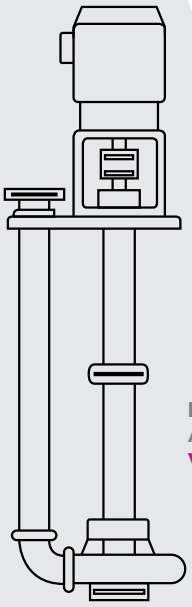
The Rheinhütte Pumpen product range historically originated from applications in the chemical industry. Highly corrosive media requires the use of various materials of construction such as metallic alloys, exotic materials, plastics and ceramics.

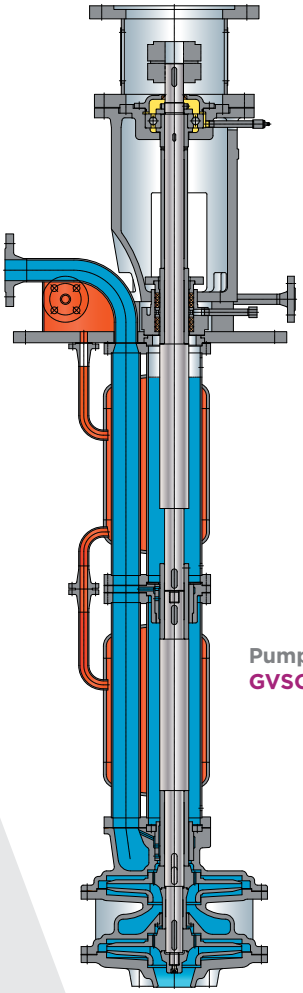
The use of such different materials in conjunction with the nature of corrosive, abrasive or toxic fluids has decisive impact on the design of pumps.

There are few differences between pumps per API 610/ISO 13709 and pumps used in the chemical industry. This standard was issued by the American Petroleum Institute to meet the specific requirements of the petroleum and petrochemical industry such as high system pressures at elevated temperatures while corrosion is not a serious criterion.

The GVSO/GVSN is according to API 610 standards and can be classified as vertically suspended, single-casing, volute, line-shaft-driven sump pumps designated as pump type VS4, except for some small deviations, which are mentioned in this document.



Pump type
API 610
VS 4



Pump type
GVSO/GVSN

RHEINHÜTTE PUMPEN
An ITT Brand

VERTICAL CHEMICAL CENTRIFUGAL PUMP MADE FROM METAL **TYPE GVSO/GVSN**

PUMP TYPE VS 4 ACCORDING TO API 610 11TH EDITION/ISO 13709:2009

THE RIGHT SOLUTION. FOR ANY FLUID.

API 610 11th edition / ISO 13709:2009 Comments

Chapter	Designation	Comments
		6 Basic designs
6.1.14	Sound pressure and sound power level are per octave band	Sound pressure and sound power level is only caused by motor and depending on motor size and type (defined by motor vendor). Octave band requires special measuring equipment and is inside buildings at a test bay and technically not a suitable requirement.
6.1.18	Jackets	Due to construction reasons and safety purposes, heating jackets are not equipped with cleanout connections or drains at all. Therefore vertical arrangements inside tanks can only be supplied with steam heating systems.
6.1.29	Bolting and threads	Internal fasteners and bolting sizes according to DIN/ISO standards only, depending on design requirements.
6.3.3 a)	Pressure casing	Twice nozzle loads of table 5 are not applicable in general, because the pressure casing is not directly connected to the pipe system (submerged arrangement).
6.5	External nozzle forces and moments	Compared to VS4 the GVSO/GVSN is designed with an additional internal discharge bend ("side nozzle") integrated (welded) in the sole plate. The values (not twice) are in accordance to ISO 5199 and very close to API 610/ISO 13709 and sometimes exceeding them.
6.7	Wear rings and running clearances	GVSO/GVSN is not designed using wear rings. The minimum diametral running clearances are always larger than any clearance shown in Table 6.
6.9.3.5	Shaft vibration measurement peak-to-peak	A shaft vibration measurement is not applicable due to construction reasons (protected shaft design). Only ball bearing vibrations (RMS) will be provided.
6.9.4.3	Rotor balancing	Balancing is limited to impeller only. Complete rotor balancing is not applicable technically.
6.10.1.2 ff	Bearings and bearing housings	Bearing design details according to manufacturer standard. Ball bearing lifetimes are calculated with at least 20.000 h life-time for the complete allowable operating range (Qmin/Qmax) at maximum radial and axial loads.
6.11	Lubrication	Only grease lubricated bearings due to grease life greater than 2000 h (≤ 3000 h). Grease lubrication is also approved for VS4 pumps (see chapter 9.3.12.4).
6.12	Materials	Pump materials are not in full compliance with Table H.1. Rheinhütte Pumpen materials in accordance to DIN/ISO with similar or higher standard than API.
6.12.1.12.2	NACE MR0103	NACE MR0175 (also MR0103) not applicable to liquid sulphur applications (no "wet" H_2S service).
		8 Inspection, testing and preparation for shipment*
8.3.4.3	NPSH required test	Not applicable for vertical submerged pumps. Minimum submergence test on request.
		9 Specific pump types
9.3.3.1	Total indicated runout of shafts (TIR)	TIR is 50 µm/m instead of 40 µm/m of length.
9.3.8.1.1	Reverse rotation	Pumps and motor assemblies are not designed with non-reverse ratchets. GVSO may run under reverse rotation for several minutes.
9.3.12.7	Discharge nozzle according to 6.3.3	See 6.3.3 a) and 6.5 comments.

* RHEINHÜTTE Pumpen GmbH has internal procedures for inspection and testing which can be provided.
Performance test is normally done in accordance to ISO 9906 grade 2B.
All other inspection and testing requirements shall be basically discussed regarding use and feasibility.

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