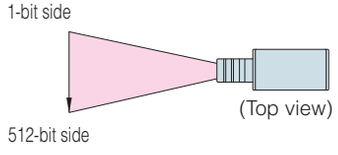
Image Sensors

- IMS512
- IMP2F (power supply unit)
- IML Series (light source)

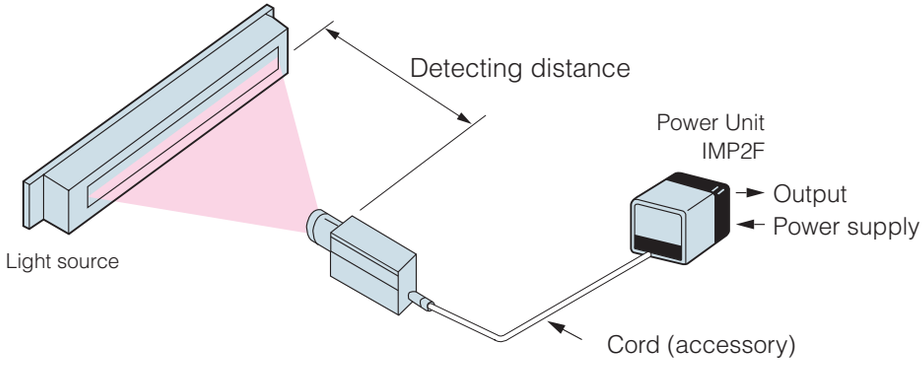
High-accuracy, high-resolution, compact and low-cost

- Video signal scanning cycle of 0.33 ms (min.) allowing detection of objects moving at high speed. Cycle variable between 0.33 and 2.2 ms with digital switch.
- Light axis monitor with LED indicator facilitating light axis and light intensity adjustment
- Field of view adjustment (variable field of view) simply monitored with video output
- Auto slicing feature following variation of received light intensity eliminating fine-tuning at slice level, allowing stable detection unaffected by intensity variation of light source due to temperature variation

Type

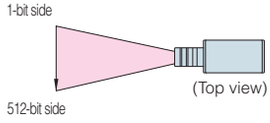
Type	Model	Detection field of view	Detecting distance
Image Sensor	**IMS512**		300mm-

Configuration



(For vertical field of view, use the mounting leg model IMAHL2 optionally available.)

Rating/Performance/Specification

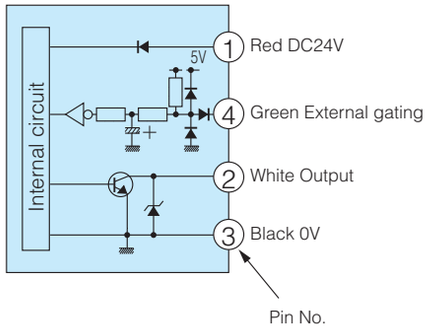
	Model	IMS512
Rating/performance	Bit count	512bit
	Detecting distance	300mm-
	Orientation of field of view	
	Resolution / Detecting distance	0.25mm max / 300mm
	Effective detecting width / Detecting distance	110mm max / 300mm
	Scanning cycle	About 0.33-2.2ms (128 us/step 15steps variable)
	Gating input	Detection permitted: H (4-24 V) or open Detection inhibited: L (0-1 V) Response time: 10 ms (max.)
	Output	NPN open collector output Rating: 30V DC 100mA max. Short circuit protection circuit provided
	Power supply	24V DC ±10% / Ripple 10% max.
	Current consumption	230mA max.
Specification	Matching	・DARK-LIGHT ……Output if field of view contains dark (DARK) or bright LIGHT) area ・LARGE-SMALL ……Output when bit count for detection area is larger (LARGE) or smaller (SMALL) than the reference ・TOTAL-SINGLE ……For differentiation between large and small, specify TOTAL for overall matching of detection areas and SINGLE for matching of individual area
	Indicator	・Light intensity level “insufficient” indicator ・Light intensity level “(1-bit side)” indicator ・Light intensity level “saturated” indicator ・Light intensity level “(512-bit side)” indicator ・OP.L: Operation indicator
	Switch (SW)	●Set switches (sliding switches) ・FAST-SLOW: switches between speeds at which the slice level follows variation of received light intensity for auto slicing ・DARK-LIGHT: switches between modes for detection (DARK: detection of dark area; LIGHT: detection of bright area) ・OFF-ON: enables/disables preset matching (OFF: normal detection; ON: preset matching ・LARGE-SMALL: switches between modes for preset matching (LARGE: detection of larger count; SMALL: detection of smaller count) ・TOTAL-SINGLE: switches between modes for preset matching (TOTAL: overall matching; SINGLE: individual matching) ●Sensing time adjustment: adjusts the scanning cycle between about 0.33 and 2.2 ms. ●Preset switch: specifies the reference value for preset matching Digits (from left): hundreds digit, tens digit, units digit in decimal system ●VIEW switch: 2 for 1-bit and 512-bit sides
	Wiring	Connector type / Cord: 0.3 mm² x 4 cores, 2m
	Case material	Aluminum
	Mass	500g max.

Environmental Specification

Environment	Ambient temperature	0 - +55 °C (non-freezing)
	Storage temperature	-20 - +70 °C (non-freezing, non-condensing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP40
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 directions
	Shock	300 m/s² / 2 times each in 3 directions

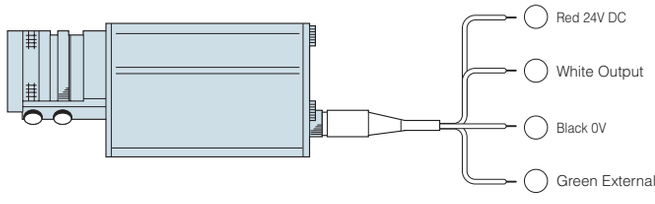
IMS

Input/Output Circuit and Connection

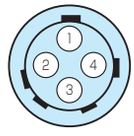


The output transistor turns off when load short circuit or overload occurs.
*Leave the external gating terminal open if unused.

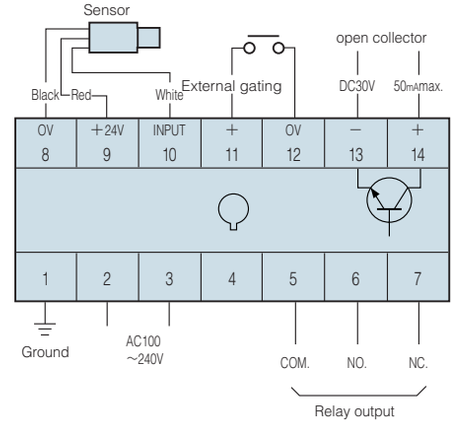
Connection



ピン配列



(Special power supply unit: in combination with **IMP2F**)

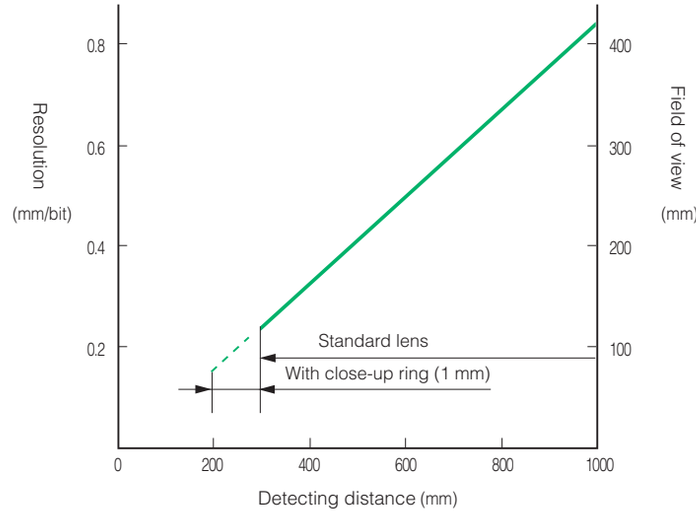


Resolution and Measurement Accuracy

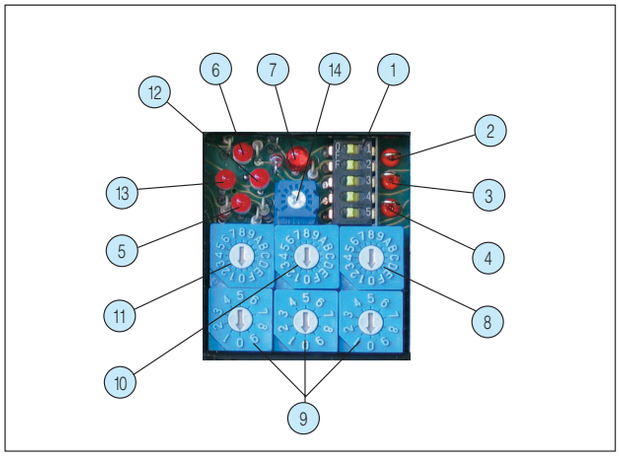
Resolution can be calculated by dividing the entire field of view (at 0.0) by 512.
The following formula provides an approximate resolution.

X = Distance (mm)
Y = Resolution (mm)
Y = (0.44X – 15)/512
X = (512Y + 15)/0.44

Measurement accuracy can be described as follows:
*Measurement Accuracy ≥ Resolution x 2



Panel Description (with rear panel removed)



①Set switches

- FAST-SLOW: switches between speeds at which the slice level follows variation of received light intensity for auto slicing. Normally set this switch at FAST. <FAST: fast speed; SLOW: slow speed>
- DARK-LIGHT: switches between modes for detection. <DARK: detection of dark area, LIGHT: detection of bright area)
- OFF-ON: enables/disables preset matching. Preset matching is a function that compares the detected bit count and value preset with digital switch for matching. <OFF: normal detection; ON: preset matching>
- LARGE-SMALL: switches between modes for detection. LARGE specifies activation when detected bit count is equal to or larger than the preset value. SMALL specifies activation when bit count is equal to or smaller than the preset value. <LARGE: detection of larger count; SMALL: detection of smaller count>
- TOTAL-SINGLE: switches between modes for detection. TOTAL specifies matching with the total bit count, or cumulative total of count for all detection areas. SINGLE specifies matching with the bit count for each detection area in the same field of view. <TOTAL: overall matching; SINGLE: individual matching>

②Video monitor pin
Pin that outputs video signal, which can be used for adjustment while monitoring with an oscilloscope.

③Sensing monitor pin
Pin that outputs sensing signal, which can be used as timing for oscilloscope during video signal monitoring.

④Ground pin
Pin for 0 V, which can be used as the ground of the probe for monitoring.

⑤Light intensity level (insufficient)
Illuminated when the received light intensity is not sufficient.

⑥Light intensity level (saturated)
Illuminated when the received light intensity is saturated.

⑦OP.L
Illuminated when the output is activated.

⑧Sensing time adjustment switch
Adjusts the scanning cycle between about 0.33 and 2.2 ms. Larger value increases the cycle and light intensity. The sensing time can be calculated with the following formula:

Ts: Sensing Time (ms) X: Setting (on switch)

Ts (ms) ≈ 0.33 + 0.128x

(Ex.) With setting 8

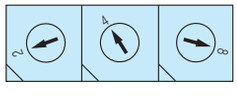
Ts ≈ 0.33 + 0.128 x 8 ≈ 1.4 (ms)

With setting F (= 15)

Ts ≈ 0.33 + 0.128 x 15 ≈ 2.2 (ms)

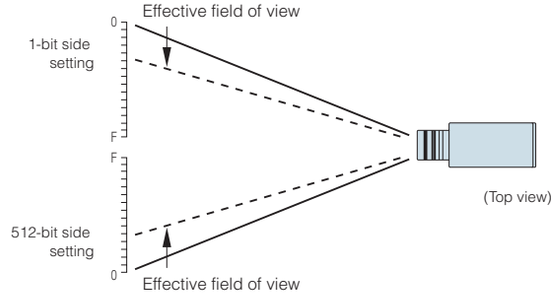
⑨Preset switch
Specifies the reference value for preset matching. Digits (from left): hundreds digit, tens digit, units digit in decimal system

(Ex.) Preset value 248



⑩ VIEW (field of view) switch [1-bit side]
Use this switch when the field of view contains the same conditions as the LIGHT and DARK settings that needed to be excluded from the detection. Also adjust this for decreasing the received light intensity for setting only at the center of the field of view.
Setting "0" specifies the maximum field of view and increasing the setting by 1 narrows the field by 16 bits from the 1-bit side.

⑪VIEW (field of view) switch [512-bit side]
Narrows the field of view from the 512-bit side.
The minimum field of view available with the 1-bit and 512-bit VIEW switches (at F.F.) is 32 bits.



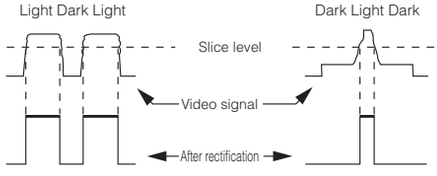
⑫Light axis level [1-bit side]
Illuminated when partial light intensity degradation caused by light axis misalignment or light blocking object is present for the received light intensity level between the center of the field and 1-bit side.

⑬Light axis level [512-bit side]
Illuminated when partial light intensity rise is present for the received light intensity level between the center of the field and 1-bit side.

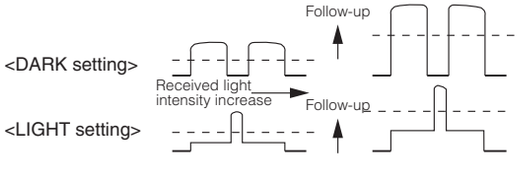
⑭Auto slicing adjustment
Adjusts the level for auto slicing. Turning clockwise increases the level and counterclockwise decreases the level. Generally, set at the center.
*For initial light axis alignment, turn clockwise all the way.

Auto slicing and adjustment

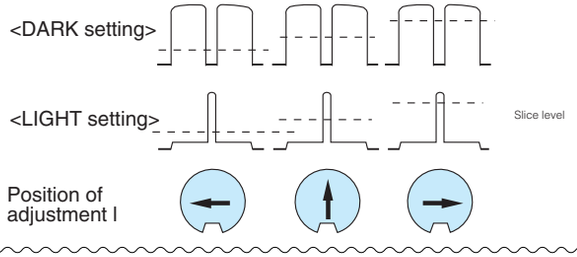
①Slicing
Slicing is to rectify signals by binarizing analog level difference between dark and light of video signals at the reference (slice) level.



②Auto slicing
Auto slicing automatically adjusts the slice level based on the received light intensity and the DARK-LIGHT setting.

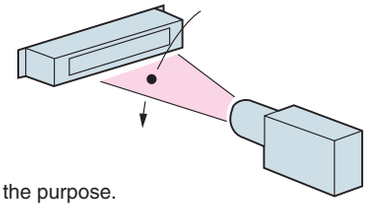


③Slice adjustment
Allows increase or decrease of the auto slice level. Generally, set at the center.



Sample Applications and Settings

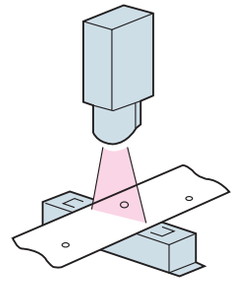
Detection of passage



- For wide range detection
- Quick sensing time ideal for the purpose.

FAST		●	SLOW
DARK	●		LIGHT
OFF			ON
LARGE			SMALL
TOTAL			SINGLE

Pinhole detection

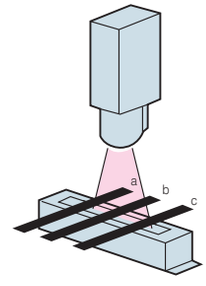


FAST		●	SLOW
DARK		●	LIGHT
OFF			ON
LARGE			SMALL
TOTAL			SINGLE

Pay attention to the relation between the line speed and the object diameter.

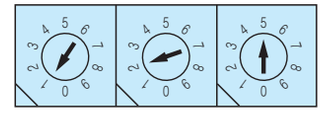
SMALL-TOTAL matching

- When three objects a, b and c are being fed and the width is the same for the three at 50 bits, detection signal is output when any of the three is missing.



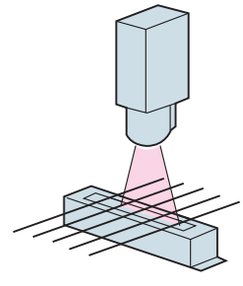
- Preset values:
  3 detected: 50 (bits) x 3 = 150 (bits)
  1 missing: 50 (bits) x 2 = 100 (bits)
  Setting: (150 + 100)/2 = 125

FAST		●	SLOW
DARK	●		LIGHT
OFF		●	ON
LARGE		●	SMALL
TOTAL	●		SINGLE



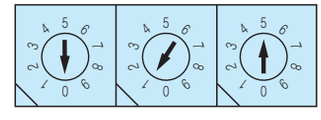
SMALL-SINGLE matching

- When five objects are being fed and the width is the same for the five at 20 bits, detection signal is output when any of the five is thinner.



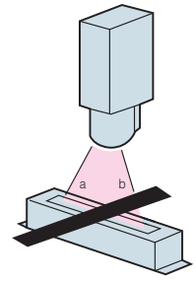
- Preset value: 15 bits as opposed to 20 bits for non-defective object.

FAST		●	SLOW
DARK	●		LIGHT
OFF		●	ON
LARGE		●	SMALL
TOTAL		●	SINGLE



LARGE-SINGLE matching

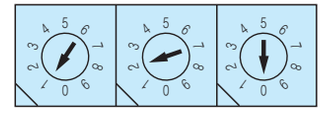
- When the object is being fed at the center of the range and the width of the bright areas on both sides a and b is 100 bits, detection signal is output when the object shifts to either side (meanders).



- Preset value: according to the tolerance for meandering (120 in the example)

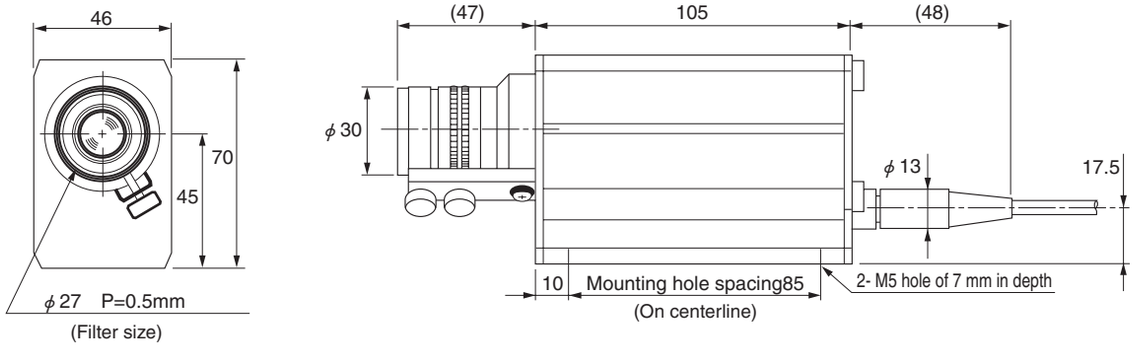
*Set the slicing adjustment slightly low.

FAST		●	SLOW
DARK		●	LIGHT
OFF		●	ON
LARGE	●		SMALL
TOTAL		●	SINGLE

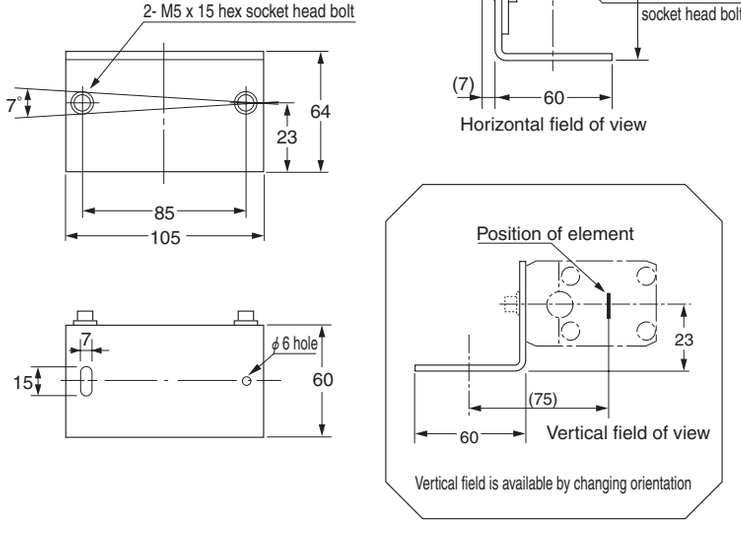


Dimensions (mm)

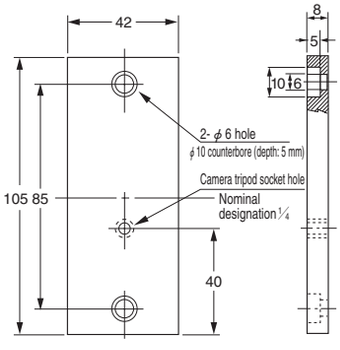
Image sensor
IMS512



Mounting bracket
IMAHL2



IMAHL3



IMP2F

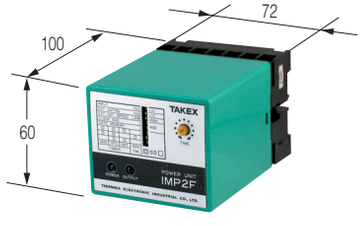
Power supply unit for image sensor

High-capacity, compact, plug-in

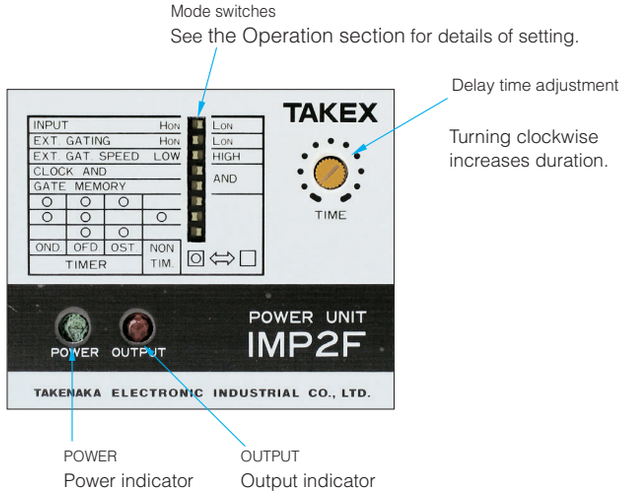
- IMP2F provides power supply to image sensor of 24 VDC/400 mA max. by connecting 100-220 VAC power.
- Combining with external gating allows logic operations including AND, CLOCK AND and GATE MEMORY.
- Timer function integrated for on-delay, off-delay and one-shot operations by setting switch on the panel in addition to ON-OFF basic operation.

Type

Model	Power supply	Operation mode	Output mode	Timer feature	Power supplied to sensor
IMP2F	100-220V AC	Logic operations AND, CLOCK AND, GATE MEMORY Timer function selectable	Relay contact output NPN open collector	Provided	24V DC 400mA max.



Panel Description



Rating/Performance/Specification

	Model		IMP2F
Rating/performance	Power supply		AC100-220V ±10% 50/60Hz
	Power consumption		18W max.
	Operation mode		●Logic operation in combination with external gating AND、CLOCK AND、GATE MEMORY ●Timer function selectable (On-delay, off-delay, one-shot, timer disabled) Delay time: 0.1-10 s
	Output mode		Relay contact output 1C Rating: 3A (250V AC) max. noninductive load NPN open collector, Isolation Rating: 50mA (30V DC), Residual voltage: 1V max.
	Power supplied to sensor		DC24V ±10% 400mA (short circuit protection circuit provided)
	External gating		Contact input NPN transistor input (L: 1 V max.; H: 8 V min.)
	Response time	Input	Sensor input: 50 us max. External gating input: HIGH…50 us max./ LOW---30ms max. (GAT.SPEED selector switch provided)
		Output	Use of timer: Timer duration setting Relay output: 10 ms max. Open collector output: 1 ms max. (with external gate unused)
	Sensor input		NPN transistor input (L: 1 V max.; H: 8 V min.)
Specification	Indicator		P.L : power indicator (green LED) OP.L: output indicator (red LED)
	Volume (VR)		TIME: delay time adjustment (0.1-10 s variable; turn clockwise to increase)
	Switch (SW)		●Logic operation selector switch: See Operation ●Timer selector switch: OND. (on-delay) OFD. (off-delay) OST. (one-shot) NON TIM. (timer disabled) } Selectable with switch according to combination table
	Case material		Polycarbonate (green)
	Connection		Plug-in terminal block (with 3.5 mm screws)
	Mass		320g max.
	Notes		Terminal block (TB14) provided

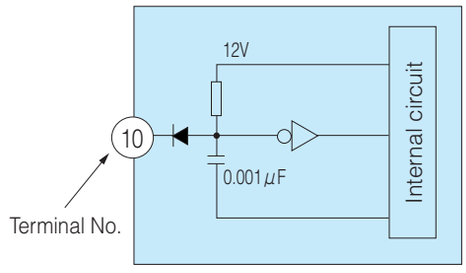
Environmental Specification

Environment	Ambient temperature	-10 - +55 °C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP40
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 directions
	Shock	1000 m/s² / 2 times each in 3 directions
	Dielectric withstanding /insulation resistance	Between case and power supply Between grounding terminal (FG) and power supply Between case and relay contact } 2000V AC for 1 minute Between grounding terminal (FG) and relay contact Between power supply and relay contact } 500V DC mega 20 MΩ or higher Between sensor power supply and power supply Between sensor power supply and grounding terminal (FG) } 1000V AC for 1 minute Between open collector output and power supply Between open collector output and grounding terminal (FG) Between open collector output and sensor power supply } 250V DC mega 20 MΩ or higher

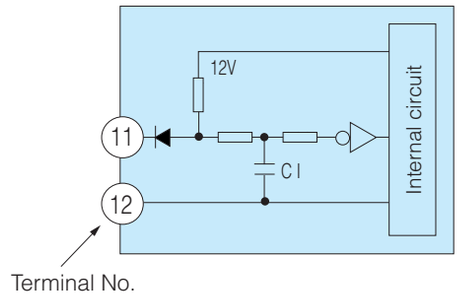
IMP2F

Input Circuit

(Sensor input)



(External gating input) (EXT.GATING)

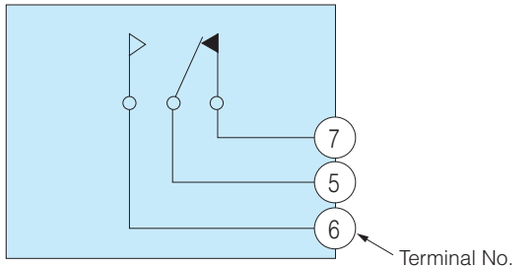


C1: GATE.SPEED HIGH: 0.001 μF
LOW: 2.2 μF

Leave open when unused and set the mode switch on the panel EXT.GATING H on L on at H on.

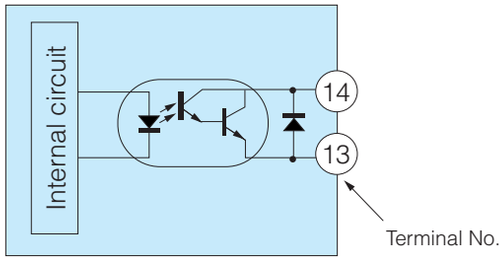
Output Circuit

(Relay contact output)



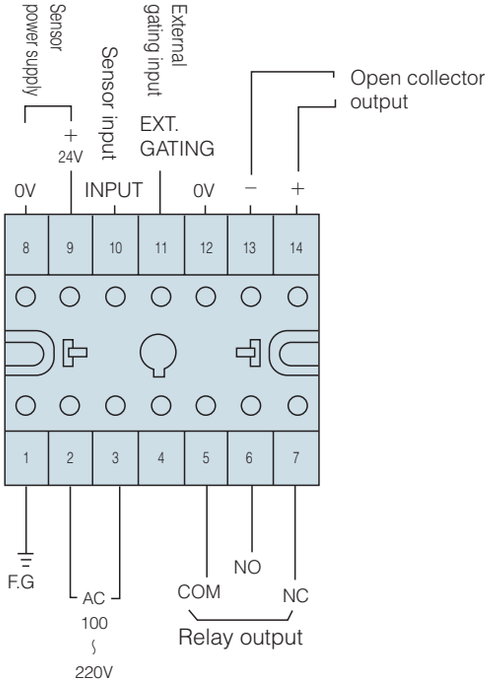
Contact capacity: 250 VAC 3 A (noninductive load)

(Isolation/NPN open collector output)

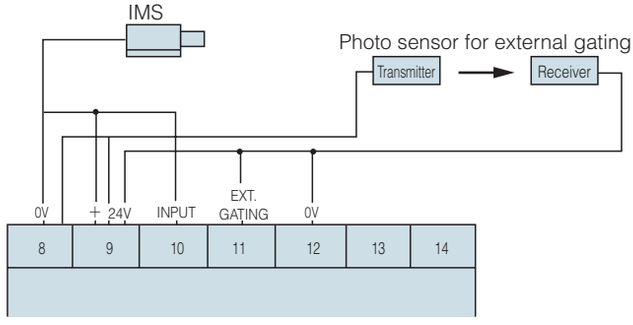


Rating 30V DC / 50 mA max.
Residual voltage 1.0 V max.

Connection



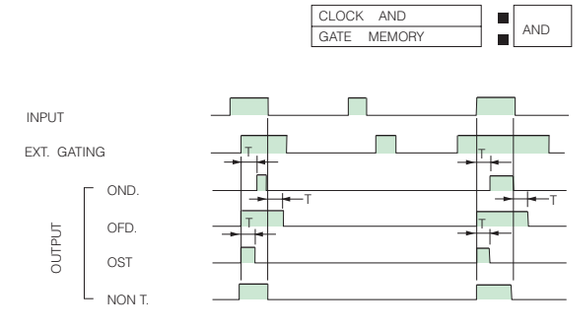
- Using image sensor IMS512 and photo sensor for external gating



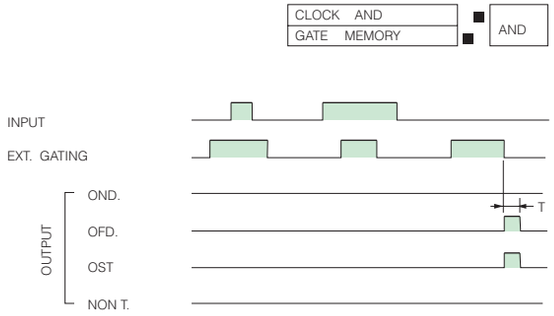
When image sensor IMS512 is used, the current capacity of the photo sensor for external gating is 50 mA max.

Operation Timing Chart

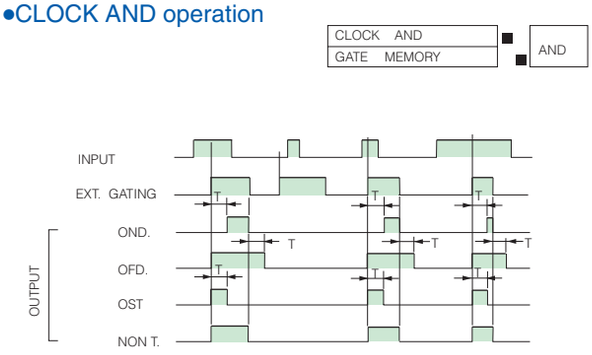
●AND operation



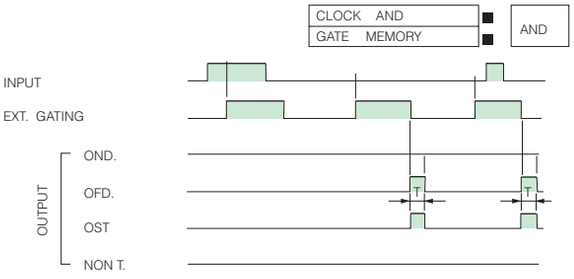
●GATE MEMORY operation



●CLOCK AND operation



●Combination of CLOCK AND and GATE MEMORY



Operation (description of mode switches)

*INPUT: specifies the operation logic for sensor input.

- When using image sensor IMS series or activating Light-ON type sensor at light reception, set this switch at LON .

*EXT.GATING: specifies the operation logic for external gating.

- When not using external gating, set this switch at HON .

*EXT.GAT.SPEED: selects between the input response times for external gating.

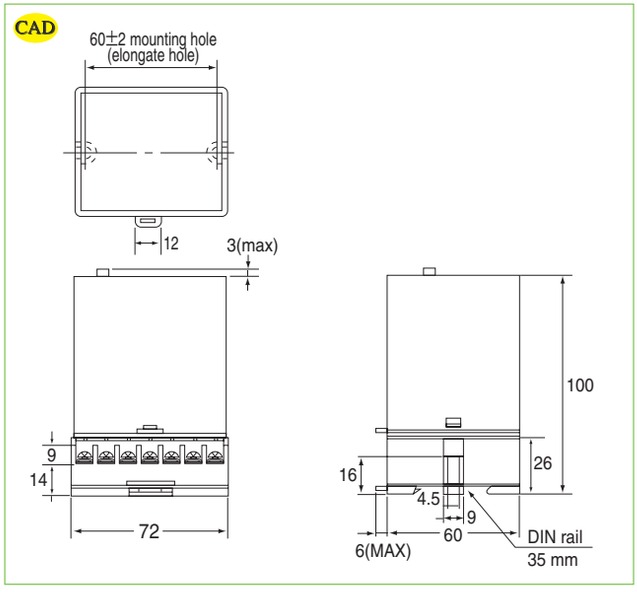
- For contact input, set this switch at LOW .

*CLOCK AND

GATE MEMORY: used in combination with external gating.

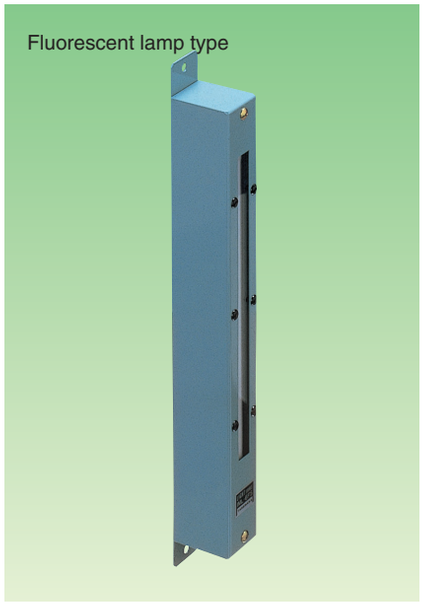
- Setting both switches at AND enables ANDing of the sensor and external gating signals for output.
- CLOCK AND enables judgment of the input state of the sensor signal at the moment of input of the gating signal, the result of which is output. One-shot output is normally used for this purpose.
- GATE MEMORY temporarily stores whether sensor input has been supplied during gating signal input for output at the fall of gating signal.
- CLOCK AND and GATE MEMORY may be combined.
- When not using external gating, set the switch at AND .

Dimensions (in mm)



IML series

Light source
for image sensor



- LED type:

  ……IML100/IML20D

  No fear of burned-out bulbs, long life

- Fluorescent lamp

  ……Effective light source length:

  200~1000 mm

- Halogen lamp

  ……Suitable for reflective applications

Type

Model	Detection method	Light source	Effective light source length	Light source service life	Power supply
IML10D	Through-beam type	LED	100mm	30,000 hours av.	24V DC
IML20D			200mm		
IML10F		Fluorescent lamp (high-frequency illumination)	200mm	50,000 hours av.	100-110V AC / 200-220V 50/60Hz
IML20F			400mm		
IML40F			1,000mm		
IML50H	Reflective type	Halogen lamp	35 x 120 mm (at 300 mm)	20,000 hours av.	12V AC/DC

*Power unit IMP50H is separately required.

Optional parts

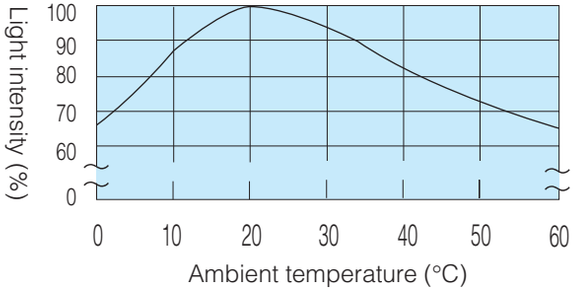
Type	Model	Description
Power Unit	**IMP50H**	Power supply for IML50H

Rating/Performance/Specification

	Model	IML10D	IML20D	IML10F	IML20F	IML40F	IML50H
Rating/performance	Applicable detection method	Through-beam type					Reflective type
	Light source	LED		Fluorescent lamp (high-frequency illumination) about 22-30kHz			Halogen lamp 50W
	Effective light source length	100mm	200mm	200mm	400mm	1,000mm	30 x 120mm (at 300 mm)
	Power supply	24V DC		100-110 / 200-220V AC / 50/60Hz			12V AC/DC
	Current/power consumption	100mA	200mA	20VA	38VA	80VA	5A max.
	Light source service life	30,000 hours av.		50,000 hours av.			20,000 hours av.
	Lamp	————		FL10D	FL20SD	FLR40SW/MX	12 V 50 W halogen TH-5
Specification	Ambient temperature	+5 - +50 °C					–10 - +55 °C
	Connection	Permanently attached cord type		Connector type			Terminal block
	Cord	0.3mm² x 2 cores 2m		3C / 2m			————
	Mass	130g	260g	3kg	6.8kg	11.1kg	450g (Holder 250g)
	Notes	● When using a fluorescent lamp as the light source, be sure to use high-frequency illumination type dedicated for image sensor. ● When using a fluorescent lamp as the light source, wait at least 5 minutes after power-up before use. The lamp does not provide sufficient brightness immediately after power-up. The brightness may vary depending on the ambient temperature, which should be noted for high-accuracy detection. ● Note that the window is longer than the effective length and the light intensity may be decreased at the end. ● IML50H may be operated directly with 12 VAC or VDC. Combining it with power supply unit IMP50H additionally allows operation with 100/220 VAC.					Power supply unit model **IMP50H** is optionally available. (Holder provided)

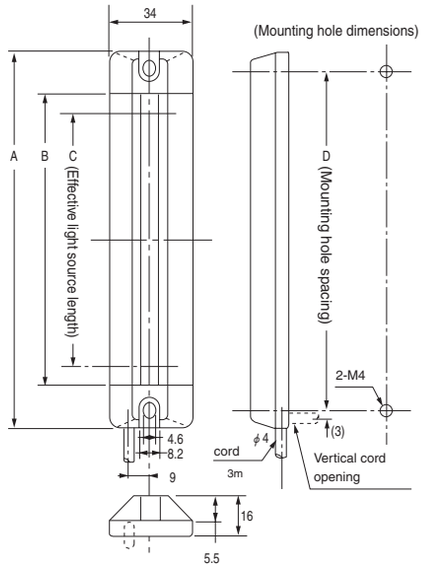
Temperature-Light Intensity Characteristics

(Typical example IML10F)



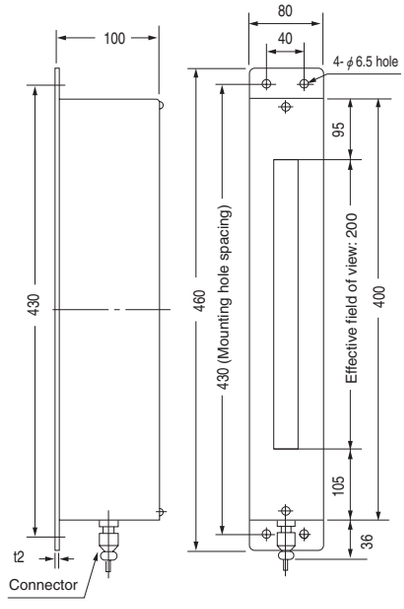
Dimensions (in mm)

IML10D IML20D

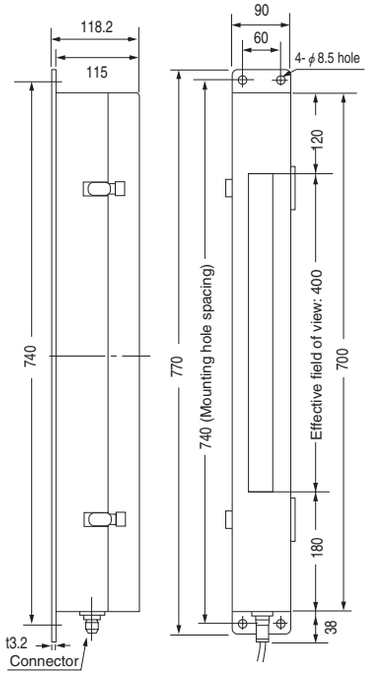


Model	Dimensions of portions (mm)			
	A	B	C	D
IML10D	150	116	100	137
IML20D	250	216	200	237

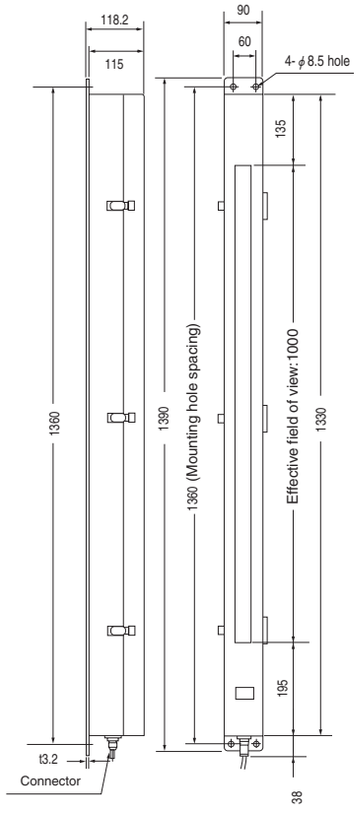
IML10F (10W)



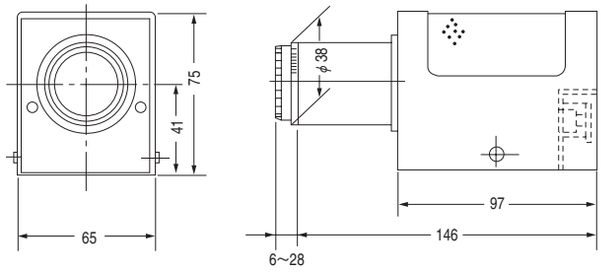
IML20F (20W)



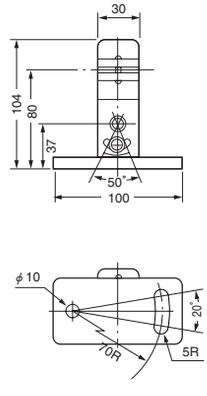
IML40F (40W)



IML50H



Holder



IMP50H