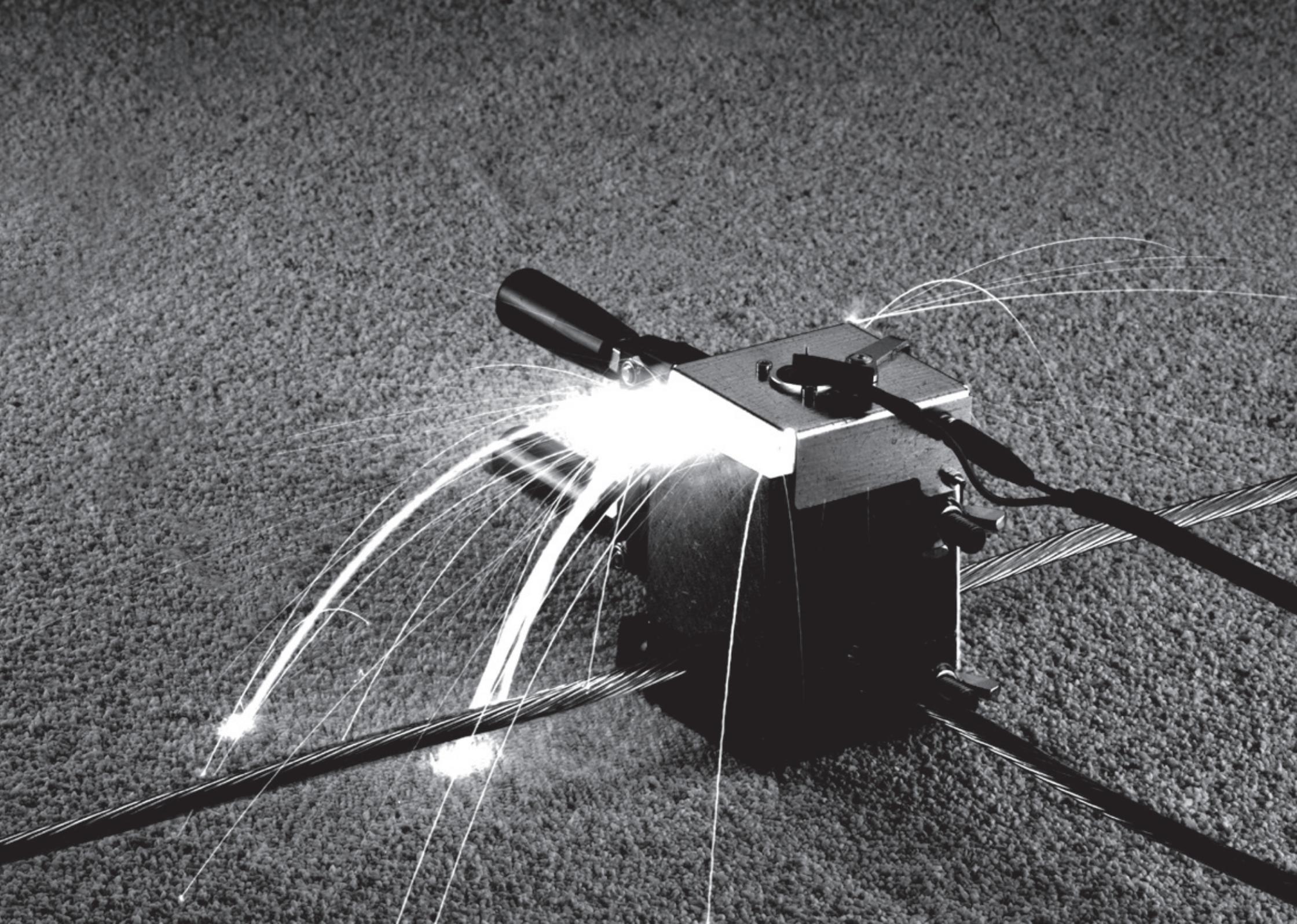


# APLIWELD® EXOTHERMIC WELDING MANUAL



## APLIWELD Secure+

- + COST SAVING
- + LABOUR AND RISK PREVENTION
- + HANDY TO USE



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## A. GENERAL PREVENTIVE MEASURES IN EXOTHERMIC WELDING PROCEDURES

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For a suitable and safety installation work, **Apliweld** products must be used in conformance to this manual or in each particular product instructions, all available in **www.at3w.com**.

Should you require more information about the welding processes or in case of any doubt, mail us to **atsa@at3w.com** or call to **+34 96 131 82 50**.

### A.1. SAFETY INSTRUCTIONS

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- Read carefully the particular product instructions supplied in all **Apliweld** products before its use. Personal should be properly trained.
- Do not connect items except as detailed in instruction sheets or in this manual.
- Do not use worn or broken equipment. These could cause material leakages, unacceptable or unsafe connections, personal injures and property damage.
- Do not modify equipment or material without technical authorization. Consult **APLICACIONES TECNOLÓGICAS S.A.** technical department.
- Safety gloves and glasses are required.
- Avoid contact with hot materials. The exothermic process reaches temperatures in excess of 1500°C. Welding material is not considered as explosive.
- The material is not explosive
- Remove/minimize fire hazards in the working area.
- Do not smoke when handling and use Apliweld products.
- Avoid direct visual contact when “flashing” ignition occurs (using starting powder)
- In case of fire, use of water or CO2 will aid in control of burning containers. Large quantities of water will aid in controlling a fire if the exothermic materials become involved. Water should be applied from a safety distance.
- Avoid moisture in moulds and conductors, since contact between hot molten metal and moisture or contaminants may result in material leakages or wrong welding results.

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS

### B.1. PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 1. Clean and remove any impurities off the mould or conductors

Conductors and mould have to be clean and dry. This is very important to avoid rejectable weldings and hazardous reactions (material leakages) when melting copper contacts moisture or impurities.

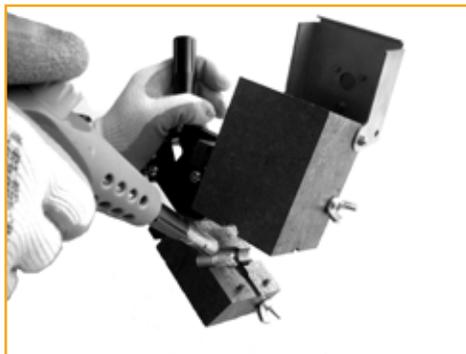
Clean conductors using **AT-061N** brush. Check F10, F11, F12 and F13 in this manual for a particular surface or conductor cleaning indications.



#### 2. Heat the mould.

Heat the mould always before the first welding of the day or when the mould is not hot enough. Heat it up to 120°C. Graphite gets moisture from the environment at ambient temperature, so it is necessary to heat it above water boiling point.

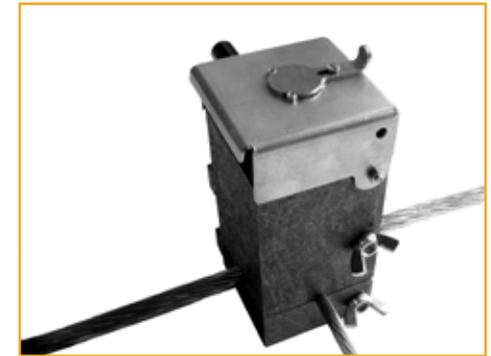
This is a very important step in order to reach an acceptable result for first welding but also makes the reaction more safety for the user. Moisture could cause material leakages out of the mould and pinholes in the welding result.



#### 3. Fit the conductors in the mould and close the handle clamps

Check if the mould is tightly closed. Also the conductors must be fixed and well positioned.

If conductors doesn't fit or they loose-fit in their cavities, it could be because their sections are not the standards. Find in the third section "Considerations on the moulds" (section C1) the standard diameters and dimensions for the conductors in **Apliweld** moulds. If you have any doubt, do not hesitate to contact us.



#### 4. Set the proper number of tablets in the crucible.

The number of tablets required for a particular connection is engraved on the mould surface as it is in the packaging label. Metallic disk is not required.

Find in C.2 section the keys for the mould codes and how to get the right number of tablets for each one.



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS

### B.1. PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 5. Close the mould cover and place the electronic starter.

After closing the cover, place the Electronic Starter (AT-010N) case in its position and fix it using the security lever.

This security lever ensures good electrical contact and easy work conditions.



#### 6. Open the Ignition Unit and connect the plugs.

Connect the plugs in the device as showed in the picture. The Electronic Starter has no polarity so the order of connection is irrelevant. Connect the other side of the cable to the lateral part of the mould. Fix the clamp to the spike of the Electronic Starter.

The electric contact between the clamp and the spike is essential. The clamp must not touch any other part of the cover. If the clamp becomes worn, just replace it (**AT-100N** kit Apliweld-E includes 5 of these clamps)



#### 7. Keep away from the mould and switch on the Ignition Unit.

Keep as far from the mould as the connection cable allows (2m). Switch on the device pressing On/Off button. A bip sound indicates it is ready. Then a green light signal is also displayed.



#### 8. Press both ignition buttons simultaneously until the welding process starts

Press both ignition buttons at the same time. The welding in process indicator will light on and an audible alarm will activate: two bips of approx. 3 seconds and then a continuous tone. During this last sound the welding reaction will ignite. Keep both buttons pressed until the reactions starts.

Consult section F.5 in case the ignition doesn't occur.

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS

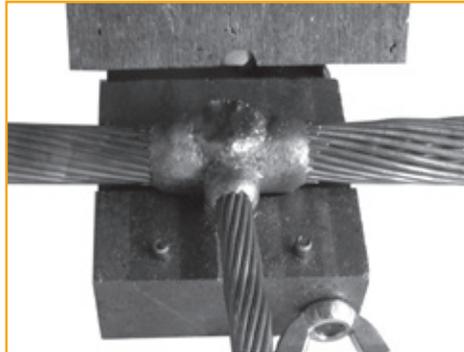
### B.1. PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 9. After the reaction, wait during 15 seconds and open the mould.

Once the reaction is over, wait 15 seconds before opening, assuring the melting of the materials.

Open the mould cover using the appropriate handle clamps and safety gloves, since the whole system is very hot. Exercise extreme caution.

Take the welded conductors out of the mould



#### 10. Cleaning the mould.

Use the right cleaning tools to remove the slag and clean the crucible. **AT-064N** is the appropriate brush to clean the welding cavity. Use **AT-062N** brush to clean the mould cover, specially the Electronic Starter cavity.

Find a detailed description of cleaning tools and how to use them on section C3 in this manual.

### IMPORTANT

**ALL CLEANING TOOLS ARE INCLUDED IN AT-069N TOOL SET**

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.2. PROCEDURE USING THE SPARK LIGHTER

#### 1. Clean and remove any impurities off the mould or conductors

Conductors and mould have to be clean and dry. This is very important to avoid rejectable weldings and hazardous reactions (material leakages) when melting copper contacts moisture or impurities.

Clean conductors using **AT-061N** brush. Check F10, F11, F12 and F13 in this manual for a particular surface or conductor cleaning indications



#### 2. Heat the mould.

Heat the mould always before the first welding of the day or when the mould is not hot enough. Heat it up to 120°C. Graphite gets moisture from the environment at ambient temperature, so it is necessary to heat it above water boiling point.

This is a very important step in order to reach an acceptable result for first welding but also makes the reaction more safety for the user. Moisture could cause material leakages out of the mould and pinholes in the welding result.



#### 3. Fit the conductors in the mould and close the handle clamps

Check if the mould is tightly closed. Also the conductors must be hold and well positioned.

If conductors doesn't fit or they loose-fit in their cavities, it could be because their sections are not the standards. Find in the third section "Considerations on the moulds" the standard diameters and dimensions for the conductors in **Apliweld** moulds. If you have any doubt, do not hesitate to contact us.



#### 4. Set the proper number of tablets in the crucible.

The number of tablets required for a particular connection is engraved on the mould surface as it is in the packaging label. Metallic disk is not required.

Find in C.2 section the keys for the mould codes and how to get the right number of tablets for each one.



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.2. PROCEDURE USING THE SPARK LIGHTER

**5. Put 60% of the Starting Powder from the edge of the mould to the crucible, thus acting as a wick. Then sprinkle the rest on the surface of the last welding tablet.**

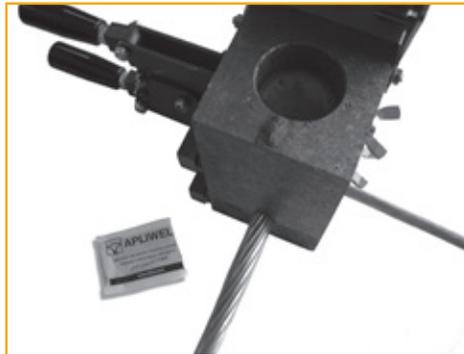
Put 60% of the Starting Powder package contents from the edge of the mould to the crucible, providing a path of 5mm width approximately.

Sprinkle the remaining powder on the surface of the last tablet placed.

DO NOT pour the whole contents of the package on the tablet. It would make the ignition more dangerous and will damage the spark lighter (**AT-060N**). The powder path is aimed to provide an easy and safe ignition.

**6. Close the mould cover.**

The safety lever must be closed in order to avoid material leakages or sparks out of the mould coming from the cavity of Electronic Starter.



**7. Ignite the Starting Powder using the Spark Lighter AT-060N.**

Shoot the lighter pointing the starting powder wick.

Stand always aside or behind of the mould for avoiding damages caused by occasional material leakages

The ignition has to be carried out using **AT-060N** Spark lighter.



#### **⊕ IMPORTANT**

**NEVER USE A FIRE TORCH OR ANY OTHER DEVICE. STARTING POWDER IGNITES WITH SPARKS, NEVER WITH FLAME.**

**8. Keep away from the mould during the reaction.**

Remain aside or behind of the mould during the welding.

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

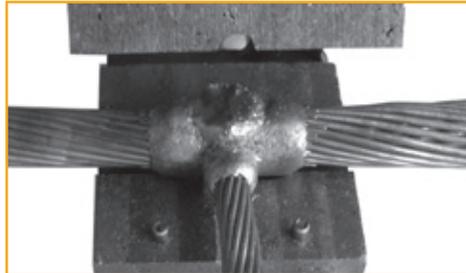
### B.2. PROCEDURE USING THE SPARK LIGHTER

#### 9. After the reaction, wait during 15 seconds and open the mould.

Once the reaction is over, wait 15 seconds before opening, assuring the melting of the materials.

Open the mould cover using the appropriate handle clamps and safety gloves, since the whole system is very hot. Exercise extreme caution.

Take the welded conductors out of the mould



#### 10. Cleaning the mould.

Use the right cleaning tools to remove the slag and clean the crucible. **AT-064N** is the appropriate brush to clean the welding cavity. Use **AT-062N** brush to clean the mould cover, specially the Electronic Starter cavity.

Find a detailed description of cleaning tools and how to use them on section C3 in this manual.

Once cleaned, the mould is ready for a new welding. No heating step is required if the new process is carried out within 10-15 minutes.

### IMPORTANT

All the described cleaning tools are integrated in AT-068N Basic tool set, including the At-060N Spark lighter.

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.3. MULTIPLE MOULD: PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 1. Clean and remove any impurities off the mould or conductors.

Conductors and mould have to be clean and dry. This is very important to avoid rejectable weldings and hazardous reactions (material leakages) when melting copper contacts moisture or impurities.

Clean conductors using **AT-061N** brush. Check F10,F11,F12 and F13 in this manual for a particular surface or conductor cleaning indications.



#### 2. Open the handle clamp and place the required lower piece .

The multiple mould box **MM-CT14** (or CT16, CT17... ) contains the clamp (**MM-053N**) with the crucible and lower piece (**MM-PH**) already fixed:

- **MM-PH Lower piece for horizontal weldings (T, cross, straight connections).** This piece is placed in the multiple clamp for cable to cable connections. For tape to tape weldings just turn it over. For earth rod connections change the lower piece and place the other piece in the box (the one divided in two parts)



- **MM-PTX for cable or tape to earth rod (usually T shape)** The piece has the diameter of the earth rod according to the requirement (**MM-PT14, MM-PT16...**), working only for this specific rod diameter (see mechanized earth rod diameters on section C.1 in this manual)



Fix the stand pliers approximately 4 cm below the end of the rod. Open the lower part of the clamp **MM-053N** and place the piece divided in two.

Put the multiple clamp on the stand plier and insert the earth rod in its place. Close the lower base of the clamp to fix tighten the graphite piece to the earth rod thus avoiding material leakages in between the gasket.



Now the clamp should remain estable on the pliers, letting both hands free to place later the rest of conductors easily

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.3. MULTIPLE MOULD: PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 3. Heat both graphite pieces

Heat the mould always before the first welding of the day or when the mould is not hot enough. Heat it up to 120°C. Graphite gets moisture from the environment at standard temperatures, so it is necessary to heat it above water boiling point.

This is a very important step in order to reach an acceptable result for first welding but also makes the reaction more safety for the user. Moisture could cause material leakages out of the mould and pinholes in the resulting welding.



#### 4. Place the lower cavity sealer (MM-CS), the conductors and all the other cavity sealers.

Place in the centre of the lower piece of the mould a cavity sealer. Then put the conductor/s as the union type requires. Try to centre as much as possible the conductors on the graphite piece. Over the conductors, place 1-2 cavity sealers as the table below marks:

- **For T/ straight weldings**, just close the clamp squeezing down the crucible as much as possible to get a sealed system avoiding material leakages.
- **For cross weldings** (conductor over conductor unions) repeat the previous steps setting over the last cavity sealer a new conductor and then 1-2 cavity sealers more according to the table below. In all cases each conductor layer is wrapped between cavity sealers.
- In order to know how many cavity sealers are advisables in a particular connection, each multiple mould (basic or complete) is supplied with this table where the required tablets and cavity sealers are settled.



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.3. MULTIPLE MOULD: PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

CONDUCTOR 1	CONDUCTOR 2	UNION	TABLETS	CS	CS/ LAYER
Cable: Up to 70mm <sup>2</sup>	Cable: Up to 70mm <sup>2</sup>	<b>T horizontal</b>	2	2	1+1
Cable: 95mm <sup>2</sup>	Cable: Up to 95mm <sup>2</sup>	<b>T horizontal</b>	2,5	4	2+2
Cable: Up to 50mm <sup>2</sup>	Cable: Up to 50mm <sup>2</sup>	<b>cross</b>	2	3	1+1+1
Cable: 70mm <sup>2</sup>	Cable: 70mm <sup>2</sup>	<b>cross</b>	2,5	4	1+2+1
Cable: 95mm <sup>2</sup>	Cable: Up to 50mm <sup>2</sup>	<b>cross</b>	2,5	6	2+2+2
Cable: Up to 70mm <sup>2</sup>	E.rod: Any	<b>T vertical</b>	2	2	1+1
Cable: 95mm <sup>2</sup>	E.rod: Any	<b>T vertical</b>	2,5	4	2+2
Tape: Any	Tape: Any	<b>T/ cross</b>	2	3	1+1+1
Tape: Any	E.rod: Any	<b>T</b>	2	2	1+1

- CS = Cavity Sealers.
- CS/layer: Number of sealers between layers of conductors. Ex.:1+1 means placing first one CS, then the conductors to be welded and on them the other CS
- Besides the described ones, straight weldings are possible for all combinations. They require 2 tablets except for 95mm<sup>2</sup> cable which requires 2,5 tablets.
- For re-bar connections use the following equivalence: C70 = V10, C95=V12
- For cable to tape joints, tape is equivalent to cable up to 50mm<sup>2</sup>
- Parallel connections are possible for cables up to 50mm<sup>2</sup>. They all require 2,5 tablets with 1+2+2 CS
- For any other required but not described connection please consult us.

#### 5. Close the mould cover and place the electronic starter.

After closing the cover, place the Electronic Starter (AT-010N) in its position and fix it using the security lever.

This security lever ensures good electrical contact and easy work conditions.



#### 6. Open the Ignition Unit (AT-096N) and connect the plugs.

Connect the plugs in the device as showed in the picture. The Electronic Starter has no polarity so then order of connection is irrelevant. Connect the other side of the cable to the lateral part of the mould. Fix the clamp to the spike of the Electronic Starter.

The electric contact between the clamp and the spike is essential. The clamp must not touch any other part of the cover. If the clamp becomes worn, just replace it (AT-100N kit Apliweld-E includes 5 of these clamps)



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.3. MULTIPLE MOULD: PROCEDURE USING ELECTRONIC DEVICE APLIWELD® SECURE+

#### 7. Keep away from the mould and switch on the Ignition Unit.

Keep as far from the mould as the connection cable allows (2m). Switch on the device pressing On/Off button. A bip sound indicates it is ready. Then a green light signal is also displayed.



#### 8. Press both ignition buttons simultaneously until the welding process starts.

Press both ignition buttons at the same time. The welding in process indicator will light on and an audible alarm will activate: two bips of approx. 3 seconds and then a continuous tone. During this last sound the welding reaction will ignite. Keep both buttons pressed until the reactions starts.

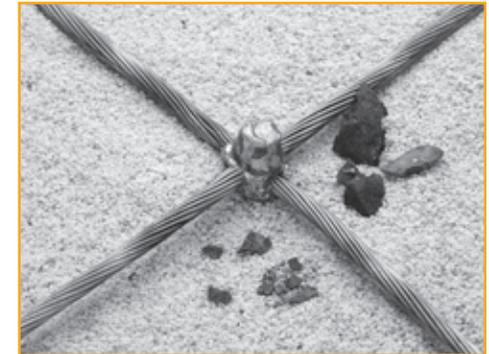
Consult section F.5 in case the ignition doesn't occur.

#### 9. After the reaction, wait during 15 seconds and open the mould.

Once the reaction is over, wait 15 seconds before opening, assuring the melting of the materials.

Open the mould cover using the appropriate handle clamps and safety gloves, since the whole system is very hot. Exercise extreme caution.

Take the welded conductors out of the mould



#### 10. Cleaning the mould.

Use the right cleaning tools to remove the slag and clean the crucible. **AT-064N** is the appropriate brush to clean the welding cavity. Use **AT-062N** brush to clean the mould cover, specially the Electronic Starter cavity.

Find a detailed description of cleaning tools and how to use them on section C3 in this manual.

Once cleaned, the mould is ready for a new welding. No heating step is required if the new process is carried out within 10-15 minutes.

### IMPORTANT

**ALL CLEANING TOOLS ARE INCLUDED IN AT-069N TOOL SET**

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.4. MULTIPLE MOULD: PROCEDURE USING THE SPARK LIGHTER

#### 1. Clean and remove any impurities off the mould or conductors.

Conductors and mould have to be clean and dry. This is very important to avoid rejectable weldings and hazardous reactions (material leakages) when melting copper contacts moisture or impurities.

Clean conductors using **AT-061N** brush. Check F10, F11, F12 and F13 in this manual for a particular surface or conductor cleaning indications.



#### 2. Open the handle clamp and place the required lower piece.

The multiple mould box **MM-CT14** (or CT16, CT17...) contains the clamp (**MM-053N**) with the crucible and lower piece (**MM-PH**) already fixed:

- **MM-PH** Lower piece for horizontal weldings (T, cross, straight connections). This piece is placed in the multiple clamp for cable to cable connections. For tape to tape weldings just turn it over. For earth rod connections change the lower piece and place the other piece in the box (the one divided in two parts)



- **MM-PTX** for cable or tape to earth rod (usually T shape). The piece has the diameter of the earth rod according to the requirement (**MM-PT14, MM-PT16...**), working only for this specific rod diameter (see mechanized earth rod diameters on section C.1 in this manual).



- Fix the stand pliers around 4 cm below the end of the rod. Open the lower part of the clamp **MM-053N** and place the piece divided in two.
- Put the multiple clamps on the stand pliers and insert the earth rod in its place. Close the lower base of the clamp to fix tighten the graphite piece to the earth rod thus avoiding material leakages in between the gasket.
- Now the clamp should remain stable on the pliers, letting both hands free to place later the rest of conductors easily.



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.4. MULTIPLE MOULD: PROCEDURE USING THE SPARK LIGHTER

#### 3. Heat both graphite pieces.

Heat the mould always before the first welding of the day or when the mould is not hot enough. Heat it up to 120°C. Graphite gets moisture from the environment at standard temperatures, so it is necessary to heat it above water boiling point.

This is a very important step in order to reach an acceptable result for first welding but also makes the reaction more safety for the user. Moisture could cause material leakages out of the mould and pinholes in the resulting welding.



#### 4. Place the lower cavity sealer (MM-CS), the conductors and all the other cavity sealers.

Place in the centre of the lower piece of the mould a cavity sealer. Then put the conductor/s as the union type requires. Try to centre as much as possible the conductors on the graphite piece. Over the conductors, place 1-2 cavity sealers as the table in page 13 marks:

- **For T/ straight weldings**, just close the clamp squeezing down the crucible as much as possible to get a sealed system avoiding material leakages.
- **For cross weldings (conductor over conductor unions)** repeat the previous steps setting over the last cavity sealer a new conductor and then 1-2 cavity sealers more according to the table below. In all cases each conductor layer is wrapped between cavity sealers. In order to know how many cavity sealers are advisable in a particular connection, each multiple mould (basic or complete) is supplied with the table on page 13 where the required tablets and cavity sealers are settled.



## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

### B.4. MULTIPLE MOULD: PROCEDURE USING THE SPARK LIGHTER

**5. Put 60% of the Starting Powder from the edge of the mould to the crucible, thus acting as a wick. Then sprinkle the rest on the surface of the last welding tablet.**

Put 60% of the Starting Powder package contents from the edge of the mould to the crucible, providing a path of 5mm width approximately.

Sprinkle the remaining powder on the surface of the last tablet placed.

DO NOT pour the whole contents of the package on the tablet. It would make the ignition more dangerous and will damage the spark lighter (**AT-060N**). The powder path is aimed to provide an easy and safe ignition.

**6. Close the mould cover.**

The safety lever must be closed in order to avoid material leakages or sparks out of the mould coming from the cavity of electronic starter.



**7. Ignite the Starting Powder using the Spark Lighter AT-060N.**

Shoot the lighter pointing the starting powder wick.

Stand always aside or behind of the mould for avoiding damages caused by occasional material leakages

The ignition has to be carried out using **AT-060N** Spark lighter



#### **+ IMPORTANT**

**Never use a fire torch or any other device. starting powder ignites with sparks, never with flame.**

**8. Keep away from the mould during the reaction.**

Remain aside or behind of the mould during the welding.

## B. HOW TO MAKE APLIWELD® EXOTHERMIC WELDINGS.

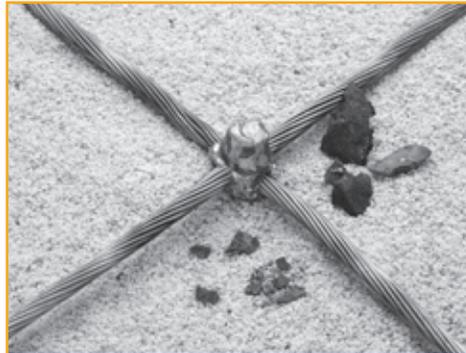
### B.4. MULTIPLE MOULD: PROCEDURE USING THE SPARK LIGHTER

#### 9. After the reaction, wait during 15 seconds and open the mould.

Once the reaction is over, wait 15 seconds before opening, assuring the melting of the materials.

Open the mould cover using the appropriate handle clamps and safety gloves, since the whole system is very hot. Exercise extreme caution.

Take the welded conductors out of the mould.



#### 10. Cleaning the mould.

Use the right cleaning tools to remove the slag and clean the crucible. **AT-064N** is the appropriate brush to clean the welding cavity. Use **AT-062N** brush to clean the mould cover, specially the Electronic Starter cavity.

Find a detailed description of cleaning tools and how to use them on section C3 in this manual.

Once cleaned, the mould is ready for a new welding. No heating step is required if the new process is carried out within 10-15 minutes.

### IMPORTANT

All the described cleaning tools are integrated in AT-068N Basic tool set, including the At-060N Spark lighter.

## C. MOULD CONSIDERATIONS

### C.1. CONDUCTORS DIMENSION TABLES.

Find in the following tables the standard mechanized sizes for the conductors in Apliweld moulds. In this way, and in accordance to the table below, a mould for 50mm<sup>2</sup> cable it is always machined to 9 mm, doing likewise with all the conductors.

Should you require a non-specified size or the conductor size is not the one showed in the table, please give us the precise size of the conductor to make it up to your particulars.

#### a. Stranded copper cable:

Cable Section	Code	Machined diameter (mm)
35 mm <sup>2</sup>	C35	7,5
50 mm <sup>2</sup>	C50	9
1/0 AWG	C50	9
70 mm <sup>2</sup>	C70	10,5
2/0 AWG	C70	10,5
3/0 AWG	C85	12
95 mm <sup>2</sup>	C95	12,5
4/0 AWG	C107	13,5
120 mm <sup>2</sup>	C120	14,5
150 mm <sup>2</sup>	C150	16,1
185 mm <sup>2</sup>	C185	18
240 mm <sup>2</sup>	C240	20

#### b. Re-Bar:

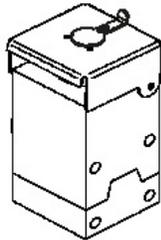
Re-Bar diameter	Code	Machined diameter (mm)
10 mm	V10	10,5
12 mm	V12	13
16 mm	V16	18
20 mm	V20	22
25 mm	V25	27

#### c. Copper coated earth rod:

Earth rod	Code	Machined diameter (mm)
1/2"	T12	12,5
14,3 mm	T14	14,3
14,6 mm	T15	14,6
16 mm	T16	16
5/8"	T16	16
17,2 mm	T17	17,2
18,3 mm	T18	18,3
19 mm	T19	19
3/4"	T19	19
22 mm	T22	22
25 mm	T25	25
1"	T25	25

## C. MOULD CONSIDERATIONS

### C.2. APLIWELD® MOULD CODE KEYS

APLIWELD	MOLDE/MOULD
<p>REF: C70/C70/XS            TABS: AT-020N x 4            PINZA/CLAMP: AT-049N</p> <p><a href="http://www.at3w.com">www.at3w.com</a></p>  <p>NOTAS/REMARKS:            Permite tanto ignición electrónica como tradicional con chisquero  <i>Allows either electronic or traditional spark lighter ignition</i></p>	

Following data are labelled in the package, but also engraved on the mould surface:

**REF:** XXX / YYY / ZZ

**TABS:** AT-020N (or AT-021N) x n

**CLAMP:** AT-0ABN

“REF” is the mould reference. The key for the Apliweld® mould code is always:

- **XXX:** Conductor A. Run conductor (see tables in C1).
- **YYY:** Conductor B. Tap conductor (see tables in C1).
- **ZZ ó ZZZ:** Union type:
  - TH= T horizontal, PV= parallel vertical, XH= horizontal cross... etc.
  - If any doubt consult our catalogue, website or contact us.
- **TABS:** Number of tablets (n) and tablet reference. **AT-020N** (standard) or **AT-021N** (large size tablets).
- **CLAMP:** : Each mould requires a clamp for handling easily and more safely. General code is **AT-0ABN**, where A,B are numbers (0-9) The most usual clamp is **AT-049N**.

#### + IMPORTANT

Do NOT use the mould if the reference is not clear. Contact us if any problem comes up.

## C. MOULD CONSIDERATIONS

### C.3. CLEANING AND MAINTENANCE



**AT-069N**

#### C.3.1. Basic tool sets: AT-068N - AT-069N

Both sets contain basic tools for cleaning the moulds and to carry out the welding. The difference between them is that **AT-069N** does not include the spark lighter, which is not needed for electronically started weldings (Apliweld-E).

#### Contents of the basic tool set AT-068N

Reference	Description	Units
<b>AT-060N</b>	Spark lighter	1
<b>AT-061N</b>	Conductors cleaning brush	1
<b>AT-062N</b>	Crucible and cover (for electronic starter) cleaning brush	1
<b>AT-063N</b>	Slag removal spade	1
<b>AT-064N</b>	Welding cavity brush	1
<b>AT-065N</b>	Sealing paste	1
<b>AT-073N</b>	Working gloves	1

## C. MOULD CONSIDERATIONS

### C.3. CLEANING AND MAINTENANCE

#### C.3.2. Moulds cleaning: Tools for cleaning and maintenance.

At the end of the welding process, an adequate cleaning increases the mould life and prepares it for the following welding. Take care in this step; the mould is still very hot.

1. Remove the slag in the crucible using slag removal spade (**AT-063N**), screwing down to scrape it off. If slag persists, a hammer could help. Handle with care not to damage the mould.
2. Use **AT-062N** cleaning brush after for a complete cleaning of the crucible. This tool is also suitable for cleaning the cover in the electronic starter holding place. Do not use this tool to clean the welding cavity.
3. Clean welding cavity, tap hole and conductors location using **AT-064N** brush.
4. Check the mould is already clean, with no impurities and with correct open and close movements.
5. Once these cleaning steps are done, the mould is prepared for a new welding.



**AT-060N**



**AT-061N**

#### IMPORTANT

All these cleaning tools are included in AT-068N and AT-069N tool sets

## C. MOULD CONSIDERATIONS

### C.3. CLEANING AND MAINTENANCE



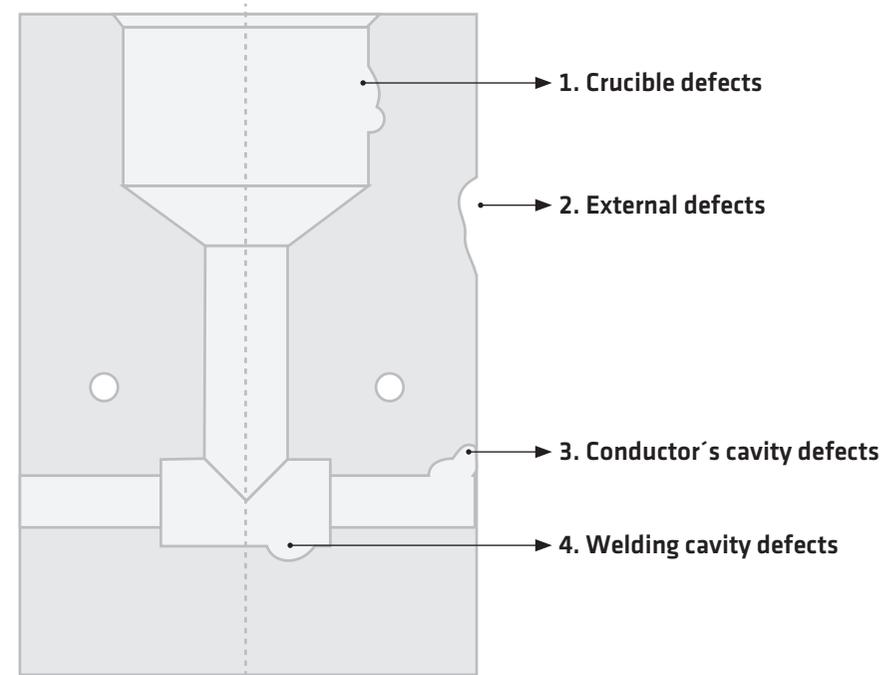
## C. MOULD CONSIDERATIONS

### C.4. INSPECTION

The first step for obtaining correct weldings is keeping the mould in best conditions. The mould should work for 80 weldings in average, which can vary depending on the user's care, working conditions, the union type and the conductors involved.

Check the mould regularly. Replace it if becomes worn. Assess the following points to decide if the mould has to be replaced:

1. **Defects in the crucible:** Clean the crucible using the proper cleaning tools (**AT-062N y AT-063N**) in order to place the tablets easily. There is no need of metallic disk for the tap hole so no special cleaning tool is required.
2. **External surface defects:** Damages on the external surface of the mould do not affect the final result if they don't affect the structure or the adjustment of the clamp.
3. **Defects in the cable location:** Clean this part using **AT-064N** brush. Conductors must readily fit in there before closing the mould. Once closed, the clamp fix them tight.
4. **Defects in the welding cavity:** This is the most sensitive area in the mould. Its erosion or manipulation can cause material leakages or a badly molten metal distribution. Use **AT-064N** brush to clean the cavity. Any other cleaning tools could damage this mould part



Remember that the sections of the conductors are the marked on the mould. Consider also the right diameter for the section. Otherwise use **AT-072N** Adapter Sleeves in case of cables. Conductors must keep a convenient shape with no deformation, allowing the correct closure of the mould/clamp system.

## D. CONSIDERATIONS ON THE TABLETS

There are two formats for **Apliweld®-T**:

- **AT-020N:** 43mm diameter standard tablets, supplied in 20 unit packages. Tablets do not include starting powder or electronic starter because the ignition might be either electronic or traditional.

Tablets could be halved if needed. So the quantities required for a determinate connection may vary in 1, 1.5, 2, 2.5, 3, 3.5....depending on the connection.

Ignition might be produced using the electronic device or starting powder. Select the right reference for each case:

- **AT-010N:** 10 Electronic starters to carry out the ignition using **AT-100N** Ignition Unit.
- **AT-012N:** 10 Starting powder units for ignition using **AT-060N** Spark lighter.

In both cases, regardless the number of tablets required for a connection, use only one starter per welding.

- **AT-021N:** This is the large tablet (55mm diameter) format supplied in 20 units packages as well. These are recommended for bigger conductors and joints requiring 6 or more tablets. **AT-021N** economizes the preparation times and mould cost for these connections. Tablets do not include starting powder or electronic starter because the ignition might be either electronic or traditional.

For choosing AT-020N or AT-021N reference; consult our technical department or our catalog.



## E. WELDING CHECK-UP: ACCEPTABLE OR UNACCEPTABLE RESULTS

In order to meet the requirements for an acceptable welding, the mould must be clean, with cavities for cables and welding well defined so the conductor and clamp would fit easily.

The conditions to validate a welding are:

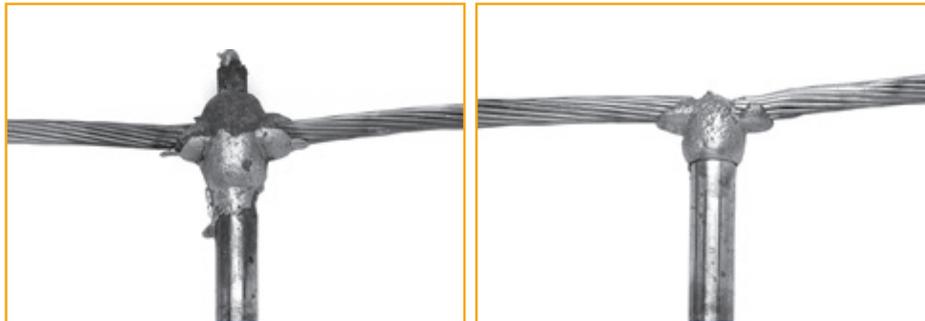
- The molten material should completely cover the limits of the welding cavity or at least the thickness the conductors had initially, in order to keep its previous section.
- The result should not present superficial porosity of a depth of more than 1mm.
- Welding result should be free of slag, accomplishing all the preceding conditions.
- The color of the welding varies from gold to bronze once cleaned.

Therefore perfect welding shows a solid, gold to bronze appearance, covering the whole surface of the conductor within the welding cavity and with fewer imperfections.

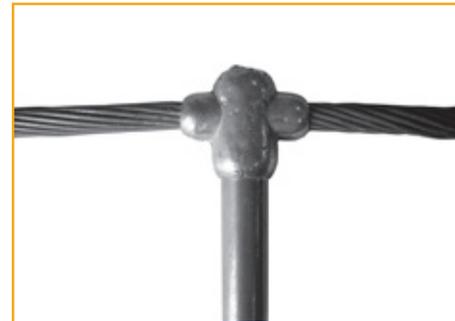
A welding can be unacceptable for different reasons ranging from the inadequate use of the welding mixture packaging to faults in the structure of the mould.

The inspection of the most usual defects in the graphite mould and in the welding itself, indicate the causes of the faults and how to prevent them happening again.

### UNACCEPTABLE



### ACCEPTABLE



## F. FAQ'S. HOW TO PROCEED

### F.1 PINHOLES IN THE WELDING SURFACE

**CAUSE:** Moisture or impurities in the conductors and/or in the mould.

- **SOLUTION:** Heat the mould again. Clean and remove all oil or combustible material as well as galvanized, strips, adhesives....from the conductors.



### F.2 LACK OF WELDING MATERIAL IN THE RESULT

**CAUSE A:** The tension on the cables may separate them when the welding melts (and then cuts) the conductors. This enlarges the cavity that has to be filled with welding material.

- **SOLUTION:** Use **AT-059N** Holding cable clamp to fasten the conductors.



**CAUSE B:** Welding material leakages.

- **SOLUTION:** Check the mould as in section C.4 Inspection. See also F3.

**CAUSE C:** Wrong tablet selection. The mould requires more tablets than used.

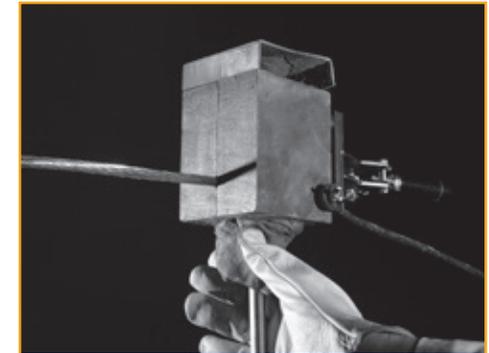
- **SOLUTION:** Check the mould label or the reference engraved. If any doubt do not hesitate to consult us.

### F.3 MATERIAL LEAKAGES TROUGH THE CONDUCTORS

**CAUSE:** Cable mould opening becomes worn or the cable size is smaller than mould requires.

**SOLUTIONS:**

- Use Sealing paste around the cable cavities once the mould is locked. Sealing paste never has to be applied inside the welding cavity. When the mould becomes worn, the use of sealing paste is only recommended when a few connections remain to end the work: It takes more time to prepare than a regular joint and the mould won't last for longer.
- Use cable adapters (**AT-072N**). These are 0'3 mm thick copper sleeves to wrap the conductors enlarging their diameters to shim the conductors to de mould. This solution is also only recommended when few connections are required, because it takes long time to prepare the conductors.
- Replace the mould



## F. FAQ'S. HOW TO PROCEED

### F.4 LARGE SLAG AMOUNTS STUCK TO THE WELDING SURFACE

It is important to distinguish between superficial slag over the welding and slag over the conductor.

- After removing the slag, if there is welding material below, then the result is correct provided that general conditions are accomplished. In this case is just superficial slag.
- But if behind the slag the conductors are not melted, then the result is rejectable and the cause could be as follows:

**CAUSE A:** Wrong tablet selection. The mould requires more tablets than used.

- **SOLUTION:** Check the mould label or the reference engraved. If any doubt do not hesitate to consult us.

**CAUSE B:** Welding material leakages.

- **SOLUTION:** Check the mould as in section C.4 Inspection. See also F3.

### F.5 ELECTRONIC DEVICE TROUBLESHOOTING

The power button (ON) does not light up and there is no bip sound indicating that it is ready.

**CAUSE:** Battery is not loaded or is exhausted.

- **SOLUTION:** charge the battery at least during 10 hours and check that the ON button is right. Start the working time with this marker always lit.

When the two ignition buttons are pressed, there is no bip sound and the process does not start.

**CAUSE A:** the two ignition buttons have not been pressed simultaneously.

- **SOLUTION:** press the buttons again, assuring that they are pressed simultaneously.

**CAUSE B:** Low battery.

- **SOLUTION:** Charge the battery.

When the two ignition buttons are pressed, there is bip sound but the process does not start.

**CAUSE:** connections cable-clamp-electronic starter are not correct.

**SOLUTIONS:**

- Verify all the connections and substitute the clamp if necessary.
- Clean the connection between the electronic starter and the mould cover.
- Adjust the closing of the electronic starter.

## F. FAQ'S. HOW TO PROCEED

### F.6. SPARK LIGHTER IGNITION PROBLEMS

**PROBLEM: I do not have a spark lighter**

- **SOLUTION:** Get a Spark lighter to carry out the ignition.

**+ IMPORTANT**

**Do not use torch, matches or any other flame tool for ignition.**

**PROBLEM: Spark lighter doesn't work**

**CAUSE A:** The end of the igniter is blocked.

- **SOLUTION:** Clean the Flint igniter immersing the end in ammonia during 8 hours

**CAUSE B:** the flint in the igniter is worn.

- **SOLUTION:** change the flint placing a new one. The reference **AT-070N** contains 10 units of these recharges.

**CAUSE C:** others

- **SOLUTION:** change the spark lighter.

The following images show the correct use of the Spark Lighter. This proper use will enlarge its working life.

**CORRECT USES**

**Right use**



**Optimal use**



**INCORRECT USE**



## F. FAQ'S. HOW TO PROCEED

### F.7 CLAMPS DO NOT LOCK CORRECTLY THE MOULD

**CAUSE:** Clamps do not press with enough strength.

#### SOLUTIONS

- Remove the key and pin in the adjustment linkage to balance locked strength.
- Remove remaining slag or any other object if it blocks the correct clamp closure.
- If the conductor is bended, straighten it. Check if you are using the right conductor for the mould.



Adjustment wingscrew in AT-049N and AT-050N clamps



MM-CT 14 Multiple mould box

### F.8. MULTIPLE MOULD BOX (MM-CTX) SPARE PIECES AND ITEMS

Multiple mould boxes contain:

Code	Description	Units
MM-053N	Multiple clamp	1
MM-T	Multiple mould crucible	1
MM-PTX	Lower piece for earth rod. Diameter X*	1
MM-PH	Lower piece for welding cables and tapes	1
MM-CS	60 cavity sealers package	2
AT-080N	Multiple mould box	1
AT-060N	Spark lighter	1
AT-061N	Conductors cleaning brush	1
AT-062N	Crucible and cover (for electronic starter) cleaning brush	1
AT-063N	Slag removal spade	1
AT-064N	Welding cavity brush	1
AT-065N	Sealing paste	1
AT-073N	Working gloves	1
AT-082N	Stand pliers	1

- \*X= diameter of the selected earth rod T12, T14, T16... (See table on section C1).
- All pieces are available separately.
- MM-BTX is also available. It contains only the multiple clamp, crucible and lower pieces.

## F. FAQ'S. HOW TO PROCEED

### F.9 CORRESPONDENCE BETWEEN AT-020N TABLETS AND TRADITIONAL WELDING MATERIAL

Traditional **Apliweld** welding material in powder has been used for years using the common packages of 10 units of one type, containing 32, 45, 65, 90, 115, 150, 200, 250 grams depending on the required size. These references are still in use and there is a reliable tablets-traditional package comparison in order to make the traditional weldings using moulds that are marked for tablets or vice versa.

Moulds can be used indistinctly, with the only difference that, for each type, they will be marked with the number of tablets or the amount of traditional welding. Crucibles for tables only allow cartridges up to E0150, but even so the table is correct.

- Equivalences work for changing to **Apliweld-T** tablets requirements provided with traditional packages but also using moulds of another brands.
- Equivalences are an approximation. We cannot accept responsibilities for other brand moulds.

But the most advisable and common way to request is directly to assign **Apliweld** moulds and estimate the quantity of weldings for each connection to carry out. Consult our catalog, web or our technical department to set up the suitable tablets, moulds and accessories.

Sizes	Tablets
E0032	1
E0045	1
E0065	1,5
E0090	2
E0115	2,5
E0150	3,5
E0200	4,5
E0250	6

## F. FAQ'S. HOW TO PROCEED.

### F.10. METALLIC SURFACE CONNECTIONS.

Before making a connection, the surface must be clean, rust free, heated and flat.

Remove the rust layer, grease or painting using the right brush or a grinder, to let the bright metal open thus favoring the connection.

In galvanized surfaces remove the galvanic layer of the connection point. Use a galvanizing spray after the connection if "bright metal" still stands in some points.

### F.11. RE-BAR CONNECTIONS.

The irregular shape of re-bar rods causes slight leakages from the mould even if it is locked tight.

Wrap the rebar using sealing paste once the mould is well-locked.

### F.12. VERTICAL RE-BAR CONNECTIONS.

There are two methods to perform vertical connections to reinforcing bars:

**E.g.:** Welding 50mm<sup>2</sup> cable to 20mm vertical rebar.

- **Method 1:** Traditional mould.  
Select the specific mould, clamp and correspondent tablets:

Mould **C50/V20/TO**

Clamp **AT-050N**

2.5 Tablets **AT-020N**

Then follow the general procedure.

- **Method 2:** Using the re-bar accessory (AVX, where X is the diameter of the re-bar), that allows the use of smaller moulds (moulds to flat surface).  
Select the right mould for the cable, the re-bar accessory and the correspondent tablets.

Mould **C50/M/VPH+**

Accessory **AV20**

Clamp **AT-051N**

2 tablets **AT-020N**

Fix the mould as shown in the figures  
Follow the instructions given in each mould to box.

Both methods require sealing paste in the lower part of the rebar out of the mould.

Method 2 - Step1



Method 2 - Step2



Method 2 - Step3



## F. FAQ'S. HOW TO PROCEED.

### F.13. OTHER MATERIAL IMPURITIES.

#### Remove all the impurities in mould and conductors:

- **Mud impurities:** Remove using AT-061N and wiping the conductor with a dry cloth before heating with a torch.
- **Grease, fuels, oils impurities ...:** remove using a torch or using an adequate dissolvent. Heat after applying it.
- **Rust and painting impurities:** Remove all these impurities because the welding won't "stick" to this kind of oxides...
- **Other impurities:** Any other burning material like paper, adhesive strip must be out of the mould to avoid flames to damage final results.

In case of unknown materials or if any doubt, do not hesitate to contact us before making the connection.

#### IMPORTANT

**WARNING:** Check the working area to assure a convenient surrounding to use the torch and carry out the welding reaction.

## G. REFERENCE INDEX & COMMON PRODUCT CODES

More than 600 references are available to consult in our catalog and website. The most demanded are:

### APLIWELD® SECURE PRODUCTS

REFERENCE	DESCRIPTION	FOR MORE INFORMATION:
AT-020N	<b>Apliweld®-T</b> : Exothermic welding tablets (20 Un.)	Section D Page 25
AT-010N	<b>Apliweld®-E</b> : Electronic starter (10 Un.)	Section D Page 25
AT-021N	<b>Apliweld®-T</b> : Exothermic welding tablets, 55mm thick (20 Un.)	Section D Page 25
AT-100N	Kit <b>Apliweld®-E</b> : Electronic starting device including the Ignition Unit ( <b>AT-096N</b> ), connection cable ( <b>AT-098N</b> ), 5 connection clamps ( <b>AT-099N</b> ), battery charger and a portable bag.	Picture B.16 page 6
AT-069N	Basic tool kit	Section 3.1.1 page 21

### OTHERS APLIWELD® PRODUCTS COMPATIBLES WITH APLIWELD® SECURE+

REFERENCE	DESCRIPTION	FOR MORE INFORMATION:
AT-012N	Starting powder (10 Un.)	Section D Page 25
AT-068N	Basic tool kit + spark lighter	Section 3.1.1 page 21
AT-065N	Sealing paste 0,45 Kg	See F3 page 27
AT-060N	Spark lighter	Picture C.3.2 page 22
AT-061N	Conductors cleaning brush	Picture C.3.2 page 22
AT-072N	Adapter sleeves (25 Un.)	See F3 page 27
AT-059N	Conductors clamp	See F3 page 27

### MULTIPLE MOULD

REFERENCE	DESCRIPTION	FOR MORE INFORMATION:
MM-CT14	Multiple mould box and accessory for 14.3mm earth rod	See F8 page 30
MM-CT16	Multiple mould box and accessory for 15.9mm earth rod	See F8 page 30
MM-053N	Multiple mould clamp	Picture B.3.2 page 11
MM-CS	Cavity sealer (60 Un.)	Picture B.3.2 page 12

## G. REFERENCE INDEX & COMMON PRODUCT CODES

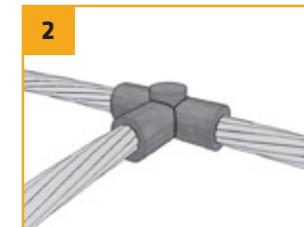
Find the most used moulds below among more than 600 reference available.

	SPECIFIC MOULDS	DESCRIPTION
1	<b>C50/T14/TV</b>	T shape cable 50mm <sup>2</sup> over 14.3mm earth rod
	<b>C50/T16/TV</b>	T shape cable 50mm <sup>2</sup> over 15.9 mm earth rod
	<b>C70/T14/TV</b>	T shape cable 70mm <sup>2</sup> over 14.3mm earth rod
	<b>C70/T16/TV</b>	T shape cable 70mm <sup>2</sup> over 15.9mm earth rod
	<b>C95/T14/TV</b>	T shape cable 95mm <sup>2</sup> over 14.3mm earth rod
	<b>C95/T16/TV</b>	T shape cable 95mm <sup>2</sup> over 15.9mm earth rod
2	<b>C35/C35/TH</b>	T shape horizontal 35mm <sup>2</sup> cable to 35mm <sup>2</sup> cable mould
	<b>C50/C50/TH</b>	T shape horizontal 50mm <sup>2</sup> cable to 50mm <sup>2</sup> cable mould
	<b>C70/C70/TH</b>	T shape horizontal 70mm <sup>2</sup> cable to 70mm <sup>2</sup> cable mould
	<b>C95/C95/TH</b>	T shape horizontal 95mm <sup>2</sup> cable to 95mm <sup>2</sup> cable mould
	<b>C120/C120/TH</b>	T shape horizontal 120mm <sup>2</sup> cable to 120mm <sup>2</sup> cable mould
	<b>C150/C150/TH</b>	T shape horizontal 150mm <sup>2</sup> cable to 150mm <sup>2</sup> cable mould
3	<b>C35/C35/XS</b>	Cross shape vertical 35mm <sup>2</sup> cable to 35mm <sup>2</sup> cable mould
	<b>C50/C50/XS</b>	Cross shape vertical 50mm <sup>2</sup> cable to 50mm <sup>2</sup> cable mould
	<b>C70/C70/XS</b>	Cross shape vertical 70mm <sup>2</sup> cable to 70mm <sup>2</sup> cable mould
	<b>C95/C95/XS</b>	Cross shape vertical 95mm <sup>2</sup> cable to 95mm <sup>2</sup> cable mould
	<b>C120/C120/XS</b>	Cross shape vertical 120mm <sup>2</sup> cable to 120mm <sup>2</sup> cable mould
	<b>C150/C150/XS</b>	Cross shape vertical 150mm <sup>2</sup> cable to 150mm <sup>2</sup> cable mould
4	<b>C35/M/VPV</b>	Vertical 35mm <sup>2</sup> cable to vertical metallic surface mould
	<b>C50/M/VPV</b>	Vertical 50mm <sup>2</sup> cable to vertical metallic surface mould
	<b>C70/M/VPV</b>	Vertical 70mm <sup>2</sup> cable to vertical metallic surface mould
5	<b>P302/T14/TV</b>	T shape tape 30x2mm over 14.3mm earth rod mould
	<b>P302/T16/TV</b>	T shape tape 30x2mm over 15.9mm earth rod mould
6	<b>P302/P302/XS</b>	Cross shape tape 30x2mm over tape 30x2mm mould
7	<b>C50/P302/LH</b>	Straight 50mm <sup>2</sup> cable to 30x2mm tape mould
	<b>AT-049N</b>	Handle clamp S
	<b>AT-050N</b>	Handle clamp G

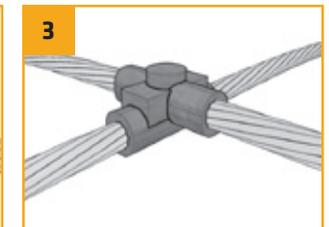
T SHAPE CABLE OVER EARTH ROD



T SHAPE HORIZONTAL CABLE TO CABLE



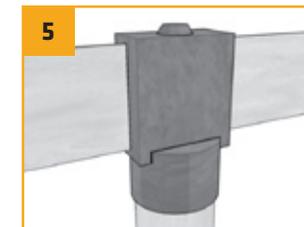
CROSS SHAPE CABLE OVER CABLE



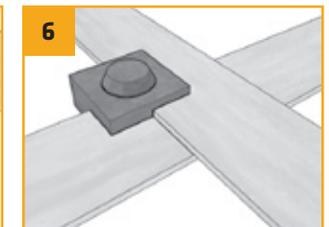
VERTICAL CABLE TO VERTICAL METALLIC SURFACE



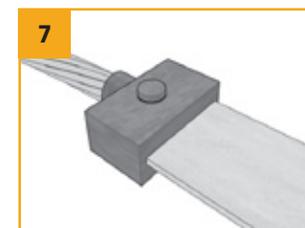
T SHAPE TAPE OVER EARTH ROD



CROSS SHAPE TAPE OVER TAPE



STRAIGHT CABLE TO TAPE



For a suitable mould, tablets and accessories selection, consult our catalog, website or directly our technical department. If any doubt, do not hesitate to contact us.

## H. ENVIRONMENT.

### H.1. INDICATIONS FOR USE AND RECOMMENDATIONS FOR RECYCLING EQUIPMENT LEAD BATTERIES ELECTRONIC IGNITION AT-096N

- During the accumulator recharging process, the unit switches off automatically. Respect the charging times and do not use the unit during this process.
- Use the chargers provided by the manufacturer avoiding fire hazards if charging the accumulator with other kind of them.
- Keep the accumulator stored far from clips, coins, keys... or any other metallic objects to avoid bypassing. Accumulator short circuits may cause fire hazards and burns.
- Take steps to avoid leakage of liquid from the battery. Avoid direct contact in case of accidental spillage. In case of direct contact wash with water, if persist seek for medical attention. The battery liquid could cause skin irritation and burns.
- Disposal measures: Electric tools accessories and packages should be disposed for recycling always respecting the environment.

As a company committed to the environment, we are responsible to dispose all accumulators and consoles according with local and European environmental regulations (2002/96/CE)

- **Accumulators/batteries:**

**Warning:** Accumulators may contains toxic materials (Lead, sulphuric acid)

Electrolyte contains sulphuric acid which is corrosive and may cause burns.

Accumulators must be stored for recycling or environmental approved disposal.



## I. WARNINGS, WARRANTY & LITIGATION OF LIABILITY

### I.1. WARNINGS.

**APLIWELD®** products shall be installed and used only as indicated in particular instructions of use sheets or in this manual, download available at [www.at3w.com](http://www.at3w.com)

Improper installation or use, misapplication or other failure to completely follow Apliweld® instruction and warnings may cause product malfunction, property damage, serious bodily injury...

Store **Apliweld®** product in a safety clean a dry place, far from ignition sources like sparks, heating devices o electric discharges. Avoid strong vibrations and prevent any rough handling or physical damage.

Under these storage conditions, no expiration rate known for the products.

Consult Material Safety data Sheets for a more detailed information and product properties

### I.2. WARRANTY.

**Apliweld** products are warranted to **APLICACIONES TECNOLÓGICAS S.A.**, owner of the brand, be free from defects in material and workmanship at the time of shipment. No other warranty, whether express or implied, including any warranty do merchantability or fitness for a particular purpose, shall exist in connection with the sale or use of **APLICACIONES TECNOLÓGICAS S.A.**

Claims for errors, or nonconformities must be made in writing and returned to **APLICACIONES TECNOLÓGICAS S.A.** for inspection, prior written approval in accordance with its standard terms and procedures. **APLICACIONES TECNOLÓGICAS S.A.** shall in no event be responsible if the products have not been stored or used in accordance with its specifications and recommended procedures. **APLICACIONES TECNOLÓGICAS S.A.** will, at its option, either repair or replace nonconforming or defective products for which it is responsible or return the purchase price to the customer.

### I.3. LIMITATION OF LIABILITY.

**Should APLICACIONES TECNOLÓGICAS S.A. be held liable its liability shall in no event exceed the total purchase price under the contract. APLICACIONES TECNOLÓGICAS S.A** shall no event responsible for any loss of business or profits, downtime of delay, labor, repair or material costs or any similar or not consequential loss or damage included by buyer.

As a consequence of our continuous development and investigation politics, all specifications and products are subject to change without notice

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# APLICACIONES TECNOLÓGICAS

All technologies for lightning protection

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