PROVASET T3LPF

TEST EQUIPMENT FOR AIR FLOW RATE TESTS AND FOR PRESSURE DECAY TESTS

INSTRUCTION MANUAL
Rev.20210610
Updated to fw 1.0.42

Revision	Description	Date
20190311	Issued	11/03/2019
20190612	French text update	12/06/2019
20190718	Chapter integration: Firmware Update page 94 Chapter integration: Collection of test data on the pen drive page 82 Paragraph integration: Programmable output parameters (SWPDO option) page 56 Parameter update Set product with: 'Via Ethernet' see Unit: barcode reader (option) page 70 Paragraph update: Available options page 11 Paragraph update: Flow rate test: PASSED/FAILED result messages page 41 Paragraph update: Leak test: PASSED/FAILED result messages page 50 Paragraph update: Volume+leak test: PASSED/FAILED result messages page 54 Updating of the parameter 'Enable code database': Unit: barcode reader (option) page 70 Weight update: Technical data page 96	18/07/2019
20190909	Update csv file name (enable database codes?): Unit: barcode reader (option) page 70 Update products no. and programs no.: Description page 10 Updating of the PRODUCT or TEST PROGRAM selection for each test cycle: Testing products and programs page 34	09/09/2019
20191015	Chapter integration: Printer page 84 Paragraph update: Barcode associations database group (option) page 72 Program code integration: Test program: name, type of test, mode page 37 Integration of printer model selection: Unit: serial line 1 (first expansion board) page 68 Replacement of the term Permeability with Blockage for the English language version Constant temperature update: Leak test: leak rate Q page 49 Updating calibration sensor image with LTC Tecna pressure gauge: Calibration of the relative pressure page 87	15/10/2019
20191204	Update Products / Programs parameter: Unit: digital inputs page 62 Unit: digital outputs page 64	04/12/2019
20200722	Declaration of Conformity aligned Update: QLP "Low-pressure" mode 30 mbar and "QLP extra digit" page 39 Chapter integration: 6.5.5 Air flow rate test: flow calculation at nominal pressure PN page 41 Chapter integration: 5.5.6 Air flow rate test: calculation of pressure at nominal flow FNpag. 42	22/07/2020
20210212	Added paragraph 7.8 Unit: Ethernet (OPTION) page 66 7.9 Unit: Part11 Options(option) page 68 8.2 Utility: Autotest cycle page 77 8.3 Utility: Backup and Restore page 78 Added Leak in pressure per second as measuring scales	12/02/2021
20210505	Added hectoliters to units of measurement selectable	05/05/2021
20210511	Update 7.3 Unit: measuring scales page 62	11/05/2021

Revision	Description	Date
20210610	Updated: 6.6 page 43, 7.2 page 61, 7.5 page 64, 8 page 75	10/06/2021

Legend:
ABC = display message
ABC = programmed parameter

SUMMARY

1. LIST OF USED SYMBOLS

CAUTION: Safety rules for the operator, considering as operator any installer, user or present person.

WARNING: Instructions to be followed carefully for the correct operation of the equipment and to avoid any damage to the equipment or to the operator.

NOTE: Contains important indications for the equipment maintenance.

NOTE: Contains important supplementary information or useful suggestions.

2. RISKS AND WARNINGS

CAUTION: Compressed air risk: when the equipment is installed and used, the operator must be protected against any possible injuries caused by the accidental detachment of parts under pressure. The tested product must conform with the mandatory requirements (e.g. The tested product must conform with the mandatory requirements (e.g. "Pressure Equipment Directive", PED 97/23/CEE)

CAUTION: Electrical shock risk: class I equipment.
The electrical power supply requires mandatory a protective ground connection. Check regularly the protective ground connection of the power supply. Always keep the power supply cable in good conditions. Disconnect the power supply cable for any maintenance and before cleaning the equipment housing.

CAUTION: Moving parts risk: if the pneumatic or electrical outputs of the equipment are used to drive external moving parts, the operator must be protected applying all the safety standards of the Machinery Directive for moving parts.

CAUTION: Before carrying out any maintenance work, depressurise the pneumatic system and disconnect the power supply cable to the device.

WARNING: Clean the outside of the equipment with soft cloths, using only water with neutral detergents or disinfectants.
Do not use alcohol, benzine or thinner; do not use flammable or toxic detergents.
Do not spray the cleaning agent directly on the device.
Use specific cleaning products for LCD monitors to clean the screen.

WARNING: Do not pour fluids on the equipment: this could damage some of its parts permanently, especially the live parts.

WARNING: Use the equipment only for the intended purposes, described in this manual; different uses can be unsafe for the operator and can damage the equipment.

WARNING: This manual must be read carefully before using the equipment of which it is integral part. Keep this manual for future reference.

3. GENERAL INFORMATION

3.1 Description

Provaset T3LPF is an electro-pneumatic device, designed for air flow rate tests with mass flow sensors and for air tightness tests with pressure drop measurement.
Main features:

- modern and powerful electronics, with a 32 bits microprocessor, flash memories;
- graphical colour display, with pressure and flow graphs, which help the operator to evaluate the efficiency of the test cycle and to define the test parameters;
- touch screen, for a fast and easy programming of all operating parameters;
- advanced serial interfaces, for data collection and remote programming of all functions;
- innovative pneumatic circuit., designed to ensure the safety of the tests and the accuracy of the measurements.

The Provaset T3 models can be used both for manual testing benches and for test stations on highly automated systems, controlled by a PLC or computer.
The basic models of the T3PF series offer the following features:

- air flow test with mass flow sensor and optional full scale range:
  - up to 20 l/min), resolution 0.001 l/min;
  - from 50 l/min to 300 l/min, resolution 0.01 l/min;
- pressure decay tests, with optional full scale range:
  - up to 2 bar (resolution 0.1 Pa);
  - up to 6 bar (resolution 1 Pa);
- 300 programmable test programs;
- 300 programmable products, each of which can contain a sequence of 1 to 16 programs;
- various scales for measuring the air flow rate (l/min, l/h, m^3/h, scfm, ...) according to various temperature standards (0°C, 21°C, ...);
- various pressure measurement scales (kPa, mbar, mmH2O, mmHg, psi, inH2O);
- various scales of pressure loss or loss in flow units;
- electronic pressure regulation with a proportioning valve;
- Staubli quick connector for leak masters;
- procedure for the automatic measurement of the equivalent volume for leak tests;
- Available languages: Italian, English, Spanish, French, Chinese, Japanese, German;
- programmable PLC inputs and outputs;
- clock / calendar;
- test counters;

- serial lines USB slave and RS232/RS485 for remote management from a computer;
- assisted procedure for the calibration of flow and pressure sensors.

All Provaset T3 instruments are provided with valid calibration certificates for certification to ISO9001:2008 standards.

3.1.1 Available options

- Option - **SWT**: barcode management, qr code and label printer;
- Option - **SWPDO**: programmable outputs;
- Option - **CP**: SPC statistics function and daily and hourly counters;
- Option - **SWCFR**: user access and data logging in accordance with FDA CFR 21 part 11;
- Option - **IO421**: expansion board for interface **PROFINET**;
- Option - **IO400**: expansion board for interface **PROFIBUS**;
- Option - **IOB:** 8-in / 8-out expansion board (supplied as an option for slot 2);
- Option - **Eth**: communication over ethernet connection;
- Option - **V24**: external power supply 24Vdc.

3.1.2 Available accessories

- tower lights (semaphore) with audible alarm;
- external valves for filling/discharge/volume control;
- remote commands box;
- lateral fixing brackets.

3.2 Packaging and transport

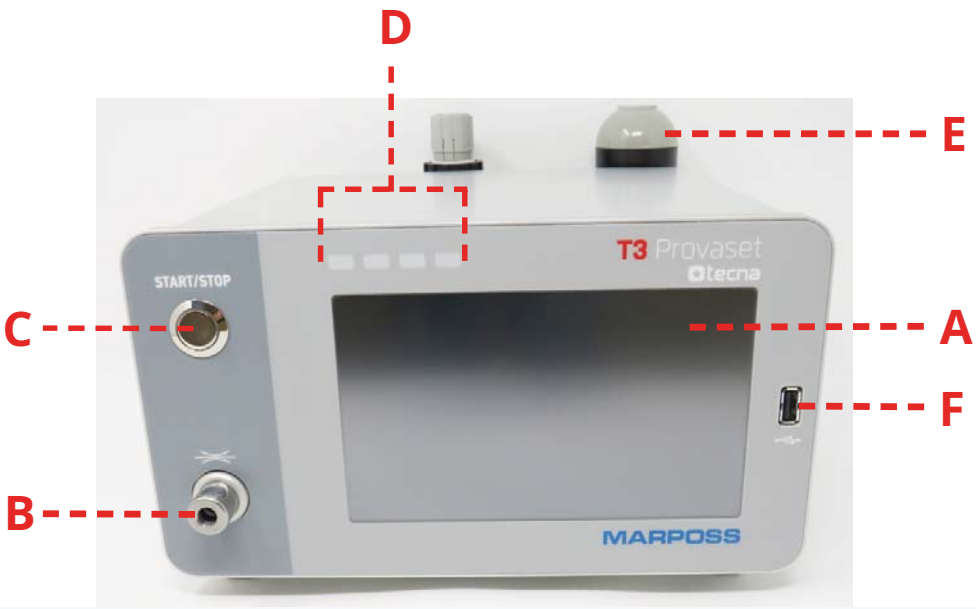
The type of packaging is selected according to the transport means, the quantity to be delivered and the place of destination.
Normally, every single instrument is contained within a cardboard box.

Keep the cardboard packing in order to use it when the instrument is shipped to authorized service centers or to the manufacturer for required maintenance.
If the original packaging has not been stored, use a cardboard box, with adequate dimensions and fill all the empty spaces with soft material (paper, foam. etc...) to prevent any movement of the instrument inside the box.
Transport must be carried out at temperatures between –10 °C and 50 °C, with a maximum relative humidity of 50% and ambient pressure between 700 hPa and 1100 hPa.

3.3 Storage

In case of prolonged inactivity, keep the equipment, possibly packaged, or otherwise protected, in rooms with a temperature between 0 ° C and 50 ° C, maximum relative humidity 50%, ambient pressure between 700 hPa and 1100 hPa.

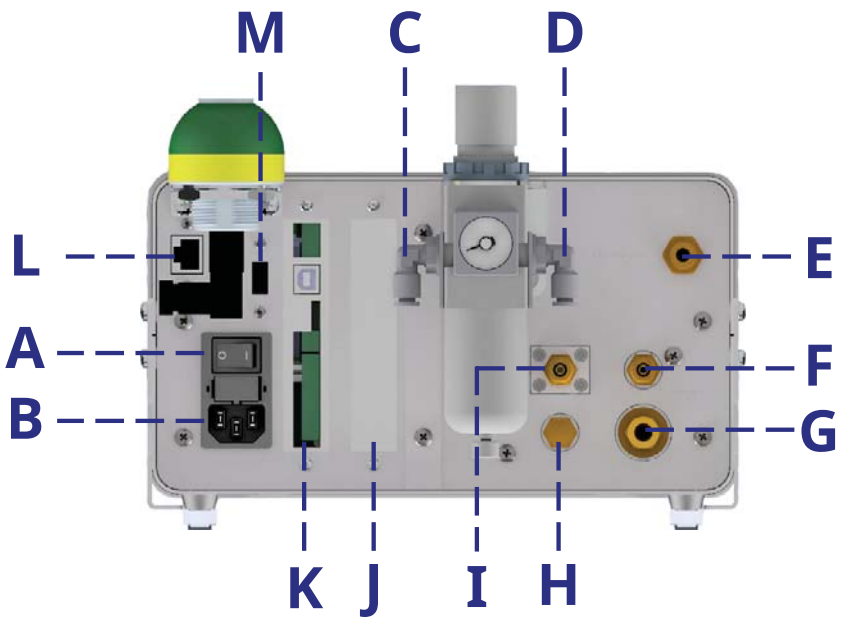
3.4 Front panel



A	LCD Display, Colour TFT, 7” with touch screen;
B	Leak master quick connector, with shut-off valve, type Staubli RBE03.
C	Start/Stop push button, push to start a new test, push again for about 1 s to stop the test.
D	Test cycle phase lights
E	Lights tower with loud alarm, removable, with 1.5 m cable (semaphore option)
F	USB Host connector.

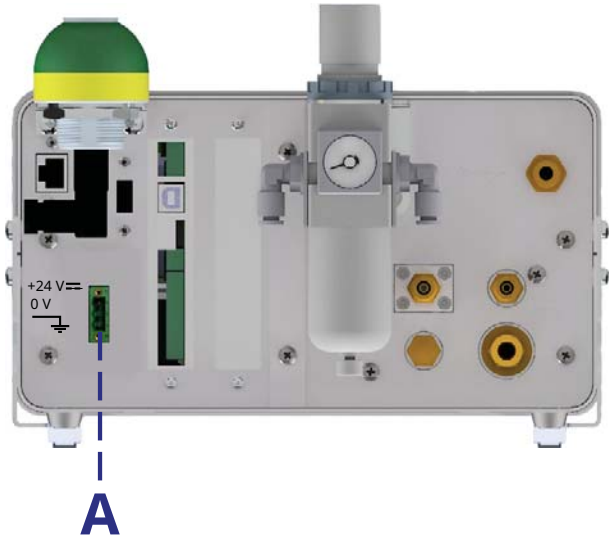
WARNING: do not use sharp or pointed objects on the touch screen, use only fingers without excessive pressure.

3.5 Rear panel with mains power supply (90 ÷ 230 Vac)



A	Power On/Off switch, with fuses and power cord inlet
B	Power input socket with ground connection, type IEC320
C	Compressed air supply input, 3 bar min, 10 bar max;
D	Filtered air output, to be connected to the input port E;
E	Filtered air input, from point D
F	Output port for reading the local pressure (with a cap or connected with a tube to port I)
G	TEST air flow output connected to the tested component.
H	Air exhaust outlet, with silencer
I	inlet port for reading the test pressure, connected with a tube to the local pressure port F (local pressure) or directly to the tested component (remote pressure).
J	Housing 2, for expansion board (option);
K	Housing 1, for expansion board (standard IOB type)
L	Ethernet connector
M	USB Host connector.

3.5.1 Rear panel for external 24 Vdc power supply



A Terminal block plug, 3 positions, pitch 5.08, clamping screw for wires, Phoenix Contact type 1777992;

The power supply with two common +24Vcc and 0V outlets, is supplied only if requested by the client. (option)
Terminals:

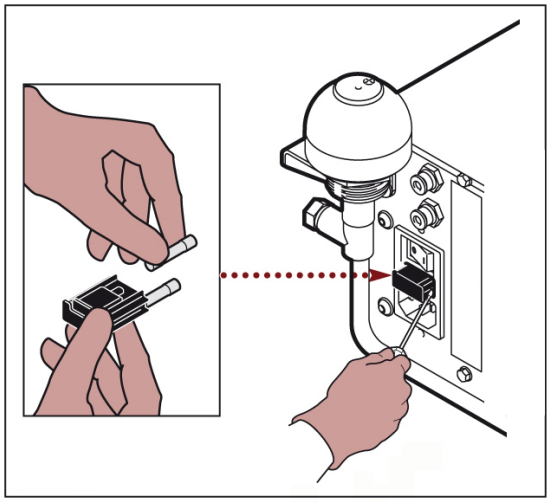
+24V= Power supply 24Vcc, 1.5 A max
0V Common 0V (connected to the frame)
⏚ Ground

⚠ **WARNING:** EMI/EMC compliance; the connection to ground is required for EMI/EMC electromagnetic compliance.

⚠ **WARNING:** Electrical shock risk.
the external power supply must comply with standards.

3.6 Fuses

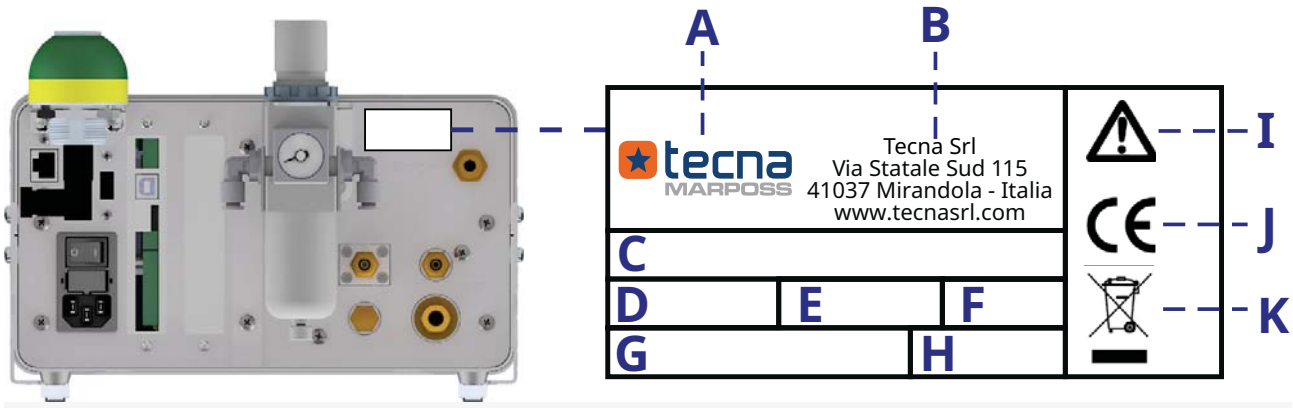
Version with mains power supply (90÷230 V~)
Two fuses, size 5x20 mm, retarded type T, 630 mA rated.
Fuse drawer below the power switch.



⚠ **CAUTION:** disconnect the power supply cable before changing the fuses.

Version with 24V= power supply
Single fuse, internally mounted, resettable, 1.5A.

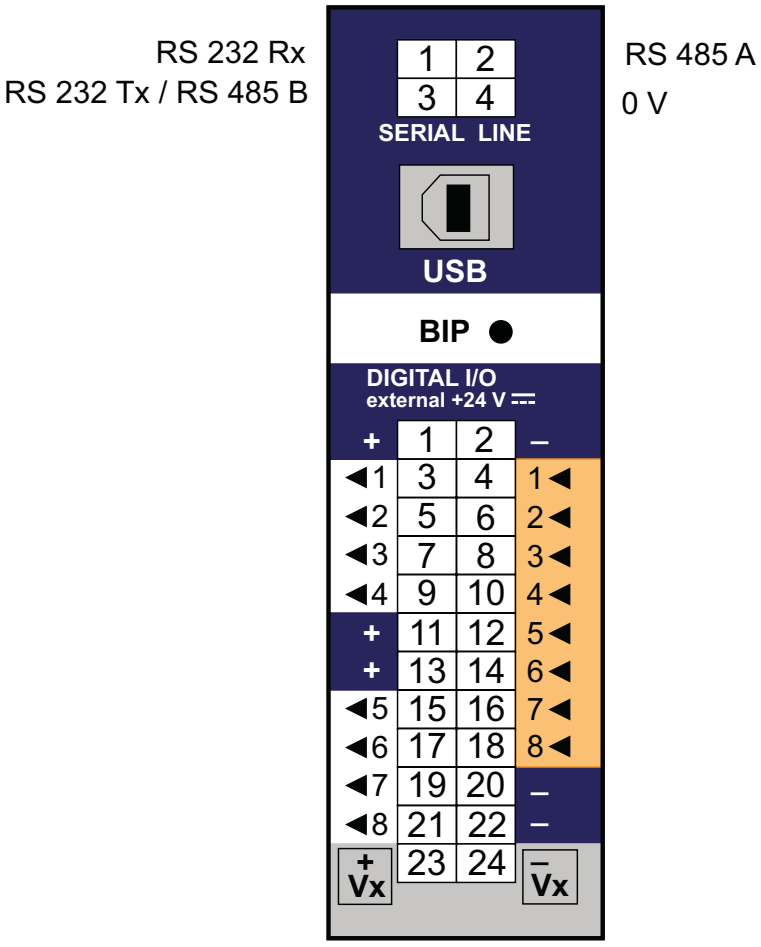
3.7 Manufacturer label



A	Logo Tecna Srl	**G**	Mains power supply
B	Company address	**H**	Air pressure supply, 3 <= bar <= 10
C	Equipment type, PROVASET T3L	**I**	Instruction manual
D	Model code, T3LPxxx-2C	**J**	CE marking
E	Serial number	**K**	WEEE marking
F	Production year		

3.8 Expansion board

3.8.1 Expansion board, 8 inputs / 8 outputs (type IOB)



The input/output board, type IOB with 8 Inputs / 8 Outputs, features:

SERIAL LINE: isolated serial line, configurable, type RS232 or RS485, Phoenix Contacts connector, type DFMC 1,5/2-ST-3,5-LR, code 1790483.

USB: USB slave connector type B , for communication with a PC; when two expansion boards are mounted, only the first one, on the left, is enabled for USB slave connection to a PC.

BIP: acoustic buzzer, low intensity.

DIGITAL I/O: +24V= power supply, digital inputs/outputs, Phoenix Contacts connector, type DFMC 1,5/12-ST-3,5-LR, code 1790580.

1:	+	+24V=	2:	–	-0V common
3:	<1	(Output 1)	4:	1<	(Input 1)
5:	<2	(Output 2)	6:	2<	(Input 2)
7:	<3	(Output 3)	8:	3<	(Input 3)
9:	<4	(Output 4)	10:	4<	(Input 4)
11:	+	(Output +)	12:	5<	(Input 5)
13:	+	(Output +)	14:	6<	(Input 6)
15:	<5	(Output 5)	16:	7<	(Input 7)
17:	<6	(Output 6)	18:	8<	(Input 8)
19:	<7	(Output 7)	20:	–	(Output -)
21:	<8	(Output 8)	22:	–	(Output -)
23:	+Vx	(Output +Vx)	24:	–	(Output -Vx)

Power supply for digital inputs/outputs:

+	external power supply of PLC: +24V=
-	external power supply of PLC: -0V common

Digital I/O

Output <1: <8	PNP output, 0.7 A max, configurable
Output +	Auxiliary output at positive power supply voltage +
Output -	Auxiliary output at power supply common 0 Volt -
Input 1<: 8<	PNP input, 5 mA max, configurable

Auxiliary internal power supply +Vx, -Vx

If an external power supply is not available (+ PLC 24V=), it is possible to use the internal power supply (+Vx , -Vx) of the equipment; connections:

23: +Vx	(Output +Vx)	connected to	1: +	(PLC: +24V=
24: -Vx	(Output -Vx)	connected to	2: -	(PLC: -0V common)

The maximum output current is limited to 300 mA (max 10W), protected by an autoresettable internal fuse.
The digital outputs and inputs are isolated, up to 50 Volts, if supplied by an external power supply (24V=PLC). The digital inputs and outputs are not isolated if powered by the internal power supply +VX and -VX.

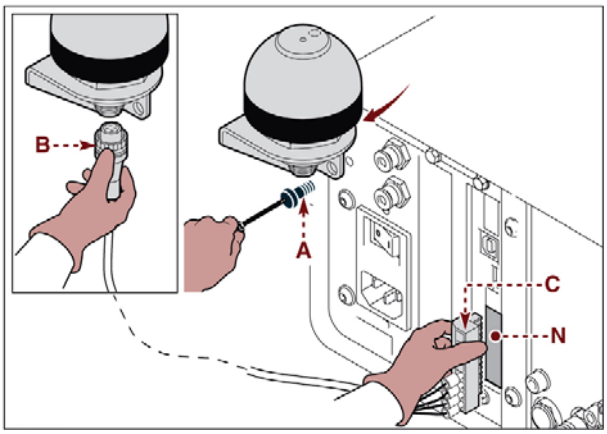
WARNING: Use only a single power supply source. Never connect the auxiliary internal power supply (+Vx, -Vx) to any other external power supply.

WARNING: Electrical shock risk. Any external conductive connection to the expansion board must be considered as an accessible conductive part of the equipment and must have a double insulation to the mains supply.

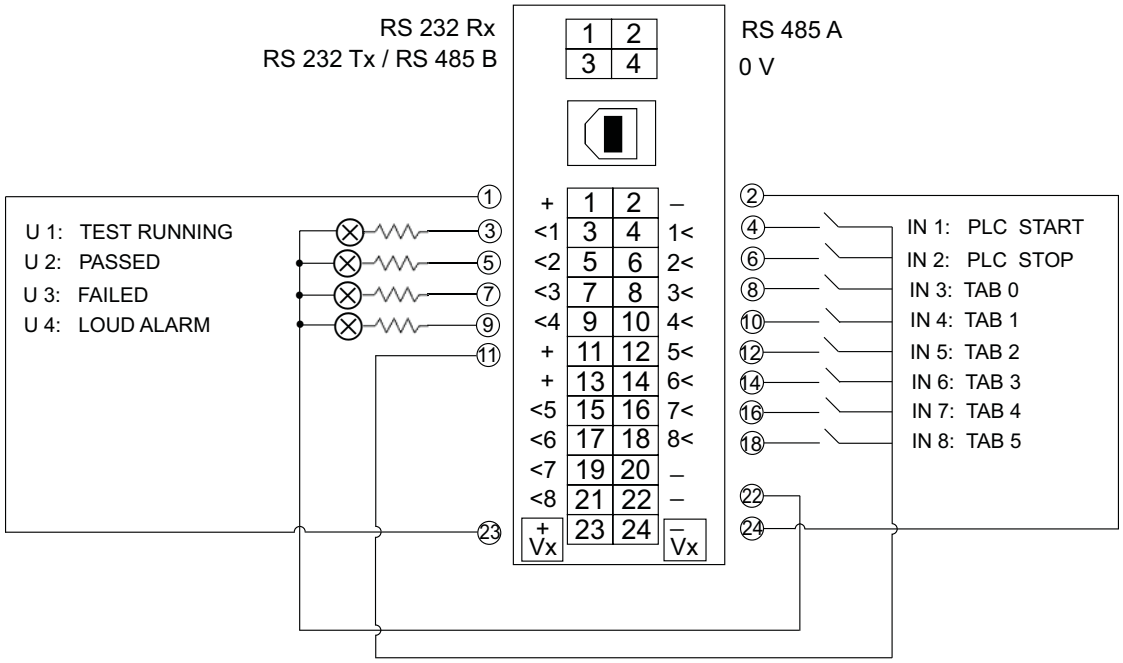
3.9 Lights tower indicator, loud alarm, remote control box

The lights tower (semaphore) indicator is useful for the operators if the equipment is placed in a noisy environment and not in front of the operator.
The semaphore has 3 lights and one acoustic signal:

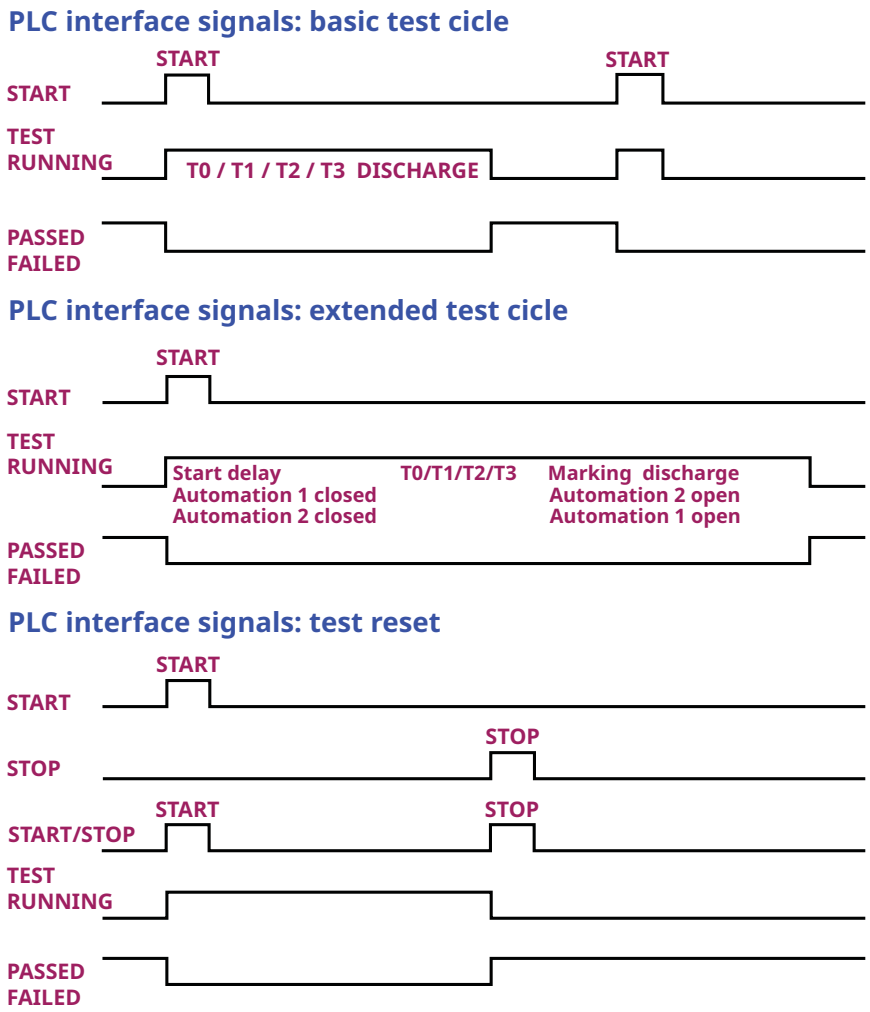
- yellow: test running
- green:test PASSED
- red: test FAILED
- buzzer: test FAILED / ALARM



The inputs and outputs of the expansion board can be used for mechanical contacts such as START, STOP, selection of products being tested and light control signals, as in the example in the figure.



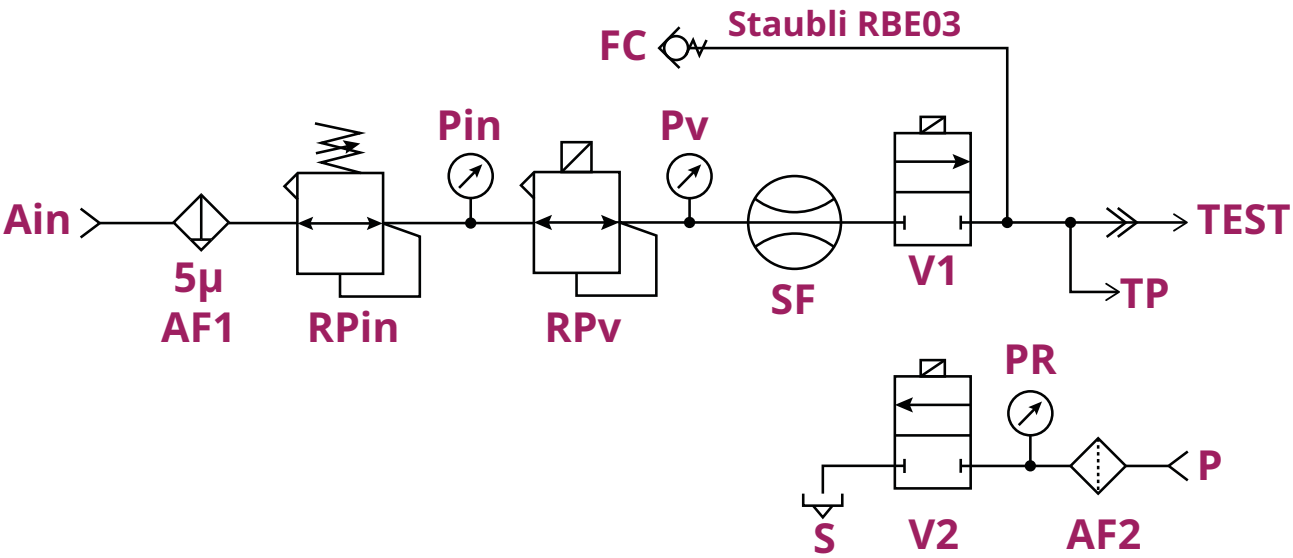
3.10 PLC: interface signals



A Programmable Logic Controller (PLC) can use a single START/STOP signal to command the START of a test cycle and to reset a running test.
The START signal should be a pulse, that can be lowered down when the "TEST RUNNING" signal is received.
The START signal must be lowered down before to start a new test.
If the START/STOP pulse is repeated while a test is running, the test is terminated (reset).
If an input signal is programmed as RESET command, the reset input terminates the running test and disables the start input (START).

All PLC inputs and outputs are PNP signal (signal on at 24Vdc).

3.11 Pneumatic diagram



Ain	Compressed air supply
AF1	Air filter
RPin	Input regulator
Pin	Input pressure gauge
RPv	Test pressure regulator
Pv	Regulated pressure
SF	Flow sensor
V1	Internal valve
TEST	Output connection to the test circuit
TP	Connection for reading the internal test pressure, on the TEST output
FC	Master leak connection
V2	Internal valve
PR	Test pressure
AF2	Internal filter
S	Discharge connection
P	Pressure reading connection

Ain: compressed air supply
Connection to the compressed air supply, quick connector for 6x4 mm pipe, max pressure 10 bar, min pressure 3 bar.

AF1: air filter
5 micron filter on the inlet compressed air.

RPin: input regulator
Manual pressure regulator for the inlet pressure of the filtered air; the pressure must be adjusted to at least 1 bar above the full scale pressure of the equipment, with a minimum of 3 bar.

Pin: input pressure gauge

RPv: test pressure regulator
Electronic pressure regulator.
The pressure is automatically adjusted to the programmed nominal pressure, corrected by the **RP%** parameter; special cycles at different filling pressures are also possible, with up and down ramps.

Pv: regulated pressure
The adjusted pressure is read by a dedicated transducer and is visible in a menu page on the screen, to check the output pressure before starting a test.

SF: flow sensor
Mass flow sensor.

V1
Internal valve, normally closed, open only during testing for the emission of air at the TEST output to the component being tested.

TEST
Output connection to the test circuit, for pipe Ø 8 x 6 mm.

TP
Connection for reading the internal test pressure, on the TEST output.
If the test pressure is read directly on the component being tested, the bypass output must be closed.

FC: master leak connection
Quick coupling with Staubli RBE03 type check valve on the front panel for the connection of a leak master.

V2
Internal valve, normally closed, open only to relieve the pressure in the component being tested.

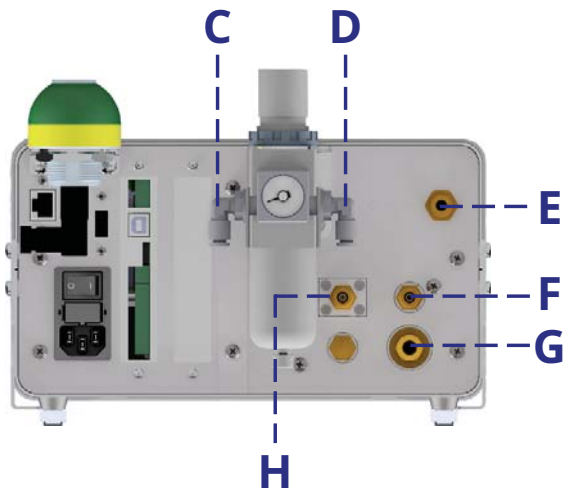
PR: test pressure
Pressure transducer for measurement of the relative test pressure, to be connected to the TEST output (bypass connection) or directly to the component being tested, with a separate tube.

AF2: internal filter
Sintered filter, disc, mounted inside the pressure reading fitting.

S: discharge connection

P: pressure reading connection

3.12 Pneumatic installation, air supply and test connections



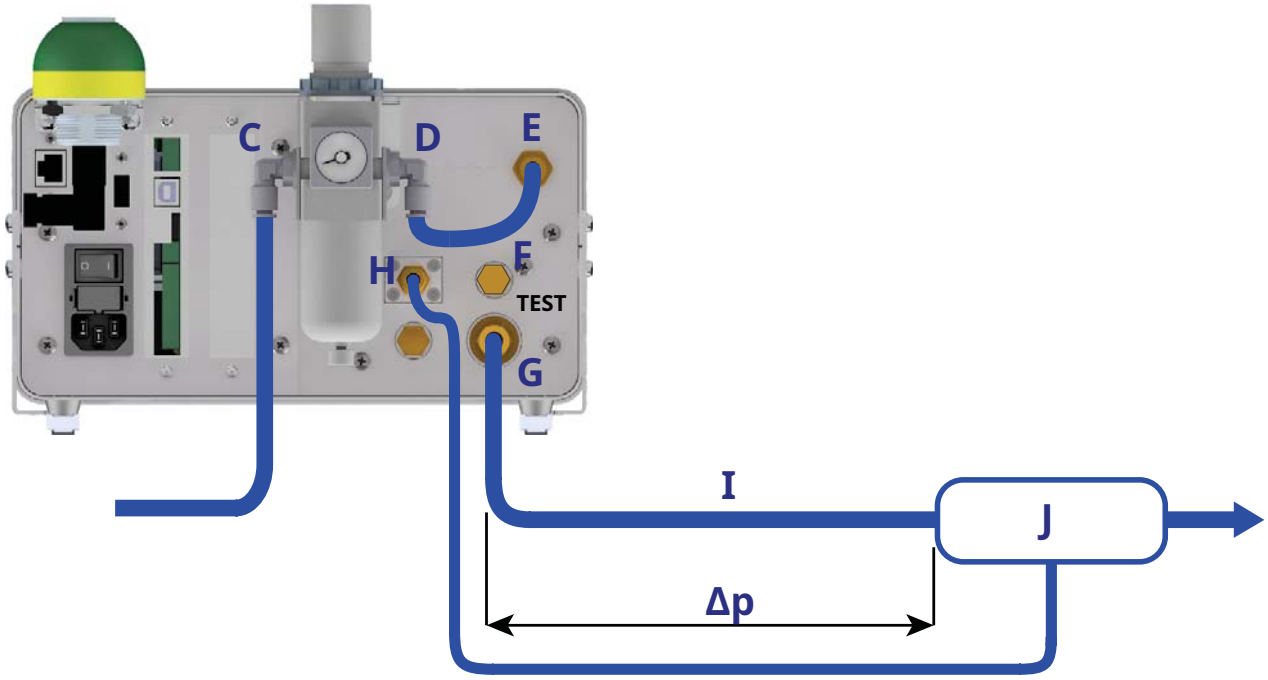
C	Inlet connection for compressed air supply, to the air filter, for 6x4 or 8x6 mm pipe. The air supply pressure should be at least 1 bar over the regulated test pressure. Maximum supply pressure: 10 bar Minimum supply pressure: 3 bar (for the internal pilot valves). Air filter: 5 micron max
D	Output connection from the air filter to the internal pneumatic circuit, to be connected to the E connection, for 6x4 or 8x6 mm pipe.
E	Input of filtered air into internal pneumatic circuit.
F	Output connection for reading the local pressure; the connection can be connected to the inlet H or it can be closed.
G	TEST: output of the air flow to the test circuit, for pipe Ø 8x6 mm.
H	Test pressure: inlet connection for reading the test pressure, connected to output F for reading the local pressure, or directly to the component being tested, for reading the remote pressure, with pipe Ø 6x4 mm.

WARNING: Use only dry air, without condensation, filtered, not lubricated and free from explosive gases, conforming to ISO 8573-1 air quality.

WARNING: never bypass the inlet air filter; always connect the compressed air to the filter inlet, to fitting C; always connect the filter output from fitting D to fitting E.

CAUTION: All the pneumatic tubes must be approved for safety at the maximum supplied air pressure.

3.12.1 Flow rate test: connection with remote pressure reading

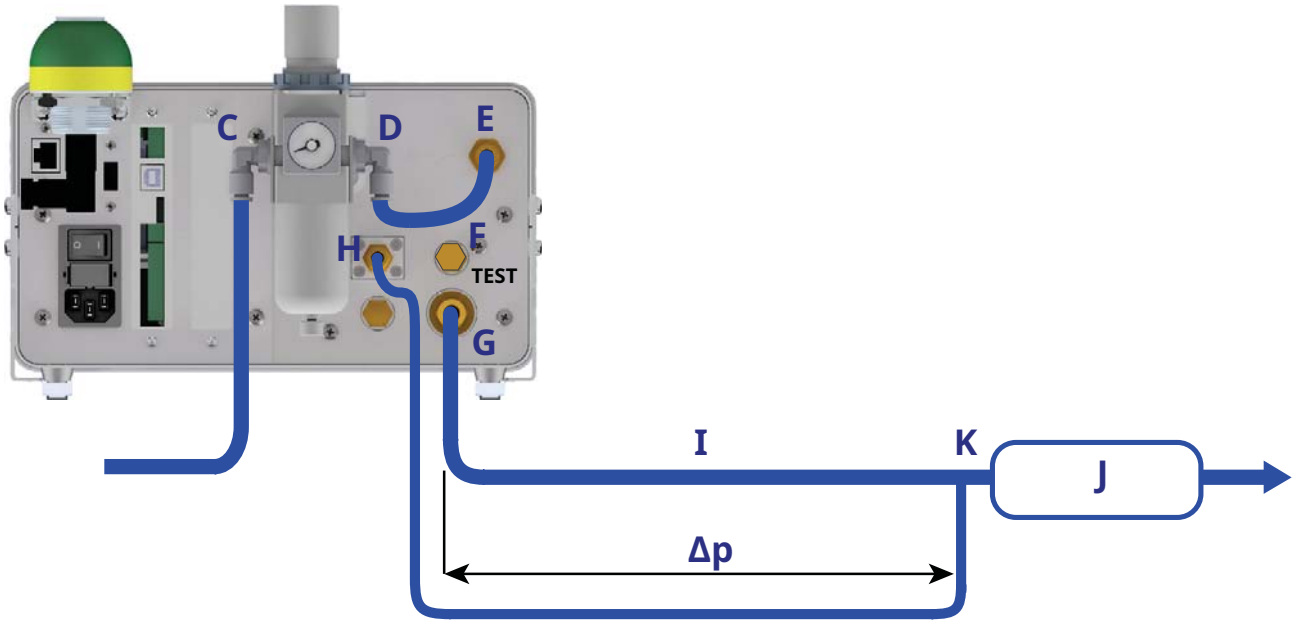


C	Compressed air supply input
D>E	Filtered air 5 µ
F	Sealing cap
G	TEST output for the air flow to the tested component
H	Test pressure reading
I	Connection tube to the tested component
J	Component being tested
Δp	Pressure drop Δp of the air flow on the connection pipe

The tested component must be connected to the TEST output port G, with a tube of suitable diameter (standard 8x6 mm) for the air flow.
The pressure transducer (connection H) must be connected directly to the component being tested with a second tube (standard 6x4 mm), separated from the air flow passage tube; connection F must be closed with a sealing cap.

The two pipes, for air passage and pressure reading, should be connected separately at two different points of the component being tested, with two separate fittings, because the pressure in the output fitting G is not equal to the pressure in the component being tested J.
The air flow, through the output filter and the output tube, generates a pressure drop between the output port G and the tested component; this pressure drop Δp depends on the air flow, increasing with higher flow rates, decreasing with lower flow rates.

By using separate tubes and access points for the air flow and for the pressure, the pressure reading is taken directly on the tested component and is independent from the air flow and the pressure drop Δp on the output tube.
For air flow tests, this mode of connection is recommended whenever the test pressure is low (< 100 mbar) or with high flow rates (> 10 l/min).
If the component being tested has only one access point, the two tubes must be connected together, with a T-fitting, but as close as possible to the component being tested.



F	Sealing cap
G	TEST output for the air flow to the tested component
H	Test pressure reading
I	Connection tube to the tested component
J	Component being tested
Δp	Pressure drop Δp of the air flow on the connection pipe
K	T-fitting

The pressure on the output port G is equal to the test pressure plus the pressure drop Δp on the output filter and the output tube.
The output pressure at port G is regulated automatically by an internal proportioning valve that works properly at pressures higher than about 50 mbar.

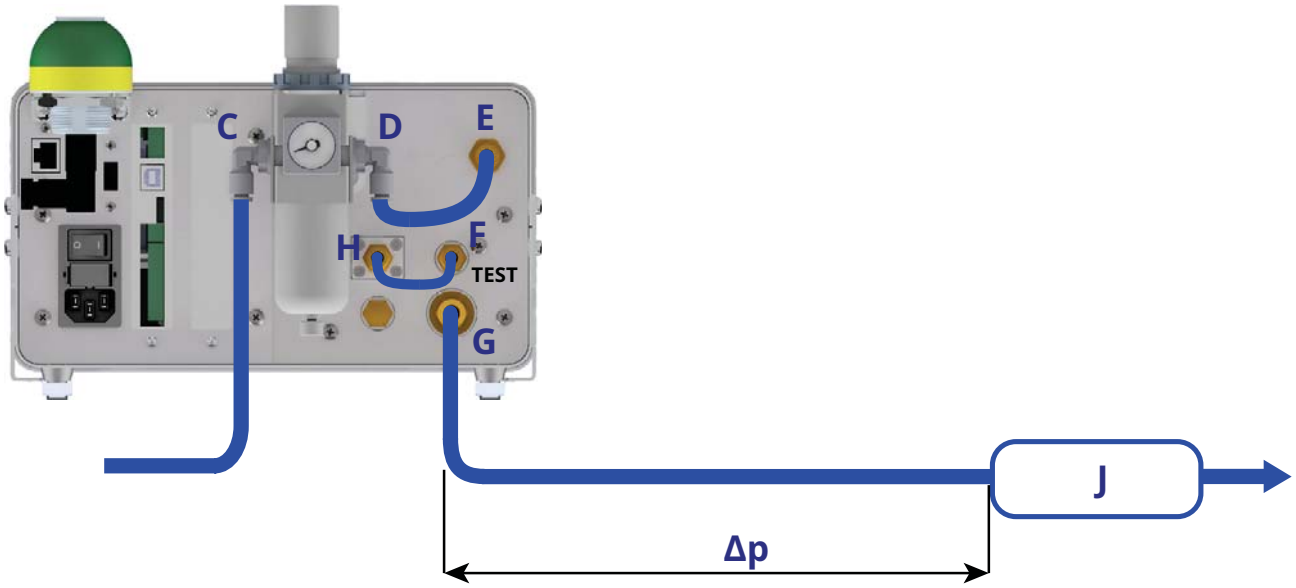
NOTE: If the air flow rate is small, it develops a small pressure drop Δp on the output tube; if the test pressure is also small, then the total output pressure required at port G may become less than 50 mbar and it will not be regulated correctly.
To avoid this condition, insert a restriction on the output tube, so that the air flow will develop a pressure drop Δp greater than 50 mbar on the output port G.
The simplest method to insert a restriction on the air flow is by using a tube with a small internal diameter, for example, a Ø 4 x 2.5 mm tube instead of the standard Ø 8 x 6 mm.
In any case, the pressure reading of the test pressure at port H, taken from the T-fitting with a separate tube, will not be affected by the pressure drop Δp on the output tube.

NOTE: Regulated pressure display
The pressure regulated by the internal proportioning valve is shown in an information page of the basic menu, accessible with the left and right arrow keys.

WARNING: Tests at low pressure with auto-calibration of the pressure zero offset
For tests at low pressure, less than 50 mbar, it is strongly recommended to enable the auto-calibration function of the pressure zero offset.

3.12.2 Flow rate test: connection with local pressure reading

In order to simplify the connection to the component being tested, you can also use a single tube for the air flow and a single access point to the component being tested.



C	compressed air supply input
D>E	5µ filtered air input
H<>F	bypass for the local reading of the test pressure
G	TEST output for the air flow to the tested component
J	component being tested
Δp	pressure drop Δp of the air flow on the connection pipe

The pressure sensor (input port **H**) must be connected to the output port **F** to read the pressure inside the equipment.
The connection is simpler, however the test pressure is measured locally at the TEST output port, inside the equipment, not directly on the component being tested.
In this case, the test pressure reading also includes the pressure drop **Δp**, due to the air flow from the output port **G**, through the connection tube, down to the input port of the component being tested.

NOTE: Pressure drop Δp on the connection tube.

This test set up with a single tube is suitable only if the pressure drop Δp on the output connection is negligible, for example in case of high-test pressures or low flow rates.

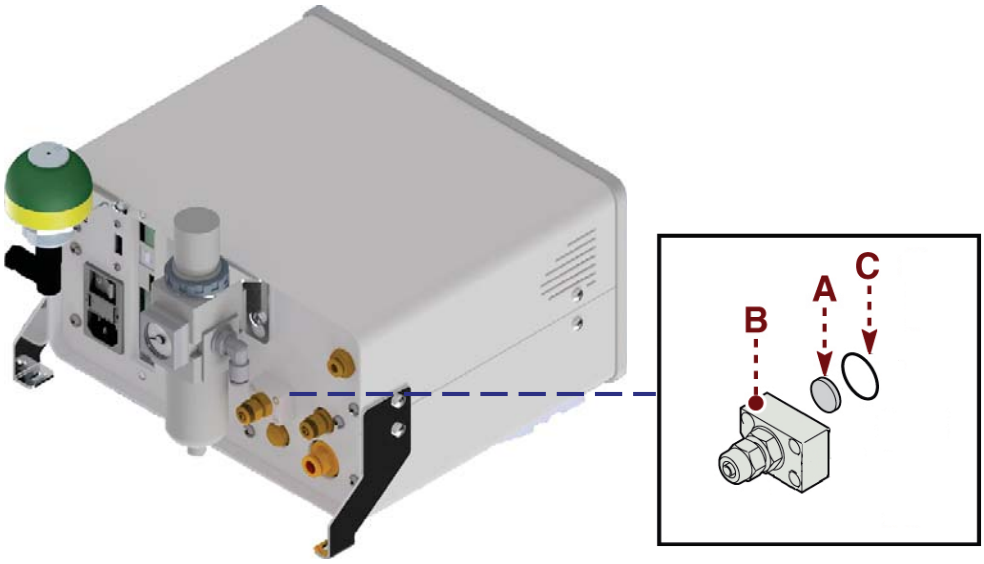
3.12.3 Leak test: pneumatic connections

For the leak test, the same connections as for the flow test can be used: obviously the component being tested (J) must be closed.

3.13 Air filter on the input port for pressure reading

An air filter (a sintered disc) is mounted behind the pressure input port H, to protect the internal pneumatic circuit when the pressure is discharged inside the tested component.

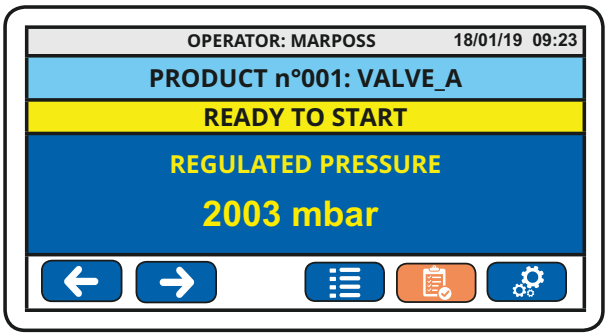
NOTE: Check the filter periodically and replace if clogged.



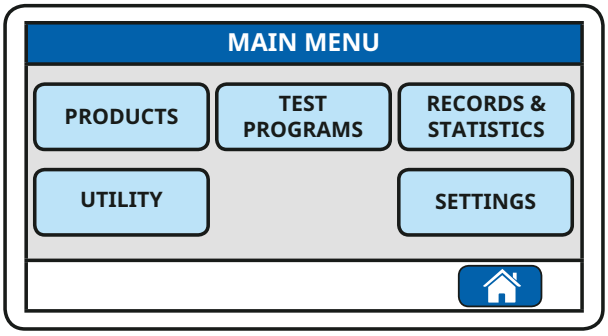
To check and replace the filter, do not unscrew the tube fitting port, but only the flange (B), fixed with 4 screws, to access the filter (A) under the flange, then replace the filter, making sure the sealing ring (C) is correctly mounted.

WARNING: the air filter prevents the infiltration of dust, filaments, waste, but it is not effective for oil or water.

4. MAIN MENU



To access the main menu, press the key 



The main menu allows access to all the programmable functions of the instrument.
Press the desired function box on the touch screen.
An access code is usually required to modify the test products and programs, the general configurations, the calibration parameters.

Press the  key to return to the base menu.

5. USER INFORMATION

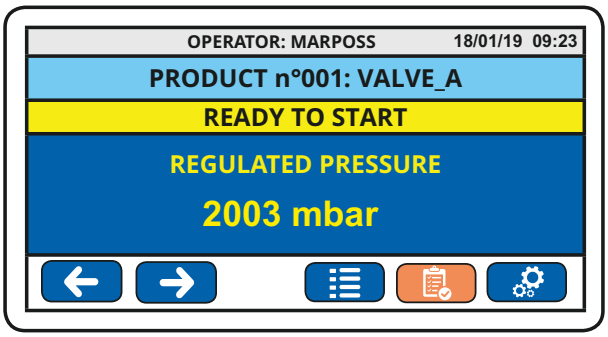
The Provaset T3LPF instrument is designed for flow rate tests, with measurement of the air flow through the component being tested, and for pressure leak tests, with measurement of the absolute pressure drop.

5.1 Power on

When the instrument is powered on, the display shows a few seconds the following information:

- Logo Tecna Srl
- Model and code of the instrument
- Serial number
- Type of instrument
- Version of the sofware

The phase lights on the front panel are flashed sequentially and simultaneously, then only the red light keeps on flashing.
The acoustic alarm is triggered for some seconds.
After the power on sequence, the instrument enters a wait phase.
If no alarm is present, the instrument is waiting ready to start a new test with the selected active program of test parameters.



The display shows:

- clock/calendar: clock/calendar status (top right line), in red if date and time are not valid, due to prolonged power failure;
- active product: number and name of the tests sequence (product program) that will be executed at START;
- the regulated pressure for the next test.

⚠ **WARNING:** Before initializing testing, the operator must check that the parameters of the active test program and the regulated pressure output are safe and correctly set for the parts to be tested.

Press the START button (if enabled) on the front panel to make a new test.

5.2 Touch screen keys for managing display menus


Press the left-hand arrow key to scroll the pages of the base menu (information about the instrument, bar code function, pressure readings).


Press the right-hand arrow key to scroll the pages of the base menu (pressure readings, bar code function, information about the instrument).


Press the [TESTS LOG] key to visualize the results of the last tests.

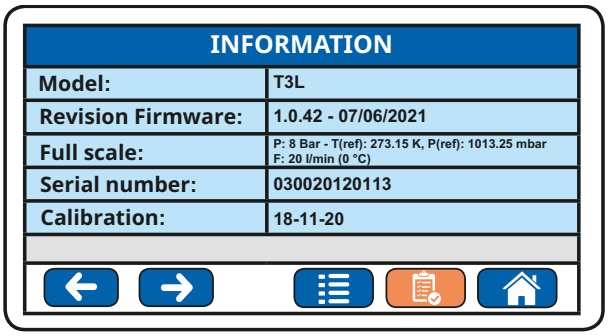

Press the key [PRODUCT] on the touch screen to read and eventually modify the parameters of the PRODUCT program that is enabled and active for the tests.


Press the [GEAR] key to enter the main menu page for all the programmable functions (test programs, general settings, records, calibration ...)

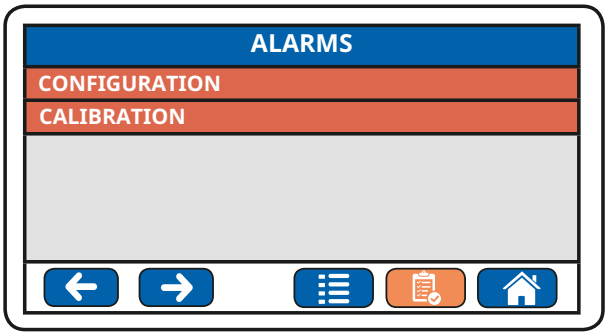

Press the modify key to enable the modification of the test programs.

5.3 Information pages display

Some of the base menu pages show useful information for the operator.
To display pages, press the keys

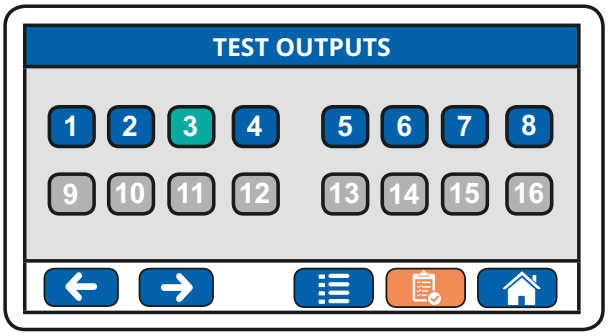


Instrument Information:
Model: instrument code
Revision Firmware: version of the software.
Full scale: full scale limits of the sensors.
Serial: serial number of the instrument.
Calibration: date of the last calibration of the sensors performed by Tecna srl

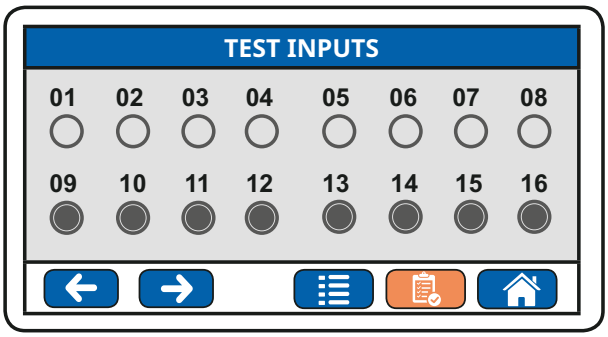


Alarm page: displayed only if alarms are present; example:
ALARM Configuration: reprogram the configuration parameters;
ALARM Calibration: repeat the procedure for calibrating the sensors.

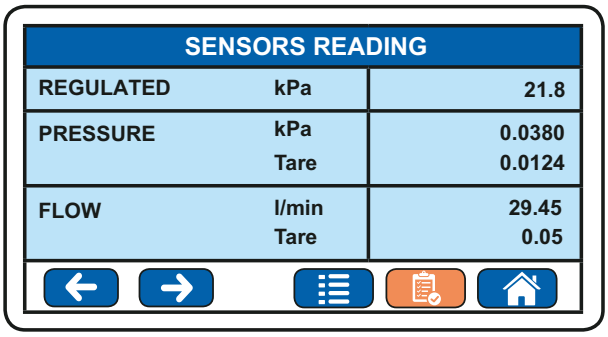
> **NOTE:** pressing on the line that displays the alarm opens a text page that contains useful information for the operator to manage the alarm.



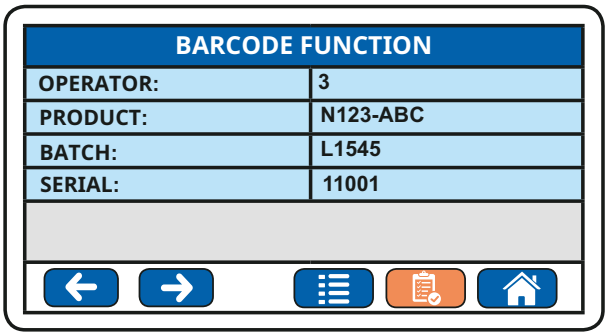
The page displays the status of the digital outputs on the expansion boards.
The status of the outputs cannot be changed manually.



The page displays the status of the digital inputs on the expansion boards.



The page displays the readings of the sensors
Regulated: internal pressure, regulated by the proportioning valve.
Pressure: external test pressure, measured on the component being tested.
Flow: flow measured at the TEST output.
Tare: tare stored and applied to pressure and flow readings; present only if enabled.



Barcode management: example
Barcode 1: operator code
Barcode 2: product code
Barcode 3: production batch code
Barcode 4: serial number of the product being tested.

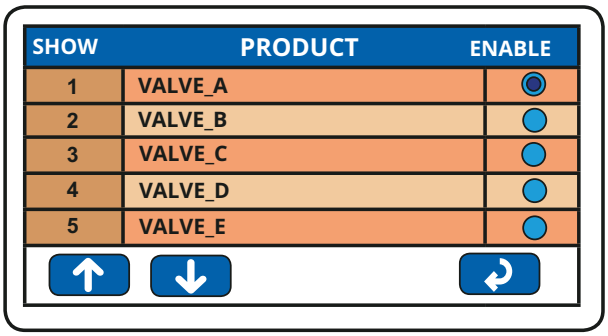
5.4 Testing products and programs

The test cycle of a component being tested can be performed using a PRODUCT or a TEST PROGRAM, to use a PRODUCT access the PRODUCT menu and in the list of available products enable the desired product by selecting it (see Products page 35), whereas to use a TEST PROGRAM access the TEST PROGRAMS menu and in the list of available test programs enable the desired test program by selecting it (see Test programs page 37).

The test parameters are organised in a PRODUCTS archive and a TESTS archive.
To view the parameter pages, use the keys , and the key .
To change the parameters, press the key .
To copy a PRODUCT onto another or a TEST onto another, use the key .

5.4.1 Products

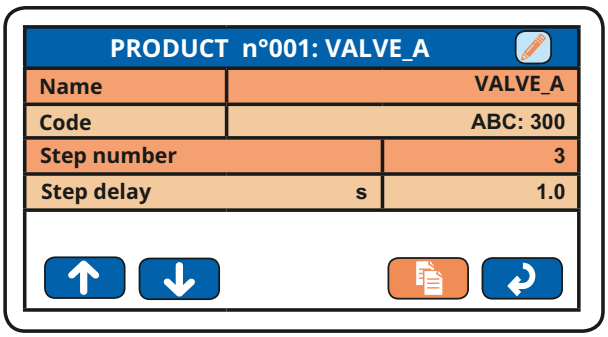
The PRODUCT function makes it possible to program and perform a test cycle consisting of one or more tests in sequence, so that the test meets the characteristics of the product to be tested.
For example, testing a product may require only one leak test or, in sequence, two tests, a flow test and a leak test.
At the START test command, the instrument performs the test according to the enabled and active PRODUCT program.



List of programs available as PRODUCT.
The enabled and active product is indicated in the ENABLE column on the right with a full circle.

Enabling and activating a PRODUCT
Press on the box on the right, in the ENABLE column, to select and enable an active PRODUCT for testing; the full circle indicates the enabled and active PRODUCT.
Displaying and changing a PRODUCT
Press on the number or on the name of a PRODUCT to display the sequence of steps (test programs) associated with the PRODUCT.

5.4.1.1 Product parameters



To change the parameters, press the key .

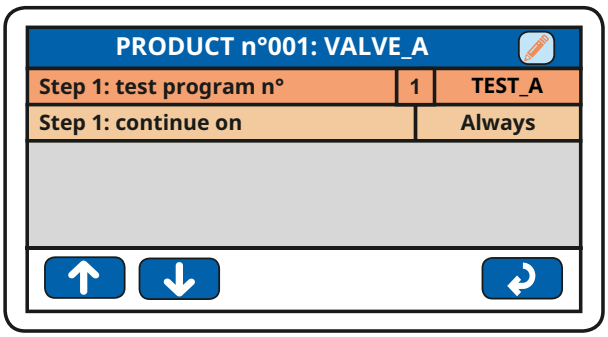
First Name
Product name, 16 characters max, can be entered manually.

Product code
Product code, 24 characters max, can be entered manually or with a barcode reader (option).

Number of steps
Number of tests to be performed in sequence for PRODUCT testing;
field 1: 16.

Step delay
Waiting time between one test and the next in sequence; range 0.0:3600.0 s.

Press the ↓ and ↑ keys to display the sequence steps of the TEST programs associated with PRODUCT testing.



Product no.1
Step 1: test program no. 5, named VALVE

For each step of the PRODUCT sequence, it is possible to modify the associated TEST program and the conditions for continuing the step sequence.

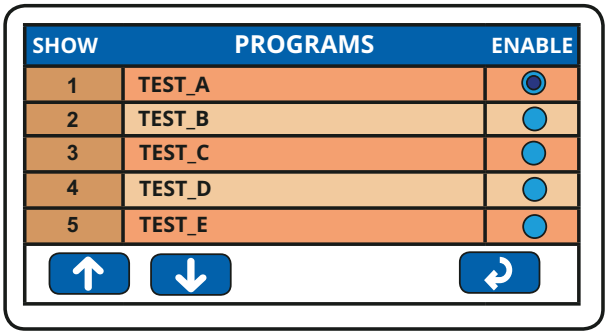
Step n
Number of the test program executed in step n.
Press on the number of the TEST program to choose directly with the numeric keypad the associated TEST program.
Press on the name of the TEST program to choose another program from the list of available TEST programs.

Step n continues if:
Conditions at the end of the test to continue with the next step in the PRODUCT sequence:

- **Passed** Continues only with a PASSED result, end of testing if FAILED;
- **Failed** Continues only with a FAILED result, end of testing if PASSED;
- **Always** Continues in any event.

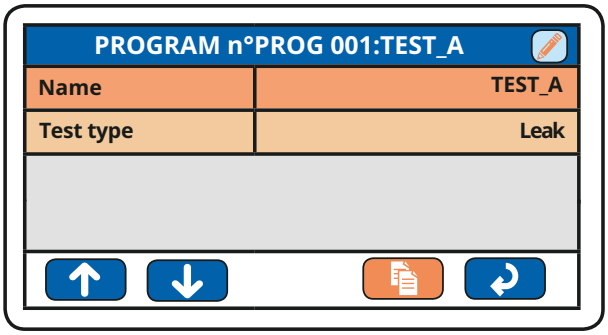
5.4.2 Test programs

Each individual trial of a test sequence (PRODUCT) is performed according to the parameters of the corresponding TEST program.
The test parameters are displayed on subsequent pages; the presence and functions of the parameters depend on the type of test selected and the options installed.



List of programs available as TEST
Only when a test program is used to perform a test cycle of a component must the test program be selected in the ENABLE column on the right, a full circle indicates that the test program is active for testing.

Displaying and changing a TEST program
Press on the number or on the name of a TEST to display the parameters of the test program.



Press the keys to display the parameters of the test program in succession.
Press the key to change the parameters.

5.4.2.1 Test program: name, type of test, mode

First Name
Name of the test program, max 16 alphanumeric characters, can be entered manually.

Program code
Program code, 24 characters max, can be entered manually or with a barcode reader (option).

Test type: Flow rate, Pressure decay, Volume + Pressure decay
Selectable test cycle:
Flow rate: air flow with mass sensor.
Pressure decay: leak test for absolute pressure drop.

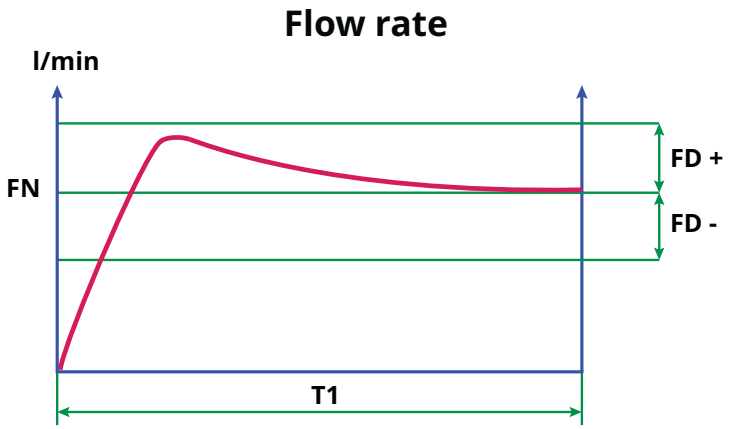
Volume + pressure decay: leak test with volume control of the test circuit.

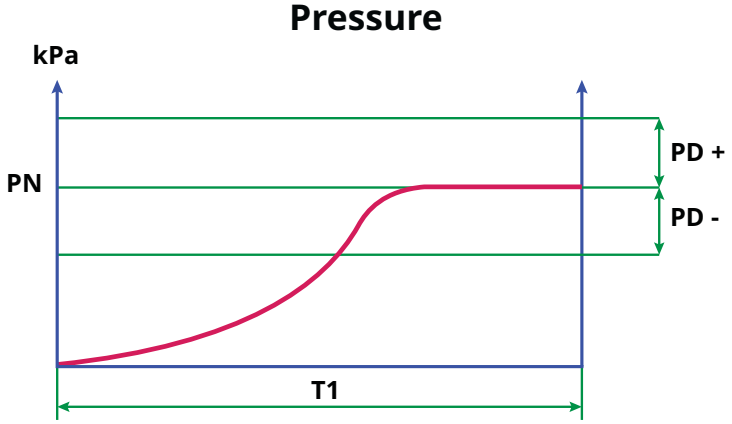
Mode: Constant pressure, Constant flow
Only for the flow rate test.
Constant pressure: flow rate measurement with pressure regulation at the programmed value.
Constant flow: pressure measurement with flow regulation at the programmed value.

5.5 Air flow rate: test cycle and parameters

5.5.1 Air flow rate: test cycle

The basic test cycle for air flow rate tests is performed in a single time phase, according to the parameters programmed in the test program.
The air flow (FLOW) is measured at test pressure, that is set by the proportioning valve (electronic pressure regulator).





5.5.2 Flow rate test: pressure regulation

The pressure is regulated by a proportioning valve with a PID algorithm.

PID: speed
Response speed: range 1:12

PID: action
Action intensity: range 1:15

PID: set start
Sets the adjustment value at the start of testing (START).

PID: delay adjustment
If enabled (value other than 0), it sets a delay at START between the setting of the start set and the beginning of the adjustment.
Useful when the component being tested needs initial settling.

PID: self-learning
If enabled, the parameter "PID: set start" is automatically updated at the end of each successful test, with the last control value used.

5.5.3 Flow rate test: test parameters

T1
Test time, range: 0.2: 3600.0 seconds.

QLP
“Low-pressure" mode.
Recommended for flow tests with pressures below 30 mbar.
Allows the following parameters **PN**, **PD+** and **PD-** to be set with a resolution of 1 Pascal and enables a pressure regulation mode which is better adapted to maintain low pressures.
If the "QLP Extra digit" parameter is active, in the flow test an additional decimal is added for the parameters PN, PD+ and PD-, if the QLP parameter is active in the table.
The "QLP Extra digit" parameter is found in the "Configure" menu → "General parameters" → "Instrument settings" → "QLP Extra digit".

PN
Nominal test pressure:

- (if QLP=0), range 0.0 : (full scale pressure sensor) kPa, < PRMAX;
- (if QLP=1), range 0.000: 0.500 kPa (5.00 mbar), < PRMAX.

Constant pressure flow: during testing, the test pressure is automatically adjusted to the programmed **PN**, value, to measure the flow through the component being tested.

Constant flow pressure: during testing, the test flow is automatically adjusted to the programmed **FN,** value, to measure the pressure on the component being tested.

PD+
Positive Delta max, maximum limit of increase of the actual test pressure compared to the programmed nominal pressure **PN.**
Programming range: such as **PN.**
Result **MAX PRESSURE ERROR** if the test pressure at the end of time **T1** is greater than the maximum limit **PN** + **PD+.**

PD-
Negative Delta max, maximum limit of decrease of the actual test pressure with respect to the programmed nominal pressure **PN.**
Programming range: such as **PN.**
Result **MIN PRESSURE ERROR** if the test pressure at the end of time **T1** is not greater than the minimum limit **PN** - **PD-.**

FN
Nominal flow through the component being tested.
Field 0: Flow sensor full scale] l/min.
Constant flow rate: during testing, the flow rate delivered is automatically adjusted to the programmed value **FN.**
Flow rate at constant pressure: during testing, the flow rate delivered is not controlled but only measured and depends on the regulated pressure **PN.**

FD+
Delta max, maximum permissible difference between the actual measured flow and the programmed nominal flow **FN.**
Field 0: [Flow sensor full scale] l/min.
Result **MAX FLOW ERROR** if the flow measured at the end of time T1 is greater than the maximum limit FN + FD+.

FD-
Delta min, the maximum permissible difference between the programmed nominal flow **FN** and the actual measured flow.
Field 0: [Flow sensor full scale] l/min.
Result **MIN FLOW ERROR** if the flow measured at the end of time **T1** is not greater than the minimum limit **FN** - **FD-.**

NOTE: Flow rate at constant pressure: minimum and maximum flow limits.
If programmed **FN** = 0, the limit **FD+** represents the maximum acceptable flow at the nominal test pressure **PN,** as well as the limit **FD-** represents the minimum flow.

NOTE: Flow rate at constant flow: minimum and maximum pressure limits.

If programmed **PN** = 0, the limit **PD+** represents the maximum acceptable pressure at the nominal test flow **PN,** as well as the limit **PD-** represents the minimum pressure.

AT
Enables the automatic tare function of pressure and flow to zero:
NO: tare not executed; YES: automatic tare enabled.

NOTE: it is recommended to enable the automatic calibration function for tests in "low pressure" mode (**QLP**=1)

5.5.4 Flow rate test: PASSED/FAILED result messages

5.5.4.1 PASSED result messages

PASSED
A test ends with a PASSED result if the pressure measured during the time T1 does not exceed the PD+ PD- values set in the test program and if the flow does not exceed the FD+ FD- values which are also set in the test program.

5.5.4.2 FAILED result messages

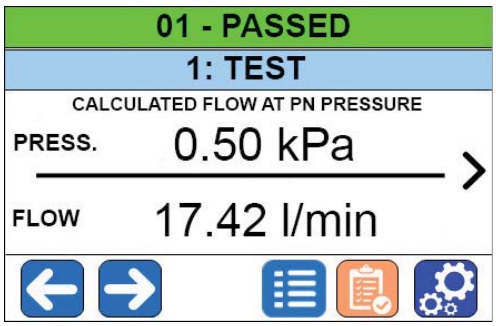
Out of scale pressure
Each type of test: the test pressure has exceeded by at least 10 % the maximum full-scale pressure.

Max flow
Flow rate test: out of limit flow, MAX FLOW ERROR result.

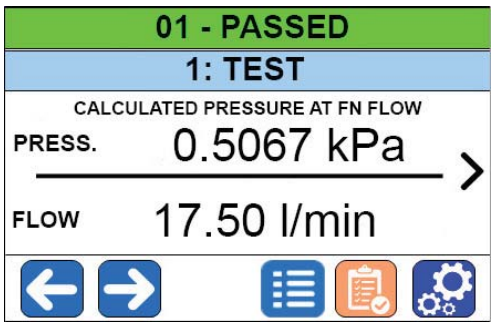
Min flow
Flow rate test: out of limit flow, MIN FLOW ERROR result.

5.5.5 Air flow rate test: flow calculation at nominal pressure PN

Usually, at the end of test phase time T1, the test is PASSED if the measured flow rate is not outside the programmed nominal flow rate limits FD+ and FD-, compared to FN parameter and the measured pressure is within the pressure limits PD+ and PD-, compared to PN parameter.
Due to continuous automatic pressure regulation and perturbation inside measuring system, measured pressure unlikely will be exactly at PN set value.



If in the active test table the parameter EF is enabled, during the measurement time T1, but only if the pressure is within the tolerance limits PD+ and PD-, the instrument performs a calculation using measured pressure and flow values and from the calculation itself the flow corresponding to the nominal pressure PN is obtained; the calculated flow is displayed on the main alphanumeric page together with the nominal pressure PN and is compared with the limits FD+ and FD- to determine the test result. The pressure rating and the calculated flow are displayed at the end of the test in the main alphanumeric page of the T3 display.
The EF parameter is available only by setting constant pressure in the Mode parameter of the active test table.



In that case, if the pressure at the end of the test is within the range between PN and the limits for PD+ and PD-, the result is given by the calculated quantity only. It means, for example, that a REJECTED result of a test performed without the recalculations being activated could become a PASSED result in case of recalculations being activated and vice-versa. It is on the user responsibility to consider and decide to use or not this function.

5.5.6 Air flow rate test: calculation of pressure at nominal flow FN

Usually, at the end of test phase time T1, the test is PASSED if the measured pressure is not outside the programmed pressure limits PD+ and PD-, compared to PD parameter and the measured flow rate is within the flow rate limits FD+ and FD- compared to FD parameter.
Due to continuous automatic flow rate regulation and perturbation inside measuring system, measured flow rate unlikely will be exactly at FN set value.
If in the active test table the EP parameter is enabled, during the measurement time T1, but only if the flow falls within the tolerance limits FD+ and FD-, the instrument performs a calculation using measured pressure and flow values and from the calculation itself the pressure corresponding to the nominal flow FN is obtained; the calculated pressure is displayed on the main alphanumeric page together with the nominal flow FN and is compared with the PD+ and PD- limits to determine the test result. The pressure rating and the calculated pressure are displayed at the end of the test in the main alphanumeric page of the T3 display.
The EP parameter is available only by setting constant flow in the Mode parameter of the active test table.
In that case, if the pressure at the end of the test is within the range between FN and the limits for FD+ and FD-, the result is given by the calculated quantity only. It means, for example, that a REJECTED result of a test performed without the recalculations being activated could become a PASSED result in case of recalculations being activated and vice-versa. it is on the user responsibility to consider and decide to use or not this function.

5.6 Leak test: test cycle with test parameters

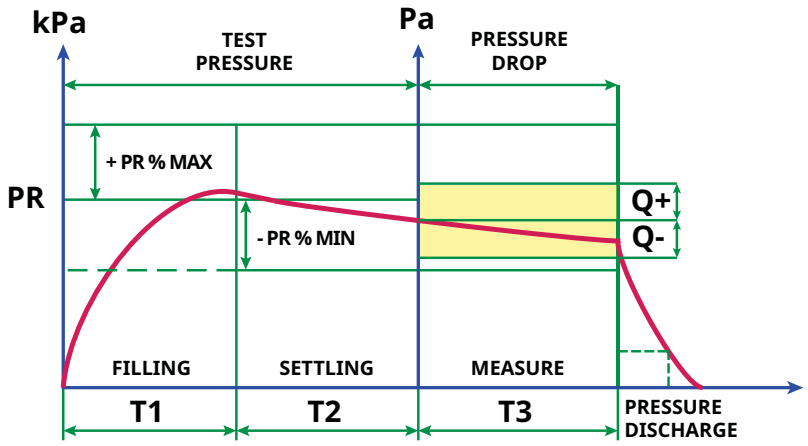
Provaset T3LPF is an electro-pneumatic instrument, designed for air flow rate tests with mass flow sensors and for leak tests with pressure decay measure.

5.6.1 Leak test: test cycle

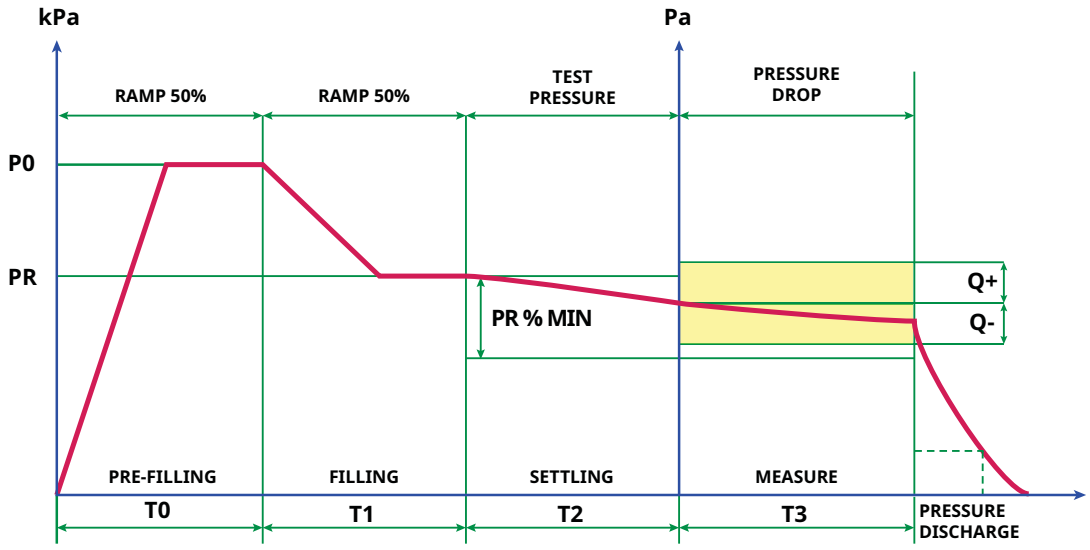
The basic test cycle for leak tests is made of the following phases:

- T0, pre-filling phase time at the pre-filling pressure;
- T1, time, to fill the test circuit at the nominal test pressure;
- T2, time, to stabilize the pressure in the test circuit;
- T3, time, to measure the pressure decay in the test circuit;
- discharging phase, to discharge the pressure in the test circuit.

The filling phases T0 and T1 can be programmed as pressure rise and fall ramps.
In the example: test cycle (without pre-filling).



In the example: test cycle with pre-filling and pressure ramps



5.6.2 Leak test: pressure regulation

The pressure is automatically regulated by a proportioning valve with a PID algorithm (proportional, integral, derivative); the parameters of the algorithm must be selected to optimise the testing time and the stability of the test conditions; the optimal choice depends on the type of component being tested:

PID: Adjustment mode

- **Automatic PID**: automatic adjustment according to response speed and action intensity.
- **Fixed PID**: fixed adjustment: at the beginning of the test, the proportioning valve is controlled starting from a fixed position;
- **Fast PID**: used for volumes < 1 litre
- **Medium PID**: used for volumes < 2 litres
- **Slow PID**: used for large volumes

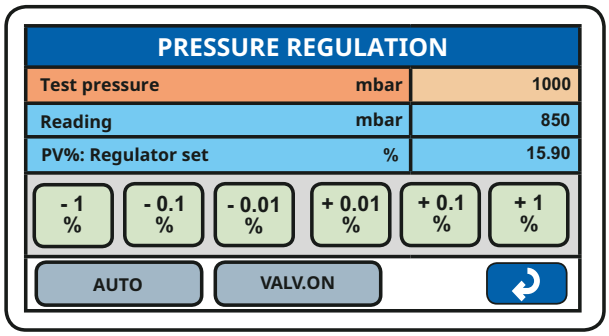
PID: speed
Only with Automatic PID, response speed: range 1:12

PID: action
Only with Automatic PID, action intensity: range 1:15

5.6.3 Leak test: Fixed PID

If choosing the control mode with a fixed PID, the proportioning valve behaves like a manual pressure regulator. The valve is piloted with a preset value in the test program, accessible only when the test pressure is programmed.

NOTE: To set the proportioning valve, it is necessary to simulate the actual test conditions; the component being tested must be connected to the TEST output as in the test; if the pneumatic connections or the type of component being tested are changed, the proportioning valve must be reprogrammed.



If no test component is connected to the TEST output fitting, the pressure setting can be set without opening the output valves, i.e. without air outside the TEST fitting.
If a sample of the tested components is connected to the TEST output fitting, the pressure adjustment can be set by opening the output valves, then with the air outside of the TEST fitting.

Example:
Connect a sample of the tested components to the TEST output fitting to simulate the actual test conditions:
Test pressure: set the parameter **PR** or **P0** for the filling test pressure;
Read: regulated pressure value;
PV%: position % of the proportioning valve;
Keys +/- %: the output pressure can be adjusted manually by pressing the +/-% keys;
AUTO: pressing the button, the proportioning valve is automatically piloted to obtain the programmed output pressure;
VALV.ON: the output valves are closed, press the key to open the valves and adjust the test pressure on the TEST output;
VALV.OFF: the output valves are open, press the key to close the valves and adjust the internal pressure.

When the pressure reading corresponds to the programmed value, press the key to exit the menu page.

NOTE: The inlet air pressure supply must be at constant pressure in order to obtain a stable pressure regulation at the fixed value; if the inlet pressure supply changes or if the programmed pressure P0 or PR is changed, the starting position of the proportioning valve must be reprogrammed.

NOTE: this method generally allows faster testing, but the operator must always manually set the starting position in the test table when programming the P0/PR test pressures.

5.6.4 Leak test: test parameters

Pre-filling phase

T0
Pre-filling time, range 0.0: 3600.0 s.
The test pressure is set to the programmed value **P0.**

P0
Pre-filling pressure, range 0: **PR_MAX** .
With the option -V: range -800: **PR_MAX** (mbar).

> **NOTE:** The pre-filling pressure P0 is generally higher than the nominal test pressure PR, however the programming of the parameter is free.

T0/P0
End of pre-filling mode: Time **T0** / Pressure **P0**
The pre-filling phase ends upon expiry of time **T0** (**T0/P0** = TIME) or when the test pressure **PR** (**T0/P0** = PRESS.) is reached.
This mode is used to save time and move immediately to the next step (filling time **T1**) as soon as the **P0** test pressure is reached.

Ramps T0
It is possible to program a pressure up ramp during the pre-filling time **T0**, to reach the pressure **P0** in one or more steps.
Field 0: 255 steps ; 0=no ramp.

Ramp % T0
Each step of a pre-filling ramp can be divided into an rising starting part and a waiting end part.
The parameter indicates the percentage of rising time for each step.
Dimension: 0: 100%.

Filling phase

T1
Filling time, range 0.0: 3600.0 s.
Open valves for filling the test circuit to pressure **PR.**
If **T1** = 0, the test cycle starts directly from the settling phase **T2,** without opening the internal filling valves, therefore the component being tested must be filled with an external circuit before performing the test; the external circuit can be checked using the delay function at Start (parameter **PSDEL**) and activating a programmable output (parameter **PSOUT**).

PR
Nominal test pressure, range 0: **PR_MAX** (mbar).
With the option -V: range -800: **PR_MAX** (mbar).

The **PR_MAX** configuration parameter limits the maximum value that can be programmed as test pressure.

> **NOTE:** The minimum test pressure is programmable from **PR** = 0, but actually depends on the technical specifications of the pressure regulator.

T1/PR
End of filling mode: Time **T1** / Pressure **PR**
The filling phase ends upon expiry of time **T1** (**T1/PR** = TIME) or when the PR test pressure **PR** (**T1/PR** = PRESS.) is reached.
This mode is used to save time and move immediately to the next step (settling time **T2**) as soon as the **PR** test pressure is reached.

Ramps T1
It is possible to program a pressure up/down ramp during the filling time **T1**, to reach the filling pressure **PR** in one or more steps.
Field 0: 255 steps; 0=no ramp.

Ramp % T1
Each step of a pre-filling ramp can be divided into an rising starting part and a waiting end part.
The parameter indicates the percentage of rising/falling time for each step.
Dimension: 0: 100%.

Settling phase

T2
Settling time, range 0.0: 3600.0
Waiting time to stabilise the pressure in the test circuit before the measurement phase **T3.**

PR+
PR%MAX: maximum % limit of the test pressure, range 0.0: 100.0 %.
The test ends with a result **FAILED: MAX % PRESSURE** if the limit is exceeded.
For leak tests:

- maximum test pressure P < PR + PR * (PR%MAX/100);
- limit applied during all phases **T1, T2, T3**;
- limit not applied if **PR** = 0.

PR-
PR%MIN: minimum % limit of the test pressure, range 0.0: 100.0 %.
Minimum test pressure, P > PR – PR * (PR%MIN/100).
The test ends with a result **FAILED: MIN % PRESSURE** if the limit is exceeded.
For leak tests:

- limit applied during all phases **T2, T3**;
- limit not applied if **PR** = 0.

NOTE: The test pressure must also be greater than the pressure drop limit **Q-** in the time **T3.**

AT
Enables the automatic tare function of pressure and flow to zero:
NO: tare not executed; YES: automatic tare enabled.

QHD
For models T3LPFxxxP05 and T3LPFxxxP2 only, the pressure reading resolution is high definition with 0.1 Pa resolution; in these models, the test parameters for the pressures can be high or low resolution.
Changing the QHD parameter changes the format of the Q+ and Q- (leak limits) parameters, which must be reprogrammed, and the format of the pressure drop displayed in measurement phase T3.
0=NO, low definition 1 Pa;
1=YES, high definition 0.1 Pa.

Measure test phase

T3
Time of measurement of the pressure drop of the test circuit at the TEST output,
field 0.0: 3600.0 s

Q+
Maximum limit of pressure increase or rate of leak in flow in the test circuit at the TEST output in time **T3;** programming range:
resolution 0.1 Pa: +/- 6000.0 Pa (+/- 60.000 mbar);
Resolution 1 mbar +/- 60000 Pa (+/- 600.00 mbar).
An increase in pressure is an abnormal condition; a minimum pressure drop may be required in some applications.
If the volumetric coefficient **CV** is programmed to be different from zero, the pressure limit **Q+** is also calculated and shown as equivalent rate of leak in flow, expressed in scc/m or scc/h.

Q-
Leakage limit: maximum limit of the pressure drop or rate of leak in flow in the test circuit at the TEST output in time **T3;** programming range as for the **Q+** limit, but only with negative sign (leak with pressure drop).
The leak limit **Q-** , with negative sign, must always be lower than the pressure limit **Q+** .
Examples: **Q+** = 50 Pa, **Q-** = -10 Pa; **Q+** = -5 Pa, **Q-** = -10 Pa.
If the **Q+** limit is programmed below the **Q-** limit, the **Q-** limit value is automatically corrected.
The test has **PASSED** only if the pressure delta in time **T3** remains within the limits **Q+** and **Q-** .

If the volumetric coefficient **CV** is programmed to be different from zero, the pressure limit **Q-** is also calculated and shown as the equivalent rate of leak in flow, expressed in scc/min or scc/h.

T3/Q
End mode of measurement phase **T3** .
The measurement phase ends when the time **T3** **(T3/Q** = TIME) expires or when the leak limit Q **(T3/Q** = LEAK. It is not available if SETTINGS->MEASURE UNITS->"Leak in flow rate unit?"= Yes) is reached.
This mode is used to save time and switch immediately to a new test before the time runs out.

CV
Volumetric coefficient for the test volume.
Field 0.0: 6000.0 cm^3, or (0.000 : 60,000 litres).
Used to calculate the leak rate Q equivalent to the pressure drop in time **T3** .
The volumetric coefficient **CV** ideally corresponds to the test volume on the TEST output (volume of the component being tested + volume of pipes + internal volume of the instrument).
For the automatic measurement of the volumetric coefficient **CV** a leak master or a certified leak simulator is required (Example: LTC, Leak tester control, of Tecna Srl).

5.6.5 Leak test: leak rate Q

If the coefficient of the test volume, **CV** parameter, programmed in the active test program, is different from zero, the instrument calculates and displays the equivalent leak rate Q, expressed in scc/m or scc/h.
The leak rate Q is calculated using the following formula which derives from the general laws of (ideal) gases and which can also be applied to air, when it is close to ambient conditions:

$$Q_{[scc/m]} = \frac{\Delta P_{[mbar]} * V_{[mL]}}{P_r * t_{m\,[min]}} * \frac{T_{r\,[K]}}{T_{[K]}}$$

Example: leak pressure (ΔP)= - 0.35 mbar, volume 31.2 mL,
T3 = 5 s =5/60 minutes, air temperature= 273 °K:
Q= (0.27 * (- 0.35) * 31.2 * 60) / (5 * 273) = - 0.13 scc/m

5.6.6 Leak test: PASSED/FAILED result messages

5.6.6.1 PASSED result messages

PASSED
A test ends with result PASSED if the pressure variation ΔP or rate of leak in flow, measured during the time T3, does not exceed the limits Q+ (pressure increase) and Q- (pressure drop) programmed in the test program.

5.6.6.2 FAILED result messages

Min. PR pressure %
Leak or burst test: after phase T1, the pressure dropped below the PR%MIN limit compared to the programmed PR test pressure.

Max. PR pressure %
The test pressure exceeded the PR%MAX limit with respect to the programmed test pressure PR.

Out of scale pressure
The test pressure has exceeded the maximum full-scale pressure by at least 10%.

Max leak
The pressure drop ΔP or rate of leak in flow, measured during phase T3, exceeded the programmed limit Q-.

Anomaly
the pressure increase ΔP or rate of leak in flow, measured during phase T3, exceeded the programmed positive Q+ limit.

Upper limit
The pressure drop ΔP or rate of leak in flow, measured during phase T3 did not reach the programmed negative Q+ limit.

Max. pressure
Out of range pressure result, MAX PRESSURE ERROR.

Min. pressure
Out of range pressure result, MIN PRESSURE ERROR.

5.7 Volume + leak test (sealed parts): test cycle and parameters

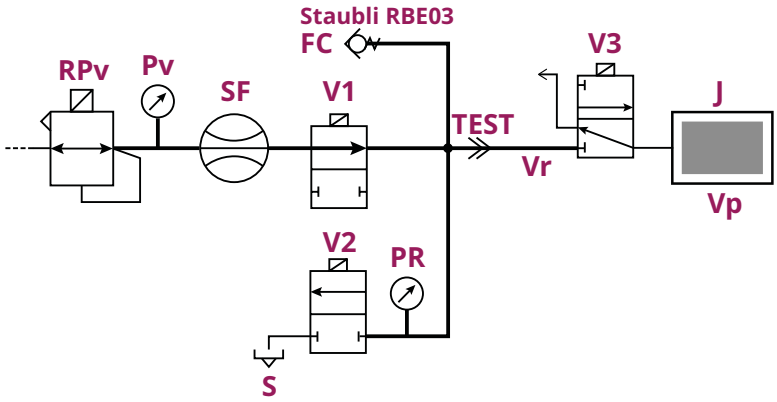
A method to control or measure the volume of air, that is supplied to the test circuit, is necessary for the following types of tests:

- volume test: control of the volume of the tested components;

- sealed parts: leak test of sealed components, with an internal cavity but without external connections, inside a test chamber (bell jar).

5.7.1 Volume+leak test: test cycle

The volume of a tested component can be controlled by applying the well-known rule for the relationship between pressure and volume of a gas (P * V = constant).
For volume control, an external valve (option) is used, mounted between the TEST output of the instrument and the tested component or the interspace of the test chamber (bell jar).



RPv	Test pressure regulator	**TEST**	Output connection to the test circuit
Pv	Regulated pressure	**Vr**	Filling volume
SF	Flow sensor	**V3**	External valve
V1	Internal valve	**J**	Component being tested or in test chamber (bell) with the component being tested inside
V2	Internal valve		
PR	Test pressure		
S	Discharge connection		
FC	Master leak connection	**Vp**	Test volume

During a test cycle programmed for leak testing with volume control, the external valve V3 is operated automatically,
It is necessary to program the configuration parameters of the digital outputs, assigning to the external valve V3 an output available on an expansion board.

Filling volume: volume included between the output of valve V1 and the input of the external valve V3; the volume is used as a fixed reference volume of air to fill the test circuit.

Test volume: volume of the tested components, or of the interspace of the test chamber (bell jar), connected to the output of the external valve V3.

RVP% coefficient: ratio % between filling and test pressures, programmed in the parameters of the test cycle.

Filling phase T1:

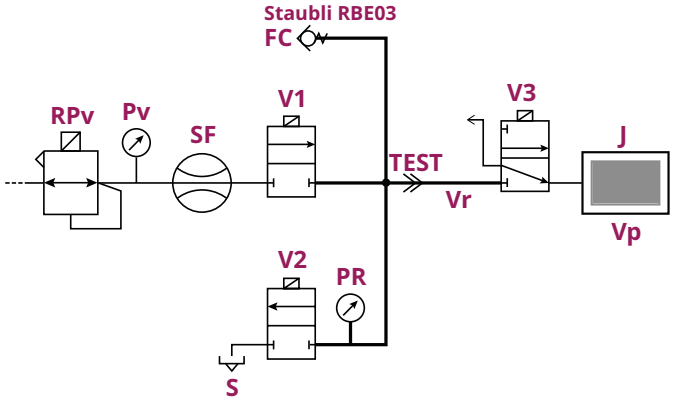
- the external valve V3 is closed, the internal valve V1 is open;
- the filling volume is automatically filled at the calculated filling pressure;
- filling pressure = programmed test pressure **PR** * (**RVP%** / 100);

Valve advance

At the end of the filling phase T1, valve V1 must be closed in advance to reduce the effects of switching the valves and stabilise the pressure reading **P1** at the beginning of the next settling phase T2.

The valve advance time is programmed in the parameter **AV1**; typical value is 1 s.

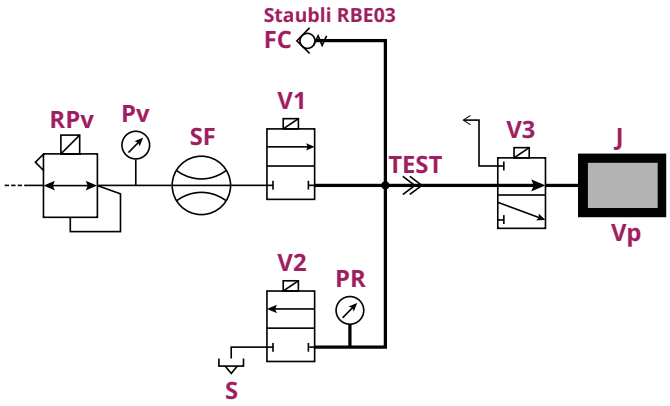
Pressure **P1** is the initial settling pressure in the filling volume, from valve V1, already closed, to the external valve V3, still closed.



RPv	Test pressure regulator	**TEST**	Output connection to the test circuit
Pv	Regulated pressure	**Vr**	Filling volume
SF	Flow sensor	**V3**	External valve
V1	Internal valve	**J**	Component being tested or in test chamber (bell) with the component being tested inside
V2	Internal valve		
PR	Test pressure		
S	Discharge connection		
FC	Master leak connection	**Vp**	Test volume

T2 settling phase:

- the pressure is recorded at the beginning of the phase (pressure **P1**);
- the external valve V3 is opened, so that the filling volume fills the test volume;
- at the end of phase T2, the final settling pressure is recorded (pressure **P2**);
- the percentage ratio between pressures **P1** and **P2**, coefficient **RVP%**, corresponds to the volumetric ratio between the total volume filling volume + test volume) and the filling volume.



RPv	Test pressure regulator	**TEST**	Output connection to the test circuit
Pv	Regulated pressure	**V3**	External valve
SF	Flow sensor	**J**	Component being tested or in test chamber (bell) with the component being tested inside
V1	Internal valve	**Vp**	Test volume
V2	Internal valve		
PR	Test pressure		
S	Discharge connection		
FC	Master leak connection		

Volume control:

- if the coefficient RVP% =(P1/P2)*100, calculated on the basis of the pressure measurements **P1** and **P2**, corresponds to the programmed **RVP%** parameter, within the permitted tolerance limit (+/- **RVP%MAX**), the test cycle proceeds to the leak measurement phase T3, otherwise the test ends with a FAILED result, due to **RVP%** error.

T3: measure test phase

- The leak measurement phase is performed in the same way as the basic leak test cycle;
- the sealing is checked on the total volume, from valve V1 to the test volume;
- if the test is limited to the volume control, the measurement phase T3 can be avoided by programming the parameter **T3=0**.

5.7.2 Volume+leak test: test parameters

The volume+leak test uses the same parameters as the leak test, adding the parameters for the volume control.

RVP%
Volumetric coefficient for the ratio of % between the volumes of the test pneumatic circuit; range 100.0: 649.99 %.
RVP% = (filling volume + test volume)/filling volume.
During the filling phase **T1,** the filling pressure is set to P=PR * (RVP% /100).
Example: **PR** = 1000 mbar, **RVP%** = 140.00; regulated pressure during filling in the phase **T1:** P=1000*(140.00/100)=1400 mbar.

NOTE: The filling pressure is limited to the full scale pressure of the instrument; if the **RVP%** coefficient is too high, so that the calculated value exceeds the full scale, it is necessary to reduce the **RVP%** coefficient by increasing the filling volume, for example by increasing the length or diameter of the pipe or by adding a volume between the TEST output and the external V3 valve.

RVP%MAX
Maximum tolerance +/- % on the coefficient **RVP%** : range 0.10 : 50.00 %.
The effective coefficient **RVP%** is calculated at each test at the end of the settling phase **T2,** as the ratio between the pressure P1 measured at the beginning of the phase and the pressure P2 measured at the end of the phase.
The calculated coefficient RVP%= (P1/P2) *100 must be within the tolerance limits **RVP%** +/- **RVP%MAX** .
The test ends with a result **RVP% FAILED** if the calculated coefficient does not remain within the tolerance limit **RVP%MAX** with respect to the programmed value; the test continues to the measurement phase **T3** if the volume control is successful.

AV1
Early closing time of valve V1 at the end of filling phase **T1** , used to reduce the effects of valve switching and stabilize pressure reading P1 at the beginning of phase **T2** .
Field 0.0: 1.9 s; typical value 1.0 s.

5.7.3 Volume+leak test: PASSED/FAILED result messages

5.7.3.1 PASSED result messages

A test ends with result PASSED if the pressure variation ΔP measured during the time T3, does not exceed the limits Q+ (pressure increase) and Q- (pressure drop) programmed in the test program and if the calculated RVP is within the threshold.

5.7.3.2 FAILED result messages

The FAILED result messages of the volume+leak test are the same as for the leak test, implemented by the following messages:

RVP%: max tolerance
The measured value of the RVP% coefficient is not within the +/- RVP %MAX tolerance limit of the programmed test program value.

Out of scale pressure
The test pressure has exceeded the maximum full-scale pressure by at least 10%.

5.8 General test parameters

The general parameters apply to all types of testing.

5.8.1 Management parameters

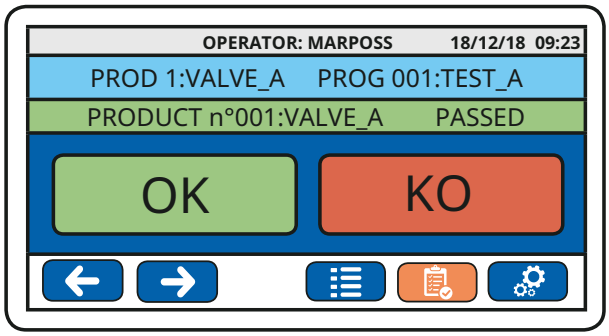
PSDEL
Start delay: waiting time after the Start command, before the pre-filling or filling phases; range 0: 25 s; 0=not used.

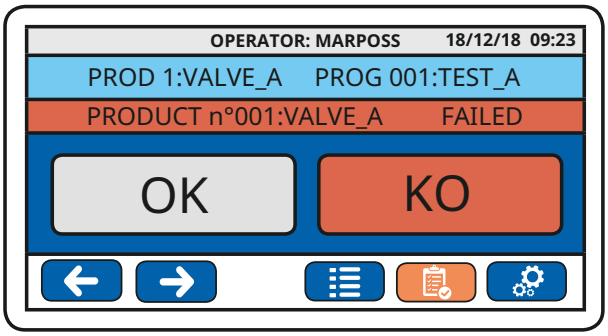
PSIN
Consent input upon Start: the test starts only if the selected input is active and ends if the signal is deactivated.
No: not used;
START button: manual button on the front panel;
START double button: double safety START inputs;
PLC inputs, range 1: 16.

PSOUT: output
Auxiliary output: PLC output activated with the Start command, according to the mode programmed in the parameter: PSOUT: mode .
NO: not used;
PLC outputs, range 1: 16.

PSOUT: mode
Auxiliary output: at the Start command, the output programmed in the parameter PSOUT: output can be activated as desired with the following modes:
No: auxiliary output not active.
Pre-adjust: pre-adjustment with external valve, to keep the connection pipe to the component being tested under pressure.
Test in progress: the output is activated at the start and is maintained until the end of the test.
PSDEL after delay: the output is activated at the start with the PSDEL delay and is maintained until the end of the test.
Pulse during PSDEL: the output is active at the beginning of the PSDEL delay and is deactivated at the end of the PSDEL delay.
T0: the output is active at the beginning of time T0 and is deactivated at the end of T0.
T1: the output is active at the beginning of time T1 and is deactivated at the end of T1.
T2: the output is active at the beginning of time T2 and is deactivated at the end of T2
T3: the output is active at the beginning of time T3 and is deactivated at the end of T3
Always: the output is always active when the test program is selected for testing (active program).

OPERATOR RESULT
This function allows the operator to modify the result of the test: the operator can use two buttons on the touch screen or two external digital inputs, one to confirm the PASSED result, the second to modify the result from PASSED to FAILED or to confirm a FAILED result.
NO: result at the end of the test, without operator action.
YES: the operator must confirm or change the result.
If the test has been passed, the operator can confirm or change the result from PASSED to FAILED; the FAILED result can be confirmed but not changed.





5.8.2 Programmable output parameters (SWPDO option)

Programmable output command 1 ÷ 8
The 8 programmable output are available only with the SWPDO option
If you press START, the programmed output can be activated selecting one of the following modalities:
No: auxiliary output not active.
Pre-adjust: pre-adjustment with external valve, to keep the connection pipe to the component being tested under pressure.
Test in progress: the output is activated at the start and is maintained until the end of the test.
PSDEL after delay: the output is activated at the start with the PSDEL delay and is maintained until the end of the test.
Pulse during PSDEL: the output is active at the beginning of the PSDEL delay and is deactivated at the end of the PSDEL delay.
T0: the output is active at the beginning of time T0 and is deactivated at the end of T0.
T1: the output is active at the beginning of time T1 and is deactivated at the end of T1.
T2: the output is active at the beginning of time T2 and is deactivated at the end of T2
T3: the output is active at the beginning of time T3 and is deactivated at the end of T3
Always: the output is always active when the test program is selected for testing (active program).

5.8.3 Printing parameters

STM
Print mask (template), range 0:100.
The printing masks must be stored on the printer with external means (Tecna Srl can provide a program for managing the printing masks for certain printer models).
The **STM** parameter is sent to the printer before the data is printed, to choose the format and presentation of the data to be printed, according to the tested product and customer specifications.

STS
Printing mode according to the result of the test.
Print failed?
No: print only with result PASSED;
YES: print at the end of each test, with any result.

STN
Label printer: number of labels to be printed.
Field 0: 15; **STN** = 0, printing disabled; typical value **STN** = 1.

5.8.4 Discharge phase parameters

At the end of a test, the pressure in the test circuit is automatically discharged only if the discharge function is programmed in the corresponding parameters of the test program.

FSM
Pressure discharge mode at the end of the test.
NO: the discharge is disabled.
ON HOLD: the discharge remains active until the next test.
FAILED: the discharge is only activated with a failed result.
PASSED: the discharge is only activated with a passed result.
TIME: the discharge is activated for the set time.
PRESSURE: the discharge is activated until the pressure inside the component being tested falls below the set pressure.

FST
During the phase of discharging pressure in the test circuit.
With **FSM**=PRESSURE, the pressure must be discharged within the time **FST**.
With **FSM**=TIME, the internal valves are open in discharge at the end of the test for the time **FST**.
Field 0.0 : 3600.0 s.

FSL
Discharge pressure limit (absolute value without sign): if **FST** > 0, the discharge phase ends with a discharge alarm if the pressure does not fall below the programmed value within the time **FST** .

NOTE:
- if **FST** = 0 and **FSM** = TIME, the discharge phase is not performed;
- if **FST** > 0 and **FSL** = 0 , the discharge phase is completed when the time ends, without checking the final pressure;
- if **FST** = 0, **FSL** = 0, **FSM** = PRESSURE, the valves remain open for discharge until the next test.

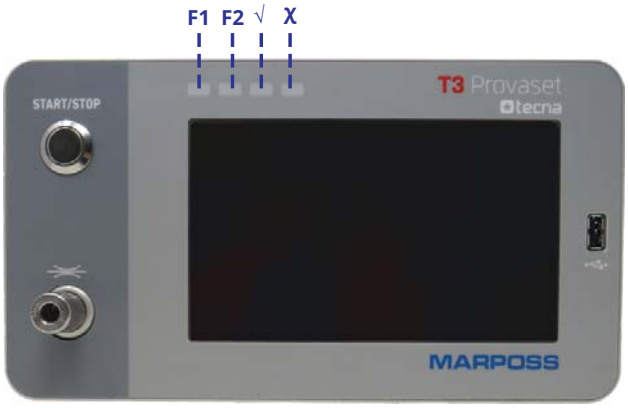
NOTE: The PLC test in progress signal remains active during the discharge phase. If the discharge phase is active and the pressure has not been discharged, it is not possible to start a new test: the test in progress can be completed with a RESET command or by pressing the manual Start/Stop button for 1 second.

WARNING: Equipment switched off, pressure not discharged.
The instrument cannot discharge pressure if it is not switched on, because the internal discharge valves are normally closed.

WARNING: Compressed air closed, pressure not discharged.
The instrument cannot discharge pressure if the compressed air supply is not connected, because the internal discharge valves are normally closed and require a minimum pilot pressure of 3 bar to be opened.

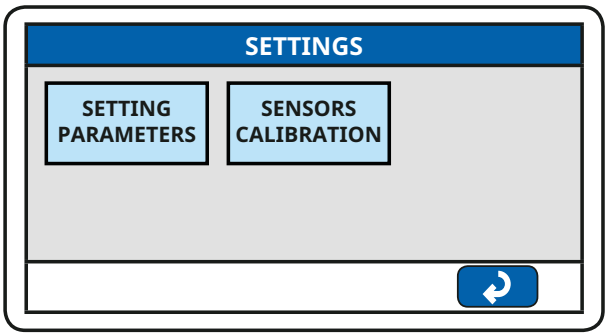
NOTE: Discharge with external valve (Option)
In the case of testing components that can release liquids (water, oil, ...) or greases or other contaminants in large quantities, it is recommended to perform the discharge phase through an external valve.
If in the configuration parameters, in the digital output unit, an output is programmed for "EXTERNAL DISCHARGE", the discharge phase does not use the internal valves but only the external valve (option), installed by the user.
The external valve must ensure the seal during the test cycle.

5.9 Test cycle phase lights



PHASE	F1	F2	√	x
Waiting (Power on / Reset)	Light blinking	Light off	Light off	Light blinking
Cage: closing	Light blinking	Light off	Light off	Light off
Plug: closing	Light blinking	Light off	Light off	Light off
Start: delay test phase	Light blinking	Light off	Light off	Light off
Pre-filling test phase T0	Light on	Light off	Light off	Light off
Filling test phase T1	Light on	Light off	Light off	Light off
Stabilization test phase T2	Light on	Light on	Light off	Light off
Measure test phase T3	Light off	Light on	Light off	Light off
Marking	Light off	Light blinking	Light off	Light off
Pressure discharge	Light off	Light blinking	Light off	Light off
Plug: opening	Light off	Light blinking	Light off	Light off
Cage: opening	Light off	Light blinking	Light off	Light off
PASSED result	Light off	Light off	Light blinking	Light off
FAILED result	Light off	Light off	Light off	Light blinking
Alarm	Light blinking	Light blinking	Light off	Light blinking

6. CONFIGURATION MENU



The configuration menu includes:
- general configuration parameters;
- calibration procedures for the pressure sensors.

General configuration parameters

The Administrator access code is always required to access the menu.
The parameters are divided into groups, which can be accessed by pressing on the line with the group name; for each group, the parameters are listed on the screen with the description on the left and the value on the right; press the box on the right with the parameter value to modify it; press the up/down arrow keys to scroll through the menu pages.

NOTE: The devices are delivered with Administrator Password=1234.

NOTE: no automatic checks are performed on the reciprocal consistency of the programmed parameters; it is the responsibility of the operator to check that the programmed values are not in conflict.

6.1 Unit: screen & sound

Menu language
Language of on-screen messages (Multilingual)

Buzzer duration
Duration of the acoustic signal in the event of an alarm or a FAILED result, range 0: 60 s.

On-screen keys with sound effect
Enable buzzer (beep) on touch screen keys; range: No / Yes.

Test display mode
Preferred test display: numeric or graphical mode.

Sequence summary
At the end of a test sequence, it enables the display of the final page that summarizes the results of the individual tests.

6.2 Unit: instrument settings

Select product/program from:
Selection mode of the active product/program for the tests.
PARAMETER: selection from the product/program menu (box with full circle).
BCD base 1: choice with PLC inputs on expansion boards, counted from 0 (all inputs at zero, choice of table no. 0, not valid).
BCD base 0: choice with PLC inputs on expansion boards, counted from 1 (all inputs at zero, choice of table no. 1).

Start Button
Enable / Disable the button on the front panel.
If the button is disabled, the Start/Reset commands of the tests are managed only by the PLC inputs or by the commands on the serial lines.

⚠ **WARNING:** Risk of moving parts;
Disable the Start/Stop button on the front panel if the pneumatic or electrical outputs are used to control moving parts.

Reset if test passed?
After a test with result **PASSED**, the START command of a new test is accepted only after a RESET command.

Reset if test failed?
After a test with result **FAILED**, the START command of a new test is accepted only after a RESET command.

MAX pressure
PR_MAX: maximum adjusted test pressure; the maximum test pressure may be reduced in relation to the nominal full scale of the instrument; this function may be used for the safe testing of components which cannot withstand full scale pressure.

Instrument name
Programmable name that identifies the instrument, max 16 characters.
Applicable for printing reports and serial line communication.

Check data com.
Before performing a test, the instrument checks whether the serial connection to a PC or to a server over Ethernet is active.
No: Communication is not checked before starting a test.
Yes: If communication is not active, Start commands are not accepted.

DEMO mode?
Demonstration mode or normal use.
No: Normal use for testing.
Yes: Demonstration use, tests are simulated automatically but are not performed.

Air temperature (K):
Parameter that can be set manually and used by the instrument for the calculation of the equivalent leak flow during the leak test.

Calibration date:
Date the instrument was last calibrated. To be modified in case of new calibration ONLY.

6.3 Unit: measuring scales

Test pressure unit
Test pressure: mH_2O, mbar, kPa, mmHg, inH_2O, psi

Leak pressure decay unit
Pressure decay, pressure delta: mmH_2O, mbar, Pa, mmHg, inH_2O, psi

Leak flow rate unit
Pressure decay, equivalent leak flow: scc/m, scc/h

Volume unit
Pressure decay, equivalent test volume: L, mL, hL, cc. It is suggested to use hL only for volumes greater than 30 liters.

Flow rate
Test flow: l/min, l/h, m^3/h, SFCM

Leak in pressure per second
By activating this parameter, the measured leak and so the evaluation of the test result is based using as misure unit the leak pressure per time unit (eg Pa / s)

Leak in flow rate unit?
By activating this parameter, the measured leak in T3 and so the evaluation of the test result, is based using "Leak flow rate unit".

⚠ **WARNING:** when changing the units of measurement, check the correctness of the parameters in the test programs

6.4 Unit: digital inputs

A maximum of 16 inputs are available; the number of inputs actually available depends on the expansion boards installed, I/O B type (8 inputs + 8 outputs), with a maximum of two boards; the inputs available are programmable, the inputs not available are obscured and are not programmable.

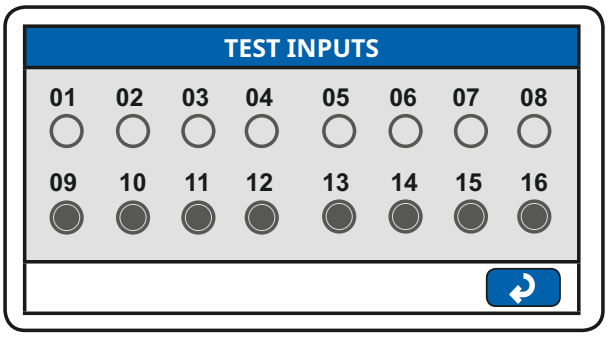
Inputs 1:16
Input signal on an expansion board:

- **FREE:** signal not assigned

- **PLC START:** START input test (high active signal)
- **PLC START INV**: START input test (low active signal)
- **PLC STOP:** STOP input test in progress (high active signal)
- **PLC STOP INV:** STOP input test in progress (low active signal)
- **PLC START/STOP:** alternating START/STOP input
- **EXT START/STOP:** manual external push button (with debounce filter)
- **BiStart A:** double safety start, input A
- **BiStart B:** double safety start, input B
- **Start Consent**: the instrument before starting a test is waiting for a consensus signal
- **Emergency:** emergency lock (reverse, 0=emergency)
- **Man. discharge:** manual pressure discharge control
- **Products / Programs:** input = 0 the programs are enabled; input = 1 the products are enabled
- **Tab b0:** select test table, bit 0
- **Tab b1:** select test table, bit 1
- **Tab b2:** select test table, bit 2
- **Tab b3:** select test table, bit 3
- **Tab b4:** select test table, bit 4
- **Tab b5:** select test table, bit 5
- **Automation 1:** limit switch FC1 closed position
- **Automation 1:** limit switch FC2 open position
- **Automation 2:** limit switch FC1 closed position
- **Automation 2:** limit switch FC2 open position
- **PRINTING** (Option) Print labels
- **Operator OK:** (Option) Result PASSED confirmed by the operator.
- **Operator KO:** (Option) Test result changed to or confirmed as FAILED.

Input tests

Selecting the test function opens a page that displays the status of the inputs, as in the base menu.



6.5 Unit: digital outputs

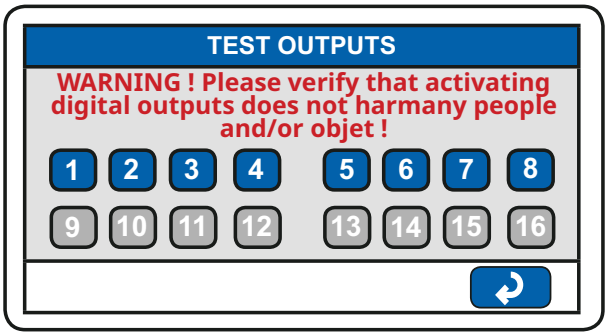
A maximum of 16 outputs are available; the number of outputs actually available depends on the expansion boards installed, I/OB type (8 inputs + 8 outputs), with a maximum of two boards.
Available outputs are programmable, unavailable outputs are obscured.

Type OUT 1:4
Control mode of outputs 1:4 on the first expansion board.
PLC outputs: free outputs for PLC signals
Traffic light: 1=Test in progress, 2=PASSED (flashing), 3= FAILED (flashing), 4= Audible alarm.

Outputs 1:16
Output signal on an expansion board

- **FREE:** not assigned
- **TEST IN PROGRESS:** test in progress
- **TEST NOT IN PROGRESS**: test not in progress
- **PASSED:** result **PASSED**
- **FAILED:** result **FAILED**
- **PRODUCTS / PROGRAMS:** output = 0 the programs are enabled; output = 1 the products are enabled
- **PASSED - PREVIOUS TEST**: result **PASSED** previous test
- **FAILED- PREVIOUS TEST**: result **FAILED** previous test
- **INTERMITTENT BUZZER:** acoustic signal Failed/Alarm
- **FIXED BUZZER:** acoustic signal Failed/Alarm
- **PRE-ADJUSTMENT:** pre-adjustment with external valve
- **VACUUM:** External valve for vacuum module (MAV)
- **RVP VALVE:** external valve (volume control)
- **MACHINE ALARM (REVERSE):** alarm signal (reversed, 0=alarm)
- **AUTOMATION 1:** automation control 1
- **AUTOMATION 2:** automation control 2
- **MARKER:** Automation: marker command
- **DISCHARGE:** External discharge valve control
- **COMMAND n=1÷8:** output for external devices command (option)
- **STEP PASSED n=1÷16:** output with result **PASSED** in step n of a sequence
- **STEP FAILED n=1÷16:** output with result **FAILED** in step n of a sequence
- **CLOCK:** Square wave signal, period 100 ms.

Output test
Manual activation of digital outputs.
Selecting the test function opens a page that displays the status of the outputs, as in the base menu, but in this page the outputs can also be activated manually by pressing the corresponding keys.



⚠ **WARNING:** Risk of moving parts and parts under pressure.
If the digital outputs are used to control external components (valves, cylinders, etc.), manual activation can be dangerous for the operator and the equipment.

Internal circuit valves test

Manual activation of the internal valves

Selecting the test function it opens a page through which it is possible to activate / deactivate the individual internal valves of the instrument. Each valve corresponds to a button, but, depending on the model of the instrument, not all buttons are valid.

⚠ **WARNING:** The manual activation of the valves can be dangerous for the user and for the instrument.

6.6 Unit: automations (Option)

Automation 1: closing

Automation 1: maximum delay of limit switch FC1-Automation 1; Range 0 : 3600.0 s; 0=not used, function disabled.

Automation 1: opening

Automation 1: maximum delay of limit switch FC2-Automation 1; Range 0: 3600.0 s; 0=not used, function disabled.

Automation 2: closing
Automation 2: maximum delay of limit switch FC1-Automation 2; Range 0: 3600.0 s; 0=not used, function disabled.

Automation 2: opening
Automation 2: maximum delay of limit switch FC2-Automation 2; Range 0: 3600.0 s; 0=not used, function disabled.

Marking
Marking command duration, range 0 : 3600.0 s; 0=not used.

Marking: result
Choice of marking control:
PASSED: (only PASSED result),
FAILED: (only FAILED result),
ALL: (end of test signal).

6.7 Unit: USB device/slave interface

USB protocol
Communication protocol:

MODBUS	For supervision and data collection with Modbus RTU network
CSV TEXT	For data collection on terminal in CSV format
PC-PRINT	For managing print formats (templates) (option)
DISABLED	not used

NOTE: USB device/slave interface manuals are provided on request.

USB variant
USB interface enabled with Modbus RTU communication protocol; registers format:

T3	Standard version for Provaset T3 instruments.
DPxBx	Compatible with DELTA DPxBx instruments.
DPxB2C	Compatible with DELTA DPxB2C instruments.
DTxB01	Compatible with DELTA DTxB01 instruments
ISOxBx	Compatibile with PROVASET ISOxBx instruments

USB address
Address of the Modbus RTU node for communication on the USB port; range 1:255

6.8 Unit: Ethernet (OPTION)

ETH: protocol
Ethernet communication protocol. Only selectable one at a time.

T3 MODBUS TCPIP → FOR SUPERVISION AND DATA COLLECTION WITH MODBUS TCP / IP
JSERVER → For data collection through jServer software (*)

NONE → No active protocol

(*) JSERVER
jServer software is a multi-platform software system produced by Tecna by which it is possible to collect the tests data carried out by Provaset T3, T3L and T2.

ETH: IP address
Provaset T3L IP address

ETH: netmask
Netmask of T3L

ETH: gateway
Gateway of the T3

ETH: MAC address
MAC address of Provaset T3L in display only

ETH: jServer IP
Server IP address on which jServer software is installed

ETH: jServer port
Port by which Provaset T3L communicates with jServer at the IP address indicated above

ETH: sending graphs
If set to Yes, Provaset T3L will send the points of the graph to jServer server during the test

ETH: sending barcode
Instant sending to the Barcode jServer server, read by the barcode reader (for any server-side processing).

> **NOTE:** a barcode read before testing will still be present in the appropriate field at the end of testing.

ETH: jServer check frequency

Frequency at which a control communication is made to the jServer server. Possibility to choose between the following items:

DISABLED
VERY LOW (100S)
LOW (1950S)
MEDIUM-LOW (25 YEARS)
MEDIUM-HIGH (15S)
HIGH (5S)

6.9 Unit: Part11 Options(option)

P11: Aut. jServer

User authorization system activation sub-menu via jServer. Choice of the following items:

YES
NO

P11: Timeout logoff jServer (No = 2h)

Sub-menu for time setting after which the machine will request to login.
Possibility of choosing between 0 and 7200s in steps of 1 second.

P11: End test logoff

Sub-menu for login request activating at the end of each test. Choice between:

YES
NO

6.10 Unit: serial line 1 (first expansion board)

LS1: protocol

Communication protocol:
MODBUS: For supervision and data collection with Modbus RTU network
CSV TEXT: For data collection on terminal in CSV format
PRINTING: For label printer (option)
BARCODE: For barcode reader (option)
BARCODE+PRINTING: For transmitting printer and receiving barcode (option)
RFID: (Option)

LS1: Variant

If in the parameter **LS1: protocol MODBUS** is selected, the parameter **LS1: Variant** enables serial line 1 with Modbus communication protocol.
Modbus registers can be managed in the Provaset T3L's own format or in a format compatible with other devices, as indicated above for the USB device/slave interface.

If in the parameter **LS1: protocol PRINT** or **BARCODE+PRINT** is selected the parameter **LS1: Variant** enables the selection of a printer model on the menu page that contains all the types of printers that Tecna provides.

LS1: address
Address of the Modbus RTU node for communication on the serial line.

LS1: type
Serial line type; to choose: RS232, RS485.

LS1: baud rate
Baud rate of the serial line; 8 bit format, no parity, 1 stop bit.
To select: 4800, 9600, 19200, 38400, 56000, 57600, 115200 baud

NOTE: Communication protocol manuals are available on request.

6.11 Unit: serial line 2 (second expansion board, option)

LS2: protocol
Communication protocol: as above for serial line 1.

LS2: variant
Modbus registers format: as above for serial line 1.

LS2: address
Address of the Modbus RTU node for serial line 2.

LS2: type
Serial line type: as above for serial line 1.

LS2: baud rate
Baud rate of serial line 2: as above for serial line 1.

6.12 Change date and time unit

The clock and calendar functions are used to record the date and time of the tests performed for data collection on the serial line.
When the instrument is switched off, the clock is powered by the charge accumulated in a super-condenser, which can keep it running for about 7 days.
Press the boxes on the right side of the screen to enable the modification of the date, **day / month / year** and time, **hour / minute / second**.

6.13 Unit: password management

Administrator
Access code for the Administrator. The code is always required for changing the general configuration parameters and for the calibration procedures of the sensors.

Change test cycles
Access code for modifying or copying products and test programs; not used if null and void.

Activate product
Access code for the selection of the active product for testing; not used if null and void.

> **NOTE:** the devices are delivered with Administrator Password=1234 and with zero password, not used, for modification and activation of products and test programs.

6.14 Unit: barcode reader (option)

A single barcode reader can be used several times before a test to read and store various information; for example: operator code, batch code, product code, serial number.
Up to 4 barcodes can be defined, each with its own set of programmable parameters. The function assigned to each barcode is recognized by the first two characters of the barcode itself.

Single scan?
If codes with different meanings (up to 4) are used, indicate whether they are read with a single scan (YES) or with multiple scans of different codes (NO).
If the scan is single, it will then be possible to set the position of the first character and its length for each code type, so that codes with different meanings can be exported from a single string.

Set test cycle with
NO: the product is not selected by barcode;
Barcode 1: the product is selected from barcode 1;
Barcode 2: the product is selected from barcode 2;
Barcode 3: the product is selected from barcode 3;
Barcode 4: the product is selected from barcode 4.
Via Ethernet: association of Barcode with test program through jT3 Manager software

Request selection?
NO: if the code read does not correspond to a valid code for selecting a product, at the Start command the operator is warned that the last product already used will be used and that the Start command must be repeated.
YES: if the code read does not correspond to a valid code for the selection of a product, the operator is warned that it is not possible to perform testing.

Reset at the end of the test
NO: at the end of the test, the codes read are kept in memory and remain valid for the next test.
YES: at the end of the test the codes with setting REQUEST=YES are reset.

Automatic start?
NO: not used;
Barcode 1: the start of the test starts after reading barcode 1;
Barcode 2: the start of the test starts after reading barcode 2;
Barcode 3: the start of the test starts after reading barcode 3;
Barcode 4: the start of the test starts after reading barcode 4;
Always: the start of thetest starts after reading each barcode.

Barcode 1: enabled
NO: not used;
YES: reading accepted before each test.

Barcode 1: name
Programmable name, 16 characters max, assigned to barcode 1; examples: operator, batch, product, series number.

Barcode 1: starts with
Initial characters of barcode 1, to recognize the function attributed to the code; maximum two initial characters.

Barcode 1: starts with
Only active if single scan is selected.
Specify the start position of the code. If the position is entered with a negative sign, it is counted from the end.

Barcode 1: max length
If multiple scan is selected, it indicates the maximum length of the code.
If single scan is selected, it indicates the maximum length of the field to be exported.

Barcode 1: request
NO: reading accepted but not necessary;
YES: reading necessary before each test.

Barcode 1: reset others
NO: the reading does not reset the other codes already read.
YES: the reading requires the rereading of all the other codes;
Example: reading the batch code forces the rereading of the product code.

Barcode 2:
As above, for barcode 1.

Barcode 3:
As above, for barcode 1.

Barcode 4:
As above, for barcode 1.

Example for barcode 1:

Parameters:
Enabled= YES; Name= VALVE ; Start with=V ; Requested=YES; Reset=NO; Set product with= barcode 1; Requested product= YES.

Barcode reading:
VN123-ABC

When the code is read, the menu window shows: VALVE N123-ABC.
If a product programmed with the parameter name = N123-ABC exists, a new test is started with the product called by the code.

6.15 Barcode associations database group (option)

Enable associations database?
NO: not used;
YES: reading the barcode enables the test cycle with the product or program related to the code itself present in the database on the T3L.

> **NOTE:** enabling the association database function excludes the use of a certain product or program associated with the relative barcode set in the product code menu or program code for test cycles with the use of a barcode reader. Tests are performed with the product or program associated with the relative barcode code set in the database.

The CSV file must be downloaded using the pendrive inserted in the front or rear port of the T3L.
To download the CSV file, press the key **Load associations database from USB memory** and then confirm by pressing the **YES**key.
The **Imported associations** box shows the number of associations (e.g. CSV file codes) imported into the T3L database.
If in the menu '**Can the operator add associations?'** the **YES** key is selected and then with the barcode reader a code is read that is not present in the T3L database, it is possible to add the code in the database itself, pressing the **YES** key on the message **Add new association in the database**, then it is necessary to associate the code read to a PRODUCT or a TEST PROGRAM by pressing the dedicated key in the menu that appears on the T3L display.
In the next step it is necessary to select the desired PRODUCT or TEST PROGRAM from the list that is displayed and press the **YES** key to confirm the new association.
In this way, the T3L database now contains the new code associated with a product number or a program number and in the **Imported associations** box the number of associations (e.g. codes) present in the T3L database is updated.

Then, by default, the menu page is displayed to export the updated database with the new code to the pendrive, press the **YES** key on the message **Export database of associations** to perform the export.
Pressing the NO key cancels the export procedure, the operator can perform this operation at any time by pressing the **Export associations database to USB memory**key.
If the operator presses the NO key on the message **Add new association in the database** , the operation is cancelled and the current PRODUCT or TEST PROGRAM will be maintained.
The T3L database can contain a pre-established number of associations (e.g. codes), once this number has been reached it is no longer possible to add associations and an alarm message appears on the display indicating that the associations (e.g. codes) in excess have not been loaded.
The modification of the associations (e.g. codes) of the existing database on the T3L is only possible if carried out on a personal computer, therefore to carry this out it is necessary to export the database from the T3L, modify it (with a PC) and subsequently import the modified database on the T3L.
To delete all the associations (e.g. codes) present in the database from the T3L, it is necessary to import an empty CSV file, without associations but complete with header (columns with their names e.g. **code, test cycle, notes**).
Each time an associations (e.g. codes) import operation is carried out using a CSV file, the CSV file overwrites the existing file in the database.

> **NOTE:** The CSV file must be called (T3L_Barcode.csv) and must consist of at least three columns for inputting the following data: code, test cycle, notes.
> **Code**: it must contain the codes of the components to be tested (barcode).
> **Test cycle**: it must contain the product number or program enabled for the test cycle. To enable a product it is necessary to enter the desired product number, to enable a program it is necessary to enter the letter P and the program number.
> **Note**: this may contain useful descriptive notes for the user.
> In the CSV file the fields recorded must be separated by the character [semicolon, comma or tab].
> This setting is necessary to allow the correct reading of the CSV code database file from the T3L.

Can the operator add associations?
YES: the operator can add associations (e.g. codes) to the T3L database by reading a code using a barcode reader
NO: the operator cannot add associations (e.g. codes) to the T3L database.

Last import:
The box shows the date and time of the last association (e.g. codes) import operation in the T3L database.

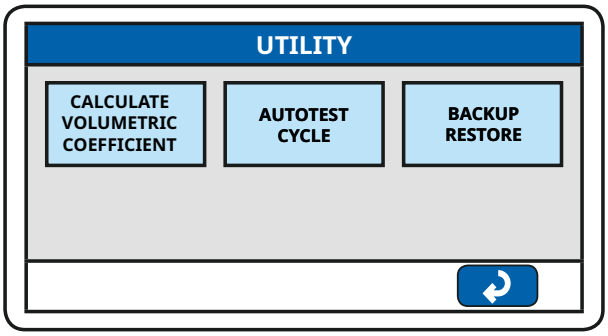
Imported associations:
The **Imported associations** box shows the number of associations (e.g. codes) imported into the T3L database, using CSV files or barcode readers.

Upload associations database from a USB memory
Pressing the key it is possible to import a CSV file from a pendrive to the T3L database.

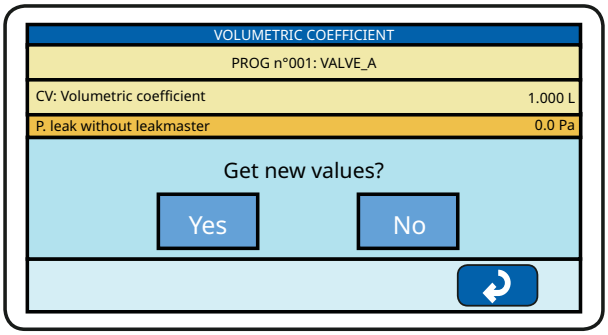
Export association databases to USB memory
Pressing the key it is possible to export the database (present on the T3L) onto a pendrive.

7. UTILITY

7.1 Utility: calculation of the volumetric coefficient



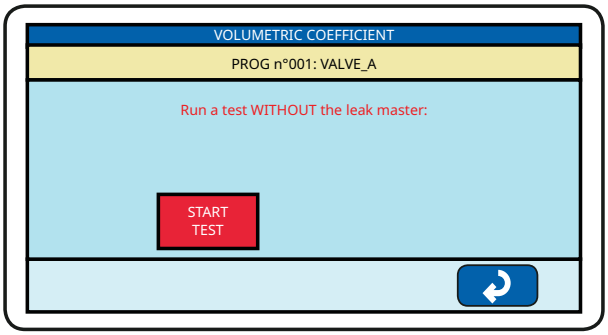
This test cycle is only applicable for leak tests for the purpose of automatically measuring and programming the volumetric coefficient CV for the calculation of the leak rate Q.
The actual relationship between the loss in pressure and the rate of loss in flow depends on numerous factors, especially mechanical expansions and changes in air temperature in the test circuit.
The piece under test must therefore preferably be thermodynamically and mechanically at rest, and the time T3 must be adequate.
For these reasons, the correct value to use for the calculation is not the real geometric volume of the test circuit but an equivalent volumetric coefficient, which can also be manually entered as a parameter in the active test program (CV parameter). It is preferable to experimentally determine the value of the volumetric coefficient CV using a sample leak master to be connected to the test circuit, with this prucedure. The value of the leak master must be the closest to the leak rate you want to intercept in the piece under test.
The test cycle requires the use of a leak master or leak simulator (Example Tecna LTC).
Press on the button "Calculate volumetric coefficient" to proceed.



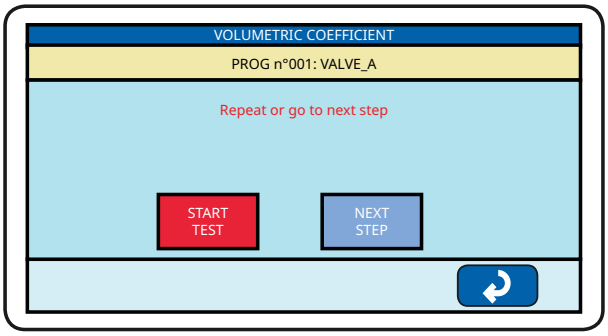
The test cycle is performed with the parameters of the active test program.

The indicated volume is the value of the volumetric coefficient **CV** already programmed in the test parameters.

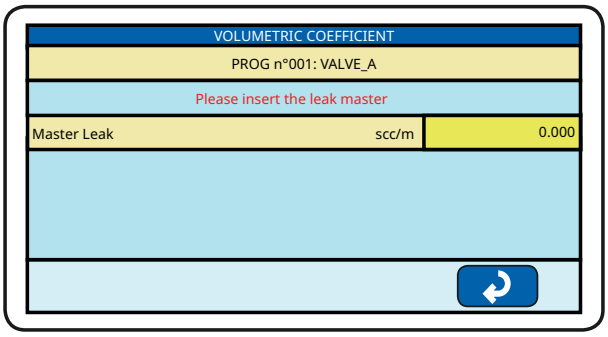
Confirm with the [YES] key to proceed.



On the next screen click on START TEST, being careful not to connect the calibrated leak for now.

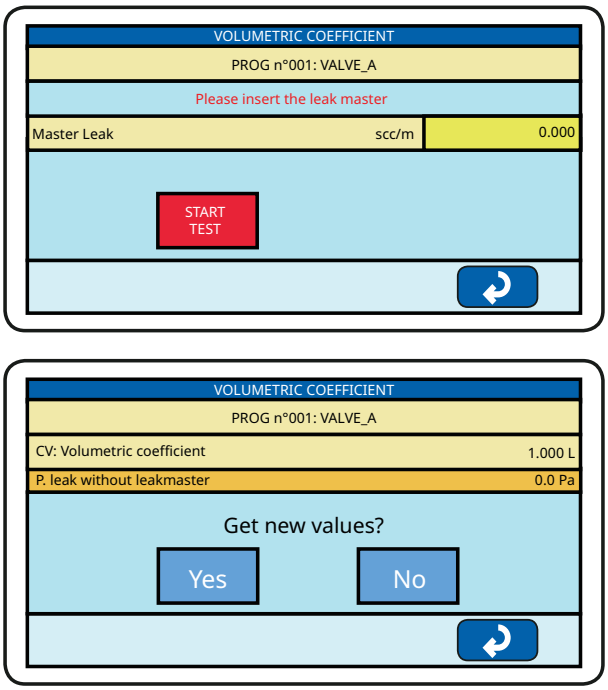


Once the first step has been carried out, the instrument asks you to confirm the measurement just performed and proceed with the next step or repeat from the beginning.



Choosing to continue, you will have to connect the leak master in any point of the pneumatic circuit, in derivation on the pipe connected to the TEST output or on the component under test and enter the expected leak flow rate value using the leak at

the set pressure in the program. Once the required value has been entered, the instrument will proceed with the second step.



At this point, once the measurement is finished, we can either accept the value obtained or repeat the entire process.

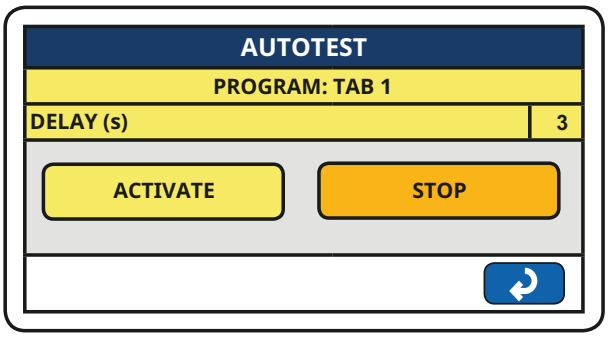
The value of the leak without the leak master will be saved in the parameter P. leak without leakmaster (step 1 of the procedure). This parameter is reset if the CV is changed manually by the user in the test program.
Tecna Srl can supply leak masters to the user's specifications, made on quick couplings that can be inserted in the STAUBLI RB03 type sealed sockets on the front panel.

WARNING: The leak rate Q of the leak master must be certified at the **PR** test pressure programmed in the test program.

7.2 Utility: Autotest cycle

It is possible to activate the autotest cycle from the UTILITY menu and then AUTOTEST CYCLE.
This cycle is used to repeat the active program or product.

WARNING: When the AUTOTEST is active, once the test is finished, the T3L will proceed with a new test within the time indicated in DELAY (s). Pay attention!



Press on the numerical value to the right of the DELAY (s) item to change the time interval between one test and the next one.

Press ACTIVATE to activate the autotest cycle: the cycle will start only after giving a start. The information that the autotest is active will be shown in the top bar of the T3L.
Press STOP to disable the autotest. IMPORTANT: this will not stop the test but only the automatic start of the following test.
If necessary, it is also possible to stop the autotest in the same way as when you reset with the start button.

7.3 Utility: Backup and Restore

It is possible to find Backup and Restore functions in the UTILITY menu and then BACKUP RESTORE menu.

Through this function it is possible to backup programs, products, general parameters, and internal configurations.
By pressing the BACKUP key, T3L copies the general parameters, programs, products, and other internal configurations of the instrument onto the USB key. The folder structure on the key is as follows:

```
T3LBAK
└──── <serial number>
        ├──── PROGRAMS
        ├──── PRODUCTS
        └──── CONFIGS
              └──── RESERVED
```

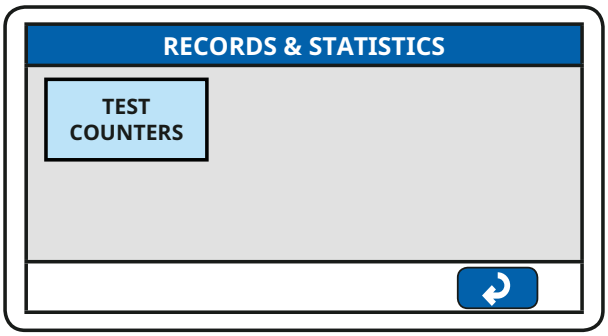
By pressing the RESTORE key, the T3L copies the general parameters, programs, and products, from the internal key.

WARNING: It is highly recommended to restore what was saved on the T3L with the same Firmware revision.

NOTE: the internal configurations backup does not include the restore of the same ones (these configurations could however be requested from the Customer by Tecna for any after-sales assistance).

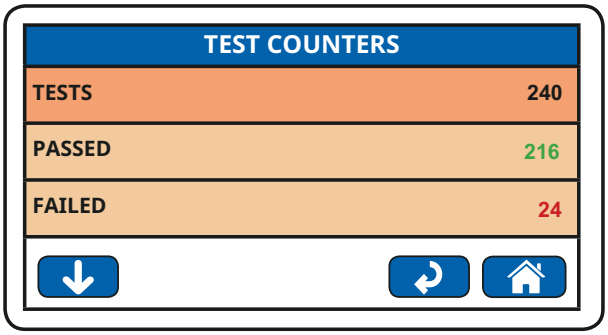
NOTE: it is strongly recommended do not remove the pendrive during the back-up

8. PART COUNTER



From the main menu, by pressing the "Data and Statistics" button, it is possible to access the menu for managing the part counters and, only if the option is enabled, also the daily statistics.

8.1 Partial part counter

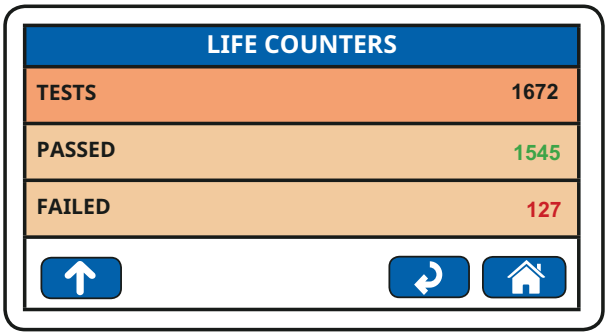


At the end of each test, the instrument updates the partial counters:

No. of TESTS: total number of tests carried out since the last reset.
OK: total number of tests carried out with **PASSED** result, since the last reset.
FAILS: total number of tests carried out with **FAILED** result, since the last reset.

The counters can be reset manually with the red [Recycle Bin] key.
Press the arrow key to display the total part counter.

8.2 Total part counter

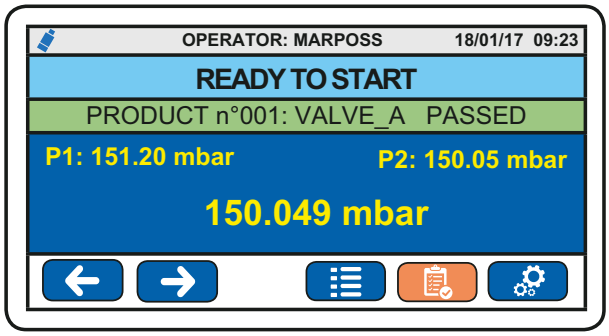


At the end of each test, the instrument also updates the total counters, which cannot be reset, and indicate the working life of the instrument.

No. of TESTS: total number of tests carried out
OK: total number of tests carried out with **PASSED** result.
FAILS: total number of tests carried out with **PASSED** result.

9. COLLECTION OF TEST DATA ON THE PEN DRIVE

The Provaset T3L is equipped with two USB Host Type A ports, one on the front panel and one on the rear panel both can be used to collect test data on a pen drive.
If a pen drive is connected to one of the T3L ports, the top bar of the display shows the status of the USB interface.



The status of the pen drive is indicated by the colour of the icon displayed in the top bar of the T3L display in the top left corner:

blue icon, the pen drive is inserted correctly and functioning, data collection is enabled on the pen drive

red icon (momentary), data writing is in progress do not extract the pen drive from the port

To save the test data on the pen drive, proceed as follows:

- Insert the pen drive into the desired USB port either on the front panel or on the rear panel

NOTE: test data can only be saved on a pen drive. If two pen drives are connected to the respective ports of the T3L, data collection is performed only on the pen drive connected to the front panel.

- The blue pen drive icon will appear in the top left corner of the T3L display.
- Press the START button on the front panel to perform a test
- After the test the pen drive icon will turn red to indicate that the writing of the test data is in progress (during this phase do not remove the pen drive from the USB port)

WARNING: damage to the pen drive and loss of data;
the pen drive may be damaged if it is removed during the writing phase indicated by the red USB icon, with the consequent risk of losing the collected data.

- After this phase of writing test data onto the pen drive is finished, the icon on the T3L display will turn blue, now it is possible to extract the pen drive from the USB port.

WARNING: date and time error during data collection.
The date and time of the tests are important information for data collection; incorrect date and time values can render the collected data unusable.
See configuration menu Change date and time unit page 69.

9.1 Format of data recorded on the pen drive

By inserting a pen drive, a directory is created with the name corresponding to the type of instrument (T3L) and the serial number of the instrument itself; in this way, the same pen drive can be used in succession on different instruments collecting the tests of each instrument in distinct and identifiable directories.
Inside the directory 'T3L - Serial number' the data is collected in a file called T3L_Test_Log_yyyy-mm-dd.csv which contains all the test data carried out during the entire 24 hours. After 24 hours, a new file is created with the new date of the day in question.
The data files are in CSV-compatible text format and can therefore be used with any spreadsheet (e.g. Excel).
File structure specifications:

- encodes UTF-8;
- The first row of the file contains the column header for the spreadsheet in the language set on the tool;
- the lines of each test end with the characters (carriage return) + (line feed), corresponding to the characters ASCII 13 and ASCII 10;
- the fields recorded shall be separated by the character (semicolon), corresponding to the character ASCII 59;
- numeric fields shall use as a decimal point the character (point), corresponding to the character ASCII 46.

10. PRINTER

If the printer option **SWT** is installed, the PROVASET T3L instrument can print one or more labels with significant information about the last test performed.
Press the key to print the labels.

Printer interface

Serial line configured in the General parameters menu, serial line 1 or serial line 2.
See Unit: serial line 1 (first expansion board) page 68.
Example, to print with serial line 1:
LS1: protocol = PRINT communication with printer;
LS1: variant = Printer model it is possible to select a printer model on the menu page that contains all the types of printer that Tecna provides.
LS1: type = RS232 communication on RS232 interface;
LS1: baud rate = 115200 8-bit communication, no parity, 1 stop bit.

Print command
A print command can be issued by:
- key on the T3L display (only one copy);
- digital input, on the expansion board, assigned in the configuration menu (only one copy);
- automatic printing at the end of the test, programmed in the test program.

Printing parameters

Labels are printed according to the parameters programmed in the test program.
See Printing parameters page 57
STM print mask: label printing format selection number;
STS automatic printing mode: printing only with a PASSED result or always with every test, even with a FAILED result;
STN number of printed copies to be printed automatically at the end of testing;
Range 1 enables the ability to print on a predefined label range;
Range 2 enables the ability to print on a predefined label range.

Automatic printing
At the end of each test, automatic printing is enabled if **STN** > 0; the equipment prints a single label, with STN=1, or more labels in copy, with STN > 1.
With the parameter STS=0, the labels are printed only for tests with a PASSED result; otherwise the labels are printed for every test, even with a FAILED result.

Print mask

The formatting (print mask) of the label to be printed can be configured by the operator, and sent to the printer, using a service program on a Personal Computer, that is provided on request.
All available print masks are saved on the printer at the start, with an identification number, which can be set in the STM parameter of the test program.
The message sent to the printer at the end of the test begins with the print mask number and continues with a fixed list of variables that include all the significant information on the last test performed; the print mask (template) contains information to extract from the message only the variables to be printed, with the position on the label and its formatting.
With this method, the operator can configure the labels to be printed for each product by simply programming the **STM** parameter in the test program.

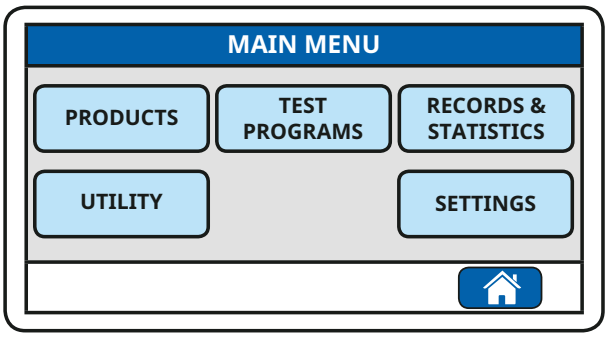
Layout program for print masks

The application program "T3 label layout ", for the Windows operating system, is available with the option to print **SWB,** for a standard printer.
The layout program can be used both to design the print masks, positioning the variables and indicating their formatting, and to send the print masks to the printer.

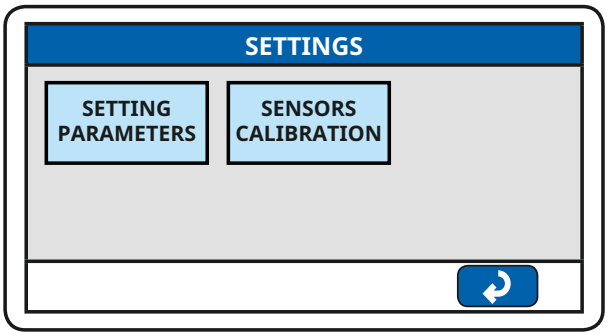
11. CALIBRATION OF PRESSURE AND FLOW SENSORS

WARNING: The calibration of the sensors must be carried out by authorised and technically competent personnel, with certified measuring instruments, following the instructions carefully.

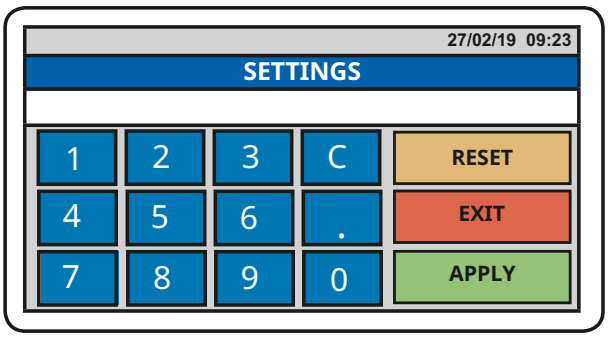
NOTE: Calibration interval: it is advisable to check the pressure and flow settings at least once a year; the manufacturer offers the periodic calibration service at their own premises or at the Customer's premises.



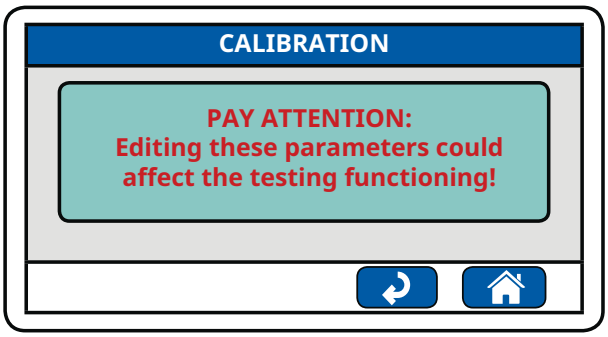
Press the SETTING button to enter the "SENSOR CALIBRATION" menu.



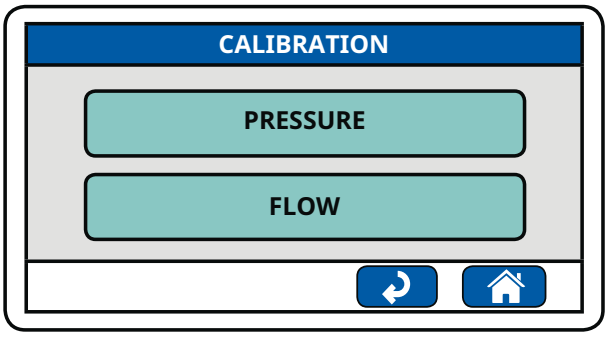
Press the "SENSOR CALIBRATION" key.
To access the menu it is necessary to enter the administrator's password.



Enter the administrator's password and press the APPLY key.



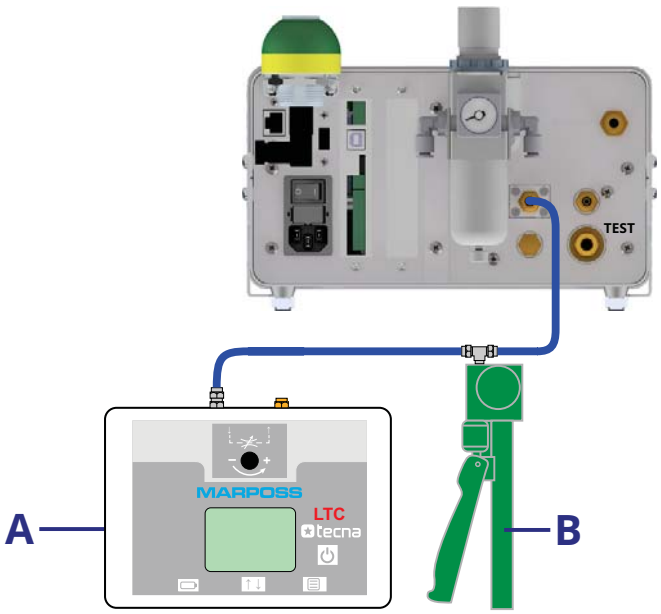
Press the message on the screen: "FOLLOW THE INSTRUCTIONS!"



Select "Relative pressure" or "Flow".

11.1 Calibration of the relative pressure

The relative pressure is the pressure in the component being tested, in relation to the ambient pressure, in the phases of filling, settling, measurement.
Calibration procedure:



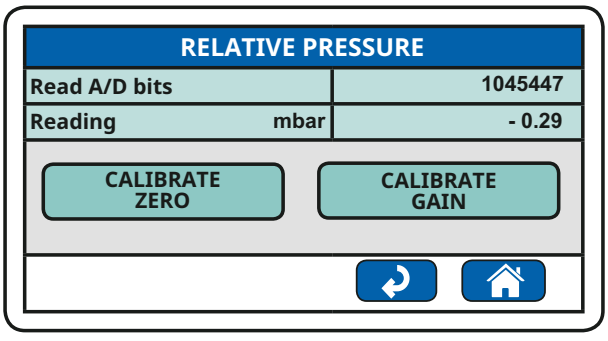
1. Switch on the equipment and wait at least 10 minutes for the pressure readings to stabilize;

2. Choose the CONFIGURE menu and then the SENSOR CALIBRATION menu;
3. Enter the administrator's access code (password);
4. Pay attention to the message "FOLLOW INSTRUCTIONS"; refer to the manual;
5. Press on the message area to open the calibration page;
6. Select the calibration menu "Relative pressure";
7. Connect the described instruments to the equipment as shown in the figure.

A. Certified digital pressure gauge (e.g. LTC **Tecna)** , with full scale of the test pressure; resolution at least 0.1 mbar, accuracy 0.2% FS.
B. Pressure source, capable of generating full scale pressure; may be a precision pressure regulator, but a manual pump with micrometer regulator and pressure relief valve is preferable.

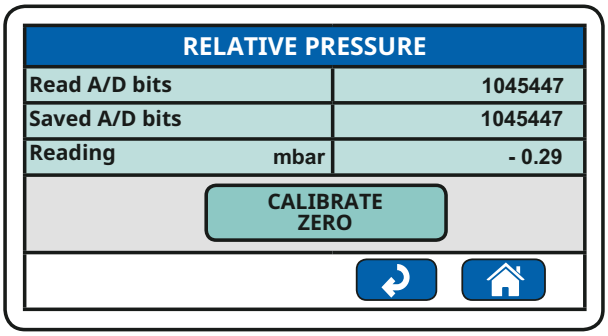
NOTE: Pressure generation with external source or internal valves.
Initially, when entering the calibration procedure, the internal valves are closed, so the test pressure can only be generated from an external source; but if the external source is not available, the operator can open the internal valves and generate the test pressure with the electronic pressure regulator, inside the equipment.
On the gain calibration page, where it is necessary to generate the test pressure, there are some [+/-%] keys that the operator can use to adjust the pressure.
Press a key [+%] to open the internal valves, then adjust the pressure with the keys [+/- %]; if a key [-%] is pressed until the pressure regulator is reset to zero, the internal valves close again.

The digital pressure gauge is used as a reference sample.



To verify the calibration of the instrument, change the pressure with the external source and compare the pressure measurement of the instrument with the measurement of the digital reference standard pressure gauge (the [+/-%] keys are not enabled on this page).
Carry out the check over the entire pressure measuring range, at regular intervals, upwards from zero to full scale, then downwards from full scale to zero.
Choose zero or gain calibration (GAIN).

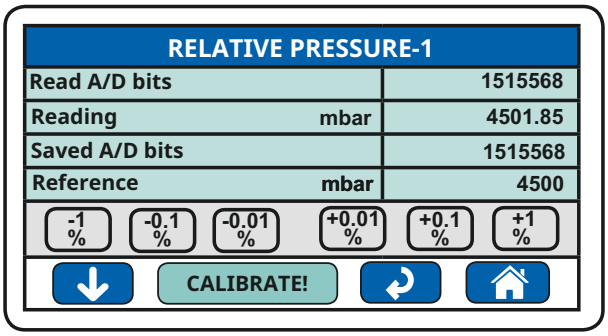
11.1.1 Calibration of the "zero" relative pressure



To adjust the pressure to the "ZERO" value, proceed as follows:

1. The pressure reading fitting must be free at ambient pressure to ensure the zero reading;
2. Open the discharge valve on the manual pump or disconnect the pipe from the reading fitting;
3. Press the ZERO CALIBRATION key to request zero calibration and confirm with the YES key again, or exit with the NO key.

11.1.2 Calibration of the "gain" for the reading of the relative pressure



Gain calibration for pressure reading (sensor amplification) can be performed in steps, maximum 10, from zero to full scale pressure.
Proceed as follows for the adjustment:

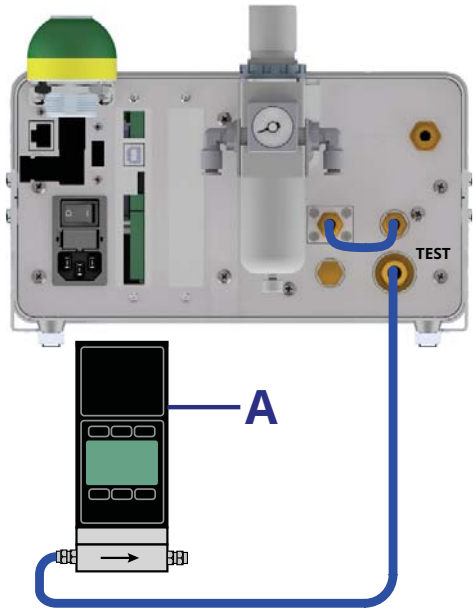
1. Connect the manual pump and the digital sample pressure gauge to the reading fitting;
2. Press the GAIN CALIBRATION button to display the calibration page;
3. The calibration step is indicated in the upper line; in the example: RELATIVE PRESS. -1 = step 1;
4. On the menu page, set the parameter "P. Sample" to the desired pressure for the calibration step and generate the corresponding pressure;

5. The pressure measured by the digital reference pressure gauge must be equal to the value programmed in the "P. Sample" parameter indicated on the menu page;
6. Adjust the pressure or change the parameter "P. Sample" as necessary to make them equal;
7. Press the CALIBRATION key, then confirm with the YES key, but only if the pressure reading on the digital pressure gauge is equal to the value programmed in the parameter "P. Sample";
8. Press the Down Arrow key to continue to the next step;
9. For each calibration step, the reference pressure value ("P. Sample" parameter) must be greater than the previous step, increasing the pressure at each step, from zero to full scale;
10. The calibration procedure ends only after 10 steps or by programming the parameter "P. Sample" to zero as the last calibration step.

WARNING: To avoid damage to the pressure transducer, never exceed the instrument's full-scale pressure rating.
A maximum overpressure of 10% is permitted.

11.2 Flow sensor calibration

The air flow rate is measured with a mass flow sensor.



Proceed as follows for the adjustment:

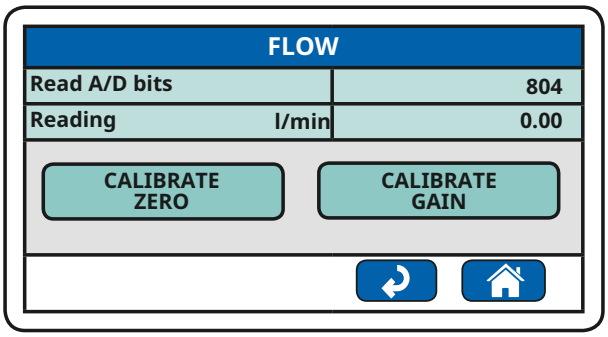
1. Switch on the equipment and wait at least 10 minutes for the readings to stabilize.

2. Choose the CONFIGURE menu, then the SENSOR CALIBRATION menu and enter the administrator's access code (password).
3. Pay attention to the message FOLLOW INSTRUCTIONS! ; consult the manual.
4. Press on the message area to open the calibration page.
5. Select the calibration menu "FLOW"
6. On the TEST output, connect a flow calibrator, as shown in the figure.

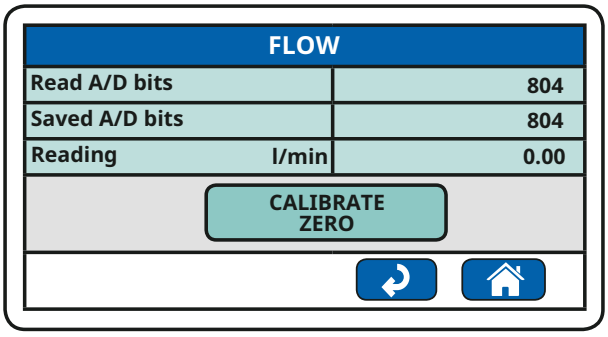
A. Digital flow meter: certified sample instrument, with full scale not less than the test range, resolution at least 0.01 litre/minute, accuracy at least 1 % FS.

⚠ **WARNING:** To avoid damage to the flow sensor, never exceed the full-scale values of pressure and flow of the equipment; values higher than the maximum of 10% are allowed.

In the calibration procedure, the internal valves are open and the outflow is controlled by the electronic test pressure regulator.
When accessing the calibration menu, the initial pressure and flow are nominally zero.



11.2.1 Zero flow sensor calibration (offset)



For zero flow calibration, any residual flow must be excluded:

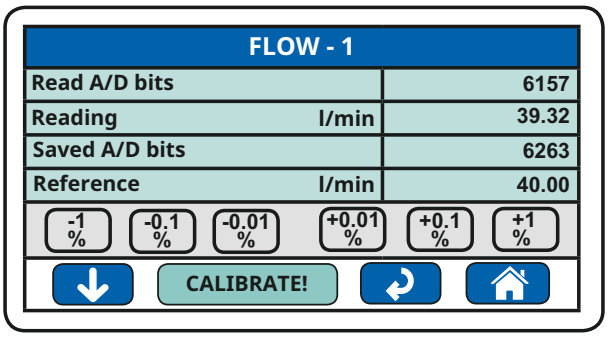
- Close the compressed air supply and wait for the flow to stabilise at zero;
- Alternatively, seal the pipe at the TEST output;

Press the [ZERO CALIBRATION] key to command zero flow calibration, then confirm the request with the [YES] key or press the [NO] key to exit.

11.2.2 Flow sensor gain calibration (gain)

Calibration of the gain for the flow (amplification of the mass flow sensor) can be performed up to a maximum of 10 calibration points, from zero to full scale positive.

NOTE: Adjustment of the calibration flow with the [+/-%] keys
A reference sample flow is required for gain calibration of the flow sensor, generated by the electronic pressure regulator inside the instrument and adjusted using the [+/-%] keys, available in the menu pages for gain calibration.
Press a [+%] key to open the internal valves and start delivering the flow, then adjust the flow using the [+/- %] keys.



Proceed as follows for the adjustment:

1. Connect the digital flow meter (certified reference sample) to the TEST output;
2. Press the “Gain calibration” button to display the calibration page;
3. The calibration step is indicated in the upper line; in the example: FLOW -1 = step 1;
4. On the menu page, set the parameter "F. Sample" to the desired flow for the calibration step;
5. Adjust the calibration flow with the [+/- %] keys by reading the flow on the digital flow meter (certified reference standard);
6. The flow measured by the digital flow meter must be equal to the value programmed in the "F. Sample" parameter indicated on the menu page;
7. Adjust the flow or change the parameter "F. Sample" as necessary to make them equal;
8. Press the CALIBRATION key, then confirm with the YES key, but only if the flow reading on the digital meter is equal to the value programmed in the parameter "F. Sample";
9. Press the [Down Arrow] key to continue to the next step;
10. For each calibration step, the reference flow value ("F. Sample” parameter) must be greater than the previous step, increasing the pressure at each step, from zero to full scale;

11. The calibration procedure ends only after 10 steps or by programming the parameter "F. Sample" to zero as the last calibration step.

CAUTION: To avoid damage to the flow sensor, never exceed the full scale values of pressure and flow of the equipment; values higher than the maximum of 10% are allowed.

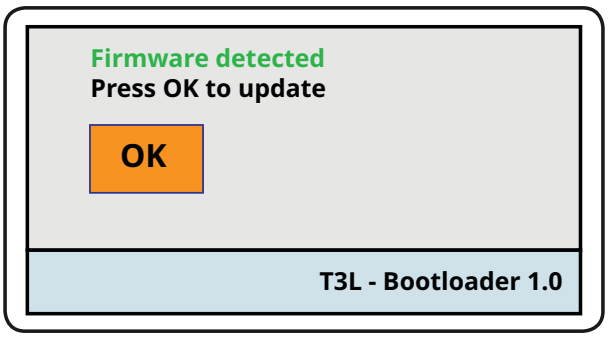
12. FIRMWARE UPDATE

NOTE: Before updating the firmware, take note of all the products, test programs and general configuration data.

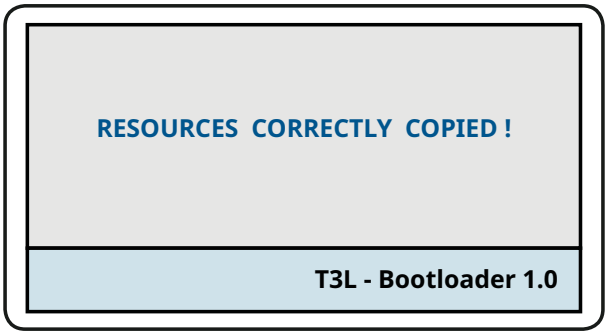
To update firmware, Tecna provides two file types **t3fwupd.bin** and **resource.bin .**

Firmware update procedure

- Download the files **t3fwupd.bin** and **resource.bin** and copy them onto a pen drive within the root directory
- Check that the T3L switch is in the off position (0) and then connect the T3L to the mains power supply.
- Insert the pen drive into the USB port on the front panel of the T3L
- Push the T3L switch into the ON position (I).
- Press the button **OK** that appears on the T3L display to perform the update.



If the firmware update has been performed correctly, the message RESOURCES COPIED CORRECTLY will appear on the T3L display.



NOTE: Once the update phase is completed and before carrying out tests, check that the products, test programs and general configuration data correspond to that previously noted before the Firmware update.

13. ALARMS

If there are alarms active, a new test cannot be started.
A test in progress is automatically terminated if an alarm occurs and the result of the test is not already acquired, including marking, if envisaged.

ALARM TEST PARAMETERS:
Data memory alarm: the test parameters are not valid; check and reprogram all the test parameters of the active product.

ALARM CONFIGURATIONS:
Data memory alarm: the parameters of the configuration menu are not valid; check and reprogram all the parameters of the menu.

ALARM CALIBRATION:
Data memory alarm: the calibration constants of the pressure or flow sensors are not valid; repeat the calibration procedure.

ALARM OUT OF SCALE PRESSURE:
Disconnect the compressed air supply, discharge the pressure in the test circuit.

⚠ **WARNING:** In case of out of scale pressure, follow a safety procedure to manually discharge the pressure into the test pneumatic circuit and into the component being tested.

ALARM FLOW READING:
Flow sensor alarm: reading error.
If the error persists, technical assistance is required.

ALARM PRESSURE DISCHARGE:
Pressure not discharged at the end of test.

WARNING: this alarm occurs when the machine has failed to release the pressure of the piece under test having set the FSM parameter on PRESSURE. If the FSM parameter is not set to pressure (for example: to TIME or WAITING) and the machine for some reason has failed to unload, the alarm will not appear in this case.

If a new test cannot be started due to an alarm, the alarm type is displayed on a red background.
The active alarms are visible in a dedicated page of the base menu, which can be accessed by pressing the key ← .

14. TECHNICAL SPECIFICATIONS

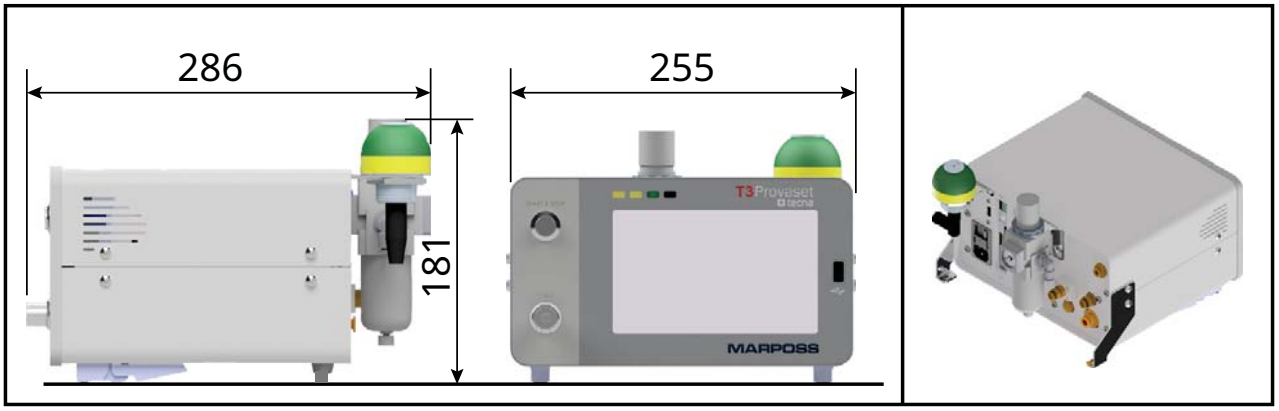
14.1 Technical data

Mains power supply		100 ÷ 240 V~ 50 ÷ 60 Hz , 35 VA
Fuses		T 630 mA, 2 fuses 5 x 20 mm
Class		I
Environmental conditions	**Temperature**	5 ÷ 50 °C
	Relative humidity	80% RH max
	Ambient pressure	700 hPa ÷ 1100 hPa
Air pressure supply		from 3.0 bar up to 10 bar max
Air supply quality		ISO 8573-1
Air input filter		5 µm
Pressure	**Class 0.5 % FS, resolution 0.1 Pa (0.001 mbar):**	**Test pressure range**
	T3LPFxxxP05	0.000 ÷ 500.000 mbar
	T3LPFxxxP1	0.000 ÷ 1000.000 mbar
	Class 0.5 % FS, resolution 1 Pa (0.01 mbar):	**Test pressure range**
	T3LPFxxxP2	0.00 ÷ 2000.00 mbar
	T3LPFxxxP6	0.00 ÷ 6000.00 mbar
Flow	**Accuracy**	+/- 3.5% reading [> 0.5 % FS]
	Resolution 0.001 l/min	**Test pressure range**
	T3LPF20Px	0.000 ÷ 20.000 nl/min
	Resolution 0.01 l/min	**Test pressure range**
	T3LPF50Pxx	0.00 ÷ 50.00 nl/min
	T3LPF100Pxx	0.00 ÷ 100.00 nl/min
	T3LPF300Pxx	0.00 ÷ 300.00 nl/min
Leak master connection	**Quick connector:**	Staubli RBE03

Case	**Materials**	Anodized aluminium
		ABS
	Size	255 x 181 x 286 mm
	Weight	7.0 Kg
Auxiliary power supply output +Vx	24 Vcc, 300 mA max	
	Resettable fuse, not isolated output	
Serial line USB 2.0	USB type B connector, 5 Vcc; isolation, 50V max	
Serial line RS232/RS485	5 Vcc for RS485 signals	
	+/-12 Vcc for RS232 signals; isolation, 50V max	
PLC digital inputs	24Vcc, 3 mA max	
	Conforming to IEC 61131-2; isolation, 50V max	
PLC digital outputs	24Vcc, 0.7 A max	
	Conforming to IEC 61131-2; isolation, 50V max	

NOTE: the nl/min scale is set at 1013 mbar and 0°C; the instrument can be calibrated with standards at different temperatures (Example: slpm at 21°C).

14.2 Size, weight, brackets



Weight: 7.0 kg (basic weight without accessories and options).
Brackets: two brackets (left and right side) are available (option) to fix the equipment to the test bench; the brackets are mounted on the rear screws of the cover plates.

DECLARATION OF CONFORMITY

CE

Producer and distributor	Tecna Srl
Address	Via Statale Sud 115, 41037 Mirandola (MO) Italy

declares that the product (s)

Model	T3LPF
Description	Air flow rate tester and pressure decay tester.

complies with the following directives and standards:

ELECTRIC SAFETY	
Directives	**2014/35/EU** of 26 February 2014 “low voltage”
Standards	**CEI EN 61010-1:2013** "Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements”
ELECTROMAGNETIC COMPATIBILITY	
Directives	**CE 2014/30/EU** of 26 February 2014 “electromagnetic compatibility”
Standards	**CEI EN 61326-1:2013** and subsequent amendments “Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements”
DISPOSAL, WASTE AND HAZARDOUS SUBSTANCES	
Directives	**CE 2011/65/EU** of 8 June 2011 “restriction of the use of certain hazardous substances in electrical and electronic equipment “ **CE 2012/19/UE** of 4 July 2012 “preventing the creation of waste electrical and electronic equipment (WEEE)”

Eng. Giulio Bignardi

Mirandola, 22/07/2020

General ManagerTecna Srl

15. GUARANTEE

This warranty is valid for contracts between Tecna Srl and companies and/or professionals holding VAT number (B2B) and only for the Client to whom the transport document (DDT or accompanying invoice) is issued by Tecna Srl.
Tecna Srl warrants its products for12 (twelve) months from the date of delivery against manufacturing defects and defective components.
The delivery date shall be that of the transport document (DDT or the accompanying invoice) issued by Tecna Srl at the time of delivery to the customer or to the carrier in-charge for the delivery.
The terms of this warranty do NOT apply to the sale of the spare parts and/or consumables which are subject to wear and tear.
The initial time period of the warranty of the whole instrument implies the end of the warranty even for all the parts eventually replaced during the warranty period, regardless of the time of implementation.
Only Tecna srl is authorized to perform repairs on the instruments under warranty: intervention by unauthorized personnel, as well as tampering to the warranty seal, shall terminate the said warranty.
Warranty repairs shall be carried out in the Headquarters of Tecna Srl.
Any requests for repairs on the customer's site shall be evaluated by Tecna Srl each time, and, in case of acceptance of the request, the transfer expenses (travel hour tariff, travel costs and out of office costs, call fee) shall be invoiced according to the current pricelist.
During the warranty period, parts and/or components that are not correctly functioning due to manufacturing defects, defective components and/or improper assembly of parts shall be replaced or repaired free of charge.

The evaluation on whether to proceed with a replacement or a repair is the sole responsibility of Tecna Srl.
The hours of work required for warranty service will also be provided free of charge.
The customer, following a written authorization by Tecna srl, will have to deliver the equipment properly packed in its original packaging, to the courier sent by Tecna srl for pick-up. The freight will be paid by Tecna Srl but will be charged back to the customer, if the necessary maintenance does not fall within the terms of this warranty.

The following are always excluded from the warranty:

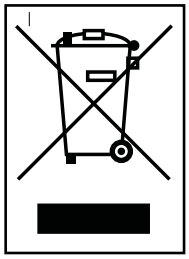
- consumable parts that are subject to wear and tear or which may require replacement due to the normal use of the instrument during the warranty period such as, but not limited to: valves and/or their valve stems, pressure and/or flux sensors, dirt filters, printer ribbons, batteries etc.;
- damages caused by transport, due to wrong or improper installation, improper handling, carelessness or incapability to use, tampering by unauthorized persons and any other causes within Tecna Srl control;
- damages arising from the use of the instrument in environmental conditions outside the specifications indicated;
- damages arising from the use of the instrument without the air filter (where required) mounted at the entrance of the compressed air, or with a dirty and/or worn-out filter;
- damages arising from the use of the instrument without the air filter (where required) mounted at the entrance of the compressed air, or with a dirty and/or worn-out filter;
- damages arising due to accidents or unforeseeable incidents, such as, but not limited to: fire, flood, earthquake, weather events (e.g. lightning), strikes, acts of vandalism, riots, unrests, thefts etc.;
- damages or malfunctions due to irregularities or anomalies in the mains supply (blackouts, power surges interference, etc.) or any other local power equipment;
- damages resulting from the misuse, repairs or maintenance activities performed by unauthorized personnel or use of non-original materials, damages due to use of corrosive materials for cleaning or otherwise that may damage the mechanical, electrical or electronic parts;
- damages or malfunctions caused by the installation of programs, software or operating systems or parts thereof or virus attacks that may damage or interfere with the operation of the operating system and software management of the instrument, in particular but not limited to installation via USB sticks, ethernet network or through other interconnecting systems;
- in general, all the damages that may be caused by the Customer or personnel authorized by him to operate the instrument, that is due to incorrect use of the instrument and/or against the instructions received or written in the instruction manual supplied with the instrument.

In all the above cases, the warranty does not apply and the repairs arising from such damages shall be quantified and billed according to the current tariffs.
The applicability or otherwise of the warranty is the sole responsibility of Tecna Srl.
Tecna Srl is not liable for eventual costs or damages caused by the machine downtime and is not liable for any direct or indirect damages resulting from the incorrect functioning of the supplied products or their use.
For any dispute that should arise in connection with the execution or interpretation of this warranty the court of Modena shall be exclusively competent.
The applicable law shall be the Italian law.

Revision 01/01/2015

Tecna Srl

16. USER INFORMATION EUROPEAN DIRECTIVE 2012/19/UE



This product conforms to European Directive 2012/19/UE.
This appliance bears the symbol of the barred waste bin. This indicates that, at the end of its useful life, it must not be disposed of as domestic waste, but must be taken to a collection center for waste electrical and electronic equipment, or returned to a retailer on purchase of a replacement.
It is the user's responsibility to dispose of this appliance through the appropriate channels at the end of its useful life.
Proper differential collection, and the subsequent recycling, processing and environmentally compatible disposal of waste equipment avoids unnecessary damage to the environment and possible related health risks, and also promotes recycling of the materials used in the appliance.

17. SHIPPING LIST

1x Instrument T3L
1x Instruction Manual
1x Calibration report (sensor)
1x USB key
1x USB cable to connect Personal Computer
1x Power supply 230 Volt / 24 Volt (Ext. Power supply + cable)
2x Terminal block for I/O expansion boards
2x Plugs (1 x 6 x 4 + 1 x 8 x 6)