



Reactor Vessel Head Tensioning System

TENSOR design and manufacture complete bolt tensioning systems including digitally controlled pump units with multiple redundancies. Tensor's bolt tensioning system is designed to in a simple way, using the highest technology, preload a bolted joint to the chosen preload level.

Briefly, the system consists of 6 basic elements:

BOLT TENSIONERS

Steel in high tensile qualities.

High force, low weight and easy to use

CONSOLE UNIT

Easy manouvering, just two levers and a switch.
Overview with stroke indicators for each tensioner

Quick relief of pressure 1000 bar down to 0 from up to 6 bolt tensioner in less than 5 seconds

Measuring instrument for measuring the pressure consists of:

Programmable electronic display with stop function.

Pressure sensor / gauge with high precision.

A chart recorder to register pressure / time.

MANIFOLD UNIT

Hydraulic pressure gauges.

PUMP UNIT

The pump unit is operated by a separate pressure sensor, a PLC controls and stops the pumps.

The pump unit consists of 3-5 high capacity pumps, all running with the high pressure pump at 100 % speed:

The system has multiple redundancy features

The high pressure pump stops at 1000 bars

The high pressure pumps can be runned at 100%, or separately 75%, 50%, 25% capacity and will stop pumping in +/- 1 Bar from the requested pressure by the electronic display.

The pump unit uses a wateryglycol mixture, non flammable, a leakage can be handled as water.

HOIST, OPTION

A quick hoist over each bolt tensioner.



Bolt tensioner system

The ideal sequence looks as follows:

	Pro- mised	Achie- vable
1. Lowering the bolt tensioner, engage nut and stud.	60	40
2. Threading down the puller sleeve	50	25
3. Pressurizing, > 1000 Bars	30	20
4. Relief of pressure.	10	5
5. Threading up the puller sleeve	30	20
6. Lifting bolt tensioner	40	20
7. Moving bolt tensioner to the next stud.	110	50
Time (seconds) per sequence:	300	180

Benefits

- Compact design reduces the tensioner weight
- Promotes worker safety and easy handling
- Reduced equipment set-up/removal time
- Less weight is added to the carousel
- Minimal tooling maintenance requirements
- Fail-safe design with built-in redundancies and alternative operation modes
- Flexible pump and console positioning to enable location in the low-dose area
- Less than 30 seconds pressurization time, adapted to customer requirements