

**Service Manual**  
**MicorMIG**

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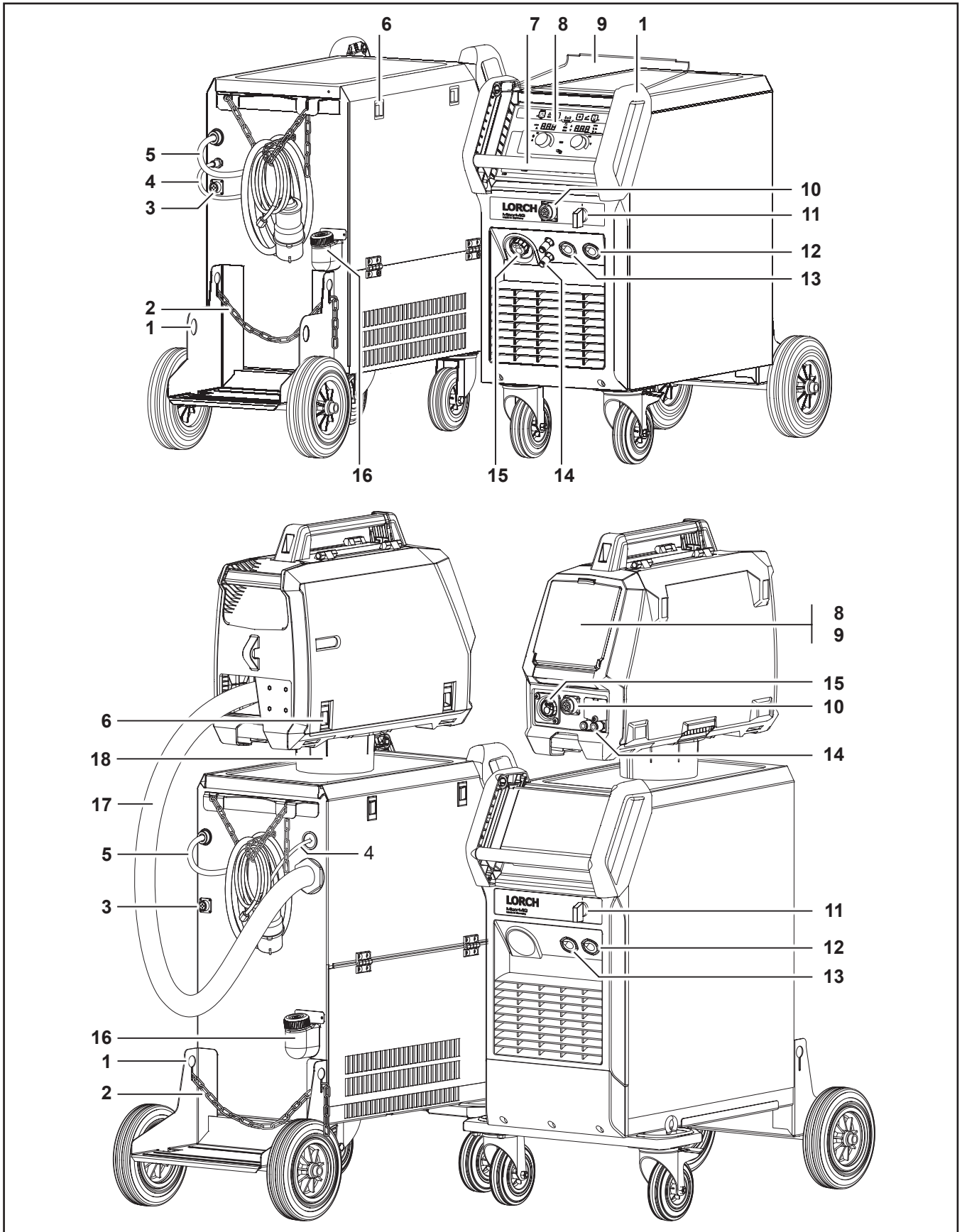
Document no. 909.2130.1-10

Issue date: 03.11.2020

## Machine elements

1	Hoisting point	10	Torch socket/digital push pull (optional)
2	Chain	11	Main switch
3	Diagnostics connection socket (internal bus)	12	Minus socket for ground cable (MIGMAG, MMA), electrode holder (MMA), torch (TIG)
4	Inert gas hose	13	Plus socket for ground cable (MMA, TIG), electrode holder (MMA),
5	Mains cable	14	Coolant supply line and return line (optional)
6	Lock, side part, wire feed	15	Central bush
7	Hand grip	16	Coolant filling nozzle (optional)
8	Control panel	17	Interpass hose package
9	Protective cover, operating console	18	Rotary bearing

# Machine



# Safety precautions

## Requirement

**Use and maintenance of welding and cutting machines can be dangerous. Please draw user's attention to follow the safety precautions to avoid injuries. Welding and cutting machines must be used appropriately and only by qualified/trained staff. Please follow safety regulations and use safety precautions in order to prevent accident when working with these machines.**

Only qualified workers who are knowledgeable and have been trained to work safely with test instruments and equipment on energized circuits shall be permitted to perform testing work on electrical circuits or equipment where there is danger of injury from accidental contact with energized parts or improper use of the test instruments and equipment.

Use only original spare parts

Replace immediately any components that are not in perfect condition.

## Norms

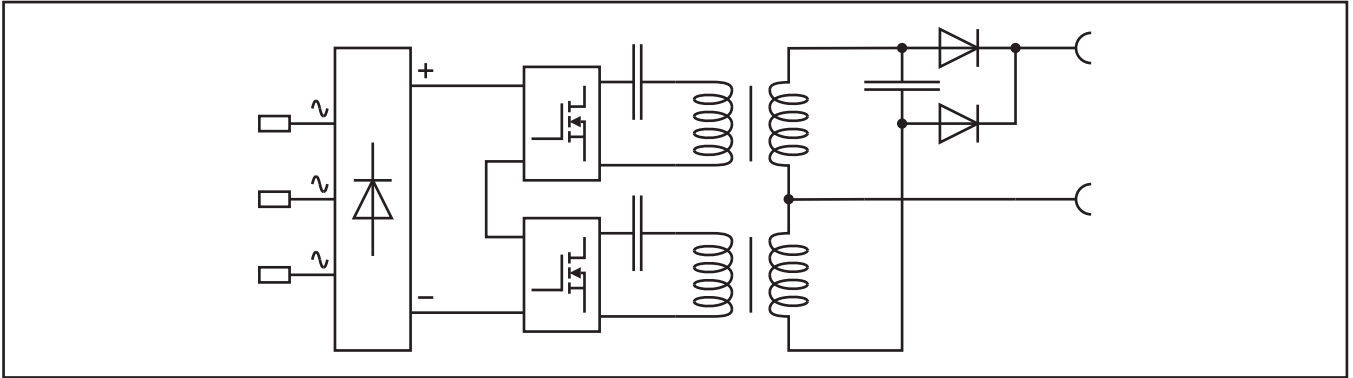
IEC 60974-4                      In-service inspection and testing

## Testing Lorch machines according to IEC 60974-4

- it is not necessary to disconnect any components of the power unit for the test
- it is recommended to disconnect the torch at water cooled machines
- the machine has to be cleaned properly before the test
- switch to MMA mode (stick electrode) if possible

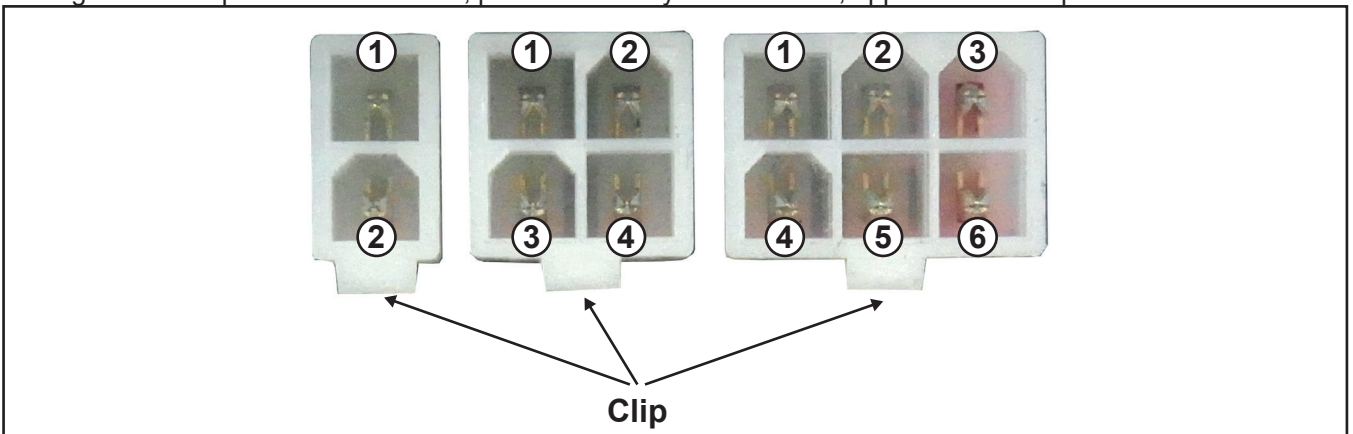
## The MicorBoost Inverter Principle

A welding inverter is an electronically controlled welding power source. At conventional transformer based machines, the mains voltage with 50/60 Hz is directly switched to the welding transformer. At a welding inverter the mains voltage is rectified first and with electronic power switches (MOSFETs or IGBTs) chopped into a much higher frequency, to drive the transformer. At conventional inverters this is a fixed frequency (e.g. 80kHz) at MICOR machines the frequency is variable (up to 200kHz), because the frequency is also used for controlling the welding process. Driving the transformer, the primary side is a series resonant circuit (primary transformer coil in series with a capacitor) and the secondary side is a parallel resonant circuit, so that the control has an additional influence on the output voltage by shifting the frequency. With this principle an almost ideal output characteristic can be realized.



## Counting pins for Minifit and Microfit connectors

The way of reading the pin numbers on the Minifit- and Microfit-connectors is done always in the same way: when looking from the top onto the connector, pin no.1 is always on the far left, opposite to the clip.



# Common Functions

## Gas test

- press key A14
- the gas test LED is lit
- the solenoid valve is switched on for 30 seconds
- press key A14 again to switch off the valve manually

## Fan test

When switching on the machine at the on/off switch, the fans are activated for a short time during initialisation.

## Water pump test

Basic/BasicPlus:

- press key A2 and keep it pressed for about 5 seconds (menu machine configuration)
- select menu item "CoL" with the left encoder
- with the setting "on" the water pump runs continuously
- with the setting "Aut" the water cooling runs in automatic mode (factory setting)

ControlPro:

- select menu item M4 Settings
- select Menu item M4-3 Mode cooling unit
- selection "On" the water pump is running continuously
- selection "Auto" the water pump runs in automatic mode (factory setting)
- press knob A49 to confirm the new selection

## Front panel test

- press keys A2 and A14 at the same time
- all LEDs are on

## Master reset

Basic/BasicPlus:

- switch off the machine
- press key A2 and keep it pressed
- switch on the machine with the key pressed
- release key A2
- select parameter "rSt" with the left encoder
- press key "Save"

ControlPro:

- switch off the machine
- press and hold menu key A50
- switch on the machine with the key pressed
- release menu key A50
- select parameter "Masterreset" with knob A49
- press knob A49 to confirm

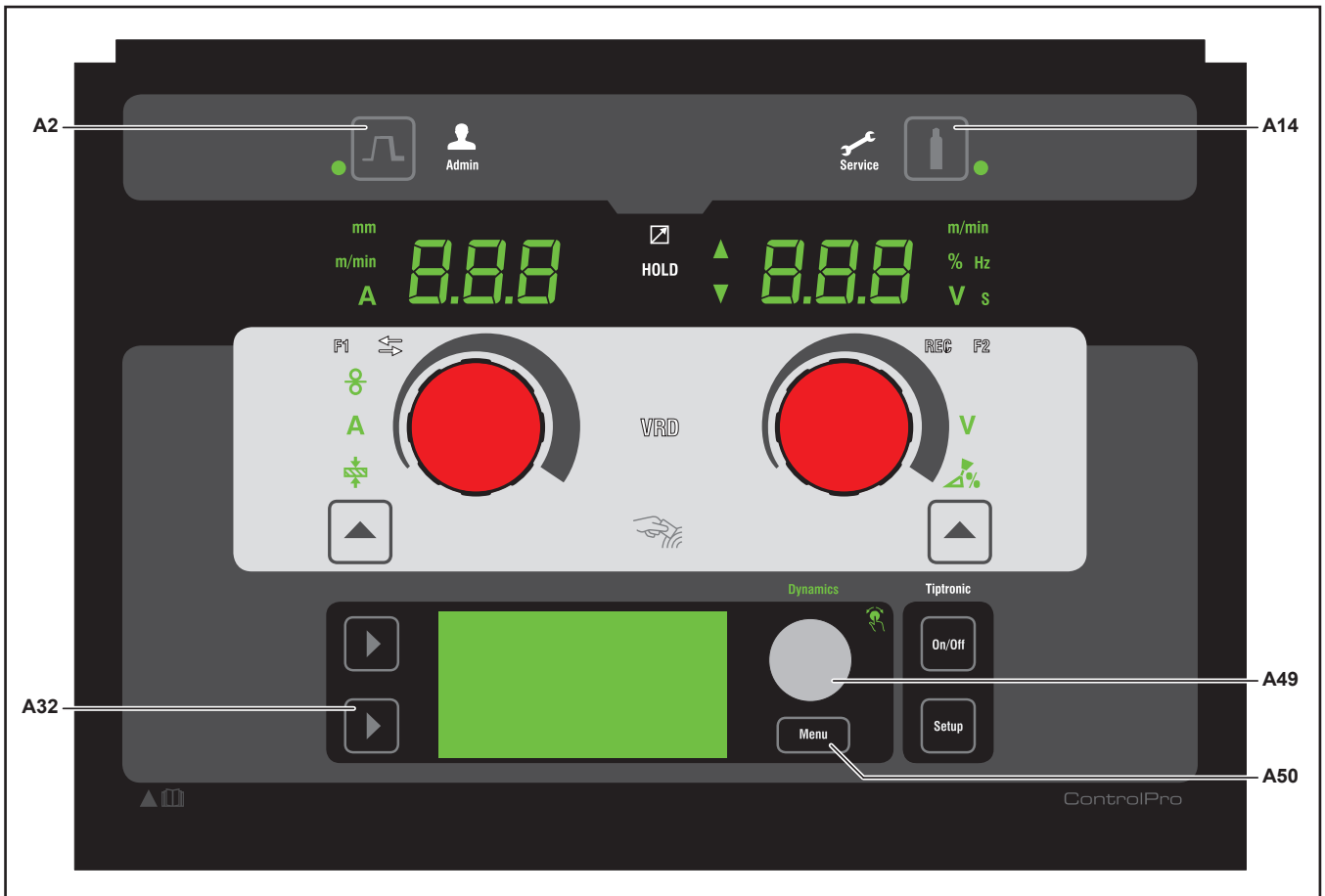
Since software version 2.02, the start-menu can also be accessed without switching off the machine:

- press and hold the keys A2 and A32
- after about 3 seconds the start-menu is displayed
- select "rSt" (BasicPlus) or "Masterreset" (ControlPro)
- press key A14 "Save" (BasicPlus) or press knob A49 (ControlPro) to confirm

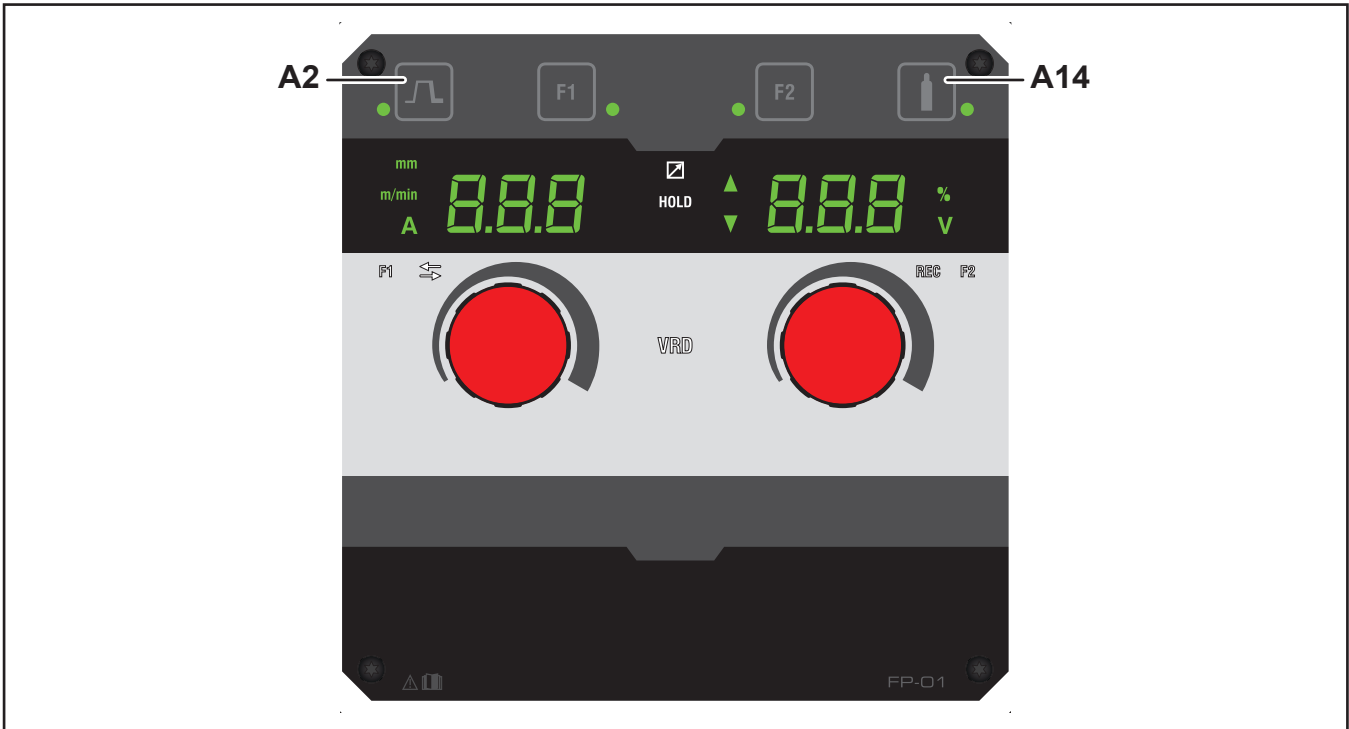
## Front panel MicorMIG BasicPlus



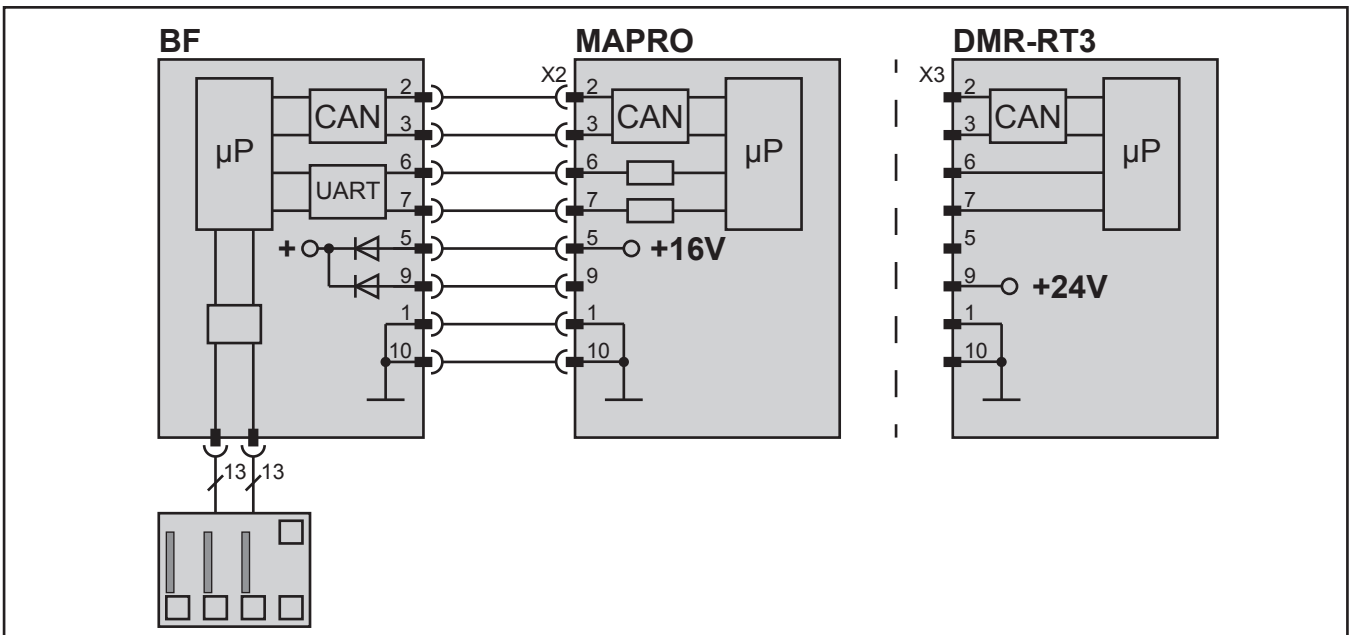
## Front panel MicorMIG ControlPro



## Front panel MicorMIG Feeder Panel



## Schematic

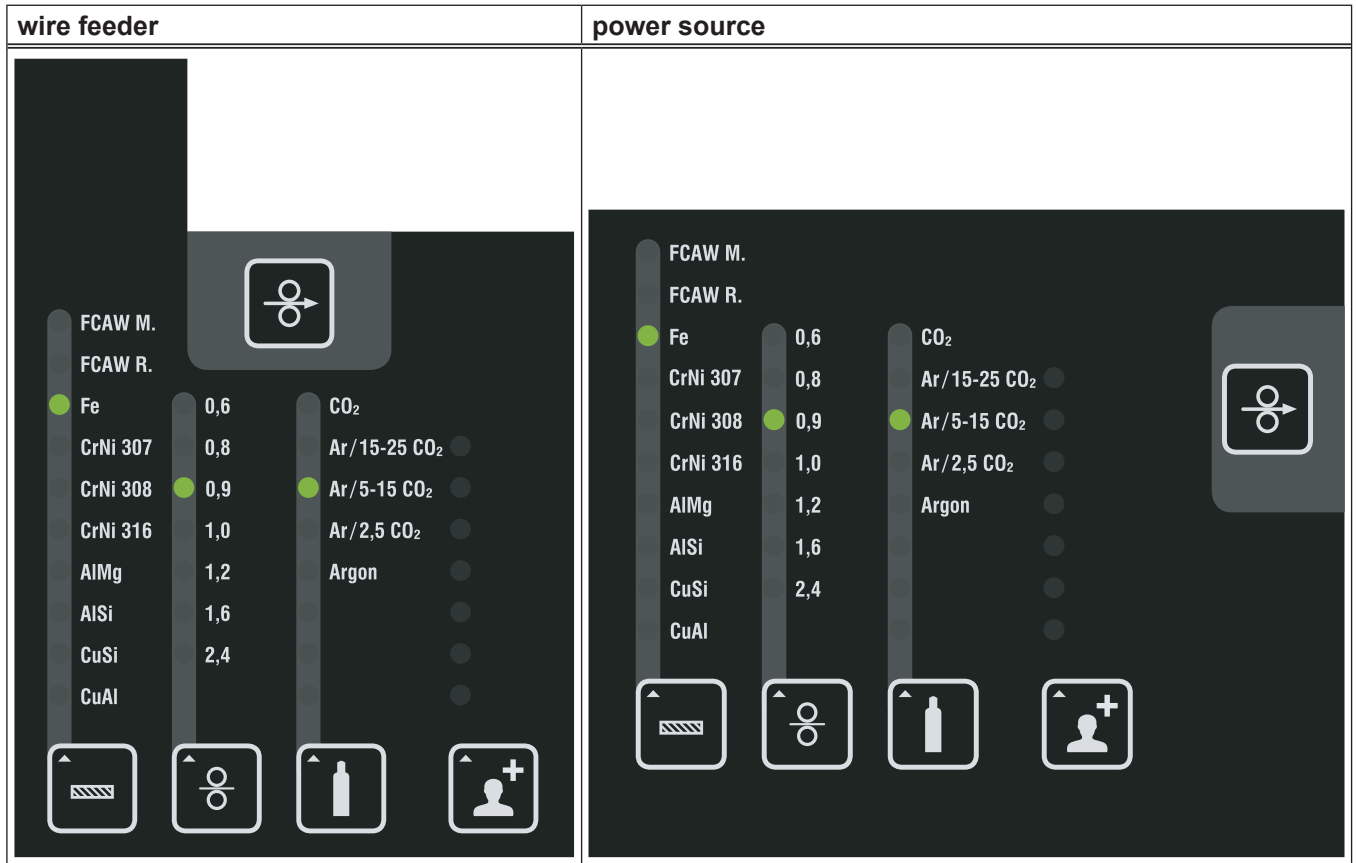


At compact machines the front panel is directly connected to the MAPRO. At a wire feeder MF08 the front panel is connected to the DMR-RT3. All front panels are designed for a supply voltage range of 15V to 24V DC. The data communication is done via CAN-bus only (pins 2 and 3 of the flat ribbon cable). The serial interface wires (UART on pins 6 and 7) are only used for programming the microprocessor (front panel software update).

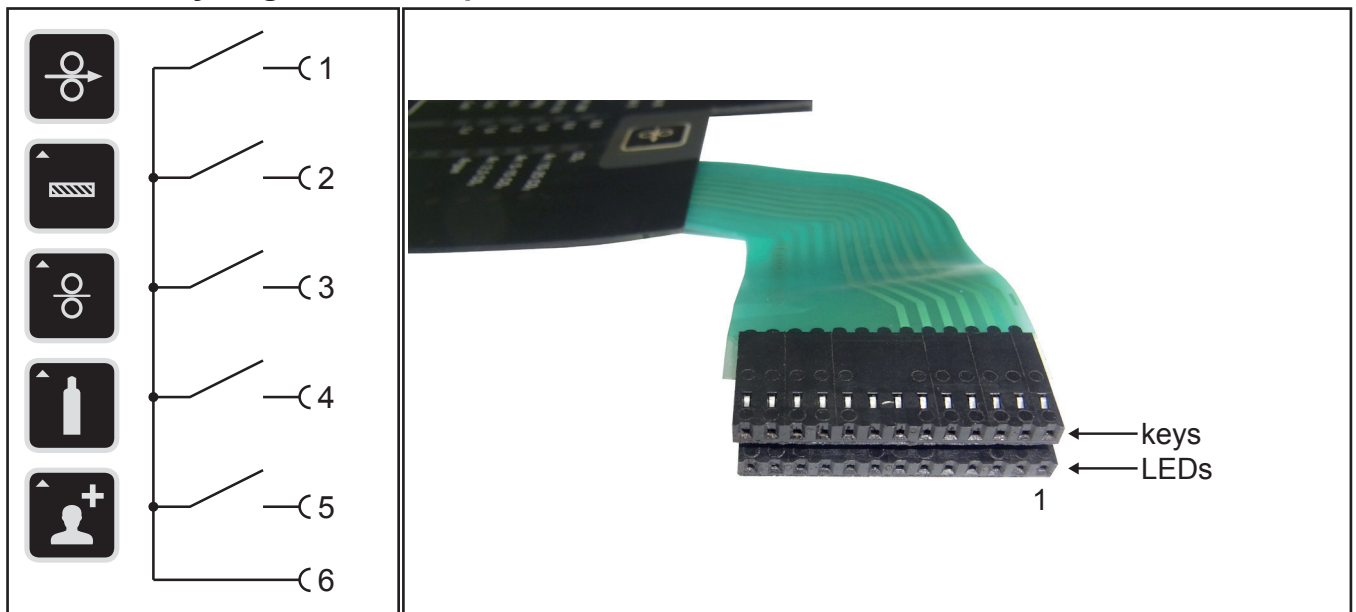


## Synergic selection panel

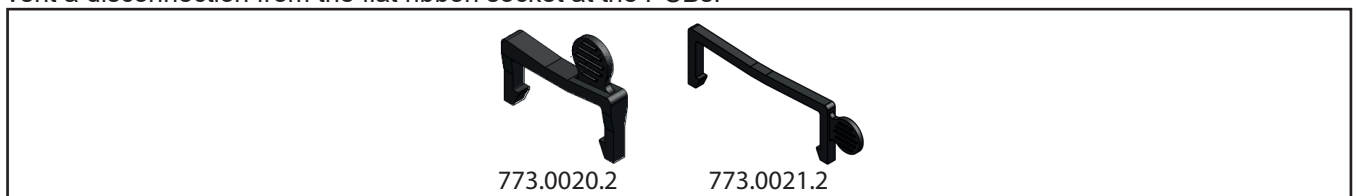
Since week 24 of 2018 new welding programs have been added to the new software version 2.12 including new materials and 0.9mm wire. Thus the synergic selection panel were changed also.



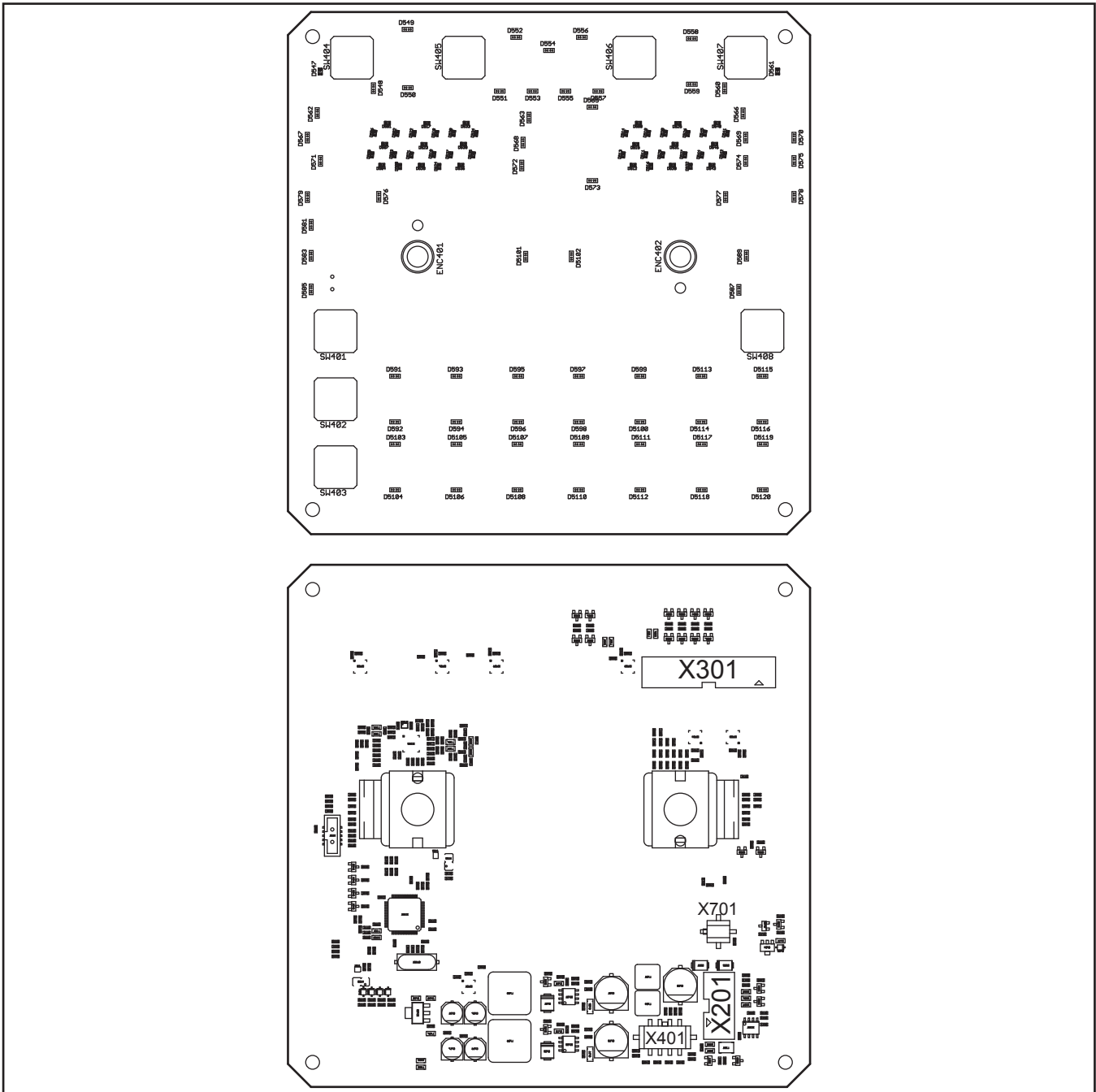
## Schematic synergic selection panel



Since May 2017 there are locking clips available to keep the flat ribbon cables fixed at the front panels and prevent a disconnection from the flat ribbon socket at the PCBs.

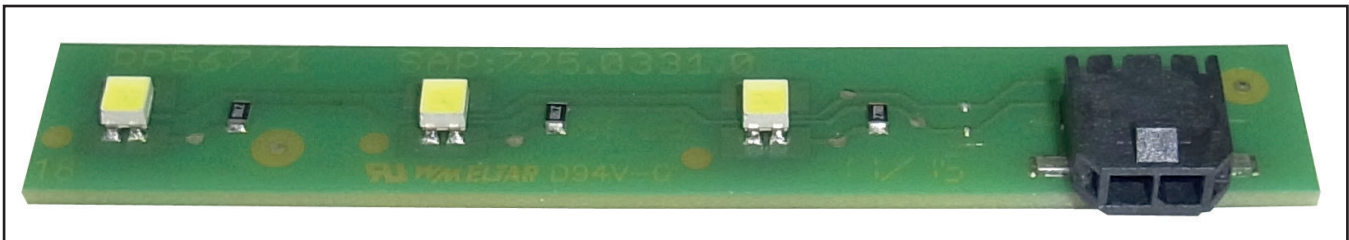


## Picture pc-board BF07 (Basic Plus wire feeder)



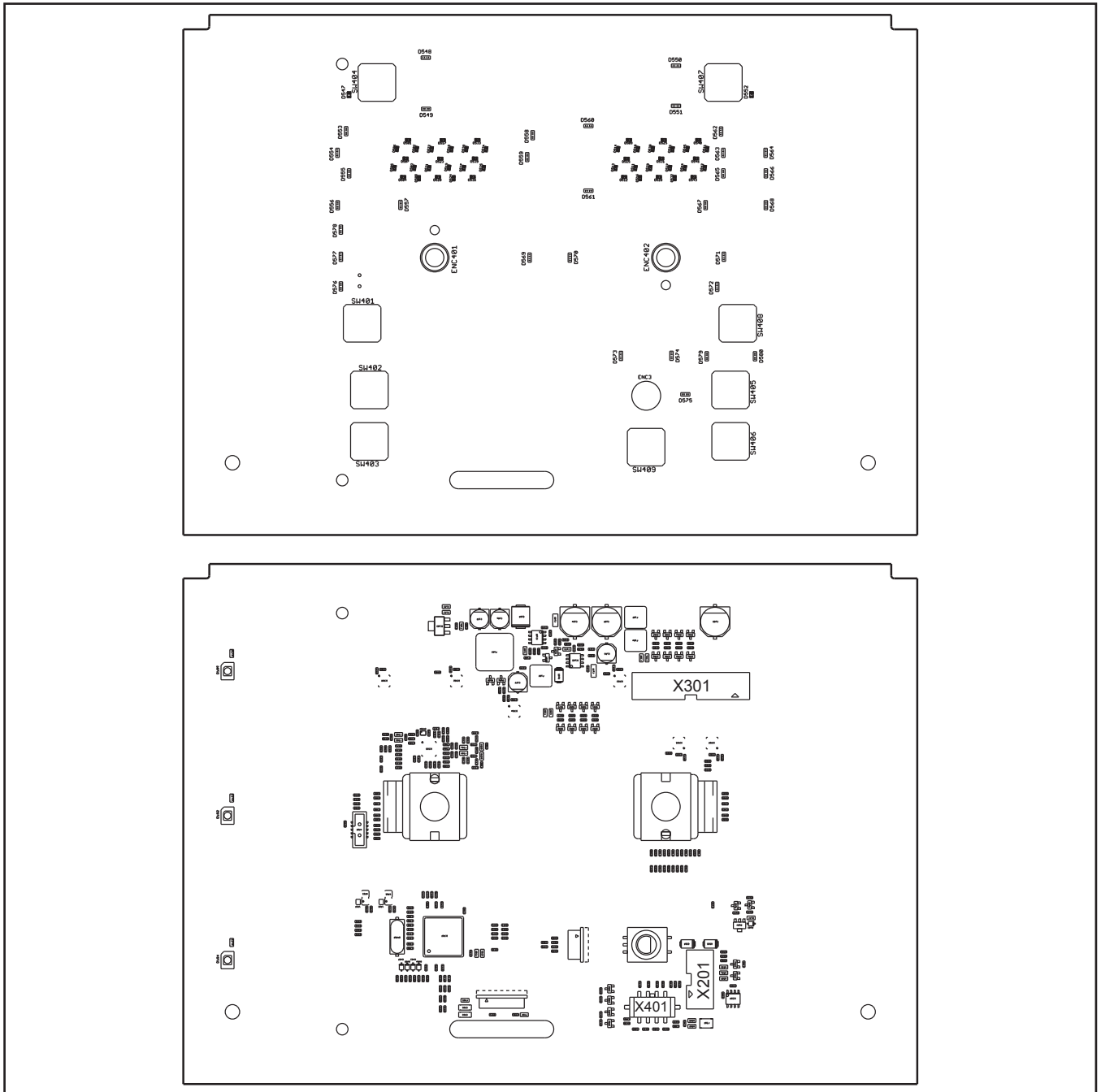
Since week 10 in 2015 the front panels of the wire feeder are equipped with longer flat ribbon cables. With this it is possible to use the wire feeder horizontally in a lying way and turn the front panel by 90°.

## Picture pc-board SF17



The pc-board SF17 is used for illuminating the interior of the MF08 wire feeder and is connected to the front panel pc-board (connector X701).

## Picture pc-board BF11 (ControlPro power source)



### Overview changes front panels

Some front panels had been exchanged by versions with bigger memory.  
 Since week 51 from 2017 the version "Pulse" was added.

front panel	designation (old)	part no.	designation (new)	part no.	version pulse	part no.	usage
FP01	BF05	653.0062.5	BF25	653.0083.5			wire feeder
Basic	BF06	653.0048.5	BF26	653.0079.5			
Basic Plus	BF07	653.0049.5	BF27	653.0080.5	BF27	653.0107.5	
Basic	BF09	653.0051.5	BF29	653.0081.5			power source
Basic Plus	BF10	653.0052.5	BF30	653.0082.5	BF30	653.0109.5	

# Pc-Board NEFI02

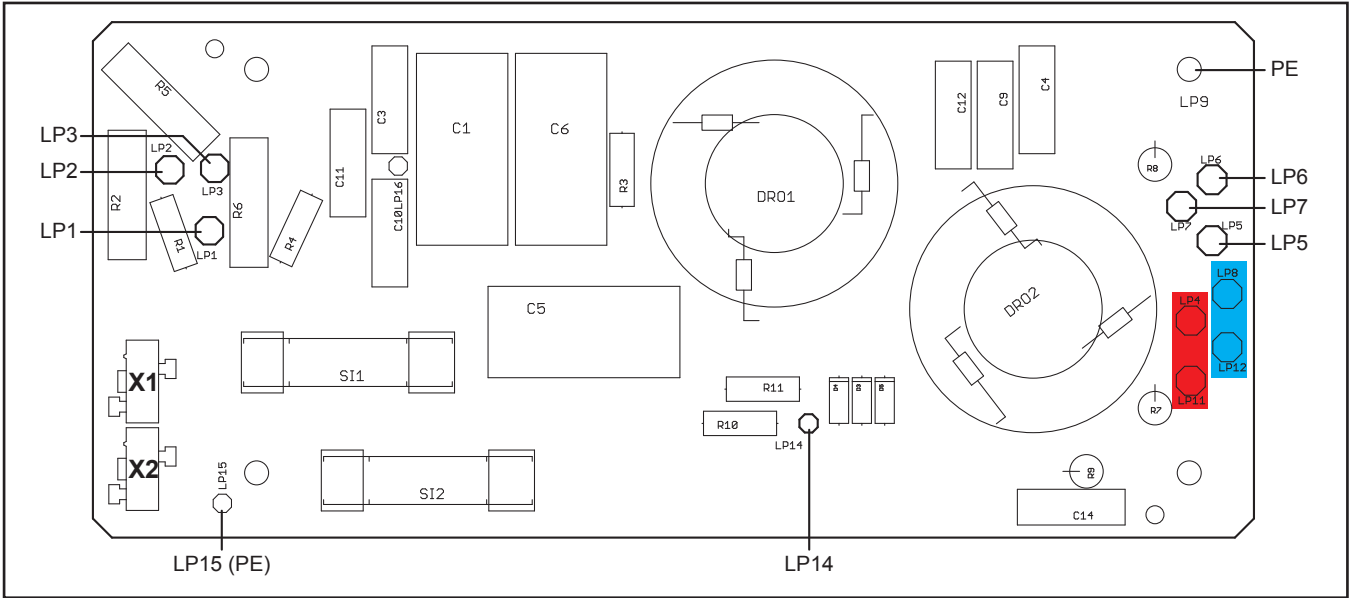
The pc-board NEFI02 is the mains filter board of the MicorMIG 300 and 350.

Since week 49 2015 the varistors at the mains input had been replaced by types with higher voltage (S20K620).

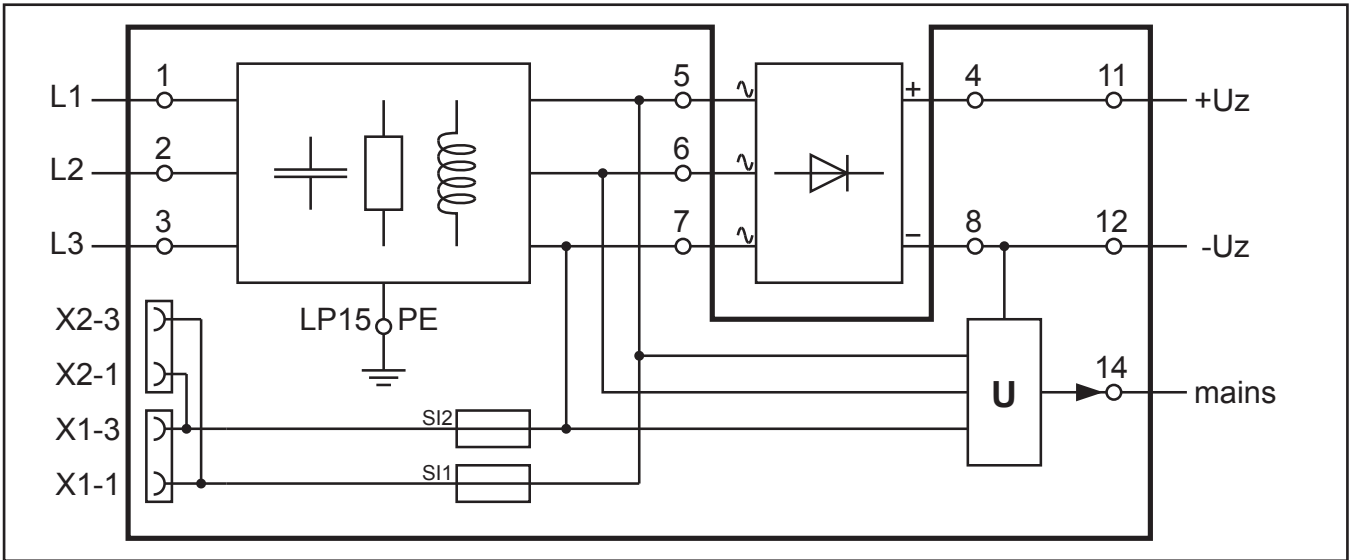
## Functions

- mains filter
- mains detection
- safeguarding control transformer (2 x 4.0A, 500V, slow)

## Picture pc-board NEFI02



## Schematic



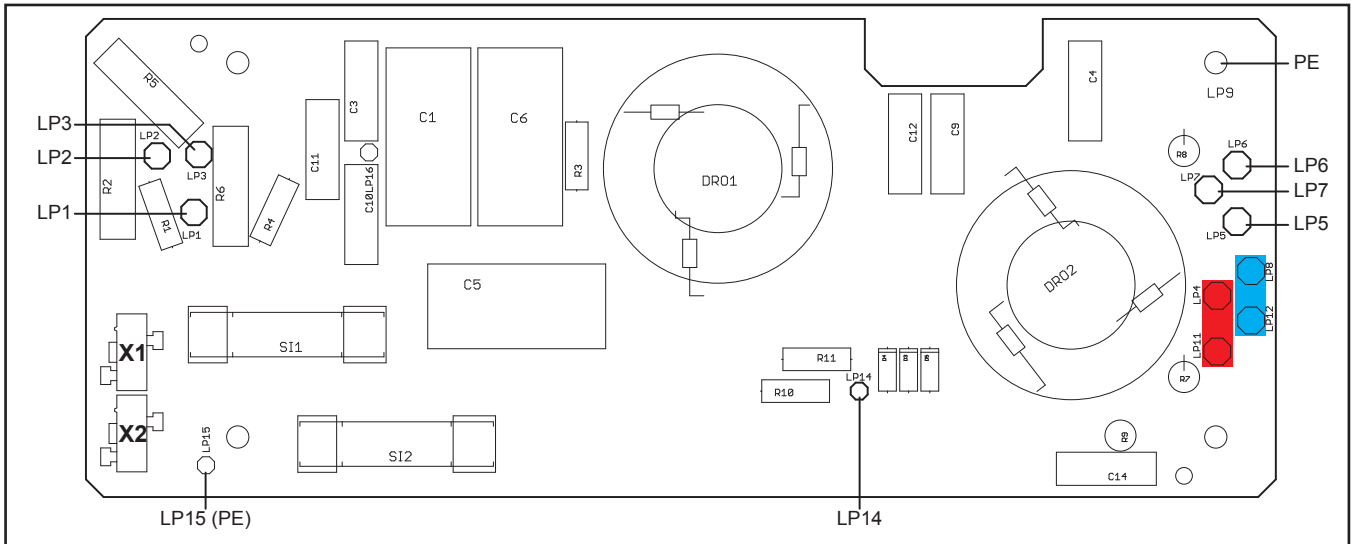
# Pc-Board NEFI04

The pc-board NEFI04 is the mains filter board of the MicorMIG 400.  
 Since week 49 2015 the varistors at the mains input had been replaced by types with higher voltage (S20K620).

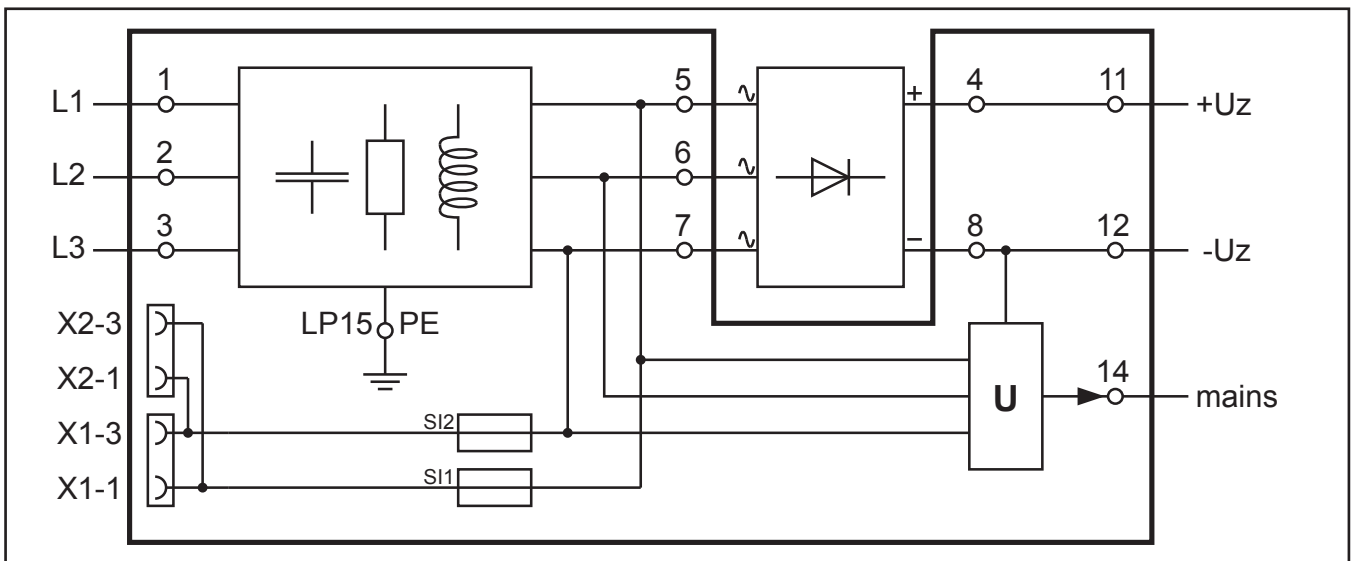
## Functions

- mains filter
- mains detection
- safeguarding control transformer (2 x 4.0A, 500V, slow)

## Picture pc-board NEFI04



## Schematic



# Pc-Board NEFI05

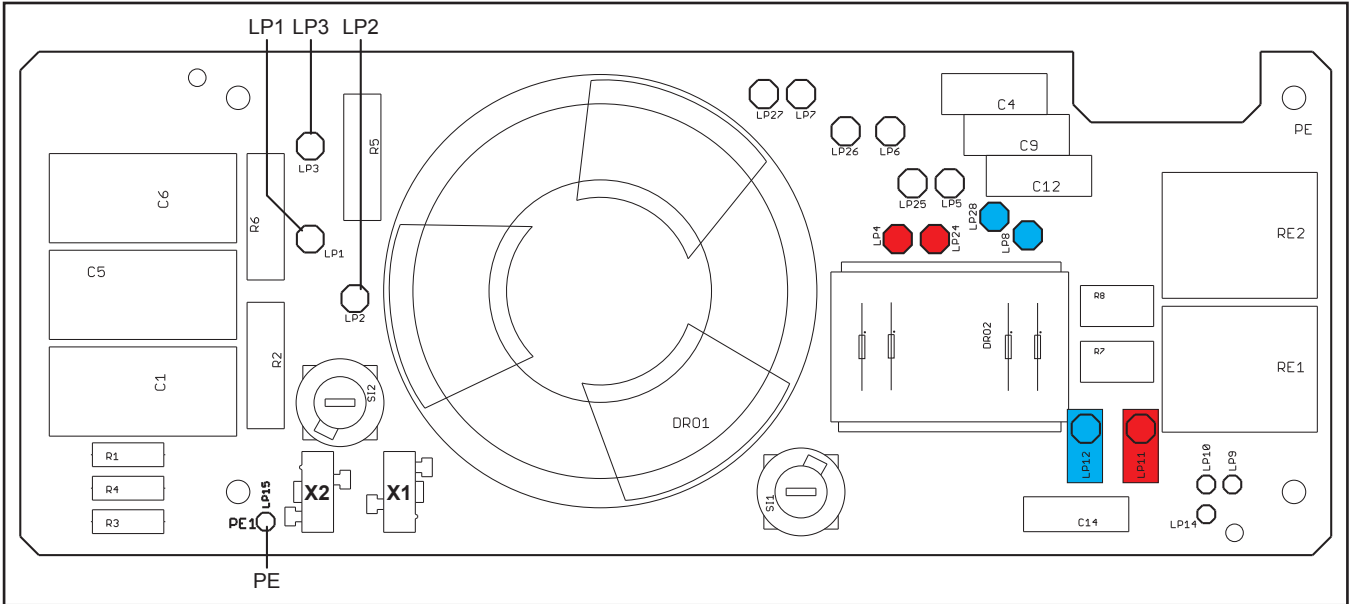
The pc-board NEFI05 is the mains filter board of the MicorMIG 500.

Since week 49 2015 the varistors at the mains input had been replaced by types with higher voltage (S20K620).

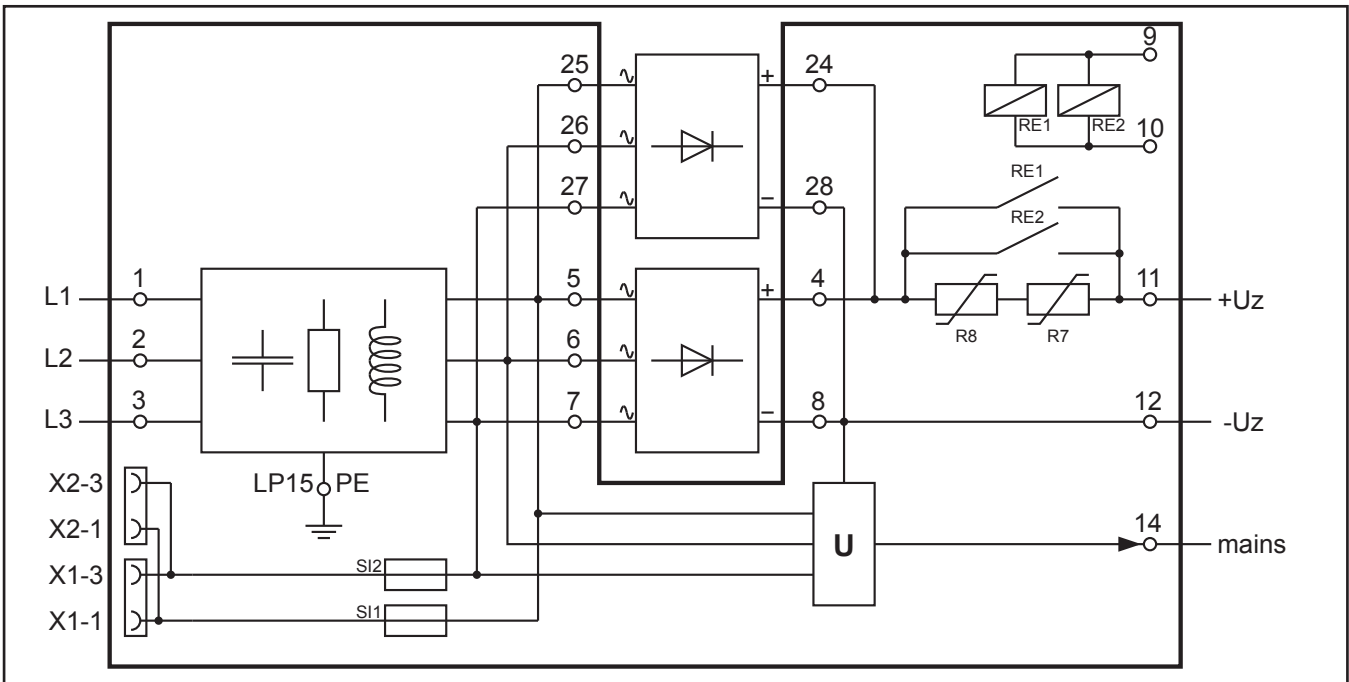
## Functions

- mains filter
- mains detection
- safeguarding control transformer (2 x 4.0A, 500V, slow)
- power-up function

## Picture pc-board NEFI05



## Schematic



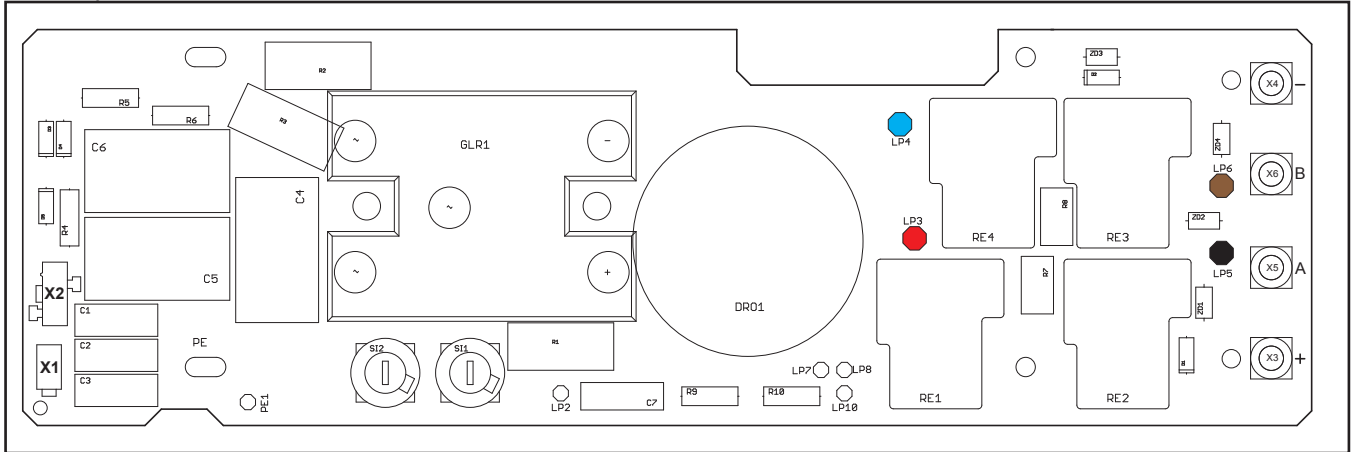
# Pc-Board NEFI07

The pc-board NEFI07 is the mains filter board of the MicorMIG 400 MV and 500 MV.

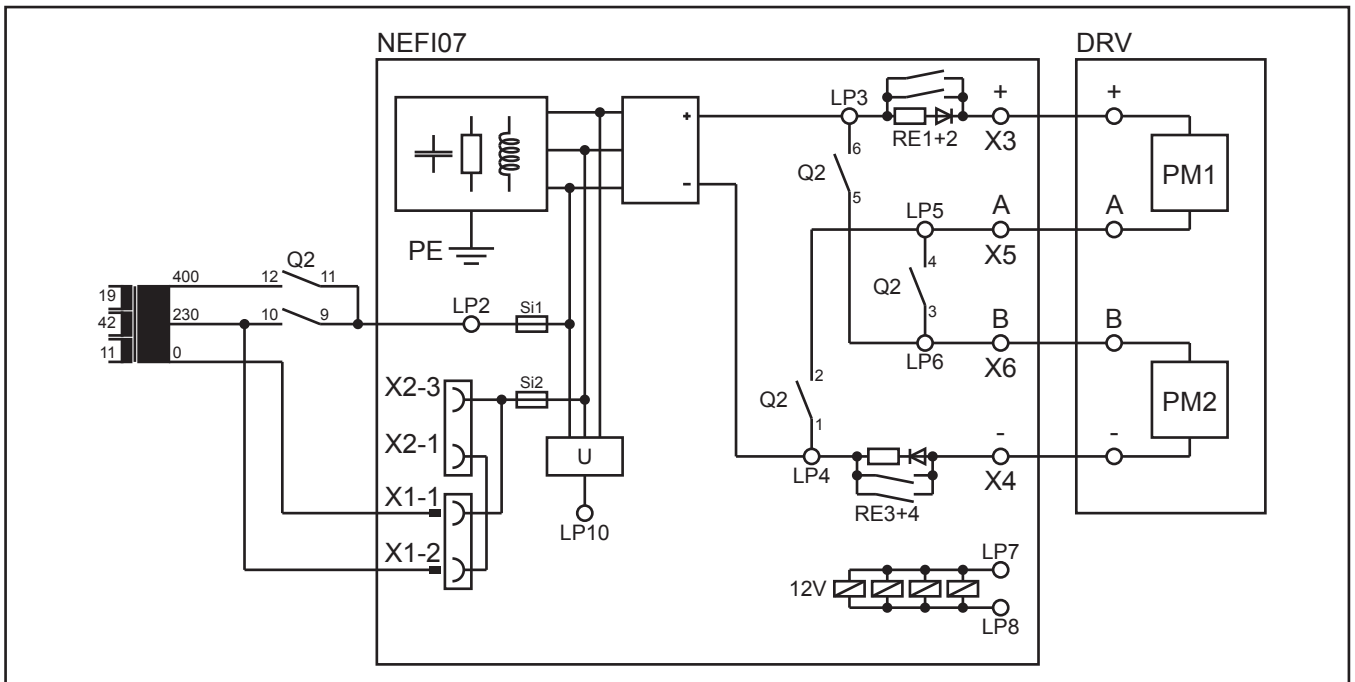
## Functions

- mains filter
- mains detection
- safeguarding control transformer (2 x 4.0A, 500V, slow)
- power-up function

Picture pc-board NEFI07



## Schematic



## Pc-Board DRV03 / DRV13

The pc-board DRV03 is the primary driver board of the MicorMIG 300 and 350.  
Since week18 2017 the DRV03 was replaced by the DRV13. For details see page 27.

### Functions

- primary driving of the transformer
- capture primary input current
- measuring temperatures
- generating internal supply voltages
- driving fans
- switching power-up relays
- PE monitoring
- coding power unit
- monitoring mains voltage
- monitoring bus voltage

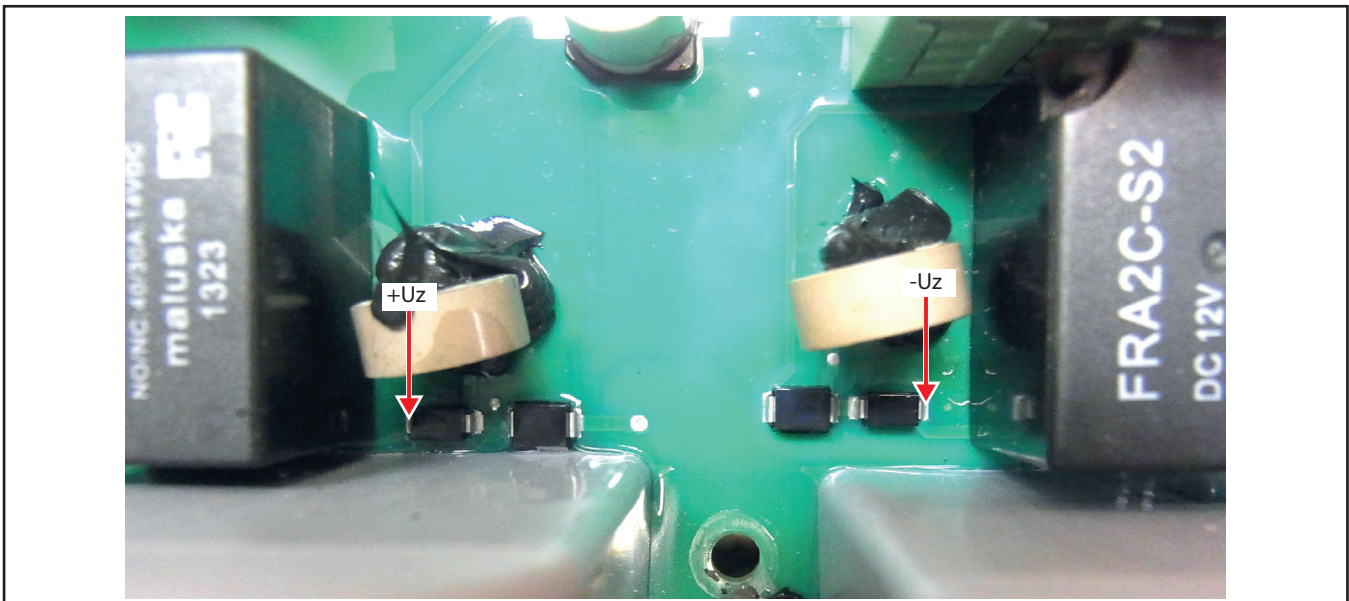
### LEDs

LED	state	designation
1 (red)	blinking (1 Hz)	normal operation
	blinking (3 Hz)	when switching off the machine (no mains voltage present)
	lit weak	DSP not programmed
	off	3.3V supply voltage is missing

### Measuring points

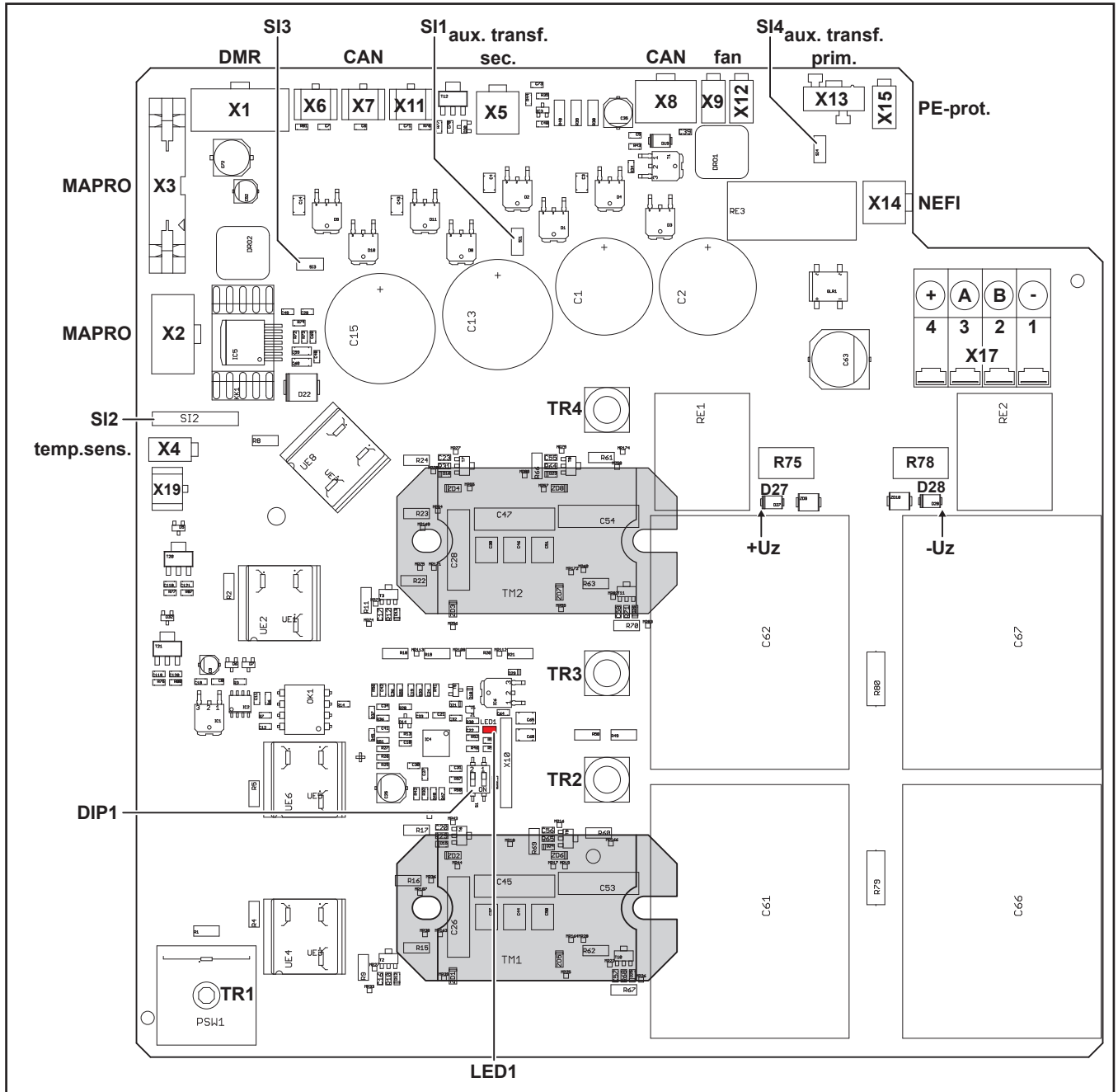
designation	measuring point		result
bus voltage (from rectifier)	X17-4	+Uz	ca. +580 V DC
	X17-1	-Uz	
bus voltage (at the power modules)	D27	+Uz	ca. +580 V DC
	D28	-Uz	
supply voltage +24V	X6-2, X7-2, X11-2	+	+24V DC
	X6-1, X7-1, X11-1	-	
supply voltage +16V	X2-1	+	+16V DC
	X2-2	-	
supply voltage +60V	X1-5	+	+60V DC
	X1-6	-	

### Measuring points bus voltage (power modules)

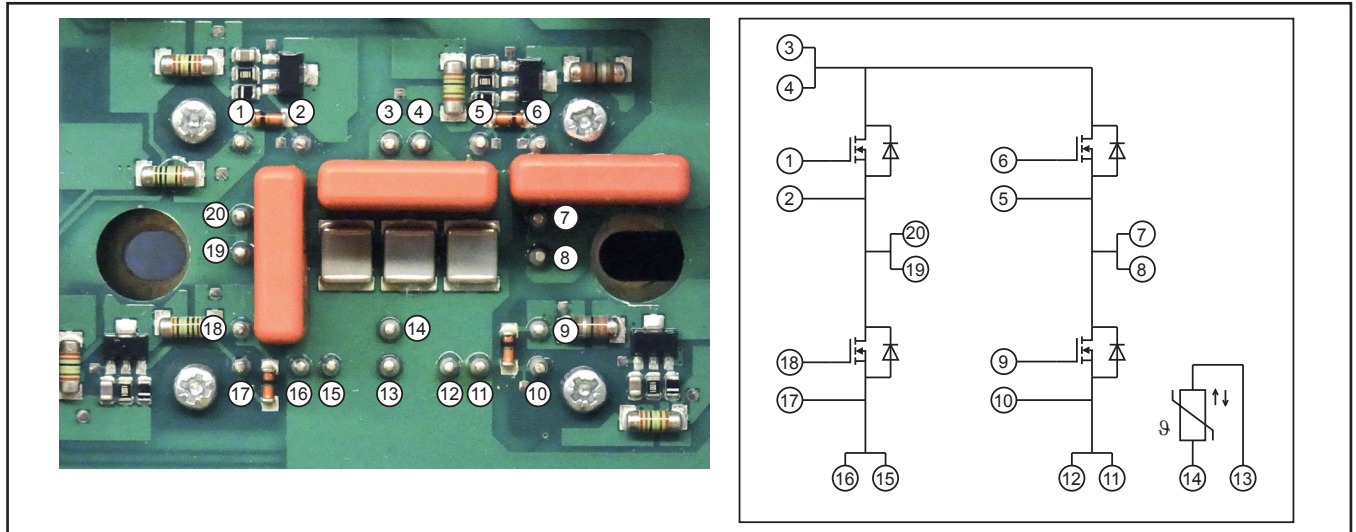




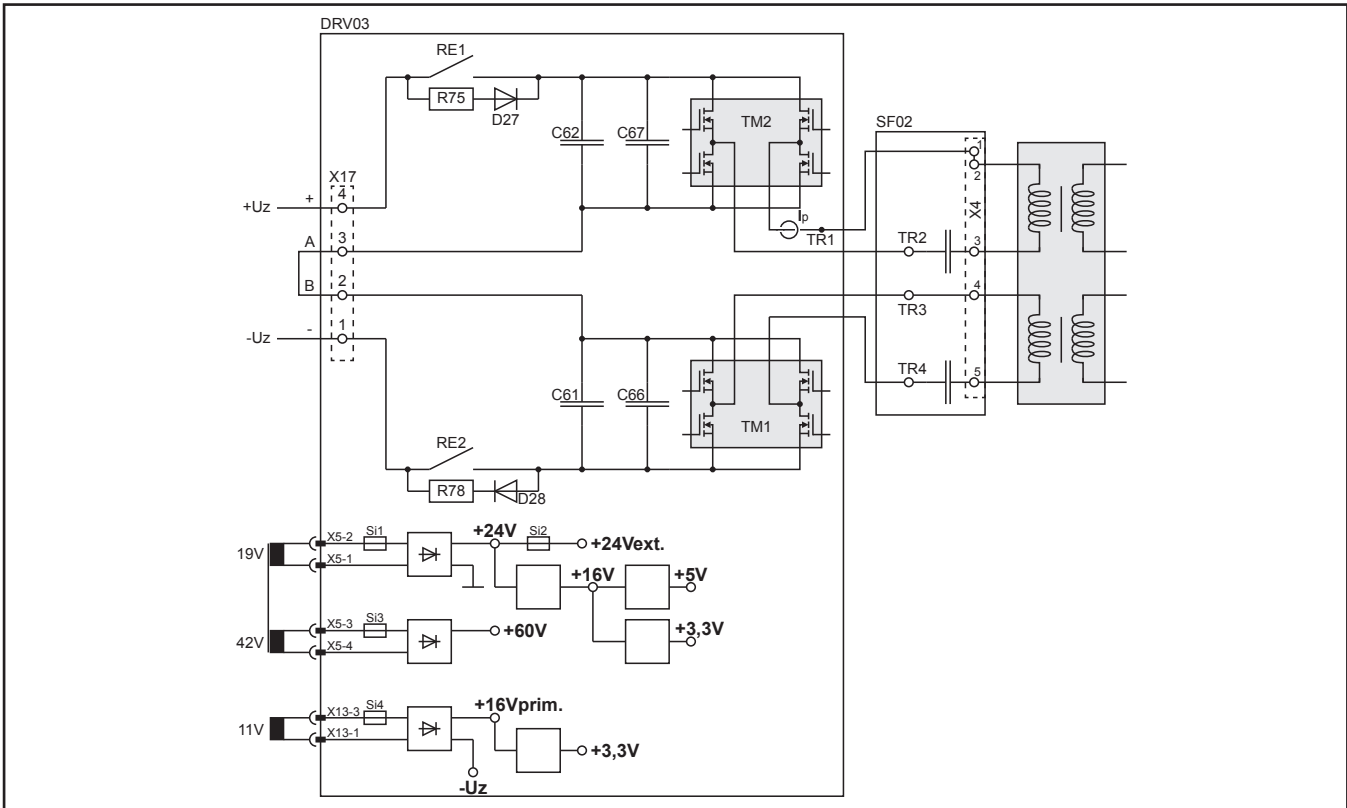
# Picture pc-board DRV13



## Inside diagram power module



## Schematic



## Fuses DRV13

fuse	value
Si1 (24V)	6.3 A
Si2 (24V ext.)	1.5 A
Si3 (60V)	6.3 A
Si4 (16V)	0.63 A

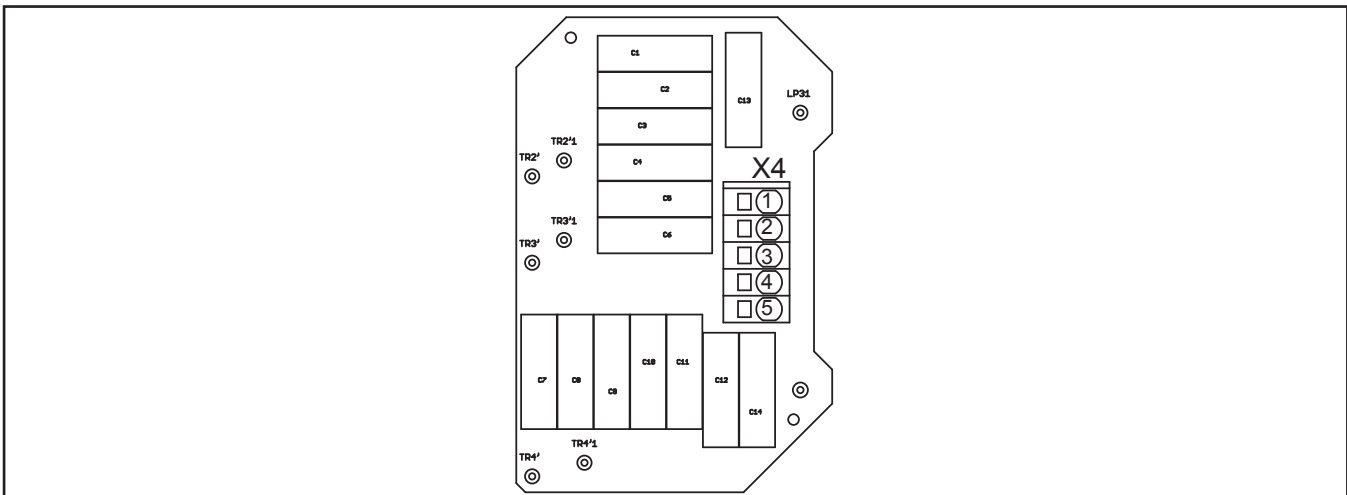
## Pc-Board SF02

The pc-board SF02 contains the primary resonance capacitors and is only used together with the pc-board DRV03.

## Functions

- wiring primary transformer wires
- connecting resonance capacitors

## Picture pc-board SF02



## Pc-Board DRV05 / DRV15

The pc-board DRV05 is the primary driver board of the MicorMIG 400.  
Since week18 2017 the DRV05 was replaced by the DRV15. For details see page 27.

### Functions

- primary driving of the transformer
- capture primary input current
- measuring temperatures
- generating internal supply voltages
- driving fans
- switching power-up relays
- PE monitoring
- coding power unit
- monitoring mains voltage
- monitoring bus voltage

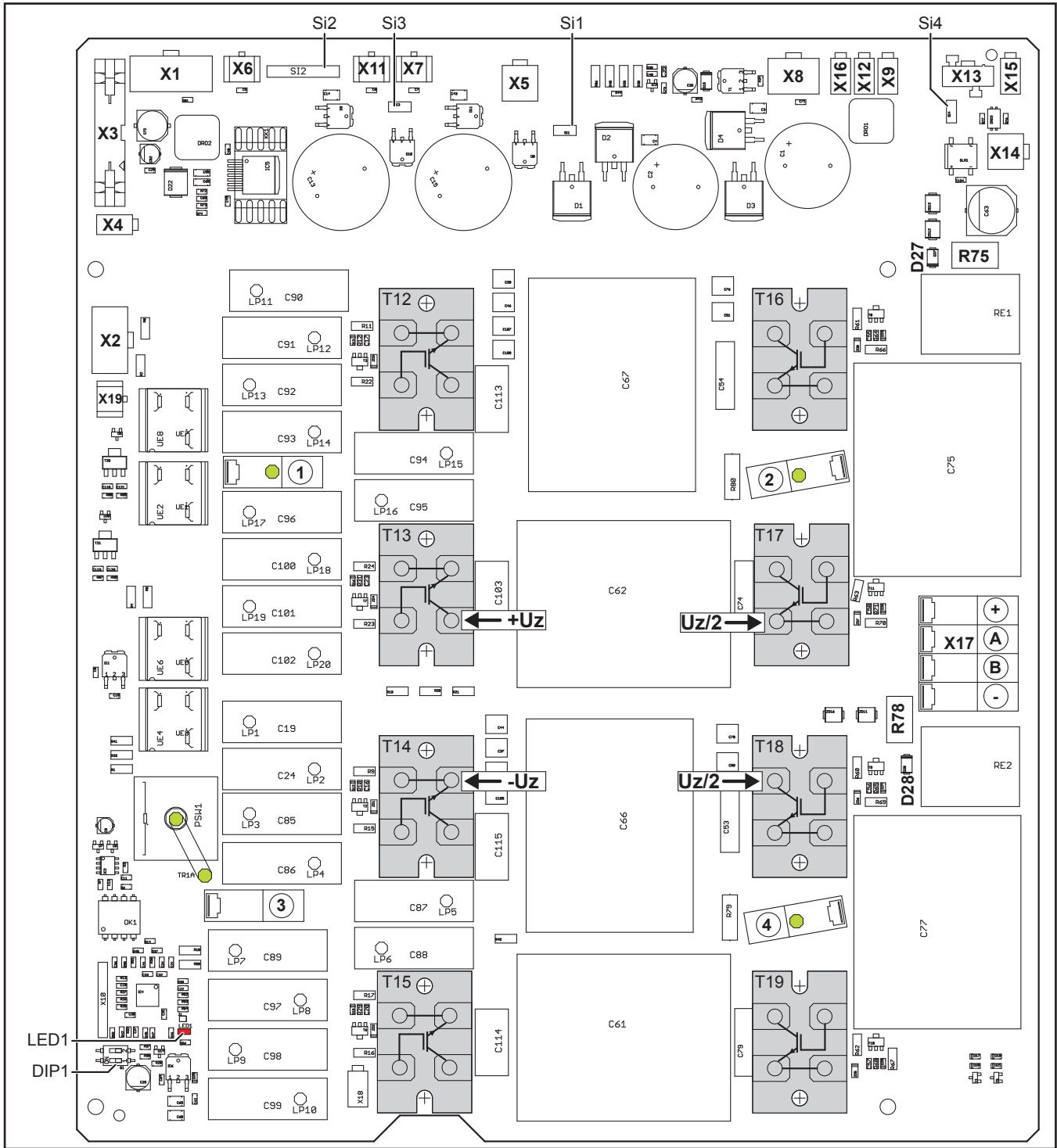
### LEDs

LED	state	designation
1 (red)	blinking (1 Hz)	normal operation
	blinking (3 Hz)	when switching off the machine (no mains voltage present)
	lit weak	DSP not programmed
	off	3.3V supply voltage is missing

### Measuring points

designation	measuring point		result
bus voltage (from rectifier)	X17-4	+Uz	ca. +580 V DC
	X17-1	-Uz	
bus voltage (at the power modules)	T13	+Uz	ca. +580 V DC
	T14	-Uz	
supply voltage +24V	X6-2, X7-2, X11-2 X6-1, X7-1, X11-1	+	+24V DC
		-	
supply voltage +16V	(X19) X2-1 (X19) X2-2	+	+16V DC
		-	
supply voltage +16V (primary)	X14-2 X17-1 / T14	+	+16V DC
		-Uz	
supply voltage +60V	X1-5 X1-6	+	+60V DC
		-	

# Picture pc-board DRV15

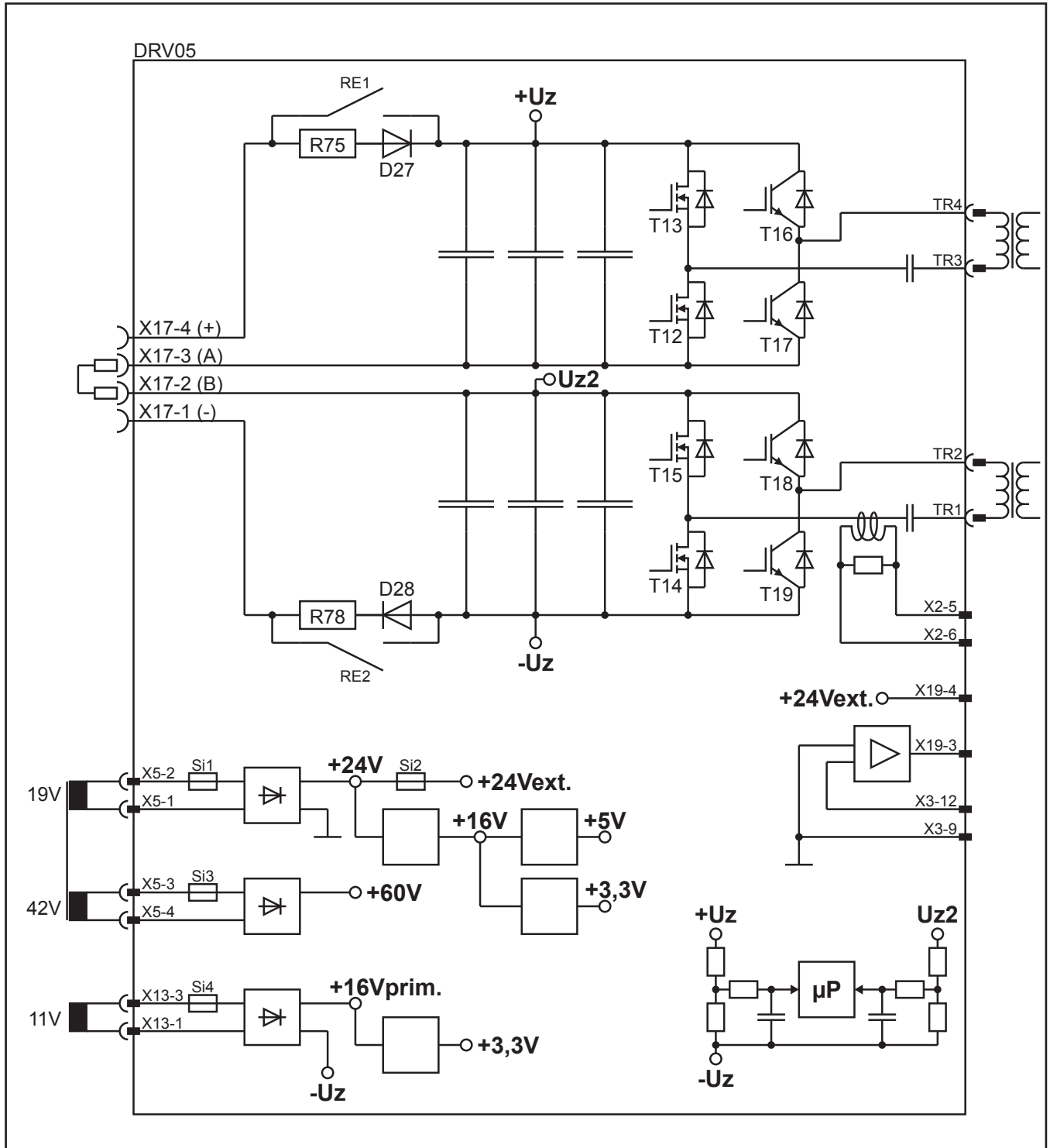


## Change from MOSFET to IGBT (DRV05)

Since the 10th of July 2015, since serial number 4062-2528-0021-6 only IGBTs are used for the MicorMIG 400.

type	old	new
T12 - T15	MOSFET (711.2614.0)	IGBT (711.0530.0)
T16 - T19	IGBT (711.2616.0)	IGBT (711.0530.0)

## Schematic



\*the connector X19 was later renamed to X2

## Fuses DRV15

designation	value
Si1 (24V)	6.3 A
Si2 (24V ext.)	1.5 A
Si3 (60V)	6.3 A
Si4 (16V)	0.63 A

## Pc-Board DRV07 / DRV17

The pc-board DRV07 is the primary driver board of the MicorMIG 500.  
Since week18 2017 the DRV07 was replaced by the DRV17. For details see page 27.

### Functions

- primary driving of the transformer
- capture primary input current
- measuring temperatures
- generating internal supply voltages
- driving fans
- switching power-up relays
- PE monitoring
- coding power unit
- monitoring mains voltage
- monitoring bus voltage

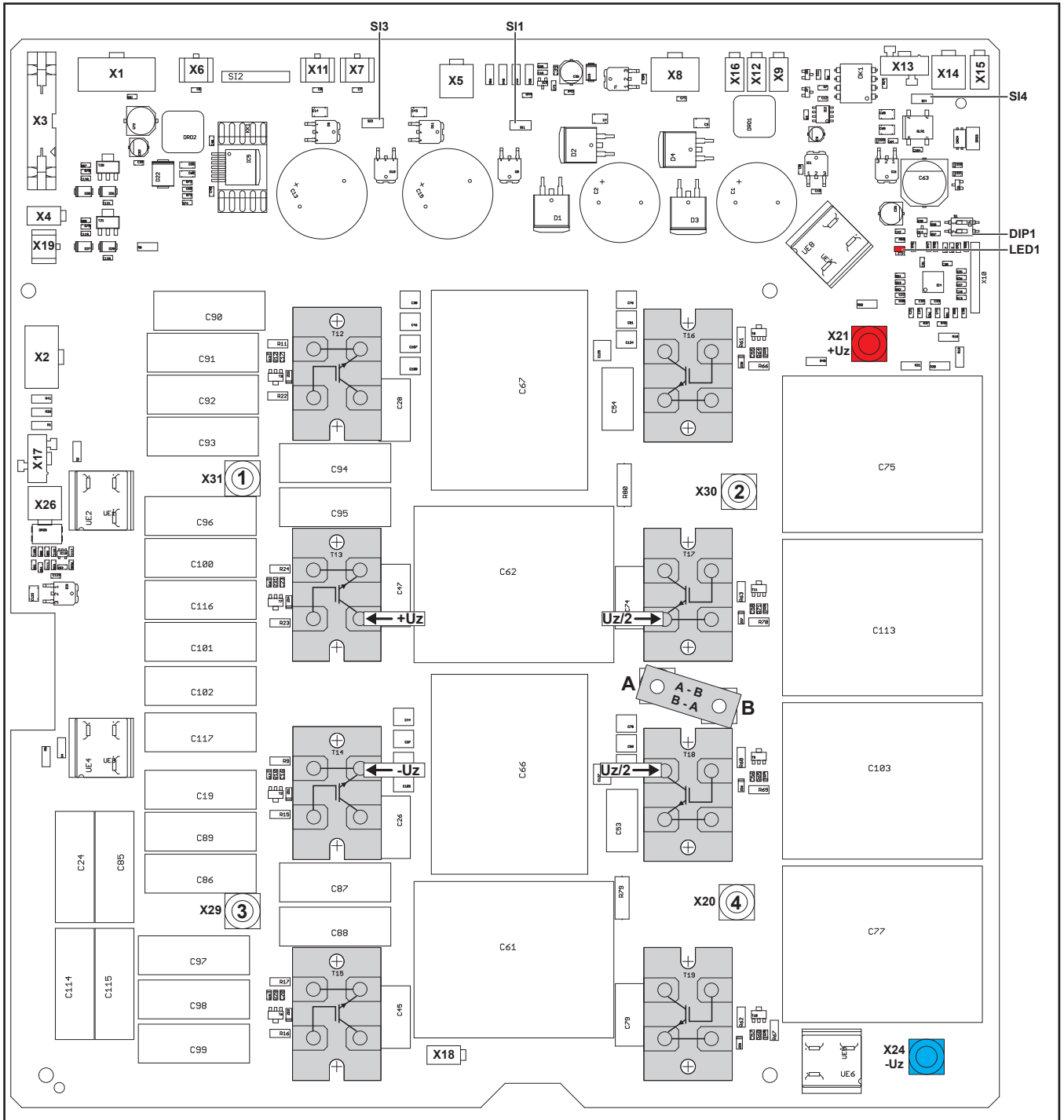
### LEDs

LED	state	designation
1 (red)	blinking (1 Hz)	normal operation
	blinking (3 Hz)	when switching off the machine (no mains voltage present)
	lit weak	DSP not programmed
	off	3.3V supply voltage is missing

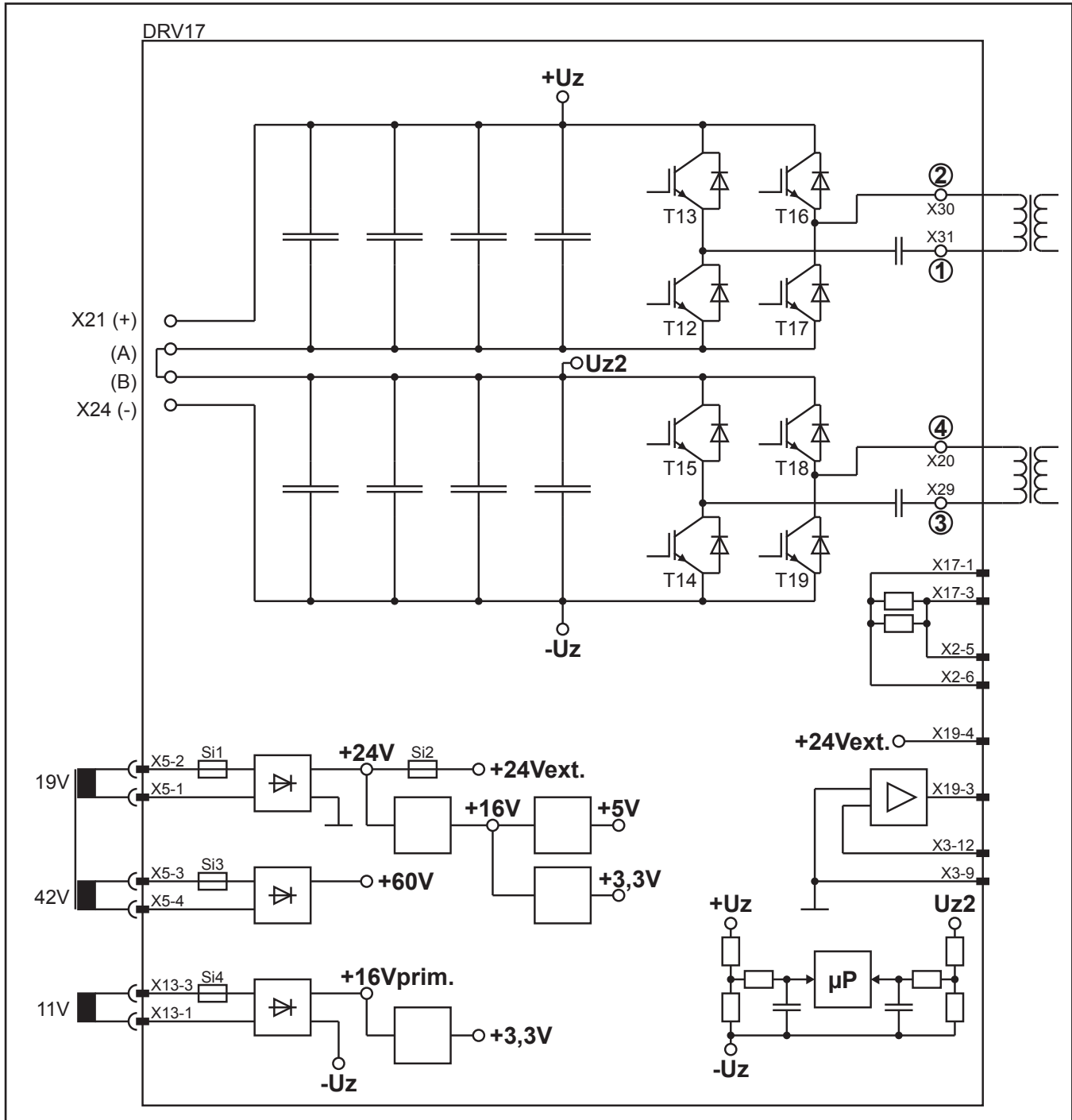
### Measuring points

designation	measuring point		result
bus voltage (from rectifier)	X21 X24	+Uz -Uz	ca. +580 V DC
supply voltage +24V	X6-2, X7-2, X11-2, X8-2 X6-1, X7-1, X11-1, X8-1	+ -	+24V DC
supply voltage +16V	X2-1 X2-2	+ -	+16V DC
supply voltage +16V (primary)	X14-2 X24	+ -Uz	+16V DC
supply voltage +60V	X1-5 X1-6	+ -	+60V DC

# Picture pc-board DRV17



## Schematic



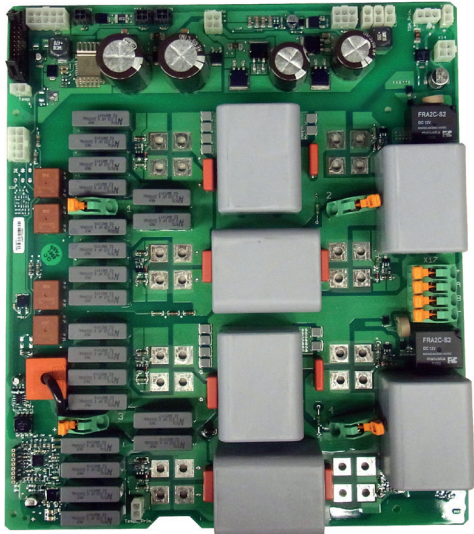
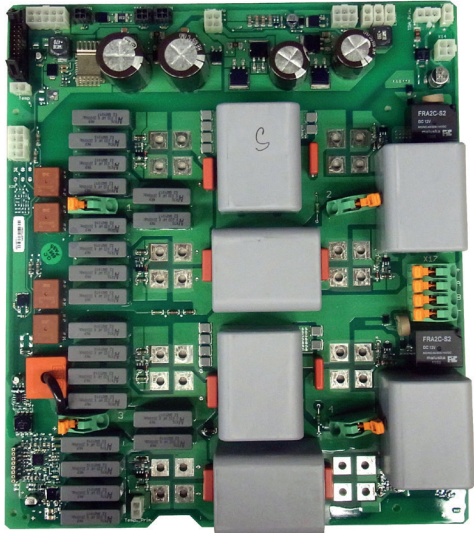
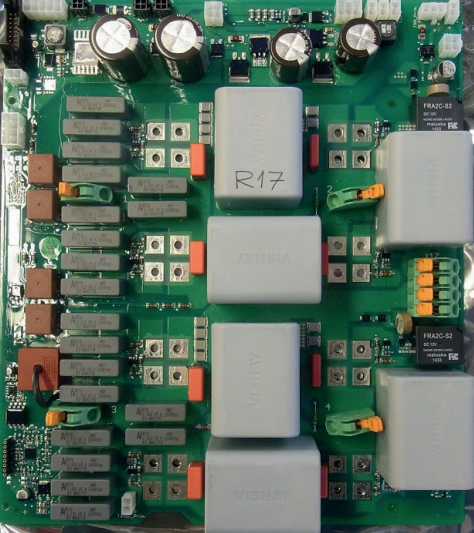
## Fuses DRV17

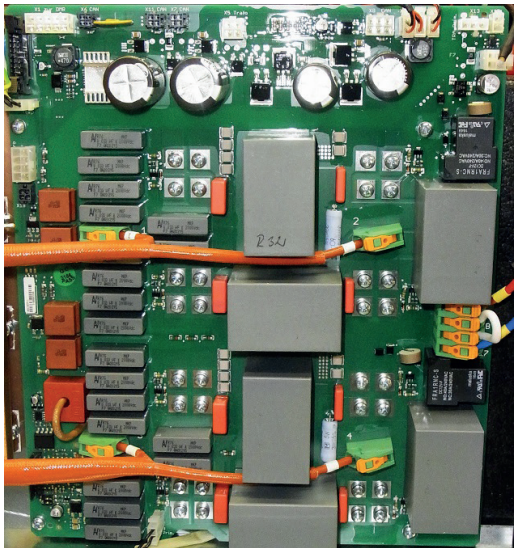
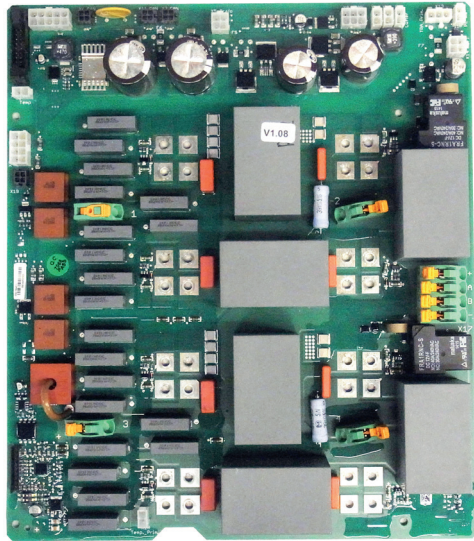
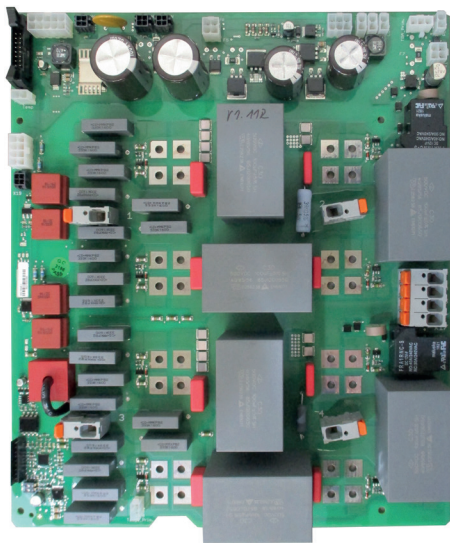
designation	value
Si1 (24V)	6.3 A
Si3 (60V)	6.3 A
Si4 (16V)	0.63 A



## Overview DRV versions

In the past the software of the primary processor on the pc-board DRV was changed and improvements had been implemented. The different versions were marked manually on the grey bus-voltage foil capacitors.

marking		description
none		initial version
"S"		<ul style="list-style-type: none"> <li>- useage since week 21 2014</li> <li>- power-up phase stabilized (switching of power-up relays)</li> </ul>
"R17"		<ul style="list-style-type: none"> <li>- useage since week 11 2015</li> <li>- quicker balancing of bus-voltages</li> <li>- automatic reset of overvoltage error message</li> </ul>

marking	description
<p data-bbox="97 143 159 170">"R32"</p> 	<ul data-bbox="767 143 1225 197" style="list-style-type: none"> <li>- useage since week 40 2016</li> <li>- modification of filter for bus-voltage measuring</li> </ul>
<p data-bbox="97 703 172 757">"V1.08" "V1.10"</p> 	<ul data-bbox="767 703 1123 779" style="list-style-type: none"> <li>- useage since week 18 2017</li> <li>- multivoltage (3-phase 230V / 400V)</li> <li>- preparation for generator use</li> </ul>
<p data-bbox="97 1263 188 1290">"V1.11R"</p> 	<ul data-bbox="767 1263 1433 1370" style="list-style-type: none"> <li>- useage since week 30 2018</li> <li>- fully fit for generator use</li> <li>- since week 40 2018: new terminals for transformer wires and supply</li> </ul>

## Change from pc-board DRV0x to DRV1x

Since week 18 2017 the new DRV boards are used in the MicorMIG series. To ensure the multivoltage function and generator useage, not only the hard and software of the DRV were changed, also the software of the MAPRO board (version 2.02 for Master and Process firmware) needed to be changed.

That is why the new DRV boards are **NOT compatible** with the MAPRO software 1.xx.



If a “old” DRV0x board needs to be replaced by a “new” DRV1x board, it is absolutely necessary that the MAPRO needs to be updated to minimum version 2.02!!!

previous board	replaced by	new part no.
DRV03	DRV13	981.1219.0
DRV05	DRV15	650.5645.5
DRV07	DRV17	650.5647.5

# Pc-Board DC01

The pc-board DC01 is the secondary board for wiring the secondary diodes at the MicorMIG 300 and 350.

## Functions

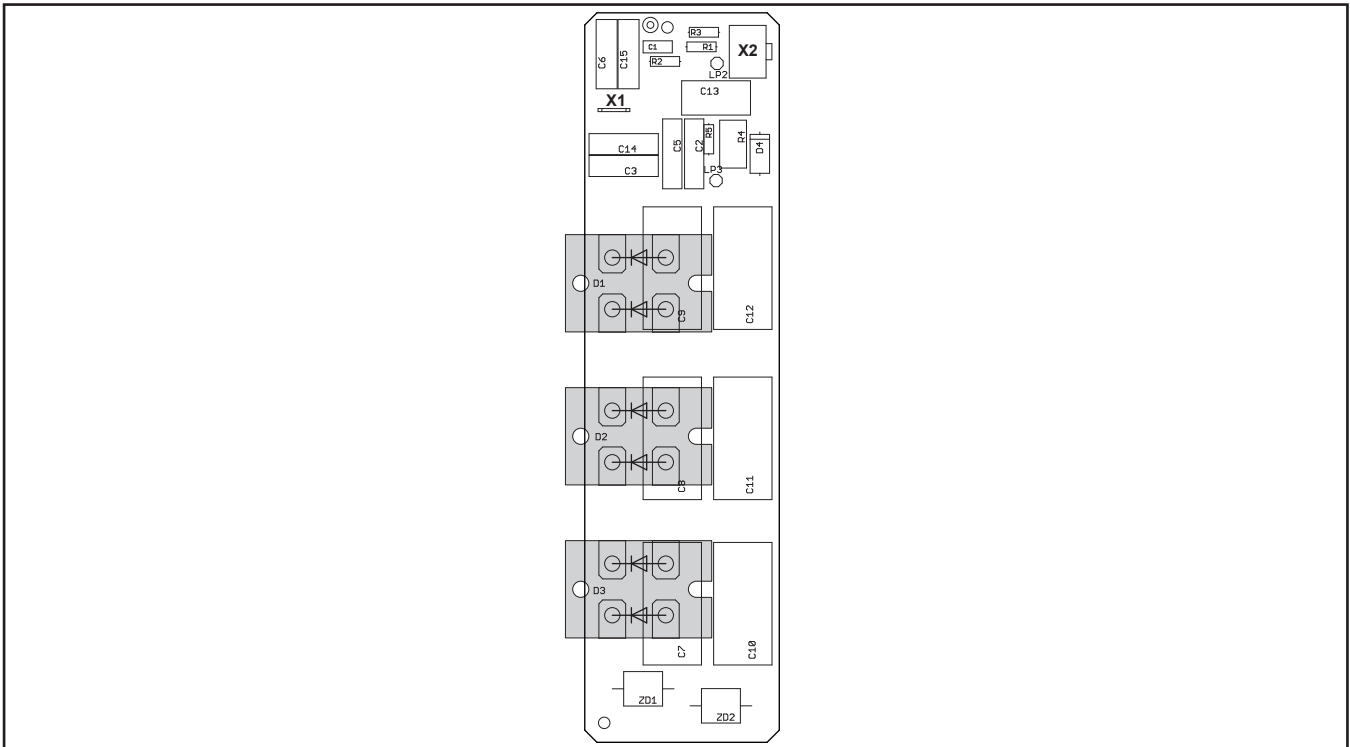
- wiring secondary diodes
- connecting resonance capacitors
- providing output voltage for measuring

## Measuring points

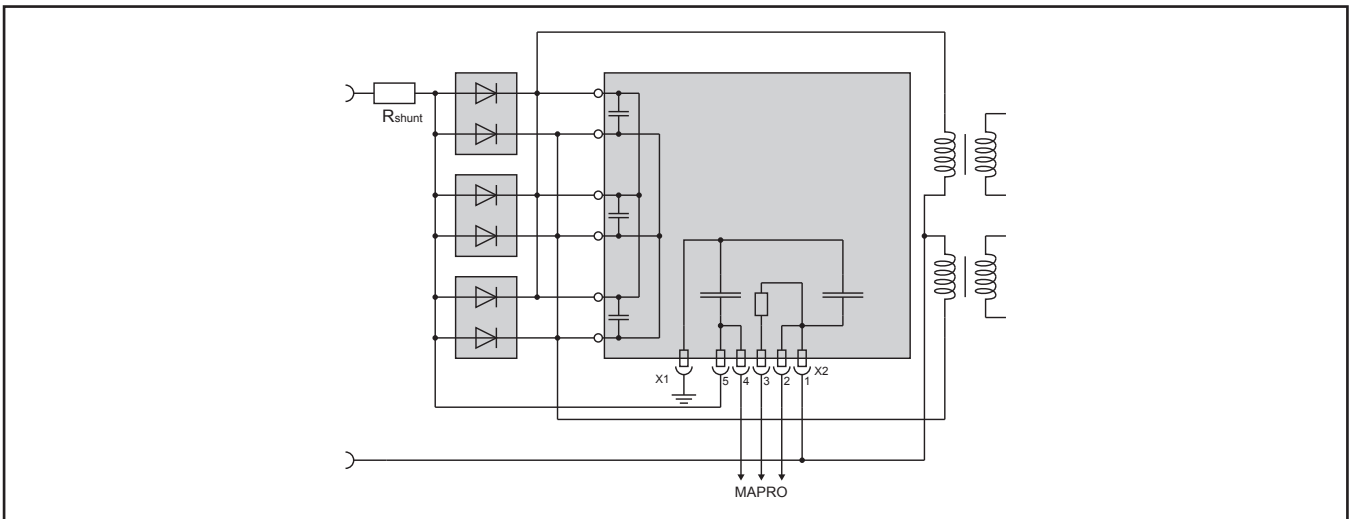
designation	measuring point		result
output voltage	X2-5	+	+80V DC*
	X2-1	-	

\*only at machines with no VRD, at machines with activated VRD, the VRD voltage is measured.

## Picture pc-board DC01



## Schematic



# Pc-Board DC03

The pc-board DC03 is the secondary board for wiring the secondary diodes at the MicorMIG 400.

## Functions

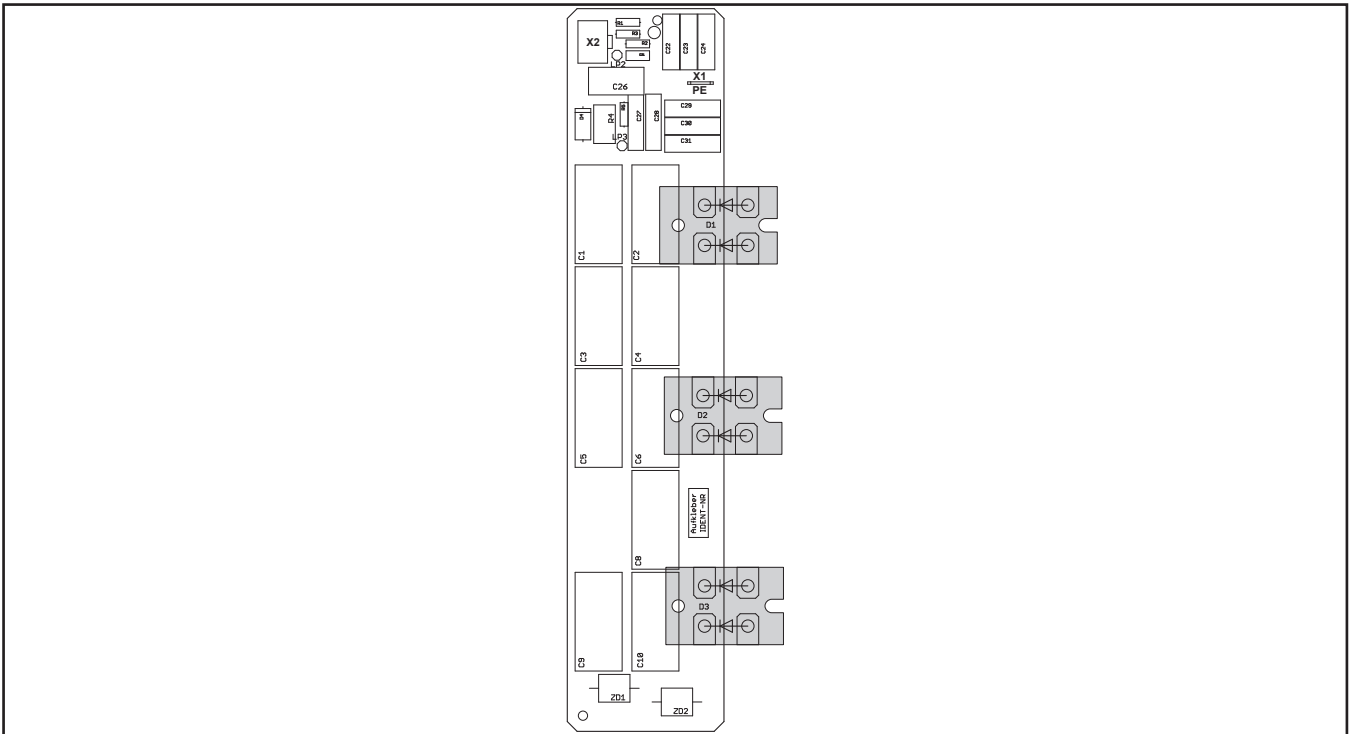
- wiring secondary diodes
- connecting resonance capacitors
- providing output voltage for measuring

## Measuring points

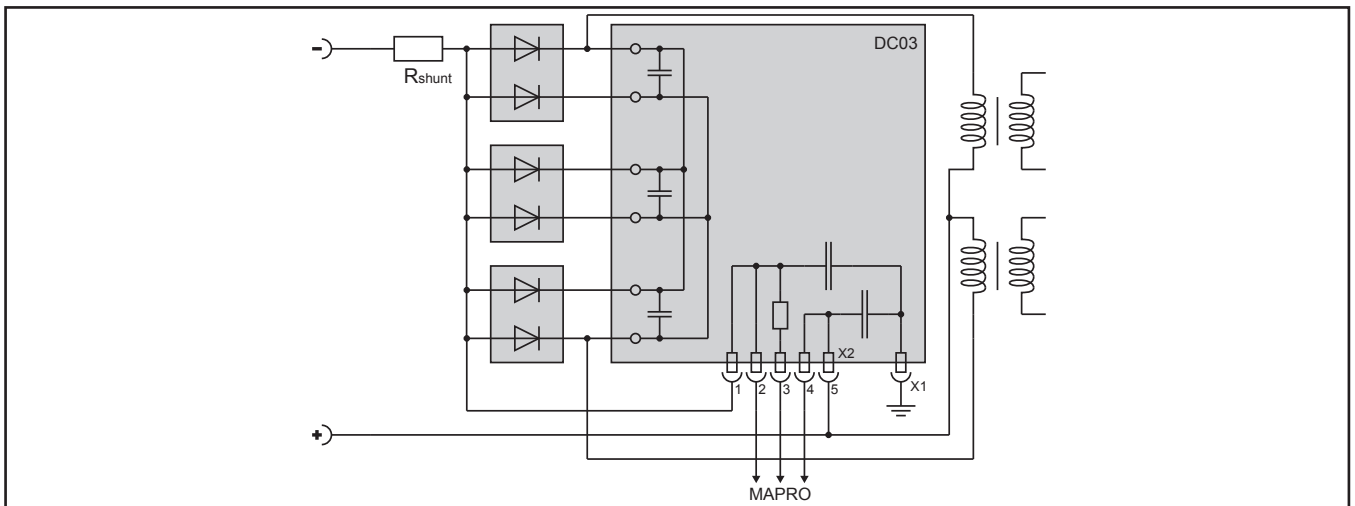
designation	measuring point		result
output voltage	X2-5 X2-1	+ -	+80V DC*

\*only at machines with no VRD, at machines with activated VRD, the VRD voltage is measured.

## Picture pc-board DC03



## Schematic



# Pc-Board DC04

The pc-board DC04 is the secondary board for wiring the secondary diodes at the MicorMIG 500.

## Functions

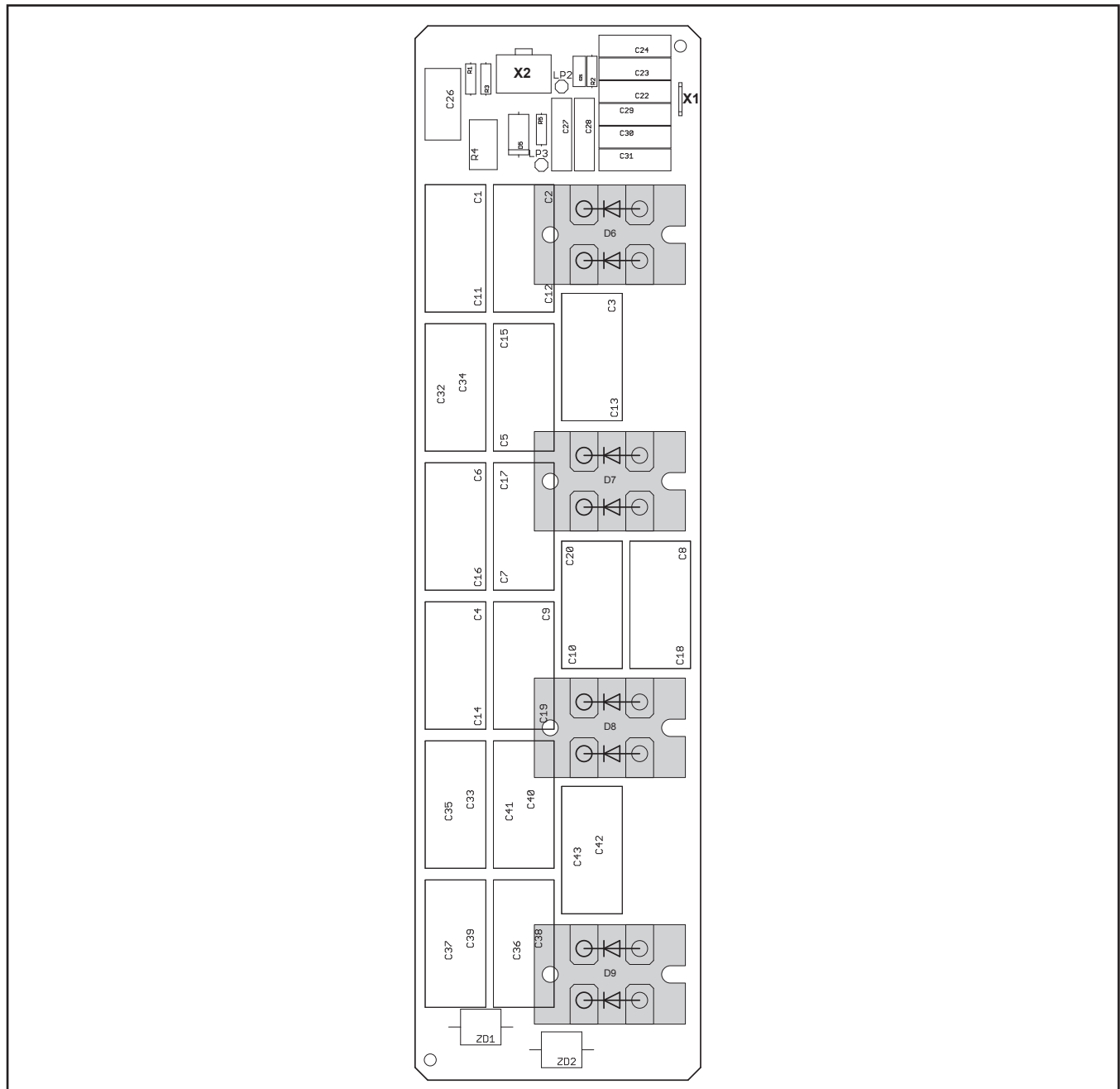
- wiring secondary diodes
- connecting resonance capacitors
- providing output voltage for measuring

## Measuring points

designation	measuring point		result
output voltage	X2-5 X2-1	+ -	+80V DC*

\*only at machines with no VRD, at machines with activated VRD, the VRD voltage is measured.

## Picture pc-board DC04





# Pc-Board DMR-RT3

The pc-board DMR-RT3 is the wire feed control of the MicorMIG machines.

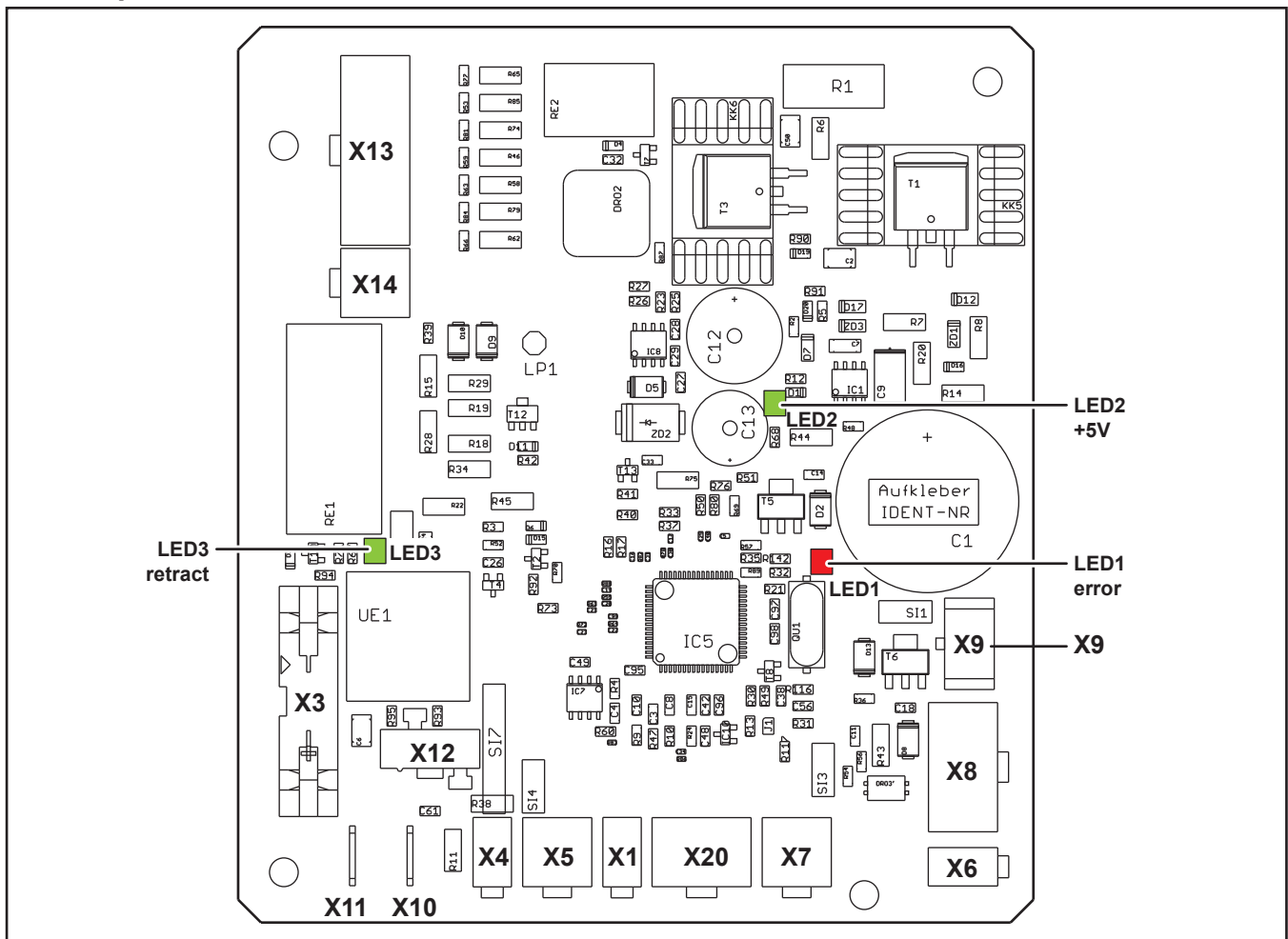
## Functions

- driving and monitoring the wire feed motor
- monitoring torch trigger switch
- communication PowerMaster torch

## LEDs

LED	status	designation
1 (red)	off	until software version 1.11: normal operation from software version 1.12 on : micorprocessor not working
	blinking	until software version 1.11: malfunction LorchNet (CAN bus) from software version 1.12 on : normal operation
	lit weak	micro processor not programmed
	on	micro processor detected a fault
2 (green)	on	5V supply voltage ok
	off	5V supply voltage missing
3 (green)	on	wire retract active
	off	normal wire feed

## Picture pc-board DMR-RT3



**! CAUTION !** the cable-bridge on connector X13 pins 5 and 11 must always be present.



## Pc-Board DMRPP05

The pc-board DMRPP05 is the control unit for Push-Pull torches and the NanoFeeder.

In case of a Push-Pull application the DMRPP05 replaces the standard motor control pc-board DMR-RT3. it consists of two pc-boards that are connected via flat ribbon cables:

- pc-board DMRPP-P: power board containing the motor driver circuits
- pc-board DMRPP-C05: control logic

### Functions

- driving and monitoring the normal wire feed motor as well as the Push-Pull motor
- driving the solenoid valve
- monitoring control elements (front panel, torch trigger switch)

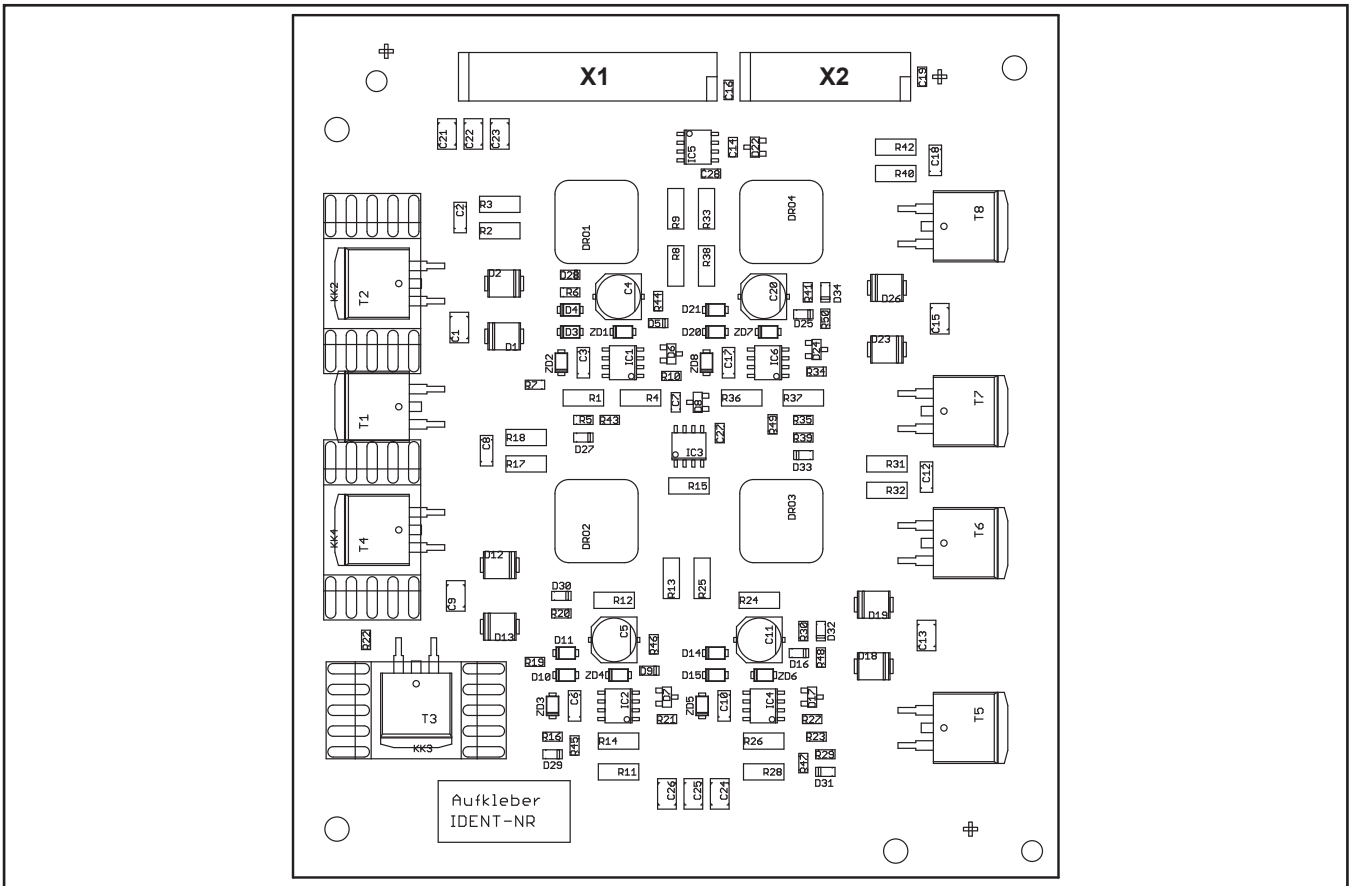
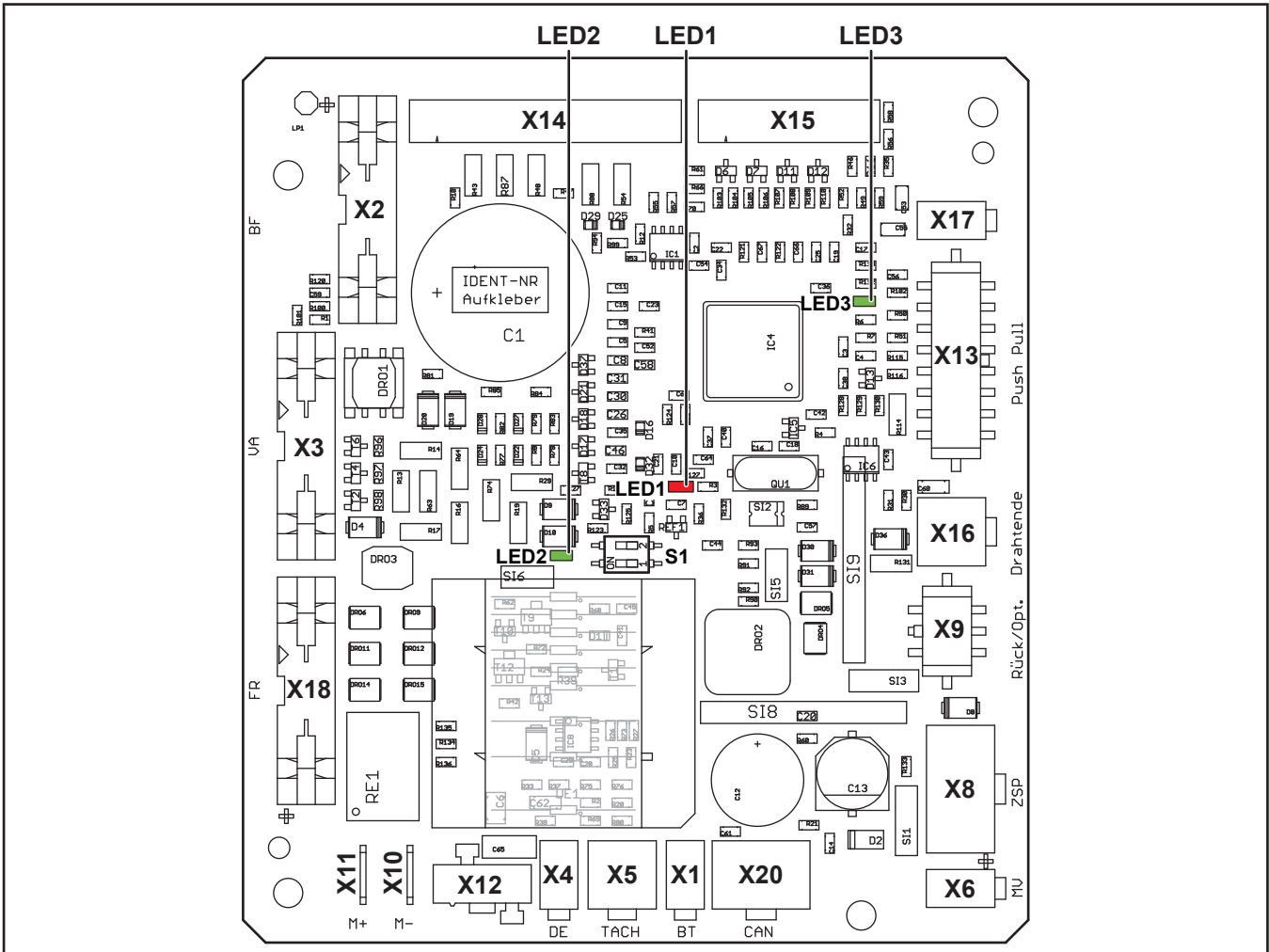
### LEDs

LED	state	designation
1 (red)	off	DSP is ok
	lit bright	pc-board is in programming "flash" mode (DIP switch 1 is set to "ON")
	lit weak	DSP is not programmed
2 (green)	on	+5V supply voltage ok
	off	+5V supply voltage is missing
3 (green)	blinking	DSP is working
	lit continuously	wrong configuration (if DIP switch 2 is set to "ON")

### DIP switch

DIP switch	setting	function
1	ON	programming mode active
	OFF	"normal" operation
2	ON	configuration "intermediate feeder" (not supported by MicorMIG)
	OFF	configuration Push-Pull / NanoFeeder

Picture pc-board DMRPP05





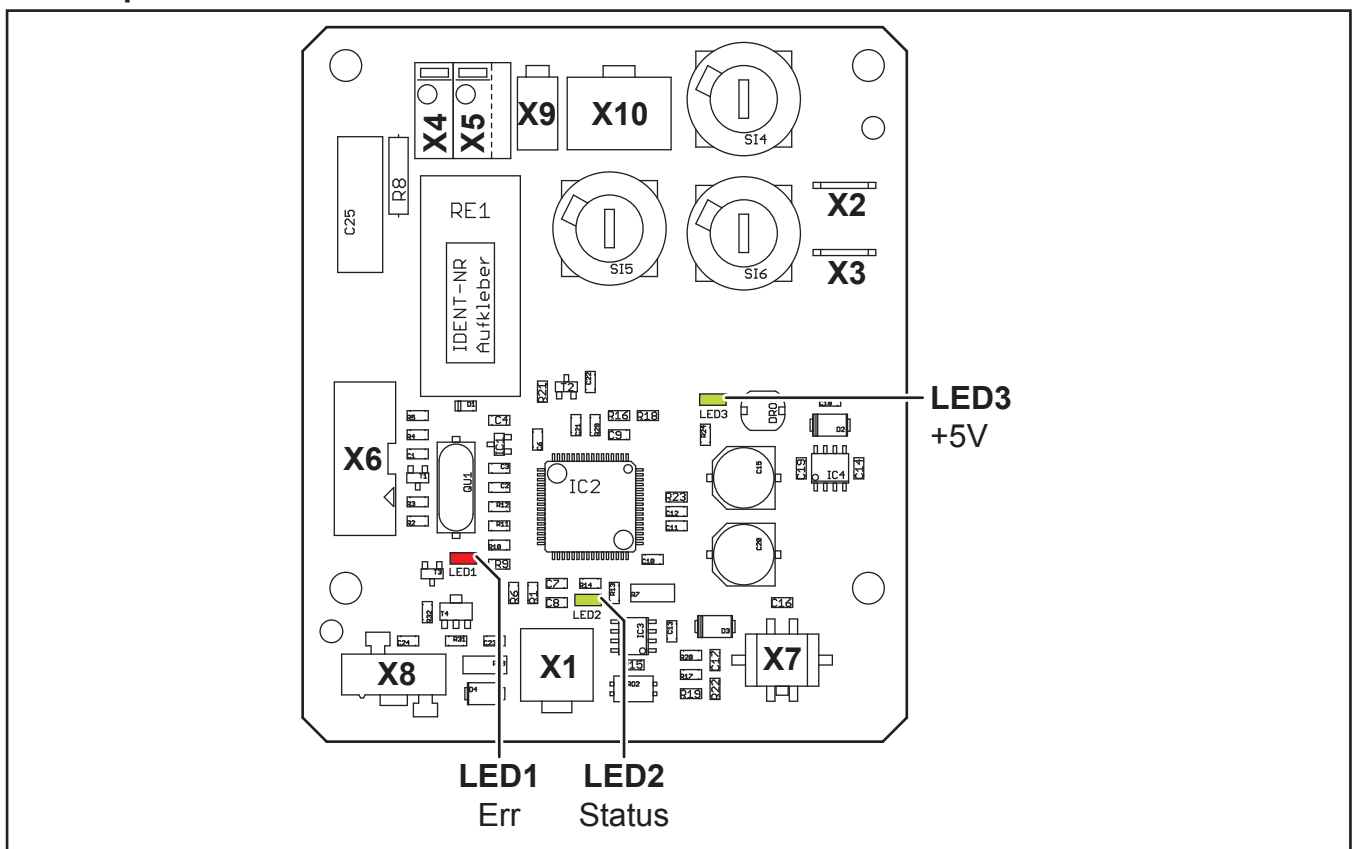
## Pc-Board SF18

The pc-board SF18 was the control logic of the water cooling unit. Since September the 16th 2015 it was replaced by the pc-board SF24.

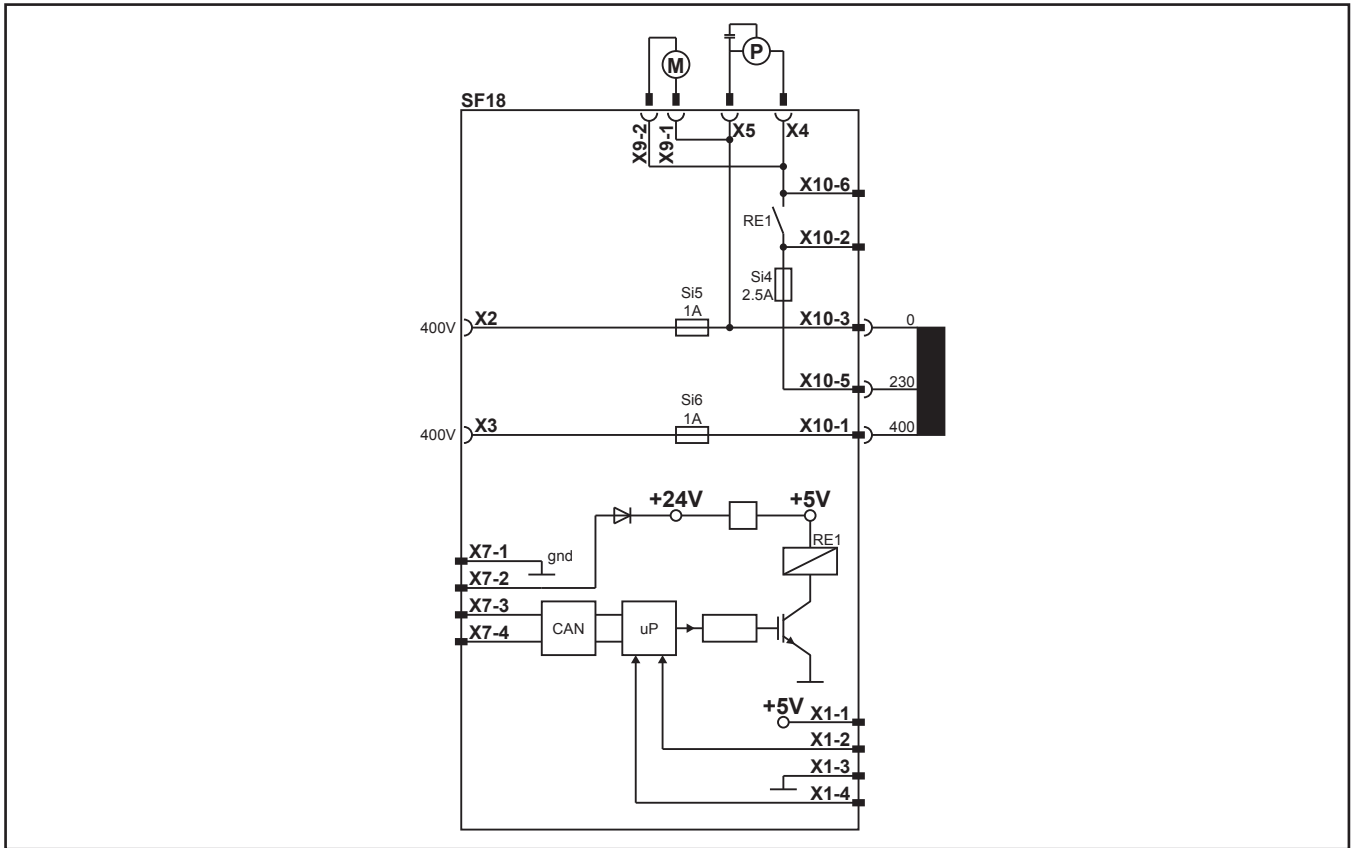
### LEDs

LED	state	designation
1 (red)	lit weak	microprocessor not programmed
	blinking irregular	LorchNet (CAN-bus) error
	blinking synchronous with LED2	flowrate too low (<0.3 l/min)
2 (green)	off	status not ok
	blinking	Status: blinking with 1Hz if pump off, LED is blinking with short pulses if pump on, LED is blinking with long pulses
3 (green)	on	5V supply voltage ok
	off	5V supply voltage missing

### Picture pc-board SF18



## Schematic pc-board SF18



### !!! CAUTION !!!

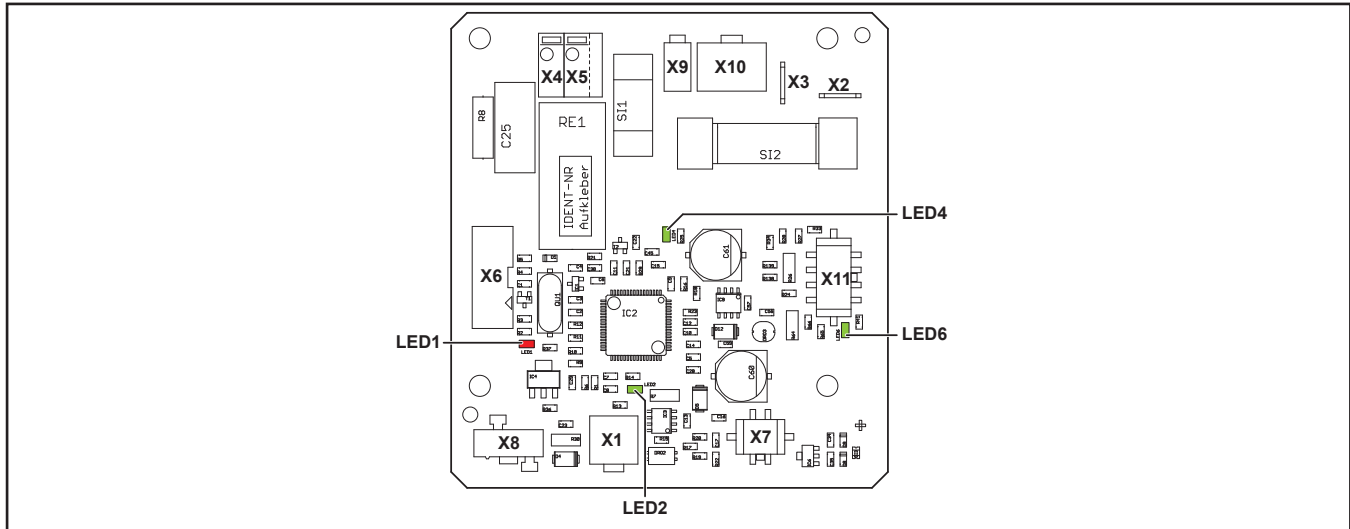
Because the pc-board SF18 is no longer produced and not available as spare part, the pc-board SF23 is used instead in case of a replacement.

The pc-board SF23 is the standard control board for the water cooling unit of the Robo-MicorMIG and is also part of the retrofit kit "Water-Detection MicorMIG" (570.8066.0)

## Pc-board SF23

The pc-board SF23 is the standard control of the Robo-MicorMIG. It is also used as replacement pc-board for the SF18 as well as in the retrofit kit, to retrofit the water monitoring in machines build before 2016.

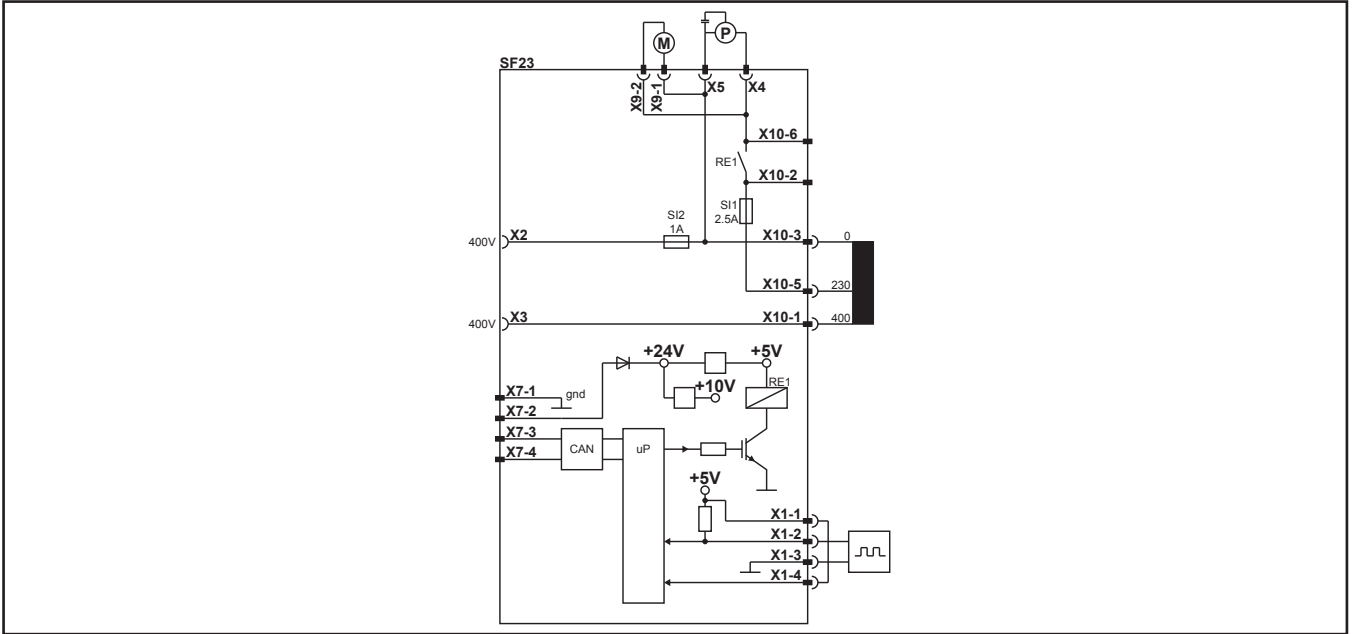
### Picture pc-board SF23



### LEDs

LED	state	designation
1 (red)	off	status ok
	on (weak)	processor not programmed
	blinking irregularly	LorchNet error
	blinking synchronous to LED2	coolant flowrate too low (<0.3 l/min)
2 (green)	off	status not ok
	blinking	status: blinking with 1 Hz if pump off, LED is blinking with short pulses if pump on, LED is blinking with long pulses
4 (green)	on	+5V supply ok
6 (green)	on	+10V supply ok

## Schematic pc-board SF23



Connector	Function
X1-1	+5V DC supply
X1-2	sensor input flow rate < 0.3 liter/minute : pins X1-2 and X1-3 are open (error message E05) flow rate > 0.3 liter/minute : pins X1-2 and X1-3 are closed
X1-3	gnd
X1-4	activation sensor input with +5V (bridge to X1-1) the sensor input (X1-2) is active

## Picture water sensor

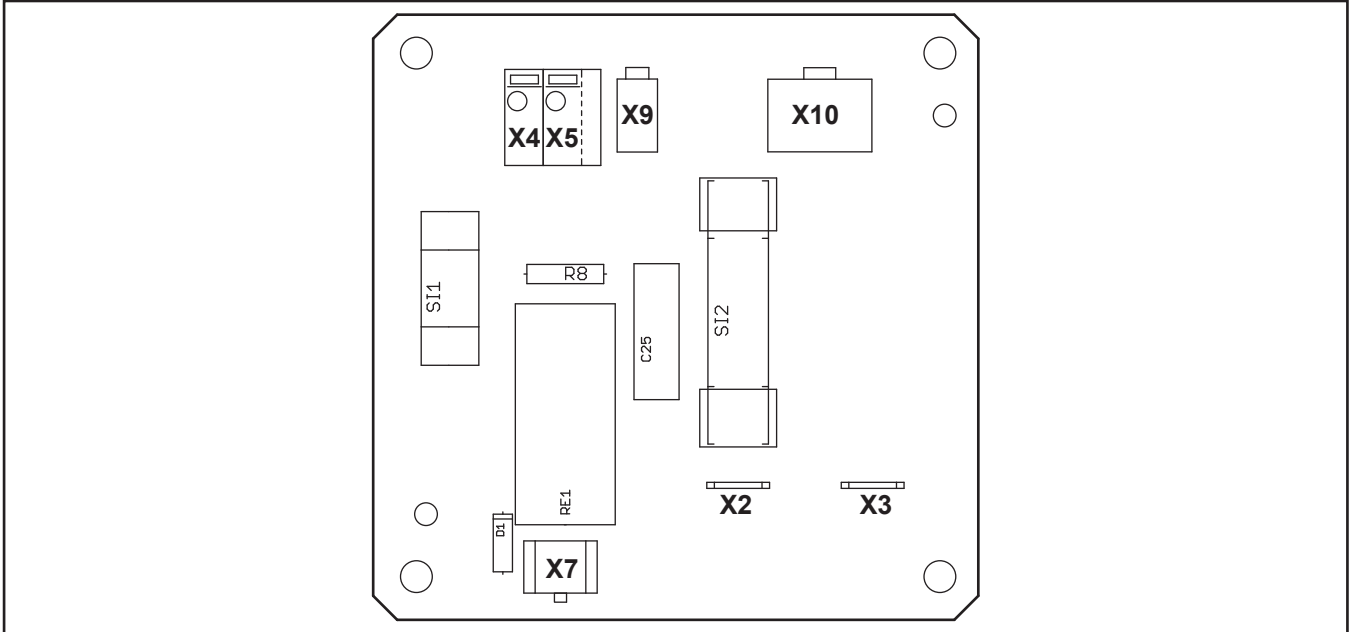


## Pc-board SF24

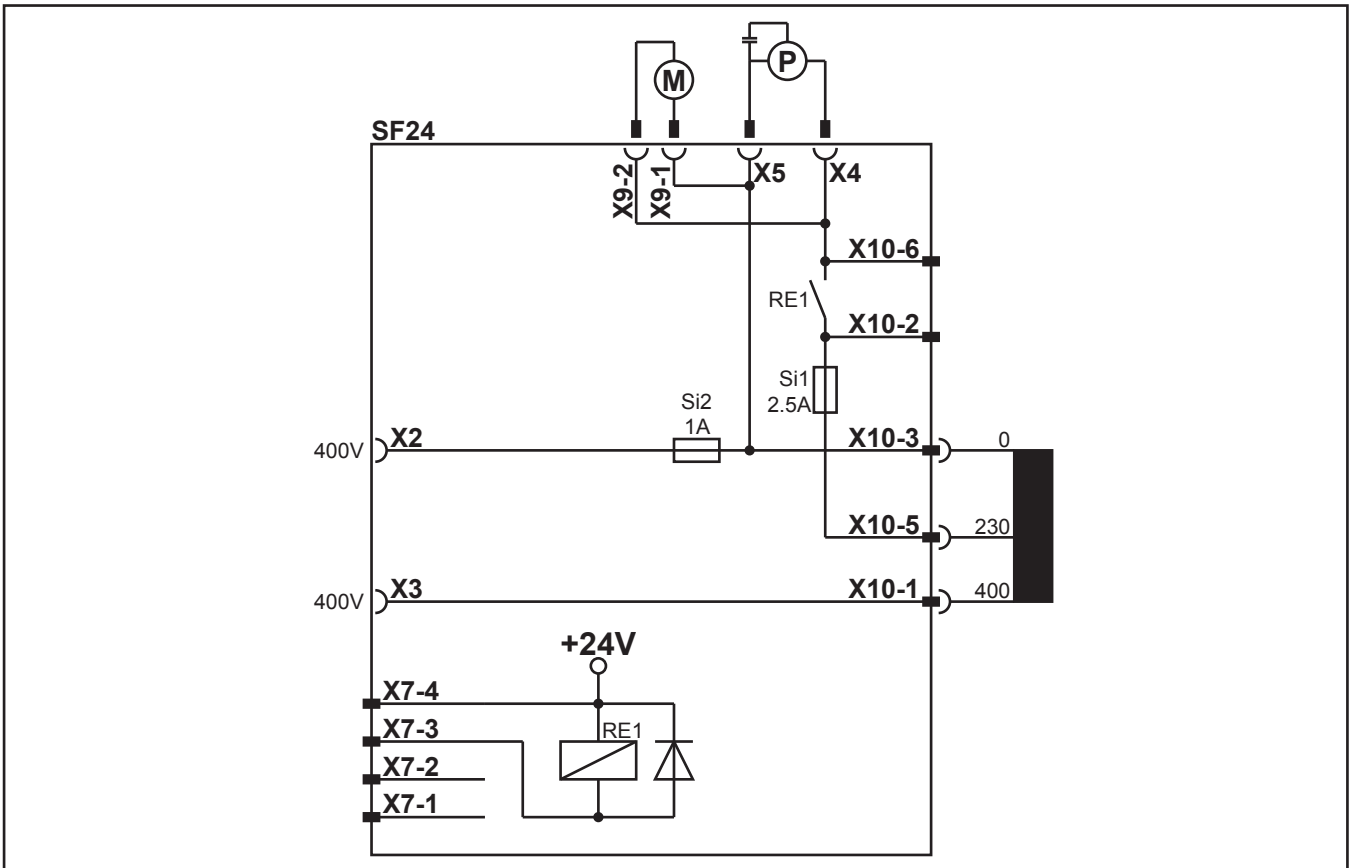
The pc-board SF24 is replacing the pc-board SF18. Since serial number 40xx-2538-0001-x, the SF24 is the standard control board for the water cooling unit of the MicorMIG. At the same time the pc-board DRV was changed (implementation of connector X19) to drive the relay on the SF24.

Since January 14th 2016 (with the introduction of cooling water detection) the SF24 was replaced with the pc-board SF27.

## Picture pc-board SF24



## Schematic pc-board SF24

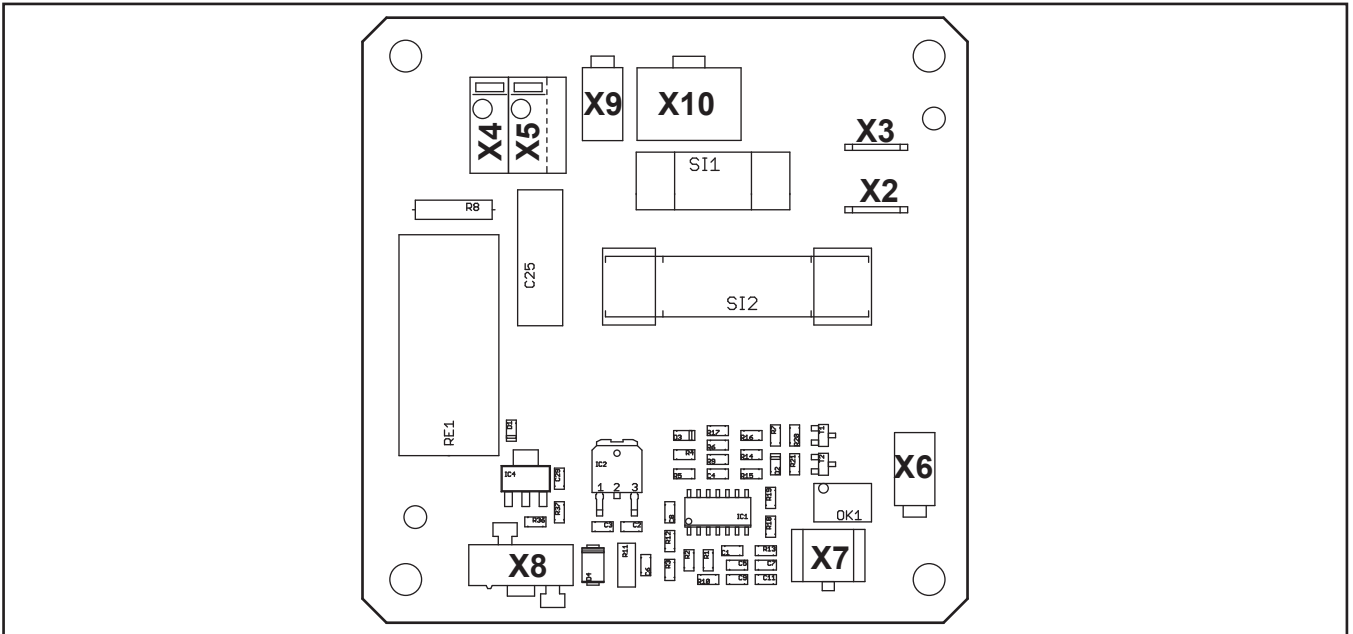




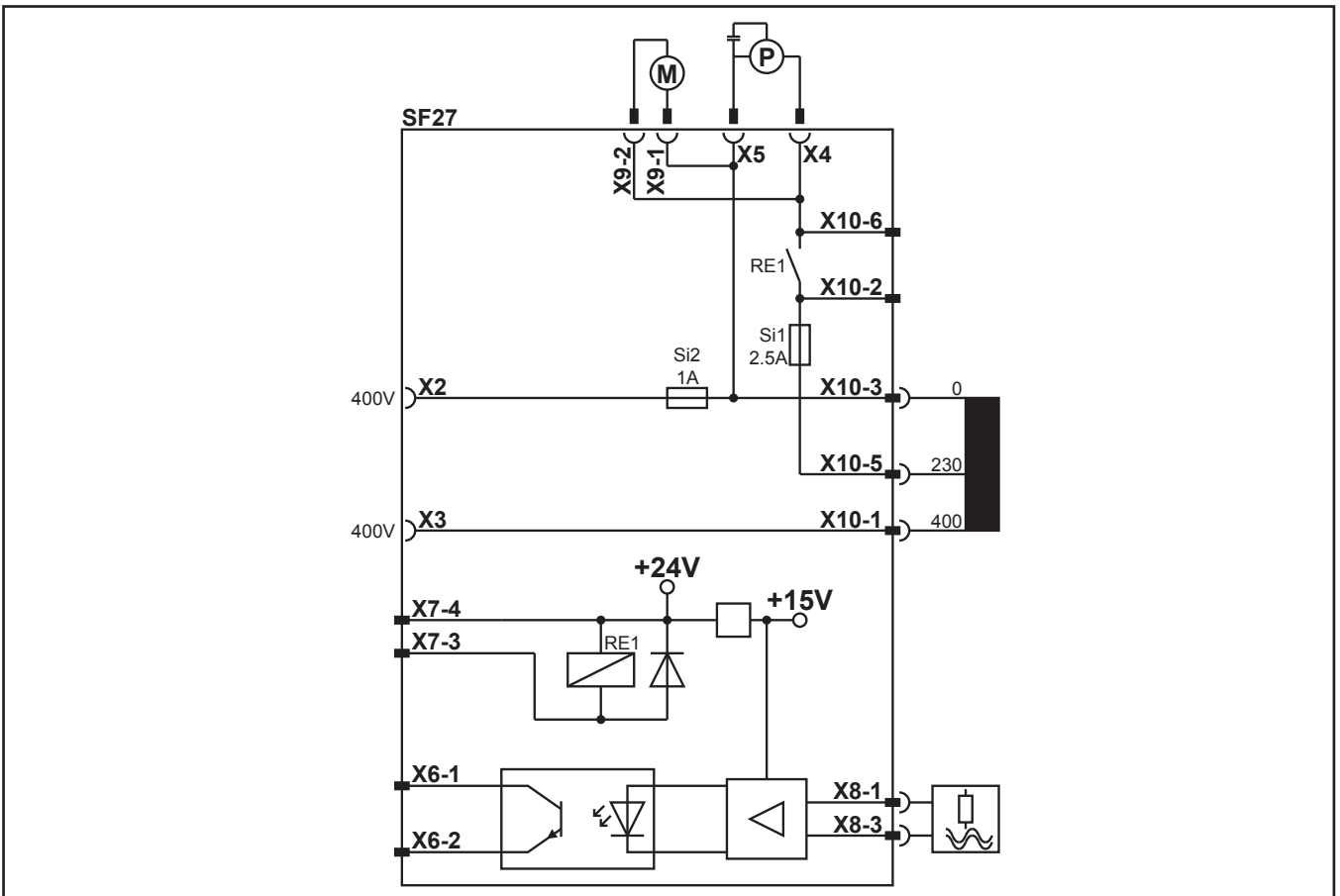
## Pc-board SF27

The pc-board SF27 is the actual control board for the water cooling unit with water flow detection. The sensor can only detect if water is flowing or not. It cannot measure the flow rate.

### Picture pc-board SF27



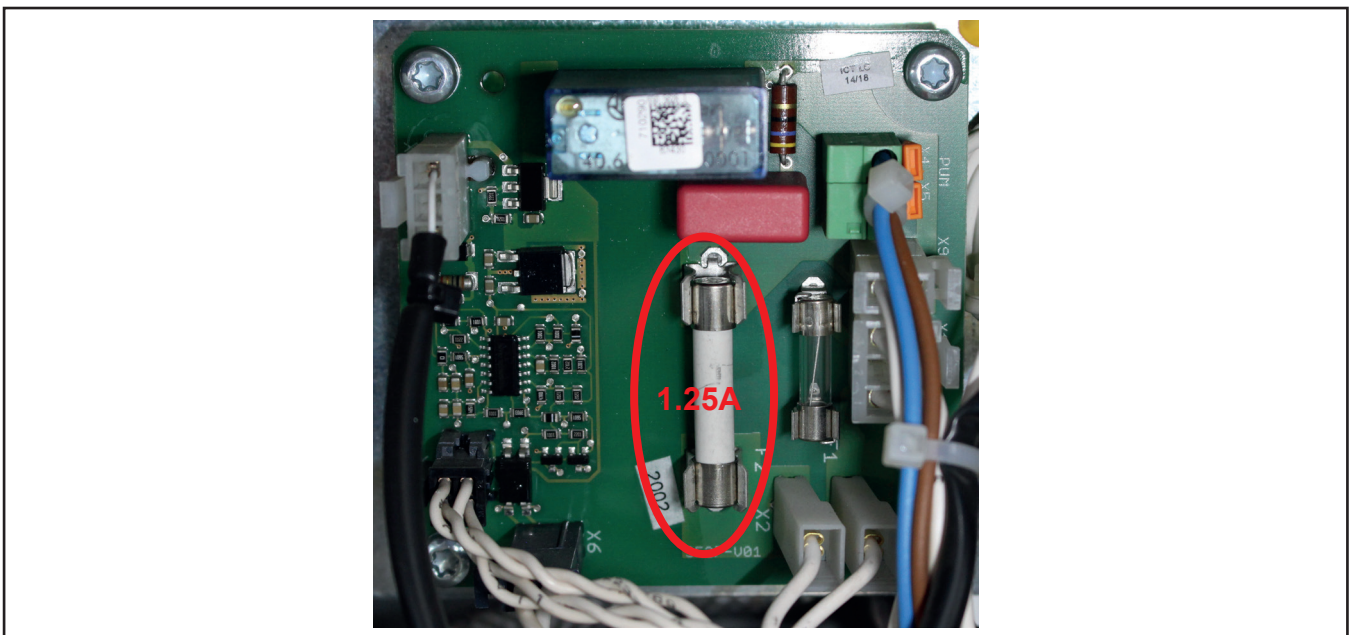
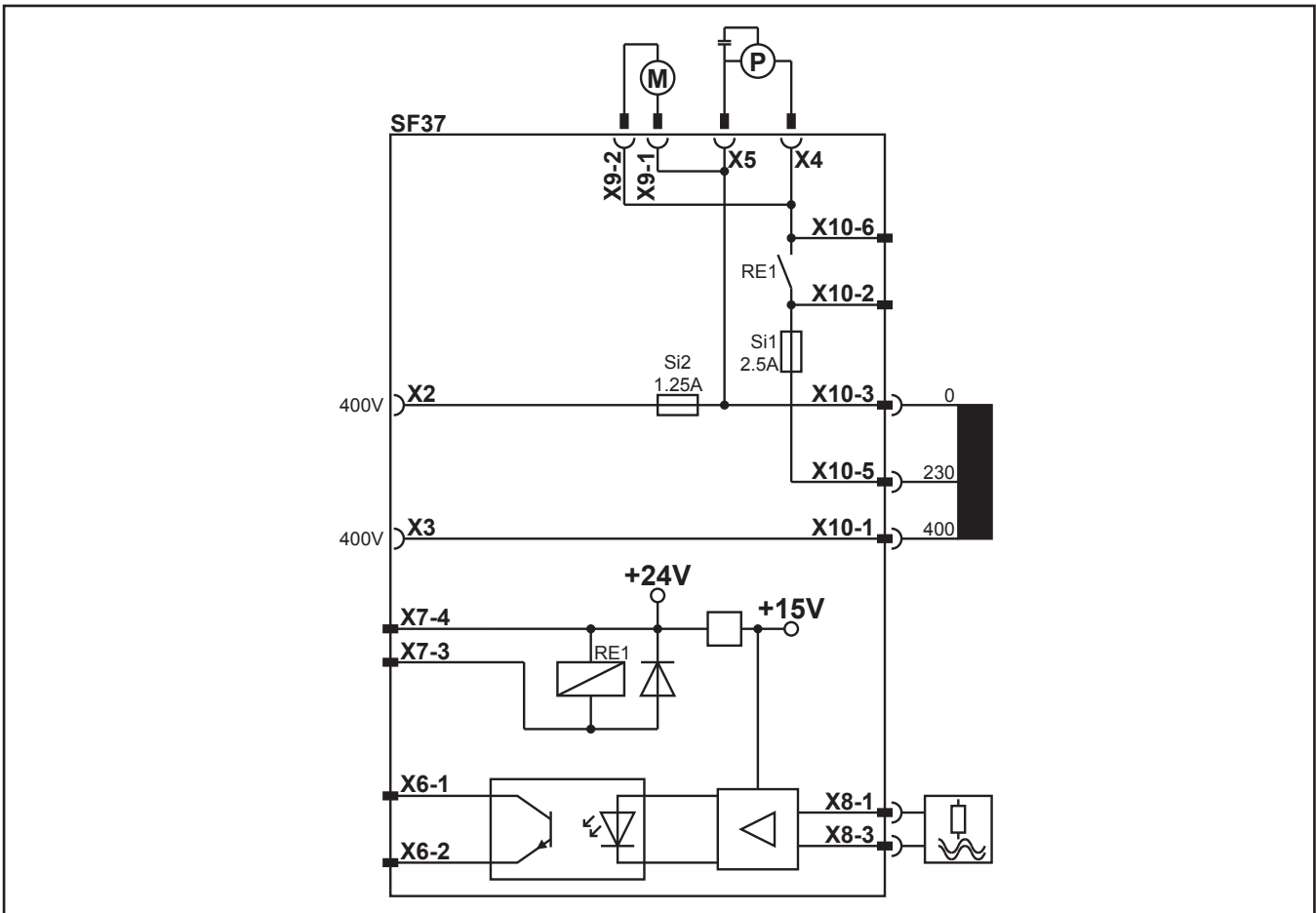
### Schematic pc-board SF27



## Pc-board SF37

Since 07/15/2020 (from serial number 4xxx-3029-xxx-x), the SF37 is used as a standard pc-board used for water cooling. The threshold value for detection of water flowing / water not flowing has been raised by 10 Kelvin. Furthermore, the fuse SI2 has been changed: 1.25A (instead of 1A) because at the same of the switch to SF37, the autotransformer was changed to a stronger version.

### Schematic pc-board SF37

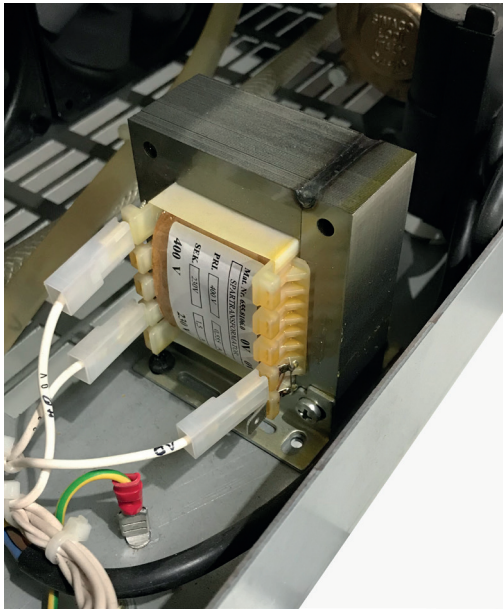


## Transformer 400V/230V

At the same time as the switch to the SF37 board, a more powerful transformer was used.

A retrofit kit is available for older systems: 981.8131.0

This includes an adapter plate (adaptation to the hole pattern of the old transformer) and the 1.25A fuse for the SF27 pc-board.



old transformer  
655.8106.0

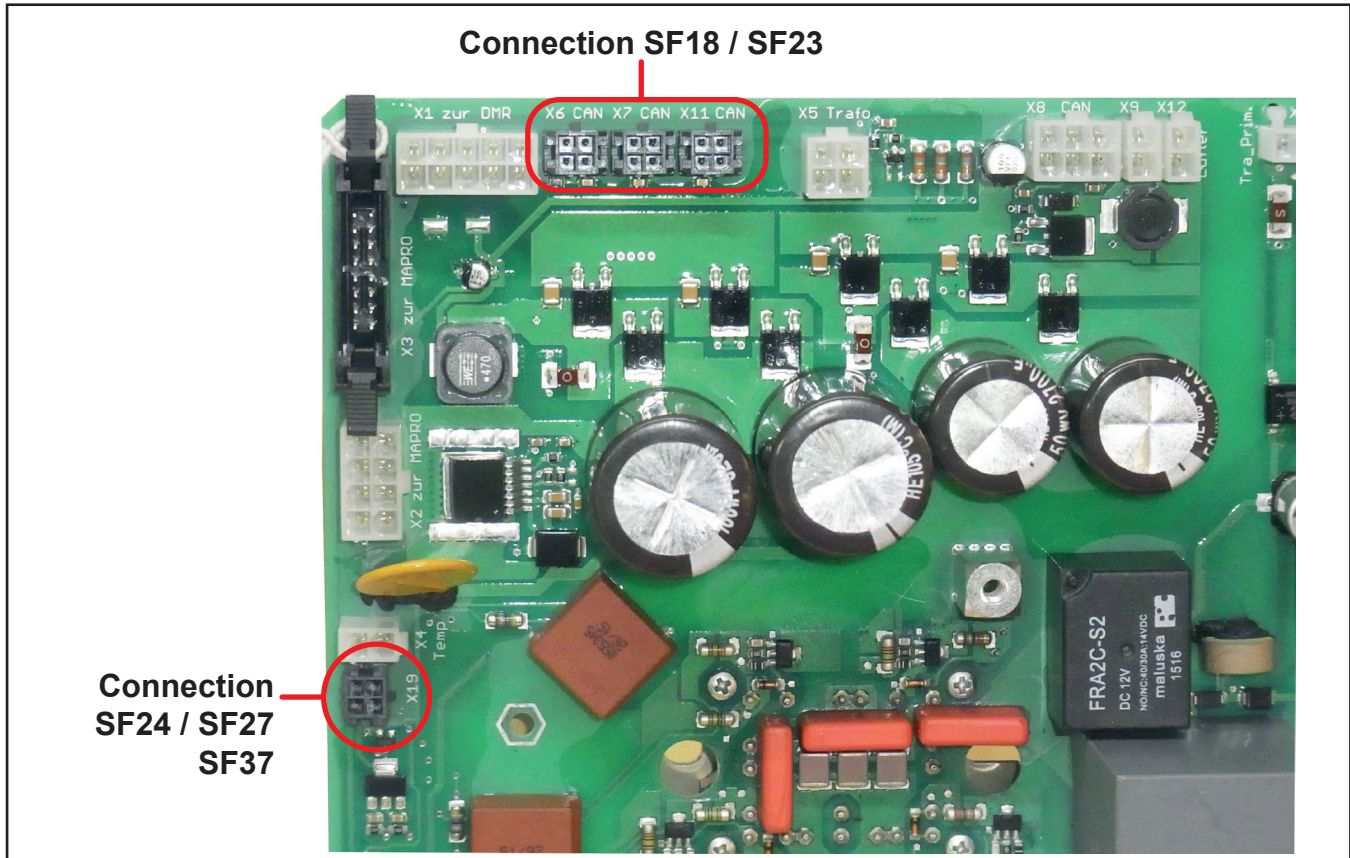


new transformer  
655.8109.0

## Connection cooling unit

At machines with internal water cooling, the pc-board SF18 was the main control board of the cooling unit. It has a microprocessor and was connected via the internal CAN-bus (LorchNet) to the pc-board DRV (x6 or X7, X11). Since September 16th 2015 the pc-board SF18 was replaced by the pc-board SF24, without microprocessor. It was still connected to the pc-board DRV, but not to the CAN bus any more. It must be connected to the separate X19 connector.

Since January 28th 2016 all MicorMIG machine are equipped with a water flow sensor for monitoring the cooling unit. For this the SF24 was replaced by the SF27. On the pc-board SF27 is a new connector for the water flow sensor.

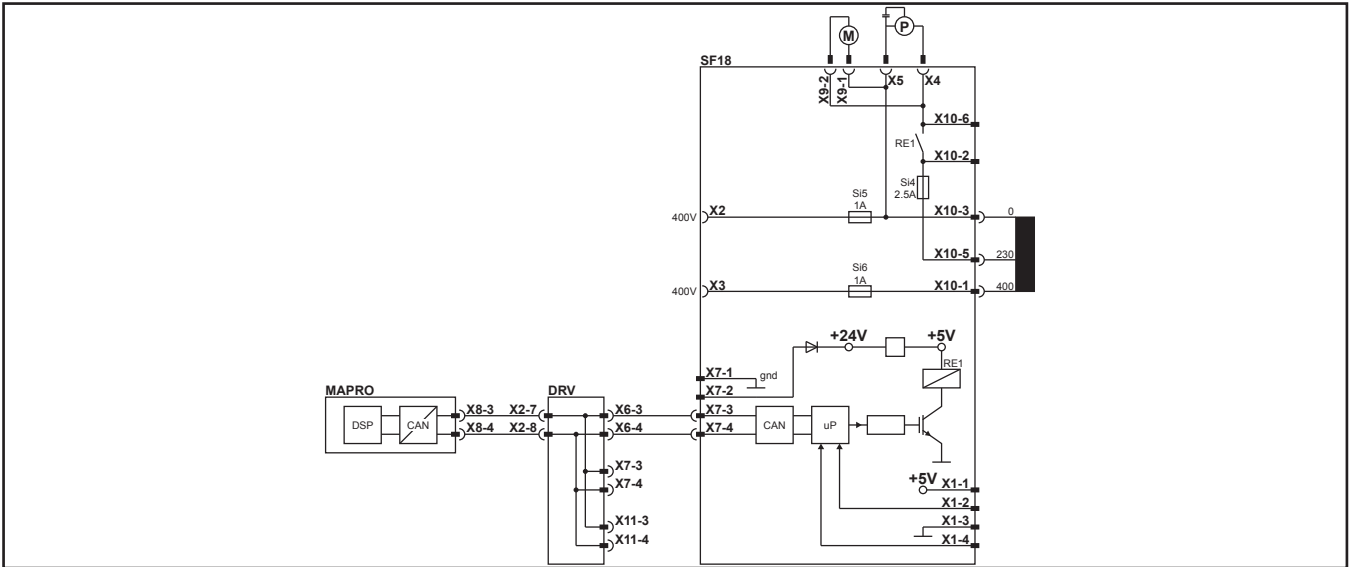


### !! CAUTION !!

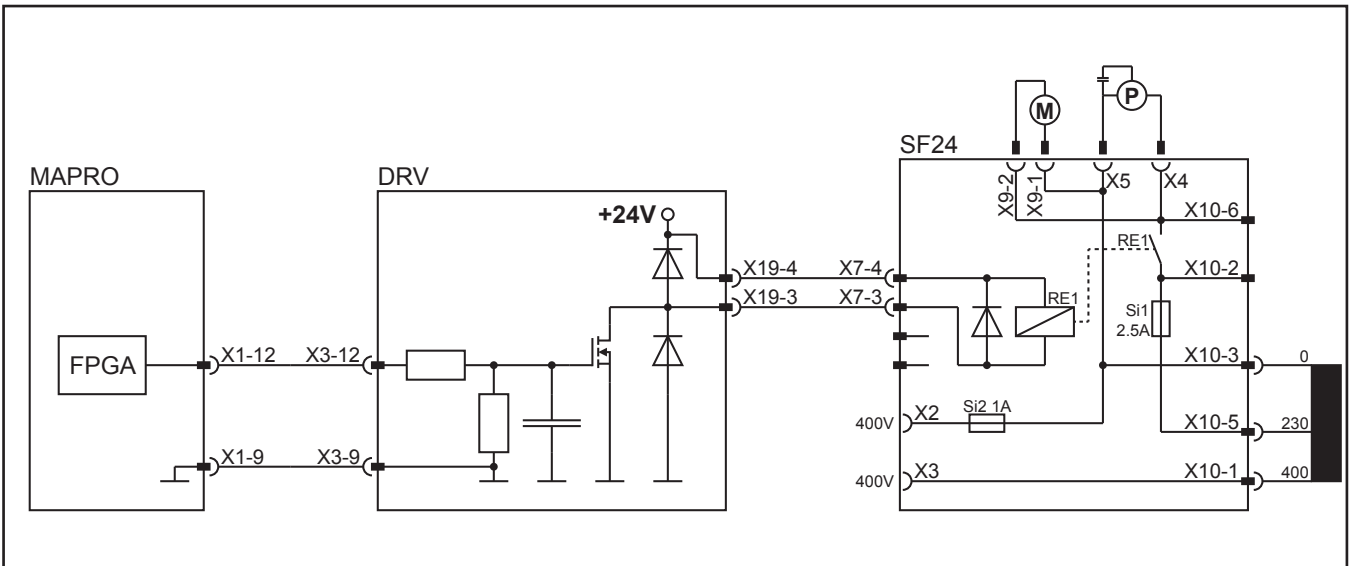
It is important not to mix up the connections X19 and X6, this could lead to a damage on the DRV or SF- pc-board.

# Control of the water cooling unit

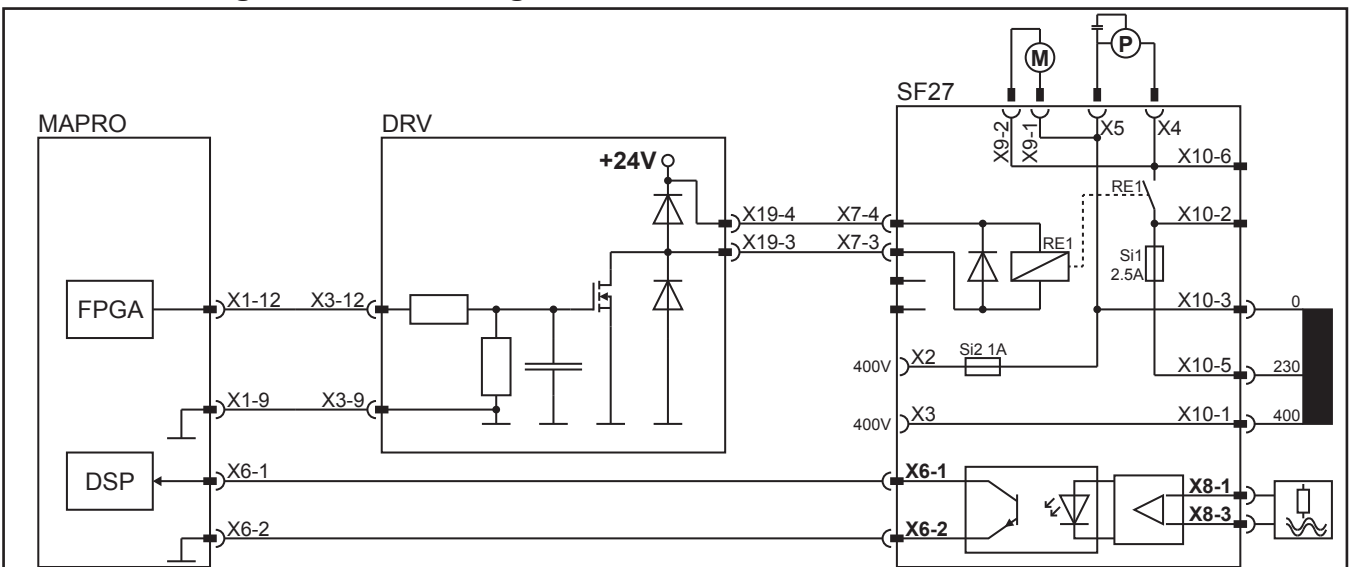
## Connection diagram water cooling unit SF18/SF23



## Connection diagram water cooling unit SF24

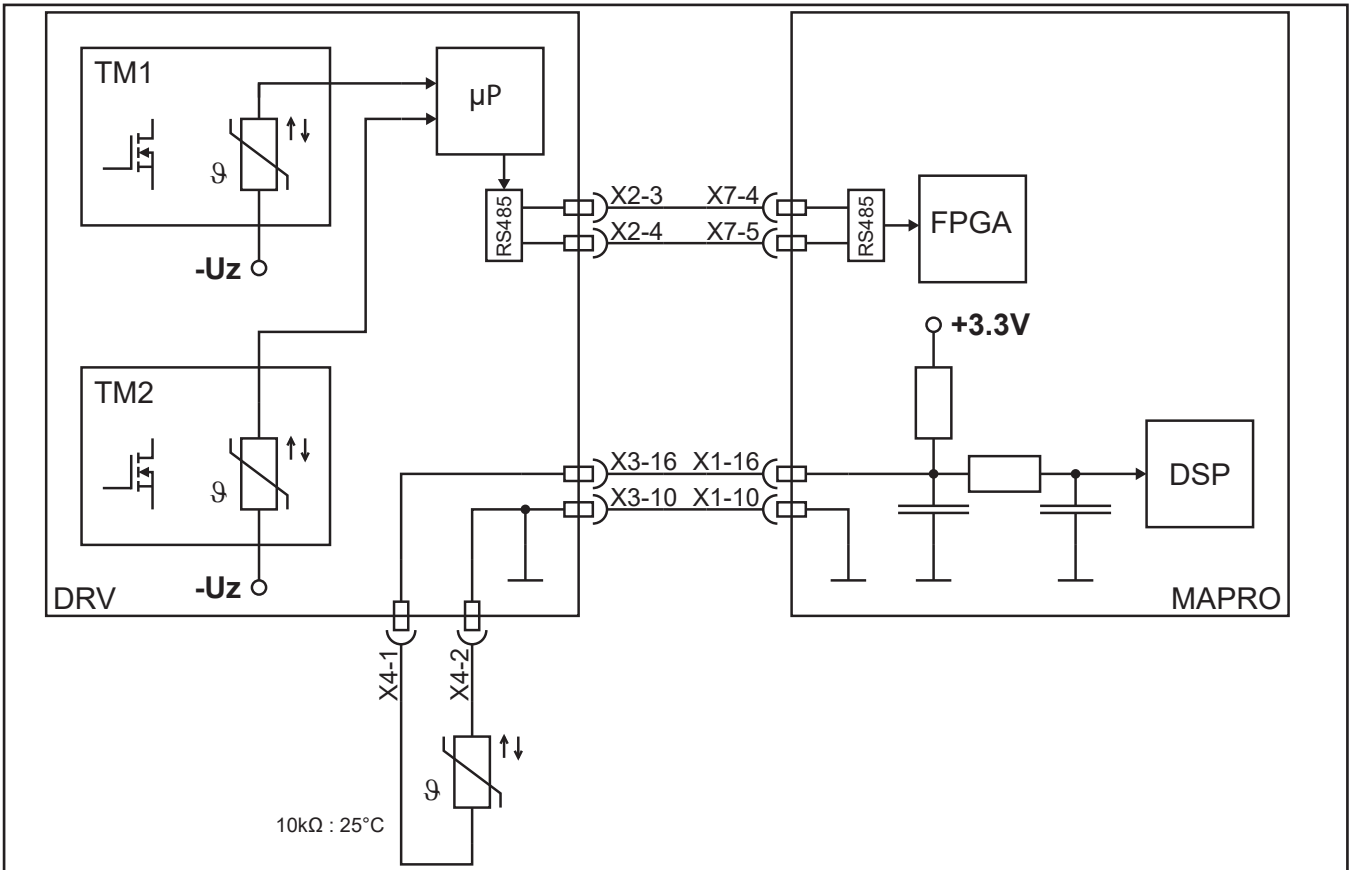


## Connection diagram water cooling unit SF27

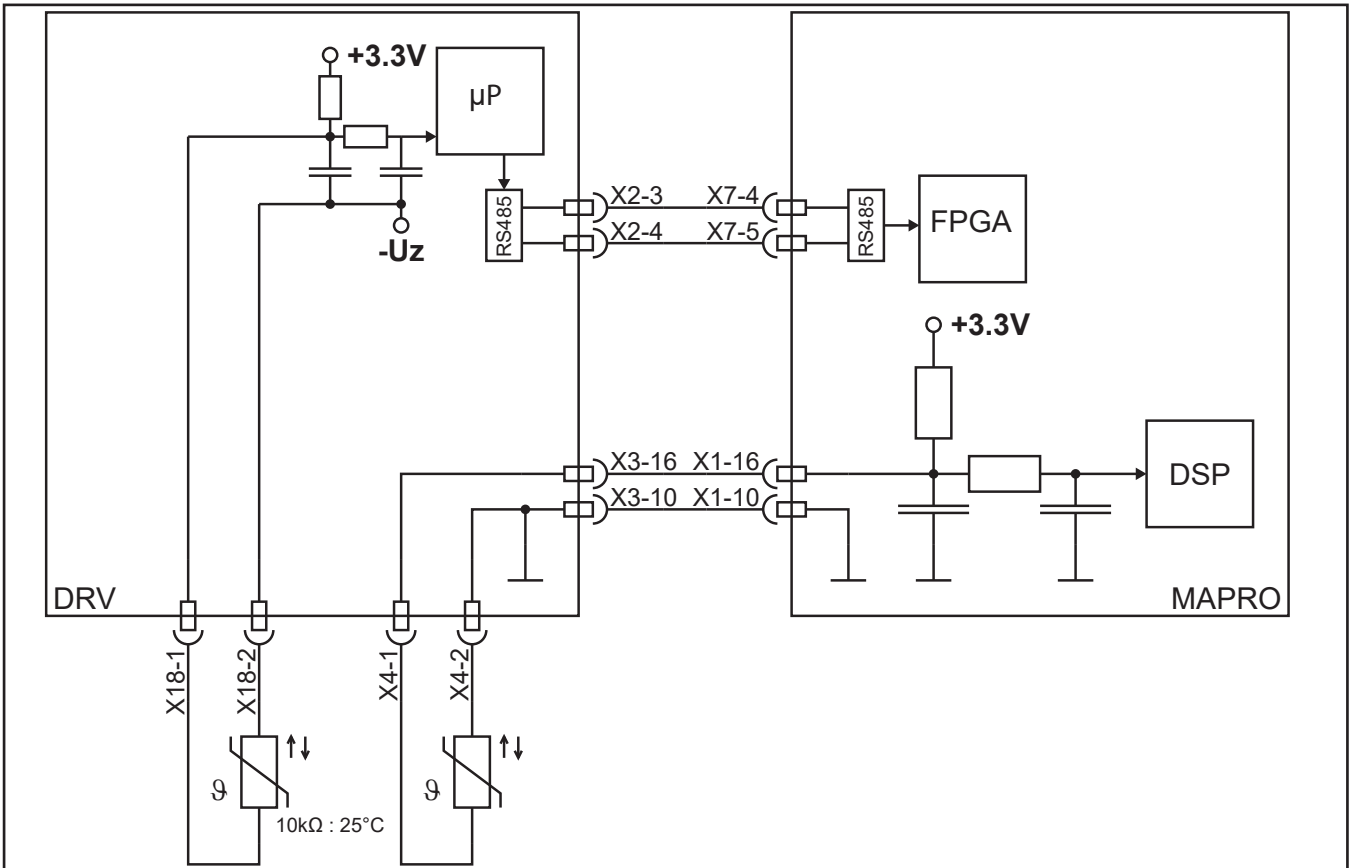


# Temperature monitoring

## Schematic MicorMIG 300/350



## Schematic MicorMIG 400/500



The temperature sensors are temperature dependant NTC resistors. As soon as one of the sensors is measuring a too high temperature, the machine stops with **E01** "Overtemperature". The sub-code indicates which sensor detected the overtemperature. The fans keep running to cool down the machine. If the temperature drops below 55°C, the error code disappears and the machine can be used again.

The middle heat sink temperature is calculated over a longer period of time. The effective limit is depending on the actual current setting, that means if the machine is used with a welding current below the 100% duty cycle, the **E01-04** can never come up.

sensor	code	limit	monitoring
output diodes	E01-01	ca. 80°C	MAPRO
primary modules	E01-02	ca. 70°C	DRV
middle heatsink temperature	E01-04	current depending	MAPRO

If one of the sensors should be faulty or disconnected from the measuring circuits, the machine will stop with the error code **E13** "Error Temperature Sensor".

The sensors have a resistance value of about 10kΩ at 25°C.

code	sensor
E13-01	at output diodes
E13-02	inside primary modules (MicorMIG 300/350) / MOSFETs and IGBTs (MicorMIG 400/500)

## Monitoring bus voltage

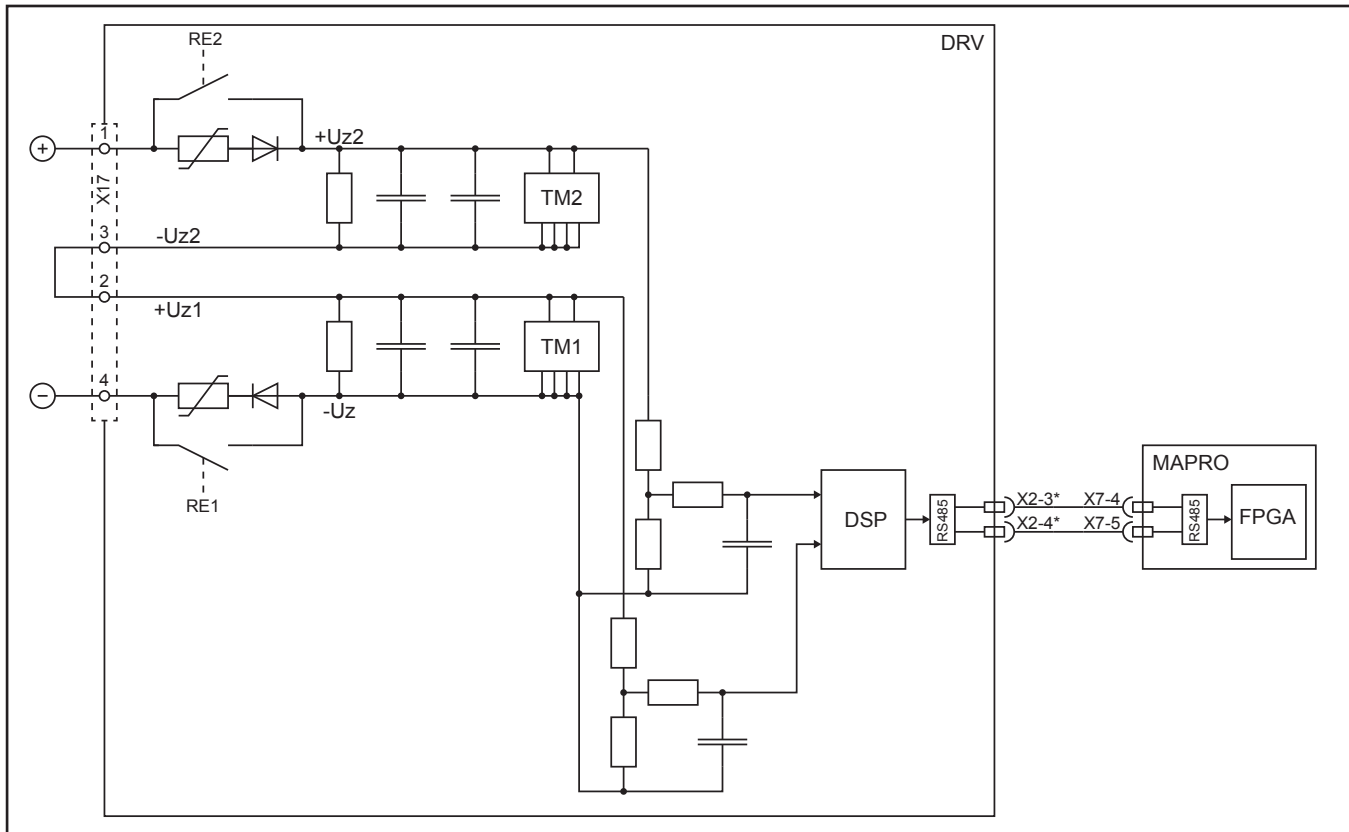
Right from switching on the machine, the bus voltage is monitored directly by the DSP of the DRV.

The actual value of the bus voltage is send from the DSP of the DRV to the MAPRO.

As soon as the voltage gets too high, the machine stops with **E02** "Overvoltage". In this case the power-up relays on the DRV are switched off, so that the power-up resistors are active again, lowering the input voltage.

If the minimum value of 390V DC is not reached during startup (switching on), the machine stops with **E22-03** "Undervoltage Startup".

## Schematic



\*(at the DRV05 the connector designation X19 was later renamed into X2)

In general the values of both bus voltages at the power modules TM1 and TM2 are equal (symmetrical). If there should be a difference >60V, the machine stops with **E33-01** Unsymmetrical bus voltage.

If a difference >60V is detected during startup, the machine stops with **E33-02** Unsymmetrical bus voltage Startup.

As soon as the difference gets below 60V, the error code is reset.

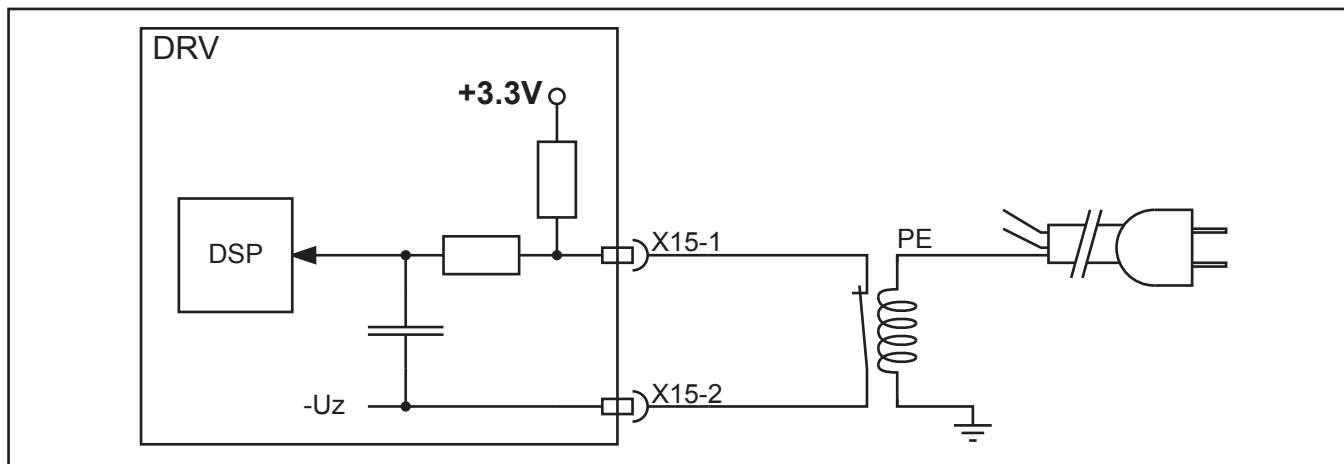
Code	Cause
E02-02	During startup the maximum limit of 700V DC was exceeded.
E02-04	The maximum limit of 750V DC (or 400V DC at the modules) was exceeded during operation.
E02-05	The FPGA measured a too high bus voltage (>400V DC) at the modules.
E22-03	During startup the minimum limit of 390V DC was not reached.
E33-01	The difference between the bus voltages of module 1 and 2 is greater 60V.
E33-02	The difference between the bus voltages of module 1 and 2 is greater 60V at startup.



## PE (Protective Earth) -Protection

The PE monitoring is a standard feature in every machine. As soon as a current  $>15A$  is flowing via the PE wire of the mains cable, a reed-contact opens up and the machine stops with **E04-01** PE-monitoring.

### Schematic

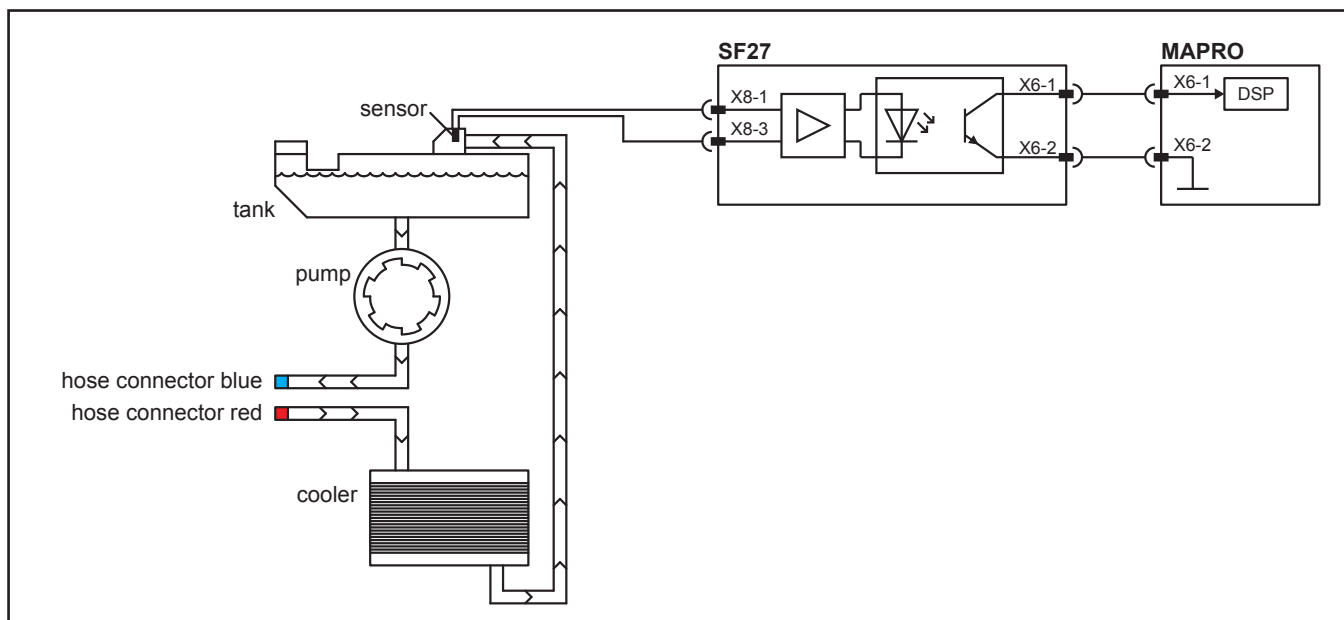


## Cooling unit

Since January 14th 2016 the water cooled machines of the MicorMIG series are equipped with a water monitoring. A sensor is mounted in the water tank, that is washed around by the cooling water of the return-flow. The sensor is a "self-heating" sensor: the temperature is decreasing as soon as the water is flowing over it. If the water is not flowing, the temperature of the sensor is kept stable.

If the pump is running and a flow of the water cannot be detected for longer than seven seconds, the machine stops with the error message **E05**.

### Schematic



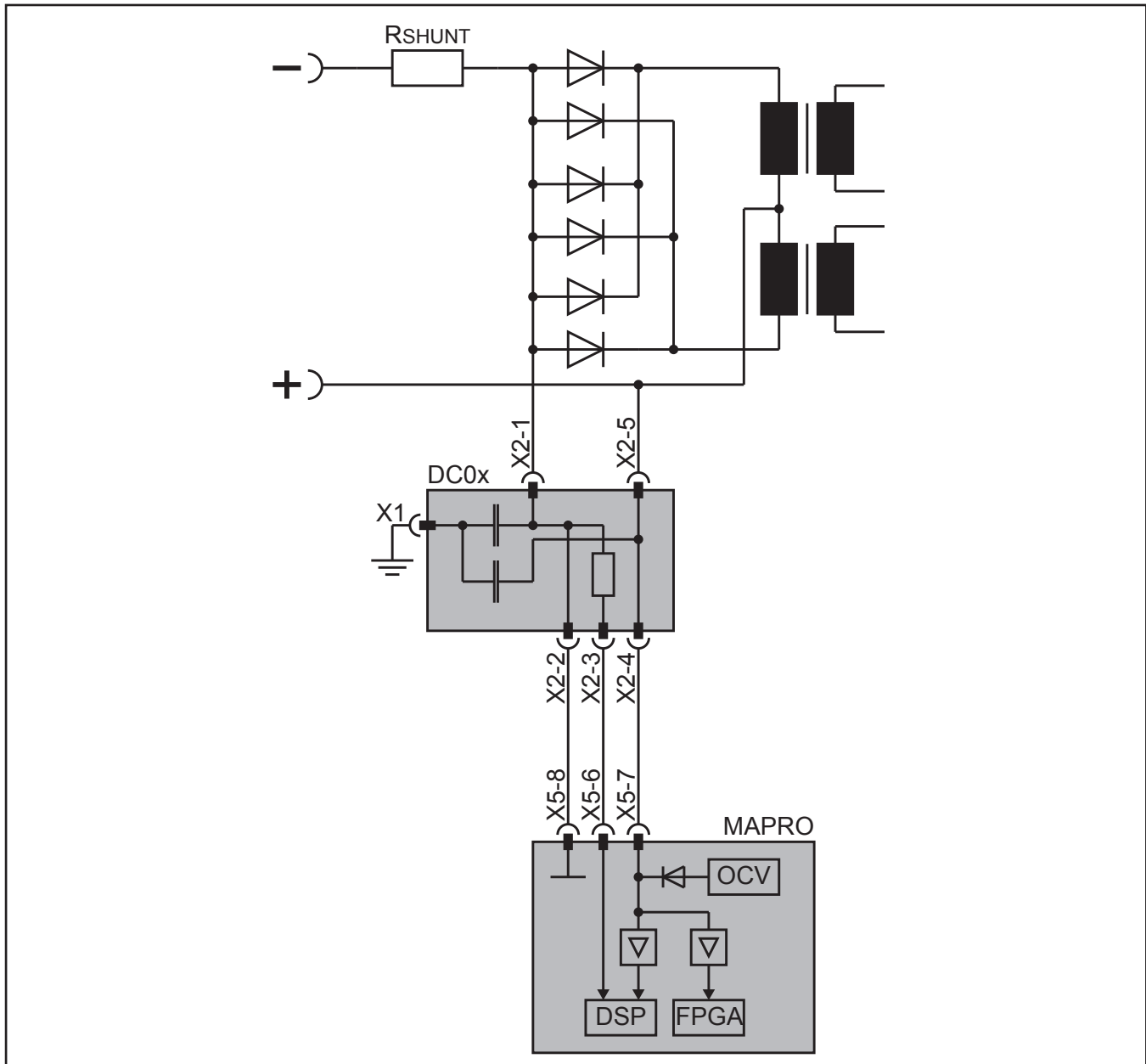
Since November 2017 with the software release 2.09 the water surveillance time was enhanced from 7 seconds to 10 seconds.

## Monitoring Output Voltage

The output-/welding voltage is measured directly by the DSP of the MAPRO. If a voltage >100V DC is measured for longer than 100ms, the machine stops with **E06-00** "Overvoltage secondary".

In case that the FPGA is measuring the too high voltage, the machine stops with **E06-01** "Overvoltage secondary FPGA". The output voltage is measured directly at the secondary diodes (via X5-7 of the MAPRO).

### Schematic



When switching on the machine the power unit is activated shortly and the output voltage is measured. If there is no output voltage during driving the power unit, the machine stops with **E12-00** "Power unit error Startup".

The reason can be a fault in the measuring path or a fault in the primary driver (e.g. interchanged transformer wires at the pc-board SF02).

If a machine is used too far off the "normal" welding characteristic, it will stop after the machine recognizes a too high output voltage for a longer period of time. This will overload the machine at it protects itself by stopping with the error code **E18-01** "Overload". In such situations it is very likely that the temperature of the power unit gets very high in a short time and maybe also reach the maximum allowed temperature, stopping with **E01**.

## Open Circuit Voltage Generator & VRD

The open circuit voltage of the MicorMIG machines is not produced via the power unit, it is a DC signal voltage generated by the MAPRO. At machines with active VRD, the VRD voltage is programmed with a lower voltage (like 24V) instead of 80V.

When the machine is switched on, the MAPRO is activating the open circuit voltage for a short time to check its function. If no voltage is measurable, the machine stops with **E25-01 “Error voltage generator”**.



Since software version 1.12 the display of the error message is suppressed, when at switching on the machine. If a short circuit at the output is present (torch is laying on the work table, wire is touching the ground), the E25-1 is NOT displayed at the front panel. In this situation (as long as the short circuit is still present), the wire inching button is not working. As soon as the short circuit is removed (taking the torch away from the work table), the machine functions normally.

When switching between to a different welding mode like MMA (stick electrode) or TIG, the open circuit voltage generator is stopped and started again. If no voltage is measurable after the re-start, the machine stops with the error code **E25-02**.

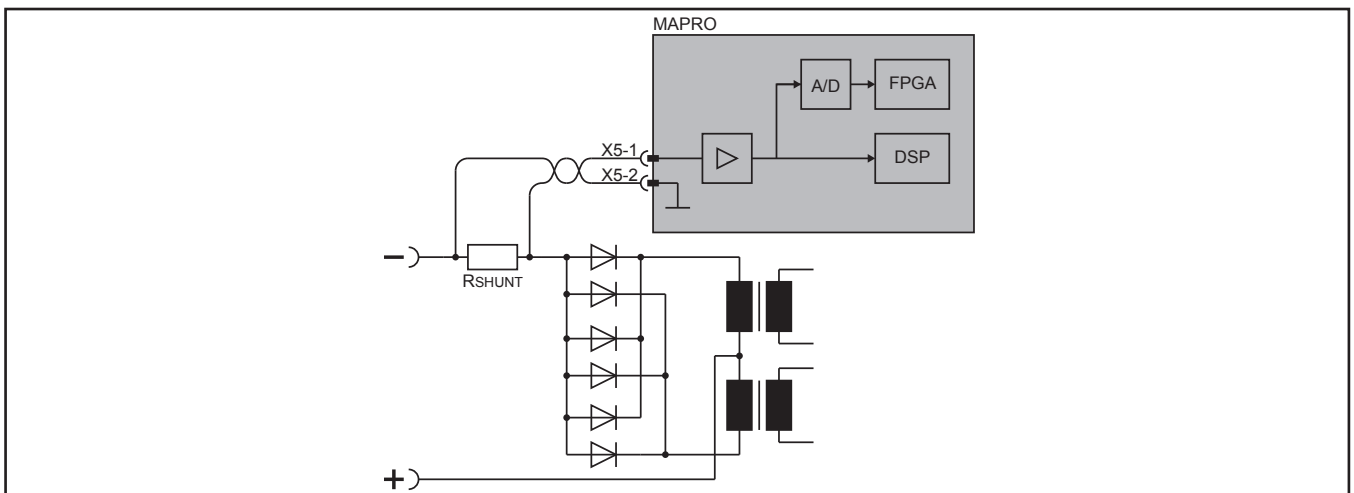
## Monitoring welding current

The welding current is measured directly via the DSP of the MAPRO using a shunt resistor. Parallel to this, the FPGA of the MAPRO is also monitoring the voltage across the shunt resistor via an A/D converter.

When the machine is not welding, the voltage across the shunt resistor is 0V. If a voltage is measured anyway (voltage offset), the machine stops with the error code **E15-01 “current offset FPGA”**.

In case of a contact problem between MAPRO and shunt resistor, the machine stops with the error code **E15-00**.

## Schematic

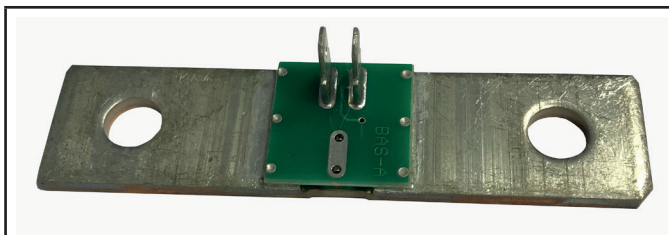


## New Shunt resistor

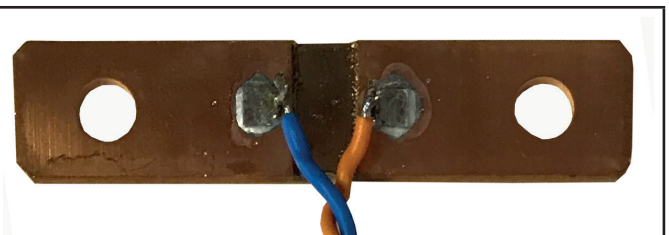
Since May 2020 (from serial number 4xxx-3019-xxxx-x) a new shunt resistor is used where the connecting wires are now directly soldered to the shunt. Also new spare part kits were generated (including a mounting instruction):

MicorMIG 300/350/400: 666.0012.0

MicorMIG 500: 666.0015.0



old shunt



new shunt

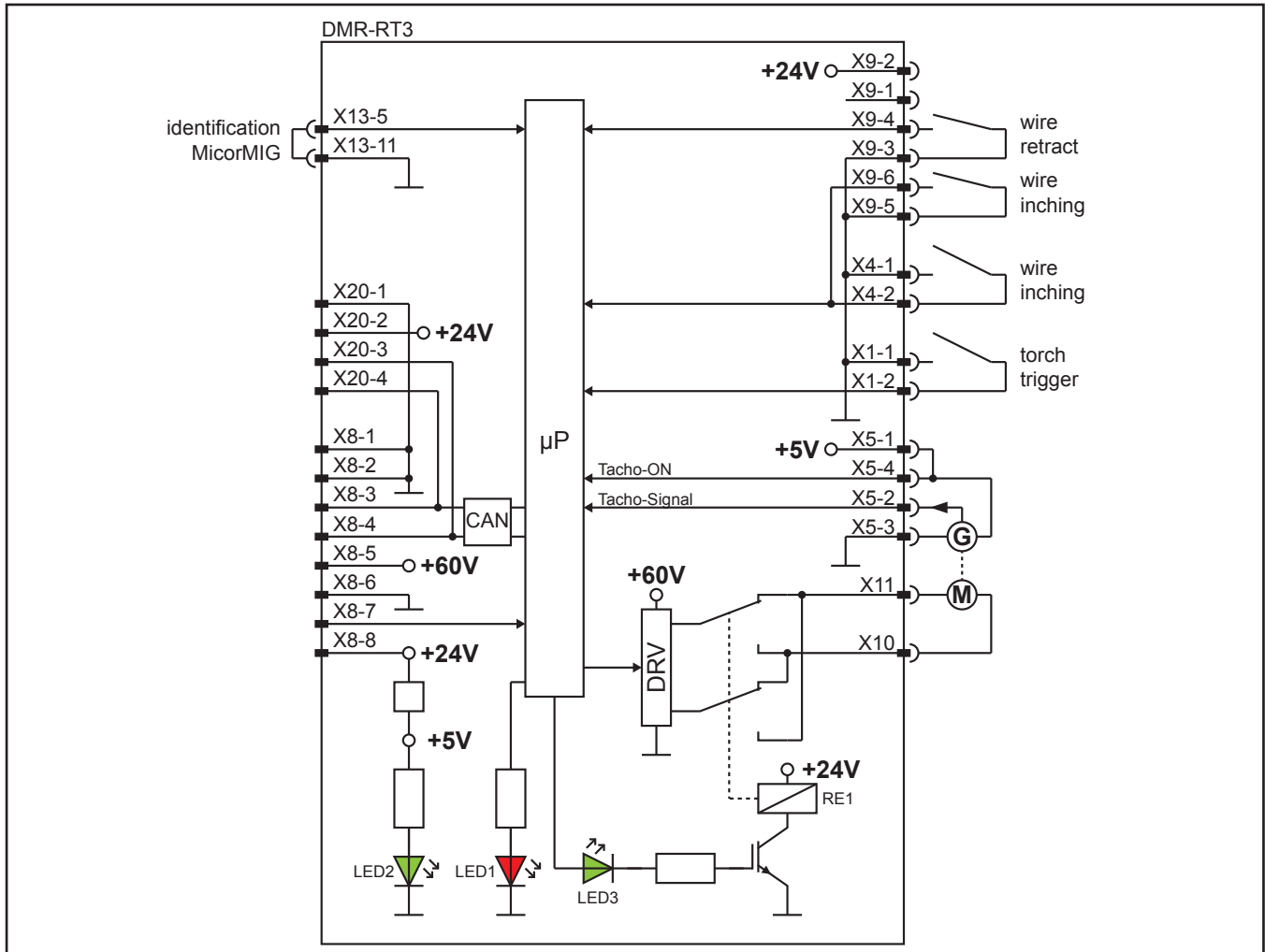
# Monitoring and driving the wire feed motor

The wire feed motor is driven and monitored by the pc-board DMR-RT3. If the current consumption of the motor is too high, the machine stops with the error code **E08** "Motor overcurrent".

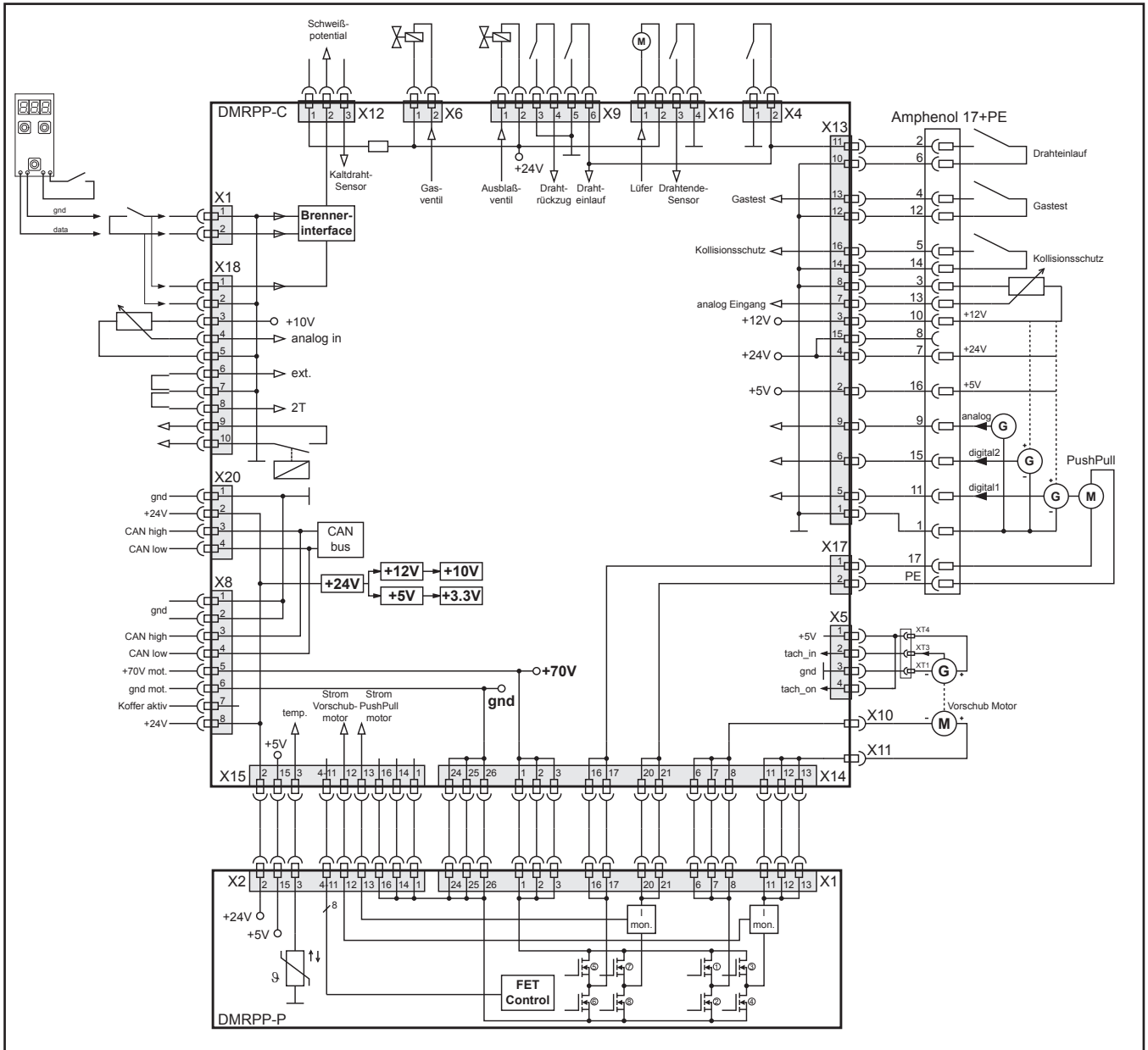
## Motor identification

The pc-board DMR-RT3 is also used in other machines with other motors, not only at the MicorMIG. Because of this, a identification (cable-bridge at connector X13, pins 5 and 11) is needed to indicate that the DMR-RT3 is used in a MicorMIG machine. This cable must always be present at every MicorMIG machine.

## Schematic



# Schematic DMRPP05

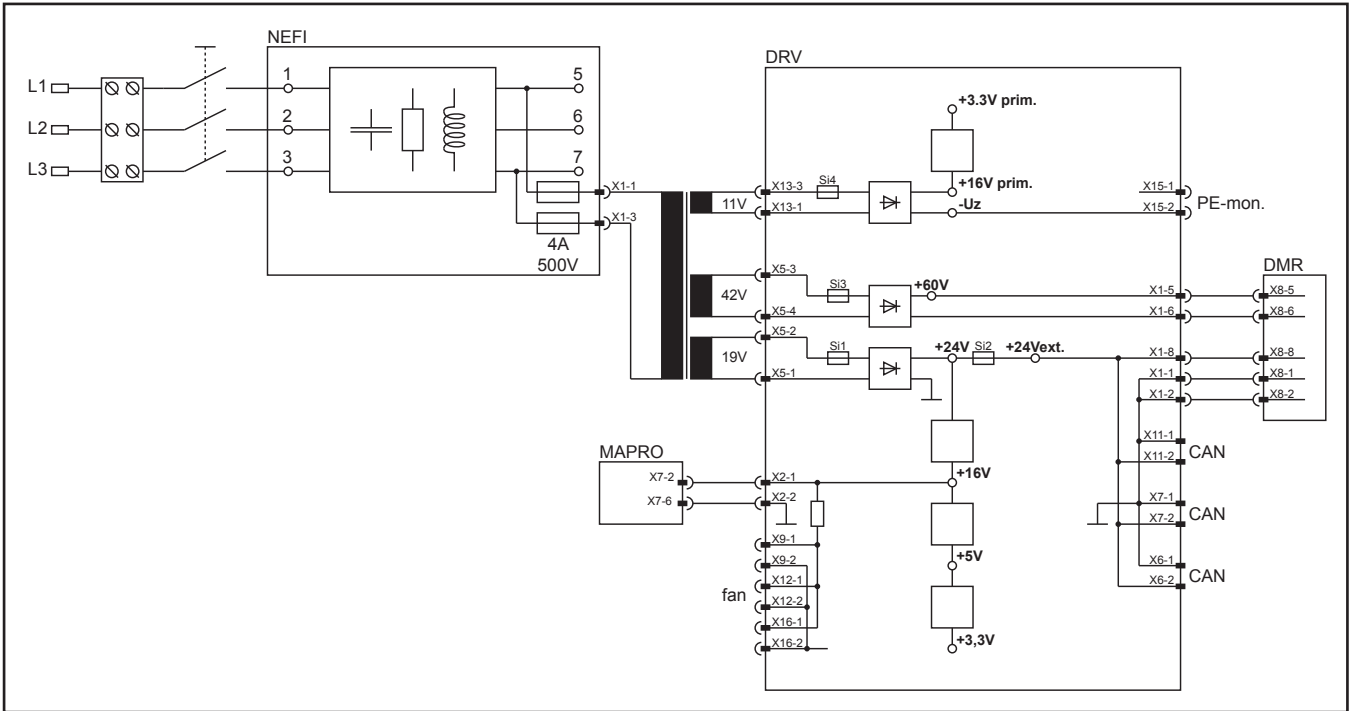


In case of a installed Push-Pull option, instead of the DMR-RT3 the pc-board DMRPP05 is present. An additional menu item is available where the Push-Pull torch type can be selected. The normale wire feed motor as well as the Push-Pull motor is controlled by the DMRPP05.

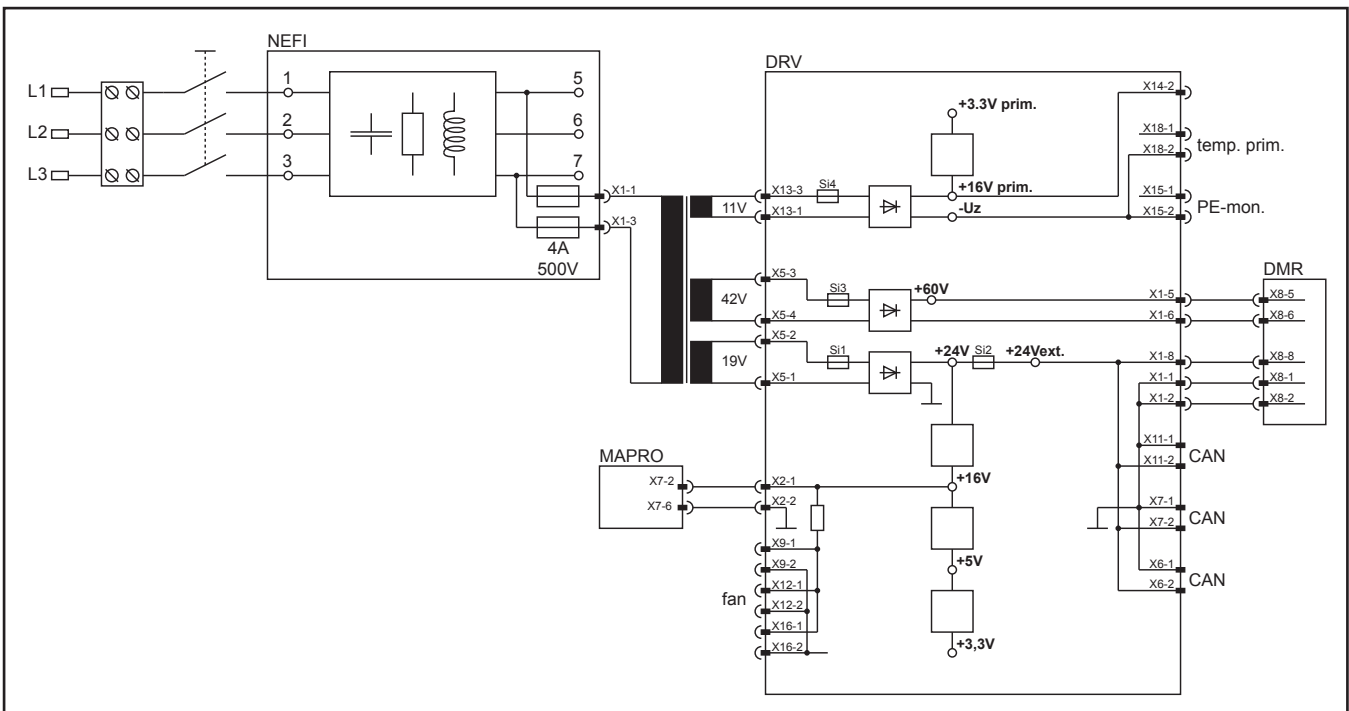
## Supply Voltages

The MAPRO is supplied with 16V from the DRV. If the voltage gets below 12V, the machine stops with **E14-00** "Undervoltage".

### Schematic MicorMIG 300/350



### Schematic MicorMIG 400/500



# Machine Configuration

The hardware configuration is saved internally inside the machine. When switching on, the MAPRO is reading the configuration and compares it with the actual present hardware identifications of the DRV, the actual software version and the identification of the front panel.

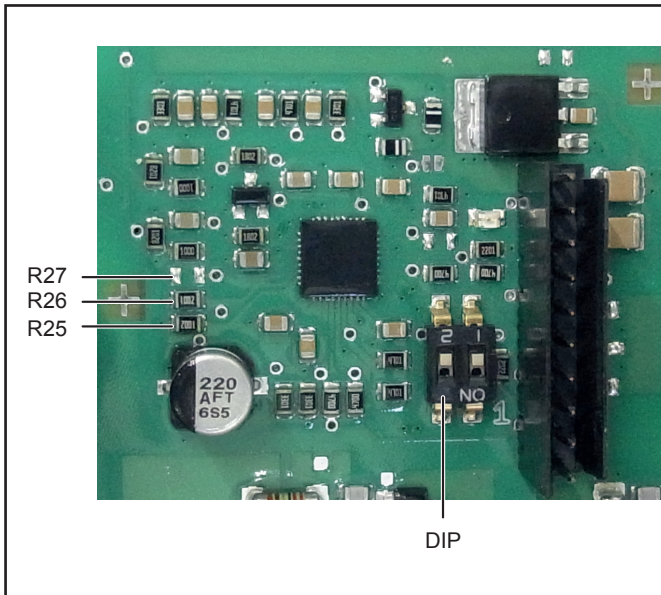
If the configuration does not match the actual hardware configuration or if the configuration could not be read correctly, the machines stops with **E30** "Configuration".

code	designation	cause
E30-04	configuration primary	the measured bus voltages do not match the actual saved configuration
E30-05	error configuration	error when reading the configuration: no valid data present or data is corrupted
E30-06	configuration software	the actual software does not fit to the hardware

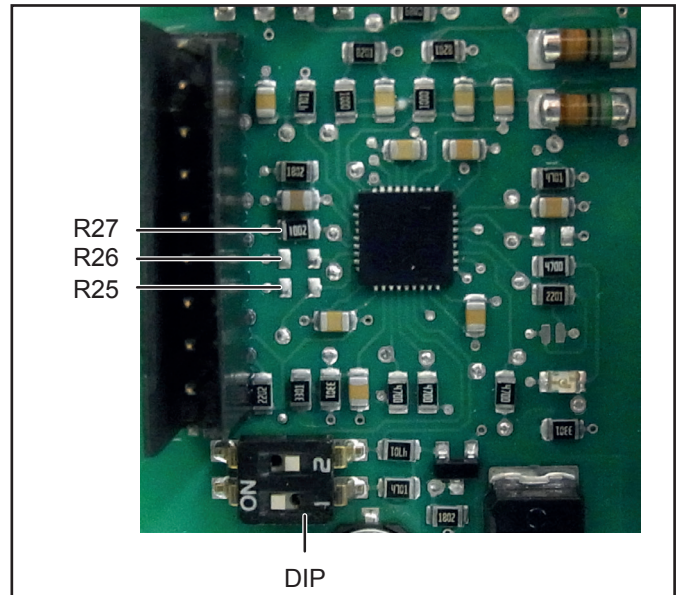
R25	R26	R27	configuration
X	X		300 / 350
		X	400
	X	X	500

DIP1	DIP2	configuration
OFF	OFF	3-phase 400V
OFF	ON	3-phase 230V
ON	OFF	multivolt (selection switch 230V / 400V)

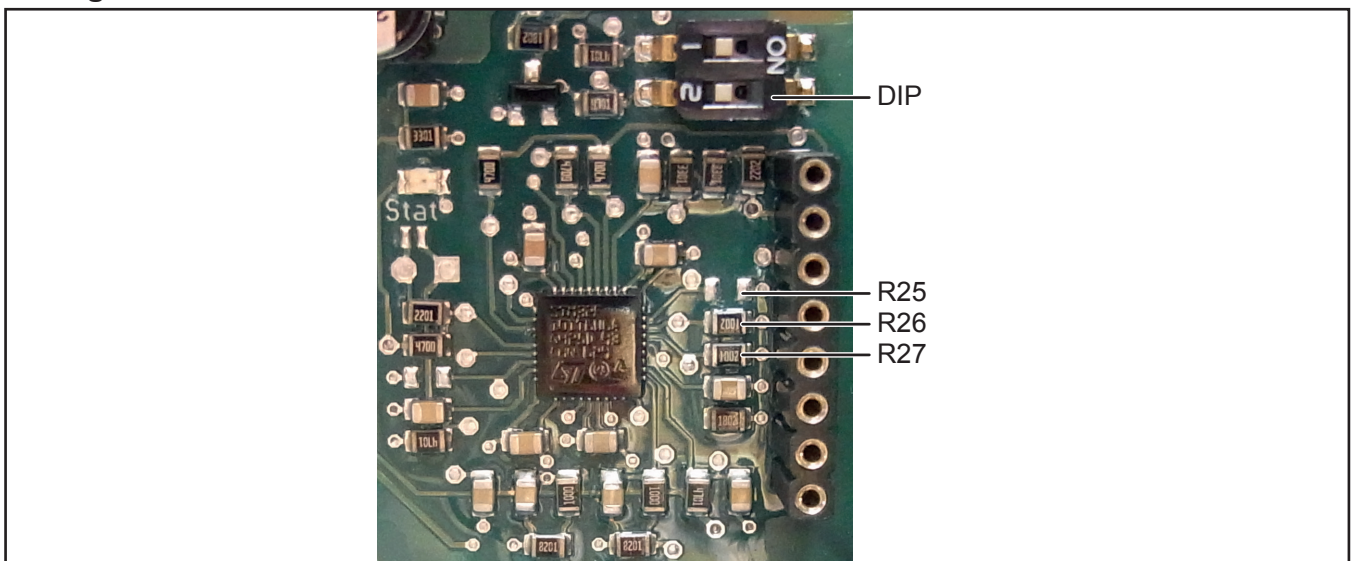
## Configuration resistors DRV13



## DRV15



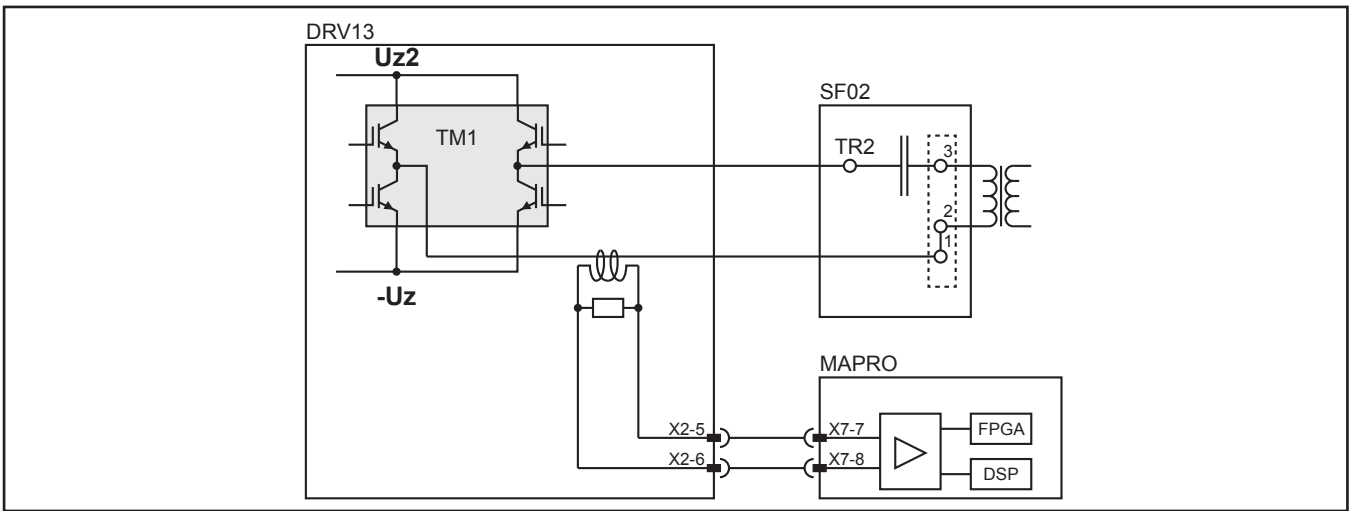
## Configuration resistors DRV17



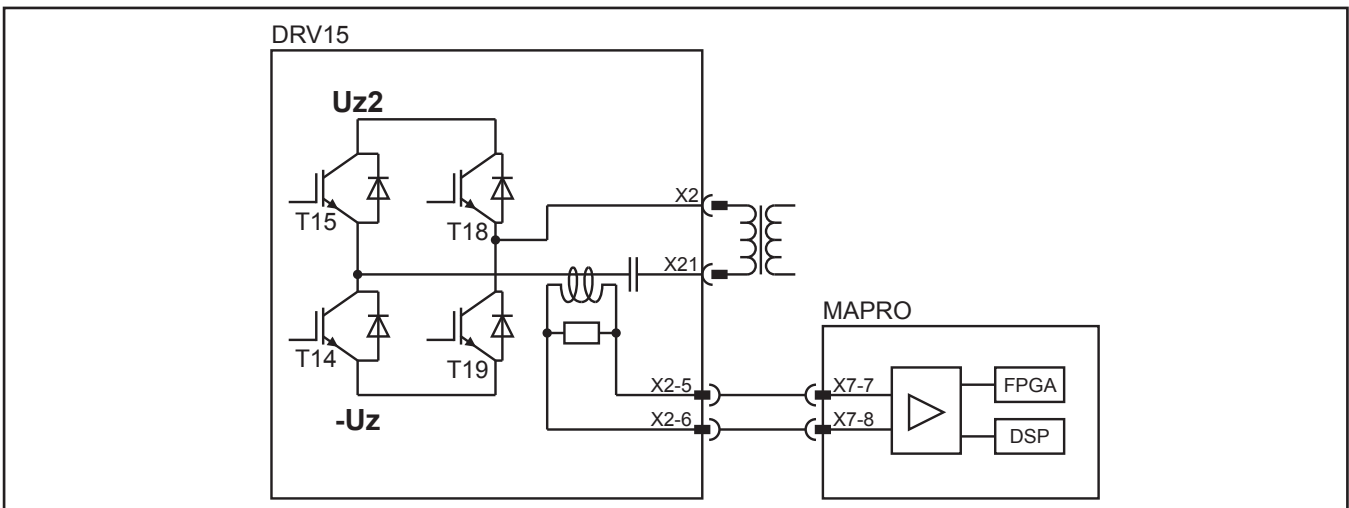
## Monitoring Primary Input Current

The current consumption of the machine is monitored by the DSP and the FPGA. As soon as the input current is getting too high, the machines stops with the error code **E32-01** "Overcurrent FPGA" or **E32-04** "Overcurrent IPMax".

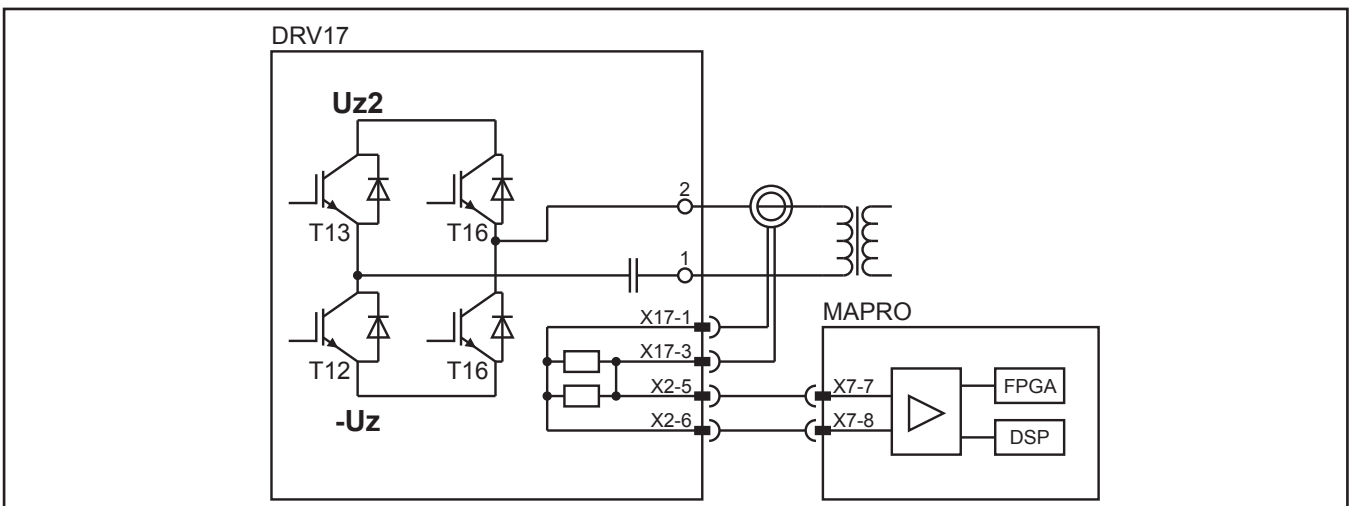
### Schematic MicorMIG 300/350



### Schematic MicorMIG 400



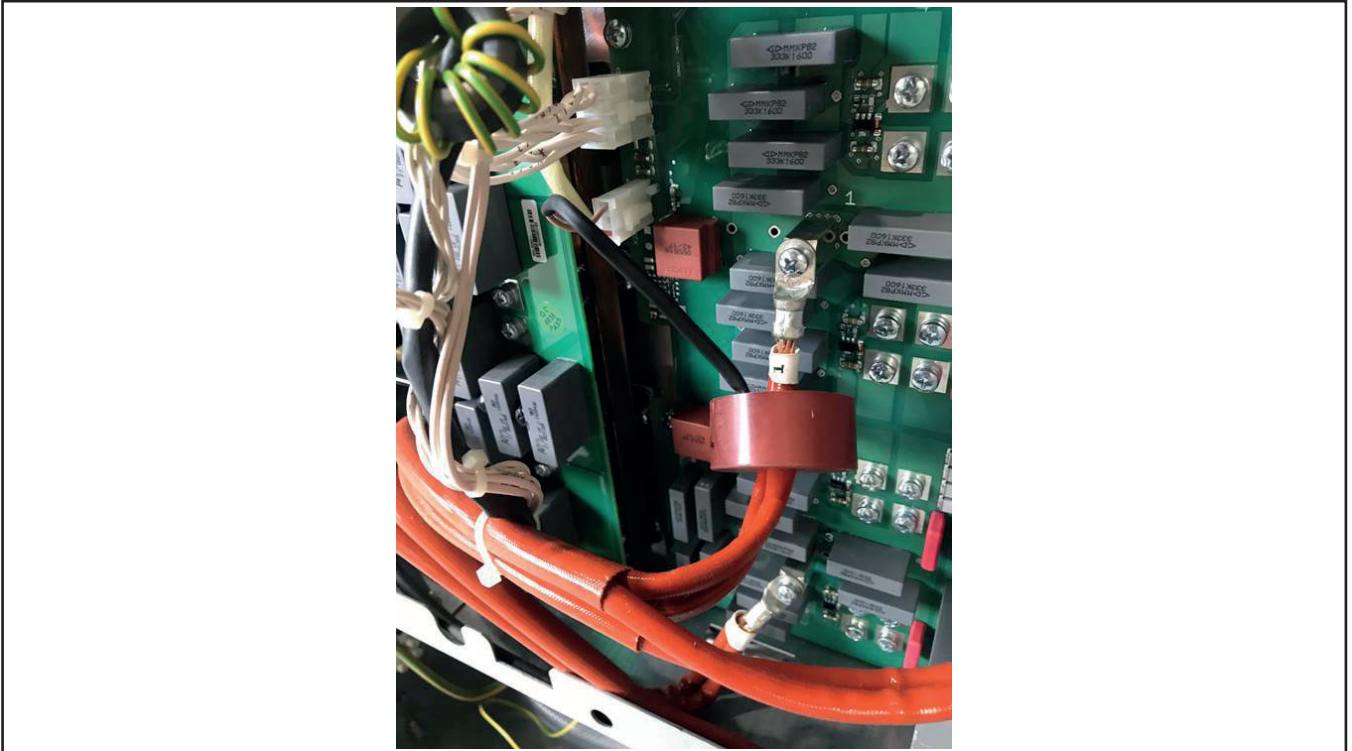
### Schematic MicorMIG 500





If no current zero crossing is measured after a certain time when activating the welding transformer (polarity reversal of the full bridge inverter), the system stops with **E32-02** "Timeout".

Especially with the MicorMIG 500, the current direction of the primary current sensor must be set to the correct mounting position:



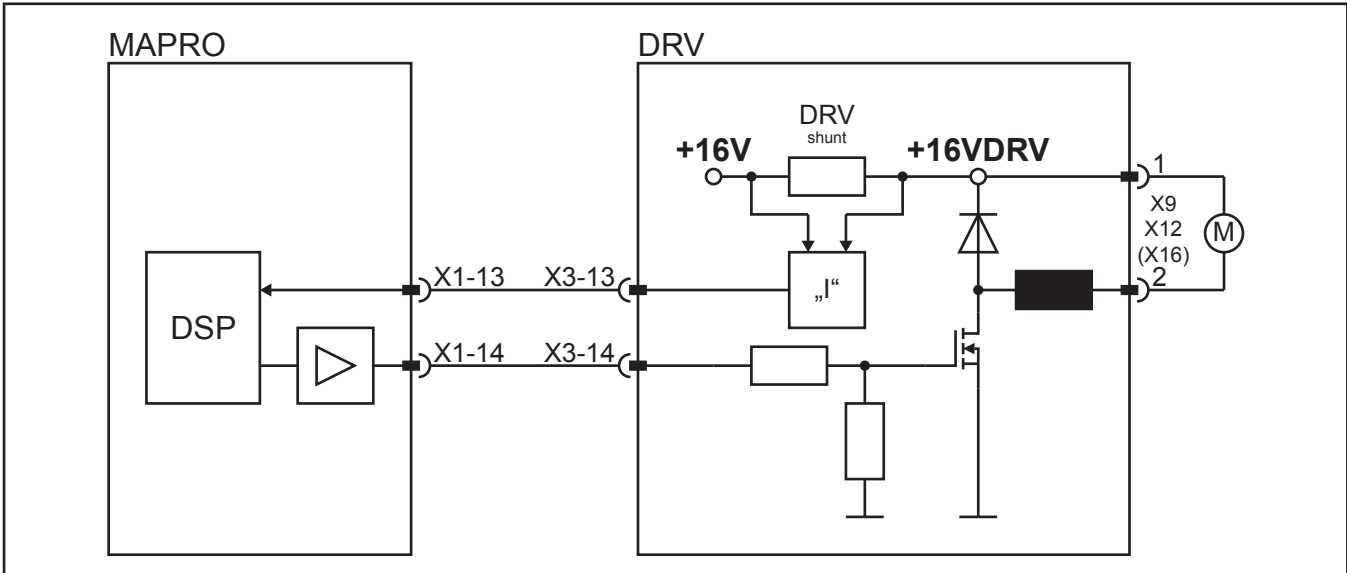
The black connecting lead of the sensor must point in the direction of the cable shoe of the transformer lead. If the sensor is mounted incorrectly (rotated by 180 °), this would also result in fault message **E32-02**.

## Fan Control

The cooling fans of the machine are driven and monitored directly by the MAPRO. The MicorMIG 300/350 have two fans, the MicorMIG 400/500 have three fans. As soon as the current consumption of the fans is getting too high, the machine stops with the error code **E34-00** "error fan current".

machine	max. current
MicorMIG 300/350	2.5A for longer than 0.9 seconds
MicorMIG 400/500	3.5A for longer than 0.9 seconds

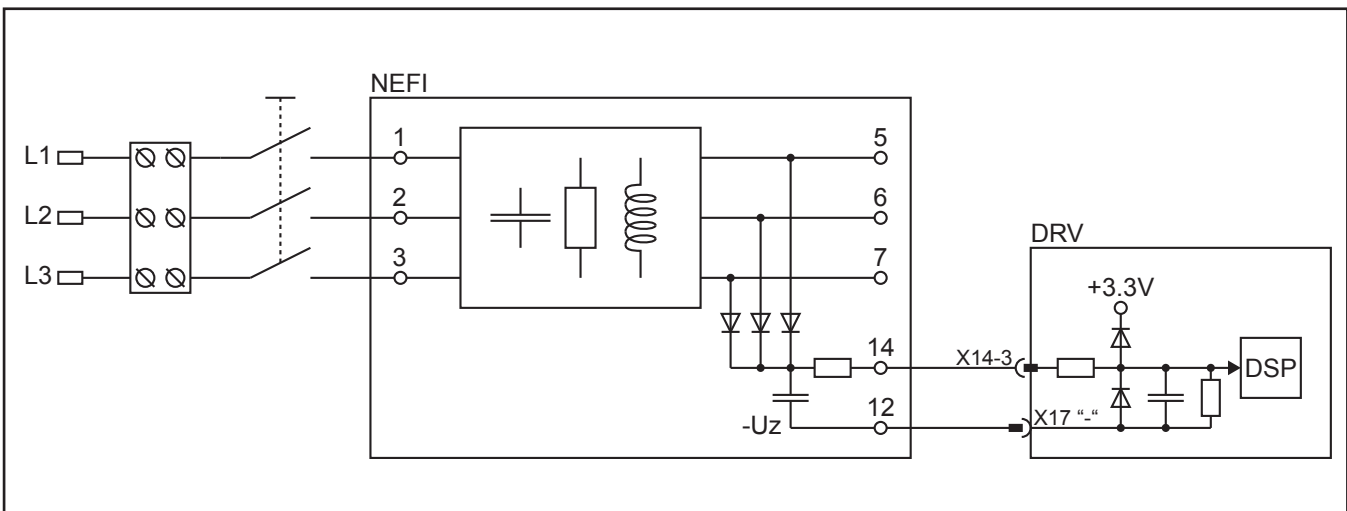
## Schematic



## Mains Monitoring

The three mains phases are monitored by the DSP on the DRV. If during welding the mains cannot be detected, the machine stops with the error code **E41-01** "mains loss".

## Schematic



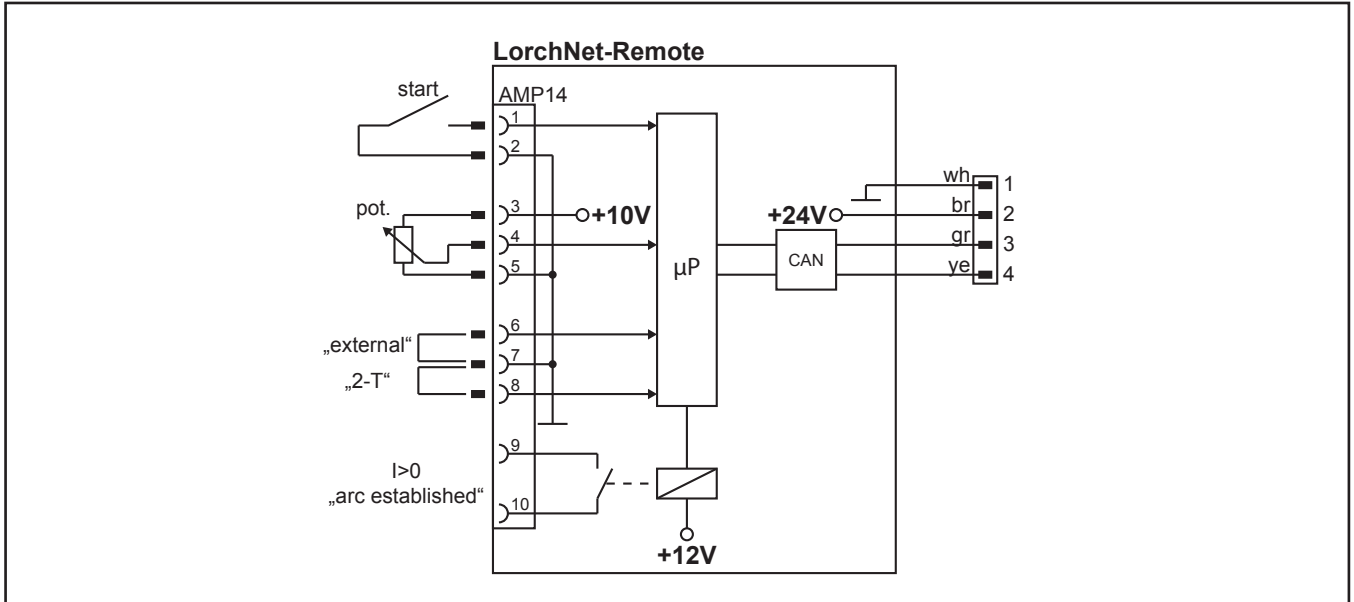
# LorchNet-Remote

LorchNet-Remote is the optional remote control interface of the MicorMIG.

It is connected to the power source via the 4-pin socket “LorchNet” at the rear-side, where also the “LorchNet Connect” can be plugged in.

If the start contact (pins 1 and 2) is closed during the time the machine is switched on, the error message **E25-01** is displayed at the front panel.

## Schematic

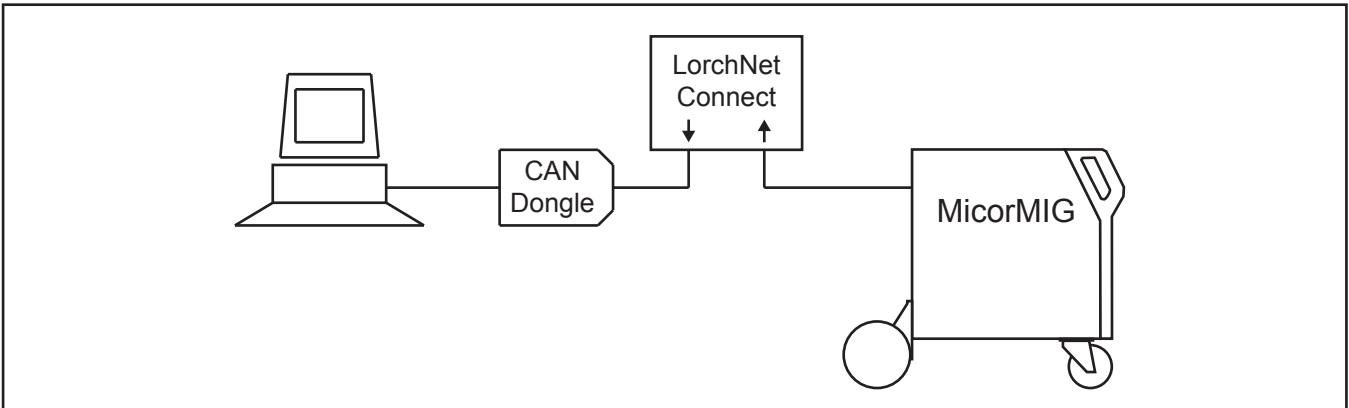


signal	pin	description
start	1 and 2	as soon as pins 1 and 2 are closed, the machine starts the welding process (like pressing the trigger switch at the torch)
energy setting	4	analog input for setting the welding energy (e.g. via a potentiometer) 0V = min. energy setting of the actual selected welding program 10V = max. setting of the actual selected welding program <b>CAUTION</b> : the analog input is only valid, when the identification “external” at the pins 6 and 7 is active !
identification “external”	6	as soon as pin 6 is closed to pin 7 (gnd), the analog input (pin 4) is active and the remote control LED at the front panel is lit
identification “2-T”	8	as soon as pin 8 is closed to pin 7 (gnd), the machine switches automatically to 2-stroke mode (2-T) when the start signal is given
arc established (I>0)	9 and 10	as soon as welding current is flowing, the potential free relay contact is closed max. contact load: 1A



## LorchNet Connect

To connect a computer to a MicorMIG machine, a LorchNet-Connect adapter box (570.4030.0) is necessary. It provides the LorchNet interface potentially separated for “external” use. With the software tool “Lorch System Manager” software updates can be made or the list of the last error messages can be read out.

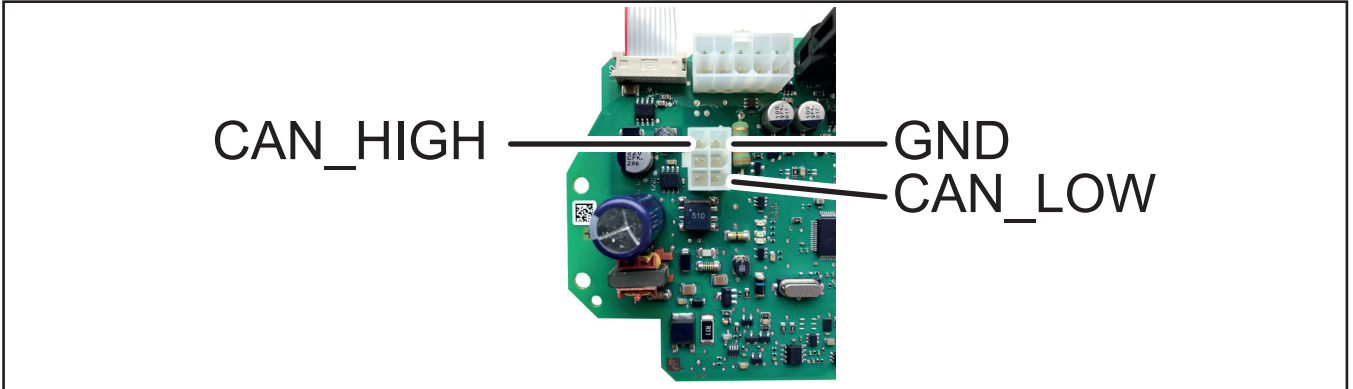


## Measuring CAN bus

The CAN bus is easily checked at each pc-board by measuring the resistance value between CAN-low and CAN-high against GND (ground). Before measuring, disconnect the pc-board completely from the machine. If the measuring result is too low (1k ohm or lower), the CAN controller chip is damaged and the pc-board must be exchanged.

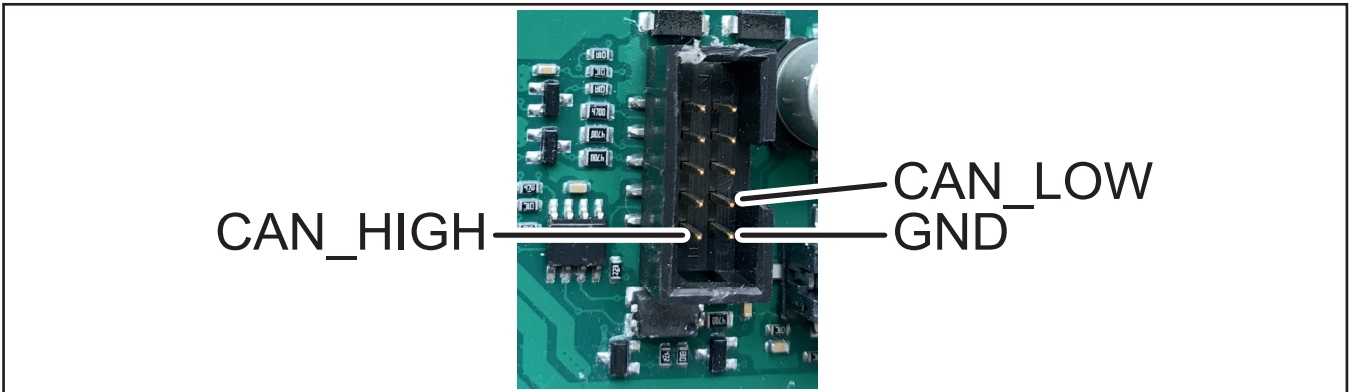
Measuring the CAN bus at the MAPRO

Result: about 60k ohm each



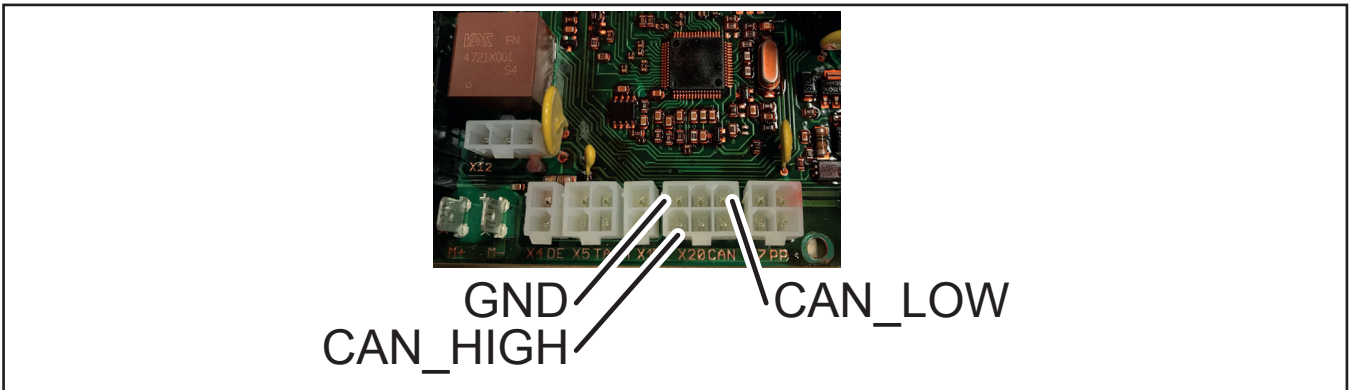
Measuring the CAN bus at the front panel

Result: 50k ohm - 60k ohm each



Measuring the CAN bus at the DMR-RT3

Result: about 490k ohm each



Measuring the CAN bus at the DMRPP05 (Push-Pull DMR) is different, there the result is about 0.9k ohm by standard. A faulty CAN controller chip may not be directly detectable.

Since week12 2017, CAN controllers with a higher dielectric strength are used on all pc-boards.

# Reading out machine data

Since the software version 1.12 from the 30th November 2015 it is possible to read out machine data using a smartphone. Depending on the existing front panel the data can be transferred with different methods:

front panel	read out via
Basic, BasicPlus	NFC
ControlPro	NFC, QR-code

The following data can be read out:

- software versions
- information- and error messages
- operating hour counters
- machine configuration
- actual settings and welding parameters

## Read out via NFC

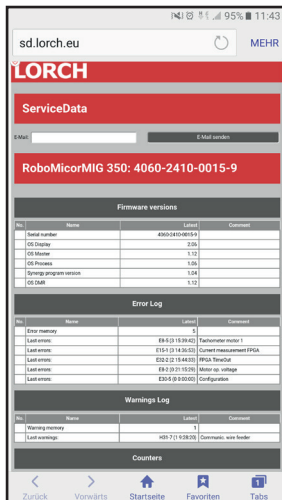
A smartphone with NFC functions is required. To read out the data follow these steps:

Basic/BasicPlus:

- switch off the machine
- press the menu button (upper-left button) and keep it pressed
- switch on the machine
- release the menu button

ControlPro:

- switch off the machine
- press the menu button A50 and keep it pressed
- switch on the machine with the button pressed
- release the menu button A50



The machine shows “nFc Act” at the front panel.

In this condition a smartphone with NFC functions must be held to the front panel. The machine transfers the data to the smartphone and accesses a Lorch web site automatically that displays the data:

The email address of the user/technician can be put into the field “E-Mail” and hit the button “Send E-Mail”. A PDF with the data is then send to the e-mail address that was entered.

## Read out via QR-code

With a ControlPro front panel the machine data can be transferred via QR-code. A smartphone with installed QR-code scanner app is required for this. To read out the data follow these steps:

- switch off the machine
- press the menu button and keep it pressed
- switch on the machine
- release the menu button

The QR-code is displayed at the front and can be scanned with a smartphone.



Since software version 2.02, the start-menu can also be accessed without switching off the machine:

- press and hold the keys A2 and A32
- after about 3 seconds the start-menu is displayed

## Information Messages

Information messages are malfunctions that are not blocking the welding functions in general. If a information message is displayed at the front panel, it must be acknowledged with the "Exit" key.

Welding is still possible but maybe with some restrictions.

code	designation	cause	remarks
H30-02	configuration calibration data	no valid calibration data could be found	Standard calibration data are used instead, this can result in a difference between the displayed current value and the real current value.
H30-03	configuration maximum current	no valid data for the maximum current could be found	Standard values are used instead, it can happen that the machine is not able to reach the maximum current.
H30-04	configuration duty-cycle	no valid data for the duty cycle could be found	Standard values are used instead, it can happen, that the machine has a less duty cycle than normal.
H31-07	Communication DMR	The internal CAN bus communication between MAPRO and DMR-RT3 is blocked or interfered.	- check CAN bus wires between DMR-RT3 (X8) and DRV (X1) - check CAN bus wires between DRV (X2) and MAPRO (X7)
nFc-H01	Read/write error	Cancel, faulty saving	Present card again
nFc-H02	NFC card invalid	No valid Lorch NFC card	Use suitable NFC card
nFc-H03	Connection interrupted	Interruption on removing the NFC card	Present card again
nFc-H10	NFC card used	NFC card has already been used	-
nFc-H11	Incorrect serial number	Not intended for this welding device	Use a suitable NFC card
nFc-H12	NFC card blocked	Action was interrupted during installation on another system	Complete the installation operation on the other system
nFc-H13	Incorrect TAN code	Code input incorrectly, incorrect input values on the TAN website. (e.g.: Swap: "b" and "6" or missing ".")	Check the input on the TAN server Check the TAN web address.
nFc-H15	Decryption error	Incorrect data, card not from Lorch	Use a suitable NFC card
nFc-H16	Invalid signature	Data error, no valid Lorch signature	Use a suitable NFC card
nFc-H30	Upgrade already installed	Update already performed	-
nFc-H31	Invalid customer number	Welding program created for another customer	Use a suitable NFC card
nFc-H32	Invalid product family	NFC card not suitable for this product family/ series	Use a suitable NFC card
nFc-H33	Authorisation required	Lorch authorisation card must be used first, or time run out	Perform authorisation again
nFc-H34	Insufficient user level	e.g. action not available for WPS welder	Contact welding supervisor
nFc-H35	Condition failed	General conditions are not fulfilled	Are all preconditions fulfilled (card label/order data). Have the card checked
nFc-H40	Activation error	Data error on the card or function not supported	Have the card checked
nFc-H41	Inconsistent data	Data error on the card	Have the card checked
nFc-H46	Wrong job card contents	Job card does not fit to compensation mode	Re-write job card or change the compensation mode to "cable length"
nFc-H59	Missing NFC-card information or decryption error	Incompatible front panel firmware	Make software update to power source and front panel (with LSM)
nFc-H61	NFC card invalid	Invalid card type	request a new card
nFc-H62	NFC card invalid	Wrong card type for this TAN process	request a new card
nFc-H63	Incompatible front panel for this process	Incompatible front panel firmware	Make software update to power source and front panel (with LSM)
nFc-H64	Inconsistent data	Data error on card	Let card check by Lorch
noP-H20	Function upgrade missing	e.g. read NFC not updated	Perform the necessary upgrade first
noP-H21	Material upgrade missing	e.g. CrNi job loaded to device but device without CrNi upgrade	
noP-H22	Process upgrade missing	e.g. SpeedArc job loaded to device but device without SpeedArc upgrade	
noP-H23	Welding program missing	Job with welding program number not available on device	
noP-H24	Incorrect software	Incompatible software version	SW update (Master, control panel)



## Error codes

As soon as the machine is detecting a malfunction, the power unit is stopped immediately (welding process is interrupted) and the corresponding error code is displayed at the front panel. Every recognized error code together with the actual operation hour counter is written into the list of last error messages (error memory). A maximum of 16 error codes can be saved.

Using a computer with CAN interface and LorchNet Connect adapter, the error memory can be read out via the program "Lorch System Manager".

Code	designation	cause	remarks
E01-01	Overtemperature diodes	The maximum temperature was exceeded.	fans keep running to cool down the machine for details see page 46
E01-02	Overtemperature primary modules		
E01-04	Overtemperature middle heatsink temp.		
E02-02	Overvoltage startup	The DRV measured a too high bus voltage during startup.	- check mains and bus voltage - check wiring between DRV and MAPRO - check flat ribbon cable between DRV and MAPRO for details see page 48
E02-04	Overvoltage primary	The DRV measured a too high bus voltage during operation.	
E02-05	Overvoltage FPGA	The FPGA on the MAPRO measured a too high bus voltage.	
E04-01	PE-monitoring	A current >15A was flowing via the PE wire of the mains cable.	- check machine for short circuits to the housing - check wiring of the reed contact at connector X15 of the DRV for details see page 49
E05-00	Cooling unit	A flow of the cooling liquid could not be detected.	- check coolant and cooling unit - check fuses on pc-board SF 18/23/24/27 - check step-down transformer 400V/230V - check wiring of pump and sensor for details see page 49 and page 45
E06-00	Overvoltage secondary	The DSP of the MAPRO measured a too high output voltage (>100V).	- check wiring of the power unit to pc-board DC0x (X2) - check wiring between MAPRO (X5) and DC0x (X2) - check flat ribbon cable between DRV and MAPRO for details see page 50
E06-01	Overvoltage secondary FPGA	The FPGA of the MAPRO measured a too high output voltage (>100V).	
E07-01	EEPROM initialisation error	Error during reading of the error memory, accessing the EEPROM memory is not possible (hardware failure).	Switch machine off and on again. At a permanent fault, the MAPRO needs to be exchanged.
E08-00	Wire feed	The wire feed motor draws too much current.	- check motor and its wiring - check wiring of the DMR for detail see page 51
E08-01	Motor overvoltage	The voltage at the motor is too high (>100V).	- check motor and its wiring - check DMRPP05 and its wiring for details see page 53
E08-02	Motor supply	The supply voltage of the motor (60V DC) is too high (>75V).	
E08-03	Motor overcurrent 1	The wire feed motor draws too much current (>12A).	
E08-04	Motor overcurrent 2	The Push-Pull motor draws too much current.	
E08-05	Tachometer motor 1	The tacho encoder of the wire feed motor is not connected or faulty.	
E08-06	Tachometer motor 2	The tacho encoder of the Push-Pull motor or NanoFeeder is not working.	
E08-10	Torch connection	At the torch trigger wires a voltage > 2.5V was measured.	
E12-00	Power unit startup	When testing the power unit during initialisation (switching on the machine) no output voltage could be measured.	- check wiring of the power unit to pc-board DC0x (X2) - check wiring between MAPRO (X5) and DC0x (X2) - check flat ribbon cable between DRV and MAPRO for details see page 50

Code	designation	cause	remarks
E13-01	Temperature sensor diodes	After a certain time, no rise of the temperature could be measured. Sensor faulty or disconnected (loose connection)	- check sensor and its connection at DRV - check wiring between DRV (X6) and MAPRO (X7) - check flat ribbon cable between DRV and MAPRO for details see page 46
E13-02	Temperature sensor primary modules		
E14-00	Supply undervoltage	The 16V supply voltage of the MAPRO is too low (<12V)	- check mains supply - check wiring between NEFI, control transformer, DRV and MAPRO - check fans for details see page 54
E15-00	Current offset	Contact problem between MAPRO and shunt resistor or shunt wires not connected	- check shunt and its wiring - check torch and central connector (trigger wires to power cable)
E15-01	Current offset FPGA	The offset voltage across the shunt resistor is too high.	- replace shunt resistor if necessary for details see page 51
E18-01	Overload	The power unit was overloaded (unusual operation from the characteristic). An E01 is likely to appear in this condition.	Let the machine cool down (in case of E01), switch off and on again. for details see page 50
E22-03	Undervoltage Startup	During startup the bus voltage didn't reach the minimum limit of 390V DC.	- check mains and bus voltage - check wiring between DRV (X6) and MAPRO (X7) for details see page 48
E25-01	OCV generator Startup	No open circuit voltage could be measured during startup. The start contact at the LorchNet-Remote interface was active during switching on of the machine.	- check for short circuits at the output sockets - check wiring of power unit and DC0x (X2) - check between DC0x (X2) and MAPRO (X5) - check LorchNet-Remote
E25-02	OCV generator	No open circuit voltage could be measured when switching to MMA or TIG	- check torch and central connector for details see page 51
E27-00	No program or missing process	Welding programs are not present or missing.	reprogram the machine, exchange MAPRO if necessary
E30-04	Configuration primary	The measured bus voltages are not matching the actual configuration.	- check wiring at X17 of the DRV - check configuration resistors on DRV for details see page 55
E30-05	Configuration machine	The data of the machine configuration could not be read or is corrupted.	Switch the machine off and on again, contact Lorch Service if necessary.
E30-06	Configuration software	The actual software is not compatible to the machine hardware.	Re-program the machine with the correct software.
E30-07	Configuration VRD	The VRD voltage setting was changed (reprogrammed).	This is only a status message in the list of the last error codes to indicate that the VRD voltage setting was changed.
E31-04	Communication FPGA-DSP	The FPGA doesn't recognize any activity of the DSP.	Switch the machine off and on again, if the error is permanently, the MAPRO should be exchanged.
E31-05	Communication primary DSP	Malfunction in the communication between the primary DSP on the DRV and the DSP of the MAPRO.	- Switch the machine off and on again - check the flat ribbon cable between MAPRO and DRV
E31-06	Communication primary DSP Startup	When switching on the machine, there was no signal received by the MAPRO from the primary DSP (DRV).	
E32-01	Overcurrent FPGA	A primary input current >80A was measured.	- check secondary diodes - check primary modules
E32-04	Overcurrent IPmax	A primary input current >60A was measured.	- check wiring between DRV (X6) and MAPRO (X7) - check the flat ribbon cable between MAPRO and DRV for details see page 56
E32-02	Timeout	When driving the power unit, after some time a zero-crossing (polarity change) of the current could not be detected.	- check wiring between DRV (X6) and MAPRO (X7) - MicorMIG 500: check current sensor for details see page 56

<b>Code</b>	<b>designation</b>	<b>cause</b>	<b>remarks</b>
E33-01	Unsymmetrical bus voltage	The difference between the bus voltages of the power modules 1 and 2 is >60V.	- check power modules - check the flat ribbon cable between MAPRO and DRV
E33-02	Unsymmetrical bus voltage Startup	The difference between the bus voltages of the power modules 1 and 2 is >60V at startup.	- check connector X17 on DRV for details see page 48
E34-00	Fan current	The current consumption of the fans is too high.	- check fans and their wiring for details see page 58
E41-01	Mains loss	The primary DSP couldn't detect a mains supply.	- check mains supply - check wiring between NEFI and DRV (X14) for details see page 58
E48-00	End of Demo mode	The maximum test time of the demonstration mode has ended.	Restart the machine
Lines in display "= = ="		CAN bus connection between front panel and MAPRO is jammed.	- Check CAN bus connection/wires - measure the CAN bus (see page 61) - replace MAPRO and/or front panel if necessary

