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.

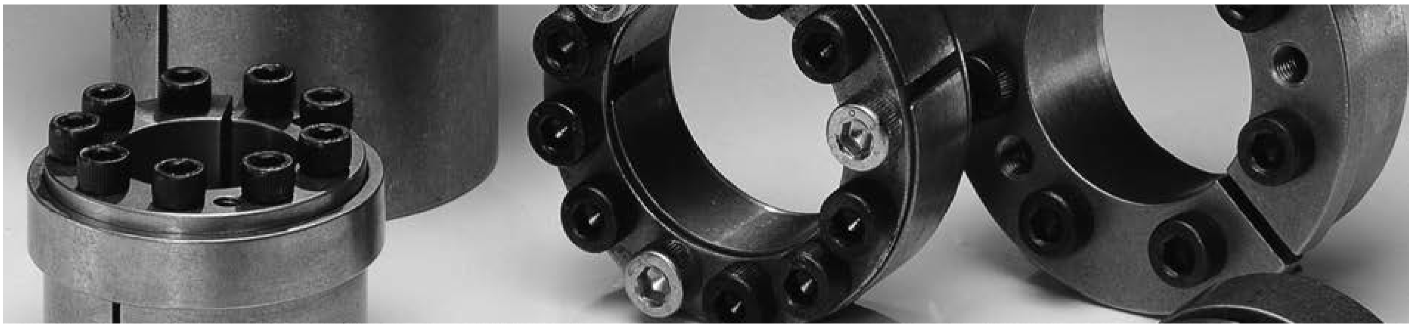
To avoid decrease of locking unit performances, do not use molybdenum disulfide lubricant or other substances that drastically reduce coefficient of friction.

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]

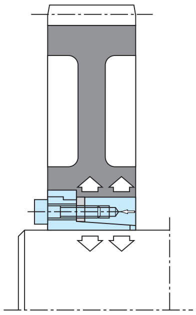


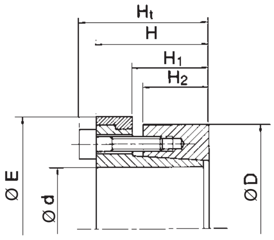
SIT-LOCK®

SIT-LOCK® 5B - Self-Centering with Flange

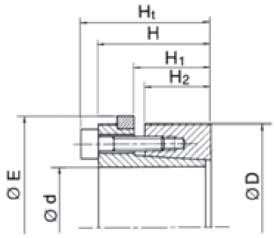
Locking assembly with single taper design. It is suitable for high torques. Provide good concentricity and self centring.

It is recommended for medium torques and is self-centering. The flange design prevent axial movement during installation.





from type 20x47 to 100x145



from type 110x155 to 180x235

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 all locking screws. Remove and transfer the screws into the releasing tapped holes and tighten them until the SIT-LOCK® is released.

Note: ITo 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.

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

SIT-LOCK® 5B

	Dimensions [mm]					Performances		Pressure [N/mm²]		Clamping screws (DIN 912 - 12,9)		
d x D	H_t	H	H_1	H_2	E	M_T [Nm]	F_{ax} [kN]	p_w	p_n	N°	Type	M_s [Nm]
20 x 47	49	43	30	26	53	341	34	174	73	6	M6	17
22 x 47	49	43	30	26	53	375	34	158	73	6	M6	17
24 x 50	49	43	30	26	56	409	34	145	73	6	M6	17
25 x 50	49	43	30	26	56	426	34	139	73	6	M6	17
28 x 55	49	43	30	26	61	478	34	124	73	6	M6	17
30 x 55	49	43	30	26	61	512	34	116	73	6	M6	17
32 x 60	49	43	30	26	66	819	51	163	109	9	M6	17
35 x 60	49	43	30	26	66	895	51	149	109	9	M6	17
38 x 65	49	43	30	26	71	972	51	137	109	9	M6	17
40 x 65	49	43	30	26	71	1.023	51	131	109	9	M6	17
42 x 75	60	52	35	30	81	1.324	63	133	94	6	M8	41
45 x 75	60	52	35	30	81	1.418	63	124	94	6	M8	41
48 x 80	60	52	35	30	86	1.513	63	116	94	6	M8	41
50 x 80	60	52	35	30	86	1.576	63	111	94	6	M8	41
55 x 85	60	52	35	30	91	2.600	95	152	142	9	M8	41
60 x 90	60	52	35	30	96	2.836	95	139	142	9	M8	41
65 x 95	60	52	35	30	102	3.073	95	129	142	9	M8	41
70 x 110	67	57	46	40	117	4.087	117	111	117	7	M10	83
75 x 115	67	57	46	40	122	4.379	117	103	117	7	M10	83
80 x 120	67	57	46	40	127	4.670	117	97	117	7	M10	83
85 x 125	67	57	46	40	132	5.671	133	104	134	8	M10	83
90 x 130	67	57	46	40	137	6.005	133	98	134	8	M10	83
95 x 135	67	57	46	40	142	7.923	167	116	168	10	M10	83
100 x 145	78	66	53	46	153	8.500	170	98	127	7	M12	145
110 x 155	80	68	52	46	165	10.988	200	105	150	8	M12	145
120 x 165	80	68	52	46	175	14.984	250	120	187	10	M12	145
130 x 180	80	68	52	46	188	19.479	300	133	224	12	M12	145
140 x 190	90	76	58	51	199	23.986	343	127	204	10	M14	230
150 x 200	90	76	58	51	209	30.840	411	143	244	12	M14	230
160 x 210	90	76	58	51	219	32.896	411	134	244	12	M14	230
170 x 225	90	76	58	51	234	40.777	480	147	285	14	M14	230
180 x 235	90	76	57	51	244	43.175	480	139	285	14	M14	230

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

For assemblies requiring larger dimensions, contact our Technical Department.

It is possible to decrease the screws tightening torque Ms by up to 40% of the value stated in the table. Consequently, M_T, F_{ax}, P_w and P_n will decrease proportionally.

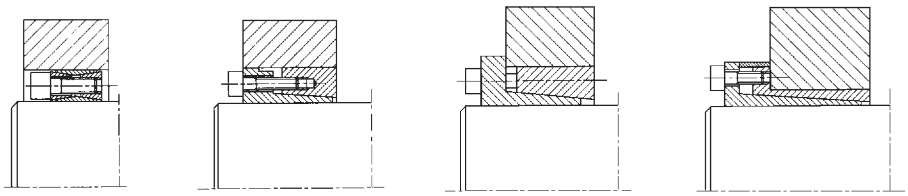
SIT-LOCK®

M_S	Screw tightening torque	Nm
M_T	Transmissible torque moment	Nm
F_{ax}	Transmissible axial load	N
p_w	Shaft pressure	N/mm^2
p_n	Hub pressure	N/mm^2

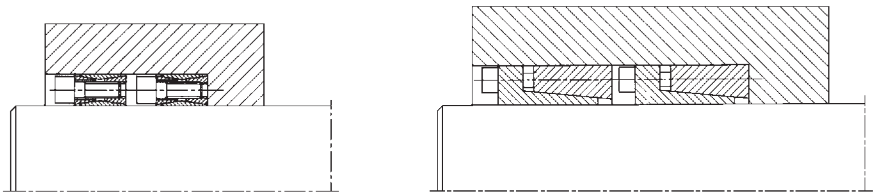
Design of hub outside minimum diameter

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).

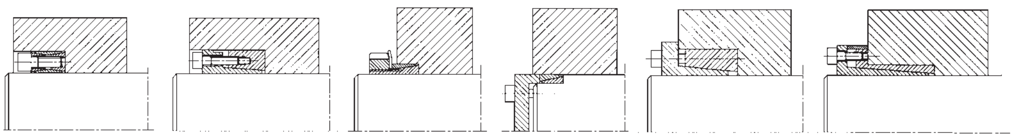
Installation type A ($L_M \cong L_C$)
X = 1



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.

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 $M_T \geq Ma$

  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:

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

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