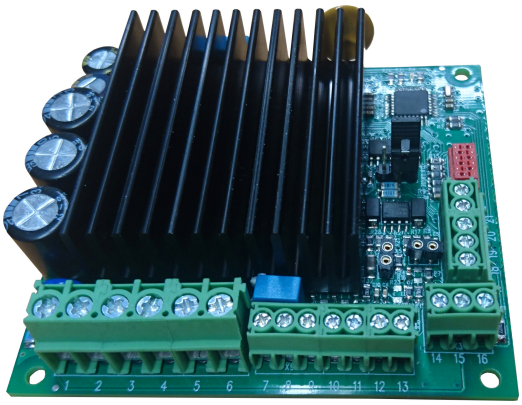
EM-339A-PLI PARALLEL DRIVER FOR TWO ACTUATORS or MOTORS 12/24Vdc 2x10A or 2x20Apeak, Rs -485

339Abr12 26.11.2020



FEATURES

- synchronized parallel driving
- operates with pulse feedback
- pulse counting PNP or NPN logic
- quadrature pulse counting
- current and temperature limit
- 2 or 16kHz pwm frequency
- acceleration and deceleration ramps
- stroke length limitation
- setting with serial interface
- brake (release) output
- safety switch input
- safety reverse function
- EM-339A is recommended as a substitute for EM-239 in new application
- EM-339A version has added Rs-485 bus
- version -A board needa A version firmvare

APPLICATIONS

- For Table lifter and Door and Hatch control
- Synchronous Actuator or Pilar control

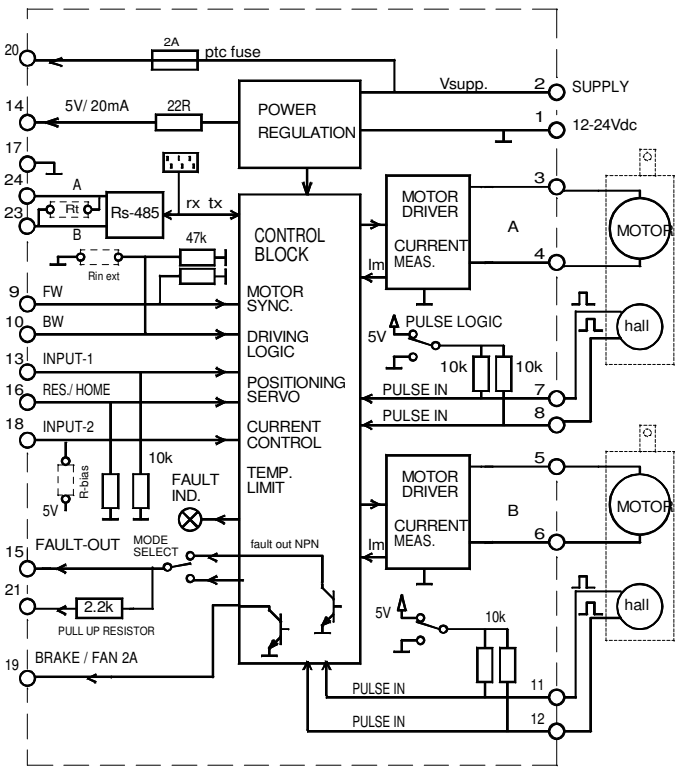
EM-339A-PLI is designed for driving two actuators in parallel. The drive is done as synchronized according actuators pulse feedback signal. The synchronization is achieved by adjusting actuator speed during drive. If the adjustment can not compensate the unbalance between actuators, the motors will be stopped. This way the mechanical stress and breakage can be avoided. Additively the driver includes current limit and power stage temperature limit.
Driver works with actuators that can offer pulse feedback signal. Pulses can be derived from Hall-sensors, reed or other kind of switches which generate 0 and 90° pulse chains. Driver can be set to read negative or positive pulses.
Driver power stage operates with PWM (pulse width modulation), that enables the high efficiency and low losses of power stage.
The basic control is done with FORWARD- and BACKWARD-commands. These command can be done in continuous or in impulse control mode. In continuous mode the drive is done as long the command is on. In impulse mode the command impulses start and stop the driving. INPUT-1 and INPUT-2 are multifunction inputs and can be set to work several different function, as STOP, DISABLE, SPEED-2, EMERG. STOP and END LIMITS. Driver has also support for SAFETY-SWITCH with line monitoring, and also with parameter can be set SAFETY REVERSE reversing time.
RES/HOME- input can be used for fault resetting or with long command starts HOME routine for resetting and balancing pulse counter. FAULT and BRAKE outputs can be also set to different function with parameters.
EM339A version has also possibility for Bus control with Rs-485 Modbus RTU, and this has own separate guide.

The parameters are set with a handy interface unit EM-236. There is also possibility to use EmenTool Lite PC-sofware with EM-268 and EmenTool App with smartphones for parameter setting.

TECHNICAL DATA (pcb 339A v2, prog. v1.2)

Supply voltage 12- 35Vdc (max. peak 40Vdc)
Undervoltage shut down 8V, start up 10V
Idle current 15mA
Motor output currents
2 x 10A cont. or 2 x 20A peak (at 25% duty and 2kHz)
2 x 6A cont. or 2 x 15A peak (at 25% duty and 16kHz)
PWM frequency 2kHz/ 16kHz
Current limit 1-25A
Temp. limit 120℃ (pow.stage)
Ramp times 0 - 2s
Pulse input freq. max. 700Hz/ input ch
Pulse inputs pull- up/down 10kohm.
Control inputs 0-1V = OFF / 4-30V = ON
Input impedances 47kohm.
Fault-output, pull down max. 100mA
Brake-output, pull down max. 2A
Brake res. recom. 22-47ohm 20W
Aux. voltage output 5V, max. 20mA
Bus Rs-485 half duplex, 9600bps
Dimensions 78 x 73 x 25mm
Operating temp. range -20 to 60℃
Weight of card 110g
CE Electromagnetic compatibility
EN-55022B and EN 61000-6-2/ -4-2...6

EM-339A BLOCK DIAGRAM



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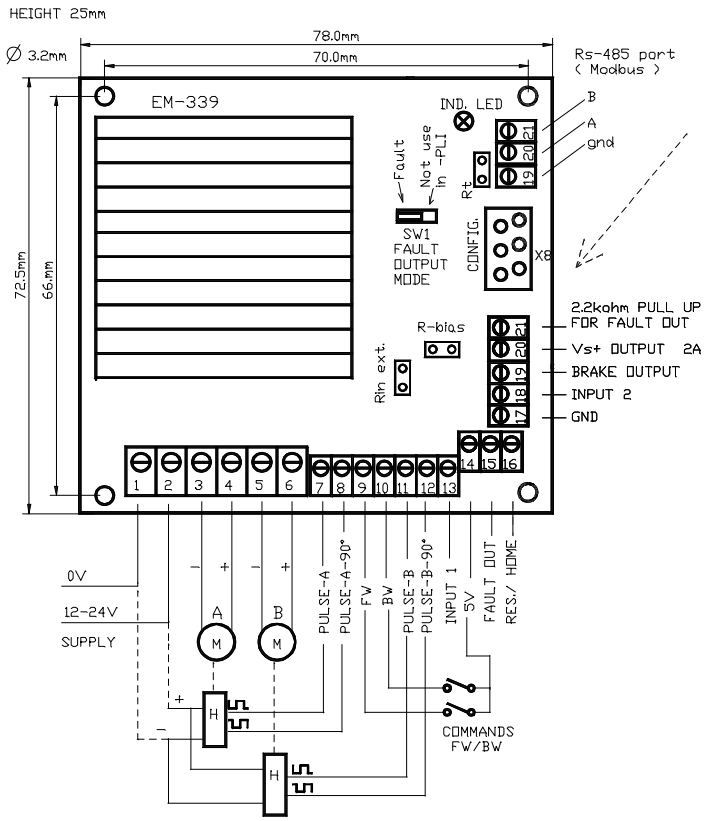
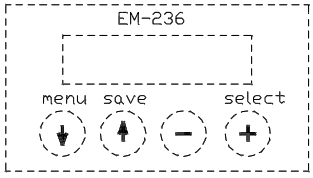
EM-339A PLI WIRING EXAMPLE





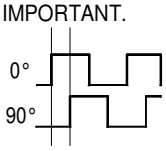
CONNECTION

In drawing above can be seen typical connection of card. Supply voltage can 12-35Vdc filtered so that ripple is less than 20%. Device has not inbuilt fuse, so use a external fuse, max value 40A

TERMINALS

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

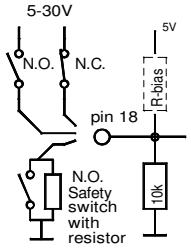
IMPORTANT.



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

FW and BW are PNP input for operating commands These starts running FW or BW direction

INPUT 1 is multifunction PNP input, which can be set with parameter 6



INPUT 2 is a multifunction input, which can be set with parameter 7. This input can be used also as line monitored safety switch input.
NOTICE ! safety-stop stops on when run FW direction

Beside examples about wiring options for input 2

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

FAULT OUTPUT is a normally open NPN output, this can also use as PNP output with connecting internal pull up resistor (link pin 20 and 21)
This output mode can be set with parameter 14
See also switch SW1 when set parameter 14

BRAKE OUTPUT is NPN 2A output for releasing magnetic brakes of motors or alternatively for switching on brake resistor in overvoltage situation where motor regenerating in slowing down.
The function of this output can be set with param. 8
The Mang. brake or brake resistor can be connect between terminal 19 and 20.

Rs-485 port
This halfduplex serial port, device can be work as Modbus RTU. Bus control has own instructions

PARAMETER SETTING AND MONITORING

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

PARAMETER LIST EM-339A-PLI v1.2(default in brackets)

1 Motor output regulation 10-50V / 10-50 (0)
0-9 = regulation disabled
10-50 = max motor voltage = param. value.
2 Overvoltage 15-60V / 15-60 (35)
Do not set higher than supply max. 35V
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 13) function options (1)
1 stop
2 speed 2 activation
3 end limit fw direction closing contact (N.O.)
4 end limit fw direction opening contact (N.C.)
5 disable
7 INPUT-2 (pin 18) 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 closing contact (N.O.)
6 end limit bw direction opening contact (N.C.)
7 disable
8 Brake output activation (pin 19) (0)
0= overvoltage
1= "run" indication, activated when motor run
2= "end" indication, activated when it has stopped at the "end limit"
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 Start kick options 0-255 (1)
0=start kick disabled
1= start kick after homing (100ms)
2 to 255 = start also after I-trip and the param. value defines start kick time as milliseconds
14 Fault output (pin15) modes 1-4 (see also switch SW1) (1)
1= output activates (= pull down) if fault detected
2= output shifting on/off, if homing or learning faults
3= output shifting on/off in phase with indication led
15 Start ramp 0-2.5 / 0-25 (10)
16 Stop ramp 0-2.5 / 0-25 (2)
17 Pulse Lost reaction time 0.01-1s / 1-100 (80)
18 Safety reverse option 3x 1-10s / 0-30 (0)
- 0= disabled
- 1-10s reversing time both dir.
- 11-20 reversing time 1-10s. only FW. dir
- 21-30 reversing time 1-10s only BW. dir.
19 Load compensation 0-255 / 0-255 (0)
20 Syncronisation strength 1-50 / 1-50 (15)
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)

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 current limit setting 0.1A/digit
5 motor A pulse counter value
6 motor B pulse counter value
7 operating voltagen 0.075V / digit
8 safety edge 0.05V/digit

INDICATION LED (number of blinks)

Continuous light = homing in progress
1 blink = homing failed or position corrupted
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
7 blinks = Bus time-out

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 mustmatched again with homing routine. During homing the motors run at speed-2. After the homing motor will start with "start-kick", which means short 0.1s with full drive, this to prevent motor jamming.

START THE HOMING CYCLE

The homing routine is activated with HOME input with 5s command or it can be started with 10 second simultaneously command with FW and BW inputs. After starting, the ind. led on card turn on and fault 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 turned off
keep command on until 2 second after motors has stopped.
Notice If fault out stay blinking then homing is failed - try again
Notice ! driver use "start kick" in first start after homing

TROUBLE SHOOTING AT HOMING

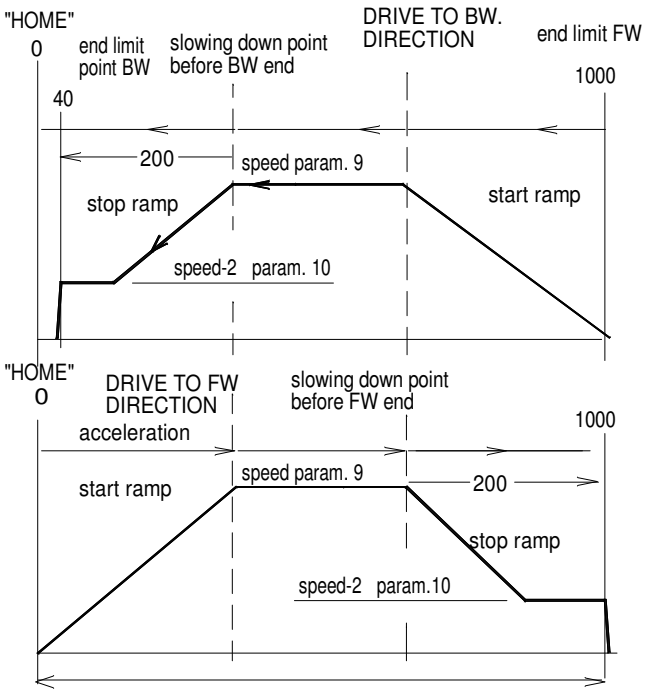
A: motor run only about second and ind. led blinking
- check parameter 4
- check pulse sensor voltage
- pulse sensor phasing wrong = wrong counting direction
swap the pulse wires
- motors run wrong direction = swap motor wires

B: motor not run at all:
-current limit is too low, check parameters 11 and 12
-motor or system is mechanically stuck

C: The homing works, but into the wrong direction, then swap the motor wires and also swap the pulse sensor wires.

FAULT RESET

Current limit and pulse lost faults can be reset with short command for RES/HOME input. or with new BW or FW command. Difference limit and homing fail errors need to reset by doing "homing" routine . Overvoltage and Overtemp. errors will be reset automatically when error situation disappear.



Full mechanical range of example application

END LIMITS

After the succesful homing the device is ready for normal use. The settable end limits of this card are based on internal position counter. There can be set BW and FW direction stop points and also slowing down points for both direction. At slowing down points motors will slowing down to speed -2.
Pictures above shows function both direction. In pictures has used default values of end limit and slowing down parameters.

MOTOR OUTPUT REGULATION (speed regulating)

This function regulates motor speed so that changes of supply voltage will not affect the motor speed. This is enabled and adjusted with parameter 1. For example, if supply voltage varies 25-32V, then you can set this parameter to value 24V. which means that motor output 100% =24V. If this function is disabled (param. <10) then 100% output is = supply voltage

OVERVOLTAGE (brake output)

NOTICE! don't set param 2 higher than supply voltage max. Overvoltage limit activated when overvoltage limit is exceed. The limit is set with param. 2. Brake output activated also if param. 8 is set = 0. If voltage rises 1V higher than limit then driver powerstage set to freewheel.

PWM FREQUENCY

Driver has two option for pwm frequency 2 or 16kHz, with 2kHz power stage has lower losses and it can give more output current. But 2kHz can also generate whistling voice, this can be avoided with selecting 16kHz frequency.

SPEED

Driver has two speed setting parameter 9 and 10.
The speed-1 is normally in use The speed-2 is enabled in homing, and in slowing down area when approaching end point. Speed-2 can be also enabled with input-1 or input -2 if particular function is selected with input options parameter

CURRENT LIMIT (torque limit)

Both motor has own current limit measuring, if current of another motor exceeds the current limit, then both motor will shut down. Overcurrent shut down is disabled during start ramp, but the current limitation is always active and it protecs against overtorque. Current can be set separately for FW and BW direction with parameter 11 and 12.

START AND STOP RAMPS

ramps smooths start and speed changing. These are set with parameter 15 and 16

PULSE LOST REACTION TIME

Parameter 17 defines delay time for pulse lost shutdown. If some of motors don't give pulses then all motors stopped Default value for reaction time is 0.5s

SAFETY "REVERSE" FUNCTION

This function reversing motors automatically if one or both meets obstacle. With parameter 18 can be set the direction when functionis enabled and also how long time motor reversing. This function trigs on from current limit or with safety switch command.
NOTICE ! safety switch inputs trigs this function only to when sytem run FW direction

LOAD COMPENSATION (torque at low speed)

If the motor seems weak 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 torque enough for low speed. However, setting a too high value will make the motor twitch.

SYNCHRO STRENGTH

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

DIFFERENCE LIMIT (unsynchronous. shutdown)

If position difference between motors increase over 50 counts, then both motors shutdown. Recovery from this situation need "homing"

SAFETY SWITCH MONITORING (input-2)

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