

# TOPTIG

A new robot welding  
process for the  
industry



2005-895

# TOPTIG process: principles, featur



**AIR LIQUIDE Welding continues to innovate.**

**From its research centre specialising in welding/cutting technologies, AIR LIQUIDE Welding introduces a new welding process for thin plate combining speed of operation, quality and total absence of spatters.**

## The TOPTIG robot

welding process offers:

- High travel welding speed
- Total absence of spatters,
- Very high quality,
- Optimum operating costs.

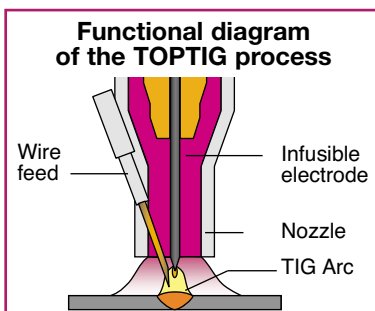
Comparison of the main robot welding processes

Feature Processes	Speed	Quality	Spatter	Cost
TIG	☹	😊	😊	😊
MIG	😊	☹	☹	😊
LASER	😊	😊	😊	☹☹
TOPTIG	😊	😊	😊	😊

😊 Excellent    ☺ Good    ☹ Fair

## Principles of the TOPTIG process

In TIG automatic welding mode, the filler wire is fed into the weld pool in front of the torch. A feature of the TOPTIG process is that the melting of the filler wire is equivalent to that of MIG. Indeed, the support wire is fed



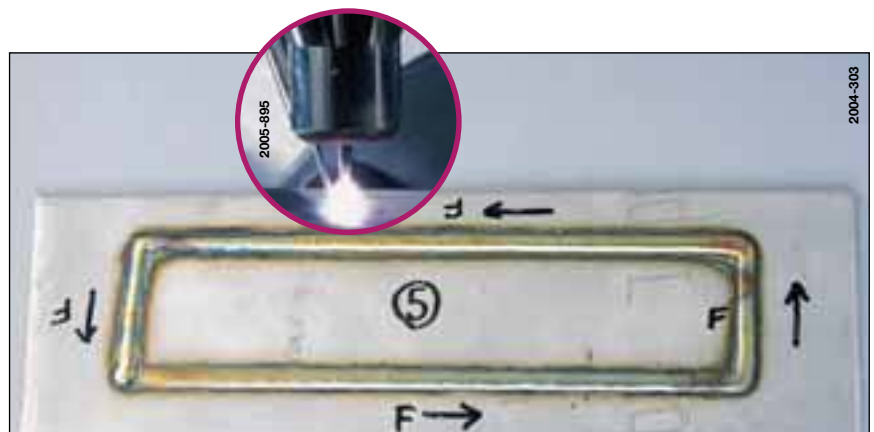
through the welding nozzle into precisely that area of the arc where the temperatures are the highest: the wire therefore melts into small droplets exactly as in the MIG process. The use of a pulsed current gives additional control over how the drops are detached so giving better control over the welding operation.

## Features of the process and the TOPTIG torch

The way the filler wire behaves in melting enables the TOPTIG process to achieve speeds near to or indeed greater than those obtained with the MIG process. As the process remains basically TIG, the welding operations are carried out with a total absence of spatter and noise. Another great advantage of this new process is that the special way the wire melts means that the torch can be moved without the filler wire having to be orientated which is usually the case with traditional robot TIG

welding (see photo below).

The robot can therefore weld in all positions as in the MIG process, and a robot axis is freed up. Developed at our welding research centre, the torch is always the main component considered when implementing a process. It has been especially designed to facilitate the accessibility and interchangeability of the electrode which is necessary in robot welding operations.



# es and advantages

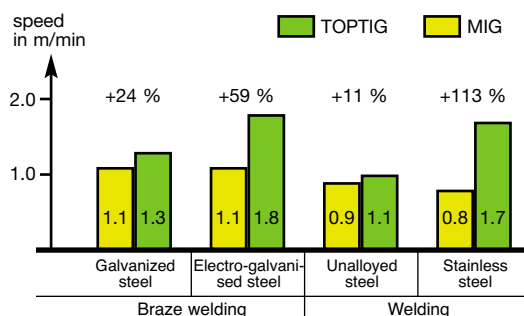


The TOPTIG process has two decisive advantages - the speed of travel which comes near or even greater than those obtained in MIG welding and the exceptional appearance of the weld bead with its complete absence of spatters.

## Travel speeds and appearance of weld

On plate up to 3 mm thick, the TOPTIG process gives travel speeds near or even greater than those obtained with the MIG process. The quality and appearance of the weld beads are exceptional, as the TIG process does not generate spatter: so no finishing work is needed after welding.

Performances of the process and gain over the MIG process (fillet welding in lap joint)

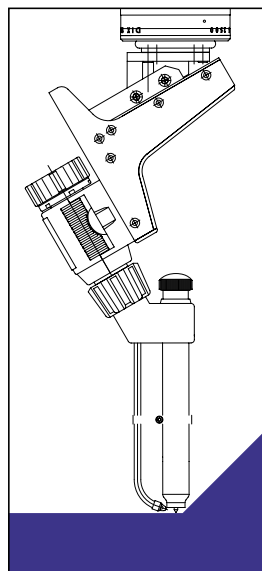


Assembly	Position	Plate thickness	TOPTIG		MIG	
			Current	Speed	Current	Speed
Galvanized steel braze welding	lap joint	0.8 / 1.5 mm	110 A	1.3 m/min	100 A / 18 V	1.1 m/min
Electro-galvanized steel braze welding	lap joint	1.0 / 1.0 mm	180 A	1.8 m/min	140 A / 20 V	1.1 m/min
Unalloyed steel welding	lap joint	1.0 / 1.0 mm	150 A	1.0 m/min	120 A / 20 V	0.9 m/min
Stainless steel welding	lap joint	1.5 / 1.5 mm	210 A	1.7 m/min	140 A / 18 V	0.8 m/min

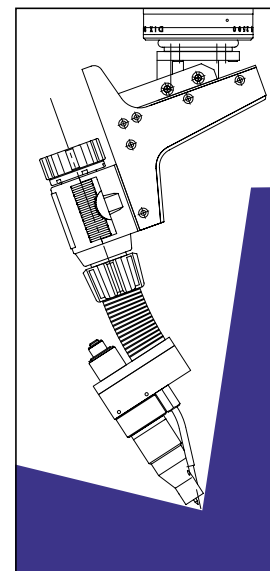
## Torch accessibility

Compared with a traditional automatic TIG torch, the compactness of the wire lead-in incorporated into the nozzle gives accessibility at an angle comparable with that obtained using a MIG/MAG torch.

This increases the scope for robotization and extends the range of workpieces which can be welded automatically.



Conventional TIG torch



TOPTIG torch

# TOPTIG process - industry sectors



The TOPTIG process is intended for any industry working with thin plate, whether in carbon steel or stainless steel, and looking for an excellent weld quality associated with a high travel speed. This process is suited to the requirements of the automobile industry and its subcontractors but other industrial sectors will also find it very useful.

## Materials and industrial sectors

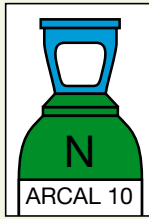
### Material thicknesses:

- 1** coated steels,
- 2** unalloyed steels,
- 3** stainless steels,
- 4** aluminum alloys, (under development using alternating current)

### Industry sectors:

- A** automobile,
- B** automobile subcontracting,
- C** food,
- D** metalworking,
- E** metal furniture.





To improve travel speeds and wetting of the weld bead, we recommend using TOPTIG with ARCAL 10 gas



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4 D



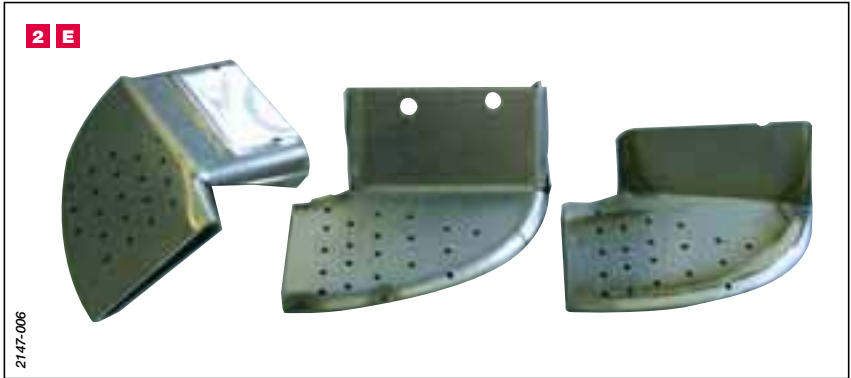
3 D



2 B



2 E



2147-003

3 C



4 A



# The TOPTIG installation, a turnkey



Using its considerable robotics expertise, the AIR LIQUIDE Welding group can also, after studying your application and requirements, supply a turnkey robot installation.

Our group service packages will help you with integrating and putting your TOPTIG installation into production.

## Components and technical specifications of a TOPTIG 220 DC installation.

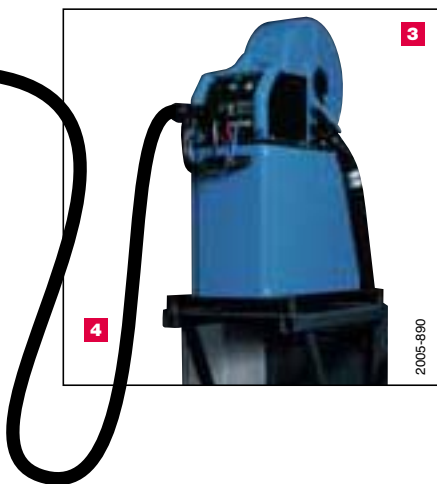
### TOPTIG 220 DC installation

This installation can be easily integrated with any standard robot\* to replace a MIG installation.



### The installation is made up of the following components:

- 1 a TOPTIG torch with integrated wire feed and easily interchangeable electrode (automatic system as an option),
- 2 a TOPTIG 220 DC generator with integrated robot interface and remote control,
- 3 a high-precision push-pull wire-feed assembly,
- 4 a torch harness (length 5 m),
- 5 a torch safety system.



### Technical specifications:

- Welding current:
  - 180 A at 100%
  - 220 A at 100% with water-cooled nozzle (option),
- Complete and pulsed TIG welding cycle (max. 350 A),
- Arc striking using pilot arc on water-cooled nozzle (option under development),
- Program call and chaining by the robot,
- Double-motorised wire feed for 0.8 to 1.6 mm wire.

\* High frequency protection needed.

# industrial solution



The modular design of the torch incorporates an electrode-holder which holds and allows easy manual dismantling of the electrode. This holder maintains the electrode at a calibrated distance and it can thus be easily adjusted by the operator. An optional automatic holder changing device is also available to facilitate maintenance.

## TOPTIG, an effective industrial tool.

### Torch

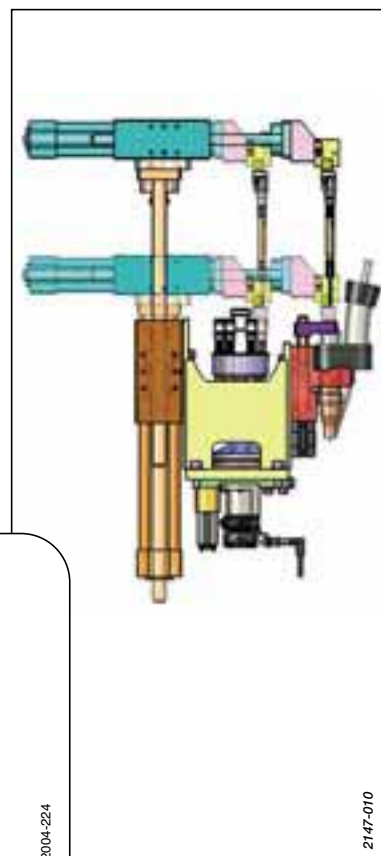
Special consideration has been given in the design to the service life of the electrode between two grinding operations, nevertheless, during production runs requiring more frequent electrode changes, an automatic holder changing device can be installed as an option near the robot. This electrode changer automatically extracts the holder

from the torch and inserts a new one storing it in a 6-position magazine. This sequence is entirely managed by an automatic control device linked to the robot. This means the product is installed autonomously without any unexpected stoppages. The operator is thus able to grind electrodes in the magazine while not affecting the robot production cycle.

### Wires packaged in drums

A system of feeding wires held in drums of type ENDURO, MAGNUM, SPEEDPACK, SUPERPAC, etc. can be adapted upon request.

This improves still more the productivity of the robot installation.



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