ABOLUTE PRESSURE DECAY LEAK TESTER DOUBLE CHANNEL

T4890
USER MANUAL

FORTEST

Manual Index

Certificate of Conformity CE

Manufacturer: ForTest Italia srl
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ForTest declares that the instrument object of this manual, complies the following standards:
-) 2014/35/UE Low voltage directive
Applied norms:

- EN 61010-1

-) 2014/30/UE Electromagnetic compatibility (EMC) directive
Applied norms:

- EN61326-1/ EN61326/A1
- EN61000-3-2/ EN61000-3-2/A14
- EN61000-3-3/ EN61000-3-3/A1
- EN61000-4-2/ EN61000-4-2/A1
- EN61000-4-3/ EN61000-4-3/A1/ EN61000-4-3/A2
- EN61000-4-4
- EN61000-4-5
- EN61000-4-11

Then ForTest guarantees the use of the equipment object of the present manual with its higher safety.
Moreover it is guaranteed that the design of the equipment object of the present manual has been made to protect the operator from:

- Electrical shock
- Mechanical hazards
- Flame propagation beginning from the equipment
- Mechanical resistance to heat
- Gas emissions, explosions and implosions in the following ambient conditions:
  - Internal use
  - Ambient temperature of working from 5°C to 40°C (±2°C)
  - Max relative humidity of 92,5% (±2,5%)

Warranty is not valid in case you do not respect the prescribed conditions or in case of an usage against the rules of the interested job.

ForTest is not responsible in case of non compliance of the conditions above mentioned.

Chief executive
Alessandro TOMASINI

General Warranty Conditions

- Performances under guarantee must be made exhaustively from ForTest authorized staff.
- Excluded the clauses written in this warranty certificate none is authorized to give any other, written or oral ones.
- These conditions have a value for the UE countries.

1) Duration

- ForTest guarantees the user:
  - 24 months warranty on M4xx0 for all the components or parts that can present manufacturing defects.
  - On the modified equipments of the M series the limits prescribed by law are used.

2) Effect

- The warranty period begins from the date of production of the equipment, verifiable by the date written on the transport document.

3) Warranty development

- The possible intervention of first start and configuration of the equipment is totally charged to the Customer.
- Warranty implies the reset or the substitution of the faulty parts and the respective manpower.
- During the warranty period, the Customer has to pay to the authorized staff that makes the intervention the relative charges concerning the possible transfer.
- Interventions, under warranty or out of warranty, made on the equipment must to be make by ForTest authorized staff. Otherwise the terms expected on the equipment fall down immediately.
- Warranty does not cover damages to the components of the equipments caused by:
  - Bad maintenance.
  - Bad or wrong setting.
  - Bad or improper quality of the compressed air put into the equipment.
  - Possible electrical or pneumatic system not in accordance with laws in force.
  - Carelessness or misuse.
  - Electrical power with instantaneous voltage values or continuous one out of rule.
  - Impacts or falling down of foreign bodies.

- It should be noted that the opening of the box of the equipment, together with the conditions above described, will cause the immediate revocation of the guarantee.
- Removal of safety adhesive seal implies the immediate fall of the warranty.
- Passed or fall warranty conditions, the user must pay not only the possible transfer of the authorized staff, but also the manpower and the cost of the replaced parts.
- Authorized staff will supply to the Customer, on his special request, the possible replaced pieces with in attached the reasons of the repairing.

Charges due to the manpower will be paid by the Customer whenever the requested intervention has been caused by bad maintenance or incorrect installation of the equipment itself.

Safety Considerations

1) Considerations above the ambient control

- Testing zone must be clean.
- Use M series equipments with the precise pressure they have been designed for.
- Do not connect pieces that have different use pressure than those ones M series equipments have been designed for.

WARNINGS: use gas to a different pressure than the ambient one can cause risks depending by the force that the gas can have. Whatever it is the application, the testing parts, pipes, plugs they can however represent a possible source of risk and of danger for human people and objects. Take care to verify always the hydraulic circuit, to put it under protection with the use of barriers or any other system with this aim. We recommend to train your personnel about the risks caused by the use of gas under pressure, and also about the use of the equipments and how to test the pieces. ForTest guarantees its products safety (if they are used with gas and pressures they have been designed for, and if they work with a qualified staff), but it disclaims any responsibility if they are used in a wrong way or without respecting basic conditions contained in the present manual.

2) Considerations above the operator

- ForTest recommends that the operator who uses the equipment has a training and that he is properly qualified for the work required.

3) General Considerations

- Do not use this equipment before having read and respected all the points above listed in this chapter.
- Read carefully this manual before its use.
- All the electric connections towards the equipment must be supplied of safety system appropriate for its need and according to laws in force.
- To avoid any electromagnetic interferences, electric connections made on the equipment must have a length less than 2 m.
- If present, power socket must be supplied with its connection to earth.
- Disconnect power supply (socket, connection cable to the feeder, battery charger, battery) before to make any maintenance.
- Stop the compressed air feeder during any operation on the pneumatic assembly.
- Do not open the equipment, if you do not want your guarantee decades.
- Avoid any direct contact of the equipment with the water.
- If present, do not disassemble or handle the rechargeable lithium battery.
- If there is a rechargeable battery, use only the battery charger supplied together with the equipment.

ForTest is not responsible in any case of any accidents caused by non-compliance of safety rules and caused by the wrong use of the testing equipment.

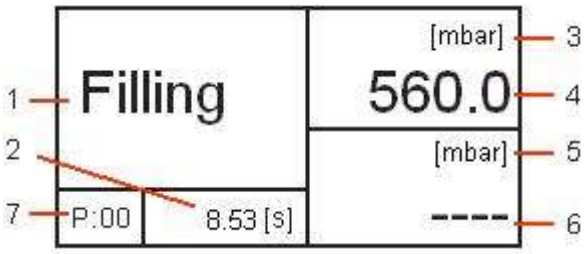
Introduction

M4000 series is the entry-level leak testers range of ForTest.
This equipment has a graphic OLED 128X64 pixel display, 5 control buttons, 5 programming inputs and “no break-through” Plexiglas front panel. The external case is compact and very resistant , the anodized aluminium integrates pneumatics elements and electric connectors. Thanks to the optimisation of the pneumatic circuit, the additional test volume has been practically removed, so the tests are even faster than before.
Each control can be done with several different programs (up to 100), they can be programmed with different values among them.
M4xxx is equipped in its standard version of a 24 poles connector with 24 Vdc and power outputs, a USB port and a optisolated port for industrial multi test stations networks. We can supply also external accessories as: printers, Staubli fittings for the connection on the front panel of M0710 (calibrated leaks), kits network sorting for the realization of complex PC networks, mechanical precise regulators etc …
The transducer calibration for periodic certification of test mode, can be done without opening the equipment, but simply with a procedure from external inputs, by using a certificated manometer (SIT,NAMAS,etc.).

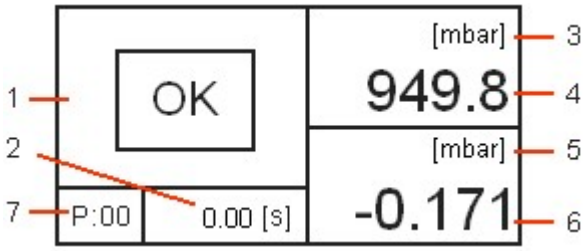
Frontal Panel

The frontal panel is constituted by different elements (eventually also optional) of interface with the operator. Here below we make a short description, but for more information it is better to read carefully the chapter *Test Cycle*.

DISPLAY:
OLED, 128X64 pixel, here you find this information: ongoing test details, results, program pages (SET UP and TEST). Here below the information shown on the display are explained:



In the field 1 it is indicated the current phase of the test (in English, whatever it is the language you have set): under it, you see on the left the field 7, that describes the current program, and on the right the time 2 to the end of the phase, with its relative unit. On the right you will find the indication of what the equipment is measuring: there is a high field 3-4 with its relative unit and numeric value, and a low field 5-6 with the same information (but referring to another measure). According to the phase where the equipment is (and according the calibration parameters and some test parameters), these fields display different measures. In the fields 4 and 6 a message **"OVER"** could appear: it identifies that the transducer relating to the indicated measure is full scale. In the field 6 dashes **"----"** can appear in case that the test has not reached yet a phase in which you measure the relative dimension.
Equipment with flashing result:



The field 1 that was first used for the phase, now it visualizes the last phase made by the equipment, and alternated to it the result flashes (see below the possible results). Program number, field 7, is that one of just completed phase. The field 2 visualizes the time remaining to the end of the phase, in the moment in which the test has been interrupt. On the right, in the fields 3-4-5-6 there are visualized the characteristic values of the test stored by the equipment (useful for reports) that depend on the phase in which the result has been generated.
In fields 4 and 6 it could appear at display, flashing with numeric values, some strings, that supply some more details about the kind of result:

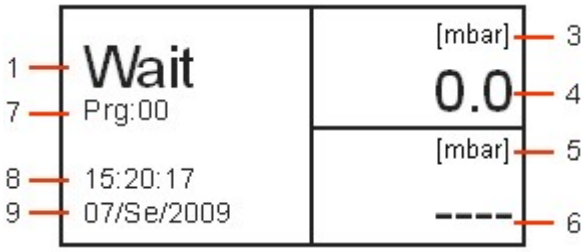
- **"OVER"** (for the fields 4 and 6) to indicate that the test is finished because the full scale has been reached.
- **"P%lo"** (for the field 4) to indicate that the test is finished because the pressure in the piece has decreased under the tolerance limit, or it has never reached the tolerance range (see the relative parameter of the chapter *Test Menu*)
- **"P%hi"** (for the field 4) to indicate that the test is finished because the pressure in the piece has risen over the tolerance, or it has never reached the tolerance range (see the relative parameter of the chapter *Test Menu*).
- **"NoLev"** (for the field 4) to indicate that the test is finished because the pressure has never reached the set value (see the relative parameter of the chapter *Test Menu*).

Possible Result Messages

“OK”: good result
“NO OK”: waste result
“POS LEAK! ”: positive decay

Equipment with flashing result with graphic on:
Modality not supported by the equipments M6xxx, but only by M8xxx and M9xxx.

Equipment in wait state:



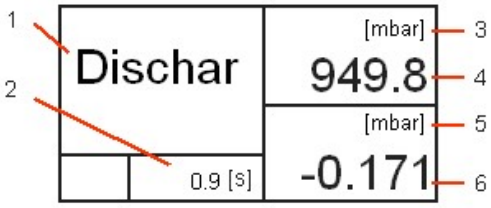
The equipment is waiting when it is not inside a menu, is not under test, does not display a flashing result.
There are different possible messages concerning the field 1:

- **"Error Flash"**: potentially serious error, if this message appears you have to call right away the assistance
- **"Error EEProm"**: warning, in case it happens, try to modify a test parameter and verify if the message continues to appear: if it does not appear anymore warning will be reset. In any case please contact the assistance.

- **"PR Full Scale!"**: the primary pressure transducer it is on the full scale: disconnect alimentation air pressure and possibly the piece, paying attention.
- **"VOUT Full Scale!"**: the secondary transducer it is on the full scale: disconnect alimentation air pressure and possibly the piece, paying attention.
- **“Error EVOUT"**: warning of power output: disconnect what it was connected to AUX connector please contact the assistance.
- **“Error ElReg"**: warning of the electronic regulator: it is show when the electronic regulator don’t succeed to set the wanted pressure, generally simply because the compressed supply air connected on the back panel is not sufficient or not present.
- **“WAIT Prg:"**: the equipment is ready for the start of the visualized program.

In any case below, in the fields 8 and 9, we find the date and the hour (format hh:mm:ss and dd/mm/yyyy where the month is in letters), while on the right, the fields 3 4 5 6, the same parameters that we find when a test is running.

Equipment in discharge phase:

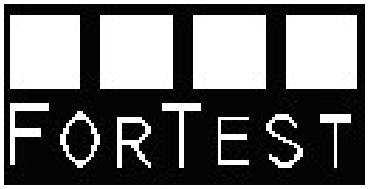


The visualization of the current discharge zero phase, field 1, and of the relative time, field 2, is always central, both that it happens in waiting phase, and that it happens with flashing result. The discharge has only a possible phase:

- **“Dischar”:** it indicates the discharge phase is running.

The remaining fields, 3 4 5 and 6, are similar to the equipment in waiting phase if the discharge follows an abort, otherwise they are similar to the case of the equipment with flashing result

Equipment at the start up:



M6990-015015-230		
000000000000		
Sn:	3589	Ck: A8F5
FSPres [mbar]:		1000.0
FSVOUT [mbar]:		1000.0

At the start up the display shows for one second the company logo, and for the following two seconds some information similar to that ones that appears in the chapter *Version Menu,* that is the specific characteristics of the equipment. The information are (for a more detailed explanation we send you to the *Version Menu* chapter):

- Equipment code
- **“Sn:”**, serial number
- **“Ck:”**, cheksum of the firmware
- **“FSPres:”**, direct pressure full scale and relative unit
- **"FSVOUT:"**, channel VOUT full scale and relative unit.

INDICATION LEDS

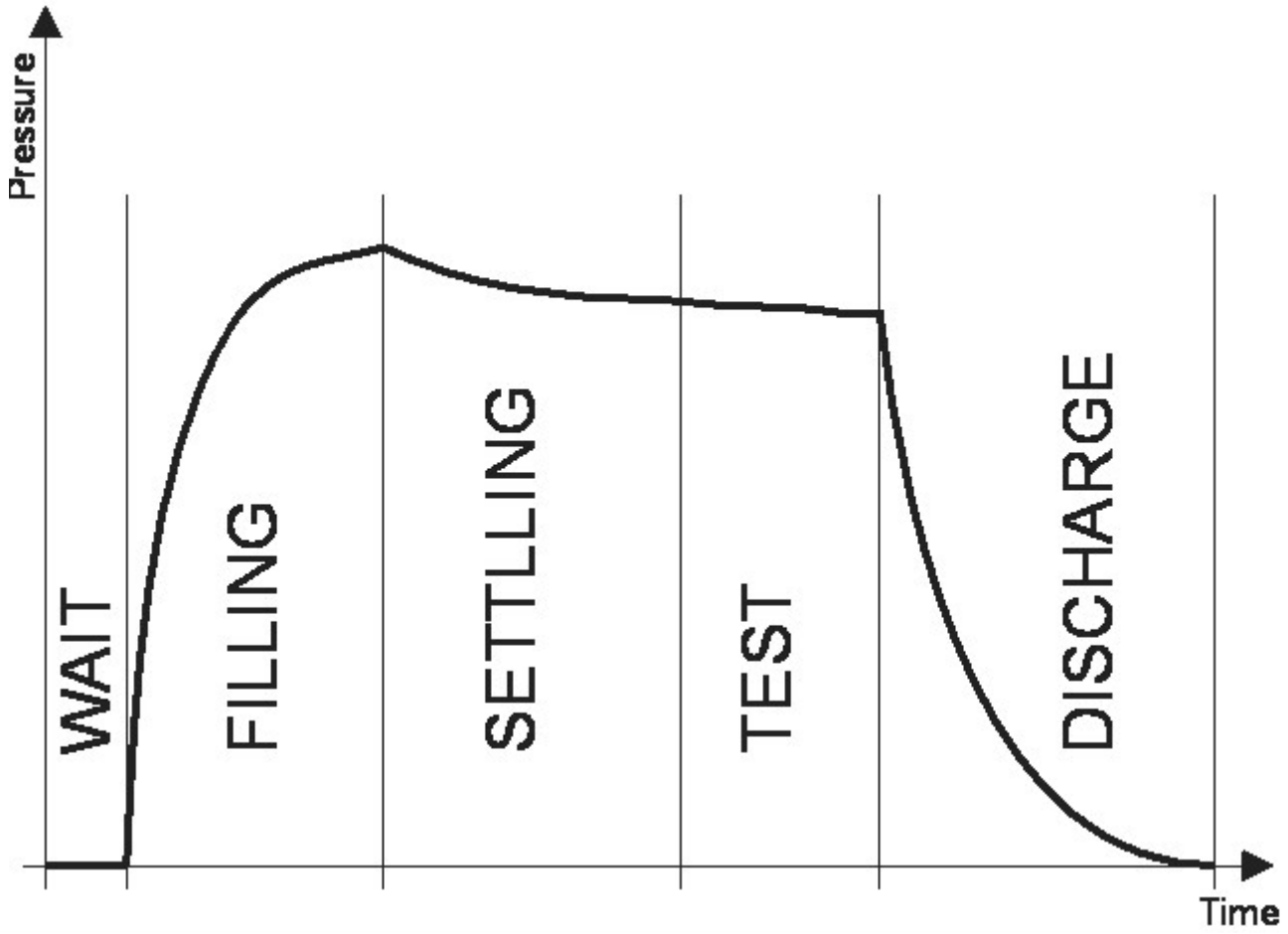
According to its color each led shows a particular condition:

- Blue: shows ongoing test
- Green: shows GOOD result
- Red: shows REJECT

Test Cycle

The equipment has like primary measure the direct pressure referred to the ambient one, and for second measure the pressure decay inside the piece under test.
Pressure measure will have a positive sign (sign not at display) in case of relative pressure higher than the ambient one, and a negative sign in the opposite case (depression).
A pressure decay corresponds to a pressure in the piece that decreases (in case of positive direct pressure, otherwise pressure decay will be in reality a pressure that will increase in case of test in depression), and for convention we display it with the sign **"-"** if the kind of measure is in pressure, and with the sign **"+"** if the kind of measure is in pressure/time or volume/time (signs will be inverted in case of test in depression).

ABSOLUTE PRESSURE DECAY LEAK TEST CYCLE
A leak test is a kind of test in which you check if the piece is airtight, by putting inside this one a certain pressure and measuring in some way that after you fill it you have not too big pressure decay. Here below we show in a schematic way a standard leak test cycle:



Graphic shows the essential phases of leak test cycle, writing in the graphic the pressure inside the piece. Instead, below you will find the description of all the leak test phases made by the equipment, with the corresponding written message of each phase.
"Wait" / **"WAIT"**: the equipment is waiting for start input.
"DisPFil" / **"DISCHPREFIL"**: It is the discharge phase of the prefilling one. Pre-filling is an optional, so we send you to the relative chapter about optional for an explication of this phase.
"Filling" / **"FILLING"**: This one corresponds to the filling phase, in which the inside pneumatic circuit work in order to allow the pressurization of the piece under test at the filling pressure you have set (see chapter *Test Menu*).
Filling phase can be made into two different ways, by time or by level: both modes are explained in chapter *Test Menu*, where relative test parameters can be set.
If the equipment in this phase does not succeed in filling in the right way according to parameters that have been set, then it will give waste as result. If the equipment does not succeed in filling piece under test (or if it fills it at a pressure

that is higher than its limit), this could be caused to the piece itself (great leakage, wrong pneumatic connection, great elasticity of the piece), or simply caused by a low regulation of pressure regulator used. In this last case, you have to set the pressure by the regulator, rotating the knob according to the directions marked on the same one in order to increase or decrease filling pressure.
During this phase (in reality already beginning from waiting phase) the equipment displays the pressure value inside the piece.
“Settling” / **”SETTLING"**: This is the phase of adjustment, perhaps the most important one, that allows the stabilization of pressure and of temperature inside the piece under test. A too short time, in fact, will false the results of the entire test, causing for example false waste and false good result. In this phase the pneumatic circuit does not fill the piece anymore.
If during this phase pressure goes out of the tolerance range (whatever it is the filling type that has been set), then the equipment gives waste as result. In case that the settling tentative are activated (see the relative parameter in the chapter *Setup Menu*), the equipment, before of giving waste as result, will restart the phase filling for several times before of giving waste as result, a number of time according to the relative parameter.
At the end of this phase, direct pressure inside the piece visualization will remain the same, because it identifies the real pressure in which test phase begins.
“Test” / **”TEST"**: This is the phase in which the equipment makes the real test, that one that will recognize based on pressure leakage (case of test in pressure) inside the piece (measured during this phase) if it is hermetic enough or not, showing at the end of the test the result. The end of this phase is established by the relative setup parameter (**“IfBad:”** / **“At a bad outcome:”**), we send you, therefore, to the relative chapter *Setup Menu*. It will happens that pressure will increase instead of decreasing (case of test in pressure, the opposite one in depression): this could be caused by temperature phenomena or by wrong test parameters, and in this case the equipment will give a different result (**“OK”** or **“POS LEAK!”**) according to the entity of this increasing based on the parameter **“OppDecay:”** / **“Tolerance on the opposite decay:”**, see the chapter *Setup Menu*.
“Discharge” / **”DISCHARGE"**: in this phase the equipment empties the piece under test, obviously only if there is the discharge solenoid optional (internal or external). It is highly recommended for high test pressure, in order to avoid danger for the operator. Discharge phase, if activated, is made at the end of the test whatever it will be the way it ends: good result, waste result, any other result, abort.
The equipment in this case visualizes that discharge phase is arriving, but it continues to visualize both on the display and on the led the same information of the result phase; in case of abort it displays the same information as during wait phase.

OBSTRUCTION TEST CYCLE
Obstruction test allows to verify in an approximate way if a piece is obstructed or to verify its flow capacity. What you have to make it is to open the air to fill the piece, and verify in testing phase that the pressure you have measured remains inside the range fixed by the test parameter (see the chapter *Test Menu*).
Phases that compose obstruction test made by the equipment are almost the same as the ones of leak test. Differences are:

- There is not any settling phase
- Transaction from filling phase to test phase is underlined by a beep
- On the graphic there is always and only direct pressure.
- During the testing phase you continue to put air into the piece.
- As this kind of pressure measures only direct pressure, during the testing phase you continue to visualize direct pressure datum, leaving the field concerning the leakage empty.

IDENTIFICATION OF LEAK TEST PARAMETERS
Leak test equipment setting have to be made when you know both the maximum leakage value you can accept, and at which pressure you want to make tests.

1. Supply electric power at the equipment.
2. Supply the equipment with compressed air, following the instructions described in the chapter *Back Panel*: in it you can find how to supply the equipment, and also how to make pneumatic connections.
3. After having set known data (leakage value and test pressure) the first step is then to set an settling time, also an excessive one, in order to make a first check. This verification, to be made on a good piece rigorously, let us

know if all is working in the right way: airtight plugs or connections to the piece, verification of static of mechanics during the test, verification of thermal variation between the piece under test and the gas used for filling.

4. Then you must check out if this good sample causes a leakage close to zero or at least less than a third of what has been set. In this check the leakage has never to be a positive (pressure increasing) if it is measured like a pressure variation, or negative if it is measured like a pressure/time or volume/time variation
5. At this point you begin to reduce settling time, with attempts. Practically the decreasing of settling time will be accepted till the leakage value you have found is less than 50% of the theoretical one.
6. At this point you can increase leakage value you have set, recalculated as a sum between the previous theoretical value and the leakage result of the good piece. Theoretical leakage value must be understood as the leakage limit, compared to the good piece surely hermetic: in fact, parasite decrease has not to be understood as a leakage, but it is due to adjustment decay measure.
7. Repeating more times this operation, and taking care always not to exceed 50% of leakage on good pieces, you can obtain the practical calibration of test parameters of the equipment.
8. Check that with a waste piece the equipment detects the non-conformity of the particular.

IDENTIFICATION OF PARAMETERS OF OBSTRUCTION TEST

In order to verify that the piece is not blocked, practically you have to check that it cannot fill.

1. Supply electric power at the equipment.
2. Supply the equipment with compressed air, following the instructions described in the chapter *Back Panel*: in it you can find how to supply the equipment, and also how to make pneumatic connections.
3. Obstruct the piece
4. Make a test with a very long filling time, in order to see at what pressure the obstructed piece can be filled. At the same time, check by decreasing or by increasing the filling time, what is the minimum filling time necessary to fill the obstructed piece.
5. Do not touch the pressure regulator anymore, in order to keep the pressure that supplies stable.
6. Set as filling time the minimum time found in the previous point, properly added in order to secure a safety margin (for example added of 10%). Set as maximum test pressure a pressure lower than that one that can fill the piece.
7. With good pieces and waste pieces, refine the values of testing pressures.

Test Menu

Test menu is the menu that contains, indexed at the program number, the test parameters of each single program: these are the parameters that characterize the test that the equipment makes (for more details, see the chapter *Test Cycle*). In all the screens it is visualized the program number actually under modification, on the top to the right the arrows navigation: only in the first screen it is possible to select and to modify the program number (as any other normal parameter). If you modify the program number, the equipment uploads and visualizes the stored parameters for that program. When you exit from the menu, the last selected program, will be then the activated one.
How to enter/exit from the menu, to scroll through the submenu, to modify the parameters, to scroll them, it is explained in the chapter about electrical components
In order to enter the TEST menu, you should enter the “Programming” mode as described in the chapter “Electrical components” and activate the button TST (pin 13 AUX connector).
In order to change program number (when the number is flashing), you should activate BUTTON +(pin 11 AUX connector) to go on through programs and to go back through the programs, you should activate BUTTON – (pin 10 AUX connector)
In order to scroll down the pages of test menu, you should activate BUTTON + (pin 11 AUX connector) and this way you can go on through pages. While, to go back through the pages you should activate BUTTON – (pin 10 AUX connector). It is possible to scroll through pages in the TEST menu, only when up and down arrows (up right) are flashing.
To enter one page and modify parameters, you should activate button ENTER (pin 12 AUX connector), in order to modify the value, you should activate BUTTON + (pin 11 AUX connector) and BUTTON – (pin 10 AUX connector), in order to confirm the modification you made and save the value, you should activate button ENTER (pin 12 AUX connector).

Here below the menu screens are visualized in order of appearance into the display (from the first one to the last one) and its parameters are described: the chapter refers to the standard menu, that is without any optional activated. Some optional activate other sub menu, activate other parameters, modify the meaning of some standard parameters. All these modifications will be discussed in the chapter concerning the optional itself. Moreover, the following screens and parameters refer to all the M equipments: according to the single model, you can have some (few) modifications, that in the case are always indicated. In case that a parameter cannot be modified or selected, at the place of its value it will appear dashes”----“.

FILL,PRG:	00/A	▲▼
Kind:	Decay	[----]
FillPress:	1000.0	[mbar]
TolPress:	20	[%]
Type:	Time	[----]

In this screen it is possible to modify the program number, that will appear on the first line besides the arrows. For each channel (both channel A and channel B) it is possible to select up to 50 programs can be selected, If beside the program number you see “A”, it means that the program you selected is referred to A channel. As a consequence if beside the program number you see “B”, it means that the program you selected is referred to B channel.

Here below the parameters of TEST MENU.

- **“Kind:”** kind of test: this parameter allows to select the test type to be made in this program. It can have the value:
- **“Decay”**: it identifies that this program is concerning to a leak test, only leak testers (Mx9xx) can have this value.
- **“Obstr”**: it identifies that this program is concerning to an obstruction test; neither flow testers Mx7xx, nor low cost equipments Mxxx3, nor compliance leak testers (Mx98x) can have this value.

According to the type of selected test, the screen concerning the test phase change (see here below).
“FillPress:” filling pressure: this value expresses the pressure with which the piece under test will be filled. In case of level filling (**“Type”** = **“Level”**), if you do not reach the limit set during the time **“Fill”**, the result will be waste. In case of filling time (**“Type”** = **“Time”**), the equipment controls that the pressure at the end of this time is included in the range **“Pres”** +/- **“TollPress:”** (filling pressure +/- filling tolerance); if the measured pressure is over the set range, the result will

be waste. Whatever it will be the filling time you have set, if during the adjustment phase the pressure goes over certain limit (see *Setup Menu* chapter), then the equipment will give a waste result. In case you are making an obstruction test, this parameter will lose the meaning, because the filling is set by minimum and maximum test pressures (see after).
NOTE: in case of an obstruction test, this parameter will be ignored, and you will take as a reference for filling the pressure set in the parameter **"MaxPress:"**.
"TolPress:" filling tolerance: already explained before.
"Type:" filling type: it indicates the modality to fill the piece under test; if it is set at the level (**"Level"**), the equipment, to pass at the settling phase should reach the set pressure in the field **"FillPress"** within the time **"Fill"**, otherwise it will stop the test giving waste result. If it is set in time (**"Time"**), the equipment fills during all the time **"Fill"** and at the end of this phase it check that the pressure is in the range **"FillPress"** +/- **"TolPress"**. in negative case, the equipment stops the test living waste result.
In case you are making an obstruction test, filling is always managed and blocked by the time.

TIME,PRG:	00/A	▲▼
Fill:	10.0	[s]
Settl:	20.0	[s]
Test:	30.0	[s]
Disch:	1.0	[s]

"Fill:" duration of the filling phase: this parameter represents the total or maximum duration of the filling phase, according to the setting of the filling type (and of the equipment concerned).
"Settl:" duration of adjustment phase: it indicates the adjustment time (stabilization) of the piece under test (and of the reference piece in case of a differential equipment Mx96x).
In case o fan obstruction test, this parameter is blocked to zero, because this phase is not present in the cycle test (see chapter *Test Cycle*).
"Test:" duration of test phase: it indicates the test time of the piece under test.
"Disch:" duration of discharge phase: it indicates the air discharge phase at the end of the test. Obviously the discharge will work only if the equipment is supplied inside or outside of a discharge solenoid (that can be an optional or not according to the type of equipment).

LEAK TEST
Setting the parameters of the first screen **"Kind"** in **"Decay"** you could make a leak test. **"TEST"** menu will be the following one:

DECAY,PRG:	00/A	▲▼
Kind:	[p]	[----]
Leak:	0.100	[mbar]
Volume:	30.0	[cc]
Offset:	0.000	[mbar]

"Kind:" measure type: it indicates how you want to visualize the measure of the pressure decay inside the piece under test
Modes are the following ones:

- **"[p]"** pressure: the equipment visualizes the leak like a pressure, in the equipment unit measure
- **"[p/t]"** pressure/time: the equipment visualizes the leak like a pressure according to a time, where the pressure is in the equipment unit measure
- **"cc/h"** cc/h: the equipment visualizes the leak rate in this unit measure. In this mode the equipment visualizes with one decimal point.
- **"cc/min"** cc/min: the equipment visualizes the leak rate in this unit measure. In this mode the equipment visualizes with two decimal points.

Note: the two measures volume/time needs to set a testing volume different from 0. In case that the parameter of the volume has been set at 0, the equipment will force the kind of measure in the mode **"[p]"**.
"Leak:" maximum leak: this is the maximum value of pressure leak allowed during the leak test phase: it will be a pressure decay inside the piece.

“Volume:” volume under test: this parameter allows the conversion of pressure decay in a leak of volume/time type, according to the parameter set **“Kind”**. It must be set equal to the volume of the testing piece; it is necessary to count pipe fitting volume from the equipment to the volume under test, otherwise the conversion could take to wrong leak values.
“Offset:” offset on the decay: it allows to subtract or to add a value (an offset) to the measured leak. This parameter is useful to eliminate any adjustment queues that repeat always and all the same for the piece under test. Attention: a wrong use of this parameter can bring to give wrong results of measure because, if it is set at a too high value, it could mask a real leak. It has the same unit and the decimal points of the parameter **“Leak:”**.

OBSTRUCTION TEST
Setting the parameter of the first screen **“Kind”** into **“Obstr”** you can make the obstruction test. **“TEST”** menu will be the following one:

OBSTR,PRG:	00/A	▲▼
MinPres:	0.0	[mbar]
MaxPres:	1000.0	[mbar]

“MinPress:” minimal pressure of obstruction test: minimal pressure to which the valve (or the piece) submitted to an obstruction test must open. If the equipment, at the end of the testing phase measures a pressure lower than that one that has been set, it will give a result of waste.
“MaxPress:” maximal pressure obstruction test: maximal pressure at which the valve (or the piece) submitted to the obstruction test has to be opened. If the equipment, at the end of testing phase measures a pressure higher than the set one, it will give a waste result.

OTHERS,PRG:	00/A	▲▼
ProgFoll:	0	[prg]
InitDelay:	0.0	[s]
OutCoup:	----	[chout]
InCoup:	----	[chin]

“ProgFoll:” program following the current one: in case of good result, a start to the program set in this parameter has been given automatically. It is particularly easy to make complex cycles with more testing programs or little automations. We have to notice that at the end of the sequence of linked programs, a following generic start command will start again the first of the programs of the sequence. Zero program cannot be linked, because if this parameter is at zero, this means that there are not any programs to link to it. A program can’t linked itself (that means that if this parameter is equal to the program that it contain it, the linked sequence will not be done).
In case of program linked, the AUX1 connector signal behaviour change. If the actual program finishes with a waste result (or an abort too), and it has a program linked, this one don’t have be done, and the entire test stop it: in this case, the signal behaviour is the same. If the actual program finishes with a good result, and it has a program linked, this one start at the first useful time for a new start (that means at the end both of the **“Label:”** time and the discharge time **“Disch:”**). The AUX1 connector good signal remain active for all **“Label:”** time if not null, rather than it is not activated. The **“EOC:”** signal remain active during the linked sequence. All this described is valid for the parameter combination **“Bad:”**= **“Std”**, **“Abort:”**= **“Std”**, **“EOC:”**=**” Std”.**
“InitDelay:” initial delay at the start: after having given the start, this timer runs, that will delay the departure of the filling phase **“InCoup:”**.
“OutCoup:” not used parameter
“InCoup:” not used parameter

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Pieces counter

Pieces counter Menu is the menu that contains the amount of the tests made by the equipment, of the pieces decreed as good ones and of the waste ones (these three counting can be put to zero.)
In order to enter the Pieces counter menu, you should switch the tester in “programming” mode as described in the menu “Electrical Components” and activate the button TST (pin 13 of AUX connector). Now you should see the program number flashing on the display. If so, please activate ENTER button (pin 12 of AUX connector). Now you should see the up and down arrows flashing on the right part of the display. Finally, you should activate button TST (pin 13 of AUX connector).

Here below the menu screens are visualized in order of appearance into the display (from the first one to the last one) and its parameters are described.

COUNTER		▲▼
Total=		53
Good=		28
Bad=		25
14:30:00	07/09/09	

This screen does not contain any parameters but it is only a visualization one.
“Total=”: it represents the sum of pieces **“Good”** and of pieces **“Bad”**: it does not count the pieces of which the test has been interrupted with an Abort and does not count the pieces that gives result of a positive decay (for those equipments that provide this kind of result), because we expect that these pieces are tested again.
“Good=”: number of pieces tested by the equipment that gives a good result from the last zero made. The meter counts all the good ones
“Bad=”: number of pieces tested by the equipment that gives a result of waste from the last zero made. The meter counts all the waste pieces
In case of malfunction, or more easily if the count pieces has never been put at zero, it will be visualized instead of the previous screen the following one:

COUNTER ▲▼
ATTENTION, memory
loss: verify battery
and reset to zero
the counters.

It indicates a memory loss of the count pieces or an initialization failure (that is the case in which it has never been put at zero). If this screen appear, it is necessary to make zero in the count pieces. In case we are sure that the initialization has already been done and this message of error appear all the same, it is better to contact the assistance (it could be simply the inside battery discharged).

COUNTER		▲▼
Reset?		Yes
Last reset:		
14:30:00	07/09/09	

In the last line there is the indication of the date and of the hour of the last zero made (in case you have never put it at zero date and hour will contain casual values). The counter pieces rest procedure allow to reset all the count of the first screen.
To put the equipment at zero it is necessary to move on **“Yes”** (that is similar to a parameter of modification, you will see it flashing) and you have to keep pushed the button [+] for about 3 seconds. Once you have put the equipment at zero, the tester will return automatically at the screen that shows the counts.

Setup Menu

Setup Menu is the menu that contains the appropriate setting parameter of the specific equipment.
In order to enter the SET UP menu, you should enter the “Programming” mode as described in the chapter “Electrical components” and activate the button SET (pin 14 AUX connector).
In order to scroll down the pages of SET UP menu, you should activate BUTTON + (pin 11 AUX connector) and this way you can go on through pages. While, to go back through the pages you should activate BUTTON –(pin 10 AUX connector). It is possible to scroll through pages in the SET UP menu, only when up and down arrows (up right) are flashing.
To enter one page and modify parameters, you should activate button ENTER (pin 12 AUX connector), in order to modify the value, you should activate BUTTON + (pin 11 AUX connector) and BUTTON – (pin 10 AUX connector), in order to confirm the modification you made and save the value, you should activate button ENTER (pin 12 AUX connector)

Here below the menu screens are visualized in order of appearance into the display (from the first one to the last one) and its parameters are described: the chapter refers to the standard menu.

In case that a parameter cannot be modified or selected, at the place of its value it will appear dashes”----“.

SETTINGS		▲▼
Da:	07/09/2009	[----]
Time:	15:21:17	[----]
Contrast.:	------	[%]
MinLight.:	50	[%]

“Da:” Date setting: it allows to regulate the date, format dd/mm/yyyy.
“Time:” Hour setting: it allows to regulate the hour, format hh/mm/ss (seconds cannot be changed).
“Contrast:” Parameter locked.
“MinLight:” minimum brightness of display: the value in percentage of the brightness in standby of LCD display. We talk about standby because the display has a maximum brightness (set with **“MaxLight:** parameter**”**) when there is a result, when there is a start or a pressure of a button, while after 5 seconds in case of a result or of a start and 45 seconds after the pressure of a button, the brightness decrease till it reaches that one during pause. During this parameter setting, display has immediately the brightness of standby, not the maximum one, in order to allow the operator to see the effect of this setting.

SETTINGS		▲▼
SerialAddr:	1	[----]
Start:	Panel [+]	[----]
Language:	ENG	[----]
Graph:	---	[----]

“SerialAddr:” Serial address: this parameter represents the ID of the equipment during serial/USB communication, or of whatever other kind of informatics communication of the equipment.
“Start:” start type: it allows to give the START to a test in different ways. According to the parameter value, modes are the following ones (see the chapter *Electric Signal* for further details):

- **“Biman”:** bimanual, value that can be visualized, only the relative optional is activated, see the chapter relative to the optional itself.
- **“NoPan”**: excluded panel: START of the current program can be given with the activation of the input (pin 11 AUX connector) combined to this mode.
- **“Panel [+]”**: From the panel [+]: the start of the current program can be given both with the activation of the correspondent input on the connector AUX (pin 11), and with the pressure of the button [+] of the frontal panel (see the chapter *Frontal Panel*).
- **“3Start”**: 3Start: the three inputs of the connector AUX combined with this mode (pin 12, 13, 14), they allow with their activation to make the three associated programs to start (**“01”**, **“02”, “03”**). Keeping not activated the inputs of 3Start, it is possible activating the input combined with the connector AUX1 (pin 12), to make the current program to start (that can be anyone of the 100 programs).

- **"BCD+S"**: BCD+STROBE: the three inputs of the connector AUX combined with this mode (pin 12, 13, 14) allow by activating them to select in a binary logic BCD the desired program (the program **"00"** is excluded, that is the equipment is not sensible to the combination BCD 000, then programs from **"01"** to **"07"** can be activated by this pin). When the input corresponding to the START is activated (pin 12 connector AUX1), this signal is interpreted as Strobe, and the program currently selected will start. Keeping BCD input not activated, it is possible activating the input combined with the connector AUX, to make the current program to start (that can be anyone of the 100 programs).

- **"BCD+T":** BDC+200ms: the three inputs of the connector AUX combined with this mode (pin 8, 9, 10) allow activating them to select according to a binary logic BCD the desired program (the program "00" is excluded, that is the equipment is not sensible to the combination BCD 000, then programs from "01" to "07" can be activated by this pin). After 200ms from the activation of the first input, the program currently selected will start. Keeping the inputs BCD not activated, it is possible activating the input combined with the connector AUX, to make the current program to start (that can be anyone of the 100 programs).
  In any case, the activation of the ABORT input (pin 10 AUX connector), aborts the running test cycle. Serial protocol functions are not affected by this parameter.

- **"Language:"** equipment language: this parameter allows to set the language of the equipment. Five languages can be selected, "ITA", "ENG", "ESP", "FRA", "DEU", "POR". All the menu of the equipment visualize messages using the language currently selected, unless the main menu and the menu of the running test, that are always in English.
- **"Graph:"** In M4xxx testers, this parameter is off

TIMES		▲▼
Label:	1.0	[s]
Acoustic:	----	[s]
Del.EVgen:	----	[s]
Del.EVset:	----	[s]

"Label:" duration of the label signal: this parameter, if it is different from zero, identifies the time (in tenth of a second) for which at the end of the test the output of the result combined with, activates, and the output concerning the running test remains active for all this time and the discharge time. In case this parameter is set at **"0.0"**, then the output of end of test disables at the end of the discharge time, and the output corresponding to the result will activate, and it remains active till the starting of a new test.
What we have described is valid only if the parameters **"EOC:"** (end test signal), **"Bad:"** (waste management) and **"Abort:"** (abort management), are all set on **"Std"** (standard). Otherwise, the signal behaviour of AUX1 connector is different (see here below the description of these three parameters), and this parameter is ignored.
"Acoustic:" In M4xxx testers, this parameter is off
"Del.EVgen:" In M4xxx testers, this parameter is off
"Del.EVset:" In M4xxx testers, this parameter is off

MEASURE		▲▼
NmeanP:	5	[----]
NmeanV:	5	[----]
DecVisP:	2	[----]

"NmeanP:" Average number of filter pressure: this parameter indicates on how many values the direct has to be mediate. Much greater it is the number of values with which you have to make an average and much greater it will be the stabilization of the measure but the speed of variation of the same one will be lower, vice versa, much lower it is the number of values with which you have to make an average, less it will be filtered, resulting in this way less stable. Generally, for highest speed tests, you have to reduce it at minimum, for long tests instead you have to raise it.
"NmeanV:" Average number of VOUT filter: it has the same function as the previous one, but it acts on the second dimension that the equipment measures.
"DecVisP:" decimal points factor display direct pressure: in order to make more readable and clearer the direct pressure measure, considering the high resolution of the measurement inside the equipment necessary to calculations, with this

parameter we can reduce the number of decimal points or of less significant digits of the value displayed, without reducing or compromise in anyway the goodness of total measures.

TEST		▲▼
OppDecay:	50	[%]
IfBad:	Stop	[----]
SetEqua:	30	[%]

"OppDecay:" percentage of inverted decay: this parameter defines a tolerance limit (calculated on the maximum admitted decay set in the chapter *Test Menu* **"Leak:"**, on spurious phenomena: in fact we talk about of inverted decay because this limit is activated when the decay instead of decreasing, it increases. We assume to be simple that the test is in pressure, and not in depression (in this case discussion is inverted). We can talk about a positive decay, because the pressure inside the piece when test is running instead of decreasing, it increases. This parameter is useful to define a limit under which the piece can yet be considered as good one: above this limit , the equipment gives a result of positive decay **"POS LEAK!"** (considered as an abort). Let's analyse this example: if admitted pressure is 10 mbar and the parameter in the description has a value of 50%, then in case that the pressure inside the pieces would increase not over +5 mbar (10mbar x 50%) the piece is considered good, while if it will increase moreover, the equipment will give as result a positive decay. Generally, inverted decay should not happen, because it is an indicator of wrong test parameter, temperature problems, dilation of the piece in test, etc…

"IfBad:" at the waste: this parameter indicates the way the equipment behaves in case of overcoming of the limit of maximum decay admitted in leak test phase. Particularly, according to the selected mode:

- **"Cont"**: test continues to run: the limit passed, the equipment continues the test till setting test time is finished, and it continues to measure and to visualize the decay.
- **"Stop"**: Stop the test: once you overcome the limit, the equipment stops the test even if timing test is not finished, and it visualizes as a decay, the maximum admitted decay set (**"Leak:"**).
- **"Calc"**: stops but calculates: once you overcome the limit, the equipment stop the test even if timing test is not finished, and it visualizes as a decay a predictor number about what it would be the decay measured at the end of timing test.

The equipment is sensible to this parameter only if the type of measure of the decay in test menu (see chapter *Test Menu*) is pressure. (**"[p]"**): in all the other cases, the equipment will behave as if this parameter would be set on **"Cont".**

"SetEqua:" adjustment equalization: this parameter expresses, in percentage, a time in the adjustment phase during which at the beginning of the adjustment phase itself some actions can be made. Regarding differential leak testers Mx96x, during this time equalization solenoid continues to keep in communication reference piece and piece under test. This function allows to better that would be the imbalance phenomenon of two branches of measure. As we said, this parameter is in percentage, it is connected to the parameter **"Settl:"** of Test Menu in order to change it in a time: the solenoids remain open for a time equal to **"Settl:"** x **"SetEqua:"** /100: if for example **"Settl:"** has a value of **"10,0"** and **"SetEqua:"** In M4xxx testers, this parameter is off

COM PORTS		▲▼
C1:	PC	[----]
Br1:	9600	[bps]
C2/usb:	Trace	[----]
Br2/usb:	9600	[bps]

"C1:" mode COM1: on the port COM1 of the equipment different functions can be possible according to the value of this parameter:

- **"Noth"**: nothing: any type of communication and of protocol is activated on this port..
- **"PC"**: PC directly: on the port the protocol of type you ask – I answer is activated, between the RS232 terminal and the equipment.
- **"TTY"**: PC by TTY: like the case **"PC"**, but in the hardware side, the communication is a ring current.
- **"Trace"**: end of test trace: the equipment at the end of the test sends a trace (a series of characters) with specific parameters of the same one.

- **“Barcode”**: Barcode: on the port, by a barcode reader, it is possible to read barcodes.
- **“LolaSma”**: Lola little label**:** on the port, by the use of a printer LolaLP2, it is possible to print a label of 55x25mm dimension with the standard information of the test.
- **“LolaBig”**: Lola big label: as in the case of **“LolaSma”**, but for label of 60x60mm dimension.

For further information on the protocols and on the transmitting data, see the separated chapter of the serial communication.

“Br1:” Baud Rate COM1: with this parameter it is possible to select the speed in bit per second (bps) of communication on the port COM1. Possible values are **“2400”**, **“4800”**, **“9600”**, **“19200”**, **“38400”**, **“57600”**, **“115200”**.

“C2/usb:” mode COM2/USB: As for the parameter **“C1:”**, but physically the communication is on the port COM0 and on the port USB of B type. Moreover the TTY communication is not physically possible, and the it is not selectable.

“Br2/usb:” Baud Rate COM2/USB: See the similar parameter on COM1 (**“Br1:”**); the meaning it is the same but it influences COM2 port speed and USB B port.

PASSWORD	▲▼
ParBlock:	Unblocked
Action?	Block?
PW:	**********
New:	

The equipment contains four passwords of 10 alphanumeric characters per each one (code ASCII from 33 to 126 including extremes):

- One is selected by the Customer and it can be set, at the birth of the equipment is set on **“0000000000”** (PWCLIENTE).
- One is for recovery in case the Customer loose his password, supplied by the company (PWMAGIC1).
- Another one for recovery but it is not supplied by the company (PWMAGIC2).
- One that allows temporarily to unblock the equipment (PWTEMP) (the equipment passes at the state **“TEMPunblocked”**): temporarily it means that if the equipment is turned off it will come back to **“Blocked”** state.

“ParBlock:” parameters block: this is not a parameter, because it cannot be set, but it expresses the state of the equipment software key. It can be:

- **“Unblocked”**: it means that the key is open, than it is allowed the modification of the parameters of the equipment. This condition is remembered at the turn off: if the equipment turns off when it is in this status, and after it is turned on, you will find it again in this condition.
- **“Blocked”**: it means that the key is closed, then you cannot modify the equipment parameter. This condition is remembered when the equipment turned off: if the equipment is turned off when it is in this condition, and after it is turned on, you find it again in this condition.
- **“TEMPunblocked”**: this means that the key is open, then you can modify the equipment parameters. This condition is not remembered when you turned off the equipment, if the equipment is turned off when it is in this condition, and then it is turned on, you will find it in the state **“Blocked”**.

To pass from a state to another one it is necessary to insert a correct password.

From the state **“Unblocked”** you can pass to the state **“Blocked”**.

From the state **“Blocked”** you can pass at the state **“Unblocked”** inserting the passwords PWCLIENTE (set by the Customer), PWMAGIC1 (from the factory, contact the assistance to know this password), PWMAGIC2 (from the factory, contact the assistance to know this password). From the state **“Blocked”** you can also pass at the state **“TEMPunblocked”** inserting the password PWTEMP.

From the state **“TEMPunblocked”** you can also pass at the state **“Unblocked”** inserting passwords PWCLIENTE, PWMAGIC1, PWMAGIC2.

“Action:” what do you want to do?: with this parameter you can tell to the equipment which kind of action connected to the parameter block you want to do:

- **“Unblock?”**: the operator wants to disable the parameters block. As we said the unblock can be definitive or temporary: which one of the two will be put in action, depends from the password that will be insert.

- **“Block?”**: the operator wants to activate the parameter block.
- **“ModPW?”**: the operator wants to modify the PWCLIENTE.

If the equipment is in the **“Blocked”** state, the only action allowed is **“Unblock?”**.
If the equipment is in the “**Unblocked”** state, the operator can **“Block?”** or **“ModPW?”**.
If the equipment is in the **“TEMPunblocked”** state, the only action allowed is **“Unblock?”**.
“PW:” insert the password: in this parameter it is necessary to insert the password. The first message that will appear to the operator is **“Press [E]”**: pushing the button it will be possible to begin setting the password, then it will appear an initialized password at **“0000000000”**. At this point it will be possible to set character by character the password, as for any other parameter. As the last character will be confirmed, different messages could appear:

- **“WRONG PW"** if the password put in does not correspond to any of the correct ones.
- **“CORRECT PW "** if the password put in is correct, and it is different from the temporary one.
- **“TEMP OK"** if the password put in is correct, and it coincides with the temporary one

“New:” put the new password in: this parameter is activated only if the selected action is **“ModPW?”**. To enter this section, first of all it is necessary that you have insert a correct password previously (section **“PW:”**), and different from the temporary password. New password insertion works in the same way as the password insertion at the section **“PW:”**. Last character confirmed, the message will appear is **“PW SAVED "**, to show the actual saving of the new password.

In case the optional analogical output is activated, at this point it will appear the screen of the parameters related to the use that you want to do of the analogical outputs. We send you at the chapter about optional for the explaining of the same ones.

VARIOUS		▲▼
AZeroPress:	0	[min]
LumLedMax	---	[----]

“AZeroPress:": Auto-zero pressure every: it allows to set a cyclic time at the end of which the equipment makes automatically the auto zero procedure. If this parameter is set to zero, we mean that the automatic auto zero proceeding has been excluded, while it remains possible to make the auto zero by the BUTTON – (Pin 10 AUX connector).
“LumLedmax”: In M4xxx testers, this parameter is off

PLC SIGNAL		▲▼
EOC:	Std	[----]
Bad:	Std	[----]
Abort:	Std	[----]
KindOUT:	----	[----]

This menu contains some parameters that allows to modify the behaviour of output and input signals placed on AUX1 connector, but they do not influence on the input that the operator can give from the frontal panel (by the buttons) or outputs on the frontal panel (visualized on the display or on the led). They influence the behaviour of the equipment (for example on the automatic activation or by external activation of the solenoid discharge), and they are thought typically for an exclusive use of the equipment with a PLC (or another automation or with an appropriate keyboard and indicator light).
More specifically, the values taken by these three parameters, allow a different strategy of management of the good pieces but mostly of the waste ones and of the abort ones (for example if you disable the automatic discharge keeping the testing piece under pressure, you can search the leak with soap or foam methods), a different activation of the signal that indicates running/end test (and consequently the different moments in which you can give the new start). Here below we describe in words how these parameter working, and we send to the appropriate chapter *Timing Diagram* for a better comprehension, and also to the chapter concerning the electric signals.
NEW START: according to the value of the following parameters, it changes the moment in which the new start is allowed:

- if **“Bad:”** / **“Abort:”** and **“EOC:”** has a value of **“Std”**, and **“Label:”** is null, a new start can be given once that the **“Disch:”** time has finished (in case that the discharge time is null, is like than the discharge is not active). See chapter *Test Menu* for the case of program linked.
- if **“Bad:”** / **“Abort:”** and **“EOC:”** has a value of **“Std”**, but **“Label:”** it is not null, a new start can be given once that both the **“Disch:”** time and the **“Label:”** time has finished (in the case that the discharge time is null, is like than the discharge is not active; we remind that the **“Label:”** time starts at the end of the test and it is the time for which the outcome output remain active). See chapter *Test Menu* for the case of program linked.
- if **“Bad:”** / **“Abort:”** has a value **“Auto”** and **“EOC:”** has a value **“Busy”** or **“Ready”** or **“Pulse”**, then a new start can be given after the end of the discharge.
- if **“Bad:”** has a value **“Val”** and **“EOC:”** has a value **“Busy”** or **“Ready”**, then a new start can be given after the end of the discharge.
- if **“Bad:”** has a value of **“Val”** and **“EOC:”** has a value of **“Pulse”**, then a new start can be given after the cycle test end impulse.
- if **“Bad:”** / **“Abort:”** has a value of **“Full”** and **“EOC:”** has a value of **“Busy”** or **“Ready”**, then a new start can be given after the discharge end.
- if **“Bad:”** / **“Abort:”** has a value of **“Full”** and **“EOC:”** has a value of **“Pulse”**, then a new start can be given after the cycle test end impulse.

“EOC:” End Cycle signal: by this parameter it is possible to change the function of the end cycle signal (PIN 2 AUX connector) according to the value that has been set:

- **“Std”:** standard: the signal is activated when you give the START to the test, and deactivated when both the **“Label:”** time, which start at the beginning of the discharge, and the **“Disch:”** time are finished. See chapter *Test Menu* for the case of program linked.
- **“Busy”** : busy: the signal is activated when you give the START to the test, and deactivated at the end of the discharge when there is the end of the test.
- **“Ready”** : ready: exactly dual of the **“Busy”** case.
- **“Pulse”** : impulse at the end of the test: as in case of **“Ready:”**, but instead of activating the signal, at the discharge end and when the test is finished, after a pause of 500ms it is generated a pulse of the duration of 200ms.

“Bad:” waste management: by this parameter it is possible to modify the working of waste signal (PIN 6 aux connector), of the signal of good and of the input of abort (and indirectly of the signal of test end) placed on the connector AUX according to the value that has been set:

- **“Std”:** standard: the waste or good signal is activated at the beginning of the discharge phase, and it is deactivated at the end of the parameter **“Label:”** or at the start of a new test; if the parameter **“Label:”** is placed at **“0.0”** s, the waste signal or the good signal remains activated till a new start. The discharge will start automatically. See chapter *Test Menu* for the case of program linked.
- **“Auto”**: all automatic: at the end of the test phase the waste or good signal is activated and the discharge will begin automatically; at the end of the discharge also the test ends (and there is the activation of the signal of test end according to the parameter **“EOC:”**, and consequently the possibility to give a new start): the waste or good signal is deactivated at the start of a new test or it can be deactivated with an ABORT impulse.
- **“Val”:** validation: if the result of the test is good, the behaviour is the same as in the case **“Auto”**. If the result is waste, at the end of testing phase the waste signal is activated and it begins the discharge automatically; only the reception of an abort signal (to receive all the way at the end of the discharge) will give an end to the test (and then the activation of the signal of test ending according to the parameter **“EOC:”**, and consequently the possibility to give a new start) and the deactivation of waste signal (if the parameter **“EOC:”** has a value of **“Pulse”**, the waste signal is deactivated at the end of 500ms of delay, that is together with the rising edge of the signal of test ending).
- **“Full”**: it remains filled: if the result is good, the behaviour will be the same as in the case of **“Auto”**. If the result is waste, at the end of testing phase the waste signal will be activated; the piece remains filled till the abort signal will arrive: at this point the discharge will begin, and at the end of the same one there will be the test ending (and then the activation of the signal of test ending according to the parameter **“EOC:”**, and consequently the possibility to give a new start) and the waste signal is deactivated (if the parameter **“EOC:”** has a value of **“Pulse”**, the waste signal is deactivated at the end of 500ms of delay, that is together with the rising edge of the signal of test ending).

"Abort:" Abort management: by this parameter it is possible to modify the working of abort input (and indirectly of ending test signal) placed on pin 13 of AUX connector according to the value that has been set:

- **"Std"** : standard: if during a test (in any case before the beginning of the discharge) the equipment receives an abort signal: the test will stop and the discharge phase starts.
- **"Auto"**: all automatic: if during a test (in any case before the beginning of the discharge) the equipment receives an abort signal, the test will stop and the discharge starts: at the end of the discharge there is the end of the test (and then the activation of the end testing signal according to the parameter **"EOC:"**, and consequently the possibility to give a new start).
- **"Full"**: it remains filled: if during a test (in any case before the beginning of the discharge) the equipment receives an abort signal, the test stops: the piece remains filled till it does not receive a new abort impulse (at least 500ms from one to the other). At this point the discharge starts, and at the end of the discharge there is the test ending (and then the activation of the signal of test ending according to the parameter **"EOC:"**, and consequently the possibility to give a new start).

NOTA: not all the combinations of the three parameters are allowed, both for functional reason and logical ones. In particular these combinations are allowed (that are in any cases forced as choice level from the equipment):

- **"Bad:"**= **"Std"**, **"Abort:"**= **"Std"**, **"EOC:"**= **"Std"**.
- **"Bad:"**= every value except **"Std", "Abort:"**= every value except **"Std"**, **"EOC:"**= every value except **"Std"**.

The combination **"Bad:"**= **"Std"**, **"Abort:"**= **"Std"**, **"EOC:"=" Std"**, is that one that has a behaviour as compatible as possible with the use of the frontal panel (indeed the difference is in the possibility to give a new start: in the button case, it is not necessary to wait the end of the discharge time and of the label time). For the other combinations, it is better to set the parameter **"Start:"** on a different value of **"[+]"**, in order to avoid management conflict.

TEST		▲▼
Ctrl%settT:	0	[----]
Rech%fillT:	0	[----]
SettAtt:	0	[----]

- **"Ctrl%settT"**: This parameter checks the filling pressure in stabilisation phase: percentage of settling time. During this phase the equipmnet verifies that the measured pressure is inside the tolerance set in the test menu. For instance, if we set a value of 20% and we have a settling/stabilisation time of 10 seconds, this verification will last 2 seconds. If filling pressure is not inside in the tolerance you set, test result will be REJECT.
- **"Rech%fillT"**: Richarge Filling pressure time: in this phase the tester makes a new filling. If the parameter is **"SettAtt"** is different than "0" and filling pressure is not inside the tolerance set in the test menu, the tester will make a new filling for the same time as the one set in the percentage, referred to the filling time.
- **"SettAtt"**: Number of pressure checking attempts: maximum times of checking attempts on filling pressure during stabilization phase. If for example we set a value of 2, the tester makes a first check and detects that the pressure is out of the tolerance, it will make a second filling and check of stabilization pressure. If the second check will be negative once again, the tester will give REJECT.

STAMPA		▲▼
NumLabel:	0	[----]
PrintLinked:	NO	[----]
PrintBad:	NO	[----]
PrintAbort:	NO	[----]

"NumLabel": Labels number. Numbers of labels printed by the printer (if installed)

"PrintLinked": Printing labels. If this parameter is set on "YES" mode, the tester will make one label printed for each program that has been enchained.

If the operator enchained 5 programs, the tester will print 5 labels. If this parameter is set on "NO" mode, the only label that will be printed is the one about the last program in the group of the 5 enchained programs.

“PrintBad”: Print if REJECT. If this parameter is set on “NO” mode, the equipment will not make any label printed in case of REJECT. If this parameter is set on “YES” mode, the tester will make a label priontед even if the result is REJECT.

“PrintAbort”: Print if Abort: If this parameter is set on “NO” mode, the equipment does not make any label printed in case of Abort. If this parameter is set on “YES”, the tester will make a label printed even in case of abort.

Version Menu

The Version Menu is the menu that summarizes the particular characteristics of the equipment.
To enter the menu you should activate twice SET button (pin 14 AUX connector). In order to scroll trough the pages of this menu, you should activate button + (pin 11 AUX connector) to go on through the pages and button – (pin 10 AUX connector) to go back through the pages.
Here below the menu screens are visualized in order of appearance into the display (from the first one to the last one) and its parameters are described.

INSTR VERSION		▲▼
Press:	1000.0	[mbar]
VOUT:	1000.0	[mbar]
Chk:	B05F / A8F5	[----]
SN:	3589	[----]

"Press:" Direct pressure: maximum full scale in pressure of the equipment, that is to say: maximum test pressure
"VOUT:" VOUT channel: VOUT equipment full scale, pressure full scale of the tester's leak rate measurement.
"SN:" Serial number: serial number of the equipment, each equipment has a unique serial number, belonging to any model.

INSTR VERSION		▲▼
PneuOp:	0000	[----]
InstrOp:	0000	[----]
ModOp:	0000	[----]

"Code:" Tester's code: it represents the exact code of the equipment
"(OPT):" Tester's optional. This parameter identifies the accessories connected to the tester. This is the copy of the calibration parameter that has its same name. This parameter is shown in hexadecimal format.
"Chk:" Checksum: value of the firmware's checksum of the equipment. Two values are shown: the lower one is about the checksum of the tester's boot, the higher one is about the total checksum of the firmware installed. They are both shown in hexadecimal format.

Calibration Menu

The calibration menu allows to adjust the pressure measurement and the leak rate after getting a NOT OK outcome to your calibration attempt. This operation can be made only by technical and highly qualified staff, experts on leak testing. This is why we suggest to contact ForTest's customer assistance.
The page to enter the calibration menu is the following:

CALIBRATION		▲▼
Enter the menu?		Yes
Last calibration made on the:		
Press:	12:30:33	07/09/09
VOUT:	12:31:57	07/09/09

Initialization Menu

The equipment has a mode that allows a test of the hardware, a restoration of initial settings, an updating of the equipment firmware. Seen the functionality of this menu, it is recommended not to use it unless it is clearly indicated by our assistance, To enter in this mode, it is necessary to start the equipment keeping the button [ENTER] (PIN 12 aux connector) pressed. Making this it will appear the following screen:

[+] for FLASH MODE
[-] for TEST MODE
[SET] to program STP
[TST] to program TST
[E] to EXIT

As you can deduce also from the text, the pressure of the two different buttons allows different functions:

- button [+]: it allows to make the equipment entering in flash mode. This mode is made in order to obtain an serial updating of the firmware installed on the equipment, for which it is necessary an appropriate PC program, and also a new firmware to install in the equipment (both supplied by ForTest).
- Button [-]: it allows to make the equipment entering in test mode. This mode allows to verify hardware functionality of the equipment. Before entering in this mode we recommend to disconnect everything is connected on the pneumatic junctions of the equipment.
- Button [SET]: it initializes all the setup and calibration parameters (unless the calibration of the transducer/s of measure) to default values. NB: for default value we mean general values for the particular model of the equipment, and then not the specific ones of the particular application of the Customer. This proceeding is then surely to be made at the first start up of the equipment, but if the equipment had been already started and initialized, it is to avoid if not for cases advised from our assistance.
- button [TST]: it initializes all the program parameters to default values. NB: for default value we mean general values for the particular model of the equipment, and then not the specific ones of the particular application of the Customer. This proceeding is surely to be made at the first start up of the equipment, but if the equipment had been already started and initialized, it is to avoid if not for cases advised from our assistance.
- Button [E]: it allows to go out from the menu.

FLASH MODE

After the button pressure, the equipment enter into the flash mode, ready to be updated. During the uploading the display will visualize two lines of vertical bars that progress: the superior one corresponds to the progression of writings of different sections of memory, while the inferior one to the progression of kbyte inside the current section. At the end of a section, the inferior bar will become full, while the superior one will become full at the end of the entire proceeding, that is at the end of the writing of all the section. At the end of the uploading, the equipment will restart alone.

The only input by the pressure of the button in this mode, does not delete in any way the memory of the equipment: if you do not connect anything on the serial connector, it is possible to turn off the equipment and to restart it without having made anything.

TEST MODE

After the button pressure the equipment visualize the following screen:

ADPressure			956148
ADVOUT:			5025848
Button:	00	RX:	-
IN:	0000	OUT:	0004
COM1:	1	COM2:	3

On the first line we visualize AD point read on the channel corresponding to the transducer of direct pressure. Instead on the second line we visualize those ones corresponding to the secondary transducer, that one of the VOUT. On the third line to the left it is visualized a number in hex decimal format corresponding to the button (or buttons) pressed at the moment (frontal panel button) with a hex decimal code: in this way it is possible to verify that the equipment read all the buttons (it is sufficient to verify that at the change of pressured button, corresponds a change of the number visualized, and that if you keep pressed two different buttons, also the visualized number has a different result). On the right it is visualized a number in hex decimal format corresponding to the inputs that the equipment understands as active ones by

radio remote control (optional): keeping the buttons of the radio remote control pressed it is possible to verify the correct reading of them by the equipment, in the same way as we make for the buttons of frontal panel keyboard. On the fourth line it is visualized on the left a number in hex decimal format corresponding to the inputs that the equipment understands as active ones at the moment (in case the expansion card optional is activated, also those inputs will be visualized): activating them one at a time, as for the buttons, it is possible to verify the correct reading of the same ones by the equipment. On the right it is visualized a number in hex decimal format corresponding to the output that the equipment is piloting actually (in case the expansion card optional is activated, also the output of this card are activated): in this way it is possible to verify that the equipment really succeeds in piloting all the outputs (every second the equipment change the output that is piloting, starting again at the end of a cycle). On the last line in the end, it is visualized the command that the equipment is sending to the serial communication, to the left the command that has been sending to the COM1, to the right that one that has been sending to COM2: in this way it is possible to verify connecting serial ports of the equipment with a program like Hyper terminal, that communication hardware works correctly (clearly having set up in an appropriate way the parameters of the chapter *Setup Menu* relative to the communication speed and mode, **"C1:"** and **"Br1:"** , **"C2/usb:"** e **"Br2/usb:"**). In this mode, it can be checked also the beeper working, that rings every five seconds, RGB led, that light for one second green and for a second red cyclically, blue led of two bars, that light one at a time sequentially (also them cyclically, with the led of the superior bar that light from the left to the right and those one of the inferior bar from the right to the left). To go out from this mode, it is necessary to keep the button [E] pressed for some seconds, afterwards the equipment will restart alone.

PROGRAM STP

After button pressure the equipment visualizes the following screen:

```
Inizialization
Setup Par
in PROGRESS
```

It indicates precisely that we are restoring the setup and calibration equipment parameters to default value. Together with this screen, red led will light and the two bar of blue led, both at low brightness. At the end of initialization of the parameters, this screen will appear:

```
Inizialization
Setup Par
DONE!!!!!!
```

It indicates that initialization ended. Together with this screen, green led will light with the bar of inferior blue led, alternating to red led with the bar of superior blue led, at max brightness. Flashing will be at a third of a second, for a total of ten flashings.

At the end of the visualization of the initialization, the equipment will restart alone.

PROGRAM TST

After button pressure the equipment visualizes the following screen:

```
Inizialization
Program Par
in PROGRESS
```

It indicates precisely that we are restoring the program equipment parameters to default value. Together with this screen, red led will light and the two bar of blue led, both at low brightness. At the end of initialization of the parameters, this screen will appear:

```
Inizialization
Program Par
DONE!!!!!!
```

It indicates that initialization ended. Together with this screen, green led will light with the bar of inferior blue led, alternating to red led with the bar of superior blue led, at max brightness. Flashing will be at a third of a second, for a total of ten flashings.
At the end of the visualization of the initialization, the equipment will restart working.

Back Panel

This chapter gives basic information on the right installation of the equipment. We have to premise that these operations must be made by qualified staff.

- Keep the equipment far from heating source or from cold one to avoid phenomena of thermal drift, that would distort the running test. In fact the pressure is directly proportional to the temperature, then, in testing phase, if we had a temperature change, we would have by consequence an increase (in case of heat) or a decrease (in case of cold) of the pressure (and therefore of the decay and flow too).
- Use compressed air at ambient temperature, filtered and without oil, to avoid fault or malfunctions at the pneumatic circuit. We recommend a two-stage filter of 25 micron and 1/100 micron before the pneumatic supply of the equipment.
- Pieces under test must be at ambient temperature to avoid false tests due to temperature increasing during the test.
- Use for the pneumatic connections Rilsan® PA11 straight pipe (NOT in spirals), to avoid any expansions phenomena, or add excessive volume to the test circuit.
- For the connection to the TEST PORT with the piece under test use the shortest pipe you can to avoid to add a parasite volume at the testing circuit, that would make increase testing time and expansion phenomena or thermal drift.
- Do not use quick couplings on the measure circuit, because they are not indicated for leak circuits.
- For the connection to the piece under test use only tight –fitting ring.

WARNINGS: use gas to a different pressure than the ambient one can cause risks depending by the force that the gas can have. Whatever it is the application, the testing parts, pipes, plugs they can however represent a possible source of risk and of danger for human people and objects. Take care to verify always the hydraulic circuit, to put it under protection with the use of barriers or any other system with this aim. We recommend to train your personnel about the risks caused by the use of gas under pressure, and also about the use of the equipments and how to test the pieces. ForTest guarantees its products safety (if they are used with gas and pressures they have been designed for, and if they work with a qualified staff), but it disclaims any responsibility if they are used in a wrong way or without respecting basic conditions contained in the present manual.

Here below there is the picture with the disposal of pneumatic components present in the back panel of the equipment for the standard version of the equipment (some optional could modify the components placed on the panel, in this case modifications will be indicated in the chapter concerning the same optional). For electric junctions, refer to the chapter *Back Panel Electric Components*.

N.B: when we act on these components, both electric junctions and mechanical and pneumatic parts, please be careful, in order to avoid to damage them.

IN AIR	Air supply junction: make the connection with filtered compressed air at 25 micron, without oil, without agents or contaminated bodies (chips, dust, etc…). If the full scale pressure of the equipment is under the 6 bar, pneumatic supply has to be 6 bar; if, on the contrary, the equipment has a full scale more than 6 bar, then the pneumatic supply must be 20% higher than this value (for example, if the full scale is of 10 bar, then supply with 12 bar). In the case of depression instrument (model only in depression, not a positive / negative), plug in the vacuum line connection. We recommend a two stage filter of 25 micron and 1/100 micron before the pneumatic supply of the equipment.
TEST PORT A	Junction connection CHANNEL A of the piece under test: connect the piece to be tested, taking care to use a rigid pipe Rilsan® with a length as little as possible.
TEST PORT B	Junction connection CHANNEL B of the piece under test: connect the piece to be tested, taking care to use a rigid pipe Rilsan® with a length as little as possible.

Electrical components

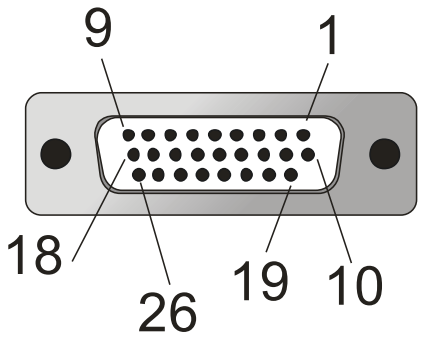
Hereby we describe characteristics, meaning, pinout … of M4890's electrical connectors. This information is referred only top the standard version of M4890, in case of custom-made version the meaning of some signals can be different.

USB B

USB –Female connector, type B-: it is possible to connect to this connector by an ordinary USB cable (type B) and communicate to a device though USB protocol. Please, go to the chapter about the serial protocol and Setup Menu parameters, in order to get information about the possible ways to communicate, communication fastness and communication protocol. The pinout connector is the standard one. Internally, the signals are optoisolated.

AUX
DB26 -Female connector for the connection to PLC or external automations-: By this connector it is possible to select the way to program the test equipment. The tester M4xxx has not got any keyboard to set parameters, this is why you can introduce test programs only by serial line or by AUX connector

We can divide the signals on AUX connector in four groups:
-GND: Electrical supplying mass and electrical supplying power signals mass (used as common mass of outputs)
-24 Vdc: Electrical supply of the equipment and electrical common mass for the habilitation of input signals
-Out: active outputs 24 Vdc (common to GND), open collector type, maximum supply: 2.5 A, internally protected and limited, with additional firmware management for the diagnostics of problems on outputs.
- In: Active 24 Vdc inputs (common to 24Vdc), optoisolated, maximum assimilation: 50mA.
- Communication signals: it is possible to comunicate with the tester by different kind of communication. The tester has several interfaces: serial RS232, CAN port and serial RS485.
Here below you find a picture that shows the numeric placement of pins and the table with the pinouts of the AUX connector.



Pin	Programming mode	Normal mode	Kind of Signal
1	OUT 0	OUT 0	Output (+24 Vdc)
2	OUT 1 TEST-A	OUT 1 TEST-A	Output (+24 Vdc)
3	OUT 2 REJECT-A	OUT 2 REJECT-A	Output (+24 Vdc)
4	OUT 3 GOOD-A	OUT 3 GOOD-A	Output (+24 Vdc)
5	OUT 1 TEST-B	OUT 1 TEST-B	Output (+24 Vdc)
6	OUT 2 REJECT-B	OUT 2 REJECT-B	Output (+24 Vdc)
7	OUT 3 GOOD-B	OUT 3 GOOD-B	Output (+24 Vdc)
8	OUT 7	OUT 7	Output (+24 Vdc)
9	OUT 8	OUT 8	Output (+24 Vdc)
10	- Button / Abort	INPUT 0 ABORT-ALL	Input (Active at +24 Vdc)
11	+ Button / Start	INPUT 1 START-ALL	Input (Active at +24 Vdc)
12	Enter Button	INPUT 2 START-A	Input (Active at +24 Vdc)
13	TST Button	INPUT 3 ABORT-A	Input (Active at +24 Vdc)
14	SET Button	INPUT 4 START-B	Input (Active at +24 Vdc)
15	----	INPUT 5 ABORT-B	Input (Active at +24 Vdc)
16	TX0 RS232	TX0 RS232	Communication COM1
17	RX0 RS232	RX0 RS232	Communication COM1
18	TX1 RS232	TX1 RS232	Communication COM2
19	RX1 RS232	RX1 RS232	Communication COM2
20	RS485	RS485	Communication RS485
21	RS485	RS485	Communication RS485
22	24 Vdc Power Supply	24 Vdc Power Supply	+24 Vdc
23	24 Vdc Power Supply	24 Vdc Power Supply	+24 Vdc
24	GND	GND	Gnd
25	GND	GND	Gnd
26	GND	GND	Gnd

As showed above, the tester can work in two different ways “Programming” and “Normal”. You need to choose the mode you prefer when you switch the tester on. If when you switch the tester on, you set pin 10 and 13 at 24 VDC at the same time, the tester will enter “Programming” mode. If “Programming” mode is on, the tester will show the test menu.

If “programming” mode is on, the tester will interpret the pins from 10 to 14 as input for the tester set up.
The features are described in the table above.

Please, go to the chapters about the parameters set up for the correct use of these input as “buttons emulation”.

If “Normal” mode is on, inputs will work as below:
START-ALL: allow to make tests on program /A and /B at the same time
START-A, START-B: allow to make a test on program xxx/A or xxx/B respectively

The various ABORT signals, will ABORT a test that is running at the moment in the same way as the various START signals make a test.

The outputs of the tester work independently of the two modes and reproduce this behavior:
TEST signal identifies the tester condition, distinguishing between ongoing test and not ongoing test. The activation of the TEST signal depends on **“EOC:”** (relative setup parameter) and **“Label:”** parameters. Please, go to the chapter about Setup menu for further information.

The REJECT signal identifies the bad result of the last test the tester made. The activation of REJECT signal depends on**“EOC:”, “REJECT:”** and **“Label:”** parameters. Please, go to the chapter about Setup menu for further information.

The GOOD signal identifies the good result of the last test the tester made. The activation of GOOD signal depends on **“EOC:”** and **“Label:”** parameter. Please, go to the chapter about Setup menu for further information.

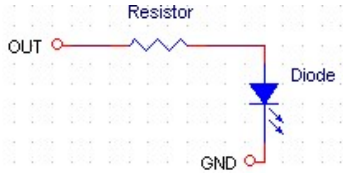
In the same way of the input signals, the ouputs follows the /A and /B behavior. So, for example, TEST-A is on if the program xxx/A is doing a TEST.

You can set the three communication ports of AUX connector in this way:
-) RS232 0 (pin 16-17) can be set in the SET menu at the line: “COM2”
-) RS232 1 (pin 18-19) can be set in the SET menu at the line: “COM1”
-) RS485 (pin 20-21) can be set in the SET menu at the line: “COM1”

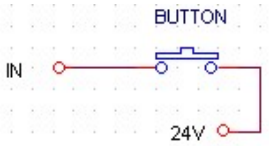
Please, Notice: It is not possible to use RS485 and RS232 ports at the same time because they are referred to the same hardware source inside the tester.

Examples of Electrical Connections

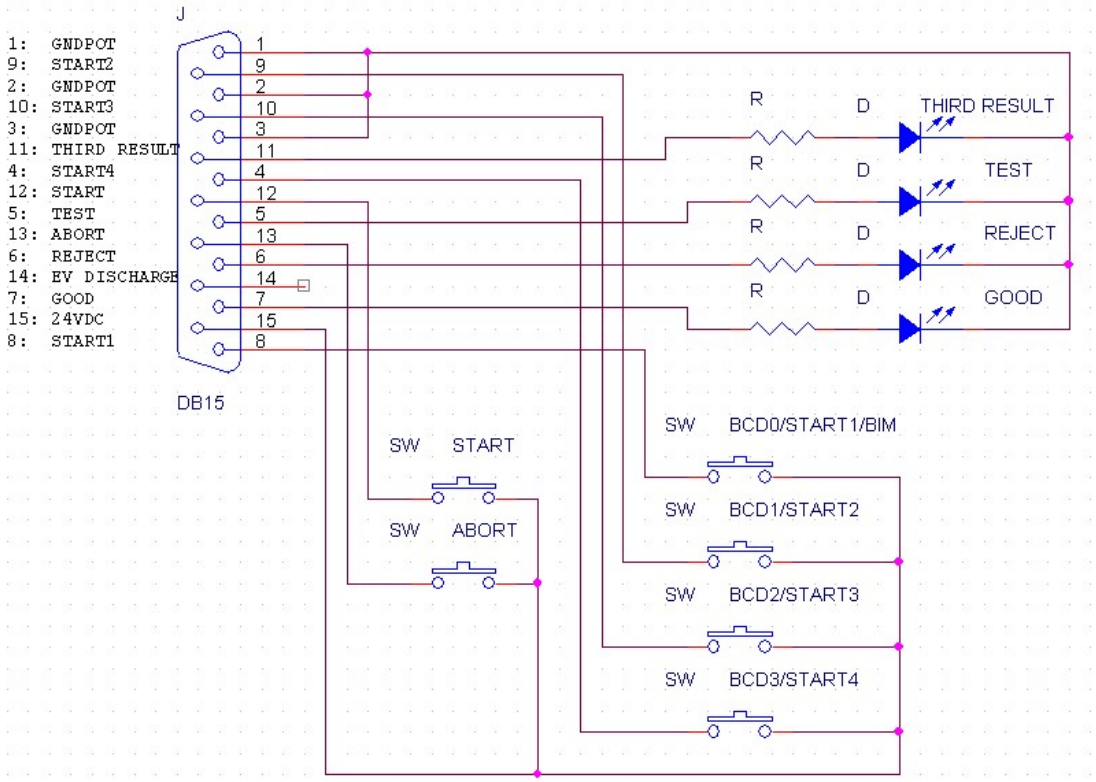
In this chapter we describe some examples of electrical schemes for the signals connection. For more complex circuits or for PLC interfacing, we highly recommend the use of some devices that decouples the two parts (i.e. some simple relè)



The picture shows a basic scheme for the connection of a led with an outcome output (OUT).
R= (24V - Vf) / If
Where R is the resistance value, 24V is the power supplied by the connector, Vf is the direct voltage of diode led, If the direct voltage of diode led.



The picture shows the basic scheme for the connection of a button to the input of an equipment (IN).



The picture shows a possible complete bench but almost simple, to exploit all the I/O supplied by the connector AUX1 of the equipments M9xxx, M8xxx and M6xxx (in this last case, we remember that pin 4 it is used for the power supply, so the button on the figure doesn't have to mount).
NB: in case of equipment M6xxx you have to remember that it has to be feed on the connector AUX1, that at the proposed scheme it has to be added the supply connector with +24Vdc directly to the pin 4 and 15 and the mass to the pin 1, 2 and 3.

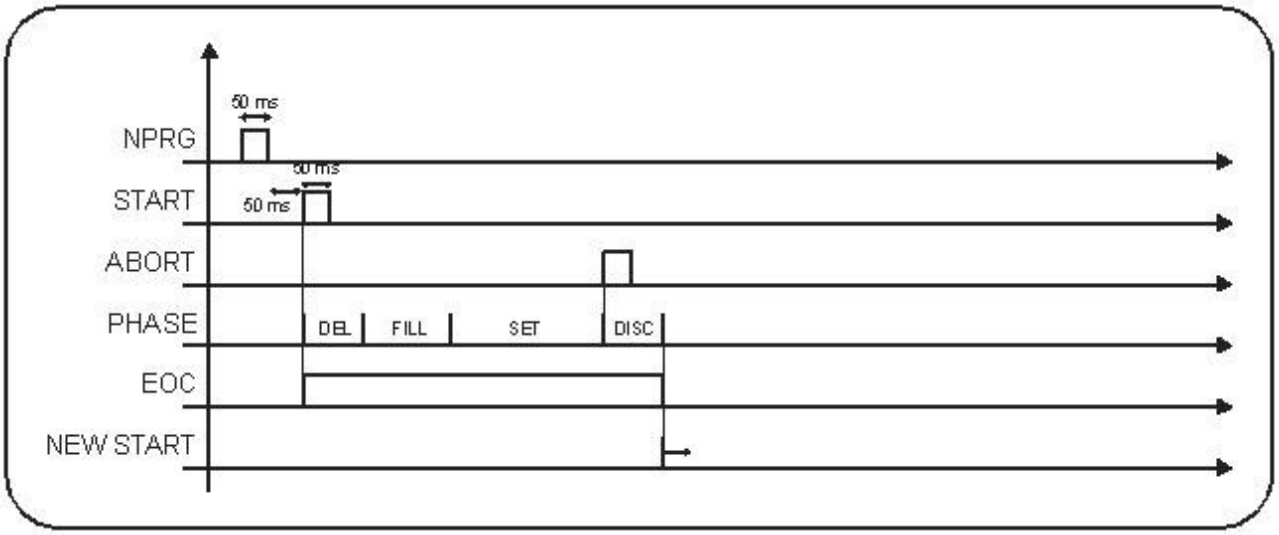
Timing Diagrams

In this chapter there are some pictures that represent timing trends of signals that are on the AUX1 connector. These diagrams and their signal function change according to their parameter setup **“Label:”**/ **"Label signal duration:"**, **“EOC:”**/ **"End of cycle signal:"**, **“Bad:” / “Bad management:“**, **“Abort:”/ “Abort management:”**. In this chapter we realize only timing diagrams for a better understanding of the description already given in the explanation of the same parameters in the chapter *Setup Menu*.

Generally, in order to recognize input signal by the equipment, it is necessary that these ones remain activated for at least 50ms. In case you want to send two different input signals (for example program of setup in **"BCD+S" / "BCD+STROBE"** mode and its consequent start), they have to be distant temporarily at least 100ms between their rising edges.

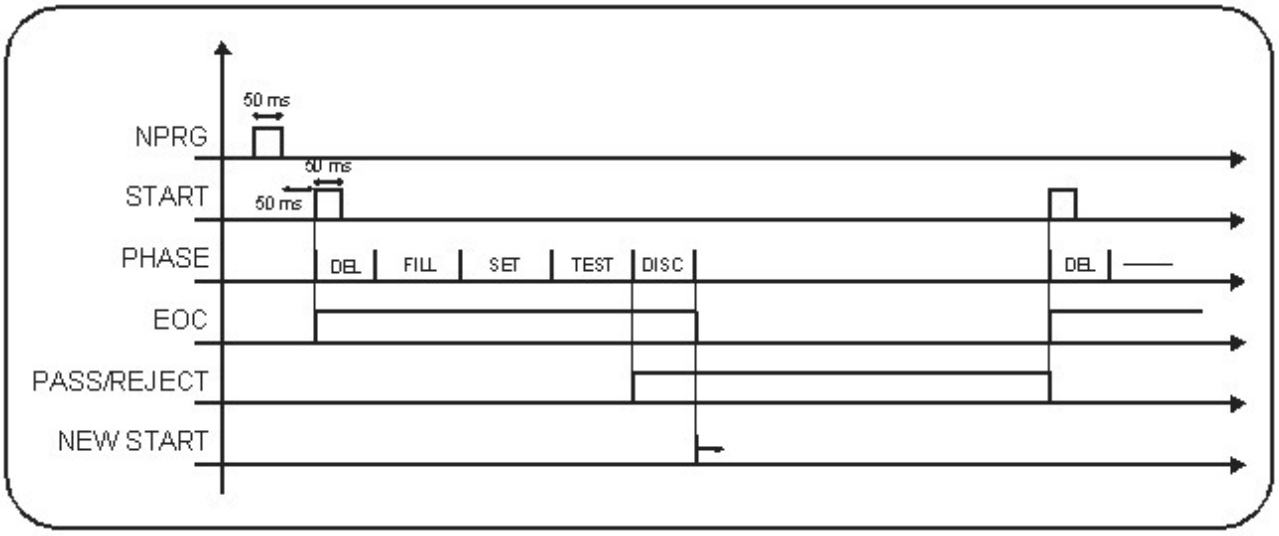
Standard Configuration in case of abort:

“EOC:” / "End of cycle signal:"	**“Std” / “Standard”**
“Abort:” / “Abort management:”	**“Std” / “Standard”**



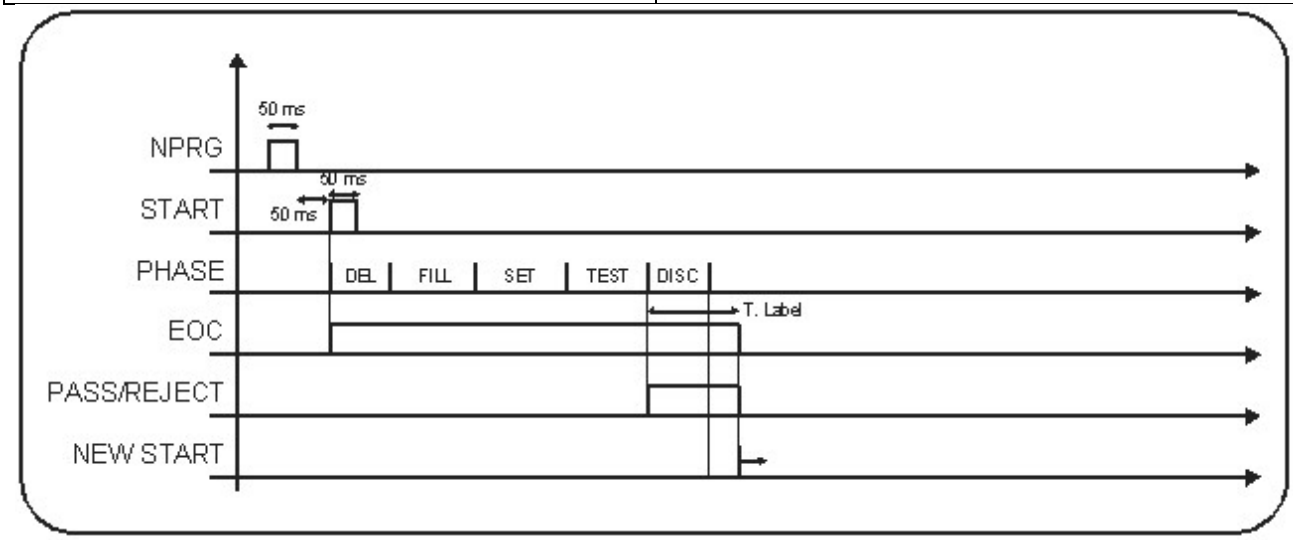
Standard Configuration in case of waste/good with null time:

“EOC:” / "End of cycle signal:"	**“Std” / “Standard”**
“Bad:” / “Bad management:“	**“Std” / “Standard”**
“Label:” / "Label signal duration:"	**“0.0”**



Standard Configuration in case of waste/good with time different from zero:

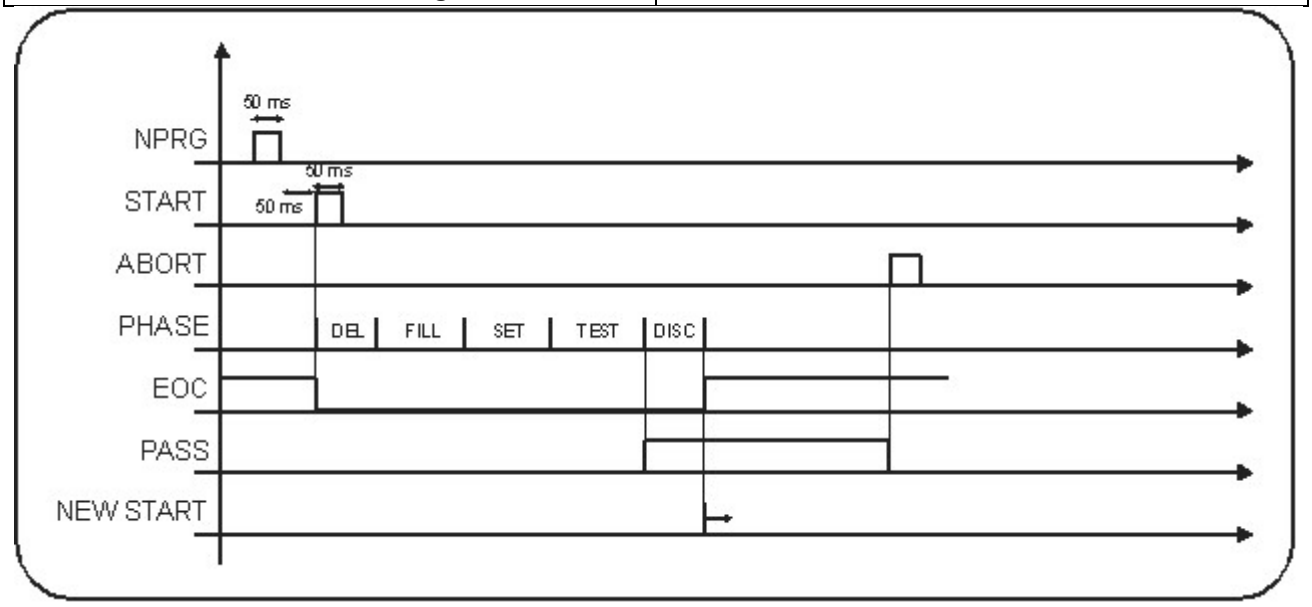
“EOC:” / "End of cycle signal:"	**“Std” / “Standard”**
“Bad:” / “Bad management:“	**“Std” / “Standard”**
“Label:” / "Label signal duration:"	**“2.0”**



To note that in the example the discharge is quickly than **“Label:”** / **"Label signal duration:”**: in the opposite case, the signal **“EOC:”** / **"End of cycle signal:"** would have been disabled at the end of the discharge (and at the same time a new start would have been possible), while **“Bad:” / “Bad management:“** are disabled in both the two case at the end of **“Label:”** / **"Label signal duration:”**.

Non Standard configuration with end cycle ready and case of good result:

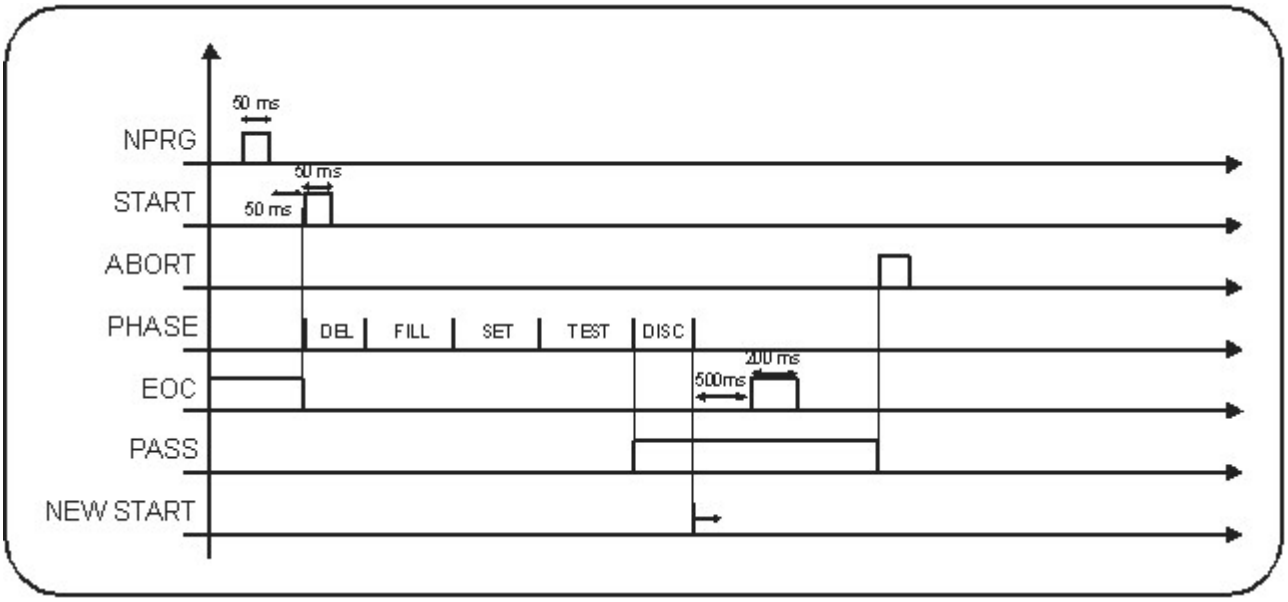
“EOC:” / "End of cycle signal:"	**“Ready” / “Ready”**
“Bad:” / “Bad management:“	Different from **“Std” / “Standard”**



Whatever it is the parameter set **“Bad:” / “Bad management:“**, in case of good as result the behaviour is that one described (it coincides with a waste in case of **“Bad:” / “Bad management:“** has the value **“Auto:” / “All Automatic:“**). In the case the **“EOC:”** / **"End of cycle signal:"** has the value **“Busy”** / **"Busy"** it is totally the same, unless the signal **“EOC:”** / **"End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

Not Standard configuration with impulsive end of cycle and case of good result:

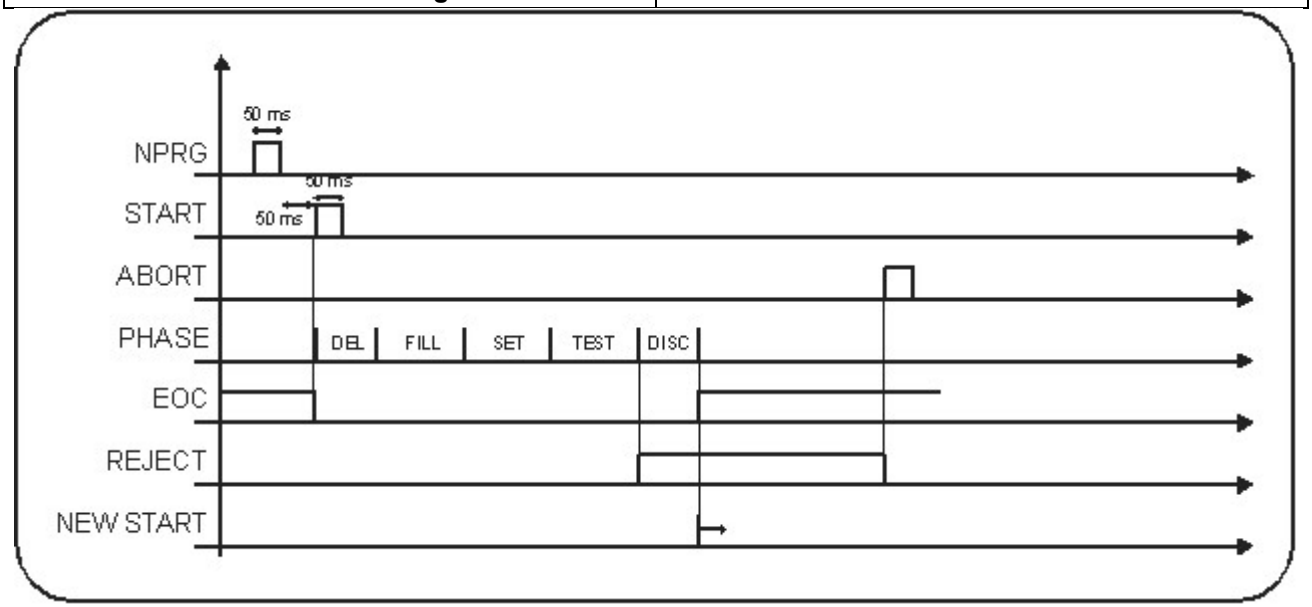
“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Bad:” / “Bad management:“	Different from **“Std” / “Standard”**



Whatever it is parameter set **“Bad:” / “Bad management:“**, in case of good result the behaviour is that one described (it coincides with a waste in case of **“Bad:” / “Bad management:“** has the value **“Auto:” / “All Automatic:“**).

All automatic configuration with end of cycle ready and case of waste result:

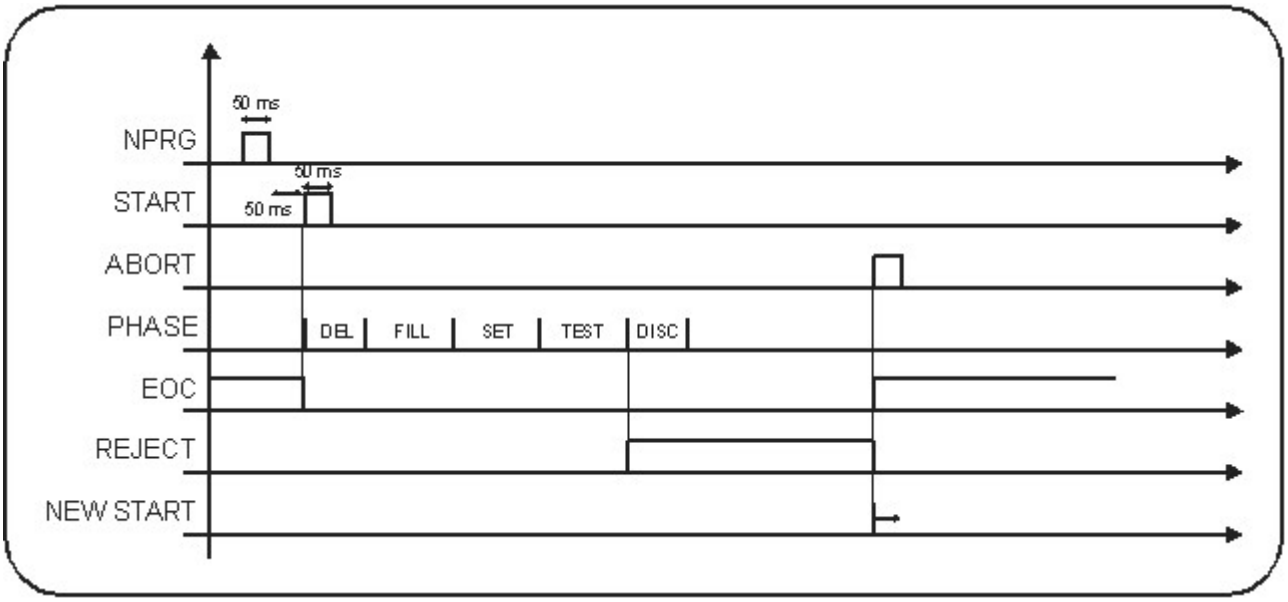
“EOC:” / **"End of cycle signal:"**	**“Ready” / “Ready”**
“Bad:” / “Bad management:“	**“Auto” / “All Automatic”**



In this case the abort signal serves to disarm waste output, that obviously it would be disarmed also by a new start. In the case **“EOC:”** / **"End of cycle signal:"** has the value **“Busy”** / **"Busy"** is totally the same, unless that the signal **“EOC:”** / **"End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

Configuration validation with end of cycle ready and case of waste as result :

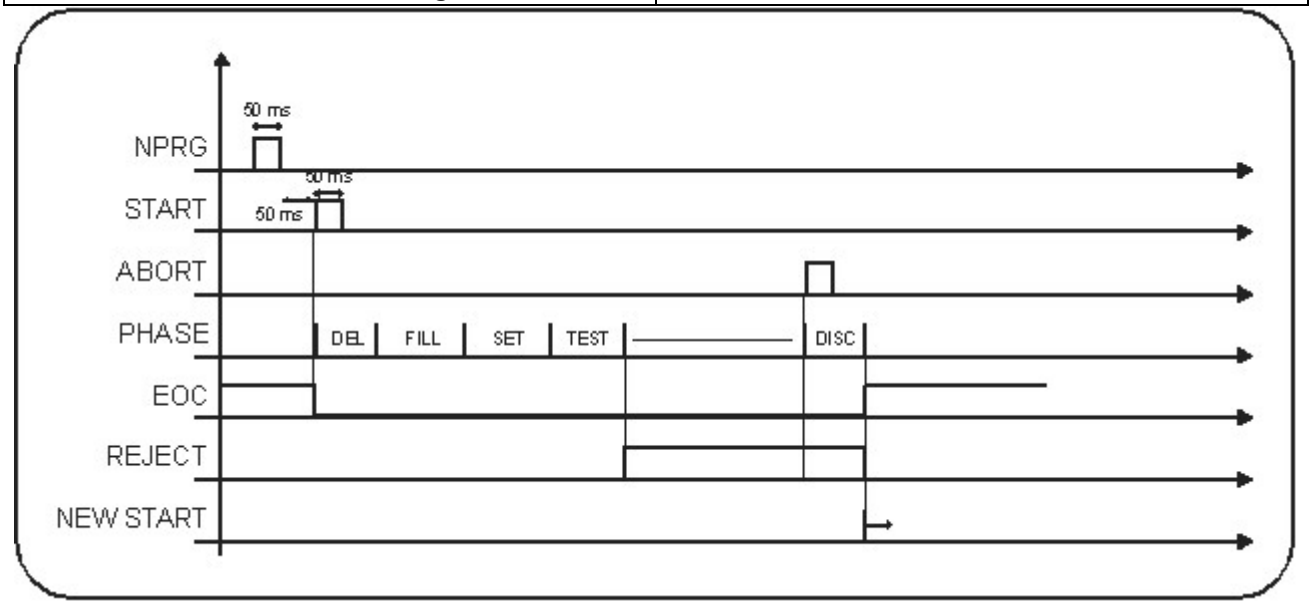
“EOC:” / **"End of cycle signal:"**	**“Ready” / “Ready”**
“Bad:” / “Bad management:“	**“Val” / “Validation”**



In this case the abort signal serves to validate the test: in fact it decrees the end of the test, the deactivation of waste signal, and the possibility of giving a new start. Since the equipment does not receive the abort signal it remains fixed with waste result without allowing to make new tests.
In case **“EOC:”** / **"End of cycle signal:"** has the value **“Busy”** / **"Busy"** it is totally the same, unless that the signal **“EOC:”** / **"End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

Configuration leak detection with end of cycle ready and case of waste as result:

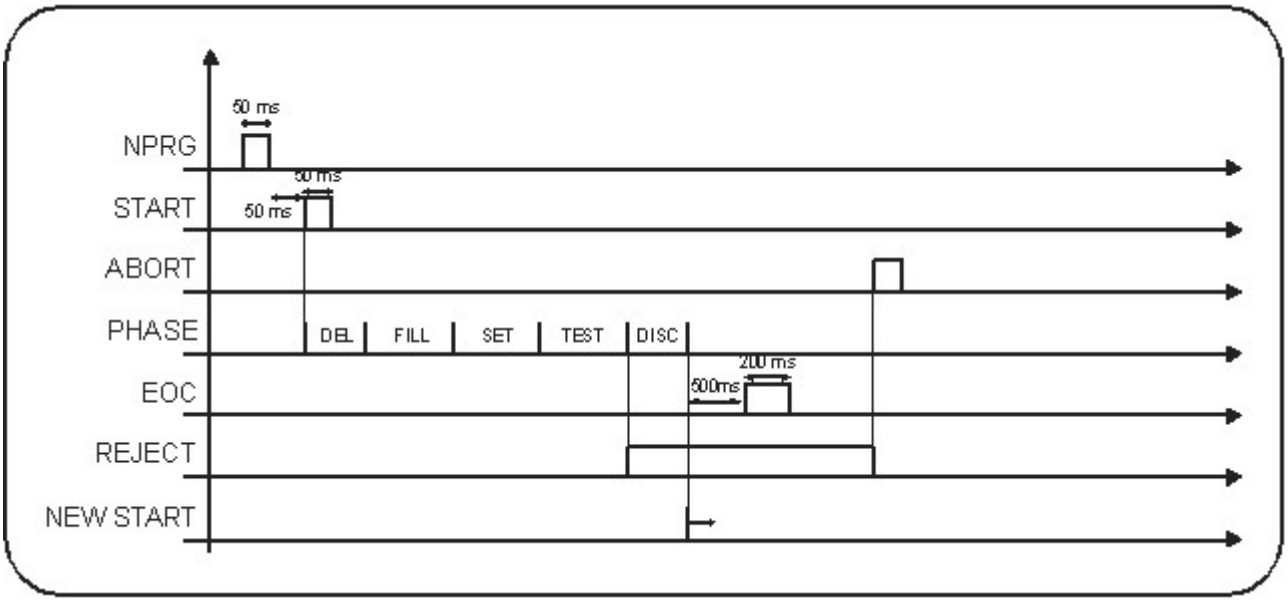
“EOC:” / "End of cycle signal:"	**“Ready” / “Ready”**
“Bad:” / “Bad management:“	**“Full” / “Remain full”**



In this case abort signal serves to start the discharge and then to end the test: in fact at the end of the test phase, the discharge does not start in an automatic way leaving under pressure the testing piece (this can be particularly useful in case you want to detect, by soap methods or other ones where is the leak). When the equipment has received the abort signal it starts the discharge phase and the following activations and deactivations of signals.
In case **“EOC:”** / **"End of cycle signal:"** has a value **“Busy”** / **"Busy"** it is totally the same, unless that the signal **“EOC:”** / **"End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

All automatic configurations with impulsive end of cycle and case of waste:

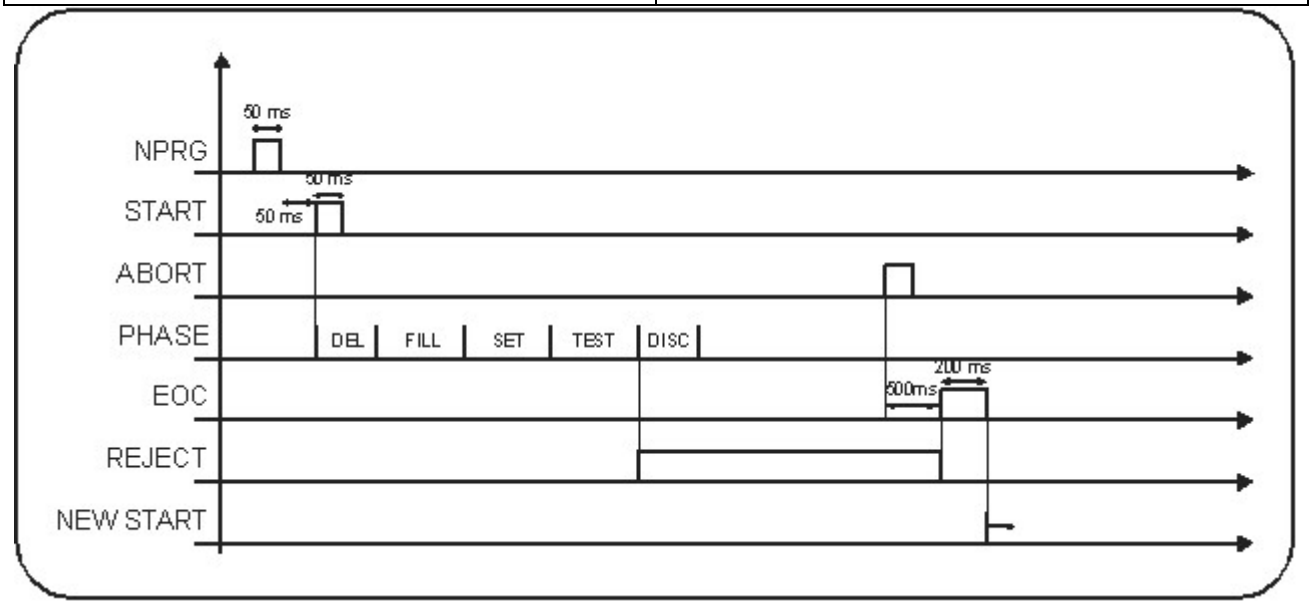
“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Bad:” / “Bad management:“	**“Auto” / “All Automatic”**



In this case the abort signal serves to disarm the waste output, that obviously it would be disarmed also by a new start.

Configuration validation with impulsive end of cycle and case of waste:

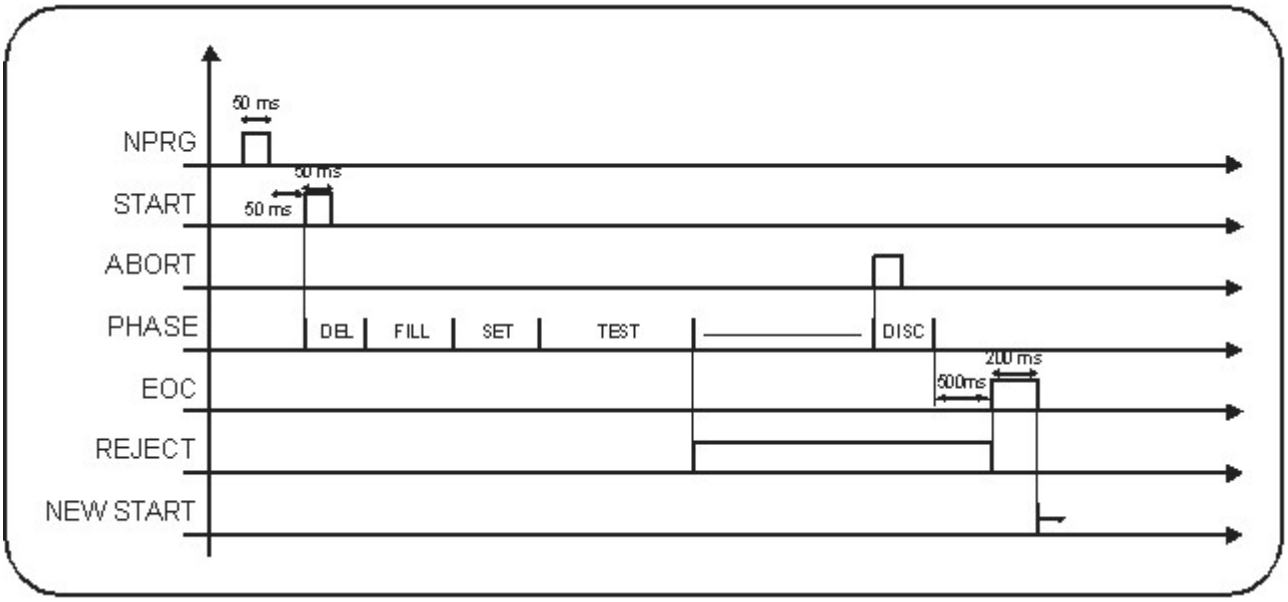
“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Bad:” / “Bad management:“	**“Val” / “Validation”**



In this case the abort signal serves to validate the test; in fact it decrees the end of the test, the deactivation of waste signal, and the possibility of giving a new start. Since the equipment does not receive the abort signal it remains fixed with waste as result without allowing to make any other tests.

Configuration of leak detection with impulsive end of cycle and case of waste:

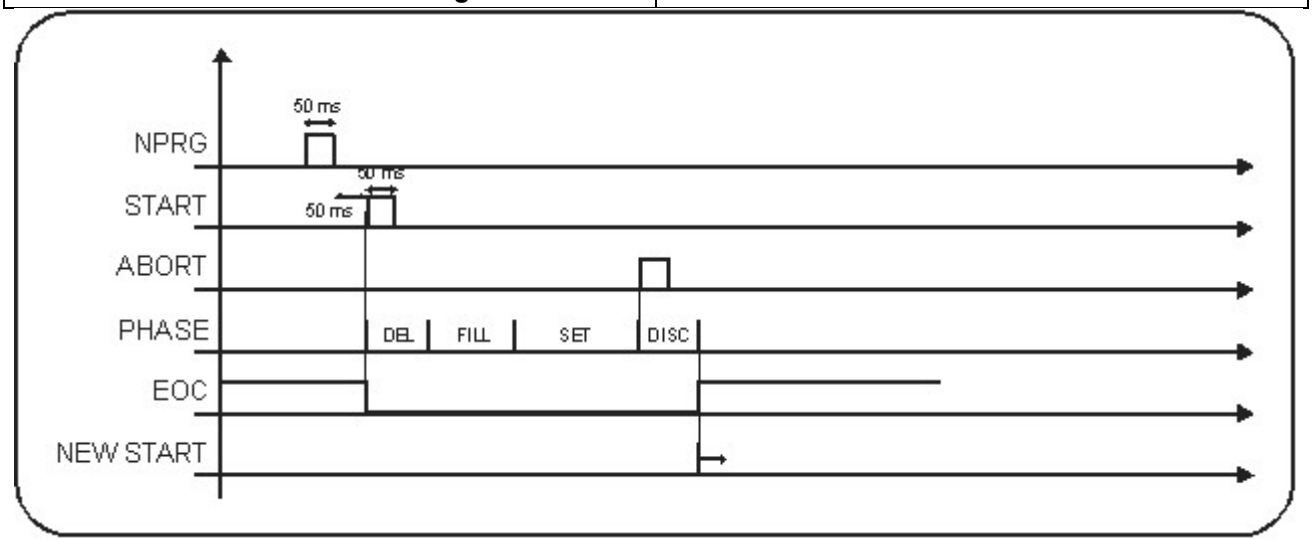
“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Bad:” / “Bad management:“	**“Full” / “Remain Full”**



In this case the signal of abort serves to start the discharge and then to end the test phase: in fact at the end of the testing phase the discharge does not start automatically leaving under pressure the testing piece (this can be particularly useful in case you want to detect, by soap methods or other ones where is the leak). When the equipment has received the abort signal it starts the discharge phase and the following activations and deactivations of signals.

All automatic configuration with end of cycle ready and case of abort:

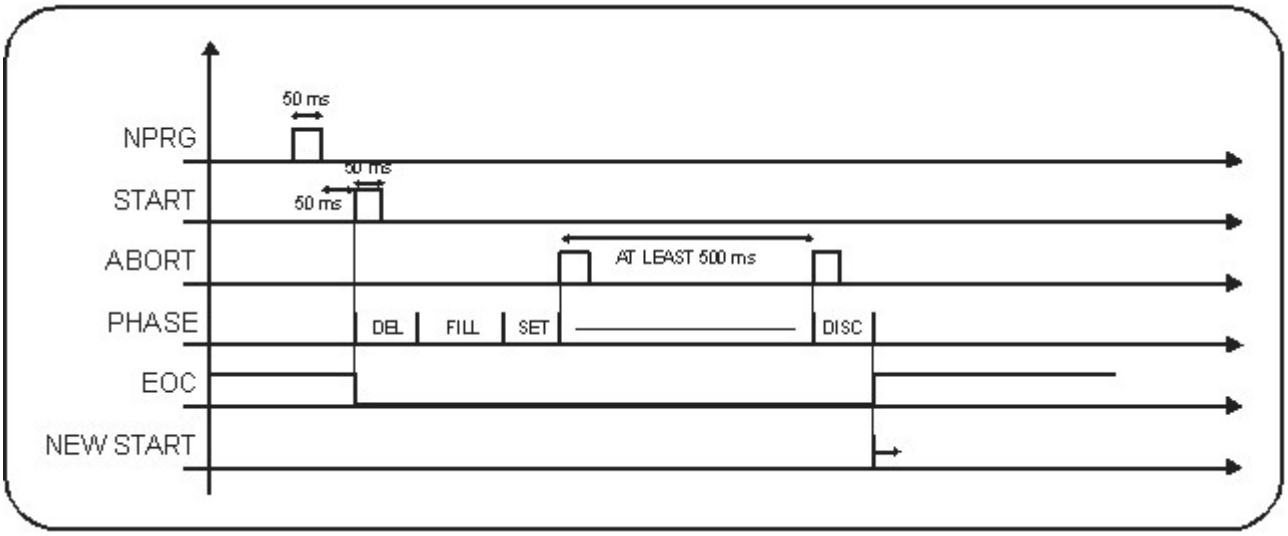
“EOC:” / "End of cycle signal:"	**“Ready” / “Pronto”**
“Abort:” / “Abort management:“	**“Auto” / “All automatic”**



In case **“EOC:” / "End of cycle signal:"** has a value **“Busy” / "Busy"** it is totally the same, unless that the signal **“EOC:” / "End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

Leak detection configuration with end of cycle ready and case of abort:

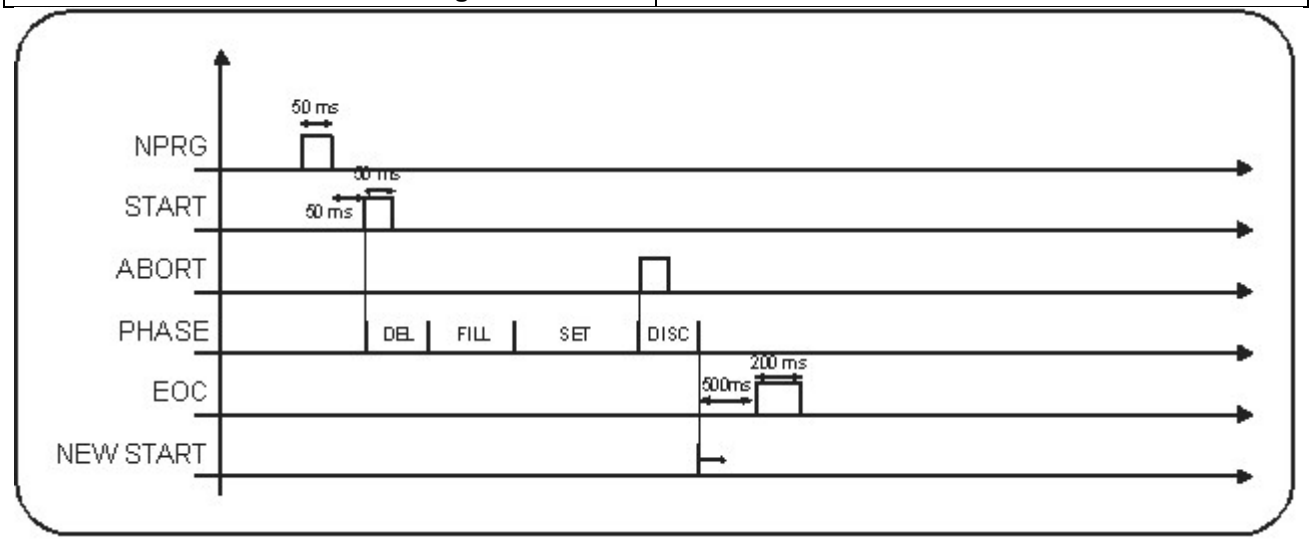
“EOC:” / "End of cycle signal:"	**“Ready” / “Ready”**
“Abort:” / “Abort management:“	**“Full” / “Remain Full”**



In this case a second signal of abort (that has to be temporarily away from the first one of at least 500ms) serves to start the discharge and then to end the test: in fact after the first abort signal the discharge does not start automatically leaving the testing piece under pressure (this can be particularly useful in case you want to detect, by soap methods or other ones where is the leak). When the equipment has received the second abort signal it starts the discharge phase and the following activations and deactivations of signals.
In case **“EOC:”** / **"End of cycle signal:"** has a value **“Busy”** / **"Busy"** it is totally the same, unless that the signal **“EOC:”** / **"End of cycle signal:"** has a dual working (i.e. it is low out of the test and high during the test).

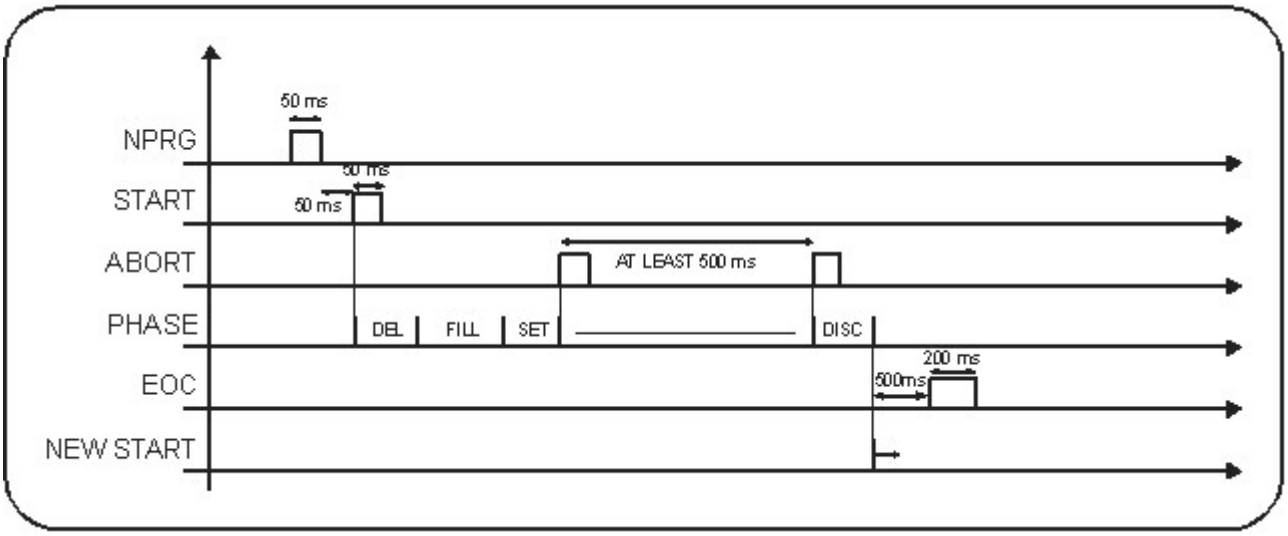
All automatic configuration with impulsive end of cycle and case of abort:

“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Abort:” / “Abort management:“	**“Auto” / “All Automatic”**



Leak detection configuration with impulsive end of cycle and abort case:

“EOC:” / "End of cycle signal:"	**“Pulse” / “Pulse”**
“Abort:” / “Abort management:“	**“Full” / “Remain Full”**



In this case a second signal of abort (that has to be temporarily away from the first one of at least 500ms) serves to start the discharge phase and then to end the test: in fact after the first abort signal the discharge phase does not start automatically leaving the testing piece under pressure (this can be particularly useful in case you want to detect, by soap methods or other ones where is the leak). When the equipment has received the second abort signal it starts the discharge and the following activations and deactivations of signals.

Measure accuracy

This optional allows to increase the resolution of the equipment. If activated, the measure resolution, both of pressure, and of decay or of flow, is increased of a factor 10.

Regular Maintenance of the Equipment

Regularly the equipment has to be check in order to avoid malfunctions. The most important checks have to be divided between the daily ones or the periodic ones.

REGULAR CHECK OF LEAK TESTERS: LEAK CONTROL OF THE TESTER
To verify in a correct way the pneumatic leak of an equipment, follow these procedures, regularly every 6 months:

1. Set test parameters, that are different according to the full scale.
   Es1. Full scale equipment 6000.0 mbar:
   Filling pressure: 5500.0 mbar
   Setting time: 300.0 s.
   Test time: 60.0 s.
   Max pressure decay: 1.000 mbar
   Es2. Full scale equipment 1000.0 mbar:
   Filling pressure: 900.0 mbar
   Setting time: 300.0 s.
   Testing time: 60.0 s.
   Max pressure decay: 0.500 mbar
   Looking to the two examples mentioned above, it is easy to understand that filling pressure setting change according to the full scale of the equipment, and exactly it must be lower than some hundreds of mbar.
2. Connect to the TEST PORT junction a cap with the smallest volume that is possible (clearly the cap has to be tight).
3. Reduce the pressure turning counterclockwise the pressure regulator placed on the frontal panel (see chapter *Frontal Panel*), in order to avoid excessive pressure bump due to a volume almost at zero.
4. Make the test starting, raising the pressure regulator till arriving to the set pressure.
5. Make more times leak test, removing and hanging up from time to time the pipe under test, controlling that the equipment give a good result.

N.B: For flow test equipments or digital calibrators, you have not to test the leak, because, measuring a flow, they do not need this procedure.

REGULAR CONTROL FOR ALL THE EQUIPMENTS: CONTROL OF THE CLEANING OF THE EQUIPMENT
Control regularly (every 3 months) equipment cleaning:

- Plexiglas (or aluminum front case) must be cleaned regularly with a cloth moistened with warm water.
- Control any aluminum button are not seized for presence of dust, metal debris, etc…
- Clean the box in anodized aluminum regularly with a cloth moistened with warm water to prevent the entry of contaminants inside the equipment.
- If present, clean the back aluminum panel to avoid the entry of contaminants inside the equipment.

REGULAR CONTROL FOR ALL THE EQUIPMENTS: CLAMPING SCREWS
Regularly verify (every 6-12 months) the correct clamping screws of the equipment:

- Control the 4 frontal screws securing plexiglass (or aluminum frontal), if loosen, softly tighten them.
- Control 4 fixing screws of back panel (if present). If loosen, close them softly..

DAILY CONTROL OF THE EQUIPMENT: VERIFY CONTROL SYSTEM
As recommended by the standard ISO it is better to have two referring samples corresponding one to the good and the other to the waste.
Really, analysing better ISO procedure, and considering that the leak measured has to be understand as a limit of tolerance T not acceptable (obviously as a term of leak this tolerance cannot be symmetrical but only as loss), the ideal procedure is to place a sure good piece and to place both the frontal panel Staubli option (see chapter *Frontal Panel*) both the calibrated leak M0710 at the loss level (T) of the application in object and then to superimpose at the good piece to obtain a sure value of waste.

Therefore, before every cycle of control you have to verify that the equipment detect correctly the two limits, using two referring samples and repeating different tests, alternating the good sample to the calibrated leak. Make the two sample rest for some minute between a test and the other one, to avoid phenomena of temperature, expansion, etc…

Problem solutions

Problem	Solution
The equipment does not start.	Verify that power cable is connected. In case of equipments with rechargeable battery, recharge it with the recharger.
The equipment does not start.	Verify that the fuse in the net filter is complete. (Fuses 4 A – 250V delayed in glass 5X20 mm.)
The equipment does not start and both the fuses and the power cable are ok. The battery is charged.	Send the equipment back to an assistance point.
The graphic display starts but very dim.	Verify the parameter that regulates its brightness in the Setup Menu.
The graphic display is on has a good brightness, but messages are not readable.	Verify the parameter that regulates contrast in the Setup Menu (if you cannot see anything on the front side, it could be sufficient to see something, to look at the display with a better view corner)..
The display does not start.	Send the equipment back to an assistance point.
The equipment remains blocked at its starting making a persistent acoustic signal.	Send the equipment back to an assistance point.
The equipment has not a perfect tight.	Check the entireness of the pipe connected to the Test-Port of the equipment and any other plugs of the piece under test.
The equipment presents not a perfect tight even after the control of the pipes and of the plugs.	Send the equipment back to an assistance point..
The equipment does not read the pressure injected in a right way.	Go on with the calibration of the internal transducer of pressure (see the chapter *Calibration Menu*).
The test does not start pushing the button [+]	Verify that the relative setup parameter has been correctly set.
The equipment does not answer to the instructions sent by the serial protocol.	Verify that the serial address of the equipment (you can regulate it in the Setup Menu) is congruent with that one sent in the instructions.
The equipment does not answer to the instructions sent by the serial protocol.	Check to be connected with the right port COM or USB port.
The equipment does not answer to the instructions sent by the serial protocol.	Check you have set correctly the communication baud rate (in the Setup Menu).
In the filling phase the equipment does not succeed in pressurize the piece.	Verify you are really feeding with compressed air the IN AIR junction.
In the filling phase the equipment does not succeed in pressurize the piece.	Verify the pressure regulator.

Utilities

Pressure unit table with conversion

Unità di misura Measuring unit	Simbolo Symbol	Pa	bar	at	mm Hg	kgf/m^2	psi	lbf/ft^2	in w.	in Hg	ft w.
pascal	**Pa**	1	10^{-5}	$1,0197x10^{-5}$	0,0075	0,10197	$0,145x10^{-3}$	0,02088	0,00401	$0,295x10^{-3}$	$0,335x10^{-3}$
bar	**bar**	10^{5}	1	1,0197	750,07	10197	14,505	2088	401,46	29,530	33,456
atmosfera $=kgf/cm^2$ atmosphere	**at**	98070	0,9807	1	735,56	10000	14,223	2048,16	393,71	28,960	32,808
millimetri di Hg millimetre of mercury	**mm Hg**	133,32	$1,3332x10^{-3}$	$1,3595x10^{-3}$	1	13,595	0,0193	1,392	0,5353	0,0394	0,0446
chilogrammi per m^2 kilogramme per sq. m	**kgf/m^2**	9,807	$9,807x10^{-5}$	10^{-4}	0,0735	1	0,00142	0,205	0,0394	0,0029	0,0033
libbre per pollice quadro pounds per sq. inch	**psi**	6894,14	0,06894	0,0703	51,719	703,07	1	144	27,683	2,0362	2,3069
libbre per piede quadro pounds per sq. foot	**lbf/ft^2**	47,876	$4,7876x10^{-4}$	$4,8824x10^{-4}$	0,7183	4,8824	0,00694	1	0,1922	0,01414	0,01602
pollici di c.a. inches of water	**in w.**	249,09	0,00249	0,00254	1,868	25,4	0,03614	5,203	1	0,07355	0,0833
pollici di mercurio inches of mercury	**in Hg**	3386,36	0,03386	0,03453	25,4	345,34	0,4912	70,731	13,595	1	1,1329
piedi di c.a. feet of water	**ft w.**	2989	0,02989	0,03048	22,42	304,8	0,4334	62,43	12	0,8827	1

Conversion table of volumetric measures (y= nx)

X \ Y	Pa · m³/s	mbar · l/s oppure bar · cm³/s	Pa · l/s	torr · l/s	lusec (micron l s^{-1})	μ · ft³/s (micron ft³ s^{-1})	atm · ft³/min oppure ft³ (NTP)/min	std cm³/s	molecole/s	moli/s
Pa · m³/s	1	10	1×10^{3}	7,5	$7,5 \times 10^{3}$	$2,65 \times 10^{2}$	$2,097 \times 10^{-2}$	9,87	$2,651 \times 10^{20}$	$4,403 \times 10^{-4}$
mbar · l/s oppure bar · cm³/s	1×10^{-1}	1	1×10^{2}	$7,5 \times 10^{-1}$	$7,5 \times 10^{2}$	$2,65 \times 10^{1}$	$2,097 \times 10^{-3}$	$9,87 \times 10^{-1}$	$2,651 \times 10^{19}$	$4,403 \times 10^{-5}$
Pa · l/s	1×10^{-3}	1×10^{-2}	1	$7,5 \times 10^{-3}$	7,5	$2,65 \times 10^{-1}$	$2,097 \times 10^{-5}$	$9,87 \times 10^{-3}$	$2,651 \times 10^{17}$	$4,403 \times 10^{-7}$
torr · l/s	$1,33 \times 10^{-1}$	1,333	$1,33 \times 10^{2}$	1	1×10^{3}	$3,53 \times 10^{1}$	$2,795 \times 10^{-3}$	1,316	$3,535 \times 10^{19}$	$5,87 \times 10^{-5}$
lusec	$1,33 \times 10^{-4}$	$1,33 \times 10^{-3}$	$1,33 \times 10^{-1}$	1×10^{-3}	1	$3,53 \times 10^{-2}$	$2,795 \times 10^{-6}$	$1,32 \times 10^{-3}$	$3,535 \times 10^{16}$	$5,87 \times 10^{-8}$
μ · ft³/s	$3,76 \times 10^{-3}$	$3,76 \times 10^{-2}$	3,76	$2,83 \times 10^{-2}$	$2,83 \times 10^{1}$	1	$7,92 \times 10^{-5}$	$3,71 \times 10^{-2}$	$1,001 \times 10^{18}$	$1,662 \times 10^{-6}$
atm · ft³/min oppure ft³ (NTP)/min	$4,78 \times 10^{1}$	$4,78 \times 10^{2}$	$4,78 \times 10^{4}$	$3,58 \times 10^{2}$	$3,58 \times 10^{5}$	$1,267 \times 10^{4}$	1	$4,72 \times 10^{2}$	$1,268 \times 10^{22}$	$2,105 \times 10^{-2}$
std cm³/s	$1,013 \times 10^{-1}$	1,013	$1,013 \times 10^{2}$	$7,6 \times 10^{-1}$	$7,6 \times 10^{2}$	$2,67 \times 10^{1}$	$2,12 \times 10^{-3}$	1	$2,687 \times 10^{19}$	$4,461 \times 10^{-5}$
molecole/s	$3,77 \times 10^{-21}$	$3,77 \times 10^{-20}$	$3,77 \times 10^{-18}$	$2,83 \times 10^{-20}$	$2,83 \times 10^{-17}$	$9,99 \times 10^{-19}$	$7,88 \times 10^{-23}$	$3,72 \times 10^{-20}$	1	$1,66 \times 10^{-24}$
moli/s	$2,271 \times 10^{3}$	$2,271 \times 10^{4}$	$2,271 \times 10^{6}$	$1,703 \times 10^{4}$	$1,703 \times 10^{7}$	$6,016 \times 10^{5}$	$4,749 \times 10^{1}$	$2,24 \times 10^{4}$	$6,022 \times 10^{23}$	1

Conversion from mass flow to volumetric one

The following formula can be used in the conversion from pV flow to mass flow for a particular gas:

$q\_M = q\_V \times M / RT$

where,
q_M is the mass flow expressed in kg / s;
M is the molar mass, expressed in kg for mass;
q_V is the passing flow, expressed in Pa m3 / s;
R is the universal constant gas = 8,314 J K mass;
T is the temperature expressed in K

Volumes calculation

Pipe volume calculation (cylinder)	Parallelepiped volume calculation	Sphere volume calculation
$r^2 \times \pi \times h$	l x w x h	$r^3 \times 4/3\ \pi$
where r: Internal pipe ray π: greek pi h: total length of pipe	where l: length w: wide h: high	where r: sphere ray π: greek pi

Technical Details

- Case dimensions 91x69x145 mm, pneumatic and electrical connectors not included
- Plexiglas frontal panel “no break-through”
- 24Vdc Power supply
- Two bar of 11 blue led to indicate pressure and measure
- Graphic Display 128x64 pixel back illuminated blue
- Parameters memory EEPROM 4k plus external memory not volatile 32k, with control algorithms
- Hour date RTC buffer battery (time of information retention higher than 250000 hours)
- Outputs at 24Vdc source type (with gnd common) from 1,5 A, protected against over power over temperature and short circuit.
- Optisolated inputs at 24Vdc 10 mA (with common at 24Vdc)
- 2 RS232 communication ports (optoisolated microprocessor side)
- USB port B type optisolated towards microprocessor side.
- 1 communication port RS485 (optoisolated microprocessor side)

Addresses

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Fax. 0039 (0) 059 579022

Web - Email :
http://www.fortest.com - info@fortest.com

Repair Request Form

Please photocopy this page and attach it to the equipment to be repaired.

Customer	
Street	
Cap	
Town	
Province / State	
Telephone	
Fax	
e-mail	
Referent	
Model	
Serial Number	
Defect found:	

Send together with the equipment to:
ForTest s.r.l.
Via Sibilla Aleramo, 7 - Sez. 2° – 41123 Modena
Tel. +39 (0)59/557250
Fax. +39 (0)59/579022

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Information contained in this manual can be changed without any forewarning.