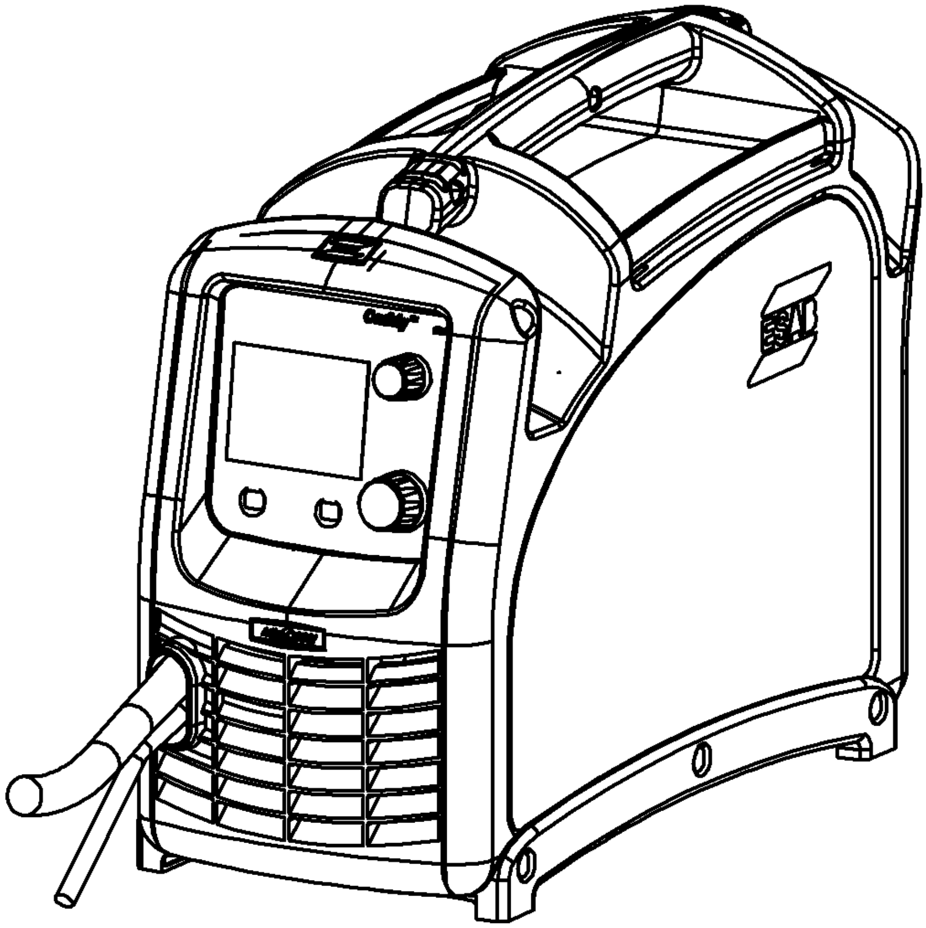
Caddy®

Mig C200i



Service manual

0349 300 095   110810   Valid for serial no. 932−xxx−xxxx

READ THIS FIRST

Maintenance and repair work should be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended replacement parts.

This service manual is intended for use by technicians with electrical/electronic training for help in connection with fault-tracing and repair.

Use the wiring diagram as a form of index for the description of operation. The circuit board is divided into numbered blocks, which are described individually in more detail in the description of operation. All component names in the wiring diagram are listed in the component description.

This manual contains details of all design changes that have been made up to and including August 2011.

The Caddy® Mig C200i is designed and tested in accordance with international and European standard IEC/EN 60974-1/-5/-10 and EN 61000-3-12.
On completion of service or repair work, it is the responsibility of the person(s) etc. performing the work to ensure that the product does not depart from the requirements of the above standard.

INTRODUCTION

Caddy® Mig C200i is an inverter based, portable semiautomatic welder in a compact design, intended for MIG/MAG welding.
The possibility of welding with homogeneous wire/shielding gas and welding with gasless tubular wire is obtained by switching the + and - connections on the switching terminal close to the wire feed unit.
The machine operates with wire diameters from ∅0,6 to ∅1,0 mm. As shielding gas pure argon, mixed gas or pure CO_2 may be used.
The Caddy® Mig C200i draws current with near-unity power factor which produces very low level harmonics in the mains.

TECHNICAL DATA

Voltage	230 V, 1~ 50/60 Hz
Permissible load at 100% duty cycle	100 A
60 % duty cycle	120 A
25 % duty cycle	180 A
Setting range (DC)	30 – 200 A
Open circuit voltage	60 V
Open circuit power	15 W
Efficiency	82%
Power factor	0.99
Wire feed speed	2 – 12m/min
Wire diameter	
Fe	∅0.6–1.0
CW	∅0.8–1.0
Ss	∅0.8–1.0
Al	∅1.0
Bobbin size	∅200 mm
Dimensions lxwxh	449x198x347
Weight	12 kg
Operating temperature	–10 to +40°C
Enclosure class	IP 23C
Application classification	S

Duty cycle

The duty cycle refers to the time as a percentage of a ten-minute period that you can weld or cut at a certain load without overloading. The duty cycle is valid for 40° C.

Enclosure class

The **IP** code indicates the enclosure class, i. e. the degree of protection against penetration by solid objects or water. Equipment marked **IP23C** is designed for indoor and outdoor use.

Application class

The symbol S indicates that the power source is designed for use in areas with increased electrical hazard.

WIRING DIAGRAM

Component description

ESD

CAUTION

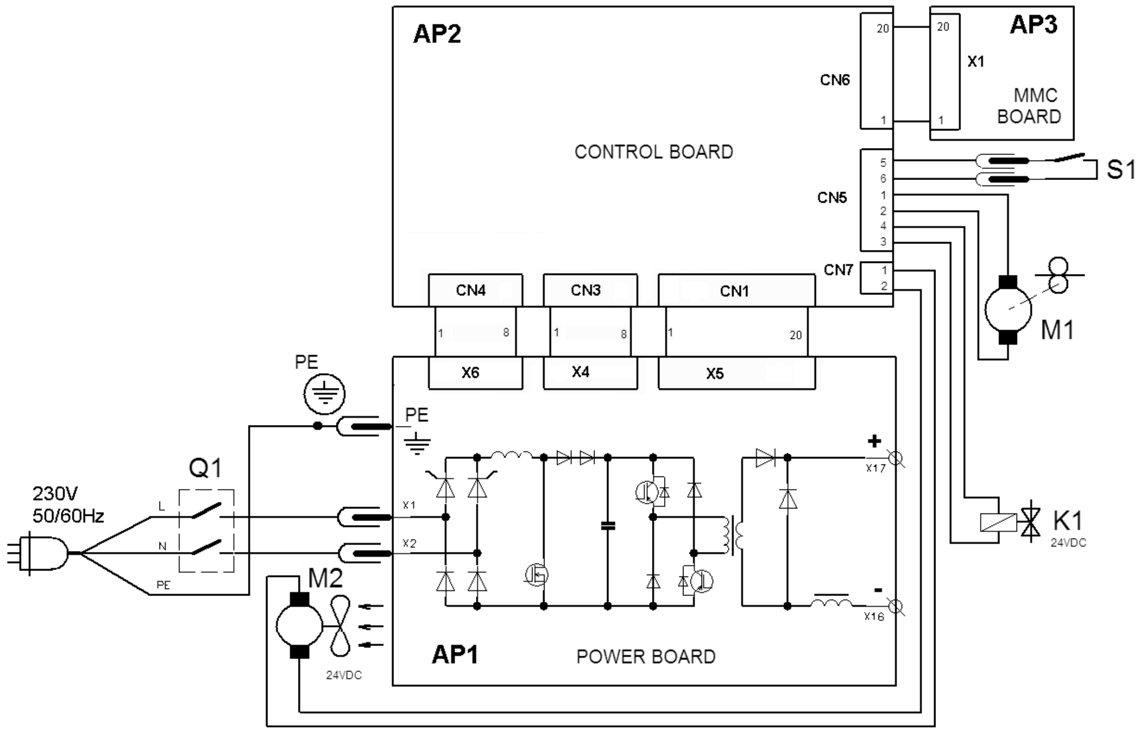
STATIC ELECTRICITY can damage circuit boards and electronic components.

- **Observe precautions for handling electrostatic-sensitive devices.**
- **Use proper static-proof bags and boxes.**

WARNING !
High DC voltage may remain on the electrolytic capacitors on the power board.
Check the voltage and discharge capacitors if needed.

AP1	Power board
AP2	Control board
AP3	MMC board
K1	Gas valve
M1	Wire feeding motor
M2	Fan
S1	Torch switch
Q1	Mains switch

Caddy® Mig C200i



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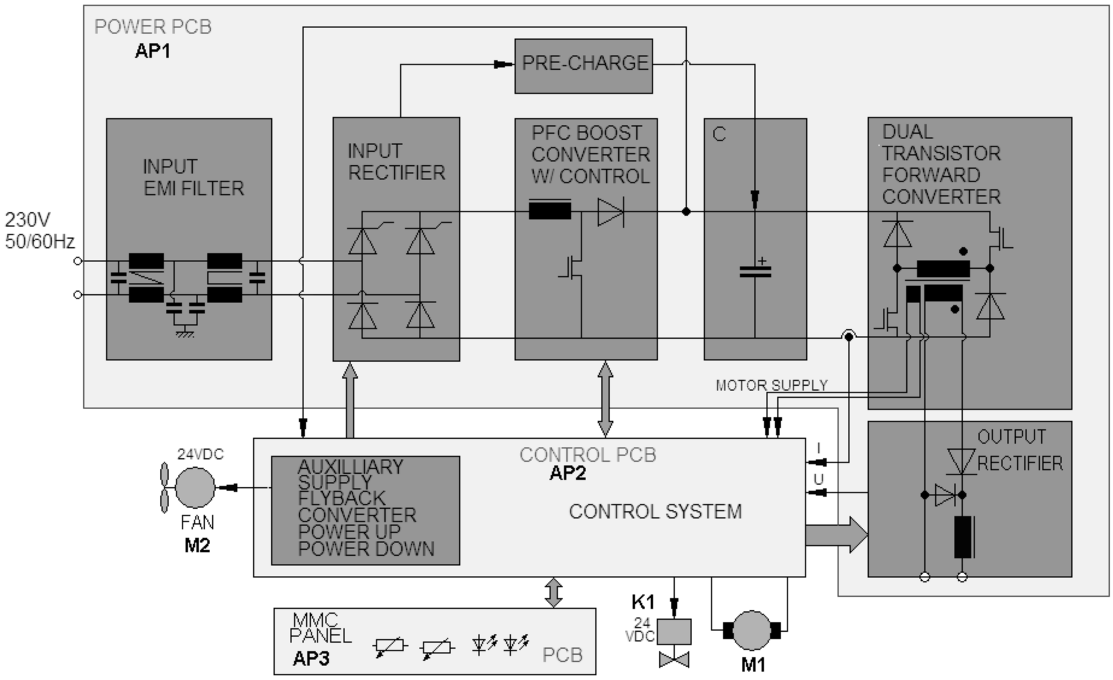
DESCRIPTION OF OPERATION

Caddy® Mig C200i is a set of following modules:

- power PCB - AP1
- control PCB - AP2
- MMC panel - AP3
- gas valve - K1
- wire feeding motor - M1
- fan - M2



The power PCB contains all the track of energy conversion. It is supplied from the 230V 50/60Hz mains. There is the EMI filter on the input, then half-controlled thyristor bridge. Thyristor are not fired until DC bus capacitors are not charged via pre-charge circuit. Between the rectifier and the DC bus capacitors the boost converter is placed. It contains the high frequency inductor, the switch (MOSFET) and the diode. Control system of the boost converter is placed on the control PCB (AP2). The switch in boost converter control provides: a) sinusoidal shape of the input mains current, b) stabilised voltage on the DC bus.

By the principle, the voltage is higher the amplitude value of the AC input voltage. In the CaddyMigs it is 390...400V. The boost converter's frequency is 70 kHz. The converter that provides the power to welding has two switch forward topology. The switching frequency is 70 kHz. By the principle, the maximum converter's duty cycle is less then 50%. Transformer ratio is 5,5:1, what means that peak voltage in secondary winding of the power transformer is about 70V. The high frequency rectifier + inductor are connected to the transformer's secondary winding. The control circuits of the forward converter are included in the control PCB.

Beyond the both converters control circuits the control PCB contains also the rest of needed circuits. On the primary side it includes voltage supervisor, auxiliary power supply, primary circuits overheating and overvoltage protection. On the secondary side there are: process sequence and control, short arc control, overheating protection, wire feed speed regulator, and gas valve controller.

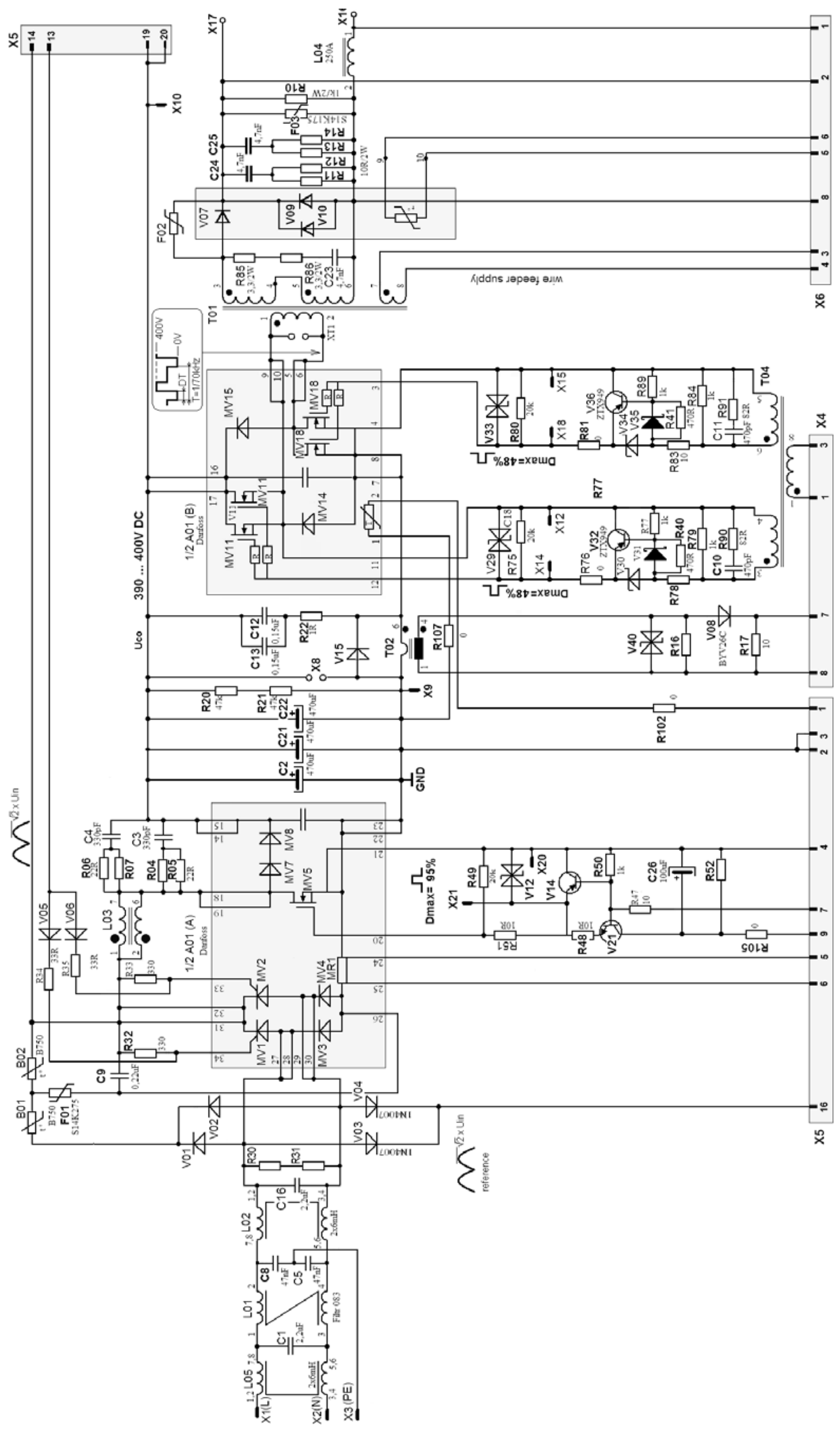


Fig. 3.2. Power PCB with 1 integrated module. Schematic diagram.

AP1:1. EMI mains filter

The EMI mains filter contains capacitors and inductors intended for suppression of the common-mode interferences and the differential-mode interferences. The EMI filter contains following parts: L05, C1, L01, L02, C5, C8, C16. The resistors R30, R31 provides discharge path for the filter's capacitors.

AP1:2. Pre−charge circuit

The pre-charge circuit contains diodes V01, V02 and PTC resistors B01, B02. Internal diodes MV3, MV4 of the power module together with diodes V01, V02 create the non-controlled rectifier. The filter capacitors C2, C21, C22 are charged by this rectifier via non-linear resistor B01, B02 up to the amplitude value of the mains voltage. It is lower then the eventual DC bus voltage, nevertheless it protects the supply mains and capacitors from the big inrush currents and makes easier start of the PFC boost converter.

After charging of the capacitors, the auxiliary supply placed on the control PCB, starts to work, providing also firing pulses to thyristors. The main rectifier made of thyristors MV1, MV2, and diodes MV3, MV4 takes over the rectifying role.

The boost converter created by the inductor L03, switch MV5 (and MV6), diodes MV7, MV8 (MV9, MV10) starts working, charging the DC bus capacitors to 390...400V.

AP1:3. Two−switch forward converter

The two-switch forward converter is created on transistors MV11, MV18, and diodes MV14, MV15. Others diodes and transistors if exists, are not activated. There is the current sense resistor MR1 placed on the (-) placed before the PFC converter. It's purpose is to provide information of the momentary current to the PFC control system what is needed for creation of the average current control loop in the PFC control.

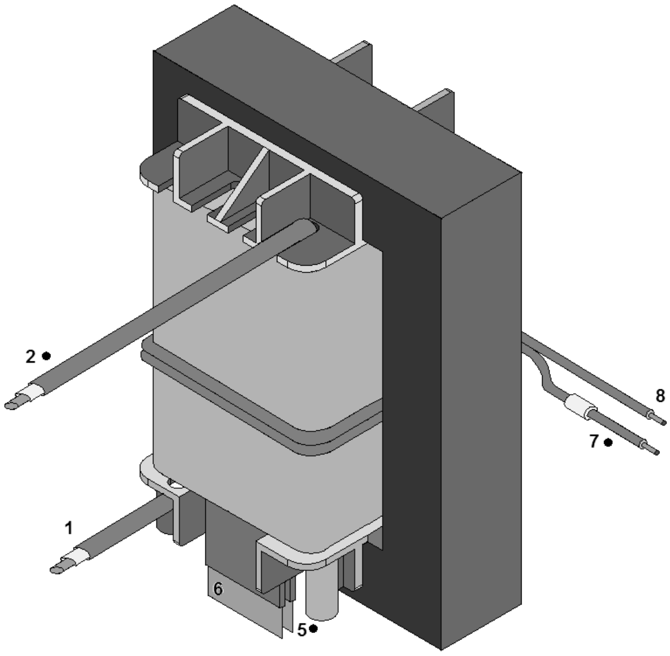
Drivers for the switches in the PFC and forward converters are placed on the power PCB.

AP1:4. Current sense transformer

The current sense transformer T02 is placed on the (-) line. It senses the pulse current, which is needed for creation of the peak current control loop in the inverter's control system.

AP1:5. High frequency transformer

The high frequency transformer is mounted on the power PCB. Due to high power soldering and anticipated high reliability, replacement of the transformer is not subject of service routines.

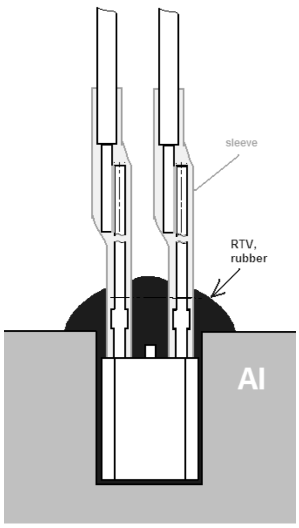


Numbers of outlets of the power transformer.

AP1:6. Thermal protection sensors

The thermal protection sensors are placed inside the power modules (or module) and on the heatsink of the output rectifier. In the power module there are (is) NTC (negative temperature coefficient) non-linear sensor - 22kΩ @ 25°C, while on the output rectifier the PTC (positive temperature coefficient) 1,0 kΩ @ 25°C linear sensor is installed.

The replacement of the sensor in the heatsink can be carried out only along with damaging the old sensor. The new one should be installed by means of the electrically non-conductive and thermally conductive silicon rubber.



Fixing of the
PTC thermal sensor

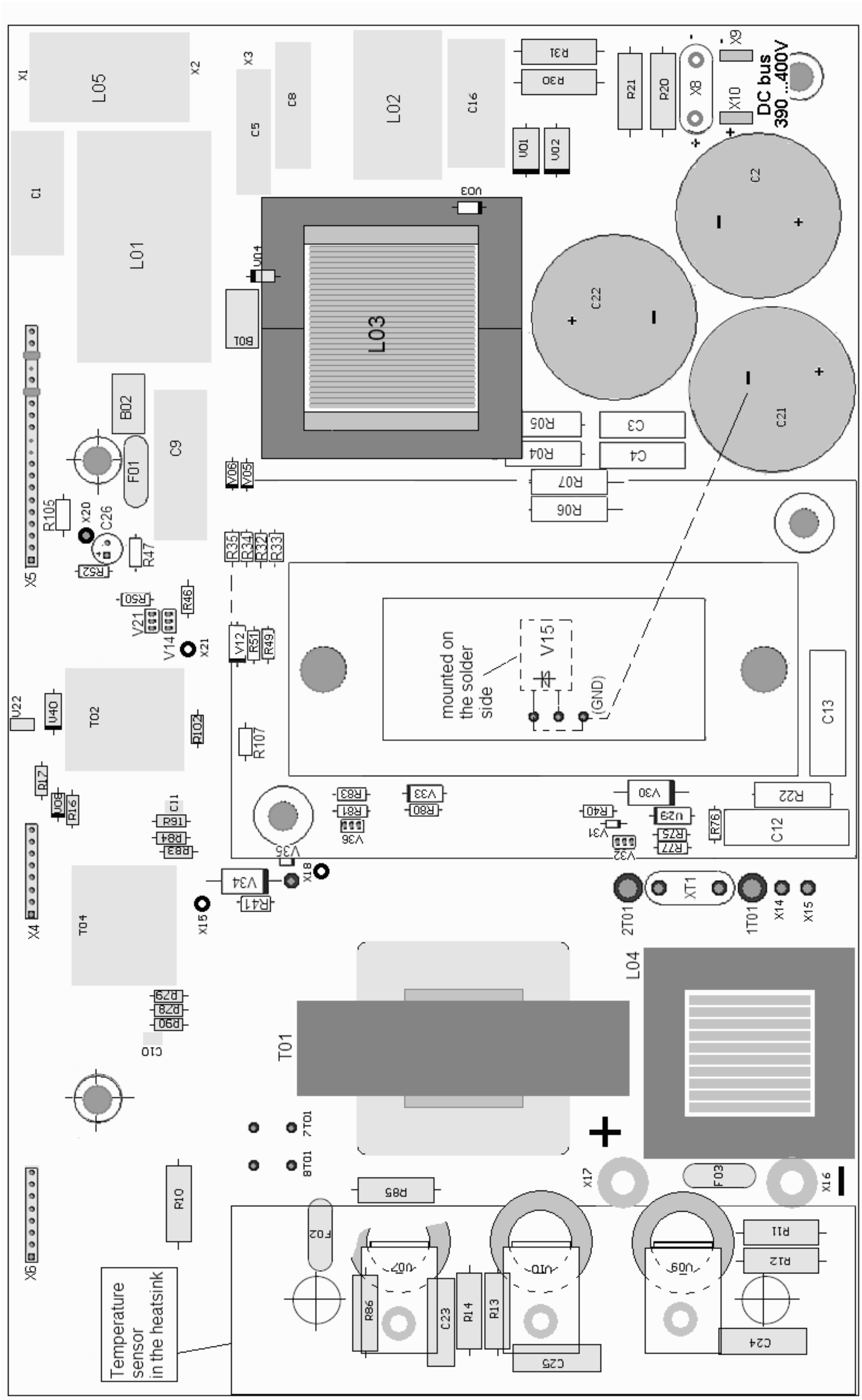


Fig 4.2. Power PCB with 1 integrated power module - assembly view

AP2 Analogue control board

The analogue control PCB contains circuits connected to the input (high voltage, primary) and circuits connected to the output (low voltage, secondary).

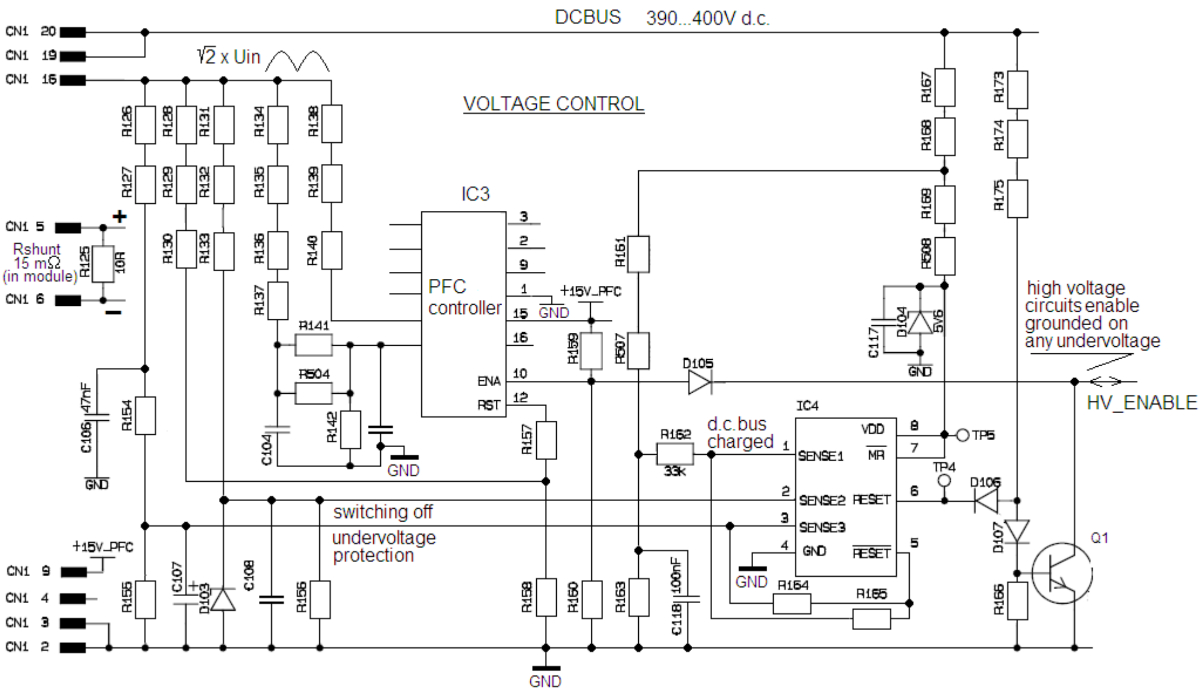
Note! In case there is a problem with the display showing the wrong measurement (current or voltage reading when not welding) check service information Si110629.

High Voltage Circuits

High voltage circuits (primary side) are placed on the right part of the PCB and they are connected to the external circuits by means of the connector CN1. High voltage circuits contains:

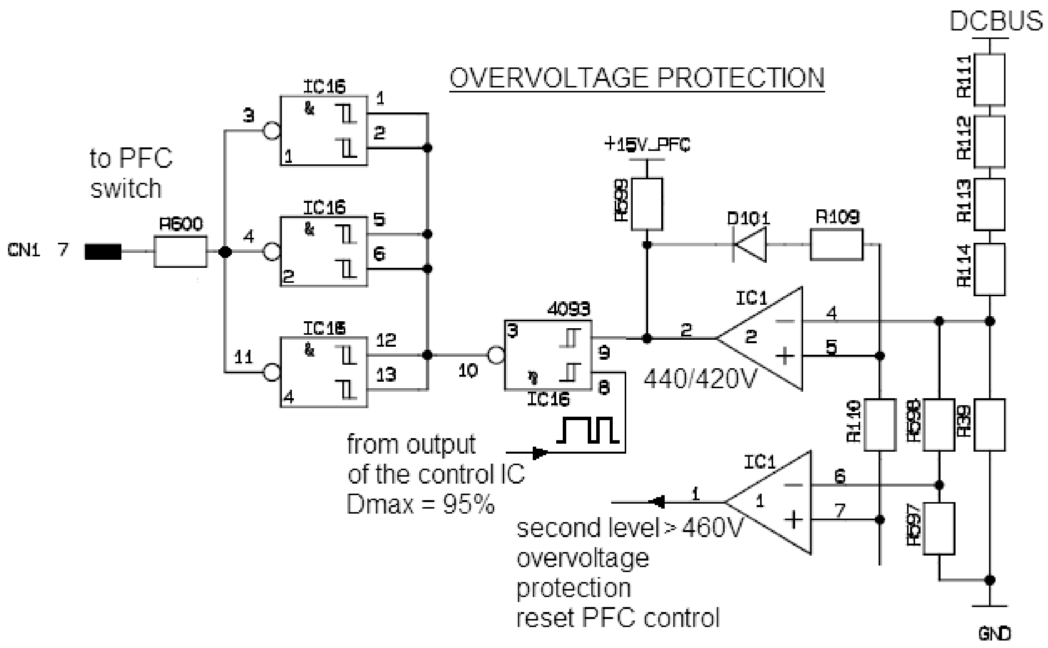
- voltage supervision circuits
- PFC control circuits
- auxiliary power supply
- temperature sensors circuits

AP2:1H. Voltage supervision and PFC control



Voltage supervision circuits senses the DC bus voltage (inputs 19,20 CN1) and the rectified input voltage (input 15 CN1). As long as voltage are not within limits high voltage enable line (HV_ENABLE) is grounded by means of transistor Q1. Operation of the PFC and auxiliary power supply is disabled. The reset IC4 is used for the voltage control. Two of inputs are connected to the rectified input voltage, one to the DC bus. Operation of the machine is disabled as long as the a.c. voltage is less then 188 Vrms or drops under 177 Vrms (SENSE3), and DC bus voltage is less then 259V or drops below 173V (SENSE1). Another sense input (SENSE2) has very low time constant along with voltage limitation. It provides fast disable during the machine switching off.

PFC control is built on the specialised integrated circuit IC3. PFC control senses the DC bus voltage, input current (5,6 CN1) and input voltage, providing the constant 390...400V on the DC bus along with sinusoidal form of the input current. This goal is achieved by the control of the switch in the boost converter placed on the power PCB. Actually, the control circuit placed on the control PCB produces the drive signal for PFC switch.



Specialised PFC controller (IC3), used in the present solution, does not provide overvoltage protection. Therefore, extra two comparators were applied to control the DC bus voltage. There is a two-step overvoltage protection. First, on the lower level simply cuts off the drive signal from the PFC control IC by means of the logic AND gate.

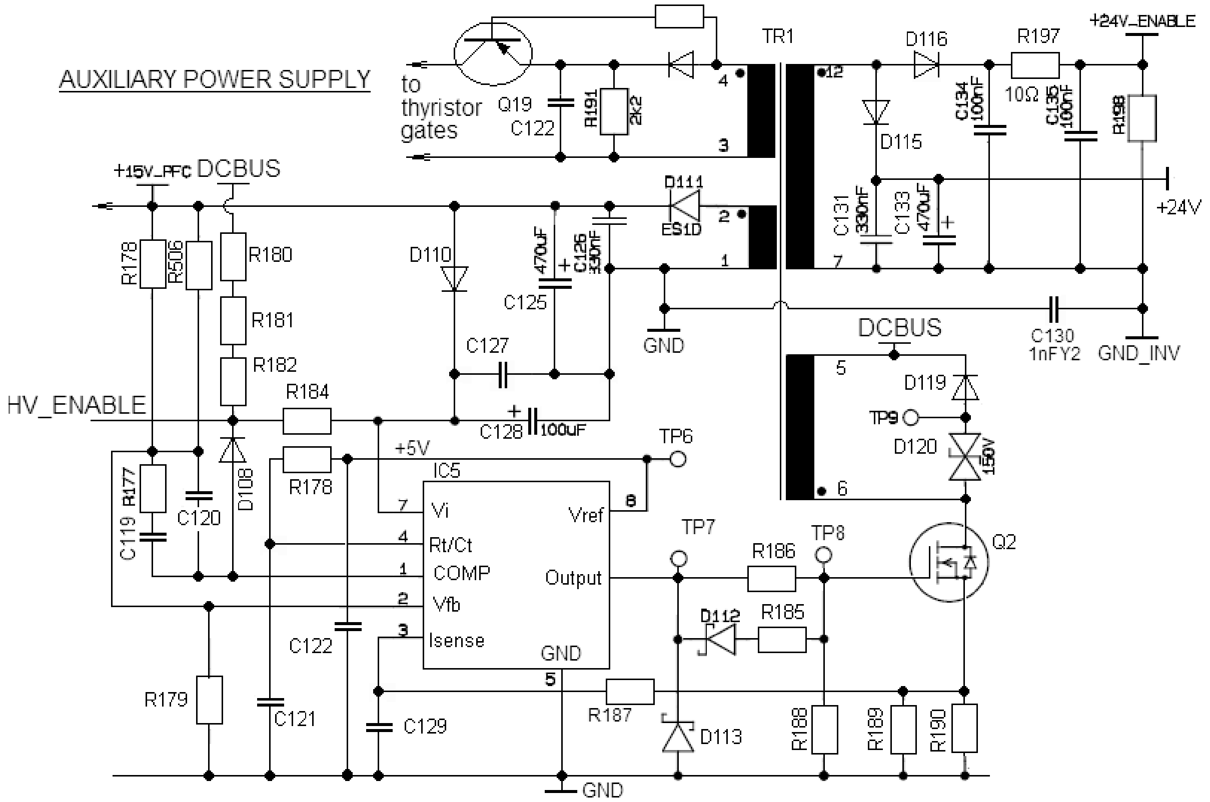
Second level is higher the first, and it resets the PFC control IC via it's soft start input.

The system of overvoltage protection is needed especially for work with engine driven generator, where the voltage surges occur at the end of the welding.

AP2:2H. Auxiliary power supply

The auxiliary power supply provides power for primary and secondary control circuits. Basically it produces +15V supply for the primary circuits and galvanically separated +24V supply for secondary circuit. In addition it provides firing pulses to the thyristor in the input rectifier.

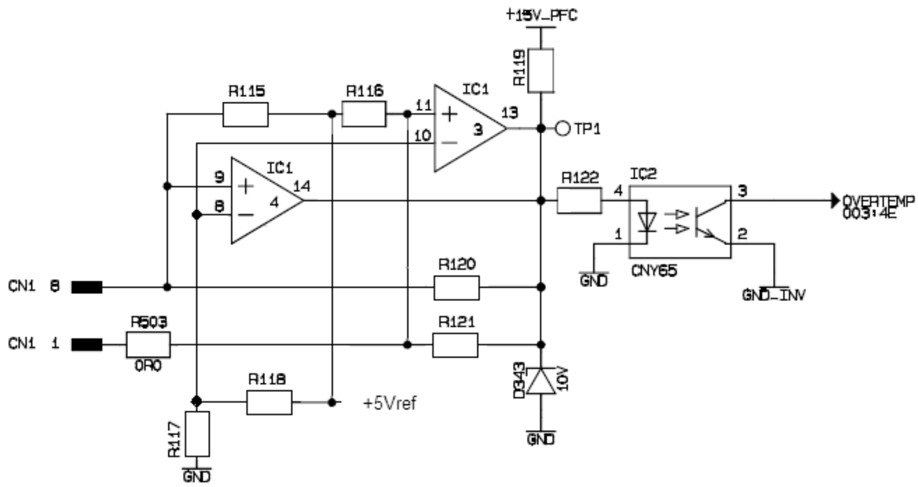
The auxiliary power supply is switched off by means of the voltage control circuit (HV_ENABLE). Therefore thyristor firing pulses are not delivered until DC bus capacitors are charged to the peak input voltage.



The auxiliary power supply is built as flyback converter. Estimated maximum power of it is 25W. The most loaded output is the +24V secondary side. It provides the power for all low voltage control circuits and also power for the fan and the gas valve.

The wire feeder motor is supplied from the auxiliary winding of the power transformer. However it's energy storage capacitor is pre-charged from the +24V, to provide power for uninterrupted start of the motor.

AP2:3H. Thermal protection on the primary side



As temperature sensors (sensor) are on the high voltage potential, the thermal protection circuit (fig.) is placed on the high voltage side, then the 0/1 signal is transferred via the optocoupler IC2 with extended isolation, to the secondary circuits.

Low Voltage Circuits

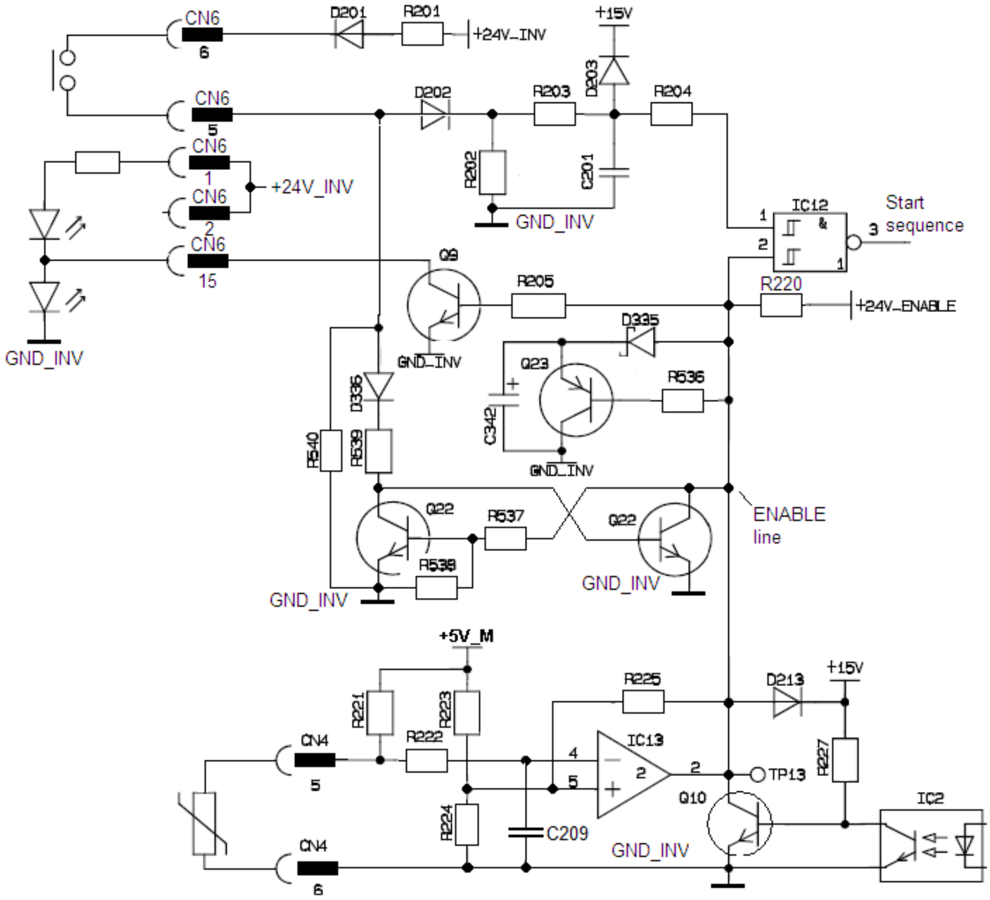
Low voltage circuits (secondary side) are placed on the left part of the PCB and they are connected to the external circuits via existing connectors, except the CN1.

Low voltage circuits include:

- command system of the semiautomatic welder
- short arc control system
- wire feeder motor speed control circuit
- low-energy control of the electromagnetic valve

AP2:1L. Command system

Command system produces assumed program control on discrete inputs and outputs. In particular it provides logic dependencies and generates the sequence control of parts of the semiautomatic welder.



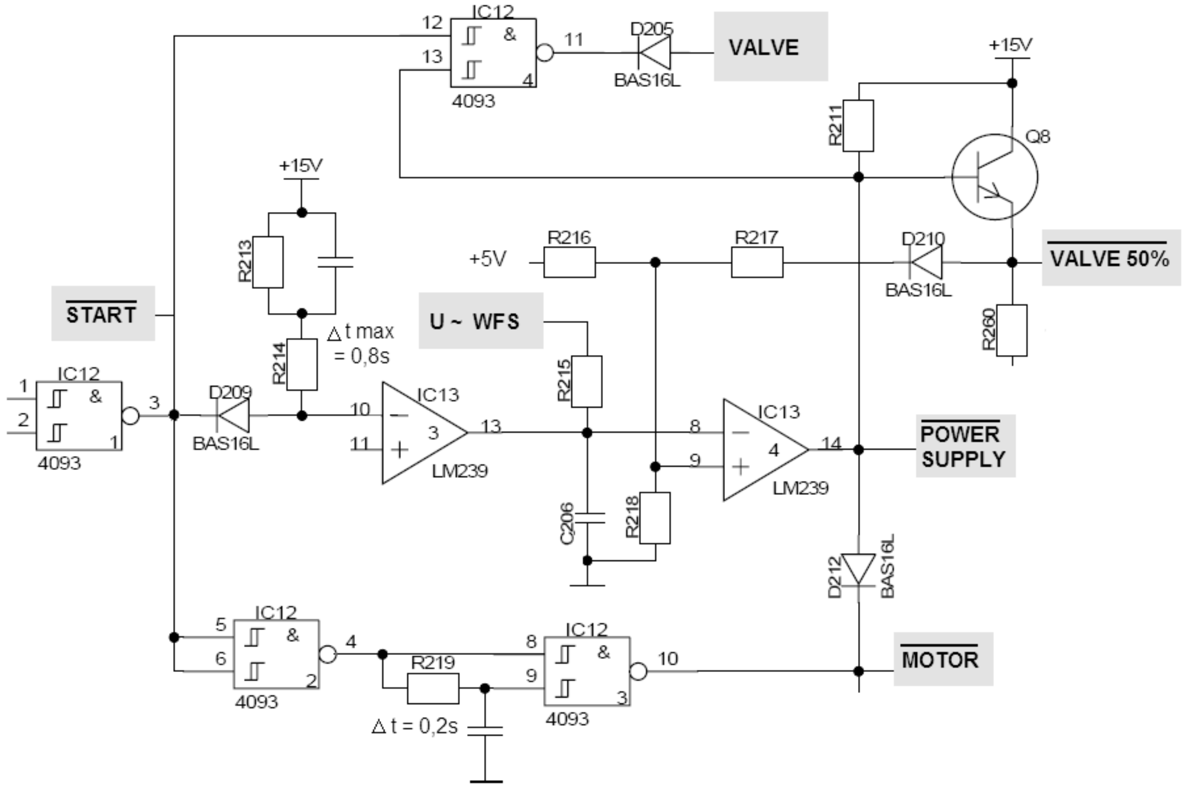
The start signal from the welding torch is the basic input of the command system. As shown on the fig. the start signal can be disabled in several cases:

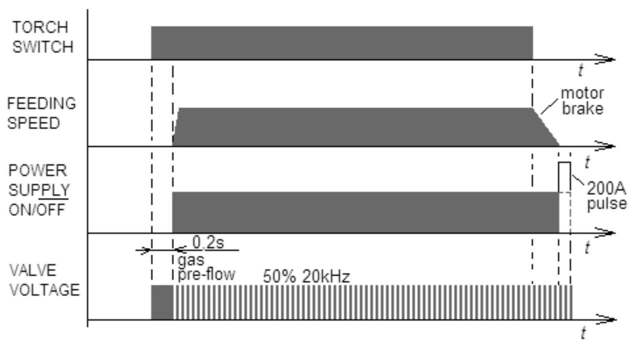
- thermal protection from the primary side (IC2),
- thermal protection form the secondary side (CN4.5,6),
- torch switch is pressed during the power up (charging of the C342, hold by the pressed switch)
- lack of the +24V_ENABLE signal

As shown any of listed cases keeps the ENABLE line low. Note that even after removal all listed error signals, the machine is kept in disable state, until the torch switch is released. This is additional protection of unintentional switching on.

The command system is shown below. 0.2 s gas preflow is created.
The same 0.2 s delay provides the full 24 V DC to the gas valve. The power supply is switched off at the stop of the wire feeding by sensing the actual motor voltage on the feeder's motor.

The sequence of the switching off and on is shown in the time diagram.

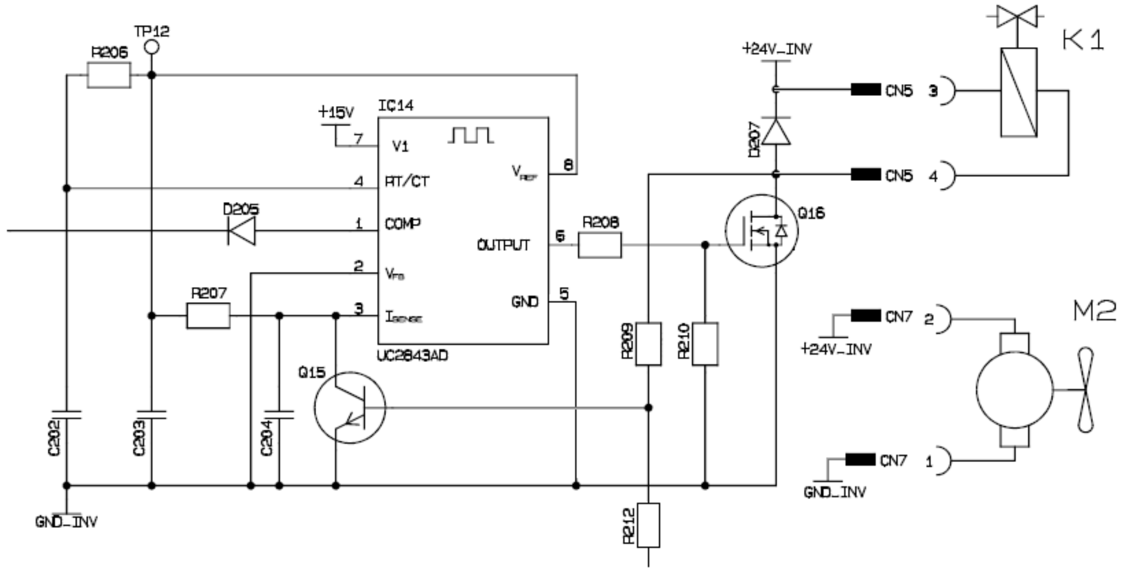




As shown, there is 0.2 gas pre-flow delay. The power source is kept on until the motor is running.

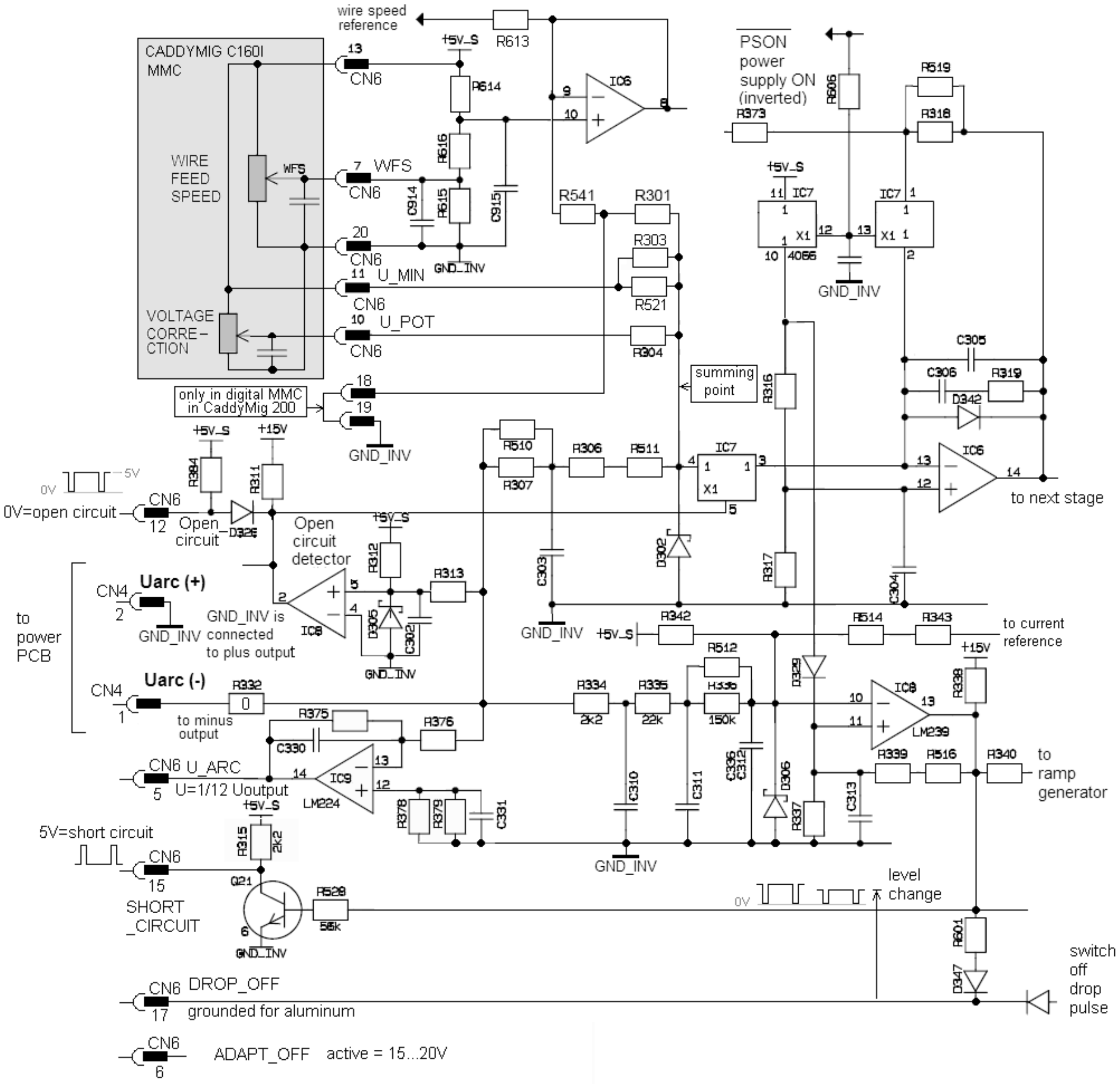
AP2:2L. Electromagnetic valve

The electromagnetic valve control works in a specific mode.



As shown on the diagram the first 0.2 s coil of the valve is supplied from 24 volts d.c. Then the generator starts running, providing 50%, 20kHz, 24V amplitude supply of the gas welding. In result the drawn power is reduced down to1/4 of the rated power, but the valve due to its relay-type characteristics is kept open.

AP2:3L. Short arc control



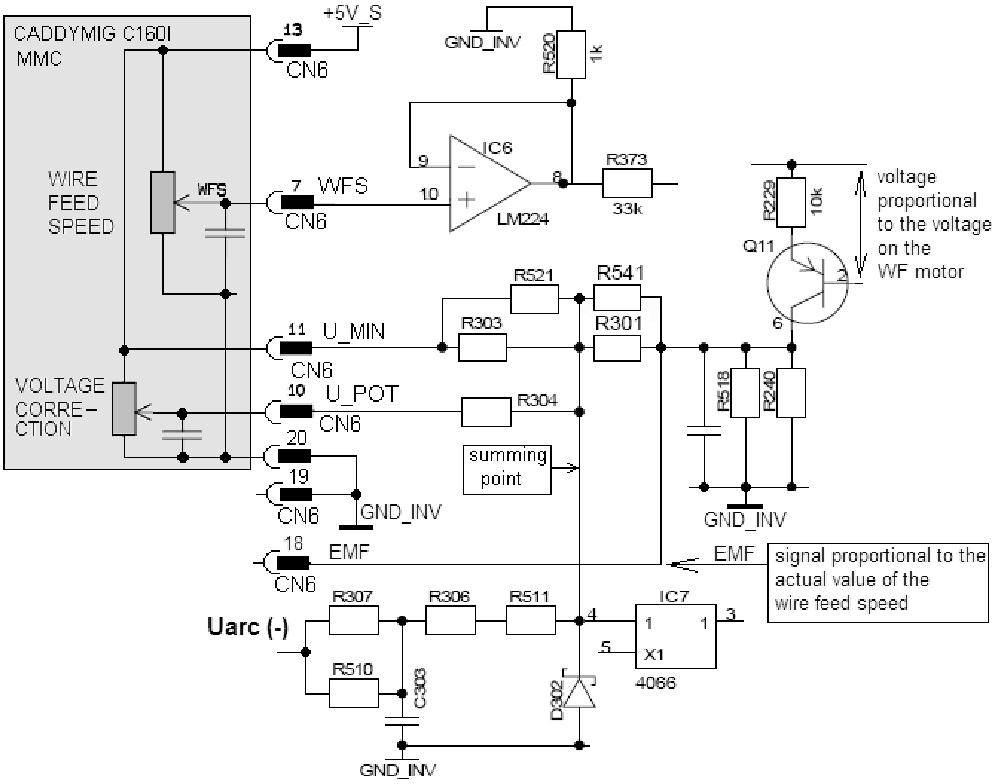
The voltage reference is proportional with different coefficients to:

a. wire feed speed reference
b. voltage on the Umin input
c. voltage on the Upot input

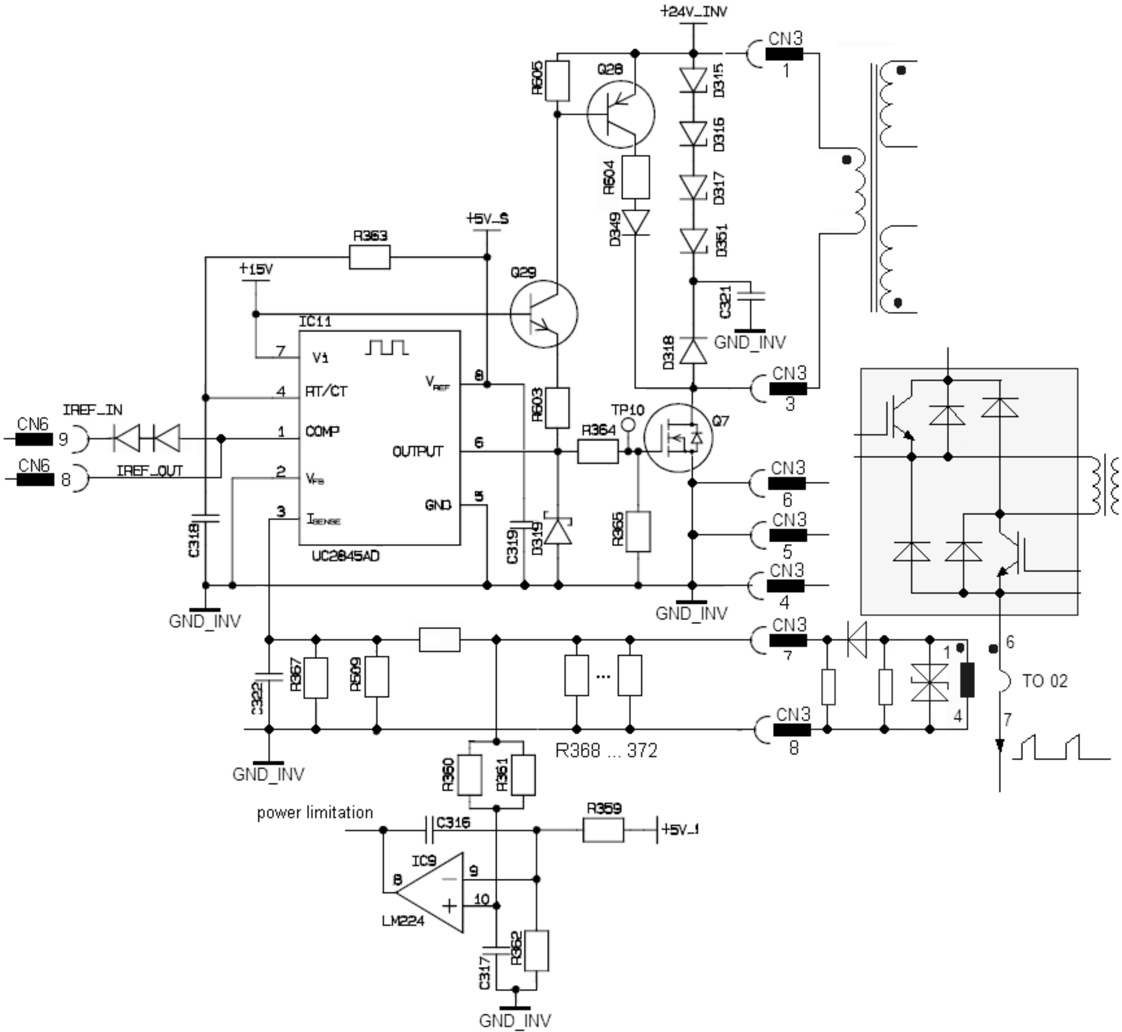
In the previous solution the source a. was replaced by the EMF - voltage proportional to the actual wire feed speed, i.e. the EMF voltage was 0, when the motor was stopped.

In one or either way, the voltage reference was in relation to the wire feed speed.

In the actual solution it is achieved by grounding pin 18 of CN6. In previous solution, the EMF signal was delivered to micro controlled and then subtracted from the reference with adequate coefficient.



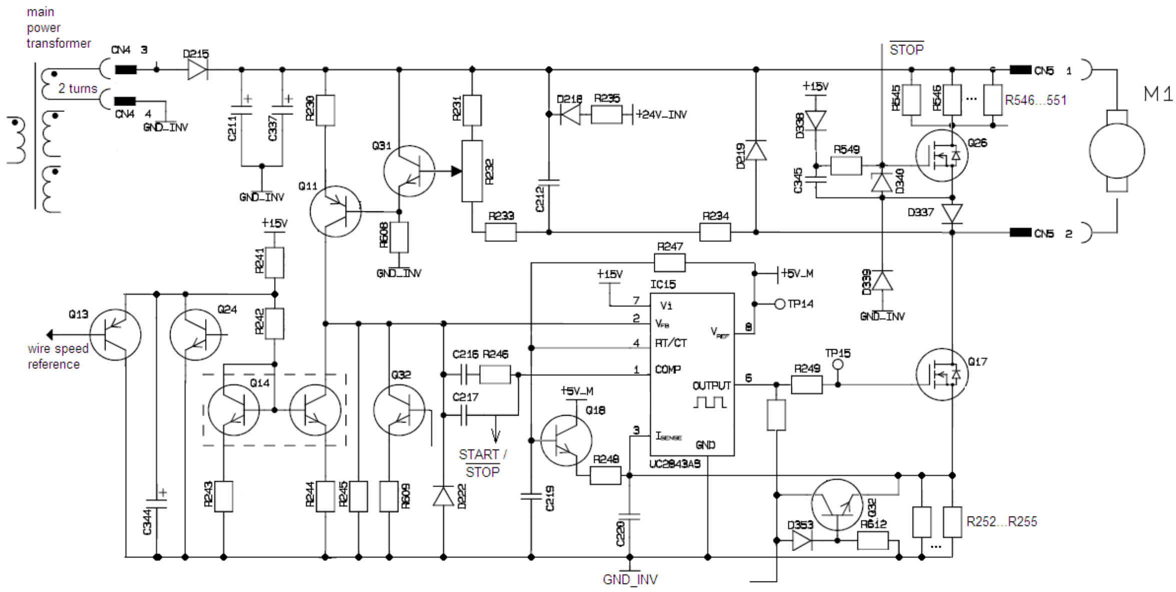
Voltage feedback is given on the CN4.1. Note that low voltage ground (GND_INV) is connected via CN4.2 to the power supply (+). It enables creation of the summing point in system with unipolar supply. Nevertheless the voltage feedback inverting amplifier gives the signal in opposite phase. This signal is delivered to the next inverting amplifier, which is not shown on the drawing. This amplifier also adds the fraction proportional to the ramp signal, created during short circuit. In his way, a current reference signal is delivered to the peak current mode PWM integrated circuit IC11.



The current reference signal IREF_IN from the voltage regulator is delivered via 2 diodes to the current input (COMP) of the PWM controller IC11. Diodes were applied to compensate voltage drop on diodes embedded in the IC11.
Current feedback is provided by means of the current transformer TO02, placed on the power PCB. Pulsed current signal is delivered to the current sense input (Isense) of the IC11. As the voltage on the DC bus is stable, the average primary current is proportional to the drawn power. Therefore, the signal from the current transformer is also given the input of the integrator on IC9 (8,9,10), providing the power limitation.

AP2:4L. Wire feeder motor speed controller

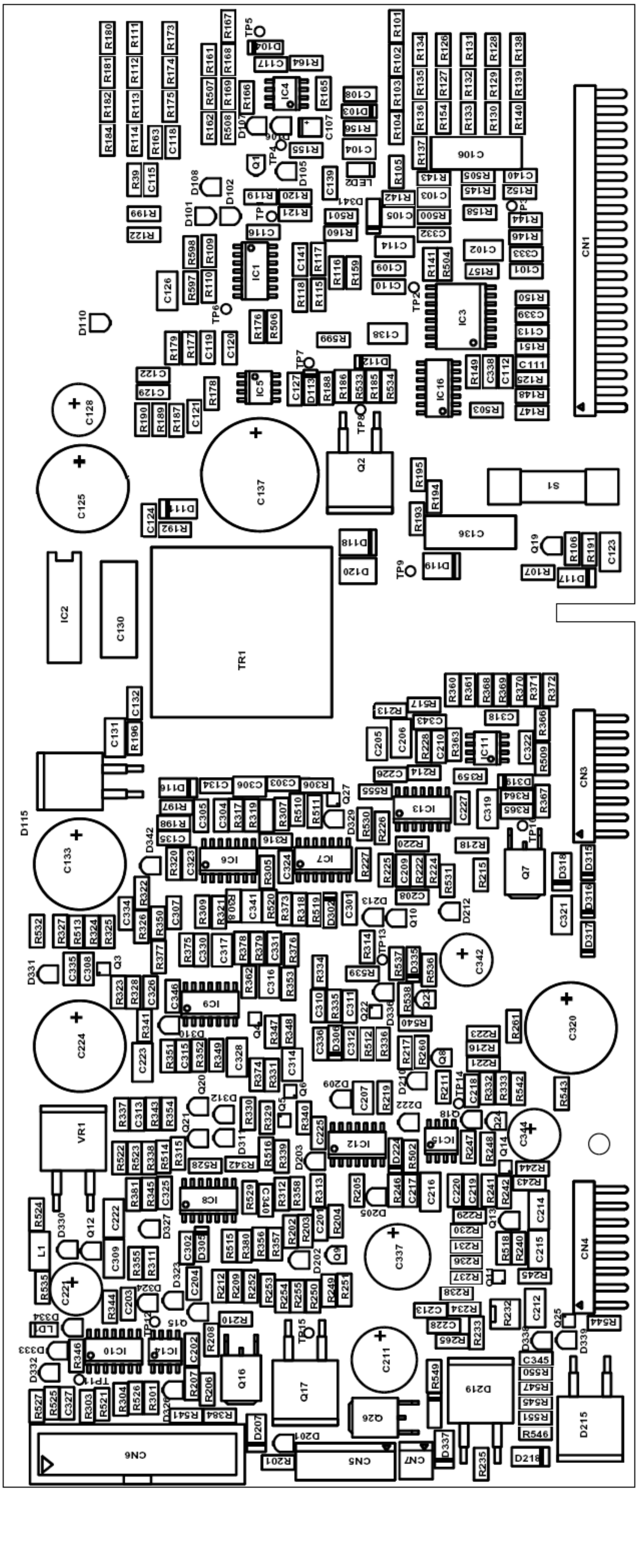
The motor drive is supplied from the auxiliary winding on the main trafo as shown on the figure below.



The wire speed motor controller is built on the peak current mode PWM controller IC. This IC does not provide the reference input, the internal reference is +2,5V. In this case the negative voltage feedback is provided in the form of the sourcing current, and the reference value is provided in the form of the sinking current. PWM controller commands the MOSFET Q17, which delivers PW modulated voltage to the motor.

When the motor must be switched off the Q26 MOSFET short circuits the motor, providing effective way of fast stopping of the motor.

AP2 Components layout



AP3 MMC panel

Man-machine communication panel (MMC) provides controls for process settings and machine operation, as well as feedback from the process and the machine condition.

Physically, the MMC is printed circuit board (PCB) which consist of:

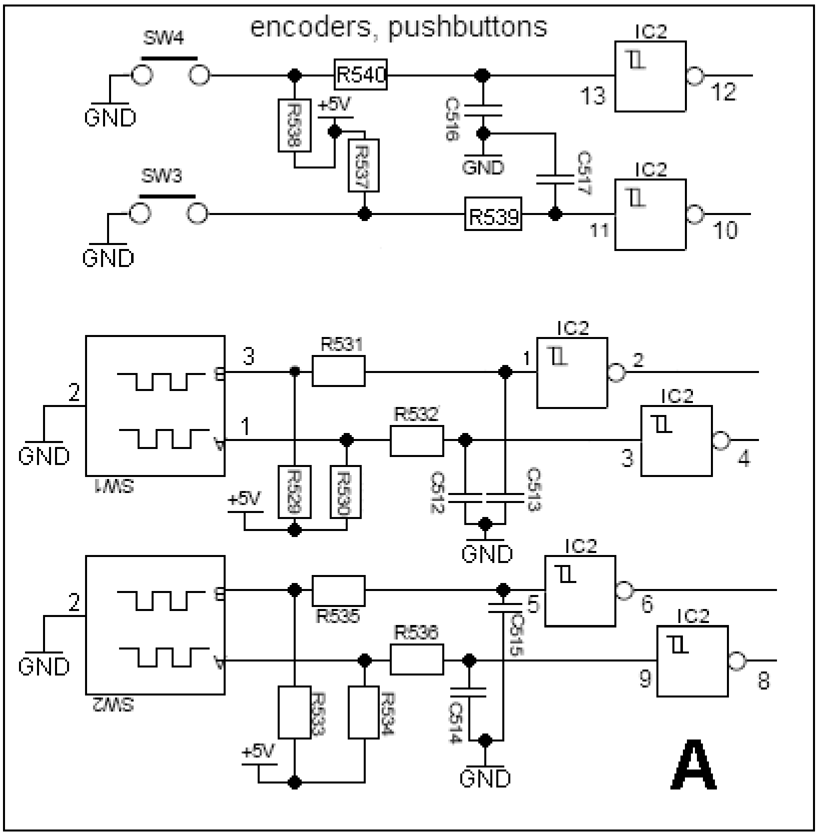
- microprocessor system,
- manual controls: pushbutton, rotary encoders
- LCD display

The MMC is connected to the analog control PCB via connector CN1.

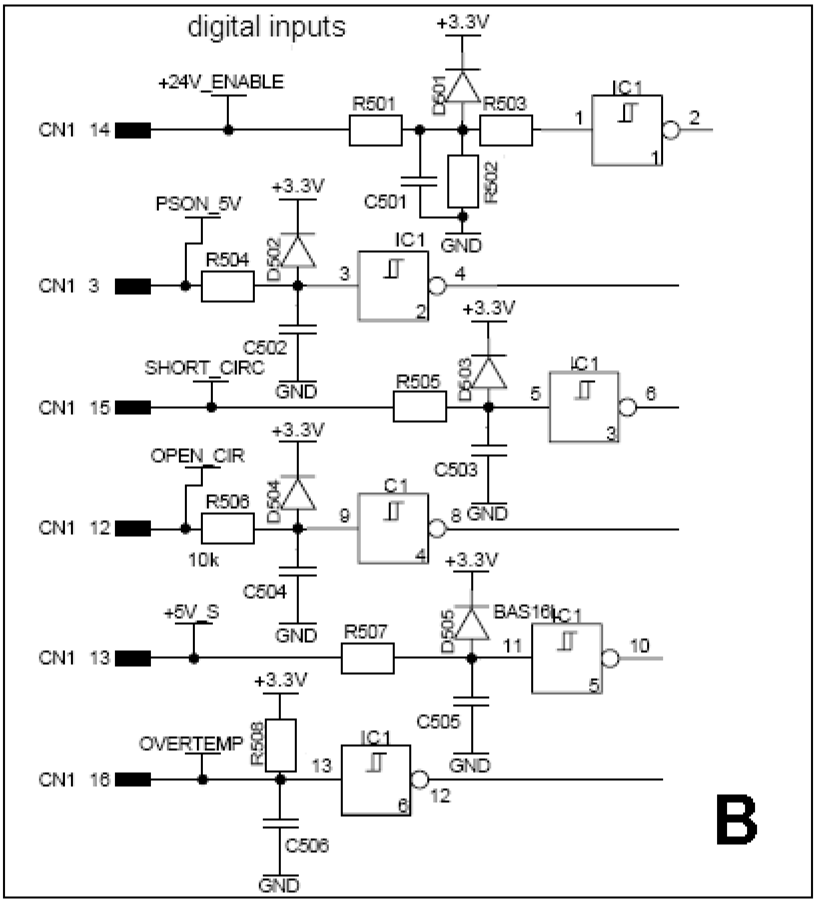
AP3:1,2,3. Manual, digital and analog input circuits

Circuits do not need special explanations. Both, manual and digital inputs have input filters and Schmidt trigger buffers, to protect signal lines from interferences. Analog inputs also consist of filters. Voltage followers on the operational amplifiers are added as buffers.

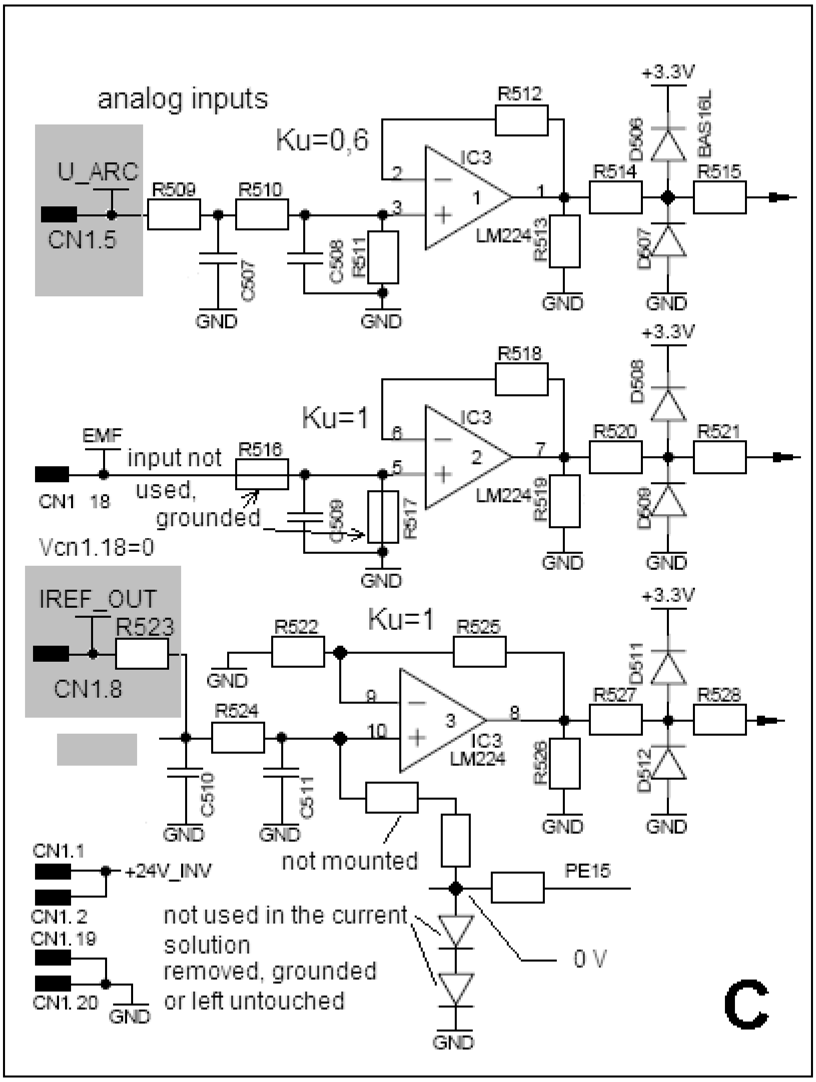
Manual inputs



Digital inputs

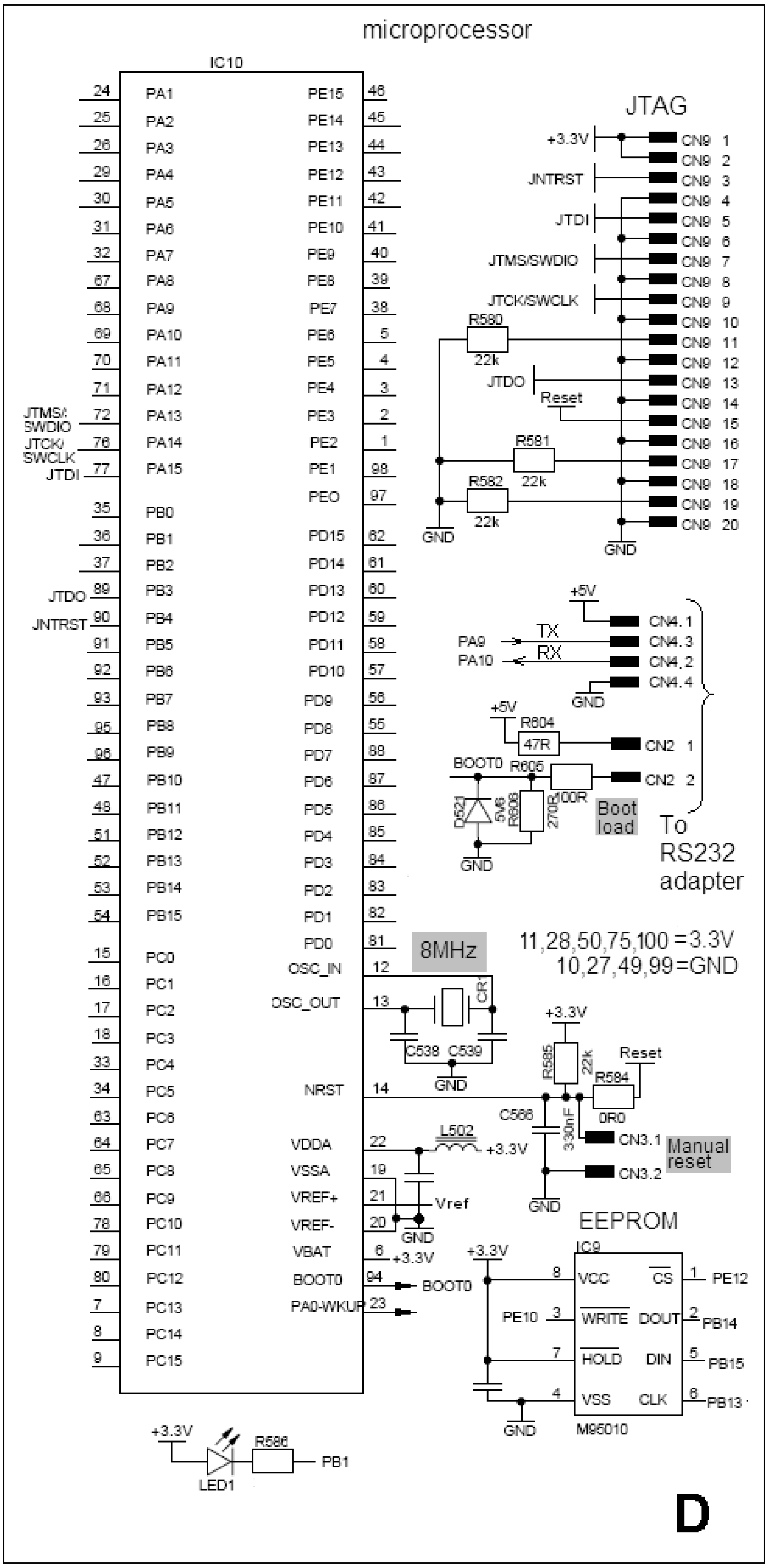


Analog inputs



AP3:4. Microprocessor and its circuits

The programming is available through the standard serial connector RS232, connected to CN4 via buffer PCB. Program updating can be carried out via this way. JTAG connector is not mounted.



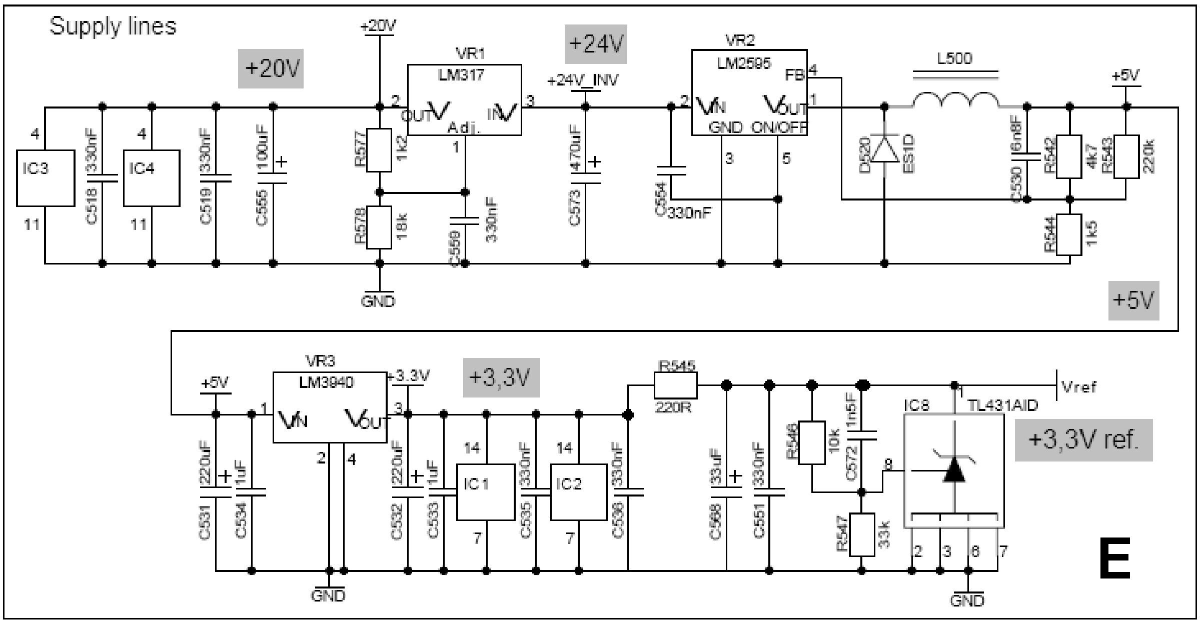
AP3:5. Power supplies

The MMC panel is supplied from the 24V delivered by the power supply placed on the analog PCB.

+5V power supply is built as the pulse buck converter. The integrated regulator VR2 together with the inductor L500 and the diode D520 composes a simple buck converter.

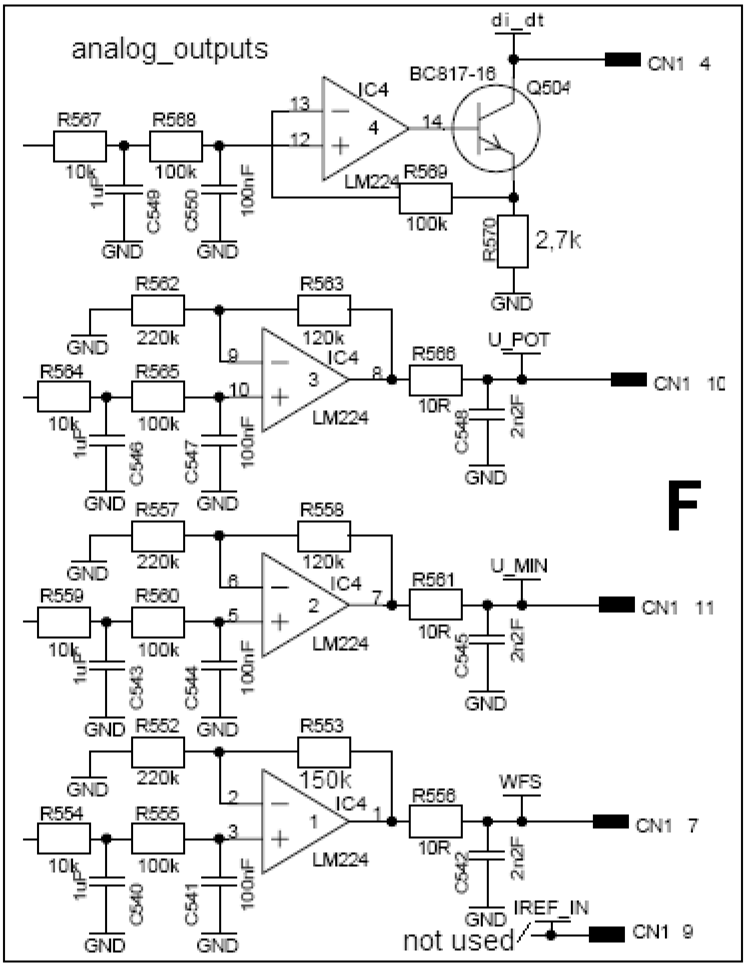
+3,3V supply is created from the +5V by means of the low-drop regulator VR3.

Operational amplifiers are supplied from the +20V supply, created on the VR1 regulator.



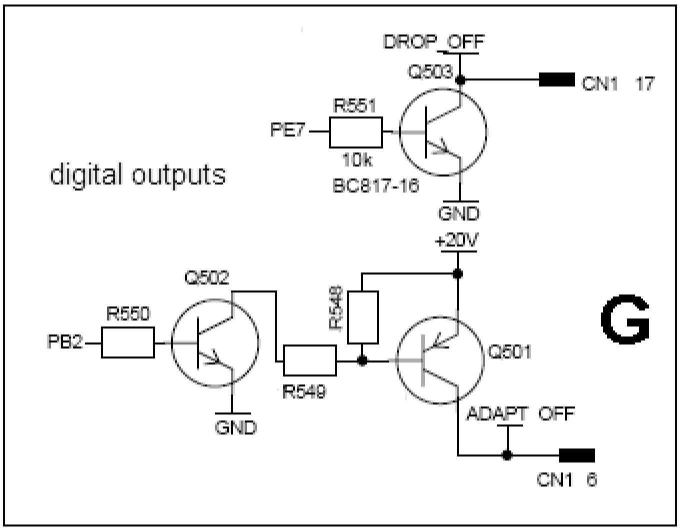
AP3:6. Analog outputs

All outputs are slow response PWM outputs. PWM signal are filtered and conditioned to the required level by means of the operational amplifiers. The di/dt output has a form of the sinking current source, where the npn transistor Q504 with resistor R570 in emitter is placed in the feedback of the operational amplifier.



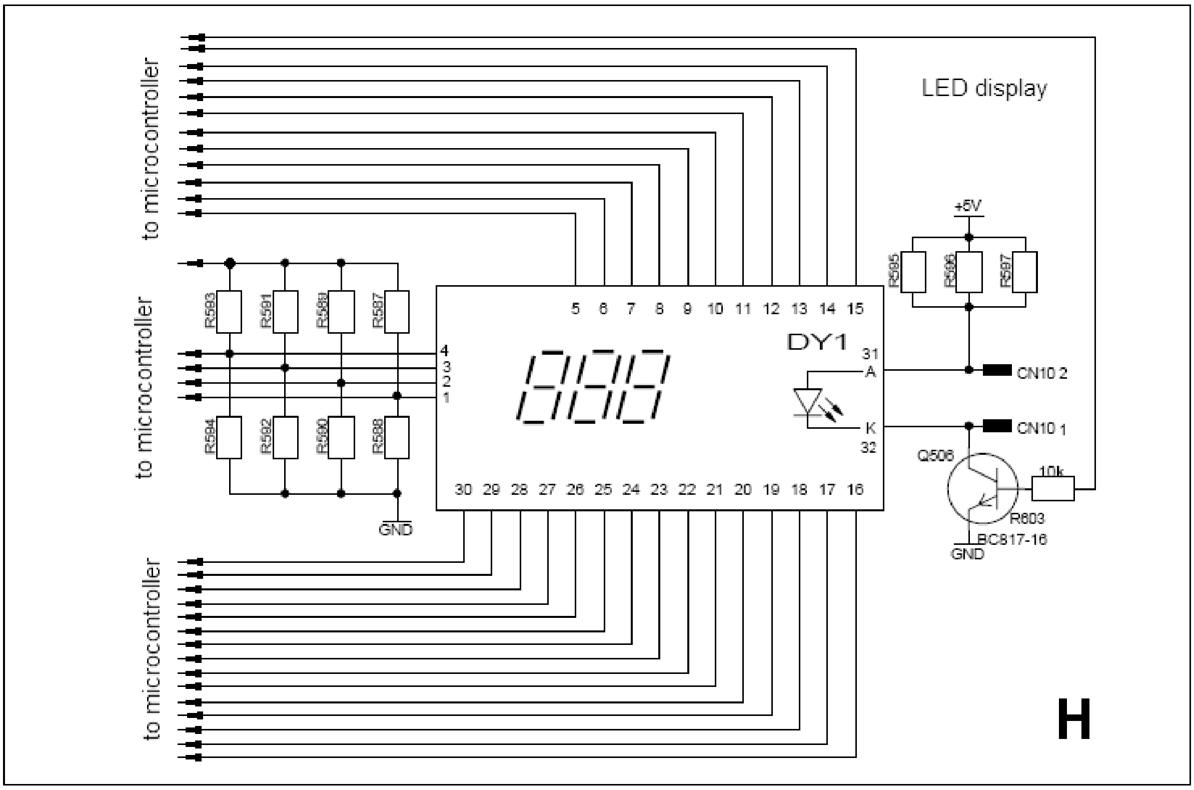
AP3:7. Digital outputs

Digital outputs are created in form of the npn and pnp open collectors, connecting adequate output lines to ground and to +20V respectively.

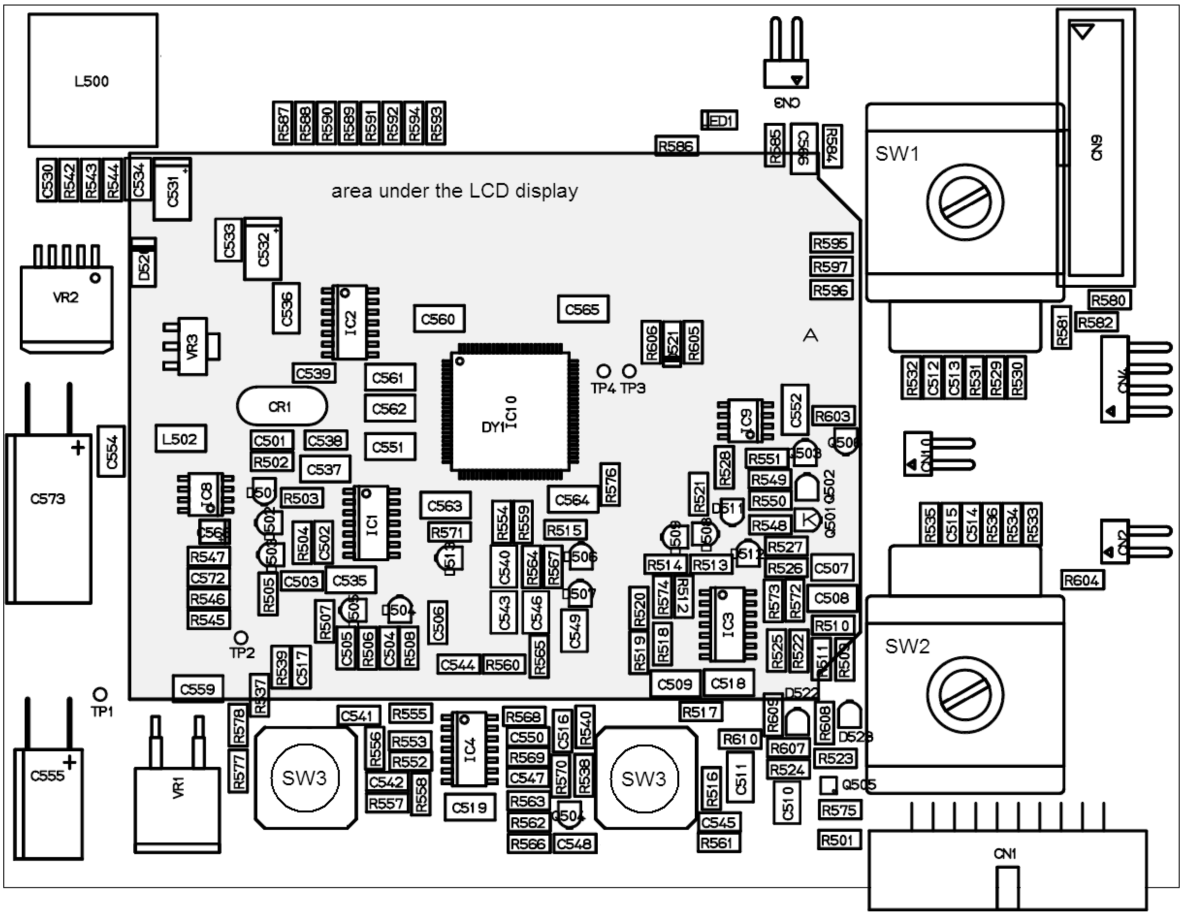


AP3:8. LCD display

LCD display is connected directly to the microprocessor lines. Group lines are connected to the voltage dividers on resistors R587-594, which are necessary to create a.c. voltage on particular segments. (The d.c. fraction is not allowed as it would damage the display). The display background is highlighted by means of the edge white LED diodes. Backlight diodes are switched off during the power-down sequence by means of the microprocessor and the transistor Q506.



AP3 Components layout



SERVICE INSTRUCTIONS

ESD

CAUTION

STATIC ELECTRICITY can damage circuit boards and electronic components.

- **Observe precautions for handling electrostatic-sensitive devices.**
- **Use proper static-proof bags and boxes.**

What is ESD?

A sudden transfer or discharge of static electricity from one object to another. ESD stands for Electrostatic Discharge.

How does ESD damage occur?

ESD can cause damage to sensitive electrical components, but is not dangerous to people. ESD damage occurs when an ungrounded person or object with a static charge comes into contact with a component or assembly that is grounded. A rapid discharge can occur, causing damage. This damage can take the form of immediate failure, but it is more likely that system performance will be affected and the component will fail prematurely.

How do we prevent ESD damage?

ESD damage can be prevented by awareness. If static electricity is prevented from building up on you or on anything at your work station, then there cannot be any static discharges. Nonconductive materials (e.g. fabrics), or insulators (e.g. plastics) generate and hold static charge, so you should not bring unnecessary nonconductive items into the work area.
It is obviously difficult to avoid all such items, so various means are used to drain off any static discharge from persons to prevent the risk of ESD damage. This is done by simple devices: wrist straps, connected to ground, and conductive shoes.

Work surfaces, carts and containers must be conductive and grounded. Use only antistatic packaging materials. Overall, handling of ESD-sensitive devices should be minimized to prevent damage.

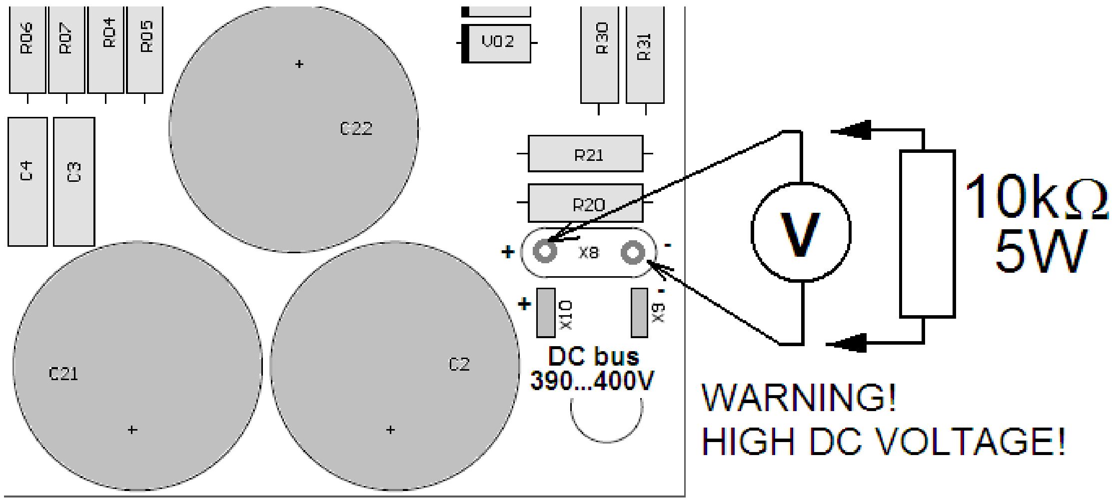
Before the service work

WARNING !
High DC voltage may remain on the electrolytic capacitors on the power board.
Check the voltage and discharge capacitors if needed.

Disconnect the equipment from the mains before opening the housing.

The capacitors of the PFC filters are charged up to 400V and collect significant charge. It is recommended to wait 5 min. after switching the equipment off and disconnecting it from mains. This time may include the time of unscrewing all screws of the housing.
Check the voltage on the capacitors on the X8 pads. Openings have standard 2,0mm diameter as standard multimeter's probes.
If accelerated discharge of the high voltage is required use 10kW 5W resistor with safe outlets (i.e. cables with 2,0 mm probes). Note that the time constant is still 15 s.
It is recommended to discharge capacitors entirely.

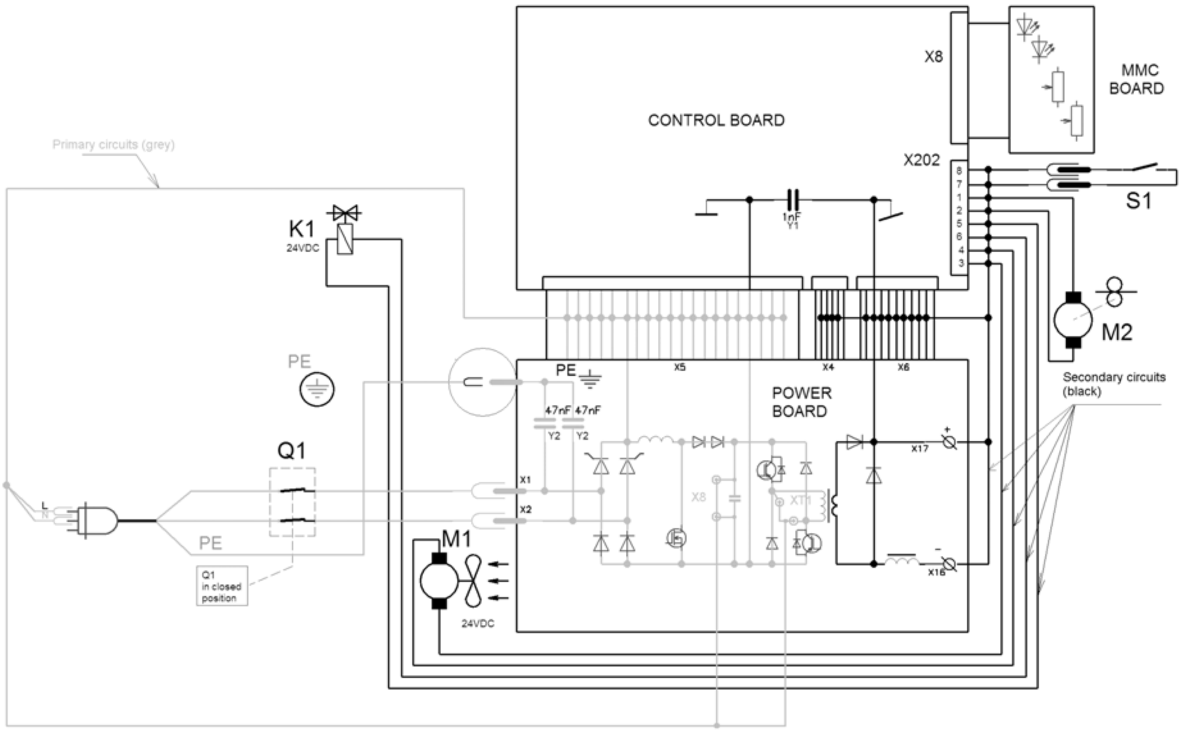
When the voltage is less then 50V a 1kW 0,5W resistor may be used for the final discharge.



Handling of the control PCB

Carefully put the control PCB in place. Try to avoid touching the wrong pins during placement of the PCB. The slit in the control PCB and the diode on the power PCB should help with positioning. Nevertheless remove and place the control PCB carefully.

Insulation resistance measurement



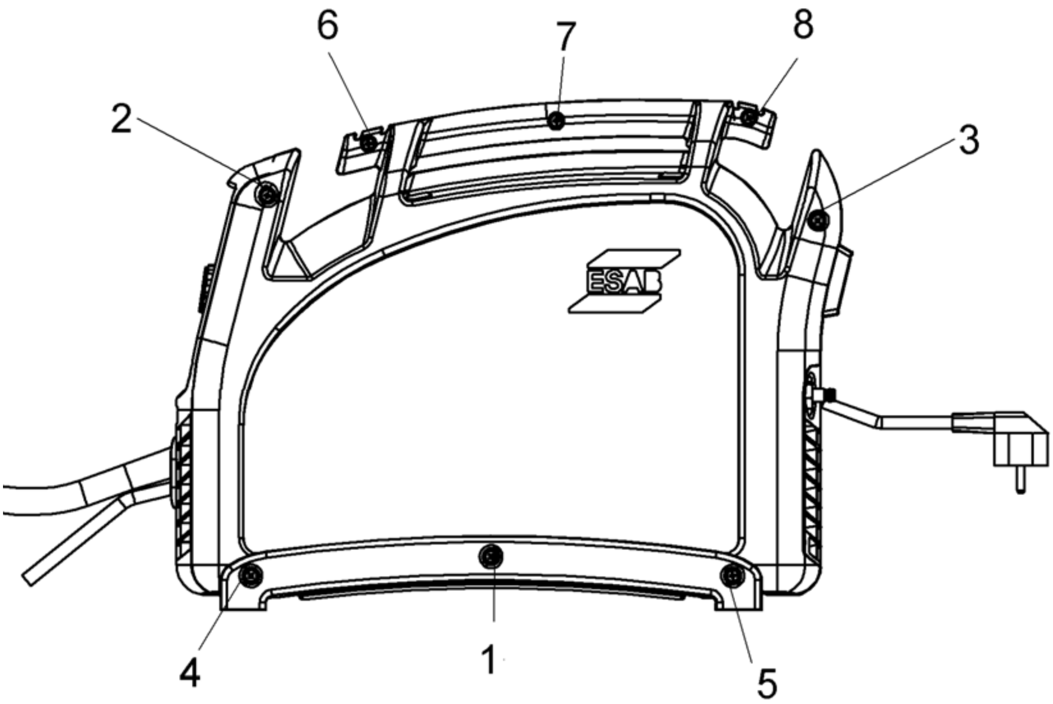
ATTENTION!
All primary and secondary circuits must be short-circuited to protect semiconductor devices.

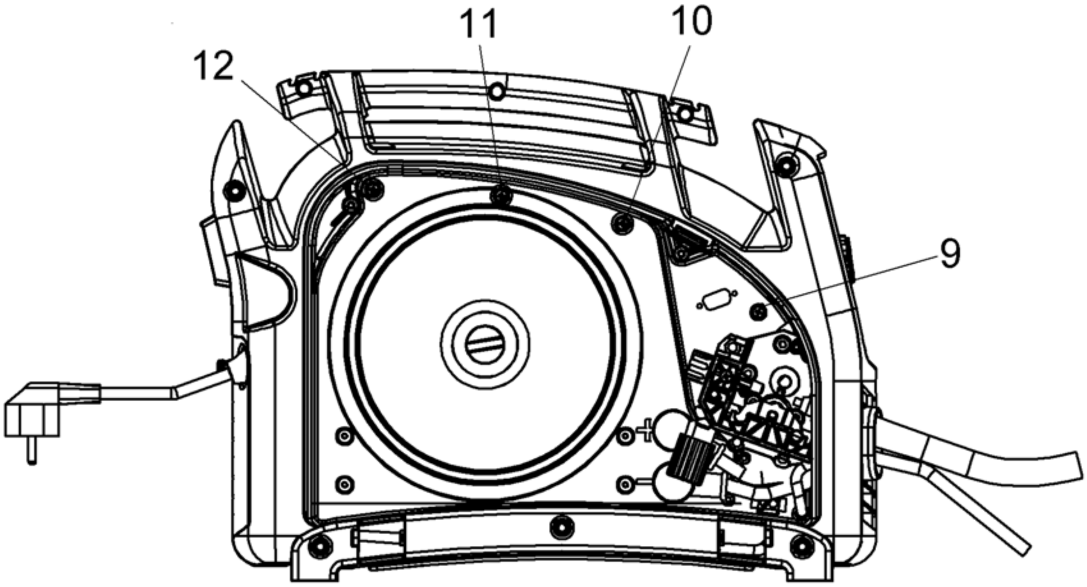
The insulation resistance between welding circuits (secondary circuits) and primary circuits should be more then 5MΩ.

It is recommended to carry out the insulation resistance test during periodical survey dependently on the environmental conditions, not less then once a year.

If needed, the inside of the equipment should be cleaned by means of the compressed air.

Assembly of the housing





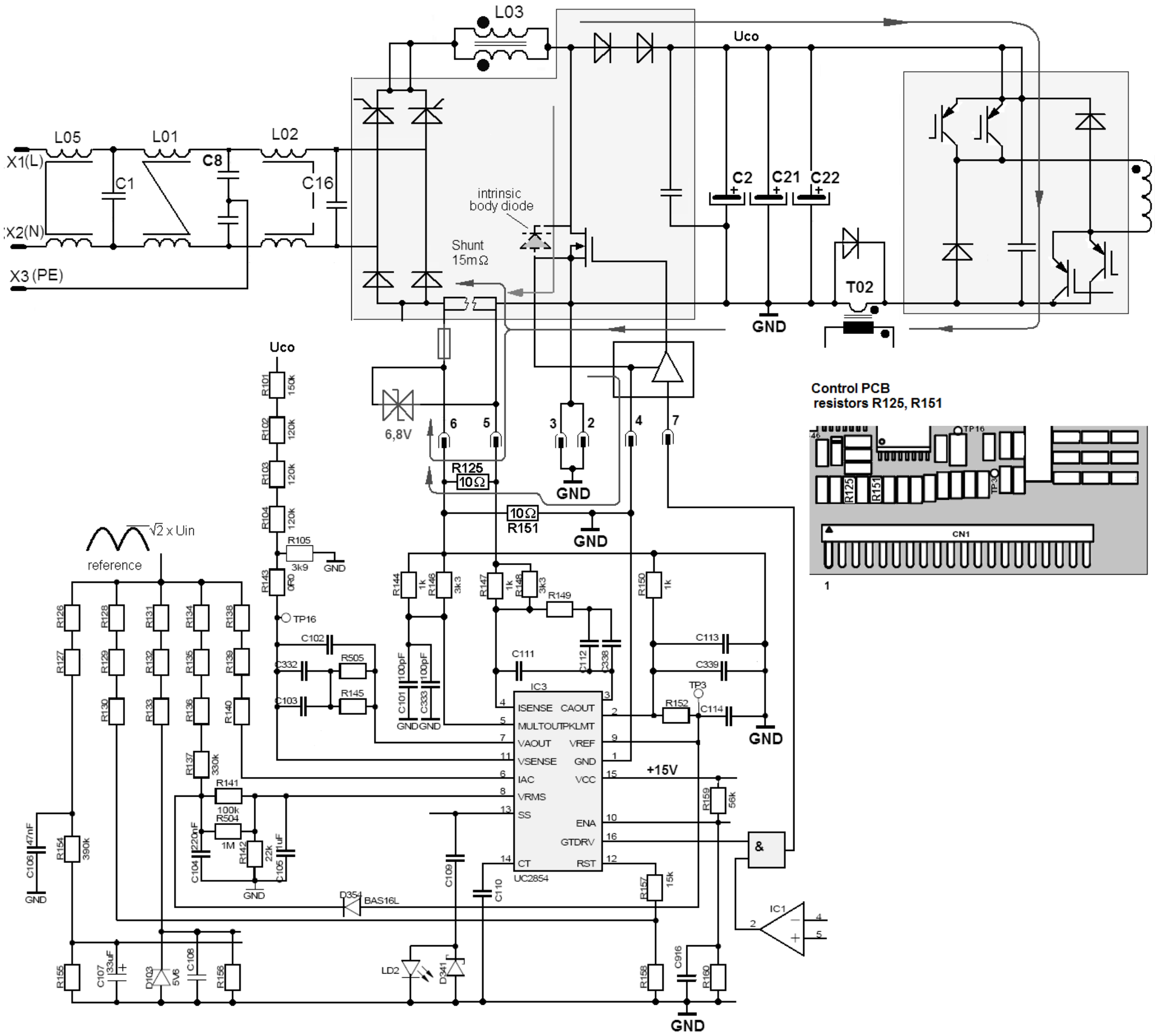
Two main parts of plastic housing are assembled together by means of bolts.

There are tongue-and-groove joints in the upper part of housing. To avoid damaging of the joint and achieve good connection, it is strongly recommended to follow the bolts insertion sequence presented on the drawing.

Fault tracing

Type of fault	Actions
Machine is dead. LED is off (display is off). Fan is not working.	• Check that the mains power supply switch is turned on. • Check that the welding current supply and return cables are correctly connected.
The machine is dead. LED is off (display is off). Fan is not working. Mains fuse tripped.	General failure in the power block. • Check the power PCB according to the description on the next page. • Replace damaged parts. **CAUTION** *Incomplete identification of failures can cause another failure of the new part. Both PCB:s power and control must be checked for failures and replaced if needed before installing the new part.*
No wire feeding. Fan is working. LED (or display) is on.	• Check torch switch circuit. Check lack of the indicated failure. Press the torch pushbutton and check the open circuit voltage. If it is proper cca 58V, search failure in the control PCB.
The equipment seems to work properly, however the welding is troublesome.	• Make sure that the welding parameters are correct. • Check the open circuit voltage. If it is significantly less then 58V, check the DC bus voltage (390...400V). Search for the failure in the PFC part. • Check the gas supply. • Visually check the quality of the wire feeding. Correct wire placement, roll etc.
No shielding gas.	• Check gas connection. • Check the gas valve operation by listening to the sound of the tripping. • Check the voltage on the solenoid. In the steady state it should amount approx. 12V DC (average).
The equipement seems to work, but it is permanently blocked by some error. The yellow diode is on (the display shows error).	• Note that any failure is latched, when the torch button is on. Release it if pressed. • Overheating should disappear after 3...4 minutes. Wait. • Switch the equipment off and switch on again after 2 minutes. If it is still disabled - look for failure in the control PCB. Lack of any voltage may cause permanent blockade of the equipment.

General failure of the power block



Failure in the power block frequently means the short-circuit of the DC bus. Unfortunately it causes an avalanche of further failures. Mechanism of the avalanche of failures is shown on the picture. DC bus short-circuit causes damage and disconnection of the shunt resistor inside the module. Consequently resistors R125, R151 on the control PCB are damaged into the disconnection. It leads to further failures, in particular of the PFC control circuit.

To avoid the damage of the control circuit the protective fuse and transient suppressor were implemented. However it does not guarantee 100% of the control PCB protection.

CAUTION
When the power PCB is replaced, only the fully functional control PCB could be applied. Verify the control PCB by checking the resistance of R125 and R151 on the CN1 connector. Both resistors should have 10 Ohm resistance.
It is recommended to check both resistors visually, using magnifying glass or microscope. Burns, holes and cavities means failure.

To check the power block measure the DC-bus voltage and/or check the PCB using ohmmeter. The DC bus must be completely discharged before using the ohmmeter. Use diode check mode. Presence of the big capacitor is showed by the growing resistance.

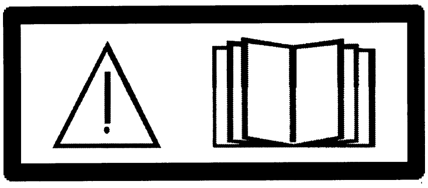
INSTRUCTIONS

This chapter is an extract from the instructions for the Caddy® Mig C200i.

SAFETY

CAUTION

Read and understand the instruction manual before installing or operating.



S0349 300 095/E110810/P48

INSTALLATION

Placing

Position the welding power source such a way that its cooling air inlets and outlets are not obstructed.

Mains power supply

Check that the unit is connected to the correct mains power supply voltage, and that it is protected by the correct fuse size. A protective earth connection must be made, in accordance with regulations.

Rating plate with supply connection data

Caddy® Mig C200i	1~ 50/60 Hz
Voltage V	230±15%
Current A	
at 100% duty cycle	10
at 60% duty cycle	12.8
at 25% duty cycle	23
Cable area mm²	3 x 1.5
Fuse slow A	16

NB: *The mains cable areas and fuse sizes as shown above are in accordance with Swedish regulations. They may not be applicable in other countries: make sure that the cable area and fuse sizes comply with the relevant national regulations.*

PFC

The machine is equipped with Power Factor Correction converter and has near-to-unity power factor. It complies with standard EN 61000-3-12:2005-04 Electromagnetic compatibility (EMC) - Part 3-12: Limits for harmonic currents produced by equipment connected to public low-voltage systems with input
current > 16 A and <= 75 A per phase.

Extension cord

If extension cord is needed it is recommended to use cord 3x2,5mm^2 of maximum length 50m.

Supply from power generators

The machine can be supplied from different types of generators. However, some generators may not provide sufficient power for welding. The generators with AVR, equivalent or better type of regulation with rated power 5,5...6,5 kW are recommended to supply the Caddy® Mig C200i semiautomatic welder within it's full capacity. It is also possible to use generators with lower rated power, starting from 3,0kW, but in that case the machine setting must be proportionally limited. The machine is protected against undervoltage. If the power supplied by the generator is not sufficient, the welding is interrupted by the undervoltage protection. Especially welding start could be disturbed. The generator should be replaced with a more powerful one or welding parameters be decreased if operator finds the welding process disturbed.

OPERATION

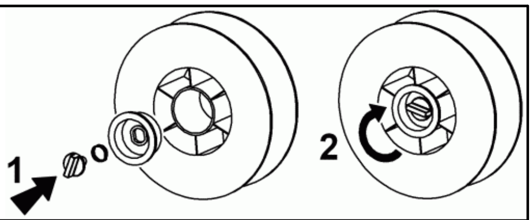
General safety regulations for the handling of the equipment appear from page 37. Read through before you start using the equipment!

WARNING

Rotating parts can cause injury, take great care.

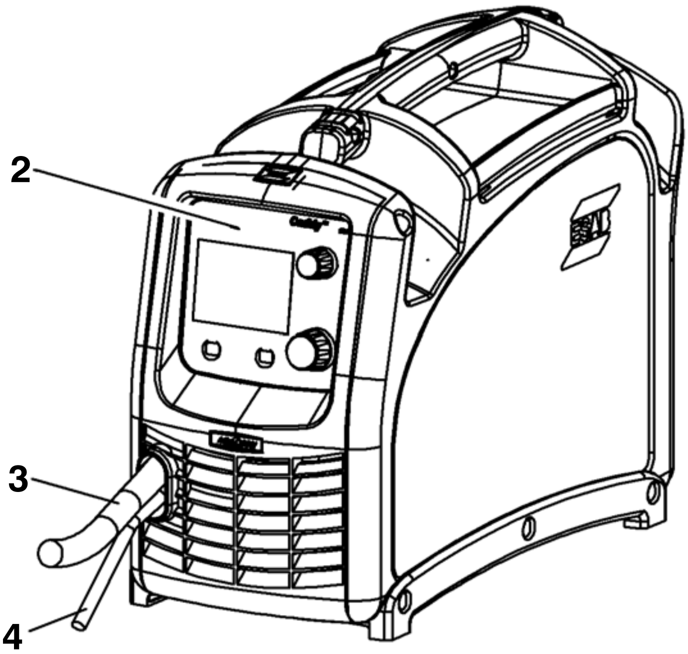
WARNING!

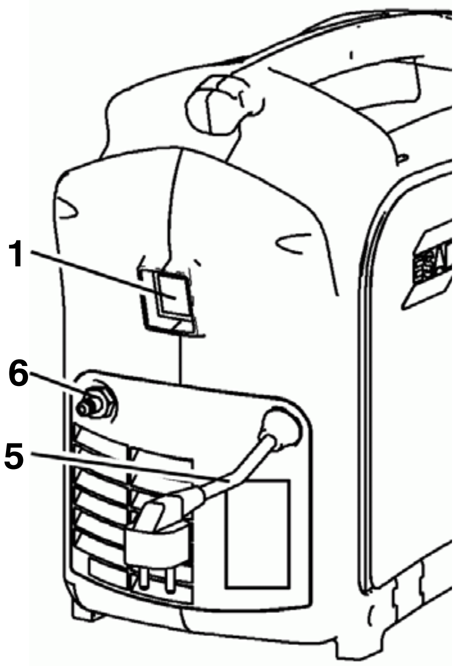
Lock the bobbin in order to prevent it from sliding off the hub.



Connection and control devices

1	Mains supply switch	**4**	Return cable
2	LCD (see Manual / QSet mode)	**5**	Mains cable
3	Welding torch	**6**	Gas connection





Operation

Once the machine is turned-on, it is not powered instantly. Approximately 2 seconds after switching the machine on by means of the mains switch , the LCD display indicates that the machine is ready.

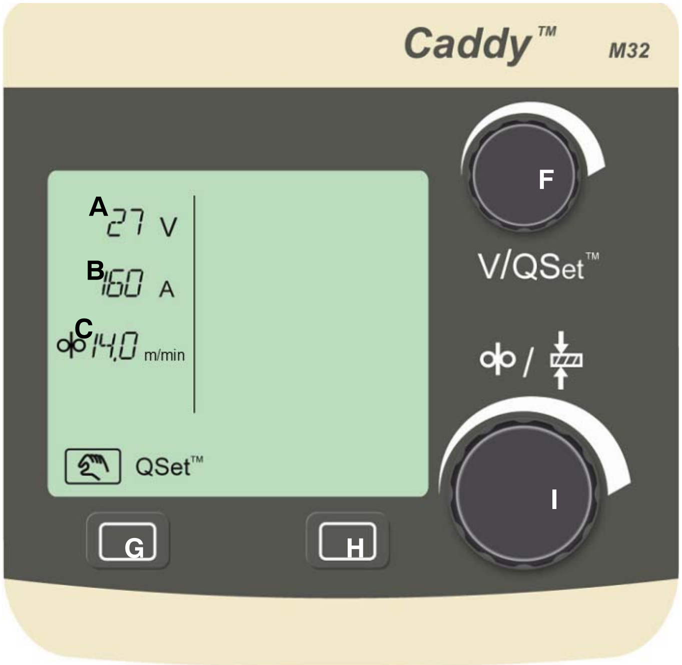
The machine is protected against welding start during power on. If the torch pushbutton is pressed while the machine is being turned-on, the operation is disabled, until the torch button is released.

The return cable must be reliably connected to the workpiece or to the welding table.

The wire spool section must be closed prior to the welding.

Machine is instantly switched off by means of the mains switch.

Manual mode

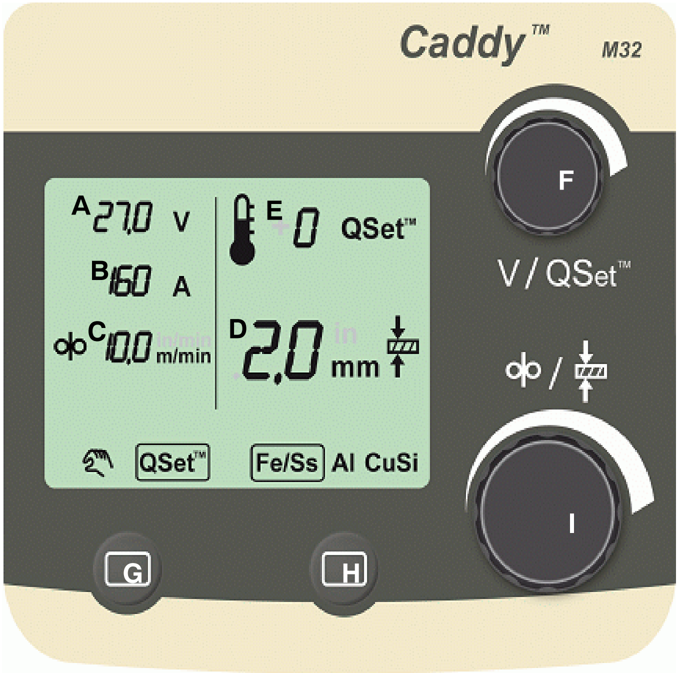


A – welding voltage
B – welding current
C – wire feed speed

F – voltage setting knob
G – Manual / QSet™ mode button
H – dynamics setting button
I – wire feed speed setting knob

The operator must set appropriate values for the wire feed speed and welding voltage.

QSet™ mode



A – welding voltage
B – welding current
C – wire feed speed
D – workpiece thickness
E – QSet™ value

F – QSet™ value setting knob
G – Manual / QSet™ mode button
H – material selection / dynamics setting button
I – plate thickness setting knob

In QSet™ mode the appropriate welding voltage is automatically set by the machine. QSet™ monitors the welding arc and continuously adjusts the voltage to maintain the optimal setting.

Calibration

The first time you use QSet™ mode, and when you change welding wire material or shielding gas, you need to allow QSet™ to calibrate. This is done by making a test weld (min. 6 seconds). Simply start welding and let QSet™ find the correct parameter settings.

Material selection

Since different materials have different heat dispersion it is necessary to select the right material group (H) so that a correct plate thickness value can be calculated.

Plate thickness setting

Set the plate thickness of the object you want to weld using the plate thickness setting knob (I). This knob sets the wire feed speed (C). A suitable voltage setting is automatically calculated by QSet™. The recommended plate thickness for the set wire feed speed is displayed simultaneously (D). The plate thickness recommendation is calculated for a fillet weld using the following wire dimensions: Fe/Ss and CuSi - ∅0,8mm. Al - ∅1,0mm. If you use a smaller diameter wire you should set a slightly higher value for plate thickness than what you are going to weld. If you use a larger diameter wire set a slightly lower value.

Heat input adjustment

The heat input can be adjusted with the QSet™ knob (F) in steps from -9 to +9 to make the weld hotter or colder. A higher value gives a hotter, more concave, weld (longer arc length) for more penetration. A lower value gives a colder, more convex, weld (shorter arc length) to prevent burning through the welded material. Typically the QSet™ value should be set to 0 which gives you an average heat input that is suitable in most cases. The heat input setting is symbolised with a thermometer indicating hotter or colder settings.

Error codes

If an error occurs only the error code will be visible.

Error No.	Mnemo	Description	Action
1	EPROM_CHSUM	program related error	Switch the machine OFF, wait 30 sec. and switch it ON. Call for service if the error remains.
2	POWER_SUPPLY_5V	hardware related error	
3	POWER_SUPPLY_24V	hardware related error	
5	WATCHDOG_ERROR	program related error	
4	**HIGH_TEMP**	**thermal protection**	**Do not switch the machine OFF, let it to cool down.**

Setting the dynamics (Fe/SS)

In certain cases especially for mild steel welding in different gases the quality of welding may be improved by changing the dynamics of the Caddy® Mig C200i.

Setting of the dynamics function is normally hidden, but can be invoked by the pressing and keeping pressed the pushbutton 7 for 5s or more. When this setting is available, all graphics from the right side of the display disappears, and only number from 00 to 10 is displayed . This number corresponds to the virtual inductance. 00 means that virtual inductance is small and the welding arc is ”sharp”, 10 means that the virtual inductance is high and the welding arc is ”soft”.

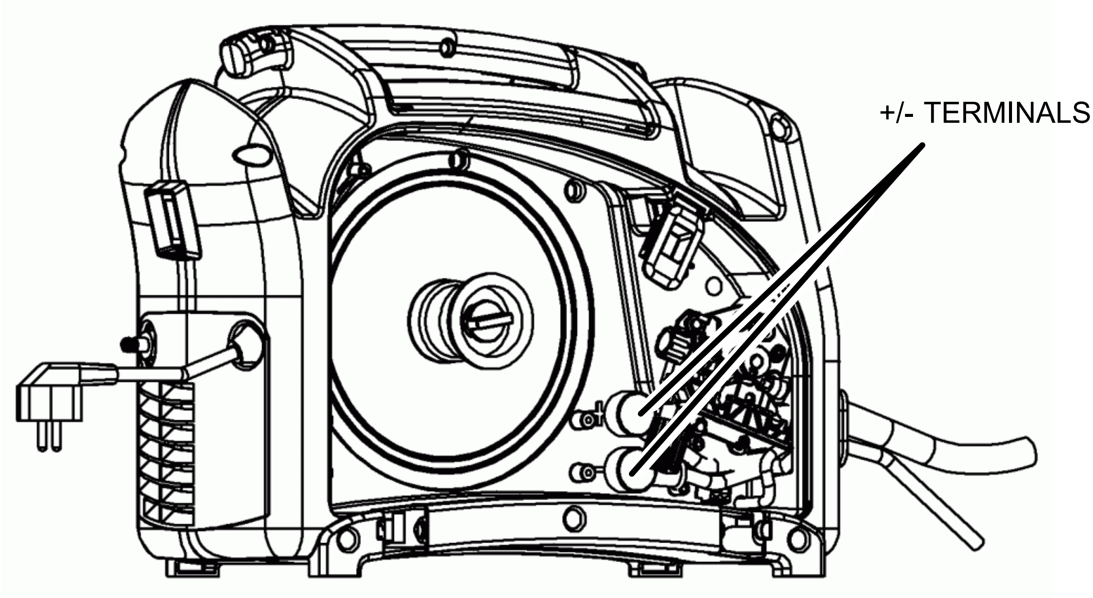
The value of the virtual inductance can be set by means of the knob 8. Default setting is 05.

Recommendations:

- When the CO_2 is used it is recommended to set set lower ”inductance” then 05, for instance from 03 down to 00.
- When the Ar/CO_2 mixture is used, the operator should set higher ”inductance” from 05 up to 10.

The interface goes back to the regular appearance 10s after the last movement of the knob 8 or pressing pushbutton 7. Operator can accelerate the return to the regular mode by again pressing and keeping pressed the pushbutton 7 for 5s.

Polarity change



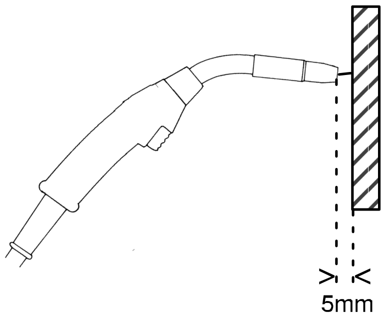
The machine is delivered with the welding wire connected to the plus pole. Some wires, e.g. gasless cored wires, are recommended to be welded with negative polarity (welding wire connected to the minus pole and return cable connected to the plus pole). Check the recommended polarity for the welding wire you want to use.

The polarity can be changed inside the wire feed cabinet:

1. Switch off the machine and disconnect the mains cable.
2. Bend the rubber covers back to give access to the cable lugs.
3. Remove the nuts and washers. Note the correct order of the washers.
4. Change the position of the cables to the desired polarity (see marking).
5. Install the washers in correct order and tighten the nuts to spanner tightness.
6. Make sure the rubber covers are covering the cable lugs.

Wire feed pressure

Start by making sure that the wire moves smoothly through the wire guide. Then set the pressure of the wire feeder's pressure rollers. It is important that the pressure is not too great.



cmek0p10

Fig 1

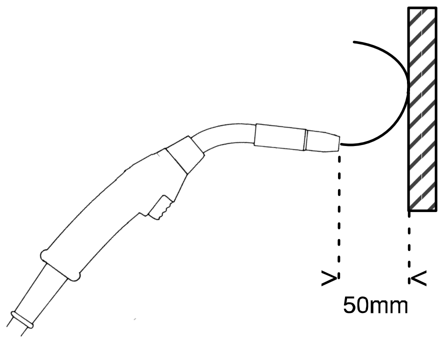


Fig 2

To check that the feed pressure is set correctly, you can feed out the wire against an insulated object, e.g. a piece of wood.

When you hold the gun approx. 5 mm from the piece of wood (fig. 1) the feed rollers should slip.

If you hold the gun approx. 50 mm from the piece of wood, the wire should be fed out and bend (fig. 2).

Replacing and inserting wire

To prepare the machine, a spool with wire should be installed. See technical data for suitable wire dimensions for each wire type.

Use only ∅200mm spools. ∅100mm/1kg spools are not applicable.

- Open the side panel.
- Place the spool on the hub and secure it with the lock.
- Disconnect the pressure arm by folding it sidewards, the pressure roller slides away.
- Straighten out the new wire 10-20 cm. File away burrs and sharp edges from the end of the wire before inserting it into the wire feed unit.
- Make sure that the wire goes properly into the feed roller track and into the outlet nozzle and the wire guide.
- Secure the pressure arm.
- Close the side panel.

Feed the wire through the welding torch until it comes out of the current tip. This operation should be carried out carefully, as the wire is on the welding potential and unintentional arc may occur. Keep the torch off conducting parts during feeding the wire through and terminate wire feeding instantly when the wire comes out of the current tip.

WARNING!
Do not keep the torch near the ears or the face during wire feeding, as this may result in personal injury.

NOTE.
Remember to use the correct contact tip in the torch for the wire diameter used. The torch is fitted with a contact tip for ∅0,8mm wire. If you use another diameter you must change the contact tip. The wire liner fitted in the torch is recommended for welding with Fe and Ss wires. Change the liner to the PTFE type for welding Al or Brazing (CuSi). See 7.2 regarding how to change the wire liner.

Changing the feed roller groove

The machine is delivered with the feed roller set for ∅0.8/1.0mm welding wire. If you want to use it for ∅0.6mm wire you must change the groove in the feed roller.

1. Fold back the pressure device to release the pressure roller.
2. Switch on the machine and press the torch trigger to position the feed roller so that the locking screw is visible.
3. Switch off the machine.
4. Use a 2mm Allen key to open the locking screw about half a turn.
5. Pull the feed roller off the shaft and turn it around. See marking on the side of the feed roller for suitable wire diameters.
6. Put the roller back on the shaft and make sure it goes all the way in. You may need to turn the roller to position the locking screw over the flat surface of the shaft.
7. Tighten the locking screw.

Shielding gas

The choice of suitable shielding gas depends on the material. Typically mild steel is welded with mixed gas (Ar + CO2) or carbon dioxide. Stainless steel can be welded with mixed gas (Ar + CO2 or O2) and Aluminium with pure argon. MIG/MAG brazing (CuSi) uses pure argon or mixed gas (Ar + O2). Check the recommended gas for the welding wire you want to use. QSet™ mode (see 6.2.2) will automatically set the optimal welding arc with the gas you use.

Overheating protection

Overheating is indicated on the LCD with error code E4. A thermal overload cutout protects the unit against overheating by disabling the welding if overheating occurs. The cutout resets automatically when the unit has cooled down.

MAINTENANCE

Regular maintenance is important for safe, reliable operation.

Note!
All guarantee undertakings from the supplier cease to apply if the customer himself attempts any work in the product during the guarantee period in order to rectify any faults.

Inspection and cleaning

Check regularly that the power source is free from dirt.

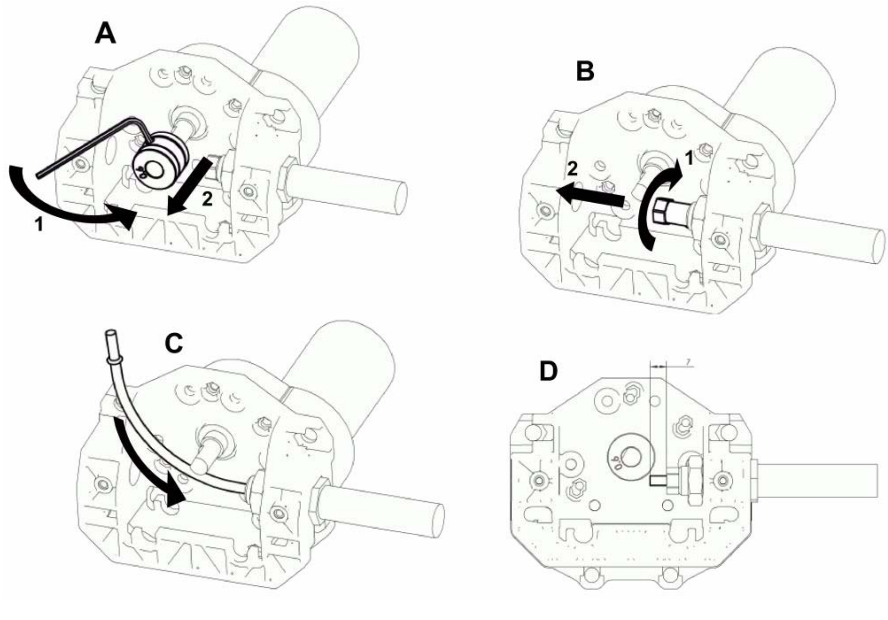
The power source should be regularly blown clean using dry compressed air at reduced pressure. More frequently in dirty environments.

Otherwise the air inlet/outlet may become blocked and cause overheating.

Welding gun

- The welding gun's wear parts should be cleaned and replaced at regular intervals in order to achieve trouble-free wire feed. Blow the wire guide clean regularly and clean the contact tip.

Changing the wire liner



A.
Loosen the fixing screw and take the roller off the axle.

B.
Loosen the adaptor nut, straighten the torch and remove the liner.

C.
Insert the replacement liner into the straightened torch until it touches the contact tip.

D.
Lock the liner with adaptor nut. Cut excess of liner so it sticks 7mm out of adaptor nut.

ORDERING OF SPARE PARTS

Spare parts may be ordered through your nearest ESAB dealer, see the last page of this publication.

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