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For further information, consult the corresponding manual or contact us directly.
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</table>
## MODEL CODE SELECTION

### Rack Selection

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDMA</td>
<td>A</td>
</tr>
<tr>
<td>CDMA</td>
<td>B</td>
</tr>
<tr>
<td>CDMA</td>
<td>C</td>
</tr>
<tr>
<td>CDMA</td>
<td>D</td>
</tr>
<tr>
<td>CDMA1152</td>
<td>E</td>
</tr>
<tr>
<td>CDMA</td>
<td>F</td>
</tr>
<tr>
<td>CDMA</td>
<td>G</td>
</tr>
<tr>
<td>CDMA</td>
<td>H</td>
</tr>
</tbody>
</table>

### Model Selection

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSE</td>
<td>A</td>
</tr>
<tr>
<td>DSE</td>
<td>B</td>
</tr>
<tr>
<td>DSE</td>
<td>C</td>
</tr>
<tr>
<td>DSE</td>
<td>D</td>
</tr>
</tbody>
</table>

### Panel DC Voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 VDC</td>
<td>A</td>
</tr>
<tr>
<td>115 VAC</td>
<td>B</td>
</tr>
<tr>
<td>220 VAC</td>
<td>C</td>
</tr>
</tbody>
</table>

### Power Supply Redundancy

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single PS</td>
<td>A</td>
</tr>
<tr>
<td>Dual PS</td>
<td>B</td>
</tr>
</tbody>
</table>

### Serial Communications

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM-1</td>
<td>A</td>
</tr>
<tr>
<td>COM-2</td>
<td>B</td>
</tr>
<tr>
<td>COM-3</td>
<td>C</td>
</tr>
</tbody>
</table>

### Ethernet Communications

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESN-1</td>
<td>A</td>
</tr>
<tr>
<td>ESN-2</td>
<td>B</td>
</tr>
</tbody>
</table>

### Board Configuration

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board 1</td>
<td>A</td>
</tr>
<tr>
<td>Board 2</td>
<td>B</td>
</tr>
</tbody>
</table>

### Graphical Display

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>A</td>
</tr>
</tbody>
</table>

---

**Note 1:** Only available for TCP-A without multiplugs.

**Note 2:** To see the order of the parts in the chassis, check the rear view of the device. COM-1 and COM-2 have a fixed default configuration; the other ports will be defined in an ascending order according to the following criteria:
- COM-3
- COM-4
- COM-5

**Note 3:** The options U and V correspond to redundant EC211550 modules. If one of these choices is selected, Ethernet will be X.

**Note 4:** The number of cards depends on the chassis type. To see the order of the cards in the chassis, check the numbers in the rear view of each device. TCP-F0 modules are made up only of X and Y type cards.

**Note 5:** The chassis will be placed according to the following criteria, in ascending order, from the position 1 on:
- 18 DX - 16 UX
- 18 DX - 16 E00
- 32 DX
- 14 OptiHub
- 24 OptiHub

**Note 6:** Not available for TCP-R.

**Note 7:** Not available for TCP-C with extension board or for TCP-A with extension board.

**Note 8:** Only available for TCP-A, TCP-AM and TCP-AF.

**Note 9:** Only available for TCP-AM and TCP-AF with multiplugs and protection module and for TCP-F0.

**Note 10:** Not available for TCP-A, TCP-AM, and TCP-AF.
TCP CONFIGURATION

The TCP has a physical support consisting of a 19" or ½ 19" chassis with high reliability modular hardware composed of different boards.

It features:

- A control and communications CPU module, which includes:
  - 1 RS232 serial communication port.
  - Up to 4 optional serial ports for communication, selectable among: RS232, RS485, GFO and PFO.
  - Up to 2 optional serial ports for Ethernet communication, allowing redundancy just as it is described in the DSS_IEC61850 document, selectable between: GFO and RJ 45.
  - 1 demodulated IRIG-B input.
  - 1 hardware status digital output.
- Independent power supply module with redundancy option.
- Input/output boards
  - 32 digital inputs divided into sets of 8 inputs with a common point
  - 16 digital inputs divided into sets of 8 inputs with a common point + 16 digital outputs divided into sets of 8 outputs with common point.
  - 16 digital inputs divided into sets of 8 inputs with a common point + 8 independent digital outputs.
  - 16 digital inputs divided into sets of 8 inputs with a common point + 7 analogue outputs, with one common output.
  - 16 digital inputs divided into sets of 8 inputs with common point + 4 independent analogue inputs + 3 analogue inputs, with one common output.
- Optical hub communications boards (O.H.)
  - 1 to 5 optical hub (G.F.O. or P.F.O.)
  - 2x3 optical hub (G.F.O. or P.F.O.)
- Measurement module (Multitrans).
- Protection module, with independent power supply and processor.
- Power quality module, with independent power supply and processor.
- IP40 frontal protection. Optional IP54 frontal protection.

FUNCTIONS TABLE

<table>
<thead>
<tr>
<th>Units incorporating**</th>
<th>TCP-C</th>
<th>TCP-A</th>
<th>TCP-M</th>
<th>TCP-Q</th>
<th>TCP-R</th>
<th>TCP-FO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL300, PL300FI, PL300BC, PD300 or PM300</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X: Available function  O: Optional function  *With PQM300-T  ** See the corresponding Data Sheet for each unit for characteristics  *** Through analogue converter only
**MAXIMUM CAPACITY**

* Only 2x3 optical hub modules

<table>
<thead>
<tr>
<th></th>
<th>TCP-C</th>
<th>TCP-A</th>
<th>TCP-M</th>
<th>TCP-Q</th>
<th>TCP-R</th>
<th>TCP-FO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control CPU + P.S.</strong></td>
<td>Control CPU + P.S.</td>
<td>Control CPU + P.S.</td>
<td>Control CPU + P.S.</td>
<td>Control CPU + P.S.</td>
<td>Control CPU + P.S.</td>
<td>P.S.</td>
</tr>
<tr>
<td><strong>V/O and OH Modules</strong></td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8 (5 U rack)</td>
<td>5</td>
</tr>
<tr>
<td><strong>Protection and Measurement</strong></td>
<td>Series 300 protection with extension</td>
<td>Series 300 protection without extension</td>
<td>Multitrans</td>
<td>Multitrans</td>
<td>PQM with extension</td>
<td>PQM without extension</td>
</tr>
<tr>
<td><strong>Alarm function</strong></td>
<td>Display of up to 112 programmable text alarms</td>
<td>Display of up to 112 programmable text alarms</td>
<td>Display of up to 112 programmable text alarms</td>
<td>Display of up to 112 programmable text alarms</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Display of alarms via 16 LEDs</td>
<td>Display of alarms via 16 LEDs</td>
<td>Display of alarms via 16 LEDs</td>
<td>Display of alarms via 16 LEDs</td>
<td>Display of alarms via 16 LEDs</td>
<td>Display of alarms via 16 LEDs</td>
</tr>
</tbody>
</table>

**COMMUNICATIONS**

- Communication with UCS:
  - PROCOME

- Communication as MASTER:
  - DNP 3.0 level 2
  - MODBUS RTU
  - IEC60870-103
  - IEC60870-101
  - SEL ASCII
  - PROCOME

- Communication as SLAVE (RTU function, Bay Controller function):
  - IEC 60870-101 (several profiles)
  - IEC 60870-104 (several profiles)
  - IEC 870-5-103
  - DNP 3.0 (level 3)
  - DNP3.0 TCP/IP
  - MODBUS RTU
  - PROCOME

- Communication with SIPCON console:
  - PROCOME

- SERVER-CLIENT communication:
  - IEC 61850

- Gateway operation:
  - Between different protocols
  - Between 61850 and other protocols
The HMI is equipped with the following light indicators:

- **1 two-colour status LED:**
  - Green LED: Correct operation
  - Red LED: Incorrect operation
  - Slow flicker: Equipment has not been configured
  - Fast flicker: Equipment has been configured

- **4 LEDs**, which usually indicate the following:
  - LOC: Local Position
  - FCOM: Communications failure alarm
  - DEF: Default alarm
  - ORD: Command output indication
The HMI is equipped with 5 keys, which correspond to the following functions:

- Close / Running / Automatism / Remote control
- Open / Out of order / Manual / Local
- Discharge
- Selection
- Information

This is a basic configuration for the TCP-M model. Other configurations:

- The TCP-A models are also equipped with 16 LEDs in the front panel and user-configurable settings.
- The TCP-C models are also equipped with a protection interface (For example, see Datasheet PL300).
- The TCP-Q models are also equipped with 8 LEDs and an RS232 port in the front panel.
- The TCP-FO are not equipped with displays, keyboards or LEDs.

### STANDARDS AND TESTS

<table>
<thead>
<tr>
<th>Electromagnetic</th>
<th>IEC60255-25/EN55022</th>
<th>Class A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of conducted radioelectric emissions in DC power port</td>
<td>IEC 60255-25/EN55022</td>
<td>Class A</td>
</tr>
<tr>
<td>Measurement of radiated radioelectric emissions</td>
<td>IEC 60255-25/EN55022</td>
<td>Class A</td>
</tr>
<tr>
<td>Insulation resistance test</td>
<td>IEC60255-5</td>
<td>500Vcc, &gt;100M Ω</td>
</tr>
<tr>
<td>Dielectric test</td>
<td>IEC60255-5</td>
<td>2kVac</td>
</tr>
<tr>
<td>Impulse voltage test</td>
<td>IEC60255-5</td>
<td>±5kV/±1kV</td>
</tr>
<tr>
<td>Electrostatic discharges immunity test</td>
<td>IEC61000-4-2</td>
<td>±1kV</td>
</tr>
<tr>
<td>Radiated radiofrequency fields immunity test</td>
<td>ENV 50204/IEC 61000-4-3</td>
<td>10V/m</td>
</tr>
<tr>
<td>Electrical fast transients immunity test</td>
<td>IEC61000-4-4</td>
<td>±2kV, 2kHz PS</td>
</tr>
<tr>
<td>Surge immunity test</td>
<td>IEC61000-4-5</td>
<td>±2kV, 5kHz the rest</td>
</tr>
<tr>
<td>Conducted disturbances induced by radio-frequency fields</td>
<td>IEC61000-4-8</td>
<td>±4kV CM</td>
</tr>
<tr>
<td>1 MHz damped waves immunity test</td>
<td>IEC60255-22-1</td>
<td>±2.5kV CM</td>
</tr>
<tr>
<td>DC power supply variations and interruptions immunity test</td>
<td>IEC61000-4-29/IEC60255-11</td>
<td>±1kV DM</td>
</tr>
<tr>
<td>50 Hz magnetic fields immunity test</td>
<td>IEC61000-4-8</td>
<td>100% 100ms</td>
</tr>
<tr>
<td>Pulse magnetic fields immunity test</td>
<td>IEC61000-4-9</td>
<td>60% 1000 ms</td>
</tr>
<tr>
<td>Damped oscillatory magnetic fields immunity test</td>
<td>IEC61000-4-10</td>
<td>30% 1000ms</td>
</tr>
<tr>
<td>Climatic</td>
<td>IEC 60068-2-1</td>
<td>-40°C 16h</td>
</tr>
<tr>
<td>Cold test</td>
<td>IEC 60068-2-2</td>
<td>+85°C 16h</td>
</tr>
<tr>
<td>Dry heat test</td>
<td>IEC 60068-2-78</td>
<td>+40°C, 93% Relative humidity 16h</td>
</tr>
<tr>
<td>Damp heat test, steady state</td>
<td>IEC 60068-2-30</td>
<td>+55°C, 93% Relative humidity, 6 cycles</td>
</tr>
<tr>
<td>Damp heat test, cyclic</td>
<td>IEC 60068-2-14</td>
<td>-20°F+70°F</td>
</tr>
<tr>
<td>Mechanical</td>
<td>IEC60255-21-1</td>
<td>Class I</td>
</tr>
<tr>
<td>Vibration test</td>
<td>IEC60255-21-2</td>
<td>Class I</td>
</tr>
<tr>
<td>Shock and bump test</td>
<td>IEC60255-21-1</td>
<td>Class I</td>
</tr>
</tbody>
</table>
TECHNICAL SPECIFICATIONS

CPU Module

- 1 or 2 32-bit microprocessor, 66 MHz clock
- 16 Mbytes SDRAM memory for variables and the running of firmware and applications
- 1 Mbyte SDRAM memory for storing settings, agony variables, etc.
- 8 Mbytes FLASH memory for firmware, settings, applications and back-up
- Demodulated IRIG-B input
- 1 switched digital output for signalling hardware status.
- 1 RS232 serial communication port.
- Up to 4 selectable serial communication ports:
  - RS232
  - RS485
  - GFO
  - PFO
- Serial communication characteristics:
  - Communication mode: Half-duplex or Full-duplex
  - Baud rate: 600 to 115200 bps (maximum for PFO, 56000bps)
- Up to 2 serial ports for Ethernet communication, allowing redundancy just as it is described in the DSS_IEC61850 document, selectable between:
  - F.O. (100 Base-Fx)
    - Operating speed: 10/100 Mb
    - Multimode G.F.O.: 62.5/125µm
    - Connector: ST (SC optional)
    - Minimum optical Power at transmitter output: -20dbm
    - Maximum receptive optical power: -31dbm
    - Wave length: 1300nm
    - Allowed attenuation: 8db with glass fibre of 62.5/125 µm
    - Maximum distance: 1.5 Km
  - RJ45 (10/100 Base-Tx)
    - Operating speed: 10/100Mb
    - Insulation: 500 Vac
    - Communication capacity: 10 /100Mbps in Half-duplex (Ethernet)
    - Cable length: 100 m max.
Power Supply Module

- 1 or 2 P.S. in a single slot within the TCP
- They generate 2 internal voltages: +5 Vdc for supplying the CPU and the DIs and +5 Vdc to supply the DOs.

- 24 Vdc P.S. module
  - Input voltage range: 19-34 Vdc
  - Output power: 40 W

- 48 Vdc P.S. module
  - Input voltage range: 34-60 Vdc
  - Output power: 40 W

- 125 Vdc P.S. module
  - Input voltage range: 86-165 Vdc
  - Output power: 40 W

- 220 Vdc P.S. module
  - Input voltage range: 165-280 Vdc
  - Output power: 40 W

- Protection against the inversion of the input voltage polarization
- Protection against short-circuits in the output

1x5 Optical hub module.

- This module, which is designed to be installed in any TCP models, is powered by a flat cable common to the I/O modules.
- It is mainly employed for small SIPCs (Integrated Protection and Control System) with a TCP unit working as a UCS (Substation Control Unit), for which these modules make available to have an economical and compact UCS cubicles.

- Burden: 875mW
- Nº secondary channels (slaves): 5
- Nº primary channels (master): 1
- Several modules may be connected in cascade format in order to increase the number of communication channels. To do so, the modules in question must be connected via external wiring - one of the module's secondary channels is to be connected to the following module's primary channel.

- Each optical channel is equipped with 1-Tx + 1-Rx
  - Glass multimode (λ=820nm) ST
  - Plastic or Silicate multimode (λ=650nm) HP-VLF

- Optical indicators
  - Green LEDs RX secondary channel 5
  - Red LEDs TX primary channel 1

- Maximum distances without connections from -20ºC to + 75ºC
  - Glass multimode OF 62.5/125 µm 1.2 Km at 115200 bps
  - Low loss 1mm multimode POF 100 m at 56,000bps
  - Silicate multimode OF 200 µm (HCS) 1.9 Km

- The module is equipped with a security system which locks any channel which receives a permanent signal or fixed frequency in order to avoid the rest of the channels being affected.
2x3 Optical hub module.

- This module, which is designed to be installed in any TCP, is powered by the unit's internal power supply.
- It is mainly employed for small SIPCs (Integrated Protection and Control System) with internal or external TCP units acting as a UCS (Substation Control Unit), for which these modules make available to have an economical and compact UCS cubicles.

- Burden: 500 mW – without communication
  2 W maximum

- N° secondary channels (slaves) Configurable (maximum of 5 per module)
- N° primary channels (master) Configurable (maximum of 4 per module)

- Several modules may be connected in cascade format in order to increase the number of communication channels. To do so, the modules in question must be connected via external wiring - one of the module's secondary channels is to be connected to the following module's primary channel.

- Each optical channel is equipped with 1-Tx + 1-Rx
  - Glass multimode (λ =820nm) ST
  - Plastic or Silicate multimode (λ=650nm) HP-VLF

- Front elements
  - Green LEDs RX secondary channel 6
  - Green LEDs TX primary channel 6
  - Red LEDs Fault 2 (shared with Tx3)

- Maximum distances without connections from -20°C to + 75°C
  - Glass multimode OF 62.5 /125 µm 1.2 Km at 115200 bps
  - Low loss 1mm Plastic multimode OF 100 m at 56,000bps
  - Silicate multimode OF 200 µm (HCS) 1.9 Km

- The module is equipped with a security system which locks any channel which receives a permanent signal or fixed frequency in order to avoid the rest of the channels being affected.

**Digital inputs, digital outputs and analogue converter inputs module**

**Options:**

- 32 DIs, with an independent common DI for each 8 DIs
- 16 DIs, with one common input for each 8 inputs, + 16 DOs, with one common output for each 8 outputs.
- 16 DIs, with a common DI for each 8 DIs + 8 independent DOs
- 16 DIs, with one common input for each 8 inputs, + 7 AIs, with one common input.
- 16 DIs, with one common input for each 8 inputs, + 3 AIs, with one common input + 4 independently-insulated AIs.
### Digital inputs characteristics

- **Galvanic separation by means of optoisolators**

- **Supervision circuit with the following checking functions:**
  - Module power supply voltage
  - Module access monitoring

- **Digital input voltage:**
  - 24 Vdc DIs: 18-34 Vdc
  - 48 Vdc DIs: 36-60 Vdc
  - 110-125 Vdc DIs: 86-160 Vdc
  - 220 Vdc DIs: 165-264 Vdc

- **Permanent surge:** 30%

- **Surges (10 sec.):** 44%

- **Input type:** Externally powered contact

- **Nominal burden per input:** 3 mA

- **Digital anti-bounce filter:** 1 ms

### Digital outputs characteristics

- **The outputs are supplied with potential-free contacts**

- **Supervision circuits with the following checking functions:**
  - Module power supply voltage
  - Module access monitoring, with output deactivation if access is not gained within 100 ms
  - Independent hardware selection, checking and execution system for each output

- **Breaking capacity (L/R=40 ms):**
  - 48 Vdc: 0.5 A
  - 125 Vdc: 0.3 A
  - 220 Vdc: 0.2 A

- **Closure capacity (0.5 s):** 30 A

- **Continuous current:** 5 A

- **Current (1 s):** 50 A
### Analogue inputs characteristics

- Adaptation and filtering of 7 analogue inputs
- Insulation via optoisolators between the input and the internal logic
- Insulated part powered via +5Vdc/-5Vdc converter with galvanic separation
- 12-bit A/D conversion for successive approaches

- Supervision circuits with the following checking functions:
  - Module power supply voltage
  - Conversion failure
  - Incorrect conversions
  - Optoisolator failure

- Measurement range: ±2.5 mA, ±5 mA, ±20 mA
- Resolution: 11 bits + sign
- Precision: 0.2 % at 25°C
- Connection type: 2 wires per measurement

- Insulation:
  - With internal logic: 2,500 Vac
  - Between inputs:
    - Standard: No
    - Insulated: 1,000 Vac

### Internal supply burden (+5Vdc)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Module burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 DIs, with an independent common DI for each 8 DIs</td>
<td>125mW</td>
</tr>
<tr>
<td>16 DIs, with one common input for each 8 inputs, + 16 DOs, with one common output for each 8 outputs.</td>
<td>350mW</td>
</tr>
<tr>
<td>16 DIs, with a common DI for each 8 DIs + 8 independent DOs</td>
<td>350mW</td>
</tr>
<tr>
<td>16 DIs, with one common input for each 8 inputs, + 7 AIs, with one common input.</td>
<td>1.5W</td>
</tr>
<tr>
<td>16 DIs, with one common input for each 8 inputs, + 3 AIs, with one common input + 4 independently-insulated AIs.</td>
<td>3W</td>
</tr>
</tbody>
</table>

- Additional consumption per active DI: 2.5mW
- Additional consumption per active DO: 450mW
Directing of input / output modules

- All modules I/O are equipped with 4 micro-breakers. The micro-breakers enable the identification, by means of a unique code, of each module within unit.
  - The “OFF” value = “1”, whilst the “ON” value = “0”

![Internal front view of the direction switches]

Configuration of communication modules

- The 2x3 optical hub modules are equipped with the following switches for configuration.

![Internal front view of the configuration switches]

**ENVIRONMENTAL CONDITIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-20°C to +75°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°C to +85°C</td>
</tr>
</tbody>
</table>
CONSTRUCTIVE CHARACTERISTICS

Dimensions TCP 19" 4U

Dimensions TCP-R 1/2 19" 4U
**CONNECTIONS**

**CPU Module**

---

**Power Supply Module**

---

**2x3 optical hub, configurations:**

Printed information on module plate

<table>
<thead>
<tr>
<th>RX1</th>
<th>RX2</th>
<th>Switch ON</th>
<th>Switch OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>M</td>
<td>S1/11: 1-2-3-4-5-6-7</td>
<td>S2/12: 1-2-3-4-5-6</td>
</tr>
<tr>
<td>M</td>
<td>E</td>
<td>S1/11: 2-3-4-5-7-8</td>
<td>S2/12: 1-2-3-4-5-6</td>
</tr>
<tr>
<td>E</td>
<td>E</td>
<td>S1/11: 1-6-7</td>
<td>S2/12: 2-3-4-5-6</td>
</tr>
</tbody>
</table>

Note: in independent groups, the shaded switches are OFF.
Ingeteam Transmission & Distribution S.A.

CONTROL AND PROTECTION TERMINAL

MMS
2x3 optical hub, master connectors 1 and 2 and slave connector 3

MSS
2x3 optical hub, master connector 1 and slave connectors 2 and 3

MMS and SSS
2x3 optical hub, master connector 1A and 2A and slaves 3A, 1B, 2B and 3B

MSS and SSS
2x3 optical hub, master connector 1A and slaves 2A, 3A, 1B, 2B and 3B

Connections and rear view of 2x3 optical hub module
Digital Input Module

Module with 16 digital inputs and 16 digital outputs

Module with 16 independent digital inputs and 8 independent digital outputs

Module with 16 digital inputs and 7 analogue inputs

Module with 16 digital inputs and 7 analogue outputs (4 insulated analogue inputs)

*Depending on position of card in chassis