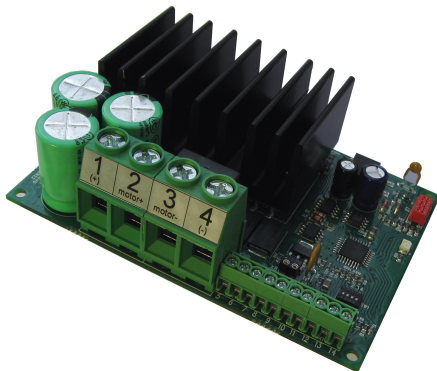# EM-243C DC-MOTOR CONTROLLER 12-48V 50A


FEATURES (notice Prog. and PCB versions)

- **small size**
- **high current output**
- **current limit**
- **zero current limit**
- **speed setting**
- **flexible control inputs**
- **impulse / continuous mode**
- **rail base mountable**
- **digital parameter setting**
- **C ver. card compatible with A version card**
- **C firmware can be loaded A-ver. card**
- **C ver. new features**
   - **+ freewheel options parameter (param 19)**
   - **+ 2 or 16kHz pwm freq.select (param. 20)**
   - **+ current limit analog input (param 6&7)**
   - **+ speed+dir operating mode (param. 5)**
   - **+ Fan and Brake available in board 243C v.2**
   - **+ Extend operating voltage in board 243C v.2**

EM-243C is a full bridge DC-motor starter. It is designed to work with DC-motor in applications where some special functions are needed. Starter has adjustable acceleration and deceleration ramps, which make possible the smooth starts and stops. Adjustable current limit protects motor against overcurrent and it can also be used as an end-stop. This device has also two settable speeds, which are usefull in positioning applications. Control inputs FW and BW start the forward and backward run. STOP is for the motor shut-down but there are also available individual limit inputs for FW and BW directions. SPEED-2 input activates preset speed-2, but it can also be used as input for analog speed control signal 0-5V. FAULT terminal has at the same time input and output function, the pin is normally high, but is pulled down in overheat and conditionally also in current trip situation. If FAULT-line is pulled down externally it will cause a stop and prevent the new start. For example, it is possible to link fault pins of several units together and achieve a syncronous stop.
There are 2 selectable control modes, contionuous and impulse. In continuous mode the motor runs as long as the control is active. In impulse mode a short comand starts the motor, and only a new impulse will change the status. The card has selectable input logics. Inputs are divided in two groups, control and limit -inputs. Groups can be individually set for NPN or PNP logic. The parameters are set with EM-236 interface unit. Operation of the controller and some of its functional values can also be monitored with EM-236 interface unit.
In C-version program is possible to select 16kHz pwm frequency (= silent) but notice that current output capability is lower with 16kHz.

TECHNICAL DATA

Supply voltage nominal 12-48V, limits 10-58V
Start up voltage 9V, shutdown voltage 8V
Idle current typ 15mA
Motor current max. with 2kHz pwm
100% pwm 50A , 20-99pwm% 35A and peak 100A (5s)
Motor current max. with 16kHz pwm
100% pwm 40A , 20-99pwm% 20A and peak 60A (5s)
Current limit adjustable 1-100A
NOTICE ! during start ramp the current limit is 50% boosted
Overheat limit 100℃
Start and stop ramp adjustable 0-5s
PWM frequency 2kHz or 16kHz
Speed input scale (speed-2) 0-5 or 0-10V= 0-100% pwm
I-limit input scale (stop) 0-4V = 0-100A
Input control logic: high =4-30V, low=0-1V
Control input impedances typ. 10kohm
Control input response time typ 5ms.
Fault out. NPN open coll. max. 40V / 1A
Fault in actives Uin < 1V (NPN)
Fan-output switch on 55℃, off 50℃ (only pcb Cv.2 of later)
Fan-output NPN max. 40V 2A
Break load output Max. 60V 5A
Vout lim output max 25V 15mA
Motor and supply connectors 2.5mm
Control connectors 1mm
Dimensions 107x72x40mm
Dimensions in DIN-rail base 110x80x55mm
CE-tested for industrial environment (EMC)
Operating ambient temp (Ta) -40...60℃
Weight 190g

EM-243C PCB v.4 BLOCK DIAGRAM

ELECTROMEN Oy
www.electromen.com
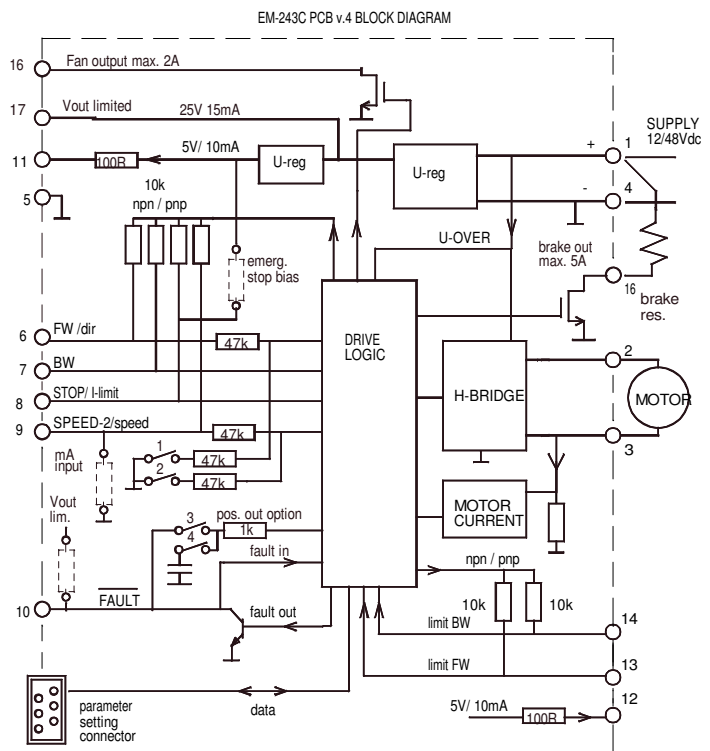
CONNECTIONS

Supply voltage recomendation is 12-48VDC
and ripple should be less than 30% at full load.
Supply voltage limit is 58Vdc
CAUTION ! Wrong polarity can damage the unit.
CAUTION ! Unit doesn't have an internal fuse, so
an external fuse should be added if fuse required.

MONITORABLE VALUES

1/5 Motor current 0-100A (0-100)
2/5 PWM-level-% 0-100% (0-100)
3/5 hour counter (max.65535h)
4/5 start counter (max.65535)
5/5 carry counter for start counter

FAULT-LED signal codes

1. power on   one blink
2. current on limit   led is lit
3. current trip   fast blinking...
4. zero-cur trip   long blink- short pause...
5. overvoltage   4 x blink -pause...
6. overheat   short blink- long pause...
7. timeout   3 x blink + long blink...
8. fault input   2 x short + 1x long blink...

ADJUSTMENT AND SETTINGS (prog. EM-243C v.1.4)

Settings can be done with 3 interface device options.
1. EM-236 interface unit
2. EM-268 or 328 interface units with EmenTool Lite PC-software
3. EM-326 interface unit with EmenTool App smartphone
   application. If using App you can set device-specific
   access code, which protects device against
   unauthorized smartphone connections.
   The access code can be reset with simultaneous
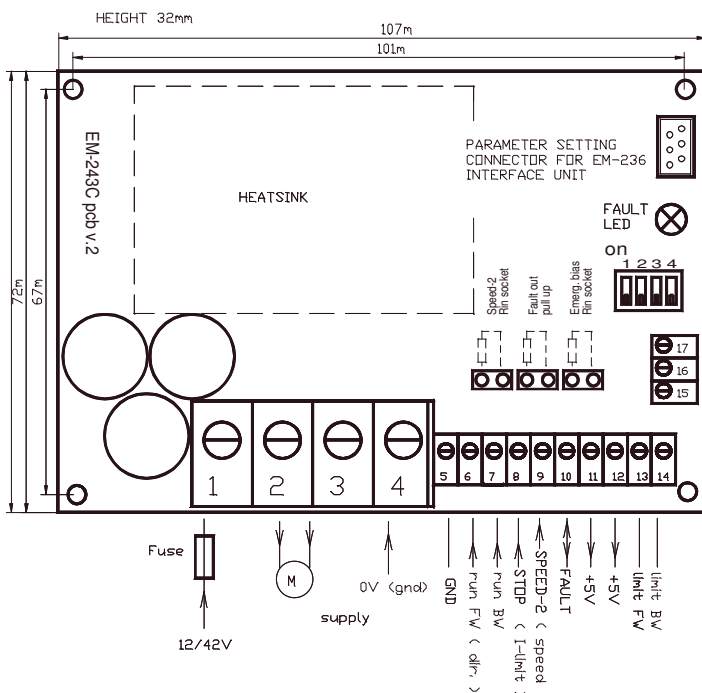   FW and BW comand, when power switch on.

DIP SWITCHES

A-version has a dip swithes, When switch are
in OFF position the card will be compatible with
earlier version.

Dip-1 ON pos. damping FWD input (pin 6)
Dip-2 ON pos. damping Speed-2 input with 2 (pin9)
Dip-3 position output option, keep OFF
Dip-4 position output option, keep OFF

SETTABLE PARAMETERS
prog. 243C v1.4 (defaults in brackets)

1 command mode: continuous = 0, impulse= 1 (0)
2 start condition combinations: 0-3   (1)
 0= start both direction after I-trip and Stop
 1= start only opposite direction after I-trip
 2= start only opposite direction after Stop
 3= start only opposite direction after I- and Stop
3 input logic combinations 0-7 PNP/NPN (0)
 PNP control with positive signal and input has pull down res.
 NPN control with negative signal and input has pull up res.
 N.C. = input resistor as above, but control signal logic is inverted
 0= cont. PNP, limits PNP   4=cont. PNP, limits PNP N.C.
 1= cont. NPN, limits PNP   5=cont. NPN, limits PNP N.C.
 2= cont. PNP, limits NPN N.C.   6=cont. PNP, limits NPN
 3= cont. NPN, limits NPN N.C.   7=cont. NPN, limits NPN
4 running speed-1: 0-100% / 0-100 (100)
5 running speed-2: 0-100% / 0-100 (50)
 0= "speed 2-input" is used as analog 0-5V speed control input.
 1= as above but FW direction is automatically "on" and
    FW input works as direction change input.
6 current limit FW: 1-100A / 1-100 (10)
7 current limit REV: 1-100A / 1-100 (10)
  NOTICE ! If both 6 & 7 is set = 0, then I-limit input is enabled,
  and works as current limit adjust input.
8 Trip combinations: 0-3 (1)
 0= no I-trip, no zero-current-trip
 1= only I-trip
 2= only zero-current-trip
 3= both I-trip and zero-current-trip
9 I-trip delay: 0-255ms / 0-255 (20)
10 Fault output combinations: 0-3 (1)
 0= I-trip and zero current won´t cause fault output signal
 1= only I-trip causes fault output signal
 2= only zero current causes fault output signal
 3= both I-trip and zero current causes fault output signal.
 4= overcurrent indication = pull down
 5= "run" indication = pull down when motor run

11 overvoltage limit: 15-60V / 15-60 (55)
 Overvoltage can be caused by load driving the motor or
 when braking the speed down but supply can not accept
 the current back from driver. Exceeding the limit will cause
 the power stage set to free-wheel state.
 With a direct battery supply the brake current is charging the
 battery and the voltage will not normally rice.
12 load compensation: 0-255 / 0-255 (0)
 Load compensation (RxI) improves low speed and start
 torgue, but too high compensation achieve unstable running.
 Run motor at low speed (30%) Increace compensation
 with small steps until motor start behaviour unstable,
 then decrease value about 10%
13 timeout: 0-255s. / 0-255 (0=not in use) (0)
14 reset for start and hour-counter 0/1 (0)
 selecting 1 and push save = reset counters
15 start ramp: 0-5s / 0-500 (100)
16 stop ramp: 0-5s / 0-500 (100)
17 start kick 0-200ms / 0-200 (0)
 gives short 0-200ms full drive pulse for start
18- I-trip auto reversing 0-5s / 0-500 (0)
 Change automatically run direction when I-trip occurs
 the revesing time will select with this parameter
19- Freewheel options 0-5 (0)
 0= freewheeling when overvoltage
 1= freewheeling when overv. or stopped
 2= freewheeling when overv. or during stop ramp
 3= freewheeling when overv. or when stopped during stop ramp
 4= freewheeling when stopped
 5 =freewheeling disabled
20- Pwm frequency 1=2kHz / 2=16kHz (1)
21- Pin-16 (brake load) options 0-2 (0)
  0= regen. braking = switch on when overvoltage exceed
  1= running indication = switch on pin-16 when motor run
  2 =as above but also stop input switch on pin-16

HEIGHT 32mm
107m
101m

EM-243C pcb v.2

HEATSINK

PARAMETER SETTING
CONNECTOR FOR EM-236
INTERFACE UNIT

FAULT LED

on
1 2 3 4

Speed-2 Rin socket
Fault out pull up
Emerg. bias Rin socket

5 6 7 8 9 10 11 12 13 14

17 Vout 24V
16 brake load out
15 Fan output

72m 67m

Fuse

12/42V

M
supply

0V (gnd)

GND
run FW (dir.)
run BW
STOP (I-limit)
SPEED-2 (speed)
FAULT
+5V
+5V
limit FW
limit BW

Optional resistor :
1.Speed-2 input 250ohm resistor if want to
  use 0-20mA speed set signal
2. Fault output 2.2kohm res for pull up
   if want to connect for PNP input of PLC
3. Emerg. bias resistor for stop input
   for stop input line monitoring in safety
   switch installation (need special software)

The input functions in brackets
will be activate with parameter.
speed input - param 5=0
I -lim input - param 6&7= 0
speed input +dir. - param 5= 1

243cbr14 18.09.17