EKE

Technical Specifications

Smarter trains. Better future.

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CENTRAL PROCESSING UNIT WITH DUAL HOMING

COMPLIANCE

EN 50155
EN 45545
IEC 61131

THE EKE-TRAINNET® CENTRAL PROCESSING UNIT WITH DUAL HOMING (CPD) IS DESIGNED TO MANAGE TRAIN COMPUTERS AND CONNECTED SUBSYSTEMS. IN ADDITION TO PROCESSING, THE CPD MODULE ALSO SUPPORTS THE STORAGE OF DIGITAL MEDIA CONTENT.

The EKE-Trainnet® CPD can be used to develop, store and run applications for the control and diagnostics of on-board systems, making it suitable to develop Train Control and Management Systems or Vehicle Control Units. It can also implement Gateway functionalities by providing the necessary interfaces and routing capabilities.

KEY FEATURES

DUAL HOMING

The CPD's Dual Homing feature uses two 10/100 Mbit/s full-duplex Ethernet interfaces for connecting to Ethernet networks, typically linking the CPD to switches or electronic equipment. These interfaces can also connect directly to Ethernet-enabled devices, such as network cameras, and support channel bridging.

PROGRAMMABLE ISOLATED SCC CHANNELS

Four programmable isolated asynchronous or bit-synchronous SCC channels are available (RS-485) for the connection to compatible devices in the train.

BUILD TRAIN MANAGEMENT APPLICATIONS

The CODESYS® PLC kernel embedded in the CPU acts as the CPU's operating software. Train management applications can be developed with the CODESYS® PLC software in order to create the desired control and diagnostic functions of the train. The open platform runs on the Linux Operating Software and supports further software development in C language, either as a CODESYS® extension or on top of the module's Linux kernel. The PowerPC processor provides enough processing power for demanding applications with 400 MHz core speed and 64 megabytes of 64-bit wide 100 MHz SDRAM.

PORTABLE SYSTEM TESTER

The EKE-Trainnet® Portable System Tester (PST) interface (usually serial link or Ethernet) enables the use of the PST as well as other tools for event log operations, maintenance, debugging, downloading and application development purposes.

REAL-TIME CLOCK WITH 30-DAY BACKUP POWER

The EKE-Trainnet® CPD real-time clock is powered by a back-up capacitor and will run for a minimum of 30 days from the time power is no longer applied.

EVENT LOGGING FLASH MEMORY

The EKE-Trainnet® CPD has extended event logging flash memory with 4 GB capacity. The EKE-Trainnet® CPD can act as a low cost event recorder when limited protection is required.

EKE-Trainnet® Central Processing Unit with Dual Homing

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
8 TE x 3 U x 160 mm

Weight:
300 g

Input Power:
5 V DC ± 5 % (1.5 A max., 1 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 320 000 h (CPD5594)

Serial Interfaces:
An isolated group of 4 RS-485 on front
1 RS-232 on front (for maintenance, configuration or ESN dongle)
1 RS-485 on back for I/O bus connectivity

Ethernet Interfaces:
2 x 10/100 Mbit, M12 connectors

Boot Flash Memory:
8 MB

File System Flash Memory:
512 MB

Event Logging Flash Memory:
4 GB

Processor RAM:
64 MB

VME Bus (IEC 821) Interface:
A24/D16 Master or Slave

CENTRAL PROCESSING UNIT WITH GRAPHICAL DISPLAY CONTROLLER

COMPLIANCE

EN 50155
EN 45545
IEC 61131

THE EKE-TRAINNET® CENTRAL PROCESSING UNIT WITH GRAPHICAL DISPLAY CONTROLLER (CPG) MANAGES TRAIN COMPUTERS AND CONNECTED SUBSYSTEMS.

Featuring an integrated graphical display controller, the EKE-Trainnet® CPG supports both analogue and digital displays and can also manage the display of video surveillance recordings. The EKE-Trainnet® CPG module is also capable of storing digital media content such as audio announcements in a compressed format for on-board use. The EKE-Trainnet® CPG can be used to develop, store and run applications for the control and diagnostics of on-board systems, making it suitable to develop Train Control and Management Systems or Vehicle Control Units. It can also implement Gateway functionalities by providing the necessary interfaces and routing capabilities.

KEY FEATURES

DEDICATED VIDEO AND AUDIO PROCESSING

The Digital Signal Processor of the EKE-Trainnet® CPG is dedicated for video and audio processing. The Digital Visual Interface (DVI-I) combines both analogue and digital signals and can be directly connected to DVI displays with resolutions up to 1024 x 768 pixels. Touch screens can be connected either through an isolated RS-485 interface or a DVI-cable when using EKE-Trainnet® Human Machine Interface (HMI). The audio interface line output can be used to drive audio announcement systems. The interface is isolated on the digital side in order to provide the best audio quality.

PROGRAMMABLE ISOLATED SCC CHANNELS

Three programmable isolated asynchronous or bit-synchronous SCC channels are available (RS-485) for the connection to compatible devices in the train.

ETHERNET INTERFACE

Two 10/100 Mbit/s Full Duplex Ethernet interfaces can be used to connect to any Ethernet Communication Network, typically connecting the CPG with switches or other electronic racks. The Ethernet interfaces can also be directly connected to any Ethernet enabled devices (e.g. network cameras). A bridge between two channels is also supported.

PORTABLE SYSTEM TESTER

The EKE-Trainnet® Portable System Tester (PST) interface (usually serial link or Ethernet) enables the use of the PST as well as other tools for event log operations, maintenance, debugging, downloading and application development purposes.

BUILD TRAIN MANAGEMENT APPLICATIONS

The CODESYS® PLC kernel embedded in the CPU acts as the CPU's operating software. Train management applications can be developed with the CODESYS® PLC software in order to create the desired control and diagnostic functions of the train. The open platform runs on the Linux Operating Software and supports further software development in C language, either as a CODESYS® extension or on top of the module's Linux kernel. The PowerPC processor provides enough processing power for demanding applications with 400 MHz core speed and 64 megabytes of 64-bit wide 100 MHz SDRAM.

REAL-TIME CLOCK WITH 30-DAY BACKUP POWER

The EKE-Trainnet® CPG real-time clock is powered by a back-up capacitor and will run for a minimum of 30 days from the time power is no longer applied.

EKE-Trainnet® Central Processing Unit with Graphical Display Controller

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
8 TE x 3 U x 160 mm

Weight: 300 g

Input Power:
5 V DC ± 5 % (1.5 A max., 1 A typ.)

Temperature Range (operational):
-40 °C…+70 °C

MTBF (40 °C ambient temperature):
770 000 h (CPG1824)

Video Interface:
DVI-I; Single TMDS digital output and analogue RGB
Resolution up to 1024 x 768

Audio Interface:
Isolated stereo audio line output
0 – 700 mVRMS to 10 kΩ load

Touch Screen Interface:
Integrated RS-485 on DVI interface

Serial Interfaces:
2 isolated RS-485 on front
(3 if not using the Touch Screen Interface)
1 RS-232 on front (for maintenance, configuration or ESN dongle)
1 RS-485 on back for I/O bus connectivity

Ethernet Interfaces:
2 x 10/100 Mbit, M12 connectors

Boot Flash Memory: 8 MB

File System Flash Memory:
512 MB (On request up to 2 GB)

Processor RAM: 64 MB

Graphics Controller RAM: 32 MB

Digital Signal Processor RAM: 16 MB

VME Bus (IEC 821) Interface: A24/D16
Master or Slave

SERIAL LINKS INTERFACE UNIT

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® SERIAL LINKS INTERFACE UNIT (SIU) IS USED TO IMPLEMENT UP TO EIGHT SERIAL LINKS.

The physical layer level and parts of data link layer are implemented within SIU and higher protocol layers are implemented on the system's Central Processing Unit (CPU). For gateway applications, the routing between the Serial Link buses and other buses are implemented by the train computer CPU module.

KEY FEATURES

CONFIGURABLE SERIAL LINKS

The module has one DIN41612- F48 connector on the front panel where Serial Links can be connected. Serial links are split into two identical groups which are isolated from the FPGA and from each other. In each group there are four Serial Links that can be configured in different ways according to the table below.

MODULE & TRAIN COMPUTER/ SYSTEM COMMUNICATION

Communication between the module and the train computer/system is done through shared memory over the IEC 821 VME back plane bus.

DOUBLE BUFFERED SERIAL LINKS

The EKE-Trainnet® SIU module provides 2 kByte long RX and TX double buffers for each serial link. The system CPU can access these buffers through the VME shared memory. A dedicated FPGA controls precise timing for all eight channels in parallel and provides convenient double buffering for the system CPU. This guarantee high performance in demanding safety critical applications.

OPTIONS

TWO VERSIONS AVAILABLE

The EKE-Trainnet® SIU comes in two different versions offering different Serial Interface combinations. Please consult the table below for specifications. Other configurations are available upon request.

Module Reference	RS-485 Half or Full Duplex *	RS-232 **
SIU3448A	8	0
SIU3449A	6	2

** The RS-485 Full Duplex can be used for RS-422 applications*
*** Optional handshake signals*

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
140 g

Input Power:
5 V DC ± 5 % (250 mA typ., 400 mA max.)

Temperature Range (operational):
-40 °C...+70 °C

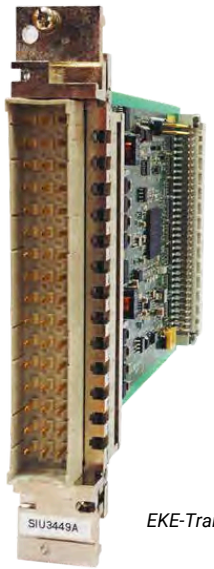
MTBF (40 °C ambient temperature):
2 600 000 h

Connector:
DIN41612-F48 (at front)

Serial Link Interfaces:
2 isolated groups
See table for all options

FPGA Shared Memory:
TX buffers: 8 x 2 x 2 kB
RX buffers: 8 x 2 x 2 kB

VME Bus (IEC 821) Interface:
A24 Slave with D08(EO)/D16



EKE-Trainnet® Serial Links Interface Module

CENTRAL PROCESSING UNIT WITH SERIAL LINKS

COMPLIANCE

EN 50155
EN 45545
IEC 61131

THE EKE-TRAINNET® CENTRAL PROCESSING UNIT WITH SERIAL LINKS (CPS) SERVES AS PROCESSORS FOR MANAGING TRAIN COMPUTERS AND CONNECTED SUBSYSTEMS.

The EKE-Trainnet® CPS module is a processing unit providing serial communication interfaces. They enable the development, storage, and execution of applications for controlling and diagnosing on-board systems, making them ideal for creating Train Control and Management Systems (TCMS) or Vehicle Control Units (VCU). Additionally, the CPS can function as a Gateway, offering essential interfaces and routing capabilities.

KEY FEATURES

PROGRAMMABLE ISOLATED SCC CHANNELS

Three programmable isolated SCC channels (RS-485), with an optional fourth channel, are available for asynchronous or bit-synchronous communication with compatible train devices.

ETHERNET INTERFACE

A 10/100 Mbit/s full-duplex Ethernet interface enables connection to any Ethernet communication network, typically linking the CPS to switches or electronic racks. Alternatively, it can connect directly to Ethernet-enabled devices, such as network cameras.

BUILD TRAIN MANAGEMENT APPLICATIONS

The CODESYS® PLC kernel embedded in the CPU acts as the CPU's operating software. Train management applications can be developed with the CODESYS® PLC software in order to create the desired control and diagnostic functions of the train. The open platform runs on the Linux Operating Software and supports further software development in C language, either as a CODESYS® extension or on top of the module's Linux kernel. The PowerPC processor provides enough processing power for demanding applications with 400 MHz core speed and 64 megabytes of 64-bit wide 100 MHz SDRAM.

PORTABLE SYSTEM TESTER

The EKE-Trainnet® Portable System Tester (PST) interface (usually serial link or Ethernet) enables the use of the PST as well as other tools for event log operations, maintenance, debugging, downloading and application development purposes.

REAL-TIME CLOCK WITH 30-DAY BACKUP POWER

The EKE-Trainnet® CPS real-time clock is powered by a back-up capacitor and will run for a minimum of 30 days from the time power is no longer applied.

EKE-Trainnet® Central Processing Unit with Serial Links

OPTIONS

EVENT LOGGING MEMORY

The EKE-Trainnet® CPF is similar to an EKE-Trainnet® CPS with an extended event logging flash memory (4 GB vs 512 MB). EKE-Trainnet® CPF can act as a low cost event recorder when limited memory and protection are required. The EKE-Trainnet® CPF has all the features of the EKE-Trainnet® CPS.

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
255 g

Input Power:
5 V DC ± 5 % (1.5 A max., 1 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 340 000 h

Ethernet Interface:
1 x 10/100 Mbit M12 connector

Serial Interfaces:
3 isolated RS-485 on front
1 RS-485 on back for I/O bus connectivity

Boot Flash Memory:
8 MB

File System Flash Memory:
512 MB

Event Logging Flash Memory:
512 MB (CPS2258)
4 GB (CPF3027)
16 GB (CPF357)

Processor RAM:
64 MB

VME Bus (IEC 821) Interface:
A24/D16 Master or Slave

WIRE TRAIN BUS INTERFACE MODULE

COMPLIANCE
EN 50155
EN 45545
IEC 61375-2-1

EKE-TRAINNET® WIRE TRAIN BUS (WTB) MODULES ARE USED TO CREATE TRAIN-WIDE COMMUNICATION NETWORKS.

The EKE-Trainnet® WTB module implements the WTB link layer functions of the IEC 61375-2-1 Train Communications Network (TCN) standard. The TCN's real-time protocols, the UIC leaflet 556 specifications and the routing between the WTB and other buses are implemented by the gateway Central Processing Unit (CPU) module.

KEY FEATURES

SUPPORTS PHYSICAL CABLE REDUNDANCY

The EKE-Trainnet® WTB Medium Attachment Unit (MAU) supports physical cable redundancy as specified in the IEC 61375-2-1 standard. It uses TCN standard's Sub D-9 type connectors located on the front panel of the module. Communication to the gateway is done through a shared memory over the IEC 821 VME back plane bus. The WTB link layer functions are implemented by the WTB module's local processor.

STATIC SHARED RAM MEMORY

The EKE-Trainnet® WTB module has a static shared RAM memory accessible from both the local CPU and the VME Bus interface. The TCN standard's source and sink port handling for WTB process data is supported. A separate memory area is reserved for message data and maintenance messages as well as for Remote Procedure Call type access to the Link Layer primitives. The EKE-Trainnet® WTB module is able to provide applications with timing synchronisation when a Macro Period finishes.

EFFICIENT PROCESSING WITH DIAGNOSTICS

The EKE-Trainnet® WTB module is realised through the highly efficient combination of a dedicated microprocessor and FPGA logic. In addition to strict compliance with the IEC 61375-1 standard, the WTB module has the capability of carrying out enhanced diagnostics functions, like monitoring the bit error ratios between individual train coaches in order to identify communication issues.

INTELLIGENT REPEATER MANAGEMENT

In order to handle incompatible cabling or extremely harsh operating conditions, the WTB module is able to act as a bus repeater by completely regenerating the data streams towards both extremities. Intelligent repeater management is included in the WTB module's system software. It supports the selection of an optimal number of concurrently enabled repeaters on the train bus, thus allowing the network timing to retain undegraded specifications.

OPTIONS

FRITTING VOLTAGE

The EKE-Trainnet® WTB bus interface sustains fritting voltage. Fritting voltage source is available as an option: see EKE-Trainnet® WTF2259 and WTF2376 modules.

SEPARATED CONNECTORS FOR THE REDUNDANT BUS

In the basic module, the bus redundancy is integrated into a single bus connector. Separated connectors for the redundant bus are available as an option: see EKE-Trainnet® WTB1912 and WTF2376 modules.

EKE-Trainnet® Wire Train Bus Interface Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm (WTB1822)
8 TE x 3 U x 160 mm (WTB1912)
8 TE x 3 U x 160 mm (WTF1765)
4 TE x 3 U x 160 mm (WTF2259)
8 TE x 3 U x 160 mm (WTF2376)

Weight:
166 g (WTB1822)
214 g (WTB1912)
226 g (WTF1765)
177 g (WTF2259)
225 g (WTF2376)

Input Power:
5 V DC ± 5 % (1 A max., 0.5 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 370 000 h (WTB1822)
1 330 000 h (WTB1912)
1 010 000 h (WTF1765)
1 030 000 h (WTF2259)
1 010 000 h (WTF2376)

Train Bus:
IEC 61375-1: WTB

Data Rate:
1 Mbit/s (Half speed 500 kbit/s on request)

MAU:
Transformer isolation
Combined or individual bus connectors

VME Bus (IEC 821) Interface:
A24 Slave with D08(EO)/D16
256 kB DP RAM for process and message data

MULTIFUNCTION VEHICLE BUS INTERFACE MODULE

COMPLIANCE
EN 50155
EN 45545
IEC 61375-3-1

EKE-TRAINNET® MULTIFUNCTION VEHICLE BUS (MVB) MODULES ARE USED TO CREATE VEHICLE BUSES OR MORE COMPREHENSIVE TRAIN COMMUNICATION NETWORKS.

EKE-Trainnet® MVB implements the MVB link layer functions of the IEC 61375-3-1 Train Communications Network (TCN) standard. The TCN's real-time protocols and the routing between the MVB and other buses are implemented by the gateway Central Processing Unit (CPU) module.

KEY FEATURES

SUPPORTS PHYSICAL CABLE REDUNDANCY

The EKE-Trainnet® MVB module supports physical cable redundancy and full bus master functionality as specified in the IEC 61375-3-1 standard. Bus administrator redundancy is supported on the software level.

MVB COMMUNICATION AND CONTROL

TCN standard's D-9 type connectors are located on the front panel of the module. Communication to the gateway is conducted through shared memory over the IEC 821 VME back plane bus. The MVB link layer functions are implemented by the MVB module's local processor. Multiple EKE-Trainnet® MVB modules can be controlled by a single EKE-Trainnet® CPU to implement physically separated MVB networks.

STATIC SHARED RAM MEMORY

The EKE-Trainnet® MVB module has static shared RAM memory accessible from both the local CPU and the VME Bus interface. A separate memory area is reserved for message data and maintenance messages as well as for Remote Procedure Call type access to the Link Layer primitives.

EFFICIENT PROCESSING AND DIAGNOSTICS

The EKE-Trainnet® MVB module is realised through a highly efficient combination of local microprocessor and FPGA logic. In addition to strict compliance with the IEC 61375-3-1 standard, the EKE-Trainnet® MVB module has the capability of carrying out some diagnostic functions.

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
160 g (EMD, MVB1820)
220 g (ESD, MVB2791)

Input Power:
5 V DC ± 5 % (1 A max., 0.5 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 650 000 h (EMD, MVB1820)
1 580 000 h (ESD, MVB2791)

Physical Medium:
Electrical Medium Distance (EMD, MVB1820)
Isolated Electrical Short Distance (ESD, MVB2791)

Data Rate:
1.5 Mbit/s; Manchester encoding

VME Bus (IEC 821) Interface:
A24 Slave with D08(EO)/D16
246 kB SRAM and 512 kB traffic memory for process and message data

OPTIONS

PHYSICAL INTERFACE

The EKE-Trainnet® MVB module offers the following physical interfaces:

- Electrical Short Distance with isolation (ESD+) and
- Electrical Medium Distance (EMD).

Each are equipped with two sub D-9 connectors.

EKE-Trainnet® Multifunction Vehicle Bus Interface Module

MULTIFUNCTION VEHICLE BUS REMOTE I/O MASTER MODULE

COMPLIANCE
EN 50155
EN 45545
IEC 61375-3-1

THE EKE-TRAINNET® MULTIFUNCTION VEHICLE BUS REMOTE I/O MASTER MODULE (MVR) SERVES AS A GATEWAY BETWEEN MVB AND THE MODULES CONNECTED TO THE EKE I/O BUS.

The EKE-Trainnet® MVR module is designed to ensure reliable data transmission on board a train. The EKE-Trainnet® MVR module provides a redundant MVB interface, fully compliant with the IEC 61375-3-1 Train Communication Network (TCN). The purpose of MVR System is to provide I/O interfaces to remote locations, utilising MVB. The system consists of an MVR module, power module, back plane and I/O modules, such as AIO, AIM, AOM, DIO, DRO, PTI and TSI. The central system, which connects to MVB RIOM is called the Vehicle Control Unit (VCU). The VCU is a system with at least one CPU module and an MVB module.

KEY FEATURES

AUTOMATIC CONFIGURATION

The configuration of the EKE-Trainnet® MVR is fully automated; it automatically detects the I/O modules, and configures itself as an MVB slave, with MVB Port Data interfaces of all connected I/O modules. The MVB module configuration is done through the Gateway CPU, and the MVB reads it through its shared memory at the start-up of the system. For the MVB module, the configuration is read-only and it is managed by the CPU software. If any changes are made through the debug terminal, the original configuration is retained when the module is reset.

SUPPORT FOR EMD/ESD

The EKE-Trainnet® MVR module has a Medium Attachment Unit (MAU) with an MVB FPGA which internally supports the EMD (MVR3297) or ESD (MVR4570) interface.

FULL REDUNDANCY

To ensure uninterrupted functionality of the EKE-Trainnet® MVR, the bus is duplicated: there are two lines through which the devices transmit data. If one line is temporarily out of order, the other line can take over and full redundancy is ensured. In this way, the flow of important data can continue without interruption even in the case of potential problems.

OPTIONS

TWO MODULE VERSIONS AVAILABLE

There are two EKE-Trainnet® MVR module versions available, each with different physical interface options:

- MVR4570 for MVB Electrical Short Distance RIOM, supporting cable lengths up to 20 meters, and
- MVR3297 for MVB Electrical Medium Distance RIOM, supporting cable lengths up to 200 meters.

EKE-Trainnet® Multifunction Vehicle Bus Remote I/O Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 179 mm

Weight:
155 g

Input Power:
5 V DC ± 5 % (1 A max., 0.5 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 620 000 h (MVR3297)
1 550 000 h (MVR4570)

Physical Medium:
Electrical Medium Distance (EMD, MVR3297)
Electrical Short Distance (ESD, MVR4570)

Data Rate:
1.5 Mbit/s; Manchester encoding

CAN VEHICLE BUS INTERFACE MODULE

COMPLIANCE
EN 50155
EN 45545
IEC 61375-3-3

THE EKE-TRAINNET® CAN VEHICLE BUS INTERFACE MODULE (CVB) IS USED TO CREATE UP TO TWO CAN BUSES IN THE TRAIN.

The two CAN ports can be independently configured as CAN 2.0 A/B or CANopen®. The EKE-Trainnet® CVB module implements the CAN link layer functions. The routing between the CAN bus and other buses are implemented by the gateway Central Processing Units (CPU) module.

KEY FEATURES

DUAL INDEPENDENT CAN NETWORK INTERFACES

The module has two CAN network connectors on the front panel, one 9-pin sub-miniature D-type connector for each independent interface. Communication to the gateway is done through shared memory over the IEC 821 VME back plane bus. The CAN link layer functions and CAN network access are implemented with the local CPU of the CAN module. Multiple EKE-Trainnet® CVB modules can be controlled by a single EKE-Trainnet® CPU to implement physically separated CAN networks.

EFFICIENT PROCESSING AND DIAGNOSTICS

The EKE-Trainnet® CVB module has static shared RAM memory accessible from both the local CPU and the VME Bus interface. The CVB module is realised through a highly efficient combination of local microprocessor and FPGA logic. The EKE- Trainnet® CAN Vehicle Bus Interface Module has the capability of carrying out some specific diagnostics functions. Interfaces are Dual CAN 2.0 B and ISO 11898 compatible with a CiA DS-102 standard pin.

OPTIONS

INTEGRATED BUS TERMINATION RESISTORS

The EKE-Trainnet® CVB module is available as an option with integrated bus termination resistors.

EKE-Trainnet® CAN Vehicle Bus Interface Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
149 g

Input Power:
5 V DC ± 5 % (500 mA nominal)

Temperature Range (operational):
-40 °C…+70 °C

MTBF (40 °C ambient temperature):
1 880 000 h (CVB1621 CAN terminated)
1 880 000 h (CVB2456 CAN not terminated)

CAN Network Interface:
Two CAN interfaces

Data Rate:
Up to 1 Mbit/s

Protocol:
CAN 2.0 compatible

Electrical:
24 V compliant, optically isolated

Connector:
9-pin sub-miniature D-type connector
AWG 20 STP cable recommended

Bus Termination:
On board 120 Ohm termination on request

VME Bus (IEC 821) Interface:
A24 Slave with D08(EO)/D16

CENTRAL PROCESSING UNIT WITH SERIAL LINKS & GPS

COMPLIANCE

EN 50155
EN 45545
IEC 61131

EKE-TRAINNET® CENTRAL PROCESSING UNIT WITH SERIAL LINKS AND GPS (CPS-GPS) OFFERS ADVANCED CAPABILITIES FOR MANAGING TRAIN COMPUTERS AND CONNECTED SUBSYSTEMS. WITH AN INTEGRATED GNSS RECEIVER, IT PROVIDES PRECISE LOCATION AND TIME DATA FOR SEAMLESS SYNCHRONISATION WITH PROCESSED INFORMATION.

The EKE-Trainnet® CPS-GPS unit supports the development, storage, and execution of applications for controlling and diagnosing on-board systems, making it suitable for developing Train Control and Management Systems or Vehicle Control Units. Additionally, it functions as a Gateway by offering essential interfaces and routing capabilities, enhancing overall system integration.

KEY FEATURES

GNSS FUNCTIONALITY

The GNSS function is available for simultaneous GPS and GLONASS or, optionally, GPS and BeiDou. CPS-GPS supports active and passive antennas.

PROGRAMMABLE ISOLATED SCC CHANNELS

Three programmable isolated SCC channels (RS-485), with an optional fourth channel, are available for asynchronous or bit-synchronous communication with compatible train devices.

ETHERNET INTERFACE

A 10/100 Mbit/s full-duplex Ethernet interface enables connection to any Ethernet communication network, typically linking the CPS-GPS to switches or electronic racks. Alternatively, it can connect directly to Ethernet-enabled devices, such as network cameras.

USB HOST INTERFACE

A USB Host Interface is provided to connect memory sticks or other devices for maintenance purposes. B-type connector is used to protect unattended usage (special tools required).

BUILD TRAIN MANAGEMENT APPLICATIONS

The CODESYS® PLC kernel embedded in the CPU acts as the CPU's operating software. Train management applications can be developed with the CODESYS® PLC software in order to create the desired control and diagnostic functions of the train. The open platform runs on the Linux Operating Software and supports further software development in C language, either as a CODESYS® extension or on top of the module's Linux kernel. The PowerPC processor provides enough processing power for demanding applications with 400 MHz core speed and 64 megabytes of 64-bit wide 100 MHz SDRAM.

PORTABLE SYSTEM TESTER

The EKE-Trainnet® Portable System Tester (PST) interface (usually serial link or Ethernet) enables the use of the PST as well as other tools for event log operations, maintenance, debugging, downloading and application development purposes.

REAL-TIME CLOCK WITH 30-DAY BACKUP POWER

The EKE-Trainnet® CPS-GPS real-time clock is powered by a back-up capacitor and will run for a minimum of 30 days from the time power is no longer applied.

OPTIONS

EVENT LOGGING MEMORY

The EKE-Trainnet® CPF-GPS is simply an EKE-Trainnet® CPS-GPS with an extended event logging flash memory (4 GB vs 512 MB). EKE-Trainnet® CPF-GPS can act as a low cost event recorder when limited memory and protection are required. The EKE-Trainnet® CPF-GPS has all the features of the EKE-Trainnet® CPS-GPS.

EKE-Trainnet® Central Processing Unit with Serial Links & GPS

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
8 TE x 3 U x 160 mm

Weight:
265 g

Input Power:
5 V DC ± 5 % (1.5 A max., 1 A typ.)

Temperature Range (operational):
-40 °C…+70 °C

MTBF (40 °C ambient temperature):
850 000 h

Ethernet Interface:
1 x 10/100 Mbit M12 connector

USB Interface:
One 2.0 High Speed host, Type B connector

Serial Interfaces:
3 isolated RS-485 on front
1 RS-485 on back for I/O bus connectivity

GNSS Antenna Interface:
SMA

Supported GNSS:
GPS+GLONASS, GPS+BeiDou

Boot Flash Memory:
8 MB

File System Flash Memory:
512 MB

Event Logging Flash Memory:
512 MB or 4 GB

Processor RAM:
64 MB

VME Bus (IEC 821) Interface:
A24/D16 Master or Slave

ANALOGUE INPUT MODULE

COMPLIANCE

EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® ANALOGUE INPUT MODULE (AIM) PROVIDES A STANDARD INTERFACE FOR ANALOGUE INPUT SIGNALS. SIGNALS CAN BE CURRENT (-20…+20MA) AND VOLTAGE (-10…10V). SEPARATE CHANNELS ARE PROVIDED FOR FREQUENCY SIGNAL MEASUREMENTS WITH THE CAPABILITY TO MEASURE PULSE-WIDTH RATIO (PWM).

The EKE-Trainnet® AIM converts the analogue signals and makes them available to the train computer's CPU module. The EKE-Trainnet® AIM can be used as a part of an EKE-Trainnet Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® AIM can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

CURRENT & VOLTAGE MEASUREMENT CHANNELS

The EKE-Trainnet® AIM5250 has 6 current channels, and 6 voltage channels, and 4 frequency input channels in two groups: two for the low-voltage tachometer measurements and two for the high-voltage pulse width modulation measurements.

The current measurement channels can measure currents between -20 and +20 mA. The module has the capability to supply voltage to external sensors or to supply loop voltage to the current loops. The module's voltage measurement channels can measure voltages between -10 and +10 V.

OVER RANGE INDICATIONS FOR DIAGNOSTICS

The resolution of the input A/D conversion is sign+12 bits, and the cut-off frequency of the hardware low pass filter is 10 Hz. Both current and voltage channels are capable of giving over range indications which can be used for diagnostic purposes.

SIGNAL MEASUREMENTS

The frequency input channels can measure frequencies up to 16 kHz, period, pulse width, pulse count and rotary decoding with direction indication (compatible with most industry standard tachometers).

32-BIT EMBEDDED PROCESSOR

The module has its own 32-bit embedded processor that uses factory calibration values to convert the measurement value to mV or µA with great accuracy. The embedded processor also implements diagnostics functions and reports to the system CPU module if it suspects that the input values cannot be trusted.

EKE-Trainnet® Analogue Input Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
160 g

Input Power:
5 V DC ± 5 % (700 mA typ. 3 A max.)

Temperature Range (operational):
-40 °C…+70 °C

MTBF (40 °C ambient temperature):
500 000 h (AIM2505)
1 600 000 h (AIM5250)

I/O Connector:
DIN41612-F48 (at front)

Host Interface:
RS-485

Input Channels, Analogue:
6 voltage channels, -10…10 V (Vin)
6 current channels, -20…20 mA (Iin)

Input Channels, Frequency:
4 input channels in 2 groups: 2 low-voltage tachometer, 2 high-voltage PWM

Frequency Input Voltage Range:
0…36 V DC

Frequency Input Threshold level:
Each channel has its own software configurable threshold level, fixed hysteresis

Frequency Input Range:
DC to 16 kHz, 0.25 Hz resolution

Frequency Input Pulse Width Measurement:
0.1% resolution

Tachometer Supply Outputs (Vout):
15 VDC, max. 100 mA

HIGH SPEED ANALOGUE INPUT MODULE

COMPLIANCE
SIL 2
EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® HIGH SPEED ANALOGUE INPUT MODULE (HSA) PROVIDES A STANDARD INTERFACE FOR ANALOGUE INPUT SIGNALS

Signals can be current (-20…+20mA) and voltage (-10…10V). Separate channels are provided for frequency signal measurements with the capability to measure pulse-width ratio (PWM). The EKE-Trainnet® HSA converts the analogue signals and makes them available to the train computer's Central Processing Unit (CPU) module. The EKE-Trainnet® HSA can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder.

KEY FEATURES

FOUR ISOLATION GROUPS

The EKE-Trainnet® HSA has 4 current channels and 4 voltage channels divided into four isolated groups. 4 frequency channels are also available.

CURRENT & VOLTAGE MEASUREMENT CHANNELS

The four current measurement channels can measure currents between -20 and +20 mA. The module has the capability to supply voltage to external sensors or to supply loop voltage to the current loops. The module 4 voltage measurement channels can measure voltages between -10 and +10 V.

OVER RANGE INDICATIONS FOR DIAGNOSTICS

The resolution of the input A/D conversion is sign+12 bits, and the cut-off frequency of the hardware low pass filter is 150 Hz. Both current and voltage channels are capable of giving over range indications which can be used for diagnostic purposes.

SIGNAL MEASUREMENTS

The four frequency input channels can measure frequencies up to 16 kHz, period, pulse width, pulse count and rotary decoding with direction indication (compatible with most industry standard tachometers).

32-BIT FLOATING POINT DIGITAL SIGNAL PROCESSOR

The module has its own 32-bit Floating point Digital Signal Processor (DSP) for a high signal processing capability and uses factory calibration values to convert the measurement value to mV or µA with great accuracy. The embedded DSP processor can be used to perform signal processing tasks like filtering. It also implements diagnostics functions and reports to the system CPU module if it suspects that the input values cannot be trusted.

SIL 2 CERTIFIED

The module development is based on the railway standards EN 50126, EN 50716 (previously EN 50128) and EN 50129 in accordance with safety integrity level SIL 2. A non-SIL version of the module is also available.

EKE-Trainnet® High Speed Analogue Input Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm (HSA2620A, HSA2620B, HSA5530A)

Weight:
170 g (HSA2620A, HSA2620B, HSA5530A)

Input Power:
5 V DC ± 5 % (1 A typ. 3 A max.) (HSA2620A, HSA2620B, HSA5530A)

Temperature Range (operational):
-40 °C…+70 °C (HSA2620A, HSA2620B, HSA5530A)

MTBF (40 °C ambient temperature):
420 000 h (HSA2620A, HSA2620B, HSA5530A)

I/O Connector:
DIN41612-F48 (at front) (HSA2620A, HSA2620B, HSA5530A)

Host Interface:
VME Bus A24/D08/D16 Slave (HSA2620A, HSA2620B, HSA5530A)

Input Channels, Analogue:
4 voltage channels, -10…10 V (Vin) (HSA2620A, HSA2620B, HSA5530A)
4 current channels, -20…20 mA (Iin) (HSA2620A, HSA2620B, HSA5530A)

Input Channels, Frequency:
4 input channels (HSA2620A, HSA2620B, HSA5530A)

Frequency Input Voltage Range:
0…36 V DC (HSA2620A)

Frequency Input Current Range:
0...24 mA (HSA2620B)

Analogue Input Bandwidth:
150 Hz (HSA2620A, HSA2620B)
3 kHz (HSA5530A)

Frequency Input Threshold level:
Each channel has its own software configurable threshold level, fixed hysteresis (HSA2620A, HSA2620B, HSA5530A)

Frequency Input Range:
DC to 16 kHz, 0.25 Hz resolution (HSA2620A, HSA2620B, HSA5530A)

Frequency Input Pulse Width Measurement:
0.1% resolution (HSA2620A, HSA2620B, HSA5530A)

Group-wise Output Supply (e.g. for Tachometer):
15 VDC, max. 70 mA each (HSA2620A, HSA2620B, HSA5530A)

ANALOGUE OUTPUT MODULE

COMPLIANCE
EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® ANALOGUE OUTPUT MODULE (AOM) PROVIDES A STANDARD INTERFACE FOR ANALOGUE OUTPUT SIGNALS.

The EKE-Trainnet® AOM receives instructions from the train computer's Central Processing Unit (CPU) module and sends analogue signals to sub-systems accordingly. The EKE-Trainnet® AOM can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® AOM can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

FOUR ISOLATION GROUPS

The module has four individually isolated analogue output groups. All groups are identical and have four analogue output channels. Each group has two PWM outputs.

CHANNEL CONFIGURATION

By default, two channels are configured as bipolar voltage output and two digital pulse width modulation outputs (voltage mode). The channel configurations can easily be changed from current mode to voltage mode and vice-versa, depending on your needs.

INTERNAL CURRENT LOOP SUPPLY VOLTAGE

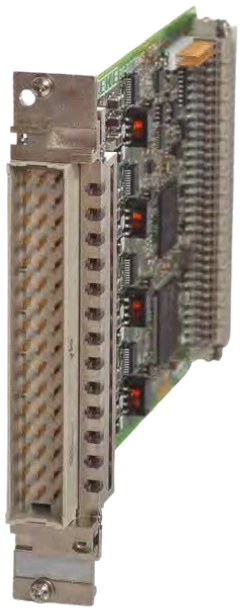
The EKE-Trainnet® AOM is able to provide current loop supply voltage internally: there is no need for an external power supply. Configurable ranges are from 4 to 20 mA for current and from -10 to +10 V for voltage.

32-BIT EMBEDDED PROCESSOR

The module has its own 32-bit embedded processor to manage serial communication with the train computer's CPU module. The embedded processor also implements diagnostic functions and reports to the train computer's CPU module if it suspects that the output values cannot be trusted.

CALIBRATION AND DIAGNOSTICS

Each output channel has parameters for calibration (factory set), and diagnostics to detect short or open in current loop and short in voltage output. Outputs are factory calibrated.



EKE-Trainnet® Analogue Output Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
165 g

Input Power:
5 V DC ± 5 % (1 A typ., 3A max.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
910 000 h (AOM2610)

I/O Connector:
DIN41612-F48 (at front)

Host Interface:
RS-485

Current Output Mode:
4...20 mA
1 µA resolution

Voltage Output Mode:
-10...+10 V
1 mV resolution

Analogue Output Channels:
16 (in 4 groups of 4 isolated channels)

PWM Outputs:
8 (2 in each of the 4 groups)
Selectable base frequency 10 Hz to 10 kHz
Pulse width adjustable with 0.1% resolution
Output level 15 V

DIGITAL INPUT/OUTPUT MODULE

COMPLIANCE
SIL 2
EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® DIGITAL INPUT/OUTPUT MODULE (DIO) PROVIDES A STANDARD INTERFACE FOR MANAGING DIGITAL INPUT AND OUTPUT SIGNALS. IT RECEIVES DIGITAL SIGNALS THROUGH ITS INPUT CHANNELS AND DELIVERS THEM TO THE TRAIN COMPUTER'S CENTRAL PROCESSING UNIT (CPU) MODULE FOR PROCESSING.

The EKE-Trainnet® DIO receives instructions from the train computer's CPU module and sends digital signals to the subsystems accordingly via its output channels. Separate channels are provided for frequency measurements (can be used for tachometer inputs). The EKE-Trainnet® DIO module can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® DIO can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

DEDICATED CHANNELS

The EKE-Trainnet® DIO features 24 dedicated input channels and 8 channels that can be configured as either inputs or outputs. The DIO2908 and DIO2378 models allow up to four outputs to be connected in parallel for increased current capacity. Additionally, the DIO2378 includes 2 frequency input channels, while the DIO1823 offers 2 high-speed input channels.

SUPPORTS UIC-556 SLEEP MODE

One special feature of the EKE-Trainnet® DIO module is to support the UIC-556 sleep mode. The DIO can remain active with WTB modules, and provide local inauguration and battery voltage monitoring.

EMERGENCY OUTPUT SHORT CIRCUIT PROTECTION

The module includes emergency output short circuit protection. If the output current exceeds its maximum value, the short circuit protection shuts down the output. The status of this protection is communicated to the train computer's CPU. In the event of communication failure, the output channel defaults to an emergency state defined in the application software, with individual settings for each channel.

DIAGNOSTIC FUNCTIONS

The module features a 32-bit embedded processor that performs diagnostics and alerts the train computer's CPU if input values are unreliable. Each input channel includes a common test circuit for real-time diagnostics, both at power-on and during normal operation. The train computer's CPU can access the input and output states, as well as configuration parameters such as wetting current and threshold levels.

TWO SEPARATE GROUP VOLTAGE

Two separate group voltages with common ground allow split behind two circuit breakers, or having a mixed voltage system. Input and Input/Output channels are split evenly between group voltage 1 and 2. Please note that the groups are not isolated from each other.

SIL 2 CERTIFIED

The module development of DIO2908 is based on the railway standards EN 50126, EN 50716 (previously EN 50128), and EN 50129 in accordance with safety integrity level SIL 2. A non-SIL version of the module is also available.

EKE-Trainnet® Digital Input/Output Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight: 140 g /179 g (DIO1823A)

Input Power:
5 V DC ± 5 % (500 mA max., 200 mA typ.)

Temperature Range (operational):
-40 °C…+70 °C

MTBF (40 °C ambient temperature):
2 520 000 h (DIO1823)
2 360 000 h (DIO2378)
1 350 000 h (DIO2908) (SIL 2)

I/O Connector: DIN41612-F48 (at front)

Host Interface: RS-485

Input-only Channels: 24

Input/Output Channels: 8

Frequency Input Channels: 2 (DIO2378)

High Speed Input Channels: 2 (DIO1823)

Frequency/High Speed Input Range:
0...32 kHz, resolution 1 Hz

Battery Voltage Monitor:
Yes, one or two (UIC-556)

Temperature Measurement:
Yes, local CPU

Input Type: Current sink

Output Type:
High side (FET) from battery voltage

Voltage Drop: Max. 2 V

Input/Output Voltage Range:
16.8...137.5 V DC (1 sec 14…154 V DC)

Threshold levels:
Software selectable, both positive and negative. Either V or % V_{in}

Wetting Current:
0 … 20 mA, Software selectable (DIO1823)
0 … 23 mA, Programmable (DIO2378)
20 mA (DIO2908)

Output Current: 1.0 A Continuous

DIGITAL RELAY OUTPUT MODULE

COMPLIANCE
EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® DIGITAL RELAY OUTPUT MODULE (DRO) PROVIDES STANDARD RELAY CONTACTS. IT RECEIVES COMMANDS FROM THE TRAIN COMPUTER'S CENTRAL PROCESSING UNIT (CPU) MODULE AND CONTROLS THE OUTPUT RELAYS ACCORDINGLY.

The EKE-Trainnet® DRO module can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® DRO can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

EMERGENCY STATES

The DRO modules are able to take up pre-set output states in case of emergency. If the communication between the train computer's CPU module and the DRO fails, the relays go to emergency states that you can define in the application software. When the EKE-Trainnet® DRO is unpowered, all relays are in Normally Closed state. Emergency states should be defined to match the wiring to Normally Open (NO)/ Normally Closed (NC) contacts.

OPTIONS

SPDT RELAY OUTPUT CHANNELS

The EKE-Trainnet® DRO2342 features 8 Single Pole Double Throw (SPDT) relay output channels on the front panel, while the DRO5141 version has 4 SPDT relay output channels. Relay contacts are accessible via the DIN41612 connector on the module's front.

EKE-Trainnet® Digital Relay Output Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
190 g

Input Power:
5 V DC ± 5 % (500 mA max., 200 mA typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
1 000 000 h (DRO2342)
3 250 000 h (DRO5141)

Relay electrical endurance:
500 000 operations (at 24 V DC 3.0 A resistive load)

I/O Connector:
DIN41612-F48 (at front)

Host Interface:
RS-485

Number of Channels:
8 (DRO2342)
4 (DRO5141)

Relay Type:
Change over (SPDT) AgNi 0.15 Contacts (DRO2342)
Change over (SPDT) AgCuNi + Au 0.15 Contacts (DRO5141)

Maximum Switching Current vs Voltage:
24 V DC 3.5 A (DRO2342)
48 V DC 1.4 A (DRO2342)
110 V DC 0.5 A (DRO2342)
24 V DC 3.0 A (DRO5141)
48 V DC 1.0 A (DRO5141)
110 V DC 0.3 A (DRO5141)

Temperature Measurement:
Yes, local CPU

PT100/PT1000 TEMPERATURE SENSOR INPUT MODULE

COMPLIANCE
SIL 2
EN 50126
EN 50716
(PREVIOUSLY EN 50128)
EN 50129
EN 50155
EN 45545

THE EKE-TRAINNET® PTI MODULES ARE TEMPERATURE SENSOR INPUT MODULES. THEY ACQUIRE THE SIGNALS FROM THE PT100 (PTI2037) OR PT1000 (PTI3593) TEMPERATURE SENSORS (RESISTANCE MEASUREMENT) AND CONVERT THEM INTO TEMPERATURE VALUES EXPRESSED IN DEGREES CELSIUS.

The PTI modules make the measured temperature values available to the train computer's Central Processing Unit (CPU). The EKE-Trainnet® PTI module can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® PTI can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

SIX MEASUREMENT CHANNELS

The EKE-Trainnet® PTI has six measurement channels which can measure temperature within the -110 to +325 °C range with over range indication. Each channel is isolated from each other, thus a fault in one channel will not affect the others. The temperature sensors can be connected using 2-wire, 3-wire or 4-wire schemes providing flexibility.

HIGH MEASUREMENT RESOLUTION

The measurement resolution is 0.01 °C, with accuracy better than ±1 °C within the measurement range.

32-BIT EMBEDDED PROCESSOR

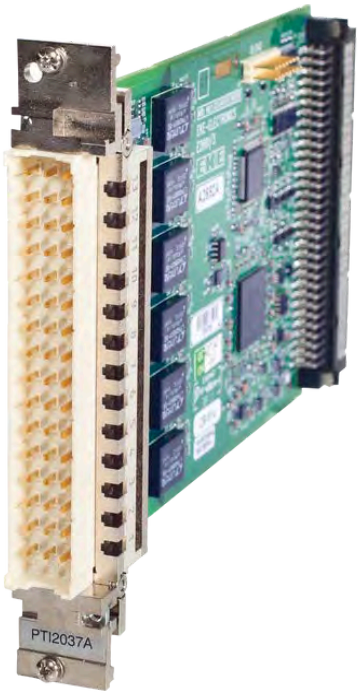
The module has its own 32-bit embedded processor that uses factory calibration values to convert measurement values to degrees Celsius with the best possible accuracy.

DIAGNOSTIC FUNCTIONS

The embedded processor also implements diagnostic functions and reports to the train computer's CPU module if it suspects that the input values cannot be trusted. The EKE-Trainnet® PTI detects the temperature sensor as well as cable faults and input channel faults.

SIL 2 CERTIFIED

The module development is based on the railway standards EN 50126, EN 50716 (previously EN 50128), and EN 50129 in accordance with safety integrity level SIL 2. A non-SIL version of the module is also available.



EKE-Trainnet® PTI Temperature Input Sensor Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
160 g

Input Power:
5 V DC ± 5 % (310 mA typ., 400 mA max.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
2 490 000 h

I/O Connector:
DIN41612-F48 (at front)

Host Interface:
RS-485

Input Channels:
6 Pt100 sensor

Connection Type:
2-wire, 3-wire or 4-wire

Measurement Range:
-110 °C to + 325 °C

Resolution:
0.01 °C

Accuracy:
Better than ± 1 °C (3- or 4-wire)

TEMPERATURE SENSOR INPUT MODULE

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® TSI IS A TEMPERATURE SENSOR INPUT MODULE. IT ACQUIRES THE SIGNALS FROM THE PT100, OR PT1000 OR NTC TEMPERATURE SENSORS (RESISTANCE MEASUREMENT) AND CONVERTS THEM INTO TEMPERATURE VALUES EXPRESSED IN DEGREES CELSIUS.

The used sensor type can be configured by software. The TSI module makes the measured temperature values available to the train computer's Central Processing Unit (CPU). The EKE-Trainnet® TSI module can be used as a part of an EKE-Trainnet® Train Control and Management System, Vehicle Control Unit or Event Recorder. Alternatively, the EKE-Trainnet® TSI can be fitted into the EKE-Trainnet® Remote I/O System.

KEY FEATURES

SIX MEASUREMENT CHANNELS

The EKE-Trainnet® TSI has six measurement channels which can measure temperature using the NTC sensor temperature within the -25 to +125 °C range with over range indication. Each channel is isolated from each other, thus a fault in one channel will not affect the others. The temperature sensors can be connected using 2-wire, 3-wire or 4-wire schemes providing flexibility.

HIGH MEASUREMENT RESOLUTION

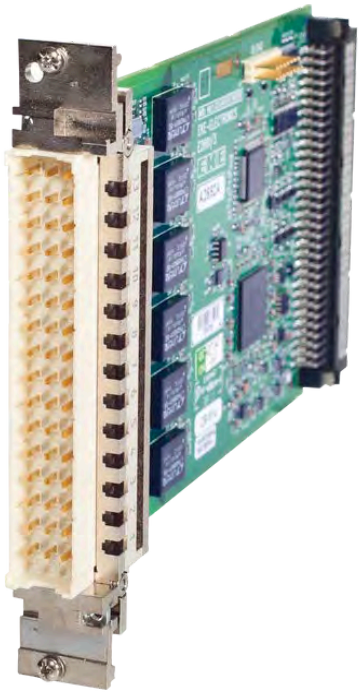
The measurement resolution is 0.01 °C, with accuracy better than ±1 °C within the measurement range.

32-BIT EMBEDDED PROCESSOR

The module has its own 32-bit embedded processor that uses factory calibration values to convert measurement values to degrees Celsius with the best possible accuracy.

DIAGNOSTIC FUNCTIONS

The embedded processor also implements diagnostic functions and reports to the train computer's CPU module if it suspects that the input values cannot be trusted. The EKE-Trainnet® TSI detects the temperature sensor as well as cable faults and input channel faults.



EKE-Trainnet® Temperature Sensor Input Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
160 g

Input Power:
5 V DC ± 5 % (310 mA typ., 400 mA max.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
2 490 000 h

I/O Connector:
DIN41612-F48 (at front)

Host Interface:
RS-485

Input Channels:
6 Pt100 sensor

Connection Type:
2-wire, 3-wire or 4-wire

Measurement Range:
-110 °C to + 325 °C

Resolution:
0.01 °C

Accuracy:
Better than ± 1 °C (3- or 4-wire)

POWER SUPPLY UNIT FOR VME

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® POWER SUPPLY UNIT FOR VME (PSV) IS A HIGHLY RELIABLE SWITCHING MODE POWER SUPPLY MODULE.

The EKE-Trainnet® PSV, specifically designed for VME Bus systems, works only together with the EKE-Trainnet® Power Input Unit (PIU) module which takes power from the train batteries and transfers it to the EKE-Trainnet® PSV module.

KEY FEATURES

PREVENT COMPONENT DAMAGE

The EKE-Trainnet® PSV has built-in circuitry to detect and control the input current in the event of a power-up. Controlling the in-rush current prevents component damage.

GRACE SUPPLY FUNCTION

The EKE-Trainnet® PSV grace supply function enables the module to continue working for a short period of time when the power is cut off. The PSV module withstands 10 ms input power breaks without disrupting any of the normal operations (Voltage Supply Interruption as per EN50155 Class S2 and Supply change over as per EN50155 Class C1). If the break lasts longer, the power supply is capable of supplying a +5 V DC output during a minimum of 100 ms after the input power is lost, 80 ms for PSV1133.

EVENT DIAGNOSTICS

The ACFAIL and SYSRESET signals are activated to ensure proper shutdown of the systems. This feature allows the system to record subsystem and module states during the shutdown, thus enabling event diagnostics.

CURRENT CONSUMPTION MINIMISED

When the input supply voltage is below the set minimum value, EKE-Trainnet® PSV minimises current consumption in order to prevent the deep discharge of train batteries.

EKE-Trainnet® Power Supply Units for VME

TECHNICAL SPECIFICATIONS

Reference	PSV1133	PSV2513	PSV3034	PSV1513	PSV1018
Dimensions (W x H x D)	8 TE x 3 U x 160 mm				
Weight	500 g	500 g	470 g	500 g	500 g
Temperature Range (operational)	-40 °C...+70 °C				
MTBF (40 °C ambient temperature)	700 000 h	690 000 h	700 000 h	690 000 h	690 000 h
Input Voltage	24 V DC	36 ... 52 V DC	48 ... 110 V DC	72 V DC	110 V DC
Input Voltage Range (V DC)	16.8 ... 30.0	25.2 ... 65.0	33.6 ... 143	50.4 ... 90.0	77 ... 138
Input Fluctuation (1s) (V DC)	14.4 ... 33.6	21.6 ... 72.8	31.2 ... 154	43.2 ... 100.8	66 ... 154
Input Current (<0.1 s/1 s)	5 A max.	4 A max.	3 A max.	3 A max.	2 A max.
Input Power	80 W max.	75 W max.	100 W max.	100 W max.	100 W max.
Supported Supply Interruption (S2)	10 ms				
Efficiency	> 78%				
Output Power	60 W	54 W	80 W	80 W	80 W

Output Voltage 5 V DC

Reference	PSV1133	PSV2513	PSV3034	PSV1513	PSV1018
Maximum Output Current	8.5 A	8.5 A *	13 A	12 A	13 A
Minimum Output Current	0.5 A	0.5 A	0.1 A	0.5 A	0.5 A
Ripple/noise p-p	50 mVpp (<20 MHz)				
Output Voltage Hold-on at nom. load	100 ms				
Output Voltage	5.15 V DC ± 2 % (at nominal line, nominal load) 5.00 V DC min. (at line range, load range)				

Output Voltage 12 V DC

Reference	PSV1133	PSV2513	PSV3034	PSV1513	PSV1018
Maximum Output Current	1.25 A	2.0 A *	1.25 A	1.25 A	1.25 A
Ripple/noise p-p	50 mVpp (<20 MHz)				
Output Voltage	12.15 V DC ± 2 % (at nominal line, nominal load) 11.80 V DC min. (at line range, load range)				

** Total output loading must not exceed Output power*

POWER INPUT UNIT

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® POWER INPUT UNIT (PIU) IS USED TO PASS TRAIN BATTERY VOLTAGE TO THE EKE-TRAINNET® POWER SUPPLY UNIT FOR VME (PSV) MODULE, THUS POWERING THE ENTIRE EKE-TRAINNET® SYSTEMS.

KEY FEATURES

RANGE OF INPUT VOLTAGES AVAILABLE

The EKE-Trainnet® PIU input voltages can be:

- 24 V DC (PIU2056)
- 24 to 36 V DC (PIU4233)
- 36 to 52 V DC (PIU2510)
- 48 to 110 V DC (PIU4234)
- 72 V DC (PIU2280)
- 110 V DC (PIU2219)

An EKE-Trainnet® PSV with a similar input voltage must be selected.

OPTIONS

ISOLATED DC CONVERTER OUTPUT

An isolated DC/ DC converter may be installed as an option to provide power to any external equipment. If required, the output voltage may be switched off during the system reset in order to force hard-resets of external equipment. Currently available PIU modules with DC Converter Output are listed in the table below. We can also provide you with other versions upon request.

VEHICLE IDENTIFICATION UNIT

The EKE-Trainnet® Vehicle Identification Unit (VIU) has the functionalities of the EKE-Trainnet® PIU, and in addition, provides an interface for Electronic Serial Number (ESN). An ESN dongle can be connected to VIU for device identification and configuration. There are VIU versions for 24 V DC (VIU3688) and 110 V DC (VIU2336) input voltages.

Available PIU Modules with DC Converter Output

Module Reference	Input Voltage	Output Voltage	Output Power
PIU2034	24 V DC	16 V DC	17 W
PIU2023	110 V DC	16 V DC	17 W
PIU3394	110 V DC	24 V DC	25 W

EKE-Trainnet® Power Input Units

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
4 TE x 3 U x 160 mm

Weight:
100 - 150 g

Input Voltage:
24, 24-36, 36-52, 48-110, 72 or 110 V DC available
Others on request

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
38 570 000 h

Output Voltage (optional):
12 V DC (from PSV)

Technical Data DC Converter option

Weight:
350 g

Input Voltage:
24 or 110 V DC available
Others on request

MTBF (40 °C ambient temperature):
2 400 000 h

Output Voltage and Power:
See table

Vehicle Identification Unit (VIU)

Weight:
155 g

Input Voltage:
110 V DC

MTBF (40 °C ambient temperature):
5 290 000 h

COMPACT POWER SUPPLY UNIT

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® COMPACT POWER SUPPLY UNIT (PSR) IS A HIGHLY RELIABLE SWITCHING MODE POWER SUPPLY MODULE. IT TAKES POWER DIRECTLY FROM THE TRAIN BATTERIES.

The EKE-Trainnet® PSR module is primarily designed to power the EKE-Trainnet® Remote Input/Output System but can also be used for some simple VME Bus systems.

KEY FEATURES

RANGE OF INPUT VOLTAGES AVAILABLE

The EKE-Trainnet® PSR can be operated with either 24 to 36 V DC (PSR3031) or 48 to 110 V DC (PSR3032) coach supply voltage and provide 5 V DC output power. The input supply is provided directly from the train battery to the PSR module through a 2W2C D-Sub connector.

PREVENT COMPONENT DAMAGE

The EKE-Trainnet® PSR has built-in circuitry to detect and control the input current in the event of a power-up. Controlling the in-rush current prevents component damage.

CURRENT CONSUMPTION MINIMISED

When the input supply voltage is below the set minimum value, EKE-Trainnet® PSR minimises current consumption in order to prevent the deep discharge of train batteries.

POWER INTERRUPTION PROTECTION

The EKE-Trainnet® PSR module withstands 10 ms input power breaks without disrupting any of the normal operations (Voltage Supply Interruption as per EN50155 Class S2 and Supply change over as per EN50155 Class C1). In case of a longer break in the power supply, the SYSRESET signal is activated to ensure proper shutdown of the systems.

EKE-Trainnet® Compact Power Supply Units

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
8 TE x 3 U x 160 mm

Weight:
410 g

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
800 000 h

Input Voltage:
24 to 36 V DC (PSR3031)
42 to 110 V DC (PSR3032)

Input Voltage Range (V DC):
16.8 ... 47.8 (PSR3031)
33.6 ... 143 (PSR3032)

Input Fluctuation (1s) (V DC):
14.4 ... 50.4 (PSR3031)
28.8 ... 154 (PSR3032)

Input Current (<0.1s/1s):
7.5 A max. (PSR3031)
4 A max. (PSR3032)

Supported Supply Interruption (S2):
10 ms

Efficiency:
> 80% (typically 85%)

Output Power:
80 W

Output Voltage 5 V DC
Maximum Output Current:
16 A max.

Minimum Output Current:
0.1 A min.

Ripple/noise p-p:
50 mVpp (<20 MHz)

Output Voltage
At nominal line, nominal load:
5.15 V DC ± 2 %

At line range, load range:
5.05 V DC min

RUGGED MEMORY MODULE

COMPLIANCE

EN 50155
EN 45545
IEEE 1482.1-1999
IEC 62625-1:2013
GM/RT2472:2014
EEIG 97E461-3.1998

THE EKE-TRAINNET® RUGGED MEMORY MODULE (RMM) IS A HIGHLY PROTECTED MEMORY MODULE TO BE USED AS PART OF AN EKE-TRAINNET® EVENT RECORDER.

As an essential part of the Train Event Recorder, the EKE-Trainnet® RMM collects and stores vital train-borne information. Depending on your needs, it can record all kinds of data including audio and video recordings.

KEY FEATURES

STANDALONE OR INTEGRATED EVENT RECORDING

The EKE-Trainnet® RMM is paired with an EKE-Trainnet® 3U 84TE Rack and power supply (typically EKE-Trainnet® PSV and PIU modules) to create a fully functional standalone event recorder. The EKE-Trainnet® RMM can also be integrated into a larger EKE-Trainnet® system, such as a 6U 84TE Rack, complementing Gateways, Vehicle Control Units, or Train Control and Management Systems.

HIGH LEVEL OF DATA PROTECTION

The EKE-Trainnet® RMM is designed for high data protection. Its crash-proof construction ensures protection against fire, magnetic fields, liquids, and mechanical stress from impacts or continuous pressure. The memory board is housed in a fire-resistant insulation block and enclosed in a hermetically sealed steel case.

STORE BOTH ANALOGUE AND DIGITAL SIGNAL DATA

The EKE-Trainnet® RMM stores both analogue and digital signal data for a set period. Data can be accessed anytime using the EKE-Trainnet® Train Inspection Program for performance analysis and optimisation. For convenience, data can also be copied to a USB stick for easy transport and storage.

EASY ACCESS TO DATA

Data from the EKE-Trainnet® RMM can be retrieved through the Ethernet and USB ports on the module's front panel, as well as via the VME back plane, from added interface modules, and the RS-485 port. The module receives power through the VME back plane.

RECORD VIDEO STREAMS

The EKE-Trainnet® RMM can record video streams from onboard digital video recorders (DVR) or directly from cameras. For easy data retrieval, the stream format can be made compatible with your CCTV software or any other video analysis software that you use. Alternatively, we can develop customised video analysis tools to fit your needs.

OPTIONS

FRONT-PANEL IMPRINTS

Front-panel imprints are available on request in English or any other language of your choice.

INTEGRATED GNSS RECEIVER

A GNSS (Global Navigation Satellite System) receiver can be integrated with the EKE-Trainnet® RMM to provide location and time information. Options are available with either GPS+GLONASS or GPS+BeiDou.

Please note that adding this feature will increase the module's width by 4TE.

EKE-Trainnet® Rugged Memory Module

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D):
32 TE x 3 U x 160 mm

Weight:
7 Kg

Input Power:
5 V DC ± 5 % (1 A max., 0.5 A typ.)

Temperature Range (operational):
-40 °C...+70 °C

MTBF (40 °C ambient temperature):
890 000 h (2 GB)
870 000 h (16 GB)

Interfaces:
3 or 4 Isolated RS-485
1 x 10/100 Mbit/s Ethernet, M12 connector
1 x USB 2.0 Host for retrieval

Memory:
2 GB or 16 GB

Protection Levels (Rugged Memory Module)
Ingress Protection (IP) rating: 68

Shock: Up to 100 g / 10 ms and 55 g / 100 ms

Crush: Up to 110 kN for 5 minutes in all axes

Penetration:
Up to 23 kg drop from a height of 1.5 m focussed on an area of 30 mm2

Temperature:
Up to 700 °C for 5 minutes and 650 °C for 30 minutes followed by 300 °C for 1 hour followed by 100 °C for 5 hours

Chemical Immersion:
Winter Diesel (*), Summer Diesel (*), Regular Water (*), Salt Water (*), Lubricating Oil (*), Transformer Oil (**), Hydraulic Oil (**), Anti Fire Fighting Foam (*), Refrigerant R134A (**), Alcohol (**), Anti Freeze (**), Battery Acid (**)
(*) minimum for 48 hours
(**) minimum for 60 min

Magnetic Field:
Current flow of 64 kA at rising rate of 107 A/s

Hydrostatic pressure:
Immersion in salt water at a depth of 15 meters for 48 hours

STANDARD RACKS

COMPLIANCE
EN 50155
EN 45545

EKE-TRAINNET® RACKS ENABLE COMMUNICATION BETWEEN MODULES VIA AN INTEGRATED IEC 821 VME BACK PLANE BUS. ALL MODULES ALSO TAKE POWER FROM THE POWER SUPPLY VIA THE BACK PLANE.

EKE-Trainnet® Racks are required with every EKE-Trainnet® System. EKE-Trainnet® modules only work when integrated into an EKE-Trainnet® Rack.

KEY FEATURES

DIFFERENT SIZES TO FIT ALL NEEDS

EKE-Trainnet® Racks come in different sizes to fit all needs. While 44TE and 84TE wide racks are commonly used, a 20TE wide rack is also available for smaller systems. When working with a high number of modules the 6U 84TE can be used. Other racks sizes are also available upon request.

DIFFERENT BACK PLANE OPTIONS

The 3U 44TE and 3U 84TE Racks have different back plane options. Please read the table below for an overview of the possible rack back plane combinations. The number of free slots for both VME modules (CPUs, bus interface modules and HSA module) and I/O modules (all I/O but HSA) are mentioned. The space required for the power supply is already taken into account.

OPTIONS

SIDE MOUNTING FOR 20TE RACKS

The 3U 20TE Racks can be sided mounted as an option, instead of the usual front mounting. Dimensions are then W127 x H133 x D306 mm.

Available VME and I/O Slots

Racks	VME Only Slots	VME or I/O slots	I/O Only Slots	MTBF	Comments
3U 20TE	2	1	0	3 480 000 h	-
3U 44TE	1	7	0	1 830 000 h	-
3U 44TE RIOM	1	0	8	2 330 000 h	-
3U 84TE	3	7	8	980 000 h	-
3U 84TE Dual: Left	1	6	0	970 000 h	-
3U 84TE Dual: Right	2	6	0	970 000 h	The right back plane has an extra VME slot that usually remains unused
3U 84TE RMM	4*	7	0	1 440 000 h	28TE* reserved for RMM or third party equipment
3U 84TE RIOM	1	0	0	1 130 000 h	-
6U 84TE	Select a 3U 84TE rack version		18	850 000 h (RMM)	The other 3U fits 2 x 1U ESU

** If using RMM, please note it uses 1 VME slot (leaving 3 out of 4 free)*

TECHNICAL SPECIFICATIONS

External Dimensions (W x H x D):
3U 20TE Rack:
158 mm x 133 mm x 215 mm
(installation width 117 mm)

3U 44TE Rack:
280 mm x 133 mm x 215 mm
(installation width 240 mm)

3U 84TE Rack:
483 mm x 133 mm x 215 mm
(installation width 443 mm)

6U 84TE Rack:
483 mm x 266 mm x 215 mm
(installation width 443 mm)

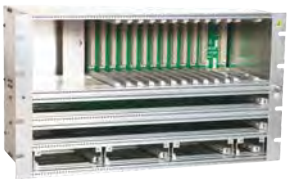
Weight:
3U 20TE Rack: 1.3 Kg
3U 44TE Rack: 2.3 Kg
3U 84TE Rack: 4 Kg
6U 84TE Rack: 7.3 Kg

Ingress Protection (IP) rating: 20

EKE-Trainnet® 3U 20TE Rack

EKE-Trainnet® 3U 44TE Rack

EKE-Trainnet® 3U 84TE Dual Rack



EKE-Trainnet® 6U 84TE RMM Rack

FLAT RACKS

COMPLIANCE
EN 50155
EN 45545

THE EKE-TRAINNET® FLAT RACKS ARE DESIGNED TO BE USED IN TRAINS WHERE SPACE IS LIMITED, FOR INSTANCE TRAMS AND LIGHT RAIL VEHICLES. THEY ARE ALSO PROVIDING AN ALTERNATIVE TO STANDARD RACKS DIMENSIONS AND MOUNTING MECHANISMS.

EKE-Trainnet® Racks are required with every EKE-Trainnet® System. EKE-Trainnet® modules only work when integrated into an EKE-Trainnet® Rack. The Racks enable communication between modules via an integrated IEC 821 VME back plane bus. All modules also take power from the power supply via the back plane. **Please note** - EKE-Trainnet® Flat Racks are only available by request.

KEY FEATURES

VARIETY OF SMALL SIZES AVAILABLE

EKE-Trainnet® Flat Racks come in 3U and 6U format, either as a 12TE or 16TE wide rack. Thanks to their small sizes, Flat Racks can be used in the vicinity of train systems, thus allowing savings by reducing cabling. The Flat Racks have a power supply connector integrated at the back.

DIFFERENT BACK PLANE OPTIONS

The number of free slots for both VME modules (CPUs, bus interface modules and HSA module) and I/O modules (all I/O modules except HSA) are mentioned in the table below. The space required for the power supply is already taken into account. Please note that in the 6U versions, there is no VME bus communication between the two rows of modules.

Available VME and I/O Slots

Racks	VME Only Slots	VME or I/O slots	I/O Only Slots	MTBF
3U 12TE	0	1	0	8 150 000 h
3U 16TE	0	2	0	5 680 000 h
6U 12TE	0	4	0	3 140 000 h
6U 16TE	0	5	1	2 440 000 h

TECHNICAL SPECIFICATIONS

External Dimensions (W x H x D):
3U 12TE Flat Rack:
87 mm x 229 mm x 215 mm

3U 16TE Flat Rack:
107 mm x 229 mm x 215 mm

6U 12TE Flat Rack:
87 mm x 363 mm x 215 mm

6U 16TE Flat Rack:
107 mm x 363 mm x 215 mm

Weight:
3U 12TE Rack: 1.21 Kg

3U 16TE Rack: 1.32 Kg

6U 12TE Rack: 2.15 Kg

6U 16TE Rack: 2.33 Kg

Ingress Protection (IP) rating: 20

EKE-Trainnet® 3U 12TE Flat Rack

EKE-Trainnet® 3U 16TE Flat Rack

EKE-Trainnet® 6U 12TE Flat Rack

EKE-Trainnet® 6U 16TE Flat Rack

NOTES

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IRIS® Certification

EKE

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