ASCA Servospindel Standardausführung
ASCA Servo Screw Standard Version

Series overview

Model	Lead p [mm]	Rated-ø screw d [mm]	max force [kN]	Dynamic load rating C [kN]	maximum permitted speed[1] n_{max} [U/min]	max. length of screwshaft[2] L_{max} [mm]	maximum stroke[2] S_{max} [mm]
PWG 10	1 2	9,4	4,5	8	14000	220	150
PWG 12	1 2	11,7	9	17	11660	250	170
PWG 16	1 2 3	15,7	12	26	8750	400	200
PWG 20	1 2 3 4	19,7	22	45	7000	500	300
PWG 25	1 2 3 4 5	24,7	30	60	5600	850	400
PWG 32	1.5 3 4,5 6	31,7	60	95	4370	850	400
PWG 44	1.5 3 4,5 6 7.5 9	43,4	100	200	3180	850	400
PWG 63	2 4 6 8 10 12	62,7	170	330	2220	850	400
PWG 73	3 6 9 12 15	72,6	210	420	1920	850	400
PWG 100	3 6 9 14,5 17,5 20,5	97.7	300	765	1750	850	400

[1] Higher speeds are only permitted after contacting Orlieb
[2] On request we check the feasibility in detail

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Screw nut versions

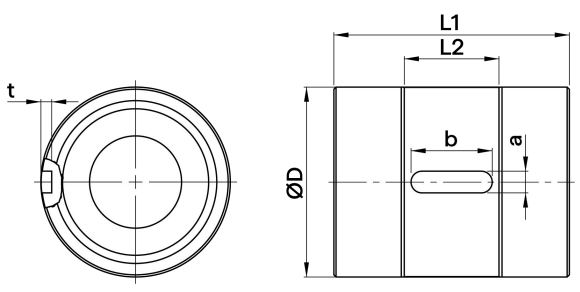
A1 Screw nut cylindrical with keyway

A2 Screw nut with flange (flat sides)

A1 Cylindrical

Dimensions (cylindrical type)

All dimensions in mm

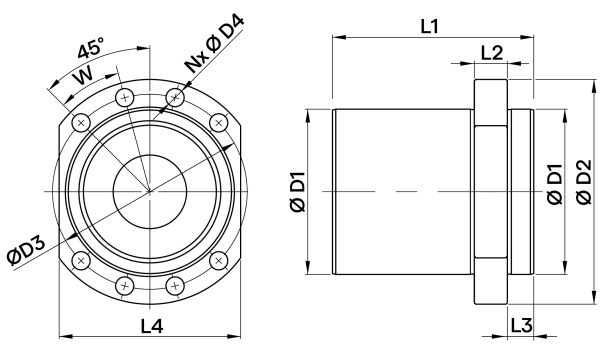


Type: A1 Cylindrical	Model	D g6	L1	L2	a	b	t
	PWG 10 x..-A1	27	35	15	3	12	1,8
	PWG 12 x..-A1	35	45,5	17	4	14	2,5
	PWG 16 x..-A1	38	49	19	4	16	2,5
	PWG 20 x..-A1	49	62	25	5	20	3
	PWG 25 x..-A1	54	69,5	27,5	6	22	3,5
	PWG 32 x..-A1	70	87	35	8	30	4
	PWG 44 x..-A1	100	122	50	12	40	5
	PWG 63 x..-A1	130	160	On request			
	PWG 73 x..-A1	155	190				
	PWG 100 x..-A1	185	190				

A2 Flat-sided flange

Dimensions (flat-sided flange type)

All dimensions in mm



Type: A2 Flat-sided flange	Model	D1 g6	D2	D3	D4	L1	L2	L3	L4	N	W
	PWG 10 x..-A2	26	39	32,5	3,4	35	6	5	29	6	45°
	PWG 12 x..-A2	33	49	41	4,5	45,5	8	7	36	6	45°
	PWG 16 x..-A2	37	56	47	5,5	49	9	8,5	42	6	45°
	PWG 20 x..-A2	48	72	60	6,6	62	11	9,5	52	6	45°
	PWG 25 x..-A2	54	78	66	6,6	69,5	12	10	60	6	45°
	PWG 32 x..-A2	70	100	85	9	87	15	12	75	6	45°
	PWG 44 x..-A2	100	136	118	11	122	20	16	110	8	30°
	PWG 63 x..-A2	127	172	150	13,5	155	27	22	135	10	22,5°
	PWG 73 x..-A2	155	On request			160	On request				
	PWG 100 x..-A2	185	240	210	17,5	190	30	25	187	14	15°

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Calculation of ASCA servo screw service life

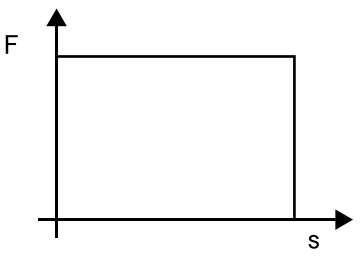
The service life of ASCA servo screws follows an S-N (or Wöhler) curve with k = 3.

$$L_{10} = 10^6 \left(\frac{C}{F_A}\right)^3 \text{ revs.}$$

L_{10}	Service life with 10 % probability of failure
C	Dynamic load rating
F_A	Equivalent load

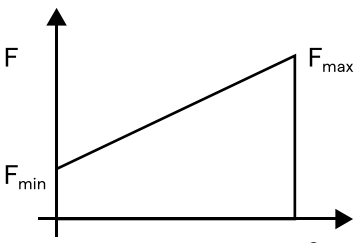
Calculation of equivalent load F_A

1 . Constant load



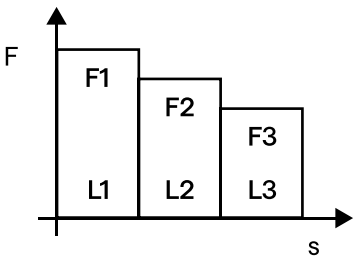
$$F_A = F$$

2 . Increasing load



$$F_A = \frac{F_{min} + 2F_{max}}{3}$$

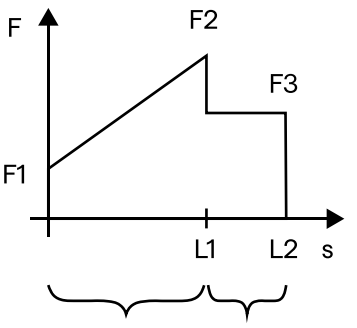
3 . Load steps



$$F_A = \sqrt[3]{\frac{\sum_{i=1}^{m} F_i{}^3 L_i}{\sum_{i=1}^{m} L_i}}$$

Sample calculation

The equivalent load and service life are determined for the following load profile:



F1 = 1 kN
F2 = 10 kN
F3 = 5 kN

L1 = 15 mm
L2 = 20 mm

Applicable to load step 1:

$$F_{A1} = \frac{F_{A1} + 2F_2}{3} = \frac{1\,\text{kN} + 2 \times 10\,\text{kN}}{3} = 7\,\text{kN}$$

Applicable to load step 2:

$$F_{A2} = F_3 = 5\,\text{kN}$$

Therefore for 2 F_{Alot}:

$$F_{Alot} = \sqrt[3]{\frac{F^3_{A1} \times L_1 + F^3_{A2} \times (L_2 - L_1)}{L_{21}}}$$

$$= \sqrt[3]{\frac{(7\,\text{kN})^3 \times 15\,\text{mm} + (5\,\text{kN})^3 \times 5\,\text{mm}}{20\,\text{mm}}}$$

$$= 6{,}6\,\text{kN}$$

An ASCA servo screw PWG 16 with lead p = 2 mm is used. The dynamic load rating is 26 kN.

The service life is calculated as follows:

$$L_{10} = 10^6 \left(\frac{26\,\text{kN}}{6{,}6\,\text{kN}}\right)^3 \text{ revs.} = 61.1 \text{ million revolutions}$$

At a stroke of s = 35 mm and a lead of p = 2 mm, the ASCA servo screw makes 17.5 revolutions per stroke.

The service life in strokes is calculated as:

$$\frac{61.1\,\text{mill.}}{17.5} = 3.5 \text{ million strokes}$$

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Calculation of motor torque and speed

Calculation of motor torque

The driving torque of the ASCA servo screw is calculated as follows:

$$M_{PWG} = \frac{p \times F_a}{2\pi \times \eta_{PWG}}$$

M_{PWG}	Driving torque of ASCA servo screw
P	Lead
F_a	Axial force
η^{PWG}	Efficiency of ASCA servo screw

Calculation of holding torque

$$\text{Holding torque} = \frac{2\pi \times M}{p \times (2\text{-}1/\eta_{PWG})}$$

$M_{Holding}$	Holding torque
P	Lead
F_{Bremse}	Torque to brake
η^{PWG}	Efficiency of ASCA servo screw

Calculation of motor torque and speed

At an axial force of F = 14 kN, a screw lead of p = 1 mm and an efficiency of the ASCA servo screw of 85%, the driving torque required for the ASCA servo screw is obtained as follows:

$$M_{PWG} = \frac{1\,\text{mm} \times 14\,\text{kN}}{2\pi \times 0.85^*} = 2.62\,\text{Nm}$$

The bearing friction must also be considered when designing the motor torque; it depends on the type of bearing and the lubrication.

More precise data should be requested from the bearing manufacturer.

In this example the bearing friction at 14 kN is approx. 0.5 Nm.

A required driving torque for the motor of approx. 3.12 Nm is obtained. **Safety factors of 30-50 % should be considered when selecting the motor**.

* Efficiency at rated load and a speed of n = 200 rpm; lower efficiency can be expected at higher speeds due to the increasing grease friction

Calculation of motor speed

The motor speed is calculated as follows:

$$n = \frac{s}{p \times t_{stroke}}$$

s	Stroke
p	Lead
t_{stroke}	Time in which the stroke s must be travelled

In the above example a stroke of approx. 10 mm should be completed in less than 0.5 s.

Without considering acceleration and braking, this gives:

$$n = \frac{s}{p \times t_{stroke}} = \frac{10\,\text{mm}}{1\,\text{mm} \times 0.5\,\text{s}} = \frac{60\,\text{s}}{\text{min}} = 1200\,\frac{1}{\text{min}}$$

The duration for acceleration and braking can only be calculated when the mass moment of inertia is known.

A required average speed for the motor of n = 1200 rpm is obtained.

A correspondingly higher maximum speed would result if acceleration and braking were included.

Speed limit

The following factor applies to the maximum speed limit of the ASCA servo screw:

$$d \times n < 140\,000$$

d	ASCA servo screw nominal diameter in mm
n	Speed in rpm

Sample calculation

An ASCA servo screw PWG 44 is to be operated at a speed n = 3000 rpm.

The nominal diameter is d = 43.4 mm.
This gives:

$$d \times n = 43.4\,\text{mm} \times 3000\,\frac{1}{\text{min}} = 130\,200 < 140\,000$$

Therefore a speed of 3000 rpm is allowable for the ASCA servo screw.

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Model Codes / Order Data

Equipment parameter	Version specification	Order Code	PWG 10	PWG 12	PWG 16	PWG 20	PWG 25	PWG 32	PWG 44	PWG 63	PWG 73	PWG 100
Screw lead	1 mm		1	1	1	1	1					
	1.5 mm							1.5	1.5			
	2 mm		2	2	2	2	2			2		
	3 mm				3	3	3	3	3		3	3
	4 mm					4	4			4		
	4.5 mm							4.5	4.5			
	5 mm						5					
	6 mm							6	6	6	6	6
	7.5 mm								7.5			
	8 mm									8		
	9 mm										9	9
	10 mm									10		
	11.5 mm											11.5
	12 mm										12	
	14.5 mm											14.5
	15 mm										15	
	17.5 mm											17.5
	20.5 mm											20.5
Nut type	Cylindrical	A	1	1	1	1	1	1	1	1	1	1
	Flat-sided flange	A	2	2	2	2	2	2	2	2	2	A

Sample order: PWG 10 x 2 – A1

Size / Screw lead / Nut type