



# *Giotto FullControl*

Advanced tube-tube-sheet  
TIG orbital welding system

Welding

TIG Orbital welding



## A winning story since 1961

### The Beginning

At the end of the 1950s, Domenico Franco Agostino became the Italian representative of Albert Otto, a German manufacturer of tube expanders. In 1961 Franco Agostino's Albert Otto Italiana was founded and in 1972, after purchasing an area of 10,000 square metres in the municipality of Bagnolo Cremasco, Maus Italia Sas was established.

### The Growth

In 1976 his son Stefano, a mechanical engineer, joined the company. Together with his father, he studied products, introduced new machinery onto the market and filed the first patents by Maus Italia. Above all, Stefano was firmly convinced that people are the very heart of a company's success. Therefore, he invested in human capital by valuing people and roles, and he surrounded himself with skilled operators as well as technical, commercial and administrative collaborators. The result was a winning, competent and proactive team.

His daughter Anna - also a mechanical engineer - has been working in the company since 2016, giving new impetus and energy to the business her father and grandfather had built.

Father and daughter work together side by side every day to guarantee the excellence of Maus Italia and support all customers worldwide with competence and passion: the company's distinctive traits.



**Stefano Agostino**

*CEO - Mechanical Engineer*

**Anna Agostino**

*COO - Mechanical and Management Engineer*



## ***In-house production of each component*** ***Workshop 4.0 and 24/7 production control***

The production of Maus Italia branded items is entirely carried out in Bagnolo Cremasco, in the heart of an Italian industrial area 30 km southeast of Milan.

The company boasts a 4.0 workshop equipped with state-of-the-art machinery, an in-house heat treatment room and a final inspection department that allow Maus Italia to independently manage every phase of the manufacturing process of its wide range of products whilst maintaining high quality standards.



## ***Quality first.*** ***Design and development***

One of Maus Italia's strengths is its willingness to understand its customers' needs.

Our technical department is always ready to find operational solutions to the most complex applications, even via feasibility studies. We develop accurate work processes, draw with FEM analyses to verify our mechanical-structural performance and optimise the manufacturing process of each component.

## ***Ready To Deliver***

A well-stocked and complete warehouse of finished products enables Maus Italia ship quickly to customers all over the world according to a ready-to-deliver logic.

The warehouse is fully located within our premises in Bagnolo Cremasco at controlled temperatures and conditions to guarantee the maximum safety and quality of Maus Italia products for all our customers.

## ***Quality, environment and safety policy***

Research, quality and safety are the watchwords of Maus Italia Spa.

Maus Italia has several projects underway aimed at increasingly sustainable development and integrates environmental concerns into its business model. The company's actions, behaviour and development choices are focused not only on the short run but rather mainly on a medium and long-term horizon.



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# Giotto FullControl

## Advanced system for a total control of tube-tube-sheet TIG orbital welding

Maus Italia presents the **Giotto FullControl system**, top-of-the-range trolley-mounted semi-automatic systems for heat exchanger tube-tube-sheet orbital welding. In-house design and construction has allowed this product to be optimised, providing a high quality system, composed by:

- A Giotto FC 250 orbital head for tube-tubesheet TIG welding
- Giotto PG 300 programmer/generator with microprocessor inverter complete with cooling unit and touchscreen interface
- Accessories, options and spare parts to meet every need for welding tubes to the tube-sheet

Extremely precise

Revolutionary features

Fixed angle - Electrode incidence setting

Adjustable wire feed unit

Single key adjustments

Continuous recording of the weld

Remote control with display

Protective gas line



## Focus features



### Electrode angle setup

The electrode holder system with preset angles adapts to any welding geometry and makes setup easy and repeatable.



### Adjustments with a single key

All available adjustments for different welding geometries require a single supplied key.



### Continuous recording of the weld

All work parameters can be stored on a USB pen drive and printed on board the machine.



### Remote control with display

Simple and intuitive interface for control of welding parameters. Comes complete with all manual controls for the welding head.



### Sectors

The division into up to 9 sectors of the welding cycle allows compensation for the negative effects of gravity on the welding puddle.



### 24/7 Usage

The enhanced cooling system inside the head allows intensive use of the system.



### Test gas

The operator has the option to check and adjust the flow of the gas to the flowmeter before the start of the welding cycle.



### Protective gas line

There is an additional dedicated gas line, inside the body of Giotto FC 250, for the external protection of welding.

## Optionals



### IWFG Filler wire

Rotating supply unit for the filler wire.



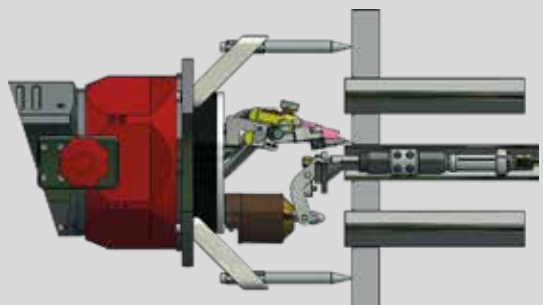
### Thrust devices

Mounted on the welding head, these allow welding of flush or protruding tubes and, when necessary, for welding in a protected atmosphere.



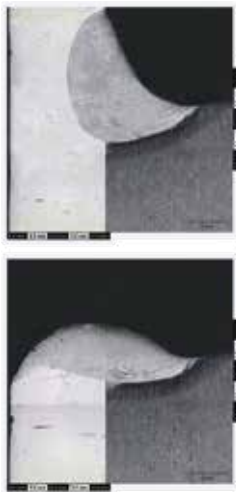
### Argo clamp

TIG orbital welding head centring and locking system.



# TIG Orbital welding

Unique technology for tube-tube-sheet joints

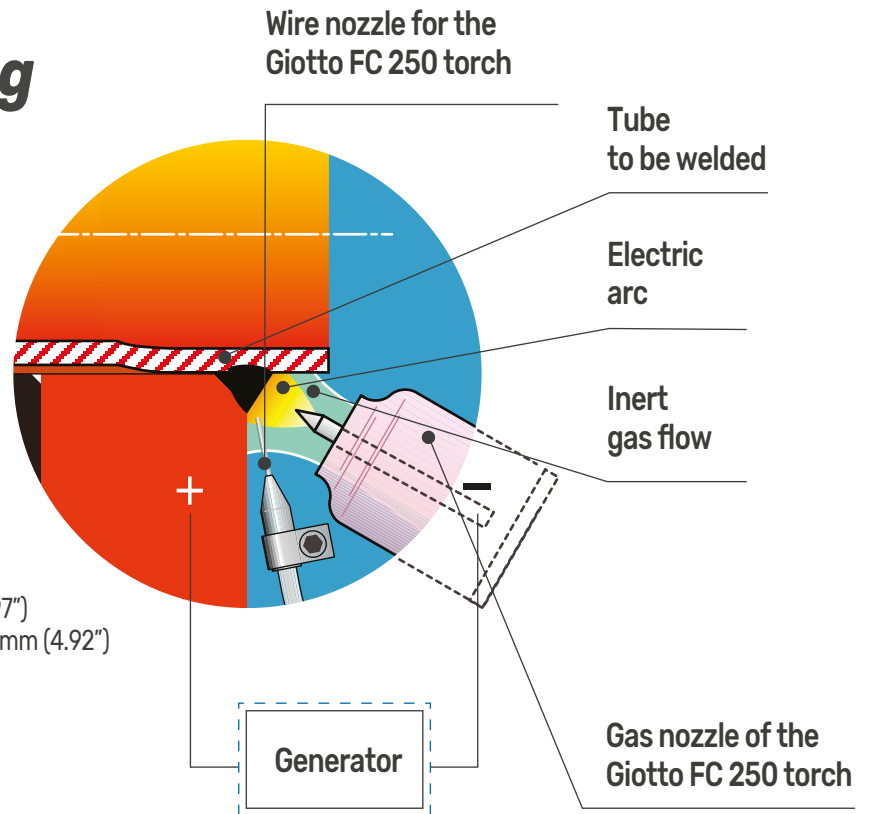


## Test X-ray

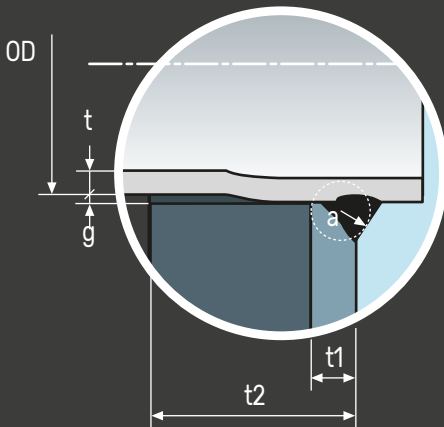
3/4" Tube 14 BWG  
Material 316L  
Tube overhang 5 mm (0.197")  
Tube-sheet thickness 125 mm (4.92")

## Test X-ray

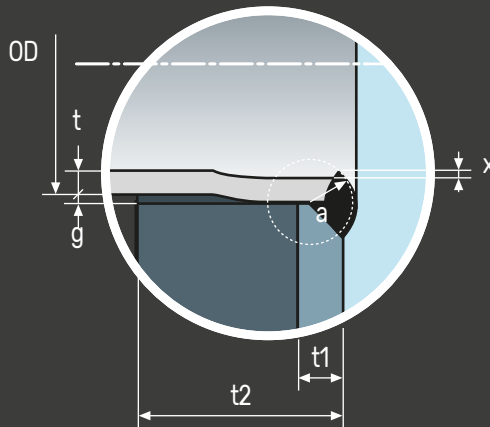
1" Tube 18 BWG  
Material 304L  
Flush tube  
Tube-sheet thickness 72 mm (2.83")



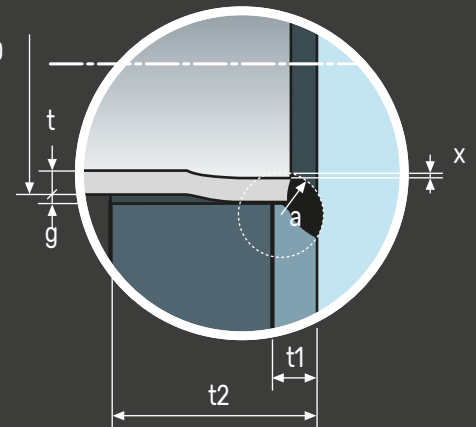
## Protruding tube



## Flush tube



## Recessed tube



a welding thickness

OD external diameter of the pipe

g gap between external tube diameter and tube sheet hole

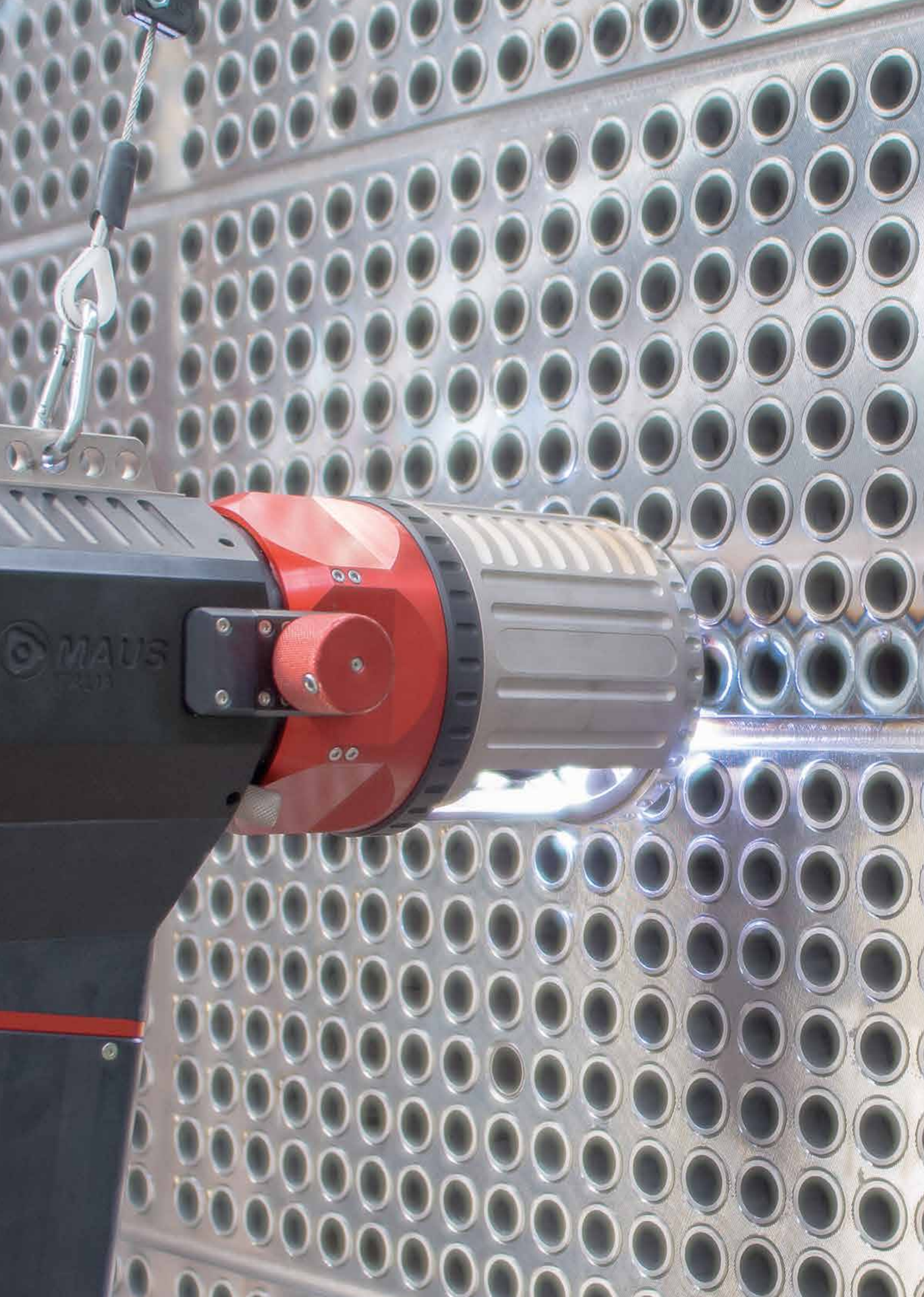
t tube thickness

t1 thickness of plating

t2 thickness of the tube-sheet

x weld overflow





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# Giotto FullControl

## Advanced tube to tubesheet TIG orbital welding system

Advanced portable product, suitable for complex applications.  
Stands out for its reliability, precision, ease of use and robustness.

Reliable

Precise

Ergonomic

### Standard supply

- Giotto FC 250** - Orbital head with cables (torch power/ cooling)
- Giotto PG 300** - Trolley-mounted digital programmer generator with inverter
- Remote control with display
- Ground wire
- Digital gauge
- Electrode holder bracket kit with various angles of incidence
- Welding head adjustment and maintenance kit
- Instruction manual
- Carrying case



### Optionals

- Argo clamp** - TIG orbital welding head centring and locking system
- IWFG** - Rotating filler wire supply unit
- WTC-FT** - Thrust device for welding flush tubes with BlockOut anti-glare screen
- WTC-PT** - Four-point thrust device for welding protruding (or recessed) tubes
- WTC-GAS2** - Thrust device for welding tubes in a protected atmosphere



#### Test X-ray

Tube  $\varnothing$  26,7 mm x 2,87 mm (1.051" x 0.113")  
ASTM A210 Material  
Tube overhang 5 mm (0.197")  
Tube-sheet thickness 30 mm (1.181")



#### Test X-ray

1.3/4" Tube - 10 BWG  
Material TP 316 L  
Tube overhang 5 mm (0.197")  
Tube sheet thickness 30 mm (1.181")



### Micrometer adjustment

Device for adjusting the distance of the electrode from the tube-sheet.



Complete range of devices for centring in the tube consisting of HS cartridge spindles and HC self-centring cartridges.

Different WTC thrust devices to be selected on the based of tube geometry and material, with Maus Italia BlockOut screens for anti-dazzle protection.



### Single key Adjustable filler wire feed unit

All adjustments are made with a single supplied key.



### New electrode tightening system

The tangential screw does not require service keys and speeds up replacement of the worn electrode without touching other parts that could change the geometric setting.

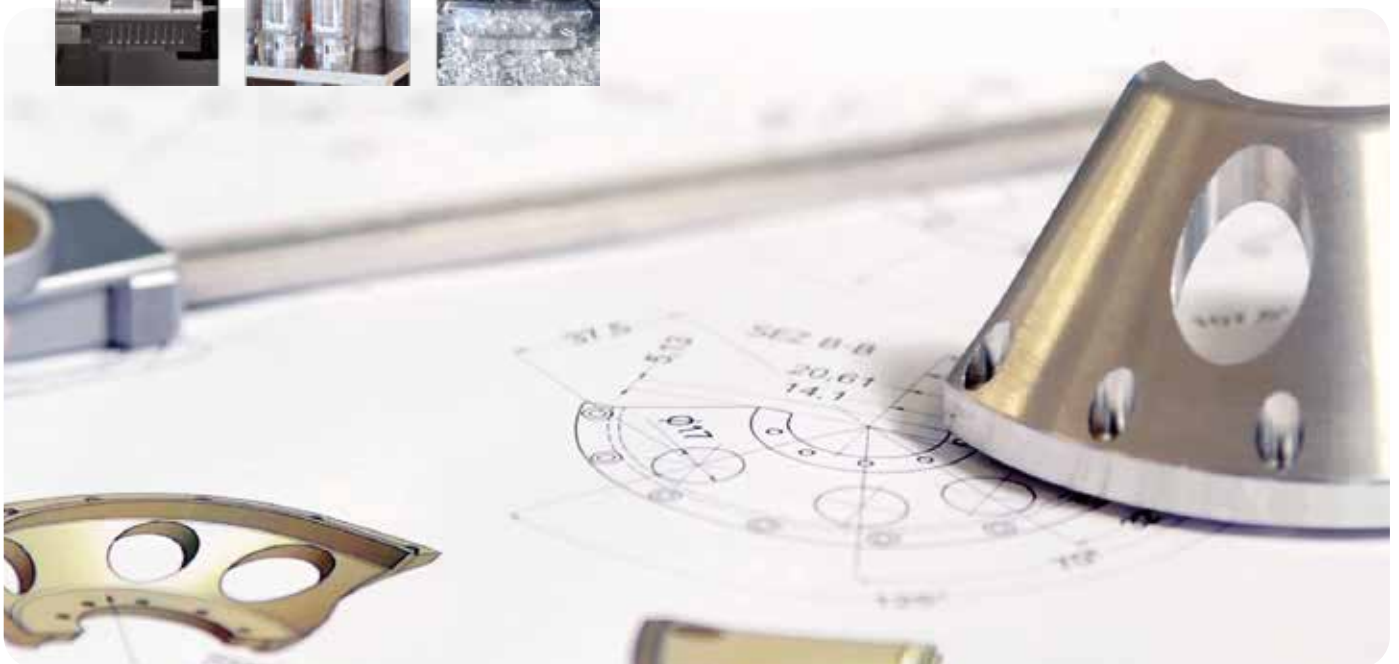
# **Giotto FC 250**

## Tube-tube-sheet TIG orbital welding head

The Giotto FC 250 head is the result of extensive development and prototyping. Each component is designed and manufactured by Maus Italia.

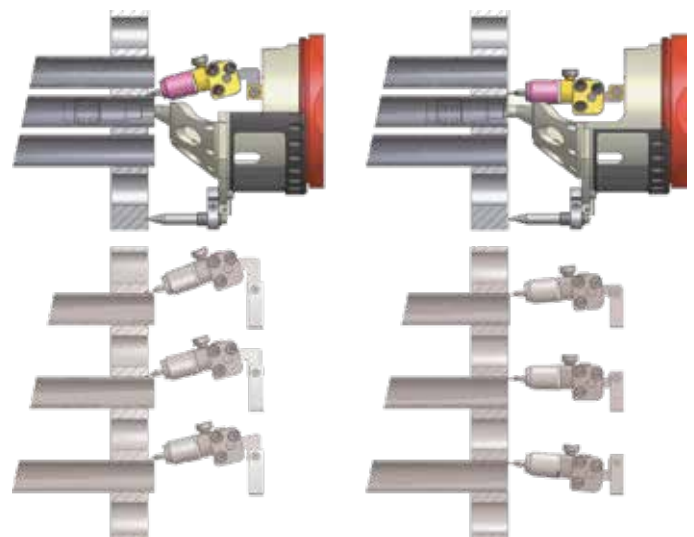


*In-house production*

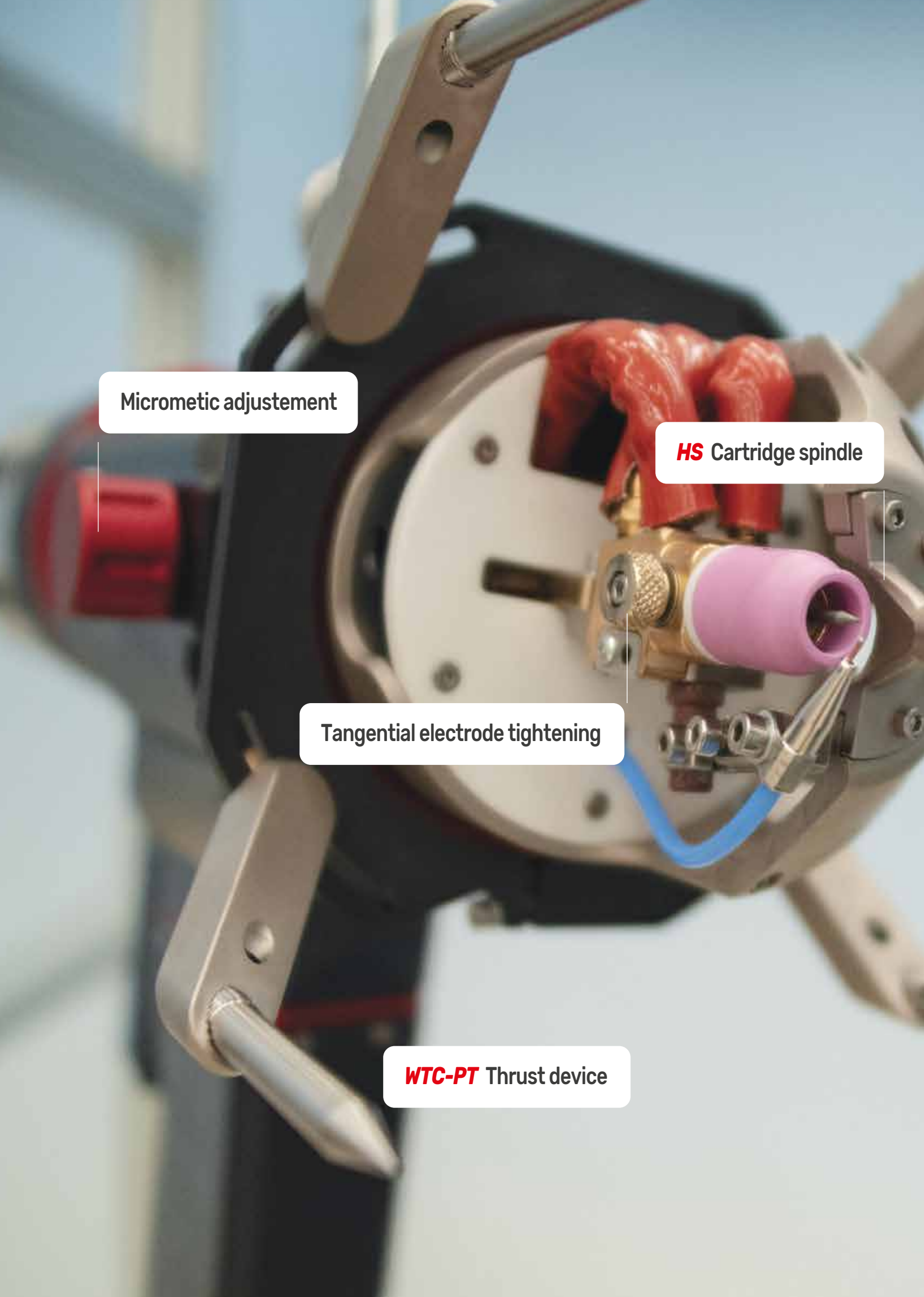


### Electrode angle setup guaranteed

Thanks to components with predetermined angles, the proposed system for each welding geometry is absolute and repeatable. It facilitates geometric setup operations as well as being extremely stable and robust.







Micrometric adjustment

**HS** Cartridge spindle

Tangential electrode tightening

**WTC-PT** Thrust device



### Speed adjustment

Programming of the peripheral speed of head rotation.



### Precise position

Absolute optical control of the angular position using an encoder.



### Protective gas line

There is an additional gas line, inside the body of the Giotto **FC 250**, dedicated to the external protection of the weld for combination with the **WTC-Gas2** thrust device.

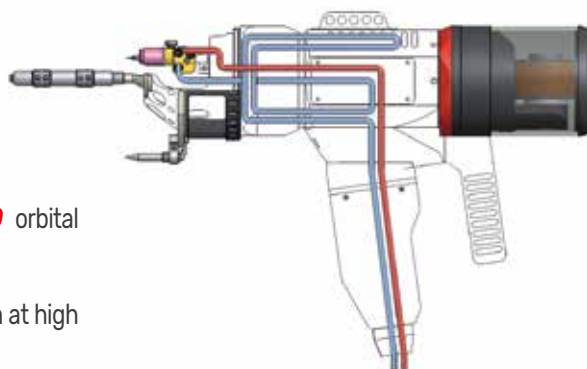
### **HC** Self-centring cartridge



### Welding with the ideal temperature

The effective internal cooling system of the **Giotto FC 250** orbital welding head guarantees:

- control of the internal temperature of the rotating joint even at high welding amperages;
- continuous use in 24/7 shifts;
- high quality of the welding puddle with a lower average temperature of the electrode and the protective gas passing through it;
- significant improvement in welding performance.



# Giotto PG 300

## Digital programmer/generato with inverter with integrated-control microprocessor and digital interface on monitor

Powerful and compact, Maus Italia's offers the Giotto PG 300 programmer/generator for controlling the TIG Giotto FC 250 orbital welding head to guarantee 100% repeatability. Mounted on "carriage pickUp" with gas bottle holder

Powerful

Compact

Ergonomic







## Pre-weld gas control

The operator, using the remote control, has the possibility of checking and adjusting the flow of the gas to the flowmeter before the start of the welding cycle.



## Operator panel on color monitors

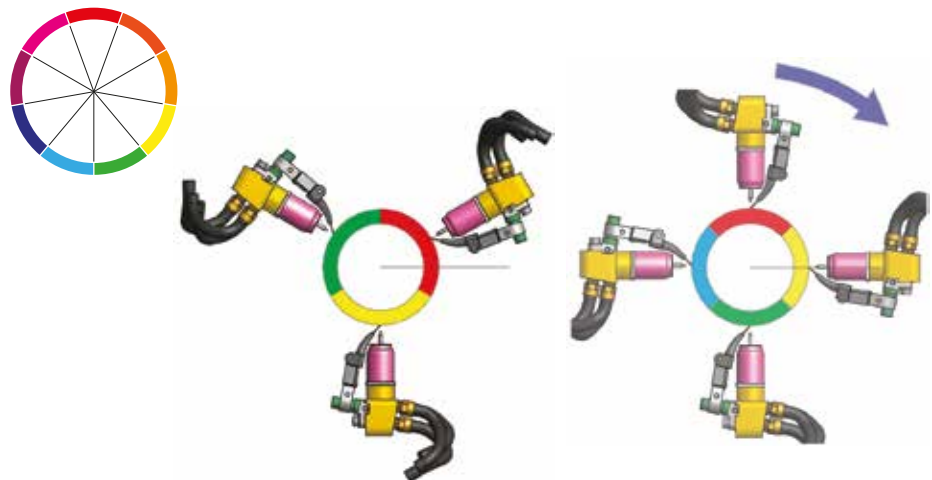
This is the interface where the working parameters (and setting) of the orbital head are programmed and displayed.

Thanks to the integrated 12.1" monitor, backlit in colors (capacitive touch - screen), parameter programming is extremely fast and simple.



## Welding sectors

There is the option to program, using the integrated software, subdivisions of up to 9 sectors of the welding cycle to compensate for the negative effects of gravity on the welding puddle.



## Available parameters

- Date and time
- Serial number of the generator
- Serial number of the connected gun
- Operator
- Name of welding program in use
- Angular position of the torch
- Time in seconds from the beginning of the cycle.
- Average current value
- Average voltage value.
- Peripheral speed of the orbital head.
- Speed of the filler wire.
- Applied energy.
- Pre-gas
- Starting current
- Slope times
- Welding puddle formation time
- Welding current
- Base current
- Pulse frequency
- Pulse balancing
- Final current
- Post gas time
- Welding speed
- Amount of filler wire
- Programmable sectors: 1 to 9 plus slopes
- Programmable up- and downslopes
- Program diagnosis simulation cycle
- Continuous recording of heat input (applied energy in kJ)

## Dedicated TIG orbital welding programming and diagnostics software

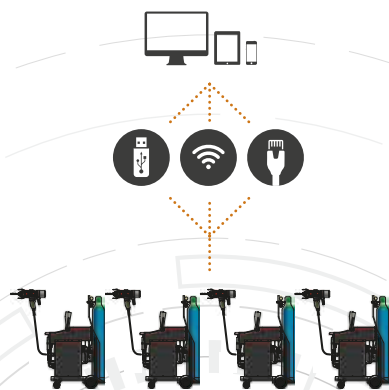
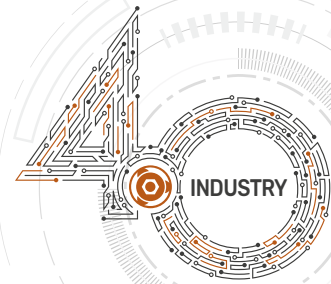
The Giotto FullControl is supplied with dedicated Maus Italia software for intuitive programming of all welding parameters and prompt intervention of complete diagnostics for any malfunctions.

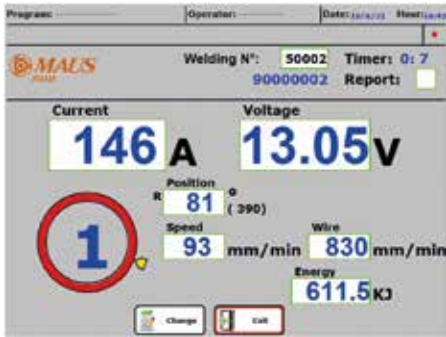
The simulation cycle allows you to try programs stored by the operators in advance (with space available for over 200 programs).

## Optional

### Maus Italia machines transform you into a Smart Factory!

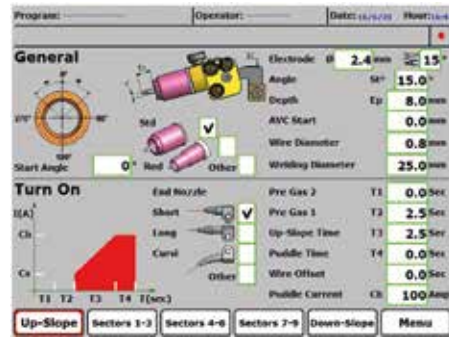
Compliance of the Giotto FullControl system with the requirements of the "INDUSTRY 4.0" system, has been examined by an accredited Third party and considered suitable to allow interconnection between the machine and company systems.





## Parameter monitor

- Clear real-time display of the main welding parameters to allow the operator immediate feedback.



## Welding head setup - Ignition

- Fundamental variables to guarantee total repeatability. Facilitate the exchange of correct information between operators.
- Definition of the welding start phase



## Welding sectors

- Definition of the number of sectors ( 1 to 9 ) and programming of parameters for each sector.
- Control of the arc when shutting down



## Shut-down - Reports

- Definition of the final welding phase
- Enabling of welding report production modes



## Continuous welding recording

All work parameters can be stored on a USB pen drive and printed on board the machine:

- in "time lapse" ( for rotation angle/weld no. )



## Remote control with display

Simple and intuitive interface for controlling the welding parameters. Complete with all manual welding head controls as well as:

- start-up
- stop
- test gas
- on/o filler wire selector.

Supplied with 8 m ( 26 ft ) connection cable

# **Giotto FC 250**

## Optional components

IWFG filler wire feed unit and WTC thrust devices for the Giotto FC 250 tube-tube-sheet TIG orbital welding head

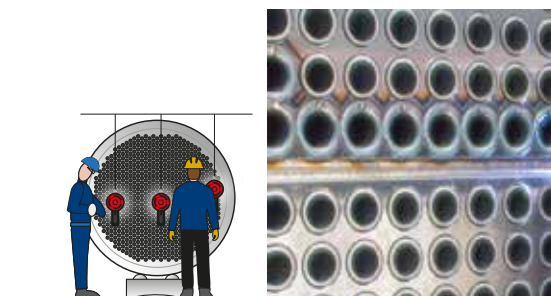


**Rotating filler wire supply unit for wire from  $\varnothing$  0.8 to 1 mm ( 0.0315" to 0.0394" ) in 1 kg coils ( 2.2 lb )**

Guarantees regular supply of the wire to the welding puddle. Wire consumption is always in full view of the operator thanks to the transparent protective cloche.



With manual manoeuvring levers for quick adaptation to the tube pitch.



Multiple welders can operate simultaneously on the same tube-sheet to increase productivity.

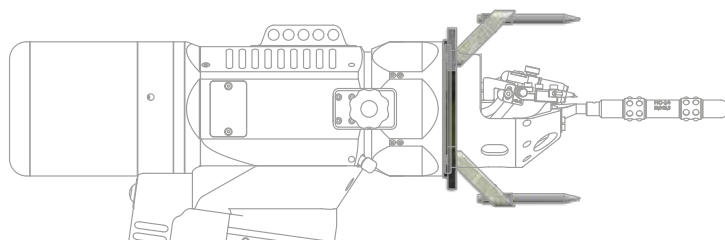


The protective atmosphere is created by injection of inert gas into the thrust device with the aim of eliminating any contamination



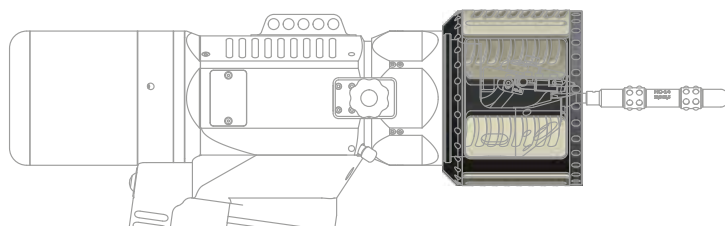
## **WTC-PT**

4-point of contact thrust device for welding protruding tubes



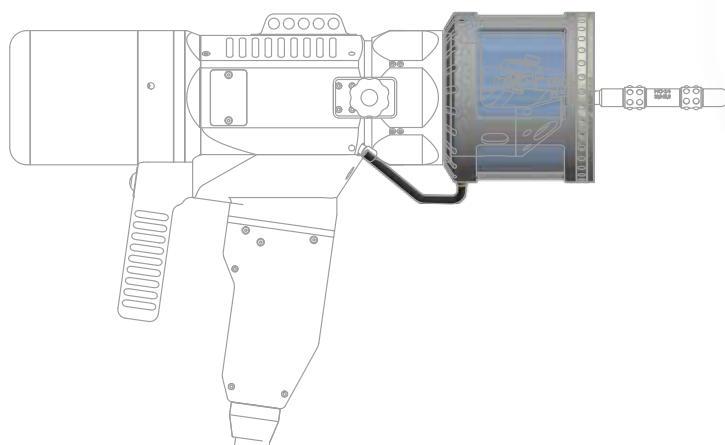
## **WTC-FT**

Thrust device for welding flush or recessed tubes with rotating **BlockOut** anti-dazzle screen

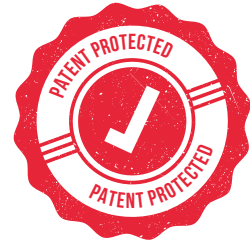


## **WTC-Gas2**

Thrust device for welding tubes in a protected atmosphere



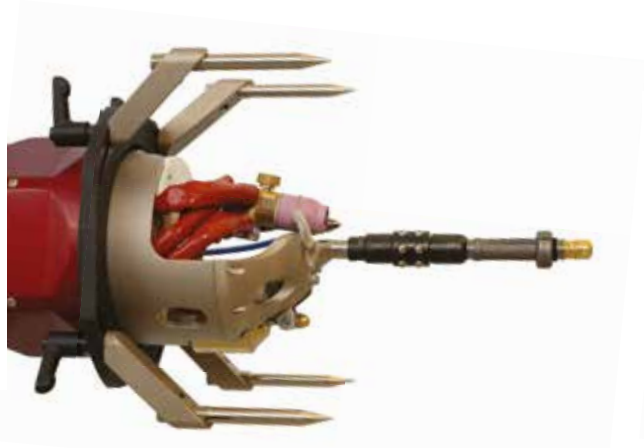
# Argo clamp



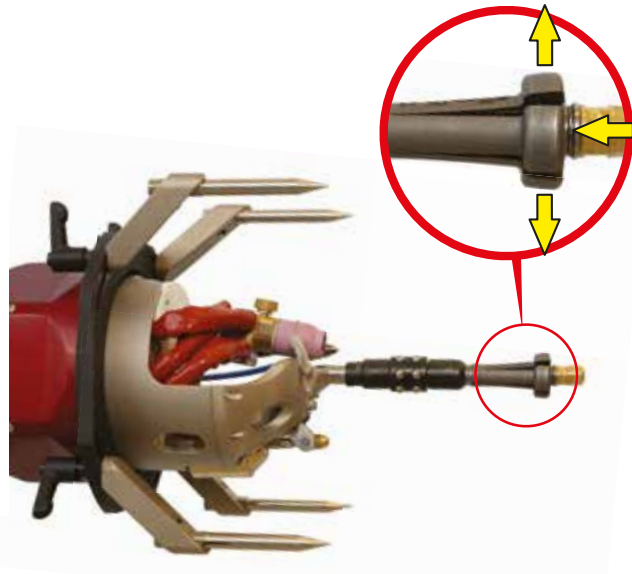
## TIG orbital welding head centring and locking system

Argoclamp ensures centring and precise support of the head to the tube to be welded. Maus Italia, thanks to experience of its already patented products using radial caliper expanding tools, fits this technology directly on the Giotto FC 250 welding head. Argoclamp instantly expands inside the tube to be welded, locking the orbital head. The Argoclamp is powered by the protective gas dedicated to the torch electrode.

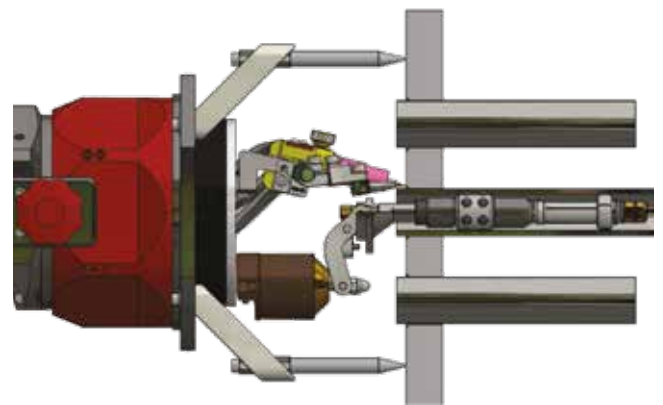
Head locking



Disarmed Argo clamp for insertion and removal of the HP self-centering cartridge in the tube to be welded.



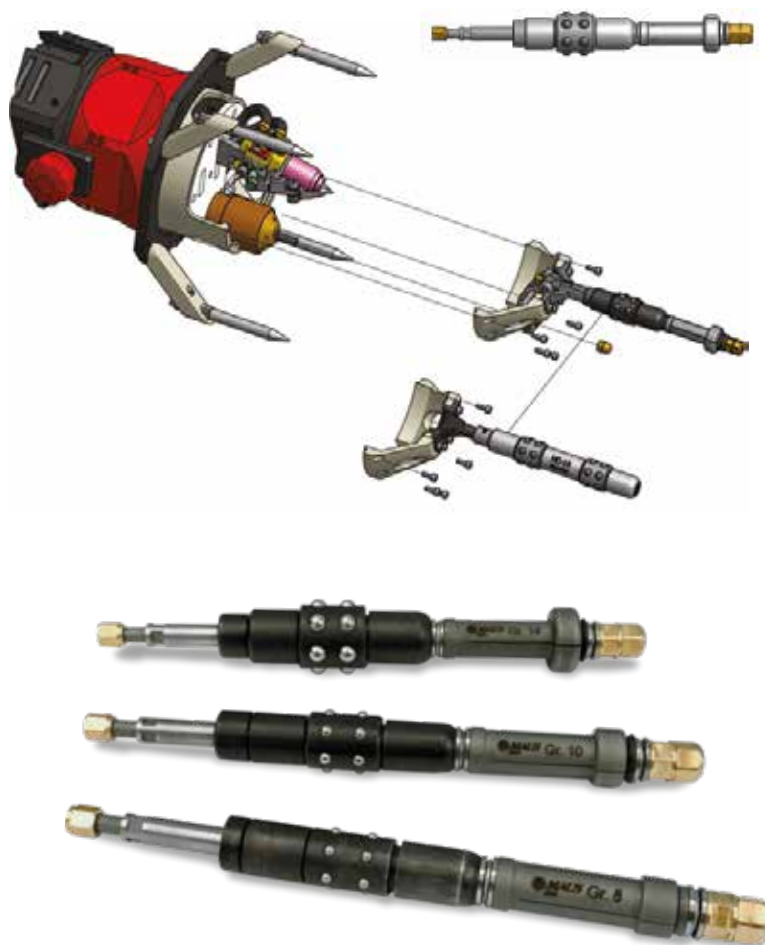
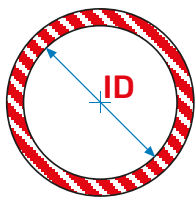
Active Argoclamp for centring and locking the head in the tube to be welded.



# HP Centring for FC AG 250 welding head

Special centring to support the Argo clamp system ( FC AG 250 welding head + PG 300 AG generator )

Special HP centring is interchangeable with the standard centering system consisting of HC cartridges and HS spindles.



	Tube size		Cartridge
	ID		HP
	mm	inches	Cod.
STANDARD for immediate delivery	12,0 ÷ 12,5	0.472 ÷ 0.492	HP-5
	12,5 ÷ 13,0	0.492 ÷ 0.512	HP-6
	12,8 ÷ 14,0	0.504 ÷ 0.551	HP-7
	13,3 ÷ 14,5	0.524 ÷ 0.571	HP-7A
	13,8 ÷ 15,0	0.543 ÷ 0.590	HP-8
	14,3 ÷ 15,5	0.563 ÷ 0.610	HP-8A
	14,8 ÷ 16,0	0.583 ÷ 0.630	HP-9
	15,8 ÷ 17,0	0.622 ÷ 0.669	HP-10
	16,8 ÷ 18,0	0.661 ÷ 0.709	HP-11
	17,8 ÷ 19,0	0.701 ÷ 0.748	HP-12
	18,8 ÷ 20,5	0.740 ÷ 0.807	HP-13
	19,3 ÷ 21,5	0.760 ÷ 0.846	HP-13A
	19,8 ÷ 22,5	0.779 ÷ 0.886	HP-14
	20,9 ÷ 23,8	0.823 ÷ 0.937	HP-14A
	22,3 ÷ 25,0	0.878 ÷ 0.984	HP-15
	24,5 ÷ 27,0	0.965 ÷ 1.060	HP-16
	26,5 ÷ 29,0	1.043 ÷ 1.141	HP-17
	28,5 ÷ 31,2	1.122 ÷ 1.220	HP-18



The management system of Argo clamp pneumatic drive take place from the welding gas already present on board.



Argo clamp activation is ergonomically positioned on the welding head.

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A photograph of a MAUS Italia welding system in a factory. The system consists of a red vertical column with a white starburst logo and the text 'MAUS ITALIA' on a red panel. A large white circular fan is visible in the background. In the foreground, a black service trolley with a motorized unit is shown. The trolley has a top shelf with various tools and a motor unit labeled 'MAUS' and 'Giotto'.

## **Accessories**

Maus Italia, in order to meet the needs of a market that increasingly seeks quality, efficiency and design, has created a series of accessories to accompany its Giotto welding systems that offer the opportunity to create a modern, flexible and functional working environment.

### ***Giotto Slide Deck***

Trolley-mounted deck

### ***Giotto Equipower 20***

Equipotential power supply

### ***Giotto Service Trolley***

Service trolley

# **Giotto Slide Deck**

## Sliding horizontal trolley-mounted deck for welding head support using balancer

With the aim of providing customers with every accessory necessary for tube-tube-sheet TIG orbital welding, Maus Italia has designed the Slide Deck sliding trolley-mounted deck, available in two sizes:

- **Giotto Slide Deck 1800**
- **Giotto Slide Deck 2800**

Supplied in assembly kit, the Slide Deck allows the operator to connect the TPB-3A series balancer (supplied separately).


Improved stability

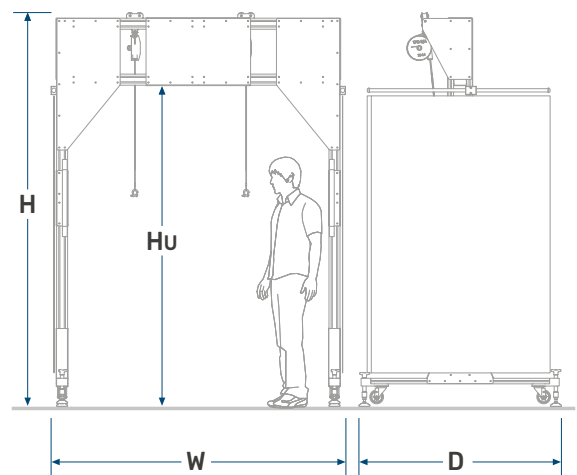
Less operator fatigue





Dimensions			1800		2800	
Width	W	mm inches	2060	81.1	2860	112.6
Depth	D	mm inches	1390	54.7	1450	57.1
Height	H	mm inches	2800	110.2	2900	114.2
Useful height	HU	mm inches	2400	94.5	2500	98.4
Capacity		kg lb	50	110	45	99
Weight		kg lb	150	330	170	374

Shipping						
Width		cm ft	160	5.3	160	5.3
Depth		cm ft	60	2.0	60	2.0
Height		cm	50	1.7	50	1.7
Crate weight		kg lb	35	78	35	78
Total weight		kg lb	185	408	185	408



## Slider

The sliding system is designed to give stability and manoeuvrability to the horizontal movement of the welding head in front of the tube-sheet.  
 Each Giotto Slide Deck includes a Slider for connecting a TPB-3A balancer (supplied separately) for vertical movement of the welding head.  
 There is the option, on request, to install up to 3 Slider (2 optional) for the manoeuvring of 3 Giotto FC 250 welding heads.

## TPB-3A

(Optional)

Spring balancer for the support and vertical movement of the welding head with a capacity of 10 to 14 kg (22.0 to 30.8 lb).



# **Giotto Equipower 20**

## Balanced potential power supply for the simultaneous use of two welding systems

To promote increased productivity, Maus Italia suggests the simultaneous use of two or more Giotto FullControl systems with the relevant TIG GiottoFC250 orbital heads on the same tube-sheet.

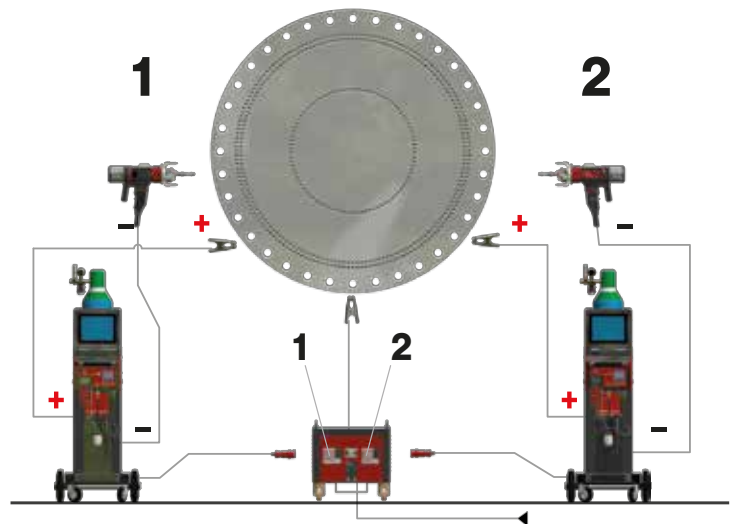
Giotto Equipower 20 is equipped with a three-phase transformer and connection point to balance the power supply to the two connected welding systems.

Giotto Equipower 20 prevents welding systems from interfering each other during production with changes in the electrical network ensuring the right protection to the programmers' electronics.

Protection for electronics on board the machine

Avoid mains power supply disturbances

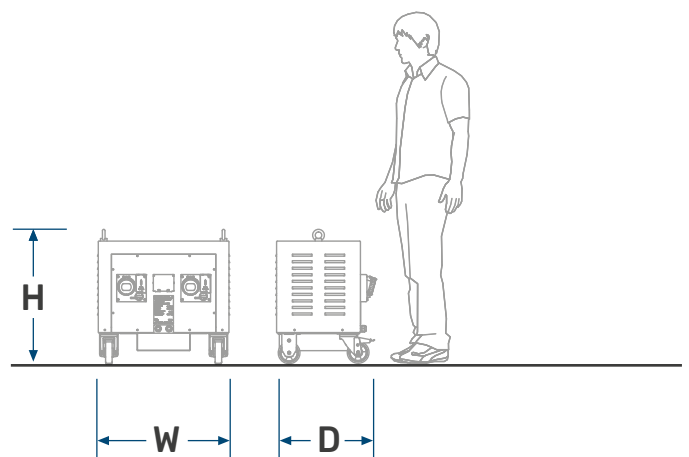




Power supply			
Supply voltage IN	Volt - Ph	400/440/480 - 3	*
OUT Voltage	Volt - Ph	2x400 - 3	

Dimensions			
Width	W	mm inches	600   23,6
Depth	D	mm inches	450   17,7
Height	H	mm inches	615   24,2
Weight		kg lb	150   330

Different INPUT voltage \*  
available on request



# *Giotto Service Trolley*

## Service trolley and storage for spare parts

A tidy and well-organised workspace is synonymous with efficiency and good practice. The Giotto Service Trolley allows you to organise the consumable spare parts for Giotto orbital heads and to store all the keys and service accessories.

- Three drawers mounted on telescopic ball rails with centralised front security lock.
- Large thermoplastic work top
- Orbital head support ensuring stability and functionality
- Lower shelf with rubber mat
- Equipped with 4 wheels of Ø 125 mm

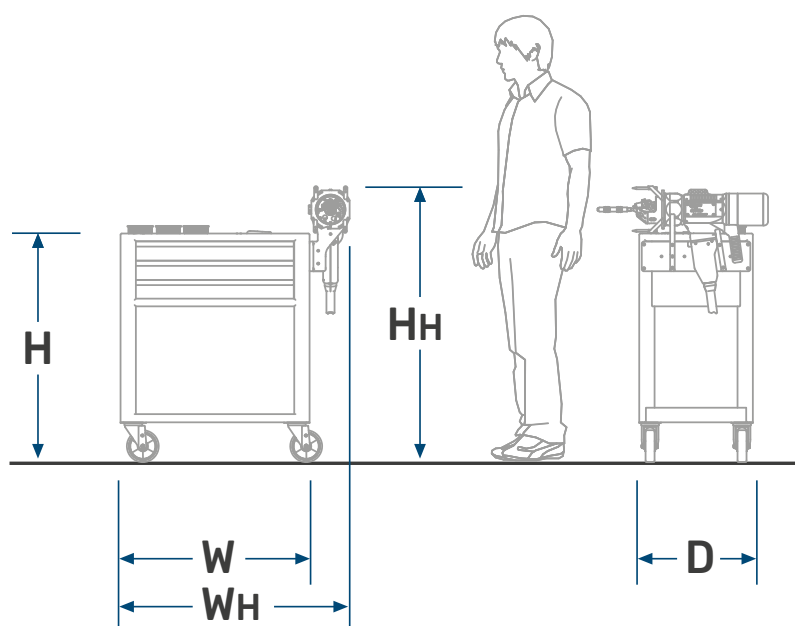
**Rapid maintenance**

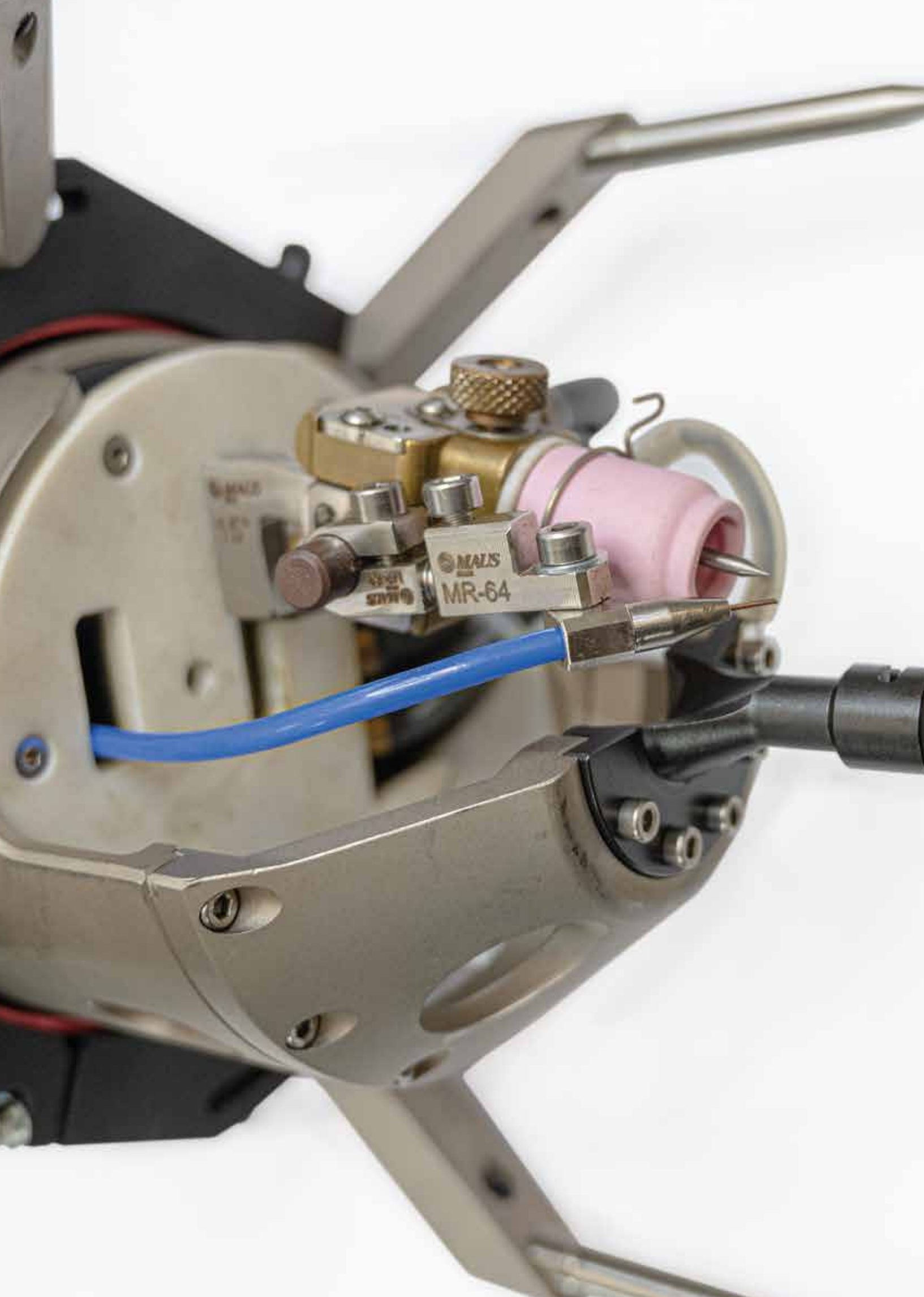
**Everything always in order and protected**





Dimensions					
Width	<b>W</b>	mm	inches	740	29.1
Width + head	<b>WH</b>	mm	inches	900	35.4
Depth	<b>D</b>	mm	inches	450	17.7
Height	<b>H</b>	mm	inches	895	35.2
Height + head	<b>HH</b>	mm	inches	1160	45.7
Capacity		kg	lb	400	881
Weight		kg	lb	41	90



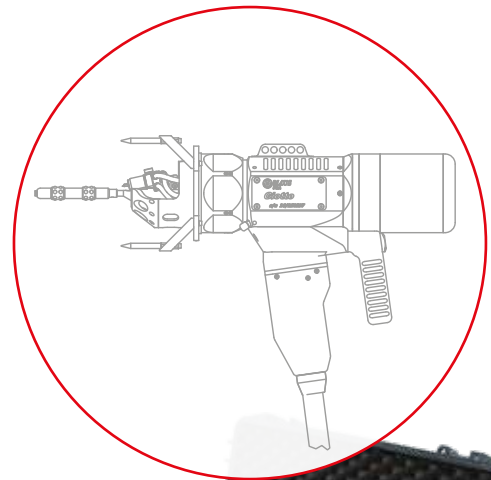
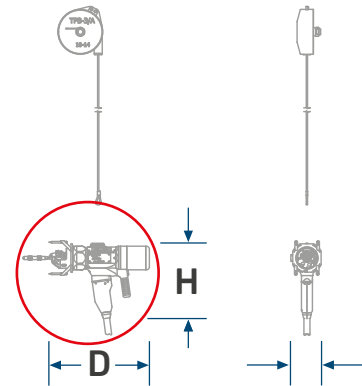




# Technical features

Technical features of the advanced tube-tube-sheet TIG orbital welding system

General features			
Duty Cycle	A (60%)		250
Orbital welding speed (max)	rpm		10
ID Tube (min.)	mm inches	8	0.315
OD Tube standard (max.)	mm inches	51	2.008
Welding head cooling			closed liquid circuit
Welding geometry			
Flush			✓
Recessed (max.)	mm inches	3,0	0.118
Protruding (max.)	mm inches	12,0	0.472
Tungsten			
Ø 1.6			optional
Ø 2.4			standard
Ø 3.2			optional
Electrode distance adjustment	mm inches	12 (±6)	0.472(±0.236)
Filler wire			
Wire coil (weight/Ø)	kg/m lbs/inches	1/100	2.21/3.937
Recommended wire diameter	mm inches	0,8	0.0315
• Wire diameter (optional)	mm inches	0,6	0.0236
• Wire diameter (optional)	mm inches	1,0	0.0394
• Wire diameter (optional)	mm inches	1,2	0.0472
Wire speed (max.)	mm/min inches/min	2000	78.5
Dimensions			
Width	<b>W</b> mm inches	150	6
Depth (without centring)	<b>D</b> mm inches	530	21
Height	<b>H</b> mm inches	475	19
Weight excluding cables and oil	kg lb	12	26.5
Cable length	m ft	6	19.7
Packaging			
Width	cm ft	70	2.3
Depth	cm ft	52	1.7
Height	cm ft	30	1.0
Packaging weight	kg lb	3	7.0
Total weight	kg lb	18	39.7



Operator: .....

Date: 17-6-21

Hour: 11:24

es ...>



Electrode  $\emptyset$  2.4 mm  $15^\circ$

Angle  $St^\circ$  15.0°

Depth  $Ep$  7.0 mm

AVC Start 0.0 mm

Wire Diameter 0.8 mm

Welding Diameter 20

Pre Gas 2  $T1$  0.0 Sec

Pre Gas 1  $T2$  1.6 Sec

Up-Slope Time  $T3$  2.5 Sec

Puddle Time  $T4$  0.5 Sec

Wire Offset 0.0 Sec

Puddle Current  $Cb$  135 Amp

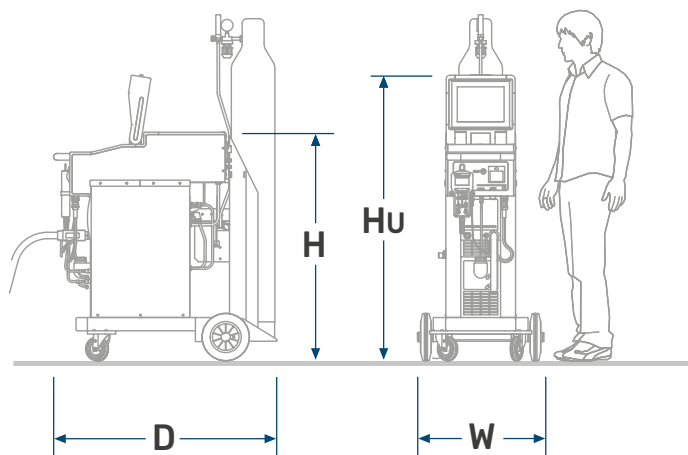
Other

s 4-6

Sectors 7-9

Down-Slope

Menu



## Giotto PG 300

Power supply			
Supply voltage ( $\pm 10\%$ )		Volt - Ph	400 - 3
Absorbed power		kW	10
Network fuses		A	16
Cos $\phi$ / efficiency			0,99 / 84%
Open circuit voltage		Vdc	63
Utilisation factor (40°C/104°F. - X=60%)		A	250
	(40°C/104°F. - X=100%)	A	210
Capacity			
Cooling power (25°C./77°F.)		W	650
Liquid coolant tank		l US gal	2,0 0.53
Coolant flow (max.)		l/min US gpm	3,3 0.87
Dimensions			
Width	<b>W</b>	mm inches	670   26.4
Depth	<b>D</b>	mm inches	1180   46.5
Height (transport)	<b>H</b>	mm inches	1210   47.7
Height (usage)	<b>HU</b>	mm inches	1510   59.5
Weight (without cylinder)		kg lb	125   276
Degree of protection		IP	23
Shipping (with Giotto FC 250 head case)			
Width		cm inches	80   2.7
Depth		cm inches	130   4.3
Height		cm inches	145   4.8
Crate weight		kg lb	8   18
Total weight		kg lb	152   334

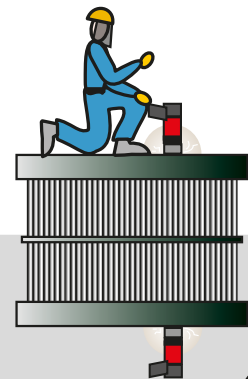
Pressure reducer for 50-litre argon cylinders



### Work cycle

250 A (40°C./104°F.)  
60%

210 A (40°C./104°F.)  
100%



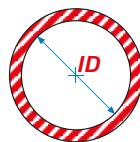
### EXpandable sector cartridge mod. **HSE**

Self-centring system particularly suitable in tube-tube-sheet welding of boilers for internal diameters greater than 57 mm (2.1/4") and in vertical negative head applications (sugar refinery exchangers) where the support of the orbital welding head is guaranteed by the expansion of the sectors.



The centring of the torch is guaranteed by the spindle + cartridge system. Use the table to select the correct combination of the HS series spindle and the HC series cartridge according to the internal diameter of the tube.

# Giotto FC 250



## Centring

HS cartridge spindles and HC self-centering cartridges for Giotto FC AG 250 tube-tube-sheet TIG orbital welding head.

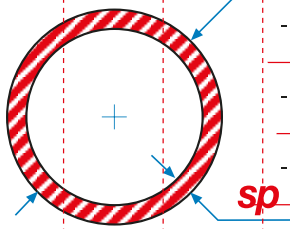
STANDARD - for immediate delivery	Tube size		Cartridge	Spindle	Diagram
	ID		HC	HS	
	mm	inches	Cod.	Cod.	
	7,4 ÷ 7,8	0.291 ÷ 0.307	HC-76	HS-MINI	
	7,7 ÷ 8,3	0.303 ÷ 0.327	HC-80		
	8,2 ÷ 8,9	0.323 ÷ 0.350	HC-87		
	8,5 ÷ 9,3	0.335 ÷ 0.366	HC-90		
	8,8 ÷ 9,7	0.346 ÷ 0.381	HC-95		
	9,8 ÷ 10,3	0.386 ÷ 0.466	HC-0	HS-A	
	10,0 ÷ 10,5	0.394 ÷ 0.413	HC-1		
	10,5 ÷ 11,0	0.413 ÷ 0.433	HC-2		
	11,0 ÷ 11,5	0.433 ÷ 0.453	HC-3		
	11,5 ÷ 12,0	0.453 ÷ 0.472	HC-4		
	12,0 ÷ 12,5	0.472 ÷ 0.492	HC-5		
	12,5 ÷ 13,0	0.492 ÷ 0.512	HC-6		
	12,8 ÷ 14,0	0.504 ÷ 0.551	HC-7		
	13,3 ÷ 14,5	0.524 ÷ 0.571	HC-7A	HS-B	
	13,8 ÷ 15,0	0.543 ÷ 0.590	HC-8		
	14,3 ÷ 15,5	0.563 ÷ 0.610	HC-8A		
	14,8 ÷ 16,0	0.583 ÷ 0.630	HC-9		
	15,8 ÷ 17,0	0.622 ÷ 0.669	HC-10		
	16,8 ÷ 18,0	0.661 ÷ 0.709	HC-11		
	17,8 ÷ 19,0	0.701 ÷ 0.748	HC-12		
	18,8 ÷ 20,5	0.740 ÷ 0.807	HC-13		
	19,3 ÷ 21,5	0.760 ÷ 0.846	HC-13A		
	19,8 ÷ 22,5	0.779 ÷ 0.886	HC-14		
	20,9 ÷ 23,8	0.823 ÷ 0.937	HA-14A		
	22,3 ÷ 25,0	0.878 ÷ 0.984	HC-15	HS-C	
	24,5 ÷ 27,0	0.965 ÷ 1.06	HC-16		
	26,5 ÷ 29,0	1.043 ÷ 1.141	HC-17		
	28,5 ÷ 31,	1.122 ÷ 1.220	HC-18		
	30,5 ÷ 33,0	1.201 ÷ 1.299	HC-19		
	32,5 ÷ 36,0	1.279 ÷ 1.417	HC-20		
	35,5 ÷ 39,0	1.398 ÷ 1.535	HC-21		
	38,5 ÷ 42,0	1.516 ÷ 1.653	HC-22		
	41,5 ÷ 45,0	1.634 ÷ 1.772	HC-23		
	44,5 ÷ 48,0	1.752 ÷ 1.890	HC-24		
	47,5 ÷ 51,0	1.870 ÷ 2.008	HC-25		
	50,5 ÷ 54,0	1.988 ÷ 2.126	HC-26	HS-D	
	53,5 ÷ 58,0	2.106 ÷ 2.283	HC-27		
	57,5 ÷ 62,0	2.264 ÷ 2.441	HC-28		
	61,5 ÷ 68,0	2.421 ÷ 2.677	HC-29		
	65,5 ÷ 70,0	2.579 ÷ 2.756	HC-30		





# BWG Table

OD mm	00 BWG		0 BWG		1 BWG		2 BWG		3 BWG		4 BWG		5 BWG		6 BWG		7 BWG		8 BWG		9 BWG		10 BWG		11 BWG		
	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	
sp →	0.380	9,65	0.340	8,64	0.300	7,62	0.284	7,21	0.259	6,58	0.238	6,05	0.220	5,59	0.203	5,16	0.180	4,57	0.165	4,19	0.148	3,76	0.134	3,40	0.120	3,05	
1/4” (6,3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3/8” (9,5)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/2” (12,7)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5/8” (15,9)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3/4” (19,0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.482	12,2	0.510	12,9	
7/8” (22,2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.607	15,4	0.635	16,1	
1” (25,4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.670	17,0	0.704	17,9	0.732	18,6	0.760	19,3	
1.1/4” (31,8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.890	22,6	0.920	23,4	0.954	24,3	0.982	25,0	1.010	25,7	
1.1/2” (38,1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.140	28,9	1.170	29,7	1.204	30,6	1.232	31,3	1.260	32,0	
1.3/4” (44,4)	-	-	-	-	-	-	-	-	-	-	1.310	33,2	1.344	34,1	1.390	35,2	1.420	36,0	1.454	36,9	1.482	37,6	1.510	38,3	-	-	
2” (50,8)	-	-	-	-	-	-	-	-	-	1.524	38,7	1.560	39,6	1.594	40,5	1.640	41,6	1.670	42,4	1.704	43,3	1.732	44,0	1.760	44,7	-	-
2.1/4” (57,1)	1.490	37,8	1.570	39,8	1.650	41,8	1.682	42,7	1.732	43,9	1.774	45,0	1.810	45,9	1.844	46,8	1.890	47,9	1.920	48,7	1.954	49,6	1.982	50,3	2.010	51,0	
2.1/2” (63,5)	1.740	44,2	1.820	46,2	1.900	48,2	1.932	49,1	1.982	50,3	2.024	51,4	2.060	52,3	2.094	53,2	2.140	54,3	2.170	55,1	2.204	56,0	2.232	56,7	2.260	57,4	
2.3/4” (69,8)	1.990	50,5	2.070	52,5	2.150	54,5	2.182	55,3	2.232	56,6	2.274	57,7	2.310	58,6	2.344	59,5	2.390	60,6	2.420	61,4	2.454	62,3	2.482	63,0	2.510	63,7	
3” (76,2)	2.240	56,9	2.320	58,9	2.400	60,9	2.432	61,8	2.482	63,0	2.524	64,1	2.560	65,0	2.594	65,9	2.640	67,0	2.670	67,8	2.704	68,7	2.732	69,4	2.760	70,1	
3.1/4” (82,6)	2.490	63,3	2.570	65,3	2.650	67,3	2.682	68,2	2.732	69,4	2.774	70,5	2.810	71,4	2.844	72,3	2.890	73,4	2.920	74,2	2.954	75,1	2.982	75,8	3.010	76,5	
3.1/2” (88,9)	2.740	69,6	2.820	71,6	2.900	73,6	2.932	74,5	2.982	75,7	3.024	76,8	3.060	77,7	3.094	78,6	3.140	79,7	3.170	80,5	3.204	81,4	3.232	82,1	3.260	82,8	
3.3/4” (95,2)	2.990	75,9	3.070	77,9	3.150	79,9	3.182	80,8	3.232	82,0	3.274	83,1	3.310	84,0	3.344	84,9	3.390	86,0	3.420	86,8	3.454	87,7	3.482	88,4	3.510	89,1	
4” (101,6)	3.240	82,3	3.320	84,3	3.400	86,3	3.432	87,2	3.482	88,4	3.524	89,5	3.560	90,4	3.594	91,3	3.640	92,4	3.670	93,2	3.704	94,1	3.732	94,8	3.760	95,5	
4.1/4” (108,0)	3.490	88,7	3.570	90,7	3.650	92,7	3.682	93,6	3.732	94,8	3.774	95,9	3.810	96,8	3.844	97,7	3.890	98,8	3.920	99,6	3.954	100,5	3.982	101,2	4.010	101,9	
4.1/2” (114,3)	3.740	95,0	3.820	97,0	3.900	99,0	3.932	99,9	3.982	101,1	4.024	102,2	4.060	103,1	4.094	104,0	4.140	105,1	4.170	105,9	4.204	106,8	4.232	107,5	4.260	108,2	





12 BWG		13 BWG		14 BWG		15 BWG		16 BWG		17 BWG		18 BWG		19 BWG		20 BWG		21 BWG		22 BWG		23 BWG		24 BWG		OD			
“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm
0.109	2,77	0.095	2,41	0.083	2,11	0.072	1,83	0.065	1,65	0.058	1,47	0.049	1,24	0.042	1,07	0.035	0,89	0.032	0,81	0.028	0,71	0.025	0,64	0.022	0,56			← <i>sp</i>	
-	-	-	-	-	-	-	-	-	-	-	-	0.152	3,8	0.166	4,1	0.180	4,5	0.186	4,7	0.194	4,9	0.200	5,0	0.206	5,2			1/4"	(6,3)
-	-	-	-	0.209	5,3	0.231	5,8	0.245	6,2	0.259	6,5	0.277	7,0	0.291	7,3	0.305	7,7	0.311	7,9	0.319	8,1	0.325	8,2	0.331	8,4			3/8"	(9,5)
-	-	0.310	7,9	0.334	8,5	0.356	9,0	0.370	9,4	0.384	9,7	0.402	10,2	0.416	10,5	0.430	10,9	0.436	11,1	0.444	11,3	0.450	11,4	0.456	11,6			1/2"	(12,7)
0.407	10,3	0.435	11,1	0.459	11,7	0.481	12,2	0.495	12,6	0.509	12,9	0.527	13,4	0.541	13,7	0.555	14,1	0.561	14,3	0.569	14,5	0.575	14,6	0.581	14,8			5/8"	(15,9)
0.532	13,4	0.560	14,2	0.584	14,8	0.606	15,3	0.620	15,7	0.634	16,0	0.652	16,5	0.666	16,8	0.680	17,2	0.686	17,4	0.694	17,6	0.700	17,7	0.706	17,9			3/4"	(19,0)
0.657	16,6	0.685	17,4	0.709	18,0	0.731	18,5	0.745	18,9	0.759	19,2	0.777	19,7	0.791	20,0	0.805	20,4	0.811	20,6	0.819	20,8	0.825	20,9	0.831	21,1			7/8"	(22,2)
0.782	19,8	0.810	20,6	0.834	21,2	0.856	21,7	0.870	22,1	0.884	22,4	0.902	22,9	0.916	23,2	0.930	23,6	0.936	23,8	0.944	24,0	0.950	24,1	0.956	24,3			1"	(25,4)
1.032	26,2	1.060	27,0	1.084	27,6	1.106	28,1	1.120	28,5	1.134	28,8	1.152	29,3	1.166	29,6	1.180	30,0	1.186	30,2	1.194	30,4	1.200	30,5	1.206	30,7			1.1/4"	(31,8)
1.282	32,5	1.310	33,3	1.334	33,9	1.356	34,4	1.370	34,8	1.384	35,1	1.402	35,6	1.416	35,9	1.430	36,3	1.436	36,5	1.444	36,7	1.450	36,8	1.456	37,0			1.1/2"	(38,1)
1.532	38,8	1.560	39,6	1.584	40,2	1.606	40,7	1.620	41,1	1.634	41,4	1.652	41,9	1.666	42,2	1.680	42,6	1.686	42,8	1.694	43,0	1.700	43,1	1.706	43,3			1.3/4"	(44,4)
1.782	45,2	1.810	46,0	1.834	46,6	1.856	47,1	1.870	47,5	1.884	47,8	1.902	48,3	1.916	48,6	1.930	49,0	1.936	49,2	1.944	49,4	1.950	49,5	1.956	49,7			2"	(50,8)
2.032	51,5	2.060	52,3	2.084	52,9	2.106	53,4	2.120	53,8	2.134	54,1	2.152	54,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1/4"	(57,1)
2.282	57,9	2.310	58,7	2.334	59,3	2.356	59,8	2.370	60,2	2.384	60,5	2.402	61,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1/2"	(63,5)
2.532	64,2	2.560	65,0	2.584	65,6	2.606	66,1	2.620	66,5	2.634	66,8	2.652	67,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3/4"	(69,8)
2.782	70,6	2.810	71,4	2.834	72,0	2.856	72,5	2.870	72,9	2.884	73,2	2.902	73,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3"	(76,2)
3.032	77,0	3.060	77,8	3.084	78,4	3.106	78,9	3.120	79,3	3.134	79,6	3.152	80,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1/4"	(82,6)
3.282	83,3	3.310	84,1	3.334	84,7	3.356	85,2	3.370	85,6	3.384	85,9	3.402	86,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1/2"	(88,9)
3.532	89,6	3.560	90,4	3.584	91,0	3.606	91,5	3.620	91,9	3.634	92,2	3.652	92,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3/4"	(95,2)
3.782	96,0	3.810	96,8	3.834	97,4	3.856	97,9	3.870	98,3	3.884	98,6	3.902	99,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4"	(101,6)
4.032	102,4	4.060	103,2	4.084	103,8	4.106	104,3	4.120	104,7	4.134	105,0	4.152	105,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1/4"	(108,0)
4.282	108,7	4.310	109,5	4.334	110,1	4.356	110,6	4.370	111,0	4.384	111,3	4.402	111,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1/2"	(114,3)

# Heat exchanger's world

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**MAUS ITALIA SPA IS THE WORLD LEADING MANUFACTURER OF TOOLS AND MACHINES FOR THE PRODUCTION AND MAINTENANCE OF HEAT EXCHANGERS**



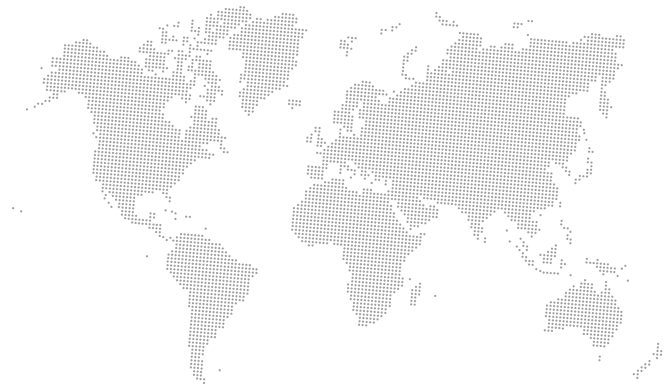
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