INTRODUCTION

MIGATRONIC welding equipment has a good reputation - and we know how important it is to live up to the standards we have set ourselves.
The welding machine you have purchased is the result of **MIGATRONIC'S** years of experience in the field of welding machine manufacture. This experience, combined with correct operation and maintenance of your machine, provides a guarantee of excellent performance in the years ahead.
Thank you for buying a **MIGATRONIC** machine.

INSTRUCTION MANUAL

MTE DIALOG

Version C 50174520

EC DECLARATION OF CONFORMITY

MIGATRONIC A/S
Aggersundvej 33
9690 Fjerritslev
Denmark

hereby declare that our machines as stated below

Type: MTE
as of: week 50, 1995

conform to directives 73/23/EEC and 89/336/EEC.

European Standards: EN60974-1
EN50199

Issued in Fjerritslev on 11th December 1995.

P. Roed
Peter Roed
Managing director

Valid from 9946

CONTENTS

WARNING

Arc welding and cutting can be dangerous to the user, people working nearby, and the surroundings if the equipment is handled or used incorrectly. Therefore, the equipment must only be used under the strict observance of all relevant safety instructions. In particular, your attention is drawn to the following:

Electricity
- The welding equipment must be installed according to safety regulations and by a properly trained and qualified person.
- Avoid all contact with live components in the welding circuit and with electrodes and wires if you have bare hands. Always use dry welding gloves without holes.
- Make sure that you are properly and safely earthed (e.g use shoes with rubber sole).
- Use a safe and stable working position (e.g. avoid any risk of accidents by falling).
- Make sure that the welding equipment is correctly maintained. In the case of damaged cables or insulation work must be stopped immediately in order to carry out repairs.
- Repairs and maintenance of the equipment must be carried out by a properly trained and qualified person.

Light and heat emissions
- Protect the eyes as even a short-term exposure can cause lasting damage to the eyes. Use a welding helmet with suitable radiation protection glass.
- Protect the body against the light from the arc as the skin can be damaged by welding radiation. Use protective clothes, covering all parts of the body.
- The place of work should be screened, if possible, and other persons in the area warned against the light from the arc.

Welding smoke and gases
- The breathing in of the smoke and gases emitted during welding is damaging to health. Make sure that any exhaust systems are working properly and that there is sufficient ventilation.

Fire hazard
- Radiation and sparks from the arc represent a fire hazard. As a consequence, combustible materials must be removed from the place of welding.
- Working clothing should also be secure against sparks from the arc (e.g. use a fire-resistant material and watch out for folds and open pockets).

Noise
- The arc generates surface noise according to welding task. In some cases, use of hearing aids is necessary.

Use of the machine for other purposes than it is designed for (e.g. to unfreeze water pipes) is strongly deprecrated. If occasion should arise this will be carried out without responsibility on our part.

Read this instruction manual carefully
before the equipment is installed and in operation

Electromagnetic emissions and the radiation of electromagnetic disturbances

This welding equipment for industrial and professional use is in conformity with the European Standard EN50199. The purpose of this standard is to prevent the occurrence of situations where the equipment is disturbed or is itself the source of disturbance in other electrical equipment or appliances. The arc radiates disturbances, and therefore, a trouble-free performance without disturbances or disruption, requires that certain measures are taken when installing and using the welding equipment. The user must ensure that the operation of the machine does not occasion disturbances of the above mentioned nature.

The following shall be taken into account in the surrounding area:
1. Supply and signalling cables in the welding area which are connected to other electrical equipment.
2. Radio or television transmitters and receivers.
3. Computers and any electrical control equipment.
4. Critical safety equipment e.g. electrically or electronically controlled guards or protective systems.
5. Users of pacemakers and hearing aids etc.
6. Equipment used for calibration and measurement
7. The time of day that welding and other activities are to be carried out.
8. The structure and use of buildings.

If the welding equipment is used in a domestic establishment it may be necessary to take special and additional precautions in order to prevent problems of emission (e.g. information of temporary welding work).

Methods of reducing electromagnetic emissions:
1. Avoid using equipment which is able to be disturbed.
2. Use short welding cables.
3. Place the positive and the negative cables close together.
4. Place the welding cables at or close to floor level.
5. Remove signalling cables in the welding area from the supply cables.
6. Protect signalling cables in the welding area, e.g. with selective screening.
7. Use separately-insulated mains supply cables for sensitive electronic equipment.
8. Screening of the entire welding installation may be considered under special circumstances and for special applications.

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.

TECHNICAL DATA

				MTE 320 A/W		
	Duty cycle %	**X**	:	**100**	**60**	**30**
	Permitted load	**I_2**	:	190	245	320
	At voltage V	**U_2**	:	28	30	30
	MAINS VOLTAGE / CURRENT					
	U_1: 1 x 220	**I_1**	:	48	65	88
	U_1: 1 x 250	**I_1**	:	42	57	77
	U_1: 1 x 380	**I_1**	:	28	38	51
	U_1: 1 x 415	**I_1**	:	26	36	48
	U_1: 1 x 440	**I_1**	:	24	33	44
*)	**U_1: 1 x 500**	**I_1**	:	21	28	39
	Consumption kvA		:	12,9	16,7	21,8
	Consumption max. kvA		:			25
	Current range AC		:	20-320		
	Current range DC		:	5-320		
	Open circuit voltage AC		:	84-90 dc		
	Open circuit voltage DC		:	84-90 dc		
	Ripple voltage, open cir.		:	< 5%		
**)	**Effect 150 A/26 V**		:	0,52		
**)	**Effect cos.phi.**		:	0,77		
**)	**Efficiency**		:	0,60		
	No load consumption kW		:	0,5		
	[1]**Protection class**		:	IP21AF		
	Standard		:	EN60974-1 EN50199		
	LxWxH, air	**mm**	:	1020x570x855		
	LxWxH, water	**mm**	:	1020x570x1010		
	Weight	**kg**	:	224		

***)** Not standard, can be delivered for other voltages

****)** AC-balance set at 50%

[1] Indicates that the machine cannot be used outside in the rain

TECHNICAL DATA

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	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
Digital ammeter	X	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.

Configuration:
MIGATRONIC disclaims all responsibility for damaged cables and other damages related to welding with under sized welding torch and welding cables measured by welding specifications e.g. in relation to permissible load.

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.

WARNING! Only exchange the control box when the electrical mains power is switched off.

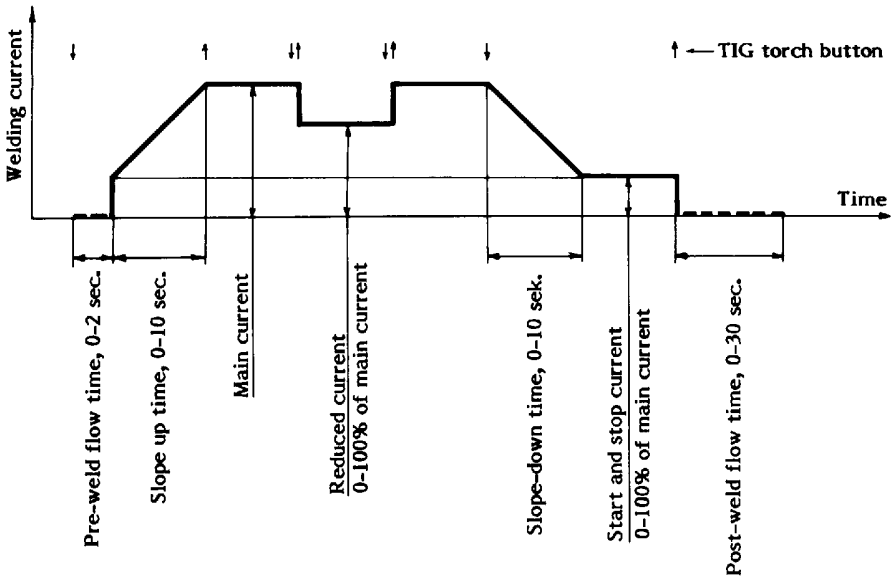
Fuse sizes and cable sizes for various mains voltages.

Mains voltage	**220/250 V**		**380/415 V**		**440 V**		**500 V**	
	Fuse	**Mains cable**	**Fuse**	**Mains cable**	**Fuse**	**Mains cable**	**Fuse**	**Mains cable**
MTE 320*	63 A	16 ■	50 A	10 ■	35 A	6 ■	35 A	6 ■

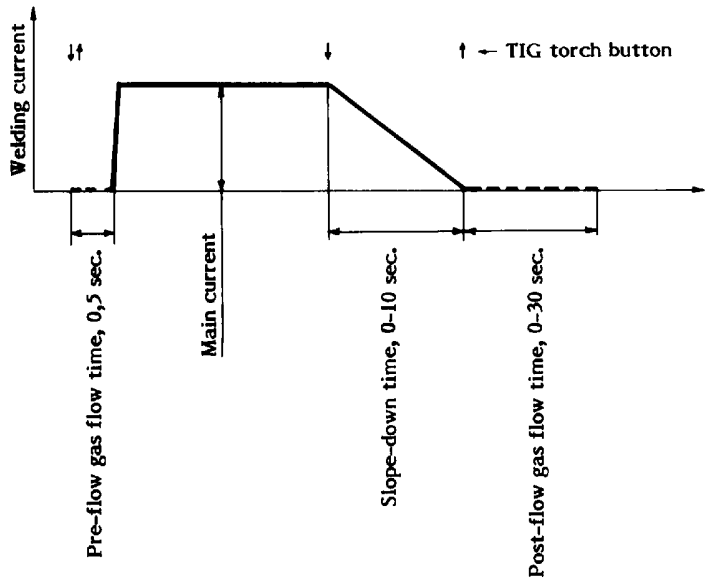
incl. phase compensating condenser.

DEFINITIONS

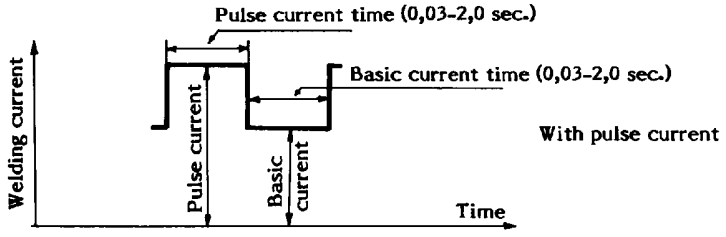
BOX TYPE I



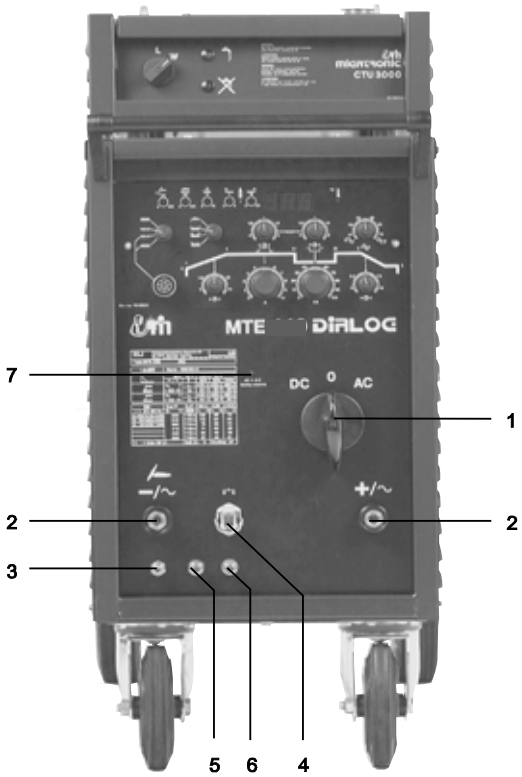
BOX TYPE II OG III



BOX TYPE I (internal pulse/external pulse)
BOX TYPE II OG III (external pulse)



ADJUSTMENT FUNCTIONS



1. **Mains switch and switch between AC and DC.**
   When the machine is turned on, this is indicated by light in the ammeter, 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.

6. **Quick release connection** for recirculation of water from water cooled TIG torch.

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.

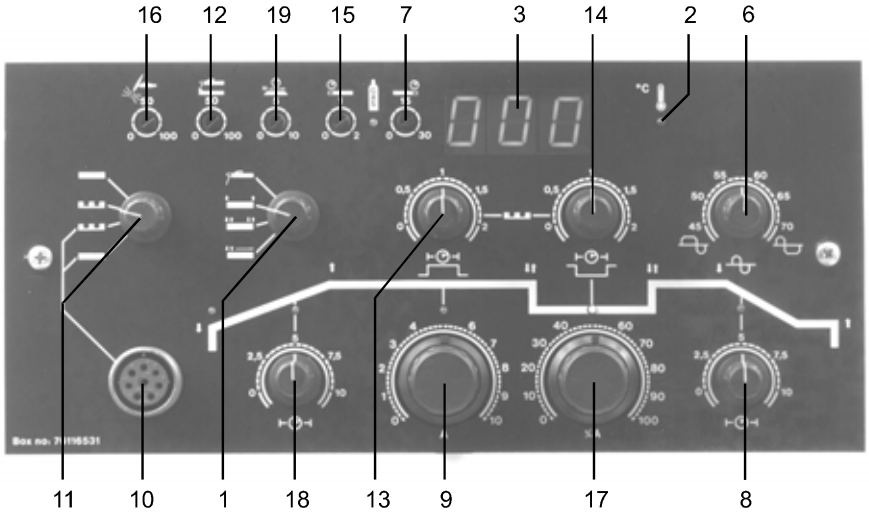
The construction of the MTE machines ensures that the open circuit voltage is **always a DC voltage** with a ripple voltage less than 5 per cent, also for AC welding.

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.

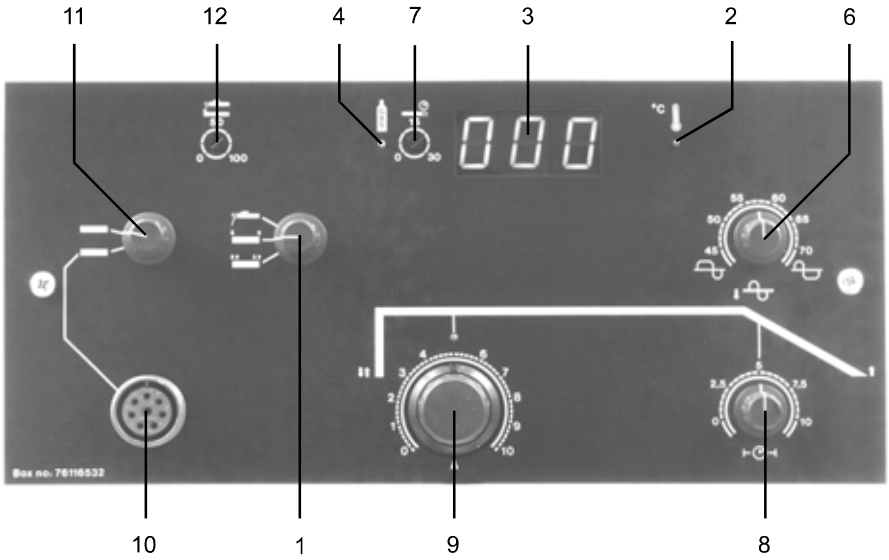
It is usual for the lamp to light during AC welding.

ADJUSTMENT FUNCTIONS BOXES

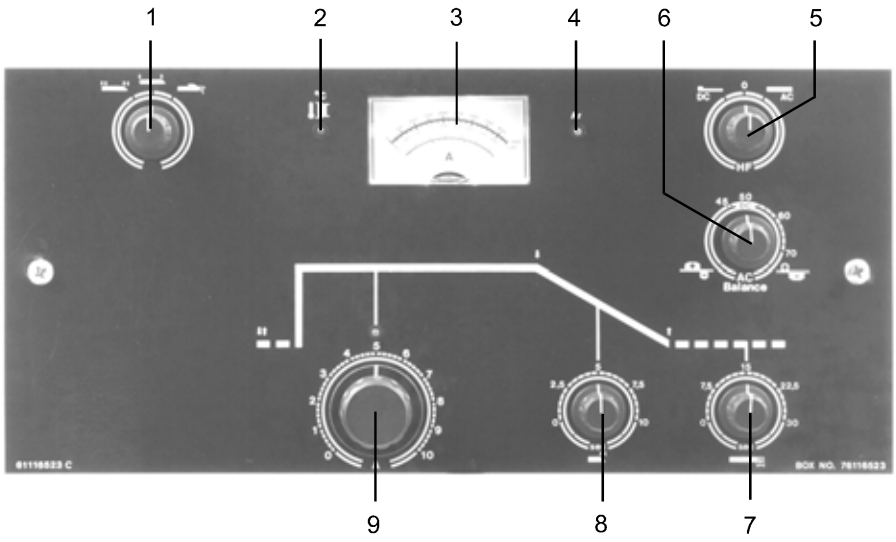
TYPE I



TYPE II



TYPE III



ADJUSTMENT FUNCTIONS BOXES

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).

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.

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.

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

5. **HF switch**
   Only on box type III. Boxes of type I and II have automatic 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.

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 "45" the highest cleaning effect. At DC welding the AC balance is set at "50" as this gives the lowest consumption of mains current. At type I and II boxes, this happens automatically.

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.

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.

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:

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

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.

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:

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".

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".

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.

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.

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.

18. Slope-up

For some difficult welding jobs it is avantageous 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.

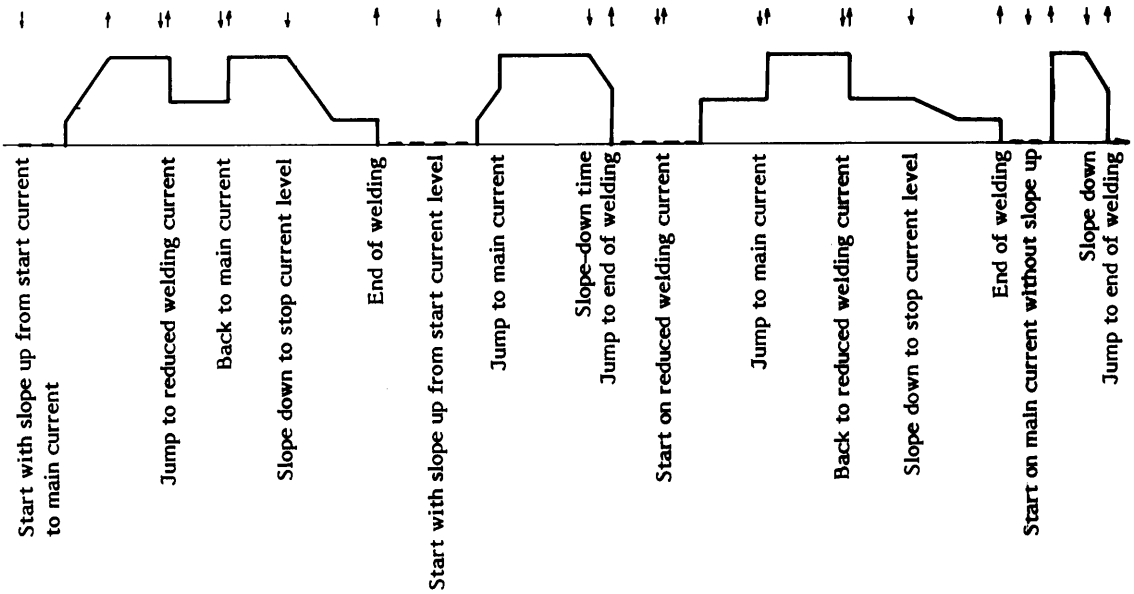
19. Spot welding time

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.

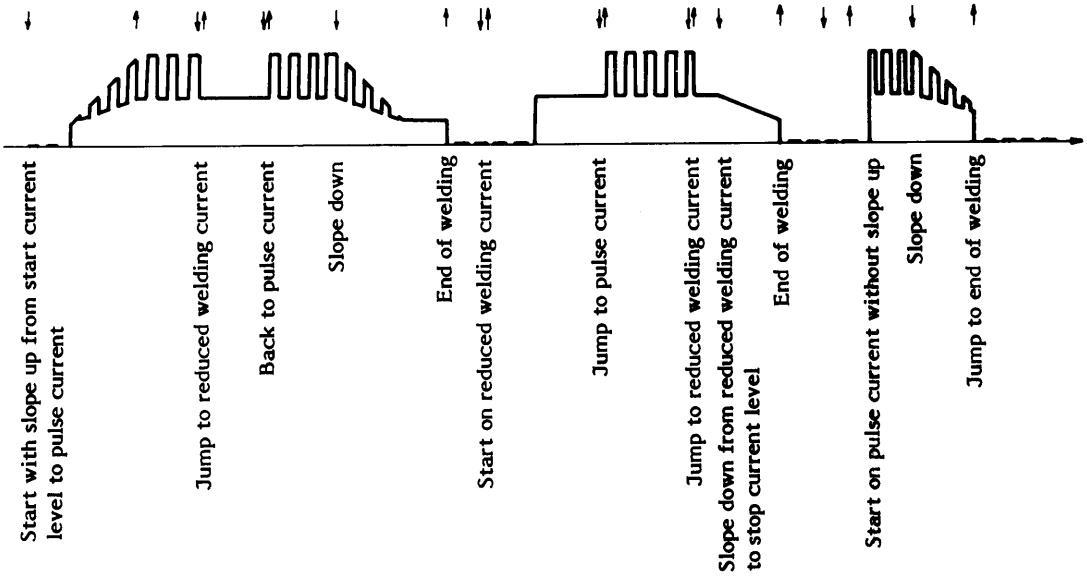
Over the buttons slope-up, set current, slope down and crater filling current there is a green lamp indicating how long the machine has reached in the programme. The following two pages show the many variations of the programmes.

ILLUSTRATION OF CONTROL PROGRAMMES FOR BOX TYPE I

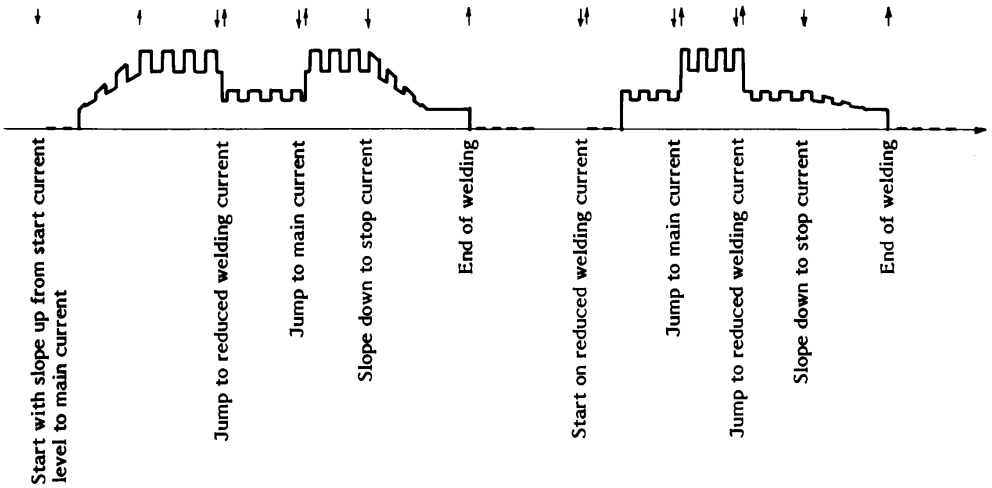
Programme: self hold



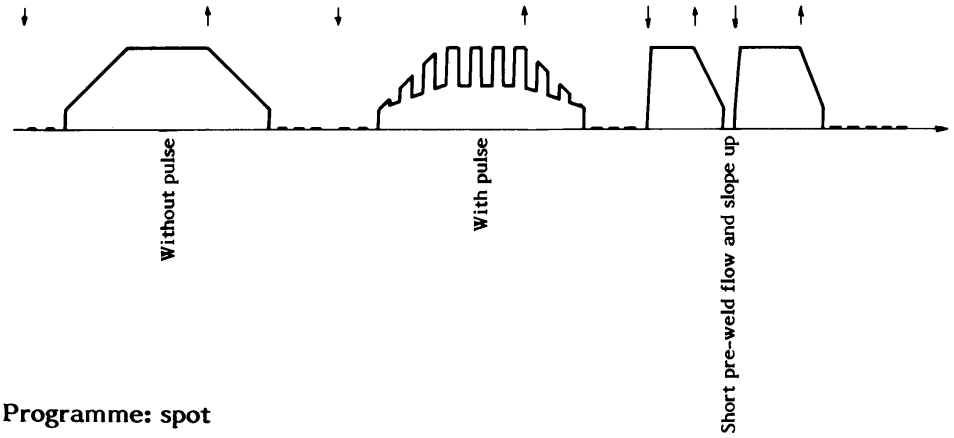
Programme: self hold, internal pulse



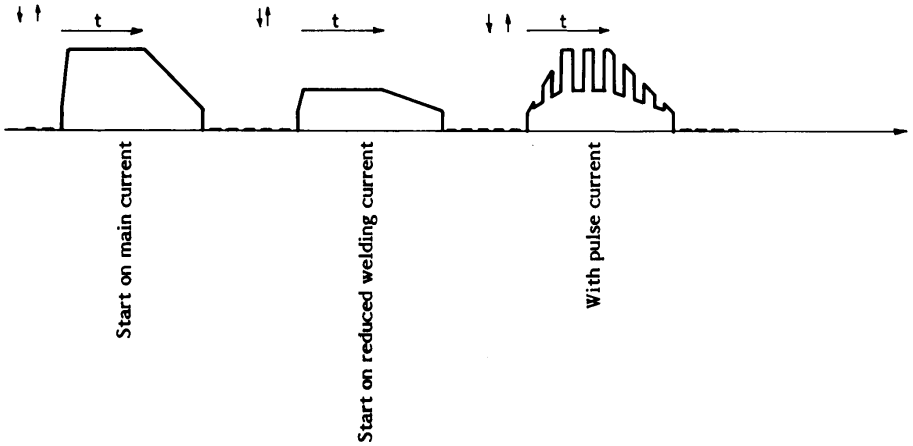
Programme: self hold, pulse via pulse remote control



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.

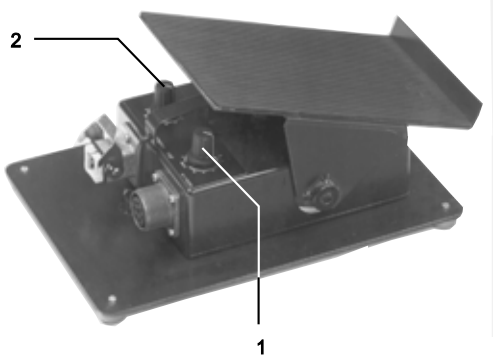
Pos. 5 Switch
Under symbols " ▬▬ " and " ▬▪▬▪ " the machine can be set at constant or pulsatory current respectively.

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.

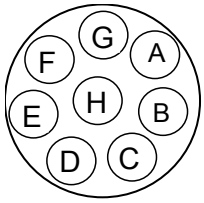
FHB (part no. 76116383)
The FHB remote control allows infinitely variable adjustment of the welding current and the hot start current by use of two control knobs.

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).

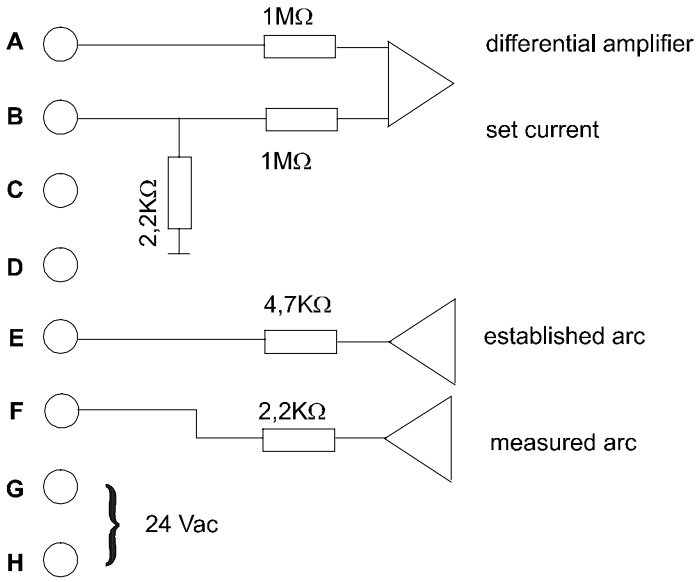


TECHNICAL DATA FOR CONNECTION OF REMOTE CONTROL

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.

MAINTENANCE

Lack of maintenance can lead to reduced reliability and cancellation of the guarantee.

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.

The water module

If the volume of liquid in the tank goes down to a level, which might cause the cooling of the torch to stop and interruption of the weld procedure by the supervision circuit, cooling liquid must be filled up.
Only use glycol and water (mixture 30/70); the cooling liquid must contain an anti-bacteria-agent in order to prevent cultures of bacteria from damaging the cooling liquid. This means that ordinary motor cooling liquid cannot be used if this agent has not been added, since the temperature of the cooling liquid when welding is not sufficient to kill the bacteria.

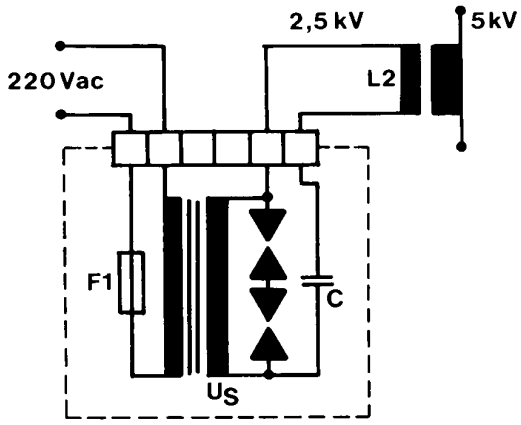
Cooling liqued with anti-bacteria-agent can be ordered under part no. 99290400.

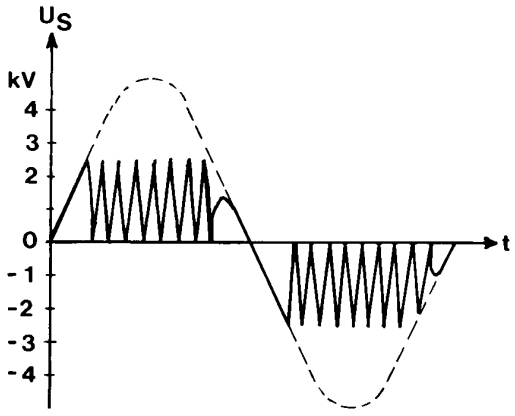
FUNCTIONS HF

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.

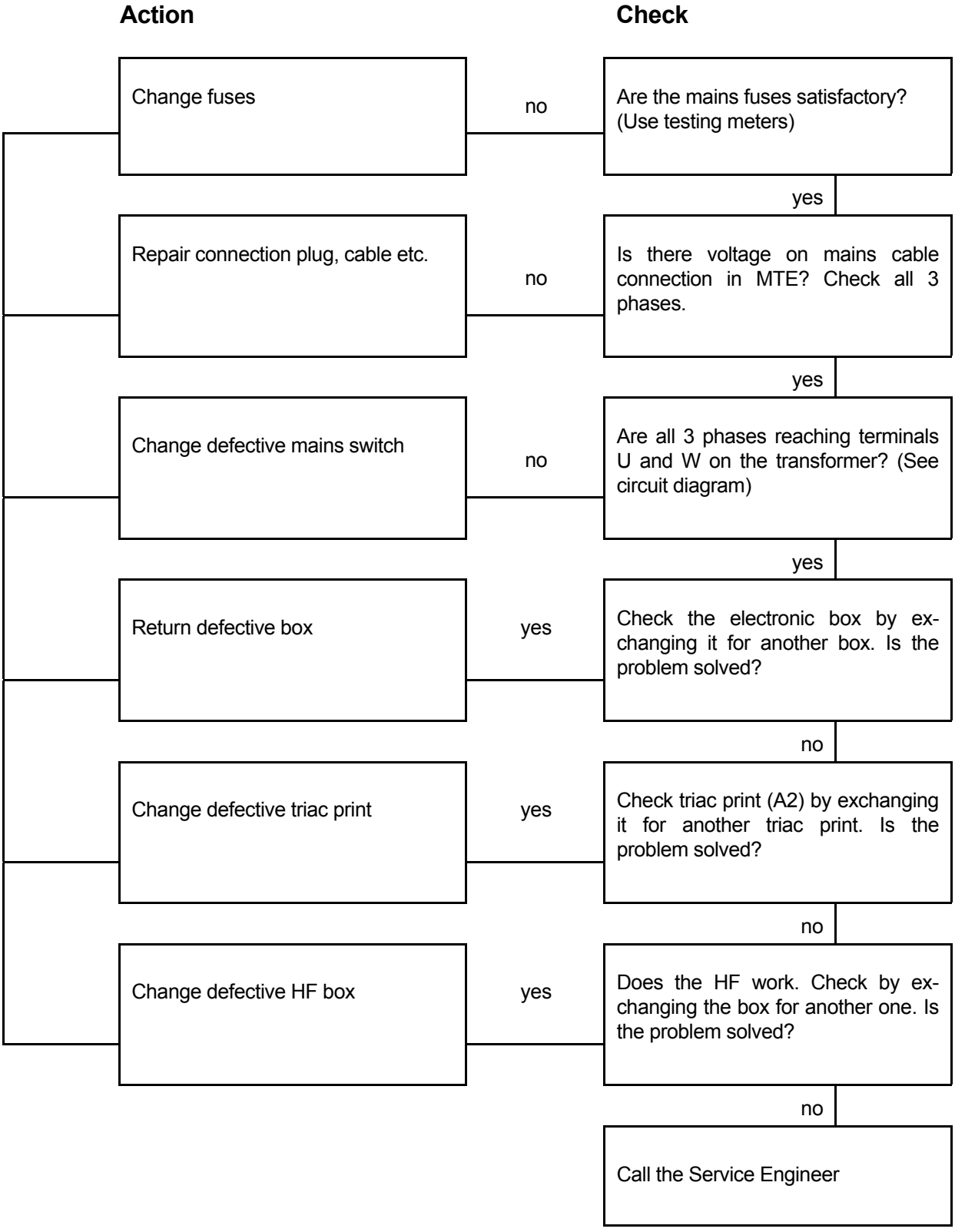




FAULTS

Only to be carried out by qualified electricians.

f the machine does not weld satisfactorily, follow the check list.



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 (mm/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 (mm/min.)**	**Remarks**
1.0	1.0	25 - 45	4	6	- 1.5	300	preferably
1.5	1.6	40 - 60	4 - 6	6	- 1.5	300	flanging
2.0	1.6	50 - 80	4 - 6	6	2	300	
3.0	1.6 – 2.4	80 - 110	4 - 6	8	3	250	
5.0	2.4	110 - 130	5 - 7	8	4 - 5	-	
	2.4	150 - 170	6	8	4 - 5	-	first layer
	1.6 – 2.4	80 - 90	5 - 6	9	4 - 5	-	second layer

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 (mm/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 (mm/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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