

CIS-KDCX2 Series

KD6R367CX2

KD6R587CX2

KD6R807CX2

KD6R367CX2-NL

KD6R587CX2-NL

KD6R807CX2-NL

DataSheet

Mitsubishi Electric Corporation
Electronics and Communication Systems Center

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※CoaXpress is a trademark or registered trademark of JIIA(Japan Industrial Imaging Association).

※GenICam is a trademark or registered trademark of EMVA(European Machine Vision Association).

1. Application

This document describes Mitsubishi Electric contact image sensors and applies to the following product families.

(Hereinafter referred to as “Products”).

KD6R367CX2, KD6R587CX2, KD6R807CX2, KD6R367CX2-NL, KD6R587CX2-NL, KD6R807CX2-NL

This product includes models with built-in light sources featuring white LED arrays (KD6R367CX2, KD6R587CX2, KD6R807CX2) and models without built-in light sources designed to be used with external light sources (KD6R367CX2-NL, KD6R587CX2-NL, KD6R807CX2-NL).

2. Related Documents

Documents related to this product are listed below.

Table 1 Related Documents List

Document No.	Name	Note.
TM-XN137	Date sheet	This document. This document describes the specifications of the product and our shipping inspection conditions.
TM-XN192	Users manual	This section contains the warranty and precautions regarding the use of this product. Please read this section carefully and follow the instructions before using the product.
TM-XN194	Functions specification	This manual describes the functions of this product in detail. Please use it when you want to use functions not described in the instruction manual.

3. Production specifications and configuration

Table 2 Production specifications and configuration

Items			unit	Specifications and configuration			Remarks
				KD6R367CX2 KD6R367CX2-NL	KD6R587 CX2-NL	KD6R5 87CX2	KD6R807CX2 KD6R807CX2-NL
Imaging element			-	CMOS Line sensor			288 pixels x 3 colors per chip
Valid scan width			mm	367	587.2	807.4	
Pixel density			dpi	600			Pixel density in the chip. Density between chips are equivalent to 300dpi.
Total pixels (pixel)	Interpolation:OFF		pixel	8,640 × 3	13,824 × 3	19,008 × 3	
	Interpolation: ON			8,669 × 3	13,871 × 3	19,073 × 3	
Maximum line rate	10bit	600dpi	kHz/line	50.6(55.0)	44.2(55.0)	50.6(55.0)	CXP-6 Quad connection, on external sync and color mode. Value in brackets () are on internal sync.
		300dpi		80.9(96.2)	88.7(96.2)	80.9(96.2)	
		200dpi		100.9(130.6)	130.6(130.6)	100.9(130.6)	
		150dpi		115.2(159.1)	159.1(159.1)	115.2(159.1)	
	8bit	600dpi		55.0(55.0)	55(55.0)	55.0(55.0)	
		300dpi		91.8(96.2)	96.2(96.2)	91.8(96.2)	
		200dpi		112.0(130.6)	130.6(130.6)	112.0(130.6)	
		150dpi		125.9(159.1)	159.1(159.1)	125.9(159.1)	
Focal position			mm	Built-in light source: 52 Without light source: 51.4			Mounting reference hole standard
Output data rate			Gbps	Max 6.25Gbps × 4	Max 6.25Gbps × 4	Max 6.25Gbps × 4 × 2 lines	
RoHS			-	Compliant (10 substances) (Note1)			(Note1) Parts with the following exemption item numbers are used. Exemption item number Annex III 6(c),7(a),7(c)- I ,15
CE Marking			-	Compliant			
Functions			-	LED control Electronic shutter control Dark correction (each pixel) White Correction (each pixel) PGA(Programmable Gain Amp) Line Adjustment Gamma correction Pixel interpolation Switching resolution 600/300/200/150dpi (Note2) Overlap output function (board gap: 6.1mm, 144 pixels @ 600dpi)			(Note2) Pixel interpolation function is turned off except for 600 dpi.

Items		unit	Specifications and configuration				Remarks
			KD6R367CX2 KD6R367CX2-NL	KD6R587 CX2-NL	KD6R5 87CX2	KD6R807CX2 KD6R807CX2-NL	
			Save user setting (3 patterns)				
Optical system		-	Rod lens array				
Illumination		-	White LED array				The values in parentheses are for products without light sources.
Power supply	For sensor and Illumination (VDD)	V	24V ×1 line	24V ×1 lines	24V ×2 lines	24V 2lines	The values in parentheses are for products without light sources.
	Maximum Current Consumption	A	4.8(2.4)	7.0(3.5)		9.7(4.9)	
Exposure control		-	Illumination pulse Duty adjustment/ Electronic shutter				Products without light sources output lighting control pulses to the external.
Communication format		-	CoaXPress™ Rev1.1 compliant GeniCam™ compliant				20.83Mbps MAX
Output image format		-	24bit/30bit color、8bit/10bit monochrome				
Weight(Typ)		kg	2.9(2.2)	4.2(3.1)		5.5(4.2)	The values in parentheses are for products without light sources.
Dimensions	Length	mm	434.1±0.5	654.1±0.5		874.1±0.5	The values in parentheses are for products without light sources. Refer Fig.3～Fig.6, Fig.8～11
	Width		64.0±2.0				
	Height		120.1±1.6(116.9±1.6)				

4. Standard Operation Condition and Measurement Conditions (Ta=25℃)

Table 3 Standard operation condition

Item	Symbol	Specifications		Units	Remarks
Dark output	DVd	8bit	2~54	digit	Refer 4.1 below
Maximum white output	DVpmax	8bit	123~244	digit	Refer 4.2 below
White output uniformity	UEp	50 MAX		%	Refer 4.3 below
MTF	MTF	30 MIN		%	Refer 4.4 below

4.1 Dark output (DVd)

(dark correction :OFF, white correction :OFF, illuminations :OFF)

DVd is output value before dark correction when the illuminations is off.

4.2 Maximum white output (DVpmax)

(dark correction:OFF, white correction :OFF, illuminations :ON)

DVpmax is maximum output value scanning white-reference document before black and white correction.

DVpmax is defined by a maximum value among R,G,B output.

4.3 White output uniformity (UEp)

(dark correction:ON, white correction :OFF, illuminations :ON)

The symbols are defined as follows to calculate the White output uniformity.

$$DVEp(n) = DVp(n) - DVd(n)$$

DVEp(n) : nth pixel valid output

DVp(n) : nth pixel output value scanning white-reference document before dark and white correction when the illuminations are on. (original data of white output)

DVd(n) : nth pixel output value before white correction when the illuminations are off.

$$UEp = \frac{DVEp_{\max} - DVEp_{\min}}{DVEp_{\max}} \times 100 \%$$

DVEpmax : the maximum values of DVEp(n) respectively.

DVEpmin : the minimum values of DVEp(n) respectively.

4.4 M T F (MTF)

(dark correction:ON, white correction :ON, illuminations :ON)

$$MTF = \frac{IE_{\max} - IE_{\min}}{IE_{\max} + IE_{\min}} \times 100\%$$

IEmax : The maximum values of DVEp, respectively, obtained every sensor ICs when scanning the MTF test document.

IEmin : The minimum values of DVEp, respectively, obtained every sensor ICs when scanning the MTF test document.

Table 4 Measurement Conditions (Standard Condition of factory shipment inspection)

Item	Symbol	Specifications	Units	Remarks
Supply Voltage for sensors and illumination	VDD	+24.0±1.2	V	
White chart	—	White PET Film Lumirror ®#250-E22	-	-
MTF chart	—	Mitsubishi Electric standard	-	5.68lp/mm
Position of document	—	52±0.2	mm	Built-in light source products, distance from datum hole (nominal focal position)
		51.4±0.2		Light source-less product, distance from datum hole (nominal focal position)
Storing time	trep	19.8±0.1	μsec	
LED lighting period	—	14±0.1	μsec	
Temperature	Ta	23±4	°C	
Inspection light source	-	Refer to item 11.	-	Used for inspecting Light source-less product.

5. Absolute maximum rating

Table 5 Absolute maximum rating

Item	Symbol	Specifications	Units	Remarks
Supply voltage	VDD	-0.3 ~ 30	V	
Input voltage 1	Vi	-0.3 ~ 6	V	LED_CONT
Input voltage 2	Vi	-0.3 ~ VDD+0.3	V	Enable
Input voltage 3	Vi	-0.5 ~ +1.6	V	CoaXPress™
Output voltage 1	Vo	-0.5 ~ +1.6	V	CoaXPress™
Output Voltage 2	Vo2	-0.3 ~ 3.6	V	OUT_PULSE_A,OUT_PULSE_B
Output Current 1	Io1	-50 ~ 50	mA	OUT_PULSE_A,OUT_PULSE_B

6. Operating condition (Ta=25°C)

6.1 Standard operating conditions (recommended operating conditions)

Table 6 Standard operating conditions (recommended operating conditions)

Item	Symbol	Conditions		Specification			Units	Remarks
				MIN.	TYP.	MAX.		
Supply voltage	VDD	GND basis		22.8	24.0	25.2	V	
Current Consumption	IDD	VDD=24V	KD6R367CX2	—	3.0	4.8	A	
			KD6R587CX2	—	4.0	7.0		
			KD6R807CX2	—	6.0	9.7		
			KD6R367CX2-NL	—	1.5	2.4		
			KD6R587CX2-NL	—	2.3	3.5		
			KD6R807CX2-NL	—	3.4	4.9		
Input voltage 1	VEN	Device startup		-	-	0.7	V	Enable
		Device shutout		22.8	24	25.2		
Input voltage 2	VLED	LED_CONT		-	GND	-	V	GND : on OPEN : off
Output Voltage 1	VOH	OUT_PULSE_A		2.4	—	—	V	
	VOL	OUT_PULSE_B		—	—	0.4		
Output current 1	IOH	OUT_PULSE_A		-16	—	—	mA	
	IOL	OUT_PULSE_B		—	—	16		
Storing time	trep	150dpi		6.3	19.8	1872	μsec	
Environmental temperature	Ta	In operating temperature		+5 ~ +50			℃	
		In storage temperature		-5 ~ +55				
Environmental humidity	Rh	No dew condensation		10 ~ 90			%(RH)	
Frame temperature	Tw	In operating temperature		+5 ~ +70			℃	Refer Fig.7, Fig.11 for details
FPGA internal temperature				+5 ~ +85			℃	In operating temperature (※1)

(※1) Temperature inside FPGA device can be checked by reading control register Device Temperature Mainboard.

6.2 Output format

Output channel : Selectable CXP Quad、Dual、Single

Comparable bit rate : Supporting 6.25Gbps、5Gbps、3.125Gbps/channel

Image format : Selectable 24bit color、30bit color、8bit monochrome、10bit monochrome

Refer to Table.3 for the output pixels.

Table 7 Output pixels

model			KD6R367CX2 KD6R367CX2-NL	KD6R587CX2 KD6R587CX2-NL	KD6R807CX2 KD6R807CX2-NL	
Height			1			
Width	Overwrap OFF		Chanel 1	Chanel 1	Chanel 1	Chanel 2
		600dpi interpolation ON	8672 (8669+dummy3)	13872 (13871+dummy1)	8672 (8670+dummy2)	10404 (10403+dummy1)
		600dpi	8640	13824	8640	10368
		300dpi	4320	6912	4320	5184
		200dpi	2880	4608	2880	3456
		150dpi	2160	3456	2160	2592
	Overwrap ON	600dpi interpolation ON	Same as Overwrap OFF	Same as Overwrap OFF	8816 (8814+dummy2)	Same as Overwrap OFF
		600dpi			8784	
		300dpi			4392	
		200dpi			2928	
		150dpi			2196	

7. Serial communication

This product can be accessed through the CoaXpress™ connector.

It is compatible with GenICam™ standard, therefore it could be easily controlled by GenICam™ compliant Grabber board.

One CXP signal block exists for KD6R367CX2/ KD6R587CX2/KD6R367CX2-NL/KD6R587CX2-NL and two for KD6R807CX2/KD6R807CX2-NL.

GenICam™ compatible camera definition files (XML files) are stored in the product for each system and are read out during device discovery. (Please refer to the specifications of your grabber board for the device discovery procedure.)

The first block (connectors D1 to D4) is the master line for the CXP signal system. The main functions of this product are controlled from the first block.

When using the external sync mode, input the external sync signal from the first master connector (D1). (No input is required when internal sync mode is selected.)

8. Connector Pin Assignments

This product is equipped with the connectors shown in the following list.

Table 8 Connector list

Model	Power supply connector for sensors and illumination	CoaXPress™ Connector							
		Single	Dual		Quad				
KD6R367CX2 KD6R367CX2-NL	V1	D1	D1	D2	D1	D2	D3	D4	
KD6R587CX2	V1,V2	D1	D1	D2	D1	D2	D3	D4	
KD6R587CX2-NL	V1								
KD6R807CX2 KD6R807CX2-NL	V1,V2	D1	D1	D2	D1	D2	D3	D4	
		D5	D5	D6	D5	D6	D7	D8	

8.1 CoaXpress™ Connector

D1~D8: DIN 1.0/2.3

Table 9 Connector pin assignment

No	Name	Symbol	I/O	
1	CXP signal block 1 (Master block)	CXP1	I/O	D1 : Image signal, Control signal (Master) ,External sync. signal D2~D4 : Image signal
2	CXP signal block2 (Slave block)	CXP2	I/O	D5 : Image signal, Control signal (Slave) D6~D8 : Image signal

8.2 Power Cable Connectors for sensors and Illumination

V1,V2: SACC-DSI-M12MST-4CON-M16/0,5 [Phoenix Contact]

Table 10 Pin Assignment

No	Name	Remarks
1	LED_CONT	OPEN : LED OFF GND : LED ON
2	ENABLE	Normal operation : GND or OPEN Reboot : GND or OPEN after +24V is applied
3	+24V	VDD
4	GND	GND

8.3 External Lighting Control Connector L1

L1: LF10WBR-4P [HRS]

Table 11 Pin Assignment

No	Name	symbol	I/O
1	OUT_PULSE_B		O
2	NC		-
3	OUT_PULSE_A		O
4	GND	GND	-

9. Precautions on Use

This Product is designed for the purpose of being used in general industries. If you plan to use it for special applications (aerospace applications, combustion equipment, transportation equipment, life-support systems, safety devices, etc.) where especially high quality and reliability are required and failure or malfunction could directly threaten people's lives, or do harm to the human body, or if you plan to use it for applications other than the standard application intended by Mitsubishi Electric (the "Company"), please consult our sales department personnel before doing so. If you have used it for applications other than the general industries intended by the Company without consulting our sales department personnel, the Company SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT.

The Company will analyze a defective Product on your request. And if the defect is attributable to the Company and within 1 year from the Product shipment, we will repair the Product itself at free of charge or replace with the alternative Product.

The Company's quality assurance responsibility is limited to the above and the Company does not assume responsibility for any indirect damages, etc.

(1) Be careful with the glass of the Product in case of carrying the product, or when replacing the glass.

(2) Keep the glass surface always clean. Do not touch the surface directly with fingers or use it in a dusty environment. When it is contaminated, wipe it lightly with a cloth soaked with alcohol.

Upon doing so, handle with care not to form any streak on the glass. Do not blow off dust with air guns.

(3) To prevent foreign objects from entering the Product, do not remove the side plates (bracket), etc.

(4) The Product can be damaged by ESD. Handle the Product with care as shown below.

1) Do not handle the Product on the insulating sheet or wooden desk.

2) In case of touching the Product, do not use gloves made of chemical fiber (example: nylon).

Use gloves and fingerstalls preventing from static electricity.

3) Do not wrap the Product with paper, polyethylene or other electrical chargeable sheet.

4) To prevent an electrostatic breakdown occurring in the IC etc., take great care not to touch the terminal, other electrical parts and board directly by fingers or keep it away from electrical chargeable objects.

5) When the equipment, which the Product will be installed, tends to generate static electricity, take The great care on static electricity, which it may not cause negative impact to the Product, when operating the equipment.

(5) To realize the stable behavior of IC, take care on handling the Product as follows:

1) Applying a voltage exceeding the absolute maximum rating of IC, even if it is a surge, will cause a latch-up, resulting damage to the sensor. Take the great care not to allow the voltage to each terminal to exceed the absolute maximum rating at rapid changes in the current passing through the external circuits or at power-ON/OFF. If the same power supply is used for this product and your equipment, or if the cable wiring of this product and the wiring of your equipment with a large current flow are connected in parallel, the coupling may cause a surge that exceeds the rating. Please be careful about surges caused by the operation of your equipment.

2) To scan the stable image, it is recommended to refresh the dark and white correction data (Shading correction) before each scan.

3) Please be careful not to misconnect the power supply for driving the sensor and light source. Internal electrical components may be damaged.

(6) Precautions for installing the Product

1) Please do not place any components, boards, cables, etc. that may be affected by noise near the cover of this product.

2) Do not seal near the air outlet of the FAN by any obstructions.

(7) Storage environment and usage environment

- 1) If the light source unit of this product is exposed to corrosive gas such as hydrogen sulfide, the amount of light may decrease due to the sulfur component. Do not store or use this product in an environment exposed to corrosive gas.
- 2) Because corrugated cardboard contains sulfur components, corrosive gas may be generated. When storing this product for a long period of time, please take care not to place cardboard boxes around it after unpacking it from the packing box in which it was shipped from our company.

(8) For details on product handling, refer to the instruction manual (TM-XN192).

10. Outline drawing

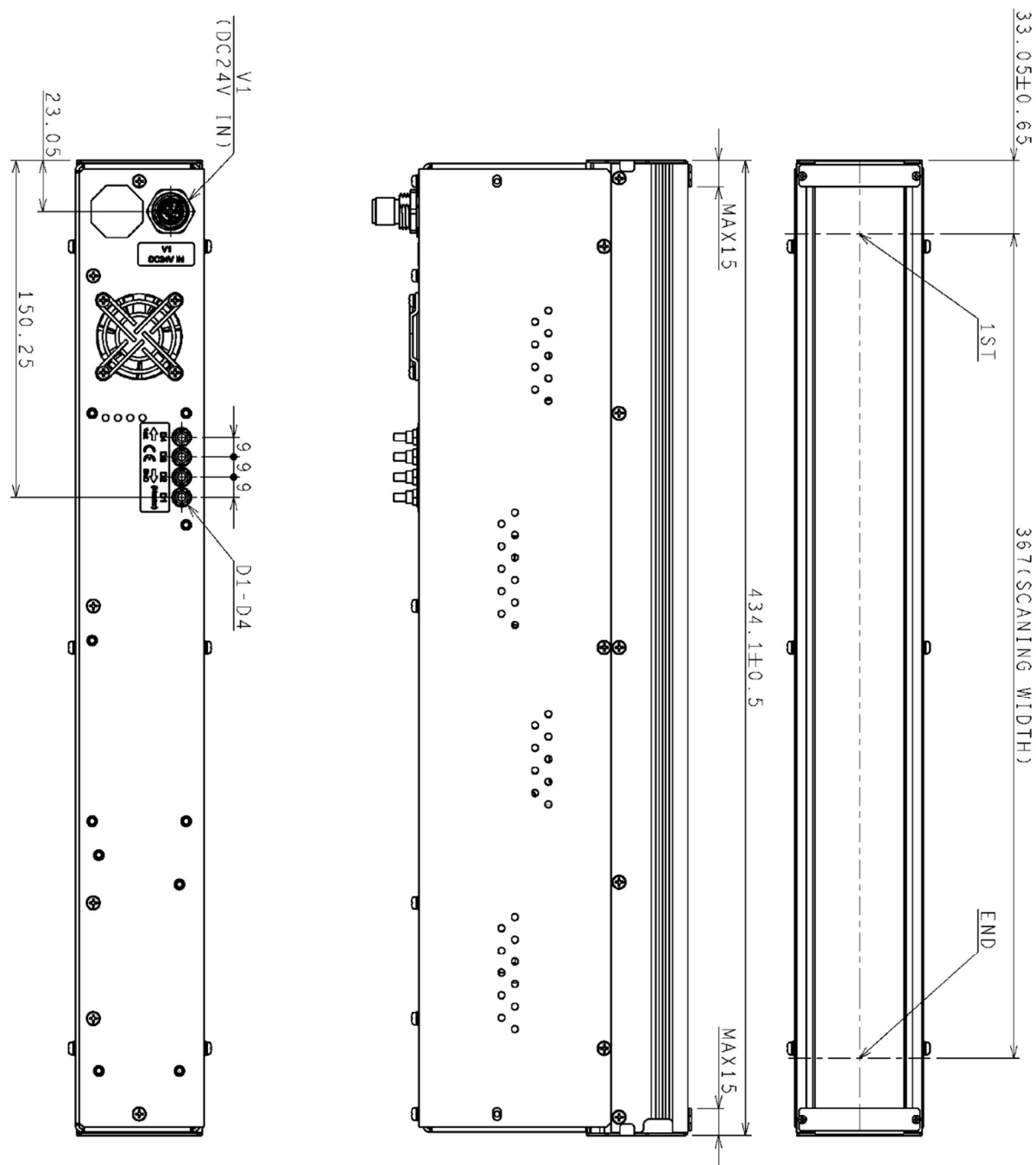


Fig.3 KD6R367CX2 Outline drawing

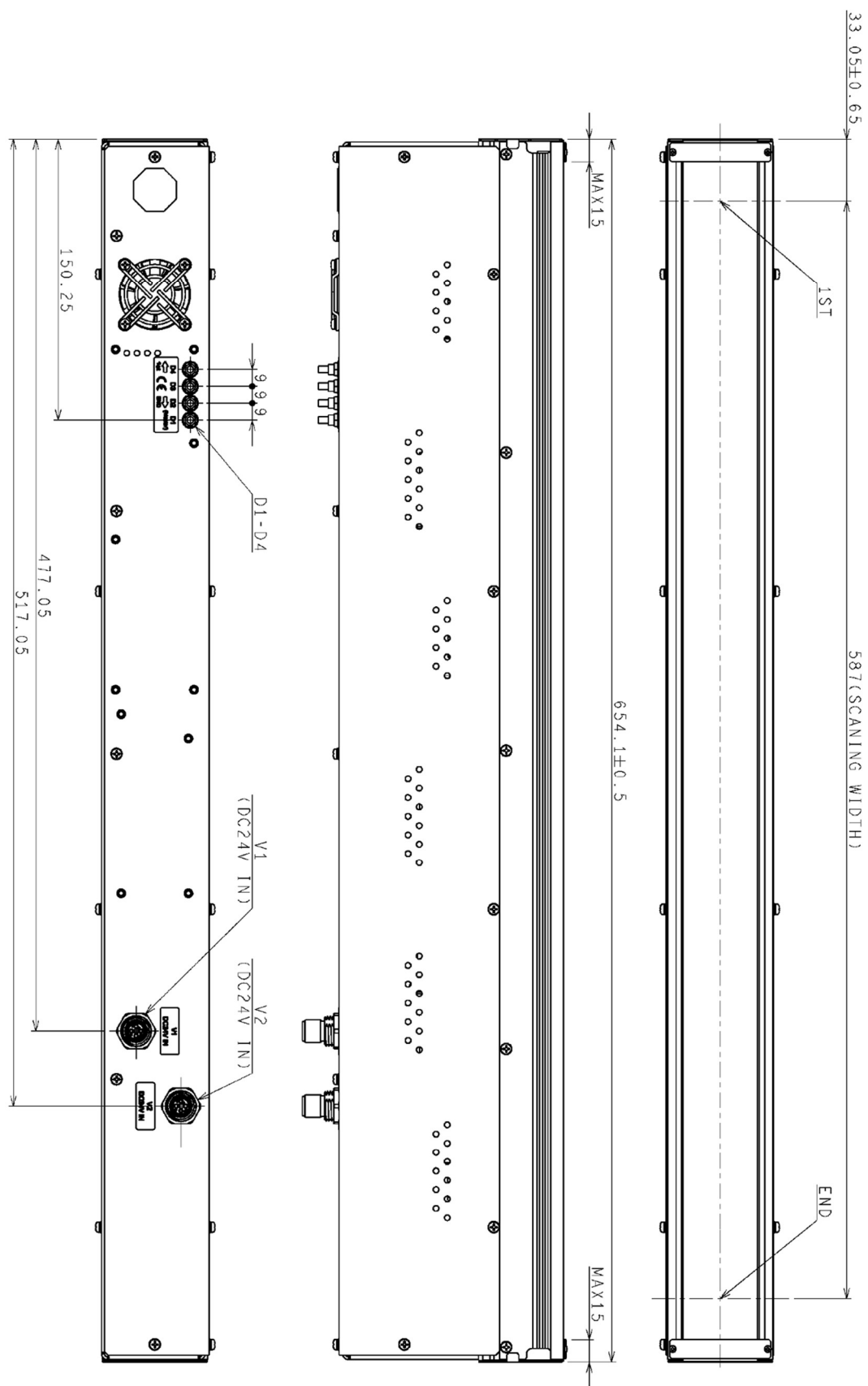


Fig.4 KD6R587CX2 Outline drawing

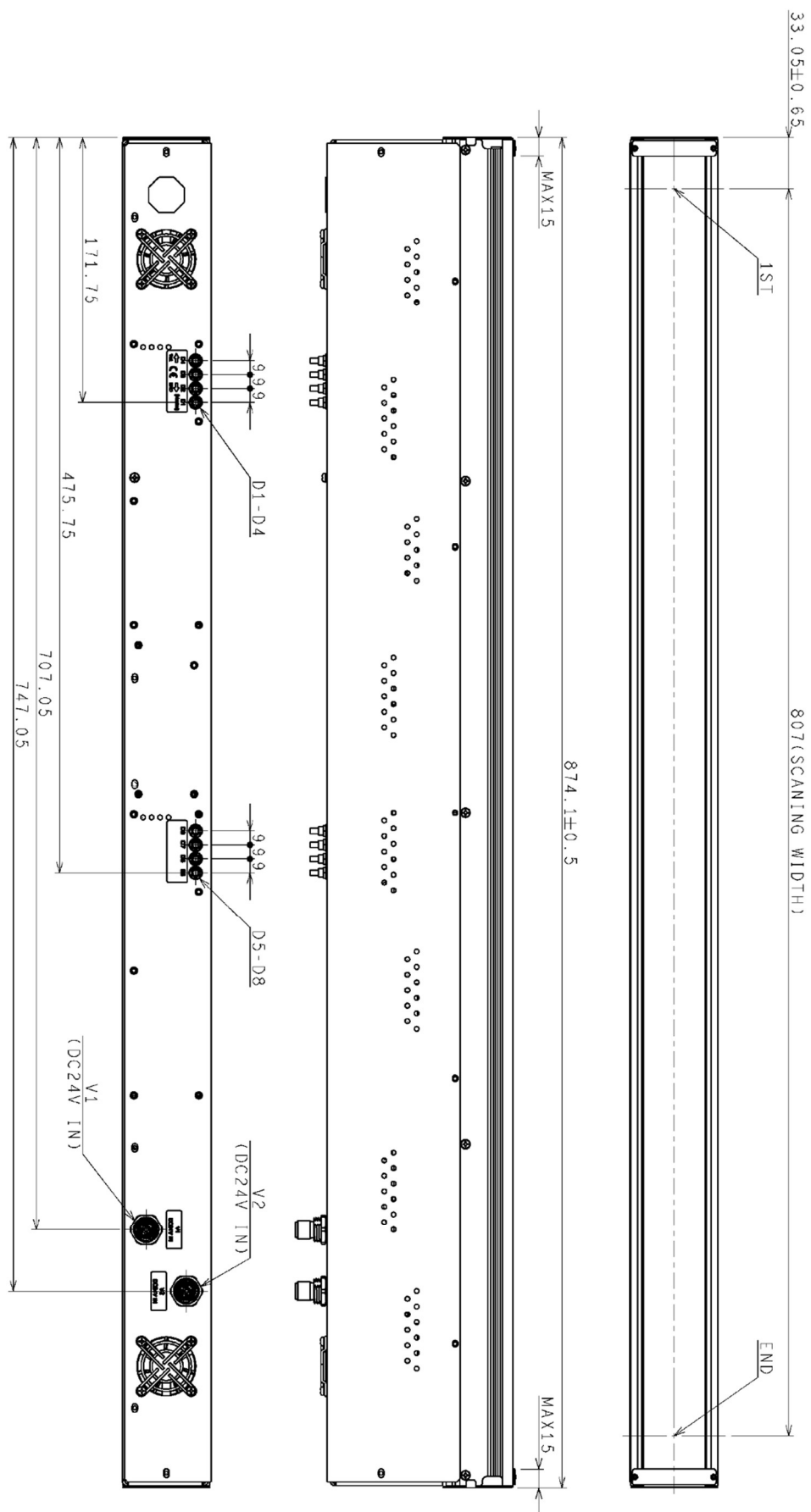


Fig.5 KD6R807CX2 Outline drawing

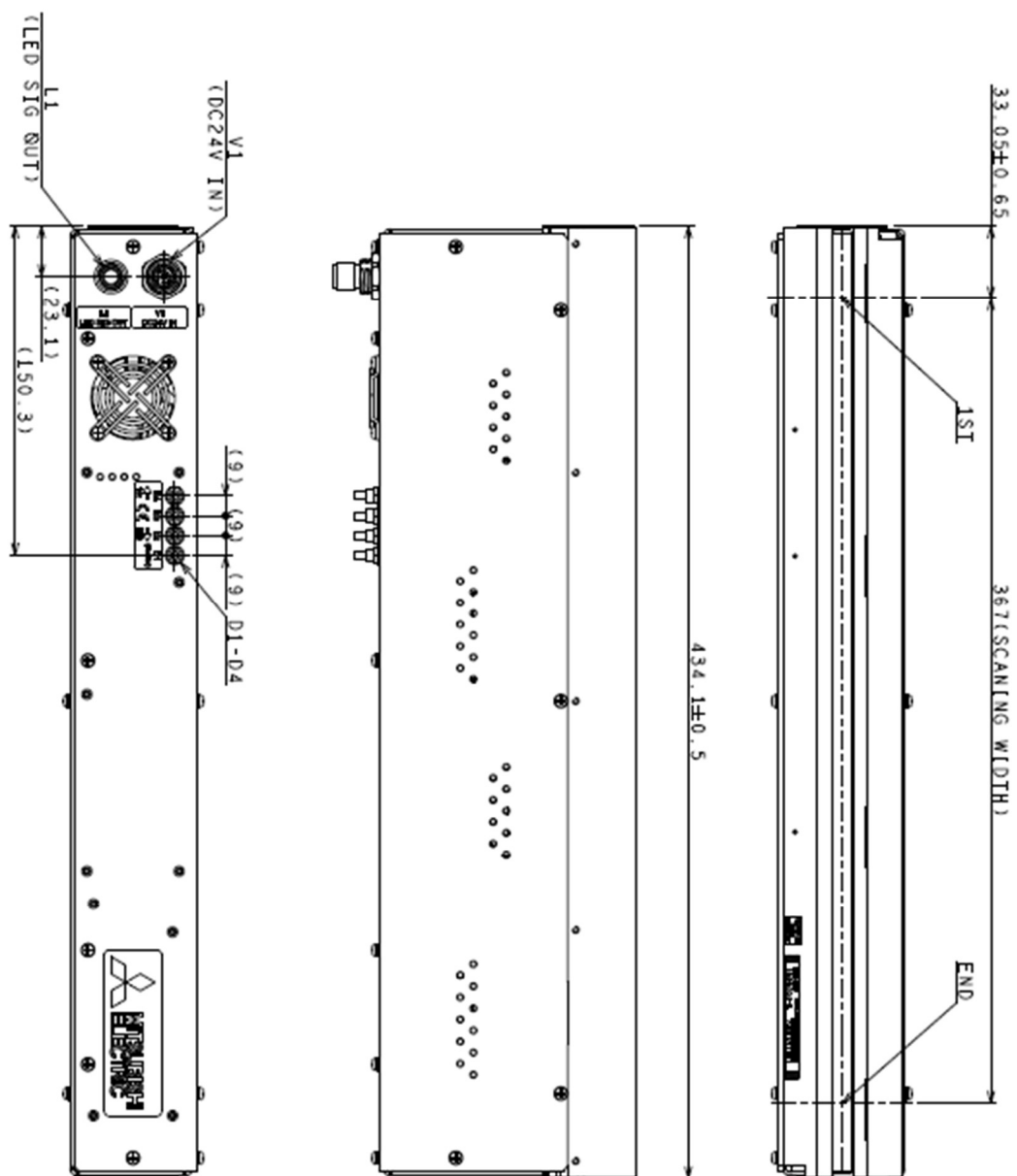


Fig.8 KD6R367CX2-NL Outline drawing

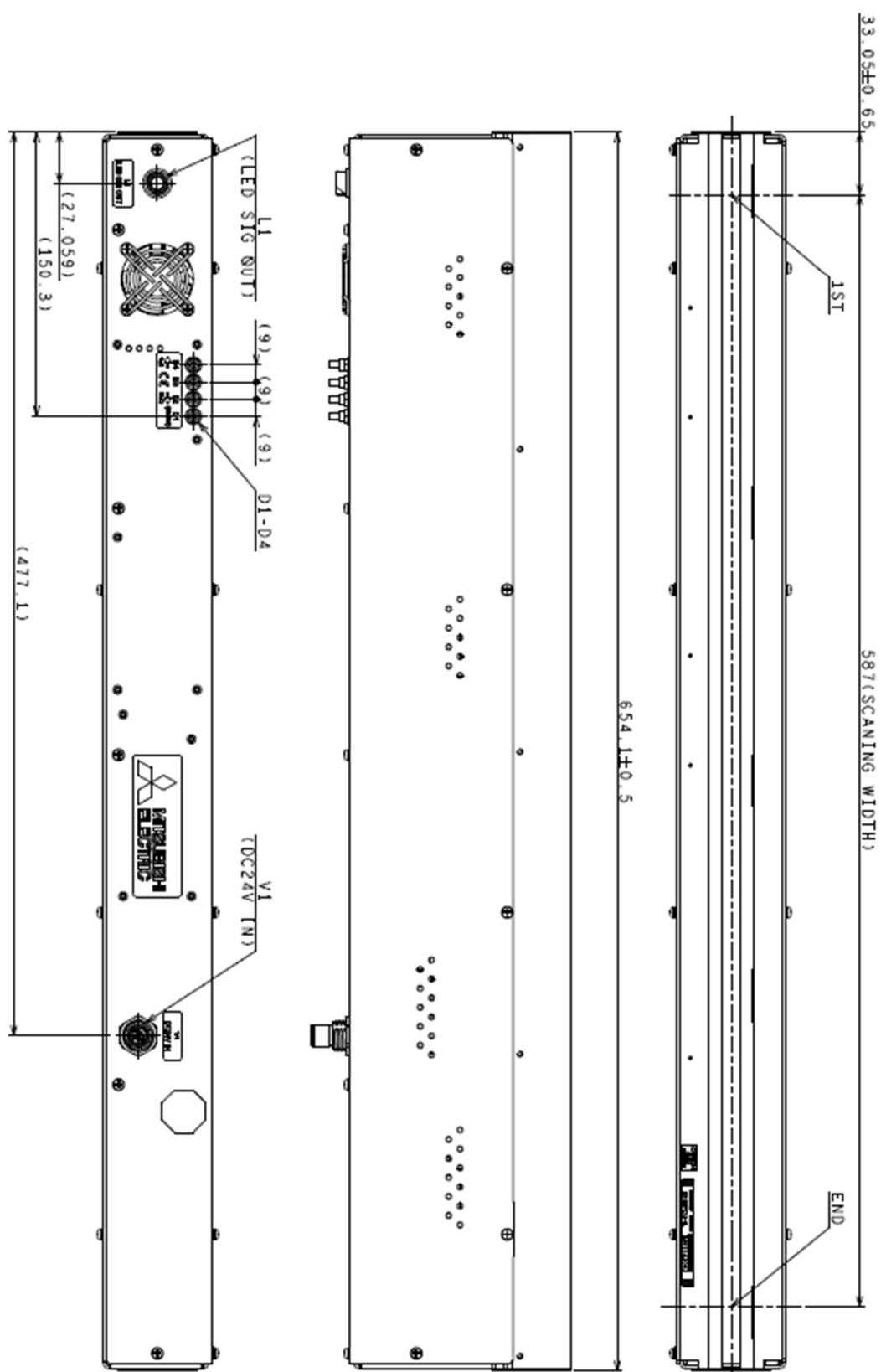


Fig.9 KD6R587CX2-NL Outline drawing

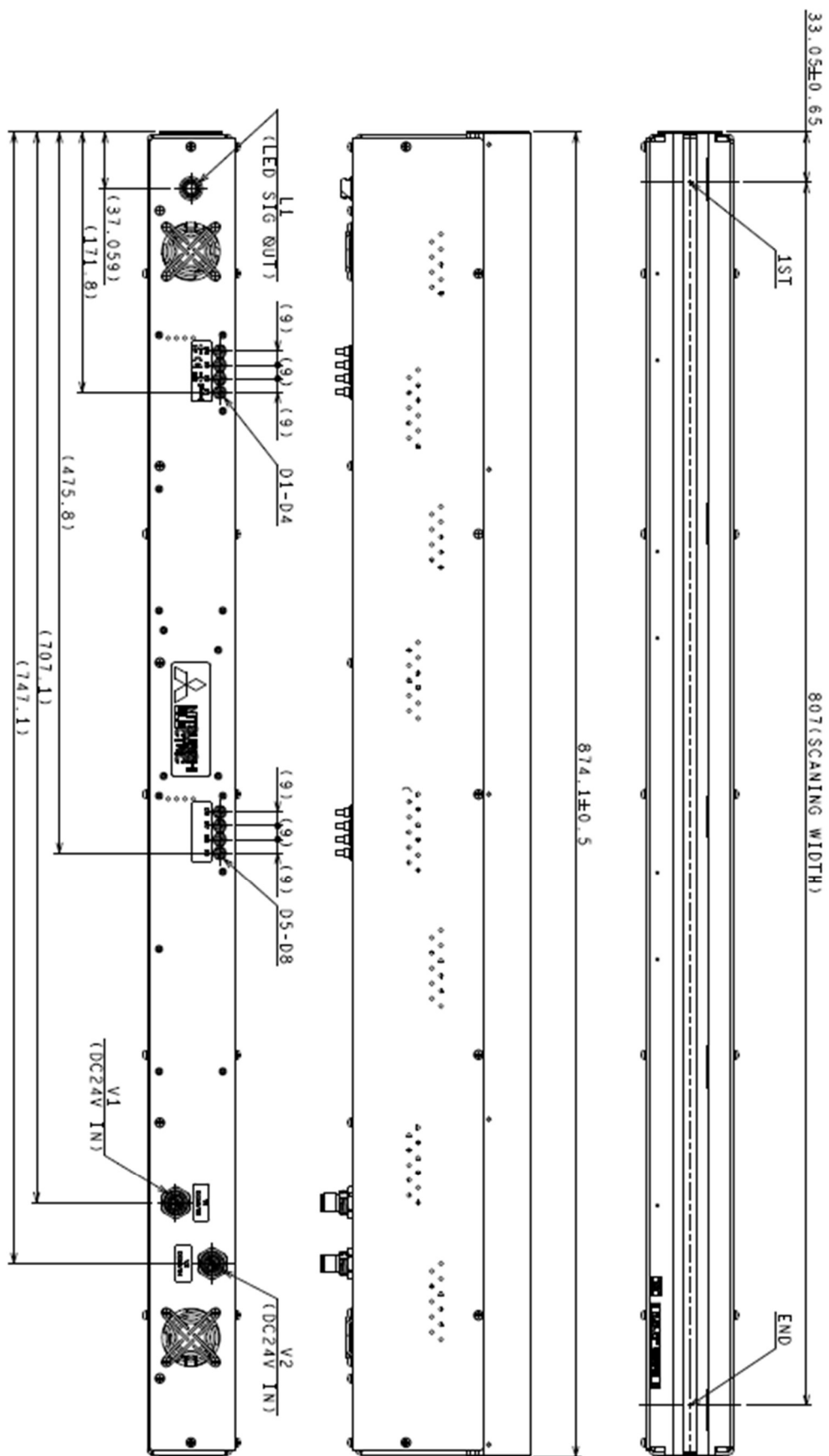


Fig.10 KD6R807CX2-NL Outline drawing

1st

END

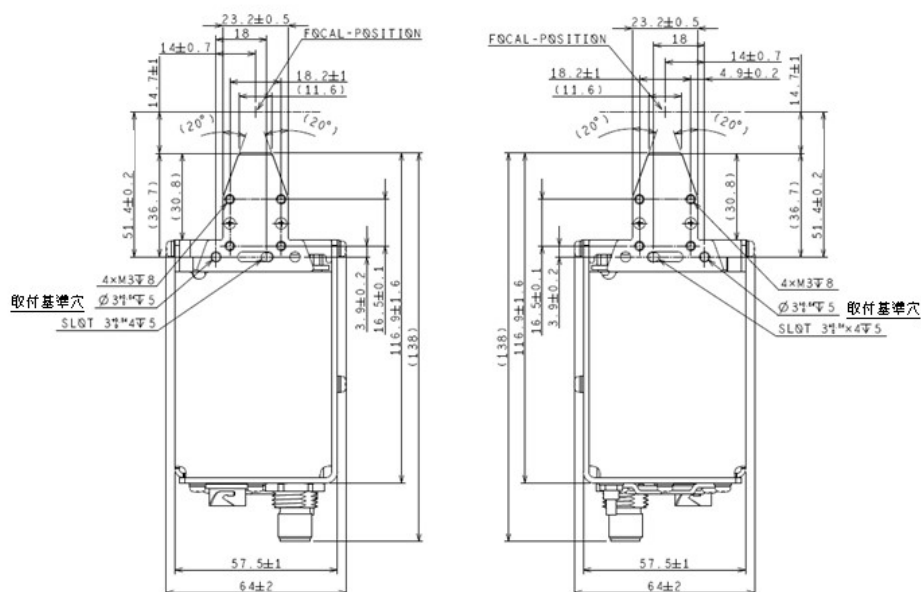
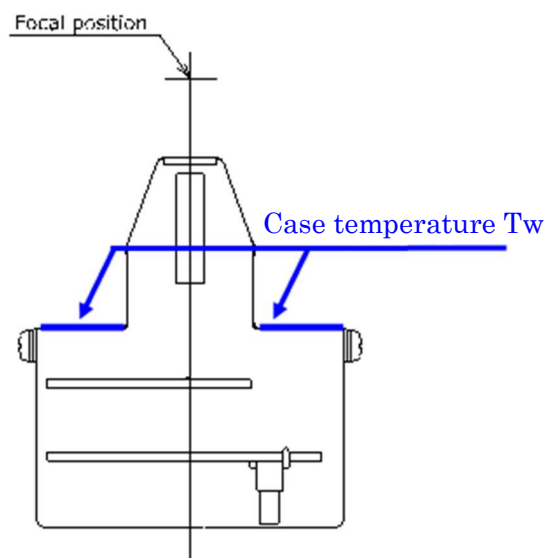


Fig.11 Side views (common to products without light sources)



< Definition of Frame Temperature >

Frame temperature is described as TW in Fig.12.

Since a temperature gradient may be generated depending on the fan installation position, check the enclosure temperature at the hottest part in the longitudinal direction and use the product in an environment where the temperature does not exceed 70° C (343.15 K).

Fig.12 Side views (common to products without light sources)

11. Illumination (LED) for Outgoing Test

The following is for reference only. When using products without light sources, please use it after fully evaluating it in advance with the combination of the external light sources used.

We use Mitsubishi standard white LED illumination, which is the same as the one used in in products with built-in light sources, in our factory shipment inspection. The inspection measures a diffused light reflected from Mitsubishi standard white-basis-chart. We use an illuminometer T-10MA manufactured by Konica Minolta.

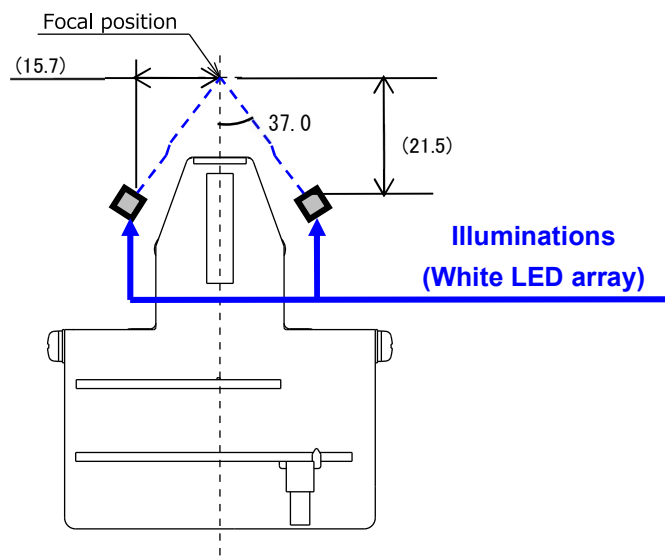


Fig.13 Standard illumination mounting position of products with built-in light sources

Table 8 Mitsubishi standard white LED illumination

Item	Specifications	Unit	Remarks
Average intensity	86,500±15%	lx	Average value at the focal position when lit with a storing time of 19.8 μsec and a lighting period of 14 μsec.
Uniformity	30 MAX	%	(max-min)/max
Chromaticity (Reference value)	Range enclosed by (x,y)=(0.2750, 0.2374),(0.2750, 0.2574), (0.2900, 0.2850),(0.2900, 0.2650)	-	Catalog spec for single LED chip

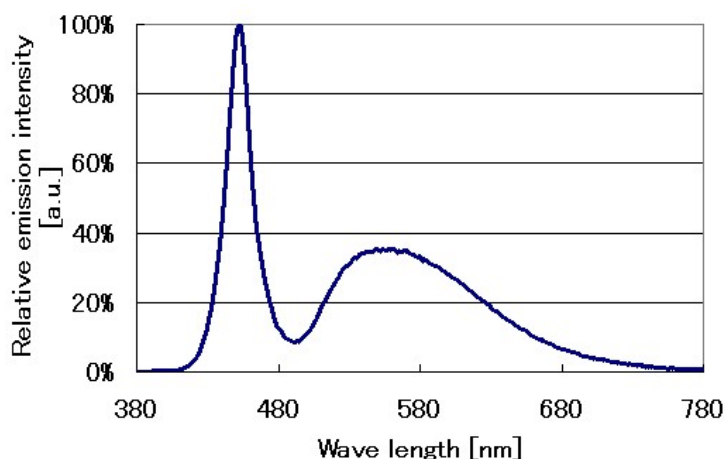


Fig.14 Spectrum example of Mitsubishi standard white LED illumination

12. Product serial

The product serial consists of 10-digit number.

Serial No (Example) : 24 02 ** 5001

24 : Production year (2024)

02 : Production month (02:February)

** : Model No

60 (KD6R367CX2)

61 (KD6R587CX2)

62 (KD6R807CX2)

63 (KD6R367CX2-NL)

64 (KD6R587CX2-NL)

65 (KD6R807CX2-NL)

5001 : Manufacturing No

0001~9999