CLAMPING BOLTS, NUTS AND WASHERS - QUALITY OF AMF

> **Material:** Tempering steel to DIN regulations within tensile strength classes 8.8, 10.9 and 12.9.

> **Machining:** All bolts and studs have rolled threads and guarantee high clamping forces and long life.

> **Tempering:** Tensile strength classes according to DIN regulations.

Bolts, T-nuts and nuts are manufactured to DIN 267 and ISO 898. By galvanizing tempered and hardened components there is a certain risk of the material getting brittle. In the event of components being subsequently galvanized we refuse all possible claims regarding breakages and damages.

There are strong reasons for demanding operators to only use AMF-clamping bolts of highest quality:

> Strict checks guarantee a consistent quality level.

> High quality clamping bolts and nuts last longer, reduce tool management and idle periods resulting in more economy in the long run.

Please notice!

The torque which can be achieved by hand can be higher than required by DIN standard for screws sizes up to 12 mm dia. Result: Only under worst conditions will the screw first of all twist and eventually break when overstressed. A small but decisive contribution to safety at the workplace.

AMF-T-SLOT BOLTS DIN 787 and No. 787
are manufactured within tensile strength classes 8.8, 10.9 and 12.9.

AMF-STUDS DIN 6379 and No. 6379
are manufactured within tensile strength classes 8.8, 10.9 and 12.9.

AMF-HEXAGON NUTS DIN 6330B, DIN 6331 and No. 6334
are manufactured within tensile strength class 10.

The individual characteristics in tensile strength classes 8.8, 10.9 and 12.9 are defined as follows:

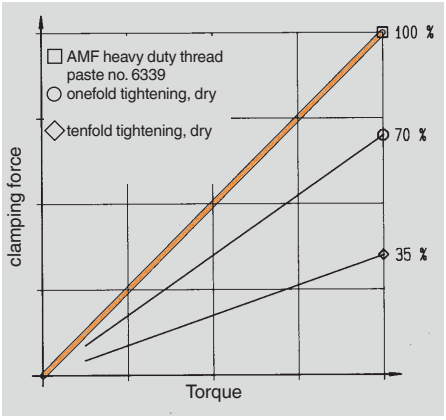
8. = minimum tensile strength = 800 N/mm²
.8 = minimum yield point (80% of min. tensile strength) = 640 N/mm²
10. = minimum tensile strength = 1000 N/mm²
.9 = minimum yield point (90% of min. tensile strength) = 900 N/mm²
12. = minimum tensile strength = 1200 N/mm²
.9 = minimum yield point (90% of min. tensile strength) = 1080 N/mm²

STRENGTH OF HEXAGON NUTS:

The individual characteristic in tensile strength class 10. defined is:
10. = minimum test strength = 1000 N/mm2
This test strength is equal to the minimum tensil strength of a screw which can be charged to its minimum breaking load, when matched with the respective nut.

A normal screw / nut combination for load transmission would be a nut of tensil strength class “8” for 8.8 screws. For manufacturing of this nut, a minor quality material than for 8.8 screws neccessary could be used, since lower tensions occur in the nut, compared with screw. But since nuts require a high wear resistance in addition to sufficient strength, we manufacture them of the same material as our 8.8-screws. This results with tensile strength class “10” for nuts.

Clamping forces depending on lubrication.

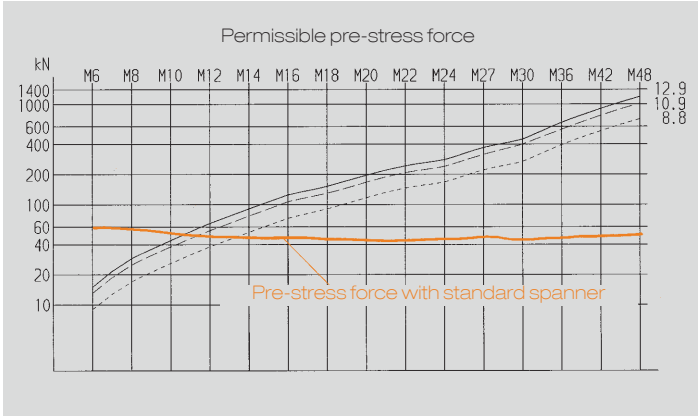


Test results revealed clearly:
Frequent use of non-greased bolt/nut connections in fixtures will reduce clamping forces consider-ably at still constant torques, with additional wear involved!

We therefore recommend the AMF-Heavy-duty thread paste no. 6339. It has a synergetic acting combination of highly active white solid lubrications and is resistant to heat and wash-off. It provides optimal sliding characteristics for increased clamping force and improved thread life.

	Tensile strength classes			
	8.8	10.9	12.9	10
DIN 787 / No. 787 	X	X	X	-
DIN 6379 / No. 6379 	X	X	X	-
DIN 6330B DIN 6331 No. 6334 	-	-	-	X
Nominal tensile strength [N/mm²]	800	1000	1200	1000*
Minimum yield point [N/mm²]	640	900	1080	-

CHART OF PERMISSIBLE AND POSSIBLE PRE-STRESS FORCES:



* Strength figures of the right bolts

EXPLANATION OF TABLE CHARACTERISTICS:

> **PERMISSIBLE BOLT LOAD** is the maximum tension load, the screw can be stressed with talcing into account all active forces. The yield point is only utilized to 80% for safety.

> **PERMISSIBLE PRE-STRESS FORCE** is the load, the screw can be pre-stressed at most, when tightening the matching nut. Figures of table are valid for a friction of μ = 0,14 in thrust faces and thread, corresponding to the friction of greased medium faces.

> **REQUIRED LENGTH FOR LEVER OF SPANNER:** These length figures were calculated with the mean value of hand forces achieved in test series by different workmen.

STRENGTH FIGURES AND TORQUES FOR BOLTS AND NUTS:

Thread		Tensile	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30	M36	M42	M48
Pitch of thread	mm		1	1.25	1.50	1.75	2	2	2.50	2.50	2.50	3	3	3.50	4	4.50	5
Nuts:																	
Hardness DIN6330/6331/6334	HRC	10	26 - 36													20 - 30	
Test force (AS x Sp) DIN EN ISO 898-2	kN	10	20.9	38.1	60.3	88.5	120.8	164.9	203.5	259.7	321.2	374.2	486.5	594.7	866	-	-
Nuts for T-slots DIN508/DIN508L:																	
Size			M6x8	M8x10	M10x12	M12x14	-	M16x18	-	M20x22	-	M24x28	-	M30x36	M36x42	M42x48	M48x54
Hardness	HRC		22 - 30														
Test force to DIN 508	kN		16	29	46	67	-	128	-	196	-	282	-	448	653	653	653
Bolts:																	
Hardness	HRC	8.8	22 - 32						23 - 34								
		10.9	32 - 39														
		12.9	39 -44														

PERMITTED SCREW LOADS AND TIGHTENING TORQUES:

Minimum breaking force (AS x Rm)	kN	8.8	16	29	46	67	92	125	159	203	252	293	381	466	678	930	1222
		10.9	21	38	60	88	120	163	200	255	315	367	477	583	850	1165	1531
		12.9	24	45	71	103	140	192	234	299	370	431	560	684	997	1367	1797
Permissible bolt load max. 80% of yield point	kN	8.8	10	19	30	43	59	80	101	129	160	186	242	296	431	591	777
		10.9	14	27	43	63	86	118	144	184	228	265	345	421	614	843	1107
		12.9	17	32	51	74	101	138	169	215	266	310	404	493	719	986	1296
Test force (AS x Sp) to DIN EN ISO 898, part 1	kN	8.8	12	21	34	49	67	91	115	147	182	212	275	337	490	672	882
		10.9	17	30	48	70	96	130	159	203	252	293	381	466	678	930	1222
		12.9	20	35	56	82	112	152	186	238	294	342	445	544	792	1087	1428
Permissible pre-stress force max. 90% of yield point and friction μ = 0,14	kN	8.8	9	17	26	38	53	73	91	117	146	168	221	269	394	542	714
		10.9	13	25	38	55	77	107	130	167	208	240	315	384	561	773	1018
		12.9	15	29	44	65	91	125	152	196	243	281	369	449	657	904	1191
Necessary tightening torque for permissible pre-tensioning force and a friction of μ=0.14	Nm	8.8	10	25	46	82	130	206	284	407	542	698	1021	1355	2372	3802	5730
		10.9	14	36	67	120	191	302	405	580	772	994	1455	1930	3378	5415	8162
		12.9	17	43	79	141	223	354	474	679	903	1163	1703	2258	3953	6337	9571
Required length for lever to achieve permissible pre-stress force	mm	8.8	30	67	120	205	310	479	645	900	1130	1395	-	-	-	-	-
		10.9	42	97	175	300	545	700	920	1285	1600	1980	-	-	-	-	-
		12.9	51	116	207	352	530	823	1075	1500	1880	2300	-	-	-	-	-
Combination wrench test torque in accordance with ISO 1711-1	Nm	-	58	107	175	230	330	451	594	760	884	1165	1579	2067	3140	4021	5394

A_S = nominal cross section in mm² / S_p = min. clamping force in N/mm² / R_m = minimum tensile strength in N/mm² / μ = friction