



Multimodal  
Biometric on Card  
Comparison

**MegaMatcher On Card SDK**



# MegaMatcher On Card SDK

## Multimodal Biometric on Card Comparison

Document updated on **December 22, 2021**

### CONTENTS

Technology features and capabilities . . . . .	3
MegaMatcher On Card SDK contents . . . . .	4
Supported fingerprint scanners under Microsoft Windows . . . . .	6
Supported fingerprint scanners under Linux, macOS and Android . . . . .	7
Supported face capture cameras . . . . .	8
Supported iris capture cameras . . . . .	8
Technical specifications . . . . .	9
Reliability & performance tests . . . . .	11
System requirements . . . . .	14
Related products . . . . .	17
Licensing MegaMatcher On Card . . . . .	18
Prices . . . . .	20

MegaMatcher On Card SDK offers matching-on-card technology that stores a person's fingerprint, iris and face templates on a smart card and **performs template matching in a microprocessor embedded in the card**, instead of matching biometric information on a PC processor. This method ensures that personal biometric information does not transfer to an external computer as it would in a more basic template-on-card system. More than **130 million** smart cards and secure elements worldwide already include MegaMatcher On Card.

MegaMatcher On Card SDK is developed utilizing a set of ISO/IEC standards to enable interoperability with and easy integration into existing smart card and/or biometric systems.

- NIST MINEX-compliant fingerprint engine
- PC-like verification accuracy
- Configurable verification modes
- Security and privacy
- Multi-biometrics support
- ISO/IEC standards support
- Easy integration with existing systems
- Different smart card platforms supported



## Technology Features and Capabilities

MegaMatcher On Card 12 is based on MegaMatcher multi-biometric AFIS technology and provides a number of advantages over a standard fingerprint / face / iris identification system or similar products for smart cards, including:

- **NIST MINEX-compliant fingerprint engine.** MegaMatcher On Card algorithm for fingerprint matching on a smart card is compliant with the same NIST MINEX III criteria used to evaluate much more resource-intensive PC-based algorithms.
- **PC-like verification accuracy.** MegaMatcher On Card provides the same level of accuracy of an AFIS (automated fingerprint identification system) in a verification process using ISO/IEC 19794-2 compact card minutiae format templates together with the security of storage of biometric templates and matching algorithm on a smart card. Face and iris modalities on-card verification precision conforms to the large scale multi-biometric MegaMatcher SDK accuracy rates of Neurotechnology's compact format templates matching. See the reliability testing results.
- **Configurable verification modes.** MegaMatcher On Card fingerprint algorithm has different performance configurations that can be chosen according to the operating scenario, the requirements to matching accuracy, the smart card platform speed and memory constraints.
- **Security.** Biometric verification can replace or be combined with less secure (e.g., PIN) authentication techniques to achieve higher security.
- **Privacy.** The original template remains on the smart card, providing a safeguard against misuse of information or fraudulent scanning systems.
- **Multi-biometrics support.** The face and iris matching engines can be used as an additional or alternative factor of authentication that enhances the fingerprint verification. Fingerprint, iris and face templates can be stored on a single card together with the fingerprint, iris and face matching algorithms.
- **ISO/IEC standards support.** MegaMatcher On Card 12 SDK is compliant with the following standards:
  - ISO/IEC 7816-3
  - ISO/IEC 7816-4
  - ISO/IEC 7816-9
  - ISO/IEC 7816-11
  - ISO/IEC 19794-2 (compact size finger minutiae card format)
- **Easy integration with existing systems.** Implementing the system will not require major overhauls of existing infrastructure, as MegaMatcher On Card SDK is developed utilizing a set of ISO/IEC standards to enable interoperability with and easy integration into existing smart card and/or biometric systems. The process of fingerprint, iris and face enrollment during the card issuance, often connected to the avoidance of emission of duplicates, can also be developed with VeriFinger, VeriEye, VeriLook or MegaMatcher components that are fully compatible with MegaMatcher On Card. This provides the advantages of both using the whole set of features of Neurotechnology proprietary templates format to improve the accuracy of duplicates searching and the possibility to ensure the quality of the biometric data stored into the card.
- **Different smartcard platforms supported.** MegaMatcher On Card can be integrated at different stages of the card life cycle for various smart cards platforms. The post-issuance library gives the possibility to rapidly integrate matching on card in projects where time constraints are critical. On the other hand the possibility to store the code directly into the ROM mask and the partnership with several card vendors offer a faster matching on card solution and the possibility to maintain more EEPROM available for post-issuance applications.



## MegaMatcher On Card SDK Contents

Components	Windows (32 & 64 bit)	Linux (32 & 64 bit)	macOS	Android
• Fingerprint Card Extractor	2 single computer licenses			
• Face Card Extractor	1 single computer license			
• Iris Card Extractor	1 single computer license			
• Library for communication with a smart card	+	+	+	
• Device Manager library	+	+	+	+
<b>Programming samples</b>				
• C#	+			
• Visual Basic .NET	+			
• Java	+	+	+	+
<b>Programming tutorials</b>				
• C	+	+	+	
• C++	+	+		
• C#	+			
• Visual Basic .NET	+			
• Java	+	+	+	
• JCDKv2.2.2 apdutool	+			
• NXP JCOP tools JCSHELL	+			
<b>Documentation</b>				
• MegaMatcher On Card SDK documentation			+	

**Smart cards are available on request** for new and existing MegaMatcher On Card SDK customers. The smart cards include preloaded fingerprint, face and iris matching engines, as well as Java Card enrollment and verification applets. The supply of smart cards depends from stock availability and export regulations.

### MegaMatcher On Card fingerprint matching engine

MegaMatcher On Card 12 fingerprint matching engine performs fingerprint template matching in 1-to-1 mode (verification). Being based on the MegaMatcher technology, the engine is tolerant to fingerprint rotations, translations and deformations.

### MegaMatcher On Card face matching engine

MegaMatcher On Card 12 face matching engine performs face template matching in 1-to-1 mode (verification).

### MegaMatcher On Card iris matching engine

MegaMatcher On Card 12 iris matching engine performs iris template matching in 1-to-1 mode (verification).



## **Fingerprint Card Extractor component**

Fingerprint Card Extractor creates ISO/IEC 19794-2 on-card comparison format fingerprint templates from fingerprint images.

## **Face Card Extractor component**

Face Card Extractor creates face templates in proprietary on-card comparison format from face images. The Extractor can generalize a face template from several face images to improve the template's quality.

## **Iris Card Extractor component**

Iris Card Extractor creates iris templates in proprietary on-card comparison format from eye images.

## **Device Manager**

Device Manager software allows to capture data from supported fingerprint readers, iris scanners, cameras and webcams. Integrators can also write plug-ins to support their fingerprint readers, cameras or other devices using the plug-in framework provided with the Device Manager.



## Supported Fingerprint Scanners under Microsoft Windows

	Windows 7		Windows 8		Windows 10	
	32 bit	64 bit	32 bit	64 bit	32 bit	64 bit
• 3M Cogent CSD 330	+	+(1)				
• Abilma UNITY	+	+	+	+		
• ACS AET62 / AET65	+	+	+	+		
• Aratek A400 / A600 / FRO900	+	+	+	+	+	+
• ARH AFS 510	+	+			+	+
• Athena ASEDive IIIe Combo Bio F2	+	+	+	+		
• BioLink U-Match MatchBook v.3.5	+	+	+	+	+	+
• Biometrika Fx2100 / Fx3000 / HiScan / HiScan PRO	+		+		+	+
• Cross Match Guardian 100 / 200 / 300 / Module / USB	+	+	+	+	+	+
• Cross Match L Scan 500P / Patrol / Patrol ID / Verifier 320	+	+	+	+	+	+
• DERMALOG LF10 / F1 / ZF1	+		+	+	+	+
• DigitalPersona U.are.U 4500 / 5100 / 5160 / 5200 / 5300 / EikonTouch 710	+	+	+	+	+	+
• Futronic FS10 / FS26 / FS50 / FS64 / FS80 / FS82 / FS88 / FS88H / FS90 / eFAM	+	+	+	+	+	+
• Green Bit DactylID20 / DactyScan40i / MultiScan527 / DactyScan84c	+	+	+	+		
• HID Lumidigm M / V series sensors	+	+	+	+	+	+
• HFSecurity HF-4000 / HF-7000	+	+	+	+		
• iMD GF601BM / SF202 / SF302GM					+	+(1)
• Integrated Biometrics Columbo / Kojak / Sherlock / Watson / Watson Mini	+	+	+	+	+	+
• Jenetric LIVETOUCH QUATTRO / LIVETOUCH QUATTRO Compact	+	+	+	+	+	+
• Koehlke KIAU-5110B3	+		+	+(1)	+	+(1)
• L-1 DFR 2100 / DFR 2300	+	+(1)			+	+(1)
• Mantra MAPRO-CX / MFS500	+	+	+	+	+	+
• Neubio MARS 02	+	+	+	+		
• NEXT Biometrics NB-3010-U / NB-3023-U2 / NB-65200-U	+	+	+	+	+	+
• NITGEN Fingkey Hamster / Fingkey Hamster II / Fingkey Mouse III	+	+	+	+	+	+
• NITGEN eNBioScan-F / eNBioScan-C1 / eNBioScan-D Plus / NScan-T	+	+	+	+	+	+
• SecuGen Hamster III / Hamster Plus / Hamster IV	+	+	+	+	+	+
• SecuGen Hamster Pro / Pro 20 / Pro Duo CL/SC/PIV / iD-USB SC/PIV	+	+	+	+		
• Startek FC320U / FN220U / FPC360U	+	+(1)	+	+(1)	+	+(1)
• Suprema BioMini / BioMini Plus / BioMini Plus2 / BioMini Slim / BioMini Slim 2	+	+	+	+	+	+
• Suprema RealScan-G10 / RealScan-G1 / RealScan-10 / RealScan-D / RealScan-FC	+	+	+	+	+	+
• TENBIO TOUCH ONE	+	+(1)	+	+(1)	+	+(1)
• Thales Cogent CSD101i					+	+
• TopLink Pacific BLUEFiN	+	+	+	+		
• UPEK Eikon / Eikon Solo / Eikon To Go / EikonTouch 300 / 500 / 700 / TouchChip	+	+	+	+	+	+
• ViRDI FOH02SC	+		+			
• ZKTeco SLK20R / ZK9500	+	+	+	+	+	+
• Zvetco Verifi P5100	+	+	+	+		

(1) Can be used on 64-bit OS, but only in 32-bit applications.



## Supported Fingerprint Scanners under Linux, macOS and Android

	Linux (x86)		macOS	Android
	32-bit	64-bit		
• Abilma UNITY	+	+	+	+
• ACS AET62 / AET65	+	+	+	
• Aratek A400 / A600				+
• Aratek BM5510 / BM7500				+ <sup>(2)</sup>
• Aratek FRO900	+	+		+
• ARH AFS 510	+	+		
• BioLink U-Match MatchBook v.3.5	+			
• Credence ID Credence One / CredenceTWO-R / Trident				+ <sup>(2)</sup>
• DERMALOG LF10 / F1 / ZF1	+			
• DigitalPersona U.are.U 4500 / 5100 / 5160 / 5200 / 5300	+	+		+
• Famoco FX100 Bio				+ <sup>(2)</sup>
• Fujitsu MBF200	+	+	+	
• Futronic FS10 / FS26 / eFAM (FS84)	+	+		+
• Futronic FS50 / FS80 / FS80H / FS82 / FS88 / FS88H	+	+	+	+
• Futronic FS28				+
• Green Bit DactyScanID20 / DactyScan40i / DactyScan84c / MultiScan527	+	+		+
• Identos Tactivo Mini for Android Optical				+
• Integrated Biometrics Curve / LES650	+			
• Integrated Biometrics Columbo / Kojak / Sherlock / Watson / Watson Mini	+	+		+
• Lumidigm M / V series sensors	+			
• Maxis SM-201				+
• NEXT Biometrics NB-3010-U / NB-3023-U2 / NB-65200-U	+	+	+	+
• NITGEN eNBioScan-F	+			
• SecuGen Hamster IV / Hamster Plus / Hamster Pro / Pro 20				+
• SMUFS Biometric SMUFS BT				+
• Startek FPC360U				+
• Suprema BioMini / BioMini Plus / BioMini Slim / BioMini SFU-S20	+	+		+
• Suprema RealScan-D / SFR300-S / SFU300	+	+		
• Suprema RealScan-G10	+			
• TopLink Pacific BLUEFiN	+	+		+
• UPEK Eikon / Eikon Solo / Eikon To Go	+	+	+	+ <sup>(1)</sup>
• UPEK EikonTouch 300 / 500 / 700 / TouchChip TCRU1C / TCRU2C				+ <sup>(1)</sup>
• ZKTeco SLK20R				+
• Zvetco Verifi P5100	+	+		

(1) requires root access to the device.

(2) the device has pre-installed Android OS.



## Supported face capture cameras

These cameras are supported by MegaMatcher On Card SDK:

- Any **webcam** or camera that is accessible using:
  - **DirectShow** or **Windows Media** or **Media Foundation** interfaces for Microsoft Windows platform
  - **GStreamer** interface for Linux or Mac platforms.
- Any built-in **smartphone** or **tablet** camera that is supported by Android OS. The camera should have at least 0.3 MegaPixel (640 x 480 pixels) resolution.
- Cameras, which can operate in **near-infrared** spectrum, can be also used for image capture.
- Any **IP camera** that supports **RTSP** (Real Time Streaming Protocol):
  - Only **RTP over UDP** is supported.
  - **H.264/MPEG-4 AVC** or **Motion JPEG** should be used for encoding the video stream.
- These models of **still cameras** are supported:
  - Canon EOS family still cameras (Microsoft Windows only; the supported camera models are EOS M50, EOS 2000D, EOS 4000D, EOS M100, EOS 6D Mark II, EOS 200D, EOS 77D, EOS 800D, EOS M6, EOS M5, EOS 5D Mark IV, EOS-1D X Mark II, EOS 80D, EOS 1300D, EOS M10, EOS 5DS, EOS 5DS R, EOS 760D, EOS 750D, EOS 7D Mark II)
  - Nikon DSLR still cameras (Microsoft Windows only; a specific camera model should support video capture)
  - Fujifilm X-T2 still camera (Microsoft Windows only)
- These advanced cameras are supported:
  - Akiyama Akys-10 Biometric Camera
  - CMITech EMX-30 - face & iris camera (Microsoft Windows only)
  - Iris ID iCAM R100 and iCAM TD100 – face & iris cameras (Microsoft Windows only)
  - VistaFA2 / VistaFA2E / VistaEY2 face & iris cameras (Microsoft Windows only)

## Supported iris capture cameras

Iris capture cameras	Microsoft Windows 7 / 8 / 10		Linux		Android
	32 bit	64 bit	32 bit	64 bit	
• CMITech BMT-20 / EMX-30	+	+			
• Credence ID Trident					+
• HID Crossmatch I Scan 2 / Crossmatch I Scan 3	+	+			
• Iris ID iCAM R100 / iCAM T10 / iCAM TD100	+	+			
• Iritech IriShield USB MK 2120U / IriShield-USB BK 2121U	+	+	+	+	+
• Iritech IriMagic1000BK	+	+			
• Mantra MIS100V2					+
• VistaFA2 / VistaFA2E / VistaEY2 / VistaEY2-02 / VistaEY2R	+	+			
• VistaEY2H	+	+			





## Technical Specifications

MegaMatcher On Card 12 can be configured according to different requirements and smart card constraints, at both pure Java Card level and native code. The summary of average memory requirements is available below. The MegaMatcher On Card 12 template matching engines performance was tested for smart cards from several vendors; see the testing results for more information on matching speed for a particular card.

- Fingerprint engine specific:
  - **500 ppi** is the recommended fingerprint image resolution.
  - Fingerprint scanners with scan area of up to 1.55" x 1.45" (39 x 37 mm; FAP10, FAP20, FAP30 scanners) are recommended.
- Face engine specific:
  - **32 pixels** is the **minimal distance between eyes** for a face on image or video stream to perform face template extraction reliably. **64 pixels or more recommended** for better template extraction results. Note that this distance should be native, not achieved by resizing an image.
  - MegaMatcher On Card face extraction engine has certain tolerance to face posture that assures face detection:
    - head **roll** (tilt) –  $\pm 30$  degrees from frontal position.
    - head **pitch** (nod) –  $\pm 30$  degrees from frontal position.
    - head **yaw** (bobble) –  $\pm 30$  degrees from frontal position.
- Iris engine specific:
  - **640 x 480 pixels** is the minimum image size for iris capture with **64 pixels** minimal radius of circle containing full iris texture.
  - **$\pm 15$  degrees** is the default verified iris rotation tolerance; this value can be extended on demand.
  - **Near-infrared** spectral region is recommended for iris image capture.

*Continued on the next page*



Below are provided the memory requirements for the native level integration and Java Card post-issuance libraries. Note that the Java Card post-issuance libraries utilize Java level static RAM for internal matching engine routines, whereas the native level integrations temporarily utilize RAM available at the native level while the internal routines run, thus consuming no static Java level RAM.

MegaMatcher On Card 12 memory requirements for native level integration (maximized accuracy configuration)			
	Code size (kilobytes)	Required RAM (bytes)	Template size (bytes)
Fingerprint verification engine	6.1 - 11.0	960 - 2,200 <sup>(1)</sup>	660 - 2,100 <sup>(1)</sup>
Face verification engine	Not implemented		
Iris verification engine			
Multi-modal verification engines			

<sup>(1)</sup> Depends on the configurable maximal number of minutiae.

MegaMatcher On Card 12 memory requirements for Java Card post-issuance libraries (maximized speed configuration)			
	Code size (kilobytes)	Required RAM (bytes)	Template size (bytes) <sup>(4)</sup>
Fingerprint verification engine	less than 13.7	less than 600 <sup>(1)</sup>	less than 1024 <sup>(1)</sup>
Face verification engine	less than 7.0	less than 120	less than 1800 <sup>(2)</sup>
Iris verification engine	less than 8.9	less than 650 <sup>(3)</sup>	less than 1150 <sup>(3)</sup>
Bi-modal fingerprint + face verification engine	less than 14.2	less than 600 <sup>(1) (2)</sup>	see specific modalities above
Bi-modal fingerprint + iris verification engine	less than 20.7	less than 750 <sup>(1) (3)</sup>	
Bi-modal face + iris verification engine	less than 13.1	less than 650 <sup>(2) (3)</sup>	
Tri-modal verification engine	less than 24.9	less than 750 <sup>(1) (2) (3)</sup>	

<sup>(1)</sup> Depends on the configurable maximal number of minutiae.

<sup>(2)</sup> Using faces card template format.

<sup>(3)</sup> Using irises compact card template format.

<sup>(4)</sup> Specifies actual non-volatile memory consumption per appropriate biometric modality enrolled template including both public and private data of the card holder.



## Reliability & Performance Tests

The MegaMatcher On Card 12 template verification algorithm is a version of MegaMatcher algorithm adapted to the limited computational resources of smart cards. These tests were performed:

- Matching reliability tests with internal biometric dataset;
- Matching speed tests with smart card models from several vendors.

### Matching reliability tests with internal biometric dataset

The tests with MegaMatcher On Card biometric fingerprint, face and iris matching engines and fused template matching algorithm were performed using a multi-biometric dataset:

- The dataset had 7,500 sets of biometric records; each set contained 1 face, 2 irises and 10 fingerprints representing a unique person.
- 1,500 unique persons were represented in the dataset.
- 5 capture sessions were performed for each person.

The tests were performed with these biometric template types:

- **1 fingerprint record** – taken from left index fingerprint.
- **1 face record.**
- **1 iris record** – taken from left eye image.
- **2 fingerprint records** taken from same person's left and right index fingerprints.
- **2 iris records** taken from same person's different eyes.
- **1 fingerprint + 1 face records** left index fingerprint and face taken from the same person.
- **1 face + 1 iris records** left iris and face taken from the same person.
- **1 fingerprint + 1 iris records** left index fingerprint and left iris taken from the same person.
- **1 fingerprint + 1 face + 1 iris records** left index fingerprint, left iris and face taken from the same person.

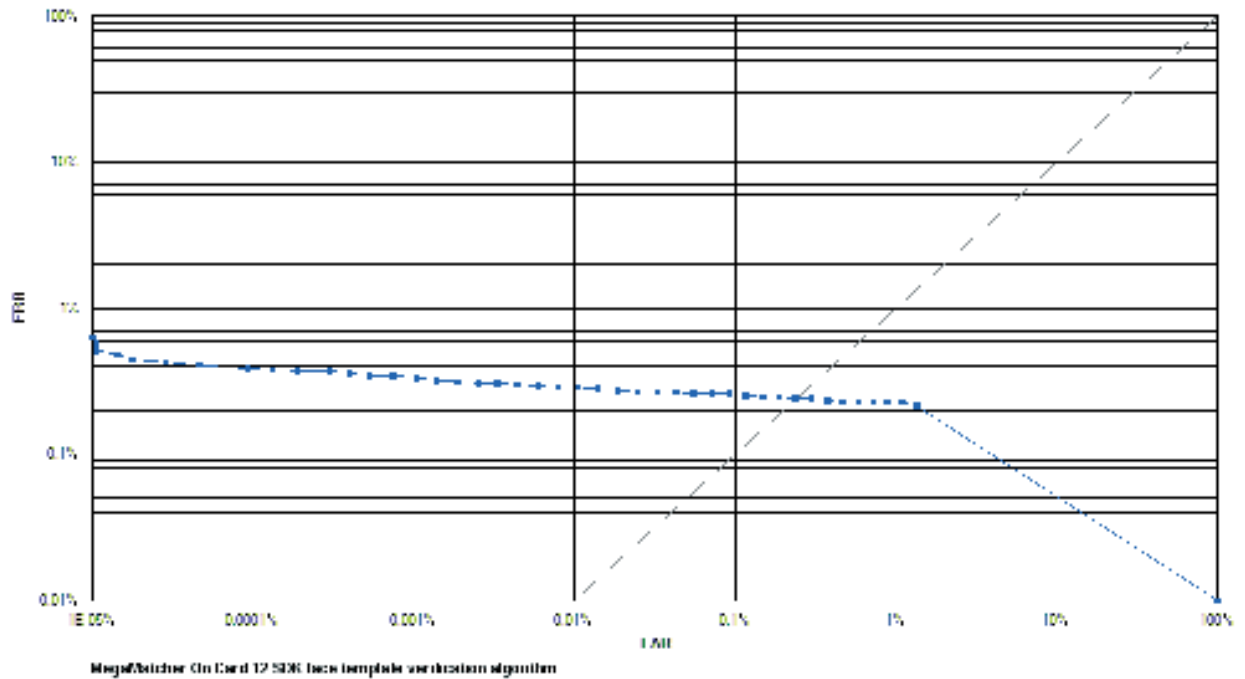
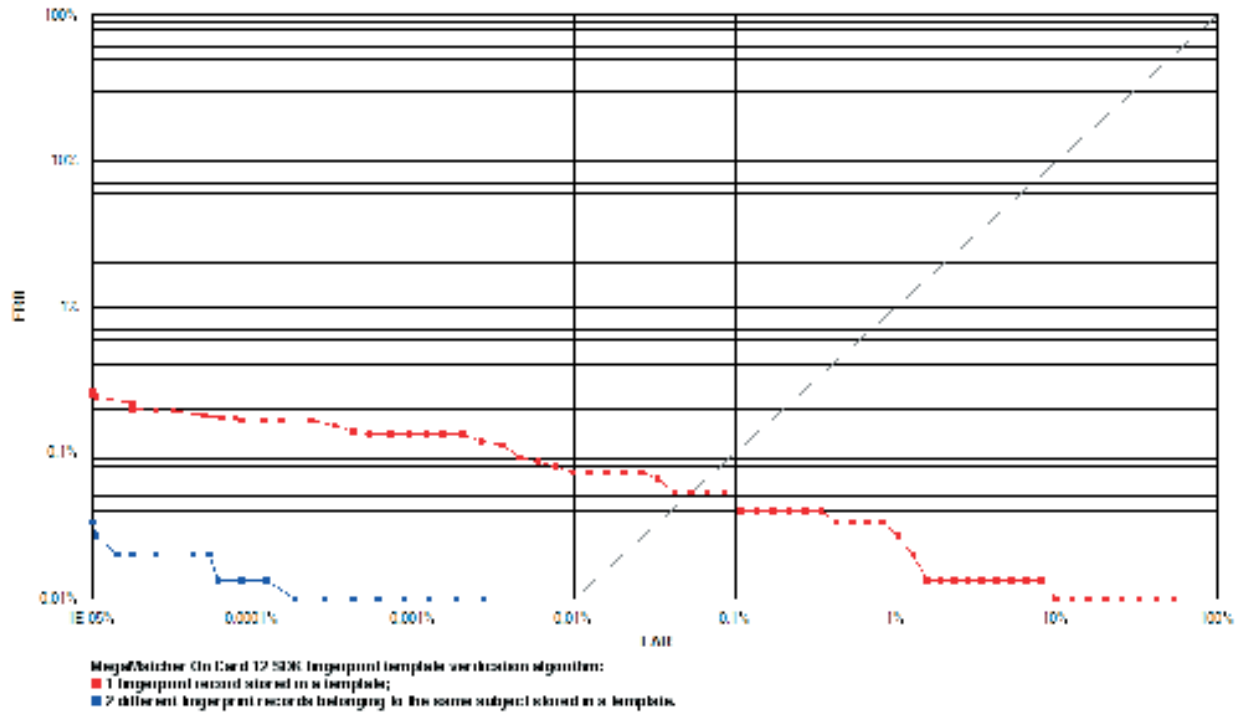
The fingerprint template extraction and matching was performed with these settings:

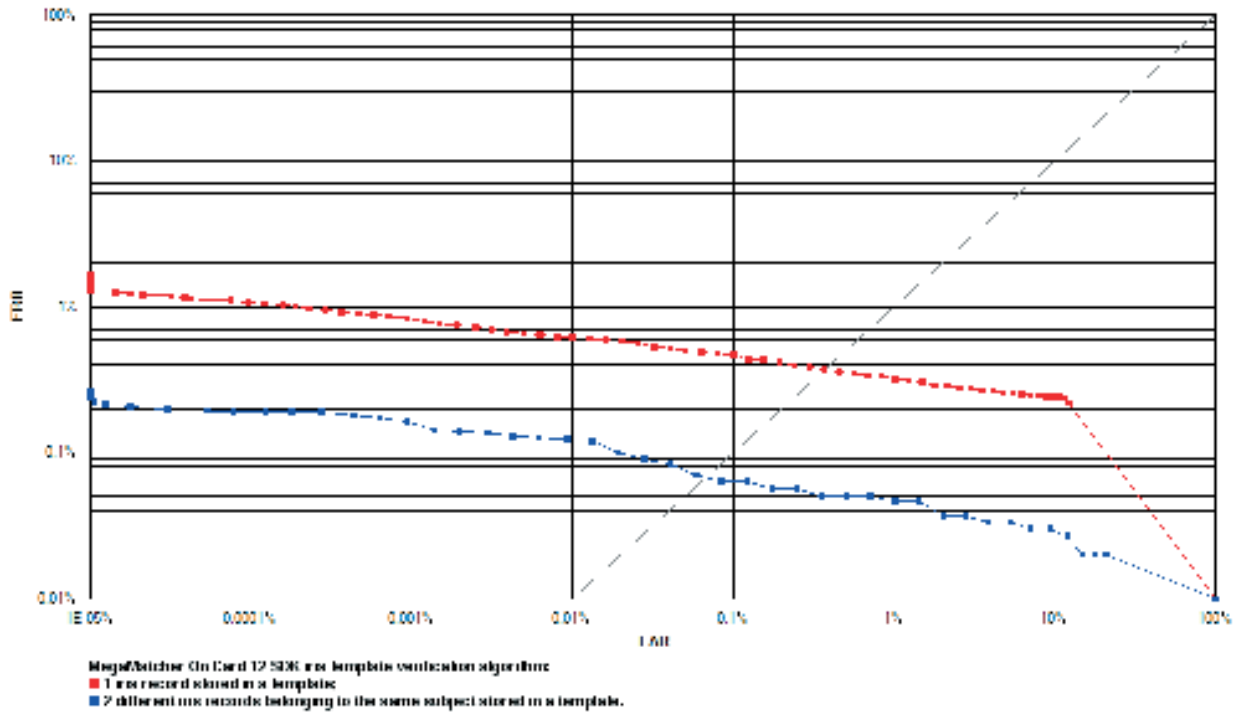
- the number of minutiae was **truncated to 48** in both probe and gallery compact templates prior to matching;
- **±180 degrees (unlimited) fingerprint rotation tolerance** value was used for template matching.

Receiver operation characteristic (**ROC**) curves are usually used to demonstrate the recognition quality of an algorithm. ROC curves show the dependence of false rejection rate (**FRR**) on the false acceptance rate (**FAR**).

The tests with multi-biometric template types resulted with **0 % FRR** for all FAR values, thus their charts are not shown:

The charts with ROC curves are on the next pages.





MegaMatcher On Card 12 template matching engines reliability testing results

A template contains these biometric records	FRR at 0.001 % FAR	FRR at 0.0001 % FAR
1 fingerprint	0.17 %	0.13 %
1 face	0.39 %	0.35 %
1 iris	1.07 %	0.83 %
2 fingerprints	0.01 %	0.01 %
2 irises	0.19 %	0.16 %
1 fingerprint + 1 face	0.00 %	0.00 %
1 fingerprint + 1 iris	0.00 %	0.00 %
1 face + 1 iris	0.00 %	0.00 %
1 fingerprint + 1 face + 1 iris	0.00 %	0.00 %



## Matching speed tests

MegaMatcher On Card 12 fingerprint, face and iris matching algorithms were tested on smart cards from several vendors. The matching speeds are available below. Please contact us to get more information about the expectations on a specific platform on which you intend to use it.

MegaMatcher On Card 12 genuine template verification time averages (seconds) <sup>(1)</sup>			
	Fingerprints <sup>(2)</sup>	Faces <sup>(3)</sup>	Irises <sup>(3)</sup>
<b>Java Card OS</b> (post-issuance application, maximized speed configuration)	≥ 0.693	≥ 0.122	≥ 0.561
<b>Java Card OS</b> (native level, maximized accuracy configuration)	0.094 - 1.117	-	-
<b>Pure native OS</b> (native level, maximized accuracy configuration)	0.621 - 1.011	-	-

- (1) The performance on a specific smart card depends on the hardware chip platform, OS, also on-card matching algorithm integration level and the memory space it is being executed from. The verification times are provided as **ranges**, with the lowest values corresponding to the **averages** of the tests on appropriate OS smart cards with the fastest performance, and the highest values – with the slowest performance.
- (2) Performance depends on the maximal number of minutiae features within enrolled and verified fingerprint templates. Results correspond to matching test of an enrolled and verified templates each containing 48 minutiae. Contact SCR335v1 USB smart card reader was used for PC/SC communication.
- (3) Performance depends on the baud rate of contact or contactless protocol and APDU type chosen. Results correspond to matching face and iris compact card format templates using short length field APDUs. Timings are available for contact interface tests using SCR335v1 smart card reader.



## System requirements

### System requirements for installation and usage of components on JavaCard

- Java Card 2.2.1 / 2.2.2 (or newer), Global Platform 2.1.1 (or newer) compatible smart card
- See the technical specifications section for the required amount of free persistent EEPROM and RAM

### System requirements for PC-side components installation and usage

- PC or Mac with **x86-64 (64bit)** compatible processors.
  - **AVX2 support is highly recommended.** Most modern processors support this instruction set, but please check if a particular processor model supports it.
  - x86 (32-bit) processors can still be used, but template extraction algorithms will provide lower performance.
- At least **512 MB of free RAM** should be available for the application.
- **Smart card reader.** An ISO/IEC 7816 compliant smart card reader is required.
- **Fingerprint scanner.** See pages 6 and 7.
- **Camera or webcam (optional)** for face image capture. See page 8.
- **Iris camera (optional)** for iris image capture. See page 8.
- **Microsoft Windows specific requirements:**
  - Microsoft Windows 7 / 8 / 10.
    - Note that some fingerprint scanners will work only from 32-bit applications.
  - Microsoft .NET framework 4.5 or newer (for .NET components usage).
  - Microsoft DirectX 9.0 or later (for face capture using camera/webcam).
  - Microsoft Visual Studio 2012 or newer (for application development under C/C++, C#, VB .NET)
  - Java SE JDK 8 or newer (for application development with Java)
- **Linux specific requirements:**
  - Linux 3.10 or newer kernel is required. Note that some fingerprint or iris scanners have only 32-bit support modules and will work only from 32-bit applications.
  - glibc 2.17 or newer
  - GStreamer 1.10.x or newer with gst-plugin-base and gst-plugin-good (for face capture using camera/webcam or rtsp video)
  - libgudev-1.0 219 or newer (for camera usage)
  - gcc 4.8 or newer (for application development)
  - GNU Make 3.81 or newer (for application development)
  - Java SE JDK 8 or newer (for application development with Java)
  - PCSC-Lite 1.4.4 or newer
  - ccid-1.3.0 or newer
- **macOS specific requirements:**
  - macOS (version 10.12.6 or newer)
  - XCode 4.6 or newer (for application development)
  - GStreamer 1.10.x or newer with plugins (for RTSP support)
  - GNU Make 3.81 or newer (to build samples and tutorials development)
  - Java SE JDK 8 or newer (for application development with Java)



## System requirements for Android components installation and usage

- A smartphone or tablet that is running Android 5.0 (API level 21) OS or newer.
  - If you have a custom Android-based device or development board, contact us to find out if it is supported.
- ARM-based 1.5 GHz processor recommended for fast creation of fingerprint, face or iris compact template. Slower processors may be also used, but the processing of fingerprints, faces and irises will take longer time.
- At least **256 MB of free RAM** should be available for the application.
- Optionally, depending on biometric modalities and requirements:
  - A fingerprint reader. MegaMatcher On Card is able to work with several supported fingerprint readers under Android OS. Integrators may also use image files or receive image data from external devices like flatbed scanners or other stand-alone cameras.
  - A camera for face capture. MegaMatcher On Card is able to work with all cameras that are supported by Android OS. At least 0.3 MegaPixel (640 x 480 pixels) camera is required for the MegaMatcher On Card template extraction algorithm. Integrators may also use image files or receive image data from external devices like flatbed scanners or stand-alone cameras.
  - An iris scanner. A project may require to capture iris images using some hand-held devices:
    - Iritech IriShield single iris camera is supported by the MegaMatcher On Card SDK under Android OS.
    - MegaMatcher On Card technology also accepts irises for further processing as BMP, JPG or PNG images, thus almost any third-party iris capturing hardware can be used with the MegaMatcher On Card technology if it generates image in the mentioned formats.
    - Integrators may implement the iris scanner support by themselves or use the software provided by the scanners manufacturers. The integrators should note, that the most accurate iris recognition is achievable only when iris images are captured with near-infrared cameras and appropriate illumination. However, it is still possible to recognize irises with reasonable accuracy, when the irises are captured with cameras, which are built in smartphones or tablets, using proper illumination and focus, and choosing proper environment.
- PC-side development environment requirements:
  - Java SE JDK 8 (or higher)
  - AndroidStudio 4.0 IDE
  - AndroidSDK 21+ API level
  - Gradle 6.1.1 build automation system or newer
  - Android Gradle Plugin 4.0.0
  - Internet connection for activating MegaMatcher On Card component licenses





## Related Products

These Neurotechnology products are compatible with MegaMatcher On Card SDK. See the corresponding products brochures for more information.

- **Face Verification system** – designed for integration of secure facial authentication into enterprise and consumer applications for mobile devices and PCs. The system provides enrolling, verification, liveness check, quality check, as well as export the biometric data verified on device for further authentication on smart cards
- **FingerCell SDK** – for integrating fingerprint recognition into embedded platforms, like low-power, low-memory microcontrollers. It may be combined with MegaMatcher On Card and fingerprint scanner enabled smart cards to implement biometric System On Card.
- **MegaMatcher Automated Biometric Identification System (ABIS)** – an turnkey multi-biometric solution for national-scale identification projects.
- **MegaMatcher SDK** – for development of AFIS/ABIS or multi-biometric fingerprint, palmprint, face, iris and voice identification products.
- **VeriFinger SDK** – for development of PC-based or network-based fingerprint identification systems.
- **VeriLook SDK** – for development of PC-based or network-based face identification systems.
- **VeriEye SDK** – for development of PC-based or network-based face identification systems.



## Licensing MegaMatcher On Card SDK

### Product Development

An integrator should obtain a MegaMatcher On Card 12 SDK (EUR 439) to develop an end-user product based on MegaMatcher On Card technology. The SDK needs to be purchased just once and may be used for all projects and by all the developers within the integrator's company.

See the "MegaMatcher On Card SDK contents" chapter (page 4) for the list of component licenses included with MegaMatcher On Card 12 SDK.

Integrators can obtain additional PC-side component licenses if more component licenses are required for the development process. **Smart cards** with installed fingerprint and/or iris and/or face matching component for the product development may be obtained according to stock, availability of suppliers and export regulations.

### Product Deployment

To deploy their developed products, an integrator needs to obtain the additional smart cards with fingerprint, iris and/or face matching engines and the licenses of components for **every computer or device**, where component will be installed together with integrator's product. Integrators can purchase additional MegaMatcher On Card extractor component licenses if required at anytime.

Additional cards with installed fingerprint and/or iris and/or face matching component for the product deployment can be obtained at any time, according to stock and availability of suppliers.

### License activation options

The components are copy-protected. The following license activation options are available:

- **Serial numbers** are used to activate licenses for particular MegaMatcher On Card components on particular computer or device. The activation is done via the Internet or by email. After activation the network connection is not required for single computer license usage.  
Note: activation by serial number is **not suitable for virtual environments**.
- **Internet activation.** A special **license file** is stored on a computer or a mobile or embedded device; the license file allows to run particular MegaMatcher On Card components on that computer or device after **checking** the license over the Internet. **Internet connection** should be available periodically for a short amount of time. A single computer license can be **transferred** to another computer or device by moving the license file there and waiting until the previous activation expires.
- **Volume License Manager.** Licenses may be stored in a volume license manager **dongle**. License activation using volume license manager may be performed without connection to the Internet and is suitable for virtual environments. Volume license manager is **used on site by integrators or end users** to manage licenses for MegaMatcher On Card components in the following ways:
  1. **Activating single computer licenses** – An installation license for a MegaMatcher On Card component will be activated for use on a particular computer. The number of available licenses in the license manager will be decreased by the number of activated licenses.
  2. **Managing single computer licenses via a LAN or the Internet** – The license manager allows the management of installation licenses for MegaMatcher On Card components across multiple computers or mobile/embedded devices in a LAN or over the Internet. The number of managed licenses is limited by the number of licenses in the license manager. No license activation is required and the license quantity is not decreased. Once issued, the license is assigned to a specific computer or device on the network.
  3. **Using license manager as a dongle** – A volume license manager containing at least one license for a MegaMatcher On Card component may be used as a dongle, allowing the component to run on the particular computer where the dongle is attached.



## Licenses Validity

All SDK and component licenses are perpetual and do not have expiration. There are no annual fee or any other fees except license purchasing fee. It is possible to move licenses from one computer or device to another. Neurotechnology provides a way to renew the license if the computer undergoes changes due to technical maintenance.

## Licensing Agreement

The Licensing Agreement (<https://www.neurotechnology.com/megamatcher-on-card-sdk-sla.html>) contains all licensing terms and conditions.

Note that you unambiguously accept this agreement by placing an order using Neurotechnology online ordering service or by email or other means of communications. Please read the agreement before making an order.



## Prices for MegaMatcher On Card SDK

- The prices are **effective November 29, 2021**. The prices may change in the future, so please **download and review the latest version** of the brochure before making an order.
- Quantity discounts do not accumulate over time.
- Prices do not include local import duties or taxes.
- Product shipping costs depend on delivery country
- Customers with Solution Partner status are eligible for product discounts.

MegaMatcher On Card SDK			
MegaMatcher On Card 12 SDK	€ 439.00		
Additional smart cards with fingerprint, iris and/or face matching engines	contact us		
MegaMatcher On Card Extractor components (price per single computer license)			
Quantity	Fingerprint Card Extractor	Face Card Extractor	Iris Card Extractor
1 - 9	€ 12.00	€ 12.00	€ 18.00
10 - 19	€ 9.00	€ 9.00	€ 13.20
20 - 49	€ 7.80	€ 7.80	€ 11.40
50 - 99	€ 6.60	€ 6.60	€ 10.20
100 - 199	€ 6.00	€ 6.00	€ 9.00
200 - 499	€ 5.40	€ 5.40	€ 7.80
500 - 999	€ 4.80	€ 4.80	€ 7.20
1,000 - 1,999	€ 4.20	€ 4.20	€ 6.60
2,000 - 3,999	€ 3.84	€ 3.84	€ 6.00
4,000 - 7,999	€ 3.48	€ 3.48	€ 5.40
8,000 and more	contact us		
License management			
Volume license manager	€ 16.00		

MegaMatcher On Card SDK and related products can be ordered:

- online, at [www.neurotechnology.com/cgi-bin/order.cgi](http://www.neurotechnology.com/cgi-bin/order.cgi)
- via a local Neurotechnology distributor; the list of distributors is available at [www.neurotechnology.com/distributors.html](http://www.neurotechnology.com/distributors.html)