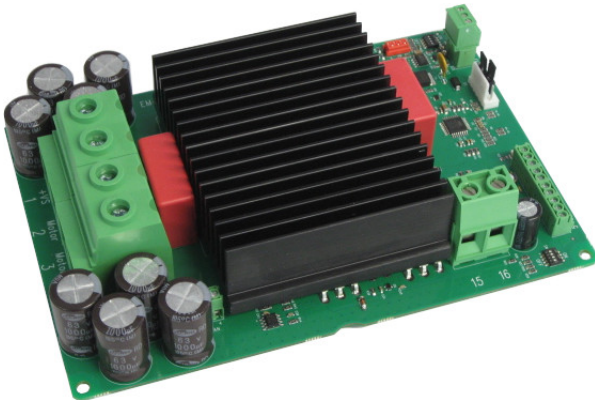


# DC-MOTOR CONTROLLER EM-282D or EM-282D-fan 12-48V , 100A - 80A



## FEATURES

- for motors up to 1.5kW
- available with integrated fan.
- high current output
- brake load output
- current limit
- current limit for brake also
- zero-current limit
- speed setting/adjustment
- flexible control inputs
- impulse / continuous mode
- rail base mountable
- digital parameter setting
- C versions program
  - + 2/16kHz pwm freq. options
  - + freewheel options
  - + autoreverse option
  - + running indication options
  - + expanded input logic options
  - + thermal cont. Fan-output
  - + speed range adj. v1.5 ->
  - + serial com. control option v1.8 ->
- D board ver. replaces earlier versions both EM-282C and EM-282C-48V
  - + extended supply voltage range
  - + added Rs-485 bus
  - + D pcb v3 shutdown input added

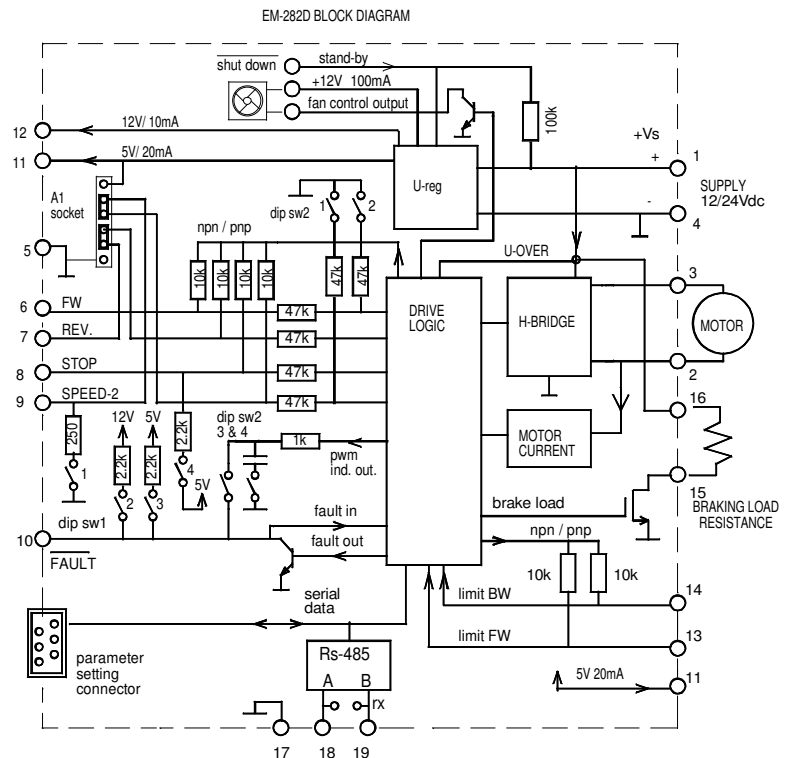
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EM-282D is a full bridge DC-motor starter. It is designed to work with DC-motor (permanent magnet and brushed) in applications where a variety of special functions and settings are needed. Starter has an adjustable acceleration and deceleration ramps enabling the smooth starts and stops. Adjustable current limit protects motor against overcurrent. Current limitation for braking is also available (regeneration). EM-282 has two selectable and settable speeds. This feature can be useful eg. in positioning applications. The FW and BW -inputs control the forward and backward run. STOP input is to stop the motor but there are also available individual limit inputs for FW and BW direction end stops that will cause a motor shut-down. SPEED-2 input activates the presettable speed-2, but it can also be set for use as an analog speed control input (0-5V signal). FAULT terminal operates same time as an input and output. Fault line is internally pulled high (100kohm to Vsupply), but will be pulled down in overheat or conditionally also in current trip situation. If FAULT-line is pulled down externally it will cause a stop and disable a new start. For example it is possible to link FAULT pins of several units together and achieve this way a synchronous stop.

Driving can be done with two selectable control modes, continuous and impulse. In continuous mode the motor runs as long as the command is on. In impulse mode a short command starts the motor, and only a new impulse will change the status. Inputs are divided in to two groups, command and limit -inputs. These groups can be individually set to work with NPN (connect to zero control) or PNP (positive voltage control) -logic. The parameters are set digitally with a hand held EM-236 interface unit. With this unit the same settings (adjustments) can also be easily copied to an other or to multiple devices. Operation of the controller and some of its functional values can also be monitored with EM-236 interface unit.

## TECHNICAL DATA ( prog. EM-282D v2.1 / pcb -D ver.3 or later )

- Supply voltage nom. 12-48Vdc (abs. limits 10-60V)
- Shutdown voltage 10V
- Overvoltage limit adjustable 15-60V
- Idle current typ 20mA or 1mA ( shutdown input conn. to gnd )
- Motor current max. cont. 100A ( at 24Vdc and 25°C amb. temp )
- 80A and 100A with fan installed ( at 24Vdc and 60° amb. temp )
- Motor currents are about 20% lower with 16kHz pwm freq.
- At 48V supply voltage motor current is typically 15% less
- Braking load current (pin 16) max cont 50A peak 100A
- Current limit adjustable 1-200A
- NOTICE! current limit is 20% boosted during start ramp.
- Over temp. limit 100°C
- Start and stop ramp adjustable 0-5s
- PWM frequency 2kHz / 16kHz
- Speed input scale ( speed-2 ) 0-4.5V = 0-100% pwm
- I-lim input scale 0-5V = 0-200A
- 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 42V / 0.5A
- Fault in. active Uin < 1V ( NPN with 100k pull up )
- Fan-output switch on 55°C, off 50°C
- Fan-output NPN 12V 100mA
- Rs-485 bus, halfduplex, Modbus RTU, 9.6/19.2 kbps
- Brake output NPN max. 50A
- Motor and supply connectors 16mm<sup>2</sup>
- Control connectors 1mm<sup>2</sup>
- Dimensions 180x122x45mm ( height 52mm with fan )
- CE-tested for industrial environment ( EMC )
- Operating ambient temp ( Ta ) -40...60°C
- Weight 615g ( 640g with fan )



CONNECTIONS

Supply voltage must be filtered DC of 12-48V, and ripple should be less than 20% at full load.  
**CAUTION !** Wrong polarity can damage the unit.  
**CAUTION !** Unit doesn't have an internal fuse.  
 So if required, an external fuse should be added.  
**NOTICE !** thermal controlled FAN-out only in PCB version -C v3 or later

ADJUSTMENT AND SETTINGS

Settings can be done with 3 interface device options.  
 1. EM-236 interface unit  
 2. EM-328 series interface units with EmenTool Lite PC-software ( free download from our website )  
 3. EM-326 interface unit with EmenTool App smartphone

SETTABLE PARAMETERS ( EM-282D v1.0 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 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 )  
 If analog speed input mode is select with parameter 5, then parameter 4 work analog input range adjust
- 5 control mode / running speed-2 preset 0-100% / 0-100 ( 50 )  
 0= Analog speed mode -1  
 "speed 2-input" is used as analog 0-5V speed control input.  
 1= Analog speed mode -2  
 as above but FW direction is automatically "on" and BW input works as direction change input.  
 FW input works as pause input  
 2-100 = 2-speed mode ( two digitally settable speed )  
 speed-1 preset with param. 4 and speed-2 with param. 5)
- 6 current limit : FW 0-200A / 0-200 ( 30 )
- 7 current limit : BW 0-200A / 0-200 ( 30 )  
**NOTICE!** if both 6 & 7 is set = 0, then I-lim input is active
- 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: 0-5 ( 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  
 5 = "run" indication = pull down when motor run

Limit inputs FW / BW

These inputs stop motor without ramp with dynamic brake But in control mode "2-speed" dynamic brake is enabled only when speed-2 is activated.  
 If motor has stopped with limit switch the dynamic brake is at least 1s. active, also in case when freewheel is selected.

FAULT in/out

This NPN input pull down when fault. Combination can be selected with parameter 10.  
 If this input is pulled down with externally, then it would disabled motor as long as pulled down.

SPEED-2 input

This input activates speed-2 when 2-speed mode is selected. In analog speed modes this input work as speed set input

SERIAL PORT ( red micromatch connector )

This is normally for parameter settings and monitoring with Ementool program or EM-interface units.  
 But there is also availability for open protocol control ( Modbus )  
 This option has own instruction guide.

Rs-485 ( Bus )

This port can be used with Modbus protocol  
 This option has own instruction guide.

- 11 overvoltage limit: 15-65V / 15-65 ( 40 )  
 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 first the brake load switch on and if voltage still rise 10% as limit value 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 ( Rxl ) improves low speed and start torque, but too high compensation achieve unstable running.  
 Run motor at low speed ( 30% ) Increase 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: 0.05-5s / 5-500 ( 100 )
- 16 stop ramp: 0.05-5s / 5-500 ( 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 reversing time will select with this parameter
- 19- Freewheel options 0-3 ( 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 or during stop ramp
- 20- Pwm frequency 1=2kHz / 2=16kHz ( 1 )
- 21- Current limit in braking 5-200A / 5-200 ( 50 )
- 22- Pin-15 ( 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
- 23 Serial port configuration, 1-8 ( 1 )  
 speed, parity, and number of stop bits  
 1 =9600bps 8N1 5 =19200bps 8N1  
 2 =9600bps 8N2 6 =19200bps 8N2  
 3 =9600bps 8E1 7 =19200bps 8E1  
 4 =9600bps 8O1 8 =19200bps 8O1
- 24 Modbus address 1-247 ( 1 )

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. over voltage     | 4 x blink -pause...          |
| 6. over heat        | short blink- long pause...   |
| 7. time-out         | 3 x blink + long blink...    |
| 8. fault input      | 2 x short + 1x long blink... |

MONITORABLE VALUES

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

