Instructions for dimensioning of screw unions

To choose the right method of assembly is very important within jointing techniques. The choice of method directly influences the screw dimension that is needed, and is therefore an important parameter in the screw union calculation. In addition to the method of assembly, variations in for example the factors mentioned below influence the bias variation in a screw union.

- Machine spread (variations in the equipment).
- Operator error (managerial or reading error).
- Pulling speed.
- Coefficients of friction.
- Screw resistance.
- Geometrics.
- Surface finish.
- Flatness.

The most common method of assembly for screw unions is moment assembly. The screw is appropriately pulled to a determined priming speed grade; it should be situated within the screw's elastic area. In the elastic area there is no risk for any permanent extension of the screw.
In the following section there is a complement to earlier sections about tightening torque, priming speed grade and friction etc. that can be found on page 301 and after.

Contact surfaces friction

It is important to divide the fasteners friction. If the friction of the contact surface is decreased with 10%, the essential clamp power is increased by 10%.

In the table mentioned below you can find the guideline values for contact surface friction for some commonly occurring material combinations.

Table 231 Guideline values for the smallest contact surface friction for common material combinations

Material	Minimum contact surface friction
Steel - Steel	0,10
Steel - Lacquered surface	0,10
Cast iron - Cast iron	0,15
Cast iron - Steel	0,15
Aluminium - Aluminium	0,18
Aluminium - Steel	0,15
Aluminium - Lacquered surface	0,10
Lacquered surface - Lacquered surface	0,08

Surface pressure

When assembling a screw union it is important that the clamped parts' allowed surface pressure is not exceeded. If the value is exceeded it can cause subsidence in the union or, in the worst case, lead to a breakdown of in-bound material.
In the table below we show the allowed surface pressure for washers and some common materials.

The surface pressure is calculated according to the following:
Surface pressure $P_h = \frac{4F}{\pi(d_w^2 - d_h^2)}$

d_h = Bore diameter
d_w = The fasteners external contact diameter against the bedding
F = Power

Table 232 Maximum surface pressure for washers and material

Washer/ Material	Tensile strength	Maximum surface pressure (N/mm²)
Washer HB 100		450
Washer HB 200		950
Washer HB 300		1450
Structural steel SS-1330	370	260
Structural steel SS-1672	800	700
Structural steel St 37-2	340	490
Low-alloy steel for heat treatment Cq 45	700	630
Low-alloy steel for heat treatment SS-2173	1000	900
Toughened steel SS-2244	100	850
Sintered steel SINT - D30	510	450
Stainless steel A2 SS-2333 (AISI 304)	500	630
Stainless steel A4 SS-2347, 2348 (AISI 316, 316L)	510	460
Cast iron, grey cast iron GG-25	250	900
Cast iron, nodular iron GGG-50	500	900
Die-cast aluminium GD-AlSi9Cu3	240	290

When calculating a screw's quality consideration should be taken so that the chosen screw does not give higher surface pressure than the material allows.

Table 233 Maximum surface pressure if the screw is loaded to yield point in tension

Dimension	8.8 (N/mm²)	10.9 (N/mm²)	12.9 (N/mm²)
M5	275	390	465
M6	290	410	490
M8	340	475	570
M10	350	495	590
M12	535	755	905
M14	510	720	860
M16	505	715	855
M20	480	675	810
M22	480	675	810
M24	460	650	780
M27	535	755	905
M30	475	670	800
M33	470	665	795
M36	475	670	800