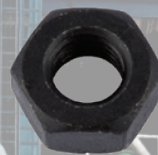


A large industrial distillation column with multiple levels of platforms and ladders, set against a clear blue sky. In the background, other industrial structures and steam are visible. In the foreground, a blurred image of a worker wearing a white hard hat and an orange safety vest is partially visible on the left side.

PRESSURE EQUIPMENT FASTENERS



What is the Pressure Equipment Directive PED?

Pressure Equipment Directive (PED) refers to the EU Directive 2014/68/EU. Originally, it entered into force in 1999 already under the identifier 97/23/EC. In the industry, "pressure equipment" means, for example, piping or safety accessories and various kinds of actuators (valves, flow meters etc.).



been approved in a Member State, it may also be marketed in the other Member States. However, the main goal of the legislation is to ensure that pressure equipment does not cause risks to anyone's health, safety or property when properly installed, used and maintained.



The PED specifies the essential safety requirements applicable to the design, manufacture and conformity assessment of pressure equipment subject to a maximum allowable pressure (PS) greater than 0.5 bar.

The Pressure Equipment Directive is a legal act, not a recommendation. One of its goals was to remove the technical barriers to trade within the European Economic Area, meaning that once a piece of pressure equipment has

"Pressure equipment" means, for example, vessels, piping, safety accessories and various kinds of actuators (valves, flow meters etc.).

Normal fasteners cannot be used in the manufacture of pressure-bearing bolted joints in such equipment.

The requirements of the Pressure Equipment Directive can be met through various procedures, national standards (such as the German AD2000) or other regulations and additional requirements (such as ASME/ASTM in North America). Several pan-European, harmonised EN standards have been created for pressure equipment, however, that are the most straightforward way to meet the requirements of the PED. Requirements applicable to attachments used in pressure equipment are specified in the following standards, among others:

- ⬢ SFS-EN 1515-4: 2010. Flanges and their joints. Bolting. Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 97/23/EC
- ⬢ SFS-EN 10269:en: 2013. Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties.
- ⬢ SFS-EN 13445-2:2014 + A1:2016:en. Unfired pressure vessels. Part 2: Materials
- ⬢ SFS-EN 13480-2:2013 + A1:2013 + A2:2016:en. Metallic industrial piping. Part 2: Materials

Suitable pressure equipment fasteners

PED fasteners are very different from “normal standard bolts”. They must be tough and strong enough: the minimum required elongation after rupture is $A \geq 14\%$ and the minimum required impact strength is 27 J tested at the lowest operating temperature. Likewise, the steel used in the manufacture of the fastener must meet the requirements applicable to materials as specified in the standards.

The manufacturer must hold a PED certification issued by an accredited European inspection body. The conformity of the products is demonstrated by means of an inspection certificate in accordance with EN 10204 3.1, and they must be traceable throughout the supply chain.



Material 25CrMo4 (1.7218)

Partial thread hexagonal screws ISO 4014 and hexagonal nuts ISO 4032 made of 25CrMo4 in European factories are the core of Ferrometal's PED fasteners. If necessary, ISO 7089 standard washers can be used in the connections. Tempering steel 25CrMo4 exceeds all the PED material requirements. It's a very versatile steel that can be used for all pressure categories and at temperatures ranging from -60 to +500°C. This material can be used instead of many traditional steel grades.



25CrMo4 replaces the previous property class 5.6. It offers better strength properties and a wider operational temperature range. In addition, 25CrMo4 meets the requirements of EN 10269. 25CrMo4 is also more versatile than C35E in nuts, for example.

Torque guideline values for fasteners made of 25CrMo4:

| Torques and prestress forces for hexagonal screws and nuts made of 25CrMo4+QT $R_m \geq 600 \text{ MPa}$, $R_{p0.2} \geq 440 \text{ MPa}$ | | | | | | | |
|---|---------|--|-------|-------|--|---------|---------|
| M thread | Pitch P | Maximum prestress force (kN) at different friction coefficients | | | Maximum allowable torque (Nm) (usage 90% of the yield strength) | | |
| | | 0.10 | 0.12 | 0.14 | 0.10 | 0.12 | 0.14 |
| M12 | 1.75 | 30.1 | 29.4 | 28.6 | 49.8 | 56.7 | 63.0 |
| M16 | 2.0 | 56.6 | 55.3 | 53.9 | 122.0 | 139.3 | 155.5 |
| M20 | 2.5 | 88.6 | 86.5 | 84.2 | 239.1 | 273.2 | 304.9 |
| M24 | 3.0 | 127.6 | 124.5 | 121.3 | 412.0 | 470.8 | 525.4 |
| M27 | 3.0 | 167.3 | 163.5 | 159.3 | 606.1 | 694.9 | 777.7 |
| M30 | 3.5 | 203.7 | 198.9 | 193.9 | 825.0 | 944.7 | 1,056.2 |
| M33 | 3.5 | 253.3 | 247.5 | 241.3 | 1,112.6 | 1,277.0 | 1,430.4 |
| M36 | 4.0 | 297.6 | 290.7 | 283.4 | 1,433.1 | 1,642.9 | 1,838.5 |

Ferrometal's stock products

The procurement of industrial PED fasteners has typically required long delivery times due to project-type operations. Fasteners that used to be difficult to procure are now available from stock for the first time!

| | Hexagonal screws ISO 4014 25CrMo4 + hexagonal nuts ISO 4032 25CrMo4 | | | | | | |
|-----|--|-----|-----|-----|-----|-----|-----|
| | M12 | M16 | M20 | M24 | M27 | M30 | M36 |
| 50 | ● | | | | | | |
| 55 | ● | | | | | | |
| 60 | ● | ● | | | | | |
| 65 | ● | ● | | | | | |
| 70 | ● | ● | | | | | |
| 75 | ● | ● | ● | | | | |
| 80 | ● | ● | ● | | | | |
| 85 | ● | ● | ● | ● | | | |
| 90 | ● | ● | ● | ● | | | |
| 95 | | ● | ● | ● | | | |
| 100 | ● | ● | ● | ● | ● | | |
| 110 | ● | ● | ● | ● | ● | ● | ● |
| 120 | ● | ● | ● | ● | ● | ● | ● |
| 130 | | ● | ● | ● | ● | ● | |
| 140 | ● | ● | ● | ● | ● | ● | ● |
| 150 | ● | ● | ● | ● | ● | ● | ● |
| 160 | ● | ● | ● | ● | ● | ● | ● |
| 170 | | | ● | ● | ● | ● | ● |
| 180 | | ● | ● | ● | ● | ● | ● |
| 190 | | | ● | ● | ● | ● | |
| 200 | | ● | ● | ● | ● | ● | ● |
| 210 | | | ● | ● | | ● | |
| 220 | | | ● | ● | ● | ● | ● |
| 230 | | | ● | ● | ● | ● | |
| 240 | | | ● | ● | ● | ● | ● |
| 250 | | | ● | | | ● | |
| 260 | | | ● | ● | ● | ● | ● |
| 280 | | | ● | ● | ● | ● | |
| 300 | | | | ● | | ● | ● |
| 320 | | | | | | ● | |



● = time of delivery 2–3 weeks

| Threaded rods and nuts made of 42CrMo4 (ASTM A320-L7) further supplement Ferrometal's PED attachment stock. Threaded rods are also available as studs cut to length *). | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|
| Threaded rod DIN 976-B 42CrMo4/ASTM A320-L7 + hexagonal nuts | | | | | | | | |
| | M12 | M16 | M20 | M24 | M27 | M30 | M33 | M36 |
| Length 2,600 mm *) | ● | ● | ● | ● | ● | ● | ● | ● |

Ferrometal Oy – Finland

Karhutie 9
01900 NURMIJÄRVI

Tel. +358 10 308 11
myynti@ferrometal.fi

Ferrometal – Estonia

Laki 14 A
11621 Tallinn

Tel. +372 6990 470
eesti@ferrometal.fi

Ferrometal – Latvia

Ganību dambis 17a, Office No: 308
1045 Riga

Tel. +371 2666 5158
latvia@ferrometal.fi