REAL-TIME
PUMP CONDITION MONITORING

CHROMATECH TECHNOLOGIES

LEADING THROUGH TECHNOLOGY

pump genie

Thermodynamic Pump Testing

How Thermodynamic Pump Testing Works

Nearly all energy losses in pumps are transmitted through temperature which is carried in the liquid being pumped. Thus, an increase in temperature in the liquid results in an increase in losses and efficiency. This increase is measured differentially across the pump.

In a similar fashion, differential pressure measurements are made calculating the head of the pump. By varying the head rise on the pump, its performance characteristics can effortlessly be tested across a range of flows.

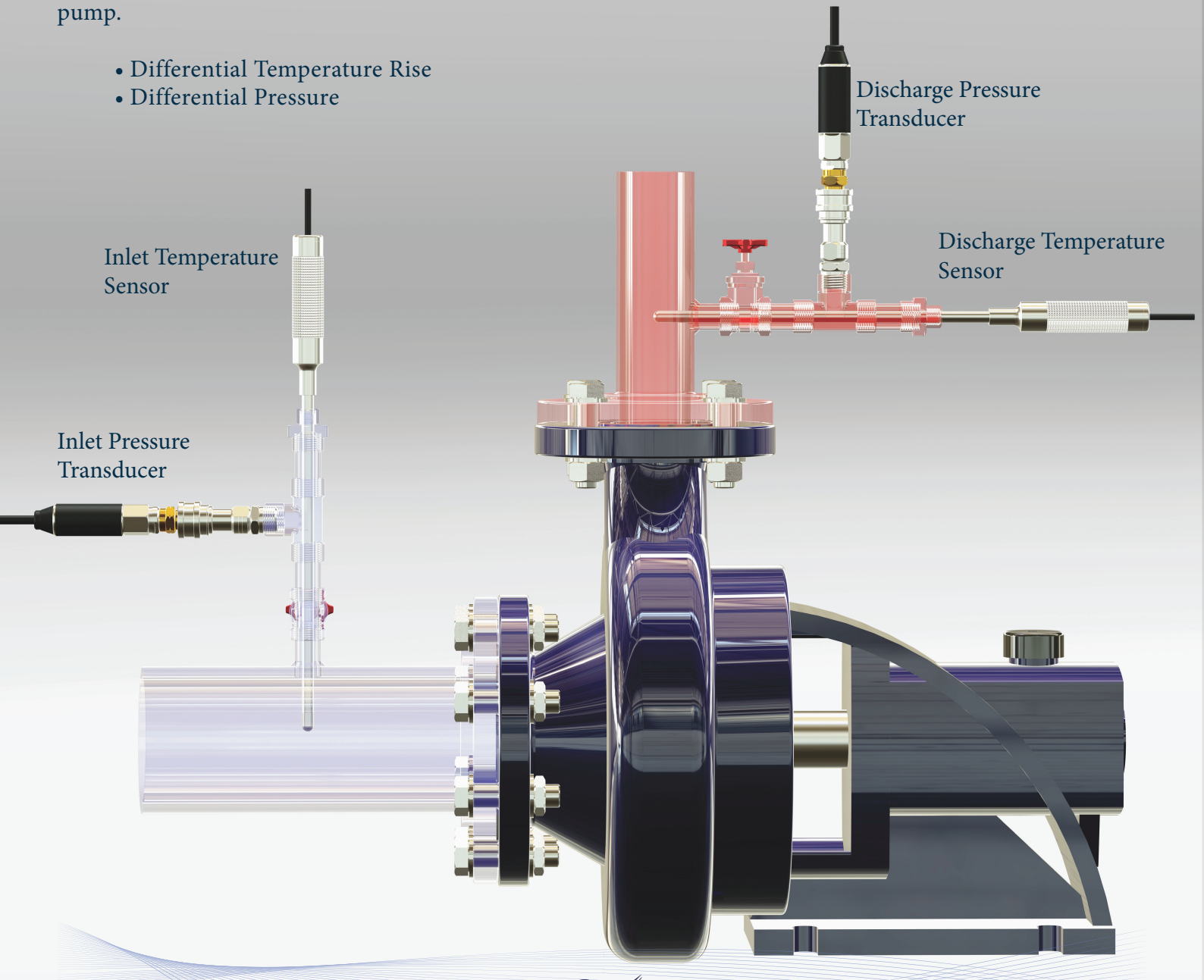
In thermodynamic pump testing, only 2 variables are of concern when determining the efficiency of a pump.

- Differential Temperature Rise
- Differential Pressure

With these two parameters, system losses can be determined.

Additional measurements from a power analyser provides actual power consumption readings which allows for the determination of the volumetric flow rate of the pump.

Temperature and Pressure measurements are facilitated by means of fitting tapping points to the suction and discharge sides of the pump. Temperature probes and pressure transducers are physically inserted into the stream to allow for these measurments to be taken.



pump genie

Applications

- Water Supply
- Sewage
- Power Generation
- Mining
- Agriculture
- Pump Manufacturing
- Industrial
- Resources

Some Notable Uses

- Certifying BEP Guarantee
- Calibrating Flow Meters
- System Curve Tests
- Other applications where conventional testing cannot provide accurate results
- Perpetual efficiency monitoring
- Used to gauge the performance of pumps for preventative maintenance and to inform re placement and refurbishment decisions

Thermodynamic vs Conventional Testing

Conventional and thermodynamic testing methods are widely accepted in the industry. More often than not, the use of flow meters cannot be reliably implemented. This is due to the fact that the most crucial factor in obtaining accurate results in conventional testing relies entirely upon correct flow measurements.The physical configuration requirements of the surrounding pipes are extremely stringent in regard to conventional testing standards, and in most cases do not permit implementation of this technique in order to comply with set standards.

Thermodynamic pump testing is generally regarded as the most accurate and reliable technology for in situ testing because pump efficiency can be directly measured without the need for flow measurements. Thermodynamic testing allows for the operation of multiple pumps while tests are performed. Conventional pump testing usually only permits flow measurements from common discharge headers. This is a major drawback to conventional testing as multiple pumps cannot be in operation when conducting a test.

Advantages Of Thermodynamic Testing

- Pump efficiency and performance can be accurately determined on-site
- Accuracy is not sensitive to pipework configuration (accurate flow metering is s ensitive to pipework configuration)
- Portable testing equipment can be easily installed
- Test work can be carried out with the minimum disruption to operations
- Testing does not rely in existing installed flow metering equipment of variable accuracy

Pump Genie Measurement Accuracy Specifications	
Differential Temperature	< 1mK
Absolute Temperature	± 0.05 °C
Pressure	± 0.1%
Total Power	± 0.1%
Pump Efficiency	< 1%
Flow	< 1%

On-site Pump Performance Testing Service

Chromatech offers on site pump testing services in addition to the sale and distribution of portable and fixed testing units. Upon request for a pump test, all necessary information regarding the pump(s) and motor(s) should be made available to Chromatech. Once all the required information has been received, an initial site inspection will be scheduled by Chromatech where all necessary pipe setup requirements for commencement of testing will be discussed.

Pump Genie Data Aquisition Module

Pump Genie Application Software

The Chromatech Pump Genie application software displays standard measured and derived parameters including:

- Differential Temperature
- Inlet and Delivery Pressure
- Fluid Properties including ambient tempera ture, density and specific heat capacity.
- Power Consumption
- Flow
- Vibration and rotational speed are optional.

Once a pump test has been completed, a test report is generated ready for print or email and all test parame-ters are stored in a SQL database which can be accessed at a later time.

Realtime Data

Fluid Temp	15.87	°C	ΣV_{rms}	381.4	V
Diff Temp	201.09	mK	ΣI_{rms}	13.2	A
Suction Pressure	0.5	m	PF	0.93	
Discharge Pressure	68.1	m	Motor Eff	98.0	%
Suction Velocity	2.7	m/s	Velocity Head	1.8	m
Discharge Velocity	6.5	m/s	Fluid Density	999.1	kg/m³
Shaft Input Power	8.0	kW	Spec Heat Cp	4187.2	J/(Kg.K)

Fig 1 Software Displaying Real time Performance Charicteristics

In Situ Thermodynamic Testing Advantages

- Detect loss in performance and aid optimisation of maintenance intervals
- Assess the effectiveness of refurbishment work
- Optimise operating schedules to minimise operating costs
- Evaluate system losses and condition without interrupting operations
- Assess pump system fitness for purpose
- Calibrate permanently installed flowmeters
- Generates a full set of characteristic curves (head, power, efficiency over flow) on site.
- Determines actual operating conditions (blockages, faulty valves, over-sized impellers, suction problems, incorrectly specified pumps).
- Pin points optimum time for pump refurbishment.
- More cost effective than conventional testing methods.

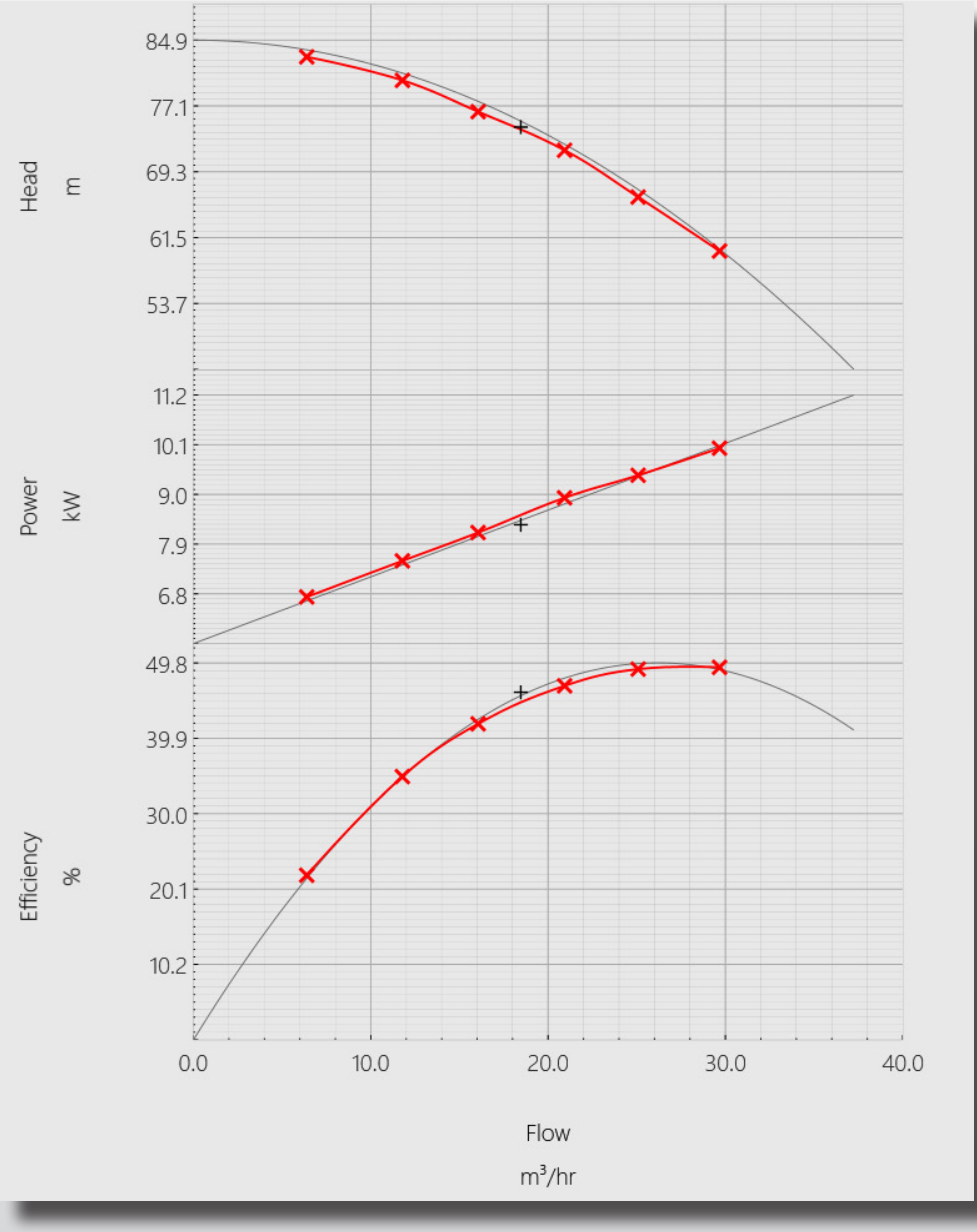
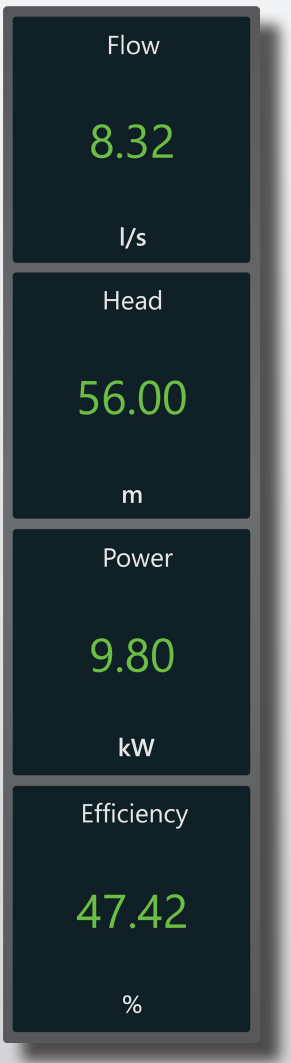


Fig 2 Graphical Performance curves displayed during a pump test

The Application Software's Real Time Charting Feature enables rapid confiramtion of test parameters and reliable test data from all transducers and power analyser readings



Pipe Setup Requirements

Acquiring the differential temperature and pressure readings requires high and low pressure tappings being made into the pipe on either side of a pump.

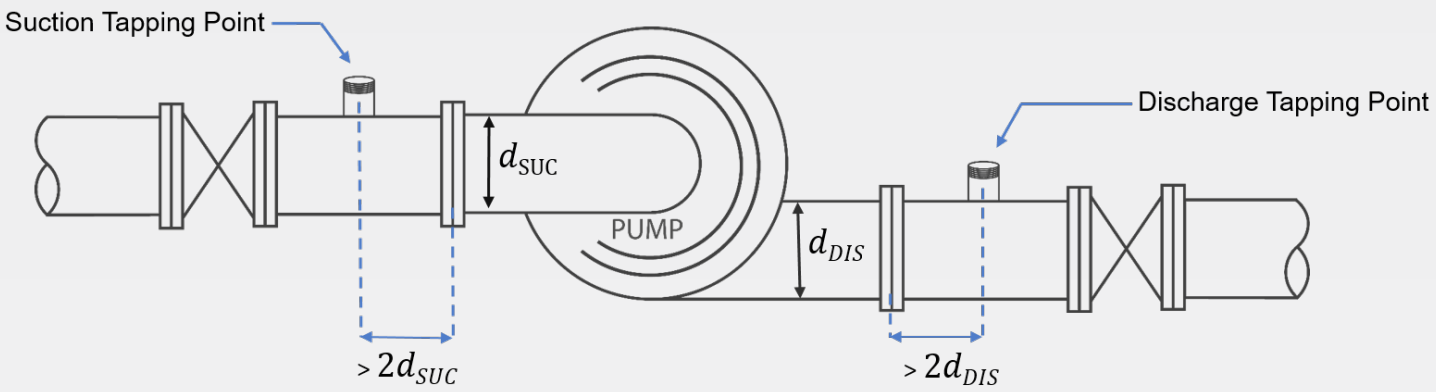


Fig 3 Where to Measure In a Pump System

Low Pressure Applications

A low-pressure tapping is where the delivery pressure does not exceed 100m Water (10 bar). The tapping consists of a ½" gate valve mounted at the identified tapping points as close to the pipe as possible. A typical arrangement for the tapping is given below.

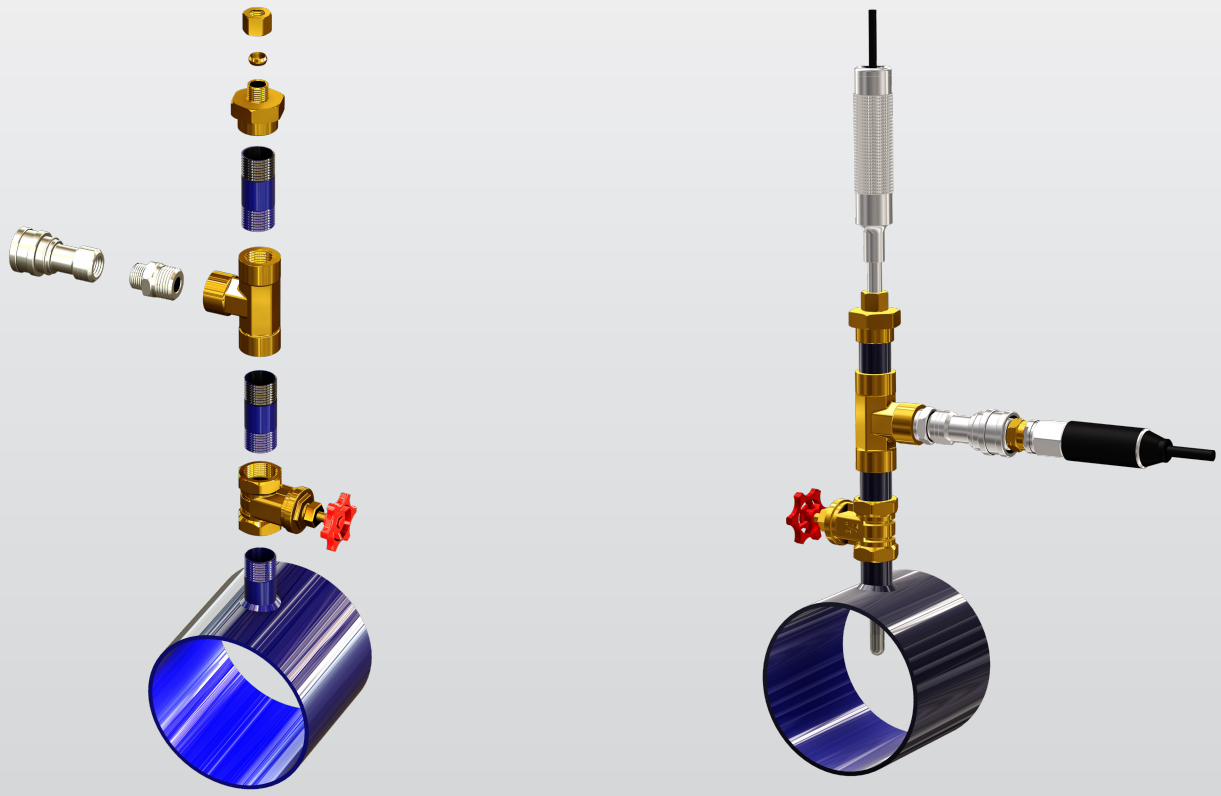


Fig 4 Low Pressure Application

HighPressure

Applications

A high-pressure tapping is where the delivery pressure exceeds 100m Water (10bar). A Chromatech supplied thermowell for measuring temperatures must be installed to protect the tester and equipment from the high pressures. Thermowells are commonly available in 2 lengths, however can be modified when necessary. The diameter of the pipe will determine the length required.

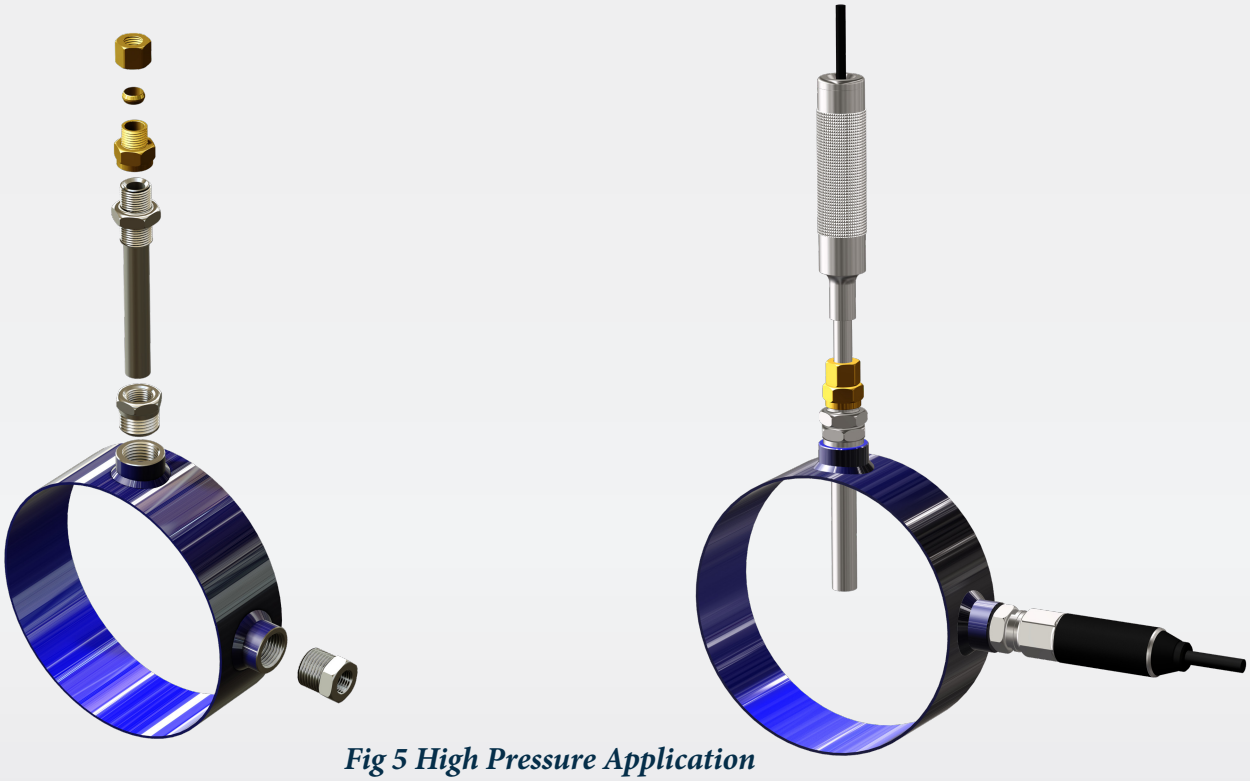


Fig 5 High Pressure Application

HighPressure

Applications Accessories

Chromatech supplies thermowells and all other consumables as needed per application including nitriding parts for corrosive liquids

Tel: +27 (0)11 958 1924
E-mail: jean@chromatech.co.za

P.O. Box 1864, Ruimsig, 1732, Roodepoort
Gauteng, South Africa

CHROMATECH TECHNOLOGIES
LEADING THROUGH TECHNOLOGY

pump genie

www.chromatech.co.za