

Z-LOCK

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Z-LOCK

SHAFT LOCKING ASSEMBLIES

Z2, Z5, Z6 & Z8

Shaft and Hub machining detail

Surface Finish for hub and bore: $R_t \leq 16\mu$

Tolerances: Z5, Z6 & Z8: Shaft h8 / Bore H8
Z2: Shaft from h11 to k11 / Bore from H11 to N11

Hub Diameters

Locking assembly transmissible torques are based on minimum hub diameter requirements being adhered to. Minimum hub diameters are determined by hub material. The hub minimum diameters indicated in this publication represent hub material yield point in N/mm² ($\sigma_{0.2}$).

Coefficients of Friction

Locking assemblies are supplied in a lightly oiled condition. Assemble with this oil coating in place.

Locking Assembly $\mu = 0.12$
Screws: $\mu = 0.14$

NB: Lubricants containing Molybdenum disulphide or other extreme pressure additives must **not** be used.

Used locking assemblies should be cleaned and lightly re-oiled before re-assembly.

Screws

Locking assemblies are fitted with **DIN 912 Grade 12.9 screws**. At original assembly, the tightening torques shown in this publication should be used. **When re-fitting a used locking assembly, reduced tightening torques should be used. Please contact the supplier for reduced torque figures.**

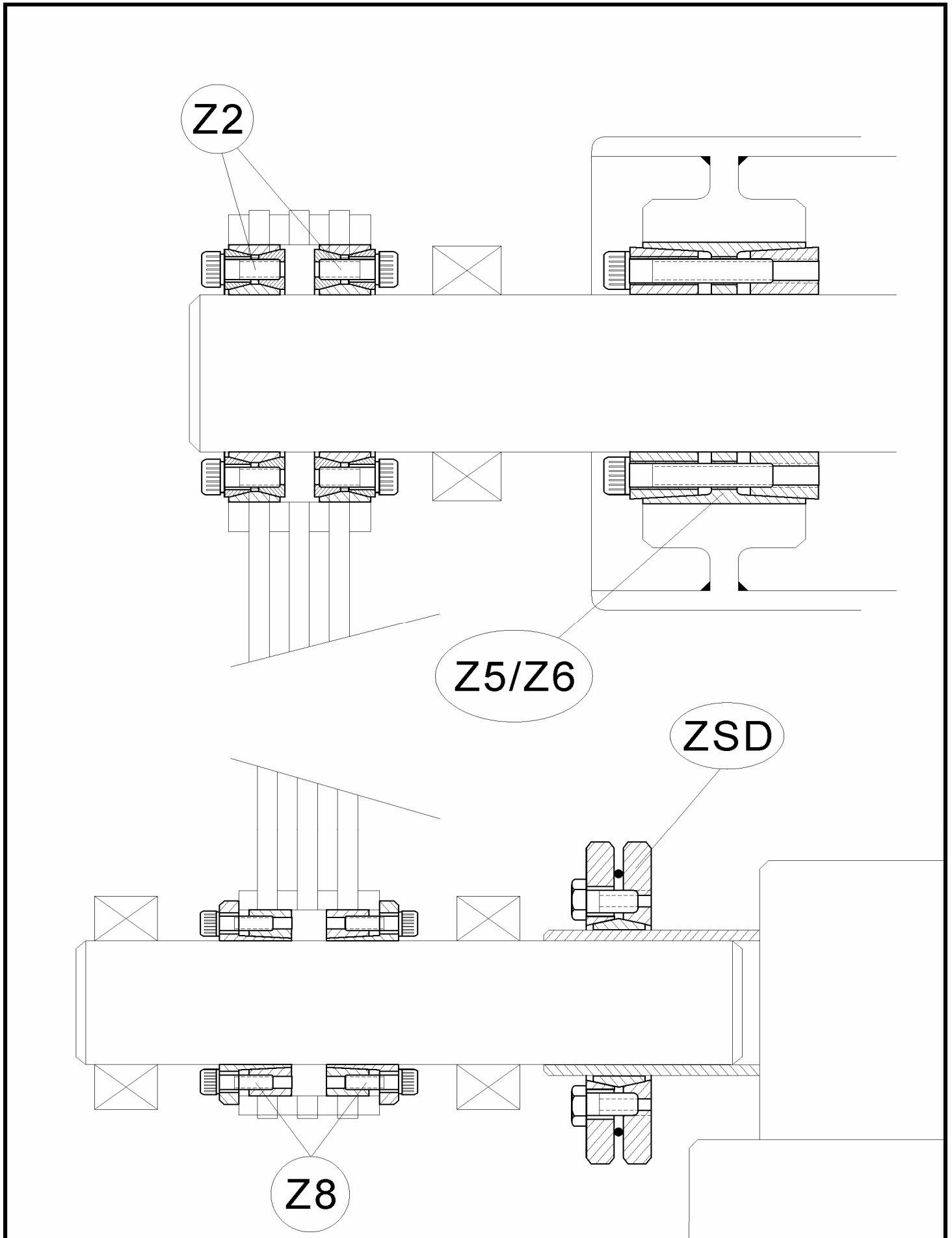
Screws are to be tightened up to the nominated tightening torque M_a , in a crosswise pattern several times. Ensure that screws either side of the slots are tightened one after the other.

ZSD SHRINK DISCS

Tolerances: Shafts up to & incl dw 150mm h6
Shafts above dw 150mm g6
Hub bore H7
Hub outside diameter f7

Follow assembly instructions given in this publication.

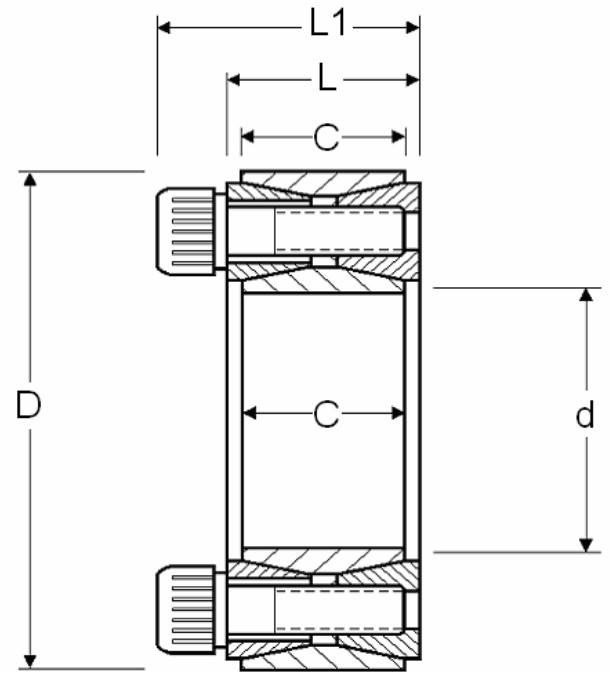
Z-LOCK TYPICAL APPLICATIONS



Z2 SERIES

LOCKING ASSEMBLIES

Ma = screw tightening torque
Ft = axial holding force when $Mt=0$
Mt = transmissible torque when $Ft=0$
Pf = specific pressure on mating shaft and hub

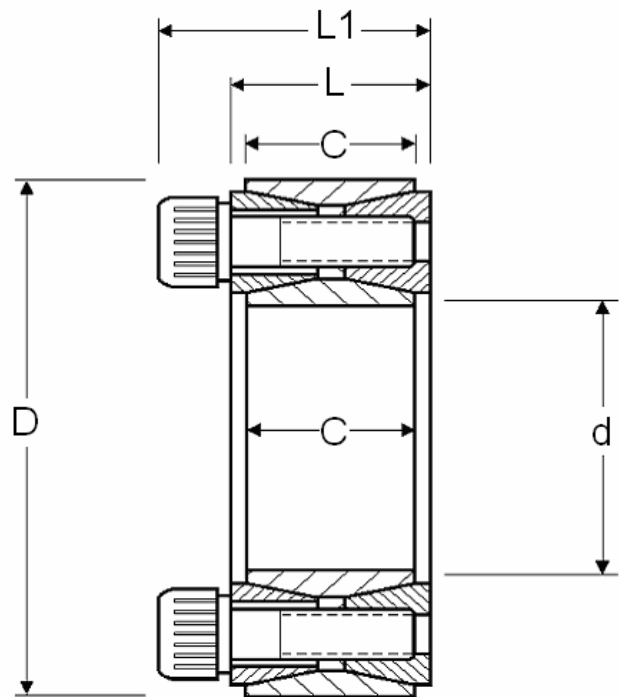


DIMENSIONS						SCREW			CAPACITIES				
Z - Lock number	d	D	C	L	L1	Size	Qty	Ma Nm	Ft kN	Mt kNm	Pf-N/mm2 Shaft	hub	Wgt kg
Z2-20X47	20	47	17	20	27.5	M6x18	8	17	32	0.32	255	110	0.24
Z2-25X50	25	50	17	20	27.5	M6x18	9	17	36	0.36	230	116	0.25
Z2-30X55	30	55	17	20	27.5	M6x18	10	17	40	0.60	212	116	0.29
Z2-35X60	35	60	17	20	27.5	M6x18	12	17	48	0.85	219	128	0.32
Z2-38X63	38	63	17	20	27.5	M6x18	14	17	52	0.93	219	134	0.33
Z2-40X65	40	65	17	20	27.5	M6x18	14	17	55	1.10	219	134	0.34
Z2-42X72	42	72	20	24	33.5	M8x22	12	41	81	1.38	228	144	0.48
Z2-45X75	45	75	20	24	33.5	M8x22	12	41	84	1.89	246	147	0.57
Z2-50X80	50	80	20	24	33.5	M8x22	12	41	83	2.06	223	135	0.60
Z2-55X85	55	85	20	24	33.5	M8x22	14	41	97	2.65	234	152	0.63
Z2-60X90	60	90	20	24	33.5	M8x22	14	41	97	2.89	210	140	0.69
Z2-65X95	65	95	20	24	33.5	M8x22	16	41	109	3.56	223	152	0.73
Z2-70X110	70	110	24	28	39.5	M10x25	14	83	156	5.45	249	154	1.26
Z2-75X115	75	115	24	28	39.5	M10x25	14	83	155	5.81	231	148	1.33
Z2-80X120	80	120	24	28	39.5	M10x25	14	83	155	6.15	213	142	1.40
Z2-85X125	85	125	24	28	39.5	M10x25	16	83	175	7.44	231	154	1.49
Z2-90X130	90	130	24	28	39.5	M10x25	16	83	174	7.80	213	148	1.53
Z2-95X135	95	135	24	28	39.5	M10x25	18	83	198	9.35	231	160	1.62
Z2-100X145	100	145	29	33	47	M12x30	14	145	223	11.1	226	157	2.01
Z2-110X155	110	155	29	33	47	M12x30	14	145	221	12.2	209	145	2.15
Z2-120X165	120	165	29	33	47	M12x30	16	145	263	15.2	215	157	2.35
Z2-125X170	125	170	29	33	47	M12x30	18	145	285	18.7	191	142	2.95
Z2-130X180	130	180	34	38	52	M12x35	20	145	315	20.4	191	133	3.51
Z2-140X190	140	190	34	38	52	M12x35	22	145	345	24.2	191	145	3.85
Z2-150X200	150	200	34	38	52	M12x35	24	145	376	28.0	197	145	4.07
Z2-160X210	160	210	34	38	52	M12x35	26	145	406	32.3	197	151	4.30
Z2-170x225	170	225	38	44	60	M14x45	22	230	467	39.7	194	145	5.78
Z2-180x235	180	235	38	44	60	M14x45	24	230	505	45.7	200	151	6.05
Z2-190x250	190	250	46	52	68	M14x45	28	230	591	56.3	182	139	8.25

Z2 SERIES

LOCKING ASSEMBLIES

Ma = screw tightening torque
Ft = axial holding force when $Mt=0$
Mt = transmissible torque when $Ft=0$
Pf = specific pressure on mating shaft and hub



DIMENSIONS						SCREWS		CAPACITIES					
Z - Lock number	d	D	C	L	L1	Size	Qty	Ma Nm	Ft kN	Mt kNm	Pf-N/mm2 Shaft	hub	Wgt kg
Z2-200x260	200	260	46	52	68	M14x45	30	230	630	63.5	182	139	8.65
Z2-220x285	220	285	50	56	74	M16x50	26	355	744	81.7	181	138	11.2
Z2-240x305	240	305	50	56	74	M16x50	30	355	862	103	193	150	12.2
Z2-260x325	260	325	50	56	74	M16x50	34	355	960	124	199	156	13.2
Z2-280x355	280	355	60	66	86.5	M18x60	32	485	1092	153	174	138	19.2
Z2-300x375	300	375	60	66	86.5	M18x60	36	485	1215	183	180	144	20.5
Z2-320x405	320	405	72	78	100.5	M20x70	36	690	1558	249	178	143	29.6
Z2-340x425	340	425	72	78	100.5	M20x70	36	690	1558	266	172	137	31.1
Z2-360x455	360	455	84	90	116	M22x80	36	930	1940	350	173	137	42.2
Z2-380x475	380	475	84	90	116	M22x80	36	930	1935	366	161	131	44
Z2-400x495	400	495	84	90	116	M22x80	36	930	1930	384	155	125	46
Z2-420x515	420	515	84	90	116	M22x80	40	930	2120	445	161	131	50
Z2-440x545	440	545	96	102	130	M24x90	40	1200	2470	545	150	126	64.6
Z2-450x555	450	555	96	102	130	M24x90	40	1200	2460	555	150	124	65
Z2-460x565	460	565	96	102	130	M24x90	40	1200	2450	565	150	120	67.4
Z2-480x585	480	585	96	102	130	M24x90	42	1200	2550	619	150	120	71
Z2-500x605	500	605	96	102	130	M24x90	44	1200	2650	668	150	120	73
Z2-530x640	530	640	96	102	130	M24x90	45	1200	2790	740	145	118	83.6
Z2-560x670	560	670	96	102	130	M24x90	48	1200	2930	816	142	117	85
Z2-600x710	600	710	96	102	130	M24x90	50	1200	3090	930	142	117	91
Z2-630x740	630	740	96	102	130	M24x90	52	1200	3210	1010	140	115	94
Z2-670x780	670	780	96	102	130	M24x90	60	1200	3385	1130	138	112	101
Z2-710x820	710	820	96	102	130	M24x90	62	1200	3565	1260	135	110	106
Z2-750x860	750	860	96	102	130	M24x90	66	1200	3750	1410	135	110	112
Z2-800x910	800	910	96	102	130	M24x90	70	1200	3910	1560	130	108	118
Z2-850x960	850	960	96	102	130	M24x90	70	1200	4200	1785	133	110	125
Z2-900x1010	900	1000	96	102	130	M24x90	75	1200	4410	1980	130	108	132
Z2-950x1060	950	1060	96	102	130	M24x90	80	1200	4650	2205	130	108	139
Z2-1000x1110	1000	1110	96	102	130	M24x90	82	1200	4800	2400	125	107	146

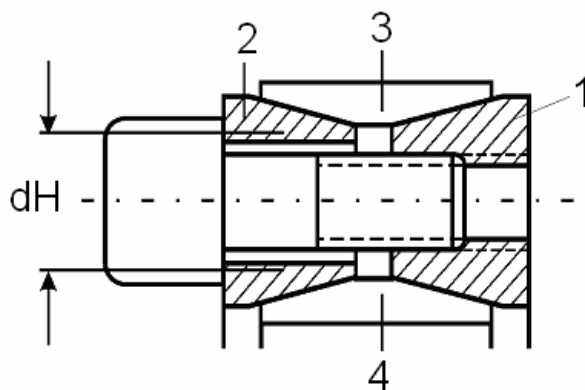
MINIMUM HUB DIAMETER

Z – Lock Series Z2	Pf Hub N/mm	YIELD POINT ($\sigma_{0.2N/mm^2}$)								
		150	180	200	220	250	270	300	350	400
		GG-22	GG-26 GS-38 V2A-S V2A-E	GG-30 V4A-S GTS-35 1020 AS1434	GS-45 ST35 ST37-3 V4A-E 1040 AS1434	GS-52 GS-C25 GGG-40 ST45 1045 AS1434 Gr250 AS3678	C35 ST50-2 X8CrTi17 AlCuNic 1050 AS1434	GS-60 St60-2 C10 GTS-45 Gr300 AS3678	GS-62 St70-2 St52 Gr350 AS3678	GS-70 C60 25CrMo4 Gr400 AS3678
Z2-20X47	110	76	70	68	65	62	62	60	58	56
Z2-25X50	116	84	75	72	70	68	65	64	62	60
Z2-30X55	116	92	84	80	78	74	72	70	68	66
Z2-35X60	128	106	95	90	88	84	82	78	75	74
Z2-38X63	134	120	100	95	92	88	88	82	80	78
Z2-40X65	134	120	106	100	96	92	90	86	82	80
Z2-42X72	144	148	122	110	105	102	100	98	92	88
Z2-45X75	147	148	130	122	115	110	105	102	98	95
Z2-50X80	135	148	135	124	118	112	110	106	102	100
Z2-55X85	152	165	150	140	132	125	122	118	112	108
Z2-60X90	140	170	155	142	135	128	124	120	116	112
Z2-65X95	152	190	168	156	148	140	135	132	125	120
Z2-70X110	154	210	195	182	172	162	158	152	145	140
Z2-75X115	148	228	198	186	176	168	164	158	150	145
Z2-80X120	142	230	202	190	182	172	168	162	155	150
Z2-85X125	154	245	220	208	195	185	180	172	165	160
Z2-90X130	148	258	225	210	200	190	185	178	170	165
Z2-95X135	160	270	245	230	218	205	198	188	180	175
Z2-100X145	157	285	260	245	230	220	210	202	195	185
Z2-110X155	145	305	265	248	238	225	220	210	200	195
Z2-120X165	157	310	298	278	262	248	238	230	220	210
Z2-125X170	142	320	305	280	265	250	240	232	225	220
Z2-130X180	133	328	315	285	272	252	245	240	230	225
Z2-140X190	145	370	325	305	290	275	268	260	250	240
Z2-150X200	145	390	340	320	305	290	280	270	260	250
Z2-160X210	151	410	368	345	328	308	300	290	275	265
Z2-170x225	145	438	382	358	345	325	315	305	295	285
Z2-180x235	151	450	410	385	365	345	335	325	310	300
Z2-190x250	139	468	415	390	375	355	345	335	320	310
Z2-200x260	139	488	430	408	388	370	360	350	335	325
Z2-220x285	138	532	472	445	425	402	392	380	365	355
Z2-240x305	150	570	528	495	470	448	430	415	400	385
Z2-260x325	156	620	580	540	515	482	470	450	430	415
Z2-280x355	138	662	588	552	530	502	490	475	455	445
Z2-300x375	144	725	635	600	570	540	525	510	485	470
Z2-320x405	143	780	682	640	615	580	565	545	525	510
Z2-340x425	137	790	700	660	630	600	585	565	540	525
Z2-360x455	137	845	748	708	675	642	625	605	580	560
Z2-380x475	131	852	760	720	690	658	645	625	600	580
Z2-400x495	125	858	775	735	710	675	660	640	615	600
Z2-420x515	131	925	826	780	750	715	700	675	650	630
Z2-440x545	126	950	852	815	780	742	725	705	665	660
Z2-450x555	124	955	860	820	790	755	735	715	680	670
Z2-460x565	120	960	865	825	800	765	745	725	695	680
Z2-480x585	120	990	896	855	825	790	770	750	720	705
Z2-500x605	120	1025	930	885	855	820	795	775	745	730

Fitting:

1. All contact surfaces, including threads and heads of locking screws, have to be clean and covered with an oil film. Shaft, hub and Locking Assembly are to be assembled in this condition.
2. Tighten locking screws lightly and position hub.
3. Tighten locking screws evenly crosswise up to the nominated torque (tighten in 2-3 stages).
4. Re-check the tightening torque of the locking screws all the way round. When no screw can be tightened further with the torque wrench set to the tightening torque M_a , the fitting process is completed.

Note: Used Locking Assemblies, prior to fitting, must be cleaned and lightly oiled, then re-assembled as shown in **Figure 1**. The cadmium plated screws are to be placed through tapped holes of front thrust ring (see dH).

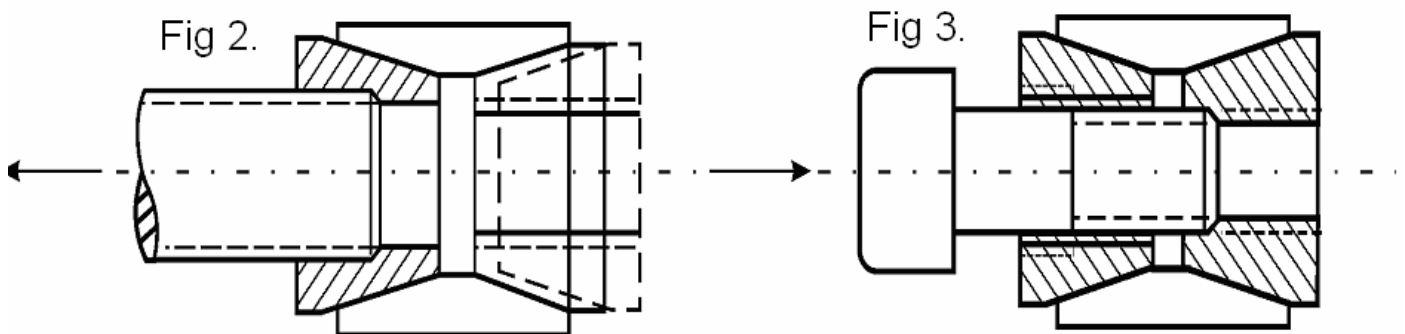


Fig,1

- 1=Rear thrust ring
- 2=Front thrust ring
- 3=Outer ring
- 4= Inner ring

Removal:

1. Loosen all screws crosswise several turns.
2. Now the loosened connection can be dis-assembled. If necessary, the front and rear thrust ring can be dis-assembled as shown in **Figures 2 and 3**.



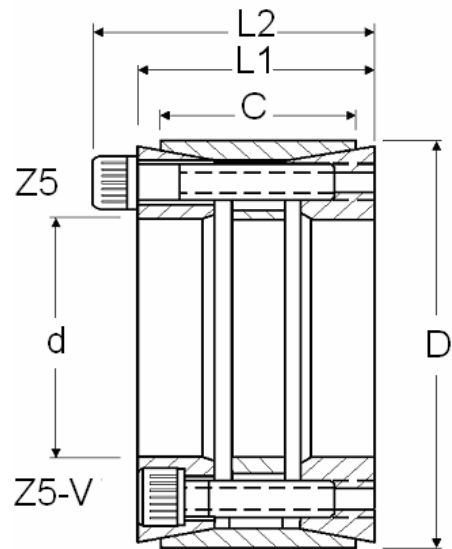
Tightening Torques for screws Gr. 12.9 DIN 912

Screw	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24
Torque M_a (Nm)	17	41	83	145	230	355	485	690	930	1200
dH	M8	M10	M12	M16	M18	M20	M22	M24	M27	M30

Z5 SERIES

LOCKING ASSEMBLIES

Ma = screw tightening torque
Ft = axial holding force when $Mt=0$
Mt = transmissible torque when $Ft=0$
Pf = specific pressure on mating shaft and hub



DIMENSIONS						SCREWS			CAPACITIES				
Z – Lock number	d	D	C	L1	L2	Size	Qty	Ma Nm	Ft kN	Mt kNm	Pf-N/mm2 Shaft	hub	Wgt kg
Z5-100X145	100	145	60	65	77	M12X50	10	145	372	18.6	205	126	4.1
Z5-110X155	110	155	60	65	77	M12X50	10	145	372	20.5	187	118	4.4
Z5-120X165	120	165	60	65	77	M12X50	12	145	408	24.5	188	122	4.8
Z5-130X180	130	180	68	74	86	M12X60	15	145	520	33.8	197	128	6.5
Z5-140X190	140	190	68	74	86	M12X60	18	145	557	39.1	196	130	7.0
Z5-150X200	150	200	68	74	86	M12X60	18	145	557	41.8	183	123	7.4
Z5-160X210	160	210	68	74	86	M12X60	21	145	593	47.5	183	125	7.8
Z5-170X225	170	225	75	81	95	M14X65	18	230	764	64.9	193	133	10.0
Z5-180X235	180	235	75	81	95	M14X65	18	230	777	83.0	182	127	10.6
Z5-190X250	190	250	88	94	108	M14X65	20	230	815	88.0	163	103	14.3
Z5-200X260	200	260	88	94	108	M14X65	24	230	1020	105	194	124	15.0
Z5-200X260V	200	260	88	94	94	M12X70	24	145	763	76.3	156	101	14.8
Z5-210X275	210	275	98	104	120	M16X90	18	355	1060	110	185	120	17.5
Z5-220X285	220	285	98	104	120	M16X90	18	355	1070	117	174	113	19.8
Z5-240X305	240	305	98	104	120	M16X90	24	355	1410	170	212	140	21.4
Z5-250X315	250	315	98	104	120	M16X90	24	355	1460	181	209	138	22.0
Z5-260X325	260	325	98	104	120	M16X90	25	355	1480	193	205	138	23.0
Z5-280X355	280	355	120	126	144	M18X110	24	485	1650	232	213	141	35.2
Z5-280X355V	280	355	120	126	126	M16X100	24	355	1429	200	170	112	35.0
Z5-300X375	300	375	120	126	144	M18X110	25	485	1660	249	198	134	37.4
Z5-300X375V	300	375	120	126	126	M16X100	24	355	1483	222	159	107	37.0
Z5-320X405	320	405	135	142	162	M20X120	25	690	2170	354	191	125	51.3
Z5-320X405V	320	405	135	142	142	M18X110	24	485	1840	295	153	100	51.0
Z5-340X425	340	425	135	142	162	M20X120	25	690	2210	376	180	119	54.1
Z5-340X425V	340	425	135	142	142	M18X110	24	485	1840	313	144	96	53.8
Z5-360X455	360	455	158	165	187	M22X130	25	690	2680	496	185	118	74.4
Z5-380X475	380	475	158	165	187	M22X130	25	930	2750	524	175	113	79.0
Z5-380X475V	380	475	158	165	165	M20X120	24	690	2378	452	140	90	78.5
Z5-400X495	400	495	158	165	187	M22X130	25	930	3010	602	183	122	82.8
Z5-420X515	420	515	158	165	187	M22X130	30	930	3300	694	190	127	86.5
Z5-440X535	440	535	158	165	187	M22X130	30	930	3300	728	166	123	109
Z5-450X555	450	555	172	180	204	M24X150	30	1200	3700	832	159	120	112
Z5-460X555	460	555	172	180	204	M24X150	32	1200	3700	832	159	118	115
Z5-480X585	480	585	172	180	204	M24X150	32	1200	3950	948	159	119	119
Z5-500X605	500	605	172	180	204	M24X150	32	1200	3950	988	153	115	123
Z5-530X640	530	640	190	200	227	M27X160	30	1600	4320	1145	164	120	151
Z5-560X670	560	670	190	200	227	M27X160	30	1600	4320	1210	163	121	160
Z5-600X710	600	710	190	200	227	M27X160	32	1600	4320	1380	153	118	170

MINIMUM HUB DIAMETER

Z – Lock series Z5	Pf Hub N/mm	YIELD POINT ($\sigma_{0.2N/mm^2}$)								
		150	180	200	220	250	270	300	350	400
		GG-22	GG-26 GS-38 V2A-S V2A-E	GG-30 V4A-S GTS-35 1020 AS1434	GS-45 ST35 ST37-3 V4A-E 1040 AS1434	GS-52 GS-C25 GGG-40 ST45 1045 AS1434 Gr250 AS3678	C35 ST50-2 X8CrTi17 AlCuNic 1050 AS1434	GS-60 St60-2 C10 GTS-45 Gr300 AS3678	GS-62 St70-2 St52 Gr350 AS3678	GS-70 C60 25CrMo4 Gr400 AS3678
Z5-100x145	126	481	340	300	280	250	240	226	219	201
Z5-110x155	118	485	350	310	285	260	250	237	222	212
Z5-120x165	122	495	370	345	305	285	272	264	239	230
Z5-130x180	128	673	450	395	355	320	304	290	270	255
Z5-140x190	130	710	475	415	375	340	321	302	281	266
Z5-150x200	123	765	480	420	385	350	330	315	290	280
Z5-160x210	125	710	495	440	400	365	350	330	305	295
Z5-170x225	133	795	595	520	460	415	390	365	340	317
Z5-180x235	127	880	595	520	470	420	400	375	350	330
Z5-190x250	103	890	580	435	420	390	380	360	340	330
Z5-200x260	124	920	615	540	500	450	430	405	380	360
Z5-200x260V	101	780	490	450	405	365	345	325	305	290
Z5-210x275	120	940	610	540	505	460	445	420	400	380
Z5-220x285	113	950	610	550	510	470	450	430	405	385
Z5-240x305	140	1780	865	730	650	575	545	506	470	435
Z5-250x315	138	1820	910	765	680	590	570	530	490	460
Z5-260x325	138	1895	920	775	690	610	580	540	500	470
Z5-280x355	141	2070	1015	520	755	670	635	590	545	505
Z5-280x355V	112	1600	820	420	605	540	510	475	436	405
Z5-300x375	134	1650	995	855	765	690	650	610	565	530
Z5-300x375V	107	1300	800	710	620	560	520	490	450	430
Z5-320x405	125	1350	960	850	775	700	670	630	590	565
Z5-320x405V	100	1120	790	720	725	560	540	505	475	455
Z5-340x425	119	1280	960	850	785	720	685	650	610	585
Z5-340x425V	96	1020	800	720	735	580	550	520	490	470
Z5-360x455	118	1365	1020	910	840	770	735	700	650	625
Z5-380x475	113	1310	1010	920	850	780	750	715	670	640
Z5-380x475V	90	1020	815	760	680	625	600	575	540	515
Z5-400x495	122	1650	1170	990	910	860	820	775	720	690
Z5-420x515	127	1950	1285	1130	1015	920	870	820	765	725
Z5-440x535	123	1780	1260	1150	1025	925	890	835	780	750
Z5-450x555	120	1700	1250	1120	1025	935	900	850	800	760
Z5-460x555	118	1700	1250	1120	1030	940	900	850	800	760
Z5-480x585	119	1745	1310	1180	1090	990	950	895	850	810
Z5-500x605	115	1680	1330	1190	1100	1010	965	905	865	815
Z5-530x640	120	1950	1420	1280	1170	1080	1020	980	910	870
Z5-560x670	121	2210	1510	1340	1240	1150	1090	1040	970	940
Z5-600x710	118	2220	1580	1420	1310	1240	1150	1080	1010	980

Z5-Z6 FITTING AND REMOVAL OF Z-LOCK LOCKING ASSEMBLIES

Fitting:

1. All contact surfaces, including the threads and heads of locking screws, have to be clean and are covered with an oil film. Shaft, hub and Locking Assembly are to be assembled in this condition.
2. Unscrew all locking screws several turns and screw at least three screws into the threads of Parts 2 and 3, so that they press against the stop and hold Parts 1 and 3 away from Part 2.
3. Place locking assembly in hub bore. Take screws from the jacking screw holes in Part 3 and screw back into the threaded holes of Part 1.
4. Tighten screws evenly to the given torque M_a , crosswise covering the circumference several times. (Tighten the screws on both sides of the slot one after the other). When no screw can be tightened any further with the torque wrench set to the tightening torque M_a , the fitting process is complete.

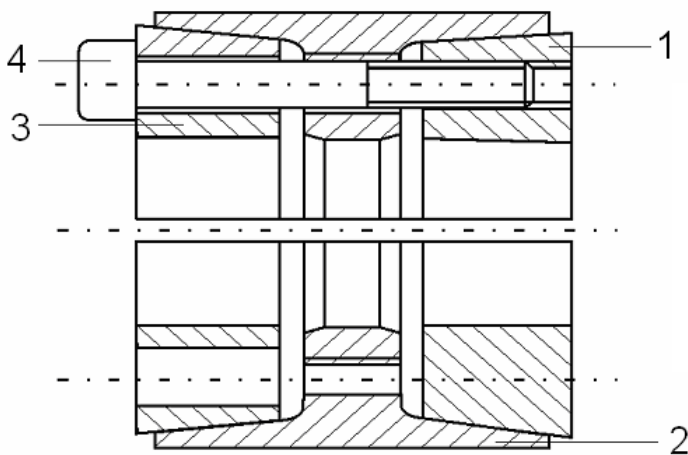


Fig 1

- 1 = Back thrust ring
- 2 = Internal bush
- 3 = Front thrust ring
- 4 = Locking screws
DIN 912 12.9

Note:

Used locking assemblies, prior to fitting, must be cleaned and lightly oiled, then re-assembled as shown in **Figure 1**. On assembly, ensure that both front and back thrust rings and also internal bush have correct orientation, ie: all threaded holes in back thrust ring are opposite through holes in the web of the internal bush and front thrust ring.

Removal:

1. Loosen all screws several turns.
2. Insert screws into all jacking screw holes in the front thrust ring and the web of the internal bush, which are screwed out of the back thrust ring.
3. Tighten the screws in the jacking screw holes evenly (the screws on both sides of the slot one after the other), the assembly is then loosened.

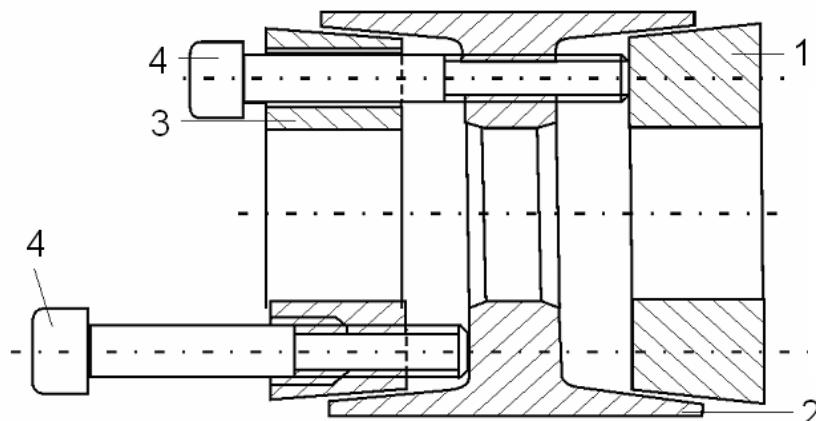


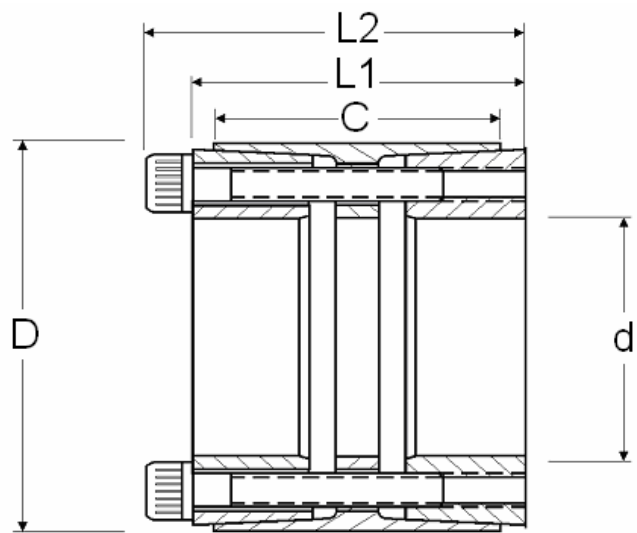
Fig 2

- 1 = Back thrust ring
- 2 = Internal bush
- 3 = Front thrust ring
- 4 = Locking screws
DIN 912 12.9

Z6 SERIES

LOCKING ASSEMBLIES

Ma = screw tightening torque
 Ft = axial holding force when Mt=0
 Mt = transmissible torque when Ft=0
 Pf = specific pressure on mating shaft and hub



DIMENSIONS						SCREW			CAPACITIES				
Z – Lock number	d	D	C	L1	L2	Size	Qty	Ma Nm	Ft kN	Mt kNm	Pf-N/mm2 shaft hub		Wgt kg
Z6-25X55	25	55	32	40	46	M6X35	6	17	67	0.84	297	101	0.47
Z6-28X55	28	55	32	40	46	M6X35	6	17	67	0.94	265	101	0.44
Z6-30X55	30	55	32	40	46	M6X35	6	17	67	1.00	248	101	0.42
Z6-35X60	35	60	44	54	60	M6X45	7	17	74	1.30	165	87	1.00
Z6-40X75	40	75	44	54	62	M8X50	7	41	145	2.90	282	116	1.10
Z6-45X75	45	75	44	54	62	M8X50	7	41	145	3.26	251	116	1.20
Z6-50X80	50	80	56	64	72	M8X50	8	41	166	4.15	200	98	1.40
Z6-55X85	55	85	56	64	72	M8X50	9	41	186	5.15	205	104	1.60
Z6-60X90	60	90	56	64	72	M8X50	10	41	207	6.20	202	106	1.70
Z6-65X95	65	95	56	64	72	M8X50	10	41	207	6.75	187	100	1.90
Z6-70X110	70	110	70	78	88	M10X60	10	83	329	11.5	223	114	3.10
Z6-80X120	80	120	70	78	88	M10X60	11	83	362	14.5	215	115	3.50
Z6-90X130	90	130	70	78	88	M10X60	12	83	390	17.8	208	115	3.80
Z6-95X135	95	135	70	78	88	M10X60	12	83	435	19.7	197	107	4.20
Z6-100X145	100	145	90	100	112	M12X80	14	145	527	26.3	200	107	6.10
Z6-110X155	110	155	90	100	112	M12X80	14	145	575	31.8	198	110	6.60
Z6-120X165	120	165	90	100	112	M12X80	18	145	670	40.4	212	120	7.20
Z6-130X180	130	180	104	116	130	M14X90	16	230	789	51.6	192	112	10.0
Z6-140X190	140	190	104	116	130	M14X90	18	230	920	64.7	208	124	10.6
Z6-150X200	150	200	104	116	130	M14X90	19	230	966	74.2	208	127	11.3
Z6-160X210	160	210	104	116	130	M14X90	20	230	1050	84.5	208	128	11.9
Z6-170X225	170	225	134	146	162	M16X110	19	355	1280	106.2	182	113	18.0
Z6-180X235	180	235	134	146	162	M16X110	20	355	1370	123.2	184	115	18.8
Z6-190X250	190	250	134	146	162	M16X110	21	355	1460	133.8	186	116	21.9
Z6-200X260	200	260	134	146	162	M16X110	22	355	1460	146.0	177	112	23.0
Z6-220X285	220	285	134	146	162	M16X110	24	355	1640	181.0	188	115	27.0
Z6-240X305	240	305	134	146	162	M16X110	26	355	1820	218.0	184	119	29.2
Z6-260X325	260	325	134	146	162	M16X110	28	355	1920	280.0	178	117	31.5
Z6-280X355	280	355	165	177	197	M20X130	24	690	2550	360.0	185	117	48.0
Z6-300X375	300	375	165	177	197	M20X130	25	690	2850	428.0	192	123	51.0
Z6-320X405	320	405	165	177	197	M20X130	28	690	3000	480.0	188	119	62.0
Z6-340X425	340	425	165	177	197	M20X130	29	690	3140	534.0	186	119	66.0
Z6-360X455	360	455	190	202	224	M22X150	28	930	3730	670.0	176	115	91.0
Z6-380X475	380	475	190	202	224	M22X150	30	930	3900	742.0	175	115	95.0
Z6-400X495	400	495	190	202	224	M22X150	31	930	4260	852.0	181	120	100
Z6-420X515	420	515	190	202	224	M22X150	32	930	4260	894.0	173	116	104
Z6-440X535	440	535	190	202	224	M22X150	24	930	4260	937.0	165	112	109
Z6-460X555	460	555	190	202	224	M22X150	24	930	4260	980.0	158	107	113
Z6-480X575	480	575	190	202	224	M22X150	28	930	5040	1200	176	121	118
Z6-500X595	500	595	190	202	224	M22X150	28	930	5040	1240	169	117	122
Z6-520X615	520	615	190	202	224	M22X150	30	930	5400	1390	174	121	126
Z6-540X635	540	635	190	202	224	M22X150	30	930	5400	1430	172	126	132
Z6-560X655	560	655	190	202	224	M22X150	32	930	5760	1610	179	122	139
Z6-580X675	580	675	190	202	224	M22X150	33	930	5760	1670	173	131	147
Z6-600X695	600	695	190	202	224	M22X150	33	930	5940	1780	173	127	158

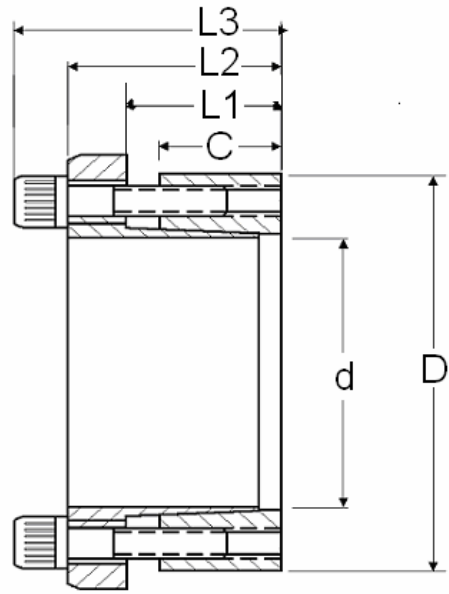
MINIMUM HUB DIAMETER

Z – Lock series Z6	Pf Hub N/mm	YIELD POINT ($\sigma_{0.2N/mm^2}$)								
		150	180	200	220	250	270	300	350	400
		GG-22	GG-26 GS-38 V2A-S V2A-E	GG-30 V4A-S GTS-35 1020 AS1434	GS-45 ST35 ST37-3 V4A-E 1040 AS1434	GS-52 GS-C25 GGG-40 ST45 1045 AS1434 Gr250 AS3678	C35 ST50-2 X8CrTi17 AlCuNic 1050 AS1434	GS-60 St60-2 C10 GTS-45 Gr300 AS3678	GS-62 St70-2 St52 Gr350 AS3678	GS-70 C60 25CrMo4 Gr400 AS3678
Z6-25X55	101	110	95	90	85	80	78	75	71	70
Z6-28X55	101	110	95	90	85	80	78	75	71	70
Z6-30X55	101	110	95	90	85	80	78	75	71	70
Z6-35X60	87	122	105	100	95	90	88	85	80	76
Z6-40X75	146	570	230	190	166	150	140	130	116	110
Z6-45X75	146	570	230	190	166	150	140	130	116	110
Z6-50X80	98	175	150	140	130	122	120	112	106	103
Z6-55X85	104	205	160	155	145	135	130	125	116	111
Z6-60X90	106	220	180	165	150	145	140	130	123	118
Z6-65X95	100	215	180	165	155	145	141	135	130	125
Z6-70x110	114	305	235	215	200	180	175	165	155	150
Z6-80x120	115	330	260	235	215	200	190	180	170	165
Z6-90x130	115	360	280	250	235	215	210	195	185	180
Z6-95x135	107	360	285	265	250	230	220	210	200	195
Z6-100x145	107	360	285	265	250	230	220	210	200	195
Z6-110x155	110	395	315	290	270	250	240	230	215	210
Z6-120x165	120	495	370	330	305	280	270	255	240	230
Z6-130x180	112	475	375	340	315	295	280	270	255	245
Z6-140x190	124	620	445	400	360	330	315	295	275	265
Z6-150x200	127	700	485	430	390	350	335	315	295	280
Z6-160x210	128	740	510	445	405	370	355	330	310	295
Z6-170x225	113	610	470	430	400	365	355	335	315	305
Z6-180x235	115	650	500	455	425	390	375	355	335	320
Z6-190x250	116	700	540	490	450	415	400	380	355	340
Z6-200x260	112	685	540	500	455	420	405	385	365	350
Z6-220x285	115	785	610	550	510	470	450	430	405	385
Z6-240x305	119	900	677	605	560	515	490	470	440	420
Z6-260x325	117	930	710	640	590	540	520	490	460	445
Z6-280x355	117	1010	775	695	645	590	565	540	505	485
Z6-300x375	123	1195	865	775	705	645	615	585	540	520
Z6-320x405	119	1195	890	805	740	680	650	620	575	550
Z6-340x425	119	1260	945	845	780	715	680	650	605	580
Z6-360x455	115	1260	970	880	815	750	720	685	645	615
Z6-380x475	115	1310	1015	920	850	780	755	715	670	645
Z6-400x495	120	1485	1110	990	915	840	800	760	710	680
Z6-420x515	116	1450	1110	1010	930	850	820	780	735	700
Z6-440x535	112	1410	1110	1015	940	870	835	795	745	720
Z6-460x555	107	1360	1100	1010	945	880	845	805	760	735
Z6-480x575	121	1795	1315	1165	1070	980	935	890	830	795
Z6-500x595	117	1700	1300	1170	1080	990	950	900	845	810
Z6-520x615	121	1920	1405	1250	1150	1050	1000	950	890	850
Z6-540x635	126	1810	1380	1250	1150	1055	1010	960	905	870
Z6-560x655	122	2050	1495	1330	1220	1115	1070	1010	950	905
Z6-580x675	131	2110	1540	1365	1260	1150	1095	1040	975	935
Z6-600x695	127	2120	1530	1380	1265	1165	1115	1060	990	945

Z8 SERIES

LOCKING ASSEMBLIES

Ma = screw tightening torque
 Ft = axial holding force when Mt=0
 Mt = transmissible torque when Ft=0
 Pf = specific pressure on mating shaft and hub



DIMENSIONS							SCREWS			CAPACITIES				
Z - Lock number	d	D	C	L1	L2	L3	Size	Qty	Ma Nm	Ft kN	Mt kNm	Pf-N/mm2 Shaft	hub	Wgt (kg)
Z8-20X47	20	47	17	22	28	34	M6x20	5	17	28	0.28	219	95	0.28
Z8-24X50	24	50	17	22	28	34	M6x20	5	17	28	0.34	185	95	0.30
Z8-25X50	25	50	17	22	28	34	M6x20	6	17	34	0.42	210	110	0.31
Z8-28X55	28	55	17	22	28	34	M6x20	6	17	33	0.47	187	100	0.35
Z8-30X55	30	55	17	22	28	34	M6x20	6	17	33	0.50	174	100	0.36
Z8-35X60	35	60	17	22	28	34	M6x20	8	17	45	0.78	199	110	0.39
Z8-38x63	38	63	17	22	28	34	M6x20	8	17	45	0.84	188	108	0.41
Z8-40X65	40	65	17	22	28	34	M6x20	8	17	45	0.90	176	105	0.45
Z8-45X75	45	75	20	25	33	41	M8x25	7	41	72	1.60	214	135	0.70
Z8-50X80	50	80	20	25	34	42	M8x25	7	41	72	1.80	213	130	0.80
Z8-55X85	55	85	20	25	34	42	M8x25	8	41	83	2.25	222	135	0.85
Z8-60X90	60	90	20	25	34	42	M8x25	8	41	83	2.47	203	125	0.90
Z8-65X95	65	95	20	25	34	42	M8x25	9	41	93	3.02	205	135	0.96
Z8-70X110	70	110	24	30	42	52	M10x30	8	83	131	4.60	227	140	1.70
Z8-75X115	75	115	24	30	42	52	M10x30	8	83	131	4.90	212	130	1.82
Z8-80X120	80	120	24	30	42	52	M10x30	8	83	131	5.25	198	125	1.92
Z8-85X125	85	125	24	30	42	52	M10x30	9	83	148	6.30	210	135	1.96
Z8-90X130	90	130	24	30	42	52	M10x30	9	83	148	6.65	198	130	2.10
Z8-95X135	95	135	24	30	42	52	M10x30	10	83	164	7.80	209	140	2.20
Z8-100X145	100	145	26	32	46	58	M12x35	8	145	215	10.75	229	145	2.90
Z8-105X150	105	150	26	32	46	58	M12X35	8	145	215	11.15	221	140	3.05
Z8-110X155	110	155	26	32	46	58	M12x35	8	145	215	11.85	208	135	3.20
Z8-120X165	120	165	26	32	46	58	M12x35	9	145	215	12.90	191	140	3.40
Z8-125X170	125	170	26	32	46	58	M12X35	9	145	215	15.85	189	135	4.15
Z8-130X180	130	180	34	40	52	64	M12x40	12	145	308	19.90	190	140	4.60
Z8-140X190	140	190	34	40	57	71	M14x40	9	230	296	20.90	181	120	5.40
Z8-150X200	150	200	34	40	57	71	M14x40	10	230	328	24.60	187	120	5.70
Z8-160X210	160	210	34	40	57	71	M14x40	11	230	361	28.95	193	130	6.00
Z8-170X225	170	225	44	50	64	78	M14x40	12	230	394	33.55	150	115	8.30
Z8-180X235	180	235	44	50	64	78	M14x40	12	230	394	35.55	142	110	8.80
Z8-190X250	190	250	44	50	64	78	M14x40	15	230	597	52.05	187	130	9.50
Z8-200X260	200	260	44	50	64	78	M14x40	15	230	548	54.80	177	125	9.90
Z8-220X285	220	285	50	56	75	91	M16x40	12	355	548	60.25	141	100	14.4
Z8-240X305	240	305	50	56	75	91	M16x40	15	355	685	82.26	161	120	15.5
Z8-260X325	260	325	50	56	75	91	M16x50	18	355	731	95.10	180	120	16.7
Z8-280X355	280	355	60	66	87	105	M18x50	16	485	879	123.0	139	110	24.0
Z8-300X375	300	375	60	66	87	105	M18x50	18	485	989	148.0	146	120	25.0
Z8-320X405	320	405	74	81	104	124	M20x50	18	690	1140	182.5	128	100	38.0
Z8-340X425	340	425	74	81	104	124	M20x50	24	690	1280	218.0	136	110	40.8
Z8-360X455	360	455	86	94	120	142	M22x60	18	930	1600	290.0	138	110	48.0
Z8-380X475	380	475	86	94	120	142	M22x60	21	930	1600	305.0	131	105	57.0
Z8-400X495	400	495	86	94	120	142	M22x60	21	930	1770	355.0	137	110	63.0

MINIMUM HUB DIAMETER

Z – Lock series Z8	Pf Hub N/mm	YIELD POINT ($\sigma_{0.2N/mm^2}$)								
		150	180	200	220	250	270	300	350	400
		GG-22	GG-26 GS-38 V2A-S V2A-E	GG-30 V4A-S GTS-35 1020 AS1434	GS-45 ST35 ST37-3 V4A-E 1040 AS1434	GS-52 GS-C25 GGG-40 ST45 1045 AS1434 Gr250 AS3678	C35 ST50-2 X8CrTi17 AlCuNic 1050 AS1434	GS-60 St60-2 C10 GTS-45 Gr300 AS3678	GS-62 St70-2 St52 Gr350 AS3678	GS-70 C60 25CrMo4 Gr400 AS3678
Z8-20X47	95	70	65	63	61	59	58	57	55	54
Z8-24X50	95	78	74	70	67	65	64	62	60	59
Z8-25X50	110	78	74	70	67	65	64	62	60	59
Z8-28X55	100	82	77	74	72	70	69	67	65	64
Z8-30X55	100	82	77	74	72	70	69	67	65	64
Z8-35X60	110	100	91	87	84	81	79	77	74	72
Z8-40X65	105	105	95	92	88	85	83	82	79	77
Z8-45X75	135	132	120	115	110	105	102	100	95	92
Z8-50X80	130	136	123	117	113	108	106	103	100	96
Z8-55X85	135	152	136	130	125	120	115	111	108	105
Z8-60X90	125	155	145	135	130	125	120	117	115	110
Z8-65X95	135	175	155	145	140	135	130	125	121	120
Z8-70X110	140	200	180	170	165	155	150	145	140	136
Z8-75X115	130	210	185	175	170	160	155	150	145	140
Z8-80X120	125	215	190	180	175	165	160	155	150	145
Z8-85X125	135	235	215	200	185	175	170	165	160	155
Z8-90X130	130	240	220	200	195	180	175	170	165	160
Z8-95X135	140	255	230	210	200	190	185	180	175	170
Z8-100X145	145	295	255	240	225	215	210	200	190	185
Z8-110X155	135	300	260	245	235	225	215	210	200	195
Z8-120X165	140	310	280	260	250	240	230	220	215	210
Z8-130X180	130	320	290	280	260	250	245	240	230	225
Z8-140X190	120	330	300	285	270	260	255	245	240	230
Z8-150X200	120	350	320	300	290	275	270	265	255	245
Z8-160X210	130	385	345	325	320	295	285	280	270	260
Z8-170X225	115	380	330	315	300	290	285	280	270	265
Z8-180X235	110	380	330	320	310	300	295	290	280	275
Z8-190X250	130	450	400	385	370	350	340	330	320	310
Z8-200X260	125	460	415	400	375	360	350	340	330	320
Z8-220X285	100	440	410	390	380	370	360	350	340	330
Z8-240X305	120	515	470	445	430	415	405	390	380	370
Z8-260X325	120	550	490	470	455	435	425	415	400	390
Z8-280X355	110	570	525	500	490	470	455	445	430	420
Z8-300X375	120	630	570	550	530	505	495	470	450	445
Z8-320X405	100	620	570	550	535	520	505	495	485	470
Z8-340X425	110	680	630	600	580	560	550	535	520	505
Z8-360X455	110	740	680	650	630	600	585	570	550	540
Z8-380X475	105	750	690	670	640	620	605	590	570	560
Z8-400X495	110	800	740	700	680	650	640	620	600	585

Z8 FITTING AND REMOVAL OF Z-LOCK LOCKING ASSEMBLIES

Fitting:

1. Fit at least 3 screws, evenly spaced around the circumference, into the threaded jacking holes, until resting against the face of the outer hub. This separates the hub and flange, and also stops tilting during assembly.
2. Tighten locking screws carefully until the locking assembly is located in the correct place without any looseness. Remove the lifting screws and tighten with the remaining screws.
3. Tighten all screws evenly to the given torque M_a , crosswise covering the circumference several times. (Tighten the screws on both sides of the slot one after the other). When no screw can be tightened any further with the torque wrench set to the tightening torque M_a , the fitting process is complete.

Removal:

1. Loosen all locking screws several turns and insert one screw into each of the flange's threaded jacking holes.
2. Tighten the screws crosswise to loosen the connection.
3. Tighten the screws both sides of the slot one after the other.

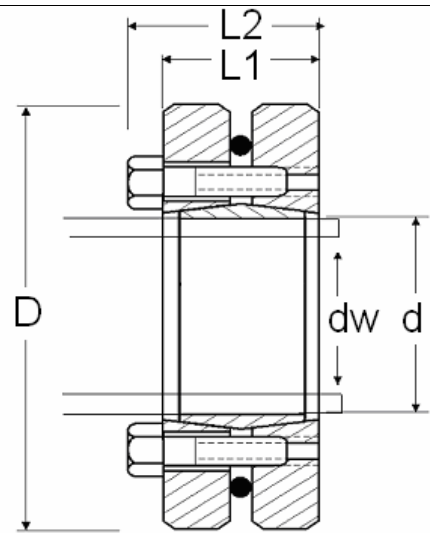
Tightening Torques for screws Gr. 12.9 DIN 912

Screw	M6	M8	M10	M12	M14	M16	M18	M20	M22
Torque M_a (Nm)	17	41	83	145	230	355	485	690	930

ZSD SERIES

SHRINK DISCS

Ma = screw tightening torque
 Ft = axial holding force when Mt=0
 Mt = transmissible torque when Ft=0
 Pf = specific pressure on mating shaft and hub



DIMENSIONS						SCREWS			CAPACITIES		
Z – Lock number	d	dw	D	L1	L2	Size	Qty	Ma Nm	Ft kN	Mt kNm	Wgt kg
ZSD24-72	24	19 20 21	50	14	18	M5x15	6	5	17 21 23	0.17 0.21 0.25	0.2
ZSD30-72	30	24 25 26	60	16	20	M5x18	6	5	25 27 29	0.30 0.34 0.38	0.3
ZSD36-72	36	28 30 31	72	18	22	M6x20	5	12	31 38 40	0.44 0.57 0.63	0.5
ZSD44-72	44	34 35 36	80	20	24	M6x20	7	12	41 44 47	0.71 0.78 0.86	0.6
ZSD50-72	50	38 40 42	90	22	26	M6x22	8	12	49 58 65	0.94 1.16 1.38	0.8
ZSD55-72	55	42 45 48	100	23	29	M6x25	8	12	55 67 78	1.16 1.52 1.88	1.1
ZSD62-72	62	48 50 52	110	23	29	M6x25	10	12	73 80 86	1.75 2.00 2.25	1.3
ZSD68-72	68	50 55 60	115	23	29	M8x30	6	29	74 91 105	1.85 2.50 3.15	1.4
ZSD75-72	75	55 60 65	138	25	31	M8x30	7	29	87 106 121	2.40 3.20 3.95	2.4
ZSD80-72	80	60 65 70	145	25	31	M8x30	7	29	106 120 131	3.20 3.90 4.60	2.5
ZSD90-72	90	65 70 75	155	30	38	M8x30	10	29	146 171 193	4.75 6.00 7.25	3.3
ZSD100-72	100	70 75 80	170	34	43	M8x35	12	29	171 200 225	6.00 7.50 9.00	4.3
ZSD110-72	110	75 80 85	185	39	49	M10x40	9	58	192 225 254	7.20 9.00 10.8	5.9
ZSD125-72	125	85 90 95	215	42	53	M10x40	12	58	258 288 315	11.0 13.0 15.0	8.6
ZSD140-71	140	95 100 105	230	46	58	M12x50	10	100	317 352 382	15.1 17.6 20.1	10
ZSD155-71	155	105 110 115	263	50	62	M12x50	12	100	419 454 487	22.0 25.0 28.0	15
ZSD165-71	165	115 120 125	290	56	68	M16x55	8	240	539 583 624	31.0 35.0 39.0	22

DIMENSIONS						SCREWS			CAPACITIES		
Z – Lock number	d	dw	D	L	H	Size	Qty	Ma Nm	Ft kN	Mt kNm	Wgt kg
ZSD175-71	175	125 130 135	300	56	68	M16x55	8	240	640 677 711	40 44 48	22
ZSD185-71	185	135 140 145	330	71	85	M16x65	10	240	815 857 896	55 60 65	37
ZSD195-71	195	140 150 155	350	71	85	M16x65	12	240	928 1013 1052	65 76 81.5	41
ZSD200-71	200	150 155 160	350	71	85	M16x65	12	240	1040 1084 1125	78 84 90	41
ZSD220-71	220	160 165 170	370	88	103	M16x75	15	240	1250 1309 1365	100 108 116	54
ZSD240-71	240	170 180 190	405	92	107	M20x80	12	470	1412 1533 1642	120 138 156	67
ZSD260-71	260	190 200 210	430	103	119	M20x85	14	470	1726 1840 1943	164 184 204	82
ZSD280-71	280	210 220 230	460	114	132	M20x95	16	470	2062 2227 2374	217 245 273	102
ZSD300-71	300	230 240 245	485	122	140	M20x100	18	470	2278 2442 2514	262 293 308	118
ZSD320-71	320	240 250 260	520	122	140	M20x100	20	470	2550 2720 2877	306 340 374	131
ZSD340-71	340	250 260 270	570	134	155	M20x110	24	470	3152 3308 3452	394 430 466	186
ZSD360-71	360	280 290 295	590	140	159	M24x120	24	820	3622 3793 3878	507 550 572	204
ZSD380-71	380	290 300 310	645	144	163	M24x120	20	820	4069 4267 4452	590 640 690	239
ZSD390-71	390	300 310 320	660	144	163	M24x120	21	820	4400 4580 4750	660 710 760	260
ZSD420-71	420	330 340 350	690	164	184	M24x130	24	820	4727 4940 5143	780 840 900	316
ZSD440-71	440	340 350 360	750	172	192	M24x130	24	820	5235 5486 5722	890 960 1030	408
ZSD460-71	460	360 370 380	770	172	192	M24X130	28	820	5556 5784 6000	1000 1070 1140	420
ZSD480-71	480	380 390 400	800	188	213	M24X140	30	820	6316 6513 6700	1200 1270 1340	505
ZSD500-71	500	400 410 420	850	188	213	M27X170	24	1100	7200 7415 7619	1440 1520 1600	575
ZSD530-71	530	430 440 450	910	213	238	M27X160	30	1100	8465 8818 9156	1820 1940 2060	746
ZSD560-71	560	450 460 470	940	213	238	M27X160	32	1100	8889 9261 9617	2000 2130 2260	775
ZSD590-71	590	470 480 490	980	228	260	M27X170	36	1100	9574 10000 10410	2250 2400 2550	900
ZSD620-71	620	500 510 520	1020	254	286	M30X190	32	1640	10800 11220 11620	2700 2860 3020	1080
ZSD660-71	660	530 540 550	1070	260	292	M30X190	36	1640	11700 12150 12580	3100 3280 3460	1190

Fitting:

1. Before fitting to shafts, remove any spacers that may have been installed between pressure plates for transport reasons.
2. Loosely tighten the screws such that the inner ring will still rotate.
3. Grease the hub on which the inner ring is to be fitted.
4. Slide the shrink disc on to the hub.
5. Slide the hub on to the solid shaft. Both hub bore and solid shaft surface must be ungreased.
6. Ensure that the pressure plates are parallel by carefully tightening screws at a low torque.
7. Begin tightening the screws to full tension M_a , evenly in a clockwise direction (not crosswise). Repeat the clockwise tensioning procedure several times until all screws are tensioned to the recommended torque M_a .

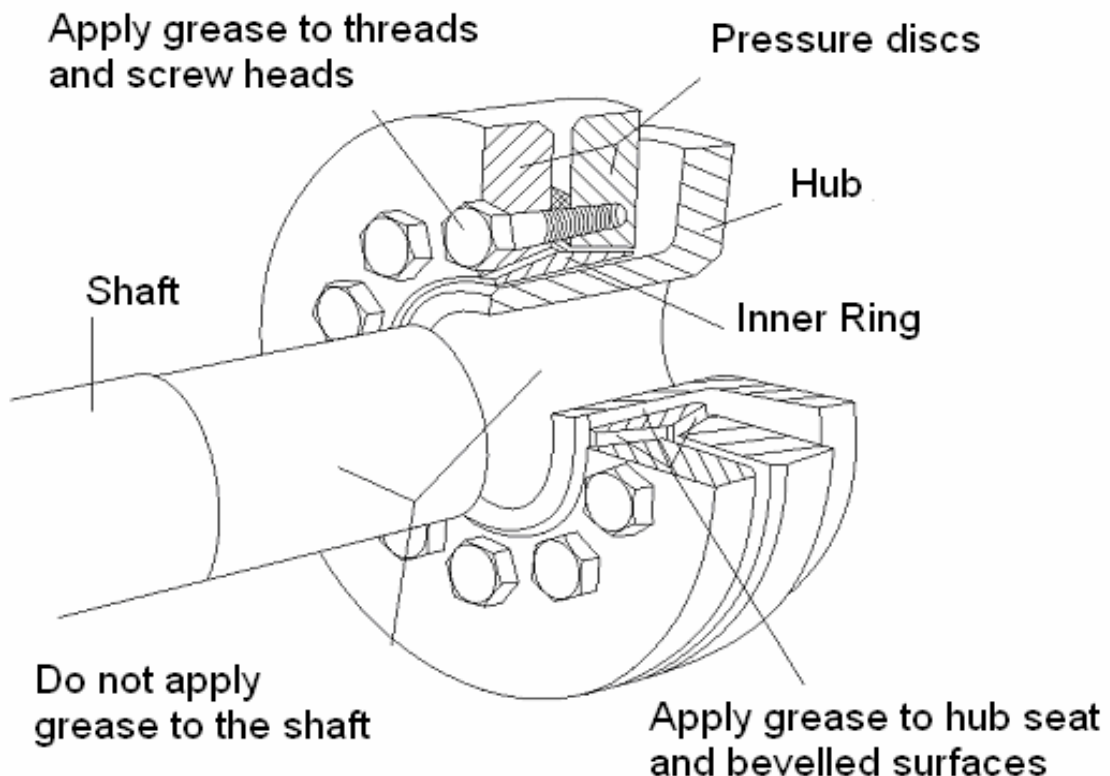
Removal:

1. Loosen screws evenly in a clockwise direction several times, take care to keep the pressure plates parallel.
For safety reasons do not completely unscrew the screws as this could allow a pressure plate to jump off.
2. Check for and remove any corrosion on hub and shaft, before hub is removed from solid shaft.
3. Remove shrink disc from hub.

Used Shrink Discs:

Used shrink discs must be disassembled and cleaned. Undamaged bevel surfaces, screw threads and under screw heads should be re-greased with Molykote G Rapid or a suitable equivalent.

Screw (Grade12.9)	M5	M6	M8	M10	M12	M16	M20	M24	M27	M30
Torque M_a (Nm)	5	12	29	58	100	240	470	820	1100	1640



Z - Lock INTERCHANGE

Z - Lock	Z1	Z2	Z3	Z4	Z5	Z6	Z8	ZT8	ZSD
MAV	3003	2005	1062		1008	4061	1061	5061	2008
TAS		3020	3003		3015	3012	3006		3071
Tollok	300	200	132		401	450	133	110	603
Ringblok	1060	1120	1710		1810	1800	1720	1100	2200.01
Peter Gerwah	3001	2001	2006		2009	2005	2006.3	2010.1	5003
Euroconic	31	210	913			910	914	55	915
Ringfeder	8006	7012						7110.1	4071
SIT	2	1	6			4	7	3	11S
Bikon	5000	4000	1003		1015	1012	1006	8000	1029.71
Chiaravalli	50	40	13			11	16	80	19
Tsubaki	EL	AS				AD	AE		
Ammertech	310	210	142		411	410	143	120	613
B-Loc	B-500	B-400	B-103		B-115	B-112	B-106	B-800	SD-10
Bonfiglioli	3000	2000	4100			9500	4600	1000	8000
Compomac	C	A	DS			F	ES	B	SD
Vincentia	500	400	130		115	112	160	800	129
Quantum	80	30				70		10	
KTR	150	100	203		401	400	206	250	603