

## GENERAL

EM-A24 is a DC-motor driver module, it's based on EM-241 driver card. This module is PCB mountable and it needs a very small pcb area, because it will be installed vertically. This module has effective H-bridge power stage. The power stage has low EMC emission and it can meet EMC directives for industry and household environments without external components. This big benefit when integrated this module to the "motherboard". Module has two pwm frequency option 2kHz offer more current, and 16kHz is noiseless.

There is available various firmware version for this module This version EM-A24C-JS1 is specially for joystick use, and included for example three point calibration. Firmware includes also many basic features for dc motor driver, like current limits, stop and start ramps, and load compensation. The settings of device can be done digitally with parameters. Firmware update can be done also with Ementool interface unit.

## INSTALLATION

Supply voltage must be filtered DC of 10-35V, and ripple should be less than 30% at full load.

### NOTIFICATIONS !

- Wrong polarity can be damage the unit.
- Module doesn't have an internal fuse, so an external fuse should be added if a fuse is required.
- Module needs two external capacitors
- 1000uF 35V near to supply pins
- 470uF 6.3V for 5V output
- If use 5.5V out for sensor voltage notice that max load is 10mA

## ADJUSTMENT AND SETTINGS

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 the basic parameter setting device. EM-268 and EM- 328 are USB-serial converters, which makes possible to set parameters also with computer where is installed EmenTool Lite program. EM-326 is Bluetooth -dongle which can be used in smart devices with the EmenTool App.

### PARAMETERS for prog. ver. EM-A24C-JS1 v1.0 ( defaults in brackets )

- 1- not in use
- 2- not in use
- 3- input logic for limit inputs 1 or 2 PNP/NPN ( 1 )  
1= limit inputs PNP 2= limit input NPN
- 4- max. speed FW. 0-100% / 0-100 ( 100 )
- 5- max. speed REV. 0-100% / 0-100 ( 100 )
- 6- current limit FW. 0.1-20A / 1-200 ( 30 )
- 7- current limit REV. 0.1-20A / 1-200 ( 30 )
- 8- current trip 0= disabled, 1= enabled : ( 1 )
- 9- not in use
- 10- Fault output combinations: 0-2 ( 1 )  
0= overtemp, current trip, overvoltage  
1= as above + calibration indication  
2= current limit indication  
NOTICE ! fault input is disabled in setting 2
- 11- overvoltage limit: 15-40V / 15-40 ( 35 )  
Overvoltage can be caused by load driving the motor or when braking the speed down but supply cannot 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.  
There is also 40V fixed dynamic brake point = motor pole shorted
- 12- load compensation: 0-255 / 0-255 ( 0 )  
Load compensation ( Rx1 ) improves low speed and start torque, but too high compensation will 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 wide 0-50% / 0-50 ( 5 )
- 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

### 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... |

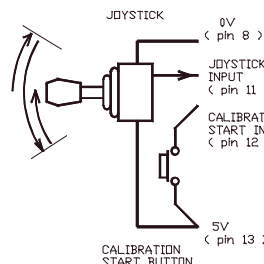
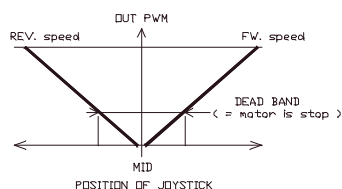
### MONITORABLE VALUES

- |                                     |
|-------------------------------------|
| 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        |

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

### TECHNICAL DATA ( prog ver. EM-A24C-JS1 v1.0 )

Supply voltage cont. max. 10-35V  
Overvoltage limit adjustable 15-40V ( connect motor to freewheel )  
Overvoltage dynamic brake 40V ( shorting motor poles )  
Start up voltage 5V, shutdown voltage 5V  
Continuous current output when ambient temp. is < 50°C  
12A at 100% speed / 7A at 5-99% speed ( pwm freq. 2kHz )  
8A at 100% speed / 4A at 5-99% speed ( pwm freq 16kHz )  
Peak current ( 5s. ) 30A at 2kHz / 25A at 16kHz  
Current limit adjustable 0.1-25A ( at start max. 30A )  
Overheat limit 100°C  
Start and stop ramp adjustable 0-5s  
PWM frequency 2kHz / 16kHz ( selectable )  
Joystick input scale 0-5V  
Input control logic: high =4-30V, low=0-1V  
Control input impedances typ. 47kohm  
Limit FW / BW input imped. typ 10kohm  
Control input response time typ 5ms.  
Fault out. NPN open coll. max 30V / 50mA  
Fault in active Uin < 1V ( NPN )  
Motor and supply connectors 2.5mm  
Control connectors 1mm  
Dimensions 42x72x25mm  
Dimensions in DIN-rail base 45x80x45mm  
CE-tested for industrial environment ( emc )  
Operating temp ( Ta ) -40...60°C  
Weight 75g



### JOYSTICK CALIBRATION

Give about 3s. control signal to CALIB input, when Fault-led of device will be lit:  
-push joystick full forward, then  
-pull joystick full reverse, then  
-release joystick to mid position, then  
-wait until led start to blink = calibration done

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

### COMPANY

ELECTROMEN OY

### DRAWN

K.M.K

### DATE

2.6.16

### TITLE

DATASHEET  
EM-A24 DC-MOTOR DRIVER MODULE