

Hexapod Motion Controller with EtherCAT

Control a 6-Axis Positioning System via Fieldbus Interface



C-887.53x

- Integration into an automation system
- Synchronous motion in 6 axes
- Cycle time ≥ 1 ms
- Commanding in Cartesian coordinates
- High-resolution analog inputs and motion stop as an option

Digital controller with EtherCAT fieldbus interface

Digital controller for hexapods (6-axis parallel kinematics). In addition, the motor drivers for two further single axes can be controlled. For operation in an EtherCAT network, a higher-level programmable logic controller (PLC) is required on the user side (EtherCAT master with CoE protocol). Operation without PLC is possible via TCP/IP or RS-232. The controller then corresponds to a C-887.52x in terms of functionality and is controlled with the GCS 2.0 command set.

Functions

The position is entered in Cartesian coordinates from which the controller calculates the control of the kinematics. To simplify integration of the hexapod, the coordinate systems (Work, Tool) can be changed. The pivot point can be freely defined. A data recorder can record operating data, e.g., motor control, velocity, position, or position error. The execution of macros and Python scripts on the controller enables stand-alone operation. The controller supports all currently available standard hexapods from PI and, in addition, customer-specific parallel kinematics.

Interfaces

EtherCAT fieldbus interface. TCP/IP for network-based control and maintenance. RS-232. USB port for manual control unit.

Additional interfaces (depending on version):

- High-resolution and extremely fast analog inputs which are ideal for fast alignment routines
- Connection for a motion stop button that activates/deactivates the 24 V output for the hexapod

Optional

- Control via manual control unit
- In case of restricted movement space: Collision check with PIVeriMove software. Executable as a simulation and directly on the controller

Software support (for control via GCS)

For example, PIMikroMove user software enables fast alignment routines to be depicted graphically. Extensive set of drivers, e.g., for use with NI LabVIEW, MATLAB, and Python. PIHexapodEmulator for virtual startup and operation without hardware.

Scope of delivery

The scope of delivery includes the controller, a software package, and a power adapter for the power supply. It is recommended to order the hexapod mechanics and a suitable cable set together with the controller so that the components can be adapted to each other. A PLC master controller is not included in the scope of delivery!

Basics			C-887.53	C-887.531	C-887.532	C-887.533
Axes/channels			6	6	6	6
Additional axes			2 single axes	2 single axes	2 single axes	2 single axes
Processor			Intel Atom dual core (1.8 GHz)	Intel Atom dual core (1.8 GHz)	Intel Atom dual core (1.8 GHz)	Intel Atom dual core (1.8 GHz)
Application-related functions			Controller macros GCS, Controller macros PIPython, Data recorder, Scan procedures, Startup macro	Controller macros GCS, Controller macros PIPython, Data recorder, Fast alignment, Scan procedures, Startup macro	Controller macros GCS, Controller macros PIPython, Data recorder, Scan procedures, Startup macro	Controller macros GCS, Controller macros PIPython, Data recorder, Fast alignment, Scan procedures, Startup macro
ID chip detection			ID chip 2.0	ID chip 2.0	ID chip 2.0	ID chip 2.0
Configuration management			reading the ID chip, manual parameter input	reading the ID chip, manual parameter input	reading the ID chip, manual parameter input	reading the ID chip, manual parameter input

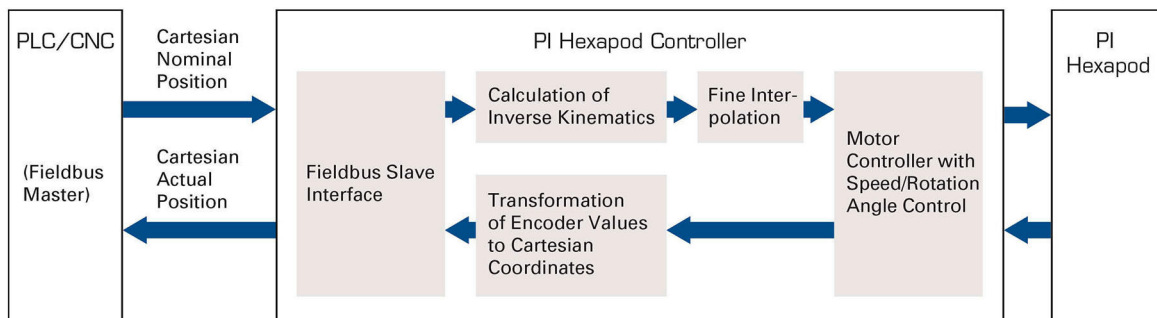
Motion and Servo Controller	Unit		C-887.53	C-887.531	C-887.532	C-887.533
Supported sensor signal			A/B quadrature, RS-422, BiSS-C	A/B quadrature, RS-422, BiSS-C	A/B quadrature, RS-422, BiSS-C	A/B quadrature, RS-422, BiSS-C
Closed-loop values			Position	Position	Position	Position
Maximum control frequency (servo cycle)	Hz		10000	10000	10000	10000
Motion types			Area scan routines, Wave generator, Gradient search routines, Point-to-point motion with profile generator, Cyclic transfer of target positions	Area scan routines, Wave generator, Gradient search routines, Point-to-point motion with profile generator, Cyclic transfer of target positions	Area scan routines, Wave generator, Gradient search routines, Point-to-point motion with profile generator, Cyclic transfer of target positions	Area scan routines, Wave generator, Gradient search routines, Point-to-point motion with profile generator, Cyclic transfer of target positions
Motion coordination			Coordinated multi-axis motion, User-defined coordinate systems, Work-and-tool coordinate systems	Coordinated multi-axis motion, User-defined coordinate systems, Work-and-tool coordinate systems	Coordinated multi-axis motion, User-defined coordinate systems, Work-and-tool coordinate systems	Coordinated multi-axis motion, User-defined coordinate systems, Work-and-tool coordinate systems
Reference switch input			TTL	TTL	TTL	TTL
Limit switch input			TTL	TTL	TTL	TTL

Interfaces and Operation			C-887.53	C-887.531	C-887.532	C-887.533
Communication interfaces			EtherCAT slave, RS-232, TCP/IP, USB (only for manual control units)	EtherCAT slave, RS-232, TCP/IP, USB (only for manual control units)	EtherCAT slave, RS-232, TCP/IP, USB (only for manual control units)	EtherCAT slave, RS-232, TCP/IP, USB (only for manual control units)
On/off switch			Hardware switch on/off	Hardware switch on/off	Hardware switch on/off	Hardware switch on/off
Display and indicators			Status LED, Error LED, Power LED, Macro LED	Status LED, Error LED, Power LED, Macro LED	Status LED, Error LED, Power LED, Macro LED	Status LED, Error LED, Power LED, Macro LED
Manual control(s)			Manual control unit with USB interface	Manual control unit with USB interface	Manual control unit with USB interface	Manual control unit with USB interface
Command set			GCS 2.0	GCS 2.0	GCS 2.0	GCS 2.0
User software			PIMikroMove	PIMikroMove	PIMikroMove	PIMikroMove
Software - APIs			MATLAB, NI LabView, Python	MATLAB, NI LabView, Python	MATLAB, NI LabView, Python	MATLAB, NI LabView, Python
Analog inputs			4	6	4	6
Analog input signal			4 x -10 to 10 V, 12 bit	2 x -5 to 5 V, 16 bit, 5 kHz bandwidth; 4 x -10 to 10 V, 12 bit	4 x -10 to 10 V, 12 bit	2 x -5 to 5 V, 16 bit, 5 kHz bandwidth; 4 x -10 to 10 V, 12 bit
Digital inputs			4	4	4	4
Digital input signal			TTL	TTL	TTL	TTL
Digital outputs			4	4	4	4
Digital output signal			TTL	TTL	TTL	TTL
Motion-dependent inputs and outputs			Digital trigger input, Digital trigger output, Analog sensor input	Digital trigger input, Digital trigger output, Analog sensor input	Digital trigger input, Digital trigger output, Analog sensor input	Digital trigger input, Digital trigger output, Analog sensor input
Industrial Ethernet protocol			EtherCAT	EtherCAT	EtherCAT	EtherCAT
EtherCAT device class			EtherCAT slave	EtherCAT slave	EtherCAT slave	EtherCAT slave
EtherCAT communication profile			CAN application protocol over EtherCAT (CoE)	CAN application protocol over EtherCAT (CoE)	CAN application protocol over EtherCAT (CoE)	CAN application protocol over EtherCAT (CoE)
Drive profile implemented for EtherCAT			CiA402 drive profile (IEC 61800-7-201)	CiA402 drive profile (IEC 61800-7-201)	CiA402 drive profile (IEC 61800-7-201)	CiA402 drive profile (IEC 61800-7-201)
Supported operating modes according to CiA402			Homing mode, Cyclic synchronous position mode (CSP), Safe basic state for activating coordinate systems (no mode changes / no mode selected)	Homing mode, Cyclic synchronous position mode (CSP), Safe basic state for activating coordinate systems (no mode changes / no mode selected)	Homing mode, Cyclic synchronous position mode (CSP), Safe basic state for activating coordinate systems (no mode changes / no mode selected)	Homing mode, Cyclic synchronous position mode (CSP), Safe basic state for activating coordinate systems (no mode changes / no mode selected)
EtherCAT synchronization modes			Distributed clocks (DC), Synchronous with SYNC0 event	Distributed clocks (DC), Synchronous with SYNC0 event	Distributed clocks (DC), Synchronous with SYNC0 event	Distributed clocks (DC), Synchronous with SYNC0 event
EtherCAT cycle time			≥1 ms	≥1 ms	≥1 ms	≥1 ms

Electrical Properties	Unit		C-887.53	C-887.531	C-887.532	C-887.533
Output voltage	V		24	24	24	24
Peak output current	mA		7000	7000	7000	7000

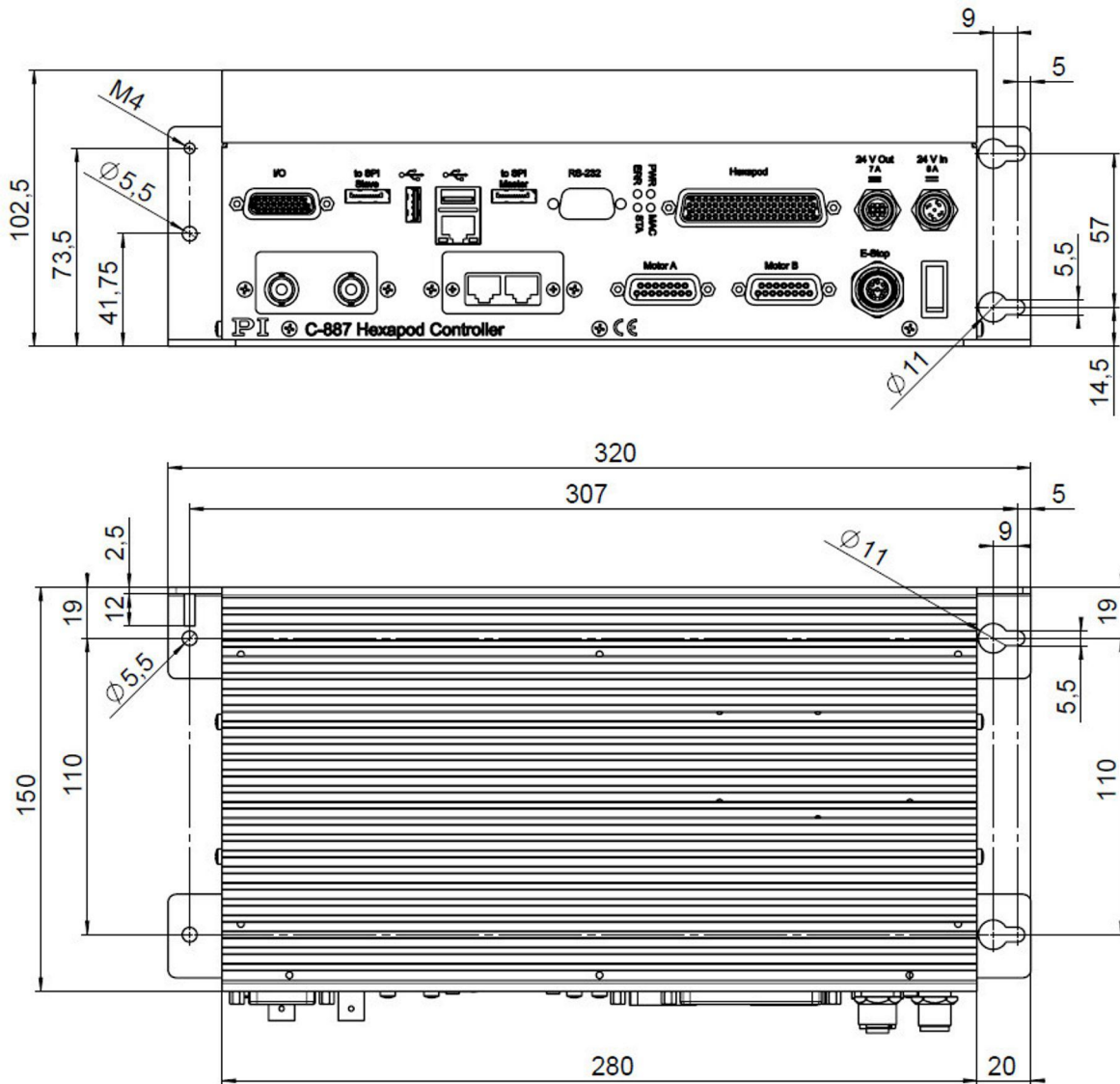
Miscellaneous	Unit		C-887.53	C-887.531	C-887.532	C-887.533
Connector hexapod power supply			M12 4-pole (f)	M12 4-pole (f)	M12 4-pole (f)	M12 4-pole (f)
Connector hexapod data transmission			HD D-sub 78 (f)	HD D-sub 78 (f)	HD D-sub 78 (f)	HD D-sub 78 (f)
Connector additional axes			D-sub 15 (f)	D-sub 15 (f)	D-sub 15 (f)	D-sub 15 (f)
Connector analog input			HD D-sub 26 (f)	BNC, HD D-sub 26 (f)	HD D-sub 26 (f)	BNC, HD D-sub 26 (f)
Connector digital input			HD D-sub 26 (f)	HD D-sub 26 (f)	HD D-sub 26 (f)	HD D-sub 26 (f)
Connector digital output			HD D-sub 26 (f)	HD D-sub 26 (f)	HD D-sub 26 (f)	HD D-sub 26 (f)
Connector TCP/IP			RJ45 socket, 8P8C	RJ45 socket, 8P8C	RJ45 socket, 8P8C	RJ45 socket, 8P8C
Connector RS-232			D-sub 9 (m)	D-sub 9 (m)	D-sub 9 (m)	D-sub 9 (m)
Connector EtherCAT			RJ45 socket, 8P8C	RJ45 socket, 8P8C	RJ45 socket, 8P8C	RJ45 socket, 8P8C
Connector for supply voltage			M12 4-pin (m)	M12 4-pin (m)	M12 4-pin (m)	M12 4-pin (m)
Operating voltage	V		24 (ext. power adapter included)	24 (ext. power adapter included)	24 (ext. power adapter included)	24 (ext. power adapter included)
Maximum current consumption	A		8	8	8	8
Operating temperature range	°C		5 to 40	5 to 40	5 to 40	5 to 40
Overall mass	g		2800	2800	2800	2800

Drawings / Images



Integration of the hexapod motion controller into an automation system

Drawings / Images



C-887.5xx, dimensions in mm. Version-dependent interfaces

Drawings / Images



Example configuration: H811.D2 miniature hexapod with C-887.532 motion controller with EtherCAT interface and motion stop. The EtherCAT master, here a Beckhoff controller, is provided and programmed by the customer.

Order Information

C-887.53

6-axis controller for hexapods, TCP/IP, RS-232, benchtop device, incl. control of two additional axes, EtherCAT® interface

C-887.531

6-axis controller for hexapods, TCP/IP, RS-232, benchtop device, incl. control of two additional axes, EtherCAT interface, analog inputs

C-887.532

6-axis controller for hexapods, TCP/IP, RS-232, benchtop device, incl. control of two additional axes, EtherCAT interface, motion stop

C-887.533

6-axis controller for hexapods, TCP/IP, RS-232, benchtop device, incl. control of two additional axes, EtherCAT® interface, motion stop, analog inputs