maxon motor

maxon motor control — Shunt Regulator DSR 70/30

Order Number 235811

Operating Instructions — August 2012 Edition

The Shunt Regulator DSR 70/30 is designed to limit the supply voltage of the amplifier. The adjustable threshold voltage allows a great voltage range to be covered.
The Shunt Regulator is an article from the supplementary product line of maxon motor control.

Putting it into operation is very easy; additional equipment is not required.

In normal operation the value of the supply voltage is appointed by the power supply.
4-quadrant amplifiers are able to feed back brake energy into the supply and therefore work like a generator. Thus a long braking process can cause the supply voltage to rise due to the fed back energy.
The task of the Shunt Regulator is to limit the voltage increase up to a permissible value and to transform the excess energy into heat.

Table of contents

The latest edition of these operating instructions may be downloaded from the internet as PDF-file under www.maxonmotor.com, category “Service”, subdirectory “Downloads”, Order Number 235811.

1 Safety Instructions

Skilled Personnel
Only experienced, skilled personnel should install and start the equipment.

Statutory regulations
The user must ensure that the amplifier and the components belonging to it are assembled and connected according to local statutory regulations.

Additional safety equipment
Any electronic apparatus is, in principle, not fail-safe. Machines and apparatus must therefore be fitted with independent monitoring and safety equipment. If the equipment breaks down, if it is operated incorrectly, if the control unit breaks down or if the cables break, etc., it must be ensured that the drive or the complete apparatus is kept in a safe operating mode.

Over-temperature
Once the over-temperature deactivation is enabled the supply voltage cannot be limited anymore. If the Shunt regulator fails it must be guaranteed that the drive or the entire system is led into a safe operating condition.

Repairs
Repairs may only be carried out by authorised personnel or the manufacturer. It is dangerous for the user to open the unit or carry out any repairs.

Danger
Ensure that no apparatus is connected to the electrical supply during installation. After switching on, do not touch any live parts!

Switched off status
If the supply voltage is turned off, the capacitors used in this device are still capable of conducting voltage.

Wiring procedure
All cable connections should only be connected or disconnected when the power is switches off.

Electrostatic sensitive device (ESD)

2 Performance Data

2.1 Electrical data

Supply voltage V_{cc} ..... 12...70 VDC
Threshold voltage V_{th} ..... 12...75 VDC
Max. continuous power loss P_{cont} without additional cooling[1] at T_U=25°C .....25 W
Intermittent power loss P_{max} .....see Diagram 1, Chapter 6
Max. current .....30 A
No-load current.....15 mA

2.2 Capacity

Capacity of the condensers.....8800 µF

2.3 Inputs

Operating voltage ..... 12...70 VDC
Set value of the threshold voltage .....configurable by DIP switch S1...6

2.4 Outputs

Output 1, Output 2..... 12...70 VDC

2.5 Display

LED red ..... over temperature
LED yellow..... Shunt Regulator active

2.6 Ambient temperature / humidity range

Operation temperature .....see Diagram 2, Chapter 7
Storage.....-40...+85°C
No condensation.....20...80%

2.7 Mechanical data

Weight ..... ca. 500 g
Dimensions (LxWxH).....see Dimension drawing, Chapter 9
Fastening.....flange for M4 screws

2.8 Connections

PCB-clamps..... 10 poles
Pitch.....5 mm
Suitable for wire cross section..... 0.14...1.5 mm^2 (AWG 26-16)

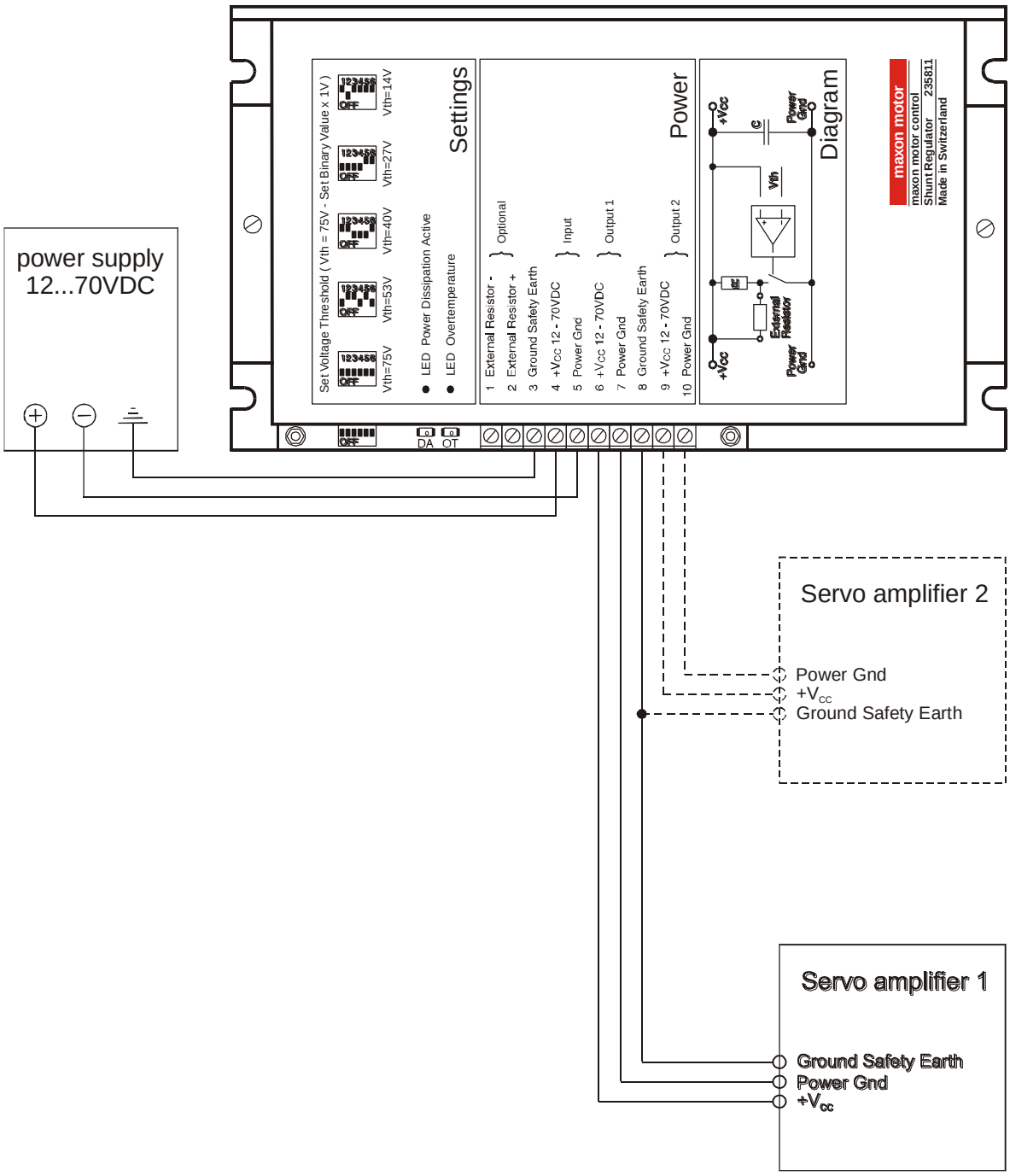
2.9 Options

External power resistor.....min. 5 Ω[2]

[1] The continuous power loss is determined by the thermal resistance of the housing (approx. 2.2 K/W). Therefore the power loss will increase if the housing is cooled by an additional heat sink or fan.

[2] The external resistance value (normally not necessary) should not be under 5 Ω. Thus it can be guaranteed that with the highest admissible voltage the permitted current is not exceeded by the MOSFET.

3 Minimum External Wiring



Important:
There must be no connection between the terminals “External Resistor –“ (terminal 1) and "Power GND" (terminal 5, 7 or 10)!

Figure 1: Minimal External Wiring

4 Operating Instructions

4.1 Power supply

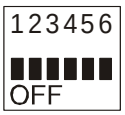
The connection of the Shunt Regulator to the supply voltage must be in parallel to the servo amplifier. Therefore unwanted increases of the supply voltage can be detected and compensated. The operating voltage of the Shunt Regulator and the servo amplifier must be set between 12 VDC to 70 VDC. Otherwise there are no further demands made against the supply.

4.2 Adjust the threshold voltage V_{th}

To adjust the threshold voltage use the DIP switches S1...6. The value is binary coded.
The actual value of the threshold voltage V_{th} can be calculated as follows:

$$V_{th} = 75V - \text{adjusted binary code} \cdot 1V$$

Switch	Binary code	Value
1	2^0	1
2	2^1	2
3	2^2	4
4	2^3	8
5	2^4	16
6	2^5	32



To get the decimal value of the set binary code add up the values of all DIP switches that are in „ON“ position.

Examples:
The following table is to serve as an assistance. (it is not complete)

Switch	1	2	3	4	5	6	
Valency	1	2	4	8	16	32	
Switch setting							Calculation of V_{th}
	0	0	0	0	0	0	75V - (0) • 1V = 75V
	0	1	1	0	1	0	75V - (2+4+16) • 1V = 53V
	1	1	0	0	0	1	75V - (1+2+32) • 1V = 40V
	0	0	0	0	1	1	75V - (16+32) • 1V = 27V
	1	0	1	1	1	1	75V - (1+4+8+16+32) • 1V = 14V

The set threshold value can be checked by measuring the voltage between the two measuring points, indicated with VM. Multiply this value by 10 and you will get the actual threshold voltage (V_{th} = VM · 10).

Important:
The following conditions must be absolutely considered when adjusting the threshold voltage:

- ⇨ The adjusted value must be higher than the nominal voltage of the used power supply unit in use.
- ⇨ The adjusted value has to be lower than the over-voltage threshold of the amplifier in use.

5 Operating Status

5.1 Shunt Regulator active

The yellow LED (indicated with DA; **D**issipation **A**ctive), shows if the Shunt Regulator is activated (Electrical energy will be converted into heat).

Note:
Check the position of the DIP switches if the yellow LED is shining continuously.

5.2 Over temperature

The red LED (indicated with OT; **O**ver **T**emperature), shows the over temperature deactivation. The LED shines if the case temperature exceeds approx. 75°C.

Important:
- ⇨ Once the over temperature deactivation is enabled the supply voltage cannot be limited anymore. If the Shunt Regulator fails it must be guaranteed that the drive or the entire system is led into a safe operating condition.
- ⇨ The over temperature deactivation will only be enabled if the Shunt Regulator is operated out of the specified range!
- ⇨ If the Shunt Regulator will be operated permanently outside of the specified range and for any reason the overtemperature shutdown does not work, so a built-in temperature protection ensures that the current is switched off. In this case, the Shunt Regulator has to be returned for repair to maxon.

5.3 Shunt Regulator inactive

None of the two LED's will light up, if there is no electrical energy converted into heat.

6 Diagram 1: Maximal performance in dependency of the time

The following diagram shows how long a given power value can be dissipated by the shunt regulator.
The values in the diagram are valid for a starting temperature of 25°C of the shunt regulator. The duration of power dissipation is reduced if the shunt regulator has disspated power before applying a power pulse.

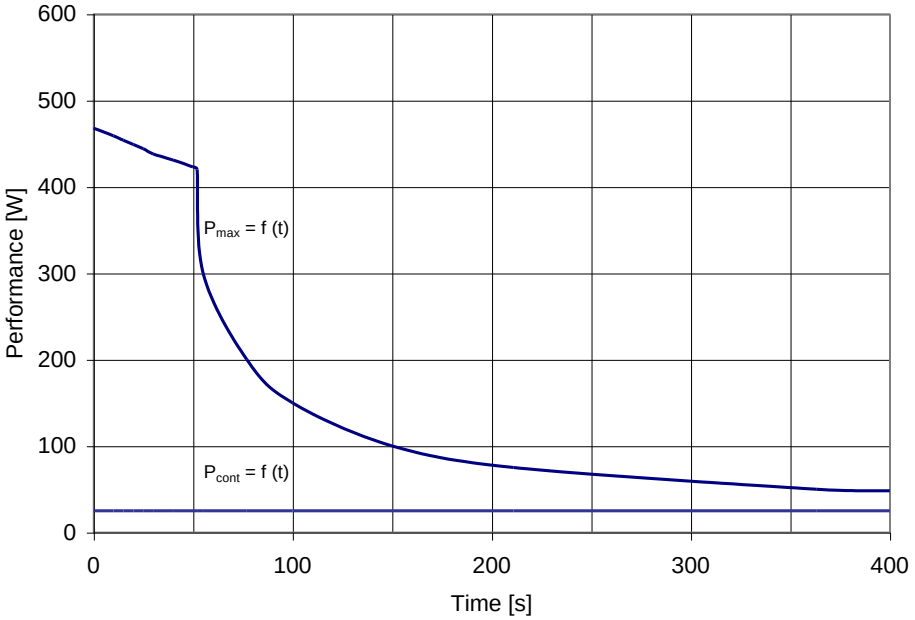


Diagram 1: Maximal performance depending on time

7 Diagram 2: Maximal power dissipation depending on temperature

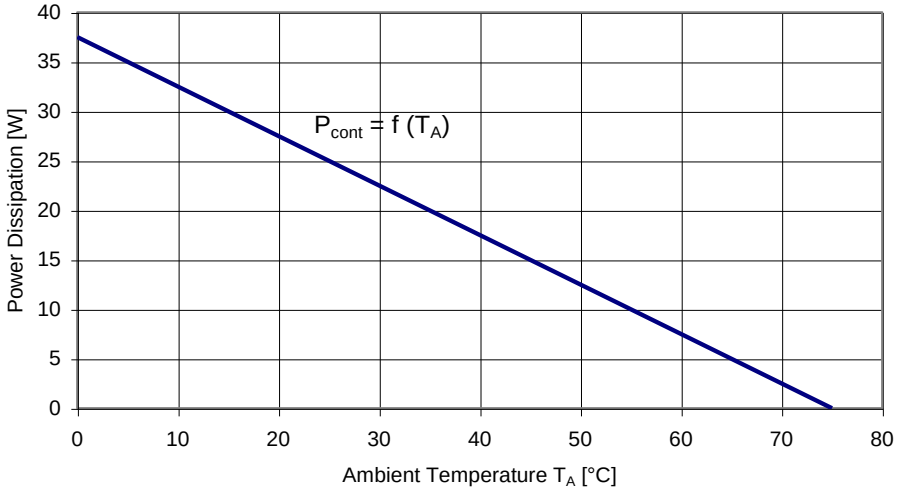


Diagram 2: Maximal Power Dissipation depending on temperature

8 Block Diagram

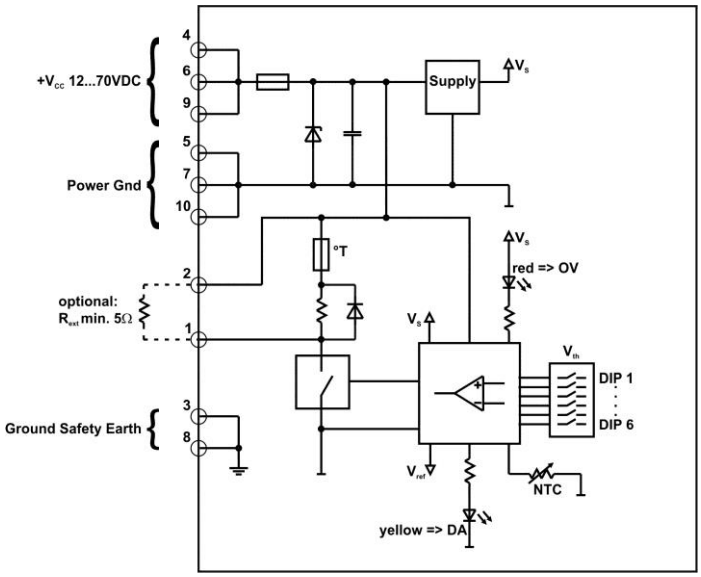


Figure 2: Block Diagram

9 Dimension Drawing

Dimensions in [mm]

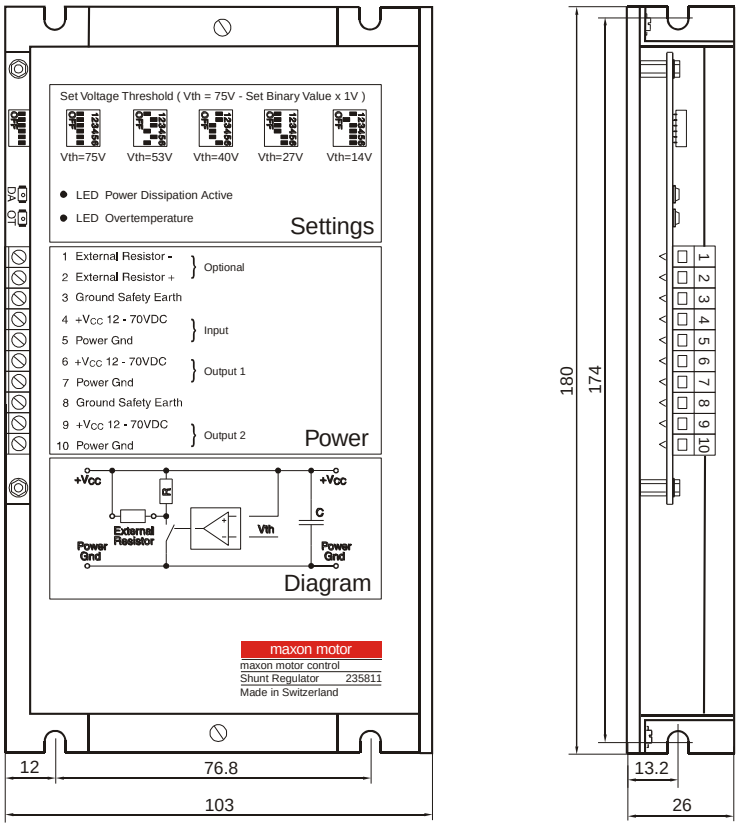


Figure 3: Dimension Drawing