

RESTAN
ELECTRIC MOTOR
VERSION

**SYSTEM FOR MEASURING RESIDUAL STRESS
BY THE HOLE-DRILLING METHOD**

OPERATING AND MAINTENANCE MANUAL

Calenzano, Florence, Italy

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1 INTRODUCTION

1.1 Presentation of the system

The system presented in this manual is a special version of the system with an end mill operated by a high-speed air turbine.

In this configuration, the tool is rotated by a high-performance electric motor at 300 rpm, specially developed for measuring residual stresses in plastic materials.

The motor is a 24 Vac, brushless model, directly controlled by the same operating and acquisition software as the Restan system with an air turbine.

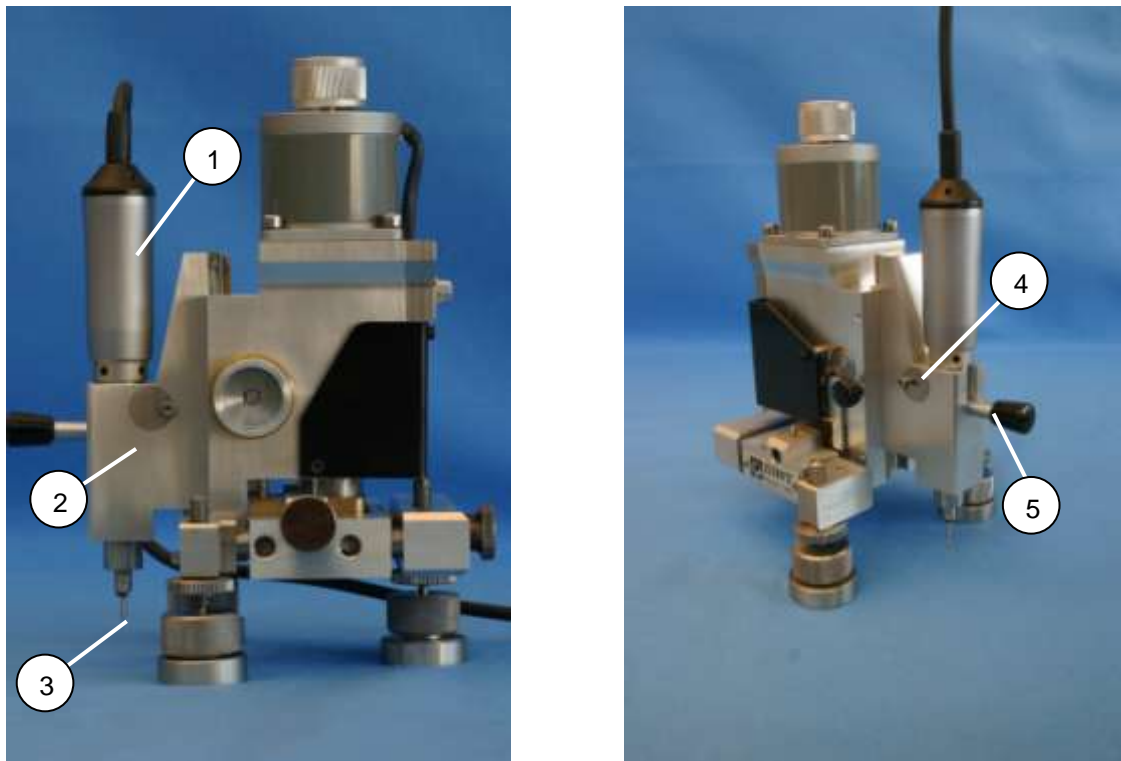


fig 1.1

1. Electric motor powering the end mill
2. Special support for the electric motor and optical system
3. Drilling tool
4. Screw locking the motor in position
5. Spindle release knob

1.2 Electronic Control Unit

The electronic control unit supplied with this system can operate the drilling system with either an air turbine or an electric motor.

The following figure shows the connectors on the rear panel.

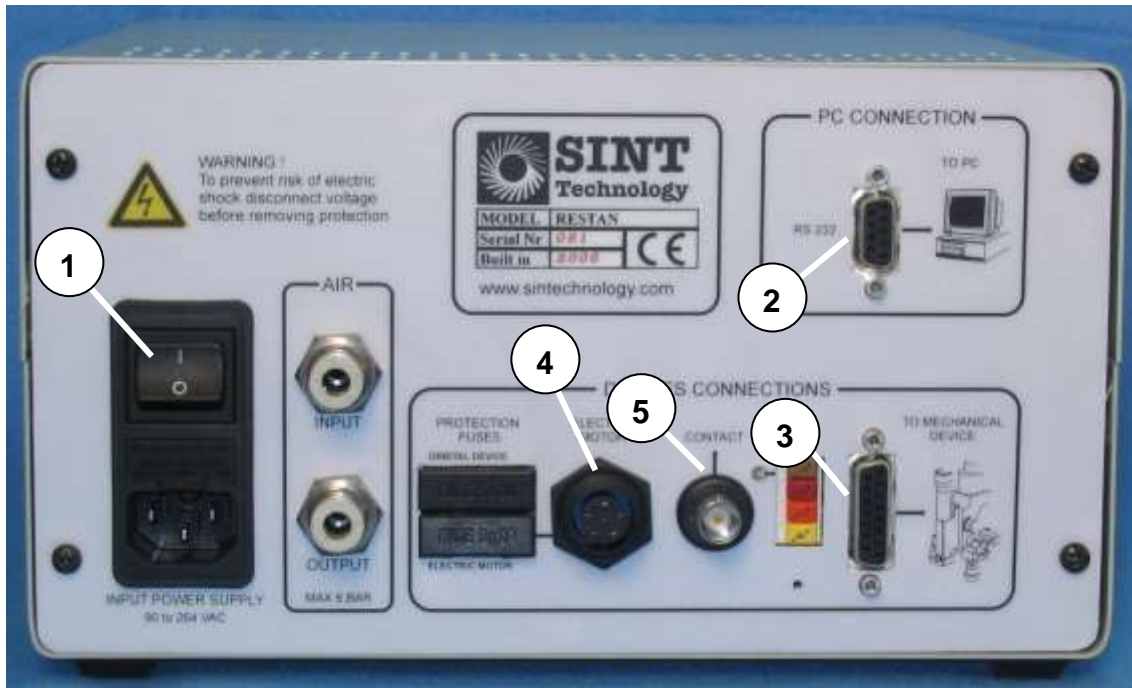


Fig 1.2

- | | |
|---|--|
| 1. On-off switch | 4. Electric motor power supply connector |
| 2. 25-pole connector for PC (RS 232) | 5. BNC cable for end mill positioning (zero-setting) |
| 3. 15-pole connector for stepping motor | |

1.3 General precautions

**CAUTION:**

Precautions and ways to use are described in the standard manual of the standard MTS3000 system and are not show in this paper. Refer then to this manual for general precautions and ways to use.

- Read this manual carefully before going ahead with starting, servicing and/or doing any other type of operations on the machine.
- The safety of the operator and other people near the machine depends on it being used sensibly and carefully so it is necessary to know the position and function of all the controls well.
- The operator must be experienced in using this type of machine.
- Parts subject to wear should be regularly inspected to check that they are in good condition and working properly.
- Under no circumstances should the electrical wiring of the machine be tampered with.
- Unauthorized people should not be allowed to carry out repairs or maintenance.
- Never use petrol, solvents or other inflammable fluids for cleaning the system; use non-inflammable, non-toxic approved commercial solvents.
- Under no circumstances should the micromotor be set in operation without having fitted a tool
- Do not put any kind of oil in the micromotor and/or in any of its components.

2 CHANGING THE DRILLING TOOL

**CAUTION:**

The maintenance and replacement of parts must be made by qualified people, with proven experience, advanced and adequately trained. If you need to make extraordinary and / or special maintenance, you must contact a customer service of the manufacturer.

To change the burs follow the procedure provided herebelow, referring to the figures:

- Loosen a little bit the screw on the support side with the appropriate (3mm) allen wrench (fig. 1.1, number 4).

WARNING: To avoid the disassembling of the motor locking system, loosen the screw only a little bit (the quantity necessary to lift the motor out). Do not loosen or tighten the screw when nothing (motor or optical device) is inside the slide and do not loosen the other screws near this one.



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- Lift out the motor from the top without forcing it; if necessary try and loosen the dowel on the support side a little more



- Turn the knob on the motor side 90° to release the spindle



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- Insert the drill securely and turn the knob back to its original position to lock the burr in the spindle



- Put the motor back in position making sure that the knob fits in the slot on the support



- Tighten the socket head screw for locking the motor in position



- Regularly calibrate the optical device. The procedure is explained in the standard manual and should be done with a centering end mill for an electric motor (diameter 2.35 mm with adapter), provided with the system. Once the alignment has been done, the motor should be changed with the optical system as explained herebelow.

3 FITTING THE OPTICAL SYSTEM IN PLACE OF THE MOTOR

The optical system is fitted before testing the drilling to align the apparatus with the center of the strain gauge and after testing to measure the hole diameter and eccentricity. If the eccentricity is high, it is advisable to recenter the microscope.

The following steps should be followed, referring to the figures, to fit the optical centering system in place of the motor:

- Unscrew the dowel on the support side and remove the motor (as explained in the preceding section)



- Fit the pin on the optical system (see following figures)



- Slide the optical system with its pin into the electric motor seat and lodge it securely; check that the reticle axes are parallel to the two directions of the mechanical system slides (X and Y) and tighten it with the dowel on the support side. If they are not parallel, follow the procedure explained in the standard manual.



4 ELECTRIC MOTOR SPECIFICATIONS

Rotational speed	300 rpm
Chuck diameter	3 mm
Voltage	24 Vac
Torsion	22 N*cm
Acceleration	< 2 m/s ²
Weight	about 240g

5 ACCESSORIES

- √ Electric motor support
- √ Optical system pin
- √ Allen wrench, 3 mm diam.

6 RECOMMENDED PARAMETERS FOR PLASTIC MATERIALS

- End mill feed speed: 0.1 mm/min
- Delay time between drilling steps: 90 seconds (minimum). Recommended: 120 seconds
- It is strongly recommended that the specimen is firmly secured (for example, with X60 HBM adhesive). It is also advisable to install the strain gauge a few hours or even a day before testing and to protect the rosettes (but not the center of the rosette) with a suitable protective material for strain gauge installations. Since testing is automatic, it is also advised that the test be remote controlled using the Windows function or that the operator stays away from the rosette during drilling to avoid disturbance in the acquisition of data.