



TECHNICAL INFORMATION

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FOR

MATTKE ANALOGUE CONTROLLER

TYPE

MAST 24/6 Z-2E

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Dear customer,

We always try to guarantee for an optimum of security measures and to inform ourselves about the latest developments in technical research. However, it is necessary that we pass on the following further information to you as the user of our components: The appliances are supply parts meant for processing by industry, trade or other factories specialised in electronics.

Safety precaution!!

Attention - do not touch! The appliances have unprotected live parts. The voltage may be highly dangerous.

We also have to inform you that, for your own security, only an expert should work on the appliances.

In order to comply with the safety precautions, open connections must be protected against contact with cases, coverings or anything similar. Even after the appliance had been disconnected, there may still be a dangerous voltage (discharges of the capacitors).

Due to an error in handling or unfavourable conditions, the electrolytic capacitors may explode. If you have to work on the open appliance, do protect your body (hands!) and your face!

Make sure that there is enough ventilation because of the fire risk in case of overheating.

Description and Initial Operation

Description

These appliances of our well established series of MAST units, are 1-quadrant linear operation amplifiers especially designed for the use with permanent magnet DC-motors. The disadvantage of higher power dissipation compared with PWM amplifiers is largely compensated in case leakage radiation disturbing peripheral electronics has to be avoided.

The amplifiers only need a single power supply without auxiliary voltages and can therefore be used for battery operation or in DC mains. They can be operated with either IxR compensated control or tacho control. As a consequence of the clear and compact design they are easy to service and universally usable.

The heat dissipation pcb contains the power final stage, the wiring board is provided with fuses and a locking screw connector block, the pcb GL 1078 contains rectification and filtering of the operation voltage of the power transformer, the second pcb RP 779 provides the reference voltage source (+ 8,2 V) for the peak output voltage), the adjustable current limitation the circuit for the I x R compensation and the tacho adjustment and the regulation circuit for the following driver stage. Devices with a "Z" in the article code have a time switch-off control explained in detail hereafter. The transformer needed for operation can also be supplied by our company and has to be ordered separately.

Function

A set value, supplied by the user from an external potentiometer or control voltage, is compared against a feedback voltage in an operation amplifier and the difference is used to regulate the final output voltage to the motor. The feedback voltage is either the back EMF from the motor compensated for the IxR drop across the motor's armature (IxR mode) or the voltage from a tacho generator (tacho mode).

Tacho mode control (consider the position of the jumpers)

Any DC voltage tacho generator with a low ripple producing an output voltage of 3 - 6 V /1000 rpm can be connected. Adjustment of the tacho voltage relative to the output voltage is done with trimming potentiometer P6. It is correct if at no load and for a maximum set value voltage (8.2 V) the output voltage is approximately 2 to 4 V below the motor's nominal voltage. When a load is applied the output voltage increases and should not exceed the nominal voltage at nominal current.

If the adjustment range is not sufficient appropriate additional resistors or voltage dividers can be added in the tacho cable. We recommend the use of our tacho generator T 505.

IxR Mode control (consider the position of the jumpers)

This mode causes a change in the output voltage in proportion to the current consumption of the motor and thus counteracts any speed drop due to increased load. In order to adjust the amplifier to the motor used the PCB contains a trimming potentiometer P5, marked "IxR". This should be turned until the motor starts to "pump". Then turn the trimmer back until the motor again starts to drive regularly and quietly. If a stroboscope lamp is available, a better adjustment is possible. Pointing the beam of light at a mark on the motor shaft adjust the trimmer until the smallest tolerance is achieved for different loads at different speeds. If you do not want an IxR compensation turn the trimmer to its minimum. Then, the amplifier operates as a voltage regulator. In this case it could be suitable to connect "sense lines" (voltage probes) in accordance with the connection instructions. Fine wires connected to the consumer are sufficient.

External control voltage

If you want to control the output by an external control voltage instead of the set value potentiometer P4 connect this between pin 6 and pin 4 of the screw connector. A control voltage range of approximately 8,2 V is sufficient to control the electronics. If the external control voltage range is higher, adjust it with the help of a resistor voltage divider to the relevant values.

Current limiter

Further to a fuse in the output circuit the amplifier provides a adjustable current limitation starting from 1% to the nominal current with a steep falling characteristic curve. The adjustment of the maximum output current is made with potentiometer P 5 (input number 5). For special application there is enough space reserved to mount a usual trimmer on the regulation board usable also for the set value potentiometer P 4. Please take care to avoid parallel wirings.

Automatic time switch-off (only covering units marked with "Z", e.g. MAST 24/6 Z)

A particularity of our MAST amplifiers consists in the addition of an automatic check and switch-off circuit. It allows to adjust a current threshold I_{ab} - independent of the above mentioned current limitation - which could be exceeded only for a certain (also adjustable) time. If the over-current occurs the preselected time the automatic circuit cuts the motor voltage and indicates this by a LED-signal. The motor remains stopped until a reset switch has been pressed allowing the unit to operate (after the elimination of possible defects.)

The status of the circuit is indicated by three LED's which can also be fixed externally (see connection scheme) is as follows:

LED green = normal operation under the adjusted current threshold I_{ab} .

LED yellow = the motor current is above the adjusted current threshold, time control is running.

LED red = the preselected time (T) is exceeded without a motor current drop (over-current condition), the automatic circuit has disabled the amplifier. By pressing "reset" the unit will be operating once more.

If required the automatic switch-off could become active if the maximum current I_{max} is reached. Therefore please connect the uninsulated strip conductor under the integrated circuit with one of the 16 pins. Attention ! C-mos circuit, use only grounded tools! Three different connections with different time constants depending on the position of the trimmer P1 (time) are possible.

The switch-off will be:

at pin 13 in 1/32

at pin 14 in 1/64

at pin 15 in 1/16

of the preadjusted time.

The exact set-up allows for example to accelerate the motor to his current limit without an immediate switch-off of the automatic circuit. As a consequence of the great variety of applications the exact adjustment should be determined by experiment.

Further to the red LED the disabling of the amplifier can be signalized by other signal transmitters, the pins 6 and 7 of the 19-poles plug at the front end of the pcb can be used. This plug allows to connect all the other functions of the switch-off automatic in case external control is desired. In this case the concerned components on the board have to be unsoldered in order to avoid parallel circuits.

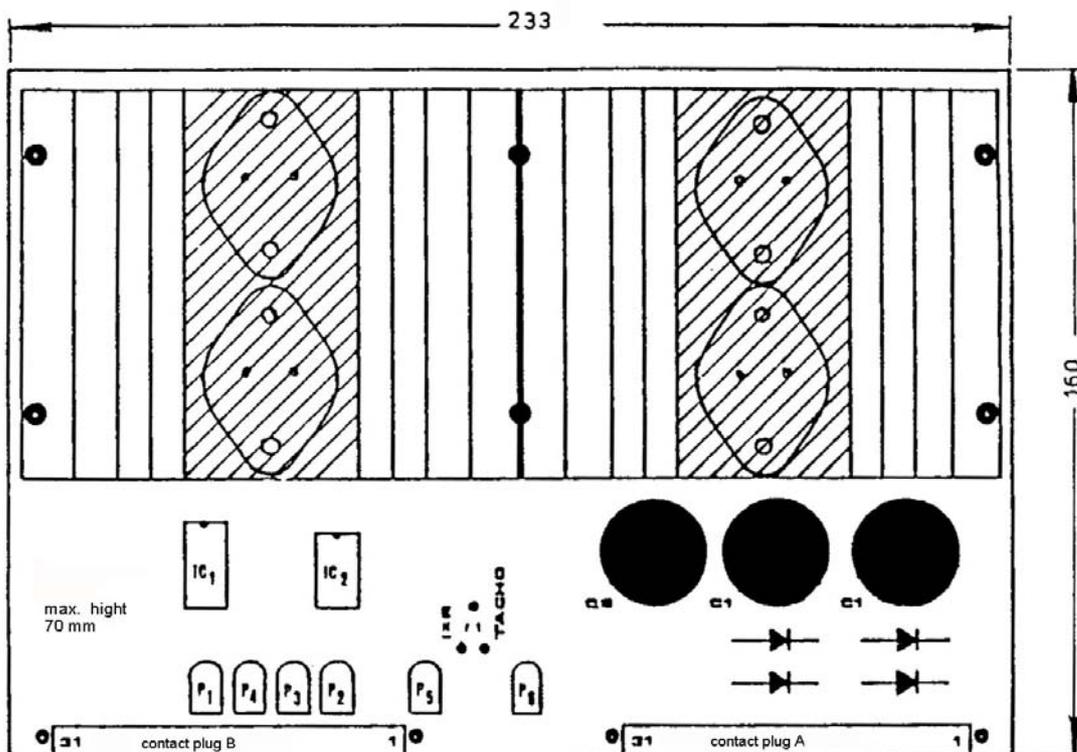
Initial operation

As a first step please connect the amplifier to the motor according to the wiring diagram hereunder. The motor and transformer cable should have a diameter of at least 1.5 mm² all the other conductors may have a smaller diameter. In case of long distances the cable should be drilled and screened in order to avoid interferences. Connect the screen to the amplifier's earth. Normally you can do without the sensing cables, however, if using extremely long motor cables and using the IxR mode these connections should be made directly to the motor. Make sure that the polarity is correct! There is no need for a tacho cable (pin 7 and 8) in case the amplifier is in mode IxR.

If the set value input is driven by an external controller and the set value cable is screened the screen should only be connected to earth at the controller. If the screen is earthed at both ends the advantages of the set value differential input are lost and, additionally, interference may arise.

First, put the "mode of operation" link into the position corresponding to the desired mode of operation. That is: For connection to a motor-tacho-combination put the link into the "tacho" position or, if the motor is not equipped with a tacho, put the link into the "IxR" position. The external potentiometer for the set value should be a 10 k Ω linear potentiometer. The other cables may be smaller. We recommend that you screen the tacho cables and preferably the set value input cables also. Normally you can do without the sensing cables (connector pins 10 + 11), however, if using extremely long motor cables and using the IxR mode these connections should be made directly to the motor. Make sure that the polarity is correct!

Covering the "Z" units it is recommended to remove the red test plug at the bottom end of the amplifier in order to put the time switch-off out of operation; Once all other functions are running at your satisfaction this circuit should be reconnected and adjusted.



Connections

Contact plug A:

1 - 4		+ UB (in case of DC power supply)
8 - 10	B	
13 - 15	C	30 V AC (secondary transformer connection)
17- 20		- UB (in case of DC power supply)
23		- sense (optional)
24 - 26		- motor
27		+ sense (optional)
28		+ tachogenerator
29		- tachogenerator
30 - 31		+ motor

Contact plug B:

4 B	B	
5 P	C	trimmer P 2, 10 kOhm, lab
6 E	D	
8 B	B	
9 P	C	trimmer P 3, 10 kOhm, I _{max}
10 E	D	
12 B	B	
13 P	C	trimmer P 4, 10 kOhm, U _{aus}
14 E	D	
16 B	B	
17 P	C	trimmer P 1, 500 kOhm, time
18 E	D	
20 cathode	B	LED green
21 anode	C	
23 cathode	B	LED yellow
24 anode	C	
26 cathode	B	LED red
27 anode	C	
29		output for additional signal, transistor with open collector
30 reset	B	reset when
31 reset	C	contact closed

ELECTRIC DIAGRAM

MAST 24/6Z 2E

