

REMOTE TEST BENCH EQUIPPED WITH SERVICE MOVABLE PLATFORM IN TWO AXES.

Manual instructions and warnings.

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1.1 General warnings and information to the recipients.

This booklet is addressed to all potential users of the bench with a moving floor in two movements: X axis (horizontal and along major bench axis) and Y-axis (vertical).

The Tecni.Com.Srl, manufacturer of the bench, was responsible for designing and construction of mechanical parts only, ensuring the movement of the platform via custom mechanical parts and industrial components placed on the market. They released the technical characteristics of the mechanical components in a separate document.

Electronic and electric driving systems were designed and purchased by qualified personnel of INFN and from these ones assembled. They have not shared the competences with Tecni.Com.Srl, which was limited to verifying whether these components would allow good movements, with the required accuracy, of the mechanics elements.

The bench with moving platform will be used for test activities in the research laboratories of INFN. The commands related to the moving (CNC) and the control of the position of the platform may be carried out either locally or at a distance (remote control), via an Ethernet port with the aid of a PC and a custom software. **THE MAIN USE OF THE BENCH IS ONLY INTENDED FOR ENGINEERS AND RESEARCHERS OF INFN AND / OR COMPARABLE PERSONNEL BELONGING TO OTHER RESEARCH INSTITUTIONS WITH WHICH THE INFN COLLABORATES.**

1.2 Declaration of conformity.

We declare that the bench complies with the laws of the following directives:

- Directive 2006/42/EC (Machinery Directive).
- Directive 2006/95/EC (Low Voltage Directive).

Manufacturer: TECNI.COM.Srl - Via Dell'Olmo, 2-00044 Frascati (RM).

2. Features and dimensions of the bench.

- Overall dimensions: 2100 x 705 x 915 mm (with the platform in the lowest position).
- Iron platform: 500 x 500 x 20 mm.
- Weight of the bench: about 250 daN (including all the electrical components attached).
- Travel of the moving floor:
 - X-axis = 1000 mm,
 - Y-axis = lowest position 915 mm (ground clearance). Highest position (again from the ground) 1250 mm; 335 mm maximum excursion.
 - Position accuracy = 100 µm
- Movement of the two axes by jackscrews with a reduction ratio of 1/10 (approximately).
- Maximum lifting weight load on the platform: 200 daN.
- Maximum static load for each of the two jackscrews: 1,000 daN (traction and / or compression) (do not exceed the maximum weight for the wheels).
- Bench wheels for moving: n.4. Two fixed and two pivoting for manual handling, load capacity 180 daN (each).
- Handles: n.4. Two per side for taking and moving the bench, load capacity each. 200 daN. (IMPORTANT: not to be used for lifting).
- Feet: n.4. Use feet for supporting, position fixing, offset adjustment and leveling to the floor. Maximum load 2,300 daN.
- Steel brackets provided with an eyelet for attaching lifting cables: n.4.
- Movement Protections (automatic roller blinds for X-axis movement): 2.
- Accident prevention spacers (Y-axis movement): 4.

3. Preparation for use.

BEFORE ANY MAINTENANCE OR CLEANING, MAKE SURE TO SWITCH OFF THE POWER SUPPLY AND DETACH THE RELATED CABLES.

4. Mechanical safety.

All the movable system (movable platform) is placed in a metal frame made of welded tubular steel. All sides of the structure are protected by screwed removable panels of sheet metal. One of the narrow sides of the bench is directly covered by an electrical cabinet in which is located part of the electrical components necessary to drive and control the movable platform.

The upper zone of the bench, hosts the moving platform (X axis). It is completely protected by two automatic winding systems, consisting of two shutters in PVC / polyester 0.6 mm thick.

The platform can also be moved vertically (Y axis). In the resting phase (fully lowered) the underlying wall of the platform is still raised approximately 60 mm with respect to the metal structure, a safety measure sufficient to prevent the accidental crushing of fingers and hands. In this position, the stop of the platform is made of an inductive limit switch device. In case of failure, a further electromechanical limit switches are installed to cut off motors. Finally, to further ensure safety, there is another stop of the mechanical type, consisting of 4 hard rubber spacers under the platform which may become active only in the unlikely malfunction event of both limits, thus preventing an uncontrolled platform's fall.

5. Mechanical maintenance.

The mobile platform moves along the X axis by means of a mechanical jack (fixed on the platform itself) and with the aid of a threaded shaft (fixed on the bench) on which the jack translates. The platform is raised (Y axis) with the aid of a second mechanical jack. In this case, however, is the threaded shaft the one that moves inside the jack.

The mechanical parts placed inside the casing of the two cylinders are lubricated for long life operations and, taking in account the non-continuous using of the bench, it will require virtually no maintenance. Only in the unlikely event of accidental deterioration of the seal and only after having found a substantial leakage of the lubricant, it is necessary to refill the case with Total Ceram CA-15 +130°C DIN 51502: OGPON-25

Different emphasis should be given to the two threaded shafts that will be periodically checked and lubricated with suitable grease: Total Carter EP2200 AGMA 9005: D94 or similar; this takes the simple use of a brush soaked in oil.

The maintenance cycle has to keep under control the two horizontal guides, used in the sliding of the four pads fixed to the movable carriage. Although the running tracks of the two guides are constantly kept clean by the wiper track skating places, periodically raceways must still be lubricated with special grease with mineral oil based lithium soap thickener (-30 +120 °C).

The wheels that make up the four pads are lubed for life.

A periodic inspection must be reserved to the two articulated supports places at the edges of the threaded shaft (X axis). These are made of self-lubricating material, but if the maintenance staff adds a layer of lubricant, it will improve the friction on the rolling surface.

Another part of the mechanism necessary for the vertical movement (Y axis) regards the four grinded round steel shafts and their guide made of bushings and sliding ball. For best operation, in addition to monitoring

and cleaning of the rods, these latter must be kept covered with a thin layer of lubricant. This one may be the same type used for the two guides.

6. Electrical work.

Main components:

- The movements made by two step-motor Sanyo Denki SM2862-5275 drive by RTA drives Plus line B4.
- Goya Controller S&H with feedback and self-granted motion. The management of the controller is both locally (via keypad and display) and with a personal computer thought Ethernet device via Moxa NPort 5950.
- The electric cabinet, attached to one side of the structure of the bench, is to electrical safety. Inside the cabinet are included the power electronics, the power supplies with their electrical protection instrumentation and the Goya controller.

The NPort 5950 Moxa has four configurable ports each of those RS232 and RS422/485. The system uses one over four, the remaining ones are useful for the eventual connection of other devices. The Moxa is located in the bottom plane of the movable platform together with a mains distributor with multiple protection 220V-16A, useful for the feeding any further instrumentation.

The controller Goya has an internal operating system capable of achieving control of multiple processes in parallel:

- 1) Operator Interface (with keyboard and display).
- 2) CNC (management and control of the axes).
- 3) PLC (optional process that can handle I / O section of the machine as a PLC).
- 4) Auxiliary Processes (communications errors. Timers, alarms, watchdogs, etc..)

The controller GOYA can be used both as a standalone device or via PC.

We supply software written in NI LabVIEW® for the complete management of CNC via Ethernet, using a PC with a licensed copy of NI LabVIEW®.

Please consult the user manual is that the programming manual provided in the documentation.

7. Electrical safety.

In order to control the stroke of the two axes X and Y, for each of these are installed:

- inductive limit switches: n.2. Type: Pepperl + Fuchs NBN4-F29-E2-RSC.
- electromechanical wheel limit switches: n.2. Type: Honeywell electromechanical wheel type 91 MCE2-P1.
- "machine zero" homing switch: n.1 for each axis. Type: Pepper + Fuchs type NBN4-F29-E2.

The inductive limit switches act on the controller Goya, like the electromechanical ones, by shutdown the power of the two-step motor Sanyo Denki.

Two mushroom emergency switches with key Moeller IP66 are located on two diametrically opposed sides of the bench. They act simultaneously on the Goya alert subsystem and on the power circuit of the engine such as the electromechanical limit switches.

The bench is equipped with a horn / light (amber LED buzzer 24Vac/dc 65 mm 103 dB, Allen Bradley) that is activated when the engines are in operation.

8. Startup procedures.

The bench is powered via an electrical panel placed on a fixed wall near the entrance gate of the BTF hall and it is equipped with two differential magneto thermal breakers: one for the system itself and the other for the multiple mains distributor placed under the platform, necessary for any electrical safety request of all the electrical equipment mounted on the platform.

8.1 Power up procedure

- 1) Switch on the two circuit breakers on the electrical wall.
- 2) If necessary, operate the differential magneto thermal switch DS 672 RCBO inside the control panel located on top of the XY table.
- 3) Check if the lights L1, L2, and L3 are turned on.

L1, checks for power at the cabinet control.

L2, checks for power at control circuit on the engines.

L3, checks for power on auxiliary mains plugs.

8.2 Local control:

When you turn on the controller Goya has two options:

- A) Manual handling of motors via the local keypad.
- B) Automatic: handling of engines through the programs stored in the Goya (See Goya manual).

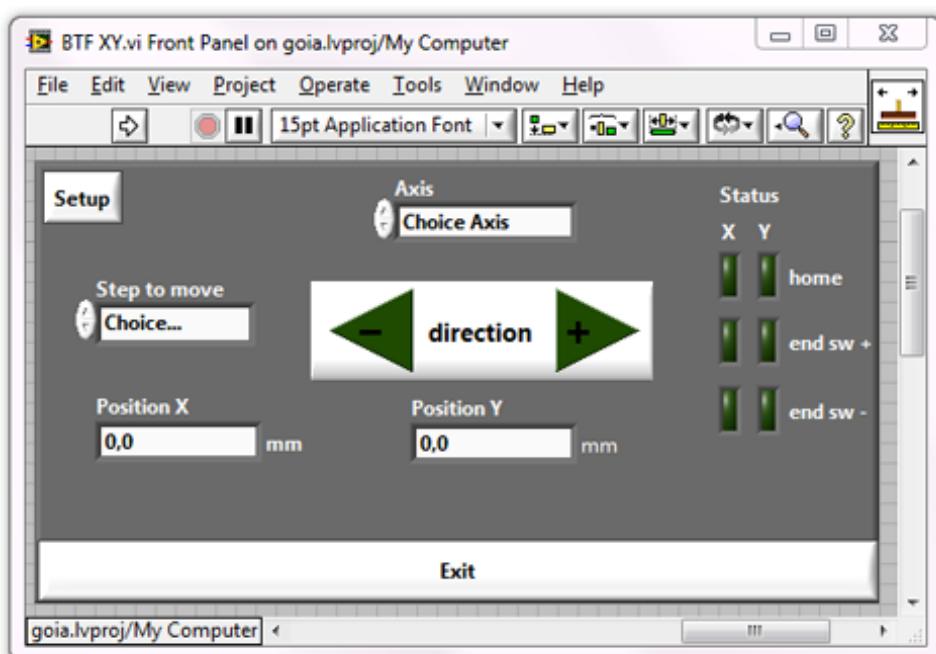
8.3 Remote Control:

To use the remote Goya type the code "74269" using the numeric keypad. You will see a menu to choose from which will be selected in the "PC Connection", then press the return key.



9. Procedures for the handling of the two axes: the X-Y table, remotely.

Remotely via PC, launch the "BTF XY.vi"



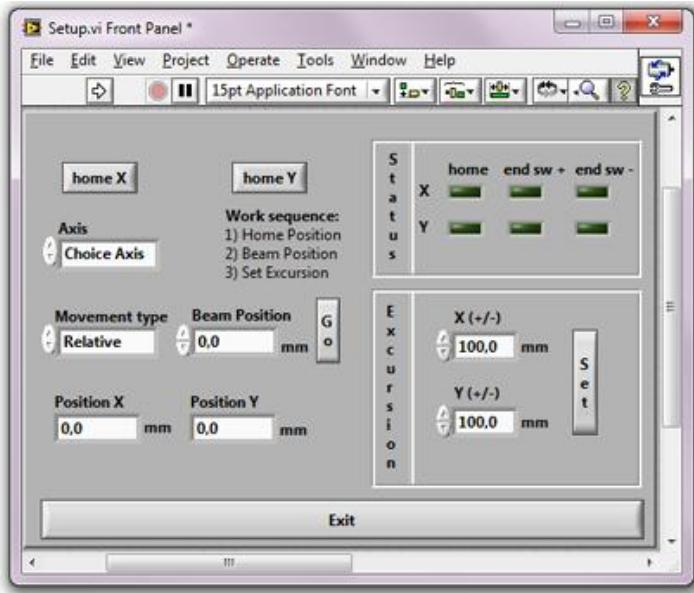
9.1 EXPERT USER Setup Procedures

Homing Procedure:

If a power on-off cycle occurs or if change in the test equipment needs homing, the expert user should search the machine zero (home position), using the program Setup.vi.

Setup.vi is called when the “Setup” button, located in the main panel, is pushed.

You will be prompted for a password, once you enter the password you will see the following panel:



Pushing the home button for each of the X and Y axes, the system starts searching the zero position by moving the platform to negative X or Y directions.

NB: the search for the origin axes must be done each time the system is turned off and then on again.

NB: Don't use homing procedure when the platform is loaded.

Expert User Positioning Procedure:

In order to place the detector at the center of the beam, you must choose the axis to move (X or Y), the type of movement (Absolute or Relative) and enter the distance from the homing point where you want to stick the detector.

Once positioned at the center of the beam, enter the maximum allowed differential excursion left to the control by the user.

NB: When you set the range of allowable motion, the actual platform position is set as software center and from this point it will be define the limits of software movement.

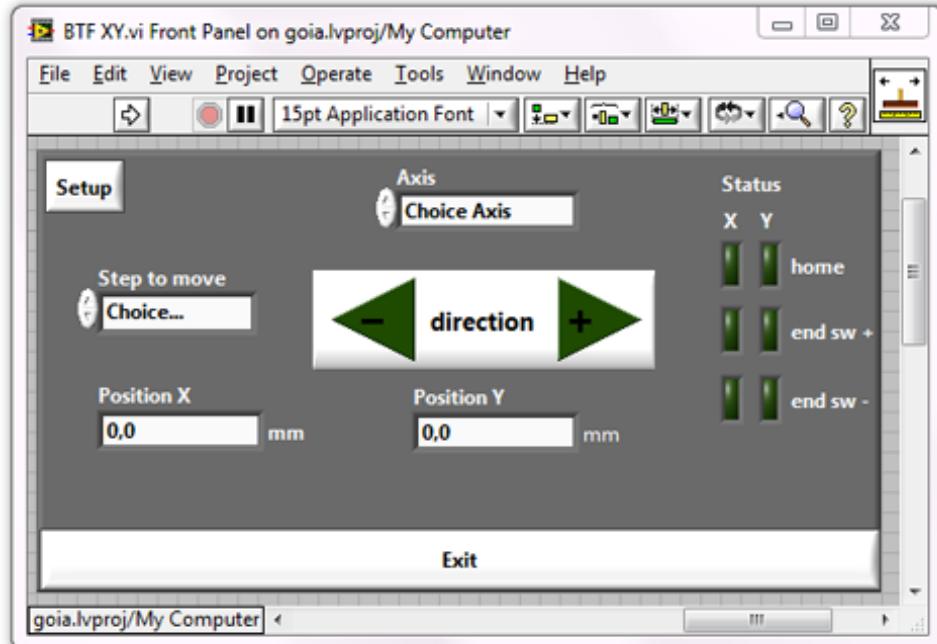
In “Position X” and “Position Y” controls, are displayed the actual location of the platform, expressed in mm. In Status Led Group, are displayed the status of homing point successful condition and the status of limit switch hardware.

The “Exit” button exits the Setup.vi control software.

NB: If a limit switch is pressed there is a popup control that indicates the type of alarm, see next session.

9.2 NORMAL USER Setup Procedure

The program that is used by normal users is only the main panel:



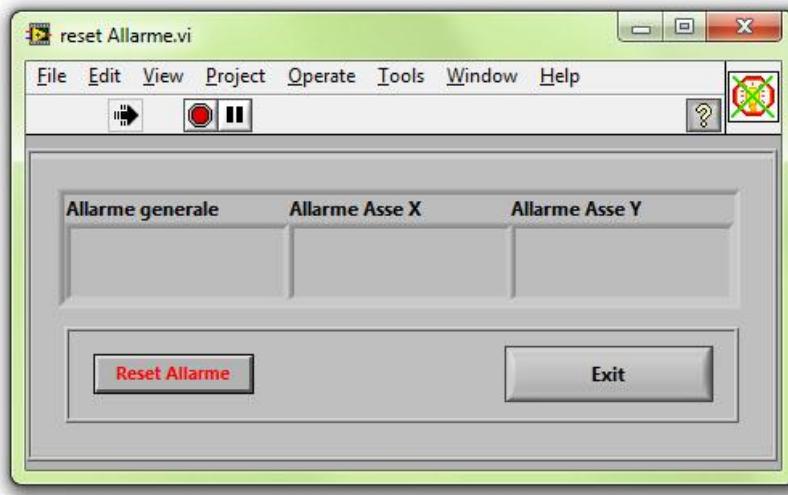
The movements are performed with relative movement from the actual position.

Execution of a movement:

- 1) Select the axis you want to move (X or Y) by menu "Axis".
- 2) Choose the differential step of movement by "Step to move": 0,5-1-2.5-5-10-20-30-40-50 (mm)
- 3) Push the arrow "+" for forward direction, or push the arrow "-" for reverse direction
- 4) In the indicator "Position X" or "Position Y" is explained the actual position of the axes in mm, even if the table moves.

NOTE: If a limit switch is pressed, a popup message indicates the type of alarm. See the indication of the popup for reset the alarms. See next topics.

10. Popup Alarms



Alarm event opens the "reset_Allarme.vi" panel.

- In the "general alarm" may appear:
 - "Emergency activated by the controller axes" (Activated by a malfunction of the axes X, Y)
 - "Emergency triggered by entry of emergency" (On the "Mushrooms" or by mechanical stops)
- In the "Alarm X axis" and / or "Alarm Y Axis":
 - "Alarm on input from emergency board"
 - "Drive Fault" (Malfunction power electronics)
 - "Limit Software (-)" (Exceeding the limits set by the software)
 - "Limit Software (+)" (Exceeding the limits set by the software)
 - "Limit Hardware (-)" (Activation of limit "-")
 - "Limit Hardware (+)" (activation of limit "+")

10. Unblock Procedures

10.1 EXPERT USER Reset crushing of electromechanical limit switch

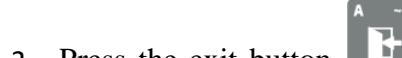
The next is on the procedures to be taken if you intend to reactivate the blocked system because of crushing of an electromechanical limit switch - (**ONLY FOR EXPERT USERS**).

In case of:

- one of the inductive limit switches for some reason is being in fault
- due to the actuation of a not appropriate command, the platform exceed the stroke end predetermined by the programmer,
- again, in the case of accidental power cycle of the GOYA and the platform stopped moving out of position without previously having restored the machine zero,

the operator must follow the following guidelines:

1. Noting the event, stand near the bench and proceed directly the restoring of the alarm via the keypad of GOYA.

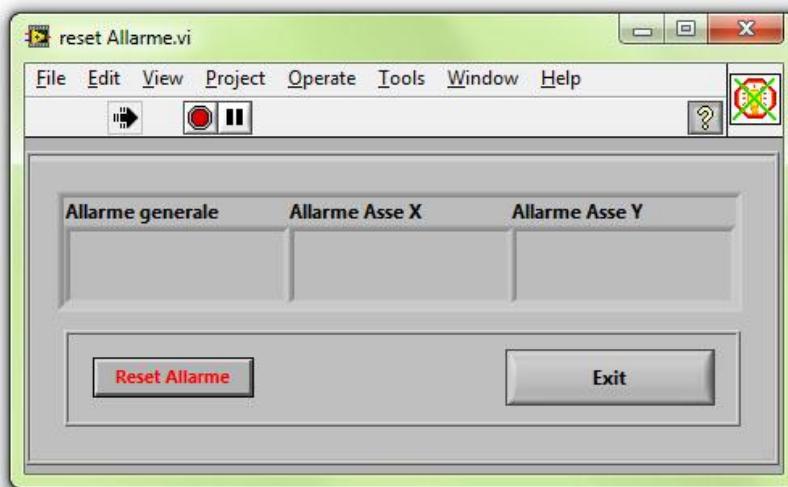


2. Press the exit button on the GOYA display, then in the menu dial button "menu choice" select "Manual" to enter local commands.
3. Look for the SB1 button control panel located inside the cabinet has the purpose to nourish the power electronics until remains pressed.
4. Press the SB1 button in the cabinet meanwhile in the GOYA display, select the axis and use the arrows to drive the motor (NB use the arrow opposite to the movement that caused the accident).
5. Once the platform movement slide releases the electromechanical limit switches, remove the main power supply providing a possible hardware repair, in case it is needed.

10.2 NORMAL USER Reset the flashing siren H1

To reset the flashing siren H1, you can choose three options:

- From the remote control software, operate directly from the alarm window of the "reset Allarme.vi" (recommended).



- From local GOYA display, use the keypad, select from the menu choose "Terminal" then type "G67P0" and then press the enter key
- Turn off and then turn on the GOYA (procedure not recommended).