

# PIglide Motion Controller for 1, 2, or 4 Axes

For Stages with Direct Drive, TCP/IP Interface



## A-81x

- 1, 2, & 4 motion axes
- Fully integrated closed-loop servo control, amplifier module, and power supplies
- For voice coil drives, DC motors, and brushless 3-phase motors
- Quiet PWM drives
- Encoder inputs support incremental (analog sine/cosine and RS-422) and absolute (BiSS-C, EnDat 2.1/2.2) encoder
- Output current up to 10 A continuous / 20 A peak per axis

#### Overview

The A-81x motion controller series from PI offers a fully integrated electronics solution with controller, servo drives, and power supplies in a compact 19-inch rack unit. The A-81x controllers are designed and optimized for the operation of air bearing PIglide linear and rotation stages with direct drive and other positioners from PI that are equipped with servo motors and high-resolution encoders.

Standard options include inputs for incremental and absolute encoders. Support for sine/cosine encoders has an integrated interpolation factor of up to 4096x. All controllers feature on-board flash memory for stored motion programs and parameters.

The A-81x controllers can be operated in stand-alone mode running stored programs, or controlled via an external PC. A PC is required for programming and startup. All software is supplied with the controller.

If the controller is purchased together with a PIglide air bearing stage or positioning system, PI will do the servo tuning, startup of the controller, and error calibration, and supply a complete ready-to-use positioning system.

The A-81x motion controller features the state-of-the-art ACS SPiiPlusEC motion controller and EtherCAT master.

#### **Options and Upgrades**

- Various encoder inputs. Custom configurations are required for mixing encoder types across channels.
- Various motor current output levels
- G-Code Programming
- Input shaping for an improved settling behavior and a decreased motion caused by reaction forces
- Additional control axes for external drives via EtherCAT (up to 64 axes)
- ServoBoost<sup>TM</sup> or ServoBoost<sup>TM</sup> PLUS for an improved position stability and a reduction of servo jitter
- Additional programming buffers for storing motion programs (up to 64 axes)



## Specifications

General specifications	A-81x
Controller type	ACS SpiiPlus EC controller and EtherCAT master for closed-loop servo control, parameter change during operation, synchronized multi-axis motion via native XSEG motion commands with advanced look-ahead and corner rounding algorithms. Dynamic error compensation functionality during multi-axis operation.
Servo frequency current control	20 kHz
Servo drive type	PWM
Motor types	Brushless 3-phase motor with sine commutation (default) Voice coil Brushed DC motor
Cooling	Fan on the side (continuous operation, constant speed)
Interlock / E-stop	1x 24 V DC sink, switches off the power supply of the motors when open
Connectors	Rear panel connectors D-sub for motor and signal connections IEC 60320 type C14 for power supply
Power supply	120 - 240 V AC, single phase, 50-60 Hz, 600 W
Output voltage	60 V DC (default) Possible factory setting: 48 V DC
Communication interfaces	Ethernet: TCP/IP (100/1000 Mbps), EtherNet/IP, Modbus/TCP
User software	ACS SPiiPlus MMI Application Studio Optional (separate licence required): ACS SpiiPlus SPC Smart Processing Commander
Command set	ACS SPiiPlus ACSPL+ command set Optional: G-Code
Application programming interfaces	Programming libraries for C/C++, COM, .NET Optional: MATLAB
Dimensions	482.6 mm (19'') × 453 mm (17.8'' = 2U) × 89 mm (3.5'')

Configurations	A-811.21xxx	A-812.21xxx	A-814.21xxx
Number of axes	1	2	4
Number of synchronized axes via $EtherCAT^{(1)}$	Up to 2	Up to 8	Up to 8
Control rate and EtherCAT clock rate	2 kHz <sup>(2)</sup>	5 kHz	5 kHz
User I/O (without limit switch) <sup>(3)</sup>	2 × digital input, 24 V DC sink (NPN) 2 × digital output, 24 V DC source (PNP) 1 × analog input, differential 12-bit 1 × analog output, differential 10-bit 2 × RS-422 5 V high-speed output for position trigger (PEG)	2 × digital input, 24 V DC sink (NPN) 2 × digital output, 24 V DC source (PNP) 1 × analog input, differential 12-bit 1 × analog output, differential 10-bit 2 × RS-422 5 V high-speed output for position trigger (PEG)	4 × digital input, 24 V DC sink (NPN) 4 × digital output, 24 V DC source (PNP) 2 × analog input, differential 12-bit 2 × analog output, differential 10-bit 4 × RS-422 5 V high-speed output for position trigger (PEG)
Motor brake output	2 × 24 V DC 1 A max. per channel, 1 A max. total	2 × 24 V DC 1 A max. per channel, 1 A max. total	4 x 24 V DC 1 A max. per channel, 1 A max. total
Regeneration clamp	50 W continuous, 800 W peak	-	-
Mass	8.5 kg	8.5 kg	9.3 kg



Configurations	A-81x.21Axx	A-81x.21Bxx	A-81x.21Cxx
Encoder type	Incremental	Absolute	Incremental
Signal type	Analog 1 V <sub>pp</sub> sine/cosine Differential 4 × up to 4096x interpolation (internal)	BiSS-C, EnDat 2.1/2.2 Serial data	RS-422 A/B quadrature, TTL Differential
Max. velocity encoder impulses	500 kHz	-	12.5 million lines/s 50 million quadcounts/s
Limit switch <sup>(3)</sup>	24 V DC sink (NPN) or open collector	-	24 V DC sink (NPN) or open collector or 5 V DC TTL source

Configurations	A-81x.21x10	A-81x.21x00	A-81x.21x02
Max. output current (per axis)	10 A continuous operation, 20 A peak <sup>(4)</sup>	5 A continuous operation, 10 A peak	2.5 A continuous operation, 5 A peak

<sup>(1)</sup> Upgrade option to up to 64 axes (separate licenses necessary)
<sup>(2)</sup> Upgrade to 5 kHz possible
<sup>(3)</sup> All single-ended, opto-isolated

(4) Values can only be reached with single axis variant
Additional servo drives can be controlled with the EtherCAT master of the A-81x. Contact PI for possible upgrade options.
The A-81x controllers support a dual-channel encoder feedback, the secondary feedback channel, however, uses an additional controller axis.



### Drawings / Images



A-81x, dimensions in mm

### **Ordering Information**

#### One axis

#### A-811.21A10

PIglide motion controller, 19" rack unit, one axis, incremental encoder with sin/cos signal transmission, Output current 10 A continuous / 20 A peak

#### A-811.21A00

PIglide motion controller, 19" rack unit, one axis, incremental encoder with sin/cos signal transmission, Output current 5 A continuous / 10 A peak

#### A-811.21A02

PIglide motion controller, 19" rack unit, one axis, incremental encoder with sin/cos signal transmission, Output current 2.5 A continuous / 5 A peak



#### A-811.21B10

PIglide motion controller, 19" rack unit, one axis, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 10 A continuous / 20 A peak

#### A-811.21B00

PIglide motion controller, 19" rack unit, one axis, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 5 A continuous / 10 A peak

#### A-811.21B02

PIglide motion controller, 19" rack unit, one axis, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 2.5 A continuous / 5 A peak

#### A-811.21C10

PIglide motion controller, 19" rack unit, one axis, incremental encoder with A/B quadrature signal transmission, Output current 10 A continuous / 20 A peak

#### A-811.21C00

PIglide motion controller, 19" rack unit, one axis, incremental encoder with A/B quadrature signal transmission, Output current 5 A continuous / 10 A peak

#### A-811.21C02

PIglide motion controller, 19" rack unit, one axis, incremental encoder with A/B quadrature signal transmission, Output current 2.5 A continuous / 5 A peak

#### Two axes

#### A-812.21A00

PIglide motion controller, 19" rack unit, two axes, incremental encoder with sin/cos signal transmission, Output current 5 A continuous / 10 A peak

#### A-812.21A02

PIglide motion controller, 19" rack unit, two axes, incremental encoder with sin/cos signal transmission, Output current 2.5 A continuous / 5 A peak

#### A-812.21B00

PIglide motion controller, 19" rack unit, two axes, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 5 A continuous / 10 A peak

#### A-812.21B02

PIglide motion controller, 19" rack unit, two axes, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 2.5 A continuous / 5 A peak

#### A-812.21C00

PIglide motion controller, 19" rack unit, two axes, incremental encoder with A/B quadrature signal transmission, Output current 5 A continuous / 10 A peak

#### A-812.21C02

PIglide motion controller, 19" rack unit, two axes, incremental encoder with A/B quadrature signal transmission, Output current 2.5 A continuous / 5 A peak

#### Four axes

#### A-814.21A00

PIglide motion controller, 19" rack unit, four axes, incremental encoder with sin/cos signal transmission, Output current 5 A continuous / 10 A peak

#### A-814.21A02

PIglide motion controller, 19" rack unit, four axes, incremental encoder with sin/cos signal transmission, Output current 2.5 A continuous / 5 A peak



#### A-814.21B00

PIglide motion controller, 19" rack unit, four axes, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 5 A continuous / 10 A peak

#### A-814.21B02

PIglide motion controller, 19" rack unit, four axes, absolute encoder with BiSS-C or EnDat 2.1/2.2 signal transmission, Output current 2.5 A continuous / 5 A peak

#### A-814.21C00

PIglide motion controller, 19" rack unit, four axes, incremental encoder with A/B quadrature signal transmission, Output current 5 A continuous / 10 A peak

#### A-814.21C02

PIglide motion controller, 19" rack unit, four axes, incremental encoder with A/B quadrature signal transmission, Output current 2.5 A continuous / 5 A peak

#### Upgrades (at factory or retrofitted)

#### A-810.SHP1

input shaping upgrade for ACS-based controller

A-810.GCD1 G-Code programming

#### A-810.SB1

ServoBoost<sup>™</sup> upgrade for ACS-based controllers (4 axes)

#### A-810.SBP1

ServoBoost<sup>™</sup> PLUS upgrade for ACS-based controller (ServoBoost<sup>™</sup> upgrade must have already been installed)

#### A-810.P4AX

Controller upgrade, 4 additional axes for ACS-based controllers

#### A-810.UPGD

Further factory default options (additional axes, customized programming, ...). Contact PI for further information.

#### Accessories (please order separately)

A-810.LCM1 ACS laser control module

#### A-810.LCM2

ACS laser control module with A/B quadrature option