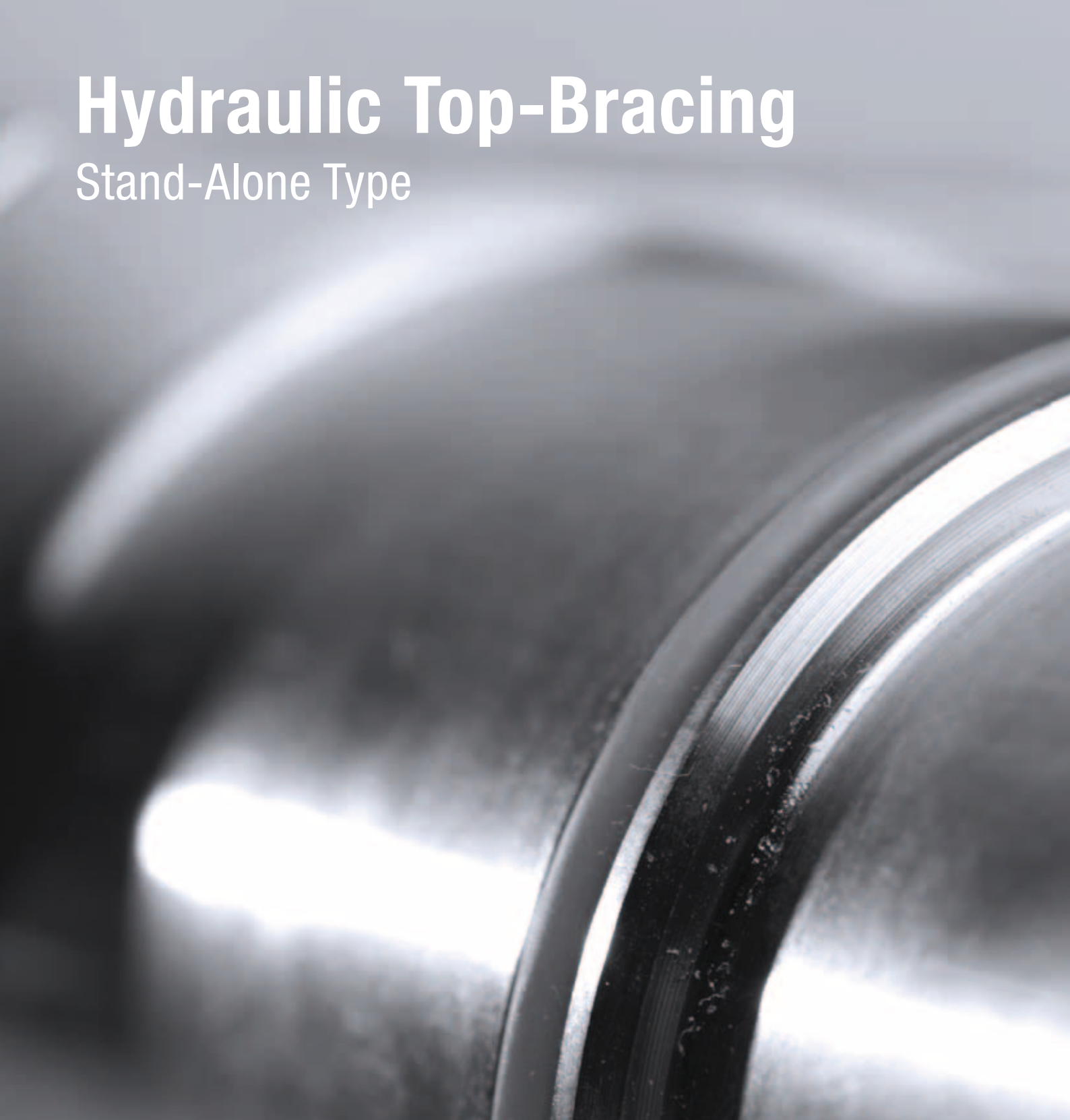


Hydraulic Top-Bracing

Stand-Alone Type

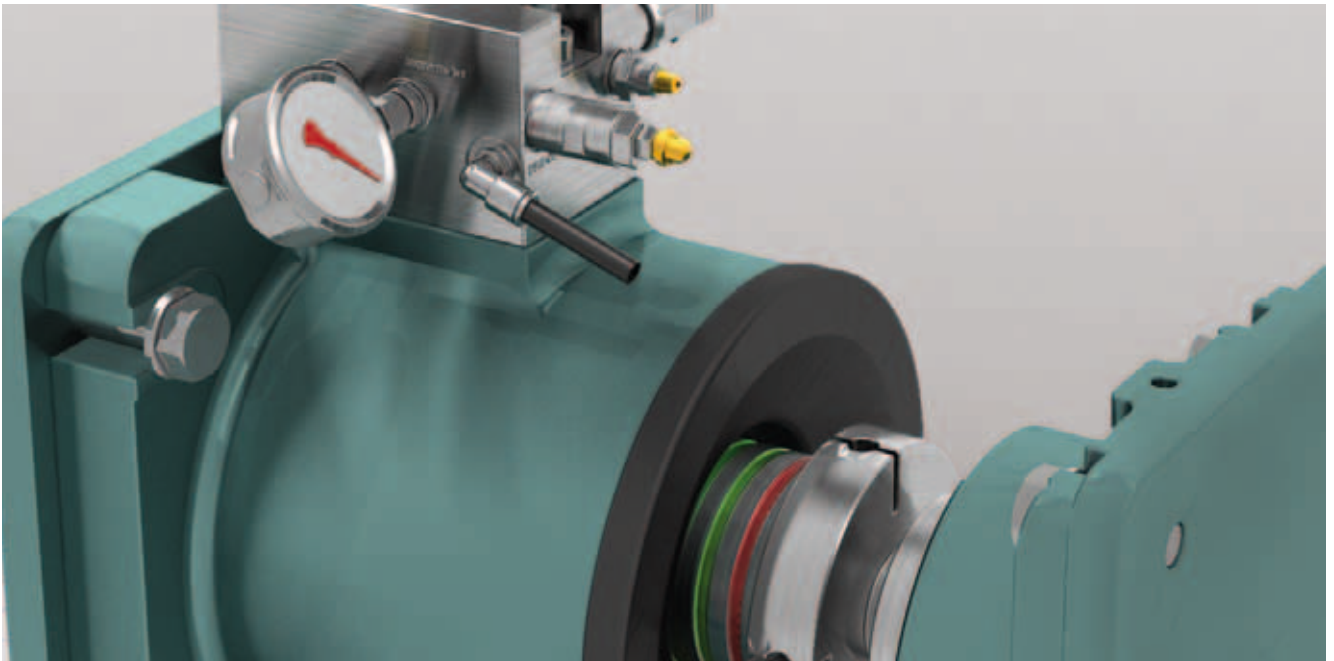


MAN Diesel



Hydraulic Top-bracing – Stand-Alone Type

MAN Diesel has developed a new and simplified hydraulic top-bracing that has successfully passed full-scale testing and is now available generally.



Working principle

The new top-bracing consists of a single-acting hydraulic cylinder and a hydraulic control-unit mounted directly on the cylinder housing. The top-bracing is self-adjusting, using the vibration energy emitted by the engine. When the engine is running, the unit builds up a pressure in proportion to the vibration level; this detunes the engine's natural frequencies and accordingly lowers the impact of the vibrations. When the engine is at standstill, the pressure is then released. The top-bracing's working principle is illustrated here in figures 1 and 2.

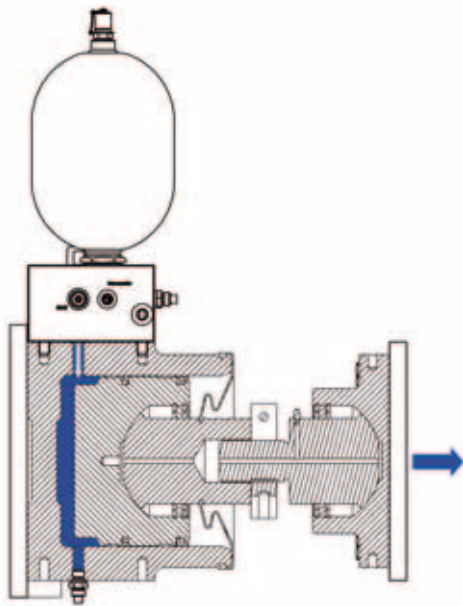


Figure 1: When the distance between the hull and engine increases, oil flows into the cylinder under pressure from the accumulator

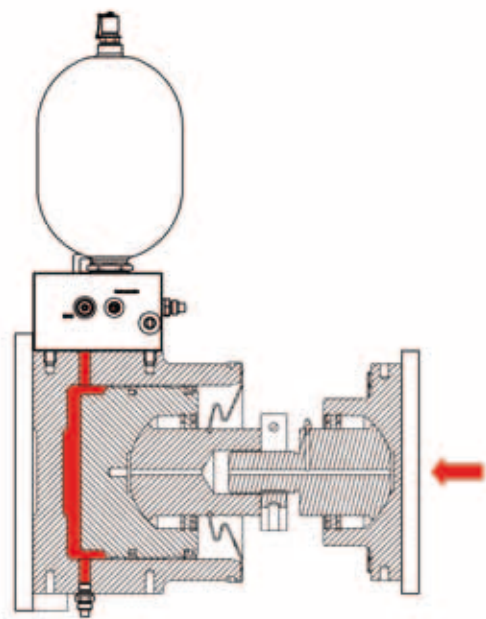


Figure 2: When the distance between the hull and engine decreases, a non-return valve prevents the oil from flowing back to the accumulator and the pressure rises.

If the pressure reaches a preset maximum value, a relief valve allows the oil to flow back to the accumulator, maintaining the force on the engine and hull structures below the specified level

Simplified design

Compared to traditional, hydraulic top-bracings, the new top-bracing has been simplified in several ways.

One of the most significant of these has been to change the hydraulic system. The pump station, the pipe system and the hydraulic equipment have been replaced by a simple, hydraulic control-unit, mounted directly on the cylinder unit, as shown in figure 3.

As there are no electrically driven pumps, there is no need for a power supply. The electrical system is accordingly minimal and just required to control the system.

Furthermore, changes to the cylinder unit mean that the dimensions, weight and number of parts have all been reduced.

The top-bracing units are delivered in a low-pressure version for small-bore engines, and a high-pressure version for large-bore engines. Unlike traditional, hydraulic top-bracings, which are produced in two quite different versions, there are no physical differences between the low-pressure and high-pressure versions except for a different relief-valve setting.

Although there are several differences between the new and older versions, the way the top-bracing units are arranged, including the number of cylinder units and built-in length, remain unchanged. Replacement of an old-style top-bracing with a new is thus straightforward and requires no additional changes.

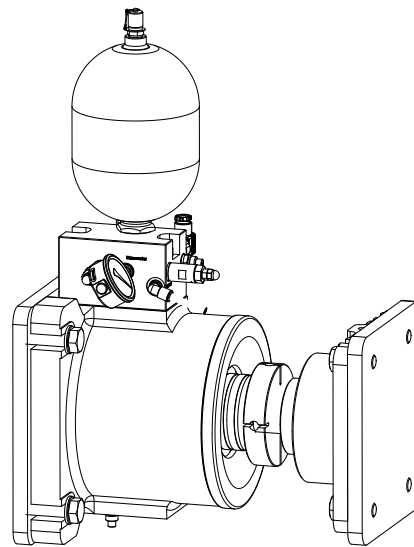


Figure 3: The cylinder unit and hydraulic unit are integrated as one

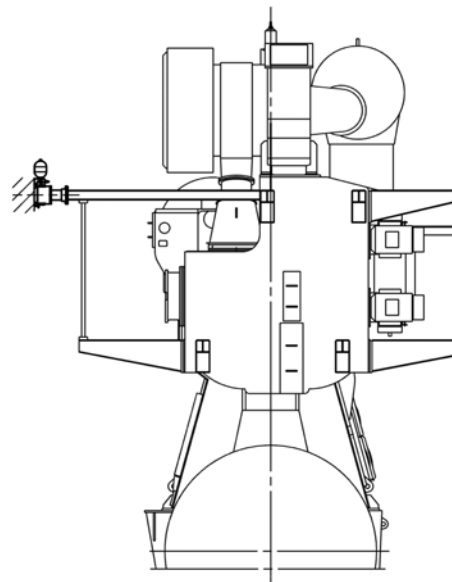


Figure 4: The top-bracing arrangement is unchanged

Installation

With the elimination of the pump station and connecting pipes, labour and installation costs are significantly reduced, and the space occupied by the pump station freed up.

Special tools have been developed to facilitate installation of the top-bracing. The plates on which the units are mounted are kept in the correct positions by a supporting fixture, shown in figure 5, until the plates have been welded to the structure. Additionally, the handling and installation of the cylinder unit are eased by a lifting tool, shown in figure 6, that also serves as transport bracket.

Slotted holes in the unit flanges and an adjustment screw between the two parts allow for easy adjustment of the installation. Vertical adjustment is performed on the engine part, and horizontal adjustment on the hull part with the distance in-between manipulated using the adjustment screw.

The oil accumulator and hydraulic control unit can be placed either above or beneath the cylinder unit, giving extra flexibility. Figure 7 shows an installation using both alternatives.

Operation

The top-bracing is automatically controlled by the RPM signal from the propulsion control-system. The system is active as standard when the engine is running, but a programmable switch makes it possible to choose an RPM range within which the top-bracing system is active. For service purposes, manual control is also possible.

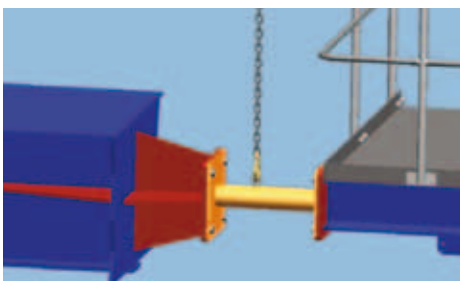


Figure 5: Supporting fixture for mounting flanges

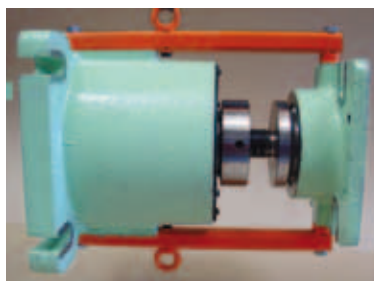


Figure 6: Lifting tool mounted on the cylinder unit

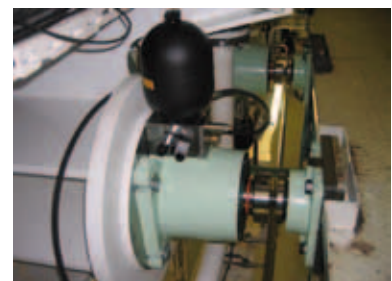


Figure 7: A set of hydraulic top-bracings

Maintenance

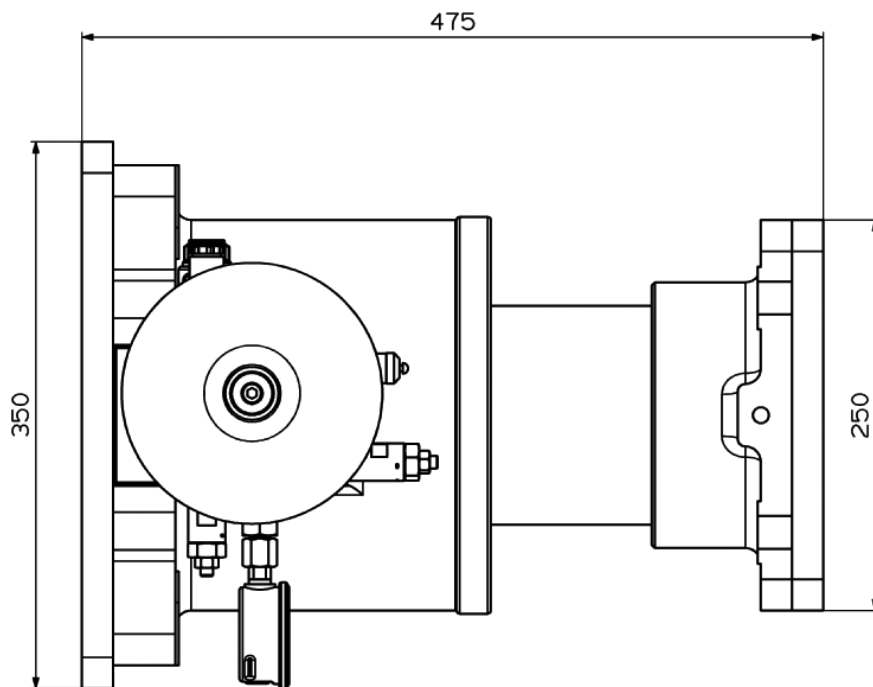
Maintenance of the top-bracing system is reduced to a minimum with the simplification of the hydraulic system.

The hydraulic pressure in each top-bracing unit is monitored by a transmitter connected to an alarm system. If the pressure drops below the preset level, the unit must be checked for deficiencies and appropriate measures, such as replacing the sealing rings, taken.

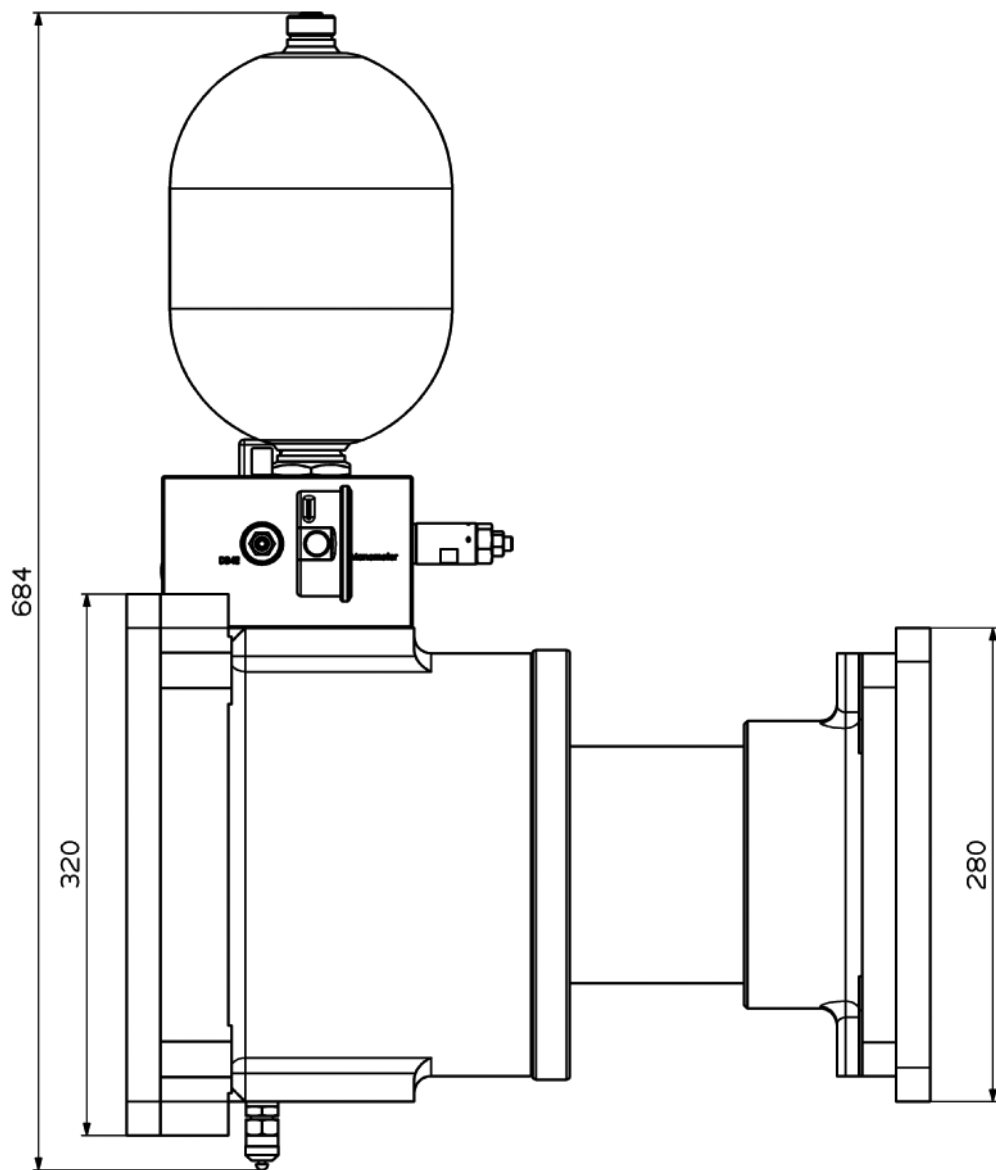
Various vessel loading-conditions can potentially lead to a misalignment of the top-bracings. A green and a red band between the two parts of the bracing indicate whether adjustments are necessary.

Specifications

Cylinder diameter	200 mm
Built-in length	475 mm
Weight	130 kg
Nominal force (7 bar)	22 kN
Max. force, low-pressure version (26 bar)	82 kN
Max. force, high-pressure version (40 bar)	126 kN



Hydraulic Top Bracing, Top View



Hydraulic Top Bracing, side View

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