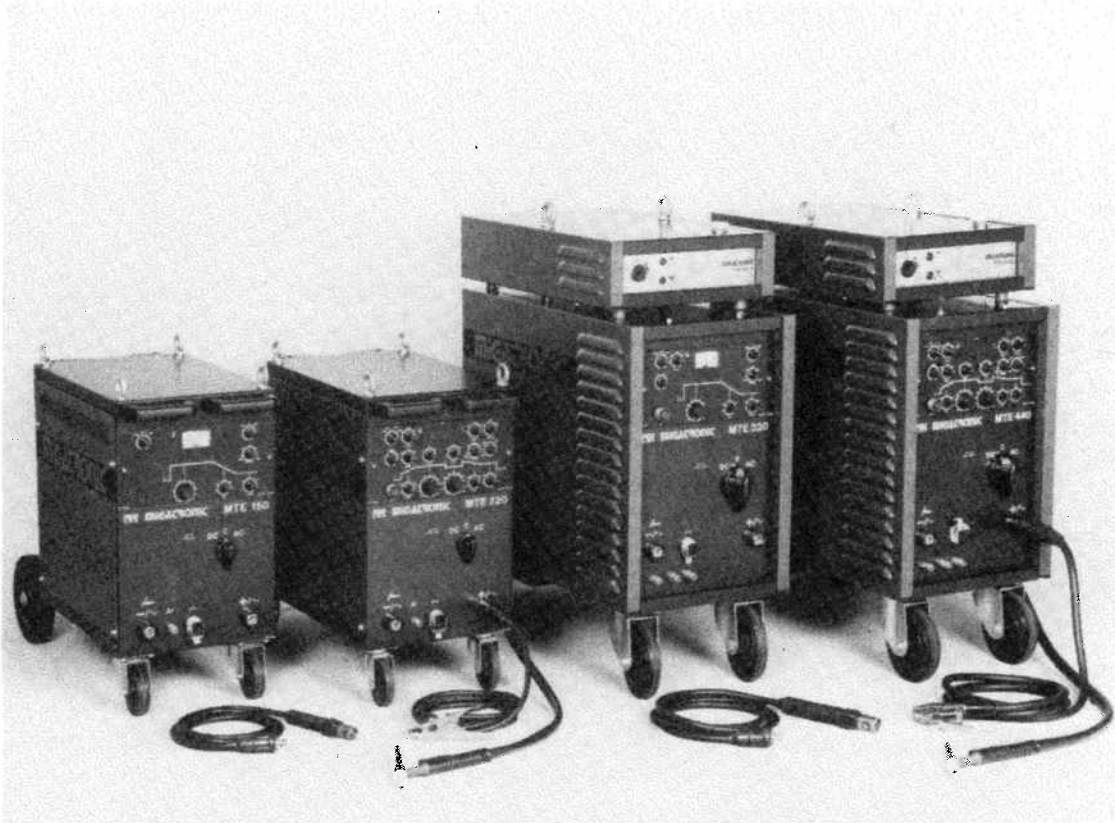


LENZ-VERLAG
09 DEC. 1985

INSTRUCTION

TYPE: MTE



MICATRONIC

50174020

VALID FROM SERIAL NO.: 8651XXXX

CONTENTS

	PAGE
INTRODUCTION	
GENERAL DESCRIPTION	1-1
TECHNICAL DATA	2-1
INITIAL OPERATING	
MAINS CONNECTION	3-1
CONNECTION OF WELDING CABLE	3-1
THE CONTROL BOX	3-2
INSTRUCTION	
DEFINITIONS	4-1
ADJUSTMENT FUNCTIONS	4-2
ILLUSTRATION OF CONTROL PROGRAMMES	4-9
REMOTE CONTROL	4-11
TECHNICAL DATA FOR CONNECTION OF REMOTE CONTROL ...	4-13
PERSONAL SECURITY	
DRESS	5-1
PROTECTION OF FACE AND EYES	5-1
GENERALLY	5-2
MAINTENANCE	6-1
FUNCTIONS HF	6-1
FAULTS	7-1
WELDING TABLES	8-1

INTRODUCTION

MIGATRONIC's long experience in designing and producing welding machines, combined with your proper operation and maintenance, will ensure satisfactory performance of this machine.

Thank you for your confidence.

MIGATRONIC A/S

Peter Roed

GENERAL DESCRIPTION

The **MTE** machines are single-phase, thyristor controlled AC/DC welding machines for manual electrode welding with all types of electrodes as well as for manual and automatic TIG welding.

The special construction of the power source with a bifilar-wound welding inductor provides square waved welding current when welding AC. Contrary to a conventional welding machine with sine waves, square waves have the advantage that the current tops are reduced to ensure a softer arc and less load on the electrode when TIG welding. The special construction of the machine allows an adjustment of the relation between the positive and the negative half-wave to obtain the correct relation between cleaning and penetration, that is, AC balance.

The square wave technique in conjunction with the balance adjustment ensure a stable arc and a better penetration as well as a reduced electrode wastage.

The all-electronic control unit ensures that the actual welding current corresponds to the set value.

When electrode welding an "anti-sticking" device prevents electrodes "sticking" to the workpiece as the current is reduced to 5 A in case of short-circuit.

A watercooling unit type CTU 3000 (part no: 76118013) can be mounted on models **MTE 320** and **MTE 440**.

TECHNICAL DATA

	MTE 150			MTE 220			MTE 320 L/W			MTE 440 L/W						
	X:	60	100	30	60	100	30	60	100	35	60	100	35	60	100	35
Duty cycle %																
Permitted load	I ₂ : 80	100	150	120	150	120	220	190	245	320	260	335	440	260	335	440
At voltage V	U ₂ : 23	24	26	25	26	25	29	28	30	30	30	33	34	30	33	34
Mains voltage/current																
U ₁ : 1 x 200	I ₁ : 27	34	50	46	53	46	78	48	65	88	72	96	129	72	96	129
U ₁ : 1 x 220	I ₁ : 23	29	44	37	46	37	67	48	65	88	72	96	129	72	96	129
U ₁ : 1 x 250	I ₁ : 20	26	38	32	41	32	60	42	57	77	63	84	113	63	84	113
U ₁ : 1 x 380	I ₁ : 13	17	25	21	27	21	39	28	38	51	42	56	75	42	56	75
U ₁ : 1 x 415	I ₁ : 12	15	23	19	25	19	37	26	36	48	39	53	71	39	53	71
U ₁ : 1 x 440	I ₁ : 12	15	22	18	23	18	34	24	33	44	36	48	65	36	48	65
*) U ₁ : 1 x 500	I ₁ : 10	13	19	16	20	16	30	21	28	39	31	42	57	31	42	57
Consumption kVA:	: 5,1	6,4	9,6	8,1	10,1	8,1	14,8	12,9	16,7	21,8	18,2	23,5	30,1	18,2	23,5	30,1
Consumption max.	:		11				16			25			34			34
Current range AC	:	5-150			5-220				20-320			20-440			20-440	
Current range DC	:	5-150			5-220				5-320			5-440			5-440	
Open circuit voltage AC :		80-84 dc			82-86 dc				84-90 dc			85-91 dc			85-91 dc	
Open circuit voltage DC :		80-84 dc			82-86 dc				84-90 dc			85-91 dc			85-91 dc	
Ripple voltage, open circ. :		< 5%			< 5%				< 5%			< 5%			< 5%	
**) Effect 150A/26V	:	0,72			0,59				0,52			0,47			0,47	
**) Effect cos.phi.	:	0,72			0,68				0,77			0,82			0,82	
**) Efficiency	:	0,60			0,65				0,60			0,65			0,65	
No load consumption W:		0,3			0,3				0,5			0,5			0,5	
Insulation class	:	H			H				H			H			H	
Protection class	:	IP21AF			IP21AF				IP21AF			IP21AF			IP21AF	
Standard	:	VDE 0542			VDE 0542				VDE 0542			VDE 0542			VDE 0542	
L x W x H, air	MM :	805 x 375 x 705			805 x 375 x 705				1020 x 570 x 855			1020 x 570 x 855			1020 x 570 x 855	
L x W x H, water	MM :	805 x 375 x 705			805 x 375 x 705				1020 x 570 x 1010			1020 x 570 x 1010			1020 x 570 x 1010	
Weight	Kg :	105			135				210			265			265	


*) not standard, can be delivered for other voltages.

**) AC-balance set at 50%.

BOX TYPE:	I	II	III
Infinitely variable balance adjustment between positive/negative halfwaves	X	X	X
4 cycle, self hold	X	X	X
2 cycle, latching	X	X	X
Spot welding, infinitely variable 0,5-10 sec.	X		
Electrode welding AC and DC	X	X	X
Hot-start when electrode welding, infinitely variable from 0-100%	X	X	
Pre-flow, gas flow, fixed		X	X
Pre-flow, gas flow, infinitely variable 0-2 sec.	X		
Post-flow, gas flow, infinitely variable 0-30 sec.	X	X	X
Infinitely variable slope-up, 0-10 sec.	X		
Infinitely variable slope-down, 0-10 sec.	X	X	X
Infinitely variable reduced current level	X		
Infinitely variable start and stop current	X		
Analog ammeter		X	X
Digital ammeter	X		
Connection of remote control	X	X	
Pulsatory arc via remote control	X	X	
Pulsatory arc via internal reg.	X		
Pulse current time: (0,03-2,0 sec.)			
Basic current time: (0,03-2,0 sec.)			
Pulse frequencies: Max. 33,3 Hz			= 1998 P/min.
Min. 0,5 Hz			= 30 P/min.

INITIAL OPERATING

Mains connection

The mains cable is taken through the sleeve at the back of the machine and is connected to the terminal strip at L1 and L2. The yellow/green earth connection is attached to the  marked screw.

Before the machine is connected to the mains supply, it must be ensured that the welding transformer is connected to the correct voltage. A switch diagram for the various voltages is placed at the terminal strip on the transformer. The terminal strip is placed behind the left side panel.

Fuse sizes and cable sizes for various mains voltages.

Mains voltage	220/250V		380/415 V		440 V		500 V	
TYPE	Fuse	Mains cable	Fuse	Mains cable	Fuse	Mains cable	Fuse	Mains cable
MTE 150	35 A	6 [□]	20 A	4 [□]	20 A	4 [□]	16 A	2,5 [□]
MTE 220	50 A	10 [□]	35 A	6 [□]	25 A	4 [□]	25 A	4 [□]
*) MTE 320	63 A	16 [□]	50 A	10 [□]	35 A	6 [□]	35 A	6 [□]
*) MTE 440	80 A	25 [□]	63 A	16 [□]	50 A	10 [□]	50 A	10 [□]

*) incl. phase compensating condenser.

WARNING: ELECTRICAL MAINS POWER MUST BE SWITCHED OFF BEFORE THE CABINET IS OPENED, AND ONLY QUALIFIED AND AUTHORIZED ELECTRICIANS SHOULD WORK ON ELECTRICAL MACHINES.

Connection of welding cables

The welding and return cables are connected to the sockets on the front of the machine. After connection the plugs should be turned approximately 90° to avoid damage being caused by high contact resistance.

The control box

All control functions are built into the sealed and easily removed control box.

By loosening the two Allen screws on the front of the machine the control box can be removed without opening the machine.

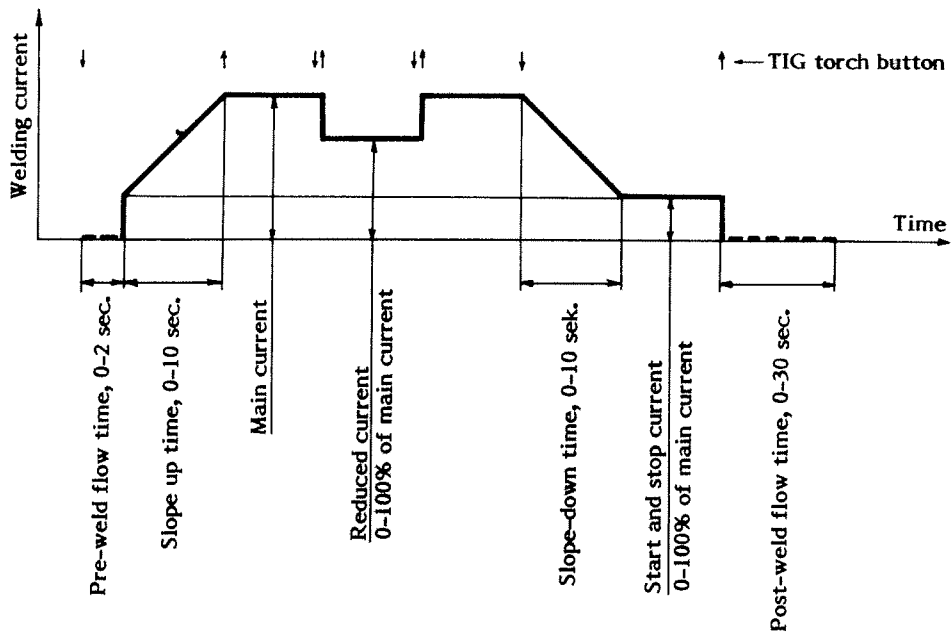
On the back of the control box is both a multiplug which connects the control box to the machine modules, and the fuse for the protection of the remote control circuit.

The control box is available in 3 versions with different control functions fitting all MTE machines from 150 to 440.

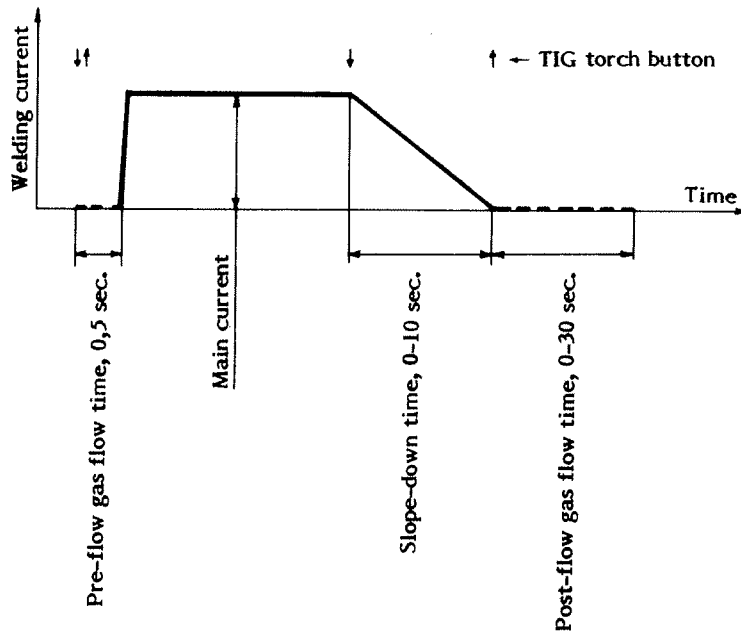
WARNING! ONLY EXCHANGE THE CONTROL BOX WHEN THE ELECTRICAL MAINS POWER IS SWITCHED OFF.

DEFINITIONS

BOX TYPE I

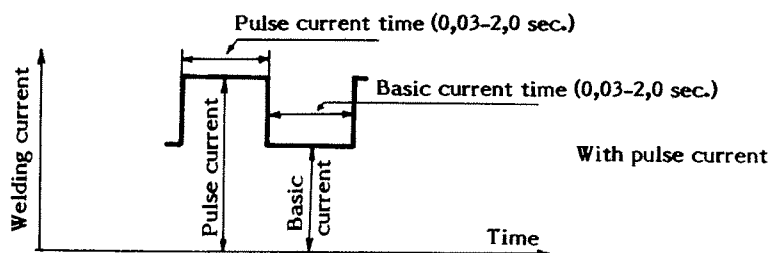


BOX TYPE II OG III

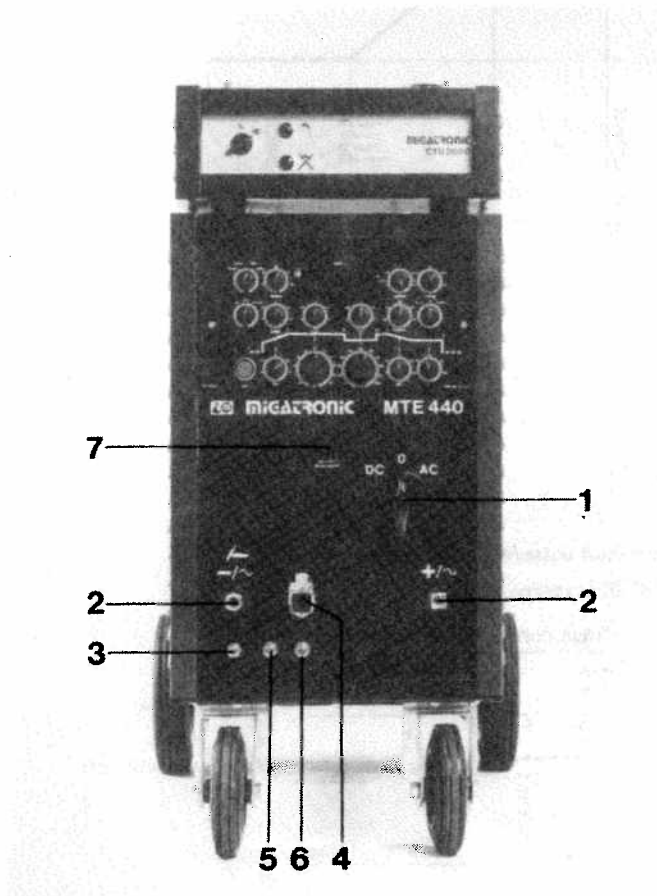
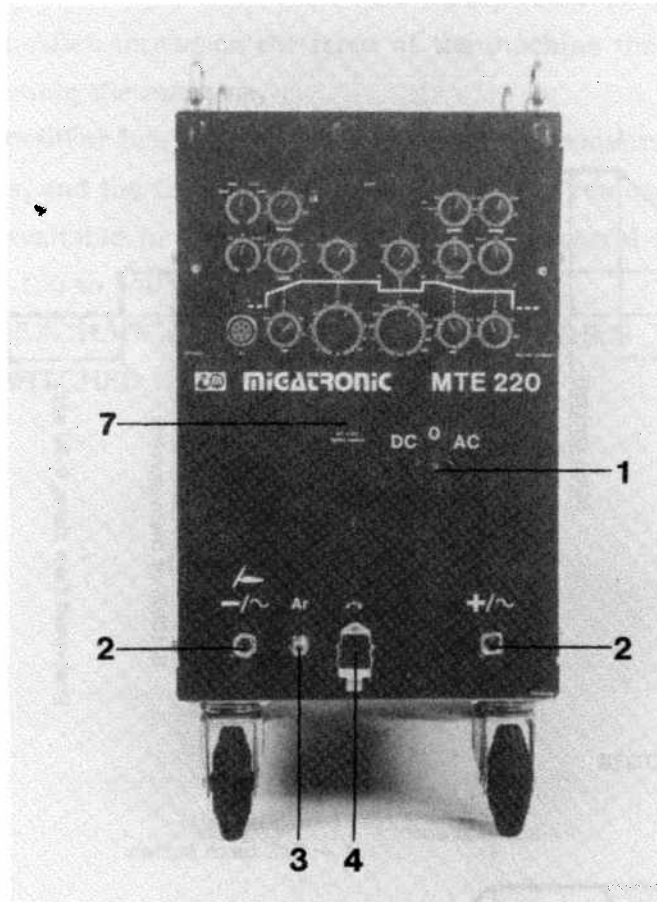


BOX TYPE I (internal pulse/external pulse)

BOX TYPE II OG III (external pulse)



ADJUSTMENT FUNCTIONS



ADJUSTMENT FUNCTIONS

1. **Mains switch and switch between AC and DC.**

When the machine is turned on, this is indicated by light in the ammeter, a short operation of the fan and a short opening of the solenoid valve to purge gas hose.
2. **Welding cable sockets.**
3. **Quick release connection for shielding gas.**
4. **Multiplug for the connection of TIG torch control wire.**
5. **Quick release connection for water flow to water cooled TIG torch (MTE 320/440).**
6. **Quick release connection for recirculation of water from water cooled TIG torch (MTE 320/440).**
7. **Safety control.**

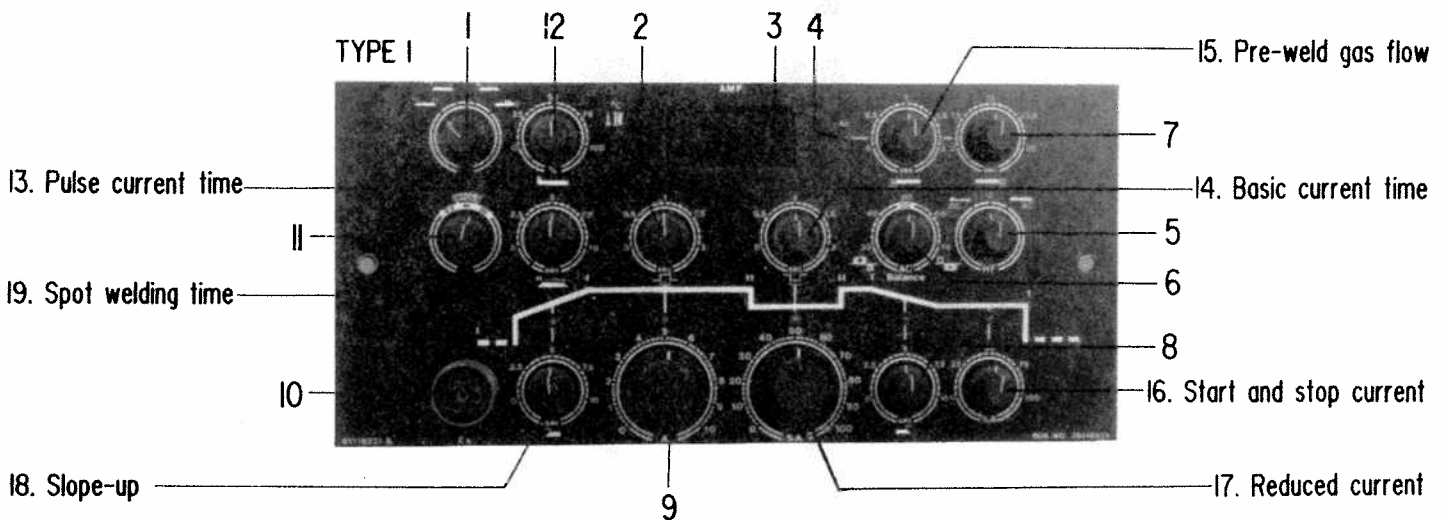
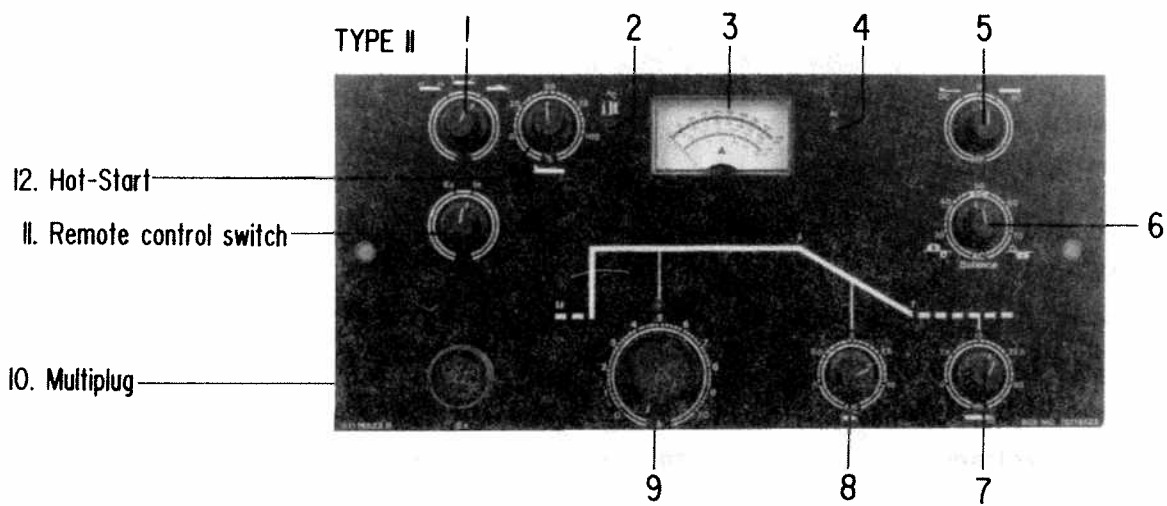
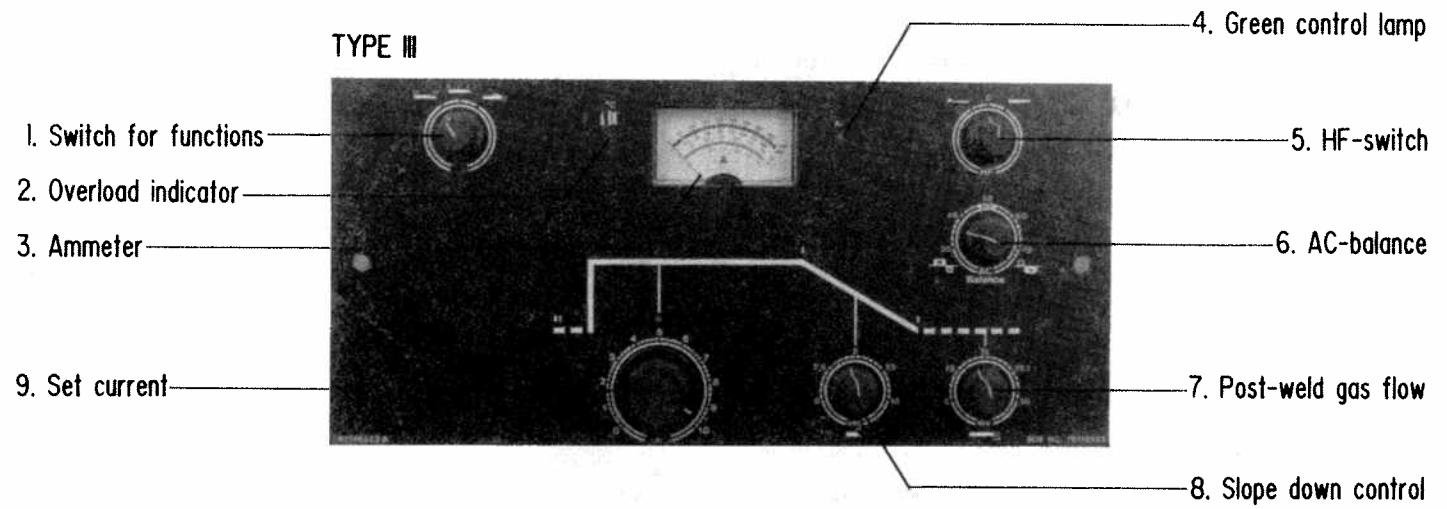
Control lamp is turned on if there is more than 9 V AC on the welding cable sockets. This lamp should not light when not welding.

The construction of the MTE machines ensures that the open circuit voltage is **always a DC voltage** with a ripple voltage less than 5 per cent, also for AC welding.

If the lamp lights when not welding, the machine does not meet the safety regulations for welding under special conditions as described in the power current regulations.

It is usual for the lamp to light during AC welding.

ADJUSTMENT FUNCTIONS BOXES




ADJUSTMENT FUNCTIONS BOXES

Pos. 1 Switch for functions: Self hold  , seam  , electrode welding

 .

Control boxes of type I are also equipped with the spot welding function

 .

If the switch is set at electrode welding the "hot-start" and "anti-sticking" automatics are activated. In the other positions these functions are automatically cut out.

If the machine is activated by a pressure on the torch button when it is not welding, the machine is automatically cut out after approximately 10 sec. (self hold and spot welding).

Pos. 2 Overload indicator



The red lamp lights if the automatic thermal overload protection device has cut out the machine. The thermostatically controlled fan continues working until the machine has cooled to normal temperature, after which the red light will turn off automatically and the machine is ready for use.

Pos. 3 Ammeter

Shows the set welding current. The machine is equipped with a very exact electronic circuit measuring the welding current. On the basis of the measured and the set current, comparisons and adjustments are currently made to ensure a constant welding current irrespectively of varying mains voltage, cable lengths or machine heating.

Pos. 4 Green control lamp indicating that the solenoid valve has opened for the shielding gas.

Pos. 5 HF switch

If the selector switch is at  , the HF will work only at the time of ignition and will cut out automatically when the arc is stable. At  the HF striking works during the whole welding activity. This position is used for AC welding. During electrode welding the HF striking is automatically cut out.

Pos. 6 AC balance

Button for adjustment of the relation between cleaning effect and




penetration at aluminium welding. This is done through a regulation of the positive and negative halfwaves.

A setting at "70" gives the highest penetration and "30" the highest cleaning effect. At DC welding the AC balance is set at "50" as this gives the lowest consumption of mains current.

Pos. 7 Post-weld gas flow

The post-weld gas flow time should be set in accordance with the plate thickness and the diameter of the tungsten electrode to prevent oxidation of electrode and welding seam when the welding is ended. The time is correctly set when there is no temper colour at the end of the tungsten electrode after the burn-back delay is over, and a correct setting will extend the life of the tungsten electrode. The max. post-weld gas flow time is 30 sec.

Pos. 8 Slope down control

Crater formation at the end of a weld seam can be prevented by using this control to set the time for the welding current to decay after completing the welding seam. If the switch (pos. 1) is at self hold  the slope down works as long as the torch button is held down and the welding ends when it is released. If the switch is at seam  or spot  the welding only stops when the slope down time has expired.

Pos. 9 Set current

The welding current is adjusted by this potentiometer equipped with a multidrive reduction.

Control boxes I and II are furthermore equipped with the following:

Pos. 10 Multiplug for connection of remote control or welding robot. Signals for set current, measured current and "arc established".

Pos. 11 Remote control switch

Switch between external or internal current adjustment and for box I furthermore internal adjustment of pulsatory arc. Machines equipped with box I or II can also weld with pulsatory arc by addition of remote control FPB (part no. 76116383). Max. pulse frequency is 16 Hz.

Pos. 12 Hot start

This control can only be used when electrode welding.

If this control is set at 100% the machine will start with a welding current twice as high as the set main current (pos. 9). This hot-start surge continues for 1 second after which the machine automatically drops to the set welding current.

Control box I is also equipped with the following:

Pos. 13 Pulse current time

Here the duration of the pulse current is variable between 0.03 and 2 seconds when the remote control switch (pos. 11) is at "internal pulse".


Pos. 14 Basic current time

Here the duration of the basic current is variable between 0.03 and 2 seconds when the remote control switch is set at internal pulse.

Pos. 15 Pre-weld gas flow



The pre-weld gas flow time is adjustable between 0 and 2 seconds. It is thus possible to choose the optimum pre-weld gas flow time.

Pos. 16 Start and stop current

With this control it is decided at what current level the welding shall start and stop. Start and stop current are set in percentage of the set current (pos. 9). When the switch (pos. 1) is at self hold  , the stop current is switched on as long as the torch button is held down after the slope down time has expired.

Pos. 17 Reduced current

With this control a reduced current level is set in percentage of the set current (pos. 9).

If the switch (pos. 1) is at self hold  or at spot  , a brief pressure (less than 0.3 sec.) on the torch button will make the machine start on reduced current. A long pressure (more than 0.3 sec.) will make it start on set current, with or without slope up. The yellow lamp over the button shows that the welding current is at the reduced setting.




Please observe that the reduced current cannot be set to a lower value than the one set at the button for start and stop current (pos. 16).

During welding a brief pressure on the torch button makes the machine switch from set current to reduced current and back again. The slope down function can work from set current as well as reduced current.

If the remote control switch (pos. 11) is at "internal Pulse", the basic current is controlled by the reduced current knob (pos. 17), while the pulse current can be adjusted by current potentiometer (pos. 9).

When "reduced current" is activated by a brief pressure at internal pulse, the pulse is stopped and can be started again by a brief pressure. The yellow lamp will light together with the pulse current.

Pos. 18 Slope-up

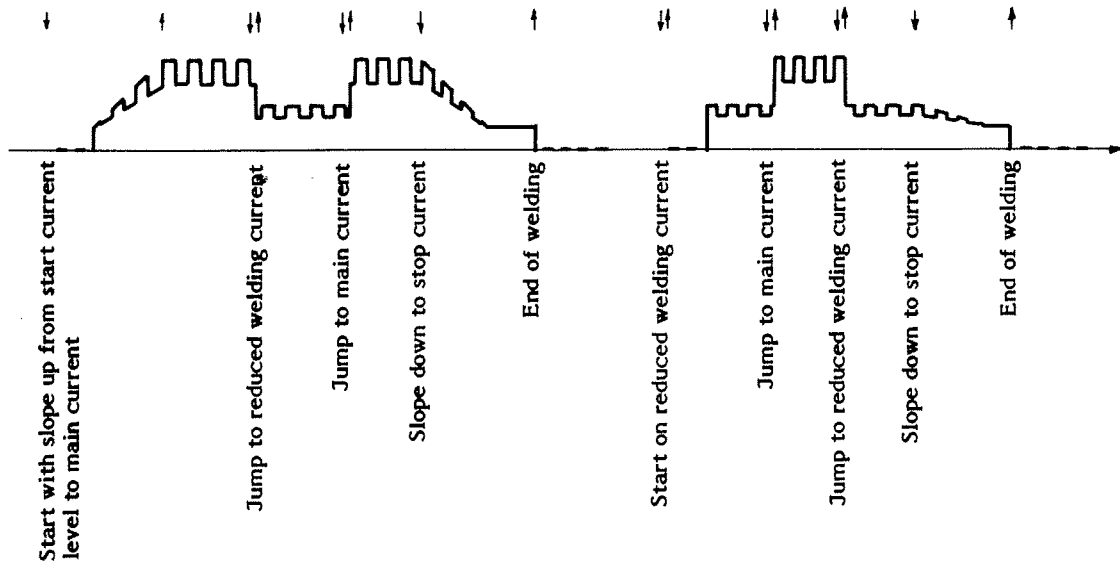
For some difficult welding jobs it is advantageous to use the slope up function. If the switch (pos. 1) is at self hold  the slope up works as long as the torch button is held down and when it is released the current will jump to "set current". If the switch is at seam  or spot  the slope up function works until set current has been reached. The slope up time is adjustable between 0 and 10 seconds.

Pos. 19 Spot welding time

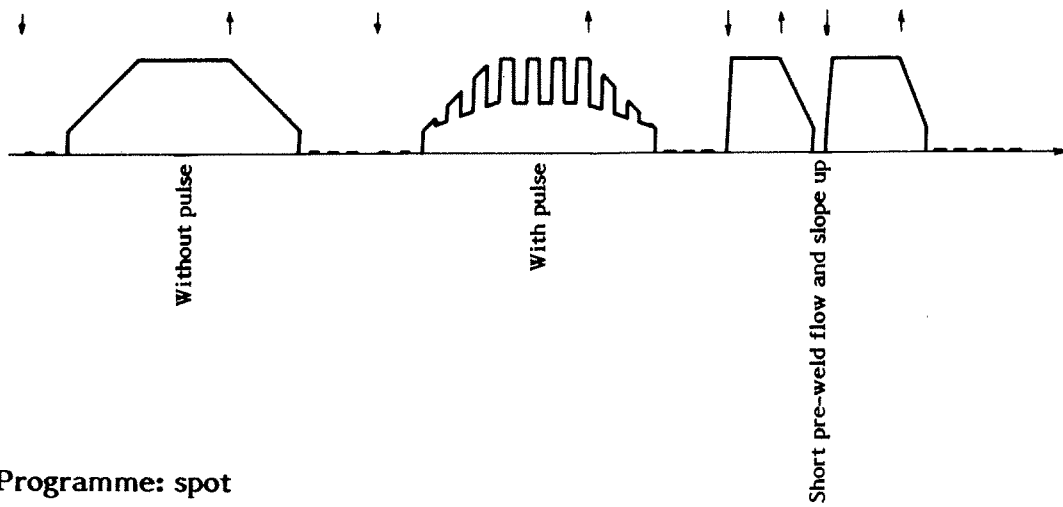
Here the spot welding time can be set between 0.5 and 10 seconds. The time is measured after the arc has been struck and when the time expires the slope down function is activated.

Over the buttons slope-up, set current, slope down and crater filling current there is a green lamp indicating how long the machine has reached in the programme. The following two pages show the many variations of the programmes.

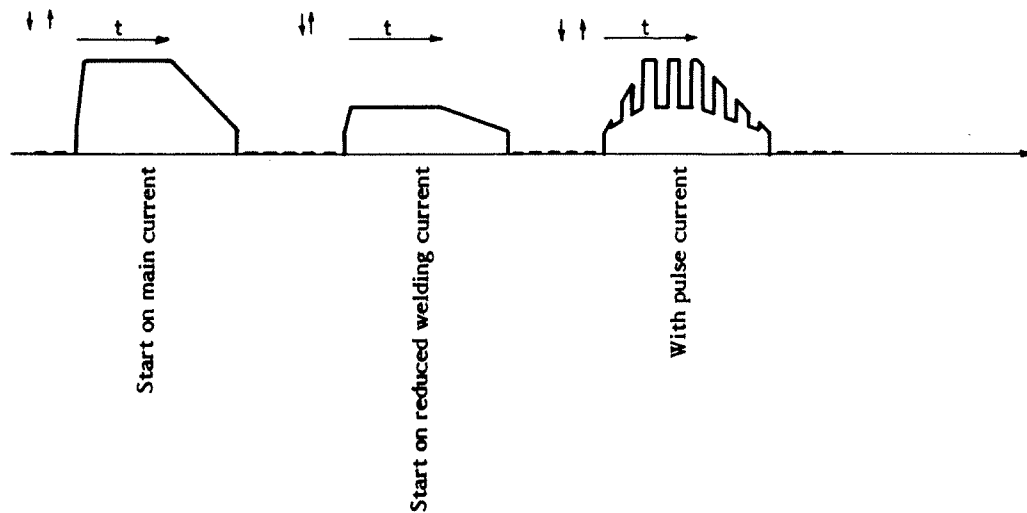
Programme: self hold, pulse via pulse remote control



Programme: seam



Programme: spot

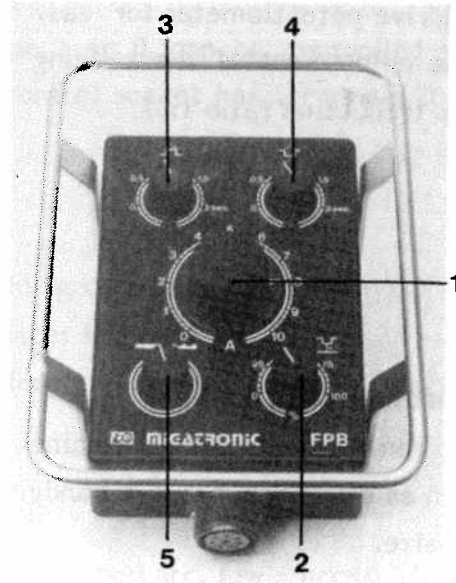


REMOTE CONTROL


FPB (part no. 76116380)

By using the FPB with the TDE 400 unit, MTE machines equipped with control box type I or II become pulse TIG welding units.


The FPB has the following controls:



Pos. 1 Welding current potentiometer.

Here the welding current is infinitely variable and when the switch (pos. 5) is in position "  " the pulse current is set.

Pos. 2 Basic current potentiometer.

Here the basic current for the pulsatory arc is set when the switch (pos. 5) is in position "  ". The basic current is shown as a percentage of the pulse current.



Pos. 3 Potentiometer for pulse current time.

The duration of the pulse current is infinitely variable between 0.03 and 2.0 seconds.

Pos. 4 Potentiometer for basic current time.

The duration of the basic current is infinitely variable between 0,03 and 2,0 seconds.

Pos. 5 Switch.

Under symbols "  " and "  " the machine can be set at constant or pulsatory current respectively.

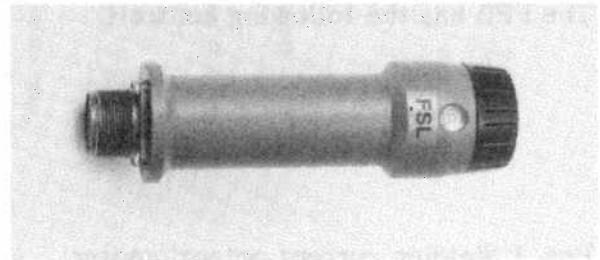
FSB (part no. 76116381)

This remote control is equipped with a multidrive potentiometer for easy and fine adjustment of the welding current. (reduction ratio 1:6)



FSL (part no. 76116382)

An FSL remote control has the same function as the FSB but is in a handy pocket size.



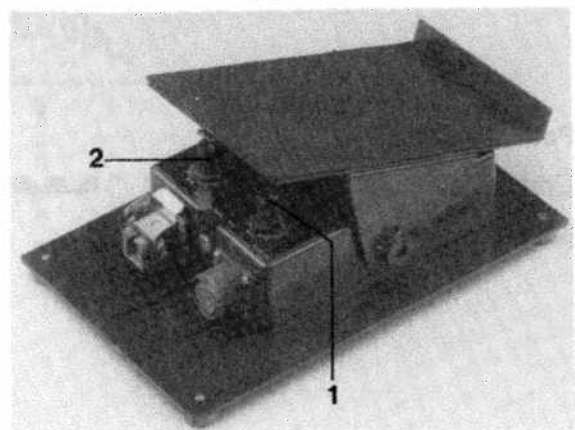
FHB (part no. 76116383)

The FHB remote control allows infinitely variable adjustment of the welding current and the hot start current by use of two control knobs.



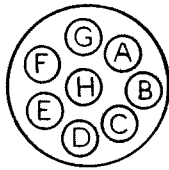
FSF (part no. 76116384)

This remote control is fitted with a footswitch remote control, and has two potentiometers and a cut-out. Current adjustment is infinitely variable throughout the range and is set by the potentiometer (pos. 1) and (pos. 2).

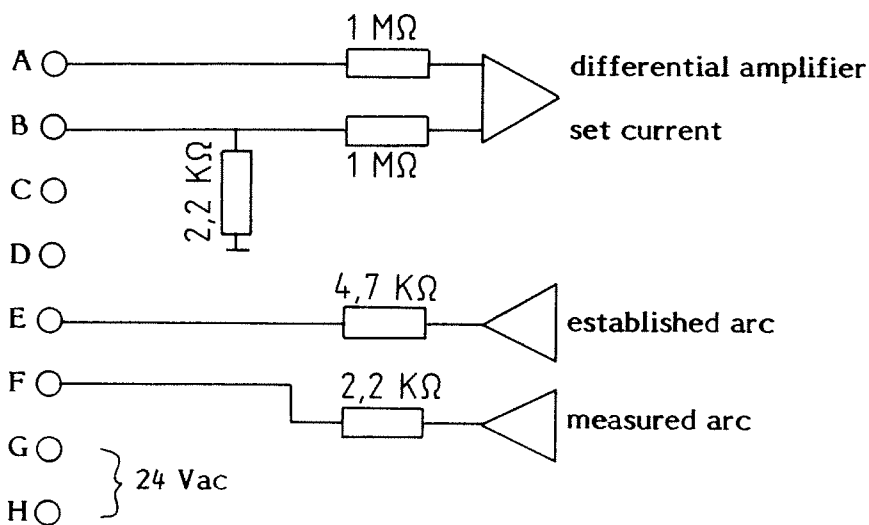


TECHNICAL DATA FOR CONNECTION OF REMOTE CONTROL

MTE-machines equipped with control box of type I or II can be controlled via a remote control or a welding robot. The remote control socket has terminals for the following function:



- A. Input signal for welding current (main current), 0 - +10 V input impedance: 1 Mohm.
- B. Signal ground, reference for all signals, input impedance 2.2 Kohm.
- C. NC
- D. NC
- E. Output signal for established arc, low = arc (0 V), high = not arc (+15 V). Output impedance 4.7 Kohm.
- F. Output signal for measured welding current 0 - -10 V (-2 V/100 A). Output impedance 2.2 Kohm.
- G. Supply voltage for remote control etc. 24 Vac, slow fuse on back of control box 5 A.
- H. Supply ground.



The figure shows a part of the MTE box diagram.

PERSONAL SECURITY

Dress

When manual metal arc or TIG welding the welder should wear dry and durable protective clothing. If damp clothes are worn the effects of normally harmless welding voltages can be increased, and may prove dangerous if the welder is working in awkward places e.g. at a height.

Gloves should be worn to avoid burns from spatter or sparks, including HF ignition sparks.

Protection of face and eyes.

The electric arc produces ultraviolet and infrared rays which can cause permanent eye damage or damage to the skin. Welding helmets or handshields fitted with approved welding filter glass must be used for protection from these rays.

Recommended glass shades are:

Glass shade	Electrode welding	TIG welding
8	For welding with electrodes $\leq 2,5\text{mm } \phi$	
9	For welding with electrodes $\leq 5,0\text{mm } \phi$	Welding with current below 75 A.
10	For electrodes $> 5,0\text{mm } \phi$	
11	Electrode diameter $> 5,0\text{mm}$ and carbon electrodes	Welding with current between 75 and 140 A
12	HF-current electrodes (deep burning electrodes) Carbon electrodes $> 8\text{mm } \phi$	Welding with current over 400 A

Light sensitivity of the eyes varies from person to person.

In general, the filter glass should be as dark as possible for satisfactory welding results.

Generally

The instructions for welding and cutting must be followed. Welding and cutting smoke and gases are injurious to health and should be removed by appropriate measures e.g. ventilators.

Only suitable insulated cables should be used and all junctions of the welding cables must be sound and properly insulated.

MAINTENANCE

MTE type machines require little maintenance but dusty and damp conditions are to be avoided if possible.

A recommended procedure at least once a year is to open the machine and clean all parts with dry, compressed air. The fan blades should also be cleared, and all terminals should be inspected and cleaned or replaced as necessary. All mechanical connections on the electrical wires can be sprayed with a silicon-based spray for damp-proofing.

N.B. No other type of spray should be used.

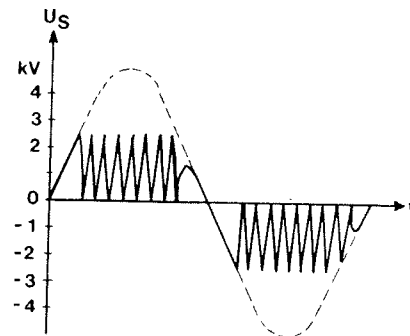
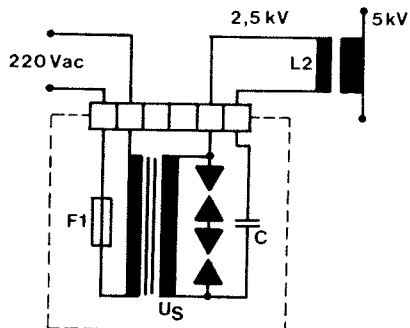
FUNCTIONS HF

A voltage of 220 V is led to the primary coil of the transformer.

On the secondary coil it is transformed to 3 KV.

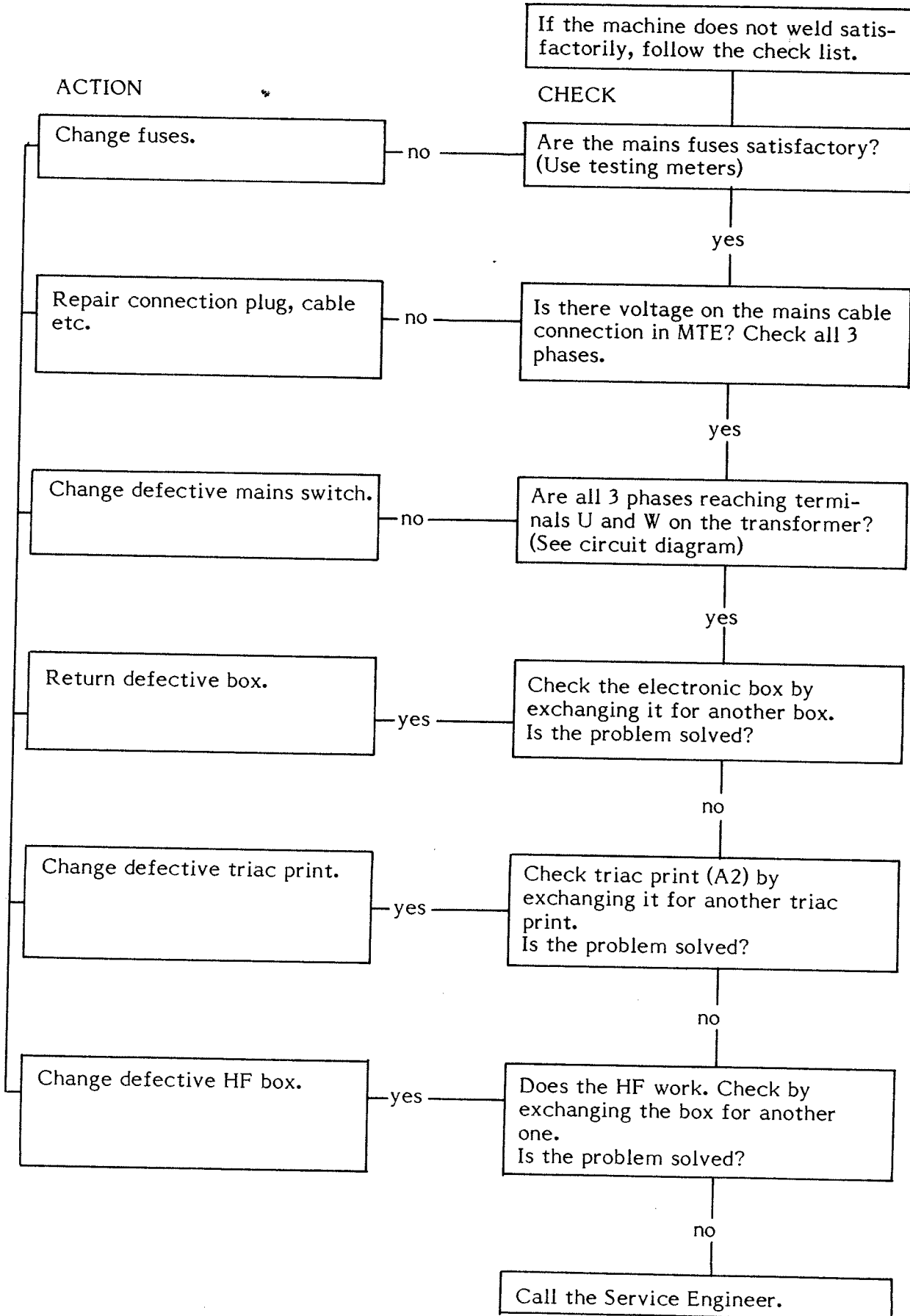
Via the primary winding (L2) of the air transformer the condenser is charged and when the voltage is approx. 2,5 KV it is short circuited by the two multiple spark gaps. When the condenser is discharged the charging of it starts again.

The output voltage of the HF can be set by an adjustment of the distance between the spark gaps. However, the voltage also influences the spark frequency so that the higher the voltage is the lower the frequency is. The distance between the spark gaps is normally set to 0.4 mm.



FAULTS

Only to be carried out by qualified electricians.



WELDING TABLES

TABLE 1 GUIDE VALUES FOR ALUMINIUM AND ALUMINIUM ALLOYS							
Plate thickness (mm)	Electrode diameter (mm)	Welding current (AC) with HF pulses (Amp.)	Gas nozzle (no.)	Gas quantity (l/min.)	Filler wire diameter (mm)	Welding speed (m/min)	Remarks
1,0	1,0	40 - 50	4	4 - 6	-	400	Flanging
1,5	1,6	60 - 70	4 - 6	4 - 6	2	300 - 350	
2,0	1,6	80 - 90	4 - 6	5 - 6	2	300 - 350	
3,0	2,4	120 - 140	5 - 7	6 - 7	2 - 3	260 - 300	
5,0	3,2	200 - 240	6 - 8	8 - 10	3 - 5	220 - 250	
6,0	4,0	220 - 340	8	8 - 10	4	200 - 250	

TABLE 2 GUIDE VALUES FOR MAGNESIUM AND MAGNESIUM ALLOYS							
Plate thickness (mm)	Electrode diameter (mm)	Welding current (AC) with HF pulses (Amp.)	Gas nozzle (no.)	Gas quantity (l/min.)	Filler wire diameter (mm)	Welding speed (m/min)	Remarks
1,0	1,0	25 - 45	4	6	- 1,5	300	Preferably flanging
1,5	1,6	40 - 60	4 - 6	6	- 1,5	300	
2,0	1,6	50 - 80	4 - 6	6	2	300	
3,0	1,6 - 2,4	80 - 110	4 - 6	8	3	250	first layer second layer
5,0	2,4	110 - 130	5 - 7	8	4 - 5	-	
	2,4	150 - 170	6	8	4 - 5	-	
	1,6 - 2,4	80 - 90	5 - 6	9	4 - 5	-	

High welding current with backing - low welding current without backing

TABLE 3 GUIDE VALUES FOR ALLOYED AND NON-ALLOYED STEEL							
Plate thickness (mm)	Electrode diameter (mm)	Welding current (DC) (Amp.) Straight polarity	Gas nozzle (no.)	Gas quantity (l/min.)	Filler wire diameter (mm)	Welding speed (m/min)	Remarks
1,0	1,0	30 - 60	4	4	- 1,5	300 - 350	
1,5	1,6	70 - 80	4 - 5	5	- 1,5	300	
2,0	1,6	90 - 110	4 - 5	5	2	280 - 300	
3,0	1,6 - 2,4	130 - 150	4 - 6	5	3	250 - 300	
5,0	2,4 - 3,2	180 - 250	6 - 8	6	4	200 - 240	
6,0	4,0	190 - 340	8	6	4	180 - 220	

TABLE 4 GUIDE VALUES FOR COPPER							
Plate thickness (mm)	Electrode diameter (mm)	Welding current (DC) (Amp.) Straight polarity	Gas nozzle (no.)	Gas quantity (l/min.)	Filler wire diameter (mm)	Welding speed (m/min)	Remarks
1,0	1,6	80 - 100	5 - 6	6	- 1,5	280 - 320	
1,5	1,6	110 - 140	5 - 6	6	- 1,5	270 - 300	
2,0	2,4	140 - 170	6 - 7	7	2	260 - 300	
3,8	2,4 - 3,2	170 - 220	6 - 8	7	3	240 - 280	
5,0	3,2 - 4,0	250 - 300	8	7	4,5	200 - 240	

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