PRODUCT RANGE.

Horizontal pumps
with hydrodynamic shaft seal
up to the dry-running magnetic drive

Vertical pumps
– for dry installations, short design
– for wet installations,
  without bearing in the liquid
– for wet installations,
  with rolling bearing independent of product
– with feeder propeller
  for space-saving installation

Tank pumps
with intake from above

Horizontal- and Vertical pumps
– with semi-open impellers
– with closed impellers
– with torque flow impellers

Downstream seals
for pumps with hydrodynamic relief of the shaft gap
– gland packing
– mechanical seal
– magnetic drive
– particular solution for problem cases

Comprehensive information about each type of pumps is featured in individual product broschures.

MATERIALS.

– all castable and weldable stainless steel qualities
– castable and weldable special alloys
– grey cast iron, rubber lined
– special materials such as titanium, zirconium, etc.

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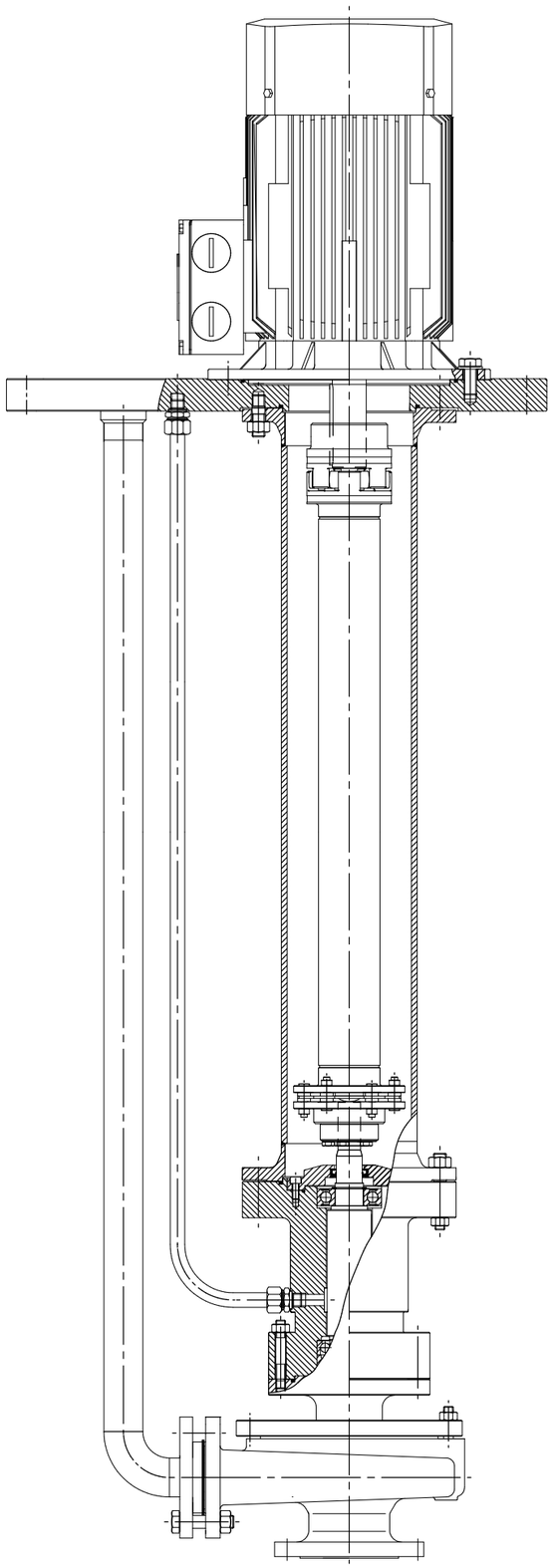
TCC/15_e



BUNGARTZ
CENTRIFUGAL PUMPS
TCCDryRun

FULLY CAPABLE.

THE DRY-RUNNING SUBMERGED PUMP TCCDryRun.

The idea of a high-performance submerged pump is not new. Back in 1997, Bungartz developed the magnet-coupled product series with the MPAT submerged pump, and then the MPCH horizontal pump. Pumping toxic, sometimes boiling products with high solid contents: that was a real challenge. Their use in refinery slop tanks was a demanding task, for example. The pumps used previously mostly failed due to their excessively sensitive slide bearings. The next stage, the MPATAN, solved this problem. The pump is safe to run dry, and can take any type of pumping medium. This is because the magnetic drive runs separately from the pumping medium in a nitrogen atmosphere, and the compensation line returns any steam and gas fractions back to the gas space in the tank.

So far, so good. Except for the fact that magnetic drive pumps have higher costs. Further developments produced a universally applicable series. The aim here was to generate high flexibility through the use of interchangeable, case-specific hydraulic systems. It is not only just as reliable, but is also qualified for additional industrial applications. This is the **TCC**DryRun. The innovative concept for this submerged pump is based on the tried-and-tested DryRun technology invented by Bungartz. Pumps thus equipped are one hundred percent safe to run dry. They have axially pretensioned, grease-lubricated rolling bearings. The result of this is that the rolling bearings have a sufficient minimum load at all times – even when there are no hydraulic forces, e.g. in the event of dry running. A further special feature is the robust shaft sealing system, which utilises lip seals. These are arranged back-to-back with a sealing gas isolation, which likewise facilitates total dry running, independent of the product.

The sealing gas isolation ideally uses an inert gas such as nitrogen. This creates an extremely clean and oxidation-free environment for the rolling bearings. Experience with the existing series MPAT, MPCV and MPCH has shown that an extended bearing life of over 50,000 hours is realistic.

Furthermore, the inert gas isolation allows safe use in potentially explosive atmospheres. Furthermore, the parameters for gas pressure and gas flow rate allow the condition of the shaft seal to be monitored.

APPLICATION AREAS.

- for chemical liquids from tanks and containers, where the escape of product gas is undesirable
- for chemical waste water with solid fractions
- for replacing submerged pumps with slide bearings that suffer frequent bearing damage
- for boiling-sensitive products such as hot water
- for applications where the residual draining of vessels is desired
- for gaseous media

ADVANTAGES.

- safe to run dry, because seal and bearing are independent of the pumping medium
- no product-lubricated bearings
- high submersion depths with few bearing points
- depressurised, frictionless and robust sealing system
- self venting
- modular series
- maintenance-free for 3 to 5 years
- low life-cycle costs
- minimal monitoring required due to intrinsically safe design

TÜV NORD

Certificate of type test according to TA-Luft

Manufacturer:	**Paul Bungartz GmbH & Co. KG** **Düsseldorfer Straße 79** **40549 Düsseldorf**
Testing Requirements:	**TA - Luft Paragraph 5.2.6.4 (24.07.2002)** **VDI 2440 Paragraph 3.3.1.3 (11.2000)**
Object of the test:	**PUMP with Lip seal**
	Pump Typ: VKC 1313DI/40/32-AN **seal length:** shaft sleeve d = 48 mm (d π = 0,15 m) **materials:** Lip seal PTFE shaft sleeve CrNi-steel coated
Drawing:	5052/189, section drawing pump 2/74681, drawing test conditions
Test report:	**111613** from 22.02.2012 and the details of 08/02/2012
Test methods:	**On line testing with seal gas flushing with nitrogen** gas test method Helium leak test acc. DIN EN 13185 method B.3 (Accumulation method), nitrogen purge with 15l/h, n = 2900 min^{-1}

This certificate is valid only in combination with the test report 111613 + annex.

It is confirmed that the shaft seal in normal operation with seal gas flushing of ≥ 15 Nl / h, and also at standstill without purge gas, as part of the evaluation scale $q_{RU} \leq 1 \times 10^{-4}$ [hPa·l·s^{-1}·m^{-3}] according to TA-Luft / VDI 2440 technically classified as tight.

Hamburg den 29.02.2012

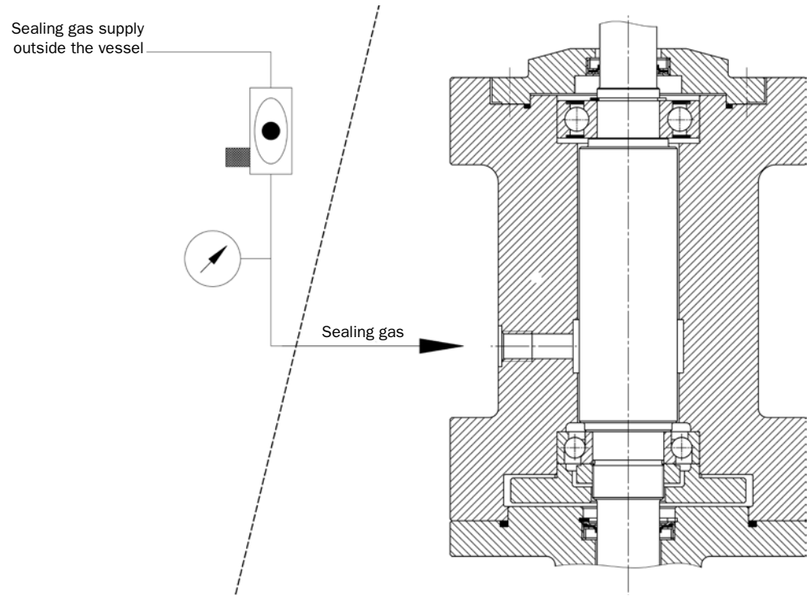
TÜV Nord Systems GmbH & Co. KG
Competence Center Druckgeräteanlagen
S. Luckmann, Dipl.-Ing. (FH)

CLOSED TODAY.

THE DRY-RUNNING LIP SEAL.

The innovative seal of the **TCC**DryRun is a shaft seal consisting of multiple frictionless components. Its intelligent individual components guarantee the very highest levels of safety and reliability. Back vanes on the impeller, a labyrinth and anti-siphon holes reduce the shaft gap pressure to equal the pressure inside the tank. As a result of this, only low sealing pressure and a low sealing gas flow rate are required. The gas isolation creates a protective atmosphere upstream of the shaft seal. This means that product gases, liquid and solids cannot get too close to the lip seal. Thanks to its special surface-pressure balance, the operation of this seal is completely frictionless. If a fault nevertheless somehow occurs, it reacts instantly and closes like a valve – but only then.

The faultless operation of the seal is indicated by the sealing pressure and sealing gas flow rate of the sealing gas system. Bungartz can include this system in the delivery if required, and installs it directly on the support plate.



SEALING GAS SUPPLY
for bearing and sealing unit

MODE OF OPERATION.

- with minimal sealing gas isolation
- sealing gas consumption varies between 20 and 50 Nl/h depending on application, at a sealing gas pressure approx. 3 bar above the intakte pressure
- safety through monitoring of sealing gas flow rate and pressure

The design of the lip seal resembles the gas-lubricated double mechanical seal. Its advantage in comparison, however, is the robust design, which can tolerate operating faults such as sealing gas failure. While the double mechanical seal fails after a few seconds, the new shaft seal will even survive half an hour of operation without sealing gas. The monitoring can be performed in the same manner as for the double mechanical seal.

German certifying organization, TÜV identified only minimal leakage values by means of a helium leak test. The seal can therefore be categorised as technically leakproof.

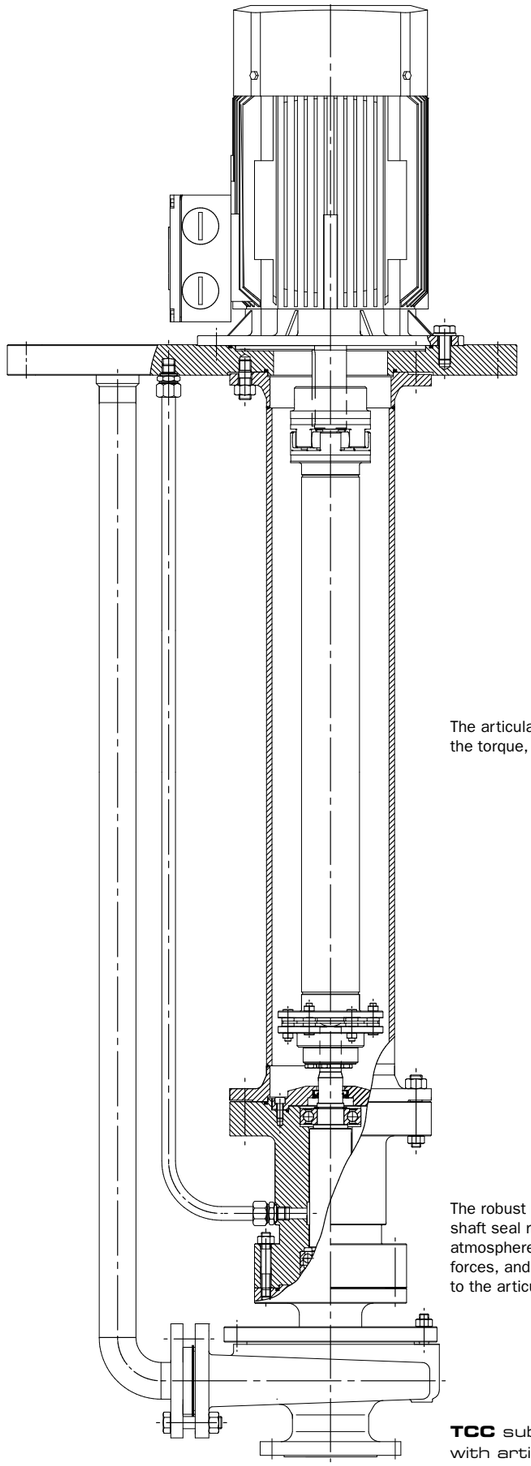
If – contrary to expectations – problems occurred in the area of the bearing or the seal, they would immediately become apparent. This is because the higher nitrogen consumption is immediately displayed on the flow meter. A drop in sealing pressure indicates a malfunction of the lip seal. The operation of the pump can then safely be stopped. Once it has been ensured that the sealing gas is flowing again after the malfunction, the pump can continue to be operated in total safety until the next scheduled stoppage.

PERFECT TOGETHER.

THE MODULAR DESIGN.

The special feature of the **TCC**DryRun: submerged pump is that its structure is modular, and hence particularly flexible. In the standard design, it is a robust vertical submerged pump with a closed or a semi-open impeller – ideal for contaminated pumping liquids. The volute-casing pump with a single-stage radial impeller is permanently sealed, and is capable of dry running. It fulfils the technical requirements of ISO 5199. Where necessary or appropriate, the hydraulic unit can also be used with quick boilers in the design TCC-AN. In order to achieve the required length for submerged pumps, articulated shafts (up to approx. 2.8 m) and an additional bearing unit (up to approx. 5.5 m) can be attached. A maximum of four grease-lubricated rolling bearings can be used here.

The respective pumping product leaves the bearing and sealing unit entirely cold. It has no effect whatsoever. A positive side-effect of this is that the **TCC**DryRun is one hundred percent safe to run dry.



The articulated coupling transmits only the torque, and no transverse forces.

The robust bearing unit, with the shaft seal running in a nitrogen atmosphere, absorbs the hydraulic forces, and transmits the torque to the articulated shaft.

TCC submerged pump with articulated coupling

PUMPE TYPE	IMPELLER GEOMETRY	MAGNETIC DRIVE	LIP SEAL	MEDIUM PROPERTIES	SOLID CONTENT	GASEOUS	BOILING	SUITABLE FOR USE IN ZONE 0
TCC-GS	closed		x	1	low	low		
TCC-OS	open		x	2	x	higher		
TCC-AN	open		x	2, 3	x	high	x	
MPCT	open	x		2, 4	x	higher		
MPCT-AN	open	x		2, 3, 4, 5	x	high	x	x

All of the pumps listed are safe to run dry and operated with sealing gas.

WELL DEVELOPED.

PRODUCT FAMILY AND VARIANTS.

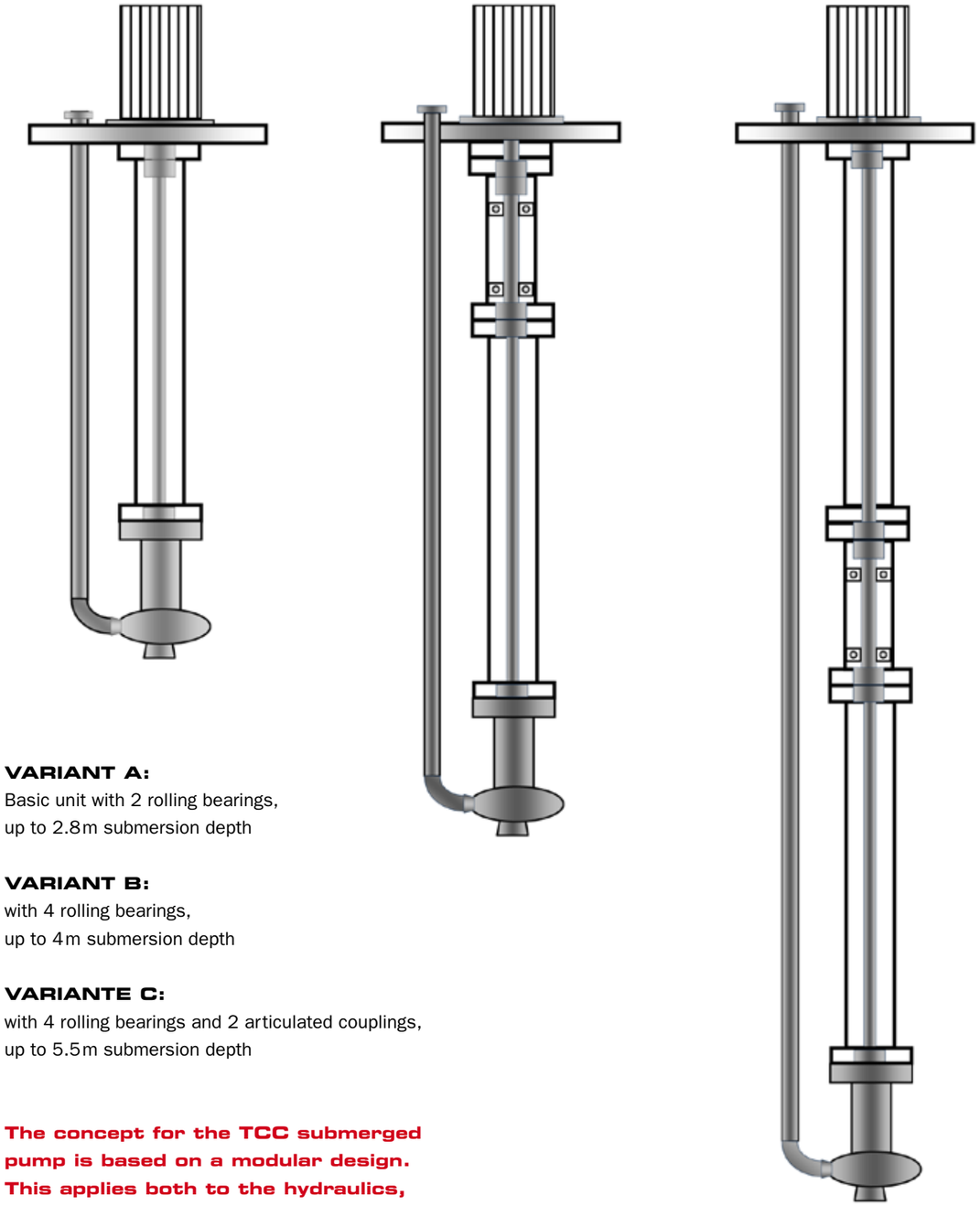
The family of centrifugal pumps was already scoring points with its DryRun technology, and with the **TCC** it has now grown significantly. The newest member is the equal of the others in every respect – and particularly in terms of quality standard, availability and efficiency.

MEDIUM PROPERTIES.

1 normally contaminated or clean pumping media
2 pumping media with higher solid content
3 gaseous, boiling-sensitive and contaminated liquids
4 toxic liquids for which hermetic sealing is desired
5 toxic liquids that are additionally also boiling-sensitive or gaseous, or for applications where automatic monitoring or residual draining are required – e.g. slop tanks in refineries

DESIGN VARIANTS.

For a wide range of requirements, standard solutions are hardly useful. What is the pumping medium? How far down is it? **TCC**DryRun has three different variants for every eventuality.



VARIANT A:
Basic unit with 2 rolling bearings,
up to 2.8m submersion depth

VARIANT B:
with 4 rolling bearings,
up to 4m submersion depth

VARIANTE C:
with 4 rolling bearings and 2 articulated couplings,
up to 5.5m submersion depth

The concept for the TCC submerged pump is based on a modular design. This applies both to the hydraulics, which are available for everything from normal liquids to boiling-sensitive liquids containing gases and solids, and in relation to the overall size, which even for a length of 5.5m requires only a maximum of 4 rolling bearings.

DESIGN VARIANTS A, B, C

TCC 80 / 50 / 250 – DN ____ – GS

- TCC: Submerged pump with lip seal unit
- 80: Nominal diameter of suction nozzle
- 50: Nominal diameter of pressure port or vessel pressure connection
- 250: Nominal diameter of impeller
- DN ____: Minimum diameter of the tank interior
- GS: Impeller type: OS open, GS closed, AN self-regulating

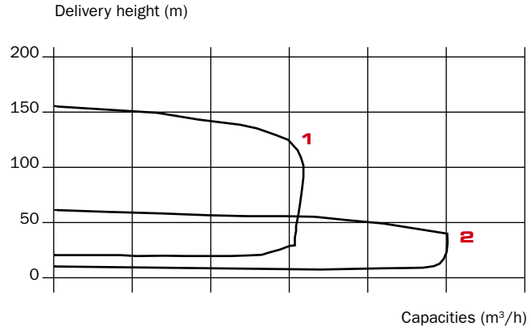
MODEL CODES

TECHNICALLY SOPHISTICATED.

DESIGN, MATERIALS AND MORE.

In order to fully rely on the **TCC**DryRun submerged pump, in any location and at all times, the technical design is critical.

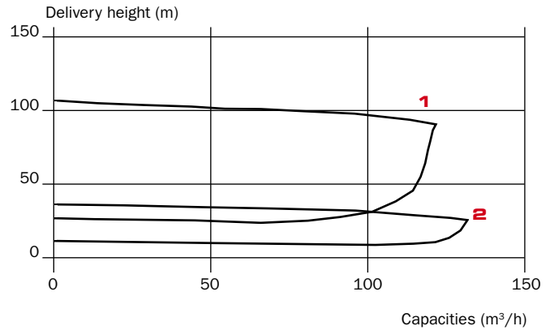
- no sensitive, product-lubricated slide bearings
- precise rolling bearing running in a sealing gas atmosphere with a service life of min. 32,000 h
- maintenance only every three to five years
- bearing has slight mechanical pretensioning, allowing operation without any liquid filling
- shaft seal as leak-free as a double mechanical seal, but less sensitive and frictionless
- modular design adapts various hydraulic features to correspond to the properties of the pumping fluid



CHARACTERISTIC DIAGRAM OF TCC-GS
Closed impeller
GS 1: n = 2900 rpm; **2:** n = 1450 rpm

MATERIALS AND APPLICATION LIMITS.

- materials for all parts in contact with product in the basic version TCC-GS (closed impeller) 1.4408 / 1.4571
- TCC-OS and TCC-AN (open impeller) are available in all castable stainless steel grades
- temperature/pressure: 120 °C at 10/16 bar
- submersion depths: approx. 1 to 5.5 m
- permitted ATEX-zones: Zone 2, Zone 1, in variant MPCTAN also Zone 0



CHARACTERISTIC DIAGRAM OF TCC-OS
Open impeller
OS 1: n = 2900 rpm; **2:** n = 1450 rpm