Hardware Specifications of V4KU-*** Series Hybrid Manual Insertion Card Reader

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ADVANCED MODULES BUSINESS COMPANY

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[Specification History of Modification]

Rev	Date	Page	Content
A	Oct 8, 2003		The first edition is created.

1. Abstract

This document provides the hardware specifications of Hybrid Manual Insertion Card Reader of V4KU-*** Series with USB 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: 1995-08-15

Identification cards - Physical characteristics

[2] ISO/IEC 7811-1,2,3, 6: 1995-08-15

Identification cards -- Recording technique

[3] ISO 7816-1:1998

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

Part 1: Physical characteristics

[4] ISO 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

[9] ENV1375-1: 1994

Interjectors integrated circuit(s) cards additional formats Part 1. ID-000

000 card size and physical characteristics

[10] USB 2.0

Universal Serial Bus Specification, Compaq/Hewlett-Packard/Intel/Microsoft/NEC/Philips,

Revision 2.0 April 27, 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
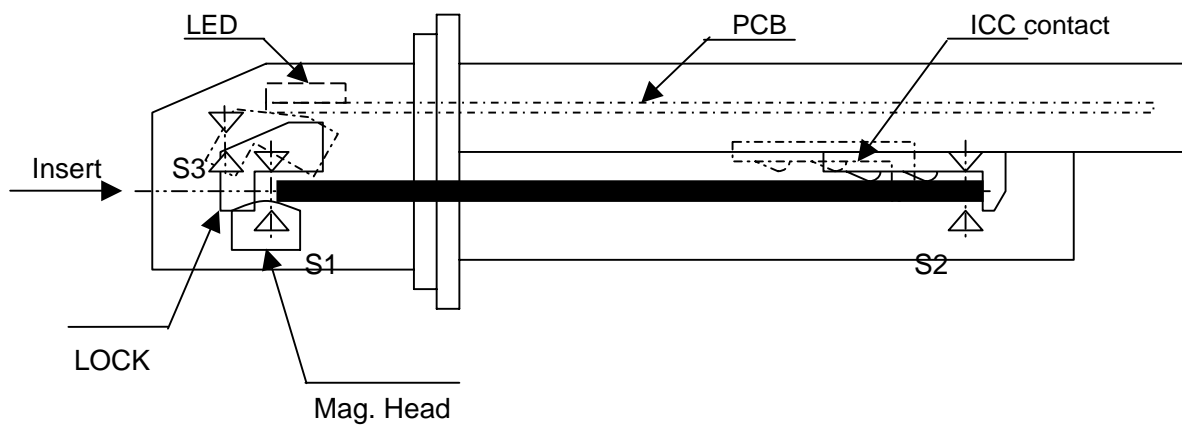
4. Applicable Module Name

No	Module Name	Magnetic card read			ICC controller	SAM	Bezel
		Track 1	Track 2	Track 3			
1	V4KU-01JS-001	R*1	R	R	Y*2	Y*3	Round Type
2	V4KU-01JF-001	R	R	R	Y	Y	Flat Type

 *1 R : Magnetic reading function
 *2 Y : 8 contacts for C1 to C8 are provided.
 *3 Y : 1 SAM Provided

5. Specifications

5.1 Mechanical Specification

[1] External dimensions (See Outline Drawing)

	Width	Height	Length
V4KU-01JS-001	80.0mm	50.0mm	133.0mm
V4KU-01JF-001	101.6mm	76.2mm	133.0mm

[2] Weight   Less than 250g
[3] Mounting (See Mounting Drawing)
 (1) In case of using the Mounting Hole (V4KU-01JS-001, V4KU-01JF-001)
   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 (V4KU-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, ISO/IEC 7811-1/2/3/6
[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 7816-2 figure 2.

[2] Applicable ICC

   (1) Asynchronous card

1)	Support ICC	In conformity to ISO/IEC 7816-1/2/3, EMV4.0 Level1
2)	Protocol	T=0 and T=1
3)	Data byte reading/writing	Inverse convention (MSB first, negative logic) and direct convention (LSB first, positive logic)
4)	Clock during/after ATR	3.5712 MHz(Conform to ISO / IEC 7816-3)
5)	Communication speed	T=0: 1etu = 372/ (3.5712 x 10^6) sec (Constant Value) T=1: 1etu = (372/D) x 1/(3.5712 x 10^6) sec D=1(Default), 2, 4
6)	Vpp	Not connected
7)	Vcc	5V / 3V (Type A and Type B)

   (2) Synchronous card

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

<Notice>

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

5.4 SAM

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

[2] SAM specification

1)	Support SAM chip	In conformity to ENV1375-1(ID000)
2)	Vpp	Not connected
3)	Vcc	5V/3V

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   21.6 - 26.4V DC (including ripple)
[2] Ripple of power supply   100mV (p-p) or less
[3] Power consumption (Input voltage: 24V DC)

In operation	magnetic card	500mA or less
	IC card	1.0A or less
In Standby		100mA or less

[4] Power supply connector
    4 nodes, 2.54mm pitch in serial 5046-04A(Molex Japan) is used in PCB

Pin assignment of C/R

Pin No.	Assigned power rails
1	+24V: Power supply
2	GND: Power ground
3	NC
4	NC

(Cable with connector for Power supply is not included)

4	NC
3	NC
2	GND
1	+24V
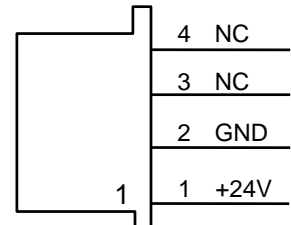
Counter Connector
(connector on the side of cable)

[5] Power failure
     1) Detection Voltage   Less than 21.6V DC
     2) Power failure process
        In case of power failure, C/R deactivates the ICC and releases the Lock.

5.8 Electrical interface

[1] Interface specification
     (1) Protocol Version   Compliance with USB Version 2.0 certified logo program
     (2) Power supply   Self-powered
     (3) Device Class   Human Interface Devices (HID) class
     (4) Transmission Speed   Full Speed (12Mbps)
     (5) Transmission Type   Interrupt Out for command
                             Interrupt In for response

[2] USB interface connector
    Type B Connector
    (USB interface Cable between Host and C/R is not attached. You should use the cable meet the Universal Serial Bus Specification)

5.9 Software Interface

[1] Transmission protocols   V4KU Series Card Reader Data Transmission Specification (Document No. MTA-H-03022).
[2] Port to host   Handling with a magnetic card and an IC card via single port
[3] Format   A common APDU format is used for handling various ICC
[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 V4KU Series Card Reader Data Transmission Specification (Document No. MTA-H-03022).

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

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

*1 In detail, V4KU Series Card Reader Data Transmission Specification (Document No.MTA-H-03022).

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

6. Environmental Condition

[1] Temperature
    (1) In operation   5 to 55
    (2) In storage   -25   for 16 hours to 70   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^3 or less
    (2) In storage   5 to 90% RH, no condensation and absolute air humidity of 40 g/m^3 or less

7. General performance

[1] Insulation Resistance   20M or more at 100V DC
                                   (At normal temperature and humidity)
[2] Dielectric Strength   500V AC for 1minute

[3] Durable Vibration	Frequency	10-150 Hz
	Single vibration width	0.10mm
	Acceleration	15mm/s^2
	Direction	X,Y,Z
[4] Shock Endurance	Acceleration	150mm/s^2
	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
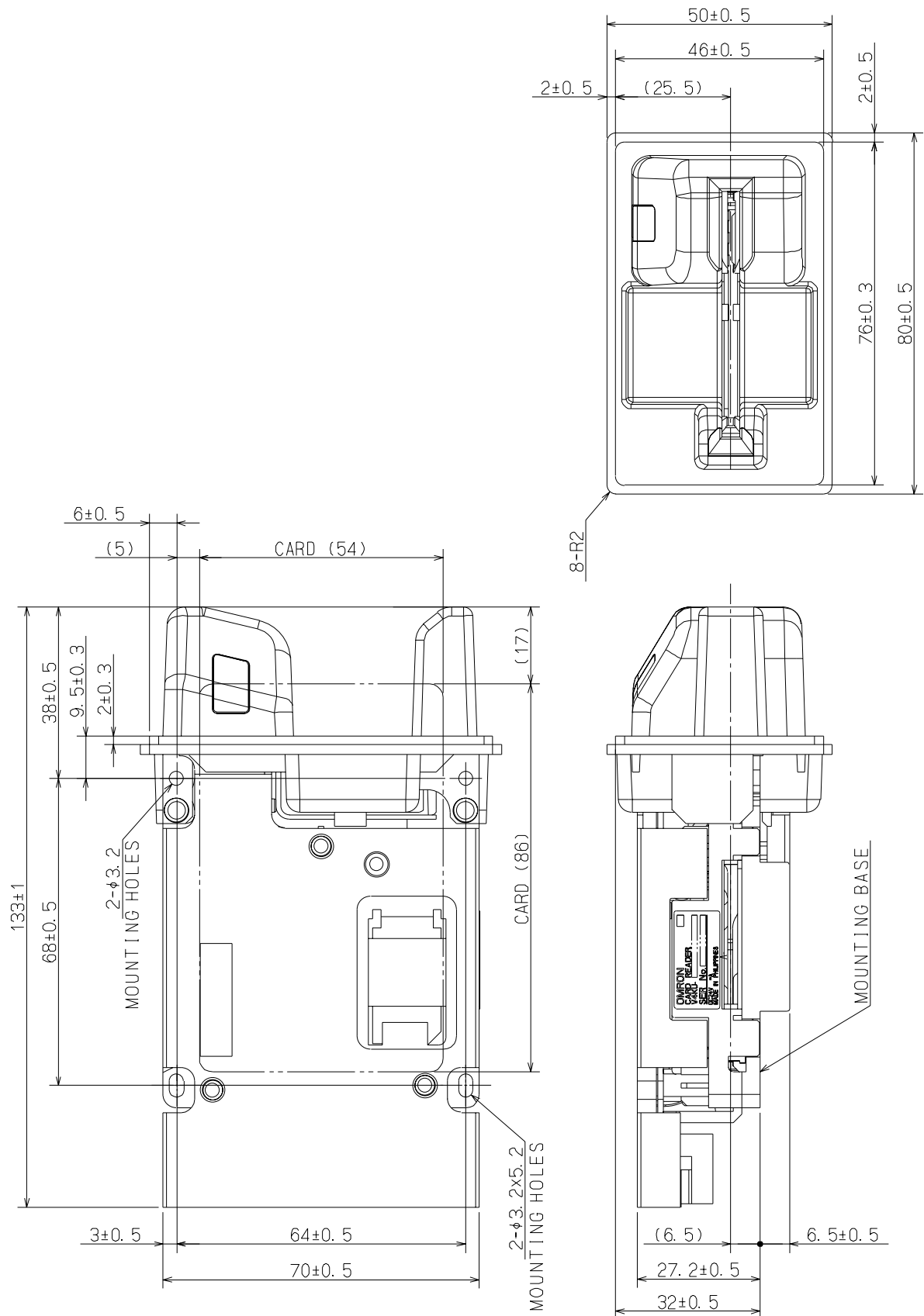   (Contact unit should be replaced every 300,000 operations.)

    *1 One pass denotes forward and backward movement.
    *2 One operation denotes the movement of fully insertion and extraction.

9. Outline drawing

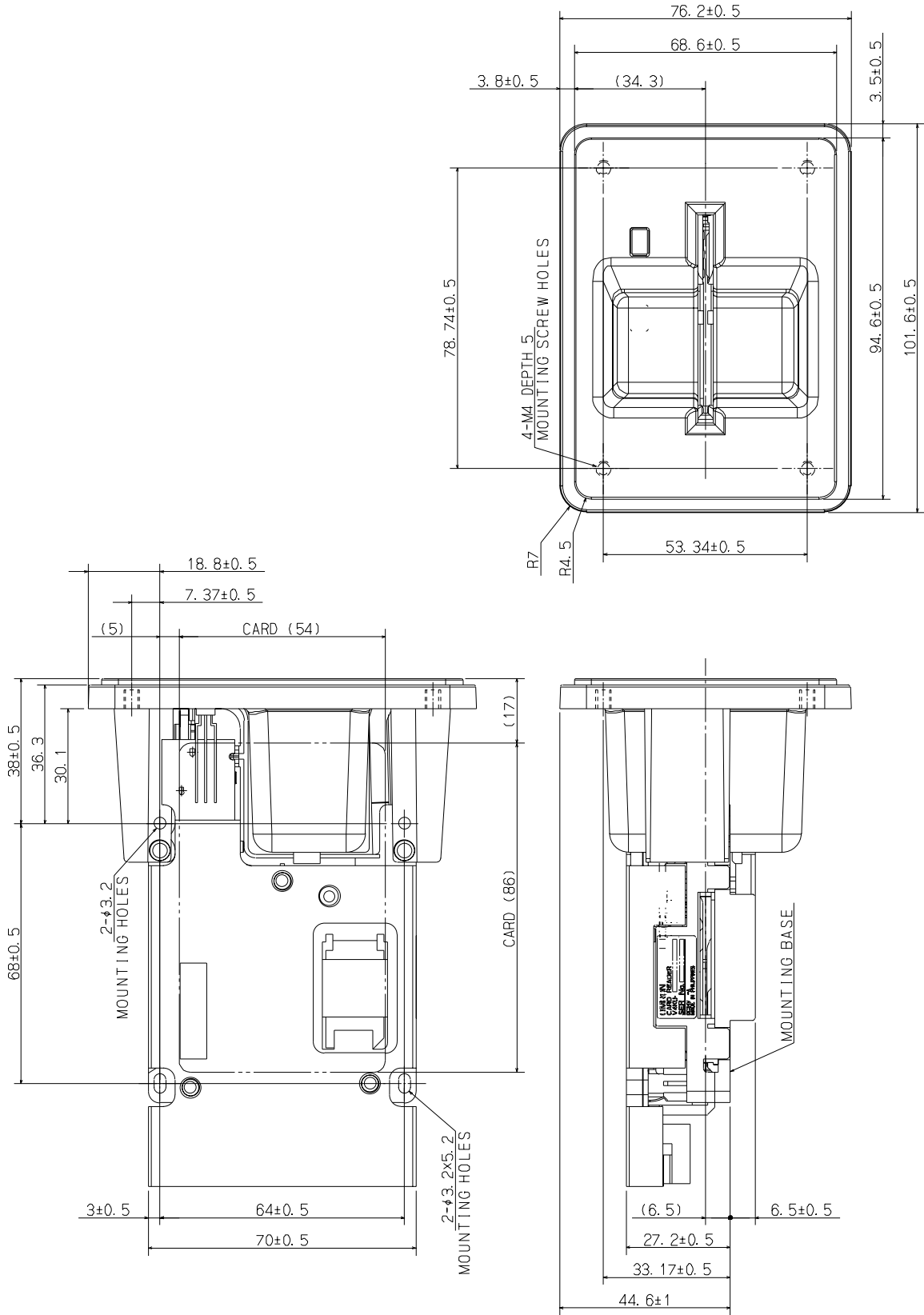(1) V4KU-01JS-001   Dimensions in millimeters

(2) V4KU-01JF-001   Dimensions in millimeters

10. Appendix A

Abstract from ISO 7816-2: 1999 (E)

4. Number and locations of the contacts
This part of ISO 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.

Dimensions in millimeters

Upper edge

19.23 max.

19.87 min.

20.93 min.

17.87 max.

21.77 max.

23.47 min.

12.25 min.

24.31 max.

10.25 max.

26.01 min.

26.85 max.
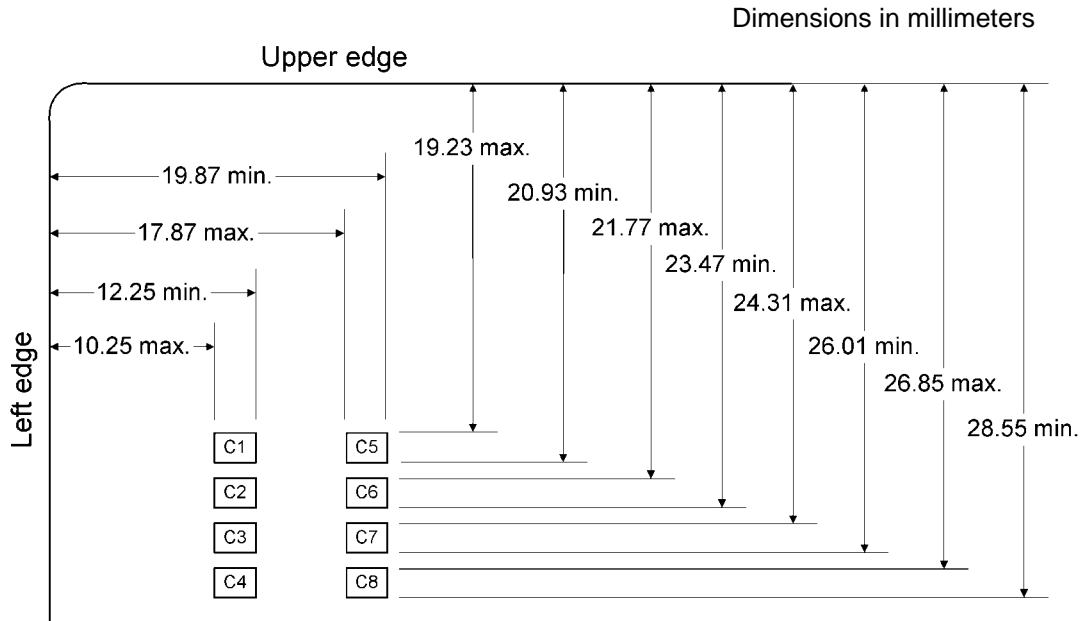
28.55 min.

Left edge

C1		C5
C2		C6
C3		C7
C4		C8

Figure 2. Contacts location