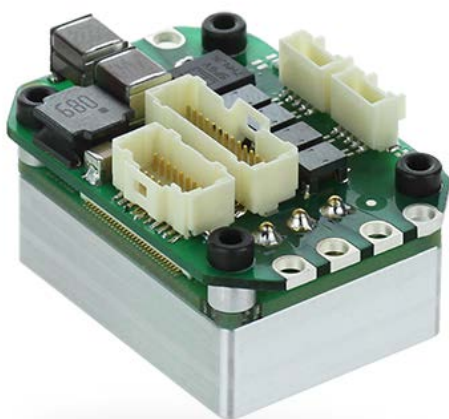


Everest XCR - Product Manual



Edition 10/15/2018

For the most up to date information visit the online manual.



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INGENIA
passion for motion

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2. General Information

2.1. Manual revision history

| Revision | Release Date | Changes | PDF |
|----------|--------------|--------------------|-----|
| v1 | | Preliminary draft. | |

For the most up to date information use the online Product Manual. The PDF manual is generated only after major changes.

Please refer to product hardware revisions for information on previous hardware revisions and changes.

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2.3. Contact

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3. Safety Information

3.1. About this manual

Read carefully this chapter to raise your awareness of potential risks and hazards when working with the Everest XCR Servo Drive.

To ensure maximum safety in operating the Everest XCR Servo Drive, it is essential to follow the procedures included in this guide. This information is provided to protect users and their working area when using the Everest XCR Servo Drive, as well as other hardware that may be connected to it. Please read this chapter carefully before starting the installation process.

3.2. Warnings

The following statements should be considered to avoid serious injury to those individuals performing the procedures and/or damage to the equipment:

- To prevent the formation of electric arcs, as well as dangers to personnel and electrical contacts, never connect/disconnect the Everest XCR Servo Drive while the power supply is on.
- Disconnect the Everest Servo Drive from all power sources before proceeding with any possible wiring change.
- After turning off the power and disconnecting the equipment power source, wait at least 10 seconds before touching any parts of the controller that are electrically charged or hot.

3.3. Precautions

The following statements should be considered to avoid serious injury to those individuals performing the procedures and/or damage to the equipment:

- The Everest Servo XCR Drive components temperature may exceed 100 °C during operation.
- Some components become electrically charged during and after operation.
- The power supply connected to this controller should comply with the parameters specified in this document.
- When connecting the Everest Servo XCR Drive to an approved power source, do so through a line that is separate from any possible dangerous voltages, using the necessary insulation in accordance with safety standards.
- High-performance motion control equipment can move rapidly with very high forces. Unexpected motion may occur especially during product commissioning. Keep clear of any operational machinery and never touch them while they are working.
- Do not make any connections to any internal circuitry. Only connections to designated connectors are allowed.
- All service and maintenance must be performed by qualified personnel.
- Before turning on the Everest Servo XCR Drive, check that all safety precautions have been followed, as well as the installation procedures.

4. Product Description

PRELIMINARY

Everest XCR is a compact, smart digital servo drive. Thanks to its small size and rugged design it can be mounted virtually anywhere: collaborative robot joints, wearable robots, unmanned ground or aerial vehicles as well as inside motors. The drive features best in class energy efficiency thanks to the latest GAN technology. At 30 A_{RMS} (42 A amplitude) 80 V_{DC} it generates just 20 W of total heat dissipation exceeding by far any comparable servo drive. The standby power losses of Everest XCR are minimal, even using EtherCAT, the **consumption is less than 2.5 W**. **Everest will save energy on your project and provide longer battery times.**

The control loops have sampling times that exceed the electrical and mechanical time constants of almost any motor. Up to 14 μs (75 kHz) current loop and 40 μs (25 kHz) position and velocity loops. The bandwidth of the control system will only be limited by the physical limits of the system and the feedback. Configurable digital filters offer extra flexibility. In addition, control algorithms can be programmed and executed real time on the drive. Power stage PWM frequency can be adapted to each application, with a minimum 10 kHz for low electrical noise and power losses and a maximum of 100 kHz for low inductance motors. Current gain can also be configured on 4 different ranges allowing the same drive and part number to be used for various motor sizes and thus simplifying stocking and complexity in your application.

The Everest XCR can close loops with a Digital Incremental Encoder, Dual BiSS-C encoder and Digital Halls. Everything can be easily configured with the new INGENIA MotionLab 3.

Everest XCR include compliant EtherCAT & CANopen communication. The drive can be accessed from a standard EtherNET port for configuration.

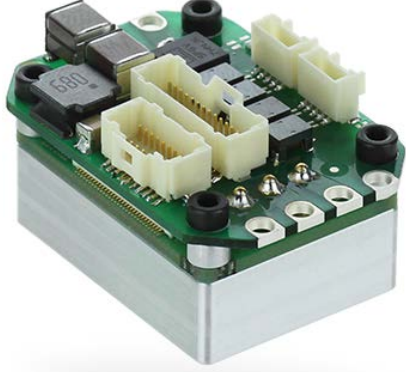
The Everest XCR can be operated with a single power supply on its full operating range and includes an additional logic supply up to 50 V. It includes 4 digital inputs and 4 digital outputs, a dedicated brake output, motor temperature sensing input and a 16 bit ±10 V analog input to interface with load cells and torque meters.

The driver has built-in safety torque off (STO) and includes several safety protections to protect against most issues like short-circuits, temperature and voltage based current foldback, overtemperature, overvoltage, and has industry grade EMC and ESD immunity.

PRELIMINARY

4.1. Everest XCR part numbering

Everest XCR is available on a single part number. Rated at 30 A_{RMS} continuous current and an operation voltage between 8 V_{DC} to 85 V_{DC}. Variable gain current sense amplifier and 16 bit ADC allow controlling low current motors.

| Product | Ordering part number | Status | Image |
|-------------|----------------------|-----------------|--|
| Everest XCR | EVE-30/100-XCR | PRE-PROD |  |

4.2. Specifications

A list of features of the Everest XCR Servo Drive is shown next. For further details, please check the Operational characteristics section below.

| Electrical and power specifications | |
|---|--|
| Minimum power supply voltage | 8 V _{DC} |
| Maximum absolute power supply voltage | 80 V _{DC} (continuous) 85 V _{DC} (peak 100 ms) |
| Recommended power supply voltage | 12 V _{DC} ~ 72 V _{DC} This voltage range ensures a safety margin including power supply tolerances and regulation. |
| Logic power supply voltage (optional) | 8 to 50 V _{DC} Providing the logic supply is optional, as the drive is supplied from the DC bus (single supply) on its full operating voltage range. |
| Nominal phase continuous current (BLDC mode) | 30 A _{RMS} |
| Nominal phase continuous current (DC mode) | 30 A _{DC} |
| Maximum phase peak current | 60 A _{RMS} @ 5 sec Active current limiting based on power stage and motor temperature. |

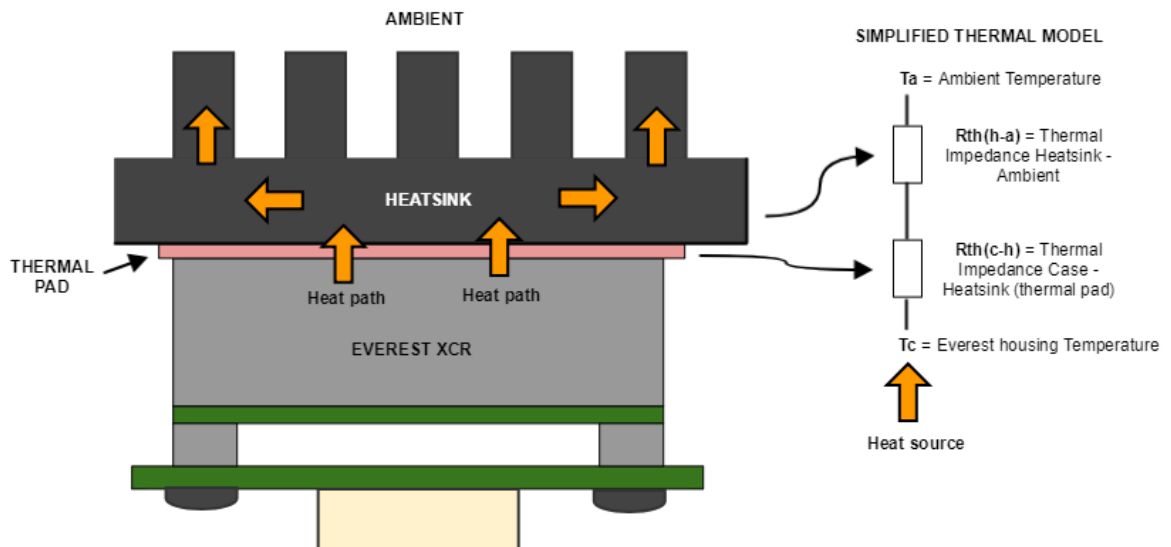
| | |
|---|--|
| Efficiency (at nominal conditions) | > 99% |
| Bus voltage utilization | > 96% |
| Motion control specifications | |
| Standby power | ≤ 2.5 W |
| Supported motor types | <ul style="list-style-type: none"> • Rotary brushless (sinusoidal commutation only) |
| Power stage PWM frequency | 10 kHz, 20 kHz, 50 kHz & 100 kHz user configurable |
| Current sensing | 16 bit ADC resolution. Accuracy is ± 1% full scale. Current gain is configurable in 4 ranges. |
| Current sense range (configurable 4 gain levels) | ±87.7A, ±47.7A, ±20.6A, ±13.8A |
| Current sense resolution (configurable) | 2.676 mA/count, 1.46 mA/count, 0.63 mA/count, 0.42 mA/count |
| Max. Current loop bandwidth | TBD |
| Feedbacks | <ul style="list-style-type: none"> • Digital Hall • Quad. Incremental encoder / BiSS-C • BiSS-C |
| Supported target sources | <ul style="list-style-type: none"> • Network communication |
| Control modes | Cyclic Synchronous Position, Cyclic Synchronous Velocity, Cyclic Synchronous Torque Profile Position, Profile Velocity, Profile Torque, Interpolated Position, Homing |
| Inputs/outputs and protections | |
| Inputs and outputs | <p>General purpose:</p> <ul style="list-style-type: none"> • 4 x non-isolated single-ended digital inputs - 5 V logic level. 3.3V ready. • 1 x non-isolated single-ended digital outputs - 5 V logic level (continuous short circuit capable with 470 Ω series resistance. • 1 x ±10V fully differential analog input 16 bit. Typ. for load cells and closing torque loop. <p>Dedicated:</p> <ul style="list-style-type: none"> • 1 x Motor temperature analog input (with 1.65 kΩ pullup to 3.3V) • 2 x isolated STO dedicated inputs. |

| | |
|--------------------------------------|---|
| Protections | <ul style="list-style-type: none"> • User configurable: <ul style="list-style-type: none"> • DC bus over-voltage • DC bus under-voltage • Drive over-temperature • Drive under-temperature • Over-current • Overload (I²t) • Short-circuit protections: <ul style="list-style-type: none"> • Phase to DC bus • Phase to phase • Phase to GND • Motor over-temperature • Motor under-temperature • Mechanical limits for homing functions • Hall sequence / combination error • Following error |
| Motor brake | <p>1 A 50 V Dedicated brake output. Open drain with re-circulation diode to +V_LOGIC.</p> <p style="text-align: center;">Brake enable and disable timing can be configured accurately. PWM modulation available to reduce brake voltage and power consumption.</p> |
| Communications for Operation | |
| EtherCAT | <p>CANopen over EtherCAT (CoE)</p> <p>File over EtherCAT (FoE)</p> <p>Ethernet over EtherCAT (EoE)</p> |
| CANopen (Software selectable) | <p>CiA-301, CiA-303, CiA-305, CiA-306 and CiA-402 (3.0) compliant</p> |
| Environmental conditions | |
| Cold plate | Yes |
| Cold plate temperature | <ul style="list-style-type: none"> • -40 °C to +85 °C full current • +85 °C to +95°C derated current <p>Storage:</p> <ul style="list-style-type: none"> ▪ -55 °C to +100 °C |
| Maximum humidity | 5% - 85% non-condensing |
| ESD and EMC immunity | <p>ESD immunity IEC 61000-4-2: ± 30 kV contact discharge , ± 30 kV air discharge</p> <p>EFT immunity IEC 61000-4-4: > 40 A</p> <p>Surge immunity: IEC 61000-4-5 IPPM > 8 A</p> |

| Mechanical specifications | |
|---------------------------|---|
| Dimensions | 42.1 mm x 29.1 mm x 23.1 mm Dimensions include mating connectors |
| Weight | TBD |
| Certifications | |
| Certification | CE, RoHS STO SIL3 (certification pending) |

4.3. Thermal specifications

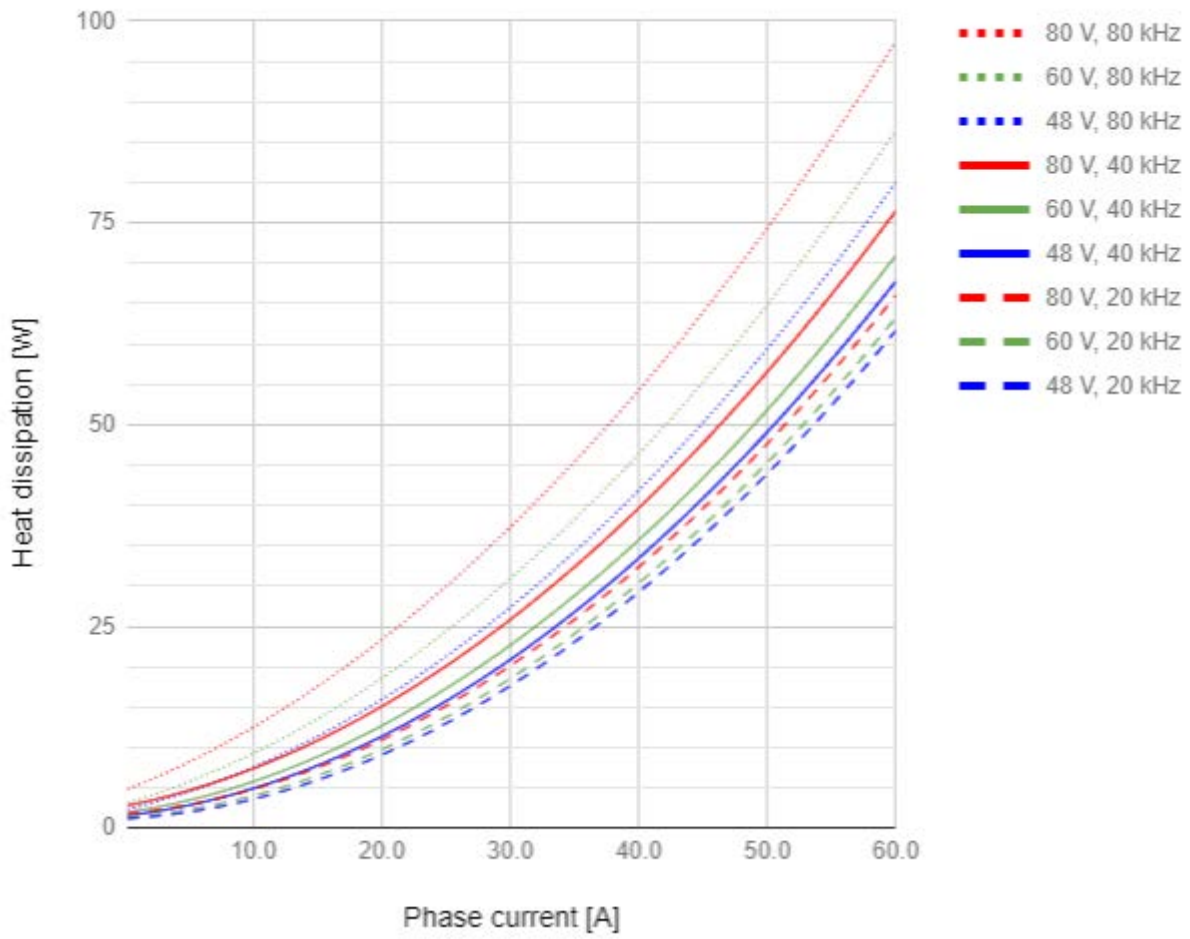
The following diagram depicts the general dissipation model and the equivalent thermal model.



To ensure a proper performance of Everest XCR, the **housing temperature must be held below 85 °C**. The following figures show how to calculate the required heatsink

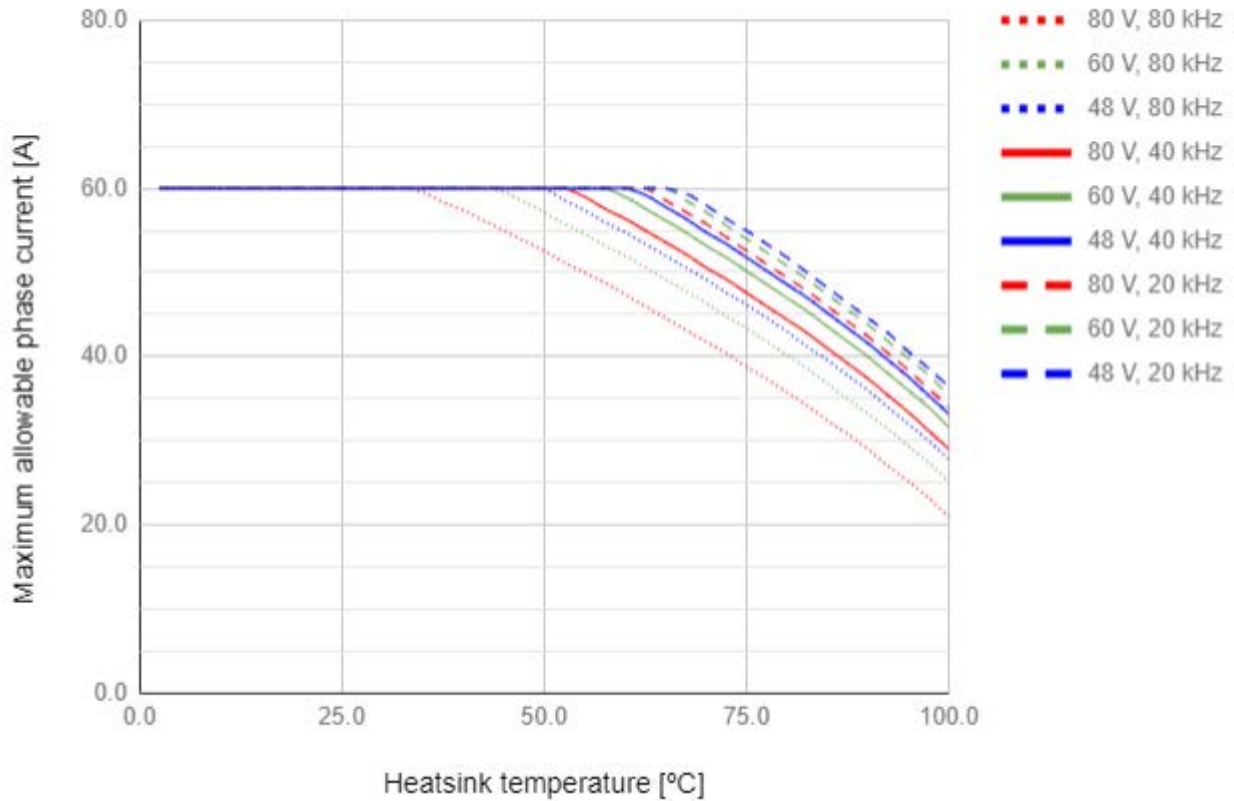
The following figure depict the power losses of Everest Core for different phase current values in RMS value. To obtain the equivalent current in amplitude, multiply by 1.41.

Total heat dissipation at various operation points



Note this is theoretical. The maximum heatsink temperature must be kept at 85°C.

Current derating based on heatsink temperature



For ensuring a good thermal coupling between Everest and the heatsink, a good quality thermal pad is required. For example, a thermal sheet **TGX-150-150-0.5-0**, which (for Everest XCR contact surface) has an estimated thermal impedance of **R_{th(c-h)} = 0.2 K/W**



Considering the previous parameters, the **maximum thermal impedance heatsink-to-air** required can be calculated as:

$$R_{th(h-a \text{ max})} = \frac{T_c - P \cdot R_{th(c-h)} - T_a}{P}$$

5. Connectors Guide

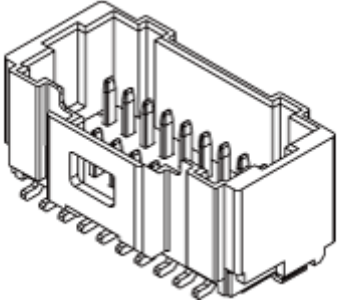
5.1. Supply

| P1 connector | | |
|---|---------------|-----------------------|
| 2.6 mm diameter gold plated solder pads or flying leads option. Pad pitch is 5.08 mm. | | |
| Pin | Signal | Function |
| 1 | POW_SUP | Power supply positive |
| 2 | GND_P | Power supply return |
| Notes | | |
| <p>Recommended section wire is 2.5 mm² ~ 5.3 mm², AWG 10 ~ AWG 13 for applications working at maximum current. Adapt the cable diameter to your current needs.</p> <p>It is recommended to use flexible silicone cables to ensure low mechanical stress to the board as well as high temperature ratings (≥ 110 °C). Diameter of the cable Jacket (insulator) should be less than 5.08 mm to prevent collision between wires.</p> | | |

5.2. Motor

| P2 connector | | |
|---|---------------|--|
| 2.6 mm diameter gold plated solder pads or flying leads option. Pad pitch is 5.08 mm. | | |
| Pin | Signal | Function |
| 1 | PH_A | Motor phase A |
| 2 | PH_B | Motor phase B |
| 3 | PH_C | Motor phase C |
| 4 | PE | Protective earth connection, internally connected to standoffs and drive cold plate. |
| Notes | | |
| <p>Recommended section wire is 2.5 mm² ~ 5.3 mm², AWG 10 ~ AWG 13.</p> <p>For long cables it is essential to use a shielding connected to protective earth at both ends of the cable.</p> | | |

5.3. Feedback connector

| J1 connector | | |
|---|---------------|--|
|  | | |
| 20 pins 2 row Pico-Clasp 1 mm pitch header. Molex 501190-2027 | | |
| Pin | Signal | Function |
| 1 | +5V_OUT | 5 V 200 mA total max. Short circuit protected. Pins 1, 9, 14 are internally connected. |
| 2 | GND_D | Digital signal ground |
| 3 | ENC_A+/DATA2+ | Differential digital encoder: A+ input Single ended digital encoder: A input Absolute encoder 2: Data + |
| 4 | ENC_B+ | Differential digital encoder: B+ input Single ended digital encoder: B input |
| 4 | ENC_A-/DATA2- | Differential digital encoder: A- input Single ended digital encoder: Leave unconnected Absolute encoder 2: Data - |
| 6 | ENC_B- | Differential digital encoder: B- input Single ended digital encoder: Leave unconnected |
| 7 | ENC_Z+/CLK+ | Differential digital encoder: Index+ input Single ended digital encoder: Index input Absolute encoder 2: Clock + |
| 8 | ENC_Z-/CLK- | Differential digital encoder: Index- input Single ended digital encoder: Leave unconnected Absolute encoder 2: Clock - |



| | | |
|----|---------|--|
| 9 | +5V_OUT | 5 V 200 mA total max. Short circuit protected. Pins 1, 9, 14 are internally connected. |
| 10 | GND_D | Digital signal ground |
| 11 | HALL_1 | Digital hall sensor input 1 |
| 12 | HALL_2 | Digital hall sensor input 2 |
| 13 | HALL_3 | Digital hall sensor input 3 |
| 14 | +5V_OUT | 5 V 200 mA total max. Short circuit protected. Pins 1, 9, 14 are internally connected. |
| 15 | GND_D | Digital signal ground |
| 16 | DATA+ | Absolute encoder DATA positive signal input |
| 17 | CLK+ | Absolute encoder CLK positive signal output |
| 18 | DATA- | Absolute encoder DATA negative signal input. For single ended absolute encoders with TTL or CMOS levels leave this pin floating and connect the signal to DATA+. |
| 19 | CLK- | Absolute encoder CLK negative signal output. For single ended absolute encoders with TTL or CMOS levels leave this pin floating and connect the clock to CLK+. |
| 20 | PE | Protective earth connection, internally connected to standoffs and drive cold plate. |




| J1 mating connector | |
|----------------------------|---|
| Description | Molex Pico-Clasp™ 1.0 mm pitch 20 position dual row receptacle with locking ramp |
| Image |  |
| Part number | Molex 501189-2010 |
| Distributor code | Digi-Key WM7929-ND |


5.3.1. Mating terminals and cables common for all signal connectors

Everest XCR signal connectors are of Molex Pico-Clasp™ family. All share the same crimp terminals and jumper wires. Given the small size of the connectors, crimping must be done with appropriate tools and application guides

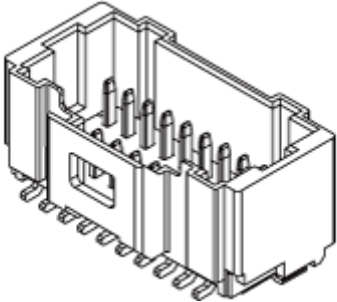
provided by Molex. Otherwise it is strongly recommended to buy pre-crimped jumper wires and connect to your system using split (or butt) terminals. Spiral wraps are recommended to order and protect the thin wires.

| J1, J2, J3, J4 Crimp terminals | |
|--|---|
| Description | Molex Pico-Clasp™ crimp socket 28 AWG ~ 32 AWG selective gold plated |
| Image |  |
| Part number | Molex 5011933000 |
| Distributor code | Digi-Key WM10136CT-ND |
| Crimper tool | |
| Description | Hand crimper tool 28-32 AWG |
| Image |  |
| Part number | Molex 63819-1500 |
| Distributor code | Digi-Key WM9018-ND |
| J1, J2, J3, J4 Crimped wires 150 mm | |
| Description | Molex Pico-Clasp™ 28 AWG black jumper lead socket to socket 150 mm length |

| | |
|--|---|
| Image |  |
| Part number | Molex 079758-1016 |
| Distributor code | Digi-Key WM15694-ND |
| J1, J2, J3, J4 Crimped wires 300 mm | |
| Description | Molex Pico-Clasp™ 28 AWG black jumper lead socket to socket 300mm length |
| Image |  |
| Part number | Molex 079758-1017 |
| Distributor code | Digi-Key WM15695-ND |
| Wiring accessory: Spiral wire wrap | |
| Description | Nylon spiral wrap abrasion resistant. Internal diameter: 2.41 mm, 3.18 mm expanded 5.08 mm, 6.35 mm expanded |
| Image |  |
| Part number | Alpha Wire SW20 NA005 SW21 NA008 |
| Distributor code | Digi-Key ASW20-100-ND ASW21-25-ND |

| Wiring accessory: wire to wire solder sleeve | |
|--|---|
| Description | Wire to Wire Solder Sleeve Heat shrinkable. Can be used to reliably connect pre-crimped wires to specific sensor, feedback or other thin wires. |
| Image |  |
| TE | B-155-9001 |
| Distributor code | Digi-Key A104848-ND |

5.4. Input / Outputs connector

| J2 connector | | |
|--|---------|---|
|  | | |
| 30 pins 2 row Pico-Clasp 1 mm pitch header. Molex 501190-3017 | | |
| Pin | Signal | Function |
| 1 | STO_1 | Safe Torque Off input 1 (positive, active from 5 V to 32 V, ISOLATED) |
| 2 | PE | Protective earth connection, internally connected to standoffs and drive cold plate. Can be used to connect cable shield. |
| 3 | STO_RET | Safe Torque Off common (optocoupler LEDs cathode, ISOLATED). |
| 4 | NC | Intentionally not connected. |
| 5 | STO_2 | Safe Torque Off input 1 (positive, active from 5 V to 36 V, ISOLATED) |
| 6 | GND_D | Digital signal ground |
| 7 | NC | Intentionally not connected. |
| 8 | +5V_OUT | +5 V output, can be used for STO circuit. |

| | | |
|----|--------------------|---|
| 9 | CAN_H | CAN bus line dominant high |
| 10 | UART_3V3_RX | Reserved |
| 11 | CAN_L | CAN bus line dominant low |
| 12 | UART_3V3_TX | Reserved |
| 13 | GND_D | Digital signal ground |
| 14 | IN1 | Digital input 1 (5V levels) |
| 15 | IN2 | Digital input 2 (5V levels) |
| 16 | IN3 | Digital input 3 (5V levels) |
| 17 | IN4 | Digital input 4 (5V levels) |
| 18 | OUT1 | Digital output 1 (5V levels) |
| 19 | OUT2 | Digital output 2 (5V levels) |
| 20 | OUT3 | Digital output 3 (5V levels) |
| 21 | OUT4 | Digital output 4 (5V levels) |
| 22 | AN1+ | Analog input 1 positive ($\pm 10V$ range) |
| 23 | BRAKE_N | Brake output (open drain with PWM capability) |
| 24 | AN1- | Analog input 1 negative ($\pm 10V$ range). Connect to GND if a single ended analog input is used. |
| 25 | +LOG_SUP | Logic supply, connected to pin 25. Can be used as brake positive |
| 26 | GND_D | Digital signal ground |
| 27 | +LOG_SUP | Logic supply positive. Providing the logic supply is optional as the drive is powered from the DC bus on its full operating voltage range. Logic supply can be used for brake or just to keep communications alive while the power bus is off. |
| 28 | MOTOR_TEMP | Motor temperature sensor input. A 1.65 k Ω pull-up resistor to 3.3 V is included on the drive. |
| 29 | GND_D | Digital signal ground, logic supply negative |
| 30 | MOTOR_TEMP_RE T | Motor temperature sensor return (referred to GND_D) |

J2 mating connector

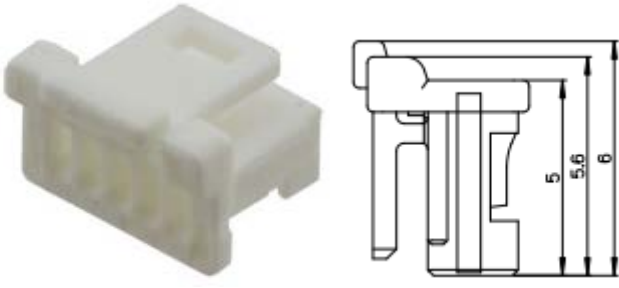

| | |
|-------------|--|
| Description | Molex Pico-Clasp™ 1.0 mm pitch 30 position dual row receptacle with locking ramp |
|-------------|--|

| | |
|------------------------|---|
| Image |  |
| Part number | Molex 501189-3010 |
| Distributor code | Digi-Key WM7930-ND |
| Crimp terminals | |
| See table above. | |

5.5. EtherCAT connectors

| J3 & J4 connector | | |
|--|---------|--|
| 5 pins 1 row Pico-Clasp 1 mm pitch header. Molex 501940-0507 | | |
| Pin | Signal | Function |
| 1 | TX_D+ | Transmit Data+ line. Colour typ: White - Orange |
| 2 | TX_D- | Transmit Data- line. Colour typ: Orange |
| 3 | RX_D+ | Receive Data+ line. Colour typ: White - Green |
| 4 | RX_D- | Receive Data- line. Colour typ: Green |
| 5 | GND_ETH | Connection for the EtherCAT cable shield. This pin is directly connected to the chassis of the drive - PE. |

| J3 & J4 mating connectors with latch holder | |
|--|---|
| Description | <p>Molex Pico-Clasp™ 1.0 mm pitch 5 position single row receptacle with Latch Holder.</p> <p>Provides stronger locking performance and is easy to extract. Use this connector in case the wiring ensures no strong pull will be performed to the cables, this could cause damage on the PCB connector.</p> |

| | |
|--|---|
| Image |  |
| Part number | Molex 501939-0500 |
| Distributor code | Digi-Key WM4384-ND |
| J3 & J4 mating connectors with locking ramp | |
| Description | <p>Molex Pico-Clasp™ 1.0 mm pitch 5 position single row receptacle with locking ramp.</p> <p>Provides less strong locking compared to the latch holder but will avoid breaking the PCB connector in case of strong pull.</p> |
| Image |  |
| Part number | Molex 501330-0500 |
| Distributor code | Digi-Key WM7918-ND |
| Crimp terminals | |
| See table above. | |

6. Signalling LEDs

Everest XCR Drive provides information through 6 signalling LEDs:

- Supply and operation: 2 LEDs (one of them bi-color) next to the Supply, shunt and motor connector.
- EtherCAT communication: 4 LEDs next to the EtherCAT connectors (2 LEDs shared with CANopen option).

6.1. Power and Operation Signalling LEDs

Two LEDs situated next to the Supply, shunt and motor connector indicate the supply and operation status. Note that Power LED and Braking resistor LED are packed into a single green/blue bi-color LED.

| LED | Colour | Meaning |
|-------|--------------|--|
| POWER | Green | LED is on when internal power supply is working. |
| SHUNT | Blue | LED is turned on when the supply voltage is greater than the maximum voltage configured by the user. Configuration required This signal will only work if the braking resistor output is configured as active. |
| FAULT | Red | LED is on when an error event has occurred and the drive is trapped in the Fault state . |

6.2. EtherCAT Signalling LEDs

Four LEDs below the EtherCAT connectors provide information regarding communication status according to [EtherCAT](#) specification.

The EtherCAT green and red LEDs (shared with CAN communication) indicate the EtherCAT state machine status. The green LED is the **RUN LED**, and the red LED is the **ERROR LED**. Next table shows their states meaning:

| RUN LED state | EtherCAT slave status | ERROR LED state | EtherCAT slave status |
|----------------------|------------------------------|------------------------|--------------------------------|
| Off | INIT | Off | No error |
| Blinking | PRE-OPERATIONAL | Blinking | Invalid configuration |
| Single Flash | SAFE-OPERATIONAL | Single flash | Local error |
| On | OPERATIONAL | Double flash | Watchdog timeout |
| | | On | Application controller failure |

For high severity errors inside the Triton Go Servo Drive, an special LED state has been developed:

| Status | Signalling | RUN LED state | ERROR LED state |
|-----------------------|-------------------|--------------------------------|-------------------------------|
| Internal error | Interleaved blink | Blinking (Initial status: OFF) | Blinking (Initial status: ON) |

The two yellow LEDs at the sides are the **LINK 0** and **LINK 1** LEDs. The **LINK LEDs** indicates the state of the EtherCAT physical link activity:

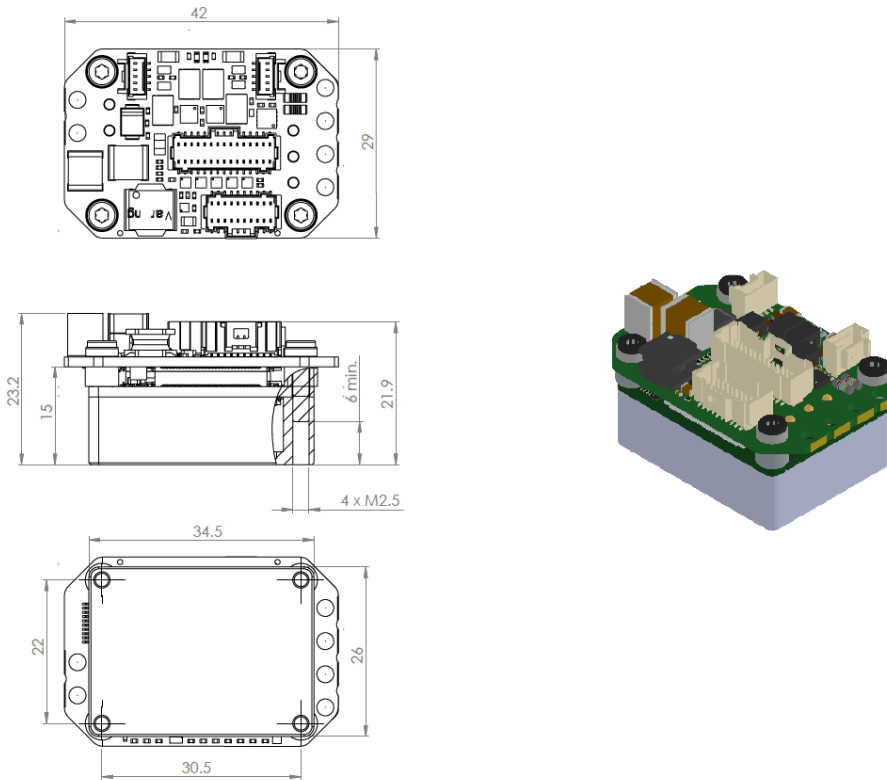
| LINK LED state | Slave State |
|-----------------------|-----------------------------------|
| Off | Port closed |
| Flickering | Port opened (activity on port) |
| On | Port opened (no activity on port) |

7. Dimensions

Preliminary Information

Attention, this dimension are preliminary and could change without previous notification.

All dimensions are in **mm**. All tolerances $\leq \pm 0.2$ mm



3D Model

For further detail, download the [STEP 3D](#) model. Note that the model is simplified: it does not show all the internal components, but does show the major volumes.

8. EtherCAT specifications

| | |
|----------------------------|---|
| Ports available | 2 |
| LED Signals | Status LED |
| | Link/Act LED |
| Supported Mailbox | CoE, FoE, EoE |
| <i>SDO info</i> | Not supported |
| <i>Segmented SDO</i> | Supported |
| <i>SDO complete access</i> | Not supported |
| Modes of Operation | DS402 drive device profile |
| | Open loop (vector & scalar) |
| | Velocity Mode |
| | Profile Torque |
| | Profile Velocity |
| | Profile Position |
| | Homing modes |
| | Interpolated Position Mode |
| | Cyclic Synchronous Position Mode <ul style="list-style-type: none"> • <i>Max. Update rate up to 100 μs (10 kHz)</i> |
| | Cyclic Synchronous Velocity Mode <ul style="list-style-type: none"> • <i>Max. Update rate up to 100 μs (10 kHz)</i> |
| | Cyclic Synchronous Torque Mode <ul style="list-style-type: none"> • <i>Max. Update rate up to 100 μs (10 kHz)</i> |
| | Synchronization modes |
| | Distributed clock <ul style="list-style-type: none"> • <i>Cyclic modes</i> |
| Process data object | Configurable |
| | Up to 64 objects |

9. Service

We are committed to quality customer service. In order to serve in the most effective way, please open a ticket on our service desk at www.ingeniamc.com/support or contact your local sales representative for assistance.

If you are unaware of your local sales representative, please contact the Customer Support.

| | | | |
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