TEST REPORT

Test report

On Behalf of

TimeTec Computing Sdn. Bhd.

For

OFIS Y Fingerprint scanner

Model No.: OFIS Y

Prepared for :	**TimeTec Computing Sdn. Bhd.** **No 6, 8 & 10, Jalan BK 3/2, Bandar Kinrara, 47180 Puchong, Selangor, Malaysia**
Prepared By :	**WST Certification & Testing (HK) Limited** **12/F., San Toi Building,137-139 Connaught Road Central,Hong Kong**
Date of Test:	**Mar. 23, 2015 to Apr. 03, 2015**
Date of Report:	**Apr. 07, 2015**
Report Number:	**WST1503101E**

TEST REPORT
ANSI INCITS 378
For Information Technology – Finger Minutiae Format for Data Interchange

Report Number. ..... :	WST1503101E
Tested by (+ signature) ..... :	Alan Zhou
Approved by (+ signature) ..... :	Michael Ling
Date of issue..... :	Apr. 07, 2015
Testing laboratory ..... :	WST Certification & Testing (HK) Limited
Address ..... :	12/F., San Toi Building, 137-139 Connaught Road Central, Hong Kong
Testing location ..... :	As above
Applicant's name..... :	TimeTec Computing Sdn. Bhd.
Address ..... :	No 6, 8 & 10, Jalan BK 3/2, Bandar Kinrara, 47180 Puchong, Selangor, Malaysia
Test specification:	
Standard..... :	ANSI INCITS 378:2009 +Amd 1:2010
Test procedure ..... :	--
Non-standard test method..... :	N/A
Test Report Form No..... :	**ANSI INCITS 378_A**
Test Report Form(s) Originator ..... :	WST testing
Master TRF ..... :	Dated 2015-02

This test report is specially limited to the above client company and product model only. It may not be duplicated without prior written consent of WST Test.

Test item description ..... :	OFIS Y Fingerprint scanner
Trade Mark ..... :	FingerTec
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	OFIS Y
Ratings ..... :	Input: DC 5V, 500mA

Summary of testing:	
Tests performed (name of test and test clause): -- ANSI INCITS 378:2009 +Amd 1:2010. The submitted samples were found to comply with the requirements of above specification.	Testing location: 12/F., San Toi Building, 137-139 Connaught Road Central, Hong Kong
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A (or N)
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	Mar. 23, 2015
Date(s) of performance of tests ..... :	Mar. 23, 2015 to Apr. 03, 2015
General remarks:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	

hAbbreviations used in the report:

- normal conditions	N.C.	- single fault conditions	S.F.C
- functional insulation	OP	- basic insulation	BI
- double insulation	DI	- supplementary insulation	SI
- between parts of opposite polarity	BOP	- reinforced insulation	RI

Indicate used abbreviations (if any)

ANSI INCITS 378			
Clause	Requirement + Test	Result - Remark	Verdict
6	**Minutiae Extraction**		P
6.1	**General**		P
	This clause defines the placement of minutiae on the fingerprint.		P
	Compatible minutiae extraction is required for interoperability between different finger matchers for the purposes of matching an individual against a previously collected and stored finger record.		P
6.2	**Principle**		P
	Establishment of a common feature-based representation must rest on agreement on the fundamental notion for representing a fingerprint.		P
	A significant number of technology providers follow a traditional approach of encoding a fingerprint through location of “minutiae”.		N
	Fingerprint images may be represented with “dark ridges” or (less commonly) “light ridges”.		P
	The minutiae shall be located in such a way that their locations and their directions do not change when the light and dark polarity of the image is inverted.		P
	Fingerprints may be captured or acquired using different technologies ranging from ink rolled and scanned to capacitive silicon to ultrasonic to the more traditional optical.		P
	Image sizes may vary substantially.		N
6.3	**Minutia Type**		P
	Each minutia has a “type” associated with it. There are two major types of minutiae: a “ridge ending” and a “ridge bifurcation” or split point.		P
	There are other types of “points of interest” in the friction ridges that occur much less frequently and are more difficult to define precisely.		P
	Implementers are strongly encouraged to use "ridge ending" and "ridge bifurcation" whenever possible.		P
6.4	**Minutia Location**		P
6.4.1	**Coordinate System**		P
	The coordinate system used to express the minutiae of a fingerprint shall be a Cartesian coordinate system.		P
	Points shall be represented by their X and Y coordinates.		N
	The origin of the coordinate system shall be the upper left corner of the original image with X increasing to the right and Y increasing downward.		P
6.4.2	**Minutia Placement on a ridge ending**		P

ANSI INCITS 378			
Clause	Requirement + Test	Result - Remark	Verdict
	The minutia for a ridge ending shall be defined as the point of forking of the medial skeleton of the valley area immediately in front of the ridge ending		P
	A ridge ending shall be encoded only if all of the legs used to calculate the minutiae angle (as defined in 6.5.2 – Angle of a ridge ending) are ≥ 0.51 mm (0.02 in.) in length.		P
6.4.3	**Minutia Placement on a ridge bifurcation**		P
	The minutia for a ridge bifurcation shall be defined as the point at which a ridge splits into two ridges.		P
	The ridge bifurcation is located at the center of the intersection of three ridges. If a thinned image is considered, it is the location of the pixel with three neighbors.		P
	A ridge bifurcation shall be encoded only if all of the legs used to calculate the minutiae angle (as defined in 6.5.3 – Angle of a ridge bifurcation) are ≥ 0.51 mm (0.02 in.) in length.		P
6.4.4	**Minutia Placement on Other Minutia Types**		N
	This standard does not allow any vendor-defined minutiae types.		N
	Ridge endings and ridge bifurcations are the only allowed minutiae types.		N
6.5	**Minutia Direction**		P
6.5.1	**Angle Conventions**		P
	Angles are expressed in standard mathematical format.		P
	A minutia centered on the transposed origin of the coordinate system, extending to the right and positioned on a line parallel to the horizontal axis of the coordinate system shall have a value of zero degrees.		N
	Minutia angles increase in the counterclockwise direction from the horizontal line.		P
6.5.2	**Angle of a ridge ending**		P
	Determination of the minutia direction can be extracted from each skeleton ridge ending.		P
	The three legs of every skeleton ridge ending must be examined and followed for 1.63 mm (0.064 in);		P
	In these figures, the shaded regions represent fingerprint ridges, the free-hand curved lines represent the valley skeleton, and the straight lines represent the legs and horizontal axis.		N
6.5.2.1	**Case 1 – Ridge ending with all valley skeleton leg lengths ⩾1.63 mm**		N

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Clause	Requirement + Test	Result - Remark	Verdict
	Figure 4 illustrates the case where the lengths of three legs, RB_1, RB_2, and RB_3, ≥1.63 mm (0.064 in).		N
	Angle of R = (Angle B_1RH + Angle B_2RH) / 2, where the line RH parallels the horizontal axis.		N
	If the line RH is between the two legs RB_1 and RB_2, the angle of the ridge ending, R, is defined as:		N
	Angle of R = ((Angle B_1RH + Angle B_2RH) / 2) - 180º, where angles outside the range of 0º–359º shall be normalized to fall within this range.		N
6.5.2.2	**Case 2 – Ridge ending with one valley skeleton leg length <1.63 mm but ⩾0.51 mm**		N
	Figure 5 illustrates a case similar to (1), but the length of one of the legs of the paralleled valley ridge ending, RB_2, is <1.63 mm (0.064 in), but ≥ 0.51 (0.02 in). The angle of the ridge ending, R, is defined as:		N
	Angle of R = (Angle B_1RH + Angle B_2RH) / 2, where the line RH parallels the horizontal axis.		N
	If the line RH is between the two legs RB_1 and RB_2, the angle of the ridge ending, R, is defined as:		N
	Angle of R = ((Angle B_1RH + Angle B_2RH) / 2) - 180º, where angles outside the range of 0º–359º shall be normalized to fall within this range.		N
6.5.2.3	**Case 3 – Two ridge endings in close proximity**		P
	Figure 6 illustrates a case similar to (1), but with the lengths of two legs, $R_1B_1$and R_1B_2, of the paralleled valley ridge ending ≥1.63 mm (0.064 in)		P
	Angle of R_1 = (Angle B_1R_1H + Angle B_2R_1H) / 2, where the line R_1H parallels the horizontal axis.		P
	If the line R_1H is between the two legs R_1B_1 and R_1B_2, the angle of the ridge ending, R_1, is defined as:		P
	Angle of R_1 = ((Angle B_1R_1H + Angle B_2R_1H) / 2) - 180º, where angles outside the range of 0º–359º		P
6.5.2.4	**Case 4 – Short ridge with two endings Ridge with length <1.63 mm but ⩾0.51 mm**		N
	Figure 7 illustrates the case where two paralleled valleys meet together at a valley ridge ending and the length of both legs are <1.63 mm (0.064”)		N
	Angle of R_1 = Angle R_2R_1H, where the line R_1H parallels the horizontal axis.		N
	If the line R_1H intersects R_2, the angle of the ridge ending R_1 is 0º and the angle of the ridge ending R_2 is 180º.		N
6.5.2.5	**Ridge ending examples**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Figure 8 illustrates Case 1 above, where point R is a valley ridge ending while points B_1, B_2, and B_3 represent the end points that lie on thinned valley skeleton lines		P
	Figure 9 illustrates Case 2 above, where point R is a ridge ending while points B_1, B_2, and B_3 represent the nearest valley end points.		P
6.5.3	**Angle of a ridge bifurcation**		P
	Determination of the minutia direction can be extracted from each skeleton ridge bifurcation.		P
	The three legs of every skeleton ridge bifurcation must be examined and followed for 1.63 mm (0.064 in); special cases are outlined below.		P
	The smallest of the three angles formed by the rays is bisected to indicate the minutiae direction.		P
6.5.3.1	**Case 1 – All legs of ridge bifurcation with length ⩾1.63 mm**		N
	Figure 10 illustrates the case where the lengths of three legs, BR_1, BR_2, and BR_3 ≥1.63 mm (0.064 in). The angle of the ridge bifurcation, B, is defined as:		N
	Angle of B = (Angle R_1BH + Angle R_2BH) / 2, where the line BH parallels the horizontal axis.		N
	If the line BH is between the two legs BR_1 and BR_2, the angle of the ridge ending, B, is defined as:		N
	Angle of B = ((Angle R_1BH + Angle R_2BH) / 2) - 180º, where angles outside the range of 0º–359º shall be normalized to fall within this range.		N
6.5.3.2	**Case 2 – One leg of the ridge bifurcation with length <1.63 mm but ⩾0.51 mm**		N
	Figure 11 illustrates a case similar to (1), but the length of one of the legs of the paralleled ridge bifurcation, BR_2, is <1.63 mm (0.064 in), but ≥0.51 mm (0.02 in). The angle of the ridge ending, B, is defined as:		—
	Angle of B = (Angle R_1BH + Angle R_2BH) / 2, where the line BH parallels the horizontal axis.		N
	If the line BH is between the two legs BR_1 and BR_2, the angle of the ridge ending, B, is defined as:		P
	Angle of B = ((Angle R_1BH + Angle R_2BH) / 2) - 180º, where angles outside the range of 0º–359º shall be normalized to fall within this range.		N
6.5.3.3	**Case 3 – Two ridge bifurcations in close proximity**		P
	Figure 12 illustrates a case similar to (1), but with the lengths of two legs, $B_1R_1$and B_1R_2, of the paralleled valley ridge ending ≥1.63 mm (0.064 in)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Angle of B_1 = (Angle R_1B_1H + Angle R_2B_1H) / 2, where the line B_1H parallels with the picture horizontal axis.		P
	If the line B_1H is between the two legs BR_1 and BR_2, the angle of the ridge ending, B, is defined as:		P
	Angle of B_1 = ((Angle R_1B_1H + Angle R_2B_1H) / 2) - 180º, where angles outside the range of 0º–359º shall be normalized to fall within this range.		P
6.5.3.4	**Case 4 – Short ridge separating two ridge bifurcations**		N
	Figure 13 illustrates the case where two paralleled ridges meet together at a ridge bifurcation		N
	Angle of B_1 = Angle B_2B_1H, where the line B_1H parallels with the picture horizontal axis.		N
6.5.3.5	**Ridge bifurcation examples**		P
	Figure 14 illustrates Case 1 above, where point B is a ridge bifurcation while points R_1, R_2, and R_3 represent the end points that lie on thinned ridge skeleton lines,		P
	Figure 15 illustrates Case 2 above, where point B is a ridge bifurcation while R_1, R_2, and R_3 represent the nearest ridge end points.		P
7	**Finger Minutiae Record Format**		P
7.1	**Introduction**		P
	The minutiae record format shall be used to achieve interoperability between finger matchers providing a one-toone verification or one-to-many identification.		P
	The minutiae data shall be represented in a common format, containing both basic and extended data.		P
7.2	**Byte Order**		P
	All multibyte quantities are represented in Big-Endian format; that is, the more significant bytes of any multibyte quantity are stored at lower addresses in memory than (and are transmitted before) less significant bytes.		P
	All numeric values are fixed-length integer quantities, and are unsigned quantities.		P
7.3	**Finger Minutiae Record Organization**		P
	The organization of the record is as follows:		P
	-- A 21-byte record header containing information about the overall record,		P
	-- A single finger view, consisting of:		P
	--- A fixed-length (17-byte) header containing information about the data for a single view of a single finger, including the number of minutiae;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	--- A series of fixed-length(6-byte) minutia descriptions, including the position, type, angle and quality of the minutia;		P
	--- One or more “extended” data areas for this finger view, containing optional or vendor-specific information;		N
	-- Optionally, additional finger views, each followed by one or more extended data areas for that finger view.		N
7.4	**Record Header**		P
	There shall be one record header for the minutiae record, to hold information describing the identity and characteristics of the device that generated the minutiae data**.**		P
	Each extended data area may contain vendor-specific data, ridge count data, or core and delta data.		P
	Extended data areas of different types may be present in any order.		P
7.4.1	**Format Identifier**		P
	The Finger Minutiae Record shall begin with the three ASCII characters “FMR” followed by a zero byte as a NULL string terminator.		P
7.4.2	**Version Number**		P
	The version number for the version of this standard used in constructing the minutiae record shall be placed in four bytes.		P
	This version number shall consist of three ASCII numerals followed by a zero byte as a NULL string terminator.		P
	The first and second character shall represent the major revision number and the third character shall represent the minor revision number.		P
	The version number shall be 0x30333000 which in ASCII is the sequence ‘0’ ‘3’ ‘0’ and the null terminator '\0'.	Refer to label	P
7.4.3	**Length of Record**		P
	The length of the entire record shall be recorded in four bytes. Note that valid record lengths are in the range 20..(2_{32} -1) inclusive.		P
7.4.4	**CBEFF Product Identifier (PID)**		P
7.4.4.1	**General**		P
	Two two-byte fields shall be present to identify the capture device. These are described in the next two subclauses.		P
7.4.4.2	**Format Owner**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The 'format owner' of the encoding equipment (or transforming application) shall be uniquely identified by this two byte field.		P
	A value of zero shall not be used.		P
7.4.4.3	**Format Type**		—
	The 'format type' number of the "feature extractor" shall be encoded in the next two bytes.		P
	The supplier shall be solely responsible for the content of this field. If the format type is unspecified, the value shall be 0.		P
7.4.5	**Capture Equipment Compliance**		P
	One byte shall be used to record the image quality specification certification.		P
	The image capture equipment, used to originally acquire the image from which the minutiae were extracted, has been certified to adhere to the requirements of this specification.		P
	If the equipment has not been certified to be in compliance with any acknowledged image quality specification, this byte shall contain a zero.		P
7.4.6	**Capture Equipment ID**		—
	The capture equipment ID shall be recorded in the next two bytes.		P
	A value of all zeros is acceptable and shall indicate that the capture equipment ID is unreported.		P
	The value of this field is determined by the vendor. Applications developers may obtain the values for these codes from the vendor.		P
7.4.7	**Number of Finger Views**		P
	The number of finger views (the summation of the number of views for each finger) contained in the minutiae record shall be recorded in one byte.		P
	Permissible values for this field are 0 to 176 (up to 16 views per finger, up to 11 finger positions).		P
7.4.8	**Reserved byte**		P
	This byte is reserved for future uses. For version 3.0 of this standard, this field shall be set to 0.		P
7.5	**Finger View Format**		P
7.5.1	**Finger View Header**		P
	A finger header shall start each section of finger data providing information for that finger view.		P
	There shall be one finger view header for each finger view contained in the minutiae record.		P
7.5.1.1	**Finger Position**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The finger position shall be recorded in the first byte.		P
7.5.1.2	**View Number**		P
	The view number shall be recorded in the second byte.		P
	If more than one finger view in a general record is from the same finger, each finger view shall have a unique view number. Each finger may have a maximum of 16 views.		P
7.5.1.3	**Impression Type**		N
	The impression type of the finger image that the minutiae data was derived from shall be recorded in third byte.		N
	The codes for this byte shall be as defined in Table 11 of ANSI/NIST-ITL 1-2007.		N
7.5.1.4	The quality of the finger image sample used to produce the finger minutiae data shall be represented in a fivebyte set of fields stored in bytes 4 to 8.		N
	The quality score shall occupy the first byte of this set.		N
	A value of 255 shall indicate that the sample quality assessment was attempted but was unsuccessful.		N
	Values of biometric sample quality must be interpreted in view of the method used to assess the quality.		N
	Therefore, the quality assessment algorithm's format owner and specific format type are contained in the next four bytes.		N
7.5.1.5	**Size of Scanned Image in X Direction**		N
	The size of the original image in pixels in the X direction shall be contained in two bytes.		N
7.5.1.6	**Size of Scanned Image in Y Direction**		P
	The size of the original image in pixels in the Y direction shall be contained in two bytes.		P
7.5.1.7	**X (Horizontal) Resolution**		N
	The resolution of the minutiae coordinate system shall be recorded in two bytes having the units of pixels per centimeter.		N
	The value of the sensor X resolution shall not be zero.		N
7.5.1.8	**Y (Vertical) Resolution**		P
	The resolution of the minutiae coordinate system shall be recorded in two bytes having the units of pixels per centimeter.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The value of the sensor Y resolution shall not be zero.		P
7.5.1.9	**Number of Minutiae**		—
	The number of minutiae recorded for the finger shall be recorded in one byte.		P
	A value of 0 in this field represents a failure to extract any minutiae.		P
7.5.2	**Finger Minutiae Data**		P
	The finger minutiae data for a single finger shall be recorded in blocks of six bytes per minutia.		P
	The order of the minutiae is not specified.		P
7.5.2.1	**Minutia Type**		N
	The type of minutia shall be recorded in the first two bits of the upper byte of the X coordinate.		N
	The bits “00” shall represent a minutia of type “either”, “01” shall represent a ridge ending and “10” shall represent a ridge bifurcation.		N
7.5.2.2	**Minutia Position**		P
	The X coordinate of the minutia shall be recorded in the rest of the first two bytes (fourteen bits).		P
	The first two bits of the upper byte of the Y coordinate field shall be reserved and shall be zero.		P
	The Y coordinate shall be placed in the lower fourteen bits of the following two bytes.		P
7.5.2.3	**Minutia Angle**		P
	The angle of the minutia shall be recorded in one byte in units of 2 degrees.		P
	The value shall be a non-negative value between 0 and 179, inclusive.		P
	The value for this field shall be determined by dividing the angle by 2 and rounding up.		P
7.5.2.4	**Minutia Quality**		N
	The quality of each minutia shall be recorded in one byte.		N
	Minutia quality shall represent the certitude of the existence of that minutia point.		N
	Any equipment that does not supply quality information for individual minutia shall set all quality values to 254.		P
7.6	**Extended Data**		P
7.6.1	**Extended Data Block Function**		P
	This clause of the finger view is open to placing additional data that may be used by the matching equipment.		P

ANSI INCITS 378			
Clause	Requirement + Test	Result - Remark	Verdict
	The size of this clause shall be kept as small as possible, augmenting the data stored in the standard minutiae clause.		P
	While the extended data area allows for inclusion of proprietary data within the minutiae format, this is not intended to allow for alternate representations of data that can be represented in open manner as defined in this standard.		P
7.6.2	**Extended Data Block Structure**		P
7.6.2.1	**Extended Data Block Length**		P
	All finger views shall contain the extended data block length. This field will signify the existence of extended data.		P
	A non-zero value shall indicate the length of all extended data starting with the next byte.		P
7.6.2.2	**Type Identification Code**		P
	This field shall have a length of two bytes. It shall identify the format of the extended data area when this area is present.		P
	A value of zero in both bytes is a reserved value and shall not be used.		P
7.6.2.3	**Length of Data**		P
	The length of the extended data section shall be recorded in two bytes.		—
	This value is used to skip to the next extended data type identification field if the matcher cannot decode or use this data.		P
7.6.2.4	**Data Section**		P
	The data field of the extended data is defined by the equipment that is generating the finger minutiae record, or by common extended data formats contained in this standard;		P
7.6.3	**Ridge Count Data Format**		P
	If the extended data area type code is 0x0001, the extended data area contains ridge count information.		P
	This format is provided to contain optional information about the number of fingerprint ridges between pairs of minutiae.		P
7.6.3.1	**Ridge Count Extraction Method**		N
	The ridge count data area shall begin with a single byte indicating the ridge count extraction method.		N
	Ridge counts associated with a particular center minutia are frequently extracted in one of two ways		P
	If either of these specific extraction methods is used, the ridge counts shall be listed in the following way:		—

ANSI INCITS 378			
Clause	Requirement + Test	Result - Remark	Verdict
	-- all ridge counts for a particular center minutia shall be listed together;		N
	-- the center minutia shall be the first minutia referenced in the three-byte ridge count data;		N
	-- if a given quadrant or octant has no neighboring minutiae in it, a ridge count field shall be recorded with both the minutia index and the ridge count fields set to zero		—
	-- no assumption shall be made regarding the order of the neighboring minutiae.		N
7.6.3.2	**Neighborhood ridge count extraction methods**		—
	For the eight-neighbor ridge count extraction method, ridge count information shall be extracted for each minutia recorded in the minutiae data area.		N
	-- Every minutia identified in the minutiae data area shall be assigned its own unique “neighborhood” consisting of eight octants (angular sectors of 45 degrees) of a (theoretical) circle centered on the location of the minutia.		N
	-- For each octant, a ridge count is produced by counting the number of ridges crossed		N
7.6.3.3	**Ridge Count Data**		N
	The ridge count data shall be represented by a single byte containing the extraction method as chosen from Table 5.		N
	This field shall occur only once and shall be followed by a list of three-byte elements for each minutiae.		N
	The third byte is a count of the ridges intersected by a direct line between these two minutiae		N
7.6.3.4	**Ridge Count Format Summary**		N
	The ridge count data format shall be as follows:		—
7.6.4	**Core and Delta Data Format**		P
7.6.4.1	**Structure**		P
	If the extended data area type code is 0x0002, the extended data area contains core and delta information.		P
	This format is provided to contain optional information about the placement and characteristics of the cores and deltas on the original fingerprint image.		P
	The core and delta information shall be represented as follows: The first byte shall contain the core information type and the number of core points included; legal values are zero or greater.		P
7.6.4.2	**Core Information Type**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The core information type shall be recorded in the upper two bits of the number of cores.		P
7.6.4.3	**Number of Cores**		P
	The number of core points represented shall be recorded in the least significant four bits of this byte.		P
	The next most significant two bits of this byte (bits 4 and 5, counting from the least significant bit as bit 0) are reserved and shall be set to zero in this version of the specification.		P
7.6.4.4	**Core Data**		P
	The X coordinate of the core shall be recorded in the least significant fourteen bits of the first two bytes (fourteen bits).		P
	The Y coordinate shall be placed in the least significant fourteen bits of the following two bytes.		P
	The core is located at the focus of the innermost recurving ridgeline.		P
	-- Circular Whorl: A single core at the center of the inner most ridge;		P
	-- Elongated Whorl: Two cores, located at the foci of the locally innermost ridgelines;		P
	-- Loop: The focus of the inner most ridge;		P
	-- Compound: For a double loop or other compound core structure, the location and angle of each structure should be treated separately.		P
	-- Arch or Tented Arch: The focal point of the ridge of maximum curvature;		P
7.6.4.5	**Core Angle**		P
	The angle of the core shall be recorded in one byte in units of 2 degrees.		P
	Angles are expressed in standard mathematical format, with zero degrees to the right (positive X-Axis) and angles increasing in the counterclockwise direction. The range is 0-179, with each increment consisting of 2°.		P
	-- The average tangent direction of the two closest ridges as measured 0.064 inches from the focal point.		P
	-- No angular information for this pattern. The core information type is '00'.		P
	-- The direction of the line connecting the core points. Also, the direction of the major axis of the best fitting ellipse. The range is 0-89 in increments of 2°.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	-- A pattern fulfilling requirements for two or more pattern types including a double loop or other structure with multiple cores.		P
	-- The tangent direction of the ridge ending closest to the core or the average tangent direction of the two closest ridges as measured 0.064 inches from the focal point.		P
7.6.4.6	**Delta Information Type**		P
	The delta information type shall be recorded in the first two bits of the same byte as the number of deltas.		P
	The bits “01” shall indicate that the delta has angular information while “00” shall indicate that no angular information is relevant for the delta type.		P
7.6.4.7	**Number of Deltas**		P
	The number of delta points represented shall be recorded in the least significant four bits of this byte.		P
	The next most significant two bits of this byte (bits 4 and 5, counting from the least significant bit as bit 0) are reserved and shall be set to zero in this version of the specification.		P
7.6.4.8	**Delta Data**		P
	The X coordinate of the delta shall be recorded in the least significant fourteen bits of the first two bytes (fourteen bits).		P
	The Y coordinate shall be placed in the least significant fourteen bits of the following two bytes.		N
	The coordinates shall be expressed in pixels at the resolution indicated in the record header.		N
7.6.4.9	**Delta Angles**		N
	The three angle attributes of the delta shall be recorded in three bytes (one byte per angle) in units of 2 degrees.		—
	Angles are expressed in standard mathematical format, with zero degrees to the right (positive X-Axis) and angles increasing in the counterclockwise direction.		N
	For the purpose of the data record format the delta angles should be recorded as follows.		N
	-- The first angle to be recorded is the one closest to 90 degrees.		N
	-- The two subsequent angles are encoded in the order of their appearance when moving counterclockwise.		—

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Clause	Requirement + Test	Result - Remark	Verdict

Annex A	**Record Format Diagrams**		—
A.1	**Overall Record Format**		N
A.2	**Record Header**		N
A.3	**Finger View**		—
A.4	**Finger Minutiae Data**		—
A.5	**Extended Data**		N
Annex B	**Example Minutiae Record**		N
	This example minutiae record demonstrates the format for a given set of data		—
B.1	**Data**		—
	Plain live-scan prints of the left and right index fingers		N
B.2	**Example Data Format Diagrams**		N
B.3	**Raw Data for the Resulting Minutiae Record**		N
Annex C	**Bibliography**		N

Attachment No. 2: PHOTO

Fig. 1

Fig. 2

Fig. 3

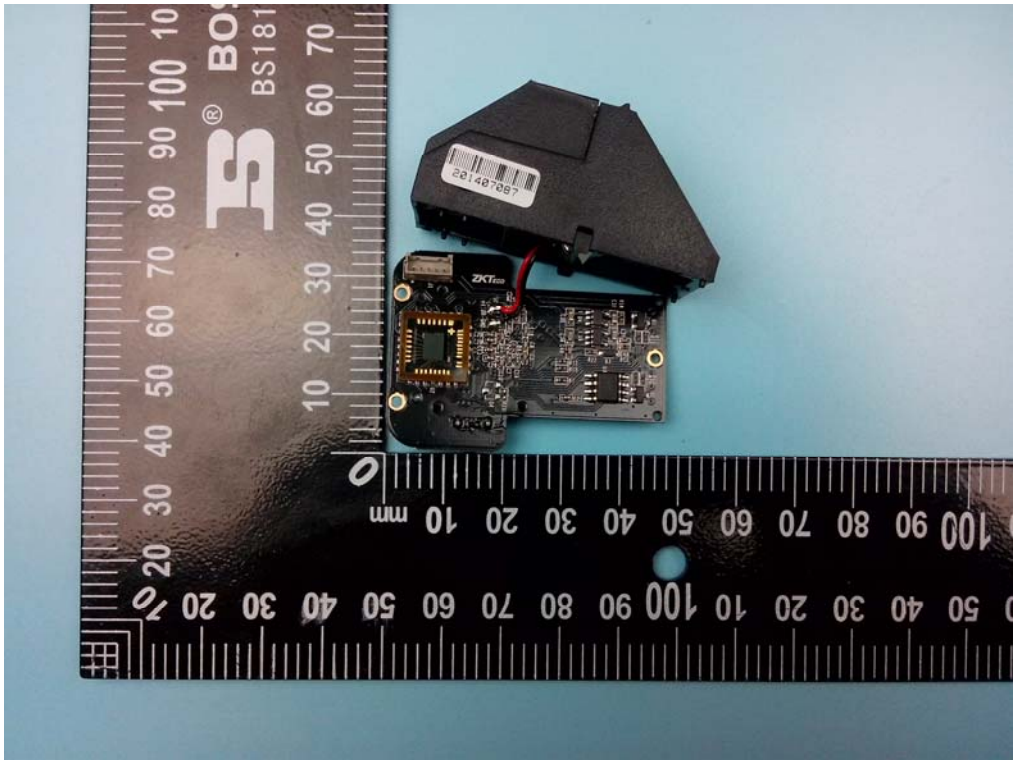

Fig. 4

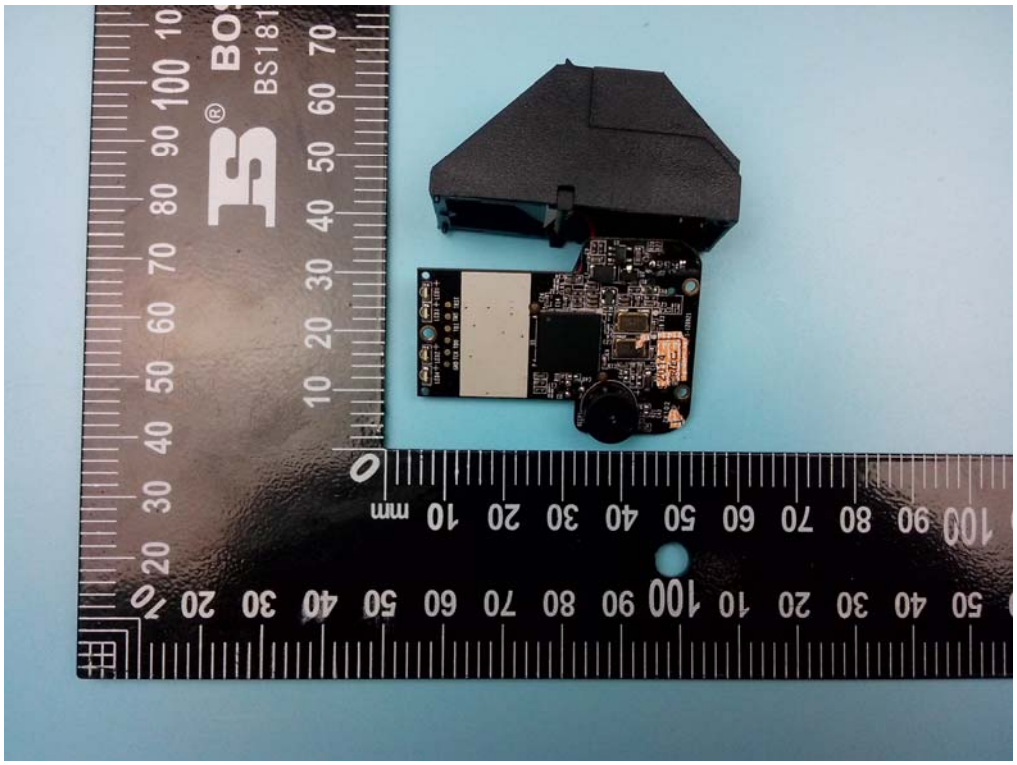

Fig. 5

===== End of Test Report =====