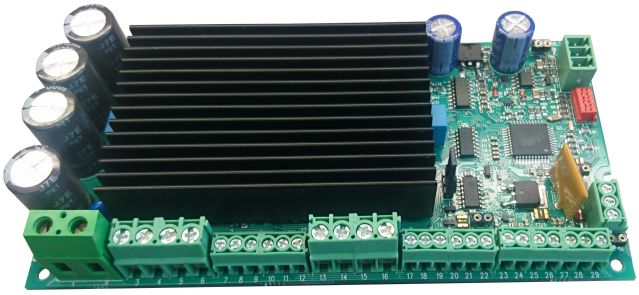
EM-337-PLI PARALLEL DRIVER FOR 4 ACTUATORS or MOTORS 12/24Vdc 4x10A



FEATURES

- synchronized 4 parallel driving
- operates with pulse feedback
- pulse counting PNP or NPN logic
- quadrature pulse counting
- current and temperature limit
- settable drive speed
- 2 or 16kHz pwm frequency
- acceleration and deceleration ramps
- stroke length limitation
- setting with serial interface
- brake (release) output
- safety switch input
- optional Rs-485 (Modbus) control
- safety reverse function

APPLICATIONS

- table lifter
- hatch control
- worktop control

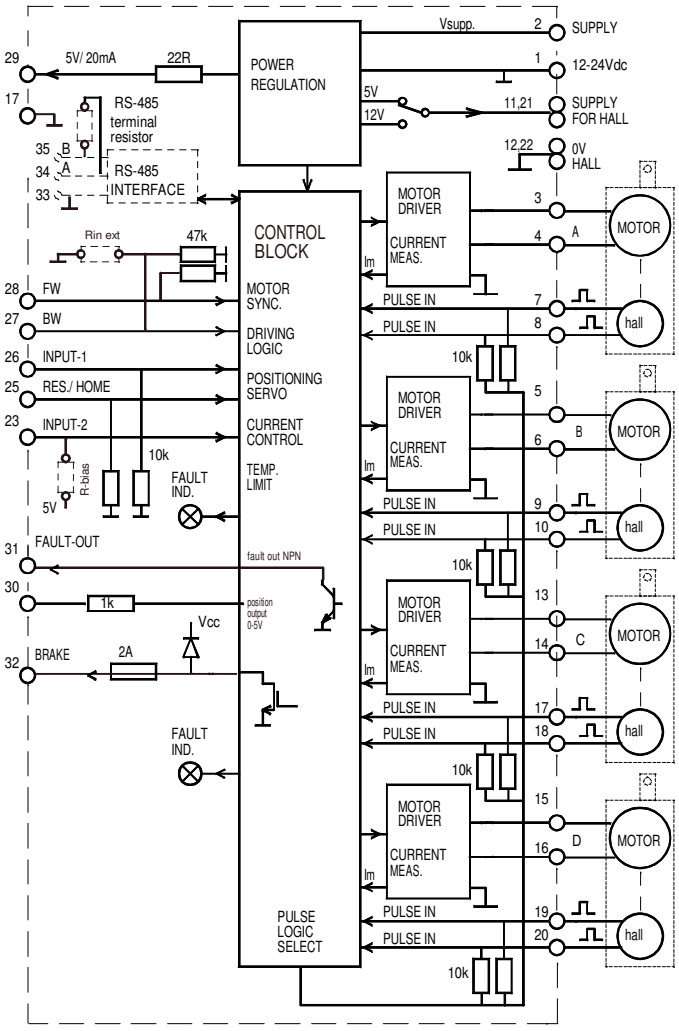
EM-337

EM-337 is a parallel synchro controller for up to 4 DC-motors. The controller has four H-bridge power stages. The driver works with actuators that can offer pulse feedback signal. The control is done with FW / BW commands.
The synchronization control will keep all motors in the same speed and position. If synchronous error exceeds the set difference limit, all motors will be stopped.
Device includes adjustable acceleration and deceleration ramps, which produce the smooth starts, stops and direction changes. Load compensation also enables good operation with asymmetric loads. Adjustable current limits can be set to protect motor and mechanics against overcurrent (over sized forces).

TECHNICAL DATA

Supply voltage 10-35V
Undervoltge shutdown 8V
Overvoltage limit 38V
idle current < 20mA
Motor current: (@ 2kHz / 16kHz)
4x8A / 4x4A at continuous use
4x10A / 4x5A at duty cycle 25%
4x15A/ 4x8A at duty cycle 10%
4x25A max. in start
Current limit, setting 1-25A
Overtemp limit 90℃
PWM frequency 2kHz or 16kHz
Input control logic levels:
"NPN" ON= 0-1V, OFF=4-30V or open
"PNP" ON=4-30V, OFF=0-1V or open
Control input impedances typ. 47 or 10kohm
Pulse input freq. max. 700Hz/ input ch
Pulse inputs pull- up/down 10 kohm.
Fault out. NPN open coll. max 30V/50mA
5V aux. output max 20mA
Position out 0-5V (Rout 1kohm)
Brake out NPN max. 4A
Supply connectors 4mm2
Motor/control connectors 2.5/1,5mm2
Weight 190g
Recom. oper. temp (Ta) -40...60℃
Over temp. shut down. 120℃ (pow.stage)
CE Electromagnetic compatibility
EN-55022B and EN 61000-6-2/ -4-2...6
Dimension and housing options:
- Card 142x73x28mm
- Installed in DIN-rail base 145x127x50mm
- Fibox PC150/60, (180x130x60mm)
- Fibox PC175/100 (180x180x100mm) include 300VA supply

EM-337-PLI BLOCK DIAGRAM



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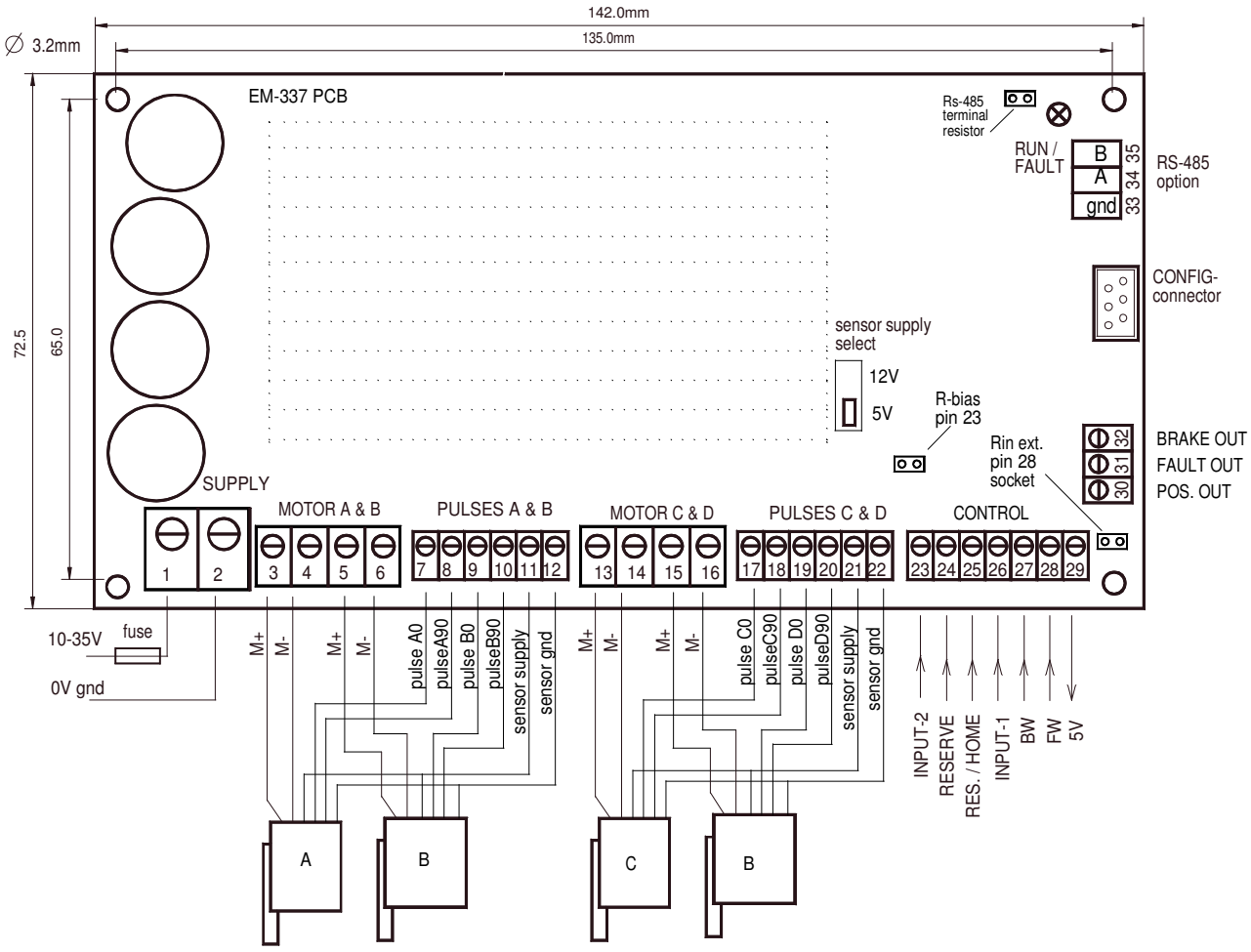
ELECTROMEN Oy www.electromen.com

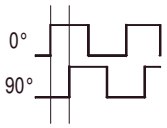
EM-337 connector & dimensions.



CONNECTION

In the drawing above, a typical connection of the card can be seen. Supply voltage should be 12-35Vdc filtered. Ripple less than 20%. Device has no inbuilt fuse, so use an external fuse, max value 60A.

IMPORTANT.



The phase shift of pulse lines should be about 90 deg. Also the frequency of one pulse sensor should be lower than 700Hz.

TERMINALS

PULSE SENSOR INPUTS can be set to work in NPN (pull to gnd) or PNP (pull to positive) mode. The modes are set with parameter 4. The hall switches of motors can be supplied with supply voltage or with 5V from card. Check the right voltage from motor datasheet.

FW and BW are PNP inputs are for operating commands. These start running in FW or BW direction.

INPUT 1 is a multifunction PNP input, which can be set with parameter 6. It can work as STOP, SPEED-2 activation, or BW END limit.

INPUT 2 is a multifunction PNP input, which can be set with parameter 7. This input also has a wiring monitor possibility. When safety stop switch option is selected, R-bias has to install. R-bias should be the same value as the resistor on safety switch. This input can also work as SPEED-2 activation or FW end limit.

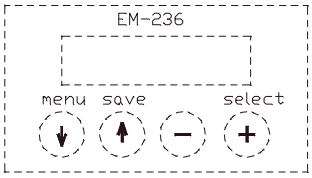
RES. / HOME input is PNP input. Short command resets fault, long command (>5s) starts home routine.

FAULT OUTPUT is normally an open NPN output, but this has an optional 2.2kohm pull up resistor if you want to use it for PNP input. Pull up resistor is enabled by connecting wire between pin 20 and 21.

BRAKE OUTPUT is NPN 4A output for releasing magnetic brakes of motors or alternatively for switching brake resistor in overvoltage situtation. The function of this output can be set with parameter 8.

PARAMETER SETTING AND MONITORING

Parameter adjusting can be done with
the following EM- interface devices.
-EM-236 is a basic stand alone setting device.
-EM-328 USB-serial converters, which makes
it possible to set parameters with a computer
that has EmenTool Lite installed.
-EM-326 is a Bluetooth-dongle, which can be used
in smart devices with the EmenTool App.



MONITORABLE VALUES

1 fault code, as indication led blink count
2 motor A current - 0.1A/digit
3 motor B current - 0.1A/digit
4 motor C current - 0.1A/digit
5 motor D current - 0.1A/digit
6 current limit setting 0.1A/digit
7 motor A pulse counter value
8 motor B pulse counter value
9 motor A pulse counter value
10 motor B pulse counter value
11 operating voltagen 0.05V /1digit
12 safety edge 0.05V/digit

INDICATION LED (number of blinks)

1 blink = homing in progress
2 blinks = overcurrent
3 blinks = no pulses detected
4 blinks = motor position difference too big
(synchronisation error)
5 blinks = overvoltage
6 blinks = safety edge wiring failure

PARAMETER LIST EM-337-PLI v1.3 (default in brackets)

1 Motor output regulation 10-30V / 0-30 (0)
0-9 = regulation disabled
2 Overvoltage 15-40V / 15-40 (35)
3 PWM frequency 1=2kHz , 2=16khz (1)
4 Motor pulse logic 1=PNP , 2=NPN (2)
5 Control mode (1)
1=continuous (run as long as command is active)
2=impulse (short command starts run)
3=impulse-2 (impulse, direction change without stop)
6 INPUT-1 (pin 26) function options (1)
1 stop (disable)
2 speed 2 activation
3 end limit fw direction
4 end limit fw direction inverted
7 INPUT-2 (pin 23) input function options (2)
1 safety switch input with opening contact (N.C.)
2 safety switch input with closing contact (N.O.)
3 safety switch input with (N.O.) contact and line monitor
4 speed 2 activation
5 end limit bw direction
6 end limit bw direction inverted
8 Brake output activation (pin 19)
0= overvoltage / 1 = "run" indication
9 Motor Speed 20-100% / 20-100 (100)
10 Motor Speed-2 20-100%/20-100 (60)
11 Current limit FW 0.1-25A / 1-250 (50)
12 Current limit BW 0.1-25A / 1-250 (50)
13 Not in use
14 Not in use
15 Start ramp 0-2.5 / 0-25 (10)
16 Stop ramp 0-2.5 / 0-25 (10)
17 Difference limit 0-255 / 0-255 (50)
0=difference limit disabled
18 Safety reverse option 3x 1-10s / 0-30 (0)
0= disabled
1=1-10s reversing time both dir.
2=11-20 reversing time 1-10s. only REV. dir
3=21-30 reversing time 1-10s only FW dir.
19 Load compensation 0-255 / 0-255 (0)
20 Syncronisation strength 1-30 / 1-30 (10)
21 REV. direction End stop 0-65000p (40)
22 FW. direction End stop 0-65000p (1000)
23 Slow down before REV end. 0-65000 (200)
24 Slow down before FW. end 0-65000 (200)
25 Serial line 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
26 Modbus address 1-247 (1)
27 Not in use
28 Not in use

HOMING CYCLE (position counter reset)

At the start of the use the pulse counters of the device has to reset. In some situations the device might lose the position infomation, for example when it's moved manually while the power is off. In the cases the position counter must matched again with homing routine. During homing the motors run at speed-2.

START THE HOMING CYCLE

The homing routine is activated with HOME input. Alternatively it can be started with 10 second simultaneously command with FW and BW inputs. After starting, the led on card start to blink and flut output also activated. Same time the motors starts to run in BW direction until they meet their end points. If only one motor reaches mechanical end, then start homing routine again so many times that both motors reach mechanical end.

Notice ! don't stop the homing until led has stopped blinking.
Wait 2 second after last motor has stopped.

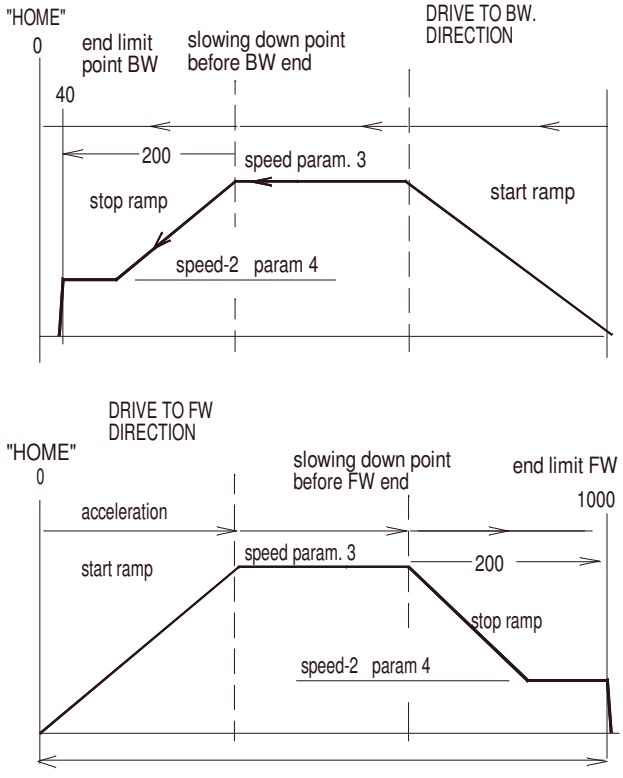
TROUBLESHOOTING AT HOMIMG

A: motor runs only for about a second or not at all: The device don't read pulses, pulse logic is wrong or current limit is too low.
- Check parameter 4 setting and also that supply voltage of sensors is correct.
- Pulse phasing is wrong, in that case the counting direction is also wrong. This can be corrected with swapping pulse wires.
- Check that mechanism is not stuck and you can also try to increase the current limit, parameter 12.

B: The homing works well but to the wrong direction. Swap the motor wires and also swap the pulse sensor wires.

END LIMITS

After succesful homing the device is ready for normal use. The settable end limits of this card are based on internal position counter. BW and FW direction stop points can be set, as well as slowing down points for both directions. At slowing down points motors will slow down to speed -2 until they reach end points. Pictures below show function in both directions. Default values of end limit and slowing down parameters are used in the pictures.



Full mechanical range of example application

START AND STOP RAMPS

Ramps have smooth start and speed changing available. These are set with parameters 15 and 16.

CURRENT LIMIT (torque limit)

Both motors have their own current limit measuring, if current of either motor exceeds the current limit, then both motors will shut down. Overcurrent shut down is disabled during start ramp, but the current limitation is always active and it protects against overtorque. Current can be set separately for FW and BW directions with parameters 11 and 12.

PWM FREQUENCY

Driver has two options for pwm frequency, 2 or 16kHz. The 2kHz power stage has lower losses and it can give more output current. But 2kHz can also generate a whistling sound, this can be avoided by selecting 16kHz frequency.

SPEED

Driver has two speed setting parameters, 9 and 10.
The parameter gives proportional value of supply voltage, but if motor output regulating is active, then it gives proportional value of parameter 1.
Speed-1 is normally in use. Speed-2 is enabled in homing and in slowing down area when approaching end point.
Speed-2 can also be enabled with input-1 or input -2 if particular function is selected with input options parameter.

MOTOR OUTPUT REGULATION (speed regulating)

This function limits maximum output voltage, but it also regulates motor output voltage in case that supply voltage drops. This offers better torgue at low speed (speed-2) with unregulated power. This function can be enabled and adjusted with parameter 1.

LOAD COMPENSATION (torque at low speed)

If the motor seems feeble when using a slow speed (speed-2) its endurance can be improved with compensation parameter 19. Slowly increase the parameter's value, for example by 10 units and make loading test. Repeat this until you get enough torque for low speed. However, setting a too high value will make the motor twitch.

SYNCHRO STRENGTH

Parameter 20 defines how strong synchronisation is between motor A and B. The bigger the value, stronger the sychronisation, which means that the motors follow each other better, but a too big value could generate twitching.

DIFFERENCE LIMIT (sync. lost shutdown)

Parameter 17 defines limit for position difference of motors A and B. If this value exceeds, then both motors shut down, but the start for opposite direction is still available.

SAFETY "REVERSE" FUNCTION

This function reverses motors automatically if one or both meets an obstacle. With parameter 18 the direction can be set when function is enabled, as well as how long the motor will reverse. This function triggers on from current limit or with safety switch command.

SAFETY SWITCH MONITORING (input-2)

Safety switch usually has a monitoring resistor, which is used to monitor the condition of safety switch wires. Input-2 has the possibility to monitor this line when "safety switch" option has been selected with parameter. R-bias has to be set same as resistor of safety switch. Line fault will be detected with fault output.