

MIYACHI

Universal Servo Weld Head

WH-L090A, WH-L180A

OPERATION MANUAL



Annex:

- Safety Regulations
- General References
- Contact addresses

Versions		
Version	Date	Basis of Version
3	2019-02	Conversion to new layout
4	2020-04	Details Update
5	2020-06	Addition of IO table to section 6
6	2021-02	Addition of Low Force spring detail to section 9
7	2022-01	Product name and artwork changes
8	2023-08	Environment Specification added

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1 General Information



Information about safety regulations, symbols, copyrights, protection rights, usage location conditions can be found in the back section of these operating instructions.

Please read this information carefully before using these operating instructions.

These operating instructions should help you familiarize yourself with the system and take advantage of its application possibilities when used as directed.

It contains important notes to help operate the unit safely, properly, and economically.

Observing the notes will help avoid risks, decrease repair costs and down times, and enhance reliability and the service life of the unit.



Warning

It is a rule: **Safety first!**



Danger

Incorrect or inappropriate configuration, installation, settings, handling or use can cause mechanical, electrical or thermal hazards, which may result in serious damage or injury.

Ensure the correct execution of these points and follow the respective notes in the operating instructions.



Do not put the system into operation before you have read the **operating instructions!**



Danger



Persons with **cardiac pacemakers** and **metallic implants** are prohibited from approaching to within a radius of **at least 5 m** of welding equipment!



Warning

Crushing Hazard

There is a risk of crushing during the adjustment movement due to closing electrodes, stops for limiting adjustment or stroke movement and the stop on the basic pincers unit for limiting floating movement.



Warning

This **Class A welding equipment** is not supposed to be used in living quarters, where the power supply is carried out by a public low voltage supply.

There it can be difficult to ensure electromagnetic compatibility because of conducted or radiated disturbances.



Warning

Restrictions on use environment conditions

Use this equipment in an environment without conductive dust. If conductive dust enters into equipment, it may cause failure, electric shock or ignition. If using equipment in such environment, consult Amada Weld Tech.

2 Technical Description

2.1 Technical Specification

	WH-L090A	WH-L180A
Minimum Force Newtons	7	8
Maximum Force Newtons	90	180
Force Repeatability	Up to 99%	Upton 99%
Duty Cycle	5% at 90N	
Accuracy	Within +/-0.1N at 25°C	
Maximum Electrode travel	20mm	
Total Motor Travel including 10mm Spring Compression	30mm	
Maximum Speed	100mm/s	
Servo Controller input voltage	88-264Vac 50/60Hz Single phase	
Load cell calibration	Via welder head calibration menu	
Permissible Humidity	Max 70%, non- condensing	
Ambient Temperature	Max 40 degree Celsius	

2.2 Introduction

Thank you for purchasing this Amada Weld Tech Weld Head.

This manual is designed to help the new user to understand and operate the equipment quickly and safely. Please take a few moments to become familiar with the equipment and this manual before attempting to use the equipment.

The Amada Weld Tech servo weld head range is designed for use with Amada Weld Tech power supplies. The low mass design enables rapid movement through all aspects of the welding process.

Weld force can be adjusted to between 7 and 90 newtons (or 8 and 180 newtons) using automatic electronic adjustment.

For very accurate/critical applications, a displacement transducer is fitted which provides a means of monitoring and measuring weld displacement.

Bespoke electrode holders are available. Please contact us with your requirements.

The following information covers the model you have purchased and others in the range and should be kept for reference. This will also help you identify model specific features mentioned in this manual.

IMPORTANT

Inspect the unit for any shipping damage prior to connecting to the mains supply. The control unit MUST be connected to the correct mains supply voltage. Refer to the identification plate located on the rear panel.

Connecting the Input Cable to Mains Supply

Single-Phase

Cable Colour:

Brown

Live

Blue

Neutral

Yellow/Green

Safety Earth / Ground

Ensure a good earth / ground connection is provided for operator safety.

3 Quick Start Guide

Inspect the head for any shipping damage prior to installation and report to Amada Weld Tech if necessary.

Electrode Holders

The electrode holder, current connector and insulating washer fit on the main shaft and are clamped using the cap head screw on the side of the holder.

Main current cables

Use a suitable rated conductor and keep both leads as short as possible and close together to avoid any inductive loops. In severe cases, this can cause excessive back emf resulting in damage to the power supply.

When selecting cable for connection of the power supply to the weld head, ensure the correct rating is chosen. Small diameter cable will result in excessive voltage drop and cause a fault. As a guide, a connecting cable of 50 sq.mm has a voltage drop of approximately 0.45 volts per metre per 1000 amps. This excludes connections.

It is desirable to earth one of the welding electrodes for operator safety.

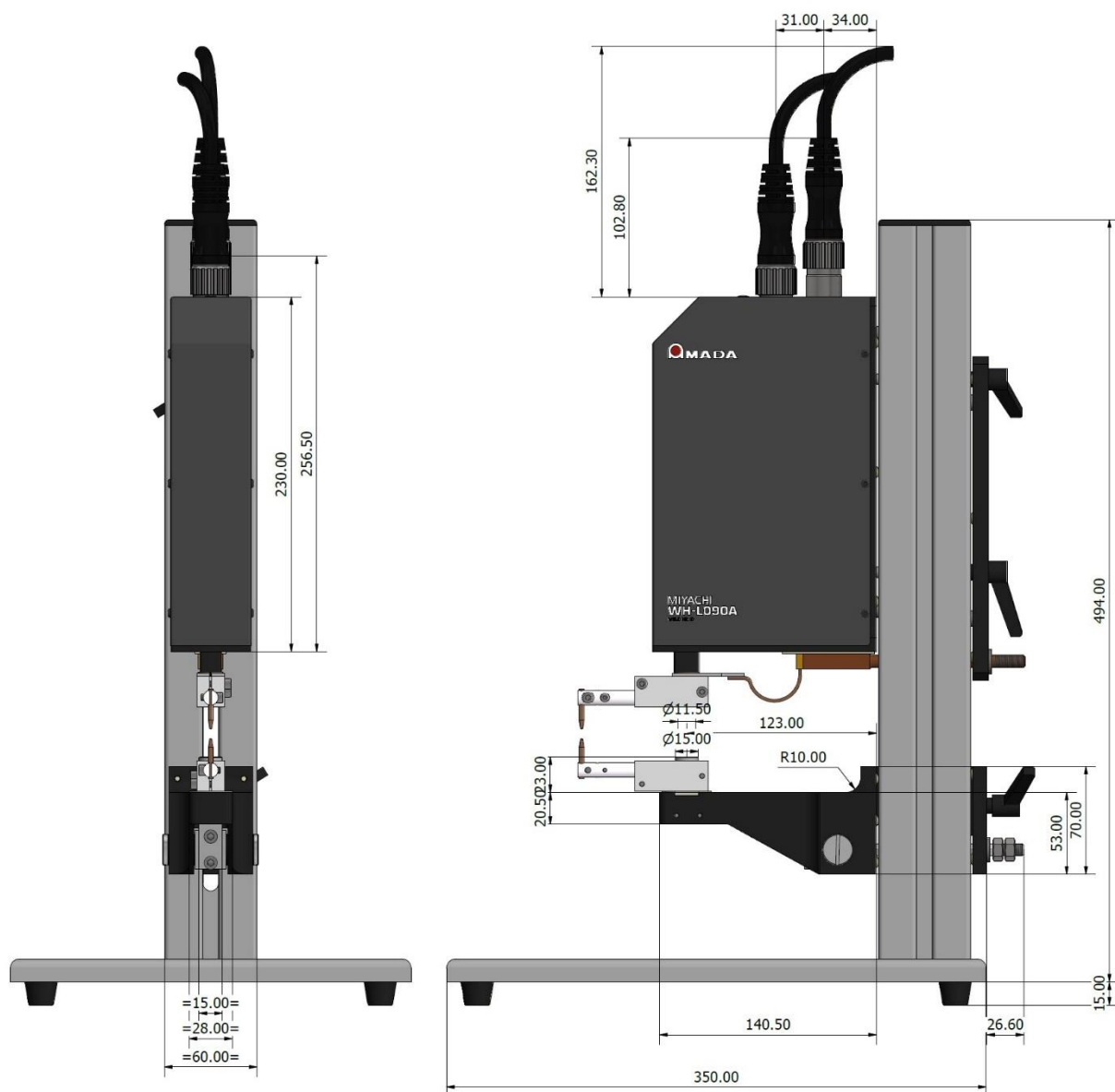
Voltage sensing

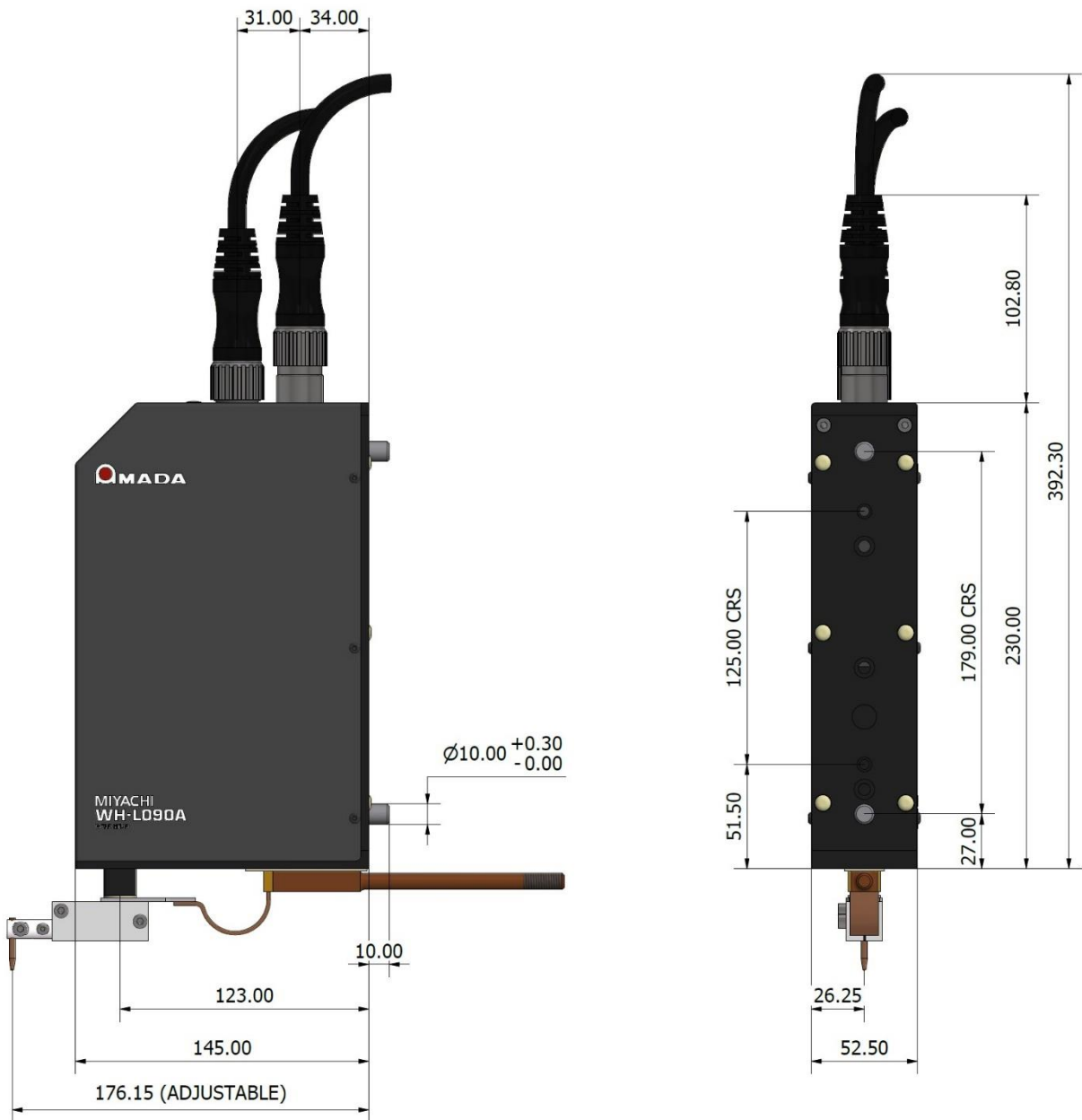
If using an Amada Weld Tech power supply or system with voltage-sensing, a tapped hole has been included in the electrode holders. Suitable low current cable can then be attached between the electrodes and the voltage sensing input on the rear of the power supply.

Sample setting procedure

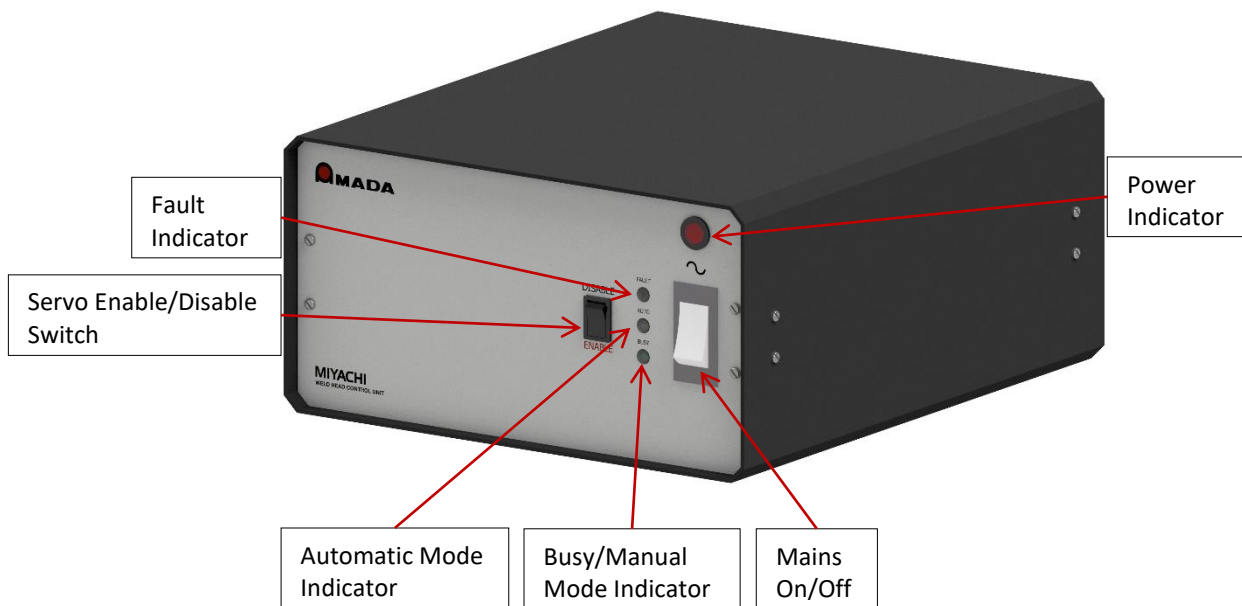
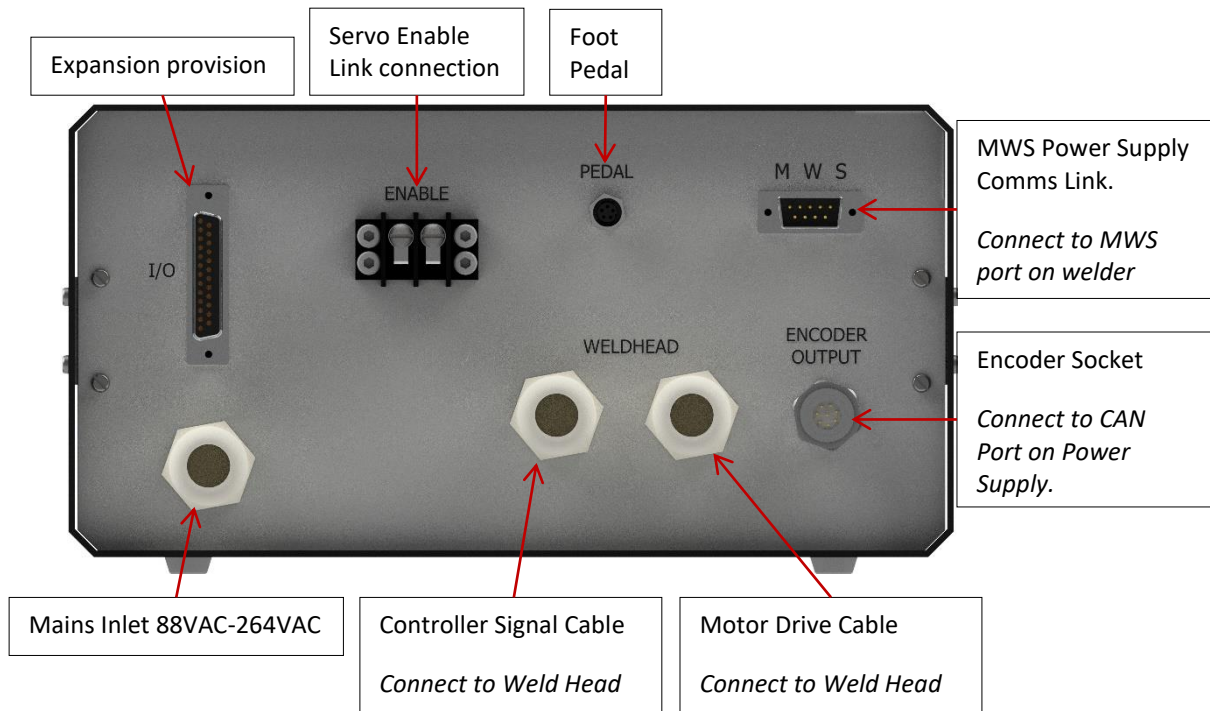
- Inhibit welder
- Fit electrodes
- Enter welding parameters
- Insert parts to be welded
- Remove inhibit and start weld trial

4 Weld Head Dimensions





5 Basic Features – Control Unit

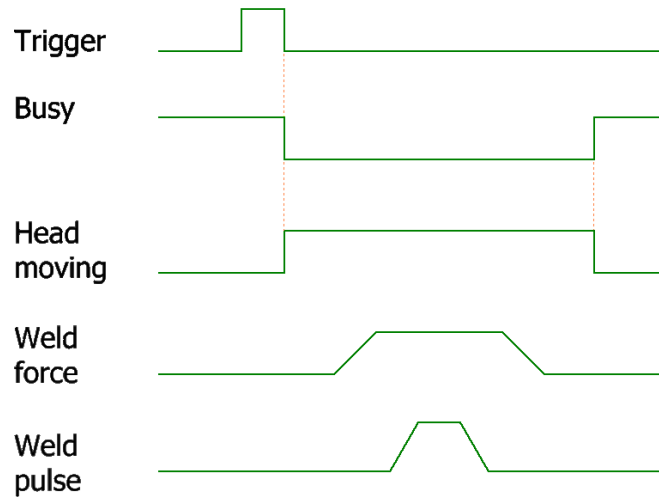


6 Interface Information for Automation

Below is a timing diagram for the weld head.

The trigger goes directly into the welder. The busy signal indicates when the weld head is clear.

(Read the power supply manual for more information.)

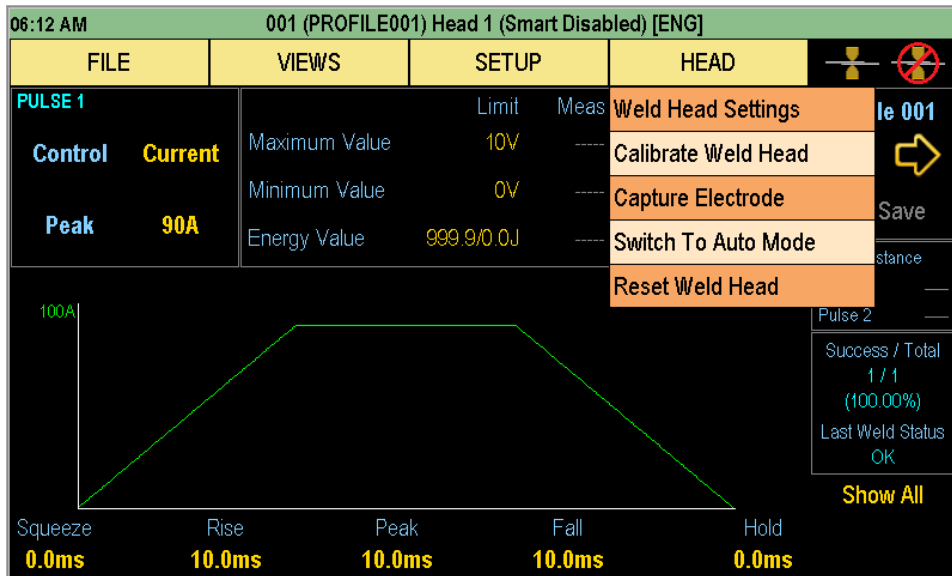


The 25 way D connection on the rear of the unit (labelled IO) contains additional signals to help interfacing the unit to a PLC of product line. These are detailed in the table below.

PIN NUMBER	FUNCTION
1	Normally open relay contact closes when the weld head starts to move (timing as per 'head moving' graph above). Opens when weld head returns to retracted position. Rating 1A 250vac max
2	Common for the above relay contact.
3	0vDC
4	Output from home sensor (pepperl+fuchs NBB1,5-F79-E2). Output on when weld head is in home (fully up) position. Output rated maximum of 100mA output, at 24V DC.
13	0vDC
25	+24vDC output. Rated 250mA

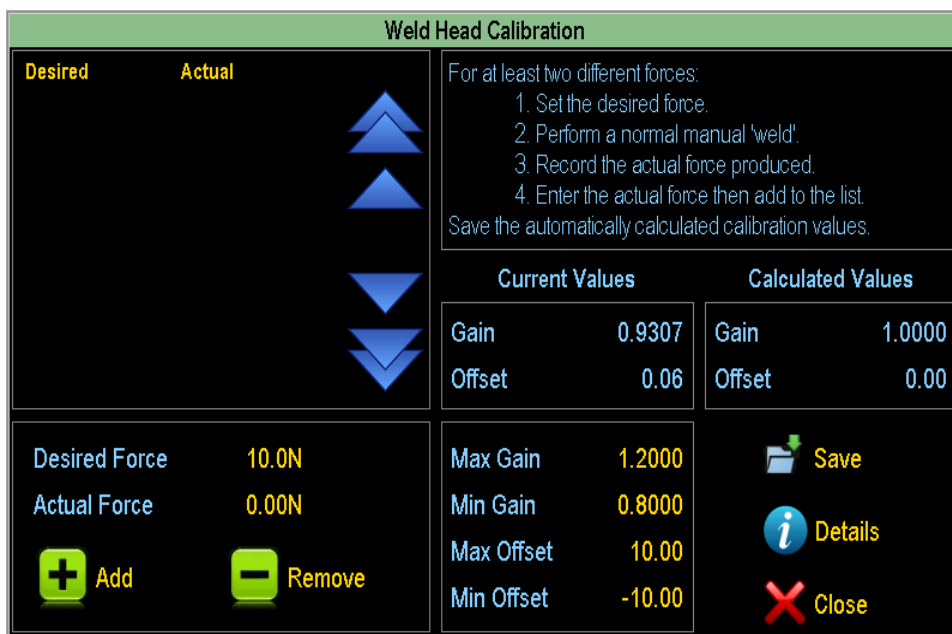
7 Weld Head Interface Option

Machines with SMART weld head interfaces are equipped with an additional drop down “HEAD” menu, which provides the means to setup and calibrate an attached servo weld head. There are also menu options to quickly switch between manual and auto mode, and to reset the smart head.



7.1 Weld Head Calibration

Weld head calibration is password protected (unless in Engineering mode) and requires external measurements to be made and entered against the existing pre-set values in the machine. As shown below, the calibration method involves entering a list of actual forces (externally measured) against desired forces (those programmed). From these values, gain and offset calibration values are automatically calculated and can be saved back to the weld head.



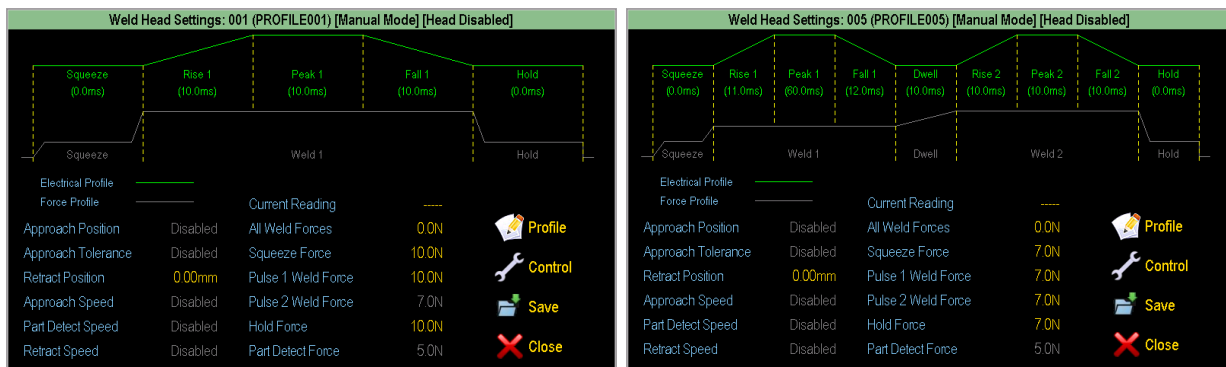
7.2 Electrode Capture

The electrode value can be captured using the 'Capture Electrode' menu option in the same way as for other displacement options (see the 'Changing Electrodes' section). The display is different to account for the different weld head operation.



7.3 Weld Head Settings

The settings menu allows the welding speed and force profile to be defined.



In double pulse mode, separate force settings can be used for each pulse. In practical terms, the welder will wait until the head has achieved the position and force requirements before triggering. Hence a 'double force' profile could be defined for the same part.

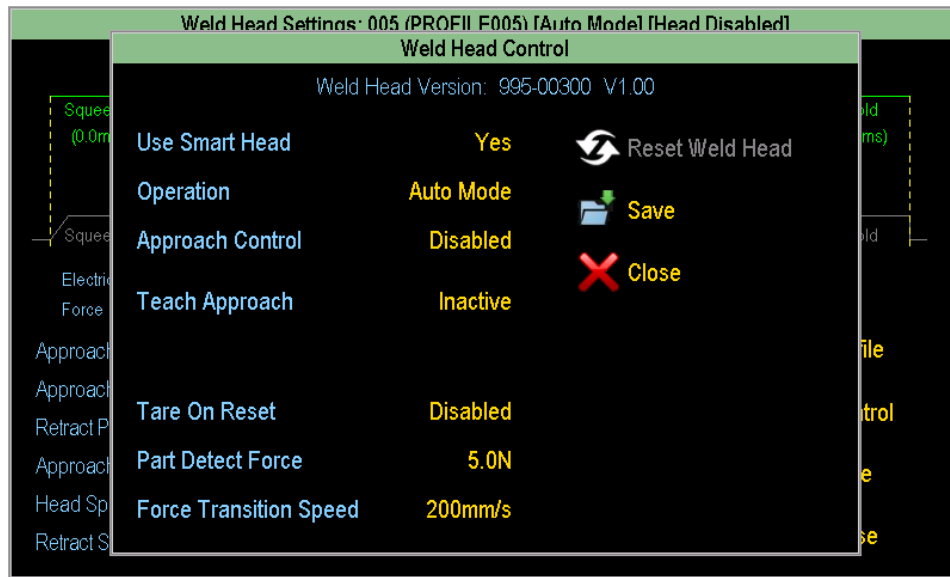
The 'Retract Position is a programmable upper arm rest position after each weld.

The 'All Weld Forces' can be used to ensure that all forces during the weld profile are the same.

Pressing the 'Profile' button takes the user directly to the details for the currently loaded profile.

Pressing the 'Control' button brings up the weld head control screen, which allow overall (non-profile-specific) weld head settings to be made.

7.4 Weld Head Control Screen



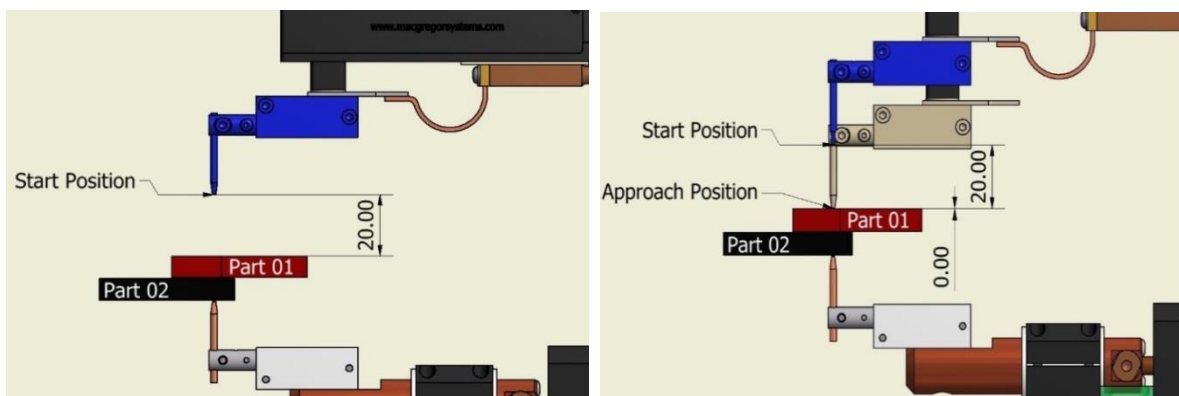
The control screen provides another method to switch between manual (weld head position controlled using a pedal or equivalent) and auto (weld head position controlled by the weld head motor) modes.

The 'Part Detect Force' is the force used by the equipment whilst locating the part to be welded (while approaching at Part Detect Speed). Part detection occurs immediately after the approach phase and is usually set to a slower speed and lighter force for maximum sensitivity. After part detection, the unit applies the Squeeze, Weld and Hold forces as programmed in the profile-specific settings.

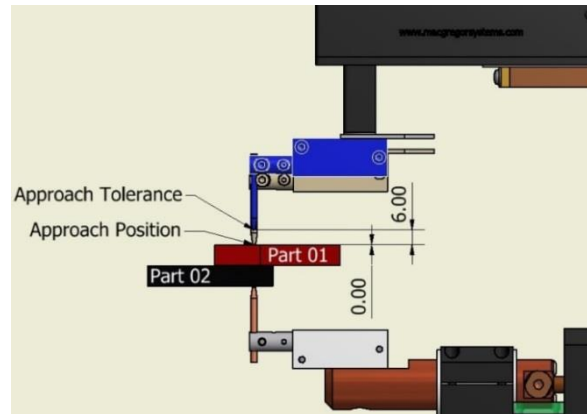
A tare value is stored in the unit representing the weight of the electrode holder and mechanism. The unit can be programmed to remeasure the tare upon every reset, by toggling the 'Tare On Reset' option. If disabled, the current tare value remains in the memory. Therefore, when changing an electrode holder or fitting a new head to the controller, a new tare operation is required to ensure calibration is maintained.

7.5 Approach Variables

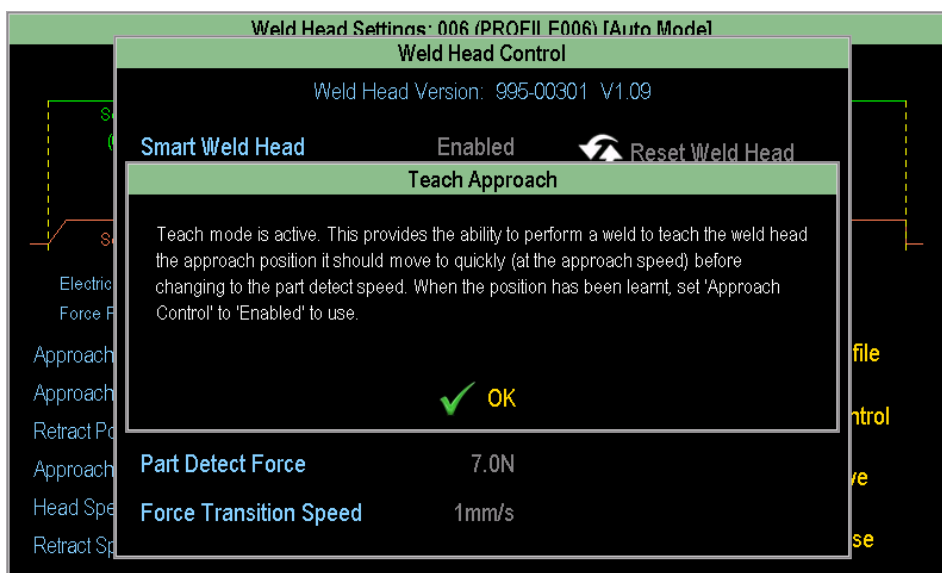
These are used to define a high speed actuation zone that moves the weld head from its home (up) positions to (down) just above the part to be welded. This down position can be taught using Teach Approach. When teaching, the electrodes grip the part at low force. Upon contact, the positional information is stored as 'Approach Position'.



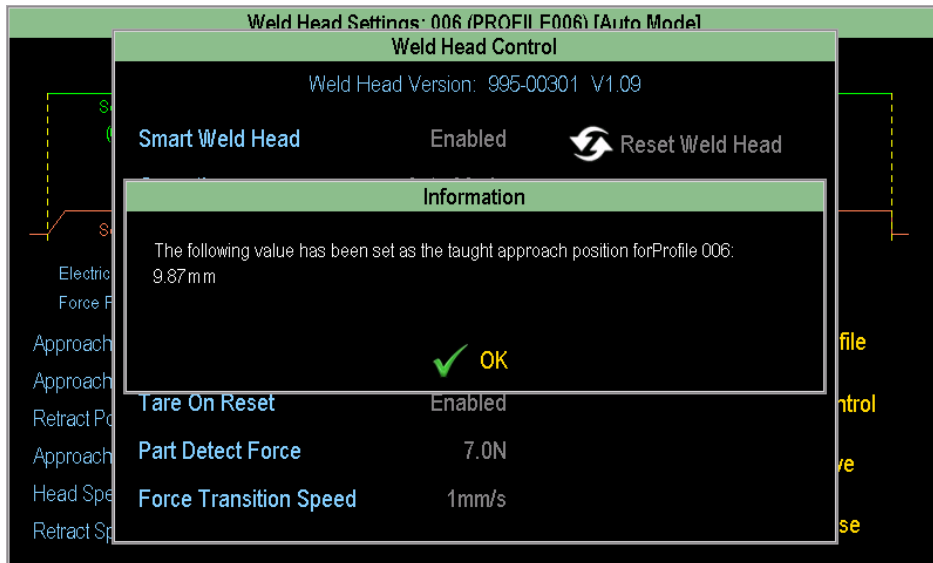
The 'Approach Tolerance' is a negative offset value from the Approach Position. If the head has been taught against a part, this value represents the desired gap between the electrode and the part prior to moving slowly for part detection.



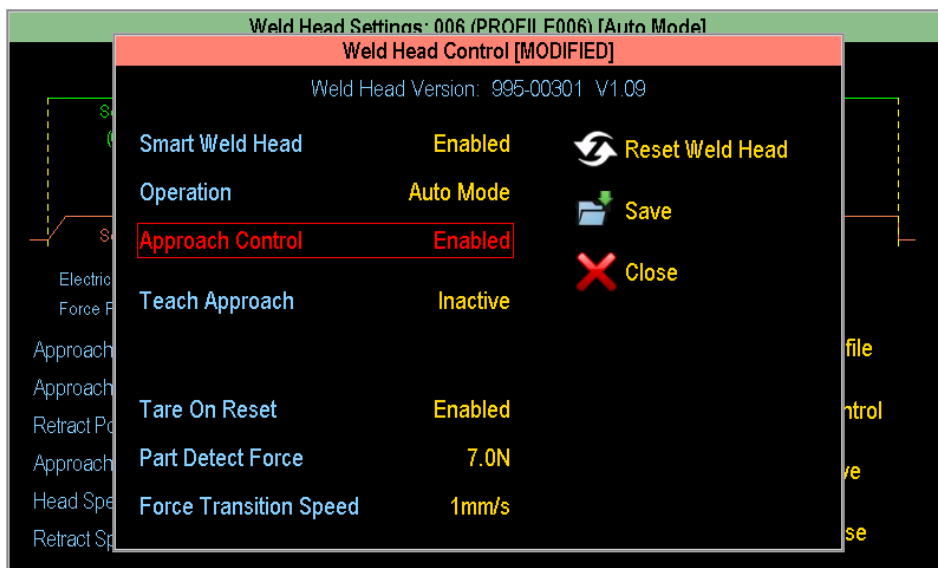
To activate 'Teach Approach' select it on the weld head control screen. Note that the Smart Weld Head must be enabled and in auto mode. The following window will appear.



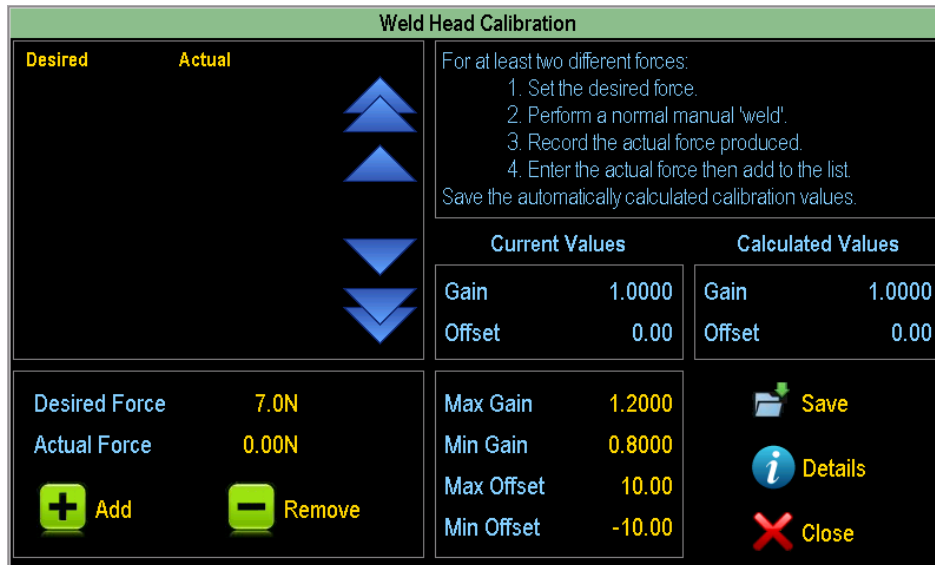
Place a part between the electrodes and perform a 'weld'. The electrodes will make contact at low force. Upon contact, the positional information is stored as Approach Position.



Now 'Approach Control' can be enabled.



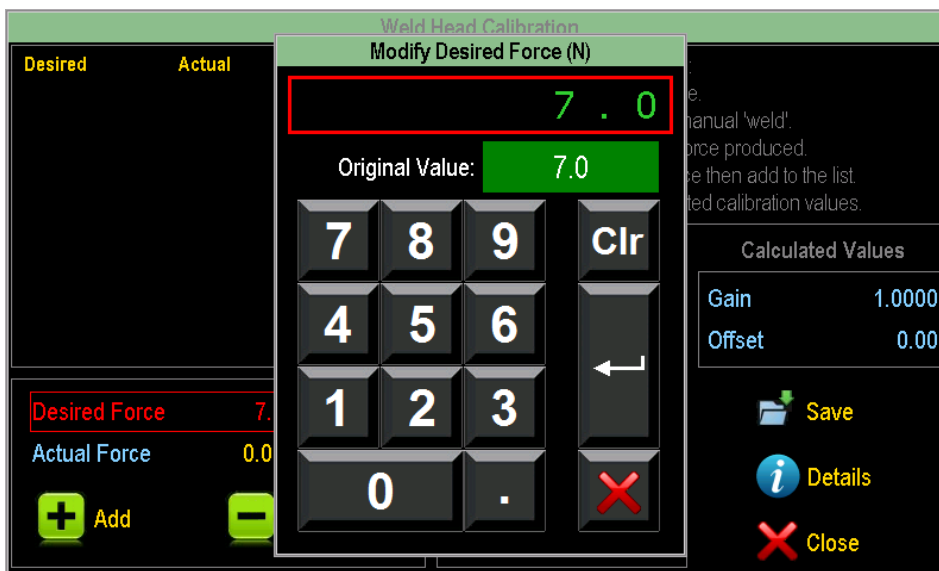
7.6 Calibrating Head



The above screen (or similar) appears when the 'Calibrate Weld Head' menu option is selected. The default gain and offset values for the calibration are 1 and 0 respectively. If the head has already been calibrated then different values may be shown on entry.

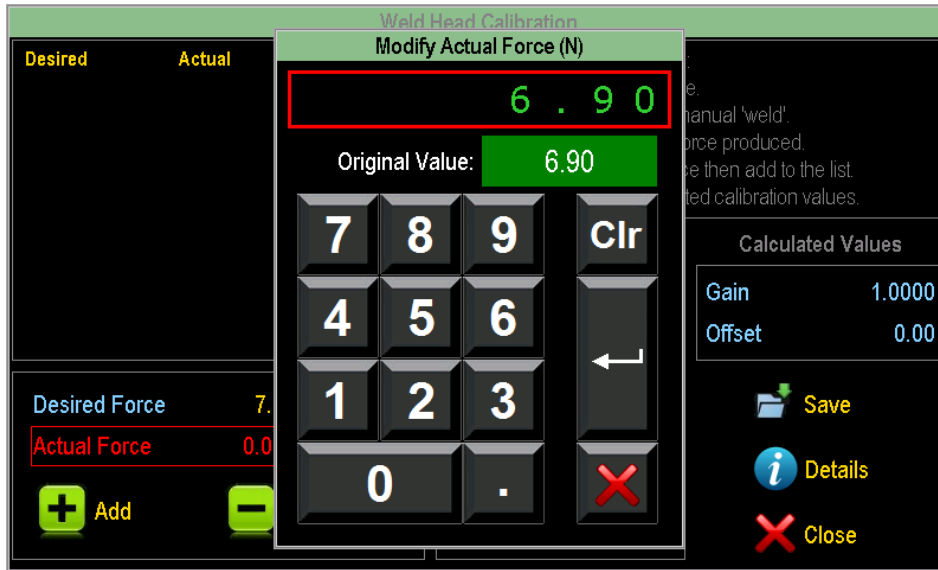
It is recommended to calibrate the head over a range of values, preferably comprising the range of forces that will be used when welding. When at least 2 different values have been entered, new gain and offset values are automatically calculated using a line of best fit.

To create a new desired/actual force pairing, select the 'Desired Force' field as follows:



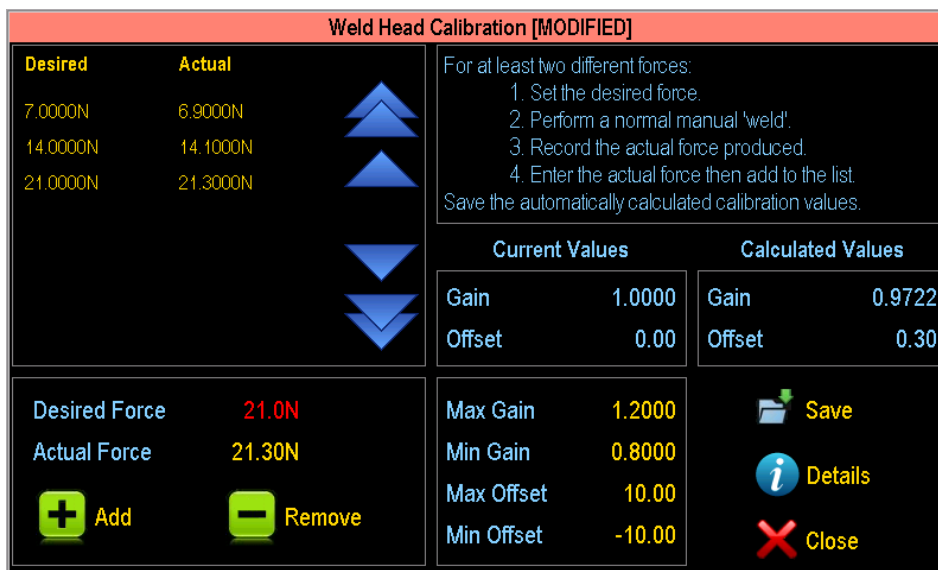
The actual force then needs to be measured with a suitable force gauge. (Such a gauge is available from Amada Weld Tech if required.) To do this, a 'weld' needs to be performed by closing the weld head. When using a pedal, the head will remain closed the first time that the pedal is released. Note that no electrical current will be passed during this process.

The measured value should then be entered by selecting the 'Actual Force' field as follows:

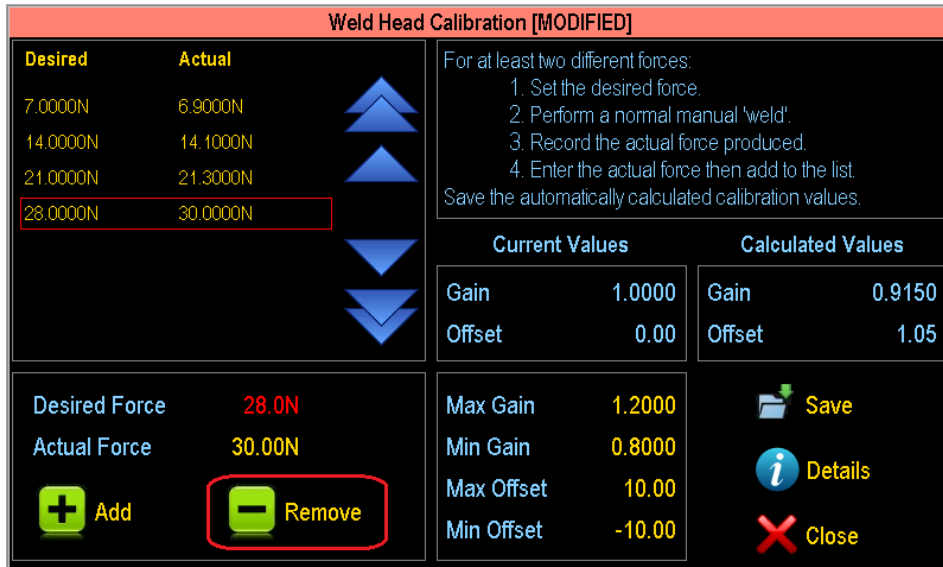


The weld head can then be released by pressing and releasing the pedal again. If the desired/actual force pairing is deemed to be accurate, the pair can be added to the list by pressing the 'Add' button.

This process should be repeated over the required range of forces. As can be seen below, the calculated values have been updated accordingly:



At any time, unwanted desired/actual force pairings can be deleted by selecting them and then using the 'Remove' button:

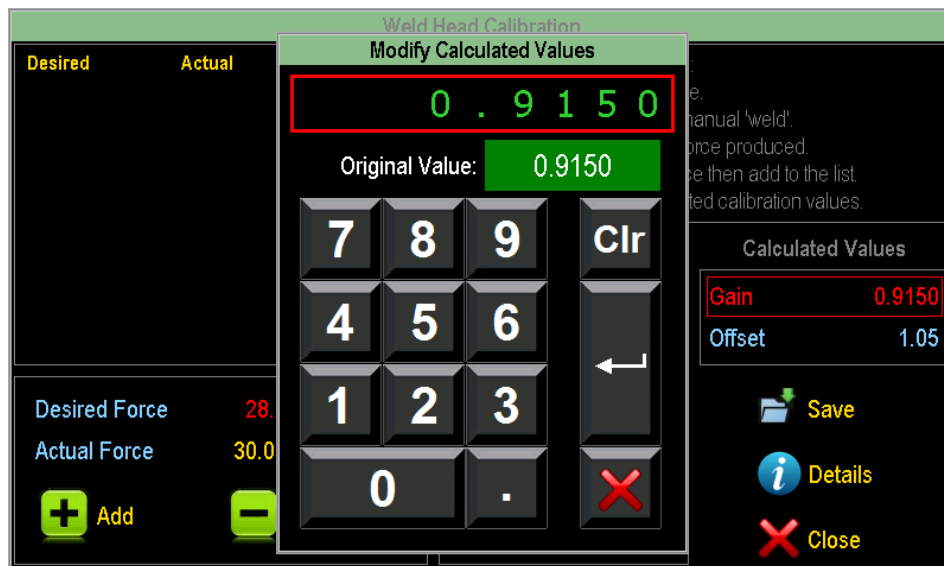


Further explanation of the calibration process is available on the welder by pressing the 'Details' button.

When the measurements are complete, the newly calculated calibration values can be saved by pressing the 'Save' button. The current values will then be updated with the new values.

The maximum and minimum gain and offset values can be adjusted if these prevent accurate calibration from being performed. It is unlikely, however, that the gain and offset will be very far from the defaults of 1 and 0, unless there is a problem with the system.

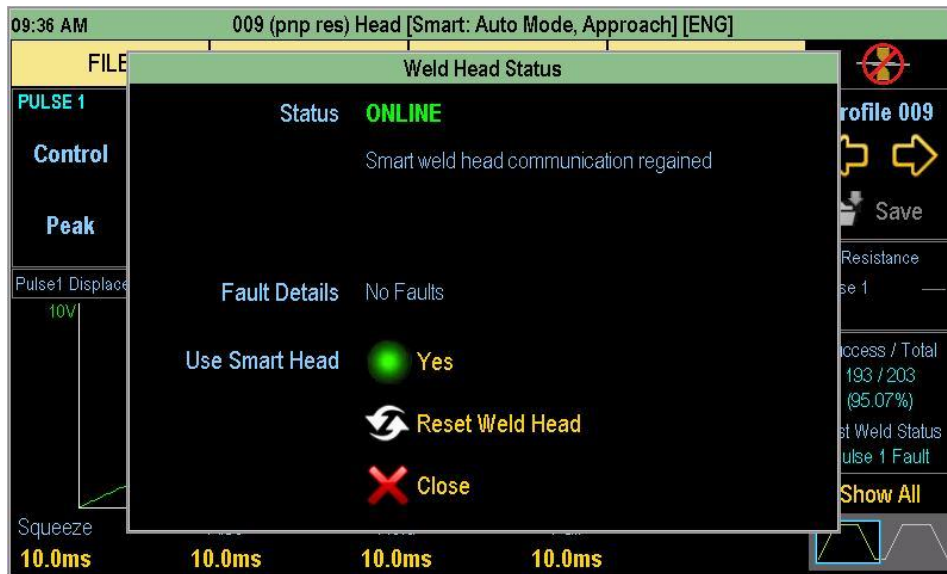
The option is also available to manually enter calibration values by pressing the Calculated Values gain and offset fields. However, this is not recommended as any such values are unlikely to be accurate.



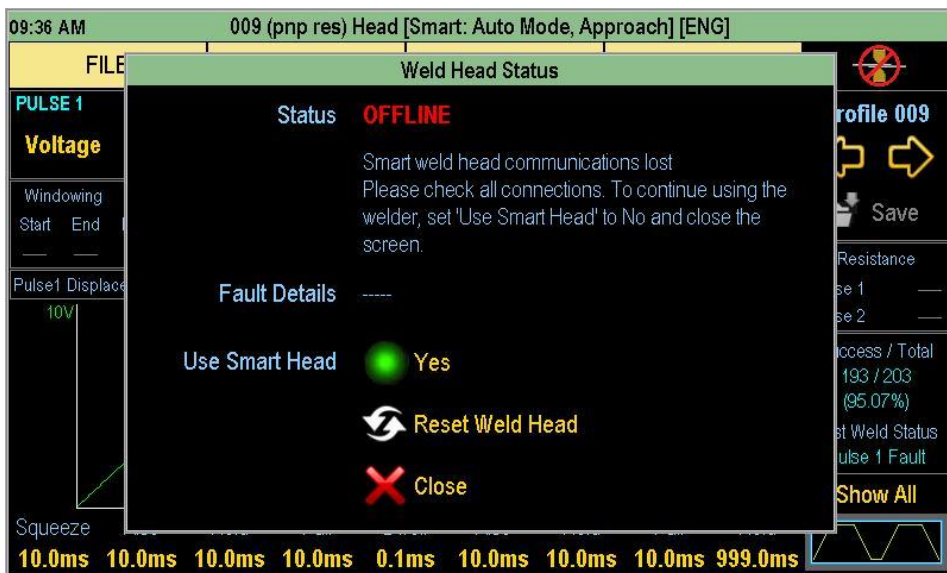
Please be aware that certain weld head and welder settings are changed when the calibration screen is active. These are returned to their previous values when the screen is closed. If the power supply or the weld head controller are powered down whilst the screen is active, then these values will be retained and may affect operation.

7.7 Weld Head Status Screens

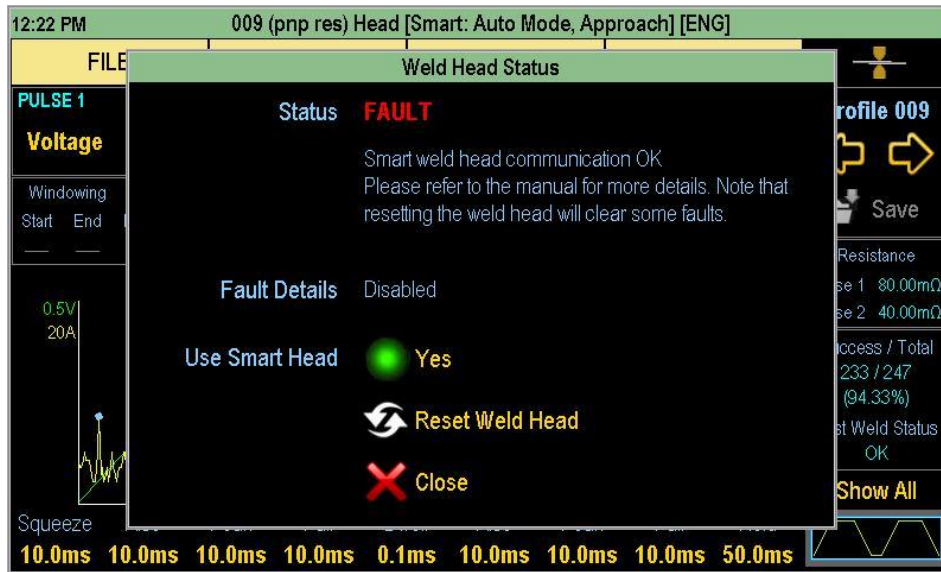
The weld head status screen gives information about the communication status between the welder and the weld head. The window will open automatically when information needs to be shown or action needs to be taken. Instructions are given where necessary, and the weld head can be reset, disabled, or enabled and the status window can be closed.



The above screen is shown when the weld head has come online (from an offline status). The window can be closed and welding can be continued.



The above screen is shown when the weld head has gone online. If the weld head is no longer needed then it should be disabled by changing the 'Use Smart Head' setting to 'No'. If the weld head needs to continue to be used then connections should be checked. If the connections are correct but the status is still offline then power should be cycled on the weld head controller.



The above screen is shown when an internal weld head controller fault has been detected. Any actions to be taken are dependent upon the actual fault. These are listed in the table below.

Fault Name	Details	Actions
Disabled	Check the status of the enable link on the rear panel and the enable/disable switch on the front panel. Both must be enabled to clear the fault. Afterwards, the head must be reset	Enable Reset head
Command	Internal command error. Head must be reset	Reset head
Under voltage	Indicates motor supply problem. Switch the system on and off. If the fault does not clear, please contact Amada Weld Tech.	Power cycle
Over voltage	Indicates motor supply problem. Switch the system on and off. If the fault does not clear, please contact Amada Weld Tech.	Power cycle
Over temperature (drive)	Do not operate, switch the weld head controller off and wait for the unit to cool down.	Power down Allow to cool
Over temperature (motor)	Do not operate, switch the weld head controller off and wait for the unit to cool down.	Power down Allow to cool
I2T	Indicates an over duty cycle error. Reset the weld head and increase the delay between welds.	Reset head Increase delay
Over current	Motor has exceeded the internal current limit. Head must be reset	Reset head
Short circuit	Output from motor to drive has a short circuit. Switch of the system and check the connections.	Power down Check connections
Position wrap	Internal position calculation error. Reset the weld head	Reset head
General control	Internal error	Reset head
Invalid setup	Motor data file is missing. Reset the weld head to reload the data file.	Reset head
Closure disabled	This error only applies to MK1 weld heads with the 5-pin black motor cable. Check that the closure / enable switch on the front panel of the weld head controller is in the 'enable' position then reset the weld head.	Check enable Reset head

8 Spring Change

The Please follow the next steps:

1. Switch off the power supply and weld head controller.
2. Disconnect the cables and remove all screws from the cover
3. If side fan fitted, unplug as cover is removed. Fig 1
4. Compress the spring/springs and remove them through the cutout. Fig 2
5. Compress the new spring/springs and put it/them back into the correct place. Fig 3
(Double spring system Fig 4)
6. Carefully replace the cover.
7. Refit screws and the cables.
8. After changing the spring carry out a tare operation before starting to use the head, if tare on reset, not selected on welder.

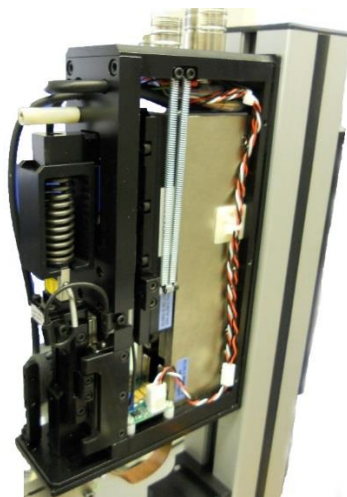


Fig 1

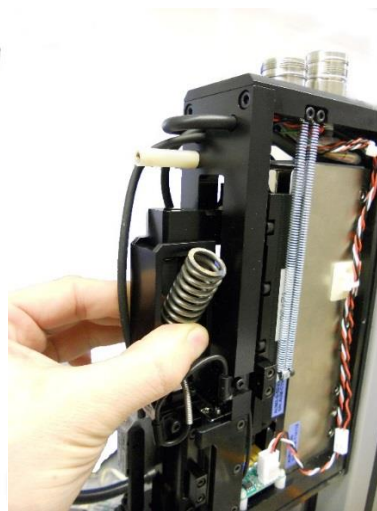


Fig 2



Fig 3



Fig 4

9 Spring Options

We cater for all your welding force requirements.

Below is the standard spring fitted to the weld heads. Different gauges of springs are available on request.

Type	Part Number	Range (N)	Range (Kg)	Range (Pounds)
90N head	388-00049, 388-00050	7 - 90	0.71 - 9.18	1.57 - 20.23
180N head	304-00122, 304-00123	8 - 180	0.81 - 18.3	1.79 - 40.5

Additional springs are provided with the unit. If operating at low force with a large displacement, it is recommended to change to one of the springs listed below.

Part Number	Max Force (N)
388-00045	30
388-00054	70

10 Trouble Shooting Guide

The following information only applies when this product is used in configuration with an Amada Weld Tech power supply. All functional operations are programmed via the power supply. Any error codes are reported via the power supply HMI.

Check / Symptom	Reasons	Remedy
Head fails to operate	Check head is programmed for correct mode – Manual or Automatic Incorrectly connected Head is overheating	Check menu setup Check cabling Allow to cool down and power cycle
Incorrect force is applied	Calibration error Electrode holder weight change	Check calibration values and re-calibrate if necessary Check Tare On Reset
Displacement error	Mounting issues	Check tightness of head mounts Check electrode datum position

11 Error Codes and Description

Fault Code	Information	P1	P2	Fault Code	Information	P1	P2
0	No fault			33	Limit fault	both limits	both limits
1	Hardware fault			34	Limit fault	over limit	under limit
2	Limit fault	under limit		35	Limit fault	over limit	both limits
3	Limit fault	both limits		36	Pre-weld failed	pre-weld	
4	Limit fault	over limit		37	Auto part condition	apc	
5	Limit fault		under limit	40	Displacement fault - undersize		
6	Limit fault		both limits	41	Displacement fault - oversize		
7	Limit fault		over limit	42	Displacement fault - limit	over limit	
8	Limit fault	under limit	under limit	43	Displacement fault - limit	over limit	over limit
9	Limit fault	under limit	both limits	44	Displacement fault - limit	over limit	under limit
10	Limit fault	under limit	over limit	45	Displacement fault - limit	over limit	condition limit
11	Energy fault	over limit		46	Displacement fault - limit		over limit
12	Energy fault		over limit	47	Displacement fault - limit	under limit	
13	Energy fault	over limit	over limit	48	Displacement fault - limit	under limit	over limit
14	Energy fault	under limit		49	Displacement fault - limit	under limit	under limit
15	Energy fault		under limit	50	Displacement fault - limit	under limit	condition limit
16	Energy fault	under limit	under limit	51	Displacement fault - limit		under limit
17	Pulse duration > 100ms			52	Displacement fault - limit	condition limit	
18	Three phase failure			53	Displacement fault - limit	condition limit	over limit
19	Fuse 2 failure			54	Displacement fault - limit	condition limit	under limit
20	IGBT temperature failure			55	Displacement fault - limit	condition limit	condition limit
21	Other temperature failure			56	Displacement fault - limit		condition limit
22	Both temperature failure			57	Displacement fault - CAN or other		
23	Main transformer temperature failure			58	Displacement fault - limit	over/under limit	
25	x2 pulse			59	Displacement fault - limit		over/under limit
26	Energy fault	over limit	under limit	100	Linear code comms pre weld		
27	Energy fault	under limit	over limit	101	Linear code dwell timeout		
28	Safeguard			102	Linear code comms post weld		
30	Limit fault	over limit	over limit	103	Weld head comms failed		
31	Limit fault	both limits	over limit	104	Weld head error code		
32	Limit fault	both limits	under limit				

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