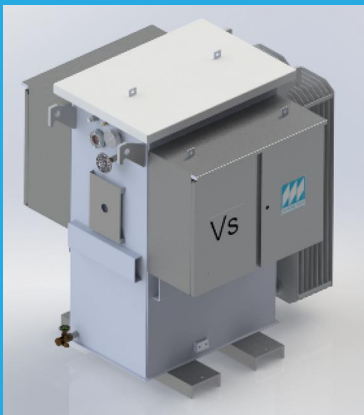


### General Information:

Due to the multiple benefits generated by the use of variable speed drives (VSD1) in electrical oil-submersible pumping systems (ESP2), its use has become widespread in production fields that handle high volumes of fluids. The use of the VSD generates some drawbacks when connected to the electric power network, because it contains static power converters, which produce non-linear loads affecting the natural sine waveform of alternating current by introducing harmonic currents to the electrical grids, which can cause interference in the communication circuits and problems in the equipment installed in the aforementioned network. In order to attenuate the effect produced by the variable speed drives when connected to the network, special transformers that allow the reduction of the harmonics that are directed to the network have been designed, depending on the number of pulses of the VSD. This harmonic distortion can be attenuated by increasing the number of rectifier sections used in the VSD, for example, a 12 pulse drive contains 2 rectifying sections shifted 30°, an 18 pulse drive contains 3 rectifying sections shifted 20° and a 24 pulse drive contains 4 rectifying sections shifted 15°. Therefore, a greater number of pulses make the firing distance between waves smaller; for this reason the distance between wave peaks is smaller and as a consequence, the harmonic distortion is reduced. It is necessary to consider that increasing the number of pulses also increases the complexity of the system and therefore, the cost of the required equipment rises significantly.



#### **Offer scope:**

These products are manufactured in compliance with applicable NTC, IEC, ANSI standards and/or customer specifications.

#### **Three-phase transformers power:**

Ranging from 260 kW to 1500 kW.

#### **Connection type:**

Delta - ZigZag

### Product description:

The 24 pulse PST Magnetron has been specifically designed to connect the speed drives used in ESP to the electric power distribution grids, based on the extensive knowledge of Magnetron S.A. in the design and manufacturing of transformers and in the technological developments of the main manufacturers of variable speed drives, producing as a result equipment perfectly adapted to the technical and economic needs of the oil industry. The voltage reduction transformer and 24 pulse phase shifter has a primary winding designed to be connected to power supplies with voltages of 34.5 kV, 13.8 kV, 13.2 kV, 4.1 kV, 0.48 kV (Note that the transformer is designed only for a type of supply voltage). It is not switchable from 13.8 kV to 13.2 kV, nor to any of the other options. The secondary windings are four, at 480V each, shifted 15° with each other, for connection to 24 pulse speed drives.

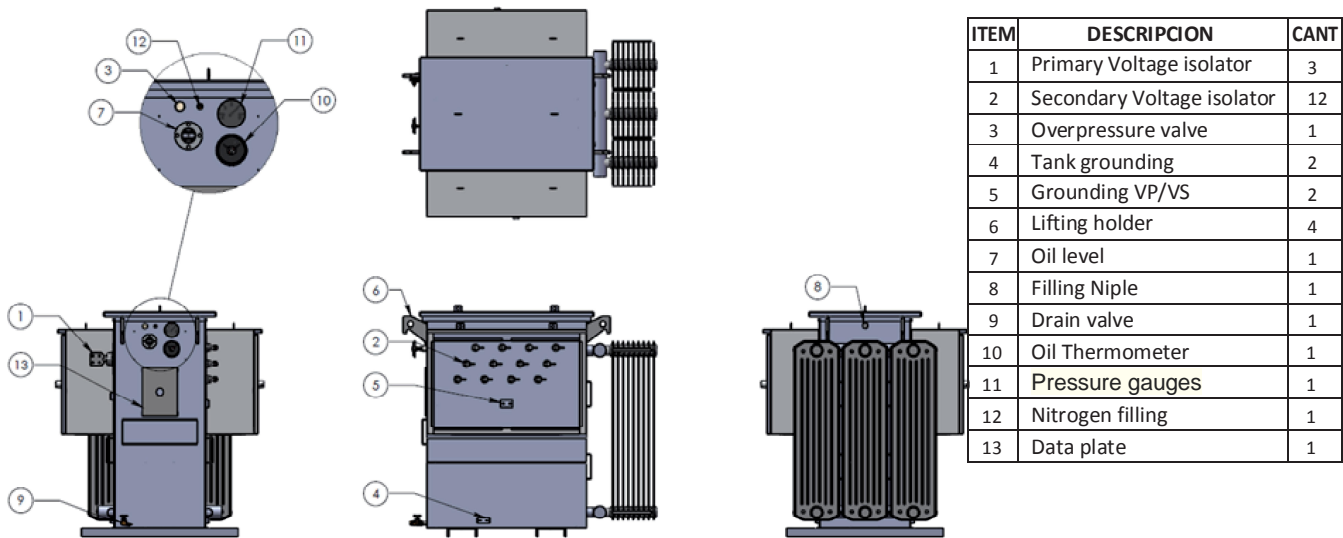
**Special cases:** Transformers with voltages in the primary or secondary windings different to those indicated here can be manufactured, prior requirements check by our engineering team.

The transformers are normally constituted by an active part composed by the core (magnetic circuit), the coil (electric circuit) and the flange, which is defined depending on the type of transformer, in a tank that gives specific characteristics to the equipment according to the use it will be intended for.

**Coils:** rectangular or circular section, in a concentric shape with copper or aluminum windings. Insulations: high quality papers coated with epoxy resins.

**Cores:** Shell type or core type, rolled or stacked, arranged in groups for easy assembly and disassembly without loss of dimensional characteristics, ensuring low levels of loss and exciting currents. Material: silicon steel foil, grain-oriented, cold rolled, insulated on both sides, low losses and high permeability.

**Tanks:** They are rectangular in Cold Rolled and Hot Rolled foil with reinforcements that allow to withstand internal pressures due to temperature increase and mechanical efforts of handling and equipment installation. The three-phase TANKS are provided with a cabinet screwed or welded to the transformer, which serves as protection for the circuits of both Low and Medium Voltage, with mechanical envelope that for safety reasons does not allow to open the compartments without the proper key.



- 1(VSD) Variable Speed Drive.
- 2(ESP) Electrical Submersible Pumps.
- 3(PST) Phase Shift Transformer.
- 4(SDPST) Step Down Phase Shift Transformer.