

Pre-Loading of high-strength structural bolts

Complete sets are only to be used. Hot dip galvanized nuts supplied by us are treated and ready for assembly (coated with molykote). An additional lubrication of screws, nuts or washers is not permissible, since it alters the preload values and leads to failures in assembly. The preload is generally applied by tightening the nut. For this purpose, torque wrenches, impact screwdrivers or similar devices may be used.

Tightening via the bolt head requires a free turning shank, so that no additional frictional resistance is developed.

Torque wrench

When tightening with a torque wrench, the necessary pre-loading force is provided by applying a measured torque.

The wrench used must be properly adjustable or allow a reliable reading of the required torque.

The maximum discrepancy allowed for adjusting and reading should be +0.1 Ma. Testing is to be done before the torque wrench is used and also during use at least every six months.

Impact screwdriver

When tightening with impact screwdrivers the necessary preload force is provided by impulses. The screwdriver is to be adjusted to the prescribed preload by tests with suitable equipment (e.g. tensometer) on at least three screws intended for use in the assembly.

Angle of rotation

Pre-loading the screws by the angle of rotation method is done by an alignment ("snug") tightening and then adding a further rotation through the angle ϕ .

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TECHNICAL INFORMATION and DATA

Bolt diameter	Necessary preload P _v in the bolt	Method of tightening							
		Torque wrench		Impact Screwdriver	Angle of rotation method				
		Tightening torque M _a to be applied		Preload P _v to be applied	Necessary alignment torque	Clamping range	Angle of rotation	Rotation	
	Bolt lubricated with MoS ₂ (hot dip galvanized)	Bolt slightly oiled	1)	M _{av} 1)	l _k	Φ 1)	U 1)		
	kN	Nm ²⁾	Nm	kN	Nm	mm			
M 12	50	100	120	60	10	M 12 to M 36	0–50	180°	1/2
M 16	100	250	350	110	50				
M 20	160	450	600	175	100		51–100	240°	4/6
M 22	190	650	900	210					
M 24	220	800	1100	240	200		101–240	270° ³⁾	3/4 ³⁾
M 27	290	1250	1650	320					
M 30	350	1650	2200	390					
M 36	510	2850	3800	560					

1) Independent of lubrication of the thread or the surfaces of nut and bolt.

2) For tightening from the head, please ask for data.

3) For bolts M 12–M 22 with clamping range of 171–240 mm, an angle of rotation = 360° or U = 1 is to be applied.

Important: Tightening torques for hot dip galvanized bolts differ from those for plain. See table above.