High-quality High-performance
WON Linear Motion Guide

WON ST Linear Motion Guide is a four-row circular face-to-face duplex structure and a 4-direction equal load type which is excellent in bearing high load with high rigidity as well as compatibility between a rail and a block, and allows smooth and precise operation.

Compact Ball Spline

Linear Ball Spline

Ball Spline
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Ball Spline
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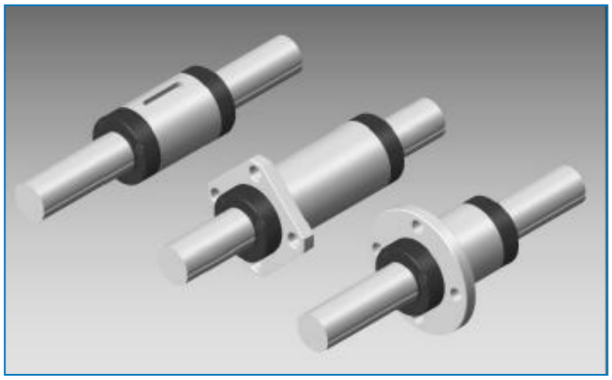


1 Ball Spline

1. Structures & Features

WON Ball Spline is an innovative linear motion system, in that balls accommodated in the spline nut transmit torque while linearly moving on precision-ground raceways on a spline shaft.
Furthermore, one significant difference against the usual ball bush is that a single spline nut can exert preload. As a result of this ability, the Ball Spline is well suited for using under severe service conditions involving vibration and the application of impact loads, and in locations that require highly precise positioning and high-speed operation.
The Ball Spline has two loading ball rows to be arranged so that ball rows in the 2 grooves at 180°Δ to be precisely ground.

2. Transmission of High Torque

The Ball Spline has grooves to be very precisely ground in a round type closely to a ball diameter so that, if torque load is put over spline shaft and spline nut 2 rows are evenly put in the direction of the torque load within the 2 rows with load. The rotation center is automatically determined.

3. High load capacity and long life

The Ball Spline can be made compact, and besides stable safety & longer life should be guaranteed in spite of overload and torsional load.

4. Zero Gap

The Ball Spline minimizes clearance in the rotational direction Gap. Pre-loading on a spline nut can reduce Gap to zero if necessary, there by increasing rigidity.

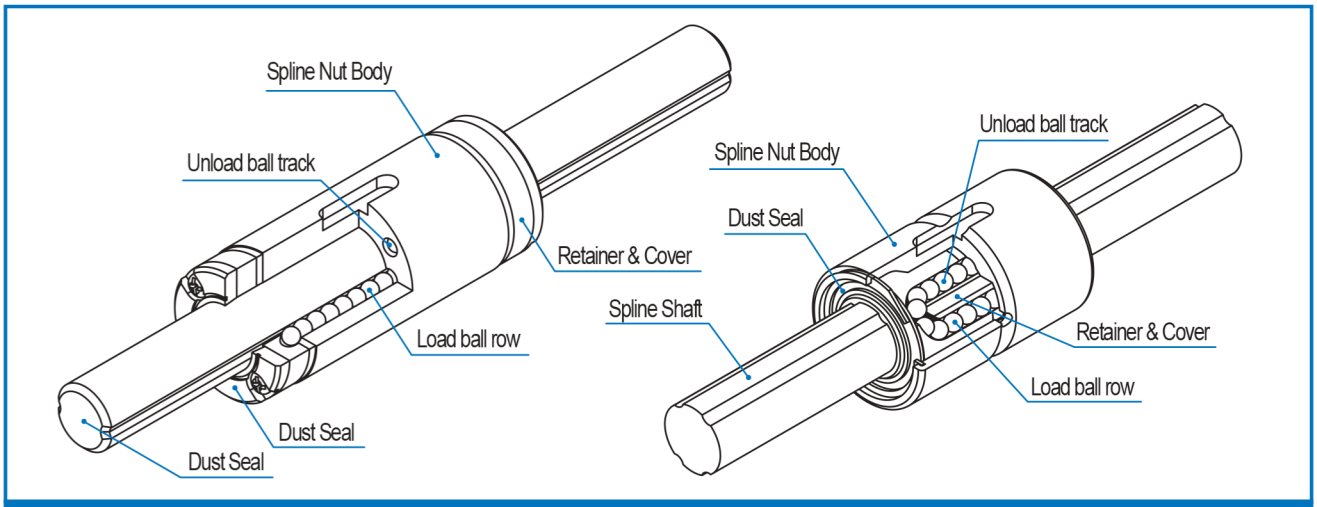


Fig 1. Feature of Compact Ball Spline

Ball Spline	Compact Ball Spline	- 2 rows and 4 points contact type - Simple structure and very compact
	Linear Ball Spline	- 4 rows and 2 points contact type - Angular contact type and high load rating of radial direction and torque direction

2 Selection of Ball Spline

1. Overview

To select Ball Spline, most of all identify detailed requirements and prioritize the requirements to select the Ball Spline suitable for the service conditions.

2. Procedure

1 Identify service conditions	equipment, maintenance structure, installation space, assembly status, functional requirements, service conditions
2 Select the type of Ball Spline	Select the appropriate type by considering motion condition, load level, rigidity, friction, and assembly
3 Select the model number of Ball Spline	Determine the model number and the quantity of nut by considering the space and load
4 Calculate load	Calculate the load in vertical and horizontal directions and moment
5 Calculate equivalent load	Calculate each load applied to the nut and shaft by converting it into equivalent load
6 Calculate mean load	Calculate each load applied to the nut, shaft and variable load during deceleration by converting them into mean load
7 Calculate static safety factor	Calculate the static safety factor identified by basic load rating and max. equivalent load and check if it fits for service conditions
8 Calculate life	Check if it fits for service conditions by calculating load rating and life
9 Review preload & clearance	Select the pre-load and clearance suitable for service conditions
10 Determine the class of precision	Determine the class of precision required by Ball Spline while driving or rotating
11 Lubrication, dust proof, surface handling	Select lubricant suitable for the environment using grease, oil, and special grease lubrication and select seal for dust proof / determine the method of surface handing for rust prevention and low dust raise
12 Complete selection	Complete the decision of final specifications of Ball Spline

3 Life Calculation

1. Life

If external load is applied to Ball Spline while driving, fatigue fracture occurs by stress created as load is repeatedly applied to the raceway surface and rolling elements, and flaking-peeling off in scale-like flakes arises. A total driving distance until flaking occurs due to tinitial fatigue fracture is the life of a linear motion guide.

- Defects may occur in Ball Spline earlier than when flaking normally occurs due to wear or fatigue in the following cases:

a. Excess load by the imprecise assembly following a difference in temperature or tolerance
b. If Ball Spline is contaminated with foreign substance
c. Driving with insufficiention
d. Reciprocating motion in a very short distance in the form of vibration or wave during the halt or drive
e. Excessive load to Ball Spline
f. Deformation of plastic end-plate

2. Rating fatigue life(L)

Generally Ball Spline does not always have same life even though the products are manufactured in the same way because of the difference in scattering of way material's original fatigue. For this reason, the reference value of life is defined as the rating fatigue life which is a total driving distance that flaking does not occur in 90% of Ball Spilne in a group when having them run under the same conditions by grouping multiple Ball Splines with same specifications into a group.

Radial load rating

$$L=\left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C}\right)^3 \times 50\,km$$

Torque load rating

$$L=\left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{T}{P_T}\right)^3 \times 50\,km$$

$$L_h=\frac{10^3 \cdot L}{2 \times \ell_S \times n_1 \times 60}$$

L	: Basic life time	(km)
C	: Basic dynamic load torque	(N)
T	: Basic dynamic torque	(N · m)
P_C	: Calculated load	(N)
P_T	: Calculated torque	(N · m)
f_H	: Hardness factor(refer to Pic 4)	
f_T	: Temperature factor(refer to Pic 5)	
f_C	: Contact factor(refer to table 1)	
f_W	: Load factor(refer to table 2)	

L_h	: Life time	(h)
ℓ_S	: Stroke length	(m)
n_1	: number of round-trip times per minute	(min^{-1})

• Hardness factor (f_H)

To realize the best performance of Ball Spline, the proper hardness and depth should be maintained between the nut contacting a rolling element (ball) and the raceway surface of shaft. WON Ball Spline has HRC58-64 surface hardness, so there is no need to consider hardness factor. But if the hardness is lowered than baseline, Ball Spline's load capacity decreases, so hardness factor needs to be reflected in calculating life.

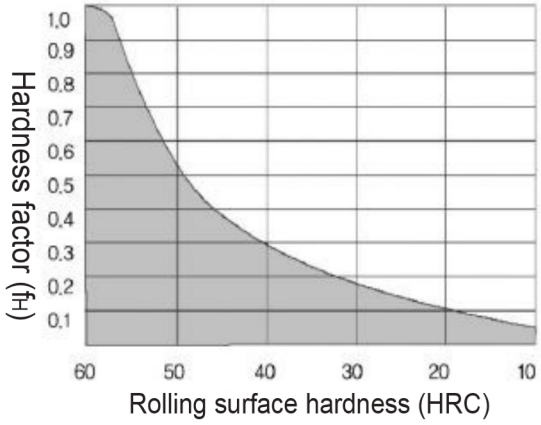


Figure 2. Hardness factor (f_H)

• Temperature factor (f_T)

If high temperature over 100°C is applied to Ball Spline, temperature factor (f_T) needs to be taken into account when selecting Ball Spline. WON Ball Spline must be used at less than 80°C But you have to use it at over 80°C , please use a high-temp Ball Spline -WON ST's specially customized product.

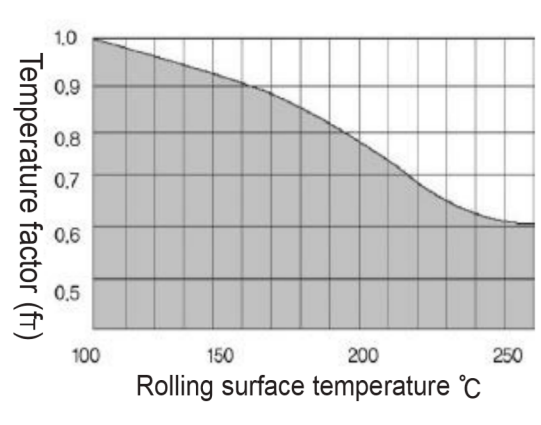


Figure 3. Temperature factor (f_T)

Note) In ambient temperature of over 80, materi als for seal, end plate, and support plate should be changed to the specifications for high temperature.

• Contact factor (f_C)

If over two nuts of Ball Spline are closely assembled, since uniform load may not be applied to nuts due to difference among mounting surfaces, you have to multiply basic static load rating (C) and basic dynamic load rating (Co) by contact factor shown in Table 2.

Table 2. Contact factor (fc)

No. of nuts contacted	Contact factor (fc)
2	0.81
3	0.72
4	0.66
5	0.61
Over 6	0.6
Common use	1.0

• Load factor (fw)

Generally the static load applied to the nut of Ball Spline can be calculated by formula. But the load applied to the nut while running the machine tends to come from vibration or impact. Therefore, you have to consider load factor (fw) shown in Table 3 for the vibration or impact load during the speedy running of the machine. It can be calculated by dividing the basic dynamic load rating of Ball Spline by load factor (fw).

Table 3. Load factor (fw)

External condition	Service conditions	Load factor(fw)
Low	There is no external vibration or impact due to the smooth running of machine at mild speed.	1.0 ~ 1.3
Moderate	There is moderate external vibration or impact due to the running of machine at low speed.	1.2 ~ 1.5
Big	There is strong vibration or impact due to the running of machine at fast speed.	1.5 ~ 2.0
Very big	There is strong vibration or impact due to the running of machine at very fast speed.	2.0 ~ 4.0

3. Static safety factor(fs)

Ball Spline cannot be gotten good movement caused by sectional permanent deformation on a ball and race way if heavy load or impact load act on it. In general, a limit in use depends on the working condition and the requirement of ball spline. In this case, static safety factor is obtained using the following equation and the general values shown in table 4.

$$fs = \frac{Co}{Pro} \quad or \quad fs = \frac{To}{Pto}$$

fs : Static safety factor
Co : Basic static load rating, (N)
To : Static rated toque, (N · m)
Pro : Applied load (N)
Pto : Torque (N · m)

Table 4. Static safety factor (fs)

Used environment	fs
Vibration & impact	3 ~ 5
High running	2 ~ 4
General movement	1 ~ 3

4. Basic dynamic load rating(C)

Basic dynamic load rating means a load in regular size of stop diameter direction with the direction which travels at 50 x 10^3m without material's damage(spalling or flaking) by 90% of fatigue when a group of anguler Ball Splines are individually travelled.
Each value of basic dynamic load rating (C) is stated in the catalogue. (Refer to Fig. 4)

5. Basic static load rating(Co)

Basic static load rating defines a static load to be given a regular contact stress in the middle of contacting portion both of a rolling body with the maximum load and a track. (Refer to Fig. 4)

6. Basic dynamic rating torque(T)

Load rating torque means a torque in regular size with the direction which travels at 50 x 10^3m without material's damage(spalling or flaking) by 90% of fatigue when a group of anguler Ball Splines are individually travelled. (Refer to Fig. 5)

7. Basic static rating torque(T_O) · Basic static rating moment(T_M)

Basic static torque and static moment is defined as the constant stress in the middle of contacting portion both of a rolling body and a track under the maximum load when torque and moment (Refer to Fig. 5) are loaded.(T_M) indicated in the dimension table can endure static moment both of 1 and 2 outer nut to be adhered closely

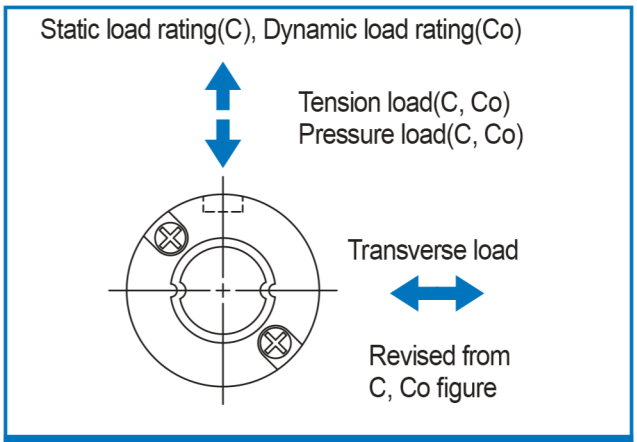


figure 4. Load rating and load effect direction

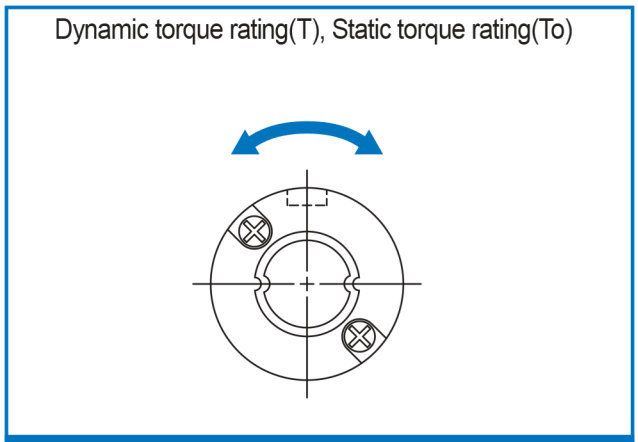


figure 5. Load effect direction of Torque rating

Compact Ball Spline must be used with their load rating corrected in accordance to the load direction. The basic dynamic load rating and basic static load rating shown in the dimension table should be corrected to values in Table below.
(Basic dynamic rating torque, Basic static rating torque & Basic static rating moment are corrected using the same multiple.)

Size	Basic dynamic load rating			Basic static load rating		
	Downward	Upward	Lateral	Downward	Upward	Lateral
4 ~ 12	C	C	1.73 Co	Co	Co	1.73 Co
15 ~ 40	C	C	1.19 Co	Co	Co	1.19 Co

4 Pre-load of Ball Spline

Pre-load

WON's angular Ball Spline can be pre-loaded in case that rigidity and high positioning repeatability in rotational irection are necessary. The average of pre-load is 1/2~1/3 of load, but the amount of pre-load is necessary to be selected with consideration of travel life of Ball Spline in case that vibration load or pulsating load is added, and especially high rigidity is necessary.
WON's angular Ball Spline serves with calculated pre-load based on the load in the circumferential direction. It is indicated according to the method of part number format. We serve the standard pre-load unless there is customer's special requirement/indication. Please inquire to WON in case of the pre-load exceeding light pre-load.

Table 5. Pre-load & Application

Type of pre-load	Symbol	Amount of pre-load	Application
Clearance	CL	0(1) ~ +	• Machines/Equipments for definitely simple operation
Standard	CM	0(2) ~ –	• General machines/equipments • Machines/Equipments to need small motion resistance
Light preload	CT	0.02Co	• Machines/Equipments to need rigidity • Machines/Equipments for big vibration/impact load • Machines/Equipments with big moment load or pulsating load

Note(1) Zero or a little of clearance.
Note(2) Zero or a little of pre-load.
Remark) Clearance applies to WSP(F)(K) 4.Light pre-load does not apply to WSP(F)(K) 4

5 Accuracy

WON's angular Ball Spline has the accuracy of KS B 1422(JIS B 1193). It is divided into 3 grades-normal (no symbol), high(H) and Precision(P), and the details is shown in the Table 1~3. The symbol of the grades is marked by the arrangement of the part-numbers. The figures of the tables also include the precision of the case that the shaft-ends are processed(the portions both of supporting and parts mounting in Fig.2) can help even special requirements/inquires for other precision. The measuring method of accuracy is shown in Table 6.

Table 6. The torsion of Ball Spline

Accuracy grade	Torsion (MAX)		
	Normal grade	High(H)	Precision(P)
Tolerance	33㎛/100㎜	13㎛/100㎜	6㎛/100㎜

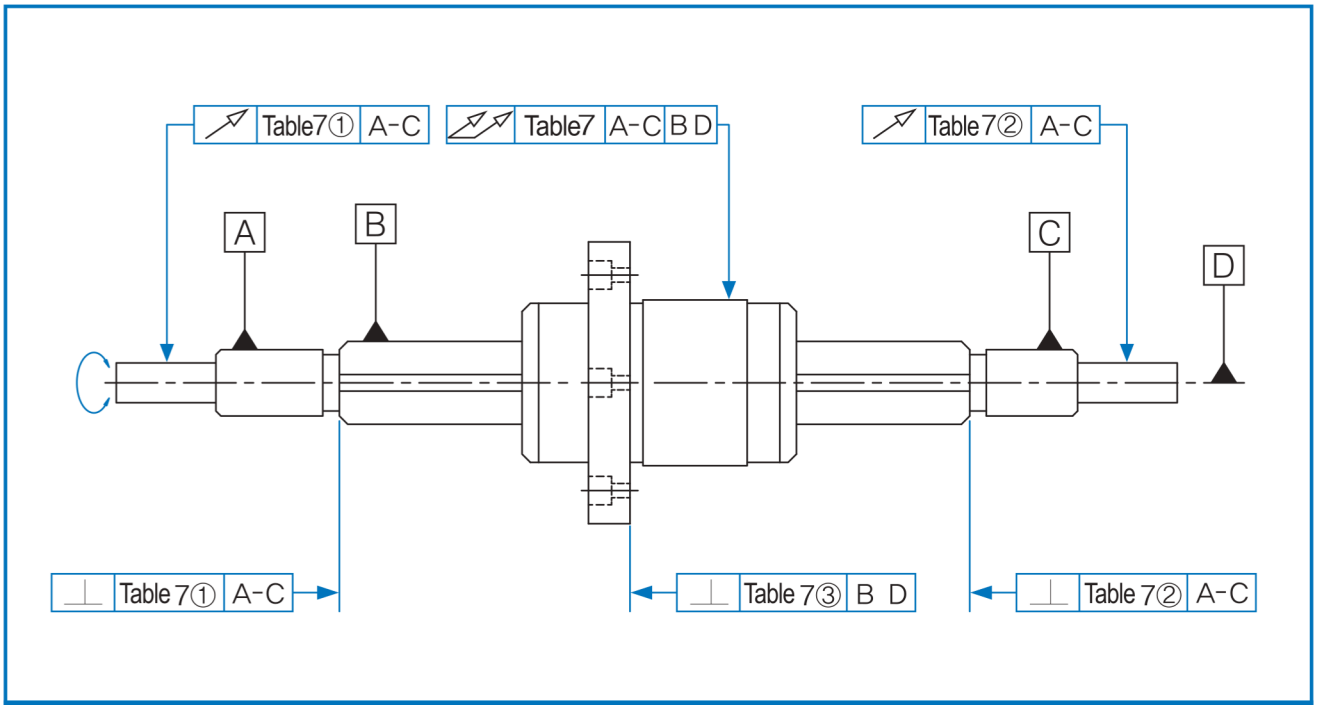


Figure 6. The several parts of accuracy measurement of Ball Spline

Figure 7. The precision of each part on Ball Spline

Unit : μm

Part No.			WSP 4	WSP 5	WSP6	WSP 8	WSP 10	WSP 12	-	WSP 15	WSP 20	WSP 25	WSP 30	WSP 40
			–			WLS 8	WLS 10	-	WLS 13	WLS 16	WLS 20	WLS 25	WLS 30	WLS 40
datum plane A – C	① torsion to radial direction on installation place	Normal	33				41		46			53		62
		High H	14				17		19			22		25
		Precision P	8				10		12			13		15
	② vertical angle degree of spline	Normal	22						27			33		39
		High H	9						6			13		16
		Precision P	6						8			9		11
datum plane A – C B D	③ vertical angle degree of flange face to the center line of spline shaft	Normal	27				33					39		46
		High H	11				13					16		19
		Precision P	8				9					11		13

Figure 8. Torsion to radial direction on the center line of Ball Spline

Unit : μm

Shaft (mm)	Over	–	200	315	400	500	630	800	1000	1250
	Below	200	315	400	500	630	800	1000	1250	1600
WSP 4 WSP 5 WSP 6 WSP 8 WLS 8	Normal	72	133	185	236	–	–	–	–	–
	High H	46	89	128	163	–	–	–	–	–
	Precision P	26	57	82	108	–	–	–	–	–
WSP 10 WSP 12 WLS 10	Normal	59	83	103	123	151	190	–	–	–
	High H	36	54	68	82	102	130	–	–	–
	Precision P	20	32	41	51	65	85	–	–	–
WSP 15 WSP 20 WLS 13 WLS 16 WLS 20	Normal	56	71	83	95	112	137	170	–	–
	High H	34	45	53	62	75	92	115	–	–
	Precision P	18	25	31	38	46	58	75	–	–
WSP 25 WSP 30 WLS 25 WLS 30	Normal	53	58	70	78	88	103	124	151	–
	High H	32	39	44	50	57	68	83	102	–
	Precision P	18	21	25	29	34	42	52	65	–
WSP 40 WLS 40	Normal	53	58	63	68	74	84	97	114	139
	High H	32	36	39	43	47	54	63	76	93
	Precision P	16	19	21	24	27	32	38	47	–

6 Lubrication and contamination prevention of Ball Spline

Ball Splines are taken care of by all mineral oils and anti-corrosive with affinity. Grease should be recommended for anti-corrosion as it can be lubricated by oil or grease, grease-lubrication additionally gives another sealing effect, and it can be easily adhered inside of Ball Spline.
WON's Ball Spline is taken good care of protection against dust using by high quality lithium-soap group of grease with extreme pressure lubricant. Ball Spline with oil-hole to be machined on the nut is used for supplying grease.

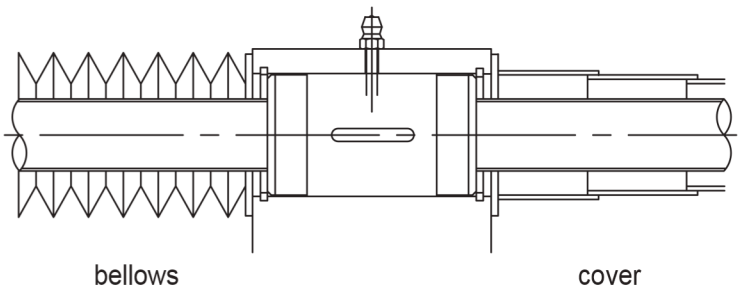


Figure 7. contamination-proof item example

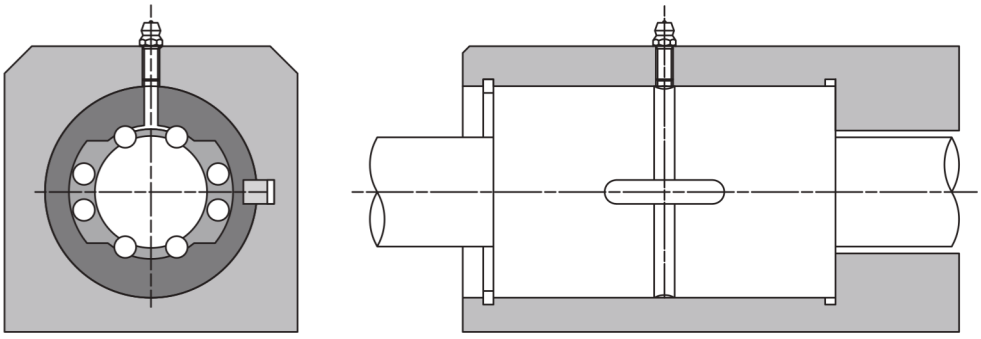


Figure 8. refueling item example

7 Assembly

Fitting

WON's Angular Ball Spline generally has a stop fit (J7) in fitting the nut and the housing.
In case that accuracy & rigidity are not so necessary, a clearance fit (H7) is used.

Insertion of the spline nut

When a spline nut is inserted into a housing, it can affect to the operation. Please use a tool for installation and insert it so as not to give any impact to retainer. (fig. 9)

Insertion of the spline shaft

When a spline shaft is inserted into a spline nut, a ball may come out. So that, it should be inserted after exactly setting the location of the track slot of the shaft, the row of balls of the spline nut and the location of the seal.

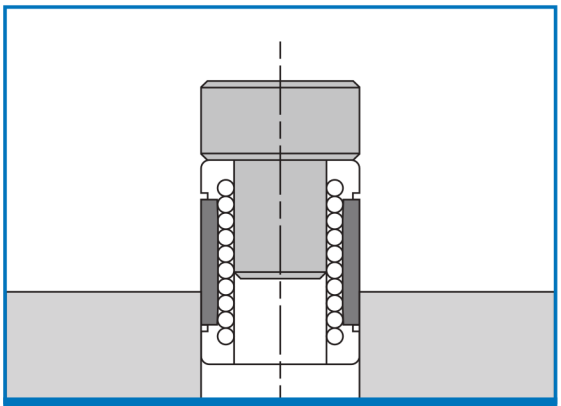


Figure 9.

8 Caution in Use

① WON's Ball Spline can be used in an environment up to a temperature 120℃, and up to 80℃ for continuous use. Please inquire to WON for the application exceeding the temperature 80℃

② WON's Ball Spline has an optimum precision of adjustment at the same portion of both symbols ofspline shaft and nut. (refer to fig. 10) When ball spline is installed in a machine, it is necessary to payattention to keeping steering both nut & ball spline, the arrangement of nut and the steering direction.

③ In case that 2 nuts and more are used per shaft and so 2 keys and more is used on the rotational direction of outside fixing, the location of nut key ways should be parallel. For this case, please inquire to WON

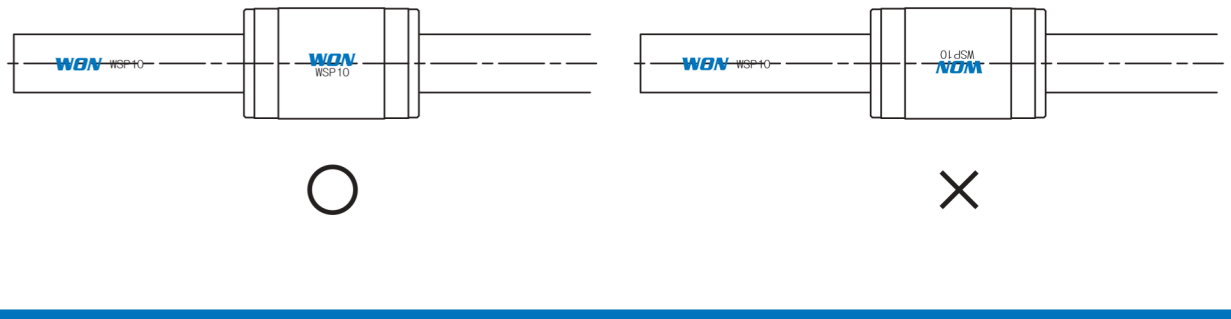


Figure 10.

9 Compact Ball Spline

1. Structure and Feature

The structure of WON Ball Spline is composed of nut and shaft.
Balls are in the nut and gothic arch grooves are on the shaft and balls in the nut roll on the grooves as linear movement on the shaft grinded precisely.
One nut withstands radial load, moment load and transfers rotation torque to circumferential direction of shaft. Preload can be adjusted by using the balls assembled between grooves on nut and shaft so this linear movement system could against high vibrating impact load and suitable for high precise position decision, high speed movement and longer life time.

2. High torque transfer

The grooves of spline are on the rolling face of nut and shaft which is ground precisely as gothic arch shape so balls contact with grooves by 4 points. Therefore 2 rows receive same load and transfer turning force under the condition of turning torque on shaft or nut owing to this kind of structure.

3. High load capacity and Long life

Ball Spline has compact structure but the rolling faces of nut and shaft meet ball, the rolling element by face contact. So it can sustain the rated load 10 times more than ball bush in the condition of same diameter and assure longer life time. It's very advantageous for miniaturization of facility and support radial load, moment load and overhang load.

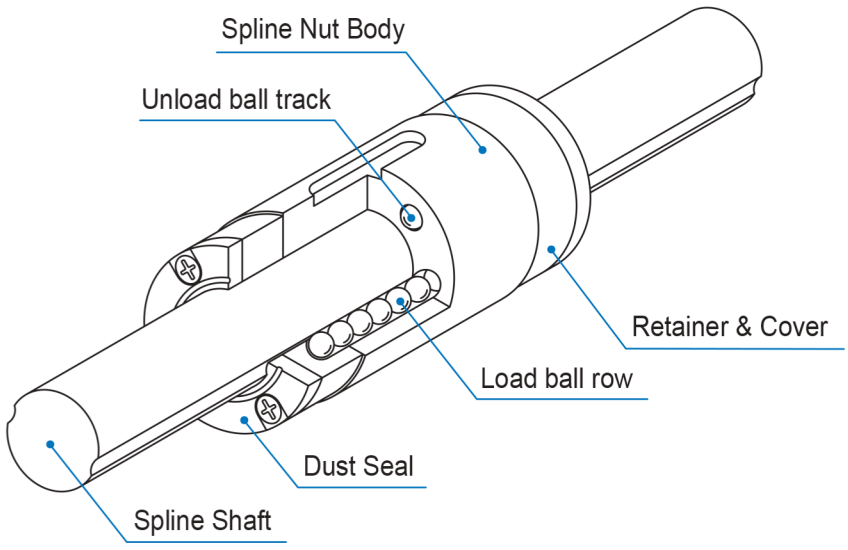


Figure 11. The structure of Compact Ball Spline

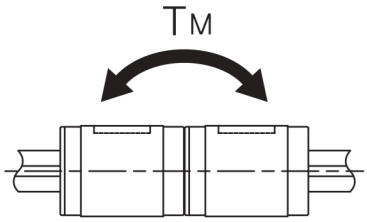
Classification	Type	Type & Features	
Round Type	WSP WSPL		Ball Spline nut has a machined key groove so that can fix exactly the position in rotational direction.
	WSPT WSPTO		It has the neat apperance as well as the stable strength according as retainer is inserted into the cover.
Flange Type	WSPF WSPFL		It has enough strength as it is all-in-one both of flange and the body of Ball Spline nut.Easier installation with round flange.
	WSPK WSPKL		Easier and more compact installation with square flange.
	WSPTF WSPTFO		It has enough strength as it is all-in-one both of flange and the body of Ball Spline nut. Easier installation with round flange.

WSP Type

Examples of model number formation

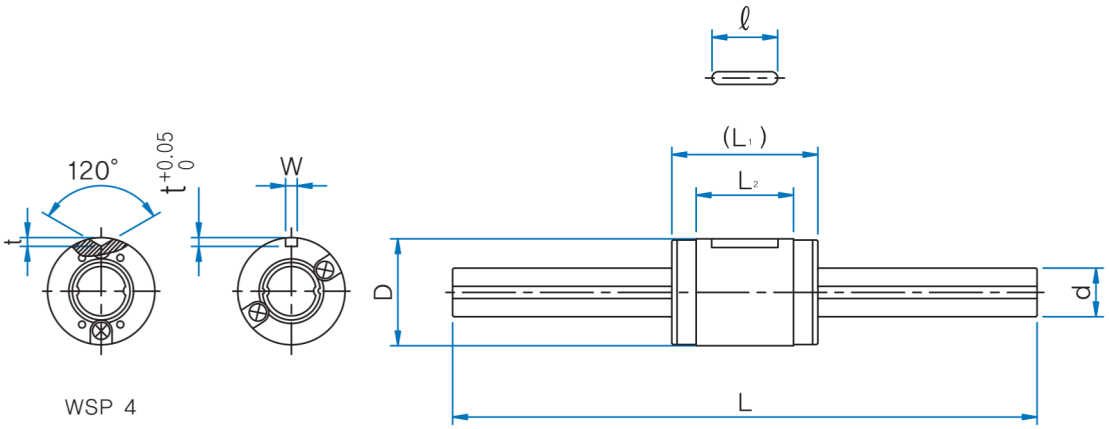
2 WSP 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions											
	Outer Diameter D	Allowable Tolerance	L_1	L_2	W	Allowable Tolerance	t	ℓ	d	Allowable Tolerance	Length L	Max. length
WSP 4(2)	8	0 −0.009	12	7.9	–	–	1	–	4	0 −0.012	100 150	200
WSP 5	10		18	8.9	2		1.2	6	5		100 150	200
WSP 6	12	0 −0.011	21	12.4	2		1.2	6	6		150 200	300
WSP 8	15		25	14.6	2.5	+0.014 0	1.5	8.5	8	0 −0.015	150 200 250	500
WSP 10	19	0 −0.013	30	18.2	3		1.8	11	10		200 300	600
WSP 12	21		35	23	3		1.8	15	12	0 −0.018	200 300 400	800
WSP 15	23		40	27	3.5	+0.018 0	2	20	13.6		200 300 400	1000
WSP 20	30	0 −0.016	50	33	4		2.5	26	18.2	0 −0.021	300 400 500 600	1000
WSP 25	37		60	39.2	5		3	29	22.6		300 400 500 600 800	1200
WSP 30	45		70	43	7	+0.022 0	4	35	27.2		400 500 600	
WSP 40	60	0 −0.019	100	70.8	10		4.5	55	37.2	0 −0.025	700 1100	

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.
(2) There are no seals in WSP 4.



WSP 4

Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
304	382	0.686	0.882	0.49 2.94	2.5	9.6	WSP 4(2)
588	637	1.764	1.96	1.078 7.84	4.8	14.9	WSP 5
715	853	2.45	3.038	1.764 11.76	8.9	19	WSP 6
1176	1372	5.488	6.174	3.234 21.56	15.9	39	WSP 8
1862	2156	10.78	12.74	6.958 41.16	31.5	60.5	WSP 10
2156	2646	14.7	18.62	10.78 58.80	44	87.5	WSP 12
4214	6076	31.36	45.08	27.44 151.90	59.5	111	WSP 15
6566	9016	65.66	90.6	49.00 287.14	130	202	WSP 20
11196	14294	138.94	177.93	92.76 550.78	220	310	WSP 25
15394	19392	230.91	291.88	146.94 873.65	430	450	WSP 30
21291	31587	425.83	631.75	363.85 1939.22	760	808	WSP 40

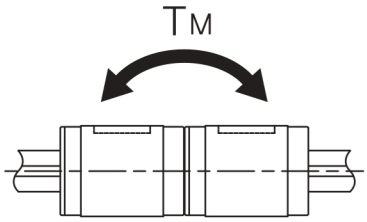
1N≒0.102kgf

WSPL Type

Examples of model number formation

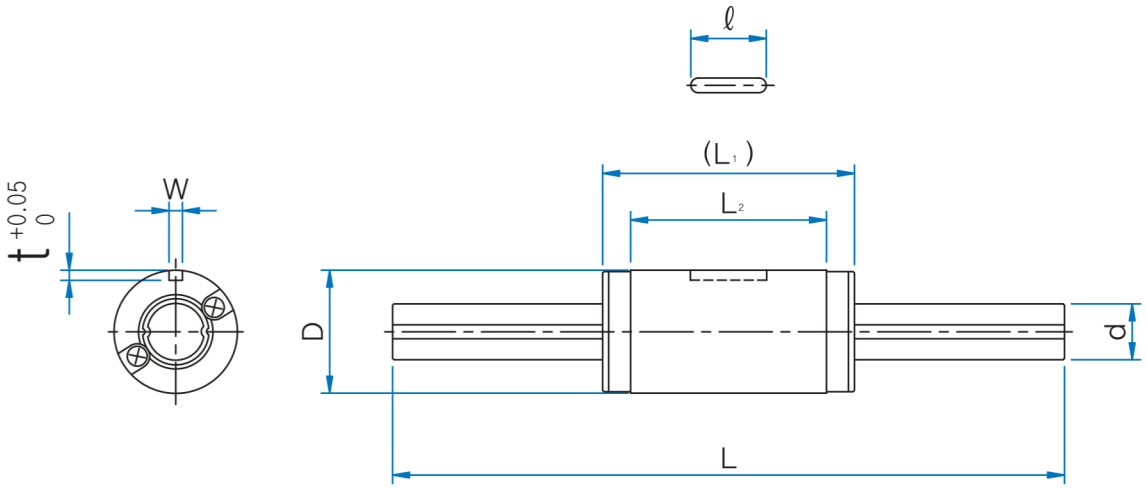
2 WSPL 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions											
	Outer Diameter D	Allowable Tolerance	L_1	L_2	W	Allowable Tolerance	t	ℓ	d	Allowable Tolerance	Length L	Max. length
WSPL 5	10	0 −0.009	26	17.4	2	+0.014 0	1.2	6	5	0 −0.012	100 150	200
WSPL 6	12	0 −0.011	30	21.4	2		1.2	8	6		150 200	300
WSPL 8	15		37	26.6	2.5		1.5	8.5	8		150 200 250	500
WSPL 10	19	0 −0.013	47	34.9	3		1.8	11	10	0 −0.015	200 300	600
WSPL 12	21		54	42	3		1.8	15	12		200 300 400	800
WSPL 15	23		65	52	3.5	+0.018 0	2	20	13.6	0 −0.018	200 300 400	1000
WSPL 20	30	0 −0.016	71	54	4		2.5	26	18.2		300 400 500 600	1000
WSPL 25	37		84	63.2	5		3	29	22.6	0 −0.021	300 400 500 600 800	1200
WSPL 30	45		98	71	7	+0.022 0	4	35	27.2		400 500 600 700 1100	

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.



Unit : mm

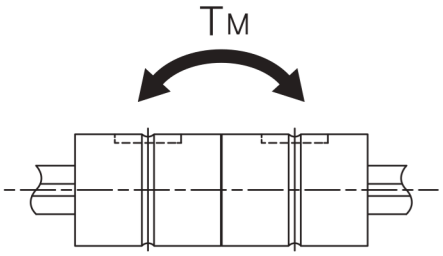
Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
882	1176	2.646	3.528	3.136 19.60	7.9	14.9	WSPL 5
1078	1470	3.626	5.194	4.998 27.44	14.5	19	WSPL 6
1764	2450	8.33	11.76	9.80 56.84	26.5	39	WSPL 8
2842	4018	16.66	23.52	22.54 115.64	56.5	60.5	WSPL 10
3234	4802	21.56	33.32	32.34 156.80	76.8	87.5	WSPL 12
6370	11564	48.02	86.24	94.08 447.86	110	111	WSPL 15
9310	15092	93.10	150.92	127.40 619.36	198	202	WSPL 20
15394	23191	192.92	289.88	228.91 1189.52	336	310	WSPL 25
21291	31587	319.87	473.81	363.85 1899.24	634	450	WSPL 30

WSPT Type

Examples of model number formation

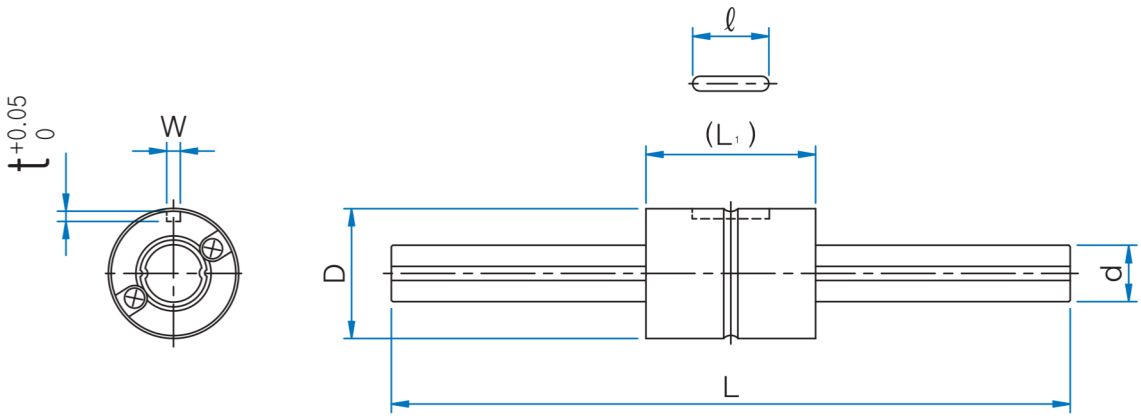
2 WSPT 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions										
	Outer Diameter D	Allowable Tolerance	L_1	W	Allowable Tolerance	t	ℓ	d	Allowable Tolerance	Length L	Max. length
WSPT 4(2)	10	0 -0.009	16	2	+0.014 0	1.2	6	4	0 -0.012	100 150	200
WSPT 5	12	0 -0.011	20	2.5		1.2	8	5		100 150	200
WSPT 6	14		25	2.5		1.2	10.5	6		150 200	300
WSPT 8	16		25	2.5		1.2	10.5	8	0 -0.015	150 200 250	500
WSPT 10	21	0 -0.013	33	3		1.5	13	10		200 300	600
WSPT 12	24		36	3		1.5	15	12	0 -0.018	200 300 400	800
WSPT 15	31		50	3.5	+0.018 0	2	17.5	13.6		200 300 400	1000
WSPT 20	35	0 -0.016	63	4		2.5	29	18.2	0 -0.021	300 400 500 600	1000

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.
(2) There are no seals in WSP 4.



Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
441	637	0.588	0.784	0.882 6.272	2.5	9.6	WSPT 4(2)
686	882	0.882	1.372	1.47 11.368	4.8	14.9	WSPT 5
1176	2156	0.98	1.96	4.9 35.57	8.9	19	WSPT 6
1470	2548	1.96	2.94	5.88 43.12	15.9	39	WSPT 8
2842	4900	3.92	7.84	15.68 96.04	31.5	60.5	WSPT 10
3528	5782	5.88	10.78	19.20 135.24	44	87.5	WSPT 12
7056	12642	31.36	34.30	66.84 385.14	59.5	111	WSPT 15
10192	17836	56.84	55.86	115.64 686.0	130	202	WSPT 20

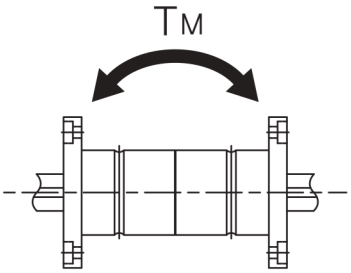
1N≒0.102kgf

WSPTF Type

Examples of model number formation

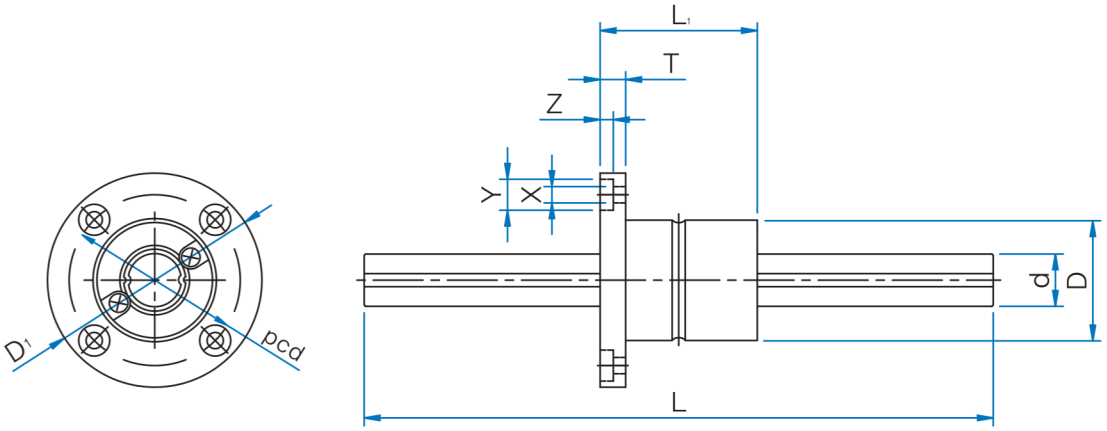
2 WSPTF 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions										
	Outer Diameter D	Allowable Tolerance	L_1	D_2	T	pcd	X x Y x Z	d	Allowable Tolerance	Length L	Max. length
WSPTF 6	14	0 -0.011	25	30	5	22	3.4 x 6.5 x 3.3	6	0 -0.012	150 200	300
WSPTF 8	16	0 -0.013	25	32	5	24	3.4 x 6.5 x 3.3	8		150 200 250	500
WSPTF 10	21		33	42	6	32	4.5 x 8 x 4.4	10		200 300	600
WSPTF 12	24	0 -0.016	36	44	7	33	4.5 x 8 x 4.4	12	0 -0.015	200 300 400	800
WSPTF 15	31		50	51	7	40	4.5 x 8 x 4.4	13.6		200 300 400	1000
WSPTF 20	35		63	58	9	45	5.5 x 9.5 x 5.4	18.2	0 -0.018	300 400 500 600	1000

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.



Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
1176	2156	0.98	1.96	4.9 35.57	37.2	19	WSPTF 6
1470	2548	1.96	2.94	5.88 43.12	39.5	39	WSPTF 8
2842	4900	3.92	7.84	15.68 96.04	64.2	60.5	WSPTF 10
3528	5782	5.88	10.78	19.20 135.24	124.7	87.5	WSPTF 12
7056	12642	31.36	34.30	66.64 385.14	265.7	111	WSPTF 15
10192	17836	56.84	55.86	115.64 686	392.5	202	WSPTF 20

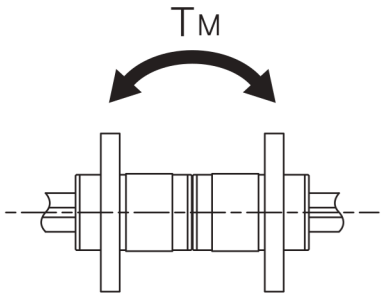
1N≒0.102kgf

WSPF Type

Examples of model number formation

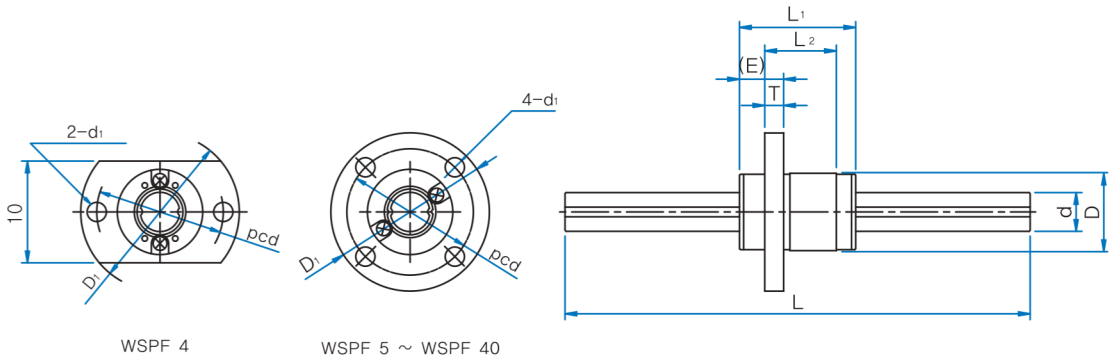
2 WSPF 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions												
	Outer Diameter D	Allowable Tolerance	L_1	L_2	D_1	E	T_1	pcd	d_1	d	Allowable Tolerance	Length L	Max. length
WSPF 4(2)	8	0 −0.009	12	7.9	21	4.6	2.5	15	3.4	4	0 −0.012	100 150	200
WSPF 5	10		18	9.4	23	7	2.7	17	3.4	5		100 150	200
WSPF 6	12	0 −0.011	21	12.4	25	7	2.7	19	3.4	6		150 200	300
WSPF 8	15		25	14.6	28	9	3.8	22	3.4	8	0 −0.015	150 200 250	500
WSPF 10	19	0 −0.013	30	18.2	36	10	4.1	28	4.5	10		200 300	600
WSPF 12	21		35	23	38	10	4	30	4.5	12	0 −0.018	200 300 400	800
WSPF 15	23		40	27	40	11	4.5	32	4.5	13.6		200 300 400	1000
WSPF 20	30	0 −0.016	50	33	46	14	5.5	38	4.5	18.2	0 −0.021	300 400 500 600	1000
WSPF 25	37		60	39.2	57	17	6.6	47	5.5	22.6		300 400 500 600 800	1200
WSPF 30	45		70	43	65	21	7.5	54	6.6	27.2		400 500 600 700 1100	
WSPF 40	60	0 −0.019	100	70.8	93	26.6	12	73	9	37.2	0 −0.025		

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.
(2) There are no seals in WSP 4.



WSPF 4 WSPF 5 ~ WSPF 40

Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
303	382	0.686	0.882	0.49 2.94	5.1	9.6	WSPF 4(2)
588	637	1.764	1.96	1.078 7.84	8.9	14.9	WSPF 5
715.4	853	2.45	3.038	1.764 11.76	13.9	19	WSPF 6
1176	1372	5.488	6.174	3.234 21.56	23.5	39	WSPF 8
1862	2156	10.78	12.74	6.958 41.16	45	60.5	WSPF 10
2156	2646	14.70	18.62	10.78 58.80	59	87.5	WSPF 12
4214	6076	31.36	45.08	27.44 151.90	77	111	WSPF 15
6566	9016	65.66	90.16	49.00 287.14	150	202	WSPF 20
11196	14294	138.94	177.93	92.76 550.78	255	310	WSPF 25
15349	19392	230.91	291.88	146.94 873.65	476	450	WSPF 30
21291	31587	425.83	631.75	363.85 1939.22	962	808	WSPF 40

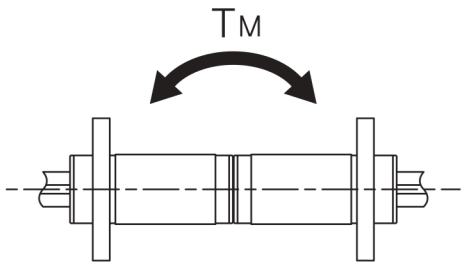
1N≒0.102kgf

WSPFL Type

Examples of model number formation

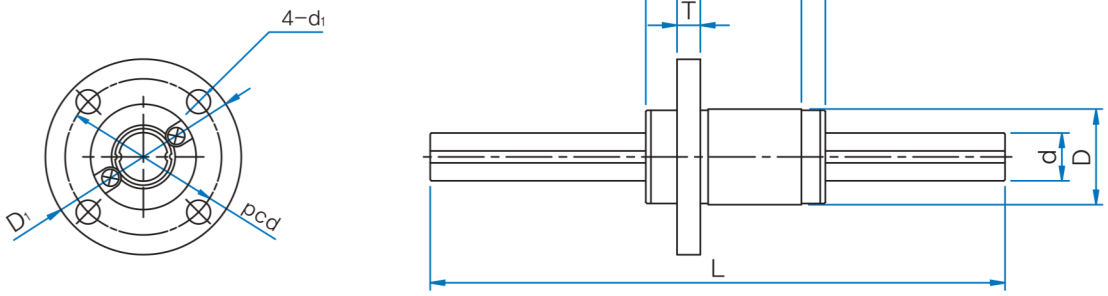
2 WSPFL 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions												
	Outer Diameter D	Allowable Tolerance	L_1	L_2	D_1	E	T	pcd	d_1	d	Allowable Tolerance	Length L	Max. length
WSPFL 5	10	0 −0.009	26	17.4	23	7	2.7	17	3.4	5	0 −0.012	100 150	200
WSPFL 6	12	0 −0.011	30	21.4	25	7	2.7	19	3.4	6		150 200	300
WSPFL 8	15		37	26.6	28	9	3.8	22	3.4	8	0 −0.015	150 200 250	500
WSPFL 10	19	0 −0.013	47	34.9	36	10	4.1	28	4.5	10		150 200 250	600
WSPFL 12	21		54	42	38	10	4	30	4.5	12	0 −0.018	200 300	800
WSPFL 15	23		65	52	40	11	4.5	32	4.5	13.6		200 300 400	1000
WSPFL 20	30	0 −0.016	71	54	46	14	5.5	38	4.5	18.2	0 −0.021	300 400 500 600	1000
WSPFL 25	37		84	63.2	57	17	6.5	47	5.5	22.6		300 400 500 600 800	1200
WSPFL 30	45		98	71	65	21	7.5	54	6.5	27.2		400 500 600 700 1100	

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.



Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
882	1176	2.646	3.528	3.136 19.60	12	14.9	WSPFL 5
1078	1470	3.626	5.194	4.998 27.44	19.5	19	WSPFL 6
1764	2450	8.33	11.76	9.80 56.84	34.1	39	WSPFL 8
2842	4018	16.66	23.52	22.54 115.64	70	60.5	WSPFL 10
3234	4802	21.56	33.32	32.34 156.80	91.8	87.5	WSPFL 12
6370	11564	48.02	86.24	94.08 447.86	127.5	111	WSPFL 15
9310	15092	93.10	150.92	127.40 619.36	218	202	WSPFL 20
15394	23191	192.92	289.88	228.91 1189.52	371	310	WSPFL 25
21291	31587	319.84	473.81	363.85 1899.24	680	450	WSPFL 30

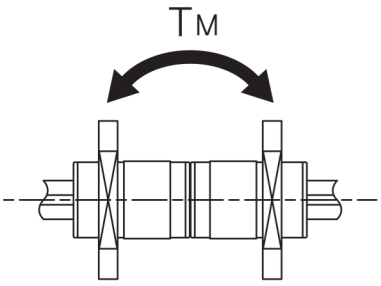
1N≒0.102kgf

WSPK Type

Examples of model number formation

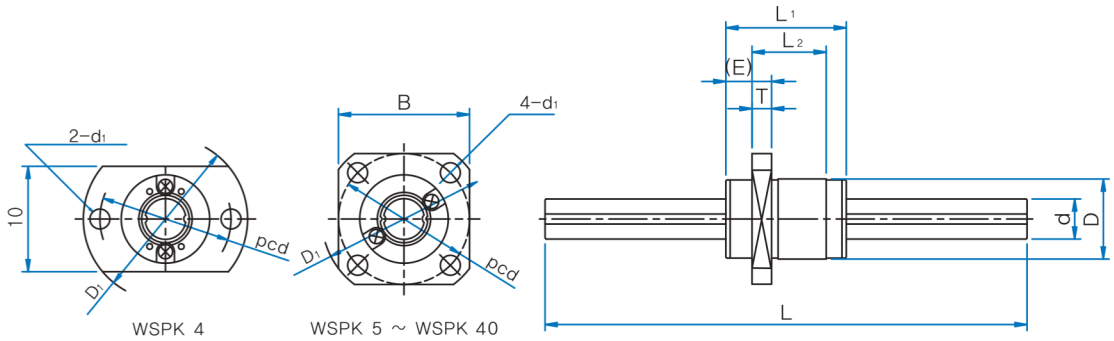
2 WSPK 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions													
	Outer Diameter D	Allowable Tolerance	L_1	L_2	D_2	B	E	T	pcd	d_1	d	Allowable Tolerance	Length L	Max. length
WSPK 4 (2)	8	0 −0.009	12	7.9	21	10	4.6	2.5	15	3.4	4	0 −0.012	100 150	200
WSPK 5	10		18	9.4	23	18	7	2.7	17	3.4	5		100 150	200
WSPK 6	12	0 −0.011	21	12.4	25	20	7	2.7	19	3.4	6		150 200	300
WSPK 8	15		25	14.6	28	22	9	3.8	22	3.4	8	0 −0.015	150 200 250	500
WSPK 10	19	0 −0.013	30	18.2	36	28	10	4.1	28	4.5	10		200 300	600
WSPK 12	21		35	23	38	30	10	4	30	4.5	12	0 −0.018	200 300 400	800
WSPK 15	23		40	27	40	31	11	4.5	32	4.5	13.6		200 300 400	1000
WSPK 20	30	0 −0.016	50	33	46	35	14	5.5	38	4.5	18.2	0 −0.021	300 400 500 600	1000
WSPK 25	37		60	39.2	57	43	17	6.6	47	5.5	22.6		300 400 500 600 800	1200
WSPK 30	45		70	43	65	50	21	7.5	54	6.6	27.2		400 500 600 700 1100	
WSPK 40	60	0 −0.019	100	70.8	93	73	26.6	12	73	9	37.2	0 −0.025		

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.
(2) There are no seals in WSP 4.



Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
303	382	0.686	0.882	0.49 2.94	5.1	9.6	WSPK 4(2)
588	637	1.764	1.96	1.078 7.84	8.9	14.9	WSPK 5
715.4	852.6	2.45	3.038	1.764 11.76	13.9	19	WSPK 6
1176	1372	5.488	6.174	3.234 21.56	23.5	39	WSPK 8
1862	2156	10.78	12.74	6.958 41.16	45	60.5	WSPK 10
2156	2646	14.70	18.62	10.78 58.80	59	87.5	WSPK 12
4214	6076	31.36	45.08	27.44 151.90	77	111	WSPK 15
6566	9016	65.66	90.16	49.00 287.14	150	202	WSPK 20
11196	14294	138.94	177.93	92.76 550.78	255	310	WSPK 25
15394	19392	230.91	291.88	146.94 873.65	476	450	WSPK 30
21291	31587	425.83	631.75	363.85 1939.22	962	808	WSPK 40

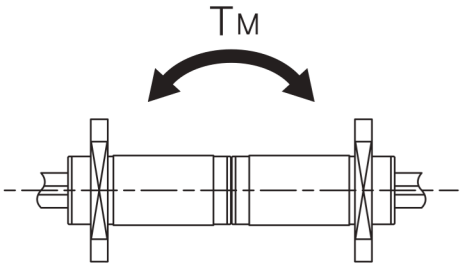
1N≒0.102kgf

WSPKL Type

Examples of model number formation

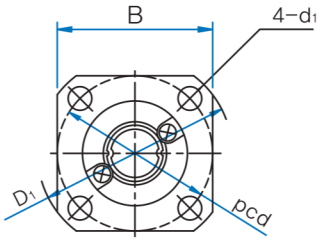
2 WSPKL 6 – S 300 CM H /A
1 2 3 4 5 6 7 8

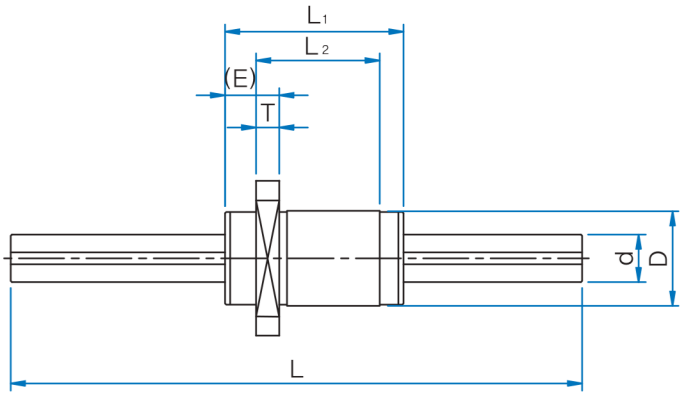
1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.



Part No.	Main dimensions													
	Outer Diameter D	Allowable Tolerance	L_1	L_2	D_1	E	B	T	pcd	d_1	d	Allowable Tolerance	Length L	Max. length
WSPKL 5	10	0 −0.009	26	17.4	23	7	18	2.7	17	3.4	5	0 −0.012	100 150	200
WSPKL 6	12	0 −0.011	30	21.4	25	7	20	2.7	19	3.4	6		150 200	300
WSPKL 8	15		37	26.6	28	9	22	3.8	22	3.4	8	0 −0.015	150 200 250	500
WSPKL 10	19	0 −0.013	47	34.9	36	10	28	4.1	28	4.5	10		200 300	600
WSPKL 12	21		54	42	38	10	30	4	30	4.5	12	0 −0.018	200 300 400	800
WSPKL 15	23		65	52	40	11	31	4.5	32	4.5	13.6		200 300 400	1000
WSPKL 20	30	0 −0.016	71	54	46	14	35	5.5	38	4.5	18.2	0 −0.021	300 400 500 600	1000
WSPKL 25	37		84	63.2	57	17	43	6.6	47	5.5	22.6		300 400 500 600 800	1200
WSPKL 30	45		98	71	65	21	50	7.5	54	6.6	27.2		400 500 600 700 1100	

Note(1) As for the Static load rating moment T_M, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.





Unit : mm

Basic load ratings		rating torque		Static load rating moment(1)	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
882	1176	2.646	3.528	3.136 19.60	12	14.9	WSPKL 5
1078	1470	3.626	5.194	4.998 27.44	19.5	19	WSPKL 6
1764	2450	8.33	11.76	9.80 56.84	34.1	39	WSPKL 8
2842	4010	16.66	23.52	22.54 115.64	70	60.5	WSPKL 10
3234	4802	21.56	33.32	32.34 156.80	91.8	87.5	WSPKL 12
6370	11564	48.02	86.24	94.08 447.86	127.5	111	WSPKL 15
9310	15092	93.10	150.92	127.40 619.36	218	202	WSPKL 20
15394	23191	192.92	289.88	228.91 1189.52	371	310	WSPKL 25
21291	31587	319.87	473.81	 1899.24	680	450	WSPKL 30

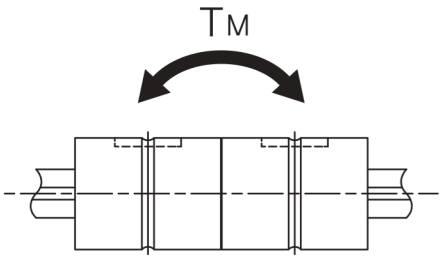
1N≒0.102kgf

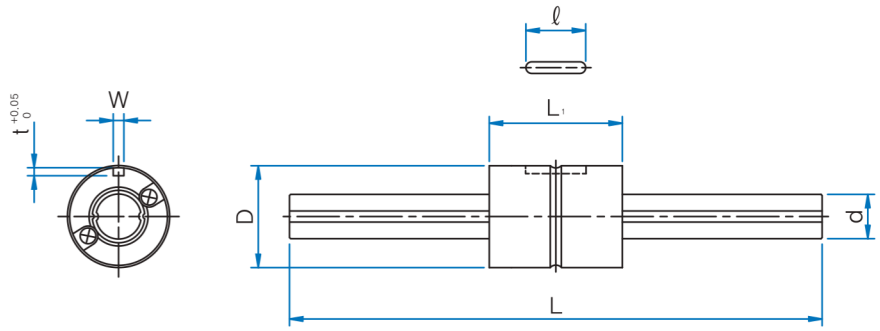
WSPTO Type

Examples of model number formation

2 WSPTO 16 – S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.





Unit : mm

Part No.	Main dimensions										
	Outer Diameter D	Allowable Tolerance	L1	W	Allowable Tolerance	t	ℓ	d	Allowable Tolerance	Length L	Max. length
WSPTO 16	31	0 −0.013	50	3.5	+0.018 0	2	17.5	16	0 −0.017	200 300 400	1000
WSPTO 20	35	0 −0.016	63	4		2.5	29	20	0 −0.020	300 400 500 600	1000

Part No.	Basic load ratings		rating torque		Static load rating moment	Mass	
	C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm
WSPTO 16	7060	12600	31.4	34.3	67.6 393	165	160
WSPTO 20	10200	17800	56.9	55.9	118 700	225	250

1N≒0.102kgf

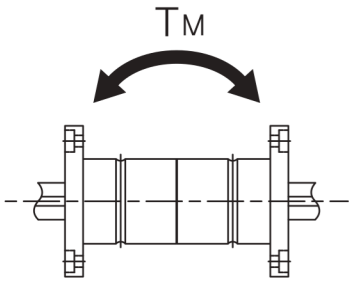
Note(1) As for the Static load rating moment TM, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.

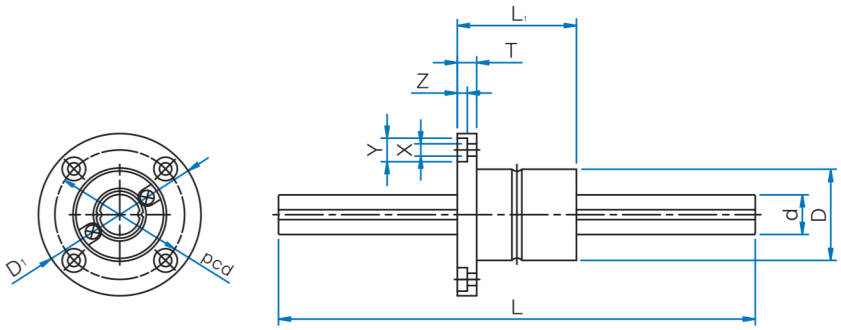
WSPTFO Type

Examples of model number formation

2 WSPTFO 16 - S 300 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.





Unit : mm

Part No.	Main dimensions										
	Outer Diameter D	Allowable Tolerance	L1	D1	T	pcd	X x Y x Z	d	Allowable Tolerance	Length L	Max. length
WSPTFO 16	31	0 −0.013	50	51	7	40	45 x 8 x 4.4	16	0 −0.017	200 300 400	1000
WSPTFO 20	35	0 −0.016	63	58	9	45	5.5 x 9.5 x 5.4	20	0 −0.020	300 400 500 600	1000

Part No.	Basic load ratings		rating torque		Static load rating moment	Mass	
	C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm
WSPTFO 16	7060	12600	31.4	34.3	67.6 393	165	160
WSPTFO 20	10200	17800	56.9	55.9	118 700	225	250

1N≒0.102kgf

Note(1) As for the Static load rating moment TM, the upside figures are for the value for one nut and the downside figure are for the values for 2 nuts to be closely adhered.

10 Linear Ball Spline

1. Structure and feature

WON Linear Ball Spline is composed of shaft and nut both has groove as rolling raceway. Retainer, seal, balls are in spline nut which design make it move smoothly.

2. High load capacity and Long life

Raceway is ground as R shape almost similar to the diameter of ball so the contact area is wide and high load capacity and long life could be achieved.

3. Precise torque transfer

The raceway groove of shaft and nut controls balls with optimal contact angle so torque can be transferred by just 1 axis. And we can increase the load capacity or the degree of precise positioning decision by zeroised the gap of rotation direction which conveys preload.

4. High speed movement, High speed rotation

Cylinder is compact and the balance is good so it's good at high speed movement and high speed rotation.

5. Product classification

There are 8 sizes from 8 to 40 and 2 types of nut shape, cylinder type(WLS), flange type(WLSF).
* please contact WON if you need one with other raw material.

6. Easy for further processing

WON Linear Ball Spline has groove raceway for ball rolling on round shaft so it's easy for diverse further processing and popular on varied industrial fields.

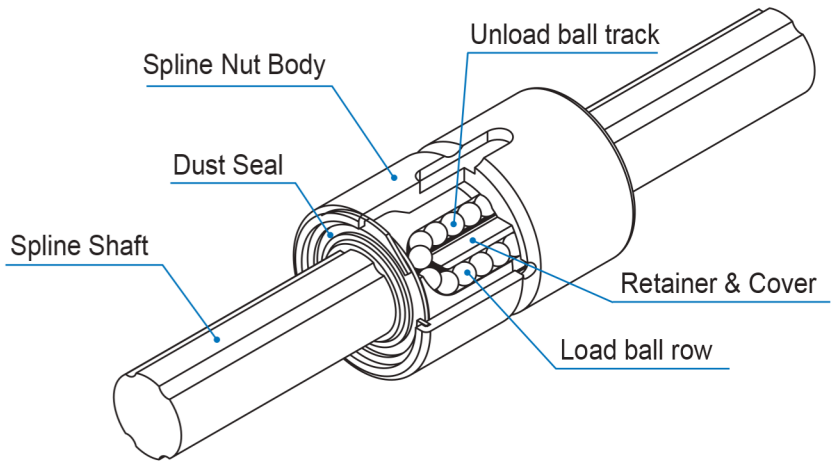


Figure 12. The structure of Linear Ball Spline

Classification	Type	Types & Feature	
Round type	WLS		Ball Spline nut has a machined key groove so that can fix exactly the position in rotational direction.
Flange type	WLSF		It has enough strength as it is all-in-one both of flange and the body of Ball Spline nut. Easier installation with round flange.

※ WON Linear Ball Spline can be selected for use and seal is in all type of nut as a standard component.

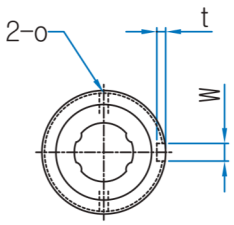
WLS Type

Examples of model number formation

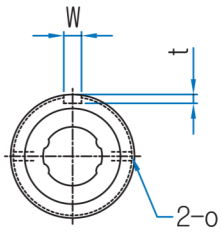
2 WLS 8 – S 400 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.

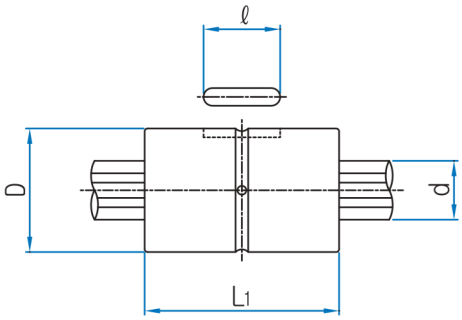
Part No.	Main dimensions										
	Outer Diameter D	Allowable Tolerance	L_1	Allowable Tolerance	W	Allowable Tolerance	t	ℓ	O	d	Allowable Tolerance
WLS 8	16	0 -0.011	25	0 -0.2	2.5	+0.014 0	1.2	10.5	1.5	8	0 -0.015
WLS 10	21	0 -0.013	33		3		1.5	13	1.5	10	
WLS 13	24		36		3		1.5	15	1.5	13	0 -0.018
WLS 16	31	0 -0.016	50		3.5	+0.018 0	2	17.5	2	16	
WLS 20	35		63		4		2.5	29	2	20	0 -0.021
WLS 25	42		71	0 -0.3	4		2.5	36	3	25	
WLS 30	47		80		4		2.5	42	3	30	
WLS 40	64	0 -0.019	100		6		3.5	52	4	40	0 -0.025



WLS 8~13



WLS 16~40



Unit : mm

Basic load ratings		rating torque		Static load rating moment	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
1,450	2,870	2.1	3.7	7.4	23	38	WLS 8
2,730	5,070	4.4	8.2	18.0	54	60	WLS 10
2,670	4,890	21	39.2	13.7	70	100	WLS 13
6,120	11,200	60	110	46	150	150	WLS 16
8,900	16,300	105	194	110	220	240	WLS 20
12,800	23,400	189	346	171	330	370	WLS 25
18,600	23,200	307	439	181	360	540	WLS 30
30,800	37,500	647	934	358	950	960	WLS 40

1N≒0.102kgf

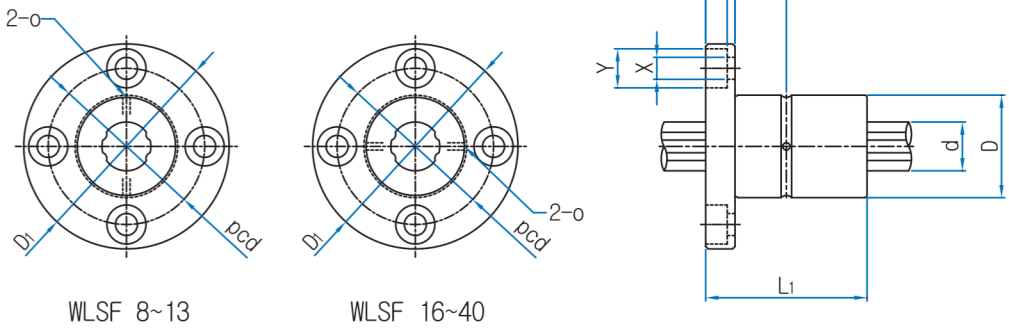
WLSF Type

Examples of model number formation

2 WLSF 8 – S 400 CM H /A
1 2 3 4 5 6 7 8

1 Q'ty of Nut 2 Part No. 3 Spline-shaft diameter
4 S:Solid, H:Hollow 5 Spline-shaft overall length
6 Preload : CT(Tight), CM(Middle), CL(Loose)
7 Accuracy symbol-Nomal(No symbol), High(H), Precision(P)
8 SUJ2(No symbol), Stainless steel(/A)
* When the grease nipple is necessary, please ask WON.

Part No.	Main dimensions											
	Outer Diameter D	Allowable Tolerance	L_1	Allowable Tolerance	D_1	T	PCD	X x Y x Z	L_2	o	d	Allowable Tolerance
WLSF 8	16	0 -0.011	25	0 -0.2	32	5	24	3.4 x 6.5 x 3.3	2.5	2.5	8	0 -0.015
WLSF 10	21	0 -0.013	33		42	6	32	4.5 x 8 x 4.4	3	3	10	
WLSF 13	24		36		43	7	33	4.5 x 8 x 4.4	3	3	13	0 -0.018
WLSF 16	31	0 -0.016	50		50	7	40	4.5 x 8 x 4.4	3.5	3.5	16	
WLSF 20	35		63		58	9	45	5.5 x 9.5 x 5.4	4	4	20	0 -0.021
WLSF 25	42		71	0 -0.3	65	9	52	5.5 x 9.5 x 5.4	4	4	25	
WLSF 30	47		80		75	10	60	6.6 x 11 x 6.5	4	4	30	
WLSF 40	64	0 -0.019	100		100	14	82	9 x 14 x 8.6	6	6	40	0 -0.025



WLSF 8~13　　WLSF 16~40

Unit : mm

Basic load ratings		rating torque		Static load rating moment	Mass		Part No.
C N	Co N	T N·m	To N·m	TM N·m	Nut g	Shaft g/100mm	
1,450	2,870	2.1	3.7	7.4	42	38	WLSF 8
2,730	5,070	4.4	8.2	18.0	94	60	WLSF 10
2,670	4,890	21	39.2	13.7	100	100	WLSF 13
6,120	11,200	60	110	46	200	150	WLSF 16
8,900	16,300	105	194	110	330	240	WLSF 20
12,800	23,400	189	346	171	450	370	WLSF 25
18,600	23,200	307	439	181	550	540	WLSF 30
18,600	37,500	674	934	358	1,410	960	WLSF 40

1N≒0.102kgf