

PIMag™ VC Linear Actuator

COST-EFFECTIVE WITH HIGH DYNAMICS



V-273

- Travel ranges to 20 mm
- Velocity to 250 mm/s
- Integrated linear encoder, 0.1 µm resolution
- Optional force sensor with 5 mN resolution
- Optional: Weight force compensation

OEM linear actuator

PIMag™ voice coil magnetic drive, high velocity and high dynamics. Low wear and high lifetime. Integrated linear encoder for reliable position control and repeatable accuracy. 10 kHz servo update rate. Optional force sensor for applying defined forces. Easy integration by coupling the guided load to the moving runner

C-413 digital PIMag™ motion controller for position and force control

2 channels (position control) or 1 channel (simultaneous position and force control). Controlled output current

up to 1.5 A at 24 V, 150 kHz. USB interface for sending commands, digital I/Os, SPI interface. Plug & Play: ID chip for reading stage parameters. Available as OEM board or bench-top device. PIMikroMove user software, compatible with PI General Command Set (GCS)

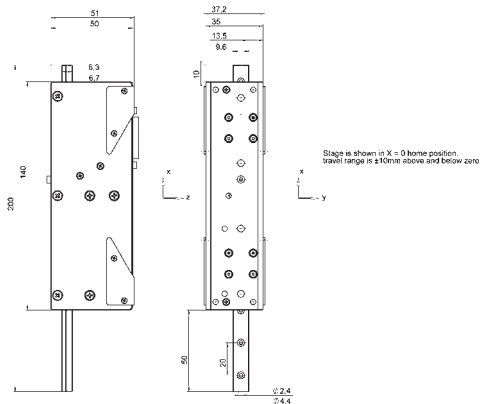
Fields of application

OEM drives in automation. For fast handling tasks and precision positioning in the micrometer range, micro-manipulation

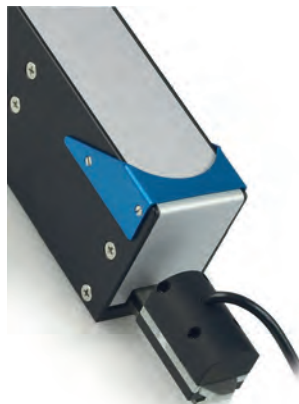
Preliminary data	V-273	Unit	Tolerance
Active axes	X		
Motion and positioning			
Travel range	20	mm	
Integrated sensor	Optical linear encoder		
Servo update rate	10*	kHz	
Open-loop resolution	10*	nm	typ.
Closed-loop resolution	100	nm	typ.
Linearity error, closed-loop	1	%	typ.
Repeatability	±500	nm	typ.
Straightness of travel	±20	µm	±5
Velocity, open-loop	250	mm/s	max.
Velocity, closed-loop	200	mm/s	
Mechanical properties			
Bearing / guiding	Linear guiding		
Moved mass	56 (59 with force sensor)	g	typ.
Drive properties			
Motor type	PIMag™ voice coil drive, moving coil		
Magnet material	N52 (NdFeB)		
Coil resistance	16	Ω	typ., at 20 °C
Coil inductance	6	mH	typ., at 20 °C
Time constant	0.375	ms	
Mutual inductance	8	Vs/m	
Force constant	8	N/A	typ.
Motor constant	2	N/W ^{1/2}	
Current constant	0.125	A/N	
Average continuous current	400**	mA	max.
Peak current (max. 3 s)	800	mA	
Average push / pull force	3	N	nominal
Power dissipation with 100 % duty cycle	2.25	W	
Maximum push / pull force	8	N	max.
Power dissipation with 10 % duty cycle	16	W	
Miscellaneous			
Operating temperature range	10 to 60	°C	
Material	Aluminum		
Mass	565	g	±5 %
Cable length	1	m	
Motor / sensor connection	Sub-D 15 (m)		
Lifetime	>10 ⁷	cycles	min.
Recommended controller	C-413		

* With C-413 controller.

** Allowable average value for continuous operation, not to be exceeded.



V-273, dimensions in mm



Optional force sensor on V-273

PIMag™ VC Vertical Linear Actuator

COMPACT WITH INTEGRATED POSITION SENSOR



V-900K PIC

- Travel range 1.5 mm
- High scanning frequencies, fast step-and-settle
- Integrated linear encoder, 0.1 μm resolution
- Wear-free flexure guiding for long lifetime
- Compact design

OEM linear actuator

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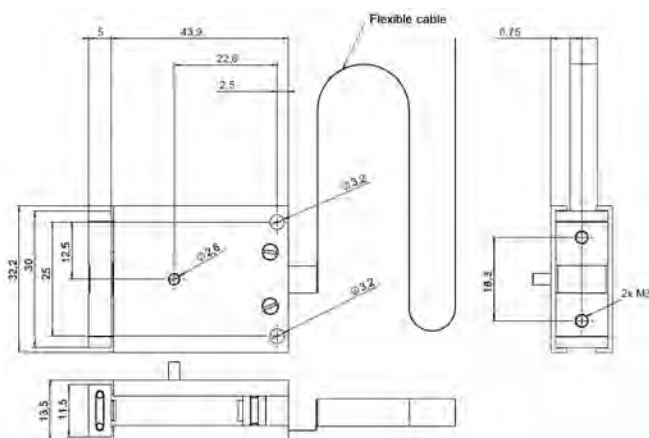
Fields of application

OEM drives in automation. For fast handling tasks and precision positioning in the micrometer range, micromanipulation

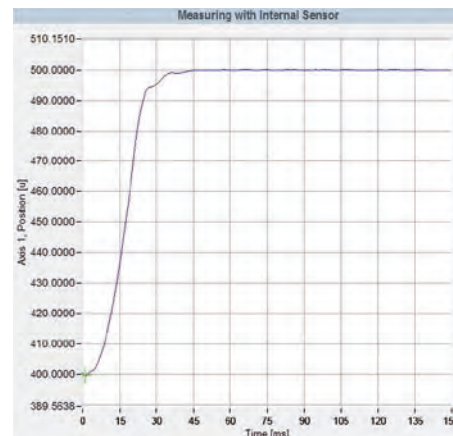
Preliminary data	V-900KPIC	Unit	Tolerance
Active axes	Z		
Motion and positioning			
Travel range	1.5	mm	
Integrated sensor	Optical linear encoder		
Servo update rate	10*	kHz	
Open-loop resolution	10*	nm	typ.
Closed-loop resolution	100	nm	typ.
Closed-loop linearity error	±1	%	typ.
Repeatability	±500	nm	typ.
Straightness of travel	±5	µm	±5
Maximum velocity, open-loop	250	mm/s	
Velocity, closed-loop	45	mm/s	
Mechanical properties			
Moved mass	10	g	typ.
Average push / pull force	0.5	N	nominal
Maximum push / pull force	0.8	N	max.
Force constant	4	N/A	typ.
Drive properties			
Motor type	PIMag™ voice coil drive		
Magnet material	NdFeB (N38SH)		
Coil resistance	8.8	Ω	typ.
Coil inductance	0.8	mH	typ.
Average continuous current	120**	mA	max.
Peak current (max. 3 s)	200	mA	
Miscellaneous			
Operating temperature range	10 to 45	°C	
Material	Aluminum		
Mass	40	g	±5 %
Cable length	0.2	m	
Motor / sensor connection	Molex 12-pin		
Lifetime	>10 ⁸	cycles	min.
Recommended controller	C-413 (plug adapter required)		

* With C-413 controller.

** Allowable average value for continuous operation, not to be exceeded.



V-900KPIC, dimensions in mm



The settling time for a 100 µm step is approx. 50 ms.

PIMag™ Motion Controller

CONTROL OF FORCE, POSITION AND VELOCITY



C-413

- + 2 motor channels
- + USB interface for sending commands and for configuration
- + Real-time SPI interface for sending commands
- + Digital in- and outputs
- + Optional analog inputs and outputs
- + Auto zero function for holding current
- + ID chip support
- + Extensive software support

Digital motion controller for PIMag™ Voice Coil drives

2 motor channels, 4 sensor channels. PID controller for force, position and velocity. Servo update rate selectable between 5 to 10 kHz

Force control

With the force control, PIMag™ actuators and stages can be operated at a defined holding and feed force. Force and position sensors are read and the sensor values are processed simultaneously. Thus it is possible to add a secondary position or velocity control loop to the force control. PI offers PIMag™ actuators with additional force sensor. The models C-413.20A / .2GA provide analog input sockets for external force sensors

Extensive functionality

Data recorder: Recording of operating data such as motor current, velocity, position or position error. Wave generator: Saves and outputs periodical motion profiles. Auto zero function defines holding current level at which the drive in open-loop operation outputs a force of 0 N, e.g. for compensating gravity. ID chip support: Identifies the connected stages and simplifies configuration and exchange of stages. Supports direction-sensing reference point switches. Extensive software support, e.g. for LabVIEW, dynamic libraries for Windows and Linux

Interfaces

USB 2.0, SPI for sending commands. Digital inputs and outputs for automation. Optional analog inputs and outputs, e.g. for sensors, for sending commands or for position feedback

Specifications

Preliminary data	C-413.20 / C-413.20A C-413.2G / C-413.2GA	Unit
Function	PIMag™ motion controller for voice coil drives, 2 channels C-413.20 / .20A: OEM board C-413.2G / .2GA: Device with case	
Motor channels	2	
Sensor channels	4	
Motion and control		
Servo characteristics	PID controller for force, position and velocity; parameter change on-the-fly	
Servo cycle time	100 µs to 200 µs, selectable in 4 steps	
Profile generator	Trapezoidal velocity profile, setting of maximum velocity and acceleration	
Encoder input	SPI sensor interface	
Reference point switches	4 × TTL, direction-sensing	
Electrical properties		
Max. output voltage	24	V
Max. output current	±1.5	A, closed-loop

Interface and operation	
Communication interfaces	USB 2.0, real time SPI
Motor connector	Sub- D 15- pin (f)
I/ O port	2 x analog inputs, -10 to 10 V, 16 bit, 1 kHz (only C-413.20A and C-413.2GA) 2 x analog outputs, -10 to 10 V, 17 bit, 1 kHz (only C-413.20A and C-413.2GA) 6 x digital outputs (open collector, voltage range 5 V to 24 V, 33 kΩ internal pull- up to 5 V) 4 x digital input (5 V TTL level, to 24 V max. input voltage, 10 kΩ input resistance)
Command set	PI General Command Set (GCS)
User software	PIMikroMove
Software drivers	LabVIEW driver, dynamic libraries for Windows and Linux
Supported functionality	Point- to- point motion; data recorder; wave generator; auto zero; ID chip detection
Miscellaneous	
Operating voltage	External power supply 24V, included in scope of delivery
Max. operating current	2 A
Operating temperature range	5 to 50 °C
Max. mass	0.3 kg
Dimensions	188 × 28 × 105 (C-413.2G / .2GA) 160 × 18 × 100 (C-413.20 / .20A)

Order Information

C-413.20

PIMag™ Motion Controller, 2 Channels, USB Interface, OEM Board, Force Control Option

C-413.20A

PIMag™ Motion Controller, 2 Channels, USB Interface, Analog Inputs, OEM Board, Force Control Option

C-413.2G

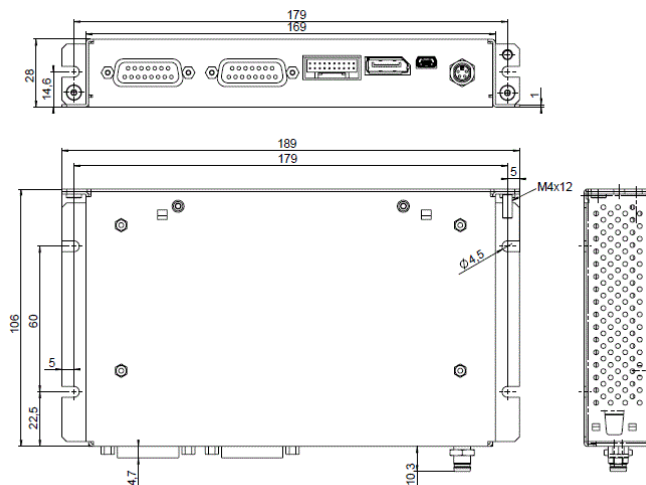
PIMag™ Motion Controller, 2 Channels, USB Interface, Bench- Top Device, Force Control Option

C-413.2GA

PIMag™ Motion Controller, 2 Channels, USB Interface, Analog Inputs, Bench- Top Device, Force Control Option

Ask about custom designs!

Drawings / Images



C-413 with case,
dimensions in mm