orbitalum
orbital | cutting + welding

ITW | ORBITAL CUTTING & WELDING

Operating instructions

For responsible bodies and persons using the machine

Enclosed orbital weld head

HX 16P

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.:

Code 848 060 202 | EN | Translation of original operating instructions

TABLE OF CONTENTS

Inhaltsverzeichnis

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.	Meaning
HX 16P	Enclosed orbital weld head, type "16 P" for Heat Exchanger (HX) applications

2. General information

The recent technological advances in the design and manufacturing processes of the heat exchangers and equipment for chemical, nuclear and mechanical industry has been the extensive use of new materials which require sophisticated and, therefore, highly precise and efficient welding system.

These critical weld joints must be sound and safe because the smallest defect may have serious consequences.

The welding process commonly applied for welding tubes to tubes is TIG carried out with fully automatic equipment. This system allows the welding operation to be completely unaffected by the skill of the welder and produces perfectly repeatable high quality welds.

The family of weld heads HX16 model has been specially designed to meet these requirements, in particular the new version HX16P has been implemented with a pneumatic system for clamping to reduce cycle times.

2.1 Technical specifications

Enclosed orbital weld head	**HX 16P**
Welding process	TIG
Welding position	Horizontal, vertical, inclined
Welding current (60%)	max. 70 A DC pulsed
Rotation gear motor	Standard 1,6 mm
Torch rotation speed	0,3 - 5 rpm
Tube diameters	13 - 16 mm

Dimensions	**HX 16P**
Radial clearance	71 mm
Height	240 mm
Min. straight part tube + bend	72 mm
Max. height tube + bend	195 mm
Weld point	bei 30 mm
Weight	1,1 kg (without cable)

3. DESCRIPTION

The HX 16P is composed of the following groups:

- Machine Body
- Pneumatic System
- Connecting cable to welding power source

3.1 Machine body

This group encloses:

- Connection to machine cable for water out / welding current, water out protection gas
- Rotation gear motor
- Conical gears group for the rotation movement with gear wheels for transmission of rotation to the rotor
- The electrode, Standard, 1.6 mm ø is fixed with dowel
- The microswitch which is actioned by a cam wheel or a cogwheel
- Lower and upper seat for clamping the tube/bend with pneumatically controlled pistons to keep the weld head in place during the weld
- Start blue button to clamping the weld head to the tube
- Start red button to initiate the welding cycle
- The protective allows to create a closed chamber for the shielding gas

3.2 Pneumatic clamping system

This group encloses:

- The pressure regulator is powered by means of the quick coupling by high pressure air (max. 16 bar), this device is equipped with a pressure gauge for the control and a knob setting
- The solenoid valve powered by the air coming from the pressure regulator serves, by means of the quick coupling, the pistons installed on the weld head
- The relay receives the signal from the blue button and controls the solenoid valve
- The connector is connected to the cable machine.

3.3 Connections

The HX 16P will be delivered with a cable (length 5 m) which allows connections of the weld head to a welding programmer/power supply.

This cable is composed of:

- Cooling water to torch hose (blue)
- Cooling water return hose (red) with copper plait for welding current
- Protection gas hose (yellow)
- The multiple cable for transmission of electrical signals from the welding programmer to the weld head
- The multiple cable for transmission of electrical signals from the welding programmer to the Pneumatic Box

4. USE AND MAINTENANCE

4.1 General information

The high technology achieved with the orbital weld head HX 16 puts this models on the top of the international market demands. This weld heads are extremely simple and it is easy to perform all necessary adjustments for a proper welding, guaranteeing a high standard of reproducibility.

The HX 16P allows to perform a great number of high quality welding.
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).
- Prepare tools for replacement of electrode.

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.

4.2 Positioning of the weld head

With the introduction of pneumatic part (in the model HX16P) placement has been completely revolutionized, much faster and more accurate than the standard versions. The low weight and efficient clamping systems allows a easy placing of the weld head on the tube to be welded. Using the new adjustment slide (OPTIONAL), the weld head have to be only positioned on the curve to be welded bringing into contact the slide previously regulated and start the pneumatic locking by pushing start/stop button, avoiding loss of time for the search of the correct position as in the case of welds on the border of the overlay.

4.3 Starting of the orbital weld head

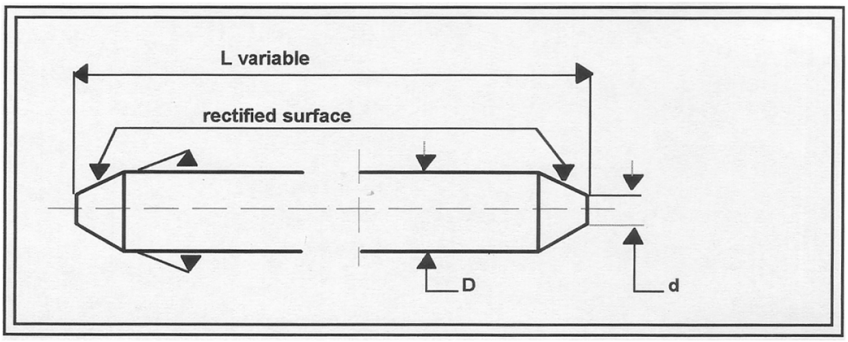
Pushing start/stop button on the handle, the welding cycle will start (real cycle or simulation).
Pushing a second time the same button will cause a cycle end with current down slope and final gas.

4.4 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 replacement move the rotor with the open weld head forwards until you can reach dowel.



Tungsten Thorium 2%			Argon	
Electrode Diameter D	Top Diameter d	Angle in °	DC Current max. val.	Pulsed Current range
mm	mm	°	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

NOTE: The distance electrode work piece influences the arc voltage.

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

4.5 Adjustment and replacement of microswitch

Adjustment of replacement is necessary when we realize that the pulse counting is no longer regular.

Act as follows:

- Remove the screws and remove cover
- Loose screw from basis

In case of replacement:

- Remove screw and un-weld the two wires
- Remove microswitch and replace it

4.6 Cleaning the orbital weld head

4.6.1 Equipment

- Compressed air (compressor)
- Brush with metal bristles
- Scotch-Brite 3M A-VFN 150x115mm (or similar)
- Cleaner for electrical contacts LOCTITE 7039
- Lubricant spray (e.g. Redoil (REDLOK))

4.6.2 Procedure

1. Without disassembling the weld head, turn the gear wheel (rotor) into position as shown in Fig. 1.

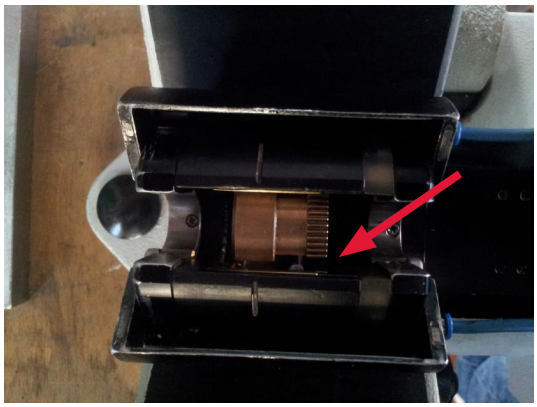


Fig. 1 Starting position for the cleaning of the gear

2. Once the gear wheel (rotor) has reached the position, spray the cleaner contacts in the direction shown in Fig. 2, continuously during the rotation on the gear. Continue for the entire extension of the gear.

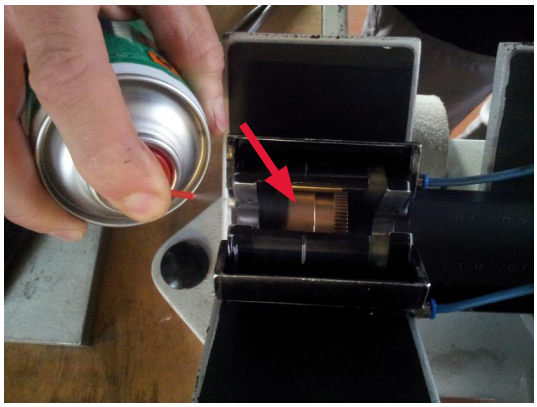


Fig. 2 Cleaning using spray

3. Brushing the toothing with the wire brush as shown in Fig. 3.

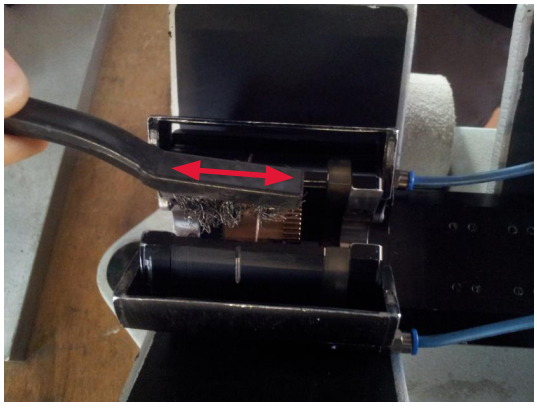


Fig. 3 Brushing teeth

4. Repeat step 2. If you need to run step 2 until you get a shiny finish of the gear.
5. Exhaust the carbonaceous deposits with a vacuum cleaner.
6. Clean the inside of the gear using scotch brite as shown in Fig. 5 and Fig. 6.

Fig. 5 Cleaning inside gear with scotch brite

Fig. 6 Cleaning inside gear with scotch brite

7. Repeat step 2 by spraying abundantly product. Both inside and outside of the gear. Repeat immediatly after step 5, taking care to remove all residual traces on all sides of the gear.

8. Align the weld head in vertical direction (Fig.7). Place the gear wheel (rotor) in position as shown (Fig. 8).

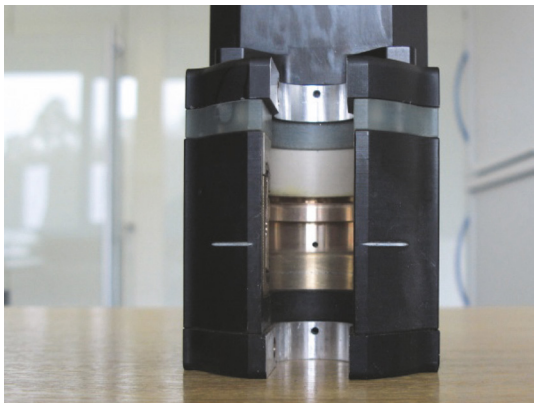


Fig. 7 Vertical alignment of the welding head

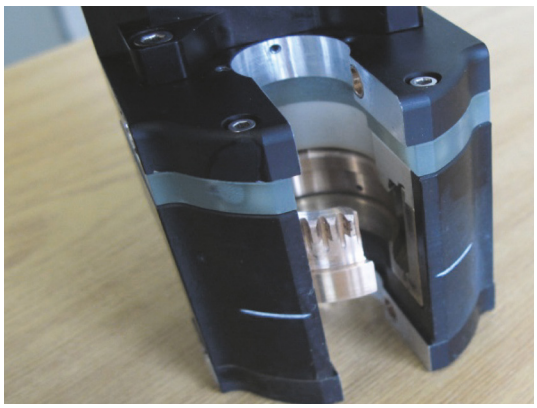


Fig. 8 Start position for cleaning the current/cooling contact surface

9. Spray quick cleaner onto the current/cooling contact surface of the gear wheel (rotor) (Fig.9).
Then rotate the gear wheel (rotor) through 360° to flush out contamination.

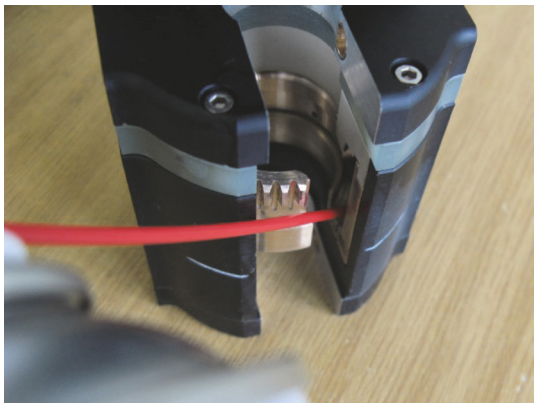


Fig. 9 Spray current/cooling contact surface with quick cleaner

10. Wipe damp current/cooling contact surface of the gear wheel (rotor) all around with a cloth (Fig.10).

⚠	Only apply the rag when the gear wheel (rotor) is at a complete standstill!
⚠	Allow the cleaning agent to evaporate completely before the next work step!

Fig. 10 Wipe current/cooling contact surface with a cloth

11. Sprinkle the cloth with Redoil (REDLOK).
Use the rag to apply a very thin film of lubricant to the current/cooling contact surface as well as to the opposite rotor face and the engaging rotor tooth flanks.

Never spray lubricant directly into the welding head. Excessive use of lubricant can severely impair the function!
Only apply minimal amounts of lubricant to the above-mentioned points!

5. GENERAL SAFETY RULES

WARNING

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.

5.1 Welding cables

▶ Always read and observe the following warning messages!

⦸ **DO NOT** overload cables.
⦸ **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 uneconomical.
⦸ **DO NOT** use worn-out or poorly connected cables.
▶ 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.

5.2 Polarity switch

▶ Always read and observe the following warning messages!

⦸ **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.

5.3 Ground power circuit

▶ Always read and observe the following warning messages!

⦸ **DO NOT** use welding machine without grounding frame of case.
▶ 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.
▶ BE SURE that conductors can safely carry the ground current.

5.4 Welding operations

▶ Always read and observe the following warning messages!

⦸ **NEVER** weld pieces without cleaning or inert materials which, when heated, give off inflammable or toxic vapours.
▶ USE steam to clean superficial material.
▶ USE a strong cleaning solution to clean out heavy oils or grease.
▶ BE SURE to remove any residues of inflammable gas or liquid.
⦸ **NEVER** use oxygen to ventilate the welding piece.
▶ CAUTION when cleaning with steam or caustic soda.
▶ WEAR goggles and gloves.
⦸ **DO NOT** clean where there is poor ventilation. Ventilation is necessary to divert harmful or explosive vapours.
⦸ **DO not** clean in the presence of open flames of arc.
▶ USE a wet tool to avoid sparks, when scaring or hammering to remove heavy sludge or scale.
▶ KEEP head and arms distant from work as possible.

5.5 Explosion hazards

▶ Always read and observe the following warning messages!

⦸ **NEVER** weld in or near explosive atmosphere. Such atmosphere can be created by inflammable gas leaks or by vapours from inflammable liquids or by combustible dust.

5.6 Ventilation

▶ Always read and observe the following warning messages!

⦸ **DO NOT** weld in enclosed spaces without adequate ventilate.
▶ When welding in enclosed spaces always provide adequate ventilation with fans, air pipes, etc.
⦸ **NEVER** use compressed oxygen. Heat and fumes from welding could cause sever discomfort or serious illnesses.
▶ When toxic fumes lead or cadmium content materials or any other substance are present in proportions that could be harmful always use a gas mask.

5.7 Solvents

▶ Always read and observe the following warning messages!

⦸ **DO NOT** weld in the presence of even a small amount of vapour from solvents such as perchloroethylene or trichloroethylene. Ultraviolet light from the electric arc can decompose the vapours forming phosgene, a poisonous gas.

5.8 Fire hazards

▶ Always read and observe the following warning messages!

⦸ **DO NOT** weld near inflammable or combustible materials. Fire can be caused by the arc, on contact with heated metal, by slag or sparks.
▶ KEEP combustibles at least 10 m from the arc, on the contrary they should be suitably protected by a flame-proof shield.

5.9 Dangers of electric shock

▶ Always read and observe the following warning messages!

▶ OPEN power circuits before checking machines.
⦸ **DO NOT** touch electrically heated parts.
⦸ **NEVER** touch any exposed or insulated part of the cables, cable connectors, electrodes, etc. to avoid harmful or fatal electric shock or burns.
⦸ **NEVER** work in a damp area without suitable insulation.
▶ KEEP hands, feet and clothing dry at all the times.

5.10 Face protection

▶ Always read and observe the following warning messages!

⦸ **DO NOT** use cracked or defective helmets or shields.
▶ KEEP helmet and face shield in good condition.
▶ If cracks occur in fibre material, replace shield, since leakage of arc rays may cause serious burns.

5.11 Eye protection

▶ Always read and observe the following warning messages!

⦸ **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 welder or other exposed persons.

5.12 Clothing

▶ Always read and observe the following warning messages!

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

5.13 Hot metals burns

⦸ **DO NOT** touch hot metals.
⦸ **DO NOT** touch pieces of metal which have just been welded or heated.
⦸ **DO NOT** substitute electrodes or centering cartridges immediately after welding.

ITW | ORBITAL CUTTING & WELDING

The **ITW ORBITAL CUTTING & WELDING** group provides global customers one source for the finest in pipe & tube cutting, beveling and orbital welding products.

For more information about us >> **www.itw-ocw.com**

orbitalum
orbital | cutting + welding

Orbital cutting, beveling and welding machines for high-purity process piping.

>> tools@orbitalum.com
>> **www.orbitalum.com**

WACHS E.H.WACHS
Superior Equipment. Complete Support.

Portable weld prep machine tools for industrial applications.

>> sales@ehwachs.com
>> **www.ehwachs.com**

worldwide | sales + service

NORTH AMERICA

USA

E.H. Wachs
600 Knightsbridge Parkway
Lincolnshire, IL 60069
USA
Tel. +1 847 537 8800
Fax +1 847 520 1147
Toll Free 800 323 8185

NORTHEAST
Sales, Service & Rental Center
E.H. Wachs
1001 Lower Landing Road, Suite 208
Blackwood, New Jersey 08012
USA
Tel. +1 856 579 8747
Fax +1 856 579 8748

SOUTHEAST
Sales, Service & Rental Center
E.H. Wachs
171 Johns Road, Unit A
Greer, South Carolina 29650
USA
Tel. +1 864 655 4771
Fax +1 864 655 4772

NORTHWEST
Sales, Service & Rental Center
E.H. Wachs
2079 NE Aloclek Drive, Suite 1010
Hillsboro, Oregon 97124
USA
Tel. +1 503 941 9270
Fax +1 971 727 8936

GULF COAST
Sales, Service & Rental Center
E.H. Wachs
2220 South Philippe Avenue
Gonzales, LA 70737
USA
Tel. +1 225 644 7780
Fax +1 225 644 7785

HOUSTON SOUTH
Sales, Service & Rental Center
E.H. Wachs
3327 Daisy Street
Pasadena, Texas 77505
USA
Tel. +1 713 983 0784
Fax +1 713 983 0703

CANADA

Wachs Canada Ltd
Eastern Canada Sales, Service & Rental Center
1250 Journey's End Circle, Unit 5
Newmarket, Ontario L3Y 0B9
Canada
Tel. +1 905 830 8888
Fax +1 905 830 6050
Toll Free: 888 785 2000

Wachs Canada Ltd
Western Canada Sales, Service & Rental Center
5411 82 Ave NW
Edmonton, Alberta T6B 2J6
Canada
Tel. +1 780 469 6402
Fax +1 780 463 0654
Toll Free 800 661 4235

EUROPE

GERMANY

Orbitalum Tools GmbH
Josef-Schuettler-Str. 17
78224 Singen
Germany
Tel. +49 (0) 77 31 - 792 0
Fax +49 (0) 77 31 - 792 500

UNITED KINGDOM

Wachs UK
UK Sales, Rental & Service Centre
Units 4 & 5 Navigation Park
Road One, Winsford Industrial Estate
Winsford, Cheshire CW7 3 RL
United Kingdom
Tel. +44 (0) 1606 861 423
Fax +44 (0) 1606 556 364

ASIA

CHINA

Orbitalum Tools
New Caohejing International
Business Centre
Room 2801-B, Building B
No 391 Gui Ping Road
Shanghai 200052
China
Tel. +86 (0) 512 5016 7813
Fax +86 (0) 512 5016 7820

INDIA

ITW India Pvt. Ltd
Sr.no. 234/235 & 245
Plot no. 8, Gala #7
Indialand Global Industrial Park
Hinjawadi-Phase-1
Tal-Mulshi, Pune 411057
India
Tel. +91 (0) 20 32 00 25 39
Mob. +91 (0) 91 00 99 45 78

AFRICA & MIDDLE EAST

UNITED ARAB EMIRATES

Wachs Middle East & Africa Operations
PO Box 262543
Free Zone South FZS 5, AC06
Jebel Ali Free Zone (South-5), Dubai
United Arab Emirates
Tel. +971 4 88 65 211
Fax +971 4 88 65 212

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

orbitalum
orbital | cutting + welding

ITW | ORBITAL CUTTING & WELDING