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OPERATING MANUAL

A7 TIG Orbital System

150

KEMPPI

CONTENTS

OPERATING MANUAL

1. INTRODUCTION

1.1 General

Congratulations on choosing A7 TIG Orbital System 150 welding equipment. Used correctly, Kemppi products can significantly increase the productivity of your welding and provide years of economical service.

This operating manual contains important information on the use, maintenance and safety of your Kemppi product. The technical specifications of the equipment can be found at the end of the manual.

Please read the operating manual and the safety instructions booklet carefully before using the equipment for the first time. For your own safety and that of your working environment, pay particular attention to the safety instructions in the manual.

For more information on Kemppi products, contact Kemppi Oy, consult an authorized Kemppi dealer, or visit the Kemppi website at www.kemppi.com.

The specifications presented in this manual are subject to change without prior notice.

Important notes

Items in the manual that require particular attention in order to minimise damage and harm are indicated with below symbols. Read these sections carefully and follow their instructions.

Note: Gives the user a useful piece of information.

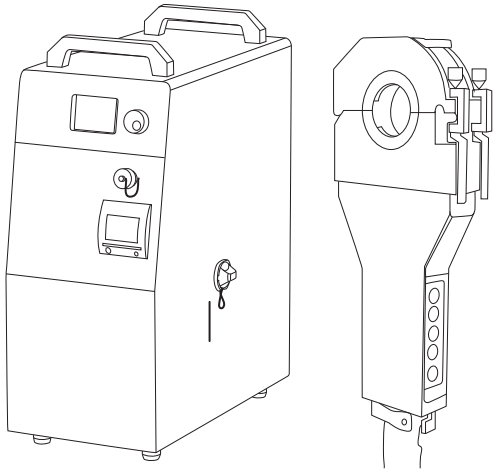
Caution: Describes a situation that may result in damage to the equipment or system.

Warning: Describes a potentially dangerous situation. If not avoided, it will result in personal damage or fatal injury.

Disclaimer

While every effort has been made to ensure that the information contained in this guide is accurate and complete, no liability can be accepted for any errors or omissions. Kemppi reserves the right to change the specification of the product described at any time without prior notice. Do not copy, record, reproduce or transmit the contents of this guide without prior permission from Kemppi.

1.2 About the product



A7 TIG Orbital System 150 is used for TIG orbital welding. It is a semi-automatic welding method where the arc moves automatically and without interruption 360° around tubes or fitting components.

The system consists of a weld head and a controller unit. The controller unit includes an integrated TIG power source and a cooling unit.

You can create and save up to 100 welding programs and select the most suitable for each welding object by using the unit's graphic interface.

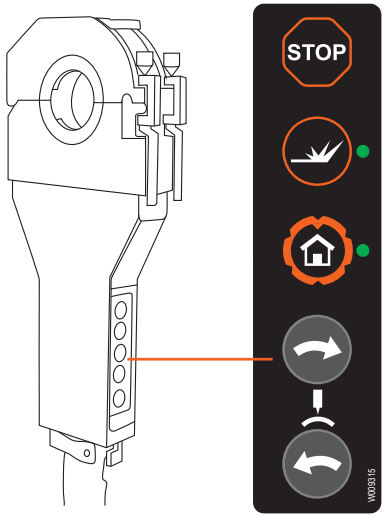
The system has been designed to weld tubes made of various materials, including stainless steel, Duplex and Titanium, up to wall thickness of 3 mm.

Weld heads of various (5) sizes enable welding pipes with diameters from 3 to 150 mm.

The system offers a wide operating range and good reach and is suitable for

- tube-to-tube
- tube-angle
- tube-to-fitting welding.

1.3 Weld head

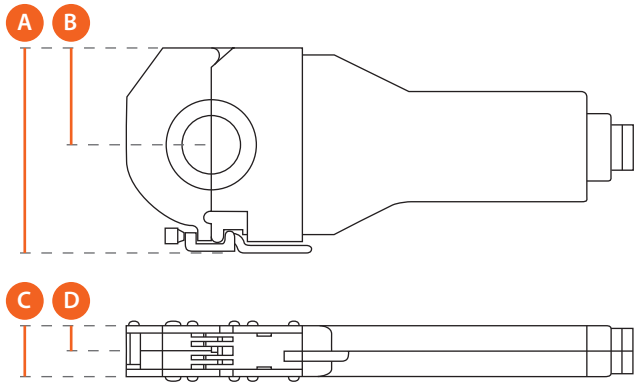


The weld head contains a U-shaped rotor gear that moves the tungsten electrode orbiting the non-moving tube. The head totally encloses the weld joint and allows the interior of the head to be flooded with shielding gas. The system includes water cooling for heavy duty cycles.

Control panel is in the handle, and assembly to the controller is provided by a 7.5-metre hose (longer cables are available).

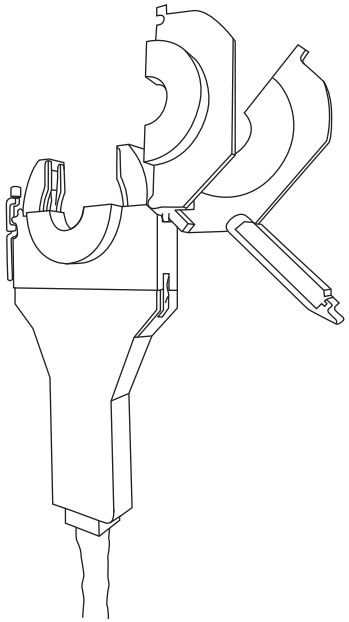
The weld head is clamped on tubes by changeable collets. It includes a chamber for shielding gas. Spesific collets are recommended for each tube outer diameter (OD).

1.3.1 Tube diameters and weld head outline dimensions



	15010	*15020*	*15030*	*15040*	*15060*
Weight (kg)	3.2	5.0	6.4	8.2	10.0
Tube Diameter (mm)	3–25	6–51	9–76	12–102	50–152.4
A (mm)	124	175	202	231	297
B (mm)	62	83	96	110	144
C (mm)	43	43	43	43	43
D (mm)	19	19	19	19	19

1.3.2 Collets



Collets are used for clamping the weld head on the tube or fitting to be welded. Collets always come in pairs, and they are mounted on the hinged collet frame with screws.

Collets are specified by:

- Weld head model
- Outer diameter (OD) of the tube or pipe.

Two types of collets are available: flush and extended.

1.3.3 Collet frame and collets

The collets mount in the weld head and are used to clamp the head on to the tube or fittings to be welded.

- The collet frame swings open on a hinge and is held closed using two latches on either side of the head.
- Both sides of the collet frame open and close independently.
- This allows one tube (or fitting) to be clamped in place and the second tube (or fitting) to be butted tightly to the first clamped tube before it is clamped.

Above function is solely to keep the head from moving during welding, and it should not be used as a substitute for external alignment fixtures, clamps, or tack welding to hold the workpieces aligned.

Each collet pair consists of two half-circle pieces that are mounted on both sides of the hinged collet frame using screws (see images below).

The collet frame and collets are connected to the work (+) lead of the torch cable, and a separate return lead is not needed.

Collet sets must be ordered separately. One weld head requires two pairs of collets (1 set = two pairs).

1.3.4 Flush collets

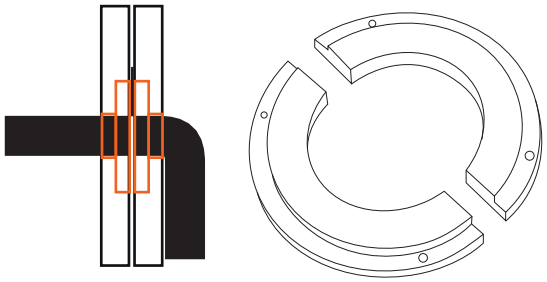


Figure: A pair of flush collets

The outer surface of the collet pair is flush with the outer face of the collet frame. Flush collets are used for joints where there is very little straight length between the joint and an obstruction.

Advantages:

- Enables welding in tight places where there is not much room for clamping, for example when welding fittings on a tube or pipe.
- Allows the minimum distance between the tungsten electrode and an obstruction. For example, if a fitting must be welded there is frequently only a minimal straight length on the fitting available for clamping.

Disadvantages:

- Less stable and less capability for holding both welded pieces aligned with each other.
- The thicker or wider the collet, the greater alignment capability it has to hold the tube or fitting so that both ends of the tubes to be welded are squarely aligned. Therefore, flush collets have minimal width alignment of tube ends.

1.3.5 Extended collets / combination

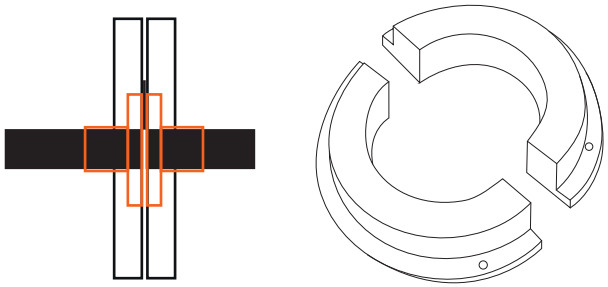


Figure: A pair of extended collets

Extended collet is thicker than flush collet, and it extends wider from the collet frame. Wider or thicker collets can be used where the parts to be welded have enough straight length to be clamped. The amount of extension is 18 mm on each side of the weld head where extended collets are used.

Advantages:

- More stable and more capability for holding both welded pieces aligned with each other.
- Greater alignment capability due to longer length.

Disadvantages:

- Takes more space, and may not allow welding in tight places for example in certain fitting-to-tube welds, depending upon fitting type.
- Requires a certain straight length of tube on which to clamp.

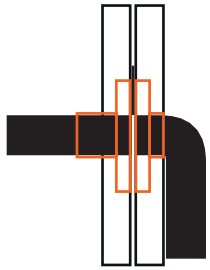
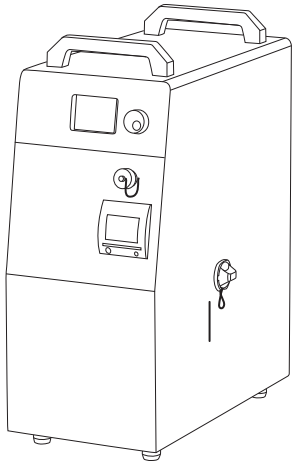


Figure: A combination of collets

Combination:

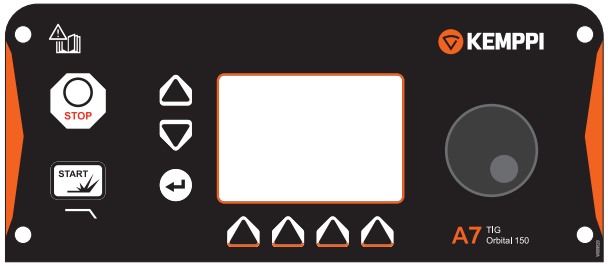
- Combination of extended and flush collet pair can be used for tube-to-fitting welding, for example.
- If your application consists of tube-to-fitting welding but you need greater alignment capability when mounting on the tube side, use an extended collet pair on one side of the head and a flush collet pair on the other

1.4 Controller unit



A7 TIG Orbital System 150 power source and cooling unit are integrated inside the controller unit. This unit also involves a printer to print welding parameters on paper. The parameters can be saved on a memory stick through the USB port. Programs can be stored in internal memory (100) and saved on a memory stick.

1.4.1 Front panel



A7 TIG Orbital System 150 features a clear color display, a control knob, and press buttons. Its intuitive graphical user interface offers easy-to-use menus and auto programming for automatic calculation of welding parameters, including:

- Electrode length calculator
- Creation of custom programs
- Instructions and information for the operator.

The power source front panel provides the controls to develop, save, and call up welding programs.

1.4.2 Gas flow

The power source is equipped with a gas flow sensor that is factory preset. Shielding gas must be flowing to the weld head to initiate a welding arc.

- If gas flow is insufficient, pressing the Start Weld button will not initiate a welding arc.
- If the gas flow is interrupted during welding, the sensor will immediately extinguish the arc. A warning message is displayed.

1.4.3 Water cooler

The controller unit contains an integrated water cooler that monitors water circulation, and any failure or block causes an alarm.

The water flow function is factory calibrated. Interruption or insufficient water flow (less than 0.5 LPM) results in termination of welding and a warning message on the display.

Water flow

The water flow sensor has a factory preset trip point that is not adjustable.

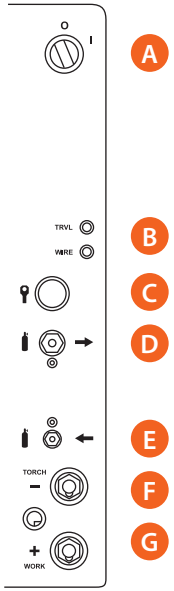
- If water flow is insufficient to actuate the sensor, a welding arc cannot be initiated.
- Pressing Start Weld causes pre-purge. When the arc should be initiated, the starting sequence is interrupted and a warning is displayed.

1.5 Compatibility

A7 TIG Orbital System 150 controller is compatible with the 150 series of weld heads.

2. INSTALLATION

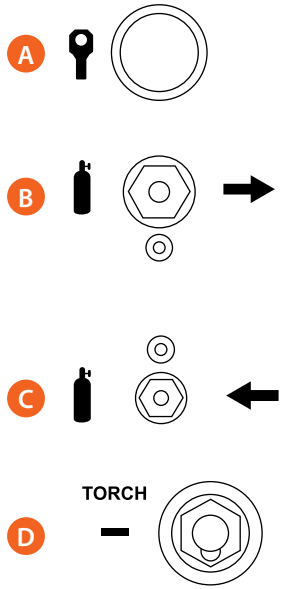
2.1 Controller unit connectors



All connections are located on the rear of the controller unit:

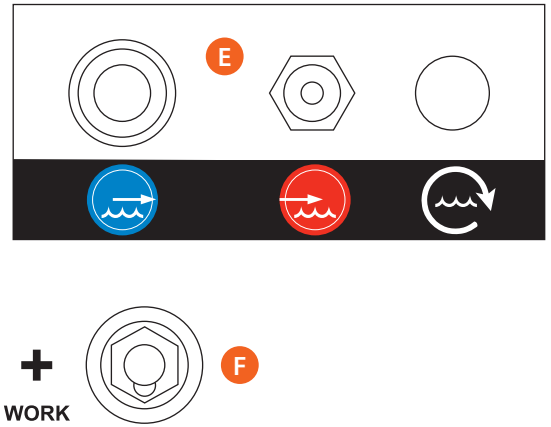
A. Power ON/OFF
B. Resettable fuses
   TRVL = Travel motor, (WIRE = Wire feed motor, not available)
C. Weld head control cable
D. Gas Out (to weld head)
E. Gas In (from cylinder)
F. Welding power connector (–)
G. Earth return connector (+)

2.2 Connecting the weld head



All connections are located on the rear of the controller unit. Do the following:

A. Connect the weld head's control cable to the connector marked with the weld head symbol.
B. Connect the weld head's gas hose to the Gas Out connector.
C. Connect the hose from gas cylinder to the Gas In connector.
D. Connect the weld head's power cable to the negative terminal (–).



E. Connect the coolant hoses to two couplings. They are different by their design to avoid incorrect installation.
F. Connect the weld head's power return cable to the positive (+) terminal of the controller unit.

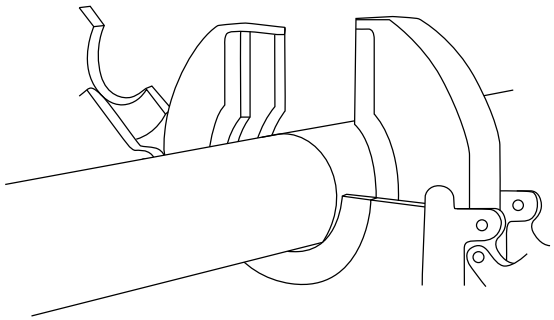
2.3 Suitable collets to the collet frame

The collets are designed to clamp firmly on the outside diameter (OD) of the tube or fittings to be welded. The interior diameter (ID) of standard collets is oversize relative to the tube to be welded by .075 mm to allow for standard dimensional tolerances. The collet halves that make a pair are identical. They are engraved to show the tube OD or tube fitting OD and type.

1. Install the two (2) pairs of appropriate collets on either side of the weld head collet frame using button head screws. The collet inserts are not threaded to eliminate stripped threads in the collet frame, which is more expensive to repair or replace.
2. Accomplish firm clamping by slight over-closure of the collet frame. Compliance and preload are provided by the collet frame adjustable latch mechanism.

⚠ *The latch lever provides very high clamping loads with minimal effort. After adjusting the thumbscrew on the latch mechanism, the toggle action of the lever should require no more than light pressure of one finger to close. Over-tightening can result in damage to the collet frame or tubing.*

2.4 Mounting the weld head

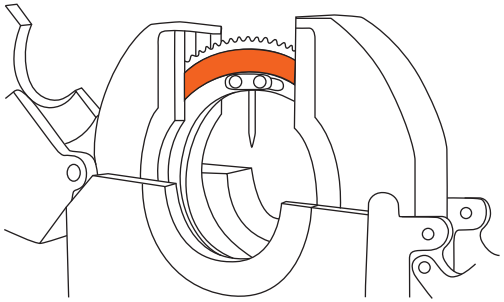


Do the following:

1. Install suitable collets on the weld head.
2. Install suitable electrode in the holder.
3. Mount the weld head on the tube and align the tungsten electrode with the welding joint.
4. Close one side of the weld head and lock it against the tube with the latch.
5. Place the other tube very tightly against the first tube already clamped.
6. Close the other side of the weld head and lock with the latch.
7. Look through the hole on top of the weld head to ensure that the alignment is right.
8. Close the hole cover.

3. OPERATION

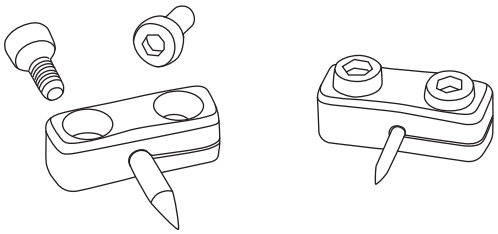
3.1 Rotor gear



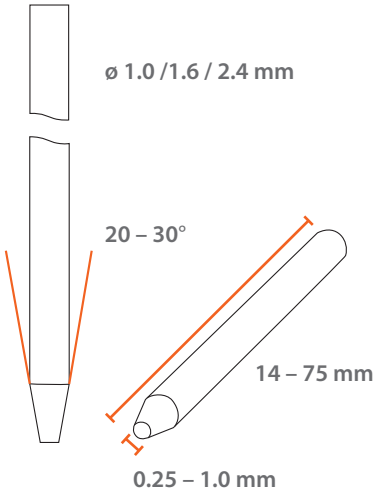
Weld head contains a rotor gear that drives the electrode around the tube. Rotor gear is U-shaped to allow easy placement of the weld head on and off the tube. Electrode is fastened on the rotor gear with an easily replaceable electrode holder. The holder prevents the rotor gear from damage.

Electrodes and holders are available in the following diameters:

- 1 mm (.040")
- 1.6 mm (.062")
- 2.4 mm (.094")



3.2 Tungsten electrode



Electrode diameter, tip geometry, and arc gap are important factors in repetitive precision welding. The electrode must be exactly the correct length with a maximum tolerance of 0.1 mm.

Inserted into the holder and carefully bottomed, the electrode forms exactly the correct arc gap. Pre-grinded and cut-to-length electrodes are available.

3.2.1 Diameter and length

You can use multiple tungsten electrode sizes in each weld head by changing the tungsten electrode holder.

Order the tungsten electrodes or cut them to a precise length by yourself. When the tungsten is inserted into the holder and bottomed, it will create the desired tip-to-work distance without the need for adjustment.

Weld head	*Rotor gear*
radius	
15010	28.7 mm
15020	42.0 mm
15030	54.6 mm
15040	66.8 mm
15060	100.6 mm

The electrode must be precisely the correct length with a maximum tolerance of 0.1 mm. Its correct length depends on the weld head size, electrode diameter and tube diameter.

To determine correct electrode length, use the 150 series controller Tungsten Length Calculator. If the controller is not available, calculate cut-length by using the formula below or a calculator on the Kemppi website.

Length calculation formula:

Length = rotor gear radius – tube radius – arc gap

3.2.2 Holder

To install the tungsten electrode and holder, do the following:

1. Turn the controller power switch ON.
2. Using the +/- Rotation Jog on the weld head handle, rotate the rotor until you can see the electrode holder's postiion at the open throat area of the weld head.
3. Using 3 mm x 6 mm cap screws, install the block and tungsten electrode into desired position. The tungsten electrode mount block is a split block.
   a. Leave screws loose and push up against the tungsten intu the holder.
   b. Tighten screws, solid side first, then split side.

The standard position of the tungsten electrode as viewed from the side along the tube centerline is a 5° down from 3 o'clock. This is to avoid breaking of tungsten when installing the weld head on pre-tacked tube. You can use alternative tapped holes in rotor (8 or 6 o'clock position) e.g. in case of stripped threads in the rotor.

3.2.3 Geometry guidelines

Diameter

Use the smallest diameter tungsten electrode suitable for the weld current range for positive arc ignition and a stable arc. Thicker diameters handle high currents and have a greater life at the expense of arc starting.

Electrode diameter	*Tube wall thickness*
Up to 1.0 mm	1.0 mm
1.0–2.4 mm	1.6 mm (.062")
2.4–4.0 mm	2.4 mm (0.094")

Arc gap

The tungsten electrode tip-to-work distance, the arc length is kept to a minimum and produces a more stable arc and deeper penetration. For general tube welding, the arc gap should be adjusted between 0.75 mm (.03") and 1.8 mm (.07").

Tube wall thickness	*Recommended arc length*
0.5–1.0 mm	0.75 mm
1.0–2.0 mm	1.3 mm
2.0–4.0 mm	1.8 mm

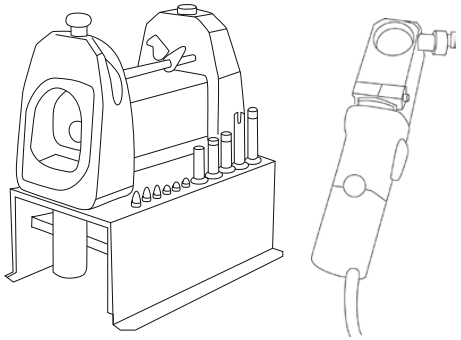
Tip angle and flat diameter

The tungsten electrode angles (included angle) between 15° to 30° enable the most automated welding. Kemppi recommends 20° for autogenous welding in the general current range used with the 150 series weld heads.

Tungsten electrode tip angle and flat diameter

Electrode Diameter mm	*Flat diameter mm*	*Included Angle (deg)*	*Constant current Range (amp)*	*Pulsed current Range (amp)*
1.0 mm	0.25 mm	20°	1	
1.6 mm	0.5 mm	20°	8–50	8–100
1.6 mm	0.75 mm	20°	10–70	10–140
2.4 mm	0.75 mm	30°	12–90	12–180
2.4 mm	1.0 mm	30°	15–150	15–250
3.2 mm	1.0 mm	30°	20–200	20–300

3.3 Electrode sharpeners



Ultima – TIG – cut NEUTRIX

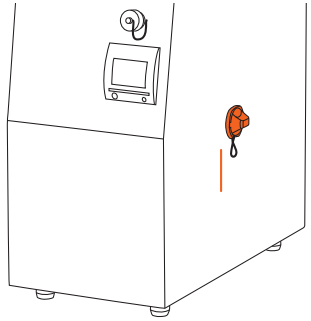
Use sharpener to sharpen the electrodes, to cut them to correct length, and to help gather and recycle welding dust.

Desktop model (recommended) allows more precise lengths. It recycles dust into liquid instead of air. You can also use a hand-held model. Only sharpening is possible with the hand-held model, not accurately cutting to length.

You can obtain a faster and more uniform grinding result compared to manual grinding with an optional auto-grind device.

⚠ *Tungsten is the most suitable material for welding electrodes but it is hazardous as waste and when breathed.*

3.4 Filling water cooler with coolant



You can fill the water tanks with normal tap water. However, the degree of water purity as well as the temperature of the environment determine if you need to apply additives and/or otherwise take care of the water supply.

ⓘ *When employing TIG system at temperatures below +8 °C, add an anti-freeze medium.*

1. Fill the water tank with 3.5 liters of Kemppi torch coolant fluid or equivalent (Monopropylenglycol).
2. Use max. 40 % of coolant fluid added to water. This will provide freezing protection to -25 °C.

ⓘ *Do not use distilled or demineralized water. Zinc deficiency causes corrosion and a risk of leakage.*

ⓘ *Even if the temperature stays above +8 °C, use a small quantity (ca. 10 %) of anti-freeze additive. It prevents adverse algal growth in warm water.*

The amount of cooling fluid required depends on the cable length of the weld head. Normally, 3.5 litres is sufficient. Check the level of coolant after several minutes of first turning on power to top off the coolant level as required.

3.5 Preparing for welding

1. Turn the power supply ON.
2. Clamp the weld head on the workpiece.
3. Purge the gas hose and chamber of the weld head using the purge button on the power supply. Purge the weld head and gas line for approximately ten (10) minutes prior to the start of welding each shift.
4. Purge the tube ID in preparation for welding with backing gas.
5. Load the appropriate weld program number as described in the power supply manual. The red LED on the handle next to the Home position ignites. If this does not occur, press the Home button. The rotor rotates until Start position is reached, and LED ignites. Press the Start Weld button.

Do not start the head if it is out of its Home position because it is then exposed to the walls of the chamber and collets that are at work return potential. While welding, the arc voltages are so low as to have no consequences, but during the start sequence having the gear partially exposed may cause misfire. In rare cases this can create an arch-over, allowing the follow on welding current to establish between the rotating gear and the housing. This will only happen if at the same time the tungsten-to-workpiece-to-collet conductivity is poor due to oxidation or contaminated from machining operations, primarily lubricants.

6. At the completion of the weld the auto rewind function rotates the rotor into "open throat" position to allow the weld head to be removed. If you do not use this function, press the Home button once again. The rotor rotates into correct position to allow the weld head to be removed from the workpiece.
7. Open both sides of the hinged collet frame and remove the weld head from the workpiece.

3.5.1 Preparing the workpiece

For successful fusion welding, do the following:

1. Ensure that the tube ends (or fittings) are machined square relative to their axis.
2. Place the two ends butt-tight together.
3. Leave no gap between the tube ends resulting from lack of squareness or burrs left from the machining process.
4. Once the tube end is faced off, check for burrs. Any burrs must be carefully removed with a hand-held deburring tool.
5. If the tube wall thickness variation exceeds 10%, use chamfer cut of 5° on the inside of the tube ends.

After the tube has been machined, it must be properly cleaned using the following procedure:

1. Wipe the tube end with a lint-free towel dipped in a solvent, such as acetone or denatured alcohol, and immediately wipe with a second clean cloth before the solvent dries. Use an abrasive cloth to remove any surface oxides or contaminants. Clean the tube end back to approximately 12 mm.
2. Repeat the cleaning operation. Ensure that tube's inner diameter is similarly cleaned.

3.5.2 Shielding and backing gas

Select proper shield gas/gas mix for optimum results.

100% argon is normally used for TIG welding. In certain cases, you can benefit from using a mixed gas, such as 95% argon, 5% hydrogen. This mixed gas gives better control of the weld puddle and lower heat input. Adding hydrogen or helium increases the arc voltage and creates a "stiffer", more focused arc column.

Industrial grade inert gas is sufficient for most stainless steel welds. Use a higher purity grade for high quality welds on easily oxidizable alloys.

The purpose of purging is to replace unwanted air and other vapor contaminants from the root pass by a gas that prevents oxidation during welding. Oxidation can produce a variety of problems, such as root oxidation (sugar), incomplete fusion, porosity and changes in weld chemistry, which can affect weld mechanical and corrosion resistance properties adversely.

Use purging when welding stainless steel, nickel alloys, and most nonferrous base metals. Argon is commonly used.

The "chamber" created around the tube joint by the installation of the weld head is flooded with inert gas that both protects the weld puddle from oxidation and the tungsten electrode. The gas hose material used in the weld heads is specifically designed to prevent atmospheric moisture from contaminating the shielding gas by permeation.

The gas regulator/flow meter should be set for 4 bar (60 PSI) and a suitable flow rate. Recommended gas flow rate is 3 to 5 l/min for backing gas and 5-10 l/min for shielding gas. Set pre-purge time so that backing gas volume is about 10 times the volume to be put inside the tube.

You can apply separate backing gas for root protection. When using backing gas, also use dual flow-meter regulator that allows having two independently regulated (shielding and backing gas) circuits from one gas bottle.

3.6 Instructions for welding

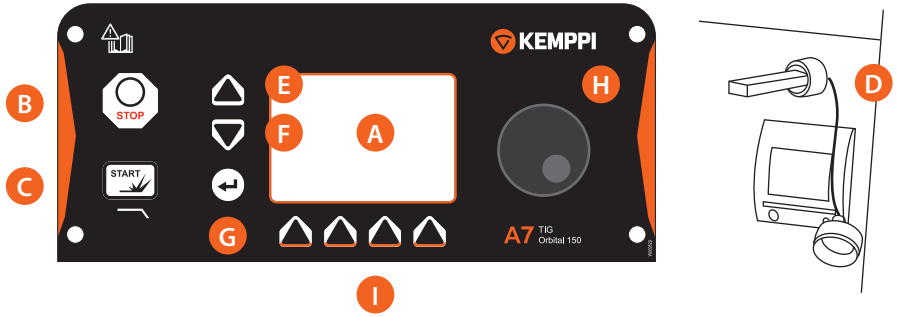
Use the following 5-step procedure to start welding:

1. Select and install suitable collets.
2. Mount weld head around the tube.
3. Pre-purge the tube ID with shielding gas.
4. Select the program you want to use.
5. Start welding by pressing the Start button.

3.7 Weld head control panel

A. Stop: immediately terminate the weld cycle and all functions of the weld head.
B. Start Weld: initiate the weld program. LED light beside the button is lit during the weld cycle. This is also a soft way to stop welding.
C. Home position: welding can be started only when the rotor gear is in its home position. It also allows easy installation and removal of the workpiece.
   1. Press the Home button to move the rotor gear to the home position.
   2. A red LED ignites next to this button, when the rotor gear reaches its home position.
D. Rotation forward or reverse: with these buttons you can move the rotor gear to either direction when welding arc is not on. This is useful when mounting or replacing the electrode or checking its condition.

3.8 Controller unit control panel



A. Color LCD display: shows the setup values, parameters and the soft key functions.
B. Stop: terminates the weld cycle and all weld head functions.
C. Start Weld/Start Downslope: starts welding or initiates downslope if welding is in progress.
D. USB port: connect memory stick to back up programs and copy them from one power source to another, to download QC programs, and to save welding parameters and print them on a PC.
E. Cursor up: highlight the item above on display.
F. Cursor down: highlight the item below on display.
G. Enter: activate the highlighted item.
H. Control knob: increase/decrease the value of the selected item.
I. Soft keys (4): select menu items shown on the display depending on the operation mode (Setup, Programming, Operation etc.)

3.8.1 Start-up

When the control is first turned on the main display will remain off except for backlighting. After approximately 12 seconds the model, S/N, software release date, and last calibration date appear on the display.

3.8.2 Main screen/Menu

Four soft keys on the main screen allow access to:

1. Library of existing procedures
2. Help with detailed explanation of highlighted item
3. Menu that provides access to various functions and system configuration
4. New to create a new weld program.

Library

Programs are listed. Use the up/down cursor to scroll through programs. Select program with Select (soft key). Library displays the following choices:

- Weld Number XX
- Run
- Review Parameters
- Review Notes
- Edit Weld

Scroll through the list to make your selection.

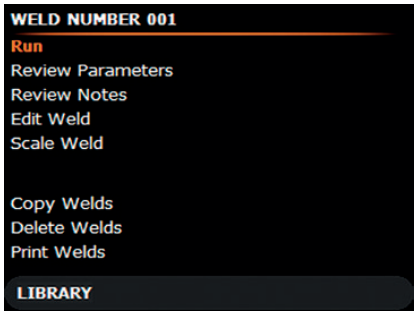
To run, review, and edit existing program in Library

Move cursor to desired program and press Select.

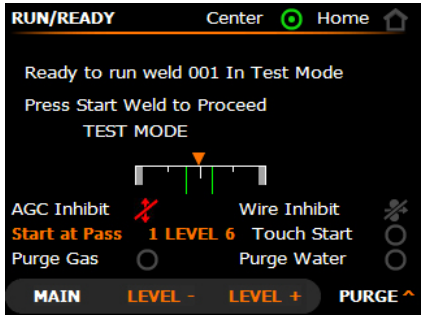
Only weld numbers 001 to 099 are in use to store programs in internal memory. Weld number 100 and above are used when exporting weld programs to another power source.

To run a weld in Library

1. Move cursor to Run (highlighted in red). Press Select.



Also use cursor and Select to Review Parameters, Review Notes, and Edit Weld.



2. Press Start Weld to initiate weld or press Purge to pull in gas solenoid if you want to use a longer purge time. (For example, to purge gas lines when first connecting the weld head to the power source.)

Menu

Use the Up/Down cursor to select from software accessories:

- Maintenance Menu
- Copy Welds
- Delete Welds
- Print Welds
- QC Set-up
- Options

New

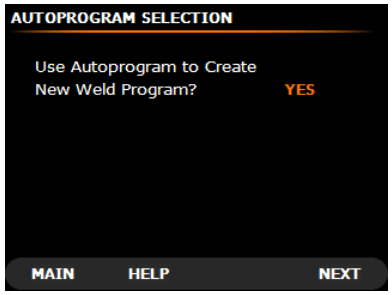
Create procedures using either the Auto program or standard manual entry.

Navigating

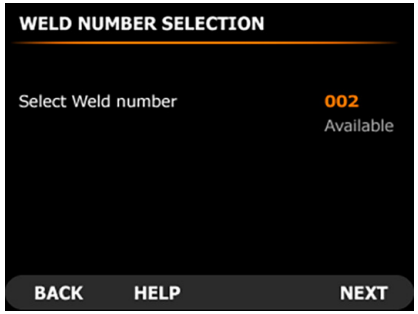
- Select and proceed through a task using four soft keys (see Main screen/ Menu). The selected item is highlighted in red. To select an item, use the up/down keys to highlight the selection in red (move the cursor).
- To change a numerical value, select Yes/No, or select an item from a drop-down menu using the control knob.
- To move to the next screen, press the Next soft key.
- Certain items are selected using Enter: for example, the digit to be changed (00.00) or the text labeling subroutine.

3.8.3 Using Auto program

You can automatically select certain default values by using Autoprogram. For example, to always use four levels. To change these default values, you must edit the weld program after it has been generated.



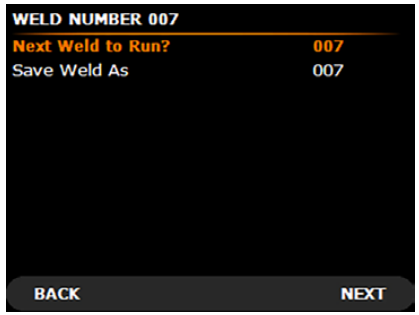
1. Select Yes with the control knob. Press Next.
2. If Password Protection has been applied, you will be asked for your password to continue.
3. Select Weld Number using the control knob.
4. Press Next when finished.
5. Use Back to move to previous screen.



1. Use the cursor to select each line (highlighted in red).
2. Use the control knob to select Head Model and Material.
3. Use Enter and the control knob to select and change each digit of O.D. and Wall Thickness.
4. Press Next when finished.

Use cursor to select line and the control knob to modify Next Weld to Run. You have two choices:

1. Repeat the weld program. At the completion of a weld, the same program is automatically loaded so that you don't need to re-enter the weld number.
2. Run a different weld program to create work cycles. Press Next when finished.



3.8.4 Override Limit function

You may override any of the pre-programmed values, but only within the limits defined during programming. The percentage of override limits can be individually programmed for each parameter between 0–100% of the programmed value.

You can gain sufficient override capacity to compensate for tube fit variations, for example, but avoid to modify the original program outside of specified heat input limitations. The override limits are saved with each weld, which allows different override values based on which the weld is run.

Use cursor to select line, the control knob to modify.

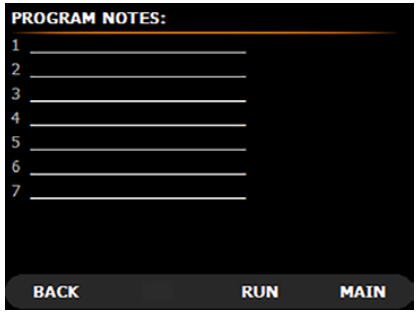
3.8.5 Program information

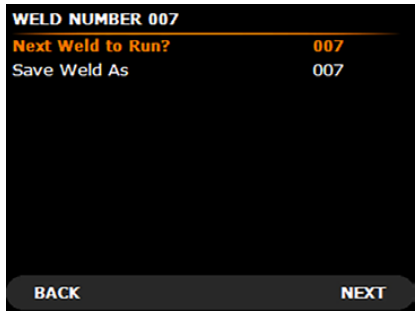
1. Use cursor to select item, the control knob to modify.

Certain items have been previously selected and cannot be changed (i.e. Weld No., Data, OD, etc.). The cursor will bypass these items. To add description under Project and Drawing, see Alphanumeric Labeling.

2. Recording notes

Use cursor to select line for additional notes. Save if all program selections have been completed (or press Back to make corrections).





Use cursor to select line, the control knob to modify.

3. Next Weld to Run

You have two choices:

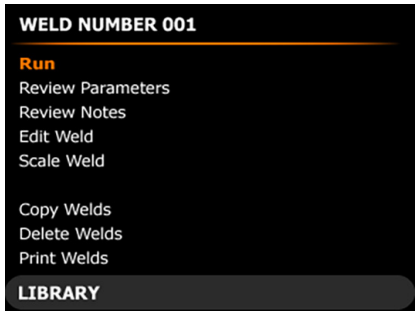
a. Repeat the weld program. At the completion of a weld, the same program will automatically be loaded, eliminating the need to enter the weld number again.
b. Run a different weld program. Press Next when finished.

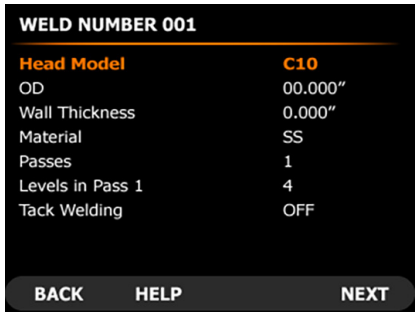
Completion of programming

Press Main to exit to Main Menu. Press Run to immediately weld with the new program.

Editing a weld program

Move cursor to edit. Press Select (soft key).

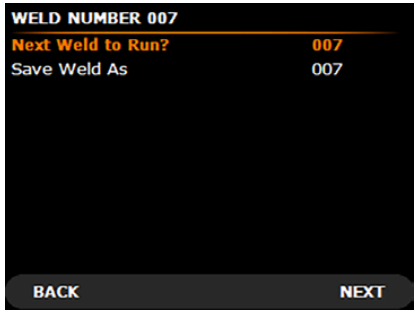




Use cursor to select item. Modify with the control knob.

Certain items may not be modified. The cursor will bypass these items.

Choose Next to move through levels and edit as you go.



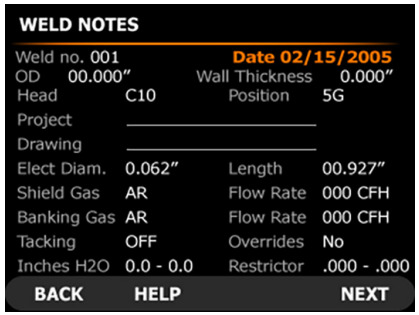
The edited weld will overwrite the original program if the same weld number is selected. To create a new program, select an unused program number.

3.8.6 Alphanumeric labeling

Using the floating keyboard

The keyboard is accessible when a highlighted line requires keyboard input; such as in the Password Entry or Program Notes screen or on any other text entry line.

Use the cursor to select the item to be labeled.



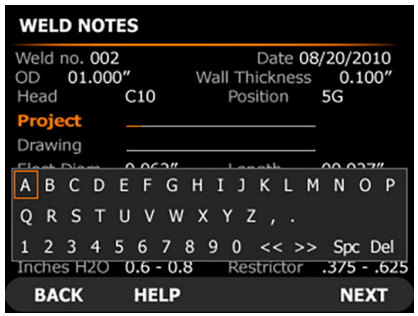
Entering text

1. Press Enter on a text entry line to display the floating keyboard.
2. Use the control knob to select a character.
3. Press Enter to insert selected on the line.

Arrow keys move the highlighted character to the left or right along the line. You can replace a typed character by moving the highlighted cursor on it and using the control knob.

Use Delete (Del) to erase a line. This function only deletes the last character on the line.

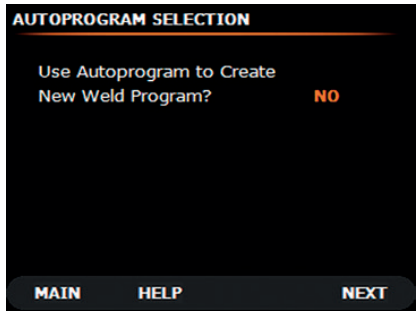
To end text entry and move to the next line on the screen, press Up or Down.



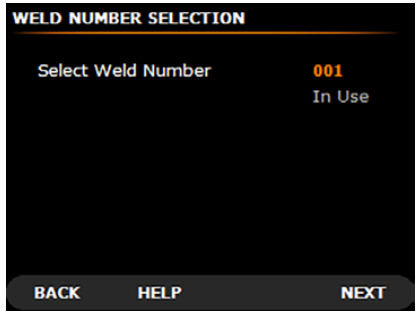
3.8.7 Manual programming

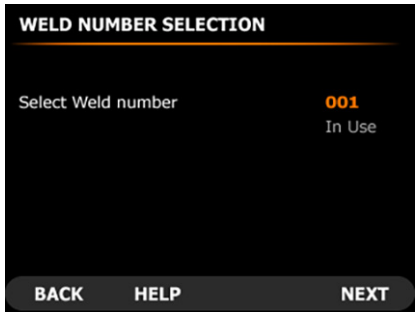
Use in the same way as Auto program but select each parameter and technique that you want to use. If password protection has been applied, you will need to submit password to continue.

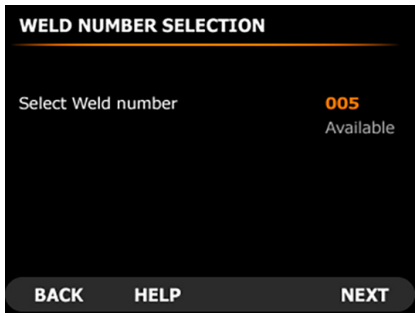
1. Select No with the control knob. Press Next.



2. Select Weld Number with control knob. Press Next.



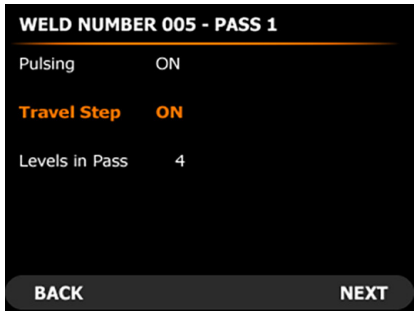




1. Input all information as in Autogen but select the number of Passes and Levels.
2. Move the cursor to the desired line and use the control knob or Enter and control knob for OD and Wall Thickness.
3. You can turn on Auto tack program if necessary using the control knob.
4. Press Next.

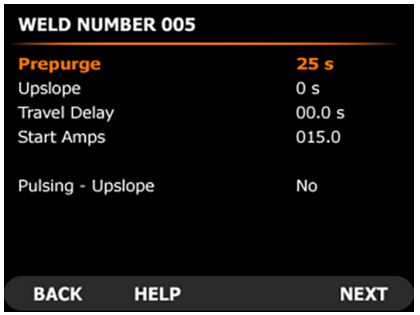
3.8.8 Pulsing levels

You can select pulsed or non-pulsed current. Move the cursor and use the control knob to change selections. Pulsing varies the current between high and low values.



3.8.9 RPM Step

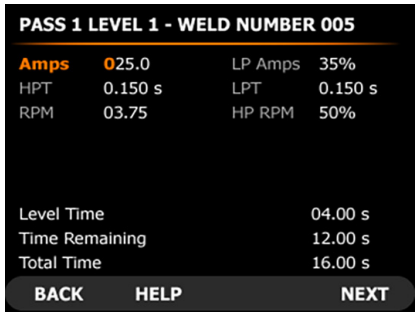
RPM Step can be turned on/off. This function indexes tungsten electrode rotation with pulsed current. Tungsten electrode will rotate during low current pulse and stop on high current pulse (or be set to run at a percentage of low current speed). Press Next.



3.8.10 Pre-purge – Upslope Screen

Move the cursor and enter values with the control knob. Press Next when finished.

- Pre-purge: the time period when gas flows at weld start before arc ignition (seconds).
- Upslope: the time period in seconds that the weld current ramps up from start amps value to level 1 value.
- Travel Delay: the period (seconds) beginning at end of upslope before rotation begins. Used to establish penetration.
- Start Amps: current level at which arc is initiated.



3.8.11 Pass level screens

Pass 1, Level 1

Move the cursor and enter values with the control knob.

- Amps: current at each level (using pulsed current, this is high pulse current).
- RPM: Rotation Speed
- LP Amps: Low Pulse Amperage, shown as percentage of high pulse current.
- HPT: High Pulse Time Period, in seconds.
- LPT: Low Pulse Time Period, in seconds.
- HP RPM: rotation speed on high current pulse (shown only when RPM STEP is turned ON). Can be set at any percentage from 0–99 of the low pulse speed listed RPM.
- Level Time: the time during which these parameters will be active in seconds.
- Time Remaining: as the tube size is input, selection of RPM automatically calculates Total (weld) Time.
- Time Remaining: automatically calculated once Level Time is entered.
- Total Time: total time for weld in seconds. Enter values and press Next soft key to go to Level 2.

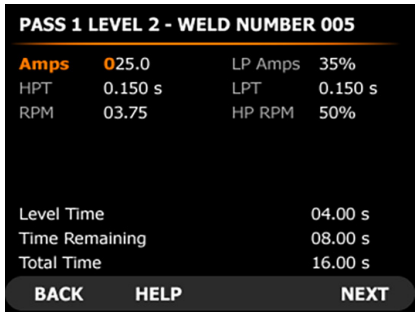
Parameters are automatically carried down through the levels.

The software of the 150 series controller makes it very easy to copy parameters from one level to the next by merely pressing Next.

Be careful when changing parameters at one specific level to avoid unwanted changes.

Example

You wish to change the amperage originally programmed in Level 4 of a one pass weld. However, other parameter changes occur in a subsequent level, such as level 5 or 6. If you make the change in amperage in Level 4 and press Next, you will automatically copy all of the Program Level 4 values into Level 5. Therefore, note any other changes that are occurring in subsequent levels within the pass before modifying any parameter in that pass. This is only true for Level parameters within any given pass. For a multi-pass weld, once you move to a subsequent pass, the parameters will not be copied from the previous pass.

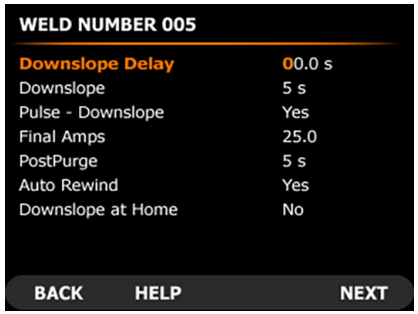


Pass 1, Level 2

Move the cursor and enter values with the control knob and press Next, or if no change is necessary, just press Next.

Pass 1, Level 3 to Final Level

Continue moving through the screens for each level and change parameters as needed



3.8.12 Other screens

Downslope Screen: move the cursor and enter values with the control knob. Press Next when complete.

Downslope Delay: downslope of weld current will occur immediately at the tie-in of the start location. If you want an overlap of the weld, set the desired seconds of Downslope Delay.

Downslope: downslope or current taper time period in seconds.

Pulsing Downslope: choice of pulse current or steady state current during downslope period (Yes or No).

Final Amps: weld current level just prior to arc termination.

Post-purge: time period gas flows after arc termination (seconds).

Auto Rewind: if this feature is "switched on" (by selecting Yes on the display), it will cause the weld head to automatically rewind at completion of a weld and come to a halt at the starting rotational position. Post-purge will also occur simultaneously with auto rewind.

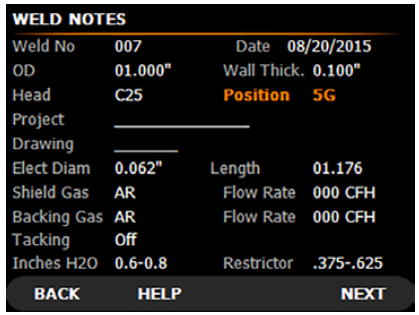
Downslope At Home: if this function is left off, program downslope will occur at the time out (completion) of the final level. If this function is turned ON with the control knob, program downslope will begin exactly as Home position is actuated. (If starting from Home position, this will be one 360° revolution, then downslope will still occur at 360° Home.

This may override level times. For example, if only one level of 15 seconds is programmed, for a 1 RPM weld (requiring 60 seconds), the weld will still be made with downslope at Home, even though there was inadequate time to complete the weld in the total level times. If the level times are longer than 360°, then downslope will still occur at 360° Home.

Parameter Override: use cursor to select line, the control knob to modify.

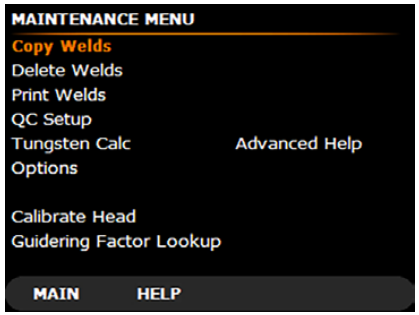
3.8.13 Override Limit function

You may override any of the pre-programmed values, but only within the limits that may be defined during programming. The percentage of override limits can be individually programmed for each parameter between 0–100 % of the programmed value. You can have sufficient override capacity to compensate for tube fit variations, for example, but to avoid modifying the original program outside of specified heat input limitations. The override limits are saved with each weld so that they allow different override values based on which the weld is being run.



3.8.14 Maintenance Menu

In the Main Menu screen, press Menu. This will open the Maintenance Menu screen. Most functions are password-protected if this option is selected.



Copy Welds (power source internal memory)

You may want copy an existing weld program as a starting point for creating a new weld program for a different tube size using the editing feature.

1. In the Maintenance Menu screen, select Copy Welds and press Enter.
2. Enter the program numbers for source weld and destination weld, then press Copy.

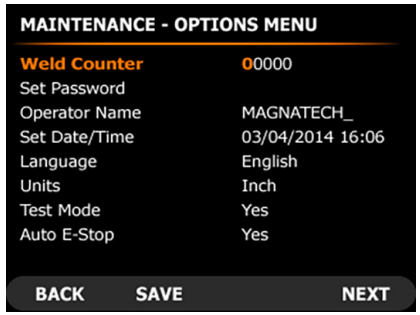
The Copy function allows you to copy a weld program within the power source's internal memory. (For example, an existing weld number 2 could be copied to weld number 10, assuming no program number 10 exists.) The program will not be deleted from weld number 2; two copies of the program now exist.

When performing a Copy or Transfer to a destination program of the same number, the new file does not write over the existing file. You may delete the existing file or select an unused destination program number.

Weld numbers 1–99 are files stored in the internal memory of the power source.

3.8.15 Options Menu

Any changes made on this screen become active immediately but are lost when the power is switched off. To maintain changes, press Save after all changes are made on the screen.

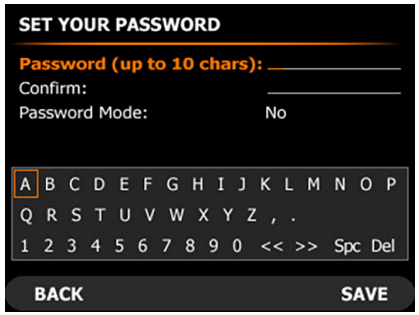


Setting the weld counter

At completion of each weld, the system stores the actual parameters run and related weld ID number, operator name, and time and date to print out if necessary. The weld number sequentially increases by one digit per weld. You can set/reset the weld counter at any specific number using the control knob.

Setting the password

Press Enter. Password screen appears. Press Enter. An alphanumeric pop-up field appears. Enter a password up to 10 characters using the technique described in section Alphanumeric labeling. To confirm password, press Save.



Entering operator's name

Enter operator's name using the technique described in section Alphanumeric labeling.

Setting date and time

Press Enter to select the Date/Time field and set date and time.

Setting the language

Use the control knob to scroll through the alternatives.

Setting the units of measure

The control knob lets you scroll between Standard and Metric.

Using the test mode

If you need to use the test mode, use the control knob to select Yes.

This mode allows simulation of an actual weld with sequencing through the weld program and simultaneous rotation of the weld head. By using this function You can observe the rotation of the tungsten electrode while changing the various levels of the program on the display. It is a useful diagnostic tool if you suspect malfunction during the weld mode. A service technician can operate the system in a simulated weld mode without the need to worry about the arc. In the test mode, the contactor signal to the power supply is disabled, preventing initiation of high frequency and a welding arc.

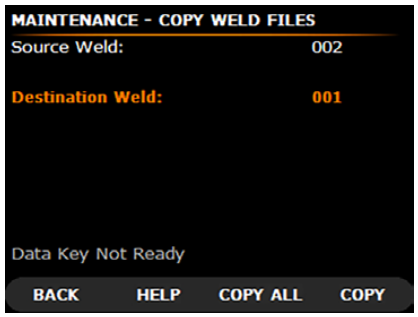
1. Exit the Options menu.
2. Select a program to run. TEST MODE appears on the screen.
3. Press Start Weld.

Following the pre-purge and current upslope time interval, the rotation motor on the weld head becomes operational. It will continue operation until current downslope is over. If the Auto Rewind function has been programmed to occur, it follows after the completion of the simulated weld. The gas solenoid is pulled in during pre-purge, welding, and post-purge.

3.8.16 Copying/transferring files to memory stick

(*These are the actual weld programs, not print files. They are special file types formatted for the welding control system, not human-readable files.)

1. To transfer a weld program from internal memory to a memory stick or vice versa, place the stick in the USB port on the front of the power source. The stick will require approximately 1 minute to initialize, during which time the LCD on the side of the key will slowly pulse. When it is ready, it will blink rapidly 5 times.
2. In the Maintenance Menu, select Copy Welds and press Enter. Enter the desired program numbers for source weld and destination weld, then press Copy. For weld programs 100 and above, indicate a program to be stored (or presently stored) on the stick.



When performing a copy or transfer to a destination program of the same number, the new file does not write over the existing file. You can delete the existing file or select an unused destination program number.

Until the stick has finished initializing, a message will appear on the display "Data Key Not Ready". If no stick is installed, ERROR message will also display.

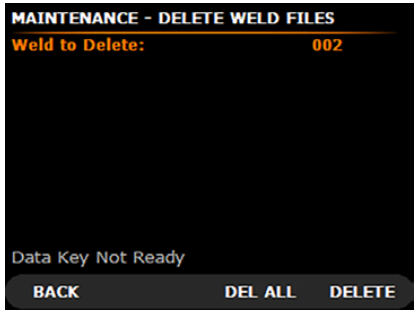
3.8.17 Deleting welds

The Delete function is used to remove unwanted programs from memory.

1. In the Maintenance Menu, select Delete Welds and press Enter.
2. Use the control knob to select a weld program.
3. Press Delete.

You can also use this feature to delete welds from a memory stick if it has been installed and initialized. Program on the stick is numbered 100 and higher.

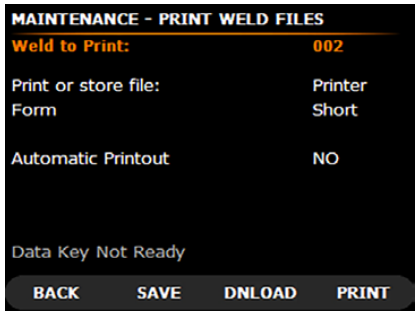
Only existing weld programs are displayed in the Delete screen.



3.8.18 Printing welds

On the Print Weld Files screen you can print to the built-in paper tape printer and/or an internal memory location. Printing to the printer provides an immediate hard copy of the weld program. You can print weld programs to memory one or more times over a period of time and then download them to a memory stick for storage or transfer them to other electronic media. The contents of memory will be deleted.

1. On the Maintenance Menu, select Print Welds.



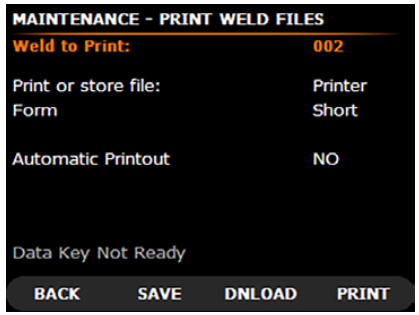
2. Select Weld To Print.
3. Using the control knob, enter the weld number to print.
4. Select Print or Store File.
5. Use the control knob to select: Memory, Printer, or Both.
6. Select Short Form (parameters only) or Long Form (parameters, as well as all procedure information and notes).
7. To save the settings that have been changed on the Maintenance / Print Weld Files screen, press Save.

Memory	Internal memory
Print	Transfer files for printing to integrated printer or transfer to memory stick for printing using a PC.
Automatic Printout	If set to Yes, the printout automatically occurs following each weld.

3.8.20.1 Transferring print files to memory stick

You can use a memory stick to transfer or move files to a standard PC equipped with a printer for later printout.

1. Select the weld number to transfer and use the control knob to select Print to Memory, Print, or Both.
2. Press Print. A screen will state that the weld has been successfully saved to memory.
3. Save one or more welds to print later. (The memory stick does not have to be installed at this time.)



To transfer a weld program from internal memory to a memory stick:

1. Place the stick in the USB port in the front panel.
2. The stick will require approximately 1 minute to initialize, at which time the LCD on the side of the key will slowly pulse.
3. When the stick is ready, the LCD blinks rapidly 5 times.

4. If no stick is installed or it has not yet finished initializing, an error message displays.
5. Press Dnload to download all stored print files to the stick.

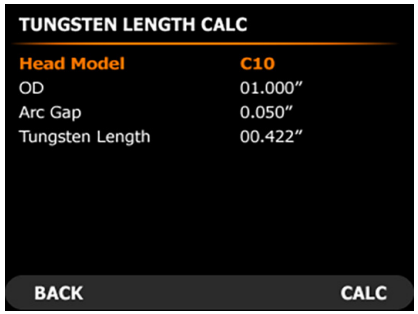
Dnload will delete these programs from memory.

You can open the print files saved on a memory stick in any text editor, such as Microsoft® Word, Microsoft® Notepad, or Microsoft® Excel.

In case you see an error message, return to Main Menu and re-enter the print screen. "Error" will change to "Dnload". If a memory stick is installed and initialized prior to entering the print screen, this step is not required.

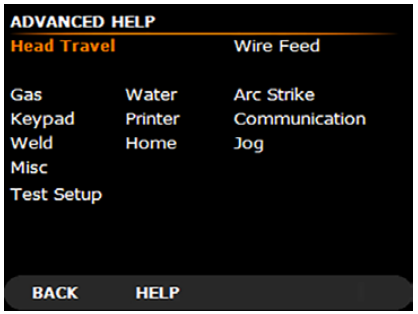
3.8.19 Tungsten electrode length calculator

To determine the optimum cut-length for the tungsten electrode, refer to this screen. For 800 series weld heads, tungsten electrode length is calculated based on tube OD.



3.8.20 Advanced Help

Advanced Help allows you to diagnose problems which may result from an external situation (e.g. an empty gas bottle) or an internal situation (e.g. the weld head control cable is damaged or not connected). Advanced Help provides assistance for the operator as well as for a competent electric repair technician.



3.8.21 Autotack

Tack welding is useful when welding larger diameter tubes, for which Autotack automatically generates a tack-welding program. Select 4 or 8 equally spaced tacks. Tacking parameters penetrate approximately 70% of the tube wall. If the intention is to make the weld to immediately follow tacking, set the welding program as the "Next Weld to Run" and the program is loaded automatically.

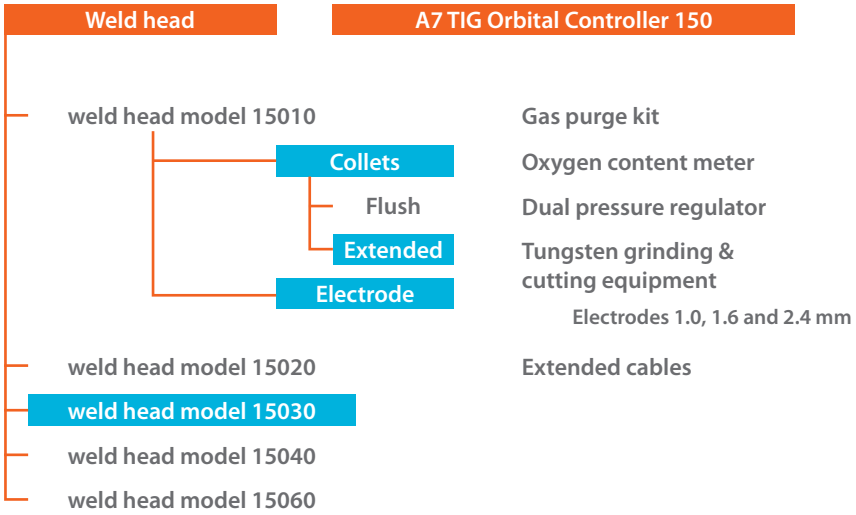
4. ADDITIONAL DETAILS

4.1 Technical data

Property	*Value*
Mains connection voltage	230 VAC ± 10%
Fuse (delayed)	16 A
Maximum output current	220 A @ 40 %, 170 A @ 100 %
Weld heads	150 series
Pipe outer diameter (O.D.)	3.2–152.4 mm
Welding positions	All
Auto-stop	Yes
Type of ignition	HF
Cooling (controller unit)	Forced air
Cooling (weld head)	Internal coolant circulator
Controller external dimensions (L x W x H)	501 x 273 x 670 mm
Weight	32 kg
Degree of protection	IP 23
Operating temperature	-20…+40 °C

5. ORDERING INFORMATION

The chart below shows the products and options required. A complete orbital welding system requires an orbital controller, a weld head of suitable size, collets for the weld head (extended or flush) and cut-to-length tungsten electrodes. There are several additional pieces of equipment available as listed below to complete a productive orbital welding environment.



Product ordering codes:

Product name	*Product code*
A5 TIG Orbital Controller 150	6204150
15010 Orbital weld head	6206002
15020 Orbital weld head	6206003
15030 Orbital weld head	6206004
15040 Orbital weld head	6206005
15060 Orbital weld head	6206006
Tungsten electrode 1.0 mm, L = 175 mm, 10 pc	9873531
Tungsten electrode 1.6 mm, L = 175 mm, 10 pc	9873532
Tungsten electrode 2.4 mm, L = 175 mm, 10 pc	9873533
150 Series Orbital Tungsten Mount Kit 1.0 mm	SP800681
150 Series Orbital Tungsten Mount Kit 1.6 mm	SP800682
150 Series Orbital Tungsten Mount Kit 2.4 mm	SP800683
Extension cable, 15 m A7 TIG Orbital Controller 150	SP800693
Dual flow meter regulator	SP800680
Ultima TIG-cut, tungsten electrode cutting/sharpening machine	6270001
Neutrix, portable tungsten electrode sharpening machine	6270002
Auto grind, tungsten electrode automated grinder	6270003
Purge plug kit 10–100 mm	6206009
Oxygen content meter 10–1000 ppm	6206008
Printer paper roll 58 mm	SP800692

Electrode lengths for different tube OD, 15010 weld head				
		Electrode diameter		
Tube OD	Tube OD	1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
3.17	0.125	26.4	25.8	25.3
6	0.236	25.0	24.4	23.9
6.35	0.250	24.8	24.2	23.7
8	0.315	24.0	23.4	22.9
9.53	0.375	23.2	22.6	22.1
10	0.394	23.0	22.4	21.9
10.2	0.402	22.9	22.3	21.8
12	0.472	22.0	21.4	20.9
12.7	0.500	21.6	21.1	20.6
13	0.512	21.5	20.9	20.4
13.5	0.531	21.2	20.7	20.2
15.88	0.625	20.0	19.5	19.0
16	0.630	20.0	19.4	18.9
17.2	0.677	19.4	18.8	18.3
18	0.709	19.0	18.4	17.9
19	0.748	18.5	17.9	17.4
19.05	0.750	18.4	17.9	17.4
20	0.787	18.0	17.4	16.9
21.3	0.839	17.3	16.8	16.3
22	0.866	17.0	16.4	15.9
23	0.906	16.5	15.9	15.4
25.4	1.000	15.3	14.7	14.2

Electrode lengths for different tube OD, 15020 weld head				
Tube OD	Tube OD	Electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
6.0	0.236	38.3	37.7	37.2
6.4	0.250	38.1	37.6	37.1
8.0	0.315	37.3	36.7	36.2
9.5	0.375	36.5	36.0	35.5
10.0	0.394	36.3	35.7	35.2
10.2	0.402	36.2	35.6	35.1
12.0	0.472	35.3	34.7	34.2
12.7	0.500	34.9	34.4	33.9
13.0	0.512	34.8	34.2	33.7
13.5	0.531	34.5	34.0	33.5
15.9	0.625	33.3	32.8	32.3
16.0	0.630	33.3	32.7	32.2
17.2	0.677	32.7	32.1	31.6
18.0	0.709	32.3	31.7	31.2
19.0	0.748	31.8	31.2	30.7
19.1	0.750	31.8	31.2	30.7
20.0	0.787	31.3	30.7	30.2
21.3	0.839	30.6	30.1	29.6
22.0	0.866	30.3	29.7	29.2
23.0	0.906	29.8	29.2	28.7
25.4	1.000	28.6	28.0	27.5
26.9	1.059	27.8	27.3	26.8
28.0	1.102	27.3	26.7	26.2
29.0	1.142	26.8	26.2	25.7
30.0	1.181	26.3	25.7	25.2
33.7	1.327	24.4	23.9	23.4
35.0	1.378	23.8	23.2	22.7
38.1	1.500	22.2	21.7	21.2
40.0	1.575	21.3	20.7	20.2
41.0	1.614	20.8	20.2	19.7
42.4	1.669	20.1	19.5	19.0
44.5	1.752	19.0	18.5	18.0
48.3	1.902	17.1	16.6	16.1
50.8	2.000	15.9	15.3	14.8

Electrode lengths for different tube OD, 15030 weld head				
Tube OD	Tube OD	Electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
9.5	0.375	49.1	48.5	48.0
10.0	0.394	48.9	48.3	47.8
10.2	0.402	48.8	48.2	47.7
12.0	0.472	47.9	47.3	46.8
12.7	0.500	47.5	47.0	46.5
13.0	0.512	47.4	46.8	46.3
13.5	0.531	47.1	46.6	46.1
15.9	0.625	45.9	45.4	44.9
16.0	0.630	45.9	45.3	44.8
17.2	0.677	45.3	44.7	44.2
18.0	0.709	44.9	44.3	43.8
19.0	0.748	44.4	43.8	43.3
19.1	0.750	44.3	43.8	43.3
20.0	0.787	43.9	43.3	42.8
21.3	0.839	43.2	42.7	42.2
22.0	0.866	42.9	42.3	41.8
23.0	0.906	42.4	41.8	41.3

Tube OD	Tube OD	electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
25.4	1.000	41.2	40.6	40.1
26.9	1.059	40.4	39.9	39.4
28.0	1.102	39.9	39.3	38.8
29.0	1.142	39.4	38.8	38.3
30.0	1.181	38.9	38.3	37.8
33.7	1.327	37.0	36.5	36.0
35.0	1.378	36.4	35.8	35.3
38.1	1.500	34.8	34.3	33.8
40.0	1.575	33.9	33.3	32.8
41.0	1.614	33.4	32.8	32.3
42.4	1.669	32.7	32.1	31.6
44.5	1.752	31.6	31.1	30.6
48.3	1.902	29.7	29.2	28.7
50.8	2.000	28.5	27.9	27.4
51.0	2.008	28.4	27.8	27.3
52.0	2.047	27.9	27.3	26.8
53.0	2.087	27.4	26.8	26.3
54.0	2.126	26.9	26.3	25.8
60.3	2.374	23.7	23.2	22.7
63.5	2.500	22.1	21.6	21.1
70.0	2.756	18.9	18.3	17.8
76.1	2.996	15.8	15.3	14.8
76.2	3.000	15.8	15.2	14.7

Electrode lengths for different tube OD, 15040 weld head				
Tube OD	Tube OD	electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
12.0	0.472	60.1	59.5	59.0
12.7	0.500	59.7	59.2	58.7
13.0	0.512	59.6	59.0	58.5
13.5	0.531	59.3	58.8	58.3
15.9	0.625	58.1	57.6	57.1
16.0	0.630	58.1	57.5	57.0
17.2	0.677	57.5	56.9	56.4
18.0	0.709	57.1	56.5	56.0
19.0	0.748	56.6	56.0	55.5
19.1	0.750	56.5	56.0	55.5
20.0	0.787	56.1	55.5	55.0
21.3	0.839	55.4	54.9	54.4
22.0	0.866	55.1	54.5	54.0
23.0	0.906	54.6	54.0	53.5
25.4	1.000	53.4	52.8	52.3
26.9	1.059	52.6	52.1	51.6
28.0	1.102	52.1	51.5	51.0
29.0	1.142	51.6	51.0	50.5
30.0	1.181	51.1	50.5	50.0
33.7	1.327	49.2	48.7	48.2
35.0	1.378	48.6	48.0	47.5
38.1	1.500	47.0	46.5	46.0
40.0	1.575	46.1	45.5	45.0
41.0	1.614	45.6	45.0	44.5
42.4	1.669	44.9	44.3	43.8
44.5	1.752	43.8	43.3	42.8

Tube OD	Tube OD	electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
48.3	1.902	41.9	41.4	40.9
50.8	2.000	40.7	40.1	39.6
51.0	2.008	40.6	40.0	39.5
52.0	2.047	40.1	39.5	39.0
53.0	2.087	39.6	39.0	38.5
54.0	2.126	39.1	38.5	38.0
60.3	2.374	35.9	35.4	34.9
63.5	2.500	34.3	33.8	33.3
70.0	2.756	31.1	30.5	30.0
76.1	2.996	28.0	27.5	27.0
76.2	3.000	28.0	27.4	26.9
85.0	3.346	23.6	23.0	22.5
88.9	3.500	21.6	21.1	20.6
101.6	4.000	15.3	14.7	14.2

Electrode lengths for different tube OD, 15060 weld head				
Tube OD	Tube OD	electrode diameter		
		1.0 mm	1.6 mm	2.4 mm
mm	inch	length [mm]	length [mm]	length [mm]
50.8	2.000	74.4	73.9	73.4
51.0	2.008	74.3	73.8	73.3
52.0	2.047	73.8	73.3	72.8
53.0	2.087	73.3	72.8	72.3
54.0	2.126	72.8	72.3	71.8
60.3	2.374	69.7	69.1	68.6
63.5	2.500	68.1	67.5	67.0
70.0	2.756	64.8	64.3	63.8
76.1	2.996	61.8	61.2	60.7
76.2	3.000	61.7	61.2	60.7
85.0	3.346	57.3	56.8	56.3
88.9	3.500	55.4	54.8	54.3
101.6	4.000	49.0	48.5	48.0
104.0	4.094	47.8	47.3	46.8
108.0	4.252	45.8	45.3	44.8
114.3	4.500	42.7	42.1	41.6
127.0	5.000	36.3	35.8	35.3
129.0	5.079	35.3	34.8	34.3
139.7	5.500	30.0	29.4	28.9
152.4	6.000	23.6	23.1	22.6

5.1.1 Collets

When ordering collets, it is important to specify the exact OD dimension of the tube or fitting. Because of the wide range of fitting manufacturers, it is necessary to specify the fitting manufacturer and type. If possible, include data sheet or drawing defining the specification for the fitting in the order.

Each fitting manufacturer has different tolerances on the dimensions of the fittings. Several fitting manufacturers have special product lines specifically designed for orbital welding.

Collets for each type of weld head are specified by:

- Weld head model
- Tube/pipe OD
- Flush or extended

The ordering codes in the above list are per pair of collets. One weld head requires two pairs.

Collet product codes for 15010 weld head					
Tube OD (inch)	Collet, Extended	Collet, Flush	Tube OD (mm)	Collet, Extended	Collet, Flush
0.125	1001227-0.125	1001232-0.125	6.0	1001234-6	1001236-6
0.250	1001227-0.25	1001232-0.25	8.0	1001234-8	1001236-8
0.375	1001227-0.375	1001232-0.375	10.0	1001234-10	1001236-10
0.402	1001227-0.402	1001232-0.402	12.0	1001234-12	1001236-12
0.500	1001227-0.500	1001232-0.500	13.0	1001234-13	1001236-13
0.625	1001227-0.625	1001232-0.625	13.5	1001234-13.5	1001236-13.5
0.677	1001227-0.667	1001232-0.667	16.0	1001234-16	1001236-16
0.750	1001227-0.750	1001232-0.750	18.0	1001234-18	1001236-18
0.839	1001227-0.839	1001232-0.839	19.0	1001234-19	1001236-19
1.000	1001227-1.00	1001232-1.00	20.0	1001234-20	1001236-20
			22.0	1001234-22	1001236-22
			23.0	1001234-23	1001236-23

Collet product codes for 15020 weld head					
Tube OD (inch)	Collet, Extended	Collet, Flush	Tube OD (mm)	Collet, Extended	Collet, Flush
0.250	1001238-0.250	1001240-0.250	6.0	1001242-6	1001244-6
0.375	1001238-0.375	1001240-0.375	8.0	1001242-8	1001244-8
0.402	1001238-0.402	1001240-0.402	10.0	1001242-10	1001244-10
0.500	1001238-0.500	1001240-0.500	12.0	1001242-12	1001244-12
0.625	1001238-0.625	1001240-0.625	13.0	1001242-13	1001244-13
0.677	1001238-0.677	1001240-0.677	13.5	1001242-13.5	1001244-13.5
0.750	1001238-0.750	1001240-0.750	16.0	1001242-16	1001244-16
0.839	1001238-0.839	1001240-0.839	18.0	1001242-18	1001244-18
1.000	1001238-1.00	1001240-1.00	19.0	1001242-19	1001244-19
1.327	1001238-1.327	1001240-1.327	20.0	1001242-20	1001244-20
1.500	1001238-1.50	1001240-1.50	22.0	1001242-22	1001244-22
1.669	1001238-1.669	1001240-1.669	23.0	1001242-23	1001244-23
1.902	1001238-1.902	1001240-1.902	26.9	1001242-26.9	1001244-26.9
2.000	1001238-2.00	1001240-2.00	28.0	1001242-28	1001244-28
			29.0	1001242-29	1001244-29
			30.0	1001242-30	1001244-30
			35.0	1001242-35	1001244-35
			40.0	1001242-40	1001244-40
			41.0	1001242-41	1001244-41
			44.5	1001242-44.5	1001244-44.5

Collet product codes for 15030 weld head					
Tube OD (inch)	Collet, Extended	Collet, Flush	Tube OD (mm)	Collet, Extended	Collet, Flush
0.375	1001246-0.375	1001248-0.375	10	1001250-10	1001252-10
0.402	1001246-0.402	1001248-0.402	12.0	1001250-12	1001252-12
0.500	1001246-0.500	1001248-0.500	13.0	1001250-13	1001252-13
0.625	1001246-0.625	1001248-0.625	13.5	1001250-13.5	1001252-13.5
0.677	1001246-0.677	1001248-0.677	16.0	1001250-16	1001252-16
0.750	1001246-0.750	1001248-0.750	18.0	1001250-18	1001252-18
0.839	1001246-0.839	1001248-0.839	19.0	1001250-19	1001252-19
1.000	1001246-1.327	1001248-1.327	20.0	1001250-20	1001252-20
1.327	1001246-1.327	1001248-1.327	22.0	1001250-22	1001252-22
1.500	1001246-1.500	1001248-1.500	23.0	1001250-23	1001252-23
1.669	1001246-1.669	1001248-1.669	26.9	1001250-26.9	1001252-26.9
1.902	1001246-1.902	1001248-1.902	28.0	1001250-28	1001252-28
2.000	1001246-2.00	1001248-2.00	29.0	1001250-29	1001252-29
2.500	1001246-2.500	1001248-2.500	30.0	1001250-30	1001252-30
3.000	1001246-3.00	1001248-3.00	35.0	1001250-35	1001252-35
			40.0	1001250-40	1001252-40
			41.0	1001250-41	1001252-41
			44.5	1001250-44.5	1001252-44.5
			51.0	1001250-51	1001252-51
			52.0	1001250-52	1001252-52
			53.0	1001250-53	1001252-53
			54.0	1001250-54	1001252-54
			60.3	1001250-60.3	1001252-60.3
			70.0	1001250-70	1001252-70
			76.1	1001250-76.1	1001252-76.1

Collet product codes for 15040 weld head					
Tube OD (inch)	Collet, Extended	Collet, Flush	Tube OD (mm)	Collet, Extended	Collet, Flush
0.500	1001254-0.500	1001256-0.500	12.0	1001258-12	1001260-12
0.625	1001254-0.625	1001256-0.625	13.0	1001258-13	1001260-13
0.677	1001254-0.677	1001256-0.677	13.5	1001258-13.5	1001260-13.5
0.750	1001254-0.750	1001256-0.750	16.0	1001258-16	1001260-16
0.839	1001254-0.839	1001256-0.839	18.0	1001258-18	1001260-18
1.000	1001254-1.00	1001256-1.00	19.0	1001258-19	1001260-19
1.327	1001254-1.327	1001256-1.327	20.0	1001258-20	1001260-20
1.500	1001254-1.500	1001256-1.500	22.0	1001258-22	1001260-22
1.669	1001254-1.669	1001256-1.669	23.0	1001258-23	1001260-23
1.902	1001254-1.902	1001256-1.902	26.9	1001258-26.9	1001260-26.9
2.000	1001254-2.000	1001256-2.000	28.0	1001258-28	1001260-28
2.500	1001254-2.500	1001256-2.500	29.0	1001258-29	1001260-29
3.000	1001254-3.000	1001256-3.000	30.0	1001258-30	1001260-30
3.500	1001254-3.500	1001256-3.500	35.0	1001258-35	1001260-35
4.000	1001254-4.000	1001256-4.000	40.0	1001258-40	1001260-40
			41.0	1001258-41	1001260-41
			44.5	1001258-44.5	1001260-44.5
			51.0	1001258-51	1001260-51
			52.0	1001258-52	1001260-52
			53.0	1001258-53	1001260-53
			54.0	1001258-54	1001260-54
			60.3	1001258-60.3	1001260-60.3
			70.0	1001258-70	1001260-70
			76.1	1001258-76.1	1001260-76.1
			85.0	1001258-85	1001260-85

Collet product codes for 15060 weld head					
Tube OD (inch)	Collet, Extended	Collet, Flush	Tube OD (mm)	Collet, Extended	Collet, Flush
2.000	1001262-2.000	1001264-2.000	6.0	1001266-51	1001268-51
2.500	1001262-2.500	1001264-2.500	8.0	1001266-52	1001268-52
3.000	1001262-3.00	1001264-3.00	10	1001266-53	1001268-53
3.500	1001262-3.500	1001264-3.500	12.0	1001266-54	1001268-54
4.000	1001262-4.000	1001264-4.000	13.0	1001266-60.3	1001268-60.3
4.500	1001262-4.500	1001264-4.500	13.5	1001266-70	1001268-70
5.000	1001262-5.000	1001264-5.000	16.0	1001266-76.1	1001268-76.1
5.500	1001262-5.500	1001264-5.500	18.0	1001266-85	1001268-85
6.000	1001262-6.000	1001264-6.000	19.0	1001266-104	1001268-104
			20.0	1001266-108	1001268-108
			22.0	1001266-127	1001268-127
			23.0	1001266-129	1001268-129

5.1.2 Tungsten electrode material

Kemppi uses ceriated tungsten to increase electrode life, arc starting, and stability, and recommends this material for orbital use.

2% ceriated = no radiation risk

These tungsten electrodes are commonly marked in grey color.

Ordering codes for standard length (175 mm) tungsten electrodes and sharpening / cutting machines:

9873531	10 pcs. 1.0 mm diameter, 175 mm long
9873532	10 pcs. 1.6 mm diameter, 175 mm long
9873533	10 pcs. 2.4 mm diameter, 175 mm long
6270001	Ultima – TIG – cut, tungsten electrode cutting/sharpening machine
6270002	Neutrix, portable, tungsten electrode sharpening machine
6270003	Auto Grind, Tungsten electrode automated grinder.

6. TROUBLESHOOTING

6.1 Operation problems

Should you experience a malfunction from your machine, please consult the trouble-shooting sections below first, and complete some basic checks.

If the machine malfunction cannot be corrected with these measures, contact your Kemppi maintenance service workshop.

The problems listed and the possible causes are not definitive but serve to suggest some standard and typical situations that may present during normal environmental use when using the A7 TIG Orbital System 150.

Problem:	*Check the following:*
Machine won't work	• Check that mains plug is connected correctly. • Check that mains power distribution is switched on. • Check the mains fuse and or circuit breaker. • Check that power source 0/I switch is ON. • Check that interconnection cable set and connectors between the power source and weld head unit are correctly fastened. See Installation section of this manual.
Dirty, poor quality weld	• Check shielding gas supply. • Check and set gas flow rate. • Check that correct welding program is selected. • Check correct selection on the control panel.
Variable welding performance	• Check welding parameter settings.

6.2 Tungsten electrode rotation not concentric to tube O.D.

The tungsten electrode should maintain an equal gap ±0.1mm (±0.005") Total Indicated Runout (T.I.R.) as it rotates around the workpiece. Variations of arc gap outside this tolerance will cause inconsistent penetration and weld bead width.

- Collets are sized to plus .075mm (.003") over tube diameter to allow production tolerance on tubing.
- Deviation of more than ± .05mm (.002"0) will cause tubing to be off-centre by more than the allowed .1mm, which will result in an inconsistent penetration and weld bead width.
- Collets should be specified to ± .5mm when ordered.

The "wheel base" of the collets determines how squarely the weld head clamps on the two tubes and how much "squaring" capability it has.

- If two long runs of tube are not parallel and standard collets are being used, the weld head cannot bring the two long lengths of tube into perfect alignment. Therefore, there will be a run-out as the tungsten electrode rotates around the tube ends.
- Correct this by using external alignment clamp or by using extended collets.

Problem	*Possible solution*
Arcing within the weld head (see Maintenance section)	Contaminated eroded or improper length tungsten electrode. • Improperly cleaned tube surface or poor contact between collets and tube may cause arcing between tube/pipe collets. • Metal debris on the inside surface of the weld head. • Arc-starting amperage too low.
High frequency but no weld current	Check for broken electrode or ground cable in the weld head, handle, or in the cable.
Defects in butt welds	
Lack of penetration with work piece in 5G (horizontal) or 2G (vertical) positions	• Insufficient current • Rotation speed too high • Contaminated gas, insufficient gas or wrong gas • Arc gap too great, wrong tungsten tip configuration or Contaminated/worn tungsten electrode • Gas flow too high • Arc not on the joint • Tube wall dimensional variation • End of tube not square • Too much gas on I.D. or no I.D. purge • Tubes not cleaned
ID location	• Increase rotation delay or increase Level 1 amps • Increase weld current or decrease weld head speed • Use next weld level 2 to increase amps • Downslope starting too soon; increase time at last level or use Start position to initiate downslope.
Concavity (suck-back) or excessive penetration	• All ID locations • Weld current too high • Rotation speed too low • Tubes not tightly butted together • Tubes ends not square • ID purge gas pressure too high; create larger gas exit hole
Over-penetration	General Most common through the 12 o'clock position in 5G (tube horizontal) welding • Increase rotation speed • Decrease weld current • Contaminated or improper gas • Gas flow too high • Tungsten arc gap may have changed or tungsten configuration has changed • Weld head not in calibration • Tubes not tightly butted • Tube ends not square ID location • Rotation delay period too long, too much weld current or • Rotation too low • Increase speed or decrease current • Current too high in weld level or may need to change to another level with reduction in current • Increase rotation delay or increase Level 1 amps • Increase weld current or decrease Head speed • Use next weld Level 2 to increase amps • Downslope starting too soon; increase time at last level or use Start position to initiate downslope
Porosity or improper gas coverage	• Contaminated gas or improper gas • Oil, dirt or other contaminant on tube ID/OD. Hole in gas line aspirating air. • Pre-purge/postpurge time too short • Poor welding tube alloy • Gas flow rate ID or OD too low

7. MAINTENANCE

When considering and planning routine maintenance, please consider the frequency of machine use and the working environment.

Correct operation of the machine and regular maintenance will help you avoid unnecessary downtime and equipment failure.

⚠ *Disconnect the machine from the mains before handling the electrical cables.*

7.1 Periodic maintenance

ⓘ *Periodic maintenance should only be carried out by a suitably qualified person. Disconnect the plug of the machine from the mains socket and wait about 2 minutes (capacitor charge) before removing any parts.*

Check at least every half year:

- Electric connectors of the machine – clean any oxidized parts and tighten loose connections.

ⓘ *Do not use compressed air for cleaning as there is a risk that the dirt will compact even more tightly into gaps of cooling profiles.*

ⓘ *Do not use pressure washing devices.*

ⓘ *Only an authorized trained electrician should carry out repairs to Kemppi machines.*

7.1.1 Factory and field calibration

Kemppi calibrates each system using instrumentation traceable according to ISO 9001. All instruments are checked for accuracy by independent laboratories at scheduled intervals. We recommend that equipment is recalibrated every twelve (12) months. You may recalibrate the power source and weld heads if proper instruments are available (with traceable calibration). Contact the factory if necessary.

7.2 Weld head maintenance

7.2.1 Calibrating the weld head

The 150 series controller software allows users to calibrate the travel speed for 150 series of weld heads. Weld heads supported by the 150 series controller software utilize built-in encoders for motor control while some others may use a tachometer. The encoder-based heads offer better control of the travel, and therefore little or no adjustment is required during the calibration process. Tachometer-based heads usually require adjustment each time they are calibrated.

Kemppi recommends that the travel speed are checked once daily to ensure accuracy.

To calibrate the head, press Menu in the Main menu to enter the Maintenance menu. Once in the Calibrate Head menu, do the following:

1. Select the model of the weld head to be calibrated.
2. Use Up/Down to navigate within the menu and Enter to make a selection.
3. If this is the first time calibrating a particular weld head or you see "Calibration Out of Range" error message, press Default after selecting the weld head to install the factory setting for the correction factor.
4. Select Travel Speed to calibrate.
5. For travel calibrations, choose the Distance to Travel or Desired RPM by rotating the dial and press Enter.
6. Press Run and measure the actual amount traveled or actual run time (or the length of wire).
7. Enter the measured value and press Save.
8. Repeat this process until you have achieved desired accuracy, then press Back to return to the Maintenance menu.

7.2.2 Cleaning the weld head

Clean the weld head periodically to maintain maximum operating efficiency. Keep the unit free of moisture, debris, and other contaminants (oil, water, abrasives, etc.) that can affect normal operation and weld consistency.

- Clean insulating components with a soft brush and a fast drying solvent, such as acetone or denatured alcohol.
- Clean drive gear assemblies using a fine wire brush and solvent. Inspect the drive gear, bevel gear, and rotor assembly to insure that debris have not damaged the rotor sprocket lobes and affected the operation of the drive assembly. Use a fine jeweler's file to repair light.
- Clean the body with a cloth or soft brush and solvent.
- Clean the collets with fine stainless steel wool or fine wire brush.

Only use stainless steel, as regular carbon steel will ruin the surface passivation. All parts must be completely dry before reassembly.

Dirt and impurities in the weld head may cause internal arcing. It is a situation where the arc jumps from the tungsten electrode to the collet frame and the welding arc fails to ignite.

7.2.3 Internal arcing

When internal arcing happens, a track of carbon is left on the dielectric material, which may cause the same problem to happen again.

To prevent internal arcing, do the following:

- Periodically clean the weld head according to instructions given above in section "Cleaning the weld head".
- Maintain the tungsten electrode in good working condition at all times.

Remember that the collet frame and collets are connected to the ground cable and act as the ground contact for the electrical circuit.

If internal arcing does occur, do the following:

- Carefully scrape all burn marks from the plastic body with a razor blade or other sharp scraping tool.
- Remove all carbon and polish with a fine wire brush.
- Remove all carbon off the collet frame and collets with a fine wire brush.
- Remove the rotor gear and polish if necessary with a fine wire brush to remove any traces of arcing.
- Clean with alcohol or other suitable solvent and a lint free cloth before reassembling.

7.3 Printer operation and maintenance

The printer is mounted in the front panel of the control unit to print program parameters and other data. The printouts remain stable for five (5) years, and they can be archived if suitably stored. This printer uses Thermal Paper P/N SP800692.

7.3.1 Installing paper in the printer

To install paper in the printer, do the following:

1. Open the hinged plastic cover over the paper roll.
2. Remove the empty roll.
3. Replace with a new roll oriented so that the paper is feeding off the bottom of the roll.
4. Lower the plastic cover until it "clicks".

7.3.2 Cleaning the printer

You can clean the surface of the printer using a soft dry cloth or a soft cloth with a neutral detergent. Do not clean using any solvents. Never wet the inside of the printer.

7.4 Updating software

The 150 series controller allows complete software upgrade via memory stick or thumb-drive. This software can be downloaded from the Kemppi datastore as an email attachment. Please contact Kemppi's service department for upgrade information. Please have the serial number of your unit, the software release number, and the core version number handy.

7.5 Service Workshop maintenance

Kemppi Service Workshops complete maintenance according to their Kemppi service agreement.

The major points in the maintenance procedure are listed as follows:

- Cleaning of the machine
- Checking and maintenance of the welding tools
- Checking of connectors, switches and potentiometers
- Checking of electric connections
- Checking of mains cable and plug
- Damaged parts or parts in bad condition are replaced by new ones
- Maintenance testing.
- Operation and performance values of the machine are checked, and when necessary adjusted by means of software and test equipment.

Software loading

Kemppi Service Workshops can also test and load firmware and welding software.

8. DISPOSAL

Do not dispose of electrical equipment with normal waste!

In observance of European Directive 2002/96/EC on waste electrical and electronic equipment, and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and taken to an appropriate environmentally responsible recycling facility.

The owner of the equipment is obliged to deliver a decommissioned unit to a regional collection centre, as per the instructions of local authorities or a Kemppi representative. By applying this European Directive you will improve the environment and human health.

And you know.

KEMPPI