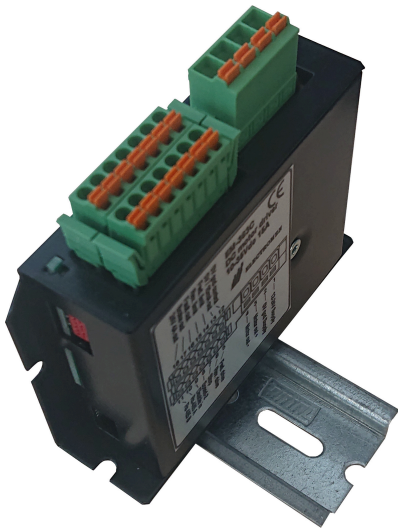# EM-363C DC-MOTOR CONTROLLER
12-24V 15A with MODBUS

FEATURES

- **High current output**
- **Current limit**
- **Overvoltage brake**
- **Speed setting**
- **Flexible control inputs**
- **Impulse / continuous mode**
- **Rail base mountable**
- **Digital parameter setting**
- **Current limit setting input**
- **Freewheel options**
- **2 or 16kHz PWM frequency**
- **Magnetic brake control output**
- **Lockable, spring gage connectors**
- **- C version Rs-485 Modbus added**
- **Different firmware option available**

EM-363A is a full bridge DC-motor starter. It's designed to work with a DC-motor in applications where some special functions are needed. Starter 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 also has two settable speeds, which are useful 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 individual limit inputs available for FW and BW directions. SPEED-2 input activates preset speed-2, but it can also be used as an input for analog speed control signal 0-5V. STOP input can be set to work as current limit setting. FAULT terminal has both input and output functions. The pin is normally up, but is pulled down in overheat and conditionally in current trip situation. If FAULT-line is pulled down externally, it will cause a stop and prevent a new start. For example, it's possible to link fault pins of several units together and achieve a synchronous stop. The device also has parameters for pwm frequency select and freewheel, which is used to release the shaft of the motor. Notice that 16kHz pwm frequency is more silent, but the output current is smaller! Device version A has added Rs-485 Modbus RTU for monitoring and controlling device.

There are two selectable control modes, continuous and impulse. In continuous mode the motor runs as long as the control is active. In impulse mode a short command starts the motor and only a new impulse will change the status. There are also a few special settings, start-kick and auto reverse. The device 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 device has black metal housing and lockable spring gage connectors. These connectors are designed for industry and automotive use. Device can be installed laterally or vertically with screw fastening or optionally with DIN-rail fastener. For parameter settings there are the following options: EM-236 interface unit, EM-268 with EmenTool-Lite PC-program and EM-326 with EmenTool-App application for smartphone.

TECHNICAL DATA (PCb v1, prog ver. 363C v1.9)

Supply voltage cont. max. 10-35V
Overvoltage limit adjustable 15-40V
Start up voltage 9V, shutdown voltage 8V
Continuous current output when ambient temp is <50℃)
  15A at 100% speed / 10A at 5-99% speed pwm=2kHz
  10A at 100% speed / 5A at 5-99% speed pwm=16kHz
  Peak (5s.) 30A at 2khz pwm and 25A at 16kHz pwm
Current limit adjustable 0.1-25A (at start max 30A)
Overheat limit 100℃
Start and stop ramp adjustable 0-5s
PWM frequency 2kHz / 16kHz
Speed input scale (speed-2) 0-5 / 0-10V (0-100%)
I-limit input scale (stop input) 0-5V = 0-20A
Input control logic: high =4-30V, low=0-1V
Bus Rs-485 Modbus RTU 9600/19200 bps
Control input impedances typ. 47kohm
Limit FW / BW input imped. typ 10kohm
Control input response time typ 5ms.
Fault out. NPN / PNP open coll. max 35V / 1A
Brake out NPN open coll. max. 35V / 4A
Disable in actives Uin < 1V (NPN)
Motor and supply connectors 2.5mm
Control connectors 1mm
Dimensions 89x26xh81mm (h88mm with rail foot EM-T55)
Weight 169g
CE-tested for industrial environment (emc)
Operating temp (Ta) -40...60℃

EM-363C BLOCK DIAGRAM
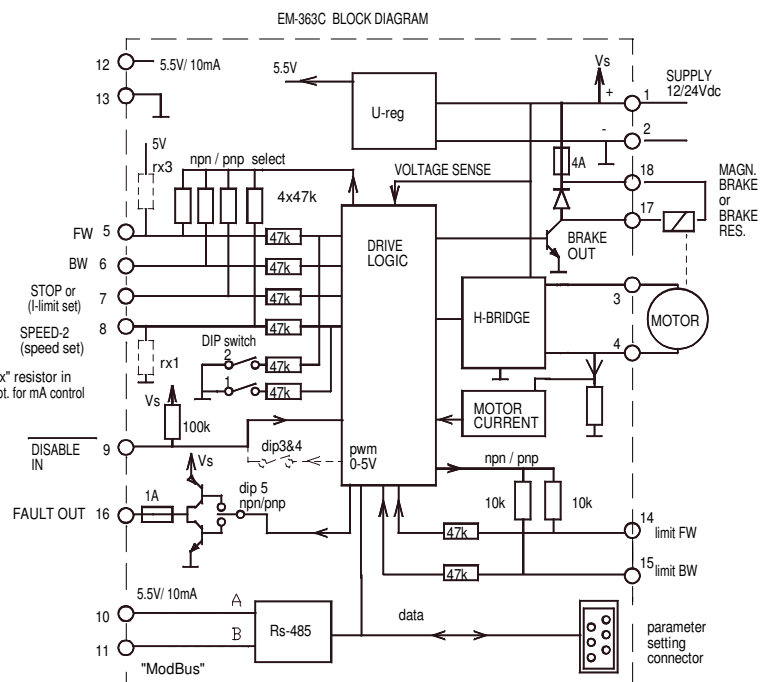
ELECTROMEN Oy

www.electromen.com

CONNECTIONS

Supply voltage must be filtered DC of 10-35V,
and ripple should be less than 30% at full load.
CAUTION ! Wrong polarity can damage the unit.
CAUTION ! Unit doesn't have an internal fuse, so
an external fuse should be added if a fuse is required.

MONITORABLE VALUES

1/5 Motor current 0-2.0A (0-200)
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. Disable input	2 x short + 1x long blink...

DIP SWITCHES

1 Pin-8 range "off"= 0-5V / "on"= 0-10V
   (if parameter 5 = 0 or 1)
2 Pin-5 range "off" =0-5V / " on=0-10V
   (support -SAF firmware option)
3 & 4 Enables pwm output 0-5V
   (standard firmware does not support !)
5 Fault output "off" = NPN / "on" =PNP

INPUTS

FW, BW, STOP and SPEED-2 are in the same group.
The group can be set to work in PNP or NPN logic.
Normally these inputs work as digital inputs.
Inputs FW and BW start running, STOP stops
running and SPEED-2 selects preset speed-2.

FW and BW LIMIT stops the motor. These
inputs have their own group and it can be
set to work in NPN or PNP mode.
Normally the activation of these inputs
will stop run with ramp, but if speed-2 is
selected, then it stops without ramp.

DISABLE input is NPN input. Activation of
this input disables action and stops motor
without ramp.

OUTPUTS

FAULT output can work in NPN or PNP mode.
The mode is selected with dip-switch. This
output has many functions, which can be set
with parameter 10.

BRAKE output is 4A NPN output. It can
drive magnetic brake or brake resistor.
Parameter 21 is the parameter for this output.

RS-485 BUS

Device has RS-485 bus for serial control, It
works as Mobbus RTU Device

ANALOG CONTROL

The speed and current of the motor can be
controlled with an analog signal.
Analog speed control is set by setting
parameter-5 to 0 or 1, then the SPEED-2
input will work as speed set input.
The motor current limit can be set with
analog signal to STOP input. This is enabled
with setting parameter 6 & 7 = 0.

ADJUSTMENT AND SETTINGS (prog ver. EM-363C v.1.9)

Settings can be done with three interface device options.
1. EM-236 interface unit
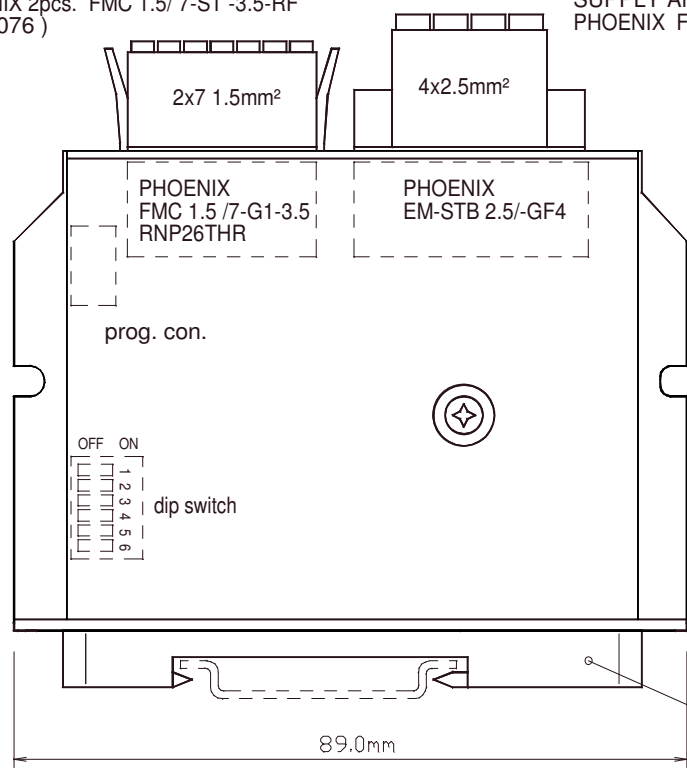2. EM-268 interface unit with EmenTool Lite PC-software

SETTABLE PARAMETERS 23pcs. (defaults in brackets)

1- Command mode: 0,1 and 2 (0)
  0= Continuos FW / REV
  1= Impulse commands FW / REV. with stop
  2=Impulse commands FW / REV without stop
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 (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)
  Special parameter values of param. 5
  0= "Speed 2-input" is used as analog 0-5V speed control input.
  1= FW direction is automatically "on" and FW input works as
       direction change input.
6- Current limit FW: 0-25A / 0-250 (30)
7- Current limit REV: 0-25A / 0-250 (30)
  Notice! If both 6 & 7 are set = 0, then I-limit input is enabled
  and it 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: 0-5 (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 runs

11- Overvoltage limit: 15-65V / 15-65 (35)
  Do not set this higher than hardwarel imit, in this card max. 40V
  Overvoltage can be caused by load driving the motor, or for example
  when braking the speed down but the supply can't accept
  the current back from the driver. Exceeding the limit will cause the
  power stage to be set to freewheel state. If the voltage still rises,
  then powerstages are short circuited to brake the motor more.
  Battery supply uses the brake current to charge the battery and
  voltage will not normally rise.
12- Load compensation: 0-255 / 0-255 (0)
  Load compensation (RxI) improves low speed and start
  torgue, but a too high compensation will cause unstable running.
  Run motor at low speed (30%). Increase compensation
  with small steps until motor starts to behave unstably,
  then decrease value for 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)
  This gives full drive at start and I-lim is 30A
  The start kick length is 0-200ms.
18- I-trip auto reversing 0-5s / 0-500 (0)
  Automatically changes run direction when I-trip occurs.
  The revesing time is selected with this parameter.
19- Freewheel options 0-3 (0)
  0= No freewheel
  1= Freewheel if overvoltge
  2= Freewheel if overvoltage, or stopped
  3= Freewheel if overvoltage, stopped or during stop ramp.
20- Pwm frequency 1=2kHz / 2=16kHz

21- Brake out options 0-2
  0= Regen. braking = if overvoltage exceed
  1= Running indication = when motor run
  2= As above but also STOP input activate output
22 Serial port configuration, speed, parity, and number of stop bits (1)
  1 =9600bps 8N1   5 =19200bps 8N1
  2 =9600bps 8N2   6 =19200bps 8N2
  3 =9600bps 8E1   7 =19200bps 8E1
  4 =9600bps 8O1   8 =19200bps 8O1
23 Modbus address 1-247 (1)
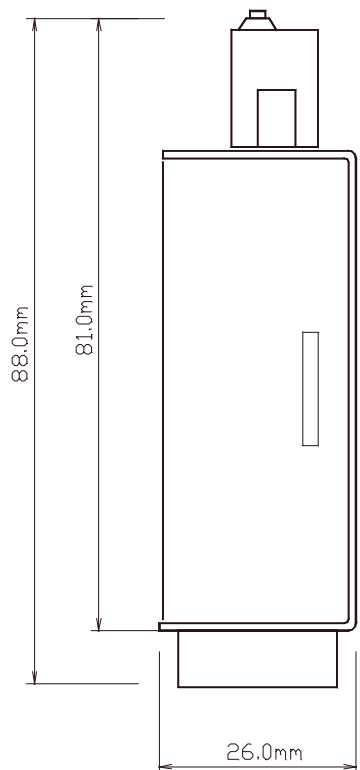
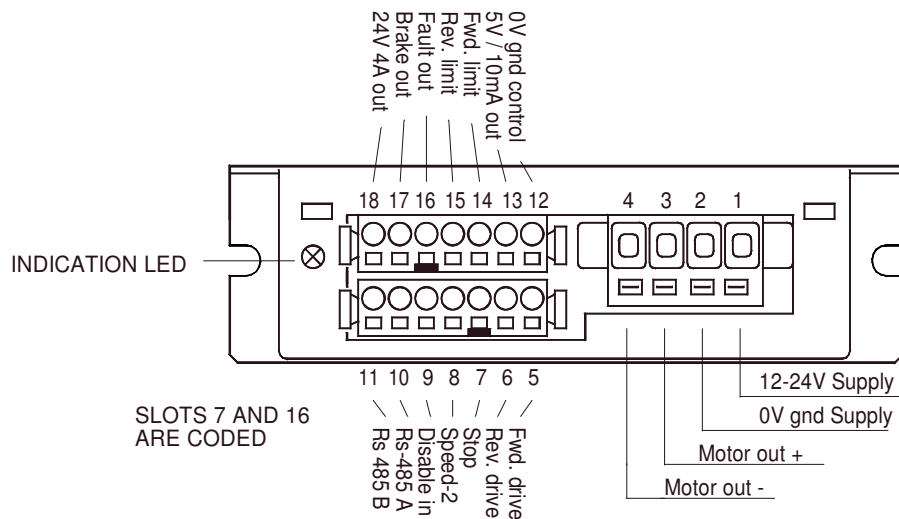CONTROL CONNECTOR PLUG
PHOENIX 2pcs. FMC 1.5/ 7-ST -3.5-RF
(1952076)

SUPPLY AND MOTOR PLUD
PHOENIX FKCN 2.5 /4 -STF

2x7 1.5mm²

4x2.5mm²

88.0mm

81.0mm

26.0mm

PHOENIX
FMC 1.5 /7-G1-3.5
RNP26THR

PHOENIX
EM-STB 2.5/-GF4

prog. con.

OFF ON
1 2 3 4 5 6
dip switch

89.0mm

DIP SWITCHES

1 Pin-8 range "off"= 0-5V / "on"= 0-10V

2 Pin-5 range "off" =0-5V / "on"=0-10V

3 & 4 Enables pwm output 0-5V
      (standard firmware does not support this !)

5 Fault output "off" = NPN / "on" =PNP

DIN-RAIL FASTENER   EM-T55 (optional)

0V gnd control
5V /10mA out
Fwd. limit
Rev. limit
Fault out
Brake out
24V 4A out

18 17 16 15 14 13 12   4 3 2 1

INDICATION LED

11 10 9 8 7 6 5

Rs 485 B
Rs-485 A
Disable in
Speed-2
Stop
Rev. drive
Fwd. drive

SLOTS 7 AND 16
ARE CODED

12-24V Supply

0V gnd Supply

Motor out +

Motor out -