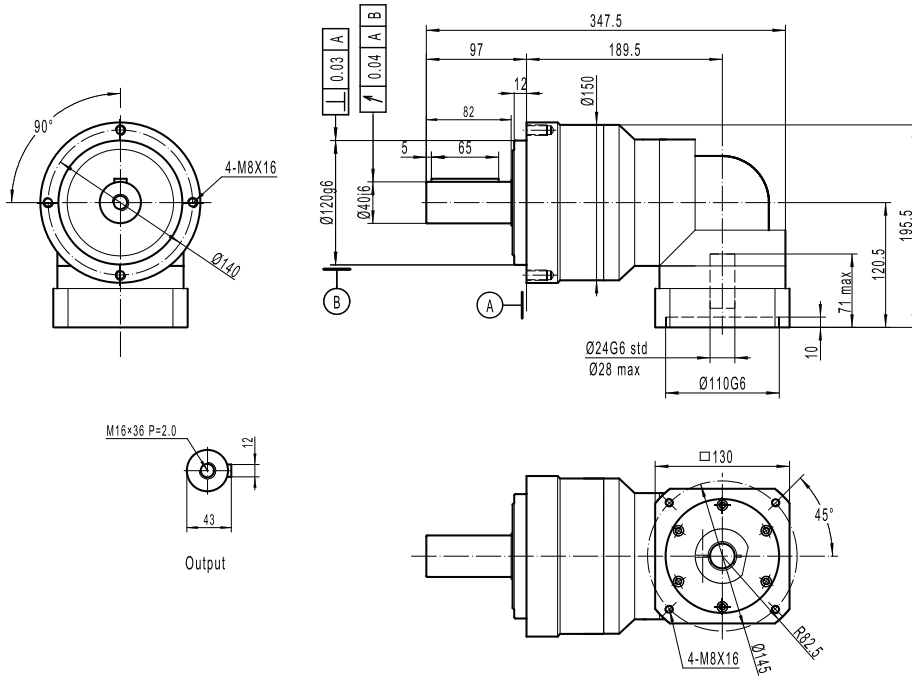
LIVELY CI-RA-155 - 1 STAGE - RATIOS 3 TO 10



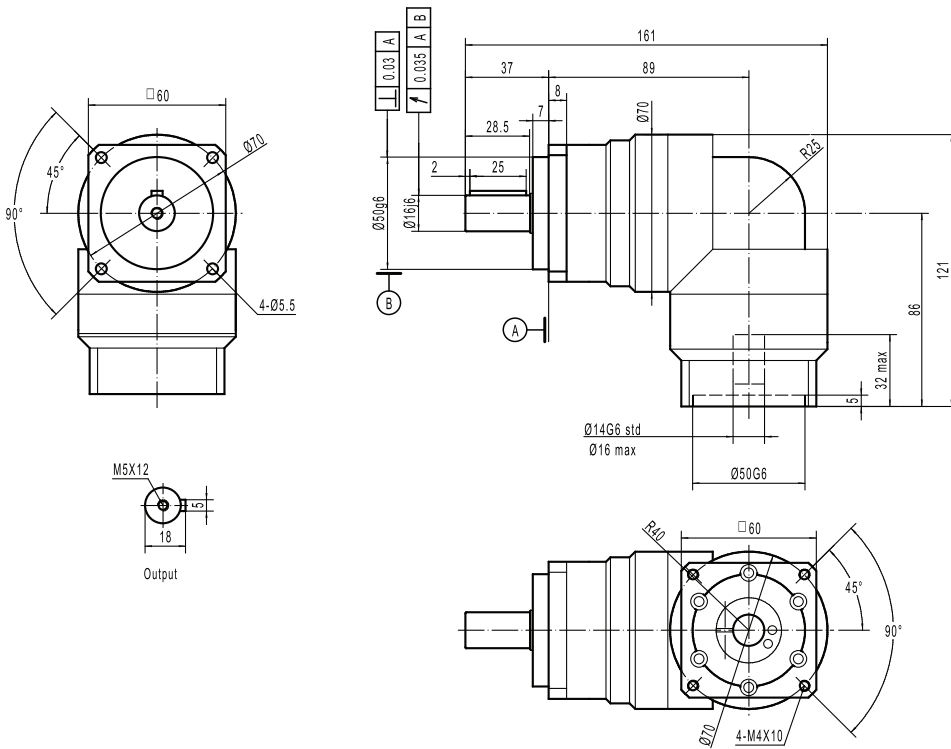
LIVELY CI-RA-155 - 2 STAGES - RATIOS 12 TO 30



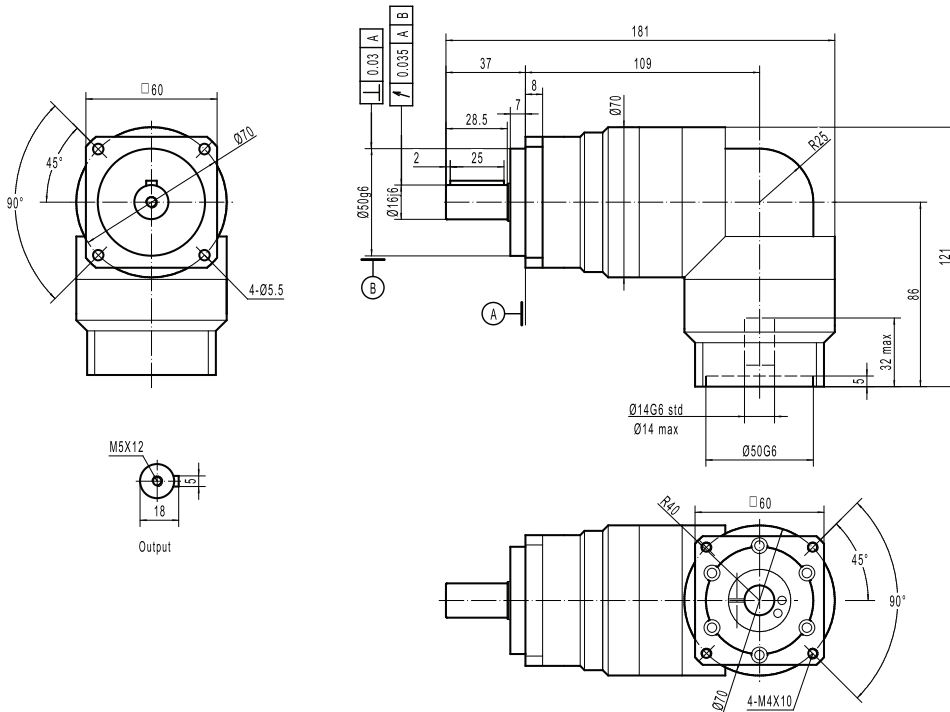
LIVELY CI-RA-155 - 2 STAGES - RATIOS 35 TO 100



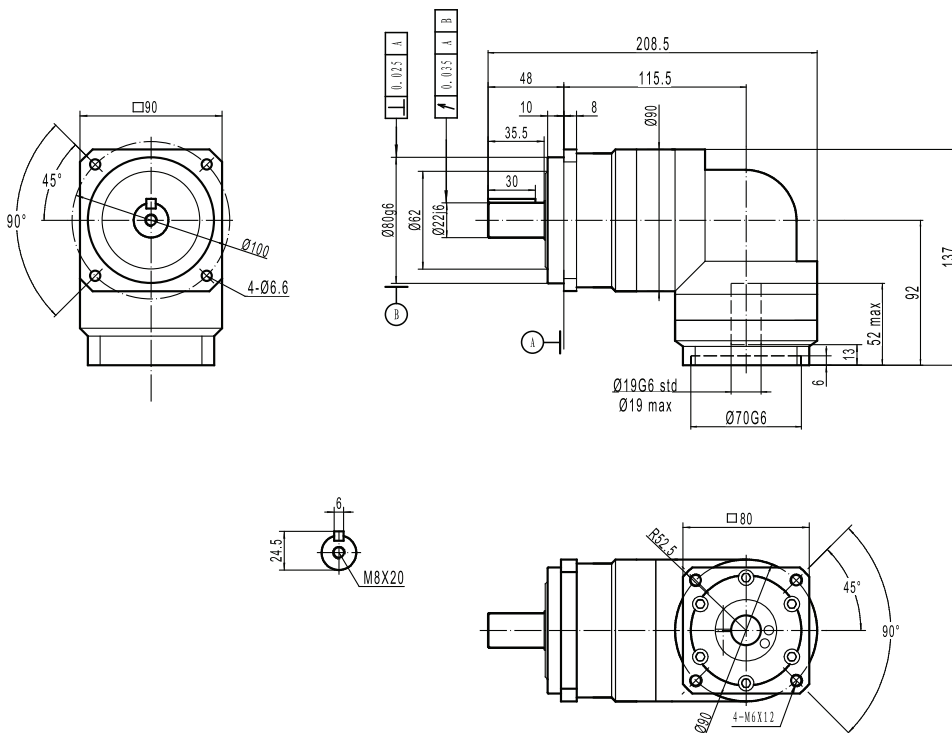
LIVELY SQ-RA-060-1 STAGE-RATIOS 3 TO 10



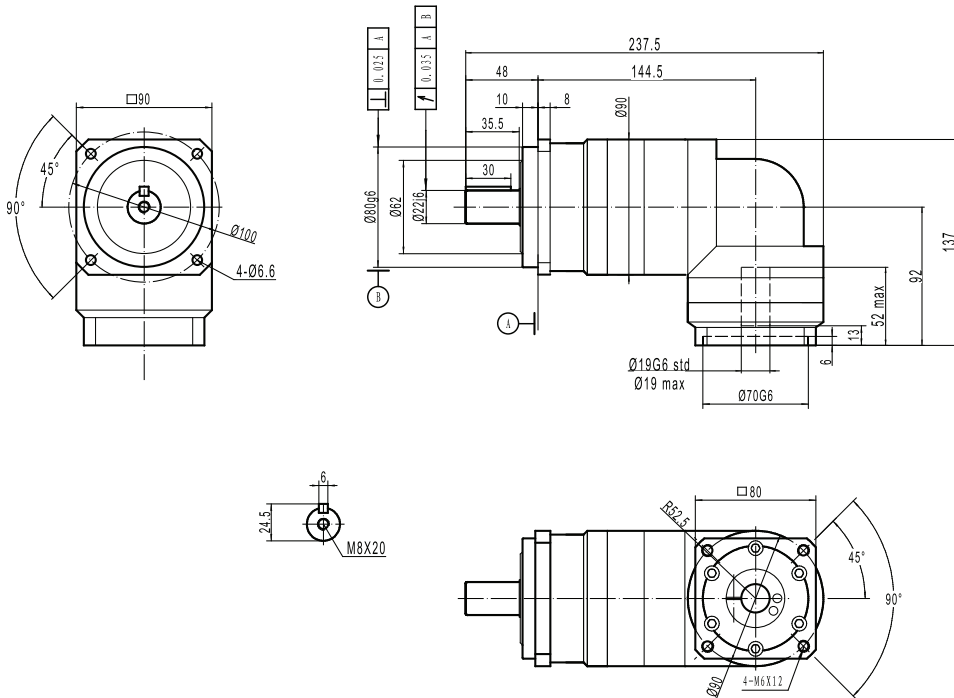
LIVELY SQ-RA-060-1 STAGE-RATIOS 12 TO 100



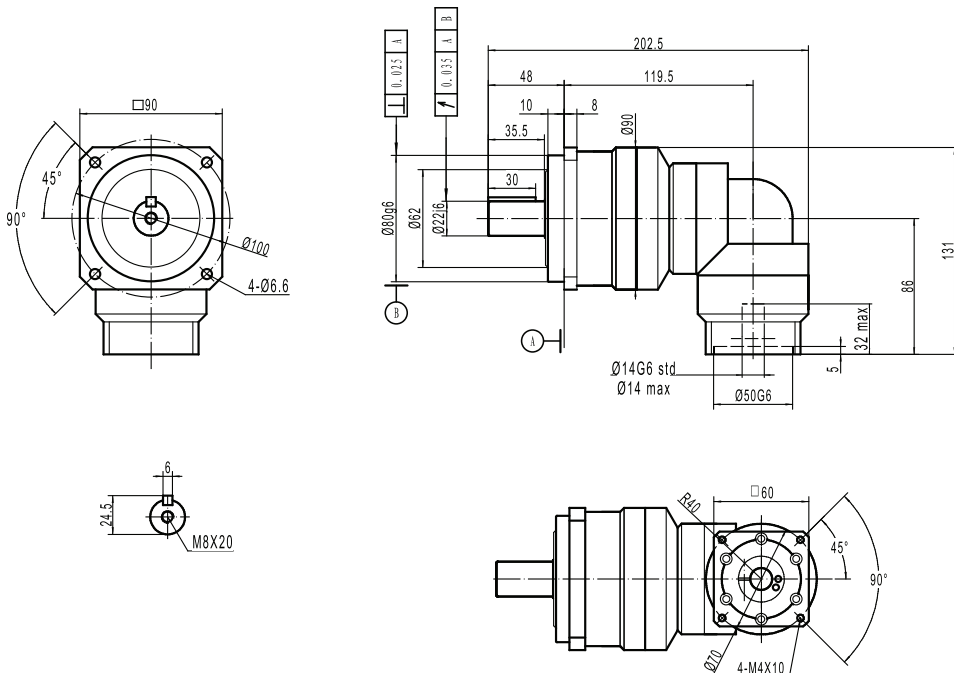
LIVELY SQ-RA-090-1 STAGE-RATIOS 3 TO 10



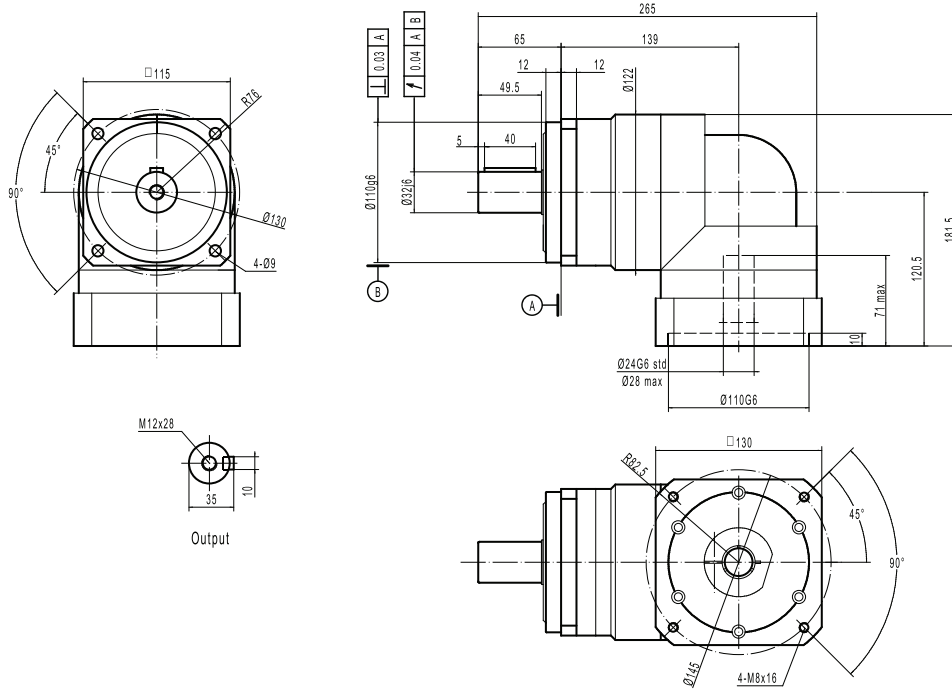
LIVELY SQ-RA-090-2 STAGE-RATIOS 12 TO 25



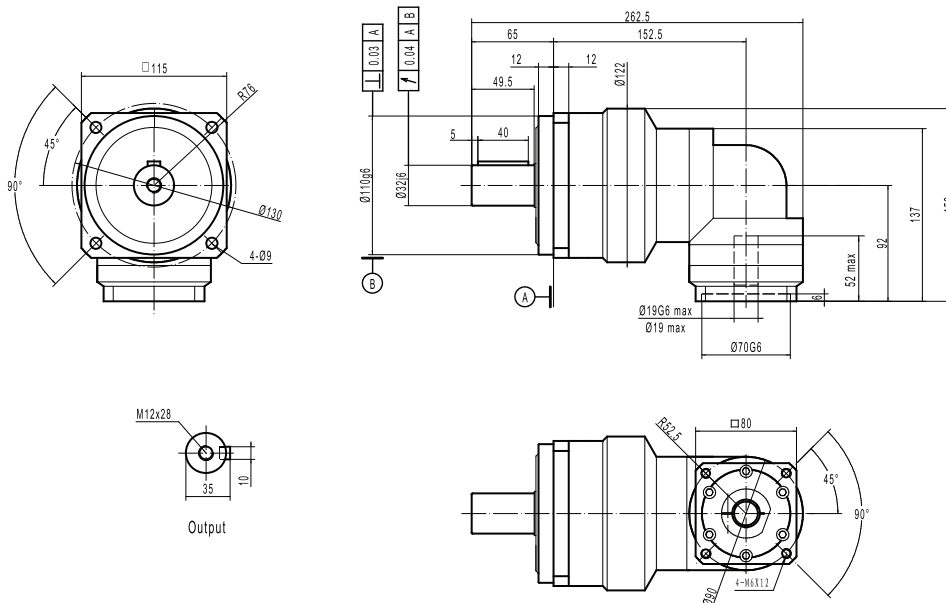
LIVELY SQ-RA-090-2 STAGE-RATIOS 30 TO 100



LIVELY SQ-RA-120-1 STAGE-RATIOS 3 TO 10



LIVELY SQ-RA-120-2 STAGE-RATIOS 12 TO 100



X-TREME RA



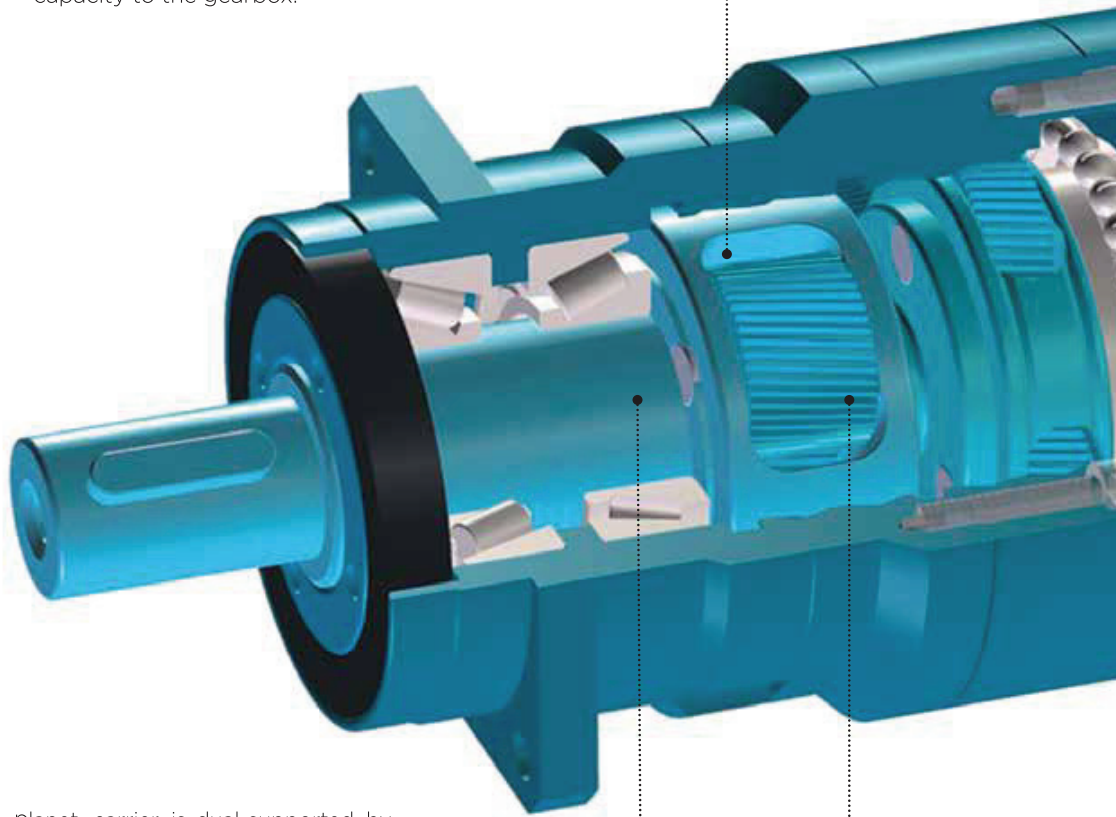
Acceleration capacity	+++
Fast reversals	+++
Radial efforts	++++
Axial efforts	++++
Stiffness	+++
Precision	+++
Economy	++



X-TREME RA_ Internal construction

X-TREME is a high-precision planetary gearbox. It was designed for applications requiring high combined radial and axial loads (like racks and pinions) with extreme precision.

The caged planet carrier provides stiffness, reliability and acceleration capacity to the gearbox.



The planet carrier is dual-supported by preloaded tapered roller bearings, to improve stiffness, guarantee a perfect alignment of gears during operation and provide greater acceptance of radial efforts.

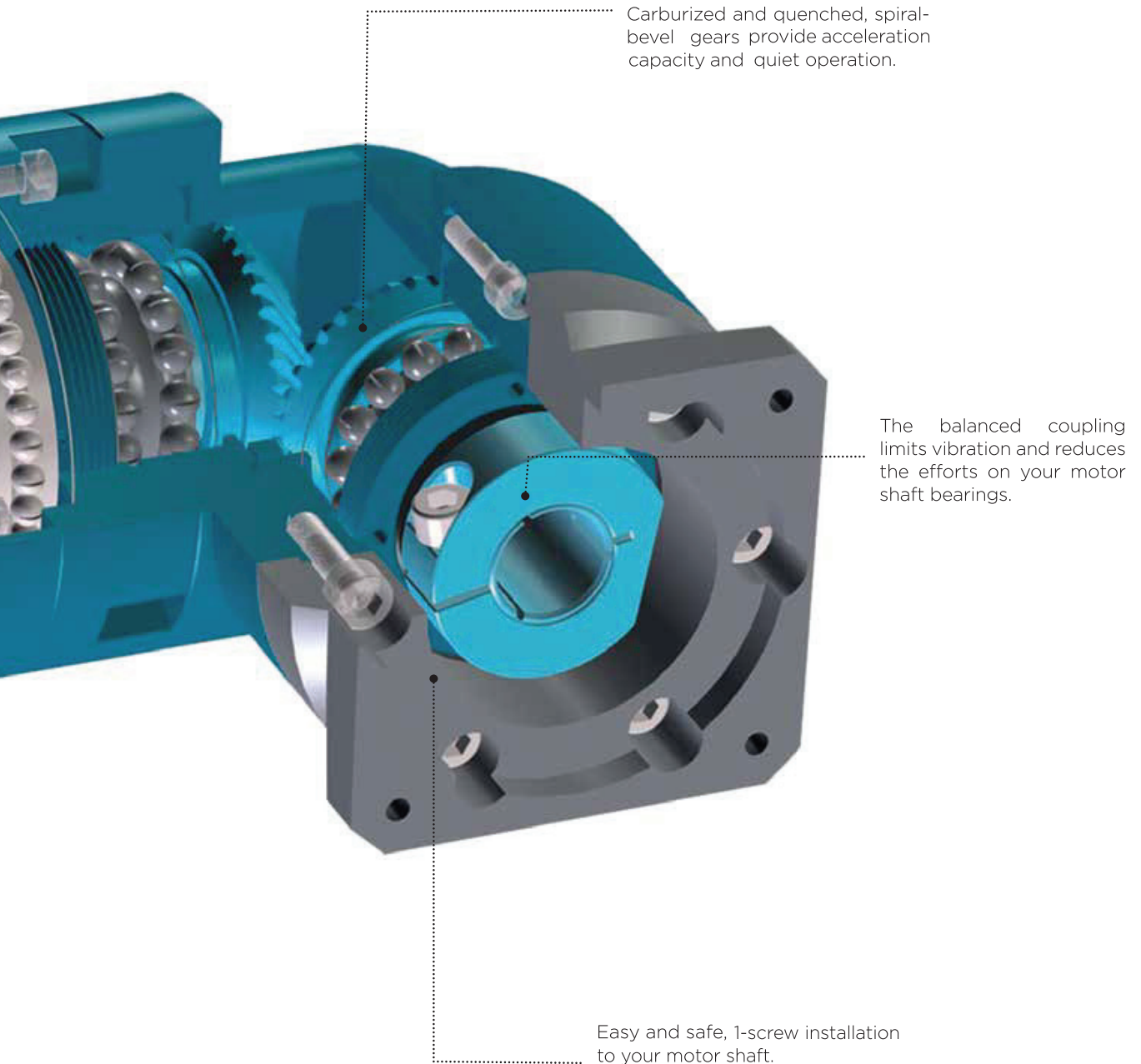
THE ENTIRE RANGE IS
LUBRICATED FOR LIFE BY



Carburized and quenched helical teeth allow quiet operation, reliability and high acceleration capacity.



PerfectPitch™



X-TREME RA_Technical data

	RATIO	X-TREME-SQ-RA			
		60	75	100	140
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	50	120	260
	1/4	42	70	220	386
	1/5	43	82	202	374
	1/6	42	75	212	365
	1/7	42	75	198	368
	1/8	39	72	193	355
	1/9	33	66	151	300
	1/10	29	65	154	264
	1/15	25	50	120	260
	1/20	42	70	220	386
	1/25	43	82	202	374
	1/50	43	82	202	374
	1/80	39	72	193	355
	1/100	29	65	154	264
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	62	150	340
	1/4	52	87	272	464
	1/5	53	102	248	464
	1/6	51	91	260	453
	1/7	52	93	237	453
	1/8	45	90	227	430
	1/9	39	81	177	372
	1/10	37	80	168	345
	1/15	32	62	150	340
	1/20	52	87	272	464
	1/25	53	102	248	464
	1/50	53	102	248	464
	1/80	45	90	227	430
	1/100	37	80	168	345
Emergency stop torque $T_x^{(3)}$		$3 \cdot T_{2n}$			
Angular backlash (arc-min)	1 stage	standard ≤ 8			
	2 stages	standard ≤ 8			
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000	6,000
Maximum radial load ⁽⁶⁾ (N)		2,700	4,000	6,300	9,700
Maximum axial load (N)		2,400	3,350	5,650	9,800
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96			
	2 stages	>93			
Torsional stiffness (Nm / arc-min)		6	10	31	53
Lifetime ⁽⁸⁾		20,000 hours			
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C			
Max housing temperature (90°)		90°C			
Protection class		IP65			
Noise level (dB)		<65	<67	<70	<72
Lubricant		Sumico grease (lubricated for life)			
Color		Capri blue (RAL 5019)			
Input flange		Anodized Aluminum			

(1) : Nominal output torque.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : 100 occurrences maximum.

(4) : Speed at which the nominal torque is applicable 20,000 hours. Also referred to as "rated".

(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

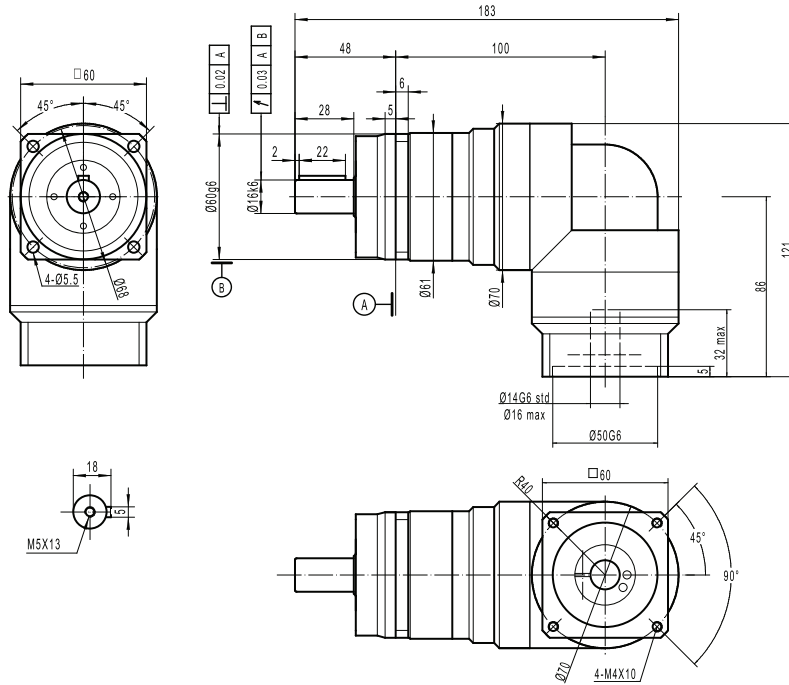
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

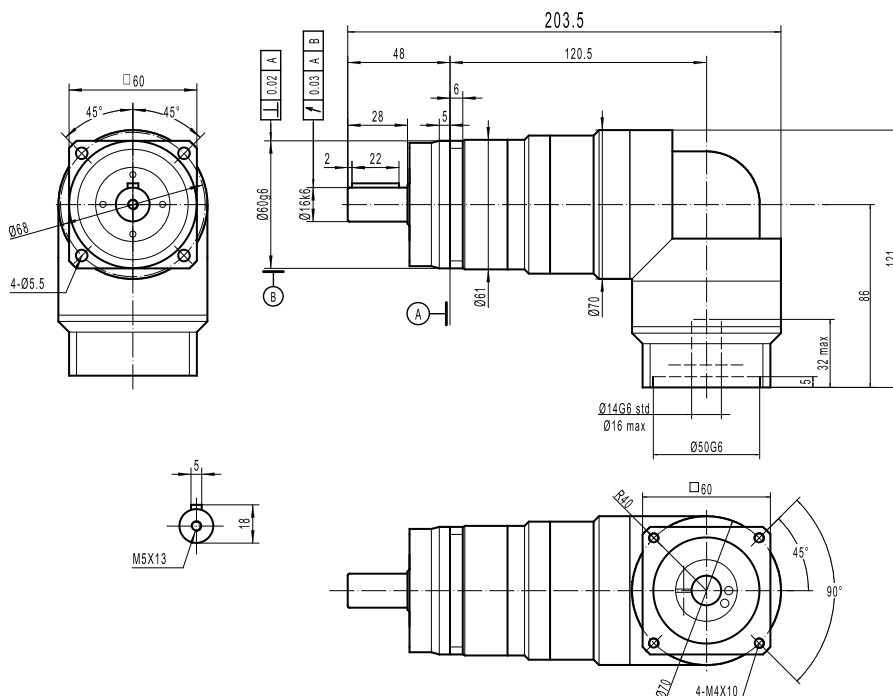
(9) : Room temperature. Refer to temperature factors on page 140.

Refer to page 134 for detailed explanations about gearbox selection and ratings.

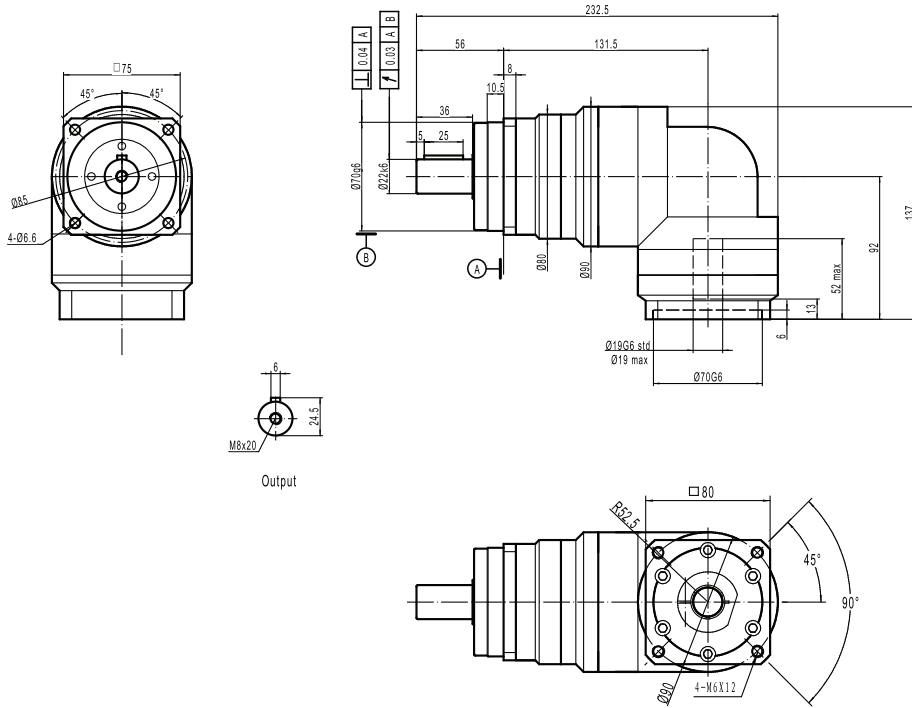
X-TREME SQ-RA-060 - 1 STAGE - RATIOS 3 TO 10



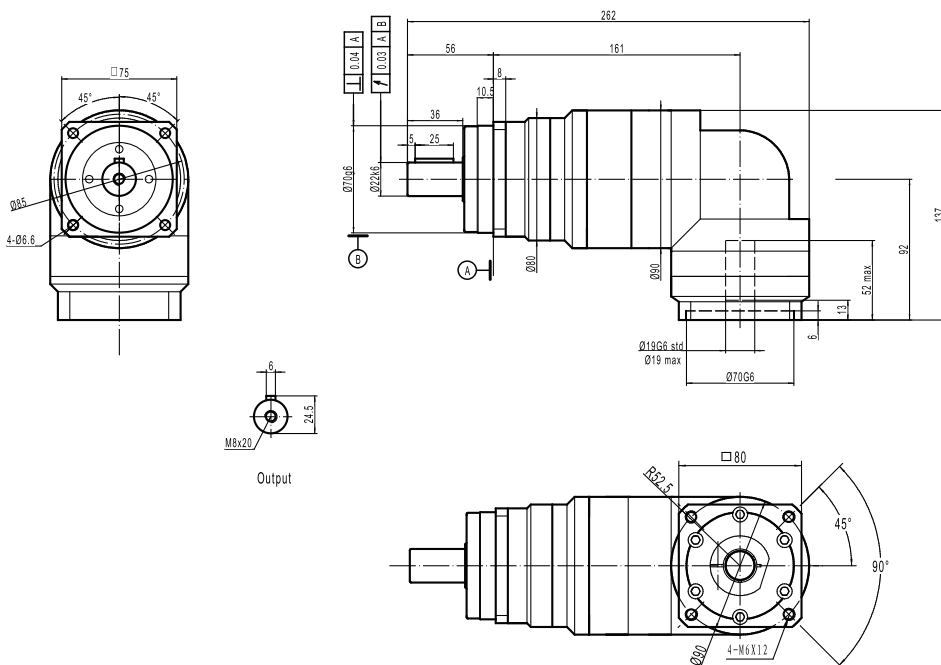
X-TREME SQ-RA-060 - 2 STAGES - RATIOS 12 TO 100



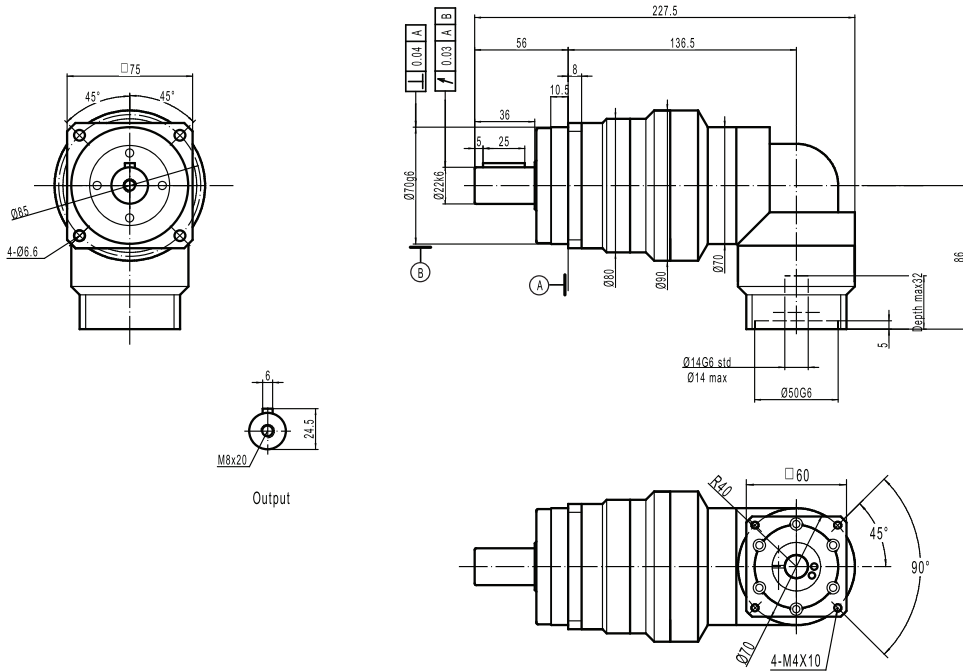
X-TREME SQ-RA-075 - 1 STAGE - RATIOS 3 TO 10



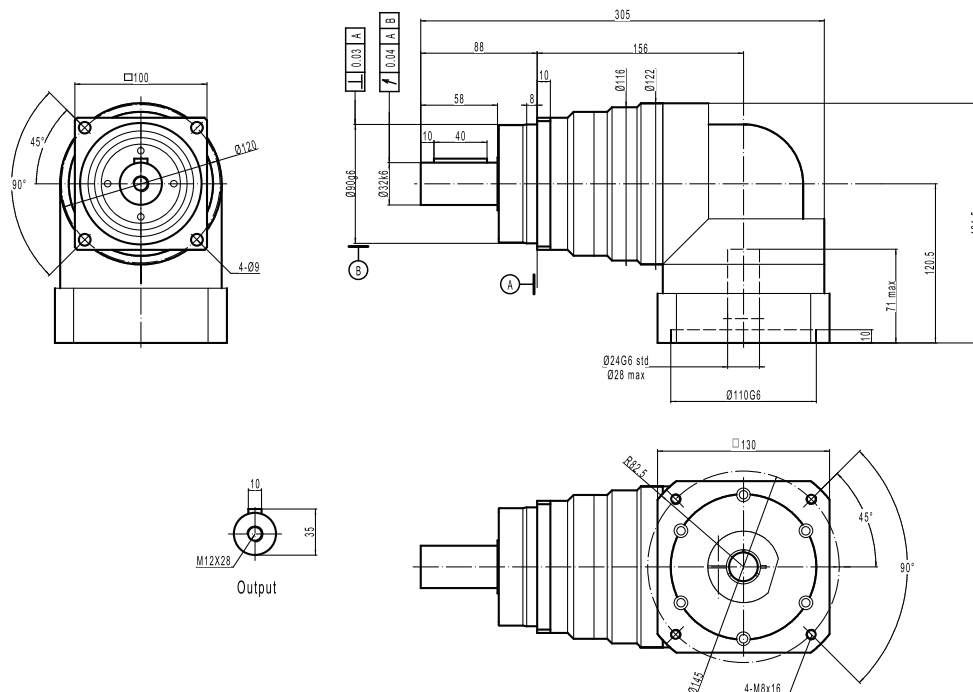
X-TREME SQ-RA-075 - 2 STAGES - RATIOS 12 TO 25



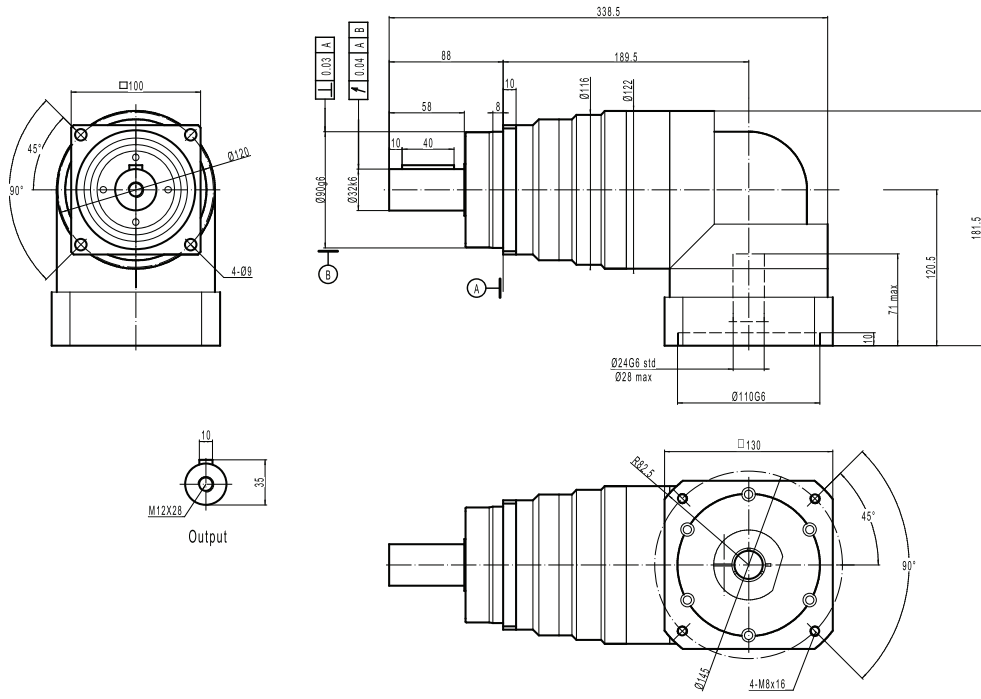
X-TREME SQ-RA-075 - 2 STAGES - RATIOS 30 TO 100



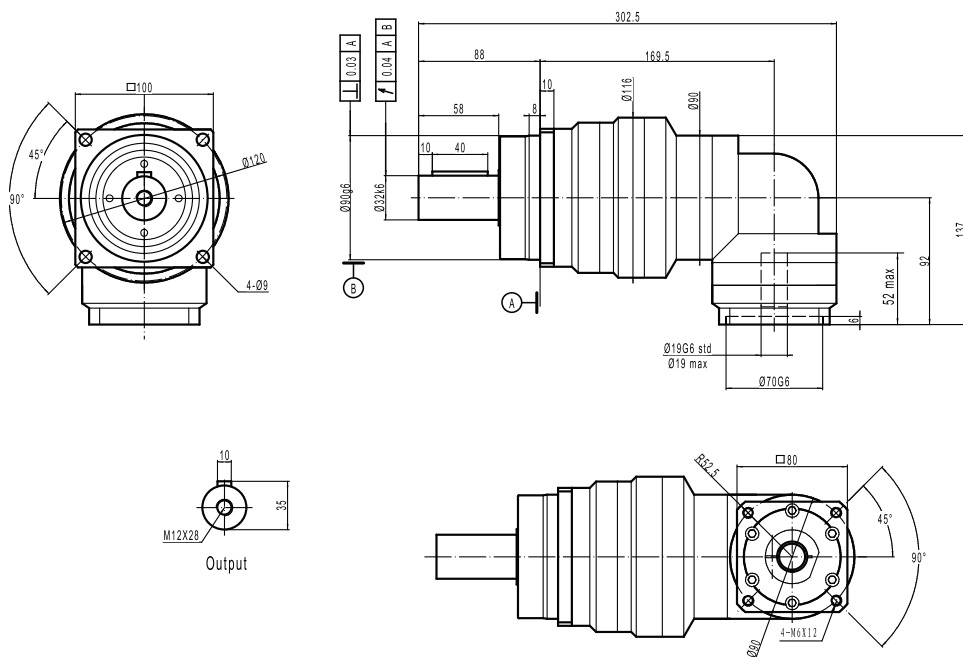
X-TREME SQ-RA-100 - 1 STAGE - RATIOS 3 TO 10



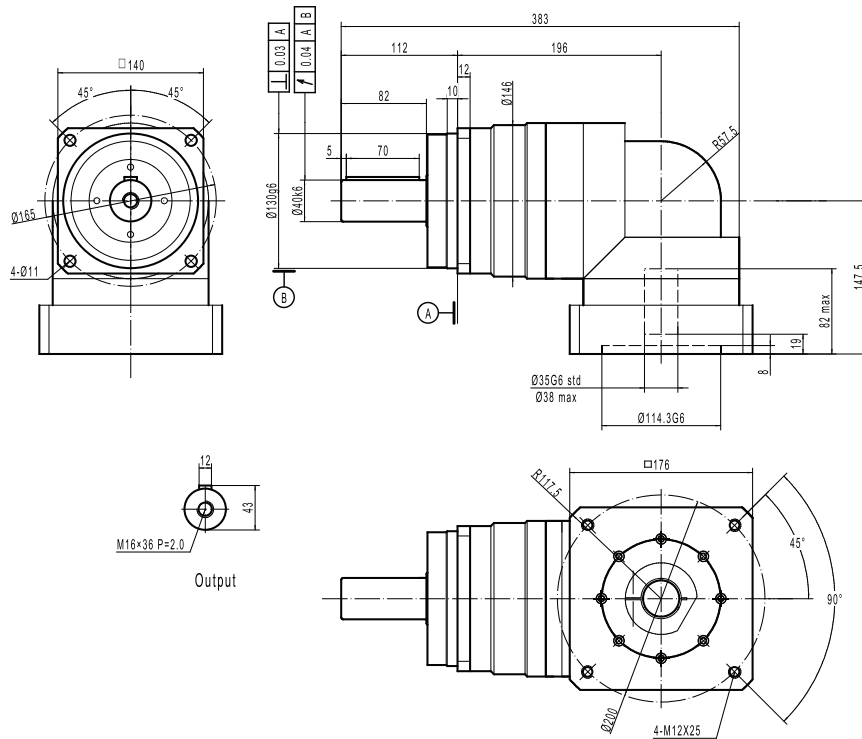
X-TREME SQ-RA-100 - 2 STAGES - RATIOS 12 TO 30



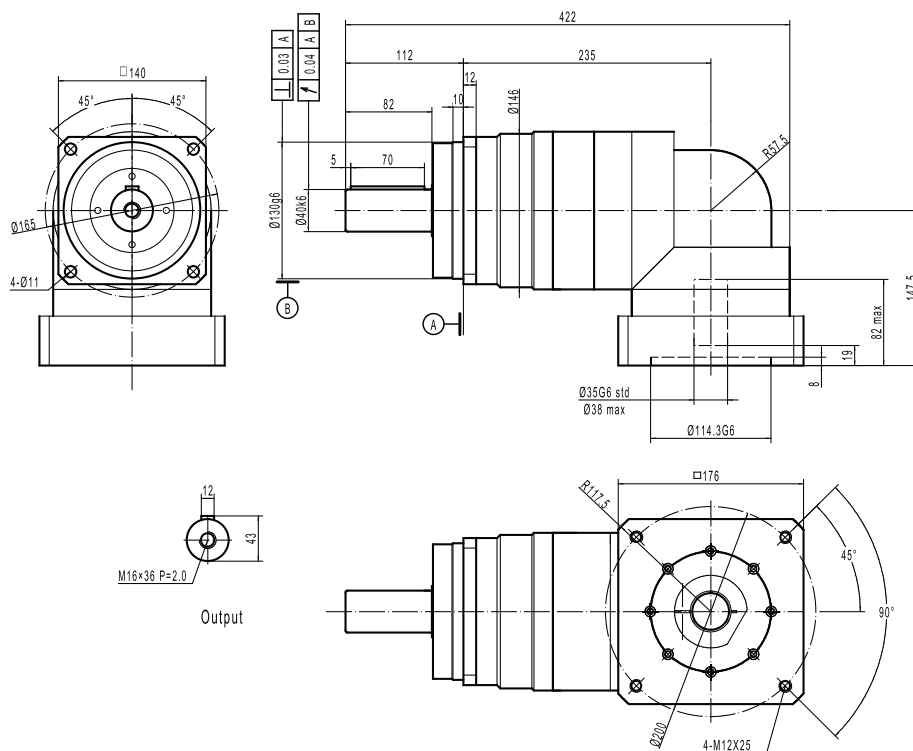
X-TREME SQ-RA-100 - 2 STAGES - RATIOS 35 TO 100



X-TREME SQ-RA-140 - 1 STAGE - RATIOS 3 TO 10



X-TREME SQ-RA-140 - 2 STAGES - RATIOS 12 TO 30



BOOSTER RA

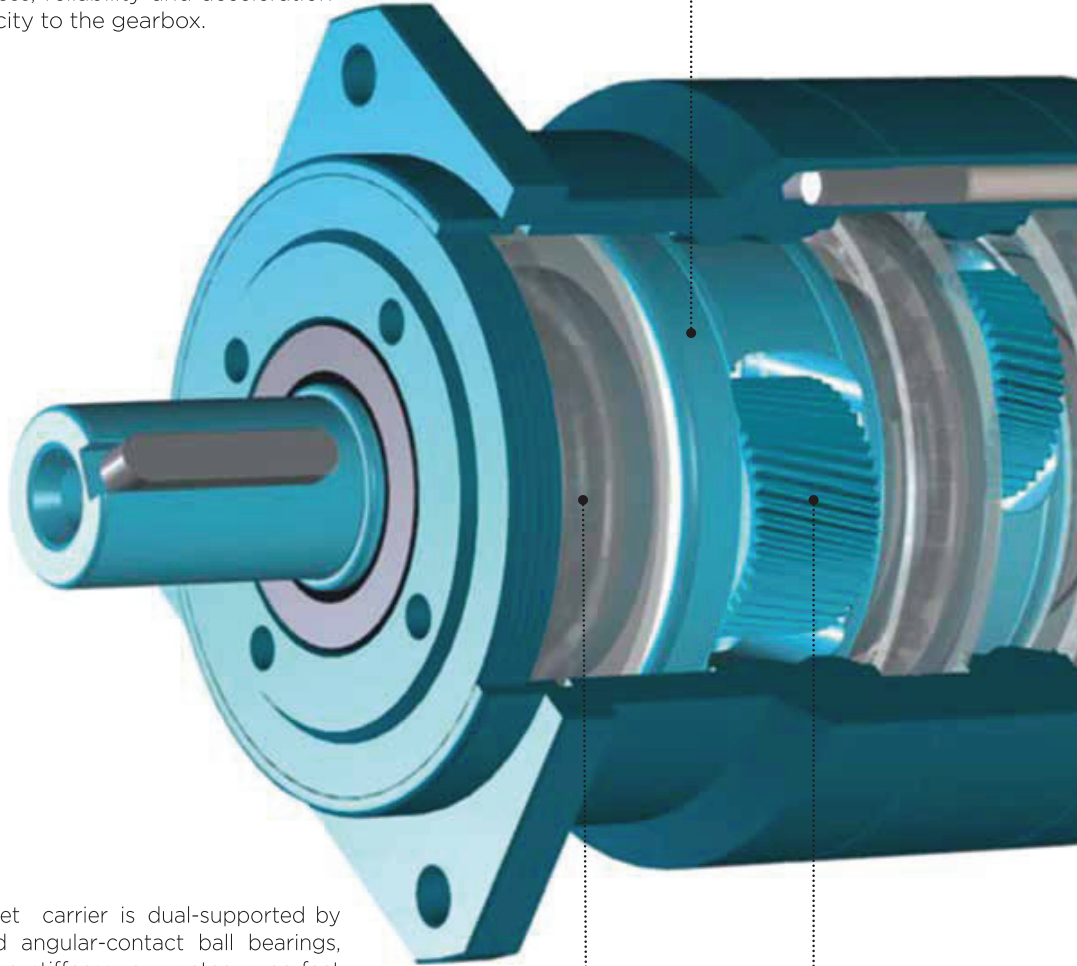


Acceleration capacity	++++
Fast reversals	++++
Radial efforts	+++
Axial efforts	+++
Stiffness	++++
Precision	++++
Economy	++

BOOSTER RA_ Internal construction

BOOSTER is a high-performance, high precision planetary gearbox. It delivers high acceleration and fast reversals to heavy duty servo-applications.

The caged planet carrier, provides stiffness, reliability and acceleration capacity to the gearbox.



The planet carrier is dual-supported by preloaded angular-contact ball bearings, to improve stiffness, guarantee a perfect alignment of gears during operation and provide greater acceptance of radial efforts.

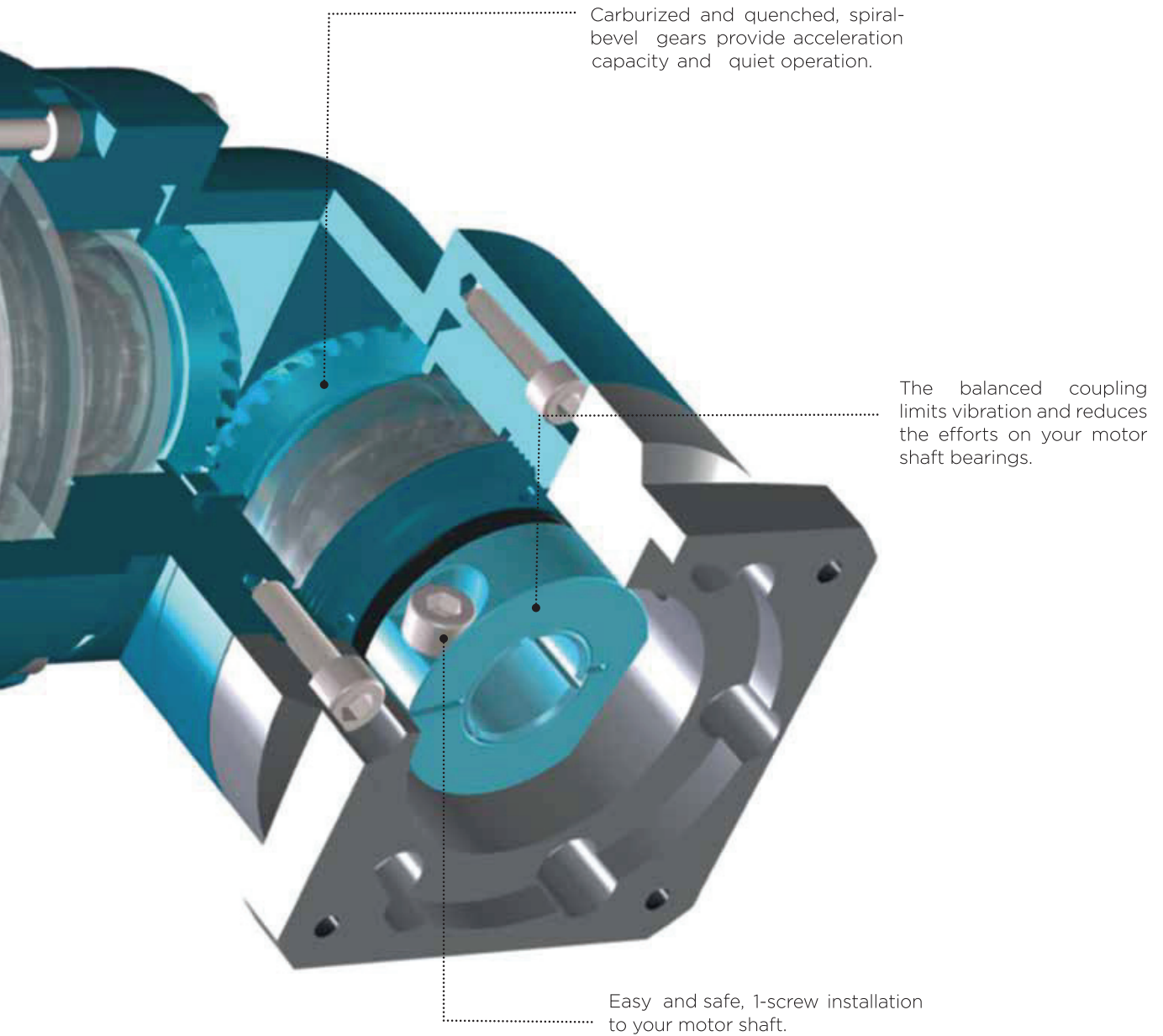
THE ENTIRE RANGE IS
LUBRICATED FOR LIFE BY



Carburized and quenched helical teeth for quiet operation, reliability and acceleration capacity.



PerfectPitch™



BOOSTER RA_Technical data

	RATIO	BOOSTER-CI-RA / BOOSTER-SQ-RA		
		60	90	120
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/3	25	60	132
	1/4	42	84	242
	1/5	43	98	222
	1/6	42	90	254
	1/7	42	90	218
	1/8	39	86	212
	1/9	33	79	166
	1/10	29	78	169
	1/15	25	60	132
	1/20	42	84	242
	1/25	43	98	222
	1/50	43	98	222
	1/80	39	86	212
	1/100	29	78	169
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/3	32	74	165
	1/4	52	104	299
	1/5	53	122	272
	1/6	51	109	286
	1/7	52	112	260
	1/8	45	108	250
	1/9	39	97	194
	1/10	37	96	184
	1/15	32	74	165
	1/20	52	104	299
	1/25	53	122	272
	1/50	53	122	272
	1/80	45	108	250
	1/100	37	96	184
Emergency stop torque $T_x^{(3)}$		3*T _{2n}		
Angular backlash(arc-min)	1 stage	standard≤8		
	2 stages	standard≤8		
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000
Maximum bending moment ⁽⁶⁾ (N.m)		105	200	380
Maximum axial load (N)		800	2,100	3,300
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>93		
	2 stages	>90		
Torsional stiffness (Nm / arc-min)		8	20	41
Lifetime ⁽⁸⁾		20,000 hours		
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C		
Max housing temperature (90°)		90°C		
Protection class		IP65		
Noise level (dB)		<65	<67	<70
Lubricant		Sumico grease (lubricated for life)		
Color		Capri blue (RAL 5019)		
Input flange		Anodized Aluminum		

(1) : Nominal output torque applicable 20,000 hours at rated speed.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : Emergency stop torque (100 occurrences maximum).

(4) : Speed at which the nominal torque is applicable 20,000 hours.

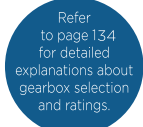
(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

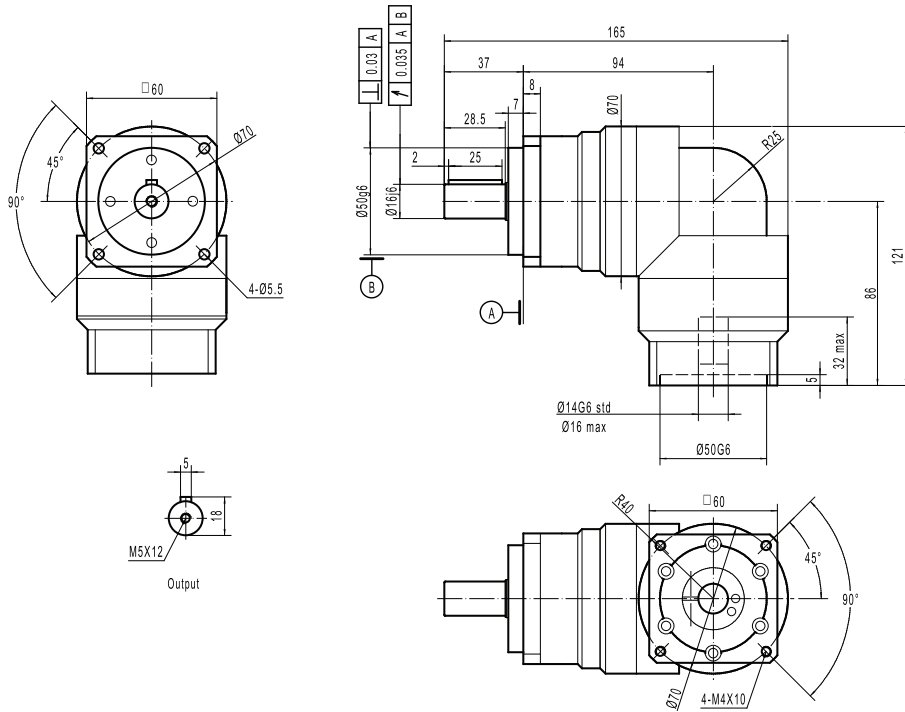
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

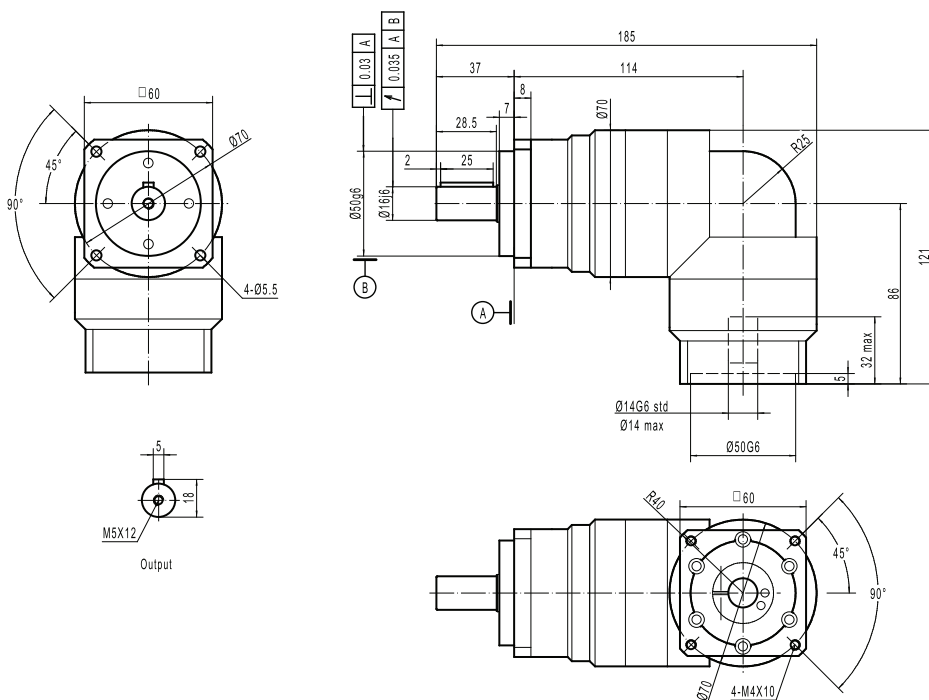
(9) : Room temperature. Refer to temperature factors on page 140.



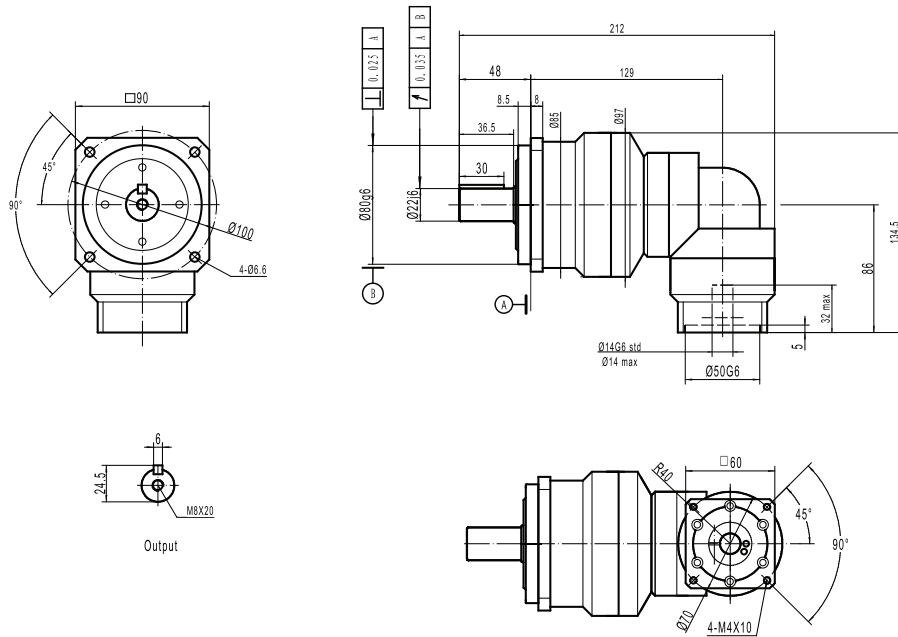
BOOSTER SQ-RA-060-1 STAGE RATIOS 3 TO 10



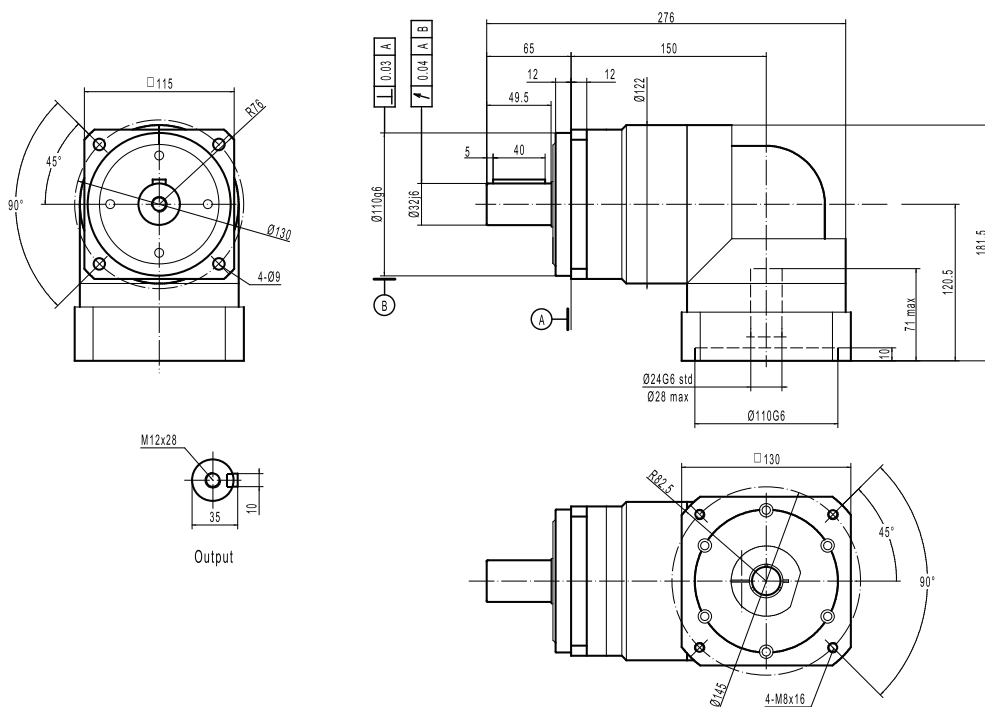
BOOSTER SQ-RA-060-2 STAGES RATIOS 12 TO 100



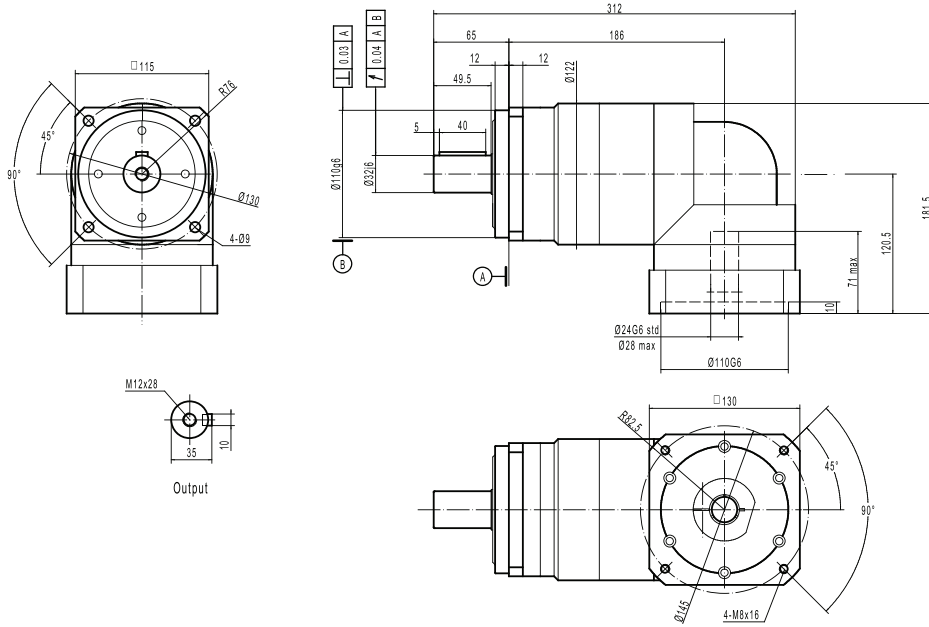
BOOSTER SQ-RA-090-2 STAGE-RATIOS 30 TO 100



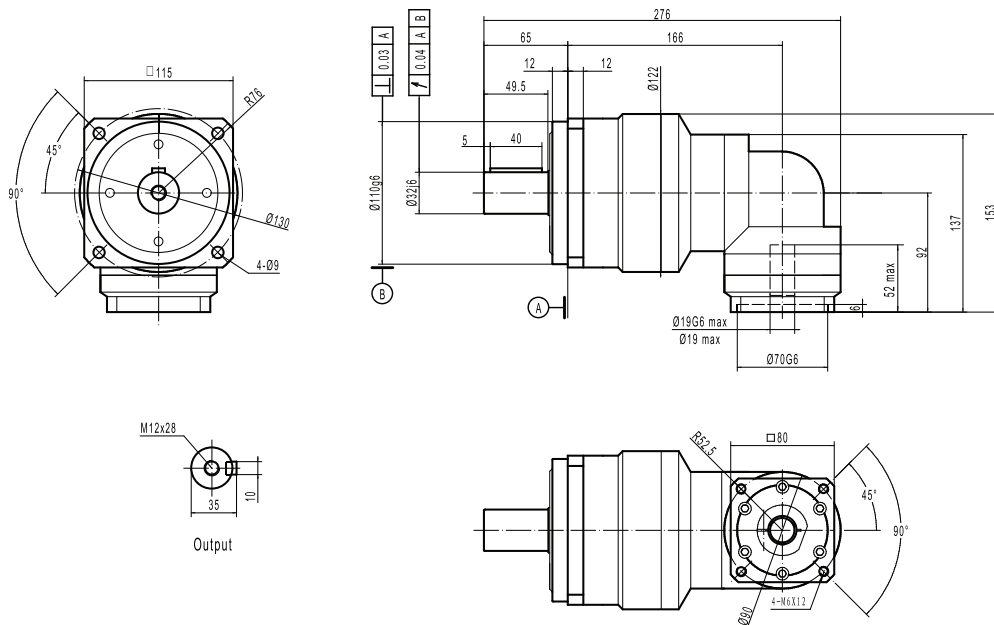
BOOSTER SQ-RA-120-1 STAGE-RATIOS 12 TO 30



BOOSTER SQ-RA-120-2 STAGE-RATIOS 12 TO 30



BOOSTER SQ-RA-120-2 STAGE-RATIOS 35 TO 100



ULTIMATE RA



Acceleration capacity	+++++
Fast reversals	+++++
Radial efforts	+++++
Stiffness	+++++
Precision	+++++
Economy	+

ULTIMATE RA_ Internal construction

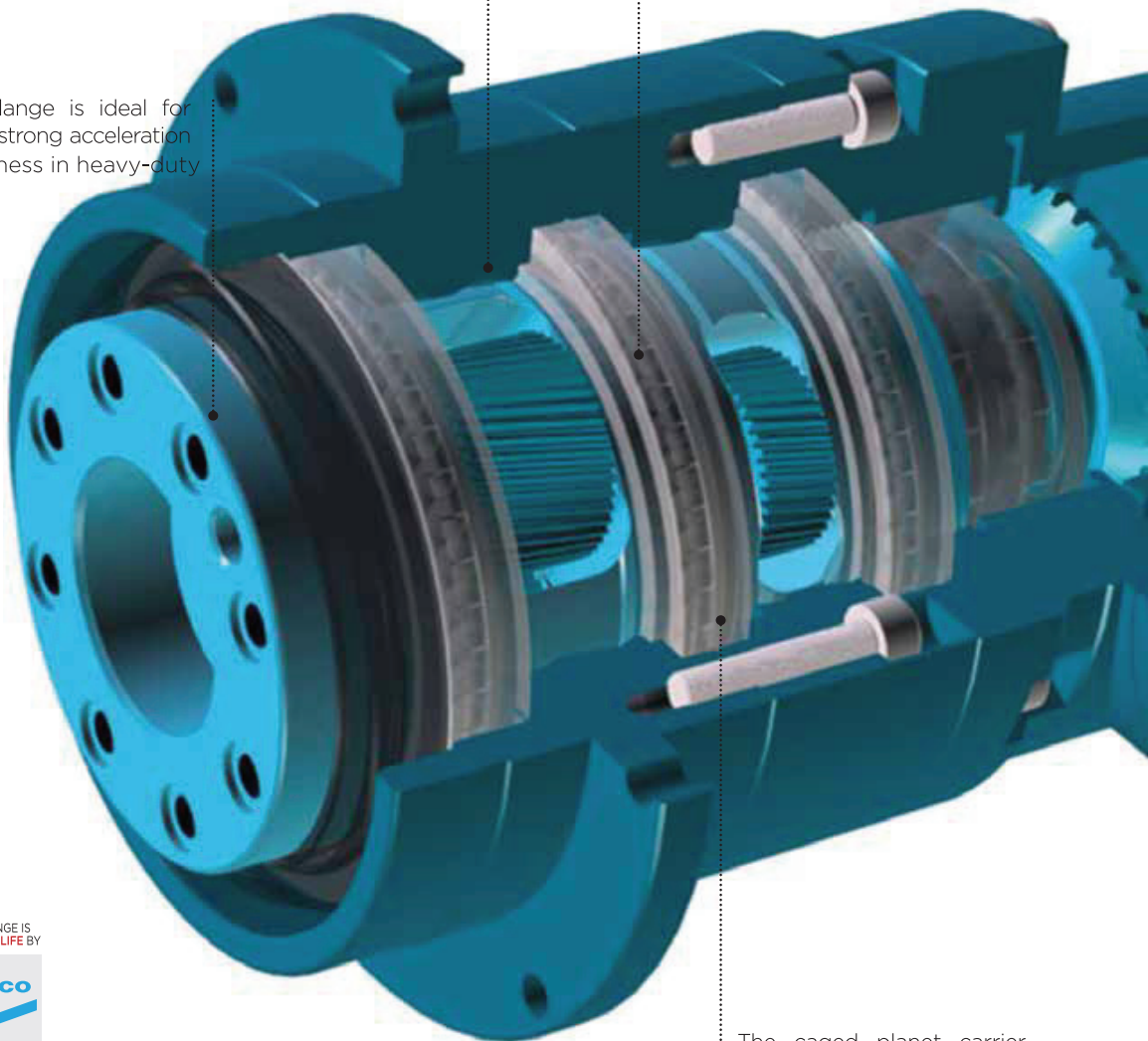
Ultimate is a low-backlash, heavy-duty planetary gearbox.

It provides amazing acceleration capacity to severe applications including new-generation lasercutting machines, delta robots or punching machines, where high precision is needed, together with torsional stiffness.

Planet carrier is dual-supported by angular-contact ball bearings to improve stiffness, guarantee a perfect alignment of gears during operation and provide greater acceptance to radial efforts.

Carburized and quenched helical teeth for quiet operation, reliability and acceleration capacity

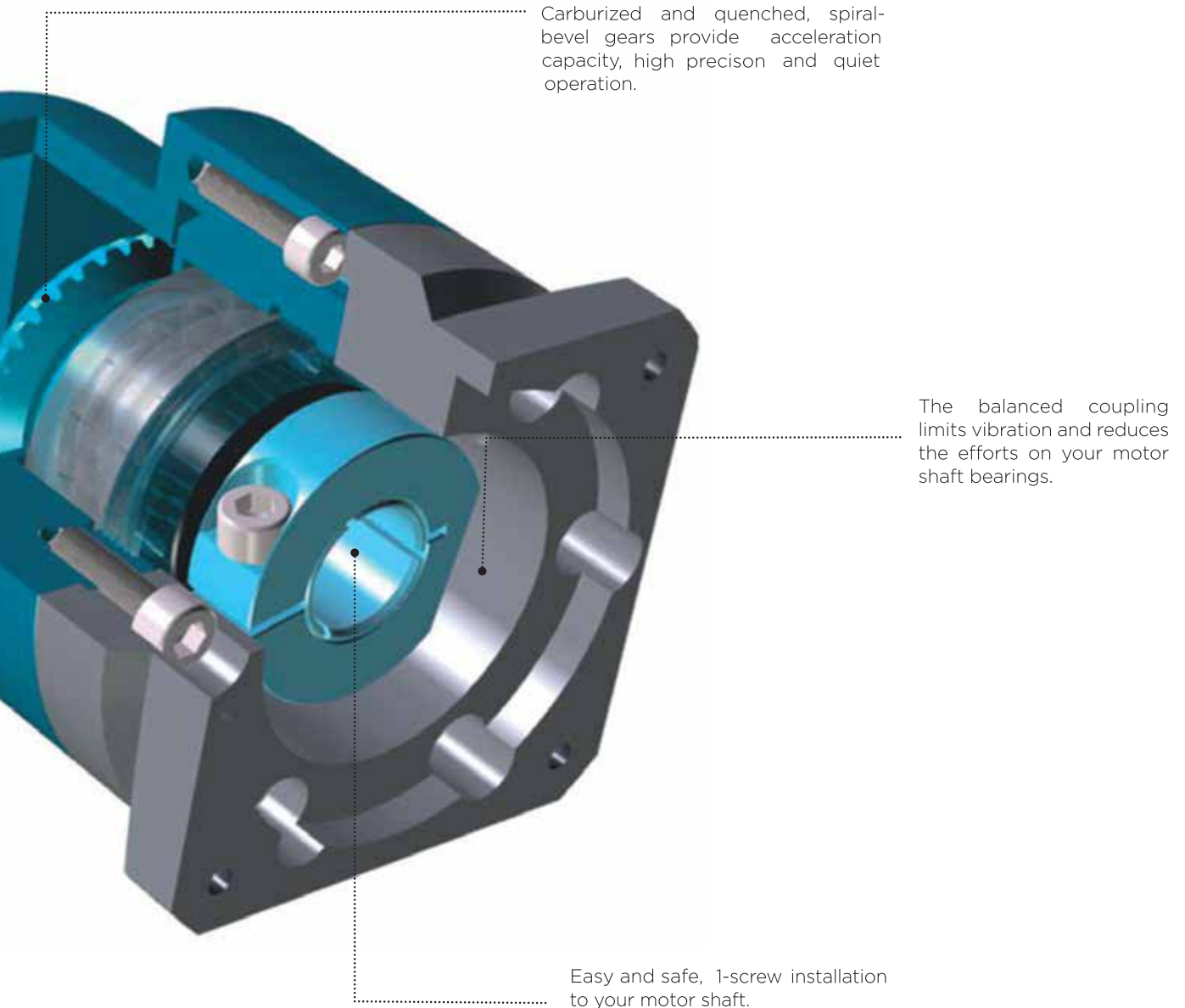
The output flange is ideal for fast reversals strong acceleration requiring stiffness in heavy-duty applications.



The caged planet carrier, provides stiffness, reliability and acceleration capacity to the gearbox.



PerfectPitch™



Carburized and quenched, spiral-bevel gears provide acceleration capacity, high precision and quiet operation.

The balanced coupling limits vibration and reduces the efforts on your motor shaft bearings.

Easy and safe, 1-screw installation to your motor shaft.

ULTIMATE RA_Technical data

	RATIO	ULTIMATE-CI-RA			
		64	90	110	140
$T_{2n}^{(1)}$ 20,000h; KA=1.25	1/4	42	84	242	386
	1/5	43	98	222	374
	1/6	42	90	254	365
	1/7	42	90	218	368
	1/8	39	86	212	355
	1/9	33	79	166	300
	1/10	29	78	169	264
	1/16	25	60	132	260
	1/20	42	84	242	386
	1/25	43	98	222	374
	1/50	43	98	222	374
	1/80	39	86	212	355
	1/100	29	78	169	264
$T_{max}^{(2)}$ 2,000h; 1,500rpm	1/4	52	104	299	464
	1/5	53	122	272	464
	1/6	51	109	286	453
	1/7	52	112	260	453
	1/8	45	108	250	430
	1/9	39	97	194	372
	1/10	37	96	184	345
	1/16	32	74	165	340
	1/20	52	104	299	464
	1/25	53	122	272	464
	1/50	53	122	272	464
	1/80	45	108	250	430
	1/100	37	96	184	345
Emergency stop torque $T_x^{(3)}$		3*T _{2n}			
Angular backlash (arc-min)	1 stage	standard ≤ 8			
	2 stages	standard ≤ 8			
Nominal input speed ⁽⁴⁾ (rpm)		3,000	3,000	3,000	3,000
Maximum input speed ⁽⁵⁾ (rpm)		6,000	6,000	6,000	6,000
Maximum bending moment ⁽²⁾ (N.m)		115	215	400	1,160
Maximum axial load (N)		950	2,500	4,000	9,000
Efficiency ⁽⁷⁾ at full load (%)	1 stage	>96			
	2 stages	>93			
Torsional stiffness (Nm / arc-min)		6	10	31	53
Lifetime ⁽⁸⁾		20,000 hours			
Nominal / min / max operating temperature ⁽⁹⁾		20°C / -10°C / +45°C			
Max housing temperature (90°)		90°C			
Protection class		IP65			
Noise level (dB)		<65	<67	<70	<72
Lubricant		Sumico grease (lubricated for life)			
Color		Capri blue (RAL 5019)			
Input flange		Anodized Aluminum			

(1) : Nominal output torque.

(2) : Torque which is necessary to start the application, applicable 2,000 hours.

(3) : 100 occurrences maximum.

(4) : Speed at which the nominal torque is applicable 20,000 hours.

(5) : Peak speed only.

(6) : Applied at the middle of the output shaft at 300 rpm.

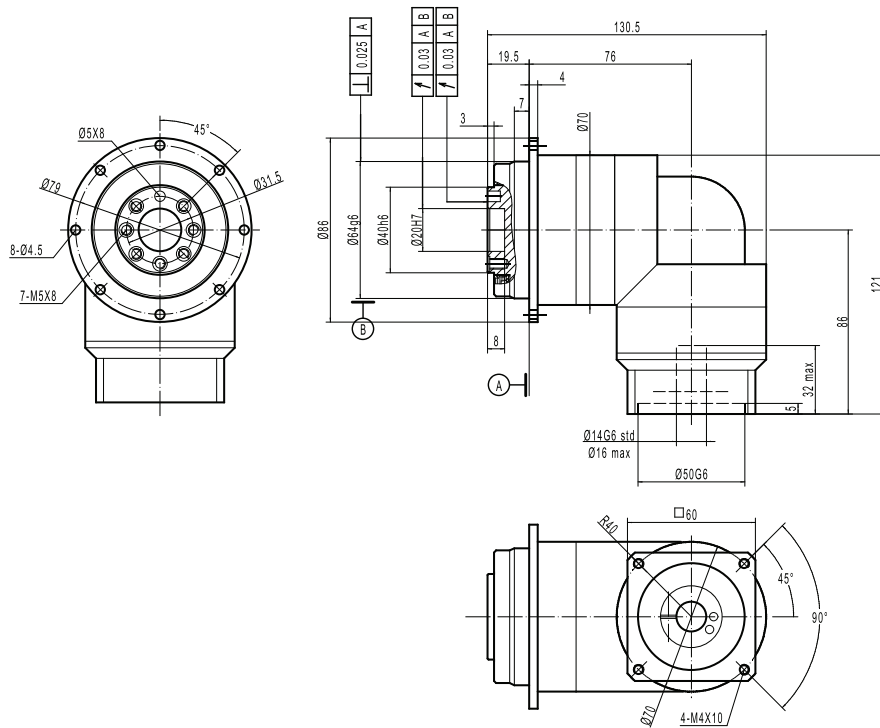
(7) : Measured at full load and at 25°C.

(8) : Lifetime at nominal torque and speed. Consult us to obtain a free estimation of lifetime in your working conditions.

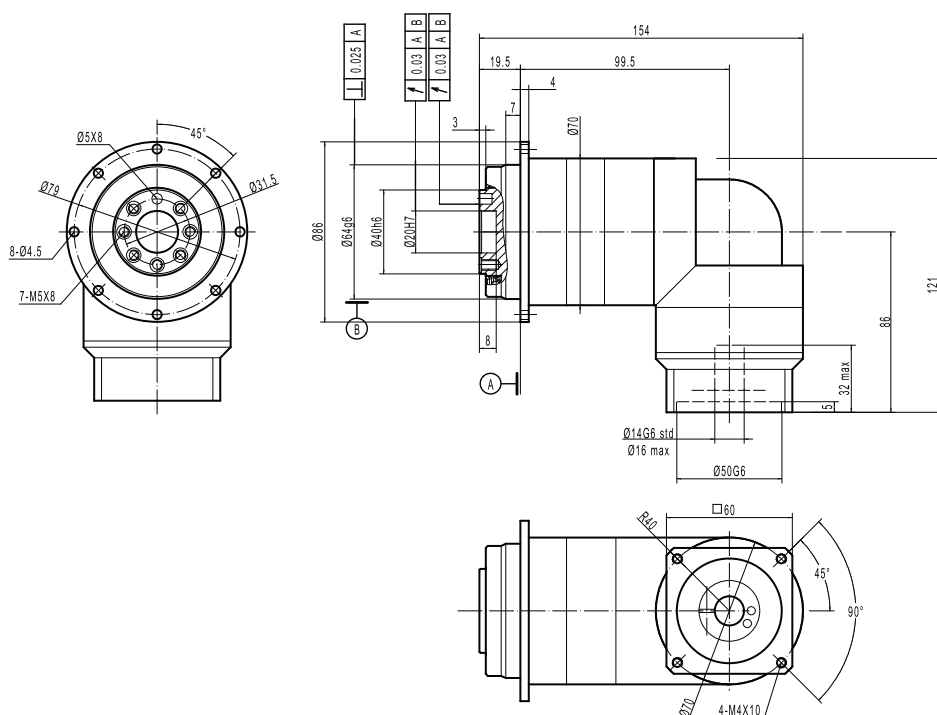
(9) : Room temperature. Refer to temperature factors on page 140.

Refer to page 134 for detailed explanations about gearbox selection and ratings.

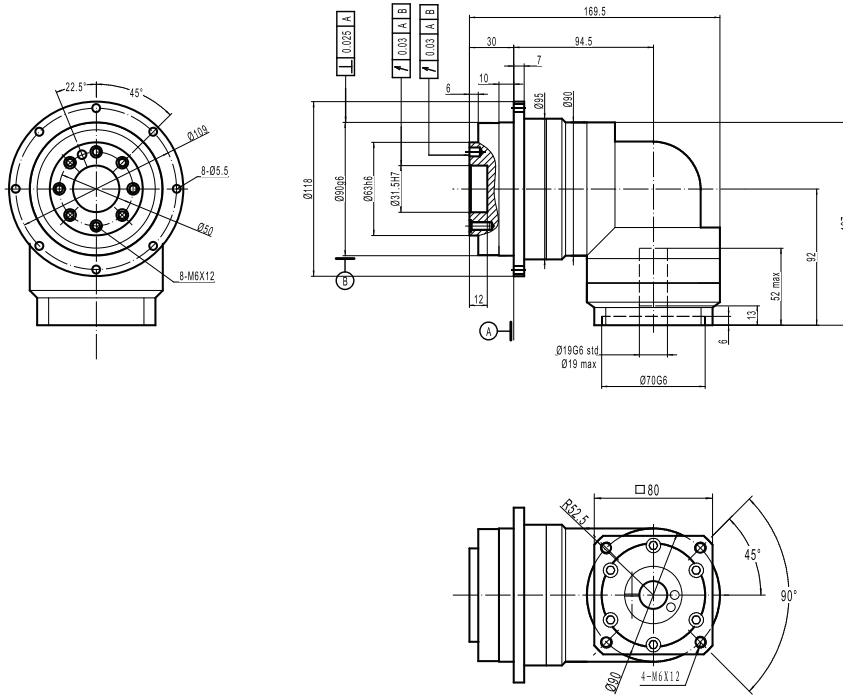
ULTIMATE CI-RA-064-1 STAGE - RATIOS 4 TO 10



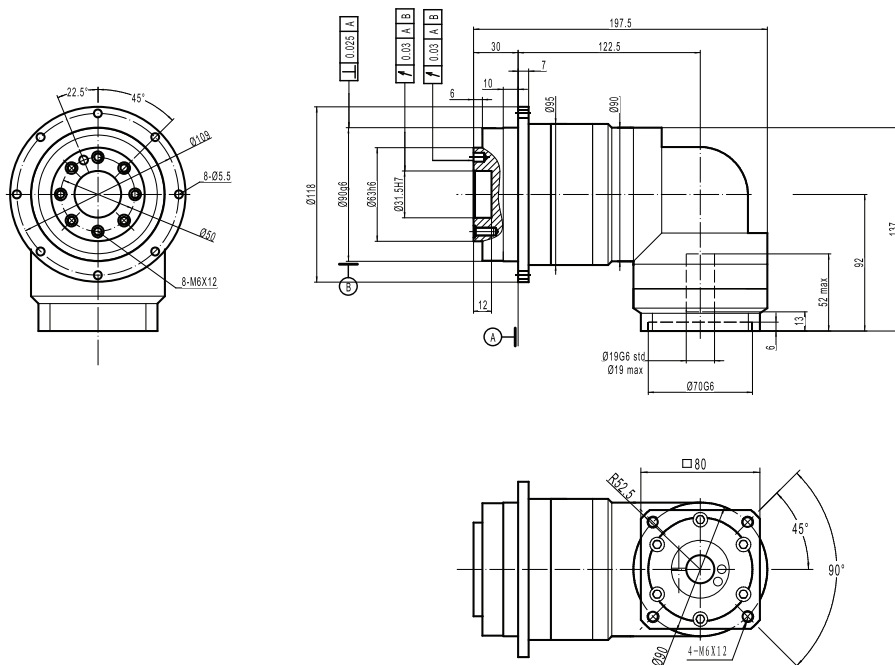
ULTIMATE CI-RA-064-2 STAGES - RATIOS 16 TO 100



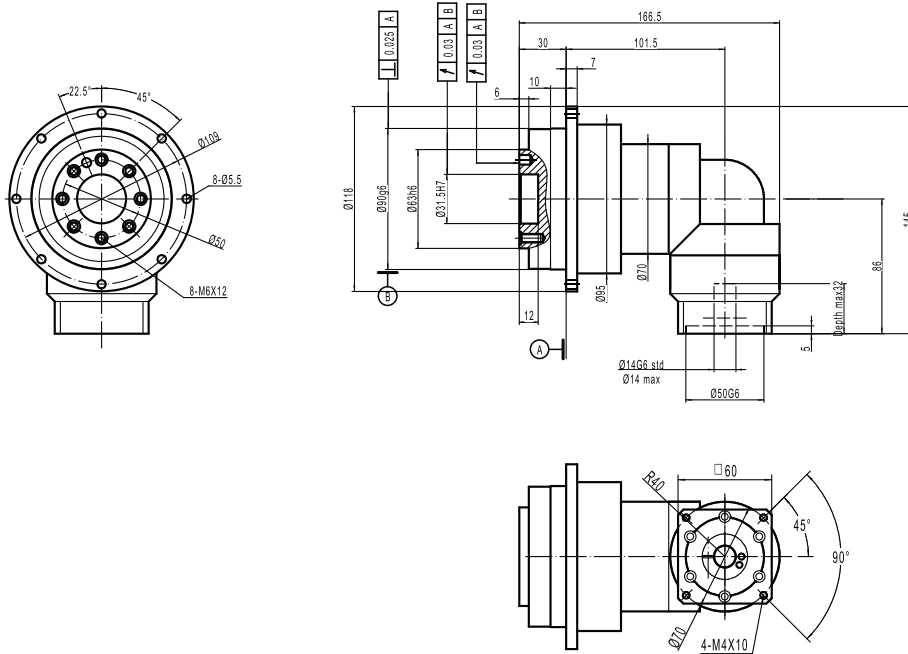
ULTIMATE CI-RA-090-1 STAGE - RATIOS 4 TO 10



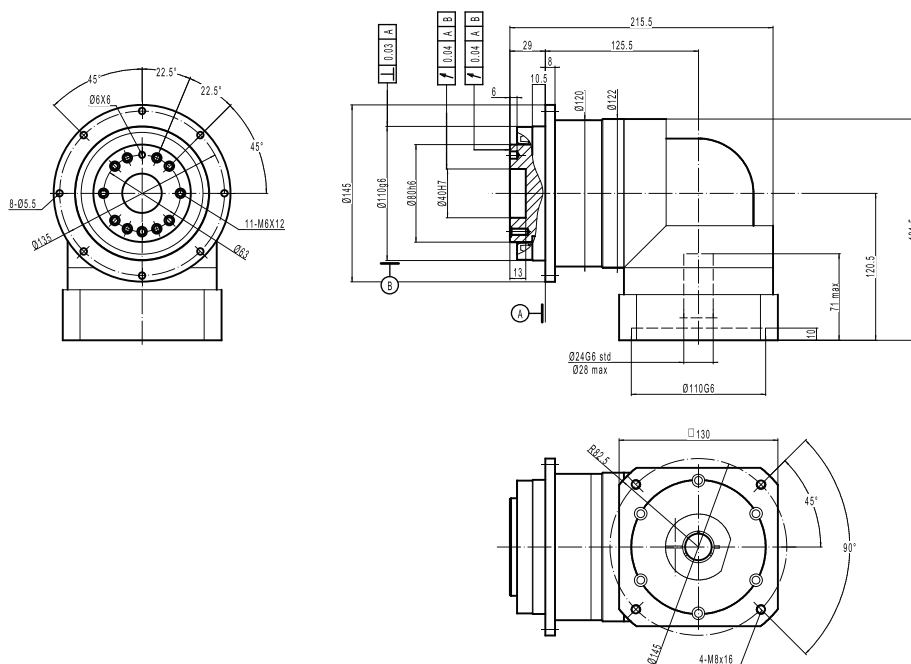
ULTIMATE CI-RA-090-2 STAGES - RATIOS 16 TO 25



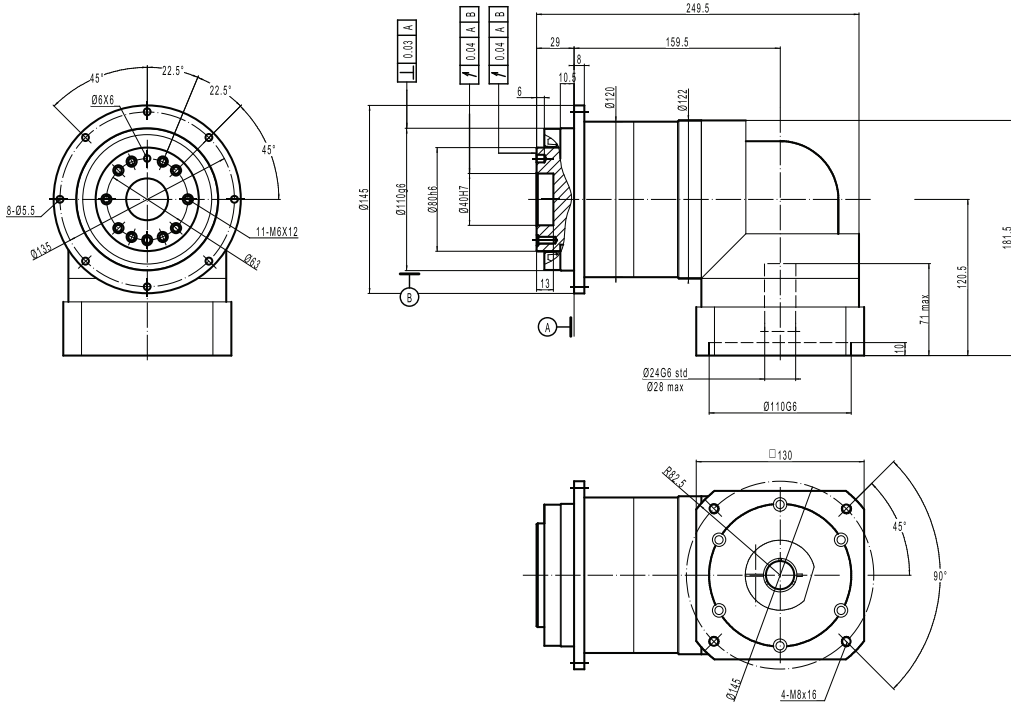
ULTIMATE CI-RA-090-2 STAGES - RATIOS 30 TO 100



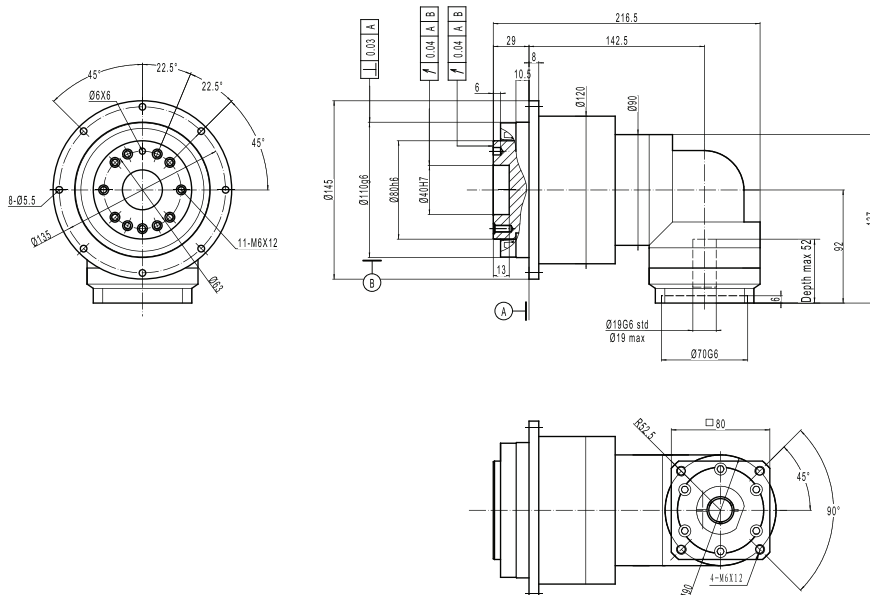
ULTIMATE CI-RA-110-1 STAGE - RATIOS 4 TO 10



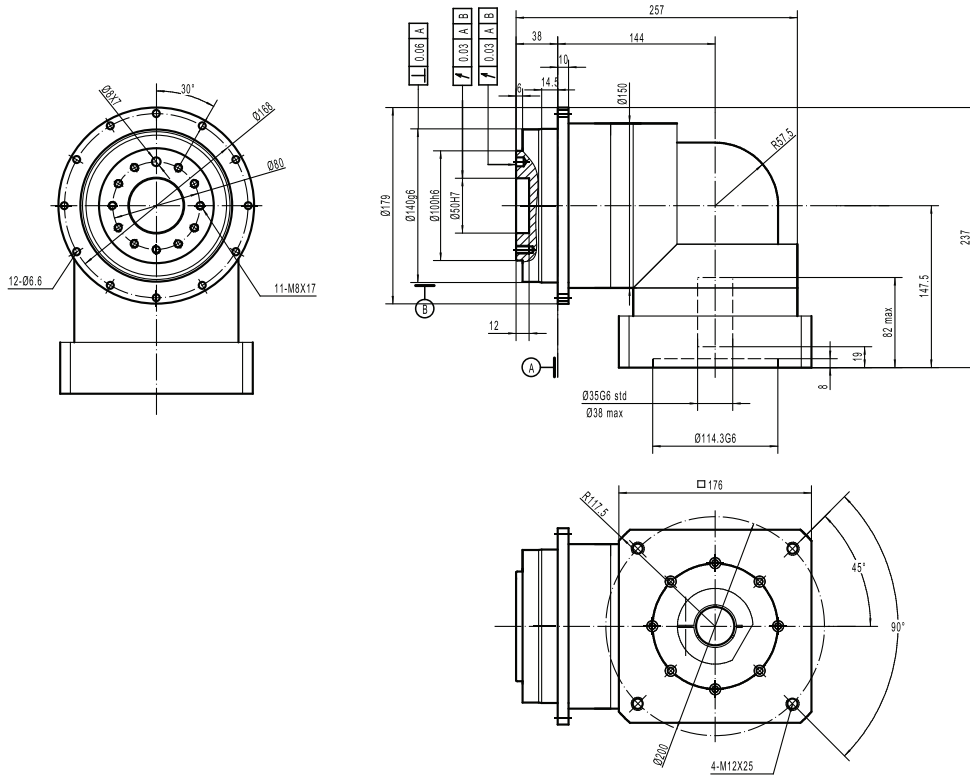
ULTIMATE CI-RA-110-2 STAGES - RATIOS 16 TO 30



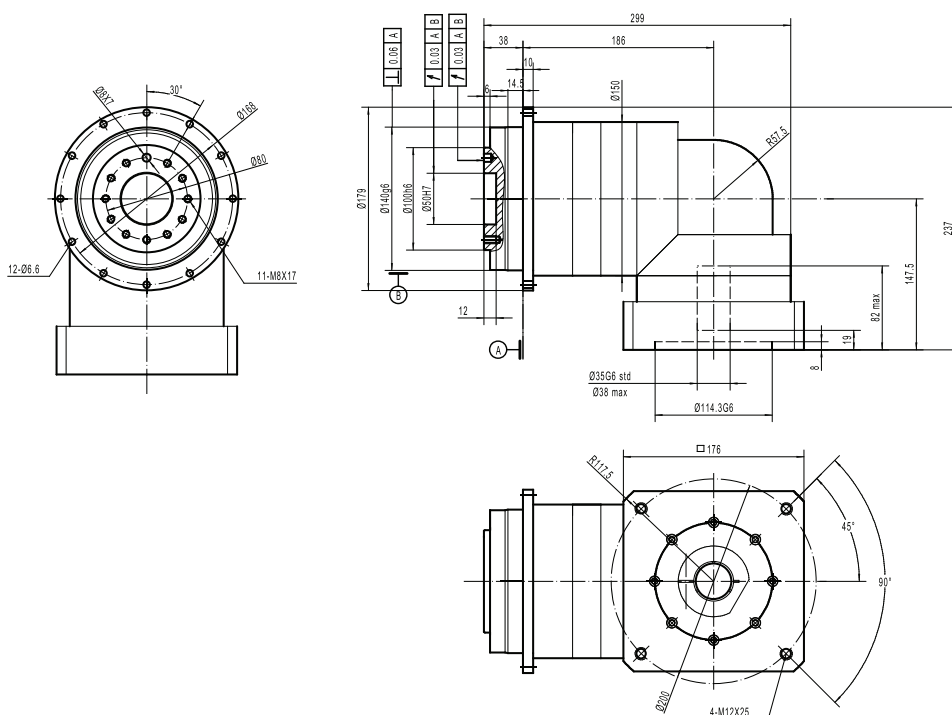
ULTIMATE CI-RA-110-2 STAGES - RATIOS 35 TO 100



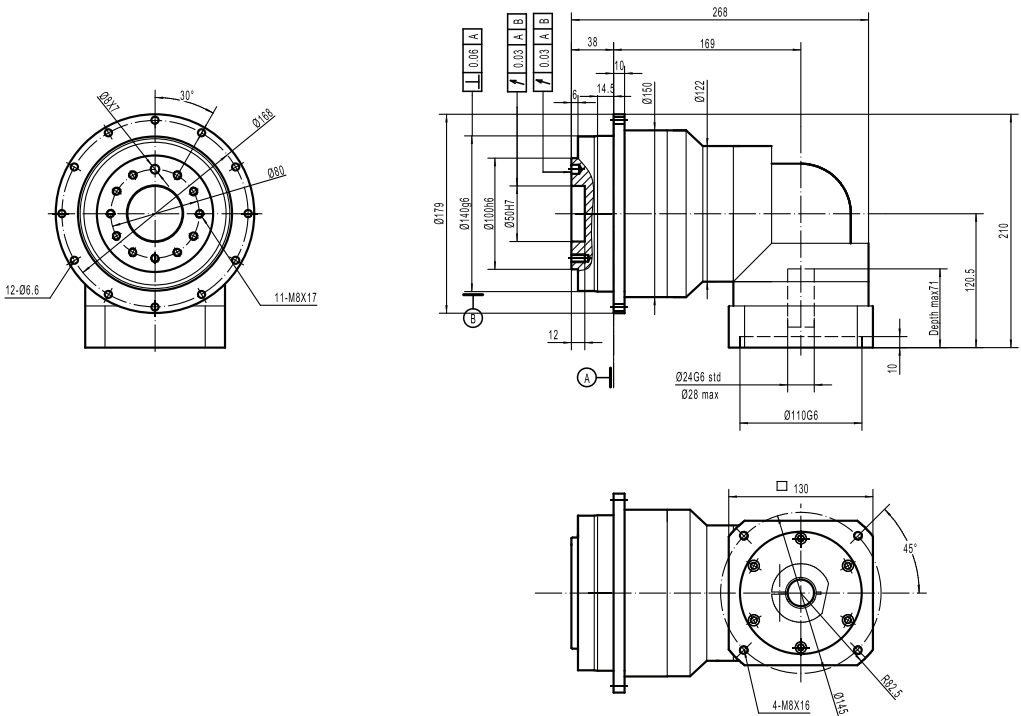
ULTIMATE CI-RA-140-1 STAGE - RATIOS 4 TO 10



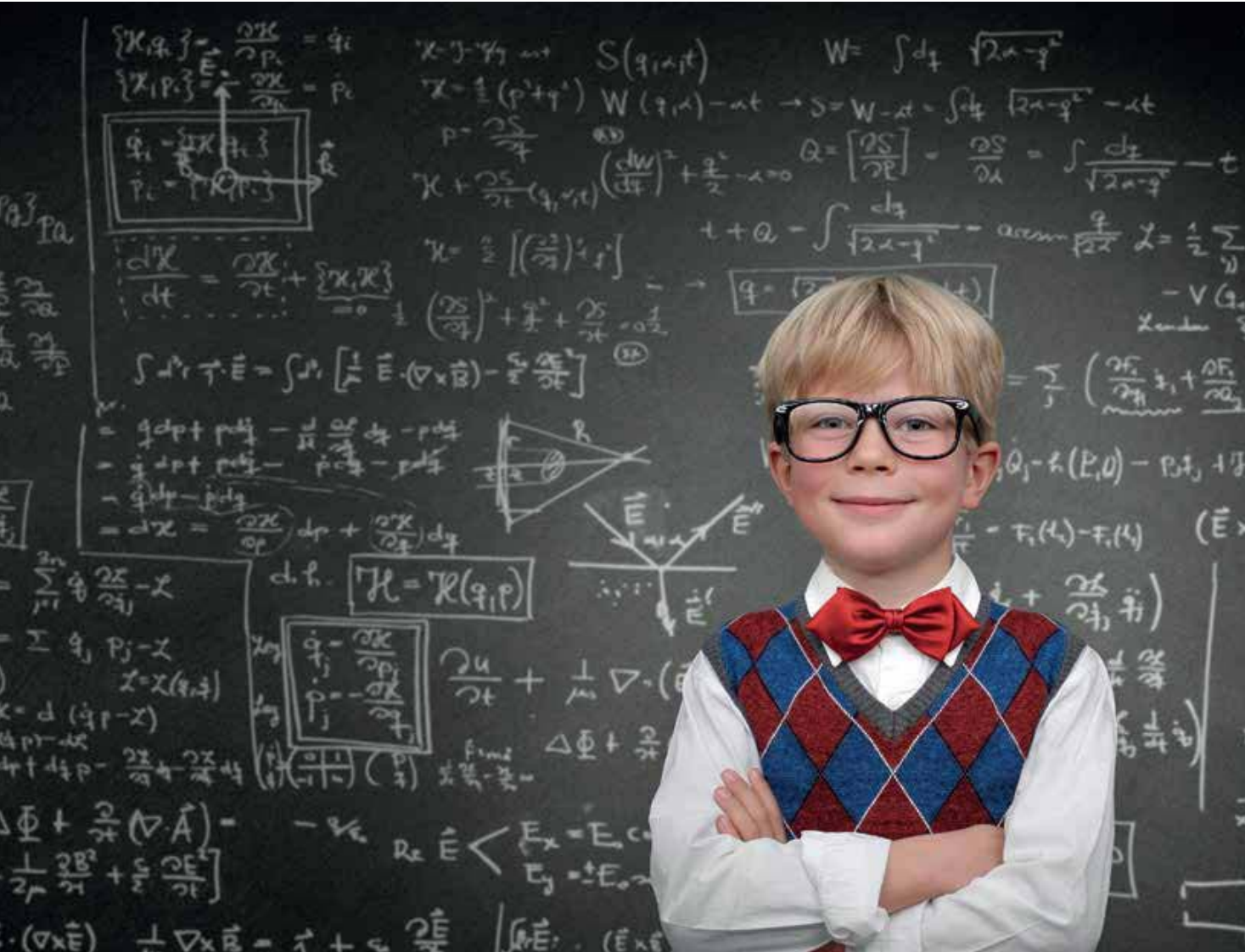
ULTIMATE CI-RA-140-2 STAGES - RATIOS 16 TO 30



ULTIMATE CI-RA-140-2 STAGES - RATIOS 35 TO 100



INFORMATION



LIFETIME AND TORQUE RATINGS

How are lifetime and torque ratings linked in a planetary gearbox?

Face-to-face comparison with competitor's products is not easy, because there is no standard way of presenting data. For any gearbox, many different ratings could be published, depending on choices made by the engineer calculating them, for instance the rotation speed, the use of an L10 life (allowing 10% of products to fail before nominal life), or the safety and application factors used when proceeding to the calculation. Results can vary from 1 to 3 with a similar product and very high torque ratings can be misleading.

At Reckon® we do not add an L10 factor to our calculation, and we chose rotation speeds, temperature and minimal application factors corresponding to real-life needs. Even so, there is no «ready-to-use» torque data corresponding exactly to the way your application works. Lifetime of a gear will depend on the way your application will:

1. Wear the surface of the teeth, causing a loss of precision and decreasing lifetime (for example when rated torque is too high compared to nominal torque),
2. Bend them, potentially leading to fatigue breakage (when the application factor used was not correct)
3. Break them instantly (when a shock occurs).

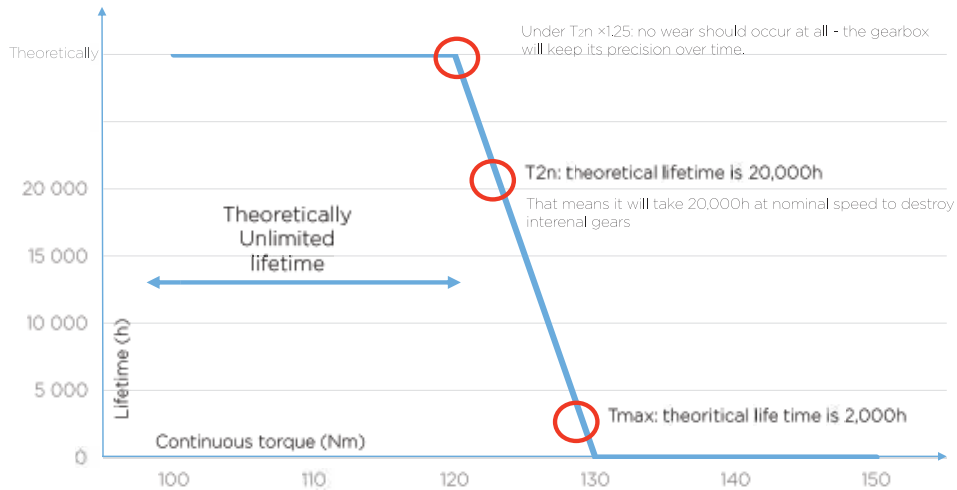
Lifetime of a gear stage is not proportional to the output torque. When a gearbox is properly dimensioned for an application, the theoretical gearing lifetime is unlimited because the film of lubricant between the gears is protecting them from working «metal-against-metal», and because fatigue breakage will not happen under such conditions.

- Theoretical gearing lifetime is unlimited if your rated torque is under T_{2n} ,
- Theoretical gearing lifetime is 20,000h if your rated torque is T_{2n} ,
- Acceleration torque can be used 2,000 hours if it is under T_{max} .

The graph below illustrates lifetime of a gear-stage vs input torque and does not take bearings or seals into consideration, and using the ISO 6336-2 calculation methodology.

You should notice how sharp the decrease of lifetime is, after nominal torque is exceeded.

Theoretical lifetime of a gear stage vs continuous torque



It should be noted that a planetary gearbox's lifetime depends as well on seals, lubricant or bearings condition, as well as it can be affected by fast variations of torque or reversals. Lifetime can consequently be impacted by heat and speed.

Reckon's published data results from dedicated software calculation, and products were tested in real-life conditions. We chose to follow the ISO 6336-2 calculation norm, as we consider it a very safe method (it is used in the gear calculation of European space mechanisms). Our data is conservative, however it is important to note that indicated torque ratings or lifetimes can be affected by different factors:

- Temperature (calculation was based on a 40°C internal temperature), as lubricant viscosity differs with it. When the gearbox was selected properly, you should not notice more than a 40°C difference with the ambient temperature, and anyway the gearbox body (housing) should never exceed 90°C (based on grease datasheet),
- Speed (calculation was based on the rated speed indicated in the product datasheet charts). Exceeding this speed can increase the internal temperature and be prejudicial to the gears, bearings and seals lifetime. Make sure you do not routinely exceed the nominal speed value,
- The Application Factor (see explanations on next pages). This is an empirical value based on experience, and you have to multiply by your average nominal torque to get your rated torque need.

As a conclusion, published data should be considered indicative because the data that correponds exactly to your application just does not exist. Our engineers will give you an evaluation of your gearbox's lifetime based on your application's real duty cycle and working conditions.

DEFINITIONS

- **The nominal torque T_{2n}** often referred to an “rated” torque is the torque that you can use continuously for 20,000h at nominal speed and with ambient temperature 25°C. Not exceeding this value ensures that the gearbox does not lose precision and can work for a very long time (years, normally). Using 15% less than the nominal torque value in SI cycle theoretically provides an even longer lifetime, as calculation gives an unlimited result.
- **The acceleration torque T_{max}** should only be used 10% of the gearbox lifetime (anyway less than 2,000h) because it slightly wears the gears, and because exceeding this duration would create the conditions of a fatigue breakage. It is important to note that the product will slightly lose precision over time when the acceleration torque is used frequently. Applications that need to preserve a very high precision in the long run (applications with high positioning accuracy or fast reversals where excessive backlash can lead to breakage) need to avoid using the acceleration torque too frequently and should combine the rated torque with an application factor (see below). In many applications, allowing just a few seconds more to the application start can prolong the gearing lifetime significantly.
- **Using the emergency stop torque** will not wear the gears or make you lose precision because it only lasts seconds in the product life. The gearbox was designed to handle it 1,000 times. Exceeding this value can cause irreversible damage to the internal components, as it applies a high bending strength on the gears teeth and strong efforts on the shafts and needle bearings.

SELECTION METHODOLOGY

Dimensioning a gearbox is easy, just follow the steps!

1. Find the appropriate dimensioning option for your application (next page)
2. Refer to the synthetic torque table on page 125 and 126 to find suitable products. Up to 4 products will possibly correspond to your application's rated torque.
3. Refer to the product pages. You will find all dimensions, permitted axial and radial forces, etc. allowing to choose the right line within ours.
4. Remember that our standard 12 months warranty is prolonged to 18 months if your product selection was approved or performed by one of our engineers (this service is free of charge).

YOUR 2 DIMENSIONING OPTIONS

There are 2 options to choose from, depending on how frequently your application accelerates. In case of a doubt, do not hesitate to contact us.

1

IF YOUR APPLICATION REQUIRES ACCELERATION TORQUE LESS THAN 10% OF THE WORKING TIME THEN NOMINAL TORQUE MORE THAN 90% OF TIME.

For instance: escalators need a high acceleration torque to reach their nominal speed, then the torque needed to keep moving is constant.

In such case, you can safely proceed to your product selection using the «nominal» and «acceleration» torques indicated in the product-lines “technical data” pages.

1. Select the appropriate reduction ratio: it should allow both the motor and the gearbox to rotate slower than their nominal speeds. Note that:

- a. Using ratio 10, 9, 8 or 7 or multiples will be more silent than using ratio 3, 4, 5 or 6 (as the fastest-rotating part will be the input pinion in high ratios, and the satellite gears in low ratios)
- b. A reduction ratio will divide motor speed by its exact number.

2. Use the synthetic rated torques table (or the tables displayed at each product line section) and find the right size and product lines that can deliver the requested torque.

> Notes

- Oversizing the gearbox will not necessarily prolong your application's lifetime, but it will cost you money, space, efficiency and inertia to rotate a larger gearbox. Just select the right match.
- Always take efficiency into consideration. The motor torque will be multiplied by the reduction ratio and efficiency. Efficiency is high when the torque is high too, as some internal friction does not depend on torque (lubricant circulation, seal or bearing friction etc.). When measured at nominal torque, average gearing efficiency is 95% to 98% for 1-stage gearboxes (ratios 3 to 10) and 92% to 95% for 2-stages gearboxes (ratios 10 to 100). Note that efficiency depends on ratio, requested torque, speed, temperature etc.

3. Select the right product-line, based on your requirements in terms of radial and axial efforts, acceleration, stiffness etc. You can find explanation on the differences between the product-lines in the tables displayed in the «in-line planetary gearboxes» or «right-angle planetary gearboxes» sections.

4. Always make sure that the gearbox acceleration torque capacity is higher than your motor's maximum torque!

2

IF YOUR APPLICATION ACCELERATES MORE THAN 10% OF TIME OR WORKS CONTINUOUSLY WITH SIGNIFICANT VARIATIONS OF TORQUE.

For instance: punching machines, when the notion of «continuous» torque is not relevant because it varies permanently.

In such case, you need to use an application factor.

1. Select the appropriate reduction ratio:

- It should allow both your motor and your gearbox to rotate slower than their nominal speed (refer to the products datasheets),
- Using ratio 10, 9, 8 or 7 will be more silent than using ratio 3, 4, 5 or 6 (as only the input pinion will turn fast in higher ratios).

2. Find your relevant application factor and multiply your average application torque by it. (Refer to the **application factors section**). Do not hesitate to contact us for any help or advice.

3. Use the synthetic rated torques table (or the tables at the end of the page of each product line) and find the right size and the size and product lines that can deliver the requested torque.


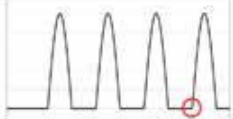
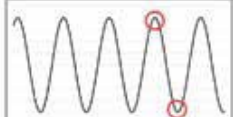
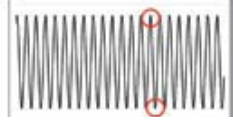
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4. Select the right product-line, based on your requirements in terms of radial and axial efforts, acceleration, stiffness etc. You can find explanation on the differences between the product-lines in the tables displayed in the **«in-line planetary gearboxes»** or **«right-angle planetary gearboxes»** sections.

5. Always make sure that the gearbox acceleration torque capacity exceeds your motor's maximum torque!

SELECT THE APPLICATION FACTOR MOST ADAPTED TO YOUR SYSTEM

Using the right application factor is key to guarantee that your gearbox will not lose precision nor break. As many applications do not work homogeneously, the ISO and DIN institutes defined application factors. We based our application factors on them. Once you have identified what application factor corresponds to your duty cycle, you need to multiply your «continuous torque» («X» in the diagrams below) by the application factor. The application factors below are indicative, as every application is different. Selecting them is empirical. You will find more explanation in norms ISO 6336, DIN 3990 and DIN 3991.

	<p>Ka = 1: continuous, stable operation with DC motor like mixers in liquid, uniformly-loaded conveyor, escalator, metal coiler etc. Never use Ka=1 with a servomotor.</p> <p>Ka = 1.1: continuous, stable operation with a servomotor (examples here-above)</p>	<p>LOW BACKLASH NEEDED</p>
	<p>Ka = 1.25: conveyors, extruder feeders with belts, meat grinders, cable reels, dough mixers etc</p> <p>Ka = 1.35: dryers etc.</p>	
	<p>1.5: radars, wire winding machines</p> <p>1.7: stone crushers, extruder screw, plastic mixers, fast pick&place robots for plasturgy, tool changers</p>	<p>VERY LOW BACKLASH NEEDED</p>
	<p>Ka = 1.8: punching machines, fast laser-welding machines</p> <p>Ka = 2.5: delta robots, compactors...</p> <p>Ka > 2.5: include cranes (2.5 to 3), piston engines etc.</p>	

Reminder : the data in the datasheets already include an application factor 1.25.

Note: the red circles represent reversals. Always make sure that your reversals are ramped-up or down, to avoid shocks on teeth inside the gearbox.

SHOCK FACTORS

For servomotor applications subject to shocks, DIN 3990 norm recommends multiplying your average torque by one of the following parameters:

- Moderate shocks: **Ka = 1.35**
- Medium shocks: **Ka = 1.60**
- Heavy shocks: **Ka = 1.85**

AMBIENT TEMPERATURE FACTORS

- T°<25°C: **Kt = 1.00** (unventilated) **or 0.9** (ventilated)
- T°<35°C: **Kt = 1.10** (unventilated) **or 1** (ventilated)
- T°<45°C: **Kt = 1.25** (unventilated) **or 1.15** (ventilated)

**In case of doubt, our engineers will be happy to verify your product selection.
Do not hesitate to ask us for a free estimation of your gearbox lifetime.**



ORDERING REFERENCES

MODEL SELECTION GUIDE

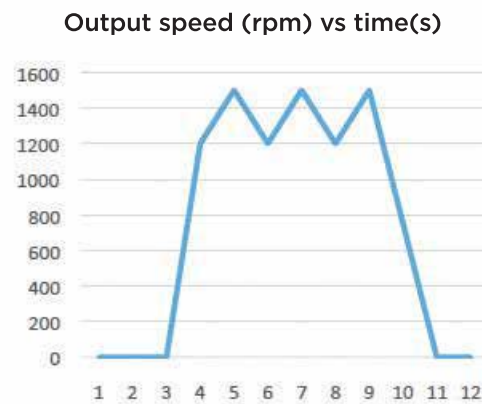
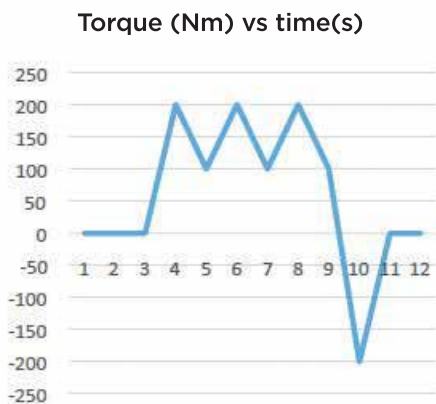
Code RECKON	Output Flange type	Right Angle	Size (mm)	Reduction ratio	Backlash (arcmin)	Lubricant	Output Shaft	Servomotor reference
WISER	SQ	ST	040	003 012	03SB	G1	K	FANUC YASKAWA SIEMENS ETC...
WISER	CI	RA	060	004 015	05SB	G2	S	
LIVELY	SQ		090	005 016	08SB	G3	C	
LIVELY	CI		120	006 021				
X-TREME	SQ		140	007 024				
BOOSTER	SQ		180	008 025	01RB			
ULTIMATE	CI		220	009 028	03RB			
			255	010 032				
			285	040				
				042				
				050				
				080				
				100				

Output Flange type	CI SQ	Circular Square
Right angle	ST RA	Straight Right angle
Backlash (arcmin)	SB RB	Standard Backlash Reduced Backlash
Lubricant	G1 G2 G3	Standard Grease Food Grease Low Temperature Grease
Output Shaft	K S C	Key Shaft Smooth Shaft Custom Shaft

Need assistance in your product selection ? Contact us!

To get an estimation of your selected gearbox's lifetime, please prepare the following information for us:

- We will need a “torque vs time” and a “speed vs time” curves like the ones below. They do not have to be very precise, a hand-made sketch can just be perfect for our engineers to estimate the application factor to use.



- Explaining where the gearbox goes is precious information. As well we will need to know:
 - the motor reference,
 - how many hours per day you are planning to use the gearbox, and how many cycles per hour,
 - what radial and axial forces are generated at the output,
 - what the ambient temperature is.

With such information we should be able to assist you in your product selection.



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