



# TRICOR®

## Coriolis Mass Flow Meter



Fiber optical converter for Modbus RTU communication via RS485 for applications in ESTA systems

- Potential separation between flow meter and PLC by using an optical fiber
- Power supply via pneumatic generator
- RS485 Modbus interface



## Manual-Version

TRICOR\_ESTA\_Package\_CLASSIC\_M\_EN\_240301\_E001



# Index

|           |                                      |           |
|-----------|--------------------------------------|-----------|
| <b>1.</b> | <b>GENERAL INFORMATION .....</b>     | <b>4</b>  |
| <b>2.</b> | <b>TECHNICAL DATA .....</b>          | <b>5</b>  |
| 2.1.      | TRICOR TCE/TCE and ESTA Package..... | 5         |
| 2.2.      | RS485 to fiber converter.....        | 6         |
| 2.3.      | Fiber Optic Cable .....              | 6         |
| 2.4.      | Pneumatic Power Generation Unit..... | 6         |
| <b>3.</b> | <b>DIMENSIONAL DRAWINGS .....</b>    | <b>7</b>  |
| 3.1.      | TCE 6000 .....                       | 7         |
| 3.2.      | TCE 8000 .....                       | 7         |
| 3.2.1.    | Compact.....                         | 7         |
| 3.2.2.    | Wallmount .....                      | 8         |
| 3.3.      | Pneumatic Power Generator .....      | 8         |
| 3.4.      | RS485 to fiber converter.....        | 9         |
| <b>4.</b> | <b>INSTALLATION .....</b>            | <b>10</b> |
| 4.1.      | TCE6000 PIN Assignments .....        | 10        |
| 4.2.      | TCE8000 PIN Assignments .....        | 10        |
| <b>5.</b> | <b>LISTINGS .....</b>                | <b>11</b> |
| 5.1.      | List of Figures.....                 | 11        |
| 5.2.      | List of Tables .....                 | 11        |



## 1. General Information

Spraying is a process for coating surfaces with paints and varnishes. In general, the paint is atomized and applied with compressed air using a paint spray gun or paint nozzles. This method is often used but has the disadvantage that the loss of paint through the spray mist passing components is relatively high.

Electrostatic wet painting is a remedy. This is particularly useful for complicated applications, as coating takes place on all sides. Here, the charged paint droplets are applied on the workpiece under the influence of electrical transport and attraction forces. Main applications are ESTA paintings for highly conductive paints and coatings.

For this purpose, we offer a combination of our TRICOR Coriolis Mass Flow Meters with an optical RS485 signal converting devices for electrostatic applications. Using a Modbus protocol via fiber optical communication allows the transfer of measurements (actual mass/volume flow rate, process density and process temperature, totalizer) and meter diagnosis values to a PLC with transfer rates of up to 10 Hz.

This allows high-precision measurement of flow ranges from 3 up to 65,000 kg/h for system pressure ranges up to 345 bar. A further benefit over conventional measuring techniques is that the flow meter contains no moving parts and thus requires considerably less maintenance than mechanical meters. Due to its media-independent measuring principle, it offers the additional advantage that it can be used for water as well as solvent lacquers with and without fillers.

### FEATURES

- High material yield and reduced air flow due to less overspray
- Short coating time due to the electrostatic “wrap-around” and uniform build-up of the coating thickness in one operation
- First-class surface properties with regard to: chemical resistance, abrasion resistance, corrosion protection and optical requirements
- No moving parts in the flow meter

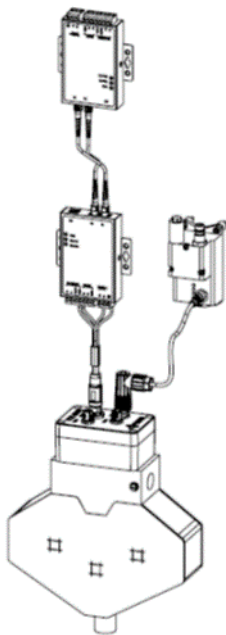
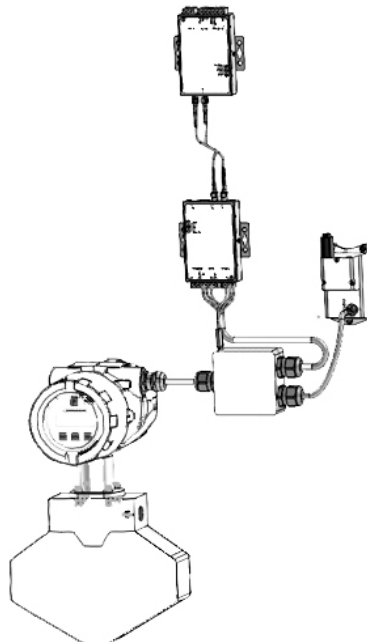
### SETUP CONSISTING OF

- Pneumatic Power Generation Unit that supplies the complete Tricor coriolis family (Classic with TCE6000 or 8000)
- Fiber optical cable
- Fiber optical converter for Modbus RTU communication via RS485
- USB RS485 converter (optional)



## 2. Technical Data

### 2.1. TRICOR Classic Series and ESTA Package

| Flow Meter                          | To be selected separately                                                                                                                                                 |                                                                                                                                                                  |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | TCE 6000                                                                                                                                                                  | TCE 8000 (24VDC-Version)                                                                                                                                         |
| <b>Electronics</b>                  |                                                                                                                                                                           |                                                                                                                                                                  |
| Power Consumption                   | Max. 7W                                                                                                                                                                   | Max. 4W                                                                                                                                                          |
| Supply Voltage                      | 24 V DC (via Pneumatic Power Generator)                                                                                                                                   |                                                                                                                                                                  |
| Interface                           | RS485                                                                                                                                                                     |                                                                                                                                                                  |
| <b>Communication</b>                | Modbus RTU (single mode or Multidrop)                                                                                                                                     |                                                                                                                                                                  |
| Ambient Temperature                 | 0 °C ... +50 °C [32 °F ... +122 °F]                                                                                                                                       |                                                                                                                                                                  |
| Storage Temperature                 | -40 °C ... +80 °C [-40 °F ... +176 °F]                                                                                                                                    |                                                                                                                                                                  |
| Process Temperature<br>(Flow Meter) | -40 °C ... +70 °C [-40 °F ... +158 °F]                                                                                                                                    |                                                                                                                                                                  |
| Protection Class                    | IP65 (Coriolis meter and Pneumatic Power Generator)<br>IP30 (for the RS485 to fiber converter)                                                                            |                                                                                                                                                                  |
| Electrical connections              | M12 plug (5-pin, female) for RS485<br>(cable length: 2.5 m)<br><br>M12 plug (5-pin, male) for Pneumatic<br>Power Generator<br>(cable length: 2.5 m)                       | Clamp terminal<br>via enclosure cable gland<br>Cable length (TCE-junction box):<br>1.5 m<br><br>Cable length (junction box-<br>Pneumatic Power Generator): 1.5 m |
| Installation                        |   |                                                                                                                                                                  |
| Dimensions                          | See dimensional drawings                                                                                                                                                  |                                                                                                                                                                  |
| <b>Certification</b>                | CE, PED, RoHS, REACH, ATEX (3G) for TRICOR Classic Series                                                                                                                 |                                                                                                                                                                  |

Tab. 1: System specification: TRICOR Coriolis Transmitter and ESTA Package



## 2.2. RS485 to fiber converter

| TCF-142 converter                  |                                             |
|------------------------------------|---------------------------------------------|
| Ambient Temperature                | 0 °C ... +60 °C [+32 °F ... +140 °F]        |
| Supply Voltage                     | 12 to 48 V DC                               |
| Input current                      | 70 to 140 mA @12 to 48 V DC                 |
| Protection Class                   | IP30                                        |
| RS485 Data Direction Control       | ADDC (R) (automatic data direction control) |
| Pull High / Low Resistor for RS485 | 1 kOhm, 150 kOhm                            |
| Latency                            | 300 ns                                      |
| Serial signals                     |                                             |
| RS485-2w                           | Data+, Data-, GND                           |
| <b>Mounting</b>                    | Screwable or DIN-rail (35 mm)               |
| Dimensions                         | See dimensional drawing                     |

Tab. 2: RS485 to fiber converter

## 2.3. Fiber Optic Cable

| Patch cord          |                                              |
|---------------------|----------------------------------------------|
| Cable material      | LZSH                                         |
| Strength Member     | Aramid                                       |
| Crush               | 1000 N                                       |
| Attenuation         | 3.0 dB/km @850 nm / 0.8 dB/km @1300 nm       |
| Bandwidth OFL       | 200 MHz x km @850 nm / 500 MHz x km @1300 nm |
| Ambient Temperature | -20 °C to +60 °C (-4 °F to +140 °F)          |
| Cable Length        | 10 m                                         |

Tab. 3: Fiber Optic Cable

## 2.4. Pneumatic Power Generation Unit

|                                     |                                                                                                                                                                                                        |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pressure min/max                    | 3/7 bar [45/100 psi]                                                                                                                                                                                   |
| Max. output at 7 bar                | 7.5 W                                                                                                                                                                                                  |
| Compressed air consumption at 7 bar | 50 NI/Min                                                                                                                                                                                              |
| Process connection                  | G1/8"                                                                                                                                                                                                  |
| Temperature range                   | 0 °C ... +50 °C [+32 °F ... +122 °F]                                                                                                                                                                   |
| Housing                             | Aluminum                                                                                                                                                                                               |
| Included                            | Compressor connection G 1/8"<br>Connection cable, 2.5 meters<br>With M8 plug-in connector (3-pin, female) for Pneumatic Power Generation Unit<br>With M12 plug-in connector (5-pin, male for TCE 6000) |
| Dimension                           | See dimensional drawings                                                                                                                                                                               |

Tab. 4: Pneumatic Power Generation Unit



### 3. Dimensional Drawings

#### 3.1. TCE 6000

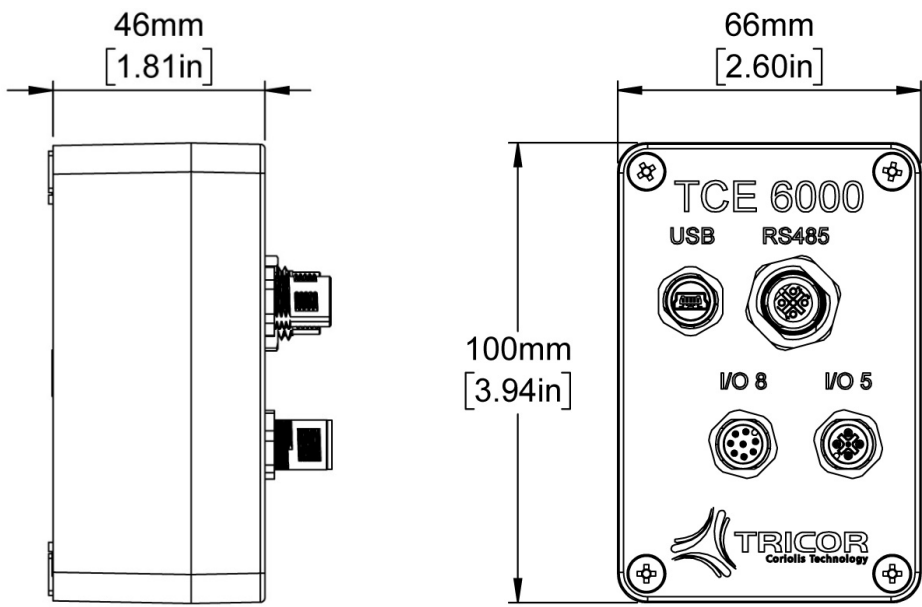


Fig. 1: Dimensional Drawing: TCE 6000

#### 3.2. TCE 8000

##### 3.2.1. Compact

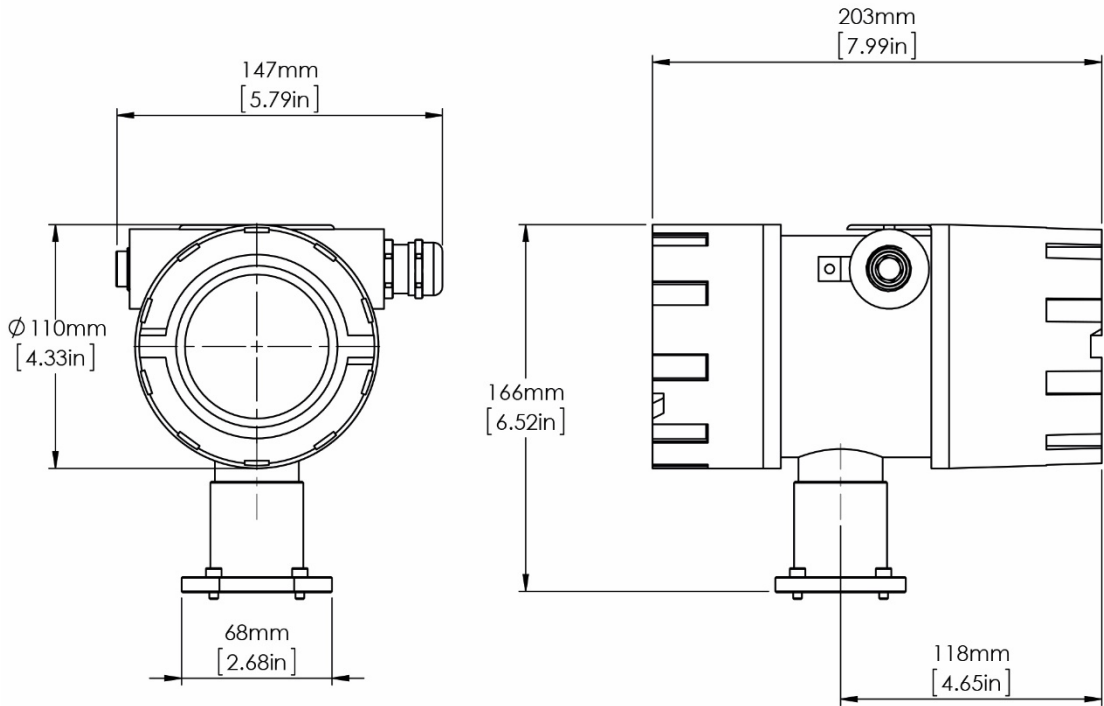


Fig. 2: Dimensional Drawing: TCE 8000 Compact



## 3.2.2. Wallmount

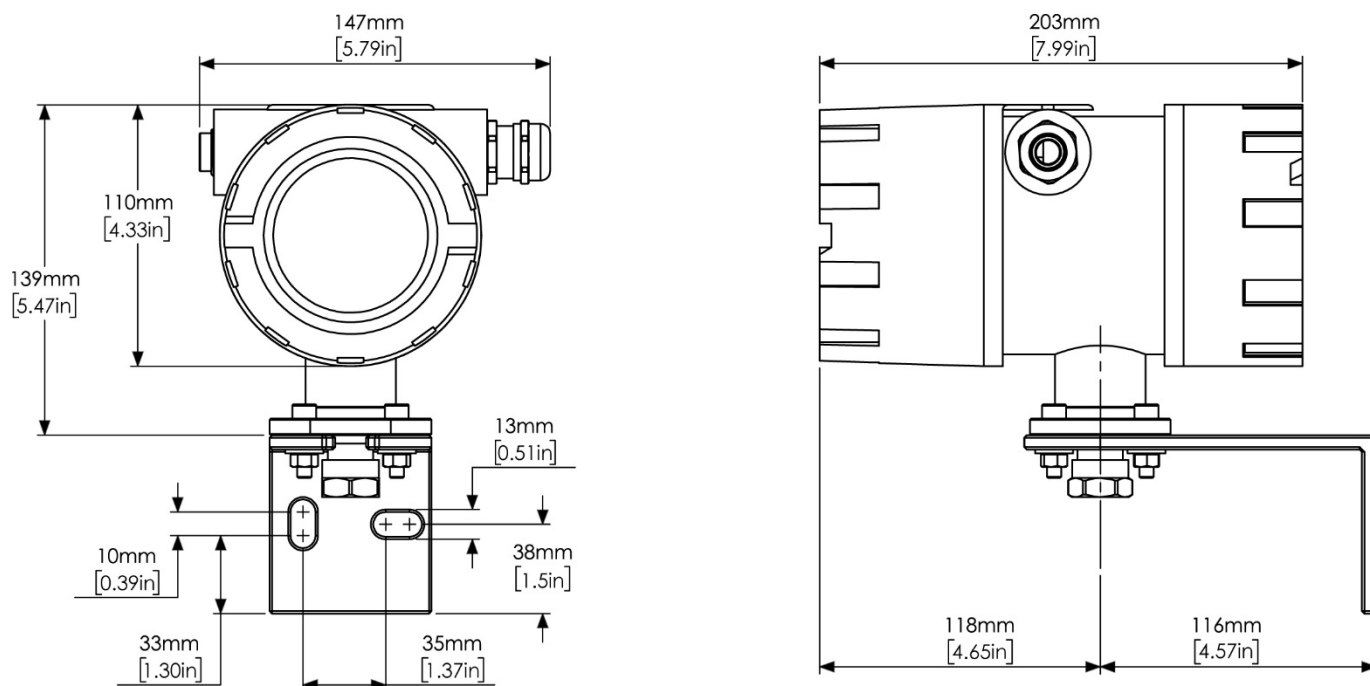


Fig. 3: Dimensional Drawing: TCE 8000 Wallmount

## 3.3. Pneumatic Power Generator

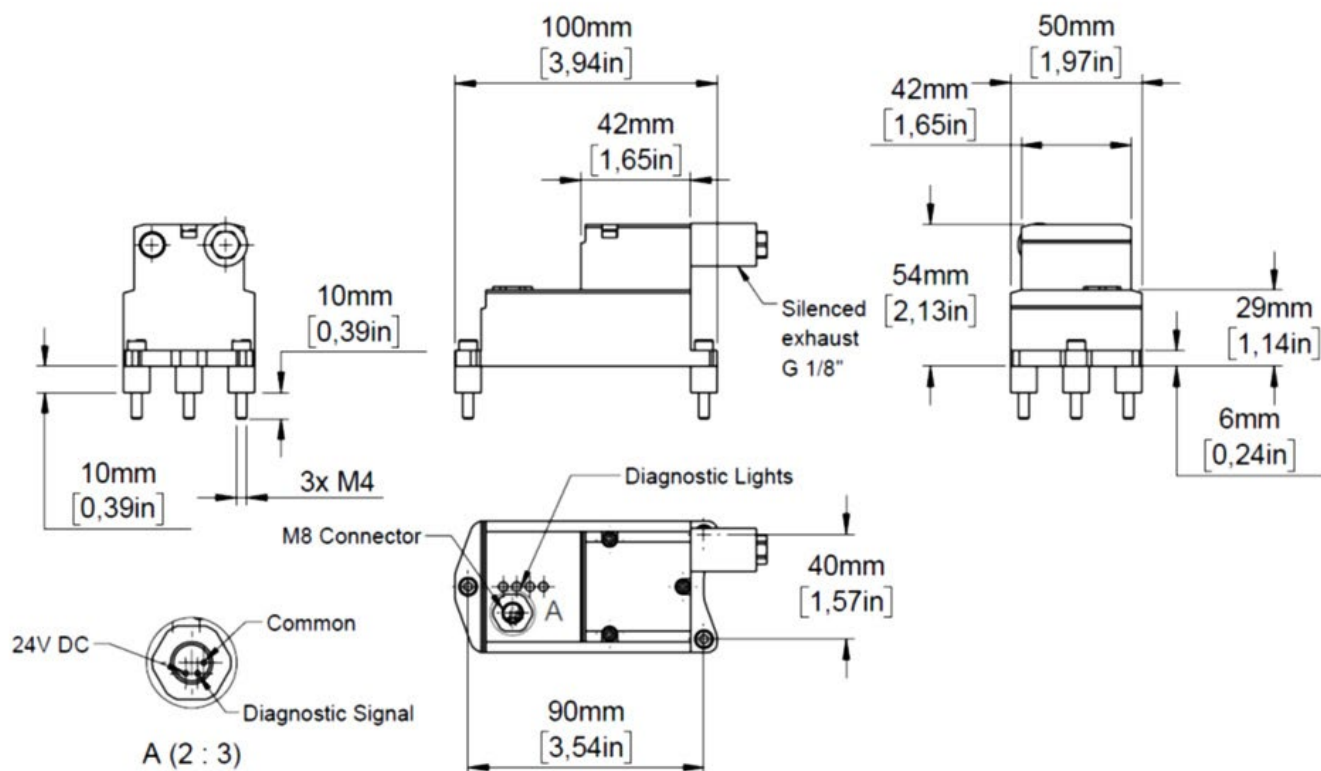


Fig. 4: Dimensional Drawing: Pneumatic Power Generator



3.4. RS485 to fiber converter

TCF-142-M/S-ST

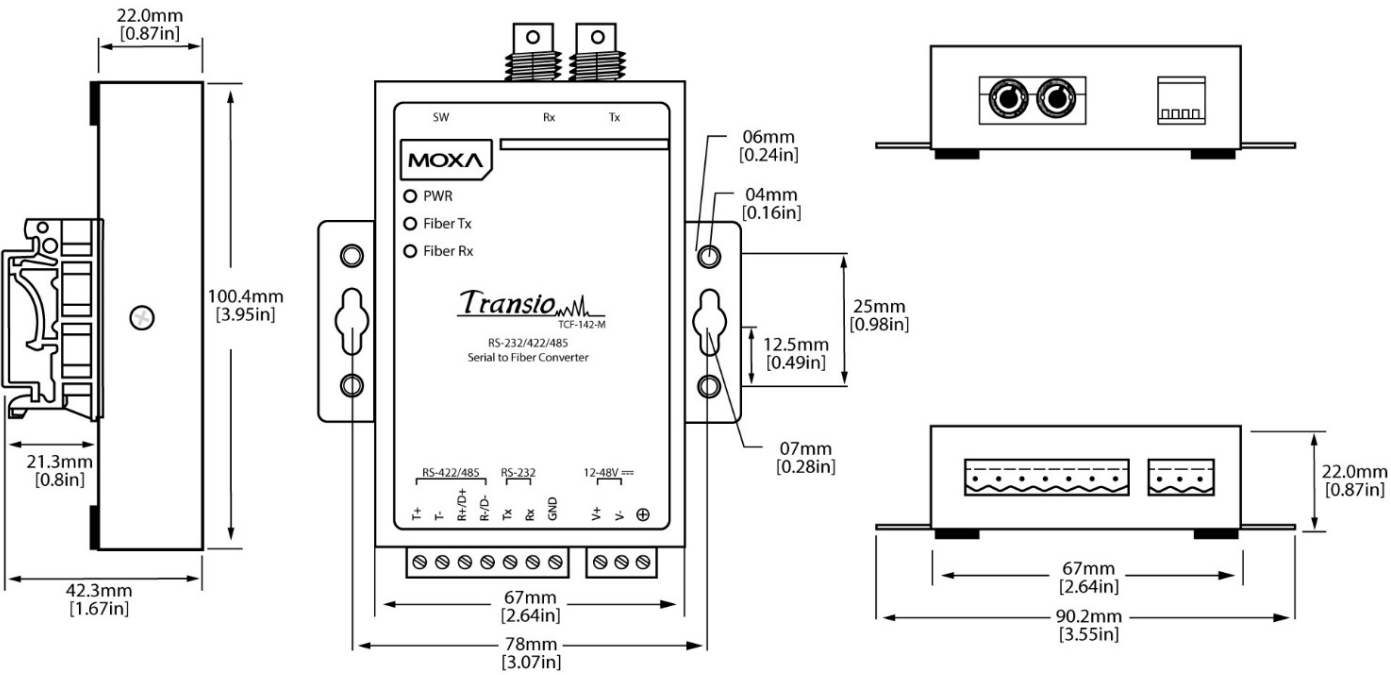


Fig. 5: Dimensional Drawing: RS485 to fiber converter



## 4. Installation

### 4.1. TCE6000 PIN Assignments

#### RS485 pinning

|   |          |                         |
|---|----------|-------------------------|
| 1 | +24 V DC | Positive supply voltage |
| 2 | -RS485   | RS485 negative line     |
| 3 | GND      | Ground                  |
| 4 | +RS485   | RS485 positive line     |
| 5 | n.c.     | Not connected           |

#### I/O-5 pinning

|   |                  |                                |
|---|------------------|--------------------------------|
| 1 | +24 V DC         | Positive supply voltage        |
| 2 | I <sub>out</sub> | not used for ESTA Installation |
| 3 | GND              | Ground                         |
| 4 | Fout             | not used for ESTA Installation |
| 5 | CTL IN 1         | not used for ESTA Installation |

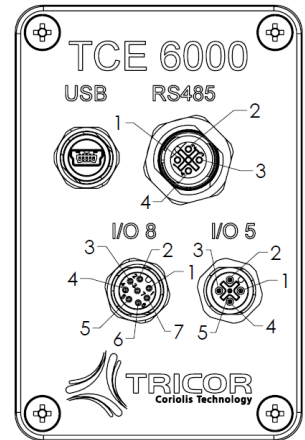


Fig. 6: TCE6000 PIN Assignments

### 4.2. TCE8000 PIN Assignments

|    |          |                         |
|----|----------|-------------------------|
| 50 | +24 V DC | Positive supply voltage |
| 51 | GND      | Ground                  |
| 21 | -RS485   | RS485 negative line     |
| 22 | +RS485   | RS485 positive line     |

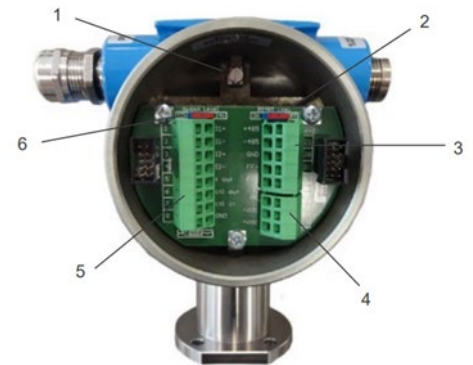


Fig. 7: TCE8000 PIN Assignments

## 5. Listings

### 5.1. List of Figures

|                                                              |    |
|--------------------------------------------------------------|----|
| Fig. 1: Dimensional Drawing: TCE 6000 .....                  | 7  |
| Fig. 2: Dimensional Drawing: TCE 8000 Compact.....           | 7  |
| Fig. 3: Dimensional Drawing: TCE 8000 Wallmount .....        | 8  |
| Fig. 4: Dimensional Drawing: Pneumatic Power Generator ..... | 8  |
| Fig. 5: Dimensional Drawing: RS485 to fiber converter .....  | 9  |
| Fig. 6: TCE6000 PIN Assignments .....                        | 10 |
| Fig. 7: TCE8000 PIN Assignments .....                        | 10 |

### 5.2. List of Tables

|                                              |   |
|----------------------------------------------|---|
| Tab. 1: TCE and ESTA Package .....           | 5 |
| Tab. 2: RS485 to fiber converter.....        | 6 |
| Tab. 3: Fiber Optic Cable .....              | 6 |
| Tab. 4: Pneumatic Power Generation Unit..... | 6 |



## NORTH & SOUTH AMERICA

AW Lake Company  
2440 W. Corporate Preserve Dr. #600  
Oak Creek WI 53154 | USA  
+1 414 574 4300  
[sales@aw-lake.com](mailto:sales@aw-lake.com)  
[www.aw-lake.com](http://www.aw-lake.com)

## ASIA PACIFIC & MIDDLE EAST

KEM Küppers Elektromechanik GmbH  
73 Science Park Drive  
#01-08/09 Cintech 1  
Singapore 118254  
+65 6347 6162  
[singapore@kem-kueppers.com](mailto:singapore@kem-kueppers.com)  
[www.kem-kueppers.cn](http://www.kem-kueppers.cn)

## EUROPE (ROW)

KEM Küppers Elektromechanik GmbH  
Liebigstraße 5  
85757 Karlsfeld | Germany  
+49 8131 59391-100  
[sales@kem-kueppers.com](mailto:sales@kem-kueppers.com)  
[www.kem-kueppers.com](http://www.kem-kueppers.com)

## CHINA

KEM flow technology (Beijing) Co., Ltd.  
Rm. 906, Block C, Ruipu Office Bldg, No. 15  
HongJunYingNan Road  
Chaoyang District, Beijing 100012 | China  
+86 10 84929567  
[sales@kem-kueppers.com](mailto:sales@kem-kueppers.com)  
[www.kem-kueppers.cn](http://www.kem-kueppers.cn)