

ELEKTRA BECKUM ®

INDUSTRIAL

Operating Instructions MIG Welding Machines

OMEGA 400 SEK/W (TIG AC/DC + MIG/MAG)

OMEGA 400 SEK/WX (TIG AC/DC)



Important!

Read these instructions carefully before installation and initial operation of this welding power source

Elektra Beckum reserves the right to discontinue models, accessories or options at any time or change specifications and materials, equipment and design without notice and without incurring obligation of any kind.

03/94 - EB-D

Equipment referred to as available or optional may be at extra cost.

Stock-no. 115 117 8541

Contents

| | | | |
|-----|---|------|---|
| 1.0 | Machine Conception | 4.0 | General Instructions for Machine Start-Up |
| 1.1 | Scope of Application | 4.1 | MIG/MAG Welding |
| 1.2 | Important Information | 4.2 | MIG/MAG Welding with Separate Wire Feed |
| 1.3 | System Component Combinations | 4.3 | TIG Welding |
| 1.4 | Specifications | 4.4 | MANUAL ARC Welding |
| 2.0 | Description | 5.0 | Safety Precautions/Accident Prevention |
| 2.1 | Panel Controls | 5.1 | Overloads/Low Voltage |
| 3.0 | MWS Multi-Function Control Description/Instructions | 6.0 | Service and Maintenance |
| 3.1 | General | 6.1 | Electronic Controls |
| 3.2 | Machine Start-Up | 7.0 | Error Messages |
| 3.3 | Menu MIG/MAG Welding | 8.0 | Trouble Shooting |
| 3.4 | Menu TIG AC Welding | 9.0 | Spare Parts List/Accessories |
| 3.5 | Menu TIG DC Welding | 10.0 | Wiring Diagram |
| 3.6 | Menu MANUAL ARC Welding | | |

1.0 Machine Conception

The multi discipline integrated welding unit OMEGA 400 SEK/W is a secondary-switched inverter serving as a welding power source for MIG/MAG welding, TIG welding AC/DC and Manual Arc welding.

All three major welding processes, used for different applications, are carried out with a single welding machine. All applications, from welding aluminium and stainless steel extrusions to heavy machinery construction and ship building, are carried out with optimal results and top weld quality (spatter-free welding, no weld finishing).

This is achieved by a newly designed secondary inverter and a new, patented display control unit. Three rotary switches and a LCD display provide the operator with complete control for all welding processes. In addition the operator can store different welding parameters and recall these when required (MIG/MAG and TIG only).

Both the OMEGA 400 SEK/W and SEK/WX have an electronically controlled choke, providing for spatter-free welding. Also the operator can choose between a hard or soft arc.

The complete unit is constantly monitored by a fault detection unit. In the event of an internal or external fault the cause is shown in the display in plaintext.

All electronic components are protected against dust built-up. The LCD-display is protected by an impact-resistant plexiglass panel. All electronic components are electrically separated and short-circuit proof, the control circuits are thus potential free and safe from harm by defective power cables etc. Both machines conform to the EN 60974/1 standard.

Model OMEGA 400 SEK/WX is a TIG welding machine only; it can be adapted later to the MIG/MAG function by connecting the external Wire Feed Unit SDV 250 RC (see 4.2 below).

1.1 Scope of Application

- suitable for operation in areas with increased electrical hazard (S)
- MIG/MAG welding (stepless control)
- TIG DC welding in 2- and 4-cycle mode
- TIG AC welding in 2- and 4-cycle mode
- TIG AC/DC pulse welding
- manual arc welding (stick welding)
- separate wire feeder can be connected
- computer interface to connect to welding robots
- suitable for welding of low-carbon steels, steel alloys, NF-metals and aluminium.

1.2 Important Information

MIG/MAG torch and/or TIG torch/electrode holder can both be connected to the machine at the same time, **but both are under current when the welding current is activated. The torch not in use has to be placed on an insulated pad or backing.**

This allows for a quick change-over to a different welding process by simply setting the to a different welding mode.

The MIG/MAG torch's trigger switch and the red button of the TIG torch work parallel, i.e. with the machine in TIG mode it welding can be started by engaging the MIG/MAG torch trigger switch, and vice versa!!

Do not use a foot control unit and a TIG torch with remote control potentiometer at the same time, as these will interfere with each other.

Important: Do not operate near data processing equipment. Ensure potential separation for computer interface.

1.1 User Responsibility

This machine will perform in conformity with the description contained in the instructions provided. This machine must be checked periodically. Defective equipment (including service leads) should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repair or replacement become necessary, it is recommended that such repairs are carried out by qualified persons approved by Elektra Beckum or their representatives. This machine or any of its parts should not be altered from standard specifications. The user of this machine shall have the sole responsibility for any malfunction which results from improper use or unauthorized modification from standard specifications, faulty maintenance, damage or improper repair by anyone other than qualified persons approved by Elektra Beckum or their representatives.

**Do not disassemble the pressure regulator. It may explode if re-assembled incorrectly.
Danger of personal injury!!**

1.2 System Component Combinations

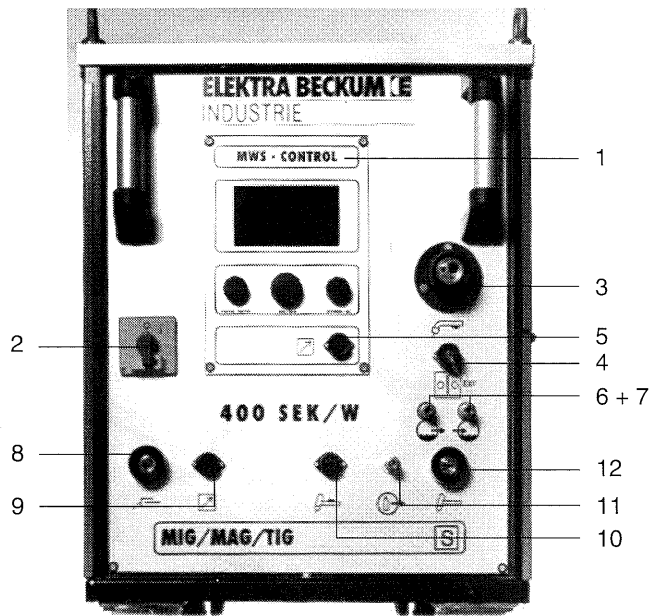
| Description | Stock-no. | MIG/MAG-TIG AC/DC | TIG AC/DC |
|---|--------------|-------------------|-------------|
| | | 400 SEK/W | 400SEK/WX |
| | | 0021084107 | 0021084000 |
| MIG torch, 3 mtr leads | 090 200 8330 | X | - |
| MIG torch, 4 mtr leads | 090 200 8349 | X | - |
| MIG torch, 5 mtr leads | 090 200 8357 | X | - |
| Earth cable ass'y, 50mm ² , 5 mtr lead | 090 201 1315 | X | X |
| Separate Wire Feed Unit SDV 250 RC | 090 201 0840 | X | X |
| Separate Wire Feed Unit SDV 250 E | 090 200 5544 | X + adaptor | X + adaptor |
| Adaptor SDV 250 E - SEK/W | 090 201 1285 | X | X |
| Trolley for SDV 250 E/EC | 090 201 0882 | X | X |
| Torch lead extension, 70mm ² , 5 mtr leads, water-cooled, interconnecting | 090 201 1269 | X | X |
| Torch lead extension, 70mm ² , 10 mtr leads, water-cooled, interconnecting | 090 201 1277 | X | X |
| TIG torch AW 424, 4 mtr leads | 090 201 2826 | X | X |
| TIG torch AW 424, 8 mtr leads | 090 201 2834 | X | X |
| TIG torch SR 18, 4 mtr leads, water-cooled | 090 201 2036 | X | X |
| TIG torch SR 18, 8 mtr leads, water-cooled | 090 201 2516 | X | X |
| TIG torch SR 26, 4 mtr leads | 090 200 9108 | X | X |
| TIG torch SR 26, 8 mtr leads, remote control | 090 200 8055 | X | X |
| Foot control unit, 5 mtr leads | 090 200 7210 | X | X |
| Accessory kit no. 9, 50mm ² (manual arc) | 132 702 2675 | X | X |
| Adaptor for wire basket K 300 | 090 201 2630 | X | - |
| Pressure regulator, dual clock | 090 200 5293 | X | X |
| Welding visor, hand held | 090 200 5528 | X | X |
| Silicon grease nozzle dip, 80 g tin | 132 703 8300 | X | X |
| Anti-spatter spray, 150 ml aerosol | 132 703 8296 | X | X |
| Wire brush, 2-row | 090 200 3908 | X | X |
| Torch cleaning pliers | 090 200 3916 | X | X |

1.3 Specifications

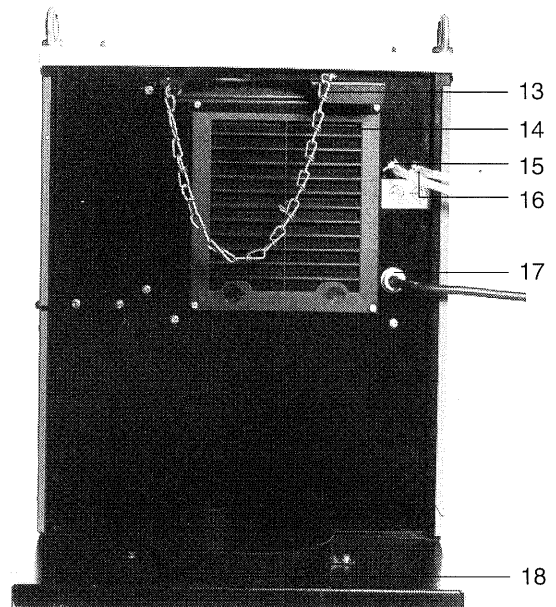
Both models meet the EN 60974-1 standard and are approved for boiler welding.

| | | | |
|---------------------------|-----------------|--------------------------|---------------------|
| Supply voltage | 3~ 400 V ± 10 % | Setting | stepless |
| Main frequency | 50-60 Hz | MIG/MAG electrode wire Ø | 0.6 - 1.6 mm |
| Open circuit voltage | 56 V | Power factor φ | 0.87 |
| Operating voltage | TIG | MIG/MAG wire feed drive | 4-roller heavy-duty |
| | manual arc | Protection class | IP 23 |
| | MIG/MAG | Insulation class | F |
| Setting range | TIG | Cooling | fan |
| | manual arc | | |
| | MIG/MAG | | |
| Input capacity | TIG | | |
| | manual arc | | |
| | MIG/MAG | | |
| Duty cycle at max. output | TIG | | |
| | manual arc | | |
| 100% duty cycle at | MIG/MAG | | |
| | TIG | | |
| | manual arc | | |
| | MIG/MAG | | |

2.0 Description
2.1 Panel Controls



Pic. 1 Front panel



Pic. 2 Rear view

- | | |
|---|--|
| <p>1 MWS Multi-Function Control (description and operation see 3.0 below)</p> <p>2 Mains ON/OFF switch A starting current limiter positively prevents start-up current peaks, keeping standard circuit breaker or time-lag fuses from tripping.</p> <p>3 Euro-connector Connector for MIG/MAG torch leads and torch lead extensions. With integrated shielding gas supply.</p> <p>4 Socket for external wire feed unit pilot leads</p> <p>5 Computer interface/socket for remote control unit for external wire feed unit SDV 250 RC</p> <p>6 + 7 Torch Coolant couplings</p> <p>8 Earth cable/electrode holder cable socket</p> <p>9 Socket for TIG foot control unit (arc starting with foot control unit possible)</p> <p>10 Socket for TIG torch pilot leads</p> <p>11 TIG shielding gas line coupling</p> <p>12 TIG torch current lead/electrode holder socket</p> | <p>13 Gas cylinder rack with safety chain</p> <p>14 Cooling fan screen</p> <p>15 Coupling MIG/MAG shielding gas supply</p> <p>16 Coupling TIG shielding gas supply</p> <p>17 Power supply cable</p> <p>18 Gas cylinder bracket</p> |
|---|--|

3.0 Multi Welding System (MWS) Control Description/Instructions

3.1 General

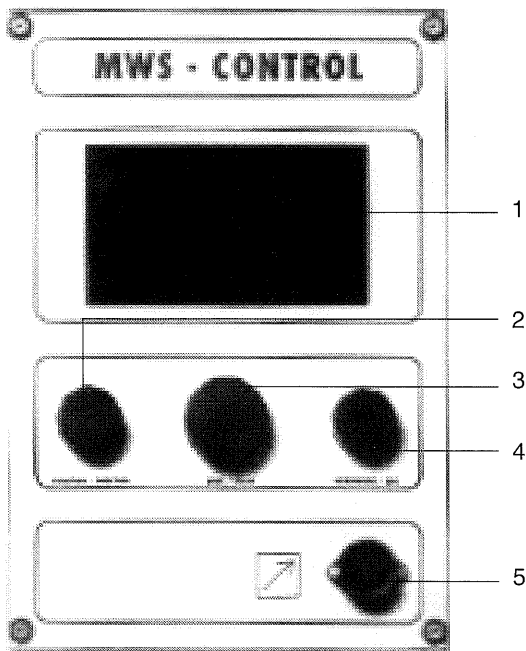
To make setting as simple as possible, the number of control elements is reduced to 3 rotary controls with the following functions:

- | | | |
|--|--|--|
| <p>1. Left control knob</p> <p>2. Center control knob</p> <p>3. Right control knob</p> | <p>ITEM</p> <p>VALUE</p> <p>ARC</p> | <p>Selects a menu or parameter (turn clockwise for next parameter, turn counter-clockwise for previous parameter or menu)</p> <p>Selects parameters/changes values</p> <p>MIG/MAG Changes the arc voltage (penetration)</p> <p>TIG Changes the balance (penetration - arc cleaning action)</p> |
|--|--|--|

Approx. 10 sec after the machine is switched on, the MWS control will display the main menu of the welding process that was active before the machine was switched off (exception: water cooling set OFF, refer to 3.2.2 below).

This is also the case after changing functions or parameters. If no controls are activated, the MWS control will return automatically to the main menu.

If the torch trigger switch is engaged the display returns immediately to the main menu, regardless of the currently selected submenu, and the welding process starts.



Pic. 3 MWS control

- 1 LCD display
- 2 Control knob ITEM, selects menus/parameters
- 3 Control knob VALUE, changes parameters
- 4 Control knob ARC for arc setting;
In MIG/MAG mode controls the arc voltage:
100%: optimal characteristic curve
up to 50%: short arc - less penetration
up to 150%: long/spray arc - deep penetration
In TIG AC mode controls the balance setting to adjust the rectifying effect.
- 5 Socket for external wire feed SDV 250 RC remote control;
computer interface.

3.2 Machine Start-Up

3.2.1 Selecting the Display Language

Switch machine on, then immediately turn knob ITEM counter-clockwise and knob ARC clockwise to activate the Language menu:



Pic. 4 Language menu

The currently selected language is highlighted. Turn knob VALUE to left or right to select the language you wish the display to show the menus/parameters. Available display languages are German (Deutsch) and English.

3.2.2 Selecting the Welding Process

After switching the machine on the Welding Process Select menu is displayed:

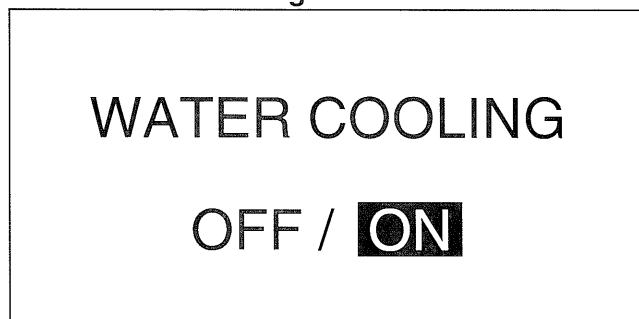


Pic. 5 Welding Process Select menu

This is the first menu shown after power up (unless the Language menu was activated as per 3.2.2 above). The welding process active before the machine was switched off is highlighted.

Turn knob VALUE to select a different welding process or turn knob ITEM clockwise to immediately display the next menu. If no action is taken, the next menu is shown after a 5 second delay.

3.2.3 Watercooling



Pic. 6 Watercooling menu

Next is the Watercooling menu. As both gas- or water-cooled torches can be used, the machine has to be set as required. With watercooling set ON, the fault detection device shuts the machine down if a fault is detected, and shows the cause in the display.

Turn knob VALUE to set the watercooling ON or OFF. Turn knob ITEM to display the Active Welding Process menu. If no action is taken, the next menu is shown after a 5 second delay.



Pic. 7 Warning message watercooling

If watercooling is set OFF, a warning is displayed to warn the operator that the fault detection device is disabled and a water-cooled torch should not be operated.

If watercooling is set ON, the warning message is skipped and the Active Welding Process menu is displayed.

3.3 Menu MIG/MAG Welding

| | | |
|-----------------|-------------|-----------|
| MIG/MAG P 0 | 1.0 s | WELD PE- |
| FE 0.8 | | NETRATION |
| SPOT | | 100% |
| WIRE FEED | 13.8 | m/min |
| WELDING CURRENT | 90 | A |
| WELDING VOLTAGE | 0 | V |
| SOFT ON | CHOKE 4 | BBT 0.3s |

Pic. 8 Active Welding Process menu

Turn knob ITEM to select any of the available parameters. The selected parameter is highlighted. Turn knob VALUE to change the value of the highlighted parameter.

If no changes are made, the MWS Control will automatically activate the Wire Feed /Welding Current parameter after a 5 second delay, as this is the parameter most often adjusted when welding.

1) Parameter WIRE

- Available selections:
- FE 0.6 mm
 - FE 1.0 mm
 - FE 1.2 mm
 - FE 1.6 mm
 - FLX 1.6 mm (flux-core wire)
 - AL 1.0 mm
 - AL 1.2 mm

It is very important to select the correct material and wire diameter in order for the processor to activate the correct current characteristics.

2) Parameter WELDING MODE

- Available selections:
- 2-step
 - 4-step
 - Stitch welding
 - Spot welding

- 2-step: Manual operation
Pressing the torch trigger starts the welding operation, releasing the switch stops the welding.
- 4-step: First operation of the trigger switch starts continuous operation, pressing the trigger switch again stops the welding.
- Stitch weld: Particularly suitable for tack welding and intermittent seams. With stitch weld mode active the display shows two additional parameters, WELD-TIME and DWELL period. Highlight parameter with knob ITEM and set duration (in seconds) with knob VALUE.
- Spot weld: With spot weld mode active the display shows the additional parameter WELD-TIME. Highlight with knob ITEM and set the weld-time (in seconds) with knob VALUE.
Pressing the trigger switch activates the welding operation for the preset weld-time period. For each spot weld the trigger switch has to be operated.

3) Parameter SOFT (automatic soft start)

Turn knob VALUE to set ON or OFF. If activated the parameter is highlighted.
While the arc has not yet ignited the filler material is fed very slowly to prevent excessive wire runout at the torch. When the arc starts the wire feed speed is automatically increased as required by the selected welding parameters. Changing the electrode wire does not require the automatic soft start to be set to off. If, after pressing the trigger switch, no welding current is sensed by the control, the automatic soft start is automatically disabled and the electrode wire can be run through the torch lead at normal speed. The automatic soft start should be disabled when working in spot weld mode.

4) Parameter WIRE FEED/WELDING CURRENT

This is the parameter most often needed by the operator. When not welding, the display shows the selected welding current and the corresponding wire feed speed in mtr per minute. The selected current must be regarded as approximate only, the actual welding current depends on several parameters like torch position, arc length, welding speed etc.

When the welding starts, the display changes to show the actual welding current and additionally the actual arc voltage. When the welding stops, these actual values are kept on display for approx. 2 seconds before the selected values are displayed again. This enables the operator to preset the required welding parameters and allows him check the actual values the welding operation was carried out with.

Because of the stepless electronic setting the operator only needs to select the required welding current, the computer automatically calculates the required wire feed speed. This requires that the correct current characteristics have been selected (parameter WIRE) and, for position welding or certain material specifications, the penetration has been corrected (control knob ARC). With the potentiometer ARC the arc voltage can be shifted to below or above the Program characteristic curve. 100% represent the optimal curve parameters (see also 8 Penetration below).

5) Parameter BACK-BURN TIMER/GAS POST-FLOW

A correctly set back-burn time keeps the electrode wire from sticking to the weld pool, and from forming a bead at the wire tip. It also regulates the gas post-flow time. Setting range 0 - 2 seconds.

6) Parameter CHOKE

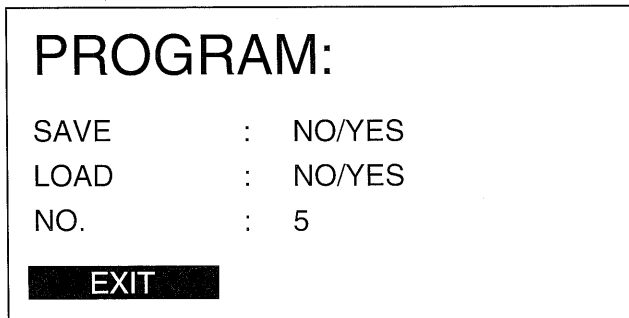
The Omega 400 SEK has an electronically controlled choke (ripple filter choke) to provide optimal welding behaviour in the short-arc welding range. As a result welding is practically spatter-free (for spray-arc welding the choke is not required).

In addition, the choke setting can be selected from 1 to 7 for a hard or soft arc. This allows the operator set the arc characteristic to suit his personal preference.

- Setting 1 = hard arc
- Setting 4 = regular arc
- Setting 7 = soft arc

7) Parameter MIG/MAG P (programming/storing welding parameters)

When highlighted, turn knob VALUE to show the Program menu.



Pic. 9 Program submenue

For MIG/MAG welding 6 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item, Select Program no. 1 - 6 by with knob VALUE.

Select NO/YES by turning knob VALUE clockwise.

To leave the Program submenue: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

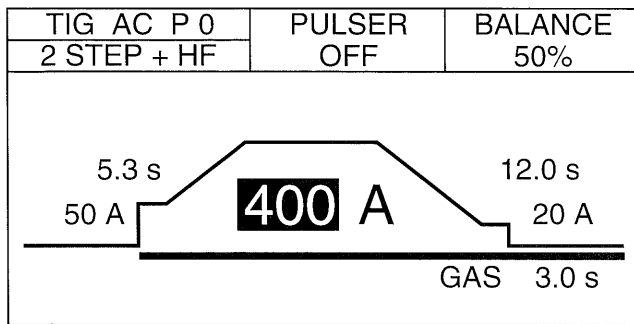
8) Weld Penetration (welding voltage)

Welding voltage fine tune gives, within certain limits, control over the automatically computed optimal wire feed speed. The penetration depth can be set from 150% (long or spray arc) to 50% (short arc). Even more important, the welding characteristics can be fine tuned for different welding positions or material specifications. The actual welding voltage is shown in the display during the welding operation.

To leave the MIG/MAG Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

3.4 Menu TIG AC Welding

Turn knob VALUE to highlight TIG-AC in the Welding Process Select menu as described in 3.2.2. Set the watercooling parameters if required, or switch with knob ITEM directly to the TIG AC Welding menu.



Pic. 10 TIG AC Welding menu

1) Parameter OPERATING MODE

Use knob VALUE to set operating mode.

Available selections:

2-step with H.F. (see 4.3.3 below)

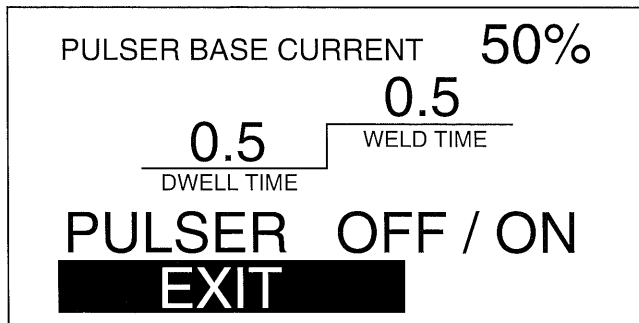
4-step with H.F. (see 4.3.4 below)

Remote start

In remote start mode the arc can be started with the foot control unit, controlling the start-up with the torch controls is not necessary.

2) Parameter PULSE (pulsed arc welding)

Turn knob ITEM to highlight PULSE OFF (or PULSE ON if already activated), turn knob VALUE to toggle ON/OFF.



Pic. 11 Pulser submenu

Use knob ITEM to select a menu item, knob VALUE changes the parameter setting.

Pulser dwell time (base current):

setting range 0.1 - 10 seconds

Pulser weld time (welding current):

setting range 0.1 - 10 second

Pulser base current:

setting range 0 - 100%

The pulser base current is set as a percentage of the max. welding current, e.g. 100 A max. welding current and 50% pulser base current compare to 50 A current during pulser dwell time and 100 A for pulser weld time. The pulser base current is independent of the starting current setting.

Highlight EXIT to return to the main menu or wait 5 seconds for the HWS Control to return automatically. If the pulser is activated, both the pulser dwell and weld time are shown in the display.

See 4.3.5 below for more information on pulsed arc welding.

3) Parameter STARTING CURRENT (base current)

Setting range 5 - 400 A. The base current is used to heat up the material and to form a small weld pool, to prevent arc blow-through or material melting away at corners etc. If required, the base or starting current can be set higher as the actual welding current.

4) Parameter UP-SLOPE

Determines the time needed to slope up from starting current to the max. welding current.

Setting range 0 - 10 seconds.

5) Parameter WELDING CURRENT

Preselects the max. welding current. When not welding the selected value is displayed, during the welding operation the actual welding current is shown in the display.

6) Parameter DOWN-SLOPE

Sets the time for sloping down from max. welding current to the set base or end current.

Setting range 0 - 10 seconds.

7) Parameter END CURRENT

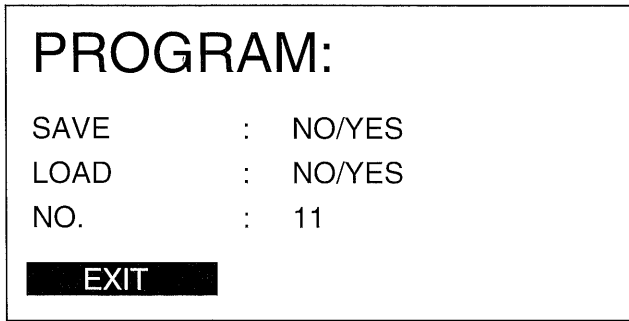
The end current is set between 5 - 400 A, independent from starting current and pulser base current. This allows for an optimal end crater filling and closing of elongated pores.

8) Parameter GAS (gas post flow)

Setting range 0 - 20 seconds.

9) Parameter TIG AC P (programming/storing welding parameters)

When highlighted, turn knob VALUE to show the Program menu.



Pic. 12 Program submenue

For TIG AC welding 16 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item. Select Program no. 1 - 16 by with knob VALUE.

Select NO/YES by turning knob VALUE clockwise.

To leave the Program submenue: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

Program no. 0 contains the default settings and can not be overwritten or deleted. Recalling Program 0 sets the default settings for TIG AC welding.

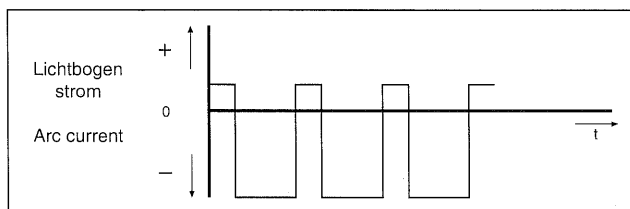
To leave the TIG AC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

10) Parameter BALANCE (balance control)

With the control knob ARC the balance can be adjusted at any time during a welding operation.

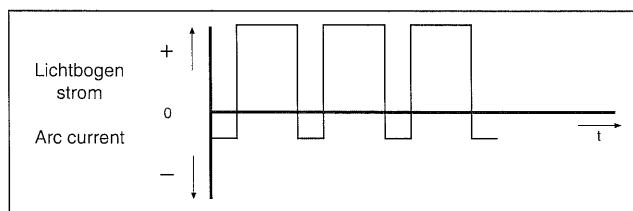
Tungsten Inert Gas welding of aluminium with alternating current generates a rectifying effect, causing the amplitudes of the square wave to be of different intensity. With the balance control this rectifying effect can be adjusted from +70% to -30%.

The negative amplitude is longer, giving deep weld penetration, with poor cleaning action.



The positive amplitude is longer, giving less penetration, with good cleaning action.

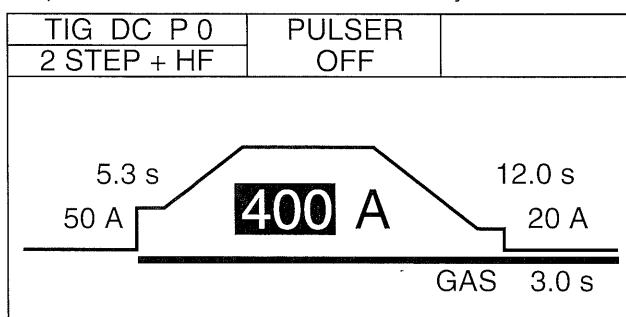
Caution: Danger of overheating the electrode



For welding aluminium the standard setting is approx. 55-58%.

3.4 Menu TIG DC Welding

Turn knob VALUE to highlight TIG DC in the Welding Process Select menu as described in 3.2.2. Set the watercooling parameters if required, or switch with knob ITEM directly to the TIG DC Welding menu.



Pic. 13 TIG DC Welding menu

1) Parameter OPERATING MODE

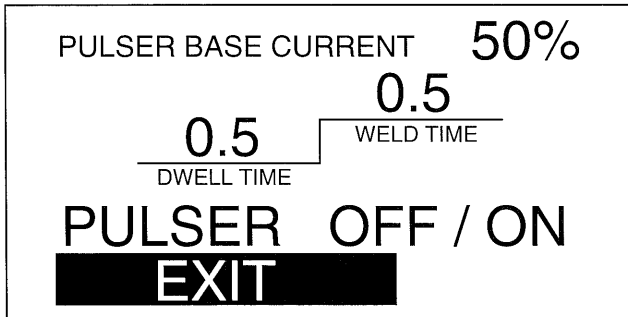
Use knob VALUE to set operating mode. Available selections:

- 2-step with H.F. (see 4.3.3 below)
- 4-step with H.F. (see 4.3.4 below)
- Remote start

In remote start mode the arc can be started with the foot control unit, controlling the start-up with the torch controls is not necessary.

2) Parameter PULSE (pulsed arc welding)

Turn knob ITEM to highlight PULSE OFF (or PULSE ON if already activated), turn knob VALUE to toggle ON/OFF.



Pic. 14 Pulsed submenue

Use knob ITEM to select a menu item, knob VALUE changes the parameter setting.

Pulsed dwell time (base current):

setting range 0.1 - 10 seconds

Pulsed weld time (welding current):

setting range 0.1 - 10 second

Pulsed base current:

setting range 0 - 100%

The pulsed base current is set as a percentage of the max. welding current, e.g. 100 A max. welding current and 50% pulsed base current compare to 50 A current during pulsed dwell time and 100 A for pulsed weld time. The pulsed base current is independent of the starting current setting.

Highlight EXIT to return to the main menu or wait 5 seconds for the HWS control to return automatically. If the pulser is activated, both the pulsed dwell and weld time are shown in the display.

See 4.3.5 below for more information on pulsed arc welding.

3) Parameter STARTING CURRENT (base current)

Setting range 5 - 400 A. The base current is used to heat up the material and to form a small weld pool, to prevent arc blow-through or material melting away at corners etc. If required, the base or starting current can be set higher as the actual welding current.

4) Parameter UP-SLOPE

Determines the time needed to slope up from starting current to the max. welding current.

Setting range 0 - 10 seconds.

5) Parameter WELDING CURRENT

Preselects the max. welding current. When not welding the selected value is displayed, during the welding operating the actual welding current is shown in the display.

6) Parameter DOWN-SLOPE

Sets the time for sloping down from max. welding current to the set base or end current.

Setting range 0 - 10 seconds.

7) Parameter END CURRENT

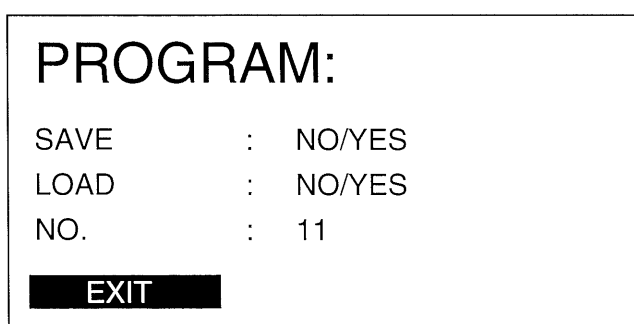
The end current is set between 5 - 400 A, independent from starting current and pulsed base current. This allows for an optimal end crater filling and closing of elongated pores.

8) Parameter GAS (gas post flow)

Setting range 0 - 20 seconds.

9) Parameter TIG DC P (programming/storing welding parameters)

When highlighted, turn knob VALUE to show the Program menu.



Pic. 15 Program submenue

For TIG DC welding 16 different sets of welding parameters can be permanently stored in memory. If a particular welding job requires specific settings, simply recall this set of parameters from memory to set the machine, rather than setting the parameters manually. Only the currently active setting can be stored; to store a different set of parameters these need to be set before storing.

Turn knob ITEM to highlight the required menu item. Select program no. 1 - 16 by with knob VALUE.

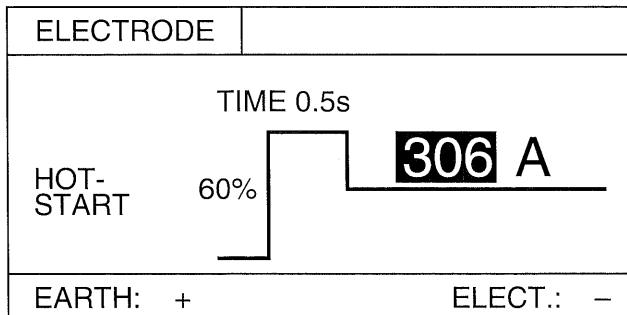
Select NO/YES by turning knob VALUE clockwise.

To leave the Program submenu: turn knob ITEM counter-clockwise to highlight EXIT, then turn knob VALUE counter-clockwise. If no action is taken MWS Control returns to the Active Welding Process menu after a 5 second delay.

Program no. 0 contains the default settings and can not be overwritten or deleted. Recalling Program 0 sets the default settings for TIG AC welding.

To leave the TIG DC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

3.6 Menu MANUAL ARC Welding



Pic. 16 MANUAL ARC Welding menu

1) Parameter TIME

Controls the length of time the hotstart is active. Setting range 0 - 2.0 seconds.

2) Parameter HOTSTART

Controls the amount of hotstart current, range is 0 - 100%. The selected percentage is added to the selected welding current, e.g. with a setting of 100 A welding current, hotstart 50% and time 0.5 sec the machine starts the arc with 150 A for 0.5 sec.

3) Parameter WELDING CURRENT

Setting range 5 - 400 A.

4) Parameter POLARITY

Changes the polarity of earth cable and electrode holder, without the need to interchange the cables on the machine.

To leave the MANUAL ARC Welding menu to select a different welding process, turn knob ITEM counter-clockwise to return to the Welding Process Select menu.

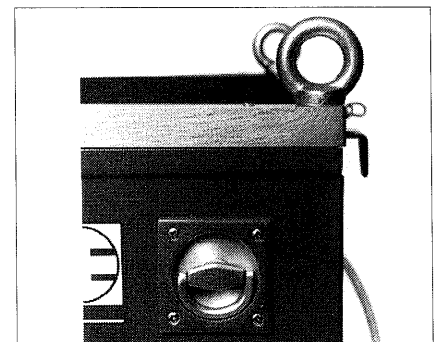
4.0 General Instructions for Machine Start-Up

4.0.1 Transportation

The machine is fitted with two rigid and two swivel casters to facilitate transportation on level ground. Moving the machine on sloping ground requires additional measures to keep it safely manoeuvrable.

Use all four lifting eyes when hoisting by crane.

Prior to all movement of the machine the gas cylinder should be secured safely to keep it from tipping over. Remove cylinder for crane hoisting.



Pic. 17 Lifting eyes

4.0.2 Connection of Gas Cylinders

On the rear housing panel two shielding gas supply hoses are led into the machine, each controlled by a solenoid valve. Each hose is clearly marked with the welding process for which it supplies the shielding gas. There is also a gas cylinder bracket, which holds two gas cylinders side by side, keeping them from tipping over when secured with the chains provided.

4.0.3 Connection to Power Mains

This welding machine will only operate on the voltage stated on the machine label. The power cable is factory installed, in which order phases are connected is irrelevant and does not affect the direction of rotation of cooling fan and coolant pump.

Important: Be sure that water cooling unit is filled with coolant before switching machine on.

4.1 MIG/MAG Welding

For setting of MIG/MAG welding parameters with the MWS Control see 3.3 above.

4.1.0 Standard Values for MIG/MAG Welding Current Selection

1. MIG welding of butt welds on unalloyed and low-alloy steels

| Material thickness mm | Weld type | Groove angle ° | Gap width mm | Root face mm | Electrode wire Ø mm | Welding current A | Arc voltage V | Number of layers |
|-----------------------|-----------|----------------|--------------|--------------|---------------------|-------------------|---------------|------------------|
| 2 | I | - | 0 | 2.0 | 0.8 | 110 | 20 | 1 |
| 4 | I | - | 0 | 4.0 | 1.2 | 170 | 22 | 1 |
| 5 | I | - | 0 | 5.0 | 1.6 | 200 | 25 | 1 |
| 5 | Y | 70 | 0 | 1.5 | 1.6 | 160 | 22 | 1 |
| 6 | Y | - | 0 | 6.0 | 1.6 | 230 | 26 | 1 |
| 6 | Y | 70 | 0 | 1.5 | 1.6 | 170 | 22 | 1 |
| 8 | Y | 70 | 0 | 1.5 | 1.6 | 1. L 220 | 26 | 1 |
| | | | | | | 2. L 220 | 26 | 2 |
| 10 | Y | 60 | 0 | 2.0 | 1.6 | 1. L 220 | 26 | 1 |
| | | | | | | 2. L 200 G 230 | 26 | 2 |
| 12 | Y | 60 | 0 | 1.5 | 1.2 | 1. L 240 | 26 | 1 |
| | | | | | | 2. L 220 G 250 | 26 | 2 |

Electrode wire: same material as workpiece

Shielding gas: Argon

1.L: first layer

2.L: second layer

G: back weld

2. MAG welding of fillet welds on unalloyed and low-alloy steel

| Actual throat mm | Welding position | Electrode wire Ø mm | Welding current A | Arc voltage V | Number of layers |
|-------------------|------------------|---------------------|-------------------|---------------|------------------|
| 1.0 ¹⁾ | f, h | 0.8 | 65 | 17.0 | 1 |
| 1.0 ¹⁾ | vd | 0.8 | 65 | 17.0 | 1 |
| 1.5 ¹⁾ | f, h | 0.8 | 115 | 18.0 | 1 |
| 1.5 ¹⁾ | vd | 0.8 | 115 | 18.0 | 1 |
| 2.0 | f, h | 0.8 | 130 | 19.0 | 1 |
| 2.0 | vd | 0.8 | 100 | 19.5 | 1 |
| 3.0 | h | 1.0 | 215 | 22.5 | 1 |
| 3.0 | vd | 1.0 | 210 | 21.5 | 1 |
| 4.0 | f, h | 1.0 | 220 | 23.0 | 1 |
| 4.0 | vd | 1.2 | 220 | 20.0 | 1 |
| 4.0 | h | 1.2 | 280 | 28.0 | 1 |
| 5.0 | h | 1.2 | 300 | 29.5 | 1 |
| 5.0 | vd | 1.2 | 190 | 19.5 | 3 |
| 6.0 | h | 1.2 | 300 | 29.5 | 1 |
| 6.0 | vu | 1.0 | 115 | 17.5 | 1 |
| 8.0 | h | 1.2 | 300 | 29.5 | 3 |
| 8.0 | vu | 1.0 | 130 | 18.5 | 2 |
| 10.0 | h | 1.2 | 300 | 29.5 | 4 |
| 10.0 | vu | 1.2 | 165 | 19.0 | 2 |
| 10.0 | h | 1.6 | 380 | 34.0 | 3 |

¹⁾ Fillet welds on thin-plate w/o measured dimension "a"

Electrode wire:

SG-2/SG-3

Shielding gas:

mixed gas

Welding positions:

f = flat

h = horizontal

vd = vertical down

vu = vertical up

3. MAG welding of butt welds on unalloyed and low-alloy steels

| Material thickness mm | Weld type | Groove angle° | Gap width mm | Welding position | Electrode wire Ø mm | Welding current A | Arc voltage V | Number of layers |
|-----------------------|-----------|---------------|--------------|------------------|---------------------|-----------------------------|----------------------|------------------|
| 1.0 | I | - | 0 | f, h | 0.8 | 70 | 18.0 | 1 |
| 1.5 | I | - | 1.0 | f, h | 0.8 | 90 | 17.0 | 1 |
| 2.0 | I | - | 1.0 | f | 1.0 | 125 | 18.5 | 1 |
| 2.0 | I | - | 1.5 | vd | 0.8 | 130 | 18.5 | 1 |
| 3.0 | I | - | 1.5 | f | 1.0 | 130 | 19.0 | 1 |
| 3.0 | I | - | 2.0 | vd | 1.0 | 130 | 19.0 | 1 |
| 4.0 | I | - | 2.0 | f | 1.0 | 135 | 19.0 | 1 |
| 4.0 | I | - | 2.5 | vd | 1.0 | 160 | 20.0 | 1 |
| 5.0 | V | 50 | 2.0 | f | 1.0 | R 125 C 200 | 18.5 21.0 | 2 |
| 5.0 | V | 50 | 2.0 | vd | 1.0 | R 130 C 170 | 18.5 19.5 | 2 |
| 6.0 | V | 50 | 2.0 | f | 1.0 | R 125 C 205 | 18.5 21.0 | 2 |
| 6.0 | V | 50 | 2.0 | vd | 1.0 | R 130 C 170 | 18.5 19.5 | 2 |
| 8.0 | V | 50 | 2.0 | f | 1.2 | R 135 F 270 C 270 | 18.0 27.5 27.5 | 3 |
| 8.0 | V | 50 | 2.0 | vu | 1.0 | R 100 C 100 | 17.0 17.0 | 2 |
| 10.0 | V | 50 | 2.5 | f | 1.2 | R 135 F 290 C 290 | 18.5 28.0 28.0 | 3 |
| 10.0 | V | 50 | 2.5 | vu | 1.0 | R 120 C 120 | 18.0 18.0 | 2 |
| 12.0 | V | 50 | 2.5 | f | 1.2 | R 135 2 x F 290 C 290 | 18.5 28.0 28.0 | 4 |
| 12.0 | V | 50 | 2.5 | vu | 1.0 | R 100 F 135 C 135 | 17.5 18.5 18.5 | 3 |
| 15.0 | V | 60 | 1.0 | f | 0.8 1.2 1.2 | R 110 2 x F 270 C 270 | 21.0 27.0 27.0 | 4 |
| 15.0 | V | 50 | 3.0 | vu | 1.2 | R 130 F 160 C 160 | 18.5 19.5 19.5 | 3 |

R = root pass
F = filler pass
C = cover pass

electrode wire: SG-2/SG-3
Shielding gas: mixed gas

4. MAG welding of fillet welds on unalloyed and low-alloy steels

| Actual throat mm | Welding position | Electrode wire Ø mm | Welding current A | Arc voltage V | Number of layers |
|--------------------|------------------|---------------------|-------------------|---------------|------------------|
| 1.00 ¹⁾ | f, h | 0.6 | 55 | 20.0 | 1 |
| 1.00 ¹⁾ | vd | 0.6 | 60 | 21.0 | 1 |
| 1.50 ¹⁾ | h | 0.9 | 135 | 22.0 | 1 |
| 1.75 ¹⁾ | h | 0.8 | 100 | 21.0 | 1 |
| 1.75 ¹⁾ | vd | 0.8 | 90 | 21.0 | 1 |
| 2.0 ¹⁾ | h | 1.0 | 175 | 21.0 | 1 |
| 2.0 ¹⁾ | vd | 0.8 | 140 | 23.0 | 1 |
| 2.5 | vd | 1.0 | 210 | 19.0 | 1 |
| 3.0 | vd | 1.2 | 190 | 20.5 | 1 |
| 3.5 | h | 1.0 | 230 | 27.0 | 1 |
| 3.5 | vd | 1.2 | 195 | 20.0 | 1 |
| 4.0 | h | 1.2 | 240 | 24.0 | 1 |
| 5.0 | h | 1.2 | 320 | 32.0 | 1 |

¹⁾ Fillet welds on thin-plate without measured dimension "a"

Electrode wire: SG-/SG-3
Shielding gas: carbon dioxide

Welding positions: f = flat
h = horizontal
vd = vertical down
vu = vertical up

5. MAG welding of butt welds on unalloyed and low-alloy steels

| Material thickness mm | Weld type | Groove angle ° | Gap width mm | Welding position | Electrode wire Ø mm | Welding current A | Arc voltage V | Number of layers |
|-----------------------|-----------|----------------|--------------|------------------|---------------------|-------------------|---------------|------------------|
| 0.75 | I | - | 0 | f | 0.8 | 55 | 20.0 | 1 |
| 0.75 | I | - | 0 | vd | 0.9 | 140 | 20.0 | 1 |
| 1.0 | I | - | 0 | f | 0.8 | 85 | 19.5 | 1 |
| 1.0 | I | - | 0 | vd | 0.9 | 120 | 21.0 | 1 |
| 2.0 | I | - | 0.3 | f | 0.9 | 135 | 22.0 | 1 |
| 2.0 | I | - | 1.0 | f | 0.8 | 80 | 19.0 | 1 |
| 2.0 | I | - | 1.0 | vd | 0.8 | 80 | 19.0 | 1 |
| 3.0 | I | - | 1.5 | f | 1.0 | 100 | 19.0 | 1 |
| 4.0 | I | - | 1.7 | f | 1.0 | 130 | 20.0 | 1 |
| 4.0 | I | - | 2.0 | vd | 1.0 | 130 | 20.0 | 1 |
| 6.0 | V | 60 | 1.7 | f | 1.2 | 150 | 21.0 | 2 |
| 6.0 | V | 60 | 1.7 | vd | 1.2 | 150 | 20.0 | 2 |
| 8.0 | V | 60 | 1.7 | f | 1.2 | 150 | 21.0 | 2 |
| 10.0 | V | 60 | 1.7 | f | 1.2 | 150 | 21.0 | 3 |
| 10.0 | V | 60 | 1.7 | R = vd C = vu | 1.2 | 150 | 20.0 | 2 |
| 15.0 | V | 60 | 1.7 | f | 1.2 | R 150 | 21.0 | 4 |
| | | | | | 1.6 | 2 x F 350 | 31.0 | |
| | | | | | 1.6 | C 350 | 31.0 | |
| 15.0 | X | 60 | 1.7 | vu | 1.2 | 2 x F 150 | 20.0 | 4 |
| | | | | | 1.2 | 2 x C 150 | 20.0 | |
| 15.0 | V | 60 | 1.0 | vu | 0.8 | R 110 | 21.0 | 4 |
| | | | | | 1.0 | 2 x F 120 | 22.0 | |
| | | | | | 1.0 | C 120 | 22.0 | |

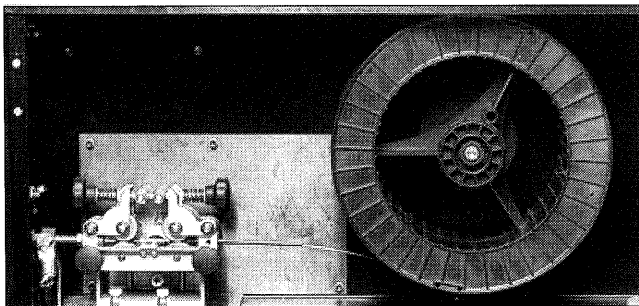
R = root pass
F = filler pass
C = cover pass

Electrode wire: SG-2/SG-3
Shielding gas: carbon dioxide

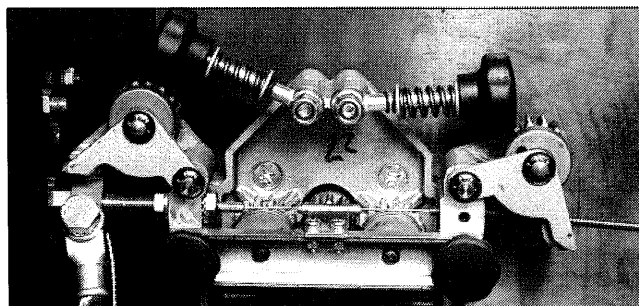
Welding positions: f = flat
h = horizontal
vd = vertical down
vu = vertical up

4.1.1 Installing the Wire Spool

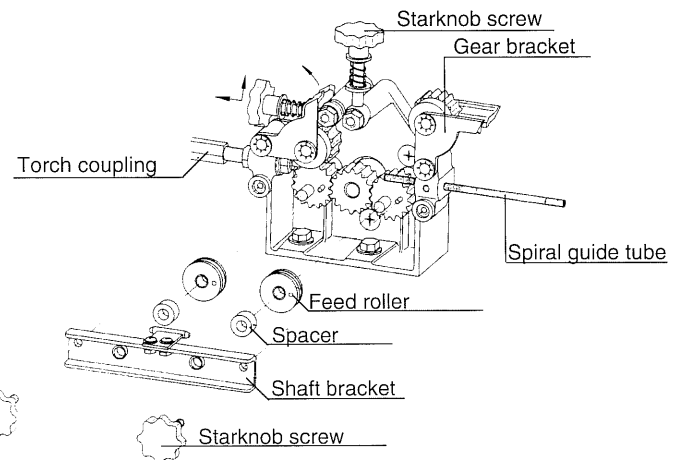
Place wire spool onto spool carrier so that wire runs off clockwise. The spool carrier is equipped with a brake, which can be adjusted by means of a hex. socket head cap screw. Set brake so spool does not idle after wire feed stops, to prevent the wire from coming loose and falling off the spool.



Pic. 18 Wire feed unit



Pic. 19 Opened wire feed drive & exploded view drawing

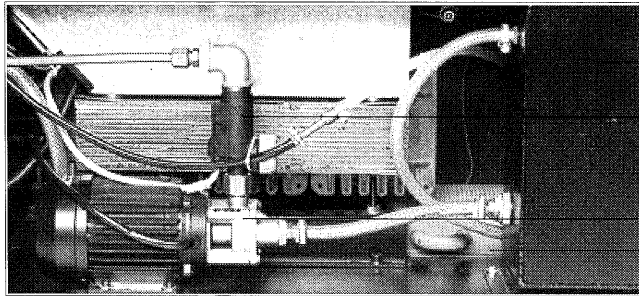


Loosen starknob screws and open gear brackets. The feed rollers are factory installed for use of 1.0/1.2 mm Ø wire (for 0.6/0.8 mm Ø wire the feed rollers must be reversed on the shaft). Insert deburred wire into spiral guide tube, place over first feed roller into guide tube of bracket, then across second feed roller into the Euro-connector. Close gear brackets and tighten starknob screws, setting just slightly more pressure to the feed roller feeding into the Euro-connector, to ensure a smooth wire feed.

Remove gas shroud by turning clockwise, and contact tip by turning counter-clockwise. Set mains switch (2) to ON and activate the torch's trigger switch until the wire protrudes approximately 2 cms from the swan neck. Reinstall contact tip and gas shroud. The Omega 400 is shipped set for 1.2 mm Ø wire. If a different wire diameter is used the steel liner and contact tip have to be changed to match the wire diameter.

4.1.2 Water Cooling/Coolant

Machines with refrigerating unit are supplied with coolant already filled into the unit. This coolant is mixed with antifreeze, providing protection to - 15°C/+ 5°F. Check the coolant level regularly, a low coolant level may cause damage to the torch. The MWS Control indicates a low coolant level in the display (see section 7 Error Messages below).



1. Coolant tank, approx. 7.2 ltr
2. Flow control
3. Coolant pump
4. Heat exchanger

Pic. 20 Water cooling unit

The Omega 400 SEK series has the water cooling system integrated into the machine housing. The coolant tank is accessed for refilling through the wire feed cabinet door. A flow control meter constantly monitors the correct function of the cooling system. A low coolant level or reduced flow rate (clogged torch lead lines) is indicated on the MWS Control display (see section 7 Error Messages).

4.1.3 Earth Cable

Connect earth cable plug to Earth Cable Socket (8) on the machine's front panel. Use only genuine Elektra parts with recommended cross sections. Structural components, beams, pipes or rails should not be used for earth conduction, if they are not the actual workpiece. When using welding tables or jigs ensure proper conducting.

4.1.4 Gas Flow Setting

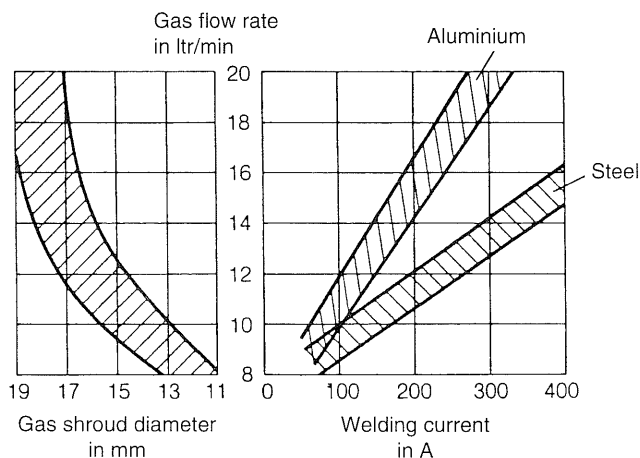
The correct amount of shielding gas, and a steady gas flow at the welding seam, is essential to provide sufficient shielding of the weld pool. Insufficient shielding causes porous welding seams.

Rule of thumb to calculate the required shielding gas flow rate:

Amount of gas in ltr/min = 10 x the electrode wire diameter in mm

Example: Wire diameter 1.0 mm requires a gas flow rate of 10 ltr/min.

Diagram showing the exact gas flow rate required, accounting for different welding current settings



4.1.4 Settings

The OMEGA 400 SEK welding machines are equipped with the intelligent MWS Control. After selecting the electrode wire use and the desired welding current, a single-chip micro-processor automatically sets the optimal wire feed speed and welding voltage. The root or weld penetration can be corrected by setting the parameter PENETRATION as required. 100% is the default setting suitable for most applications.

More penetration - higher welding voltage up to 150%

Less penetration - lower welding voltage down to 50%

The back-burn timer should be set so that the bead at the tip of the electrode wire protrudes approximately 5 mm from the contact tip.

The automatic soft start sets the wire feed speed to 100% only after the arc has started. This prevents excessive spattering and wire sticking in the start cycle. For spot welding and electrode wire changing the automatic soft start should be disabled.

4.1.6 Aluminium (MIG-Welding)

When welding aluminium replace the standard torch components with the following:

- cylindrical gas shroud
- contact tip "A"
- PA- liner c/w copper spiral liner
- support tube

The feed roller has to be set to match the wire diameter, otherwise the wire will kink. The electrode wire must match the material specification (pure aluminium or alloy). A pure inert shielding gas is required, gas flow rate 10 - 13 ltr/min.

1. Disconnect torch lead assembly from machine and remove electrode wire.
2. Place aluminium wire spool onto spool carrier.
3. Remove liner collet from the torch lead's central coupling and pull steel liner from torch lead assembly.
4. Remove gas shroud and contact tip from torch.
5. Fit PA liner into central coupling and push through lead assembly until liner protrudes from the head stock. Insert copper spiral into headstock and push into swan neck until flush, then install contact tip "A". The copper spiral liner prevents the Teflon liner from getting too hot and possibly melting.
6. Secure PA liner in place by replacing the liner collet at the central coupling.
7. For PA liners with 4.0 mm outer diameter the steel capillary tube of the wire feed unit has to be replaced by the support tube. For PA liners with 4.7 mm outer diameter no support tube is required.
8. Attach torch lead assembly to machine and cut off the PA liner just in front of the feed roller.
9. The cut-off liner piece is installed between the wire spool and wire feed unit, to provide for easy guiding here too.
10. To thread the aluminium wire into the lead assembly temporarily remove the contact tip. Thread wire into liner. Set guide rollers to match wire diameter and pressure roller to only minimal pressure, so it will not flatten the wire by excessive pressure. Let wire run through lead assembly until it shows 2-3 cms at the headstock.
12. Replace contact tip and gas shroud.

Welding aluminium requires a pure inert gas, such as Argon or Helium. The minimum electrode wire diameter recommended is 1.0 mm. Forehand welding is recommended to keep the seam from tarnishing.

The following aluminium welding conversion kits are available:

| Electrode Ø | Stock-no. | Stock-no. for polyamid liner | |
|-------------|--------------|------------------------------|---------------------------|
| | | 3 mtr | 4 mtr |
| 0.8 mm | 090 200 1514 | | |
| 1.0-1.2 mm | 090 200 1522 | 0.8 - 1.2 mm | 132 714 4550 132 714 4541 |

4.1.7 Stainless Steel

As with aluminium, a pure inert shielding gas is required. Setting of the welding current as with carbon steel. Prepare torch lead assembly for aluminium welding, but use standard contact tip and conical gas shroud. Recommended gas flow rate 13 - 14 ltr/min. To prevent a porous weld seam forehand welding is recommended.

4.1.8 High-Alloy Steel

High-alloy steels can be welded just like regular low-carbon steels without problems by setting the electrode wire diameter to the wire diameter used. For the correct shielding gas refer to the material specifications.

When welding with Stellite electrode wire Ø1.6 mm use a pure inert gas. Set parameter WIRE to FLX(1.6).

It is recommended to use a polyamid liner when welding with high-alloy filler metals.

4.1.9 Flux-Core Electrode Wire

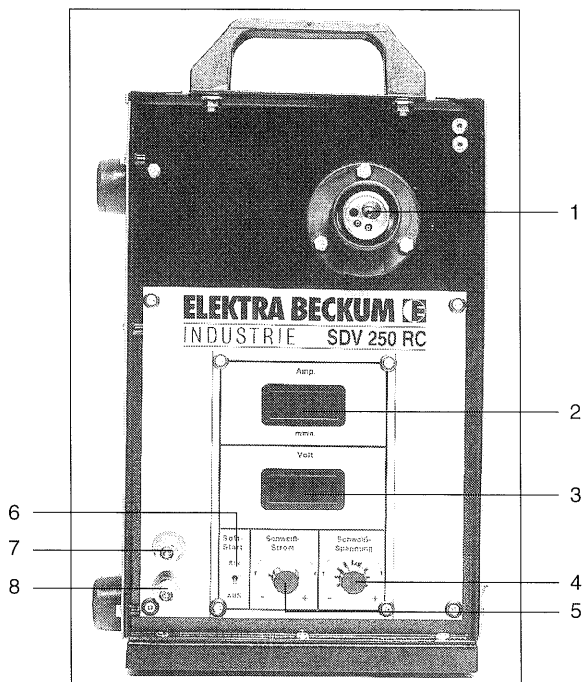
Using pure Argon as shielding gas when welding with flux-core electrode wire produces a better weld.

4.2 MIG/MAG Welding with Separate Wire Feed

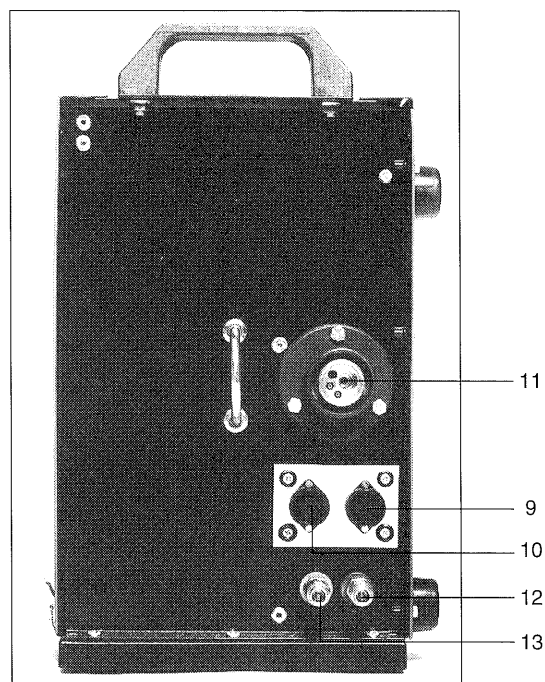
Model OMEGA 400 SEK/W X, which does not have an internal wire feed unit, can be adapted to MIG/MAG welding with a separate wire feed unit and a torch lead extension.

A separate wire feed unit can also be connected to model OMEGA 400 SEK/W, using a torch lead extension.

4.2.1 SDV 250 RC Controls



Pic. 21 Front panel



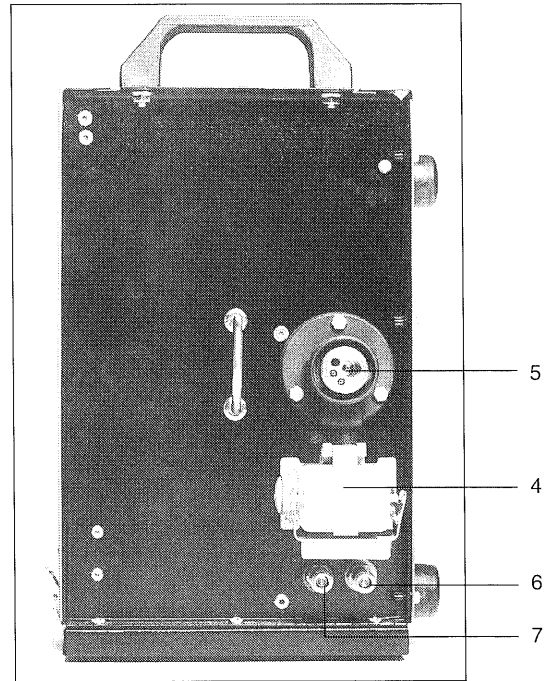
Pic. 22 Rear view

- 1 Euro-Connector for MIG/MAG Welding Torch Leads
- 2 Digital Welding Current Display (A) and actual Wire Feed Speed m/min.
While the welding power source is switched on the current wire feed speed is displayed in meters per minute. When the welding process starts, the display changes to show the selected welding current in amps.
- 3 Digital Welding Voltage Display (V)
- 4 Welding Voltage Fine Tuning
Adjusts the automatically set welding voltage. The weld penetration can be corrected to both + and - (long or short arc), but more important the welding characteristics can be fine tuned for different welding positions or material specifications. The currently selected welding voltage is displayed in the digital display [3].
- 5 Stepless Welding Current Setting
Sets the welding current steplessly from minimum to maximum. Depending on the MWS Control electrode wire parameter setting, the wire feed speed is kept within the computed, optimal range. If required, the wire feed speed can be adjusted with potentiometer [4].
- 6 Automatic Soft Start ON/OFF
While the arc has not yet ignited the filler material is fed very slowly to prevent excessive wire runout at the torch. When the arc starts, the wire feed speed is automatically increased as required by the selected welding current. When changing the electrode wire or operating in spot-weld mode, the automatic soft start should be disabled.
- 7/8 + Torch Coolant Couplings
12/13
- 9 Socket for Electronic Control Leads
- 10 Socket for Motor Leads
- 11 Euro-Connector - Torch Leads Extension

4.2.2 SDV 250 E Controls



Pic. 23 Front view



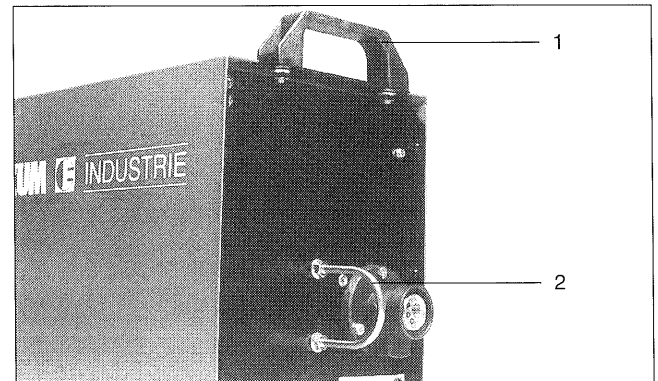
Pic. 24 Rear view

- 1 Euro-Connector for MIG Welding Gun Leads
- 2/3/6/7 Torch Coolant Couplings
- 4 Socket for Motor Leads (requires Adapter E/SEK, stock-no. 090 201 1285)
- 5 Euro-Connector for Torch Lead Extension

4.2.3 General Instructions for Start-Up

4.2.4 Transportation

The Separate Wire Feed Unit can be fitted with a rotating mount to install it on top of the welding machine. Handles [1] and jack rings [2] provide for easy transportation.

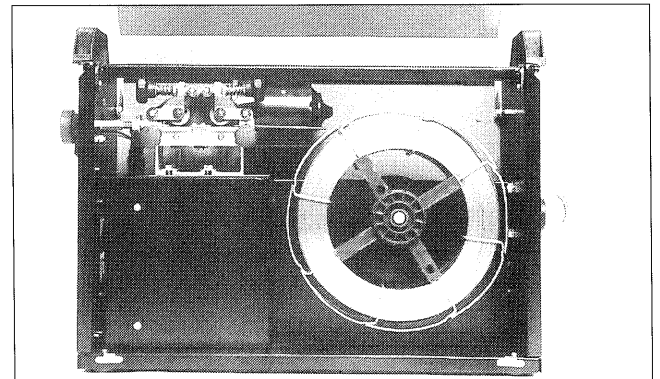


Pic. 25 View of transport facilities

4.2.5 Installing the Wire Spool

Place wire spool onto spool carrier so that wire runs off clockwise.

The spool carrier is equipped with a brake, which can be adjusted by means of a hex. socket head screw. Set brake so that wire spool does not idle after wire feed is switched off, to prevent the wire from coming loose and falling off the spool.



Pic. 26 View of wire feed unit

4.3 TIG Welding

Both welding power sources OMEGA 400 SEK/W and 400 SEK/WX are suitable for TIG DC welding of steel, nickel-chromium steel and NF-metals, and for TIG AC welding of aluminium and aluminium alloys.

TIG AC welding is always done with a high-frequency arc. The arc is started with direct current, then immediately switched to an absolutely square wave alternate current.

4.3 Standard Values for TIG Welding

Plain and alloyed steel

DC; negative electrode polarity; welding position f; butt weld

| Material thickness mm | Weld type | No. of layers | Diameter of | | Welding current A |
|-----------------------|-----------|---------------|--------------|----------------|-------------------|
| | | | Electrode mm | Welding rod mm | |
| 1.0 | II | 1 | 1 or 1.6 | 1.6 or 2.0 | 30 ... 40 |
| 2.0 | II | 1 | 1.6 or 2.4 | 1.6 or 2.0 | 70 ... 80 |
| 3.0 | II | 1 or 2 | 2.4 | 2.4 | 70 ... 90 |
| 4.0 | II or V | 2 | 2.4 | 2.4 | 70 ... 130 |
| 5.0 | V | 3 | 2.4 or 3.2 | 2.4 or 3.0 | 75 ... 130 |
| 6.0 | V | 3 | 2.4 or 3.2 | 2.4 or 3.0 | 75 ... 130 |

Aluminium

AC; negative electrode polarity; welding position f; butt weld

| Material thickness mm | Weld type | No. of layers | Diameter of | | Welding current A |
|-----------------------|-----------|---------------|--------------|----------------|-------------------|
| | | | Electrode mm | Welding rod mm | |
| 1.0 | II | 1 | 1.6 or 2.4 | 2.0 | 40 ... 50 |
| 2.0 | II | 1 | 1.6 or 2.4 | 3.0 | 60 ... 80 |
| 3.0 | II | 1 | 2.4 | 3.0 | 110 ... 130 |
| 4.0 | II | 1 or 2 | 2.4 or 3.2 | 3.0 | 120 ... 150 |
| 5.0 | V | 1 or 2 | 3.2 | 3.0 | 150 ... 200 |

Copper

DC; negative electrode polarity; welding position f; butt weld

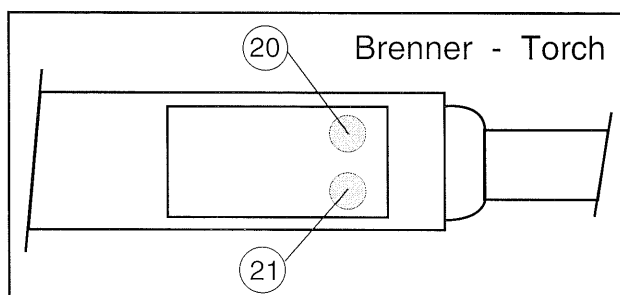
| Material thickness mm | Weld type | No. of layers | Diameter of | | Welding current A |
|-----------------------|-----------|---------------|--------------|----------------|-------------------|
| | | | Electrode mm | Welding rod mm | |
| 1.5 | II | 1 | 1.6 | 2.0 | 90 ... 100 |
| 3.0 ¹⁾ | II | 1 | 3.2 | 3.0 | 150 ... 200 |
| 5.0 ¹⁾ | V | 2 | 4.0 | 4.0 | 180 ... 300 |

¹⁾ = preheating required

Note: For vertical down and overhead welding positions reduce welding current by 10 - 20%.

4.3.1 TIG Torch Connection

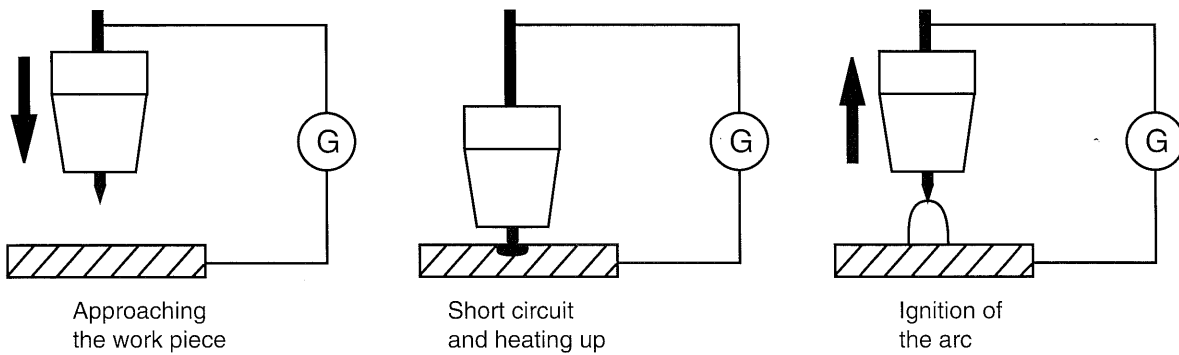
The welding current lead connects to socket [12], the pilot leads to socket [10]. The gas hose connects to the quick coupling [11] and the work piece clamp to socket [8]. In addition a foot-operated remote control unit can be connected to socket [9]. The set welding current can also be regulated with the potentiometer build into the torch. If required, the arc can be started through the foot control unit.



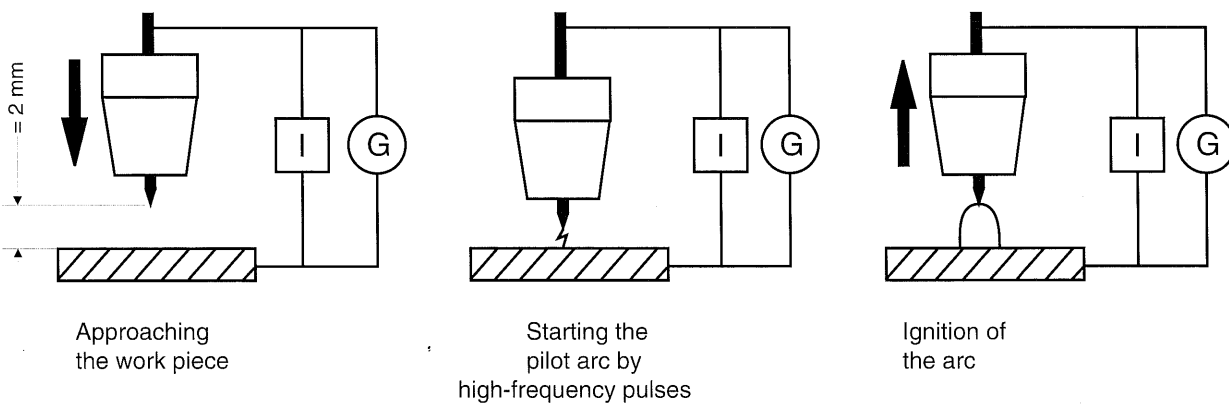
Note: If both a foot control unit and a torch with remote control potentiometer are connected to the machine, they will interfere with each other. Always connect only one remote control device.

4.3.2 Arc Starting

4.3.2.1 Arc Starting by Touching the Work Piece with the Electrode (Scratch Start)

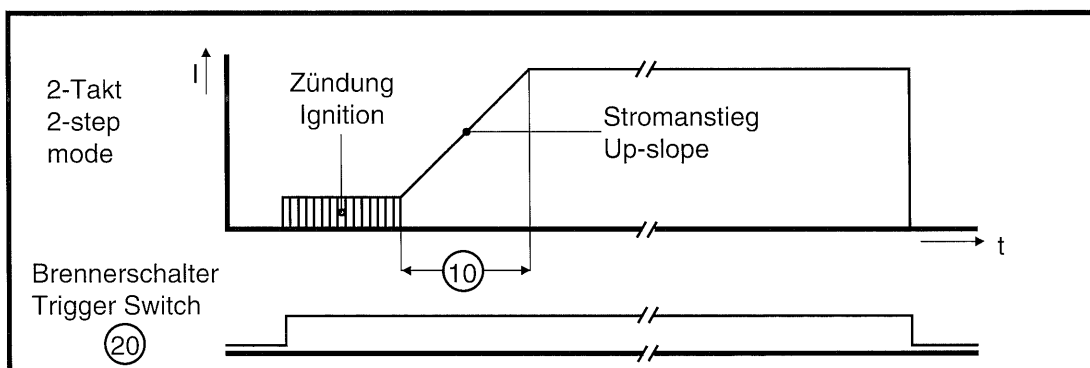


4.3.2.2 Touch-free High-Frequency Arc Starting



4.3.3 2-Step Mode

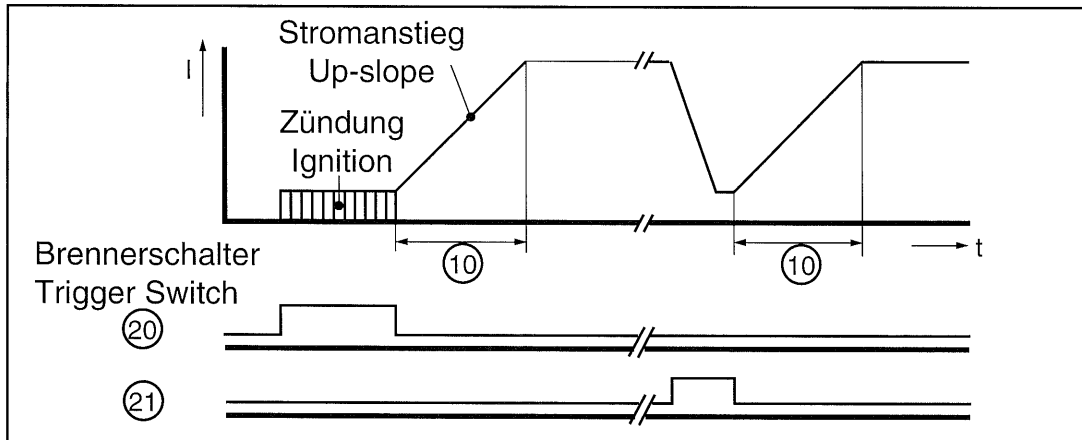
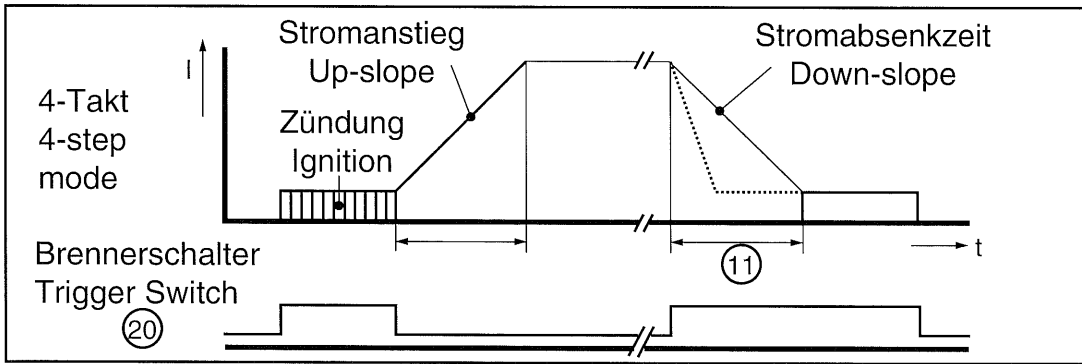
Pressing the red trigger switch [20] starts the welding operation. After the arc has started (by either H.F. or touch-contact ignition), the welding current slopes up from the selected base current to the set welding current. The base current is set with the MWS Control. The duration of the slope-up time is set with the MWS Control between 0 - 10 sec. When releasing the trigger switch [20] the arc extinguishes immediately.



4.3.4 4-Step Mode

Pressing the red trigger switch [20] starts the welding operation (ignition either by H.F. or touch-contact ignition). While the trigger switch is held down, the arc operates at the base current. The base current is set as with the 2-step mode, but should be set to a minimum of 5 A (pilot arc). After the trigger switch is released, the welding current slopes up to the selected welding current, within the preset period (0.1 - 10 sec). Pressing the trigger switch [20] again engages the slope-down function, the welding current, within the preset time, slopes down to the selected end current for end crater filling. Releasing the trigger switch ends the welding operation.

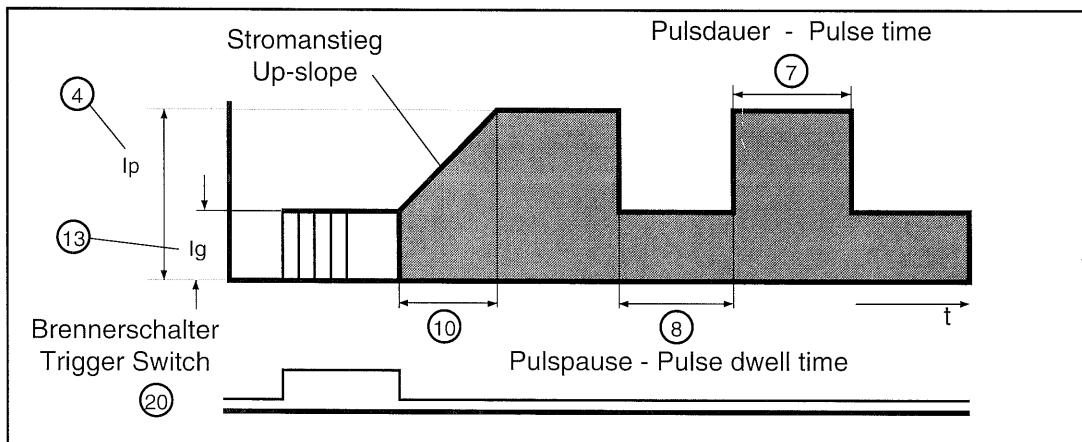
Activating the green button [21] at any given time during the welding operation reduces the welding current to the selected base current without interrupting the welding operation. Releasing the green button lets the current slope up again to the pre-selected welding current.



4.3.5 Pulsed Arc Welding

For pulsed arc welding the arc operates at an infinitely adjustable pulse base current (adjustable from 0% - 100% of the pulsed arc (welding) current). This pulse base current is independent of the base current.

The pulsed arc current is set in the MWS Control TIG Welding Pulser submenu, as are the pulser dwell and weld time parameters, each steplessly adjustable between 0 - 10 sec.



Advantages:

- welding of very thin material
- high energy input per unit length when welding high-alloy steels
- joining of thick with thin material

4.3.6 Practical Hints For Operation

To ensure good arc starting and good welding results the following should be adhered to:

4.3.6.1 Electrode Types

For DC TIG welding only thoriated electrodes are recommended for use, e.g.

WT 20 1.8-2.2 % thorium oxide, color code: red

WT 30.2.8-3.2 % thorium oxide, color code: green

4.3.6.2 Current-Carrying Capacities of Tungsten Electrodes

| Diameter mm | Welding Current with | | Gas Shroud | | |
|--------------------|---|---|-------------------------|----------|----------------|
| | Direct Current (negative electrode polarity) with 2% Thorium ¹⁾ A | Alternating Current with Filter Capacitor ²⁾ (negative electrode polarity) Pure Tungsten A | with 2% Thorium A | Size | Diameter mm |
| 1.0 | ... 80 | ... 30 | 30 ... 60 | 4 ... 5 | 6.5 ... 8 |
| 1.6 | 10 ... 140 | 30 ... 70 | 40 ... 100 | 4 ... 6 | 6.5 ... 9.5 |
| 2.4 | 20 ... 230 | 50 ... 110 | 70 ... 150 | 6 ... 8 | 9.5 ... 12.7 |
| 3.2 | 30 ... 310 | 100 ... 170 | 130 ... 200 | 7 ... 8 | 11.2 ... 12.7 |
| 4.0 | 40 ... 400 | 160 ... 200 | 170 ... 250 | 8 ... 10 | 12.7 ... 15.9 |

¹⁾ for pure tungsten electrodes the upper values are approx. 40 % lower

²⁾ without balance the values shown are approx. 50 % higher

Note: Tungsten electrodes must be clean, free from dirt, oil and grease. Store in a suitable case to protect from contamination.

4.3.6.3 Electrode Diameter

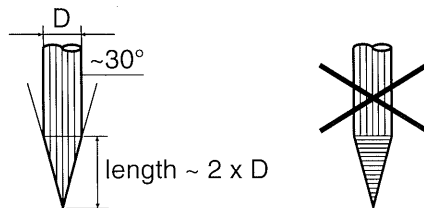
The electrode diameter should match the welding current. General values are:

- less than 80 A : diameter 1.0 mm
- 70 A to 140 A : diameter 1.6 mm
- 130 A to 250 A : diameter 2.5 mm
- with AC > 220 A : diameter 3.2 mm

4.3.6.4 Electrode Tip Ground

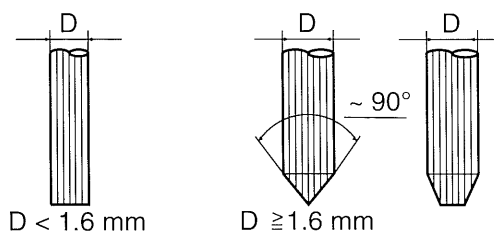
Electrodes for DC welding have to be ground in longitudinal direction only. Do not grind electrodes ≤ 1.6 mm diameter for AC welding at all, over 1.6 mm diameter with an acute-angled tip with a dull point. When welding with alternating current the electrode will automatically form a tear shape drop at the tip.

DC welding
(negative electrode polarity)



The electrode is normally ground (straight polarity) in longitudinal direction. For special applications grinding marks have to be removed by polishing.

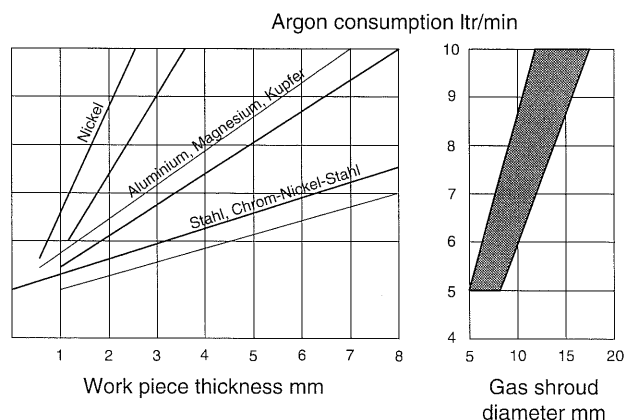
AC welding
(negative electrode polarity)



With larger diameter the electrode tip is ground. When welding, an tear shape drop forms automatically at the tip.

4.3.6.4 Shielding Gas

Too much gas flow can reduced the arc starting ability. The correct gas flow rate is depending on the base metal and the work piece thickness.



4.4 MANUAL ARC Welding

4.4.1 General Information For Welding Transformer/Rectifier Operators

Dust, dirt and metal chips will harm any welding machine. It is of particular importance that the air ventilation for cooling is not disabled. A weld should join two work pieces as if they were made from a single piece. Prior to the welding the joints must be cleaned and dirt, rust, grease and paint removed. Also slag from previous welds must be completely removed. Attach earth clamp firmly to work piece, assuring good metal to metal contact. Check that all cables and connectors are in proper operating condition to ensure proper current conduction.

With the MWS Control the polarity can be changed from + to - or vice versa, without having to change the welding cables in the machine sockets, to accommodate both straight or reversed polarity electrodes.

Normally protective glasses of shade DIN 9 are used for electrodes from 1.5 mm to 4 mm Ø, for electrodes over 4 mm Ø shade DIN 10.

Select the correct welding current as shown below:

| Current (A) | Electrode Ø | Material Thickness |
|-------------|---------------|--------------------|
| 25 - 50 | 1.0 - 2.0 mm | 1.0 - 2.0 mm |
| 50 - 100 | 2.0 - 2.5 mm | 2.0 - 4.0 mm |
| 100 - 140 | 2.5 - 3.25 mm | 4.0 - 8.0 mm |
| 140 - 220 | 3.25 - 5.0 mm | 8.0 - 12.0 mm |
| 220 - 300 | 5.0 - 6.0 mm | 12.0 - 20.0 mm |

In principle do not use too thick an electrode. As a general rule calculate 40 amps welding current per 1 mm of electrode diameter. Depending on electrode type, material thickness and weld position this calculated value may have to be adjusted to plus or minus. In manual arc welding mode the OMEGA 400 works perfectly with thin plate from 1.0 mm thickness and is suitable for vertical-down welding.

4.4.2.1 Overview Of Stick Electrodes And Their Correct Use

In order to achieve a good weld the electrode has to be dry, thus storing in a dry place is essential. Should electrodes have become moist, dry in an oven at 200° C to 300° C for 1 - 2 hours.

Basic coated low-hydrogen type electrodes always require pre-drying at 200° C to 300° C for 3 hours as atomic hydrogen causes weld flaws.

Stick electrodes are coded according to DIN 1913 and other standards, such as AWS-SFA, BS and ISO. These codes are always shown on the electrode package.

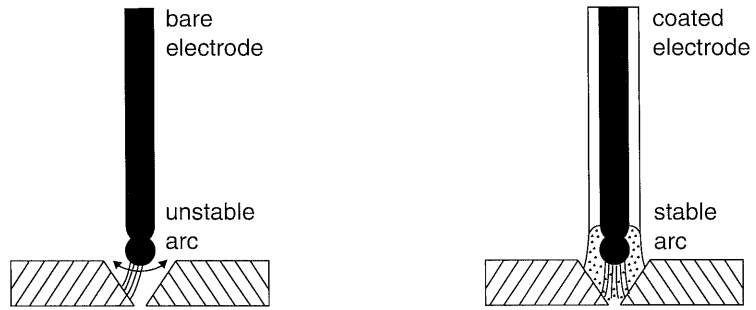
4.4.2.2 Coding Of Stick Electrodes According To DIN 1913

Example:

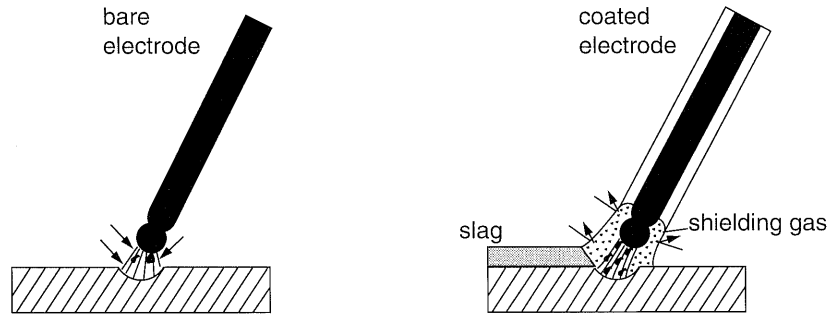
| | | | | | | | | |
|--|----------|---|---|----|---|---|----|---|
| Stick electrode | DIN 1913 | - | E | 43 | 3 | 2 | AR | 7 |
| Number of DIN standard | | | | | | | | |
| Code for manual arc welding | | | | | | | | |
| Code number for tensile strength, yield point and elongation | | | | | | | | |
| Code number for impact energy of 28 Joule minimum | | | | | | | | |
| Code number for increased impact energy of 47 Joule minimum | | | | | | | | |
| Code for coating | | | | | | | | |
| Code number for electrode class | | | | | | | | |

4.4.2.3 Function Of The Stick Electrode Coating

Stabilization of the arc and ionization of the arc space



Protection of the weld metal from atmospheric oxygen and nitroge

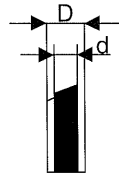


This protection is achieved by the generation of shielding gases and slag during the melting of the electrode.

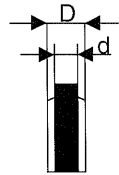
Compensation of alloy burn-off

Stick Electrodes According To DIN 1913

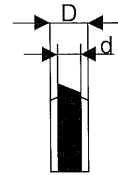
Coating thickness



light
 $D = 1,2 \cdot d$

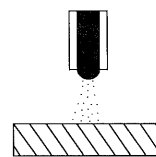
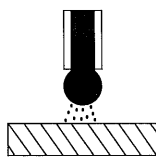
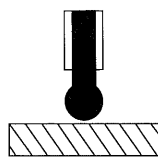


medium
 $D > 1,2 \cdot d$
but $\leq 1,55 \cdot d$

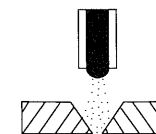
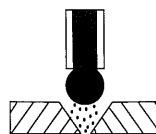
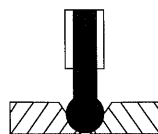


heavy
 $D > 1,55 \cdot d$

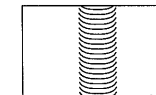
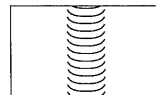
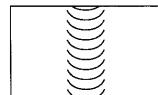
Material transfer



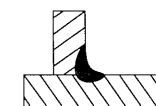
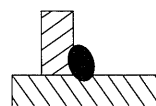
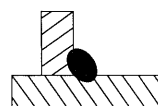
Gap bridging ability



Weld seam appearance



Penetration depth



Type of Coating

| | | | |
|----|---------------------------------|-------|--|
| A | acid coated | R(C) | rutile cellulose medium coating |
| R | rutile light and medium coating | RR(C) | rutile cellulose heavy coating |
| RR | rutile heavy coating | B | basic coating |
| AR | rutile acid coating | B(R) | basic coating with non-basic proportions |
| C | cellulose coating | RR(B) | rutile basic heavy coating |

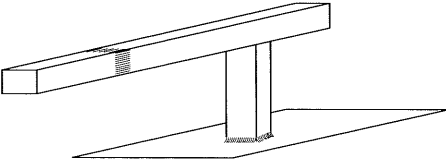
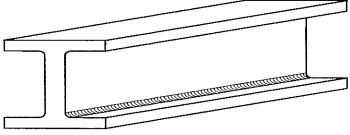
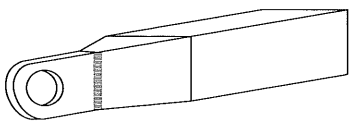
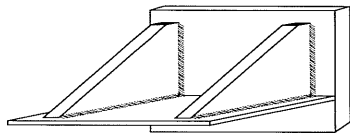
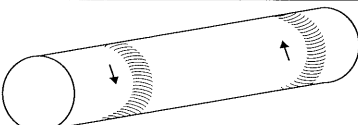
4.4.2.4 Classification of Stick Electrodes
according to table 3 of DIN 1913

| Class | Stick Electrode Type | Coating Thickness | Weld Position |
|-------|----------------------|-------------------------------|---------------|
| 2 | A 2 | light | 1 |
| | R 2 | | |
| 3 | R 3 | medium | 2 (1) |
| | R(C) 3 | | 1 |
| 4 | C 4 | | |
| 5 | RR 5 | heavy | 2 |
| | RR(C) 5 | | 1 |
| 6 | RR 6 | | 2 |
| | RR(C) 6 | | 1 |
| 7 | A 7 | | 2 |
| | AR 7 | | |
| | RR(B) 7 | | |
| 8 | RR 8 | | 1 |
| | RR(B) 8 | | |
| 9 | B 9 | | 2 |
| | B(R) 9 | | |
| 10 | B 10 | | 4 (3) |
| | R(R) 10 | | |
| 11 | RR 11 | (high performance electrodes) | |
| | AR 11 | | |
| 12 | B 12 | | |
| | B(R) 12 | | |

Code for Welding Position
according to table 4 of DIN 1913

| Code | Weld Position | Code Letter For Welding Position |
|------|--------------------------|----------------------------------|
| 1 | all | w, h, hü, s, f, q, ü |
| 2 | all except vertical-down | w, h, hü, s, q, ü |
| 3 | gravity position | w |
| | fillet weld | |
| | gravity position | w |
| | horizontal | h |
| 4 | gravity position | w |

4.4.2.5 Selecting Suitable Electrodes For A Welding Task

| Component | Welding Task | Stick Electrode Type |
|---|---|----------------------|
|  | out-of position welding of butt and fillet welds on thinwalled extrusions | RR 6 RR 8 |
|  | horizontal or gravity position fillet welds on long beams with "a" = 5 mm | RR 11 AR 11 |
|  | gravity position double-V welds on thick plate tow bars | B 10 |
|  | out-of-position fillet welds on bracket of 10 mm thick plate | RR(B) 7 RR(B) 8 |
|  | out-of-position butt welds on pipelines | weld 1: C 4 |

Stick electrodes can be classified according to their coating as under:

| Type Code Type Coating Characteristics | Type of Slag - Slag Removal Ability | Penetration Depth - Gap Bridging Ability | Electrode Manipulation | Characteristics | Weld Appearance |
|--|--|---|---|---|--|
| O Bare Electrode finely distributed arc stabilizers in the electrode material | minimal slag | shallow - excellent | more difficult to weld than any other stick electrode | very high deposition rate, minimal heat stress, little heat distortion | convex, coarsely rippled |
| OO Flux-Core Electrode arc stabilizers rolled into the electrode's core | minimal slag | average to deep - excellent | slightly easier to weld than bare electrodes | good deposition rate, minimal heat stress, little weld distortion, especially for root welds | convex - coarsely rippled |
| N Titania Oxide Type high contents of titanium oxide | porous, even slag blanket - easily removed | average - good to excellent, depending on coating thickness | weldability of fillet welds improves with increasing coating thickness | general purpose electrodes, for steels sensitive to welding conditions, for thin plate | slightly convex to flat, finely to medium-coarsely rippled |
| Es Acid-Coated Type high contents of heavy metal oxides | porous, even slag blanket | deep - average | weldability of fillet welds improves with increasing coating thickness | for steels sensitive to welding conditions, requires good weld preparation | flat, finely rippled |
| Ox Iron Oxide Type high contents of iron oxides | tight slag blanket of evenly distributed thickness - very easily | shallow - very poor | good weldability, fillet welds in gravity position only | for unalloyed low-carbon steels, requires good weld preparation | concave, very finely rippled |
| Kb Basic Low-Hydrogen Type high contents of calcium or other alkaline carbonates | thick slag blanket - fair | medium - good | handling requires some practice, in particular when setting electrode to and removing from weld | particularly suitable for thick plate and rigid assemblies, for high-carbon steels, for thermo steels | slightly convex, medium-coarsely rippled |
| Ze Cellulose Type high contents of organic components | minimal, often quickly solidifying thin slag blanket - easy | deep - very good | good handling as only minimal slag, heavy fume generation | for out-of-position welding | slightly convex, rippled |

In addition to the electrodes types shown in the above table there are several special types available coded SO. Cast iron electrodes, for example, fall into this class.

When buying Kb and So type electrodes make sure they are suitable for AC current. As far as the quality grades are concerned, a higher number indicates a better grade quality. For common low-carbon steels grades 7 - 9 are best suitable.

The last letter of the code shown on the stick electrode indicates the coating thickness.

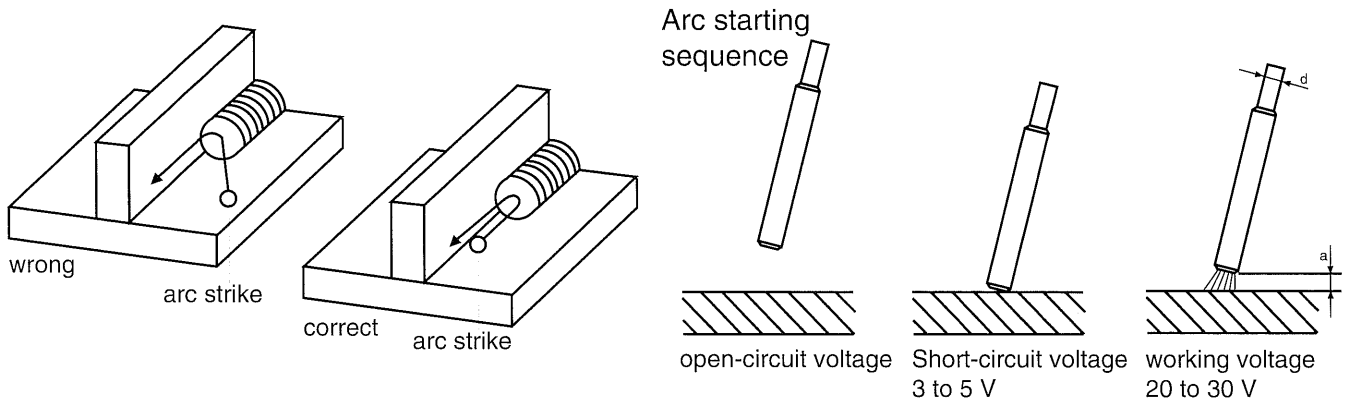
d = light coating
m = medium coating
s = heavy coating

4.4.2.6 Arc Starting And Arc Burning

Arc Strike

Always start the arc in the welding groove.

When the arc is stable weld over the arc strike and melt for good fusion, otherwise there is a risk of cracking.



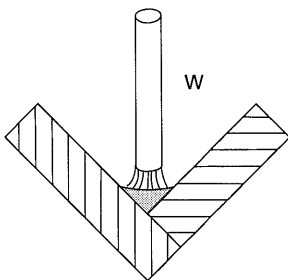
Arc Length

The arc length "a", that is the distance between the stick electrode and the work, should be:

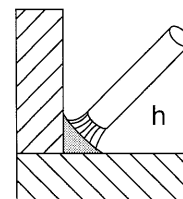
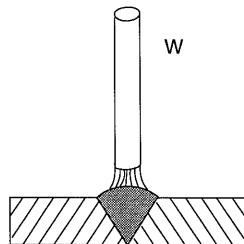
- with stick electrodes of coating type R, RR, A, C = $1.0 \times d$
- with stick electrodes of coating type B = $0.5 \times d$

Too long an arc reduces the penetration, increases the arc blow effect and, particularly with basic coated stick electrodes, causes a porous weld seam.

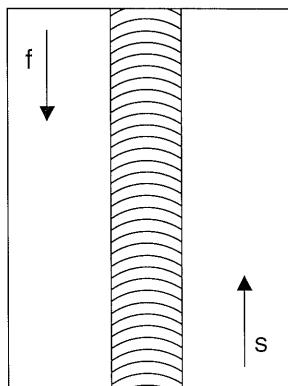
4.4.2.7 Welding Positions According To DIN 1921



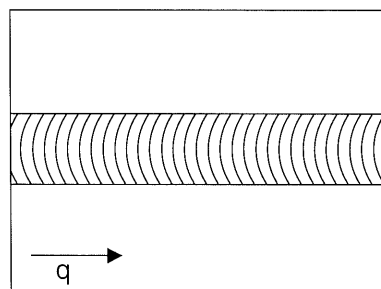
w = gravity position



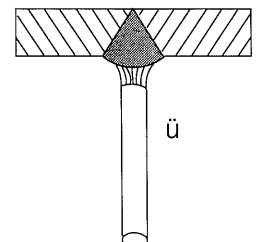
h = horizontal position



s = vertical-up position
f = vertical-down position



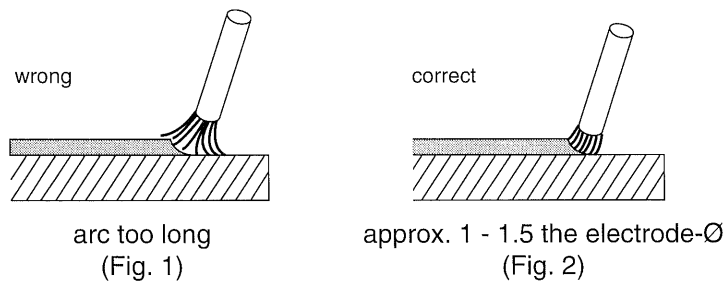
q = horizontal-vertical position



ü = overhead position

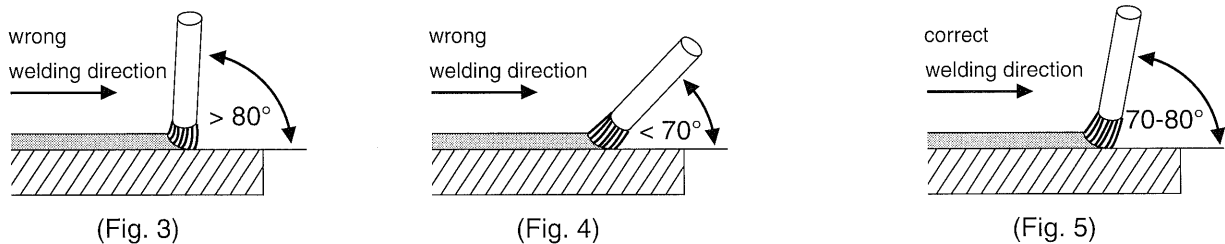
4.4.3 Welding Hints

Because of the multitude of and great differences in the important points for welding only the very basic operations for the most common electrodes for low-carbon steels, the Ti-type electrode, are introduced here. In the case that other electrodes have to be used, the electrode manufacturers supply upon request all relevant information for the type of special electrode to be used. Always make some trial welds on scrap material. Select electrode diameter and welding current as per Table 1). Attach earth clamp to work piece and place electrode into electrode holder as described earlier. Now hold the electrode tip approx. 2 cm / 3/4 inch above the starting point of your welding seam. Hold the welding visor in front of your face and draw the electrode with a short stroke along the groove. Through the welding shield you watch the arc, keeping it to a length of 1 to 1.5 times the electrode diameter.



The correct arc length is important for a good weld, because with too short or too long an arc both welding current and working voltage change. A low working voltage causes insufficient penetration. Too high or too low welding current gives a poor welding seam. Too long an arc does not sufficiently melt the parent material, resulting in high spatter losses. Also the air, with its detrimental substances like hydrogen and nitrogen, may get access to the weld pool.

For a good weld the work angle of the electrode (or electrode inclination angle) is of substantial importance. The inclination should be $70^\circ - 80^\circ$ to the welding direction. With the work angle too steep slag will run under the weld pool, too flat an work angle causes the arc to spatter, in both cases the result is a porous, weak welding seam (see figure 3 - 5).



The welder has to keep the arc at the same length, that is the electrode burn-off is compensated by feeding the electrode into the weld. At the same time the welder has to watch the weld pool for even penetration and width.

Welding is always done from left to right (backhand welding).

At the end of the welding seam the electrode can not simply be lifted or pulled from the weld, this creates porous end craters, which weaken the weld. To correctly terminate a weld the electrode is held for a short moment at the end of the weld seam, then lifted in an arc over the just laid weld.

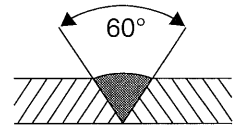


Remove slag only after it has cooled down and is no longer glowing.

If an interrupted weld is to be continued, the slag at the end of the already finished weld must be removed. Then the arc can be started either in the groove or on the weld, as described earlier, and then moved to the end of the weld, which has to be thoroughly melted for good fusion. Welding is then continued normally.

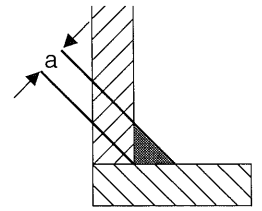
4.4.4 Weld Types

For **Butt Welds** the work piece edges should be bevelled to approx. 30°, which gives a groove angle of 60° (Fig. 8). The root opening between the two work pieces should be 2-3 mm.



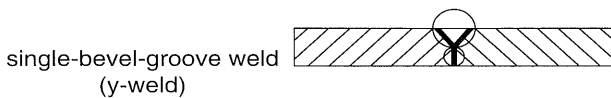
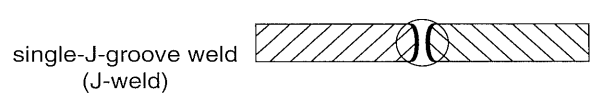
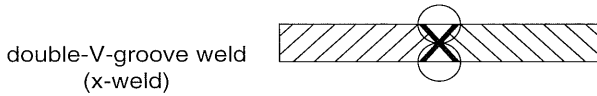
(Fig. 8)

For **Fillet Welds** "a" is the throat width size. The throat width should be at least x 0.7 the plate thickness of the thinner plate.

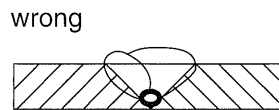


(Fig. 9)

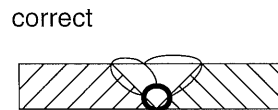
Other weld types:



A joint weld must always have a good fusion at the root.



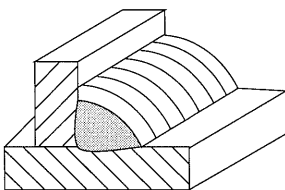
(Fig. 10)



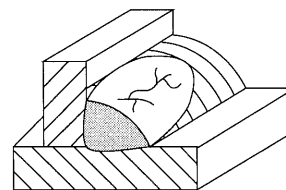
(Fig. 11)

Let weld cool down in the ambient air, do not quench.

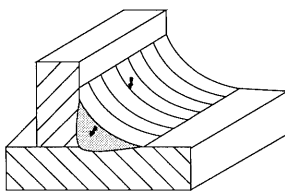
4.4.5 Weld Flaws And Possible Causes - Shown On Fillet Welds



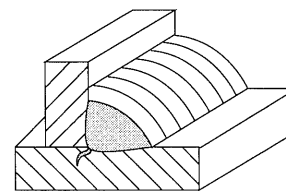
Weld Undercut
Welding current too high
Electrode work angle too steep
Arc too long



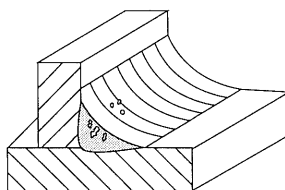
End Crater
Electrode removed too quickly from the weld pool, particularly with high welding currents risk of shrinkage cracking



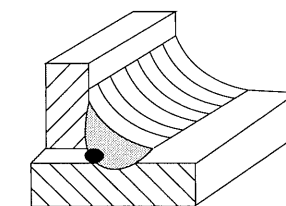
Slag Inclusion
Welding current too low
Welding speed too high
Welding over slag on multi-layer welds



Weld Toe Cracks
Material sensitive to welding conditions
Weld cooled down too fast after welding



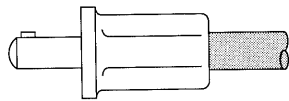
Gas Inclusion
Work surface not clean (rust, grease, paint)
Arc too long
Basic coated electrodes not sufficiently dried



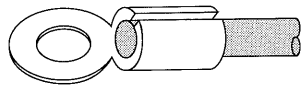
Root Flaw
Slag entering root area because distance too great

4.4.6 Accessories And Accessory Maintenance

Connecting Welding Cables To The Welding Power Source

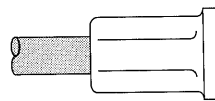


Cable plug

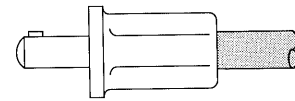


Ring tongue terminal soldered, crimped, clamped

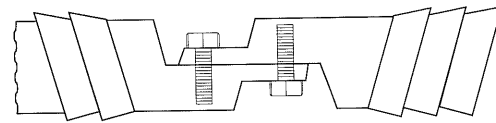
Connecting (Extending) Welding Cables



Cable socket

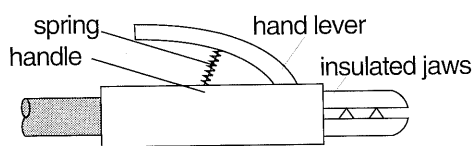


Cable plug



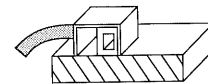
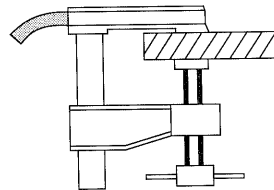
Insulate screw joint terminal with rubber bush or heat-shrinkable sleeve

Fully Insulated Electrode Holder



Replace broken insulating parts at once!

Connection Of Welding Cables To The Work Piece



Clean work piece surface for good conduction

Attach earth clamp as close as possible to the weld. Structural components, beams, pipes or rails should not be used for earth conducting, if they are not the actual work piece.

5.0 Safety Precautions/Accident Prevention

Always disconnect from power before servicing. Electrical repairs should only be carried out by a qualified electrician. At time of delivery the welding power source meets the requirements of EN 60974-1 and other applicable standards.

The open-circuit voltage is below the legal limit for welding in confined spaces having electrically conductive sides, or areas with increased electrical hazard in general, e.g. boilers. To protect the welder against increased electrical hazard insulating mats are compulsory.

The Welding Power Source itself may not be placed or operated in areas with increased electrical hazard. After actuating the trigger switch the electrode wire spool is under current.

Please refer to all local laws and regulations for the prevention of accidents and fires.

Wear only dry clothes, a leather apron and welder's gloves. Use welding visors or helmets with shaded lenses according to DIN 4647 or equivalent.

After work is finished always switch machine OFF and close the cylinder valve. Handle gas cylinders with care: do not throw or heat, keep from tipping over. Always remove cylinder from machine when it is hoisted by crane.

Workpieces, which have been degreased with chlorinated solvents, should be rinsed thoroughly with water afterwards. Otherwise there is danger of phosgene gas developing. For the same reason no degreasing baths should be located in the vicinity of the work area.

Caution: all metallic fumes are hazardous! This warning applies to lead, copper, cadmium, zinc and beryllium in particular. Keep work area well ventilated; use respiratory gear if necessary.

5.1 Overloads/Low Voltage

5.1.1 Overloads

The OMEGA 400 is positively protected against overloads by several independent protection devices. If the permissible duty cycle is exceeded, the machine is shut down automatically and a message displayed in the MWS display. After a short cooldown period the machine is operational again.

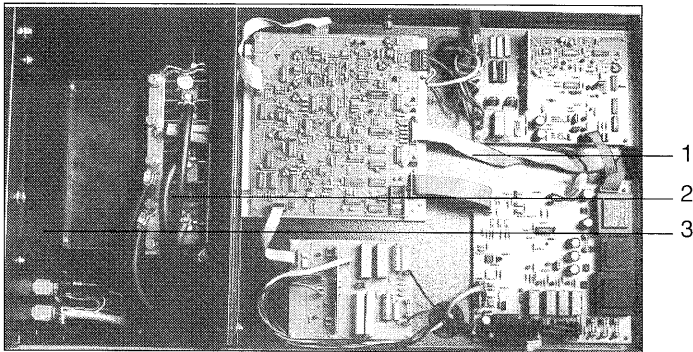
Important: Do not switch the power off, this will cut the power supply to the fan, extending the cooldown time considerably.

5.2 Safety Instructions

- This Welding Machine should only be used for its intended application (MIG/MAG, TIG and Manual Arc Welding).
- Know and adhere to all applicable local safety standards and codes.
- Always wear appropriate apparel when welding.
- Never work without welding visor and gloves, as with TIG welding the arc emits very intense ultra-violet radiation.
- Operate machine only in dry places.
- Operate machine only on power supply circuits having a fully operational protective bonding circuit (earth/ground lead).
- Do not operate near electronic data processing equipment or numerically controlled machinery in operation. The H.F. ignition may interfere with the electronics. Switch such equipment off before starting to weld.

6.0 Service and Maintenance

All Elektra Beckum Welding Machines require only minimal maintenance. All electronic components (see Pic. 27), including the front-panel PCB, are protected against dust build-up and are electrically separated (short-circuit proof). Depending on dust built-up, but at least every 4-6 months, the machine should be cleaned with dry and oil-free compressed air and all components given a visual check.



1. Electronic controls - dust protected
2. Rectifier
3. Cooling fan

Pic. 27 Location of principal components

All components are easily accessible for servicing and maintenance.

The contact tip and gas shroud are the parts most exposed to the radiant heat of the arc. They need to be cleaned regularly of spatters and treated with anti-clogging spray and/or nozzle dip.

Excessive built-up of spatters can short-circuit contact tip and gas shroud, ruining both. Spatter built-up inside the gas shroud may also prevent effective seam shielding.

The machine should be checked at regular intervals for visible defects.

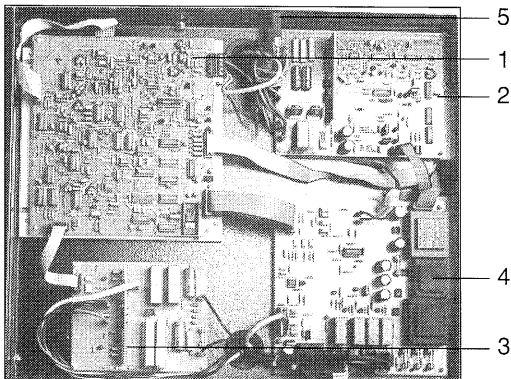
A thorough check of the electrical components should be carried out every 6 months. Disconnect machine completely from power supply (pull plug; switching off circuit breakers or removing fuses is no adequate separation).

Re-tighten all screw and clamping terminals. Have a qualified electrician check-out and repair any scorched leads or cables. Check coolant level.

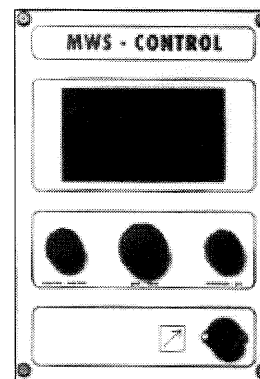
When ordering spare parts state machine model, production no. and stock number of the required part(s).

6.1 Electronic Controls

The front panel electronic controls can be removed from the machine for servicing by simply removing the four fastening screws holding it in the panel.



Pic. 28 Electronic controls



Pic. 29 Front panel PCB (MWS Control)

The PCB with the electronic controls is located directly under the machine housing's top panel. Unscrew the four lifting eyes and remove the top panel to access the PCB.

The electronic components are electrically separated.

1. Inverter control module
2. Motor module (identical to those of SEC models) is protected against damage and works load independent. A blocked wire feed or a short-circuit in the motor control leads are recognized and only cause the MWS Control to shut the machine down and display an error message.
3. H.F. module
4. Power mains module
5. ETA circuit breaker for water cooling unit (2 A)

7.0 Error Messages

In the event of a fault being detected in the system, the MWS Control displays one of the following messages:

- Display:**
- Watercooling fault
Switch off for 5 sec
(low coolant, coolant pump, fault in torch leads)

 - Excess temperatur
Please wait

 - Low voltage
switch off for 5 sec
(voltage drop > 20 % - below 340 V)

 - High voltage
switch off for 5 sec
(voltage surge > 20 % - over 440 V)

 - Error remote control
Switch off for 5 sec
(communication error with external wire feed unit or between interface and welding robot)

 - Error wire feed
Switch off for 5 sec
(w ire feed motor blocked or short circuit-external or internal)

8.0 Trouble Shooting

| Fault | Cause | Remedy |
|--|---|---|
| Irregular wire feed | Incorrect tension of tension roller Pilot groove of feed roller and intake nozzle not aligned Liner clogged or not correct size for wire Wire spooled irregularly, rusty or of inferior quality Wire spool carrier brake too tight Feed rollers dirty or worn, groove not matching wire size | Adjust tension Align Check and/or change Change spool, clean or change liner Loosen Clean or replace |
| Brittle or porous welding seam | Gas line fittings not tight Gas cylinder empty Gas cylinder valve closed Pressure regulator not working Solenoid valve not working Gas shroud or line in lead ass'y clogged Air draft at weld seam Workpiece not clean Wire of inferior quality or unsuitable gas | Check fittings Replace cylinder Open valve Check Check power at solenoid Clean shroud and spray, blow out gas line Protect from draft or increase gas flow Remove rust, grease, paint Change wire, use suitable gas |
| Constant gas flow | Solenoid valve defective or dirty | Check, clean or replace |
| No wire feed | Trigger switch or leads in lead ass'y defective PCB defective | Check, replace if necessary Replace |
| No welding current with normal working wire feed | Earth cable not conducting | Correct |
| Arcing when gas shroud touches workpiece | Short-circuit between contact tip and gas shroud | Clean shroud, treat with anti-clogging spray or nozzle dip |
| Torch becomes excessively hot | Contact tip loose or too large for wire diameter Low coolant level Defective coolant pump | Tighten tip, replace with correct size tip Top off coolant Repair or replace |
| No function of machine: Water-cooled units | Mains fuse/circuit breaker tripped Coolant pump overload protection tripped | Reset or replace Reset overload switch |

9.0 Spare Parts

| Pos. | Description | Stock-No. | SEK | WX | SEK | WX |
|------|--|--------------|-----|----|-----|----|
| 10 | Base plate, welded | 100 240 6590 | ● | ● | ● | ● |
| 20 | Swivel caster Ø 200/50 | 727 108 0284 | ● | ● | ● | ● |
| 30 | Caster Ø 200/50 | 727 108 0292 | ● | ● | ● | ● |
| 60 | Housing rear panel | 100 240 6671 | ● | ● | ● | ● |
| 70 | Louver panel | 132 140 8415 | ● | ● | ● | ● |
| 80 | Solenoid valve NW 2.5 R 1/8" 220 V | 805 200 8264 | ● | ● | ● | ● |
| 100 | Front panel, welded | 100 241 1462 | ● | ● | ● | ● |
| 110 | Panel socket 50 mm ² | 821 507 1317 | ● | ● | ● | ● |
| 120 | Terminal carrier | 132 240 6777 | ● | ● | ● | ● |
| 130 | Pilot transformer bracket | 100 240 6817 | ● | ● | ● | ● |
| 140 | Pilot transformer 7PRI 230 V - 2 x 28 V - 25 VA | 805 613 9290 | ● | ● | ● | ● |
| 150 | Pilot transformer plate | 132 240 7242 | ● | ● | ● | ● |
| 160 | Pilot transformer rectifier | 805 314 1375 | ● | ● | ● | ● |
| 170 | Spoiler plate, welded | 132 241 1444 | ● | ● | ● | ● |
| 180 | Intermediate base plate | 132 241 1100 | ● | ● | ● | ● |
| 190 | Transformer insulation bracket small | 137 108 5153 | ● | ● | ● | ● |
| 210 | Fan carrier | 132 140 2093 | ● | ● | ● | ● |
| 220 | Rotary fan | 804 113 1692 | ● | ● | ● | ● |
| 230 | Capacitor 2 µF/400 V | 805 013 8039 | ● | ● | ● | ● |
| 240 | PCB base panel | 132 241 1428 | ● | ● | ● | ● |
| 250 | Wire protecting sleeve | 824 103 3466 | ● | ● | ● | ● |
| 260 | Wire feed housing | 132 240 6114 | ● | ● | ● | ● |
| 270 | Spool carrier ass'y | 132 107 3880 | | | ● | ● |
| 271 | Inner arbor - spool carrier | 132 711 2950 | | | ● | ● |
| 272 | Outer arbor - spool carrier | 132 711 2968 | | | ● | ● |
| 273 | Cap - spool carrier | 132 711 2976 | | | ● | ● |
| 274 | Spring dish - spool carrier | 132 711 2984 | | | ● | ● |
| 275 | Pressure spring - spool carrier | 132 711 2992 | | | ● | ● |
| 278 | Cap screw M10x70 | 612 104 7932 | | | ● | ● |
| 280 | Panel socket, 4-pole | 821 514 1358 | ● | ● | ● | ● |
| 290 | Euro connector | 132 713 3868 | ● | ● | ● | ● |
| 300 | Handle | 132 111 5663 | ● | ● | ● | ● |
| 310 | Handle | 132 813 9894 | ● | ● | ● | ● |
| 320 | Gas cylinder rack, welded | 100 240 6396 | ● | ● | ● | ● |
| 330 | Cylinder carrier | 132 240 4448 | ● | ● | ● | ● |

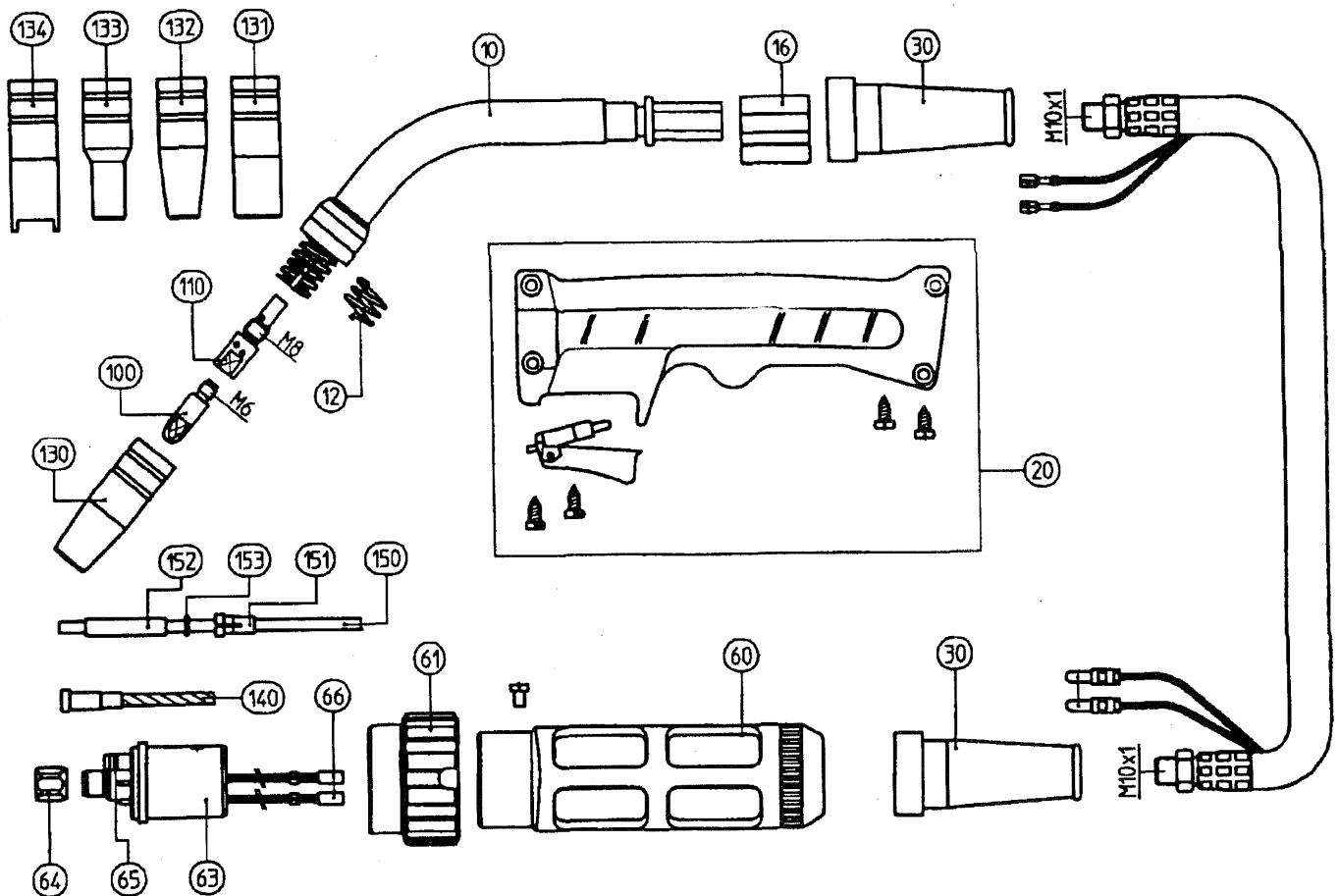
| Pos. | Description | Stock-No. | SEK | WX | SEK | WX |
|------|---|------------------------------|-----|----|-----|----|
| 340 | Knotted link chain, galvanized | 723 607 0870 | ● | ● | ● | ● |
| 350 | Side panel, large | 132 240 6696 | ● | ● | ● | ● |
| 360 | Side panel, small | 132 240 6688 | ● | ● | ● | ● |
| 370 | Door - wire feed compartment | 132 240 6700 | ● | ● | ● | ● |
| 380 | Screw hinge | 701 513 9832 | ● | ● | ● | ● |
| 390 | Lock with ring handle | 701 414 0063 | ● | ● | ● | ● |
| 400 | Tongue, narrow | 701 414 0071 | ● | ● | ● | ● |
| 410 | Thermal overload switch | 810 009 3260 | ● | ● | ● | ● |
| 420 | Housing top panel ass'y | 100 213 9738 | ● | ● | ● | ● |
| 430 | Lifting eye M12x20.5 galvanized | 615 112 9682 | ● | ● | ● | ● |
| 440 | Plug Ø 33.4x15.0 | 132 114 1362 | ● | ● | ● | ● |
| 500 | Spoiler - Transformer 400 | 132 240 7277 | ● | ● | ● | ● |
| 510 | Main transformer 400 | 100 215 9747 | ● | ● | ● | ● |
| 520 | Choke 400 | 100 216 1032 | ● | ● | ● | ● |
| 530 | Current control unit 400 | 810 616 1063 | ● | ● | ● | ● |
| 540 | Rectifier bank 400 | 805 300 4386 | ● | ● | ● | ● |
| 545 | Discharge resistor 560 Ohm | 805 116 9736 | ● | ● | ● | ● |
| 550 | MWS Control unit 400 SEK | 100 215 9801 | ● | ● | ● | ● |
| 560 | AC logic module | 810 616 1110 | ● | ● | ● | ● |
| 570 | Power mains module SEK | 810 616 1098 | ● | ● | ● | ● |
| 580 | Motor module SEK | 810 613 9513 | ● | ● | ● | ● |
| 590 | HF-AC module SEK | 810 616 1101 | ● | ● | ● | ● |
| 600 | Power cable ass'y 32 A CEE 4 x2.5x6000 | 840 213 8590 | | | ● | ● |
| 610 | Switch, mains on/off 32 A | 811 213 9215 | | | ● | ● |
| 620 | Type plate 400 SEK/W Type plate 400 SEK/WX | 110 615 9595 110 615 9609 | ● | | ● | ● |
| 1000 | Wire feed ass'y, heavy-duty | 100 214 9610 | | | ● | ● |
| 1010 | Wire feed motor | 801 109 2064 | | | ● | ● |
| 1020 | Parallel pin 8x60 | 650 500 2324 | | | ● | ● |
| 1030 | Drive cog with hub, steel | 132 500 0259 | | | ● | ● |
| 1040 | Grub screw M6x10 | 616 300 1029 | | | ● | ● |
| 1050 | Drive cog w/o hub, plastic | 132 100 0378 | | | ● | ● |
| 1060 | Feed roller, hardened | 132 500 0232 | | | ● | ● |
| 1070 | Clamping sleeve 3x16 | 650 300 1657 | | | ● | ● |
| 1080 | Needle bush Fw. 8x10 | 710 400 2352 | | | ● | ● |
| 1090 | Spacer wheel | 132 100 4837 | | | ● | ● |
| 1100 | Shaft bracket | 142 206 5993 | | | ● | ● |

| Pos. | Description | Stock-No. | SEKMX | SEKW |
|------|---|--------------|-------|------|
| 1110 | Spacer bush DH 6x9 | 644 205 9304 | | ● |
| 1120 | Electrode wire guide | 142 204 8924 | | ● |
| 1130 | Starknob screw M6x20 | 700 112 4212 | | ● |
| 1140 | Gear bracket | 132 001 6670 | | ● |
| 1150 | Fitting screw SW 13 | 142 540 8891 | | ● |
| 1160 | Spacer washer | 132 100 4845 | | ● |
| 1170 | Torsion lock | 100 201 3424 | | ● |
| 1180 | Drive cog w/o hub, steel | 132 500 9752 | | ● |
| 1190 | Pressure roller, hardened | 132 500 0240 | | ● |
| 1195 | Needle bush 8x10 | 710 400 2352 | | ● |
| 1200 | Clamping sleeve 3x16 | 650 300 1657 | | ● |
| 1205 | Set screw M8x30 | 616 800 9192 | | ● |
| 1210 | Eye bolt M8x60 | 614 100 9328 | | ● |
| 1220 | Press. spring Ø 2.5x12.5x25 | 705 108 6532 | | ● |
| 1230 | Starknob M8 galvanized | 700 001 7730 | | ● |
| 1240 | O-ring 7.00x1.50 | 763 200 9520 | | ● |
| 1250 | Clamping sleeve 6x12 | 650 308 8175 | | ● |
| 1260 | Insulating plate, drilled 1.0 - 1.2 (0.140 lg) | 132 707 1129 | | ● |
| 1270 | Insulating plate, drilled 4x100x180 | 132 140 6501 | | ● |
| 1280 | Insulating plate, drilled 2x180x300 | 132 140 6498 | | ● |
| 1290 | Insulating plate 1,5x45x127 | 132 141 2641 | ● | ● |
| 2000 | Coolant tank | 132 140 6803 | ● | ● |
| 2010 | Threaded cap Ø 62 | 132 114 6399 | ● | ● |
| 2020 | Hose stem R3/8"x9 female | 780 500 9475 | ● | ● |
| 2025 | Hose stem R 1/4"x9 male reducing to Ø 2.5 | 132 540 9173 | ● | ● |
| 2030 | Hose stem R 3/8"x9 male | 780 500 9483 | ● | ● |
| 2040 | Reducer R 3/8"x1/2" | 780 900 9291 | ● | ● |
| 2045 | Hose clamp 12 - 20 | 781 101 7820 | ● | ● |
| 2050 | Centrifugal pump c/w motor | 134 413 6927 | ● | ● |
| 2060 | Screwed joint | 787 214 0543 | ● | ● |
| 2070 | Faucet union G 1/4"xM12x1 | 132 540 7855 | ● | ● |
| 2080 | Union tee R 1/4" | 787 211 0407 | ● | ● |
| 2090 | Reducer R 1/8"x1/4" | 780 900 9275 | ● | ● |
| 2100 | Diaphragm pressure switch | 810 113 9817 | ● | ● |

| Pos. | Description | Stock-No. | SEKMX | SEKW |
|------|-----------------------------------|--------------|-------|------|
| 2110 | Elbow hose stem R 1/4"x10 male | 780 511 7618 | ● | ● |
| 2120 | Reducer R 1/4"x3/8" | 780 900 9283 | ● | ● |
| 2130 | Radiator | 132 740 5680 | ● | ● |
| 2140 | Motor protection ETA 1.5 A | 810 000 4900 | ● | ● |
| 2150 | Contactora | 810 404 2873 | ● | ● |
| 2160 | Resistor 10 Ohm 40 W | 805 116 1077 | ● | ● |
| 2170 | Resistor carrier | 132 241 1495 | ● | ● |
| 2180 | Cap, threaded | 824 314 3897 | ● | ● |
| 2190 | Bush | 821 511 5624 | ● | ● |
| 2200 | Cap, 3/4" | 824 314 1436 | ● | ● |
| 2210 | Contact carrier 6 S | 821 611 5717 | ● | ● |
| 2220 | Contact carrier 4 S | 821 611 5709 | ● | ● |
| 2230 | Quick coupling | 771 015 1002 | ● | ● |
| 2240 | Shunt-resistor 0.1 m Ohm | 805 116 1085 | ● | ● |

MIG/MAG Welding Torch

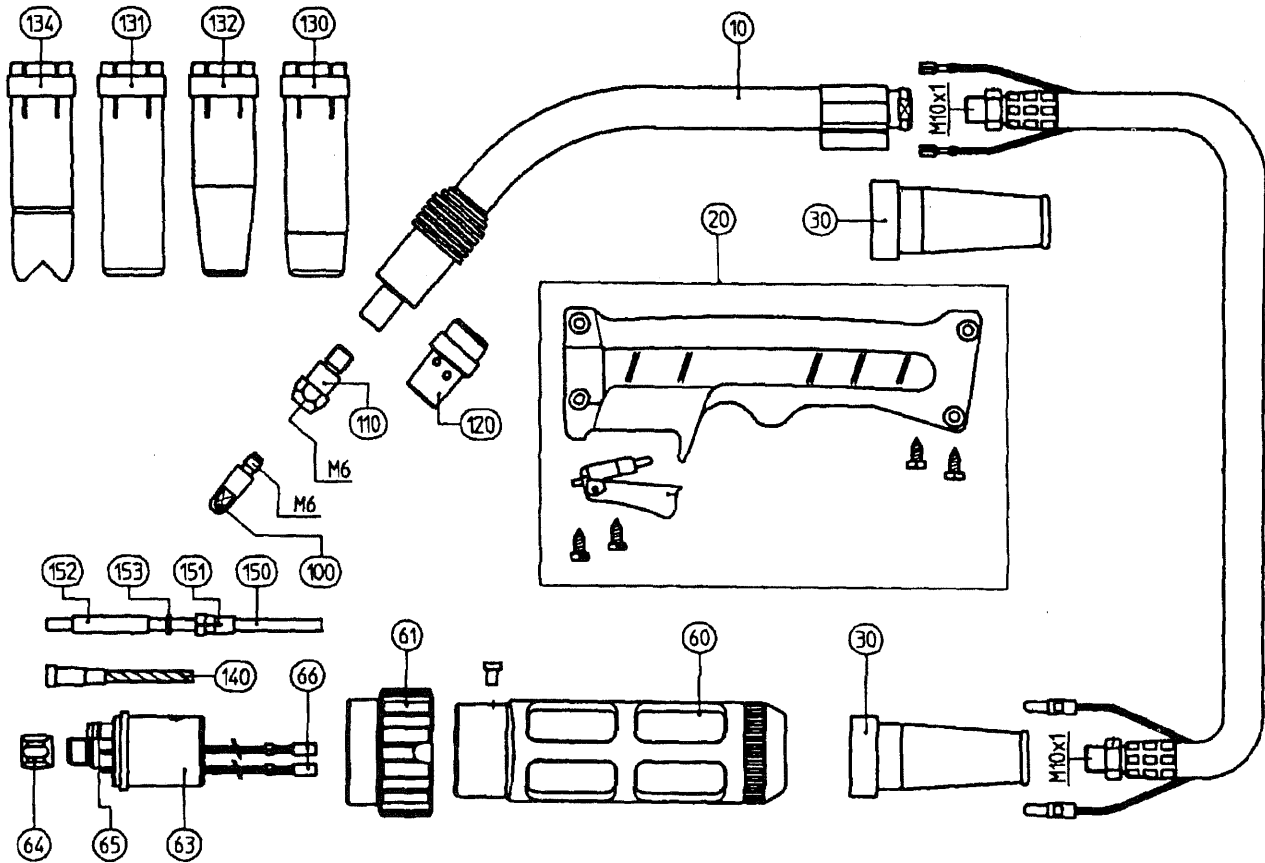
SB 25/2



| Pos. | Description | Stock-No. | Pos. | Description | Stock-No. |
|------|---|--|------|--------------------------------------|--------------|
| | Welding Torch SB 25/2 with torch leads 3 mtr with torch leads 4 mtr with torch leads 5 mtr | 090 200 8330 090 200 8349 090 200 8357 | 100 | Contact tip M6 - 1.0 mm Aluminium | 132 700 9709 |
| 10 | Swan neck, complete | 090 200 5650 | 100 | Contact tip M6 - 1.2 mm Aluminium | 132 700 9717 |
| 12 | Gas shroud spring | 132 704 5454 | 110 | Contact tip holder | 132 707 5574 |
| 16 | Torch body, plastic | 132 707 4527 | 130 | Gas shroud, conical | 132 704 5519 |
| 20 | Handle ass'y, red SB 25-SB 501 | 132 706 4319 | 131 | Gas shroud, cylindrical | 132 704 5500 |
| 30 | Lead support | 132 704 5209 | 132 | Gas shroud, conical small | 132 704 5527 |
| 60 | Lead support | 132 706 4068 | 133 | Gas shroud, bottle neck | 132 704 5535 |
| 61 | Adaptor nut | 132 706 4076 | 134 | Spot weld shroud | 132 704 5543 |
| 63 | Central adaptor block KZ2 | 132 707 5515 | 140 | Insulated liner, blue, 0.6-0.9 3 mtr | 132 706 4203 |
| 64 | Collte nut M 10x1 | 132 706 4106 | 140 | Insulated liner, blue, 0.6-0.9 4 mtr | 132 706 4211 |
| 65 | O-ring 4x1 | 132 706 4092 | 140 | Insulated liner, blue, 0.6-0.9 5 mtr | 132 706 4220 |
| 66 | Trigger lead connector | 132 706 4084 | 140 | Insulated liner, red, 1.0-1.2 3 mtr | 132 706 4238 |
| 100 | Contact tip M6 - 0.8 mm | 132 704 5462 | 140 | Insulated liner, red, 1.0-1.2 4 mtr | 132 706 4246 |
| 100 | Contact tip M6 - 1.0 mm | 132 704 5489 | 140 | Insulated liner, red, 1.0-1.2 5 mtr | 132 706 4254 |
| 100 | Contact tip M6 - 1.2 mm | 132 704 5497 | 150 | Polyamid liner, 0.8 - 1.2 3 mtr | 132 714 4550 |
| 100 | Contact tip M6 - 0.8 mm Aluminium | 132 700 9695 | 150 | Polyamid liner, 0.8 - 1.2 4 mtr | 132 714 4541 |
| | | | 150 | Polyamid liner, 0.8 - 1.2 5 mtr | 132 714 4533 |
| | | | 152 | Guide tube polyamid liner 4.0 OD | 132 704 5578 |
| | | | 153 | O-ring 3.5x1.5 for guide tube | 132 707 5531 |
| | | | | Contact tip wrench (not shown) | 132 704 5411 |

MIG/MAG Welding Torch

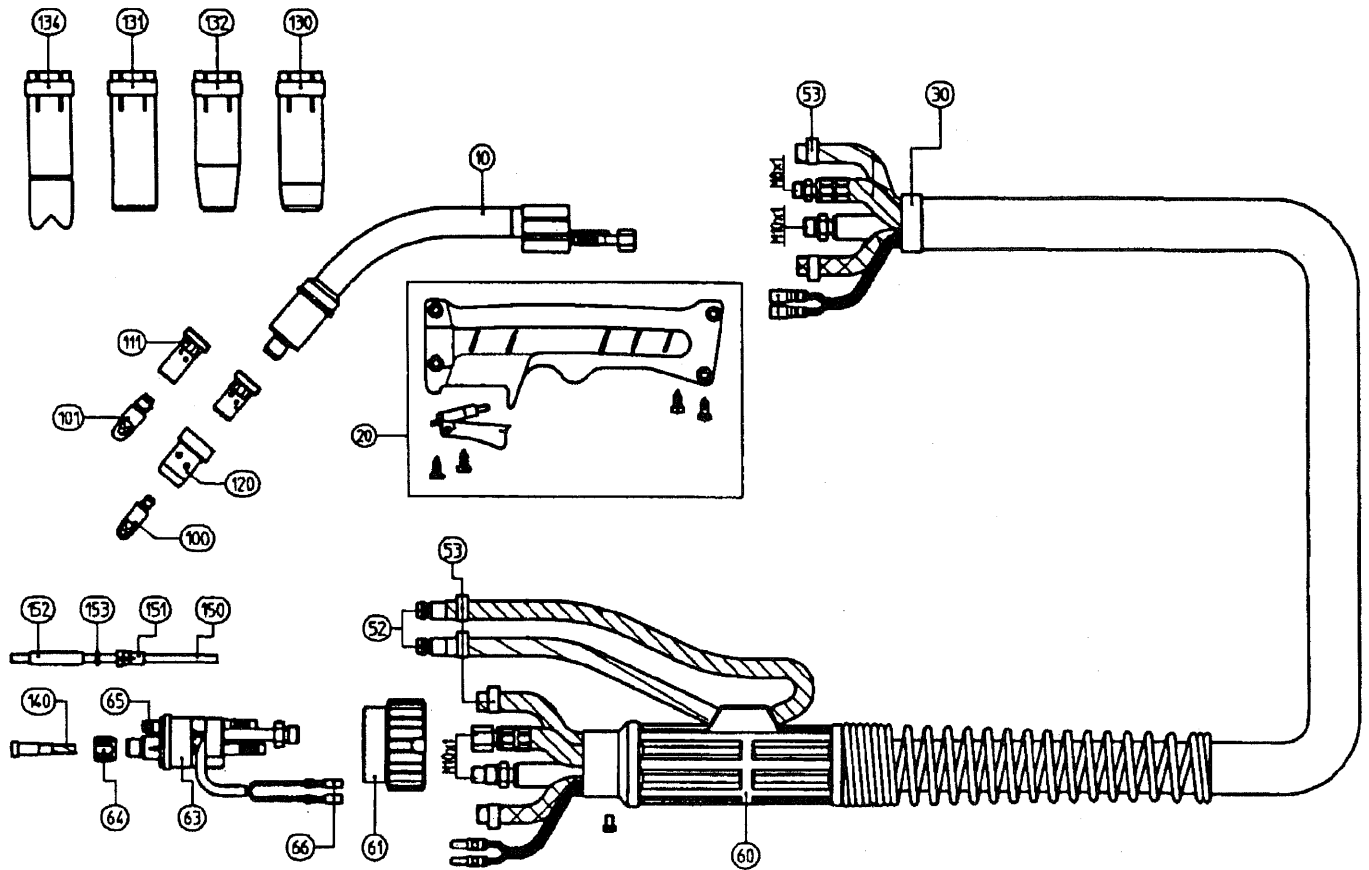
SB 36/2



| Pos. | Description | Stock-No. | Pos. | Description | Stock-No. |
|------|---|--|------|--------------------------------------|--------------|
| | Welding Torch SB 36/2 with torch leads 3 mtr with torch leads 4 mtr with torch leads 5 mtr | 090 200 8411 090 200 8420 090 200 8438 | 110 | Contact tip holder | 132 706 4149 |
| 10 | Swan neck, complete | 090 200 5668 | 120 | Standard gas diffuser | 132 706 3991 |
| 20 | Handle ass'y, red SB 25-SB 501 | 132 706 4319 | 130 | Gas shroud, conical | 132 706 4165 |
| 30 | Lead support | 132 706 4041 | 131 | Gas shroud, cylindrical | 132 706 4157 |
| 60 | Lead support ass'y | 132 706 4068 | 132 | Gas shroud, conical small | 132 706 4173 |
| 61 | Adaptor nut | 132 706 4076 | 134 | Sport weld shroud | 132 706 4190 |
| 63 | Central adaptor block KZ2 | 132 707 5515 | 140 | Insulated liner, blue, 0.6-0.9 3 mtr | 132 706 4203 |
| 64 | Liner collet M 10x1 | 132 706 4106 | 140 | Insulated liner, blue, 0.6-0.9 4 mtr | 132 706 4211 |
| 65 | O-ring | 132 706 4092 | 140 | Insulated liner, blue, 0.6-0.9 5 mtr | 132 706 4220 |
| 66 | Trigger lead connector | 132 706 4084 | 140 | Insulated liner, red, 1.0-1.2 3 mtr | 132 706 4238 |
| 100 | Contact tip M6 - 0.8 mm | 132 704 5462 | 140 | Insulated liner, red, 1.0-1.2 4 mtr | 132 706 4246 |
| 100 | Contact tip M6 - 1.0 mm | 132 704 5489 | 140 | Insulated liner, red, 1.0-1.2 5 mtr | 132 706 4254 |
| 100 | Contact tip M6 - 1.2 mm | 132 704 5497 | 150 | Polyamid liner, 0.8-1.2 3 mtr | 132 714 4550 |
| 100 | Contact tip M6 - 0.8 mm Aluminium | 132 700 9695 | 150 | Polyamid liner, 0.8-1.2 4 mtr | 132 714 4541 |
| 100 | Contact tip M6 - 1.0 mm Aluminium | 132 700 9709 | 150 | Polyamid liner, 0.8-1.2 5 mtr | 132 714 4533 |
| 100 | Contact tip M6 - 1.2 mm Aluminium | 132 700 9717 | 152 | Guide tube polyamid liner 4.0 OD | 132 704 5578 |
| | | | 153 | O-ring 3.5x1 for guide tube | 132 707 5531 |
| | | | | Contact tip wrench (not shown) | 132 704 5411 |

MIG/MAG Welding Torch

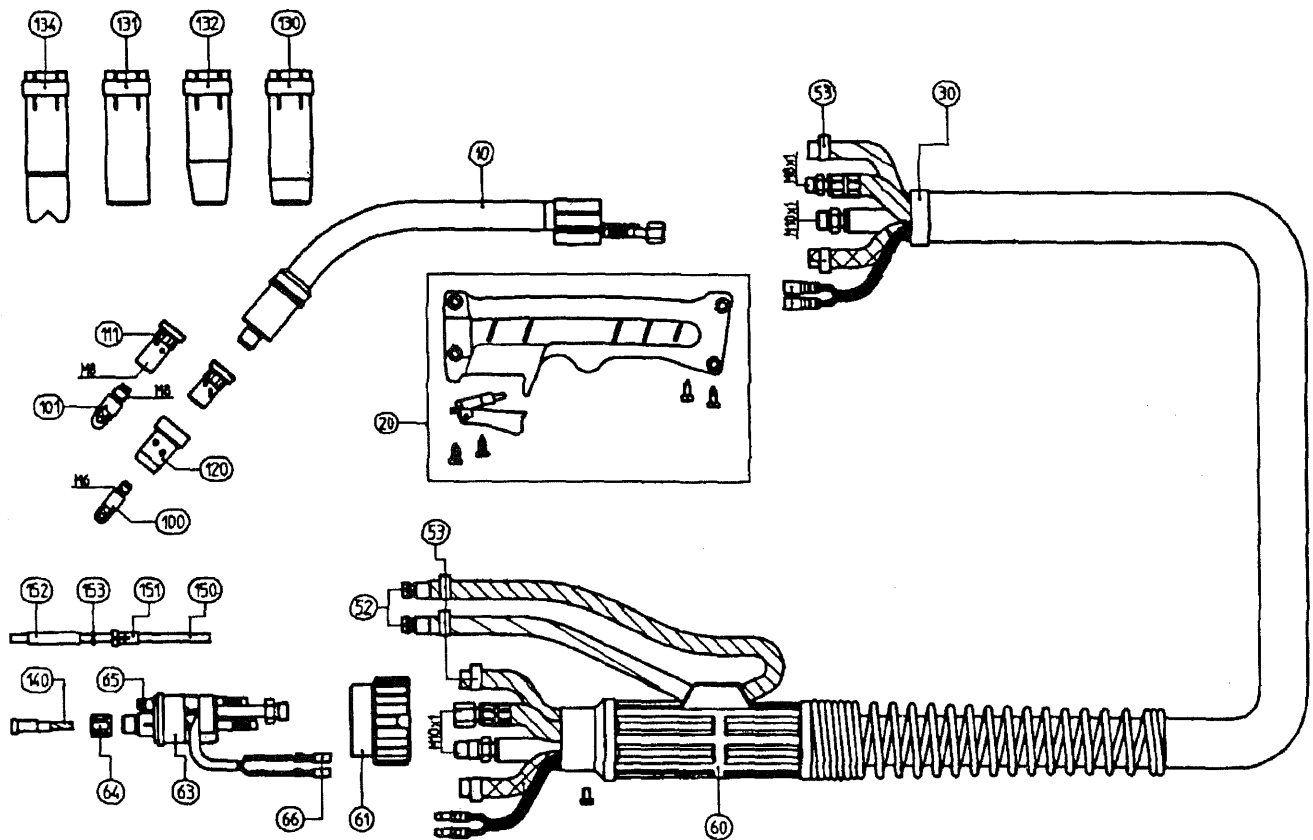
SB 401 W



| Pos. | Description | Stock-No. | Pos. | Description | Stock-No. |
|------|-----------------------------------|--------------|------|----------------------------------|--------------|
| | Welding Torch SB 401/W | | | | |
| | with torch leads 3 mtr | 090 200 8373 | 111 | Contact tip holder standard M8 | 132 710 6780 |
| | with torch leads 4 mtr | 090 200 8381 | 120 | Standard gas diffuser | 132 702 3957 |
| | with torch leads 5 mtr | 090 200 8390 | 130 | Gas shroud, cylindrical | 132 700 5029 |
| 10 | Swan neck, complete SB 401 | 132 702 3876 | 131 | Gas shroud, conical | 132 700 5010 |
| 20 | Handle ass'y, red SB 25-SB 501 | 132 706 4319 | 132 | Gas shroud, conical small | 132 700 5037 |
| 30 | Lead support | 132 704 7660 | 134 | Spot weld shroud | 132 700 5061 |
| 52 | Hose stem | 132 710 6739 | 140 | Insulated liner 0.8-0.9 3 mtr | 132 704 6884 |
| 53 | Hose clamp | 132 710 6747 | 140 | Insulated liner 0.8-0.9 4 mtr | 132 704 7120 |
| 60 | Cable support ass'y | 132 702 3949 | 140 | Insulated liner 0.8-0.9 5 mtr | 132 704 7163 |
| 61 | Adaptor nut | 132 706 4076 | 140 | Insulated liner 1.0-1.2 3 mtr | 132 704 7236 |
| 63 | Central adaptor block WZ2 | 132 702 3930 | 140 | Insulated liner 1.0-1.2 4 mtr | 132 704 7244 |
| 64 | Liner collet M 10x1 | 132 706 4106 | 140 | Insulated liner 1.0-1.2 5 mtr | 132 704 7279 |
| 65 | O-ring 4.0 x 1.0 | 132 706 4092 | 140 | Insulated liner 1.6 3 mtr | 132 704 7678 |
| 66 | Trigger lead connector | 132 706 4084 | 140 | Insulated liner 1.6 4 mtr | 132 704 7686 |
| 100 | Contact tip aluminium M8 - 1.0 mm | 132 711 3794 | 140 | Insulated liner 1.6 5 mtr | 132 704 7694 |
| 100 | Contact tip aluminium M8 - 1.2 mm | 132 711 3808 | 150 | Polyamid liner 0.8-1.2 3 mtr | 132 714 4550 |
| 101 | Contact tip standard M8 - 0.8 mm | 132 711 3891 | 150 | Polyamid liner 0.8-1.2 4 mtr | 132 714 4541 |
| 101 | Contact tip standard M8 - 1.0 mm | 132 710 6755 | 150 | Polyamid liner 0.8-1.2 5 mtr | 132 714 4533 |
| 101 | Contact tip standard M8 - 1.2 mm | 132 710 6763 | 152 | Guide tube polyamid liner 4.0 OD | 132 704 5578 |
| 101 | Contact tip standard M8 - 1.6 mm | 132 710 6771 | 153 | O-ring 3.5x1.5 for guide tube | 132 707 5531 |
| | | | | Contact tip wrench (not shown) | 132 704 5411 |

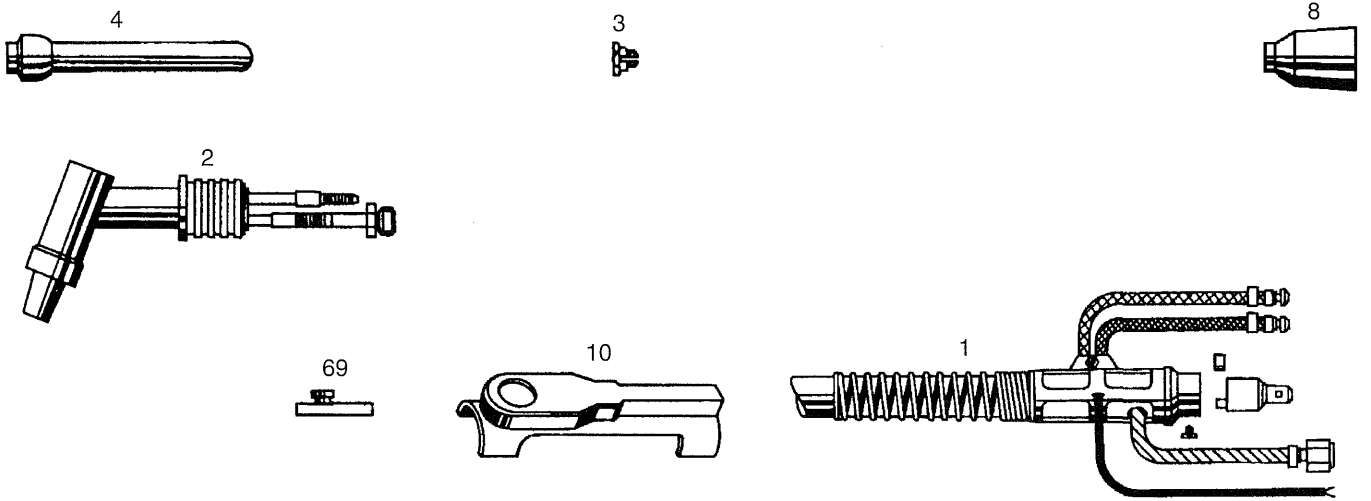
MIG/MAG Welding Torch

SB 501 W

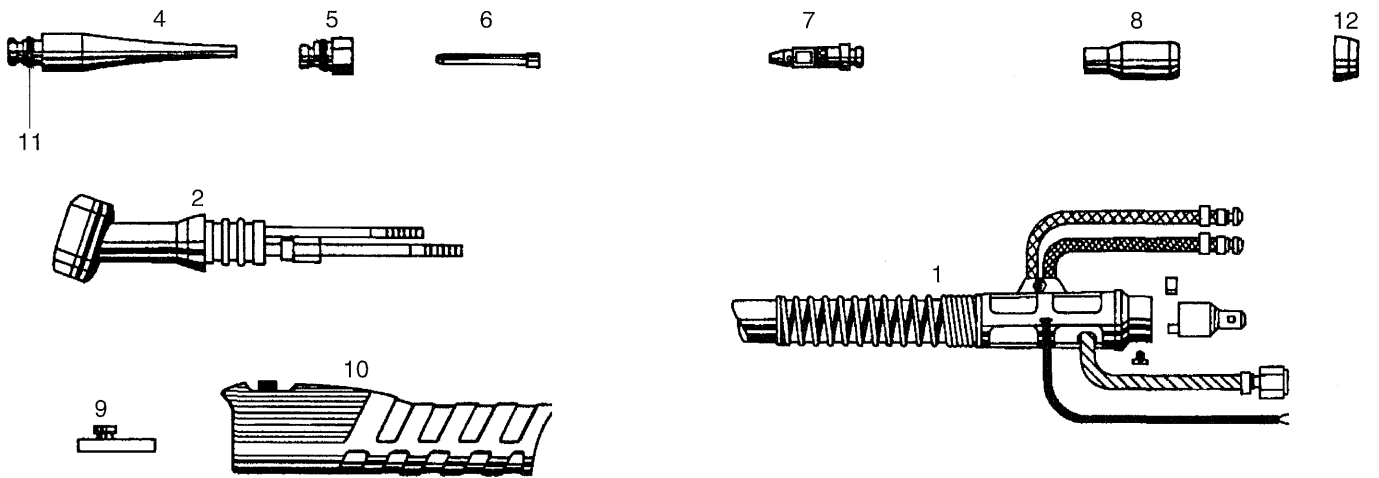


| Pos. | Description | Stock-No. | Pos. | Description | Stock-No. |
|------|--|--|------|----------------------------------|--------------|
| | Welding Torch SB 501 W with torch leads 3 mtr with torch leads 4 mtr with torch leads 5 mtr | 090 200 8462 090 200 8470 090 200 8489 | 111 | Contact tip holder standard M8 | 132 710 6780 |
| 10 | Swan neck, complete SB 501 | 132 710 6720 | 120 | Standard gas diffuser | 132 702 3957 |
| 20 | Handle ass'y, red SB 25-SB 501 | 132 706 4319 | 130 | Gas shroud, cylindrical | 132 700 5029 |
| 30 | Lead support | 132 704 7660 | 131 | Gas shroud, conical | 132 700 5010 |
| 52 | Hose stem | 132 710 6739 | 132 | Gas shroud, conical small | 132 700 5037 |
| 53 | Hose clamp | 132 710 6747 | 134 | Spot weld shroud | 132 700 5061 |
| 60 | Cable support ass'y | 132 702 3949 | 140 | Insulated liner 0.8-0.9 3 mtr | 132 704 6884 |
| 61 | Adaptor nut | 132 706 4076 | 140 | Insulated liner 0.8-0.9 4 mtr | 132 704 7120 |
| 63 | Central adaptor block WZ2 | 132 702 3930 | 140 | Insulated liner 0.8-0.9 5 mtr | 132 704 7163 |
| 64 | Liner collet M 10x1 | 132 706 4106 | 140 | Insulated liner 1.0-1.2 3 mtr | 132 704 7236 |
| 65 | O-ring 4.0x1.0 | 132 706 4092 | 140 | Insulated liner 1.0-1.2 4 mtr | 132 704 7244 |
| 66 | Trigger lead connector | 132 706 4084 | 140 | Insulated liner 1.0-1.2 5 mtr | 132 704 7279 |
| 100 | Contact tip aluminium M8 - 1.0 mm | 132 711 3794 | 140 | Insulated liner 1.6 3 mtr | 132 704 7678 |
| 100 | Contact tip aluminium M8 - 1.2 mm | 132 711 3808 | 140 | Insulated liner 1.6 4 mtr | 132 704 7686 |
| 101 | Contact tip standard M8 - 0.8 mm | 132 711 3891 | 140 | Insulated liner 1.6 5 mtr | 132 704 7694 |
| 101 | Contact tip standard M8 - 1.0 mm | 132 710 6755 | 150 | Polyamid liner 0.8-1.2 3 mtr | 132 714 4550 |
| 101 | Contact tip standard M8 - 1.2 mm | 132 710 6763 | 150 | Polyamid liner 0.8-1.2 4 mtr | 132 714 4541 |
| 101 | Contact tip standard M8 - 1.6 mm | 132 710 6771 | 150 | Polyamid liner 0.8-1.2 5 mtr | 132 714 4533 |
| | | | 152 | Guide tube polyamid liner 4.0 OD | 132 704 5578 |
| | | | 153 | O-ring 3.5x1.5 for guide tube | 132 707 5531 |
| | | | | Contact tip wrench (not shown) | 132 704 5411 |

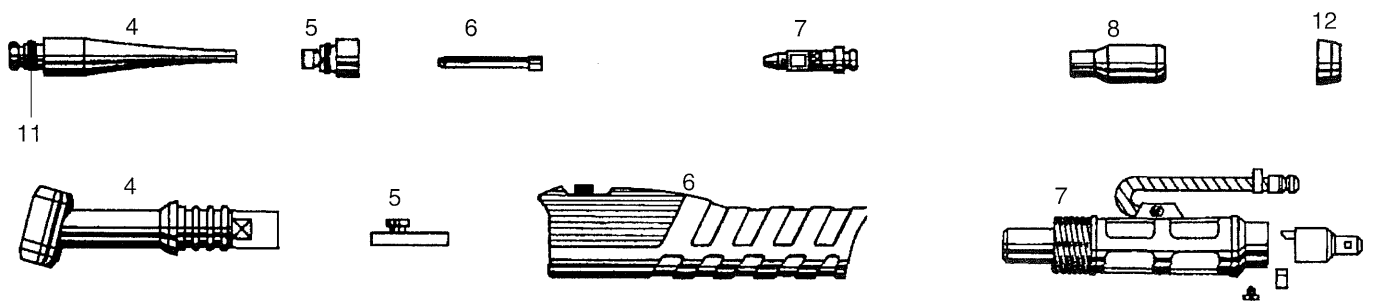
TIG Torch AW 424



TIG Torch SR 18

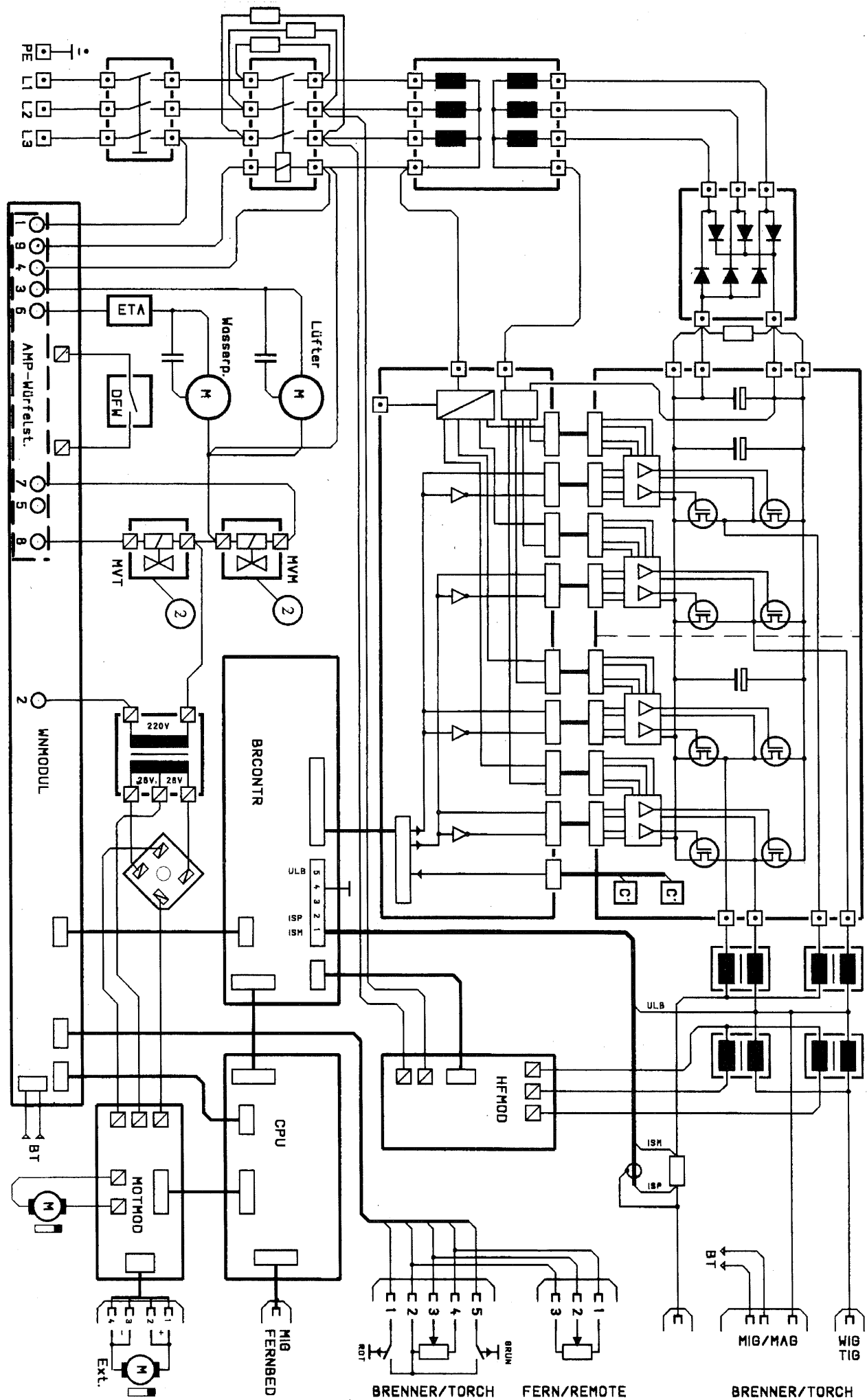


TIG Torch SR 26



| Pos. | Description | Stock-Nr. | AW 424 | SR 18 | SR 26 |
|------|---|--------------|--------|-------|-------|
| 1 | Torch ass'y - 4 mtr | 090 201 2826 | ● | | |
| | Torch ass'y - 8 mtr | 090 201 2834 | ● | | |
| | Torch ass'y - 4 mtr, water-cooled | 090 201 2036 | | ● | |
| | Torch ass'y - 8 mtr, water-cooled | 090 201 2516 | | ● | |
| | Torch ass'y - 4 mtr, water-cooled, remote control | 090 201 2044 | | ● | |
| | Torch ass'y - 8 mtr, water-cooled, remote control | 090 201 2052 | | ● | |
| | Torch ass'y - 4 mtr | 090 200 9108 | | | ● |
| | Torch ass'y - 4 mtr, with remote control | 090 200 7156 | | | ● |
| | Torch ass'y - 8 mtr, with remote control | 090 200 8055 | | | ● |
| 2 | Torch body | 132 715 7198 | ● | | |
| | Torch body | 132 717 0500 | | ● | |
| | Torch body | 132 714 0147 | | | ● |
| 3 | Collet 1.6 mm | 132 715 7210 | ● | | |
| | Collet 2.4 mm | 132 715 7228 | ● | | |
| | Collet 3.2 mm | 132 715 7236 | ● | | |
| | Collet 4.0 mm | 132 715 7244 | ● | | |
| 4 | Back cap, long | 132 715 7201 | ● | | |
| | Back cap, long | 132 712 7230 | | ● | ● |
| 5 | Back cap, short | 132 712 7248 | | ● | ● |
| 6 | Collet 1.0 mm | 132 712 7078 | | ● | ● |
| | Collet 1.6 mm | 132 712 7086 | | ● | ● |
| | Collet 2.4 mm | 132 712 7094 | | ● | ● |
| | Collet 3.2 mm | 132 713 5429 | | ● | ● |
| 7 | Collet chuck 1.0 mm | 132 712 7132 | | ● | ● |
| | Collet chuck 1.6 mm | 132 712 7140 | | ● | ● |
| | Collet chuck 2.4 mm | 132 712 7159 | | ● | ● |
| | Collet chuck 3.2 mm | 132 713 5410 | | ● | ● |
| 8 | Gas shroud, ceramic, size 5 8,0 mm | 132 715 7252 | ● | | |
| | Gas shroud, ceramic, size 6 9,5 mm | 132 715 7260 | ● | | |
| | Gas shroud, ceramic, size 7 11,0 mm | 132 715 7279 | ● | | |
| | Gas shroud, ceramic, size 5 8,0 mm | 132 712 7876 | | ● | ● |
| | Gas shroud, ceramic, size 6 9,5 mm | 132 712 7175 | | ● | ● |
| | Gas shroud, ceramic, size 7 11,0 mm | 132 712 7884 | | ● | ● |
| | Gas shroud, ceramic, size 8 12,5 mm | 132 713 5402 | | ● | ● |
| 9 | Twin touch contact switch red/green buttons | 132 717 0488 | ● | ● | ● |
| 10 | Switch housing | 132 717 0496 | ● | | |
| | Switch housing | 132 717 0526 | | ● | ● |
| 11 | O-ring for back cap | 132 712 7892 | | ● | ● |
| 12 | Heat shield, standard (insulating ring) | 132 712 7256 | | ● | ● |

10.0 Wiring Diagram OMEGA 400 SEK/W; 400 SEK/WX



Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>