
The ESAB logo consists of the letters "ESAB" in a bold, sans-serif font, centered within a black rectangular box that has a slight 3D effect with a shadow on the right side.

DTD 250 ACDC

Aristotig 250 ACDC

Svetsutrustning
Welding equipment
Schweißausrüstung
Equipement de soudage

Bruksanvisning och reservdelsförteckning
Instruction manual and spare parts list
Betriebsanweisung und Ersatzteilverzeichnis
Manuel d'instructions et liste de pieces detachees

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3 310 149

Edition: Oct 94

<u>INDEX</u>	<u>PAGE</u>
Safety Precautions (Warning)	3
Technical Description	4
Technical Data	5
Installation	6
Operation	7
Welding	10
Hints for welding	14
Maintenance	23
Accessories	24
Operating Elements	25
Exchange Information	27
Ordering Information	29
Wiring Diagram	31

WARNING

ARC WELDING AND CUTTING CAN BE INJURIOUS TO YOURSELF AND OTHERS. TAKE PRECAUTIONS WHEN WELDING. ASK FOR YOUR EMPLOYER'S SAFETY PRACTICES WHICH SHOULD BE BASED ON MANUFACTURES HAZARD DATA.

ELECTRIC SHOCK - Can kill

- Install and earth the welding unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

FUME AND GASES - Can be dangerous to health

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to keep fumes and gases from your breathing zone and the general area.

ARC RAYS - Can injure eyes and burn skin

- Protect your eyes and body. Use the correct welding screen and filter lens and wear protective clothing.
- Protect bystandards with suitable screens or curtains.

FIRE HAZARD

- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

MALFUNCTION

- Call for expert assistance in the event of malfunction.

<p>READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.</p>
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PROTECT YOURSELF AND OTHERS!

TECHNICAL DESCRIPTION

ARISTOTIG 250 AC/DC (DTD 250) is a most compact double current power supply for TIG-welding and Manual Metal Arc-welding (MMA).

"State of the art" **IGBT-inverter technology, intelligent control, fastest response speed** and a consequent **modular way of construction** leads to a unique relation between power and weight at a high duty cycle, highest precision in TIG-welding and best arc-characteristics in MMA-welding of all types of electrodes.

Due to the high **switching frequency of 40 kHz** of the DC-module (base-module) fastest reaction speed is achieved and leads to highest precision and arc-stability over the whole current range.

The AC-module, connected in series to the DC-module, is creating the alternating current in that way, that polarity change is done in such a short time that reignition of the arc is achieved **without HF-support in the whole current range.**

The cooperation of DC- and AC-module allows different wave forms on AC such as **true square wave to sinus wave** without losing the fast polarity change and reignition without HF-support.

The clearly arranged control, by symbols easily to understand, allows a fast grip to the manifold functions of control and setup.

With one switch the operator may choose between two different types of AC-wave forms, DC-welding with positive or negative polarity or positiv hot-start on negative DC-welding as well in TIG-mode as in MMA-mode without reconnection of welding cables.

During a pulsed DC- or AC-welding, pulse frequency can be set steplessly between **0,3 and 300 Hz**. The time relation between pulse- and base-current can be set in the range of 20% to 80%.

Using the non-pulsed AC-mode, the operator can change as well the AC-frequency between **30 Hz and 300 Hz** as the balance between positive and negativ half wave from **20% to 80%** in both directions.

On TIG-mode a hot start function which can be steplessly adjusted optimizes the ignition characteristic.

On MMA-mode functions like **Hot-Start** and **Arc-Force** are steplessly adjustable.

TECHNICAL DATA

	Mains voltage	3-phase (V)	400
M	permanent power	(kVA)	7,3
A	permanent current	(A)	10,5
I	Max. current	(A)	14.5
N	Power factor cos phi		0,9
S	Frequency	(Hz)	50/60
	Fuses, slow blow	(A)	16

W	Current range	DC	2-250 A
		AC	5-250 A
E	Duty cycle	TIG	60% at 250 A
		TIG	100% at 200 A
L	Duty cycle	MMA	35% at 250 A
		MMA	60% at 200 A
D		MMA	100% at 190 A
I	10 minutes cycle		
N	Open circuit voltage	AC and DC	90 V DC
G			

C	Dimensions	gascooled	L/W/H	470/270/520
O		watercooled		470/270/730
N	Weight	gascooled	(kg)	30
S		watercooled	(kg)	40
T	Protection class			IP 23
R	Cooling			F
U	Insulation class			F
C	Standards			VDE 0544-1
I				EN 60974-1
O				IEC 974-1
N				

INSTALLATION

1. **ARISTOTIG 250 AC/DC (DTD 250)** is supplied connected for 400 V 50/60 Hz. Mains voltage tolerances are accepted from +10% to -10%. Greater tolerances will lead to a fault indication.

The mains plug must comply to country regulations and must be connected by an electrician. Check the mains voltage before the machine is switched on.

2. The welding cable for MMA and the work return lead for TIG and MMA should have a cross section of at least 35 mm². Check that all cables and connections are correctly fitted.
3. If the trolley (optional), which can carry a gas bottle, is used, always secure the cylinder by the chain.

OPERATION

All controls and connections are located with easy access on the front and back of the machine (see picture 1, page 32).

A: Control functions

1. Green LED`s 1: Lights up, when main switch 16 is set to position "ON"
Lights up, when OCV or welding voltage is supplied to the outlets.
2. Switch TIG/MMA 2: To change the welding mode:
MMA,
TIG 2-stroke
TIG 4-stroke
TIG 4-stroke with manual pulsing (pilot function)
3. Switch Ignition 3: To change type of ignition:
HF-Ignition
Lift-Arc Ignition
4. Switch Pulsing 4: To change the current mode:
Non-pulsed welding
Pulsed welding with straight pulses
Pulsed welding with soft pulses
5. Potentiometer 5: To set the up-slope time from 0-10 seconds
6. Potentiometer 6: To set the welding current on non-pulsed welding or the pulse-current on pulse welding.
7. Potentiometer 7: To set the base-current on pulse welding or that current to which is switched during manual pulsing (pilot function)
8. Potentiometer 8: To set the down-slope time from 0-10 seconds.
9. Potentiometer 9: To set the post-flow time from 0-30 seconds.
10. Polarity switch 10: 5 position switch to select at the electrode:
* AC-welding with a sinus-wave
* AC-welding with square wave

- * DC-welding with straight polarity
- * DC-welding with reverse polarity
- * DC-welding with straight polarity, but with reverse start
This function should only be used on MMA or on TIG-welding with big tungsten diameters and high currents.

11. Potentiometer 11:

This potentiometer fulfills a double function:

- a) To set the pulse frequency from 0,3 to 300 Hz during pulsing
- b) To set the AC-frequency from 30 to 300 Hz during AC-welding (non-pulsed).

12. Potentiometer 12:

This potentiometer also fulfills a double function:

- a) To set the time balance between pulse- and base-current during pulse-welding
- b) To set the AC-balance of positive or negative half wave to achieve either more cleaning or more penetration, during non pulsed AC-welding.

13 Potentiometer 13:

To set the Hot-Start on TIG- and MMA-mode

14. Potentiometer 14:

To set the Arc-Force only on MMA

15. Fault indication 15:

Shows faults as:
Overtemperature of the power supply,
Exceeding the mains voltage tolerances,
No water flow using the water-cooled version (optional).

B: Connections

16. Main switch **16:** To switch the mains supply on or off
In position I the fans are started
with reduced rotation speed and the
machine is ready for operation.
17. OKC-connector Plus **17:** For the connection of the **work-re-**
turn lead or the electrode holder.
18. OKC-connector Minus **18:** For the connection of the **electrode**
holder.
19. TIG central connector **19:** Quick connector for current, gas and
control cable.
20. Socket control cable **20:** To connect the torch control cable
21. Remote control socket **21:** To connect a remote control
22. Gas nipple **22:** To connect shielding gas from the
regulator.
23. Mains cable input **23:**

WELDING

ATTENTION: During stand by, speed of fans is reduced. When igniting an arc rotation speed is automatically increased. This results in an increased noise level during welding. When welding is stopped, and the machine has cooled down, rotation speed is again reduced automatically.

TIG-welding with DC output

- * Check that the TIG-torch and the work return lead are connected correctly.
- * Check that the right thoriated tungsten or lanthanum electrodes are used and that the electrode is ground at an included angle of 40°.
- * Check that there is free air flow through the machine.

Set main switch 16 to position I. LED 1 is illuminated, cooling fan are started with reduced rotation and the machine is ready for operation. On TIG-welding three operation modes are possible:

1. 2-stroke mode,
2. 4-stroke mode
3. 4-stroke mode with manual pulsing, which means, that with short touching of the torch switch a change between two adjustable currents is possible. A torch with a double switch is not a must.

ATTENTION: The choice of automatic pulsing always overrides the choice of manual pulsing.

Set switch 2 to one of the desired positions TIG and the polarity switch 10 to position DC with negative polarity.

Set switch 3 to the desired ignition mode.

Important: To get best ignition, Hot-Start potentiometer 13 must be increased with increased tungsten diameter (2,4 mm tungsten: potentiometer position app. 0.5).

Set switch pulsing 4 to the desired position.
You may weld as well non-pulsed, as pulsed with "hard" pulses as pulsed with "soft" pulses.

The welding current is set by potentiometer 6. Using one of the pulse welding modes this value is the pulse-current, whilst the base current is set by potentiometer 7 in percent of the pulse-current.

If a pulsed process has been set, you can now adjust by potentiometer 11 the pulse frequency and the time balance between pulse and base current by potentiometer 12.

By potentiometers 5, 8 and 9 you can set up-slope time, down-slope time and gas post flow time.

Using a foot remote control, it is plugged into socket 21 and switch 2 is set to position 2-stroke.
Now you may control welding by the remote control completely.

A hand remote control can be used in any position of switch 2. This allows a stepless current control during TIG and MMA welding. Start and Stop of TIG-welding is controlled by torch switch.

WELDING

ATTENTION: During stand by, speed of fans is reduced. When igniting an arc, rotation speed is automatically increased. This results in an increased noise level during welding. When welding is stopped, and the machine has cooled down, rotation speed is again reduced automatically.

TIG-welding with AC output

- * Check that the TIG torch and the work return lead are connected correctly.
- * Check that a pure tungsten electrode is used and that the electrode is ground at an included angle of 90°.
- * Check that there is free air flow through the machine.

The setting procedure for torch switch function and the mode of ignition is the same as for DC-welding.

Important: To get best ignition, Hot-Start potentiometer 13 must be increased with increased tungsten diameter (2,4 mm tungsten: potentiometer position app. 0.5).

Please note, that, if you are setting the switch Pulsing 4 to one of the pulsing modes, the possibility of setting the AC-frequency and the balance control is out of function.

Potentiometer 11 is now used to set the pulse frequency and potentiometer 12 to set the time balance between pulse time and background time.

If you are choosing the non-pulsed AC-welding by switch 4, potentiometer 11 may be used to set the AC-frequency and potentiometer 12 to set the balance between positive and negative half-wave.

The AC-frequency is steplessly adjustable from 1 Hz to 300 Hz; the balance from 20% to 80% as well in positive as in negative direction.

An increased AC-frequency results in a most stable arc in low currents for welding extreme thin material.

The variation of the balance gives an increased cleaning in the positive direction and increased penetration in the negative direction.

By polarity switch 10 two different types of AC can be set:

1. A kind of sinus half waves, resulting in a soft arc and a reduced emission of noise.
2. A square wave AC, resulting in an arc, which is hard and stable but giving more noise emission.

Please note, that the arc is always ignited by a low DC-current, which is automatically switched to AC by the AC-module.

When the torch trigger or the foot remote control is depressed without striking an arc, HF and open circuit voltage is switched off automatically after a short time.

This **SAFETY CUT-OUT** is also effective when arc interruptions occur.

Benefits: no uncontrolled arc-striking
 no material damage
 no dissipation of shielding gas

MMA-WELDING

Stick electrodes can be welded as well with DC as AC.

Electrode holder and work return lead are connected to the OKC sockets 17 and 18 marked accordingly.

The switch **TIG/MMA 2** must be brought into **position MMA**. The LED 1 for the open circuit voltage is illuminated to show, that there is OCV at the outlets.

ATTENTION: When switching from **TIG** to **MMA**, the reduced stand by speed of the fans is automatically increased. This results in an increased level of noise while choosing MMA-process.

By **potentiometer 6** the desired amperage can be set.

Potentiometer 13 for setting the **Hot-start** and **potentiometer 14** for setting the **Arc-force** are now in function.

According to electrode type to be welded, either DC straight polarity or DC reverse polarity or AC can be selected by **polarity switch 10** without any reconnection of cables.

**IMPORTANT: Never lay down the electrode holder un-
isolated or with a stick still clamped**

**Disconnect electrode holder while
welding TIG.**

Advices for welding

Aristotig 250 AC/DC (DTD 250) offers a huge variety of settings as well in handling of the machine as in welding parameters. The following discusses those functions and parameters, which cannot be assumed that everyone knows about.

1. Pilot function

In this position of switch TIG/MMA2 it is possible to alternate between two preset current levels without extinguishing the arc just by operating the torch trigger (s. figure 1).

The process is started as with normal 4-stroke function. When up-slope is finished, the current reaches the value preset at potentiometer 6. By pressing and releasing the torch trigger for a short time (<0,5 s) the amperage alternates without slope to the value preset with potentiometer 7. Another short operation of the trigger changes the current again to the higher setting.

By pressing the torch trigger longer than 1 s, the down-slope is started and the weld will be finished. Down-slope may be started from both of the current levels. Please note, that the choice of automatic pulsing always overrides the pilot function.

2. Automatic pulsing

The amperage alternates periodically between a upper and a lower level (s. figure 2, 3 and 4).

Advantages:

- lower heat input and distortion,
- greater tolerances in edge preparation,
- regular penetration,
- easier position welding,
- less grain coarsening in weld material and the transition zones,
- good bridging in root passes,
- most stable and constricted arc at high frequencies and low currents.

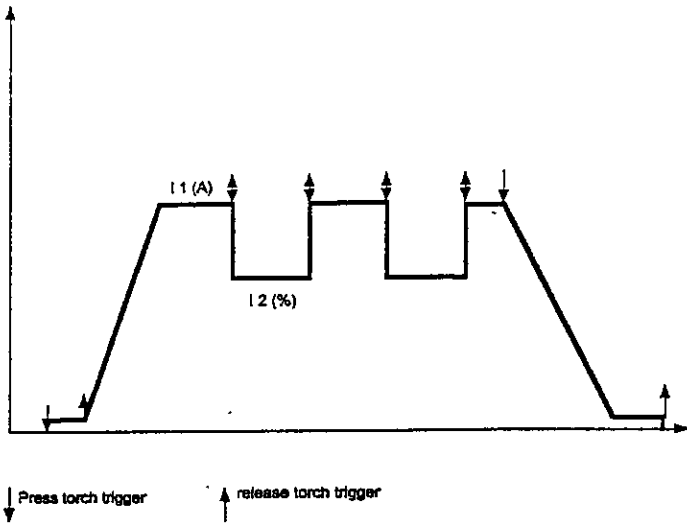


Figure 1: Pilot Function

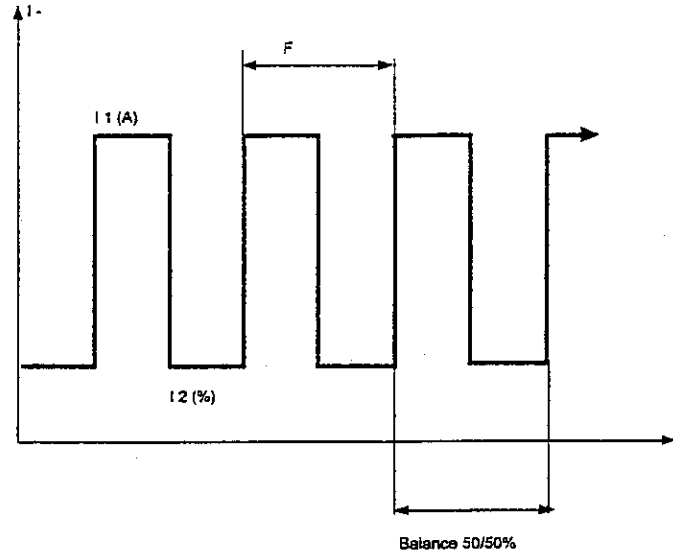


Figure 2: Pulsing DC hard

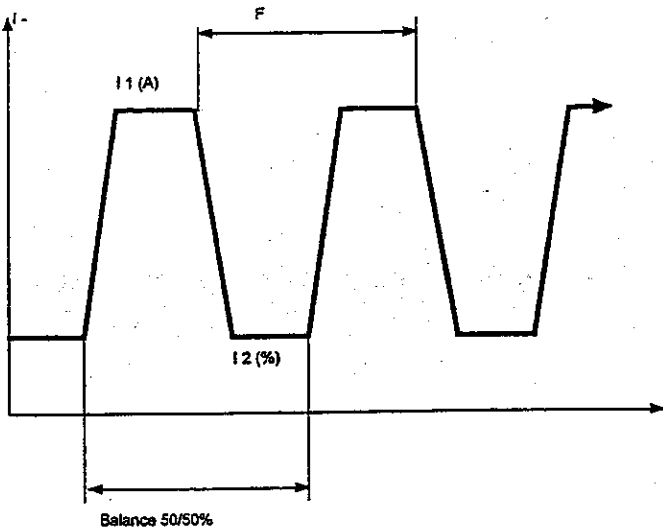
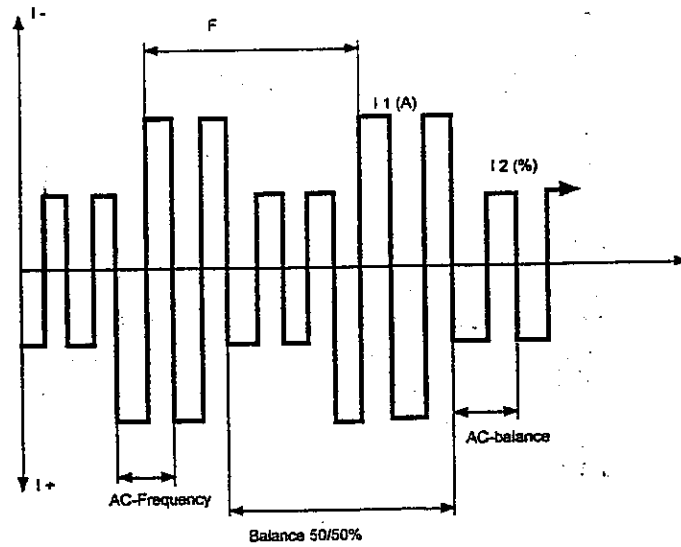


Figure 3: Pulsing DC soft



Pulsing AC

Pulse frequency F: variable 0,3-300Hz
 Pulse balance: variable 20-80%
 AC-Frequency: fixed to 100 Hz
 AC-balance: fixed to 50/50%

Figure 4:

DTD 250 offers two pulse shapes:

1. Straight, rectangular pulses (s. figure 2)

These pulses result in a stable, hard and driving arc, putting relative high pressure to the pool and increasing penetration. The arc's pressure increases with increasing frequency, increasing difference in pulse- and base-current and increasing pulse-balance.

2. Soft, trapeziform pulses (s. figure 3)

Due to the sloping change between pulse- and base-current, the arc is soft and tolerant with a low pressure on the weld pool, reducing the risk of break-through in thin sheet metal and the penetration depth.

To utilize the a. m. advantages extensively, the parameters pulse-current, base-current, pulse balance and the travel speed must be optimized for every application.

Pulse frequency can be set by potentiometer 11 between 0,3 and 300 Hz, pulse balance, the time relation between pulse- and base-current, by potentiometer 12 between 80 % and 20 % steplessly.

Pulsing can also be used in the AC-mode. Then the AC-frequency is automatically fixed to 100 Hz and AC-balance to 50/50 % (s. figure 4).

Pulse frequency and pulse-balance can be set as mentioned above by potis 11 and 12.

Stick-electrodes can be welded in the pulsed mode too.

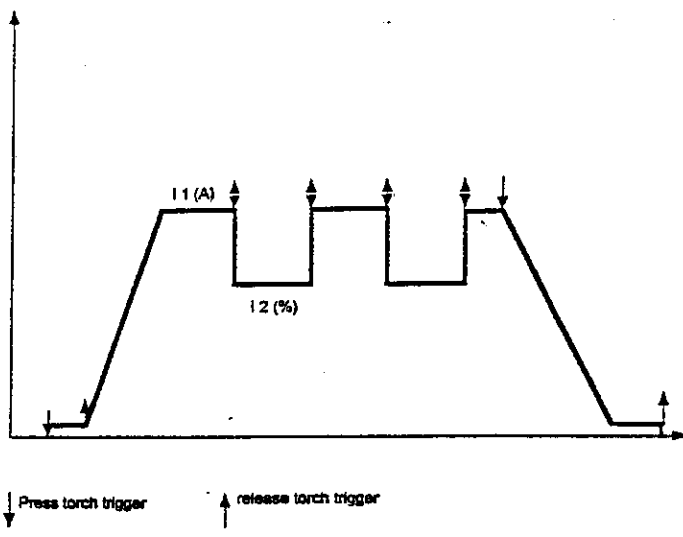


Figure 1: Pilot Function

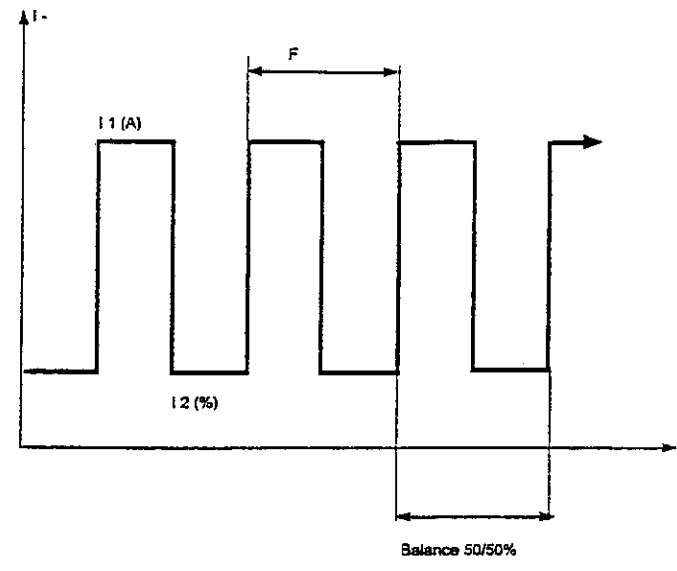


Figure 2: Pulsing DC hard

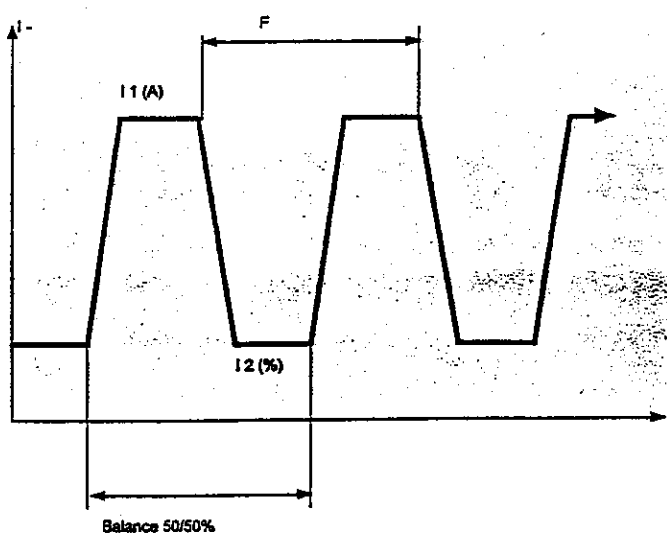


Figure 3: Pulsing DC soft

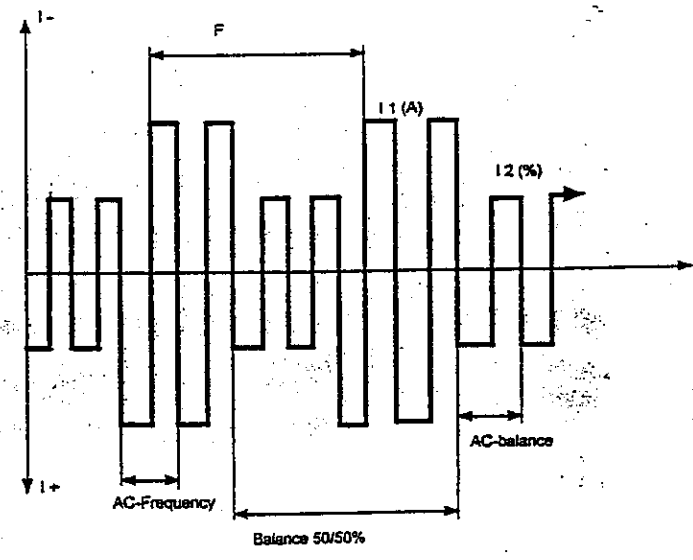


Figure 4: Pulsing AC
 Pulse frequency F: variable 0,3-300Hz
 Pulse balance : variable 20-80%
 AC-Frequency : fixed to 100 Hz
 AC-balance: fixed to 50/50%

3. AC-TIG-welding

DTD 250 AC/DC allows the AC-welding with either:

- true square wave (s. figure 5) or
 - square wave with rounded transitions (Sinus-wave) (s. figure 6) and
 - variable AC-frequency (30 - 300 Hz) as well as
 - variable AC-balance (20 - 80 %)
- by the polarity switch 10 and potentiometers 11 and 12.

Due to the rapid zero-crossing during the polarity change in both kinds of AC-waves, ionisation of the arc is maintained and the arc is reignited spontaneously without any HF-support.

Together with both of the two shapes of AC-waves, the variable balance and the variable frequency, DTD 250 enables optimized setting for any AC-application. The choice of the square wave results in a hard and stable arc whose noise level may be felt uncomfortable mainly in the upper frequency range.

The sinus-wave offers a softer arc with reduced noise level. An increased AC-frequency constricts the current path of the arc, by this the penetration and allows higher travel speeds. But in the range of maximum frequency difficulties in arc striking may be expected.

AC-frequencies in the lower range (30 - 50 Hz) result in soft arcs with comfortable noise, good arc-striking and stable processes even with lowest amperage.

The AC-balance changes the relation between the positive and the negative half-wave. An expansion of the negative half-wave increases the energy input at the workpiece and the penetration. The tungsten electrode stays cooler and the cleaning effect is reduced. The "cool" tungsten stays sharp-edged and the arc is concentrated at the tip and stable.

An enlargement of the positive half-wave increases cleaning (oxide break-up) reduces the penetration and may end in an overloaded tungsten electrode.

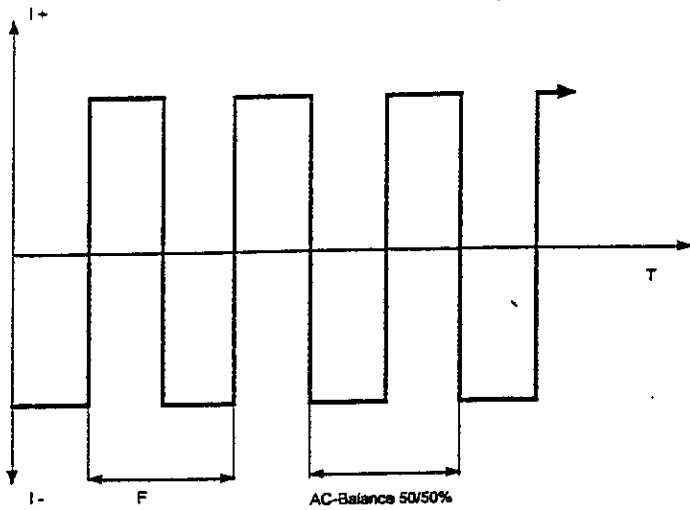


Figure 5: Square Wave

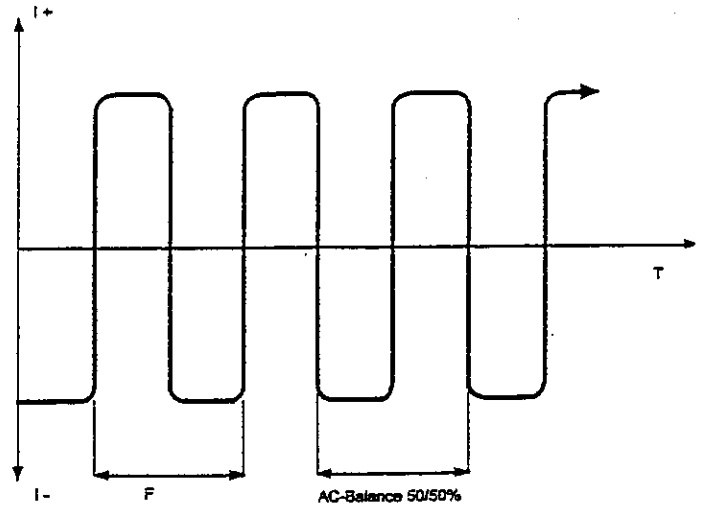


Figure 6: Sinus Wave

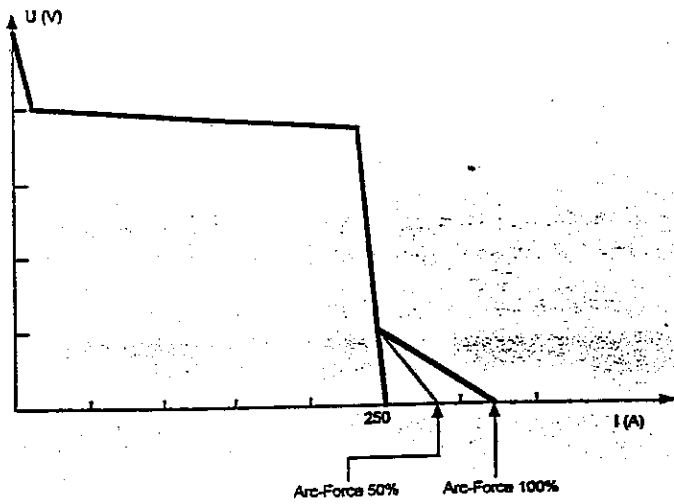


Figure 7: Arc-Force

4. Arc-Force

This function is set by potentiometer 14 and only active during MMA-welding. Arc-force monitors the metal transfer and produces a short current elevation when a short circuit between electrode and weld pool is detected. This current surge destroys the short circuit bridge (s. figure 7).

An optimized setting of Arc-force leads to perfect welding processes even with difficult kinds of stick-electrodes.

5. Hot-Start

To optimize the arc ignition as well in TIG- as in MMA-welding, hot-start can be controlled by potentiometer 13.

The hot-start procedure consists out of a hot-start current and a hot-start time which work together in a different way in TIG-AC- and MMA-welding.

1. TIG-DC:

Here the hot-start current is internally fixed to 100 A with negative polarity. This current focusses the arc to the tungsten's tip. Depending on the diameter of the tungsten, hot-start i.e. the time of the hot-start current, can be varied by poti 13 between 10 and 100 ms.

Internally it is possible to adjust hot-start current from 50 A to 200 A by a trimmer.

2. TIG-AC:

Here the hot-start current is fixed internally to 100 A with positive polarity. The positive current heats the tungsten electrode in that way that a trouble-free polarity change will take place when switching to the AC-process.

The hot-start time can also be adjusted by potentiometer 13 between 10 and 100 ms.

3. MMA:

Here the hot-start current is set automatically in its height and polarity depending on the welding current. Up to 125 A hot-start current will be 2 x welding current. Above 125 A it is fixed to 250 A.

The hot-start time is again adjustable by potentiometer 13 between 200 and 2000 ms.

Note: In TIG-welding after the hot-start the current is set to the base current, before the up-slope is started. The base current varies with the welding current in the following way:

base current = welding current up to 35 A
base current = welding current/2 above 35 A

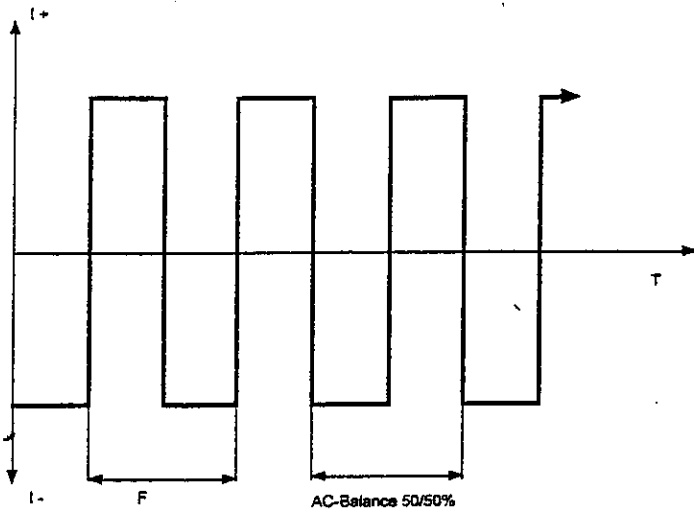


Figure 5: Square Wave

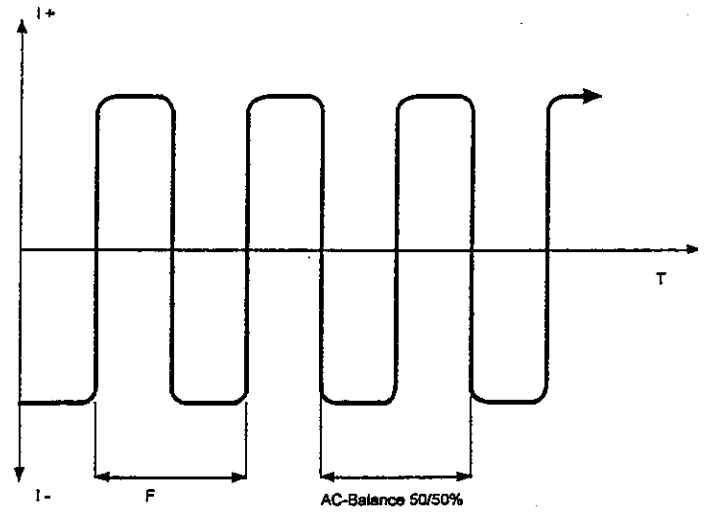


Figure 6: Sinus Wave

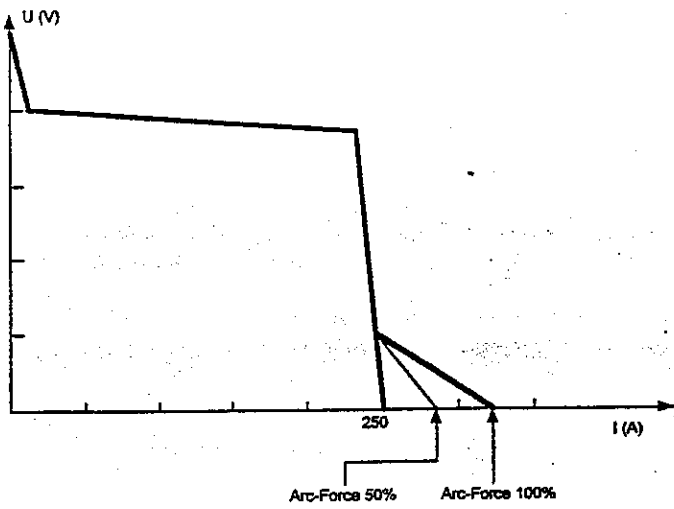


Figure 7: Arc-Force

Selecting the size of electrode

Electrode-diameter mm	Tungsten Amp. AC	Lanthan- alloyed Amp. AC	Thorium- alloyed Amp. DC
0,5	5 - 15	5 - 20	5 - 20
1,0	10 - 60	15 - 80	20 - 80
1,6	50 -100	70 -150	80 -150
2,4	100-160	110-180	120-220
3,2	130-180	150-200	200-300
4,0	180-230	180-250	250-400

MAINTENANCE

This welding equipment has been designed, manufactured and tested to the highest quality standards to ensure long and trouble free life. However, regular maintenance is an essential part of keeping the machine operating in a reliable and safe manner. Your attention is drawn to any maintenance instruction that is contained in this manual.

In general, all welding equipment should be thoroughly inspected, tested and serviced at least annually. More of frequent checking will be required when the machine is heavily used.

Wear and tear, particularly in electro-mechanical and moving components, are gradual processes. Caught in time, repair costs are low and the benefits in performance, reliability and safety are significant. Left alone they can put the equipment and you at risk.

Have this equipment regularly inspected and maintained by an approved service centre.

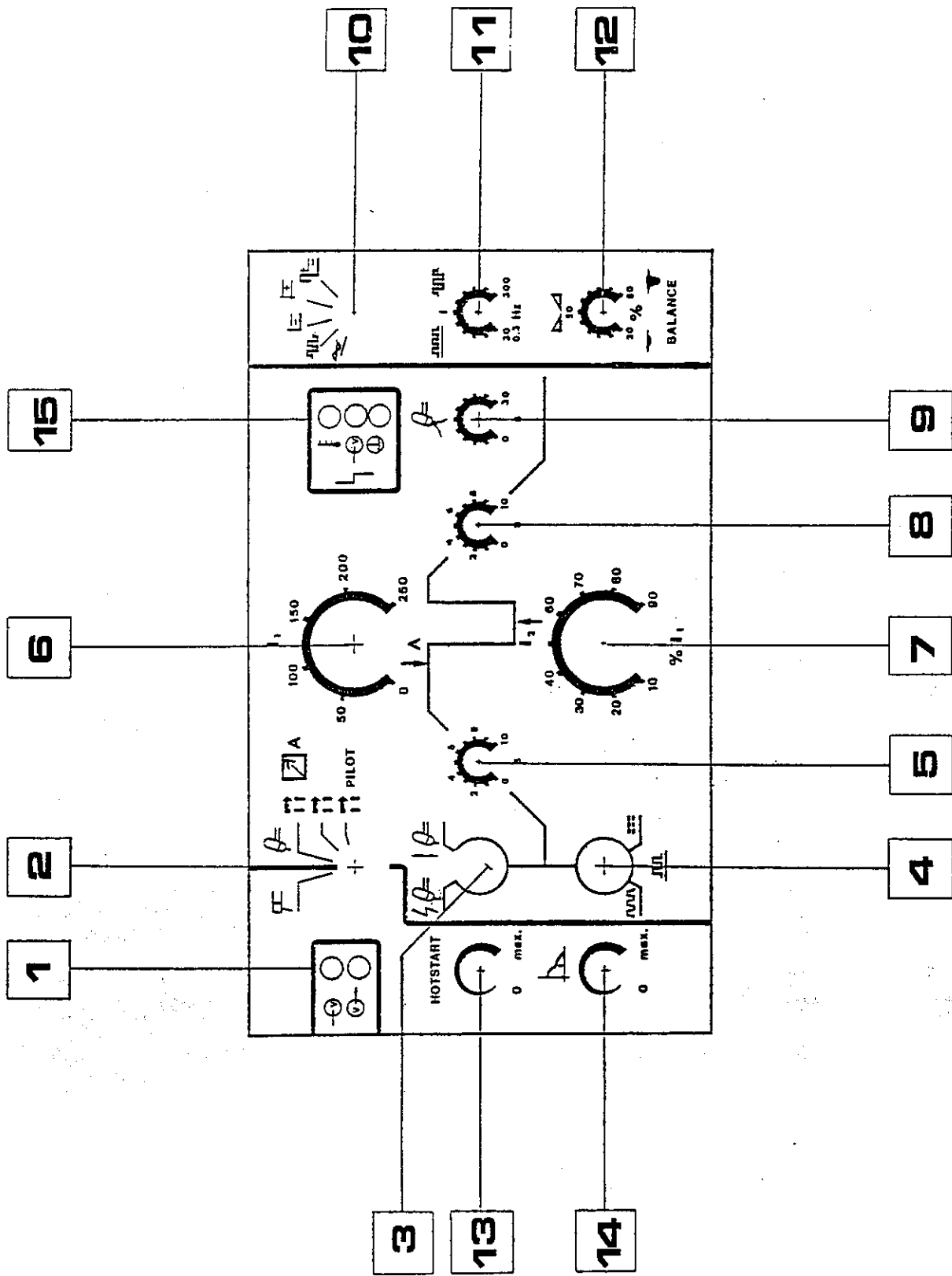
ACCESSORIES

1. Watercooler

The machine can be delivered in a water-cooled version too. The water-cooler, which is placed underneath the power supply can also be fitted to a gas-cooled machine later. To do that, only the water cooler itself is needed.

The water cooler is equipped with a powerful pump, a tank holding 3 litres, a high efficient heat exchanger, two fans and a flow guard.

Please be sure, that always a sufficient amount of frost-resistant fluid is filled in.

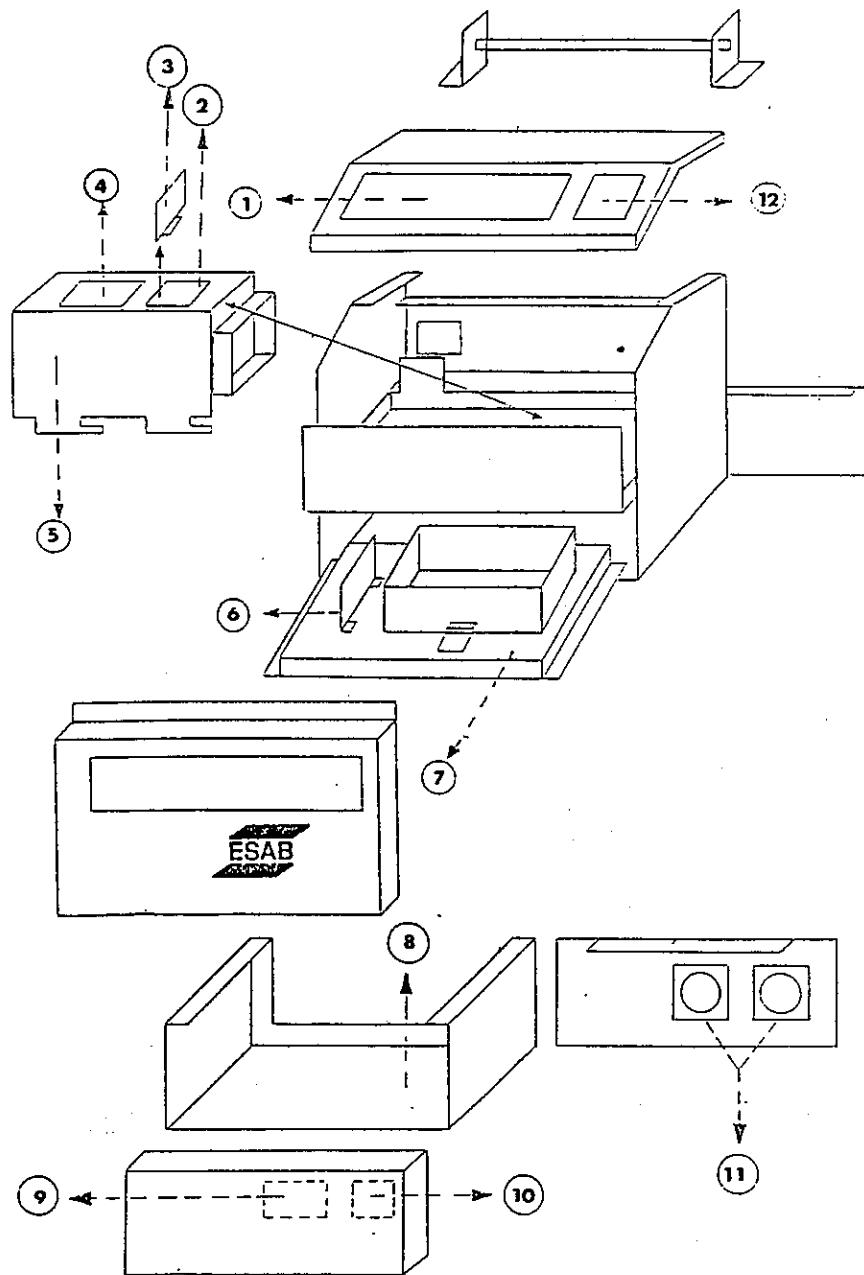




Exchange parts list

Austauschteile-Verzeichnis

Denomination/Bezeichnung	GIN-No.:
1. Adjust PCB Einstelleinheit	0 301 005 090
2. Controller PCB PREW Prozeßsteuerung PREW	0 301 005 097
3. Analog Support PCB ASUP Platine Analog Support ASUP	0 301 005 098
4. Control PCB PMST Platine PMST	0 301 005 136
5. DC-Power block DC-Leistungsteil	0 301 005 138
6. Control PCB KOMM Platine KOMM	0 301 005 137
7. AC-Power block AC-Leistungsteil	0 301 005 139
8. Water cooler Wasserkühler	0 301 005 140



Spare parts list DTD 250

Ersatzteilverzeichnis DTD 250

Denomination/Bezeichnung	GIN-No.:
# Main switch Hauptschalter	0 301 005 113
# Gas valve Magnetventil	0 301 005 142
# Remote control socket PCB Platine Fernregleranschluß	0 301 005 091
# Fan DC-block Lüfter DC-Block	0 301 005 021
# Handling knob "small" "kleiner" Drehknopf	0 301 005 143
# Handling knob "middle" "mittlerer" Drehknopf	0 467 622 001
# Handling knob "big" "großer" Drehknopf	0 301 005 144

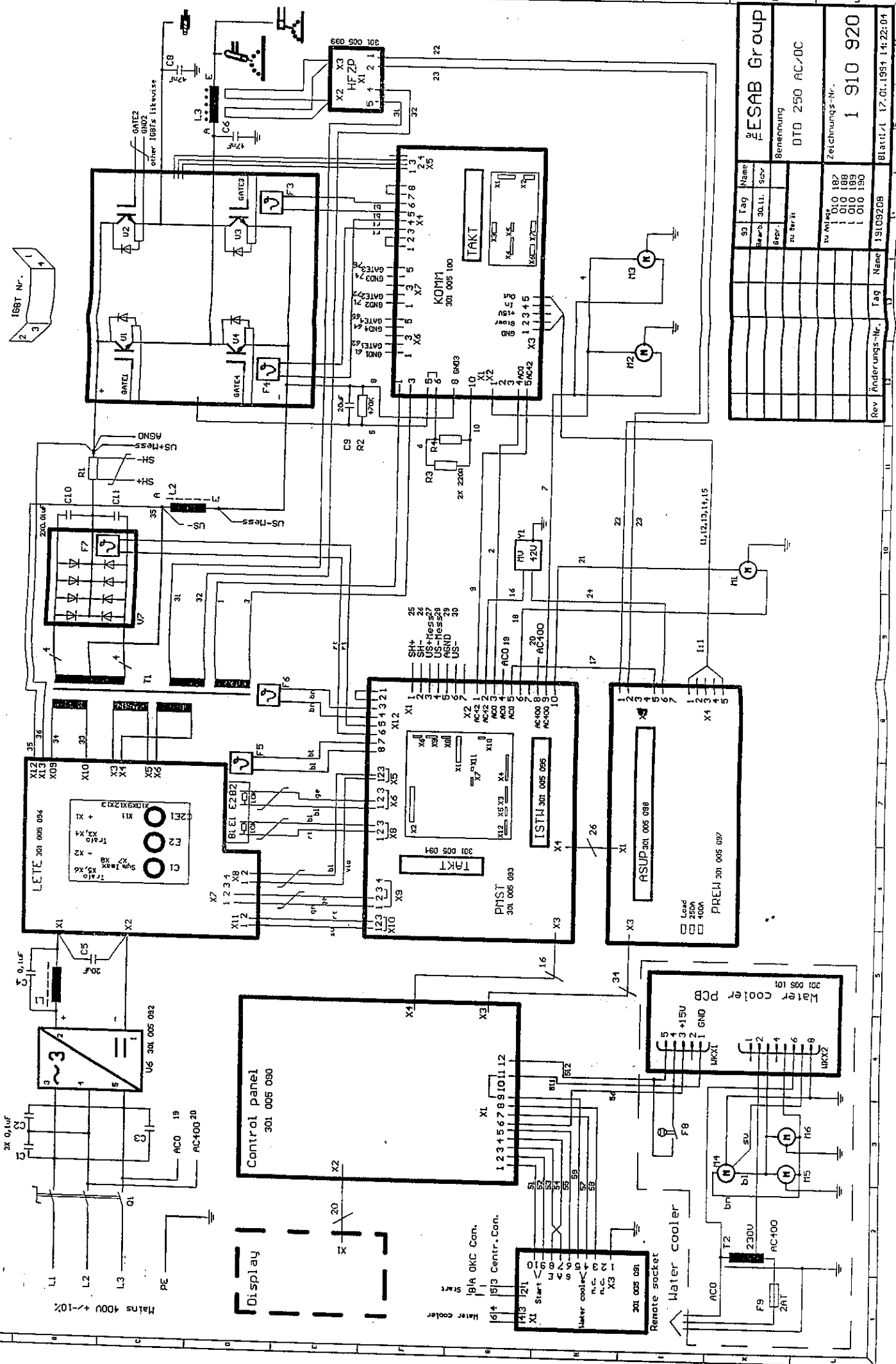
Spare parts list Water cooler

Ersatzteilverzeichnis Wasserkühler

Denomination/Bezeichnung	GIN-No.:
# Water cooler complete Wasserkühler komplett	0 301 005 140
# Pump 230 V 50/60 Hz Pumpe 230 V 50/60 Hz	0 301 005 106
# Flow switch Strömungswächter	0 467 771 001
# Water cooler PCB Platine Wasserkühler	0 301 005 101
# Control transformer watercooler Steuertrafo Wasserkühler	0 301 005 109

#	Water tank 3,5 l Wassertank 3,5 l	0 301 005 141
#	Heat exchanger Wärmetauscher	0 301 005 107
#	Fan Lüfter	0 467 621 001
#	Filling pipe Einfüllstutzen	0 368 568 001
#	Cover filling pipe Deckel Einfüllstutzen	0 369 241 001
#	Quick release connection red Schnellkupplung rot	0 467 856 001
#	Quick release connection blue Schnellkupplung blau	0 467 855 001
#	Fuse 2 A slow blow 5 x 30 Sicherung 2 AT 5 x 30	0 301 005 069

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Benennung DTD 250 AC/DC			
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Rev.	Änderungs-Nr.	Tag	Name
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