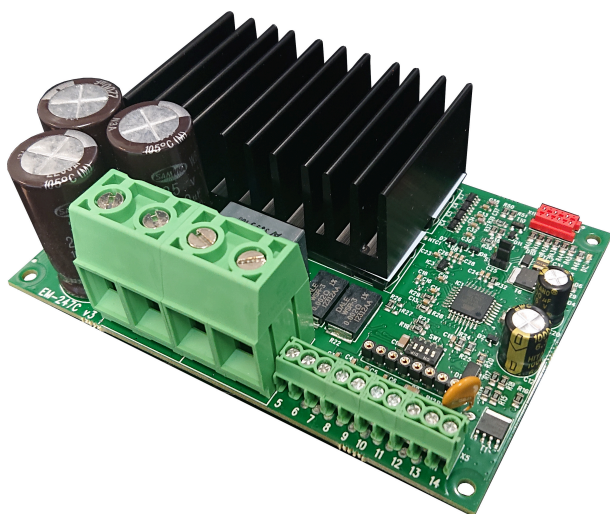# EM-247C-JS1 DC-MOTOR CONTROLLER 12-36V 70A
For JOYSTICK and THUMB THROTTLE

FEATURES

- JS1 is specially for joystick and thumb throttle
- three point or two point calibration
- compact size
- recom. motor max. 700W@12V and 1kW@36V
- high current output
- current limit
- overvoltage brake
- own speed ranges for FW and REV.
- rail base mountable
- digital parameter setting
- JS1 program can be updated EM-247C board
- Prog. 1.3 direction change input added
- Prog. 1.4 stop input, brake output and
         fan output ottions added
- Prog 1.6 wire breakage detection added
- Prog 1.8 thumb throttle kalibration improved
         added option 2 to par 2

EM-247C-JS1 is a full bridge DC-motor starter. It is designed for joystick controlled DC-motor applications. The driver has adjustable acceleration and deceleration ramps, which enable the smooth starts and stops. Adjustable current limit protects the motor against overcurrent and it can also be used as an end-stop. This device has also two settable speeds, separate speed ranges for forward and reverse direction. Control input is specially designed for joystick control. The joystick range calibration is done automatically, when calibration function is activated. Calibration detects forward, reverse and midpoint positions. FAULT terminal has simultaneously both input and output functions, 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 it from starting again. For example, it is possible to link fault pins of several units together and achieve a syncronous stop.
There are also special settings as start-kick which can be used in case the device is in danger of being jammed.
Limit input can be individually set for NPN or PNP logic.
The parameter's settings can be done with various EM- interface units. Operation of the controller and some of its functional values can also be monitored with interface units.

TECHNICAL DATA

Supply voltage nominal 12-36V, limits 10-45V
Start up voltage 9V, shutdown voltage 8V
Idle current typ 15mA
Motor current max. with 2kHz pwm
100% pwm 75A ,
20-99pwm% 45A and peak 100A (5s)
Motor current max. with 16kHz pwm
100% pwm 60A ,
20-99pwm% 35A and peak 70A (5s)
Current limit adjustable 1-100A
  Notice! current limit is boosted 50% at start
Overheat limit 100°C
Start and stop ramp adjustable 0-5s
PWM frequency 2kHz or 16kHz (selectable)
joystick input scale 0-5 or 0-10V (if dip 1 is ON)
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. 50V / 1A
Fault in actives Uin < 1V (NPN)
Brake output NPN max. 7A 60V
Fan output NPN max. 2A 50V
Motor and supply connectors 4mm
Control connectors 1mm
Dimensions 107x73x40mm
Dimensions in DIN-rail base 110x80x55mm
CE-tested for industrial environment (EMC)
Operating ambient temp (Ta) -40...60°C
Weight 200g

EM-247C PCB V.3 BLOCK DIAGRAM

ELECTROMEN Oy   www.electromen.com
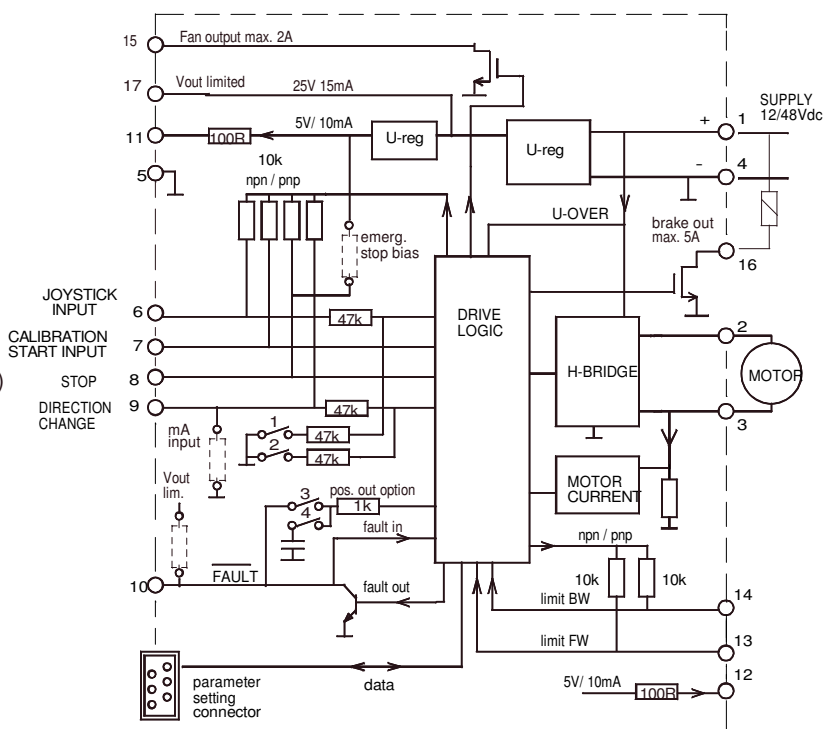
CONNECTIONS

Supply voltage recomendation is 12-36VDC
and ripple should be less than 30% at full load.
Supply voltage limit is 45Vdc
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

1/6 Motor current 0-20A (0-200)
2/6 PWM-level-% 0-100% (0-100)
3/6 hour counter (max.65535h)
4/6 start counter (max.65535)
5/6 carry counter for start counter
6/6 joystick position 0-1024

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...
9. wiring fault   2 x short + pause...

Special codes for calibration mode
solid light = calibration can be done
blink light = calibration is done

ADJUST AND SETTINGS (prog ver. EM-247C-JS1 v1.7)

Adjusting and parameter setting of eg.
current limit value, ramp times and speed-2
value can be done with various EM-interface units
EM-236 is basic parameter setting device.
EM- 328 is USB to serial converters,
which makes it possible to set parameters also
with computer where is installed EmenTool Lite
program.

DIP SWITCHES

Dip-1 Damping pin 6 if set ON (joystick input)
Dip-2 Damping pin 9 if set ON
Dip-3 NOT in use keep always OFF
Dip-4 NOT in use keep always OFF

SETTABLE PARAMETERS 21pcs. prog. v1.8 (defaults in brackets)

1- not in use
2- stop input (pin 8) and I-trip re-start options 0-2 (0)
   0= new start is possible only opposite direction
     1= stop input work as a pause and I-trip like above
     2= start both direction, speed setting 0 works as a reset
3- input logic for limit inputs 1 or 4 PNP/NPN (1)
   1= limit inputs PNP   2= limit input NPN
   3= limit inputs PNP N.C. 4=limits inputs NPN N.C
     (N.C.= normally closed = open circuits stops.)
4- max. speed FW. 0-100% / 0-100 (100)
5- max. speed REV. 0-100% / 0-100 (100)
6- current limit FW. 1-100A / 1-100 (30)
7- current limit REV. 1-100A / 1-100 (30)
8- current trip 0= disabled, 1= enabled : (1)
9- not in use
10- Fault output combinations: 0-3 (1)
   0= overtemp, current trip. overvoltage
   1= as above + calibration indication
   2= current limit indication
   3= "run" indication (pull down when motor drives)
     NOTICE ! fault input is disabled in setting 2 and 3
11- overvoltage limit: 15-60V / 15-60 (45) ! DO NOT SET OVER 45
   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 rise.
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%) Increase compensation
   with small steps until motor start behaviour becomes 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 (50)
16- stop ramp: 0-5s / 0-500 (20)
17- start-kick 0-200ms / 0-200 (0)
   This gives full drive at start and I-lim is 30A
   The start kick length is 0-200ms.
18- Dead band width 0-50% / 0-50 (10)
19- Freewheel options 0-3 (0)
   0= no freewheel
   1= freewheel when stopped
   2= freewheel during stop ramp
   3= freewheel during stop ramp and if stopped
20- Pwm frequency 1=2kHz / 2=16kHz (1)
21- Brake output options (pin 16)
   0= overvoltage activates output (brake resistor use)
   1= output activates when motor run (magn. brake use)
   2= output activates when motor run and with stop input
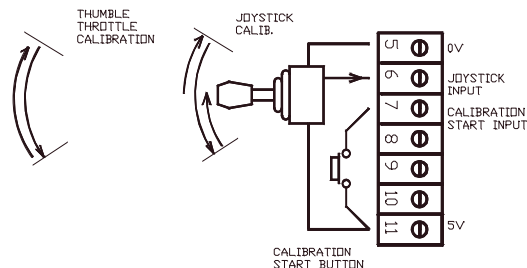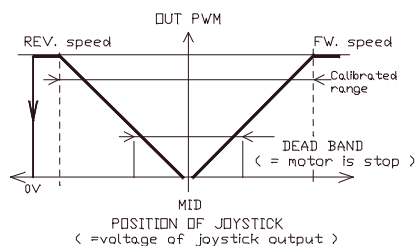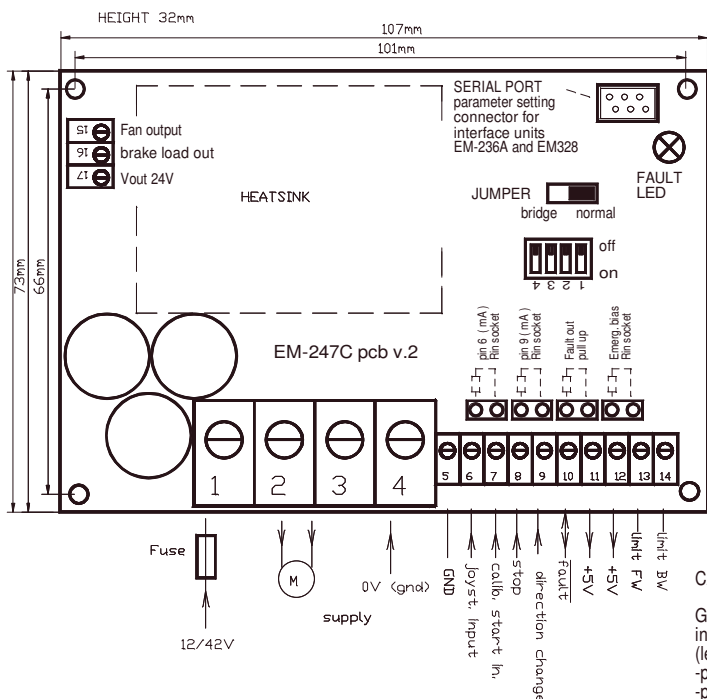
CALIBRATION

Give about 3s. control signal to CALIB
input. when Fault-led of device will be lit:
(led is active only if parameter 10 is set to 1)
-push joystick full forward, then
-pull joystick full reverse, then
-release joystick to mid position, then
-wait until led starts to blink = calibration done

In thumb throttle option, first full and the release
to idle (stop) position and wait until led starts
blinks.

NOTICE ! calibration above defines joystick
full fw, full rev. and mid point positions.
But the max. speed can be set with
parameters 4 and 5

NOTICE 2 ! Firmware version 1.6 and later
has added joystick wire breakage detection
This function watches pin 6 voltage, and if
it goes to 0V or open circuit, then driver will
shutdown motor. (fault ind. with 2 blink + pause)