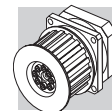


# SL



**BONFIGLIOLI**






**LC**



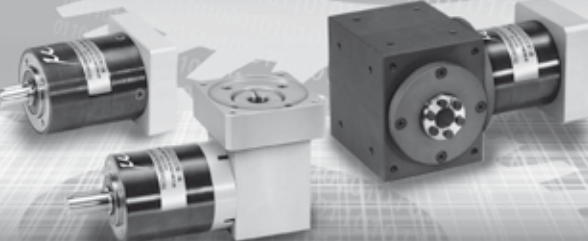
$3 \leq i \leq 100$        $18 \text{ Nm} \leq M_{n2} \leq 300 \text{ Nm}$

**LCK**



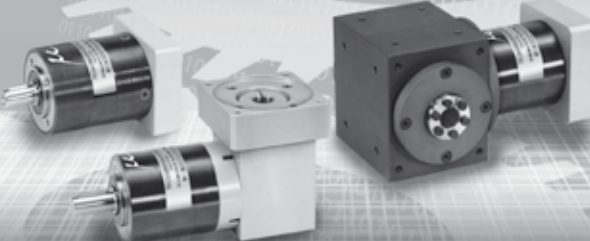
$6 \leq i \leq 100$        $10 \text{ Nm} \leq M_{n2} \leq 300 \text{ Nm}$

**MP**




$3 \leq i \leq 1000$        $12 \text{ Nm} \leq M_{n2} \leq 1000 \text{ Nm}$

**TR**



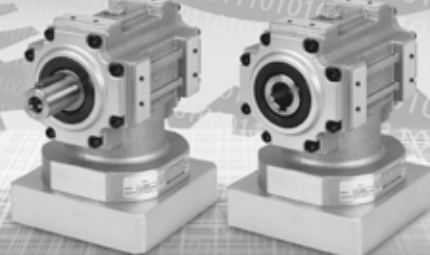
$3 \leq i \leq 1000$        $12 \text{ Nm} \leq M_{n2} \leq 1000 \text{ Nm}$

**SL**



$3 \leq i \leq 10$        $18 \text{ Nm} \leq M_{n2} \leq 110 \text{ Nm}$

**KR**



$i = 1, 2, 5$        $3 \text{ Nm} \leq M_{n2} \leq 120 \text{ Nm}$

**TQ**

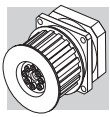


$3 \leq i \leq 100$        $30 \text{ Nm} \leq M_{n2} \leq 800 \text{ Nm}$

**TQK**



$6 \leq i \leq 200$        $30 \text{ Nm} \leq M_{n2} \leq 800 \text{ Nm}$



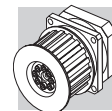
## SYMBOLS, UNITS AND DEFINITIONS

### Values depending on the **APPLICATION**

term	u.m.	definition
$A_2$	[N]	Thrust force on output shaft
$R_2$	[N]	Radial force on output shaft
<b>ED</b>	[min]	Loading time
<b>ED%</b>	[%]	Loading time %
$L_{10h}$	[h]	Bearings' basic rating life
$M_{1 \text{ PEAK}}$	[Nm]	Maximum input torque (usually motor)
$M_{2(1) \dots M_{2(n)}}$	[Nm]	Output torque at each of the time periods $t_1 \dots t_n$
$M_{2 \text{ EQU}}$	[Nm]	Equivalent output torque
$M_{2 \text{ MAX}}$	[Nm]	Maximum output torque in case of emergency
$M_{T2 \text{ MAX}}$	[Nm]	Maximum tilting moment on output shaft
$n_2$	[min <sup>-1</sup> ]	Output speed
$n_{2(1) \dots n_{2(n)}}$	[min <sup>-1</sup> ]	Output speed based on the time periods $t_1 \dots t_n$
$n_2 \text{ EQU}$	[min <sup>-1</sup> ]	Equivalent output speed
$n_2 \text{ MAX}$	[min <sup>-1</sup> ]	Maximum output speed
<b>T</b>	[C°]	Ambient temperature
$t_1 \dots t_n$	[s]	Time periods of motion
$t_{\Sigma}$	[s]	Cycle duration including pause
<b>Z</b>	[1/h]	Cycle number per hour

### Values depending on the **GEAR DRIVE SELECTION**

term	u.m.	definition
$A_{2 \text{ max}}$	[N]	Admissible thrust force
$A_{2' \text{ max}}$	[N]	Thrust force acting simultaneously with the rated radial force
$R_{2 \text{ max}}$	[N]	Admissible radial force at midpoint of output shaft
$C_B$	[Nm]	Constant for bearing's lifetime calculation
$C_t$	$\left[ \frac{\text{Nm}}{\text{arcmin}} \right]$	Torsional stiffness
$f_n$	—	Speed factor
$f_z$	—	Cycle factor
$f_T$	—	Temperature correction factor
<b>i</b>	—	Gearbox ratio
$J_G$	[kgcm <sup>2</sup> ]	Mass moment of inertia of the gearhead
$K_n$	—	Speed constant
$L_z$	[mm]	Factor for bearing's lifetime calculation
$M_{T2 \text{ max}}$	[Nm]	Permissible tilting moment
$M_{n2}$	[Nm]	Rated output torque
$M_{a2}$	[Nm]	Maximum acceleration output torque
$M_{p2}$	[Nm]	Emergency stop output torque
$n_{1 \text{ max}}$	[min <sup>-1</sup> ]	Maximum momentary input speed. The speed the unit can be driven at occasionally and in non-repetitive conditions. For cycle duty type S5, it cannot be applied continuously for more than 30 seconds
<b>p</b>	—	Bearing lifetime exponent
$\eta$	[%]	Gear efficiency
$\varphi_s$	[arcmin]	Standard backlash is calculated in static conditions and with the application of a torque equal to 2% of the gear unit rated torque
$\varphi_R$	[arcmin]	Reduced backlash is calculated in static conditions and with the application of a torque equal to 2% of the gear unit rated torque



## SUMMARY

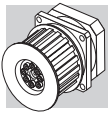


<b>1 General information</b> .....	4
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<b>2 Features of SL series</b> .....	6
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<b>4 Dimensions and technical specifications</b> .....	8
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SL 090 .....	10
SL 120 .....	12

### Revisions

Refer to page 14 for the catalogue revision index.

Visit [www.tecnoingranaggi.it](http://www.tecnoingranaggi.it) to search for catalogues with up-to-date revisions.

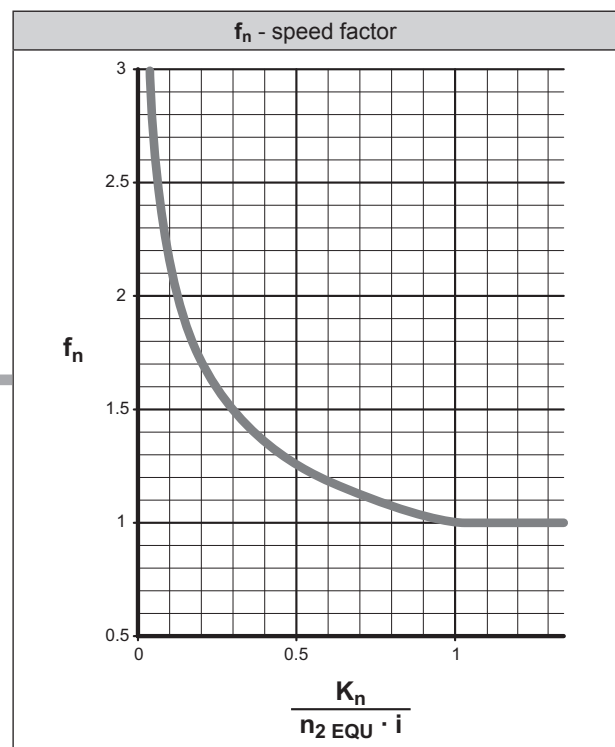


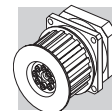
# 1 GENERAL INFORMATION

## 1.1 SELECTING THE GEAR UNIT

(a)	Ratio	$i$	—	$i = \frac{n_1}{n_2}$														
(b)	Equivalent output torque	$M_{2\text{ EQU}}$	[Nm]	$M_{2\text{ EQU}} = \sqrt[3]{\frac{n_{2(1)} \cdot t_1 \cdot  M_{2(1)} ^3 + \dots + n_{2(n)} \cdot t_n \cdot  M_{2(n)} ^3}{n_{2(1)} \cdot t_1 + \dots + n_{2(n)} \cdot t_n}}$														
(c)	Equivalent output speed	$n_{2\text{ EQU}}$	[min <sup>-1</sup> ]	$n_{2\text{ EQU}} = \frac{n_{2(1)} \cdot t_1 + n_{2(2)} \cdot t_2 + \dots + n_{2(n)} \cdot t_n}{t_\Sigma}$														
(d)	Speed factor	$f_n$	—	<p>If <math>\frac{K_n}{n_{2\text{ EQU}} \cdot i} \geq 1 \Rightarrow f_n = 1</math></p> <p>If <math>\frac{K_n}{n_{2\text{ EQU}} \cdot i} &lt; 1 \Rightarrow f_n = \text{Obtain from diagram}</math></p>														
(e)	Loading time %	ED%	[%]	$ED\% = \frac{t_1 + t_2 + \dots + t_n}{t_\Sigma} \cdot 100$														
	Loading time	ED	[min]	$ED = t_1 + t_2 + \dots + t_n$														
(f)	Cycle number	$Z$	[1/h]	$Z = \frac{3600}{t_\Sigma}$														
(g)	Cycle factor	$f_z$	—	<table border="1"> <thead> <tr> <th><math>Z</math></th> <th><math>f_z</math></th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1000</math></td> <td>1.00</td> </tr> <tr> <td><math>1000 &lt; Z \leq 1500</math></td> <td>1.25</td> </tr> <tr> <td><math>1500 &lt; Z \leq 2500</math></td> <td>1.50</td> </tr> <tr> <td><math>2500 &lt; Z \leq 4000</math></td> <td>1.75</td> </tr> <tr> <td><math>4000 &lt; Z \leq 6000</math></td> <td>2.00</td> </tr> <tr> <td><math>Z &gt; 6000</math></td> <td>contact us</td> </tr> </tbody> </table>	$Z$	$f_z$	$Z \leq 1000$	1.00	$1000 < Z \leq 1500$	1.25	$1500 < Z \leq 2500$	1.50	$2500 < Z \leq 4000$	1.75	$4000 < Z \leq 6000$	2.00	$Z > 6000$	contact us
$Z$	$f_z$																	
$Z \leq 1000$	1.00																	
$1000 < Z \leq 1500$	1.25																	
$1500 < Z \leq 2500$	1.50																	
$2500 < Z \leq 4000$	1.75																	
$4000 < Z \leq 6000$	2.00																	
$Z > 6000$	contact us																	
(h)	Temperature factor	$f_T$	—	<p>If <math>T \leq 30^\circ\text{C} \Rightarrow f_T = 1</math></p> <p>If <math>T &gt; 30^\circ\text{C} \Rightarrow f_T = 1 + \frac{T - 30}{100}</math></p>														
(i)	Maximum input torque	$M_{1\text{ PEAK}}$	[Nm]	<p>a) maximum possible application torque</p> <p>b) limited motor torque by inverter</p> <p>c) maximum motor torque</p>														

$K_n$ - speed constant			
$i$	SL 070	SL 090	SL 120
3	1392	2900	2500
4	1584	2500	2167
5	2047	2733	2367
7	3032	3500	3000
10	4000	4000	3500



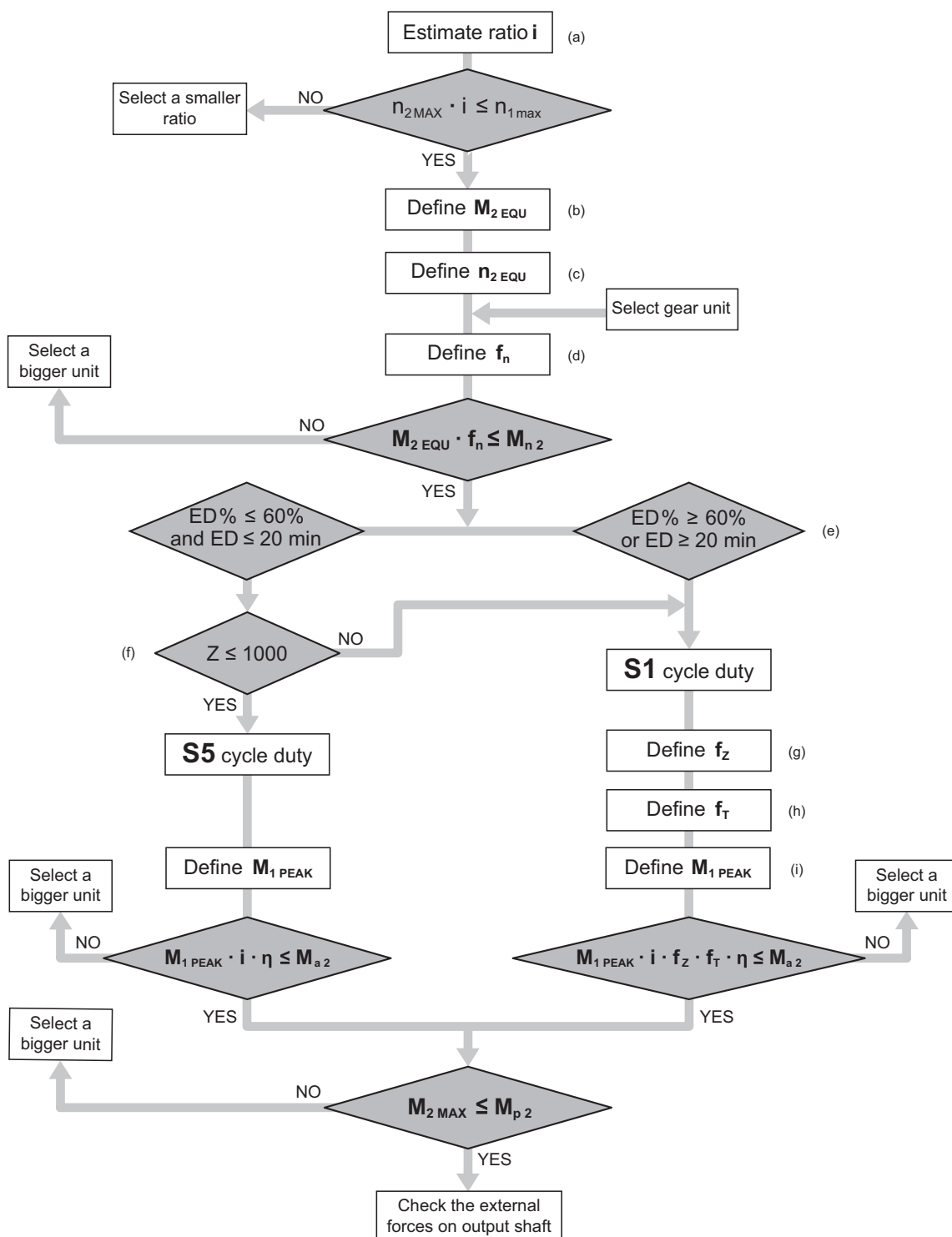
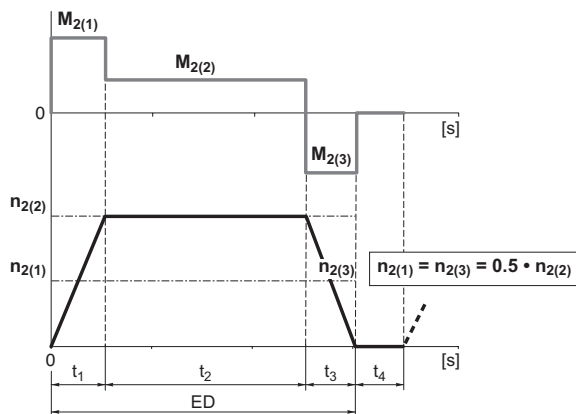


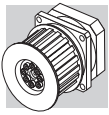
**Load diagram**

—  $M_2$ : Output torque

**Speed diagram**

—  $n_2$ : Output speed



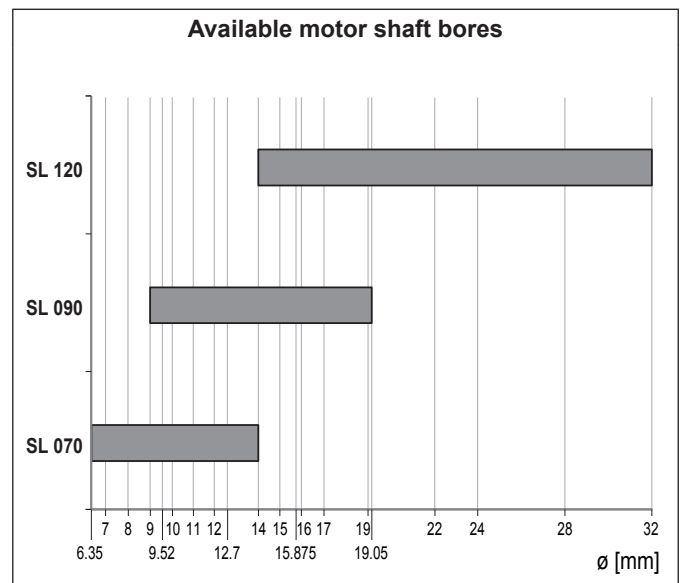
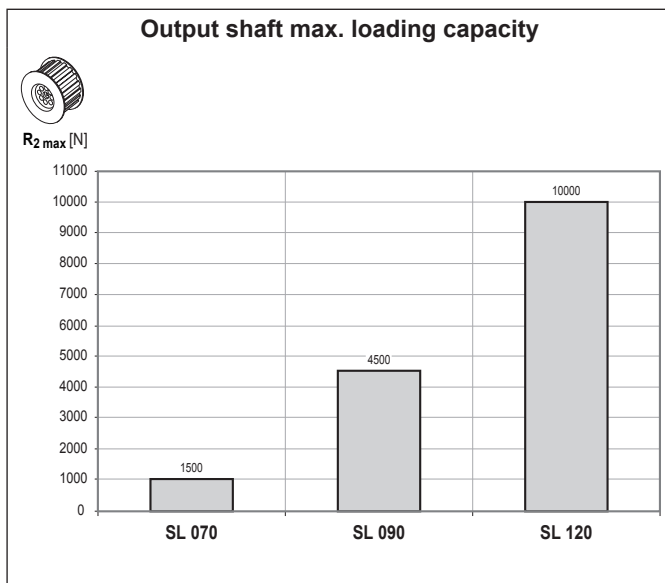


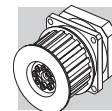
## 2 FEATURES OF SL SERIES

The new SL Series from Tecnoingranaggi knows no rivals in compactness, efficiency and optimisation for timing belt pulley drive systems. Reduced backlash units from the SL Series are the ideal complement to conveyor belt servo-drives and all other applications needing to combine high precision with ultra-compact size.

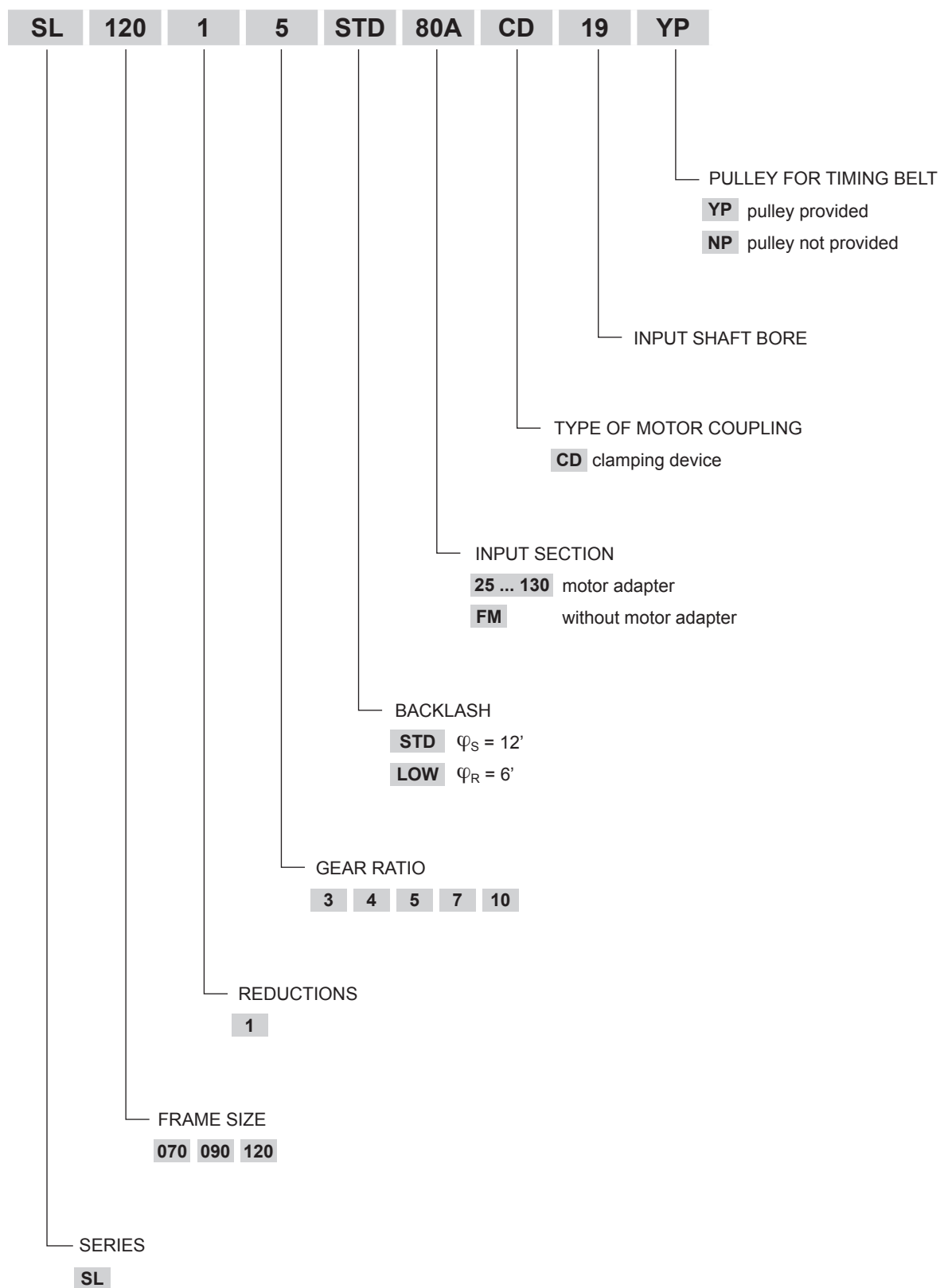
- Available with either standard ( $\varphi_S = 12'$ ) or reduced backlash ( $\varphi_R = 6'$ )
- Single-stage configuration: transmission ratios  $i = 3, 4, 5, 7, 10$
- Radial ball bearings, suitably rated for an average service life of 20,000 hours under nominal operating conditions.
- Degree of protection IP64
- Oil seals from Viton® compound as standard
- Noise level  $L_P \leq 70$  dB(A) @  $n_1 = 3000$  min<sup>-1</sup>
- Numerous input configurations
- Units are factory packed with synthetic grease to NLGI consistency class 00, suitable for operation in any mounting position and ambient temperature ranging from 0°C to 40°C.  
In the absence of contamination the lubricant requires no periodical changes.

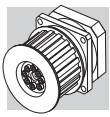
[i]	Distribution of nominal torque $M_{n2}$ [Nm]				
	3	4	5	7	10
SL 070	18	25	25	25	18
SL 090	37	43	43	43	37
SL 120	95	110	110	110	95





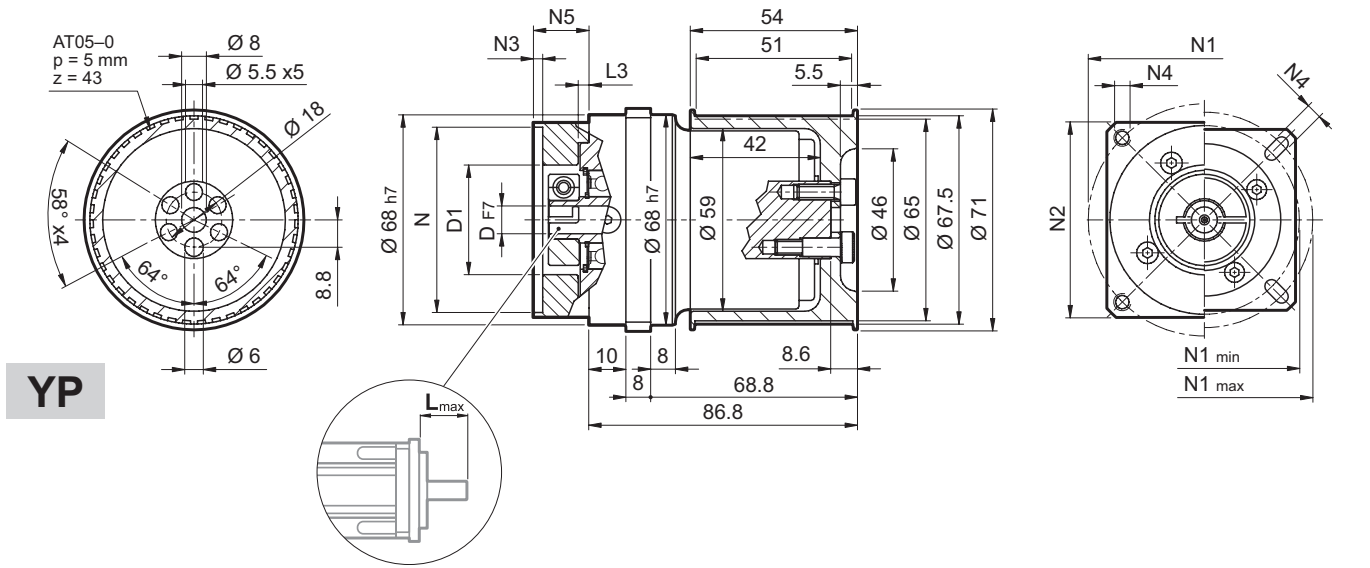
### 3 ORDERING CODE





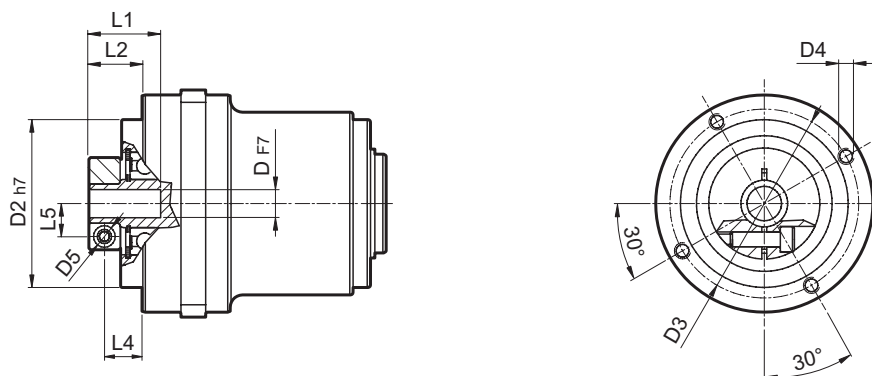
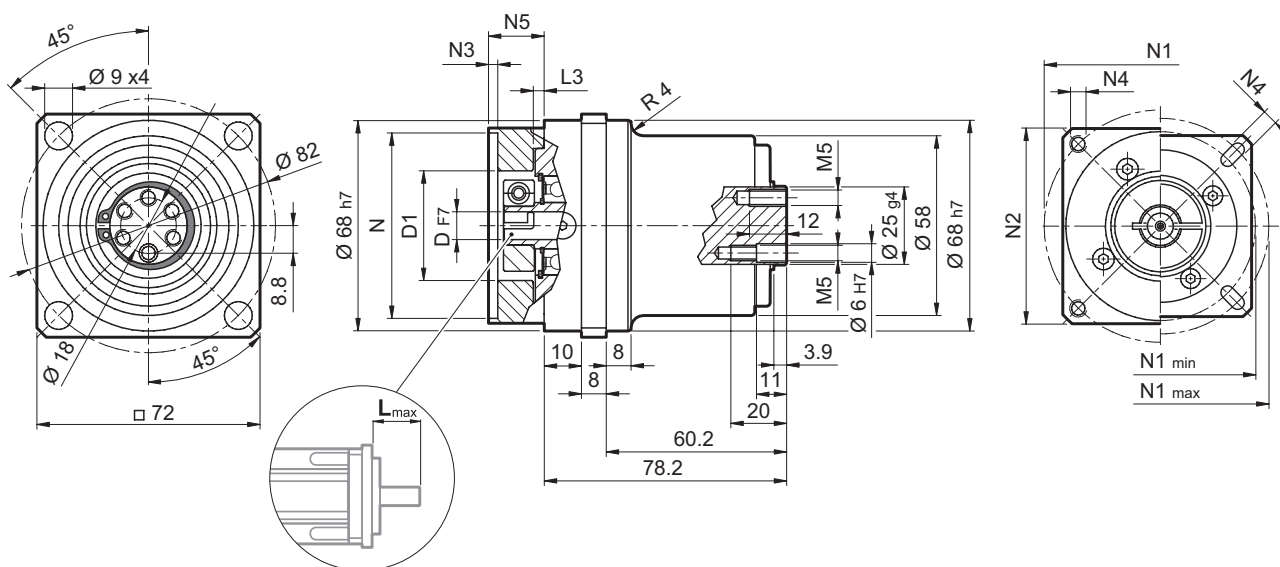
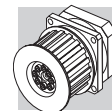
# SL 070

## 4 DIMENSIONS AND TECHNICAL SPECIFICATIONS





2.0	0.5

											N	N1		N2	N3	N4	N5	L <sub>max</sub>
												min	max					
25AH	6.35	7	8	9	9.52	-	-	-	-	-	25	39	56					
26AH	6.35	7	8	9	9.52	-	-	-	-	-	26	39	56					
28AH	6.35	7	8	9	9.52	-	-	-	-	-	28	39	56					
30AH	6.35	7	8	9	9.52	-	-	-	-	-	30	39	56					
32AH	6.35	7	8	9	9.52	-	-	-	-	-	32	39	56	65	3.5	4.5	25	25
34AH	6.35	7	8	9	9.52	-	-	-	-	-	34	40	56					
36AH	6.35	7	8	9	9.52	-	-	-	-	-	36	42	56					
39AH	6.35	7	8	9	9.52	-	-	-	-	-	39	45	56					
40AH	6.35	7	8	9	9.52	-	-	-	-	-	40	46	56					
38B	6.35	7	8	9	9.52	10	11	12	12.7	-	38.1	66.6	60	60	3	M4x10	18	25
40B	6.35	7	8	9	9.52	10	11	12	12.7	-	40	63	60	60	3	M4x10	18	25
50A	6.35	7	8	9	9.52	10	11	12	12.7	-	50	60	60	60	3	M4x10	18	25
50B	6.35	7	8	9	9.52	10	11	12	12.7	14	50	65	60	60	3	M5x12	23	30
50BH	6.35	7	8	9	9.52	10	11	12	12.7	14	50	65	65	65	3	5.5	25	32
50C	6.35	7	8	9	9.52	10	11	12	12.7	14	50	70	60	60	3	M4x10	23	30
55MH	6.35	7	8	9	9.52	10	11	12	12.7	-	55	80	65	65	2	5.5	16	23
60A	6.35	7	8	9	9.52	10	11	12	12.7	-	60	75	63	63	3	M5x12	18	25
60A1	6.35	7	8	9	9.52	10	11	12	12.7	14	60	75	63	63	3	M5x12	23	30
60B	6.35	7	8	9	9.52	10	11	12	12.7	14	60	85	75	75	3	M5x12	23	30
60C	6.35	7	8	9	9.52	10	11	12	12.7	14	60	90	75	75	3	M5x12	23	30
70A	6.35	7	8	9	9.52	10	11	12	12.7	14	70	85	75	75	3	M6x15	23	30
70B	6.35	7	8	9	9.52	10	11	12	12.7	14	70	90	75	75	3	M5x12	23	30
73A	6.35	7	8	9	9.52	10	11	12	12.7	14	73	98.4	85	85	3	M5x12	25	32
80A	6.35	7	8	9	9.52	10	11	12	12.7	14	80	100	85	85	3	M6x15	23	30

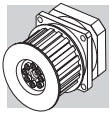


## FM

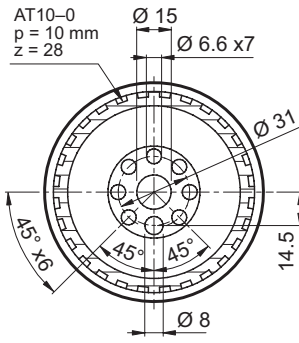
	D			D1	D2	D3	D4	D5	L1	L2	L3	L4	L5
6.35	7			32.5	50	42.5	M4x8	M4	21.7	13.2	3	8.2	8
8	9	9.52	10	32.5	50	42.5	M4x8	M4	21.7	13.2	3	8.2	9
11	12	12.7		35.5	50	42.5	M4x8	M4	22	13.5	3	8.5	11
14				35.5	50	42.5	M4x8	M4	25	17	3	10.2	11.5

 i	M <sub>n2</sub>	M <sub>a2</sub>	M <sub>p2</sub>	n <sub>1 max</sub>	φ <sub>S</sub>	φ <sub>R</sub>	C <sub>t</sub>	R <sub>2 max</sub> *	η	J <sub>G</sub> [kgcm <sup>2</sup> ]		 3.86
	[Nm]	[Nm]	[Nm]	[min <sup>-1</sup> ]	[arcmin]	[Nm/arcmin]	[N]	%	6 ... 9.52	11 ... 14		
SL 070_3	18	30	60	4000	12'	6'	3	3500	97	0.14	0.16	3.86
SL 070_4	25	35	70	5000	12'	6'	3	3500	97	0.09	0.11	
SL 070_5	25	35	70	5000	12'	6'	3	3500	97	0.07	0.09	
SL 070_7	25	35	70	5000	12'	6'	3	3500	97	0.05	0.07	
SL 070_10	18	30	60	6000	12'	6'	3	3500	97	0.04	0.06	

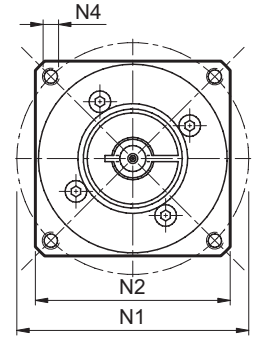
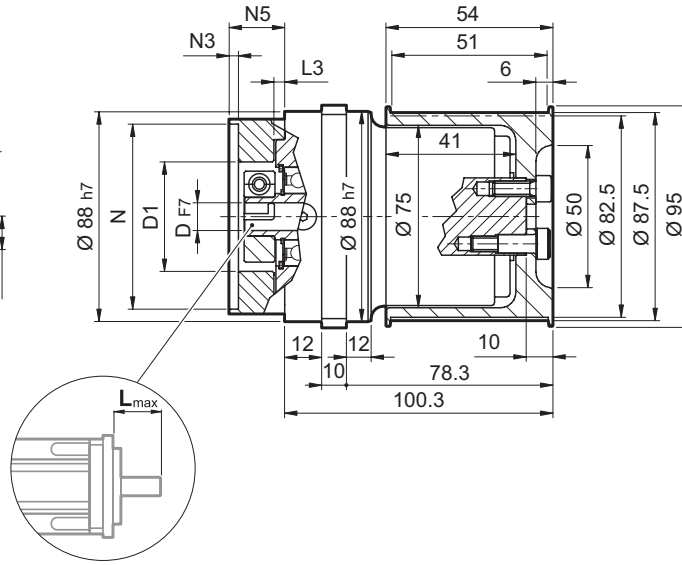
\* Applies for timing belt application








# SL 090



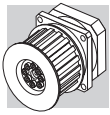
YP



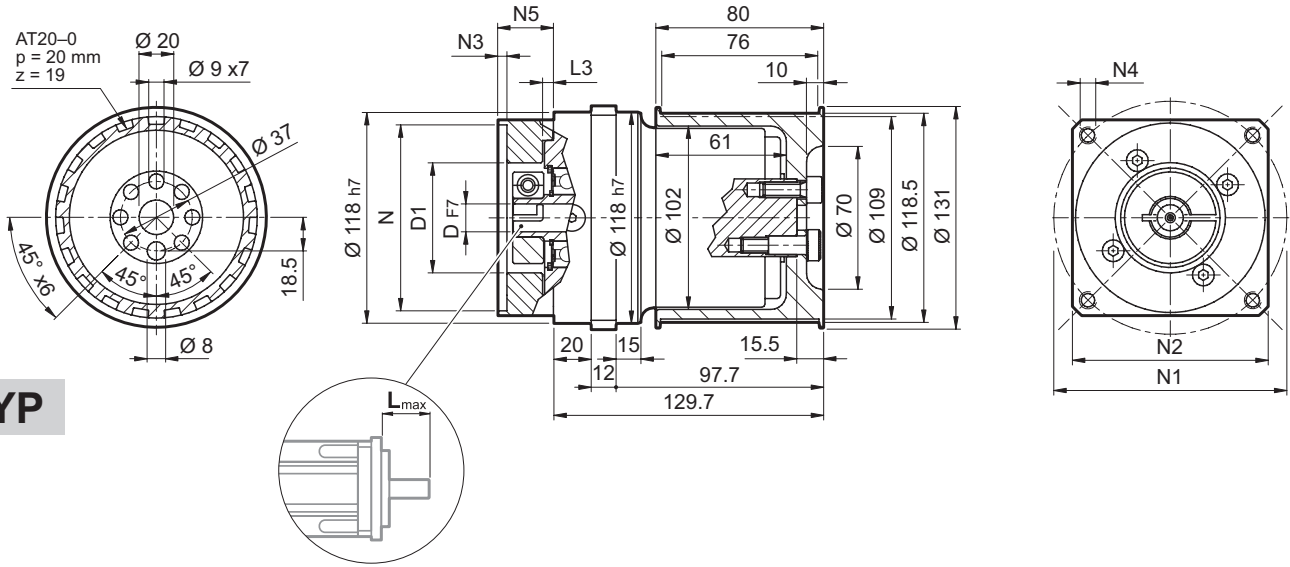
	
 3.6	0.8

												N	N1	N2	N3	N4	N5	L <sub>max</sub>
40B1	9	9.52	11	12	12.7	14	-	-	-	-	-	40	63	80	4	M4x10	34	40
45A	9	9.52	11	12	12.7	-	-	-	-	-	-	45	63	80	4	M4x10	34	40
50B1	9	9.52	11	12	12.7	14	-	-	-	-	-	50	65	80	4	M5x16	34	40
50BH1	9	9.52	11	12	12.7	14	-	-	-	-	-	50	65	80	4	5.5	34	40
50C1	9	9.52	11	12	12.7	14	-	-	-	-	-	50	70	80	4	M4x10	34	40
50D	9	9.52	11	12	12.7	14	-	-	-	-	-	50	95	80	4	M6x10	34	40
55A	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	55.5	125.7	105	4	M6x16	34	40
60A2	9	9.52	11	12	12.7	14	-	-	-	-	-	60	75	80	4	M5x16	34	40
60AH2	9	9.52	11	12	12.7	14	-	-	-	-	-	60	75	90	4	5.5	34	40
60B1	9	9.52	11	12	12.7	14	15.875	16	-	-	-	60	85	80	4	M5x16	34	40
60C1	9	9.52	11	12	12.7	14	15.875	16	-	-	-	60	90	80	4	M5x16	34	40
70A1	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	70	85	80	4	M6x20	34	40
70AH1	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	70	85	90	4	6.5	34	40
70B1	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	70	90	80	4	M5x16	34	40
73A1	9	9.52	11	12	12.7	14	-	-	-	-	-	73	98.4	85	4	M5x16	34	40
80A1	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	80	100	90	4	M6x16	34	40
95A	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	95	115	100	4	M8x20	34	40
95B	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	95	130	115	4	M8x20	34	40
110A	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	110	130	115	4	M8x20	34	40
110B	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	110	145	120	6.5	M8x20	44	50
110B1	9	9.52	11	12	12.7	14	15.875	16	17	19	19.05	110	145	120	6.5	M8x20	54	60





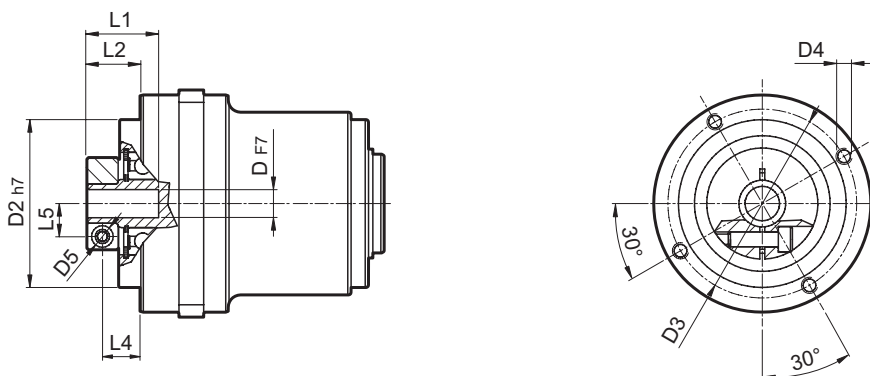
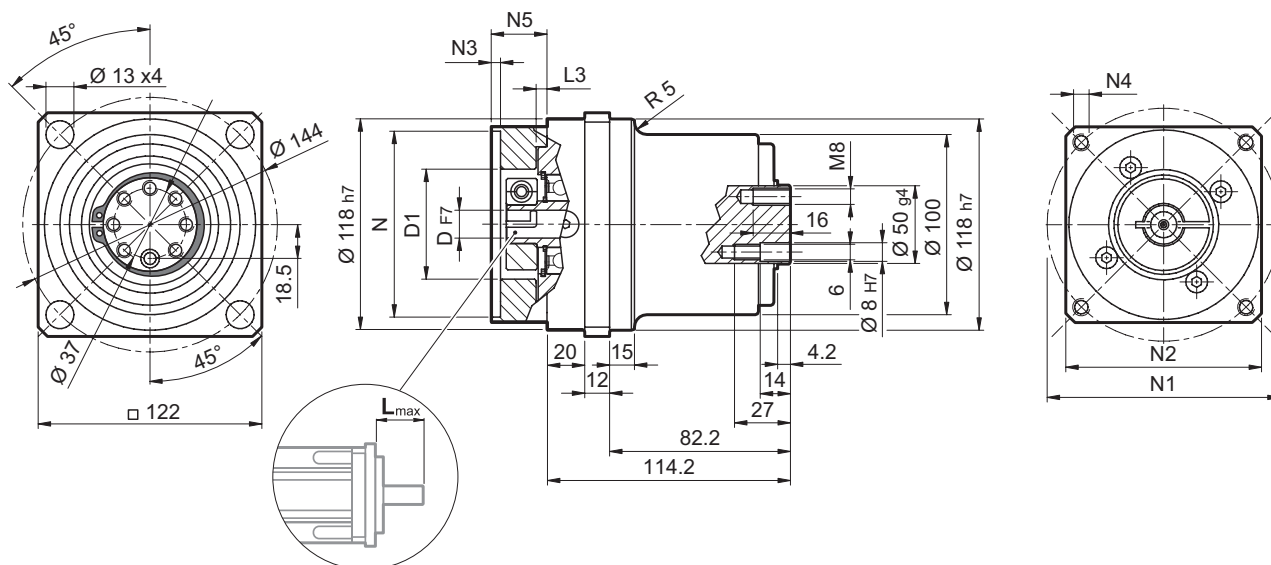
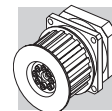
# SL 120



**YP**

	8.4	2.6

									N	N1	N2	N3	N4	N5	L <sub>max</sub>	
<b>50D</b>	14	15	15.875	16	19	-	-	-	-	50	95	100	5	M6x14	28	40
<b>55A</b>	14	15	15.875	16	19	-	-	-	-	55.5	125.7	105	5	M6x16	28	40
<b>60A2</b>	14	15	15.875	16	19	-	-	-	-	60	75	100	5	M5x14	28	40
<b>60AH2</b>	14	15	15.875	16	19	-	-	-	-	60	75	100	5	6.5	33	40
<b>60B1</b>	14	15	15.875	16	19	-	-	-	-	60	85	100	6.5	M5x14	28	40
<b>70A1</b>	14	15	15.875	16	19	-	-	-	-	70	85	100	5	M6x14	28	40
<b>70AH1</b>	14	15	15.875	16	19	-	-	-	-	70	85	100	5	6	33	40
<b>70B1</b>	14	15	15.875	16	19	-	-	-	-	70	90	100	5	M5x12	28	40
<b>80A1</b>	14	15	15.875	16	19	-	-	-	-	80	100	100	5	M6x16	28	40
<b>80AH1</b>	14	15	15.875	16	19	-	-	-	-	80	100	100	5	6.5	28	40
<b>95A</b>	14	15	15.875	16	19	-	-	-	-	95	115	100	5	M8x18	28	40
<b>95A1</b>	14	15	15.875	16	19	22	24	-	-	95	115	100	5	M8x18	38	50
<b>95B</b>	14	15	15.875	16	19	-	-	-	-	95	130	115	5	M8x18	28	40
<b>110A</b>	14	15	15.875	16	19	-	-	-	-	110	130	115	5	M8x18	28	40
<b>110A1</b>	14	15	15.875	16	19	22	24	-	-	110	130	115	6.5	M8x20	38	50
<b>110B</b>	14	15	15.875	16	19	22	24	-	-	110	145	120	6.5	M8x20	38	50
<b>110B1</b>	14	15	15.875	16	19	22	24	28	-	110	145	120	6.5	M8x20	48	60
<b>130A</b>	14	15	15.875	16	19	22	24	-	-	130	165	140	6.5	M10x20	38	50
<b>130A1</b>	14	15	15.875	16	19	22	24	28	32	130	165	140	6.5	M10x25	48	60

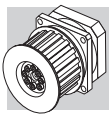


## FM


D				D1	D2	D3	D4	D5	L1	L2	L3	L4	L5
14	15	15.875	16	48	90	98	M6x15	M6	33.5	20	7.6	12.5	14.5
19				51	90	98	M6x15	M6	33.5	20	7.6	12.5	16.5
22	24			56.5	90	98	M6x15	M6	36.5	23	7.6	14	19
28				67	90	98	M6x15	M8	36.5	23	7.6	14	22.5
32				71	90	98	M6x15	M8	38	24.5	7.6	15.5	24.5

i	M <sub>n2</sub> [Nm]	M <sub>a2</sub> [Nm]	M <sub>p2</sub> [Nm]	n <sub>1 max</sub> [min <sup>-1</sup> ]	φ <sub>s</sub> [arcmin]	φ <sub>R</sub> [arcmin]	C <sub>t</sub> [Nm/arcmin]	R <sub>2 max</sub> * [N]	η %	J <sub>G</sub> [kgcm <sup>2</sup> ]				
										D	12.7	14 ... 19	22 ; 24	28 ; 32
SL 120_3	95	160	300	3500	12'	6'	22	10000	97	2.10	2.18	2.81	3.25	50.62
SL 120_4	110	190	360	4500	12'	6'	22	10000	97	1.23	1.30	1.93	2.37	
SL 120_5	110	190	360	4500	12'	6'	22	10000	97	0.89	0.96	1.59	2.03	
SL 120_7	110	190	360	4500	12'	6'	22	10000	97	0.58	0.66	1.28	1.72	
SL 120_10	95	160	300	5000	12'	6'	22	10000	97	0.41	0.49	1.11	1.55	

\* Applies for timing belt application



## INDEX OF REVISIONS (R)

R2	
	Description
4	Sect 1.1 "Selecting the gear unit" - new selection procedure
6	Sect 2 "Features of SL series" - information about oil seals newly added
7	Sect 3 "Ordering code" - ordering code for timing belt pulley provided (YP) and not provided (NP) newly added
8 ... 13	Sect. 4 "Dimensions and technical specifications" - updated dimensions - updated availability for motor shaft bores - updated weight of gear units

101025

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SL



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