Torques ranges for screws and bolts

Content

1 Purpose

This LESER Global Standard (LGS) describes torques ranges for screws and bolts.

2 Scope

This LGS is valid for all members of LESER Quality union.

3 References

None

4 Introduction

The above torque ranges are valid for material marked full shaft screws or full shaft bolts and nuts used for the connection between body and bonnet according to AD-B7 and similar applications.

The torque ranges are valid for lubricated threads with a friction factor or 0.1 and perpendicular facings of the nuts in relation to the bore. With the above torques about 70 – 90% of the yield strength of the material is reached.

For higher friction factors (0.12 – 0.15) the higher values for the torque are required. The maximum limits must not be exceeded.

Data base: The 70 % values (respectively lower torque value) for friction factor 0.1 are taken from the catalogue of „Fa. Gebr. Grohmann, 1991, Wissenswertes über Edelstahlschrauben"

5 Body and Bonnet Connection

(Observe note on next pages)

Table 1: torques for screws and nuts DIN 931, 933, 938 and EN 24032

Material DIN	Material equivalent ASME	min. – max. Torque [Nm] Thread					
		M10	M 12	M 16	M 20	M 24	M 27
Ck 35/ C 35 (1.1181)	Steel	18 - 22	28 - 36	68 - 87	130 - 166	255 - 288	
A4 – 70 (1.4401)	A193 B8M Cl.2	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
A4 – 70 (1.4401)	A193 B8M Cl.1	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	
5.6	-	19 - 22	30 - 39	73 - 93	--	--	--
8.8	-	40 - 45	65 - 84	155 - 198	--	--	--
	A320 Gr. B8M	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
1.7225	A 193 Gr. B7		55 (50*)	130 (120*)	220 - 250	280 – 300	
	A 320 Gr. L7		55 (50*)	130 (120*)	220 - 250	280 – 300	
	A 320 Gr. L7M		50 – 60	125 - 135	220 - 250	280 – 300	450-480
1.4301	A 193 Gr. B8 CL. 2	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	
	A 193 Gr. B8T CL. 2			108 - 138	204 - 261		
	A320 Gr. B8 CL. 2	25 - 30	45 - 58	108 - 138	204 - 261	202 - 258	
1.4462	SA-479	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
1.4501	SA-479	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	
	A 193 Gr. B7M		60 - 70	135 - 170	220 - 250	280 – 320	
	A453 Gr.660 Class D		70-85	160-190	280-300	340-360	
A5 - 70 (1.4571)		25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
2.4819	N10276	19 - 22	30 - 39	73 - 93	170-185	280-300	
	B8MLCuN-Cl.1B	18 - 22	28 - 36	68 - 87	130 - 166	255 - 288	
2.4360	Monel400		32	70	140	265	
2.4858	Inconel 625	25 - 30	45 - 58	108 - 138	204 - 261	202 – 258	310 - 345
Torque to yield bolts:							
17709	A 193 Gr. B16	-	31 - 37	98 - 118	190 - 228	280 - 320	
	A 193 Gr. B7	-	31 - 37	98 - 118	190 - 228	280 - 320	

* for cast iron

Note Table 1 (see previous page):

1. In case of Gylon gasket application, the nuts resp. screws have to be tightened again after 15 min.
2. If application-specific tightening torques are mentioned in section 6 to 13, these always have priority over the general specifications listed in Table 1.

6 Type 48x and Type 444 Clamp Rings and Split-rings

6.1 Type 483, 484, 485 Split-rings

Table 2 lists the tightening torques of the connection between the bonnet and the body by means of a **Split-ring**, which are currently used for Clean Service Type 483, 484, 485.

The following Figure 1 shows the Split-ring - Design 2021 - for information.

Figure 1: Split-ring design 2021, which is used in the connection between the bonnet and the body as well as the H8 lifting device on Type 483, 484, 485:

Table 2: Tightening torques for bolts and nuts of Split-rings - Design 2021 - for Clean Service Type 483, 484, 485

Material DIN	Material equivalent ASME	Tightening torque Type d0, (nominal size) (Nominal thread size for information)	
		483, 484, 485	
		d0 13 (DN 25)	d0 25 (DN 40)
Marking of the component		526.2349.0000 526.2349.0001	526.2449.0000 526.2449.0001
Split-ring (1.4408)	(CF8M)	5 Nm (M6)	7 Nm (M6)

6.2 Type 488 und die Type 444 Clamp rings

Table 3 lists the tightening torques of the connection between the Bonnet and the Body by means of a **Clamp ring**, which are currently used with Type 488 and Type 444. The Clamp ring nut must be mounted with a Retaining clip.

The following Figure 2 shows the **Clamp ring** for information.

Figure 2: Clamp ring used in the connection between the Bonnet and the Body on Type 488 and Type 444, this illustration shows the Clamp-ring with the Retaining clip.

Table 3: torques for screws and nuts for clamp rings for Clean Service Type 488 and Type 444

Material DIN	Material equivalent ASME	Tightening Torque Thread	
		M 6	M 8
Labelling of the Part		D50: 701-074 D65: 701-075	D80: 701-073 D100: 701-076 D125: 701-077
Clamp ring (1.4404)	(SS316)	6 Nm	14 Nm

6.3 Type 488 and Type 444 Split-rings

Table 4 lists the tightening torques of the connection between the Bonnet and the Body by means of a **Split-ring**, which are currently used with Type 488 and Type 444.

The following Figure 3 shows 2 Split-rings (without fasteners and without Retaining clip) for information.

Figure 3: 2 Split-rings (without fasteners and without Retaining clip), which are used in the connection between the Bonnet and the Body on Type 488 and Type 444.

Table 4: Tightening torques for bolts and nuts for Clean Service Type 488 and High Performance Type 444 - Split-rings

		Tightening Torque Thread		
Material DIN	Material equivalent ASME	Type 488 EP150	Type 488 EP175	Type 444 EP175
Labelling of the Part		EP 150: 701-011 EP175: 701-010		526.0649
A4 class 70 (1.4401)	(B8M)	51 Nm	51 Nm	16 Nm
		M10	M10	M10
		SW16	SW16	SW16

7 Caps and Lifting Devices

Table 5: Caps and lifting devices (sealing torque)

Size	Thread	Torque [Nm]**		Wrench size
		Standard	HALAR-coated gasket	
0	M 24 x 1,5	60 – 75	60 - 75	AF/SW 27
I	M 33 x 1,5	80 – 100	60 - 75	AF/SW 46
II	M 42 x 1,5	100 – 125	100 - 125	AF/SW 55
III	M 60 x 1,5	140 – 175	240 - 270	AF/SW 75
IV+V	M 75 x 1,5	175 – 220	n.a.	AF/SW 95

**) To achieve manually with 200 mm extended wrench.
Sufficient for clean and lubricated threads and not damaged sealing surfaces.

n.a. Gasket not available for this size

8 Test Gag

8.1 Short Locking Screws

For tightening of the short locking screws (pos. 2, e.g. drawing 190.0309-XX-B01) the torque ranges of Table 6 are recommended.

Table 6: Test Gag: Recommended starting torque ranges for short screws

Cap size Size lifting device	Thread size	Torque [Nm]***
0	M12	28 - 32
I	M12	
II	M12	
III	M12	
IV	M16	72 -76
V	M16	

***) The used sealing rings out of vulcanised fibre may not be deformed further because they are soft sealings.

8.2 Long locking screws

For tightening of the long locking screws (pos. 1, e.g. drawing 190.0309-XX-B01) the torque ranges of Table 7 are recommended.

Table 7: Test Gag: Recommended starting torque ranges for long screws

Cap size Size lifting device	Thread size	Torque [Nm]*
0	M12	15
I	M12	
II	M12	20
III	M12	
IV	M16	35
V	M16	

*) The torques ranges are not valid for O-ring discs and sealing plates designs. In case of need they have to be required at TB/DD.

8.3 Long locking screw as transport locking device

For tightening the long locking screw as transport locking device (e.g. drawing 190.0809-XX-B01) the torques acc. to Table 8 are used.

Table 8: Torque specification of long locking screw as transport locking device.

Cap size Size lifting device	Thread size	Torque (All types) [Nm]
0	M12	4
I	M12	
II	M12	
III	M12	
IV	M16	
V	M16	

9 Screwed Plugs, Locking Screws (Metal Sealing)

Table 9: Recommended locking torques for screwed plugs (e. g. Type 526)

Material DIN	Material equivalent ASME	Min. – max. torques [Nm] * Gewinde			
		G 1/8	G1/4	G1/2	
A4-70 (1.4401)	(B8M)	15 - 20	35-40	65-90	

*) Lower values are valid for sealing with sealing ring acc. to DIN 7603.

10 Nozzles, Inlet Bodies and Screwed Bonnets (T459/462)

Table 10: Recommended torques of valve nozzles for type 441/442; 457/458 and 526, inlet bodies of type 437/438/438/459 and 462 and screwed bonnets (type 459/462)

Benennung/Name	Orifice/DN d0 or Size	Druckstufe/ Pressure Class	Gewinde größe Thread size	Anzugs-moment Torque [Nm]
SITZBUCHSE/Nozzle 526 1E2	1 D+E2	150-600	M38x1,5	95
SITZBUCHSE/Nozzle 526 1.5E2	1,5 D+E2	900 -1500	M38x1,5	95
SITZBUCHSE/Nozzle 526 1.5F2	1,5 F2	150-1500	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5G3	1,5 G3	150-900	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5H3	1,5 H3	150-300	M48x1,5	95
SITZBUCHSE/Nozzle 526 1.5EF3	1,5 E+F3	2500	M48x1,5	95
SITZBUCHSE/Nozzle 526 2H3	2 H3	150-1500	M64x1,5	115
SITZBUCHSE/Nozzle 526 2J3	2 J3	150-300L	M64x1,5	115
SITZBUCHSE/Nozzle 526 2G+H3	2 G+H3	2500	M64x1,5	115
SITZBUCHSE/Nozzle 526 3K4	3 K4	150-600	M100x2	300
SITZBUCHSE/Nozzle 526 3L4	3 L4	150-300L	M100x2	300
SITZBUCHSE/Nozzle 526 3J4	3 J4	300-1500	M100x2	300
SITZBUCHSE/Nozzle 526 3K4/6	3 K4/6	900-1500	M100x2	300
SITZBUCHSE/Nozzle 526 4L 6	4 L6	300-600	M120x2	430
SITZBUCHSE/Nozzle 526 4L6	4L6	900-1500	M120x2	430
SITZBUCHSE/Nozzle 526 4M6	4 M6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 4N6	4N6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 4P6	4 P6	150-900	M120x2	430
SITZBUCHSE/Nozzle 526 6Q8	6 Q8	150-600	M165x2	610
SITZBUCHSE/Nozzle 526 6R8	6 R8/10	150-600	M165x2	610
SITZBUCHSE/Nozzle 526 8T10	8 T10	150-300	M220x2	700
Type 457/458				
SITZBUCHSE Nozzle 458 DN 25/ 15	d015	all	M36x1,5	95
SITZBUCHSE Nozzle 458 DN 25/ 20	d020	all	M36x1,5	
SITZBUCHSE Nozzle 458 DN 50/ 30	d030	all	M64x1,5	115
SITZBUCHSE Nozzle 458 DN 50/ 40	d040	all	M64x1,5	
SITZBUCHSE Nozzle 458 DN 80/ 50	d050	all	M100x2	300
SITZBUCHSE Nozzle 458 DN 80/ 60	d060	all	M100x2	
SITZBUCHSE Nozzle 458 DN100 d050	d050	all	M120x2	450
SITZBUCHSE Nozzle 458 DN100 d060	d060	all	M120x2	
SITZBUCHSE Nozzle 458 DN100 d074	d074	all	M120x2	
SITZBUCHSE Nozzle 458 DN100 d088	d088	all	M120x2	
SITZBUCHSE Nozzle 458 DN150/110	d0110	all	M165x2	650

Table 10: <continued>

Benennung/Name	Orifice/DN d0 or Size	Druckstufe/ Pressure Class	Gewinde größe Thread size	Anzugs-moment Torque [Nm]
Type 441/442 Sitzbuchse/Full nozzle				
DN25	d023	all	M36x1,5	95
DN40	d029+37	all	M48x1,5 M52x1,5	95
DN50	d046	all	M64x1,5	115
3"	d060	all	M85x1,5	115
DN80	d060	all	M100x2	300
DN100	d092	all	M120x2	450
Type 437/438/439 Eintrittskörper/Inlet body				
d06+10		all	M30x1,5	90
Type 459/462 Eintrittskörper/Inlet body				
d06+9,13 und 17,5	all	all	M33x1,5	100
Type 459/462 Gehäuse/Federhaube Outlet body/Bonnet/ Spacer				
d06+9,13 und 17,5	all	all	M64x1,5	250
Type 431/433 PN160				
Klemmring/Sitzbuchse Clamp/nozzle	d012	all	M33x1,5	100

11 Torques for sealing plate disks (valve types 441/433/526)

Sealing plate disks of valve types 441/433/526 had been modified in project Vendi 95 (ECO 200295) and therefore the torques in Table 11 for the fixing nuts are valid.

Table 11: Torques for sealing plate disks 441/433/526

Thread Size Fixing Nut	Torque [Nm]
M5	4
M8	15
M12	43
M16	70

12 Type 447: Torques for bolt/nut connections

Table 12 lists the torques, which have to be applied for correct mounting of the following bolt/nut connections:

- between inlet nozzle and outlet body
- between bonnet und outlet body

The following Figure 4 shows these bolt/nut connections using the example of 447 DN25.

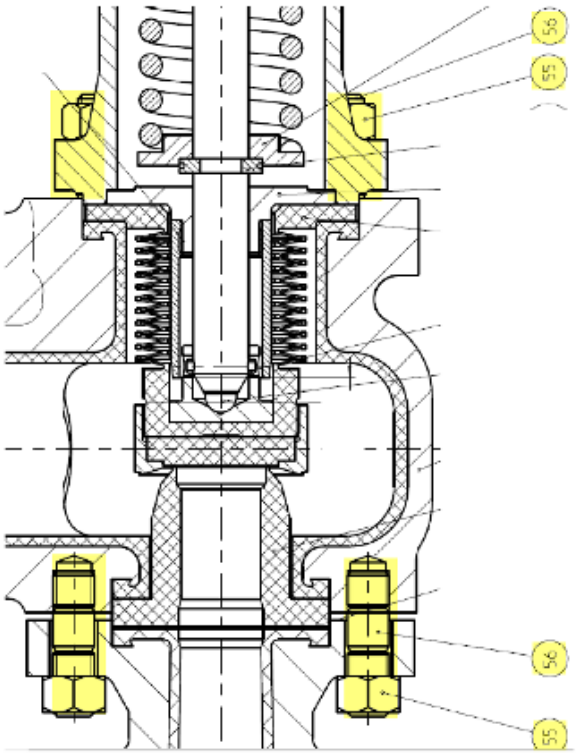

Figure 4: Bolt/nut connections of Type 447 to be mounted with tightening torques, illustrated using the example of nominal size 447 DN25

The bolt/nut connections have to be tightened **crosswise** in **three steps**. By using a step wise tightening process an even pressing of the PTFE lining over the circumference is ensured.

After the third step a minimum waiting time of 15 min has to be followed, in order to be able to take into account the loss of prestress of the bolt/nut connection due to the flow of the PTFE lining (step 4).

Then, in a 5th step, retighten the bolt/nut connections to the specified tightening torque.

The tightening torques specified in Table 12 are based on practical experience values where the tightness to the outside is guaranteed and no impermissible flow of the PTFE lining is caused.

Table 12: Stepwise tightening incl. tightening torques for bolts and nuts for Type 447

Screw material/strength class	Step	Torque bonnet	
		M12	M16
all	1	5 Nm or less	5 Nm or less
	2	20 Nm	30 Nm
	3	32 Nm	60 Nm
	4	Waiting time: ≥ 15 minutes	
	5	32 Nm	60 Nm

Screw material/strength class	Step	Torque Inlet-Outlet housing Screw Size	
		M12	M16
all	1	5 Nm or less	5 Nm or less
	2	20 Nm	30 Nm
	3	40 Nm	60 Nm
	4	Waiting time: ≥ 15 minutes	
	5	40 Nm	60 Nm

13 Tightening torques injector assembly Type 441 DN250, DN300, DN400

The following assembly conditions, lubrication conditions and tightening torques must be applied when assembling the injector of the Type 441 DN250, DN300 and DN400.

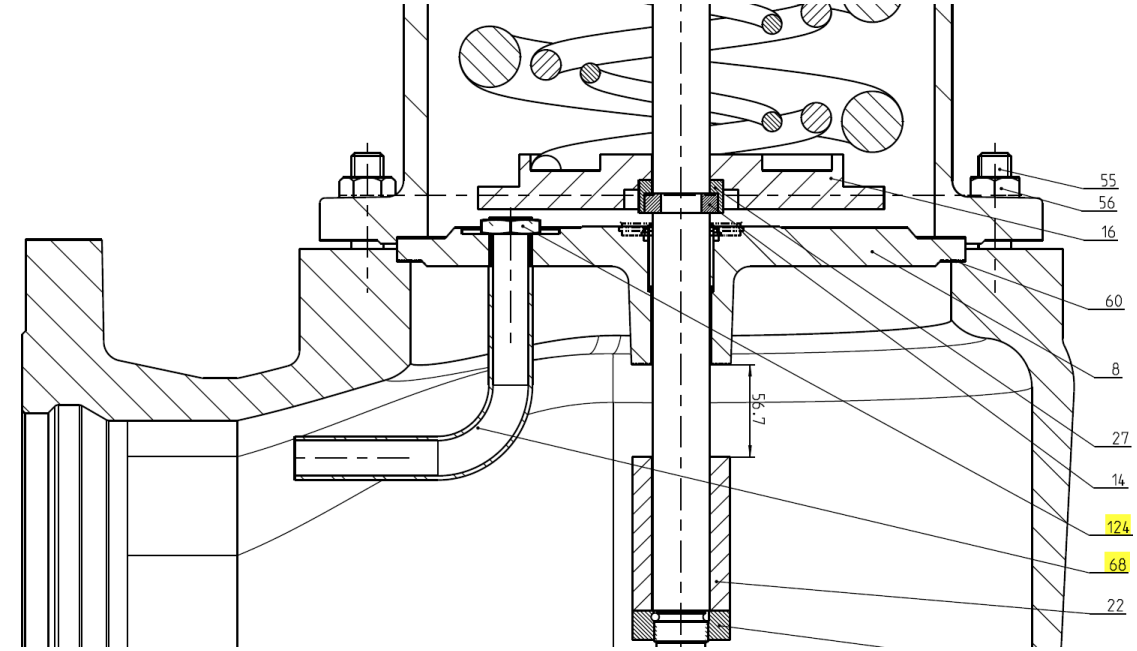

Figure 5:Overview of positioning of injector tube (68) and locknut (124)

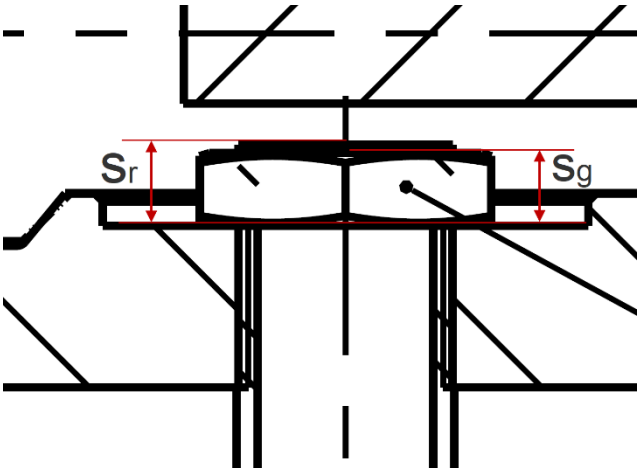

Figure 6: Overhang of tube over guide in end position

Table 13: Overhang of tube in end position and locknut

valve size / d0	tube – overhang sr	locknut - overhang sg
DN250 x DN350 / d0 200	10 mm	8 mm
DN300 x DN400 / d0 235	14,8 mm	9,5 mm
DN400 x DN500 / d0 295	14,8 mm	9,5 mm

Table 14: Assembly/lubrication injector tube

Pos	valve size / d0	assembly specification	lubrication condition
68	DN250 x DN350 / d0 200 DN300 x DN400 / d0 235 DN400 x DN500 / d0 295	1. screwing in until end position is reached in thread 2. then turn back until injector is in alignment with outlet axis 3. pipe must be able to be placed in **orientation device**	thread lubricated

Table 15: Assembly/Lubrication Locknut

Pos	valve size / d0	tightening torque locknut	wrench size	lubrication condition
124	DN250 x DN350 / d0 200	60 Nm	AF/SW 36	- thread lubricated - nut contact area non-lubricated
	DN300 x DN400 / d0 235	95 Nm	AF/SW 41	
	DN400 x DN500 / d0 295	150 Nm	AF/SW 50	

After tightening the locknut to the specified torque, the locknut must be prevented from loosening by 2 points in the thread using a center punch (approx. 90° offset to each other).

Figure 7: Securing locknut using a center punch