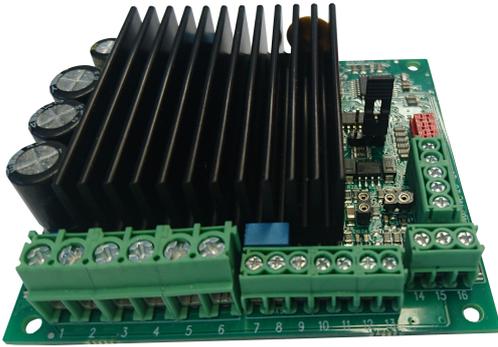


# EM-339-PLI PARALLEL DRIVER FOR TWO ACTUATORS or MOTORS

## 12/24Vdc 2x10A or 2x20Apeak

### FEATURES

- synchronized 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
- safety reverse function
- EM-339 is recommended as a substitute for EM-239 in new application
- For Table lifter and Door and Hatch control



EM-339-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.

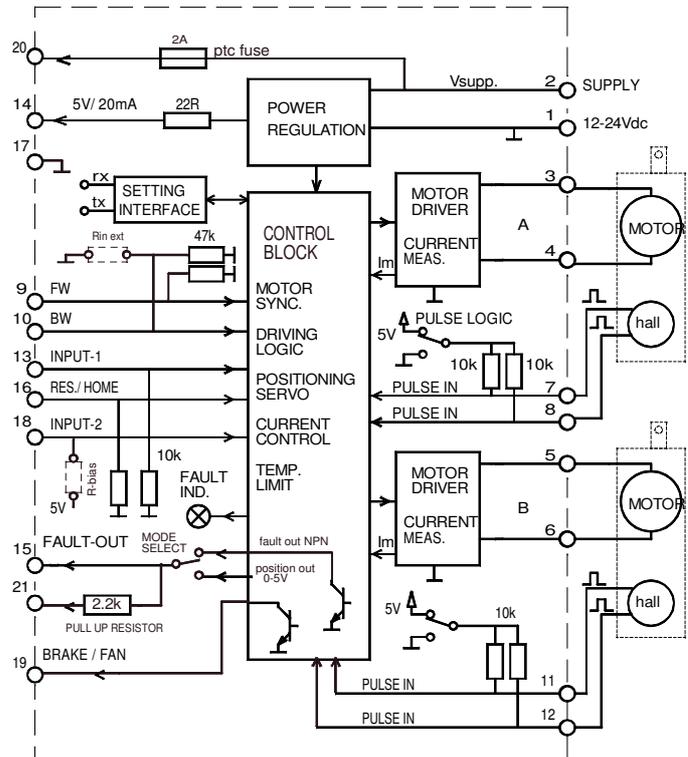
The basic control is done with FORWARD- and BACKWARD-commands. These command can be done in continuous or in impulse control mode. In continuous mode the drive is done as long the command is on. In impulse mode the command impulses start and stop the driving. INPUT-1 and INPUT-2 are multifunction inputs 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.

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

### TECHNICAL DATA ( pcb v1, prog v1.6)

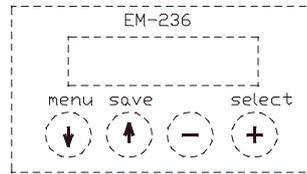
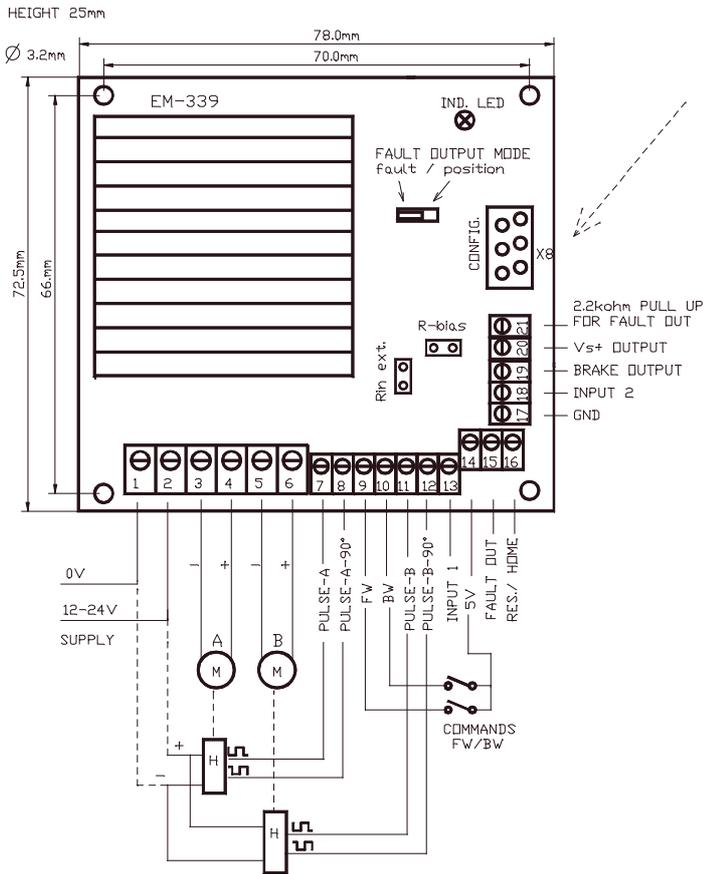
Supply voltage 12- 35Vdc  
 Quiescent current 15mA  
 Motor output currents  
 2 x 10A cont. or 2 x 20A ( at 25% duty and 2kHz)  
 2 x 6A cont. or 2 x 15A ( at 25% duty and 16kHz)  
 PWM frequency 2kHz/ 16kHz  
 Current limit 1-25A  
 Temp. limit 120°C ( pow.stage )  
 Ramp times 0 - 2s  
 Pulse input freq. max. 700Hz/ input ch  
 Pulse inputs pull- up/down 10kohm.  
 Control inputs 0-1V = OFF / 4-30V = ON  
 Input impedances 47kohm.  
 Analog control input 0-5V, 0-10V or 4...20mA  
 Input impedance 10kohm (or 250ohm at 4...20mA)  
 Fault-output, pull down max. 100mA  
 Brake-output, pull down max. 2A  
 Aux. voltage output 5V, max. 20mA  
 Measures 78 x 73 x 25mm  
 Operating temp. range -20 to 60°C  
 Weight of card 110g  
 CE Electromagnetic compatibility  
 EN-55022B and EN 61000-6-2/ -4-2...6

EM-339 BLOCK DIAGRAM



# EM-339 WIRING EXAMPLES

339pli16 26.2.19



## 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-339-PLI v1.6 (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 13 ) 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 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  
6 end limit bw direction inverted
- 8 Brake output activation ( pin 19 )  
0= over voltage / 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 Synchronisation 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 )

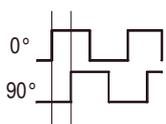
## CONNECTION

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 multifuntion PNP input, which can be set with parameter 6

INPUT 2 is multifuntion PNP input, which can be set with parameter 7. This input has also a line monitor possibility when safety stop switch option is selected, then R-bias has to install, R-bias should be same value as the resistor on safety switch

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

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

BRAKE OUTPUT is PNP 2A output for releasing magnetic brakes of motors or alternatively for switching brake resistor in overvoltage situation. The function of this output can be set with parameter 8

## 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 voltage 0.1V / digit
- 8 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

**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 information, for example when it's moved manually while the power is off. In the cases the position counter must be matched 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. 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.

Notice ! driver use "start kick" in first start after homing

**TROUBLESHOOTING AT HOME ROUTINE**

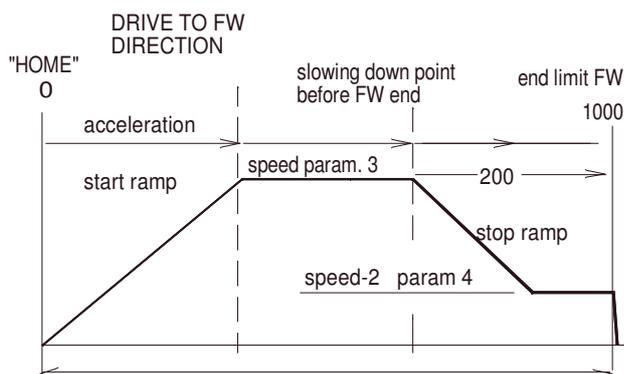
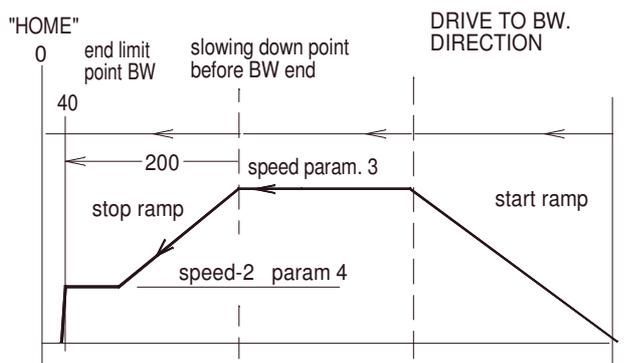
A: motor runs only for about a second or not at all: The device don't read pulses, pulse logic is wrong or current limit is too low.

- 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 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 until it reach end points. Pictures below shows function both direction. In pictures has used default values of end limit and slowing down parameters.



Full mechanical range of example application

**START AND STOP RAMPS**

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

**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 protects against overtorque. Current can be set separately for FW and BW direction with parameter 11 and 12.

**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 parameter gives proportional value of supply voltage or if motor output regulating is active, then it gives proportional value of parameter 1. 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

**MOTOR OUTPUT REGULATION ( speed regulating )**

This function limits maximum output voltage, but it also regulates motor output voltage in case when supply voltage drops, this offer better torque 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 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 synchronisation, which means that motors follow stronger to each other, but too big value could generate twitching.

**DIFFERENCE LIMIT ( unsynchronous. shutdown )**

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

**SAFETY "REVERSE" FUNCTION**

This function reversing motors automatically if one or both meets obstacle. With parameter 18 can be set the direction when function is enabled and also how long time motor reversing. This function trigs on from current limit or with safety switch command.

**SAFETY SWITCH MONITORING ( input-2 )**

Safety switch has usually monitoring 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.