TCT

The Telecontrol Transformer

General Operating, Maintenance, and Installation Manual



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1 Introduction

All technical information, descriptions and illustrations contained in this ‘Operating, Maintenance, and Installation Manual’ remain our property and shall not be used differently than for operating this system, nor shall they be copied, reproduced or passed on to third parties or brought to their notice without our prior written consent.

The information represented in this manual is in keeping with current standards and is subject to subsequent alterations.

This manual contains important instructions referring to safe installation, commissioning, operation, and maintenance.
Read this manual thoroughly, before starting up the gateway, and observe the instructions.

In order to comply with the guidelines for electro-magnetic compatibility, only CE-certified components are used in compliance with project-specific requirements.

Please note that the hardware platform is not protected against lightning and the operator should, if desired, take appropriate protective precautions.
The addition of our RS-232 isolator provides efficient protection of your data and equipment against external influences. We will be pleased to draw up a non-binding offer for you.

Finally we want to draw your attention to the fact that any warranties will be invalid in the event that:

- Operation, servicing, and maintenance are not carried out accurately according to the instructions; repairs are not carried out by our personnel or without our prior written consent.
- Commissioning is not carried out by our personnel or we have not given our approval for the commissioning or the commissioning is carried out by untrained personnel.
- The unit is used inadequately, incorrectly, negligently, or inappropriately or for a purpose other than originally intended.
- The serial number is removed from the product.

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

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2 Hardware Description

The Telecontrol Transformer (TCT) has been designed for industrial environments. All components are cooled passively. Factors like quality, availability, and high durability are of particular importance for the selection of our components.

Exhaustive tests of the TCT are performed by our company. Each device undergoes an in-depth function test. Quality assurance is conducted according to the four-eye principle. Each device passes a number of quality inspections.

Due to the functional tests carried out, the mounting brackets may show slight signs of usage.

2.1 Controls and Display Elements

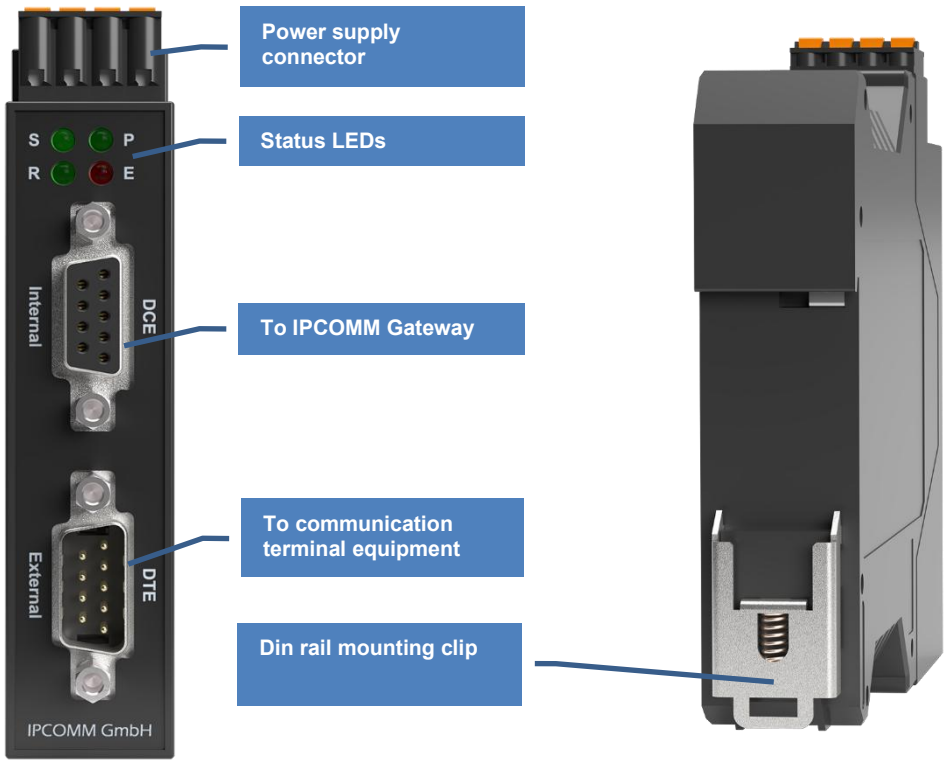
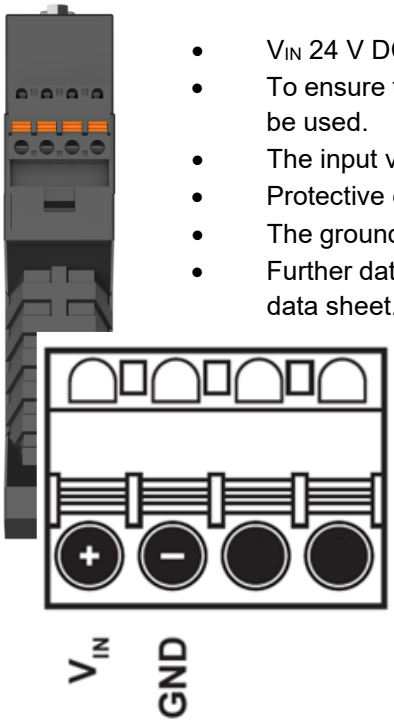


Figure 1: TCT front and rear view

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2.2 Power Supply

Please be sure to observe the polarity and the maximum input voltage.



- V_{IN} 24 V DC (details see data sheet)
- To ensure the power supply, cables with a cross-section of at least 0.5 mm² must be used.
- The input voltage cannot be used if the polarity is reversed.
- Protective earthing is provided via the DIN rail clamp.
- The ground (GND) is galvanically connected directly to the protective earth (PE).
- Further data such as current consumption or absolute values can be found in the data sheet.

Figure 2: Pluggable power supply

2.3 Diagnostic LEDs

Four light-emitting diodes (LEDs) are located on the front panel and indicate the operating status of the Telecontrol Transformer. Their behavior is described in the chapter “Electrical Commissioning”.

LED S: Send indicator (green)
LED P: Operation indicator (green)
LED R: Receive indicator (green)
LED E: Error indicator (red)

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2.4 Serial Interfaces

The following figures show the pin assignments for the Telecontrol Transformer. The “Internal DCE” interface is connected to the IPCOMM Gateway. The “External DTE” interface is connected to the data communication equipment (RTU).

The pins marked in green are required for communication.

Serial port
RS-232 DCE
DB9 female



Pin	Direction	Description	
1	OUTPUT	DCD	Data Carrier Detect
2	OUTPUT	TXD	Transmit Data
3	INPUT	RXD	Receive Data
4	INPUT	DTR	Data Terminal Ready
5		GND	Ground
6	OUTPUT	DSR	Data Set Ready
7	INPUT	RTS	Request To Send
8	OUTPUT	CTS	Clear To Send
9	OUTPUT	RI	Ring Indicator

Serial port
RS-232 DTE
DB9 male



Pin	Direction	Description	
1	INPUT	DCD	Data Carrier Detect
2	INPUT	RXD	Receive Data
3	OUTPUT	TXD	Transmit Data
4	OUTPUT	DTR	Data Terminal Ready
5		GND	Ground
6	INPUT	DSR	Data Set Ready
7	OUTPUT	RTS	Request To Send
8	INPUT	CTS	Clear To Send
9	INPUT	RI	Ring Indicator

Figure 3: Pin assignments

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2.5 DIN Rail Mounting

Installation may only be carried out by qualified personnel. The device must be disconnected from the power supply. ESD protection measures must be taken. Improper handling will void the warranty (and any additional guarantees).



The TCT must be mounted on a 35 mm DIN rail with the power supply disconnected.

The earthing connection is made directly to the DIN rail via the clamp. It must be ensured that the DIN rail is both electrically conductive and earthed.

If several TCTs are mounted next to each other, no minimum distance is required between the devices. The devices can be mounted in any orientation.

Place the back of the TCT on the upper edge of the DIN rail and swivel it downwards until the DIN rail clip engages on the back of the device.

To remove the TCT from the DIN rail, pull the DIN rail clip downwards (using a screwdriver if necessary) and swivel the TCT upwards off the DIN rail.

Figure 4: Rear of housing with DIN rail clip

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3 The Application and Function

The Telecontrol Transformer (TCT) is used for coupling bit-synchronous or pulse-length-modulated, i.e. "non-asynchronous" protocols.

The figure illustrates the basic system architecture connecting the control center, gateway, Telecontrol Transformer, and remote station.

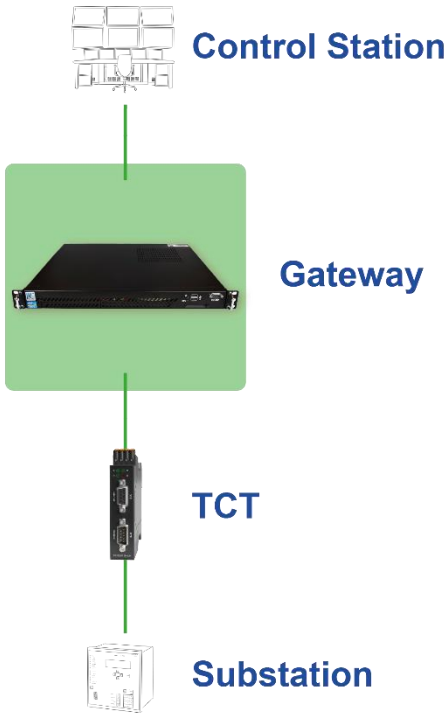


Figure 5: Basic structure

The Telecontrol Transformer (TCT) is equipped with a microcontroller responsible for converting data from or into the asynchronous format. The TCT does not perform higher-level protocol processing, i.e. telegrams are transformed on a one-to-one basis.

In order to prevent delays in receiving or transmitting, the connection in the direction of the gateway operates at very high baud rates. Data transfer does not occur after a complete telegram has been received, but in smaller data blocks during reception.

The TCT is fitted with a serial RS-232 interface in both directions as a standard. The serial interface towards the communication terminal equipment has been electrically isolated.

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3.1 Electrical Installation

The Telecontrol Transformer must be electrically connected as per the following wiring diagram.

(1) Grounding must be ensured via a grounded DIN rail

(2) IPCOMM Gateway (RS-232 Internal: Gateway DTE <> TCT DCE)
Shielded serial cable RS-232 DB9, 1:1 wired, female-to-male

(3) Substation (RTU) / Communication Terminal Equipment (RS-232 External: RTU DCE <> TCT DTE)
Shielded serial cable RS-232 DB9, 1:1 wired, female-to-male

(4) The power supply must be connected via the pluggable power connector (see chapter “Power Supply”)

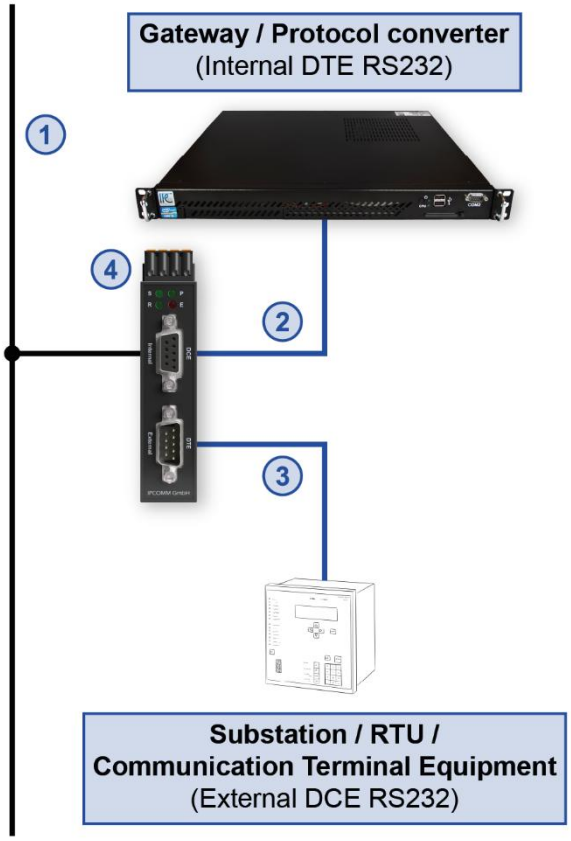


Figure 6: Wiring diagram

After electrical installation of the Telecontrol Transformer as per wiring diagram, electrical commissioning can commence.

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3.2 Electrical Commissioning

As soon as the Telecontrol Transformer is supplied with voltage all four LEDs will light up (function test of the LEDs).

- Now the gateway is switched on.
- Immediately on bootstrapping the IPCOMM Protocol Converter (default) or after starting the ipConv software (dependent on the configuration) the "DTR" signal is activated.
- This extinguishes all four LEDs.

After initializing the Telecontrol Transformer by the IPCOMM Gateway the following operational states can occur:

1. The green LED (P) "Operational Indicator" lights up.
   The Telecontrol Transformer is ready to operate; there is however no data waiting in line to be transmitted (open-circuit operation). This LED is always lit up.
2. The green LED (R) "Reception Indicator" lights up.
   Data are received from the external communication terminal equipment.
3. The green LED (S) "Transmission Indicator" lights up.
   Data are sent to the external communication terminal equipment.
4. The red LED (E) "Error Indicator" lights up.
   In this case a communication error (malfunction) has occurred.
5. The LEDs (P), (R), (S) and (E) light up.
   A malfunction has occurred.

3.3 Jumper Configuration

Modifications may only be carried out by qualified personnel. Improper handling will void the warranty and any additional guarantees.

- The device must be disconnected from the power supply, and all data cables must be disconnected.
- Appropriate ESD protection measures, such as wearing an antistatic wrist strap, are required.
- The procedure must only be performed on a grounded, electrically conductive surface.
- **This configuration is performed by IPCOMM according to project-specific requirements and generally does not need to be modified by the customer.**

The baud rates (over microcontroller clock frequency) can be configured using jumper block JP:

- JP1 → 7.3728 MHz
- JP2 → 14.7456 MHz
- JP3 → 22.1184 MHz
- Exactly **one** jumper must be set!

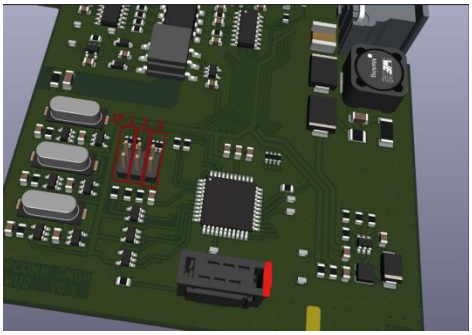


Figure 7: Jumper block

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4 Technical Data Sheet

A technical data sheet is available separately to this document. In addition to pure technical data, the document also contains information on approval and applied standards (EMC). The current version can be found on our website under Hardware / TCT / Documentation:

- TCT https://www.ipcomm.de/hardware/TCT/en/sheet.html

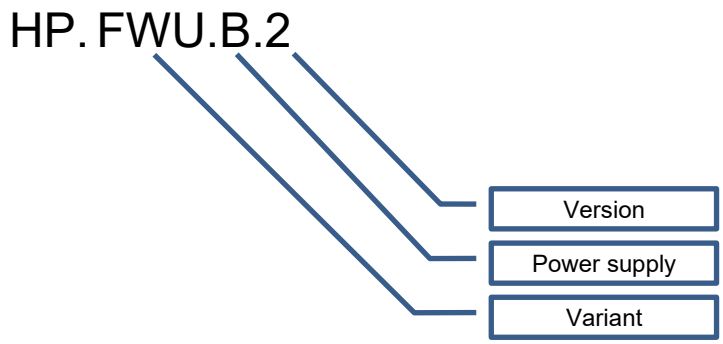
5 EU Declaration of Conformity

An EU Declaration of Conformity is available separately to this document. The current version can be found on our website under Hardware / TCT / Documentation:

- TCT https://www.ipcomm.de/hardware/TCT/en/sheet.html

6 Nomenclature of Item Code

The item code provides information about the equipment features.



Variant

Value	Description
FWU	Telecontrol Transformer (TCT)

Power Supply

Value	Description
B	24 V DC

Version

Value	Description
1	Telecontrol Transformer
2	Telecontrol Transformer 2026

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7 Dimensions

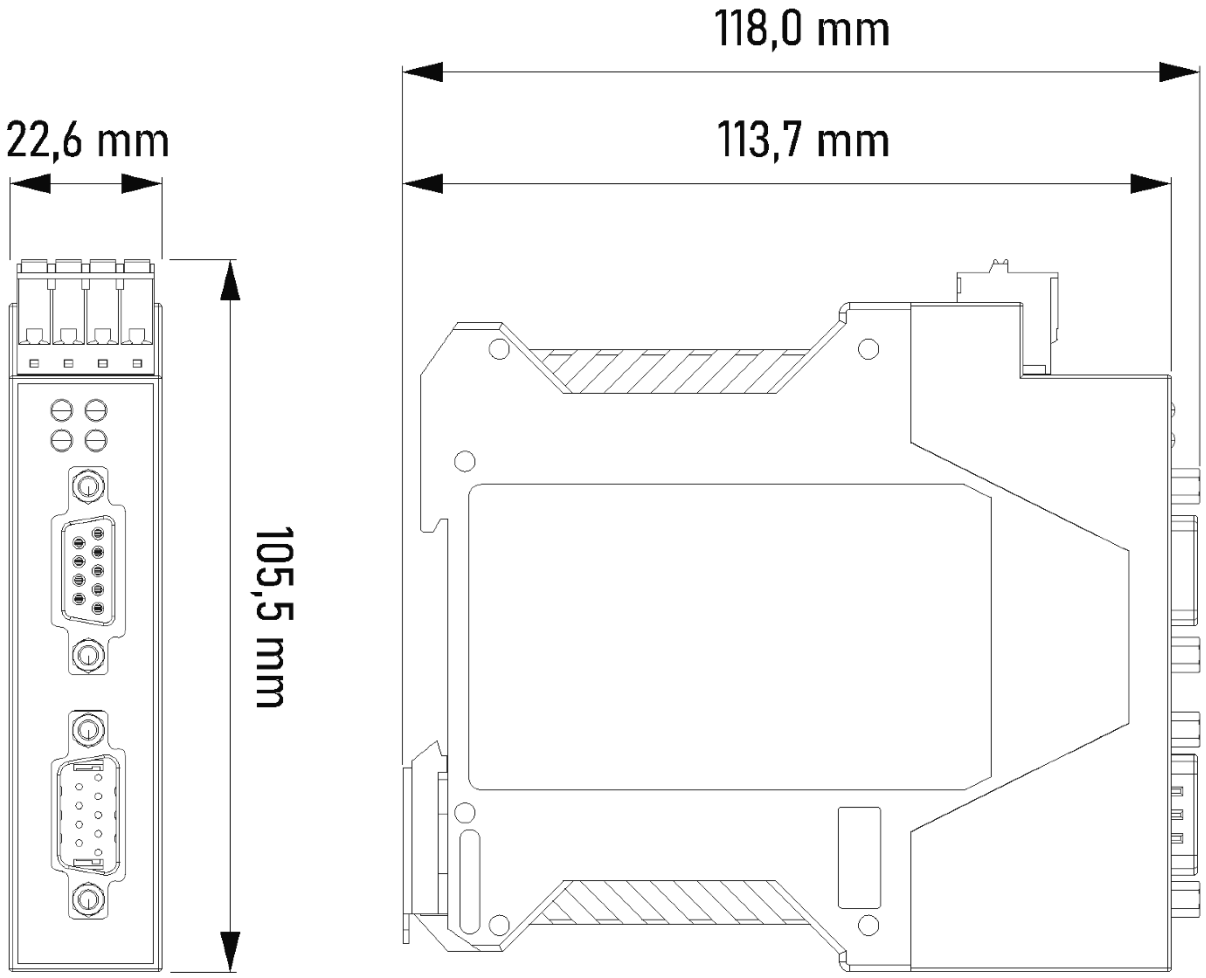


Figure 8: Dimensions – TCT

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