Managed Industrial Modular Ethernet Switch UTD-ES-5000

- Industrial modular switch system with three types of chassis: 19" 1U chassis, DIN rail mount chassis and RACK 3U mount chassis and removable modules,
- Up to 36 x 10/100/1000 Mbps Ethernet ports with UTP RJ-45, fiber SFP removable transceivers or non removable fiber transceivers, fiber with LC, SC, ST connectors, SFP slots,
- DDMI monitoring functions
- **Ethernet protection support: ITU-T G.8032 v2** ring topology protection with multi ring and dual homing support, up to 20ms protection and recovery switching,
- Spanning Tree, Rapid Spanning Tree and Multiple Spanning Tree protocol support,
- IEEE 1588-2008v.2 (***PTPv2***): precise time protocol synchronization, hardware timestamping; precise time synchronization for real-time applications with support of **IEEE C37.238-2011, IEC61850-9-3 - Power Profile,**
- Hardware ready for IEEE 1588v.3 (**PTPv3**),
- Hardware and software support for **Synchronous Ethernet**,
- Authentication **IEEE802.1x, Radius, Tacacs+**,
- Secure modules with **IEEE 802.1 MACsec,**
- **IEC61850–3, IEEE1613** design compliance for power substation,
- ***PROFINET*** *Conformance Class A,*
- Management IP, IPv6, Web browser, telnet, SSH and local CLI console, SNMP v1/v2c/v3,
- PoE÷PoE+ (optional) support (all ports max. 250W)*, with PoE watchdog,*
- -40 to +70°C operating temperature,
- Hot swap redundant power supply **80 – 350** ***V DC, 70 – 250 V AC*** *and* ***48 V DC.***

Description of the device

Transmission

UTD-ES-5000 is the advanced 10G/1G/100M modular Ethernet switch dedicated to provide the transmission of applications, supervision and operation of power stations, CCTV and other applications for the industry.

Network resiliency

UTD-ES-5000 switch supports Ethernet Ring Protection Switching according to the ITU-T G.8032 standard, providing up to 20ms protection and recovery switching for Ethernet traffic in ring topologies. Standard resiliency spanning tree protocols like STP, RSTP, MSTP are also supported to ensure system reliability.

Environmental limits

Switch was designed to operate in temperature range from -40 to 70° C.

Solid **IP-30** metal enclosures ensure stable operation in heavy environment. **UTD-ES-5000** can be mounted in standard 19” rack or on a standard DIN rail. Redundant power supply provides stable and continuous operation in case of one power supply failure.

UTD-ES-5000 device supports Energy Efficient Ethernet functionality (IEEE 802.3az) allowing for less power consumption by putting Ethernet ports into "sleep" mode during periods of low data activity and adjusting the power according to Ethernet cable length.

Network Performance

UTD-ES-5000 supports ***IEEE 1588v.2*** Precision Time Protocol with support for **IEEE C37.238-2011, IEC 61850-9-3** power profile to provide precise time synchronization for applications with restrictive real-time requirements.

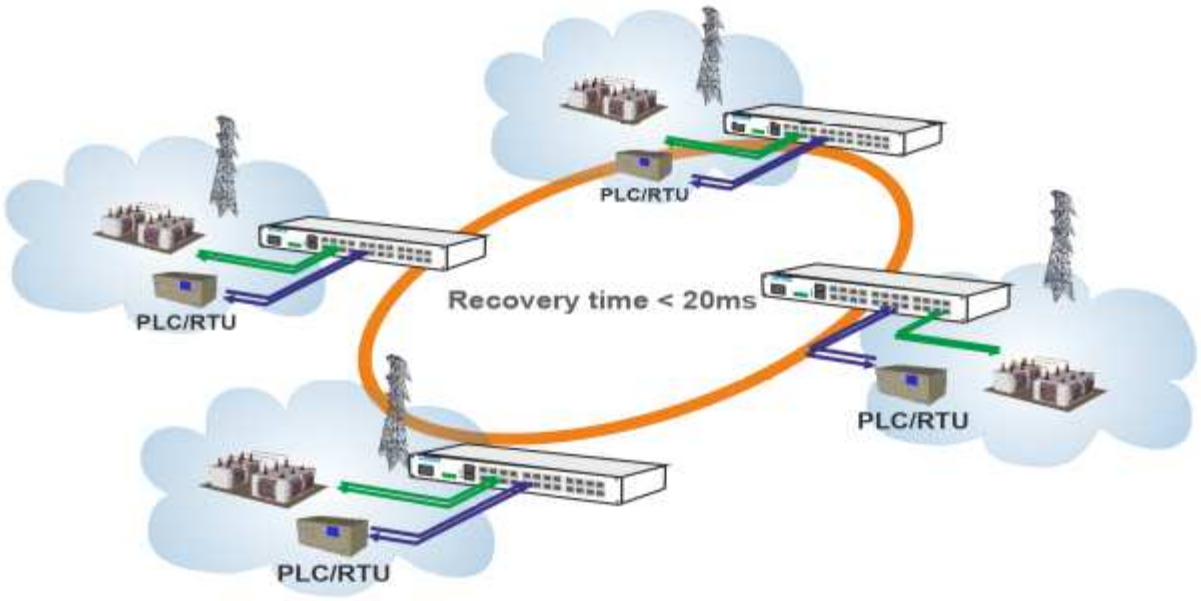
Ethernet transmission channels may be set as transparent or divided into independent transmission channels through the virtual VLAN mechanism. Device supports advanced Ethernet interface features like ***VLAN*** stacking (***QinQ***, ***IEEE802.1ad***), private VLANs, ***LACP*** links aggregation, jumbo frame size, programmable rate limiting and port priority setting. Device supports Ethernet OAM features (Link OAM and Service OAM), providing effective fault management and performance monitoring (remote loopbacks, continuity checks using CFM messages, performance monitoring measurements such as frame loss ratio, frame delay.

Management

Embedded ***HTTPs*** server, ***SSH*** server and ***SNMPv3*** agent allow free configuration of the device performance by standard Web browser and continuous monitoring from any management platforms equipped with SNMP client. In addition SSH and SNMPv3 provide secure communication with remote devices using encrypted messages. Remote software update is supported to allow further functionality improvement.

Applications

UTD-ES-5000 switch can be used to provide reliable connections between ***SCADA*** system and network controllers, to create ***IP CCTV*** monitoring systems, to provide communication for wind farms, to monitor environmental parameters in harsh environment, to realize smart grid applications and in many others industrial applications.



The sample application, illustrating the connection of peripheral systems to measure the detectors or measuring environmental parameters in power stations unattended

Technical specifications

Ethernet switch global specifications

- **Ethernet:** Store and forward switching packet, up to 36x 10/100/1000 Mbps ports, Jumbo frame: 9600 B, Packet buffer size: 4 MB, Forwarding rate: 80 Gbps,
- **Mac Table size**: 32k,
- **VLAN:** 4095 IDs, 802.1Q, 802.1QinQ, VLAN translation, private VLAN,
- **QoS:** Weighted Round Robin, Strict Priority, 8 priority queues per port, queue egress shaper, PCP 802.1p, DSCP/ToS, Port Rate Limit ingress policing and egress shaping,
- **Storm Protection**: Broadcast, Multicast, Unknown DA,
- **IGMP snooping** V1/V2/V3, IGMP Filtering/ Throttling, IGMP query, IGMP proxy reporting, MLD snooping V1/V2,
- **Port Mirroring:** copy network traffic to specified port, ingress or egress direction or both,
- **Port Aggregation:** Static 5 groups**,** dynamic LACP,
- **Port Loop Protection,**
- **SFP DDMI:** Digital Diagnostic Monitoring for all SFP slots**,**
- **PTP v2 IEEE1588:2008:** Support profiles: 1588, G.8265.1, G.8275.1 for Transparent clock, Boundary clock, Master, Slave. Support Power Profile for Transparent clock and Boundary clock,
- **Synchronous Ethernet G.8261:** SSM monit, clock source from all traffic ports,
- **Power over Ethernet+:** optional support up to 30W per port**.**

Supported standards and protocols

General information

- IEEE 802.3 10Base-T Ethernet,
- IEEE 802.3u 100Base-TX, 100Base-FX Fast Ethernet,
- IEEE 802.3ab 1000Base-T,
- IEEE 802.3z Gigabit Fiber,
- IEEE 802.3x Flow Control and Back-pressure,
- IEEE 802.1p Class of Service (CoS),
- IEEE 802.1Q VLAN, up to 4095 active VLANs,
- IEEE 802.1ad QinQ,
- IEEE 802.3ad Link Aggregation Protocol (LACP),
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP),
- IEEE 802.1ak Multiple Registration Protocol (MRP, GARP, GVRP),

Network redundancy

- IEEE 802.1D Spanning Tree Protocol (STP),
- IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP),
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP),
- ITU-T G.8032 v2 Ethernet Ring Protection Switching, Major Ring, Sub Ring - DHP dual homing protection,
- ITU-T G.8031 Ethernet Linear Protection Switching 1+1, 1:1,
- Each redundancy protocol is available on all ports and on all modules without management port in CU module.

Network security

- IEEE 802.1x Port Based Network Access Protocol, EAP, RADIUS, TACACS+,
- IEEE 802.1ae MAC security (MACsec),

Network synchronization

- IEEE 1588-2008 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems:
  Transparent clock: peer to peer, end to end with one step, two step;
  Boundary clock;
  Ordinary clock;
  Absolute maximum time error 200 ns;
  Relative time error 50 ns per network hop;
- IEEE C37.238-2011 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications,
- IEC 61850-9-3 Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation,
- Synchronous Ethernet, G.8261: Timing and synchronization aspects in packet networks,
  Synchronization precision: ±50 ns;

Power over Ethernet

- IEEE 802.3af Power over Ethernet (option),
- IEEE 802.3at Power over Ethernet Plus (option),
- IEEE 802.3az Energy Efficient Ethernet.

Management

- IPv4, IPv6, ARP, ICMP, TCP, UDP, DNS,
- DHCP Client, Server, Relay Option 82,
- Management CPU has up to 10 network interfaces with different IP address, separate by VLAN,
- Access permission: password, configurable range of source IP address,
- Privilege level for configuration/status – read/write,
- HTTP, HTTPS, telnet, SSH, NTP, Syslog, TFTP,
- SNMP v1/v2c/v3, SNMP trap, inform,
- Local (Ethernet/RS-232) and Remote CLI,
- System Log of events and alarms,
- MIB II.

Environment

- Operating temperature: -40 to 70°C,
- Operating humidity (non condensing):
5%-95%.

Supported standards, recommendations and directives EMC Security* for all of UTD-ES-5000 elements

- EN 55011:2012
- EN 55024:2011/A1:2015-08
- EN 60950-1:2007/A2:2014-05
- EN 60825-1:2014-11
- IEC 61000-4-2 Electromagnetic compatibility (EMC)- Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
- IEC 61000-4-3 Electromagnetic compatibility (EMC)- Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
- IEC 61000-4-4 Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
- IEC 61000-4-5 Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
- IEC 61000-4-6 Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
- IEC 61000-4-8 Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test
- IEC 61000-4-11 Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests
- IEC 61000-4-12 Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test
- IEC 61000-4-29 Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests,
- IEC 61850-3 Communication networks and systems for power utility automation
- IEEE 1613-2009 - IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations

* - list of supported standards may vary with the development of the device

UTD-ES-5000 - Chassis and modules specification

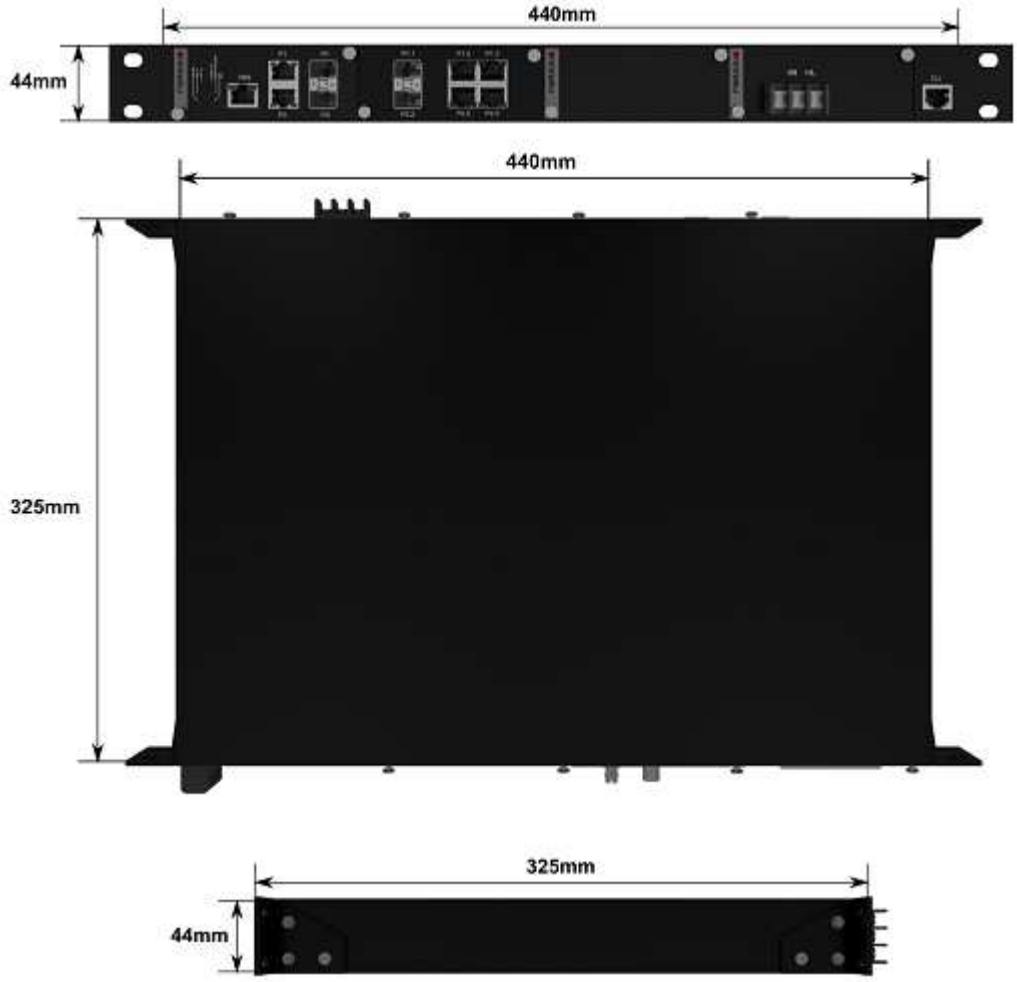
UTD-ES-5000 - 1U 19” Rackmount Chassis.

- Total 8 slots for hot swap modules,
- Both side of chassis used to install modules: 4 modules to front panel and 4 module to back panel,
- Power input to power supply modules,
- RS-232 interface for local management by CLI,
- LED status and alarm signalization,
- Standardized backplane interface for modules,
- 19” 1U Rack mount kit for front and back panel,
- Optional Synchronous Ethernet support,
- **Optional PoE÷PoE+** support (all ports max. 250W),
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- 8 slots for various types of module**,**
- **Local console:** RS-232 CLI management,
- **Power Supply input**: additional input for power supply modules and grounding screw,
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **MTBF**: 391 000 h,
- **Weight** without modules: 4 kg,
- **Dimensions** [mm]: 440 x 325 x 40.

Mechanical drawing



Code

UTD-ES-5000–(Y)–(S)–(P)–(C)

Chassis Rackmount:
1U8.1 – Rack 19“, 1U, 8 slots
3D4.1 – DIN rail mounting, 4 slots

Option:
S – Synchronous Ethernet

Option PoE:
P – PoE/PoE+

Option power input:
C – Additional front power input, option only for Rack 19” chassis

UTD-ES-5000

UTD-ES-5000 – 35 mm DIN rail Chassis.

- 4 slots for hot swap modules,
- Front side of chassis used to install modules,
- RS-232 interface for local management by CLI,
- LED status and alarm signalisation,
- Compatible with all modules,
- DIN rail mount kit,
- Synchronous Ethernet (optional) support,
- **PoE÷PoE+** (optional) support (all ports max. 250W),
- Optimized for power consumption, configuration as on the picture no more then 10 W at full traffic load,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- **4 slots** for different and many types module**,**
- **IP30** rated metal non-oxidising enclosure,
- **Grounding screw,**
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **MTBF**: 422 000 h,
- **Weight** without modules: 2 kg,
- **Dimensions** [mm]: 180 x 135 x 120.

Mechanical drawing

Code

UTD-ES-5000–Y–(S)–(P)–(C)

Chassis Rackmount:
1U8.1 – Rack 19“, 1U, 8 slots
3D4.1 – DIN rail mounting, 4 slots

Option:
S – Synchronous Ethernet

Option PoE:
P – PoE/PoE+

Option power input:
C – Additional front power input, option only for Rack 19” chassis

UTD-ES-5000 – Central Unit Module

- Central unit built in advanced Ethernet high performance switch with up to 36 interfaces,
- High performance management CPU for switch and chassis system,
- Uplink module interfaces 2x combo port 10/100/1000Base-T, 100/1000Base-X,
- Local Ethernet management port,
- Ethernet protection support: **ITU-T G.8032 v2** ring topology protection with dual ring and dual homing support, up to 20ms protection and recovery switching,
- Spanning Tree, Rapid Spanning Tree and Multiple Spanning Tree protocol full support,
- IEEE 1588-2008v.2 (**PTPv2**): precise time protocol synchronization, hardware timestamping; precise time synchronization for real-time applications with support of **IEEE C37.238-2011, IEC61850-9-3 - Power Profile.**
- Hardware ready for IEEE 1588v.3 (**PTPv3**),
- Hardware and software support for **Synchronous Ethernet**,
- Authentication **IEEE802.1x, Radius, Tacacs+**,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- SFP DDMI: Digital Diagnostic Monitoring for SFP slots**,**
- **Port Mirroring:** copy network traffic to specified port, ingress or egress direction or both,
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Supported standards and protocols

General information

- IEEE 802.3 10Base-T Ethernet,
- IEEE 802.3u 100Base-TX, 100Base-FX Fast Ethernet,
- IEEE 802.3ab 1000Base-T,
- IEEE 802.3z Gigabit Fiber,
- IEEE 802.3x Flow Control and Back-pressure,
- IEEE 802.1p Class of Service (CoS),
- IEEE 802.1Q VLAN, up to 4095 active VLANs,
- IEEE 802.1ad QinQ,
- IEEE 802.3ad Link Aggregation Protocol (LACP),
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP),
- IEEE 802.1ak Multiple Registration Protocol (MRP, GARP, GVRP),

Network redundancy

- IEEE 802.1D Spanning Tree Protocol (STP),
- IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP),
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP),
- ITU-T G.8032 v2 Ethernet Ring Protection Switching, Major Ring, Sub Ring - DHP dual homing protection,
- ITU-T G.8031 Ethernet Linear Protection Switching 1+1, 1:1,
- Each redundancy protocol is available on all ports and on all modules without management port in CU module.

Network security

- IEEE 802.1x Port Based Network Access Protocol, EAP, RADIUS, TACACS+,

Network synchronization

- IEEE 1588-2008 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems:
  Transparent clock: peer to peer, end to end with one step, two step;
  Boundary clock;
  Ordinary clock;
  Absolute maximum time error 200 ns;
  Relative time error 50 ns per network hop;
- IEEE C37.238-2011 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications,
- IEC 61850-9-3 Communication networks and systems for power utility automation - Part 9-3: Precision time
  protocol profile for power utility automation,
- Synchronous Ethernet, G.8261: Timing and synchronization aspects in packet networks,
  Synchronization precision: ±50 ns;

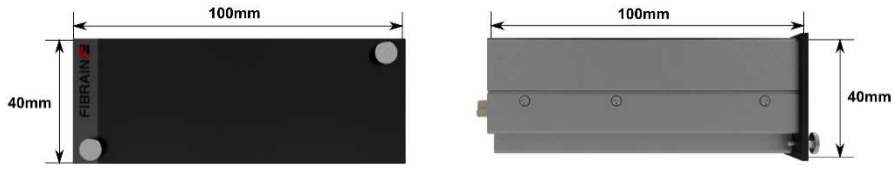
Power over Ethernet

- IEEE 802.3af Power over Ethernet (option),
- IEEE 802.3at Power over Ethernet Plus (option),
- IEEE 802.3az Energy Efficient Ethernet.

Management

- IPv4, IPv6, ARP, ICMP, TCP, UDP, DNS,
- DHCP Client, Server, Relay Option 82,
- Management CPU has up to 10 network interfaces with different IP address, separate by VLAN,
- Access permission: password, configurable range of source IP address,
- Privilege level for configuration/status - read/write,
- HTTP, HTTPS, telnet, SSH, NTP, Syslog, TFTP,
- SNMP v1/v2c/v3, SNMP trap, inform,
- Local (Ethernet/RS-232) and Remote CLI,
- System Log of events and alarms,
- MIB II.

Mechanical drawing



Code

UTD-ES-5000–CUS.1–X-Y

Module type:
CUS – Central Unit with Ethernet switch and managnent CPU

Versions:
2S – 2x SFP (100M/1G)

Versions:
2UG – 2x RJ45 (10M/100M/1G)

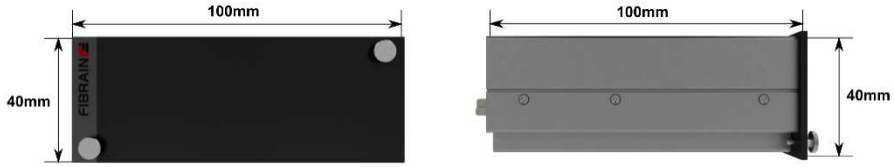
UTD-ES-5000 – Power Supply Module

- Power Supply
- Input: 80-360 V DC, 75-270 V AC,
- Power up to 25W,
- Terminal block connector,
- Reverse polarity protection,
- Power input from front panel or chassis connector,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- Input: 80-360 V DC, 75-270 V AC,
- **Power**: 25 W,
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Mechanical drawing



Code

UTD-ES-5000–PSU.1–Z

Module type:
PSU – Power Supply for chassis and modules

Versions:
25W – Power

UTD-ES-5000 – Transceiver Module 8x SFP

- Transceiver module with SFP slots for different types of fiber optic transceivers or copper transceivers,
- **DDMI** full digital diagnostic monitoring for all slots,
- Non blocked operation with the other vendor SFP
- Synchronous Ethernet support,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- SFP DDMI: Digital Diagnostic Monitoring for all SFP slots**,**
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Supported standards and protocols

General information

- IEEE 802.3 10Base-T Ethernet,
- IEEE 802.3u 100Base-TX, 100Base-FX Fast Ethernet,
- IEEE 802.3ab 1000Base-T,

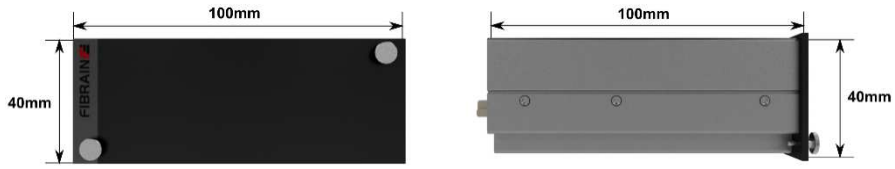
Network synchronization

- IEEE 1588-2008 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems,
- IEEE C37.238-2011 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications,
- IEC 61850-9-3 Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation,
- Synchronous Ethernet, G.8261: Timing and synchronization aspects in packet networks,

Power over Ethernet

- IEEE 802.3af Power over Ethernet (option),
- IEEE 802.3at Power over Ethernet Plus (option),
- IEEE 802.3az Energy Efficient Ethernet.

Mechanical drawing



Code

UTD-ES-5000–Y–(B)(W)

Module type:
TRX – Transceiver module

Versions*:
2S – 2 x SFP (100M/1G)
4S – 4 x SFP (100M/1G)
6S – 6 x SFP (100M/1G)
8S – 8 x SFP (100M/1G)

Versions*:
2UM – 2x RJ45 (10M/100M)
4UM – 4x RJ45 (10M/100M)
6UM – 6x RJ45 (10M/100M)
8UM – 8x RJ45 (10M/100M)
2UG – 2x RJ45 (10M/100M/1G)
4UG – 4x RJ45 (10M/100M/1G)
6UG – 6x RJ45 (10M/100M/1G)
8UG – 8x RJ45 (10M/100M/1G)

*** All version up to 8 ports per module.**

UTD-ES-5000 – Transceiver Module 8x UTP

- Transceiver module with UTP 100/10Mbit/s ports compliant to IEEE 802.3 Ethernet Specification
- Synchronous Ethernet support,
- LED status and alarm signalisation,
- **PoE÷PoE+** (optional) support,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Supported standards and protocols

General information

- IEEE 802.3 10Base-T Ethernet,
- IEEE 802.3u 100Base-TX, 100Base-FX Fast Ethernet,
- *IEEE 802.3ab 1000Base-T,*

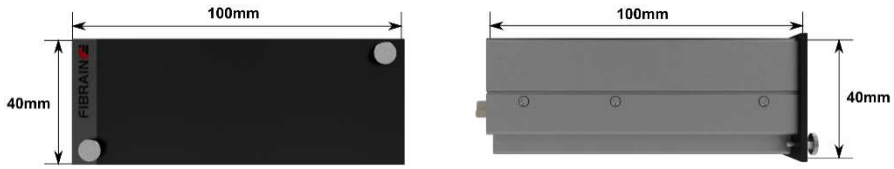
Network synchronization

- IEEE 1588-2008 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems,
- IEEE C37.238-2011 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications,
- IEC 61850-9-3 Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation,
- Synchronous Ethernet, G.8261: Timing and synchronization aspects in packet networks,

Power over Ethernet

- IEEE 802.3af Power over Ethernet (option),
- IEEE 802.3at Power over Ethernet Plus (option),
- IEEE 802.3az Energy Efficient Ethernet.

Mechanical drawing



Code

UTD-ES-5000–Y–(B)(W)

Versions*:
2S – 2 x SFP (100M/1G)
4S – 4 x SFP (100M/1G)
6S – 6 x SFP (100M/1G)
8S – 8 x SFP (100M/1G)

Versions*:
2UM – 2x RJ45 (10M/100M)
4UM – 4x RJ45 (10M/100M)
6UM – 6x RJ45 (10M/100M)
8UM – 8x RJ45 (10M/100M)
2UG – 2x RJ45 (10M/100M/1G)
4UG – 4x RJ45 (10M/100M/1G)
6UG – 6x RJ45 (10M/100M/1G)
8UG – 8x RJ45 (10M/100M/1G)

*** All version up to 8 ports per module.**

UTD-ES-5000 – Dual independent media converter module

- 1xSFP 100/1000Mbit/s slot + 2 UTP 10/100/1000Mbit/s for each converter/switch,
- Dual fully independent media converters in single module
- Total ports on module: 2 x SFP fiber and 4 x UTP cooper 10/100/1000Mbit/s Ethernet ports
- Independent or via CU module IP Management, IPv6, Web Browser, Telnet, SSH and local CLI console, SNMP v1/v2c/v3,
- Synchronous Ethernet support,
- Secure **IEEE 802.1AE MACsec ,**
- IEEE 1588-2008v.2 (**PTPv2**): precise time protocol synchronization, hardware timestamping; precise time synchronization for real-time applications with support of **IEEE C37.238-2011, IEC61850-9-3 - Power Profile.**
- Hardware ready for IEEE 1588v.3 (**PTPv3**),
- LED status and alarm signalisation,
- **IEC61850–3, IEEE1613** design compliance for power substation.

Technical specifications

- SFP DDMI: Digital Diagnostic Monitoring for all SFP slots**,**
- **Port Mirroring:** copy network traffic to specified port, ingress or egress direction or both,
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Supported standards and protocols

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- IEEE 802.3u 100Base-TX, 100Base-FX Fast Ethernet,
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- IEEE 802.3x Flow Control and Back-pressure,
- IEEE 802.1p Class of Service (CoS),
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Network redundancy

- IEEE 802.1D Spanning Tree Protocol (STP),
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- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP),
- ITU-T G.8032 v2 Ethernet Ring Protection Switching, Major Ring, Sub Ring - DHP dual homing protection,
- ITU-T G.8031 Ethernet Linear Protection Switching 1+1, 1:1,
- Each redundancy protocol is available on all ports and on all modules without management port in CU module.

Network security

- IEEE 802.1x Port Based Network Access Protocol, EAP, RADIUS, TACACS+,
- IEEE 802.1AE MAC security (MACsec) support GCM-AES-128, 128 bit AES keys,
- IEEE 802.1AEbn-2011 MAC security (MACsec) support GCM-AES-256, 256 bit AES keys,

Network synchronization

- IEEE 1588-2008 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems:
  Transparent clock: peer to peer, end to end with one step, two step;
  Boundary clock;
  Ordinary clock;
  Absolute maximum time error 200 ns;
  Relative time error 50 ns per network hop;
- IEEE C37.238-2011 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications,
- IEC 61850-9-3 Communication networks and systems for power utility automation - Part 9-3: Precision time
  protocol profile for power utility automation,
- Synchronous Ethernet, G.8261: Timing and synchronization aspects in packet networks,
  Synchronization precision: ±50 ns;

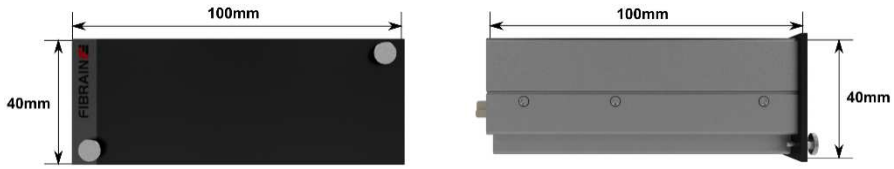
Power over Ethernet

- IEEE 802.3af Power over Ethernet (option),
- IEEE 802.3at Power over Ethernet Plus (option),
- IEEE 802.3az Energy Efficient Ethernet.

Management

- IPv4, IPv6, ARP, ICMP, TCP, UDP, DNS,
- DHCP Client, Server, Relay Option 82,
- Management CPU has up to 10 network interfaces with different IP address, separate by VLAN,
- Access permission: password, configurable range of source IP address,
- Privilege level for configuration/status - read/write,
- HTTP, HTTPS, telnet, SSH, NTP, Syslog, TFTP,
- SNMP v1/v2c/v3, SNMP trap, inform,
- Local (Ethernet/RS-232) and Remote CLI,
- System Log of events and alarms,
- MIB II.

Mechanical drawing



Code

UTD-ES-5000–Y–B W

Module type:
DMC.1* – Dual MACSec mediaconverter

Versions:
2S – 2x SFP (100M/1G)

Versions:
4UG* – 4x RJ45 (10M/100M/1G)

UTD-ES-5000 IRIG-B module

- Unbalanced NRZ 5V DC input, connector: BNC,
- Unbalanced NRZ 5V DC output, connector: BNC,
- Balanced NRZ 5V DC output, connector: Terminal Block,
- Conversion of internal synchronization signals into IRIG-B DC (TTL) output,
- Synchronization of UTD-ES-5000 device by IRIG-B DC (TLL) input,
- Signal Status Indication,
- Default configuration switch,

Technical specifications

- 5V TLL/50Ω unbalanced and 5V TLL/100Ω balanced outputs with up to 50mA port load,
- 5V TTL/600Ω unbalanced input,
- Power consumption: < 2W
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

Supported standards and protocols

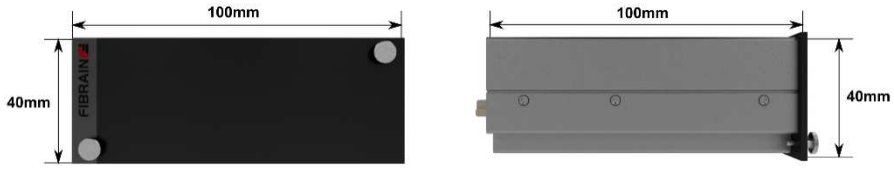
General information

- Support of IRIG-B DC (TTL) B000, B002,
- Support of 1PPS signal on IRIG-B input,

Device and network synchronization

- Provides synchronization signal extracted from PTPv.2 protocol in UTD-ES-5000 switch on IRIG-B outputs for synchronization external devices purpose
- Accepts synchronization signal from external IRIG-B DC receivers and synchronizes clock circuits in UTD-ES-5000 device.
- Accepts 1PPS signal for generation timebase for UTD-ES-5000 device

Mechanical drawing



Code

UTD-ES-5000–IRB.1–2T1F

Module type:
IRB.1 – IRIG-B for chassis and modules

Versions:
2T1F – 2 outputs, 1FO simplex, 850nm, ST connector

UTD-ES-5000- GPS clock synchronization module

- BNC Antenna Input
- GPS, GLONASS ready 52 channels receiver
- 1PPS (One Pulse Per Second) Output
- High precision, stable oscillator TVCXO on board,
- Lock and holdover status indiation,
- Fixing status and quality indication
- Default configuration switch

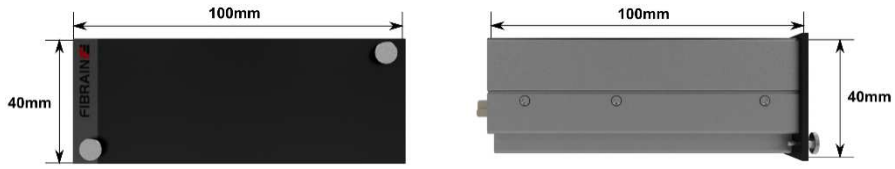
Technical specifications

- GPS PPS precision : +/-30ns
- 5V (50mA) TLL/50Ω 1PPS output
- Ultra high GPS tracking/navigation sensitivity: -165dBm/-160dBm
- Short term free run stability > 2*10-6
- Power consumption: < 3W
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

General features

- GPS, GLONASS ready 52 channels receiver
- Indication of satellites fixed number
- Indication of locking status

Mechanical drawing



Code

UTD-ES-5000–GPS.1–1A1P

Module type:
GPS.1 – TVCXO free run oscillator for chassis and modules

Versions:
1A1P – 1 antenna input, 1 output 1 pulse per second

UTD-ES-5000- GPS advance clock synchronization module

- BNC Antenna Input
- GPS, GLONASS ready 52 channels receiver
- 1PPS (One Pulse Per Second) Output
- Dedicated clock output for TDM devices synchronization High precision, stable oscillator OCXO on board,
- Lock and holdover status indiation,
- Fixing status and quality indication
- Default configuration switch

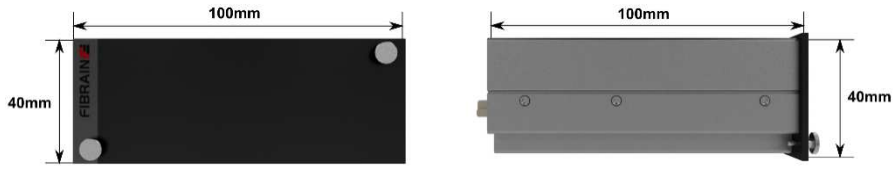
Technical specifications

- GPS PPS precision : +/-30ns
- 5V (50mA) TLL/50Ω 1PPS output
- 5V (50mA) TLL/50Ω clock output - 8kHz, 2048 kHz with ultra low jitter
- Ultra high GPS tracking/navigation sensitivity: -165dBm/-160dBm
- Short term free run stability > 1*10-9
- Supports IEEE 1588 v2 Precision Time Protocol processing
- Power consumption: < 4W
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

General features

- GPS, GLONASS ready 52 channels receiver
- Support IEEE 1588-2008 Standard and SyncE clock processing
- Built-in very low jitter DPLLs for clock generation and jitter attenuation
- PDH, SDH clock generation
- Indication of satellites fixed number
- Indication of locking status

Mechanical drawing



Code

UTD-ES-5000–GPA.1–1A1P

Module type:
GPS.1 – Support IEEE 1588 v2 Precision Time Protocol,
OCXO free run oscillator

Versions:
1A1P – 1 antenna input, 1 output 1 pulse per second

UTD-ES-5000- RS485/422/232 serial port server module

UTD-ES-5000

- 4xRS485/422/232 server module with RJ-45 connectors
- TCP/IP point to point and UDP/IP multipoint encapsulation
- Advanced loops capabilities (serial, data, etc)Traffic mirroring on TCP/UDP IP connections
- Baudrate from 300 to 230400 bit/s
- RTS/CTS signal control and processing
- Signal TX/RX activity on ports
- Default configuration switch
- 300 to 230400 baudrate for RS232 and up to 1Mbit/s on RS422/485
- Data bits: 5,6,7,8,

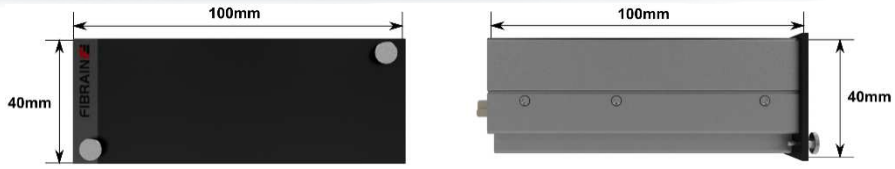
Technical specifications

- Stop bits: 1, 1.5, 2,
- Parity bits: None, Even, Odd, Space, Mark,
- 100Mbit/s/1Gbit/s backplane interface Ethernet
- Separate management system with its own credentials
- **IP30** rated metal non-oxidising enclosure,
- **Environment**: -40 to +70°C operating temperature, humidity (non condensing): 5%-95%,
- Power consumption: < 3W
- **Weight**: 0,7 kg,
- **Dimensions** [mm]: 100 x 100 x 40.

General features

- Supports of RS232/RS422 and RS485 full duplex (4wires) and half duplex mode (2 wires).
- Supports TCP/IP and UDP/IP encapsulation
- IEEE 802.1p, q VLAN support
- Sniffer mode (mirroring) on each port and data stream
- Loops function on serial port and data in both directions
- RTS/CTS signals processing
- Indication of locking status
- SSH, HTTPS, SNMP v.3 management protocols

Mechanical drawing



Code

UTD-ES-5000–SRL.1–4MR

Module type:
SRL.1 – serial port server

Versions:
4MR –4 serial multiprotocol ports with RJ-45 connectors