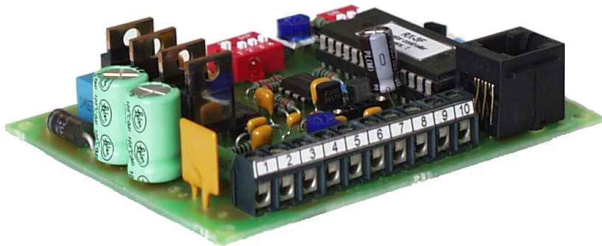# EM-101 DC-MOTOR CONTROLLER 24V 3A 4-QUAD

FEATURES:

- **4-quadrant**
- **Protection with self recovering fuse**
- **Settable current limit**
- **Settable acceleration/brake ramp**
- **Load compensation**
- **Special braking options**
- **Supply voltage compensation**
- **Continuous / 2-step speed controlling**
- **Positive driving logic**
- **Mounting with DIN-rail or screws**
- **High efficiency**

EM-101 is designed for modern automation systems. Controls can be performed easily with relay- or open collector-outputs. Analog controls work with positive voltage. Usable motor can be permanent magnet motor with brushes in power range of 5 ... 70 W. Due to the advanced pulse control (PWM) the unit operates with high efficiency, low temperature losses and provides a high starting torque.
Loading of the motor can be compensated with inbuilt RI-adjustment. The current, or in other words, the torque of the motor can be controlled with DIP-switch. The operation of the current limit is indicated with a red led.
There are a variety of braking options available in this device. For most effective braking "reverse braking"-mode can be used. In this mode reversed driving is used for braking, which effects extremely fast function. Additionally the card utilises short circuit braking which short circuits the motor circuit during the braking.
EM-101 also has inbuild settable time acceleration- and braking ramps.

TECHNICAL DATA EM-101

Supply voltage	20-34Vdc
Over voltage protection	36V
Idle current	app. 50mA
Control current	3A, mom. 4A
Control power	70W
Current limit	0,2...4.2A
Voltage loss	1V when Im=3A
Fuse	3A, self recovery
Ramp	0,5s...5s
Control voltage	0-5V, 0-10V
Control pot.meter	2...10kohm
Digital control	"on" when Uin 4-30V
	"off" when Uin=0-1V or NC
Dimensions	89x73x26
Weight	app. 70g

EM-101 BLOCK DIAGRAM
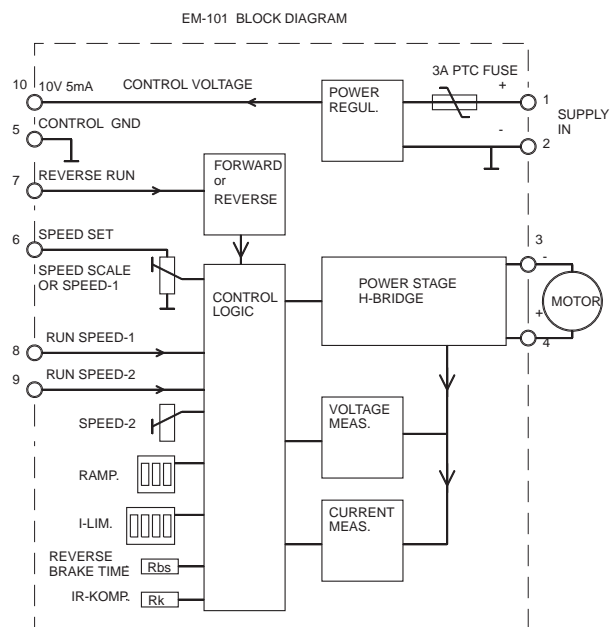
EM-101 INSTRUCTIONS

Supply voltage must be DC with ripple less than 20%. Supply voltage 20...34V (26...32V recommended). In the beginning set all trimmers in the middle position.

NOTE! When reversed braking is used the controller will take a very high current peak. Capacitor for the power supply should be at least 4700uF at 1A.


```
 1   2   3   4
 +   -   -   +
```
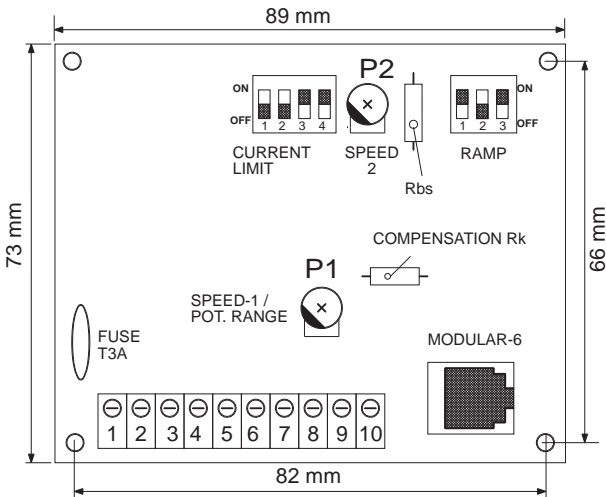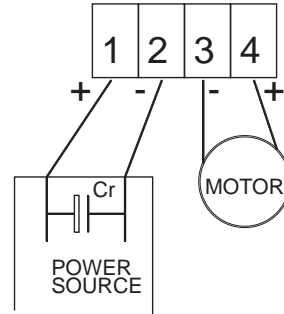
CONNECTORS:

1. Supply voltage 20-34Vdc
2. Supply voltage GND 0V
3. Motor (-)
4. Motor (+)
5. Control GND
6. Controlling voltage
7. Reverse/driving direction
8. Run speed1 (potentiometer)
9. Run speed2
10. Helping voltage for potentiometer (10V, 5mA)

MODULAR-6 CONNECTOR

Run speed2
Run speed1 (potentiometer)
Helping voltage for potentiometer (10V, 5mA)
Reverse start/driving direction
Controling voltage
Control GND OV
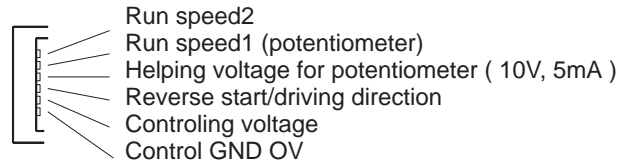
THE CURRENT LIMIT

Limitation of the current (torque)
Controlled with DIP-switches

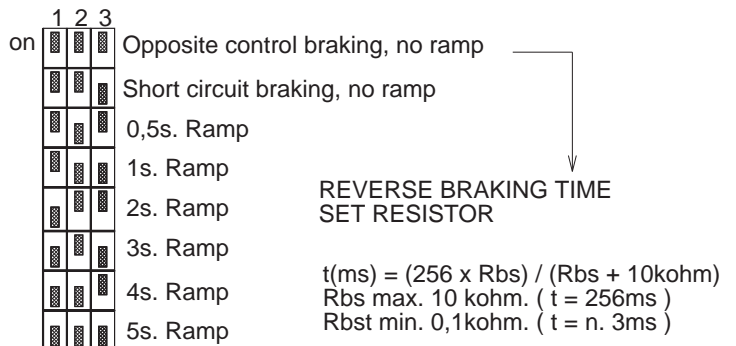|	
0A	2.3A
0.2A	2.6A
0.5A	2.9A
0.9A	3.1A
1.2A	3.4A
1.5A	3.7A
1.8A	4.0A
2.0A	4.2A

THE COMPENSATION

With compensation you can compensate the load effect to motor rpm. This feature increases controlling if current increases in the motor circuit. The need for compensation depends on application and motor. Typically small motors require more compensation than big ones. Over compensation occurs as twiching of the motor.

Example:
The smaller resistor the bigger compensation.
Typical settings: motor < 10W Rk= 50...500ohm
motor > 10W Rk= 200...2000ohm

THE RAMP & BRAKING

In the map below the first two ramp settings are special braking options. The first position is so called reverse braking; the motor is controlled in opposite direction. Reverse braking time is set with resistor (rbs). The second position is so called short circuit braking where the motor circuit is short circuited during the braking. Other positions are for normal acceleration and braking settings which are set with DIP-switches.

on 1 2 3
Opposite control braking, no ramp
Short circuit braking, no ramp
0,5s. Ramp
1s. Ramp
2s. Ramp
3s. Ramp
4s. Ramp
5s. Ramp

REVERSE BRAKING TIME
SET RESISTOR

$t(ms) = (256 \times Rbs) / (Rbs + 10kohm)$
Rbs max. 10 kohm. (t = 256ms)
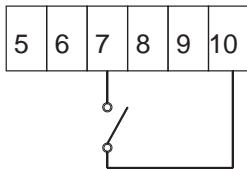Rbst min. 0,1kohm. (t = n. 3ms)

THE CONTROLLING

The max value of controlling voltage ranges 5...10V. The full range is thus maintained on 0...5V. The range can be set with trim P1. When driving with double speed controlling (run / set) the driving speed is set with trim P1 and the setting speed with trim P2.
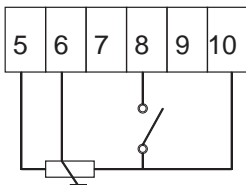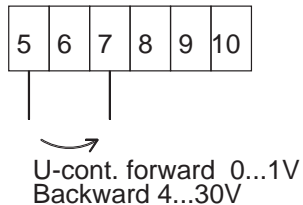

P1 100% range 0-10V (0...100%)
    50%
    0%   range 0-5V (0...100%)

P2 50%
    0%   100%
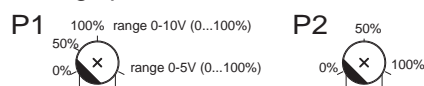
EM-101 CONNECTION EXAMPLES

Direction change
/reverse drive.

```
 5   6   7   8   9  10
```

Direction change/reverse drive
with voltage.

```
 5   6   7   8   9  10
```

U-cont. forward 0...1V
Backward 4...30V

Speed adjustment with pot.meter.
Range scaling with trim P1.

```
 5   6   7   8   9  10
```

Speed control with pot.meter,
activate with run speed1-
switch.

```
 5   6   7   8   9  10
```

Speed control with voltage
signal.
Range scale with trim P1.

```
 5   6   7   8   9  10
```

U-cont. 0-5V --> 0-10V
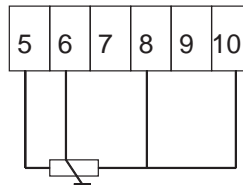
Double speed control.
Speeds set with trimmers
P2 (s2, pin9) and P1
(s1,pin6)
Activate with switches.

```
 5   6   7   8   9  10
```