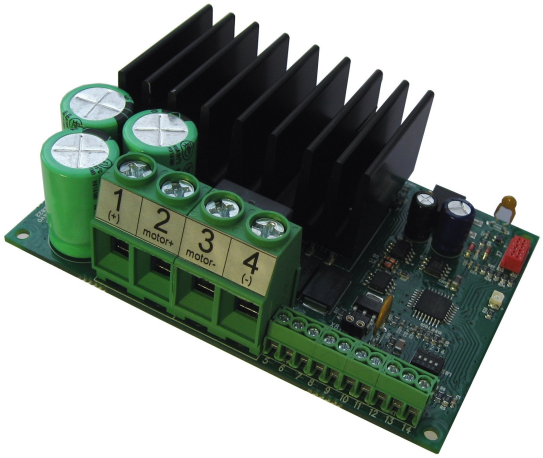
EM-243-SAF POSITIONING DRIVER 12-48V 50A



FEATURES

- analog feedback
- 5V, 10V or 4-20mA control
- position accuracy max. 0,1%
- solid state power stage
- small size, great performance
- digitally settable parameters
- verstile dynamic settings
- housing options available
- EMC-tested

Evolution
- Supply increased up to 48Vdc in C-ver PCB
- Pwm freq, 2/16kHz (since prog. v1.3)
- Improved accurate , parameter 17, prog. (v1.5)
- Modbus com. added param. 27, 28, 29 (v1.8)
- Brake output control param. 26 (v1.8)

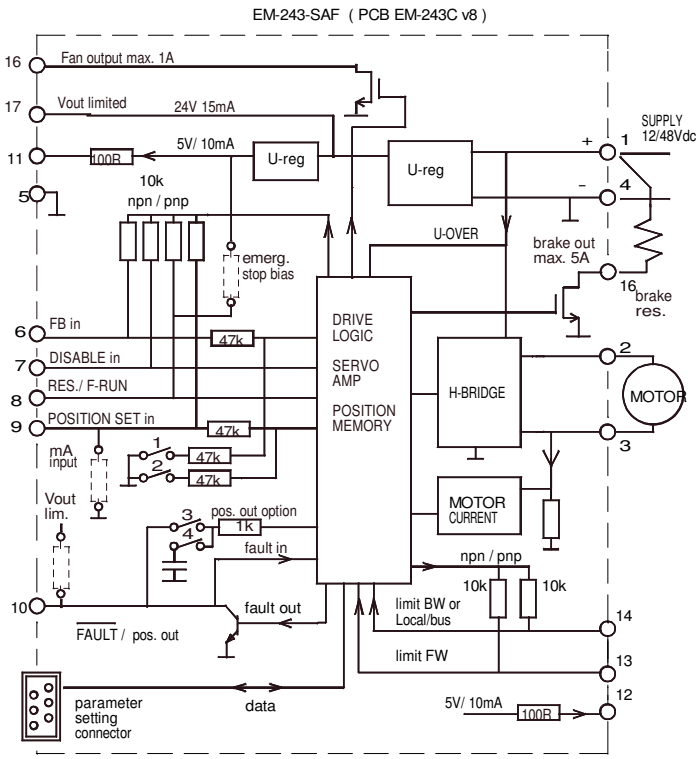
EM-243-SAF is a positioning driver to be used with DC-motors. The solid state power stage operates with high efficiency as it is realized with FET-transistors. Its literally everlasting compared to relay solutions. Control and feedback is done with analog signal. Control signal can be a voltage in range of 0 to 11V or current from 0 to 20mA. Feedback signal can be in the range from 0 to 11V. Driver supports also a potentiometer feedback, with auxiliary voltage outputs of 0V and 5,5V to exitate the potentiometer. The max. accuracy available for positioningof is 0,2% that is adequate for most actuator positioning applications. Alternatively driver can be controlled and configured with serial data communication. Modbus

The settings and adjustments are done with parameters as in all new generation Electromen products. Movement range can be modified from both ends with SW-limit parameters. Current limits and driving speeds can be set individually for both directions. Driver includes also many other dynamic adjustment possibilities like parameters for load compensation, dead-zone setting (positioning window), start and stop ramps for a smooth direction change and braking zone for well operating positioning.

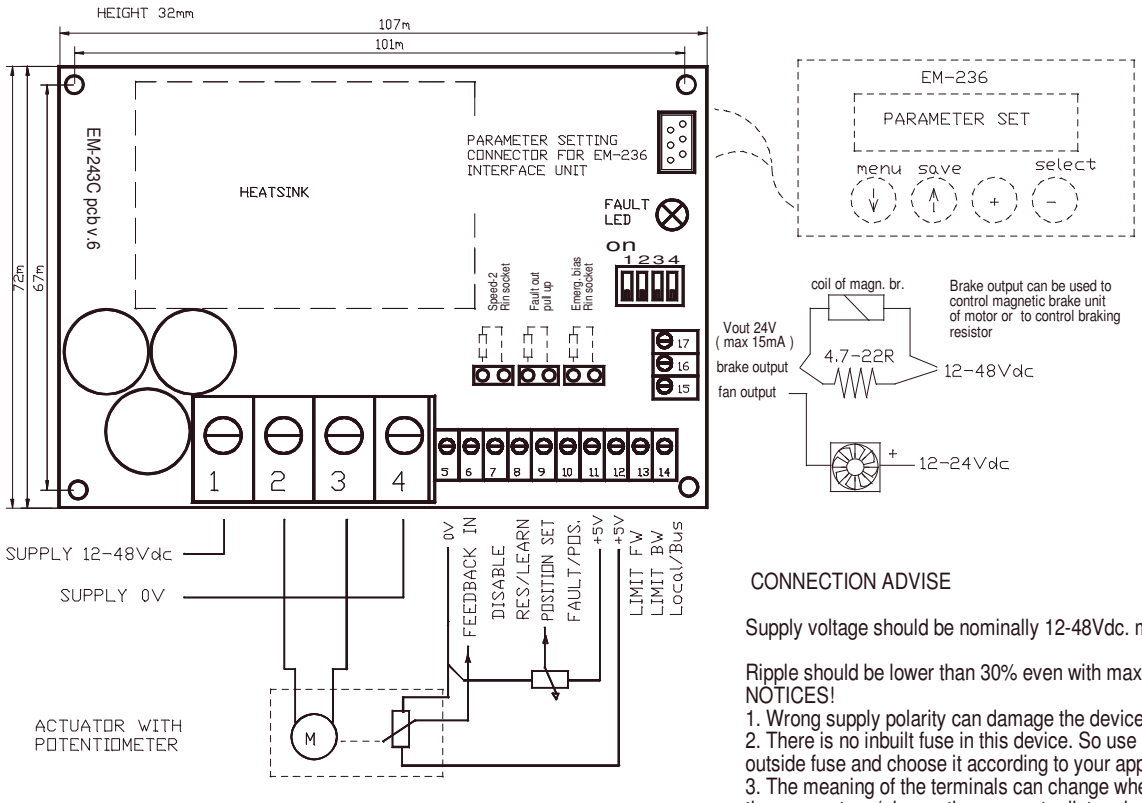
The parameter setting and status monitoring is done with EM-236 Interface Unit. With EM-236 the right parameters can also be easily copied to other driver units. The on-board LED-light indicates the possible fault situations with blinking codes. If needed, the fault can be forwarded trough combiport to other driver cards. Alternatively this port can be set to give out the "position OK" information or it can even indicate the position with an analog voltage signal. Device is EMC tested for industrial and household environment and operating temperature range is quite wide.
There are also some housing options available for EM-243-SAF driver card.

TECHNICAL DATA (prog. v1.8, pcb -243C-v.8)

Supply voltage	12-48Vdc (10-58Vdc)
Idle current	typ. 15mA
Shut down voltage	8V
Power up voltage	9V
Motor current cont.	40A, mom. 60A (Ta<50°C, 2kHz)
Motor current cont.	25A, mom. 40A (Ta<50°C, 16kHz)
Current limit	1-100A (in start max. 150A 1s)
NOTICE! current limit is 50% boosted during start ramp	
Overtemp. limit	100°C
Start and stop ramp	0-2.5s
PWM frequency	2kHz / 16kHz
Analog feed-back ranges	0-5V / 0-10V
Control input ranges (position)	0-5V / 0-10 V / 0-20mA
input impedance for mA-signal	250ohm (resistor not incl.)
Position out. signal range	0.5 - 4.5V / 0-5V
Digital input levels	high =4-30V, low=0-1V
Digital input impedances	typ. 10 kohm
Limit-FW / -BW input imp.	10kohm
Fault -output NPN, open coll.	max. 40V / 1A
Disable -input	Uin < 1V (NPN)
Indication out impedance	1kohm
Fan-output NPN open coll.	max. 40V /1A (act. T>50°)
Brake output NPN open coll.	max. 60V / 5A
Connectors for motor and supply	max. 16mm² cable
Connectors for signals	max. 1mm² cable
Operating temp(Ta)	-40...60°C
Measures	107x72x40mm
Weight	190g
EMC -tested for industrial environment	
EN-55022B, EN-61000-4-3, -4, -5, -6 passed	



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CONNECTION ADVISE

Supply voltage should be nominally 12-48Vdc. max. 58Vdc

Ripple should be lower than 30% even with maximum load.
NOTICES!
1. Wrong supply polarity can damage the device.
2. There is no inbuilt fuse in this device. So use an additive outside fuse and choose it according to your application.
3. The meaning of the terminals can change when changing the parameters (pls.see the parameter list and explanations).

TAKING IN TO USE

The setting of the driver is done with parameters, and the parameters can be set and edited with EM-236 Interface Unit or EmenTool Lite PC program and EM-328 USB to serial converter. This makes changing easy and precise. Also the copying of the same parameters to multible units is simple and same time accurate. The same parameters that are saved to one unit can be copied to an other unit with just one push of an button. Start by checking and setting the hardware related parameters. After that the actuator can be connected and operation fine tuned with other parameters.

POSITION SET RANGE

Set range areas are 0...5V and 0...10V. The 0...10V range can be selected with DIP switch 2 to "ON" position. Optionally can be used 0 to 20mA signal if you place a 250ohm resistor to the resistor socket on the driver board. The control range can be narrowed with parameters 21 and 22
If you choose to set the min. and max. as Volts, pls. notice that the values are in ratio to the lowest range 0...5V, and with 0...10V range you have to divide the actual voltage with two. With current signal you should use the 0-5V range, and the right value can be calculated I x 250.
For example: 0...20mA = 0...5,0V.

Most precise way is to let the driver to measure the values. So first connect and adjust minimum value to set input (pin.12) and change the par.21 to val. 501.
After value stops blinking the dispaly shows the measured value. Then adjust the maximum control value to pin.12, and change par.22 to 501. After a while you will see the measured value in display. Always remember to to save with long push to save button, before disconnecting EM-236 and taking power off from the driver.

Notice: If control min. value is set higher than max. value the movement range will be inverted and set accordingly.

NORMALIZED VALUE

Adjusted position set range is normalized internally for range 0-1000
Also the feedback 0-5V is normalized internally for range 0-1000
Device use these normalized value for positioning and for monitoring.

FEEDBACK RANGE

Feedback range is 0...5V as default. By setting the dip switch 1 to "ON" the range can be expand to 0 - 10V. Range can be limited with parameters 23 and 24. see example in page 4

FORCED RUN (F-run)

Forced run enables the motor to be driven to the mechanical end. That means that the motor or actuator can be driven beyond the determined software limits. The SW-limits are used to determine the operational movement range. But the parameter 14 value and the use of F-run will enable the wider driving range for service use or for use in some special situations of the application. F-run is started with a long command (>5s) to pin 11. The F-run speed is determined with parameter 5 and the driving is stopped with current trip or limit switch that cuts off the motor current. Motor will return to its servo position right after the signal to pin 11 disappears.
Notice. The same pin 11 is used also as a reset input with short command (<5s).

POSITIONING DYNAMIC

Dead zone (par.17) is to determine the accuracy of positioning. This parameter has the major effect to positioning accuracy. The smaller it is determined the more accurately the positioning is done.
Notice. If it is set too small compared to accuracy level of the mechanics an oscillation or unstability in positioning will occur.

Braking zone (par. 18) is used to optimize the time needed for positioning. Too high value slows down too early, and too low value will cause a fast position passing and needs a corrective return driving.

Start and stop ramp (par. 19 & 20) are to smoothen the direction change. Often suitable value for stop ramp is half of start ramp. Too long stop ramp can make the direction change too time consuming and too short can cause mechanical stress and non desired agressivity.

Load compensation (par.11) when set to right value, will ensure the needed force to start driving and to taking the load in to the right position. With high load and too low load compensation value, the motor dont have force enough to reach the right position. Start testing with zero value and increase value untill motor behaves unstable and twitching. Thumb rule in this point is to decrease the value with 25%.

Current limits (par. 6 and 7)should be set according to the motor current range or according to the required current of the application.

Indications

Fault situations are indicated with coded blinking of a red LED. Fault alarm can be forwarded out trough combiport (pin.13). Fault situation is reset with a short (<5s) command to RES/F-run input (pin.11).
Some faults are reset automatically with a new position command to opposite direction. Instead of fault indication the combiport can be set to inform the status of the positioning as an "on position" output, or it can be set to give an analog position indication with 0-5V or 0.5-4.5V signal. Configuration of the combiport is done with par.9. Notice: If it is set to give analog information out (par.9 val3/4), also the DIP-switch 3 should be set to ON position. If combiport (pin 13) is selected to be fault output (par.9 val.1), it will also work as fault-disable input when externally pulled down.

Adjustments and settings

Parameter setting is done with EM-236 or -328 Interface unit, which is connected to a powered controller unit trough the red connector. During the start up routine the Interface Unit will display information about it self and then the name and program version of the target device (driver which it was connected to). Then it will stay on displaying EDIT & LOAD. Pushing the "yes" button will up load and show the parameter list of the driver. Now the user can scroll the list with arrows, and make value changes with + and - buttons. Changed value is effective after few seconds when the display stops the blinking. But notice, that the change will not be saved untill you give a long press (>5s) with the "save" button. This will save the changed list also to the EM-236s memory.
Now it is easy to copy the same parameters to the next driver. Just connect the unit to the next powered driver and after start up routine just press a long "save".
You can repeate this untill all needed units have been set.

LIST OF PARAMETERS prog. v1.8 (defaults in parentheses)

1 No function (0)
2 Limit input logic (1)
  1= PNP
  2= NPN
  3= PNP inverted
  4= NPN inverted
3 Speed FW: 20-100% / 0-100 (100)
4 Speed BW: 20-100% / 0-100 (100)
5 Speed for F-driving: 20-100% / 20-100 (60)
6 Current limit out, FW: 1-100A / 1-100 (10)
7 Current limit in, BW: 1-100A / 1-100 (10)
8 Current tripp delay: 0-255ms / 0-255 (20)
  (0=tripp not in use)
9 Combiport (pin 13) function: 1-4 (1)
  1= used as Fault in/out
  2= gives the "on position" information with 0V
  3= gives position indication with 0 - 5V
  4= gives position indication with 0.5-4.5V and fault =0V
10 Over voltage limit: 15-40V / 15-40 (35)
11 Load compensation: 0-255 / 0-255 (0)
12 Time out cut-off: 1-255s. / 1-255 (0= not in use) (0)
13 Hour and start counter reset (0)
  set value = 1 and press save -> counters are set to zero
14 Forced run function with >5s command to pin 11 (1)
  1= makes F-run to BW direction
  2= makes F-run to FW direction
15 Fault reset conditions 0-1 (1)
  0= reset with RESET-input or opposite direction request .
  1 = fault reset can be done only with RESET-input (pin 11)
16 Not in use (0)
17 Dead zone : 0-5% / 0-50 (10)
18 Braking zone : 1 - 8% / 1 - 8 (3)
19 Start ramp : 0,1-2,5s / 0-250 (10)
20 Stop ramp : 0,1-2,5s / 0-250 (3)
21 Set value min. 0...5,50V / 0-551 (0)
22 Set value max. 0...5,50V / 0-551 (550)
23 Inner (BW) SW-limit: 0...-50% 0-500 (5)
24 Outer (FW) SW-limit: 0...+50% 0-500 (5)
25 Pwm frequency: 1=2kHz / 2=16kHz (0)
26 Brake output option 0-2 (0)
  0= regen. braking resistor,
  1= "running" indication (magn. brake cont.)
27 Serial line configuration, speed, parity, and number of stop bits (1)
  1 =9.6kbps 8N1 5 =19.2kbps 8N1
  2 =9.6kbps 8N2 6 =19.2kbps 8N2
  3 =9.6kbps 8E1 7 =19.2kbps 8E1
  4 =9.6kbps 8O1 8 =19.2kbps 8O1
28 Modbus address 1-247 (1)
29 Input pin 14 options and LOCAL / BUS selection options (0)
  0 = Pin 14 work as BW limit input, local /bus selection only with bus
  1 = Pin 14 defines control mode local/bus, pin open = LOCAL
  2 = Pin 14 defines control mode loacl/bus, pin open = BUS

FAULT LED -blinking codes

1. I-trip	1 blink
2. time out trip	2 blinks
3. over temperature	3 blinks
4. over voltage trip	4 blinks

Pls. notice:
when card is powered the LED- blinks onse.

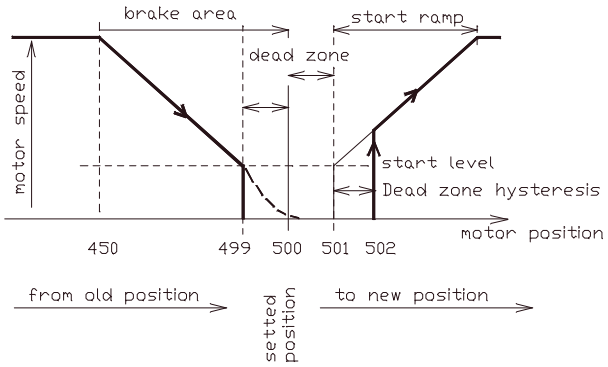
MONITORABLE VALUES (Can be read with EM-236)

1 fault code (see the fault code list)
2 motor current 0-200 (0-200A)
3 target position 0-1000 (0-100,0%)
4 realized position 0-1000 (0-100,0%)
5 hour counter (max.65535h)
6 start counter (max.65535 starts)
7 start counters over flow counter (max. 65535)
8 feedback input 0-1023 (4.9mV / digit)

ABOUT PARAMETERS

1. No function.
  This parameter position is not is use in this program.
2 Limit switch input terminals (pin 2 and 3) can be set to work with positive or negative logic. Positive =PNP, negative=NPN. The effect can also be inverted so that when signal is ON status is OK, and signal OFF status is "disable by limit".
3 & 4 are for speed setting of FW (out) and BW (in) directions.
5 the speed setting for "Forced run" (F-run).
6 & 7 current limit setting for FW (out) and BW (in) directions
8 determines the time the current is allowed to be on the limit value before driving is cut off (driver tripps off). Value is in milliseconds and if set to "0", the current tripping feature is disabled.
9 Configuring the combiport functions (pin 13). This terminal can work as combined input-output for fault. Or it can give a "position OK" signal after succesfull positioning. It can also be used to indicate the position with a continuous voltage signal (position signal). If position signal is chosen (val 3 or 4) the DIP3 must be set to "ON".
10 Over voltage protection switches the motor to free wheel. This saves the controller or other devices in supply line from over voltage in case the motor generates energy during slowing down or braking. This can happen with eg. in vehicle or lifting applications.
11 Load compensation (RxI-comp) enables good motor torque even with low speeds. It is good to start testing with zero value, but if the motor seems weak when starting with normal load, the value can be increased step by step untill there is power enough to start. Notice: Too high value is recognized from oscillation and/or twiching, If it is not possible to see the behavior of the motor and test the effect with momentary loading of a freely running motor the safest value for this parameter is zero.
12 Time out tripp will cut off the driving if continuous driving to the same direction exceeds the set value (statet in seconds).
13 This parameter is for resetting the start and hour counters. Saving value 1 will set to zero the drivers start and hour counters.
14 Parameter for choosing the forced run direction. F-run is started with long >5s command to RES/F-run terminal (pin 11)
15 Determines how the controller recovers from fault situation. Val 0. Recovers also with an opposite direction movement request. Val 1. fault requires a short (<5s) reset command to pin 11.
16 No function. Value of this parameter position has no effect.
17 Dead zone for determining the wanted positioning accuracy. If this window value is small the positioning is tended to be done more accurately. If value is too small the application is not capable to exceed this accuracy, and can not find or maintain the set position steadily. In this case the value should be increased.
18 Braking zone value is determined as a percentage of the full movement range. It determines how early driver starts to slow down before reaching the right position. Main rule is that small value for slow applications and high value for fast applications.
19 & 20 Start and stop ramps are used to smoothen the speed and direction changes. The parameter value is the time from 0-100% and from 100%-0 speed.
21 & 22 are for determining the control signal range limits. Value can be given as Volts, 0 to 550 (0 to 5,5V). The values can also be measured automatically by setting the parameters to value to 551. The card will then measure the range min. and range max. voltages on the POSITION SET input. Pls. read also the chapter "Control range setting".
23 & 24 Inner (BW) and outer (FW) SW-limits. With these adjustable limits the movement range can be limited to suite the application. Notice: the forced run will over drive these points.
25 16 kHz pwm frequency offer silent function, but cannot offer motor current as much as 2kHz option
26 brake output configuration
27 and 28 serial / Modbus speed, parity and address settings
29 LOCAL or BUS selection options, In Local mode uses only card analog and digital inputs, In Bus mode the Modbus control is active.

POSITIONING WINDOW EXAMPLE

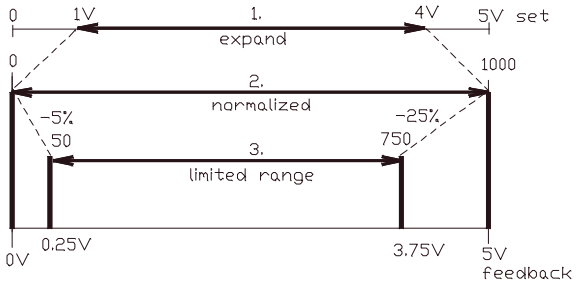


PARAMETERS SETTINGS:
Dead zone 0.1% (= 1)
Braking area 5% (=50)

SET position changes 0 to new position 500
Motor run speed FW until position reach value 450. Motors starts slowing down, Until position reach value 499 and motor shut down and motor should stopped to value 500.

Motor will start again when position SET changes over 502

RANGE SCALING EXAMPLE



POSITION SET signal range is 1...4V
Range is scaled with set parameters 21 = 100 and 22 = 400

Now the 1...4V signal is internally normalized to the range 0-1000.
This normalized value corresponds 0-5V feedback range

Feedback range can be compressed with parameter 23 and 24, in this example inner limit -5% and outer -25%.

Final result is that control range 1-4V match to 0.25...3.75V feedback range