ELECON
HIGH SPEED GEAR UNITS

ELECON
GEARING THE FUTURE

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Catalogue No.: 128/G/06/11/R2

Standard design

Design:

The gear unit can be constructed with the low-speed shaft offset to the left (arrangement I) or to the right (arrangement II).

Materials:

Grey cast iron is used for the gear unit casing. Pinion and wheel are of case-hardening steel.

Gear cutting:

The single (TAD) and double (T A) helical teeth are case-hardened and ground and modified for the most favourable meshing conditions.

Bearings:

The shafts run in plain bearings, the pinion shaft bearings being adjustable multi-slide bearings.

Lubricating oil system:

Tooth mesh and plain bearings have forced-feed lubrication.

The oil is provided by a gear-type oil pump attached to the wheel shaft or by a separate oil pump unit. As the 'Gjuantity of lubricating oil cannot be absorbed by the casing, a separate oil collecting tank is required. The frictional heat generated in the gear unit is dissipated by an oil filter cooler in the oil circuit, its filter can be disconnected and cleaned during operation.

Direction of rotation:

The input and output shafts rotate in opposite directions. The gear unit can be supplied for either direction of rotation. However, the gearing is run-in only in the direction specified in the order.

Efficiency:

Depending on power, ratio and speed an efficiency of 97.8 to 98.&3% under full load can be achieved.

Extent of supply

The gear unit of standard design is supplied completely assembled. The following instruments are supplied fitted to the gear unit or as separate items: 1 oil circulation indicator with thermometer for each bearing seat, 1 pressure gauge and thermometer each on the oil feed, and 2 measuring cylinders at the gear casing to be used for checking the internal alignment of the gear unit. These items form part of the basic unit. It is recommended that further supervisory elements, such as contact thermometers, flow detectors, thermocouples, etc. be fitted.

Additional items

The following additional items can be supplied: Built-on oil pump, separate oil pump, separate oil pump aggregate, oil filter cooler, turning drives, pinion bearing with double-eccentric adjusting device for correcting alignment, built-in segment thrust bearing, forged-on or fitted coupling flanges at the shaft ends, transmitters for optical or acoustic remote checking, etc.

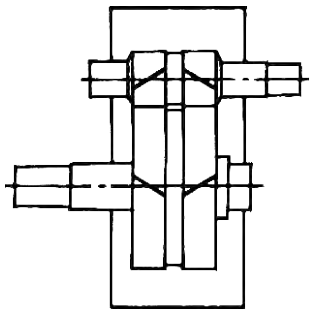
(All devices manufactured to Elecon works standard.)

The data correspond to the situation at the time this data sheet was printed.

Elecon High-Speed gear... the flexible TA system

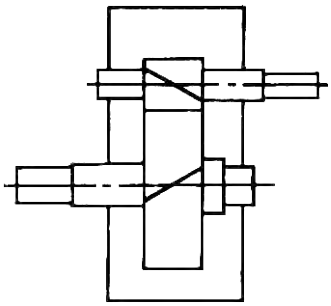
Alternative gearing arrangements

a.
TA



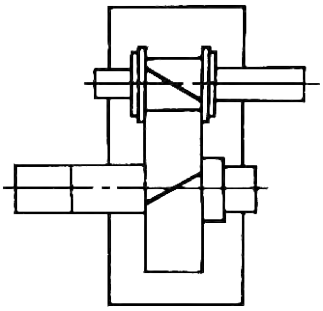
Double-helical gearing

b.
TAE



Single-helical gearing

c.
TAD

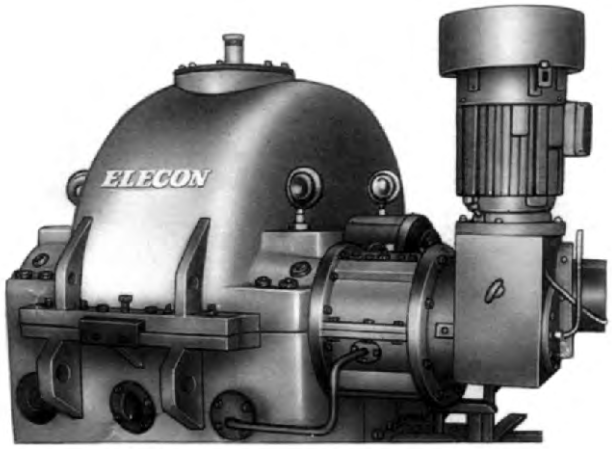


Single-helical with thrust collar gearing

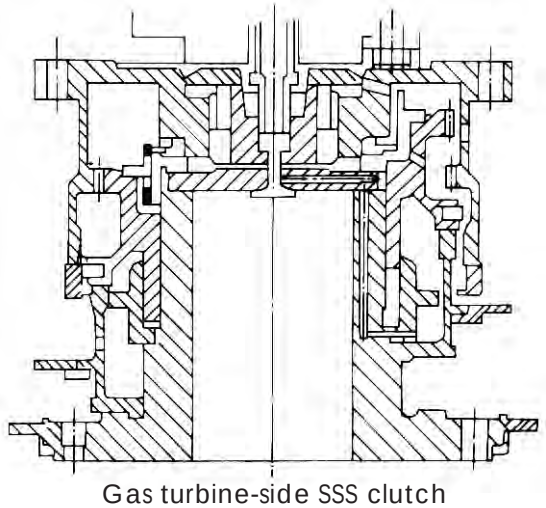
The main feature of these Elecon High-speed gear is that the teeth of the gearing are case-hardened and machined to the highest standards of accuracy. The high quality of the gearing, with tooth profile and tooth angle correction, makes it possible to achieve exceptionally high pitchline speeds, even beyond 200 m/s, with power transmissions from a few hundred kilowatts to as high as 150,000 kW.

The Elecon Tax high-speed gears are extremely flexible in their dimensions. Such flexibility is only possible using the most modern design and layout methods and through the flexibility that is possible when using welded gear cases.

Elecon accessories for TA gears



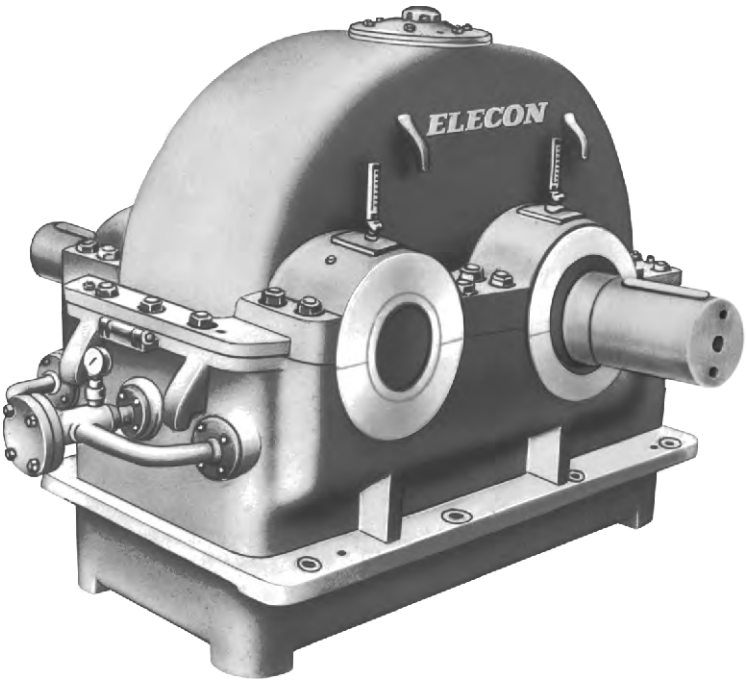
Elecon turn drive



Gas turbine-side SSS clutch

Turbo gear unit

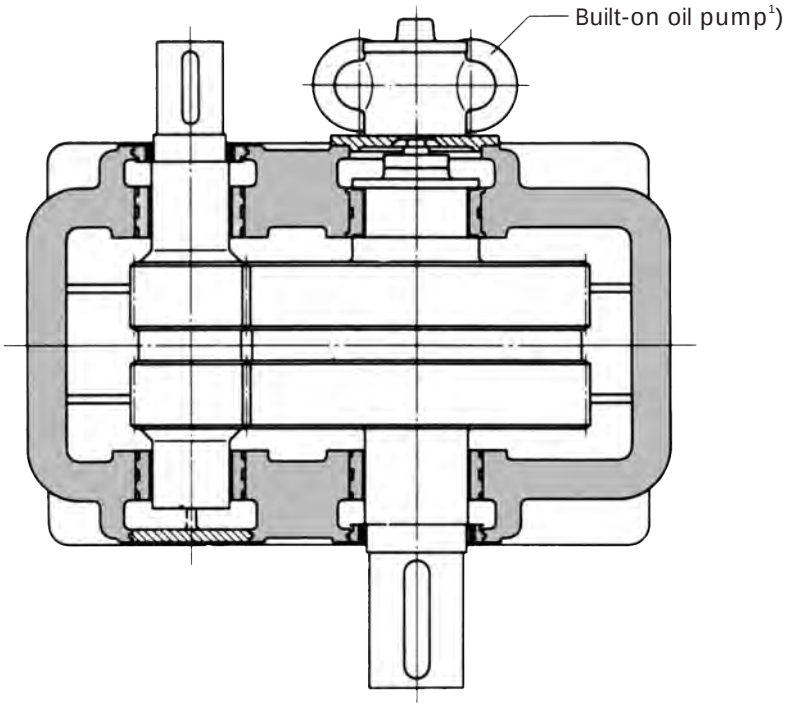
single-stage, with horizontally offset shaft



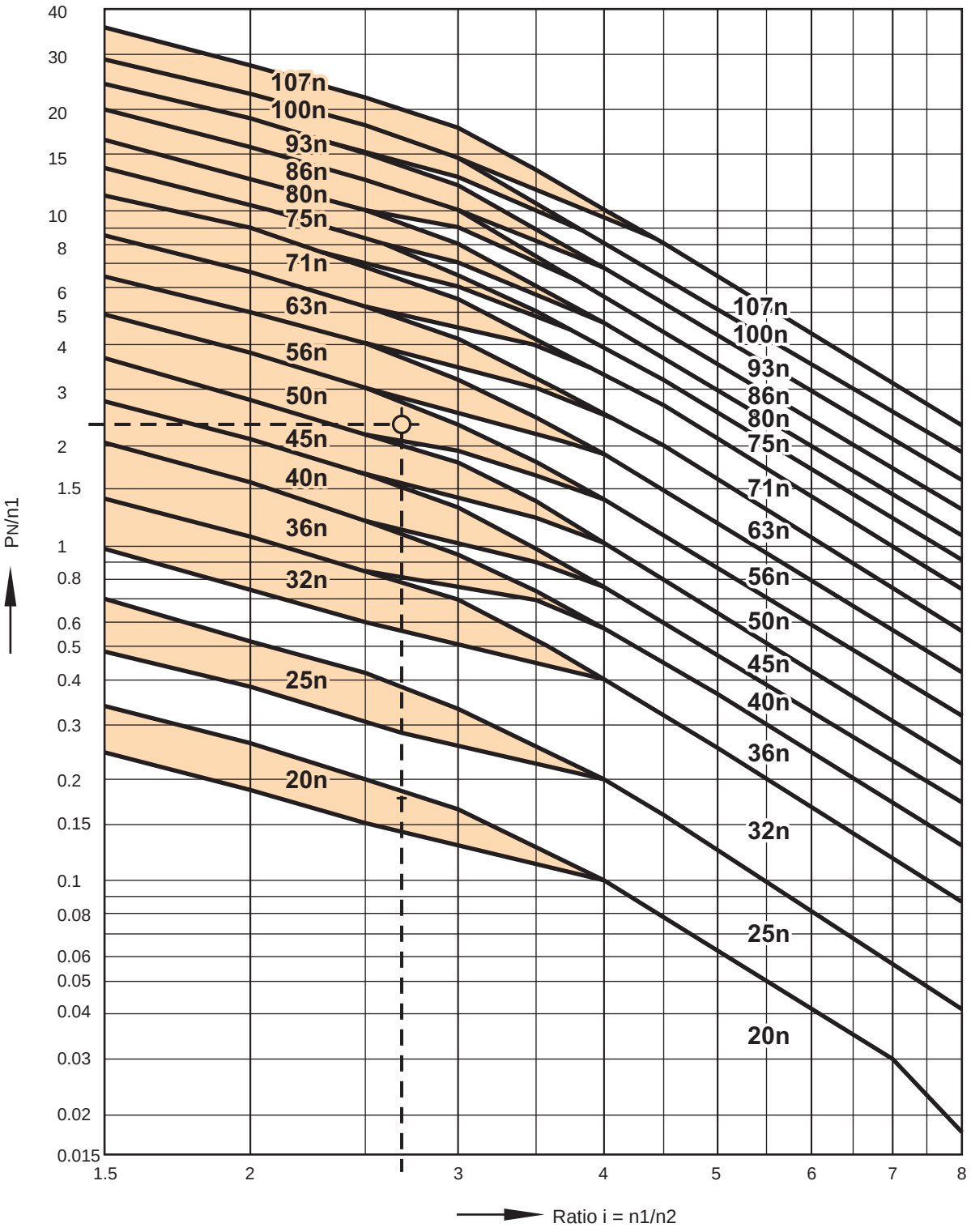
The TA turbo gear unit is a single-stage step-up or reduction gear unit with horizontally offset input and output shafts. It is designed as a double helical gear unit. High gearing quality and tooth flank modification adapted to actual tooth load allow for extremely high pitch line velocities.

The standard design »n« with normal tooth width is intended mainly for medium and high transmission ratios. The standard design »b« with enlarged tooth width is used for medium and small transmission ratios.

The gear unit is used in high-speed plants, such as turbo generators, turbo compressors, turbo blowers, boiler feed pumps, etc. and is therefore of a particularly vibration-resistant, sound-damping design.



Selection of suitable gear size.

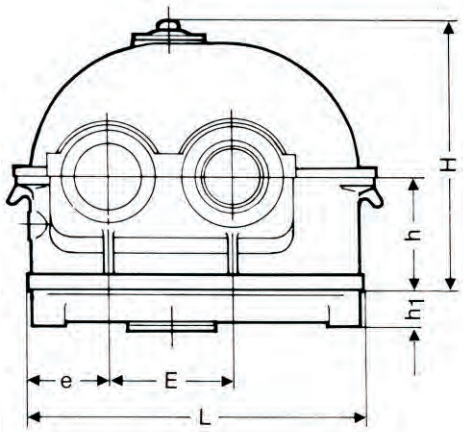


Designed power $P_N = P_{10} \cdot K_I$

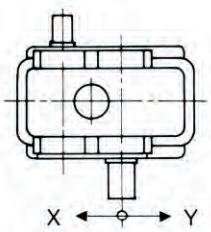
Example : Take rated power[1]) at the high-speed shaft P10 = 9300 kW, service factor KI = 1.00
high-speed shaft n1 = 4050 r.p.m., low-speed shaft n2 = 1500 r.p.m.
Suitable size TA 50 b

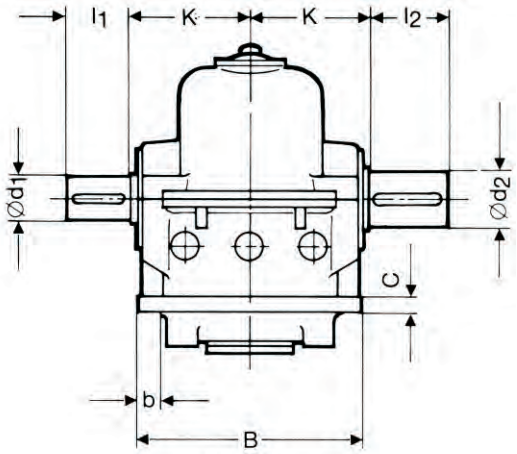
1) Largest average of the power demanded of the gear unit by the machine for normal continuous operation.

TA Dimension table

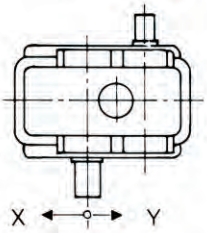


Arrangement I





Arrangement II



Dimensions and details subject to technical development.
The right of modification is reserved.

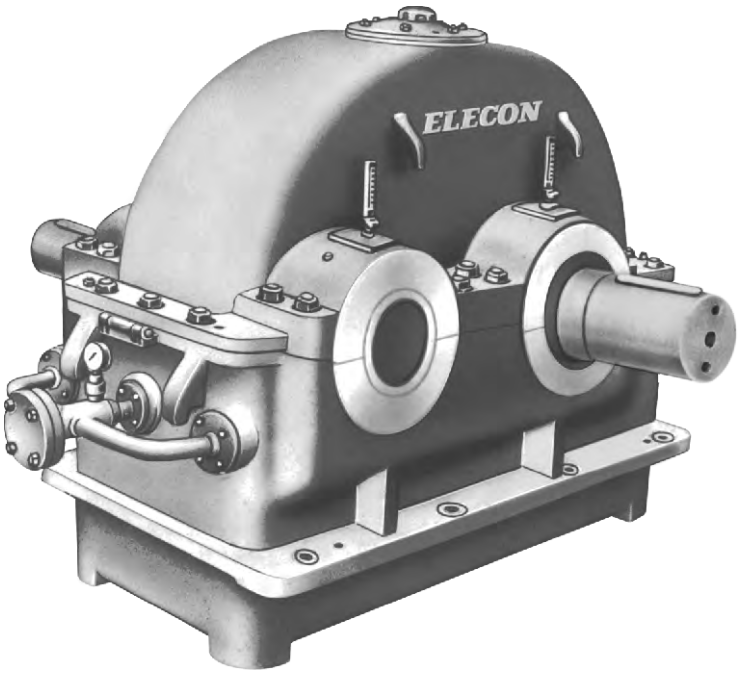
Shaft ends : fits n6, basic-hole system DIN 7161
Keys and keyways to DIN 6885, sheet 1.

Size TA	Dimensions in mm														Weight
	B	b	c	E	e	H	h	h1	K	L	d_1 [1] max.	l_1 [1] max.	d_2 max.	l_2 max.	kg.
20 n	480	70	25	200	160	500	240	70	225	600	65	95	75	110	440
25 n	560	80	30	250	190	600	280	90	270	740	80	120	95	140	680
32 n	660	90	35	320	210	710	320	110	320	900	100	150	120	180	1020
36 n	720	95	40	360	220	790	360	120	350	990	110	160	135	200	1300
40 n	770	100	40	400	240	870	400	140	380	1100	130	190	155	230	1700
45 n	810	105	45	450	255	950	420	160	400	1220	140	210	170	250	2250
50 n	900	110	45	500	270	1040	450	180	445	1350	160	230	190	280	3000
56 n	970	120	50	560	290	1150	500	200	485	1490	170	250	215	320	3900
63 n	1040	130	55	630	320	1240	530	250	505	1650	190	280	240	350	5200
71 n	1080	140	60	710	340	1350	560	300	545	1820	205	300	240	350	6900
75 n	1160	150	65	750	385	1470	600	350	600	2010	230	340	270	400	8700
80 n	1160	150	65	800	360	1470	600	350	600	2010	230	340	270	400	9200
86 n	1240	160	70	860	410	1610	630	400	635	2220	260	380	305	450	11500
93 n	1240	160	70	930	375	1610	630	400	635	2220	260	380	305	450	12500
100 n	1360	180	80	1000	455	1820	710	450	700	2570	300	450	345	500	16000
107 n	1360	180	80	1070	420	1820	710	450	700	2570	300	450	345	500	17500
20 b	550	100	30	200	195	540	300	–	280	620	90	130	90	130	560
25 b	660	115	35	250	215	640	340	–	335	755	110	160	110	160	900
32 b	760	115	38	320	260	740	380	20	390	930	130	190	140	210	1420
36 b	840	95	40	360	285	800	400	45	435	1035	150	220	160	240	1650
40 b	940	100	40	400	285	860	420	80	485	1115	140	210	170	250	1900
45 b	980	105	45	450	310	940	450	100	520	1245	160	240	190	280	2550
50 b	1060	110	45	500	335	1025	480	140	560	1360	170	250	220	330	3400
56 b	1160	120	50	560	370	1100	500	180	610	1510	190	280	240	360	4500
63 b	1250	130	55	630	410	1190	530	220	660	1685	210	310	260	390	6000
71 b	1330	140	60	710	450	1315	560	250	695	1895	240	360	275	410	8000
75 b	1460	150	65	750	515	1460	630	280	765	2100	270	400	310	460	9900
80 b	1460	150	65	800	490	1460	630	280	765	2100	270	400	310	460	10500
86 b	1640	170	70	860	590	1615	670	340	855	2400	300	450	350	520	13400
93 b	1640	170	70	930	555	1615	670	340	855	2400	300	450	350	520	14600
100 b	1790	190	80	1000	710	1785	710	400	935	2700	330	490	390	580	19000
107 b	1790	190	80	1070	640	1785	710	400	935	2700	330	490	390	580	20800

1) With smallest ratio

Turbo gear unit

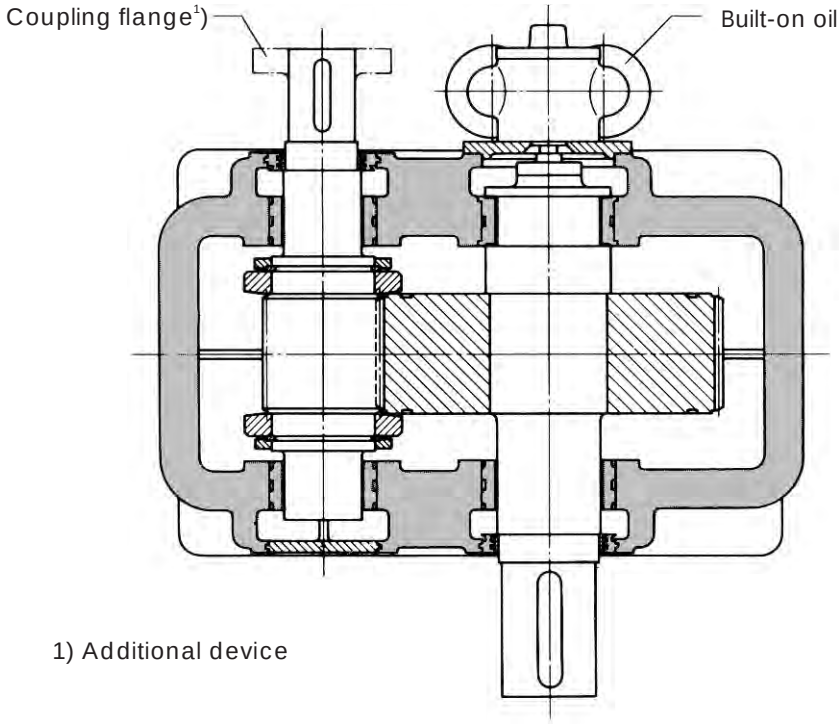
single-stage, with horizontally offset shafts

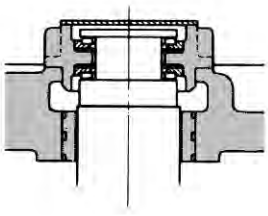


The TAD turbo gear unit is a single-stage step-up or reduction gear unit with horizontally offset input and output shafts. It is designed as single helical gear unit to the original BBC thrust collar technique. The tooth thrust resulting from the helical teeth is being compensated through the thrust collar, nearly without any loss. Thrust from connected machines acting upon the high-speed pinion shaft can be absorbed, without additional load to the teeth, by means of a thrust bearing located at the low-speed shaft. High gearing quality and tooth flank modification adapted to actual tooth load allow for quiet running and high working safety also in the case of high pitch line velocities.

The standard design »n« with normal tooth width is intended mainly for medium and high transmission ratios. The standard design »b« with enlarged tooth width is used for medium and small transmission ratios.

The gear unit is used in high-speed plants, such as turbo generators, turbo compressors, turbo blowers, boiler feed pumps, etc. and is therefore of a particularly vibration-resistant, sound-damping design.

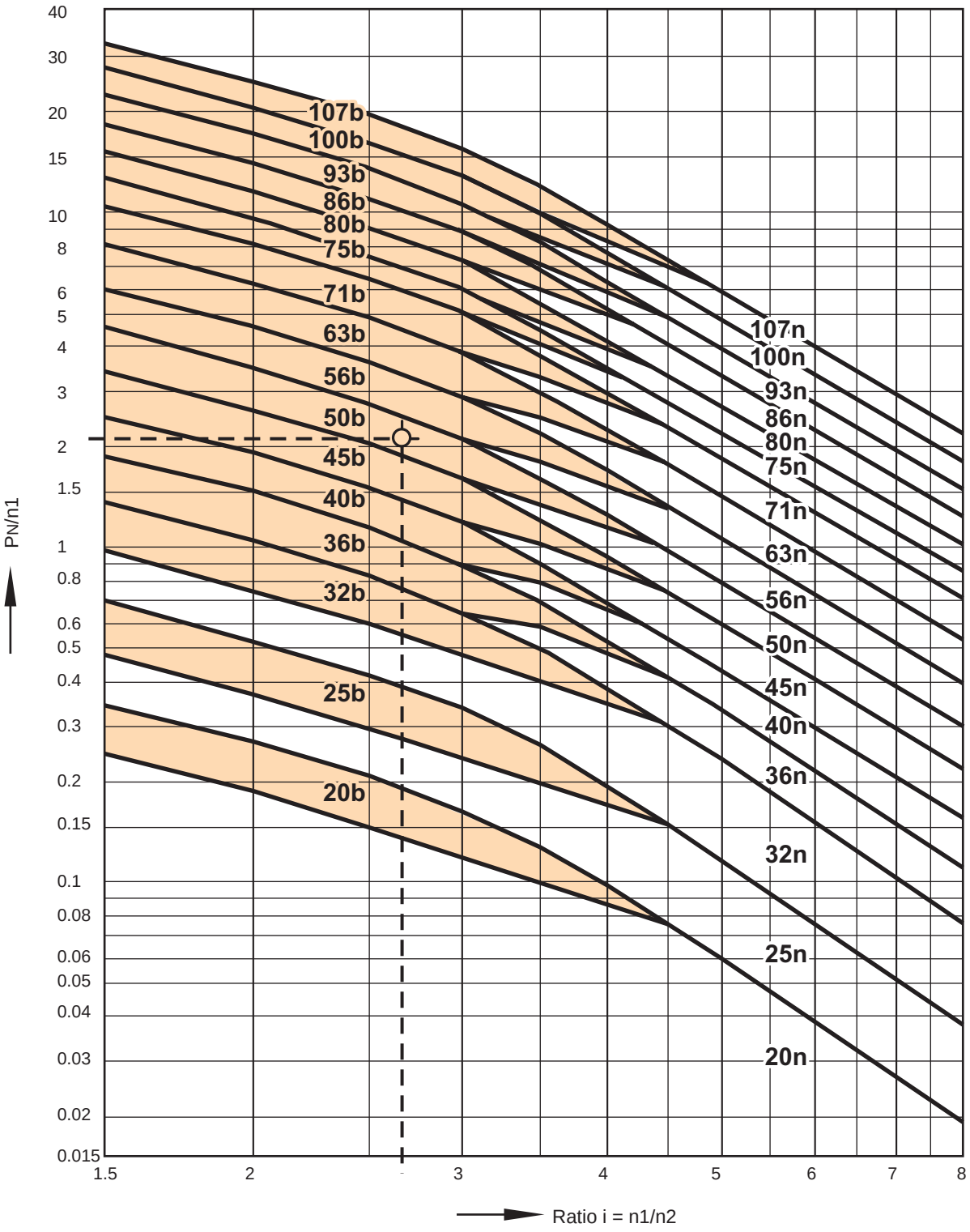




In segment thrust bearing execution[1])

1) Additional device

Selection of suitable gear size.



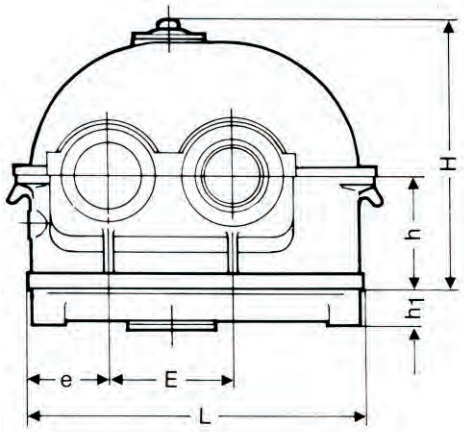
Designed power $P_N = P_{10} \cdot K_I$

Example : Take rated power[1]) at the high-speed shaft P_{10} = 8500 kW, service factor KI = 1.00
high-speed shaft n1 = 4050 r.p.m., low-speed shaft n2 = 1500 r.p.m.

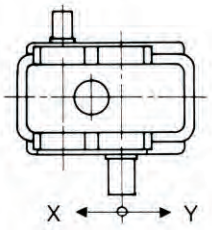
Suitable size TAD 50 b

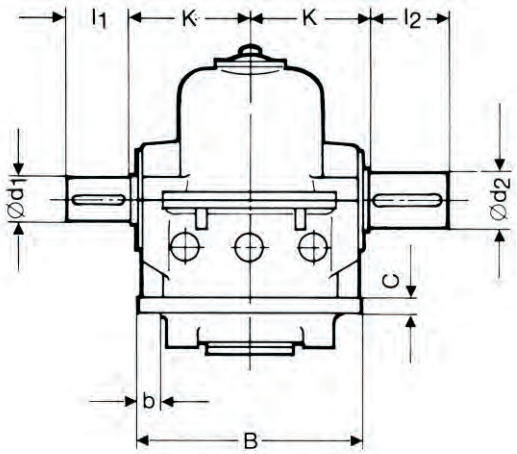
1) Largest average of the power demanded of the gear unit by the machine for normal continuous operation.

TAD Dimension table

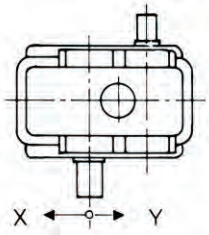


Arrangement I





Arrangement II



Dimensions and details subject to technical development.
The right of modification is reserved.

Shaft ends : fits n6, basic-hole system DIN 7161
Keys and keyways to DIN 6885, sheet 1.

Size TAD	Dimensions in mm														Weight
	B	b	c	E	e	H	h	h1	K	L	d_1 [1] max.	l_1 [1] max.	d_2 max.	l_2 max.	kg.
20 n	480	70	25	200	160	500	240	70	225	600	65	95	75	110	440
25 n	560	80	30	250	190	600	280	90	270	740	80	120	95	140	680
32 n	660	90	35	320	210	710	320	110	320	900	100	150	120	180	1020
36 n	720	95	40	360	220	790	360	120	350	990	110	160	135	200	1300
40 n	770	100	40	400	240	870	400	140	380	1100	130	190	155	230	170
45 n	810	105	45	450	255	950	420	160	400	1220	140	210	170	250	2250
50 n	900	110	45	500	270	1040	450	180	445	1350	160	230	190	280	3000
56 n	970	120	50	560	290	1150	500	200	485	1490	170	250	215	320	3900
63 n	1040	130	55	630	320	1240	530	250	505	1650	190	280	240	350	5200
71 n	1080	140	60	710	340	1350	560	300	545	1820	205	300	240	350	6900
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86 n	1240	160	70	860	410	1610	630	400	635	2220	260	380	305	450	11500
93 n	1240	160	70	930	375	1610	630	400	635	2220	260	380	305	450	12500
100 n	1360	180	80	1000	455	1820	710	450	700	2570	300	450	345	500	16000
107 n	1360	180	80	1070	420	1820	710	450	700	2570	300	450	345	500	17500
20 b	550	100	30	200	195	540	300	–	280	620	90	130	90	130	560
25 b	660	115	35	250	215	640	340	–	335	755	110	160	110	160	900
32 b	760	115	38	320	260	740	380	20	390	930	130	190	140	210	1420
36 b	840	95	40	360	285	800	400	45	435	1035	150	220	160	240	1650
40 b	940	100	40	400	285	860	420	80	485	1115	140	210	170	250	1900
45 b	980	105	45	450	310	940	450	100	520	1245	160	240	190	280	2550
50 b	1060	110	45	500	335	1025	480	140	560	1360	170	250	220	330	3400
56 b	1160	120	50	560	370	1100	500	180	610	1510	190	280	240	360	4500
63 b	1250	130	55	630	410	1190	530	220	660	1685	210	310	260	390	6000
71 b	1330	140	60	710	450	1315	560	250	695	1895	240	360	275	410	8000
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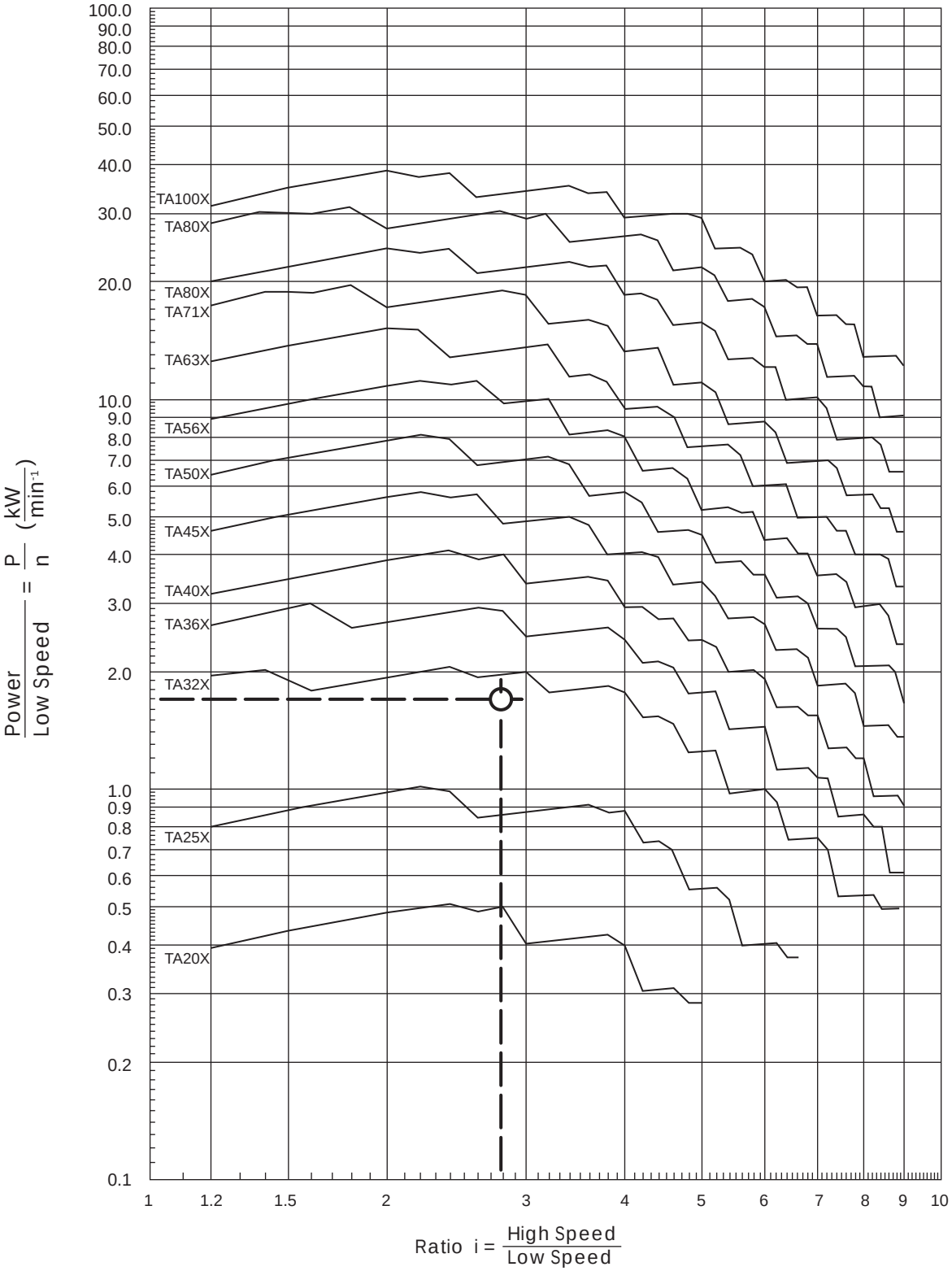
80 b	1460	150	65	800	490	1460	630	280	765	2100	270	400	310	460	10500
86 b	1640	170	70	860	590	1615	670	340	855	2400	300	450	350	520	13400
93 b	1640	170	70	930	555	1615	670	340	855	2400	300	450	350	520	14600
100 b	1790	190	80	1000	710	1785	710	400	935	2700	330	490	390	580	19000
107 b	1790	190	80	1070	640	1785	710	400	935	2700	330	490	390	580	20800

1) With smallest ratio

Diagram for the initial selection of TAX gears

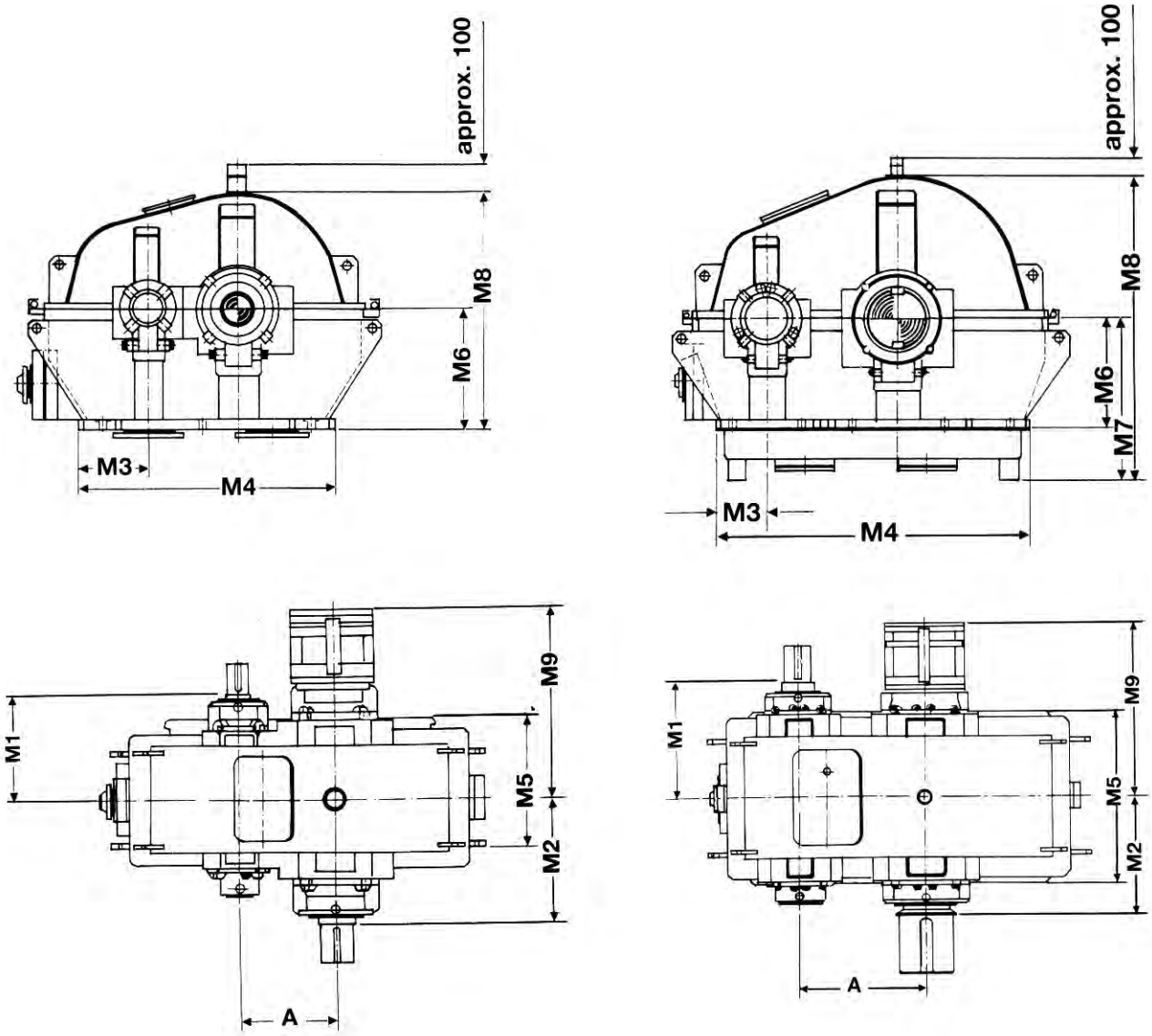


By API 613/77 Service Factor SF = 1.40

The example illustrated indicates an initial selection of a TA 32 X gear. Optimization in the works can result in a slight reduction in shaft center offset, e.g. TA 32 X (310).

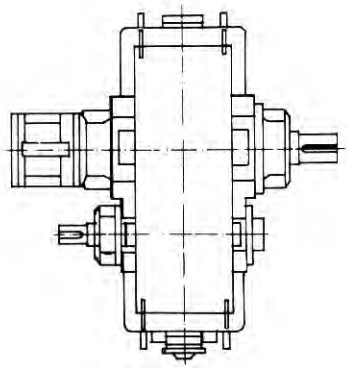
Note : The curves indicate the exact calculated capacities and so have not been smoothed. The curves are based on an service factor of 1.4. Approximate adaptation to alternative service factors can be achieved by multiplying the P/n values by a figure that relates the required service factor to the factor of 1.4.

Dimension and layout

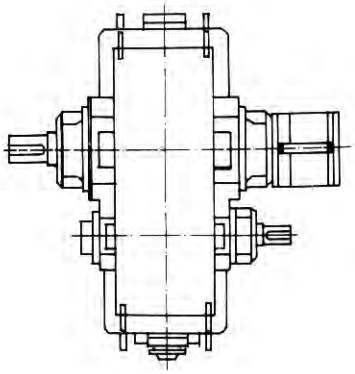


Shaft arrangements

L - R



R - L



The direction of rotation of the fast-running and slow-running shafts are marketed with CW for clockwise rotation or with CCW for counter-clockwise rotation as seen when viewing the shaft extension concerned.

Guidance values for the gear size

The table gives guidance values for the dimensions and arrangement of gears selected with the aid of the initial selection diagram.

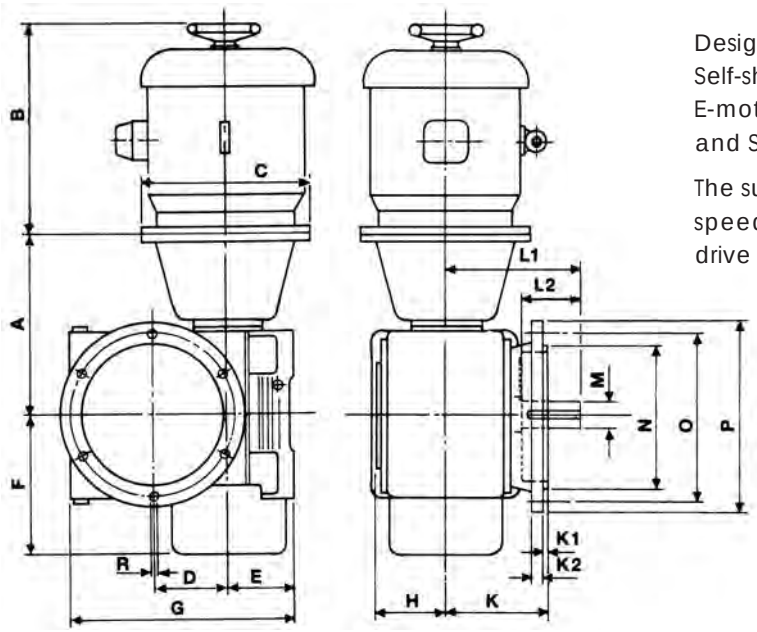
Size A	Ratio	M_1	M_2	M_3	M_4	M_5	M_6	M_7	M_8	M_9	Weight kg
TA20X	1.2-3.2	340	340	210	610	420	310	-	600	545	740
200	3.3-5.2	330	330	210	630	400	310	-	625	535	700
TA25X	1.2-3.0	450	450	235	730	610	370	-	690	660	1200
	3.1-5.0	380	390	230	740	580	370	-	720	590	1050
250	5.1-7.0	320	320	220	750	420	370	-	735	545	800
TA32X	1.2-3.0	515	515	255	880	720	410	-	760	800	2050
	3.1-6.0	450	450	245	900	600	440	-	840	650	1600
320	6.1-9.0	340	340	235	900	440	460	-	890	560	1100
TA36X	1.2-3.0	550	550	260	960	800	420	-	820	860	2740
	3.1-6.0	460	460	250	980	690	470	-	920	720	2000
360	6.1-9.0	370	380	235	985	480	490	-	960	585	1300
TA40X	1.2-3.0	585	590	285	1055	880	440	-	900	920	3500
	3.1-6.0	510	510	275	1080	730	500	-	960	750	2600
400	6.1-9.0	375	410	255	1085	530	525	-	1020	620	1550
TA45X	1.2-3.0	635	640	290	1090	1000	500	690	990	1035	4600
	3.1-6.0	550	550	280	1170	840	500	690	1050	860	3500
450	6.1-9.0	420	430	260	1180	600	500	690	1075	690	2200
TA50X	1.2-3.0	700	705	295	1240	1060	550	750	1060	1130	6000
	3.1-6.0	570	575	285	1280	830	550	750	1140	870	3900
500	6.1-9.0	460	480	265	1295	660	550	750	1170	730	2700
TA56X	1.2-3.0	760	765	305	1350	1200	600	815	1150	1200	8000
	3.1-6.0	610	620	290	1400	900	600	815	1240	900	5400
560	6.1-9.0	490	500	265	1415	700	600	815	1275	780	3600
TA63X	1.2-3.0	810	820	300	1450	1280	650	865	1250	1280	10600
	3.1-6.0	645	650	290	1540	960	650	865	1350	1070	7500
630	6.1-9.0	540	550	270	1560	750	650	890	1390	850	5300
TA71X	1.2-3.0	820	840	310	1625	1340	700	915	1380	1350	14000
	3.1-6.0	675	680	290	1690	1080	700	920	1460	1100	9500
710	6.1-9.0	565	580	270	1725	840	700	950	1510	900	7000
TA80X	1.2-3.0	860	860	320	1800	1370	750	975	1480	1360	16000
	3.1-6.0	720	730	310	1890	1130	750	1000	1580	1230	13800
800	6.1-9.0	630	650	280	1910	920	750	1050	1640	1020	9800
TA90X	1.2-3.0	920	920	340	2000	1420	750	1000	1540	1400	21000
	3.1-6.0	785	800	330	2100	1300	750	1100	1670	1300	18000
900	6.1-9.0	650	660	300	2120	1000	750	1150	1730	1100	13500
TA100X	1.2-3.0	920	920	340	2200	1450	800	1050	1640	1410	25000
	3.1-6.0	830	840	330	2300	1350	800	1160	1800	1360	23500
1000	6.1-9.0	700	710	300	2320	1050	800	1230	1860	1110	18500

The dimensions indicated may be modified when exact calculations are completed.
Efficiencies lie between 98.4 and 99.2%.

All dimensions are in millimeters

High Speed Gear Units

Rotor turning drives



Design
Self-shifting turning drive, consisting of:
E-motor with handwheel, worm gear with flange and SSS-overrunning clutch.

The suitable size results from the required turn speed and the breakaway torque of the complete drive train.

GEARBOX SIZE	MOTOR FRAME SIZE	A	B	C	D	E	F	G	H	K	K_1	K_2	L_1*	L_2*	M	N	O	P	R	Weight kg (Approx)
100 NUT	112 M	267.5	360	250	101.6	115	220	324.6	110	140	4	16	215	90	45	200 g6	235	270	6-14	125
	132 S	287.5	410	300																
125 NUT	132 S	313	410	300	127	140	245	365	126	175	4	20	235	100	50	260 g6	315	350	6-14	185
	132 M	313	450	300																
	160 L	343	575	350																
	160 M	343	530	350																
150 NUT	160 L	392	575	350	152.4	170	301	449.4	142	192	5	20	274	114	58	320 g6	360	400	6-18	235
	180 L	392	630	350																
	180 M	392	595	350																
200 SMT	180 L	455	630	350	203.2	250	362	633.2	205	208	5	22	312	140	70	380 h8	440	480	8-18	333
	200 L	455	690	400																
	225 S	485	725	450																
	225 M	485	750	450																
260 SMT	225 S	593	725	450	266.7	300	470	776	230	245	5	25	352	150	80	470 h8	540	590	8-23	605
	250 M	593	860	550																
	280 S	593	925	550																
	280 M	593	975	550																

GEAR BOX SIZE	n_N = 60 rpm			n_N = 75 rpm			n_N = 100 rpm			n_N = 150 rpm			n_N = 200 rpm			n_N = 300 rpm		
	TL	Motor		TL	Motor		TL	Motor		TL	Motor		TL	Motor		TL	Motor	
	Nm	Type	P_1(kW)	Nm	Type	P_1(kW)	Nm	Type	P_1(kW)	Nm	Type	P_1(kW)	Nm	Type	P_1(kW)	Nm	Type	P_1(kW)
100 NUT	850	112 M4	4	800	112 M4	4	800	132 M4	5.5	730	132 M4	7.5	730	132 S2	7.5	450	132 S2	7.5
125 NUT	1200	132 S4	5.5	1200	132 S4	5.5	1200	160 M4	7.5	1200	160 L4	15	1200	160 M2	15	950	160 L2	18.5
150 NUT	2750	160 L4	15	2750	160 L4	15	2750	180 L4	18.5	2500	180 L4	22	1850	180 M2	22	1100	180 M2	22
200 SMT	4800	180 L4	22	5000	200 L4	30	4300	225 S4	37	4100	225 M4	45	3500	225 M4	45	2300	225 M4	45
260 SMT	6300	225 S4	37	9500	250 S4	55	8300	250 M4	55	9300	280 M4	90	7800	280 M4	90	5100	280 M4	90

Turn Speed n_N
Break-away torque - TL
*For higher diameter and length, consult Elecon.
Owing to continuous development all dimensions are subject to change without notice.