06
BEVEL GEARBOXES

“CHARACTER ROBOTS CAN CREATE ROBOTS WITH EMPATHY.”

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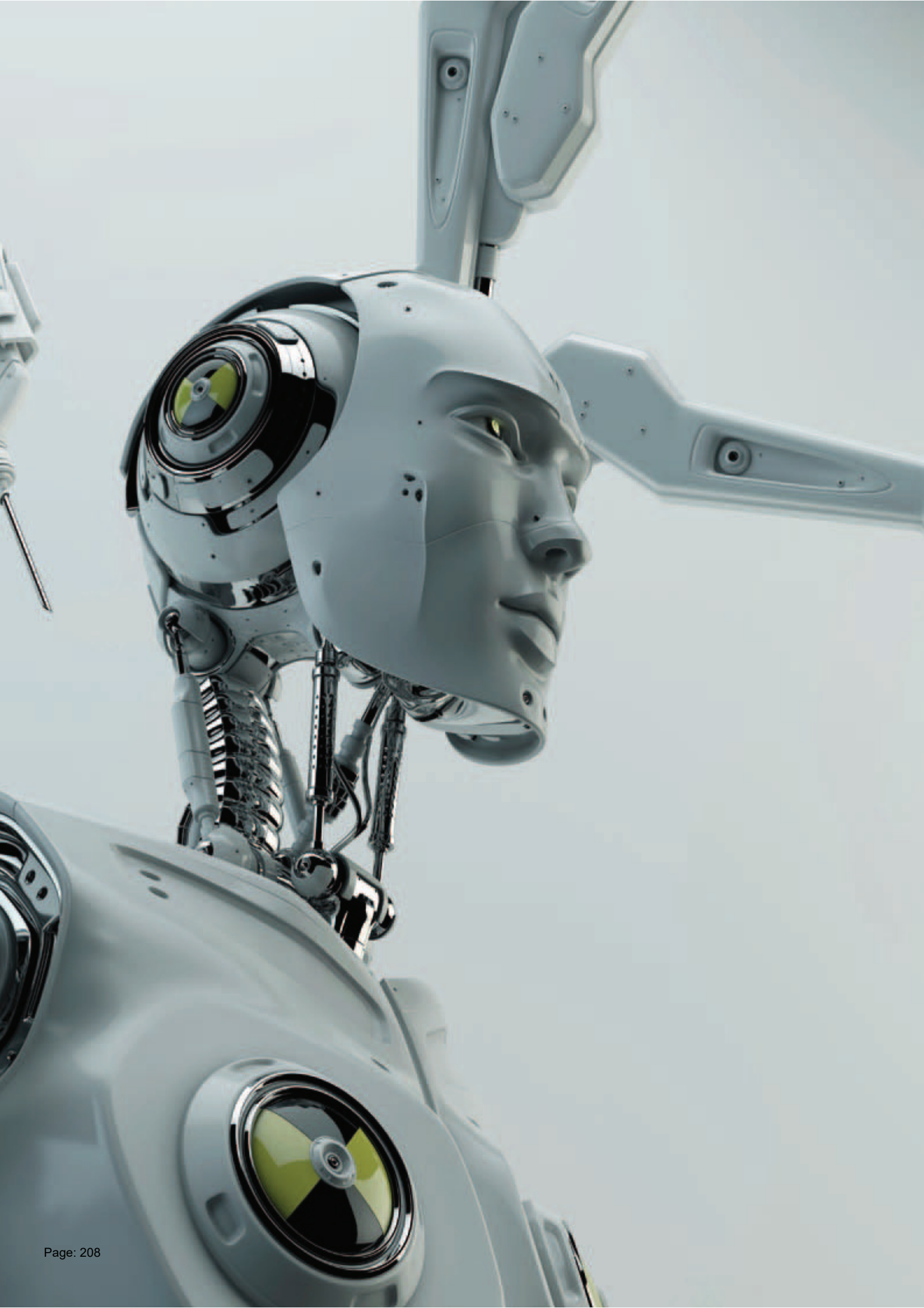


Bevel gearboxes

ACCESORIES

BEVEL GEARBOX BG

GENERAL INFORMATION

NIASA bevel gearboxes are encased in robust cast metal housings and have hardened bevel gears pairs with spiral toothing and amply dimensioned rolling bearings. Spiral bevel gears have the significant benefit of very favourable meshing characteristics (high contact ratio). They are therefore especially well suited for operation under high load factors and when the highest smoothness of running and a high degree of trans-mission precision are required.

The curved teeth are more resistant to distortion than are straight or helical teeth. A further benefit is their relative insensitivity to elastic distortion of wheels, shafts and bearings. The gearboxes are thus able to transmit extreme shock loads. A total of ten different standard versions are available, with further variations as multi-shaft gear-boxes. All gearboxes may be installed in any mounting position and may have mounting holes on all sides.

Transmission ratios

Transmission ratios of 1 - 1.5 - 2 - 3 - 4 - 5 and 6:1 are available as standard. All transmission ratios are mathematically precise. The gears can be used for gearing down and gearing up. Special transmission ratios are available. Please contact us for details.

Efficiency

NIASA bevel gearboxes are 94 - 98 % efficient, depending on rpm, mounting position, sealing and type of lubrication.

The efficiency level refers to the nominal power output from the transmission. In certain mounting positions, the bevel gears are completely immersed in the lubricant. In this case, churning loss in larger gearboxes and at high circumferential velocities of the wheels can be considerable and **NIASA** should be consulted.

In general, it should be noted that starting efficiency is always lower than operating efficiency. The resulting increased breakaway torque should be taken into consideration when determining the driving power required.

Low-backlash version

For standard bevel gearbox units have – depending on gear size and ratio – a backlash of 10 to 30 angular minutes. Neverthless all **NIASA bevel gearboxes** can be supplied in a low-backlash version.

When the drive shaft is locked, tooth backlash on the slowly-running shaft is measured on a 100 mm lever arm with a measuring force of 3% of the rated torque and then is given as a torsion angle.

The following values can be set with standard gear sets:

Design S1: i = 1:1 to 2:1 < 6 angular minutes
Design S2: i = 3:1 to 6:1 < 10 angular minutes

Tighter values can be obtained from specially selected gears (Design S0). Consult us for detailed information.

Mounting Side

To indicate clearly the positions of different gearbox features, the sides of the gearbox are numbered 1 to 6.

All six sides of the gearbox are machined and can be used as mounting surfaces. The flanges and neck flanges are fitted with threaded holes as standard equipment. The following ordering options are available:

Code
a: only in the flange surfaces
b: on all gearbox sides without flanges
c: on all gearbox sides with flange/neck flange

Preferred rotational direction

NIASA bevel gearboxes can normally be run in either rotational direction. The spiral direction of the gear set and the rotational direction used are key factors termining the forces evolved within the unit. In most instances permissible torque transmission can be maximized by using the gear pairing such that the driving gear rotates in the same direction as the spiralling. This arrangement creates a more favourable contact point which reduces gear distortion. This also reduces noise from the gear pairing by 1-2 that the axial forces caused by the spiral meshing push the gears apart. In The pinion gear always has a left-handed spiral; accordingly, the large gear has a right-handed spiral.

Shaft seals

NIASA bevel gearboxes are supplied with oil-tight shaft seals as standard equipment. Shaft seals with dust lips (Model AS) can be included on the input and output shafts as an option on request to protect against water and dust.

If extreme operating environments or high gearbox temperatures are expected, bevel gears can be supplied with optional FKM shaft seals (from VITON). Special seals are available for extremely corrosive operating environments. In such cases, please consult us and provide detailed information on the application in question.

Corrosion-resistant bevel gearboxes

NIASA corrosion-resistant bevel gearboxes are outstanding for applications in which drive units are exposed to corrosive substances. Nickel- plated housing components and stainless-steel shafts are provided in these versions as standard equipment. The shaft seals are selected in accordance with the individual application at hand.

NIASA bevel gearboxes are also available in full stainless steel versions if required for extreme applications. Please enquire for further information.

Anti-Corrosion Surface Protection

NIASA bevel gears are supplied with a primer coat only as standard equipment. Surface-protected versions are available as options for special operating environments:

i: normal environmental conditions
relative humid. less than 60 % (std equipment)
ii: low corrosive emission levels in environment
relative humidity less than 90 %
iii: medium corrosive emission levels in environment
relative humidity less than 100 %
iv: corrosivity category > C3
as defined in DIN ISO 12944-2

Environ-ment	Coating thickness (µm)	Coating thickness
i	10 - 40	1 ∃ primer (2-component wash primer / priming by zinc phosphating)
ii	40 - 60	1 ∃ spray primer (1 x 2-component covering lacquer)
iii	60 - 90	2 ∃ spray primer (1 x 2-component covering lacquer)
iv	> 100	suited for your individual (application, please enquire)

Lubrication

NIASA bevel gearboxes are supplied oil-filled and are maintenance-free under normal operating conditions. With extreme requirements or increased demands on durability we recommend to change the oil after approx. 15,000 hours of operation.

The peripheral speed of the bevel gearboxes, the power that is to be transferred, and the operating conditions are crucial for the choice of the lubricant. Consult us for further information. Modern synthetic high-tech lubricants are available for choice. For transmission application in the Pharma or Foodstuffs industry, proven lubricants with NSF release (USDA-H1) can be selected.

NIASA bevel gearboxes are lubricated for a lifetime. The amount of lubricant has been internally determined for each assembly position. Naturally, biological-degradable oils or lubricants for extreme operating conditions can be supplied. For this purpose please contact us.

Also under normal operating conditions the transmission temperature can rise to over 50 °C because of the small convection surface. If the transmission exceeds this temperature during use the included aeration filter must be fitted in order to avoid overpressure in the transmission and thus a leakage. Sufficient fresh air supply must be ensured.

If the unit is intended for use under extreme ambient conditions (dust, moisture, etc.) please consult us. With intermittent operation or other operating conditions in which a rise in temperature of the transmission to over 50 °C is not expected, the aeration hole is not required.

For certain lubrication types, the gearbox is supplied with a vent filter. Let us know your application and will determine the best lubricant and eventual filter and its location.

Long-term storage version

NIASA bevel gearboxes can be supplied in an optional version suitable for long-term storage. In this version, they receive a special preservative treatment and are supplied in airtight packaging which must not be opened until the unit is to be used. Consult us for more information.

ACCESORIES

BEVEL GEARBOX BG

SELECTION CRITERIA

The permissible nominal input power ratings P1N and the nominal output torques T2N given in the tables are valid only for shock-free operation, ten hours operation per day and ten start-ups per hour, with an input power of 2.5 times the rated power being permitted during start-up. The thermal nominal power ratings P1Nt and output torque ratings T2Nt apply for an ambient temperature of 20 °C and 100% operating time. The maximum output torques T2max may be reached frequently for brief loading peaks, but may not be exceeded.

The required input power or output torque must be calculated on the basis of the operating factors for the determination of the gearbox size.

Mechanical	Thermal
P1m = P1xf1xf2xf3	**P1t = P1xf3xf4xf5**
T2m = T2xf1xf2xf3	**T2t = T2xf3xf4xf5**

The formulae take account of the mechanical and thermal effects. The following conditions apply for selection of gearbox size:

P1m<P1N P1t<P1Nt ; T2m<T2N T2t<T2N

The values given in the specification tables apply for lubrication by synthetic oils, based on an oil temperature of 95 °C. Determination of the thermal limit is not necessary if special measures are used (eg. an oil cooler) to ensure that the permissible oil temperature is never exceeded.

The permissible torques may be exceeded in special cases, eg. very short running times or static loading only. Please consult us for detailed information.

Exploitation of the maximum output torques T2max may make a press fit on the output shaft necessary, as the normal feather key connection is not always adequate.

The efficiency data given in the specification tables relate to the permissible rated loading of the transmissions and are guide values for fully run-in gearboxes running at operational temperature with standard seals.

Please refer to us for further details such as additional loads, start-up and operating efficiencies, low backlash or increased friction from special seals.

NIASA bevel gearboxes are designed for a service life of 12,000 operating hours when using the appropriate factors in selection. The prerequisite for this service life is correct installation and commissioning and proper servicing in accordance with the operating instructions for our bevel gears.

Operational factor f1

Driving motor	Load group	Operating hours / day			
		< 0,5	3	10	24
Electro motor	a	0,8	0,9	1	1,25
Hydraulic motor	b	0,9	1	1,25	1,5
Turbine	c	1	1,25	1,5	1,75

a: Low loading/shock-free
Filling machines, elevators, light screw conveyors, light conveyor belts, blowers, small agitators, control machines, assembly lines, auxiliary drives for machine tools, centrifuges, packaging machinery.

b: Medium loading/light shocks
Reel winders, agitators, plate conveyors, calenders, lifts, mixers, balancing machines, heavy-duty conveyor belts, sheet metal bending machines, road-building machinery, planing machines, shears, extruders, main drives for machine tools, kneading machines, weaving looms, light table rollers.

c: Heavy load/heavy shocks
Excavators, heavy-duty mixers, presses, muller mixers, rolling mills, heavy-duty table rollers, cold reduction mills, stone crushers, eccentric presses, cutter heads, folding machines, rubber belt conveyors (batch loads), bark peeling drums, run ning gears, punching presses, piston pumps, rotary furnaces, mills, plate filters.

Start-up factor f2

A prerequisite for application of the start-up factor is that the start-up torque (or braking torque) of the driving machine does not exceed 2.5 times the rated torque of the transmission:
T1A < 2,5 x T1N = 9550 x P1N / n1

Start-ups / h	up to 10	10-60	60-500	500-1500
f2	1	1,1	1,2	1,3

Lubrication factor f3

The lubrication factor must be taken into consideration when mineral oil is used since the efficiency, service life and permissible oil temperature depend to a great extent on the quality of the oil used.

	Sinthetic oil	Mineral oil
f3	1	1,1

Temperature factor f4

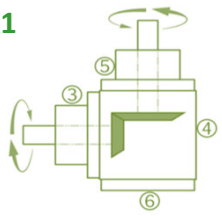
Ambient temp. °C	10	20	30	40	50
f4	0,9	1	1,15	1,4	1,7

Operating time per hour factor f5

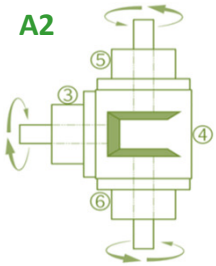
ED in %	100	80	60	40	20
f5	1	0,95	0,86	0,75	0,56

MODELS AND ROTATIONAL DIRECTIONS

A1

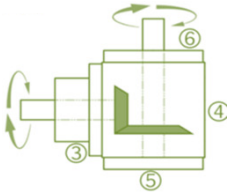


A2

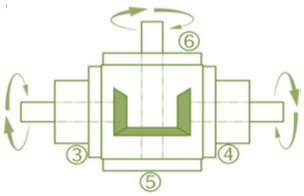


They have shafts with single bearings. The input and output sides are symmetrical at transmission ratios between 1:1 and 2:1.

B1

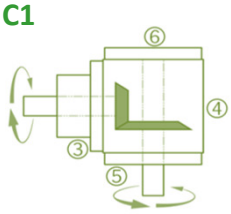


B2



The output shaft has bearings on both sides and extends out away from the side where its bevel gearbox is located. In this design the shafts have the same direction of rotation.

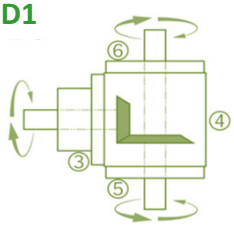
C1



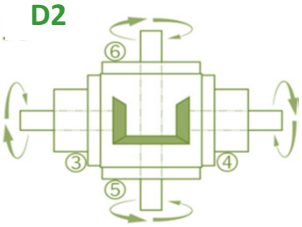
C2

The output shaft has bearings on both sides and extends out to the side where its bevel gearbox is located. In this design the shafts have opposing directions of rotation.

D1

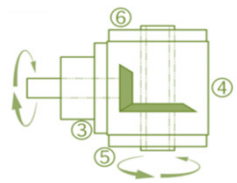


D2

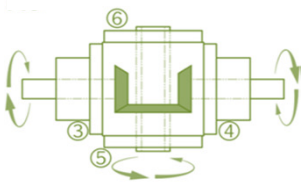


They have a straight-through output shaft. If units are intended for arrangement in series, they can be supplied with reinforced straight-through shafts and bearings.

E1



E2



They have a straight-through hollow shaft. The following options are available:
- without keyway, - with spline profile, - with polygonal profile.

ACCESORIES

BEVEL GEARBOX BG

SIZE SELECTION

i	n1 (rpm)	n2 (rpm)		BEVEL GEARBOX SIZE								
				BG-065	BG-090	BG-120	BG-140	BG-160	BG-200	BG-230	BG-260	BG-350
1:1 - 6:1			P1Nt	1,60	3,80	6,20	10,00	15,00	26,00	34,00	42,00	90,00
1:1	3000	3000	P1N	3,31	8,93	21,82	39,68					
			T2N	10,00	27,00	66,00	120,00					
	2400	2400	P1N	2,65	7,41	18,52	37,03	57,67				
			T2N	10,00	28,00	70,00	140,00	218,00				
	1500	1500	P1N	1,82	5,29	13,56	26,78	42,99	74,40	87,63	157,07	267,84
			T2N	11,00	32,00	82,00	162,00	260,00	450,00	530,00	950,00	1620,00
	1000	1000	P1N	1,32	3,75	10,14	20,28	31,96	56,21	71,65	115,73	210,53
			T2N	12,00	34,00	92,00	184,00	290,00	510,00	650,00	1050,00	1910,00
	750	750	P1N	1,07	3,06	8,51	16,20	25,63	45,88	60,76	96,72	195,92
			T2N	13,00	37,00	103,00	196,00	310,00	555,00	735,00	1170,00	2370,00
	500	500	P1N	0,83	2,20	6,34	11,46	18,19	34,17	45,19	72,75	155,41
			T2N	15,00	40,00	115,00	208,00	330,00	620,00	820,00	1320,00	2820,00
	250	250	P1N	0,47	1,21	3,39	5,92	9,64	19,56	26,73	42,44	94,52
			T2N	17,00	44,00	123,00	215,00	350,00	710,00	970,00	1540,00	3440,00
	50	50	P1N	0,10	0,28	0,72	1,21	2,09	4,13	7,00	9,64	24,47
			T2N	18,00	50,00	130,00	220,00	380,00	750,00	1270,00	1750,00	4440,00
			T2max	**25,00**	**105,00**	**220,00**	**430,00**	**660,00**	**1090,00**	**1500,00**	**2310,00**	**5400,00**
1,5:1	3000	2000	P1N	2,20	5,51	13,45	24,91	40,78	72,75	99,20	189,58	
			T2N	10,00	25,00	61,00	113,00	185,00	330,00	450,00	860,00	
	2400	1600	P1N	1,76	4,59	11,46	22,22	36,15	63,49	91,35	158,72	
			T2N	10,00	26,00	65,00	126,00	205,00	360,00	518,00	900,00	
	1500	1000	P1N	1,21	3,20	8,60	17,08	27,78	48,17	72,20	104,71	206,19
			T2N	11,00	29,00	78,00	155,00	252,00	437,00	655,00	950,00	1870,00
	1000	666,7	P1N	0,88	2,35	6,32	12,87	20,59	37,13	56,21	77,19	188,55
			T2N	12,00	32,00	86,00	175,00	280,00	505,00	765,00	1050,00	2560,00
	750	500	P1N	0,72	1,93	5,18	10,47	16,26	30,31	45,47	64,48	141,42
			T2N	13,00	35,00	94,00	190,00	295,00	550,00	825,00	1170,00	2560,00
	500	333,3	P1N	0,55	1,36	3,85	7,34	11,56	22,57	33,79	47,72	112,63
			T2N	15,00	37,00	105,00	200,00	315,00	615,00	920,00	1300,00	3070,00
	250	166,7	P1N	0,31	0,74	1,99	3,76	6,07	12,70	20,57	27,43	67,11
			T2N	17,00	40,00	108,00	204,00	330,00	690,00	1120,00	1490,00	3650,00
	50	33,3	P1N	0,07	0,16	0,41	0,76	1,29	2,73	4,89	6,18	16,34
			T2N	18,00	45,00	113,00	210,00	355,00	750,00	1330,00	1700,00	4500,00
			T2max	**25,00**	**80,00**	**169,00**	**358,00**	**650,00**	**980,00**	**1400,00**	**2100,00**	**5200,00**
2:1	3000	1500	P1N	1,65	3,80	9,26	16,53	28,11	51,25	87,63	133,92	
			T2N	10,00	23,00	56,00	100,00	170,00	310,00	530,00	810,00	
	2400	1200	P1N	1,32	3,17	8,07	14,68	25,53	45,24	80,02	112,43	
			T2N	10,00	24,00	61,00	111,00	193,00	342,00	605,00	850,00	
	1500	750	P1N	0,91	2,23	6,03	11,41	20,25	35,13	59,11	78,53	200,06
			T2N	11,00	27,00	73,00	138,00	245,00	425,00	715,00	950,00	2420,00
	1000	500	P1N	0,66	1,71	4,46	8,38	14,88	27,56	45,19	57,87	155,41
			T2N	12,00	31,00	81,00	152,00	270,00	500,00	820,00	1050,00	2820,00
	750	375	P1N	0,54	1,32	3,55	6,86	11,57	22,32	36,79	48,36	129,37
			T2N	13,00	32,00	86,00	166,00	280,00	540,00	890,00	1170,00	3130,00
	500	250	P1N	0,41	0,94	2,54	4,96	8,27	16,81	26,73	35,27	94,52
			T2N	15,00	34,00	92,00	180,00	300,00	610,00	970,00	1280,00	3430,00
	250	125	P1N	0,23	0,50	1,35	2,62	4,41	9,37	16,88	20,12	54,15
			T2N	17,00	36,00	98,00	190,00	320,00	680,00	1225,00	1460,00	3930,00
	50	25	P1N	0,05	0,10	0,29	0,55	0,98	2,07	3,66	4,55	12,79
			T2N	18,00	37,00	107,00	200,00	355,00	750,00	1330,00	1650,00	4640,00
			T2max	**25,00**	**80,00**	**169,00**	**320,00**	**650,00**	**980,00**	**1400,00**	**2100,00**	**5000,00**
3:1	3000	1000	P1N	1,10	2,54	6,39	12,12	20,94	46,29	44,09	85,97	
			T2N	10,00	23,00	58,00	110,00	190,00	420,00	400,00	780,00	
	2400	800	P1N	0,88	2,12	5,56	11,46	17,81	39,24	39,68	72,39	160,48
			T2N	10,00	24,00	63,00	130,00	202,00	445,00	450,00	821,00	1820,00
	1500	500	P1N	0,61	1,49	4,08	8,05	12,68	28,38	29,76	49,60	122,35
			T2N	11,00	27,00	74,00	146,00	230,00	515,00	540,00	900,00	2220,00
	1000	333,3	P1N	0,44	1,14	3,01	5,87	8,99	20,37	23,33	36,34	96,26
			T2N	12,00	31,00	82,00	160,00	245,00	555,00	635,00	990,00	2620,00
	750	250	P1N	0,33	0,88	2,40	4,60	6,89	15,98	19,29	28,93	81,29
			T2N	12,00	32,00	87,00	167,00	250,00	580,00	700,00	1050,00	2950,00
	500	166,7	P1N	0,24	0,63	1,66	3,20	4,79	11,04	14,07	20,43	59,34
			T2N	13,00	34,00	90,00	174,00	260,00	600,00	765,00	1110,00	3230,00
	250	83,3	P1N	0,12	0,33	0,87	1,62	2,56	5,76	7,58	11,16	34,26
			T2N	13,00	36,00	95,00	177,00	280,00	630,00	825,00	1220,00	3730,00
	50	16,7	P1N	0,03	0,07	0,21	0,34	0,57	1,29	1,63	2,55	7,79
			T2N	14,00	37,00	110,00	180,00	305,00	690,00	870,00	1360,00	4240,00
			T2max	**23,00**	**70,00**	**155,00**	**280,00**	**457,00**	**910,00**	**1300,00**	**1940,00**	**4500,00**

i	n1 (rpm)	n2 (rpm)		BEVEL GEARBOX SIZE								
				BG-065	BG-090	BG-120	BG-140	BG-160	BG-200	BG-230	BG-260	BG-350
1:1 - 6:1			P1Nt	1,60	3,80	6,20	10,00	15,00	26,00	34,00	42,00	90,00
4:1	3000	750	P1N		1,90	4,96	8,51	14,88	28,93	36,37	57,87	
			T2N		23,00	60,00	103,00	180,00	350,00	440,00	700,00	
	2400	600	P1N		1,65	4,43	7,34	13,23	26,45	32,74	51,58	113,75
			T2N		25,00	67,00	111,00	200,00	400,00	495,00	780,00	1720,00
	1500	375	P1N		1,12	3,06	4,96	9,09	18,81	24,80	37,20	78,95
			T2N		27,00	74,00	120,00	220,00	455,00	600,00	900,00	1910,00
	1000	250	P1N		0,85	2,18	3,75	6,61	13,36	18,60	28,93	58,14
			T2N		31,00	79,00	136,00	240,00	485,00	675,00	1050,00	2110,00
	750	187,5	P1N		0,66	1,69	3,06	5,17	10,54	15,19	22,73	47,95
			T2N		32,00	82,00	148,00	250,00	510,00	735,00	1100,00	2320,00
	500	125	P1N		0,47	1,16	2,12	3,58	7,23	10,95	16,26	34,72
			T2N		34,00	84,00	154,00	260,00	525,00	795,00	1180,00	2520,00
	250	62,5	P1N		0,25	0,60	1,12	1,86	3,79	5,99	8,61	19,43
			T2N		36,00	87,00	162,00	270,00	550,00	870,00	1250,00	2820,00
	50	12,5	P1N		0,05	0,12	0,23	0,39	0,80	1,35	1,82	4,17
			T2N		37,00	90,00	170,00	280,00	580,00	980,00	1320,00	3030,00
			T2max		**70,00**	**155,00**	**280,00**	**422,00**	**860,00**	**1300,00**	**1940,00**	**3500,00**
5:1	3000	600	P1N		1,52	3,97	6,61	11,90	19,84	33,73	46,29	
			T2N		23,00	60,00	100,00	180,00	300,00	510,00	700,00	
	2400	480	P1N		1,32	3,44	5,56	10,48	17,99	29,10	40,21	78,83
			T2N		25,00	65,00	105,00	198,00	340,00	550,00	760,00	1490,00
	1500	300	P1N		0,89	2,38	3,80	7,11	12,57	21,00	29,10	56,54
			T2N		27,00	72,00	115,00	215,00	380,00	635,00	880,00	1710,00
	1000	200	P1N		0,68	1,76	2,73	4,96	9,26	15,76	21,82	42,33
			T2N		31,00	80,00	124,00	225,00	420,00	715,00	990,00	1920,00
	750	150	P1N		0,53	1,42	2,15	3,97	7,27	12,73	18,19	35,88
			T2N		32,00	86,00	130,00	240,00	440,00	770,00	1100,00	2170,00
	500	100	P1N		0,37	0,98	1,50	2,76	5,18	9,15	13,23	26,67
			T2N		34,00	89,00	136,00	250,00	470,00	830,00	1200,00	2420,00
	250	50	P1N		0,20	0,51	0,79	1,49	2,78	5,07	7,11	16,09
			T2N		36,00	92,00	143,00	270,00	505,00	920,00	1290,00	2920,00
	50	10	P1N		0,04	0,10	0,17	0,32	0,58	1,09	1,47	3,56
			T2N		37,00	95,00	150,00	290,00	525,00	990,00	1330,00	3230,00
			T2max		**60,00**	**140,00**	**250,00**	**420,00**	**860,00**	**1200,00**	**1910,00**	**3500,00**
6:1	3000	500	P1N		1,25	2,95	5,18	7,09	11,45	20,17	27,27	
			T2N		23,00	54,00	94,00	129,00	208,00	366,00	495,00	
	2400	400	P1N		1,09	2,53	4,58	5,98	9,60	18,08	23,12	56,88
			T2N		25,00	57,00	104,00	136,00	218,00	410,00	524,00	1290,00
	1500	250	P1N		0,74	1,75	2,95	3,95	6,54	13,50	16,36	41,61
			T2N		27,00	64,00	107,00	143,00	237,00	490,00	594,00	1510,00
	1000	166,7	P1N		0,53	1,22	2,06	3,01	4,74	9,92	12,93	31,41
			T2N		29,00	66,00	112,00	164,00	258,00	540,00	702,00	1710,00
	750	125	P1N		0,40	0,94	1,61	2,43	3,98	7,78	10,91	24,25
			T2N		29,00	68,00	117,00	176,00	289,00	565,00	792,00	1760,00
	500	83,3	P1N		0,27	0,63	1,09	1,72	2,79	5,42	8,06	16,72
			T2N		29,00	69,00	119,00	187,00	304,00	590,00	878,00	1820,00
	250	41,7	P1N		0,14	0,33	0,56	0,92	1,44	2,82	4,35	9,28
			T2N		30,00	71,00	121,00	199,00	311,00	610,00	940,00	2020,00
	50	8,3	P1N		0,03	0,06	0,11	0,18	0,28	0,57	0,87	1,95
			T2N		33,00	66,00	120,00	197,00	306,00	625,00	951,00	2120,00
			T2max		**50,00**	**120,00**	**200,00**	**350,00**	**625,00**	**1000,00**	**1730,00**	**2300,00**

TERMS

i	Transmission ratio
n1	Speed of faster-running shaft (rpm)
n2	Speed of slower-running shaft (rpm)
P1N	Permissible rated input power, mechanical (kW)
P1Nt	Permissible rated input power, thermal (kW)
T2N	Permissible rated output torque, mechanical (Nm)
T2max	Maximum permissible output torque (Nm)

ACCESORIES

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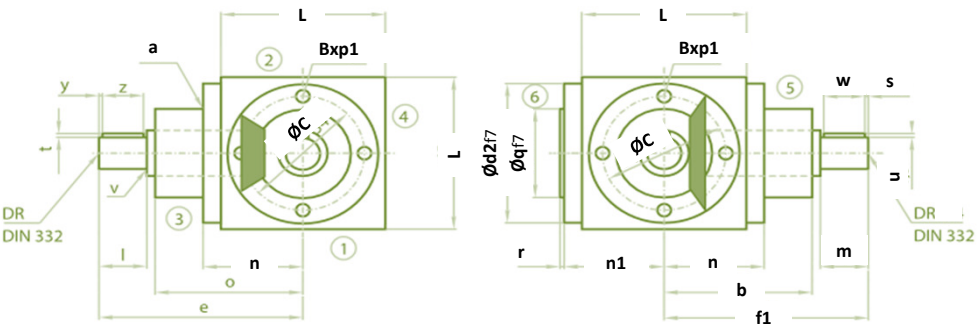
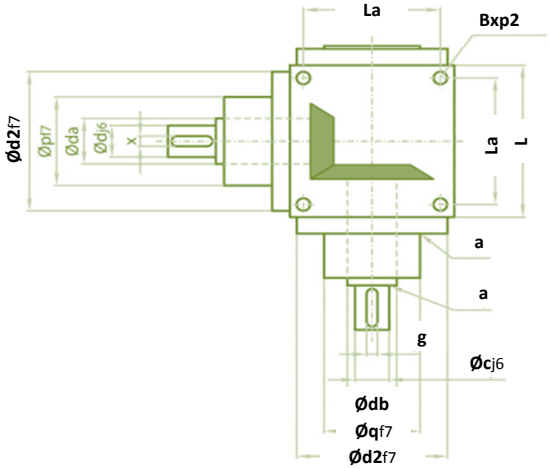
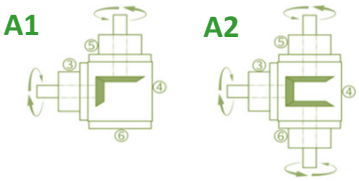
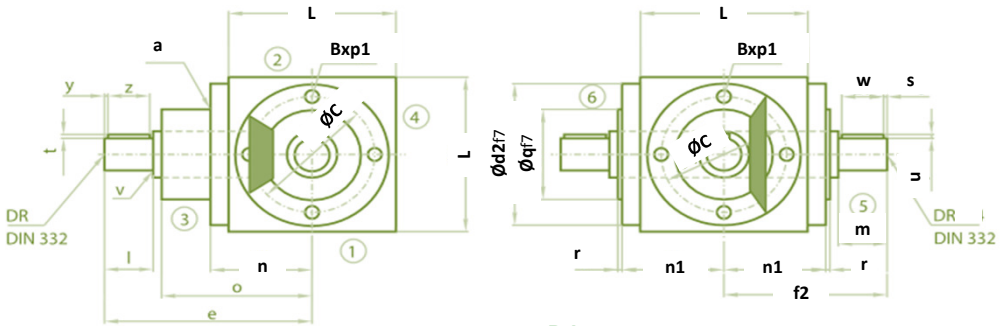
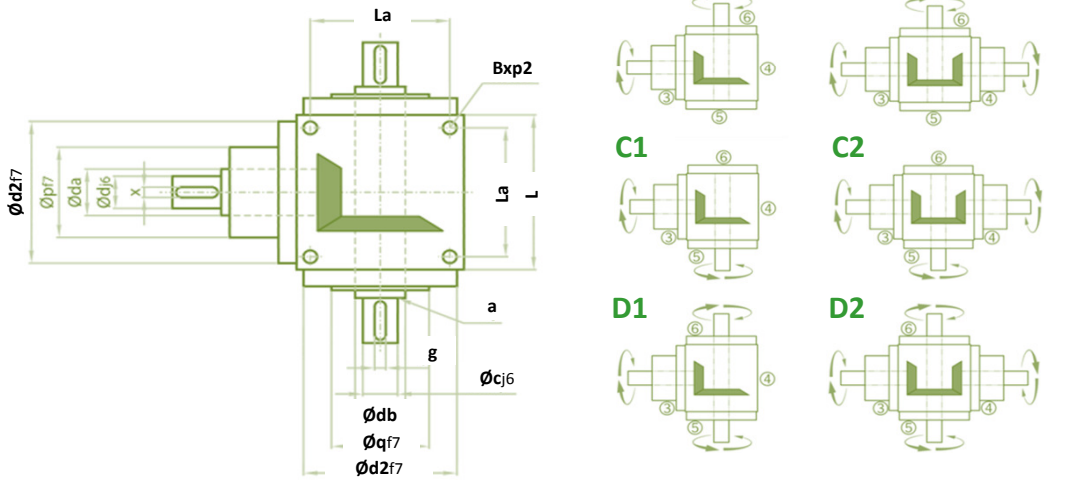
DIMENSIONS: BG-065 / BG-090 / BG-120 / BG-140

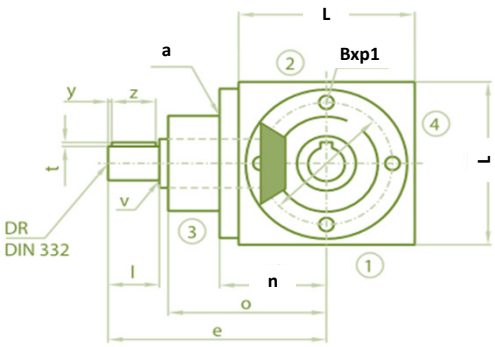


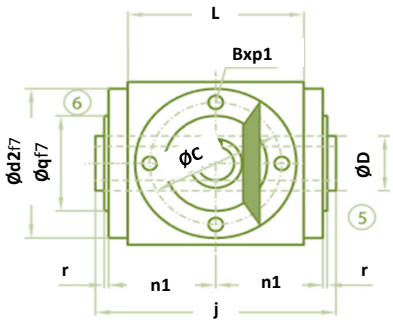


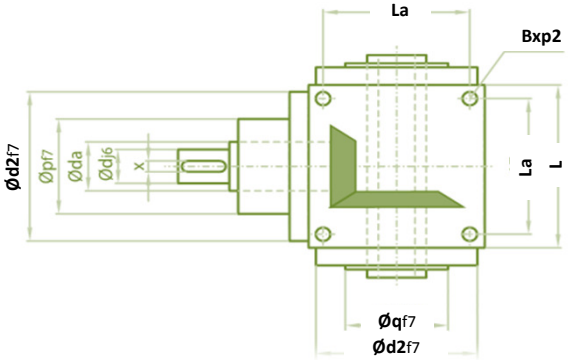




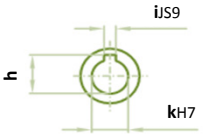




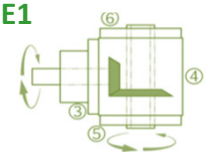




Standard



E1



E2

Size >	BG-065		BG-090				BG-120				BG-140			
Ratio >>>	i=1:1-i=2:1	i=3:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1
a	0,5		1				1				1,5			
b	72		85				115				128			
B	M6		M8				M10				M10			
c	12		18				25				32			
C	54		75											
d	12	12	18	12	12	12	25	20	20	15	32	28	24	24
D	20		30				40				50			
d2	64		89				119				135			
da	17	17	25	20	20	20	30	25	25	20	40	40	40	40
db	17		30				30				40			
DR	M4	M4	M6	M4	M4	M4	M10	M6	M6	M5	M12	M10	M8	M8
e	100	100	122	122	132	132	162	162	172	162	180	180	195	195
f1	100		122				162				180			
f2	72		95				122				137			
g	4		6				8				10			
h	13,8		20,8				28,3				35,3			
i	4		6				8				10			
j	92		124				160				180			
k	12		18				25				32			
l	26		35				45				50			
L	65		90				120				140			
La	45		70				100				110			
m	26		35				45				50			
n	42		55				75				85			
n1	42		55				72				82			
o	72	72	85	85	95	95	115	115	125	125	128	128	143	143
p	44	44	60	60	60	60	80	80	80	70	90	90	85	85
p1	9,5		10				12				12			
p2	12		14				16				20			
q	44		60				80				90			
r	2		2				3				3			
s	3		3				4				3			
t	1,5	1,5	2,5	1,5	1,5	1,5	3	2,5	2,5	2	3	3	3	3
u	1,5		2,5				3				3			
v	0,5	0,5	1	0,5	0,5	0,5	1	1	1	0,5	1,5	1	1	1
w	20		28				36				45			
x	4	4	6	4	4	4	8	6	6	5	10	8	8	8
y	3	3	3	3	3	3	4	4	4	4	3	3	3	3
z	20	20	28	28	28	28	36	36	36	28	45	45	45	45

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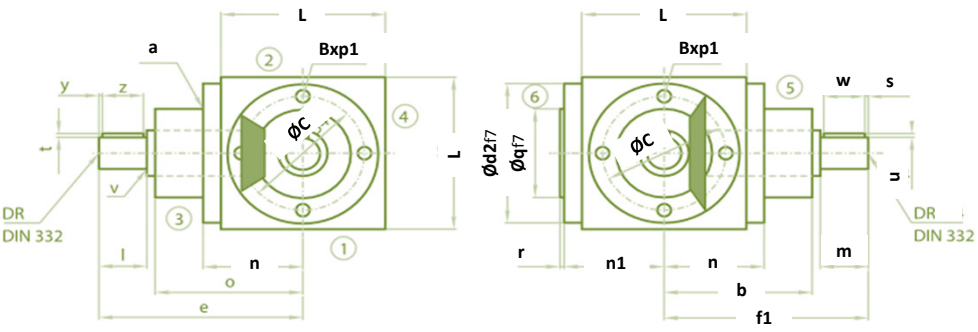
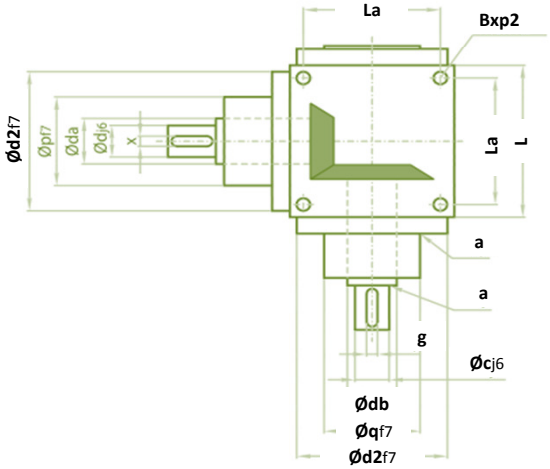
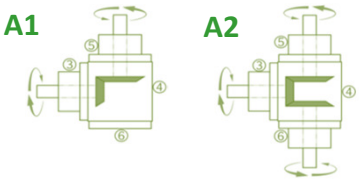
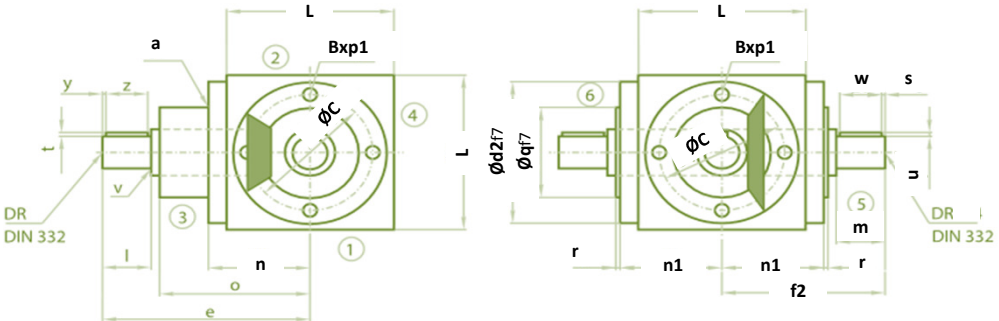
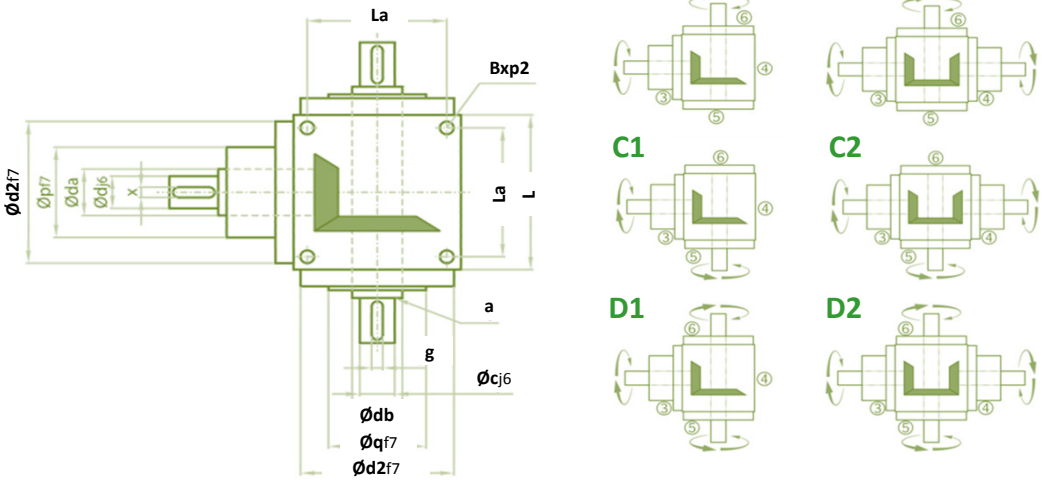
DIMENSIONS: BG-160 / BG-200 / BG-230

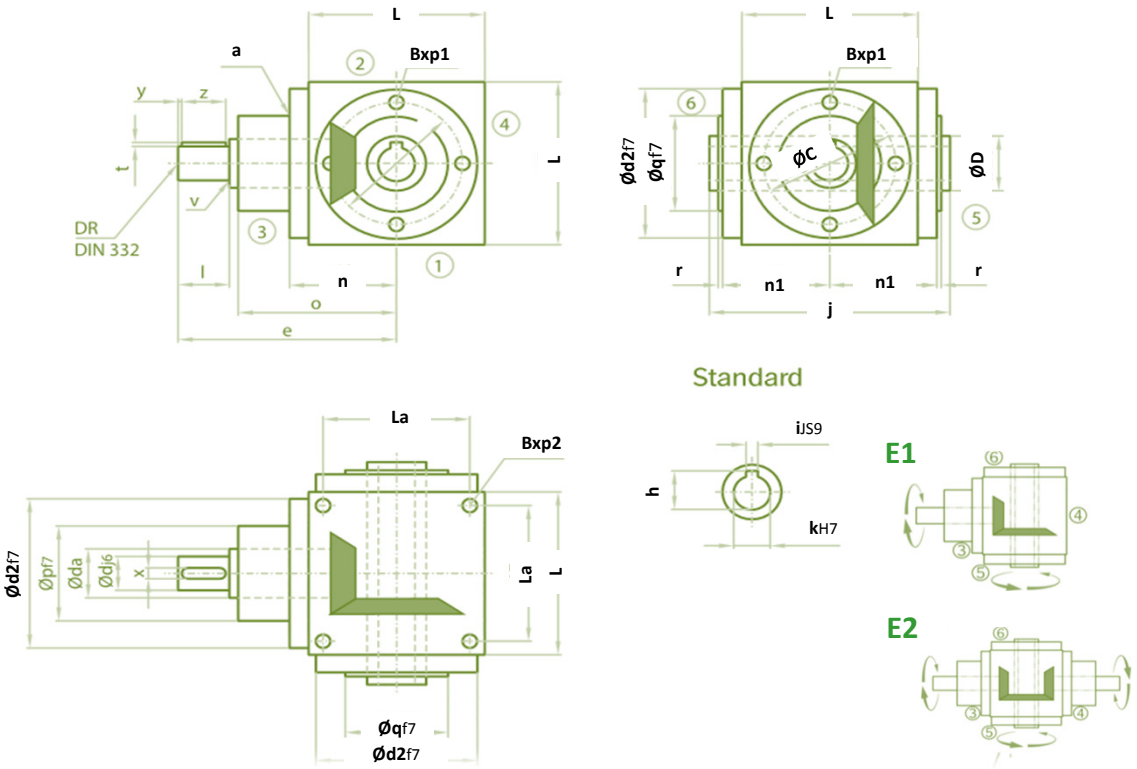












Size >	BG-160				BG-200				BG-230			
Ratio >>>	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1
a	2				3				5			
b	150				190				213			
B	M12				M12				M16			
c	35				42				55			
C	135				175				200			
d	35	28	24	24	42	35	35	28	55	40	40	35
D	55				70				80			
d2	159				199				225			
da	40	40	40	25	55	40	40	30	60	50	50	45
db	40				55				60			
DR	M12	M10	M8	M8	M16	M12	M12	M10	M20	M16	M16	M16
e	212	212	232	232	273	261	261	261	305	310	310	300
f1	212				273				305			
f2	160				203				230			
g	10				12				16			
h	38,3				45,3				59,3			
i	10				12				16			
j	206				250				285			
k	35				42				55			
l	60	60	60	60	80	68	68	68	90	80	80	70
L	160				200				230			
La	120				160				180			
m	60				80				90			
n	95				120				135			
n1	95				117				132			
o	150	150	170	170	190	190	190	190	213	228	228	228
p	110	100	100	100	120	120	120	110	150	140	140	140
p1	15				20				20			
p2	24				24				20			
q	110				120				149			
r	3				3				4			
s	5				5				5			
t	3	3	3	3	3	3	3	3	2,5	3	3	3
u	3				3				4			
v	1,5	1	1	0,5	2	1	1		1	1	1	1
w	50				70				80			
x	10	8	8	8	12	10	10	8	16	12	12	10
y	5	5	5	5	5	3	3	3	5	5	0	3
z	50	50	50	50	70	63	63	63	80	70	70	63

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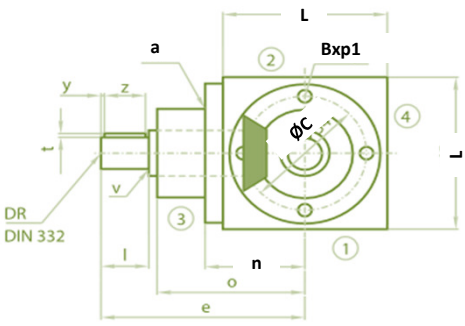
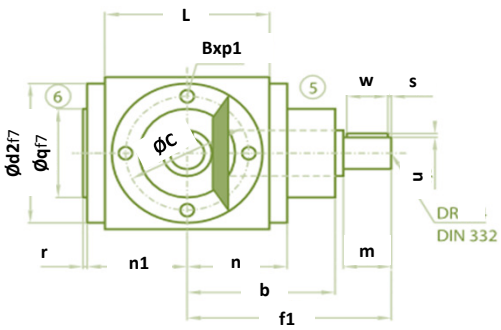
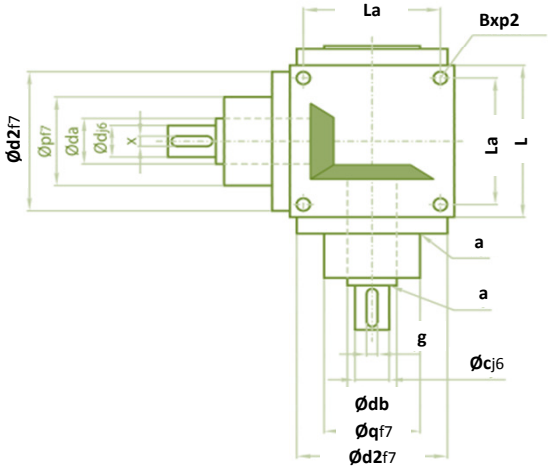
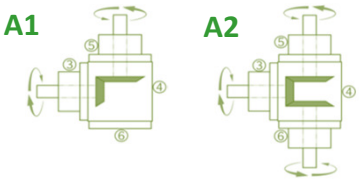
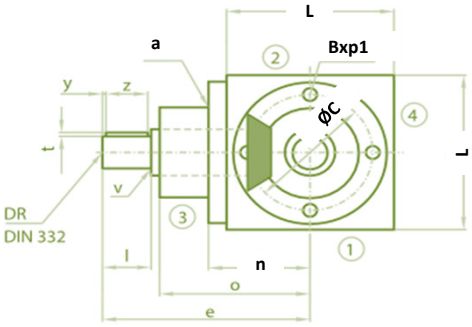
DIMENSIONS: BG-260 / BG-350

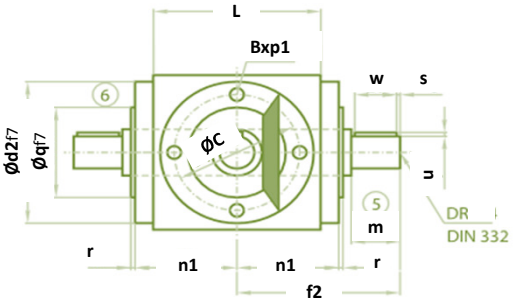


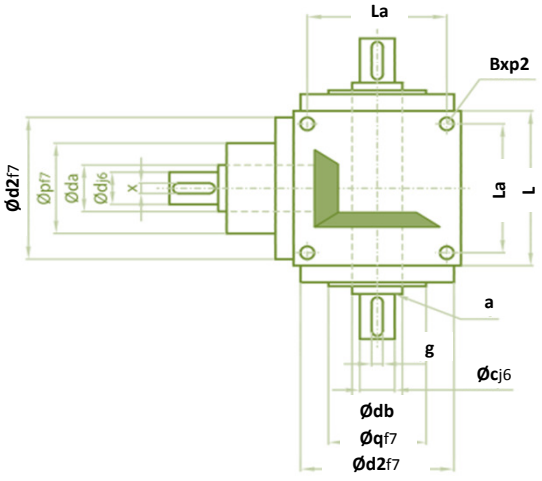


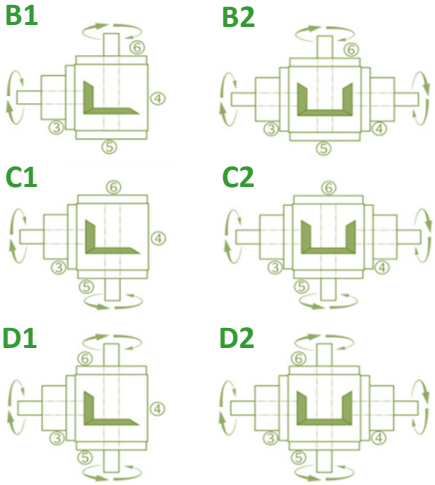


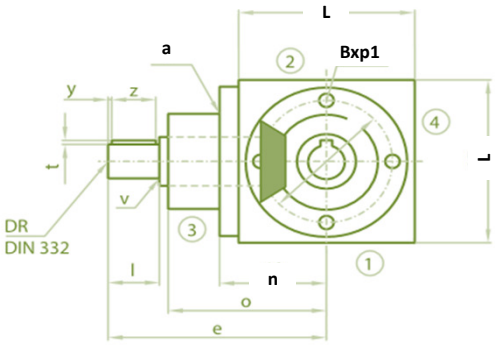


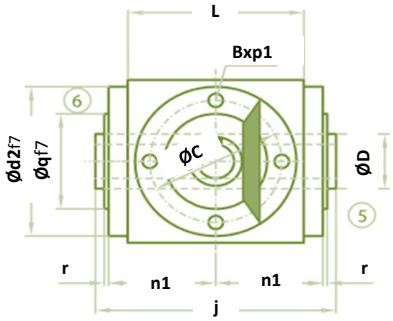


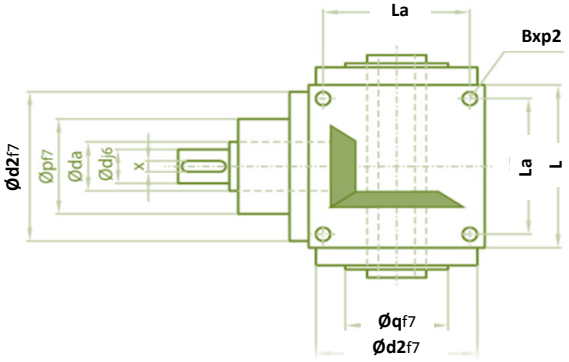




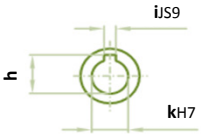




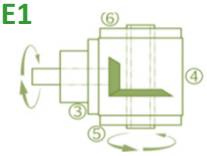




Standard



E1



E2

Size >	BG-260				BG-350			
Ratio >>>	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1	i=1:1-i=2:1	i=3:1	i=4:1	i=5:1 i=6:1
a	5							
b	265				395			
B	M160				M20			
c	60				80			
C	230				305			
d	60	45	45	45	80	65	65	55
D	80				105			
d2	255				345			
da	65	65	65	65	90	90	90	72
db	65				90			
DR	M20		M16		M20	M20	M20	M20
e	380	360	360	360	570	540	540	510
f1	380				570			
f2	268				410			
g	18				22			
h	64,4				85,4			
i	18				22			
j								
k	60				80			
l	110	90	90	90	170	140	140	110
L	260				350			
La	220				285			
m	110				170			
n	150				198			
n1	150				205			
o	265		265		395	395	395	395
p	160	160	160	160	250	250	250	250
p1	20				26			
p2	32				26			
q	160				250			
r	4				20			
s	5				5			
t	4	3,5	3,5	3,5	5	4	4	4
u	4				5			
v	1	1,5	1,5	1,5	1,5	1,5	1,5	1,5
w	100				160			
x	18	14	14	14	22	18	18	16
y	5	5	5	5	5	7,5	7,5	10
z	100	8	8	80	160	125	125	90

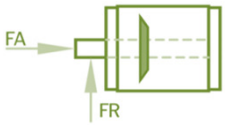
ACCESORIES

BEVEL GEARBOX BG

RADIAL FORCES (N)

The permissible radial loads given in the tables are valid centrally between the shaft ends for the speeds and torques listed. The more unfavourable direction of loading was assumed in calculating these values. Higher radial loads are permissible if the direction of stress application and of radial rotation are carefully calculated. Please, consult us on this.

Axial forces FA can be absorbed without further supplementary calculation up to a level of approx. 50 % of the permissible radial forces. If the axial forces exceed these values by a significant margin or if simultaneous FR and FA forces occur, please consult us.



Bevel gear box size	T2 (Nm)	n1 (rpm) 3000	1000	500	250	100	50	n2 (rpm) 3000	1000	500	250	100	50
BG-065	< 12	180	250	300	350	450	550	300	400	500	650	750	900
	> 12	150	210	250	290	380	460	250	330	420	540	630	750
BG-090	< 30	300	400	470	580	700	800	500	660	800	950	1250	1500
	> 30	250	330	390	490	590	670	420	550	670	790	1040	1250
BG-120	< 80	470	620	720	900	1150	1400	750	1000	1250	1500	1900	2200
	> 80	390	520	600	750	960	1170	630	830	1040	1250	1580	1830
BG-140	< 140	700	870	1150	1370	1700	2000	1300	1700	2000	2500	3000	3800
	> 140	590	730	960	1140	1420	1670	1083	1420	1670	2080	2500	3170
BG-160	< 220	1200	1600	1900	2200	2850	3300	2000	2800	3300	4000	5000	6500
	> 220	1000	1340	1590	1840	2380	2750	1670	2340	2750	3340	4170	5420
BG-200	< 500	2200	1700	3200	3900	5000	6200	3200	4300	5000	6500	8000	10000
	> 500	1840	1420	2670	3250	4170	5170	2670	3580	4170	5420	6670	8330
BG-230	< 750	4600	5150	7200	9450	11250	13100	5850	8650	10500	12250	15000	19000
	> 750	3830	4290	6000	7870	9370	10920	4870	7210	8750	10210	12500	15830
BG-260	< 950	7000	8600	11200	15000	17500	20000	8500	13000	16000	18000	22000	28000
	> 950	5830	7170	9330	12500	14580	16670	7080	10830	13330	15000	18330	23330
BG-350	< 2400	14500	15000	17500	22500	27500	33000	17500	18100	21100	26150	34200	40200
	> 2400	12000	12500	14500	18700	23000	27500	14500	15080	17580	21790	28500	33500

WEIGHTS (kg)

Bevel gearbox Size	Model	Weight
BG-065	A1	2,30
	A2	2,70
	B1 / C1	2,20
	D1	2,30
	B2 / C2	2,60
	D2	2,70
	E1	2,10
	E2	2,50
BG-090	A1	5,10
	A2	6,30
	B1 / C1	5,40
	D1	5,50
	B2 / C2	6,90
	D2	7,00
	E1	5,00
	E2	6,50
BG-120	A1	12,60
	A2	15,00
	B1 / C1	12,30
	D1	12,50
	B2 / C2	14,70
	D2	14,90
	E1	12,00
	E2	14,40

Bevel gearbox Size	Model	Weight
BG-140	A1	19,00
	A2	23,00
	B1 / C1	18,50
	D1	19,00
	B2 / C2	22,70
	D2	23,20
	E1	18,00
	E2	22,20
BG-160	A1	28,50
	A2	35,00
	B1 / C1	28,00
	D1	28,50
	B2 / C2	34,50
	D2	35,00
	E1	27,00
	E2	34,00
BG-200	A1	52
	A2	60
	B1 / C1	48
	D1	50
	B2 / C2	58
	D2	60
	E1	48
	E2	58

Bevel gearbox Size	Model	Weight
BG-230	A1	79
	A2	97
	B1 / C1	76
	D1	78
	B2 / C2	100
	D2	102
	E1	71
	E2	95
BG-260	A1	85
	A2	105
	B1 / C1	85
	D1	88
	B2 / C2	109
	D2	112
	E1	82
	E2	106
BG-350	A1	269
	A2	340
	B1 / C1	280
	D1	287
	B2 / C2	372
	D2	379
	E1	259
	E2	351

MOMENTS OF INERTIA J (kgcm^2)

Reduced to the input shaft (n1).

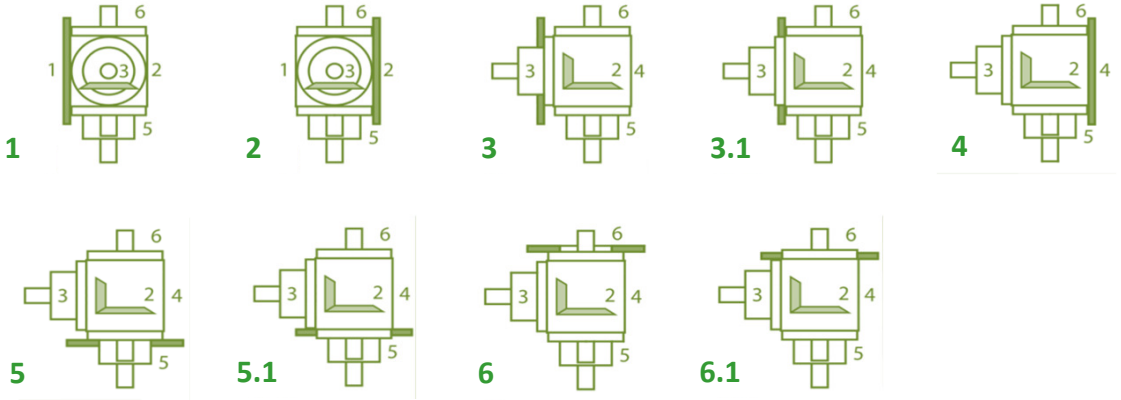
Bevel gearbox Size	Model	Transmission ratios 1:1	1,5:1	2:1	3:1	4:1	5:1	6:1
BG-065	A1	0,3888	0,2406	0,1839	0,1036			
	A2	0,5832	0,3270	0,2325	0,1252			
	B1 / C1	0,4231	0,3111	0,2330	0,1001			
	D1	0,4330	0,3155	0,2355	0,1012			
	B2 / C2	0,6175	0,4653	0,3683	0,1821			
	D2	0,6274	0,4697	0,3708	0,1832			
	E1	0,4754	0,3634	0,2853	0,1524			
	E2	0,6698	0,5176	0,4206	0,2344			
BG-090	A1	2,5590	1,4822	1,1437	0,8884	0,3631	0,3248	0,3062
	A2	3,8385	2,0508	1,4636	1,0305	0,4430	0,3760	0,3418
	B1 / C1	3,3543	2,1833	1,3652	1,0465	0,4607	0,3933	0,3502
	D1	3,3827	2,1959	1,3723	1,0496	0,4625	0,3945	0,3510
	B2 / C2	4,6338	3,0968	2,1890	1,7927	0,7438	0,6669	0,6209
	D2	4,6622	3,1094	2,1961	1,7958	0,7456	0,6681	0,6217
	E1	3,2507	2,1372	1,3393	1,0350	0,4542	0,3892	0,3473
	E2	4,5302	3,0507	2,1631	1,7812	0,7373	0,6628	0,6180
BG-120	A1	10,4976	4,8409	3,6465	2,3159	1,2164	0,7516	0,6766
	A2	15,7464	7,1737	4,9587	2,8991	1,5444	0,9615	0,8224
	B1 / C1	15,3022	7,4441	4,9747	3,0123	1,6729	1,0593	0,8982
	D1	15,5996	7,5762	5,0490	3,0453	1,6915	1,0712	0,9065
	B2 / C2	20,5510	9,9522	7,3090	4,7450	2,5612	1,6009	1,4290
	D2	20,8484	10,0843	7,3833	4,7780	2,5798	1,6128	1,4373
	E1	15,1939	7,3959	4,9476	3,0003	1,6661	1,0550	0,8952
	E2	20,4427	9,9040	7,2819	4,7330	2,5544	1,5966	1,4260
BG-140	A1	26,2670	11,8569	8,6762	6,4356	1,8432	1,5320	1,3708
	A2	39,4005	17,6940	11,9596	7,8949	2,6641	2,0574	1,7356
	B1 / C1	36,0994	18,7513	12,2785	7,9547	2,6978	2,2113	1,8426
	D1	37,0815	19,1878	12,5241	8,0639	2,7592	2,2506	1,8698
	B2 / C2	49,2329	24,7711	17,6713	12,9310	3,7202	3,2180	2,8486
	D2	50,2150	25,2076	17,9169	13,0402	3,7816	3,2573	2,8758
	E1	32,6630	17,2240	11,4194	7,5729	2,4830	2,0739	1,7471
	E2	45,7965	23,2438	16,8122	12,5492	3,5054	3,0806	2,7531
BG-160	A1	29,6710	19,6374	12,3589	8,9516	6,4348	2,2733	2,0901
	A2	44,5065	26,2309	16,0678	10,6000	7,3620	2,8667	2,5022
	B1 / C1	31,5527	32,0243	20,1006	12,0803	8,4198	3,6887	2,9407
	D1	32,5820	32,4818	20,3579	12,1947	8,4841	3,7299	2,9693
	B2 / C2	46,3882	45,0681	28,7506	19,3835	13,9274	5,3686	4,6187
	D2	47,4175	45,5256	29,0079	19,4979	13,9917	5,4098	4,6473
	E1	34,3851	33,1416	20,6658	12,3315	8,5611	3,7791	3,0048
	E2	49,2206	46,1854	29,3158	19,6347	14,0687	5,4590	4,6828
BG-200	A1	121,2522	57,6950	36,3095	18,8322	14,2651	6,1470	5,3881
	A2	181,8783	84,6400	51,4661	25,5685	18,0543	8,5721	7,0721
	B1 / C1	174,7000	103,5829	71,6215	34,1931	22,7181	12,8770	10,0616
	D1	177,8173	104,9684	72,4008	34,5395	22,9130	13,0016	10,1482
	B2 / C2	235,3261	134,3330	92,7745	46,2891	33,1941	16,5990	13,7656
	D2	238,4434	135,7185	93,5538	46,6355	33,3890	16,7236	13,8522
	E1	201,3904	109,0276	76,4341	35,2209	23,3588	13,8070	10,7075
	E2	262,0165	139,7777	97,5871	47,3169	33,8348	17,5290	14,4115
BG-230		Upon request						
BG-260	A1	814,2000	305,9333	194,2750	85,0833	46,7738	37,2840	31,8083
	A2	1221,3000	486,8667	296,0500	130,3167	72,2175	53,5680	43,1167
	B1 / C1	827,4400	168,2622	281,3350	117,2211	66,6638	50,0136	40,7039
	D1	841,8500	383,5556	284,9375	52,2667	67,5644	50,5900	41,1042
	B2 / C2	1234,5400	293,2622	373,8350	157,0711	87,9938	71,0136	61,2039
	D2	1248,9500	508,5556	377,4375	92,1167	88,8944	71,5900	61,6042
	E1	828,6900	413,2622	287,8975	120,1100	68,2888	51,0536	41,4261
	E2	1235,7900	538,2622	380,3975	159,9600	89,6188	72,0536	61,9261
BG-350		Upon request						

Bevel gearboxes

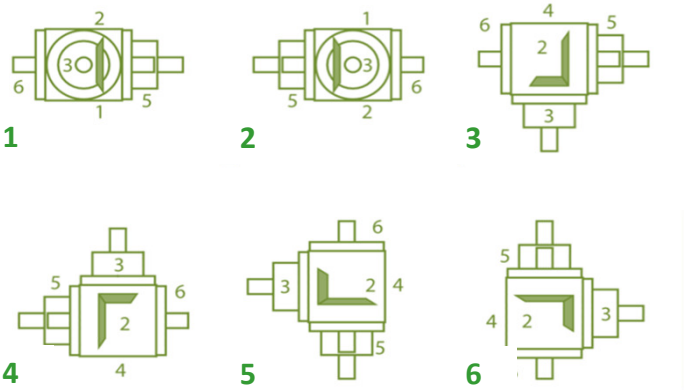
ACCESORIES

BEVEL GEARBOX BG

MOUNTING SIDE

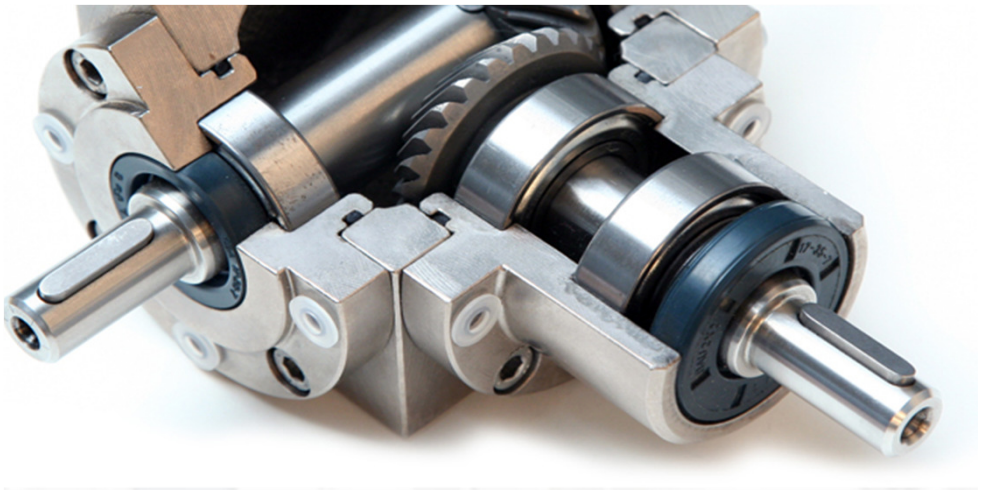


MOUNTING CONFIGURATION (Downward-facing side)



ORDER DESIGNATION

	Type	Size	Ratio	Model	Mount. side	Mount. config.	n2 max	Design
e.g. →	BG	065	1:1	A1	1	1	500	0000
	BG *NIASA Bevel gearboxes*				*9: Universal*	*9: Universal*		*0000: Standard design*

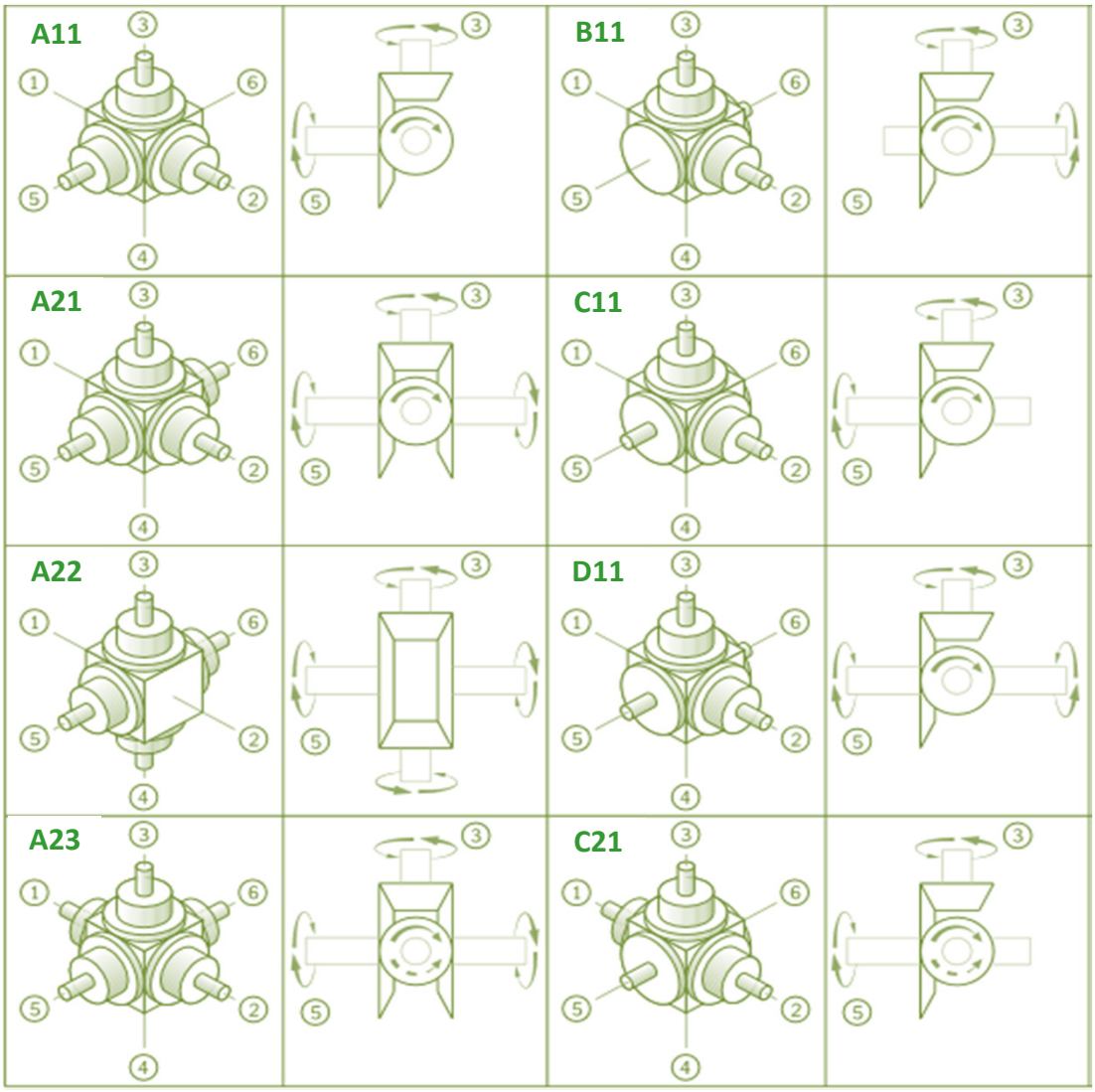


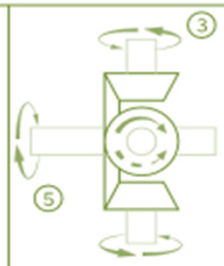
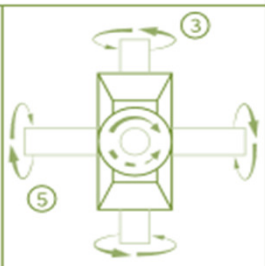
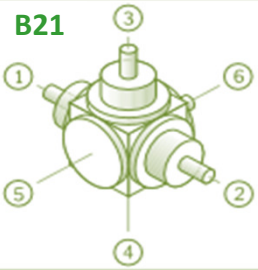
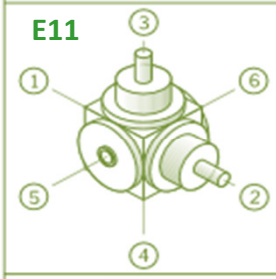
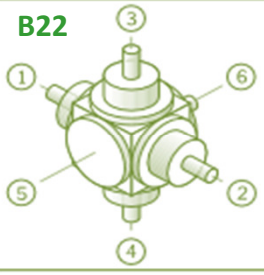
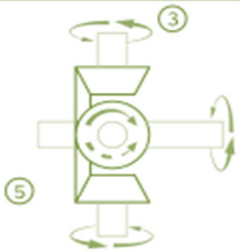
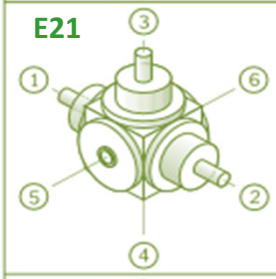
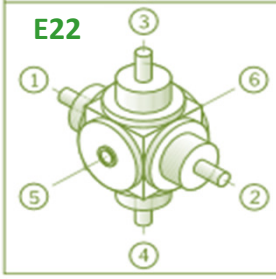
ACCESORIES

BEVEL GEARBOX BG

MULTISHAFT BEVEL GEARBOXES

The modular construction of **NIASA bevel gearboxes** makes it possible to produce a wide range of design variants. The dimensions are the same as those of the standard versions. With the exception of i=1:1, all transmission ratios are available. (Exception: model A22 is also available in i=1:1)



		C22	
A24 		B21 	
E11 		B22 	
E21 		D21 	
E22 		D22