



# Hardware Specifications of V4KF-\*\*\* Series Hybrid Manual Insertion Card Reader

|         |               |
|---------|---------------|
| Rev. A  | June 25, 2004 |
| Rev. A1 | July 24, 2004 |
| Rev. A2 | July 29, 2004 |
| Rev. A3 | Nov 02, 2004  |
| Rev. B  | Feb 10, 2005  |
| Rev. B1 | Feb 24, 2005  |
| Rev. B2 | May 20, 2005  |
| Rev. C  | July 05, 2006 |
| Rev. D  | Dec 14, 2006  |

**RoHS Compliant**

**Hitachi-Omron Terminal Solutions, Corp.**

***Leadus***

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**[Specification History of Modification]**

| Rev    | Date          | Page          | Content  |
|--------|---------------|---------------|--|
| Draft  | Dec 12, 2003  | ALL           | The draft version is created.  |
| Draft2 | Feb 27, 2004  | Page 4, 6     | Remove the standard ISO/IEC 7811-3   |
|        |               | Page 8        | Add the signal HDRST   |
|        |               | Page 9        | Correction the unit from mm/s <sup>2</sup> to m/s <sup>2</sup>                     |
| A      | June 10, 2004 | Page 9        | Correct the document number of the data transmission specification.                |
|        |               | Page 9        | Correct the low temperature from 5°C to 0°C.                                       |
| A1     | July 24, 2004 | Page 6        | Correct the supported card type to ISO/IEC 7810/ID-1.                              |
|        |               | Page 7        | Correct the description of the IC function and SAM.                                |
|        |               | Page 8        | Correct the Pin No.10 in Power supply connector from HDREST to NC.                 |
|        |               | ALL           | Correct from ISO to ISO/IEC  |
| A2     | July 29, 2004 | Page 4        | Correct ISO/IEC 7810 from 1995-08-15 to 2003-11-01.                                |
|        |               | Page 4        | Delete ENV1375-1: 1994   |
|        |               | Page 7        | Add SLE4418 in Support ICC of Synchronous card.                                    |
|        |               | Page 7        | Correct the standard of "Support SAM chip" in 5.4 SAM from ENV1375 to ISO/IEC7810. |
| A3     | Nov 02, 2004  | Page 1, 7     | The company name is changed  |
| B      | Feb 10, 2005  | Page 6, 7, 13 | Add 5SAM Version (V4KF-01JS-002).  |
| B1     | Feb 25, 2005  | Page 11, 12   | Correction of drawing  |
| B2     | May 20, 2005  | Page 6        | Modify Drawing from "Mounting" to "Outline" in 5.1 [3].                            |
|        |               | Page 7        | Add 7.1412MHz in CLK of 5.3 [2] 4)   |
|        |               | Page 8        | Add the SAM deactivation in 5.7 [5] 2).  |
|        |               | Page 9        | Add the SAM in description of 5.9 [5] and 5.11                                     |
| C      | July 05,2006  | Front page    | Indication of 'RoHS Compliant'   |
| D      | Dec 14,2006   | Page 10       | Added Chapter 9<br>"Chapter No." is changed after "Chapter 9".                     |

## 1. Abstract

This document provides the hardware specifications of Hybrid Manual Insertion Card Reader of V4KF-\*\*\* Series with RS232 interface. This equipment can read the data of Magnetic Card, and read/write the data of IC card.

## 2. Reference Standards

[1] ISO/IEC 7810: 2003-11-01

Identification cards - Physical characteristics

[2] ISO/IEC 7811-1:2002, ISO/IEC 7811-2, 6:2001

Identification cards -- Recording technique

[3] ISO/IEC 7816-1:1998

Identification cards -- Integrated circuit(s) cards with contacts

Part 1: Physical characteristics

[4] ISO/IEC 7816-2:1999

Identification cards -- Integrated circuit(s) cards with contacts

Part 2: Dimensions and location of contacts

[5] ISO/IEC 7816-3:1997

Identification cards -- Integrated circuit(s) cards with contacts

Part 3: Electronic signals and transmission protocols

[6] ISO/IEC 7816-4: 1995

Identification cards -- Integrated circuit(s) cards with contacts

Part 4: Inter-industry commands for interchange

[7] ISO/IEC 7816-4: 1995/Amd 1:1997

Secure messaging on the structures of APDU messages

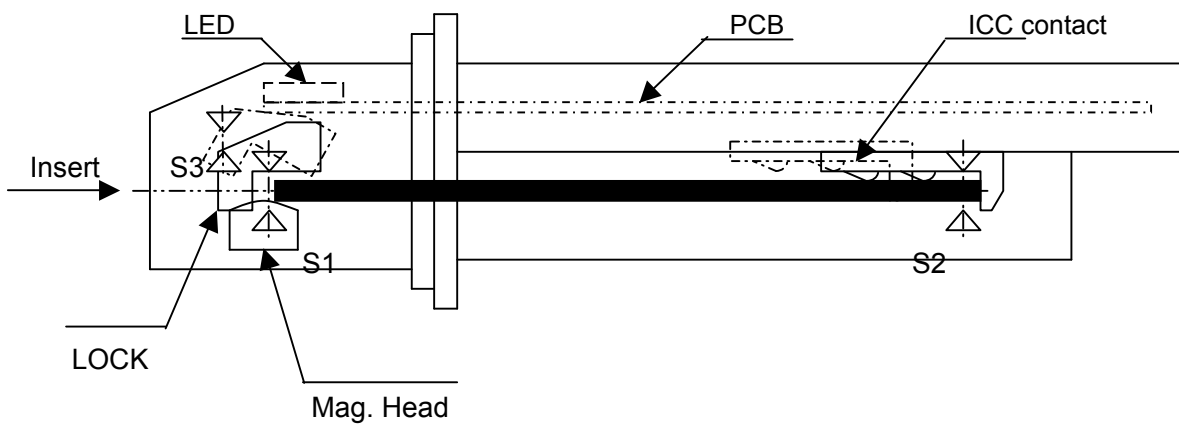
[8] EMV2000 Integrated Circuit Card Specification for Payment Systems Book 1

Application Independent ICC to Terminal Interface Requirements

Version 4.0 December, 2000

### 3. Definition of Terminology

|      |   |
|------|---|
| LED  | Light-Emitting Diode                            |
| PCB  | Printed-Circuit Board                           |
| S1   | Positioning Sensor of Insertion slot            |
| S2   | Positioning Sensor of Rear End                  |
| S3   | Sensor to detect the lock/release of Lock blade |
| ICC  | Integrated Circuit Card                         |
| SAM  | Secure Application Module                       |
| C/R  | Card Reader                                     |
| ATR  | Answer to Reset                                 |
| Etu  | Elementary Time Unit                            |
| Vpp  | Voltage at VPP                                  |
| Vcc  | Voltage at VCC                                  |
| Host | HOST Terminal                                   |
| APDU | Application Protocol Data Unit                  |
| FW   | Firmware  |



## 4. Applicable Module Name

| No | Module Name   | Magnetic card read |         |         | ICC controller | SAM  | Bezel      |
|----|---------------|--------------------|---------|---------|----------------|------|------------|
|    |               | Track 1            | Track 2 | Track 3 |                |      |            |
| 1  | V4KF-01JS-001 | R*1                | R       | R       | Y*2            | 1SAM | Round Type |
| 2  | V4KF-01JF-001 | R                  | R       | R       | Y              | 1SAM | Flat Type  |
| 3  | V4KF-01JS-002 | R                  | R       | R       | Y              | 5SAM | Round Type |

\*1 R : Magnetic reading function

\*2 Y : 8 contacts for C1 to C8 are provided.

## 5. Specifications

### 5.1 Mechanical Specification

[1] External dimensions (See Outline Drawing)

|               | Width   | Height | Length                |
|---------------|---------|--------|-----------------------|
| V4KF-01JS-001 | 80.0mm  | 50.0mm | 133.0mm (147.0 mm *1) |
| V4KF-01JF-001 | 101.6mm | 76.2mm | 133.0mm (147.0 mm *1) |
| V4KF-01JS-002 | 80.0mm  | 50.0mm | 134.5mm (147.0 mm *1) |

\*1 Including connector's lock

[2] Weight Less than 250g

[3] Mounting (See Outline Drawing)

(1) In case of using the Mounting Hole (V4KF-01JS-001, V4KF-01JF-001, V4KF-01JS-002)

- 1) Screw M3
- 2) Quantity 4 pieces
- 3) Torque Less than 0.79N·m

**<Notice>**

Design the mounting bases to keep the difference within +/-0.2mm in height among four mounting holes (refer to Outline drawing about location of these holes)

(2) In case of using the Screw Hole of Bezel (V4KF-01JF-001)

- 1) Screw M4
- 2) Quantity 4 pieces
- 3) Torque Less than 1.30N·m

**<Notice>**

Select the screw in order to keep the meshing length 4.0mm or less.

[4] Card position detection

Two photo sensors (S1, S2) are provided in order to detect the card. The state of these sensors can be retrieved by the command and response.

### 5.2 Magnetic card function

[1] Magnetic card type

In conformity to ISO/IEC 7810/ID-1, ISO/IEC 7811-1/2/6

[2] Reading function

Read specified tracks simultaneously.

[3] Reading direction

Bi-directional capability (insert/pull out)

[4] Card speed

100-1000 mm/s capability (at flat card)

### 5.3 ICC function

[1] Number and location of contacts on ICC

Number and location of contacts on ICC are specified in ISO/IEC 7816-2 figure 2.

[2] Applicable ICC

(1) Asynchronous card

- |                              |   |
|------------------------------|---|
| 1) Support ICC               | In conformity to ISO/IEC 7816-1/2/3(Default), EMV4.0 Level1<br>T=0 and T=1                                      |
| 2) Protocol                  | (Automatic protocol type selection via ATR detection is possible.)  |
| 3) Data byte reading/writing | Inverse convention (MSB first, negative logic) and direct convention (LSB first, positive logic) are available. |
| 4) Clock during/after ATR *1 | 3.5712 MHz (F=372) (Default) / 7.1428 MHz (F=744)<br>(Conform to ISO / IEC 7816-3)                              |
| 5) Communication speed       | 1etu = (F/D) x 1/f sec<br>D=1: (Default) / 2, 4: (Changeable by PPS)  |
| 6) Vpp                       | Not connected   |
| 7) Vcc                       | 5V / 3V (Type A and Type B)<br>(Automatic selection via T=15 of ATR detection is possible.)                     |
| 8) EMV Approval              | EMV4.0 Level 1 Approved (11757 0504 400 20 FIM)   |

(2) Synchronous card

- |                |   |
|----------------|---|
| 1) Support ICC | In conformity to ISO/IEC 7816-1/2/10,<br>SLE4442/4432/4428/4418 |
| 2) Vcc         | 5V  |
| 3) Vpp         | Not connected   |

\*1 Answer To Reset

#### <Notice>

HITACHI-OMRON TERMINAL SOLUTIONS asks customers to check the performance of ICC with HITACHI-OMRON TERMINAL SOLUTIONS standard ICC controller and FW in advance, if ICC is special card. Because ISO standard and ICC(s) are subject to frequent modification. HITACHI-OMRON TERMINAL SOLUTIONS supports you for capability of performing customer's ICC, provided with ICC and its specification.

### 5.4 SAM

[1] The following SAM controller is equipped with shipment. 1 SAM socket is mounted on the Main PCB.

And the additional 4 SAM socket are mounted on the additional PCB in V4KF-01JS-002 only.

- 1SAM : V4KF-01JS-001, V4KF-01JF-001
- 5SAM : V4KF-01JF-002

[2] SAM specification

- |                              |   |
|------------------------------|---|
| 1) Support SAM chip          | In conformity to ISO/IEC 7810(ID000), ISO/IEC 7816-1/2/3<br>T=0 and T=1   |
| 2) Protocol                  | (Automatic protocol type selection via ATR detection is possible.)  |
| 3) Data byte reading/writing | Inverse convention (MSB first, negative logic) and direct convention (LSB first, positive logic) are available. |
| 4) Clock during/after ATR *1 | 3.5712 MHz(Conform to ISO / IEC 7816-3)   |
| 5) Communication speed       | 1etu = (372/D) x 1/(3.5712 x 10 <sup>6</sup> ) sec<br>D=1: (Default) / 2, 4: (Changeable by PPS)                |
| 6) Vpp                       | Not connected   |
| 7) Vcc                       | 5V/3V<br>(Automatic selection via T=15 of ATR detection is possible.)   |

### 5.5 Shutter function

[1] This shutter is equipped on the insertion slot of the C/R. It opens automatically by inserting the card. It prevents foreign objects like dusts and coins from intruding to inside.

[2] This shutter should open by inserting the card that is more than 53.92mm in width.

## 5.6 Lock function

- [1] Pin type lock mechanism is equipped to hold the card during operation of ICC in response to command from host.
- [2] This lock mechanism can be controlled by the command from the host.
- [3] The condition of this lock mechanism can be checked by the command and response.
- [4] This lock mechanism is released automatically at the power failure.
- [5] This Lock mechanism works under the below conditions
- (1) The card is inserted completely.
  - (2) The card does not exist inside of C/R.

## 5.7 Power Requirement

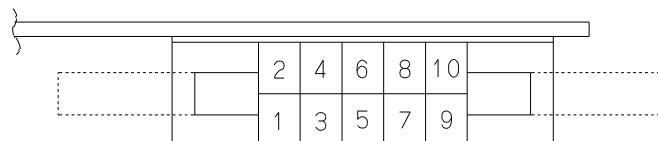
- [1] Power supply voltage 10.8 – 13.2V DC (including ripple)
- [2] Ripple of power supply 100mV (p-p) or less
- [3] Power consumption (Input voltage: 12V DC)
- |              |               |               |
|--------------|---------------|---------------|
| In operation | magnetic card | 500mA or less |
|              | IC card       | 1.5A or less  |
| In Standby   |               | 300mA or less |
- [4] Power supply connector  
HIF3BD-10PA-254DS02 (2.54mm pitch HIROSE Japan) or equivalent (MIL-C-83503) is mounted on C/R's PCB.

Pin assignment of C/R (in/out direction view from the reader)

| Pin No. | Assigned signal | IN/OUT | Function            |
|---------|-----------------|--------|---------------------|
| 1       | TXD             | OUT    | Transmit DATA       |
| 2       | RXD             | IN     | Receive DATA        |
| 3       | DTR             | OUT    | DATA Terminal Ready |
| 4       | CTS             | IN     | Clear to Send       |
| 5       | SG              | -      | 0V                  |
| 6       | 12V             | -      | Power               |
| 7       | GND             | -      | Ground              |
| 8       | 12V             | -      | Power               |
| 9       | GND             | -      | Ground              |
| 10      | NC              | -      | Not Connect         |

(Cable with connector for Power supply and RS232 interface is not included)

<Pin Layout of connector>



- [5] Power failure
- 1) Detection Voltage Less than 10.8V DC
  - 2) Power failure process  
In case of power failure, C/R deactivates the ICC and SAM chip(s), and releases the Lock.

## 5.8 Electrical interface

- [1] Interface specification
- (1) Electronic Interface RS232 interface
  - (2) Transmission Speed 1200, 2400, 4800, 9600, 19200, 38400 bps
  - (3) Synchronous Method Start-Stop synchronization Method
  - (4) Communication Method Half-duplex Method
  - (5) Pin Assignment Refer to the table in 5.7 Power Requirement



## 5.9 Software Interface

|                            |  |
|----------------------------|--|
| [1] Transmission protocols | V4KF Series Card Reader Data Transmission Specification (Document No. MTA-H-04015).  |
| [2] Port to host           | Handling with a magnetic card, an IC card and SAM via single port  |
| [3] Format                 | A common APDU format is used for handling various ICC and SAM  |
| [4] Downloadable           | All software are supported to be downloaded.   |
| [5] Module                 | Firmware is independently divided into every functional module (e.g. ICC handling module, SAM handling module, etc) and every module can be independently downloaded (regardless of order of download) respectively. |

## 5.10 LED Indicator

- [1] One LED is equipped to inform the state of C/R and the reading result of the magnetic data.  
 [2] This LED can be indicated the three colors (green, red and orange).  
 [3] The specification of LED indicator can be controlled by the command from the host. In detail, refer to V4KF Series Card Reader Data Transmission Specification (Document No. MTA-H-04015).

## 5.11 Diagnostics function

[1] C/R provides the following functions as diagnostics of each module in the C/R. This function is performed by pressing the white button located on the top of C/R just near SAM socket. The test card is required to perform diagnostics. This function reports the following. \*1

- (1) OK/NG for Sensor Level
- (2) OK/NG for Magnetic card reading
- (3) OK/NG for LOCK mechanism
- (4) OK/NG for ICC function

The SAM function is not worked.

[2] C/R indicates the result of the diagnostics by using LED indicator. \*1

\*1 In detail, V4KF Series Card Reader Data Transmission Specification (Document No.MTA-H-04015).

### <Notice>

Make sure not to press this button, when the system is in operation.

## 6. Environmental Condition

|                  |   |
|------------------|---|
| [1] Temperature  |   |
| (1) In operation | 0 to 55 °C  |
| (2) In storage   | -25 °C for 16 hours to 70 °C for 72 hours for non operation and transport             |
| [2] Humidity     |   |
| (1) In operation | 5 to 85% RH, no condensation and absolute air humidity of 23 g/m <sup>3</sup> or less |
| (2) In storage   | 5 to 90% RH, no condensation and absolute air humidity of 40 g/m <sup>3</sup> or less |

## 7. General performance

|                           |  |
|---------------------------|--|
| [1] Insulation Resistance | 20M Ω or more at 100V DC<br>(At normal temperature and humidity)   |
| [2] Dielectric Strength   | 500V AC for 1minute  |
| [3] Durable Vibration     | Frequency 10-150 Hz<br>Single vibration width 0.10mm<br>Acceleration 15m/s <sup>2</sup><br>Direction X,Y,Z |
| [4] Shock Endurance       | Acceleration 150m/s <sup>2</sup><br>Direction X,Y,Z  |

## **8. Life**

|                             |   |
|-----------------------------|---|
| [1] Card Reader life        | 800,000 passes or 5 years, whichever comes earlier.                               |
| [2] Magnetic head life *1   | 1,000,000 passes (minimum)  |
| [3] IC contact unit life *2 | 300,000 operations<br>(Contact unit should be replaced every 300,000 operations.) |

\*1 One pass denotes forward and backward movement.

\*2 One operation denotes the movement of fully insertion and extraction.

## **9. Response to Regulated Chemical Substances**

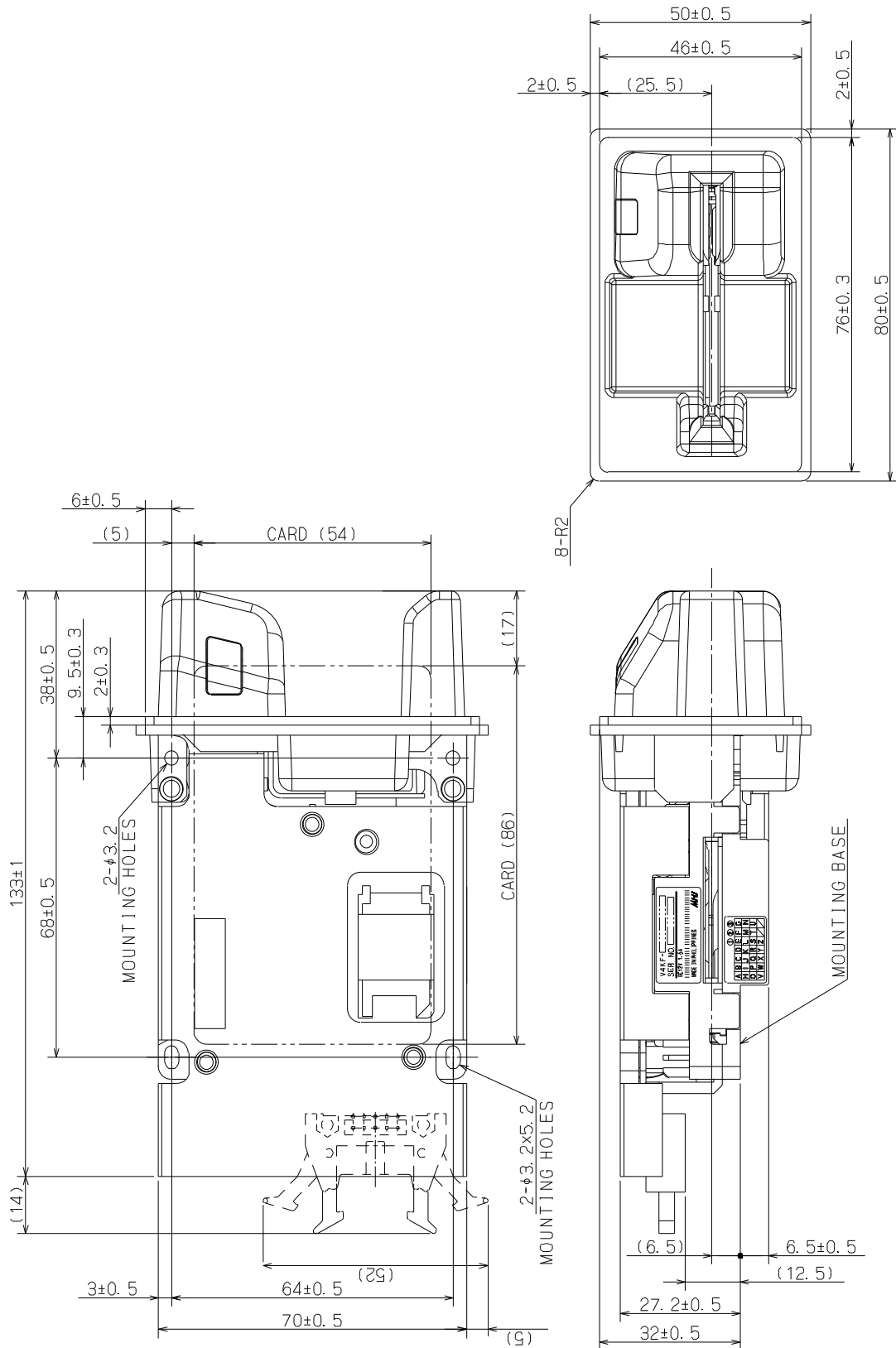
- [1] Response to RoHS: Conformed with RoHS Directive(2002/95/EC)  
"The restriction of the use of certain hazardous substances in electrical and electronic equipment".

(Notice) In case the equipment mounting this card reader will be shipped to People's Republic of China, please consult our sales representatives.

### 10. Outline drawing

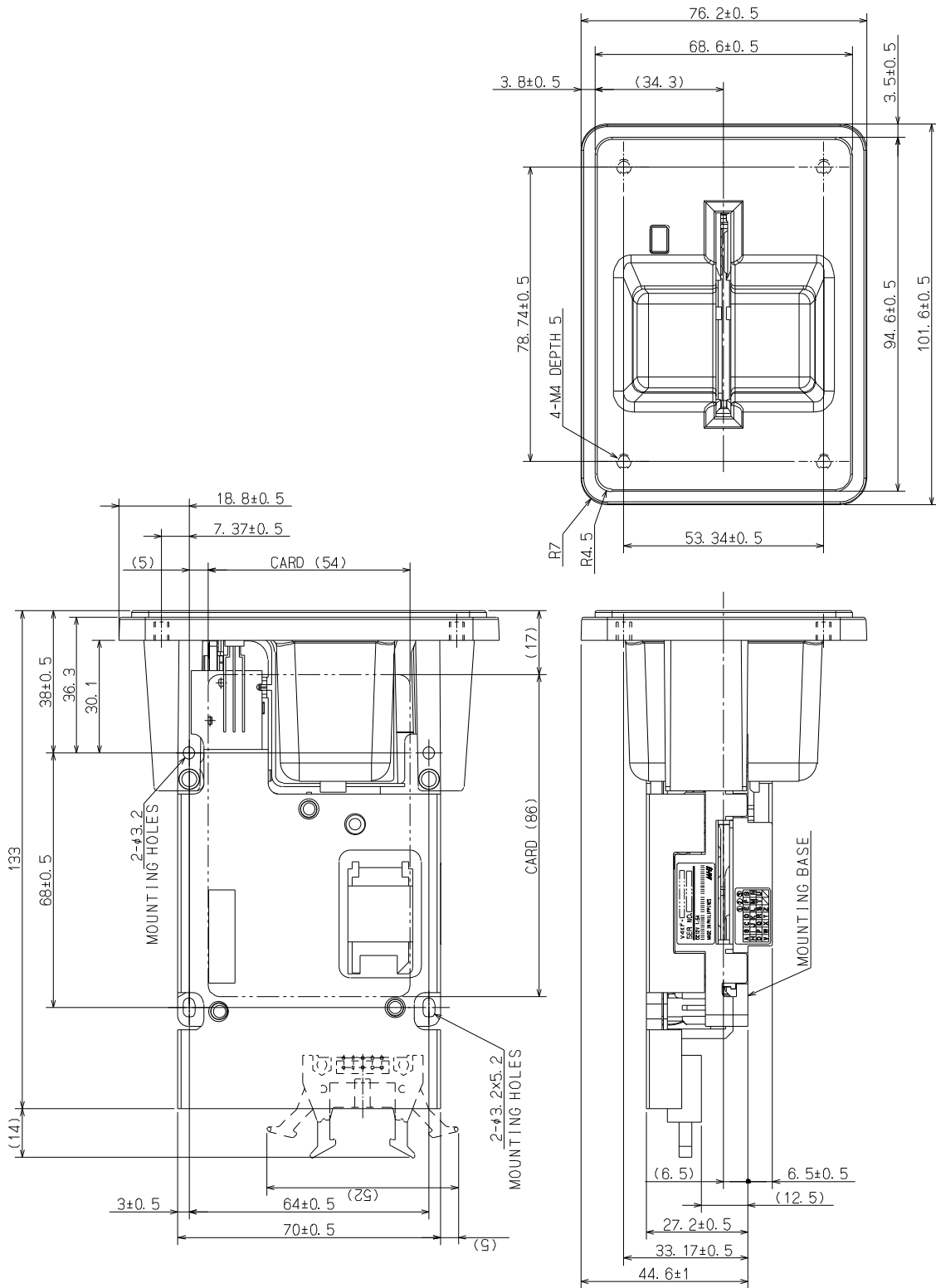
(1) V4KF-01JS-001

Dimensions in millimeters



(2) V4KF-01JF-001

Dimensions in millimeters





## 11. Appendix A

Abstract from ISO/IEC 7816-2: 1999 (E)

### 4. Number and locations of the contacts

This part of ISO/IEC 7816 defines eight contacts referred to as C1 to C8.

The contacts are located as shown in figure 2.

The contacts shall be located on the front of the card. The dimensions are referenced to the left and upper edges of the front surface of the end.

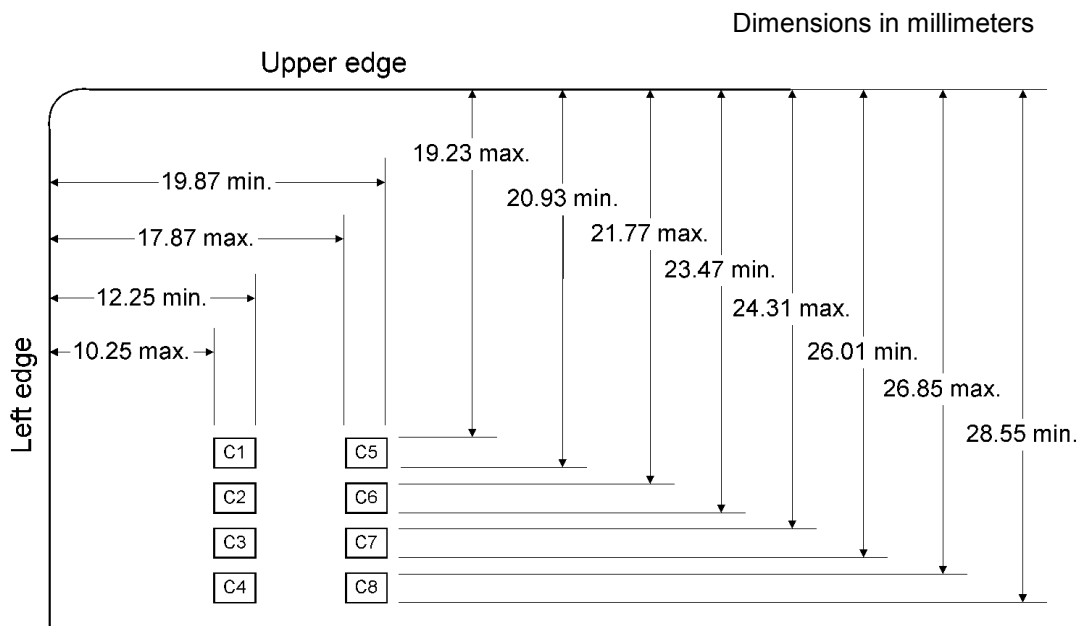


Figure 2. Contacts location