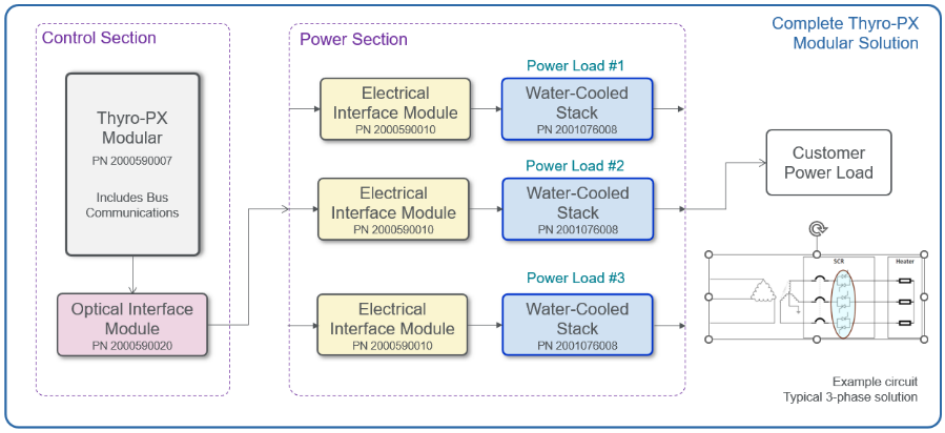
# THYRO-PX CONTROLLER

FOR USE WITH THYRO-PX MODULAR DISTRIBUTED ARCHITECTURE SOLUTION




## SOLUTION HIGHLIGHTS

- Comprehensive operating and control modes to minimize harmonic distortion and utility costs
- High-efficiency, wear-free design with integrated soft starting for use with downstream transformers
- Premier performance control accuracy to maximize end-process repeatability
- Multi-zone capability that independently controls multiple single-phase loads from a single controller
- Intuitive performance and status feedback via a modular, integrated touch screen display or PC tool
- For AC and DC configuration, suitable to design W1C to W3C or B12; B18 DC systems
- Separate power circuit and control section to avoid EMC issues, when used with fiber-optic trigger option

## TYPICAL APPLICATIONS

- Transformer loads, resistive loads, and heating elements in electric furnaces used for glass, metals, and ceramics manufacturing
- Arc furnace applications
- DC electrolyzer power supply for hydrogen

## AT A GLANCE

### Phase Type

**1, 2, and 3-phase power controller**

### AC Input Line Voltage Rating

**Up to 690 VAC [+10%]**

### Control Modes

**Zero cross firing (TAKT)**
**Phase-angle firing (VAR)**
**Voltage sequence control (VCS)**
**Soft start, soft down**

### Communications

**Ethernet/IP®, EtherCAT®, Profibus®, Profinet®, Modbus TCP/IP®**

## PRODUCT SPECIFICATIONS

| Thyro-PX Controller | |
|---|---|
| Control Accuracy | ±0.5% voltage or current, ±1% power |
| Load Type | Resistive loads, transformer loads, and loads with large Rwarm/Rcold up to factor 20 (MOSI starting mode) |
| Operating Mode | TAKT: full frequency package control |
| | VAR: phase-angle firing |
| | VSC_VAR: voltage sequence control with phase-angle firing |
| Control Type | U-voltage, U²-voltage, I-current, I²-current, P-power, without regulation |
| Set Point Input | Up to 3 analog inputs (freely configurable), control start/finish can be set as desired between 0 (4) to 20 mA; 0 (1) to 10 (2) V |
| Actual Value Output | 3 measuring values for optional display of U, I, and P, can be set as desired between 0 to 20 mA, 0 to 10 V |
| Load Circuit/Self-Monitoring | Provided |
| Operation/Fault Indicator | Via 3 fault signaling relays and status/diagnostic LEDs, freely configurable |

## ELECTRICAL SPECIFICATIONS

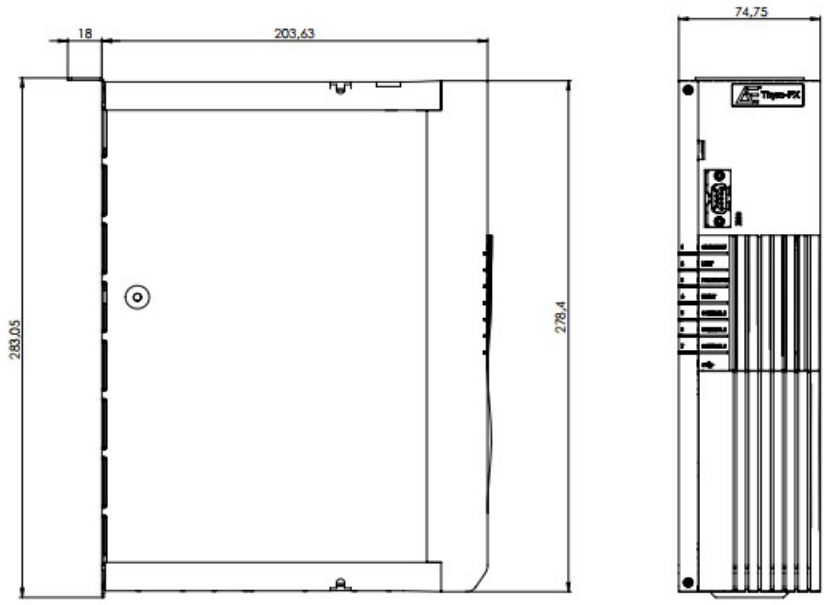
| | |
|---|---|
| Rated Connection | 690 VAC +10% via voltage transducer module |
| Frequency | All types, 45 to 65 Hz |
| Control Voltage | 90 to 265 VAC, alternative DC 24 V (±10%) / 2 A max |

| Environmental | |
|---|---|
| Ambient Temperature | Up to 40°C (104°F) |
| Storage Temperature | -25 to +55°C (-13 to 131°F) |
| Humidity Class | DIN EN 50178 Tab 7 |
| Site Altitude | Up to 1000 m (3281 ft) above sea level at nominal load, above 1000 m (3281 ft), on request |

| Regulatory | |
|---|---|
| Certifications | CE marked for EU LV Directive 2014/35/EU and 2004/108/EC |

## MECHANICAL SPECIFICATIONS

### Thyro-PX Controller with Cover for Cabinet Assembly




**Dimensions: W x H x D, 75 x 284 x 204 mm**
**Weight: 750 g appr**

| Options | |
|---|---|
| Fiber-Optic Interface Card | Transform fiber-optic light trigger to electrical trigger signal for firing SCRs, suitable for two thyristors |
| | Transform Thyro-PX electrical trigger to optic light trigger for firing SCRs |
| Voltage Transducer | Interface card for voltage synchronization when Thyro PX controller card is used |
| Water-Cooled Stack | Water-cooled power stack with two SCRs for AC and DC applications |
| Anybus Digital Interface Card | Ethernet/IP®, EtherCAT® Profibus®, Profinet®, Modbus TCP/IP® |
| Thyro-Touch Modular Display | Multi-color, multi-language touch screen display and menus for Thyro-PX configuration with integrated SD memory card and process data recorder |
| Thyro-Tool Pro PC | PC software for commissioning, visualization, configuration, and trending |

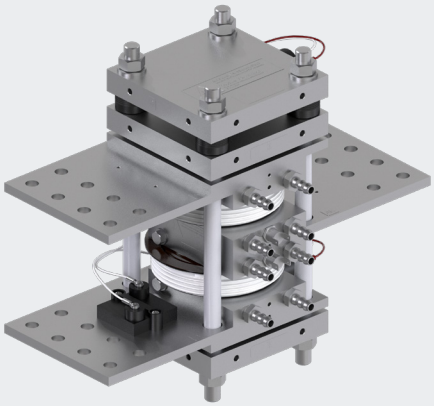
## ORDERING INFORMATION

| Model | Description |
|---|---|
| 2000590007 | Thyro-PX control unit with cover |

# WATER-COOLED STACK

EXTERNAL POWER STACK WITH SCR

UP TO 4000 A AT 690 VAC



The AE water-cooled power stack is used to build up high current stacks and allows the panel designer to achive best solution approach.

The stack can be designed for AC applications like for heating elements, resistive loads, transformer loads, in heating, melting, drying, forming arc furnace applications. DC application like electrolyzer is also suitable.

## PRODUCT HIGHLIGHTS

- Modular stack system for AC configuration and DC configuration, suitable to design W1C to W3C or B12; B18 DC systems
- Separation of power circuit and control section to avoid EMC issues, when taken advantage of fiberoptics trigger option
- Input 3-phase AC up to 690 V max.
- Takes advantage of existing Thyro–PX controller card architecture for exact control accuracy and advanced automation capabilities

## AT A GLANCE

### Phase Type

**1, 2, and 3-phase power controller**

### AC Input Line Voltage Rating

**Up to 690 VAC** [+10%]
**Up to 900 VDC**

### Type Current Range

**4000 A**
**Higher currents are available when using parallel connections**

### Water-Cooled Stack

**With thermo switch**
**RC snubber for each thyristor**
**Water inlet/outlet: fittings 3/8” hose**

## PRODUCT SPECIFICATIONS

Thyristor stack for high power disc cell thyristors with clamping force of about 8 KN up to more than 100 KN

Clamping performed either by screw or press

Different power/thyristor cell sizes will lead to different stack sizes in portfolio

- 2x thyristor disc cells
- Thyristor disc diameter: 150 mm
- Thyristor contact surface: 100 mm
- Copper cold plates
- M16 threaded steel rods PTFE insulated
- 10 mm thick copper bus bars, M12 terminals
- Thermoswitch included
- RC Snubber for each thyristor
- Water inlet / outlet: fittings 3/8” hose

## ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| Rated Connection Voltage | 690 VAC +10% |
| Frequency | All types, 45 to 65 Hz |
| Control Voltage | Not applicable |
| Water-Cooled Type | Cooling water provided by customer |

| Environmental | |
|---|---|
| Ambient Temperature | Up to 35°C water inlet (113°F) at flow water rate of 8 l/min with (Glykol 40%) |
| | At higher temperatures, operation is permissible with reduced current limits. |
| Storage Temperature | -25 to +55°C (-13 to 131°F) |
| Humidity | DIN EN 50178 Tab. 7 |
| Site Altitude | Up to 1000 m (3281 ft) above sea level at nominal load; above 1000 m (3281 ft), on request |

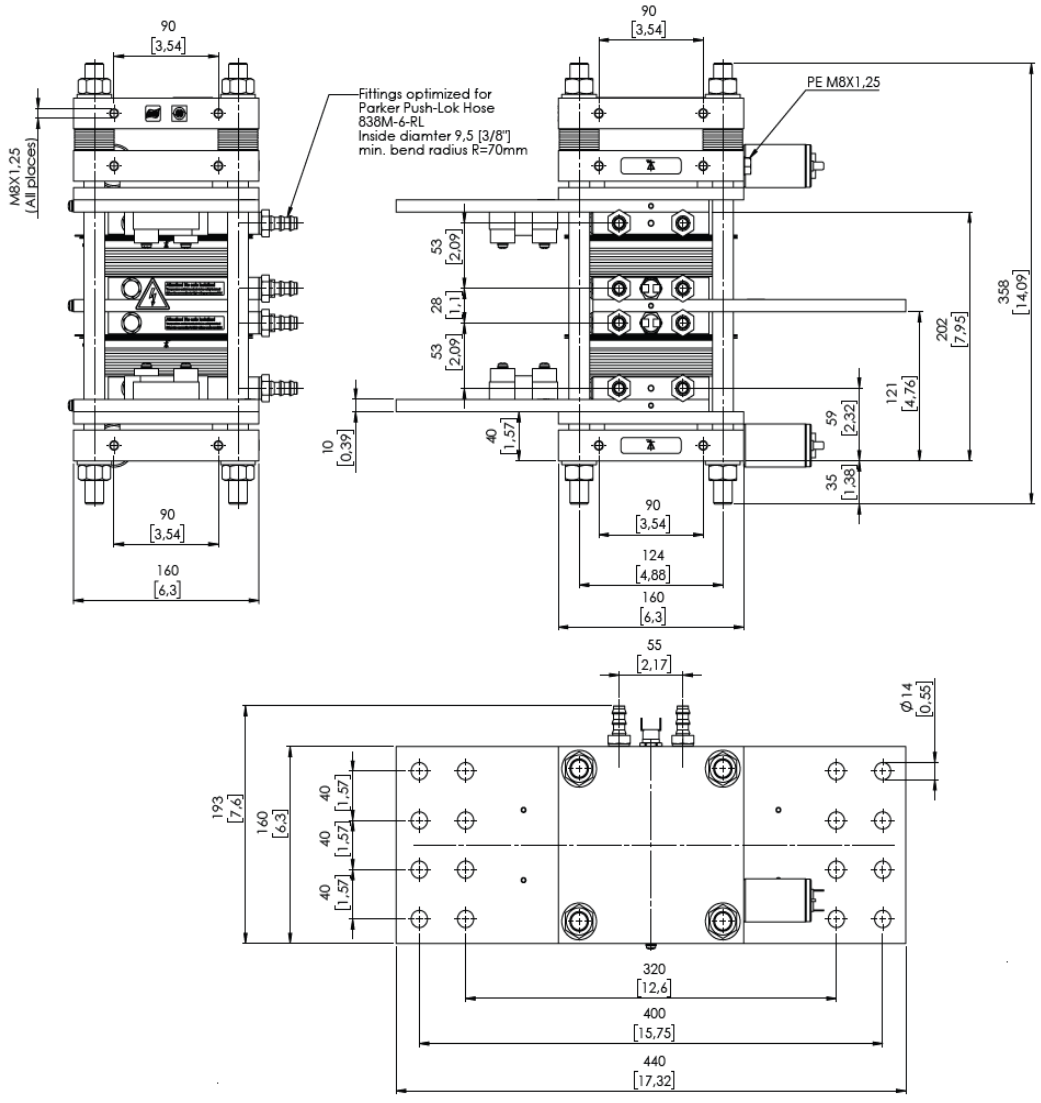
| Regulatory Approvals | |
|---|---|
| Certifications | CE marked for EU LV Directive 2014/35/EU and 2004/108/EC |

## WATER SPECIFICATIONS

| | |
|---|---|
| Maximum Pressure | 6 bar |
| Minimum Pressure | 2 bar |
| Water Cooling Connection | 3/8" with inner threat |
| Water Type | VE water |
| Cooling Water Conductivity | ≥10 µs/m and ≤ 40 µs/m (at 25°C) |
| Cooling Water pH Value | 6,5 - 8 |

## MECHANICAL SPECIFICATIONS

Water-cooled stack dimensions: 450 x 360 x 200 mm
Weight: appr. 35 kg



## MECHANICAL SPECIFICATIONS (CONTINUED)

| Options | |
|---|---|
| Fiber-Optic Interface Card | Interface card for transforming fiber optic light trigger to electrical trigger signal for firing SCR. Interface is suitable for two thyristors |
| | Interface card for transforming Thyro-PX electrical trigger to optic light trigger for firing SCR |
| Voltage Transducer | Interface card for voltage synchronization, when Thyro-PX controller card is used |
| Thyro-PX Controller Card | Controller card to provide trigger impulses for AC or DC application. Controller card has the same features like Thyro-PX series. Following options are only applicable when Thyro-PX controller card is in use |
| Anybus Digital Interface Card | Ethernet/IP®, EtherCAT® PROFIBUS®, PROFINET®, Modbus TCP/IP® |
| Thyro-Touch Modular Display | Multi-color, multi-language touch screen display and menus for Thyro-PX configuration with integrated SD memory card and process data recorder |
| Thyro-Tool Pro PC | PC software for commissioning, visualization, configuration, and trending |

## ORDERING INFORMATION

| Model | Description |
|---|---|
| CA0 TT 4000 LC 150 | Water-cooled stack |

| Code | Phase Type |
|---|---|
| CA0 | Cooling position to middle cathode to anode |
| TT | Type of semiconductor |
| 4000 | Rated current Ieff 180° Sinus; LC @ 8 l/min; 35°C water (Glykol 40%) |
| LC | Water-cooled type |
| 150 | Diameter of used semiconductor |

| Code | Type Current, TC | Apparent Power [W] |
|---|---|---|
| Available for 690 VAC Type Voltage | | CA0 TT 4000 LC 150 |
| 4000 | TC = 4000 Aac/phase<br>Max. DC current of 7000 Adc in B6C with 3xCA0-TT 4000 LC 150 | 4109 W without line fuse<br>18210 W without cell fuse |

# VOLTAGE TRANSDUCER INTERFACE BOARD

FOR THYRO-PX CONTROLLER BOARD SYNCHRONIZATION

The AE voltage transducer card is used for applying the correct synchronization voltage to the Thyro-PX Controller for each phase of the intended application.

## PRODUCT HIGHLIGHTS

- Ready to connect snap on module
- Applying correct secondary voltage rating for Thyro-PX controller card
- Is suitable with standard Thyro- PX power controller units to measure additional voltage like secondary side of a transformer
- In use with Thyro-PX external measurement card to measure external secondary CT signal
- For AC configuration and DC configuration, suitable to design W1C to W3C or B12; B18 DC systems

## AT A GLANCE

### Phase Type

**For AC and DC stack design**

### AC Input Line Voltage Rating

**Up to 690 VAC** [+10%]

## PRODUCT SPECIFICATIONS

| Thyro-PX Electrical - Optical Interface Boards | |
|---|---|
| Installation Type | Snap on type for hat rail assembly |
| Voltage Transducer Interface Board | Transduces max 690 VAC to 43 VAC for synchronization of phase line |

## ELECTRICAL SPECIFICATIONS

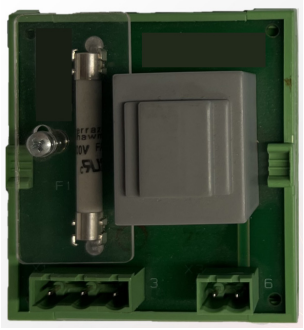
| | |
|---|---|
| Line Voltage | Prim Max. 690 VAC ±10%; Sec 37 |
| Fuse | Internal primary fuse 6, 3x46mm FF 1, 0A 1000V |

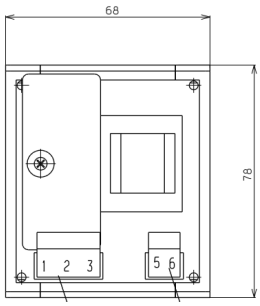
| Environmental Specifications | |
|---|---|
| Ambient Temperature | Up to 40°C (104°F) |
| Storage Temperature | -25 to +55°C (-13 to 131°F) |
| Humidity Class | DIN EN 50178 Tab. 7 |
| Site Altitude | Up to 1000 m (3281ft) above sea level at norminal load; above 1000 m (3281 ft), on request |

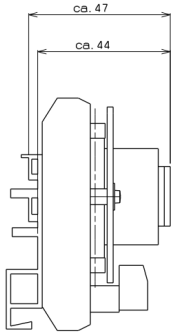
| Regulatory Approvals | |
|---|---|
| Certifications | CE marked for EU LV Directive 2014/35/EU & 2004/108/EC |

## MECHANICAL SPECIFICATIONS

### Voltage Transducer interface






Dimensions W x H x D [mm] 68 x 78 x 47

Weight: appr. 300 g

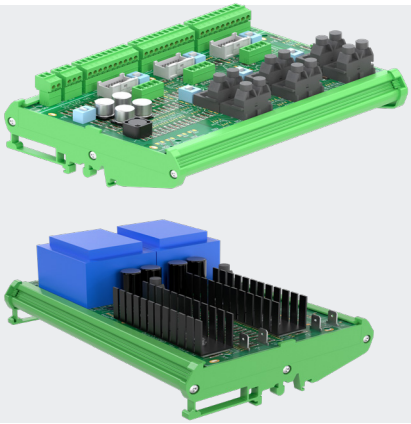
| Options | |
|---|---|
| Thyro-PX Controller Card | Controller card to provide trigger impulses for AC or DC application. Controller card has the same features like Thyro-PX series. Following options are only applicable when Thyro-PX controller card is in use |
| Water Cooled Stack | Water cooled power stack with two SCR´s for AC and DC applications |
| Anybus Digital Interface Card | Ethernet/IP®, EtherCAT® PROFIBUS®, PROFINET®, Modbus RTU®, Modbus TCP/IP®, DeviceNET™ |
| Thyro-Touch Modular Display | Multi-color multi-language, touch screen display, and menus for Thyro-PX configuration with integrated SD memory card and process data recorder |
| Thyro-Tool Pro PC | PC software for commissioning, visualization, configuration, and trending |

## ORDERING INFORMATION

| Model | Desctiption |
|---|---|
| 2000000399 | Thyro-PX voltage transducer interface |

# ELECTRICAL-OPTICAL-ELECTRICAL INTERFACE BOARDS

CONVERTING SCR TRIGGER SIGNALS FROM ELECTRICAL TO OPTICAL TO ELECTRICAL



The AE Electrical-Optical-Electrical interface boards are optional accessories for the Thyro-PX power controller board. Used for high power applications, these boards provide optical isolation between the Thyro-PX power controller board and up to six water-cooled thyristor stacks. This solution enables separation of high power circuits from control signals circuits for EMC optimized design and improved reliability in the application.

## PRODUCT HIGHLIGHTS

- Stack assembly design can be easily separated from high current circuit with harsh environmental conditions by means of the optical-electrical interface board
- Thyro-PX controller board can be assembled in an EMC safe and optimized environmental area by means of the electrical-optical interface board
- The electrical optical interface board allows paralleling high power stack assembly
- Long range distance of appr. 50 m between control and power section
- For AC configuration and DC configuration, suitable to design W1C to W3C or B12; B18 DC systems

## AT A GLANCE

### Phase Type

**For AC and DC stack designs**

### AC Input Line Voltage Rating

**Suitable for stack designs up to 690 VAC [+10%] and up to 900 VDC**

### Control Modes

**Fiber optic interface cards convert negative and positive half wave as trigger signal for SCRs**

## PRODUCT SPECIFICATIONS

| THYRO-PX Electrical - Optical Interface Boards | |
|---|---|
| Installation Type | Snap on type for hat rail assembly |
| Electrical to Optical Interface Board | The electrical-optical interface board converts the thyristor gate-control signals from the Thyro-PX controller board to an optical signal transmitted using a fiber-optic cable. |
| Optical to Electrical Interface Board | The optical-electrical interface board receives thyristor gate-control signals from a fiber-optic cable and converts these to electrical signals to control the thyristor gates in the water-cooled stack. |

## ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| Electrical to Optical Interface Board | 24 VDC, 100 mA |
| Optical to Electrical Interface Board | 230 VAC ±10%, 250 mA |
| Fiber Optics Cable Requirements | 2x simplex LC to LC style fiber-optic patch cables of appropriate length |

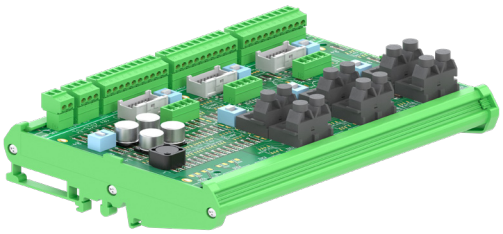
| Environmental | |
|---|---|
| Ambient Temperature | Up to 40°C (104°F) |
| Storage Temperature | -25 to +55°C (-13 to 131°F) |
| Humidity | DIN EN 50178 tab. 7 |
| Site Altitude | Up to 1000 m (3281 ft) above sea level at nominal load; above 1000 m (3281 ft), on request |

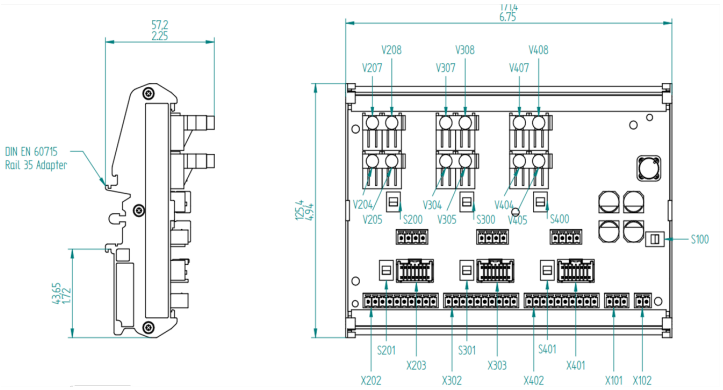
| Regulatory Approvals | |
|---|---|
| Certifications | CE marked for EU LV Directive 2014/35/EU and 2004/108/EC |

## MECHANICAL SPECIFICATIONS

### Electrical to Optical Interface

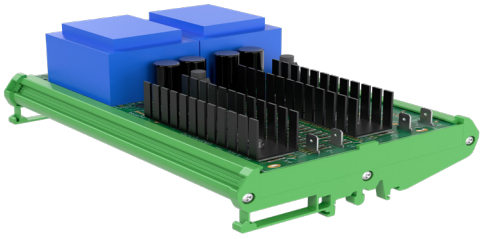
Dimensions: 172 x 126 x 58 mm
Weight: appr. 500 g

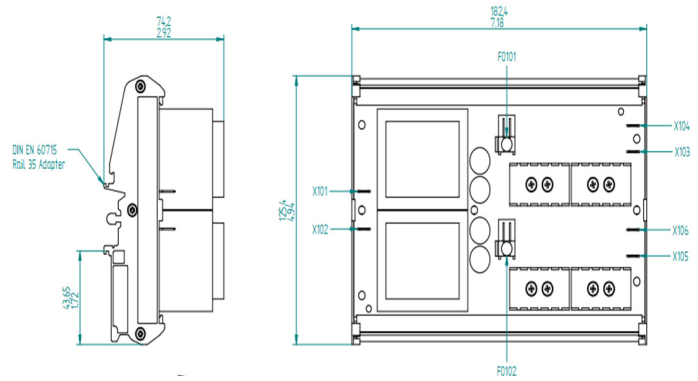





### Optical to Electrical Interface

Dimensions: 183 x 126 x 75 mm
Weight: appr. 1100 g





## MECHANICAL SPECIFICATIONS (CONTINUED)

| Options | |
|---|---|
| Thyro-PX Controller Card | Controller card provides trigger impulses for AC or DC applications. Controller card has the same features as Thyro-PX series. Following options are only applicable when Thyro-PX controller card is in use. |
| Voltage Transducer | Interface card for voltage synchronization, when Thyro PX controller card is used |
| Water-Cooled Stack | Water-cooled power stack with two SCRs for AC and DC applications |
| Anybus Digital Interface Card | Ethernet/IP®, EtherCAT® PROFIBUS®, PROFINET®, Modbus TCP/IP® |
| Thyro-Touch Modular Display | Multi-color, multi-language touch screen display and menus for Thyro-PX configuration with integrated SD memory card and process data recorder |
| Thyro-Tool Pro PC | PC software for commissioning, visualization, configuration, and trending |

## ORDERING INFORMATION

| Model | Description |
|---|---|
| 2000590010 | Thyro-PX electrical to optical interface |
| 2000590020 | Thyro-PX optical to electrical interface |

## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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Advanced Energy

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