

INSTRUCTION MANUAL COMMANDER



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 years of **MIGATRONIC's** 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.

EC DECLARATION OF CONFORMITY

MIGATRONIC A/S
Aggersundvej 33
9690 Fjerritslev
Denmark

hereby declare that our machine as stated below

Type: COMMANDER
as of: week 48 1995, step 4

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

European Standards: EN60974-1
 EN50199

Issued in Fjerritslev on 27th November 1995.

Peter Roed
Managing director

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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 deprecated. 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).

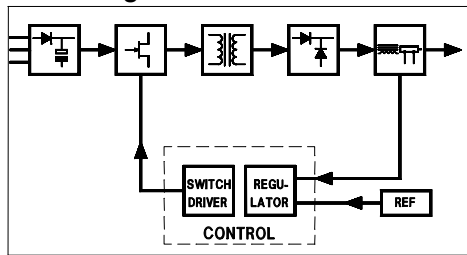
Methods of reducing electromagnetic emissions:

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.

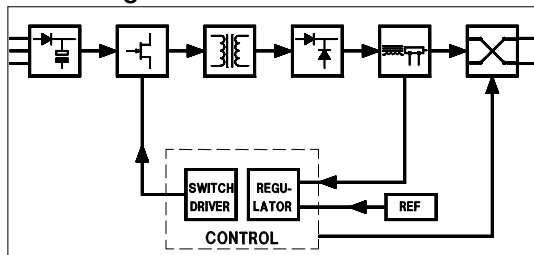
GENERAL DESCRIPTION

The COMMANDER is a three-phase welding machine based on *inverter technology*.

Block diagram COMMANDER DC



Block diagram COMMANDER AC/DC



There are several versions of the machine: MMA, TIG DC and TIG AC/DC.

All versions are designed for welding with coated electrodes and are equipped with *Hot-start*, *Arc Power* and *Antifreeze*. In addition, all versions can be fitted with all types of remote controls included in **MIGATRONIC's** standard range of accessories.

The TIG COMMANDER machine is also designed for TIG welding and features functions such as:

- variable slope-down
- fixed gas pre-flow time
- variable gas post-flow time
- option of 2-times or 4-times operation
- LIFTIG
- HF-TIG
- current control from the TIG torch handle
- remote control facility
- AC balance
- AC welding frequency
- Digital display

In LIFTIG ignition the TIG arc is ignited after making contact between the workpiece and the tungsten electrode, after which the trigger is activated and the arc is established by lifting the electrode from the workpiece.

In HF-TIG ignition the TIG arc is ignited without contact. A high-frequency (HF) impulse initiates the arc when the trigger is activated.

INITIAL OPERATION

Mains connection

After the mains cable has been connected, the machine is ready for use. Please note that connection must be made by an authorised electrician.

As standard, machines are supplied for connection to a 3x400 V supply. However, machines with an auto-transformer unit can be connected to other voltages.

Connection is made by moving the wires on the top of the auto-transformer. All three phases have to be connected similarly and in accordance with the wiring diagram on the top of the auto-transformer unit and/or the circuit diagram on page 30. Only machines up to 400 A output can be supplied with an auto-transformer, and a 230V connection can only be used on machines of up to 320 A output.

Warning: When making input voltage connection it is essential that the machine is disconnected from the mains supply, as this work can be extremely dangerous because of the high voltages across the connection terminals.

Fuse and mains voltage - see the type plate and technical data.

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.

Connection of welding cables

Connect the welding cables to the front of the machine. Please note that the plug must be turned 45 degrees after inserting the cable into the socket - otherwise the plug can be damaged due to excessive contact resistance.

Cooling liquid

Before the machine is switched on, the water-cooling module must be filled up with MIGATRONIC coolant. (This applies only to water-cooled machines).

Use of the machine

During welding a heating of various components of the machine takes place and during breaks these components will cool down again. When using current settings above a set value, the machines need periods when they can cool down.

The length of these periods depends on the current setting and the machine should not be switched off in the meantime.

If the periods for cooling down during use of the machine are not sufficiently long, the overheating protection will automatically stop the welding process and the yellow light will come on.

The yellow light switches off when the machine has cooled down sufficiently, and the machine is ready for welding. Max. load can be seen in the Technical data.

Definition:

60% max. load by welding means that a cooling period of 4 minutes is required after welding for 6 minutes at a current setting of the value of 60% variable intermittent duty; 10 minutes between start of each welding period must be calculated.

INITIAL INSTRUCTIONS BOX 1

General instructions for use

All "parameters" are set by the use of only one control knob. These parameters include current, slope-up time, etc.

This control knob is positioned below a digital display which shows the value of the parameter being set. The unit of measurement of the parameter is shown at the right hand side of the digital display.

In order to display or adjust the parameters of a particular function, the keypad in the section concerned with that function is pressed repeatedly until the indicator light below or next to the relevant symbol is indicated by a bright light. Adjustment of setting is then made with the control knob.

Welding current is set by pressing keypad marked **A** and then using the control knob.

Welding parameters e.g. pulse frequency can be adjusted during the welding process.

Briefly: Keypads select the functions, the control knob sets the parameters.

Function selection

As above, selection of a function, e.g. HF-TIG or LIFTIG, is by means of the keypad in the relevant section.

The function selected is indicated by a bright light below or next to the relevant symbol.

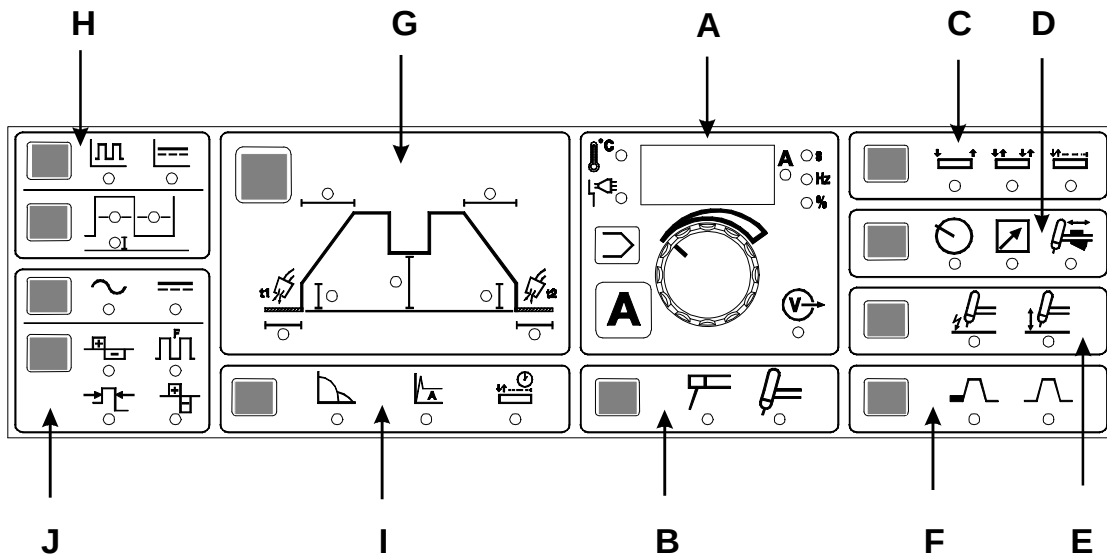
CHANGE OF FUNCTION SETTING IS NOT POSSIBLE DURING THE WELDING PROCESS.

Storage of parameters

The machine memorises all settings when the mains input voltage is switched off, thus ensuring that the same machine settings are available when the machine is switched on again.

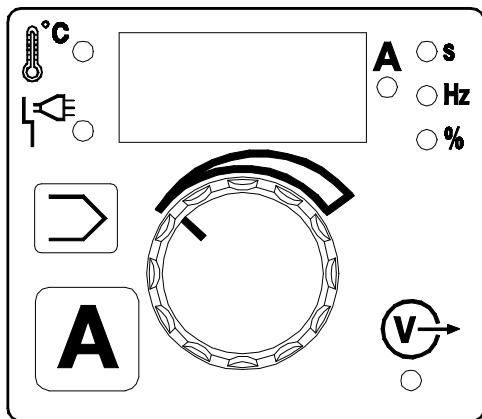
The exact adjustments in the two welding processes (MMA electrode and TIG) are stored as well so that shifting from one welding process to another does not require a new current setting

FUNCTION SELECTION AND PARAMETER SETTING



This chapter describes the operation of the machine in detail and includes references to the three different control panels illustrated at the end of the chapter.

A



Overheating

The overheating indicator is illuminated if welding is interrupted due to overheating of the machine. The indicator remains illuminated 3 seconds after the overheating error is removed.

Mains error

The mains error indicator is illuminated if the mains voltage is too high or low. The indicator remains illuminated 3 seconds after the mains error is corrected/removed.

A On pressing this keypad the control knob can be used to set the welding current.

Welding voltage

The welding voltage indicator is illuminated for reasons of safety and in order to show if there is voltage on the electrode or the TIG torch.

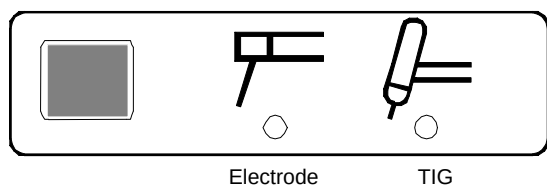
A Units of measurement of the parameter shown in the digital display.
 s
 Hz
 %

Setting of welding jobs

This function enables storage of often-used machine settings and shift from one complete setting to another. By pressing the keypad the display shows a "P" and a number: "1", "2" etc. Each number is a setting of all parameters and functions of the machine. It is therefore possible to have one setting for each welding job for which the machine is used. The control knob is used for shifting between these settings. During shifting it is possible to see both process and the other on/off-functions in each setting. Change of setting is not possible during the welding process. The setting selected is effected by releasing the keypad.

B

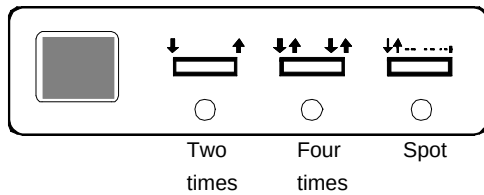
Welding process



This display is used to select the welding process to be used, e.g. MMA electrode or TIG.

C

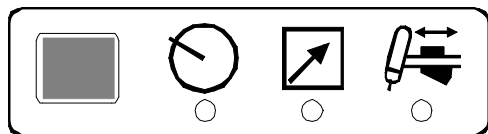
The trigger method



This display is used to decide if the start/stop method of the TIG welding process is to be two-times, four-times (latching), or spot.

It is not possible to change to another method of trigger control during the welding process.

D



AMP Setting function

The AMP keypad is used to select the method by which the required welding current shall be established. This welding current is then shown in the digital display.

The three options are as follows:

D1

Internal
The control knob positioned below the digital display is used to set the current.

D2

External:
Current setting to be by means of a MIGATRONIC remote control unit. The remote control unit is connected to a plug positioned on the rear of the machine (not standard equipment).

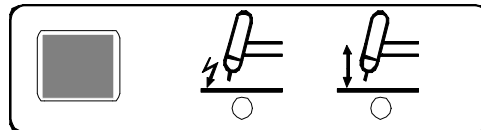
D3

Torch:
Torch adjustment

Current setting to be by means of the current control knob located in the handle of a MIGATRONIC dialog torch, if a dialog torch is used.

With regard to torch handle current control, it should be noted the maximum current is set with the control knob on the front panel. The torch control is used to reduce the current from the maximum set current. The adjustment of the machine must not be at the maximum setting by low current. (From software version 2.20 it is only possible to adjust 100 Amp lower than maximum current).

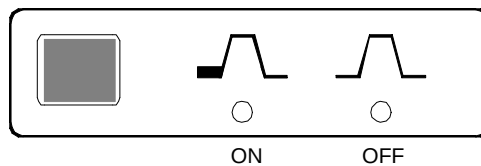
E



HF Ignition of TIG welding

LIFTIG It is possible to choose between two different methods of ignition for TIG welding: High-frequency (HF) and Liftig ignition.

F



Pilot arc

Used only in the TIG welding process, a pilot arc is a weak arc which illuminates the workpiece, and thereby makes it easier to find the starting point of the actual welding process. The pilot arc function is 5% of the chosen welding current, but 5 A is set as a minimum.

The pilot arc can be ignited by briefly activating the torch switch (less than 0.3 seconds). If activation is longer, the machine switches automatically to ordinary welding.

Switch from pilot arc to ordinary welding by keeping the torch switch activated when two-times TIG welding, or by long activation (> 0.3 seconds) when four-times TIG or spot welding.

The welding process then continues in normal fashion, with current slope-up and current slope-down. However, after slope-down the machine does not switch directly to post-flow but to pilot arc again. This is true whether or not welding is initiated by the pilot arc.

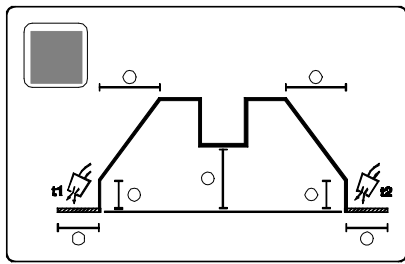
It is now possible to continue with a new welding process by a lengthy activation of the torch switch (>0.3 seconds), or to go to standby automatically by a brief activation (<0.3 seconds).

The machine will also go to standby automatically if the arc has been extinguished for more than 2 seconds.

To summarise, the pilot arc is switched on and off by brief activation of the torch switch, and actual welding is started and stopped by longer activation.

G

The parameters that can be adjusted are illustrated in the figure below:



Pre-flow

Pre-flow is the period of time for which gas flows after the torch switch is pressed and before the HF arc is established, or until the torch is lifted away from the workpiece in the LIFTIG process. Variable 0-10 secs.



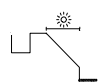
Start Amp

Immediately after the arc has been established, the machine regulates the welding current to the value stated in the Start Amp parameter. Start Amp is set as a percentage of the required welding current and is variable between 0-100% of the welding current with a minimum value of 5 amps.



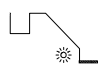
Slope-up

Once the arc has been established, the welding process enters a slope-up stage during which the welding current is increased in linear fashion from the value stated in the Start Amp parameter to the required welding current. The duration of this slope-up time is variable 0-10 secs.



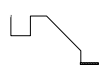
Slope-down

When welding has stopped by activating the trigger, the machine enters a slope-down stage. During this stage current is reduced from welding current to Stop Amp over a period of time called the slope-down time and variable 0-10 secs.



Stop Amp

The slope-down stage is completed when the current level has fallen to the value stated in the Stop Amp parameter. Stop Amp is stated as a percentage of the required welding current and is variable between 0-100% of the welding current with a minimum value of 5 Amps.



Post flow

Post-flow is the period of time for which gas flows after the arc is extinguished and is variable 3-20 secs.



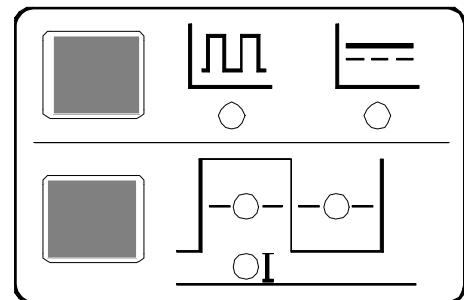
Reduced current

When four-times welding a reduced current is activated by pressing the trigger briefly. This reduced current is set to a percentage value of the welding current and is variable between 0-100% of the welding current.

H

Pulse welding

This panel controls the setting of the conditions for pulse welding. The panel is divided into two sections: the upper section being used for the selection of the pulse welding function and the lower section for the setting of parameters.



It is not possible to introduce or discontinue the use of the pulse welding function during the actual welding process.



Pulse:

Pulse welding function is operational.

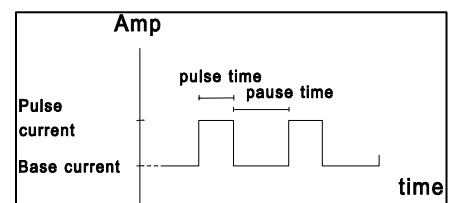


No pulse:

Pulse welding function is not in operation and it is not possible to set pulse-welding parameters.

Pulse parameters

If the pulse welding function is in use then it is possible to select and change the pulse parameters during the welding process. The importance of the pulse parameters can be seen from the illustration below.





Pulse time

The pulse time reflects the time the machine is welding with the pulse current. The pulse current in the pulse frequency is the set welding current. Time is given in seconds.



Pause time

The pause time reflects the time the machine is welding with base (background) current. Time is given in seconds.



Base amp

Base (background) current is set as a percentage value between 1 and 100% of the current level set on the display (that is, pulse current), though it cannot be less than 5 Amps.

Note 1: If the pulse function is used during AC-welding the pulse times can be reduced in proportion to the AC frequency as the pulse frequency must be 5 times higher than the AC frequency. If the pulse times are too short the indicator for AC frequency will flash on and off for 5 seconds.

I

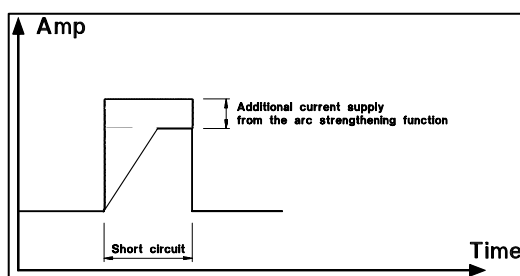
Arc power Used on the MMA welding process only, the arc power function is used to stabilise the arc.

I1



Arc power

This can be achieved by increasing welding current by a percentage value when metal droplets are short-circuited.



The additional current ceases when the short circuit is no longer present.

The arc power value is a percentage value, and can be set between 0 and 150% of the welding current setting.

E.g. if the welding current is set to 40 A and Arc power to 100% the additional current is 40 A equals 80 A when doing Arc power. If the Arc power is set to 150% the additional current is 60 A equals 100 A when doing Arc power.

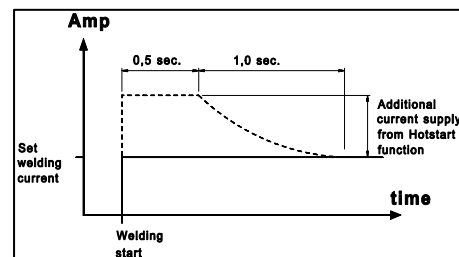
I2



Hot start

Hot start Hot start is a function that helps to establish the arc during MMA welding.

This can be achieved by increasing welding current (when the electrode is applied to the workpiece) by a certain percentage value in relation to the set value. This increased start amp is maintained for half a second, after which it decreases exponentially over a period of one second to the set value of welding current.



The hot start value reflects the percentage value by which initial current is increased, and can be set between 0% and 100%.

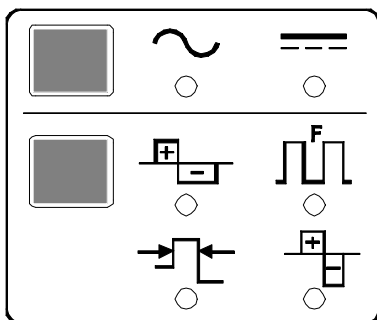
I3



Spot time

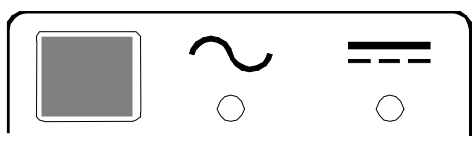
Spot time Spot time is the time for the production of a spot-weld and can only be used with the TIG process. Variable from 0-50.0 secs, the time includes any slope-up and slope-down times and can be set only after spot trigger mode has been selected on the TRIG keypad.

J



AC-welding

This panel is divided into two sections, with the function current type at the top, and the setting of conditions for special AC-functions at the bottom.



Current type

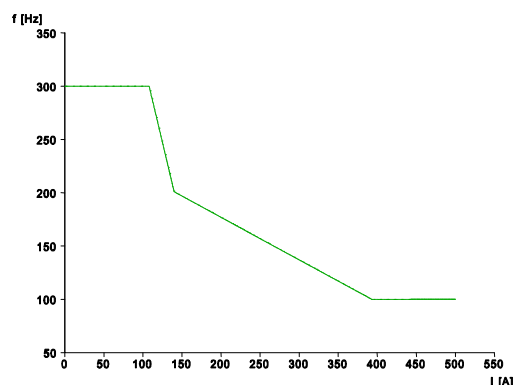
It is possible to select either AC (alternating current) or DC (direct current). In the TIG-welding process, AC is used for the welding of aluminium and its alloys, while DC is used for the welding of other materials. When TIG welding aluminium or its alloys the positive part of the AC-wave removes the oxide film covering the surface of the workpiece, and the negative part of the wave melts the material.

AC frequency

The AC frequency can be adjusted from 1 to 300 Hz for TIG welding and from 1 to 100 Hz for MMA-welding. A low frequency during TIG welding increases the tendency for the formation of a large ball at the end of the tungsten electrode. This tendency will be reduced by increasing the frequency.

Note 2: The AC frequency and welding current cannot be adjusted to maximum simultaneously during TIG welding - see illustration below. When the limit is reached by adjusting the AC-frequency, the A-lamp will illuminate in "units for parameter" and the machine will reduce the AC frequency automatically.

Note 3: If the frequency limit is exceeded by adjustment of the welding current the AC frequency will be reduced automatically (the indicator for AC frequency flashes on and off for 5 sec.).



Note 4: If the pulse function is used during AC-welding the AC frequency can be reduced in proportion to the pulse times as the pulse frequency must be 5 times higher than the AC frequency. If the AC frequency is too low the indicators for pulse times will flash on and off for 5 seconds.

Note 5: **Pulse adjustment error:** If the pulse function is used during AC-welding an automatic adjustment of the pulse setting may occur. The indicators for pulse times will then flash on and off for 5 seconds. The pulse times change automatically so the pulse time and base time will be 0.03 seconds.



Electrode preheating (TIG)

On ignition of the AC TIG pilot arc the tungsten electrode is preheated by a direct current with positive polarity. Preheating of an electrode is necessary before starting the AC welding process. The length of the preheat period depends on both the diameter of the electrode and the angle of the point of the electrode, as well as the size of the ball at the end of the electrode. Adjustment is possible from -9 to +9, with -9 being the minimum and +9 being the maximum preheat periods. If the period is too short the pilot arc will extinguish shortly after ignition. The size of the ball at the end of the electrode will increase if the pre-heat period is too long.



AC-t-balance, based on time (TIG)

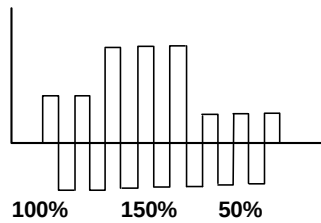
Adjustment of the refinement function during the AC TIG welding of aluminium and its alloys. The function is a balance based on time between the positive and negative halfperiod.

Adjustment is possible between 1 and 100 per cent as the statement in per cent is based on the negative part of the period time. Adjustment continues until a suitable refinement zone is established around the molten pool. When MMA welding the balance can be locked at 50 per cent which means that further regulation is impossible.



AC-I-balance, based on current intensity (TIG)

The purpose of the function is also adjustment of the refinement zone during AC TIG welding.

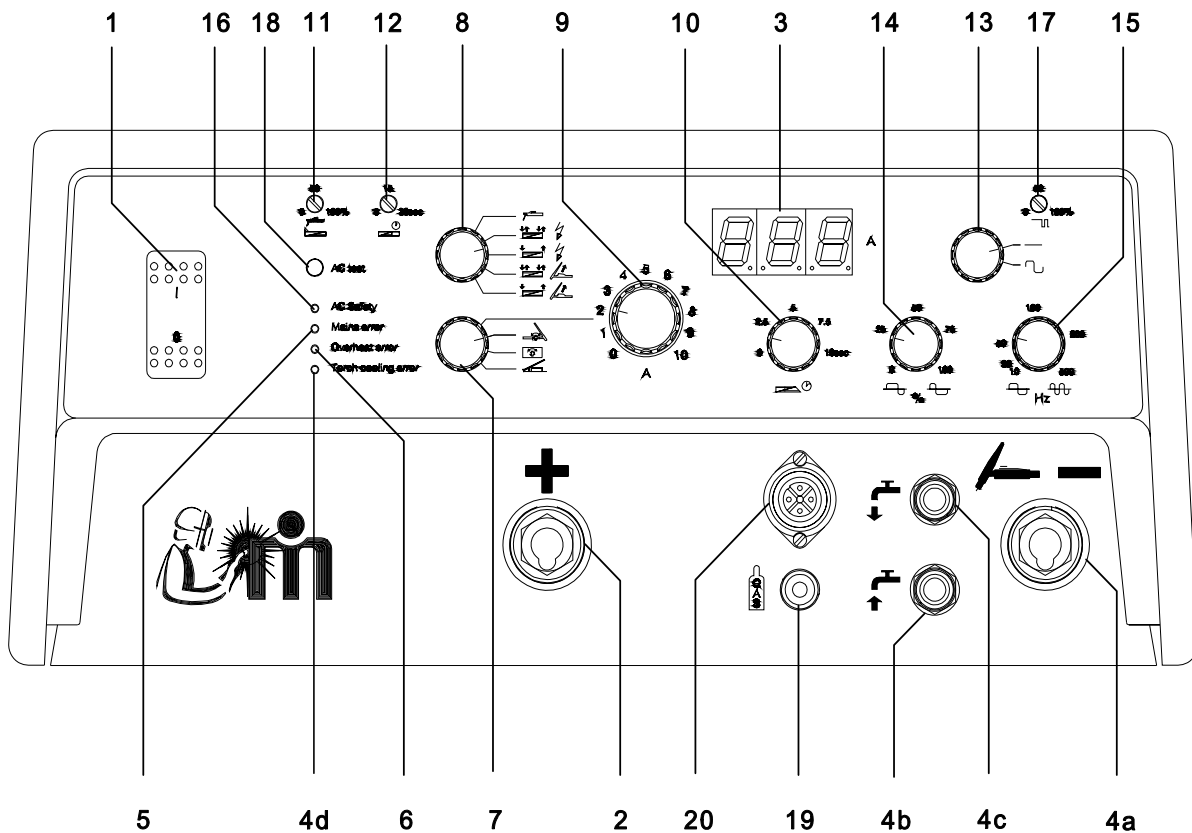


However, this balance is based on the current intensity of the positive period proportional to the current intensity of the negative period. A reduction of the positive refinement current may have the effect that dwell time of the tungsten electrode improves.

TIG-DC

It is also possible to weld in DC TIG with unalloyed tungsten electrodes (green marking). Current is set to AC and both AC-t-balance and AC-I-balance are set at 100 per cent. The machine will then establish the pilot arc by using the preheating function. After finishing the preheating period the welding current will be returned to negative polarity.

INITIAL INSTRUCTIONS BOX 2, TIG



General

- 1. Main switch**
This control switches the machine on and off.
- 2. Welding cable plug + (MMA + TIG)**
- 3. Digital display**
The control panel is fitted with a display which shows the welding current. At stand by the set welding current is shown. When welding the average welding current is shown. Please note that during 'START UP' and when error messages, for instance overheat, are displayed the digital readings may be displayed incorrectly.
- 4a. Welding cable plug - (MMA + TIG)**
- 4b. Torch cooling**
Quick release for supply of cooling water for cooling of the welding torch.
- 4c. Return water**
Quick release for return of hot water to the water-cooling unit.
- 4d. Cooling Error**
Occurs if there is insufficient flow in the hose or if the water module lacks water.
- 5. Mains error**
Cause: Excessive or insufficient mains voltage.
Symptoms: The welding stops. This error is indicated by the red light emitting diode and the words "Mains error".
Action: Adjust mains voltage.
- 6. Overheating error**
Cause: Overheating of an inverter module due to incorrect use, or fault in inverter module.
Symptoms: The welding process stops and post-flow is activated. This error is indicated by the yellow light emitting diode and the words "Overheating error". This LED switches off after 7 - 10 min. if the error is not corrected. When pressing the trigger, the LED switches on again.

Action: If the error has not been caused by incorrect use, call in service staff.

7. INT/Torch control/EXT/Footswitch

This switch enables selection between internal/external or torch control of the welding current.

When in internal position, the current is set on the machine. When in external position, the current is set through a remote control.

Slope-up, pulse welding, welding with reduced current and slope-down are also possible through remote control.

When set at torch control, the maximum current will be determined by the machine's current setting. This means that torch control can be adjusted from the minimum current (5 A) to the level selected when setting the machine's current level.

Foot switch setting is used on when MIGATRONIC FDF footswitch, part no. 78815009 is in use.

When using the MIGATRONIC FDF footswitch, part No. 78815010, the selector switch on the electronic box must be set to EXT (external control), and it should be noted that when used in the maximum current setting, the maximum current output obtainable will be between 210-280 Amps.

8. Trigger mode

During TIG welding this switch determines the function of the trigger on the TIG torch:

2-times:

Start welding by pressing the trigger on the torch. Welding continues until the trigger is released again, after which adjustable slope-down is activated.

When activating the trigger once more, the machine returns to ordinary welding. Otherwise slope-down will continue for the set period, after which post-flow will start.

4-times:

Welding starts the first time the trigger is activated, and it is not necessary to keep the trigger depressed. Adjustable slope-down is activated the next time the trigger is activated. If the trigger is released before slope-down time has elapsed, welding stops.

The HF generator is activated in position HF. This switch also enables selection between TIG and MMA welding. When switching from MMA to TIG welding, activate post-flow in order to fill the hose with gas.

9. Welding current

Use this knob to control welding current from min. 5 A to maximum welding current, as shown in the digital display (pos. 3).

10. Slope-down

TIG-function

When welding is stopped by activating the trigger, the machine starts a process of current reduction.

During this process the current is reduced from the set welding current to the minimum current (5 A). Slope-down time can be set between 0 and 10 seconds.

11. Hot-start

MMA-function

Hot-start is a function which can be used to help establish the arc when starting to weld. This can be achieved by increasing the initial current by a certain percentage in relation to the value set when the electrode is applied to the workpiece.

This increased initial current is reduced exponentially in relation to the welding current set within approx. 0.5 seconds. The hot-start value is the percentage value by which the initial current is increased, and can be set between 0 % and 100 %.

12. Post-flow

TIG-function

Gas post-flow time

The gas post-flow time is the time that elapses between switching off the arc and cutting off the gas supply. Gas post-flow time can be set between 0 and 30 seconds.

The following functions only apply to AC/DC machines

13. AC/DC-switch

Use this knob to switch between AC welding and DC welding.

14. Balance knob

With this knob the relation between cleaning and penetration when TIG welding aluminium can be adjusted. This is done by adjusting the positive and negative halfwaves. The setting area is 0-100%, thus allowing the possibility of reversed polarity.

15. Frequency knob

When AC welding the alternating current (AC) is infinitely variable from 10-500 Hz.

16. AC-safety

A green LED indicates that the AC safety circuit is activated. The AC safety circuit ensures that there is no AC voltage on the torch when the machine is on no-load voltage.

17. Preheating of TIG-electrodes

Before the AC cycle is initiated, the following adjustment should be made to set the positive ignition period. Traditionally, thin TIG electrodes require a low positive cycle and thick electrodes require a high positive cycle.

If ignition problems are experienced:

If the electrode burns away rapidly or if a bulb is formed on the tip of the electrode during ignition, the preheating should be decreased. If there are problems with arc ignition, the preheating period should be increased.

The following values are recommended:

Electrode size	Preheating
< 1.0 mm	0%
1.6 mm	20%
2.4 mm	40%
3.2 mm	60%
> 4.0 mm	80%

18. AC test

This trigger is used for testing of the AC safety circuit.

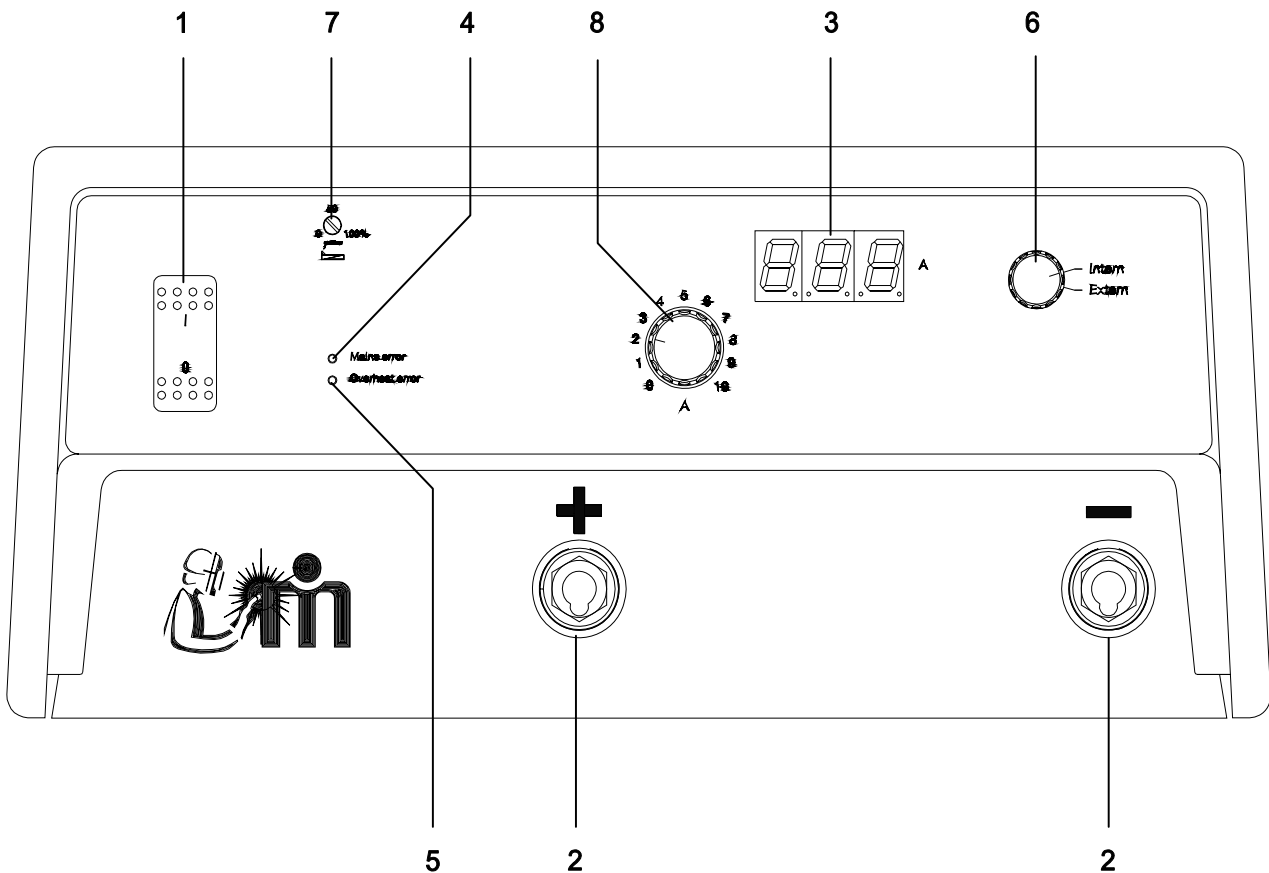
When the machine is set for MMA welding with AC, the LED (AC safety) lights continuously when the machine is on no-load voltage. If the trigger is activated, the LED will go out and remain so as long as the trigger is activated.

Should this not be the case, an authorised service technician should be called.

19. Gas connection

20. Plug for torch button, interactive control and coding of air/water-cooling.

INITIAL INSTRUCTIONS BOX 3, MMA



General

1. Main switch

This control switches the machine on and off.

2. Welding cable plug

3. Digital display

The control panel is fitted with a display which shows the welding current. At stand-by the set welding current is shown. When welding the average welding current is shown. Please note that during 'START UP' and when error messages, for instance overheat, are displayed the digital readings may be displayed incorrectly.

4. Mains error

Cause: Excessive or insufficient mains voltage.

Symptoms: The welding process stops. This error is indicated by the red light emitting diode and the words "Mains error".

Action: Adjust mains voltage.

5. Overheating error

Cause: Overheating of an inverter module due to incorrect use, or fault in the inverter module.

Symptoms: The welding process stops. This error is indicated by the yellow light emitting diode and the words "Overheating error". This LED switches off after 7 - 10 min. if the error is not corrected. When pressing the trigger, the LED switches on again.

Action: If the error has not been caused by incorrect use, call in service staff.

6. INT/EXT control

This switch enables selection between internal/external control of the welding current. When in internal position, the current is set on the machine.

When in external position, the current is set through a remote control. Slope-up, pulse welding, welding with reduced current and slope-down are also possible through remote control.

7. Hot-start

MMA-function

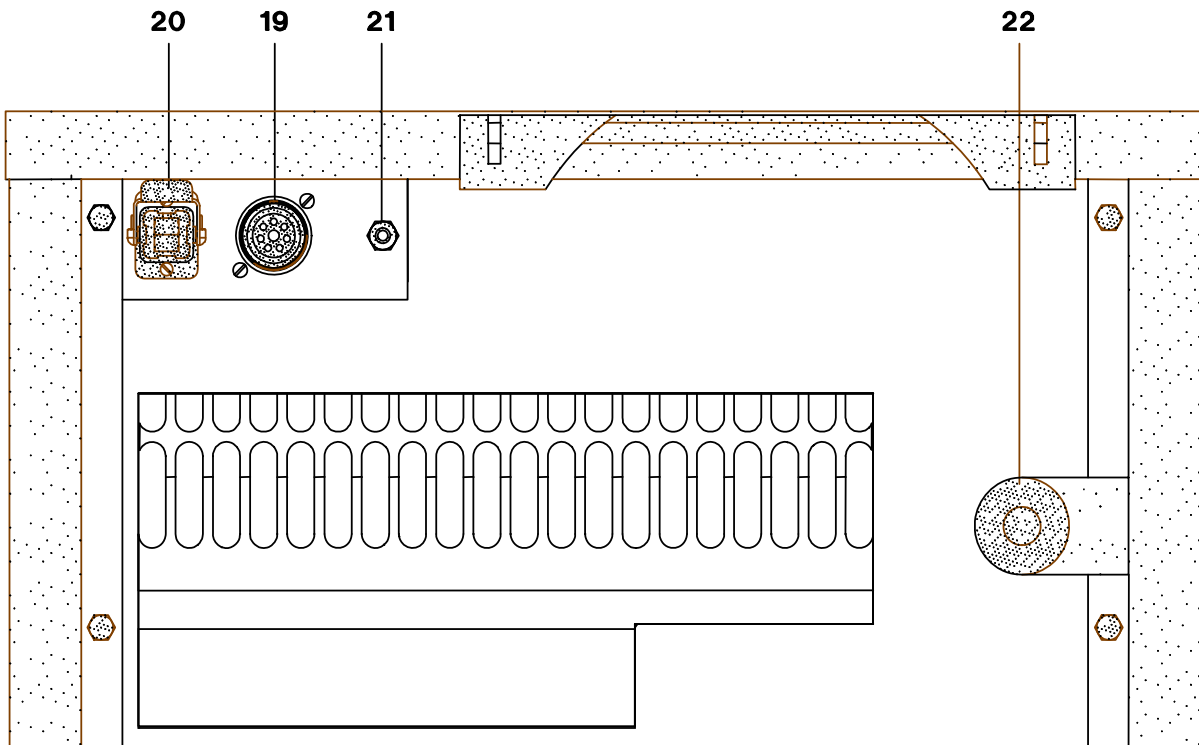
Hot-start is a function which can be used to help establish the arc when starting to weld. This can be achieved by increasing the initial current by a certain percentage in relation to the set value, when the electrode is applied to the workpiece.

This increased initial current is reduced exponentially in relation to the set welding current within approx. 0.5 seconds. The hot-start value is the percentage value by which the initial current is increased, and can be set between 0 % and 100 %.

8. Welding current

Use this knob to control welding current from min. 5 A to maximum welding current, as shown in the digital display (pos. 3).

INITIAL OPERATION TIG COMMANDER DC & AC/DC



- 19. Multiple plug, 8-pole**
For connection of remote control.
- 20. Multiple plug, 6-pole**
For connection of footswitch control.
- 21. Gas hose**
- 22. Mains cable**

INITIAL OPERATION

Secondary errors during TIG welding

Safety disconnection

Cause: During 4-times trigger operation, welders sometimes start a welding sequence and then put the torch down by accident. In such circumstances the machine will retain voltage in the torch, and HF and the gas valve will remain active, which is dangerous for the welder concerned.

Reaction: If the arc is not initiated within 2 seconds, the welding cycle stops.

Torch lift

Cause: During welding the welder may lift the TIG torch away from the workpiece by accident, which results in the extinction of the torch arc.

Reaction: The machine is initiated for 2 seconds, after which the welding cycle stops.

Fixed functions

Antifreeze

MMA function

During electrode welding, electrodes sometimes stick to the workpiece. The machine registers the fact that the electrode has stuck onto the workpiece, and will reduce the welding current to 5 A. This leads to the hardening of the pool crater, and the electrode can then be broken off. Welding can then be resumed in normal fashion.

Arc power

MMA function

The arc power function is used to stabilise the arc during electrode welding. This can be achieved by increasing the welding current during short-circuits. This function is only available when using coated electrodes.

Pre-flow

TIG function – Gas pre-flow time

The gas pre-flow time is the time that elapses between the activation of the torch trigger (which establishes a gas supply) and the establishment of the welding current.

TECHNICAL DATA

Power source:	TIG 240 AC/DC	TIG 320 DC	TIG 320 AC/DC	TIG 400 DC
Mains voltage / Fuse	3x400 V / 16 A	3x400 V / 25 A	3x400 V / 25 A	3x400 V / 25 A
Mains voltage / Fuse (changeable)		3x230 V / 50 A 3x400 V / 25 A 3x440 V / 20 A 3x500 V / 20 A	3x230 V / 50 A 3x400 V / 25 A 3x440 V / 20 A 3x500 V / 20 A	- 3x400 V / 25 A 3x440 V / 20 A 3x500 V / 20 A
Consumption, max.	11,7 KVA	17,0 KVA	17,7 KVA	22,5 KVA
Efficiency	0.85	0.85	0.85	0.85
Current range DC	5 - 240 A	5 - 320 A	5 - 320 A	5 - 400 A
Current range AC	5 - 240 A	-	5 - 320 A	-
Duty cycle 100%	165 A	310 A	300 A	310 A
Duty cycle 60%	180 A	320 A	320 A	355 A
Duty cycle 35%	240 A	-	-	400 A
Open circuit voltage DC	85 V	85 V	85 V	85 V
¹ Sphere of application				
² Protection class	IP 21	IP 21	IP 21	IP 21
Standard	EN60974-1 EN50199	EN60974-1 EN50199	EN60974-1 EN50199	EN60974-1 EN50199
Control:	Box 1		Box 2	
Anti-stick	5 A		5 A	
Pilot arc	4 %, min. 5 A		4 %, min. 5 A	
Arc power	0 - 150 %		fixed	
Hot-start	0 - 100 %		0 - 100 %	
Pulse time	0,01 - 10 secs		-	
Pause time	0,01 - 10 secs		-	
Base current	1 - 99 %, min. 5 A		-	
Gas pre-flow	0 - 10 secs		0.2 sec. (fixed)	
Gas post-flow	3 - 20 secs		0 - 30 secs	
Slope up	0 - 10 secs		-	
Slope down	0 - 10 secs		0 - 10 secs	
Reduced current	0 - 100 %, min 5 A		-	
AC-t-balance, based on time (TIG)	1 - 100 %		0 - 100 %	
AC-I-balance, based on current intensity (TIG)	1 - 100%, min 5 A		-	
AC frequency (TIG)	1 - 300 Hz		10 - 500 Hz	
AC frequency (MMA)	1 - 100 Hz		-	
Starting current	0 - 100 %, min. 5 A		-	
Stop current	0 - 100 %, min. 5 A		-	
Spot welding time	0.1 - 50 secs		-	
Dimensions and weight:				
Dimensions	700x550x1050	700x550x1050	700x550x1050	700x550x1050
Weight	122 kg	131 kg	149 kg	131 kg
Weight, changeable		161 kg	179 kg	161 kg

¹  The machine meets the standards which are demanded of machines working in areas where there is an increased risk of electric shock
² Indicates that the machine cannot be used outside in the rain

TECHNICAL DATA

Power source:	TIG 400 AC/DC	TIG 500 DC	TIG 500 AC/DC	
Mains voltage / Fuse	3x400 V / 25 A	3x400 V / 35 A	3x400 V / 35 A	
Mains voltage / Fuse (changeable)	- 3x400 V / 25 A 3x440 V / 20 A 3x500 V / 20 A			
Consumption max.	23,2 KVA	26,8 KVA	27,5 KVA	
Efficiency	0.85	0.85	0.85	
Current range DC	5 - 400 A	10 - 500 A	10 - 500 A	
Current range AC	5 - 400 A	-	10 - 500 A	
Duty cycle 100%	300 A	400 A	400 A	
Duty cycle 60%	355 A	500 A	500 A	
Duty cycle 35%	400 A	-	-	
Open circuit voltage DC	85 V	85 V	85 V	
¹ Sphere of application				
² Protection class	IP 21	IP 21	IP 21	
Standard	EN60974-1 EN50199	EN60974-1 EN50199	EN60974-1 EN50199	
Control:	Box 1		Box 2	
Anti-stick	5 A		5 A	
Pilot arc	4 %, min. 5 A		4 %, min. 5 A	
Arc power	0 - 150 %		fixed	
Hot-start	0 - 100 %		0 - 100 %	
Pulse time	0,01 - 10 secs		-	
Pause time	0,01 - 10 secs		-	
Base current	1 - 99 %, min. 5 A		-	
Gas pre-flow	0 - 10 secs		0.2 sec. (fixed)	
Gas post-flow	3 - 20 secs		0 - 30 secs	
Slope up	0 - 10 secs		-	
Slope down	0 - 10 secs		0 - 10 secs	
Reduced current	0 - 100 %, min 5 A		-	
AC-t-balance, based on time (TIG)	1 – 100 %		0 – 100 %	
AC-I-balance based on current intensity (TIG)	1 - 100%, min 5 A		-	
AC frequency (TIG)	1 - 300 Hz		10 – 500 Hz	
AC frequency (MMA)	1 - 100 Hz		-	
Starting current	0 – 100 %, min. 5 A		-	
Stop current	0 – 100 %, min. 5 A		-	
Spot welding time	0.1 - 50 secs		-	
Dimensions and weight:				
Dimensions	700x550x1050	700x550x1050	700x550x1050	
Weight	149 kg	157 kg	173 kg	
Weight, changeable	179 kg			

¹  The machine meets the standards which are demanded of machines working in areas where there is an increased risk of electric shock
² Indicates that the machine cannot be used outside in the rain

FAULT IDENTIFICATION



Overheating error

Welding is interrupted due to overheating if the machine is used beyond the specifications mentioned in chapter "Technical Data". The machine must remain turned on and connected to the mains supply as the fan continues until the machine has been sufficiently cooled. Thereafter, the machine is automatically switched in.

An overheating error is more oftenly seen if the machine is used in surroundings with temperatures above 40°C. It is not recommendable to place the machine in direct sun light as this increases the possibility of an overheating of the machine.



Mains error

The mains error arises if the mains voltage is too high or low.

Please make sure that the mains plug is correctly mounted and that all fuses are intact. Moreover, please control that the mains voltage does not exceed the technical specifications and that there are no short-term voltage drops or voltage peaks.



Torch cooling error

This error can be seen by the text "Etc" in the machine display. Turn off the machine if the cooling water does not flow in the water-cooled torch. Make sure that all hoses have a free passage, see chapter "maintenance". Turn on the machine again when a free passage has been established. Welding can then be continued.

Other errors shown in the display:

If other errors arise than those described above, please contact the MIGATRONIC service department.

MAINTENANCE

Insufficient maintenance may result in reduced operational reliability and in lapse of guarantee.

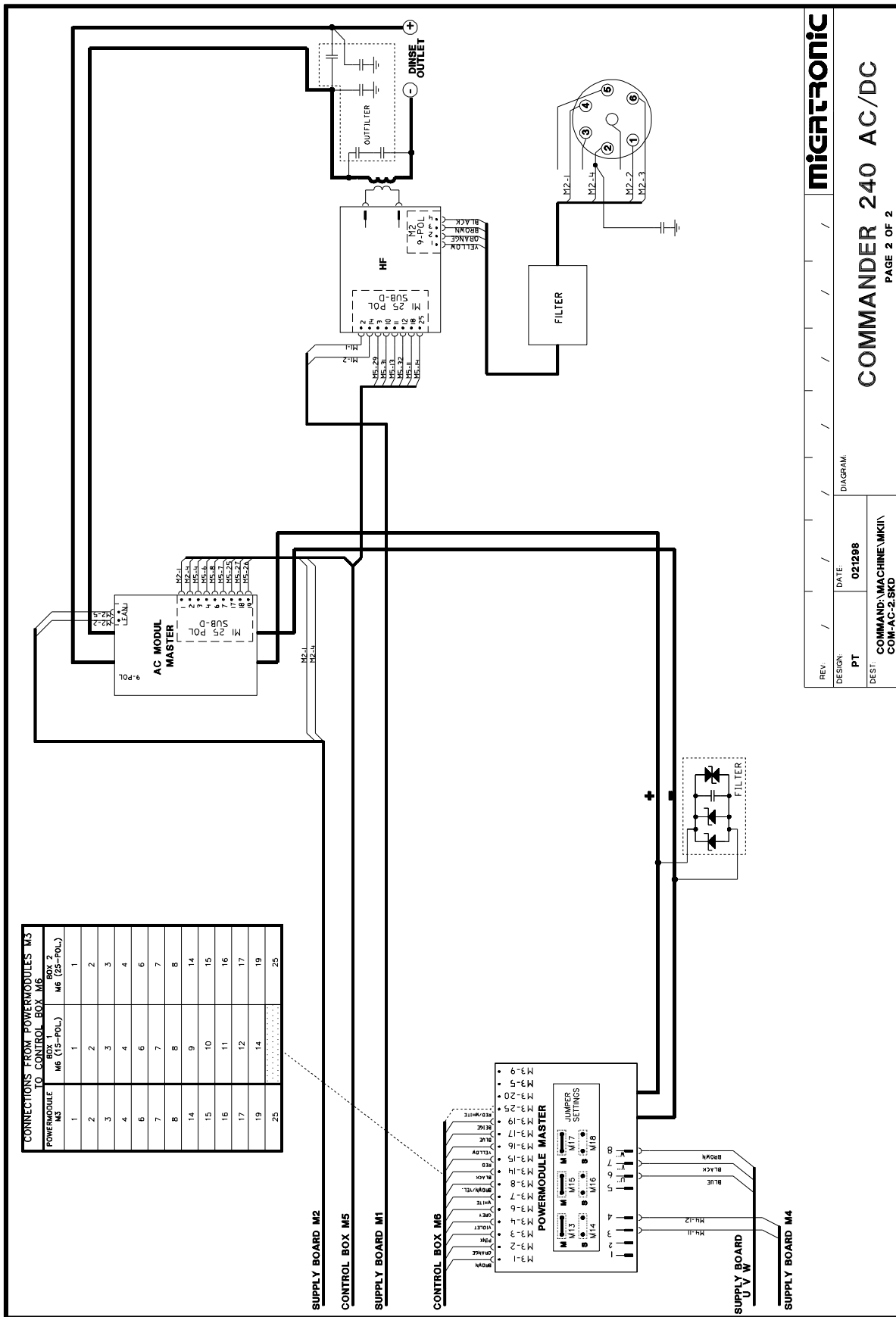
The COMMANDER welding machines require virtually no maintenance. However, exposure to extremely dusty, damp or corrosive air is damaging to welding machines.

Periodically maintenance

In order to prevent problems arising, the following procedure should be observed at least once a year or as required.

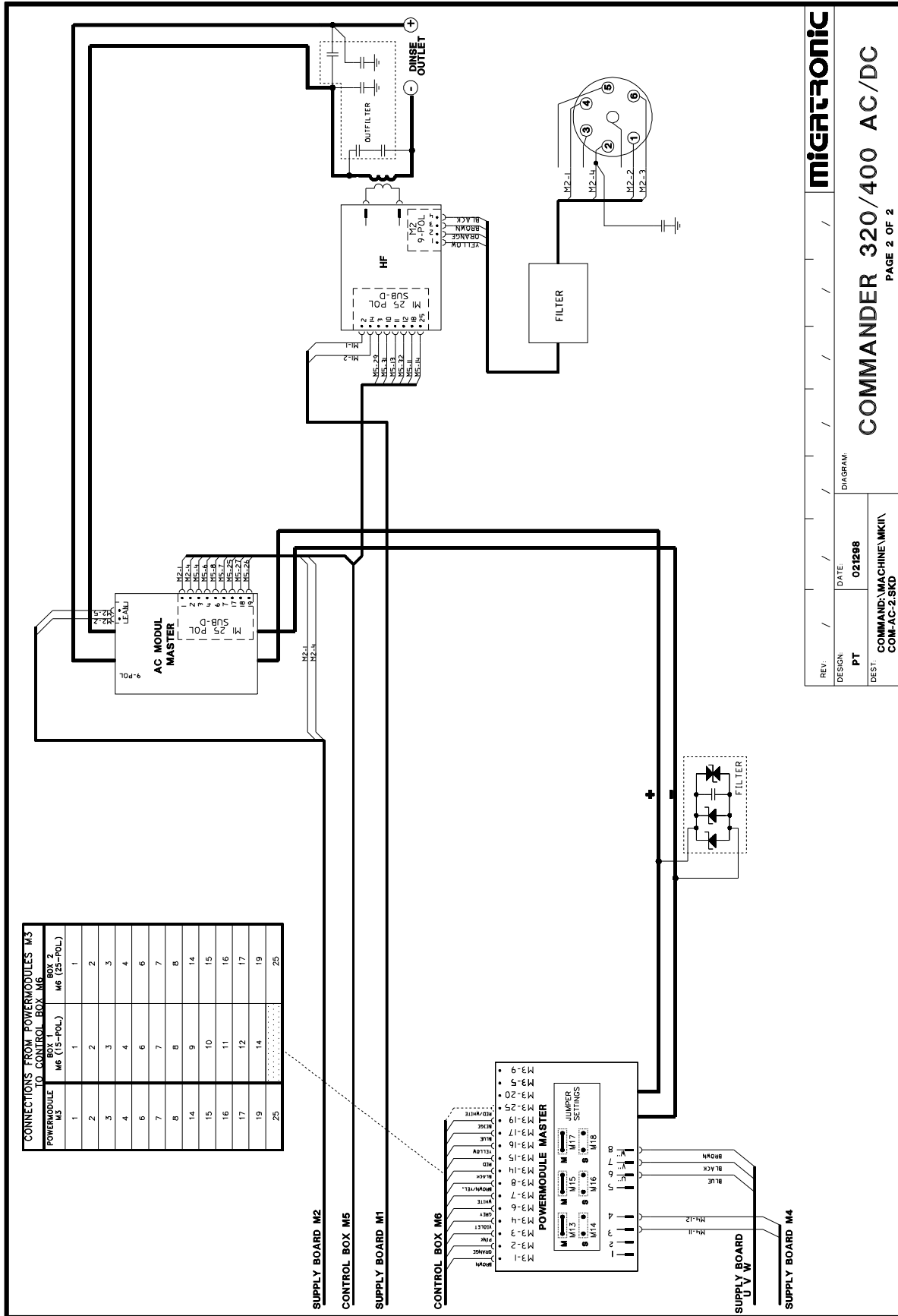
- disconnect the machine from the mains supply and wait 2 minutes before removing the front panels.
- clean the fan blades and the components in the cooling pipe with clean, dry, compressed air.
- drain the cooling liquid out of the cooling module and welding hoses. Remove dirt and flush with pure water in the tank and cooling hoses. Fill up with new cooling liquid. The machine is delivered with a cooling liquid.

CIRCUIT DIAGRAM COMMANDER 240 AC



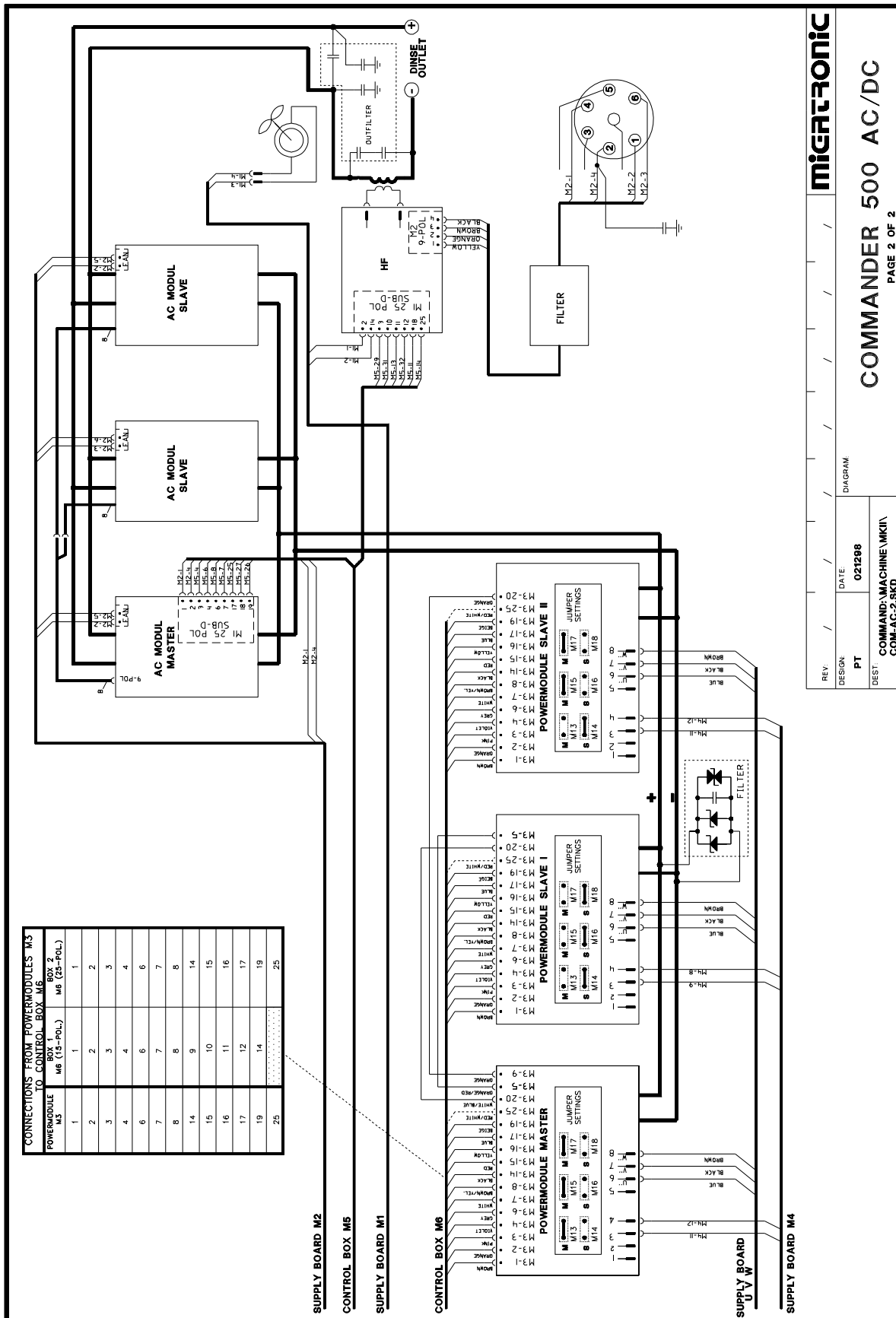
[illegible]

CIRCUIT DIAGRAM COMMANDER 320/400 AC

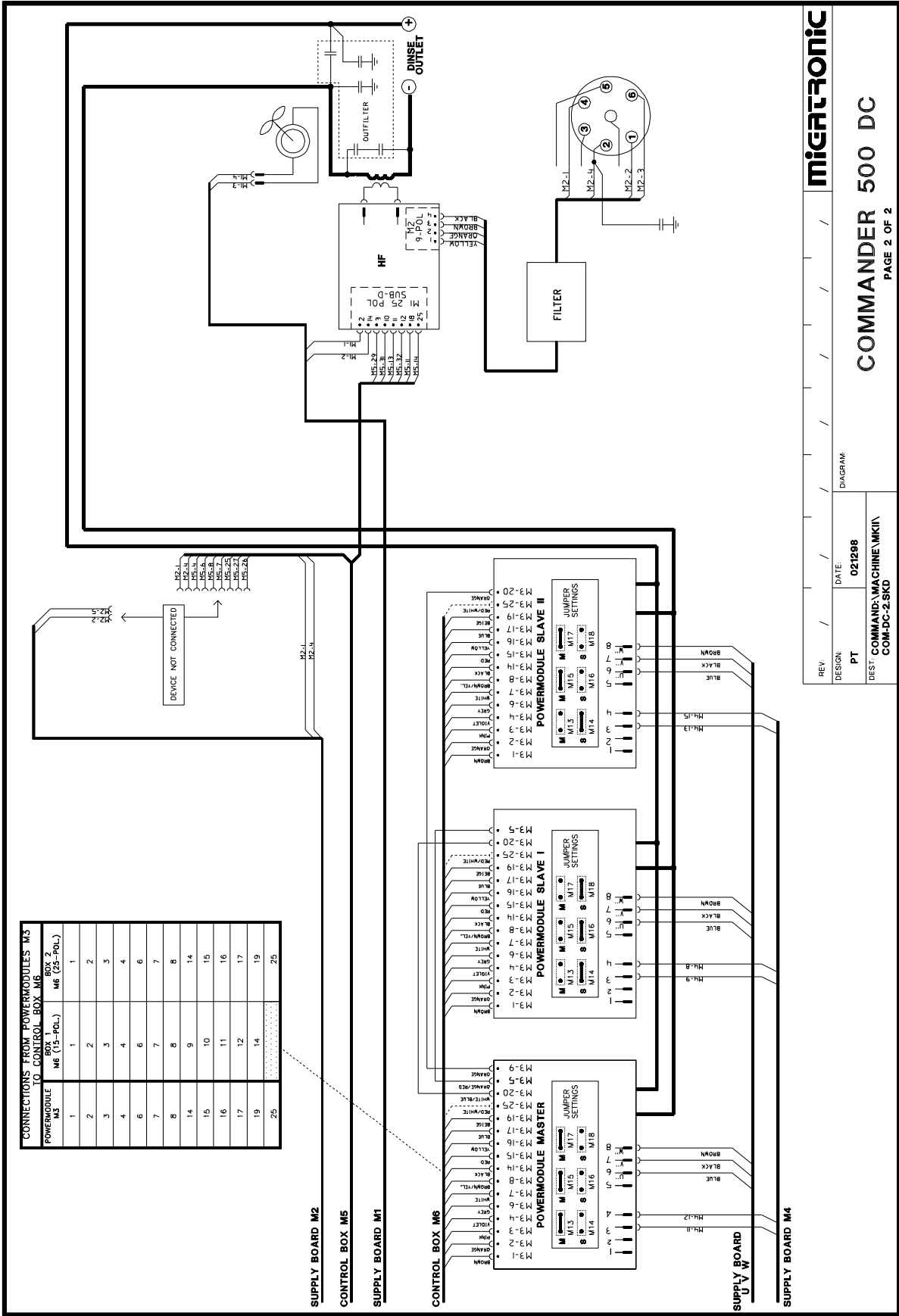


[illegible]

CIRCUIT DIAGRAM COMMANDER 500 AC

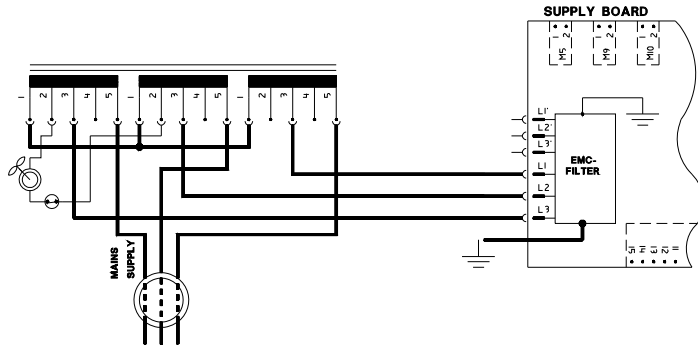


CIRCUIT DIAGRAM COMMANDER 500 DC

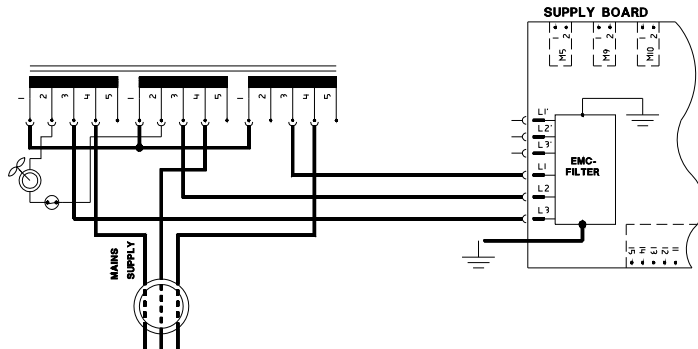


CIRCUIT DIAGRAM AUTOTRAFO

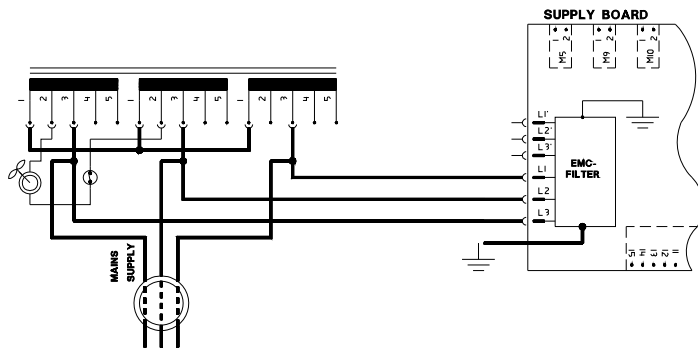
500V



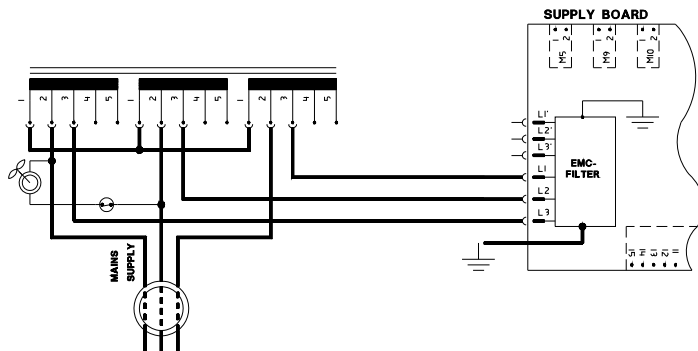
440V



400V



230V



B/PT961022		DATE	/	/	/	MICR ET RONIC	
REV.		DESIGN	PT	081295			
COMMANDO MACHINE/MKII/AUTOTRAF							

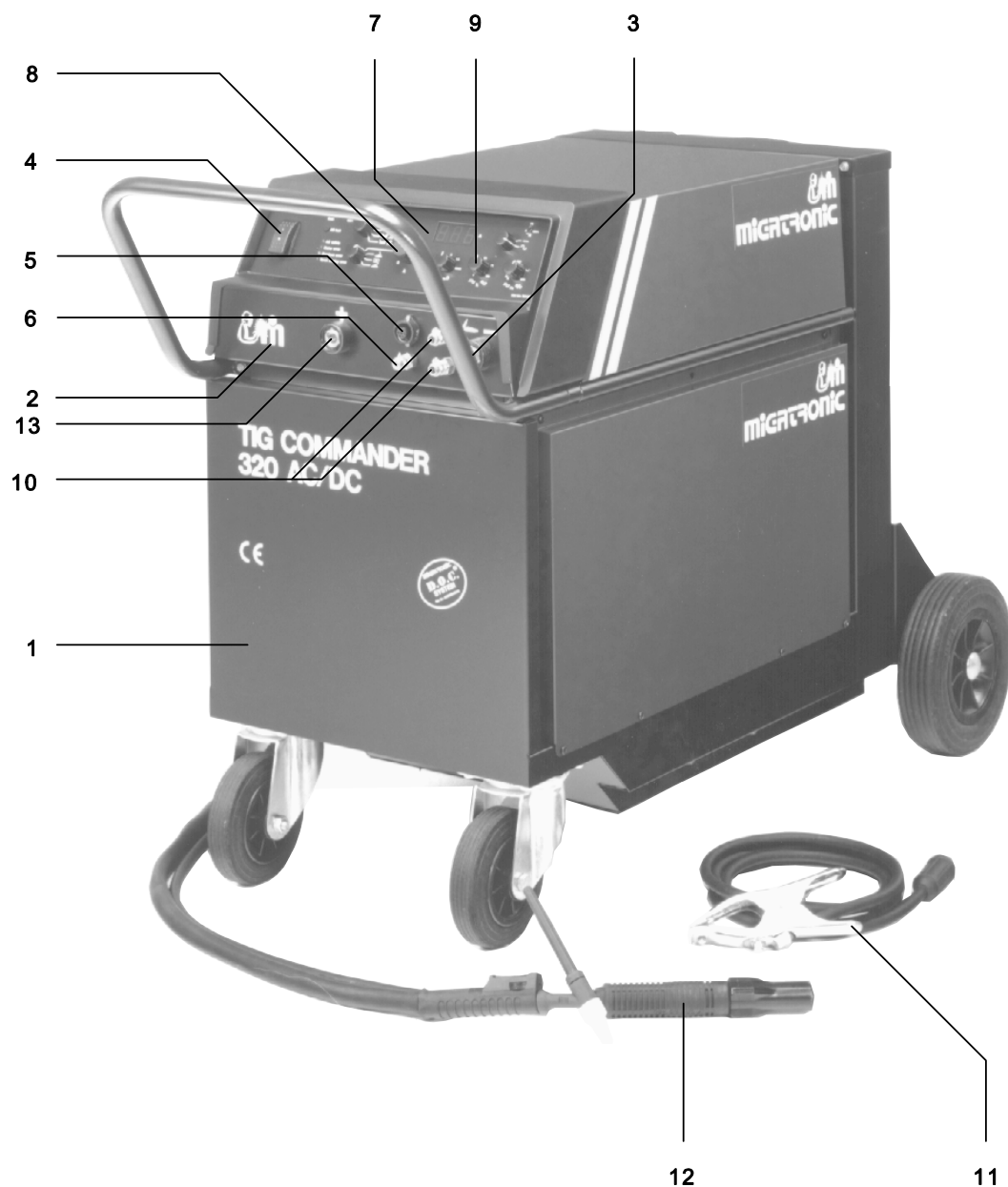
AUTOTRAFO COM./NAV.						
DIAGRAM						

AUTOTRAFO COM./NAV.

Reservedelsliste
Spare parts list
Ersatzteilliste
Liste des pièces de rechange

COMMANDER

COMMANDER

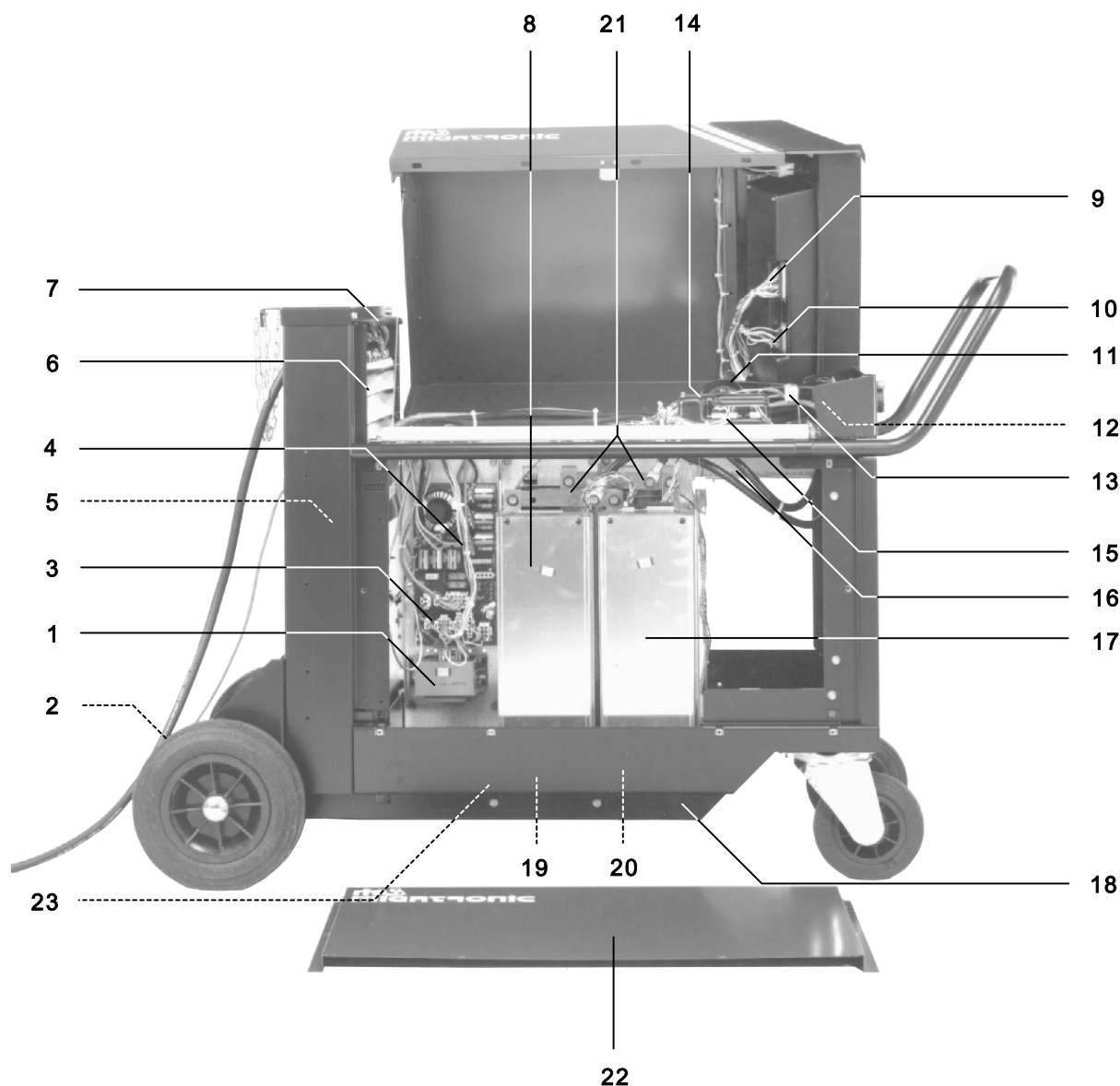


Pos.	No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
1	61119154	Frontpanel 500 AC/DC Frontplatte 500 AC/DC	Front plate 500 AC/DC Pièce avant 500 AC/DC
1	61119109	Frontpanel 400 AC/DC Frontplatte 400 AC/DC	Front plate 400 AC/DC Pièce avant 400 AC/DC
1	61119108	Frontpanel 320 AC/DC Frontplatte 320 AC/DC	Front plate 320 AC/DC Pièce avant 320 AC/DC
1	61119101	Frontpanel 320 DC Frontplatte 320 DC	Front plate 320 DC Pièce avant 320 DC
1	61119111	Frontpanel 240 AC/DC Frontplatte 240 AC/DC	Front plate 240 AC/DC Pièce avant 240 AC/DC
2	61119193*	Tilslutningspanel Anschlußpanel	Connection panel Panneau raccordement
3	18110008	TIG-tilslutning kpl. WIG-Anschluß	TIG-connection Connexion de TIG
4	17110011	Netafbryder Ein-/Ausschalter	Main switch Commutateur
5	74470907*	Ledningssæt, tast Kabelbaum, Taste	Wire harness, button Jeu de câble, gâchette
6	43120007	Lynkobling gas, ø5mm Schnellkupplung Gas, ø5mm	Quick clutch gas, ø5mm Unité d'accouplement rapide gaz, ø5mm

COMMANDER

Pos. No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
7	76115104 Elektronikbox TIG 400 AC/DC Elektronikbox TIG 400 AC/DC	Control box TIG 400 AC/DC Boîtier de commande TIG 400 AC/DC
7	76115105 Elektronikbox TIG 400 DC Elektronikbox TIG 400 DC	Control box TIG 400 DC Boîtier de commande TIG 400 DC
7	76115100 Elektronikbox TIG 240/320/500 AC/DC Elektronikbox TIG 240/320/500 AC/DC	Control box TIG 240/320/500 AC/DC Boîtier de commande TIG 240/320/500 AC/DC
7	76115102 Elektronikbox TIG 320 DC Elektronikbox TIG 320 DC	Control box TIG 320 DC Boîtier de commande TIG 320 DC
7	76115121 Elektronikboks 1, AC/DC-P, pulsbox TIG 240/320/500 Elektronikbox 1, AC/DC-P, Pulsbox TIG 240/320/500	Control box 1, AC/DC-P, pulse box TIG 240/320/500 Boîtier de commande 1, AC/DC-P, boîtier de pulsation TIG 240/320/500
7	76115135 Elektronikboks 1, AC/DC, pulsbox TIG 400 AC/DC Elektronikbox 1, AC/DC, Pulsbox TIG 400 AC/DC	Control box 1, AC/DC, pulse box TIG 400 AC/DC Boîtier de commande 1, AC/DC, boîtier de pulsation TIG 400 AC/DC
7	76115136 Elektronikboks 1, AC/DC-P, pulsbox TIG 400 AC/DC Elektronikbox 1, AC/DC-P, Pulsbox TIG 400 AC/DC	Control box 1, AC/DC-P, pulse box TIG 400 AC/DC Boîtier de commande 1, AC/DC-P, boîtier de pulsation TIG 400 AC/DC
7	76115126 Elektronikboks 1, DC-P, pulsbox TIG 240/320/500 Elektronikbox 1, DC-P, Pulsbox TIG 240/320/500	Control box 1, DC-P, pulse box TIG 240/320/500 Boîtier de commande 1, DC-P, boîtier de pulsation TIG 240/320/500
7	76115140 Elektronikboks 1, DC, pulsbox TIG 400 DC Elektronikbox 1, DC, Pulsbox TIG 400 DC	Control box 1, DC, pulse box TIG 400 DC Boîtier de commande 1, DC, boîtier de pulsation TIG 400 DC
7	76115141 Elektronikboks 1, DC-P, pulsbox TIG 400 DC Elektronikbox 1, DC-P, Pulsbox TIG 400 DC	Control box 1, DC-P, pulse box TIG 400 DC Boîtier de commande 1, DC-P, boîtier de pulsation TIG 400 DC
8	18502605 Knap ø28 Knopf ø28	Button ø28 Bouton ø28
8	18521305 Dæksel for knap ø28 Deckel für den Knopf ø28	Cover for button ø28 Couvercle de bouton ø28
9	18508003 Knap ø21.5 Knopf ø21.5	Button ø21.5 Bouton ø21.5
10	43129007* Lynkoblingssæt rød m/ventil, 8mm Anschlußsatz rot mit Ventil, 8mm	Quick adaptor set red with valve, 8mm Jeu d'accouplement rapide rouge avec valve, 8mm
10	43129008* Lynkoblingssæt blå m/ventil, 8mm Anschlußsatz blau mit Ventil, 8mm	Quick adaptor set blue with valve, 8mm Jeu d'accouplement rapide bleu avec valve, 8mm
11	80503503 Stelkabel 3m, 35mm ² Massekabel 3m, 35mm ²	Earth cable 3m, 35mm ² Câble de mise à la terre 3m, 35mm ²
11	80503506 Stelkabel 6m, 35mm ² Massekabel 6m, 35mm ²	Earth cable 6m, 35mm ² Câble de mise à la terre 6m, 35mm ²
11	80505003 Stelkabel 3m, 50mm ² Massekabel 3m, 50mm ²	Earth cable 3m, 50mm ² Câble de mise à la terre 3m, 50mm ²
11	80505006 Stelkabel 6m, 50mm ² Massekabel 6m, 50mm ²	Earth cable 6m, 50mm ² Câble de mise à la terre 6m, 50mm ²
11	80507003 Stelkabel 3m, 70mm ² Massekabel 3m, 70mm ²	Earth cable 3m, 70mm ² Câble de mise à la terre 3m, 70mm ²
11	80507006 Stelkabel 6m, 70mm ² Massekabel 6m, 70mm ²	Earth cable 6m, 70mm ² Câble de mise à la terre 6m, 70mm ²
11	80509503 Stelkabel 3m, 95mm ² Massekabel 3m, 95mm ²	Earth cable 3m, 95mm ² Câble de mise à la terre 3m, 95mm ²
11	80509506 Stelkabel 6m, 95mm ² Massekabel 6m, 95mm ²	Earth cable 6m, 95mm ² Câble de mise à la terre 6m, 95mm ²
12	80513503 Elektrodekabel 3m, 35mm ² Elektrodenkabel 3m, 35mm ²	Electrode cable 3m, 35mm ² Câble pince électrode 3m, 35mm ²
12	80513506 Elektrodekabel 6m, 35mm ² Elektrodenkabel 6m, 35mm ²	Electrode cable 6m, 35mm ² Câble pince électrode 6m, 35mm ²
12	80515003 Elektrodekabel 3m, 50mm ² Elektrodenkabel 3m, 50mm ²	Electrode cable 3m, 50mm ² Câble pince électrode 3m, 50mm ²
12	80515005 Elektrodekabel 5m, 50mm ² Elektrodenkabel 5m, 50mm ²	Electrode cable 5m, 50mm ² Câble pince électrode 5m, 50mm ²
12	80517003 Elektrodekabel 3m, 70mm ² Elektrodenkabel 3m, 70mm ²	Electrode cable 3m, 70mm ² Câble pince électrode 3m, 70mm ²
12	80517005 Elektrodekabel 5m, 70mm ² Elektrodenkabel 5m, 70mm ²	Electrode cable 5m, 70mm ² Câble pince électrode 5m, 70mm ²
13	18110002 Dinsebøsning Dinsebuchse	Dinse coupling socket Douille de raccordement, type Dinse

COMMANDER



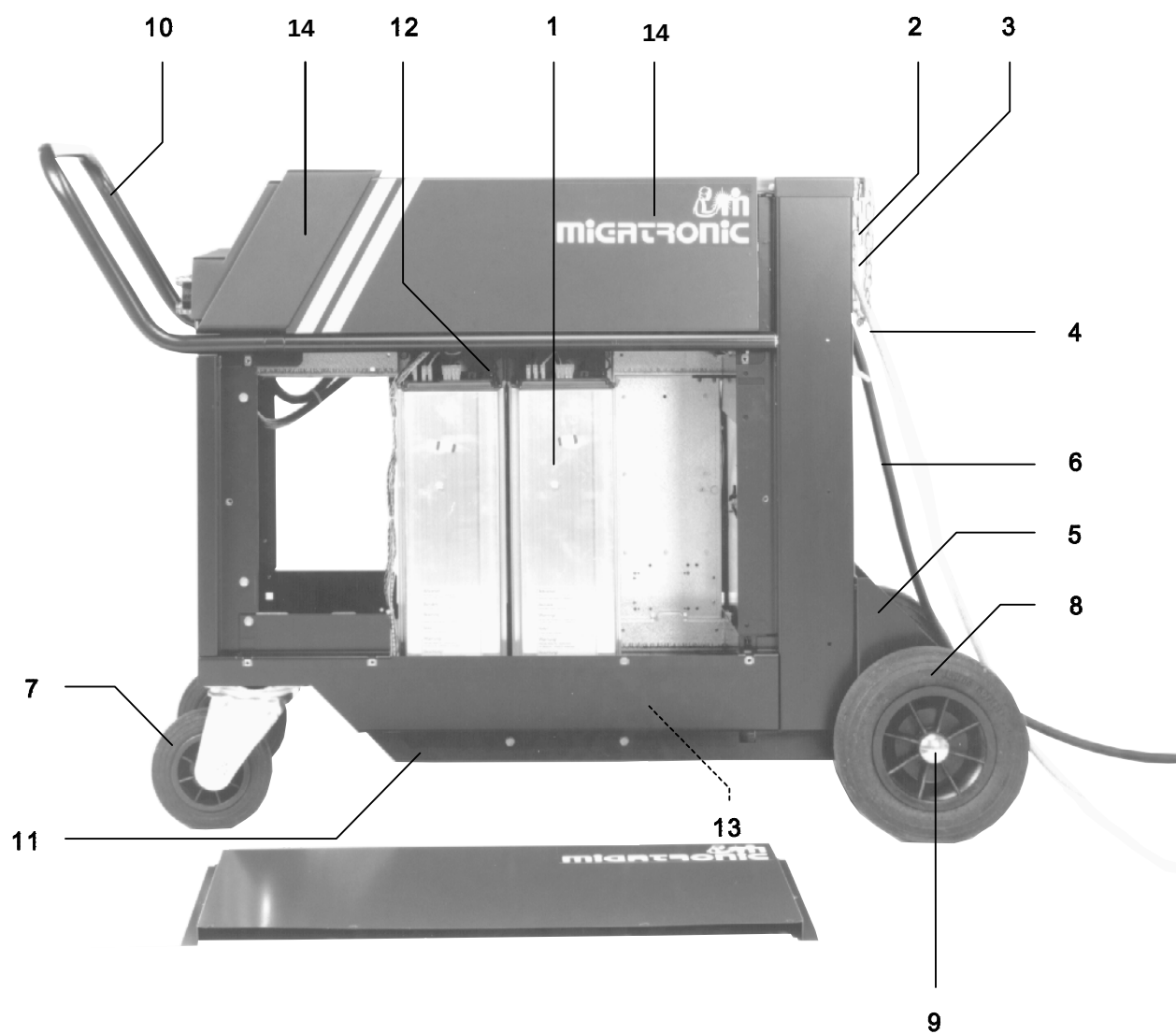
Pos.	No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
1	16160101	Styrestrømstrafo	Control transformer
		Steuerstromstrafo	Transformateur de courant de commande
2	26310513	Aksel for hjulophæng	Axle for wheel suspension
		Achse für Räderaufhängung	Axe pour suspension des roues
3	71610024	Filterprint TIG 240/320/400	Filter PCB TIG 240/320/400
		Filterplatine TIG 240/320/400	Circuit imprimé filtre TIG 240/320/400
3	71610020	Monteret filterprint TIG 500	Filter PCB TIG 500
		Filterplatine TIG 500	Circuit imprimé filtre TIG 500
4	74470787	Ledningssæt HI-power TIG 240/320/400	Wire harness HI-power TIG 240/320/400
		Leitungsbündel Hochspannung TIG 240/320/400	Filerie haute puissance TIG 240/320/400
4	74470790	Ledningssæt HI-power TIG 500	Wire harness HI-power TIG 500
		Leitungsbündel Hochspannung TIG 500	Filerie haute puissance TIG 500
5	78812013	Vandmodul komplet	Water cooling unit, complete
		Wassermodule, komplett	Module hydraulique, complet
5	75903002	Flowkontrol 0,2 l/min	Control PCB, water cooling unit 0.2 l/min
		Kontrollplatine, Wassermodule 0,2 l/min	Circuit imprimé de contrôle d'eau 0,2 l/min
5	17270003	Induktiv føler med stik	Inductive sensor with plug
		Induktionsfühler mit Stecker	Capteur avec prise
5	17310017*	Vandpumpe	Water pump
		Wasserpumpe	Pompe à eau
5	45050265*	Vandtank	Water tank
		Wassertank	Réservoir à eau
	45050269	Låg	Cover
		Deckel	Couvercle

COMMANDER

Pos. No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
5 15480150	Fasekondensator, 1,5 UF	Phase capacitor, 1.5 UF
5 15480500*	Phasenkondensator, 1,5 UF	Condenseur de phase, 1,5 UF
5 16160112*	Motorkondensator, 5 UF, 400/500V	Motor condenser 5 UF, 400/500 V
5 17300022	Motorkondensator, 5 UF, 400/500 V	Condenseur de moteur, 5 UF, 400/500 V
5 17300022	Autotrafo	Auto transformer
5 17300022	Autotrafo	Autotransformateur
5 17300022	Ventilator, vandmodul	Fan, water cooling unit
6 24611021	Lüfter, Wassermodule	Ventilateur, module d'eau
6 24611021	Dækplade for vandtank	Cover plate for water tank
7 33370013	Abdeckung für Wassertank	Plaque de recouvrement pour réservoir à eau
7 33370013	Gummiliste, låg	Rubber list (cover)
8 73250020	Gummirahmen (Deckel)	Rebord de caoutchouc pour couvercle
8 73250020	AC-modul, slave	AC-module, slave
9 74470800	AC-Modul, Sklave	Module CA, esclave
9 74470800	Ledningssæt, TIG 240/320/400	Wire harness, TIG 240/320/400
9 74470800	Leitungsbündel, TIG 240/320/400	Filerie, TIG 240/320/400
9 74470786	Ledningssæt, TIG 500	Wire harness, TIG 500
9 74470786	Leitungsbündel, TIG 500	Filerie, TIG 500
9 74470966	Ledningssæt, (digital) TIG 240/320/400	Wire harness, (digital) TIG 240/320/400
9 74470966	Leitungsbündel, (digital) TIG 240/320/400	Filerie, (digital) TIG 240/320/400
9 74470964	Ledningssæt, (digital) TIG 500	Wire harness, (digital) TIG 500
9 74470964	Leitungsbündel, (digital) TIG 500	Filerie, (digital) TIG 500
10 74470801	Ledningssæt, powermodul TIG 240/320/400	Wire harness, power module TIG 240/320/400
10 74470801	Leitungsbündel, Powermodul TIG 240/320/400	Filerie, module de puissance TIG 240/320/400
10 74470789	Ledningssæt, powermodul TIG 500	Wire harness, power module TIG 500
10 74470789	Leitungsbündel, Powermodul TIG 500	Filerie, module de puissance TIG 500
10 74470920	Ledningssæt powermodul, pulsbox TIG 240/320/400	Wire harness power module, pulse box TIG 240/320/400
10 74470920	Leitungsbündel Powermodul, Pulsbox TIG 240/320/400	Filerie module de puissance, boîtier de pulsation TIG 240/320/400
10 74470927	Ledningssæt powermodul, pulsbox TIG 500	Wire harness power module, pulse box TIG 500
10 74470927	Leitungsbündel Powermodul, Pulsbox TIG 500	Filerie module de puissance, boîtier de pulsation TIG 500
10 74470967	EMC-adaptor (digital)	EMC-adaptor (digital)
10 74470967	EMC-adaptor (digital)	Adaptateur EMC (digital)
11 16419100*	HF-spole	HF transformer
11 16419100*	HF-spule	HF transformateur
12 71619106*	Dobbelt filterprint	Double filter PCB
12a 18291008	Doppeltes Filterprint	Double circuit imprimé filtre
12a 18291008	6,3mm spadestiksudtag	6,3mm connector
12a 18291008	6,3mm Flachstecker	Prise 6,3mm
13 27150041	Støtteklods, HF	Supporting block to HF-coil
13 27150041	Stützklotz für Hochfrequenzspule	Tacquet pour bobine HF
14 45050192	Låg for HF-box	Cover for HF box
14 45050192	Deckel für HF Box	Couvercle pour box HF
15 71613052	Styreprint HF	Controller circuit board HF
15 71613052	Steuerplatine HF	Platine de commande HF
16 24611022	U-vange for ophæng	U-side member for suspension
16 24611022	U-Wange für Aufhängung	Glissière U pour suspension
17 73250019	AC-modul, master	AC module, master
17 73250019	AC-Steuermodule	Module CA, maître
18 24611077	Bundvange, højre	Base side member (right)
18 24611077	Bodenwange, rechts	Glissière de base, droite
19 24640052	Strømskinne I, TIG 240/320/400	Current connection I, TIG 240/320/400
19 24640052	Verbindung I, Strom, TIG 240/320/400	Joint de courant I, TIG 240/320/400
19 24640046	Strømskinne I, TIG 500	Current connection I, TIG 500
19 24640046	Verbindung I, Strom, TIG 500	Joint de courant I, TIG 500
20 24640053	Strømskinne II, TIG 240/320/400	Current connection II, TIG 240/320/400
20 24640053	Verbindung II, Strom, TIG 240/320/400	Joint de courant II, TIG 240/320/400
20 24640047	Strømskinne II, TIG 500	Current connection II, TIG 500
20 24640047	Verbindung II, Strom, TIG 500	Joint de courant II, TIG 500
21 24540022	Strømskinne for AC/DC-modul, TIG 240/320/400	Conductor rail for AC/DC module, TIG 240/320/400
21 24540022	Stromschiene für AC/DC-Modul, TIG 240/320/400	Guide courant pour module CA/CC, TIG 240/320/400
21 24540034	Strømskinne for AC-modul, TIG 500	Conductor rail for AC module, TIG 500
21 24540034	Stromschiene für AC-Modul, TIG 500	Guide courant pour module CA, TIG 500
22 24419118	Sideskærm, grøn	Side panel, green
22 24419118	Seitenschirm, grün	Plaque latérale, verte
23 45050178	Holder for strømskinne I	Guide rail holder
23 45050178	Halter für Stromschiene I	Support pour guide courant

* Se sidste side/See last page/Siehe letzte Seite/Voir la dernière page

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Pos.	No.	Varebetegnelse Warenbezeichnung	Description of goods Désignation des pièces
1	73250022	Powermodul Powermodul	Power module Module de puissance
2	42410001	Kæde Kette	Chain Chaîne
3	17230006	Magnetventil Magnetventil	Solenoid valve Vanne solénoïde
4	74120010	Gasslange 2,7m Gasschlauch 2,7m	Gas hose 2.7m Tuyau de gaz 2,7m
5	70210340	Flaskebakke Flaschenhalter	Bottle plate Plateau à bouteilles
6	74234011	Netzkabel 4x2,50mm ² Netzkabel 4x2,5mm ²	Mains supply cable 4x2.5mm ² Câble d'alimentation 4x2,5mm ²
6	74234001	Netzkabel 4x4mm ² Netzkabel 4x4mm ²	Mains supply cable 4x4mm ² Câble d'alimentation 4x4mm ²
6	74234002	Netzkabel 4x6mm ² Netzkabel 4x6mm ²	Mains supply cable 4x6mm ² Câble d'alimentation 4x6mm ²
7	44220161	Drejehjul Rad, drehbar	Swivelling wheel Roue pivotante
8	44210250	Endenavshjul Nabenrad	Wheel Roue d'extrémité moyen
9	44610001	Navkapsel Nabendeckel	Wheel cap Couvre-moyeu
10	70619101	Håndtag Handgriff	Handle Poignée
11	24611079	Bundvange, venstre Bodenwange, links	Base side member (left) Glissière de base, gauche
12	73250011	Ventilator komplet, powermodul Lüfter komplett, Powermodul	Fan complete, power module Ventilateur complet, source de courant
13	71613206	Filterprint AC Filterplatine AC	Filter PCB AC Circuit imprimé filtre CA
14	72220002	Komplet låg med front Kompletter Deckel mit Vorderseite	Complete cover with front Couvercle complet avec face
14	45050174	Front Front	Front plate Pièce avant
14	70210423	Låg Deckel	Cover Couvercle
	78861112	Ombygningskit, Commander MK III Kit für Umbau, Commander MK III	Kit for reconditioning, Commander MK III Jeu de rechange, Commander MK III

COMMANDER

15480500	Motor condenser 5 UF Machines until	96.04.01	use	15480800
16160112	Auto transformer Machines until	96.04.01	use	16160096
16419100	HF-trafo Machines until	96.08.12	use	16413009
17310017	Water pump Machines until	96.04.01	use	17310006
43129007	Quick adaptor set red with valve, 8mm Machines until	96.08.12	use	43120022
43129008	Quick adaptor set blue with valve, 8mm Machines until	96.08.12	use	43120022
45050265	Water tank machines until	98.09.01	use	45050167
61119193	Connection panel Machines until	96.08.12	use	45050176 and 61119153
71619106	Mount. filter PCB Machines until	96.08.12	use	71619105 and 71619101
74470907	Wire harness, button Machines until	96.08.12	use	74470668

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