

Operating instructions

For responsible bodies and persons using the machine

Tube-to-tube-sheet orbital weld heads

P16

P16 AVC

P20



To work safely with this machine, please read through the operating instructions in full before initial operation. Retain the operating instructions for future reference.

Machine no.

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1. ABOUT THESE INSTRUCTIONS

To allow quick understanding of these instructions and safe handling of the machine, all the warning messages, notes and symbols used in these instructions are presented here along with their meaning.

1.1 Warning messages

In these instructions, warning messages are used to warn you against the dangers of injury or material damage. Always read and observe these warning messages!



This is a warning symbol. It should warn you against dangers of injury.
Follow all instructions which are identified with this safety symbol in order to avoid injuries or death.

Warning symbol	Meaning
 DANGER	Direct danger! Non-observance could result in death or critical injury. ⚠ Restrictions (if applicable). ► Measures to prevent danger.
 WARNING	Possible danger! Non-observance could result in serious injury. ⚠ Restrictions (if applicable). ► Measures to prevent danger.
 ATTENTION	Dangerous situation! ► Non-observance could result in minor injuries.
ATTENTION	Dangerous situation! ► Non-observance could result in material damage.

1.2 Further symbols and displays

Symbol	Meaning
IMPORTANT NOTE	Notes: Contain particularly important information for comprehension.
	Instruction: You must take notice of this symbol.
1.	Request for action in a sequence of actions: You have to do something here.
►	Single request for action: You have to do something here.
▷	Conditional request for action: You have to do something here if the specified condition is met.

1.3 Abbreviations

Abbr.	Abbreviations
OW	ORBIWELD

2. INFORMATION AND SAFETY INSTRUCTIONS FOR THE RESPONSIBLE BODY

2.1 Requirements for the responsible body

Workshop/outdoor/field application: The responsible body is responsible for safety in the danger zone around the machine, and should allow only qualified personnel to enter the zone or operate the machine in the danger zone.

Employee safety: The safety regulations described in chap. 2 must be observed and work must be carried out with safety in mind using the prescribed protective equipment.

The employer undertakes to give the employees clear notice of the dangers arising that are specified in the EMC directives and to evaluate the workplace correspondingly.

Requirements for special EMC evaluations with regard to general activities, working materials and workplaces*:

TYPE OF WORKING MATERIALS OR WORK-PLACE	EVALUATION REQUIRED FOR:		
	Employees without particular risk	Employees at particular risk (with the exception of those with active implants)	Employees with active implants
	(1)	(2)	(3)
Arc welding, manual (including MIG (Metal Inert Gas), MAG (Metal Active Gas), TIG (Tungsten Inert Gas)) under observance of tried-and-tested procedures and without physical contact to the line	No	No	Yes

* According to Directive 2013/35/EU

2.2 Using the machine

2.2.1 Proper use

- The orbital welding equipment (Orbital Welding Power Supplies CA/CB 165/300 and Orbitwin in connection with the orbital welding heads OW/TP/P/OP/HX and the manufacturer's recommended accessories) are to be used with metal pipes and tubes up to the specified pipe/tube dimensions of the heads.
- The machine may only be used on tubes and containers that are empty, unpressurized, do not have explosive atmospheres and are not contaminated.



Proper use also includes the following:

- observing all safety instructions and warning messages included in these operating instructions
- carrying out all inspection and maintenance work
- sole use in the original condition with original accessories, spare parts and materials
- processing only materials set out in the operating instructions.

2.2.2 Improper use

- A use other than that defined under "proper use" or a use that goes beyond this or the specified constraints shall be considered improper use due to the potential risks involved.
- The responsible body shall be solely responsible for damages that arise through improper use and the manufacturer shall assume no liability whatsoever.



- No tools should be used that have not been authorized by the manufacturer for this machine.
- The removal of safety equipment is not permitted.
- Do not misuse the machine.
- The machine is not intended for use by private consumers.
- The technical values defined for normal operation must not be exceeded.
- Do not use the machine as a drive for applications other than those listed under proper use.

2.2.3 Machine constraints

- The workplace can be in tube preparation, in plant construction or in the plant itself.
- A radial space requirement/freedom of movement of approx. 2 m around the machine is required for people.
- Work lighting: min. 300 lux.
- Operator age: at least 14 years old and without physical impairments.
- User qualification: instructed operator.
- Operated by one person.
- Climate conditions: temperature range for machine operation: -10°C to 40°C, (<70% rel. humidity).
Temperature range for machine storage: -20°C to 40°C, (<70% rel. humidity).
Do not use outdoors in fog, rain or during a thunderstorm.
The cooling performance is only guaranteed when full water tank.

2.3 Environmental protection/disposal

2.3.1 Electric tools and accessories

Discarded electric tools and accessories contain large quantities of valuable raw and synthetic materials that can be recycled. Therefore:

- Electrical (electronic) devices that are marked with the symbol at the side may not be disposed of with household waste in accordance with EU regulations.
- By actively using the available return and collection systems, you actively contribute to the reuse, recycling and utilization of electrical (electronic) devices.
- Used electrical (electronic) devices contain parts that must be handled selectively according to EU regulations. Separate collection and selective treatment is the basis for environment-friendly disposal and the protection of human health.
- Appliances and products that you bought from us after August 13, 2005 will be disposed of in accordance with legal standards after they have been supplied to us at no cost.
- We may refuse to accept old appliances that pose a risk to human health or safety due to contamination produced during use.
- The end user is responsible for disposing of used appliances introduced to the market before August 13, 2005. Please contact a disposal center near you for this purpose.
- **Important for Germany:** our products may not be disposed of in municipal disposal sites as they are only used for industrial purposes.




(as per RL 2002/96/EC)

2.4 Basic safety instructions

The machine (hereinafter referred to as the P16, P16 AVC, P20) is a state-of-the-art machine designed for safe use. The risks involved in using the machine are described in the operating instructions below. Using this machine in a way other than that described in these instructions can lead to serious physical injury and material damage.

Therefore:

- Observe warning messages at all times.
- Keep complete documentation close by the machine.
- Observe country-specific regulations, standards and guidelines.

- Always ensure that the machine is in good working order. Observe the maintenance information.
- Report any unusual machine behavior to the person responsible immediately.
- Only use the dimensions and materials specified in these instructions. Other materials should be used only after consulting with Orbitalum Tools customer service.
- Use only original tools, spare parts, materials and accessories from Orbitalum Tools.
- Repair and maintenance work on the electrical equipment may only be carried out by a qualified electrician.
- At the end of each working cycle, before transportation, changing tools, cleaning and performing any maintenance, adjustment or repair work, switch off the machine, allow it to run to a stop and pull the mains plug.
- Do not carry the machine by the cable assembly and protect them from heat, oil and sharp edges.
- During operation, keep hands away from the tools.
- Check that the tube is correctly clamped.
- Switch on the machine only when the tube has been clamped.
- In extreme conditions of use, conductive dust can settle inside the machine. For this reason and for better safety, an on-site SPE-PRCD or ground-fault circuit (30 mA) is required between the mains network and the machine, to be installed and tested if necessary by a professional electrician.
- When working with the machine wear safety shoes (as per EN ISO 20345 at least S1).

NOTE

The recommendations concerning "Personal protective equipment" only apply to the product being described. Other requirements resulting from the ambient conditions on-site or of other products, or from combining with other products, are not taken into account. These recommendations do not in any way release the responsible body (employer) from its statutory health and safety at work obligations towards its employees.



WARNING

Danger of unit toppling over (Orbicular welding trolley, gas cylinder, welding power supply, cooling unit) as a result of external application of force!

Diverse physical injuries and property damage are possible.

- Install machine securely against external force and keep moving masses at minimum clearance of 1 meter.



DANGER

Danger through operation by more than one person!

Diverse physical injuries and property damage are possible.

- Ensure that only one person operates the machine and welder head at a time.



DANGER

Danger through improper maintenance of the unit!

Diverse physical injuries and property damage are possible!

- Maintenance work must be performed in accordance with the "Maintenance" section.



DANGER

Electrical forms of danger from contact and/or incorrect or damp personal protective equipment!

Electric shock.

- ⊘ Do not touch any live parts (pipes), especially during arc ignition!
- ⊘ Persons with increased sensitivity to electrical forms of danger (e.g. cardiac insufficiency) must not work with the unit.
- Dry safety shoes, dry metal-free (rivet-free) leather gloves and dry protective suits minimize the danger presented by electricity.
- Work on dry ground.



DANGER

Accidentally activated ignition function!

Electric shock.

- Always switch off the orbital welding power supply when connecting or disconnecting a welding head.



WARNING

Electromagnetic incompatibility of surrounding devices when conducting high-frequency ignition and devices without ground conductor in operation!

Diverse physical injuries and property damage are possible.

- Only use insulated electrical devices in the working area of the welding unit.
- Observe electromagnetically sensitive devices when the unit is ignited.














WARNING

Ultra-violet radiation caused by the arc during welding operation!

Damage to eyes and burns to the skin.

- During operation, wear EN 170-compliant visor and protective clothing that covers the skin.
- In the case of closed heads, check that the visor is in perfect working order.

 WARNING	Hot emergent liquids and hot plug connections during intense operation Danger of scalding. ► Observe safety measures put in place by the supervisor/safety officer.
 DANGER	Incorrect handling of pressure containers and other parts of the unit (e.g. forming gas cylinder)! Diverse physical injuries and property damage are possible. ► Observe safety regulations, especially for pressure containers. ► Observe safety data sheets. ► If > 25 kg, lift unit and its components with the help of several people/hoisting equipment.
 DANGER	Flammable materials in the vicinity of the welding zone or solvents in the ambient air! Danger of explosion and fire. ☒ Do not perform welding tasks in the vicinity of solvents (e.g. painting work). ☒ Do not perform welding tasks in the vicinity of explosive materials. ► Ensure there are no flammable materials or contaminations in the vicinity of the welding zone or being used as an underlay.
 ATTENTION	Surfaces of the welding heads and welding point remain hot for some time after welding! Danger of burning. ► Wear protective gloves.
 WARNING	Toxic vapors and materials in the welding process and handling electrodes! Damage to health, such as cancer. ☒ Do not use electrodes that contain thorium. ► Use extraction device in accordance with official regulations (e.g. BGI: 7006-1) ► Particular attention should be paid when working with chromium, nickel, or manganese.
 DANGER	Incorrect ignition when welding head has not been attached or brought into the correct position! Electric shock, physical injury, and property damage to other devices. ☒ Do not play with welding heads. ► Switch to "test" function if head is not ready for operation.
 DANGER	Improper access and opening of ORBIMAT unit! Electric shock. ☒ Never connect an open unit to the power supply. ► Disconnect unit from the power supply. ► Remove all devices connected externally to the unit (welding heads, etc.). ► If previously in use, allow to cool. ► Only allow qualified electricians to access the electronics.
 DANGER	Liquid in housing as a result of improper use and/or transport! Electric shock. ☒ Do not place any liquids (drinks) on the unit. ► Keep vents free. ► Check housing for moisture on the inside after transporting the machine and leave open to dry if necessary.
 DANGER	Damaged plug! Fatal electric shock. ☒ Do not use adapter plugs with ground protected electrical tools. ► The machine connector plug must fit the socket.
 DANGER	Loose/baggy clothing, long hair or jewelry can get caught in rotating machine parts! Serious injury or death. ☒ During operation, do not wear loose/baggy clothing, e.g. neckties. ► Tie up long hair to prevent it from being caught.
 DANGER	Safety components that are contaminated or worn are defective! The failure of safety components can cause physical injury. ► Replace defective safety components immediately and check them daily to ensure proper operation. ► Inspect the machine daily for visible signs of damage or defects, and have them repaired by a specialist if necessary.

3. TECHNICAL SPECIFICATIONS

3.1 P16

Welding process:	TIG and TIG + filler wire	
Welding position:	horizontal, vertical, inclined	
Positioning of welding head:	by means of a series of spring loaded centering cartridges and mandrels	
Centering of torch:	by means of a spring loaded balancer or positioning frame with x-y-z movement	
Torch cooling:	water cooled	
Torch inclination:	max ± 45°	
Welding diameters:	12 - 78 mm electrode parallel to tube axis 10 - 36 mm electrode inclined of 30° tube axis bigger and smaller diameters at request	
Welding current (60% duty cycle):	max. 200 A DC pulsed max. 180 A DC linear	
Rotation speed:	0,33 - 6,00 rpm (stepless adjustment)	
Front cage with steel ring:	Standard	
Adjustment of welding distance:	6 mm on torch support slider +/- 5 mm by means of adjustment ring (micrometric adjustment)	
Filler wire group:	removable if not used	
Filler wire speed:	0,15 - 1,50 m/min (step less adjustment)	
Filler wire spool:	1 kg ø spool 100 mm	
Wire diameter with rollers type 1:	min 0.6 mm - max 0.9 mm	
Wire diameter with rollers type 2:	min. 0.9 mm - max 1.2 mm If not specified the machine is delivered with rollers type 1	
Dimensions:		
Machine body:	[mm]	100
Spool protection cage:	[mm]	120
Length:		
without wire group	[mm]	350
with wire group	[mm]	480
Weight:		
without wire group	[kg]	8.0
with wire group	[kg]	10.0

3.2 P20

Welding position:	horizontal, vertical, inclined	
Welding process:	TIG and/or TIG + filler wire	
Welding current:	[A]	max. 200
Welding diameters:	[mm]	10 - 70
Welding geometries:	recessed, flush and protruding tubes	
Current transmission:	lamellar coupling	
Gas and water transmission:	rotating coupling	
Support on tube sheet:	three point support	
Torch and wire nozzle:	adjustable on three axis according to welding geometry	
Centering of torch:	by means of a series of spring loaded centering cartridges and mandrels	
Cooling of torch:	water cooled up to electrode holder	
Torch inclination:	max. +/- 45°	
Rotation and filler:	18 V DC standard motor	
Rotation speed:	min. 0,33 rpm max 6,00 rpm	
Wire speed:	min. 150 mm/min max 1.500 mm/min	
Filler wire spool:	1 kg midget spool, diam. 100 mm, mounted on machine body	
Wire diameter with rollers:	min. 0,6 mm max. 0,9 mm	
Dimensions:		
Machine body	[mm]	70
Length	[mm]	325 (without wire group)
	[mm]	470 (with wire group)
Weight (without centering devices and connection cable)	[kg]	5,0 (without wire group) 5,5 (with wire group)

3.3 Description of welding head

The weld head can rotate indefinitely as current, cooling water and gas are supplied to the torch by means of a special designed rotating coupling. In this way cable connections from the power supply to the weld head remain fix.

Electrode and wire nozzle are both completely moveable towards the tube axis. In this way the electrode and the wire nozzle inclination can be easily optimized.

All normal work operations and small maintenance jobs can easily be performed directly by the operator (replacement of spool, electrode, wire hose, etc.).

The weld head is composed of these groups:

- Central body and rotating coupling
- Wire group
- Front body and torch

On request can be supplied:

- Cage with support ring for welding of flush tubes.
- Internal bore welding torch (L= up to 400 mm), tube diam 9,5 to 80 mm.
- Front dual flow cage for second gas (for titanium welding e.g.), at request with three point support.

We would like to remind you that our staff is able to design special torches for special applications or welding geometries as well as prolonged torches for welding in hardly accessible areas.

3.3.1 Main body and rotating coupling

This group is composed of the following main items or subassemblies:

- Connection block to the main cable for cooling water, welding current and protection gas.
- Electric socket for connection to the welding programmer.
- Rotation joint spindle and main distributor for cooling water, protection gas and welding current. The electrical contact between the parts is obtained by means of a lamellar joint.
- Self-lubricating bearings for supporting the rotation joint spindle.
- Standard rotation gear motor. (On request with tachometer feedback).
- Coupling between crown wheel-pinion for transmission of rotation from the gear-motor to the welding head.
- Electro mechanic pulse-counter for controlling the welding cycle with respect to the torch position. The microswitch is actuated by a wheel with 20 cams which supplies 60 impulses during a 360° rotation of the torch.
- External body with hook. (Standard for welding in horizontal position).
- Mandrel support vessel machined out of stainless steel.
- Ball bearing which allows the rotation of the mandrel support vessel and the front group for external and internal bore welding.
- Socket.
- Start/Stop button for starting the welding cycle or act the emergency stop (if pushed during the cycle).

3.3.2 Filler wire group

- Filler wire gear-motor.
- Pair of wire feed rollers. On the machine usually are mounted rollers for wire 0,6 - 0,9 mm.
- Wire spool support Standard spool has following dimensions:
 - external diameter: 100 mm
 - min. wire coiling diameter: 40 mm
- Elastic (spring loaded) blocking device which avoids by a clutch-disc system the unrolling of the spool.
- Filler wire arrival group which is composed of:
 - guide nozzle
 - wire exit guide
 - wire entry guide and rear entry nipple
 - rear wire guide hose
 - front wire guide hose
 - shaft with insulating bushing
 - shaft support

3.3.3 Front body and torch

- Brass slide body with sliding guide for the torch support. Inside the brass body is running the cooling water and the protection gas. Three Viton hoses start from here to the torch.
- Torch body with threaded hole for the gas diffuser (gas lens). The torch is covered by a special insulating painting in order to insulate the piece against high frequency.
- Torch support with split for adjusting the welding distance. The support is insulated like the torch body. Attached to the support is the shaft for supporting the filler wire arrival group.
- Radial torch position adjustment device by special screws.
- Insulating body
- Three point support
- Mandrel support vessel

At request front cage with stainless steel support ring.

3.3.4 Centering feature for external tube sheet weldings

Is needed in order to maintain the welding gun perfectly in axis with the tube to be welded.

It consists of a spindle which is mounted by means of 5 screws on the support vessel. On this spindle (mandrel) are mounted the centering cartridges which will be located into the tube to be welded (bayonette attachment and blocked by a spring loaded ball).

The centering cartridge is equipped with four rows of spring loaded balls guaranteeing in this way a perfect centering of the welding head.

All mandrels and centering cartridges must be chosen with respect to the internal diameter of the tube to be welded.

Article	Group	Cartridge size/no.	Tube ID [mm]	Tube ID [inch]	Code	kg
Retaining arbor for centering tools for group A					832 020 003	0.060
Centering tool	A	1	10.0 - 10.5	0.394 - 0.413	832 020 004	0.040
Centering tool	A	2	10.5 - 11.0	0.413 - 0.433	832 020 005	0.050
Centering tool	A	3	11.0 - 11.5	0.433 - 0.452	832 020 006	0.070
Centering tool	A	4	11.5 - 12.0	0.452 - 0.472	832 020 007	0.070
Centering tool	A	5	12.0 - 12.5	0.472 - 0.492	832 020 008	0.080
Centering tool	A	6	12.5 - 13.0	0.492 - 0.512	832 020 009	0.100
Centering tool	A	7	12.8 - 14.0	0.504 - 0.551	832 020 011	0.110
Retaining arbor for centering tools for group B					832 020 010	0.070
Centering tool	B	8	13.8 - 15.0	0.543 - 0.591	832 020 012	0.120
Centering tool	B	9	14.8 - 16.0	0.583 - 0.630	832 020 013	0.140
Centering tool	B	10	15.8 - 17.0	0.622 - 0.669	832 020 014	0.150
Centering tool	B	11	16.8 - 18.0	0.661 - 0.709	832 020 015	0.180
Centering tool	B	12	17.8 - 19.0	0.701 - 0.748	832 020 016	0.190
Centering tool	B	13	18.8 - 20.0	0.740 - 0.787	832 020 017	0.200
Centering tool	B	14	19.8 - 22.5	0.780 - 0.886	832 020 018	0.250
Retaining arbor for centering tools for group C					832 020 019	0.115
Centering tool	C	15	22.3 - 25.0	0.878 - 0.984	832 020 020	0.340
Centering tool	C	16	24.5 - 27.0	0.965 - 1.063	832 020 021	0.350
Centering tool	C	17	26.5 - 29.0	1.043 - 1.142	832 020 022	0.360
Centering tool	C	18	28.5 - 31.0	1.122 - 1.220	832 020 023	0.400
Centering tool	C	19	30.5 - 33.0	1.201 - 1.299	832 020 024	0.500

Article	Group	Cartridge size/no.	Tube ID [mm]	Tube ID [inch]	Code	kg
Centering tool	C	20	32.5 - 36.0	1.280 - 1.417	832 020 025	0.510
Centering tool	C	21	33.5 - 39.0	1.319 - 1.535	832 020 026	0.530
Centering tool	C	22	38.5 - 42.0	1.516 - 1.654	832 020 027	0.550
Centering tool	C	23	41.5 - 45.0	1.634 - 1.772	832 020 028	0.560
Centering tool	C	24	44.5 - 48.0	1.752 - 1.890	832 020 029	1.000
Centering tool	C	25	47.5 - 51.0	1.870 - 2.008	832 020 030	1.200
Retaining arbor for centering tools for group D					832 020 031	0.215
Centering tool	D	26	50.5 - 54.0	1.988 - 2.126	832 020 032	1.500
Centering tool	D	27	53.5 - 58.0	2.106 - 2.283	832 020 033	1.800
Centering tool	D	28	57.5 - 62.0	2.264 - 2.441	832 020 034	1.900
Centering tool	D	29	61.5 - 66.0	2.421 - 2.598	832 020 035	2.100
Centering tool	D	30	65.5 - 70.0	2.579 - 2.756	832 020 036	2.400
Centering tool	D	31	69.5 - 74.0	2.736 - 2.913	832 020 037	2.600
Centering tool	D	32	73.5 - 78.0	2.894 - 3.071	832 020 038	2.800
Centering tool	D	33	77.5 - 82.0	3.051 - 3.228	832 020 039	3.100
Centering tool	D	34	82.0 - 87.0	3.228 - 3.425	832 020 045	3.100
Centering tool	D	35	87.0 - 91.0	3.425 - 3.582	832 020 046	-
Centering tool	D	36	91.0 - 95.0	3.582 - 3.740	832 020 047	-
Centering tool	D	37	95.0 - 99.0	3.740 - 3.897	832 020 048	-
Centering tool	D	38	99.0 - 103.0	3.897 - 4.055	832 020 049	-
Centering tool	D	39	103.0 - 107.0	4.055 - 4.212	832 020 050	-
Centering tool	D	40	107.0 - 111.0	4.212 - 4.370	832 020 051	-
Centering tool	D	41	111.0 - 115.0	4.370 - 4.527	832 020 052	-
Centering tool	D	42	115.0 - 120.0	4.527 - 4.724	832 020 053	-

3.4 Connections

Together with weld head is supplied a connection cable L=8m which allows the connection to the welding programmer/ power supply.

The cable contains the following tubes:

- cooling water in hose (blue)
- water return and current hose (red)
- protection gas hose (yellow)
- gas 2 (eventually to be used for double gas)
- plug of the electrical signals from welding programmer to the welding head

4. ACCESSORIES AND MODIFICATIONS

4.1 Internal bore welding without filler wire

A modification kit for the standard welding head can be supplied in order to perform internal bore welding (TIG process) without filler wire for the following dimension:

- Length std < 400 mm
- Minimum tube internal diameter 9,5 mm

Orbitalum can supply even torches longer than 400 mm and corresponding to special welding geometries.

The standard torches cover the diameter range from 9,5 -80 mm.

Referring to the diameter the torches are subdivided into 5 groups:

- Group "A" : for ID 9.5 - 13 mm
- Group "B" : for ID 3.1 - 18 mm
- Group "C" : for ID 18.1 - 30 mm
- Group "D" : for ID 30.1 - 50 mm
- Group "E" : for ID 50.1 - 80 mm

(On request even larger diameters)

Each group is composed of the following components:

Water cooled torch with front centering bushings (ceramic), gas nozzle (ceramic), electrode holder with gas diffusor. Ceramic nozzle and electrode holder are fixed to the torch by means of a threaded bush. The electrode is fixed by a screw.

Front cage with stainless steel centering bush to support the weld head on the tube plate.

It is possible to mount distance rings on the torch in order to reduce the length of the torch in case there are several welding depths with the same internal diameter. These distance rings are available on request in all dimensions.

In any case we recommend to attach with the order for an internal bore welding torch the drawing of the welding geometry in order to fit out the torch the best way possible.

4.2 Front cage for dual gas flow

For welding special material (e.g. titanium) it is necessary to obtain a completely inert environment. For this reason it is possible to fit on welding head a front cage with a transparent glass which allows to create an inert environment around the electrode. This cage can be equipped with a three point support to render easier the positioning of the weld head on the tube plate in case of slightly protruding tubes.

The accessory is supplied complete with:

- Front cage with stainless steel front ring
- Pyrex glass
- Gas hose
- Nipples
- Upon request three point support

5. USE AND MAINTENANCE

5.1 Use of weld head

The high technology achieved with weld head puts this model as response on top of the international market demands. This welding head is extremely simple and allows easily to perform all necessary adjustments for a proper welding, guaranteeing a high standard of reproducibility.

Anyhow it is recommended, before starting production, to prepare a sufficient number of welding samples (about 50) which correspond the later welding geometry. We recommend to adjust the wire arrival about 0,5 - 1,0 mm below the electrode. The wire should arrive perpendicularly to the electrode and tangentially to the tube.

The welding head should be hooked up with an elastic balancer.

The orbital weld head allows to perform a great number of high quality weldings. In order to take advantage of this feature it is recommended to organize in advance the welding position:

- Be sure to have enough gas bottles.
- Be sure to have enough electrodes (pre-cut and shaped).
- Prepare ceramic nozzles, wire nozzles, gas lenses, collets and wire spools.

The most important point to achieve a perfect weld is a perfect cleaning of the tubes and the joints to be welded. Be sure that there is no oxide, chips, grease or any impurities.

5.2 Positioning of the welding head

The low weight and the efficient centering devices allow an easy and economic way of using the welding head.

Hook up the welding machine on a balancer (size up to 15 kg).

In order to obtain an efficient support on the tube sheet it is recommended to have to rope about 2 meters long and that it may be angled 15 - 20° towards the tube sheet. In this case the welding head is slightly pressed on the tube plate.

5.3 Starting of the welding heads

In case the welding head is connected to a Orbitalum controller, pushing start / stop button the welding cycle will start (real cycle or simulation). Pushing a second time the same button the welding will be stopped (cycle end with downslope).

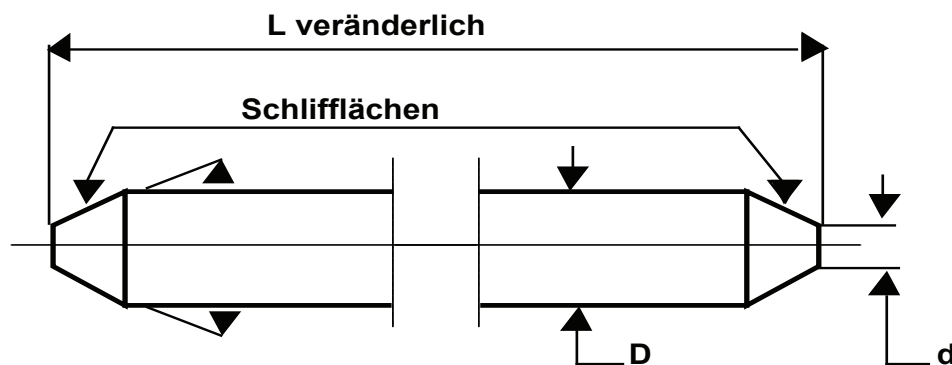
5.4 Preparation and replacement of the electrode

A correct geometry of the electrode is very important in order to guarantee a good quality of the welding. This geometry depends on the current you have chosen. For your reference see the enclosed table.

The electrode must be replaced every time you can see differences from the original geometry. In this case the welding parameters will change and the reproducibility is no longer guaranteed.

For the replacement of the electrode unscrew the cover the collet and collet body. In this way you can extract the electrode to be replaced.

Electrode collets for the following diameters are available: 1; 1.6; 2; 2.4 mm.



Tungsten Thorium 2 %			Argon	
Electrode diameter	Top diameter	Angle	DC current max. val.	Pulsed current range
D (mm)	D (mm)	in °	max. A	A
1.0	0.12	12	15	2 - 25
1.0	0.25	20	30	5 - 60
1.6	0.50	25	50	8 - 100
1.6	0.75	30	70	10 - 140
2.05	0.75	35	80	10 - 160
2.4	0.75	35	90	12 - 180
2.4	1.1	45	150	15 - 250
3.2	1.1	60	200	20 - 300
3.2	1.5	90	250	25 - 350

NOTE: The protrusion of the electrode from the ceramic nozzle geometric value to guarantee the reproducibility of the welding. It influences as well the distance electrode-workpiece.

We recommend to prepare a certain number of electrodes already cut and sharpened as soon as you have determined the electrode size.

5.5 Adjustment of welding diameter

The welding diameter can be adjusted by means of the screw with the key supplied together with the tool box.

5.6 Adjustment of the Arc distance

The distance electrode-workpiece can be defined after having determined the protrusion of the electrode from the ceramic nozzle.

Rotating the counter-ring of the three-point-support you may change the distance electrode-workpiece.

Unscrewing the screw on the torch support you may move the torch forwards or backwards parallel to the machine's axis. the stroke is 6 mm.

5.7 Adjustment of the filler wire arrival

The wire arrival group is assembled on the torch support following this way all radial and axial movements. To move the wire nozzle you just have to untighten the M3 screws on the hinges.

While adjusting the nozzle position you must keep in mind that the wire should pass about 0.5 - 1.0 mm under the electrode and that the wire arrival should be perpendicular to the tube axis and tangentially to the tube to be welded.

5.8 Replacement of the wire nozzle

It is necessary to replace the wire nozzle when the exit hole has become ovaly due to the wear or if you want to change the filler wire diameter.

In this way exact guiding of the wire to the welding bath is no longer guaranteed.

Nozzles for wire diameter 0.6 ; 0.8 ; 1.0 mm are available.

For the replacement unscrew screw, extract the nozzle and remove the nozzle from the wire liner.

5.9 Replacement of the wire spool

Act as follows:

- Cut the wire left on the spool.
- Press the wire forward button on the remote control in order to push forward the wire.
- The wire will advance until it has passed the wire feed rollers. Take a pair of pliers and tear the remaining wire out of the liner.
- Unscrew handle and remove the spool.
- Take a new spool and round off the top of the wire with a file in order to prevent cutting of the Teflon wire liner.
- Remove the wire exit nozzle near the torch.
- Introduce the wire into the guide until it arrives to the wire feed rollers.
- Act on screw in order to adjust the pressure of the rollers for feeding the wire.
- The right pressure is achieved when the wire is feeded regularly and without interruptions.
- Excessive pressure on the rollers will lead to an early wear. In order to adjust the pressure on the rollers it is necessary to act as follows.
- Switch on the welding equipment.
- In case the wire as stopped in front of the rollers which are too closed act on screw in order to open the rollers.
- Press the manual wire button on the remote control and tight screw until the wire starts to be pushed. Now tight screw half turn. The pressure will be correct now.
- Place the spool on the shaft and put handle on it.
- Push the manual filler wire button until the wire gets out on the top.
- Place again the wire end nozzle on the liner and fix it on its support.

NOTE: The wire group is equipped with a special friction which allows to keep the filler wire tight on the spool.

5.10 Removal or assembly of wire group

As mentioned before, the weld head allows to perform Tig weldings with or without filler wire. In case you intend to perform only TIG weldings you may remove the filler wire group in order to reduce dimensions and weight of the weld head. Hereafter are explained all operations to assemble the wire group on the welding head.

- assemble the front wire group fixing it by means of screw

NOTE: The insulating bushing must not be removed when disassembling the wire unit.

- remove rear tap.
- put into position the wire unit paying attention to:
 - the front wire liner must be inserted into the hole on the welding head and pushed through
 - connect the electric sockets for feeding the wire motor.
- fix the wire unit to the machine body by means of screws.
- add the wire spool as described before and adjust the front wire nozzle.

5.11 Replacement of the wire liner

This operation is necessary due to the wear of the wire liner itself. The wear depends on the roughness of the wire surface. This operation can be programmed periodically after about 10-15 wire spools. As the cost of the wire liner is very low it is recommended to forecast the replacement before the liner is actually damaged. Hereafter will be described the necessary replacement of the wire liner.

5.11.1 Replacement of the front wire liner

Act as follows:

- Cut the wire left on the spool.
- Press the button on the remote control in order to push forward the wire.
- The wire will advance until it has passed the wire feed rollers. Take a pair of pliers and tear the remaining wire out of the liner.
- Remove the wire nozzle from the support and remove it from the liner.
- Loosen screws disconnect electrical connectors and remove the whole wire unit. This way the front wire liner will be extracted from the welding head.
- Remove the liner from nozzle.
- With the help of a pencil-sharpener round off the extreme parts of the liner and screw it again on nozzle.
- Proceed as described in 3.10.

5.11.2 Replacement of the rear wire liner

Act as follows:

- Cut the wire left on the spool.
- Press the button on the remote control in order to push forward the wire.
- The wire will advance until it has passed the wire feed rollers. Take a pair of pliers and tear the remaining wire out of the liner.
- Remove the spool as illustrated in the previous paragraph.
- Unscrew the liner to be replaced from its guiding nozzle.
- Remove nozzle.
- With the help of a pencil-sharpener round off the extreme parts of the liner.
- Screw nozzle on the new liner (the liner is self-threading).
- Place again the new liner in its guiding nozzle.

6. GENERAL SAFETY RULES

These rules apply to AC and DC welding generators, AC transformers, AC/DC welding machines and DC transformer welding rectifiers.

In arc welding operations, where electrically charged parts are exposed, the following rules should be observed to assure maximum safety and protection to operator and surroundings.

Failure to observe these safety precautions may expose, not only the operator himself, but also fellow workers, to serious injuries. Once these rule are studied and well kept in mind, proceed, in any case with maximum care.

Welding cables



WARNING

DO NOT overload cables.



WARNING

DO NOT use welding cables at excessive current rates compared to their capacity. It will cause overheating and rapid deterioration of their insulation. It is certainly uneconomical.



WARNING

DO NOT use worn-out or poorly connected cables.



WARNING

INSPECT cables frequently. Repair immediately all breaks in insulation with rubber and friction tapes. Tighten and adequately insulate all cable connections. It is dangerous when exposed sections of cable come in contact with grounded metallic objects causing an arc. Unprotected eyes may be injured and fire may result if combustible materials such as oil or grease are in the vicinity.

Polarity switch



WARNING

Do NOT operate the polarity switch under load.

The polarity switch, when supplied, is provided for changing the electrode lead mutually from positive to negative. Operate this switch only while the machine is not in use and the welding circuit is open. Potential dangers of opening the circuit while charged with current are the following:

- An arc could form between contact surfaces of the switch.
- The person using the switch may receive a severe burn from this arc.

Ground power circuit



WARNING

DO NOT use welding machine without grounding frame of case.



WARNING

GROUND every power circuit to prevent accidental shock by stray current. DO NOT ground to pipelines carrying gas or inflammable liquids and lines carrying electrical conductors.

ATTENTION

BE SURE that conductors can safely carry the ground current.

Welding operations



WARNING

NEVER weld pieces without cleaning or inerting materials which, when heated, give off inflammable or toxic vapors.

ATTENTION

USE steam to clean superficial material.

ATTENTION

USE a strong cleaning solution to clean out heavy oils or grease.

ATTENTION

BE SURE to remove any residues of inflammable gas or liquid.



WARNING

NEVER use oxygen to ventilate the welding piece.



WARNING

CAUTION when cleaning with steam or caustic soda.

ATTENTION

WEAR goggles and gloves.



WARNING

DO NOT clean where there is poor ventilation.



WARNING

Ventilation is necessary to divert harmful or explosive vapors.



WARNING

DO NOT clean in the presence of open flames or arc.



WARNING

USE a wet tool to avoid sparks, when scaring or hammering to remove heavy sludge or scale.



WARNING

KEEP head and arms distant from work as possible.

Explosion hazards



DANGER

NEVER weld in or near explosive atmospheres.
Such atmospheres can be created by inflammable gas leaks or by vapors from inflammable liquids or by combustible dusts.

Ventilation



WARNING

DO NOT weld in enclosed spaces without adequate ventilation.
When welding in enclosed spaces always provide adequate ventilation with fans, air pipes, etc.



WARNING

NEVER use compressed oxygen.
Heat and fumes from welding could cause severe discomfort or serious illnesses.



WARNING

When toxic fumes from lead or cadmium content materials or any other substances are present in proportions that could be harmful always use a gas mask.

Solvents



WARNING

DO NOT weld in the presence of even a small amount of vapor from solvents such as perchloroethylene or trichloroethylene.

Ultraviolet light from the electric arc can decompose the vapors forming phosgene, a poisonous gas.

Fire hazards



WARNING

DO NOT weld near inflammable or combustible materials.
Fire can be caused by the arc, on contact with heated metal, by slag or sparks.



WARNING

KEEP combustibles at least 10 m from the arc, on the contrary they should be suitably protected by a flame-proof shield.

Danger of electric shock

ATTENTION

OPEN power circuits before checking machines.



WARNING

DO NOT touch electrically heated parts.



WARNING

NEVER touch any exposed or insulated part of the cables, cable connectors, electrodes, etc. to avoid harmful or fatal electric shock or burns.



WARNING

NEVER work in a damp area without suitable insulation.



WARNING

KEEP hands, feet and clothing dry at all times.
Salt in perspiration or sea water dangerously lowers contact resistances.



WARNING

DO NOT use cracked or defective helmets or shields.

Face protection



WARNING

KEEP helmet and hand and face shield in good condition.
If cracks occur in fibre material, replace shield, since leakage of arc rays may cause serious burns.

Eye protection



WARNING

DO NOT under any circumstances, view an electric arc without eye protection.
MAKE sure that flash goggles are used under the welding helmet at all times.
In some types of arc welding, such as TIG welding, ultra-violet and infrared radiation from the arc is particularly intense and requires constant attention to avoid arc flashes reaching weldor or other exposed persons.



WARNING

NEVER use cracked, ill-fitting or defective filter plates.
Eye burns from the arc, though not generally permanent injuries, are exceedingly painful.

Clothing



WARNING

DO NOT use inadequate or worn-out clothing.
Proper and dry, oil-free clothing is essential for weldors protection.
Clothing must not only keep off sparks and molten particles, but must also obstruct the rays from the arc.

ATTENTION

They must insulate the body from harmful electric currents.
Wear leather or asbestos gloves at all times to protect hand and wrists.
Dark coloured shirts are preferred to light ones since arc rays readily penetrate lightcoloured fabrics.
In case of gas-shielded arc welding, light colours are more reflective and may cause eye burns due to intense ultra-violet rays given off by the process. Avoid cotton fabrics with gas shielded arc welding.

Hot metals burns



WARNING

Hot metals burns: DO NOT touch hot metals.
DO NOT touch pieces of metal which have just been welded or heated.



WARNING

DO NOT substitute electrodes or centering cartridges immediately after welding.

7. EG DECLARATION OF CONFORMITY



EG-Konformitätserklärung
Declaration of conformity
Dichiarazione di conformità
Déclaration de conformité
Declaración de conformidad

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According to machine guideline 2006/42/EG (MaschR) and the EMC Directive 2014/30/EU.

Die Bauart der Maschine:
The following product:
Il seguente prodotto:
Le produit suivant:
El producto siguiente:

Tube-to-tube-sheet orbital weld heads including
orbital welding power supply
P16
P16 AVC
P20

Seriennummer:
Series number:
Numero di serie:
Nombre de série:
Número de serie:

Baujahr / Year / Anno / Année / Año:

ist entwickelt, konstruiert und gefertigt in Übereinstimmung mit folgenden EG-Richtlinien:
was designed, constructed and manufactured in accordance with the following EC guidelines:
è stata progettato costruito e commercializzato in osservanza delle seguenti Direttive:
a été dessiné, produit et commercialisé selon les Directives suivantes:
ha sido proyectado construido y comercializado bajo observación de las siguientes Directivas:

EG-Maschinen-Richtlinie 2006/42/EG (MaschR)
EMV-Richtlinie 2014/30/EU

Folgende harmonisierte Normen sind angewandt:
The following harmonized norms have been applied:
Le seguenti norme armonizzate ove applicabili:
Les normes suivantes harmonisées où applicables:
Las siguientes normas armonizadas han sido aplicadas:

DIN EN ISO 12100:2011-03
DIN EN ISO 13849-2:2013-02
DIN EN 60204-1:2007-06
DIN EN 60974-1:2014-09
DIN EN 60974-2:2013-11
DIN EN 50445:2009-02

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Singen, 22.02.2017

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We value your opinion! Please send us your comments and queries.