TRANSLATION OF ORIGINAL INSTRUCTIONS

CRIMP PULL TEST GAUGE
SMST 2000

USE AND MAINTENANCE MANUAL

Revision: **01**

Date: **2023/06**

REVISION

REVISION

MODEL	LANGUAGE	DATE	VERSION	NOTES
SMST 2000	English	14/09/2020	00	Release
SMST 2000	English	01/06/2023	01	Manual update

Mecal S.r.l. reserves the right to modify the characteristics of the product described in this manual without notice.

In case of doubts or difficulties in understanding or interpreting this manual, the original/official version indicated as "ORIGINAL INSTRUCTIONS" on the cover must be considered as the valid version.

All of the images included in this manual should be considered as examples only, as they may not refer to the machine described here.

The **Dynamometer SMST 2000**, the subject of this manual, will hereinafter be referred to as "machine".

STRUCTURE OF THE MANUAL

The manual is divided into 9 chapters, the last of are the attachments.

CHAPTER 1 – GENERAL INFORMATION

This chapter contains general descriptions regarding the structure of the manual.

CHAPTER 2 – SAFETY

This chapter contains a description of the standards, the environmental operating conditions, ergonomics, the accident prevention devices used, the residual risks and the monitoring plates applied to the machine.

CHAPTER 3 – GENERAL DESCRIPTION

This chapter contains a description of the operating principles of the machine, the work cycle, the general technical data and the description of the mechanical, electrical and fluidic units making up the machine itself.

CHAPTER 4 – PACKAGING AND TRANSPORT

This chapter contains instructions for correctly packaging, handling, transport and unloading at the user facility.

CHAPTER 5 – INSTALLATION

This chapter contains instructions for correctly carrying out installation at the user facility, connections to the facility's power supplies, verifications, checks and any adjustments to be carried out before start-up.

CHAPTER 6 – USE

This chapter, intended for operators and maintenance personnel, contains instructions for starting and using the machine in its various operating cycles, with descriptions of the controls available to the operator, the most important operating sequences and use of the diagnostic systems.

CHAPTER 7 – DISMANTLING

This chapter contains warnings and instructions for correctly performing decommissioning and dismantling of the machine at the end of its operational life.

CHAPTER 8 – MAINTENANCE

This chapter, intended for maintenance technicians, contains the machine maintenance plan. It provides warnings, precautions and instructions for properly performing maintenance operations on the machine.

CHAPTER 9 – ATTACHED DOCUMENTATION

INDEX

1. GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains all the information necessary for correct installation, , regular use and suitable maintenance of the machine.

Mecal S.r.l., manufacturer of the equipment in question, will hereafter be referred to as "**Manufacturer**".

The company that purchased the equipment will hereinafter be referred to as "**Customer**".

The Manufacturer requires that personnel in charge of running and maintaining the machine, as well as personnel in charge of transport and assembly operations, read this document.

This document is the use and maintenance manual for the machine:

DYNAMOMETER SMST 2000

and has been compiled in compliance with Machinery Directive 2006/42/EC.

The Use and Maintenance manual is to be considered an integral part of the machine and must be kept until its final disposal. It must be kept by the person in charge of the machine after final installation.

1.2 SUPPORT

For technical support, contact:

MECAL S.r.l.

Registered and production office: Strada per Felizzano, 18 - 15043 Fubine (AL)

Tel. (0131) 792792 - Fax (0131) 792733/792734 Share Cap. € 500,000 fully paid

Register of Alessandria Companies No. 11690 - Alessandria Chamber of Commerce - Economic and Administrative Index No. 153887 - Import Export Code No. AL002563

Tax Code 01328270069 - ISO Code: IT - VAT: 01328270069

1.3 GLOSSARY

Component: constitutive part of the electrical equipment, usually specified by its function, but used in various applications.
Contact: person responsible for conducting certain operations or assessments that may occur during the work or maintenance phase.
Control circuit (of a machine): circuit used to control the operation of the machine and for protection of the power circuits.
Control device: device inserted in a control circuit used for use of the machine.
Danger zone: area inside or near the machine where the presence of an exposed person constitutes a risk to his/her health and/or his/her safety.
Emergency situation: dangerous situation that needs to be urgently interrupted or avoided.
Emergency stop – emergency stop function: function that is provided:
- To avert arising or reduce existing hazard to person, damage to machinery or to work in progress, and
- To be initiated by a single human action

Exposed person: any person who has their body or any part of their body in a danger zone.
Failure: failure: the end of an element's ability to execute a required function.
Fixed guard: guard affixed in such a manner (for example by screws, nuts and welding) that it can only be opened or removed by the use of tools or by destruction of the means to which the guard is affixed.
Guard: physical barrier, designed as part of the machine (for example: using screws, nuts, welds), to provide protection.
Hazard: potential source of harm.
Improper use: use of the machine outside the limits specified in the technical documentation.
Information for use: Protective measure consisting of communication links (for example, text, words, signs, signals, symbols, diagrams) used separately or in combination, to convey information to the user.
Intended use: the use of machinery in accordance with the information provided in the instructions for use.
Machine: set of pieces or components, of which at least one is mobile, connected to each other, and possibly with actuators, with control and power circuits, etc., connected for a well-defined application, particularly for the transformation, treatment, displacement and conditioning of a material.
Interchangeable equipment modifying the function of a machine, which is placed on the market for the purpose of being assembled with a machine or a series of different machines or with a tractor by the operator himself in so far as this equipment is not a spare part or a tool.
Machinery Directive: DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the approximation of the laws of the Member States relating to machinery.
Malfunction: inability of a machine to perform its intended function.
Marking: symbol and writings for identification of the machine, affixed by the Manufacturer.
Movable guard: guard that can be opened without the use of tools.
Operator: person qualified to install, operate, adjust, clean and maintain the machine.
PLC: Programmable Logic Control able to manage and control all machine movements. Equipped with electronic boards to control the various devices and to receive the relative control signals.
Protections (protection criteria): means of protection that uses measures to protect persons against hazards that cannot be rationally eliminated, against risks that cannot be sufficiently reduced by protection measures integrated in the design.

Protective device: means of protection other than a guard.
Protective means: guard or protection device.
Qualified personnel or qualified maintenance personnel: those persons who have attended specialisation courses, training, etc. and have experience in the installation, commissioning and maintenance, repair, transport and handling of the machine.
Residual risk: risk that remains after taking protective measures.
Risk: combination of probability of occurrence of harm and the severity of that harm.
Safe operating procedure: a work method that reduces risks.
Safety measure: means that eliminates or reduces a hazard.
Safety protections: guard or protective device used as a safety measure for the protection of people from present or latent danger.
Supplier: Supplier: entity (Manufacturer, installer, systems integrator) that supplies the equipment or services associated with the machine (the user can also act as a Manufacturer for himself).
Transport: set of operations to transfer the machine from the Manufacturer's assembly site to the Customer's final work site.
User: entity that uses the machine and associated electrical equipment.
Work Area: volume delimited by accident prevention guards and intended for machine operation.

1.4 SYMBOLS

The manual uses some symbols that are intended to draw the attention of the reader and highlight some particularly important aspects.

SYMBOL	MEANING	NOTES
	**HAZARD**	Indicates a danger with risk of injury or death to the user. Pay the utmost attention to the text blocks indicated by this symbol.
	**CAUTION**	Represents a warning of possible deterioration or damage to the machine and/or equipment. Pay attention to the text blocks indicated by this symbol.
	**WARNING NOTE**	Indicates a warning or a note on key functions or useful information. Pay attention to the text blocks indicated by this symbol.
	**ADDITIONAL INFORMATION**	Text blocks containing additional information are introduced by this symbol. This information has no direct relation to the description of a function or the development of a procedure. It may be references to other complementary documentation, such as instruction manuals for the use of attachments, technical documents or other sections of this manual.

1.5 MANUFACTURER CONTACTS

The Manufacturer's Technical Department is always available to Customers for any type of information or clarification concerning use, maintenance, installation, etc.

The latter should always put the questions in clear terms, with references to this manual, always indicating the data shown on the identification plate of the machine in question.

Any requests for support at the Customer's site, or for clarification regarding the technical aspects of this document, must be addressed to:

Mecal S.r.l.
Registered office and Plant: Strada per Felizzano, 18 - 15043 Fubine (AL)
Tel. (0131) 792792 - Fax (0131) 792733/792734Cap. Cap. € 500,000 fully paid
Register of Alessandria Companies n. 11690 - CCIAA Alessandria - REA N. 153887 - N. IEC AL002563
Tax Code 01328270069 - ISO Code: IT - VAT: 01328270069

1.6 SAFETY STANDARDS

The requirements, indications, standards and related safety notes described in the various chapters of the manual are intended to define a series of behaviours and obligations which must be followed when performing the various activities that constitute the intended use of the machine, aimed at operations that are safe for personnel, equipment and the surrounding environment.

The safety standards listed are intended for all authorised personnel, instructed and delegated to perform the various activities and operations of:

- Transport
- Installation
- Operation
- Use
- Management
- Maintenance
- Cleaning
- Decommissioning and dismantling

1.7 MANUFACTURER'S RESPONSIBILITIES

The Manufacturer declines all responsibility deriving from incorrect or improper use of the machine in question and from any damage caused by the use of non-prescribed spare parts, from maintenance operations not carried out correctly or from tampering with circuits, components and system software.

The responsibility concerning the application of safety requirements, reported as follows, is at the expense of the technical personnel responsible for activities foreseen on the machine. Technical personnel must ensure that the operators authorised to carry out the required activities are qualified, that they comply with and are aware of the provisions contained in this document and of the general safety standards applied to the machine.

Failure to comply with safety standards may result in injury to personnel and damage to equipment.

1.8 MACHINE MANAGEMENT

Machine management is only allowed to be performed by authorised and appropriately trained operators, or operators with at least sufficient technical experience.

Operators in charge of machine use and maintenance must be aware that the knowledge and application of safety regulations is an integral part of their work.

Operators not authorised to work on the machine must not have access to their control panels.

Perform the following operations before starting the machine:

- Read this manual carefully.
- Be familiar with which protections and emergency stop devices are present on the machine, where they are located and how they work.

Removing or even partially removing the protections, safety devices or monitoring plates affixed on the machine is prohibited. In the event of malfunction or failure of these devices, immediately repair or replace them.

1.9 CONDITIONS CHECK

Check that machine has not been damaged during transport. Please therefore report any accidents or presence of visible damage (signs or traces of impact) as follows:

- With a written note on the Transport Document.
- Communicating the damage detected by registered letter to the carrier and to **Mecal S.r.l.**, within 48 hours of receipt of the machine.

1.10 WARRANTY

Mecal S.r.l. guarantees that its machines are free from manufacturing defects for the period of time indicated in the stipulated contractual conditions.

The purchaser is only entitled to the replacement of parts recognised as defective: the costs of packaging and transport, as well as any installation, are at the purchaser's expense. In this case, the following must be specified:

- Date and number of the purchase document
- Machine model
- Serial number

No claims for damages for production losses caused by any periods of machine downtime will be recognised.

The warranty does not cover damages due to use that does not comply with the contents of this "Use and Maintenance Manual," which is an integral part of the machine, including any maintenance that does not comply with the instructions provided.

The warranty will not be recognised if any unauthorised modifications have been made to the machine.

Modifications to or tampering with safety devices are strictly prohibited.

In the event of breakages during the warranty period, original spare parts must be used for the warranty to be valid.

Repair work must only be carried out by specialised operators who are familiar with the machine.

2. SAFETY

2.1 GENERAL INFORMATION

The Customer must instruct personnel regarding the risks of injury, the safety devices installed on the machine and the general accident prevention rules provided for by European Community directives and by legislation in the country where the machine is installed.

Operators must be familiar with the position and operation of all machine controls and their characteristics.

Tampering with or unauthorised replacement of one or more machine components and the use of accessories or spare parts other than those recommended can cause a risk of injury.

HAZARD

Excluding/tampering with the safety devices on the machine is strictly prohibited. The Manufacturer declines all responsibility for the safety of the machine in the event of non-compliance with this prohibition.

CAUTION

It is the responsibility of the operator using the machine to ensure that the area is safe and free of people or objects.

CAUTION

Use of the machine processing hot materials is prohibited.

CAUTION

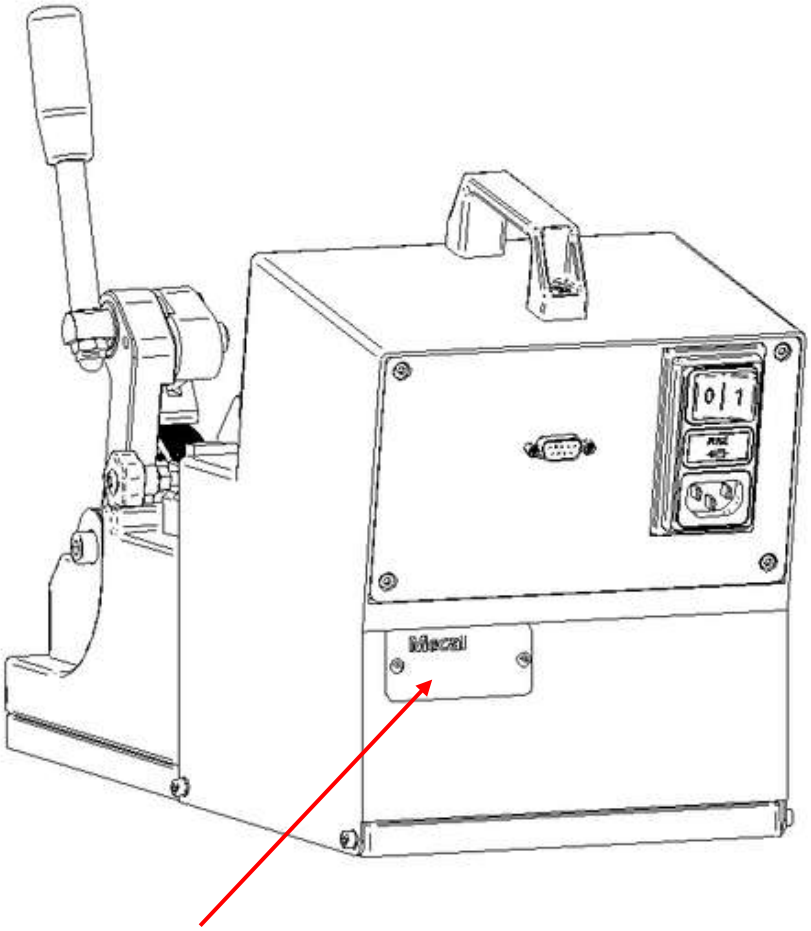
The customer/user is responsible for loading the material to be processed.

2.1.1 MACHINE CERTIFICATION

The machine is supplied with an EC Declaration of Conformity with the essential safety requirements in accordance with Machinery Directive 2006/42/EC (Annex II A) and Electromagnetic Compatibility Directive 2014/30/EU.

CAUTION

Any modification made to the machine will immediately invalidate the CE certification issued by the Manufacturer.



CE Plate

2.1.2 INTENDED AND IMPROPER USES

The machine has been designed and built to carry out pull-out and breaking load tests on crimped terminals on electrical cables.

The machine is able to work with cables that comply with the following limit characteristics:

Minimum applicable force	40 N (9 lbf)
Maximum measured force	2000 N (449.6 lbf)
Pull-out speed	from 15 to 120 mm/min.

The machine cannot be used for any use other than that envisaged or for machining other than that agreed upon.

HAZARD

Use of the machine for purposes not described in this manual is considered **IMPROPER USE**. The Manufacturer declines all responsibility for any damage caused to property and/or persons and deems all forms and types of machine warranty to be forfeited. The Manufacturer declines all responsibility in the event of tampering with the machine, for unauthorised modifications and for maintenance operations performed by untrained personnel.

HAZARD

In the event of abnormal behaviour of the machine or lack of power supply, carrying out any type of movement is prohibited, as that is under the specific competence of the operators in charge of maintenance.

CAUTION

Use of the machine by inadequately qualified and instructed personnel is prohibited. The machine user must have read and understood this document.

2.2 ENVIRONMENTAL OPERATING CONDITIONS

The area where the machine is located must be a covered environment equipped with all the safety arrangements deriving from the laws in force in the user country.

2.2.1 FIRE PROTECTION INSTALLATION

The machine is not equipped with its own fire protection system.

2.2.2 EXPLOSIVE ATMOSPHERE

This machine is not designed or built to work in environments with explosive or partially atmospheric atmosphere.

2.2.3 LIGHTING

The machine is not equipped with its own lighting system.

NOTE

It is the customer's responsibility to install and use the machine in a suitably lit environment.

For this reason, a lighting value of at least 500 LUX is recommended for normal uses with medium details and medium contrasts, as per standard UNI-EN 1837.

2.2.4 ERGONOMICS

The machine must be positioned and adjusted to meet the physical and cognitive ergonomics criteria, considering:

- Easy human/machine interfacing.
- Preventing a prolonged concentration and rhythm conditioned by the machine.
- Work spaces suitable for loading and unloading the machine reels.
- A possible variability in the physical dimensions and strength of the operator working.

In case of maintenance, the units that make up the machine are sized in such a way as not to create fatigue or stress to the operator working.

2.2.5 VIBRATIONS

The machine does not produce vibrations that are dangerous for the health of personnel working.

CAUTION

Excessive vibrations can only be caused by a mechanical failure, which must be immediately reported and eliminated.

2.2.6 NOISE

Noise measurements were made in accordance with the provisions of legislation on acoustics. The phonometric data is kept by the Manufacturer.

The operating characteristics of the machine are such that, when empty, the overall noise generated is less than 75 dB (A).

NOTE

The sound pressure level under actual operating conditions depends on the type of work performed.

NOTE

Measurements of worker noise exposure levels must be carried out by the client in accordance with the legislation in force in their own country.

2.2.7 ELECTROMAGNETIC EMISSIONS

The machine contains electronic components subject to the Electromagnetic Compatibility regulation, conditioned by conducted and radiated emissions.

The emission values comply with the standard thanks to the use of components complying with the Electromagnetic Compatibility Directive, suitable connections and the installation of filters where necessary.

The machine is therefore compliant with the Electromagnetic Compatibility Directive.

CAUTION

Any maintenance on electrical equipment carried out in a non-compliant manner, or involving the incorrect replacement of components, may compromise the efficiency of the equipment itself.

2.3 DISPOSAL OF EXHAUSTED MATERIALS

In its normal operation, the machine does not produce any kind of waste or exhausted material.

There are specific regulations for environmental protection in every country with relation to the disposal of such materials.

The Customer must be aware of these regulations and operate in such a way as to comply with them.

In particular, please see chapter 7 regarding the disposal of the materials that make up the machine.

2.4 DANGER ZONES

There are no hazardous areas in the vicinity of the instrument, created by the instrument or its use.

Make sure that personnel wear personal protective equipment in the vicinity of the dynamometer while it is running.

2.5 SAFETY DEVICES APPLIED TO THE MACHINE

The machine is equipped with the following safety devices:

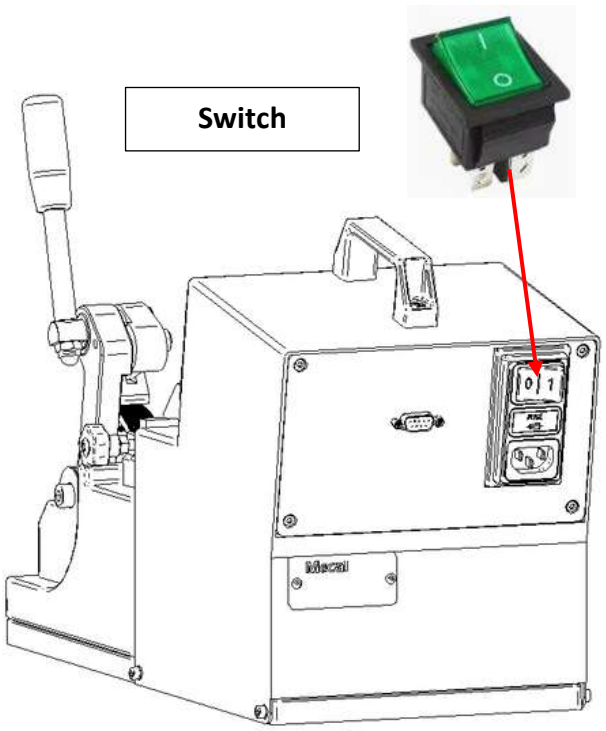
DEVICE	FUNCTION
Illuminated rocker switch	Cuts off electrical power.
Protections	Separates danger zones.
Electronic protection	Stop moving parts immediately when the force limit is exceeded.
Fuses	Cuts off power in case of overload or short circuit.

2.5.1 ILLUMINATED ROCKER SWITCH

Function: Cuts off electrical power.

Features: Before performing any operations on the machine, disconnect the power source by turning the switch on the rear of the electrical box to the (O) OFF position.

The switch is equipped with lighting to easily display the status of the machine.



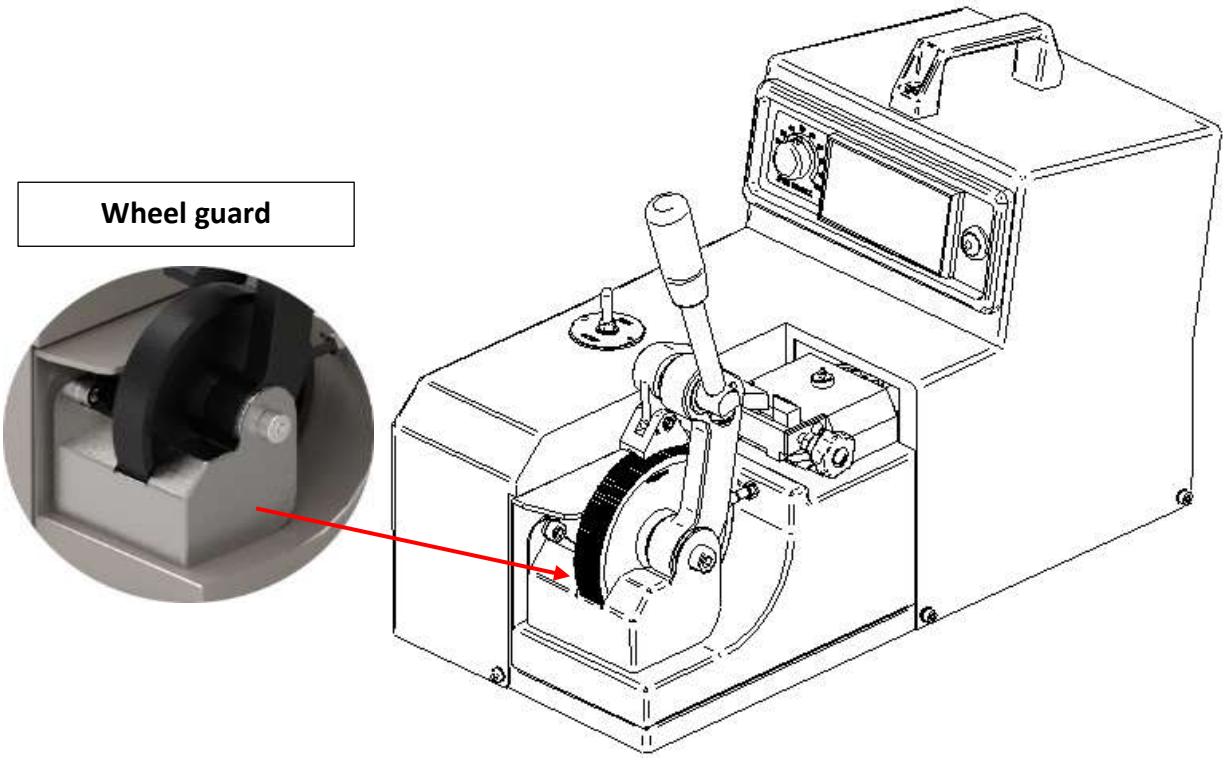
CAUTION

In case of maintenance work on the power switch. The Manufacturer declines all responsibility in the event that the machine is operated with guards incomplete, open and/or not installed.

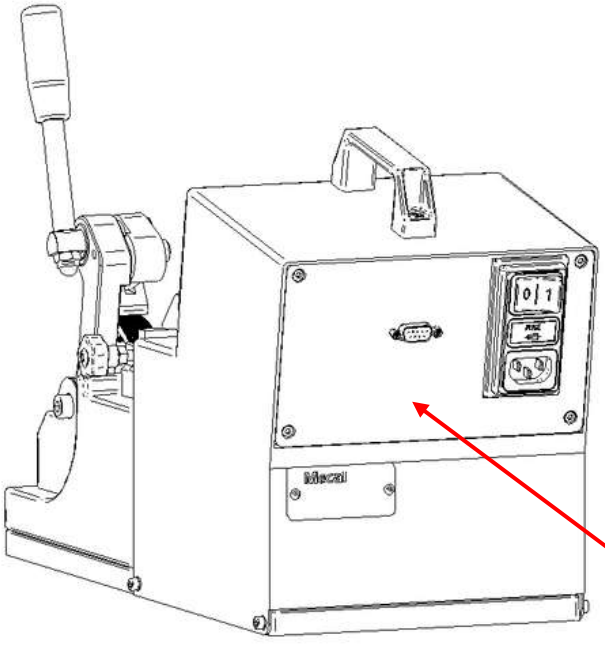
2.5.2 PROTECTIONS

Function: Separates danger zones.

Features: The protections do not allow the operator to accidentally reach any moving parts.



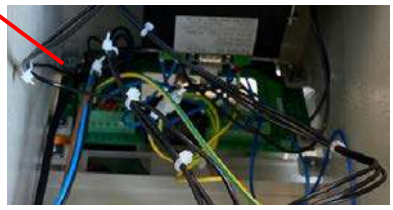
2.5.3 ELECTRONIC PROTECTION



Function: Stop moving parts immediately when the force limit is exceeded.

Features: Mecal's proprietary electronic circuit board has a safety system that intervenes when the maximum load (2000 N) is exceeded, immediately stopping the pulling operation.

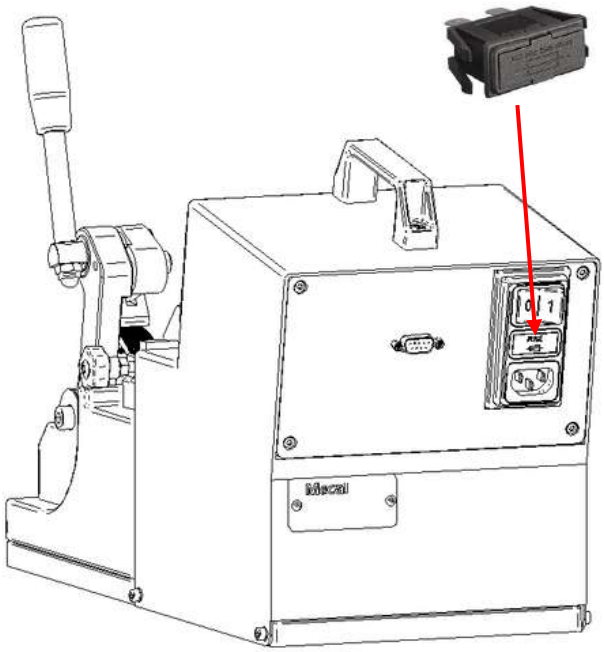
This system preserves the integrity of the machine and ensures operator protection.



2.5.4 FUSES

Function: Cuts off power in case of overload or short circuit.

Features: The fuse is installed inside the fuse holders at the rear of the dynamometer. It intervenes autonomously in the event of an overload or short circuit, interrupting the power supply to the circuit and stopping the machine immediately. The fuse must be replaced after it has been tripped.



2.6 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Persons working on the machine must use personal protective equipment such as to minimise possible risks.

HAZARD

The clothing of those working or performing maintenance on the machine must comply with the essential safety requirements defined by the European community directives and by the laws in force in the country where the machine is installed.

HAZARD

During management and maintenance operations, personnel must wear suitable work clothing so as to prevent accidents from occurring.

To avoid mechanical risks, such as dragging, trapping or other, pull back hair and do not wear bracelets, watches, rings or necklaces.

2.7 RESIDUAL RISKS

2.7.1 GENERAL INFORMATION

All the areas and the parts at risk were evaluated during the design phase, and thus all the precautions necessary to avoid risks to people and damage to machine components have been taken.

NOTE

Periodically check the functionality of all safety devices.

Do not remove the protections present.

Do not insert foreign objects and/or tools into the work area of the machine.

2.7.2 RESIDUAL RISKS

After carefully considering all the possible risks related to the machine, all the solutions necessary have been adopted to eliminate the risks and limit the dangers for exposed persons.

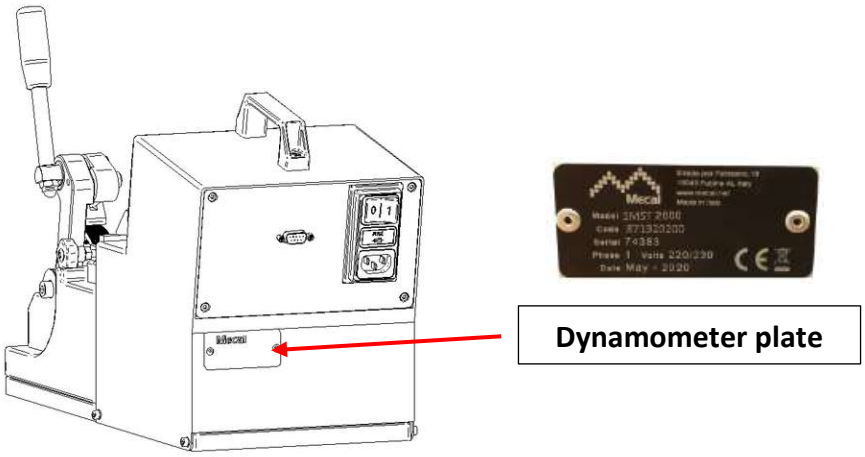
CAUTION

It is necessary to periodically check the regular operation of the safety devices as a precautionary measure for safety purposes.

Making any kind of modification is strictly prohibited, in order not to create additional dangers and consequent unforeseen risks.

2.7.3 PLATES PRESENT ON THE MACHINE

There is a plate on the machine for identification.



CAUTION

Removing the monitoring plates from the machine is strictly prohibited.

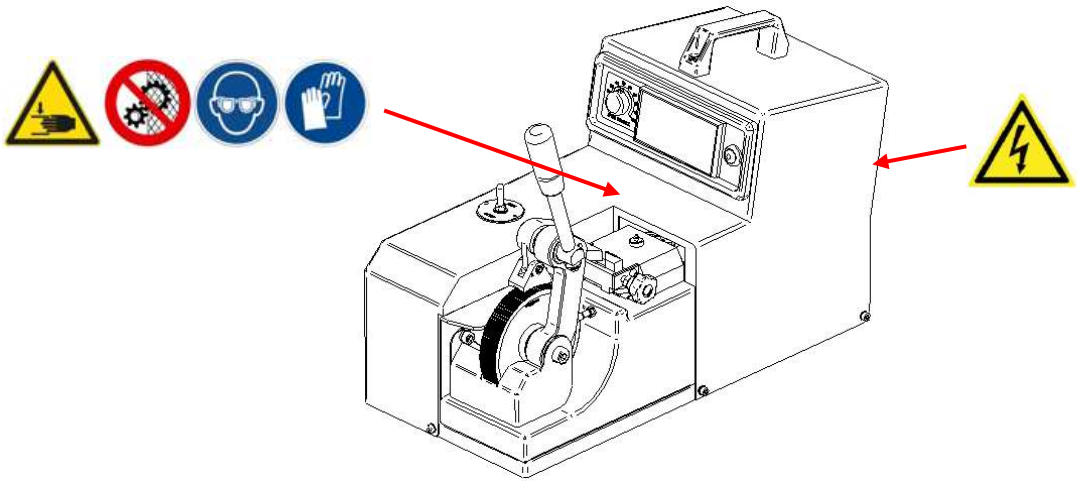
The Manufacturer declines all responsibility for the safety of the machine in the event of non-compliance with this prohibition.

Maintenance service must immediately replace any plates which have become illegible due.

2.7.4 WARNING PLATES PRESENT ON THE MACHINE

The Manufacturer has placed a series of monitoring plates on the machine, defined in accordance with European legislation regarding the graphic symbols to be used.

SYMBOL	MEANING
	Crushing hazard
	Electrical hazard
	Prohibition on the removal of protections and safety devices
	Obligation to wear safety goggles
	Obligation to wear protective gloves



CAUTION

Removing the monitoring plates from the machine is strictly prohibited.

The Manufacturer declines all responsibility for the safety of the machine in the event of non-compliance with this prohibition.

Maintenance service must immediately replace any plates which have become illegible due.

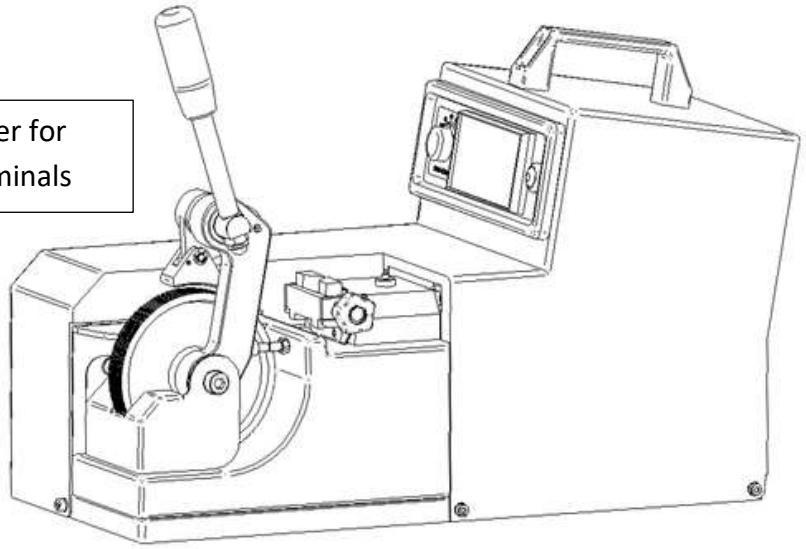
3. GENERAL DESCRIPTION

The machine has been designed and built to carry out pull-out and breaking load tests on crimped terminals on electrical cables. It can be used for measurements of compatible cables with the following characteristics:

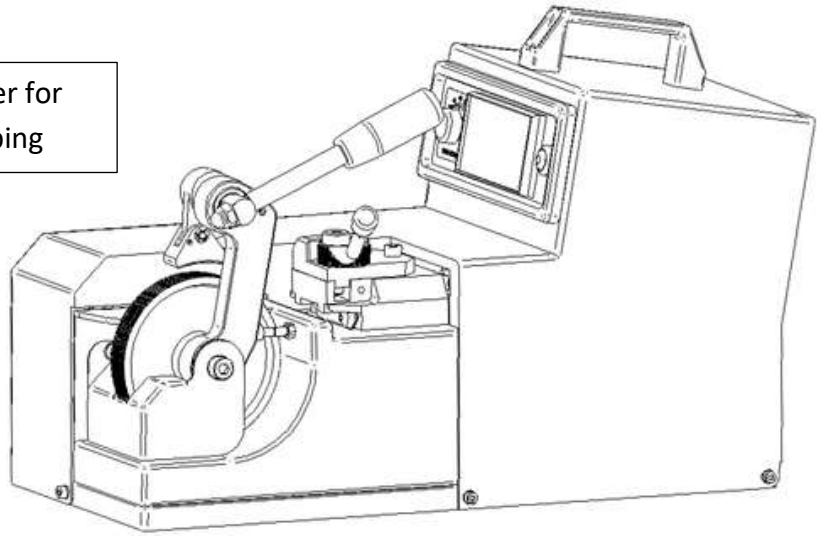
Minimum applicable force	40 N (9 lbf)
Maximum measured force	2000 N (449.6 lbf)
Pull-out speed	from 15 to 120 mm/min.

There are two versions of dynamometers: for use with samples of cables crimped to terminals or samples of cables crimped together (splice).

Dynamometer for crimping terminals

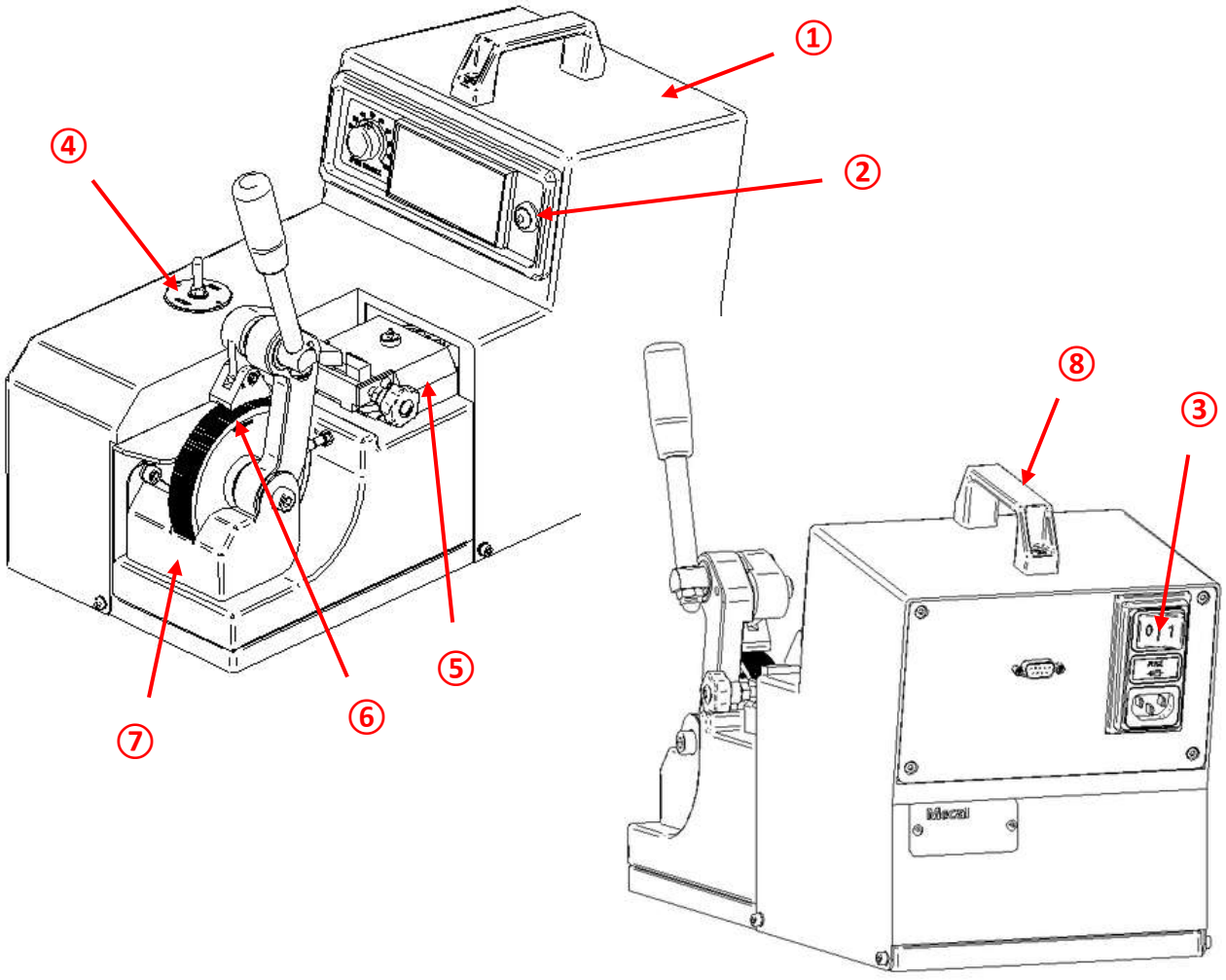


Dynamometer for splice crimping



3.1 LAYOUT

ITEM	DESCRIPTION
①	Machine body
②	Monitor and control buttons
③	Switching on, fuses and power supply
④	Start-up
⑤	Terminal or cable coupling slide
⑥	Pulling system
⑦	Protective safety cover
⑧	Lifting handle



3.2 TECHNICAL FEATURES

The following table shows the main technical features of the machine.

SMST 2000 GENERAL TECHNICAL FEATURES	
Minimum applicable force	40 N (9.9 lbf)
Maximum measured force	2000 N (449.6 in)
Resolution	0.1 N (0.02 lbf)
Precision	± 0.2 %
Pull-out speed	from 15 to 120 mm/min.
Power supply	1x230 Vac 1x100 Vac (upon request)
Consumption	30 W to 230 V
Voltage	200 - 240 Vac 100 - 120 Vac (upon request)
Frequencies	50 / 60 Hz
Unit of measurement	Newton [N] Kilogram-force [Kgf] (upon request) Pound-force [lbf] (upon request)
RS-232 serial interface	Sub-D 9-pin plug
Communication protocol	Modbus
Dimensions	(See paragraph *9.1 – Layout*)
Weight	14 Kg (31 lb)
Degree of protection	IP40
Operating temperature	from +8 to +40 °C
Humidity range for use	from 35 % to 80 %

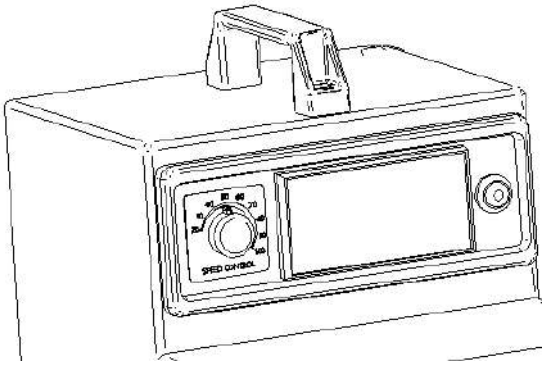
NOTE

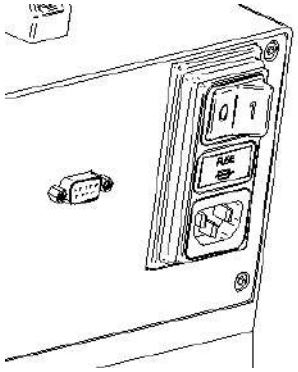
The features shown in the previous table may undergo variations; therefore, please see the attached diagrams for greater precision or verification of the machine features.

3.3 DESCRIPTION OF UNITS

3.3.1 MONITOR AND CONTROL BUTTONS

A large panel is located on the front and features, on the left the cable pull speed selector, in the centre the display for viewing measurements and on the right the button for resetting the measured value.



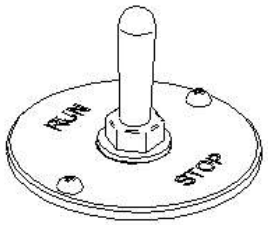


3.3.2 SWITCHING ON, FUSES AND POWER SUPPLY

At the rear is the female IEC C13 connector socket for the power cable, fuse holder and illuminated rocker switch. On the side is also the socket for data interchange.

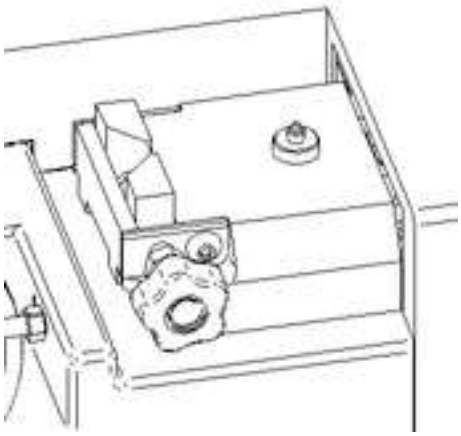
3.3.3 START-UP

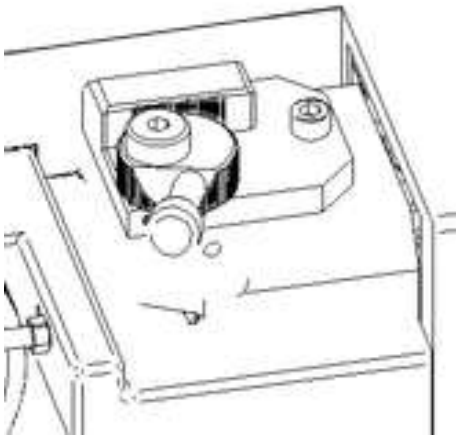
On the side is the lever switch for starting the pulling system.



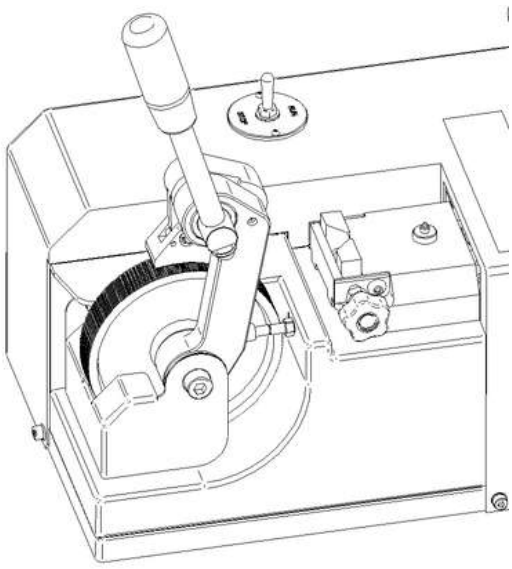
3.3.4 SLIDE

The slide is different for the two versions and provides several terminal attachment points on the first version and a dynamic cable anchoring system on the second version.





3.3.5 PULLING SYSTEM



The wheel which pulls the sample cable is equipped with a lever lock mechanism, which allows the grip on the cable to be maintained during pulling.

When the maximum pull-out load of 2000 N is exceeded, the pulling system is interrupted to preserve the integrity of the machine and the safety of the operator.

3.3.6 PROTECTIVE SAFETY COVER

The gauge is equipped with an integral protective cover that does not allow the operator access to the fast-moving parts of the machine.
In addition, there is another protection under the pulling wheel to prevent foreign objects from wrapping around the slow-moving parts of the machine.

4. PACKAGING AND TRANSPORT

4.1 PACKAGING

Unless otherwise indicated (i.e. sea transport), the packaging does not protect from external weather events such as rain, snow, hail, etc., even when the components are packed and transported in wooden crates. For this reason, if packaging remains exposed to the elements, it is essential that they remain in closed containers until they are finally stored.

All external parts subject to oxidation (machined surfaces, unpainted parts, etc.) are protected by a layer of protective antioxidant oil. The fragile parts are protected by plastic material to prevent damage during lifting and transport.

Example of packaging
Sea transport

Example of packaging
Air and/or ground transport

CAUTION

The load must always be kept in a vertical position.

Any multiple packages, and if indicated on the packaging, must not be stacked one on top of the other.

4.2 TRANSPORT

Depending on the destination, the machine can be shipped in the following ways:

- BY SEA → the various parts that make up the machine are enclosed in flat bottomed crates and anchored with tie rods. The crates are lined and have a door for customs checks. They also contain bags with desiccant salts against moisture and sea salt.
- BY AIR → the various parts that make up the machine are enclosed in flat bottomed crates and anchored with tie rods. The crates are lined and have a door for customs checks. They also contain bags with desiccant salts against moisture and other atmospheric agents.
- VIA GROUND→ transport via ground can be divided into two categories:
  - LONG DISTANCE TRANSPORT, where the various parts of the machinery are covered with protective sheets, enclosed in flat bottomed wooden creates and anchored with tie-rods on the loading surface of the articulated vehicle.

    Carefully follow the instructions printed on the outside of the packaging to lift the crates. Packaging can be recovered for possible re-use; therefore, it is good practice to try to keep them in a protected place in order to avoid damaging them and making them unreliable. If they have to be thrown out, it will be the responsibility of the Customer to dispose of them according to the regulations in force in their own country.

  - MEDIUM AND SHORT DISTANCE TRANSPORT, where each individual component of the machinery is fixed to a platform and covered with protective sheets.

    The anchorage points for lifting are indicated on the transport packages.

    All the indications for identification of the contents and for safe handling are also provided on the outside of the various packages:

    - ✓ Address of recipient and sender
    - ✓ Dimensions (length, width, height)
    - ✓ Gross, net and tare weight
    - ✓ Centre of gravity
    - ✓ Annotations and pictograms (i.e. fragile, tall, etc.).
    - ✓ Packing list plate (a copy must be present inside each package).

4.3 LIFTING AND HANDLING

You must know the weight of the machine before performing any handling and/or lifting.

CAUTION

All handling and/or lifting operations must be carried out by qualified personnel, aware of the standards regarding the lifting and handling of loads, and in full compliance with them.

CAUTION

Use a suitable lifting device, adequate for the weight and the encumbrance of the load to be handled.

CAUTION

Always ensure correct balancing of the load. If it is unbalanced, immediately place it on the ground and reposition it.

CAUTION

When the load is lifted to a height greater than 50 cm, the operators must remain at a safe distance from the perimeter, greater than 2m.

A break in the slings or an uncontrolled movement of the load are in fact serious dangers to personnel safety.

4.3.1 WEIGHT OF PACKAGES

Description	Weight
Complete machine	14 Kg (31 lb)

5. INSTALLATION

Before installing the machine:

- Remove the protective packaging of the various parts that make up the machine.
- Remove any fasteners used for transportation.

5.1 MACHINE INSTALLATION

5.1.1 GENERAL SAFETY PRECAUTIONS

The operations described in this paragraph must be performed by authorised personnel. Unauthorised personnel must remain outside the installation area.

HAZARD

Make sure there is nothing around during installation of the various parts that make up the machine (cables, pipes, etc.) that could cause interference or danger to operators.

CAUTION

Personnel in charge of all installation, connection, checks and verifications must be trained to avoid incorrect operations that could damage the machine.

ADDITIONAL INFORMATION

See the specific manuals for information on the integrated devices.

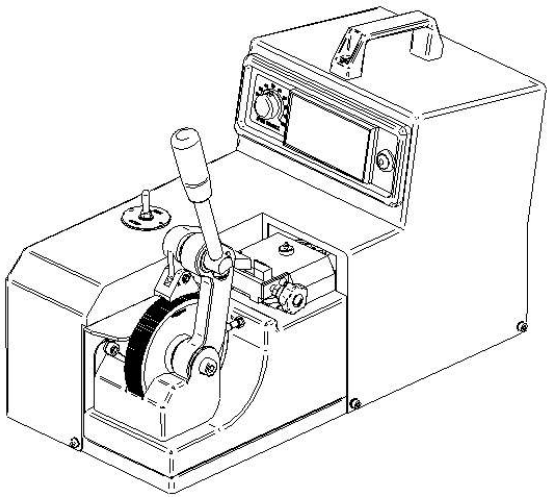
5.1.2 CHOOSING THE SITE AND VERIFYING INSTALLATION REQUIREMENTS

The customer MUST prepare:

- A sufficiently large room, free from obstacles, equipped according to the safety regulations in force in the user country.
- Proper ventilation and lighting
- Appropriate lifting means
- Operating spaces
- Transit routes
- Escape routes
- Flooring capable of supporting the weight of the machine
- A general power supply, including the earthing conductor, according to the characteristics and tolerances required
- A pneumatic supply, according to the characteristics and tolerances required.

5.1.3 POSITIONING AND SECURING THE MACHINE

The dynamometer is a bench-top instrument and can therefore be placed on an existing structure. Check the correct levelling of the machine on the bench, both longitudinally and transversely.



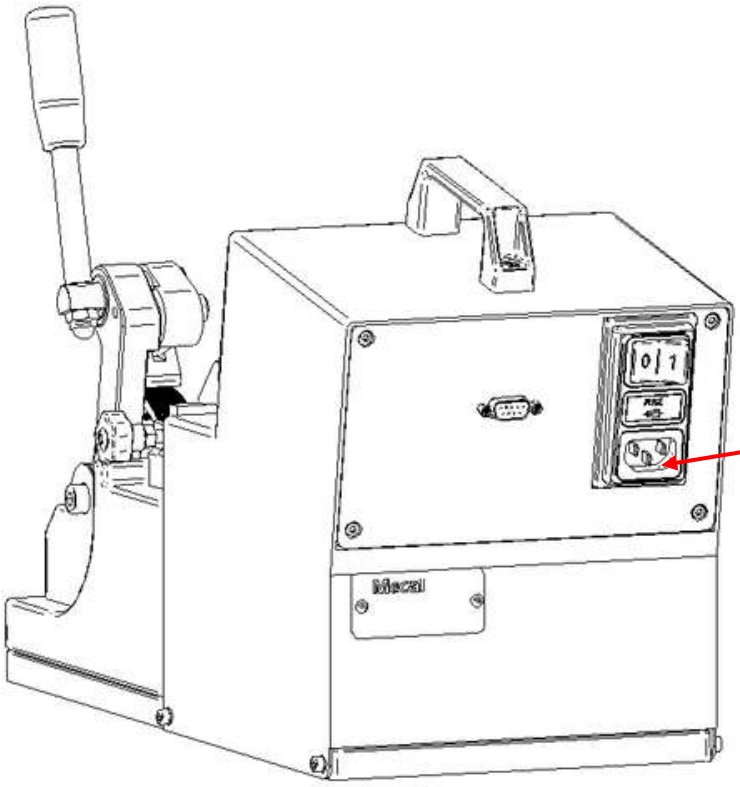
5.2 CONNECTIONS

The machine must have the following connections:

- Electrical ①

HAZARD

Machine power supply connection operations must be carried out solely by specialised personnel and are subject to use of personal protective equipment.



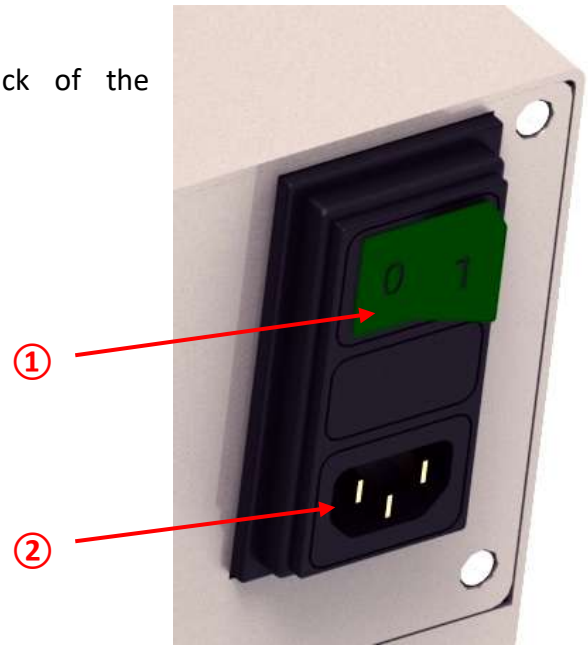
The dynamometer is supplied with a 2 metre cable with an IEC C13 socket at one end, while at the other end the conductors are equipped with ferrule terminals.

IEC C13 socket

5.2.1 CONNECTING TO THE ELECTRICAL MAINS

Before making any electrical connections:

- Make sure the main switch of the power distribution line is in the OFF (O) position and lock it.
- Check that the rocker switch ①, located on the electrical panel, is in the OFF (O) position.
- Make sure that the line voltage corresponds to the voltage indicated on the technical specifications plate and/or on the plate applied to the electrical cable of the crimping machine and/or on the attached wiring diagram.
- First, connect the ground wire.
- Connect the power cables.
- Connect the IEC C13 socket to the back of the dynamometer ②.
- Move the main switch to the ON position (I).
- Move the switch ① to the ON position (I).



HAZARD

Make sure that the electrical distribution line is sized according to the machine load.

Make the connection to the earthing system and to the equipotential protection circuit before any other connection to the electrical distribution line.

ADDITIONAL INFORMATION

For more information about the system, please refer to the attached wiring diagram.

5.3 CHECKS AND VERIFICATIONS

Before starting the machine, carry out a series of checks and verifications in order to avoid problems during its operation.

CAUTION

Before making any movement, make sure that there are no faults in order to avoid damage to the machine. Before cancelling any faults, check the cause and eliminate it.

5.3.1 GENERAL CHECKS ON THE MECHANICAL UNITS

HAZARD

These checks and verifications must be carried out with the machine stopped and with all energy sources deactivated.

- Perform a general visual inspection of the various units making up the machine, making sure that there are no particular mechanical faults or foreign bodies.
- Check that the machine parts and its guards have been properly anchored.
- Verify that the handling parts are properly lubricated if they need to be.

NOTE

Contact the Manufacturer immediately if any problems are detected.

CAUTION

Insulate the power cables by channelling them and divide them from the signal cables to avoid electromagnetic interference. Follow the reference standards.

5.3.2 ELECTRICAL SYSTEM CHECKS

Proceed with a general check of the electrical system, in particular:

1. Check that all cables are connected and secured.
2. Check the grounding of the system.
3. Perform the power insertion test and check the power and voltage distribution to the auxiliary circuits.
4. Verify the correct connection of the interconnections between the electrical panel and peripherals (complementary to the machine).
5. Verify the correct operation of:
   - Buttons and Selector switches
   - Indicator lights

ADDITIONAL INFORMATION

For more information about the system, please refer to the attached wiring diagram.

5.3.3 SAFETY SYSTEM CHECKS

Proceed with a general check of the safety circuits:

1. Check that the guards of the casing are correctly installed and working.

HAZARD

The safety of the machine is not guaranteed in the event of tampering and/or removal of safety devices.

ADDITIONAL INFORMATION

For more information about the safety system, please refer to the attached wiring diagram.

5.4 UNIVERSAL INTERNATIONAL RECYCLING CODES FOLLOWING INSTALLATION

Following the removal of machine packaging and its installation, remove the packaging from the area surrounding the machine and dispose of it in accordance with the regulations in force. The international recycling codes are indicated below.

Simbol	Code	Description
Plastics		
	#1 PET o PETE	Polyethylene Terephthalate or arnite: water bottles, drink bottles, shampoo bottles.
	#2 HDPE	High-density Polyethylene: yogurt containers, detergent bottles.
	#3 PVC o V	Polyvinyl Chloride: food containers.
	#4 LDPE	Low-density Polyethylene: frost bags, squeezable bottles.
	#5 PP	Polypropylene or Moplen: bottles.
	#6 PS	Polystyrene: disposable glasses.
	#7 - #19 O	All other plastics.
Paper		
	#20 PAP	Corrugated cardboard: boxes.
	#21 PAP	Non-corrugated cardborad: food packaging.
	#22 PAP	Paper: food packaging, newspaper, paper bags.
	#23 - #39	All other paper.
Metallic materials		
	#40 FE	Steel.
	#41 ALU	Aluminum: cans.
	#42#49	All other metallic materials.

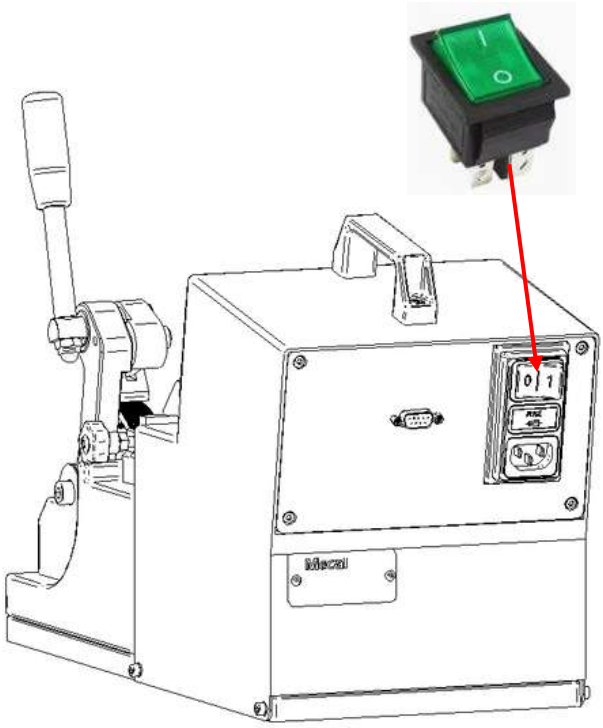
Simbol	Code	Description
Wood materials		
	#50 FOR	Wood.
	#51 FOR	Cork.
	#52 - #59	All other wood materials.
Textiles		
	#60 TEX	Cotton.
	#61 TEX	Jute.
	#62 - #69	All other textile materials.
Glass		
	#70	Vetro trasparente/incolore: bottiglie d'acqua.
	#71	Vetro di colore verde: bottiglie di vino.
	#72	Vetro di colore marrone: bottiglie di birra.
	#73 - #79	All other glasses materials.
Composite materials		
	#80 #81 #82	Paper and cardborad / Various metallic materials. Paper and cardborad / Plastic. Paper and cardborad / Aluminum.
	#83 #84	Paper and cardborad / Latta. Paper and cardborad / Plastic / Aluminum.
	#85	Paper and cardborad / Plastic / Aluminum / Tin.
	#86 - #89 #90	All other composite materials. Plastic / Aluminum.
	#91 #92 #93 - #94	Plastic / Tin. Plastic / All other metallic materials. All other composite materials.
	#95 #96	Glass / Plastic. Glass / Aluminum.
	#97 #98 #99	Glass / Tin. Glass / Various metals. All other composite materials.

6. USE

6.1 MAIN ROCKER SWITCH

An illuminated rocker switch is located on the rear of the dynamometer.
This switch has two positions:

- OFF (O) position, where the power supply is interrupted and the light on the switch is therefore off.
- ON position (I), in which the power supply is switched on and the light is steady green.



6.2 ELECTRICAL CIRCUIT

The machine is designed to automatically and continuously drive and manage the pulling cycle. This is managed by the electronics inside the box.

NOTE

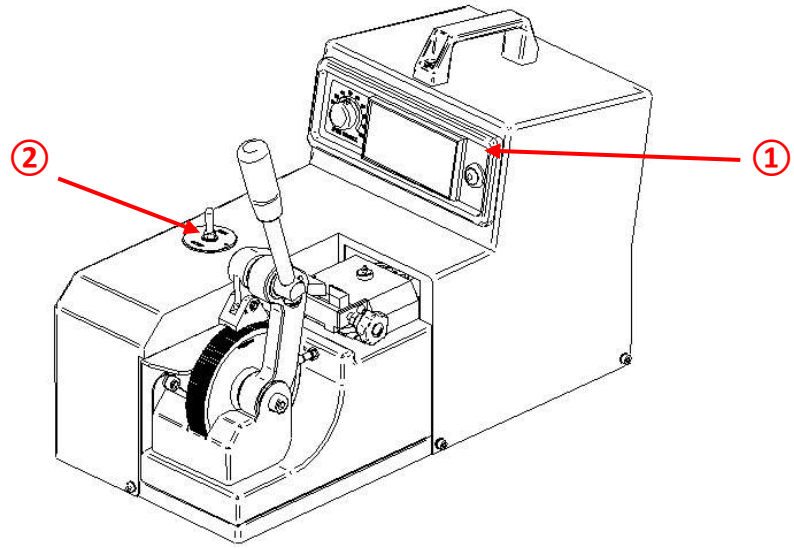
Since all machine movements are controlled by electrical and/or electronic signals, it is advantageous if these signals are controlled by qualified personnel.

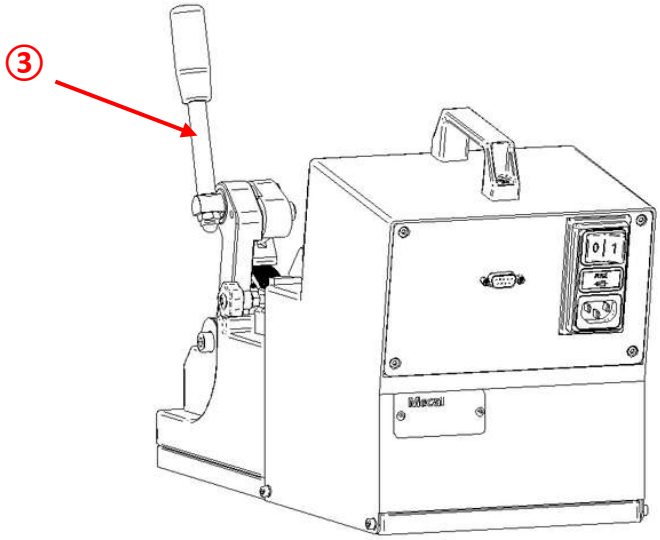
Further clarifications on the electrical connections and the components used are available on the relative wiring diagram and on the relative bill of materials.

6.3 CONTROL SYSTEMS

Below is the location of the control systems on the machine.

- ① Control panel.
- ② Lever switch for starting/stopping pulling.
- ③ Lever for pulling system.





6.3.1 PANEL

The panel houses the display to show the pulling result; on the left is the cable pulling speed selector and on the right the button to reset the measured value.

Drive	Description
	Type: selector. Function: adjust the cable pulling speed.
	Type: button. Function: to reset the value on the display.

6.3.2 SWITCH

The switch for starting and stopping the pulling wheel is located on the surface of the machine.

Drive	Description
	Type: Lever switch. Function: Driving and stopping the pulling wheel.

6.3.3 HAND LEVER

The hand lever that accompanies pull-out is located on the right side of the dynamometer.

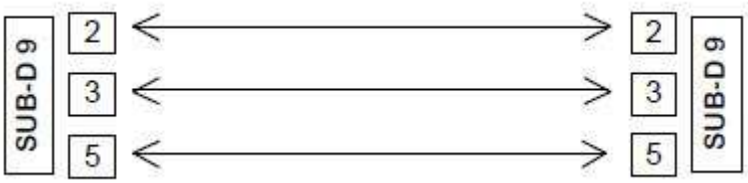
Drive	Description
	Type: Hand lever. Function: To accompany cable pull-out.

6.4 INTERFACE SYSTEMS

The rear of the control panel houses the interface connector for exporting the acquired values. Data is obtained with MOD-BUS transmission protocol.

Communication parameters	
Transmission speed	9600 bps
Data bits	8 bit
Parity	None
Stop bits	1
Instrument address	1
Protocol	Modbus
Format	RTU

Connection pin-outs:



Serial command execution:

Command: request value shown on the display

Response: in the example the display shows the value 0.0

RS-232 serial port commands:

	Command to instrument									Response received from instrument								
Function:	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8	9
Acquisition	01	03	17	88	00	02	41	95		01	03	04	00	00	00	00	FA	33
							CRC16										CRC16	

6.5 MACHINE ARRANGEMENT

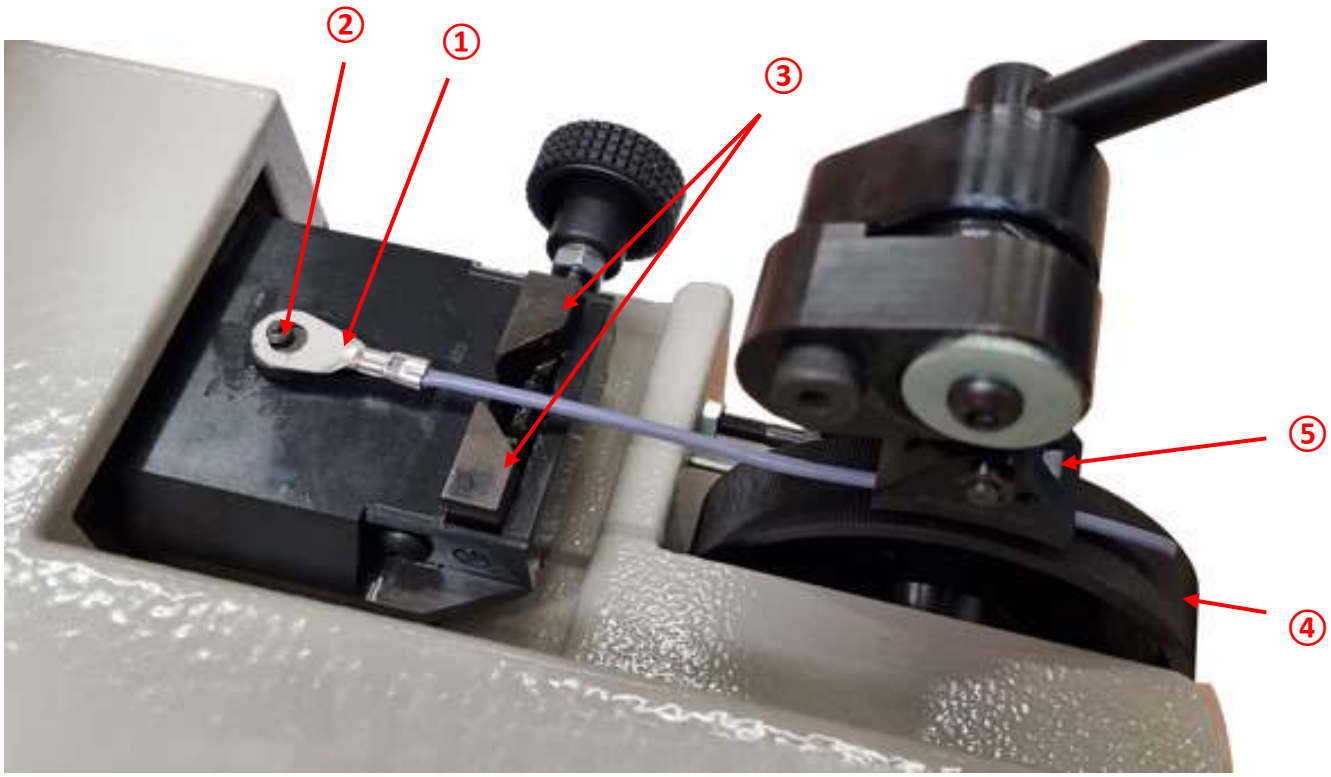
6.5.1 CABLE LOADING

Depending on the version of the dynamometer, it is possible to process cables crimped to terminals or cables crimped together (splice).

6.5.1.1 CABLE LOADING ON SMST 2000

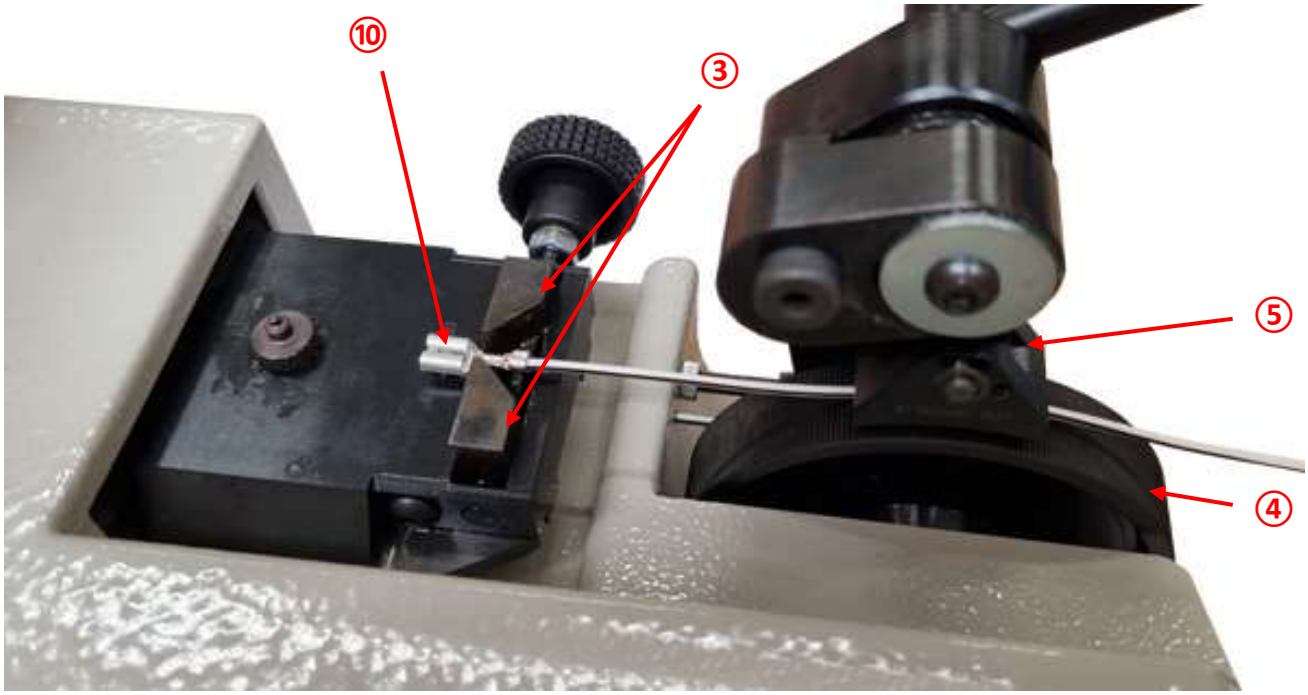
Cables with eyelet terminals

The eyelet terminals ① can be inserted into the pin ② on the slide and the cable passed through the open teeth ③ of the clamp.
The cable must then be passed between the pulling wheel ④ and the clamping sliding block ⑤.
The minimum length of the cable suitable for pulling through in this position is approx. 160 mm [6.3 in].



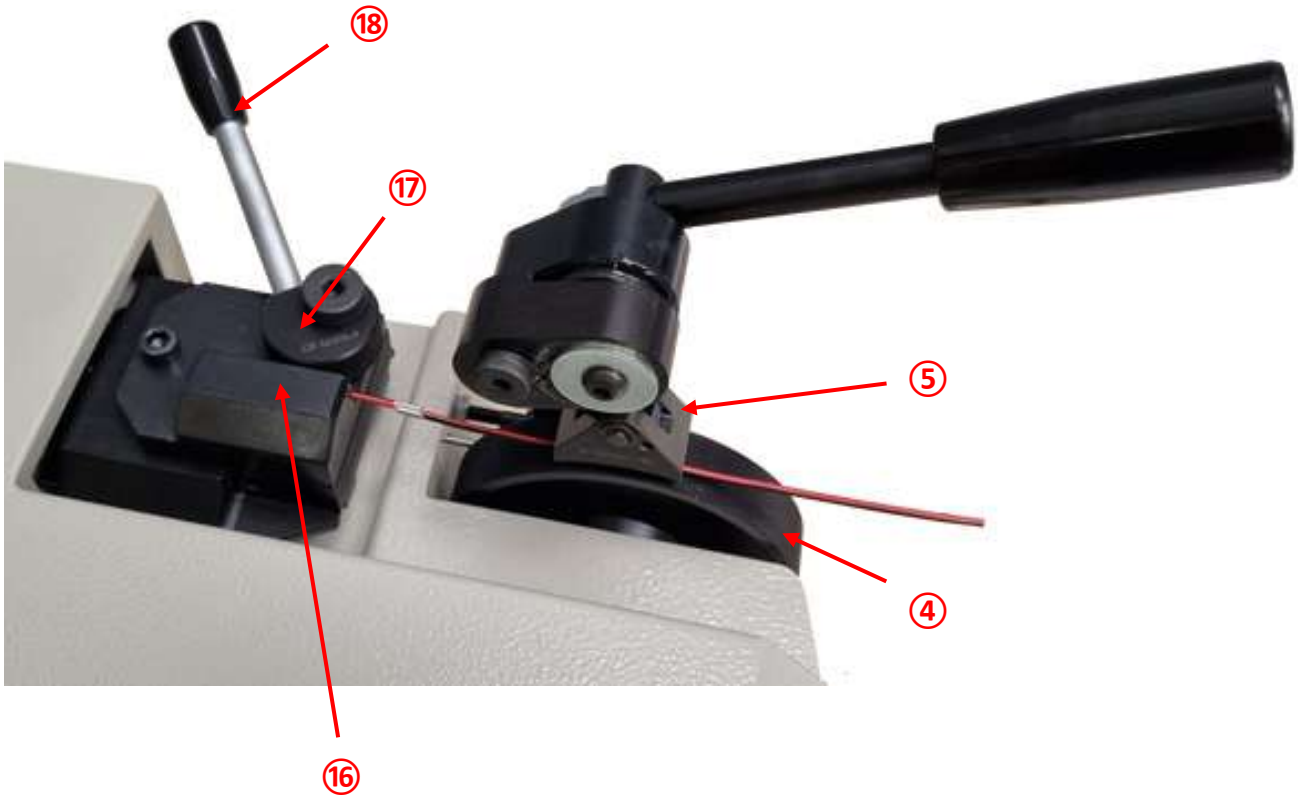
Cables with open terminals

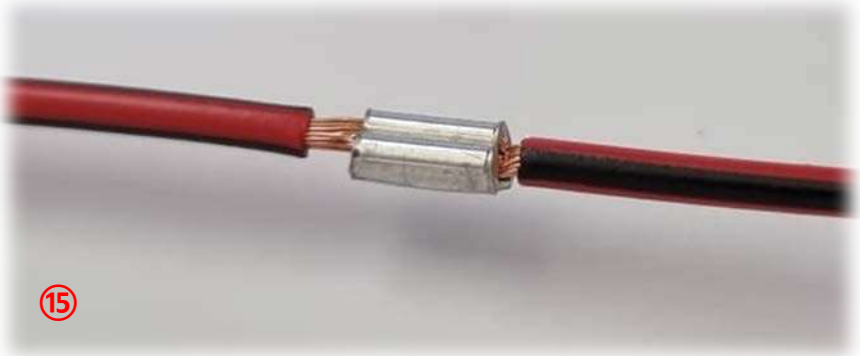
The open terminals ⑩ can be held in place by the teeth ③ of the clamp.
The cable must then be passed between the pulling wheel ④ and the clamping sliding block ⑤.
The minimum length of the cable suitable for pulling through in this position is approx. 130 mm [5.1 in].



6.5.1.2 CABLE LOADING ON SMST 2000 SPLICE

Splice type crimping ⑮ between two cables must be held in place by one of the two cables, positioned between the knurled surface of the gripper support ⑯ and the gripper wheel ⑰.
To open the gripper wheel, turn the handle ⑱ to the right; to close the gripper, turn the handle to the left.
The cable must then be passed between the pulling wheel ④ and the clamping sliding block ⑤.
The minimum length of the cable suitable for pulling through in this position is approx. 50 mm [2 in] the cable at one end and 100 mm [4 in] the cable at the other end.





Detail of splice crimping

6.6 MACHINE USE PROCEDURES

6.6.1 INITIAL CHECKS

The operator must check the following before starting the machine:

- Make sure that all power sources are properly connected to the respective power supply networks.
- Make sure that there are no foreign bodies in the radius of action of the machine.
- Check that the machine is not in maintenance or cleaning status.

6.6.2 CONNECTING POWER

Before starting the machine:

- Connect the electricity.
- Set the illuminated rocker switch on the instrument body to the ON (I) position.

6.7 OPERATING MODE

When the power is switched on, the dynamometer display lights up and shows the value “0.0”.
If the instrument is already switched on and the display shows the previous measured value, proceed with zeroing by pressing the red button (the value on the display is reset to “0.0”).

To begin pulling, it is necessary to:

- Set the lever switch to the “RUN” position.
- Position the cable according to paragraph 6.5.1 - *Cable loading.*
- Apply light pressure on the pulling system handle.

6.7.1 PULLING SPEED

The cable pulling speed can be varied using the regulator. The table shows the correspondence between the position of the regulator and the pulling speed.

Regulator position	Pulling speed [mm/min]
10	15
20	35
30	50
40	65
50	78
60	90
70	105
80	115
90	120
100	120

6.8 EMERGENCY STOP

The cable pulling operation can be interrupted by the dynamometer electronics when the maximum load of 2000 N [449.6 lbf] is exceeded.

HAZARD

All status reset operations after an emergency stop must be carried out with the dynamometer switched off.

CAUTION

Be careful during status reset operations after an emergency stop so as not to damage parts of the machine and/or equipment.

When the limit is exceeded, LEV2 appears on the display:

6.8.1 RESTORING THE INITIAL MODE

The dynamometer must be returned to its initial state after an emergency stop.

The procedure is as follows:

- Make sure that the machine is switched off.
- Perform all checks to make sure the machine is not yet in maintenance.
- Lift up the pulling system handle and release the cable with one hand, while holding the body of the dynamometer with the other hand.
- In the splice version, it is necessary to free the cable from the gripper by turning the handle connected to the gripper wheel clockwise.
- Clean the pulling area with a puff of air to remove any processing residue.
- Set the illuminated rocker switch on the instrument body to the ON (I) position.
- Move the lever switch to the “RUN” position and check the correct rotation of the pulling wheel (it should have a constant motion and there should be no strange noises).
- If the result is positive, return the lever switch to the “STOP" position and continue as described in paragraph 6.5 - *Machine arrangement and* 6.6 - *Machine use procedures*.
- If the result of the check is negative: contact Mecal S.r.l. technical support and report any malfunctions.

6.9 SWITCHING OFF THE MACHINE

To switch off the machine, the lever switch must be set to the “STOP” position, set the illuminated rocker switch in the OFF (0) position and put the padlockable disconnecting switch on the electrical panel in the OFF (O) position.

6.10 UNLOADING THE MACHINE

CAUTION

Before making any movement, be sure to switch off the machine.

See the paragraph dedicated to switching off the machine for information.

6.10.1 CABLE UNLOADING

When finished working, leave the dynamometer free of any processing residue:

- Make sure that the machine is switched off.
- Raise the pulling system handle and free it of any processing residues.
- In the splice version, the gripper must be opened by turning the handle connected to the gripper wheel clockwise and freeing it of any processing residues.
- Clean the pulling area (slide, wheel and pulling system) with a puff of air.

7. DISMANTLING

The following paragraph contains some recommendations and indications to correctly carry out the operations for decommissioning, dismantling and removal of the machine at the end of its operating life.

ADDITIONAL INFORMATION

The operations described below are the sole responsibility of authorised personnel.

- Make sure that there is enough space around the machine to allow personnel to perform all necessary movements without risk.
- Move the padlockable disconnecting switch to the OFF position (O).
- Disconnect the mains supply.
- Disconnect the dynamometer power cables.
- Disassemble the machine, proceeding downward for each unit.

HAZARD

Be very careful of the possible falling of parts and/or components of the machine during removal. This could cause serious harm to operators.

- Remove the moving parts and, as much as possible, separate the various components by type of materials (plastic, metal, etc.), to be disposed of through separate collection.
- Remove and move the machine parts from the work area taking all necessary precaution.
- Before lifting considerable size and/or weight components, check that the lifting devices are correctly secured and use only suitable slings and equipment.

ADDITIONAL INFORMATION

Disposal operations must be carried out in accordance with the regulations in force in the country where the machine is installed.

NOTE

If difficulty arises in disassembly, demolition and dismantling of the machine or for greater safety, contact the Manufacturer and indicate the cause of the removal and the serial number of the machine.

- The machine is built with different recyclable or non-recyclable materials. For this reason, its removal involves careful separation of the materials: glass, steel, aluminium, copper, bronze, special alloy, plastic, etc.
- The Manufacturer shall not be liable for damage caused by the use of any individual components differing from those prescribed.

CAUTION

Scrapping must be carried out in compliance with the laws in force. These rules must be respected.

7.1 DISPOSAL

Throughout the entire period of use of the machine, different types of waste materials are produced/used or exhausted, such as lubricants, etc.. Some specific regulations for environmental protection apply for the disposal of some of these materials.

The following environmental protection rules must be obeyed regarding the disposal of used lubricants:

- Lubricants risk contaminating water and soil; therefore, never pour lubricating products on the ground, in the water, or in sewer drains. Any infringement of these rules may be punishable by law. When using lubricants, keep an oil binder close on hand.
- Carefully recover the used lubricants, separating the mineral-based products from the synthetic-based ones. Upon disposal, comply with the regulations in force regarding the disposal of used oils.

It is the Customer's obligation to be aware of the laws in force in his/her country and to operate in such a way as to follow these laws.

Device disposal is subject to directive listed below:

User information

Part of the Operating Instructions

Scrupulously store and comply with equipment

All instructions contained in this information are general safety precautions which we strongly recommended following. They may not however only specifically relate to single parts or procedures relating to use and may necessarily appear in other parts of this publication and/or in instructions for use of other pieces of equipment, of which they are an integral part.

WEEE Policy

Under Article 13 of Legislative Decree 25 July 2005, n. 151 "Implementation of Directives 2002/95/EC, 2002/96/EC and 2003/108/EC, regarding the reduction of hazardous substances in electrical and electronic equipment, including the disposal of waste."

"SEPARATE COLLECTION"

The wheeled bin symbol on the equipment or packaging indicates that the product must be collected separately from other waste at the end of its life.

The user must therefore give or (have a third party give) equipment at end of life to the appropriate differentiated collection centres for electronic and electro-technical waste or return it to the dealer upon purchase of a new equipment of equivalent type, in the ratio of one to one.

Appropriate separate collection for the subsequent recycling, treatment and environmentally compatible disposal of decommissioned equipment helps prevent negative impact on the environment and health and promotes the re-use and/or recycling of the materials making up the product.

Illegal dumping of the product by the user entails the application of administrative penalties (Article 255 and on of Legislative Decree N. 152/06) provided by law.

When disposing of the individual parts of the press due to replacement, we recommend the following CER codes:

Iron, Steel	CER 170409
Copper, Bronze, Brass	CER 170401
Aluminium	CER 170402
Plastic material	CER 170203
Used oil	CER 130205
Electrical parts	CER 160214

These codes are indicative and it is the responsibility of the equipment owner to ensure the correct disposal mode and codes.

8. MAINTENANCE

8.1 GENERAL SAFETY PRECAUTIONS

Maintenance, troubleshooting and repair operations are only allowed to be performed by authorised personnel.

Personnel in charge of machine operation and maintenance must be properly trained and have in-depth knowledge of accident prevention regulations. Unauthorised personnel must remain outside the work area during operations.

The accident prevention precautions contained in this paragraph must always be strictly observed during machine operation and maintenance in order to avoid harm to personnel and equipment.

These precautions will be referred to and further detailed in the Manual each time a procedure involving the risk of harm or injury will be required, by means of CAUTION and HAZARD notes:

HAZARD

Hazard notes precede an operation that can cause injury if not performed correctly.

CAUTION

Caution notes precede an operation that can cause damage to equipment if not performed correctly.

Restore the existing protections, checking their correct functioning, at the end of each maintenance operation.

SAVING

It is advisable to download the documents of each machine in possession, for easier and more immediate consultation.

8.1.1 GENERAL HAZARD NOTES

- High voltages can cause death on contact. Always operate with the utmost caution and according to the accident prevention regulations in force in the country.
- There are moving parts on the machine when it is running which can cause serious damage to people. For this reason, cleaning and specialised maintenance operations, relative to the dismantling or replacement of components on the machine and on the control units, must be performed with the system switched off and with systems unpressurised.
- The main disconnecting switches must be in the OFF position and locked with the safety padlock.
- Affix specific warning signs ("MACHINE MAINTENANCE - DO NOT CONNECT POWER") in correspondence with the electrical panel and on the air treatment unit.
- Keep away from the holes and from the drain cocks during system pressure discharge operations.
- Avoid the use of flammable or toxic solvents.
- Always use protective goggles and gloves when performing maintenance operations on the equipment.
- Make sure that the tools to be used are in perfect condition and have insulated handles, where required.
- Make sure that the insulation of the cables and conductors on test equipment does not show the slightest sign of breakage or damage.
- Failure to ground the equipment can cause serious personal injury. Always make sure that the ground connections are present and that they comply with standards.
- Prolonged overloads or failures can cause the overheating of electric motors and electrical equipment, with the creation of harmful fumes. Immediately cut off the power supply for safety and do not approach the equipment until the fumes have been dispersed with adequate ventilation. Avoid inhaling the fumes left inside the equipment during repairs.
- In case of fire, never use water jets on the equipment. Disconnect all power supplies and use CO2 fire extinguishers.
- Avoid prolonged, excessive or repeated skin contact with lubrication products and change clothes immediately if soaked, as lubricants are very harmful to the skin.
- Do not handle lubricants (such as oils, greases, etc.) in the presence of electrical sparks or open flames.

HAZARD

Lubricants are flammable products. Comply with the indications provided by the signs placed on the containers.

- Before making connections, carefully inspect all the connections and make sure there are no dirt or defects on the threading.
- Before applying pressure to the systems following a repair, verify the correct tightness of connections and joints.
- Before operating the equipment, always make sure that maintenance personnel are outside the protected area and that tools or materials have not been left near the equipment.
- As much as possible, troubleshooting activities must be performed outside the protected area. If it becomes necessary during troubleshooting activities to carry out interventions with the control unit and the systems powered, all precautions required by safety standards must be taken for operation in the presence of dangerous voltages and of live units.
- Always keep away from any component that can be set in motion by pneumatic pressure, when the latter has not been completely discharged from the systems.
- Do not wear objects that could get caught in the equipment or act as conductors (chains, bracelets, etc.).
- Maintenance, repair and troubleshooting interventions must end with verification of correct machine operation and with the restoring of all its safety features.

8.1.2 GENERAL WARNINGS

- Maximum machine reliability and minimum maintenance costs are the consequence of a scheduled maintenance and inspection that is scrupulously followed throughout its entire life. Strictly comply with the established maintenance time intervals and the frequency of interventions according to specific needs in relation to the machine production cycle.
- If operations of a certain significance are required, it is advisable to contact the manufacturer for any clarifications on the project or for technical support.
- Before starting any checks and maintenance operations, it is advisable to remove dirt from the machine.
- Always use perfectly dry air during cleaning and with pressure not exceeding 0.2 Mpa.
- Always use tools in perfect condition and specially made for the operation to be performed. The use of unsuitable or inefficient equipment can cause serious damage.
- During dismantling, mark the individual parts with an identification plate to ensure that they will be correctly reassembled.
- After each maintenance operation involving the disconnection of wiring and/or fixed and mobile parts, verify that the number/plate matches with the fixed or mobile part.
- Before restarting the equipment after a breakdown, carefully inspect it to check for any damage.
- Except after a breakdown, never intervene on the adjustments and positioning of the limit switch microswitches, if present: tampering with them can cause serious damage.
- Always take the utmost care in checking the lubrication on the various machine components, as insufficient or defective greasing can be detrimental to proper functioning.
- For lubrication, only the recommended lubricants or lubricants with equivalent and known and proven qualities must be used.

- The lubricants used must have good emulsion stability and be unalterable by ageing.
- It is absolutely necessary to continue to use the lubricants used when filling for the first time.
- Upon completion of the traditional maintenance activities shown on the sheets, technical maintenance personnel must also perform instrumental predictive maintenance operations when required, consisting of specialised analyses and checks aimed at predicting the occurrence of faults over time on some machine components.

8.2 QUALIFICATION OF MAINTENANCE PERSONNEL

CAUTION

The safety manager shall ensure that all the people working on the machine have received all the instructions concerning their task contained in this manual, including the initial installation and commissioning operations.

8.2.1 GENERAL SKILLS

To meet the need for ever-increasing qualification in the field of maintenance, maintenance personnel must:

- Be familiar with the directives in force concerning accident prevention during work performed on machines with motor drives and be able to apply them.
- Have read and understood the paragraph on "Safety devices applied to the machine".
- Know the fundamental construction and functions of the handling systems.
- Know how to use and consult manufacturing files and the machine documentation.
- Take responsibility for making autonomous decisions regarding work on fully automatic manufacturing systems.
- Be willing to adapt to technological changes on the machines.
- Note irregularities in the production process and take the necessary measures, if necessary.

8.2.2 SKILLS RELATED TO QUALIFIED PERSONNEL

The composition and qualification of the personnel teams indicated in the maintenance plan are those recommended by the Manufacturer.

If necessary, the various operations can also be carried out by personnel with the same or higher qualifications who have followed corresponding training courses

The professionals responsible for intervening on the machine are as follows.

Machine manager

Typical activities:

Quality control and maintenance on part handling systems, in particular:

- Use and evaluation of diagnostic system results
- Use of the machine in its normal operating conditions and restoration of operation after the emergency stop switch has tripped
- If necessary, quality control and taking the necessary quality maintenance measures
- Cleaning of some parts of the machine (supporting elements, fixing elements)
- Collaboration to perform the following activities:
  - ✓ Maintenance
  - ✓ Troubleshooting and repairs

Carrying out regular checks/verifications, in particular:

Regular checks/verifications, in particular:

- Seal check of piping
- Lubrication effectiveness check
- Check of the state of wear of protective devices
- Check of the state of wear of cables and flexible hoses
- Checks for the absence of oil leaks visible around the hydraulic systems, where present
- Checks for the absence of foreign bodies in the machine work area
- Operational check on signal lamps
- Checks of operating pressures and flow rates in the hydraulic, pneumatic where present, lubrication systems

Required technical knowledge:

- Knowledge of machine use
- Knowledge of the lubricants used and the dangers associated with their use
- Logical search methods for failures and the evaluation of results
- Ability to organise in order to command and direct the necessary measures to return the machine to its functional state of use
- Professional experience on handling systems for special pieces (automatic handling systems, element handling systems, etc.)
- Basic knowledge of control techniques and pneumatic where present, hydraulic and electric regulation

Required qualification:

- Complete training as an industrial mechanic, specialising in the technical automated systems sector.
- Instruction and training on the machine are ensured by the Manufacturer.

Lubrication personnel

Typical activities:

- Regular operations to empty and fill lubricant tanks on systems
- Checks of the lubricant level in the lubrication control units (where present)
- Checks of the lubricant level at points of motion
- Cleaning of lubricant tanks and replacement of their contents (where present)
- Topping up of consumed lubricant reserves
- Replacing too old or used lubricants

Required technical knowledge:

- Knowledge of the lubricants and greases used in the various interventions
- Ability to work independently according to pre-defined lubrication plans
- Knowledge of the correct methods of eliminating used lubricants, in the context of environmental protection

Required qualification:

- This work can be carried out by qualified personnel who have undergone a sufficiently long training period on the machine.

Mechanical maintenance personnel

Typical activities:

- Perform preventive maintenance, overhaul and, if necessary, repair of mechanical units, in particular:
- Checks on the execution of movements
- Checks of mechanical clearance
- Repair of mechanical units

Required technical knowledge:

- Substantial knowledge of mechanical, pneumatic and hydraulic installations
- Knowledge of numerical controls used on the machine
- Fundamental knowledge of electrical control and regulation techniques
- Ability to evaluate the results of reviews and to decide on necessary measures
- Knowledge on preparing audit reports

- Knowledge of measurement and test methods to determine actual machine conditions

Required qualification:

- Complete training as an industrial mechanic, specialising in the technical sector.

Electrical/electronic maintenance personnel

Typical activities:

- Performing preventive maintenance, overhaul and, if necessary, repair of electrical and electronic units, in particular:
  - ✓ Analysis of microprocessor equipment failure
  - ✓ Analysis of electronic circuit failure

Required technical knowledge:

- Knowledge of troubleshooting and repair methods for faults in the control system, carried out through diagnostic systems, computerised control systems or similar equipment

Required qualification:

- Complete training as an industrial electronics engineering, specialising in the technical sector of devices.

8.3 SAFETY CONTROL PLAN

CAUTION

Electrically or mechanically bridging the circuit breakers on the safety circuits or tampering with them in any way is strictly prohibited.
Periodically check the efficiency of the safety systems on the machine.
This procedure must be repeated as part of normal maintenance practice.

8.3.1 CHECKS AND FUNCTIONAL TESTS ON SAFETY DEVICES

These operations must be carried out by competent personnel with specific knowledge on the use of safety devices.

ON/OFF SWITCH

Press the rocker switch on the machine and make sure that it works.

LEVER SWITCH

Check that the lever switch starts and stops the pulling wheel correctly.

ASSEMBLY FASTENERS

Check that nuts and bolts have not become deteriorated. Particular attention must be paid to the fixing screws on the parts.

CAUTION

Maintenance personnel must periodically check the functionality of safety devices.

8.4 MACHINE STOP PROCEDURE

Before carrying out the maintenance procedures described in the following chapter, the operator must stop and put the machine in maintenance status, following the procedure below:

- Set the machine in optimal conditions to be able to resume operation without delays due to abnormal cycle conditions.
- Isolate and padlock the power sources of the machine, if maintenance operations require it. In other cases, make no changes.
- Check for the presence of residual energy and discharge it before operating on the device, if necessary.
- Affix the sign "MACHINE IN MAINTENANCE - DO NOT OPERATION - WORKS IN PROGRESS, DO NOT RUN" near the main switches.

- At the end of the maintenance operations, restore the previously deactivated power supplies.
- Before resuming normal operations on the machine, re-check the entire system in accordance with the start-up procedures indicated in this manual.

8.5 CLEANING

Periodic and accurate cleaning allows the machine to always be kept in order and efficient.

CAUTION

Do not use alcohol or other alcohol-based products to clean Lexan protections and the displays.

The use of alcohol-based products ruins and compromises the mechanical characteristics and functionality of the parts.

- Clean the work area with compressed air.
- Spray a film of protective oil on the metal parts of the slide and pulling system if the dynamometer is not to be used for an extended period of time.

8.6 MAINTENANCE SHEETS

To guarantee the reliability of the machine, you need to ensure regular maintenance at the premises of the manufacturer who, in addition to the maintenance operations reserved for it, will carry out instrument testing in order to issue the calibration certificate.

FREQUENCY	DESCRIPTION
At the end of each use	Clean the slide and pulling system of any processing residues.
Every six months	Make sure that no fasteners have become loose.
Annually	Calibrate the dynamometer.

WARNING

The instrument's calibration certificate is valid for one year.
Contact Mecal S.r.l. technical support as indicated in paragraph 1.2 (SUPPORT) to request dynamometer maintenance and calibration.

MAINTENANCE LOG

DATE	OPERATOR	DESCRIPTION OF INTERVENTION

8.7 SPARE PARTS

No spare parts are available, as the instrument must not be opened by anyone other than Mecal S.r.l. technical support. **On penalty of forfeiture of the calibration certificate and warranty.**

ADDITIONAL INFORMATION

In the event of faults and/or breakage of the instrument, contact Mecal S.r.l. technical support as indicated in paragraph 1.2 (SUPPORT).

8.7.1 FUSES

Mains supply fuse: 2A 250V FF 5x20 – Code 870270007

To replace the fuse: open the door with the help of a flat screwdriver and remove the blown fuse. Insert a new fuse in the fuse box and close the door again.

8.8 TROUBLESHOOTING AND PROBLEM RESOLUTION

PROBLEM	POSSIBLE CAUSE	SOLUTION
The machine does not start and the indicator light on the power switch is off.	Power supply not connected to the mains.	Connect the power supply to the mains.
	Switch set to OFF (O).	Move the switch to the ON position (I).
	Blown fuses.	Check fuses for continuity and replace if necessary.
The machine does not start and the power light is on.	The system has failed.	Restore machine status.
	The system is blocked due to the maximum pulling force being exceeded.	Restore machine status.
The display does not show the pull-out value but is running.	The display is off.	Contact the Manufacturer.
	The display is on.	

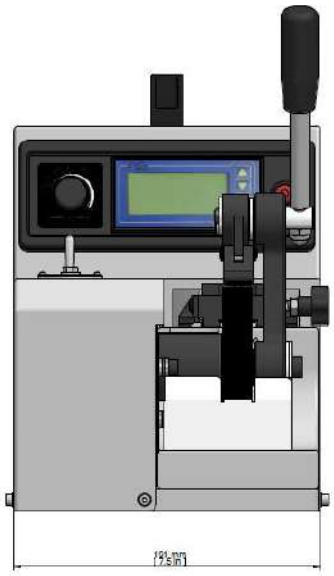
9. ATTACHED DOCUMENTATION

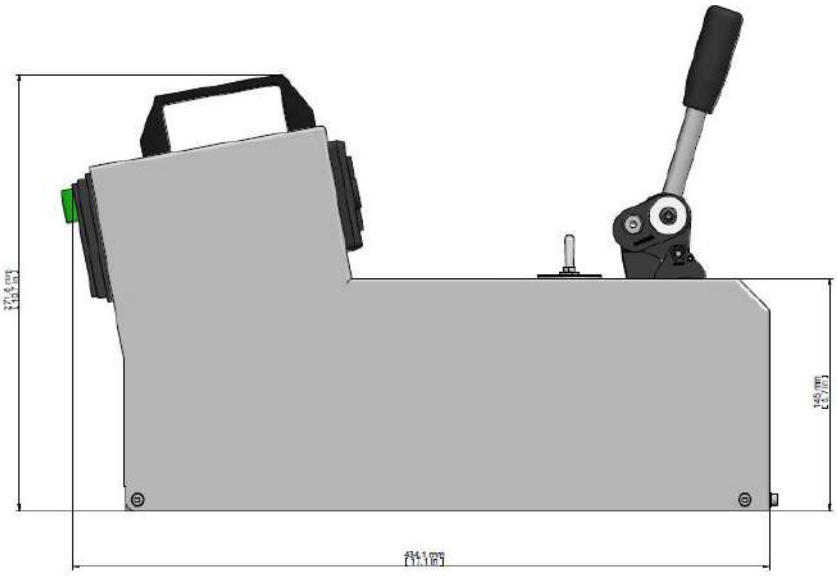
The following documents will be inserted at the end of this manual.

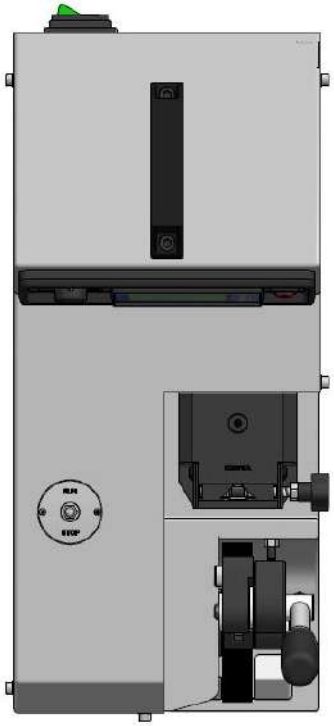
ATTACHMENT NR.	DESCRIPTION
9.1	Machine layout and detail of the working height
9.2	Exploded diagram of the machine
9.3	Wiring diagram

9.1 LAYOUT

9.1.1 SMST 2000







9.1.2 SMST 2000 SPLICE