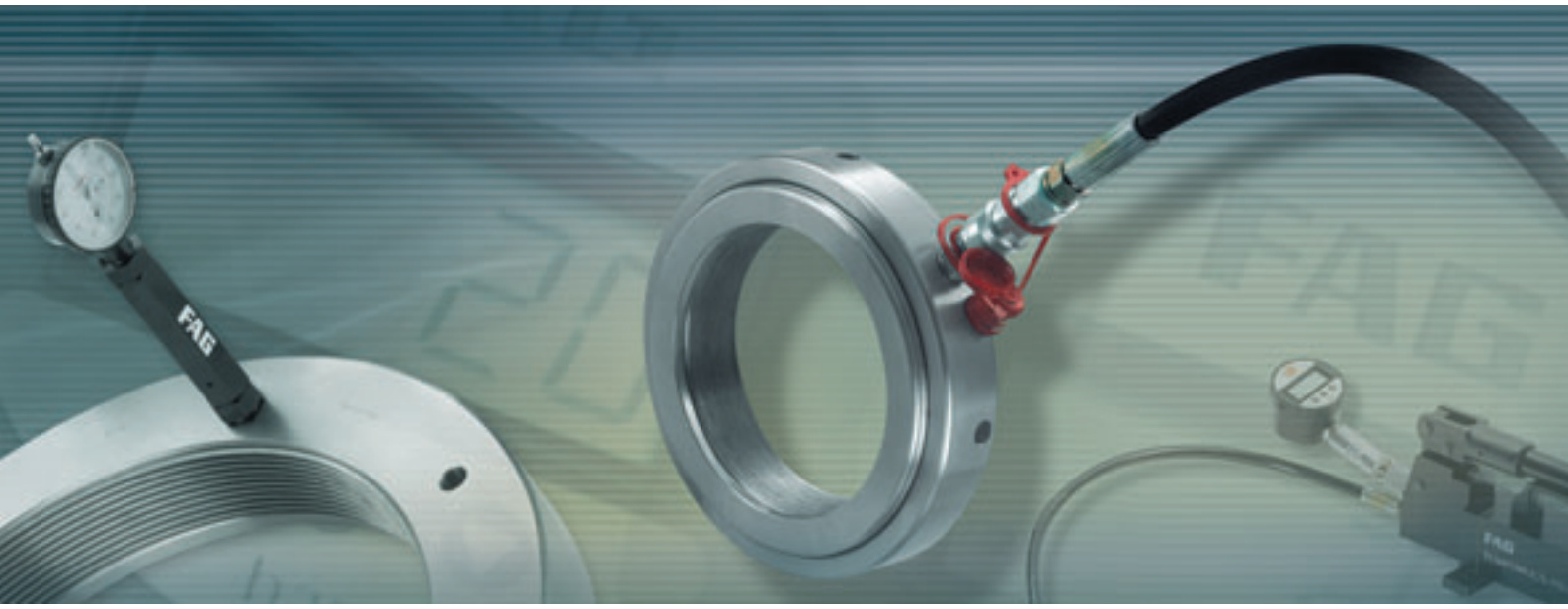
FAG



FAG Hydraulic nuts

Technical Product Information

SCHAEFFLER GROUP
INDUSTRIAL

Contents

Application · Design

Application

FAG hydraulic nuts HYD.NUT are used to press parts with a tapered bore onto their tapered seats. Presses are mainly used if the drive-up forces required cannot be applied using other devices, e.g. shaft nuts or pressure screws.

They are mainly used for:

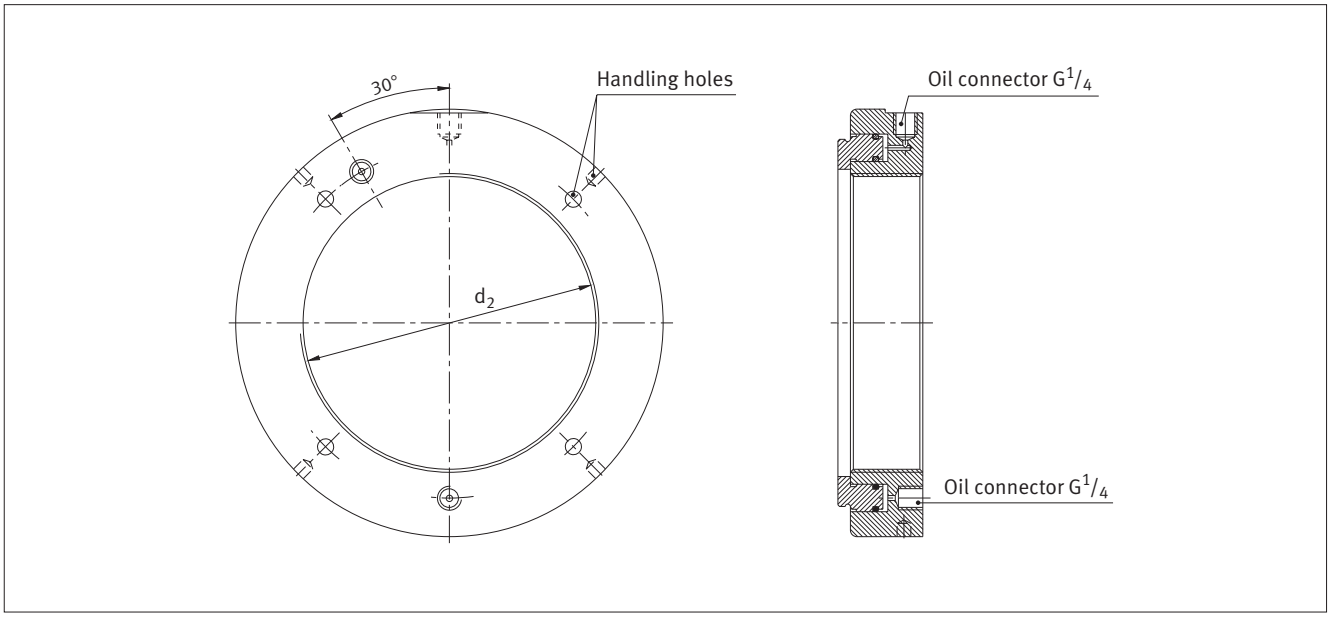
- mounting of bearings with a tapered bore. The rolling bearings can be seated directly on a tapered shaft, on an adapter sleeve or an extraction sleeve. If the bearing is located using an extraction sleeve or an adapter sleeve, the hydraulic nut can also be used for dismantling.
- mounting of couplings, gears, impellers, ships' propellers etc.

Design

FAG hydraulic nuts comprise a press ring and an annular piston, Figure 1. The piston is hydraulically operated. The pressure chamber is sealed by two soft PVC sealing cords mounted on rings.

Hydraulic nuts are designed for a maximum oil pressure of 800 bar. The stroke is designed such that the rolling bearings or other components with a tapered bore can be mounted in a single operation.
The bore d_2 of the press ring is available with a metric fine thread, a trapezoidal thread or an inch thread. A suitable FAG hydraulic nut is thus available for all common sleeve and shaft threads.

For higher drive-up forces, FAG also supplies hydraulic nuts with a smooth bore (the reinforced design).
FAG hydraulic nuts have oil connectors with a G¼ thread.
In designs with a thread, there are two connectors on the end face and one on the circumferential face. The second connector on the end face allows the use of a dial gauge (page 21). In the reinforced design, both connectors are on the circumferential face.
Hydraulic nuts with a thread have holes to make handling easier.
As the size increases, so does the number of these holes, as per the table in Figure 2.
Larger hydraulic nuts also have threaded holes for eye bolts to allow easier transport.



1: FAG hydraulic nut (threaded design)

Design · Design variants

2: Holes in the press ring for easier handling of hydraulic nuts

Thread d_2		Handling holes Quantity		Diameter
		End face	Circumferential face	
mm	inch			mm
50...200	3,527...7,847	2	2	10
205...345	8,628...13,339	4	4	12
350...395	14,170...14,957	4	4	14
≥ 400	≥ 15,745	6	6	16

Design variants

FAG hydraulic nuts are available in various designs:

- with a metric fine thread and with a trapezoidal thread
  This design fits all standardised adapter and extraction sleeves with metric dimensions.
  Ordering designations:
  HYD.NUT50 to **HYD.NUT200** (metric fine thread to DIN 13) and **HYD.NUT205** to **HYD.NUT1180** (trapezoidal thread to DIN 103)

- with an inch thread
  These hydraulic nuts comply with ABMA Standards for Bearing Mounting Accessories, Section 8, Locknuts Series N-00.
  Ordering designations:
  HYD.NUT90INCH to **HYD.NUT530INCH**.

Drive-up gauge for hydraulic nuts: see page 21.

- of reinforced design
  These hydraulic nuts have a smooth bore machined to H7. They were primarily developed for shipbuilding, where higher mounting forces are required and hydraulic nuts are generally mounted on a nut with a centring spigot.
  Ordering designations:
  HYD.NUT100HEAVY to **HYD.NUT900HEAVY**

FAG supplies special designs by agreement.

Replacement seals

Seals are subject to wear.
FAG supplies replacement seals for all hydraulic nuts (1 set is supplied with the original delivery of each HYD.NUT).

Ordering examples:
HYD.NUT160.SEAL.
(for HYD.NUT160 or HYD.NUT160INCH)

HYD.NUT600HEAVY.SEAL
(for HYD.NUT600HEAVY)

Pressure generators · Connectors

Pressure generators, connectors

Hydraulic nuts are operated by oil pressure. FAG supplies a comprehensive, matched range of accessories including pressure generators and connectors.

The FAG pressure generator required to operate the hydraulic nuts is shown in the scheme in Figure 3.

FAG hand pump sets should preferably be used due to their ease of handling, large oil volume and suitability for universal use.

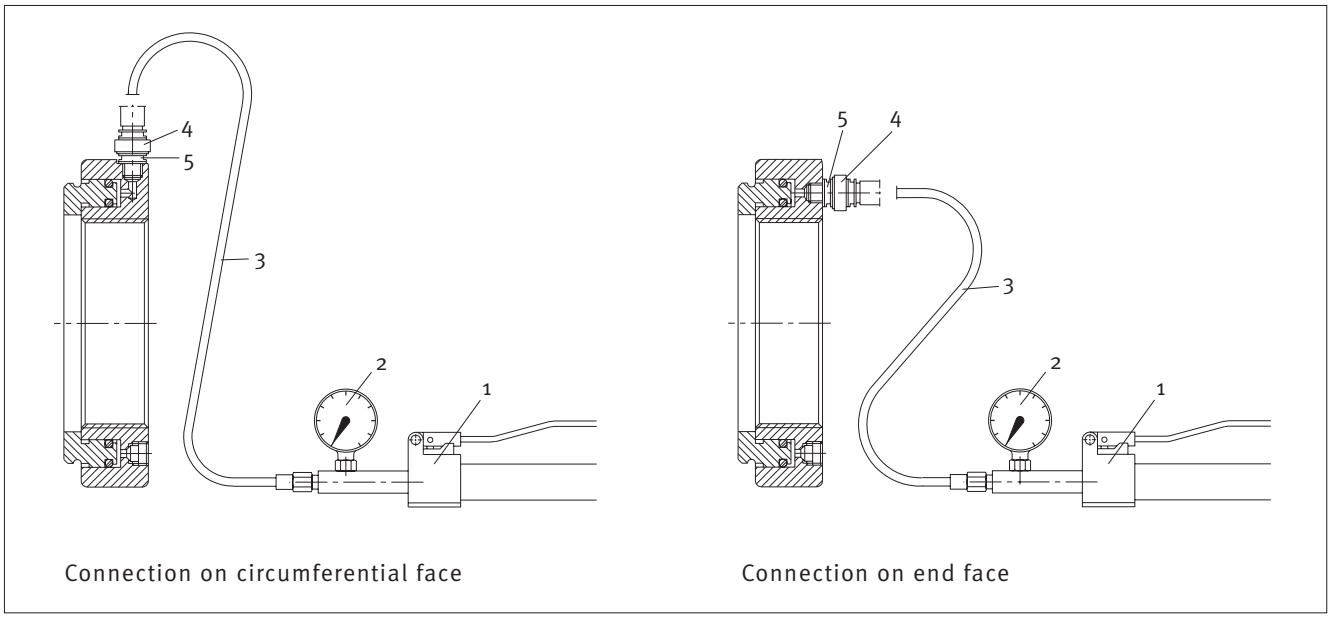
3: Allocation of FAG pressure generators to FAG hydraulic nuts

Pressure generator required (see also TPI WL 80-50)	Hydraulic nut (standard)	Hydraulic nut, reinforced design	Hydraulic nut with inch thread
PUMP1000.0,7L (...DIGI)	HYD.NUT50 ⋮ HYD.NUT395	HYD.NUT100HEAVY ⋮ HYD.NUT300HEAVY	HYD.NUT90INCH ⋮ HYD.NUT380INCH
PUMP1000.4L (...DIGI)	HYD.NUT400 ⋮ HYD.NUT800	HYD.NUT325HEAVY ⋮ HYD.NUT525HEAVY	HYD.NUT400INCH ⋮ HYD.NUT530INCH
PUMP1000.8L (...DIGI)	HYD.NUT830 ⋮ HYD.NUT1120	HYD.NUT550HEAVY ⋮ HYD.NUT675HEAVY	
AGGREGATE.E700 (electrically operated)	HYD.NUT1180	HYD.NUT700HEAVY	

4: FAG hand pump set for connection to hydraulic nuts up to HYD.NUT395 (example)

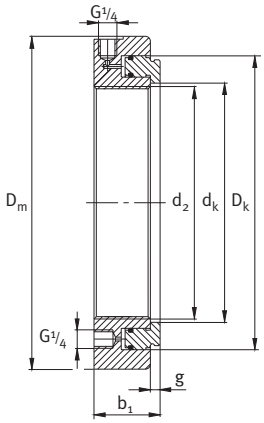
Pressure generators · Connectors

FAG hand pump set PUMP1000.4L comprising
1) Hand pump with 4 litre oil container/1 000 bar
2) Manometer, 0-1 000 bar
3) High pressure hose, 2 m long
4) Coupling sleeve
5) Coupling nipple (connector G¼)



5: Connection of a hand pump set to a hydraulic nut up to HYD.NUT800 (example)

FAG hydraulic nuts

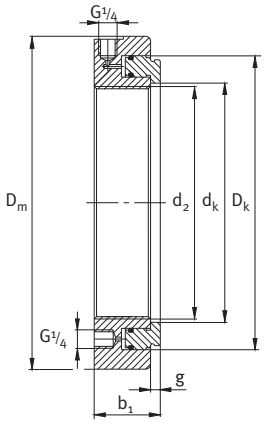


FAG hydraulic nuts

Hydraulic nut	Thread	Dimensions							Mass ≈	Drive-up force
	d_2	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		at 800 bar
Ordering designation	mm							cm^2	kg	kN
HYD.NUT50	M50×1,5	110	40	88	51	2	4	30,6	2,3	245
HYD.NUT55	M55×2	118	40	92	56	2	4	31,2	2,6	250
HYD.NUT60	M60×2	125	40	96	61	2	4	31,6	2,8	253
HYD.NUT65	M65×2	132	40	103	66	3	4	35,5	3,1	284
HYD.NUT70	M70×2	140	40	110	71	3	4	41	3,4	328
HYD.NUT75	M75×2	145	40	116	76	3	4	44,8	3,6	359
HYD.NUT80	M80×2	150	40	122	81	3	4	49	3,8	392
HYD.NUT85	M85×2	155	40	126	86	3	4	49,3	3,9	394
HYD.NUT90	M90×2	160	40	130	91	3	5	50	4,2	395
HYD.NUT95	M95×2	165	40	136	96	3	5	52	4,3	416
HYD.NUT100	M100×2	170	42	142	101	3	5	54,5	4,7	435
HYD.NUT105	M105×2	175	42	147	106	6	5	56,6	4,7	453
HYD.NUT110	M110×2	180	43	152	111	6	5	59	5	470
HYD.NUT115	M115×2	185	43	157	116	6	5	60,8	5,2	487
HYD.NUT120	M120×2	190	43	162	121	6	5	63	5,4	504
HYD.NUT125	M125×2	195	44	167	126	7	5	65	5,6	520
HYD.NUT130	M130×2	200	44	171	131	7	5	65	5,8	520
HYD.NUT135	M135×2	205	45	176	136	7	5	66,6	6	533
HYD.NUT140	M140×2	210	45	182	141	7	5	69	6,3	552
HYD.NUT145	M145×2	215	46	186	146	7	5	70,6	6,6	565

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT115): HYD.NUT115.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

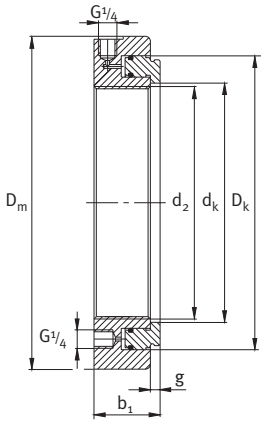


FAG hydraulic nuts

Hydraulic nut	Thread	Dimensions							Mass ≈	Drive-up force
	d_2	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		at 800 bar
Ordering designation	mm							cm^2	kg	kN
HYD.NUT150	M150×2	220	46	191	151	7	5	75,3	6,8	602
HYD.NUT155	M155×3	225	46	200	156	7	5	81,8	7,2	654
HYD.NUT160	M160×3	235	47	206	161	7	6	87,2	8	698
HYD.NUT165	M165×3	240	47	211	166	7	6	92,3	8,2	739
HYD.NUT170	M170×3	245	48	216	171	7	6	94,7	8,6	758
HYD.NUT180	M180×3	255	48	227	181	7	6	103	9,1	824
HYD.NUT190	M190×3	270	50	240	191	8	8	116	10,5	928
HYD.NUT200	M200×3	280	50	251	201	8	8	125	11,5	1000
HYD.NUT205	Tr205×4	290	51	258	207	8	8	132,2	12,3	1058
HYD.NUT210	Tr210×4	295	52	263	212	9	9	135	12,7	1080
HYD.NUT215	Tr215×4	300	53	268	217	9	9	137,7	13,2	1102
HYD.NUT220	Tr220×4	305	53	273	222	9	9	144,2	13,5	1154
HYD.NUT225	Tr225×4	315	54	282	227	9	10	153	15	1224
HYD.NUT230	Tr230×4	320	54	287	232	9	10	160	15,3	1280
HYD.NUT235	Tr235×4	325	54	290	237	9	10	161,7	15,5	1294
HYD.NUT240	Tr240×4	330	55	296	242	9	10	165,3	16,1	1323
HYD.NUT250	Tr250×4	345	56	310	252	10	10	182,2	18	1458
HYD.NUT260	Tr260×4	355	57	319	262	10	11	188	19	1504
HYD.NUT270	Tr270×4	370	58	332	272	10	12	196	21,1	1568
HYD.NUT275	Tr275×4	375	58	337	277	10	12	204	21,5	1632
HYD.NUT280	Tr280×4	380	59	342	282	10	12	211,7	22,3	1694
HYD.NUT290	Tr290×4	390	60	352	292	10	13	218,3	23,3	1747
HYD.NUT295	Tr295×4	400	60	362	297	10	13	230	25	1840

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT260): HYD.NUT260.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

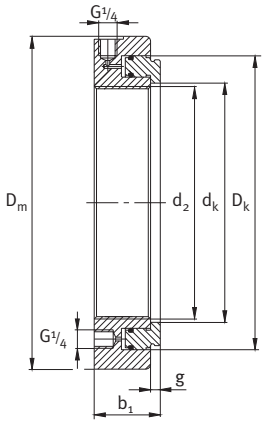


FAG hydraulic nuts

Hydraulic nut Ordering designation	Thread d_2 mm	Dimensions D_m	b_1	D_k	d_k	g	Stroke	Piston surface cm^2	Mass ≈ kg	Drive-up force at 800 bar kN
HYD.NUT300	Tr300×4	405	61	365	302	10	13	237	25,8	1 896
HYD.NUT310	Tr310×5	415	62	375	312	10	13	249	27	1 992
HYD.NUT315	Tr315×5	420	62	380	317	10	13	252,5	27,5	2 020
HYD.NUT320	Tr320×5	430	63	389	322	10	14	264	29,9	2 112
HYD.NUT330	Tr330×5	440	64	398	332	11	14	270,8	31	2 166
HYD.NUT335	Tr335×5	445	65	403	337	11	14	275	32	2 200
HYD.NUT340	Tr340×5	450	65	408	342	11	14	284	32,5	2 272
HYD.NUT345	Tr345×5	455	66	413	347	11	14	288	33,5	2 304
HYD.NUT350	Tr350×5	465	66	422	352	11	14	306	35	2 448
HYD.NUT355	Tr355×5	470	67	427	357	11	15	304	36,5	2 432
HYD.NUT360	Tr360×5	475	67	431	362	11	15	313	37	2 504
HYD.NUT365	Tr365×5	482	67	436	367	11	15	317	38	2 536
HYD.NUT370	Tr370×5	490	68	444	372	11	16	323	40	2 584
HYD.NUT375	Tr375×5	495	68	450	377	11	16	334	41	2 672
HYD.NUT380	Tr380×5	500	69	454	382	11	16	337	41,5	2 696
HYD.NUT385	Tr385×5	505	69	460	387	11	16	348	42	2 784
HYD.NUT395	Tr395×5	512	69	470	397	11	16	356	43	2 848
HYD.NUT400	Tr400×5	525	71	477	402	11	17	368	47	2 944
HYD.NUT410	Tr410×5	535	71	485	412	11	17	382	48	3 056
HYD.NUT415	Tr415×5	540	71	490	417	11	17	386	49	3 088

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT330): HYD.NUT330.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

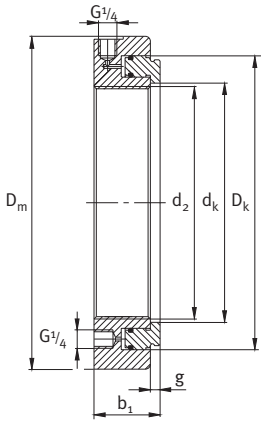


FAG hydraulic nuts

Hydraulic nut	Thread	Dimensions							Mass ≈	Drive-up force
	d_2	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		at 800 bar
Ordering designation	mm							cm^2	kg	kN
HYD.NUT420	Tr420×5	545	72	495	422	12	17	390	50	3 120
HYD.NUT430	Tr430×5	555	74	505	432	12	17	398	52	3 184
HYD.NUT435	Tr435×5	560	74	510	437	12	17	403	53	3 224
HYD.NUT440	Tr440×5	565	74	519	442	12	17	425	54	3 400
HYD.NUT450	Tr450×5	580	76	530	452	12	17	442	58	3 536
HYD.NUT460	Tr460×5	590	76	540	462	12	18	450	59,5	3 600
HYD.NUT470	Tr470×5	600	76	550	472	12	18	459	61	3 672
HYD.NUT480	Tr480×5	612	76	560	482	12	18	460	63	3 680
HYD.NUT490	Tr490×5	625	80	575	492	13	19	506	69	4 048
HYD.NUT500	Tr500×5	635	80	585	502	13	20	523	70	4 185
HYD.NUT510	Tr510×6	645	80	595	512	13	20	533	72	4 264
HYD.NUT520	Tr520×6	657	80	605	522	13	21	542	75	4 336
HYD.NUT530	Tr530×6	670	83	617	532	13	22	562	80	4 496
HYD.NUT540	Tr540×6	680	83	628	542	13	22	581	82,5	4 648
HYD.NUT550	Tr550×6	692	83	639	552	13	22	592	84,5	4 736
HYD.NUT560	Tr560×6	705	83	650	562	13	22	612	88	4 896
HYD.NUT570	Tr570×6	715	85	660	572	13	23	631	92	5 048
HYD.NUT580	Tr580×6	725	85	670	582	13	23	641	93	5 128
HYD.NUT590	Tr590×6	740	85	685	592	13	23	666	98	5 328
HYD.NUT600	Tr600×6	750	85	695	603	13	23	677	100	5 416

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT500): HYD.NUT500.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

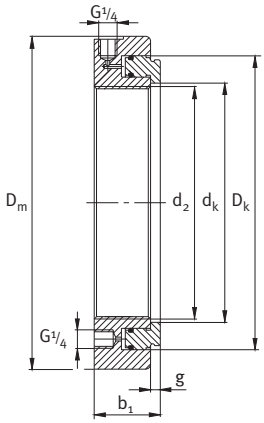


FAG hydraulic nuts

Hydraulic nut	Thread	Dimensions							Mass ≈	Drive-up force
	d_2	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		at 800 bar
Ordering designation	mm							cm^2	kg	kN
HYD.NUT610	Tr610×6	760	88	705	613	14	24	687	104	5 496
HYD.NUT625	Tr625×6	775	88	720	628	14	24	702	107	5 516
HYD.NUT630	Tr630×6	780	88	725	633	14	24	728	109	5 824
HYD.NUT650	Tr650×6	805	88	748	653	14	24	763	115	6 104
HYD.NUT655	Tr655×6	810	88	753	658	14	24	768	116	6 144
HYD.NUT670	Tr670×6	825	90	768	673	14	24	795	121	6 360
HYD.NUT680	Tr680×6	837	90	780	683	14	24	819	124	6 552
HYD.NUT690	Tr690×6	850	90	792	693	14	25	844	128	6 752
HYD.NUT695	Tr695×6	855	93	798	698	14	25	862	133	6 896
HYD.NUT710	Tr710×7	870	93	812	713	14	25	877	136	7 020
HYD.NUT720	Tr720×7	883	95	825	723	15	25	928	144	7 424
HYD.NUT740	Tr740×7	910	95	848	743	15	25	991	154	7 928
HYD.NUT750	Tr750×7	922	96	862	753	15	26	1 033	160	8 265
HYD.NUT760	Tr760×7	935	96	872	763	15	26	1 045	165	8 360
HYD.NUT780	Tr780×7	955	98	890	783	15	28	1 068	172	8 544
HYD.NUT800	Tr800×7	970	98	909	803	16	28	1 079	170	8 632
HYD.NUT830	Tr830×7	1 000	98	938	833	16	29	1 101	176	8 808
HYD.NUT850	Tr850×7	1 020	98	960	853	16	29	1 156	180	9 248
HYD.NUT880	Tr880×7	1 050	98	988	883	16	29	1 148	185	9 184
HYD.NUT900	Tr900×7	1 070	100	1 012	903	16	29	1 251	194	10 008

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT610): HYD.NUT610.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts



FAG hydraulic nuts

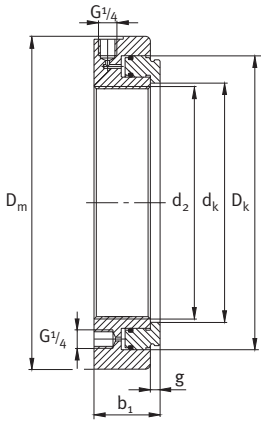
Hydraulic nut	Thread	Dimensions							Mass ≈	Drive-up force
	d_2	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		at 800 bar
Ordering designation	mm							cm^2	kg	kN
HYD.NUT930	Tr930×8	1 100	100	1 042	933	16	30	1 290	200	10 320
HYD.NUT950	Tr950×8	1 120	100	1 065	953	16	30	1 365	210	10 920
HYD.NUT1000	Tr1000×8	1 170	100	1 123	1 003	16	30	1 490	228	11 920
HYD.NUT1060	Tr1060×8	1 255	115	1 185	1 063	18	32	1 610	300	12 880
HYD.NUT1080	Tr1080×8	1 280	118	1 207	1 083	18	33	1 680	322	13 440
HYD.NUT1120	Tr1120×8	1 340	125	1 260	1 123	19	36	1 900	392	15 200
HYD.NUT1180	Tr1180×8	1 430	135	1 315	1 183	22	39	2 100	503	16 800

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT1080): HYD.NUT1080.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

Inch thread

Thread from HYD.NUT90INCH to HYD.NUT320INCH:
American National Form Threads Class 3
Thread from HYD.NUT340INCH to HYD.NUT530INCH:
Acme General Purpose Threads Class 3G



FAG hydraulic nuts, inch thread

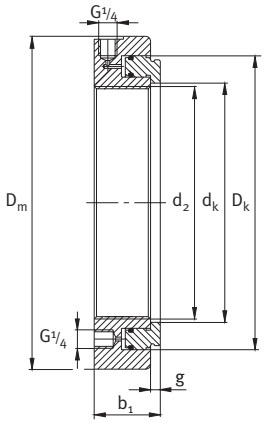
Hydraulic nut	Thread					Dimensions							Mass ≈	Drive-up force at 800 bar
	d_2		Flank diameter		Number of turns	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		
Ordering designation	mm	inch	mm	inch	per inch	mm						cm^2	kg	kN
HYD.NUT90INCH	89,586	3,527	88,212	3,4729	12	160	40	130	91	3	5	50	4,2	395
HYD.NUT95INCH	94,742	3,730	93,368	3,6759	12	165	40	136	96	3	5	52	4,3	416
HYD.NUT100INCH	99,517	3,918	98,143	3,8639	12	170	42	142	101	3	5	54	4,7	435
HYD.NUT105INCH	104,699	4,122	103,325	4,0679	12	175	42	147	106	5	5	57	4,7	455
HYD.NUT110INCH	109,855	4,325	108,481	4,2709	12	180	43	152	111	6	5	59	5	470
HYD.NUT120INCH	119,786	4,716	118,412	4,6619	12	190	43	162	121	6	5	63	5,4	504
HYD.NUT130INCH	129,692	5,106	128,318	5,0519	12	200	44	171	131	7	5	65	5,8	520
HYD.NUT140INCH	139,624	5,497	138,25	5,4429	12	210	45	182	141	7	5	69	6,3	552
HYD.NUT150INCH	149,555	5,888	148,181	5,8339	12	220	46	191	151	7	5	75,3	6,8	602
HYD.NUT160INCH	159,614	6,284	157,551	6,2028	8	235	47	206	161	7	6	87,2	8	698
HYD.NUT170INCH	169,139	6,659	167,067	6,5778	8	245	48	216	171	7	6	94,7	8,6	758
HYD.NUT180INCH	179,476	7,066	177,414	6,9848	8	255	48	227	181	7	6	103	8,1	824
HYD.NUT190INCH	189,789	7,472	187,726	7,3908	8	270	50	240	191	8	8	116	10,5	928
HYD.NUT200INCH	199,314	7,847	197,251	7,7658	8	280	50	251	201	8	8	125	11,5	1 000
HYD.NUT220INCH	219,151	8,628	217,089	8,5468	8	305	53	273	222	9	9	144,2	13,5	1 154
HYD.NUT240INCH	239,827	9,442	237,076	9,3337	6	330	55	296	242	9	10	165,3	16,1	1 323
HYD.NUT260INCH	258,877	10,192	256,126	10,0837	6	355	57	319	262	10	11	188	19	1 504
HYD.NUT280INCH	279,502	11,004	276,751	10,8975	6	380	59	342	282	10	12	211,7	22,3	1 694

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT160INCH): HYD.NUT160.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

Inch thread

Thread from HYD.NUT90INCH to HYD.NUT320INCH:
American National Form Threads Class 3
Thread from HYD.NUT340INCH to HYD.NUT530INCH:
Acme General Purpose Threads Class 3G



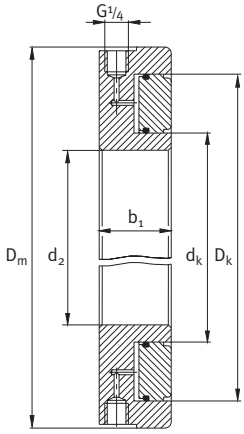
FAG hydraulic nuts, inch thread

Hydraulic nut	Thread					Dimensions							Mass ≈	Drive-up force at 800 bar
	d_2		Flank diameter		Number of turns	D_m	b_1	D_k	d_k	g	Stroke	Piston surface		
Ordering designation	mm	inch	mm	inch	per inch	mm						cm^2	kg	kN
HYD.NUT300INCH	299,339	11,785	296,588	11,6767	6	405	61	365	302	10	13	237	25,8	1 896
HYD.NUT320INCH	319,075	12,562	316,324	12,4537	6	430	63	389	322	10	14	264	29,9	2 112
HYD.NUT340INCH	338,811	13,339	335,763	13,2190	5	450	65	408	342	11	14	284	32,5	2 272
HYD.NUT360INCH	359,918	14,170	356,87	14,0500	5	475	67	431	362	11	15	313	37	2 504
HYD.NUT380INCH	379,908	14,957	376,86	14,8370	5	500	69	454	382	11	16	337	41,5	2 696
HYD.NUT400INCH	399,923	15,745	396,875	15,6250	5	525	71	477	402	11	17	368	47	2 944
HYD.NUT420INCH	419,913	16,532	416,865	16,4120	5	545	72	495	422	11	17	390	50	3 120
HYD.NUT440INCH	439,903	17,319	436,855	17,1990	5	565	74	519	442	12	17	425	54	3 400
HYD.NUT460INCH	459,918	18,107	456,87	17,9870	5	590	76	540	462	12	18	450	59,5	3 600
HYD.NUT480INCH	479,908	18,894	476,86	18,7740	5	612	76	560	482	12	18	460	63	3 680
HYD.NUT500INCH	499,923	19,682	496,875	19,5620	5	635	80	585	502	13	20	523	70	4 185
HYD.NUT530INCH	530,022	20,867	526,339	20,7220	4	670	83	617	542	13	22	562	80	4 496

Hydraulic nuts can be secured in a manner similar to conventional nuts, see page 16.
FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT360INCH): HYD.NUT360.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

Reinforced design



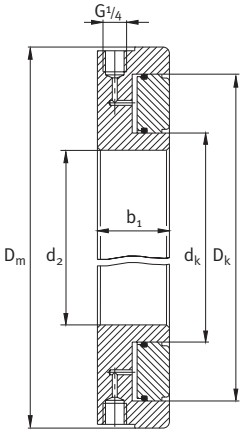
FAG hydraulic nuts, reinforced design

Hydraulic nut	Dimensions							Mass ≈	Drive-up force
	d_2^{H7}	D_m	b_1	D_k	d_k	Stroke	Piston surface		at 800 bar
Ordering designation	mm						cm^2	kg	kN
HYD.NUT100HEAVY	100	220	40	180	125	10	132	9,5	1 060
HYD.NUT125HEAVY	125	245	40	200	150	10	137	9,8	1 100
HYD.NUT150HEAVY	150	270	40	226	180	10	147	12,5	1 170
HYD.NUT175HEAVY	175	305	45	250	205	11	161	17	1 280
HYD.NUT200HEAVY	200	330	50	280	230	12	200	21	1 600
HYD.NUT225HEAVY	225	365	50	313	255	12	259	23	2 070
HYD.NUT250HEAVY	250	390	50	345	280	12	319	28	2 550
HYD.NUT275HEAVY	275	430	50	380	305	12	403	34	3 220
HYD.NUT300HEAVY	300	470	55	410	335	13	439	44	3 510
HYD.NUT325HEAVY	325	500	55	440	360	13	503	49	4 020
HYD.NUT350HEAVY	350	540	55	475	385	13	608	57	4 860
HYD.NUT375HEAVY	375	575	55	510	410	13	723	65	5 780
HYD.NUT400HEAVY	400	620	60	545	440	15	812	83	6 500
HYD.NUT425HEAVY	425	650	60	575	465	15	899	90	7 190
HYD.NUT450HEAVY	450	690	65	610	490	17	1 037	100	8 290
HYD.NUT475HEAVY	475	725	65	642	515	17	1 154	120	9 230
HYD.NUT500HEAVY	500	760	70	675	540	20	1 288	142	10 300
HYD.NUT525HEAVY	525	800	70	710	565	20	1 452	158	11 620
HYD.NUT550HEAVY	550	835	75	742	590	22	1 590	183	12 720
HYD.NUT575HEAVY	575	870	75	775	615	22	1 747	197	13 980

FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT100HEAVY): HYD.NUT100HEAVY.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

FAG hydraulic nuts

Reinforced design



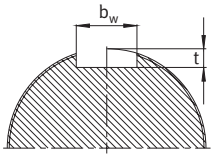
FAG hydraulic nuts, reinforced design

Hydraulic nut	Dimensions							Mass ≈	Drive-up force
	d_2^{H7}	D_m	b_1	D_k	d_k	Stroke	Piston surface		at 800 bar
Ordering designation	mm						cm^2	kg	kN
HYD.NUT600HEAVY	600	910	80	808	645	25	1 860	230	14 880
HYD.NUT625HEAVY	625	945	80	840	670	25	2 016	248	16 130
HYD.NUT650HEAVY	650	980	85	875	695	28	2 220	282	17 760
HYD.NUT675HEAVY	675	1 020	85	906	720	28	2 375	307	19 000
HYD.NUT700HEAVY	700	1 060	90	940	750	30	2 522	351	20 180
HYD.NUT750HEAVY	750	1 130	95	1 007	800	32	2 938	431	23 500
HYD.NUT800HEAVY	800	1 205	100	1 070	855	35	3 250	500	26 000
HYD.NUT850HEAVY	850	1 275	105	1 135	905	38	3 685	583	29 480
HYD.NUT900HEAVY	900	1 350	110	1 200	960	40	4 072	688	32 580

FAG also supplies replacement seals for hydraulic nuts (suffix .SEAL).
Ordering example (for HYD.NUT600HEAVY): HYD.NUT600HEAVY.SEAL. Each hydraulic nut is supplied with 1 set of seals in the original delivery.

Securing against rotation

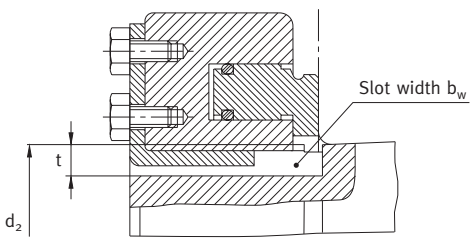
In some applications, hydraulic nuts remain on the shaft or the adapter sleeve. For these cases, FAG supplies three design of anti-rotation locking devices, Figure 6.
Locking devices of designs SA and SC comprise clamps and hexagon head cap screws. A slot is required in the shaft to the dimensions in Figure 7. Adapter sleeves have this slot as standard.
The threaded holes for the hexagon head cap screws are drilled in the press ring before mounting.
The anti-rotation locking device SB is secured by means of a set screw and a copper pin.
Ordering example:
Hydraulic nut with trapezoidal thread 400×5, U-shaped locking device with hexagon head cap screws:
HYD.NUT400SC



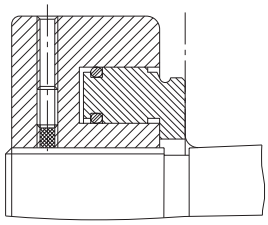
Shaft

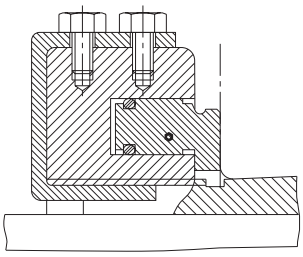
7: Dimensions of shaft slot for anti-rotation locking devices SA and SC

Hydraulic nut Press ring with thread from	to	Shaft slot b_w mm	t
HYD.NUT100	HYD.NUT150	14	7
HYD.NUT155	HYD.NUT200	16	8
HYD.NUT205	HYD.NUT260	22	9
HYD.NUT270	HYD.NUT300	26	9
HYD.NUT310	HYD.NUT400	30	10
HYD.NUT420	HYD.NUT460	34	10
HYD.NUT480	HYD.NUT500	38	12
HYD.NUT530	HYD.NUT600	42	14
HYD.NUT630	HYD.NUT670	48	14
HYD.NUT710	HYD.NUT900	55	15
HYD.NUT930	HYD.NUT1120	65	16



Design SA
L-shaped locking device
with hexagon head cap screws


Design SB
Locking by set screw and
copper pin


Design SC
U-shaped locking device
with hexagon head cap
screws

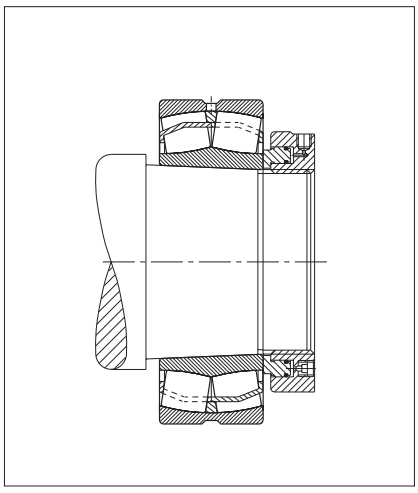
6: Anti-rotation locking devices for FAG hydraulic nuts

Mounting of rolling bearings using hydraulic nuts

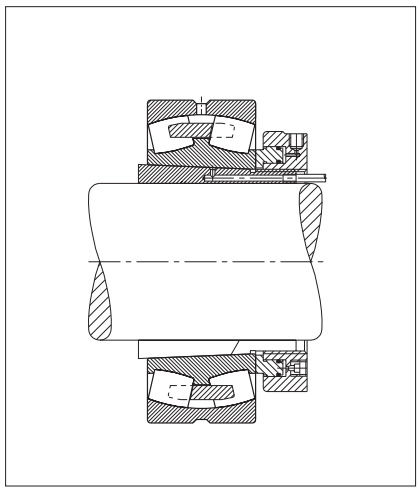
The hydraulic nut is used to mount rolling bearings with a tapered bore. Mounting is either carried out “dry” or by means of the hydraulic method. In the hydraulic method, oil is pressed between the mating surfaces to form an oil film so that the hydraulic nut only needs to apply a slight displacement.

Figure 8 shows a spherical roller bearing driven directly up a tapered shaft seat. The bearing is first located on the tapered seat and the hydraulic nut is then screwed onto the threaded portion of the shaft until the bearing is firmly seated.

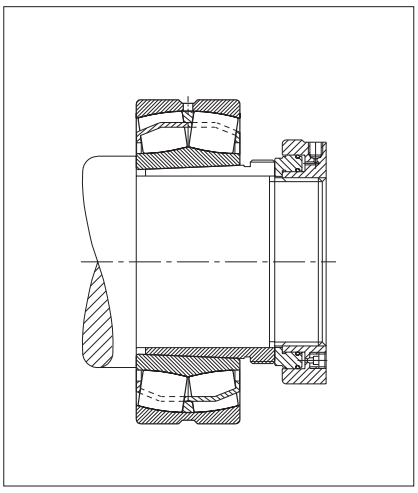
The bearing is pressed onto its seat by activating the hydraulic nut. The amount of axial displacement depends on the reduction required in the radial internal clearance of the bearing. During the drive-up process, the radial internal clearance must be continually measured using feeler gauges. If the hydraulic method is used, the oil pressure at the seat must be relieved for measurement of radial internal clearance. If the reduction in radial internal clearance cannot be measured, for example if the housing shape does not permit this, the axial drive-up can be measured instead. The values for the required reduction in radial internal clearance and the corresponding drive-up are given on pages 19 and 20 for cylindrical roller bearings and spherical roller bearings.
If the hydraulic method is used, it takes about 10 to 30 minutes after drive-up, depending on bearing size, for the oil to escape completely from the joint. It is only at this point that the hydraulic nut is removed and the shaft or sleeve nut is screwed into place and secured.
Rolling bearings with adapter or extraction sleeves can be mounted in the same way (Figures 9 and 10).



8: Drive-up of a spherical roller bearing onto a tapered shaft journal



9: Fitting of a spherical roller bearing with an adapter sleeve using the hydraulic method



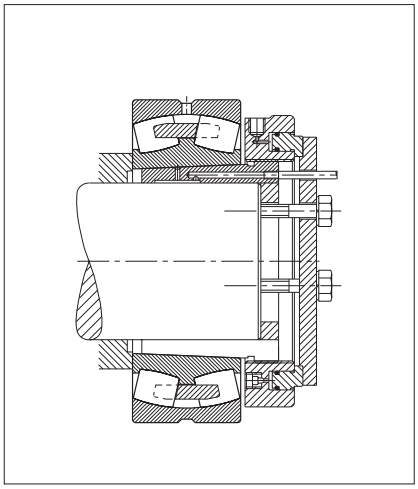
10: Fitting of a spherical roller bearing with an extraction sleeve without using the hydraulic method

Mounting of rolling bearings using hydraulic nuts

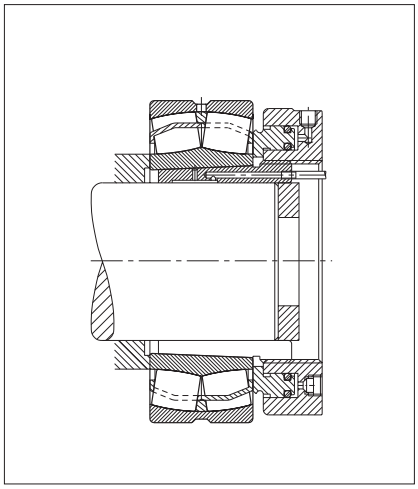
Hydraulic nuts are also suitable for mounting hydraulic extraction sleeves, see Figure 11. The piston of the hydraulic nut is abutted against a plate connected to the shaft.
Such precautions are not necessary in mounting a hydraulic adapter sleeve, Figure 9.

Dismantling of an extraction sleeve is shown in Figure 12. If the shaft is not long enough to prevent constriction of the threaded section, the extraction sleeve must be supported by a thick-walled auxiliary ring.

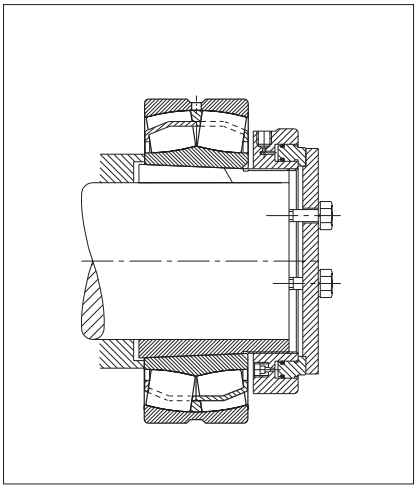
An adapter sleeve can be dismantled if the bearing inner ring is located axially and the piston of the hydraulic nut is abutted, for example against a mounting plate, Figure 13.



11: Fitting of a spherical roller bearing with an extraction sleeve using the hydraulic method



12: Dismantling of an extraction sleeve using the hydraulic method



13: Dismantling of an adapter sleeve

Reduction in radial internal clearance of FAG spherical roller bearings with tapered bore

Reduction in radial internal clearance of FAG spherical roller bearings with tapered bore

Nominal bore diameter		Radial internal clearance before fitting						Reduction in radial internal clearance[1]		Drive-up on taper 1:12[1]				Drive-up on taper 1:30[1]				Control value for radial internal clearance after fitting		
		Internal clearance group																		
d		CN (normal)		C3		C4				Shaft		Sleeve		Shaft		Sleeve		CN	C3	C4
over	incl.	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	min	min
mm		mm								mm				mm				mm		
24	30	0,03	0,04	0,04	0,055	0,055	0,075	0,015	0,02	0,3	0,35	0,3	0,4	–	–	–	–	0,015	0,02	0,035
30	40	0,035	0,05	0,05	0,065	0,065	0,085	0,02	0,025	0,35	0,4	0,35	0,45	–	–	–	–	0,015	0,025	0,04
40	50	0,045	0,06	0,06	0,08	0,08	0,1	0,025	0,03	0,4	0,45	0,45	0,5	–	–	–	–	0,02	0,03	0,05
50	65	0,055	0,075	0,075	0,095	0,095	0,12	0,03	0,04	0,45	0,6	0,5	0,7	–	–	–	–	0,025	0,035	0,055
65	80	0,07	0,095	0,095	0,12	0,12	0,15	0,04	0,05	0,6	0,75	0,7	0,85	–	–	–	–	0,025	0,04	0,07
80	100	0,08	0,11	0,11	0,14	0,14	0,18	0,045	0,06	0,7	0,9	0,75	1	1,7	2,2	1,8	2,4	0,035	0,05	0,08
100	120	0,1	0,135	0,135	0,17	0,17	0,22	0,05	0,07	0,7	1,1	0,8	1,2	1,9	2,7	2	2,8	0,05	0,065	0,1
120	140	0,12	0,16	0,16	0,2	0,2	0,26	0,065	0,09	1,1	1,4	1,2	1,5	2,7	3,5	2,8	3,6	0,055	0,08	0,11
140	160	0,13	0,18	0,18	0,23	0,23	0,3	0,075	0,1	1,2	1,6	1,3	1,7	3	4	3,1	4,2	0,055	0,09	0,13
160	180	0,14	0,2	0,2	0,26	0,26	0,34	0,08	0,11	1,3	1,7	1,4	1,9	3,2	4,2	3,3	4,6	0,06	0,1	0,15
180	200	0,16	0,22	0,22	0,29	0,29	0,37	0,09	0,13	1,4	2	1,5	2,2	3,5	4,5	3,6	5	0,07	0,1	0,16
200	225	0,18	0,25	0,25	0,32	0,32	0,41	0,1	0,14	1,6	2,2	1,7	2,4	4	5,5	4,2	5,7	0,08	0,12	0,18
225	250	0,2	0,27	0,27	0,35	0,35	0,45	0,11	0,15	1,7	2,4	1,8	2,6	4,2	6	4,6	6,2	0,09	0,13	0,2
250	280	0,22	0,3	0,3	0,39	0,39	0,49	0,12	0,17	1,9	2,6	2	2,9	4,7	6,7	4,8	6,9	0,1	0,14	0,22
280	315	0,24	0,33	0,33	0,43	0,43	0,54	0,13	0,19	2	3	2,2	3,2	5	7,5	5,2	7,7	0,11	0,15	0,24
315	355	0,27	0,36	0,36	0,47	0,47	0,59	0,15	0,21	2,4	3,4	2,6	3,6	6	8,2	6,2	8,4	0,12	0,17	0,26
355	400	0,3	0,4	0,4	0,52	0,52	0,65	0,17	0,23	2,6	3,6	2,9	3,9	6,5	9	5,8	9,2	0,13	0,19	0,29
400	450	0,33	0,44	0,44	0,57	0,57	0,72	0,2	0,26	3,1	4,1	3,4	4,4	7,7	10	8	10,4	0,13	0,2	0,31
450	500	0,37	0,49	0,49	0,63	0,63	0,79	0,21	0,28	3,3	4,4	3,6	4,8	8,2	11	8,4	11,2	0,16	0,23	0,35
500	560	0,41	0,54	0,54	0,68	0,68	0,87	0,24	0,32	3,7	5	4,1	5,4	9,2	12,5	9,6	12,8	0,17	0,25	0,36
560	630	0,46	0,6	0,6	0,76	0,76	0,98	0,26	0,35	4	5,4	4,4	5,9	10	13,5	10,4	14	0,2	0,29	0,41
630	710	0,51	0,67	0,67	0,85	0,85	1,09	0,3	0,4	4,6	6,2	5,1	6,8	11,5	15,5	12	16	0,21	0,31	0,45
710	800	0,57	0,75	0,75	0,96	0,96	1,22	0,34	0,45	5,3	7	5,8	7,6	13,3	17,5	13,6	18	0,23	0,35	0,51
800	900	0,64	0,84	0,84	1,07	1,07	1,37	0,37	0,5	5,7	7,8	6,3	8,5	14,3	19,5	14,8	20	0,27	0,39	0,57
900	1000	0,71	0,93	0,93	1,19	1,19	1,52	0,41	0,55	6,3	8,5	7	9,4	15,8	21	16,4	22	0,3	0,43	0,64
1000	1120	0,78	1,02	1,02	1,3	1,3	1,65	0,45	0,6	6,8	9	7,6	10,2	17	23	18	24	0,32	0,48	0,7
1120	1250	0,86	1,12	1,12	1,42	1,42	1,8	0,49	0,65	7,4	9,8	8,3	11	18,5	25	19,6	26	0,34	0,54	0,77
1250	1400	0,94	1,22	1,22	1,55	1,55	1,96	0,55	0,72	8,3	10,8	9,3	12,1	21	27	22,2	28,3	0,36	0,59	0,84
1400	1600	1,06	1,38	1,38	1,75	1,75	2,2	0,62	0,81	9,3	12,2	10,6	13,8	23,6	30,8	24,8	32,4	0,44	0,66	0,94
1600	1800	1,18	1,54	1,54	1,95	1,95	2,5	0,69	0,93	10,4	14	11,7	15,8	26,2	35,3	27,6	37,2	0,48	0,73	1,02
1800	2000	1,31	1,71	1,71	2,15	2,15	2,75	0,77	1,04	11,6	15,6	13,1	17,7	29,3	39,5	30,8	41,6	0,54	0,81	1,11
2000	2250	1,45	1,9	1,9	2,4	2,4	3,05	0,85	1,15	12,7	17,2	14,5	19,5	32,4	43,9	34	46	0,6	0,95	1,55
2250	2500	1,6	2,1	2,1	2,65	2,65	3,35	0,95	1,28	14,3	19,2	16,2	21,8	36,2	48,8	38	51,2	0,65	1,15	1,7

[1] Valid only for solid steel shafts and hollow shafts with a bore no larger than half the shaft diameter.

Note: Bearings with a radial internal clearance before fitting in the upper half of the tolerance range are fitted using the larger value for reduction in radial internal clearance or axial drive-up, bearings in the lower half of the tolerance range are fitted with the smaller value for reduction in radial internal clearance or axial drive-up.

Reduction in radial internal clearance of FAG cylindrical roller bearings with tapered bore

Reduction in radial internal clearance of FAG cylindrical roller bearings with tapered bore

Nominal bore diameter		Radial internal clearance before fitting						Reduction in radial internal clearance[1]		Drive-up on taper 1:12[1]				Control value for radial internal clearance after fitting		
		Internal clearance group														
d		CN (normal)		C3		C4				Shaft		Sleeve		CN	C3	C4
over	incl.	min	max	min	max	min	max	min	max	min	max	min	max	min	min	min
mm		mm						mm		mm				mm		
24	30	0,035	0,06	0,045	0,07	0,055	0,08	0,015	0,02	0,3	0,35	0,3	0,4	0,02	0,025	0,035
30	40	0,04	0,065	0,055	0,08	0,07	0,095	0,02	0,025	0,35	0,4	0,35	0,45	0,02	0,025	0,04
40	50	0,045	0,075	0,06	0,09	0,075	0,105	0,025	0,03	0,4	0,45	0,45	0,5	0,02	0,03	0,045
50	65	0,05	0,08	0,07	0,1	0,09	0,12	0,03	0,035	0,45	0,55	0,5	0,65	0,02	0,035	0,05
65	80	0,06	0,095	0,085	0,12	0,11	0,145	0,035	0,04	0,55	0,6	0,65	0,7	0,025	0,04	0,07
80	100	0,07	0,105	0,095	0,13	0,12	0,155	0,04	0,045	0,6	0,7	0,65	0,8	0,03	0,05	0,075
100	120	0,09	0,13	0,115	0,155	0,14	0,18	0,045	0,055	0,7	0,85	0,8	0,95	0,045	0,065	0,085
120	140	0,1	0,145	0,13	0,175	0,16	0,205	0,055	0,065	0,85	1	0,95	1,1	0,045	0,07	0,095
140	160	0,11	0,16	0,145	0,195	0,18	0,23	0,06	0,075	0,9	1,2	1	1,3	0,05	0,075	0,105
160	180	0,125	0,175	0,16	0,21	0,195	0,245	0,065	0,085	1	1,3	1,1	1,5	0,06	0,08	0,11
180	200	0,14	0,195	0,18	0,235	0,22	0,275	0,075	0,095	1,2	1,5	1,3	1,7	0,065	0,09	0,125
200	225	0,155	0,215	0,2	0,26	0,245	0,305	0,085	0,105	1,3	1,6	1,4	1,8	0,07	0,1	0,14
225	250	0,17	0,235	0,22	0,285	0,27	0,335	0,095	0,115	1,5	1,8	1,6	2	0,075	0,105	0,155
250	280	0,185	0,255	0,24	0,31	0,295	0,365	0,105	0,125	1,6	2	1,7	2,3	0,08	0,125	0,17
280	315	0,205	0,28	0,265	0,34	0,325	0,4	0,115	0,14	1,8	2,2	1,9	2,4	0,09	0,13	0,185
315	355	0,225	0,305	0,29	0,37	0,355	0,435	0,13	0,16	2	2,5	2,2	2,7	0,095	0,14	0,195
355	400	0,255	0,345	0,33	0,42	0,405	0,495	0,14	0,17	2,2	2,6	2,5	2,9	0,115	0,165	0,235
400	450	0,285	0,385	0,37	0,47	0,455	0,555	0,15	0,185	2,3	2,8	2,6	3,1	0,135	0,19	0,27
450	500	0,315	0,425	0,41	0,52	0,505	0,615	0,16	0,195	2,5	3	2,8	3,4	0,155	0,215	0,31
500	560	0,35	0,47	0,455	0,575	0,56	0,68	0,17	0,215	2,7	3,4	3,1	3,8	0,18	0,24	0,345
560	630	0,38	0,5	0,5	0,62	0,62	0,74	0,185	0,24	2,9	3,7	3,5	4,2	0,195	0,26	0,38
630	710	0,435	0,575	0,565	0,705	0,695	0,835	0,2	0,26	3,1	4,1	3,6	4,7	0,235	0,305	0,435
710	800	0,485	0,645	0,63	0,79	0,775	0,935	0,22	0,28	3,4	4,4	3,9	5,3	0,26	0,35	0,495
800	900	0,54	0,71	0,7	0,87	0,86	1,03	0,24	0,31	3,7	4,8	4,3	5,5	0,3	0,39	0,55
900	1 000	0,6	0,79	0,78	0,97	0,96	1,15	0,26	0,34	4,1	5,3	4,8	6,2	0,34	0,44	0,62
1 000	1 120	0,665	0,875	0,865	1,075	1,065	1,275	0,28	0,37	4,4	5,8	5,2	7	0,385	0,5	0,7
1 120	1 250	0,73	0,97	0,96	1,2	1,2	1,44	0,31	0,41	4,8	6,4	5,7	7,6	0,42	0,55	0,79
1 250	1 400	0,81	1,07	1,07	1,33	1,33	1,59	0,34	0,45	5,3	7	6,3	8,3	0,47	0,62	0,85

[1] Valid only for solid steel shafts and hollow shafts with a bore no larger than half the shaft diameter.

Note: Bearings with a radial internal clearance before fitting in the upper half of the tolerance range are fitted using the larger value for reduction in radial internal clearance or axial drive-up, bearings in the lower half of the tolerance range are fitted with the smaller value for reduction in radial internal clearance or axial drive-up.

Drive-up gauge for hydraulic nuts

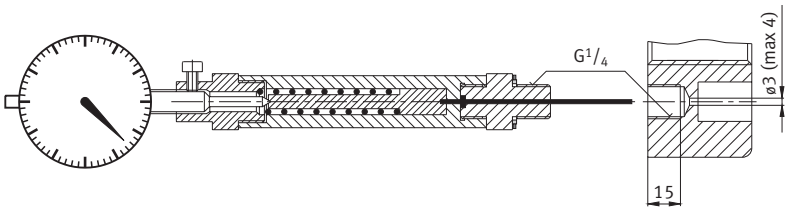
If the radial internal clearance cannot be measured according to page 17 with a feeler gauge due to poor accessibility, the axial drive-up of the bearing on the tapered seat can be measured. This can be achieved by means of a gauge mounted on the end face of the hydraulic nut, Figure 14.

If an axial threaded connector hole G¼ of the hydraulic nut is taken up by the pump, the second axial hole can be used for the drive-up gauge.

The bearing is first placed in its starting position. The oil pressure required is dependent on the bearing size and the number of displacement surfaces and is given in the user manual. A hand pump set with a digital manometer should be used, see TPI WL 80-50. The dial gauge is set to zero. The bearing is driven up by pumping until the specified drive-up distance is achieved.

The user can determine which of the metering needles supplied should be used from the comprehensive user manual included with each gauge.

a



b

c

14a to c: Drive-up gauge HYD.NUT.DISPLACE.GAUGE

Ordering designation:
HYD.NUT.DISPLACE.GAUGE
1 Drive-up gauge with dial gauge,
2 metering needles, 62 mm long,
2 metering needles, 70 mm long,
2 metering needles, 100 mm long,
2 Usit rings,
2 O rings,
1 plastic case with lining

Mounting Manager as an aid in mounting of bearings

FAG Mounting Manager

The FAG computer program **MOUNTING MANAGER** is a user-friendly aid for ensuring the correct mounting of bearings and offers the following options:

- it shows various mechanical and hydraulic mounting methods
- it calculates the data required for mounting in relation to reduction in radial internal clearance, drive-up and start pressure
- it gives useful mounting advice
- and it generates a list of the accessories and tools required

Further information on mounting and dismantling of bearings is offered in the integrated library containing appropriate publications, Technical Information documents etc. and the Rolling Bearing Learning System (WLS).

Calculation possibilities for mounting methods:

Bearings with a tapered bore are mounted either directly on the tapered shaft or journal or by means of an adapter sleeve or extraction sleeve on the cylindrical shaft. The internal clearance is set either by conventional means using feeler gauges or by means of the axial drive-up.

a) Mounting of bearings with tapered bore by measurement of the axial drive-up

The bearing is placed in its starting position on the tapered bearing seat using a hydraulic nut. The required starting pressure defined for each individual bearing is set in the hydraulic nut by means of the digital manometer. The dial gauge mounted on the hydraulic nut is used to measure the axial drive-up until the final position is reached on the tapered seat.

This mounting method:

- gives considerably shorter and simpler mounting
- offers very high security and accuracy
- allows the correct mounting of sealed bearings

b) Mounting of bearings with tapered bore by measurement of the reduction in radial internal clearance

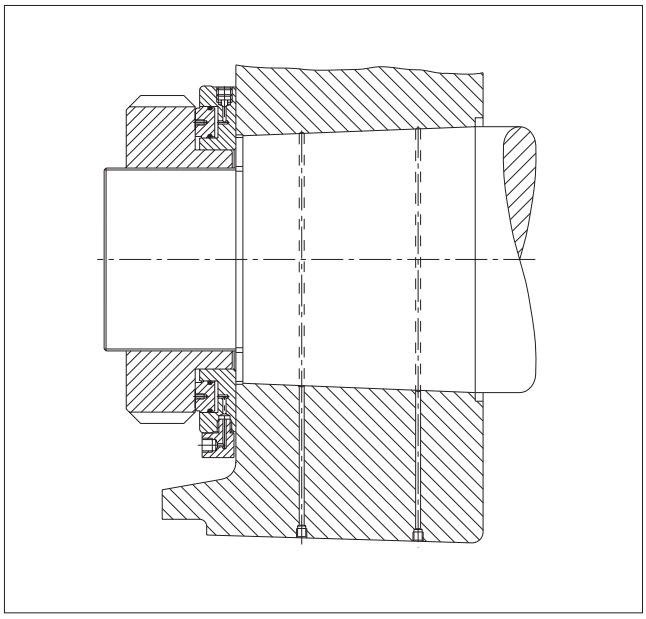
When the bearing is pushed onto the tapered seat, the inner ring is expanded and the radial internal clearance is thereby reduced. This reduction in radial internal clearance is valid as a measure of the firm seating of the bearing. It is measured by means of a feeler gauge.

The FAG Mounting Manager is available free of charge on CD-ROM.

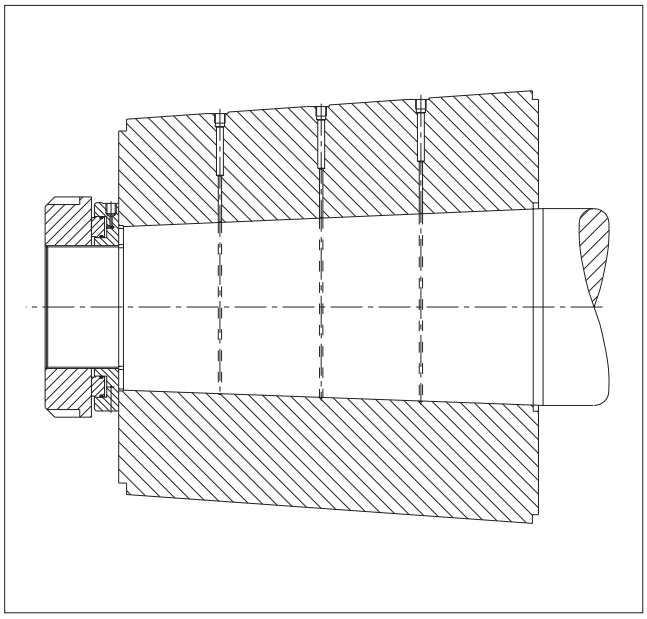
Ordering designation:
CD-MM 1.0

General mounting aids for the hydraulic methods

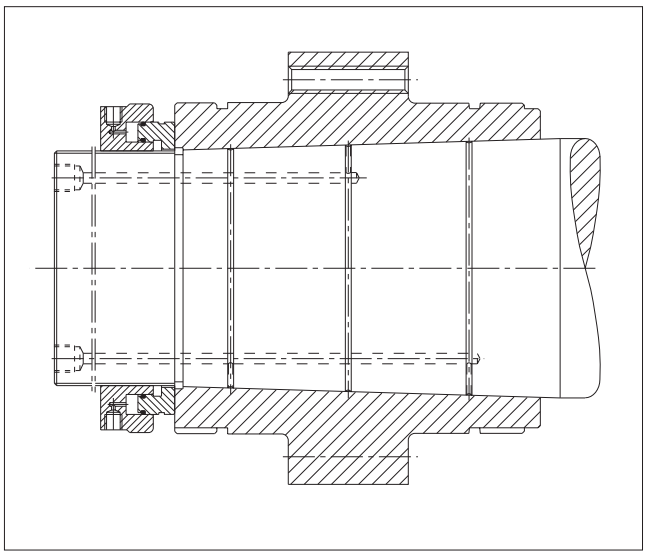
The use of FAG hydraulic nuts is not restricted to the mounting of rolling bearings. Other press fits (e.g. in the mounting of gears, drive wheels and couplings) can also be realised by means of the hydraulic method using hydraulic nuts. Considerable pressing forces are often required in general machine building and especially in shipbuilding. Such forces can be applied cost-effectively using hydraulic nuts. Figures 15 to 18 show examples of mounting.



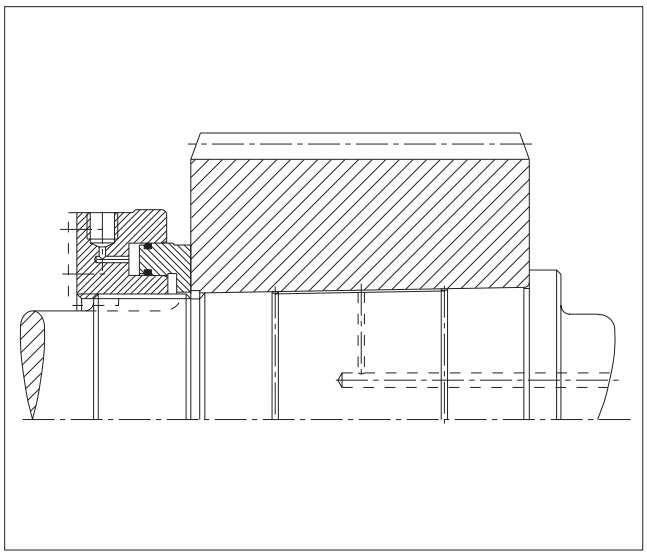
15: Mounting of a press fit between a rudder and rudder spindle



16: A hydraulic nut is used to realise the press fit between a propeller hub and ship driveshaft



17: Mounting of a coupling



18: Gear mounting using a hydraulic nut

Notes

FAG Kugelfischer AG & Co. oHG

Postfach 1260
97419 Schweinfurt (Germany)

Georg-Schäfer-Strasse 30
97421 Schweinfurt (Germany)

Service Hotline
Phone +49 2407 9149-99
Fax +49 2407 9149-59
www.fis-services.com

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