EN 1 - 38

VALIDATION CASE CALIWELD

TABLE OF CONTENTS

SYMBOLS

⚠📖	Warning ! Read the instructions manual before use.
⚠	WARNING. DANGER.
⚡	WARNING. DANGEROUS VOLTAGE. Risk of electrocution.
CE	Complies with European Union directives.
EAC	EAEC Conformity marking (Eurasian Economic Community).
UKCA	Material complies with British requirements.
⌀	Material complies with Moroccan standards.
85-265 V ~ 50/60Hz 15 VA max	Single phase power supply 50 or 60 Hz
(V)	Voltage measuring point
(A)	Current measuring point
(n)	Wire speed measuring point
🛢	Gas input measuring point
🛢	Gas output measuring point
👍	Taking back remote control
→⊘	Input point of the measurement flow
⊙→	Output point of the measurement flow
⏻	Case power indicator
USB	USB connections indicator
USB USB 2.0	USB connector
✂	Earth clamp
HF PROTECTION	Electronics protected against HF of TIG machines
IP 30	Open carry case : the product is protected against external objects larger than 2.5 mm. However, it is not waterproof.

| **IP 67** | Closed carry case : the product is dust proof and water proof for 30 min up to 1 m deep. |

SAFETY INSTRUCTIONS

Only use this device for its intended use, otherwise the warranty may be void.

Inspect the case before using the device:
• Look for potential defects or cracks.
• Check carefully the insulation of the terminals.

Do not use the product in the vicinity of explosive gases, fumes or in a wet/humid environment.

Do not work on your own.

The use of this device is limited to the indicated measurement categories, voltage and intensity.

Be aware of local and national safety requirements, and make sure to comply. Use personal protective equipment (rubber gloves, mask and heat proof clothing) in order to prevent injuries from electrocution and explosions caused by electrical arcs when dangerous live conductors are exposed.

Use measuring categories (CATII), accessories with the right voltage and intensity (sensors, measuring leads and adaptors) suitable for the device for all measurements.

Avoid contact with voltage higher than >30 V AC, 42 V AC peak or 60 V DC.

Only use the current sensors, measuring leads and adaptors supplied with the machine.

Turn the product off if it is damaged.

Do not use the device if it is damaged.

Do not use the device if it is not working properly.

Only use the sensors, measuring leads and accessories which match the measurement category, voltage and intensity of the device.

Only use cables whose voltage is suitable for the device.

Never apply a voltage exceeding the nominal value between the terminals, or between a terminal and the earth.

Measure a known voltage (prior to the test) to make sure that the device is working correctly.

Use the terminals, the mode and the range matching the measures you wish to take.

Do not use damaged measuring leads. Check for insulation defects, exposed metal parts and wear indicator on measuring leads. Check the continuity of the measuring leads by testing a known voltage.

Do not create contact between the sensors and a voltage source when the measuring leads are connected to the current terminals.

This product should be disposed of in an appropriate recycling facility. Do not throw away in a household bin.

This product should be recycled appropriately.

WELDING FUMES AND GASES

The fumes, gases and dust created when welding are a health hazard. It is required to ensure adequate ventilation or extraction for fumes and gases. Using an air fed welding helmet is recommended in case of insufficient ventilation in the workplace.
Check that the extraction is effective by checking it against recommended safety standards.

Caution, welding in small spaces requires surveillance from a safe distance. In addition, the welding of certain materials containing lead, cadmium, zinc, mercury or beryllium may be particularly harmful.
Do not weld in areas where grease or paint are stored.

GAS CYLINDERS

Gas leaking from the cylinders can lead to suffocation if present in high concentrations around the work area.
Transport must be done safely: cylinders closed and device switched off. They must be stored vertically and held by a support to limit the risk of falling.
The same recommendations apply for the storage of the cylinders. They must also be stored in open and ventilated areas.

Gas cylinders must be stored in an open or ventilated area. The cylinders must be in a vertical position and fastened to a support or trolley.
Close the cylinder in between using it. Be wary of temperature variations and sun exposure.
The cylinder must not be in contact with a flame, electric arc, torch, earth clamp or all other sources of heat.
Always keep gas cylinders away from electrical circuits and therefore never weld a pressurised cylinder.
Be careful when opening the valve of a cylinder, it is necessary to remove the valve head and to make sure that the correct gas mix is used.

ELECTRICAL SAFETY

The electrical mains used must have an earth terminal. Follow the fuse rating recommended in the table.
An electrical shock can directly or indirectly cause serious and potentially deadly accidents.

Do not make physical contact with live parts inside or outside the machine when it is powered such as the torch, earth clamp, electrodes and cables, as they are part of the welding circuit.
Before opening the device, it is imperative to disconnect it from the mains and to wait for 2 minutes in order for the capacitors to release the energy.
Do not touch the torch or electrode holder and the earth clamp at the same time.
Make sure to replace the torches and cables if they are damaged. This should be done by a qualified and authorised technician.
The dimensioning of the accessories should be sufficient.
Always wear dry clothes which are in good condition in order to be insulated from the electrical circuit. Wear insulating shoes, regardless of the environment in which you work in.

NORMATIVE REMINDER

According to the EN1090 standard, a welding generator must undergo a control of its welding parameters. This check allows us to issue a «Validation report».

The following validation procedure is based on the reference standards EN 50504 and EN 60974-14.

The objective of this procedure is to ensure a correct welding result that is reproducible over time.

Validation of welding equipment according to the standard is an action to verify the performance of the product in relation to its settings.

Validation is carried out on 5 measuring points within the adjustment range. It is nevertheless possible to validate a reduced adjustment range at the customer's request.

Select the validation/calibration range of the control or indicator assembled on the power supply as follows:
a) the complete range of the control or measuring device (see note);
b) a partial range of the control or measuring device;
c) the selected points within the range of the control or measuring device.
**NOTE** The maximum values of the range for voltmeters and ammeters are given by the no-load voltage and the maximum welding current of the current source.
Before performing the validation/calibration, it is necessary to agree with the manufacturer, customer or user on options b) or c).

Perform measurements at the minimum setting, maximum setting and at three other points which are at nominally equal distance between minimum and maximum over full range

In the case of EN 50504, the measurement is carried out twice (rising «a» measurement and falling «b» measurement) after a stabilisation time of 10 seconds for the measured values.

For En 60974-14, the measurement is performed 3 times (measurement «a», «b» and «c») at short intervals after a stabilisation time of 10 seconds.

It is recommended to leave the product in operation for 5 minutes before carrying out the validation procedure.

The validation must be carried out at least every year and after each repair or modification that may affect the settings.

Only a qualified person can perform these measurements. This person ensures that the test conditions are optimal and the results accurate. We highly advise to go through the text of the standard before performing a validation.

For specific processes such as Pulsed MIG and TIG AC, user errors and the use of indapated measuring tools may result in measurement errors. The manufacturer of the welding machine must be consulted.

Welding machine precision
The precision of the settings and/or displays is determined by a category, itself determined according to the welding specifications (PQR/WPS) and the welding machine specifications.

Validation type:
 - For EN 50504, the type of validation can be «consistency» or «accuracy».
 - For EN 60974-14, the validation type can be «validation», «calibration» or «consistency».

This category is split in 2 types: «Standard» or «Precision». It determines the tolerance for the welding settings, the measurements taken and displayed on the machine as well as the measuring tools that should be used.

TECHNICAL FEATURES

The CALIWELD case is a device which allows:
- to issue a validation report (certificate which attests the proper functioning of the product - Validation mode).
- to check the welding values (current / voltage or energy, wire speed and gas - Multimeter mode and Oscilloscope).

Power supply voltage: 85 V to 265 V (± 10%) [1 SEP]

Frequency : 50 to 60 Hz (± 3Hz)

Power : 30 VA

Supply cable : plug connection IEC 60320-C13

Interface : Norme USB-2

Remote control : 120 V max

Measurement characteristics :
• Voltage: from -120 V to 120 V AC/DC - 0.5% of precision (instantaneous, average or TRMS)
• Current: from -500 A to 500 A AC/DC - 0.5% of precision (instantaneous, average or TRMS)
• Gas flow: from 1 l/min to 30 l/min - 5% of precision
• Wire speed: from 1 m/min to 30 m/min - 1% of precision
• External temperature: from 0° to 50 °C (± 2K)

Temperature:
• Operation: from 5°C to 40°C
• Calibration (temperature): from 20°C to 25°C
• Storage: from -20°C to 60°C Preheating: 30 min to take into account the temperature of the room

Relative humidity (without condensation):
• Operation: from 5°C to 40°C < 80%
• Storage: from 0°C to 60°C < 80%

Altitude:
• Operation: <2000 meters
• Storage: <12 000 meters

DESCRIPTION OF ACCESSOIRES AND CONNECTIONS

Picture	Name - Description	Duty cycle
	Ref: 060531 - Measuring cable 2 m CALIWELD VM1- Texas connection 70.24 Insulated Texas/Dinse connection for safe voltage measurement + insulated «banana» plug for connection to CALIWELD case.	X% (25°C) 316 A@60% 120 V Max
	Ref: 060524 - Measuring cable 2 m CALIWELD ECM1 - Euro connection / CGU1.0 Allows the measurement of MIG/MAG machines (voltage, current, gas flow, wire speed, remote control ...) for calibration. *Press the button to unlock the mechanism when feeding the wire.*	X% (25°C) 316 A@60% 120 V Max
	Ref: 060548 - Measuring cable 2 m CALIWELD VM2 Clamp for MIG welding voltage measurement (pinch on the machine euro connector).	X% (25°C) 120 V Max
	Ref: 060586 - Control cable 2 m CALIWELD ARC1 - Amph / DIN (male) connection Cable allowing the remote control of a TIG welding machine, with the software (plug into the case) or the pear shape remote (connect to the remote).	
	Ref: 060579 - Control cable 2 m CALIWELD DRC1 - DIN / DIN connection (male) Cable allowing the remote control of a TIG welding machine, with the software (plug into the case) or the pear remote (connect to the remote).	
	Réf. : 060562 - Remote control 2 m CALIWELD RC1 - DIN connection (female) Pear shape control allowing to remotely control the welding machine (connects to the control cable).	
	Réf. : 060593 - Power cable 2 m CALIWELD PC1 - connection CM50.21 Cable Texas/Dinse Cable transfering power from the generator to the case.	X% (25°C) 316 A@60%
	Réf. : 060555 - Measuring cable GAZ 2 m CALIWELD GM1 Cable transfering gas from the generator to the case.	
	Ref. : 060517 - Wire speed sensor CALIWELD SWM1 The speed sensor measures the wire speed between the wire reel and wire feeder. *Push the button to unlock the mechanism when the wire is fed.*	
	Ref. : 060609 - USB cable 2.0 1,5 m CALIWELD USB1 - connection USB-A / USB-B	

SET UP

1. Minimal configuration

Windows 7 operating system
Free disk space 10 Go
Minimum resolution: 600 x 800 px
RAM : 2 Go
1 USB port

The computer must be connected to the internet during the installation of the CALIWELD software.

2. Software and hardware installation

Refer to quick start procedure (appendix, p.25).

### 3. Connection of the machine to the case

There are two different cabling situations depending on the welding process tested:
1. In welding, for the verification of the parameters.
2. On resistive load to be able to generate a validation report (the verification of welding parameters can also be checked on a resistive load).

⚠️ In TIG desactivate the HF (High Frequency) as on resistive load. However, the CALIWELD case is equipped with a «HF protection» which ensures that the product operates correctly in HF if the test conditions are optimal (cabling...). To use the HF, please follow the installation and connection procedure. In the event of incorrect connection or use, the software may not work (stop recording, software shutdown, Windows blue screen...).

CONNECTION OF THE WELDING MACHINE TO THE CASE
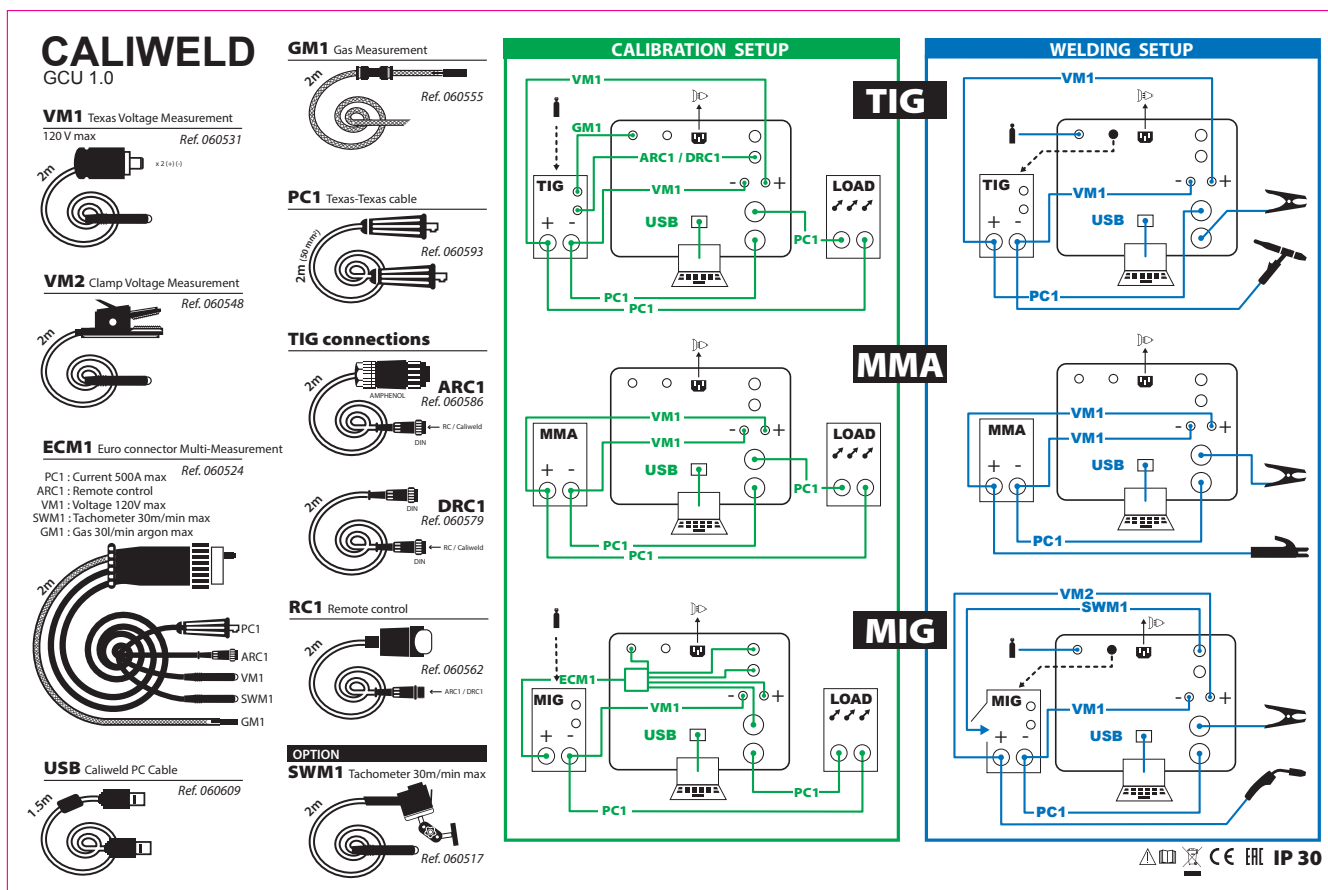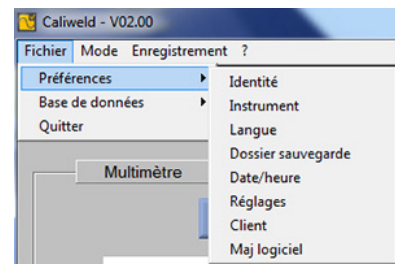

TRIGGER CONNECTION DIAGRAM
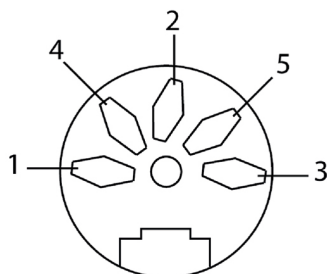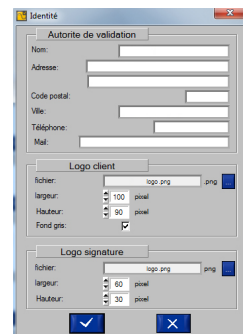

1 - Common
3 - Welding button
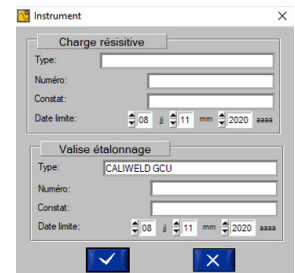
SOFTWARE OPERATION

File menu:

- *Preferences :*

◇ <u>Identity:</u> information on the validation authority: name, address, postcode, town, telephone, e-mail, logo.

◇ <u>Instrument:</u> information on resistive load and case, type, serial number, report number, verification date.

◇ <u>Language:</u> (choice of language FR (default), GB, DE, ES, IT, HU)
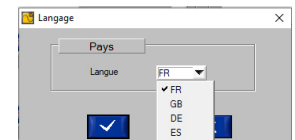
◇ <u>Backup folder:</u> choice of backup directory for «PDF» and «CSV» files.
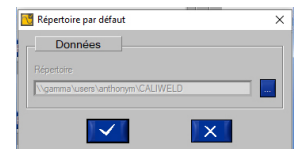
◇ <u>Date/Time:</u> choice of date format dd/mm/yyyy; mm/dd/yyyy; yyyy/mm/dd ; time in 24-hour or 12-hour format.
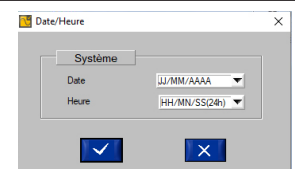
◇ <u>Settings :</u>
- • Choice of metric or SAE (American unit of measurement).
- • Assignment of the energy coefficient for welding processes (default data) :
  - ◦ MMA coef 0.8 SMAW
  - ◦ TIG coef 0.6 GTAW
  - ◦ MIG/MAG coef 0.8 GMAW
  - ◦ UNDER FLOW coef 1 SAFP
  - ◦ GAS
- • Choice of energy calculation standard.
- • Manual assignment of the correction coefficient for the gas using the **Ax + b** correction coefficients and creation of the gas library.
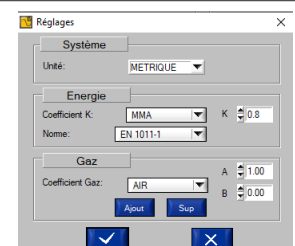
◇ Customer
  • Creation of a customer file. Filling in customer information.
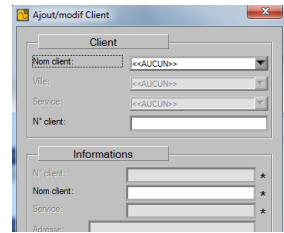
◇ Software update
  • Automatic security database update via internet.
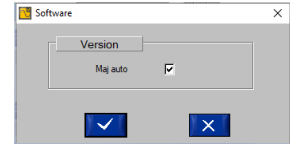
- *Database :*
  ◇ Scenario update
    • The scenarios are updated from the manufacturer's website.
  ◇ Import :
    • Scenario: imports product calibration scenarios (see p.18).
    • Product: imports the list of products that have been checked.
    • Security: imports the list of calibration benches authorised to connect.
    • Manufacturing : imports the list of the manufacturer's products.
    • Customer : imports the customer information.
  ◇ Exporting :
    • Scenario: exports product calibration scenarios (see p.18).
    • Product: exports the list of products that have been checked.
    • Security: exports the list of calibration benches authorised to connect.
    • Manufacturing: exports the list of the manufacturer's products.
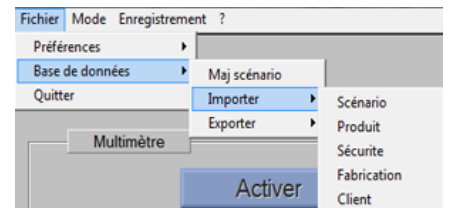   • Customer : exports the customer information.

Mode menu :

• *Multimeter:* It offers the possibility to perform QMOS/DMOS, to record welding bead parameters and to visualise measurements.
• *Oscilloscope:* It allows two measurement channels to be selected, visualised and recorded graphically.
• *Validation:* This mode is used to check and validate the performance of the product so that it complies with the EN 50504 or EN 60974-14 standard.
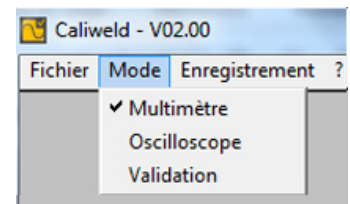
Record menu (active depending on the mode used):

• *Open:* Opens the recordings made and saved.
• *Print:* prints the recordings made.
Any PDF printout is directly saved in its file (see p.30).
• *Delete:* deletes just the selected line in the record.
• *Delete all:* deletes the entire record.
• *Back:* allows you to return to the previous window.
• *Export:* Allows you to export the records in .csv (all spreadsheet format).

Menu « ? » :

• *Infos* : Indicates information about the programme : Program version / Date of last update / Database version / Manufacturer's address.
• *Caliload 330 :* access to the adjustment table (MIG/MMA/TIG) of the resistive load.
• *Caliload 550 :* access to the resistive load setting table (MIG/MMA/TIG)
• *Help:* access to the CALIWELD product user manual

Detail of the status bar

MODE:	Multimètre	ETAT:	Connecté		25/06/2020	10:15
MODE:	Multimètre	ETAT:	Déconnecté	Nouvelle version disponible: Installer	25/06/2020	23:13
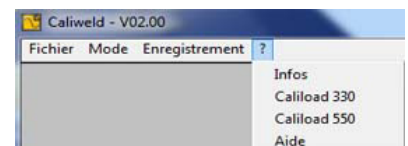
The status bar is located at the bottom of the application window.
It shows :
• *The mode (Multimeter, Oscilloscope, Validation)*
• *Status (Connected or Disconnected to the case)*
• *If an update is available, a message appears. Click Install.*
• *The date*
• *Time of day*

MULTIMETER MODE

Fig.1: Multimeter mode interface.

DESCRIPTION

The multimeter page opens when the software is launched. This mode offers the possibility to see each measurement channel, to record the displayed values and to record weld seams. It also allows the calculation of the welding energy.

The 4 measuring channels are:

- the current channel
- the tension channel
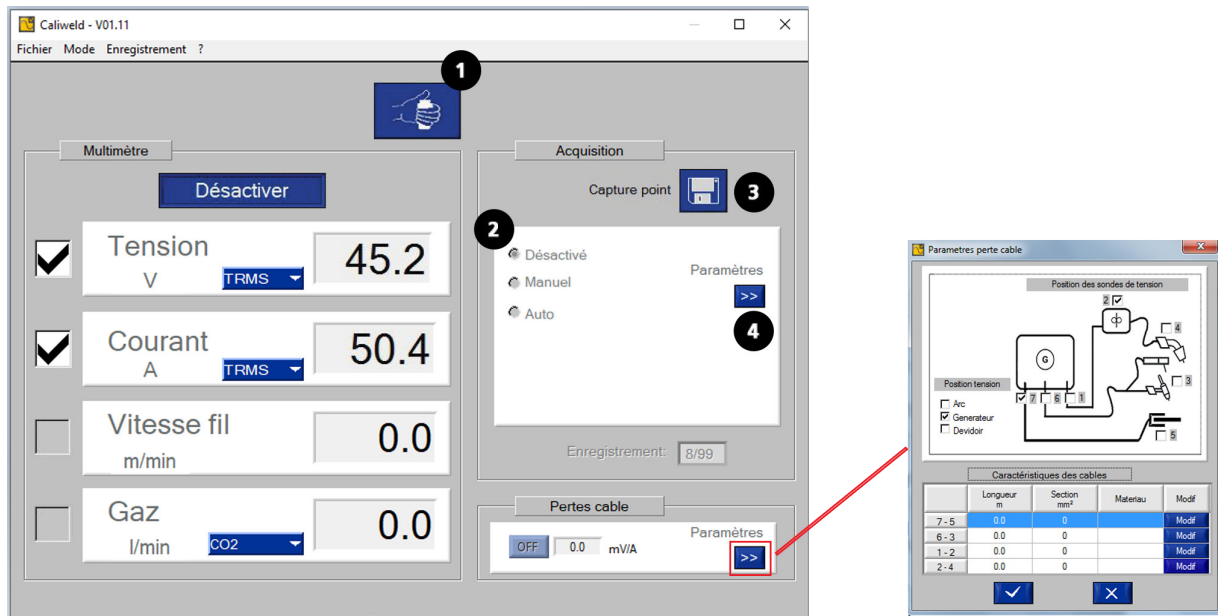- the speed channel
- the gas flow.

For the current and voltage channels, it is possible to choose the measurement mode (drop-down menu):

- TRMS (True Root Mean Square): the real effective value is displayed (default mode).
- MOY: the average value of the measurement is displayed.
- INSTANT: the instantaneous value of the measurement is displayed.

It is possible to enter the voltage drop related to the cables. To do this, enter the various parameters in the corresponding window.
In the «voltage position» section, check the box where the voltage is displayed.
In the «position of the voltage probes» section, tick the boxes where the voltage is measured.

START (FIG. 1: MULTIMETER MODE INTERFACE)

Start procedure:
- Select the measurement channels selected for the recording.
- Choose the measurement mode for each channel (TRMS ...) before starting the acquisition.
- Click on the «Activate» button.

New items appear on the window:

- A «Start / Stop welding» button **1** : button: to **control** the welding machine with the computer,
- An «Acquisition» section **2** : dedicated to the choice of the recording mode (see section manual & automatic recording),
- A «Recording point» button **3** : to record a point at a time «t».
There is a limit of 99 recordings. (points & weld seams).

RECORDING («Acquisition» section)
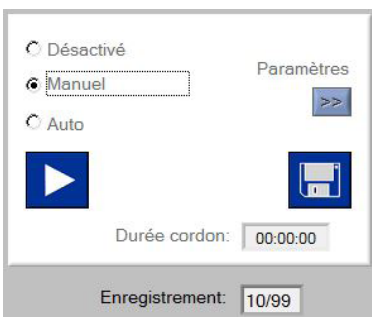
The recording of points and weld beads takes place in two steps:

1) Start a weld.
2) Carry out the capture via software.

Weld bead recording can be done in «OFF», «manual» or «automatic» mode.

Off Mode

The «Off» mode allows to take a measurement at a time «t» by clicking on the disk.

Manual mode

The choice of the manual mode implies that the user chooses when to perform his welding points. Start the manual recording of points by clicking on the button ▶. Stop the capture by clicking on the box. To save a weld bead, click on the button 💾. Repeat as many times as necessary.

Automatic mode

The automatic recording allows the user to program the software to do the recordings using several parameters which can be changed with the button >> ❹ :

- The choice of the default feed speed: required to calculate the energy according to some standards.
- The choice of the process: necessary for the future calculation of the energy.
- The triggering threshold: value of the current or flow rate above which cord acquisition starts and below which cord recording stops (a fig. 2 and diagram).
- Time between 2 weld beads: time between 2 weld beads. Recording stops beyond this duration (c fig. 2 & diagram).
- Start/stop welding rejection time: Duration at the beginning and at the end of the weld bead production during which the recording does not take place in order not to impact the measurement by the rising and decreasing phases of the current. (b & d fig.2 & diagram).
- Record every 1 sec: allows a point to be recorded every 1s during a weld bead.
- Without total energy calculation: the parameters for the energy calculation will not be requested at the end of the weld bead.
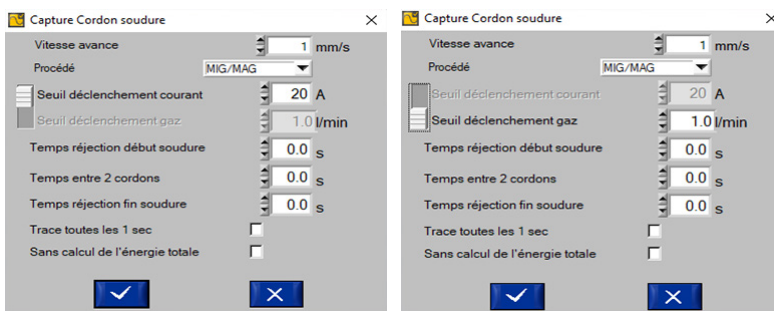
Fig.2 : cord capture settings   *Schéma : parameters and scrolling of a capture*
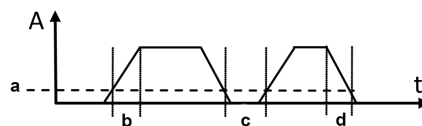
Each weld bead is triggered as soon as the current or flow rate exceeds the trigger threshold. It stops as soon as it falls below this threshold and no action is detected (pressing the trigger) for the chosen duration of time between 2 weld beads. (see diagram).

When a weld bead is being recorded automatically, the indicator 🔴 REC appears in the «Acquisition» window and the «weld bead duration» starts, it stops only when the current falls below the triggering threshold.

The recording will be automatic once a recording is completed. However, if the energy calculation has been requested in the parameters, a window will open in order to enter the parameters of the cord needed for the calculation.
The record will be in the software's backup file in .csv format.
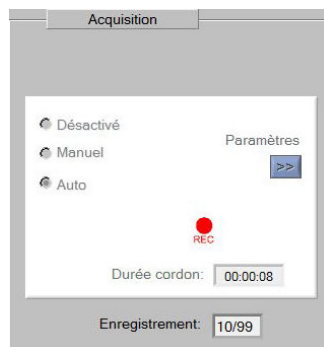
Recording of a 8 seconds weld bead by automatic recording.

Memorisation (manual & automatic mode)
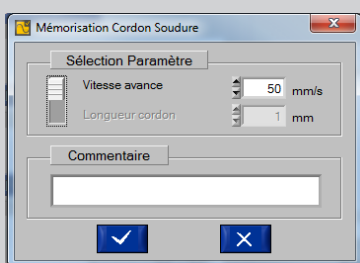
At the end of the recording, the software suggests to memorise the welding bead:

- Enter the feed speed or welding bead length. One of the two parameters must be fill in to calculate and estimate the energy.
- Comment on the measure (not mandatory).

RECORDING & PRINTING HISTORY

History

All recordings are available with several information in a history (up to 99 recordings).
To get there, click on the «disabled» box under the heading «Acquisition» and then click on «Open» in the «Recording» menu.

The measurement history gives the following information: Backup number, backup date and time, weld bead duration if recording > 0 seconds, voltage, current, speed and gas flow. The software calculates the total welding energy of the weld bead in kJ (see equation 2), it is necessary to divide the energy in kJ by the length of the weld bead (in mm). It is also possible to add a note. Lines can be deleted by clicking on «Save» and then «Delete».

Rapport multimètre — Fichier Mode Enregistrement ?

Mesures multimètre
Mesure_25-06-2020.pdf

N°	Date/Heure JJ/M/AAAA HH:MN:SS	Durée HH:MN:SS	Tension V	Type tension	Courant A	Type courant	Vitesse m/min	Gaz l/min	Type gaz
01	11/03/2020-15:29:51	00:00:05	26.1	MOYEN	161.8	MOYEN	00.0	00.0	
02	11/03/2020-15:31:05	00:00:26	26.1	MOYEN	161.7	MOYEN	00.0	00.0	
03	11/03/2020-15:31:34	00:00:04	26.1	MOYEN	161.8	MOYEN	00.0	00.0	
04	11/03/2020-15:33:06	00:00:07	26.1	MOYEN	161.8	MOYEN	00.0	00.0	
05	11/03/2020-15:35:48	00:00:04	26.1	MOYEN	161.8	MOYEN	00.0	00.0	
06	11/03/2020-15:44:07	00:00:12	19.5	MOYEN	165.1	MOYEN	00.0	00.0	
07	11/03/2020-15:52:23	00:00:20	17.5	MOYEN	131.9	MOYEN	00.0	00.0	
08	11/03/2020-15:54:14	00:00:21	23.5	MOYEN	180.1	MOYEN	00.0	00.0	

ASME IX QW 409 ISO 18491	$Q = \dfrac{U \, x \, I \, x \, t}{d}$
EN 1011-1 ISO 17671-1	$Q = k \, \dfrac{U \, x \, I \, x \, t}{d}$

Q = j/mm	Welding energy
U = V	Average current
I = A	Average current
T = s	Welding time
d = mm	Length of the weld bead
k	Thermal efficiency coefficient

Fig. 3: Recording history of the weld seam

If the recording of points and weld beads is suitable, it is possible to save it and print it in pdf using the «Save» tab and then clicking on «Print».

It is also possible to export the document in. csv (compatible with all spreadsheets: Excel, LibreOffice, etc). Using the .csv file it is then possible to amend the report. It is possible to export it in pdf from the spreadsheet after customisation. A template file is available on the USB stick provided.

Mesures multimètre
Mesure_24-5-2016.pdf

N°	Date	Heure	Durée	Tension	Courant	Vitesse	Gaz	Energie	Commentaire
1	07/04/2016	11:21:47	00:00:00	42.2 V	293.9 A	0.0 m/min	0.0 l/min	0.0 kJ	
2	07/04/2016	11:23:54	00:01:02	42.2 V	293.9 A	0.0 m/min	0.0 l/min	277.7 kJ	
3	07/04/2016	11:30:28	00:01:00	42.2 V	293.9 A	0.0 m/min	0.0 l/min	256.6 kJ	
4	07/04/2016	14:58:03	00:01:40	42.1 V	292.9 A	0.0 m/min	0.0 l/min	1244.9 kJ	
5	07/04/2016	14:59:59	00:00:33	42.1 V	293.1 A	0.0 m/min	0.0 l/min	410.3 kJ	
6	07/04/2016	15:48:27	00:47:20	42.1 V	293.3 A	0.0 m/min	0.0 l/min	35222.0 kJ	cordon ok
7	07/04/2016	16:22:34	00:00:00	42.2 V	293.8 A	0.0 m/min	0.0 l/min	0.0 kJ	
8	08/04/2016	11:55:47	00:00:00	0.7 V	3.0 A	0.0 m/min	0.0 l/min	0.0 kJ	
9	08/04/2016	14:19:44	00:00:00	0.7 V	2.6 A	0.0 m/min	0.0 l/min	0.0 kJ	
10	08/04/2016	14:20:19	00:00:00	0.7 V	2.9 A	0.0 m/min	0.0 l/min	0.0 kJ	
11	08/04/2016	14:56:59	00:00:00	0.2 V	4.4 A	0.0 m/min	0.0 l/min	0.0 kJ	
12	08/04/2016	14:57:12	00:00:00	0.2 V	4.4 A	0.0 m/min	0.0 l/min	0.0 kJ	
13	08/04/2016	14:58:09	00:00:02	0.2 V	4.0 A	0.0 m/min	0.0 l/min	0.0 kJ	
14	08/04/2016	14:58:36	00:00:17	0.1 V	4.1 A	0.0 m/min	0.0 l/min	0.0 kJ	
15	11/04/2016	11:10:16	00:00:00	41.8 V	290.6 A	0.0 m/min	0.0 l/min	9.6 kJ	
16	11/04/2016	11:10:32	00:00:00	41.8 V	290.9 A	0.0 m/min	0.0 l/min	0.0 kJ	
17	11/04/2016	11:26:01	00:00:02	41.9 V	291.3 A	0.0 m/min	0.0 l/min	25.6 kJ	
18	12/04/2016	16:38:42	00:00:00	123.6 V	855.8 A	0.0 m/min	0.0 l/min	50.7 kJ	
19	12/04/2016	16:38:49	00:00:00	123.6 V	855.8 A	0.0 m/min	0.0 l/min	0.0 kJ	

Fig. 4 : print example

To change the mode, click on the «Save» tab, then click on «Back». Finally, go to the «Mode» menu to choose a new mode.
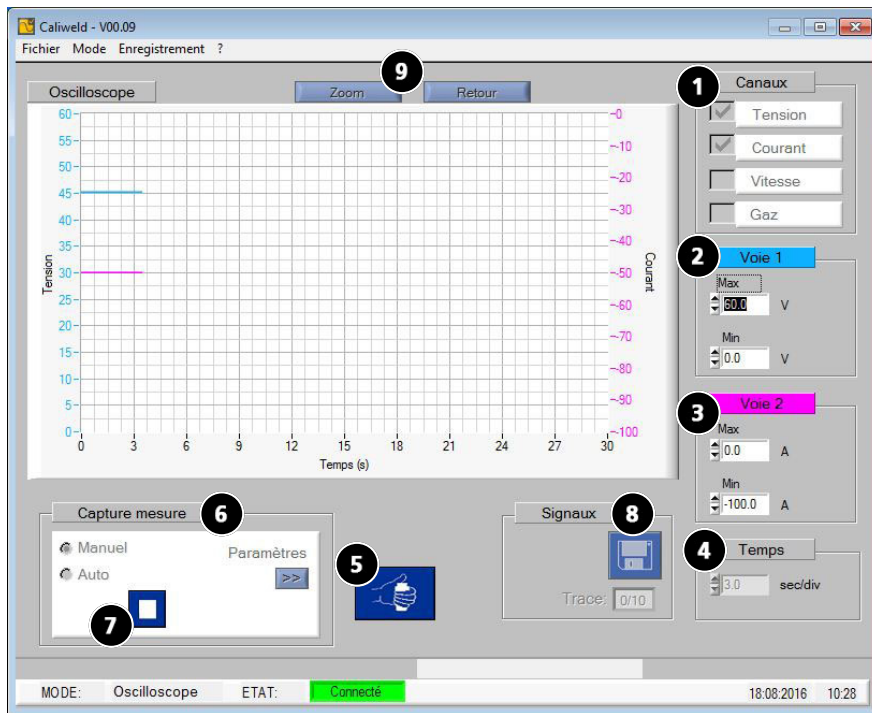
OSCILLOSCOPE MODE

Fig.5: Oscilloscope page

DESCRIPTION (Fig.5: oscilloscope page)

The oscilloscope mode allows you to select two measurement channels, view them and save them on a chart. This additional mode allows to focus on a precise channel and to compare it to another channel thanks to its chart. The elements which are included in the Oscilloscope mode page (Fig.5) are:

- A chart.

- A «Channels» section including the 4 measurable channels **1** .

- Two sections «Way 1» **2** and «Way 2» **3** are displayed once one or two channels have been selected. The measurement unit displayed in each section is used to check that the ways represent the selected channels (ex fig.5: The voltage has been selected as the first channel to be measured, the measurement unit of «Way 1» is in Volt).

- A «Time» section **4** allowing both to modify the scale of the graph, and choose between continuous recording or scanning.

- A «Start welding» remote control button **5** ,

- A «measurement recording» section **6** , allowing the possibility to choose the mode of recording «manual» or «automatic». The setting button `>>` allows to access to the settings of the «Auto Recording» mode. The maximum recording time is 30 seconds.

- A «Save» button, **8** allowing the recording of weld beads.

- And a zoom function **9** enable to zoom on the chart (refer to the «Zoom function» section below).

Zoom function

The software offers the possibility of zooming on the oscilloscope. To do so, click on the «zoom» button (**9** Fig. 5) a first time and 4 points will appear on the chart (2 horizontally and 2 vertically). Use these points to create a rectangle on the area where the zoom is required (Fig. 6). Then click again on the zoom button (fig.7). To go back to the standard view, just click on the return button.
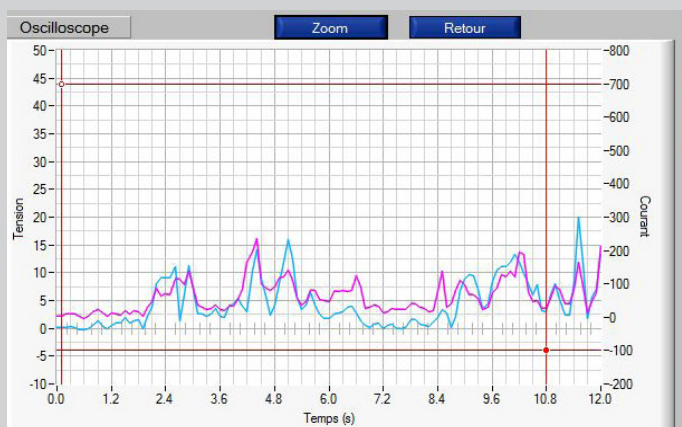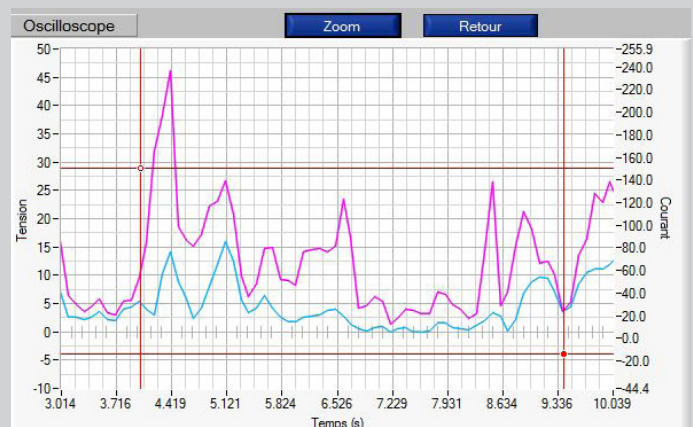

Fig.6: Chart before zoom

Fig.7: Chart after zoom

RECORDING

Manual recording

To start a new manual recording, tick the «manual» box in the «measurement recording» menu. The START box appears (**7** fig. 5) and changes to a STOP box when the recording starts. To start recording the measurements, either activate the machine by using the remote control (**5** fig.5),or by welding, and then press the button ▶ each time that a recording is required. The recording of the weld bead then starts.

To stop the recording, click on the button ☐. Repeat these actions until the weld bead or the number of measurements obtained are satisfactory.

Automatic recording

Recording can be automated by ticking the «Auto record» box (**6** fig. 5). Firstly, adjust the welding settings. Similarly to the «multimeter» mode, the following options appear in the automatic recording settings:

Start threshold : value of the current or flow rate above which acquisition starts.
Interpoint times : time between 2 welding spots. The recording stops after this time.

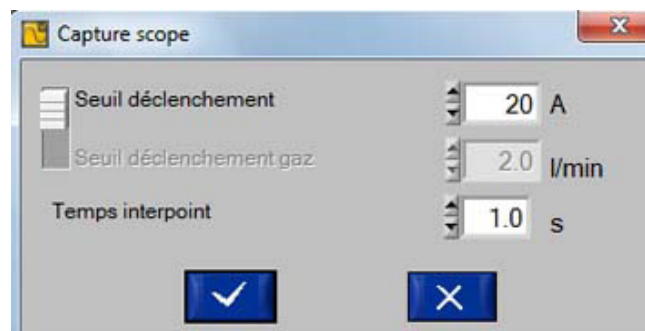Click on ✓ to validate the settings.

Fig.8: Auto capture settings

The operating of the oscilloscope automatic mode is similar to the multimeter. Firstly, either activate the machine by using the remote control (**5** fig.5) or by welding. Then click on the button ▶ (**7** fig. 5). TThe software will record any cord as soon as the current or flow rate is higher than the selected trigger threshold. It stops recording the cord as soon as the current or flow rate is lower than the trigger threshold.

Two actions will stop the measurements: either the user clicks on the button ☐ (**7** fig. 5) or if the duration of the recording reaches 30 seconds.

SAVING & PRINTING

At the end of the recording, it is possible to save and display the oscilloscope recordings (up to 10 lines max). Just click on the button 🖫 (**8** fig. 5), name the recording and click on Ajout. Click on the button ✓ to validate the recording.
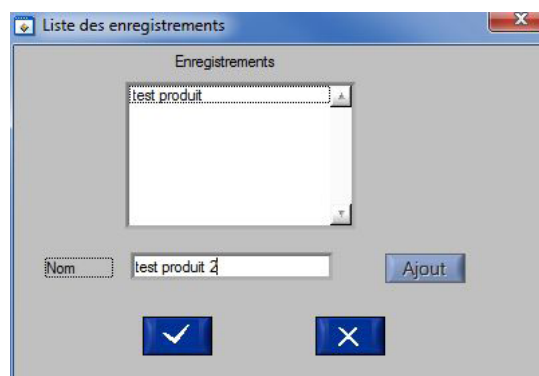
Fig.9: Recording add window

The completed recordings can be accessed later. Click on the «Recording» menu and then «Open». The below window pops up (Fig.10).

Fig.10: Recording list

To open a previous recording, click on it to select it and click on the button [✓] .

To delete a recording, click on it to select it and click on the button [Sup] .

To delete all recordings, click on the button [Supp tout] .

VALIDATION MODE

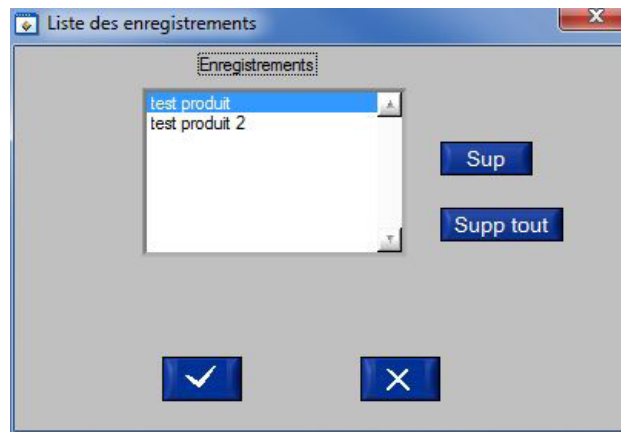*DESCRIPTION (Fig.11 : Calibration page)*

Fig.11: Calibration page

> ⚠️ **The validation of the product must be done using a load bank.**
> **Before starting the validation, follow the verification process for the welding machine and load bank.**
> **(appendix p. 24)**

This mode validates the product specifications and delivers a validation report indicating if it complies with standard EN50504 or EN 60974-14.
To validate the specifications of a machine, it is necessary to acquire the measurements from an existing scenario or by creating a new one.
Calibration scenarios are included with the CALIWELD case. If the machine used is from another manufacturer, it is possible to create or modify the scenarios. The only condition is that standard EN50504 or EN 60974-14 (p.6) is followed until the validation is complete.

> ⚠️ **Some products of the synergic type need specific scenarios to avoid the risk of incorrect measurements (manual recording, specific settings...). For more information regarding these products, refer to p.30.**

The first page of the «Validation» mode is the calibration page. The scenario used for the validation is determined there. The fields listed below need to be filled in:

- The «serial number» of the machine ❶ **.a**

- The «Identification N°» ❶ **.b** : customer machine identification

- The «product» section ❷ which will be used to automatically fill in the «information» section.
The box «wire feeder number» needs to be filled in if the wire feeder is separate and not in the machine.

- The «information» section ❸ is filled in automatically, except for the fields «supply voltage» and «U0 machine» which must be filled in by the user. «U0 machine» represents the no-load voltage. It must be measured with a multimeter or with the caliweld, if the user ticks the display checkbox (voltage).

- The section «Channels» ❹ , allows to select the channels that must be recorded during the validation. Tick the «source» box in the «source» column.

Remark : When using a machine with a digital display, it is recommended to tick the «display» box. It will be possible to compare the measurement taken by the software and the value displayed on the machine.

- The «points list» section ❺ (cf. chapter «In the case of the creation of a new scenario»).

- A « Parameters « section ❻ allowing to choose the desired standard, class and type.

- A heading «Cable losses» ❼ allowing to inform the voltage drop related to cables.

IN THE CASE OF A SCENARIO ALREADY AVAILABLE

Scenarios are already stored on the software. If the user has one of these models, he will be able to use the relevant scenario available on the software and on the on the manufacturer's website. The database can be imported or directly modified in the software (Warning : the imported database will replace the existing scenarios. Make sure you carry out the import during the first uses or all added scenarios will be lost).

To obtain the scenario matching the model to be validated, remain on the calibration page of the «Validation» mode. Enter the machine serial number

❶ . Fill in the information in the «Product» section ❷ . The sections on the calibration page will be automatically filled in.

However if one of the criteria in the scenario needs to be amended, click on the «Add/Modify Scenario» ❼ box and amend it (refer to section «In the case of a scenario creation»).

IN THE CASE OF A SCENARIO CREATION

Data are entered manually. In this case, click on «Add/Modify Scenario» **7** .
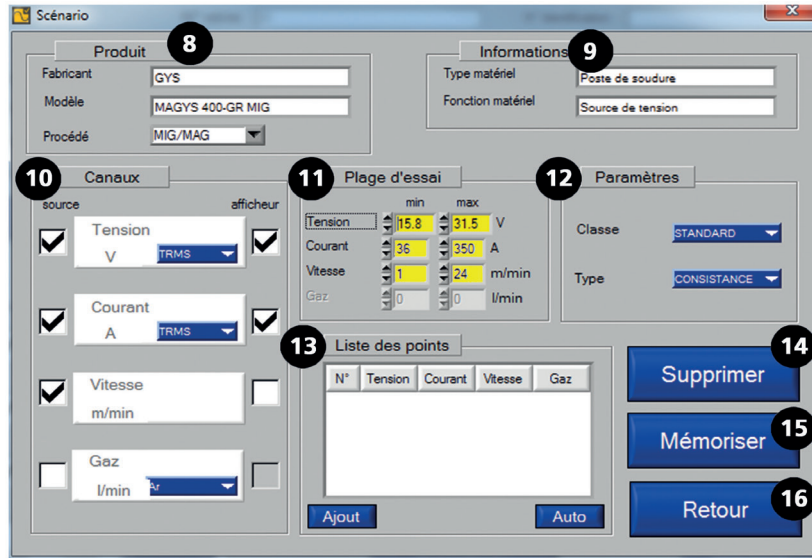
The «Scenario» window pops up :

Fig.12: Scenario page

To create a new scenario :
- From an existing scenario: open the page «Add/Modify Scenario» of the existing scenario and then save the modified scenario under another name (according to the model or manufacturer of the machine).
- From scratch : fill in the fields listed below (be careful when using CAPITALS and spaces and be aware that the fields are limited to 20 letters and digits) :

8	- *Manufacturer : manufacturer of the product.* - *Model : name of the product.* - *Process: MMA - TIG - MIG/MAG*
9	- *Type of material : welding machine* - *Material function: current source, voltage current, wire feeder, flowmeter…*
10	- *Channels: choice of channels required to validate the scenario.* - *Afficheur : option permettant de comparer la mesure logiciel à l'afficheur du poste.* - *«TRMS» : Choix du mode de prise de mesure (TRMS, Moy, Instant. - cf p.12 mode Multimètre - Partie Description)*
11	- *Test range : match the specifications of the product (max/min) : no load voltage, current, wire speed and flow (if flowmeter). For the maxium, check the values displayed on the label. For the minimum, these are the values supplied by the machine.*
12	- *Precision class: Standard / Precision, depending on the degree of accuracy required for validation.* - *Type (EN 50504): Consistency / Accuracy* - *Type (EN 60974-14): Validation / Calibration / Consistency*
13	- *List of points: determine the values for which the points are measured (p.20)* - Use the «Add» button to add points manually. - The «Auto» button generates the 5 points automatically from the information entered in the test range. Two buttons appear once the first point is created, the «Modif» button which allows you to modify a point and the «Sup» button to delete a point.
14	- *Delete: delete the scenario.*
15	- *Save : save the scenario.*
16	- *Return : exit the «scenario».*

⚠	**All criteria are required by the standard EN 50504. The input fields must be filled in.**

How to fill in the list of points ?

- Start by filling in the «Product» **8** and «Information» **9** sections.

- Then select the channels to be measured in the section **10**. If the machine has a digital display indicating the value of the selected channel, tick the «Display» box.

- Fill in the sections **11** and **12**. The «Test range» section is important because it contains the information that will allow the automatic creation of the points list.

- Click on the «Auto» button in the «Points list» section **13**.
- 5 rising points are automatically created, two choices are then possible:
- - The points are suitable, in this case switch to start.
- - The points are not suitable, in this case, go on the point to be corrected and click on the «Modify» tab. The «Point modification» page (Fig. 13) opens.
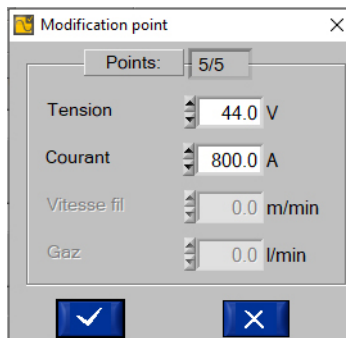
Fig. 13: «Editing point» page

Enter the desired values for each input field and click on [✓]. 5 measuring points must be filled, the software manages the rising part (from min to max) and the creation of decreasing points (once max, the software automatically creates again 5 points from max to min). To delete a point, click on the «Del» button.

> ⚠ **Deleting a scenario is irreversible. It is impossible to find a deleted scenario. It is important to make regular backups.**

Scenario memorisation

Once the list of points has been completed, the creation of the scenario is completed, click on «Save» (n° **15** fig. 12) (the scenario integrates the software database) to save and click on «Back» to exit. (n° **16** fig. 12)

START

The «Calibration» page must be fully completed before starting the validation.
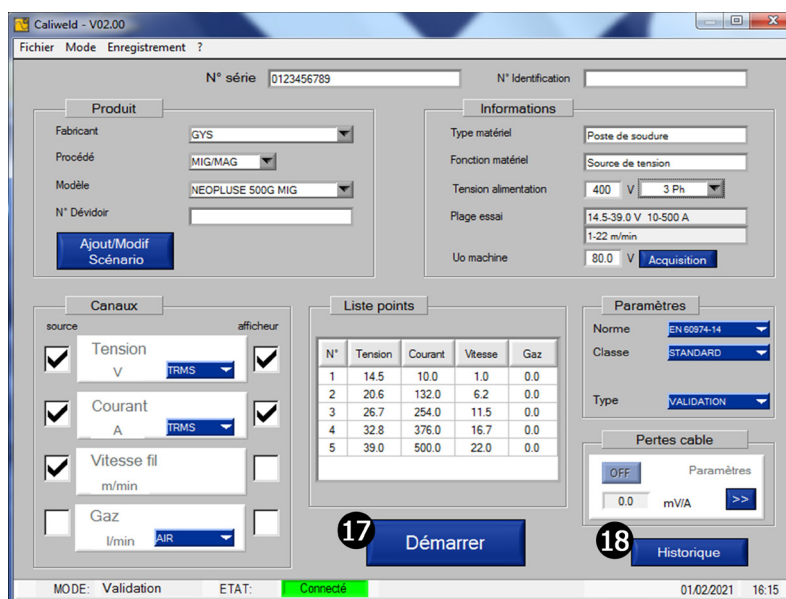
Fig.14: «Calibration» page completed

HISTORY

The «History» button (n° **18** fig. 14) allows to open the «Validation history» page. If the welding machine has already been validated with the software, it will be written in this history. It can be printed or deleted with the «Recording» menu.
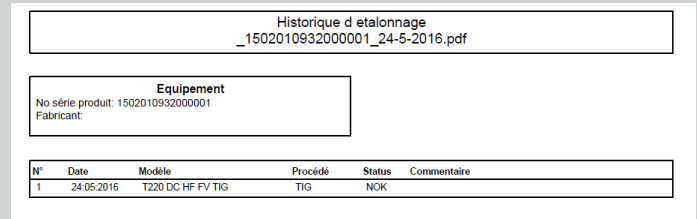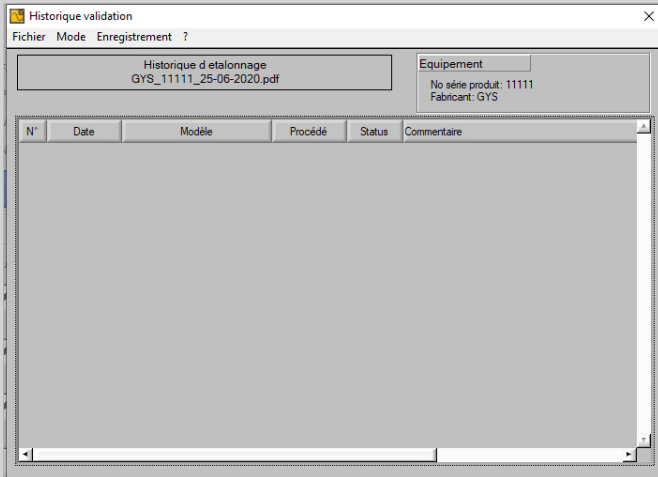
Fig.15: recording and printing «Validation history».

Click on the «Back» button to exit.

It is now possible to start the validation by clicking on the «Start» button (n° **17** fig. 14).

Product control according to 60974-4 (SEE APPENDIX):

OFF: the confirmation page opens (Fig. 16). ON: The test setup page opens (see below).	
1 - Tick the boxes corresponding to the checks carried out.	2 - At the end of the validation, a window will open to fill in the results of the checks carried out.
	3 - Fill in all the fields before validating.
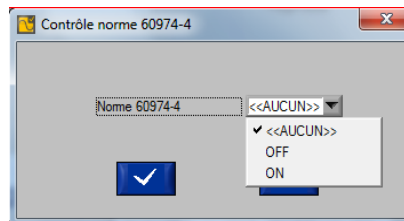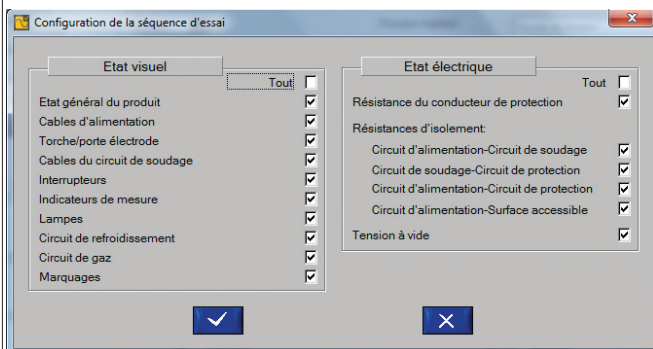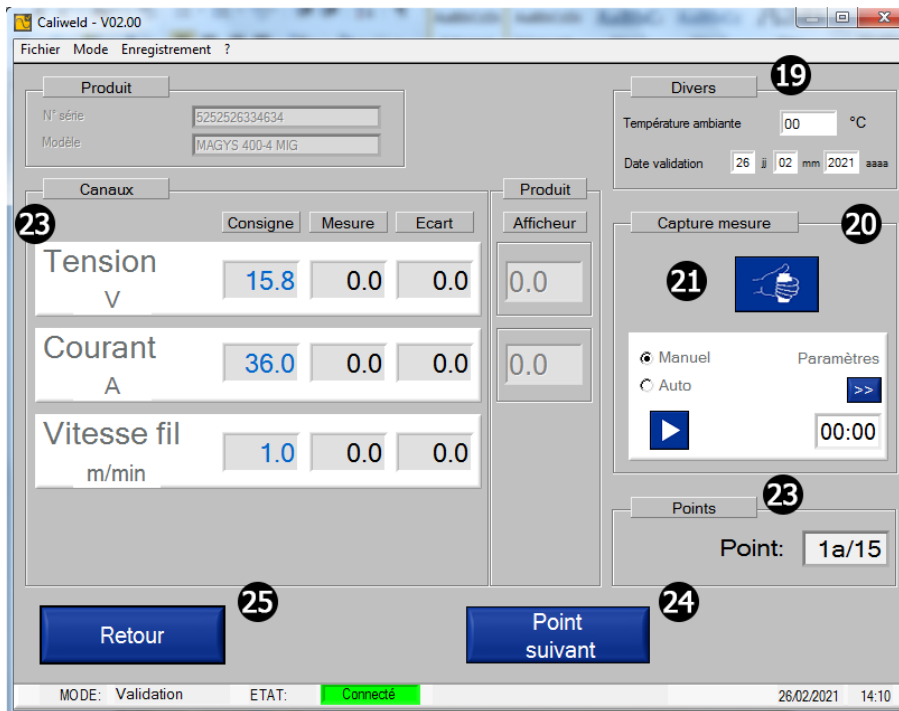
Fig. 16: Validation page

Before starting the recording, several information must be filled on the validation page in the following sections:

- «Miscellaneous» **19** :
- temperature: the actual temperature is indicated, but can be changed if necessary,
- the date,

- «Recording measurement»: two modes available , manual and automatic (see section «Recording») **22** ,

- «Channels»: indicates the measured values in the selected channels **22** ,

- «Points»: indicates the point being mesured (10 points to be measured according to the standard) **23** ,

- The «Next point« button: moves to a new point **24** ,

- The «Back» button to go back to the «calibration» page **25** .

- The «Start welding» button (n° **21** is a remote control of the load).

RECORDING

Recording the values can be done manually or automatically.

«Manual Recording»

In the «Measurement recording» section, tick the box «Manual». Start the welding (n° **21** fig. 16), and at the chosen time click on the «START» box ▶
The recording of the welding bead starts. The software saves the welding beads measurements and compares them with the target value given when the list of points is created. The red boxes become green when the given values show a correct 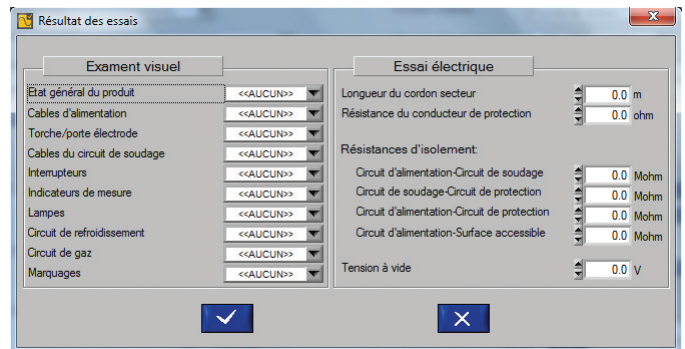gap between the measurement and the target value (see the section «welding bead values analysis»). Click on the ☐ box to stop recording the welding bead (according to the standard, the recording time must be at least 10 seconds). Go to the next spot and repeat this operation until the 10 spots are recorded.

Remark : the recording can be repeated as many times as needed by clicking again on the START box and then STOP box.

«Automatic Recording»

To activate automatic recording, use the «settings» tab >> Then tick the «Auto» box in the «Measurement recording» section.

Fig.17

To change the settings of the automatic mode once the value capture has started, it is necessary to go to the manual mode (security so that the user does not change the settings during a measurement).
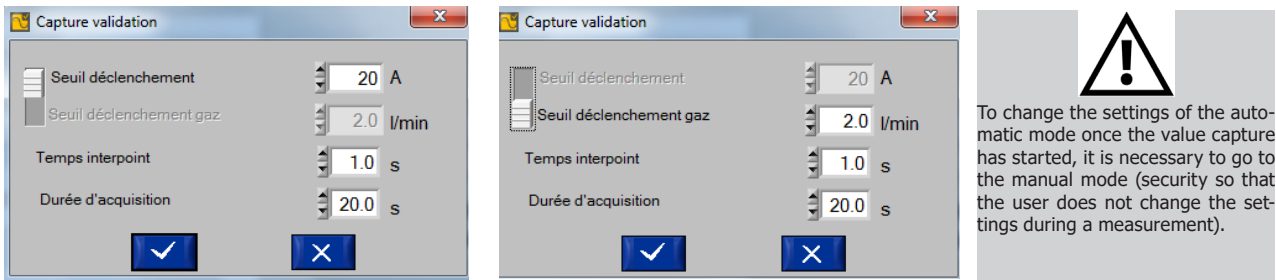
Switching threshold; value of the current or flow rate above which acquisition starts.

Acquisition parameters of the «Auto Recording» mode which can be modified:
Trigger threshold: The value of the current above which the acquisition starts.
Interpoint time: time between 2 welding points. The recording stops beyond this duration.

Click on the button ✓ to validate the parameters.

Start the welding (n°㉑ fig. 16). The automatic mode starts to record the values as soon as the triggering threshold is exceeded. The recording lasts 10 seconds, the recording of the values starts after these 10 seconds. Once the first recording is completed and validated, click on «Next Point» and continue until the 10 points are recorded.

For both manual and automatic recordings, it is possible to view the points which has been recorded using the «Next Point» and «Previous Point»

buttons (㉖ fig. 17 and ㉔ fig. 16). Thus, each point can be measured again as many times as necessary and at any time of the validation. It is possible to resume a recording, according to the «Manual» or «Automatic» mode.

Analysis of the values shown in the «Channels» section.

Instruction value: Value shown in the list of points when the scenario is created (either pre-entered in an existing scenario or chosen by the user).
Measured value : Value of the welding machine measured by the calibration case.
Difference : Instruction value - Measured value, the box is shown in green if the value is within the tolerance of the table (refer to the table in the standard reminder section on p.4) or in red if it is not.
Display : It is the value displayed on the welding machine. Contrarly to the difference, the box is shown in green if the value is within the tolerance or in red if not.

Interpretation of the results below :

The «Instruction» values for the three chosen channels were : 16.5 V for the voltage, 50.0 A for the current and 5.0 m/min for the wire speed. After 10 seconds of recording, we note that the user has chosen to use the intensity value (50.2 A). The difference is in accordance with the tolerance of the standard and therefore the box is shown in green.

The values of the voltage and wire speed are in accordance with the specified instruction values. The difference is too important and is not within the tolerance range. The boxes are shown in red. It is possible to repeat the measurements to obtain correct values. If this is not successful, the user must move to the next point and carry on with the validation. Then print the validation report, the validation will be considered as a failure. The machine is faulty and must be repaired by a qualified technician.

Once 10 measuring points have been taken (when the 1b spot is done), click on the «finish» button (n°**27** fig. 17) which now appears at the bottom right of the window.
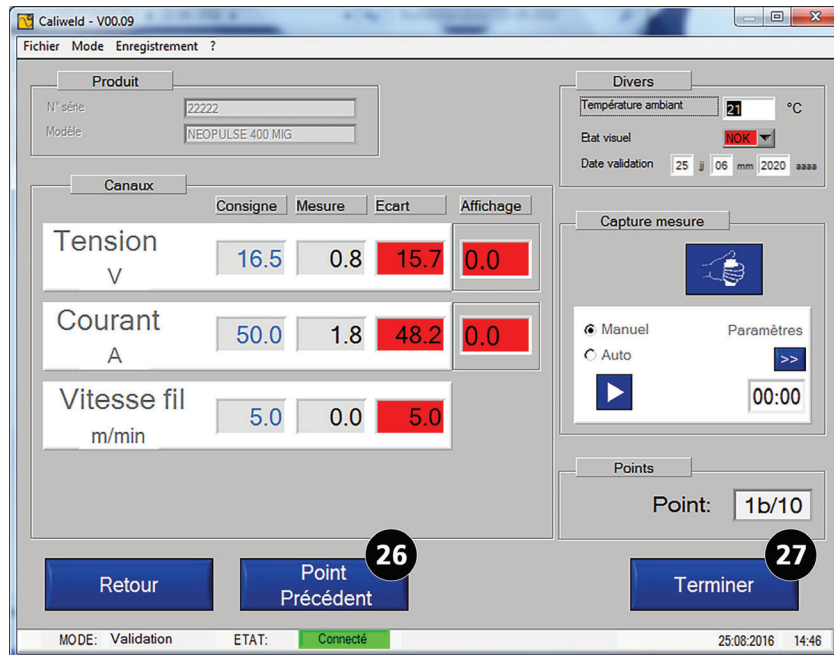
Fig.18: End of acquisition (last point 1b + box «Finish that appears»)

A «Comment» page opens up. It allows to add a comment to the recording.

This comment will be shown in the history press the button ![✓] to validate.
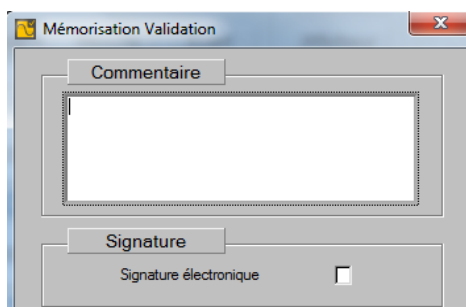
Fig.19: add a comment
Tick the «Electronic signature» box if it is entered in the database.

The comment window is replaced by a report screen called «validation report or certificate».
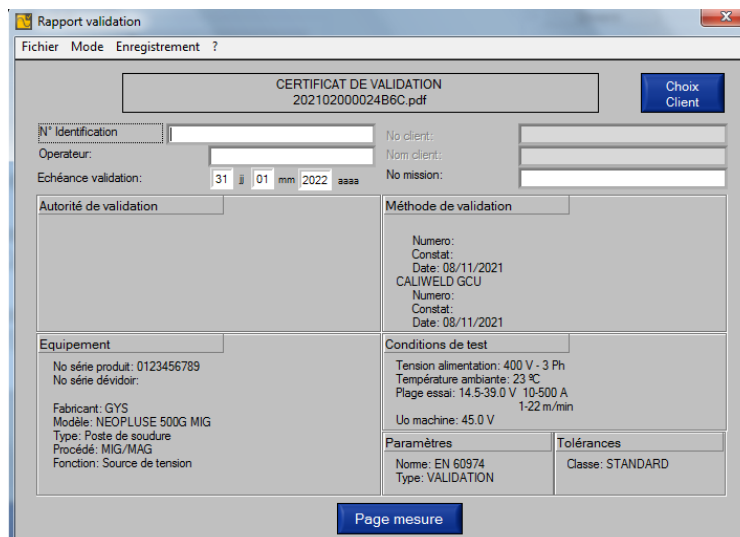
Fig.20: generated report

Some fields can be filled in if necessary:
Identification number
Operator (name of the person who has just carried out the validation)
Deadline (date of the next validation. This date is proposed according to the class selected beforehand, but can be modified if necessary).
Customer choice (retrieves customer information if it is entered in the database.)
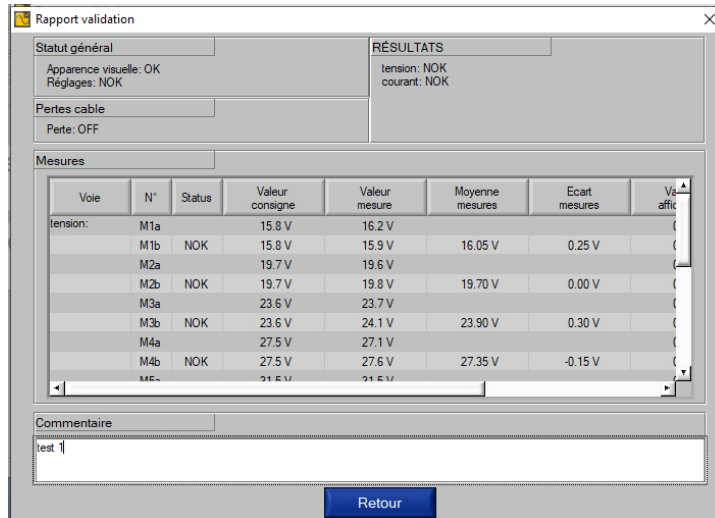
Fig.21: generated report

The information are displayed before opening the PDF file. Press the «Measure page» button. The rest of the report is displayed.
The «Back» box allows to go back to the page 1 of the report.
Click on «Record» then:

- «Print» to generate the report in PDF (Appendix - Validation Certificate).
- «Export» to generate a .csv report (compatible with all spreadsheets: Excel, LibreOffice, etc). Using the .csv file it is then possible to amend the report. It is possible to export it in pdf from the spreadsheet after customisation. A template file is available USB stick provided.

APPENDICES

QUICK START PROCEDURE

1

2

Windows 7 operating system
10 Go free space in the hard disk
Ram: 2 Go
Minimum resolution 600/800
1 USB 2.0 port
Internet connection

3

setup.exe
setup.ini
bin
license
supportfiles
dp.pmf
nidist.id
Nom

4

5

6

7

8

9

USB 2.0 cable

Power cable
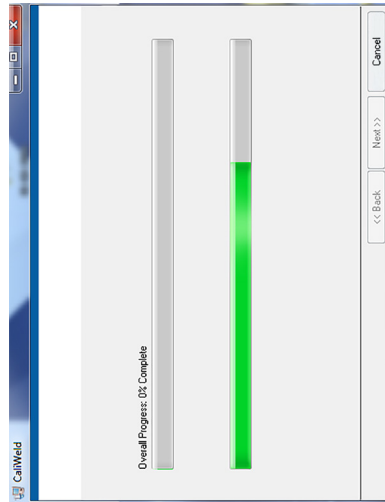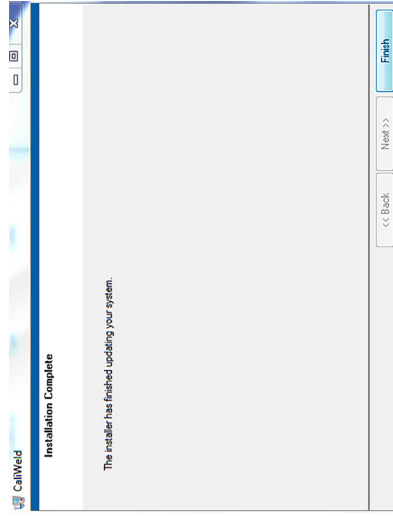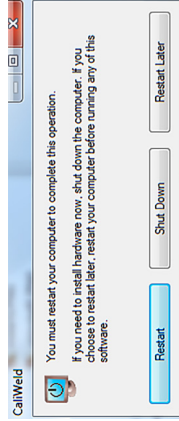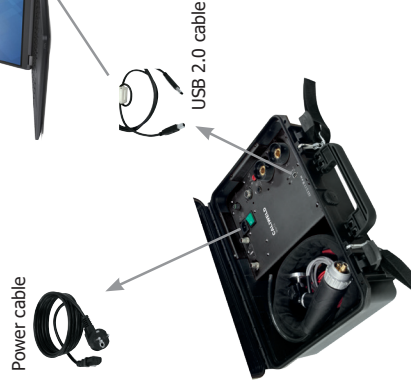
10
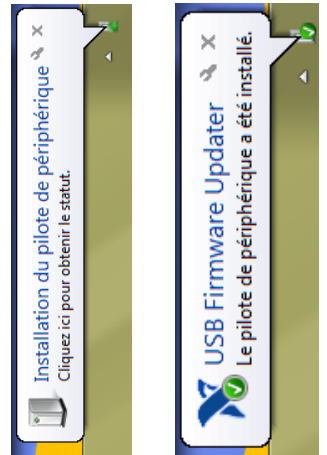
11
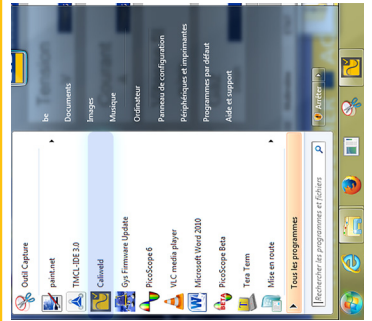
12
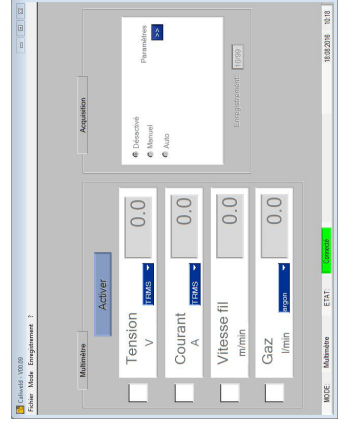
13
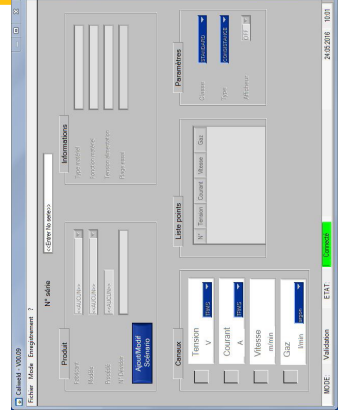
CHECKING A SETTING ON THE WELDING MACHINE

Extract from the resistive load note and from standard EN 50504

Before adjusting the product, you must:
3. Connect the welding machine to the resistive load with the grounding cable and the torch used. If not, use cables of the same dimension (length and cross section),
4. plug the control of the torch trigger,
5. check that the measuring tools are connected and switched on,
6. connect and turn on the welding machine,
7. configure the welding machine with the required process.
8. Wait 5 min.

To measure a setting:
9. Set the welding machine parameter to be checked,
10. Adjust the resistive load ,
11. Pull the trigger,
12. Measure:
    - the values of the current and the conventional voltage
    - the value of the wire speed at the tachometer after 10 sec (at stabilized speed).
13. Release the trigger.

1.   Resistive load
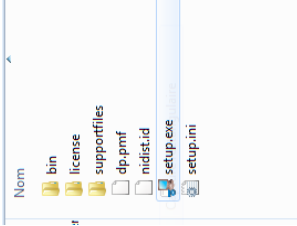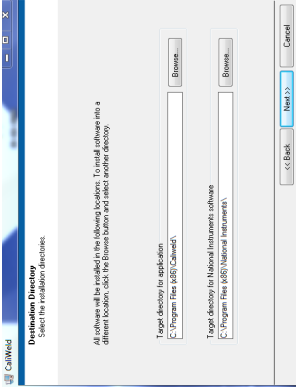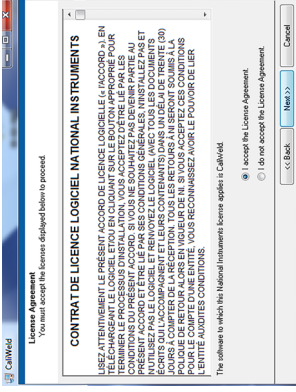The standard requires that current sources (MMA and TIG) and voltage sources (MIG) must be checked at a conventional voltage and conventional current.
The formulas given by the standard are:

MMA & SUB ARC : U(V) = 20V + 0.04 x I(A) below 600 A
TIG : U(V) = 10V + 0.04 x I(A) below 600 A
MIG : U(V) = 14V + 0.05 x I(A) below 600 A

- For MMA and TIG welding machines, used as a current source, the voltage is adjusted using the resistive load to correspond to this conventional voltage.
- For the MIG machines, used as a voltage source, the current is adjusted using the resistive load to correspond to this conventional current.

Current (A)	MMA & SUB ARC (V)	TIG (V)	MIG (V)
40	21.6	11.6	16.0
60	22.4	12.4	17.0
80	23.2	13.2	18.0
100	24.0	14.0	19.0
150	26.0	16.0	21.5
200	28.0	18.0	24.0
250	30.0	20.0	26.5
300	32.0	22.0	29.5
400	36.0	26.0	31.0
500	40.0	30.0	39.0
600	44.0	34.0	44.0

The correlation table of conventional voltages and currents.

2.   Practical use
From the table of correspondence, we can choose a current / voltage combination to realize a test and thus define the value of the resistance of our load by the equation R = U / I.
To get the resistance closest to the chosen value, use the equation

$$\frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \ldots}$$

The current / voltage combinations are given in the section «Definition of the resistors» in the CALIWELD LOAD 320A and 550A resistive load manuals.

3.   Correction of voltage drops in cables

The verification of a welding machine is done at the output of the welding machine and not at the load terminals. The measurement results can be wrong because of
the voltage drop in the cables induced by their resistors.
It is then necessary to compensate the measurement with the values indicated in the table below to obtain the voltage at the terminals of the product.
Voltage drop in copper and aluminium welding cables at normal and high temperatures:

Conductor section mm²	Voltage drop c.c.a / 100 A / 10 m de câbles aux différentes températures					
	Copper conductors			Aluminium conductors		
	20 °C	60 °C	85 °C	20 °C	60 °C	85 °C
10	1.950	2.260	2.450	-	-	-
16	1.240	1.430	1.560	-	-	-
25	0.795	0.920	0.998	1.248	1.450	1.580
35	0.565	0.654	0.709	0.886	1.030	1.120
50	0.393	0.455	0.493	0.616	0.715	0.778
70	0.277	0.321	0.348	0.440	0.511	0.555
95	0.210	0.243	0.264	0.326	0.379	0.411
120	0.164	0.190	0.206	0.254	0.295	0.321
150	0.132	0.153	0.166	0.208	0.242	0.263
185	0.108	0.125	0.136	-	-	-
240	-	-	-	0.126	0.146	0.159
By using an alternating current, the corresponding values can be much higher, depending on the configuration of the cables.						

TROUBLESHOOTING

1. List of error messages

N° erreur	Message	Solution
1	Validation case not allowed.	Update the security database. **1.** Get the database security on the website **2.** Copy - paste this database into the folder *C:\\ProgramFiles\caliweld\Ressources\database* **3.** Then in the software import the Security database (section "Database" p.11).
2	2 channels max.	It is possible to select only 2 channels for the oscilloscope mode.
3	Max 10 gas.	It is possibe to indicate a maximum of 10 different gases with their «coef».
4	Maximum number of points reached	Delete saved points.
5	Maximum period 1 hour.	In multimeter mode, limited to 1 hour of recording.
6	Report Printing Error.	Reinstall the software or contact the aftersales department.
7	Required field / Invalid value.	Fill all fields shown in red.
8	Allowed characters - _ 0-9 a-z A-Z	Use only the allowed characters: 0-9 a-z A-Z
9	Close PDF Viewer.	Close PDF Viewer.
10	sql file missing.	Reinstall the software or contact the aftersales department.
11	Import/export database error	Reinstall the software or contact the aftersales department.
12	Current channel not selected.	For automatic recording, select the channel current.
13	Product information error.	In the "Validation" mode, check the information filled in the "Product" section.
14	Channels not selected.	Select at least 1 channel.
15	Setting error from the list of points.	Check the list of points settings.

> ⚠ **In case of a bug, the software folder has a trace.log file that save what happened. Send this file by email to the After-Sales Department before restarting the session.**

2. Other errors found

    A.   Problem during registration
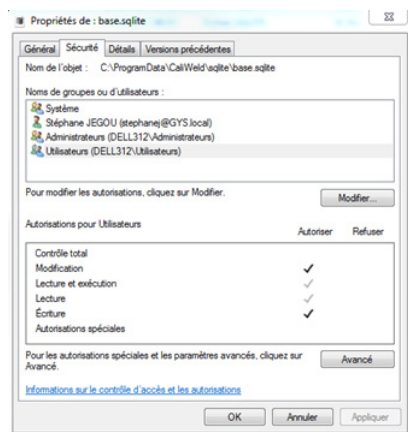
It is possible that the software will refuse to record point or scenario captures. In this case :

- Check in the C:\ProgramData\CaliWeld\sqlite\ program that the read and write rights are activated for the user.

If the window appears as shown here, it is necessary to reactivate the two Read and Read and Execute indicators by accessing the administrator part.

ORGANIZATION OF THE SOFTWARE FOLDER *(C:\\ProgramFiles\caliweld\)*

The software package includes:

1. C:\Users\...\AppData\Roaming\CaliWeld
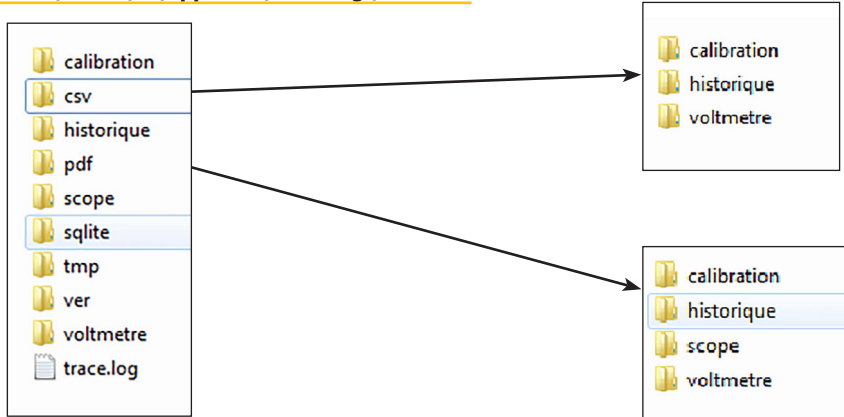
Important files for the user:

csv :
- Calibration (backup folder of validation mode .csv files).
- History (backup folder of the history .csv files).
- Voltmeter (backup folder of the multimeter and related .csv files).

pdf :
- Calibration (backup folder for PDF files of the validation).
- History (backup folder for PDF files of the history).
- Scope (backup folder for oscilloscope signals and related PDF files).
- Voltmeter (multimeter backup folder and related PDF files).

These slots are predefined in the standard software version. They can be modified in the «Backup folder» tab of the «File» menu (see p.8).

2. C:\Program Files (x86)\Caliweld

Important folders for the user:

- Manual folder
- Resources folder containing 2 folders:
    - Languages
    - Sqlite (database folder).
- Calibration-Banch.exe software (click on it to launch the software)

3. C:\ProgramData\CaliWeld
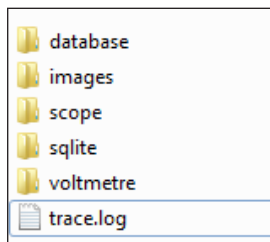
Important folders for the user:

- Database (export folder or database import).
- Images (folder to put logos for the validation report).

- trace. log file which keeps a trace of what happened in case of bug. Sent the trace.log file and then restart the session.

LIST OF PRODUCTS REQUIRING A SPECIFIC CONFIGURATION

Brand	Models / Ranges	Settings
GYS	NEOPULSE	Set the station to «MAN, 2T» mode. Select the argon steel Co2 gas and indicate the wire diameter corresponding to the coil.
IMS	PULSEMIG	
GYS	PROMIG / MAGYS	For the thread speed, set the feeder to manual mode.
IMS	POWERMIG / HEAVYMIG	
GYS	TIG, PROTIG / TITANIUM	Activate the HF and press the trigger only when the load is engaged.
IMS	IMS TIG / IMS TIG PRO	
GYS	EXAGON CC	Set to MMA (not pulsed) / rutile electrode / Arc force at -9.
IMS	GENIUS CC	
GYS	EXAGON CV	Set to either suitcase mode (CV) or reel mode. Set the choke to -9 in both cases.
IMS	GENIUS CV	
GYS	MULTIPEARL	Current mode : In MMA mode, set the Arc force to 0%.
IMS	MIG INVERTER GOLD MULTI	Voltage mode : The start algorithm makes it impossible to check the voltage regulation start.
Toutes marques	TIG / MIG / MMA	At low current and/or voltage, switch on a higher load (e.g. 70A) in addition and then return to normal to be able to start the generator.

CERTIFICAT DE VALIDATION

NF- - EN 50504

numero: 202102000026B6C

Autorité de validation

Nom
Adresse
Code
Ville
Telephone
Mail

Client

No client
Nom client
Service
Adresse
Code
Ville

Equipement

No série produit	986654740
No identification	
No série dévidoir	
Fabricant	GYS
Modèle	PROGYS 200A PFC MMG
Type	Poste de soudure
Procédé	MMA
Fonction	Source de courant

Conditions de test

Tension alimentation	230 V - 1 Ph
Température ambiante	23 ºC (+-3ºC)
Plage essai	20.4-28.0 V 10-200 A
Uo machine	96.0 V

Méthode de validation

Numero	
Constat	
Date	08/11/2021
CALIWELD GCU	
Numero	
Constat	
Date	08/11/2021

Tolérances

Classe	STANDARD
Type	CONSISTANCE

RESULTATS

Réglages

OK

Date de validation
02/02/2021

☐ **PASSE**

☐ **ECHOUE**

Echéance validation
01/02/2022

Operateur

Anthony

Signature

Commentaire

CERTIFICAT DE VALIDATION

NF- - EN 60974

numero: 202102000025B6C

Autorité de validation

Nom
Adresse
Code
Ville
Telephone
Mail

Client

No client
Nom client
Service
Adresse
Code
Ville

Equipement

No série produit	986654740
No identification	
No série dévidoir	
Fabricant	GYS
Modèle	PROGYS 200A PFC MMG
Type	Poste de soudure
Procédé	MMA
Fonction	Source de courant

Conditions de test

Tension alimentation	230 V - 1 Ph
Température ambiante	23 ºC (+-3ºC)
Plage essai	20.4-28.0 V 10-200 A
Uo machine	96.0 V

Méthode de validation

Numero	
Constat	
Date	08/11/2021
CALIWELD GCU	
Numero	
Constat	
Date	08/11/2021

Tolérances

Classe	STANDARD
Type	VALIDATION

RESULTATS

Apparence visuelle

OK

Réglages

OK

Date de validation
02/02/2021

☐ **PASSE**

☐ **ECHOUE**

Echéance validation
01/02/2022

Operateur

Anthony

Signature

Commentaire

Reminder of EN 50504 tolerances

EN 50504 classe STANDARD			
MEASURE			
Mesure	Tolerance	Reference	Validation range
Voltage	+/-10%	Of the real value	If between 25 and 100% of the maximum setting
Voltage	+/- 2.5%	From the highest setting	If less than 25% of the maximum setting
Current	+/-10%	Of the real value	If between 25 and 100% of the maximum setting
Current	+/- 2.5%	From the highest setting	If less than 25% of the maximum setting
Speed	+/-10%	Of the real value	
Speed	+/- 20%	Of the real value	
DISPLAY			
Voltage	+/- 2.5%	De Uo machine	
Current	+/- 2.5%	From the maximum setting	
Speed	+/-10%	Of the real value	
Gas	+/- 10%	Of the real value	
EN 50504 classe Précision			
MEASURE			
Mesure	Tolerance	Reference	Validation range
Voltage	+/- 5%	Of the real value	If between 40 and 100% of the maximum setting
Voltage	+/- 2%	From the highest setting	If less than 40% of the maximum setting
Current	+/- 2.5%	Of the real value	If between 40 and 100% of the maximum setting
Current	+/- 1%	From the highest setting	If less than 40% of the maximum setting
Speed	+/- 2.5%	Of the real value	
Speed	+/- 20%	Of the real value	
DISPLAY			
Voltage	+/- 1%	De Uo machine	
Current	+/- 1%	From the maximum setting	
Speed	+/- 2.5%	Of the real value	
Speed	+/- 10%	Of the real value	

Reminder of EN 60974-14 tolerances

EN 60974-14 classe STANDARD			
MEASURE			
Measure	Tolerance	Reference	Validation range
Voltage	+/- 10%	From the reference value	If between 25 and 100% of the highest set value
Voltage	+/- 2.5%	From the set value	If less than 25% of the highest set value
Current	+/- 10%	From the reference value	If between 25 and 100% of the highest set value
Current	+/- 2.5%	From the set value	If less than 25% of the highest set value
Speed	+/- 10%	From the reference value	If between 25 and 100% of the highest setting
Speed	+/-2.5%	From the highest setting	If less than 25% of the highest setting
Gas	+/- 20%	Of the real value	
DISPLAY			
Voltage	+/- 2.5%	From the rated no-load voltage (U0) or according to the manufacturer's specifications	
Current	+/- 2.5%	From the highest rated value of the welding current according to the type plate	
Speed	+/- 10%	From the reference value	If between 25 and 100% of the maximum setting
Speed	+/- 2.5%	From the maximum setting	If less than 25% of the maximum setting
Gas	+/- 10%	Of the real value	
EN 60974-14 classe Précision			
MEASURE			
Measure	Tolerance	Reference	Plage de validation
Voltage	+/- 5%	From the reference value	If between 40 and 100% of the highest set value
Voltage	+/- 2%	From the highest set value	If less than 40% of the highest set value
Current	+/- 2.5%	From the reference value	If between 40 and 100% of the highest set value
Current	+/- 1%	From the highest set value	If less than 40% of the highest set value
Speed	+/-6.25 %	From the reference value	If between 25 and 100% of the highest setting
Speed	+/- 2.5%	From the highest setting	If less than 25% of the highest setting
Gas	+/- 20%	Of the real value	
DISPLAY			
Voltage	+/- 1%	Rated no-load voltage (U0) or according to manufacturer's specifications	
Current	+/- 1%	the highest rated value of the welding current according to the type plate	
Speed	+/- 6.25%	From the reference value	If between 25 and 100% of the maximum setting
Speed	+/- 2.5%	From the maximum setting	If less than 25% of the maximum setting
Gas	+/- 10%	Of the real value	

Extract from standard 60974-4

Test sequence on used arc welding equipment	
Periodic inspection and test	**After repair**
a) Visual inspection in accordance with 5.1	a) Visual inspection in accordance with 5.1
b) Electrical test: – protective conductor resistance in accordance with 5.2 – insulation resistance in accordance with 5.3 (Optional: welding circuit touch current in accordance with 5.4, touch current in normal condition[b] in accordance with 5.5 and protective conductor current in accordance with 5.6)[a] – no-load voltage in accordance with 5.7	b) Electrical test: – protective conductor resistance in accordance with 5.2 – insulation resistance in accordance with 5.3 (Optional: welding circuit touch current in accordance with 5.4, touch current in normal condition[b] in accordance with 5.5 and protective conductor current in accordance with 5.6)[a] – no-load voltage in accordance with 5.7
c) Functional test: – no requirement	c) Functional test: – function in accordance with 6.1 – supply-circuit on/off switching device in accordance with 6.2 – voltage-reducing device in accordance with 6.3 – magnetic gas valve in accordance with 6.4 – signal and control lamps in accordance with 6.5
d) Documentation in accordance with Clause 7	d) Documentation in accordance with Clause 7

[a] If the insulation resistance test cannot be carried out for without disconnection of any component of the equipment to be tested (e.g. interference suppression networks, protection capacitors or surge protection component), the insulation resistance test may be replaced by the optional tests specified in item b).
[b] Only if there are accessible conductive surfaces not connected to the protective circuit.

Continuity of the protective circuit

For mains-powered welding equipment of protection class I, including ancillary equipment (for example, cooling system) having mains connecting cables up to a length of 5,0 m, the maximum measured protective conductor resistance shall not exceed 0,3 Ω.

For cables longer than 5,0 m, the permissible value of the protective conductor resistance is increased by 0,1 Ω per additional 7,5 m cable.
The maximum permissible value of the protective conductor resistance is 1 Ω.

Conformity shall be checked by measuring the resistance between the protective conductor contact at the plug and exposed conductive parts with testing equipment according to IEC 61557-4.

Voltmeter
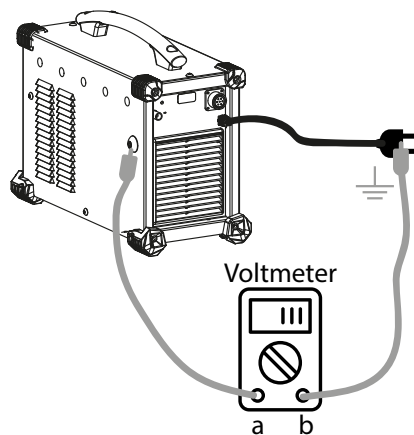
a- Connected to an external screw of the product as far as possible from the power cord. Caution, the screw must not be connected to the ground.

b- Connected to the ground terminal.

Insulation resistance

The insulation resistance shall not be less than the values given in table below:

Measurement[a]			Resistance	Insulation
Supply circuit	to	welding circuit	5,0 MΩ	Double or reinforced
Welding circuit	to	protective circuit	2,5 MΩ	Basic
Supply circuit	to	protective circuit	2,5 MΩ	Basic
Supply circuit of Class II equipment	to	accessible surfaces [b]	5,0 MΩ	Double or reinforced
[a] Control circuits are tested together with the circuit to which they are galvanically connected. Accessible control circuits separated from all other circuits are tested according to the manufacturer's specification.				
[b] For measurement to accessible non-conductive surfaces, such surfaces shall be considered to be covered by metal foil.				

Conformity shall be checked by the stabilized measurement of the insulation resistance by application of a d.c. voltage of 500 V at room temperature.

During the measurement, torches shall be disconnected, solid-state electronic components and their protective devices may be short-circuited, and liquid cooling units shall be tested without liquid.
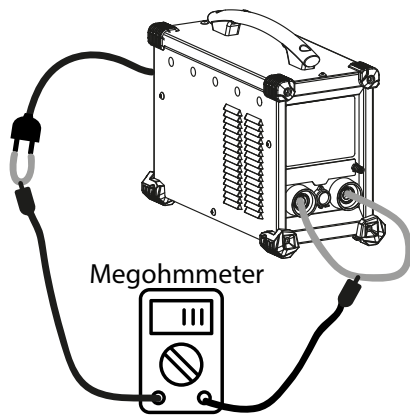
Megohmmeter

To carry out this test, you must first short-circuit the welding circuit (e.g. connect the torch with the ground clamp) as well as the power supply circuit (e.g. short-circuit the phase connectors of the power cord).
Then, connect a Megohmmeter (500 V setting) between the different circuits and check that the insulation resistances are not lower than the one in the table above.