TRASLATION OF ORIGINAL INSTRUCTIONS

CRIMP DATA ANALYZER

CDA10

USE AND MAINTENANCE MANUAL

Model: **CDA10**

Customer:

Serial number:

Year of manufacturer: **2019**

Revision: **01**

REVISION

REVISION				
MODEL	**LINGUA**	**DATE**	**REVISION**	**NOTES**
CDA10	English	10/08/2019	00	Release
CDA10	English	10/01/2020	01	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 **Crimp Data Analyser – CDA10** addressed by this manual will hereinafter be referred to as "interchangeable equipment" or "equipment".

The **Crimp Data Analyser – CDA10** is an interchangeable device which, assembled with a main system called "machine," adds a new function to the latter.

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

CONTENTS

1. GENERAL INFORMATION

1.1 INTRODUCTION

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 "**Client**".

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

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:

CRIMP DATA ANALYZER - CDA10

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

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) - Italy

Tel. +39 (0)131 792792 - Fax (0)131 792733 / 792734 Fully paid share cap. € 500.000

Register of Alessandria Companies n. 11690 - CCIAA Alessandria - REA N. 153887 - N. IEC AL002563

Tax Code 01328270069 – ISO Code: IT – VAT n.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 work or maintenance.
Control circuit (of a machine): circuit used to control the operation of the machine and for protecting 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.
protection of persons from a present or latent hazard.
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
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 Client'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	NOTE
	**HAZARD**	Indicates a hazard with risk of injury or even death for the user. Pay close attention to 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 of key features or of useful information. Pay attention to the text blocks indicated by this symbol.
	**ADDITIONAL INFORMATION**	Text blocks that contain complementary 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 Clients 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) 792733/792734 Fully paid share cap. € 500.000
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.

La garanzia non sarà riconosciuta per la macchina sulla quale sono state eseguite modifiche non autorizzate.

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.

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.

2.1.2 INTENDED AND IMPROPER USES

The CDA10, combined with the press, has been designed and built to compare the force curves of crimping with reference curves and to check the quality of the work.

Operating specifications:

Range	0 – 20 kN
Temprerature	0 – 70 °C

The machine cannot be used for any use other than that envisaged .

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 equipment 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

The equipment does not produce noise that are dangerous for the health of personnel working.

NOTE

Measurements of worker noise exposure levels must be carried out by the customer 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 equipment 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

The equipment has no danger zones. See the machine use and maintenance manual to outline the danger zones of the press.

2.5 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.

2.6 RESIDUAL RISKS

2.6.1 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.

2.6.2 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.

2.6.3 PLATES PRESENT ON THE MACHINE

The Manufacturer has installed a series of monitoring plates on the equipment, defined in accordance with European legislation regarding the graphic symbols to be used. The plates in question are in a clearly visible position on the machine.

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

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.

ADDITIONAL INFORMATION

For information concerning the monitoring plates installed on the integrated machine parts, please see the specific manuals.

3. GENERAL DESCRIPTION

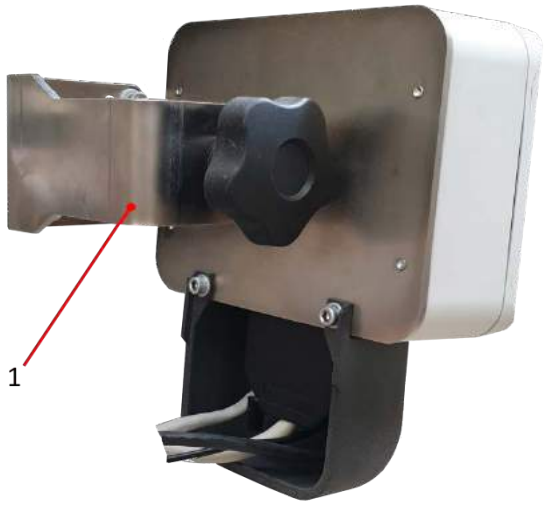
The control unit detects and analyses the force profile obtained by crimping. The profile is compared with a previously learned one and, in the event of defective crimping, the unit emits a signal to the press that disables the operating mode.

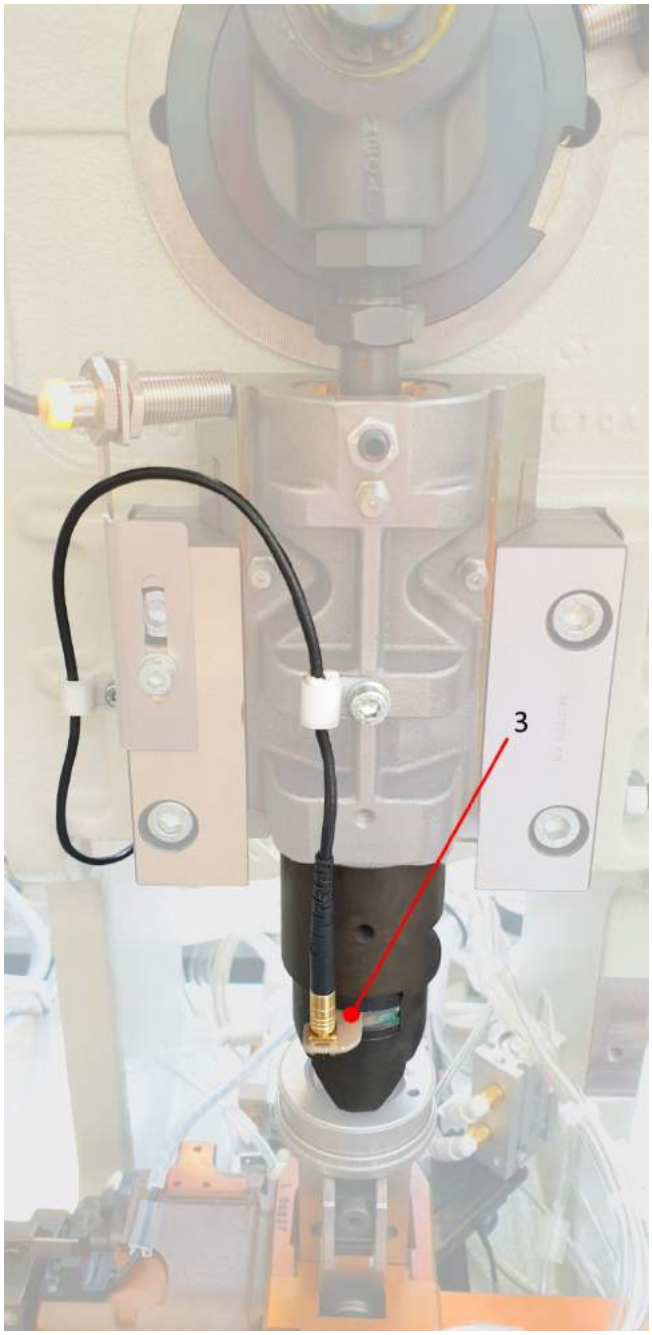
Operating specifications:

Range	0 – 20 kN
Temperature	0 – 70 °C

3.1 LAYOUT

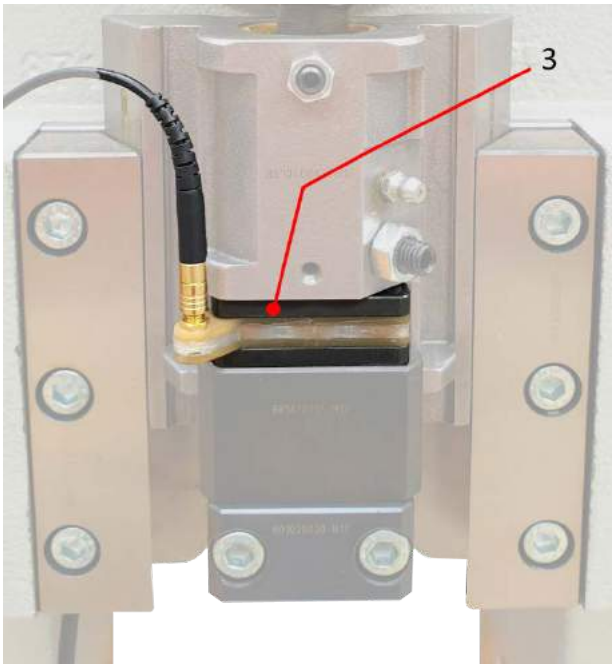
ITEM	DESCRIPTION
1	Adjustable support
2	Control unit
3	Force cell sensor
4	Encoder

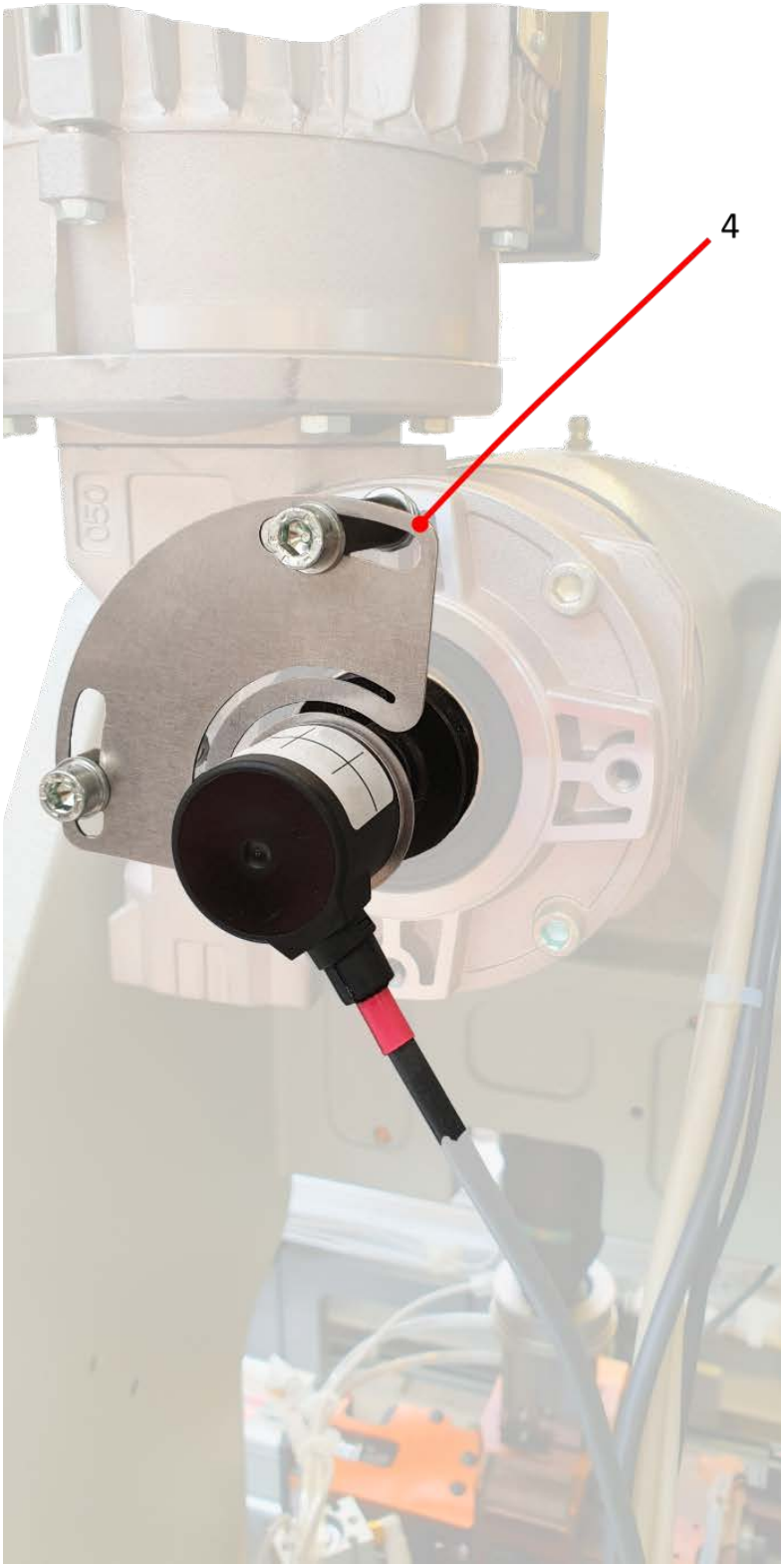




Installation on **TT** and **P107** presses.

Installation on **P040** and **P080** presses.

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3.2 TECHNICAL FEATURES

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

GENERAL TECHNICAL FEATURES	
Measuring range	0 – 20 kN
Resolution	10 Newtons
Repeatability	0,1 %
Sensor type	Piezo-ceramic
Power supply (from the press)	9 – 24 Vdc
Evaluation time	< 20 ms
Communication protocol	TCPIP / HTTP / UDP
Dimensioni (unità di controllo)	85 x 103 x 35 mm
Protection degree	IP40
Operating temperature	da 0 a +70 °C

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.

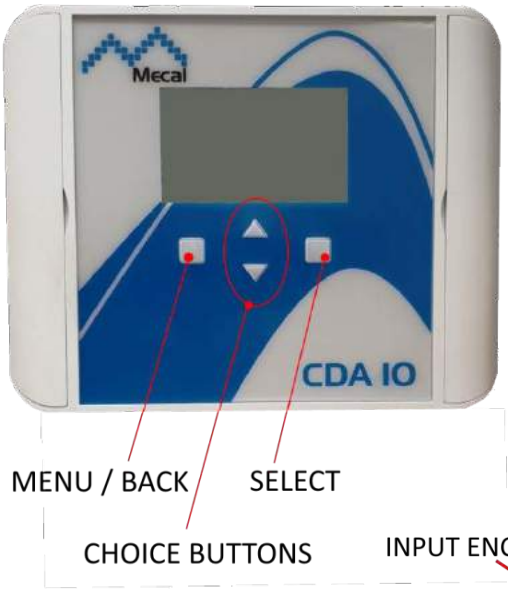
3.3 DESCRIPTION OF UNITS

3.3.1 ADJUSTABLE SUPPORT

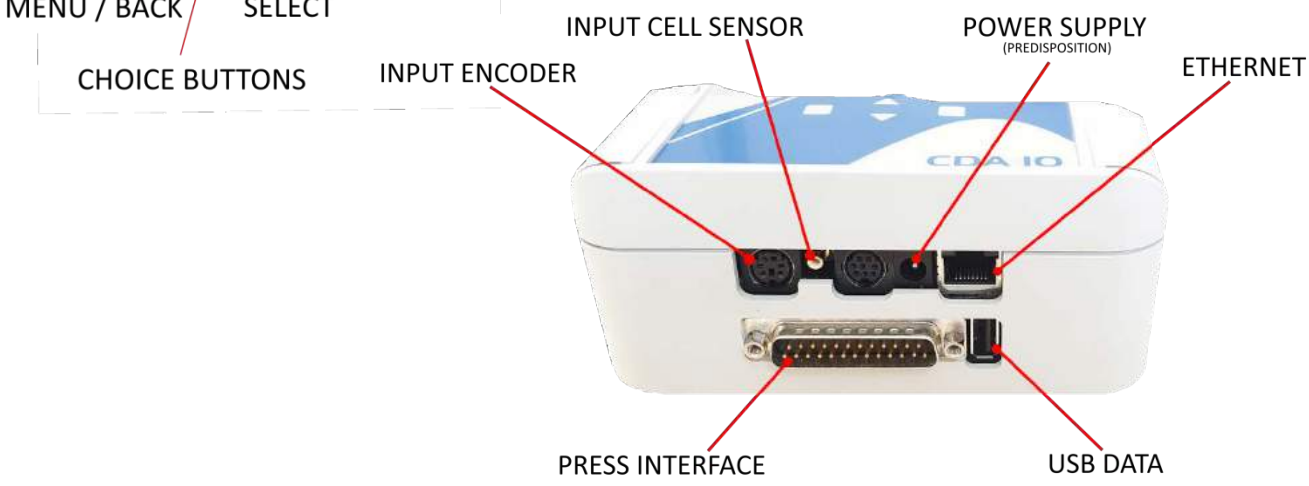
The bracket is fixed to the press frame. Controller inclination can be regulated using the knob.

3.3.2 CONTROL UNIT

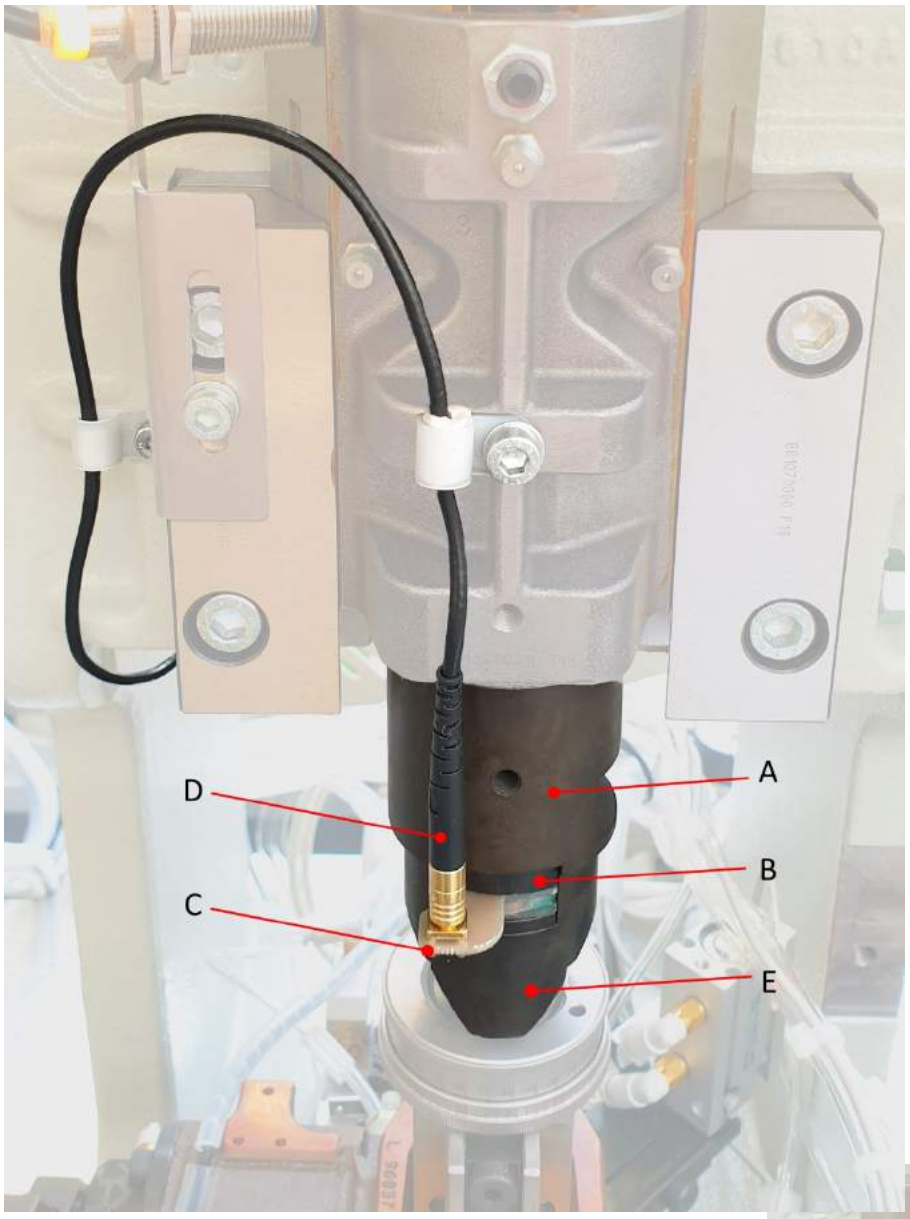
Equipped with a display to show the force curve of the crimping and four front buttons for choosing the settings and for performing configuration.
The unit disables the press if it detects failed crimping.



The connection ports are located at the bottom of the panel.



3.3.3 FORCE CELL SENSOR



The piezoelectric sensor converts the force applied by the press in an electrical signal which is read and monitored by the control unit.

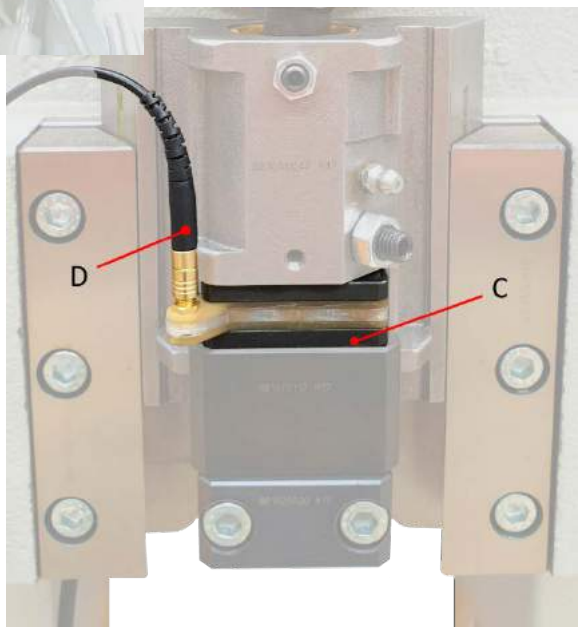
On model TT and P107 presses, the cell sensor (C) and the spacer plate (B) are placed between the support (A), screwed to the press slide, and the "T"-connector (E).

The sensor cable (D) is fixed with clips to the slide and to the press frame.

On model P040 and P080 presses, the sensor (C) is placed between the slide and the shank connection.

The sensor cable (D) is fixed with clips to the press frame.

Only on these press models, an amplifier must be inserted between the sensor and the control unit.

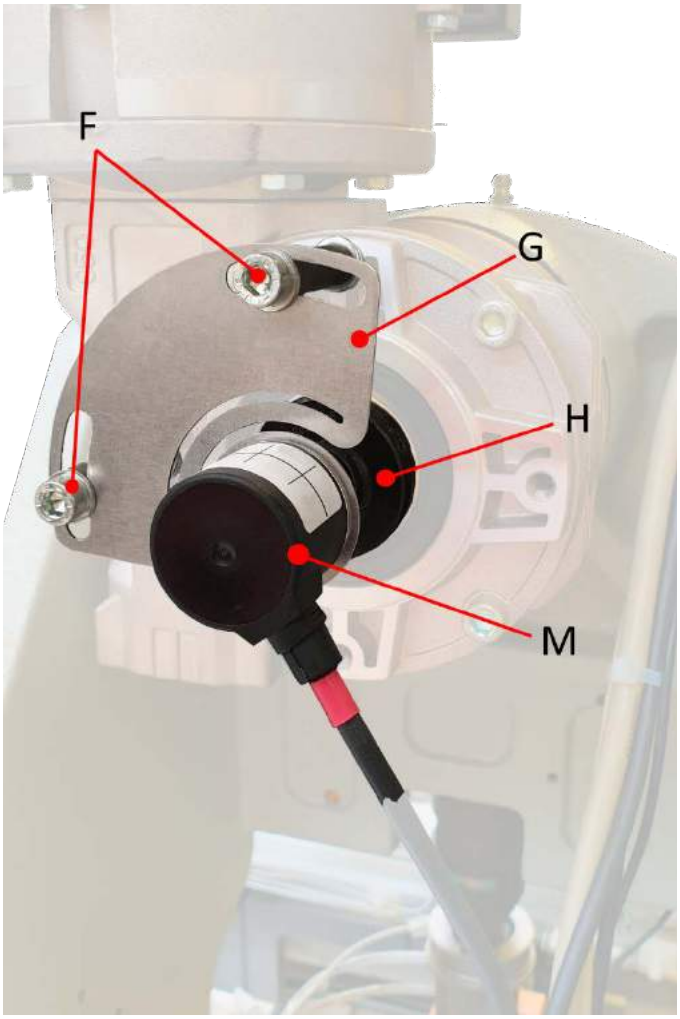


3.3.4 ENCODER

The optical and incremental encoder communicates the direction, speed and position of the press in operation to the control unit.

The control unit does not intervene if the encoder is accidentally disconnected, as it does not detect machine activity and cannot report a malfunction. To overcome this problem, the control unit checks the signal from the encoder (trigger) at start-up and periodically thereafter. If the encoder status is not detected, the controller emits a beep and a message on the display.

The encoder (M) is installed on its own support (G) and the latter is fixed by means of two spacers (F) to the holes on the gear motor flange. Motion transmission occurs by means of the control shaft (H).



4. PACKAGING AND TRANSPORT

4.1 PACKAGING

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.

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 TRASPORT

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 equipment	
➢ Adjustable support	
➢ Controller	
➢ Force cell sensor	
➢ Encoder	

5. INSTALLATION

Before installing the equipment:

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

5.1 EQUIPMENT 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.

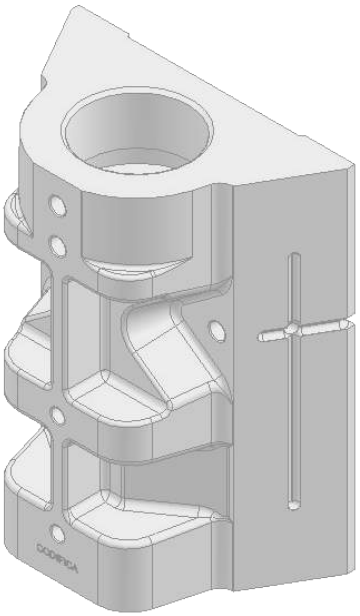
5.1.3 POSITIONING AND ASSEMBLING THE EQUIPMENT

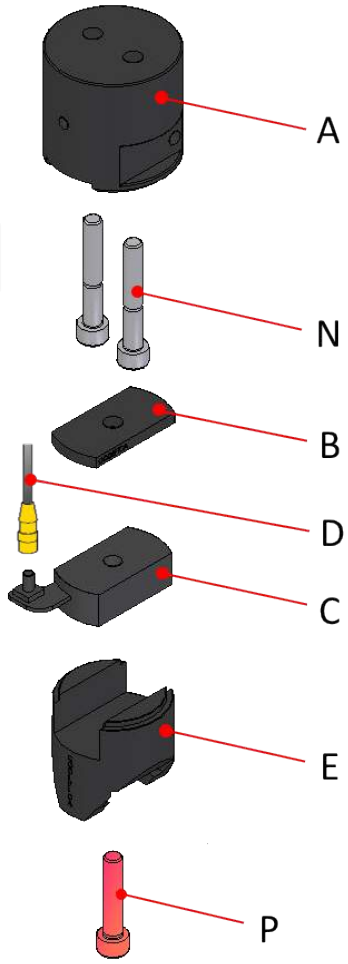
See the attached layout to position the equipment on the machine.
The controller is positioned above the adjustable support, which in turn is fixed to the press frame with two screws. There are different adapter holes, depending on the type of press on which the swivel support is fixed.

5.1.4 POSITIONING AND ASSEMBLING THE FORCE CELL SENSOR ON TT AND P107 PRESSES

Follow the procedure below to install the load cell on **press models TT** and **P107**:

- Fit the T-connector support (A) with the two hex socket head cap screws (N) on the press slide;
- Insert the load cell sensor (C), interposing the plate (B) and locking it with the T-connector (E);
- Insert the hex socket head cap screw (P) and tighten it with a torque wrench, **setting a tightening torque of 7 Nm**;
- Connect the plug (D) to the sensor.

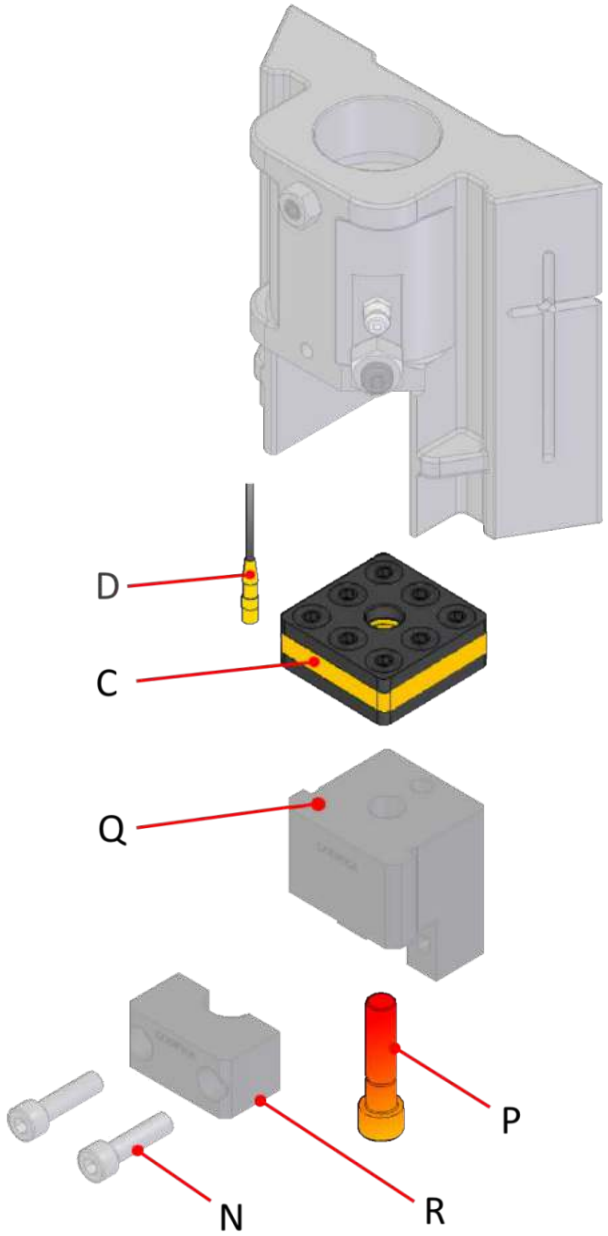




5.1.5 POSITIONING AND ASSEMBLING THE FORCE CELL SENSOR ON P040 AND P080 PRESSES

Follow the procedure below to install the load cell on **press models P040** and **P080**:

- Insert the load cell sensor (C) between the press slide and the shank connection (Q);
- Insert the hex socket head cap screw (P) and tighten it with a torque wrench, **setting a tightening torque of 40 Nm**;
- Position the collar (R) of the shank connector (Q) and secure it with two hex socket head cap screws (N).
- Connect the plug (D) to the sensor and to the amplifier.
- Connect the plug to the amplifier and to the control unit.
- Position the amplifier inside the electrical box of the press.

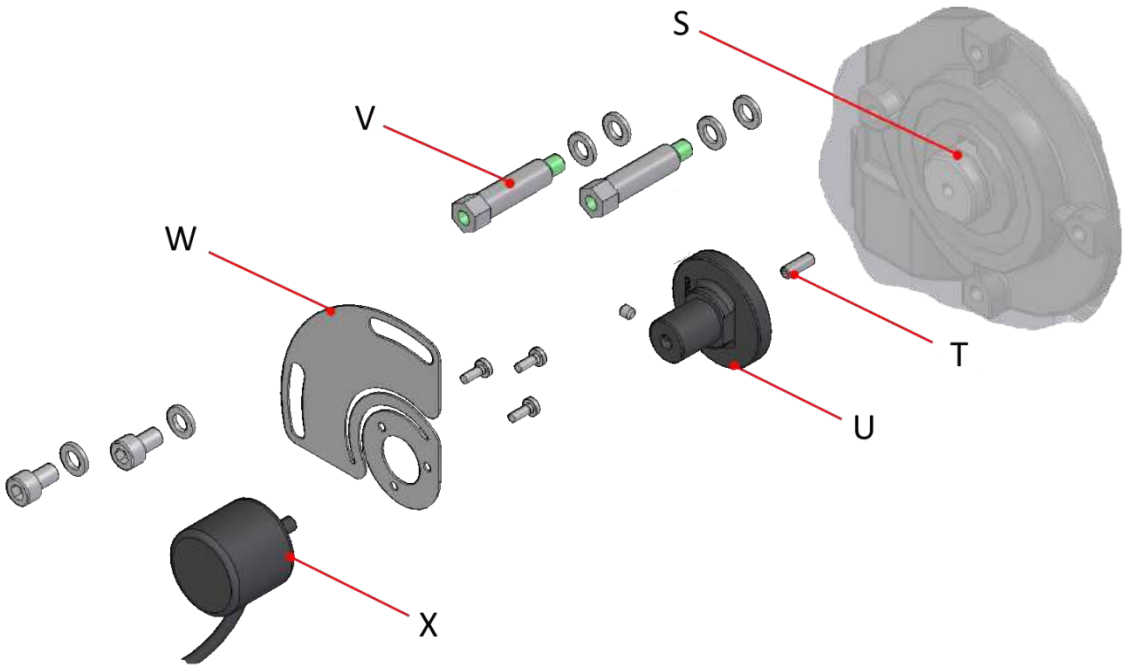


Amplifier for **P040** e **P080** presses

5.1.6 POSITIONING AND ASSEMBLING THE ENCODER

Proceed as follows to install the encoder unit:

- Tighten the headless screw, or grub screw (T), on the encoder control shaft (U);
- Tighten the hub (U) at the end of the output shaft (S) from the gear motor, on the grub screw (T) that has just been inserted;
- Position the two spacers (V) and washers in the threaded holes on the gear motor flange of the press and secure them;
- Install the encoder (X) on the encoder support plate (W) using three cylindrical-head screws with Phillips head;
- Position the hub (U) on the encoder shaft (X), leaving it free;
- Take the support plate unit with the newly assembled encoder and secure it in place by tightening the two hex socket head cap screws with washers;
- Connect the encoder connector to the sensing unit;
- Install the encoder on the sensing unit at angle 351° ±7° [follow the instructions in relative paragraph 6.4.1];
- At the same time as the previous installation phase, tighten the headless screw, or grub screw, on the hub (U).



5.2 CONNECTIONS

The machine must have the following connections:

- Electrical

HAZARD

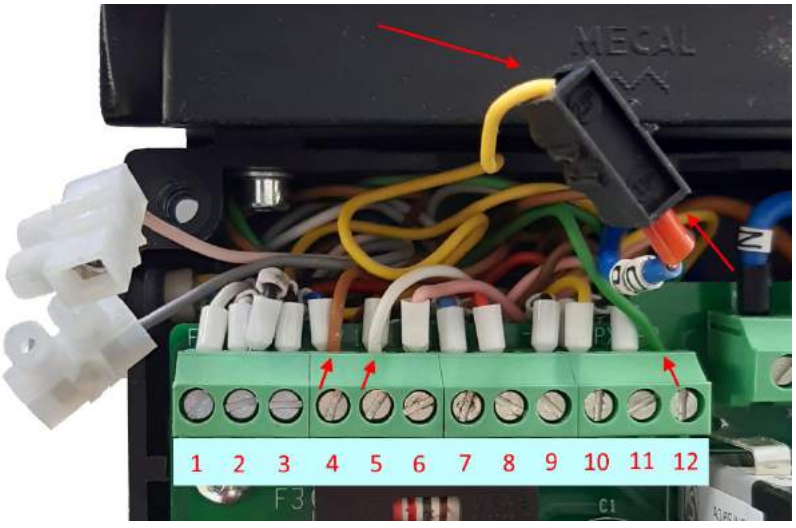
Machine power supply connection operations must be carried out solely by specialised personnel and are subject to use of personal protective equipment.

5.2.1 CONNECTING TO THE ELECTRICAL MAINS ON TT AND P107 PRESSES

5.2.1.1 STANDARD

The operations to be carried out to connect the load cell electrically are:

- Check that the switch, located on the press or in the electrical cabinet/panel, is in the OFF (O) position.
- **Disconnect the press from the electrical mains.**
- Open the electrical box of the press.
- Intercept the cables from the load cell: white, brown, yellow and green.
- Connect the brown cable to the pos.4 input [+18V] on the terminal board (combined with the cable present).
- Connect the white cable to the pos.5 input on the terminal board (combined with the cable present).
- Connect the green cable to the pos.12 input on the terminal board (combined with the cable present).
- Connect the yellow cable to the black cable with PD indication by means of the supplied clamp.
- Close the electrical box with the screws.
- Connect the press to the electrical mains.
- Move the switch to the ON (I) position.
- Configure the load cell [see the relative paragraph].



5.2.1.2 STANDARD

The operations to be carried out to connect the load cell electrically are:

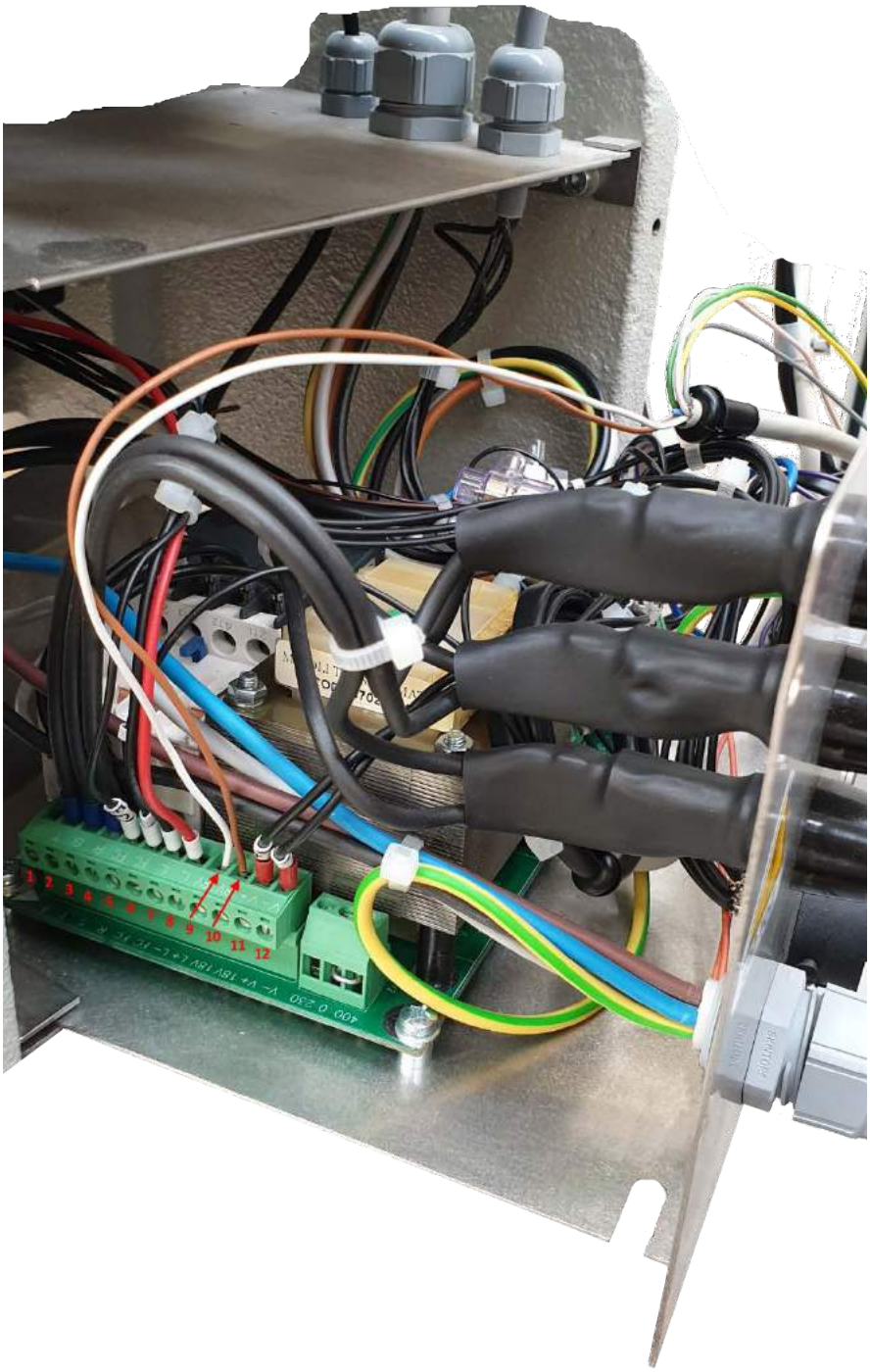
- Check that the switch, located on the press or in the electrical cabinet/panel, is in the OFF (O) position.
- **Disconnect the press from the electrical mains.**
- Open the electrical box of the press.
- Intercept the cables from the load cell and BCC: white, brown, yellow, green, rose and grey.
- Connect the brown cable to the pos.4 input [+18V] on the terminal board (combined with the cable present).
- Connect the white cable to the pos.5 input on the terminal board (combined with the cable present).
- Connect the grey cable to the pos.10 input on the terminal board (combined with the cable present).
- Connect the green cable to the pos.12 input on the terminal board (combined with the cable present).
- Connect the yellow cable to the black cable with PD indication by means of the supplied clamp.
- Connect the rose cable to the black cable with PX indication by means of the supplied clamp.
- Close the electrical box with the screws.
- Connect the press to the electrical mains.
- Move the switch to the ON (I) position.
- Configure the load cell [see the relative paragraph].

5.2.2 CONNECTING TO THE ELECTRICAL MAINS ON P040 PRESSES

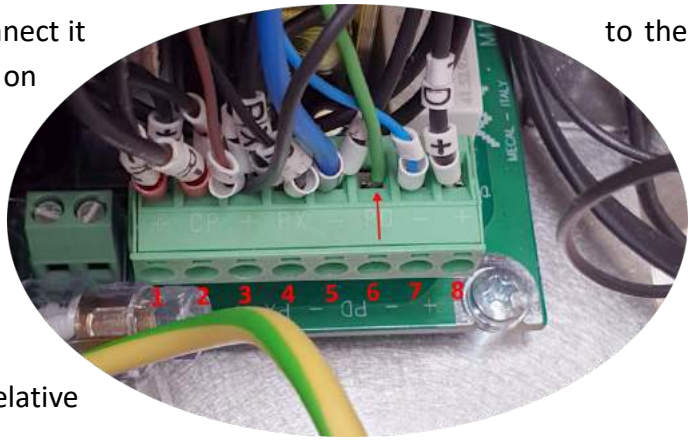
The operations to be carried out to connect the load cell electrically are:

- Check that the switch, located on the press or in the electrical cabinet/panel, is in the OFF (O) position;
- **Disconnect the press from the electrical mains;**
- Open the compartment for housing the electrical components of the machine;
- Intercept the cables from the load cell: white and brown;
- Connect the white cable to the pos.9 input on the terminal board [located on the left side, seen from the rear, in the electrical box of the press];
- Connect the brown cable to the pos.10 input on the terminal board;

- Intercept the yellow and green cables (both are equipped with clamp), coming from the load cell;
- Connect the yellow cable to the black cable with PD-indication by means of the supplied clamp;



- Eliminate clamp by the green cable and connect it to the pos.6 input on the terminal board [located on the right side, seen from the rear, in the electrical box of the press];

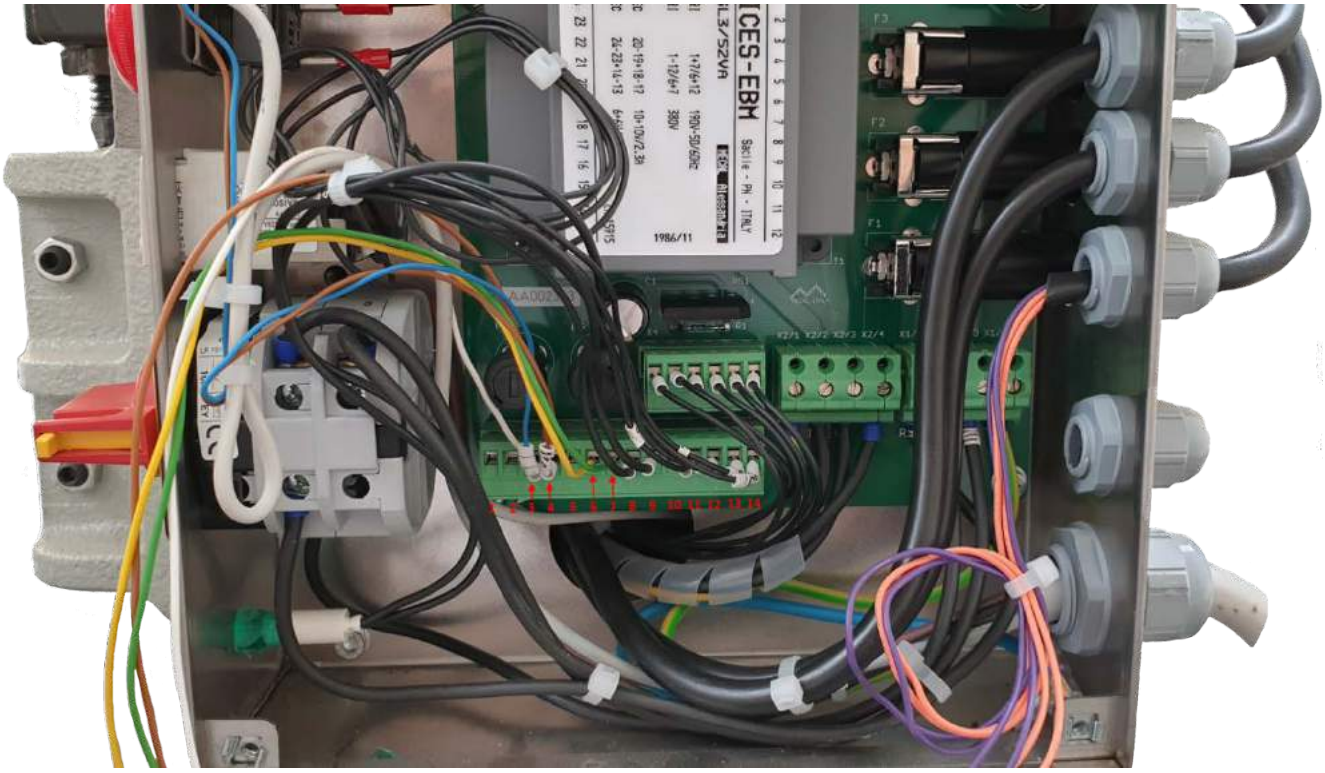


- Close the electrical box housing compartment with the screws;
- Connect the press to the electrical mains;
- Move the switch to the ON (I) position;
- Configure the load cell [see the relative paragraph].

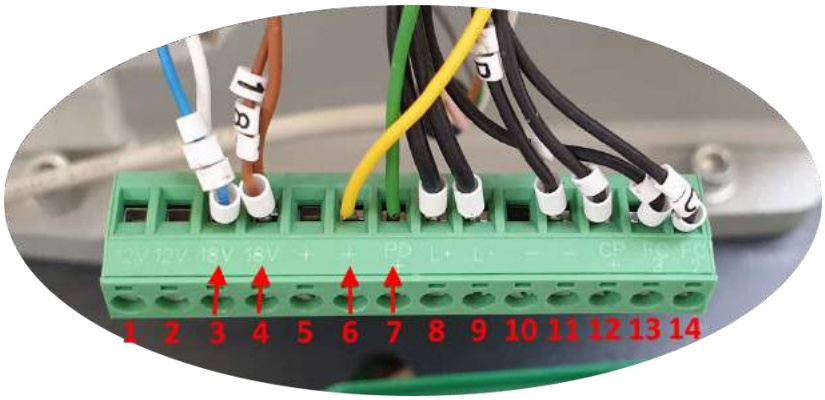
5.2.3 CONNECTING TO THE ELECTRICAL MAINS ON P080 & P120 PRESSES

The operations to be carried out to connect the load cell electrically are:

- Check that the switch, located on the press or in the electrical cabinet/panel, is in the OFF (O) position;
- **Disconnect the press from the electrical mains;**
- Open the electrical box of the press;
- Intercept the cables from the load cell: white, brown, yellow and green;
- Connect the white cable to the pos.3 input on the terminal board (combined with the cable already present);
- Connect the brown cable to the pos.4 input on the terminal board (combined with the cable present);



- Connect the yellow cable to the pos.6 input on the terminal board;
- Connect the green cable to the pos.7 input on the terminal board;
- Close the door on the electrical box;
- Connect the press to the electrical mains;
- Move the switch to the ON (I) position;
- Configure the load cell [see the relative paragraph].

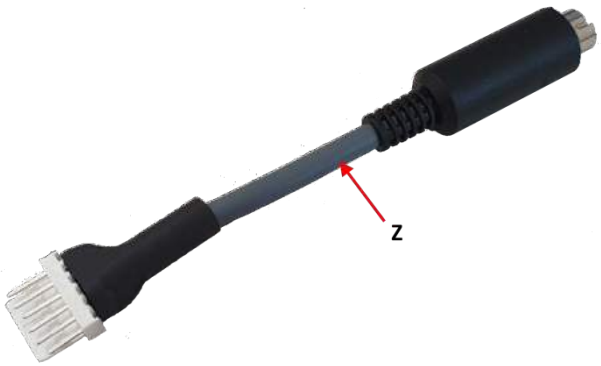


5.2.4 REPLACING THE FORCE CELL TT1000 WITH CDA10

The operations to be carried out to replace load cell TT1000 with load cell CDA10 are:

- Check that the switch, located on the press or in the electrical cabinet/panel, is in the OFF (O) position;
- **Disconnect the press from the electrical mains;**

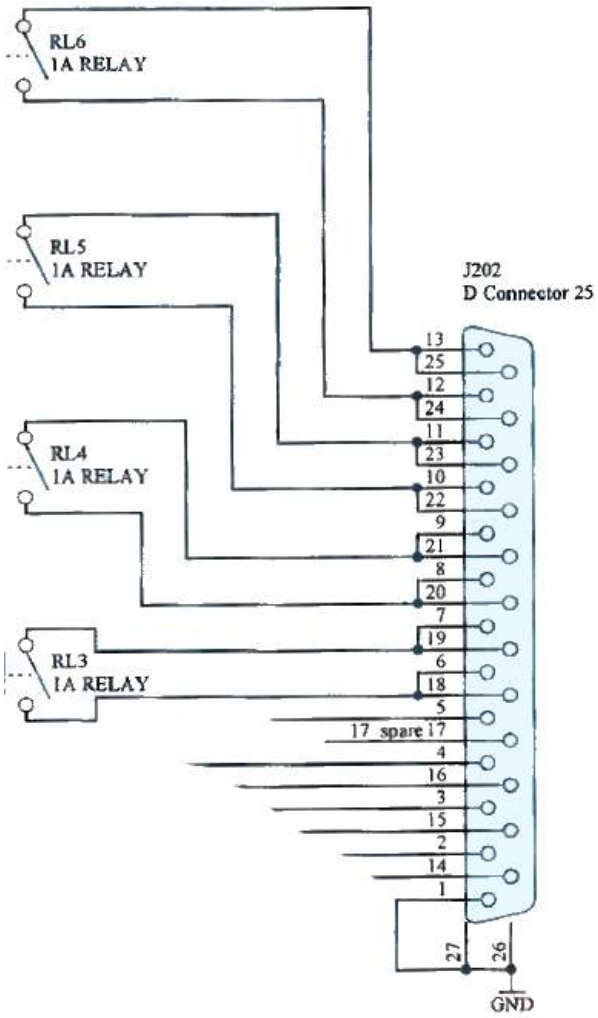
- Disassemble cell TT1000 to be replaced, disconnecting it from all connectors;
- The load cell sensor does not need to be disassembled (if working);
- The encoder does not need to be disassembled (if working);
- Install the new sensing unit on its support [see relative paragraph];
- Connect the load cell sensor to the relative input;
- Connect the encoder to the load cell sensing unit using the supplied adapter (Z);
- Connect the cables from the sensing unit to the press, following the paragraph on connection referring to the corresponding press model;
- The new load cell must be configured [see relative paragraph].



5.2.5 AUXILIARY CONNECTINGS

It is possible to use the press/equipment interface to connect different equipment to the control unit, such as the BCC (Bad Crimp Cutter) and to have some operations managed by the relays present on the electronic circuit.

Follow the connection and installation instructions present in the manual of the equipment to be connected to the CDA10.



If the equipment is not produced by Mecal S.r.l., contact the manufacturer of the device and follow the wiring diagram to the relays above. It is also necessary to use a 25-way D-Sub connector (D25 series), not supplied.

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

1. Check the electrical system in general and, in particular, check that all the cables inside the electronic boards are correctly connected [see the relative electrical diagrams].
2. Check that the connector interfacing with the machine is correctly connected to the sensing unit.
3. Check that the load cell sensor and encoder connectors are correctly connected to the respective outlets on the sensing unit.

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 container, 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 or Polystyrene: disposable glasses.
	#7-#19 O	All other plastics.
		Paper
	#20 PAP	Corrugated cardboard: boxes.
	#21 PAP	Non-corrugated cardboard: 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.
	#60-69	All other textile materials.
		Glass
	#70	Clear glasses, colorless glasses: water bottles.
	#71	Green glasses: wine bottles.
	#72	Brown glasses: beer bottles.
	#73-79	All other glasses materials.
		Composite materials
	#80	Paper and cardboard / Various metals.
	#81	Paper and cardboard / Plastic.
	#82	Paper and cardboard / Aluminum.
	#83	Paper and cardboard / Tin.
	#84	Paper and cardboard / Plastic / Aluminum.
	#85	Paper and cardboard / Plastic / Aluminum / Tin.
	#86-#89	All other composite materials.
	#90	Plastic / Aluminum.
	#91	Plastic / Tin.
	#92	Plastic / All other metallic materials.
	#93-#94	All other composite materials.
	#95	Glass / Plastic.
	#96	Glass / Aluminum.
	#97	Glass / Tin.
	#98	Glass / Various metals.
	#99	All other composite materials.

6. USE

6.1 SWITCH

The equipment is dependent on the machine; therefore, it is necessary to use the press switch to operate or switch off both. The switch has two positions:

- OFF position (O), in which the power supply is disconnected
- ON position (I), in which the power supply is connected.

6.2 ELECTRICAL CIRCUIT

The equipment is designed to be used in conjunction with the press machine. The sensing unit contains the circuit that detects and analyses the crimping force and processes its profile. The unit is connected directly to the press control unit, takes its power and disables it when monitoring failed crimping.

Further clarifications on the electrical connections and the components used are available on the relative wiring diagram and in the relative section.

NOTE

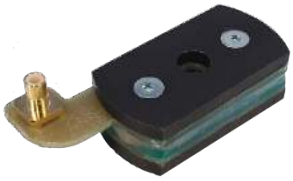
Since all machine movements are controlled by electrical and/or electronic signals, it is advantageous if these signals are controlled by qualified personnel.

6.3 CONTROL AND SENSOR SYSTEMS

Below is the location of the control systems and of the sensors that are part of the equipment:

- Sensing and control unit
  Equipped with a display to show the force curve of the crimping and four front buttons for choosing the settings and performing configuration.
  The unit disables the press if it detects failed crimping.

- Load cell sensor
  The sensor is chosen based on the maximum force the press can exert.



Sensor for **TT** and **P107** press models.

Sensor and amplifier for **P040** and **P080** press models.

NOTE

See the respective chapters for instructions on installing and adjusting the sensing unit and sensor.

6.4 MACHINE ARRANGEMENT

6.4.1 ENCODER CONFIGURATION

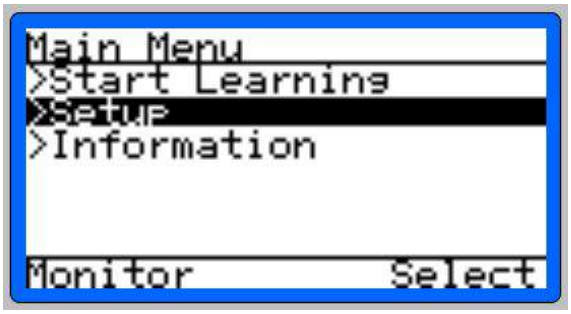
When the encoder is disconnected from the control unit, it emits an acoustic and visual signal. You must therefore make sure that the encoder connector is correctly connected to the control unit. Then press a button on the unit.

The same signal is emitted when the press is in the stand-by position [P.M.S.] and the encoder is in position ≥ 0°. To avoid this disturbance, it must be adjusted a few degrees.

Perform the following operations to set the encoder:

1. From the initial screen of the control unit (detail below), press the left button to access the "Menu" item".

2. Scroll to "Setup" and select it by pressing the right button [Select].



3. Scroll to "Installation" and select it by pressing the right button [Select].

4. The "Encoder" item shows the real time value of the encoder angle. With the press in stand-by [P.M.S.], turn the encoder until an angle between 350,00° and 355,00° is set (to avoid conflicts with "disconnected" Encoder status, do not set the angle to 0,00° and do not set angles between 0,00° and 180,00°).

Tighten the headless screw, or grub screw, on the hub (U) [follow the instructions in paragraph 5.1.6].

Activate the press three times and observe the results obtained at the end of each cycle. Values must be stable (±5°); otherwise, repeat the sequence, making sure that all screws are correctly fastened.

6.4.2 ACOUSTIC SIGNAL SETTING

The control unit is equipped with an acoustic warning device which is activated whenever the press is not crimping properly. The duration of the signal can be changed as needed. The default duration is 0.8 seconds.

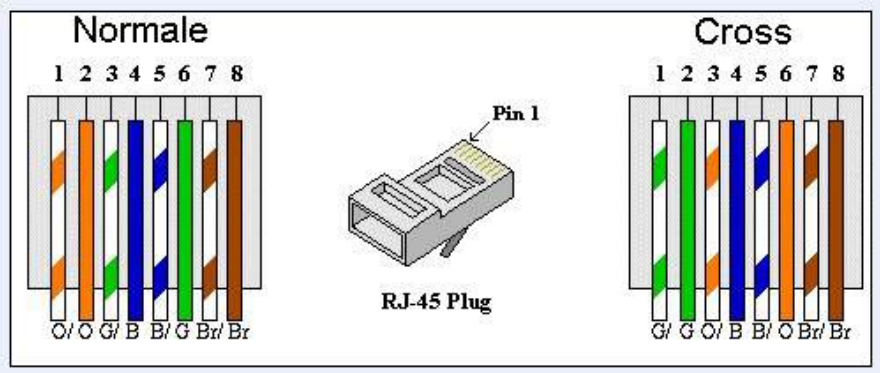
1. Access the installation menu: Menu → Setup → Installation.

2. Click on “Beep (s)” to change the value (press the scrolling keys).

3. Click on the right button [Save] to save.

6.4.3 WEB CONNECTION

The control unit is equipped with a web server, which provides a network connection to operational activities. It is possible to connect the unit to a network switch or directly to the Ethernet port of a PC; in the latter case, it may be necessary to use a cross-over cable. See the Ethernet connection diagram below for further information.



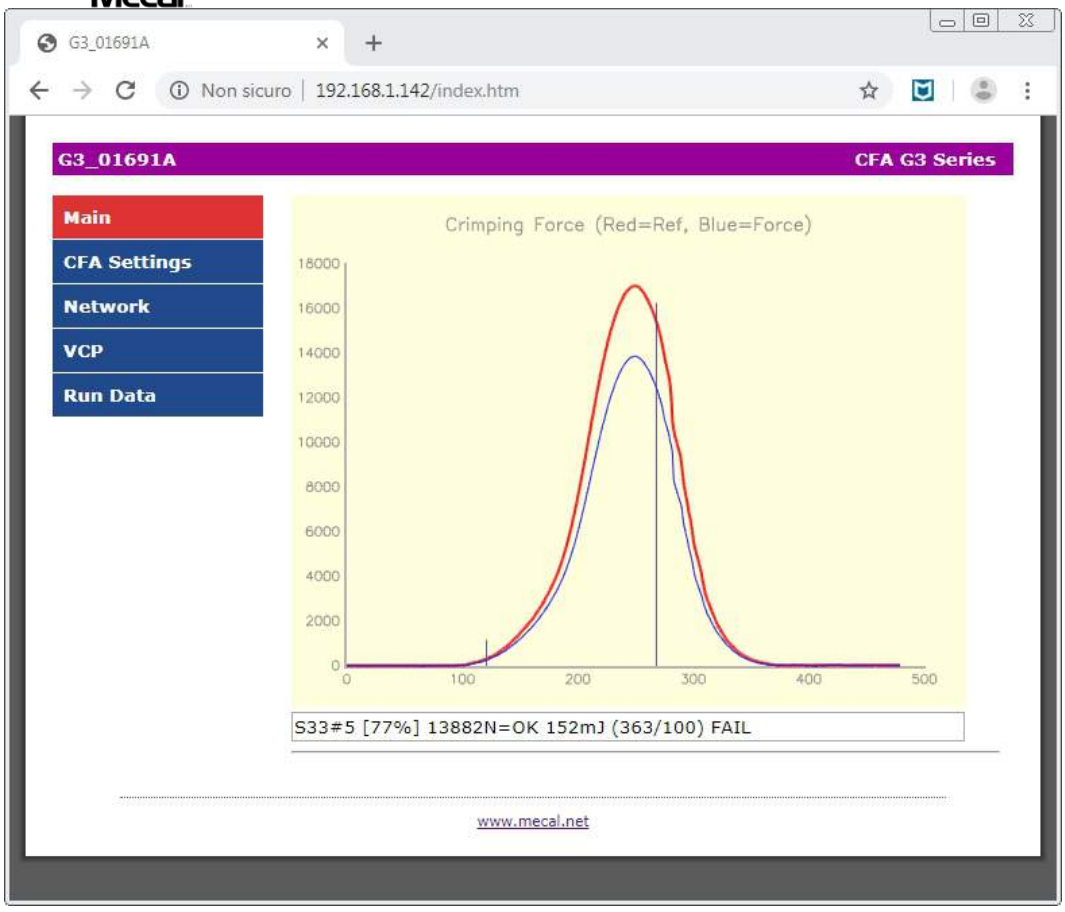
NOTA

Connections must be made by a qualified technician.

If the network has a DHCP server, the controller will try to get an IP address from the server (unless it is disabled on the "Network Settings" page); otherwise, it will choose a default IP address.

To verify the IP address associated with the controller, go to the system information menu: **Menu → Information → System Information**

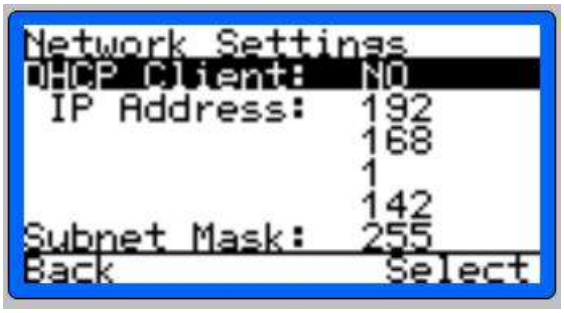
In the example, the IP address set is 192.168.1.14. Type it on the PC browser to connect directly to the controller web page. See the image on the next page, which mirrors the main screen.



If the connection fails, check that the controller's network interface has the IP address set and that it is in the same subnet as the PC and or server. Also check if your PC or server functions as a DHCP server.

To set the DHCP, IP address and Subnet Mask, go to the network menu:

Menu → Setup → Installation → Network Settings



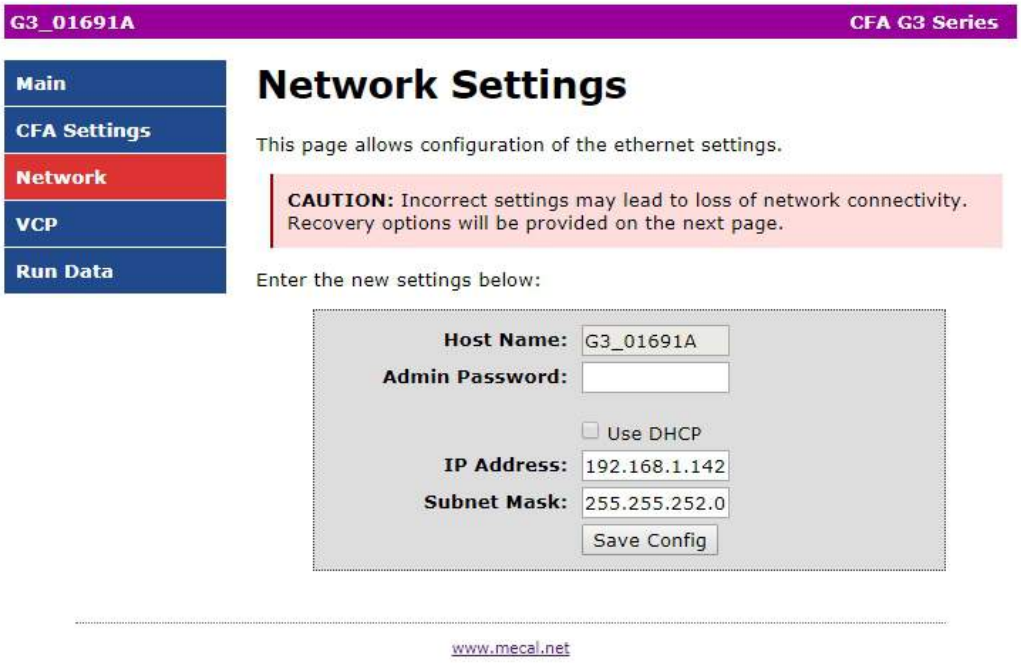
After setting the values, save and restart the control unit.

NOTE

If the unit does not connect to the network, contact your network administrator and/or a qualified technician.

6.4.4 NETWORK SETTING

Click on "Network" on the sidebar of the main web page to enter the "Network Settings" menu.



The "Network Settings" web page lets you modify the IP address parameters, the same ones that can be configured by the control unit and which are described in paragraph 6.4.3. In addition, it is possible to change the Host name and set a password for the control unit (Admin Password).

The password allows you to protect the configuration pages from unauthorised access. If it is entered, the protected pages will ask for a username and password.

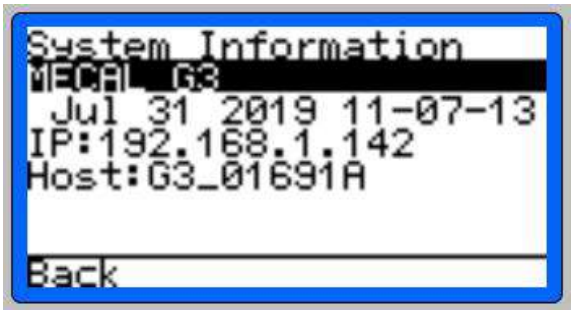
The default username for accessing protected pages is **Admin**.

The password is the one set by the user in the "Admin Password" box.

To save changes made to the data on this page, press the "Save Config" button.

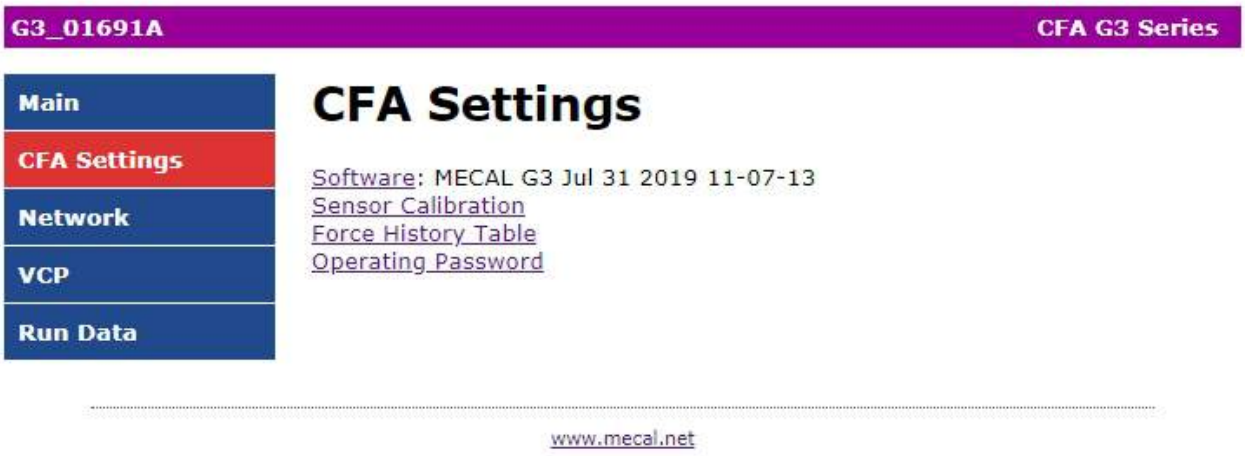
6.4.5 SOFTWARE UPDATE

Make sure that the operating software is up to date with the latest version available, as the manufacturer may have issued a new release in order to fix bugs or add new features.
To verify the installed version, go to the system information menu:
Menu → Information → System Information

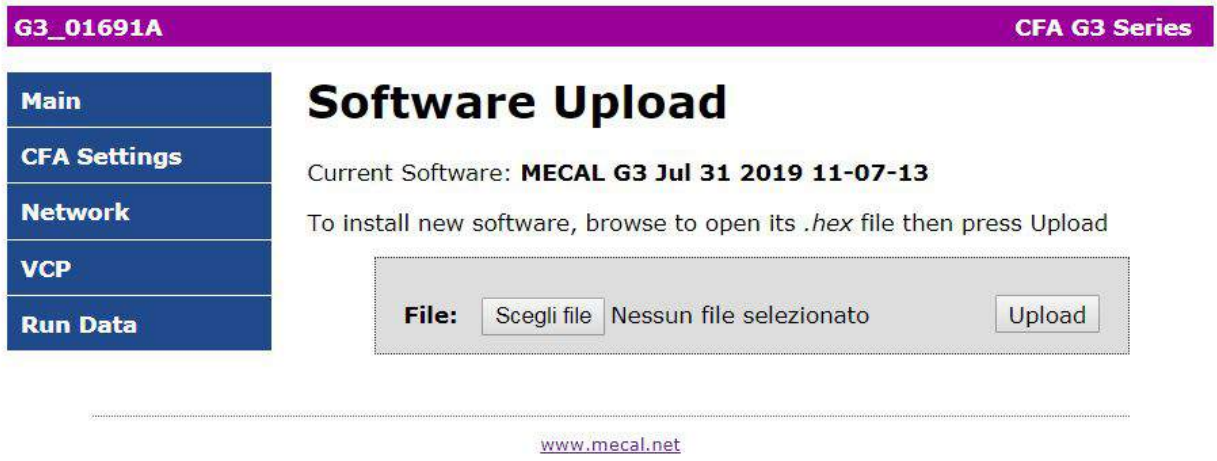


Software installation is performed via network connection, without needing to directly access the control unit, uploading the new software file from a PC to the web page of the web server embedded in the device.
After having completed connection to the web network (paragraph 6.4.3), follow the procedure:

1. Click on "Network" on the sidebar of the main web page to enter the "CFA Settings" menu and click on the "Software" link.



2. Click on “Choose file”, select the file from the desired folder and then click on “Upload”.



It takes a few seconds to transmit the file and restart the device to install the new software. During this time, the backlight on the controller screen flashes.

When the operation is complete, the controller will run the new software.

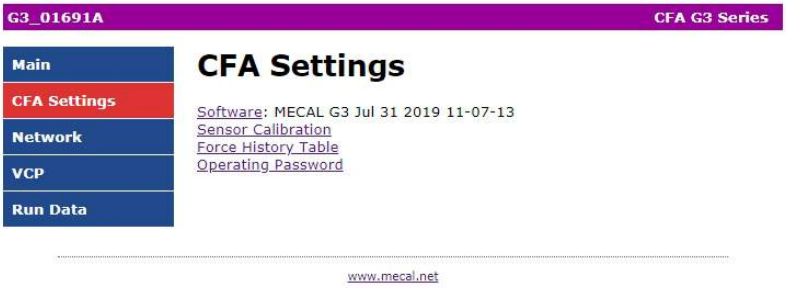
NOTE

A password and user name may be required to access the page. The two fields are empty by default, even if a password has been set on the network page.

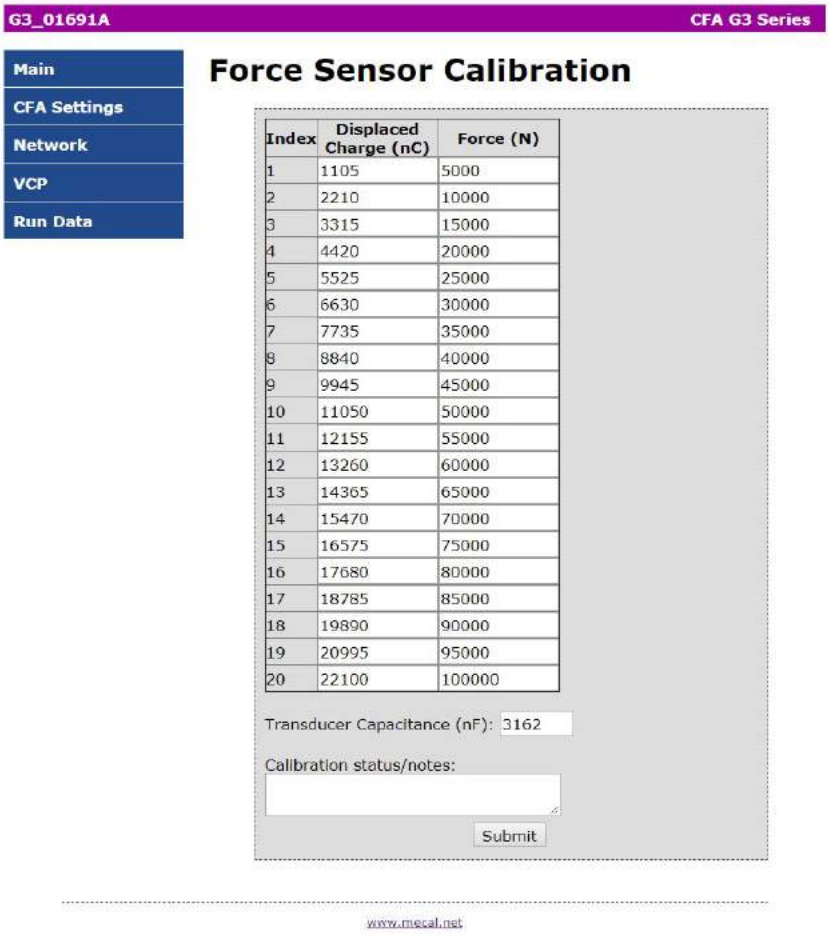
6.4.6 PEAK FORCE CALIBRATION

The control unit makes its decisions (Pass/Fail) by comparing the reference force curve profile, detected during the learning process, with the profile of the force curve of each crimp. For this reason, the load cell must not be calibrated, but must only be repeatable. The load cell can be calibrated if the operator needs to make more accurate peak force measurements. If you have a preloaded force sensor that comes with a calibration certificate, the values on the calibration certificate can be entered in the table on the "Sensor Calibration" page by following this procedure:

1. Click on "CFA Settings" on the sidebar of the main web page to enter the "CFA Settings" menu and click on the "Sensor Calibration" link".



2. Enter the data in the table and send it to the controller, clicking on "Submit".



The transducer capacity value can also be viewed or edited on this page. This value is used by the mathematical model in the controller to translate the voltage readings from the sensor into load values, which can be found in the calibration table to produce force measurements. The transducer capacity is automatically updated by the system if the auto-calibration function is activated from the controller menu.

The load cell can be calibrated approximately by changing the transducer capacity value. If you wish to change the overall gain of the model to correct the peak force display, use the

formula:

$$\text{New transducer capacitance value} = \text{present transducer capacitance value} * \frac{\text{desired force reading}}{\text{present force reading}}$$

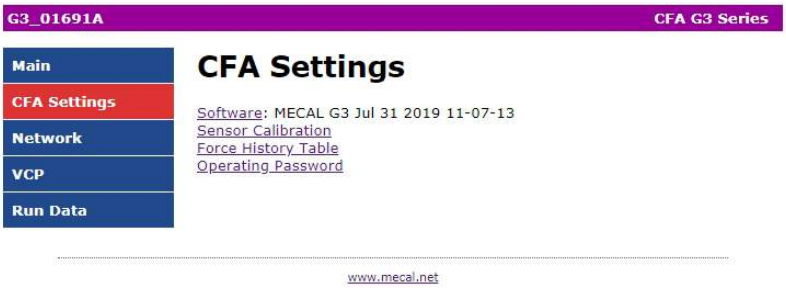
For example: If the display shows a peak force of 10kN but you want a displayed value of 8kN, change the transducer capacity value as follows: 3162 * 8 / 10 = 2530

It is also possible to view or edit the calibration notes. To save changes made to the data on this page, press the "Submit" button.

6.4.7 CRIMP FORCE DETECTION HISTORY

The "Force History Table" page shows the count of the forces detected by the controller. Follow this procedure to access the screen:

1. Click on "Network" on the sidebar of the main web page to enter the "CFA Settings" menu and click on the "Force History Table" link.



The table will then appear (see next page).

G3_01691A CFA G3 Series

Main
CFA Settings
Network
VCP
Run Data

Force History Table

This table contains counts of the peak forces applied, categorized into 'bins'.
Every crimp will increment one of these counters.
Each bin is labeled with its upper force threshold.
Each bin's lower force threshold is just above the upper threshold of the adjacent bin below it.
This data can also be viewed as a Histogram Plot

Fp<(kN)	Count
0.23	13
0.29	0
0.36	0
0.45	0
0.56	0
0.70	5
0.88	3
1.1	2
1.4	1
1.7	7
2.1	28
2.7	3
3.3	22
4.2	14
5.2	4
6.5	5
8.2	2
10	0
13	0
16	19
20	11
25	11
31	0
39	0
49	0
61	0
76	0
95	0
120	0
150	0
190	0
230	0
290	0
360	0
450	0
570	0
710	0
890	0
1100	0
inf.	0

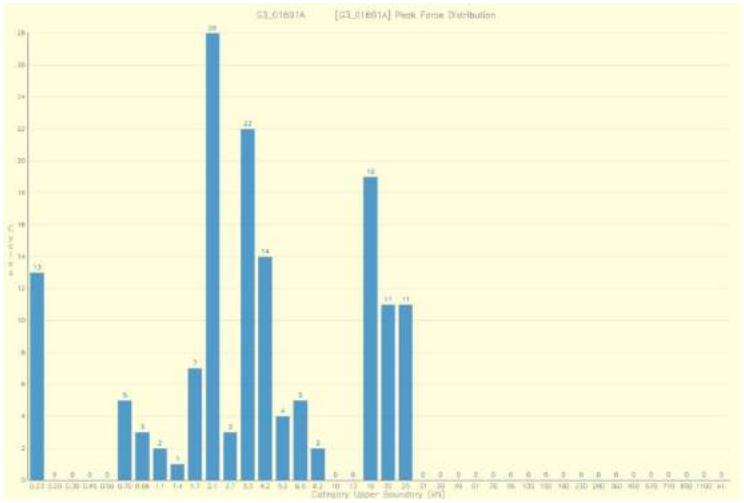
Security Code: 59D4CD015347ED56
Authorization:
Update Counters

www.mecal.net

These values can be used for service requests and/or to establish a service program dedicated to the machine.

The counters can be reset or adjusted, but an authorisation code must be provided.

Furthermore, the data can be displayed graphically by clicking on the "History Plot" hyperlink which shows the histogram:

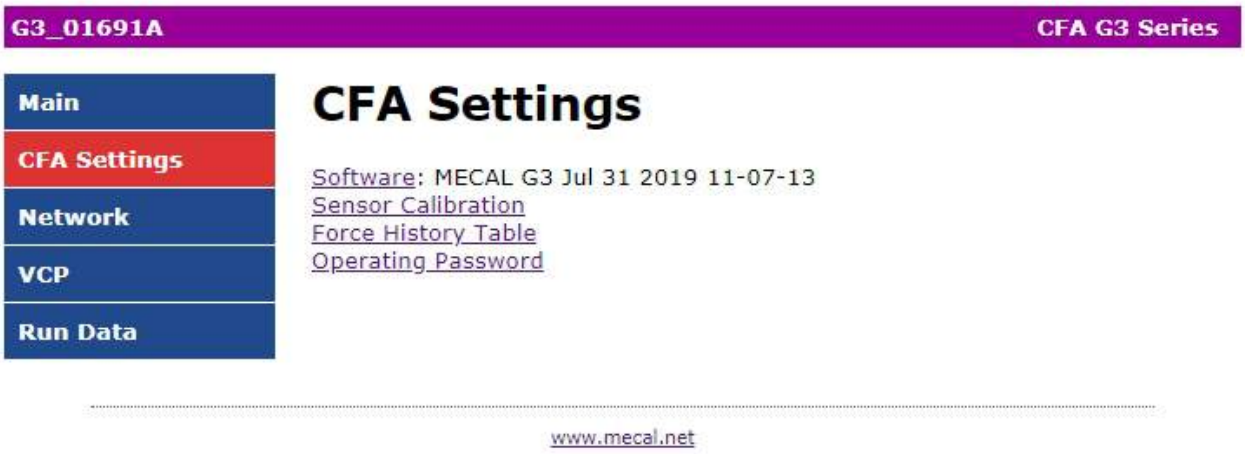


6.4.8 OPERATING PASSWORD SETTING

An operating password can be set to prevent changes to the control unit settings. The password protection and the password to install the software update are disabled by default.

Follow these steps to set the password:

1. Click on "Network" on the sidebar of the main web page to enter the "CFA Settings" menu and click on the "Operating Password" link.



2. Enter the password, select the type of protection you want to give and click on "Submit".

If the code is set to "0000", the password system will be disabled, while the system will operate if any other code is set.

6.5 MACHINE USE PROCEDURES

6.5.1 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.
- Verify correct functioning of the safety devices present (emergency buttons, etc.).
- Check that the machine is not in maintenance or cleaning status.
- Make sure that the switch is in the ON position (I).
- Verify that the press ready status light is on.
- Make sure that the load cell is correctly configured with the settings for use with equipment.

6.5.2 CONNECTING POWER

Before starting the machine:

- Connect the electricity.
- Set the switch on the electrical box of the press to the ON position (I).

6.5.3 OPERATING MODE

The control unit acquires and analyses the crimping force curve profiles. Whenever incorrect crimping is detected, the machine emits a beep and disables the press until the operator intervenes.

6.5.4 SWITCHING OFF THE MACHINE

To switch off the machine, set the switch on the electrical box of the press to the OFF (0) position.

6.6 USE

6.6.1 LEARNING

The control unit signals correct or incorrect crimping, comparing the force curve profile with a reference force curve that records during the learning phase.
In the learning phase, the press, the applicator and any accessories must be installed as in production.

NOTE

The control unit does **NOT** have integrated knowledge of how the correct crimping profile should look.

It is the operator's task to carry out three learning crimpings and to check that they are correct before proceeding with production.

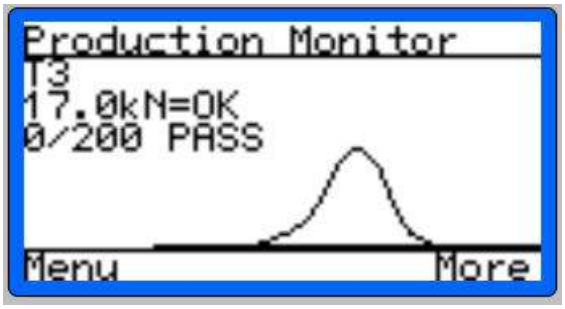
Some samples are made which must be checked in the laboratory, for example for the crimping and pull-out height measurements. The learning phase is carried out once the quality of crimping has been ascertained.

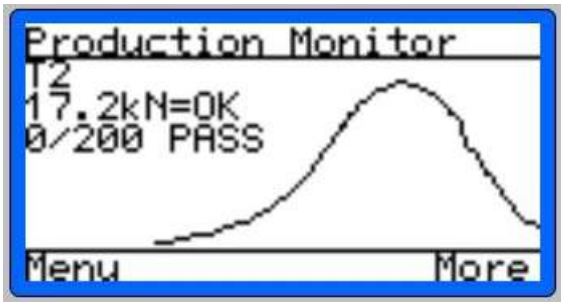
Enter the menu to start the learning procedure:

1. **Menu → Start Learning** and confirm the start of the phase with the right button (YES).

2. The title "Start Learning" will appear on the screen. It will now be possible to make the three learning crimpings.

3. Sequence of learning steps: three crimpings.

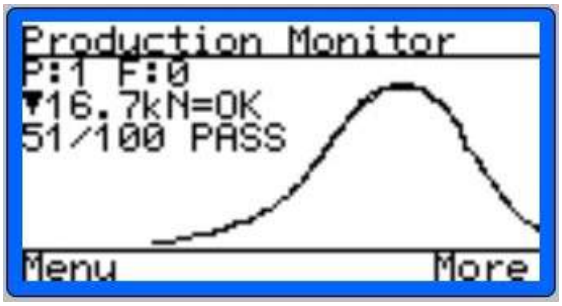




See paragraph 6.6.5 to set the parameters for evaluating the force curves.

6.6.2 PRODUCTION

The main screen on the control unit display shows the force and reference curves.



The parameters shown are as follows:

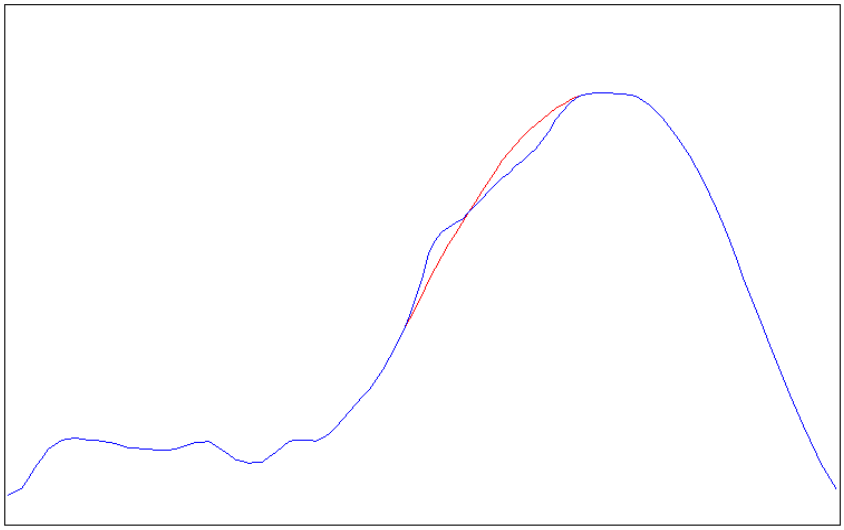
P:1	CORRECT crimping (since last learning)
F:0	INCORRECT crimping (since last learning)
16.7kN=OK	Applied force measured and result [OK/NO]
51/100 PASS	Non-corresponding result (51) and tolerance limit (100)

Press the right [More] button to display the additional information.

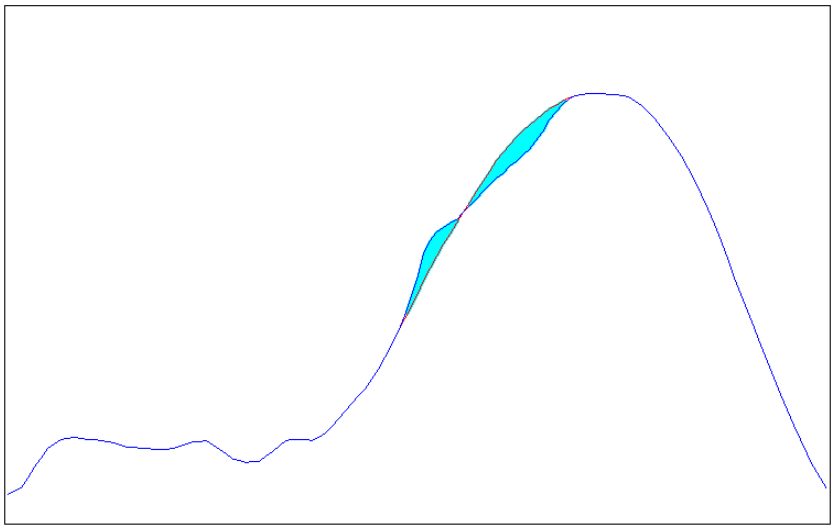
Count: 5	Total performed crimping counter (5)
Production Pass/Fail	Status of last crimping Correct/Incorrect
Variation:363/100	Non-corresponding result (51) and tolerance limit (100)
Headroom:18%	Headroom (margin between nominal level and maximum manageable value)
13882N 152mJ	Applied force and energy in the crimping

6.6.3 HOW CRIMP FORCE MISMATCH IS CALCULATED

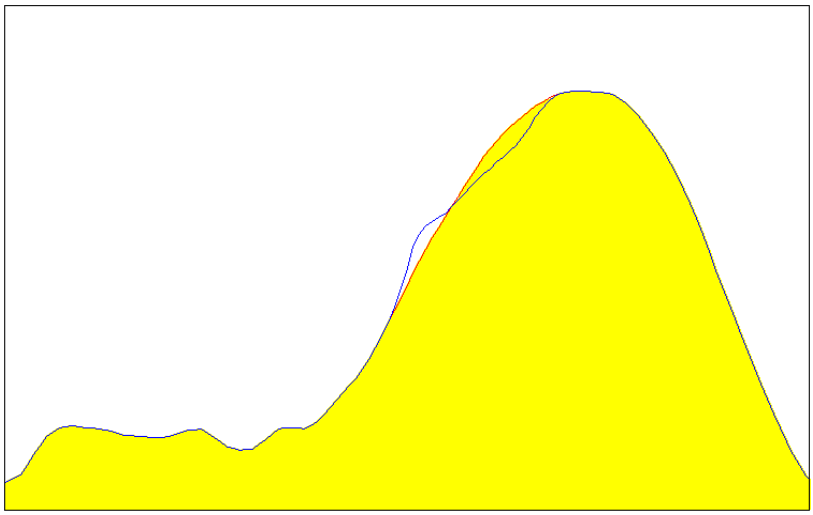
The figure below shows a reference curve (in red) and a superimposed force curve for comparison (blue). In this example, the blue curve could be typically associated with a crimping error on insulation.



The figure below shows the area that is non-corresponding, which is given by the difference between the two curves. The controller measures this area for each crimping cycle. The algorithm does not take into account whether the error occurs above or below the reference curve, but all errors are accumulated positively.



The figure below shows the reference area, which is measured and used as a divider in calculation of the non-correspondence. This helps to "normalise" the variation calculation, so that the result for incorrect crimping on a large terminal is similar to the result for incorrect crimping on a small terminal.



The crimping force curve non-correspondence is calculated using the formula:

*Non-correspondence = 1000 * Non-correspondence area / Reference area.*

Non-correspondence is a number without dimensions, that is always positive, that has no unit of measure and the multiplication of the area by thousand is used to resize the value obtained to make it easily manageable as an integer. A result that coincides with zero represents a perfect correspondence between the curves, while the more the values increase, the more there are greater differences between the force curves. Peak force does not directly influence the calculation of non-correspondence, as can be seen from the above examples: curves with identical peak forces can have a high discrepancy. The control unit shows the peak force as a secondary value in the basic process configuration. If data is recorded for each job, problems can be identified before the pull-out tests are performed.

6.6.4 CRIMP FAIL

The main screen on the control unit display shows the crimping error.

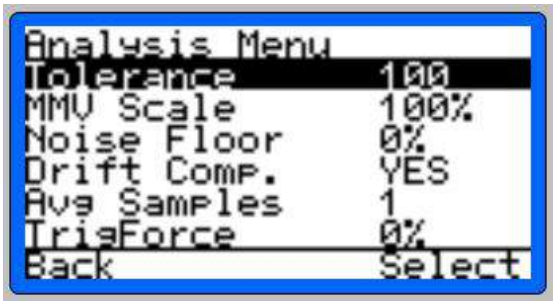
1. Press any button to return to the production screen.

2. Press the right [More] button to display additional information on the incorrect crimping.

6.6.5 PARAMETERS SETTING (ANALYSIS MENU)

From the "Analysis" menu, you can set the tolerance for the non-correspondence value. The higher the number set, the less sensitive the correspondence evaluation will be.

Menu → Setup → Analysis



- **Tolerance**

You can set the tolerance for the non-correspondence value. The higher the number set, the less sensitive the correspondence evaluation will be.

Whenever a new crimping process is initiated, the controller tolerance setting must be adjusted so that as many faults as possible can be detected, but without wrongly detecting good crimping that is reported as faulty.

- **MMV Scale**

This setting lets the user adjust the sensitivity of the analysis, if it becomes necessary to compare the sensitivity with another control unit. The basic value returned from the analysis is then multiplied by this scale factor.

The range is between 20% and 200%, while the default value is 100% (the default value is 77% for TCM software).

- **Noise Floor**

This parameter lets the operator set a threshold relative to the reference curve peak. Any position of the curve below the set threshold is then ignored. This function can be used to suppress unstable "noise" that may occur at the beginning of the force curve.

The range is 0% to 90% and the default value is 0%.

- **Drift Comp.**

This setting lets the operator enable or disable the drift compensation function.

Normally, after a correct "Pass" result, the reference curve is automatically adjusted, moving it slightly closer in line with the last force curve. This allows the control unit to keep track of gradual process variations. There is a safety limit within which the curve can be adjusted; when that limit is reached, the controller reports a "Fail" result.

Drift Compensation is a useful feature in the production process, but it can cause inconsistent results to be detected if the operator is deliberately forcing faults. For example, if small crimping errors (such as removing a strand from the cable) are being detected, the control unit may not detect the fault as a "Fail".

To test sensitivity, it is advisable to start creating large crimping errors, moving toward the creation of smaller and smaller faults, or temporarily disabling the Drift compensation function.
The value is set to YES (function enabled) or NO (function disabled). The default value is set to YES.

- **AVG Samples**

This function lets the operator apply an average filter to the force curves. It can in some circumstances help to counteract the effects of high-frequency noise.
The Filter works by setting each sample point on the curve so that it is the average value of the adjacent group of original sample points. This suppresses the high-frequency components of the signal. As the number of averaged samples increases, the signal becomes more uniform.
The value can be an odd number between 1 and 51. The default value is set to 1 (no average).

- **TrigForce**

The TrigForce option lets you ignore crimping cycles with a peak force below a set threshold. The intention is to prevent unwanted controller failures when crimping empty terminals in busbar applications.
The value sets a threshold, in percentage, of the reference curve peak.
During production, a crimping curve with a peak force below this threshold should not cause a "Fail" result.
The minimum (and default) value is 0%, which actually disables this function, while the maximum value is 70%.

6.6.6 ERROR MESSAGES

MESSAGGIO	SPIEGAZIONE	SOLUZIONE
Drift Fail	I valori di adattamento della curva di forza (Drift Compensation) vanno al di fuori dell'intervallo accettabile.	Eseguire la procedura di apprendimento. Si consiglia di effettuare nuovamente i controlli su altezza di crimpatura e sfilamenti.
OverRange Fail	Il segnale di picco della curva di forza è al di sopra dell'intervallo dell'unità di controllo.	Verificare che il sensore cella di carico non sia sovraccarico.
		Aggiungere un attenuatore (opzionale) in linea con il cavo del sensore.
Production Fail	Mancata corrispondenza del profilo della curva di forza dell'aggraffatura rispetto alla curva di forza di riferimento.	Verificare la coerenza del processo di aggraffatura e risolvere le eventuali cause di scarsa ripetibilità del processo.
		Aumentare la tolleranza della corrispondenza.
		Verificare il corretto montaggio dell'encoder e che esso non scivoli.
Teaching Fail	Mancata corrispondenza del profilo della curva di forza dell'aggraffatura nel processo di apprendimento.	Verificare la coerenza del processo di aggraffatura e risolvere le eventuali cause di scarsa ripetibilità del processo.
		Aumentare la tolleranza della corrispondenza.
		Verificare il corretto montaggio dell'encoder e che esso non scivoli.
UnderRange Fail	Il segnale di picco della curva di forza è al di sotto dell'intervallo dell'unità di controllo.	Verificare che il sensore cella di carico non sia sovraccarico.
		Verificare il corretto montaggio dell'encoder e che esso non scivoli.

6.7 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.

6.7.1 DISCARDED CABLE UNLOADING PROCEDURE

There are no procedures required for unloading the equipment.

Any unloading procedures must be carried out according to the machine manual.

6.8 FAULTS

PROBLEM	CAUSE	SOLUTION
The machine and the equipment does not start.	Power supply not connected to the mains.	Connect the power supply to the mains.
	Switch set to OFF position (O).	Move the switch to the ON position (I).
The equipment does not start (press running).	Electrical cables disconnected and/or incorrectly connected to the load cell.	Check the electrical connections between the load cell and the equipment.
		Check the signal connections between the load cell and the equipment.
The equipment does not stop the machine in case of Fail.	Cables disconnected and/or incorrectly connected to the load cell.	Check the electrical connections between the load cell and the equipment.
		Check the signal connections between the load cell and the equipment.
	Load cell not configured.	Configure the load cell as indicated in the corresponding paragraph.

If a message appears on the controller display together with the problem, see paragraph 6.6.6 ERROR MESSAGES.

7. DISMANTLING

The following paragraph contains some recommendations and indications to correctly carry out the operations for decommissioning, dismantling and removal of the equipment 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 machine switch to the OFF position (O);
- Disconnect the mains supply;
- Disconnect the connector from the control unit;
- Open the electrical box of the press and disconnect the cables;
- Disassemble the machine, proceeding downward for each unit. (paragraph 5).

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 precautions.
- 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 equipment.

- 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, no waste materials are produced/used. However, the press machine produced/used waste material, for example lubricants. Some specific regulations for environmental protection apply for the disposal of some of these materials.

See the machine manual for more information.

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.

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.

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 micro-switches, 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 and equipment 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 C FUNCTIONAL CHECKS AND TESTS ON SAFETY DEVICES

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

CAUTION

Maintenance personnel must periodically check the functionality of safety devices.

EMERGENCY BUTTONS

Where present, press each button on the machine and verify that it stops immediately.

SAFETY SWITCHES

Where present, check the correct functioning of the systems following the various openings of the movable guards. Check their correct fixing.

ASSEMBLY FASTENERS

Check that nuts and bolts have not become deteriorated. In particular, check the adjustable handles that support the bearing structures of the machine.

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 MAINTENANCE SHEETS

To guarantee the reliability of the machine, you need to ensure regular and effective maintenance and constant control of indicator instrument parameters.

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

FREQUENZA	DESCRIZIONE
Every six months	Make sure that no fasteners have become loose.

MAINTENANCE LOG

DATE	OPERATOR	DESCRIPTION OF INTERVENTION

8.6 SPARE PARTS

Below is the list of components subject to wear over time (indicated with U) and those for which replacement is recommended (indicated with R).

8.6.1 MECHANICAL SPARE PARTS

There are not mechanical parts subject to wear and/or recommended.

8.6.2 ELECTRICAL SPARE PARTS

There are not electrical parts subject to wear and/or recommended.

CAUTION

Use original spare parts only. Replacement with non-original spare parts could compromise machine functionality.

ADDITIONAL INFORMATION

To order a spare part from the Manufacturer, contact him/her as indicated in paragraph 1.2 (SUPPORT)

9. ATTACHED DOCUMENTATION

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

N° ALLEGATO	DESCRIZIONE
9.1	Machine layout
9.2	Exploded diagram of the machine
9.3	Wiring diagram

9.1 MACHINE LAYOUT