



EMV Insight

Smart card quality assurance

Executive summary

EMV Insight is a software solution intended for smart cards quality assurance. **EMV Insight** facilitates certification of EMV cards with payment systems, EMV application parameters configuration and EMV cards troubleshooting.

EMV Insight enables to obtain an insight to the EMV transaction processing of a certain card, resolve possible problems and save time during card certification preparation, card issuance and post-issuance.

If the issuer introduces a new EMV card product and has configure its parameters **EMV Insight** helps to check card's behavior during transaction processing under certain EMV application parameters values.

At the stage of EMV card issuance **EMV Insight** enables to verify card data consistency without changing the initial state of the card prior to mailing the card to the cardholder.

If problems with issued cards occur, **EMV Insight** enables to comprehend the reasons for card inoperability and manage smart card parameters (help-desk activities).



Features

EMV Insight emulates the environment of the financial transaction, which includes POS terminal simulator and Issuer host simulator and thus enables to execute financial transactions with cards and carry out EMV application management activities, including PIN change/unblock, Issuer host scripts execution.

EMV Insight enables you to:

- Control and visualize the smart card authorization process in online and offline modes;
- Analyze the results of card initialization and personalization, including the control of:
 - Card capacity for transaction processing;
 - Card data integrity;
 - Card data accuracy in terms of cryptographic issues (by verifying certificates and keys);
 - Card data consistency and non-redundancy;
 - Data format (including tag length control);
 - Accordance of conditional parameters in compliance with *VSDC* and *M/Chip* application templates requirements.
- Control the execution of cryptographic functions of the EMV application;
- Consistency EMV application data, magnetic stripe data and embossing.

Why EMV Insight?

- Verifies conformance to *EMV*, *Visa* и *MasterCard International* specifications;
- Clearly represents the results of chip and magnetic stripe data analysis;
- Recognizes personalization errors and facilitates EMV card troubleshooting;
- Performs consistency checks between magnetic stripe, chip and embossing;
- Enables crypto validation with test or production keys (for test keys all cryptographic operations are transparent due to software implementation; production keys may be securely stored in a Java card);
- Provides statistics on the authorization modes (Online/Offline) and results (Approve/Decline) for a batch of transactions, with indication of the "decision-maker" (card, terminal or issuer host);
- Clear and detailed tracking and reporting as well as provision of integral card test result (pass/fail);
- Vast customization abilities and simplicity of EMV transaction execution. Parameters configuration is not necessary due to configuration templates for the most widespread financial applications (including *VIS 1.3.2*, *VIS 1.4.0*, *M/Chip 2.1* and *M/Chip 4.0*);
- One-click EMV financial transaction.

Card data validation and analysis

Key checks

Tag values control	BER-TLV elementary tags length and templates length is controlled. Depending on the specific tag the length is checked either for strict compliance or falling within a certain range.
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Data format control	EMV Insight controls the conformity of tag values to the allowed set of symbols and data formats (character, numbers, date, time, etc.).
Duplicate tags control	EMV Insight tracks duplicate tags in the card.
Tag sequence verification	EMV Insight verifies the sequence of tags received from card.
Mandatory tags control	EMV Insight tracks the absence of mandatory tags on card.
Unknown or unused tags and templates control	EMV Insight informs the operator about all tags which are not defined in <i>EMV</i> , <i>VIS</i> , <i>M/Chip</i> specifications or are not used in smart card applications.
AIP and card data consistency	EMV Insight controls the presence of all the data required for checks, defined in the AIP (Application Interchange Profile). The system informs the operator about possible failure to get ATC and Online ATC data from card (these data are required for offline authorization risk management).
PIN control	EMV Insight controls cardholder verification procedures and accuracy of PIN verification by the card.
Data authenticity control	EMV Insight executes static and dynamic data authentication of the EMV application, verifying the keys and certificates personalized in the card.
Validity periods control	EMV Insight controls the validity period and activation date of card and certificates.
Card cryptogram control	EMV Insight checks the cryptogram received from the EMV application. Crypto operations may be executed either by software module or a Java card with a specialized crypto applet.

Allowable data values control	<p>EMV Insight controls application data for consistency:</p> <ul style="list-style-type: none"> • falling within the accepted range; • recognition of forbidden values; • conformance of codes with ISO 4217 (currency codes), ISO 3166 (country codes), ISO 639 (language codes), ISO 7813 (magnetic stripe tracks format); • RFU bits values control; • recognition of forbidden bit combinations.
CVM List control	<p>EMV Insight tests the Cardholder Verification Method list of <i>VSDC</i> application for the presence of all the mandatory checks in Visa International payment system.</p>
Geographic restrictions control	<p>If several financial applications are personalized on the card, EMV Insight controls the ability to execute transactions with both local and international transactions.</p>
Application priority control	<p>If several financial applications are personalized on the card, EMV Insight controls application priorities for applications of different types.</p>
Chip, magnetic stripe and embossing consistency control	<p>The software controls data format on the magnetic stripe and consistency of the data to the chip data and emboss data.</p>

Enhanced data analysis

EMV Insight executes the full analysis of all available data elements of the EMV application. In addition, interoperability analysis of several financial applications on a single card is performed (geographic restrictions analysis, application priority analysis).

CVM List is analyzed for all the necessary verifications for all types of POS terminals.

EMV data explorer

Operator has the ability to read EMV application data without modifying **ATC** (Application Transaction Counter) and other internal flags of the card (i.e. **New Card**).

Issuer scripts testing

Operator may generate and initiate execution of Issuer scripts in the card. To control the results of scripts execution operator has a very convenient feature to view tags and records on the card before and after the script execution.

Transaction processing parameters

EMV Insight enables flexible configuration of transaction parameters.

Transaction type, amount and quantity selection	<p>Authorization may be executed for various operation types, such as Sale, Cash back, Money Transfer etc. Operation type and can be selected by chance.</p>
Online initiated by	<p>Operator may force to process the transaction online</p>

operator	
Card in stop list	PAN of the application which is being tested may be placed to the stop list of the terminal. This is used to control card behavior in case its PAN is in the terminal stop list.
EMV applications unblocking	Operator may unblock previously blocked payment applications by putting them to the served applications list.

Payment system emulator parameters

Payment system emulator configurations enable to check card capability in different modes. **EMV Insight** enables to configure parameters of every single transaction as well as of the POS terminal and Issuer host emulators. The level of detail in the EMV application testing protocol may be configured as well. But for quick start with **EMV Insight** the user has only to choose the type of smart card reader and set the symmetric Issuer keys appropriate for the smart card being tested.

POS terminal configuration

EMV Insight allows to modify a number of POS terminal parameters, including:

- Certification Authority public keys;
- cardholder verification methods supported (plaintext or enciphered PIN, signature etc.);
- data authentication methods supported (*SDA*, *DDA*, *CDA*);
- *VLP* authorization modes parameters;
- financial transaction limits;
- *TAC* bit masks, which determine the authorization mode selected by th POS terminal.



Issuer host emulator configuration

EMV Insight enables to configure Issuer host parameters, including:

- symmetric keys;
- Issuer scripts generation parameters.

Support

EMV card quality assurance is a complex process, which implies in-depth understanding of the processes which are engaged in the EMV payment systems environments. In addition, standards which regulate various aspects of EMV payment systems are subject to constant development (one of the examples – EMV specification has evolved from *EMV 96* to *EMV 4.1*). Thus support of the EMV card quality assurance system is of utmost importance.

PRONIT specialists assist the clients in setting up and using the EMV card quality assurance system:

- explain the payment system architecture, the essence and interconnections of the processes which take place in it;
- explain the methodology of using **EMV Insight**;
- provide relevant documentation;
- and of course, install the software and keep it up-to-date with the latest *EMV*, *Visa International* and *MasterCard Worldwide* bulletins and specifications.

Specifications compliance

EMV Insight is implemented in compliance with the following standards and specifications:

ISO

www.iso.org

International standard **ISO/IEC 7816-3, -4**

International standard **ISO/IEC 7813**

International standard **ISO/IEC 4217**.
Currencies codes

International standard **ISO/IEC 3166**.
Countries codes

International standard **ISO/IEC 639-1**.
Languages codes

EMV

www.emvco.com

EMV 96

EMV 2000

EMV bulletins

Visa

www.visa.com



VIS Version 1.3.2

VIS Version 1.4.0

VIS 1.4.0 Corrections. 30 November 2003

Visa Operating Regulations

Smart Product Payment Principles (Visa Europe)

Visa CEMEA Smart Payment Product Principles

The Visa Smart Debit and Visa Smart Credit. VISA CEMEA Personalization Templates. Version 1.5

VSDC Personalization Assistant User Guide (VPA)

MasterCard International

www.mastercard.com

M/Chip Lite 2.1 Card Application Specifications for Debit and Credit

M/Chip 4 Card Application Specifications for Debit and Credit

M/Chip 4 Security And Key Management

M/Chip 4 Common Personalization Specifications

M/Chip Functional Architecture

Additional software

Authorization crypto applet	Java applet for execution of EMV transaction authorization;
CA_DKL	Crypto keys loader to the Java applet;
TLV Decoder	Decoder of data represented in BER-TLV format.