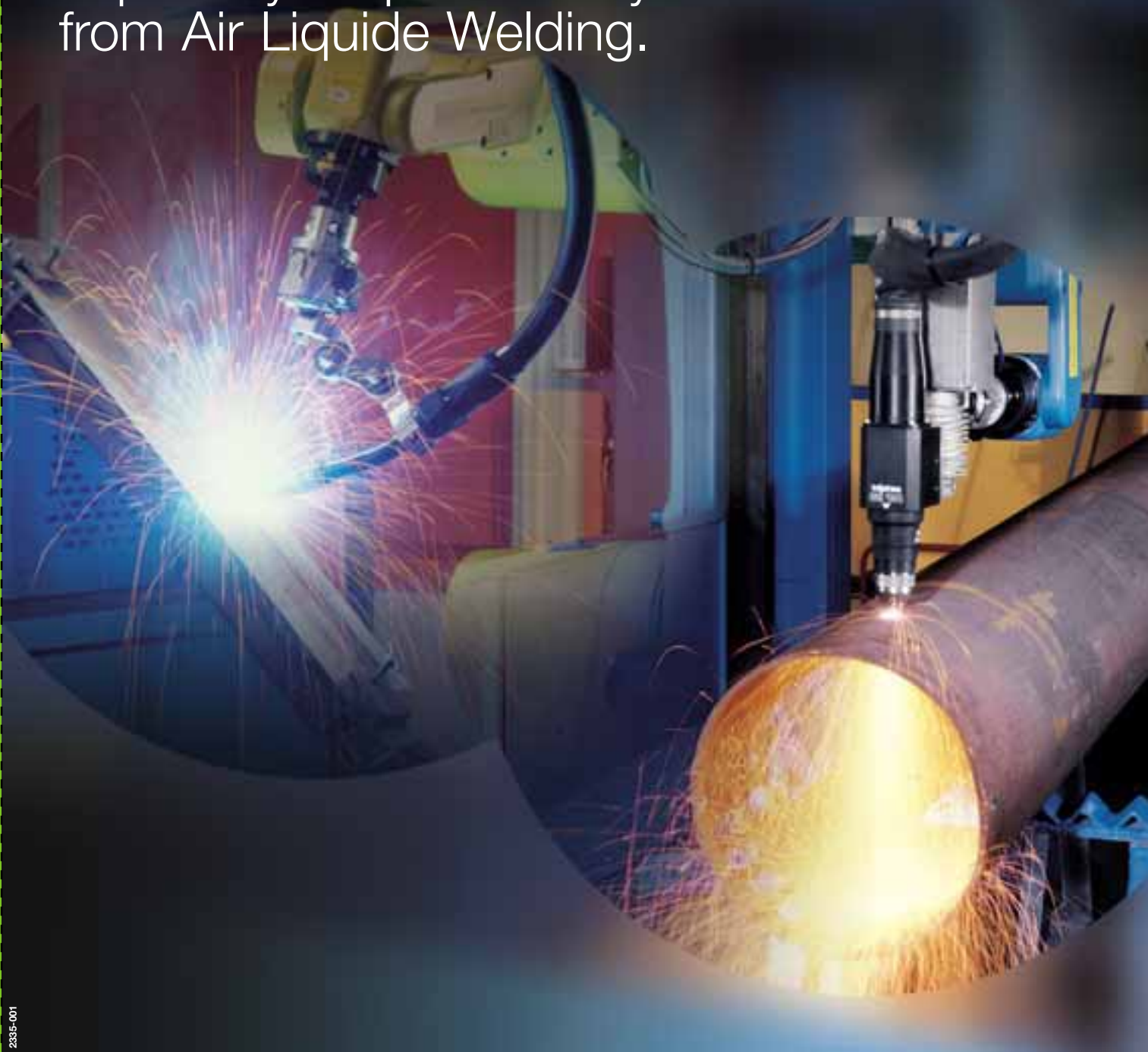


Welding and cutting robotics

Improve your productivity with solutions from Air Liquide Welding.



Improve your productivity: the robotics

The constant changes in the economic markets in which our customers operate constantly require them to react quickly to adapt to the requirements of their customers. To do this it is essential to produce as leanly as possible, to optimise production resources and to strive for the greatest possible flexibility. These obligations are shared by all companies regardless of their size, their geographic location or their field of activity. Robotisation of welding and cutting operations is one of the possibilities available to industrial companies to improve their productivity.

Air Liquide Welding, your welding partner.

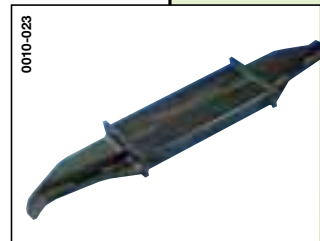
In partnership with Automatica, a dynamic team situated in the European Robotics Pole at Commercy and in your regions, the Air Liquide Welding group offers solutions for optimising your welding and cutting processes, either with standard components based on “plug and play” welding centres or with more tailor-made installations designed for a particular need.

In three successive steps the Air Liquide Welding teams guide your robotics projects to completion:

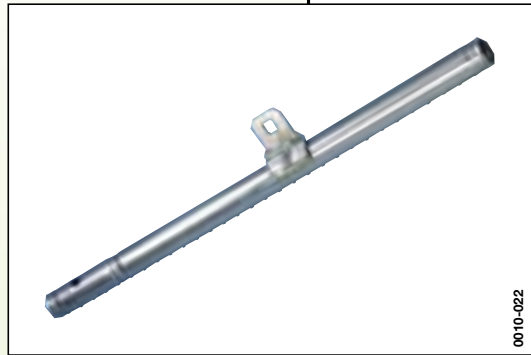
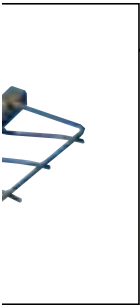
1. Preliminary study of your project.
2. Presentation of a study according to the specifications drawn up with you.
3. Construction of the machine and its environment: welding or cutting equipment, handling systems, smoke processing and welding gas supply.

The purpose of this document is to present a number of robotics installations implemented by our teams in different fields of activity: (motor industry subcontracting, metal fabrication, agricultural and handling equipment, and lifting and public works equipment components).

These examples will enable you to see, on the basis of actual implementations, the possibilities that the Automatica teams can offer to improve your productivity.



solutions.



Examples of applications



Exhaust systems

Welding catalytic converters

Part size: 1500 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg and an 8-axis control box.
- A 500 kg capacity manipulator mounted on a rocking pin with numerical control.
- A 100% computer-controlled 420 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.

Average welding time: 45 seconds per part



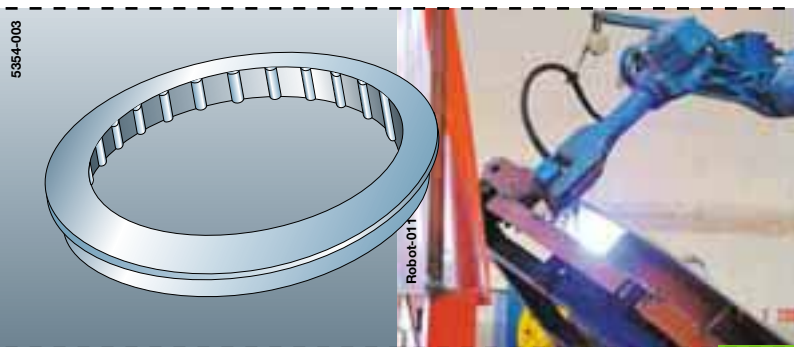
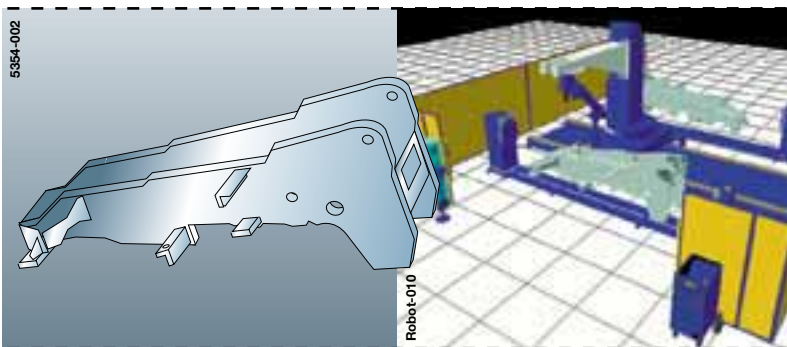
Part size: 1 500 mm

Characteristics of the installation

- A welding lathe with the possibility of performing eccentric welds.
- Two 100% computer-controlled 420 A MIG/MAG inverter current sources.
- A safety booth with smoke extraction.

Average welding time: 20 seconds per part





Power shovel arm

Welding a power shovel arm

Part size: 2 500 x 600 x 400 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg and an 11-axis control box. The installation also includes the Touch Sensing option for following multipass joints.
- A numerically controlled 5000 mm stroke heavy duty transfer gantry with a Z axis stroke of 1500 mm.
- Two manipulators each with a capacity of 3000 kg.
- A 100% computer-controlled 450 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.
- Cored wire welding.

Average production: 2 parts per day



Depot crane

Welding the base of a depot crane

Part size: 2 500 x 2 500 x 400 mm

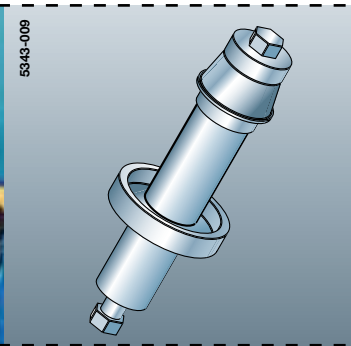
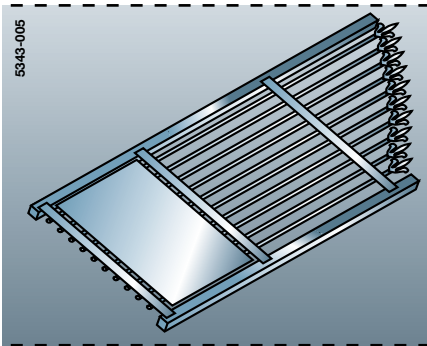
Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg and a 9-axis control box. The installation also includes the Touch Sensing option for following multipass joints.
- A 7000 mm stroke heavy duty transfer gantry.
- An interleft morse key with two axes each with a capacity of 20,000 kg.
- A 100% computer-controlled 420 A MIG/MAG inverter current source.
- Cored wire welding.

Average production: 2.5 parts per day



Examples of applications



Metal gate

Welding a metal gate

Part size: 3 000 x 2 400 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg and an 11-axis control box.
- A transfer stroke of 8000 mm.
- Two manipulators each with a capacity of 2000 kg, and 3500 mm between face plates.
- A 100% computer-controlled 450 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.

Average production: 12 parts per day



Shock absorber body

MAG welding a 2 mm thick steel shock absorber body

Part size:

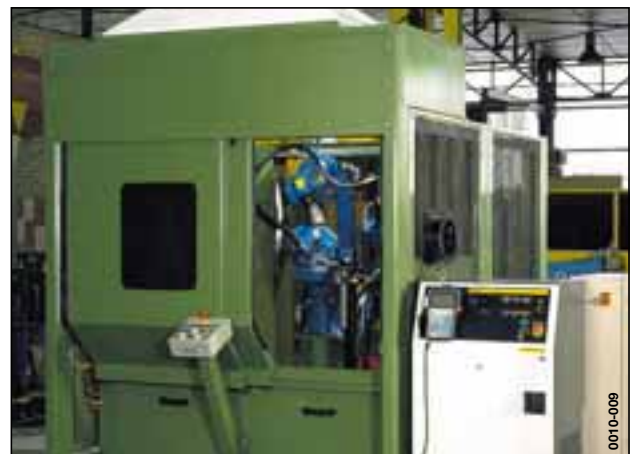
Length 450 mm – diameter 40 to 100 mm

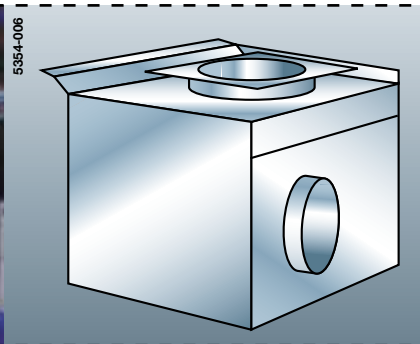
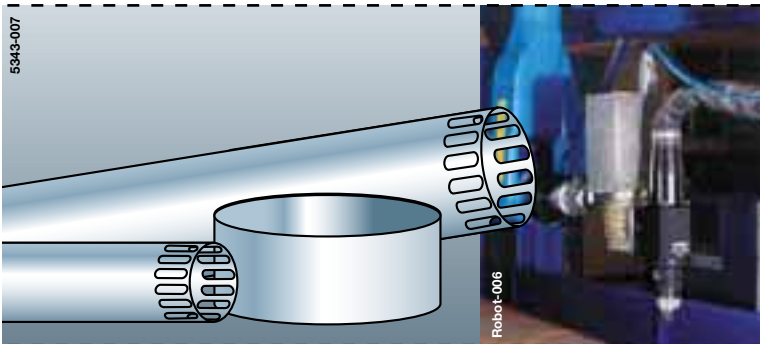
Characteristics of the installation

- A robot with a wrist-joint capacity of 6 kg and a 6-axis control box.
- A safety booth with smoke extraction.
- A compact installation with two work stations.
- A chassis-mounted unit (easy to move about in a workshop).
- Tooling with part removal and a part presence indicator. Pneumatic clamping.
- A 100% computer-controlled 420 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.

Average production: 450 parts per hour

Average welding time: 8 seconds





Candelabras

Plasma cutting various openings in candelabras

Part size:

Length 10,000 mm – diameter 400 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 16 kg.
- A safety booth with smoke extraction.
- A Nertajet HP 120 plasma cutter with an OCP 150 torch with HF-free striking device.
- An arc length auto-correction system.
- A safety booth with smoke extraction.



Boilers

MAG welding boiler casings

Part size: 800 x 800 x 600 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg and a 10-axis control box. The installation also includes the Touch Sensing option for following multipass joints.
- A turntable with two interleft Morse keys each with a capacity of 500 kg.
- A 100% computer-controlled 420 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.

Average production: 35 parts per day

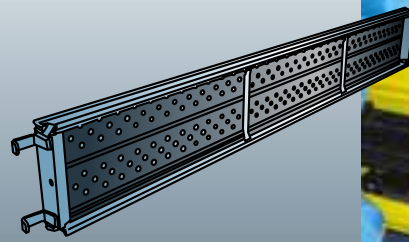


Examples of applications

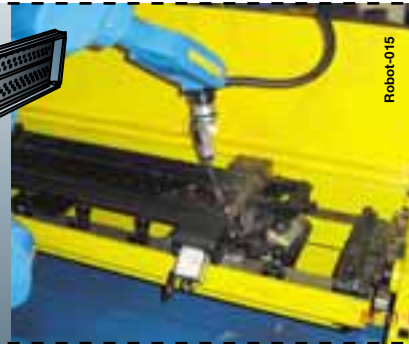
Robot-014



Robot-016



5354-010



Robot-015

Formwork

MAG welding formwork components

Part size: 2 500 x 1 000 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 10 kg.
- A gantry with a stroke of 7300 mm, traverse speed 2 m/s.
- Two positioning tools able to accept a wide range of formwork sizes.
- A 100% computer-controlled 450 A MIG/MAG inverter current source.

Average production: 6.5 parts per hour



Robot-00

Scaffolding flooring

MAG welding scaffolding flooring

Part size: 2 500 x 400 mm

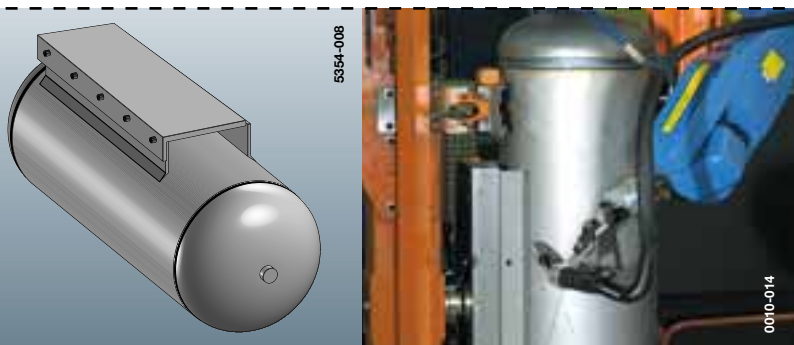
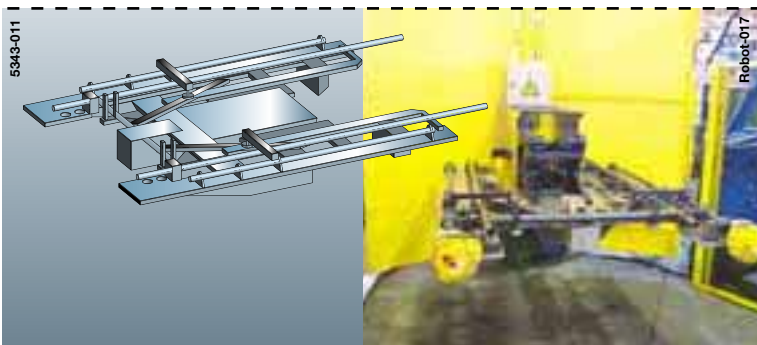
Characteristics of the installation

- Two robots with a wrist-joint capacity of 6 kg.
- A turntable with a barrel type system.
- One cell X 12 for welding flooring heads.
- Four positioning tools.
- Ergonomic parts loading tables.
- Three 100% computer-controlled 420 A MIG/MAG inverter current sources.
- A safety booth with smoke extraction.

Average production: 55 parts per hour



0010-011



Scaffolding ladders

MAG welding scaffolding ladders

Part size: 2 500 x 1 000 mm

Characteristics of the installation

- Four robots with a wrist-joint capacity of 10 kg
- A 3-position turntable with a loading station, a welding station and an unloading station.
- A manipulation robot with a wrist-joint capacity of 120 kg.
- Three positioning tools able to accept a wide range of ladder sizes.
- Six 100% computer-controlled 420 A MIG/MAG inverter current sources.
- A safety booth with smoke extraction
- The installation operates with a single operator who oversees its operation. Loading and unloading are done in automatic mode.

Average production: 65 parts per hour



Compressor tanks

MAG welding 3 mm thick compressor tanks

Part size:

Length 1500 mm – diameter 300 mm

Characteristics of the installation

- A robot with a wrist-joint capacity of 6 kg and a 6-axis control box.
- An electric turntable with two positioners.
- A 100% computer-controlled 420 A MIG/MAG inverter current source.
- A safety booth with smoke extraction.

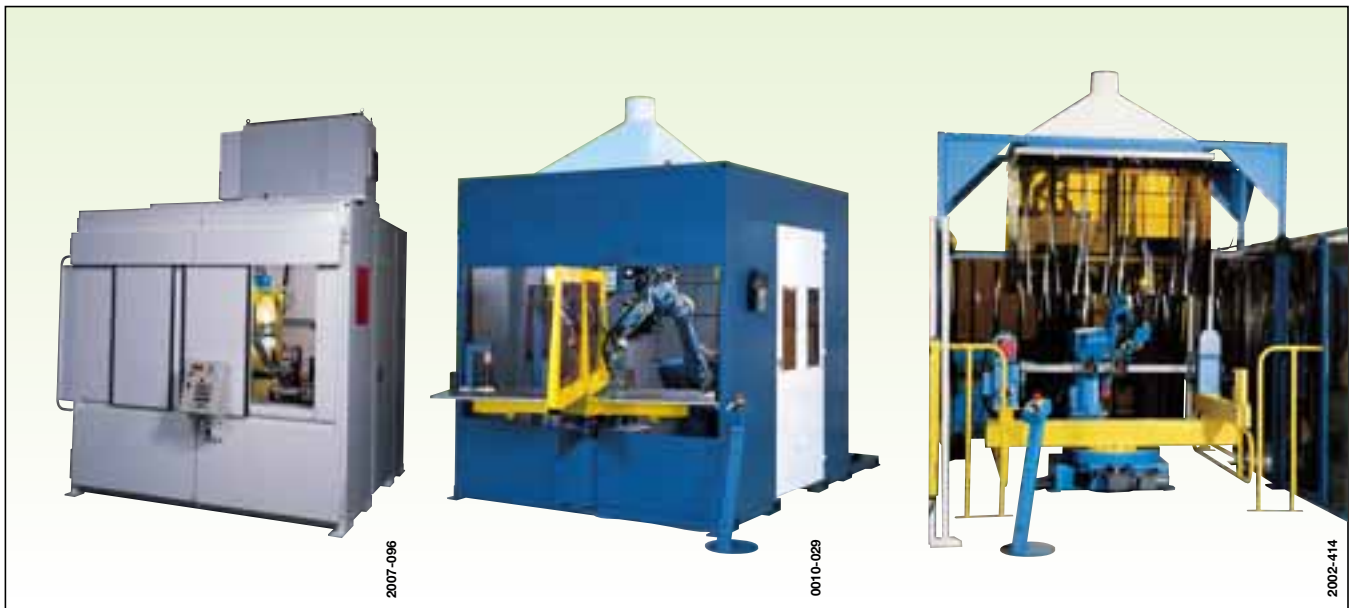
Average production: 30 parts per hour



DUAL, SENIOR and MAJOR centres

Are you looking for a reliable easy-to-use automation solution providing a quick return on your investment?

DUAL, SENIOR and MAJOR centres satisfy your requirements perfectly. By their revolutionary design and their flexibility, they are an interesting alternative to special automatic welding machines. Thanks to their ease of use they are the ideal tool for a first step into the world of welding robotics.



General design

- A compact unit, easy to move in a workshop using a simple forklift truck. The centre comprises all the equipment mounted on a monobloc chassis. The MAJOR unit is made to fold to a size suitable for road transport. The units then unfold for quick and easy installation on-site.
- Very short delivery lead time as all the components are standard.
- Very fast installation (approx. 1 hour). A simple electrical connection and a compressed air supply are the only services needed.
- A particularly suitable solution for the varied requirements in the fields of small metal fabrication, motor industry subcontracting, etc. These centres are the ideal equipment for a first step into the world of welding robotics without very heavy investment or very long and complex starting phases.
- An excellent complement to large robotic installations.

Ease of use

- Simplified control during production. Special knowledge is not required.
- High performance 6-axis robot allowing simplified programming via menus and windows on a colour screen.
- Accelerated training in 4 days.
- These centres provide specific welding applications in optimal conditions.

Excellent reliability and very easy maintenance

- Simple and strong design not needing any special maintenance.
- MBTF of the robot 60,000 hours.
- Quick access to all components of the installation by simply removing panels.
- Components tested in the severest industrial conditions.



Maximum profitability

- 2 work stations designed to allow masked time loading / unloading during the welding cycle: the robot and the operator work at 100%.
- A simple and safe environment which does not upset the routine of your production workshop.
- The reliability and availability of these installations guarantee you a fast return on investment.

CITOPULS or DIGI@PULS and CITOWAVE or DIGI@WAVE power sources: total quality

- Digital control MIG/MAG inverter current source fitted with the latest generation inverter.
- Graphic screen for easy, user-friendly adjustments.
- New arc transfer modes.
- New synergy laws (up to 152).
- Wire feed set digitally for constant and controlled feed.
- Smooth or pulsed welding current up to 500 Hz with reduced noise and pollution (absence of projections).
- Process control and traceability functions.

	DUAL	SENIOR	MAJOR
General information			
Starting up time	1 hour (self-supporting machine on a platform)		
Power supply	400 V 3-phase 50 Hz - 25 kVA		
Compressed air	6 bar		
Robot characteristics			
Repeatability	± 0.08 mm		
Wrist joint capacity	6 kg		
Characteristics of peripheral equipment			
Table dimensions	2 fixed tables, 700 x 100 mm	1 table with 2 plates, 800 x 800 mm	1 table, between-centres 1600 mm part dia. 1000 mm
Indexing	-	Mechanical	Pneumatic
Rotation	-	Electric, 0 to 180° in 4 s	Electric, 0 to 180° in 6 s
Load capacity	250 kg per table	125 kg per side	250 kg per table
Operator protection	by manual sliding door	by central panel and photo-electric cells	
Repeatability	-	0.1 mm	0.1 mm
Current source characteristics	CITOPULS 320 MX DIGI@PULS 320 MX	CITOPULS 420 MXW DIGI@PULS 420 MXW	CITOWAVE 400 MXW DIGI@WAVE 400 MXW
Welding current	320 A at 100%	350 A at 100%	350 A at 100%
Welding parameters	99 synergy laws	121 synergy laws	152 synergy laws
Welding mode	Short Arc, Speed Short Arc™, Pulsed, Cold Double Pulse™, MIG Brazing		Short Arc, Speed Short Arc™, Pulsed, Cold Double Pulse™, MIG Brazing, Soft Silence Pulse™, Spray-Modal™
Process control	Yes		
Welding parameters saving	10 programs	100 programs	100 programs
Torch	350 A at 100% - Air cooled	450 A at 100% - Water cooled	450 A at 100% - Water cooled
Torch cleaning	Oleo-pneumatic (option: mechanical)		
Safety			
Welding smoke	Extraction hood (option: extraction and electrostatic filtration)		
Doors	2 access doors with safety switch		1 access door with safety switch
Lighting	Yes		
Dimensional characteristics			
Dimensions: (L x W x H)	2 700 x 2 310 x 2 360 mm	4 950 x 2 310 x 2 360 mm	5 565 x 2 685 x 2 557 (unfolded)
Chassis weight	2 tons	2 tons	2.7 tons

DUAL, SENIOR and MAJOR centres conform to CE and CEM standards.

Power sources



MIG/MAG welding

CITOPULS and CITOWAVE
or **DIGI@PULS and DIGI@WAVE:**
total quality.

- Digital control MIG/MAG current sources fitted with the latest generation inverter with synergic welding parameter management.
- Several models with various power ranges from 20 to 280A at 100% and up to 440A at 100%
- Graphic screen for easy and user-friendly adjustment.
- New arc transfer modes.
- New synergy laws (up to 152).
- Digitally adjusted wire feed for constant, controlled output.
- Smooth or pulsed welding current up to 500 Hz with reduced noise and pollution (no projections).
- Process control and traceability functions.

TIG or unconfined plasma welding

NERTAMATIC 450

- PC 104 CPU and interface.
- 450 A chopper at 100%.
- 25 A pilot arc circuit at 100%.
- Primary 3-phase power supply, 50/60 Hz – 230/400/415/440 V.
- With a MEC 4 torch for TIG welding and a SP 150 for unconfined plasma.

Option: alternative module for aluminium,

- Variable polarity TIG operation on aluminium.
- Variable polarity current, 450 A / 100%.
- Variable polarity frequency 50 to 200 Hz.

Other processes



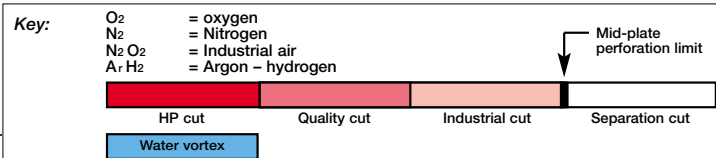
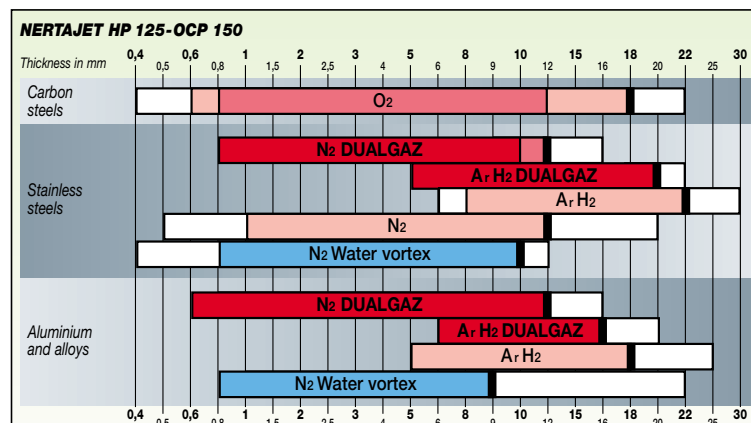
Plasma cutting

Robotisation of variants of the plasma process mastered by Air Liquide Welding is one of the possibilities offered by our teams. The advantages of this technology are numerous:

- Polyvalence: it is possible to work non-alloy steels, stainless steels and light alloys.
- Plasma cutting does not cause any mechanical pressure on the workpiece and the cuts obtained are narrow. This means that the off-cuts can be reused (e.g.: trap cut out of a candelabra), producing considerable savings.

The Air Liquide Welding offer includes:

- A NERTAJET HP 125 power source,
- An OCP 150 with HF-free striking (no electromagnetic interference).
- A special POC 50 tool holder for robotic applications,
- A touch sensor for correction of tool/part distance faults caused by the learning programming and the tolerances in the installation (robot, part, tooling, etc).

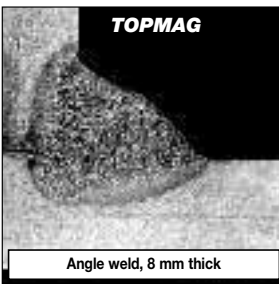


Flexibility – Productivity



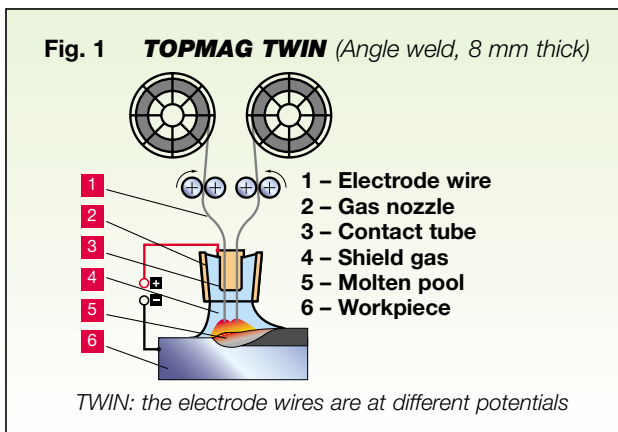
TOPMAG welding

MIG/MAG twin-wire welding to double productivity



Compared with single wire welding, the combination of two arcs extends the energy input and increases the length of the molten pool and the welding speed. The simultaneous input of metal

with the two wires also increases the deposit rate. The example described here clearly demonstrates the increase in productivity provided by the TOPMAG twin-wire process.



Various types of joint can be made:

Butt joints, lap joints, flat joints, angle joints, joggled edge joints, for thin and medium sheet from 1.5 mm.

Process	Welding speed	Deposit rate
MAG (axial spray)	0.3 m/min.	5.3 kg/h
TOPMAG	0.8 m/min.	13.2 kg/h

TOPTIG

TOPTIG for high quality welding of small thicknesses.

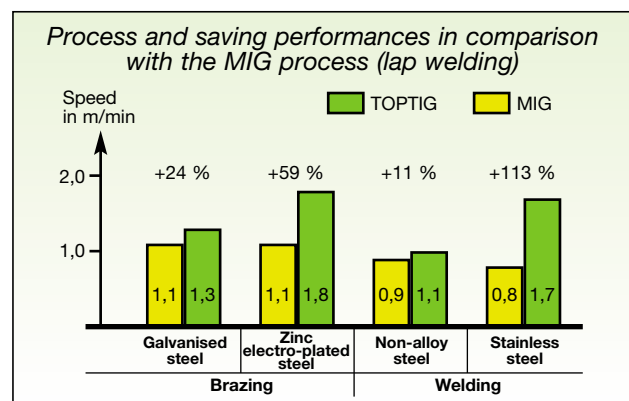
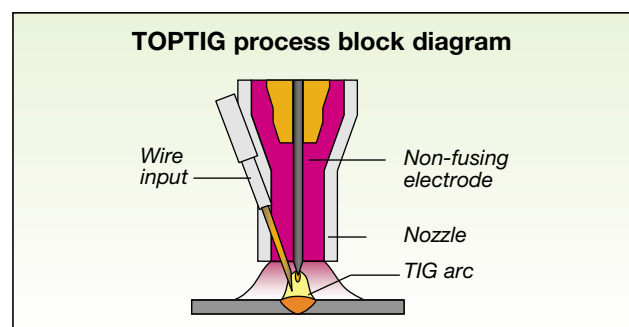
The TOPTIG process offers two decisive advantages:

Welding speed and bead appearance

- On sheet thicknesses up to 3 mm the TOPTIG process allows welding speeds close to and even above those obtained with MIG. The quality and appearance of the beads is exceptional, as the TIG process does not produce any projections; hence no finishing is required after welding.

Torch accessibility

- Compared with a conventional automatic TIG torch the compact size of the wire feed integrated with the nozzle provides accessibility in angles comparable with the one obtained with a MIG/MAG torch.
- Robotisation then becomes easier and extends the range of parts that can be welded automatically.



Examples of standard configurations



DUAL / SENIOR units

Self-supporting units for welding simple parts

2 fixed work tables (DUAL) with manual closing by a sliding door, or manual or electric turntable (SENIOR).



SENIOR cylinder unit

Self-supporting units for welding parts requiring rotation

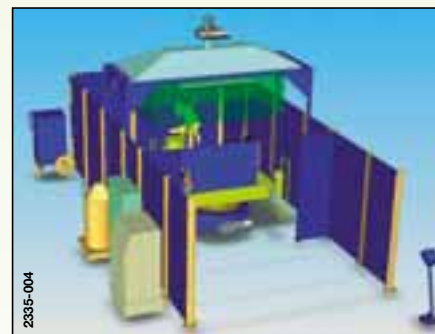
Cylinder type positioner with 2 work stations.
For parts with the following dimensions:
length 1500 mm x 650 mm diameter.
Max weight 80 kg.



MAJOR unit

Self-supporting units for welding parts requiring rotation

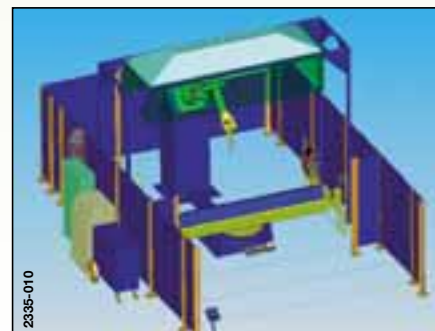
Turntable with 2 positioners, 250 kg each for parts with the following dimensions:
length 1600 mm x 1000 mm diameter.



TENOR unit

Unit for welding parts requiring rotation

Turntable with 2 positioners, 250 kg each for parts with the following dimensions:
length 3000 mm x 1000 mm diameter.



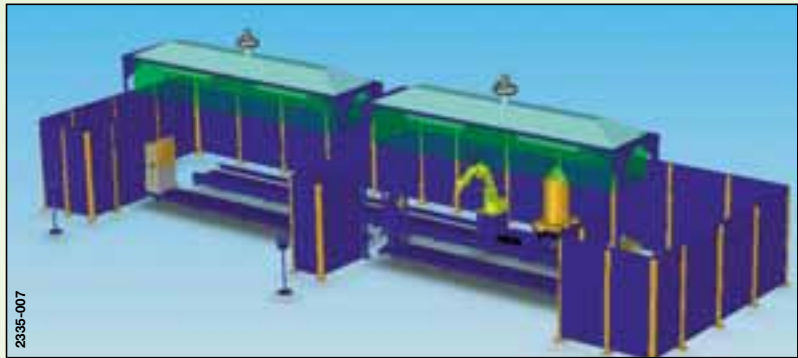


2002-148

Floor level handling

An installation for welding long, heavy and large parts.

A robot mounted on a carriage on the floor (5 to 14 m transfer).
Between-centres positioners from 500 kg to 15 T for workpieces from 1.50 m to 12 m.

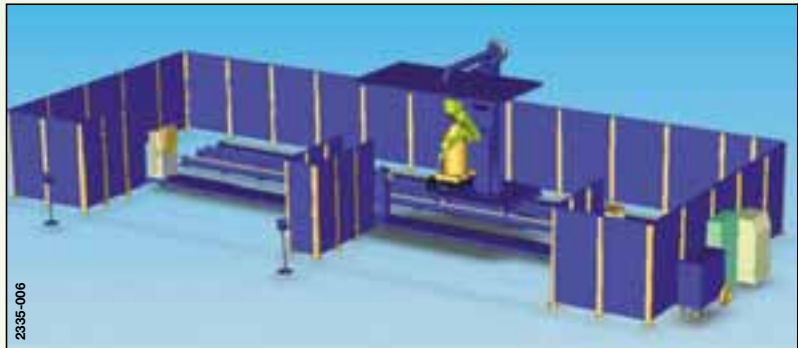


2335-007

Gantry on a floor level transfer system

An installation for welding large parts with difficult-to-access welds (on-line work stations).

A robot hanging from a 5 m to 14 m transfer system running on the floor.
Between-centres positioners from 500 kg to 15 T for workpieces from 1.50 m to 12 m.

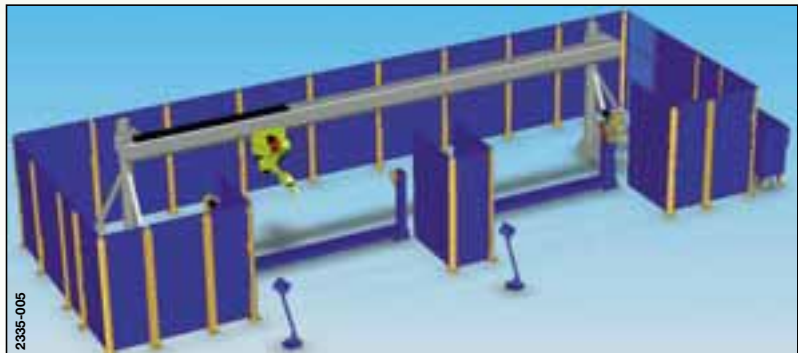


2335-006

Robot on an overhead transfer system

An installation for welding wide and long parts.

A fast-moving (2 m/s) robot hanging from a rail (8 to 12 m long).
Between-centres positioners from 500 kg to 15 T for workpieces from 1.50 m to 12 m.



2335-005



Contacts

BELGIUM

AIR LIQUIDE WELDING BELGIUM SA
Z.I. West Grijsen - Grijsenlaan 5 - 3300 TIENEN
Tel.: +32 16 80 48 20 - Fax: +32 16 78 29 22

CHINA

SAF SHANGHAI REP. OFF.
Rm. 722. Pine City Hotel
777 Zhao Jia Bang Lu - SHANGHAI 200032
Tel.: +86 21 64 43 89 69 - Fax: +86 21 64 43 58 97

CZECH REPUBLIC

AIR LIQUIDE CZ S.R.O. - WELDING AND CUTTING
Podnikatelská 565 - Areál SVUM
190 11 PRAHA 9 - Búchovice
Tel.: +420 274 023 163 - Fax: +420 274 023 233

FRANCE

AIR LIQUIDE WELDING FRANCE
13, rue d'Épluches - BP 70024 Saint-Ouen l'Aumône
95315 CERGY PONTOISE Cedex
Tel.: +33 1 34 21 33 33 - Fax: +33 1 34 21 31 30

GERMANY

OERLIKON SCHWEISSTECHNIK GmbH
Industriestrasse 12 - D-67304 EISENBERG/PFALZ
Tel.: +49 6351 4760 - Fax: +49 6351 476 335

HUNGARY

AIR LIQUIDE HUNGARY - WELDING & CUTTING
Krisztina krt. 39/b - H-1013 BUDAPEST
Tel.: +36 1 339 8650 - Fax: +36 1 339 8649

ITALY

AIR LIQUIDE WELDING ITALY
Via Torricelli 15/A - 37135 VERONA
Tel.: +39 045 82 91 511 - Fax: +39 045 82 91 536

LUXEMBOURG

AIR LIQUIDE WELDING LUXEMBOURG S.A.
5 rue de la Déportation - BP 1385 - L-1415 LUXEMBOURG
Tel.: +352 48 54 56 - Fax: +352 48 54 57

MALAYSIA

SAF-OERLIKON MALAYSIA SDN BHD
No 10, Jalan TPP 5/1
Taman Perindustrian Puchong
47100 PUCHONG, SELANGOR
Tel.: +603 8060 8638 - Fax: +603 8061 6208

NETHERLANDS

AIR LIQUIDE WELDING NETHERLANDS
Rudonk 6 B - NL 4824 AJ BREDA
Tel.: +31 76 541 00 80 - Fax: +31 76 541 58 96

POLAND

AIR LIQUIDE WELDING POLSKA - SP. Z.o.o
UL. Porcelanowa 10 - 40-246 KATOWICE
Tel.: +48 32 609 04 50 - Fax: +48 32 609 04 60

PORTUGAL

AIR LIQUIDE SOLDADURA LDA
Rua Dr. António Loureiro Borges, 4-2° Arquiparque
Miraflores - 1495-131 ALGES
Tel.: +351 21 41 64 900 - Fax: +351 21 41 69 40

ROMANIA

DUCTIL
Aleea Industriilor Nr 1 - 120224 BUZAU
Tel.: +40 238 722 058 - Fax: +40 238 716 861

RUSSIA

AIR LIQUIDE WELDING
17 Vorontsovskaya Str. - 109147 MOSCOW
Tel.: +7 495 641 28 98 - Fax: +7 495 641 28 91
E-mail: viadimir.lebedev@airliquide.com

SCANDINAVIA

OERLIKON SKANDINAVIEN AB
Krossverksgatan 7 - 216 16 LIMHAMN
Tel.: +46 (0)40 670 15 00 - Fax: +46 (0)40 670 15 01

SLOVAKIA

AIR LIQUIDE WELDING CENTRAL EUROPE S.R.O.
Prazska 35 - 94901 NITRA
Tel.: +421 37 65 19 919 - Fax: +421 37 65 19 919

SPAIN

OERLIKON SOLDADURA SA
Poligono Industrial la Noria Carretera de Castellon
Km-15,500 - 50730 El Burgo de Ebro - ZARAGOZA
Tel.: +34 976 10 47 00 - Fax: +34 976 10 42 67

SWITZERLAND

OERLIKON - SCHWEISSTECHNIK-AG
Neunbrunnenstrasse 50 - CH 8050 ZÜRICH
Tel.: +41 44 307 61 11 - Fax: +41 44 307 65 30

THAILAND

AIR LIQUIDE WELDING THAILAND Co Ltd
40 Moo 6 - Ramindra Road Km. 9.5
KHANNAYAO, BANGKOK 10230
Tel.: +66 2 9432250 - Fax: +66 2 9432256

U.A.E.

AIR LIQUIDE WELDING MIDDLE EAST FZE
Jebel Ali free zone warehouse No. FZS1AH05
P.O. BOX 18734 - Jebel Ali - DUBAI
Tel.: +971(0)48861606 - Fax: +971(0)48861608

U. K.

AIR LIQUIDE WELDING Ltd
Low March / London Road - DAVENTRY
Northants NN11 4SD
Tel.: +44 1 327 70 55 11 - Fax: +44 1 327 70 13 10

UKRAINE

AIR LIQUIDE WELDING UKRAINE, Llc.
1 rue Proskura - bureau 106A - 61070 KHARKOV
Tel.: +380 577 546 867 - Fax: +380 577 546 867
E-mail: igor.libman@airliquide.com

Contacts for other countries

ALW Export Department Italy

Via Torricelli 15/A
37135 VERONA
Tel: +39 045 82 91 511
Fax: +39 045 82 91 536
Email: export.alwitally@airliquide.com

ALW Export Department France

13, rue d'Épluches
BP 70024 Saint Ouen l'Aumône
95315 CERGY-PONTOISE Cedex
Tel: +33 1 34 21 33 33
Fax: +33 1 30 37 19 73
Email: export.alwfrance@airliquide.com

www.airliquidewelding.com



www.airliquide.com