SIT-LOCK® self locking elements

Advantages of SIT-LOCK® on the shaft-hub connection compared with traditional systems

Easy assembly and disassembly
Both actions take place by locking and unlocking the clamping screws with common tools.
The use of a torque wrench is only necessary when a more precise torque is required.

Superior holding power
The action of the clamping cones creates shaft clamping torque superior to a normal keyed hub.

Overload protection
When the pre-set torque is exceeded SIT-LOCK® will slip, preventing the connected elements from being broken.
Note: SIT-LOCK® units are not friction couplings so, excessive slip will cause damage.

Easy adjustment
Combining the SIT-LOCK® design of smooth cone action with superior holding power, the hub can be clamped at any position along a shaft, eliminating the need for lock washers, spacers, stop rings, etc.

Precision location
With the SIT-LOCK® smooth cone action, the SIT-LOCK® is ideal for clamping cams, timing devices, and indexing mechanisms accurately and precisely.

Temperature
-20 °C ÷ 150 °C

Unlimited use possibilities
SIT-LOCK® units are suitable to connect any type of hub (flywheels, chainwheels, gears, levers, pulleys, eccentrics, coupling, etc).

Various solutions in stock
Available in stock in 10 different types, SIT-LOCK® units can be utilized in a varied range of industrial applications

Order form

| SIT-LOCK® | **CAL** | **1** | **F25** | **/50** |

CAL: SIT-LOCK® self locking element
Type
Shaft diameter
External diameter (hub bore)

Performances

Given values of transmissible torque, axial force, and pressure between shaft and hub are valid for a lubricated installation (friction coefficient μ=0,12). Both hub and shaft, as well as locking unit's contact surfaces and screws, should be lubricated.

Locking unit and screws are supplied already oiled.

Always consider tolerances and roughness values per single locking unit.

To avoid decrease of locking unit performances, do not use molybdenum disulfide lubricant or other substances that drastically reduce coefficient of friction.

Design procedure

For a correct functioning of SIT-LOCK®, the transmissible torque M_T (stated in this catalogue) must always exceed the maximum torque in operation. So, in selecting the SIT-LOCK® dimensions, you must consider the start up torque could be even 4 times larger than the nominal one.
The transmissible axial forces (F_{ax}) given in the tables are valid for cases where there is no torque. If it is necessary to transmit both a torque and an axial force (ex. helical gear), the following formula must be used:

$$M_T \geq \sqrt{M_a^2 + \left(\frac{F_{ax} \cdot d}{2000}\right)^2} \quad [Nm]$$

where:
M_a = maximum torque to be transmitted [Nm]
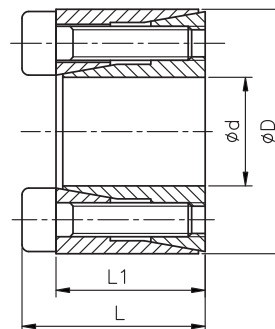F_{ax} = axial force in operation [N]
d = shaft diameter [mm]

SIT-LOCK® 15 - Self-Centering

Suitable for servomotors and small pulleys. It gives an axial force, similar to the clamp load of the screws, and an axial movement that can be used to set ball bearings.

Installation

Carefully clean contact surfaces of shaft and hub. Then, lightly oil both surfaces with standard mineral oil. Position the SIT-LOCK® on the shaft and into the hub machined bore. Align them as required by the application. Gradually and uniformly tighten the locking screws to the tightening torque (Ms).

You must tighten the screws in diametrically opposite sequence in stages:

• hand tighten the screws until the surfaces are in contact

• carefully check the position of the hub on the shaft
• tighten the screws to half the value of the tightening torque (Ms) stated in the catalogue
• repeat the operation until the tightening torque is reached using the dynamometric screw-driver
• check every locking screw to insure it has been tightened to the specific tightening torque

Do not use lubricant like "Molykote" or molybdenum disulfide based oils.

Removal

Gradually loosen the clamping screws. Transfer the screws into the releasing tapped holes and tighten them until the front cone is released. Loosen the clamping screws again. Transfer the clamping screws into the releasing holes of the intermediate ring, and tighten them until the back cone is released.

Note: To reuse the locking element, carefully oil the screws and the conical surfaces, then follow installation instructions.

Concentricity

For self-centering locking assemblies, the clamping element has a centering effect and the concentricity error can be considered 0.02-0.04 mm.

SIT-LOCK®

Maximum allowable roughness		
Rt 16 μm		
Maximum recommended tolerance		
shaft h 8 - hub H 8		

SIT-LOCK® 15

Dimensins [mm]					Performances		Pressure [N/mm²]		Clamping screws (DIN 912 - 12,9)		
d x D	d	D	L	L₁	M_T [Nm]	F_{ax} [kN]	p_w	p_n	N°	Type	M_s [Nm]
5 x 16	5	16	13,5	11	7	3	190	60	3	M2,5 x 10	1,2
6 x 16	6	16	13,5	11	9	3	160	60	3	M2,5 x 10	1,2
6,35 x 16	6,35	16	13,5	11	9	3	150	60	3	M2,5 x 10	1,2
7 x 17	7	17	13,5	11	10	3	140	60	3	M2,5 x 10	1,2
8 x 18	8	18	13,5	11	11	3	120	55	3	M2,5 x 10	1,2
9 x 20	9	20	15,0	13	17	3	120	55	4	M2,5 x 12	1,2
9,53 x 20	9,53	20	15,0	13	17	3	115	55	4	M2,5 x 12	1,2
10 x 20	10	20	15,5	13	19	3	110	55	4	M2,5 x 12	1,2
11 x 22	11	22	15,5	13	21	3	100	50	4	M2,5 x 12	1,2
12 x 22	12	22	15,5	13	23	3	90	50	4	M2,5 x 12	1,2
14 x 26	14	26	20,0	17	40	6	95	50	4	M3 x 16	2,1
15 x 28	15	28	20,0	17	43	6	90	50	4	M3 x 16	2,1
16 x 32	16	32	21,0	17	80	10	150	70	4	M4 x 16	4,9
17 x 35	17	35	25,0	21	85	10	110	55	4	M4 x 20	4,9
18 x 35	18	35	25,0	21	90	10	105	55	4	M4 x 20	4,9
19 x 35	19	35	25,0	21	95	10	100	55	4	M4 x 20	4,9
20 x 38	20	38	26,0	21	165	16	155	80	4	M5 x 20	10
22 x 40	22	40	26,0	21	180	16	140	75	4	M5 x 20	10
24 x 47	24	47	32,0	26	280	23	145	75	4	M6 x 24	17
25 x 47	25	47	32,0	26	290	23	140	75	4	M6 x 24	17
28 x 50	28	50	32,0	26	485	35	180	100	6	M6 x 24	17
30 x 55	30	55	32,0	26	520	35	170	95	6	M6 x 24	17
32 x 55	32	55	32,0	26	555	35	165	95	6	M6 x 24	17
35 x 60	35	60	37,0	31	810	46	170	100	8	M6 x 28	17
38 x 65	38	65	37,0	31	880	46	155	90	8	M6 x 28	17
40 x 65	40	65	37,0	31	925	46	150	90	8	M6 x 28	17
42 x 75	42	75	44,0	36	1350	64	170	95	6	M8 x 34	41
45 x 75	45	75	44,0	36	1450	64	160	95	6	M8 x 34	41
48 x 80	48	80	44,0	36	2050	85	190	110	8	M8 x 34	41
50 x 80	50	80	44,0	36	2140	85	190	110	8	M8 x 34	41

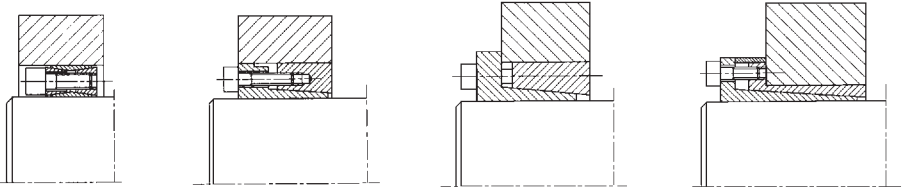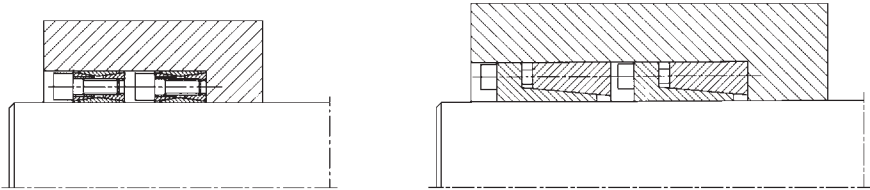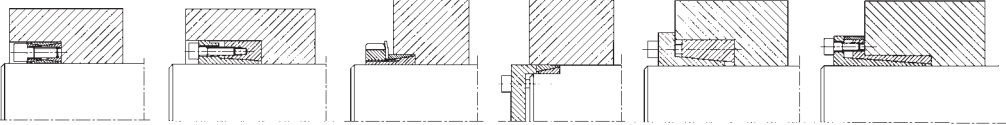*Notes:*
Dimensions representing the total length of the hub are indicative; they are calculated according to the geometric rules.

M_S	Screw tightening torque	Nm
M_T	Transmissible torque moment	Nm
F_{ax}	Transmissible axial load	N
p_w	Shaft pressure	N/mm²
p_n	Hub pressure	N/mm²

Design of hub outside minimum diameter

When using the locking units, the shaft-hub connection is characterized by a pressure on the hub surface, which is exerted by the locking unit outer ring when the clamping screws are tightened to the stated value. It is important to design correctly the hub outside diameter. The following table summarizes the procedure as a simple calculation. To determine the hub outside minimum diameter, simply multiply the factor K by the SIT-LOCK® outside diameter to obtain the hub outside minimum diameter. The factor K varies depending on the yield limit of hub material, the hub surface pressure (Pn) and the factor (x), variable according to the application type (A, B, C).

Installation type A ($L_M \cong L_C$)
X = 1

Installation type B ($L_M \cong 2\ L_C$)
X = 0,8

Installation type C ($L_M > 2\ L_C$)
X = 0,6

Hub min diameter D x K

for: K = factor stated in the table
        D = SIT-LOCK® outside diameter

L_M	Hub length	mm
L_c	SIT-LOCK® length	mm

Hollow shaft

For application with locking-assemblies on hollow shaft, it is important to scale both hub minimum diameter and hollow shaft diameter. Contact our Technical Department for design.

SIT-LOCK®

Coefficient K

Hub surface pressure		Yield limit of hub material σ_{02} [N/mm²]										
		150	180	200	220	250	270	300	350	400	450	600
		Hub material										
p_n [N/mm²]	Application	GG 20	GG 25 GS 38	GG 30 GTS 35	GS 45 ST 37-2	GG 40 GS 52	ST 50-2 C 35	GG 50 GS 60 ST 60-2	GG 60 GS 62 ST 70-2	GG 70 GS 70 C 60	Heat treatment steel	
60	C	1,29	1,26	1,21	1,19	1,16	1,15	1,13	1,11	1,10	1,09	1,07
	B	1,40	1,31	1,25	1,24	1,23	1,21	1,19	1,16	1,13	1,12	1,09
	A	1,53	1,43	1,37	1,33	1,29	1,26	1,23	1,19	1,17	1,15	1,11
65	C	1,31	1,26	1,23	1,21	1,19	1,16	1,14	1,12	1,11	1,10	1,08
	B	1,45	1,36	1,31	1,29	1,25	1,23	1,21	1,17	1,15	1,13	1,10
	A	1,61	1,46	1,41	1,36	1,31	1,29	1,25	1,21	1,19	1,17	1,13
70	C	1,35	1,27	1,25	1,23	1,19	1,17	1,16	1,13	1,12	1,11	1,08
	B	1,49	1,39	1,35	1,31	1,26	1,24	1,21	1,19	1,16	1,14	1,11
	A	1,66	1,51	1,46	1,41	1,35	1,31	1,26	1,23	1,21	1,18	1,14
75	C	1,31	1,29	1,26	1,24	1,21	1,19	1,16	1,15	1,13	1,12	1,09
	B	1,53	1,43	1,37	1,33	1,29	1,26	1,23	1,19	1,17	1,15	1,12
	A	1,75	1,56	1,49	1,43	1,37	1,34	1,31	1,26	1,21	1,19	1,14
80	C	1,40	1,32	1,29	1,26	1,22	1,21	1,19	1,16	1,14	1,12	1,09
	B	1,59	1,46	1,40	1,36	1,31	1,28	1,25	1,21	1,19	1,16	1,12
	A	1,82	1,62	1,54	1,47	1,40	1,37	1,32	1,27	1,23	1,21	1,15
85	C	1,43	1,35	1,31	1,28	1,24	1,22	1,20	1,17	1,15	1,13	1,10
	B	1,64	1,50	1,43	1,39	1,33	1,30	1,27	1,23	1,20	1,17	1,13
	A	1,91	1,68	1,58	1,51	1,43	1,40	1,35	1,29	1,25	1,22	1,16
90	C	1,47	1,37	1,33	1,29	1,26	1,23	1,21	1,18	1,16	1,14	1,10
	B	1,70	1,54	1,47	1,41	1,35	1,32	1,29	1,24	1,21	1,19	1,14
	A	2,01	1,74	1,63	1,55	1,47	1,42	1,37	1,31	1,27	1,23	1,17
95	C	1,50	1,40	1,35	1,31	1,27	1,25	1,22	1,19	1,16	1,15	1,11
	B	1,76	1,58	1,50	1,44	1,38	1,35	1,31	1,26	1,22	1,20	1,15
	A	2,12	1,81	1,69	1,60	1,50	1,45	1,40	1,33	1,28	1,25	1,18
100	C	1,54	1,42	1,37	1,33	1,29	1,26	1,23	1,20	1,17	1,15	1,12
	B	1,82	1,62	1,54	1,47	1,40	1,37	1,32	1,27	1,23	1,21	1,15
	A	2,25	1,88	1,74	1,64	1,54	1,49	1,42	1,35	1,30	1,26	1,19
105	C	1,57	1,45	1,40	1,35	1,30	1,28	1,25	1,21	1,18	1,16	1,12
	B	1,89	1,67	1,57	1,51	1,43	1,39	1,34	1,29	1,25	1,22	1,16
	A	2,39	1,96	1,80	1,69	1,57	1,52	1,45	1,37	1,32	1,28	1,20
110	C	1,61	1,48	1,42	1,37	1,32	1,29	1,26	1,22	1,19	1,17	1,13
	B	1,97	1,72	1,61	1,54	1,45	1,41	1,36	1,30	1,26	1,23	1,17
	A	2,56	2,05	1,87	1,74	1,61	1,55	1,48	1,39	1,34	1,29	1,21
115	C	1,65	1,51	1,44	1,37	1,34	1,31	1,27	1,23	1,20	1,18	1,13
	B	2,05	1,77	1,65	1,57	1,48	1,44	1,38	1,32	1,27	1,24	1,18
	A	2,76	2,14	1,94	1,80	1,65	1,59	1,51	1,42	1,35	1,31	1,22
120	C	1,70	1,54	1,47	1,40	1,35	1,32	1,29	1,24	1,21	1,19	1,14
	B	2,14	1,82	1,70	1,61	1,51	1,46	1,40	1,34	1,29	1,25	1,19
	A	3,01	2,25	2,01	1,85	1,70	1,62	1,54	1,44	1,37	1,32	1,23
125	C	1,74	1,57	1,49	1,44	1,37	1,34	1,30	1,25	1,22	1,19	1,14
	B	2,25	1,88	1,74	1,64	1,54	1,49	1,42	1,35	1,30	1,26	1,19
	A	3,33	2,36	2,09	1,92	1,74	1,66	1,57	1,46	1,39	1,34	1,25
130	C	1,79	1,60	1,52	1,46	1,39	1,36	1,31	1,26	1,23	1,20	1,15
	B	2,36	1,94	1,79	1,68	1,57	1,51	1,45	1,37	1,31	1,28	1,20
	A	3,75	2,50	2,18	1,98	1,79	1,70	1,60	1,49	1,41	1,36	1,26
135	C	1,84	1,62	1,55	1,48	1,41	1,37	1,33	1,28	1,24	1,21	1,16
	B	2,49	2,01	1,84	1,72	1,60	1,54	1,47	1,39	1,33	1,29	1,21
	A	4,37	2,66	2,28	2,05	1,84	1,74	1,63	1,51	1,43	1,37	1,27
140	C	1,89	1,67	1,57	1,51	1,43	1,39	1,34	1,29	1,25	1,22	1,16
	B	2,64	2,08	1,89	1,76	1,63	1,55	1,49	1,40	1,34	1,30	1,22
	A	5,40	2,84	2,39	2,13	1,89	1,79	1,67	1,54	1,45	1,39	1,28
145	C	1,95	1,70	1,60	1,53	1,45	1,41	1,36	1,30	1,26	1,23	1,17
	B	2,81	2,16	1,95	1,81	1,66	1,59	1,51	1,42	1,36	1,31	1,23
	A	7,67	3,06	2,51	2,22	1,95	1,83	1,70	1,56	1,47	1,41	1,29
150	C	2,01	1,74	1,63	1,55	1,47	1,42	1,37	1,31	1,27	1,24	1,17
	B	3,01	2,25	2,01	1,85	1,70	1,62	1,54	1,44	1,37	1,32	1,24
	A	—	3,33	2,66	2,31	2,01	1,88	1,74	1,59	1,49	1,42	1,30
155	C	2,07	1,78	1,66	1,58	1,49	1,44	1,39	1,32	1,28	1,25	1,18
	B	3,26	2,34	2,07	1,90	1,73	1,66	1,56	1,46	1,39	1,34	1,24
	A	—	3,67	2,81	2,41	2,07	1,93	1,78	1,62	1,52	1,44	1,31
160	C	2,14	1,82	1,70	1,61	1,51	1,46	1,40	1,34	1,29	1,25	1,19
	B	3,56	2,44	2,14	1,95	1,77	1,68	1,59	1,48	1,40	1,35	1,25
	A	—	4,13	3,01	2,53	2,14	1,99	1,82	1,65	1,54	1,48	1,32
165	C	2,22	1,87	1,73	1,63	1,53	1,48	1,42	1,35	1,30	1,26	1,19
	B	3,97	2,56	2,22	2,01	1,81	1,72	1,61	1,50	1,42	1,36	1,26
	A	—	4,81	3,24	2,66	2,22	2,05	1,87	1,68	1,56	1,48	1,34

Note: p_n is stated in the dimensional table of each of the locking assemblies. Installation type (A, B, C) are stated in the previous page.

Example of calculation procedure

Design data
- Power transmission element to be connected: V-pulley
- Shaft diameter: 50 mm
- Maximum Torque in operation (Ma): 1.500 Nm
- V-pulley material: cast iron GG20
- Yield limit of V-pulley material: 150 N/mm²

Calculation
- SIT-LOCK® type: for this kind of applcation SIT-LOCK® 1 is suggested
- Size selection: 50 x 80 mm (see table SIT-LOCK® 1)
- Performance control: verify $M_T \geq M_a$

  From the table obtain M_T = 1.889 Nm, so the above condition is verified
- Tolerance: h11 for the shaft - H11 for the SIT-LOCK® bore
- Roughness: $R_t \leq 16$
- Screws tightening torque: M_s = 37 Nm (see table SIT-LOCK® 1)
- Hub surface pressure: from the table you can find the value P_n = 125 N/mm²
- Application type: in this case it is preferable to adopt the application "C" with the centering guide between shaft and hub

- Coefficient K : obtained through the table "Coefficient K" by considering the following information:
  - yield limit of hub material = 150 N/mm²
  - hub surface pressure = 125 N/mm²
  - installation C
Then, K = 1,74

- Hub outside minimum diameter:

  Hub $D_{min} \geq D \cdot K$

  for

  - D = SIT-LOCK® outside diameter [mm]
  - K = 1,74

  Then, hub D_{min} = (80 • 1,74) = **140 [mm]**

DIN 912

Screw diameter	P_v [N]			M_s [Nm]		
	8,8	**10,9**	**12,9**	**8,8**	**10,9**	**12,9**
M2,5	1.600	2.140	2.565	0,76	1,0	1,2
M3	2.210	3.110	3.730	1,3	1,9	2,2
M4	3.900	5.450	6.550	2,9	4,1	4,9
M5	6.350	8.950	10.700	6	8,5	10
M6	9.000	12.600	15.100	10	14	17
M7	13.200	18.500	22.200	16	23	28
M8	16.500	23.200	27.900	25	35	41
M9	22.000	30.900	37.100	36	51	61
M10	26.200	36.900	44.300	49	69	83
M12	38.300	54.000	64.500	86	120	145
M14	52.500	74.000	88.500	135	190	230
M16	73.000	102.000	123.000	210	295	355
M18	88.000	124.000	148.000	290	405	485
M20	114.000	160.000	192.000	410	580	690
M22	141.000	199.000	239.000	550	780	930
M24	164.000	230.000	276.000	710	1.000	1.200
M27	215.000	302.000	363.000	1.050	1.500	1.800
M30	262.000	368.000	442.000	1.450	2.000	2.400

SIT-LOCK®