

**Pressure Test Stands for:
Burst Testing | Pressure Pulsation Testing |
Leak Testing | Function Testing and Autofrettage**

Poppe + Potthoff Maschinenbau GmbH

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Poppe + Potthoff Maschinenbau GmbH develops and manufactures systems for operational and fatigue testing of components in the automotive industry and shipbuilding and in many other industries. The precision, high-performance special machines from the specialists for high-pressure and testing technology are employed in research, development and production. They include systems for burst pressure and leak testing, impulse testing, autofrettage and automated testing. The company located in Nordhausen (Germany) is part of the Poppe + Potthoff Group. As system developers, our focus is on the customer's demands. Our main activities are concentrated on technologically complex systems for testing and high-pressure technology. As system developers we plan, design and produce systems for:

Autofrettage up to 16,000 bar, impulse testing up to 6,000 bar, function testing with 10 l/min. up to 3,800 bar, tests under climatic conditions (-40°C to +180°C), burst tests up to 15,000 bar with 100,000 measured values per second, vacuum tests down to 0.7 mbar, fully automated testing and measuring systems with 100% part testing in 3 seconds. Leak tests with precision control methods and further services as well as high-pressure units and booster stations round out our portfolio. Maintenance and service of your systems is a question of honour for us. Test us.



Autofrettage systems



Burst pressure test stands



Impulse test bench



Testing and measuring systems



Expertise, excellent knowledge of the market and affinity for our products guarantee our success. We are proud of our ability to implement strategies for testing systems operating under extreme conditions. We develop our own software applications and have a highly qualified support team at your service.

Our engineering and software specialists routinely exchange ideas with other engineers and the designers and quality managers within the Poppe + Potthoff Group.

This furthers the quality and extent of our know-how, which is then directly applied to the design of new systems and stands. Maintenance, stocking of wearing parts and minimum stock requirements are controlled through SAP.



Leak test stands



Function test stands



E-mobility test stands



Module test stands

Burst pressure testing



Tubes, pipes and connections for industry use must withstand pre-defined types of pressure. To guarantee compliance with these standards, such components are put under pressure sometimes until they burst. Up until now, the available systems were limited to those utilizing pressure relay valves. This resulted in slow pressure build-up, imprecise test results and high maintenance costs.

The Poppe + Potthoff Maschinenbau burst test stand employs a new technology that allows for identification of the burst pressure within a split second. The quality of all utilized components can thus be documented quickly.

Burst pressure test stand for pipes



Fields of application:

Hose lines
Tubes
Connector

Main features:

up to 4,500 bar
Test medium water
Burst pressure tests
Hold-down clamp for test specimens
Bursting with hydraulically controlled pressure intensifier
Stable test chamber
Freely programmable pressure ramp

Burst pressure test stand for the automotive / plastics industries



Fields of application:

Air-conditioning tubes: > 100 bar
Hydraulic tubes: > 1,000 bar
Brake pipes: > 2,000 bar
Pipe fittings: > 4,000 bar
Tubes, Accumulators, Containers,
Radiators, Coolers

Technical specifications:

Temperatures up to +180 °C
Media used includes brake fluid,
water / emulsion, oil
Max. burst pressure: $p_{max} = 10,000$ bar
Pressure relay valve technology

Test media:

Vegetable oil fuel (biodiesel)
Shell v-power diesel V140
Water with anti-corrosion additives
(ethylene glycol)
Brake fluid | Rapeseed oil

Burst pressure test stand for hydraulic components



Fields of application:

Automotive industry
Shipbuilding
General industry
Pipe fittings
Hydraulics
Hose pipes

Technical specifications:

Max. pressure up to 10,000 bar
100,000 results per second
Two pressure relay valves
Component temperature between
-40 °C to +180 °C
Special technology for very large
capacities

Burst pressure test stand for plastic components

The test stand is a stand-alone system and has been specifically designed for the plastics industry. Test specimens can be easily adapted using quick couplings. In addition to this, a quick-change device allows test specimens to be mounted manually outside of the test chamber.

Burst tests can be carried out using two test circles, each with a different method of operation. The wear-free fine control process allows an extremely precise pressure increase up to 50 bar. The other test circle has a pneumatically driven pressure booster that can be used to generate pressure of up to 400 bar. Normal mains water or test oil can be used as the test medium. In addition to this, the test stand can be fitted with a hand scanner to identify components, thus allowing burst pressures to be assigned to each component. The system is controlled via a PLC with serial interfaces for data exchange. Test requirements are entered using a touch panel.

Burst pressure test stand

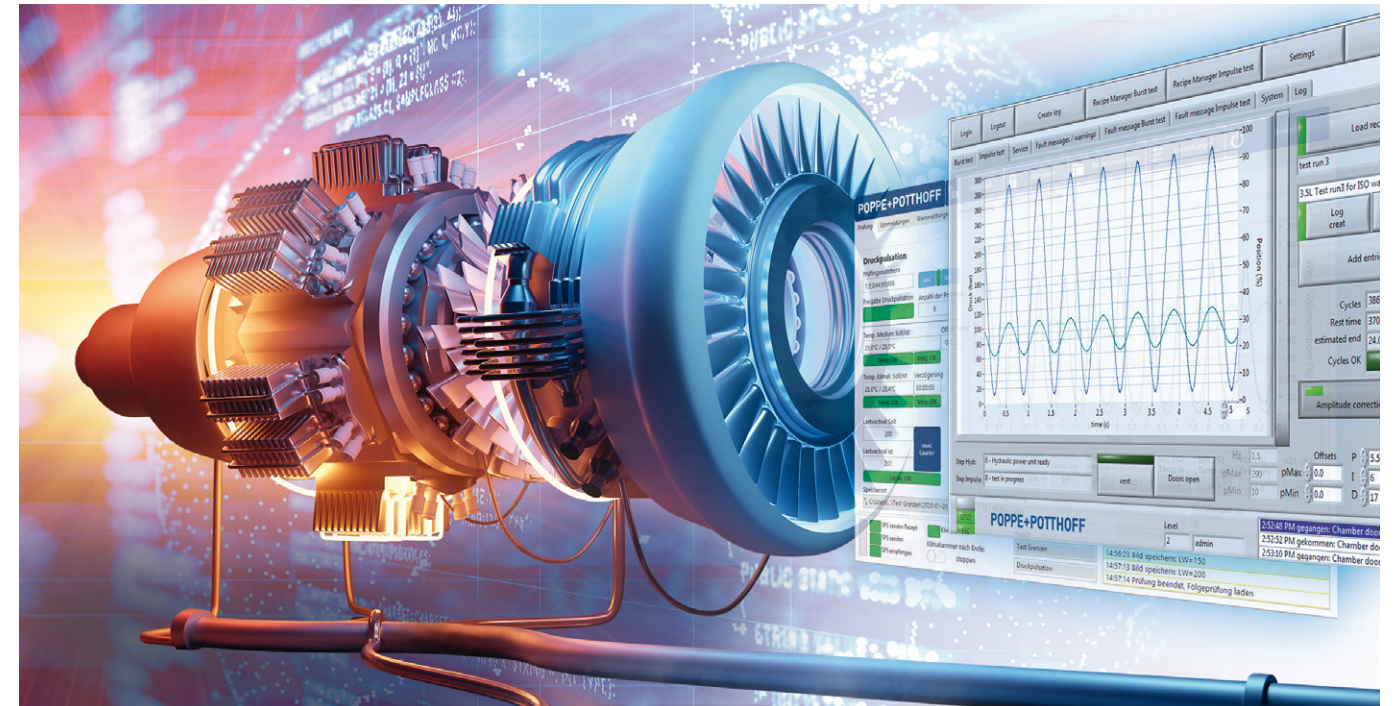


Technical specifications:

Burst pressure: up to 400 bar
 Fine pressure control: 0 – 50 bar
 Pressure testing up to 50 bar with ± 0.1 bar tolerance
 Test medium: Water or emulsion
 Medium temperature: $> 0^{\circ}\text{C}$ up to 95°C



Operational stability and lasting durability (through impulse tests)



Diesel injection systems. The Poppe + Potthoff impulse test stand tests the durability of common rail components: safely, up to 6,000 bar. The test stand is known for its ergonomic design in the Poppe + Potthoff look. We test the operational stability and durability of common rail components for marine engines in our Poppe + Potthoff high pressure testing plant. The endurance test in our testing plant simulates the life cycle under varying pressure. In just one month, a prototype travels the globe in our test stand.

High pressure impulse test stand 4,500 / 6,000 bar



Fields of application:

Research and development
 System optimization
 Endurance testing of standard parts
 Automotive industry and shipbuilding

Technical specifications:

Pressure: 6,000 bar
 Frequency: 30 Hz
 Impulse pressure testing
 at up to 6,000 bar
 impulse frequency up to 30 Hz max.
 Pulse form: Sinus
 Electronic collection of test results
 Logging and archiving

Operational stability and lasting durability (through impulse tests)

The **pulsating pressure** is generated by a pressure intensifier with hydraulic drive. A hydraulic unit generates a constant hydraulic pressure of 330 bar. This pressure drives the pressure intensifier via a control valve. The pressure intensifier has a constant pressure boosting ratio and generates the high pressure through its linear motion. The control valve is a highly dynamic servo-control valve which enables very high test frequencies with precise repeating accuracy.

The test pressure course is measured with a pressure sensor and is stored. These data sets allow the quality of the test to be assessed at a later stage. The pressure control of the unit also works via this pressure sensor. Hydraulic oil is used as test medium. An optimally matched cooling system keeps the temperature at the pressure intensifier and in the hydraulic system in balance. The cooling system is a very effective water cooling.

Visualisation of the test course is done via a PC. Operation is menu-driven and enables special software configurations. The unit operation is self-monitoring. Possible faults are displayed on the monitor and cause the unit to be switched off. Test specimen failure is detected by means of an oil mist sensor. If an automatic switch-off takes place, an information message is telecommunicated to a mobile phone. All test-relevant data are retained during such an action and are stored automatically.

Fields of application:

Gasoline injection housings
Pressure sensors
Pipes and pipe fittings

Technical specifications:

Impulse pressure: 1,000 bar / 2,000 bar
Pulse form: Sinus
Max. test frequency: 15 Hz
Test medium: Hydraulic oil ISO HLP 46
Noise level: max. 75 DBA
Electrical power input: 60 kW
Width: 3,030 mm
Height: 2,380 mm
Depth: 2,890 mm
Weight: 5,500 kg

Impulse test stand 1,000 / 2,000 bar



For **pressure pulsation testing** with subsequent endurance pressure and burst testing, the system has two chambers in each of which up to ten test specimens can be tested simultaneously at ambient temperatures from -60°C to $+180^{\circ}\text{C}$ or at room temperature. The medium – 100% glycol or various oils – is supplied via separate control loops at a temperature from room temperature to $+160^{\circ}\text{C}$. This enables tests to be carried out with very large temperature differences that are seldom encountered in reality even in the tough tests on the Nürburgring race track, in the Siberian tundra or in the deserts of Africa.

Various servo-hydraulic pressure intensifiers designed optimally for each test pressure range allow very precise control of the test pressure. Pulse tests can thereby be performed with a frequency of 0-10 Hz (the normal range is 0.5-2.5 Hz) for the trapezoidal curve with 4-25 bar and 0-160 bar; for the sinusoidal curve with a frequency of 0-10 Hz, pressures of 0-6 bar are possible. The maximum burst pressure is 500 bar. The measured data recording and visualisation uses LabVIEW applications from National Instruments. All test routines and data are automatically stored on the system and can be exported to the network for evaluation.

Impulse test stand for automotive pipes

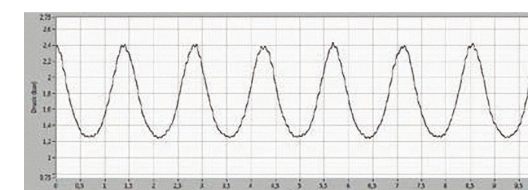


Figure 1: Sinusoidal test curve

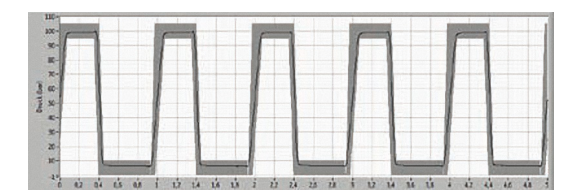


Figure 2: Trapezoidal test curve

Operational stability and lasting durability (through impulse tests)

Impulse / Burst pressure test stand



Technical specifications | Impulse pressure:

- Max. pressure up to 1,500 bar
- Proportionally controlled hydraulic pressure intensifier
- Frequency 0.25 Hz
- Test medium oil
- Total volume test setup up to 2.5 dm³
- Impulse volume up to 75 cm³
- Two test circles with automatic leakage monitoring

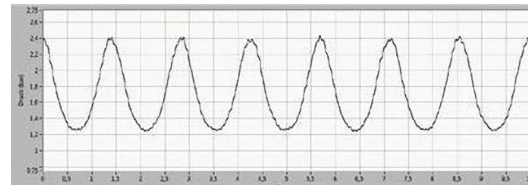


Figure: Sinusoidal test curve

Technical specifications | Burst pressure:

- Max. pressure up to 3,000 bar
- Proportionally controlled hydraulic pressure intensifier
- Proportionally controlled hydraulic clamping device
- Test medium oil
- Compensation volume up to 65 cm³

Burst and pressure pulsation test stand with special application spike test

The test stand is a stand-alone system and can be used to carry out reliable pressure tests, burst pressure tests, and pressure drop tests on components such as hydraulic hoses, brake pipes and airbags. Pressure is built up using a hydraulically driven pressure booster. In addition to this, the system can also be used to carry out pressure build-up testing up to 35 bar.

A pressure sensor measures pressure to allow tests to be assessed and makes this data available for evaluation software.

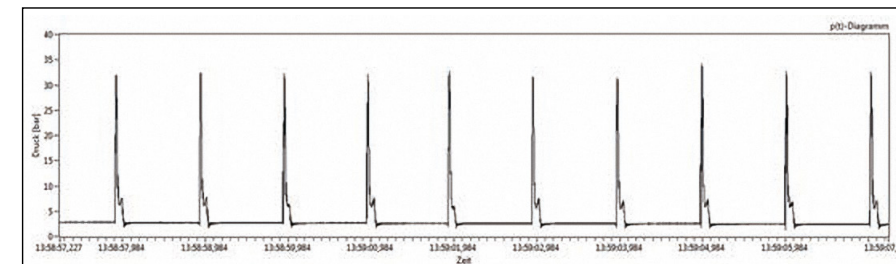


Figure: Test curve

Spike impulse test stand



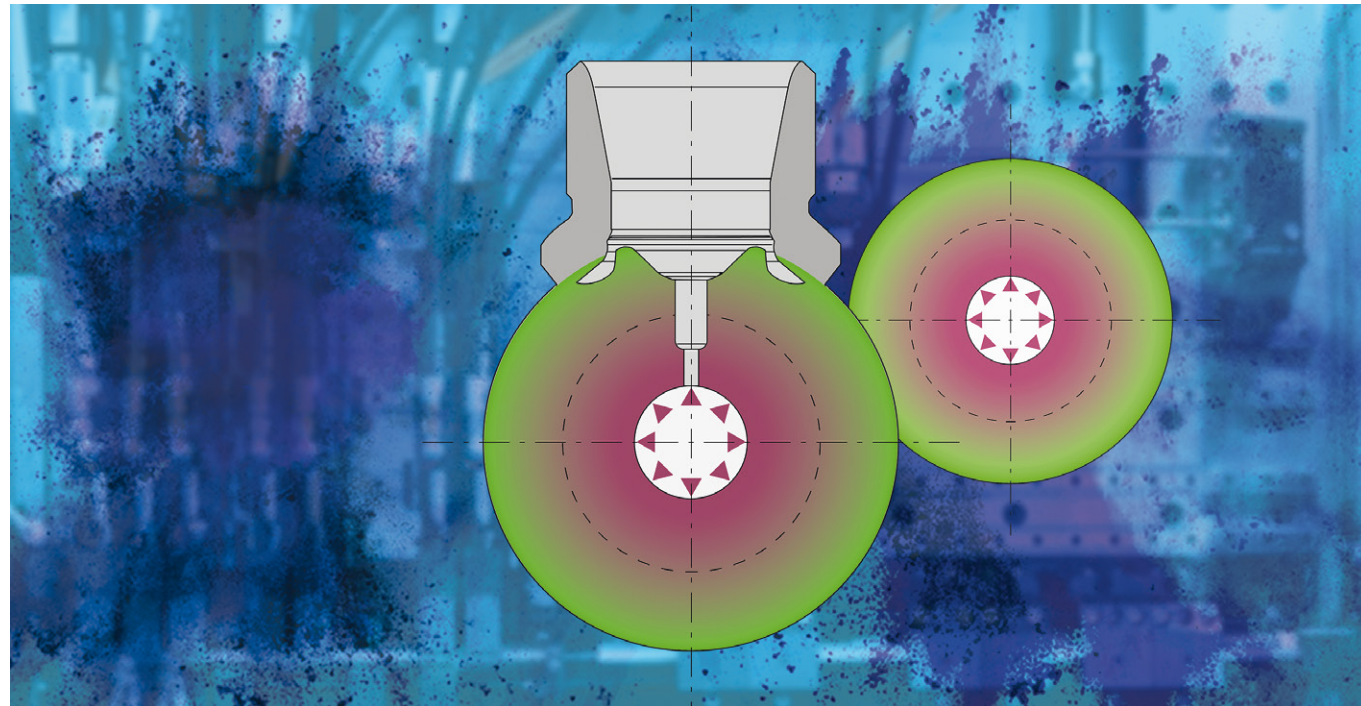
Technical specifications:

- Spike impulses in 5 ms
- Pressure surges up to 50 bar
- Automatic leakage monitoring

Main features:

- Burst pressure and spike impulse testing
- Low pulsation thanks to memory
- No energy consumption after the final pressure is achieved
- Suitable for testing applications thanks to ultra-fine filtration

Withstanding varying pressure



Autofrettage system: Autofrettage systems serve to increase the stability of components for high and pulsating pressure applications. Poppe + Potthoff offers autofrettage systems for serial production and prototypes. High-pressure components are exposed to extremely high and low pressures. In our autofrettage system they are processed in a defined high-pressure treatment. We offer our autofrettage systems for common rail components as well as for high-pressure hydraulic tubes, gas cylinders, components for water jet cutters, plant and power station construction and for chemical apparatus engineering.

Serial production autofrettage for rails



Fields of application:

Wide range of components for automotive industry and shipbuilding

Technical specifications:

Pressure range up to 12,000 bar
 Minimal set-up time for various components
 Maximum span length 1,200 mm
 Fully-automated positioning of closure disks

Serial production and development autofrettage (with clamp changing system)



Technical data:

Max. number per autofrettage	1
Conditions and tolerances	
Max. autofrettage pressure	$P_{max} = 15.000 \text{ bar}$
Pumps	Pumps
Pressure range	max. 1.000 bar
Pressure intensifier	15.000 bar
Pressure transducer	0-15,000 bar class 0.5
Working temperature	Room temperature
Max. media temperature	+50 °C
Test medium	High-pressure liquid
Filling quantity of the media tank	80 l
Dimensions of test stand	
Size W × D × H	approx.: 3,000 × 1,400 × 2,200 mm
Colour	PPM Design
Total mass	approx. 10,000 kg

Function

The **autofrettage system** is an automated production system for serial production autofrettage of diesel injection lines. Thanks to the high level of product variability the system can be used to autofrettage various components. Retooling is carried out by changing the clamping devices. The clamping area is easily accessible from the front of the system.

The operator opens a protective glass panel at the front to set up serial autofrettage. The 10 lines are inserted and removed manually. The autofrettage pressure can be programmed flexibly. The control panel is located on the right hand side. All relevant data are displayed for the operator.

Serial autofrettage for fuel lines

Fields of application:

Pipe and injection lines

Technical specifications:

Pressure range up to 10,000 bar

Minimal set-up time for various components

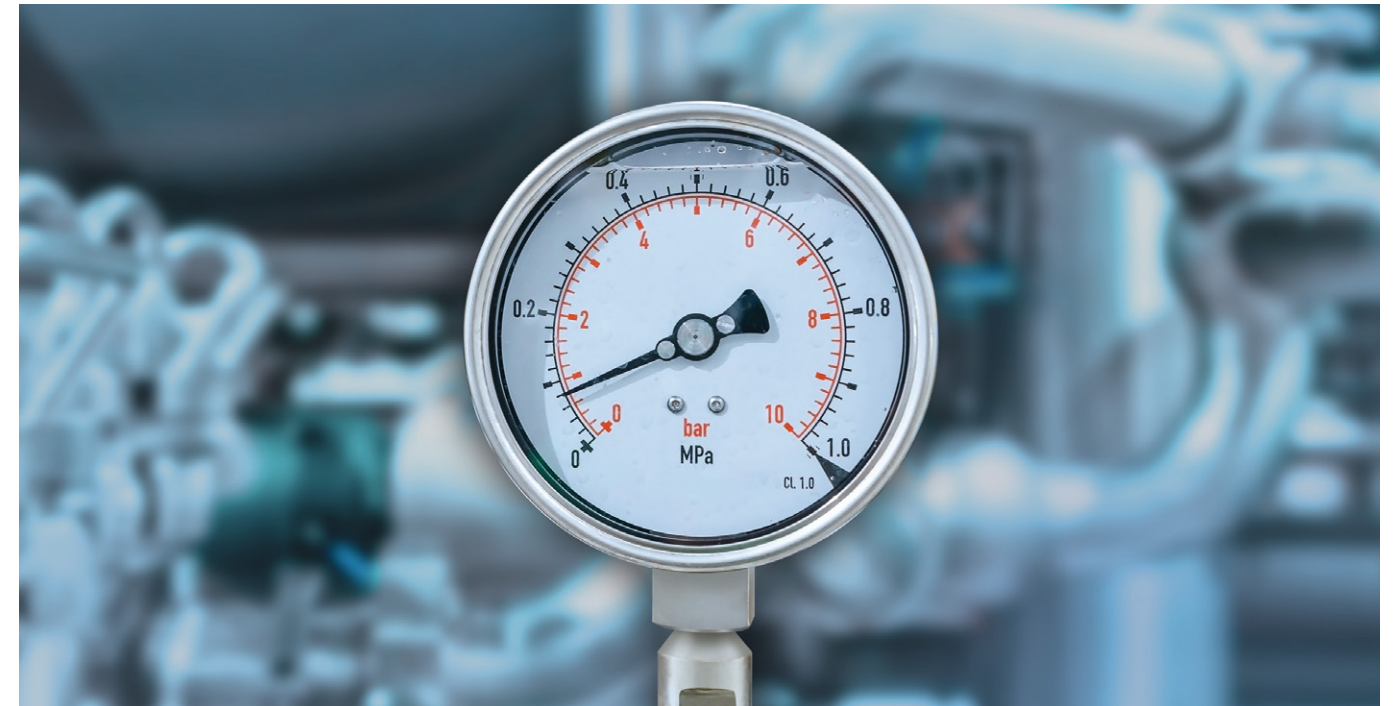
Max. span length 1,200 mm

Fully automated positioning of the closure disks

Proportional clamping device



Compressed air amplifier stations / Hydraulic units



Our **compressed air amplifier stations** can be used where the existing compressed air supply can no longer deliver the higher pressure requirement for special tools or units such as air-operated power wrenches; nailers; tire inflation systems; or similar. A PPM compressed air amplifier station can be integrated into the existing compressed air network wherever required using commercial hose couplings or directly connected to a mobile compressor, for e.g. during assembly work.

The pressure booster functions pneumatically and is driven exclusively by the existing compressed air, delivering compression performance at a transmission ratio of 1:2. This makes it possible to increase a classic compressed air network from, for e.g., 6 bar to 12 bar at specific locations. The volume requirement of a PPM compressed air amplifier station depends on the required output (volume flow rate).



DNV-simplex up to 16 bar



DNV-duplex up to 16 bar



DNV up to 50 bar



Amplifier unit up to 400 bar

Ready-to-connect hydraulic units



Our ready-to-connect hydraulic units and mobile pressure units / pressure generating units up to 4,000 bar have been specially designed for use in workshops. Used as pressure generators for the assembly and dismantling of oil pressure mountings (shaft-hub connection) the systems are suitable for both stationary and mobile applications. Pressure generation (regulation) for the pneumatically driven hydraulic unit is carried out manually by the operator. On request the mobile pressure unit / pressure generating unit – with electrohydraulic pressure generation – can also be equipped with a PLC (programmable logic controller) to allow the pressure increase and holding time to be defined.



HP valve up to 4,000 bar



Hydraulic unit up to 1,600 bar

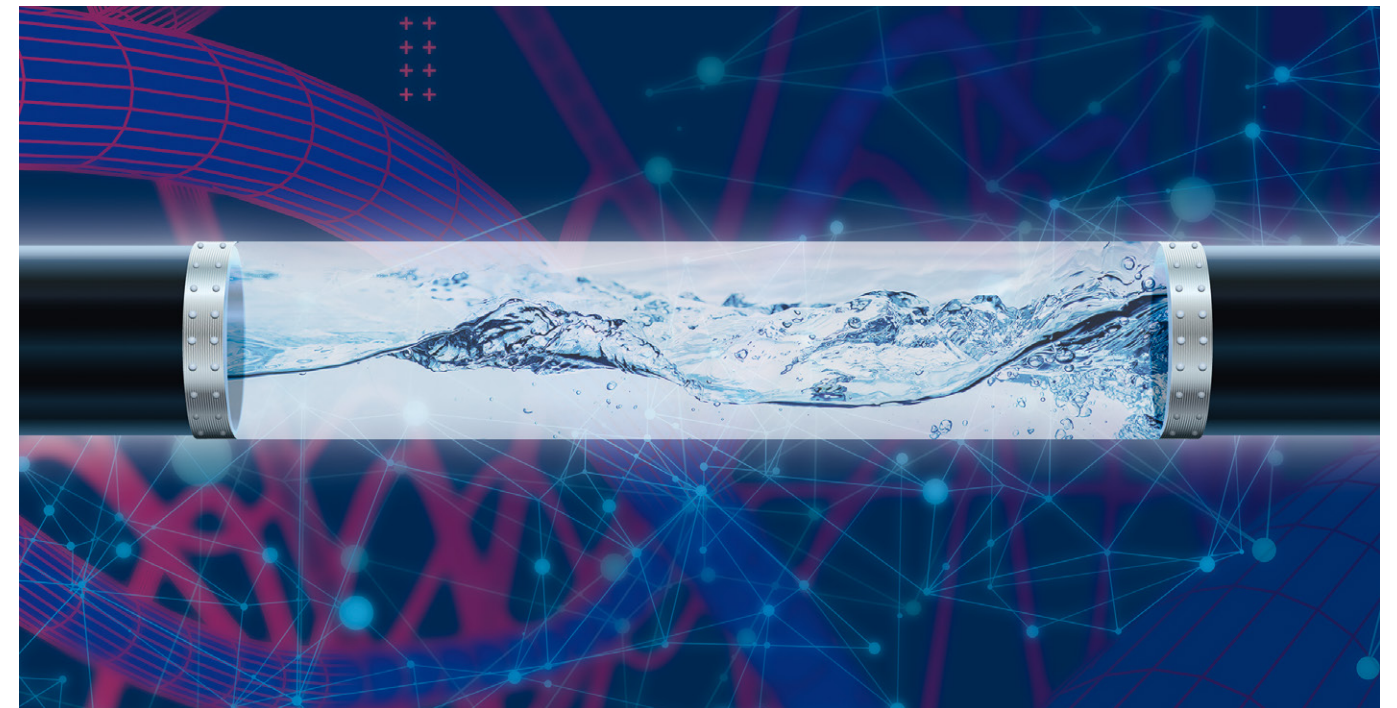


Hydraulic unit up to 4,000 bar



Mobile pressure regulation systems

Leak test stands



Leak test benches: A leak test is a process utilized to determine if a pressure vessel functions within a specified leak limit. The leak limit is usually either specified by the client or specific industry standards (e.g. ISO, DIN). Leak tests are used in many industries and have become a key part in quality control and product validation. To test the quality of the material and the pressure vessels composition gas or liquid, such as water or oil, flow through the pressure vessel. A leak is identified when the test medium is exiting the test object through a crack, a malfunctioning seal, a manufacturing defect, a material defect or simply a hole. By performing leak tests prior to distribution or installation the manufacturer ensures measurable safety and quality standards.

At Poppe + Potthoff we offer advanced Leak and Flow test benches for automotive, industrial, medical and the packaging Industry. Utilize our know how in sealing versatile and reliable leak testing equipment to gather data on your components.

PPM 257 Leak test stand



Fields of application:

- Automotive testing
- Cooling circuit components
- Pump & valve housing

Technical specifications:

- Test medium: Emulsion
- Drive: High pressure pump
- Pressure: 65 bar
- Test parts: Flint and leg rings

Leak test stands

Fields of application:

Home appliances
Automotive testing
Cooling circuit components
Pump & valve housing

Technical specifications:

Test medium: Water
Drive: Fine pressure regulator
Pressure: 50 bar
End of production line, hydrostic pressure test

PPM 329 Leak test stand



Leak test stands

PPM 453 Leak test stand | Medical technology



Fields of application:

Medical technology
Sensor industry

Technical specifications:

Test medium: Air
Drive: DNV (1:2)
Pressure: 40 bar
Programmable pressure ramps
Compact design
Seating for operator

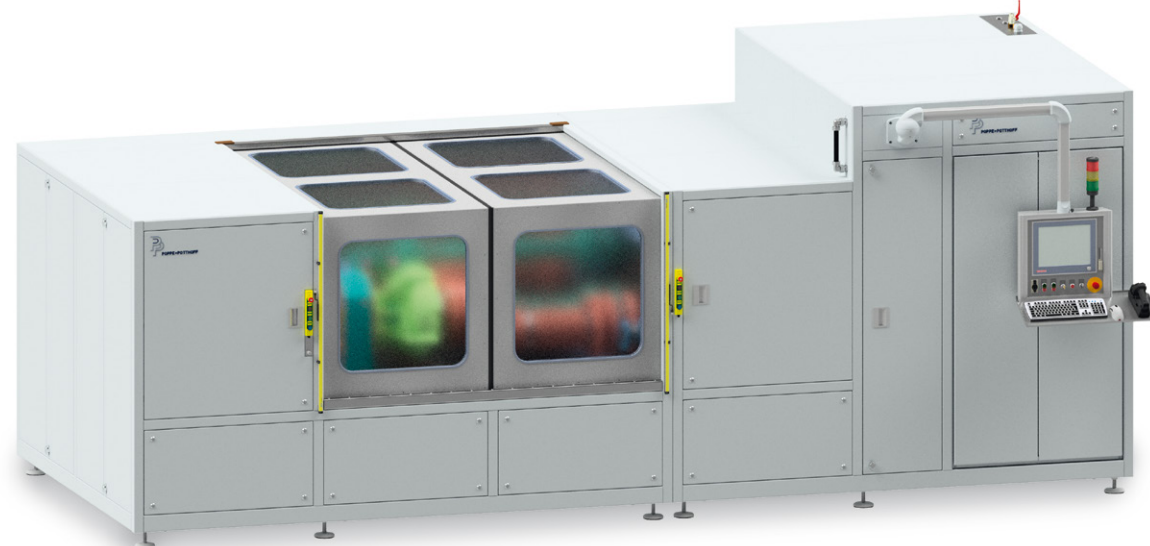
Fields of application:

Accumulators
Tanks
Very large pressure vessels (crane loading)

Technical specifications:

Test medium: Water
Drive: PPM Proprietary fine pressure control
Pressure: 25 bar
R & D and end of line production
3x Test circuits
Optional: Heated test medium

PPM 410 Leak test stand



Fields of application:

Fittings and mountings
Cooling circuit components
Pump & valve housing

Technical specifications:

Test medium: Water, emulsion
HD-Volume: 3,681 ml
Drive: Hydraulic
Pressure: 100 bar
End of production line
Hydrostic pressure test
Manual and /or robot handling

PPM 462 Leak test stand



Function test benches



Function test bench: To test the function of diesel injectors, nozzles, pressure relief valves, air-conditioning parts and many other pressure vessels the tightness and liquid flow are tested during different pressure load conditions. A typical application that we work on closely together with customers is: function testing in the electronic vehicle industry. Our function test benches allow battery operation simulation while testing components from electronic vehicles (EV). To simulate battery operation in an electric vehicle, a low voltage (0 to 20 VDC / 5A) or high voltage (0 to 600 VDC / 150A) power supply is available. The test medium (water-glycol mixture or pure glycol, for example Glysantin® G40, G44, G48) circulates at a controllable temperature of -35°C to +100°C and a volume flow of 3 to 30 l/min. Optionally, tests can also be carried out in an air-conditioning test chamber at -40°C to +140°C to simulate changing ambient temperatures.

Fields of application:

E-mobility

Technical specifications:

Test medium: Water, glycol

Pressure: 10 bar

Media temperature control:
-40°C to +140°C

Pressure curve: 0,1 to 2 Hz,
square and sine

Two test circuits, flow rate 3-30/min



Pressure pulsation test bench

Function test benches

PPM 377 Function test bench



Fields of application:

E-mobility

Technical specifications:

Test medium: Emulsion

Drive: External module

Pressure: 10 bar

Media temperature control:
-35°C to +100°C

Test parts: Water heaters

Technical specifications:

Test medium: Water, glycol

HD-volume: 1,710 ml

Drive: Hydraulic

Pressure: 20 bar

Ambient temperature control:
-60°C to +160°C (climate chamber)

Media temperature control:
-40°C to +140°C

Pressure curve: 0,1 to 2 Hz, sine

Flow rate up to 20 l/min

Fields of application:

High pressure

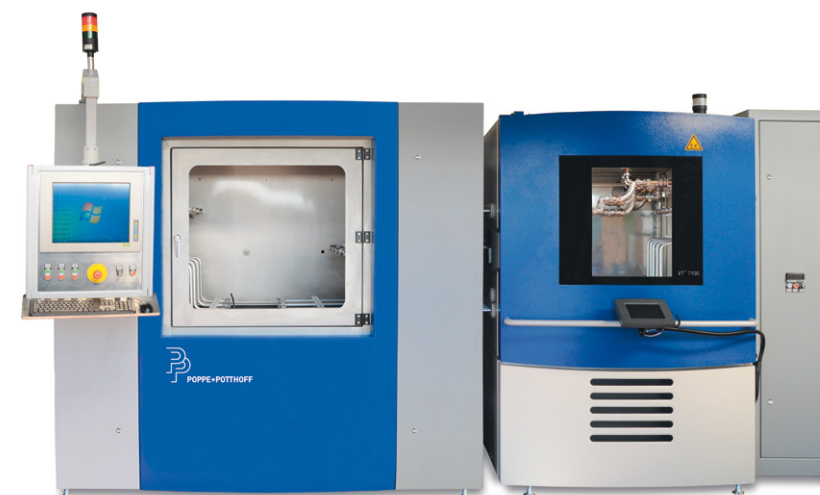
Automotive industry

Aerospace industry

PPM 430 Function test bench



PPM 472 Function test bench



Fields of application:

E-mobility

Technical specifications:

Test medium: Water, glycol

Drive: Fine pressure regulator

Pressure: 10 bar

Ambient temperature control:
-60°C to +160°C (climate chamber)

Media temperature control:
-40°C to +140°C

Test parts: Water heaters

Pressure test stands for hydrogen (H₂) components



Hydrostatic pressure fatigue- and burst test: In a typical test, the component is inserted into the test chamber of the burst test bench. This can be an auxiliary heater for an hydrogen car or valves, hoses and other hollow bodies that need to withstand more than 100,000 load changes over the lifetime of the vehicle (up to 15 years). The test benches of Poppe + Potthoff Maschinenbau allow for testing of the hydrostatic strength of components with pressures up to 3,000 bar or more.

Fields of application:

Hydrogen (H₂) components

Technical specifications:

Linear pressure increases up to 3,000 bar or more

Displacement volume max. 235 cm³

Variable programmable pressure ramps possible

Pressure hold times possible

Suitable for hydrostatic and burst pressure tests

Including function for increased displacement

Burst test stand for H₂ components



Test benches for hydrogen (H₂) components

PPM 467 Pressure pulsation & burst test stand



Fields of application:

Hydrogen (H₂) components

For pressure tests according to EG79 / EU406 - section 4.2

Technical specifications:

Impulse intensifier for small volumes up to 2,000 bar

Displacement volume max. 15 cm³

Frequency up to 10 Hz

Pressure load changes at sinusoidal & trapezoidal curve (depending on the expansion volume)

Safety test chamber with automatic door

Media treatment with dirt and clean tank

Refill for pressure change test complete electrotechnical equipment for pressure tests

Controller for maximum precision

PPM 361 Burst- & pressure pulsation test stand

Fields of application:

Hydraulics and hydrogen (H₂)

Technical specifications:

Test medium: Oil

HD-volume: 810, (327) ml

Drive: Servo-hydraulic

Pressure: 1,086, (3,200)

Pressure curve: >10 Hz

Flex pulsation intensifier for volume ranges



Leak test stand with gas (helium)

Fields of application:

Hydrogen (H₂) components

Technical specifications:

Leak test with helium, nitrogen, N₂/H₂, forming gas

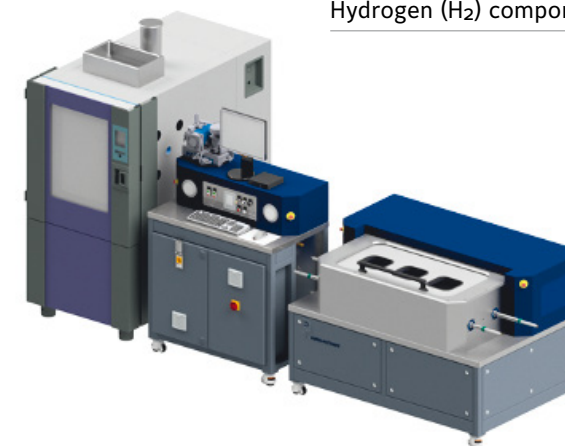
Tests with up to 1,050 bar

Testing in a climate chamber possible

Tests in a water bath

Bursting pressure test with water <3,000 bar for pre-validation

Safety concept with massive box in the climate chamber



**Poppe + Potthoff
Maschinenbau GmbH**

An der Helme 26
99734 Nordhausen | Germany
Phone +49 (0)3631 462210-0
Fax +49 (0)3631 463532

Sales:

salesppm@poppe-potthoff.com

Customer Service:

supportppm@poppe-potthoff.com

Website:

[https://www.poppe-potthoff.com/en/
products/machines-systems/](https://www.poppe-potthoff.com/en/products/machines-systems/)