DEUTA-WERKE

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DEUTA – The Home of Trust-Technology:

IconTrust® SignalTrust® TouchTrust® SelectTrust®

DEUTA Trust-Terminals

The worldwide leading solution for ERTMS/ETCS & Baseline 3 & Maintenance

Safe display - safe input

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02_2016_EN

IconTrust® – You can Trust.

DEUTA-WERKE

Technology under Control

»DEUTA Trust Terminals

The No. 1 worldwide for driver's cab displays«

DEUTA
Trust technology:

+ **Generic expertise up to SIL 3**
+ **Safe input and output**
+ **Software and hardware from a single source**
+ **Integrated Trust technology**
+ **Cost-efficient validation**
+ **Easy assessment of application changes**
+ **Cost-efficient**
+ **Many successful project references with component and system expertise**

With the commencement of the new Subset-091 Issue 3.3.0 release, focus has been placed for the first time on the **mandatory specification of the Driver Machine Interface (DMI) as Safety Integrity Level (SIL) component** as part of Baseline 3 and its "Safety Requirements for the Technical Interoperability".

The requirement of Subset-091 regarding the monitoring of safe **display and input areas on a** touch panel is fulfilled by **IconTrust** on the DEUTA Multi-Functional Terminals. IconTrust detects representation errors of an unsafe PC system and differentiates between the safety-related input areas on the TFT. The therein contained **SelectTrust function** checks the activation or release of the touch area, or the single or continuous transmission of the activation. The technology thus complies with the requirements of Subset-091 through a safe, flexible and cost-efficient fully solution.

DEUTA-WERKE is a pioneer of the proven and safe representation of Driver Machine interfaces. For 5 years DEUTA has been supplying Multi-Functional Terminals with an validation proof of safety.

DEUTA as sole provider offers the combination of highly-available redundant displays, safe SIL 3 display and SIL 2 input.

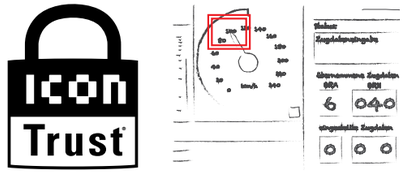
MFT R8/2

»DEUTA Trust Technology

Safe hardware and software from a single source«

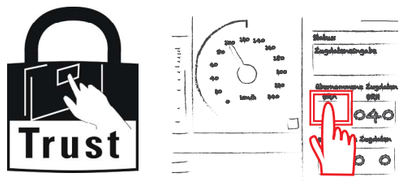
IconTrust® – for safe display

IconTrust monitors **dedicated areas on the TFT panel** and differentiates **between safety-related and non-safety-related information.**
IconTrust uses a safe computer to transmit the safe data to the panel PC. This is where the data are processed and displayed. IconTrust monitors the represented screen areas on the TFT display and transmits the protocol back to the safe computer. Comparison occurs in the safe computer, e.g. in the EVC (European Vital Computer).



SelectTrust® – for safe input

SelectTrust is worldwide the first technology which demonstrably **secures the safe manual input of information** via touch screen. The entry position and the visualisation at this position are checked in the functional safe SelectTrust solution. Only in case of total correctness the functional safe entry action will be transmitted to the safe computer.



Independent and cost-effective solutions

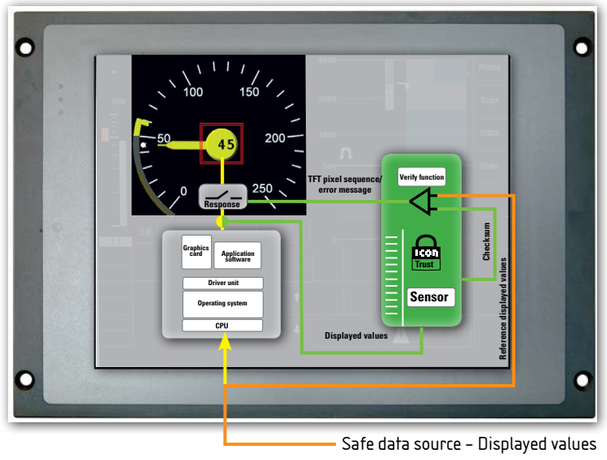
Along with IconTrust, SelectTrust provides a cost-effective solution for safety considerations and proof of compliance with current safety requirements. Both monitoring systems work fully decoupled from the display function and operating function making them unique in their mode of operation.

IconTrust is an economical and safe solution which meets today's and tomorrow's safety standards in railway traffic.
Even up to SIL3 already today!

The patented SelectTrust technology monitors SIL-related input areas of the DMI.

»IconTrust®

Infinite control up to SIL 3«



IconTrust Technology:
The independent monitoring unit guarantees that only correct display values are represented.

IconTrust is realised through economical components available long-term.

IconTrustGenericPlus: already evaluated in many projects up to SIL 3.

IconTrust®

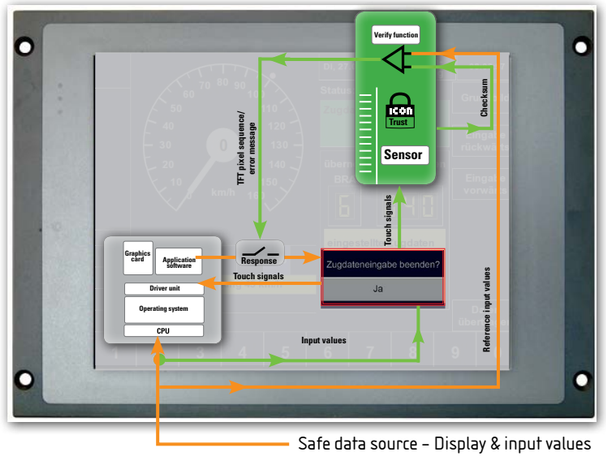
IconTrust **monitors predefined areas on the TFT display.** IconTrust analyses the displayed image there and compares the image data with the value of the original input variable. In the event of deviations IconTrust triggers a safety-oriented response.

IconTrust is independent of the chosen computer architecture. In the IconTrustGenericPlus model, a project-specific and **time-saving SIL expertise** is possible. IconTrustGenericPlus has already been evaluated successfully in many projects up to the safety level **SIL 3.** Obsolescence and device modifications can be recertified with acceptable expenditure.

In the non safety-related display zones, **customer- or project-specific software adaptations are possible without re-evaluation.** In the safety-related areas, adaptations are easily mastered with the IconTrust IVEN configuration tool.

»SelectTrust®

Ensuring correct touch input«



SelectTrust®

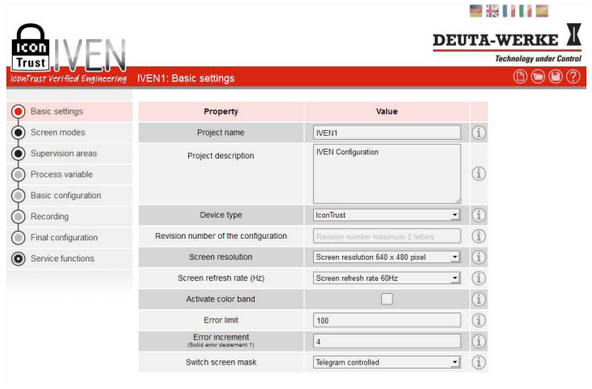
SelectTrust is worldwide the first technology to demonstrably **ensure correct manual input** of information via touch screen.

This technology is invisible to the operator: A graphical control element displayed on the TFT display is selected and touched. **SelectTrust uses IconTrust to select that activated control element,** assigns it a signature and transmits the corresponding checksum to the safe computer. There the information of the "classical" touch event is compared with the SelectTrust signatures on the basis of the previously defined reference tables. This **ensures the reliability of the information.** SelectTrust and IconTrust monitors only the customer defined safety-related areas.

SelectTrust Technology:
Patented safety at the touch screen.

Together with IconTrust, **SelectTrust** offers a cost-efficient solution method for the assessment or verification of current safety requirements.

»IVEN - makes SIL display configuration easy«



There will always be new CENELEC requirements and additional customer requests. **Safety-related changes and new configurations** of the monitoring areas can be configured specific to project with the IVEN engineering tool and prepared for the expertise.

IVEN offers a preview of the configured monitoring areas and checks the configuration for consistency. In the process, IVEN records all process values with the corresponding screen photo, transfers the configuration to the IconTrust module and automatically **generates a PDF validation report** as direct documentation for the expertise.

IVEN configuration, diagnostic & test

Define
- configuration of SIL-related monitoring areas and dialog boxes
- definition of basic parameters (resolution, error counter behaviour, etc.)

Automatically record
- determine and record the checksums for all permitted graphical elements

Programming
- upload the configuration to the IconTrust board

Document
- automatically generation of a PDF validation report as documentation for the expertise

Testing
- diagnosis of communication and hardware with detailed error output

With IVEN our customers can configure the safety-related input and display areas.

DEUTA Hardware and Software Engineers are experts in the field of Functional Safety Engineering and make the latest SIL technologies applicable for any individual terminal solution.

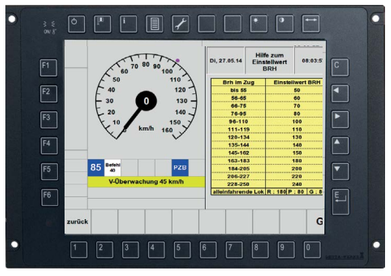
Upon request DEUTA-WERKE can supply the displays, including the application software, with a safety certificate and other approvals.

»TSI-compliant application software«

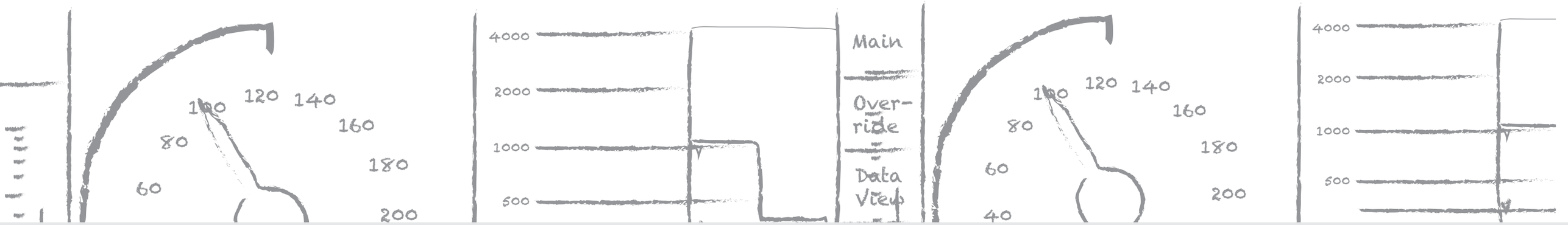
The DMI forms the stable basis for the safety functions and is an essential part for vehicle interoperability.

In the ERA ERTMS 015560 Ver. 3.4.0, the input and output behaviour of the DMIs for Baseline 3 is strictly standardised. The DEUTA software designers are acutely aware of the requirements down to the pixel and develop standards-compliant applications for their Multi-Functional Terminal from design to SIL validation for PZB and ETCS.

Upon request you can use the DEUTA communication protocol - developed and evaluated up to SIL 3 - or we will implement your specified protocol.



DEUTA also supports national train protection systems – integrated in ETCS such as the shown PZB interface.



What needs to be considered for a safe display and touch input?

- Errors and obsolescence in modern complex computer cores, caches, graphic units, etc. need to be mastered
- Errors have to be assessed in operating systems and complex software and checked and documented at great cost. Changes make elaborate verification efforts and impact analyses necessary.
- The position of the touch input must be safely acquired and the input unit must be diagnosed. If not all error states can be diagnosed and a higher safety level is required, then position acquisition must occur redundantly.
- The project-specific resource use (time and money) should be kept as low as possible.
- The safely imaged representation at the input position is required. It has to be assured that the representation is appropriate for the triggered input function. For that reason, a safe display is always necessary for a safe input.
- Input safety for operating systems depends on the safety functions:
  - Safe starting of an actuator
  - Safe stop / safe release
  - Emergency stop function

What does Subset-091 define?

As part of Baseline 3, the Subset-091 defines the European-wide uniform standardisation of the ETCS application, whereby for the first time the safe display and input of information is prerequisite for compliance with ergonomic and safety-oriented specifications.

For the producers of Driver Machine Interfaces for ETCS vehicles this means that their terminals must comply with a Safety Integrity Level of at least SIL 2 on the basis of a Tolerable Hazard Rate of $7.4 * 10^{-7}$. Railway vehicles and train protection manufacturers justifiably expect SIL 3 from DMI producers already now in order to comply with the higher safety requirements in future.

Display and input behaviour of the DMI are strictly standardised in the Subset-091. The response time after input and the representation of graphical objects is limited to 20 ms. The probability of incorrectly entering vehicle data and parameters must be minimised for the driver. Here, too, there is a standard time value: The DMI for data entry must be available within 60 seconds from out of standby mode. In the process it must be ensured that the locomotive driver can carry out his work quickly and error-free at all times without unnecessarily increasing the complexity of the overall system. It should be possible to read and understand every message on the DMI within the shortest time possible.

»SIL 3 – The cost side«

A SIL 3 DMI of the latest generation does not generally cost more than a SIL1 terminal. For the macroeconomic assessment, not only the acquisition costs of the DMI but also the future security and the follow-up costs-must be considered. A modern, cost-optimised DMI concept ensures that changes in the software application and the DMI hardware will not affect each other. The advantage is obvious: Irrespective of hardware discontinuations during a DMI life cycle, the safety assessment will retain its validity.

Trust

DEUTA-WERKE

Trust Technology Terminals

MFT R 8/2

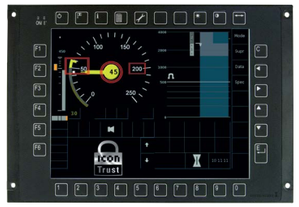
Redundant terminals

Two redundant full-value 8" vertical terminals with a total surface of 10.4" optimise the display availability of the Multi-Functional Terminal MFT R 8/2 S3.

Both terminals are full-value, individually replaceable function modules, thus satisfying the requirement towards minimised life-cycle costs. The train driver can manually switch between the terminals.

IconTrust monitors dedicated areas on the TFT panel and differentiates between safety-related and non safety-related information. The touch panels are optionally equipped with SelectTrust.

	MFT R 8/2
	consisting of 2 DATS2080kwe
Feature/Specification	**per DAT 2080kwe**
Display lighting	LED backlight
Dimmable lighting	0 to 350 cd/m²
Status LEDs	3
CPU/clock frequency	ARM, CPU, >500 MHz
RAM memory	512 MB
Internal flash disk	minimum 4 GB
Flash-EPROM	1 MB
Extensibility	upon request
PC keyboard connection	USB keyboard
Additional controller	Environment Controller
Service Interface	USB and Ethernet
Buzzer	yes
Temperature management	yes
Ambient light sensor	front side
Power supply	24 - 110V (DC ± 30%)
Power consumption	typ. 22 W
Display type/size	colour TFT / 8"
Display resolution, colour intensity	480 x 800, 18 bit
Ethernet	10/100 Base T as M12 d-coded[1)]
Vehicle bus	2x MVB
Audio out	amplifier output 1 x 8W
Serial interfaces	1 x RS 485, IBIS upon request
USB	2x USB 2.0 (M8 a-coded[1)])
Device address	3 bit
Keypad device front	none
Keypad backlight	none
Touch screen	capacitive
Weight	approx. 3 kg
Protection category front/rear	IP 65 / IP 40
Operating temperature	-25 °C to 70°C (full functionality)
Temperature storage	-25°C to 85°C
MTBF value	> 89.000 hrs.
Operating system	LINUX, others upon request
Applications	ETCS, diagnostics, brake control, etc.
Safe Supervision Function	IconTrust®, SelectTrust®
Feature/Specification	**per MFT R 8/2**
Front dimension (W x H)	652 mm x 244 mm
Mounting dimension (W x H x D)	372 mm x 211 mm x 80 mm
Indicator light	EZ155b



MFT S11/2

Patented safety

The Multi-Functional Terminal MFT S11/2 is equipped with the patented IconTrust technology as standard. IconTrust monitors dedicated areas on the TFT panel and differentiates between safety-related and non safety-related information.

Each of the individual areas of the displayed image are analysed and compared to the value of the respective input variable during every image refresh cycle in **IconTrust**.

The patented procedure demonstrably ensures topicality and correctness. The generic verification is certifiable up to the SIL 3 level. If the application changes, our customers can easily modify the monitoring areas with the **IVEN** Engineering Tool and document it for the validation.

Feature/Specification	**MFT S11/2**
Display lighting	LED backlight
Dimmable lighting	0 to 350 cd/m²
Status LEDs	3 LEDs
CPU/clock frequency	Geode, LX 800, 500 MHz
RAM memory	256 MB (incl. video memory)
Flash-EPROM	1 MB
Video memory	4 MB
Flash memory	minimum 2 GB
PC keyboard connection	USB keyboard
Additional controller	Environment Controller
Service Interface	USB and Ethernet
Buzzer	yes
Temperature management	yes
Ambient light sensor	front side
Power supply	24, 48 or 74 - 110 V (DC ±30 %)
Power consumption	typ. 25 W
Display type/size	colour TFT 10.4" (26.4 cm), additional sizes upon request
Display resolution, colour intensity	640 x 480, 18 bit, additional resolutions upon request
Ethernet	2x 10/100 BaseT as (M12 d-coded[1)])
Audio out	2x Line-Out or 2x2 W loudspeakers
USB	2x USB 2.0 (M8 a-coded[1)]) + 1x Feature Connector
Vehicle bus, I/O	Ethernet, RS 422, RS 485, MVB, CAN, RS 232, Profibus
Device address	3 bit
Keypad device front	upon request
Keypad backlight	upon request
Touch screen	yes, resistive, scratch-proof
Front dimension (W x H)	310 mm x 214 mm
Mounting dimension (W x H x D)	280 mm x 204 mm x 65 mm
Weight	approx. 3.6 kg
Protection category front/rear	IP 65 / IP 54
Temperature range operation	-25°C to +70°C (full functionality)
Temperature range storage	-35°C to +85°C
MTBF value	calculated approx. 100.000 hrs.
Operating system	LINUX, QNX™, Windows™
Applications	ETCS, diagnostics, brake control, etc.
Safe Supervision Function	IconTrust®, SelectTrust®

[1)] Available as accessory from DEUTA: Adapter/cables/loudspeaker front plates/ serial switchbox/USB Ethernetadapter/power supply