

## Excellent Integrated System Limited

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[ZFV-CA40](#)

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## Smart Vision Sensors

# ZFV Color Series



## Ordering Information

### Models

#### Sensor Heads

Appearance	Type	Setting distance	Sensing area	Model
	Narrow View	34 to 49 mm (variable)	5 x 4.6 mm to 9 x 8.3 mm (variable)	ZFV-SC10
	Standard View	31 to 187 mm (variable)	10 x 9.2 mm to 50 x 46 mm (variable)	ZFV-SC50
	Wide View	66 to 141 mm (variable)	50 x 46 mm to 90 x 83 mm (variable)	ZFV-SC90
	Ultra-wide View	114 to 226 mm (variable)	90 x 83 mm to 150 x 138 mm (variable)	ZFV-SC150

#### Amplifier Units ZFV Color Series

Appearance	Power supply	Output type	Model
	24 VDC	NPN	ZFV-CA40
		PNP	ZFV-CA45

#### Accessories ZFV Color Series (order separately)

##### Data Storage Units

Appearance	Power supply	Output type	Model
	24 VDC	NPN	ZS-DSU11
		PNP	ZS-DSU41

##### Sensor Head Extension Cable

Cable length	Model
3 m	ZFV-XC3B *1
8 m	ZFV-XC8B

\*1. ZFV-XC3BR Robot Cable is also available.

##### Panel-mounting Adapter

Appearance	ZS-XOM1	ZS-XPM2
Model	First Unit	Additional Units (for expansion)

##### Controller Link Unit

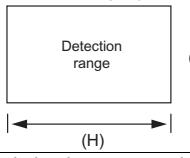
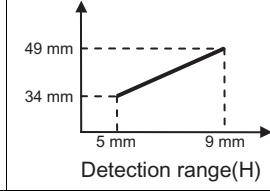
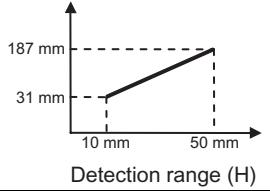
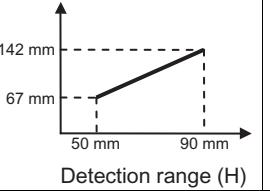
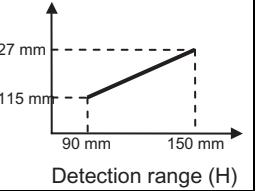
Appearance	Model
	ZS-XCN

##### External Lighting

Type	Model
Bar Lighting	ZFV-LTL01
Bar Double Lighting	ZFV-LTL02
Bar Low-angle Lighting	ZFV-LTL04
Light Source for Through-beam Lighting	ZFV-LTF01

## Specifications

### Sensor Heads

Item	ZFV-SC10 (Narrow View)	ZFV-SC50/SC50W (Standard View)	ZFV-SC90/SC90W (Wide View)	ZFV-SC150/SC150W (Ultra Wide View)
Setting distance (L)	34 to 49 mm (variable)	31 to 187 mm (variable)	67 to 142 mm (variable)	115 to 227 mm (variable)
Detection range (H × V)	5 × 4.6 mm to 9 × 8.3 mm (variable)	10 × 9.2 mm to 50 × 46 mm (variable)	50 × 46 mm to 90 × 83 mm (variable)	90 × 83 mm to 150 × 138 mm (variable)
				
Relation between setting distance and detection range				
Built-in lens	Focus: f15.65	Focus: f13.47	Focus: f6.1	
Object lighting method	Pulse lighting			
Object light source	8 white LEDs	36 LEDs	20 white LEDs	72 white LEDs
Lightning I/F (Option)	None	Yes		None
Sensing element	1/3-inch CCD			
Shutter	Electronic shutter, shutter time: 1/500 to 1/8,000			
Power supply voltage	15 VDC (Supplied from Amplifier Unit.)	15 VDC, 48 VDC (Supplied from Amplifier Unit.)		
Current consumption	Approx. 200 mA	Approx. 350 mA [15 V: approx. 150 mA, 48 V: approx. 200 mA] (Including the current consumed when external light is connected)		
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min			
Vibration resistance (destructive)	10 to 150 Hz, 0.35 mm single amplitude, 10 times each in X, Y, and Z directions for 8 min			
Shock resistance (destructive)	150 m/s <sup>2</sup> , three times each in six directions (up/down, left/right, forward/backward)			
Ambient temperature	Operating: 0 to +40 °C, Storage: -25 to +65 °C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Ambient atmosphere	Must be free of corrosive gas.			
Connection type	Prewired, Standard cable length: 2 m			
Degree of protection (IEC 60529)	IP65	ZFV-SC____: IP65 ZFV-SC____W: IP67		
Material	Case: ABS, Mounting bracket: PBT			
Weight	Approx. 200 g (including mounting bracket and cord; packaged condition: approx. 300 g)	Approx. 270 g (including mounting bracket and cord; packaged condition: approx. 350 g)	Approx. 300 g (including mounting bracket and cord; packaged condition: approx. 380 g)	Approx. 600 g (including mounting bracket and cord; packaged condition: approx. 780 g)
Accessories	Mounting bracket ZFV-XMF (1), Ferrite core (1), Instruction sheet	Mounting bracket ZFV-XMF2 (1), Ferrite core (2), Warning label (1) Instruction sheet	Mounting bracket ZFV-XMF2 (1), Ferrite core (2), Warning label (1) Instruction sheet	Ferrite core (2), Instruction sheet
LED class *1	Class 1	Class 2	Class 2	Class 1

\*1. Applicable standards: IEC60825-1: 1993 +A1:1997 +A2:2001, EN60825-1:1994 +A:2002 +A:2001

## Amplifier Units

Item		ZFV-CA40	ZFV-CA45
Output specifications		NPN open collector, 30 VDC 50 mA max., residual voltage 1.2 V max.	PNP open collector, 50 mA max., residual voltage 1.2 V max.
Input specifications	ON OFF	Short-circuited with 0 V terminal or 1.5 V or less	Supply voltage short-circuited or within supply voltage -1.5 V max.
Serial I/O	USB2.0 RS-232C	1 port, full-speed (12 Mbps) MINI-B 1 port, 115,200 bps max.	
Inspection items	PATTERN, AREA, HUE (Color), WIDTH, POSITION, COUNT, BRIGHT, CHARA		
Teaching area	Rectangular, one area		
Teaching area size	<ul style="list-style-type: none"> <li>PATTERN, BRIGHT: Any rectangular area (256 × 256 max.)</li> <li>AREA, HUE (Color), WIDTH, POSITION, COUNT, CHARA: Any rectangular area (full screen max.)</li> </ul>		
Sensing area	Full screen		
Resolution	468 x 432 (H x V) max.		
Bank switching	Supported for 8 banks.		
Image input interval	13 ms (Standard), 8 ms (1/2 for partial scan), 5 ms (1/4 for partial scan)		
Other functions	Control output switching: ON for OK / ON for NG, ON delay / OFF delay, One-shot output, "ECO" mode		
Output signals	<ol style="list-style-type: none"> <li>Control output (OUTPUT)</li> <li>Enable output (ENABLE)</li> <li>Error output (ERROR)</li> </ol>		
Input signals	<ol style="list-style-type: none"> <li>Sync measurement input (TRIG)/Continuous measurement input (TRIG); switched by menu</li> <li>Bank selection inputs (BANK1-3)</li> <li>Workpiece still teaching (TEACH)/ Workpiece moving teaching (TEACH); switched by menu</li> </ol>		
Sensor head interface	Digital interface		
Image display	1.8 inch TFT color LCD (Display dots: 557 x 234 pix)		
Indicators	<ul style="list-style-type: none"> <li>Judgment result indicator (OUTPUT, Color: orange)</li> <li>Inspection mode indicator (RUN, Color: green)</li> <li>Error indicator (ERR, Color: red)</li> <li>Ready status indicator (READY, Color: blue)</li> </ul>		
Operation interface	<ul style="list-style-type: none"> <li>Cursor keys (up, down, left, right)</li> <li>Setting key (SET)</li> <li>Escape key (ESC)</li> <li>Operating mode switching (slide switch)</li> <li>Menu switching (slide switch)</li> <li>Teaching/Display switching key (TEACH/VIEW)</li> <li>Function keys (A to D 4 input)</li> </ul>		
Power supply voltage	20.4 to 26.4 VDC (including ripple)		
Current consumption	800 mA max. (with Sensor Head connected)		
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between leads and Amplifier Unit case		
Noise resistance	1 kV, Pulse rise: 5 ns, Pulse width: 50 ns, Burst duration: 15 ms, Cycle: 300 ms		
Vibration resistance (destructive)	10 to 150 Hz, 0.1 mm single amplitude, 10 times each in X, Y, and Z directions for 8 min		
Shock resistance (destructive)	150 m/s <sup>2</sup> , three times each in six directions (up/down, left/right, forward/backward)		
Ambient temperature range	Operating: 0 to 50 °C Storage: -25 to 65 °C (with no icing or condensation)		
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)		
Ambient atmosphere	Must be free of corrosive gas.		
Degree of protection	IEC 60529, IP20		
Material	Polycarbonate (PC)		
Weight	Approx. 300 g (including cord; packaged condition: 450 g)		
Accessories	Ferrite core (1), Instruction sheet, Label (1)		

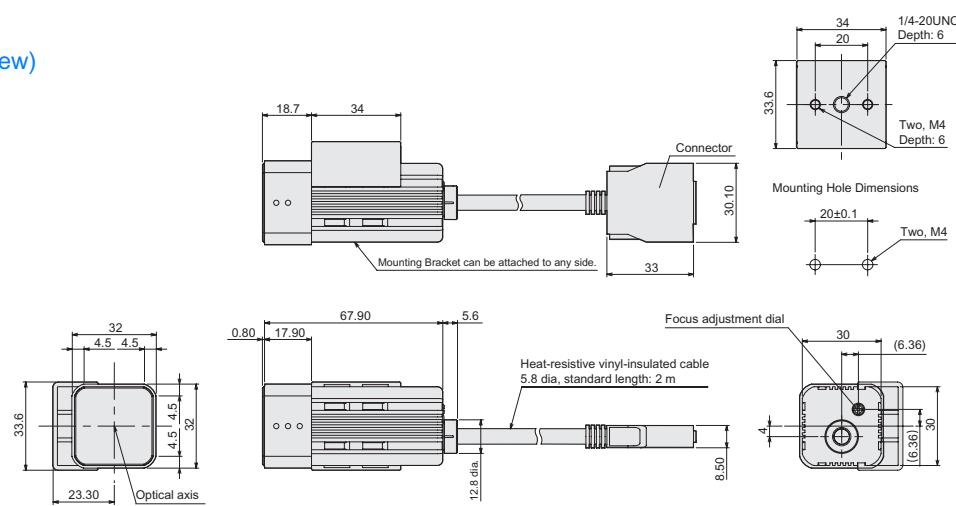
**External light units (optional)**

Item	ZFV-LTF01	ZFV-LT01	ZFV-LTL01	ZFV-LTL04
Applicable sensor head	ZFV-SC50/SC50W/SC90/SC90W			
Lighting method	Pulse lighting			
Lighting interval	Fixed (1.1 to 1.4 ms)			
Light source (Qty.)	White LEDs			
	60	20	40	80
Power supply voltage	48 VDC (Supplied from sensor head)			
Current consumption	Appprox. 160 mA	Approx. 80 mA	Appprox. 120 mA	Appprox. 210 mA
Dielectric strength	300 VAC, 50/60 Hz for 1 min			
Vibration resistance (destructive)	10 to 150 Hz, 0.35 mm single amplitude, 10 times each in X, Y and Z directions for 8 min			
Shock resistance (destructive)	150 m/s <sup>2</sup> , 3 times each in six directions (up/down, left/right, forward/backward)			
Ambient temperature	Operating: 0 to 40 °C Storage: -20 to 65 °C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% RH (with no condensation)			
Ambient atmosphere	Must be free of corrosive gas			
Connection type	Prewired, Standard cable length: 2 m			
Degree of protection	IEC6D529 IP20			
Material	SPCC	SPCC, aluminium		
Weight	Approx. 500 g (when packaged: Approx. 550 g)	Approx. 250 g (when packaged: Approx. 300 g)	Approx. 650 g (when packaged: Approx. 900 g)	Approx. 900 g (when packaged: Approx. 1,150 g)
LED class	Class 1 Applicable standards IEC6D825-1: 1993 +A1:1997 +A2:2001 EN60825-1: 1994 +A1:2002 +A2:2001			

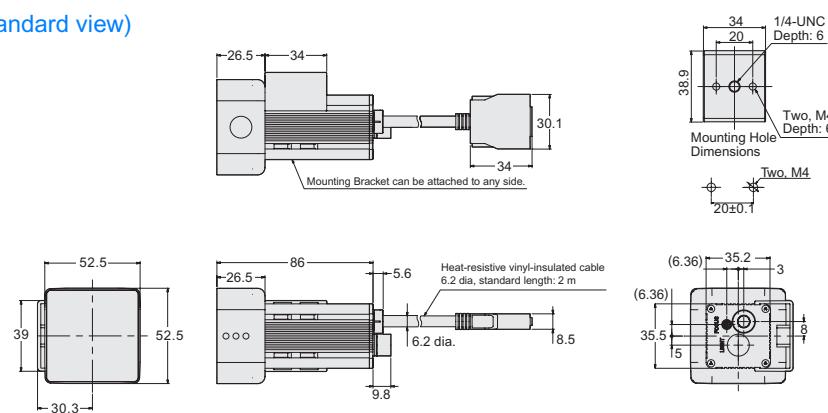
## Dimensions (Units: mm)

### Sensor Heads

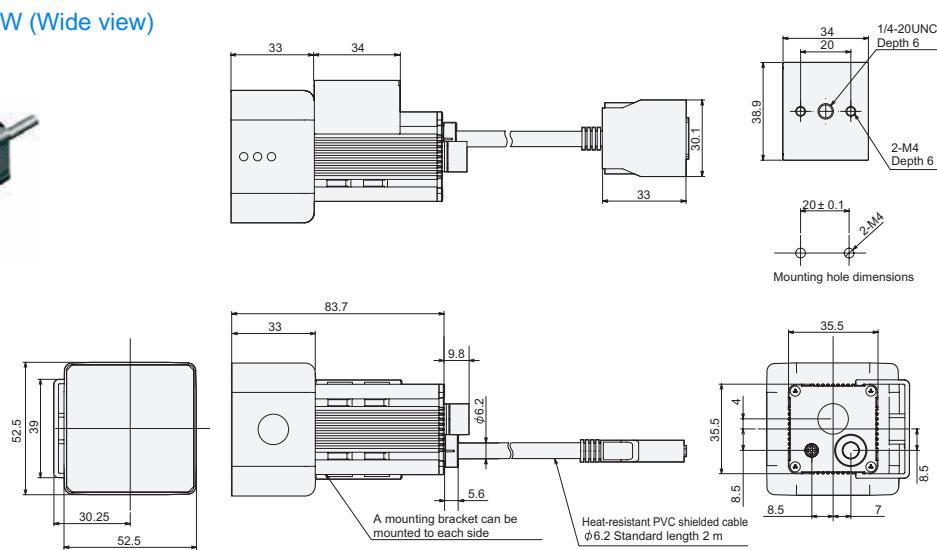
#### ZFV-SC10 (Narrow view)



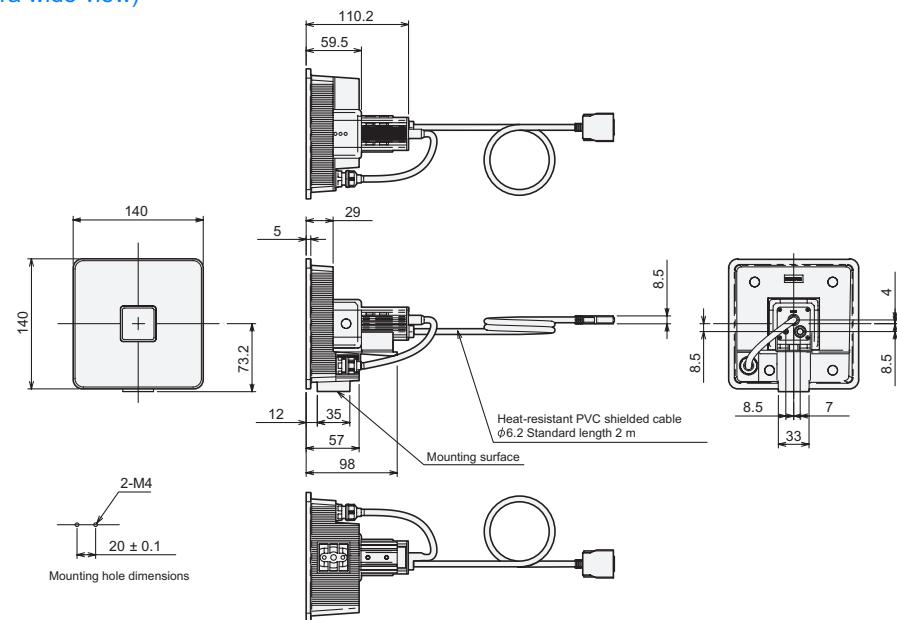
#### ZFV-SC50/SC50W (Standard view)



#### ZFV-SC90/SC90W (Wide view)

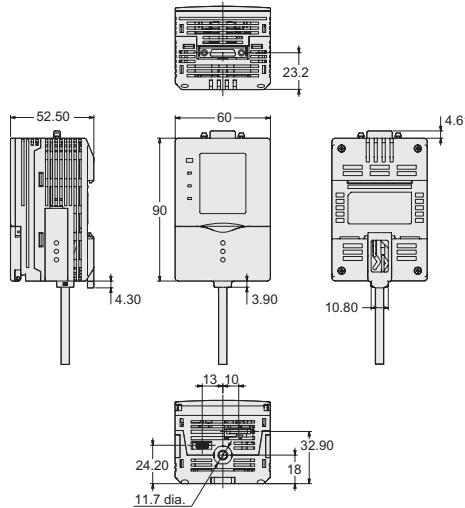


**ZFV-SC150/SC150W (Ultra wide view)**



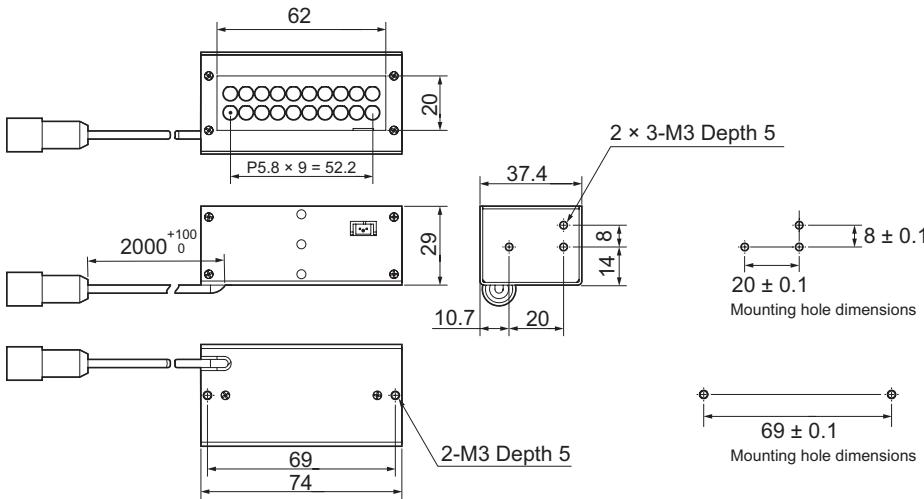
**Amplifier Units**

**ZFV-CA4□**

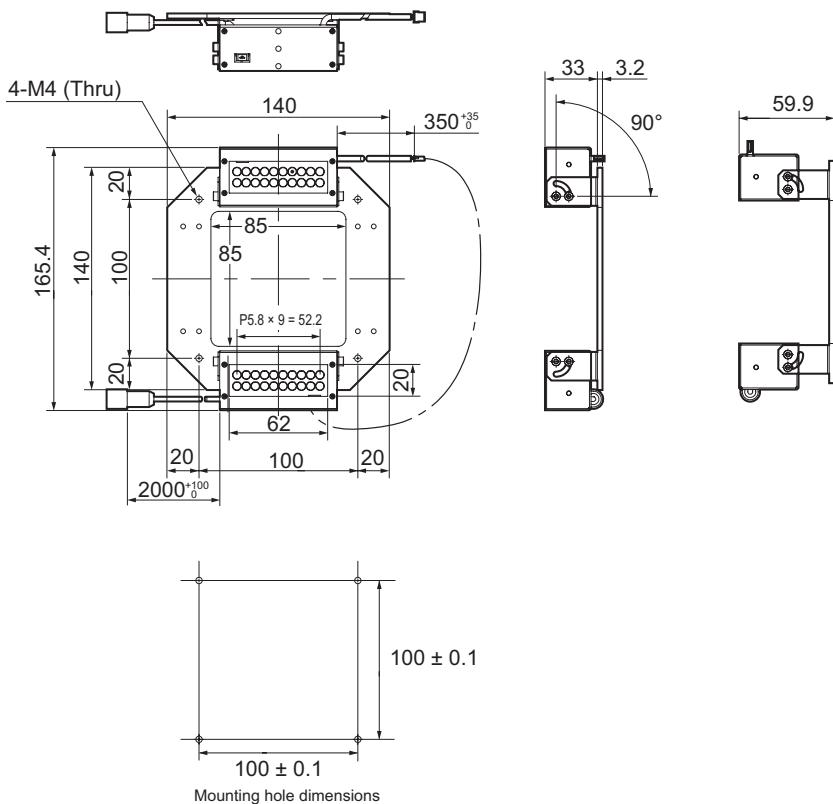


### External light units (optional)

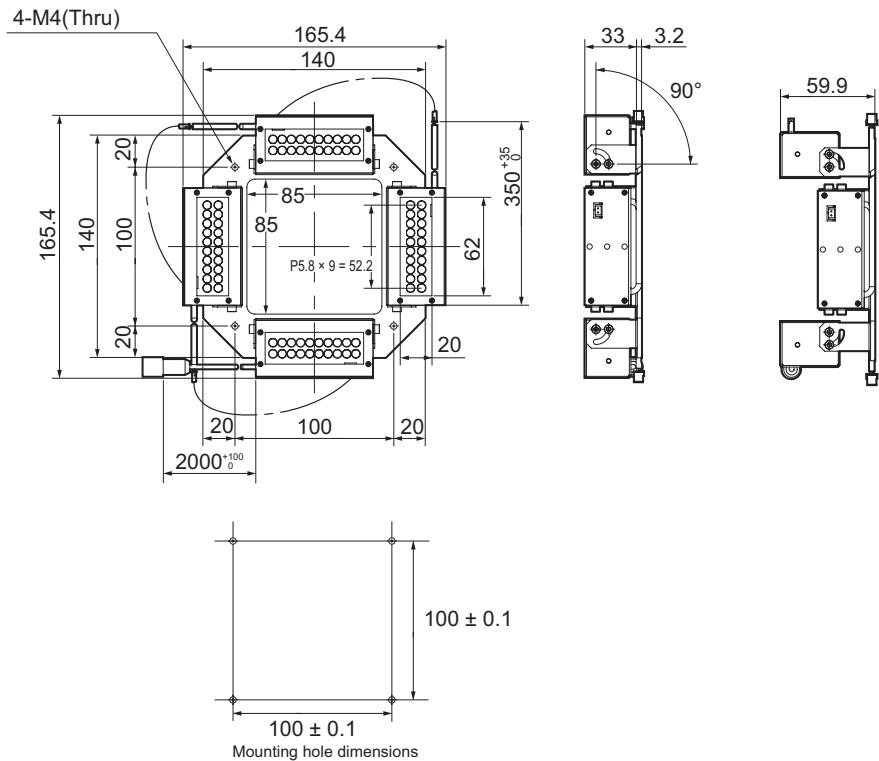
## ZFV-LTL01 (bar lighting)



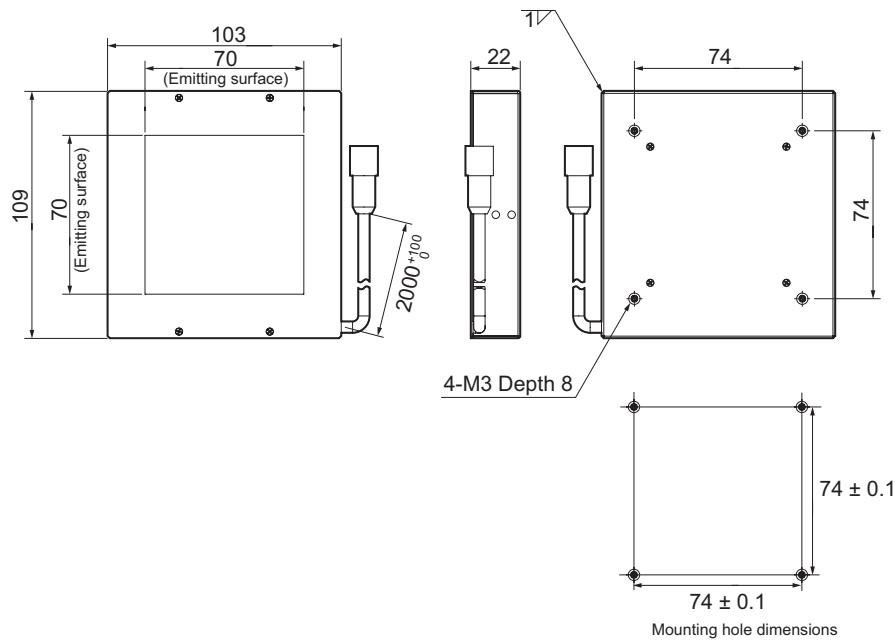
## ZFV-LTL02 (bar double-lighting)



**ZFV-LTL04 (bar low-angle lighting)**

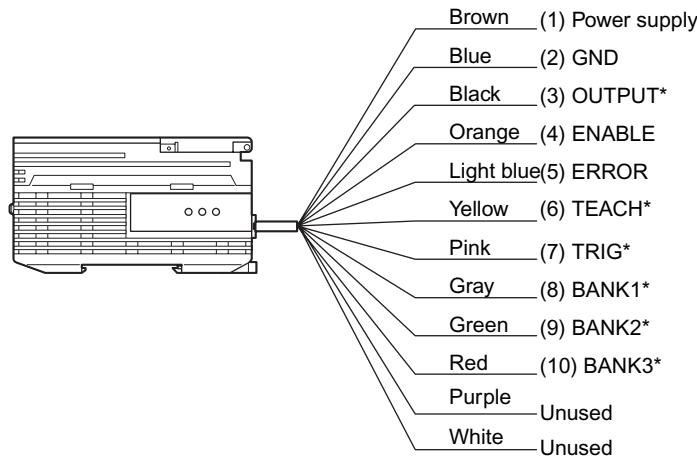


**ZFV-LTF01 (light source for through-beam lighting)**



## About the I/O cable

The following shows the leads that comprise the I/O cable.



\* : Enabled only in the RUN mode

### (1) Power Supply

This connects the power supply.

Use a DC power supply with safe extra-low-voltage circuits to prevent high voltage.

Wire the power supply separately from other devices. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.

### (2) GND

The GND terminal is the 0 V power supply terminal.

### (3) OUTPUT (control output)

This outputs judgment results. This lead is interlocked with OUTPUT LED.

### (4) ENABLE (enable output)

This turns ON when error is generated. This lead is interlocked with ERR LED.

### (5) ERROR (error output)

This turns ON when an error is generated. This lead is interlocked with ERR LED.

### (6) TEACH (teaching output)

There are two teaching modes, workpiece stop teaching and workpiece move teaching. These teaching modes can be selected in the menu.

### (7) TRIG (measurement trigger input)

There are two measurement modes, synchronous measurement and continuous measurement. Which mode of measurement is to be performed in is selected in the menu.

### (8) BANK1 (bank switching input 1)

### (9) BANK2 (bank switching input 2)

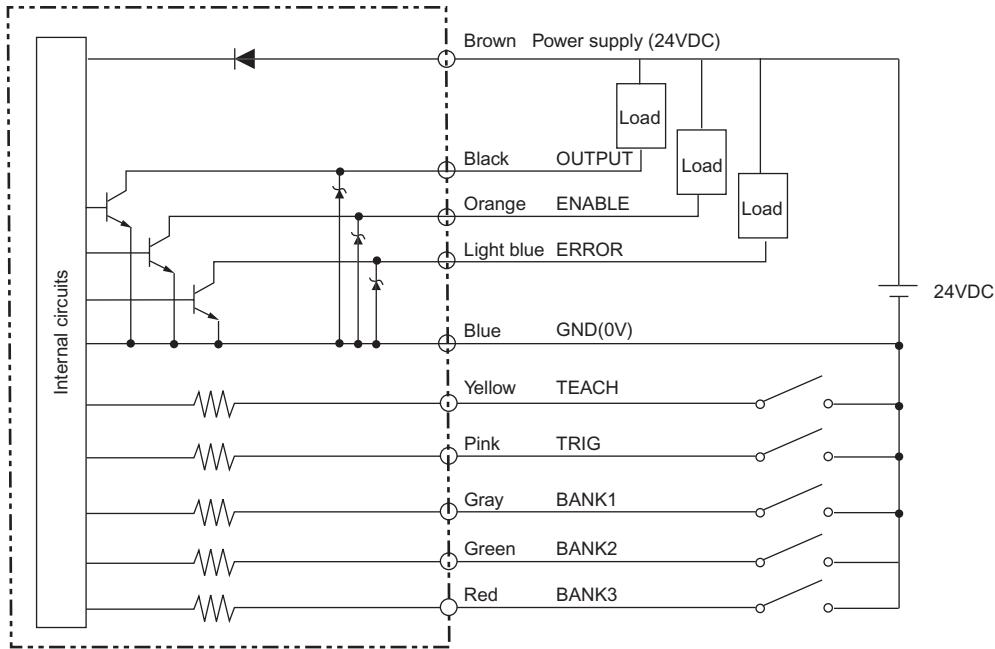
### (10) BANK3 (bank switching input 3)

The bank No. can be switched when the BANK1 to BANK3 are connected as follows

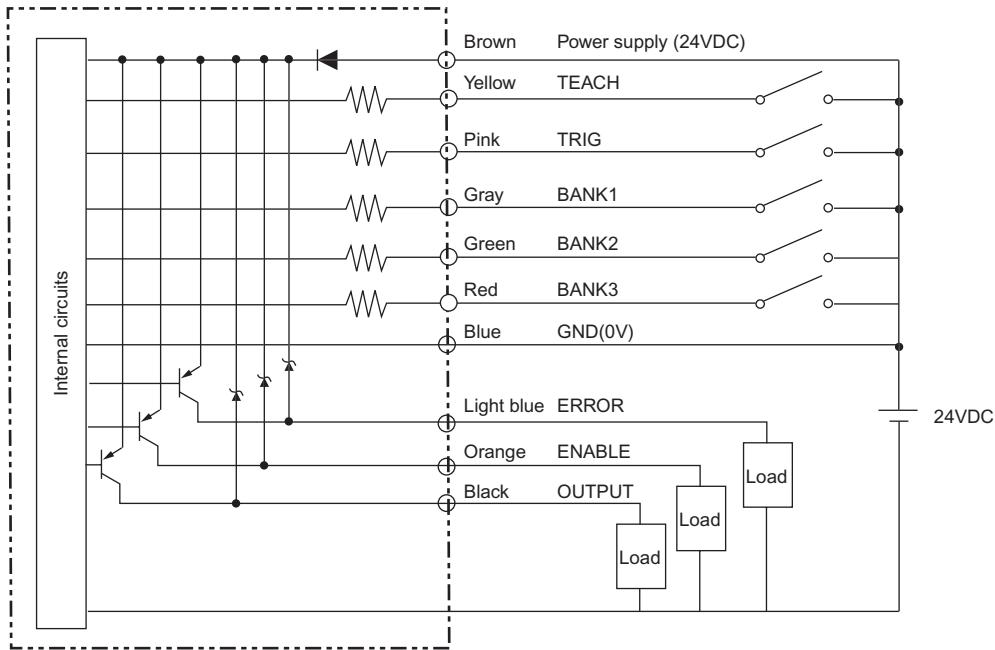
Bank No.	BANK1	BANK2	BANK3
BANK1	OFF	OFF	OFF
BANK2	ON	OFF	OFF
BANK3	OFF	ON	OFF
BANK4	ON	ON	OFF
BANK5	OFF	OFF	ON
BANK6	ON	OFF	ON
BANK7	OFF	ON	ON
BANK8	ON	ON	ON

## I/O Circuit diagrams

### NPN output type (ZFV-CA40)



### PNP output type (ZFV-CA45)



## Timing Charts

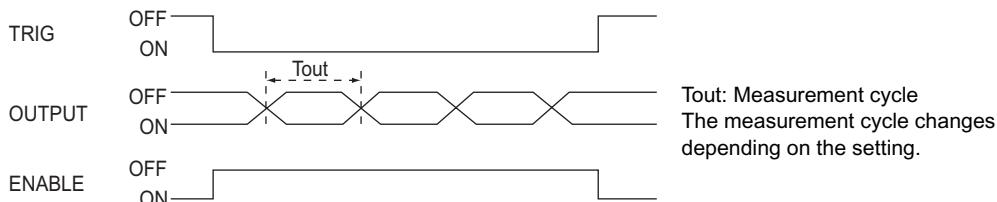
The following shows the timing charts when communication is performed with external devices.

### Measurement

#### Continuos measurement

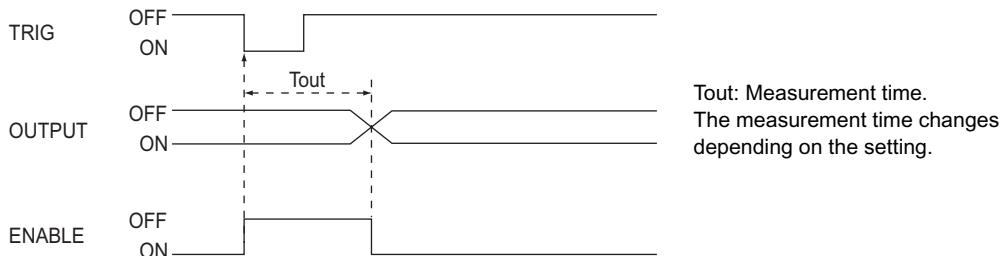
Measurement is performed continuously for the duration that the TRIG signal is ON.

The measurement result is updated and output to external devices at each measurement cycle.



#### Synchronous measurement

Measurement is performed only once in synchronous with the change in TRIG signal state from OFF to ON and the result is output.



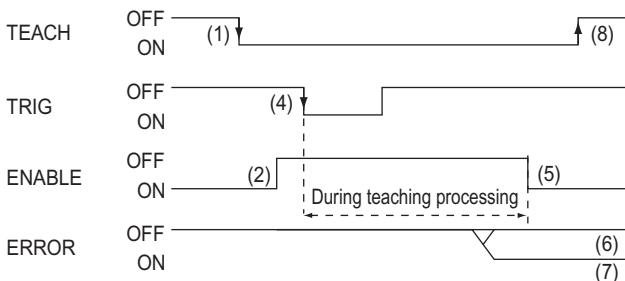
- The minimum ON time width of the TRIG signal is 1 ms.
- The OUTPUT signal is held until the measurement result is updated.

**Note:** However, when one-shot is set, the OUTPUT signal is held for the preset time.

## Teaching

### Workpiece stop teaching

Teaching processing is performed according to TRIG signal input after the TEACH signal input.  
 Measurement is not performed while teaching is being performed. Do not move the workpiece until teaching is completed.

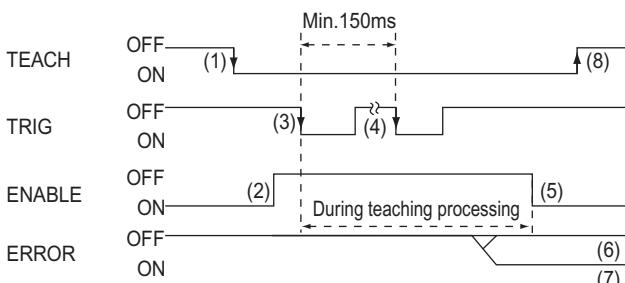


- (1) Turn the TEACH signal ON.
- (2) Confirm that the ENABLE signal has turned OFF.
- (3) Make sure that the workpiece to be taught is in the teaching area.
- (4) Input the TRIG signal.
- (5) The ENABLE signal turns ON after teaching is completed. At this timing, check the state of the ERROR signal.
- (6) When teaching has been completed successfully, the ERROR signal stays OFF.
- (7) When teaching fails, the ERROR signal turns ON.
- (8) Turn the TEACH signal OFF and end teaching processing.  
 When teaching fails, the state before teaching was initiated is returned to. Perform teaching again.  
 If the TEACH signal is turned OFF midway, teaching is disabled.

### Workpiece move teaching

Use this teaching mode when the object cannot be stopped. Teaching processing is divided up and performed in synchronous with the TRIG signal input after the TEACH signal is input.

Teaching must be performed eight times. Measurement is not performed while teaching is being performed.



- (1) Turn the TEACH signal ON from the outside.
- (2) Confirm that the ENABLE signal has turned OFF.
- (3) Input the TRIG signal at the timing for measuring the workpiece to be taught.
- (4) Repeat the input in step (3) eight times. (Trigger inputs from the ninth time onwards are ignored.)
- (5) The ENABLE signal turns ON after teaching is completed. Check the state of the ERROR signal at this timing.
- (6) When teaching has been completed successfully, the ERROR signal stays OFF.
- (7) When teaching fails, the ERROR signal turns ON.
- (8) Turn the TEACH signal OFF and end teaching processing.  
 When teaching fails, the state before teaching was initiated is returned to. Perform teaching again.  
 If the TEACH signal is turned OFF midway, teaching is disabled.

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18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

## Certain Precautions on Specifications and Use

1. **Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
  - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
  - (ii) Use in consumer products or any use in significant quantities.
  - (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
  - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
- NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. **Performance Data.** Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
4. **Change in Specifications.** Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.
5. **Errors and Omissions.** Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Complete "Terms and Conditions of Sale" for product purchase and use are on Omron's website at [www.omron.com/oei](http://www.omron.com/oei) – under the "About Us" tab, in the Legal Matters section.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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8/06

Specifications subject to change without notice

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