NFC, QR and Face Recognition AFC Validator

VAL10Datasheet
Doc. V1.3

*Fig 1:VAL10

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1. Introduction

VAL10 is a state-of-the-art **EMV L1 and L2**certified validator for automated fare collection (**AFC**) in public transport. It incorporates a**contactless** card reader, dual cameras for high-performance **facial recognition**and a **QR scanner**, that provides unmatched flexibility in public transport ticketing.In addition, VAL10**efficiently reduces revenue leaks** through biometric verification of personalized electronic tickets without violating personal data protection laws.

VAL10is based on a **powerful processor and large memory**:

- CPU : 1.8 GHz ARM,quad core
- NPU : Neural processing unit, 3TOP/s int8, allows for high-perf. face recognition
- RAM : 1 GBytes DDR3 RAM(option – 2GB)
- Flash Memory : 16GBytes eMMC(option –32GB)
- Backup memory : Micro SD Flash Memory Slot
- RTC : real time clock withan integrated lithium battery
- UID : serial EEP (128 bytes) with unique serial number, integrated to the main board, allowing for uniquely differentiation of the products
- ONEWIRE UID : identification chip, attached to the external cable, allowing for automatic identification of the vehicle(optionl)

VAL10**machine vision (face recognition) sub-system**:

- RGB(color) camera: 2MP low light, high dynamic range RGB image sensor
- IR (Infrared) camera : 2MP low light, infrared image sensor
- Illumination : 2 x white LEDs + 4 IR (infrared) LEDs
- Face recognition perf. : max. 50 millisecond

VAL10**communicates** through:

- Ethernet : 100 MB/s
- Serial interfaces : 2 x UART RS-232(option: 1 x RS-232 and 1 x RS-485)
- WiFi& BT : 802.11n & BT5.0 (optional)
- Cellular : CAT.4 LTE modem 100Mbps (DL) Max 50Mbps (UL)
- USB : 1 x USB2.0 Host+ 1 x USB2.0 OTG (internal)
- Data security : up to 4 slots (default 2) for SAM (secure access module support)

VAL10**user interface** capabilities:

- Display : 7” 24-bits color LCD with LVDS interface and LED backlight, 400 nits
- LED : 4 x high brightness RGB LED
- Audio output : Speaker, 5W
- Keyboard : Multi-touch capacitive touch panel
- RFID and NFC reader : EMV L1 and L2certified, fully compliant to NFC and ISO14443A/B, capable of communicating over NFC with smart phones.
- QR code scanner : Reads 1-D barcodes and QR codes, including those on smart phones.

VAL10**sensors:**

- GNSS (GPS+GLONASS) receiver (GPS, GLONASS, BeiDou/Compass, Galileo)
- Temperature Sensor
- Input Voltage and Current Sensor

VAL10has the following **input/output** capabilities:

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- 1 x optically isolated digital input
- 1 input from the ignition switch of the vehicle
- 2x digital outputs, high side, overcurrent protected at 200 mA

VAL10incorporates an**EMV Level 1 and Level 2 (MASTERCARD, VISA, RuPay and Discover) certifiedcontactless card reader,** fully **compliant** with the relevant ISO standards - ISO/IEC 14443A/B. VAL10 supports all ISO14443A/B compliant cards and smart phones. It also supports all types of Mifare Classic cards as well.

Besides its NFC interface, VAL10 is capable of reading with high performance even under bad light conditions all kinds of **QR codes** and barcodes on a paper or on a smart phone, either.

VAL10**efficiently reduces revenue leaksthrough face verification** of personalized electronic tickets without violating personal data protection laws. During personalization, face data is securely written to a contactless electronic ticket. When passengers present their cards to VAL10, before transaction completion VAL10 gets the face definition over the NFC interface from the card and verifies against the image frames, coming from the cameras. The entire verification process only adds 200 milliseconds to the total transaction time.

The AFC software suite runs under a high level OS – **Linux**, with special arrangements and **measures for unattended use**. Well documented **development environment and SDK** with reliable software libraries and modules are offered, allowing implementation of own software by the integrator companies. Training is also provided upon request. SDK is based on the object oriented language (C++) and the widely used Graphical User Interface (GUI) Qt.

VAL10operates**reliably in the harsh electromagnetic and mechanical environments, essential to the automotive**.

- Special precautions have been taken to prevent the negative effects of vibrations. All **connectors are automotive type**, i.e. with a latch, preventing undesired accidental disconnections.
- Special attention is paid to the **wide temperature range**in public transport vehicles – automotive grade components have been chosen;
- The power supply blocks are based on highly efficient**DC-DC converters**that reduce dissipated heat energy.
- The front side is made of a **tempered 3mm thick glass**, avoiding inadvertent scratching of the front panel

VAL10**incorporates a system and ignition control MCU** - **high speed, deterministic microcontroller**, taking care about all high speed hardware events, which otherwise could not be kept under control with the means of the main application CPU. Because uninterrupted functionality is crucial to AFC systems, great emphasis is placed on early self-diagnosis and remote monitoring capabilitiesIn case of suspected malfunction (parameters out of range, signaling a possible future problem), the VAL10 generates two levels of alarm, warning and critical.All such events are logged in the local database and in the central control office, respectively.

The following **protections** are provided:

- Reverse polarization of the input supply
- Overvoltage of the input supply
- Overcurrent
- Transient voltage suppression
- ESD protection on all connectors for all signals
- Overheating

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