



High-Resolution CCD B/W Camera

CleverDragon series

CSCQS15BC23

CSCQS15BC23-01

Specification

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TOSHIBA TELI CORPORATION

RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:

1. Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
2. Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.

-
- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.

-
- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.

(*1): Equipment directly concerned with human life refers to.

- Medical equipment such as life-support systems, equipment for operating theaters.
- Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
- Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law
- Equipment related to the above

(*2): Equipment relating to maintenance of public services/functions involving factors of safety refers to.

- Traffic control systems for air transportation, railways, roads, or marine transportation
 - Equipment for nuclear power generation
 - Equipment related to the above
-

CASES FOR INDEMNITY (LIMITED WARRANTY)

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- In the case damage or losses are caused by fire, earthquake, or other acts of God, acts by a third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.
 - In the case of indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
 - In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.
 - In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.
 - In the case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
 - In the case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).
 - Expenses we bear on this product shall be limited to the individual price of the product.
 - About the item which does not have a publication in the specifications and manual of this product, it considers as the outside for a guarantee.
-

NOTES ON USING THIS PRODUCT

● Handle carefully

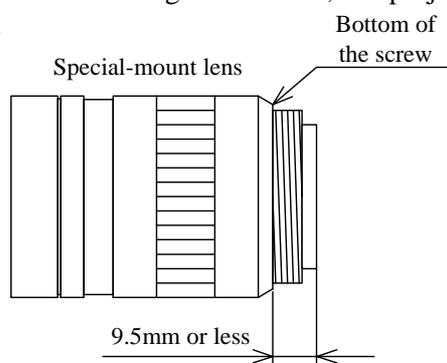
Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

● Environmental operating conditions

Do not use the product in locations where the ambient temperature or humidity exceeds the specifications. Otherwise, image quality may be degraded or internal components may be adversely affected. In particular, do not use the product in areas exposed to direct sunlight. Moreover, during shooting under high temperatures, vertical stripes or white spots (noise) may be produced, depending on the subject or camera conditions (such as increased gain). However, such phenomena are not malfunctions.

● About lens mount

As for the Special-mount lens used combining this camera, the projection distance from bottom of the screw should use 9.5mm or less.



● Check a combination with the lens

Depending on the lens and lighting you use, an image is reflected as a ghost in the imaging area. However, this is not because of a fault the camera.

In addition, depending on the lens you use, the performance of the camera may not be brought out fully due to deterioration in resolution and brightness in the peripheral area, aberration and others.

Be sure to check a combination with the camera by using the lens and lighting you actually use.

When installing a lens in the camera, make sure carefully that it is not tilted.

In addition, use a mounting screw free from defects and dirt. Otherwise, the camera may be unable to be removed.

● About the difference between the right and on the left of an image output screen

As for CCD used with this camera, the left half and the right half of the screen are independently output (2ch output method). Therefore, It is not failure, although a level difference may be visible to an image on either side or a boundary line may be visible to middle of the screen bordering on middle of the screen with the setting mode of a camera.

● Defect of CCD

In transportation and keeping, it is not a breakdown though the defect might occur by accident in CCD.

● Do not shoot under intense light.

Avoid intense light such as spot lights on part of the screen because it may cause blooming or smears. If intense light falls on the screen, vertical stripes may appear on the screen, but this is not a malfunction.

● **Occurrence of moiré**

If you shoot thin stripe patterns, moiré patterns (interference fringes) may appear. This is not a malfunction.

● **Occurrence of noise on the screen**

If an intense magnetic or electromagnetic field is generated near the camera or connection cable, noise may be generated on the screen. If this occurs, move the camera or the cable.

● **Handling of the protective cap**

If the camera is not in use, attach the lens cap to the camera to protect the image pickup surface.

● **Turn OFF the power in the case of connection**

Turn OFF the power in the case of connection of connection camera cable.

Otherwise, an electric shock or a malfunction may occur.

● **Disposal**

When disposing of the camera, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product.



”This symbol is applicable for EU member states only”

1. Overview

This CCD camera is a high-resolution camera that features all pixel readout mode 2/3 CCD.

Model	Power supply	Interface
CSCQS15BC23	I/O connector	Camera Link
CSCQS15BC23-01	Camera Link Connector	Power over Camera Link

2. Features

(1) High resolution

High pixel density CCD (number of effective pixels 5.05M, number of total pixels 5.24M) is used.

(2) Square grids

The CCD pixels arrayed in square grids facilitates computation for image processing.

(3) Full-frame shutter

Since all pixels are output even by shutter operation, high resolution can be achieved, without deteriorating the vertical resolution.

(4) Camera link interface

The interface of image output and the camera control adopts the Camera Link standard.

When you use frame grabber board for the camera link, high-speed image transfer and various controls to PC are possible.

Non-PoCL model: CSCQS15BC23

PoCL model: CSCQS15BC23-01

(5) All-pixel readout mode (normal mode)

All pixel signals (in the effective area) are output in approximately 1/15 second.

(6) Programming partial scan mode

Partial scan within the range arbitrary from 100 lines to 2456 lines is possible.

(7) High-speed draft readout mode

By reading 4 lines from every 16 lines, all signals in the effective area are output in approximately in 1/37.1 second.

(8) Random trigger shutter

By external trigger signal input, the shot image can be grabbed at an arbitrary timing.

(9) Multiple-shutter

By external trigger signal input, the shot image can be grabbed at an arbitrary timing and the accumulated shot images can be output at an arbitrary timing.

This specification subjects to change without notice.

5. Functions

By accessing the camera register published on the camera link I/F, you can control/set each function. Since access to the camera register is performed via the frame grabber board, the controlling and setting methods differ depending on the frame grabber board you use. For details, refer to the instruction manual of the relevant frame grabber board or contact our sales representative.

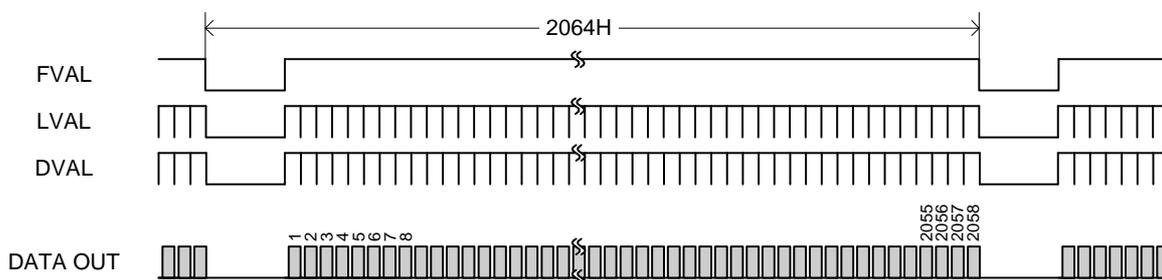
5-1. Readout mode

Video is output from the camera link connector. The output video can be grabbed by the frame grabber board. The frame rate and resolution of output images that this model supports are as follows:

- 1) All pixel readout : Approximately 15 fps / 2456(H) x 2058(V)
 - 2) High-speed draft readout : Approximately 37.1 fps / 2456(H) x 257(V)
 - 3) Partial scan : Approximately 52 to 15 fps / 2456(H) x 100(V) to 2058(V)
- * Number of minimum line is 100 lines.

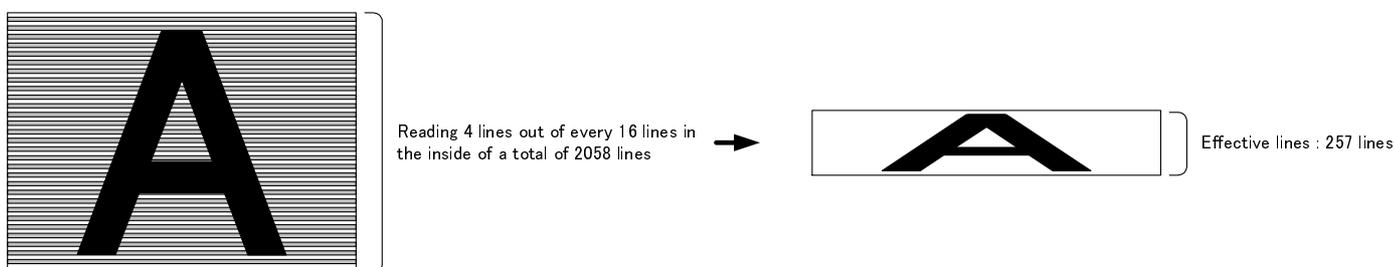
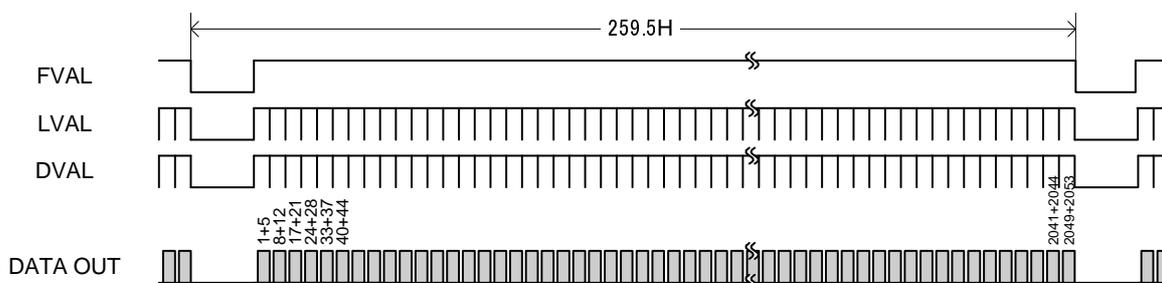
1) All pixel readout

Reads out all pixels in about 1/15 second.



2) High-speed draft readout

By reading 4 lines out of every 16 lines, reads out the whole valid area in approximately 1/37.1 seconds. Control and setting of functions can be done by accessing the cam. When the frame rate of a partial scanning exceeds it when the shutter mode is switched from normality (internal synchronization) or the partial scanning mode to the draft mode, more high-speed than the setting of the speed of the shutter it is changed at the speed of the shutter matched to the frame rate.

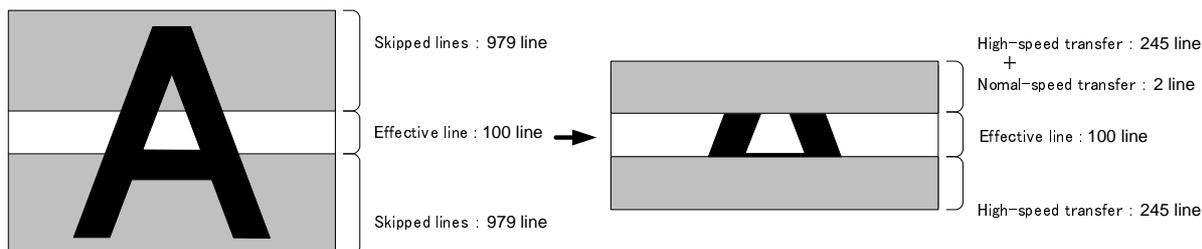
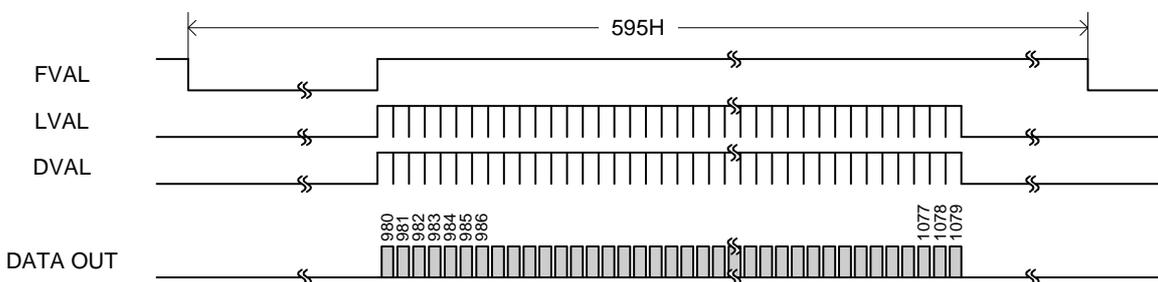


3) Programmable partial scan

A range arbitrary from 100 lines to 2058 lines can be read. The frame rate can be raised to 52 fps or less by skipping it at high speed excluding an effective area. When the frame rate of a partial scanning exceeds it when the shutter mode is switched from normality (internal synchronization) to the partial scanning mode, more high-speed than the setting of the speed of the shutter it is changed at the speed of the shutter matched to the frame rate.

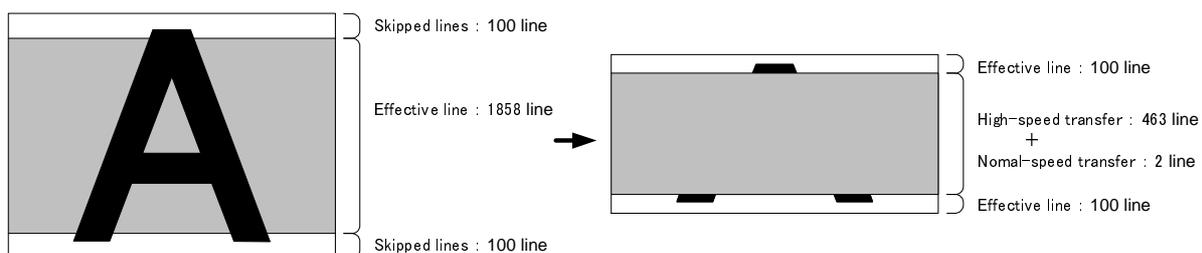
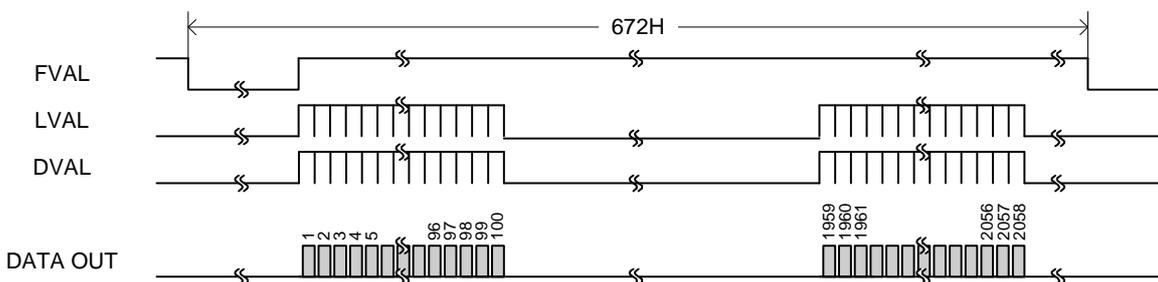
- Starting position (Partial V Start1, 2) of an effective line can be set.
- Number (Partial Height1, 2) of effective line can be set.

Example: (Partial V Start1, Partial Height1) = 100 effective lines and start 980 lines eyes(center partial)
 (Partial V Start2, Partial Height2) = 0 effective lines (60fps) and start 0 lines eyes(center partial)



Example: (Partial V Start1, Partial Height1) = 100 effective lines and start 1 lines eyes(center partial)
 (Partial V Start2, Partial Height2) =

100 effective lines (60fps) and start 1959 lines eyes(center partial)



This specification subjects to change without notice.

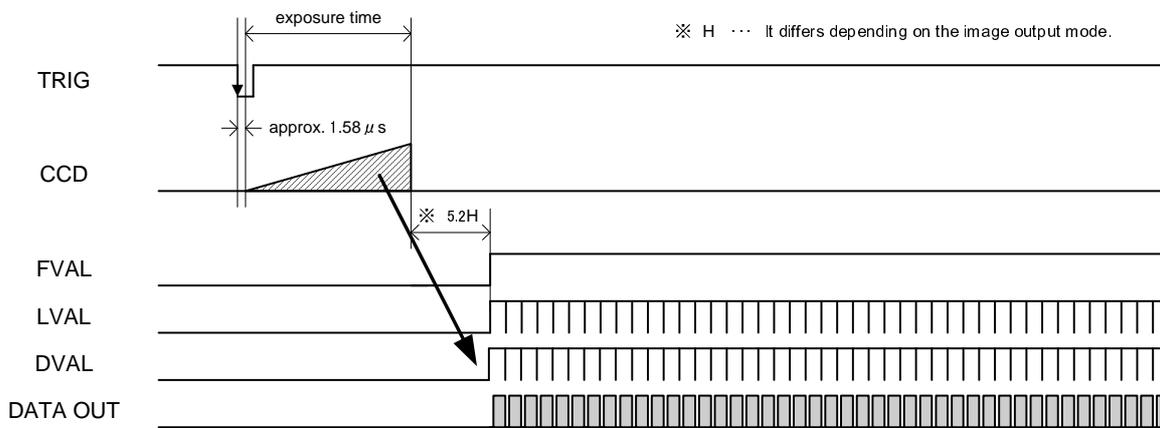
5-2. Random trigger shutter

In the random trigger shutter mode, you can shoot and grab an image at an arbitrary timing by trigger signal input from the external.

- External trigger signals can be input either from the camera link I/F CC1 or I/O connector.
- If polarity is set to negative polarity, exposure starts at the falling edge of the trigger.
- The random trigger shutter of this camera can be operated in two types of mode: fixed mode and pulse width mode. How to determine the exposure time differs depending on the mode.

1) Fixed mode

- The exposure time is determined by the setting value for the shutter speed.

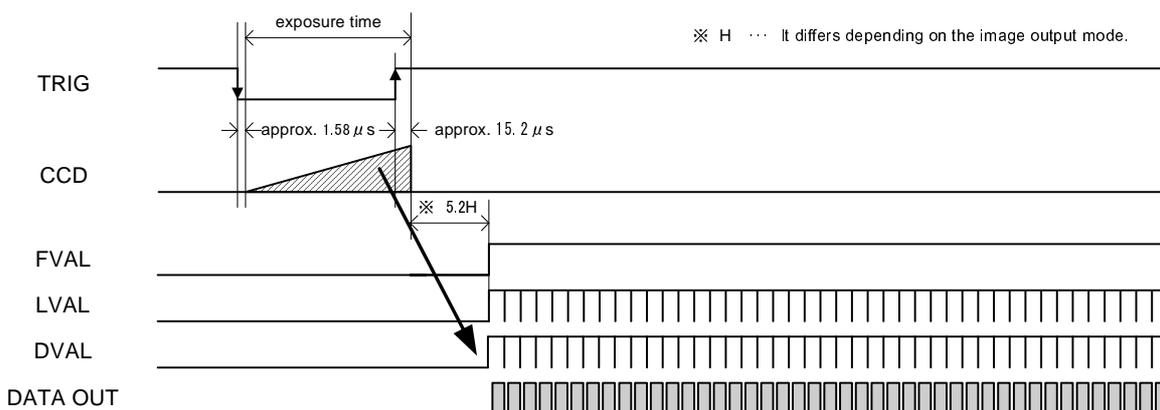


2) Pulse width mode

- The exposure time is determined by the pulse width.

$$(\text{exposure time} = \text{pulse width} + \text{approximately } 14 \mu\text{s})$$

- Set a pulse width of 1H (approximately 30.1 μs) or more.



Notes of trigger mode:

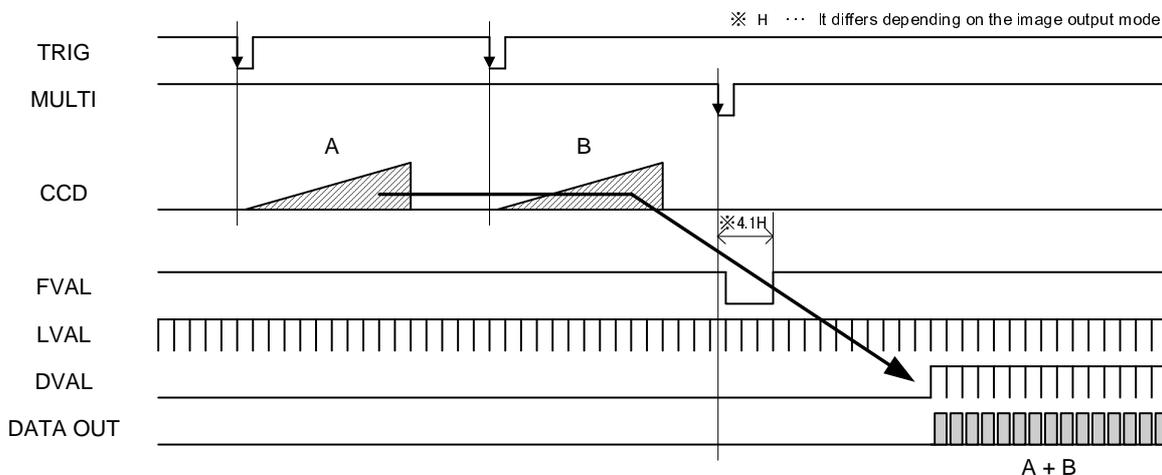
When the interval of the input trigger signal is extremely short, or when the trigger signal is noisy, there is a possibility of causing the malfunction. In this case, please input a proper trigger signal.

This specification subjects to change without notice.

5-3. Multiple-shutter mode

In the multiple-shutter mode, video is output in sync with a MULTI signal from the external after the end of exposure time.

- Valid only when the random trigger shutter mode is ON.
- MULTI signals can be input from the camera link I/F CC2.
- If exposure is executed several times before MULTI signal input, the images are input, the images are output superposed.
- The exposure time is determined by the random trigger shutter mode setting and its determination method.
- The pulse width must be set to negative polarity and 30.1 μ s to 10 ms.



Notes on multiple-shutter:

An image has been stored to CCD device until a MULTI signal is inputted and it begins to read out image after CCD is exposed. Therefore, an image may degenerate step by step when an image is stored to CCD device for a long time.

And, Electric charge is superimposed in CCD device when the multiplex exposure. Therefore, CCD will flood with electric charge when electric charge is over superimposed in CCD device. Consequently vertical stripes noise will appear. At that time please stop using spotlight and dimmer for example close the iris.

This specification subjects to change without notice.

6. Serial communication

By Camera link serial communication interface, it is possible to control the following functions.

(1) Memory control

- Store
- Readout
- Reset

(2) Setup 0 - 528 LSB

(3) Gain 0 - +12 dB

(4) Shutter speed 2 - 1/20,000 s

(5) Random shutter trigger ON / OFF

- Trigger polarity Positive / Negative

- Random trigger mode Pulse width mode / FIX mode

(6) Multiple shutter ON / OFF

(7) High-speed draft readout ON / OFF

(8) Programmable partial scan ON / OFF

* High-speed draft readout mode must be disabled.

- Start position of effective line 0 – 1957 line (1line / 1step)

- Number of effective line 100 – 2058 line (1line / 1step)

(9) TAP correction of

the left half and the right half AUTO / ONE PUSH / MANUAL

7. Specifications

[Electrical specification]

(1) Image sensor	Interline CCD
·Number of total pixels	2536 (H) x 2068 (V)
·Number of effective pixels	2456 (H) x 2058 (V)
·Pixel size	3.45 μ m (H) x 3.45 μ m (V)
·Optical size	2/3 type
(2) Scan method	Progressive
(3) Aspect ratio	6:5
(4) Synchronization method	Internal synchronization
(5) Standard subject illumination	400 lx, F5.6, 3000 K
(6) Minimum subject illumination	6.25 lx (F1.4, Gain max, all pixel readout, video level 50%)
(7) Video output	Compliant with the camera link standard. Base configuration 2tap.
Data	12 / 10 / 8 bit switching
Readout mode	
All pixel readout	Approximately 15 fps / 2456(H) x 2058(V)
High-speed draft mode	Approximately 37.2 fps / 2456(H) x 257(V)
Partial scan	Approximately 15 fps to 52fps / 2456(H) x 100 to 2058(V)

* About an image output:

As for CCD used with this camera, the left half and the right half of the screen are independently output (2ch output method). Therefore, it is not failure, although a level difference may be visible to an image on either side or a boundary line may be visible to middle of the screen boarding on middle of the screen with the setting mode of a camera.

* About a right and left level difference between TAP of the image output

In the test environment of the Teli standard, we measure the level difference by using the gray scale chart of ITE- II type. We measure a center white part of the chart.

- Shipment standard (difference of the right part and left part): 105 [digit] or less (12bit)

In the following cases, the camera might not be able to correct the level difference automatically.

- When the image level of a right and left center part is low
- When the image level of a right and left center part is high
- When the level difference of each pixel (right and left part of center) is large

When you cannot correct the level difference, please correct the level difference by the following method.

- After the source of light and object are changed, one push correction is done.
- The level difference is corrected with manual.

In the shipment setting, the calibration mode is AUTO.

This specification subjects to change without notice.

(8) Gain	0 to +12 dB (1211 levels)(initial factory setting: 0 dB)
(9) Setup	0 to 528 LSB (529 levels) (initial factory setting: 264 LSB (calculated value))
(10) Gamma correction	OFF($\gamma = 1.0$) fixed
(11) TAP correction of the left part and the right part:	AUTO / ONE PUSH / MANUAL
(12) Power supply voltage	DC+12V (10.8 to 13.2 V)(ripple 50 mV(p-p) or less)
(13) Power consumption	Approximately 4.0 W

[Electronic shutter signal specification]

(1) Shutter speed	
Readout mode	
All pixel readout	2 to 1/20,000 s
High-speed draft readout	2 to 1/20,000 s
Programmable partial scan	2 to 1/20,000 s
(2) Random shutter trigger	ON/OFF switching (initial factory setting: OFF)
Fixed mode	The exposure time depends on the shutter speed setting.
Pulse width mode	The exposure time depends on the pulse width.
(3) Multiple-shutter	ON/OFF switching (initial factory setting: OFF)
	Exposure by TRIG input, readout by MULTI input
	* Enabled when random trigger shutter is ON.

[Internal sync signal specification]

(1) Driving frequency	60.000MHz
(2) Scanning frequency	
Readout mode	
All pixel readout	Horizontal :31.185 kHz Vertical :15.104 Hz
High-speed draft readout	Horizontal :9.632 kHz Vertical :37.098 Hz
Partial scan	Horizontal :31.185 kHz Vertical :Arbitrariness

[Input signal specification]

(1) TRIG	Camera link I/F and I/O connector input
Signal level (I/O input)	TTL level
Polarity	Positive/Negative polarity switching possible (initial factory setting: Negative)
Pulse width	30.1 μ s or more
(2) MULTI	Camera link I/F input
Polarity	Negative polarity
Pulse width	30.1 μ s to 10 ms

This specification subjects to change without notice.

[Output signal specification]

(1) WEN	I/O connector output
Signal level	4 V (p-p)
Polarity	Positive polarity
Pulse width	Approximately 32.1 μ s

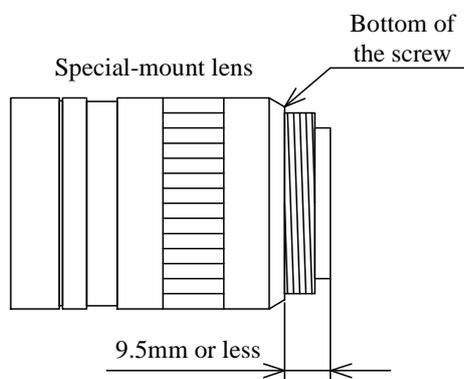
[Dimensions]

(1) Lens mount	C-mount
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Notes on combination of C-mount lens:

Depending on the lens you use, the performance of the camera may not be brought out fully due to the deterioration and brightness in the peripheral area, occurrence of a ghost, aberration and others. When you check the combination between the lens and camera, be sure to use the lens you actually use.

As for the C-mount lens used combining this camera, the projection distance from bottom of the screw should use 9.5mm or less.



(2) Flange back	17.526 mm
(3) Dimensions	54 mm (W) x 43 mm (H) x 59 mm (D)
(4) Mass	Approximately 180 g
(5) Camera body grounding: Insulation status	Conductive between circuit GND and camera body

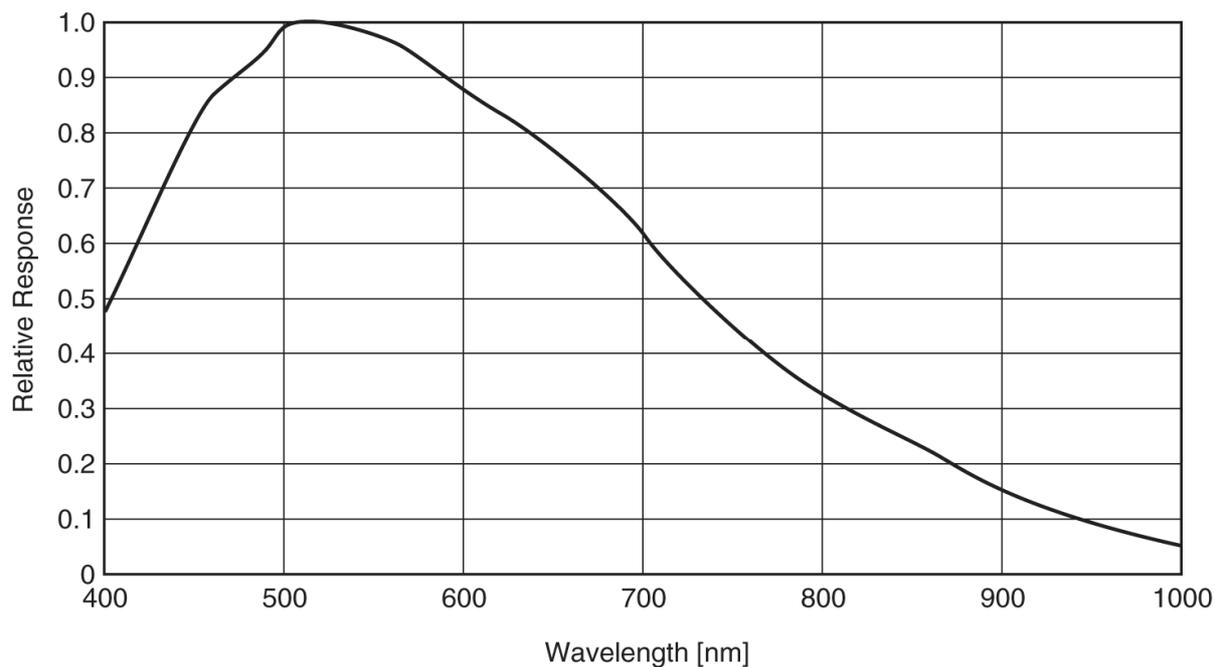
[Operating ambient conditions]

(1) Performance assurance	Temperature	0 to 40 °C
	Humidity	10 to 90 % (no condensation)
(2) Operating guaranteed	Temperature	-5 to 45 °C
	Humidity	90% or less (no condensation)
(3) Storage environment	Temperature	-20 to 60 °C
	Humidity	10 to 90% (no condensation)

This specification subjects to change without notice.

[Typical spectral response]

The lens characteristics and light source characteristics is not reflected table.

**[Applicable safety standards]**

(1) EMC conditions

EMI (Electro-Magnetic Interference) EN61000-6-4 / 2007

EMS (Electro-Magnetic Susceptibility) EN61000-6-2 / 2005

(2) FCC

FCC Part 15 Subpart B class A

* About the conformity of EMC standard of this machine, it has guaranteed in the conditions combined with our system condition. When used combined parts other than specification of our company, I ask you to have final EMC conformity checked of a visitor with a machine and the whole equipment.

[Communication specification]

(1) Communication speed	9600 / 19200 / 38400 / 57600 bps
(2) Start bit	1 bit
(3) Data bit	8 bit
(4) Start bit	1 bit
(5) Parity bit	None
(6) Handshake	None

[Connector pin assignment]

- (1) Video output/controlling connector (Camera Link Base Configuration) CAMERA LINK

Output video signals and VALID, based on the camera link standard LVDS.

This connector is connected to the frame grabber board, image processing device and others.

Connector model: MDR26-PIN connector 10226-2210PE (manufactured by 3M)

Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
1	-	GND (+12V)	14	-	GND
2	O	Tx OUT0-	15	O	Tx OUT0+
3	O	Tx OUT1-	16	O	Tx OUT1+
4	O	Tx OUT2-	17	O	Tx OUT2+
5	O	Tx CLK OUT-	18	O	Tx CLK OUT+
6	O	Tx OUT3-	19	O	Tx OUT3+
7	I	Ser TC (RxD)+	20	I	Ser TC (RxD)-
8	O	Ser TFG (TxD)-	21	O	Ser TFG (TxD)+
9	I	CC1 (TRIG)-	22	I	CC1 (TRIG)+
10	I	CC2 (MULTI)+	23	I	CC2 (MULTI)-
11	I	CC3-	24	I	CC3+
12	I	CC4+	25	I	CC4-
13	-	GND	26	-	GND (+12V)

NOTE: For model CSCQS15BC23, 1-pin and 26-pin are GND.

Please combine and use the cable and the grabber board for Camera Link.

NOTE: For model CSCQS15BC23-01, 1-pin and 26-pin are POWER (+12V).

Please combine and use the cable and the grabber board for PoCL.

This specification subjects to change without notice.

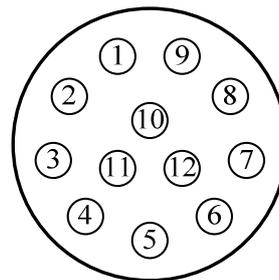
(2) Connector for power supply and sync signal input/output I/O

This is a terminal used for power supply to the camera. This connector is connected to the power supply unit. In addition, this connector is used for sync signal (WEN signal) output and external trigger signal input.

Connector (Camera side) : HR10A-10R-12PB (Manufactured by HIROSE DENKI)

Plug (Cable side) : HR10A-10P-12S (Manufactured by HIROSE DENKI)

Pin No.	I/O	Signal name
1	-	GND
2	I	+12V (N.C.)
3	-	N.C.
4	-	N.C.
5	-	GND
6	-	N.C.
7	O	VD
8	-	GND
9	-	N.C.
10	O	WEN.
11	I	TRIG
12	-	GND



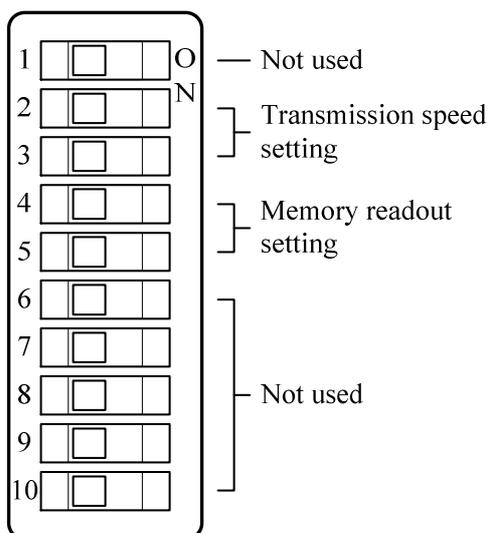
Rearview

NOTE: For model CSCQS15BC23, 2-pin is POWER (+12V).

NOTE: For model CSCQS15BC23-01, 2-pin is OPEN.

[Switch setting]

By using the DIP switches on the back surface of the camera body, you can set serial transmission speed and memory readout for when the power supply is turned on. If you change the switch setting after the power supply is turned on, the change is not reflected.



This specification subjects to change without notice.

(1) Transmission speed setting

You can set the speed of serial transmission by camera link.

SW2	SW3	Transmission speed
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	57600 bps

(2) Memory readout setting

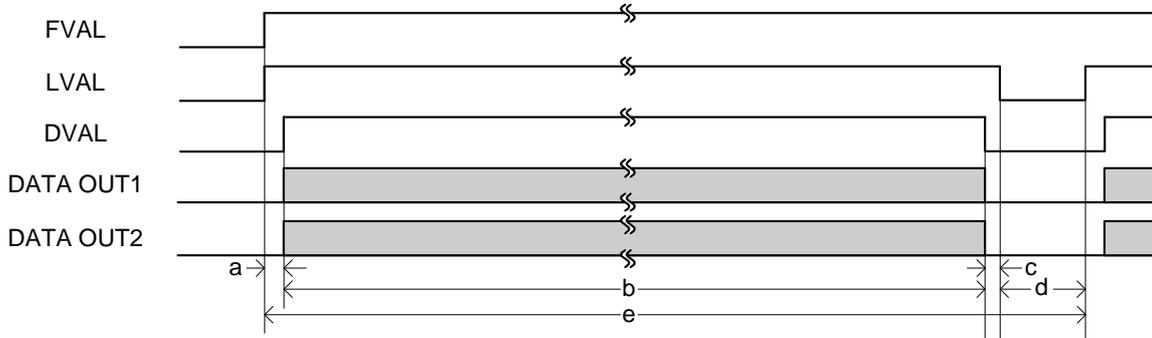
You can set the number of setting the value saving memory bank to be called when the power supply is turned on. The memory consists of 8 banks.

SW4	SW5	SW6	Memory number
OFF	OFF	OFF	1
ON	OFF	OFF	2
OFF	ON	OFF	3
ON	ON	OFF	4
OFF	OFF	ON	5
ON	OFF	ON	6
OFF	ON	ON	7
ON	ON	ON	8

8. Timing chart

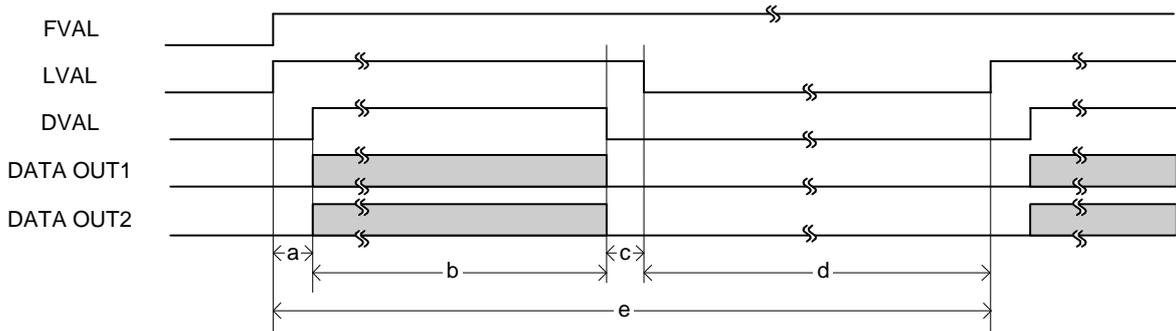
(1) Horizontal timing

1) All pixel readout, Partial scan



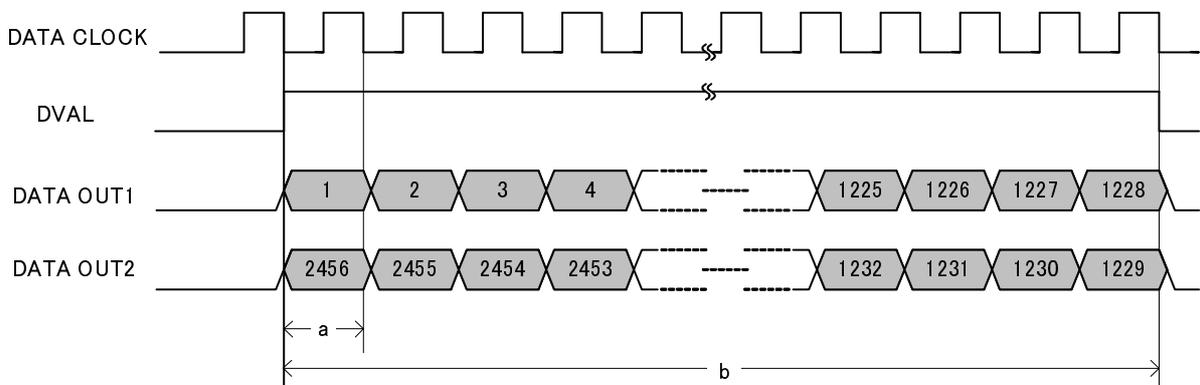
$a = 41\text{CLK}$ $b = 1228\text{CLK}$ $c = 40\text{CLK}$ $d = 615\text{CLK}$ $e = 1924\text{CLK}$

2) High-speed draft readout



$a = 41\text{CLK}$ $b = 1228\text{CLK}$ $c = 40\text{CLK}$ $d = 4920\text{CLK}$ $e = 6229\text{CLK}$

3) CLK late



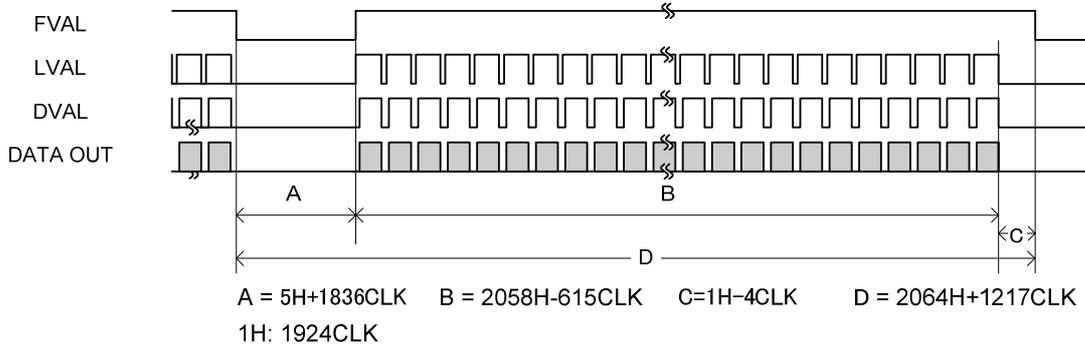
$a = 16.67\text{ns}$ $b = 20.47 \mu\text{s}$
 (60.000MHz) (48.86kHz)

This specification subjects to change without notice.

(2) Vertical timing

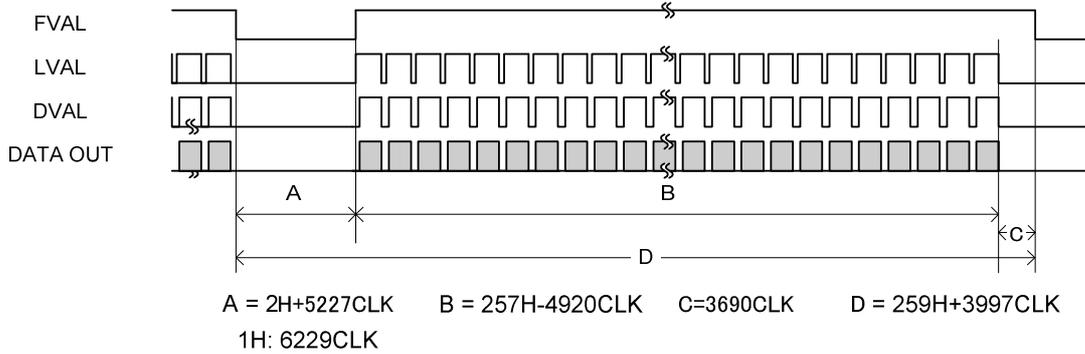
- 1) All pixel readout *ex) shutter mode: OFF

The period of A/C depend on the shutter speed. B period is fixed.

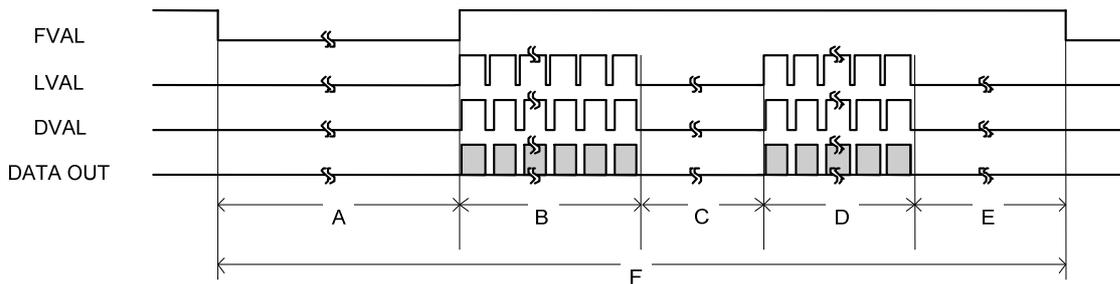


- 2) High-speed draft readout *ex) shutter mode: OFF

The period of A/C depend on the shutter speed. B period is fixed.



- 3) Programmable partial scan



$$A = 480 \times (\text{Partial V Start1} + 8) + 7616 \text{ CLK} \quad B = 1924 \times \text{Partial height1} - 615 \text{ CLK}$$

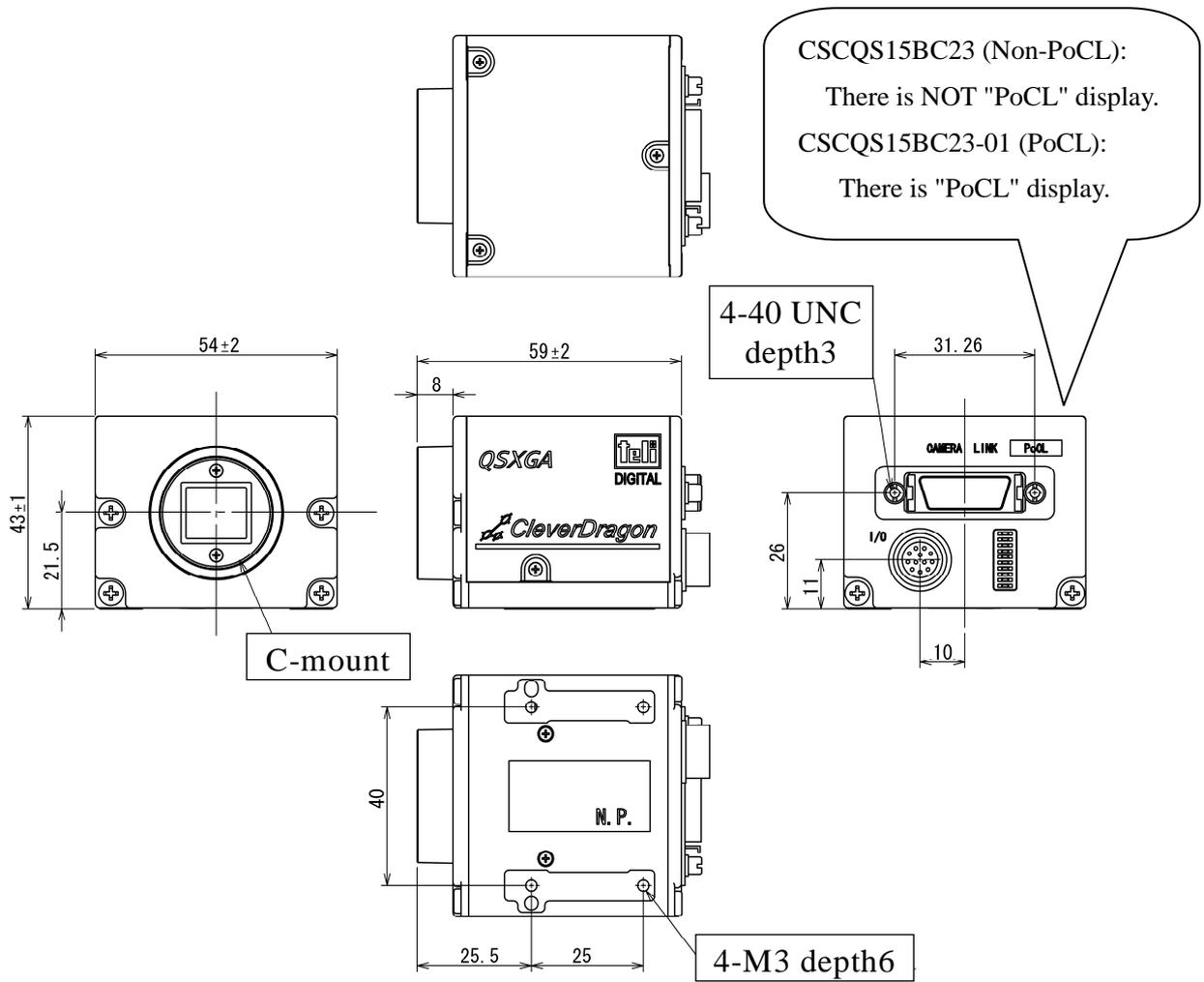
$$C = 480 \times \{ \text{Partial V Start2} - (\text{Partial V Start1} + \text{Partial height2} + 1) \} + 3983 \text{ CLK}$$

$$D = 1924 \times \text{Partial height2} - 615 \text{ CLK}$$

$$E = 480 \times \{ 2062 - (\text{Partial V Start2} + \text{Partial height2}) \}$$

This specification subjects to change without notice.

9. Outline Drawing



10. Guarantee

The term of a guarantee is one year after the product delivery. If by any chance trouble by responsibility of our company occurs before an above period, TELI repairs it free of charge. During terms of a guarantee, when the trouble cause is the case of below, TELI charges the repair costs.

- (1) Troubles and the damages that causes by misuse, unsuitable repair or remodeling.
- (2) Distribution hazards like drops and vibrations after purchase. Troubles and damages by transportation.
- (3) Troubles and damages by fire, natural calamity (earthquake, storm and flood damage, thunderbolt), damages from salty breeze, gas harm, abnormal voltage.

11. Repair

- (1) Condition for repair

Basically, has to return it to our company when the user requests us to repair product.

Beside that, customer should pay these expenses (travel expenses, camera disassembly

Technology costs) of both customer and end user. Also customer should pay in themselves costs for return camera to us.

- (2) The period of repairing product

- Repair free of charge ... Refer to Clause 10.

- Charged repair Basically, repair period is 7 years after the last production end of products.



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Distributor

- This product must be classified for disposal according to the laws of each country and municipal laws.
 - Information contained in this document is subject to change without prior notice.
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