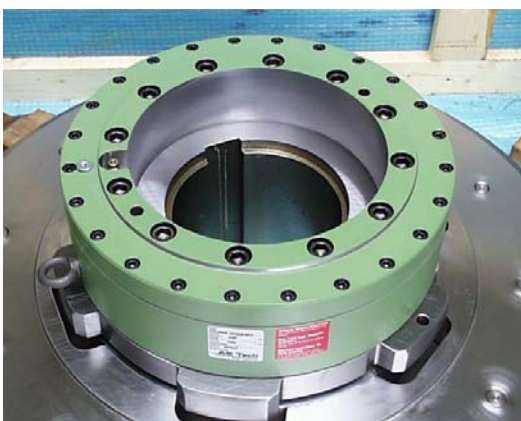


## Hydraulic nut





## Performance variations - Example





Hydraulic nut for a saw



Hydraulic clamping system

# Areas of application, conditions and advantages with **AS Tech** bolt tensioning devices and hydraulic nuts

## Areas of application

The field for bolt tensioning devices is almost unlimited. Bolts of 8 mm to 1000 mm are pretensioned in the most different threaded sizes in multiple industry areas with bolt tensioning devices. For example: Apparatures-/ Tanks | Reactors | Turbines- and Generators Engineering | Pump Engineering | Motors | Chemical Industry | Compressors | Large Gear | On Shore/ Off Shore | Heat Exchangers | Materials-Handling Technology | Steel Industry | Wind Power Plants | Mining | asf.

## Conditions

A number of conditions must be met when using bolt tensioning devices in order to work with a high degree of precision and safety.

The contact surfaces of the bolt tensioning device and the components to be tensioned must be clean, flat and at right angles to the axis of the bolt. The thread must likewise be clean and free of lubricant. The surface quality and the extent that the locating and contacting surfaces are parallel for all components are decisive factors for the quality and setting of the connection, in addition to the number of parting joints, the shape of the bodies that are deformed and the clamping length relationship.

Determination of the pre-tensioning force is done after a careful and detailed calculation (e.g. VDI2230 ). In the case of larger bolted connections we recommend a bolt thread as per DIN 2510. In general, the axial backlash of the nut should also be checked.

In order to minimise losses of the setting force, any washers that are needed should be strong enough to allow the bolt tensioning force. Tests have shown that the relationship of the diameter of the thread to the clamping length must be at least 1:5. The amount of thread protruding above the nut must be at least 0.6 -1 times the diameter of the thread, depending on the pretensioning force.

## Advantages

Bolt tensioning devices and hydraulic nuts allow controlled tightening up to the yield point.

The force is produced and applied *without any torsion*, acting on the axial direction of the bolt or screw. Since this is also done *without friction* and the nut can be turned without any friction, it is not necessary to calculate a coefficient of friction.

Since materials can be used optimally, it is possible to use *bolts with a smaller diameter* or else to apply a greater pretensioning force to achieve a *higher degree of safety*.

The use of several such devices in sequence or in parallel produces a considerable *saving of time*, together with the advantage it is possible to *simultaneously apply exactly equal pretensioning forces* when applying the pressure.

The force applied within the calculation is taken into account insofar as the pretensioning force is applied *independently of the tensioning path*, thus eliminating and subordinating installation gaps while the force is being applied.

The use of bolt tensioning devices or hydraulic nuts makes it possible to determine the residual pretensioning force without undoing the connection.

## The purely axial process for the production of the pretensioning force or clamping force

Bolts are the most commonly used and versatile forms of machine and connecting elements.

In the case of pretensioned or preloaded connections, the bolts are already loaded or pretensioned before an actual operating load is applied, this being done by tightening up the nut.

A number of different processes are used to apply this pretensioning or preloading force, and these have to be taken into consideration at the design stage of the bolted connection.

The purely axial process is increasingly gaining in importance to achieve optimum utilisation of the material and thus avoiding friction effects and twisting stresses.

When this operating principle is applied to a tool, it is called a bolt tensioning device. It is referred to as a hydraulic nut when it is used as a machine element.

The purely axial process makes it possible to apply the design clamping or tensioning force very precisely at this connection. There are also economic aspects to be considered even at the basic engineering stage, such as optimisation of the installation time or minimising the dimensions of the machine.

The pretensioning of bolted connections without any friction has the special advantage that it avoids the risk of "jamming" with fine threads and austenitic materials in particular.

Since the pretensioning force is only exerted axially and not by turning the nut, the bolt is no longer stressed torsionally.

### Operating principle of a bolt tensioning device

If the force calculated within the design of the connection is to be applied with a bolt tensioning device, first of all the holding nut and then the device are placed onto the end of the threaded part to be pretensioned (fig. 1). After connection to the pressure generator, the calculated pretensioning force is applied independently of the length by means of hydraulic pressure. The amount of force desired can be determined with precision by the piston area of the device and the pressure (fig.2).

The pressure can be read off directly from a measuring instrument. The holding nut is done up until it touches the contacting surface (fig. 3). The device can now be removed and applied to the next bolt or screw.

- |                   |                |                  |           |             |                  |
|-------------------|----------------|------------------|-----------|-------------|------------------|
| 1. tensioning nut | 2. piston      | 3. cylinder      | 4. bridge | 5. main nut | 6. adjusting rod |
| 7. connector      | 8. sealing set | 9. hexagonal nut |           |             |                  |

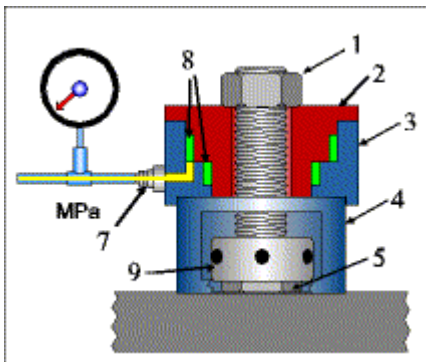


fig. 1: Basic setup

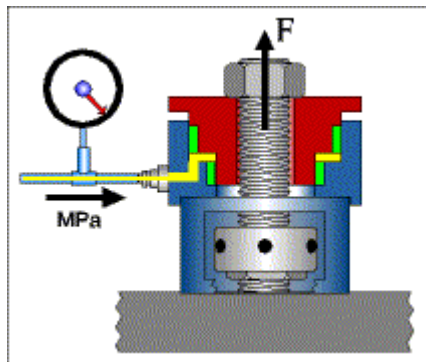


fig. 2: Pressurization

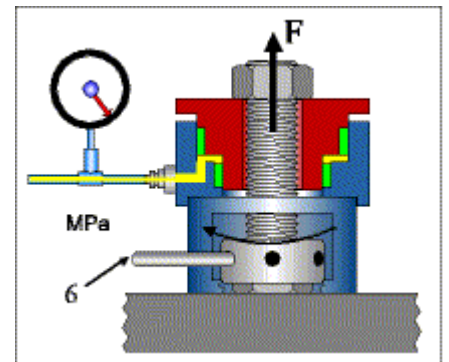


fig. 3: Finishing

## Hydraulic nuts

In addition to the advantages of the bolt tensioning device that have already been described, a hydraulic nut also provides the advantage of saving time when assembling and dismantling machine parts.

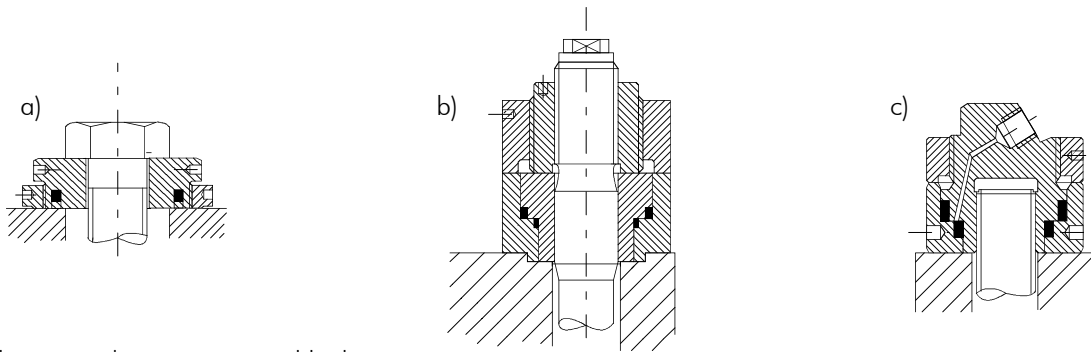
Hydraulic nuts treat your machine parts more gently, since the applied defined clamping and pretensioning forces are without friction.

These advantages mean that hydraulic nuts can be used to pull bearings, to clamp rotating components or to pretension bolts that are hard to get at.

According to the type of application intended, hydraulic nuts can have a sustained pressure applied, provided with mechanical locking or the pressure applied only temporarily.

## Performance variations

In addition to the range of configuration shown in the catalogue, it is also possible to produce hydraulic nuts in the following variations on request:

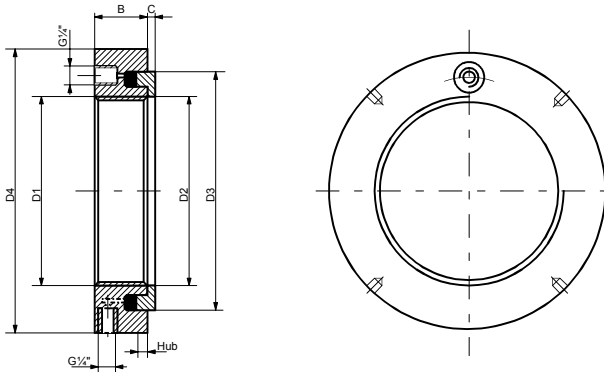


- a) Hydraulic nuts with ring piston and locking nut
- b) Hydraulic nuts with differential piston, tension- and locking nut
- c) Hydraulic nuts with differential piston and locking nut
- d) Tensioning flange (without figure)

## Equipment variations

- **Materials**
- **Pressure medium**
  - HFC
  - Oil
  - Grease
  - Water
  - Emulsions
- **Fixing**
  - All thread types and –sizes
  - Bayonet-types
- **Forces**
  - Depending on requirement and material
- **Pressure**
  - Depending on pressure generator up to **3,000** bar
- **Temperature stability**
  - -80°C up to 320°C
- **Stroke**
  - Depending on requirement
- **Stroke ratio**
  - Optical
  - Audible
  - Electrical
- **Locking of the force**
  - Locking nut
  - Shim rings
  - Hydraulic
- **Stroke limiting**
  - Mechanical
  - Hydraulic
- **Stroke return**
  - Manual
- Hydraulic
- Automatical
- **Turning of the locking nut**
  - Manual
  - Automatical
- **Connector variations**
  - Single- or series line
  - All thread types, –standard and –sizes
  - Rotary or solid
- **Surface treatment**
  - Blackened
  - Varnished
  - Nickel-plated
  - Chrome-plated
- **Certificates and acceptances**
  - Depending on requirement

## Hydraulic nut, with ring piston



### HMM10121

Specification:

- ⇒ Pressure media **Oil**
- ⇒ Max. pressure **1,000 bar**
- ⇒ Connector thread G 1/4" axial and radial

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Article-number	Thread		Ring piston		D4	B	C	stroke	Piston area
	D1	Pitch	D2 mm	D3 mm					
HMM10121001	M 50	1,5	50,5	85	114	38	4	5	29
HMM10121002	M 60	2	60,5	95	125	38	5	5	33
HMM10121003	M 65	2	65,5	101	130	38	5	5	36
HMM10121004	M 70	2	70,5	107	135	38	5	5	38
HMM10121005	M 75	2	75,5	112	140	38	5	5	40
HMM10121006	M 80	2	80,5	117	146	38	5	5	42
HMM10121007	M 85	2	85,5	122	150	38	5	5	44
HMM10121008	M 90	2	90,5	127	156	38	5	5	47
HMM10121009	M 95	2	95,5	133	162	38	5	5	49
HMM10121010	M 100	2	100,5	138	166	38	6	5	51
HMM10121011	M 105	2	105,5	143	172	38	6	5	53
HMM10121012	M 110	2	110,5	149	178	38	6	5	56
HMM10121013	M 115	2	115,5	154	182	38	6	5	58
HMM10121014	M 120	2	120,5	159	188	38	6	5	60
HMM10121015	M 125	2	125,5	164	192	38	6	5	62
HMM10121016	M 130	2	130,5	170	198	38	6	5	64
HMM10121017	M 135	2	135,5	175	204	38	6	5	66
HMM10121018	M 140	2	140,5	180	205	38	6	5	68
HMM10121019	M 145	2	145,5	186	214	39	7	5	73
HMM10121020	M 150	2	150,5	191	220	39	7	5	75
HMM10121021	M 155	3	155,5	198	226	39	7	5	81
HMM10121022	M 160	3	160,5	204	232	40	7	6	86
HMM10121023	M 165	3	165,5	209	238	40	7	6	89
HMM10121024	M 170	3	170,5	215	244	41	7	6	94
HMM10121025	M 180	3	180,5	227	256	41	7	6	103
HMM10121026	M 190	3	191,0	239	270	42	8	7	115
HMM10121027	M 200	3	201,0	251	282	43	8	8	125
HMM10121028	TR 205	4	207,0	256	288	43	8	8	128
HMM10121029	TR 210	4	212,0	262	294	44	8	9	134
HMM10121030	TR 215	4	217,0	267	300	44	8	9	137
HMM10121031	TR 220	4	222,0	273	306	44	8	9	144
HMM10121032	TR 225	4	227,0	280	312	45	8	9	152
HMM10121033	TR 230	4	232,0	285	318	45	8	9	155
HMM10121034	TR 235	4	237,0	291	326	46	8	10	162
HMM10121035	TR 240	4	242,0	296	330	46	9	10	165
HMM10121036	TR 250	4	252,0	307	342	46	9	10	176
HMM10121037	TR 260	4	262,0	319	356	47	9	11	188
HMM10121038	TR 270	4	272,0	330	368	48	9	12	198
HMM10121039	TR 280	4	282,0	341	380	49	9	12	211
HMM10121040	TR 290	4	292,0	353	390	49	9	13	224
HMM10121041	TR 300	4	302,0	364	404	51	10	14	236
HMM10121042	TR 310	5	312,0	375	416	52	10	14	249
HMM10121043	TR 320	5	322,0	387	428	53	10	14	263
HMM10121044	TR 330	5	332,0	397	438	53	10	14	270

-continue-

Article- Number	Thread		Ring piston		D4	B	C	stroke	Piston area
	D1	Pitch	D2	D3					
			mm	mm	mm	mm	mm	mm	cm <sup>2</sup>
HMM10121045	TR 340	5	342,0	408	450	54	10	14	284
HMM10121046	TR 345	5	347,0	414	456	54	10	14	294
HMM10121047	TR 350	5	352,0	420	464	56	10	14	299
HMM10121048	TR 360	5	362,0	431	472	56	10	15	313
HMM10121049	TR 365	5	367,0	436	482	57	11	15	317
HMM10121050	TR 370	5	372,0	442	486	57	11	16	328
HMM10121051	TR 380	5	382,0	452	498	58	11	16	335
HMM10121052	TR 385	5	387,0	459	504	58	11	16	347
HMM10121053	TR 400	5	402,0	475	522	60	11	17	367
HMM10121054	TR 410	5	412,0	486	534	61	11	17	383
HMM10121055	TR 420	5	422,0	498	546	61	11	17	400
HMM10121056	TR 430	5	432,0	508	556	62	11	17	408
HMM10121057	TR 440	5	442,0	519	566	62	12	17	425
HMM10121058	TR 450	5	452,0	530	580	64	12	17	441
HMM10121059	TR 460	5	462,0	541	590	64	12	17	451
HMM10121060	TR 470	5	472,0	552	602	65	12	18	469
HMM10121061	TR 480	5	482,0	563	612	65	12	19	486
HMM10121062	TR 490	5	492,0	573	624	66	12	19	495
HMM10121063	TR 500	5	502,0	585	636	67	12	19	515
HMM10121064	TR 510	6	512,0	596	648	68	12	20	533
HMM10121065	TR 520	6	522,0	606	658	68	13	20	543
HMM10121066	TR 530	6	532,0	617	670	69	13	21	562
HMM10121067	TR 540	6	542,0	629	682	69	13	21	582
HMM10121068	TR 550	6	552,0	639	693	70	13	21	592
HMM10121069	TR 560	6	562,0	650	704	71	13	22	612
HMM10121070	TR 570	6	572,0	661	716	72	13	23	632
HMM10121071	TR 580	6	582,0	671	726	72	13	23	642
HMM10121072	TR 600	6	602,0	693	748	73	13	23	673
HMM10121073	TR 630	6	632,0	726	782	74	14	23	729
HMM10121074	TR 650	6	652,0	747	804	75	14	23	762
HMM10121075	TR 670	6	672,0	768	826	76	14	24	795
HMM10121076	TR 690	6	692,0	791	848	77	14	25	842
HMM10121077	TR 710	7	712,0	812	870	78	15	25	877
HMM10121078	TR 750	7	752,0	855	912	79	15	25	952
HMM10121079	TR 800	7	802,0	908	965	80	16	25	1039
HMM10121080	TR 850	7	852,0	962	1020	86	16	26	1146
HMM10121081	TR 900	7	902,0	1015	1075	86	17	30	1241
HMM10121082	TR 950	8	952,0	1069	1126	86	17	30	1357
HMM10121083	TR 1000	8	1002,0	1122	1180	88	17	34	1458

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This demonstrated performance is the mostly used application. If another equipment option should be required, we are gladly ready to develop the solution suitable for you. Also see equipment variations as well as accessories

## Standard

- Surface are blackened
- 1 pressure connector axial G 1/4"
- 1 pressure connector radial G 1/4"
- Quality tested for max. pressure and max. force
- Operating manual in English language

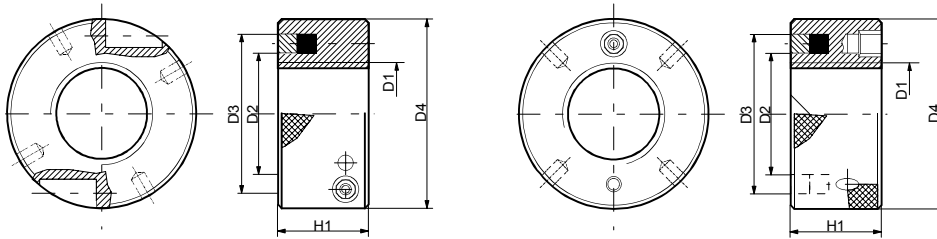
## Options

- Without thread with flat boring
- All thread types and -sizes

# Hydraulic nuts, with ring piston for continued pressurisation

radial

axial



## FMM07121

Specification:

- ⇒ Pressure media **grease**
- ⇒ Max. pressure **700** bar
- ⇒ Connector thread 1/8-18NPT  
axial or radial

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Article-number	Thread	Tension-force in kN	Ring piston		D4 mm	H1 mm	Hub mm
	D1		D2 mm	D3 mm			
FMM07121001	M 27	120	45	65	80	50	4
FMM07121002	M 30	120	45	65	80	50	4
FMM07121003	M 33	120	45	65	80	50	4
FMM07121004	M 36	120	45	65	80	50	4
FMM07121005	M 39	160	63	83	96	50	4
FMM07121006	M 42	160	63	83	96	50	4
FMM07121007	M 45	160	63	83	96	50	4
FMM07121008	M 48	160	63	83	96	50	4
FMM07121009	M 52	160	63	83	96	50	4
FMM07121010	M 55	197	80	100	116	50	4
FMM07121011	M 60	197	80	100	116	50	4
FMM07121012	M 65	197	80	100	116	50	4
FMM07121013	M 70	220	90	110	130	50	4
FMM07121014	M 75	220	90	110	130	50	4
FMM07121015	M 80	264	110	130	150	50	4
FMM07121016	M 85	264	110	130	150	50	4
FMM07121017	M 90	264	110	130	150	50	4
FMM07121018	M 95	264	110	130	150	50	4
FMM07121019	M 100	264	110	130	150	50	4
FMM07121020	M 105	330	140	160	180	50	4
FMM07121021	M 110	330	140	160	180	50	4
FMM07121022	M 115	330	140	160	180	50	4
FMM07121023	M 120	330	140	160	180	50	4
FMM07121024	M 125	330	140	160	180	50	4
FMM07121025	M 130	352	150	170	190	50	4
FMM07121026	M 135	352	150	170	190	50	4
FMM07121027	M 140	418	180	200	220	50	4
FMM07121028	M 145	418	180	200	220	50	4
FMM07121029	M 150	418	180	200	220	50	4
FMM07121030	M 155	418	180	200	220	50	4
FMM07121031	M 160	418	180	200	220	50	4
FMM07121032	M 165	418	180	200	220	50	4
FMM07121033	M 170	462	200	220	250	60	10
FMM07121034	M 175	462	200	220	250	60	10
FMM07121035	M 180	462	200	220	250	60	10
FMM07121036	M 185	462	200	220	250	60	10
FMM07121037	M 190	724	210	240	270	60	10
FMM07121038	M 195	724	210	240	270	60	10
FMM07121039	M 200	724	210	240	270	60	10
FMM07121040	M 205	724	210	240	270	60	10
FMM07121041	M 210	841	240	270	300	60	10
FMM07121042	M 215	841	240	270	300	60	10
FMM07121043	M 220	841	240	270	300	60	10
FMM07121044	M 225	841	240	270	300	60	10

This demonstrated performance is the mostly used application. If another equipment option should be required, we are gladly ready to develop the solution suitable for you. Also see equipment variations as well as accessories

## Standard

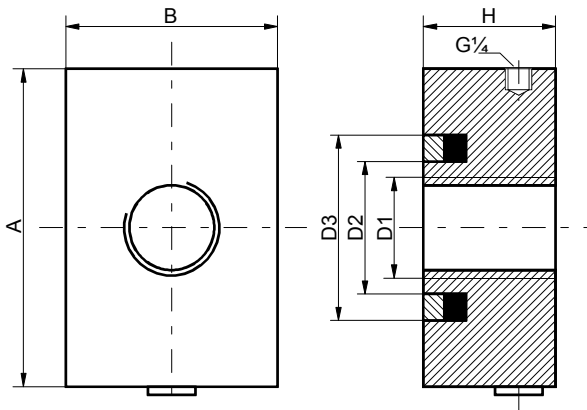
- Surfaces are blackened
- Surface area with diamond knurling
- Connector nipple and relief screw are radial or axial
- Operating manual in English language

## Options

- Without thread with flat boring
- Al thread types and -sizes
- Pressure media oil
- Surfaces are nickel-plated

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## Hydraulic nuts, with ring piston



### HMM04125

Specification:

- ⇒ Rectangle structural shape
- ⇒ Pressure media **Oil**
- ⇒ Max. pressure **400** bar
- ⇒ Surfaces are nickel-plated

Article-number	Thread	Tension-force	Hydraulic body		Ring piston		H1	Hub
	D1	in kN	A mm	B mm	D2 mm	D3 mm	mm	mm
HMM04125001	12	22	60	40	18	32	25	2,5
HMM04125002	18	26	70	50	25	38	30	2,5
HMM04125003	18	26	70	50	25	38	35	5,0
HMM04125004	25	60	90	70	35	56	40	2,5
HMM04125005	30	82	80	80	40	65	45	2,5
HMM04125006	36	70	80	80	46	66	50	4,0

This demonstrated performance is the mostly used application. If another equipment option should be required, we are gladly ready to develop the solution suitable for you. Also see equipment variations as well as accessories

### Standard

- 2 pressure connectors G 1/4"
- Surfaces are nickel-plated
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

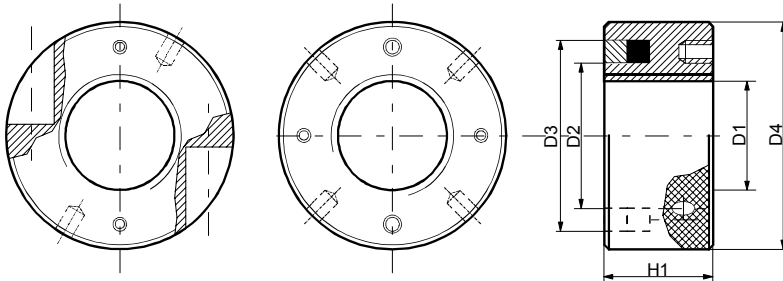
- Performance in special steel
- Fastening borings in the hydraulic body
- Other pressure connectors

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## Hydraulic nuts, with adjusting piston

tangential

axial



### FMM09127

Specification:

- ⇒ No further pressure generator is required
- ⇒ Pressure media **grease**
- ⇒ Adjusting piston tangential or axial
- ⇒ 20 Nm tightening moment of the adjusting piston

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Article-number	Thread	Tension-force in kN	Outer Ø D4 mm	Adjusting piston		Stroke mm	Ring piston		H1 mm
	D1			axial	tangential		D2 mm	D3 mm	
FMM09127001	M 16	28	44	x		2	22	28	40
FMM09127002	M 18	45	47,5	x		2	26	34	47
FMM09127003	M 20	45	47,5	x		2	26	34	47
FMM09127004	M 24	45	60	x		4	32	40	67
FMM09127005	M 27	78	72	x		4	40	52	75
FMM09127006	M 30	78	72	x		4	40	52	75
FMM09127007	M 33	60	69	x		2	44	52	48
FMM09127008	M 36	60	69	x		2	44	52	48
FMM09127009	M 39	95	80	x		2	50	62	56
FMM09127010	M 42	95	80	x		2	50	62	56
FMM09127011	M 45	111	90	x		2	60	72	60
FMM09127012	M 48	111	90	x		2	60	72	60
FMM09127013	M 52	111	90	x		2	60	72	60
FMM09127014	M 56	122	107	x		2	82	92	60
FMM09127015	M 60	122	107	x		2	82	92	60
FMM09127016	M 64	122	107	x		2	82	92	60
FMM09127017	M 68	122	107	x		2	82	92	60
FMM09127018	M 72	159	119	x		2	88	100	70
FMM09127019	M 76	159	119	x		2	88	100	70
FMM09127020	M 80	159	119	x		2	88	100	70
FMM09127021	M 90	166	145	x		2	110	125	80
FMM09127022	M 100	166	145		x	2	110	125	80
FMM09127023	M 110	144	185		x	2	135	150	45
FMM09127024	M 120	144	185		x	2	135	150	45
FMM09127025	M 125	222	205		x	2	155	175	50
FMM09127026	M 140	222	205		x	2	155	175	50
FMM09127027	M 160	179	230		x	2	180	200	50
FMM09127028	M 180	199	245		x	2	202	222	50
FMM09127029	M 200	157	260		x	2	215	230	50

This demonstrated performance is the mostly used application. If another equipment option should be required, we are gladly ready to develop the solution suitable for you. Also see equipment variations as well as accessories

## Standard

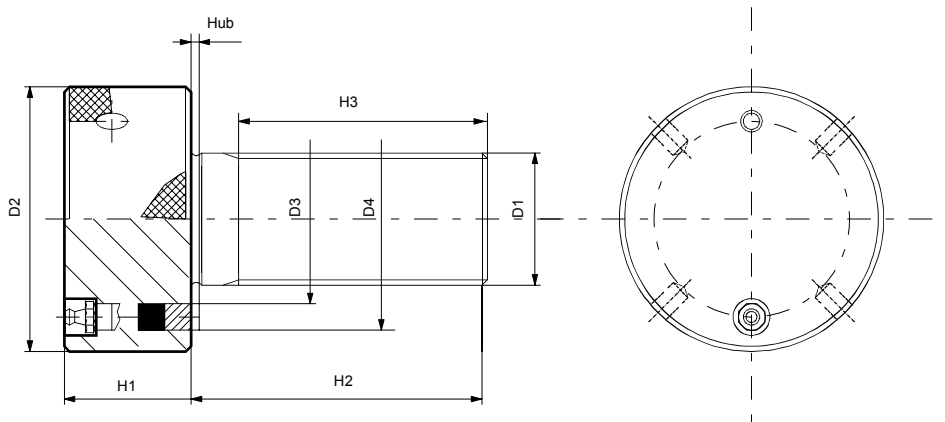
- Surfaces are blackened
- Surface area with diamond knurling
- Wrench
- 2 pressure relief screws axial
- Quality tested for max. pressure and max. force
- Operating manual in English language

fmm09127-e

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## Hydraulic nuts, as tension screw



### FMM07124

Specification:

- ⇒ Pressure media **grease**
- ⇒ No further machine element is required
- ⇒ Max. pressure **700** bar

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Article-Number	Thread	Tension-force	Tension head		Stroke	Ring piston		H2	H3
	D1	in kN	D2 mm	H1 mm		D3 mm	D4 mm		
FMM07124001	30	105	76	45	4	35	56	80	80
FMM07124002	32	105	76	45	4	35	56	80	80
FMM07124003	36	123	80	50	4	46	66	90	90
FMM07124004	39	123	80	50	4	46	66	90	90
FMM07124005	42	123	80	50	4	46	66	90	90
FMM07124006	45	123	80	50	4	46	66	90	90
FMM07124007	48	158	96	50	4	62	82	100	80
FMM07124008	52	158	96	50	4	62	82	100	80
FMM07124009	56	158	96	50	4	62	82	100	80
FMM07124010	60	158	96	50	4	62	82	100	80
FMM07124011	64	197	116	50	4	80	100	350	100
FMM07124012	68	230	132	50	4	95	115	430	150
FMM07124013	72	230	132	50	4	95	115	430	150
FMM07124014	80	230	132	50	4	95	115	430	150

This demonstrated performance is the mostly used application. If another equipment option should be required, we are gladly ready to develop the solution suitable for you. Also see equipment variations as well as accessories

### Standard

- With grease nipple
- Surface area of the screw head with diamond knurling
- Surfaces are blackened
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Pressure media oil
- Surfaces are nickel-plated