

Coupling selection

Normally the TOOLFLEX® is selected according to the nominal torque (T_{KN}) shown in the list of technical data, like all other coupling systems. In all cases the torque (T_{KN}) must exceed the maximum torque to be transmitted (accelerating or peak torque). This should mainly be considered in connection with servo motors because their accelerating torques both positive and negative can exceed the nominal torque of the coupling by a significant amount. In case of values exceeding T_{KN} (collision, trouble) only limited alternating load figures are possible. In this torque range there can be permanent deformation of the bellow and fatigue fractures can occur.

Description	Symbol	Definition or explanation	Description	Symbol	Definition or explanation
Rated torque of coupling	T_{KN}	Torque that can continuously be transmitted over the entire permissible speed range	max. engine performance	$P_{max.}$	max. power in kW which the engine may produce
Peak torque of machine	T_S	Peak torque on the coupling	engine speed	n	Rated speed in rpm of the engine
Peak torque on the driving side	T_{AS}	Peak torque with torque shock on the driving side, e. g. breakdown torque of the electric motor	Torsional angle	φ	Transmission error of the metal bellow due to torsional strain
Peak torque of load side	T_{LS}	Peak torque with torque shock on load side, e. g. braking	Torsional stiffness	C_T	Torsional stiffness of the coupling in Nm/rad. For data see tables shown on the following pages.
Moment of inertia	$J_{A/L}$	Total of moments of inertia existing on the driving or load side referring to the coupling speed	Frequency of the 2-mass-system	f_e	in s^{-1}
Rotational inertia coefficient of driving side	m_A	Factor taking into account the mass distribution with shocks and vibrations produced on the driving side	Exciting frequency of the drive	f_r	in s^{-1}
Rotational inertia coefficient of load side	m_L	Factor taking into account the mass distribution with shocks and vibrations produced on the load side	Operating factor	k	$k = 1.5$ with uniform movement $k = 2.0$ with ununiform movement $k = 2.5 - 4$ with shocking movement For drives in machine tools (servo motors) k values of $1.5 - 2$ must be used.

Judgement calculation

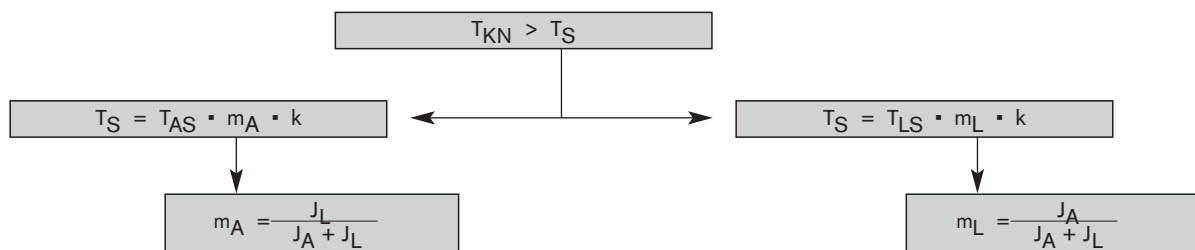
The size of the coupling must be selected so that the following conditions are met.

$$T_{KN} \geq T_{AS/LS} \cdot k$$

$$T_{KN} \text{ [Nm]} = 9550 \cdot \frac{P_{max} \text{ [kW]}}{n \text{ [rpm]}}$$

When selecting servo motors the calculations are made with the torque values of the engine suppliers and not with P_{max} . When dimensioning the coupling please use the respective data of the manufacturer considering the servo controller to be used.

Accelerating torque (drive side / load side)



Inspection of torsional stiffness

$$\varphi = \frac{180 \cdot T_{AS}}{\pi \cdot C_T}$$

Inspection of resonance frequency

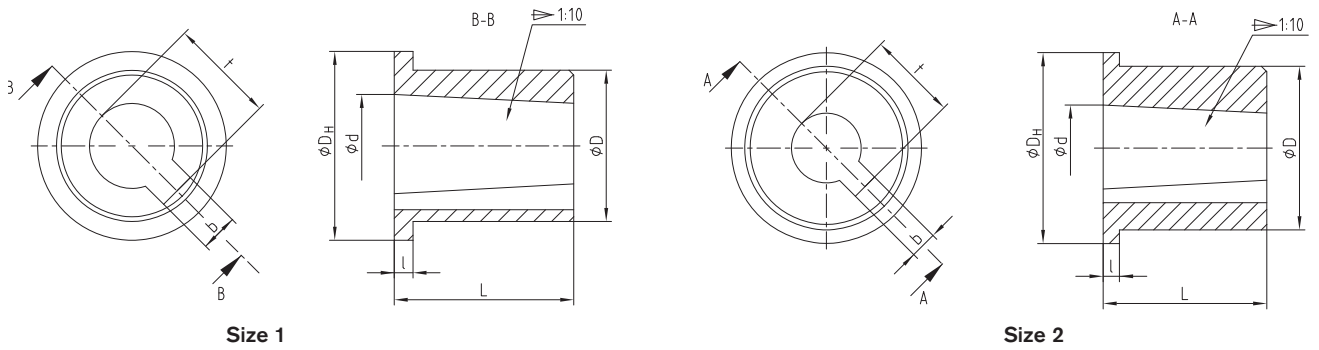
The natural frequency of the coupling must be above or below the frequency of the unit. Valid for the mechanical spare model of the 2-mass-system:

$$f_e = \frac{1}{2 \cdot \pi} \cdot C_T \cdot \frac{J_L + J_A}{J_L \cdot J_A} \text{ [Hz]} \quad \text{Valid in practice: } f_e \geq 2 \cdot f_r$$

Basic programme

Basic programme TOOLFLEX® miniature (Finish bore [mm] according to ISO fit F7)																
Size	Hub design	∅2	∅3	∅4	∅5	∅6	∅6,35	∅7	∅8	∅9	∅9,5	∅10	∅11	∅12	∅14	∅16
5	1.1	●	●	●	●											
7	1.1		●	●	●	●		●	●							
	2.5		●	●	●	●	●	●	●							
9	1.1			●	●	●		●	●	●		●				
	2.5		●	●	●	●	●	●	●	●						
12	1.1				●	●		●	●			●				
	2.5				●	●	●	●	●	●		●	●	●		

Basic programme TOOLFLEX® type M and S (Finish bore [mm] according to ISO fit F7)																													
Size	∅5	∅6	∅6,35	∅7	∅8	∅9	∅10	∅11	∅12	∅14	∅15	∅16	∅18	∅19	∅20	∅22	∅24	∅25	∅28	∅30	∅32	∅35	∅38	∅40	∅42	∅45	∅48	∅50	∅55
16	■	●	●	●	●	●	●	●	●	●	●	●																	
20	■						●	●	●	●	●	●	●	●	●														
30	■									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
38	■												●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
42	■													●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
45	■																	●	●	●	●	●	●	●	●	●	●	●	●
55	■																				●	●	●	●	●	●	●	●	●



Type M and S sleeve dimensions [mm] for FANUC engines									
Sleeve size	L	l	D _H	D	d ^{+0,05}	b ^{ISO}	t ^{+0,1}	Taper	Notice
1	16	2	20	16	10,9	4	12,2	1:10	For TOOLFLEX size 16-20
2	30	3	35	30	15,8	5	17,9	1:10	For TOOLFLEX size 30-45

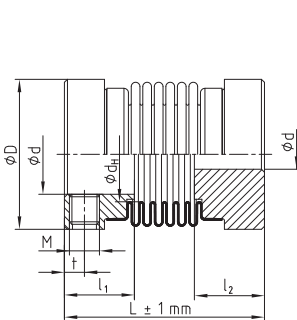
Basic programme TOOLFLEX® type KN (Finish bore [mm] according to ISO fit F7)																			
	∅14	∅15	∅16	∅18	∅19	∅20	∅22	∅24	∅25	∅28	∅30	∅32	∅35	∅38	∅40	∅42	∅45	∅48	
30	■	●	●	●	●	●	●	●	●										
38	■	●	●	●	●	●	●	●	●	●									
42	■																		
45	■			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
55	■									●	●	●	●	●	●	●	●	●	●

■ Pilot bore
Further dimensions on request

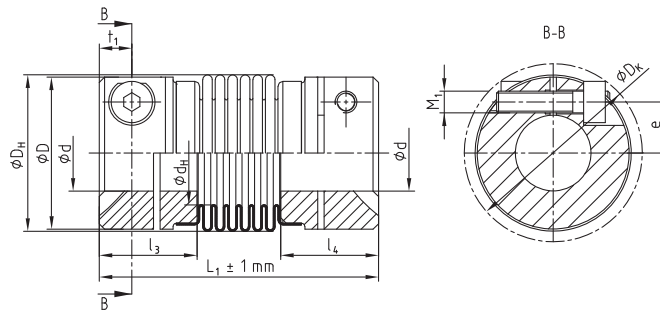
Miniature couplings



- Backlash-free, torsionally stiff
- Maintenance-free
- Low mass moment of inertia
- Easy assembly due to tolerance F7
- Temperature range - 30 °C to + 100 °C
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



TOOLFLEX® Type 1.1



TOOLFLEX® Type 2.5

Technical data of type with fixing screw (type 1.1)

Size	Design ¹⁾²⁾	Torque T_{KN} [Nm]	Dimensions [mm]									Perm. displacements			Torsional stiffness C_T [Nm/rad]	Weight ⁴⁾ [kg]
			Finish bore		General				Fixing screw			Axial [mm]	Radial [mm]	Angular [degrees]		
			$d_{min.}$	$d_{max.}$	D_H	d_H	L	$l_1; l_2$	M	t	number ³⁾ z					
5	S	0,1	2	5	10	6	15 ¹⁾	6	M2	1,8	1	0,30	0,10	0,7	97	0,0027
	17 ²⁾						0,40					0,15	1,0	75	0,003	
7	S	1,0	3	8	15	9	18 ¹⁾	7	M3	2,0	1	0,30	0,10	0,7	390	0,005
	20 ²⁾						0,40					0,15	1,0	300	0,006	
9	S	1,5	4	10	20	12	21 ¹⁾	8	M3	2,5	2	0,35	0,15	1,0	750	0,010
	24 ²⁾						0,50					0,20	1,5	580	0,011	
12	S	2,0	5	14	25	16	27,5 ¹⁾	11	M4	2,8	2	0,40	0,15	1,0	1270	0,017
	31 ²⁾						0,60					0,20	1,5	980	0,019	
16	S	5,0	5	18	32	20	37	13	M5	4	2	0,3	0,15	1,0	4500	0,046
	41						0,5					0,20	1,5	3050	0,049	
20	S	15	6	25	40	27	42	15	M5	5	2	0,4	0,15	1,0	9600	0,076
	49						0,6					0,20	1,5	6600	0,082	

Circumferential speed $v_{max} = 25 \text{ m/s}$

Technical data of type with clamping screw (type 2.5)

Size	Design ¹⁾²⁾	Torque T_{KN} [Nm]	Dimensions [mm]											zul. Verlagerungen			Torsional stiffness C_T [Nm/rad]	Weight ⁴⁾ [kg]
			Finish bore		General				Clamping screw					Axial [mm]	Radial [mm]	Angular [degrees]		
			$d_{min.}$	$d_{max.}$	D_H	d_H	L_1	$l_3; l_4$	M_1	t_1	e	D_K	I_A [Nm]					
7	S	1,0	3	7	15	9	24 ¹⁾	9	M2	3,2	5,0	16,5	0,37	0,3	0,1	0,7	390	0,007
	26 ²⁾						0,4							0,15	1,0	300	0,008	
9	S	1,5	3	9	20	12	30 ¹⁾	11	M2,5	3,5	7,1	21,5	0,76	0,35	0,15	1,0	750	0,014
	33 ²⁾						0,5							0,2	1,5	580	0,015	
12	S	2,0	4	12	25	16	34,5 ¹⁾	13	M3	4,0	8,5	26,5	1,34	0,4	0,15	1,0	1270	0,025
	38 ²⁾						0,6							0,2	1,5	980	0,027	

¹⁾ Design S = 4 shafts ²⁾ Design M = 6 shafts ³⁾ Quantity each hub, from size 9: 2x120° offset

⁴⁾ Figures refer to the complete coupling with max. bores
Circumferential speed $v_{max} = 20 \text{ m/s}$

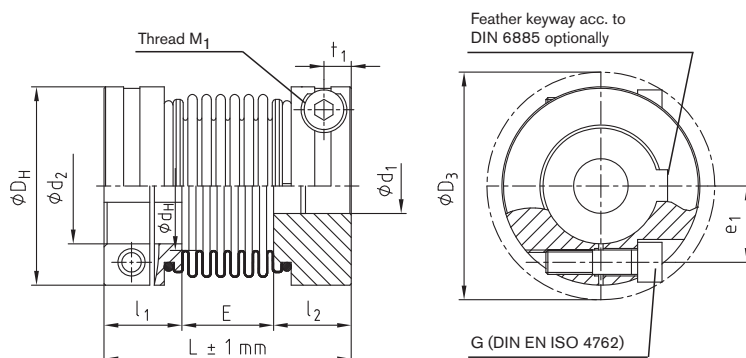
Order form:

TOOLFLEX® 7M	2.5	-	Ø4	2.5	-	Ø6
Coupling size	Hub design		Finish bore	Hub design		Finish bore

Type M



- Backlash-free, torsionally stiff
- Non-positive bellow-hub connection
- Frictionally engaged clamping hubs
- Maintenance-free
- Suitable for high temperatures due to flanged insert connection (max. 200 °C)
- Well-resistant to corrosion due to bellow made from stainless steel and aluminium clamping hubs
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



TOOLFLEX Type M

Size	Dimensions [mm]												T _A [Nm]
	Finish bore		General					Clamping screws					
	d _{min.}	d _{max.}	L	l ₁ :l ₂	E	D _H	d _H	M ₁	D ₃	t ₁	e ₁		
16	5	16	49	17,0	15	32	20	M4	35,0	5	12,0	2,9	
20	8	20	62	21,5	19	40	27	M5	43,5	6	14,5	6	
30	10	30	72	23,0	26	55	33	M6	58,0	7	19	10	
38	14	38	81	25,5	30	65	42	M8	72,6	9	25	25	
NEW 42	14	42	95	30,0	35	70	46	M8	76,1	9	27	25	
45	14	45	103	32,0	39	83	58	M10	89,0	11	30	49	
55 ³⁾	20	55	125	40,0	45	100	73	M12	106,0	14	37	120	

Technical data

Size	Torque T _{KN} [Nm]	Speed n ¹⁾ [rpm]	Moment of inertia ²⁾ [x10 ⁻⁶ kgm ²]	Torsional stiffness C _T [Nm/rad]	Axial spring stiffness [N/mm]	Radial spring stiffness [N/mm]	Perm. displacements			Mass ²⁾ [x10 ⁻³ kg]
							Axial [mm]	Radial [mm]	Winkel [Grad]	
16	5	14900	10	3050	29	92	±0,5	0,20	1,5	61
20	15	11950	32	6600	42	126	±0,6	0,20	1,5	144
30	35	8700	123	14800	65	155	±0,8	0,25	2,0	306
38	65	7350	262	24900	72	212	±0,8	0,25	2,0	448
NEW 42	95	6820	427	36500	80	333	±0,8	0,25	2,0	520
45	150	5750	1020	64000	88	492	±1,0	0,30	2,0	1125
55 ³⁾	340	4800	5118	96100	107	598	±1,0	0,30	2,0	3300

Bore range and respective torques of frictional engagement of the clamping hub [Nm]

Size	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø50	Ø55
16	8,5	8,8	9,1	9,4	9,7	9,9	10,2	10,5	11,1	11,4	11,7															
20				17,6	18,1	18,6	19,0	19,5	20,5	21,0	21,4	22,4	22,9	23,3												
30								33	34	35	36	36,4	38	38,5	39	42	42,5	44,5	46							
38												84	85	87	92	93	97	99	101	105	109					
NEW 42									84	85	87	89	90	92	96	98	101	104	106	110	114	116	119			
45														157	165	167	173	177	181	187	193	197	200	206		
55 ³⁾															397	401	413	421	429	441	453	462	470	482	502	522

¹⁾ With v = 25 m/s

²⁾ Figures refer to the complete coupling with max. bores

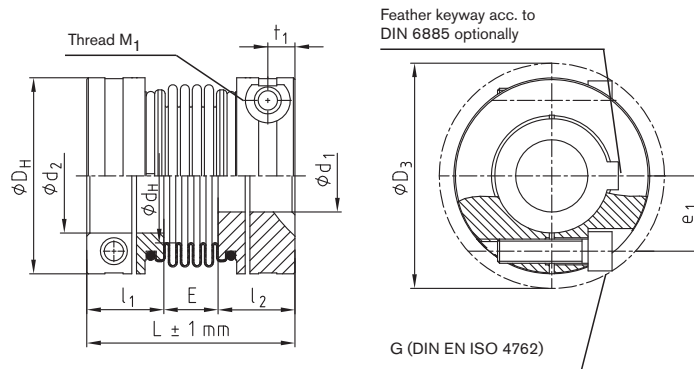
³⁾ Hubs from steel welded with bellow

Order form:	TOOLFLEX® 30 M	Ø25	Ø30
	Coupling size	Finish bore	Finish bore

Type S



- Short design
- Higher stiffness of torsion spring
- Lower mass moment of inertia
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



TOOLFLEX Type S

Size	Dimensions [mm]											
	Finish bore		General					Clamping screws				
	d _{min.}	d _{max.}	L	l ₁ · l ₂	E	D _H	d _H	M ₁	D ₃	t ₁	e ₁	T _A [Nm]
16	5	16	45	17,0	11	32	20	M4	35,0	5	12,0	2,9
20	8	20	55	21,5	12	40	27	M5	43,5	6	14,5	6
30	10	30	63	23,0	17	55	33	M6	58,0	7	19	10
38	14	38	69	25,5	18	65	42	M8	72,6	9	25	25
NEW 42	14	42	84	30,0	24	70	46	M8	76,1	9	27	25
45	14	45	86,5	32,0	22,5	83	58	M10	89,0	11	30	49
55 ³⁾	20	55	111	40,0	31	100	73	M12	106,0	14	37	120

Technical data

Size	Torque T _{KN} [Nm]	Speed n ¹⁾ [rpm]	Moment of inertia ²⁾ [x10 ⁻⁶ kgm ²]	Torsional stiffness C _T [Nm/rad]	Axial spring stiffness [N/mm]	Radial spring stiffness [N/mm]	Perm. displacements			Mass ²⁾ [x10 ⁻³ kg]
							Axial [mm]	Radial [mm]	Winkel [Grad]	
16	5	14900	9	4500	43	138	±0,3	0,15	1,0	61
20	15	11950	30	9600	63	189	±0,4	0,15	1,0	121
30	35	8700	114	17800	97	233	±0,5	0,20	1,5	243
38	65	7350	245	37400	108	318	±0,6	0,20	1,5	351
NEW 42	95	6820	396	54700	120	499	±0,6	0,20	1,5	485
45	150	5750	931	95800	132	738	±0,9	0,25	1,5	824
55 ³⁾	340	4800	4996	144100	160	894	±1,0	0,25	1,5	3213

¹⁾ With v = 25 m/s

²⁾ Figures refer to the complete coupling with max. bores

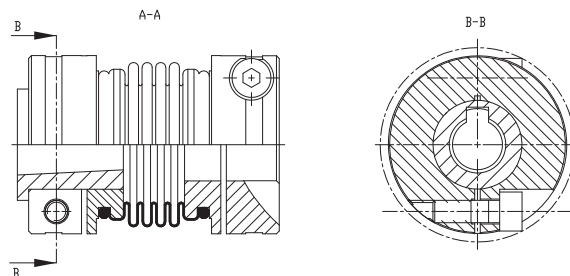
³⁾ Hubs from steel welded with bellow

Info:

Torques of frictional engagement of the clamping hub shown under Type M (page 148)

Other designs:

Type for FANUC-Motors



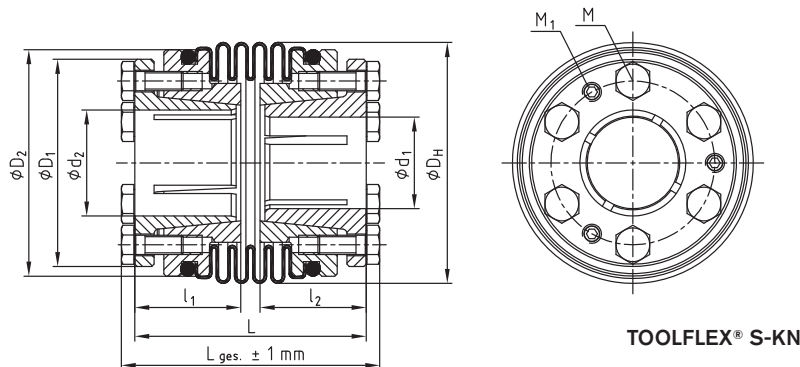
Order form:

TOOLFLEX® 30 S	Ø25	Ø30
Coupling size	Finish bore	Finish bore

Type KN



- Backlash-free, torsionally stiff
- Non-positive bellow-hub connection
- High friction torques
- Maintenance-free
- Good properties of concentric running with high speeds
- Maximum speed up to 40 m/s circumferential speed



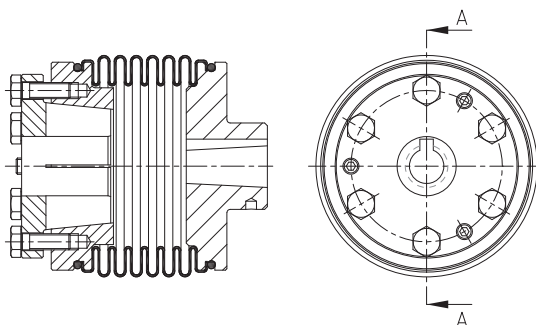
TOOLFLEX® S-KN

TOOLFLEX® Type KN																	
Size	Torque T_{KN} [Nm]	Dimensions [mm]															
		Finish bore		L		L _{ges.}		l ₁ ; l ₂	D _H	D ₁	D ₂	Clamping screw			Pull-off threads		
		d _{min.}	d _{max.}	4 shafts ¹⁾	6 shafts ²⁾	4 shafts ¹⁾	6 shafts ²⁾					M	T _A [Nm]	Number z	M ₁	Number z	T _{A1} ⁴⁾ [Nm]
30	35	12	22	48	57	54	63	22	50	43	47	M4	2,9	12	M4	6	1,2
38	65	12	28	56	68	63	75	26	60,5	52	56	M5	6	12	M5	6	1,4
NEW 42	95	14	35	64	75	71	82	29	66	60	63	M5	6	12	M5	6	1,4
45	150	15	40	74,5	91	82,5	99	34	82	68	77	M6	14	12	M6	6	3
55 ³⁾	340	15	56	95,5	109	106	120	40	97	95	95	M8	35	12	M8	6	6

Bore range d and the corresponding transmittable torques T_R of frictional engagement of the clamping hub [Nm]																		
Size	Ø14	Ø15	Ø16	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55
30	50	58	66	71	79													
38		81	92	130	103	149	161	202										
NEW 42				105	117	168	131	164	189	215	257							
45					230	332	230	288	331	376	451	531	589					
55 ³⁾							483	606	696	792	585	690	764	843	967	1101	1194	1445

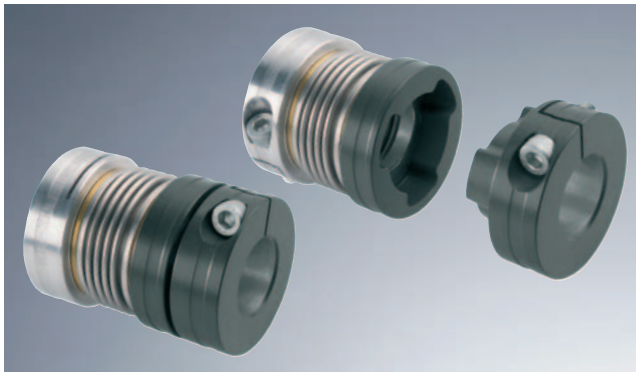
¹⁾ Design S = 4 shafts ²⁾ Design M = 6 shafts ³⁾ Hubs from steel welded with bellow
⁴⁾ After assembly of the clamping screws (M) tighten the pull-off thread (M₁) to the torque T_{A1} indicated.

Other designs: TOOLFLEX® KN for FANUC engines

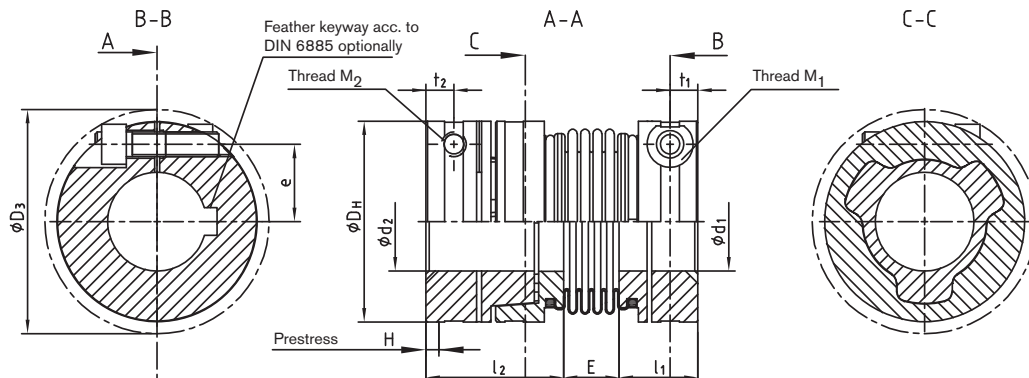


Order form:	TOOLFLEX® 38 S-KN	Ø15	Ø22
	Coupling size	Finish bore	Finish bore

Type PI



- Axial plug-in
- Backlash-free, torsionally stiff
- Maintenance-free
- Suitable for high temperatures due to flanged insert connection
- Well-resistant to corrosion due to bellow made from stainless steel and aluminium clamping hubs
- Optionally type M (6 shafts)
 - higher perm. displacements
- or Type S (4 shafts, short design)
 - higher stiffness of torsion spring
 - lower mass moment of inertia



Plug in metal bellow-type coupling type PI

Size	Design	Dimensions [mm]													
		General									Clamping screws				
		d ₁ ; d ₂ min.	d ₁ max.	d ₂ max.	L ¹⁾	l ₁	l ₂	E	D _H	H	M ₁ ; M ₂	D ₃	e	t ₁ ; t ₂	T _A [Nm]
20	S	8	20	20	67,0	21,5	33,5	12,0	40	0,5 - 1	M5	43,5	14,5	6	6
	M				74,0			19,0							
30	S	10	30	28	73,5	23,0	33,5	17,0	55	0,5 - 1	M6	58,0	19,0	7	10
	M				82,5			26,0							
38	S	14	38	32	87,5	25,5	44,0	18,0	65	0,5 - 1,5	M8	72,6	25,0	9	25
	M				99,5			30,0							
42	S	14	45	42	93,0	30	39,0	24,0	70		M8	76,1	25,0	9	25
	M				104,0			35,0							
45	S	14	45	42	96,0	32,0	41,5	22,5	83	0,5 - 1,5	M10	89,0	30,0	11	49
	M				112,5			39,0							

Technical data

Size	Design	Torque T _{KN} [Nm]	Speed n ³⁾ [min ⁻¹]	Moment of inertia ²⁾ [x10 ⁻⁶ kgm ²]	Torsional stiffness C _T [Nm/rad]	Axial spring stiffness [N/mm]	Radial spring stiffness [N/mm]	Perm. displacements		Mass ²⁾ [x10 ⁻³ kg]
								Radial [mm]	Angular [degrees]	
20	S	15	11950	37	9600	63	189	0,15	1,0	149
	M			38	6600	42	126	0,20	1,5	155
30	S	35	8700	140	17800	97	233	0,20	1,5	294
	M			145	14800	65	155	0,25	2,0	313
38	S	65	7350	329	37400	108	318	0,20	1,5	496
	M			346	24900	72	212	0,25	2,0	520
42	S	95	6820	396	54700	120	499	0,20	1,5	485
	M			427	36500	80	333	0,25	2,0	520
45	S	150	5750	1031	95800	132	738	0,25	1,5	930
	M			1127	64000	88	492	0,30	2,0	1000

Transmittable friction torque of clamping hubs $\varnothing d_1 / \varnothing d_2$

Size	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	
20	17,6	18,1	18,6	19,0	19,5	20,5	21,0	21,4	22,4	22,9	23,3										
30				33,0	34,0	35,0	36,0	36,4	38,0	38,5	39,0	42,0	42,5	44,5	46						
38									84,0	85,0	87,0	92,0	93,0	97,0	99,0	101,0					
42																					
45											157,0	165,0	167,0	173,0	177,0	181,0	187,0	193,0	197,0	200,0	

¹⁾ When being plugged in

²⁾ Figures refer to the complete coupling with max. bores

³⁾ With v = 25 m/s

Order form:

TOOLFLEX® 30 PI-S	d ₁ - Ø22	d ₂ - Ø18
Coupling size	Finish bore Component 1	Finish bore Component 2