

# 3CMOS camera

# HV-FM230SCL

## Operation Manual



Thank you for purchase this fine Kokusai Denki Electric CMOS camera.  
Before using the camera, please read this operation manual carefully.

**KOKUSAI DENKI Electric Inc.**

**RoHS Compliant**

These products comply with the requirement of the RoHS (Restriction of the use of Certain Hazardous Substances in Electrical and electronic Equipment) Directive 2011/65/EU,(EU) 2015/863.

The second edition is issued in January, 2025.

# IMPORTANT SAFETY INSTRUCTIONS

## 1. Read Instructions

All the safety and operating instructions should be read before the product is operated.

## 2. Retain Instructions

The safety and operating instructions should be retained for future reference.

## 3. Heed Warnings

All warnings on the product and the operating instructions should be adhered to.

## 4. Follow Instructions

All operating and use instructions should be followed.

## 5. Cleaning

Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

## 6. Attachments

Do not use attachments not recommended by the product manufacturer as they may cause hazards.

## 7. Water and Moisture

Do not use this product near water - for example, near a bath tub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool; and the like.

## 8. Accessories

Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.

## 9. Moving

A product and cart combination should be moved with care.

Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.

## 10. Ventilation

Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered.

The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

## 11. Power Sources

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your product dealer or local power company. For products intended to operate from battery power, or other sources, refer to the operating instructions.

## 12. Grounding or Polarization

This product is equipped with a three-wire grounding-type plug a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet.

Do not defeat the safety purpose of the grounding-type plug.

## 13. Power-Cord Protection

Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plug, convenience receptacles, and the point where they exit from the product.

## 14. Lightning

For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet. This will prevent damage to the product due to lightning and power-line surges.

## 15. Overloading

Do not overload wall outlets, extension cords or integral convenience receptacles as this can result in a risk of fire or electric shock.

## 16. Object and Liquid Entry

Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.

## 17. Inflammable and Explosive Substance

Avoid using this product where there are gases, and also where there are inflammable and explosive substances in the immediate vicinity.

## 18. Heavy Shock or Vibration

When carrying this product around, do not subject the product to heavy shock or vibration.

## 19. Servicing

Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

## 20. Damage Requiring Service

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- When the power-supply cord or plug is damaged.
- If liquid has been spilled, or objects have fallen into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- If the product has been dropped or damaged in any way.
- When the product exhibits a distinct change in performance-this indicates a need for service.

## 21. Replacement Parts

When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part.

Unauthorized substitutions may result in fire, electric shock, or other hazards.

## 22. Safety Check

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.

## 23. Wall or Ceiling Mounting

The product should be mounted to a wall or ceiling only as recommended by the manufacturer.

## 24. Heat

The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.

# WICHTIGE SICHERHEITSANWEISUNGEN

## 1. Alle Anweisungen lesen

Vor Betrieb des Erzeugnisses sollten alle Sicherheits- und Bedienungsanleitungen gelesen werden.

## 2. Die Anweisungen aufbewahren

Die Sicherheits- und Bedienungsanleitungen sollten fünfjährigen Bezug aufbewahrt werden.

## 3. Warnungen beachten

Die Warnungen auf dem Erzeugnis und in den Bedienungsanleitungen sollten beachtet werden.

## 4. Anweisungen befolgen

Alle Bedienungsanleitung- und Verwendungsanweisungen sollten befolgt werden.

## 5. Reinigung

Den Stecker des Geräts vor Reinigung aus der Steckdose ziehen. Keine flüssigen Reinigungsmittel oder Aerosolreiniger verwenden. Zum Reinigen einen feuchten Lappen verwenden.

## 6. Zubehör

Nur vom Hersteller des Erzeugnisses empfohlenes Zubehör verwenden, da es sonst zu Störungen kommen kann.

## 7. Wasser und Feuchtigkeit

Dieses Erzeugnis nicht in der Nähe von Wasser verwenden - z.B. in der Nähe einer Badewanne, eines Waschbeckens, einer Küchenspüle, eines Waschzubehörs, in einem nassen Keller, in der Nähe eines Schwimmbeckens usw.

## 8. Aufstellung

Das Erzeugnis nicht auf einen instabilen Wagen, Stand, Dreifuß, Träger oder Tisch stellen. Das Erzeugnis kann sonst herunterfallen und ein Kind oder einen Erwachsenen schwer verletzen. Außerdem kann das Gerät schwer beschädigt werden. Nur mit einem Wagen, Stand, Dreifuß, Träger oder Tisch verwenden, der vom Hersteller empfohlen oder mit dem Erzeugnis verkauft worden ist. Für jegliche Anbringung sollten die Anweisungen des Herstellers befolgt werden, und das vom Hersteller empfohlene Anbringungszubehör sollte verwendet werden.

## 9. Eine Kombination von Erzeugnis und Wagen sollte vorsichtig bewegt werden

Schneller Halt, übermäßige Krafteinwirkung und unebene Oberflächen können Umkippen der Kombination von Erzeugnis und Wagen verursachen.

## 10. Ventilation

Schlitz und Öffnungen im Gehäuse dienen der Ventilation. Sie sind für zuverlässigen Betrieb des Gerätes und Schutz vor Überhitzung erforderlich und dürfen nicht blockiert oder abgedeckt werden. Die Öffnungen sollten niemals dadurch blockiert werden, daß das Gerät auf ein Bett, ein Sofa, einen Teppich oder eine ähnliche Oberfläche gestellt wird.

Das Gerät sollte nur dann in Einbauinstallation wie in einem Bücherschrank oder einem Gestell verwendet werden, wenn angemessene Ventilation vorgesehen ist bzw. Die Anweisungen des Herstellers befolgt worden sind.

## 11. Stromversorgung

Dieses Erzeugnis sollte nur an der auf dem Typenschild angegebenen Stromversorgungsart betrieben werden. Wenn Sie nicht sicher sind, was für eine Stromversorgung Sie haben, so wenden Sie sich bitte an Ihren Erzeugnishändler oder an das lokale Elektrizitätswerk. Beziehen Sie sich für Batteriebetrieb oder andere Stromquellen vorgesehene Erzeugnisse bitte auf die Bedienungsanleitungen.

## 12. Erdung oder Polarisierung

Dieses Erzeugnis ist mit einem Schutzkontaktstecker mit drei Leitern ausgerüstet, mit einem Erdungskontakt. Dieser Stecker paßt nur in eine schuko-Steckdose. Dies ist eine Sicherheitsmaßnahme. Wenn Sie den Stecker nicht in die Steckdose stecken können, so wenden Sie sich bitte an Ihren Elektriker, damit er die veraltete Schutz des Schutzkontaktsteckers unwirksam macht.

## 13. Netzkabelschutz

Netzkabel sollten so verlegt werden, daß möglichst nicht darauf getreten wird und daß sie nicht eingeklemmt werden, mit besonderer Beachtung der Kabel an Stackern, Verlängerungskabeln und dem Austritt des Kabels aus dem Erzeugnis.

## 14. Blitzschlag

Für zusätzlichen Schutz des Erzeugnisses während eines Gewitters oder bei Nichtverwendung für lange Zeit den Stecker aus der Steckdose ziehen. Dies verhindert Beschädigung durch Blitzschlag und Netzspannungsspitzen.

## 15. Überlastung

Wandsteckdosen, Verlängerungskabel und eingebaute Bequemlichkeitssteckdosen nicht überlasten, da dies Feuer oder elektrischen Schlag verursachen kann.

## 16. Eindringen von Fremdkörpern und Flüssigkeit

Niemals Objekte irgendwelcher Art durch die Öffnungen in das Gerät schieben, da diese unter hoher Spannung stehende Teile berühren oder kurzschließen können, wodurch es zu Feuer oder elektrischem Schlag kommen kann. Niemals Flüssigkeiten irgendwelcher Art auf das Erzeugnis verschütten.

## 17. Entflammare und explosive Substanzen

Vermeiden Sie Verwendung dieses Erzeugnisses an Orten mit Gasen bzw. entflammaren oder explosiven Substanzen in der direkten Umgebung.

## 18. Starke stöße oder Vibrationen

Setzen Sie das Erzeugnis beim Transport nicht starken Stößen oder Vibrationen aus.

## 19. Wartung

Versuchen Sie nicht, dieses Erzeugnis selbst zu warten, da Sie sich durch Öffnen bzw. Entfernen von Abdeckungen hohen Spannungen und sonstigen Gefährdungen aussetzen können. Beziehen Sie sich für jegliche Wartung auf qualifiziertes Wartungspersonal.

## 20. Beschädigung, die Wartung erfordert

Ziehen Sie den Stecker dieses Erzeugnisses aus der Steckdose und wenden Sie sich an qualifiziertes Wartungspersonal, wenn eine der folgenden Bedingungen vorliegt:

- Wenn das Netzkabel oder der Stecker beschädigt ist.
- Bei Eindringen von Flüssigkeit oder Fremdkörpern in das Gerät.
- Wenn das Erzeugnis Regen oder Wasser ausgesetzt worden ist.
- Wenn das Erzeugnis bei Befolgen der Bedienungsanleitungen nicht normal funktioniert. Nur die Regelelemente verstellen, die in den Bedienungsanleitungen behandelt werden, da unangemessene Einstellung anderer Regelelemente Beschädigung verursachen kann und oft beträchtliche Arbeit durch einen qualifizierten Techniker erfordert, um das Erzeugnis wieder, zu normalem Betrieb zurückzubringen.
- Wenn das Erzeugnis fallen gelassen oder beschädigt worden ist.
- Wenn das Erzeugnis eine klare Änderung in der Leistung zeigt - dies weist darauf hin, daß Wartung erforderlich ist.

## 21. Ersatzteile

Wenn Ersatzteile erforderlich sind, darauf achten, daß der Wartungstechniker nur die vom Hersteller festgelegten Ersatzteile oder Teile mit den gleichen Charakteristiken wie die ursprünglichen Teile verwendet. Unautorisierte Ersatzteile können Feuer, elektrischen Schlag oder sonstige Gefährdungen verursachen.

## 22. Sicherheitsprüfung

Bitten Sie den Wartungstechniker nach der Vervollendung von Wartung oder Reparaturarbeiten an diesem Erzeugnis um die Durchführung von Sicherheitsprüfungen, um zu bestimmen, daß das Erzeugnis im angemessenen Betriebszustand ist.

## 23. Anbringung an der Wand oder an der Decke

Das Erzeugnis sollte nur entsprechend den Empfehlungen des Herstellers an einer Wand oder an der Decke angebracht werden.

## 24. Wärme

Das Erzeugnis sollte fern von Wärmequellen wie Radiatoren, Heizwiderständen, Öfen und anderen Wärme erzeugenden Erzeugnissen (einschließlich Verstärkern) aufgestellt werden.

# MISES EN GARDE IMPORTANTES

## 1. Lire les instructions

Lire toutes les instructions de sécurité et de fonctionnement avant de faire fonctionner l'appareil.

## 2. Conserver ces instructions

Conserver les instructions de sécurité et de fonctionnement à des fins de référence ultérieure.

## 3. Tenir compte des avertissements

Tous les avertissements qui figurent sur l'appareil et dans le mode d'emploi devront être respectés.

## 4. Observer les instructions

Observer toutes les instructions de fonctionnement et d'utilisation.

## 5. Nettoyage

Avant de procéder au nettoyage, débrancher l'appareil de la prise secteur. Ne pas utiliser de produits de nettoyage liquides ou en aérosol.

Nettoyer l'appareil avec un chiffon humide.

## 6. Fixations

Ne pas utiliser de fixations non recommandées par le fabricant de l'appareil car elles pourraient être source de danger.

## 7. Eau et humidité

Ne pas utiliser l'appareil à proximité d'eau - par exemple près d'une baignoire, d'un lavabo, d'un évier ou d'un bac à lessive, dans un sous-sol humide, ou près d'une piscine, etc.

## 8. Accessoires

Ne pas placer l'appareil sur un chariot, un socle, un pied, un support ou une table instables. L'appareil pourrait tomber, blessant grièvement des enfants ou des adultes, et étant sérieusement endommagé.

Utiliser exclusivement le chariot, le socle, le pied, le support ou la table recommandés par le fabricant, ou vendus avec l'appareil. Pour tout montage de l'appareil, respecter les instructions du fabricant, et utiliser à cette fin l'accessoire de montage recommandé par le fabricant.

## 9. L'appareil monté sur son chariot devra être déplacé avec précaution

Des arrêts brusques, une force excessive et des surfaces irrégulières pourraient provoquer le renversement de l'ensemble appareil-chariot.

## 10. Ventilation

Les fentes et les ouvertures du coffret sont prévues pour la ventilation ainsi que pour garantir un fonctionnement en toute sécurité de l'appareil et le protéger de toute surchauffe, et ces ouvertures ne devront donc être ni obstruées ni recouvertes. Ne jamais obstruer les ouvertures en plaçant l'appareil sur un lit, un sofa, un tapis ou toute surface similaire. Ne jamais placer l'appareil dans un support confiné, par exemple une bibliothèque ou une étagère, sans ventilation suffisante ou sans respecter les instructions du fabricant.

## 11. Sources d'alimentation

L'appareil devra être alimenté exclusivement sur le type d'alimentation indiqué sur l'étiquette signalétique. Si l'on n'est pas sûr du type d'alimentation local, consulter le revendeur de l'appareil ou la compagnie d'électricité locale. Pour les appareils qui fonctionnent sur batterie ou sur d'autres sources, voir le mode d'emploi.

## 12. Mise à la terre ou polarisation

L'appareil est doté d'une fiche trifilaire avec mise à la terre, dont la troisième broche assure la mise à la terre. Cette fiche ne rentrera que dans les prises trifilaires de mise à la terre. Ceci est une mesure de sécurité. Si la fiche ne rentre pas dans la prise, faire remplacer la prise défectueuse par un électricien.

Ne pas rendre vaine la mesure de sécurité assurée par cette prise avec mise à la terre.

## 13. Protection du cordon d'alimentation

Acheminer les cordons d'alimentation de façon qu'on ne risque pas de marcher dessus ou de les coincer sous un objet placé dessus ou contre eux.

Faire particulièrement attention aux fiches des cordons, à la proximité des prises, et à l'endroit où ils ressortent de l'appareil.

## 14. Foudre

Pour renforcer la protection de l'appareil pendant un orage, ou si l'on s'en éloigne ou qu'on reste longtemps sans l'utiliser, le débrancher de la source d'alimentation. Ceci permettra d'éviter tout dommage de l'appareil dû à la foudre et aux surtensions de ligne.

## 15. Surcharge

Ne pas surcharger les prises, rallonges et prises multiples car cela pourrait entraîner un risque de feu ou de choc électrique.

## 16. Pénétration d'objets et de liquides

Ne jamais enfoncer d'objets d'aucune sorte dans les ouvertures de l'appareil car ils pourraient toucher des points de tension dangereuse ou court-circuiter des pièces, ce qui pourrait provoquer un feu ou un choc électrique. Ne jamais renverser de liquide d'aucune sorte sur l'appareil.

## 17. Substances inflammables et explosives

Éviter d'utiliser l'appareil en présence de gaz, ainsi qu'à proximité immédiate de substances inflammables et explosives.

## 18. Chocs ou vibrations violents

Lorsqu'on transporte l'appareil, ne pas le soumettre à des chocs ou des vibrations violents.

## 19. Réparations

Ne pas tenter de réparer l'appareil soi-même car le fait d'ouvrir ou de retirer les caches risque d'exposer l'utilisateur à des tensions dangereuses notamment. Confier toute réparation à un personnel qualifié.

## 20. Dommages nécessitant réparations

Débrancher l'appareil de la source d'alimentation et confier les réparations à un personnel qualifié dans les cas suivants:

- Lorsque le cordon d'alimentation ou sa fiche sont endommagés
- Si du liquide s'est renversé sur l'appareil ou que des objets sont tombés dedans
- Si l'appareil a été exposé à la pluie ou à l'eau.
- Si l'appareil ne fonctionne pas normalement lorsqu'on observe les instructions d'utilisation.  
Ne régler que les commandes couvertes par le mode d'emploi ; en effet, un réglage incorrect des autres commandes pourrait entraîner des dommages et nécessiteront souvent des travaux de réparation coûteux par un technicien qualifié pour remettre l'appareil en état de marche.
- Si l'appareil est tombé ou qu'il a été endommagé.
- Si l'appareil affiche une nette modification de ses performances, cela signifie qu'il a besoin d'être réparé.

## 21. Pièces de rechange

Si l'on a besoin de pièces de rechange, veiller à ce que le technicien de réparation utilise exclusivement les pièces de rechange spécifiées par le fabricant ou des pièces ayant les mêmes caractéristiques que les pièces d'origine. Les pièces de rechange non autorisées risquent de provoquer un feu, un choc électrique et autres dangers.

## 22. Vérification de sécurité

Après tout travail d'entretien ou de réparation de l'appareil, demander au technicien de réparation d'effectuer les vérifications de sécurité pour s'assurer que l'appareil est en bon état de marche.

## 23. Montage au mur ou au plafond

L'appareil ne pourra être monté au mur ou au plafond que de la manière recommandée par le fabricant.

## 24. Chaleur

Éloigner l'appareil des sources de chaleur, telles que radiateurs, appareils de chauffage, cuisinières, et de tout produit engendrant de la chaleur (y compris les amplificateurs).

## IMPORTANT NOTICE

### For U.S.A.

These products have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### WARNING

Changes or modifications not expressly approved by Kokusai Denki responsible for compliance could void the user's authority to operate the equipment.

### For Canada

This product does not exceed the class A/class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations.

Le présent appareil n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada.

## China RoHS

The following statement is related to the regulation on "Measures for the Administration of the control of Pollution by Electronic Information Products", known as "China RoHS".

The table shows contained Hazardous Substances in this camera.

说明书（环境方面：补充资料）

对象产品：CMOS 摄像机

### 1. 电子电气产品有害物质使用限制标志



此标志是根据 2016 年 7 月 1 日施行的《电器电子产品有害物质限制使用管理办法》以及 SJ/T11364-2014《电子电器产品有害物质限制使用标志要求》而制定的，是用来表示适用于在中华人民共和国流通的电子产品的环保使用期限。

只要遵守此类产品的安全事项以及使用上应注意的问题，从制造日起到此年限内，不会发生产品中的有害物质外泄、突变等，不会对环境、人体以及财产产生严重影响。同时，此年限是除去必须定期交换的保守部件的，是其他产品的环保使用期限。

产品在正常情况下使用完毕要废弃时，请遵守各地区对电子信息产品的回收·再利用的相关各项法律、法规。

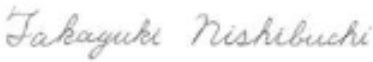
另外，从第三者处转买的情况下即使在本期限内也视为失去效力。

### 2. 产品中有毒有害物质或元素的名称及含量

	部件名称	有毒有害物质或元素					
		铅 (Pb)	水银 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
1	主机	×	○	○	○	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T26572 标准规定的限量要求以下。  
×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 标准规定的限量要求。

## EU Declaration of Conformity (No. KV-0426B)

1	Apparatus model/Product (product, type, batch or serial number): HV-FM230SCL / 001	
2	Name and address of the manufacturer or his authorized representative:	Manufacturer: KOKUSAI DENKI Electric Inc. 2-15-12 Nishi-shimbashi, Minato-ku, Tokyo 105-8039, Japan  Authorized representative in Europe : KOKUSAI DENKI Electric Europe GmbH Siemensstr.9 D-63263 Neu-Isenburg Germany
3	This declaration of conformity is issued under the sole responsibility of the manufacturer.	
4	Object of the declaration (identification of apparatus allowing traceability):	CMOS Camera : Model HV-FM230SCL
5	The object of the declaration described above is in conformity with the Union harmonization legislation listed in section 6 : EN IEC 63000:2018	
6	Applied Union harmonized legislation and references to the relevant harmonization standards used, including the date of the standard, or references to the other technical specifications, including the date of the specification, in relation to which conformity is declared:	
	Documents No	Title
	Directive 2014/30/EU EU harmonized Standards	EU EMC Directive (March 2014) EN 61000-6-3:2007/A1:2011/AC:2012 EN IEC 61000-6-1:2019
	Complies with EU Directive 2011/65 including Annex II EU Directive 2015/863.	EU RoHS Directive (July 2011,Mar 2015) EN IEC 63000:2018
7	Notified body involved ---	
8	Additional information: ---	
	Signed for and on behalf of: KOKUSAI DENKI Electric Inc.	
	(place and date of issue):	2-15-12 Nishi-shimbashi, Minato-ku, Tokyo 105-8039, Japan 27th Dec., 2024
	(name,function) (signature):	 <hr style="width: 20%; margin-left: 0;"/> T.Nishibuchi Senior Manager Product Quality Assurance Department Quality Assurance Division KOKUSAI DENKI Electric Inc.

# Operating considerations Notes to users

## **1. Important safety notes**

- Use this camera with a 12VDC (11VDC to 13VDC) power supply. Time will be needed for about four seconds by the time the camera works normally after turning on the power supply.
- Observe that flammable objects, water or metal do not enter the camera interior. These may lead to failure or accident.
- Do not modify the camera or use the camera with external covers removed. These may cause failure, void any warranties and pose a safety hazard.
- Stop using the camera at the approach of electrical storm (thunder audible). Protect the camera from rain if using it outdoors.
- In event the camera shows any abnormality, switch off the camera and disconnect the power cord. Contract a Kokusai Denki Electric service representative.
- Do not touch the optical filter on the front of the sensor. The image deteriorates due to dirt, scratches, etc.
- When using a heavy lens such as a zoom lens or when heavy vibration or shock is applied, fix the lens to the device.

## **2. Handling**

- Do not attempt to remove cover.
- When installing or removing a lens, be sure to use care that water or dust does not enter the inside of the camera.
- Please do installation work of lens at a clean place to prevent dust adhesion.
- When installing the lens, please handle carefully so as not to incline. Also, in the screw part of the lens mount, please use those with no foreign matter adhesion, scratches or garbage etc.

## **3. Installing and storage**

Avoid installing or storing the camera in the following environments.

- Environments exposed to direct sunlight, rain or snow.
- Environments where combustible or corrosive gas exists.
- Excessively warm or cold environment (Operating ambient temperature: -10 to 50°C).
- Humid or dusty environment.
- Place subjected to excessive vibration or shock.
- Environment exposed to strong electric or magnetic field.
- Do not aim the camera lens at the sun.
- Do not shoot strong light.
- When such a scene is shot, vertical trailing will appear. However, this is not due to failure. In case strong light enters camera through the lens, partial deterioration in picture quality will result.

## **4. To obtain stable performance for long time**

When the camera is used continuously for long time under high ambient temperature, the inside electrical parts become deteriorated, resulting in shortening its life. To use the camera continuously for long time, the highest temperature must be below 40°C.

## **5. Connectors**

Confirm the power is off before connecting or disconnecting a signal cable. Grasp connectors by the body, not the attached wires.

## **6. Cleaning**

- Use a blower or a lens brush to remove dusts on the lens or the optical filter.
- Wipe dirt on the case off with dry soft cloth. If dirt is hardened, wipe them off with cloth moistened with neutral detergent liquid; wipe the cover with dry cloth. Please remove dust so as not to scratch lens or optical filter.
- Do not use benzene, thinner, alcohol, liquid cleaner or spray-type cleaner.
- In event dust or other debris is lodged between the CMOS and optical filter, consult dealer for cleaning by an optical technician.
- Even when you do not use this camera, please attach a lens or seal to protect the optical filter from dust and scratches.

## **7. Phenomena inherent to CMOS imaging device**

The following phenomena are inherent to a CMOS device and do not indicate malfunction.

### **1) Fixed pattern noise**

High ambient temperature or high camera sensitivity can cause fixed pattern noise to appear throughout the scene.

### **2) Moire**

Interaction between patterns can produce an additional "phantom" pattern to appear. The CMOS picture elements (pixels) are arranged in a pattern, which can interact with a pattern in the scene (e.g., a performer wearing a finely striped necktie) to result in a Moire pattern. The effect should be considered when selecting costumes, props and other scene elements.

### **3) Ghosting**

Strong direct or reflected light near an object of interest can cause ghosting of the object to appear in the picture. The effect is more obtrusive with certain iris settings and lens types. Select the scene layout and camera pointing direction carefully in order to avoid this effect.

### **4) Defective pixels**

Imperceptible white spots may rarely come up on the screen due to cosmic rays and so on. It becomes easy to appear when the sensitivity of the camera is raised or in the operation at the high temperature.

### **5) Horizontal pull phenomenon of image**

Subject might become bright when there is strong light (strong reflection of the light, the fluorescent lamp, and sunlight etc.) next to subject. It becomes easy to see by raising the camera sensitivity.

**6) Horizontal line noise when electronic shutter is used**

Depending on the exposure time setting, horizontal line noise may appear.

The higher a camera sensitivity is, the easier it is to see it.

**8. Attention about laser light**

Laser light may do damage to CMOS image sensor. When you use laser light, be careful not to irradiate it on the CMOS image sensor surface. The CMOS image sensor breakage by laser light irradiation is out of warranty. (The repair is not free of charge.)



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# 1. Overview

HV-FM230SCL is Camera Link output type color camera which utilized the 1/2.3-inch progressive scan CMOS image sensor.

Image of 2.3million pixels is output with high speed of 30frames per second.

# 2. Standard composition

## Check when unpacking

- Camera ..... 1
- Installation guide ..... 1
- Plug for DC IN/SYNC connector (HR10A-10P12S) ..... 1

## Optional accessories

- (1) Junction box                      JU-F30
- (2) Tripod adaptor                 TA-F202
- (3) Mini-Camera Link cable
- (4) Camera cable

	Molded type	Shield type
2m	C-201KSM	C-201KSS
5m	C-501KSM	C-501KSS
10m	C-102KSM	C-102KSS

In CE marking and KCC compliant regions, use the shield type and attach clamp filter (ZCAT 2035-0930A: TDK) to the camera side of the cable.

Note : When not using the specified junction box, Mini-CameraLink cable, camera cable and clamp filter, malfunctions may be caused.

# 3. Features

## High frame rate and color fidelity

The 1/2.3-inch 2.3million pixels square lattices progressive scan CMOS and high precision lamination technology achieves high frame rate of 30fps at image size of 1920(H)×1200(V) and good color reproduction.

## Small and lightweight

The small SDR connector for digital output allows the camera size and mass to be drastically reduced to 55(W) x 55(H) x 89(D) mm / approx. 220g.

## Various picture quality enhancement

Independent size color masking is the Kokusai Denki innovation for optimizing color balance. Saturation and hue of 6 colors (Red, Green, Blue, Cyan, Magenta and Yellow) can be adjusted independently to deliver the best color in image capture, microscope and other applications.

In-out gradation control can be arbitrarily adjusted by using LUT.

## Auto shading correction

Color shading due to aberration of the lens is automatically compensated or reduced.

## Versatile CMOS drive functions

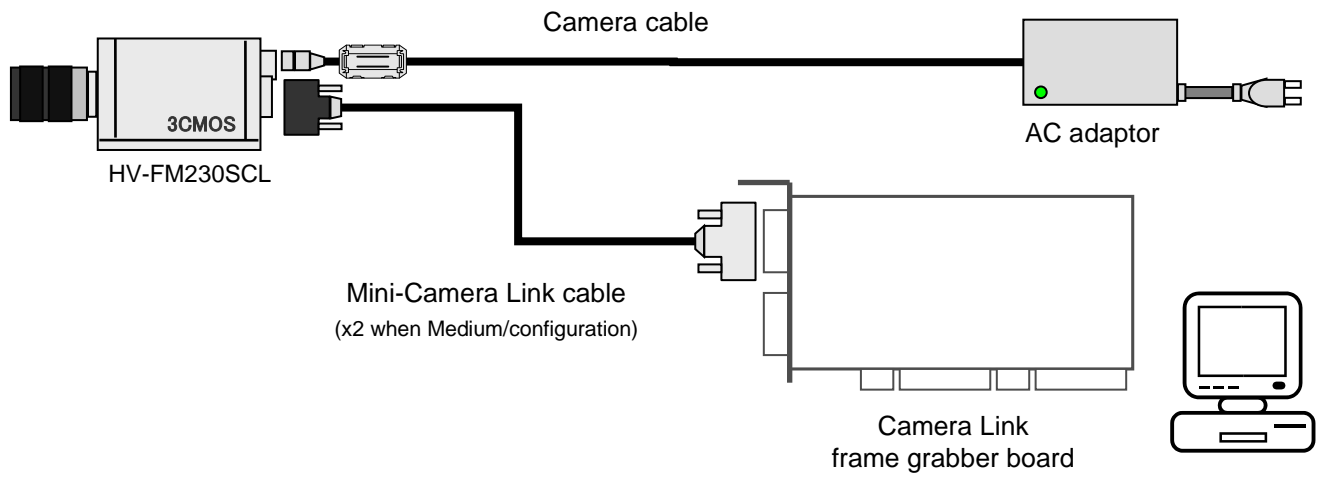
Video frame capture on demand using external trigger signal

Variable shutter mode (min. 1/50,000 second)

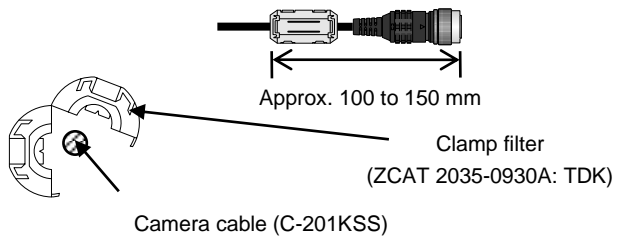
Auto electronic shutter mode

## 4. System example

HV-FM230SCL connects to frame grabber board using mini Camera Link cable.



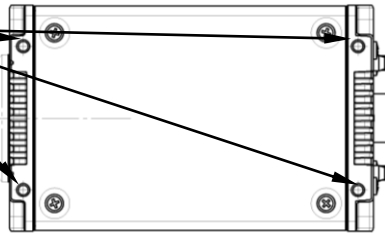
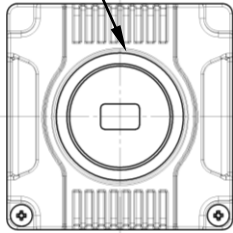
In the CE Marking region, use following specified cables and clamp filters.



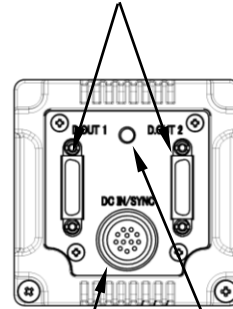
# 5. Section name and functions

Camera / Tripod adaptor mounting screw holes

Lens mount (C mount)

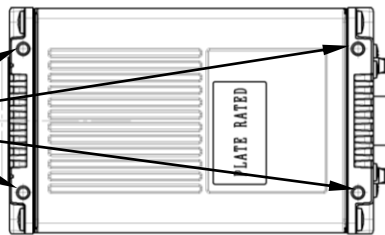


**Camera Link connector**  
Use for digital video output and camera control signal input/output signal.



**Pilot lamp**  
It is lighted when powered on.

Camera / Tripod adaptor mounting screw holes



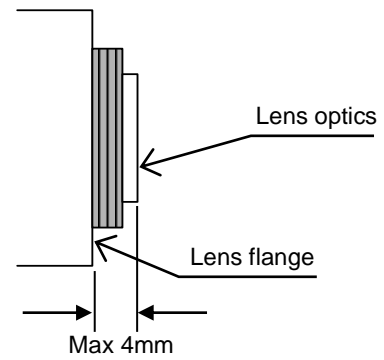
**DC IN/SYNC 12pin connector**  
Use for DC+12V power and external trigger input.

## 6. Lens

### CAUTION

Observe the dimensions of the lens mounting selection as illustrated at the right.

If the dimensions are not observed, do not use such a lens, because the lens and the camera will be damaged.



### Selecting a lens

The proper lens is important for obtaining adequate performance from the camera. Especially in the case of a three elements CMOS system C mount camera, the lens incidence and exit distances are important. If separation is too short, color irregularity is apt to occur at the top and bottom of the image.

Conversely if too long, where the lens iris is a nearly fully open, resolution is impaired, while shading and flare can seriously detract from image quality. When using 3 CMOS color system camera, it is also recommended to use a lens designed for this purpose.

# 7. Connector

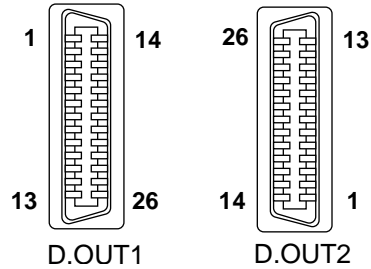
## 1. Camera Link connector

(a) Interrelation between number of DATA bit and number of used connector

	Number of Data bits	D.OUT1	D.OUT2
1	24bit (R: 8bit G: 8bit B: 8bit)	O	-
2	30bit (R: 10bit G: 10bit B: 10bit)	O	O
3	36bit (R: 12bit G: 12bit B: 12bit)	O	O

O: Use  
-: Not use

(b) Signal connection of DIGITAL OUT connector



D.OUT1 (Connector 1)

Pin No.	Signal	Pin No.	Signal
1	GND	14	GND
2	TXOUT 0 (-)	15	TXOUT 0 (+)
3	TXOUT 1 (-)	16	TXOUT 1 (+)
4	TXOUT 2 (-)	17	TXOUT 2 (+)
5	TXCLKOUT (-)	18	TXCLKOUT (+)
6	TXOUT 3 (-)	19	TXOUT 3 (+)
7	RX (+) [ SERTC (+) ]	20	RX (-) [ SERTC (-) ]
8	TX (-) [ SERTFG (-) ]	21	TX (+) [ SERTFG (+) ]
9	TRIG/VD (-) [ CC1 (-) ]	22	TRIG/VD (+) [ CC1 (+) ]
10	N.U. [ CC2 (+) ]	23	N.U. [ CC2 (-) ]
11	N.U. [ CC3 (-) ]	24	N.U. [ CC3 (+) ]
12	N.U. [ CC4 (+) ]	25	N.U. [ CC4 (-) ]
13	GND	26	GND

D.OUT2 (Connector 2: used for Medium Configuration)

Pin No.	Signal	Pin No.	Signal
1	GND	14	GND
2	TYOUT 0 (-)	15	TYOUT 0 (+)
3	TYOUT 1 (-)	16	TYOUT 1 (+)
4	TYOUT 2 (-)	17	TYOUT 2 (+)
5	TYCLKOUT (-)	18	TYCLKOUT (+)
6	TYOUT 3 (-)	19	TYOUT 3 (+)
7	N.U.	20	N.U.
8	N.U.	21	N.U.
9	N.U.	22	N.U.
10	N.U.	23	N.U.
11	N.U.	24	N.U.
12	N.U.	25	N.U.
13	GND	26	GND

SDR connector (3M) or equivalent

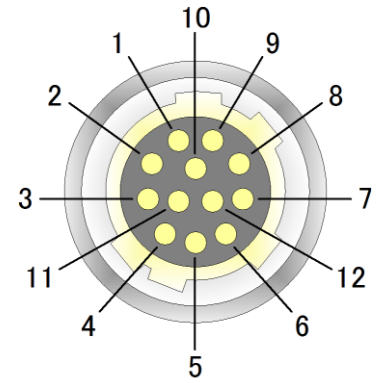
N.U.: Not Used

- The digital out cable should be comprised of a twisted pair of wires having 100Ω characteristic impedance and an outer heath shield type conductor.
- Connect the shield (ground) of the digital out cable to the ground terminal of the video equipment, frame grabber, etc.
- TX: Transmit data from camera to machine
- RX: Transmit data from machine to camera

(Note) Please do not unplug and insert cable (digital out cable) with a power supplied to a camera.

2. DCIN/SYNC connector

PIN NO.	Signal	PIN NO.	Signal
1	GND (+12V)	7	TRIG
2	+12V	8	GND
3	GND	9	N.C.
4	N.C.	10	FLASH / VD OUT
5	GND	11	N.C.
6	N.C.	12	GND



Connector (camera side) : SANWOO SHN-10-12 (RPCB) or equivalent

Plug (matching cable plug) : HR10A-10P-12S(01) HIROSE or equivalent

(Note) Please do not unplug and insert cable (camera cable) with a power supplied to a camera.  
Please do not input any signal to N.U. pin because machine may break down.

## 8. Functions and operations

Various mode setup and adjustment of HV-FM230SCL are performed by the remote control via Camera Link. Operation and adjustment way of function utilized are described below. See "Remote control"(page 14 ~) and "Command list"(page 21 ~) about communication method of each command.

### 8.1 TRIGGER : Setting about external trigger

#### -MODE : Select of mode

- OFF (Factory setting) : Trigger mode set to OFF (normal mode).
- FIXED SHUTTER : Trigger mode set to Fixed shutter.
- ONE TRIGGER : Trigger mode set to One trigger.

#### -POLARITY : Select of trigger polarity

- POSITIVE (Factory setting) : Input polarity HIGH is made into trigger signal.
- NEGATIVE : Input polarity LOW is made into trigger signal.

#### -SOURCE : Select of trigger source

- CC1 (Factory setting) : Input trigger signal from Camera Link signal CC1(see page 5 "Connector").
- 12pin : Input trigger signal from 7 pin of 12 pin DCIN/SYNC connector.

\* See "Trigger operation and timing chart" (page 30 ~).

### 8.2 SHUTTER : Setting of electronic shutter

#### -PRESET: Setting speed of PRESET shutter.

- OFF (Factory setting) : Shutter operation set to OFF (NORMAL shutter).
- 1/60, 1/100, 1/250, 1/500,  
1/1000, 1/2000, 1/10000,  
1/50000 second : Electronic shutter set to preset shutter speed (PRESET shutter).
- VARIABLE : Electronic shutter set to variable shutter speed in the range of 20 $\mu$ s to 655,370 $\mu$ s (Factory setting: 32,260 $\mu$ s)(VARIABLE shutter).

#### -VARIABLE VALUE : Setting speed of VARIABLE shutter.

- 20 $\mu$ s to 655370 $\mu$ s : Electronic shutter can be set in the range of 20 $\mu$ s to 655,370 $\mu$ s in 65535 steps. (Factory setting: 32,260 $\mu$ s)
- In 1 step, it is variable for 10 $\mu$ s.

#### -AES MODE : Selects a control mode of AES (Automatic electronic shutter).

- OFF (Factory setting) : Not perform AES (using manual setting of OFF/PRESET/VARIABLE).
- ON : An electronic shutter is controlled automatically so that the brightness of the output image will be practical level.

#### -AES MIN : Setting to shortest speed limit of an AES.

- 20 $\mu$ s to 655,370 $\mu$ s : AES range for minimum exposure limit. (Factory setting : 20 $\mu$ s)
- When become setting AES MAX < MIN, it effects same value on AES MAX.

#### -AES MAX- : Setting to longest speed limit of an AES.

- 20 $\mu$ s to 655,370 $\mu$ s : AES range for maximum exposure limit. (Factory setting : 32,260 $\mu$ s)
- When become setting AES MAX < MIN, it effects same value on AES MIN.

### 8.3 GAIN LEVEL : Setting of electrical sensitivity

#### -Value- : Adjust MANUAL gain level

- 0 (Factory setting) to 18dB : Set MANUAL gain when AGC is OFF.
- Adjustable from 0 to 18dB in steps of 0.1dB.

#### -AGC MODE- : Selects a control mode of AGC (Automatic gain control)

- OFF (Factory setting) : Not perform AGC (using manual setting of VALUE).
- ON : A gain of electrical sensitivity is controlled automatically so that the brightness of the output image will be practical level.



**-AGC MIN- : Setting to lowest gain limit of AGC.**

0 to 18dB : Set minimum gain limit for AGC range in steps of 0.1dB.(Factory setting : 0dB)  
When become setting AGC MAX < MIN, it effects same value on AGC MAX.

**-AGC MAX- : Setting to highest gain limit of AGC.**

0 to 18dB : Set maximum gain limit for AGC range in steps of 0.1dB gain limit.(Factory setting : 18dB)  
When become setting AGC MAX < MIN, it effects same value on AGC MIN.

**8.4 ALC LEVEL : Setting to practical level (ALC: Auto level control) for AGC/AES**

It is adjustable practical level for the brightness of the output image.

When AES MODE or AGC MODE is ON, those use this practical level.

0 to 255 : Setting value toward 0 side make a dark image and 255 side make a bright image.  
(Factory setting : 128).

**8.5 BRIGHTNESS : Adjust offset level**

-128 to 127 : Set the black level in the range of -128 (Approx. -25%) to 127 (Approx. +25%) based on "0".  
(Factory setting:0)

**8.6 GAMMA : Setting of gamma correction**

**-MODE : Selection of mode**

OFF (Factory setting) : Not perform gamma correction.

ON 1 : When LEVEL value is 255, that makes gamma = 0.45 so that normal gamma curve.

ON 2 : Dark side expand less than ON1, so that makes a S line gamma curve.

**-LEVEL : Adjust gamma correction**

0 (Factory setting) to 255 : Set gamma curve in 256 steps.

Setting value 0 makes gamma = 1.0 that nearly equal OFF.

Setting value 255 makes gamma = 0.45 so that normal gamma curve. (ON 1)

**8.7 KNEE : Setting of KNEE**

**-MODE : Selection of mode**

OFF (Factory setting) : Not perform knee.

ON : Knee function provides natural gradation in bright portions.

**-KNEE POINT : Adjust knee point**

0 (Factory setting) to 32 : Setting value toward 0 side increase start level of knee and  
32 side decrease start level of knee.

(Setting range of knee correction start level: 75% to 100%)

**-KNEE SLOPE : Adjust knee slope(Knee correction slope factor)**

0 (Factory setting) to 159 : Setting value toward 0 side intensify effective of knee and  
159 side weaken effective of knee.

(Setting range of knee correction factor: 0.375 to 1.0)

## 8.8 LUT : Setting of Look Up Table

This function converts input video level to arbitrary output level by using table data.

TABLE XXX[n] (XXX=RED, GREEN or BLUE; "n" indicates the input video level) is a table with 0 to 255 elements corresponding to input video level (0% to 100%).

The input video level "n" is converted to the output level specified by TABLE XXX[n].

### -MODE : Selection of mode

OFF (Factory setting) : Not use the function of LUT.

ON : The output image is converted by the values which is set in TABLE RED/TABLE GREEN/TABLE BLUE.

### -TABLE RED [n]- : 256 LUTs for Red (n is table number and that was chosen from the input level).

0 to 255 : The input level "n" is converted to the set value.

Factory setting is the same value to input video level "n". (TABLE RED[n] = n.)

### -TABLE GREEN [n]- : 256 LUTs for Green (n is table number and that was chosen from the input level).

0 to 255 : The input level "n" is converted to the set value.

Factory setting is the same value to input video level "n". (TABLE GREEN[n] = n.)

### -TABLE BLUE [n]- : 256 LUTs for Blue (n is table number and that was chosen from the input level).

0 to 255 : The input level "n" is converted to the set value.

Factory setting is the same value to input video level "n". (TABLE BLUE[n] = n.)

## 8.9 SHARPNESS : Setting of object contour correction

### -MODE : Selection of mode

OFF (Factory setting) : Not perform contour correction.

ON : Perform contour correction according to setting value.

### -LEVEL- : Adjust sharpness level

0 to 255 : Setting value toward 0 side reduces correction for soft contours  
and 255 side increase correction for sharper contours (Factory setting: 0).

## 8.10 WHITE BALANCE : Setting of white balance.

### -MODE : Selection of mode

MANUAL (Factory setting) : White balance is adjusted manually by adjusting R GAIN and B GAIN.

CONTINUOUS AUTO : White balance is adjusted in real time (automatic tracking).

ONCE AUTO : White balance is adjusted automatically by adjusting R GAIN and B GAIN.  
And after adjustment, own status will be changed to MANUAL.

### -R GAIN : Adjust red gain

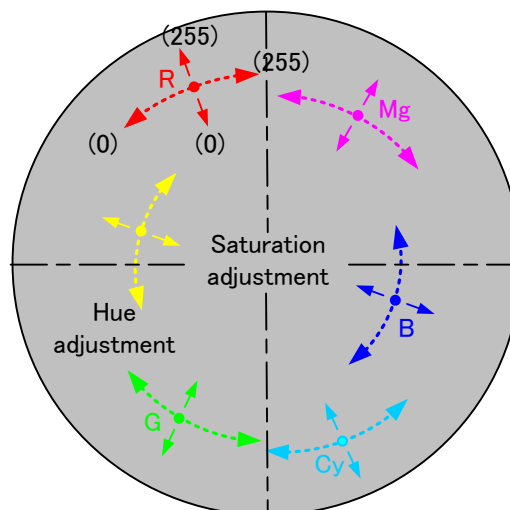
0 to 255 : Red gain is reduced at 0 side and raised at 255 side (Factory setting is 128).

### -B GAIN : Adjust blue gain

0 to 255 : Blue gain is reduced at 0 side and raised at 255 side (Factory setting is 128).

**8.11 MASKING : Setting of 6 vector independent making (primary color R G B and complementary color Ye Cy Mg saturation and hue can be separately varied).**

A figure is showing the masking effects on the color vector. ==>



**-MODE : Selection of mode**

OFF (Factory setting) : Not use masking functions.  
ON : Use masking functions.

**-RED SATURATION : Adjust red saturation**

0 to 255 : Adjust red saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**-RED HUE : Adjust red hue**

0 to 255 : Red come near to yellow at 0 side and come near to magenta at 255 side. (Factory setting is 128)

**-CYAN SATURATION : Adjust cyan saturation**

0 to 255 : Adjust cyan saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**-CYAN HUE : Adjust cyan hue**

0 to 255 : Cyan come near to blue at 0 side and come near to green at 255 side. (Factory setting is 128)

**-GREEN SATURATION : Adjust green saturation**

0 to 255 : Adjust green saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**-GREEN HUE : Adjust green hue**

0 to 255 : Green come near to cyan at 0 side and come near to yellow at 255 side. (Factory setting is 128)

**-MAGENTA SATURATION : Adjust magenta saturation**

0 to 255 : Adjust magenta saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**-MAGENTA HUE : Adjust magenta hue**

0 to 255 : Magenta come near to red at 0 side and come near to blue at 255 side. (Factory setting is 128)

**-BLUE SATURATION : Adjust blue saturation**

0 to 255 : Adjust blue saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**-BLUE HUE : Adjust blue hue**

0 to 255 : Blue come near to magenta at 0 side and come near to cyan at 255 side. (Factory setting is 128)

**-YELLOW SATURATION : Adjust yellow saturation**

0 to 255 : Adjust yellow saturation in 256 steps. (Factory setting is 128)  
Setting value toward 0 side makes pastel and 255 side makes colorful.

**- YELLOW HUE : Adjust yellow hue**

0 to 255 : Yellow come near to green at 0 side and come near to red at 255 side. (Factory setting is 128)

## 8.12 PAINT BLACK : Setting of paint black (black level of Red/Green/Blue can be separately varied).

### -MODE- : Selection of mode

OFF (Factory setting) : Not use paint black functions.

ON : Use paint black functions.

### -RED- : Adjust red color level

0 (Factory setting) to 127: Adjust black level of red color level in 128 steps.

### -GRREN- : Adjust green color level

0 (Factory setting) to 127: Adjust black level of green color level in 128 steps.

### -BLUE- : Adjust blue color level

0 (Factory setting) to 127: Adjust black level of blue color level in 128 steps.

## 8.13 WHITE SHADING : Setting of white shading correction.

There is a possibility that a camera makes an irregular color occur to an output picture by the picture taking environment. Lighting, the lens and a built-in prism will be a factor of the irregular color. Therefore this camera has the white shading function to reduce an irregular color. The zoom position and an iris value of the lens with the lighting blotches change an irregular color, so before carrying out white shading, it should be decided.

### -MODE- : Selection of mode

OFF (Factory setting) : Not perform white shading correction.

ON : Perform white shading correction.

### -ADJUST (ONCE AUTO) : AUTO SHADING (A data to correct white shading is generated.)

#### !!!Attention!!!

Don't execute in whole usual picture taking! Unnecessary correction data causes a phenomenon like branding. When was executing by mistake, please reexecute with a procedure and make it right correction data.

- i. Please build the taking picture environment first. (Lighting, the field angle and the iris value)
- ii. Please take a picture of the object by which all output pictures will be in uniform white.
- iii. Please, make a defocus for flat picture without little detail. And use a shutter for an output level 80% ~ 60% (200~150 digits on the 8bit depth).
- iv. Please adjust a white balance first.
- v. Set SHADING MODE ON and carry out AUTO SHADING. Thus, color shading in the image is corrected automatically.

## 8.14 DNR : Setting of noise reduction.

OFF (Factory setting) : Not perform noise reduction.

ON : Noise reduction function reduces the noise of image.

## 8.15 DATA BIT : Setting of output bit depth

24bit (Factory setting) : Configuration is set to Base configuration. Image is outputted by RGB 24 bit.

30bit : Configuration is set to Medium configuration. Image is outputted by RGB 30 bit.

36bit : Configuration is set to Medium configuration. Image is outputted by RGB 36 bit.

## 8.16 OUTPUT : Setting of output signal from 10 pin of 12 pin DCIN/SYNC connector

### - SIGNAL : Selection of signal form

OFF (Factory setting) : No output.

FLASH OUT : Output flash pulse (strobe out).

VD : Output camera VD.

### -POLARITY- : Selection of signal polarity of FLASH

POSITIVE (Factory setting) : Output High active signal.

NEGATIVE : Output Low active signal.

## 8.17 PIXEL CORRECTION : Setting of white spot correction

### -MODE - : Selection of mode

OFF : Not perform white spot correction.

ON (Power On status) : Perform white spot correction.

(This status follows a power supply start of a camera, and is setting to ON.)

### -RED THRESHOLD : Threshold of white spot correction for Red channel CMOS

1 to 99 : Set threshold value for Red channel CMOS by output value from 1% to 99%.

This value follows a power supply start of a camera, and is setting 5%.

### -GREEN THRESHOLD : Threshold of white spot correction for Green channel CMOS

1 to 99 : Set threshold value for Green channel CMOS by output value from 1% to 99%.

This value follows a power supply start of a camera, and is setting 5%.

### -BLUE THRESHOLD B : Threshold of white spot correction for Blue channel CMOS

1 to 99 : Set threshold value for Blue channel CMOS by output value from 1% to 99%.

This value follows a power supply start of a camera, and is setting 5%.

### -DETECT (ONCE AUTO) : Detect white spots and read the result

- i. Please wait one hour for a camera heat run.
- ii. Please close the lens iris or block light to prevent light from entering the camera.
- iii. Please set DETECT "1", execute DETECT and wait few seconds.  
The camera detects the pixel that level is higher than threshold as white spot.
- iv. When DETECT becomes 0, detection has completed normally. When DETECT becomes 2, the number of detections are overflowed.  
(The maximum number of white spot correction of each color is 2047.)
- v. When detection is completed normally, correction data is saved in non-volatile memory and read as white flaw correction coordinates even when the power is started.(No need MEMORY SAVE.)

### - RED DETECTED No : Detection number of white spot for Red channel CMOS(Read only)

0 to 2048 : The number of white spot on the Red CMOS that has been detected in the execution of the detection. When it becomes 2048, the number of detections has overflowed.

### - GREEN DETECTED No : Detection number of white spot for Green channel CMOS(Read only)

0 to 2048 : The number of white spot on the Green CMOS that has been detected in the execution of the detection. When it becomes 2048, the number of detections has overflowed.

### - BLUE DETECTED No : Detection number of white spot for Blue channel CMOS(Read only)

0 to 2048 : The number of white spot on the Blue CMOS that has been detected in the execution of the detection. When it becomes 2048, the number of detections has overflowed.

### 8.18 BINNING : Setting of Vertical Pixel Mix

OFF (Factory setting) : Not perform vertical pixel mix.

ON : Vertical pixel mix doing that make approximately double frame rate.

### 8.19 PARTIAL SCAN: Setting for Partial Scan

#### -MODE : Selection of mode

OFF(Factory setting) : Not perform partial scan.

ON : Perform partial scan.

#### -START : Starting line of partial scan

0(Factory setting) to 440 : Setting value is a starting line of partial scan on the standard picture.

#### -WIDTH- : Vertical line width of partial scan

100 to 540(Factory setting): Setting value is a vertical line number of partial scan.

(Note) The total value of the START and WIDTH of partial scan is within 1200

The other is automatically adjusted so as not to exceed the 1200 in the setting.

### 8.20 TEST PATTERN : Setting of Video test pattern

OFF (Factory setting) : Test pattern OFF.

H-RAMP : Output Horizontal RAMP signal.

COLOR BAR : Output color bar signal.

### 8.21 CLK : Setting of Camera Link clock frequency

85MHz(Factory setting) : Camera Link clock frequency set to 85MHz.

60MHz : Camera Link clock frequency set to 60MHz.

### 8.22 MEMORY : Save or load the camera setting

#### -LOAD : Load memory

DEFAULT (Factory setting): Return to the factory setting..

FILE 1 to FILE 4 : Load the file number 1 to 4

#### -SAVE- : Save memory

FILE 1 to FILE 4 : Save current settings to the file number 1 to 4

(Note) Last loading file number will become using for next setting to power supply startup.

### 8.23 FACTORY SETTING : File data initialize will become returned to the factory setting

All files (FILE 1 to FILE 4) data will be initialized as same as factory setting.

## 9. Remote control

### 1. Comms\* specifications

- Control system: Start-stop synchronization system
- Transmission rate : 115,200 bps
- Data length : 8 bit
- Star bit : 1 bit
- Stop bit : 1 bit
- Parity : None
- Bit transfer : LSB first

\*Comms: Communications

### 2. Comms control method

Supports only one-to-one communication by "Camera is slave. Remote control software on the PC is the master."

Data can be set and read by command only from master to slave.

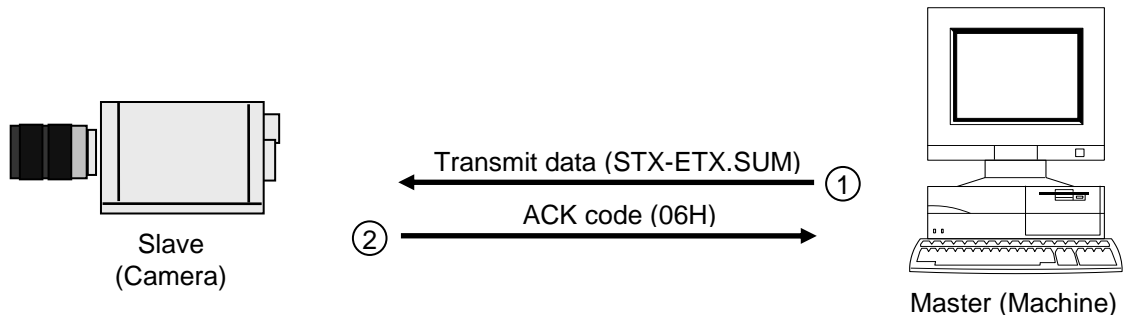
When the receiver side (master/slavecommon) receives STX of the beginning of the command and there is no continuous reception for more than 1 second in the period until reception is completed, the receiver side (master/slavecommon) regards it as invalid data and immediately discards the received data.

### 3. Description of protocol data

The contents described from the next page show the procedure for communicating with the camera by remote control software.

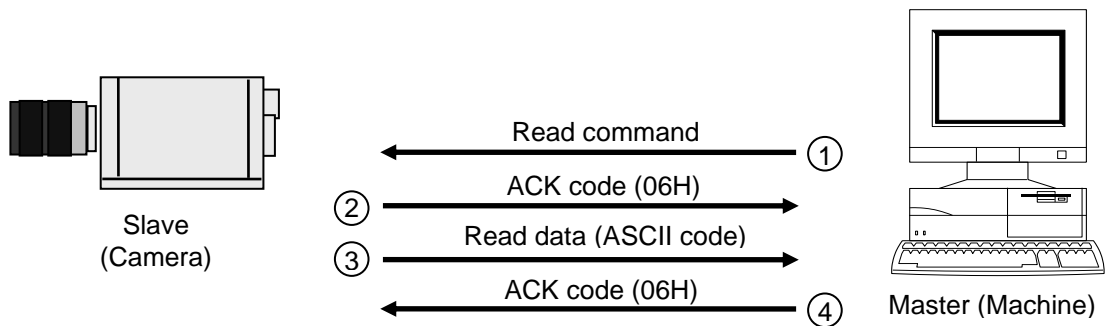
The camera is the slave, and the PC (etc.) running the remote control software is the master.

**(1) Transmission from master (normal process)**



- ① Master sends data to slave.
- ② Slave acknowledges receipt of data by again returning ACK to master and end the handshake.

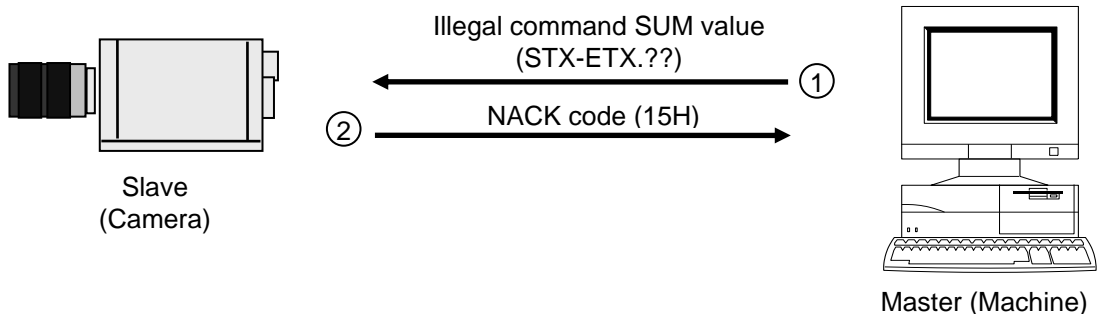
**(2) Master reads data (normal process)**



- ① Master sends read command to slave.
- ② Slave receives read command, then acknowledges by returning ACK code to master.
- ③ Slave sends read data to master.
- ④ Master receives read data, then acknowledges by returning ACK code to slave.

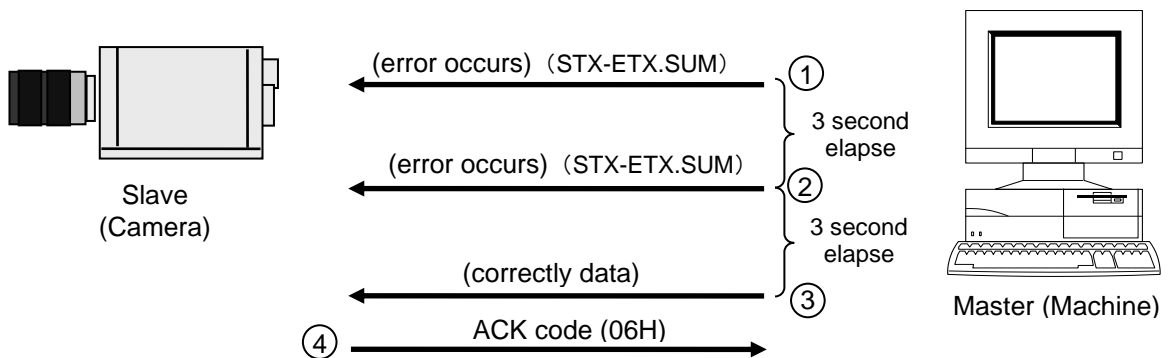


**(3) Processing at the time of SUM value error occurred**



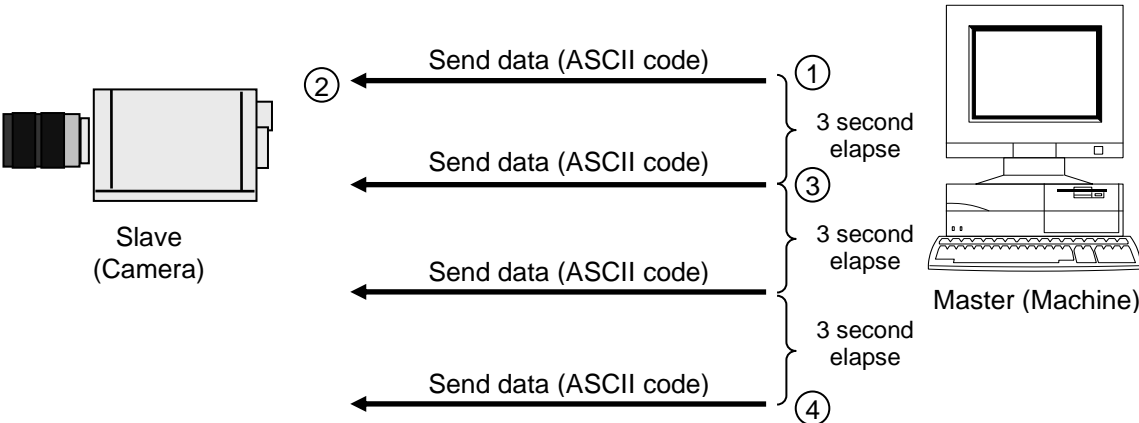
- ① Transmitted to the slave the command of illegal SUM value from the master.
- ② If the SUM value is illegal received command, the slave discards the contents of the received, send "NAK" to the master, the end of the handshake.

**(4) Processing when a communication error has occurred.**



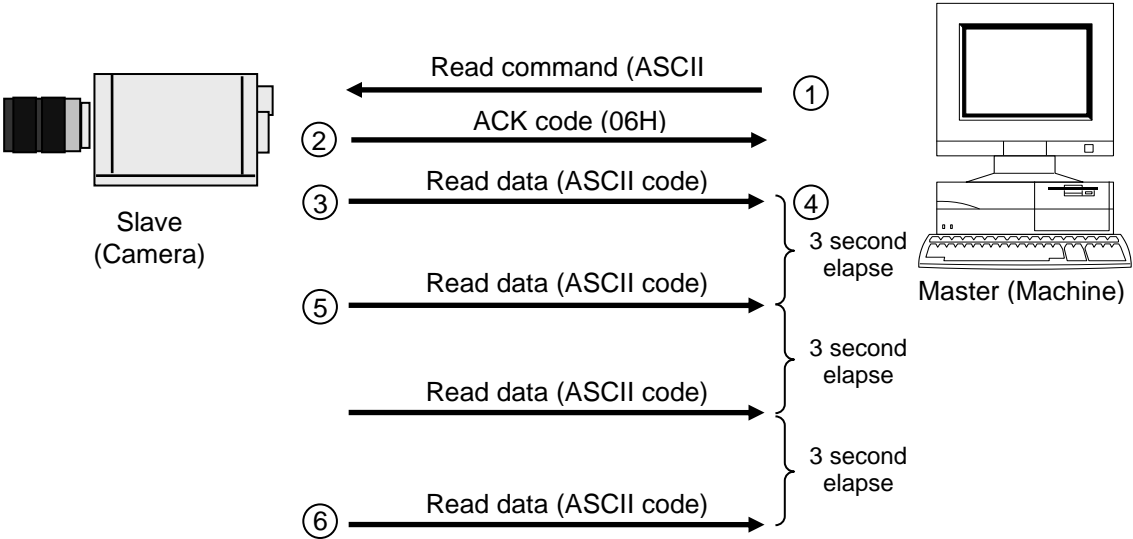
- ① Master sends data, but error detected (framing, over-run error).
- ② Master If the ACK response does not come within three seconds, to re-send the command.
- ③ Master send the correctly data.
- ④ Slave sends a "ACK code" after receiving the correctly data.

**(5) Data frame error (Master transmission)**



- ① Master sends data.
- ② For some reason, slave does not receive data.
- ③ Master does not receive acknowledgment to the send data and repeats the sequence every 3 seconds for 3 times.
- ④ If unsuccessful after 3 attempts, master aborts the sequence and ends communication.

**(6) Transmission frame error (Master receive)**



- ① Master sends read command.
- ② Slave returns ACK code to acknowledge read command.
- ③ Slave sends read data to master.
- ④ For some reason, master fails to receive read data.
- ⑤ Slave fails to receive acknowledgment of read data and attempts to resend every 3 seconds for 3 times.
- ⑥ After the third failure, slave aborts the sequence and ends communication.

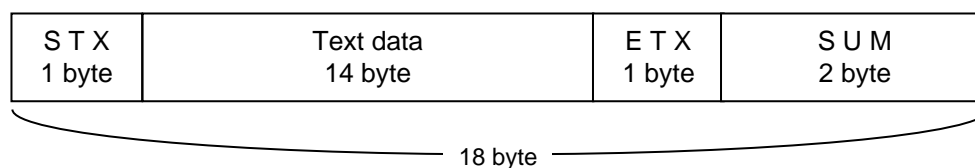
#### 4. Comms command Text data format

(1) Send data and read command (master to slave)

(a) Command data are converted into ASCII code and transmitted.

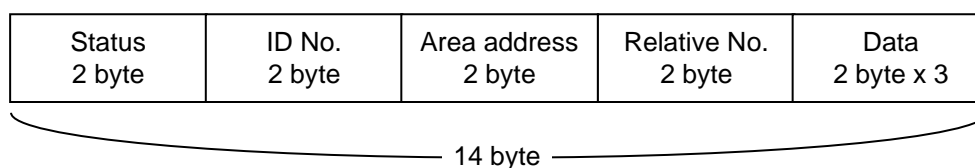
(b) Comms byte quantity is 18.

(c) Comms data format (transmission sequence).



- STX (start code) : Code indicating start of text.  
1 byte (02H)
- Text data : Transmit / receive data.  
14 byte (ASCII code)
- ETX (end code) : Code indicating end of text.  
1 byte (03H)
- SUM : XOR result (FFH), of adding STX, Text data, and ETX.  
2 byte (ASCII code)

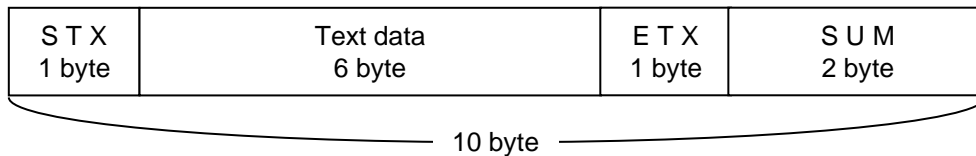
(d) Text data format details (transmission sequence).



- Status : Transmission data status.  
2 byte (ASCII code)  
HV-FM230SCL has (00H).
- ID No. : Camera peculiar ID.  
HV-FM230SCL has (FFH).  
2 byte (ASCII code)
- Area address : Classification of Send data (01H) and Read command (81H).  
2 byte (ASCII code)
- Relative No. : Sets number (0 to 255) for each adjustment item.  
2 byte (ASCII code)
- Data (note) : Sets data to be transmitted.  
2 byte x 3 (ASCII code)

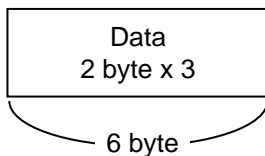
(2) Read (receive) data (slave to master)

- (a) Command data are converted into ASCII code and transmitted.
- (b) Comms byte quantity is 10.
- (c) Comms data format (transmission sequence)



- STX (start code) : Code indicating start of text.  
1 byte (02H)
- Text data : Transmit / receive data.  
6 byte (ASCII code)
- ETX (end code) : Code indicating end of text.  
1 byte (03H)
- SUM : XOR result (FFH), of adding STX, Text data, and ETX.  
2 byte (ASCII code)

(d) Text data details (transmission sequence)



- Data (note) : Sets data to be transmitted.  
2 byte x 3 (ASCII code)

Note: Data transfer sequence

Area address	Data type	Data bytes	1st byte	2nd byte	3rd byte
0x01 (Send data), 0x81 (Read command) (with some exceptions)	Common data	1	Data	0x00	0x00
		2	Upper	Lower	0x00
		3	Upper	Mid	Lower

5. Calculation method of checksum

Example

STX	1	2	3	4	5	6	7	ETX	SUM
	STATUS	ID NO	AREA ADDRESS	RELATIVE NO	DATA				
[02]	"00"	"FF"	"01"	"04"	"00"	"00"	"00"	"03"	"29"

i. STAUTUS to DATA are transformed into hexadecimal number on the basis of the ASCII code.

'0'→(30)<sub>16</sub> '1'→(31)<sub>16</sub> '4'→(34)<sub>16</sub> 'F'→(46)<sub>16</sub> STX: (02)<sub>16</sub> ETX: (03)<sub>16</sub>

ii. STX to ETX are added all.

$$(02)_{16} + (30)_{16} + (30)_{16} + (46)_{16} + (46)_{16} + (30)_{16} + (31)_{16} + (30)_{16} + (34)_{16} + (30)_{16} + (30)_{16} + (30)_{16} + (30)_{16} + (30)_{16} + (03)_{16} = (2D6)_{16}$$



iii. The XOR (Exclusive OR) between the value obtained in ii. clause and (FF)<sub>16</sub> are taken, then two column under the answer become SUM

$(2D6)_{16} \text{ XOR } (FF)_{16} = (229)_{16}$

## 10. Command list

10.1. Send data (Setting command. Note: 1 to 7 and SUM need to be transformed into ASCII code)

Item			STX	1	2	3	4	5	6	7	ETX	SUM
				STATUS	ID NO.	AREA ADDRESS	RELATIVE NO.	DATA				
TRIGGER	MODE	OFF	[02]	00	FF	01	04	00	00	00	[03]	29
		FIXED	[02]	00	FF	01	04	01	00	00	[03]	28
		1TRIG	[02]	00	FF	01	04	02	00	00	[03]	27
	POLARITY	POSITIVE	[02]	00	FF	01	0F	00	00	00	[03]	17
		NEGATIVE	[02]	00	FF	01	0F	01	00	00	[03]	16
	SOURCE	CL-CC1	[02]	00	FF	01	05	00	00	00	[03]	28
12PIN #7		[02]	00	FF	01	05	01	00	00	[03]	27	
SHUTTER	PRESET	OFF	[02]	00	FF	01	08	00	00	00	[03]	25
		1/60	[02]	00	FF	01	08	01	00	00	[03]	24
		1/100	[02]	00	FF	01	08	02	00	00	[03]	23
		1/250	[02]	00	FF	01	08	03	00	00	[03]	22
		1/1000	[02]	00	FF	01	08	04	00	00	[03]	21
		1/2000	[02]	00	FF	01	08	05	00	00	[03]	20
		1/10000	[02]	00	FF	01	08	06	00	00	[03]	1F
		1/50000	[02]	00	FF	01	08	07	00	00	[03]	1E
	VARIABLE VALUE (2Byte)	MIN (20us)	[02]	00	FF	01	11	00	00	00	[03]	2B
		MAX(655370s)	[02]	00	FF	01	11	FF	FF	00	[03]	D3
	AES MODE	OFF	[02]	00	FF	01	83	00	00	00	[03]	22
		ON	[02]	00	FF	01	83	02	00	00	[03]	20
	AES MIN (2Byte)	MIN	[02]	00	FF	01	84	00	00	00	[03]	21
		MAX	[02]	00	FF	01	84	FF	FF	00	[03]	C9
	AES MAX (2Byte)	MIN	[02]	00	FF	01	85	00	00	00	[03]	20
		MAX	[02]	00	FF	01	85	FF	FF	00	[03]	C8
GAIN	VALUE	MIN (0dB)	[02]	00	FF	01	0C	00	00	00	[03]	1A
		MAX (18dB)	[02]	00	FF	01	0C	B4	00	00	[03]	04
	AGC MODE	OFF	[02]	00	FF	01	80	00	00	00	[03]	25
		ON	[02]	00	FF	01	80	02	00	00	[03]	23
	AGC MIN	MIN (0dB)	[02]	00	FF	01	81	00	00	00	[03]	24
		MAX (18dB)	[02]	00	FF	01	81	B4	00	00	[03]	0E
AGC MAX	MIN (0dB)	[02]	00	FF	01	82	00	00	00	[03]	23	
	MAX (18dB)	[02]	00	FF	01	82	B4	00	00	[03]	0D	
ALC LEVEL		MIN (0)	[02]	00	FF	01	26	00	00	00	[03]	25
		MAX (255)	[02]	00	FF	01	26	FF	00	00	[03]	F9
BRIGHTNESS (Black Level) (*1)		MIN (-128)	[02]	00	FF	01	17	80	00	00	[03]	1D
		MAX (127)	[02]	00	FF	01	17	7F	00	00	[03]	08

Item			STX	1	2	3	4	5	6	7	ETX	SUM
				STATUS	ID NO.	AREA ADDRESS	RELATIVE NO.	DATA				
GAMMA	MODE	OFF	[02]	00	FF	01	23	00	00	00	[03]	28
		ON1(Normal)	[02]	00	FF	01	23	01	00	00	[03]	27
		ON2(S Gamma)	[02]	00	FF	01	23	02	00	00	[03]	26
	LEVEL	MIN (0)	[02]	00	FF	01	24	00	00	00	[03]	27
		MAX (255)	[02]	00	FF	01	24	FF	00	00	[03]	FB
KNEE	MODE	OFF	[02]	00	FF	01	42	00	00	00	[03]	27
		ON	[02]	00	FF	01	42	01	00	00	[03]	26
	KNEE POINT	MIN (0)	[02]	00	FF	01	43	00	00	00	[03]	26
		MAX (32)	[02]	00	FF	01	43	20	00	00	[03]	24
	KNEE SLOPE	MIN (0)	[02]	00	FF	01	44	00	00	00	[03]	25
		MAX (159)	[02]	00	FF	01	44	9F	00	00	[03]	06
LUT	MODE	OFF	[02]	00	FF	01	25	00	00	00	[03]	26
		ON	[02]	00	FF	01	25	01	00	00	[03]	25
	TABLE RED[n]	MIN (0)	[02]	00	FF	20	n (*2)	00	00	00	[03]	(*2)
		MAX (255)	[02]	00	FF	20	n (*2)	FF	00	00	[03]	(*2)
	TABLE GREEN[n]	MIN (0)	[02]	00	FF	21	n (*2)	00	00	00	[03]	(*2)
		MAX (255)	[02]	00	FF	21	n (*2)	FF	00	00	[03]	(*2)
	TABLE BLUE[n]	MIN (0)	[02]	00	FF	22	n (*2)	00	00	00	[03]	(*2)
		MAX (255)	[02]	00	FF	22	n (*2)	FF	00	00	[03]	(*2)
SHARPNESS	MODE	OFF	[02]	00	FF	01	27	00	00	00	[03]	24
		ON	[02]	00	FF	01	27	01	00	00	[03]	23
	LEVEL	MIN (0)	[02]	00	FF	01	28	00	00	00	[03]	23
		MAX (255)	[02]	00	FF	01	28	FF	00	00	[03]	F7
WHITE BALANCE	MODE	CONT..AUTO	[02]	00	FF	01	29	00	00	00	[03]	22
		MANUAL	[02]	00	FF	01	29	02	00	00	[03]	20
		ONCE AUTO	[02]	00	FF	01	29	03	00	00	[03]	1F
	RED-GAIN	MIN (0)	[02]	00	FF	01	2A	00	00	00	[03]	1A
		MAX (255)	[02]	00	FF	01	2A	FF	00	00	[03]	EE
	BLUE-GAIN	MIN (0)	[02]	00	FF	01	2B	00	00	00	[03]	19
		MAX (255)	[02]	00	FF	01	2B	FF	00	00	[03]	ED

Item			STX	1	2	3	4	5	6	7	ETX	SUM
				STAT US	ID NO.	AREA ADDRE SS	RELATI VE NO.	DATA				
MASKING	MODE	OFF	[02]	00	FF	01	31	00	00	00	[03]	29
		ON	[02]	00	FF	01	31	01	00	00	[03]	28
	RED-SATURATION	MIN (0)	[02]	00	FF	01	32	00	00	00	[03]	28
		MAX (255)	[02]	00	FF	01	32	FF	00	00	[03]	FC
	RED-HUE	MIN (0)	[02]	00	FF	01	33	00	00	00	[03]	27
		MAX (255)	[02]	00	FF	01	33	FF	00	00	[03]	FB
	CYAN-SATURATION	MIN (0)	[02]	00	FF	01	34	00	00	00	[03]	26
		MAX (255)	[02]	00	FF	01	34	FF	00	00	[03]	FA
	CYAN-HUE	MIN (0)	[02]	00	FF	01	35	00	00	00	[03]	25
		MAX (255)	[02]	00	FF	01	35	FF	00	00	[03]	F9
	GREEN-SATURATION	MIN (0)	[02]	00	FF	01	36	00	00	00	[03]	24
		MAX (255)	[02]	00	FF	01	36	FF	00	00	[03]	F8
	GREEN-HUE	MIN (0)	[02]	00	FF	01	37	00	00	00	[03]	23
		MAX (255)	[02]	00	FF	01	37	FF	00	00	[03]	F7
	MAGENTA-SATURATI ON	MIN (0)	[02]	00	FF	01	38	00	00	00	[03]	22
		MAX (255)	[02]	00	FF	01	38	FF	00	00	[03]	F6
	MAGENTA-HUE	MIN (0)	[02]	00	FF	01	39	00	00	00	[03]	21
		MAX (255)	[02]	00	FF	01	39	FF	00	00	[03]	F5
	BLUE-SATURATION	MIN (0)	[02]	00	FF	01	3A	00	00	00	[03]	19
		MAX (255)	[02]	00	FF	01	3A	FF	00	00	[03]	ED
BLUE-HUE	MIN (0)	[02]	00	FF	01	3B	00	00	00	[03]	18	
	MAX (255)	[02]	00	FF	01	3B	FF	00	00	[03]	EC	
YELLOW-SATURATIO N	MIN (0)	[02]	00	FF	01	3C	00	00	00	[03]	17	
	MAX (255)	[02]	00	FF	01	3C	FF	00	00	[03]	EB	
YELLOW-HUE	MIN (0)	[02]	00	FF	01	3D	00	00	00	[03]	16	
	MAX (255)	[02]	00	FF	01	3D	FF	00	00	[03]	EA	
PAINT BLACK	MODE	OFF	[02]	00	FF	01	3E	00	00	00	[03]	15
		ON	[02]	00	FF	01	3E	01	00	00	[03]	14
	RED	MIN (0)	[02]	00	FF	01	3F	00	00	00	[03]	14
		MAX (127)	[02]	00	FF	01	3F	7F	00	00	[03]	F7
	GREEN	MIN (0)	[02]	00	FF	01	40	00	00	00	[03]	29
		MAX (127)	[02]	00	FF	01	40	7F	00	00	[03]	0C
BLUE	MIN (0)	[02]	00	FF	01	41	00	00	00	[03]	28	
	MAX (127)	[02]	00	FF	01	41	7F	00	00	[03]	0B	
WHITE SHADING	MODE	OFF	[02]	00	FF	01	52	00	00	00	[03]	26
		ON	[02]	00	FF	01	52	01	00	00	[03]	25
	ADJUST (*4)	[02]	00	FF	01	53	01	00	00	[03]	24	
CLK	85MHz	[02]	00	FF	01	19	00	00	00	[03]	23	
	60MHz	[02]	00	FF	01	19	01	00	00	[03]	22	



Item		STX	1	2	3	4	5	6	7	ETX	SUM	
			STATUS	ID NO.	AREA ADDRESS	RELATIVE NO.	DATA					
DNR	OFF	[02]	00	FF	01	57	00	00	00	[03]	21	
	ON	[02]	00	FF	01	57	01	00	00	[03]	20	
DATA BIT	24BIT	[02]	00	FF	01	14	00	00	00	[03]	28	
	30BIT	[02]	00	FF	01	14	01	00	00	[03]	27	
	36BIT	[02]	00	FF	01	14	02	00	00	[03]	26	
OUTPUT	SIGNAL	OFF	[02]	00	FF	01	06	00	00	[03]	27	
		FLASH OUT	[02]	00	FF	01	06	01	00	00	[03]	26
		VD	[02]	00	FF	01	06	02	00	00	[03]	25
	POLARITY	POSITIVE	[02]	00	FF	01	55	00	00	00	[03]	23
		NEGATIVE	[02]	00	FF	01	55	01	00	00	[03]	22
PIXCEL CORRECTION	MODE	OFF	[02]	00	FF	01	4B	00	00	[03]	17	
		ON	[02]	00	FF	01	4B	01	00	00	[03]	16
	RED (*3) THRESHOLD	MIN(1)	[02]	00	FF	02	00	00	00	00	[03]	2C
		MAX(99)	[02]	00	FF	02	00	63	00	00	[03]	23
	GREEN (*3) THRESHOLD	MIN(1)	[02]	00	FF	02	01	00	00	00	[03]	2B
		MAX(99)	[02]	00	FF	02	01	63	00	00	[03]	22
	BLUE (*3) THRESHOLD	MIN(1)	[02]	00	FF	02	02	00	00	00	[03]	2A
		MAX(99)	[02]	00	FF	02	02	63	00	00	[03]	21
DETECT (*4,5)	[02]	00	FF	01	4D	01	00	00	[03]	14		
BINNING (VERTICVAL 2 PIXEL ADDITION)	OFF	[02]	00	FF	01	13	00	00	00	[03]	29	
	ON	[02]	00	FF	01	13	01	00	00	[03]	28	
PARTIAL SCAN (*6)	MODE	OFF	[02]	00	FF	01	1E	00	00	[03]	17	
		ON	[02]	00	FF	01	1E	01	00	00	[03]	16
	START (2Byte)	MIN	[02]	00	FF	01	1F	00	00	00	[03]	16
		MAX	[02]	00	FF	01	1F	04	4C	00	[03]	FB
	WIDTH (2Byte)	MIN	[02]	00	FF	01	20	00	64	00	[03]	21
		MAX	[02]	00	FF	01	20	04	B0	00	[03]	15
TEST PATTERN	OFF	[02]	00	FF	01	50	00	00	00	[03]	28	
	H RAMP	[02]	00	FF	01	50	01	00	00	[03]	27	
	COLOR BAR	[02]	00	FF	01	50	04	00	00	[03]	24	
MEMORY	LOAD	PRESET	[02]	00	FF	01	02	00	00	[03]	2B	
		FILE 1	[02]	00	FF	01	02	01	00	00	[03]	2A
		FILE 2	[02]	00	FF	01	02	02	00	00	[03]	29
		FILE 3	[02]	00	FF	01	02	03	00	00	[03]	28
		FILE 4	[02]	00	FF	01	02	04	00	00	[03]	27
	SAVE (*3,4)	FILE 1	[02]	00	FF	01	03	01	00	00	[03]	29
		FILE 2	[02]	00	FF	01	03	02	00	00	[03]	28
		FILE 3	[02]	00	FF	01	03	03	00	00	[03]	27
FILE 4	[02]	00	FF	01	03	04	00	00	[03]	26		
FACTORY SETTING (*3,4)	SET	[02]	00	FF	01	45	01	00	00	[03]	23	

(\*1) BRIGHTNESS is a signed hexadecimal data. (-128[80<sub>16</sub>] ~ 0 [00<sub>16</sub>] ~ 127[7F<sub>16</sub>])

(\*2) RELATIVE NO (n) of TABLE R / G / B is table number of the LUT of 0 to 255 [00<sub>16</sub> to FF<sub>16</sub>] and SUM will follow this value.

(\*3) Items that are not backed up in the MEMORY SAVE. (The value at the time of power-up is always the same.).

(\*4) After the process is completed, the set value is set to "0".

(\*5) Detection data for white pixel correction is not initialized and retains its value even when FACTORY SETTING is executed.

(\*6) START of partialscan can be set within the range of 0000h to 044Ch.

WIDTH of partialscan can be set within the range of 0064h to 04B0h.

Please set the sum total of START and WIDTH is 04B0h or less.

Please set the acquisition width as increments of 4 lines.

10.2. Read command (Note: 1 to 7 and SUM need to be transformed into ASCII code)

Item		STX	1	2	3	4	5	6	7	ETX	SUM
			STATUS	ID NO.	AREA ADDRESS	RELATIVE NO.	DATA				
TRIGGER	MODE	[02]	00	FF	81	04	00	00	00	[03]	21
	POLARITY	[02]	00	FF	81	0F	00	00	00	[03]	0F
	SOURCE	[02]	00	FF	81	05	00	00	00	[03]	20
SHUTTER	PRESET	[02]	00	FF	81	08	00	00	00	[03]	1D
	VARIABLE VALUE (2Byte)	[02]	00	FF	81	11	00	00	00	[03]	23
	AES MODE	[02]	00	FF	81	83	00	00	00	[03]	1A
	AES MIN (2Byte)	[02]	00	FF	81	84	00	00	00	[03]	19
	AES MAX (2Byte)	[02]	00	FF	81	85	00	00	00	[03]	18
GAIN	VALUE	[02]	00	FF	81	0C	00	00	00	[03]	12
	AGC MODE	[02]	00	FF	81	80	00	00	00	[03]	1D
	AGC MIN	[02]	00	FF	81	81	00	00	00	[03]	1C
	AGC MAX	[02]	00	FF	81	82	00	00	00	[03]	1B
BRIGHTNESS (Black Level)		[02]	00	FF	81	17	00	00	00	[03]	1D
GAMMA	MODE	[02]	00	FF	81	23	00	00	00	[03]	20
	LEVEL	[02]	00	FF	81	24	00	00	00	[03]	1F
KNEE	MODE	[02]	00	FF	81	42	00	00	00	[03]	1F
	KNEE POINT	[02]	00	FF	81	43	00	00	00	[03]	1E
	KNEE SLOPE	[02]	00	FF	81	44	00	00	00	[03]	1D
LUT	MODE	[02]	00	FF	81	25	00	00	00	[03]	1E
	TABLE RED[n]	[02]	00	FF	90	n (*1)	00	00	00	[03]	(*1)
	TABLE GREEN[n]	[02]	00	FF	91	n (*1)	00	00	00	[03]	(*1)
	TABLE BLUE[n]	[02]	00	FF	92	n (*1)	00	00	00	[03]	(*1)
SHARPNESS	MODE	[02]	00	FF	81	27	00	00	00	[03]	1C
	LEVEL	[02]	00	FF	81	28	00	00	00	[03]	1B
ALC LEVEL		[02]	00	FF	81	26	00	00	00	[03]	1D
WHITE BALANCE	MODE	[02]	00	FF	81	29	00	00	00	[03]	1A
	RED-GAIN	[02]	00	FF	81	2A	00	00	00	[03]	12
	BLUE-GAIN	[02]	00	FF	81	2B	00	00	00	[03]	11
MASKING	MODE	[02]	00	FF	81	31	00	00	00	[03]	21
	RED-SATURATION	[02]	00	FF	81	32	00	00	00	[03]	20
	RED-HUE	[02]	00	FF	81	33	00	00	00	[03]	1F
	CYAN-SATURATION	[02]	00	FF	81	34	00	00	00	[03]	1E
	CYANn-HUE	[02]	00	FF	81	35	00	00	00	[03]	1D
	GREEN-SATURATION	[02]	00	FF	81	36	00	00	00	[03]	1C
	GREEN-HUE	[02]	00	FF	81	37	00	00	00	[03]	1B
	MAGENTA-SATURATION	[02]	00	FF	81	38	00	00	00	[03]	1A
	MAGENTA-HUE	[02]	00	FF	81	39	00	00	00	[03]	19
	BLUE-SATURATION	[02]	00	FF	81	3A	00	00	00	[03]	11
	BLUE-HUE	[02]	00	FF	81	3B	00	00	00	[03]	10
	YELLOW-SATURATION	[02]	00	FF	81	3C	00	00	00	[03]	0F
	YELLOW-HUE	[02]	00	FF	81	3D	00	00	00	[03]	0E

(\*1) RELATIVE NO (n) of TABLE R / G / B is table number of the LUT of 0 to 255 [00<sub>16</sub> to FF<sub>16</sub>] and SUM will follow this value.

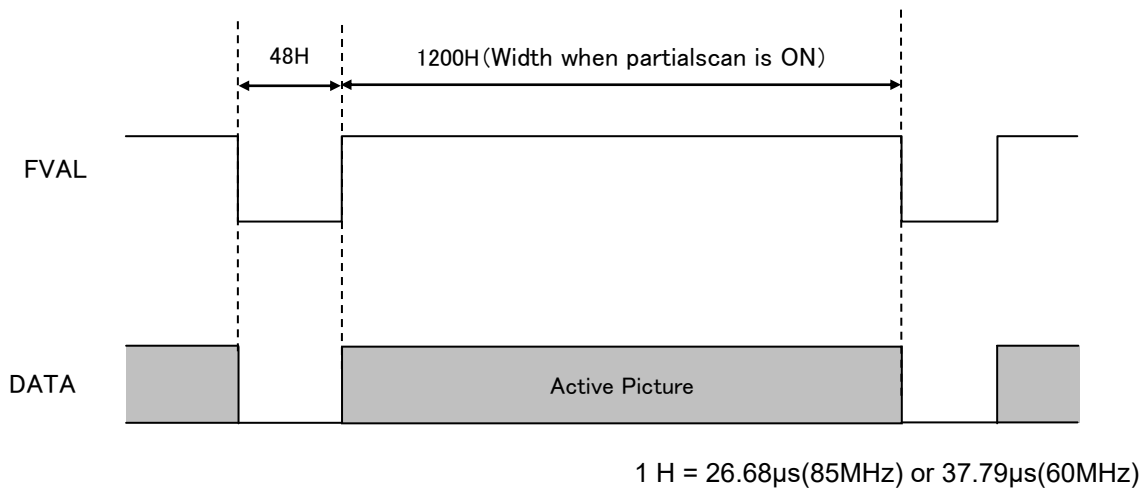
# 11. Camera Link output timing chart

## 11.1. Horizontal timing

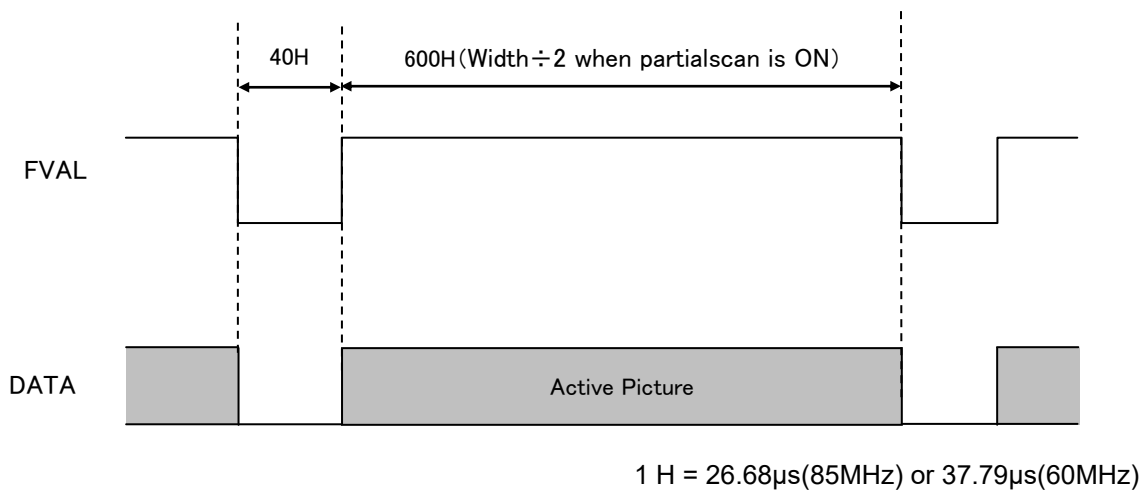


## 11.2. Vertical timing

### (1) BINNING: OFF



### (2) BINNING: ON

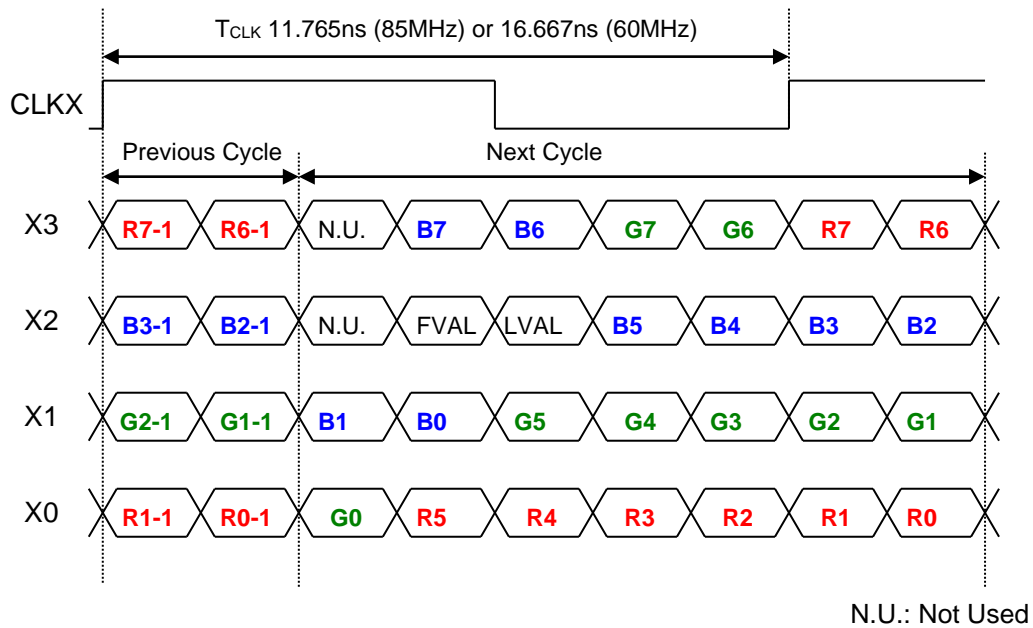


### 3. Transmitter LVDS output pulse position measurement

#### (1) Base Configuration

##### (a) 24bit

D.OUT1

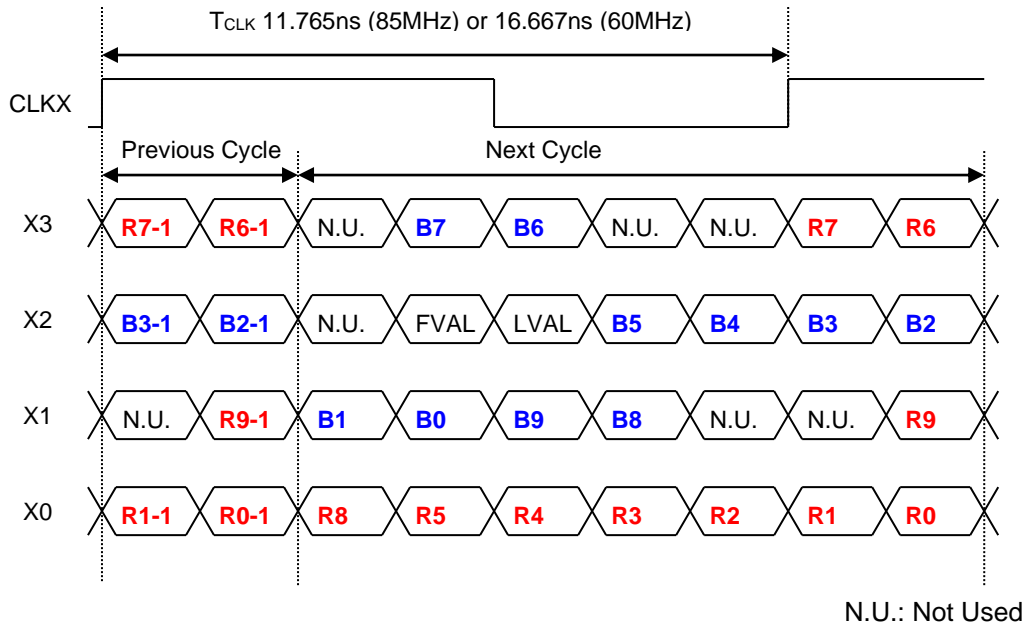


\* When using Base configuration, please be sure to connect to CameraLink cable to D.OUT1.  
If the cable is connected to D.OUT2, the machine may break down.

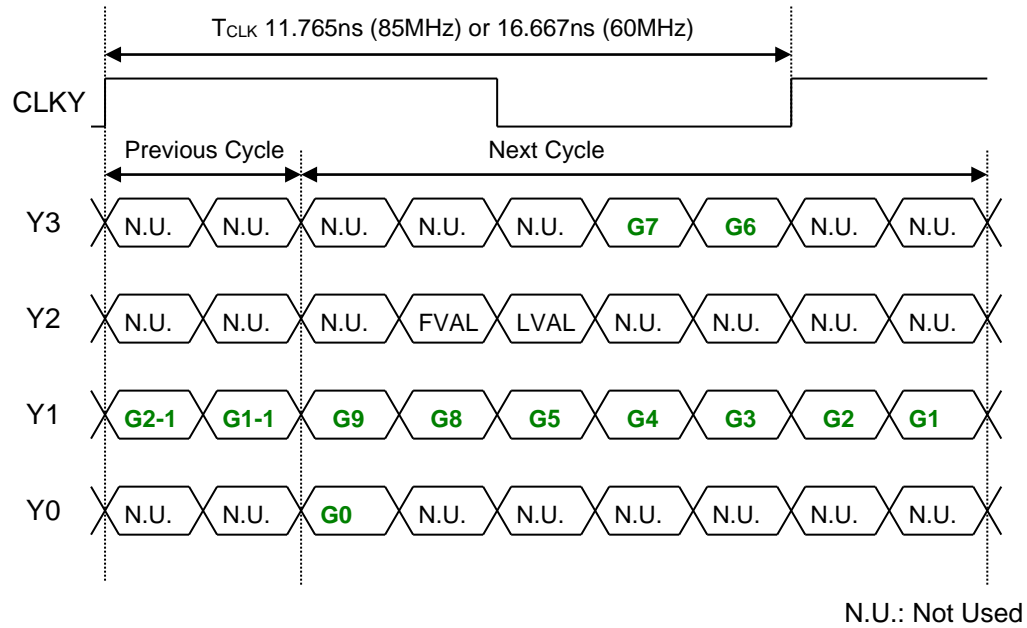
(2)Medium Configuration

(a)30bit

D.OUT1

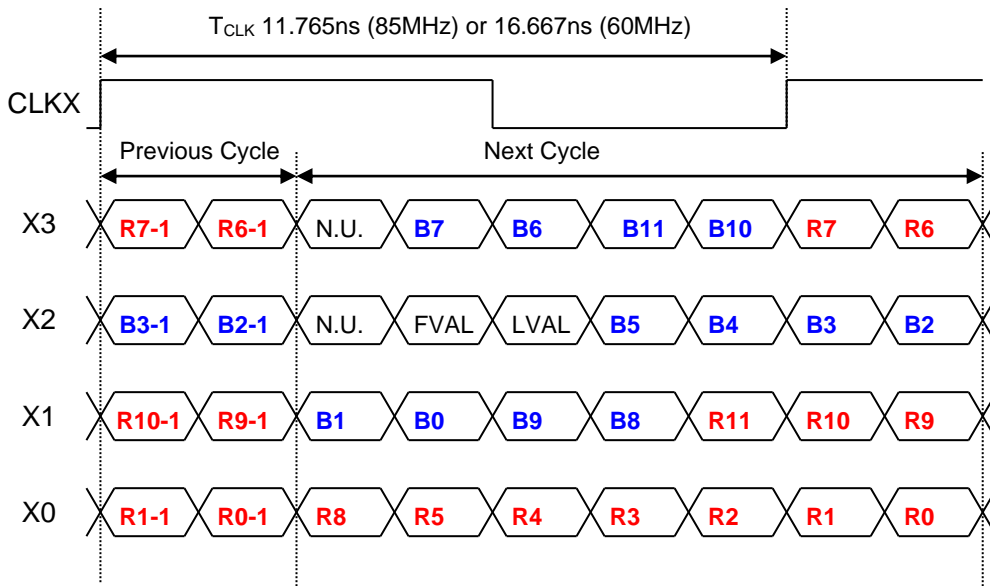


D.OUT2



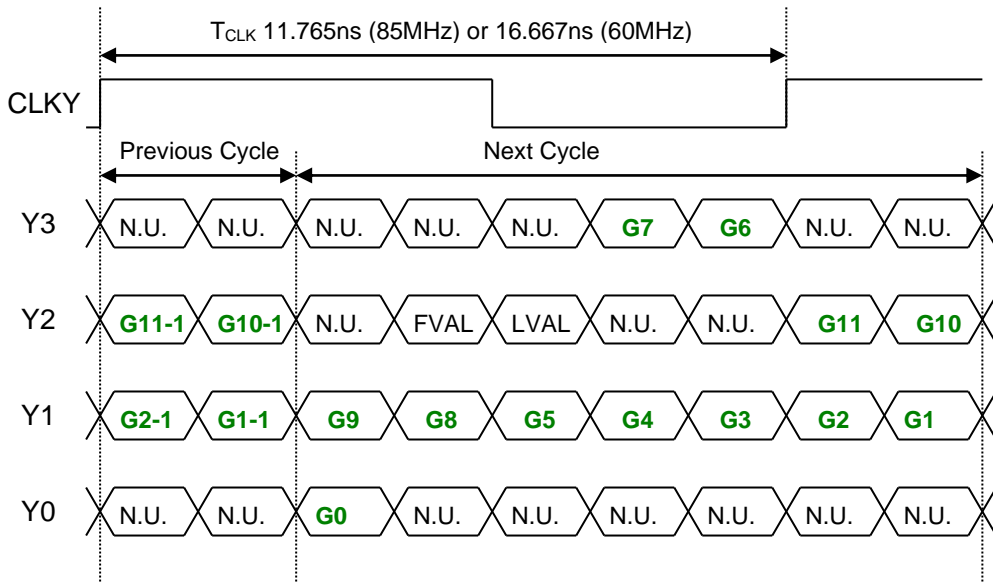
(b)36bit

D.OUT1



N.U.: Not Used

D.OUT2



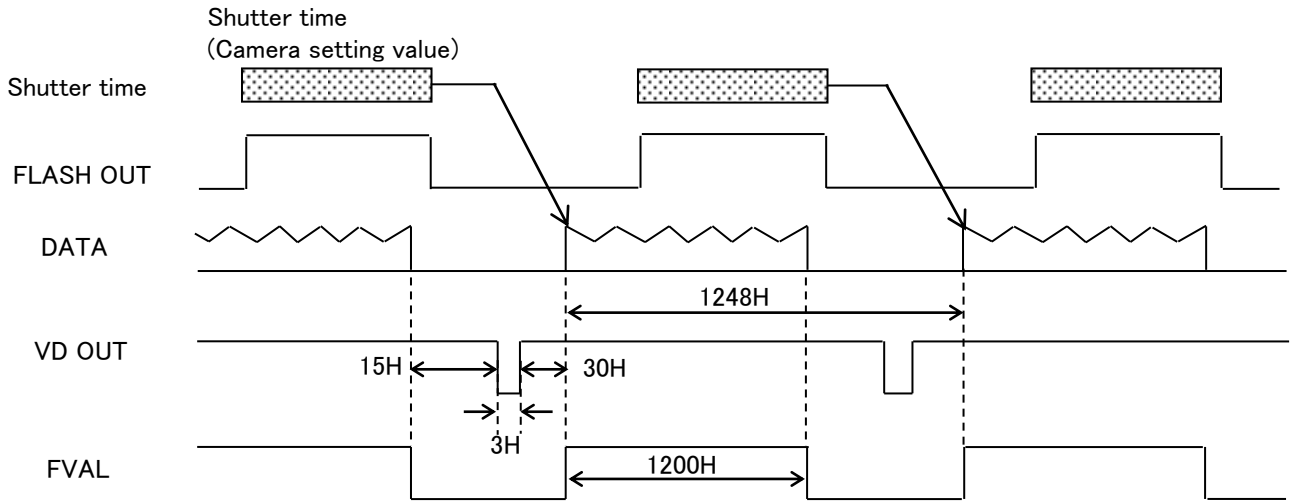
N.U.: Not Used

# 12. Trigger operation and timing chart

(1) Normal mode

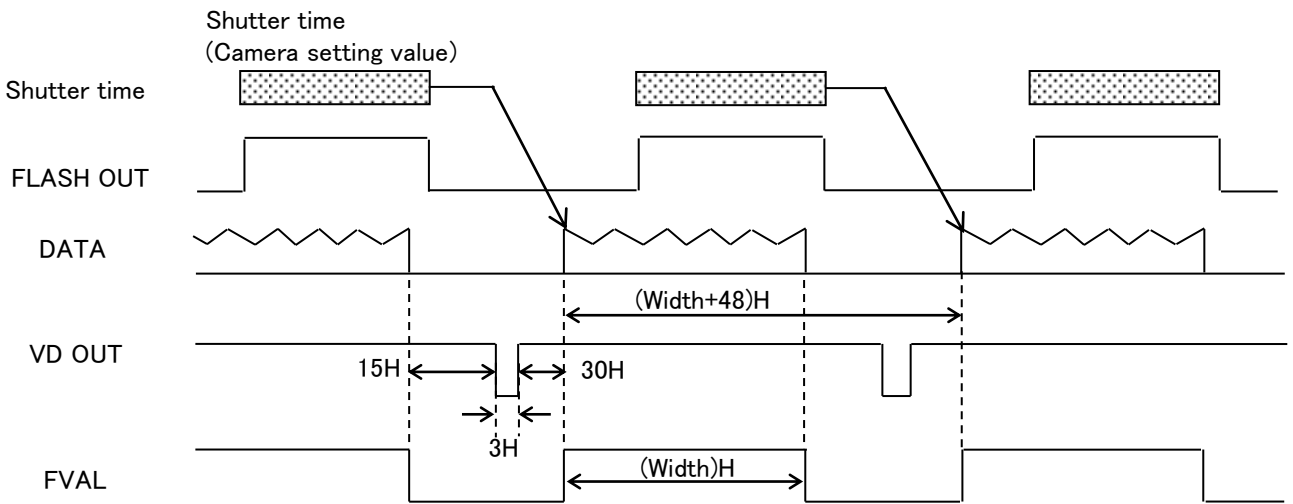
The exposure and the image output are repeated at the set shutter speed.

(a) Partial scan: OFF



1 H = 26.68 $\mu$ s(85MHz) or 37.79 $\mu$ s(60MHz)

(b) Partial scan : ON



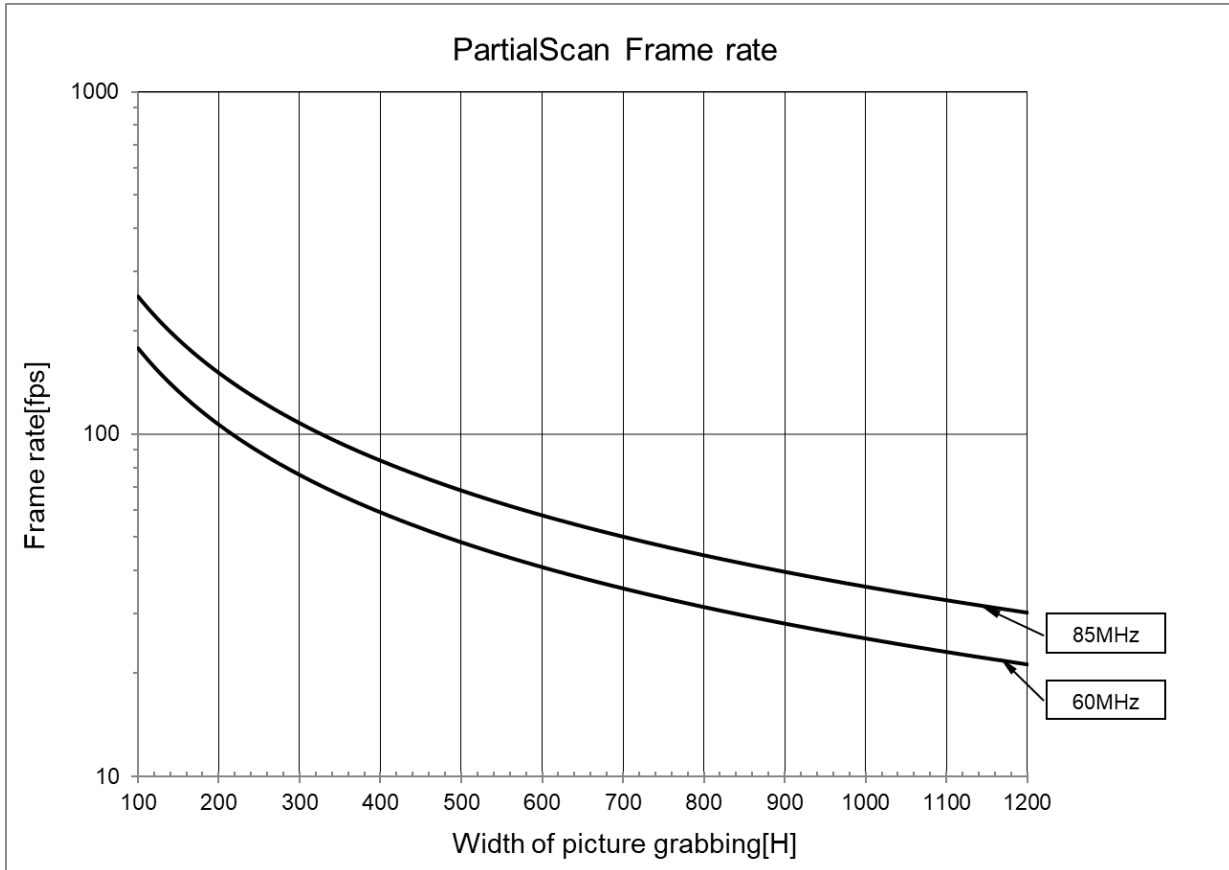
1 H = 26.68 $\mu$ s(85MHz) or 37.79 $\mu$ s(60MHz)

Frame rate can be calculated from following equations using width of picture grabbing.

Cameralink output setting	Frame rate(fps)
85MHz	$74250000 / (\text{Width} + 48) / 1981$
60MHz	$74250000 / (\text{Width} + 48) / 2806$

[Note] Please set the acquisition width as increments of 4 lines.

Graph following shows frame rate in each of picture grabbing in the partial scan mode.



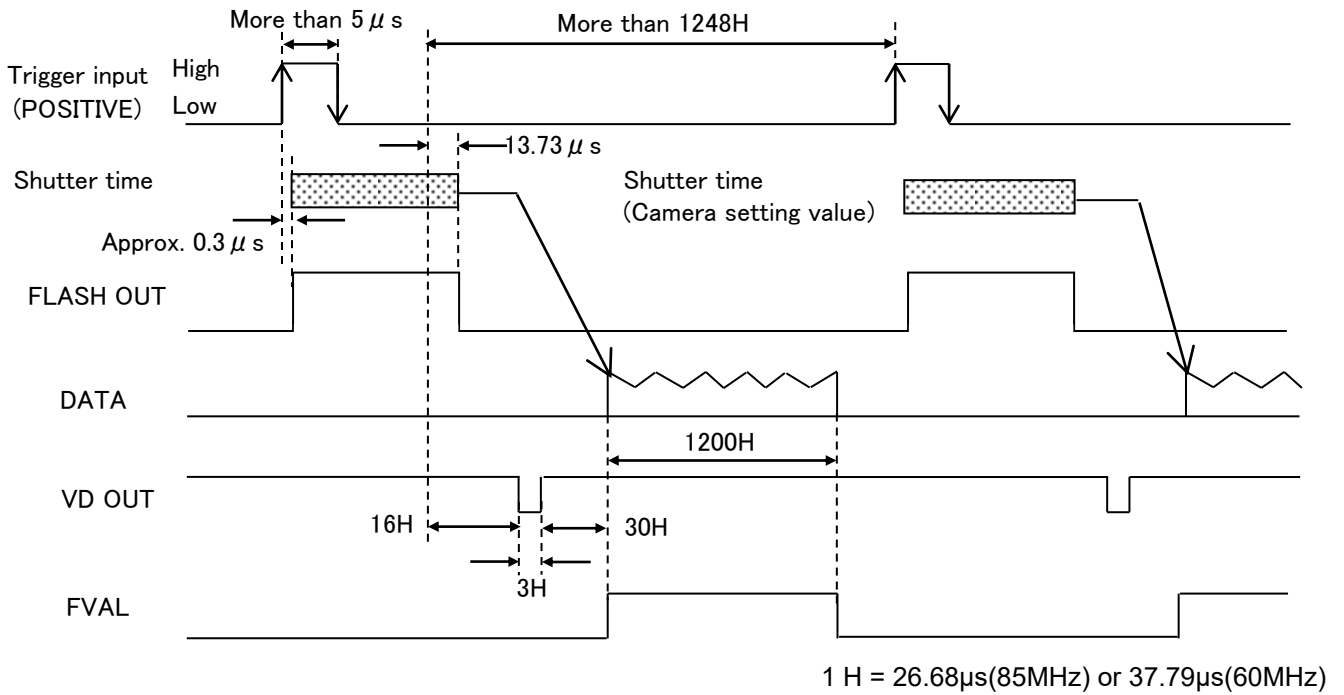
Notes on partial scan use  
 The capture start position + capture width, please use 1200 or less.



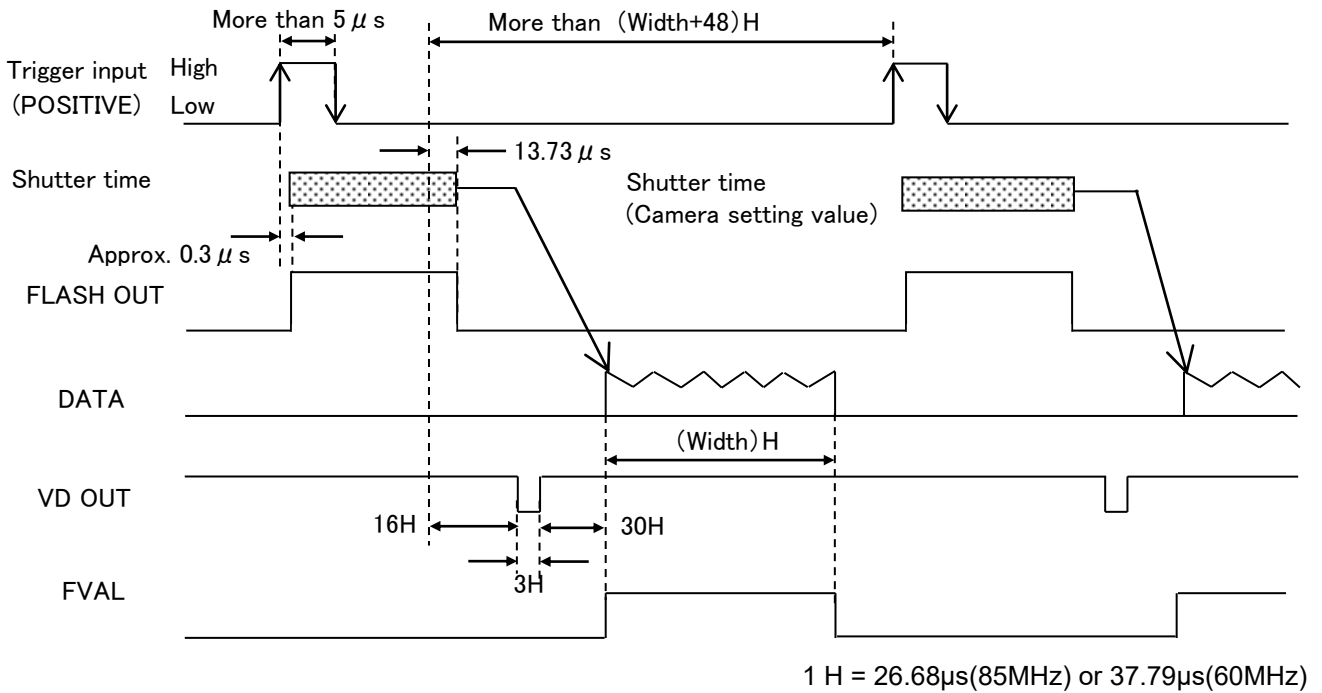
(2). Fixed shutter mode

When trigger polarity setting is POSITIVE, after the trigger signal rise, exposure is start. The exposure time is set by the camera electronic shutter speed. The video output is obtained immediately after the end of fixed exposure.

(a) Partial scan : OFF



(b) Partial scan : ON

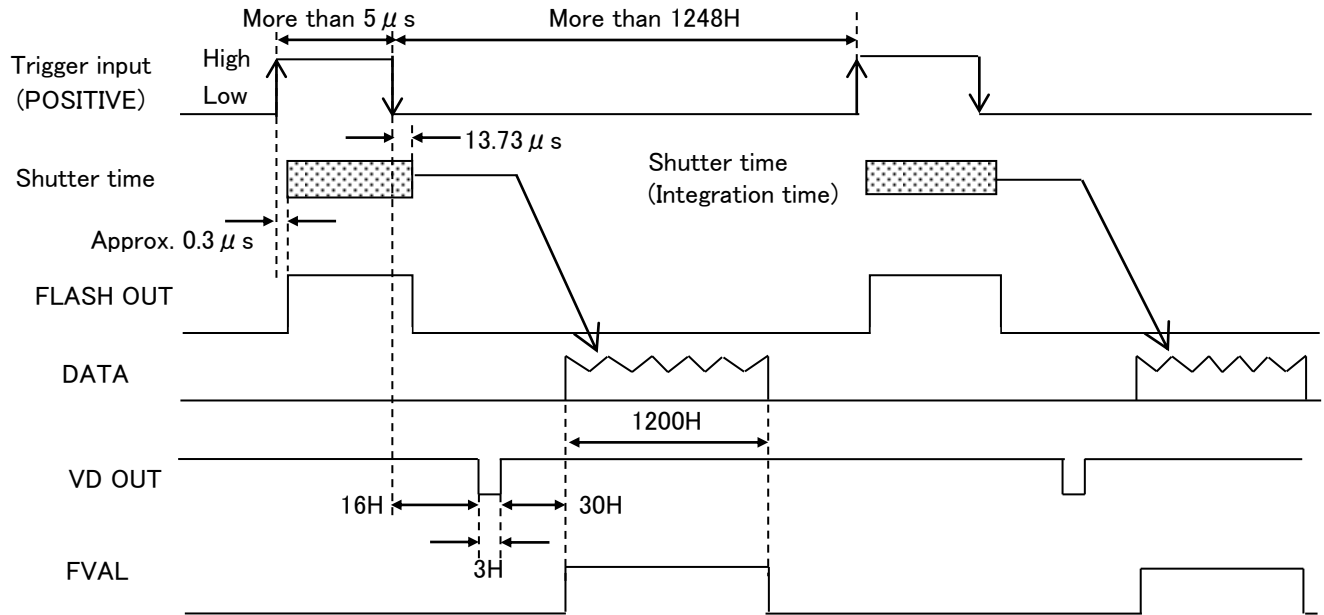


(3). ONE trigger mode

When trigger polarity setting is POSITIVE, after the trigger signal rise, exposure is start.

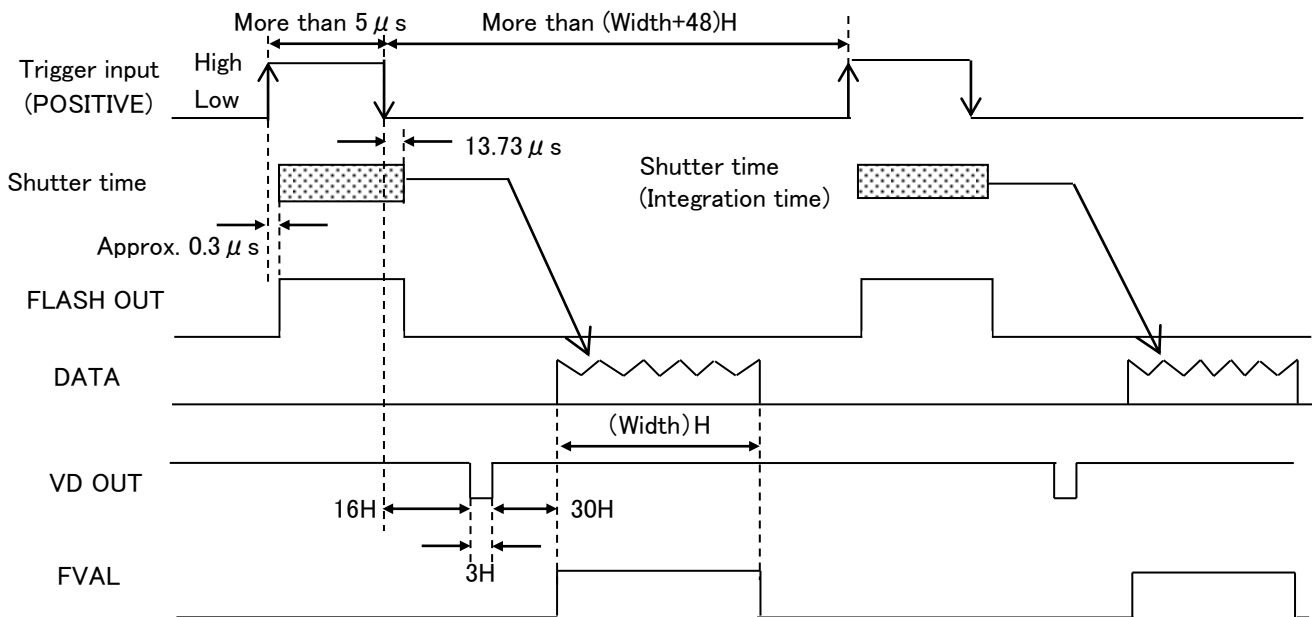
Exposure is terminated at the falling edge of the trigger, and video data is output.

(a) Partial scan : OFF



(b) Partial scan : ON

1 H = 26.68μs(85MHz) or 37.79μs(60MHz)



1 H = 26.68μs(85MHz) or 37.79μs(60MHz)

## 13. Input / Output signal

### 1. Input signal

The level of the trigger signal input to HV-FM230SCL is as follows.

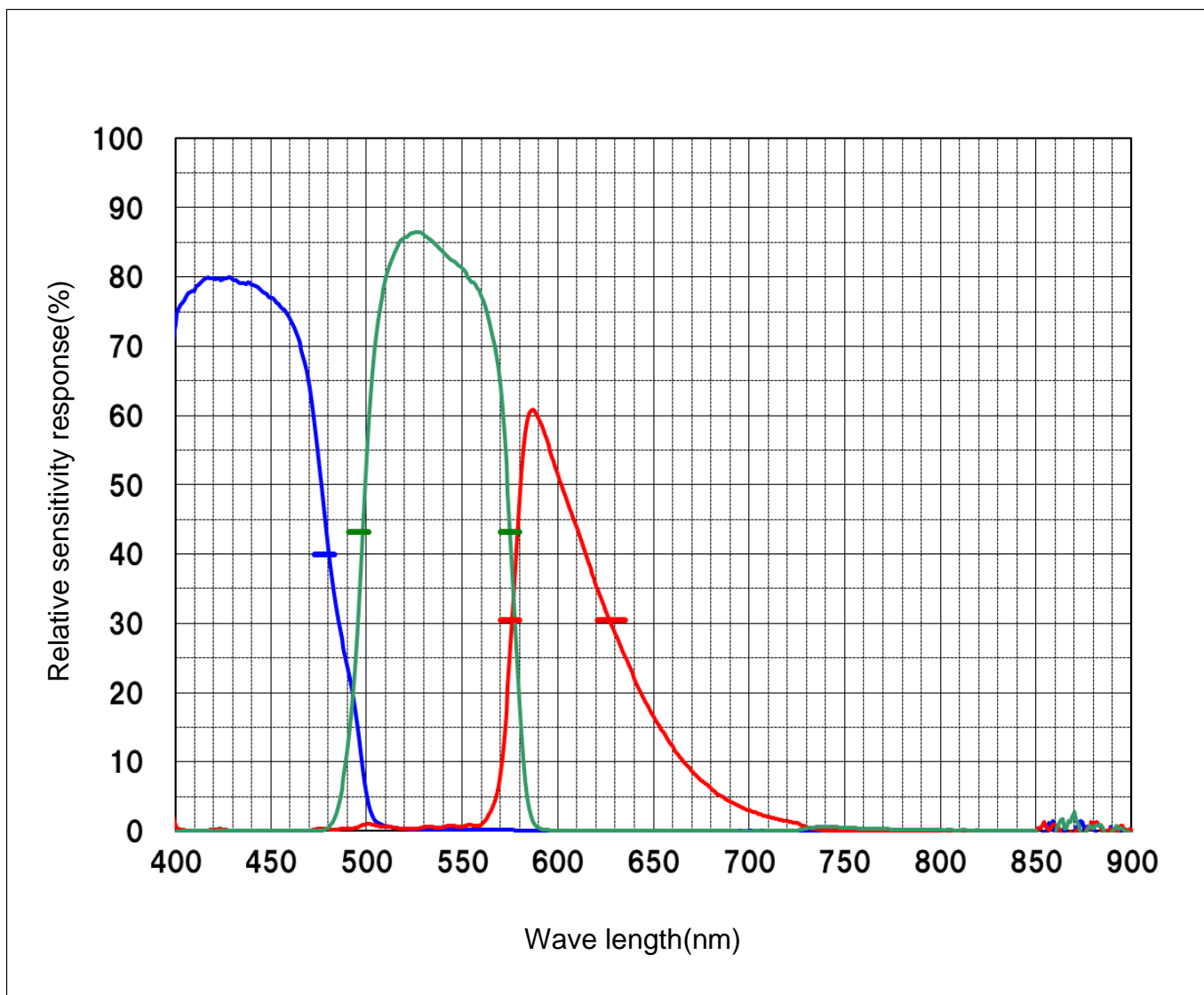
- (1) Input from CameraLink cable  
LVDS level.
- (2) Input from 12-pin connector  
5Vp-p  $\pm$  0.5V

### 2. Output signal

The level of the VD/FLASH signal output from HV-FM230SCL is as follows.  
5Vp-p

## 14. Spectral response

Spectral response of HV-FM30WCL is showing.



## 15. Specifications

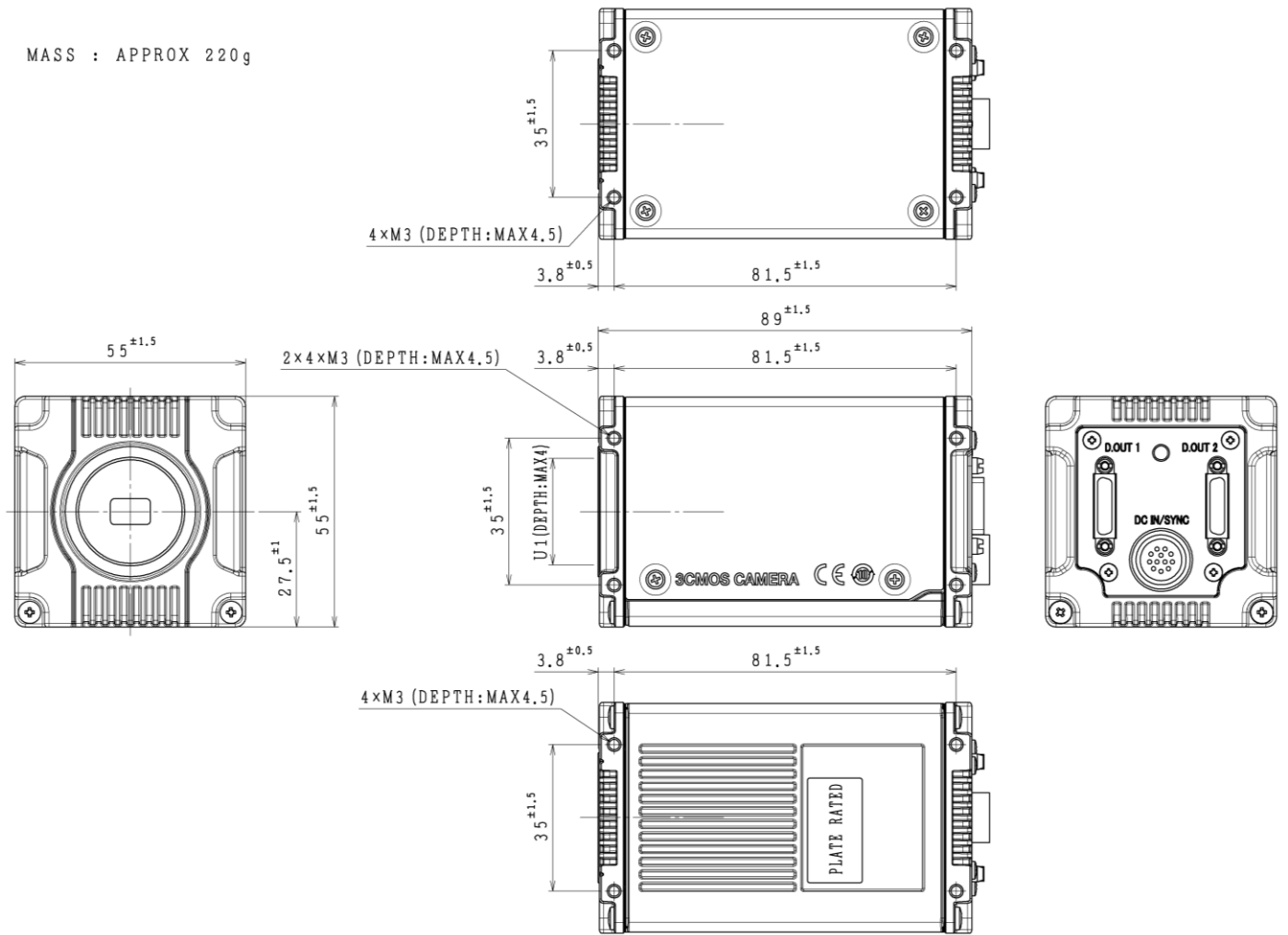
Specifications of HV-FM230SCL are showing.

1)	Optical system	1/2.3 inch prism with IR cut filter
2)	Imaging device	1/2.3 inch global shutter method CMOS(3 CMOS)
	Total pixels	1936 (H) x 1226 (V)
	Effective pixels	1936 (H) x 1216 (V)
	Active pixels	1920 (H) x 1200 (V)
	Pixel pitch	3.45 $\mu$ m (H) x 3.45 $\mu$ m (V)
3)	Sensing area	6.624mm (H) x 4.140mm (V)
4)	Scanning system	Progressive scan
5)	Frame rate	MAX.30 frame per second (full pixel readout)
6)	CameraLink clock frequency	85MHz or 60MHz
7)	Horizontal scanning frequency	37.48kHz(85MHz) or 26.46kHz(60MHz)
8)	Vertical scanning frequency	30.03Hz(85MHz) or 21.20Hz(60MHz)
9)	Synchronization	Internal
10)	Lens mount	C mount (Mount surface projection less than 4.0mm)
11)	Flange back	17.526mm (air conversion)
12)	Video output	
	Interface	CameraLink 85MHz or 60MHz Base / Medium configuration (Note: Maximum digital out cable length is 5 meters.)
	Output image size	1920 (H) x 1200 (V)
	Output system	Base Configuration RGB24bit, Medium Configuration RGB30bit/RGB36bit
13)	Sensitivity	1600 lux, F5.6, 2900 K, 1/60s
14)	Electronic shutter	
	Preset	OFF, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second
	Auto	20 to 655370us
	Variable	20 to 655370us (Can set Lower limit/Upper limit)
15)	Frame on demand	
	Mode	OFF (Normal mode), Fixed shutter mode, ONE trigger mode
	Trigger input	From CameraLink (CC1) or DCIN/SYNC 12pin connector
	Input level	5Vp-p $\pm$ 0.5V (DCIN/SYNC 12pin connector)
16)	Output signal	FLASH / VD : 5Vp-p
17)	Gamma	GAMMA 1.0 to 0.45 and/or LUT
18)	Gain	Manual / AGC : 0 to +18dB
19)	White balance	Manual / One-push Auto/ Continuous Auto
20)	Registration(opticaxis center)	Full screen 0.05% (not including lens response)
21)	Vertical contour correction	2H
22)	Remote control	
	Control system	Start-stop synchronization system
	Control items	Refer to the "Remote control" (page 14 ~) and "Command list" (page 21 ~)
23)	Power supply	DC12V $\pm$ 1V
24)	Power consumption	Approx. 366mA (Approx. 4.4W)
25)	Ambient temperature	
	Operating	0 to 40 $^{\circ}$ C less than 90% RH (without dew condensation)
	Storage	-20 to 60 $^{\circ}$ C less than 70% RH (without dew condensation)
26)	Vibration endurance	10 to 100Hz (24.5 m/s <sup>2</sup> ), sweep: 10 minutes, XYZ, 30minutes
27)	Shock endurance	392 m/s <sup>2</sup> (vertical, horizontal, once each face)
28)	Dimensions	55(W) x 55(H) x 89(D) mm (not including mount protrusions)
29)	Mass	Approx. 220g (not including the lens)
30)	Standard compositions	Camera, Installation guide, Plug for power supply

# 16. Dimensions

UNIT: mm  
SCALE: NTS

MASS : APPROX 220g



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