

# Bolt tensioning device



Performance variations - Examples

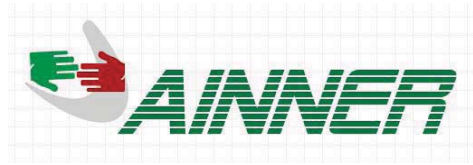




Bolt tensioning devices for a forgin press



Bolt tensioning device for a extruding machine



# Areas of application, conditions and advantages with Ainner 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 |           |             |                  |

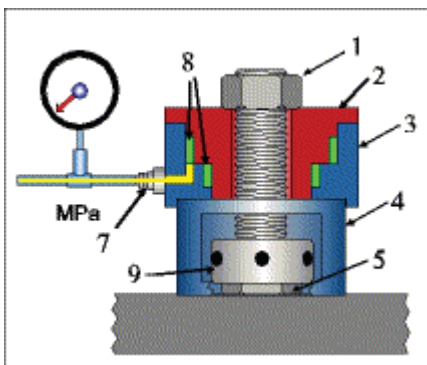


fig. 1: Basic setup

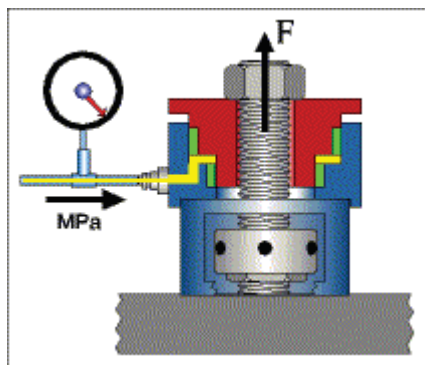


fig. 2: Pressurization

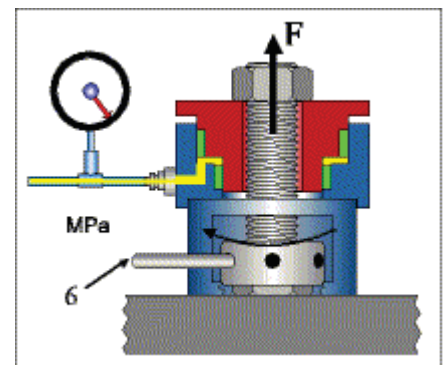
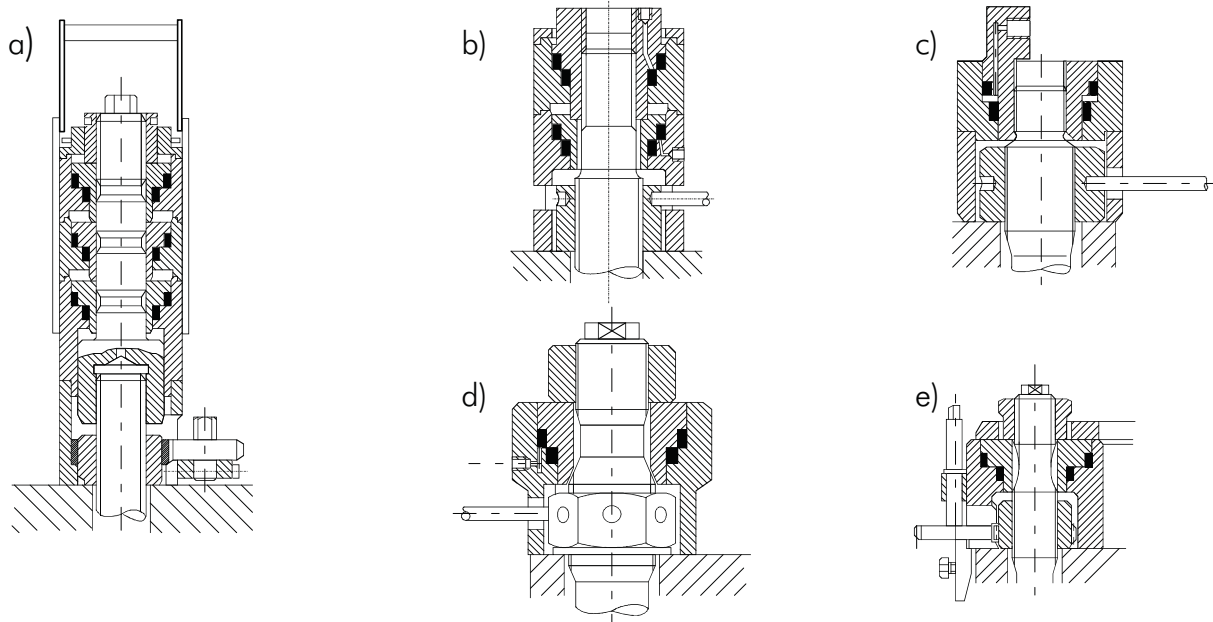


fig. 3: Finishing

## Performance variations

In addition to the range of configurations shown in the catalogue, it is also possible to produce bolt tensioning devices in the following variants on request:

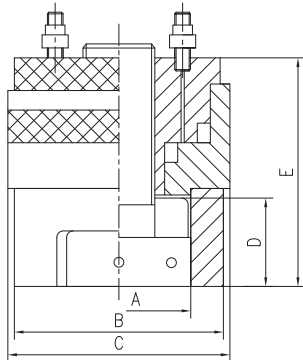


- a) Multi-stage tensioning device with exchangeable tension nut
- b) Multi-stage tensioning device with thread in piston
- c) Single-stage tensioning device with thread in piston
- d) Single-stage tensioning device with tensioning nut
- e) Single- or multi stage tensioning device on a supporting ring or -plate

## Equipment variations

- **Materials**
- **Pressure medium**
  - HFC
  - Oil
  - Water
  - Emulsions
- **Thread**
  - All thread types,
  - standard and –sizes
- **Forces**
  - Depending on requirement and material
- **Pressure**
  - Depending on pressure generator up to 3,000 bar
- **Stroke**
  - Depending on requirement
- **Stroke ratio**
  - Optical
  - Audible
  - Electrical
- **Stroke limiting**
  - Mechanical
  - Hydraulical
- **Stroke return**
  - Manual
  - Hydraulical
  - Automatical
- **Turning of the main nut**
  - Depending on carrying out
- of the main nut, manual or motor-driven
- **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

## Bolt tensioning device, single-stage with thread in piston



### KMWS 15112

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure 1500 bar
- ⇒ Suitable for screw quality **10.9**  
(at 90% from  $R_{p0,2}$ ) with thread  
overhang ca. 1 x D1

Article-number	Thread		Tension force (KN)	Diameters (mm)					Stroke (mm)
	M	Inch		A	B	C	D	E	
KMWS15112001	M16	5/8	126	37	41	52	16	72	10
KMWS15112002	M18	3/4	172	40	46	62	18	76	10
KMWS15112003	M20	3/4	208	42	51	66	19	78	10
KMWS15112004	M22	7/8	264	45	51	72	20	86	10
KMWS15112005	M24	1	327	49	59	78	22	88	10
KMWS15112006	M27	1-1/8	448	55	65	88	25	93	10
KMWS15112007	M30	1-1/8	448	61	72	98	27	93	15
KMWS15112008	M33	1-1/4	679	66	76	108	29	103	15
KMWS15112009	M36	1-3/8	810	71	80	118	32	108	15
KMWS15112010	M39	1-1/2	810	77	89	118	34	112	15
KMWS15112011	M42	1-5/8	917	83	91	126	37	114	15
KMWS15112012	M45	1-3/4	952	89	94	130	39	118	15
KMWS15112013	M48	1-7/8	1151	94	102	142	42	122	15
KMWS15112014	M52	2	1277	102	110	148	46	124	15
KMWS15112015	M56	2-1/4	1455	106	119	160	49	138	15
KMWS15112016	M60	2-3/8	1455	114	131	160	52	142	15
KMWS15112017	M64	2-1/2	1794	120	131	178	55	151	15
KMWS15112018	M68	2-3/4	1794	124	146	178	58	159	15
KMWS15112019	M72	2-7/8	2116	130	146	192	62	173	15
KMWS15112020	M76	3	2579	135	161	215	65	177	15
KMWS15112021	M80	3-1/4	2579	142	161	215	68	197	15
KMWS15112022	M85	3-3/8	2963	150	175	230	72	202	15
KMWS15112023	M90	3-1/2	3506	160	177	250	77	218	15
KMWS15112024	M95	3-3/4	3951	170	202	265	80	225	15
KMWS15112025	M100	4	4573	178	212	285	85	225	15

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

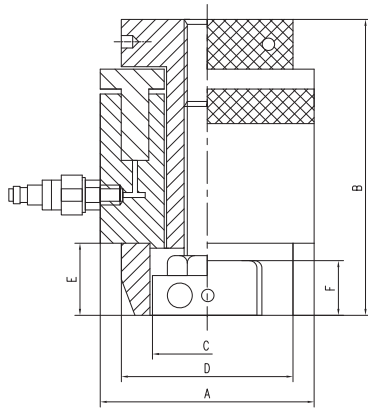
### Standard

- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector

## Bolt tensionin device , single-stage with exchangeable tension nut



### KMWS 15212

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure 1500 bar
- ⇒ Suitable for screw quality **10.9** (at 90% from  $R_{p0,2}$ ) with thread overhang ca. 1 x D1

Article-number	Thread		Tension force KN	Diameters (mm)						Stroke (mm)
	M	Inch		A	B	C	D	E	F	
KMWS15212001	M24	1	223	86	119	46	69	29	24	10
KMWS15212002	M27	1-1/8	223	86	119	52	76	29	27	10
KMWS15212003	M30	1-1/8	401	107	131	57	80	37	30	10
KMWS15212004	M33	1-1/4	401	107	131	62	85	37	33	10
KMWS15212005	M36	1-3/8	401	107	132	68	91	38	36	10
KMWS15212006	M39	1-1/2	401	107	135	75	93	41	39	10
KMWS15212007	M42	1-5/8	769	138	152	80	105	49	42	10
KMWS15212008	M45	1-3/4	769	138	153	85	111	50	45	10
KMWS15212009	M48	1-7/8	769	138	154	92	116	51	48	10
KMWS15212010	M52	2	769	138	155	96	120	52	52	10
KMWS15212011	M56	2-1/4	1467	174	170	102	136	62	56	10
KMWS15212012	M60	2-3/8	1467	174	171	108	142	63	60	10
KMWS15212013	M64	2-1/2	1467	174	172	115	150	64	64	10
KMWS15212014	M68	2-3/4	1467	174	173	120	154	65	68	10
KMWS15212015	M72	2-1/2	2262	210	192	125	158	73	72	10
KMWS15212016	M76	2-3/4	2262	210	193	130	174	75	76	10
KMWS15212017	M80	3-1/4	2262	210	195	137	178	77	80	10
KMWS15212018	M85	3-3/8	2486	240	197	143	158	78	85	12
KMWS15212019	M90	3-1/2	2486	240	200	155	174	80	90	12
KMWS15212020	M95	3-3/4	2486	240	205	160	178	85	95	12
KMWS15212021	M100	4	3958	276	210	170	158	92	100	12
KMWS15212022	M105	4-1/8	3958	276	220	180	174	95	105	12
KMWS15212023	M110	4-3/8	5860	325	230	185	275	104	110	12
KMWS15212024	M115	4-1/2	5860	325	240	193	285	108	115	12

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

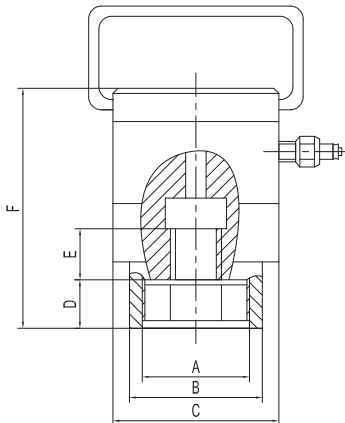
- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector



## Bolt tensionin device , single-stage with return spring



### KMWS 15112

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure 1500 bar
- ⇒ Suitable for screw quality **10.9** (at 90% from  $R_{p0,2}$ ) with thread overhang ca. 1 x D1

Article-number	Thread		Tension force (KN)	Diameters (mm)					
	M	Inch		A	B	C	D	E	F
KMWSC15112001	M22	7/8	200	42	52	65	19	20	94
KMWSC15112002	M24	1	290	49	60	78	22	24	102
KMWSC15112003	M27	1-1/8	380	55	67	86	25	27	108
KMWSC15112004	M30	1-1/8	460	61	74	97	27	30	106
KMWSC15112005	M33	1-1/4	570	66	81	107	29	33	114
KMWSC15112006	M36	1-3/8	670	71	90	117	32	36	118
KMWSC15112007	M39	1-1/2	800	77	96	127	34	39	125
KMWSC15112008	M42	1-5/8	920	83	102	137	37	42	134
KMWSC15112009	M45	1-3/4	1080	89	110	148	39	45	135
KMWSC15112010	M48	1-7/8	1220	94	116	158	42	48	140
KMWSC15112011	M52	2	1450	102	128	169	46	52	151
KMWSC15112012	M56	2-1/4	1680	106	135	176	49	56	158
KMWSC15112013	M60	2-3/8	2010	114	142	199	52	60	167
KMWSC15112014	M64	2-1/2	2210	120	151	211	55	64	172
KMWSC15112015	M68	2-3/4	2600	124	155	228	58	68	180
KMWSC15112016	M72	2-1/2	2880	130	168	238	62	72	186
KMWSC15112017	M80	3-1/4	3610	142	188	267	68	80	202
KMWSC15112018	M90	3-1/2	4650	160	210	300	77	90	220
KMWSC15112019	M100	4	5830	178	237	340	85	100	240

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

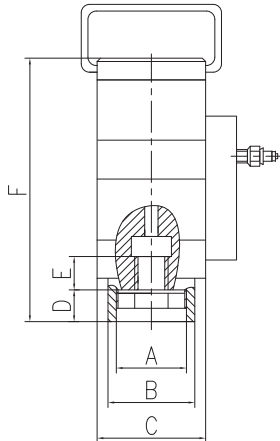
### Standard

- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut wit 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulical
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple

## Bolt tensioning device , Double-stage with return spring



### KMWSD 15112

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure 1500 bar
- ⇒ Suitable for screw quality **10.9**  
(at 90% from  $R_{p0,2}$ ) with thread overhang ca. 1 x D1

Article-number	Thread		Tension force (KN)	Diameters (mm)					
	M	Inch		A	B	C	D	E	F
KMWSD15112001	M30	1-1/8	460	61	74	75	27	30	205
KMWSD15112002	M33	1-1/4	570	66	81	80	29	33	218
KMWSD15112003	M36	1-3/8	670	71	90	85	32	36	240
KMWSD15112004	M39	1-1/2	800	77	96	90	34	39	260
KMWSD15112005	M42	1-5/8	920	83	102	96	37	42	265
KMWSD15112006	M45	1-3/4	1080	89	110	105	39	45	270
KMWSD15112007	M48	1-7/8	1220	94	116	110	42	48	280

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

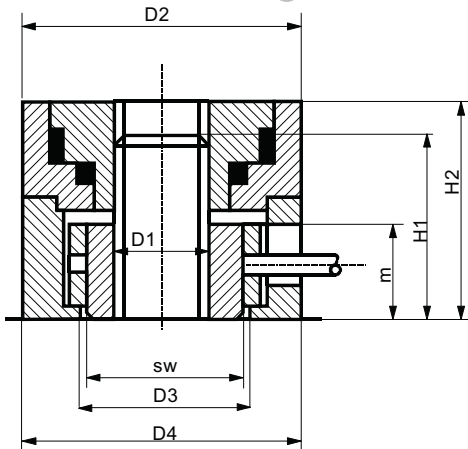
### Standard

- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple

## Bolt tensioning device, single-stage with thread in piston



### KHWS 16112

Specification:

- ⇒ Thread in piston
- ⇒ Max. pressure **1,600 bar**
- ⇒ Suitable for screw quality **10.9**  
(at 90% from  $R_{p0,2}$ ) with thread overhang ca.  $1 \times D1$

Article-number	Thread		Tension force in kN	Hexagonal nut DIN 934		D2 mm	Stroke mm	Bridge		H1 mm	H2 mm
	D1	Pitch		sw	m			D3 mm	D4 mm		
KHWS16112001	M 20	2,5	198	30	20	65	5	44	55	40	80
KHWS16112002	M 24	3,0	286	36	24	75	5	51	64	48	90
KHWS16112003	M 27	3,0	372	41	27	83	5	57	72	54	95
KHWS16112004	M 30	3,5	454	46	30	90	5	61	78	60	105
KHWS16112005	M 33	3,5	562	50	33	100	5	67	86	66	110
KHWS16112006	M 36	4,0	662	55	36	105	6	73	94	72	120
KHWS16112007	M 39	4,0	790	60	39	115	6	80	103	78	130
KHWS16112008	M 42	4,5	908	65	42	127	6	84	109	84	135
KHWS16112009	M 45	4,5	1058	70	45	135	6	91	117	90	145
KHWS16112010	M 48	5,0	1193	75	48	145	8	96	124	96	155
KHWS16112011	M 52	5,0	1424	80	52	155	8	103	134	104	170
KHWS16112012	M 56	5,5	1644	85	56	173	8	109	143	112	180
KHWS16112013	M 60	5,5	1913	90	60	183	8	115	152	120	185
KHWS16112014	M 64	6,0	2168	95	64	193	8	121	161	128	195
KHWS16112015	M 68	6,0	2475	100	68	203	10	127	170	136	205
KHWS16112016	M 72	6,0	2802	105	72	213	10	133	179	144	220
KHWS16112017	M 76	6,0	3150	110	76	228	10	139	189	152	235
KHWS16112018	M 80	6,0	3519	115	80	250	10	145	198	160	255
KHWS16112019	M 90	6,0	4529	130	90	275	10	165	225	180	280
KHWS16112020	M 100	6,0	5666	145	100	330	12	180	248	200	325
KHWS16112021	M 110	6,0	6930	155	110	355	12	191	268	220	350
KHWS16112022	M 120	6,0	8322	170	120	395	15	211	295	240	400
KHWS16112023	M 125	6,0	9065	180	125	410	15	225	312	250	410
KHWS16112024	M 140	6,0	11486	200	140	470	15	246	345	280	450

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

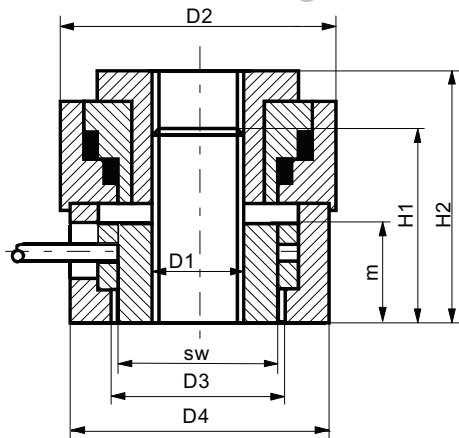
### Standard

- Hydraulic head
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various Designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector

## Bolt tensioning device , single-stage with exchangeable tension nut



### KHWS 16212

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure **1,600 bar**
- ⇒ Suitable for screw quality **10.9**  
(at 90% from  $R_{p0,2}$ ) with thread overhang ca.  $1 \times D1$

Article-number	Thread		Tension force in kN	Hexagonal nut DIN 934		D2 mm	Stroke mm	Bridge		H1 mm	H2 mm
	D1	Pitch		sw	m			D3 mm	D4 mm		
KHWS16212001	M 20	2,5	198	30	20	72	5	44	55	40	100
KHWS16212002	M 24	3,0	286	36	24	82	5	51	64	48	115
KHWS16212003	M 27	3,0	372	41	27	90	5	57	72	54	120
KHWS16212004	M 30	3,5	454	46	30	100	5	61	78	60	135
KHWS16212005	M 33	3,5	562	50	33	105	5	67	86	66	140
KHWS16212006	M 36	4,0	662	55	36	112	6	73	94	72	155
KHWS16212007	M 39	4,0	790	60	39	120	6	80	103	78	170
KHWS16212008	M 42	4,5	908	65	42	135	6	84	109	84	175
KHWS16212009	M 45	4,5	1058	70	45	145	6	91	117	90	190
KHWS16212010	M 48	5,0	1193	75	48	150	8	96	124	96	205
KHWS16212011	M 52	5,0	1424	80	52	160	8	103	134	104	230
KHWS16212012	M 56	5,5	1644	85	56	170	8	109	143	112	235
KHWS16212013	M 60	5,5	1913	90	60	193	8	115	152	120	245
KHWS16212014	M 64	6,0	2168	95	64	203	8	121	161	128	260
KHWS16212015	M 68	6,0	2475	100	68	213	10	127	170	136	270
KHWS16212016	M 72	6,0	2802	105	72	223	10	133	179	144	290
KHWS16212017	M 76	6,0	3150	110	76	233	10	139	189	152	310
KHWS16212018	M 80	6,0	3519	115	80	255	10	145	198	160	335
KHWS16212019	M 90	6,0	4529	130	90	285	10	165	225	180	370
KHWS16212020	M 100	6,0	5666	145	100	335	12	180	248	200	425
KHWS16212021	M 110	6,0	6930	155	110	365	12	191	268	220	460
KHWS16212022	M 120	6,0	8322	170	120	405	15	211	295	240	520
KHWS16212023	M 125	6,0	9065	180	125	420	15	225	312	250	535
KHWS16212024	M 140	6,0	11486	200	140	480	15	246	345	280	590

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

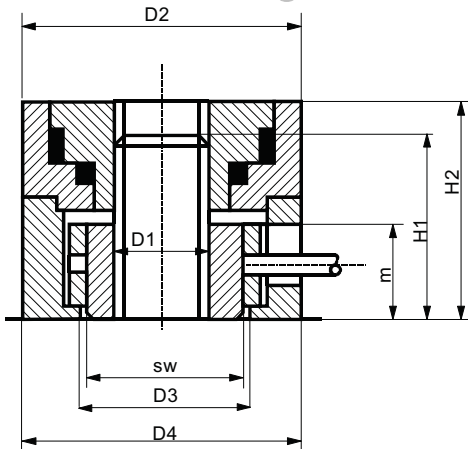
### Standard

- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector

## Bolt tensioning device, single-stage with thread in piston



### KHWS 25112

Specification:

- ⇒ Small design with small weight
- ⇒ Thread in piston
- ⇒ Max. pressure **2,500 bar**
- ⇒ Suitable for screw quality **10.9**  
(at 90% from  $R_{p0,2}$ ) with thread overhang ca. 1 x D1

Article-number	Thread		Tension force in kN	Hexagonal nut DIN 934		D2 mm	Stroke mm	Bridge		H1 mm	H2 mm
	D1	Pitch		sw	m			D3 mm	D4 mm		
KHWS25112001	M 20	2,5	198	30	20	58	5	44	55	40	80
KHWS25112002	M 24	3,0	286	36	24	67	5	51	64	48	90
KHWS25112003	M 27	3,0	372	41	27	75	5	57	72	54	95
KHWS25112004	M 30	3,5	454	46	30	83	5	61	78	60	105
KHWS25112005	M 33	3,5	562	50	33	90	5	67	86	66	110
KHWS25112006	M 36	4,0	662	55	36	95	6	73	94	72	120
KHWS25112007	M 39	4,0	790	60	39	100	6	80	103	78	130
KHWS25112008	M 42	4,5	908	65	42	115	6	84	109	84	135
KHWS25112009	M 45	4,5	1058	70	45	125	6	91	117	90	145
KHWS25112010	M 48	5,0	1193	75	48	130	8	96	124	96	155
KHWS25112011	M 52	5,0	1424	80	52	140	8	103	134	104	170
KHWS25112012	M 56	5,5	1644	85	56	153	8	109	143	112	180
KHWS25112013	M 60	5,5	1913	90	60	163	8	115	152	120	185
KHWS25112014	M 64	6,0	2168	95	64	173	8	121	161	128	195
KHWS25112015	M 68	6,0	2475	100	68	183	10	127	170	136	205
KHWS25112016	M 72	6,0	2802	105	72	193	10	133	179	144	220
KHWS25112017	M 76	6,0	3150	110	76	203	10	139	189	152	235
KHWS25112018	M 80	6,0	3519	115	80	225	10	145	198	160	255
KHWS25112019	M 90	6,0	4529	130	90	245	10	165	225	180	280
KHWS25112020	M 100	6,0	5666	145	100	295	12	180	248	200	325
KHWS25112021	M 110	6,0	6930	155	110	320	12	191	268	220	350
KHWS25112022	M 120	6,0	8322	170	120	355	15	211	295	240	400
KHWS25112023	M 125	6,0	9065	180	125	370	15	225	312	250	410
KHWS25112024	M 140	6,0	11486	200	140	425	15	246	345	280	450

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

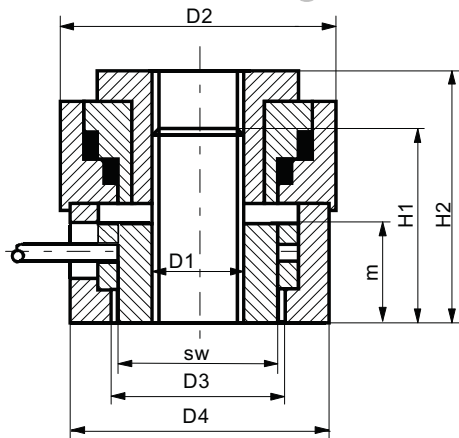
### Standard

- Hydraulic head
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various Designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector

## Bolt tensioning device, single-stage with exchangeable tension nut



### KHWS 25212

Specification:

- ⇒ One hydraulic head
- ⇒ Exchangeable hexagonal nut
- ⇒ Exchangeable tension nut
- ⇒ Max. pressure **2,500** bar
- ⇒ Suitable for screw quality **10.9** (at 90% from  $R_{p0,2}$ ) with thread overhang ca.  $1 \times D1$

Article-number	Thread		Tension force in kN	Hexagonal nut DIN 934		D2 mm	Stroke mm	Bridge		H1 mm	H2 mm
	D1	Pitch		sw	m			D3 mm	D4 mm		
KHWS25212001	M 20	2,5	198	30	20	67	5	44	55	40	100
KHWS25212002	M 24	3,0	286	36	24	75	5	51	64	48	115
KHWS25212003	M 27	3,0	372	41	27	83	5	57	72	54	120
KHWS25212004	M 30	3,5	454	46	30	90	5	61	78	60	135
KHWS25212005	M 33	3,5	562	50	33	98	5	67	86	66	140
KHWS25212006	M 36	4,0	662	55	36	105	6	73	94	72	155
KHWS25212007	M 39	4,0	790	60	39	108	6	80	103	78	170
KHWS25212008	M 42	4,5	908	65	42	125	6	84	109	84	175
KHWS25212009	M 45	4,5	1058	70	45	130	6	91	117	90	190
KHWS25212010	M 48	5,0	1193	75	48	135	8	96	124	96	205
KHWS25212011	M 52	5,0	1424	80	52	145	8	103	134	104	230
KHWS25212012	M 56	5,5	1644	85	56	155	8	109	143	112	235
KHWS25212013	M 60	5,5	1913	90	60	173	8	115	152	120	245
KHWS25212014	M 64	6,0	2168	95	64	183	8	121	161	128	260
KHWS25212015	M 68	6,0	2475	100	68	193	10	127	170	136	270
KHWS25212016	M 72	6,0	2802	105	72	203	10	133	179	144	290
KHWS25212017	M 76	6,0	3150	110	76	213	10	139	189	152	310
KHWS25212018	M 80	6,0	3519	115	80	235	10	145	198	160	335
KHWS25212019	M 90	6,0	4529	130	90	260	10	165	225	180	370
KHWS25212020	M 100	6,0	5666	145	100	305	12	180	248	200	425
KHWS25212021	M 110	6,0	6930	155	110	335	12	191	268	220	460
KHWS25212022	M 120	6,0	8322	170	120	365	15	211	295	240	520
KHWS25212023	M 125	6,0	9065	180	125	380	15	225	312	250	535
KHWS25212024	M 140	6,0	11486	200	140	435	15	246	345	280	590

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

- Hydraulic head
- Tension nut
- Bridge with 2 windows and 2 nut control slots
- Hexagonal nut with 6 adjusting rod holes
- Adjusting rod
- Surfaces are burnished
- Quality tested for max. pressure and max. force
- Operating manual in English language

### Options

- Stroke limiting
  - Mechanical
  - Hydraulic
- Piston return stroke
  - Mechanical
  - Automatical
- Gear
- Surface
  - Chemical nickel-plated
  - Varnished
- Various designs for connecting nipple
  - High pressure nipple
  - Rotary angle connector