Nidec

Highly Dynamic Servo Right-angle Gearboxes

NIDEC-SHIMPO CORPORATION

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NIDEC-SHIMPO GRAESSNER

In September of 2018, NIDEC-SHIMPO acquired MS-Graessner GmbH & Company located in Dettenhausen, Germany.

MS-Graessner was an extremely valuable addition to the NIDEC-SHIMPO corporate family, adding over 60 years of design experience and manufacturing know-how involving the production of high precision bevel and hypoid gears. The company has earned a very esteemed reputation in the European market, and MS-Graessner has been a reliable supplier to various well-known OEMs and gearbox manufacturers in Germany during that time.

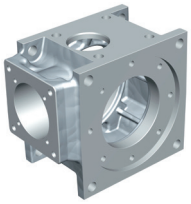
The Graessner right-angle family of products fits very well within our servo grade product offering, and greatly complements our broad planetary technology portfolio. The acquisition provides a much stronger distribution footprint for NIDEC-SHIMPO in Europe, and the headquarters in Dettenhausen will serve as base operations in that region. The addition of MS-Greassner will provide our OEM customers a strong advantage, allowing many to improve the performance of their machinery and to maintain a competitive edge globally.

Internal Highlights

The design of the DynaGear range has been influenced by extremely varied applications within many industry sectors.

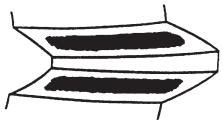
The DynaGear range has been developed with a highly dynamic servo drive solution in mind and therefore benefits from many advantages.

- Right-angle gearbox, single-stage, ratios from 3:1 to 15:1; higher ratios on request, two-stage up to 150:1
- The compact and rigid design ensures highest performance whilst being space and weight efficient.
- Lubricated for life, the gearboxes are virtually maintenance-free (when used under normal conditions). A case of fit and forget.
- The high efficiency rating of 96% saves energy costs (92 % at DG-HR).

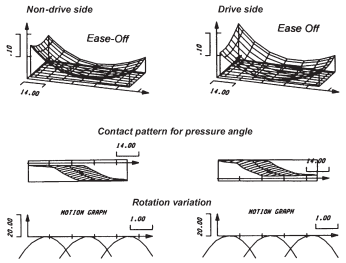


Weight efficient one-piece Aluminium housing ensures highest stability

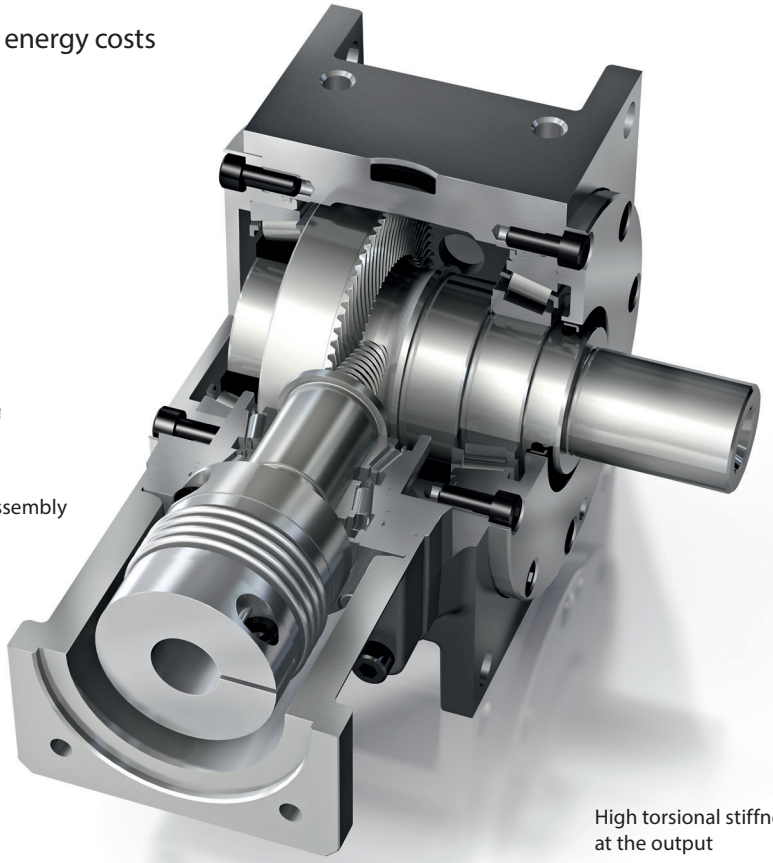
High-quality taper roller bearings absorb axial and radial loads guaranteeing a long service life



Optimized contact pattern assembly for uniform load distribution



Optimized Gleason hypoid-gearing for high torque ratings and low backlash



High torsional stiffness at the output

Fretting - and backlash-free torque transfer using a friction-locked fit between shaft and hub

Small moments of inertia at the input

System optimization via variable torsional coupling stiffness

External Highlights

The DynaGear realises the theme “Motor – Coupling – Gearbox – Mounting” in a unique way.

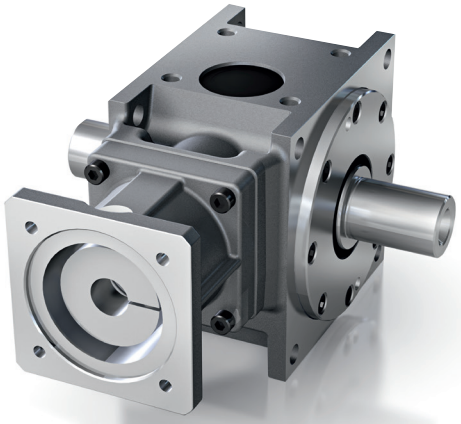
- The DynaGear fits all current servo motors by way of flanges and couplings to suit.
- Torsional vibration can be adjusted via the coupling stiffness.
- The gearbox dimensions are identical for all ratios.

Compact and weight efficient aluminium housing

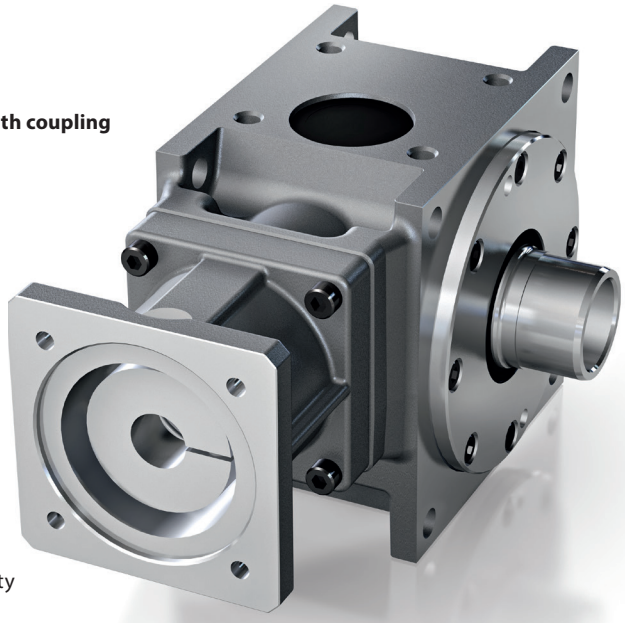
Easy mounting without additional parts

Hollow shaft version with coupling and input flange

Solid shaft version with continuous shaft, coupling and input flange



Couplings and adaptor flanges to suit all motors

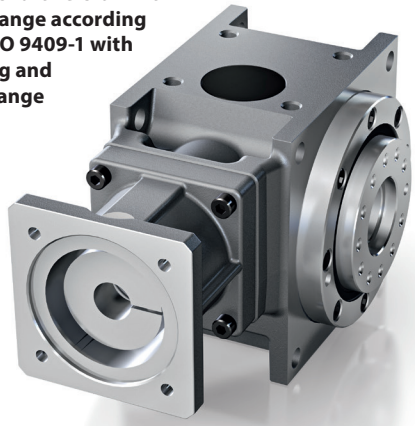


Subsequent motor type changes are possible ensuring highest flexibility

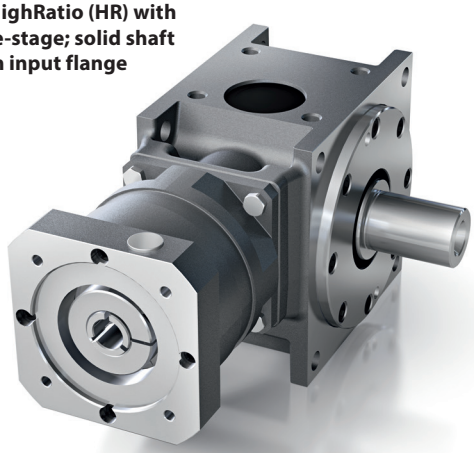
Optimal centering at the mounting sides

Largest possible integrated hollow shaft

Hollow shaft version with robot flange according to EN ISO 9409-1 with coupling and input flange



DynaGear HighRatio (HR) with lanetary pre-stage; solid shaft version with input flange



DynaGear

Size		D37	D55	D75	D90	D115	D130	D140	D160	D190
Ratio	**i**	**3/4/5/6/8/10**								
Output torque										
Nominal torque	T2N [Nm]	22	35	70	140	260	430	720	1100	1440
Maximum acceleration *4	T2B [Nm]	33	53	105	210	390	645	1080	1650	2160
Emergency stop torque *3	T2Not [Nm]	44	70	140	280	520	860	1440	2200	2880
Maximum input speed	n1max [min-1]	8000	8000	8000	7000	6000	5000	5000	4500	4500
Nominal input speed i = 3/4/5	n1N [min-1]	2300	2100	1800	1500	1150	1000	700	600	550
Nominal input speed i = 6/8/10	n1N [min-1]	3700	3200	2700	2200	1800	1500	1200	1100	1000
Standard backlash *1	jt [arcmin]	< 6	< 5	< 5	< 4	< 4	< 4	< 4	< 4	< 4
Reduced backlash *1	jt [arcmin]	< 4	< 3	< 3	< 2	< 2	< 2	< 2	< 2	< 2
Backlash stiffness at the output *5	Ct21 [Nm/arcmin]	1,3	2.1	4.2	10.5	23.4	39.6	61.8	90.0	126.0
Radial force *2	F2Rmax [N]	2200	3300	4900	7200	10000	12600	15000	18000	22500
Axial force *2	F2Amax [N]	1100	1650	2450	3600	5000	6300	7500	9000	11250
Efficiency rating at full load	h [%]	> 96	> 96	> 96	> 96	> 96	> 96	> 96	> 96	> 96
Noise level (n_1=3000 min^{-1})	LpA [dB(A)]	< 65	< 66	< 66	< 68	< 68	< 70	< 70	< 72	< 72
Weight approx.	m [kg]	1,9	3.5	5.5	9.5	15.5	23.5	32.5	46.5	60

Size		D37	D55	D75	D90	D115	D130	D140	D160	D190
Ratio	**i**	**12/15**								
Output torque										
Nominal torque	T2N [Nm]	15	25	50	95	180	300	510	815	1020
Maximum acceleration *4	T2B [Nm]	22	38	75	143	270	450	765	1223	1530
Emergency stop torque *3	T2Not [Nm]	30	50	100	190	360	600	1020	1630	2040
Maximum input speed	n1max [min-1]	8000	8000	8000	7000	6000	5000	5000	4500	4500
Nominal input speed	n1N [min-1]	4500	3900	3300	2800	2300	2000	1600	1350	1300
Standard backlash *1	jt [arcmin]	< 6	< 5	< 5	< 4	< 4	< 4	< 4	< 4	< 4
Reduced backlash *1	jt [arcmin]	< 4	< 3	< 3	< 2	< 2	< 2	< 2	< 2	< 2
Backlash stiffness at the output *5	Ct21 [Nm/arcmin]	1,3	2.1	4.2	10.5	23.4	39.6	61.8	90.0	126.0
Radial force *2	F2Rmax [N]	2200	3300	4900	7200	10000	12600	15000	18000	22500
Axial force *2	F2Amax [N]	1100	1650	2450	3600	5000	6300	7500	9000	11250
Effecieny rating at full load	h [%]	> 93	> 93	> 93	> 93	> 93	> 93	> 93	> 93	> 93
Noise level (n1=3000 min-1)	LpA [dB(A)]	< 65	< 66	< 66	< 68	< 68	< 70	< 70	< 72	< 72
Weight approx	m [kg]	1,9	3.5	5.5	9.5	15.5	23.5	32.5	46.5	60

Size			D55HR	D75HR	D90HR	D115HR	D130HR	D140HR	D160HR	D190HR
Ratio	**i** *6	**16/18/24/30/32/40/50/60/80/100**								
Output torque										
Nominal torque	T2N [Nm]	--	35	70	140	260	430	720	1100	1440
Maximum acceleration *4	T2B [Nm]	--	53	105	210	390	645	1080	1650	2160
Emergency stop torque *3	T2Not [Nm]	--	70	140	280	520	860	1440	2200	2880
Maximum input speed	n1max [min-1]	--	6000	6000	6000	6000	5000	5000	4500	4500
Nominal input speed	n1N [min-1]	--	3500	3000	3000	2500	2500	2500	2500	2500
Standard backlash *1	jt [arcmin]	--	< 7	< 7	< 6	< 6	< 6	< 6	< 6	< 6
Reduced backlash *1	jt [arcmin]	--	< 5	< 5	< 3	< 3	< 3	< 3	< 3	< 3
Backlash stiffness at the output *5	Ct21 [Nm/arcmin]	--	2.1	4.1	10.2	22.8	37.8	60.1	86.5	119.2
Radial force *1	F2Rmax [N]	--	3300	4900	7200	10000	12600	15000	18000	22500
Axial force *1	F2Amax [N]	--	1650	2450	3600	5000	6300	7500	9000	11250
Effecieny rating at full load	h [%]	--	> 92	> 92	> 92	> 92	> 92	> 92	> 92	> 92
Noise level (n1=3000 min-1)	LpA [dB(A)]	--	< 66	< 66	< 68	< 68	< 70	< 70	< 72	< 72
Weight approx	m [kg]	--	4.0	6.5	12.5	19.5	27	36	49	61.5

Service life (SL) [h]: > 30.000 based operation mode S5
Lubrication: see "Technical service and maintenance" page 10
Mounting positions: Any
Operation temperature: -10 °C to 90 °C
Paint: Primary coated RAL 9005 – black
Ex-protection: Ex II 2 D/G c T4
type of protection: IP 64

*1) At the output, at 2 % load and max. 10 Nm
*2) Resulting force centre of output shaft at output speed 400 min^{-1}
*3) Max 1000 times during the service life of the gearbox
*4) At max 1000 cycles per hour, please consider reducing factor in other cases (see page 9)
*5) At nominal torque (DynaGear without coupling)
*6) Ratios 120:1 and 150:1 on request

Symbols and units, see page 5

Mass moment of inertia I_1 related to input [kgcm^2] for shaft arrangement WA 1

DynaGear *1

Ratio i	Size								
	D37	D55	D75	D90	D115	D130	D140	D160	D190
3:1	0.178	0.39	0.98	2.42	7.12	14.03	26.96	52.32	91.47
4:1	0.140	0.30	0.73	1.77	5.09	9.17	17.44	32.78	62.43
5:1	0.123	0.23	0.58	1.41	4.00	7.12	13.53	24.76	44.29
6:1	0.113	0.22	0.52	1.41	3.65	6.76	12.25	22.49	39.55
8:1	0.104	0.17	0.43	1.12	2.85	5.09	8.95	15.67	27.07
10:1	0.099	0.15	0.38	1.00	2.46	4.27	7.38	12.47	21.43
12:1	0.097	0.14	0.36	0.88	2.25	3.81	6.47	10.67	18.14
15:1	0.095	0.13	0.34	0.81	2.07	3.45	5.76	9.23	15.53

*1) Values without coupling

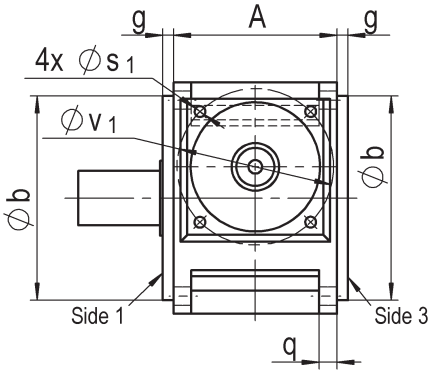
DynaGear HR

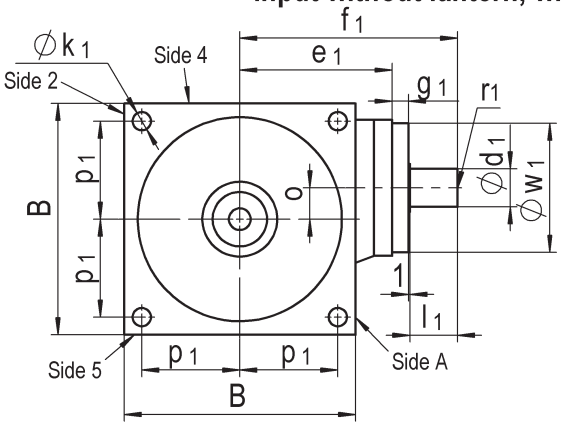
Ratio i	Size							
	D55HR	D75HR	D90HR	D115HR	D130HR	D140HR	D160HR	D190HR
16:1	0.40	1.19	1.25	5.12	5.37	8.74	9.70	11.55
18:1	0.46	1.38	1.41	6.64	6.73	12.57	12.85	13.33
24:1	0.39	1.15	1.18	4.90	4.99	7.99	8.27	8.75
30:1	0.37	1.06	1.09	4.15	4.24	6.58	6.86	7.34
32:1	0.38	1.15	1.16	4.84	4.88	7.79	7.89	8.07
40:1	0.36	1.06	1.07	4.09	4.13	6.38	6.48	6.66
50:1	0.36	1.05	1.06	4.07	4.09	6.31	6.36	6.45
60:1	0.35	0.94	0.97	3.20	3.29	4.14	4.42	4.90
80:1	0.34	0.94	0.95	3.14	3.18	3.94	4.04	4.22
100:1	0.34	0.93	0.94	3.12	3.14	3.87	3.92	4.01

Symbols and Units

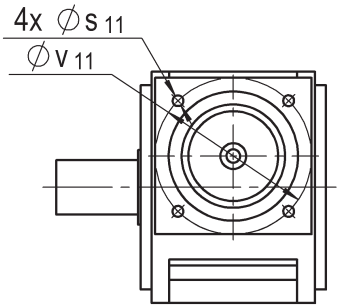
Maximum motor acceleration torque	T_{1BMot}	Nm
Nominal output torque	T_{2N}	Nm
Maximum output acceleration	T_{2B}	Nm
EMERGENCY STOP output torque	T_{2Not}	Nm
Maximum input speed	n_{1max}	min^{-1}
Nominal input speed	n_{1N}	min^{-1}
Output backlash	j_t	arcmin
Torsional output stiffness	C_{t21}	Nm/arcmin
Radial input force	F_{1Rmax}	N
Radial output force	F_{2Rmax}	N
Axial input force	F_{1Amax}	N
Axial output force	F_{2Amax}	N
Efficiency at full load	η	%
Running noise	L_{pA}	dB(A)
Weight	m	kg
Mass moment of inertia	I_1	kgcm^2
Service life	L_h	h
Run time	RT	min
Duty cycle	DC	%
Ambient temperature	t_a	°C
Thermal performance limit	P_{therm}	kW
Performance	P	kW

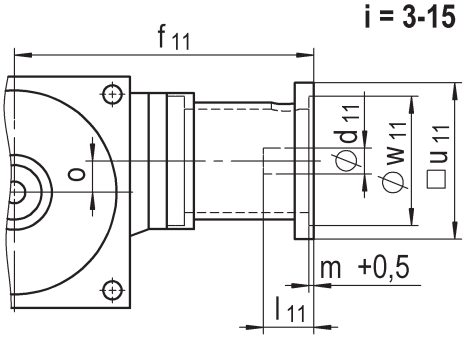
Input without lantern, without coupling



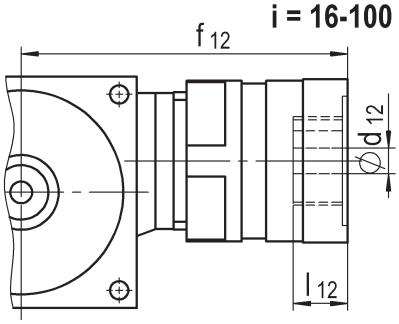


Input with lantern and coupling i = 3-15

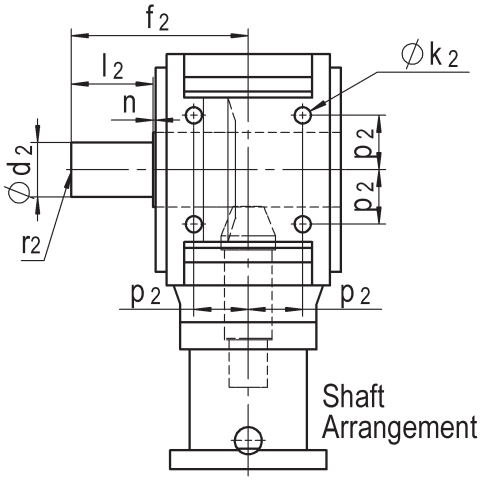




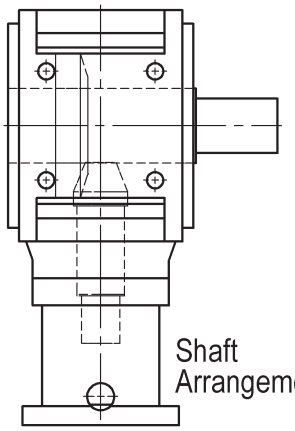
Input with planetary pre-stage i = 16-100



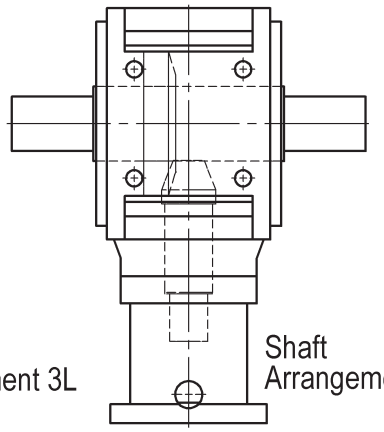
Output with solid shaft



Shaft Arrangement 1L

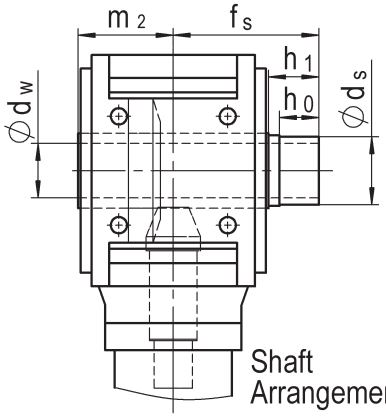


Shaft Arrangement 3L

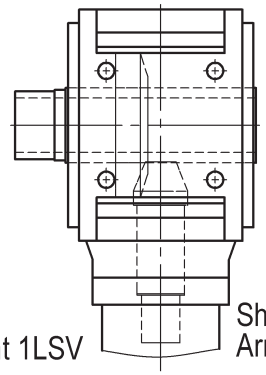


Shaft Arrangement 13L

Output with hollow shaft

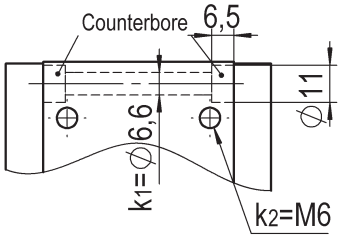


Shaft Arrangement 1LSV



Shaft Arrangement 3LSV

Fasting bores size D37



Size	A	B	Ø b_{g6}	g	o	p_1	p_2	Ø k_1	k_2	q
D37	56	75	74	11	7.5	31	21	6.6	M6	-
D55	60	90	89	13.5	9	39	22	6.6	M6	8
D75	80	115	105	8.5	14	49	27	9	M8	10
D90	100	140	125	8	18	59	33	11	M10	11
D115	120	170	150	8	23	72	40	13.5	M12	13
D130	138	192	173	10	27	82	48	13.5	M12	14
D140	146	215	195	10	32	91	52	17.5	M16	15
D160	166	240	225	10	38	103	60	17.5	M16	16
D190	196	260	245	10	42	112	70	17.5	M16	17

Input without lantern and without coupling

Size	Ø d_{1k6}	l_1	r_1 *2	Ø w_{1g6}	g_1	Ø v_1	s_1	f_1	e_1
D37	10	14	M3	46	3.5	46	M5	91.5	73
D55	14	15	M5	46	4	67	M6	101	81
D75	18	25	M6	73	11	90	M6	123	86
D90	22	30	M8	85	12	103	M8	139	96
D115	28	35	M10	95	12	115	M8	160	112
D130	32	36	M12	109	14	130	M10	177	126
D140	32	38	M12	119	16	145	M10	197	142
D160	36	42	M12	126	16	153	M10	217	158
D190	40	45	M16	137	16	165	M12	236	174

Input with lantern and coupling

Size	Ø d_{11} x l_{11}			□u x f_1 *5			
D37	9x23	11x26		55x127.5	70x127.5		Pitch circle diameter, centering diameter, thread and centering depth according to the relevant motor data sheet
D55	9x23	11x26	14x30	55x130	75x140		
D75	11x26	14x30	19x40	75x168	90x168	90x180	
D90	14x30	19x40	24x50	90x191	115x191	115x201	
D115	19x40	24x50	32x60	115x220	140x220	140x235	
D130	24x50	32x60	38x80	140x245	190x245	190x260	
D140	24x50	32x60	38x80	140x260	190x260	190x280	
D160	32x60	38x80	48x80	140x298	190x308	260x308	
D190	32x60	38x80	48x80	190x335	260x345		

Input with planetary pre-stage for motor shaft and input flange

Size	Ø d_{12} x l_{12} x f_{12}	
D55HR	9x25x158.1 / 11x25x158.1 / 14x30x168.1	Square □u, the pitch circle diameter Ø v with threads s and the centering diameter Ø w with length m are motor dependent. Please contact us!
D75HR	14x30x198.1 / 16x30x198.1 / 19x40x198.6 / 24x50x206.6	
D90HR	14x30x214.1 / 16x30x214.1 / 19x40x214.1 / 24x50x222.6	
D115HR	19x40x246.5 / 24x50x255.5 / 32x60x255.5	
D130HR	19x40x263.5 / 24x50x272.5 / 32x60x272.5	
D140HR	24x50x297.8 / 32x60x302.8 / 38x80x322.8	
D160HR	24x50x317.8 / 32x60x322.8 / 38x80x342.8	
D190HR	24x50x336.8 / 32x60x341.8 / 38x80x361.8	

Output with solid shaft

Size	Ø d_{2k6}	l_2	f_2	n	r_2 *2
D37	16	25	65	1	M5
D55	20	35	80	1.5	M6
D75	24	40	90	1.5	M8
D90	32	50	110	2	M12
D115	40	60	130	2	M16
D130	48	75	156	2	M16
D140	55	90	175	2	M20
D160	60	100	195	2	M20
D190	70	110	220	2	M20

Output with hollow shaft *3

Size	Ø d_w^{H7}	Ø d_{sf7}	h_0	h_1	f_s	m^2
D37	16	20	20	25	66	40
D55	20	24	20	25	71.5	45
D75	25	30	22	27	79.5	50
D90	30	36	26	31	93	60
D115	40	50	29	34	107	70
D130	48	55	32	37	121	81
D140	55	68	32	38	127	85
D160	60	75	34	41	139	95
D190	70	80	34	41	159	110

*1) Standard square for relevant motor type

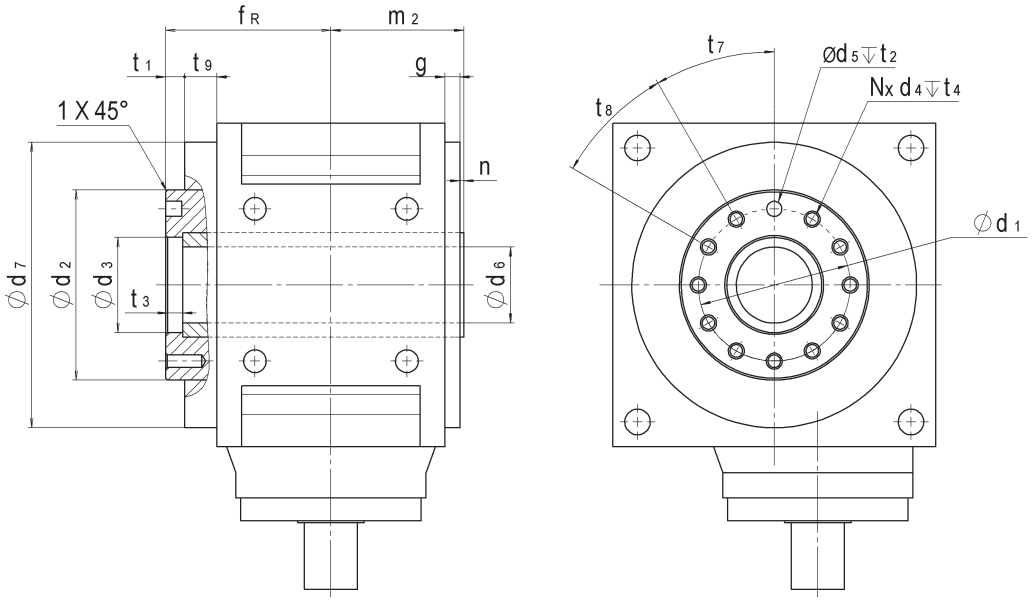
*2) According to D DIN 332

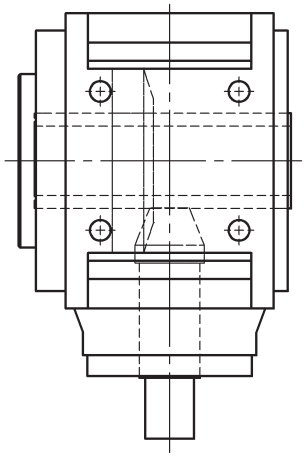
*3) Extended shaft for the shrink disk (e.g. Stüwe – Type HSD 22)
Delivery with shrink disk on request

Output with robot flange according to EN ISO 9409-1 and hollow shaft

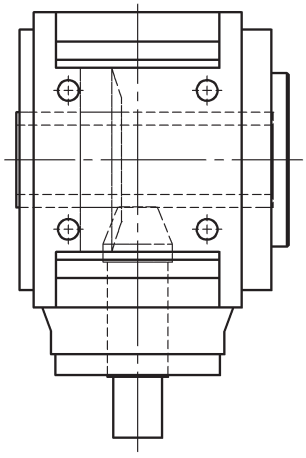
Size	Position	Pitch circle Ø d1		Ø $d_{2\,h8}$	Ø d_3^{H7}	d_4	Ø d_5^{H7}	Ø d_6	Ø d_7	f_R	m_2
		Series 1	Series 2								
D55	3	40	–	50	25	M6	6	18	89	57	45
D75	4	–	50	63	31.5	M6	6	24	105	62.5	50
D90	5	63	–	80	40	M6	6	28	125	73	60
D115	6	–	80	100	50	M8	8	40	150	87	70
D130	6	–	80	100	50	M8	8	40	173	96.5	81
D140	7	100	–	125	63	M8	8	52	195	100.5	85
D160	7	100	–	125	63	M8	8	52	225	115	95
D190	8	–	125	160	80	M10	10	65	245	132.5	110

Size	g	n	t_1	t_2	t_3	t_4	t_7	t_8	t_9	N
D55	13.5	1.5	7	6.5	7	Thread depth >1.5xd4	45°	45°	20	7
D75	8.5	1.5	7	6.5	7		45°	45°	15.5	7
D90	8	2	7	6.5	7		45°	45°	16	7
D115	8	2	10	8.5	8.5		30°	30°	17	11
D130	10	2	10	8.5	8.5		30°	30°	17.5	11
D140	10	2	10	8.5	8.5		30°	30°	17.5	11
D160	10	2	12	8.5	8.5		30°	30°	20	11
D190	10	2	12	10.5	8.5		30°	30°	22.5	11





Shaft Arrangement 1RFH



Shaft Arrangement 3RFH

Operation mode S5 duty cycle (DC) < 60 % and run time (RT) < 20 min

Maximum existing motor acceleration torque T_{1BMot} [Nm]

↓

Calculate the maximum existing acceleration torque at the gearbox output

$T_{2Bmax\ exist.} = T_{1BMot} \times i$ [Nm]

↓

Compare the maximum existing acceleration torque at the gearbox output with the permissible acceleration torque at the gearbox output

$T_{2Bmax\ exist.} \leq T_{2Bperm.} \times k$

↓

Existing average speed $n_{1\ exist.} \leq$ nominal speed n_{1N}

Valid for an average torque of 30 % of the permissible output torque T_{2N}

↓

Compare the motor dimensional details such as □ flange size, shaft diameter and shaft length with the gearbox dimensions □u, d_1, l_1 [mm]

↓

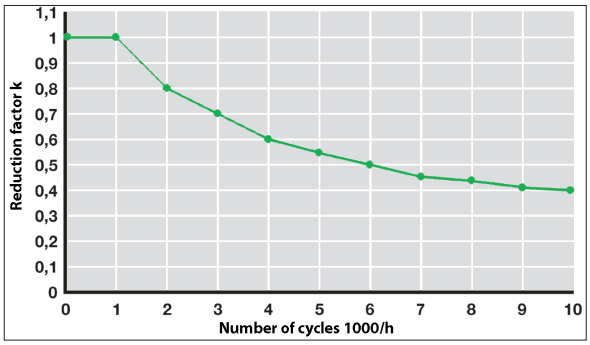
Compare the radial and axial shaft load with the maximum permissible values

$F_{2Rexist.} \leq F_{2Rmax}$ [N] $F_{2Aexist.} \leq F_{2Amax}$ [N]

These are guide values, dependent on additional loads. Upon request we calculate these values individually.

For continuous operation S1, please contact us.

Reduction factor for high number of cycles



Example: Positioning drive

Given:

Servo motor	T_{1Bmax} = 16 Nm
Ratio	i = 8:1
No of cycles	2000/h

Selection:

$T_{2B\ max.exist.}$ = 16 Nm x 8 = 128 Nm
Gearbox D90 8:1 1L
$T_{2B\ max\ exist.} \leq T_{2B\ zul}$ x k
128 Nm ≤ 210 Nm x 0.8 = 168 Nm

Connection dimensions

Motor:	Flange □105 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm
Gearbox:	Flange □115 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm

Selected: **D90 8:1 1L**

DynaGear and DynaGear Economy Gearboxes

DYNAGEAR gearboxes are supplied ready lubricated for life with a high-quality synthetic oil to CLP DIN 51 517, ISO VG-Class 150 (DIN 51 519). They are therefore maintenance-free.

We recommend that for continuous operation close to the thermal performance limit, regular leak controls are undertaken on the shaft seals. After approx 15.000 operating hours, it is advisable to change the oil. Please request instructions which also include advice on lubricants and quantity. Service kits of wear and tear parts with full instructions are available from our service department.

DynaGear High Ratio Gearboxes

DYNAGEAR High Ratio Gearboxes have two separate lubrication chambers.
The hypoid stage is lubricated with a high-quality synthetic oil (synthetic hydrocarbon plus additives) to CLP DIN 51517, ISO VG-Class 150 (DIN 51 519).

The planetary stage is filled with a special grease, consistency 00 to DIN 51818.
If used under normal conditions, the gearboxes are considered lubricated for life and are therefore maintenance-free.

We recommend that for continuous operation close to the thermal performance limit, regular leak controls are undertaken on the shaft seals. After approx 15,000 operating hours, it is advisable to change the both the oil and the grease. The gearboxes require disassembly in order to change the lubricants. We will be happy to carry out this work for you at our factory. Should you still wish to change the lubricants yourself, please request instructions which also include advice on lubricants and quantity. Service kits of wear and tear parts with full instructions are available from our service department.

D	—	75	—	8.00:1	—	1L	—	xxx
1.		2.		3.		4.		5.

1. Gearbox Series

D = DynaGear Page 4 + 5

D..HR = DynaGear High Ratio Page 4 + 5

2. Size

3. Ratio

4. Configuration

See page 6 + 8

5. Additional Data

- Input speed
- Maximum application speed
- Options – if required
- Customised design – if required

Please include the relevant motor data sheet.

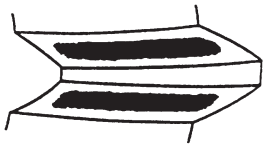
Please note that

All information contained in this catalogue is provided without guarantee and is not binding. In particular, dimensions and values only provide guidance. Any exact, specific requirements must be agreed with us. Specifications and features listed in the catalog are subject to a written contract.

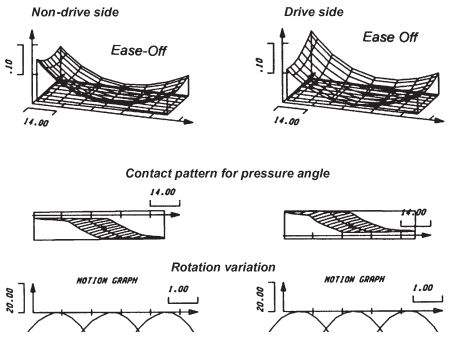
The Cost-optimized Servo Right-angle Gearbox

The design of the DynaGear Eco range has been influenced by extremely varied applications within many industry sectors. The DynaGear Eco range has been developed with a dynamic servo drive solution in mind and therefore benefits from many advantages.

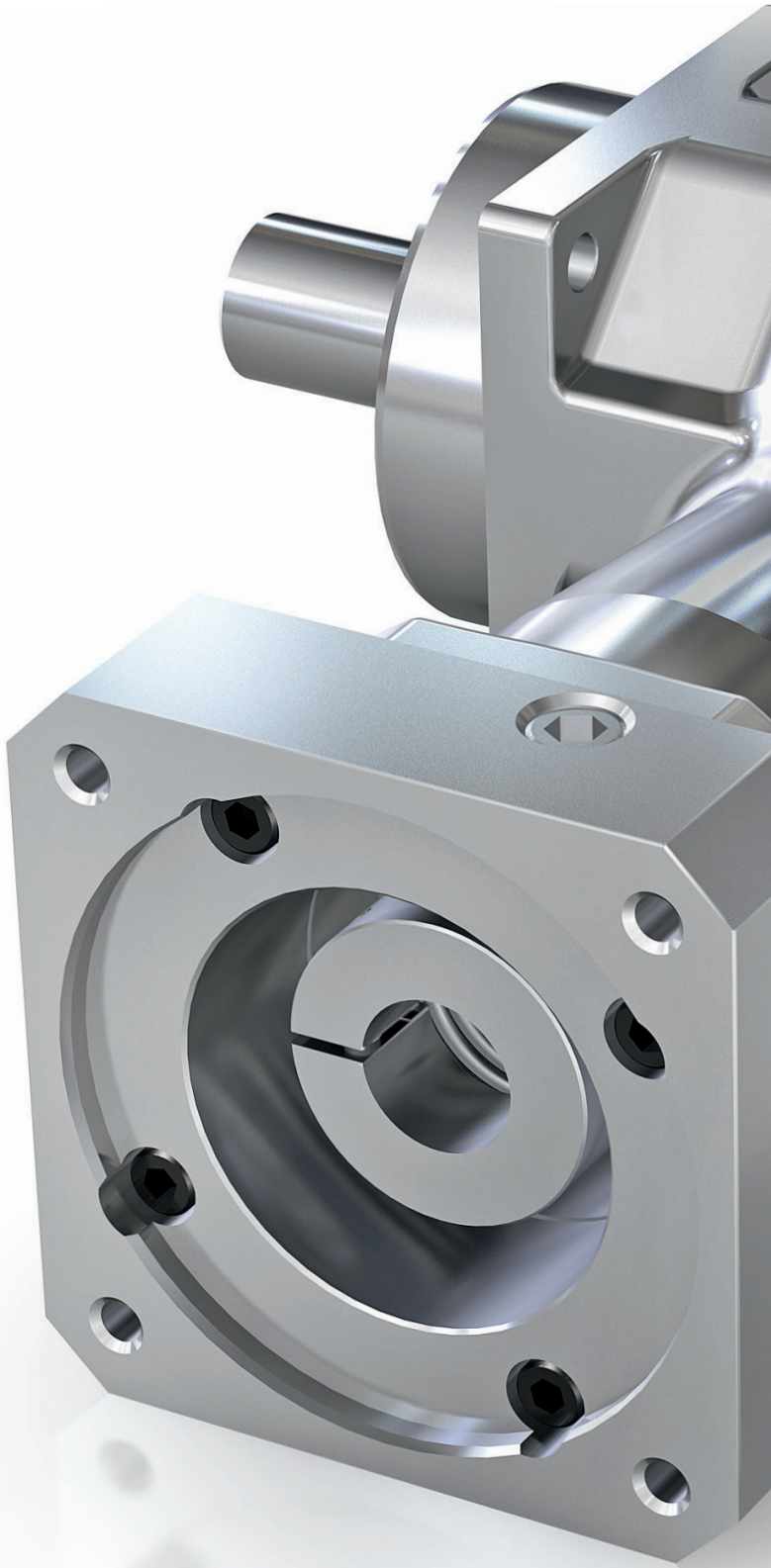
- Right-angle gearbox, single-stage, ratio
- The compact and rigid design ensures h whilst being space and weight efficient
- Lubricated for life, the gearboxes are vir free (when used under normal conditio
- The high efficiency rating of up to 96%

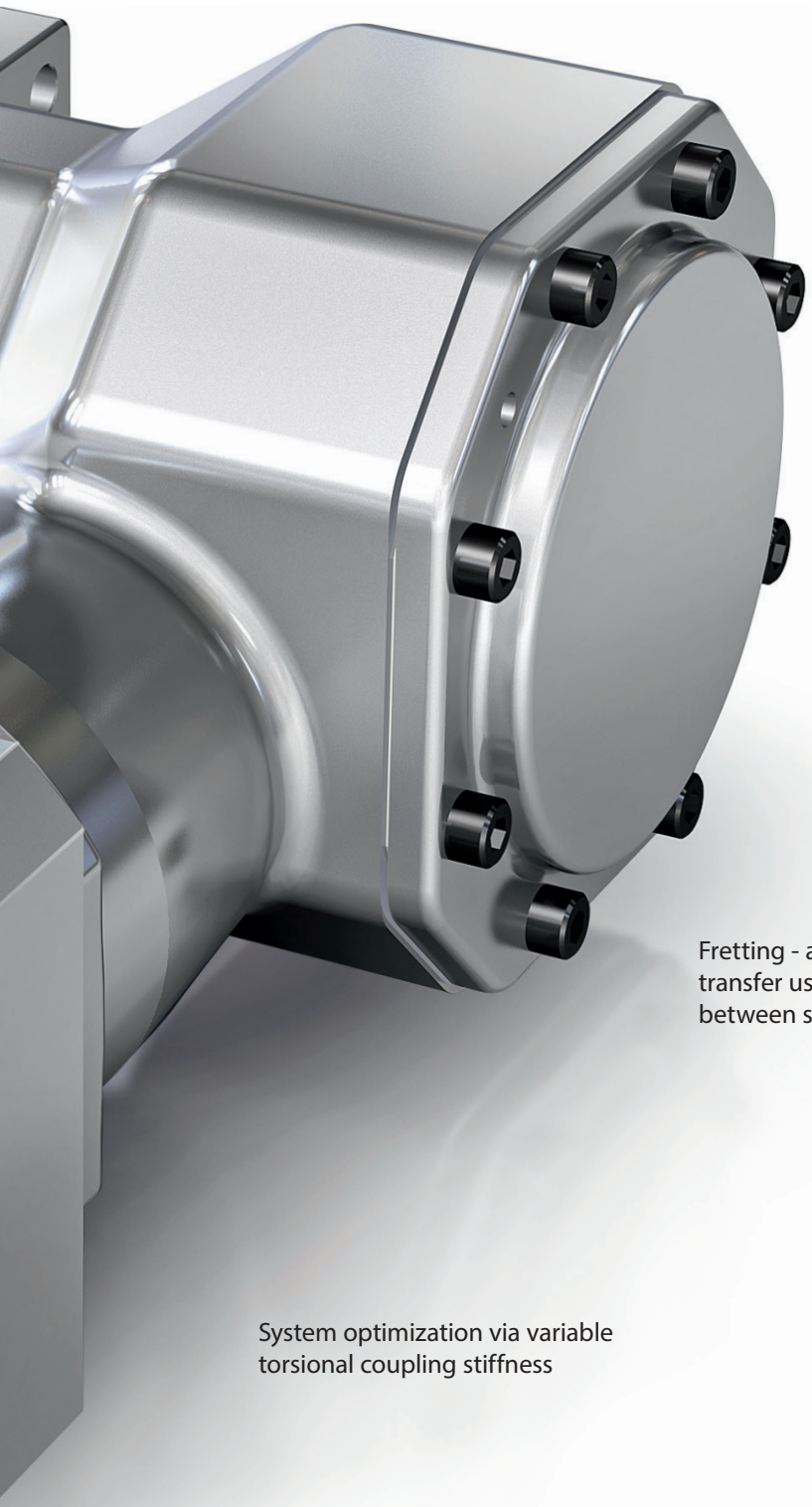


Optimized contact pattern assembly for uniform load distribution



Optimized Gleason hypoid-gearing for high torque ratings and low backlash





Weight efficient one-piece aluminium housing ensures highest stability

High torsional stiffness at the output

Fretting - and backlash-free torque transfer using a friction-locked fit between shaft and hub

System optimization via variable torsional coupling stiffness

The DE-PL version is available with a solid shaft or hollow shaft for shrink disc on the output side.

The dimensions of the output correspond to those of our standard planetary gearboxes.

DynaGear Eco DE-PL

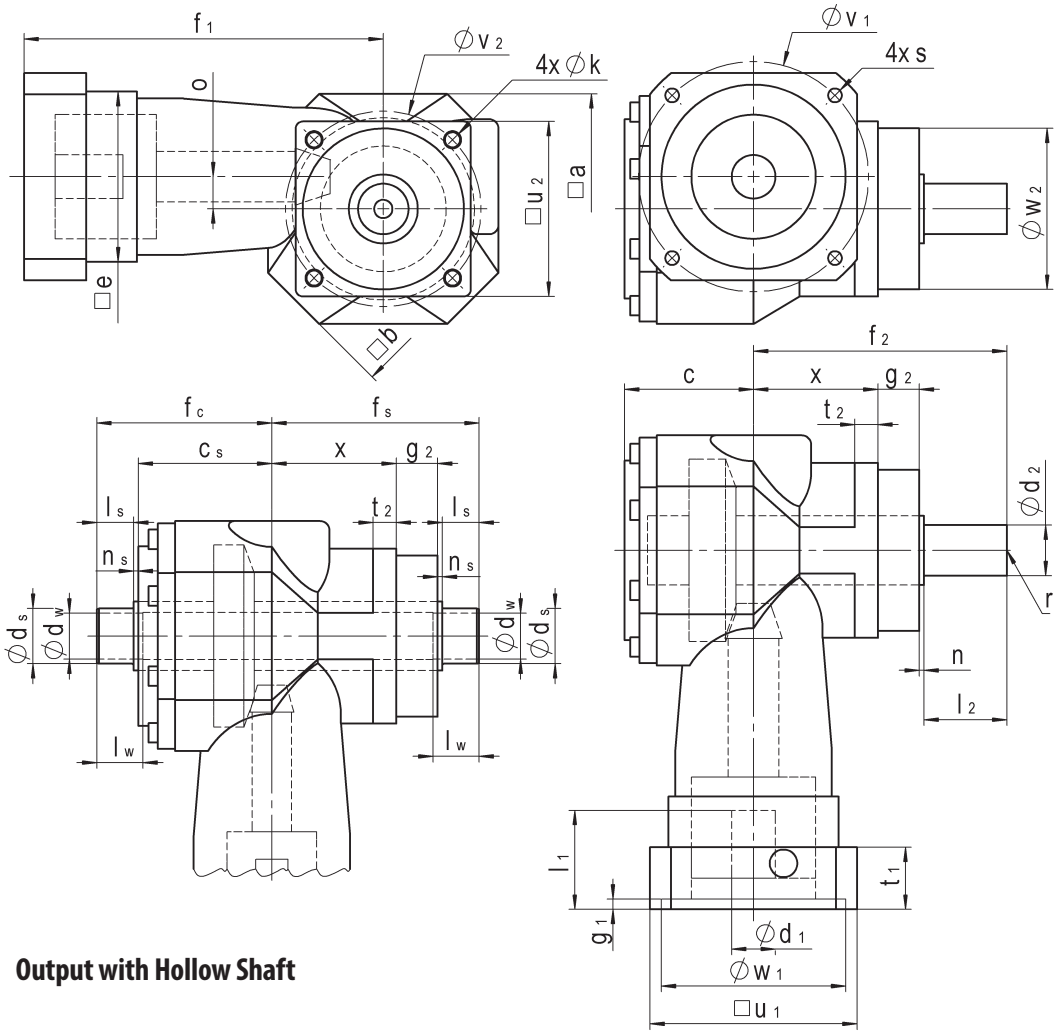
Size		DE-PL55	DE-PL75	DE-PL90	DE-PL55	DE-PL75	DE-PL90
Ratio	**i**	**5/8/2010**			**15**		
Output Torque							
Nominal Torque	T2N [Nm]	35	70	140	25	50	95
Maximum Acceleration *4	T2B [Nm]	53	105	210	38	75	143
Emergency Stop Torque *3	T2Not [Nm]	70	140	280	50	100	190
Maximum Input Speed	n1max [min-1]	6000	6000	5000	6000	6000	5000
Nominal Input Speed i = 5/8	n1N [min-1]	3100	2400	2100	–	–	–
Nominal Input Speed i = 10/15	n1N [min-1]	3800	2900	2600	3800	2900	2600
Backlash *1	jt [arcmin]	< 7	< 7	< 6	< 7	< 7	< 6
Backlash Stiffness at the Output *5	Ct21 [Nm/arcmin]	2,5	5,0	12,0	2,5	5,0	12,0
Radial Force *2	F2Rmax [N]	2200	4050	6200	2200	4050	6200
Axial force *2	F2Amax [N]	1100	2025	3100	1100	2025	3100
Efficiency Rating at Full Load	h[%]	> 96	> 96	> 96	> 93	> 93	> 93
Noise Level (n1=3000 min–1)	LpA [dB(A)]	< 66	< 66	< 68	< 66	< 66	< 68
Weight Approx.	m [kg]	2,6	4,5	9,0	2,6	4,5	9,0

Service Life (SL) [h]	>30 000 based operation mode S5
Lubrication	Lifetime lubrication, closed system
Mounting Position	any
Operation Temperature	–10°C to +90°C
Paint	Primary coated RAL 9005 – black
Ex-protection	Ex II 2 G/D EEx c k IIB T4
Type of Protection	IP 64

*1) At the output, at 2 % load or max. 10 Nm
*2) Resulting force centre of output shaft at output speed 400 min-1
*3) Max 1000 times during the service life of the gearbox
*4) At max 1000 cycles per hour, please consider reducing factor in other cases
*5) At nominal torque

Mass moment of inertia I1 related to input [kgcm^2] (coupling included)

Ratio i	Size		
	DE-PL55	DE-PL75	DE-PL90
5:01	0,44	1,07	3,7
8:01	0,37	0,89	3,0
10:01	0,35	0,84	2,9
15:01	0,33	0,79	2,7



Output with Hollow Shaft

Size	□a	□b	x	o	□e	f_1	g_1	t_1	g_2	t_2	Ø k	$□u_2$	$Øv_2$	$Øw_{2g6}$
DE-PL55	84	91,5	47	9	58	130	4,5	20	18	8,5	5,5	66	68	60
DE-PL75	100	110	54	14	74	156	4,5	27	18	10	6,5	76	85	70
DE-PL90	125	139	68	18	89	187	4,5	33	20	13	9	101	120	90

Input with Motor Flange and Coupling

Size	Version	$Ød_1$	l_1	$□u_1$	$Øv_1$	$Øw_1$ F7	s
DE-PL55	V1	9	23	60	63	40	M4
	V2	11	26	75	75	60	M5
	V3	14	33	75	75	60	M5
DE-PL75	V1	11	26	75	75	60	M5
	V2	14	33	75	75	60	M5
	V3	19	43	90	100	80	M6
DE-PL90	V1	14	33	90	100	80	M6
	V2	19	43	90	100	80	M6
	V3	24	53	115	130	110	M8

Output with Solid Shaft

Size	$Ød_{2\ k6}$	l_2	f_2	n	r *1	c
DE-PL55	16	28	95	2	M5	46,5
DE-PL75	22	36	110	2	M8	56
DE-PL90	32	58	148	2	M12	68

Output with Hollow Shaft

Size	$Ød_{W\ H6}$	$Ød_{S\ h8}$	l_S	n_S	l_W	f_S	f_C	c_S
DE-PL55	15	18	14	2	18	81	65,5	49,5
DE-PL75	20	24	16	2	20	90	76	58
DE-PL90	30	36	20	2	25	110	90,5	68,5

*1) According to form D DIN 332

Operation mode S5 duty cycle (DC) < 60 % and run time (RT) < 20 min

Maximum existing motor acceleration torque T_{1BMot} [Nm]

↓

Calculate the maximum existing acceleration torque at the gearbox output

$T_{2Bmax\ exist.} = T_{1BMot} \times i$ [Nm]

↓

Compare the maximum existing acceleration torque at the gearbox output with the permissible acceleration torque at the gearbox output

$T_{2Bmax\ exist.} \leq T_{2Bperm.} \times k$

↓

Existing average speed $n_{1\ exist.} \leq$ nominal speed n_{1N} Valid for an average torque of 30 % of the permissible output torque T_{2N}

↓

Compare the motor dimensional details such as □ flange size, shaft diameter and shaft length with the gearbox dimensions □u, d_1, l_1 [mm]

↓

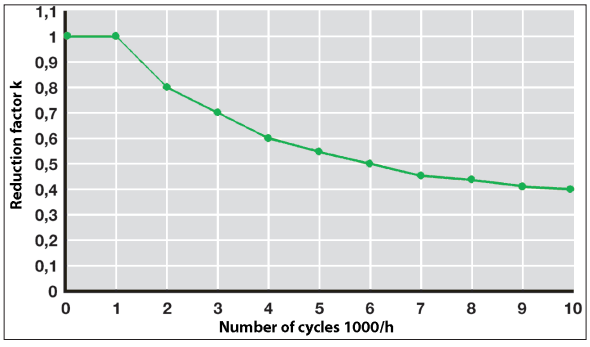
Compare the radial and axial shaft load with the maximum permissible values

$F_{2Rexist.} \leq F_{2Rmax}$ [N] $F_{2Aexist.} \leq F_{2Amax}$ [N]

These are guide values, dependent on additional loads. Upon request we calculate these values individually.

For continuous operation S1, please contact us.

Reduction factor for high number of cycles



Example: Positioning drive

Given:

Servo motor	T_{1Bmax} = 16 Nm
Ratio	i = 8:1
No of cycles	2000/h

Selection:

$T_{2B\ max.exist.}$ = 16 Nm x 8 = 128 Nm
Gearbox D90 8:1 1L
$T_{2B\ max\ exist.} \leq T_{2B\ zul}$ x k
128 Nm ≤ 210 Nm x 0.8 = 168 Nm

Connection dimensions

Motor:	Flange □105 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm
Gearbox:	Flange □115 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm

Selected: **D90 8:1 1L**

DE-PL	—	75	—	8.00:1	—	1L	—	xxx
1.		2.		3.		4.		5.

1. Gearbox Series DE-PL = DynaGear Eco PL Page 4

2. Size

3. Ratio

4. Configuration 1L, 13LSV Page 5

5. Additional Data

- Max. input speed of application
- Options – if required
- Customised design – if required

Please include the relevant motor data sheet.

Technical Service and Maintenance

DynaGear and DynaGear Eco Gearboxes

DynaGear gearboxes are supplied ready lubricated for life with a high-quality synthetic oil to CLP DIN 51 517, ISO VG-Class 150 (DIN 51 519). They are therefore maintenance-free.

We recommend that for continuous operation close to the thermal performance limit, regular leak controls are undertaken on the shaft seals. After approx 15.000 operating hours, it is advisable to change the oil. Please request instructions which also include advice on lubricants and quantity.

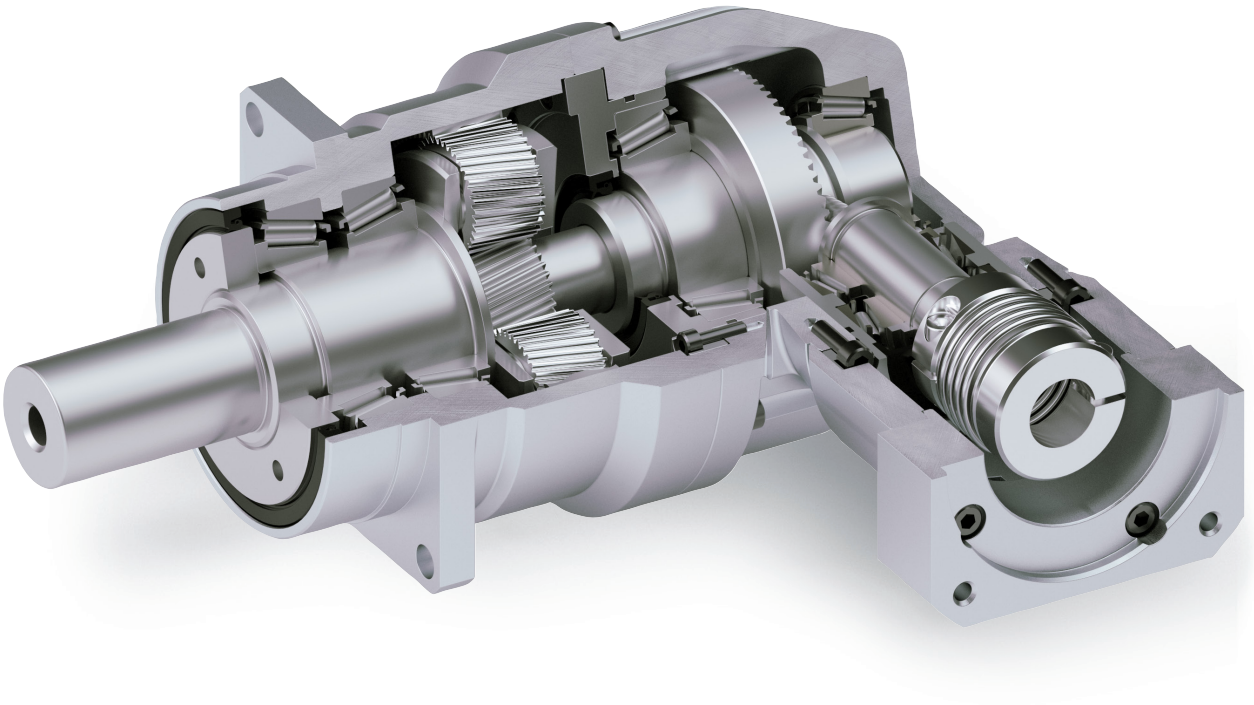
Service kits of wear and tear parts with full instructions are available from our service department.

Please note that

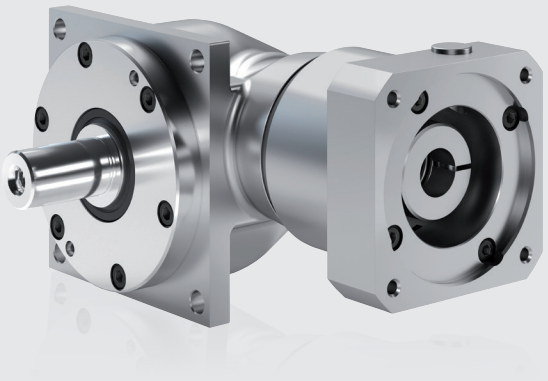
All information contained in this catalogue is provided without guarantee and is not binding. In particular, dimensions and values only provide guidance. Any exact, specific requirements must be agreed with us. Specifications and features listed in the catalog are subject to a written contract.

The New EvoGear – An All-rounder

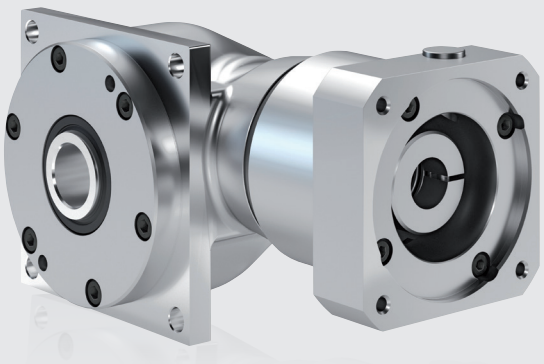
EvoGear confidently combines all the advantages of a high-performance gearbox and is aimed at all those who set value on a high ratio variety, a shapely and easy-to-clean design. As the name already suggests, the EvoGear gearbox is a further development – but also a small r(EVO)lution, because here, all the knowledge, design demands and requirements of the recent years have been invested in a cost-reduced and multifunctional product



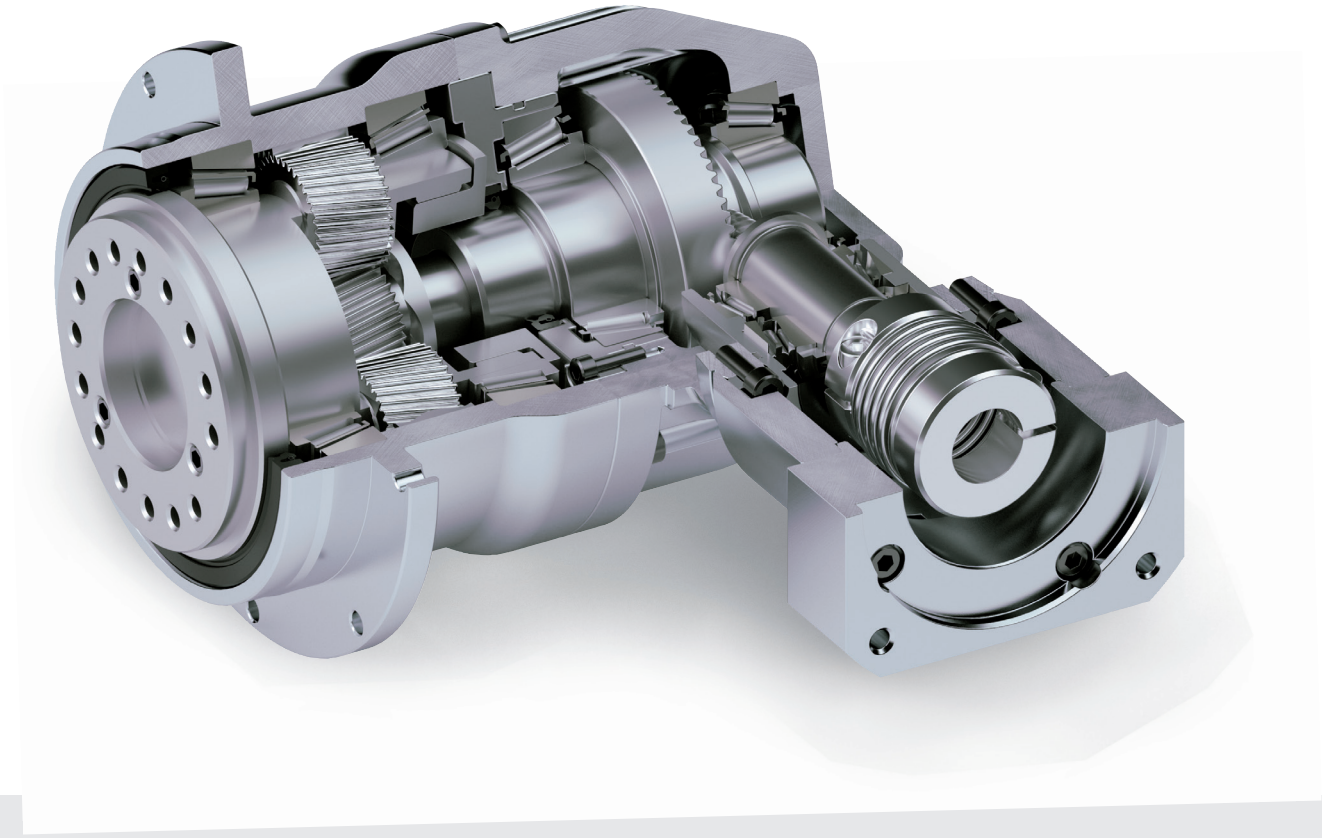
Configuration L
Solid shaft version



Configuration LSV
Hollow shaft version

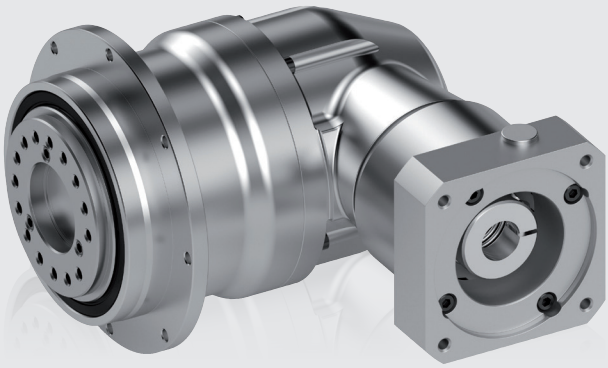


The diverse applications and areas of application in the automation industry have been taken into account in the design of the new EvoGear angular servo gearbox. EvoGear confidently combines superior top quality with product-related cost advantages. In addition, the four different sizes and four different designs as well as 17 transmission ratios offer an optimum solution for almost every application.



Configuration PLS
Solid shaft version with planetary output

Configuration PLT
Solid shaft version with planetary stage and robot flange



EvoGear with Solid Shaft or with Hollw Shaft

Size		EG55	EG75	EG90	EG115	EG55	EG75	EG90	EG115
Ratio	**i**	**3/4/5/6/8/10**				**12/15**			
Output torque									
Nominal torque	T2N [Nm]	35	70	140	260	25	50	95	180
Max. accelration torque *4	T2B [Nm]	53	105	210	390	38	75	143	270
Emergency stop torque *3	T2Not [Nm]	70	140	280	520	50	100	190	360
Maximum input speed *6	n1max [min–1]	6000	6000	5000	4000	6000	6000	5000	4000
Nominal input speed	n1N [min–1]	3100	2400	2100	1820	3800	2900	2600	2250
Backlash *1	jt [arcmin]	<5	<5	<4	<4	<5	<5	<4	<4
Backlash stiffness at the output *5	Ct21 [Nm/arcmin]	2,1	4,2	10,5	23,4	2,1	4,2	10,5	23,4
Radial force *2	F2Rmax [N]	3300	4900	7200	10000	3300	4900	7200	10000
Axial force *2	F2Amax [N]	1650	2450	3600	5000	1650	2450	3600	5000
Efficiency rating at full load	h [%]	>96	>96	>96	>96	>93	>93	>93	>93
Noise level (n1=3000 min–1)	LpA [dB(A)]	<66	<66	<68	<68	<66	<66	<68	<68
Weight approx.	m [kg]	2,9	4,8	8,6	13,3	2,9	4,8	8,6	13,3

Service life (SL) [h]	>30 000 S5-Lastkollektiv als Auslegungsgrundlage >30 000 based operation mode S5
Lubrication	Lebensdauerschmierung, geschlossenes System Lifetime lubrication, closed system
Mounting position	beliebig any
Operating temperature	-10°C bis +90°C -10°C to +90°C
Paint	Grundierung RAL 9005 - schwarz matt Primary coated RAL 9005 - black
Ex-protection	Ex II 2 G/D EEx c k IIB T4
Type of protection	IP 64

*1) At the output, at 2 % load or max. 10 Nm
*2) Resulting force centre of output shaft at output speed 400 min-1
*3) Max 1000 times during the service life of the gearbox
*4) At max 1000 cycles per hour, please consider reducing factor in other cases
*5) At nominal torque, without coupling
*6) Observe permissible operating temperatures

Mass moment of inertia see page 27

EvoGear with Planetary Output

Size		Ratio i	EG55	EG75	EG90	EG115
Output toque						
Maximum torque *4	T2M [Nm]	16	165	390	840	1850
Max. acceleration torque *4	T2B [Nm]		165	390	840	1850
Nominal torque	T2N [Nm]		80	200	380	850
Emergency stop torque *3	T2Not [Nm]		250	625	1250	2750
Maximum torque *4	T2M [Nm]	20	165	390	840	1850
Max. acceleration torque *4	T2B [Nm]		165	390	840	1850
Nominal torque	T2N [Nm]		86	220	410	910
Emergency stop torque *3	T2Not [Nm]		250	625	1250	2750
Maximum torque *4	T2M [Nm]	25	165	390	840	1850
Max. acceleration torque *4	T2B [Nm]		165	390	840	1850
Nominal torque	T2N [Nm]		106	280	590	1100
Emergency stop torque *3	T2Not [Nm]		250	625	1250	2750
Maximum torque *4	T2M [Nm]	28/35/40/50/70	165	390	840	1850
Max. acceleration torque *4	T2B [Nm]		165	390	840	1850
Nominal torque	T2N [Nm]		118	280	590	1300
Emergency stop torque *3	T2Not [Nm]		250	625	1250	2750
Maximum torque *4	T2M [Nm]	100	145	370	730	1750
Max. acceleration torque *4	T2B [Nm]		112	292	610	1350
Nominal torque	T2N [Nm]		88	220	440	930
Emergency stop torque *3	T2Not [Nm]		200	500	1000	2200
Maximum input speed *6	n1max [min-1]	16-100	8000	8000	7000	6000
Nominal input speed	n1N [min-1]	16-100	2700	2700	2600	2100
Backlash *1	jt [arcmin]	16-100	<5	<4	<4	<4
Backlash stiffness at the output PLS *5	Ct21 [Nm/arcmin]	16-100	10	31	60	175
Backlash stiffness at the output PLT *5	Ct21 [Nm/arcmin]	16-100	27	64	143	430
Radial force PLS *2	F2Rmax [N]	16-100	4300	7000	10000	19000
Axial force PLS *2	F2Amax [N]	16-100	3900	6300	9000	17000
Radial force PLT *2	F2Rmax [N]	16-100	3300	12000	19000	40000
Axial force PLT *2	F2Amax [N]	16-100	1700	8800	14000	30000
Efficiency rating at full load	h [%]	16-100	>94	>94	>94	>94
Noise level (n1=3000 min-1)	LpA [dB(A)]	16-100	<68	<68	<70	<70
Weight PLS approx.	m [kg]	16-100	5,0	9,9	19,5	38,0
Weight PLT approx.	m [kg]	16-100	5,2	9,7	18,0	41,0

Service life (SL) [h]	>20 000 based operation mode S5
Lubrication	Lifetime lubrication, closed system
Mounting position	any
Operating temperature	+ 90°C
Farbanstrich Paint	Primary coated RAL 9005 - black + silver
Schutzart Type of protection	IP64

EvoGear with Solid Shaft, Hollw Shaft or with Planetary Gear and Solid Shaft at the Output

Size	Øa	c	o	e	f_1	g_1	t_1
EG55	87	36	9	□60	133	4,5	20
EG75	110	42	14	Ø82	156	4,5	27
EG90	134	52	18	Ø90	182	4,5	33
EG115	162	63	23	Ø114	209,5	6,0	40

Size	Type	$Ød_1$	l_1	$□u_1$	$Øv_1$	$Øw_1^{F7}$	s
EG55	V1	9	23	60	63	40	M4
	V2	11	26	75	75	60	M5
	V3	14	33	75	75	60	M5
EG75	V1	11	26	75	75	60	M5
	V2	14	33	75	75	60	M5
	V3	19	43	90	100	80	M6
EG90	V1	14	33	90	100	80	M6
	V2	19	43	90	100	80	M6
	V3	24	53	115	130	110	M8
EG115	V1	19	43	115	130	110	M8
	V2	24	53	115	130	110	M8
	V3	32	63	140	165	130	M10

Output with Solid Shaft

Size	$Ød_{2k6}$	l_2	f_2	n2	r_2 *1	x_2	g_2	t_2	$Øk_2$	p_2	$□u_2$	$Øv_2$	$Øw2_{g6}$
EG55	20	35	87,0	1,5	M6	37	13,5	9	6,6	39	90	110,3	89
EG75	24	40	100,0	2,5	M8	45	12,5	11	9,0	49	115	138,6	105
EG90	32	50	122,5	2,0	M12	58	12,5	14	11,0	59	140	166,9	125
EG115	40	60	149,0	3,0	M16	71	15,0	17	13,5	75	170	203,6	150

Output with Solid Shaft *2

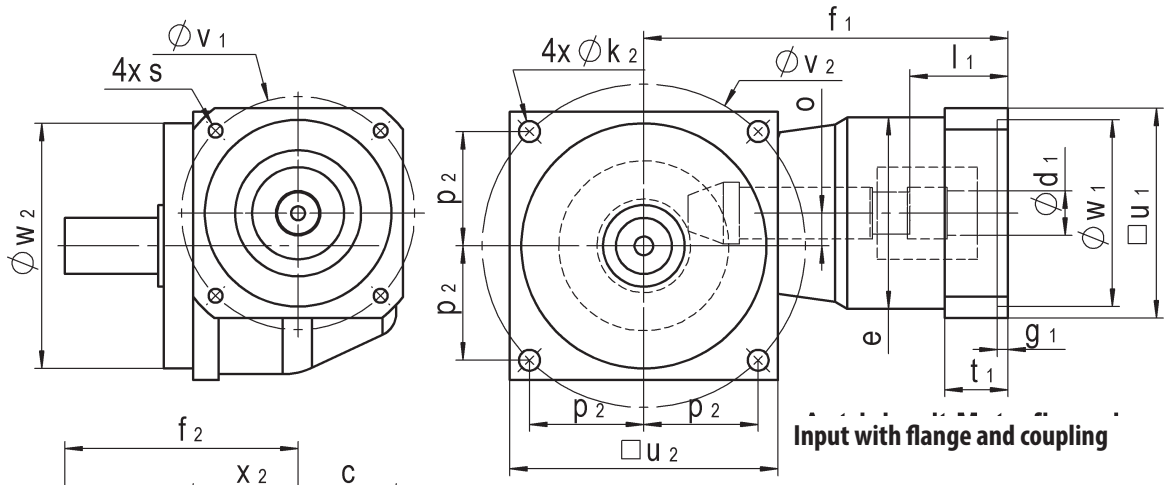
Size	$Ødw^{H7}$	$Ød_{sf7}$	h_0	h_1	f_s	m_2
EG55	20	24	20	26,5	64,5	52,0
EG75	25	30	22	27,0	71,0	60,0
EG90	30	36	26	33,0	87,0	72,5
EG115	40	50	29	37,0	102,0	89,0

Output with Planetary Gear and Solid Shaft *3

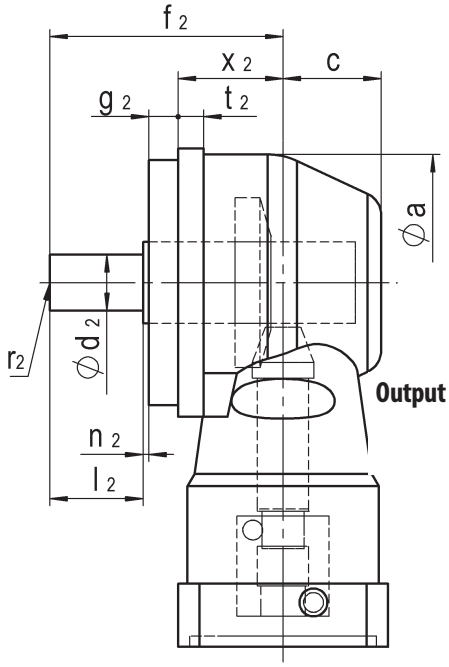
Size	$Øa_p$	$Øb_p$	$Ød_{p\ j6}$	l_p	f_p	r_p *1	$□u_p$	$Øv_p$	$Øw_{p\ g6}$	x_p	t_p	g_p	$Øk_p$
EG55	89	89	22	36	167,0	M8	75	85	70	111,0	7	6	6,6
EG75	115	120	32	58	213,0	M12	100	120	90	125,0	10	8	9,0
EG90	142	150	40	82	263,5	M16	140	165	130	151,5	12	10	11,0
EG115	181	200	55	82	300,5	M20	180	215	160	188,5	15	12	13,5

*1) According to D DIN 332
*2) Extended shaft for the shrink disk (e.g. Stüwe–Typ HSD 22). Delivery with shrink disk on request
*3) Optionally with parallel key according to DIN 6885-1

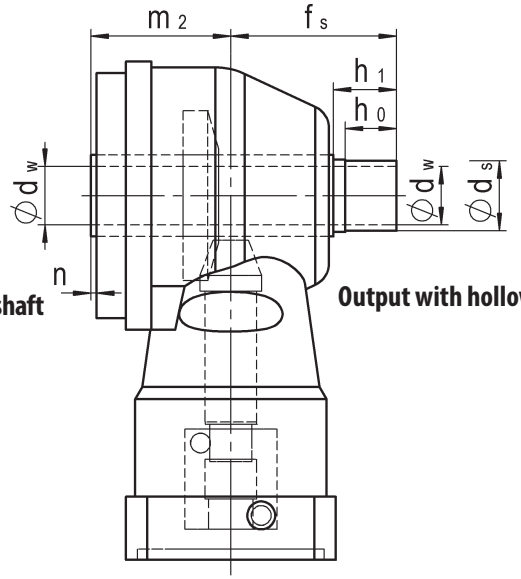
EvoGear with Solid Shaft, Hollw Shaft or with Planetary Gear and Solid Shaft at the Output



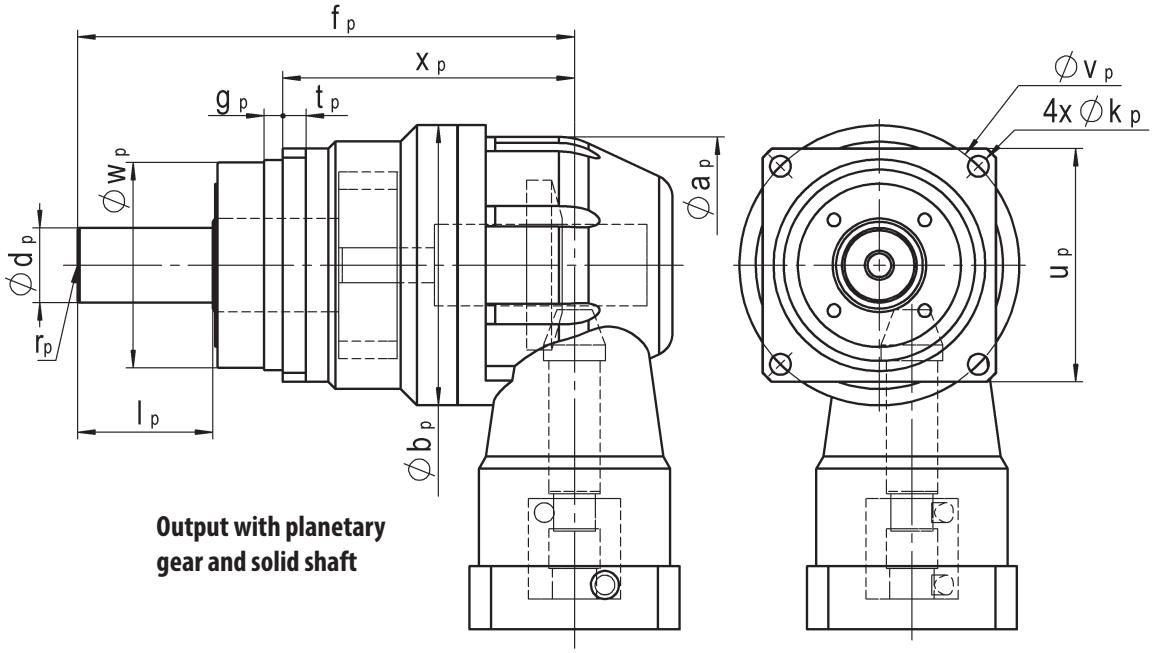
Input with flange and coupling



Output with solid shaft



Output with hollow shaft



Output with planetary gear and solid shaft

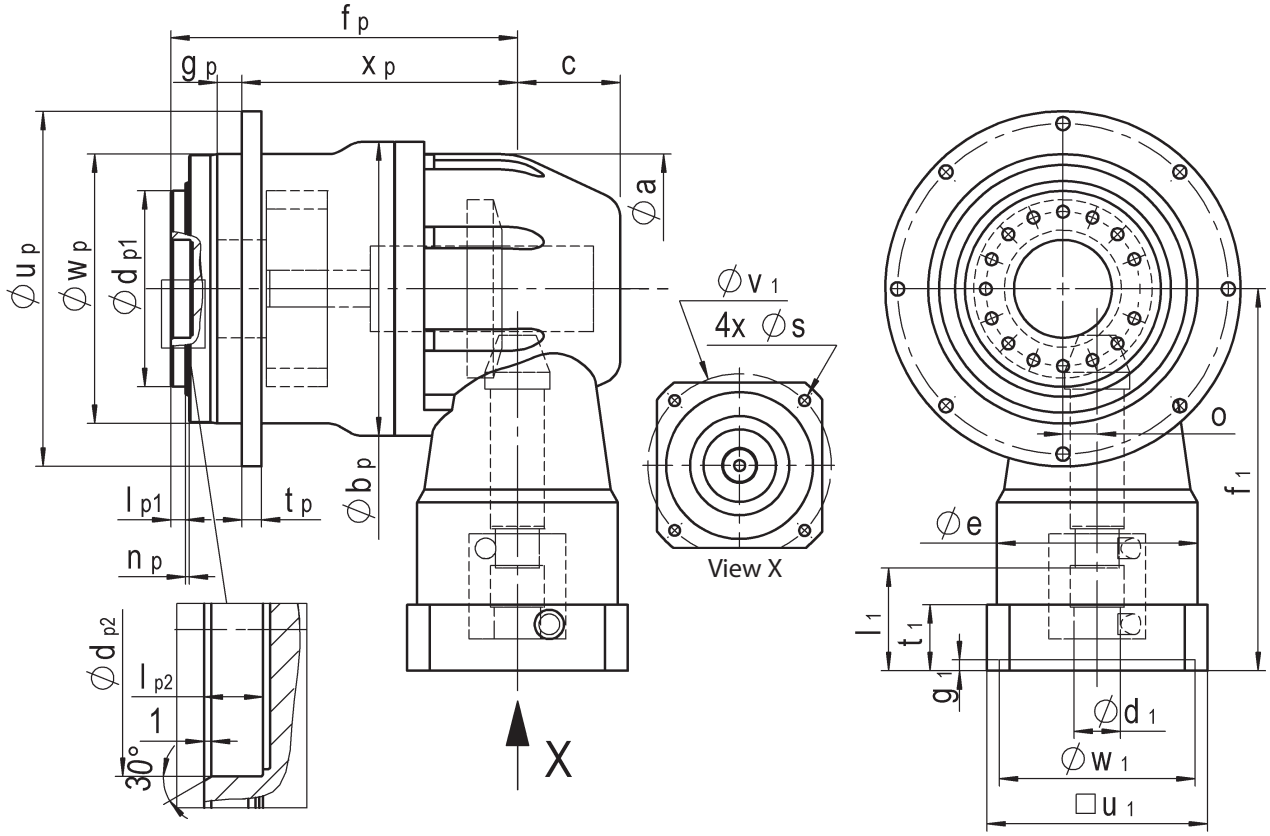
EvoGear with Planetary Gear and Robot Flange

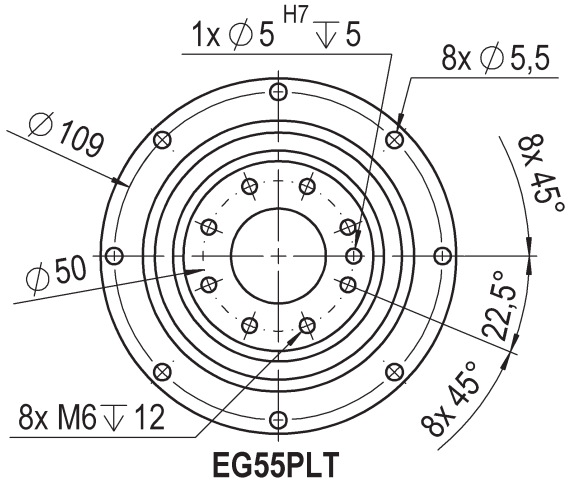
Size	$Øa_p$	x_p	x	c	o	e	f_1	g_1	t_1
EG55	89	72,5	37	36	9	□60	133	4,5	20
EG75	115	112,5	45	42	14	Ø82	156	4,5	27
EG90	142	126,0	58	52	18	Ø90	182	4,5	33
EG115	181	159,0	71	63	23	Ø114	209,5	6,0	40

Size	Type	$Ød_1$	l_1	$□u_1$	$Øv_1$	$Øw_1^{F7}$	s
EG55	V1	9	23	60	63	40	M4
	V2	11	26	75	75	60	M5
	V3	14	33	75	75	60	M5
EG75	V1	11	26	75	75	60	M5
	V2	14	33	75	75	60	M5
	V3	19	43	90	100	80	M6
EG90	V1	14	33	90	100	80	M6
	V2	19	43	90	100	80	M6
	V3	24	53	115	130	110	M8
EG115	V1	19	43	115	130	110	M8
	V2	24	53	115	130	110	M8
	V3	32	63	140	165	130	M10

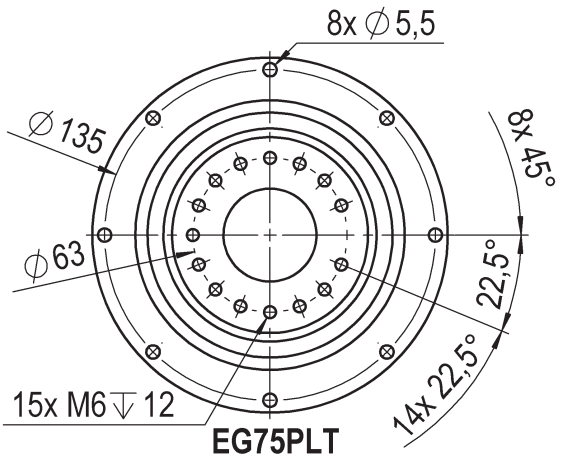
Size	$Ød_{p1\ h7}$	l_{p1}	f_p	$Ød_{p2}^{F7}$	l_{p2}	$Øu_p$	$Øw_{p\ h7}$	t_p	g_p	$Øb_p$
EG55	63	6	102,5	31,5	6	118	90	7	10	89
EG75	80	6	141,5	40,0	8	145	110	8	10	120
EG90	100	6	164,0	50,0	10	179	140	10	14	150
EG115	160	8	209,0	80,0	16	247	200	12	15	208

EvoGear with Planetary Gear and Robot Flange

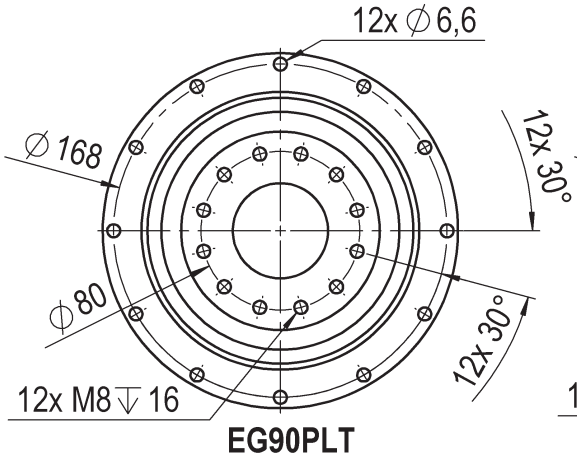




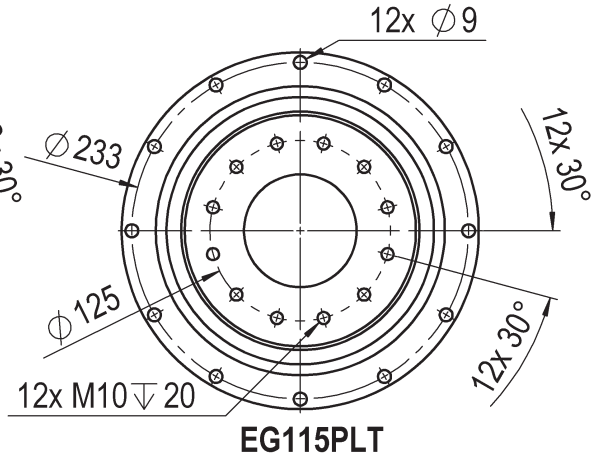
EG55PLT



EG75PLT



EG90PLT



EG115PLT

Operation mode S5 duty cycle (DC) < 60 % and run time (RT) < 20 min

Maximum existing motor acceleration torque T_{1BMot} [Nm]

↓

Calculate the maximum existing acceleration torque at the gearbox output

$T_{2Bmax\ exist.} = T_{1BMot} \times i$ [Nm]

↓

Compare the maximum existing acceleration torque at the gearbox output with the permissible acceleration torque at the gearbox output

$T_{2Bmax\ exist.} \leq T_{2Bperm.} \times k$

↓

Existing average speed $n_{1\ exist.} \leq$ nominal speed n_{1N} Valid for an average torque of 30 % of the permissible output torque T_{2N}

↓

Compare the motor dimensional details such as □ flange size, shaft diameter and shaft length with the gearbox dimensions □u, d_1, l_1 [mm]

↓

Compare the radial and axial shaft load with the maximum permissible values

$F_{2Rexist.} \leq F_{2Rmax}$ [N] $F_{2Aexist.} \leq F_{2Amax}$ [N]

These are guide values, dependent on additional loads. Upon request we calculate these values individually.

For continuous operation S1, please contact us.

Reduction factor k for high number of cycles

Configurations		~1k cycles/h	~1-3k cycles/h	~3-5k cycles/h	~5-7k cycles/h
L / LSV	-	1	0,8	0,6	0,5
PLS / PLT	< 1 h/day	1,00	0,85	0,75	0,75
PLS / PLT	< 8 h/day	0,75	0,65	0,65	0,55
PLS / PLT	< 16 h/day	0,70	0,60	0,55	0,40
PLS / PLT	< 24 h/day	0,65	0,55	0,40	0,35

Example: Positioning drive

Given:

Servo motor T_{1Bmax} = 16 Nm
Ratio i = 8:1
No of cycles 2000/h

Selection:

$T_{2B\ max.\ vorh.}$ = 16 Nm x 8 = 128 Nm
Gearbox EG90 8:1 1L
$T_{2B\ max\ vorh.} \leq T_{2B\ zul} \times k$
128 Nm ≤ 210 Nm x 0,8 = 168 Nm

Connection dimensions
Motor: Flange □105 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm
Gearbox: Flange □115 mm, shaft d_1 = Ø 19 mm, l_1 = 40 mm

Selected: **EG90 8:1 1L**

Mass moment of inertia I_1 related to input [kgcm^2] without coupling

EvoGear L + LSV

Ratio i	EG55	EG75	EG90	EG115
3:1	0,376	0,958	2,35	6,82
4:1	0,275	0,715	1,73	4,92
5:1	0,224	0,577	1,41	3,84
6:1	0,217	0,529	1,42	3,62
8:1	0,177	0,440	1,13	2,84
10:1	0,157	0,396	0,99	2,47
12:1	0,146	0,366	0,91	2,27
15:1	0,135	0,345	0,85	2,10

EvoGear PLS

Ratio i	EG55	EG75	EG90	EG115
16:1	0,302	0,829	2,20	6,43
20:1	0,241	0,649	1,71	4,81
25:1	0,238	0,629	1,65	4,57
28:1	0,292	0,772	2,00	5,74
35:1	0,235	0,613	1,58	4,37
40:1	0,182	0,462	1,20	3,11
50:1	0,160	0,410	1,03	2,64
70:1	0,160	0,406	1,02	2,59
100:1	0,159	0,404	1,01	2,57

EvoGear PLT

Ratio i	EG55	EG75	EG90	EG115
16:1	0,321	0,904	2,44	8,19
20:1	0,253	0,698	1,86	5,93
25:1	0,246	0,666	1,76	5,33
28:1	0,298	0,804	2,09	6,38
35:1	0,239	0,634	1,64	4,77
40:1	0,185	0,476	1,24	3,41
50:1	0,162	0,419	1,06	2,84
70:1	0,161	0,411	1,03	2,70
100:1	0,160	0,407	1,02	2,63

EG	—	55	—	20.1	—	PLS	—	xxx
1.		2.		3.		4.		5.

1. Gearbox Series EG = EVOGEAR

2. Size Page 6 + 7

3. Ratio Page 6 + 7

4. Configuration

L - Solid shaft	Page 8 - 9
LSV - Hollow shaft	Page 8 - 9
PLS - Planetary gear and solid shaft	Page 8 - 9
PLT - Planetary gear and robot flange	Page 10 - 11

5. Additional Data

- Max. input speed of application
- Options - if required
- Customized design - if required

Please enclose motor data sheet!

Please note that

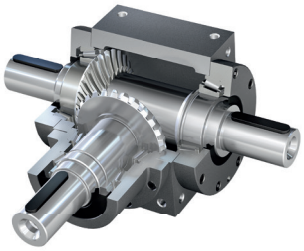
All information contained in this catalogue is provided without guarantee and is not binding. In particular, dimensions and values only provide guidance. Any exact, specific requirements must be agreed with us. Specifications and features listed in the catalog are subject to a written contract.

BEVELGEAR

Spiral, Hypoid and Zerol Bevel Gears

- Standard range of products and custom-made versions
- Module ms from 0.5 to 12
- Diameters up to 410 mm
- Shaft angles from 10° to 170°
- More than 60 years of experience
- In-house gearing calculations
- We manufacture to your drawing or advise you of possible alternatives
- Milled or ground gear tooth cutting

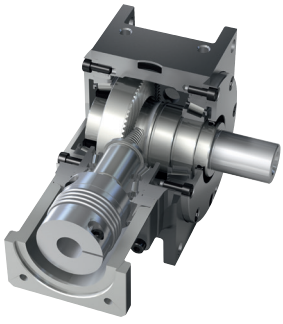
POWERGEAR



The High Performance Bevel Gearbox

- High torque, small size
- For highest input speeds
- Ratios from i = 1:1 to 5:1
- Torques up to 7000 Nm
- Output via solid and hollow shaft
- Motor mounting either directly or via coupling and lantern
- Variable ratios and uniform dimensions

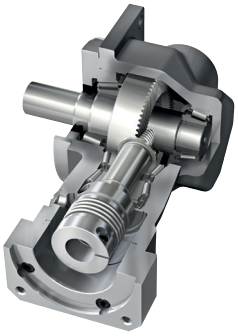
DYNAGEAR



The Highly Dynamic Servo Right-angle Gearbox

- Hypoid gearing
- High input speeds at medium to high torques
- Ratios single-stage i = 3:1 to 30:1
- Ratios, two-stage , up to 150:1
- Torques up to 1440 Nm
- Flexible motor mounting via coupling and lantern
- Low backlash < 2 arcmin
- Variable ratios and uniform dimensions

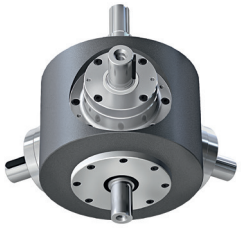
DYNAGEAR



The Cost-effective Servo Right-angle Gearbox

- Hypoid gearing
- High input speeds at medium torques
- Ratios single-stage i= 5:1, 8:1, 10:1 and 15:1
- Torques up to 260 Nm
- Flexible motor mounting via coupling and flange
- Backlash < 6 arcmin
- Variable ratios and uniform dimensions

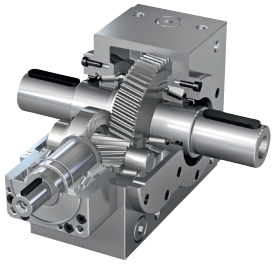
DESIGNGEAR



The Customised Gearbox

- Single-stage gearbox available as gear-change or reversing gearbox
- Forced oil circulation lubrication system gearbox for high speeds and torques
- Labyrinth sealed gearbox with an efficiency of > 99%
- Special gearbox with additional functional elements
- Endless possibilities on request

KS TWINGEAR



The Bevel Helical Gearbox

- Two-stage bevel helical gearbox with ratios of up to 75:1
- Torques up to 7500 Nm
- Torsional backlash < 6 arc min
- Compact design
- Motor mounting either directly or via coupling and lantern
- High torsional stiffness
- High input speeds at high torques
- Variable ratios and uniform dimensions

Nidec

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