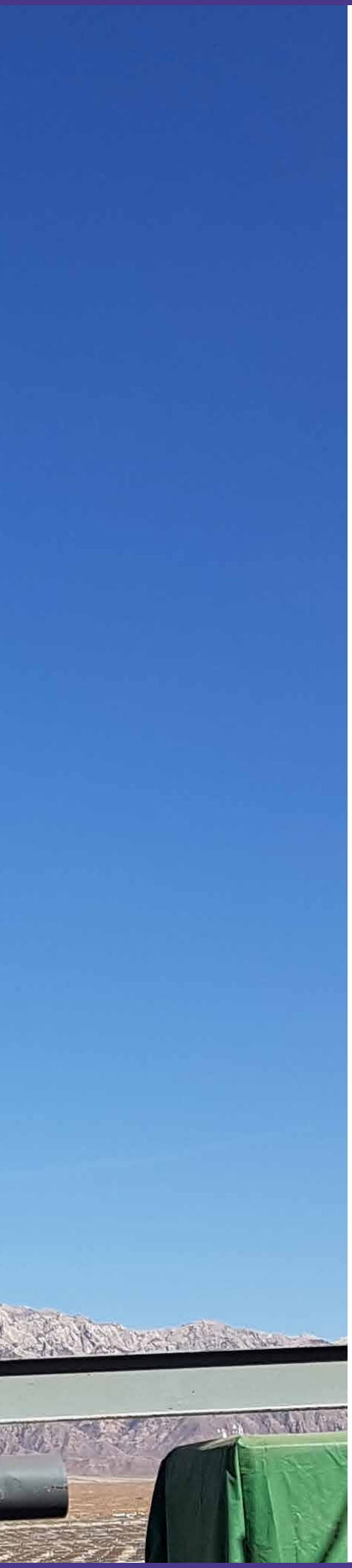
GVSO for

Zhejiang Supcon Solar Technology Co., Ltd.

RHEINHÜTTE PUMPEN

An ITT Brand

Delingha 50MW Solar Thermal Power Generation Project



High-performance pumps

for the operation in solar power plants

The Kyoto agreement in 1997, the climate agreement of Paris 2015, nuclear phase-out:
Climate protection and the need for alternative sources are on the agenda worldwide. The energy industry is increasingly turning to renewable energies.
This also poses new challenges for manufacturers of solar energy systems and requires constant innovation to serve the growing market.
Since the strengthening of the solar energy sector, molten salt is increasingly used as a heat carrier and above all as a heat storage medium.
With the GVSO, ITT Rheinhütte Pumpen GmbH has developed a pump that meets the requirements of solar energy systems that use molten salt as a heat transfer medium or heat storage.

Molten salt in solar power plants

Molten salt is created when salt is heated above its melting point, which - depending on the salt or salt mixture - occurs at temperatures between 150 °C and 600 °C. Eutectic mixtures of alkali and alkaline earth salts are excellent heat transfer media for oil and gas. The reason: molten salt is the only medium that can also be used at temperatures above 400 °C. Even temperatures up to 600 °C do not pose a problem.

The good heat transfer properties, the high temperature tolerance and the low viscosity.
However, the use of molten salt as a heat transfer medium also poses challenges for pump manufacturers, especially due to the high temperatures that the systems and components have to withstand.
Pumping is extremely demanding and requires a great deal of know-how in the design of the pumps.
ITT Rheinhütte Pumpen GmbH from Wiesbaden is a specialist for corrosion and wear-resistant materials and the design of highly stressable pumps.

GVSO for solar power plant in China

Delingha 50MW is the first commercially operating solar thermal power tower in China, and Zhejiang SUPCON Solar Energy Technology has developed modular solar thermal power plant technology for the project. First unveiled at ACHEMA 2015, this further development of the enhanced multi-stage hydraulic design will secure the pioneering position of the GVSO series in high-pressure and high-temperature applications.
The chemical submersible pump is used for pumping aggressive, hot and contaminated media. It is capable of pumping hot molten salt at temperatures of up to 600 °C up to a delivery head of 320 m in solar thermal power towers.

The GVSO for Supcon

Performance data and features in detail

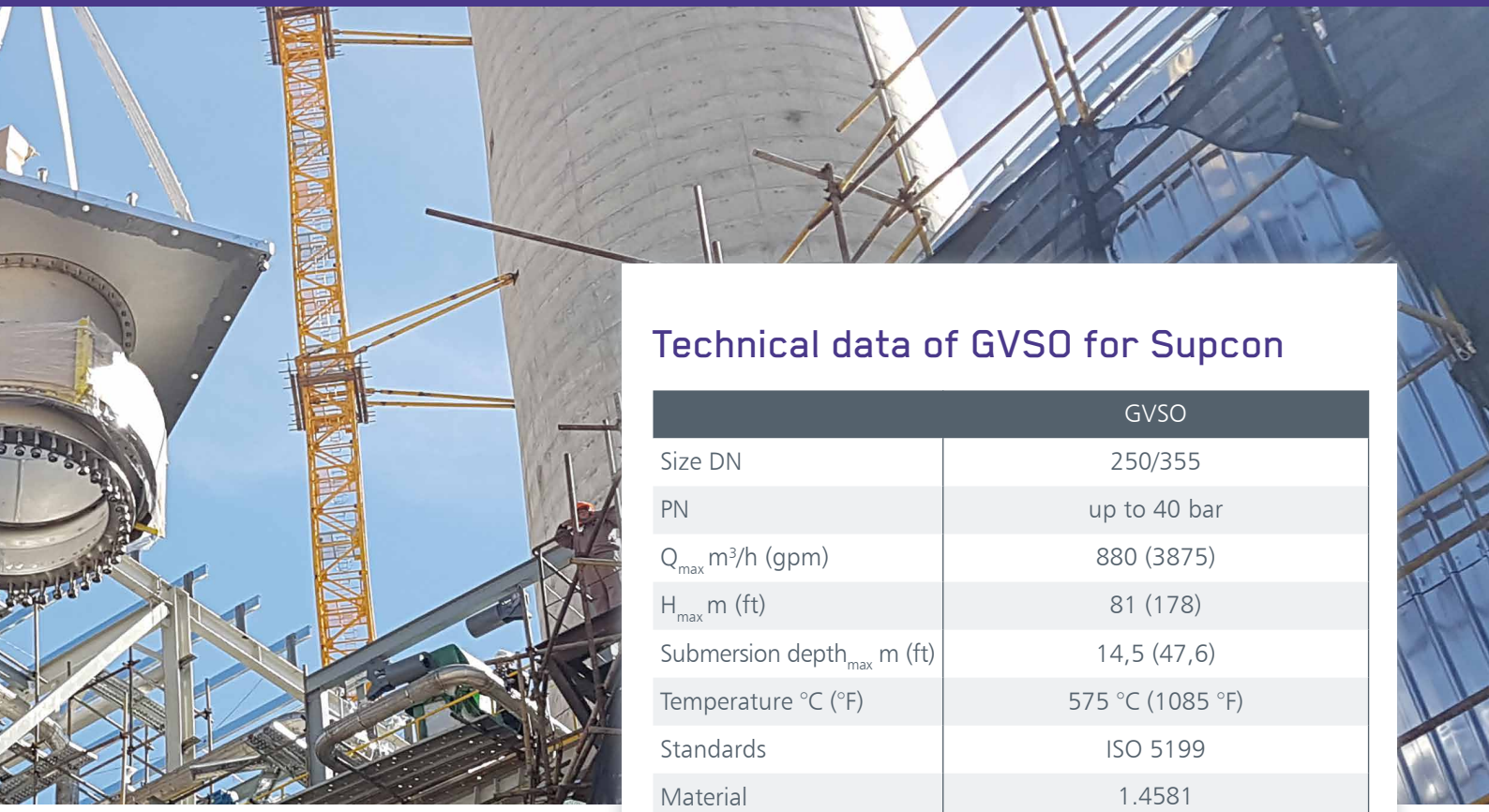
With its special design and innovative details for high-temperature applications, our vertical GVSO has always persuaded users through their long-term availability, corrosion resistance, high reliability and quality.

High Pressure Mulitstage Design

- Segregation of shaft piping and pressure piping - Stability at greater submergence depths
- Medium lubricated, corrosion and abrasion resistant sleeve bearings
- Compact multistage design

Expansion joint system with Sole Plate for installation

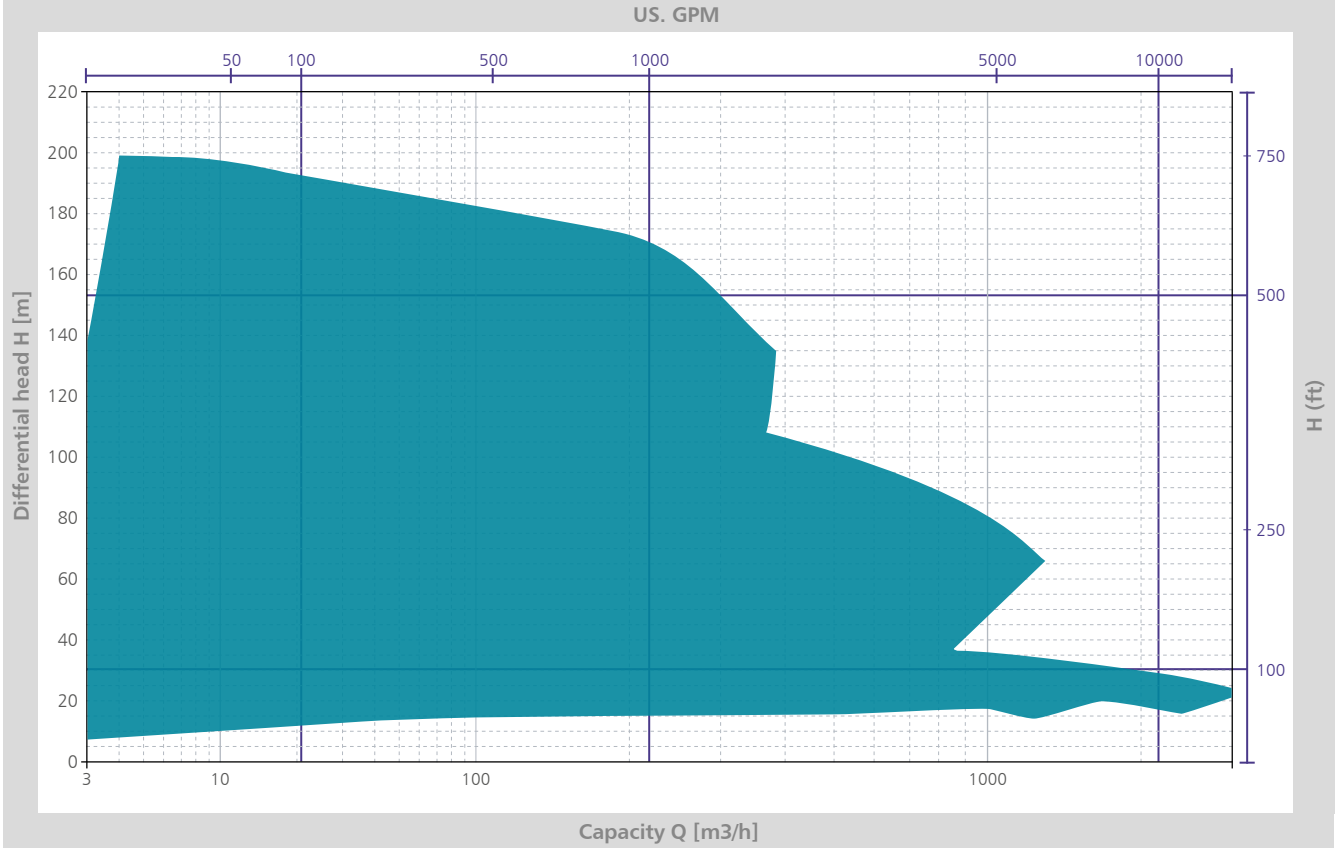
- Sole / Mounting Plates for pump installation can be designed and manufactured in our workshop as per requirements and structure of customers tank / vessel.
- Compensators which have the function to decouple the pump from the tank are optionally available. These compensators ensure, especially at large pumps and high temperatures, that thermal induced movements in lateral or vertical direction will not lead to higher forces and/or moments towards tank / vessel shell.
- The compensator unit is installed once and can remain installed for repairs and maintenance.



Picture: Installation of the GVSO in the solar power plant

Technical data of GVSO for Supcon

	GVSO
Size DN	250/355
PN	up to 40 bar
Q_{max} m³/h (gpm)	880 (3875)
H_{max} m (ft)	81 (178)
Submersion $depth_{max}$ m (ft)	14,5 (47,6)
Temperature °C (°F)	575 °C (1085 °F)
Standards	ISO 5199
Material	1.4581
Seal	Stuffing box packing
Mulitstage Design	2-Stage



SUPCON

From test bench to installation

01 After the design and assembly of the customised GVSO pumps, they were tested on our test bench in Wiesbaden (Germany). At our modern test stand we have the possibility to test pumps with an immersion depth of up to 16 meters. After the successful test run, the machines were disassembled for shipping, professionally packed and shipped.

02 The Delingha 50MW Solar Thermal Power Generation Project is the first solar power demonstration project that officially announced the start of construction after the publication of the solar power subsidy tariff and started in June 2017.

03 After dispatch, the two GVSO pumps reach Delingha. The huge components are transported to the right place with the help of a crane. Service technicians from Rheinhütte travel to China to ensure a qualified installation on site.

04 Rheinhütte Pumpen employees take over the professional installation of the pumps on site. This begins with the volute casing and is then carried out piece by piece towards the mounting plate.

05 After the pumps have been installed, the compensators are mounted and aligned on the tank/steel construction. The alignment is very important for two reasons. Firstly, the compensator can be damaged if it is not in its specified position, as only a certain amount of linear expansion can be compensated for when the tank expands. On the other hand, damage can be caused to the pump's slide bearings if the compensator's support plate lies at an angle on the steel construction, as this also determines the position for the pump.

06 We completed the installation of our pump on the construction site in October 2018. Since then our pumps have been running well on the construction site and the customer is very satisfied with our pumps.

Delingha 50MW CSP-Plant

- One of China's first batch of CSP Demonstration Projects
- Construction started in March 2017, Inaugurated in December 2018, full-load operation in April 2019.
- Designed to displace 121,000 tons of CO2 and save 46,000 tons of coal per year, power more than 80,000 homes

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