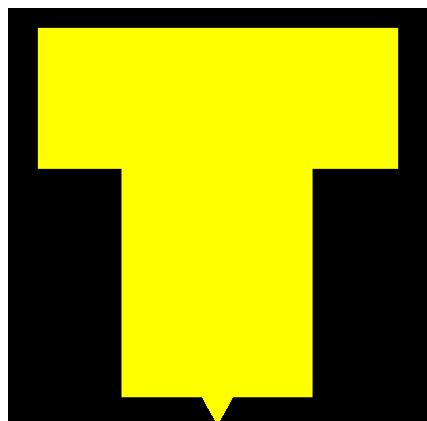


TAYLOR STUDWELDING SYSTEMS LIMITED.

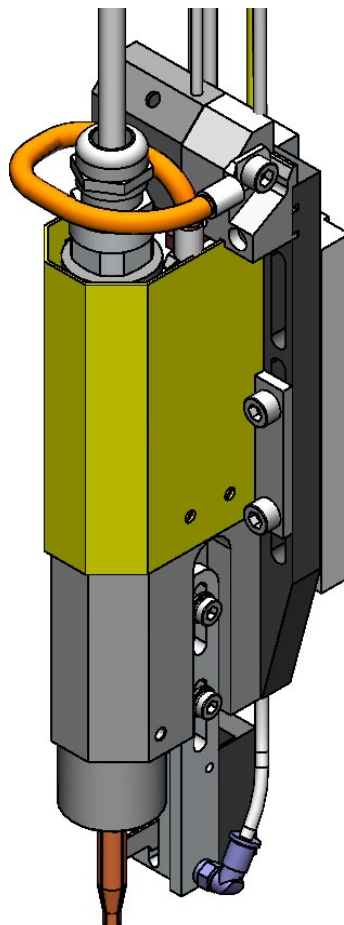
OPERATING MANUAL
FOR
SIK2 CAPACITOR DISCHARGE
AUTOMATIC WELD HEAD



TAYLOR

STUDWELDING

SYSTEMS LIMITED



INDEX

PAGE	CONTENT
1	GENERAL INFORMATION
3	INTRODUCTION
4	GENERAL ARRANGEMENT
5	FEED SEQUENCE
6	SAFETY
9	EXPLOSION DRAWINGS & PARTS LISTS
11	MAKING ADJUSTMENTS
14	PLUNGE SPEED
15	CHANGING COLLETS
18	COLLET TYPES
20	STUD FEED HOSE
21	CHANGING FLICKERS
22	FLICKER TYPES
23	HEAD UP SENSOR
23	CHANGING STUD DIAMETER
24	WELD QUALITY
26	TROUBLE SHOOTING
28	EC DECLARATION OF CONFORMITY



GENERAL INFORMATION

MANUFACTURERS DETAILS



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PURPOSE AND CONTENT OF THIS MANUAL

This manual has been written for :

-  The operator of the welding machine.
-  The personnel of the final customer responsible for the installation and operation of the machine.

This manual contains information on :

-  Installation and connection
-  Operation.
-  Technical data.
-  Spare parts.
-  Accessories.

GENERAL INFORMATION

FURTHER INFORMATION

Should you require additional technical information, please contact us directly (details on page 1) or our local agent / distributor (details of agents etc. can be obtained from us).

This manual contains important information which is a pre-requisite for safe operation of the equipment. The operating personnel must be able to consult this manual. In the interests of safety, make this manual available to your personnel in good time.

If the equipment is sold / passed on, please hand over this manual to the new owner. Please immediately inform us of the name and address of the new owner, in case we need to contact him regarding the safety of the device.



Please read this manual carefully before installation of the machine.



Please especially observe the safety instructions.

INTRODUCTION

INTRODUCTION

The complete range of Taylor Studwelding Systems Capacitor Discharge units are compact, portable Stud Welding equipments. The units are specifically designed to enable a small diameter range of ferrous and non-ferrous weld studs to be welded to light gauge, self-finish or pre-coated materials, in most cases with little or no reverse marking.

The equipment consists of a control unit, an automatic weld head and the necessary interconnecting cables and.

THE PROCESS

Capacitor Discharge stud welding is a form of welding in which the energy required for the welding process is derived from a bank of charged capacitors. This stored energy is discharged across the gap between the two surfaces to be welded as they are propelled towards each other. The arc produced heats the two surfaces, melting a thin film of metal on each surface and the propelling force closes the gap between the two faces, thus forming a weld.

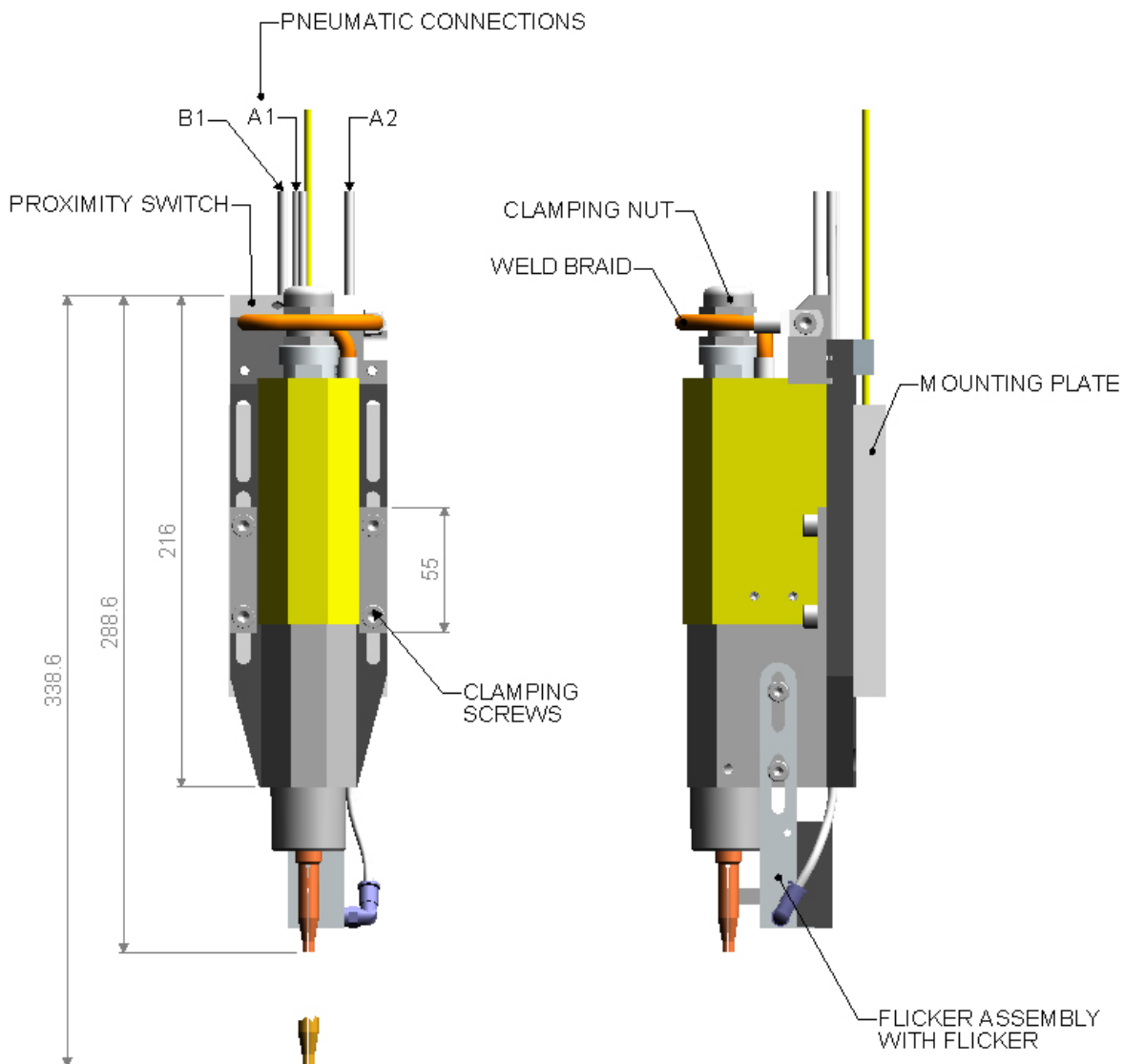
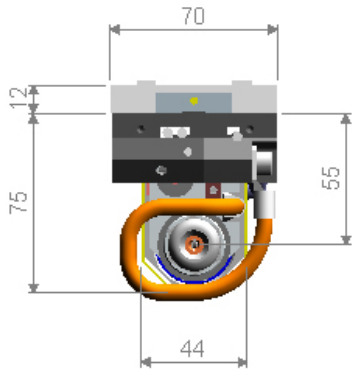
- | | |
|----------------|---|
| Start | The weld stud is accelerated by the weld head to a speed of 0.5 to 1.0m/sec, at the same time the power from the capacitors is applied between the weld head and work piece. |
| 0 - 1ms | The ignition tip touches the base material and the discharge current begins to flow. The tip is heated by the current and rapidly evaporates. |
| 2 - 3ms | An arc is initiated between the stud and work piece, this lasts for 1 to 2 milliseconds and melts the face of the stud & work piece. |
| 3ms | The weld stud contacts the molten pool. |
| 4ms | The weld pool cools and solidifies, due to heat absorption by the work piece. |

SIK 2 WELDING HEAD

TECHNICAL DATA

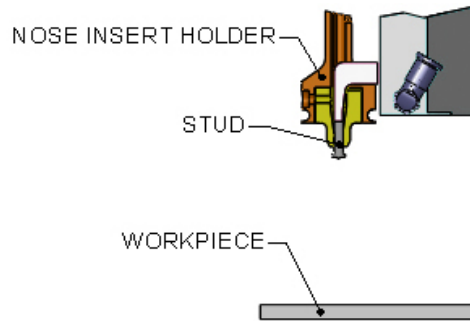
Weight: 1.5kg without welding cable Drive: pneumatic cylinder

Guide shaft: hardened & ground Weld stroke: 50mm

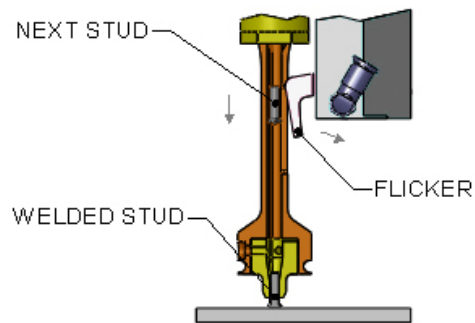


WELDING SEQUENCE

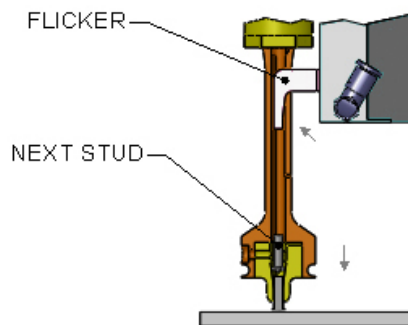
In the start position, the nose insert holder with a stud in place is positioned approx. 50mm above the workpiece.



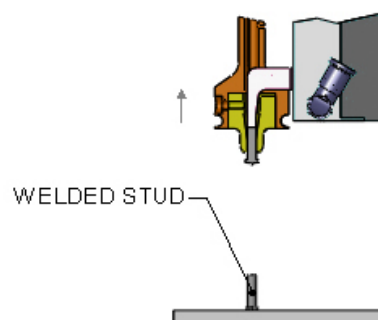
At the start of the welding process, the nose insert holder moves towards the workpiece. Welding begins when the stud touches the workpiece. The next stud is fed automatically at the same time. The flicker retracts out of the way, allowing the next stud to pass.



The flicker moves back into the nose insert holder. Welding has now been completed. The new stud is now located between the flicker and the nose inserts.



The nose insert holder moves back to the start position. The new stud is pressed back against the flicker and is pushed through the nose inserts. The head is now back in the start position.



SAFETY

PROTECT YOURSELF AND OTHERS !

Read and understand these safety notices.

1. ELECTRICAL

No portion of the outer cover of the welding controller should be removed by anyone other than suitably qualified personnel and never whilst mains power is connected. **ALWAYS** disconnect the mains plug from the socket.



RISK TO LIFE !!!

BE AWARE ! This equipment contains a sealed power supply module which operates on high frequency inverter principles. Due to the potentially fatal voltages in this module we do not recommend tampering with the module. It can be safely removed and replaced via our factory exchange system.

BE AWARE ! Capacitors store electrical energy. Check for residual charge before carrying out any internal maintenance.

DO NOT ! use any fluids to clean electrical components as these may penetrate into the electrical system

Installation must be according to the setting up procedure detailed on page 10 of this manual and must be in line with national, regional and local safety codes.

2. FIRE

During welding small particles of very hot metal are expelled. Ensure that no combustible materials can be ignited by these.

SAFETY

3. PERSONNEL SAFETY

Arc rays can burn your eyes and skin and noise can damage your hearing.

Operators and personnel working in close proximity must wear suitable eye, ear and body protection.

Fumes and gases can seriously harm your health. Use the equipment only in a suitably ventilated area. If ventilation is inadequate, then appropriate fume extraction equipment must be used.

Hot metal spatter can cause fire and burns. Appropriate clothing must be worn.

Clothing made from, or soiled with, combustible materials must NOT be worn. Have a fire extinguisher nearby and know how to use it.

Magnetic fields from high currents can affect heart pacemakers or other electronically controlled medical devices. It is imperative that all personnel likely to come into the vicinity of any welding plant are warned of the possible RISK TO LIFE before entering the area.

4. MAINTENANCE

All cables must be inspected regularly to ensure that no danger exists from worn or damaged insulation or from unsound electrical connections. Special note should be made of the cables close to the pistol, where maximum wear occurs.

As well as producing inconsistent welds, worn cables can overheat or spark, giving rise to the risk of fire.

5. TRAINING

Use of the equipment must be limited to authorised personnel only who must be suitably trained and must have read and understood this manual. This manual must be made available to all operators at all times. Further copies of this manual may be purchased from the manufacturer. Measures must be taken to prevent the use of this equipment by unauthorised personnel.

SAFETY

6. INSTALLATION

Ensure that the site chosen for the equipment is able to support the weight of the equipment and that it will not fall or cause a danger in the course of its normal operation. Do not hang connecting cables over sharp edges and do not install connecting cables near heat sources or via traffic routes where people may trip over them or they may be damaged by the passage of vehicles (forklifts etc.).

7. INTERFERENCE

During welding operations, intense magnetic and electrical fields are unavoidably produced and these may interfere with other sensitive electronic equipment.

As previously mentioned, all personnel wearing heart pacemakers or other electronically controlled medical devices must be kept well away from any welding operations.

The welding equipment should be installed at least 5 metres away from any computer equipment to minimise any possible interaction. Note that cables carrying signals between electronic devices are also capable of picking up interference which may modify the way in which those devices function and therefore should be sited outside the 5 metre zone.

Do not place objects which are sensitive to magnetism near the welding area, wristwatches, credit cards, computer disks etc. may all be rendered useless.

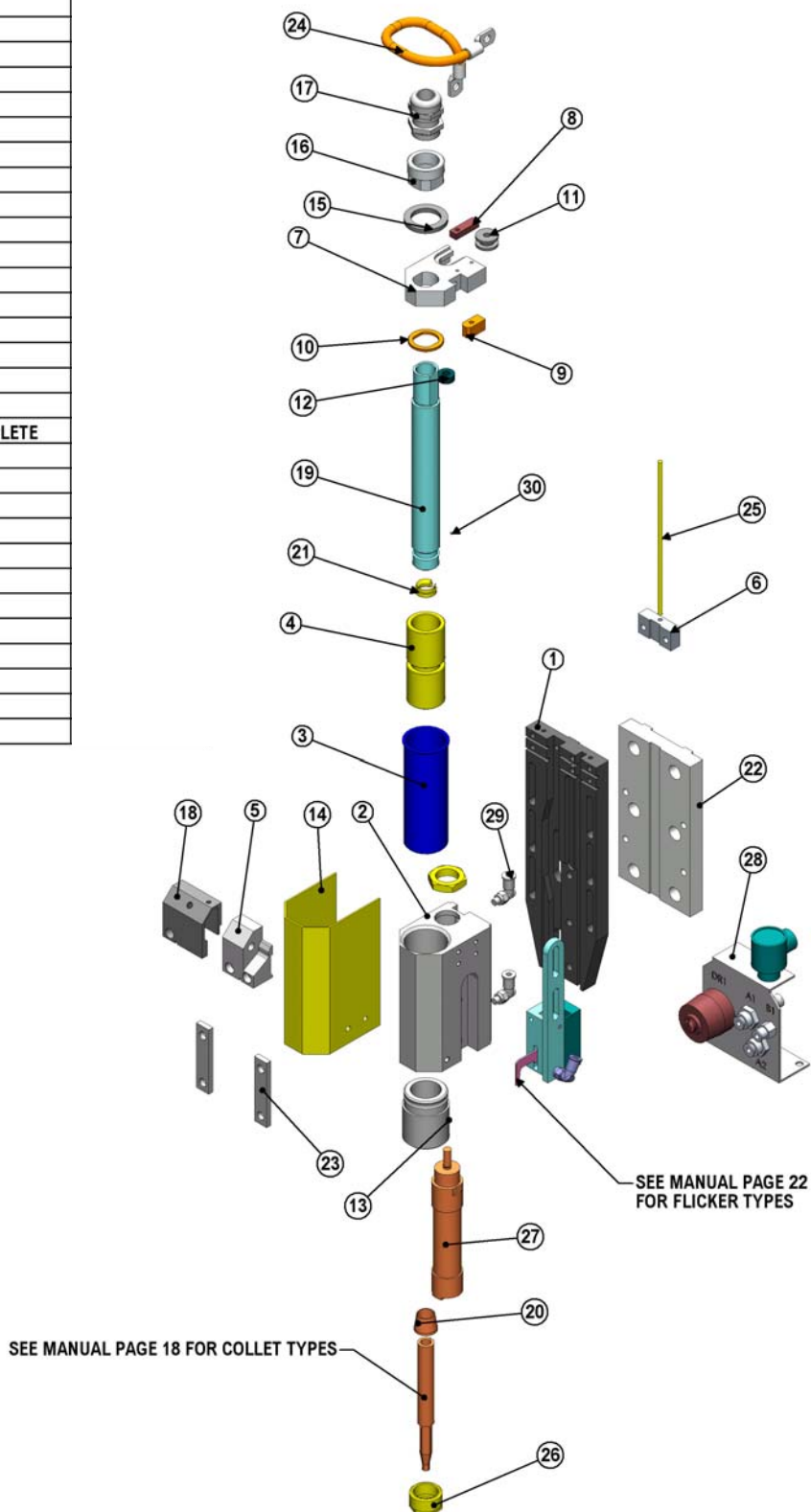
The welding equipment, like all other welding equipment, is itself electronically sensitive and its position relative to other radiation emitting equipment (mobile phones, remote controls, motor speed controllers etc.) must be considered.

8. DISPOSAL

The equipment either wholly or any of its component parts may be disposed of as part of general industrial waste or passed to a scrap merchant. None of the components used in the manufacture are toxic, carcinogenic or harmful to health.

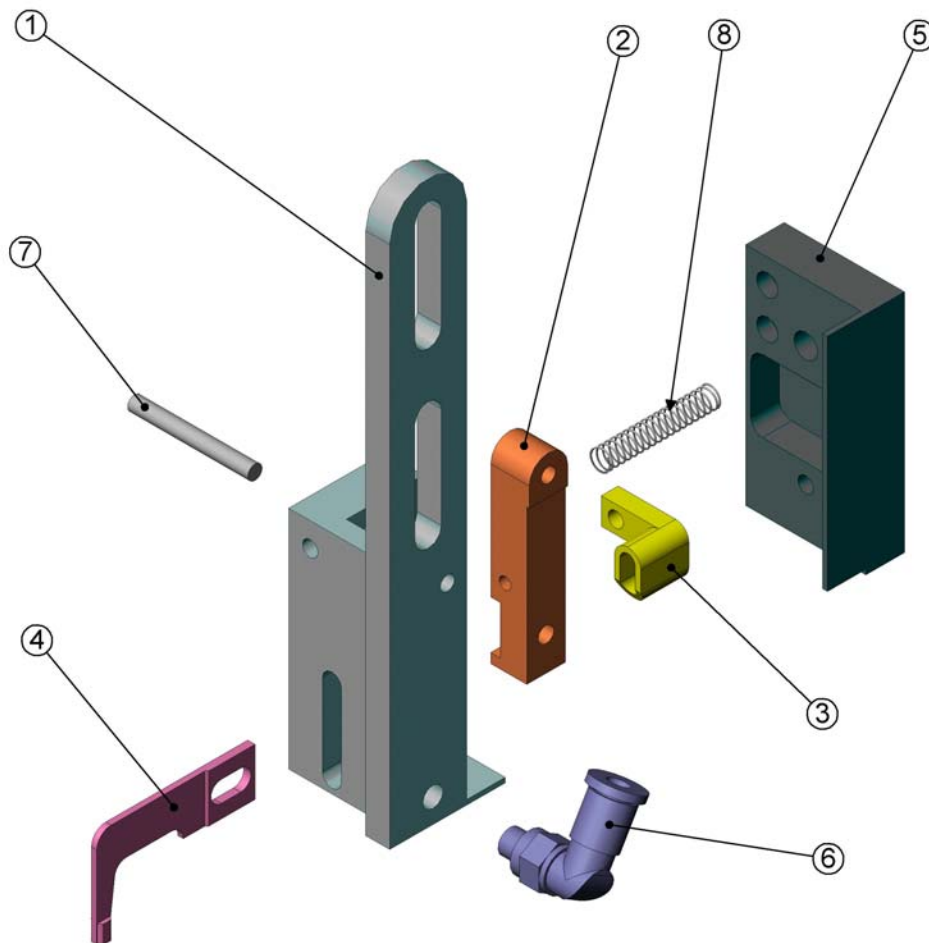
WELD HEAD EXPLOSION & PARTS LIST

ITEM NO.	QTY.	PART NO.	DESCRIPTION																																				
1	1	71-105-040	BACKPLATE																																				
2	1	71-105-041	MAIN BLOCK																																				
3	1	71-105-042	BEARING TUBE																																				
4	2	71-105-043	BEARING																																				
5	1	71-105-044	CABLE MOUNT																																				
6	1	71-105-045	ADJUSTMENT BLOCK																																				
7	1	71-105-046	DRIVE PLATE																																				
8	1	71-105-047	BUMP STOP																																				
9	1	71-105-048	ALIGNMENT BLOCK																																				
10	1	71-105-049	TUBE WASHER																																				
11	1	71-105-050	ROD END																																				
12	1	71-105-051	BUMP STOP																																				
13	1	71-105-052	SLEEVE																																				
14	1	71-105-053	MAIN COVER																																				
15	1	71-105-028	SHAFT LOCKWASHER																																				
16	1	71-105-054	TOP NUT </td																																				
17	1	71-103-081	TUBE CLAMP																																				
18	1	71-105-061	SWITCH HOUSING COMPLETE																																				
19	1	79-900-300	WELD SHAFT																																				
20	1	71-105-002	TAPERED OLIVE																																				
21	1	79-900-302	TUBE GUIDE </tr <tr><td>22</td><td>1</td><td>75-100-814</td><td>HEAD MOUNTING PLATE</td></tr> <tr><td>23</td><td>2</td><td>71-105-055</td><td>CLAMP PLATE</td></tr> <tr><td>24</td><td>1</td><td>71-105-056</td><td>WELD BRAID</td></tr> <tr><td>25</td><td>1</td><td>71-105-057</td><td>SCREW ADJUSTER</td></tr> <tr><td>26</td><td>1</td><td>71-105-058</td><td>COLLET NUT</td></tr> <tr><td>27</td><td>1</td><td>71-105-059</td><td>DRIVE CYLINDER</td></tr> <tr><td>28</td><td>1</td><td>71-105-060</td><td>PNEUMATIC BRACKET</td></tr> <tr><td>29</td><td>3</td><td>71-105-066</td><td>PNEUMATIC FITTING</td></tr> <tr><td>30</td><td>1</td><td>71-105-070</td><td>ALIGNMENT PIN</td></tr>	22	1	75-100-814	HEAD MOUNTING PLATE	23	2	71-105-055	CLAMP PLATE	24	1	71-105-056	WELD BRAID	25	1	71-105-057	SCREW ADJUSTER	26	1	71-105-058	COLLET NUT	27	1	71-105-059	DRIVE CYLINDER	28	1	71-105-060	PNEUMATIC BRACKET	29	3	71-105-066	PNEUMATIC FITTING	30	1	71-105-070	ALIGNMENT PIN
22	1	75-100-814	HEAD MOUNTING PLATE																																				
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29	3	71-105-066	PNEUMATIC FITTING																																				
30	1	71-105-070	ALIGNMENT PIN																																				



FLICKER HOUSING EXPLOSION & PARTS LIST

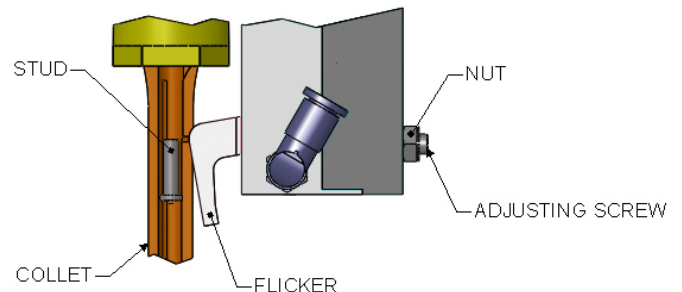
ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	71-105-062	HOUSING
2	1	71-105-063	ARM
3	1	71-105-064	PISTON
4	1	Depends on stud type	FLICKER
5	1	71-105-065	REAR COVER
6	1	71-105-066	PNEUMATIC FITTING
7	1	71-105-067	PIN
8	1	71-105-068	SPRING



MAKING ADJUSTMENTS

FLICKER ACTUATION

Movement of the flicker is triggered at the same time as the welding stroke. However the flicker must return its engaged position before the head starts to move back up. The return movement is controlled on simple machines by a pneumatic delay valve, on CNC machines it is controlled by the system PLC.



ADJUSTING FLICKER MOVEMENT

Loosen the nut.

Set the adjusting screw so that the flicker moves out of the collet and the stud can pass the flicker without catching.

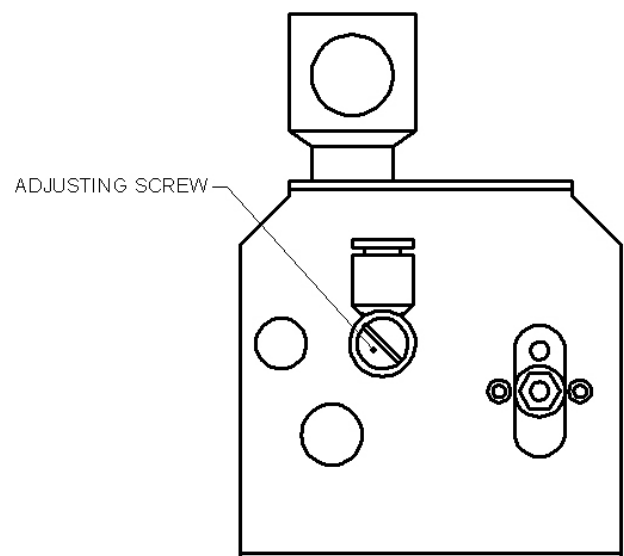
Tighten the nut.

ADJUSTING HEAD RETURN SPEED

A pneumatic restrictor is fitted to control the return speed of the weld head.

This is located on the back of the pneumatic connection bracket.

Undo the locknut and screw the adjuster out to increase the head speed and screw it in to reduce the speed. Re-tighten the locknut.



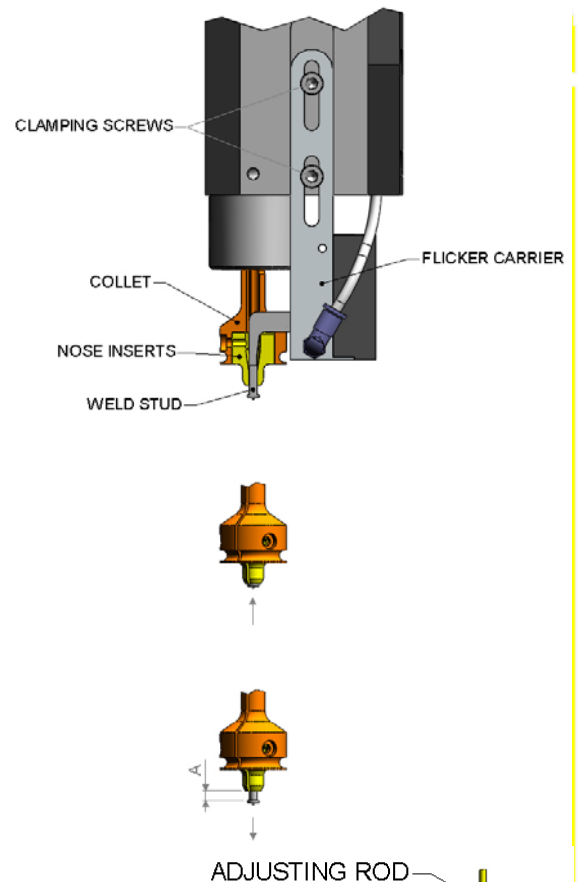
MAKING ADJUSTMENTS

ADJUSTING FOR DIFFERENT STUD LENGTHS

The weld head must be in the up position.
Load a stud into the collet.
Loosen the flicker housing clamp screws.
Move the flicker housing to its top position.
Press the stud fully up into the collet, so that the stud flange is in contact with the nose inserts.
Push the flicker housing down until the stud sticks out of the nose inserts by dimension A.
Lock the flicker housing clamp screws.

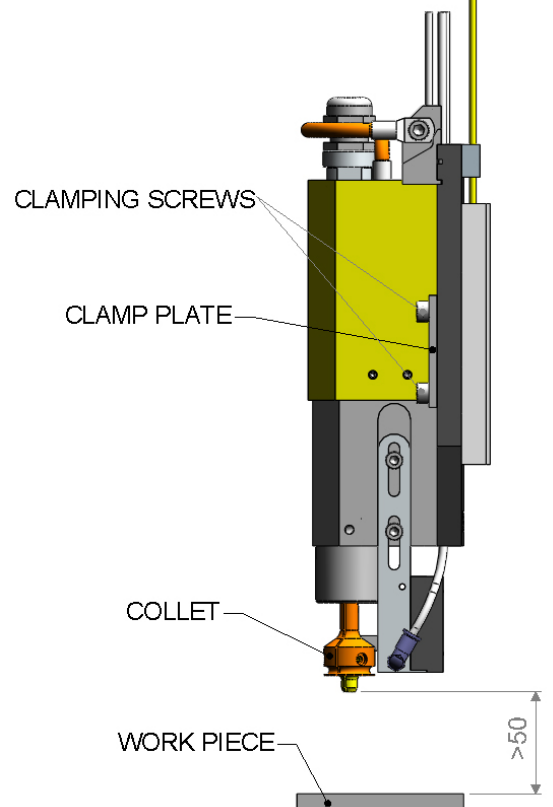
Values for dimension A:

Stud Length	Dimension A
6 to 8mm	1 to 2mm
10 to 15mm	3 to 4mm
15 to 20mm	5 to 8mm
20 to 30mm	10 to 15mm



ADJUSTING HEAD HEIGHT

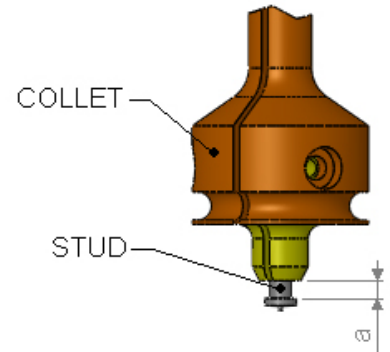
The stroke of the weld head is limited to approx 50mm.
Special heads with strokes up to 300mm are available.
The complete head is moved to set up the correct height.
Loosen the clamping screws.
Turn the adjusting rod clockwise to increase the distance between collet & workpiece.
Turn the adjusting rod anti clockwise to decrease the distance between collet & workpiece.
Once the head is at the correct height, tighten the clamping screws.



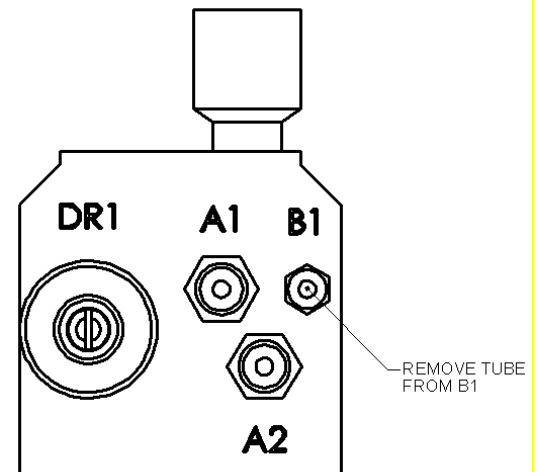
MAKING ADJUSTMENTS

ADJUSTING HEAD HEIGHT (cont.)

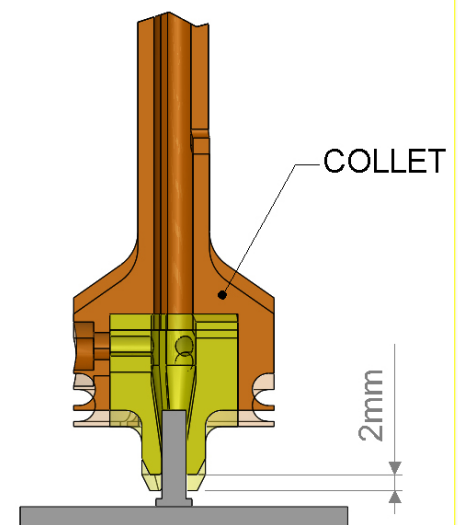
Fasten the workpiece into the jig.
Feed a stud into the collet.
Check the distance 'a' as shown on page 12



Turn off the air pressure, or pull tube B1 out of the pneumatic connection. This connection has a non-return valve.



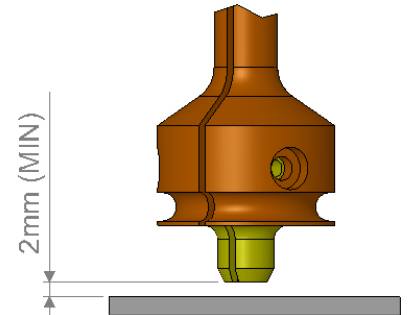
Drop the collet down, until the stud contacts the workpiece.
The head height is correct if the stud is pushed back into the collet by approx. 2mm before the collet reaches the limit of its travel.



MAKING ADJUSTMENTS

ADJUSTING HEAD HEIGHT (cont.)

For very short studs (6 - 8mm), adjust the welding head so that between the nose inserts and the workpiece is a gap of 2mm.



PLUNGE SPEED

To have good welding results, the stud must touch the workpiece and plunge into the molten pool at a precise speed.

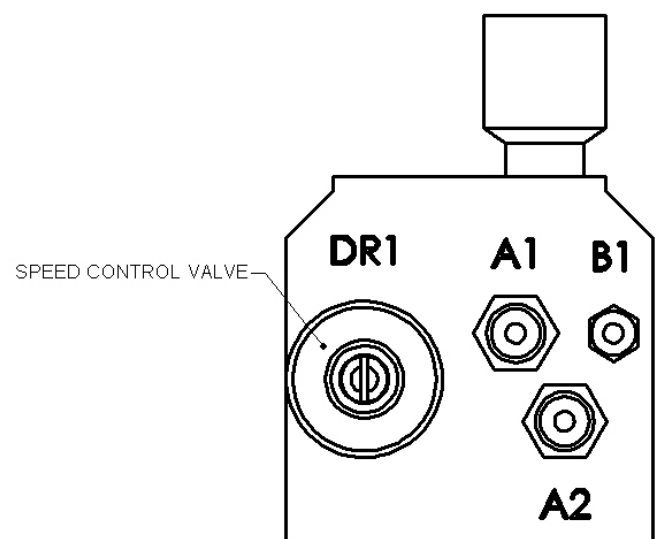
This speed depends on the material being welded and the tip dimensions of the stud. The best results are achieved after test welding with different settings.

ADJUSTING THE PLUNGE SPEED

To adjust the plunge speed, set the valve DR1 on the pneumatic connection bracket.

Actual speeds are shown below:

DR1 scale	Plunge speed (m/s)
1.5	1.0
2.2	0.9
2.5	0.8
3.0	0.7
3.4	0.6
3.8	0.5

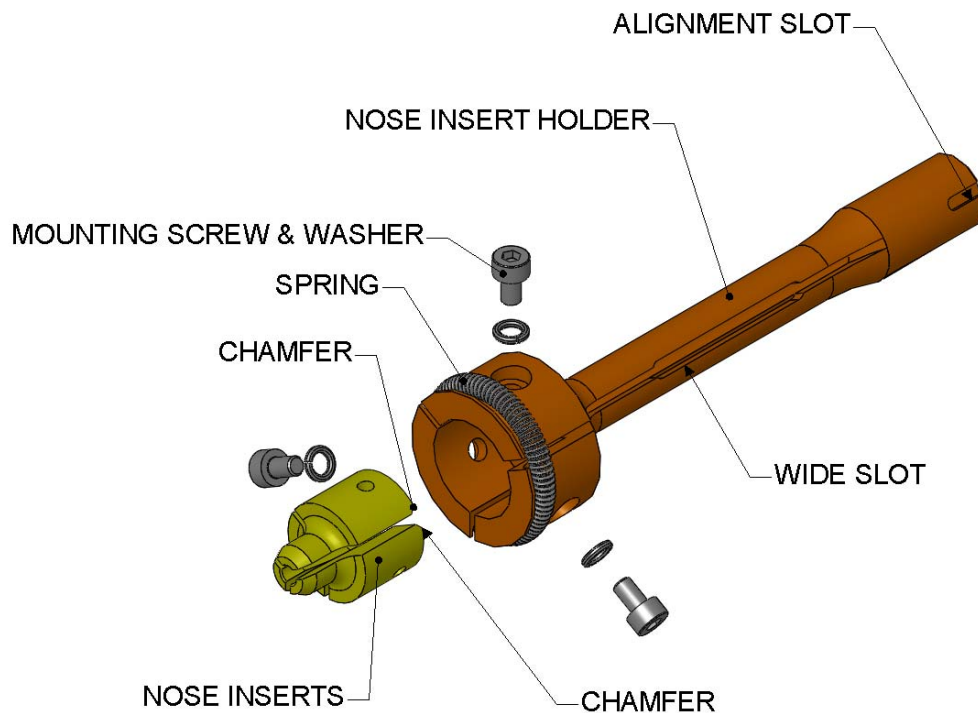


CHANGING COLLETS

COLLET

The standard collet is made up of three parts:

- 1: Holder
- 2: Nose inserts
- 3: Spring



CHANGING THE NOSE INSERTS

Note: the nose inserts are made from one piece. They are supplied together in a set. Do not mix single contact pieces from different sets.

The nose inserts are all slightly different, when fitting them ensure that the two pieces with a chamfer are placed together and that these also align with the wide slot in the nose insert holder.

Fit the nose inserts into place and loosely fit the screws and lockwashers. Push a stud into the nose inserts and press the flange against them. Tighten the mounting screws. The nose inserts are now centred.

CHANGING COLLETS

REMOVING THE COLLET

Switch off the air supply, or remove tube B1.

Push the guide shaft down.
Loosen the clamping nut with an open spanner.

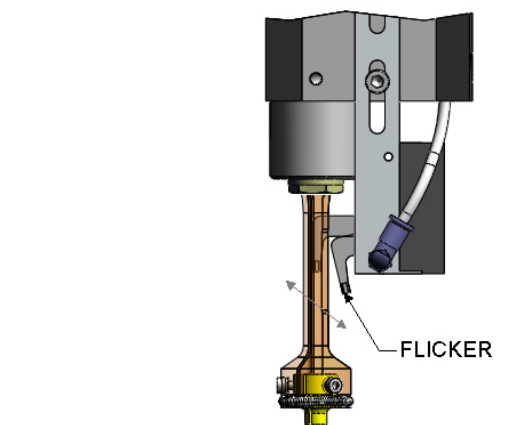
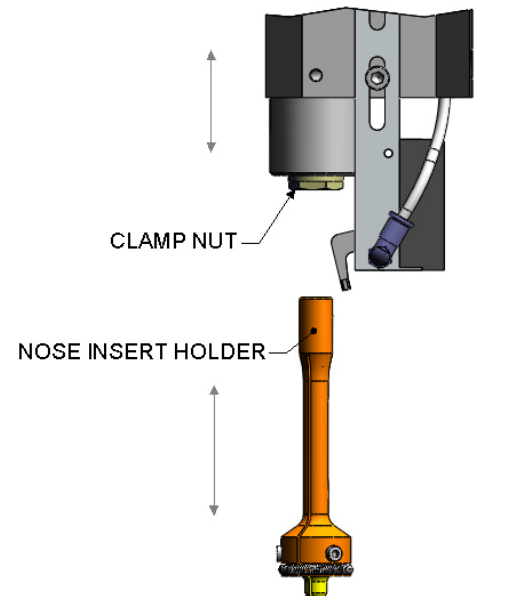
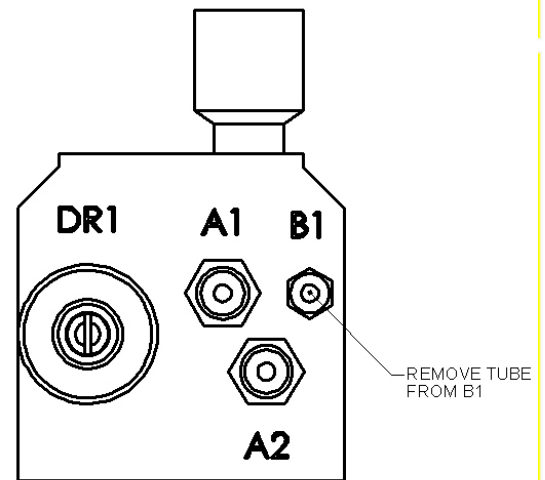
Lightly tap the collet holder with the spanner until the holder comes free.

FITTING THE COLLET

Note that the wide slot in the collet holder is oriented towards the flicker.
Push the collet holder into the guide shaft.
With the flicker out of the way, check that the slot on the collet holder is engaged onto the pin in the guide shaft. If it is in position the collet holder should not rotate.

Tighten the clamping nut.

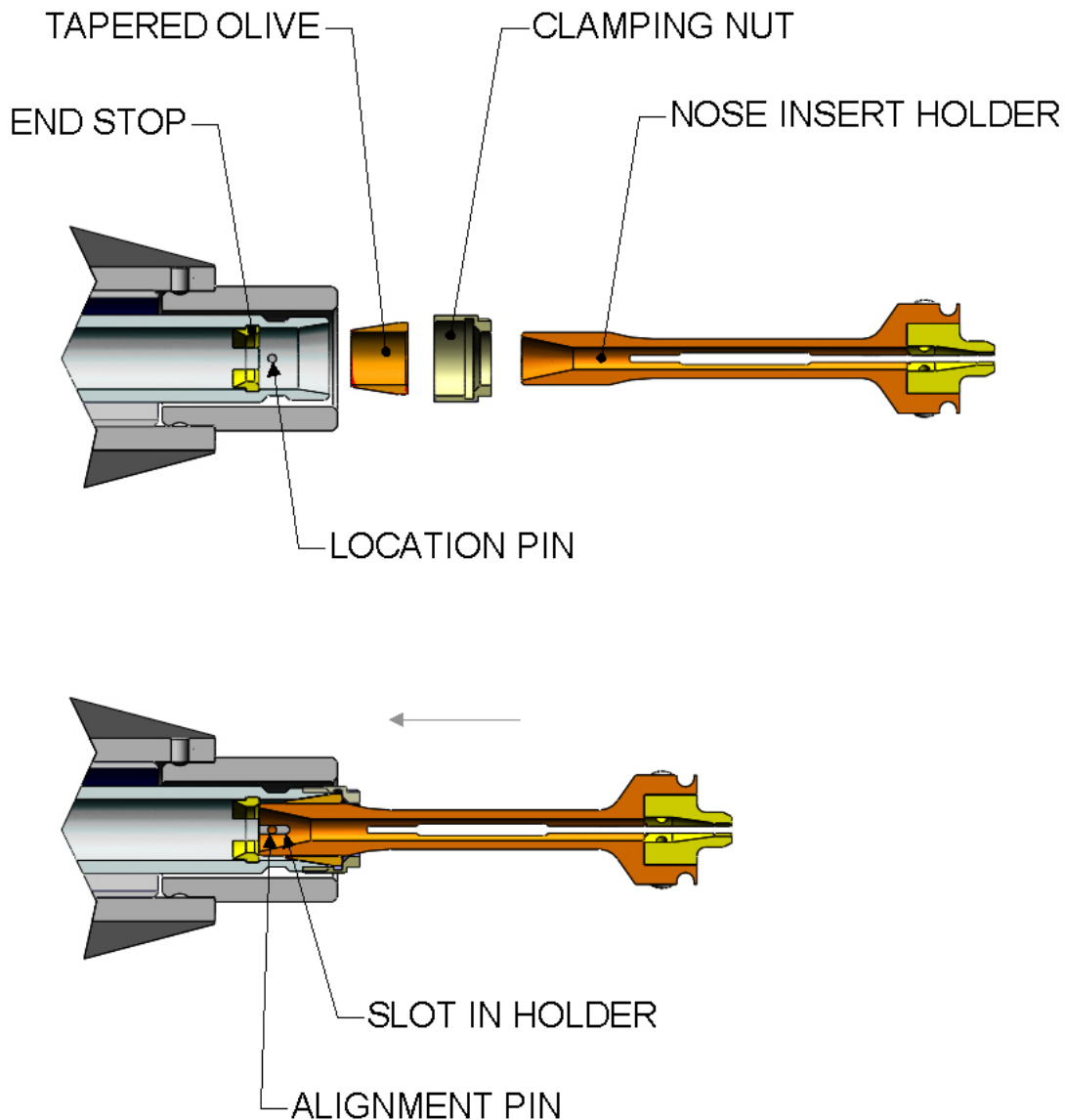
Move the flicker by hand, if the collet holder is fitted correctly, the flicker should move easily in and out of the slit in the collet.



CHANGING COLLETS

FITTING THE COLLET (cont.)

The collet is held into the guide shaft with a tapered olive, this makes sure that there is a good electrical and mechanical contact between the collet and guide shaft.



**Push the collet into the guide shaft until it reaches the end stop.
Ensure that the slot in the collet holder, engages with the alignment pin in the guide shaft.
Tighten the collet holder in place with the clamping nut.**

COLLET TYPES

COLLET PART No's

Collet holder

Stud \varnothing mm (inch)	Part No
M3	40-13077
M4 (6-32)	40-13085
M5 (3/16") (10-32)	40-13107
M6 (8-32) (1/4")	40-13166
$\varnothing 7.1$	40-13069
M8	40-13174



The collet spring and nose insert screws are available under part number 40-14111

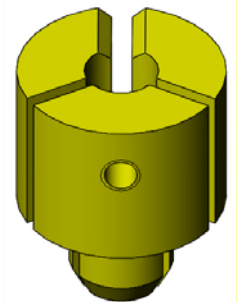


COLLET TYPES

COLLET PART No's

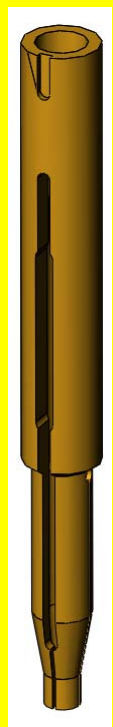
Nose inserts

Stud \varnothing	Part No
3 (6 to 20 long)	40-14928
3 (15 to 30 long)	40-14901
4 (6 to 20 long) 8-32"	40-13522
5 (8 to 20 long) 3/16"	40-13409
6 (8 to 20 long)	40-15037
7.1 (10 to 25 long)	40-15150
8 (10 to 25 long)	40-15053



Close centre one part collet

Stud \varnothing	Part No
2.3	40-11449
2.5	40-17226
3	40-15266
6-32" (3.5)	40-15401
4 (8-32")	40-17668
5 (3/16")	40-15258
6	40-15274
7.1	40-17676
8 (5-18")	40-17692



STUD FEED HOSE

STUD SUPPLY TUBE

The stud supply tube transports the stud into the welding head. The tubes are made from a non-abrading polyamide. The tube diameter depends on the stud size:

Stud \varnothing (mm)	Tube OD (mm)	Tube ID (mm)	Part No (per m)
3	8	5	40-20863
4	10	6	40-26667
5	10	7	40-19989
6	10	8	40-20901
7.1 & 8	12	10	40-20928

TUBE REPLACEMENT

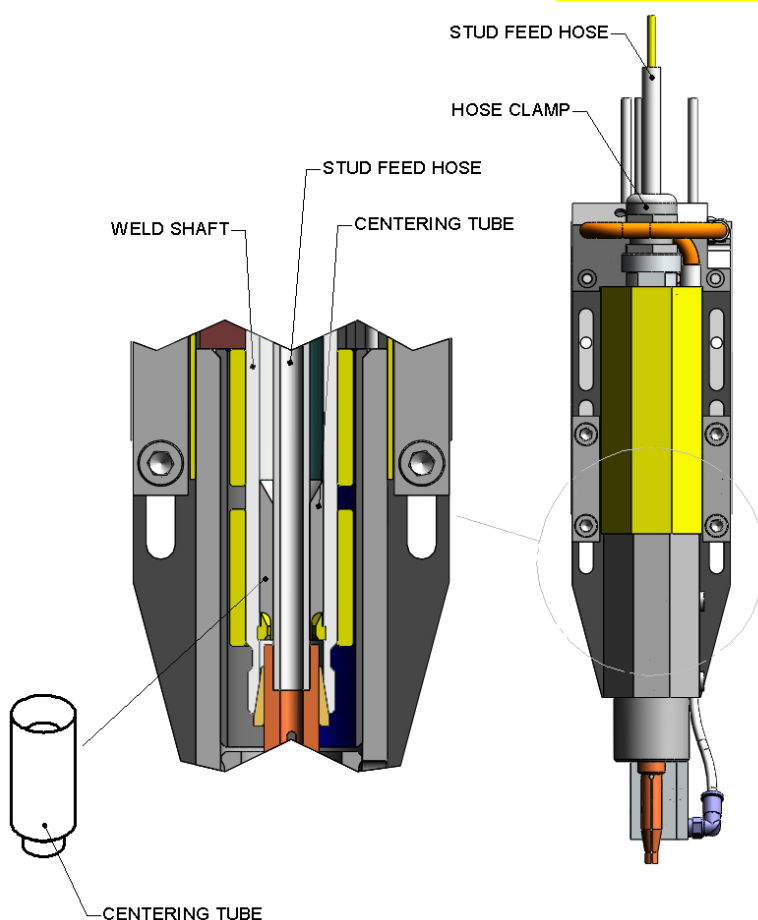
The stud supply tube goes straight through the guide shaft and is clamped at the top, by a hose clamp.

Loosen the clamp nut and pull the supply tube out of the guide shaft.

Make sure that a collet is in place before you fit another supply tube.

Push the new tube down until it stops against the collet, re-tighten the clamp nut.

For M3 studs it is recommended that a centring tube (75-100-833) is fitted.



CHANGING FLICKERS

CHANGING THE FLICKER

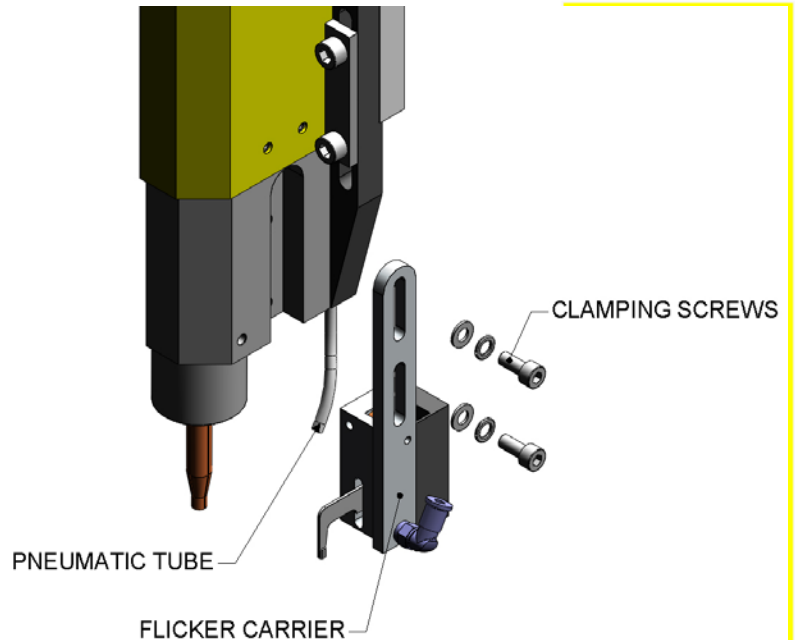
In addition to the standard flicker, special flicker for different applications are available.

The table on page 22 shows the various types and their uses.

REPLACEMENT

The easiest way to replace the flicker is to remove the flicker carrier.

Remove the clamping screws.
Remove the pneumatic tube: press down on the blue flange of the tube fitting and pull out the pneumatic tube.

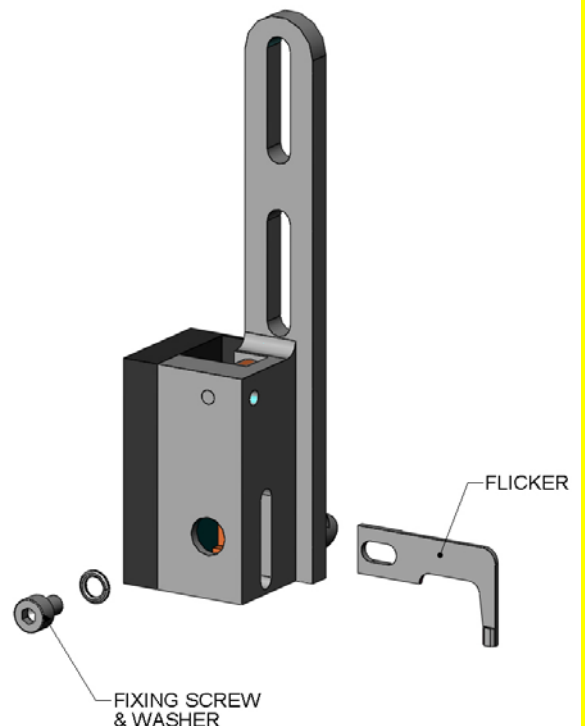


Take the flicker housing, remove the fixing screw and lockwasher.

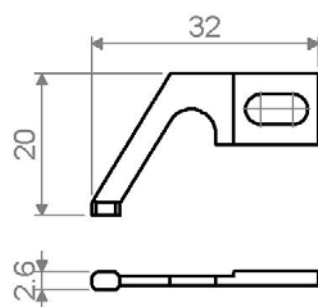
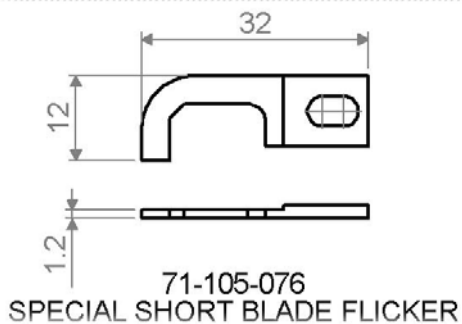
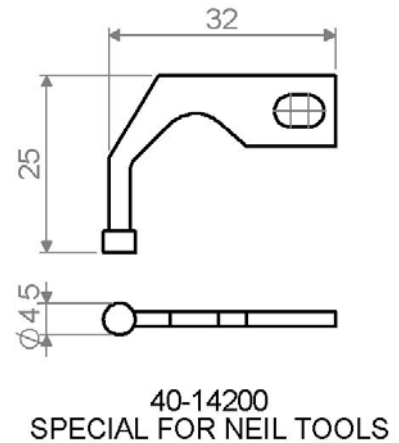
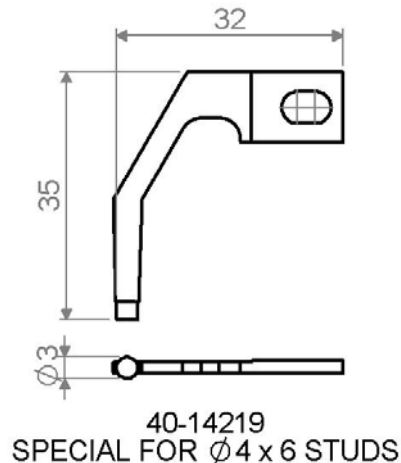
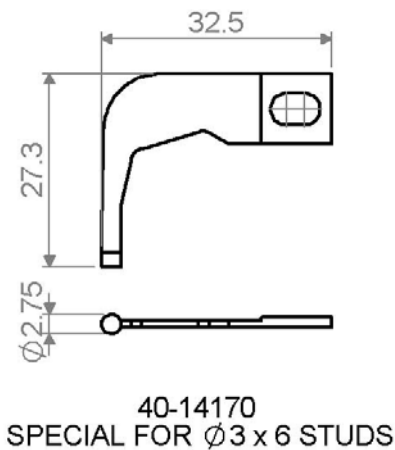
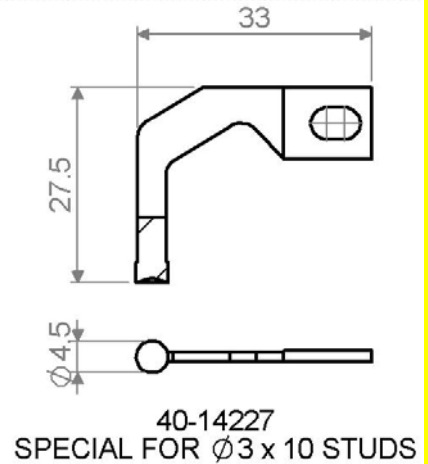
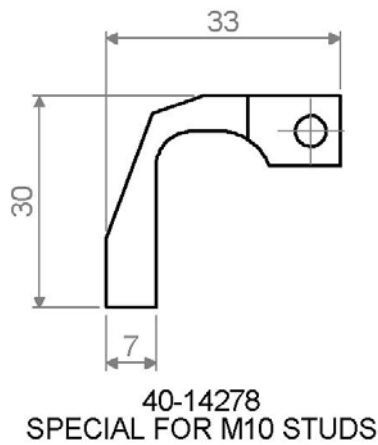
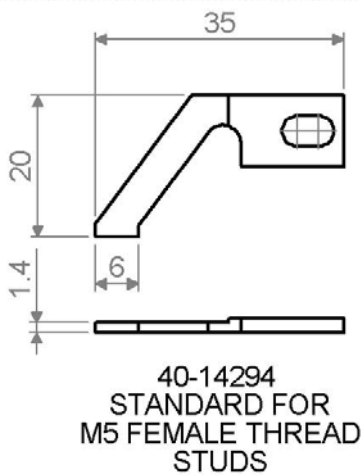
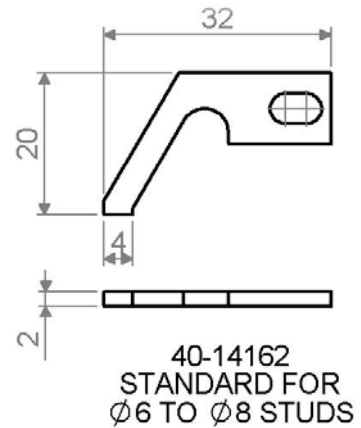
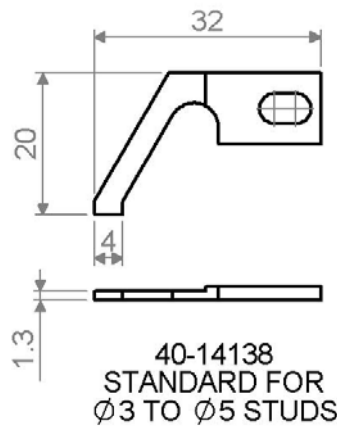
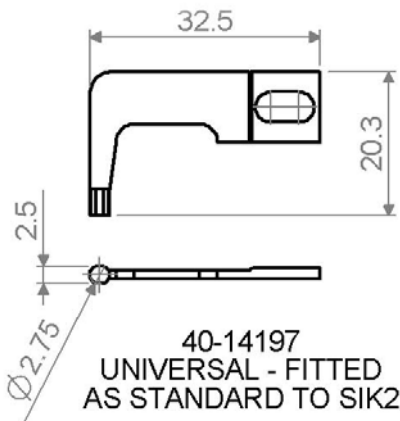
Pull the flicker out of the housing.

Fit a new flicker in reverse of the above procedure.

Once the flicker housing has been fastened back onto the head, loosen the flicker fixing screw and adjust the flicker in or out, until it is central in the collet holder.



FLICKER TYPES



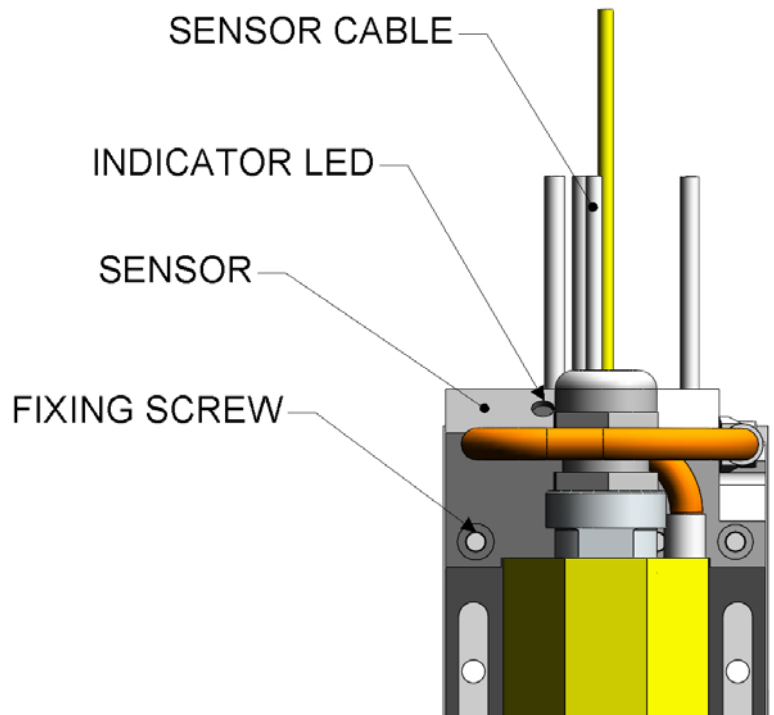
HEAD UP SENSOR

The weld head has a sensor to detect when the head is in the up position. An LED shows the position:

Green = Head up
Red = Not in position.

CHANGING THE HEAD UP SENSOR

Undo the M4 fixing screw and remove the sensor.
Unplug the sensor cable.
Fit a new sensor, re-connect the sensor cable.



CHANGING STUD DIAMETER

To change the stud diameter the following components have to be changed:

- 1 Collet holder (see page 15)
- 2 Flicker if needed (see page 21)
- 3 Feed tube if needed (see page 20)

WELD QUALITY

VISUAL ASSESMENT OF WELD QUALITY

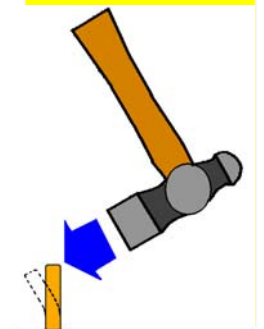
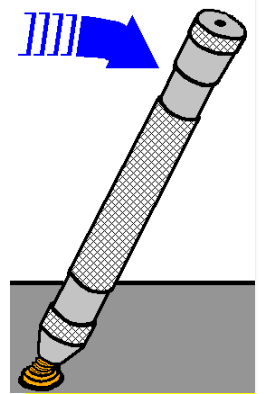
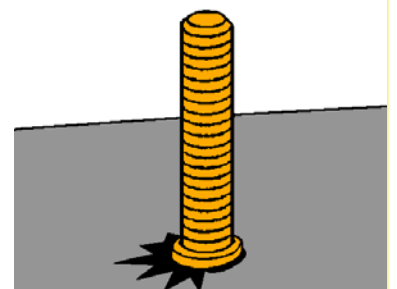
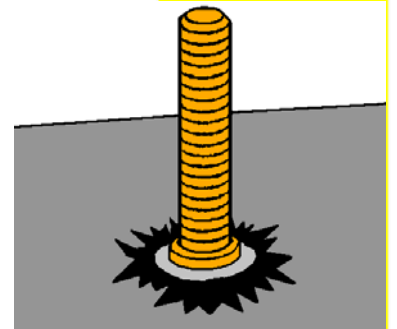
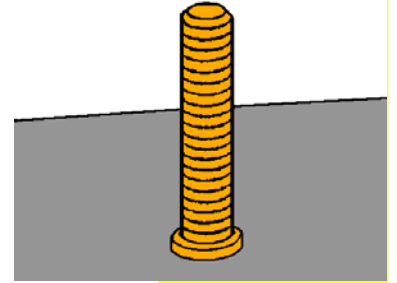
A cold stud weld is noticeable by undercutting of the flange and lack of / minimal formation of spatter. A cold weld is usually caused by too little energy and / or too fast a plunge speed.

A hot stud weld is noticeable by excessive spatter formation and partial melting of the flange. A hot weld is usually by too much energy and / or too slow a plunge speed.

A one sided stud weld (arc blow) is usually caused by incorrect earthing of the work piece. This may be corrected by placing the welding earths opposite each other across the area where the weld is to occur.

Finished studs may be subjected to a bending test to ascertain the strength of the weld. This may be achieved by placing a bending bar assembly, fitted with the correct nozzle, over the stud and bending the stud through 30° and then back to the vertical. This test follows the specification of DVS 0905 part 2.

A simpler test may be achieved by bending the stud over 30° using a hide mallet.



WELD QUALITY

Visual examination of weld quality can, even with limited experience, provide a useful quality assessment. In such a check the presence of a small even witness of weld material around the base of the stud flange after welding should be ensured. Poor welds are indicated by excess metal on one side of the welded flange and / or the presence of an undercut or non-fused area between the stud flange and the parent sheet or plate. Incorrect settings, adverse magnetic effects etc. such as those at edge welding positions or with unbalanced earths and studs welded to the work piece at an angle, the controller and pistol should be examined with a view to correcting such defects.

MECHANICAL TESTS :

① BENDING.

The most easily applied method of testing the quality of welded fasteners considered here, involves the use of a bending bar. This bending bar (available from your supplier, see the accessories section of this manual) fitted with the correct size of nozzle for the stud to be tested is used to bend over the stud in accordance with the DVS0905 (German Welding Society Spec') specification .

② TORSION.

A torsion test provides useful information for threaded fasteners. This involves tightening a nut on the stud against a spacer, suitably relieved to cater for the flange and weld spatter. For quantitative assessments a suitably calibrated torque wrench may be used, but at its simplest, a spanner will suffice.

In the above tests the performance of the welded joint should be considered in relation to the thickness of the material to which the stud is welded. On thicker materials, a full strength weld is denoted by deformation or failure of the stud shank. On lighter gauge material, severe "dimpling" or "dishing" at the reverse to the weld side normally indicates sufficient strength, whilst in most cases, the tearing of a slug of material from the parent sheet will occur.

TROUBLE SHOOTING

Fault / Error	Cause	Remedy
Sudden decline in weld quality	Worn welding contacts	Check the contacts of the collet & earth clamps. Replace worn out parts
	Welding energy too high or too low	Too much spatter around the weld area: energy too high - decrease the weld voltage No spatter around the weld area: energy too low - increase the weld voltage
	Burnt welding cable plug and sockets. Welding cable damaged	Check the weld cables and replace as necessary
	Plunge speed of the weld head too fast or too slow	Check the plunge speed & change the setting of the valve DR1
	Weld head faulty	Check the bearings and guide shaft, replace if necessary
	Dimensions of the stud tip outside of tolerance	Check the dimensions of the stud tip. The size and tolerance must be to EN ISO 13918
	Wrong stud material	Check the material of the stud, it must be suitable for welding
	Wrong workpiece material	Check the material of the sheet, it must be suitable for welding
	Workpiece surface contaminated	Check the surface of the sheet, it must be clean & free from oil or grease

TROUBLE SHOOTING

Fault / Error	Cause	Remedy
Studs show material ejected to one side only	Arc blow effect. Earthing contacts not applied evenly	Apply earthing contacts symmetrically to the weld position
Burn marks on stud	Collet contact worn	Replace the contact inserts
No stud in the collet	Stud blockage in the stud feeder	Check the vibrator bowl and stud feeder
	Feed tube	Check that the feed tube is fully inserted into the head. If the feed hose is kinked, replace it
	Stud has not reached the collet	Check all the points through which the stud is guided, from the stud feeder down to the collet. Check the air pressure and air flow
	Several studs in the feed tube or the collet	Insufficient freedom of motion of the flicker. Remove the studs from the feed tube or collet. Check that the flicker is free to move, also check the air pulse for the flicker and the control signal for the stud separator
	Worn out collet	Replace the collet

EC DECLARATION OF CONFORMITY

TAYLOR STUDWELDING SYSTEMS LIMITED

Hereby certifies on it's sole responsibility that the following products :

SIK 2 Automatic CD weld head

Which is explicitly referred to by this Declaration meet the following Directives and Standards :

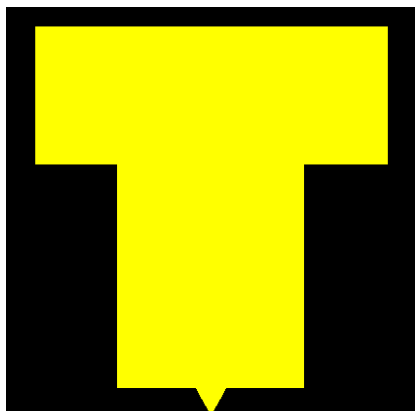
Directive 89/336/EEC
Electromagnetic compatibility
Directive 93/68/EEC
CE Marking
European Standard
EN 50 199

Documentation evidencing conformity with the requirements of the Directives is kept available for inspection at the above Manufacturer's headquarters.

D. Taylor



Managing Director



TAYLOR

STUDWELDING

SYSTEMS LIMITED

