

Smart Vision Sensors

ZFV Color Series



ZFV

Ordering Information

Models

Sensor Heads

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

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 |

Sensor Head Extension Cable

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

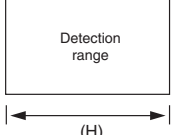
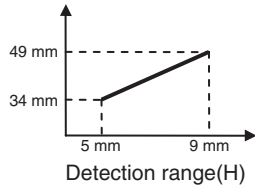
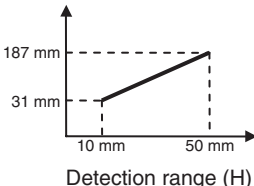
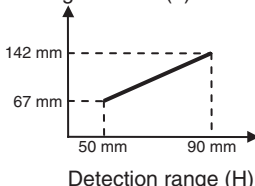
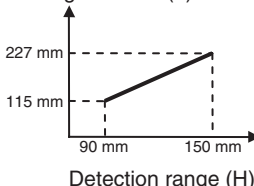
*1. ZFV-XC3BR Robot Cable is also available.

Panel-mounting Adapter

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

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 | Setting distance (L)  | Setting distance (L)  | Setting distance (L)  | Setting distance (L)  |
| 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 ² , 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 | Short-circuited with 0 V terminal or 1.5 V or less | Supply voltage short-circuited or within supply voltage -1.5 V max. |
| | OFF | Open (leakage current 0.1 mA max) | Open (leakage current 0.1 mA max) |
| Serial I/O | USB2.0 | 1 port, full-speed (12 Mbps) MINI-B | |
| | RS-232C | 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"> • PATTERN, BRIGHT: Any rectangular area (256 × 256 max.) • AREA, HUE (Color), WIDTH, POSITION, COUNT, CHARA: Any rectangular area (full screen max.) | |
| 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 | | (1) Control output (OUTPUT) (2) Enable output (ENABLE) (3) Error output (ERROR) | |
| Input signals | | (1) Sync measurement input (TRIG)/Continuous measurement input (TRIG); switched by menu (2) Bank selection inputs (BANK1-3) (3) Workpiece still teaching (TEACH)/ Workpiece moving teaching (TEACH); switched by menu | |
| 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"> • Judgment result indicator (OUTPUT, Color: orange) • Inspection mode indicator (RUN, Color: green) • Error indicator (ERR, Color: red) • Ready status indicator (READY, Color: blue) | |
| Operation interface | | <ul style="list-style-type: none"> • Cursor keys (up, down, left, right) • Setting key (SET) • Escape key (ESC) • Operating mode switching (slide switch) • Menu switching (slide switch) • Teaching/Display switching key (TEACH/VIEW) • Function keys (A to D 4 input) | |
| 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 ² , 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) | |

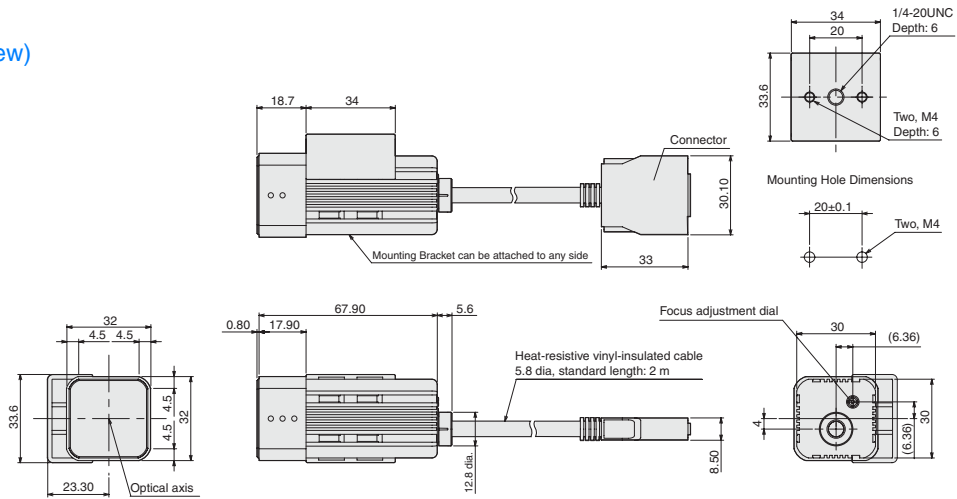
External light units (optional)

| Item | ZFV-LTF01 | ZFV-LTL01 | ZFV-LTL02 | 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 | Approx. 160 mA | Approx. 80 mA | Approx. 120 mA | Approx. 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 ² , 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 | IEC60529 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 IEC0825-1: 1993 +A1:1997 +A2:2001 EN60825-1: 1994 +A1:2002 +A2:2001 | | | |

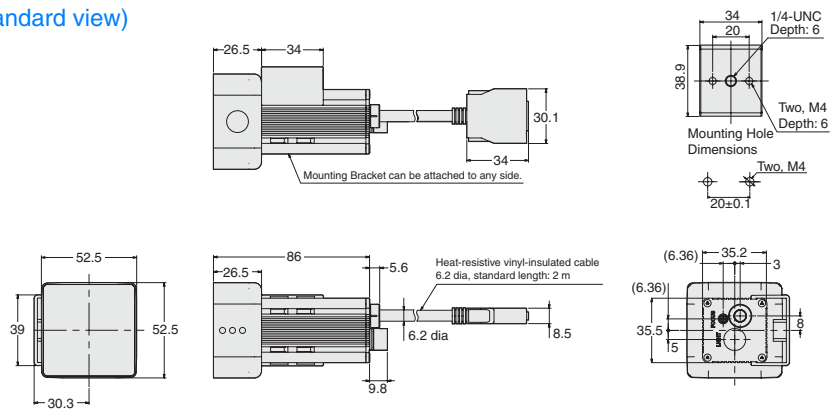
Dimensions (Units: mm)

Sensor Heads

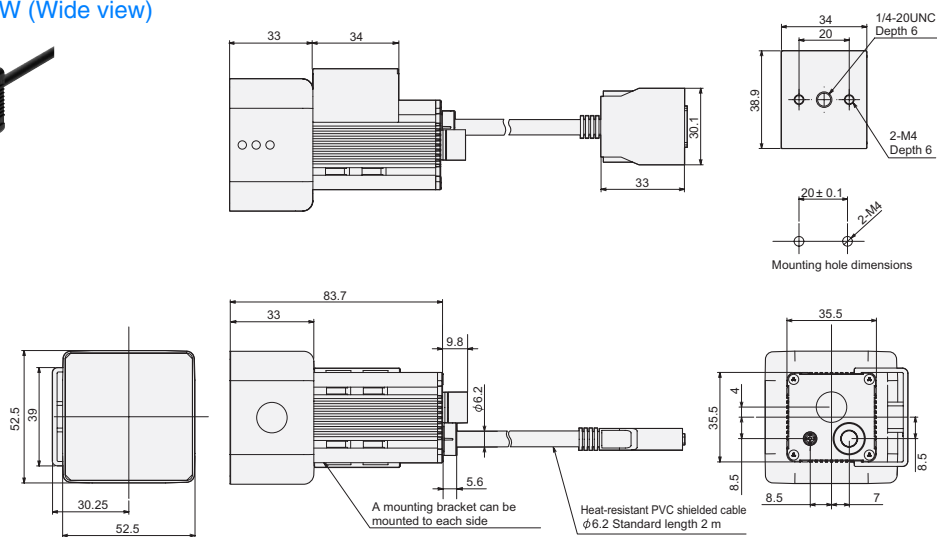
ZFV-SC10 (Narrow view)



ZFV-SC50/SC50W (Standard view)

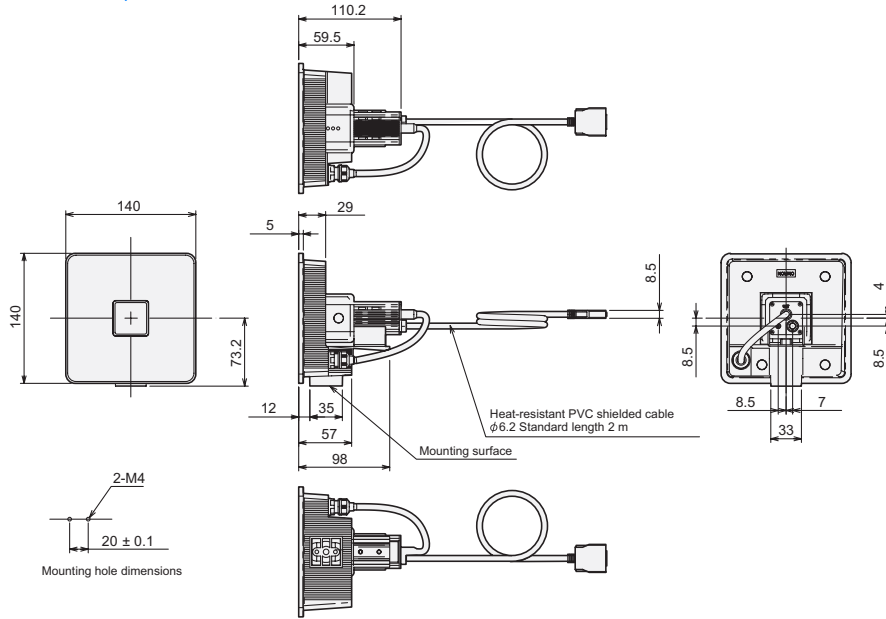
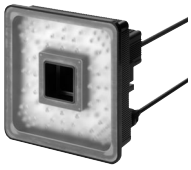


ZFV-SC90/SC90W (Wide view)



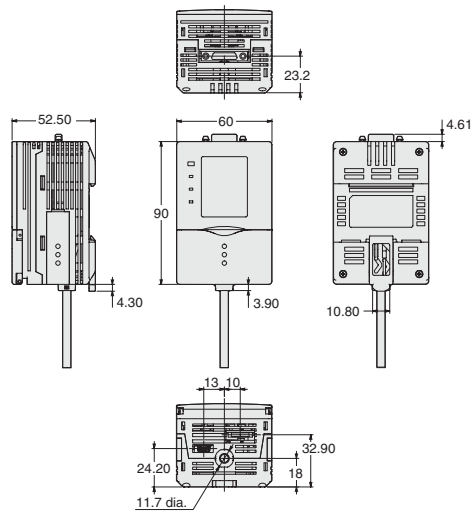
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ZFV-SC150/SC150W (Ultra wide view)



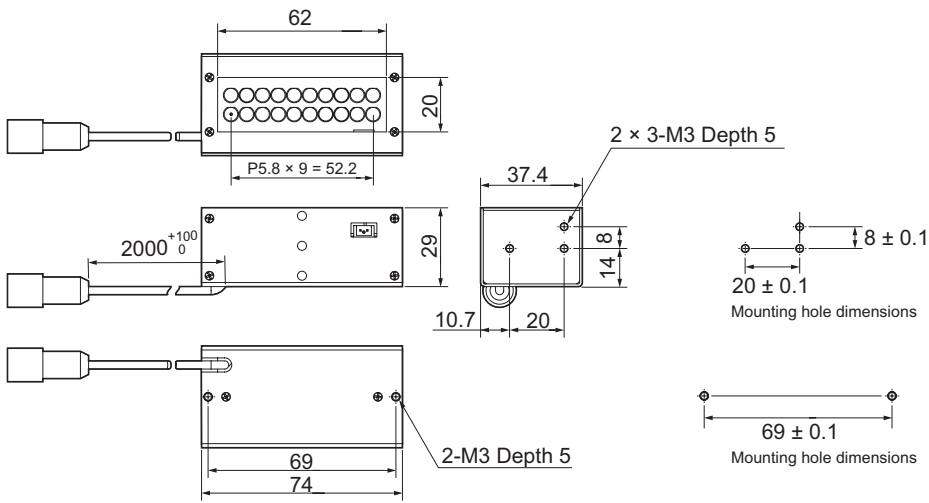
Amplifier Units

ZFV-CA4□

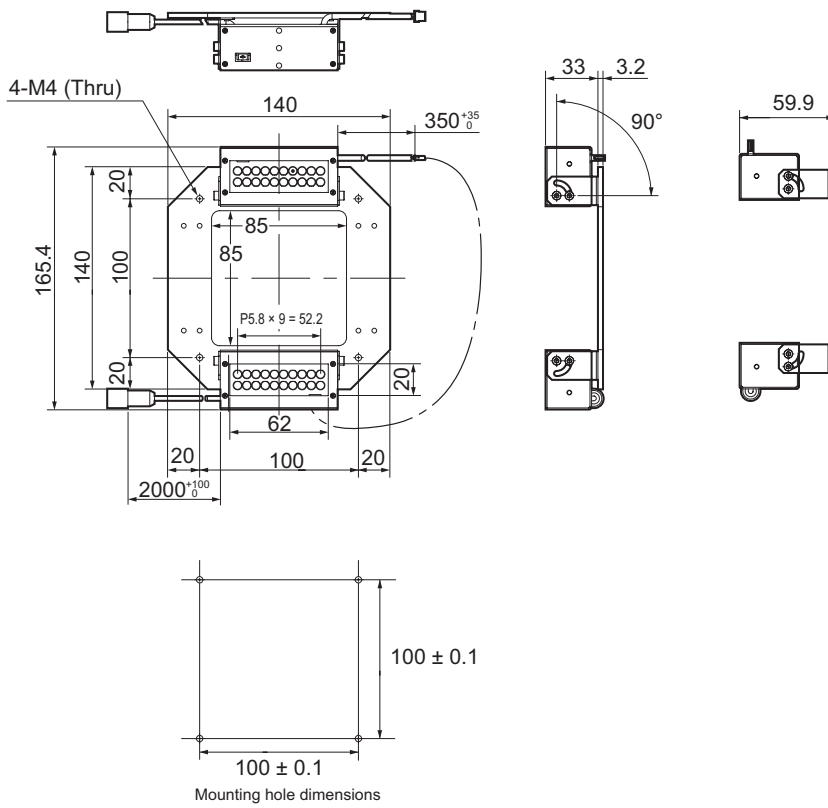


External light units (optional)

ZFV-LTL01 (bar lighting)

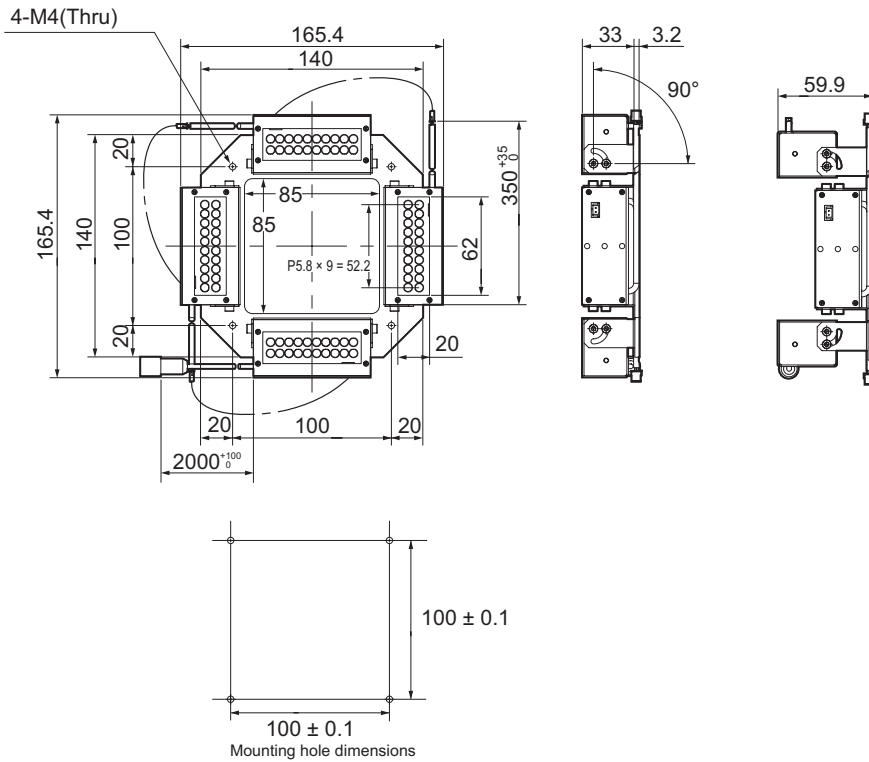


ZFV-LTL02 (bar double-lighting)

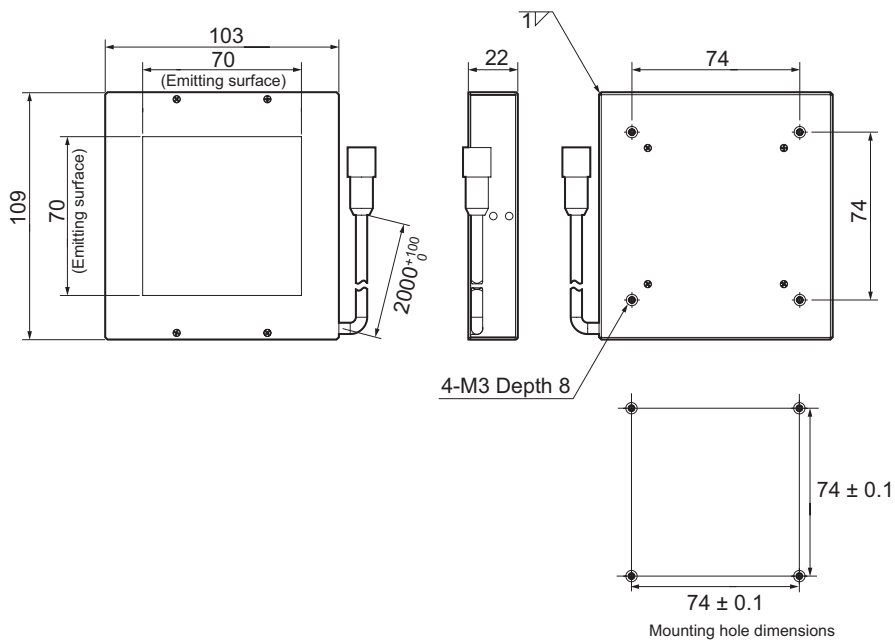


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ZFV-LTL04 (bar low-angle lighting)

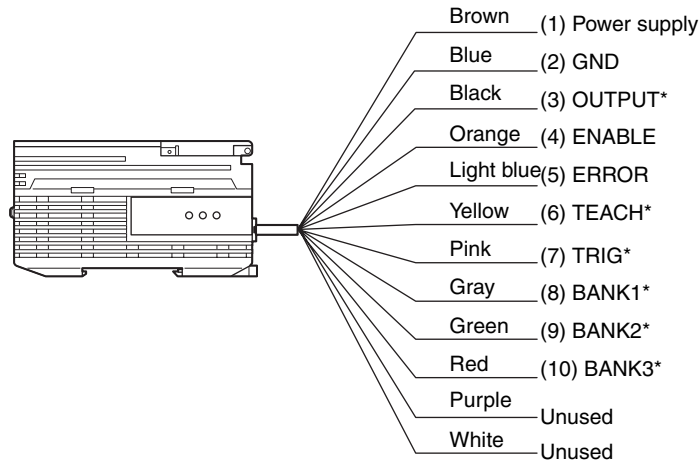


ZFV-LTF01 (light source for through-beam lighting)



About the I/O cable

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



* : Enabled only in the RUN mode

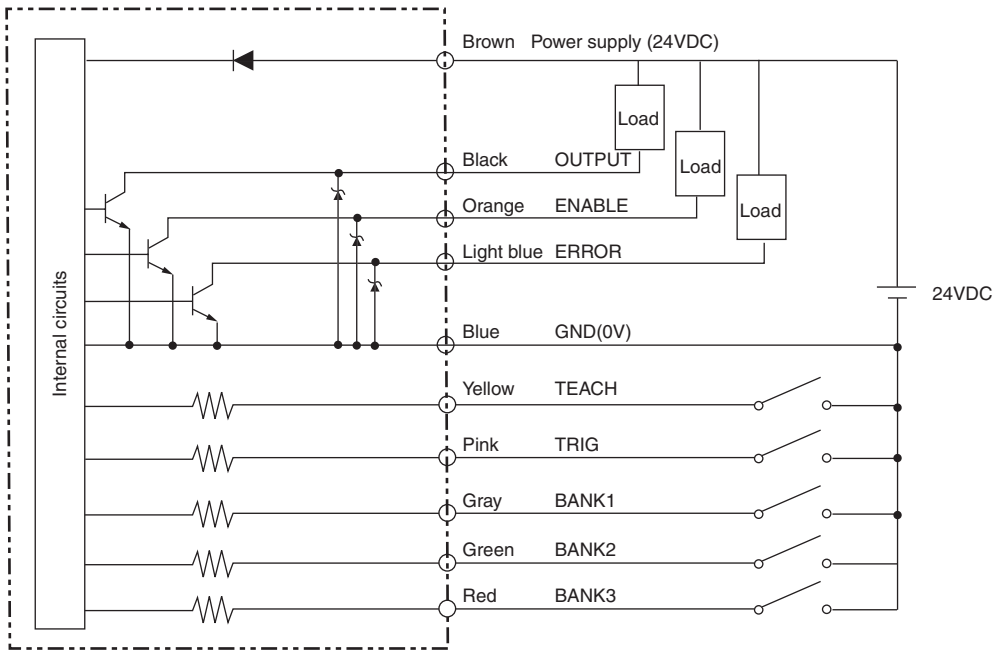
- (1) **Power Supply**
This connects the power supply.
Use a DC power supply with safe extra-low-voltage circuits to prevent high voltage.
Wire the power supply separately from other devices. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
- (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 the sensor is ready for measurement.
- (5) **ERROR (error output)**
This turns ON when an error is generated. This lead is interlocked with ERR LED.
- (6) **TEACH (teching input)**
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, synchronus measurement and continuous measurement. Which mode of measurement is to be performed in is selected in the menu.
- (8) **BANK1 (bank swichting input 1)**
- (9) **BANK2 (bank swichting input 2)**
- (10) **BANK3 (bank swichting input 3)**

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

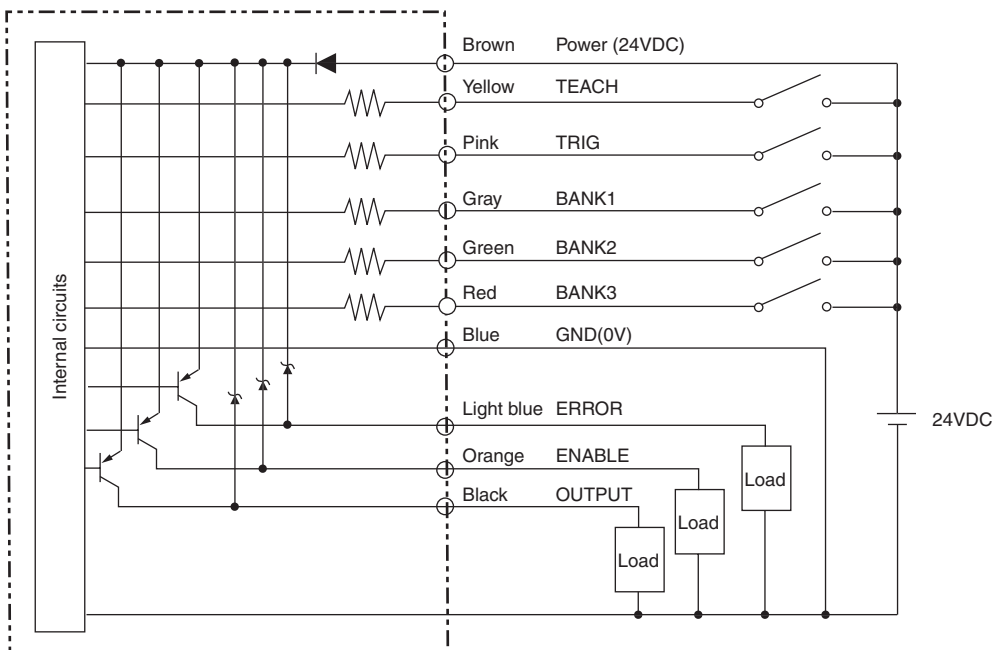
| Bank No. | BANK1 | BANK2 | BANK3 |
|----------|-------|-------|-------|
| BANK1 | OFF | OFF | OFF |
| BANK2 | ON | OFF | OFF |
| BANK3 | OFF | ON | OFF |
| BANK4 | ON | ON | OFF |
| BANK5 | OFF | OFF | ON |
| BANK6 | ON | OFF | ON |
| BANK7 | OFF | ON | ON |
| BANK8 | ON | ON | ON |

I/O Circuit diagrams

NPN output type (ZFV-CA40)



PNP output type (ZFV-CA45)



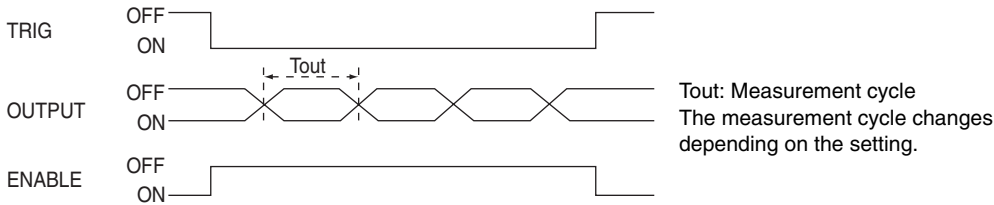
Timing Charts

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

Measurement

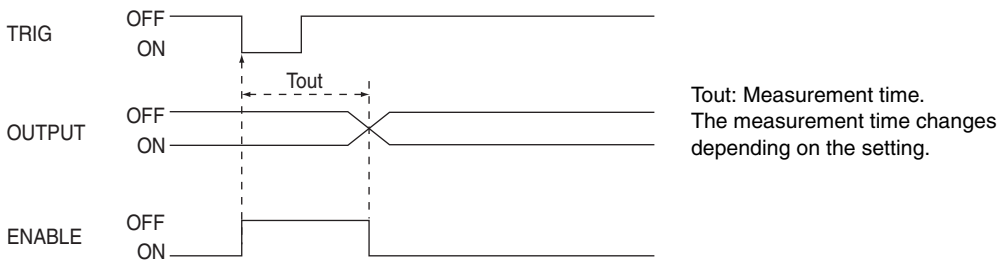
Continuous measurement

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 synchrony with the change in TRIG signal state from OFF to ON and the result is output.



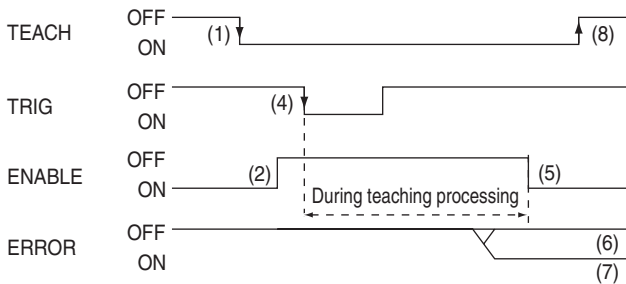
- The minimum ON time width of the TRIG signal is 1 ms.
 - The OUTPUT signal is held until the measurement result is updated.
- Note:** However, when one-shot is set, the OUTPUT signal is held for the preset time.

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.

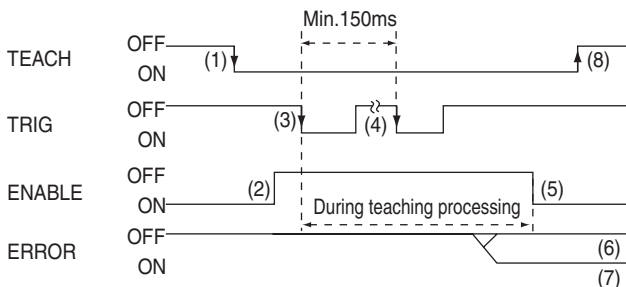


- (1) Turn the TEACH signal ON.
- (2) Confirm that the ENABLE signal has turned OFF.
- (3) Make sure that the workpiece to be taught is in the teaching area.
- (4) Input the TRIG signal.
- (5) The ENABLE signal turns ON after teaching is completed. At this timing, check the state of the ERROR signal.
- (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. Performe 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 processewd 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 return to. Perform teaching again.
If the TEACH signal is turned OFF midway, teaching is disabled.

Cat. No. E373-E2-02A-X

In the interest of product improvement, specifications are subject to change without notice.

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