

**Ultra-miniature B/W CCD Camera
Model MC-RS**

Operation Manual

BEFORE USE - GENERAL SAFETY INSTRUCTIONS

This instruction manual contains important information for the operator (user) and/or people around him/her to avoid personal injury, or property damage to him/her or people around him/her by using this product correctly. Prior to use, read this operation manual carefully to fully understand its instructions for correct use.

OWNER'S RECORD

Please fill in the blank below the model name and product serial number, which is found on bottom chassis of your device. Keep this number for your record.



Model Name _____

Serial No. _____

WARNINGS & CAUTIONS





[Definition of markings]

The meaning of each mark used in this instruction manual is given below.










 DANGER	This mark warns the user that improper use, indicated with this mark, may cause death or severe personal injuries against the user or people around him/her.
 CAUTION	This mark warns the user that improper use, indicated with this mark, may cause personal injuries (*1) or material damages (*2) against the user or people around him/her.

Notes








- *1 : Personal injuries mean wounds, burns, electric shocks, and others for which the person injured need not to be hospitalized or to be cared for the long term.
- *2 : Material damages mean any direct or consequential damages related to property or material loss.

	This mark indicates what the user SHOULD NOT DO . The details of things that the user should not do are described next to this mark.
	This mark indicates what the user MUST DO . The details of things that the user must do are described next to this mark.
	This mark indicates that the user must be alert against a possible DANGER . The details of the danger that the user must be aware of are described next to this mark.
	This mark indicates that the users are given a CAUTION against possible hazards. The details of the caution that the user must be aware of are described next to this mark.

● Handling Precautions

 DANGER	
 MUST	<p><u>If any overheating sign is observed, discontinue use immediately.</u></p> <p>In the event that smoke, smell, or any other overheating sign is observed, turn its power switch OFF immediately, and remove its camera cable from camera connector. Do NOT try to continue to use your camera. To do so in spite of a clear sign of a malfunction invites a fire, an electric shock hazard, or any other serious damage. In such case, after confirming that there is no risk of a fire accident, contact us or our dealer/distributor through which you purchased this device for repair service. To avoid hazard, do NEVER attempt to repair it yourself.</p>
 MUST	<p><u>If any malfunctioning sign is observed, discontinue use immediately.</u></p> <p>Do NOT try to use this device when it is obviously malfunctioning. (Example: No images on the monitor) In the event of a malfunction, turn its power switch OFF immediately, and remove its camera cable from camera connector. In such case, contact us or our dealer/distributor through which you purchased this device for repair service.</p>
 MUST	<p><u>If any liquid gets into the device, discontinue use immediately.</u></p> <p>In the event that water, or any other type of liquid gets into the body, do NOT try to continue to use the device. To do so invites a fire or an electric shock hazard. In such case, turn its power switch OFF immediately, and then remove its camera cable from camera connector. After that, contact us or our dealer/distributor through which you purchased this device for repair service/technical advice.</p>
 MUST	<p><u>Connection/Disconnection only AFTER power OFF.</u></p> <p>When you connect/disconnect camera connector, make sure to turn power SW OFF first. This camera is not designed for “hot-plugging”. Do NEVER make connection/disconnection while power ON. Doing so might cause a breakdown.</p>
 MUST	<p><u>Use manufacturer-recommended peripheral devices (option units) only.</u></p> <p>Make sure to use option units specified in this operation manual only. When connected with any other non-guaranteed peripheral devices, your camera might fail to perform its full capacity. In the worst case, it might cause a fire or breakdown.</p>
 NEVER pull apart	<p><u>Do NOT disassemble this device.</u></p> <p>Do NOT attempt to pull apart, repair, or modify your camera yourself. To do so might lead to a fire or an electric shock accident. Contact us or the dealer/distributor from which you purchased the device for repair/modification.</p>
 DON'T	<p><u>Do NOT supply any power other than specified.</u></p> <p>This device is designed to work only under specified voltage. Do NOT attempt to supply the device with power other than specified. Supplying the device with any unspecified power invites a fire or an electric shock hazard. (MC-RS --- DC+12V)</p>
 DON'T	<p><u>Do NOT use the camera in a high-humidity environment.</u></p> <p>Do NOT place your camera near a humidifier, or in other high-humidity environment. To do so might cause a fire or an electric shock accident.</p>

● Handling Precautions

 CAUTION	
 CAUTION	<p>If the camera is operated in the electromagnetic field, there may be cases where beat noises (vertical, horizontal, or oblique stripes) appear in the video output. In that case, take preventive measures on the electromagnetic-wave generating source so that your camera does not receive the interference by the electromagnetic-wave. Take extra precautions against electromagnetic-wave-interference if your camera is used with a servomotor, inverter, or other electromagnetic-wave-generating equipment.</p>
 CAUTION	<p>Avoid giving a strong shock against the camera body. It might cause a breakdown or damage. If your camera is used in a system where its camera head is subjected to strong repetitive shocks, its camera head is possible to break down. If you intend to use your camera in such a situation, make sure to use an optional camera-connector-fixing-hardware to connect the connector-plug to the camera body.</p>
 CAUTION	<p>When the camera is not in use, put a lens or a lens-cap onto the camera head so that the image pickup plane of CCD is protected from dust, foreign object, or any other flaw-causing object. If the glass plane (image pickup plane) gets dirty, clean it with a cotton swab. When it needs to be cleaned with a cleaner, be sure NOT to use any organic solvent other than ethyl alcohol. As a countermeasure against condensation, when the camera is moved from a warm condition/environment to a cold one, take appropriate precautions to prevent condensation from forming on the camera.</p>
 CAUTION	<p>Do not pull strongly the camera cable/camera-head nor swing it. The stress from pulling or swinging may cause damage in the coating of the cable, or breaks in the inside wires.</p>
 CAUTION	<p>Avoid short-circuiting signal output. Otherwise, it may cause a malfunction.</p>
 CAUTION	<p>Do NEVER expose its camera head to any intensive light (such as direct sunlight). Otherwise, its inner image pickup device might get damaged.</p>

RESTRICTION FOR USE

In the case where a malfunction of this camera (e.g. video output cut-off) can be expected to lead to a significant accident, avoid using this device for such system build-in use.

DISCLAIMER (LIMITED WARRANTY)

We assume no responsibility and shall be held harmless for damage or loss incurred by the user in the following cases.

1. In the case where damage or loss is caused by fire, earthquake, or other acts of Gods, acts by a third party, misuse by the user deliberately or erroneously, or use under extreme operating conditions.
2. In the case where any indirect, additional, consequential damages (e.g. loss of expected interest, suspension of business activities) are incurred as results of a malfunction or non-functioning of this device, we shall be exempted from assuming responsibility for such damages.
3. In the case where damage or loss is caused by incorrect use which is not in line with the instructions given in this operation manual.
4. In the case where damage or loss is caused by a malfunction resulting from bad connection with other equipment.
5. In the case where damage or loss is caused by repair or modification done by the user.

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1. PRODUCT DESCRIPTION

Model MC-RS is a miniature camera featuring its ultra-small light-weight body. The MC-RS camera is designed mainly for factory automation, machine vision, and image measurement application.

2. FEATURES

(1) High resolution

The 380,000 pixels CCD realizes the horizontal resolution of 570TV lines. High-density images with minimum moire-fringes & beatings are obtained.

(2) Ultra-compact & light-weight body

The camera features its ultra-small light-weight body. Its super-small body will free you from much of your space restriction problem. The camera is driven by DC12V.

(3) Electronic shutter

The built-in electronic shutter allows this camera to capture a fast-moving object clearly and sharply. (ON/OFF selection via panel SW, Shutter-speed selection via inner SW)

(4) AGC (Automatic Gain Control)

This series is equipped with AGC function. With the AGC, the camera obtains optimal images constantly even when the amount of incoming light fluctuates. (ON/OFF selection via panel SW)

(5) Restart/Reset

When the restart/reset function set ON, the camera captures images at any timing given by R.R. pulse input (VD input). (ON/OFF selection via inner SW)

(6) SS (Special shutter) & RTS (Random trigger shutter)

This camera is fitted with special shutter and random trigger shutter function, which allows the camera to capture images cued by external trigger input. (ON/OFF selection via inner SW)

3. CONFIGURATION

(1) Camera body

1

4. CONNECTION / MODE / REAR-PANEL SWITCH

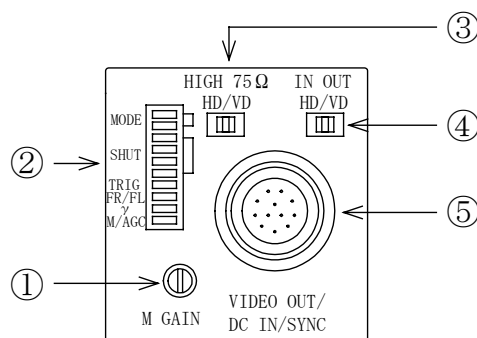
(1) Connector Pin Assignment

Compatible plug: HR10A-10P-12S (Manufactured by HIROSE ELEC.)

Pin No.	External sync.			Internal sync.
	HD VD	VS/SYNC	R.R.	
1	GND	GND	GND	GND
2	+12V	+12V	+12V	+12V
3	GND	GND	GND	GND
4	VIDEO OUT	VIDEO OUT	VIDEO OUT	VIDEO OUT
5	GND	GND	GND	GND
6	HD IN	-----	HD IN	HD OUT*
7	VD IN	VS/SYNC IN	R.R. IN	VD OUT*
8	GND	GND	GND	GND
9	CLOCK OUT	CLOCK OUT	CLOCK OUT	CLOCK OUT
10	WEN OUT	WEN OUT	-----	WEN OUT
11	TRIG IN	TRIG IN	TRIG IN	TRIG IN
12	GND	GND	GND	GND

* HD VD output is available via inner SW selection under internal sync operation.

(2) Rear SW, Potentiometer, Connector



Rear View

1. Gain adjustment potentiometer

This manual gain adjuster is enabled under Manual Gain Control setting (Gain selection SW: MGC). Turned clockwise, video amplification gain increases.

2. Mode selection SW

This is the camera mode selection switch.

3. 75-ohm termination ON/OFF SW

This SW switches external-sync input terminal 75-ohm termination ON/OFF. When set in right side, the termination is 75-ohm. When set in left, it is 10k-ohm. The initial factory setting is in OFF position.

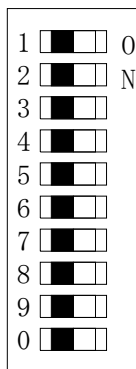
4. HD VD IN/OUT selection SW

This is the HD VD sync-signal IN/OUT selection switch. The status is HD VD IN when set in left side, HD VD OUT when in right. The initial setting is EXT.

5. DC IN/SYNC

This connector is for DC power input, external sync signal input, and video output, to be connected with a power supply, sync-signal generator, and video monitor.

(3) DIP SW



Using the rear-panel DIP switch, you can make various mode setting. Each numbered switch is OFF in LEFT position, and ON in RIGHT position.

[Shutter-speed Setting]

Number	Shutter OFF	1/125	1/250	1/500
1	---	---	---	---
2	---	---	---	---
3	OFF	ON	OFF	ON
4	OFF	OFF	ON	ON
5	OFF	OFF	OFF	OFF
6	OFF	OFF	OFF	OFF
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
0	---	---	---	---

Number	1/1000	1/2000	1/4000	1/10000
1	---	---	---	---
2	---	---	---	---
3	OFF	ON	OFF	ON
4	OFF	OFF	ON	ON
5	ON	ON	ON	ON
6	OFF	OFF	OFF	OFF
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
0	---	---	---	---

Number	Flicker-less	1FLD	2FLD	4FLD
1	---	---	---	---
2	---	---	---	---
3	OFF	ON	OFF	ON
4	OFF	OFF	ON	ON
5	OFF	OFF	OFF	OFF
6	ON	ON	ON	ON
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
0	---	---	---	---

Number	6FLD	8FLD	10FLD	Pulse-width
1	---	---	---	---
2	---	---	---	---
3	OFF	ON	OFF	ON
4	OFF	OFF	ON	ON
5	ON	ON	ON	ON
6	ON	ON	ON	ON
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
0	---	---	---	---

[Mode Setting]

Number	GAIN		TRIG Polarity	
	MGC	AGC	POSI	NEGA
1	---	---	---	---
2	---	---	---	---
3	---	---	---	---
4	---	---	---	---
5	---	---	---	---
6	---	---	---	---
7	---	---	OFF	ON
8	---	---	---	---
9	---	---	---	---
0	OFF	ON	---	---

Number	Integration Mode		Gamma Correction	
	Frame	Field	1.0	0.45
1	---	---	---	---
2	---	---	---	---
3	---	---	---	---
4	---	---	---	---
5	---	---	---	---
6	---	---	---	---
7	---	---	---	---
8	OFF	ON	---	---
9	---	---	OFF	ON
0	---	---	---	---

[Restart/Reset, Special Shutter]

Number	Normal Shutter	Restart/Reset	Special Shutter
1	OFF	ON	ON
2	OFF	ON	ON
3	OFF	ON	ON
4	OFF	ON	ON
5	OFF	ON	ON
6	OFF	ON	ON
7	---	---	---
8	---	---	---
9	---	---	---
0	---	---	---

[Random Trigger Shutter]

Number	Normal	Mode 1 / Mode 2	Mode 3 / Mode 4
1	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	---	---
4	OFF	---	---
5	OFF	---	---
6	OFF	---	---
7	---	---	---
8	---	---	---
9	---	---	---
0	---	---	---
Number	----- -	Mode 5 / Mode 6	Mode 7 / Mode 8
1	----- -	OFF	ON
2	----- -	OFF	OFF
3	----- -	---	---
4	----- -	---	---
5	----- -	---	---
6	----- -	---	---
7	----- -	---	---
8	----- -	---	---
9	----- -	---	---
0	----- -	---	---

5. OPERATION

- (1) Connect each system component.
- (2) Turn the power switch of the video monitor ON.
- (3) Feed power to the camera.
- (4) Confirm that images appear on the video monitor. Adjust the lens aperture so that the optimal illumination is obtained.
- (5) While monitoring the images on the video monitor, adjust the lens-focus so that the sharpest images are obtained.

- (6) Adjust sensitivity. The factory setting is in MGC (Manual Gain Control). AGC (Automatic Gain Control) mode is also available. The selection is made via DIP SW selection on the rear side. Under the MGC mode, a user enables the rear-panel M GAIN potentiometer for manual gain adjustment.
- (7) Select gamma factor. The factory setting is 1.0. The selection between 1.0 and 0.45 is made via the rear DIP SW selection.
- (8) Select the electronic shutter ON/OFF. The factory setting is in OFF position. To set E-shutter ON, use the rear-panel DIP SW.
- (9) Select integration mode. The selection between the frame/field integration is made via the rear DIP SW selection. The initial factory setting is the frame integration.
- (10) Set restart/reset, special shutter, or random trigger shutter mode as necessary. The factory setting is all in OFF position. Each function is set ON/OFF via the rear DIP SW selection.
- (11) If you need HD VD output, use the rear DIP SW under internal sync operation.
- (12) For connection with an image processor and other peripheral devices, this camera is provided with CLK OUT (Clock output function).

6. SPECIFICATIONS

Model	MC-RS
(1)TV system	EIA format
(2)Image sensor	Interline CCD ICX038DLA
Total pixel counts	811 (H) x 508 (V)
Active pixel counts	768 (H) x 494 (V)
Video output pixel counts	756 (H) x 485 (V)
Cell size	8.4 x 9.8 micro m
Scanning area	6.5 x 4.85 micro m (= Equivalent to 1/2 type pickup tube)
H driving frequency	[Internal sync] 14.31818MHz plus / minus 100ppm
(3)Scanning lines	525 lines
(4)Scanning format	2:1 interlace
(5)Sync system	Internal / External synchronization (Automatic change-over)
(6)Scanning frequency	Horizontal: 15.734kHz plus / minus 100ppm Vertical: 59.94Hz plus / minus 100ppm
(7)Aspect ratio	4:3
(8)Subject illumination	Standard: GAIN MGC, Gamma = 1.0 400 lx, F5.6 (3100K) Minimum: GAIN MAX, Gamma = 0.45 0.3 lx, F1.4
(9)Video output	VS: 1.0V(p-p)/75-ohm terminated
(10)Resolution	570TV lines (H) 485 lines (350TV lines) (V)
(11)SN ratio (typical)	60dB(p-p)/rms (GAIN MGC, Gamma = 1.0)
(12)Input signal	
-1. Ex-sync signal	HD.VD/SYNC/VS
Input level	HD.VD/SYNC: From 2 through 6V(p-p) VS: 1.0V(p-p) [SYNC: 0.3V(p-p)]

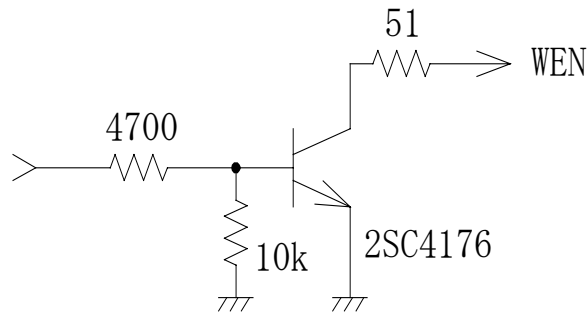
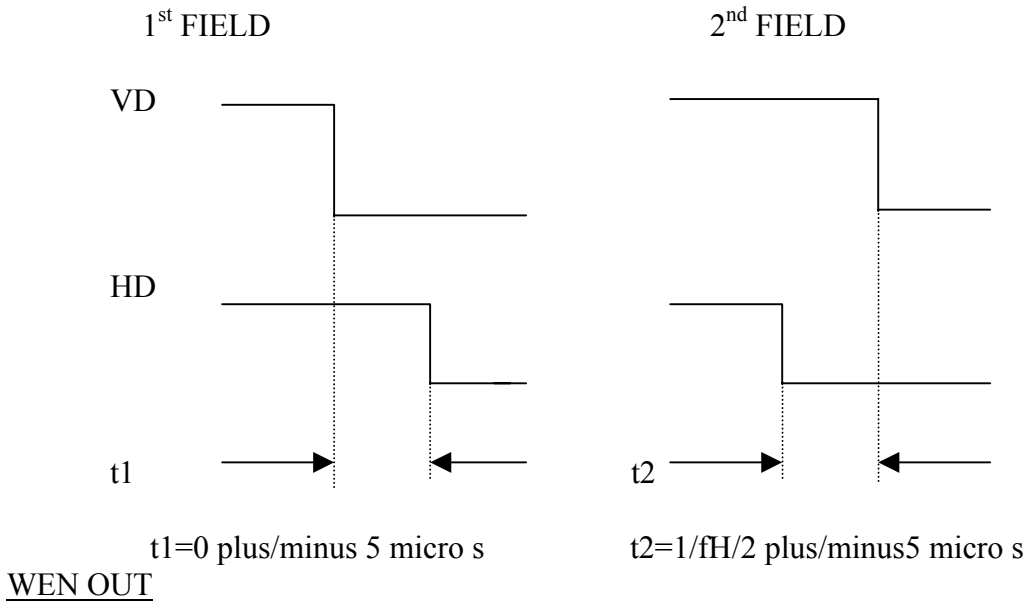
Input impedance	75-ohm/High: Switch-able by the panel SW (Initial factory setting: High)
Operation	2:1 interlace
Polarity	Negative
Pulse width	HD: 6.4 plus / minus 3 micro sec. VD: From 150 through 800 micro sec.
Repeating frequency	fH = 15.734kHz plus / minus 2 percent fV = 2fH/525
Scanning lines	525 lines
Phase difference	The difference in phase between the falling edge of VD and that of HD is shown in the figure below.
-2. Shutter trigger (TRIG)	
Input level	VL = From 0 through 0.5V VH = From 2 through 5V
Input impedance	High impedance
Polarity	Positive
Pulse width	From 2 micro sec. through 1/4 sec.
(13)Output signal	
-1. HD VD signal	Under internal sync operation, output available by the panel SW selection (Initial factory setting: OFF)
Output level	HD: 4.5 plus / minus 0.5V(p-p) VD: 4.5 plus / minus 0.5V(p-p) (Under no load)
Operation	2:1 interlace
Polarity	Negative
Pulse width	HD: 6.36 plus / minus 1 micro sec. VD: 572 plus / minus 10 micro sec.
Repeating frequency	fH = 15.734kHz p/m 100ppm fV = 2fH/525
Scanning lines	525 lines
-2. CLOCK signal	
Output level	2.0 plus / minus 0.3V(p-p) (Under no load)
Repeating frequency	14.318181MHz plus / minus 100ppm (Under internal sync)
-3. WEN signal	Under random trigger shutter operation, WEN is output during the period starting from the VIDEO OUT START VD falling edge through the VIDEO OUT END VD falling edge.
Polarity	Positive
Diagram	The circuit is shown in the figure below.
(14)Sensitivity setting	Mode selection via panel SW (Initial factory setting: MGC) AGC (Automatic Gain Control) MGC (Manual Gain Control)
(15)AGC	Video output fluctuation level within plus / minus 2dB against the fluctuation of incoming light amount ranging from 0dB through 12dB-under the standard subject illumination level.
(16)MGC	Manual sensitivity adjustment available

(17)Gamma	1.0 / 0.45 selectable via rear panel SW (Initial factory setting: 1.0)																																
(18)White-clip	Clip-level: 820m plus / minus 40mV(p-p)(Excluding SYNC)																																
(19)Electronic shutter	<u>Normal shutter</u> Shutter-speed selection available among; Normal, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000s, and Flicker-less (Initial factory setting: Normal) <u>Slow-speed shutter</u> 1FLD, 2FLD, 4FLD, 6FLD, 8FLD, and 10FLD																																
(20)Random trigger shutter	RTS Mode selection available <table border="1"> <tr> <td>1</td> <td>Shutter-speed Switch Setting</td> <td>Internal sync</td> <td>SYNC Non-reset</td> </tr> <tr> <td>2</td> <td>Shutter-speed TRIG Pulse-width</td> <td>Internal sync</td> <td>SYNC Non-reset</td> </tr> <tr> <td>3</td> <td>Shutter-speed Switch Setting</td> <td>Internal sync</td> <td>SYNC Reset</td> </tr> <tr> <td>4</td> <td>Shutter-speed TRIG Pulse-width</td> <td>Internal sync</td> <td>SYNC Reset</td> </tr> <tr> <td>5</td> <td>Shutter-speed Switch Setting</td> <td>HD / VD IN (*1)</td> <td>SYNC Non-reset</td> </tr> <tr> <td>6</td> <td>Shutter-speed TRIG Pulse-width</td> <td>HD / VD IN (*1)</td> <td>SYNC Non-reset</td> </tr> <tr> <td>7</td> <td>Shutter-speed Switch Setting</td> <td>HD / VD IN (*2)</td> <td>SYNC Non-reset</td> </tr> <tr> <td>8</td> <td>Shutter-speed TRIG Pulse-width</td> <td>HD / VD IN (*2)</td> <td>SYNC Non-reset</td> </tr> </table> <p>*1: Consecutive HD / Consecutive VD IN *2: Consecutive HD / Single VD IN</p>	1	Shutter-speed Switch Setting	Internal sync	SYNC Non-reset	2	Shutter-speed TRIG Pulse-width	Internal sync	SYNC Non-reset	3	Shutter-speed Switch Setting	Internal sync	SYNC Reset	4	Shutter-speed TRIG Pulse-width	Internal sync	SYNC Reset	5	Shutter-speed Switch Setting	HD / VD IN (*1)	SYNC Non-reset	6	Shutter-speed TRIG Pulse-width	HD / VD IN (*1)	SYNC Non-reset	7	Shutter-speed Switch Setting	HD / VD IN (*2)	SYNC Non-reset	8	Shutter-speed TRIG Pulse-width	HD / VD IN (*2)	SYNC Non-reset
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8	Shutter-speed TRIG Pulse-width	HD / VD IN (*2)	SYNC Non-reset																														
(21)Special shutter	User-defined shutter-timing and shutter-speed cued and timed by shutter trigger and restart / reset pulse input ON / OFF selectable via panel SW (Initial factory setting: OFF)																																
(22)CCD integration mode	Field / Frame storage (integration) Switch-able by panel SW selection (Initial factory setting: frame integration)																																
(23)Restart / Reset	Restart / Reset function available via panel SW selection (Initial factory setting: OFF)																																
(24)Power supply	DC12V plus / minus 10% [Ripple level: Less than 10mV(p-p)]																																
(25)Power consumption	Approx. 1.3W																																
(26)Ambient condition	Performance guaranteed; Temperature: From 0 through 40 degree Celsius Humidity: From 20 through 80 percent (No condensing) Operation guaranteed; Temperature: From minus 10 through 50 degree C Humidity: From 20 through 80 percent (No condensing) Storage condition; Temperature: From minus 20 through 60 degree C Humidity: From 20 through 95 percent (No condensing)																																

(27) Lens mount	C mount
(28) Flange-back	17.526mm
(29) External dimension	29(W) x 29(H) x 31(D) mm (Excluding protruding part)
(30) Mass	Approximately 50g

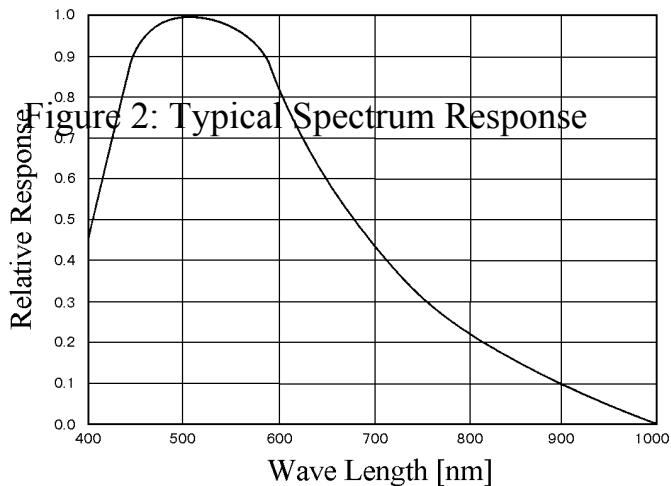
HD/VD Phase Difference

The phase-difference between the HD / VD falling edge is shown in figure below.

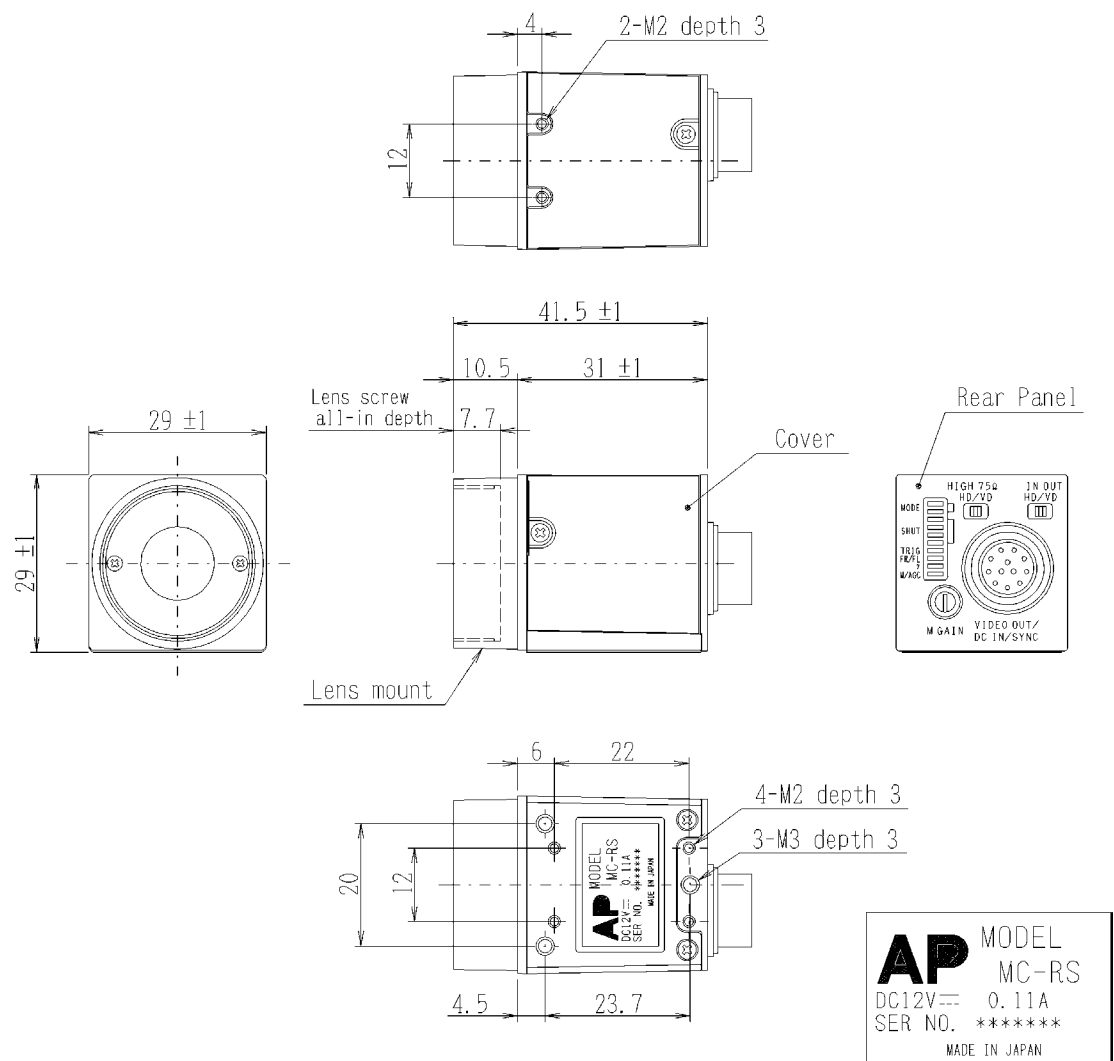


7. SPECTRUM RESPONSE OF CCD

[The lens characteristics and light source characteristics are not reflected in the table.]



8. EXTERNAL VIEW DRAWING



Specification

Material	Lens-mount, Rear panel	: Aluminum die-cast
	Cover	: Anticorrosion aluminum alloy
Processing	Lens-mount, Rear panel	: Cation coating
	Cover	: Leather satin coating

Name plate detail