## Trajexia stand-alone

Trajexia motion controller

Stand-alone advanced motion controller over EtherCAT

- Perfect motion control of up to 64 axes. Scalability with EtherCAT masters for 4, 16 and 64 axes.
- Supports position, speed and torque control
- Multi-tasking controller capable of running up to 22 tasks simultaneously
- Advanced motion control such as linear, circular, helical or spherical interpolation, electronic cams and gearboxes via simple motion commands.
- Control of servos, inverters, vision systems and distributed I/Os over a single EtherCAT network
- Support for EtherNet/IP communications
- Advanced debugging tools including data trace and oscilloscope functions
- Open communication: Serial and EtherNet/IP built-in, PROFIBUS-DP, DeviceNet and CANopen

System configuration

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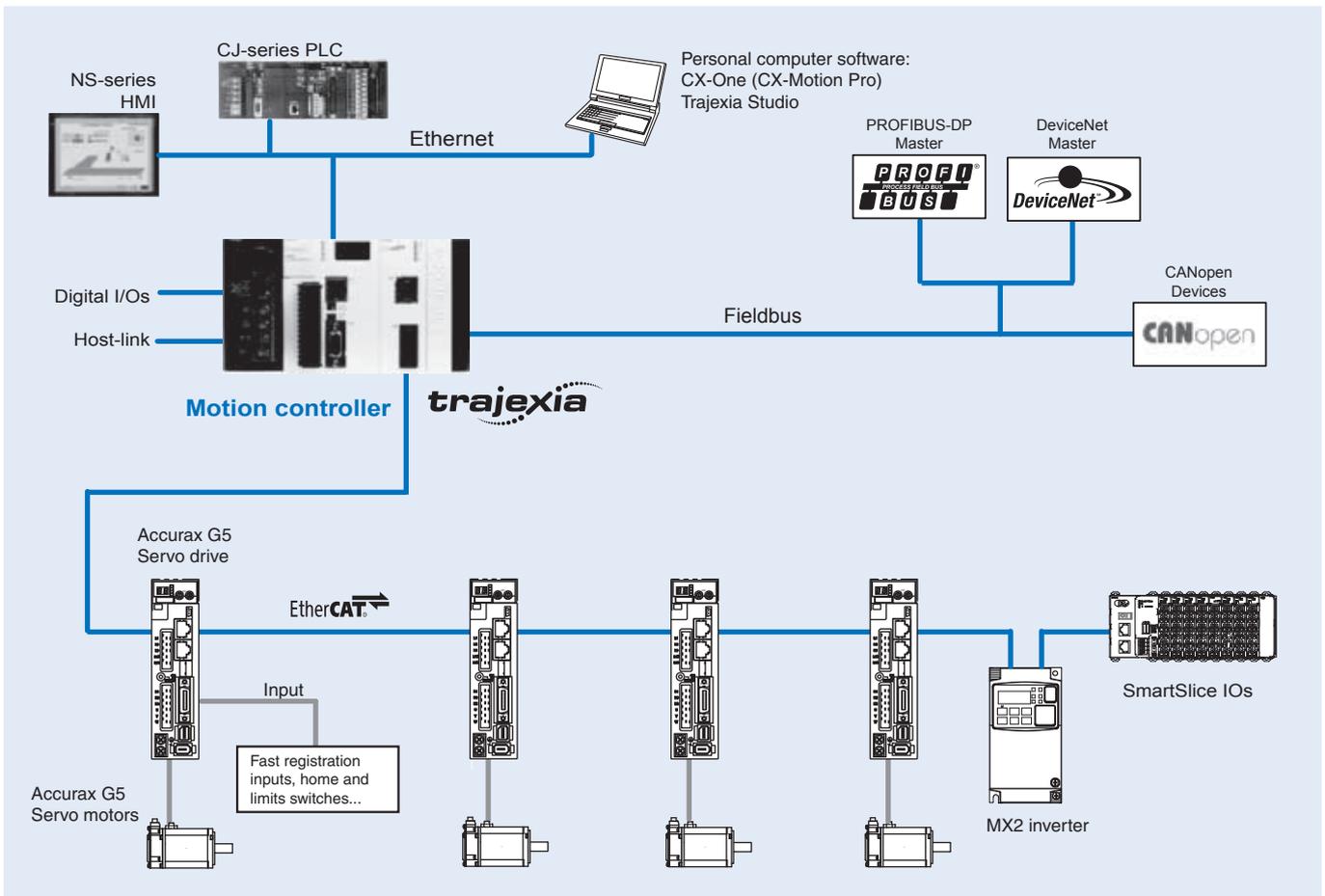
Specifications

Trajexia general specifications

Item	Details
Model	TJ□
Ambient operating temperature	0 to 55°C
Ambient operating humidity	10 to 90%RH
Ambient storage temperature	-20 to 70°C
Ambient storage humidity	90% max. (with no condensation)
Atmosphere	No corrosive gases
Vibration resistance	10 to 57 Hz: (0.075 mm amplitude) 57 to 100 Hz Acceleration: 9,8 m/s^2, in X, Y and Z directions for 80 minutes.
Shock resistance	143 m/s^2, 3 times each X, Y and Z directions.
Insulation resistance	20 MOhm
Dielectric strength	500 Volt
Protective structure	IP20
International standards	CE, EN 61131-2, cULus, Lloyds, RoHS compliant

Trajexia motion control units

Item		Details		
Model		TJ2-MC64	TJ1-MC16	TJ1-MC04
Number of axes		64	16	4 (+1 using TJ1-FL02 unit)
Number of inverters and I/O modules		Up to 64 (Inverters in position, speed or torque mode)	8 maximum (Inverters in position, speed or torque mode)	8 maximum (Max. 4 Inverters in position mode)
Motion bus	Number of EtherCAT master units[*1]	1 EtherCAT master is allowed per controller (see below TJ2-ECT64/ECT16/ECT04 for detailed info)	not supported	
	Number of ML2 master units	Up to 4 MECHATROLINK-II master units per controller (see below TJ1-ML16/ML04 for detailed info)		
Cycle time		Selectable 0.25 ms, 0.5 ms, 1 ms or 2 ms	Selectable 0.5 ms, 1 ms or 2 ms	
Programming language		BASIC-like motion language		
Multi-tasking		Up to 22 tasks running simultaneously	Up to 14 tasks running simultaneously	
Built-in digital I/O		16 inputs and 8 outputs, for general purpose		
Measurement units		User definable		
Available memory for user programs		8 MB	500 KB	
Data storage capacity		Up to 32 MB Flash data storage	Up to 2 MB Flash data storage	
Saving program data, motion controller		Flash-ROM	SRAM with battery backup and Flash-ROM	
Saving program data, personal computer		Via CX-Motion Pro/Trajexia Studio software		
Communication ports		1 Ethernet port and 2 serial ports		
Firmware update		Via CX-Motion Pro/Trajexia Studio software		
Ethernet port	Electrical characteristics	Conform to IEEE 802.3 (100BaseT)		
	Connector	RJ45 Ethernet connector		
	Transmission protocol	Modbus TCP slave		
		TELNET		
		FINS server and client		
		EtherNet/IP slave	not supported	
Serial port	Electrical characteristics	Conform 1 port to RS232C and 1 port to RS485/RS422A (selectable by switch)		
	Connector	SUB-D9 connector (Counterpart included in the package)		
	Synchronization	Start-stop synchronization (asynchronous)		
	Baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 bps		
	Transmission format	Databit length (7 or 8 bit)		
		Stop bit (1 or 2 bit)		
		Parity bit (Even/Odd/None)		
	Transmission mode	Point-to-multipoint (1:N)		
	Transmission protocol — RS-232C (1:1)	Host Link master protocol, Host Link slave protocol, ASCII general-purpose, Modbus RTU slave		
	Transmission protocol — RS-485 (1:N) RS-422A (1:N)	Host Link master protocol, Host Link slave protocol, ASCII general-purpose, Modbus RTU slave		
	Galvanic isolation	RS422A port		
	Communication buffers	254 bytes		
	Flow control	None		
	Terminator	Yes, selectable by switch		
	Cable length	15 m for RS232 and 500 meter for RS422/485		

*1. The EtherCAT master unit cannot be used in combination with a MECHATROLINK master unit when using TJ2-MC64 motion controller unit with firmware 2.0132.

Trajexia EtherCAT master units

Item	Specifications		
Model	TJ2-ECT64	TJ2-ECT16	TJ2-ECT04
Controlled devices with EtherCAT interface	Accurax G5 servo drive, MX2 inverter and SmartSlice IOs		
Electrical characteristics	Conform to Ethernet (IEEE 802.3), 100Base Tx		
Communications port	1 EtherCAT communication connector (to connect the EtherCAT twisted-pair cable)		
Transmission speed	100 Mbps		
Topology	Daisy chain, line or drop line		
Communications media	STP Category 5		
Communication cycle	0.5 ms, 1 ms or 2 ms		
Stations slave types[1]	Servo drives (axis)		
	Frequency inverters (axis)		
	I/O modules (devices)		
Number of axes per master / Cycle time[2]	Max.64 axes/2 ms	Max. 16 axes/2 ms	Max. 4 axes/2 ms
	Max.32 axes/1 ms	Max. 16 axes/1 ms	Max. 4 axes/1 ms
	Max. 16 axes/0.5 ms	Max. 16 axes/0.5 ms	Max. 4 axes/0.5 ms
Transmission distance	Up to 100 meters between nodes		
Auxiliary I/Os	8 fast registration inputs		

*1. The TJ2-MC64 CPU supports a total of 1024 digital I/O points and 36 analogue I/O points.
*2. The number of axes per master/ cycle time is currently (TJ2-MC64 motion controller with firmware 2.01.32) limited to:
   Max.32 axes @ 2 ms
   Max. 16 axes @ 1 ms
   Max. 8 axes @ 0.5 ms

Trajexia MECHATROLINK-II master units

Item	Specifications	
Model	TJ1-ML16	TJ1-ML04
Controlled devices with MECHATROLINK-II interface	Accurax G5, G-Series, MX2 inverter and SmartSlice IOs	
Electrical characteristics	Conforms to MECHATROLINK standard	
Communication ports	1 MECHATROLINK-II master	
Transmission speed	10 Mbps	
Communication cycle	0.5 ms, 1 ms or 2 ms	
Stations slave types	Axes or servo drives	
	Frequency inverters	
	I/O modules	
Number of stations per master / Cycle time	Max.16 Stations/2 ms	Max. 4 Stations/2 ms
	Max. 8 Stations/1 ms	Max. 4 Stations/1 ms
Transmission distance	Max. 50 meters without using repeater	

Trajexia PROFIBUS slave unit

Items	Specifications
Model	TJ1-PRT
PROFIBUS standard	Conforms to PROFIBUS-DP standard EN50170 (DP-V0)
Communication ports	1 PROFIBUS-DP slave
Transmission speed	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000 and 12000 kbps
Node numbers	0 to 99
I/O size	0 to 122 words (16 bit), configurable, for both directions
Galvanic isolation	Yes

Trajexia DeviceNet slave unit

Items	Specifications
Model	TJ1-DRT
DeviceNet standard	Conforms to DeviceNet standard of CIP edition 1
Communication ports	1 DeviceNet slave
Transmission speed	125, 250 and 500 Kbps, auto-detect
Node numbers	0 to 63
I/O size	0 to 32 words (16 bit), configurable, for both directions
Galvanic isolation	Yes

Trajexia CANopen unit

Items	Specifications
Model	TJ1-CORT
Electrical Characteristics	Conforms to CAN 2.0 B
Communication ports	1 CANopen
Transmission speed	20, 50, 125 and 500 Kbps
Implemented CiA Standards	DS301, DS302
PDO Support	8 TPDO and 8 RPDO
PDO Mapping	Each PDO can be mapped into TJ1-MC16/04 VR, table, analogue and digital IO. BASIC commands assign mapping and start address[1]
CANopen slave configuration	Any SDO message can be sent using BASIC during start-up and operation
CANopen network states	CANopen network can be set to pre-operational and operational using BASIC
CANopen slave emergencies	Available using BASIC command
Galvanic isolation	Yes

*1. The TJ1-MC16/04 CPUs support a total of 256 digital I/O points and 36 analogue I/O points. The TJ2-MC64 CPU supports a total of 1024 digital I/O points and 36 analogue I/O points.

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Trajexia flexible axis unit

Items	Specifications
Model	TJ1-FL02
Number of axes	2. Every axis has 1 analog output, 1 encoder in/out -software configurable - and several digital I/O
Control methods (independent per axis)	±10 V analogue output + encoder input (closed loop) Line driver AB output Stepper pulse output in closed loop or pulse train output in open loop
Encoder	Encoder protocols	Abs SSI 200 kHz, Abs EnDat 1 MHz, Abs Tamagawa and Incremental Line driver AB
	Encoder Input maximum frequency	6 MHz
	Encoder/pulse output max. frequency	2 MHz
Auxiliary I/Os	2 fast registration inputs, 2 definable inputs, 2 enable output, 4 position switch outputs or axes reset
Galvanic isolation	Yes

SmartSlice EtherCAT interface unit

Item	Specifications
Model	GRT1-ECT
Electrical characteristics	Conform to Ethernet (IEEE 802.3), 100Base-TX
Communication cycle	0.25 ms min.
Power supply	24 VDC
Number of connectable Slices	Up to 64 slices with a maximum amount of 128 bytes[1]
IO mapping	Automatic analogue and digital IO mapping into TJ2-MC64 CPU
Slice unit configuration	Not supported
Supported slice units	See ordering information section

[1]. The TJ2-MC64 CPU supports a total of 1024 digital I/O points and 36 analogue I/O points.

SmartSlice MECHATROLINK-II interface unit

| Item	Specifications
Model	GRT1-ML2
Electrical characteristics	Conform to MECHATROLINK standard
Communication cycle	0.5, 1 or 2 ms
Power supply	24 VDC
Number of connectable Slices	Up to 64 slices with a maximum amount of 128 bytes[1]
IO mapping	Automatic analogue and digital IO mapping into TJ1-MC16/04 and TJ2-MC64 CPUs
Slice unit configuration	Not supported
Supported slice units	See ordering information section

[1]. The TJ1-MC16/04 CPUs support a total of 256 digital I/O points and 36 analogue I/O points.
The TJ2-MC64 CPU supports a total of 1024 digital I/O points and 36 analogue I/O points.

Motion controllers

Nomenclature

Trajexia motion controller unit - TJ2-MC64, TJ1MC-16/04

LEDs

Battery compartment

Digital I/O connector

Display

Ethernet port

RS422A/RS485 switches

RS-232C and RS422A/485 serial ports
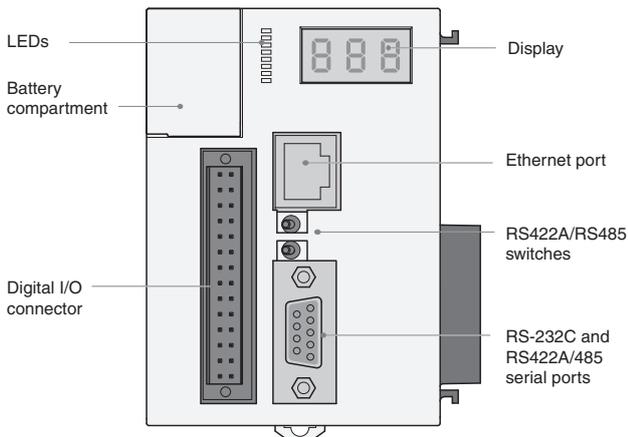
Trajexia EtherCAT master unit - TJ2-ECT04/16/64

ECT64
EtherCAT

CN1

CN2

Unit LEDs

EtherCAT master port

12-pin connector (Registration inputs)

Trajexia DeviceNet slave unit - TJ1-DRT

DRT
DeviceNet

RUN
ERC
ERH
NOK
NF

NODE x10

x1

CN1
V-
CAN L
DRAIN
CAN H
V+
DC24V
INPUT

Unit LEDs

Node selection
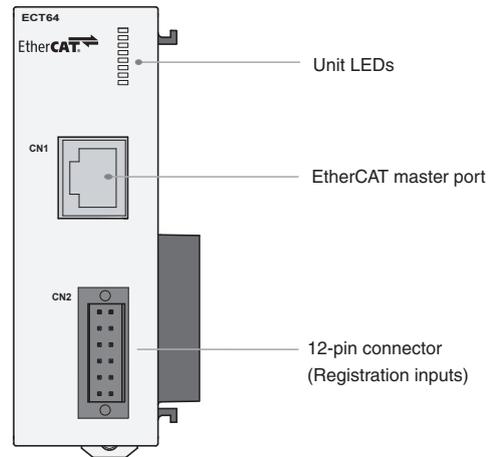
DeviceNet slave port
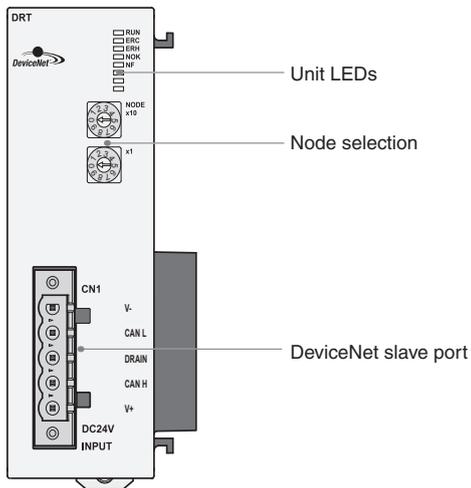
Trajexia MECHATROLINK-II master unit - TJ1-ML16/04

ML16

RUN
BF

CN1

Unit LEDs

MECHATROLINK-II master port
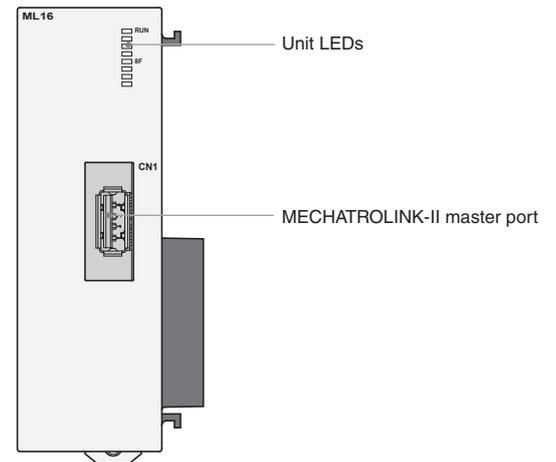
Trajexia PROFIBUS-DP unit - TJ1-PRT

PRT

RUN
ERC
ERH
COM
BF

NODE x10

x1

CN1

Unit LEDs

PROFIBUS node selection

PROFIBUS-DP slave port

Trajexia CANopen unit - TJ1-CORT

CORT

RUN
ERC
ERH
NOK
NF

NODE x10

x1

CN1
V-
CAN L
DRAIN
CAN H
V+
DC24V
INPUT

Unit LEDs

Node selection

CANopen port

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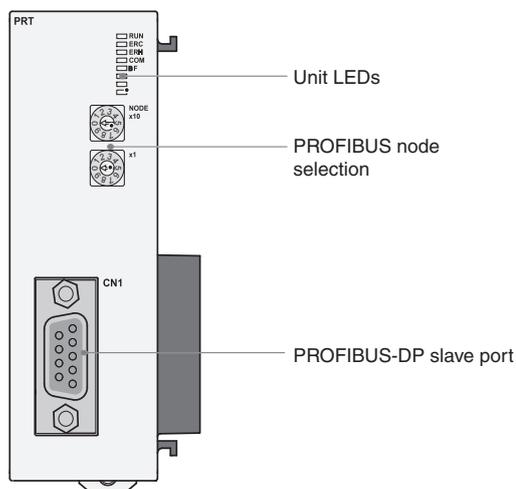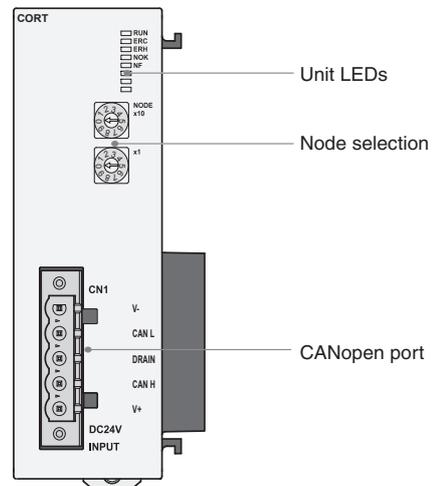
Trajexia Flex axis unit - TJ1-FL02

- Unit LEDs
- 15 pin connector (Encoders IN/Out)
- 18 pin connector (Digital and Analogue IOs)

SmartSlice EtherCAT interface unit - GRT1-ECT

- EtherCAT node selection
- Unit LEDs
- Link/activity LED IN port
- EtherCAT connector IN
- Unit dipswitches
- Link/activity LED OUT port
- EtherCAT connector OUT
- Unit power supply terminals
- I/O power supply terminals
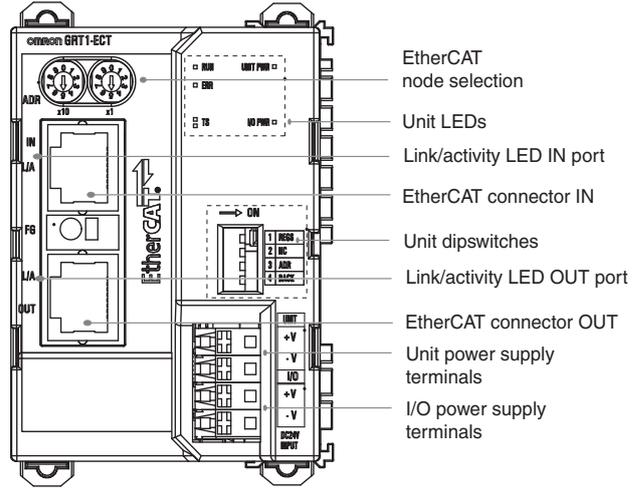
SmartSlice MECHATROLINK-II interf. unit - GRT1-ML2

- MECHATROLINK-II node selection
- Unit LEDs
- FG connector
- Slice-master switches
- ML connectors
- Unit power
- IO power
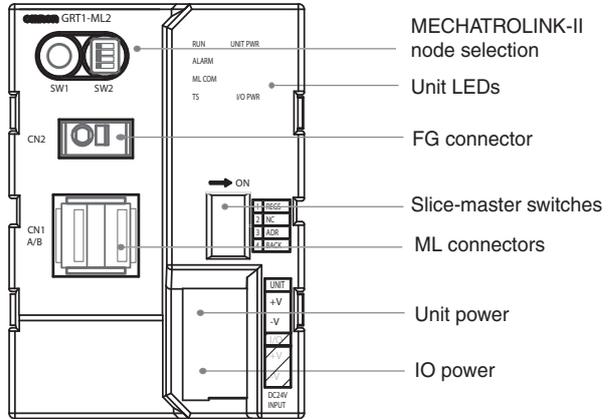
Dimensions

Trajexia motion controller - TJ2-MC64, TJ1-MC16/04
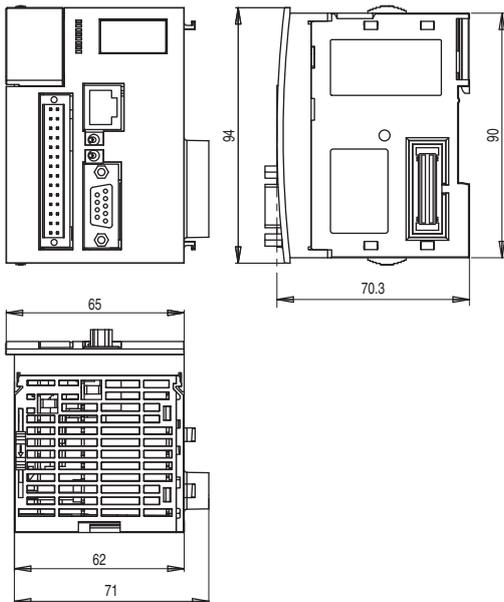

## Trajexia units - TJ1-ML16/04, -PRT, -DRT, -CORT, -FL02, TJ2-ECT64/16/04
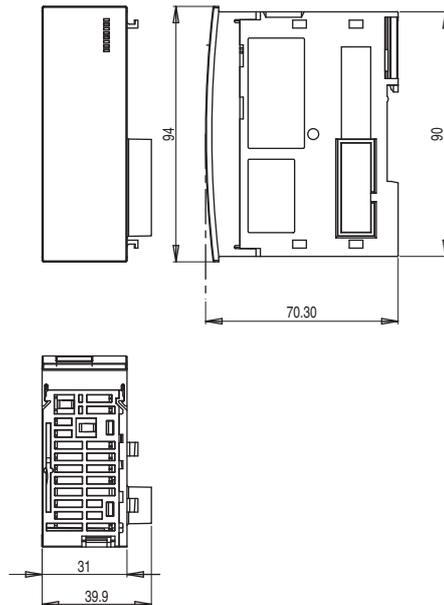
**Trajexia system - CJ1W-PA202 + TJ1-MC16 + one module + TJ1-TER**
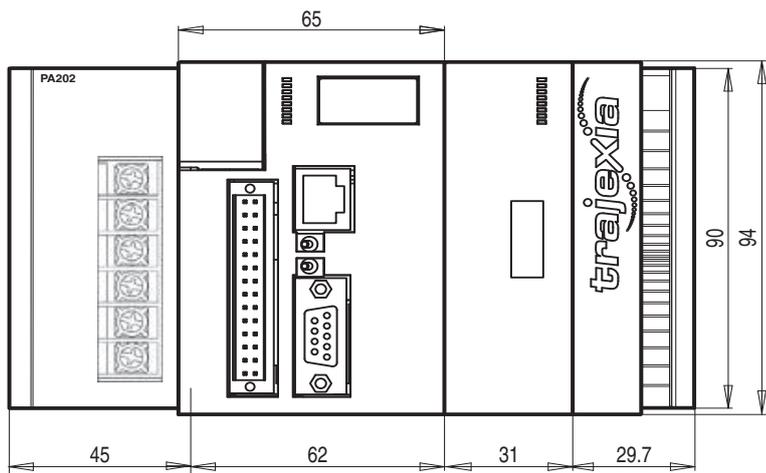
**SmartSlice interface unit - GRT1-ML2**


SmartSlice interface unit - GRT1-ECT
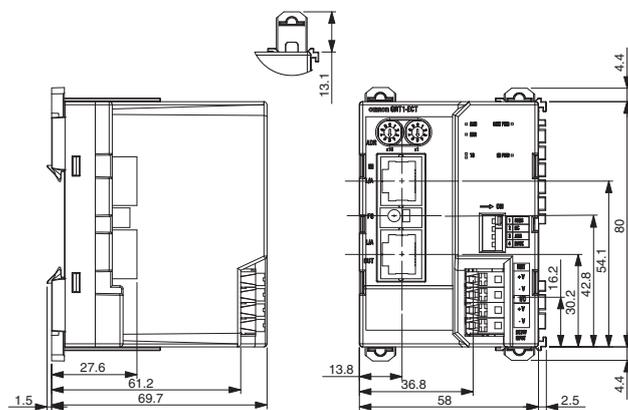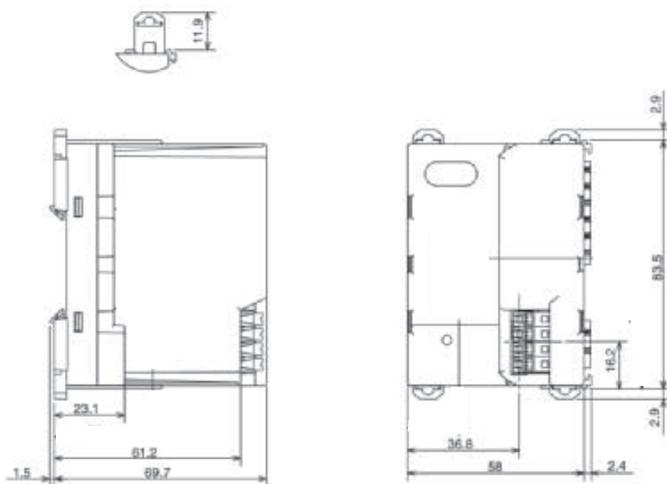
SmartSlice end unit - GRT1-END

SmartSlice I/O units - GRT1-_

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Ordering information

Power Supply | Motion controller | Axes control | Communication slave | End cover (Included into the Motion controller)
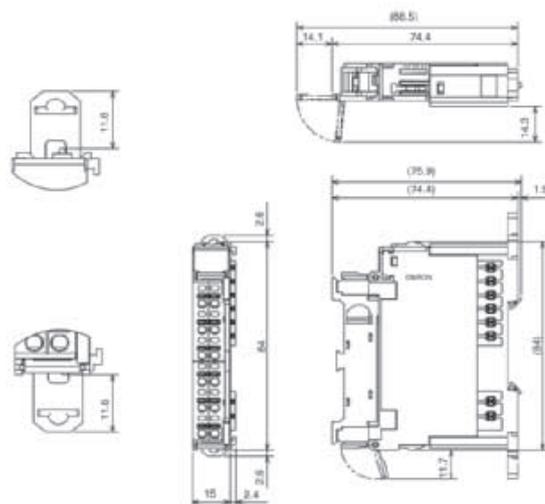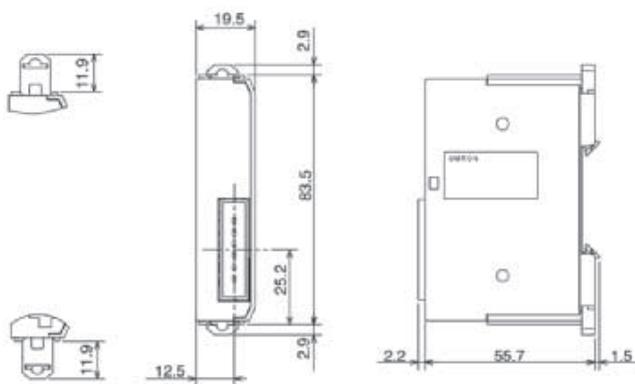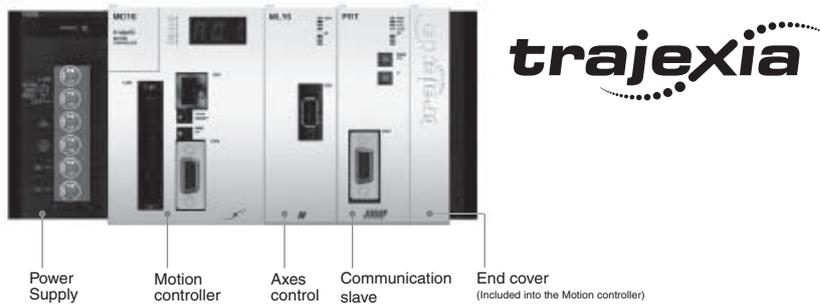
Trajexia motion controller

Name	Model
Trajexia motion controller Unit, up to 64 axes. (Trajexia end cover unit TJ1-TER is included)	TJ2-MC64
Trajexia motion controller unit, up to 16 axes. (Trajexia end cover unit TJ1-TER is included)	TJ1-MC16
Trajexia motion controller unit, up to 4 axes. (Trajexia end cover unit TJ1-TER is included)	TJ1-MC04
Power supply for Trajexia system, 100-240 VAC	CJ1W-PA202
Power supply for Trajexia system, 24 VDC	CJ1W-PD022

Trajexia - axes control modules

Name	Model
Trajexia EtherCAT master unit (up to 64 servo drives)[*1]	TJ2-ECT64
Trajexia EtherCAT master unit (up to 16 servo drives)	TJ2-ECT16
Trajexia EtherCAT master unit (up to 4 servo drives)	TJ2-ECT04
Trajexia MECHATROLINK-II master unit (up to 16 stations)	TJ1-ML16
Trajexia MECHATROLINK-II master unit (up to 4 stations)	TJ1-ML04
Trajexia flexible axis unit (for 2 stations)	TJ1-FL02

*1. The number of servo drives is currently limited to 32 when using TJ2-MC64 motion controller with firmware 2.0132.
Note: The TJ1-ML04 and TJ1-ML16 supported by the TJ2-MC64 motion controller are V2 (Version 2) and lot number equal or above Lot. No.091019 (YYMMDD).

Trajexia - communication modules

Name	Model
Trajexia DevicNet slave unit	TJ1-DRT
Trajexia PROFIBUS-DP slave unit	TJ1-PRT
Trajexia CANopen unit	TJ1-CORT

EtherCAT - related devices
Servo system & frequency inverters

Name		Model
Accurax G5 servo drive EtherCAT built-in		R88D-KN□□□-ECT
MX2 inverter with EtherCAT option board	Frequency inverter	3G3MX2-A□
	EtherCAT option board	3G3AX-MX2-ECT

Note: Refer to servo systems and frequency inverter sections for detailed specs and ordering information

SmartSlice IOs system

Function	Specification	Model
SmartSlice Interface unit	SmartSlice EtherCAT inteface unit	GRT1-ECT
End plate, one unit required per bus interface		GRT1-END
4 NPN inputs	24 VDC, 6 mA, 3-wire connection	GRT1-ID4
4 PNP inputs	24 VDC, 6 mA, 3-wire connection	GRT1-ID4-1
8 NPN inputs	24 VDC, 4 mA, 1-wire connection + 4xG	GRT1-ID8
8 PNP inputs	24 VDC, 4 mA, 1-wire connection + 4xV	GRT1-ID8-1
4 AC inputs	110 VAC, 2-wire connection	GRT1-IA4-1
4 AC inputs	230 VAC, 2-wire connection	GRT1-IA4-2
4 NPN outputs	24 VDC, 500 mA, 2-wire connection	GRT1-OD4
4 PNP outputs	24 VDC, 500 mA, 2-wire connection	GRT1-OD4-1
4 PNP outputs with short-circuit protection	24 VDC, 500 mA, 3-wire connection	GRT1-OD4G-1
4 PNP outputs with short-circuit protection	24 VDC, 2 A, 2-wire connection	GRT1-OD4G-3
8 NPN outputs	24 VDC, 500 mA, 1-wire connection + 4xV	GRT1-OD8
8 PNP outputs	24 VDC, 500 mA, 1-wire connection + 4xG	GRT1-OD8-1
8 PNP outputs with short-circuit protection	24 VDC, 500 mA, 1-wire connection + 4xG	GRT1-OD8G-1
2 relay outputs	240 VAC, 2 A, normally-open contacts	GRT1-ROS2
2 analogue inputs, current/voltage	±10 V, 0-10 V, 0-5 V, 1-5 V, 0-20 mA, 4-20 mA	GRT1-AD2
2 analogue outputs, voltage	± 10 V, 0-10 V, 0-5 V, 1-5 V	GRT1-DA2V
2 analogue outputs, current	0-20 mA, 4-20 mA	GRT1-DA2C
2 Pt100 inputs	Pt100, 2-wire or 3-wire connection	GRT1-TS2P
2 Pt1000 inputs	Pt1000, 2-wire or 3-wire connection	GRT1-TS2K
2 Thermocouple inputs	Types B, E, J , K, N, R, S, T, U, W, PL2, with cold junction compensation	GRT1-TS2T

Note: Refer to Automation systems catalogue for detailed specs and accesories information

GX-Series I/O Blocks

Name		Model
16 NPN inputs	24 VDC, 6 mA, 1-wire connection, expandable	GX-ID1611
16 PNP inputs	24 VDC, 6 mA, 1-wire connection, expandable	GX-ID1621
16 NPN outputs	24 VDC, 500 mA, 1-wire connection, expandable	GX-OD1611
16 PNP outputs	24 VDC, 500 mA, 1-wire connection, expandable	GX-OD1621
8 inputs and 8 outputs, NPN	24 VDC, 6 mA input, 500 mA output, 1-wire connection	GX-MD1611
8 inputs and 8 outputs, PNP	24 VDC, 6 mA input, 500 mA output, 1-wire connection	GX-MD1621
16 NPN inputs	24 VDC, 6 mA, 3-wire connection	GX-ID1612
16 PNP inputs	24 VDC, 6 mA, 3-wire connection	GX-ID1622
16 NPN outputs	24 VDC, 500 mA, 3-wire connection	GX-OD1612
16 PNP outputs	24 VDC, 500 mA, 3-wire connection	GX-OD1622
8 inputs and 8 outputs, NPN	24 VDC, 6 mA input, 500 mA output, 3-wire connection	GX-MD1612
8 inputs and 8 outputs, PNP	24 VDC, 6 mA input, 500 mA output, 3-wire connection	GX-MD1622
16 relay outputs	250 VAC, 2 A,1-wire connection, expandable	GX-OC1601
4 analogue inputs, current/voltage	±10 V, 0-10 V, 0-5 V, 1-5 V, 4-20 mA	GX-AD0471
2 analogue outputs, current/voltage	±10 V, 0-10 V, 0-5 V, 1-5 V, 4-20 mA	GX-DA0271
2 encoder open collector inputs	500 kHz Open collector input	GX-EC0211
2 encoder line-driver inputs	4 MHz Line driver input	GX-EC0241

Note: The GX-Series I/O blocks are only supported by the T2-MC64 motion controller and with official firmware release above 2.0132.

Vision system

Name	Specification	Model
Vision system with EtherCAT interface	NPN	FZM1-350-ECT
	PNP	FZM1-355-ECT
Smart camera with EtherCAT interface	NPN/ Color camera	FQ-MS120-ECT
	NPN/ Monocrome camera	FQ-MS120-M-ECT
	PNP/ Color camera	FQ-MS125-ECT
	PNP/ Monocrome camera	FQ-MS125-M-ECT

Note: The vision systems are only supported by the T2-MC64 motion controller and with official firmware release above 2.0132.

MECHATROLINK-II - related devices
Servo system & frequency inverters

Name		Model
Accurax G5 servo drive ML-II built-in		R88D-KN☐☐-ML2
G-Series servo drive ML-II built-in		R88D-GN☐☐H-ML2
MX2 inverter with MECHATROLINK-II option board	Frequency inverter	3G3MX2-A☐
	ML2 option board	3G3AX-MX2-MRT

Note: Refer to servo systems and frequency inverter sections for detailed specs and ordering information

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SmartSlice IOs system

Function	Specification	Model
SmartSlice Interface unit	SmartSlice MECHATROLINK-II inteface unit	GRT1-ML2[*1]
End plate, one unit required per bus interface		GRT1-END
4 NPN inputs	24 VDC, 6 mA, 3-wire connection	GRT1-ID4
4 PNP inputs	24 VDC, 6 mA, 3-wire connection	GRT1-ID4-1
8 NPN inputs	24 VDC, 4 mA, 1-wire connection + 4xG	GRT1-ID8
8 PNP inputs	24 VDC, 4 mA, 1-wire connection + 4xV	GRT1-ID8-1
4 AC inputs	110 VAC, 2-wire connection	GRT1-IA4-1
4 AC inputs	230 VAC, 2-wire connection	GRT1-IA4-2
4 NPN outputs	24 VDC, 500 mA, 2-wire connection	GRT1-OD4
4 PNP outputs	24 VDC, 500 mA, 2-wire connection	GRT1-OD4-1
4 PNP outputs with short-circuit protection	24 VDC, 500 mA, 3-wire connection	GRT1-OD4G-1
4 PNP outputs with short-circuit protection	24 VDC, 2 A, 2-wire connection	GRT1-OD4G-3
8 NPN outputs	24 VDC, 500 mA, 1-wire connection + 4xV	GRT1-OD8
8 PNP outputs	24 VDC, 500 mA, 1-wire connection + 4xG	GRT1-OD8-1
8 PNP outputs with short-circuit protection	24 VDC, 500 mA, 1-wire connection + 4xG	GRT1-OD8G-1
2 relay outputs	240 VAC, 2 A, normally-open contacts	GRT1-ROS2
2 analogue inputs, current/voltage	±10 V, 0-10 V, 0-5 V, 1-5 V, 0-20 mA, 4-20 mA	GRT1-AD2
2 analogue outputs, voltage	± 10 V, 0-10 V, 0-5 V, 1-5 V	GRT1-DA2V
2 analogue outputs, current	0-20 mA, 4-20 mA	GRT1-DA2C
2 Pt100 inputs	Pt100, 2-wire or 3-wire connection	GRT1-TS2P
2 Pt1000 inputs	Pt1000, 2-wire or 3-wire connection	GRT1-TS2K
2 Thermocouple inputs	Types B, E, J , K, N, R, S, T, U, W, PL2, with cold junction compensation	GRT1-TS2T

*1. The GRT1-ML2 supports the GRT1-IA4-1, GRT1-IA4-2, GRT1-OD4G-3, GRT1-TS2P, GRT1-TS2K and GRT1-TS2T slice units only in combination with TJ2-MC64 motion controller. They are not supported in combination with TJ1-MC16/04.

Refer to Automation systems catalogue for detailed specs and accesories information

MECHATROLINK-II cables

Name	Remarks	Model
MECHATROLINK-II cables	0.5 meter	JEPMC-W6003-A5
	1 meter	JEPMC-W6003-01
	3 meters	JEPMC-W6003-03
	5 meters	JEPMC-W6003-05
	10 meters	JEPMC-W6003-10
	20 meters	JEPMC-W6003-20
	30 meters	JEPMC-W6003-30
MECHATROLINK-II terminator	Terminating resistor	JEPMC-W6022
MECHATROLINK-II repeater	Network repeater	JEPMC-REP2000

Computer software

Specifications	Model
CX-Motion Pro V1.3.3 or higher	CX-One
Trajexia Studio[*1] V1.3.3 or higher	TJ1-Studio

*1. When the Trajexia Studio software is included in CX-One, then it is called CX-Motion Pro.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. I53E-EN-04   In the interest of product improvement, specifications are subject to change without notice.