# BPF-Q600-8

## *FLOW-RATE TEST BENCHES*
## *LINE 2024*

# INDEX

# 1 - INTRODUCTION

## APPLICATIONS:

The **BPF** series test benches have been designed to carry out single hydraulic test or life test of fitting, multilayer tubes, flexible tubes, plastic tubes, valves, heat exchanger and many others hydraulic components by readings and measurements the hydraulic characteristics in real operative conditions. The benches are designed to simulate pressure variation with possibility to adjust the water temperature and air chamber temperature, the test are performed according the Standards.

Examples of components that is possible to test with BPF benches:

- Flexible hoses, plastic tubes, multi-layers tubes, tube/connections assembly.
- Connections and hydraulic/pneumatic couplings.
- Valves, heat exchangers, plastic and metallic devices, hydraulic components.

The **BPF-Q** test benches' family allows to perform flow-rate tests on several kind of different hydraulic devices. Various kinds of flow-rate tests are available according the typology of the device under test (flow-rate with linear increase of pressure, Kv coefficient calculation, measure of generated pressure as a function of flow-rate and measure of flow-rate as a function of pressure drop).

Each bench is realized with specific features of pressure and flow-rate in order to adapt to the typical working conditions of the device on test.

# 2 - DEDICATED MODEL

## 2.1 - BPF-Q600-8

| | | | |
|---|---|---|---|
| - | Maximum flow-rate with one pump: | plant DN25 | 10÷295 L/min. |
| | | plant DN40 | 25÷400 L/min. |
| - | Maximum flow-rate with two pumps: | plant DN40 | 25÷754 L/min. |
| - | Adjustable pressure: | | 0,2÷11 bar. |
| - | Maximum pressure at 300 L/min (with one pump): | | 8 bar. |
| - | Maximum pressure at 600 L/min (with two pumps): | | 8 bar. |
| - | Maximum pressure at 750 L/min (with two pumps): | | 6 bar. |
| - | Hydraulic supply: | | Cold water. |

Test bench with internal tank and closed circuit supply.

### *2.1.1 - Applications:*

It allows to perform flow-rate tests and Kv coefficient calculations.

**Code: F02**

| | |
|---|---|
| **Kv calculation:** | with differential pressure measurement and Kv coefficient calculation performed in open circuit with cold water passage up to 750 L/min. |
| *Modality:* | the inlet and the outlet of the component under test are connected to the measurement line and to the corresponding pressure transducers. The software is structured so as to perform the plant tare and the measurement of the Kv coefficient of the component, purified from the system pressure drop. The supply pressure is automatically controlled while the flow rate is manually changed by acting on a downstream adjustment valve. |
| *Number of pieces under tests:* | 1. |
| *Software:* | AQ2TB-KV-LAB. |

**Code: F01**

| | |
|---|---|
| **Flow-rate test:** | with free drain, performed in open circuit with cold water passage up to 750 L/min. |
| *Modality:* | the component under test is connected directly to the outlet or by hoses. The supply pressure can be adjusted manually or automatically with linear increase or decrease.<br>Up to 6 acquisitions on the same graph. |
| *Number of pieces under tests:* | 1. |
| *Software:* | AQ2TB-FLOW-LIN. |

**Code: F03**

**Outlet pressure as a function of flow-rate:** with free drain, performed in open circuit with cold water passage up to 750 L/min.

*Modality:* the inlet and the outlet of the component under test are connected to the measurement line and to the corresponding pressure transducers, a fixed pressure is set and the flow-rate is adjusted with a regulation valve. The outlet pressure is measured as a function of the flow-rate. With this software is possible detect the characteristic curve of pressure reducers.
Up to 6 acquisitions on the same graph.

*Number of pieces under tests:* 1.
*Software:* AQ2TB-P-FLOW.

**Code: F04**

**Flow-rate as a function of the differential pressure:** with free drain, performed in open circuit with cold water passage up to 750 L/min.

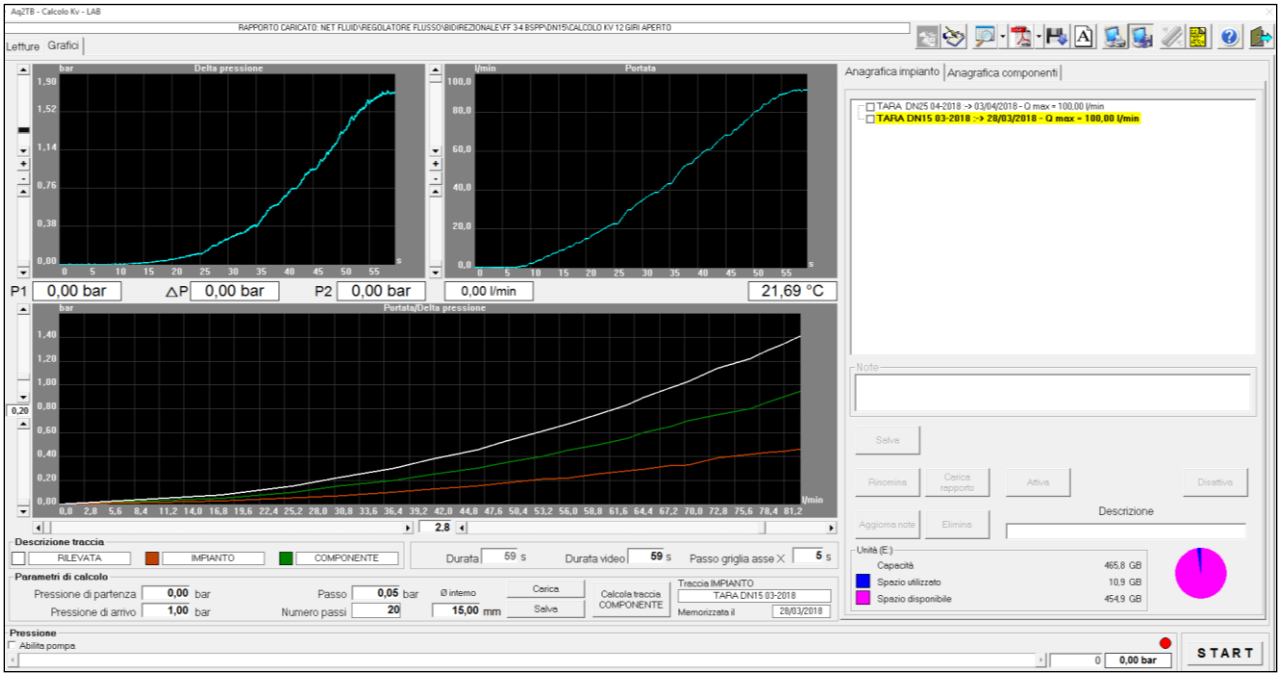
*Modality:* the inlet and the outlet of the component under test are connected to the measurement line and to the corresponding pressure transducers, a fixed supply pressure is set, the flow-rate is adjusted with a regulation valve. The flow-rate is measured as a function of the pressure drop on the component under test.
Up to 6 acquisitions on the same graph.

*Number of pieces under tests:* 1.
*Software:* AQ2TB-FLOW-DP.

## *2.1.2 - Basic software installed:*

**A)** **AQ2TB-BASEMOD** "SWG" service software with multichannel acquisition engine, management of users, calibration, change of units of measure, change of language, messages, water and air temperature regulation (if available on the bench).

**B)** **AQ2TB-KV-LAB** software for the evaluation of the pressure loss and the calculation of the Kv coefficient through the measure of the differential pressure as a function of the flow-rate. The software provides the following information as a function of the differential pressure: flow-rate (in L/min and kg/min), speed of the fluid, coefficients Kv and Cv, the flow resistance coefficient (ζ) and Reynolds number.




**C)** **WINDOWS 10** OEM Multilanguage.

**D)** **MACRIUM BACKUP** software for automatic back up of test data and operative system.

**E)** **SOMACHINE** software for management of PLC.

**F)** **TEAM VIEWER** internet remote control.

***Basic software included is in Italian language + second language English or German. Others languages only by request with extra cost.***

### *2.1.3 - Ethernet connection:*

The test bench is provided with Ethernet plug in order to allow the connection to Internet and enable the remote assistance functionalities through TEAMVIEWER software (installed by default on the PC).
The Ethernet plug also allows the integration of the bench inside the customer's network (intranet). In this way is possible to export data and reports and remotely check the functioning of the bench.
It allows, in conjunction with AQ2TB-MANSYS software, the incoming (from corporate server to test bench) and outgoing data exchange (from bench to server).

### *2.1.4 - Main components:*

**SUPPLY TANK AND HYDRAULIC PLANT:**

- **Pressurization system** with two multistage vertical pumps, stainless steel made, 11,0 kW (22SV08), installed in parallel on a structure independent by the test bench. Each pump can work individually or simultaneously in case of high flow-rate test.
- **Two inverters** for the control of the pumps with frontal panel for manual functioning matched with automatic control by PC using the pressure transducer as feedback in order to keep the pressure constant independently by the flow-rate.
- **Recovery and supply tank, size 2300 x 1200 x (h) 750 mm** made by fiberglass, total volume approx. 2000 L. The tank is provided with overflow tube, coverage panels, minimum floating level switch and manual drain ball valve.
- **Safety door** Plexiglas made to protect the operator in case of failure of the device under test.
- Test rig made by PN16 press-fittings and tubes according to EN 1267 Standard including:

    - **Supply line** made by DN90 tubes.

    - **Inlet line** with connection flanges, two DN65 collectors and one final DN90 collector.

    - **Test rig for low and medium flow-rate DN25** with motorized inlet valve, flow-rate regulation with manual valve, support collars and pipe unions (**optional:** proportional regulation valve, controlled by PC).
    - **DN25 measure line,** operative range 10-295 L/min with two pressure boxes made according EN standard and DN25 tubes.
    - **DN10 measure line,** operative range 1,5-47 L/min with two pressure boxes made according EN standard and DN10 tubes (optional).

    - **Test rig for high flow-rate DN40** with motorized inlet valve, flow-rate regulation with manual valve, support collars and pipe unions (**optional:** proportional regulation valve, controlled by PC).
    - **DN40 measure line,** operative range 25-754 L/min with two pressure boxes made according EN standard and DN40 tubes.

    - Independent **drain lines** made by DN90 tubes with water recovery on the working tank.

## CONTROL CONSOLE:

- Supporting structural frame made of aluminum and laminated panels.
- Worktop with supports for monitor, keyboard and mouse.
- Drawer positioned below the worktop for documents.
- Electric control cabinet for pumps' inverters, electro-valves, 24 V DC power supplier, acquisition multi-channel card, terminal block, signal converters and connection cables.
- Main switch, emergency push-button, Harting sockets for the power supply of the pumps.
- PC, backup hard disk and UPS.
- Assembly on rotating wheels provided with parking brakes.

## MOVABLE CARRIAGE:

- Used as a support for the measure lines and the regulation valves, the movable carriage allows a conveniently connection of the components with several different dimensions, varying the distances between the connection fittings of the device under test.
- The carriage con be located in straight position or in perpendicular position (or also in any other position) to allow the measure of the flow-rate of component with off-axis inlet and outlet connections (example: 90 ° valves).
- Supporting structural frame made of aluminum and laminated panels assembled on rotating wheels provided with parking brakes.

DIMENSION: approx. 800 x 700 x (h) 1000 mm with 800 mm cantilever frame.

## *2.1.5 - PC and software:*

***Installed WORKSTATION consisting of:***

- **Intel processor** – the configuration changes according the last components in the market: acquisition card National Instruments, network cards, two hard disks, DVD burner.
- **Keyboard and mouse wireless.**
- **23" LCD monitor** 16:9 touchscreen, assembled on adjustable holder.
- **UPS power supply 500 W.**
- **Back-up external unit – USB HDD.**
- On request - **A4 laser printer** and support trolley – (Code: KIT-LASERPRINTER).
- **Instruction manuals and Help on-line.**

***Operative system and acquisition software SWG:***

- Operative system: **Windows 10 Enterprise LTSC**.
- **Dedicated software: SWG 2024** to perform hydraulic tests.
  The new multilanguage software SWG allows to work with different units of measure**,** it allows to acquire the parameters for the functioning of the bench and to provide documentation for the tests through the following screens:
  - ◊ Start-up screen with several options available: the account (admin/users) and passwords management, calibration, transducers check, selection of software language, units of measure, messages and software for the execution of the tests.
  - ◊ Main screen showing the virtual synoptically panel, with all the measures acquired in real time.
  - ◊ Specific screen showing pressure and flow-rate in graphic format with adjustable video size, possibility to perform enlargements of the working area, final summary data with the minimum, maximum and average values at the end of the acquisition.
  - ◊ Final report with all the test data and a significant video screen. It is possible to generate each report in different languages.
  - ◊ It is possible to control the opening and closing of all the internal valves and the pumps by clicking with the mouse on the graphic symbol representing each component in the synoptic panel.
  - ◊ All the existing screens may be printed with customer's notes and logo.
  - ◊ Help On-line support, with all the main operational instructions.

### *2.1.7 - Transducers installed:*

| | |
|---|---|
| TEMPERATURE: | accuracy ±0,3 °C, resolution 0,01 °C.<br>Pt100 low-inertia, 4-wires probe. |
| PRESSIONE: | operative range 0-20 bar.<br>accuracy ±0,05% of the full-scale value.<br>resolution 0,01 bar, transducers with high dynamic response. |
| FLOW-RATE DN25: | accuracy ±0,25% of reading value (range 75÷295 L/min)<br>accuracy ±0,50% of reading value (range 10÷75 L/min)<br>accuracy ±1,00% of reading value (range 4÷10 L/min) |
| FLOW-RATE DN40: | accuracy ±0,25% of reading value (range 190÷754 L/min)<br>accuracy ±0,50% of reading value (range 25÷190 L/min)<br>accuracy ±1,00% of reading value (range 8÷25 L/min)<br>resolution 0,01 L/min with precision electromagnetic flow meter with output connected to microprocessor converter. |

**The measuring equipment assembled on the bench is equipped with an inspection report relative to the operational fields and performed according to the ISO 9001 standards, with reference to the *Accredia* (Italian Calibration Service) primary samples.**

**The test bench is provided with a final test report of electrical safety according to standard CEI EN 60204-1 and CE declaration of conformity.**

### *2.1.8 - Technical data:*

| **WEIGHT AND DIMENSION** | |
|---|---|
| - TESTING TANK (APPROX.) | 2300 x 1200 x (h) 750 mm |
| - CONTROL CONSOLE (APPROX.) | 1200 x 1050 x (h) 1800 mm |
| - MOVABLE CARRIAGE (APPROX.) | 800 x 700 x (h) 1000 mm |
| - TOTAL AREA REQUIRED (APPROX.) | 5000 x 2500 x (h) 1800 mm |
| - TOTAL WEIGHT (APPROX.) | 1700 kg |
| **SUPPLY CHARACTERISTICS** | |
| - ELECTRICAL SUPPLY | 400 V 3 phases + N + GND<br>50 Hz |
| - POWER | 23,0 kW |
| - HYDRAULIC SUPPLY | Manual filling |
| - WATER DRAIN FLOW | 80 L/min |
| - WATER TEMPERATURE | Ambient |

# 3 - ADDITIONAL SOFTWARE

## 3.1 - Additional software for testing

**AQ2TB-FLOW-LIN** Flow-rate test with linear increase and/or decrease of pressure and multi-trace flow-rate/pressure or pressure/flow-rate charts.

**AQ2TB-P-FLOW** software for pressure reducers testing with automatic or manual linear increase of flow-rate and measuring of outlet pressure. Up to 6 acquisitions on the same graph.

**AQ2TB-FLOW-DP** software for flow-rate tests as a function of the pressure drop on the device under tests for the calculation of the characteristic curve of excess flow valves. Up to 6 acquisitions on the same graph.

## 3.2 - Service functionalities

**AQ2TB-OPZ-MLG** Possibility to generate and print in five different languages (Italian, English, German, French and Spanish) all the test reports. The language of the report is independent from the language of the software. Each report can be generated more than one time in different languages.

**AQ2TB-DATA-EXP** Possibility to export in a TXT format file all the samples acquired during a test. It is possible to activate this function for all the software; this function is independent by the graphs shown in each software. For laboratory tests, it is possible to export the data of the entire test. For endurance tests, it is possible to export data of a single cycle, the number of saved cycles can be chosen by the operator. The maximum acquisition frequency is about 10 Hz (sample per second) for each channel.

**AQ2TB-DATA-INFO** Additional option for the personalization of the test information in all the active languages. The standard menu, composed in English by the entries "*Client*", "*Category*", "*Line*", "*Model*", "*Serial number*" and "*Test description*" can be modified in order to adapt the management of the tests on bench (including the reports) to the modality adopted by the company internally.

## 3.3 - AQ2TB-MANSYS

This optional software, installable on one or more PCs with suitable characteristics and integrated into the company network, can be used for remote management activities on the test bench.

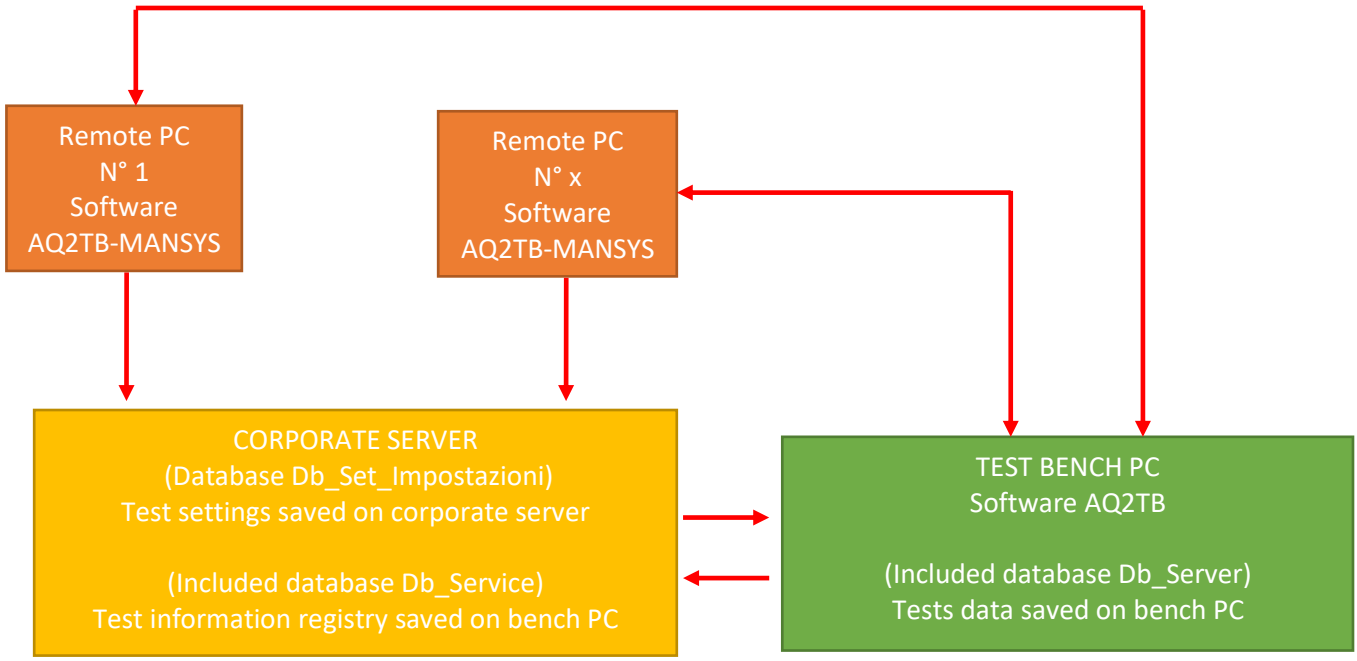
**Software specification:**

- The software allows the remote creation, modification and cancellation of the test's execution parameters for each test. (*)
- The software allows the access to the test data and, consequently, to their analysis and exportation; it allows the creation of the test report independently from the activity carried out on the bench in that moment. (**)
- It allows the visualisation of the bench status (normal functioning or in alarm) and the kind of test in execution in real time. (**)
- It allows the creation of test information registry usable on the bench during the saving procedure. (*)

* The bench will not have access to data in case of absence of network connection.
** Features active only in case of available network connection.

**Notes:**

- In case of absence of network connection, the normal functioning of the bench is always guarantee.
- The effective functioning of the software depends on the corporate server features, and cannot be guaranteed before the start-up of the bench.



# 4 - ACCESSORIES

## 4.1 - BPF-OPZ-PV

Proportional (linear) regulation valves on each measure line, controlled by PC with 0-10 V command. They allow the automatic regulation of the flow-rate without any manual intervention by the operator.

Regulation valve for DN25 line: Kv = 25,0 m³/h.

Regulation valve for DN40 line: Kv = 40,0 m³/h.

Regulation valve for DN50 line: Kv = 63,0 m³/h.

## 4.2 - BPF-OPZ-KV10

Dedicated DN10 measure line for flow-rate tests and Kv calculation up to 47 L/min. Includes pressure boxes, flow meter and hydraulic plant realized according EN Standard.

Includes automatic regulation valve for DN10 line: Kv = 2,7 m³/h (3/8")

Includes automatic regulation valve for DN10 line: Kv = 3,8 m³/h (1/2")

Includes automatic regulation valve for DN10 line: Kv = 6,0 m³/h (3/4")

### *4.2.1 - Transducers installed:*

| | |
|---|---|
| FLOW-RATE DN10: | accuracy ±0,25% of reading value (range 11÷47 L/min) |
| | accuracy ±0,50% of reading value (range 1,5÷11 L/min) |
| | accuracy ±1,00% of reading value (range 0,6÷1,5 L/min) |

## 4.3 - SPARE PARTS KIT

The spare parts kit includes transducers, valves, fuses, lamps according to the configuration of the test bench.

**Code: SPARE-PARTS**

# 5 - EXAMPLES