MVS SERIES LINE UP

PM MVS-PM-R

Color pattern matching camera unit

Using advanced technology, it is possible to inspect objects fast and reliably.
Objects can be inspected for Color, Color and Shape, Blob/Stain, Contour, Differentiation of picture, etc.


Direction of electronic parts

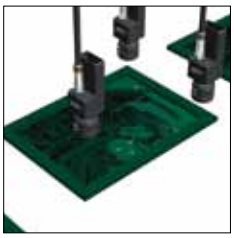

Quality of labeling


Page order of print

EM MVS-EM-R

Measurement camera unit

Reliable measurement of length and/or edge count.
Measure the distance between edges, measure the pitch of pins, count edges, etc.


Positioning of printed circuit board


Shape of condenser

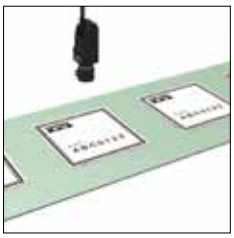

Shape of parts for automobile

OCR MVS-OCR2

Color OCR camera unit

Inspection of Date, Time and Text.
Verification of Expiration date,Time stamp, Lot number or Text.


Shelf life of confection


Lot number of labels


Type mark of parts for automobile

MVS-DN-E

Controller

Connect up to three cameras.
Touchscreen operation.
USB, RS232 and Ethernet interface.
10 key data entry.
Onboard Lighting control.
∗PNP output type is MVS-DP-E


Backlit buttons show which are active to assist in Setup and Adjustment.
Help functions can be accessed at any time by pressing the "?" button

HEMOMATIK
Länna, S-142 50 SKOGÅS
Stockholm, Sweden
Ordertel 08-771 00 04
Orderfax 08-771 62 00
Växel 08-771 02 20
Teknisk 08-771 35 80
Email info@hemomatik.se
Internet www.hemomatik.se

Advanced Technology
High speed vision processing and cost savings

PM EM OCR

Original LSI with CPU integrated

ECO-Engine: OPTimum CPU Ver.5

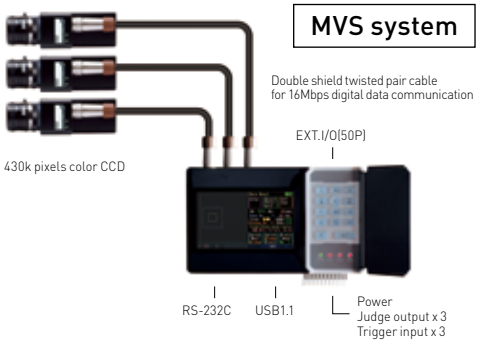
The MVS features an Optex original design LSI with CPU integrated, we were able to integrate the vision process engine into the camera unit. This solution provides high speed image processing and accurate inspection for a variety of applications. Each camera processes the image internally and transmits the result to the controller.

PM EM OCR

No change in response speed when operating multiple cameras

Three Cameras inspect independently

We utilized a new technology in the MVS that features low heat generation and low power dissipation. This concept was originally developed for the CVS series as an all-in-one design, the same technique was carried over to the MVS.
There is no change in the response time when multiple cameras are used. The all-in-one design allows the camera to operate independent from the controller.



PM EM OCR

Integrated system technology

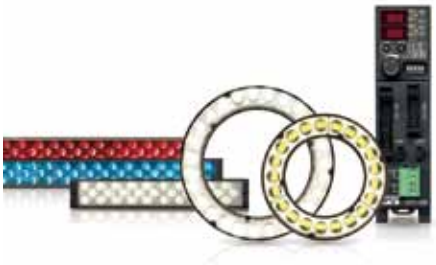
High Performance, Easy Installation and Low Cost

The controller has a built-in touchscreen interface, full color display and ten-key input panel. A power supply for control of the external lighting is also integrated into the controller. Simply connect the cameras and lights to the controller. There is no need for a console, external monitor or a separate power supply for lighting.

PM EM OCR

Support is available from LED lighting to training

Lighting is the single most important factor to capturing a good quality image for inspection. Optex FA offers a complete selection of lighting options. We can provide customer support for the selection of lighting, lenses, and training.

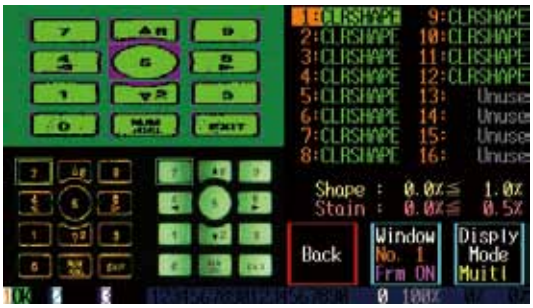


PM EM

Up to 16 inspections can be done at the same time with one Camera

16 Inspection windows are available for each Camera

Each Camera can have a maximum of 16 inspection windows in one Bank of memory. Each inspection window can be set to inspect a different feature based on 6 inspection functions. The inspection judgment output for each inspection window can be output through the 50 pin I/O connector.



OCR

Up to 4 inspection windows

The parameters for each inspection window can be individually set.
Up to 2 Forms of each Date and Time are available for one window and up to 4 Forms of strings are available(max. total of 4 Forms).

PM EM OCR

Quick change over

32 Banks are available for one Camera

You can remotely select the bank to use by using a controller, PLC or the RS-232C I/F. The setup parameters for each bank are stored in memory and can be recalled when the product is run again.

PM EM OCR

Lighting control without the need of a separate power supply

Controller has LED lighting control built in

Support for a total of three LED lights(12VDC, 24W total)is available.
The output connector for the power source is a quick connect/disconnect type.
The intensity level for each light can be adjusted separately.

For stable inspection and better process yield
7 functions are available

PM EM OCR Continuous capture

When the camera checks the image it will automatically check up to 5(EM-R) or 6 images(PM-R) or 8 images(OCR2), looking for a good reading. This insures stable operation if the trigger is not stable or the position of the object changes slightly. If the result is found to be OK the inspection will stop prior to reaching the maximum number of inspections.

PM EM OCR Variable shutter speed

When the camera is checking image using the Continuous Capture feature the shutter speed will automatically be adjusted up to +36% ~ -24%(PM-R/EM-R) or +/-12% (OCR2). This compensates for changes in the lighting.

PM EM OCR Search function

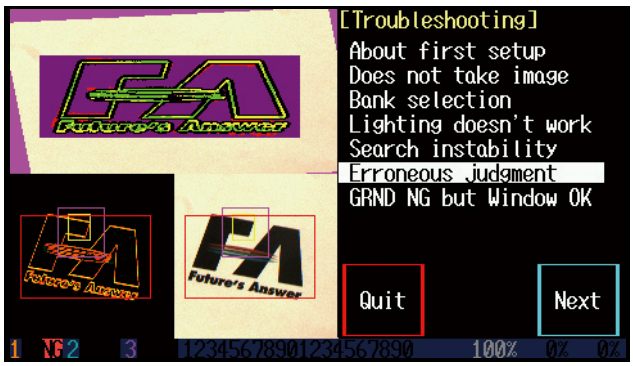
The images is searched not only in the X and Y direction but it also can be rotated up to +/- 180 degrees (PM-R/OCR2) or +/- 45 degrees(EM-R). This is useful when the position or orientation of the object changes.

PM Scaling up/down

When the camera is checking the image using the Continuous Capture feature the image will automatically be scaled Up/Down by up to +/-6%. This compensates for changes in the distance between the camera and object.

PM EM Trouble Shoot

button leads you to the Trouble Shooting menu. From this menu, you are able to view what corrections need to be done.



PM EM OCR Help function

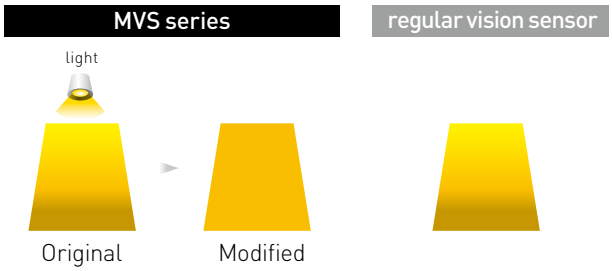
button on the ten-key panel shows what the parameter means and what adjustments can be done.

PM OCR Dark Compensation (OCR2 : Illuminance Correction)

For reliable inspection of color, the hue of each pixel is calculated. This function insures that captured images are stable even with variations in lighting or when the distance to the target changes.

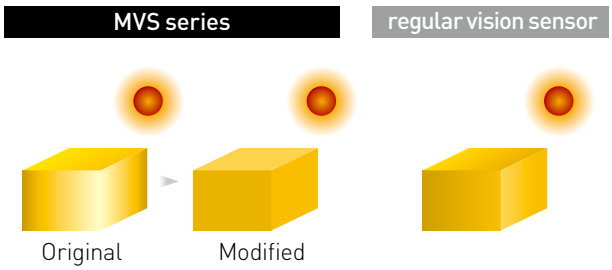
When the light is from the top

The MVS calculates the hue of each pixel so it can get a homogenous color for each pixel. Regular vision sensors simply adjust the brightness so the upper part is brighter than the lower part.



When a bright ambient light is present

The MVS can get a homogenous color for each pixel even if the object has an area which is brighter due to external ambient light.

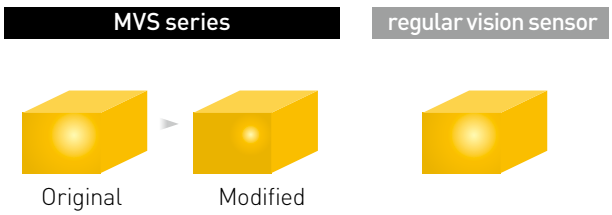


When the distance varies

The Dark Compensation function is effective when the object distance varies and its brightness changes.

When the object is glossy

The Dark Compensation function helps to reduce bright spots on glossy surfaces.



PM EM Simply follow the explanation on the display

Fast and easy "SETUP Menu"

Concept : No operating manual required

Setup button leads you to the SETUP menu where each step is clearly described.

Backlit buttons show which are active to assist in Setup and adjustment. Help functions can be accessed at any time by pressing the "?" button.

Following is example of MVS-PM SETUP Menu

1. Touch[Setup]button

2. Select"Bank"and"Trigger mode"

3. Adjust shutter speed

4. Adjust brightness and direction of the image

5. Storing captured image

6. Select Color mode or Black and White mode

7. Determine search area and its function

8. Setup inspection windows

9. Setup inspection function

Select function from Stain/Color Area/Full Color/Differential/ Contour/Color Shape

10. Touch[Finish]to exit setup menu

OCR Easy Setting and Processing

3 - Step - setup

What you have to do is just proceed setting parameters as shown on the display one by one. This helps you not to forget setting some parameters and reduce setting wrongly. It's just 3 steps you have to go through settings that is much more simple than conventional MVS-OCR. You can reduce time for installation as well.

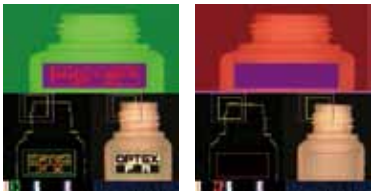
STEP 1	STEP 2	STEP 3	
Camera setting	Store master image	Teaching	Setup complete

Inspection for Color, Flaw, Blob, Shape, etc.
6 inspection modes are available

Stain

The camera compares the differential ratio of the stored master image with the differential result of the target image to determine the Stain value. When this value exceeds the upper limit or is less than the lower limit, it is defined as NG. This is used to detect the presence of stain (flaws) on the surface of metal objects or defects in plastic materials.

OK(label present) processed | NG(no label) processed

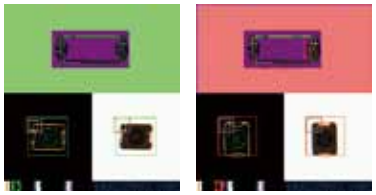


Differential Original Differential Original

Contour

The camera compares the contour of the stored differential master image with the contour of the target object. It counts the number of pixels that do not match the Target contour to determine the Contour value (Lack of pixels). It counts the number of pixels outside of the Target contour area (background) which have the selected color to determine the Stain value.

OK(correct direction) processed | NG(rotated) processed

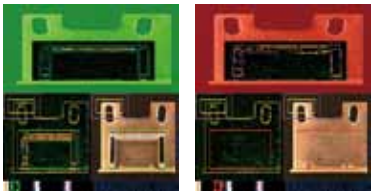


Differential Original Differential Original

Differential

The camera compares the stored differential master image with the target object. If the difference exceeds the threshold it is defined as NG.This function is used to inspect metal parts with uneven lighting. It is not good for detecting color or its depth.

OK(part present) processed | NG(no parts) processed

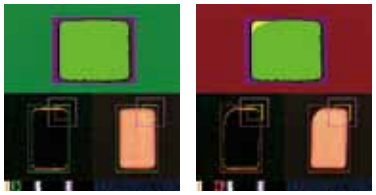


Differential Original Differential Original

Color Shape

The camera inspects the shape of the area that contains the selected color.
It counts the number of pixels that have a different color in this area to determine the Contour value (Lack of pixels). It counts the number of pixels outside of the area (background) which have the selected color to determine the Stain value.

OK(matches) processed | NG(corner missing) processed



Differential Original Differential Original

Color Area

The camera calculates the ratio of the number of pixels that have the selected color to all the pixels in the inspection window. When it exceeds the upper limit or is less than the lower limit, it is defined as NG.
This is used to detect color differences, especially when the color is not stable and that there is no need to detect object shape.

OK(all lights on) processed | NG(light missing) processed

Differential Original Differential Original

Full Color

The camera will compare the difference between the full color image of the target and the stored image.
If the sum of the difference exceeds the threshold value it is defined as NG.
This is used to inspect color and depth of pictures and prints under stable lighting.

OK(correct direction) processed | NG(rotated) processed

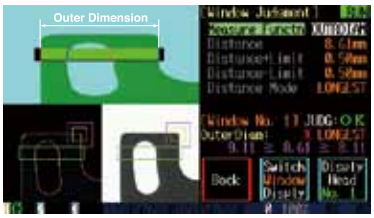
Differential Original Differential Original

Measurement of Inner / Outer Dimension, Edge position, Counting edges, etc.
6 inspection modes are available

Outer Dimension

The camera measures the distance between the two outermost edges. Choose between the longest, shortest or the mean value in the selected inspection window.

processed

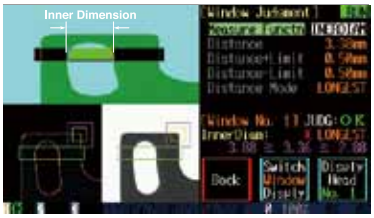


Differential Original

Inner Dimension

The camera measures the distance between the two innermost edges. Choose between the longest, shortest or the mean value in the selected inspection window.

processed



Differential Original

Position

Measures the distance between two edges in two different inspection windows. This function is useful for detecting the displacement of edges. Choose between the longest, shortest or the mean value in the selected inspection window.

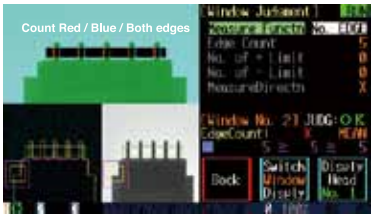
processed

Differential Original

Number of Edges

The camera counts the number of edges in the inspection window. Choose the edges to count based on the transition of light to dark, dark to light or all of the edges. In the processed image, a red line means a light to dark transition and a blue line means dark to light.

processed

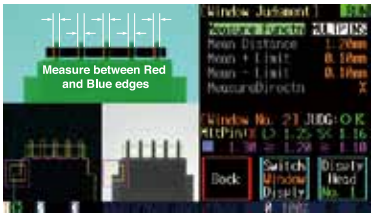


Differential Original

Multiple Edges

The camera measures the distance between edges in the inspection window. Choose the edges of a light part (blue line to red line) or a dark part (red line to blue line). It judges by longest limit, shortest limit or the mean value.

processed



Differential Original

Center Pitch

The camera measures the pitch between the centers of the edges in the selected inspection window. It judges by longest limit, shortest limit or the mean value.

processed

Differential Original

MVS-OCR2 FEATURE

Achieved 8 times better resolution NEW

High resolution system enables accurate print inspection

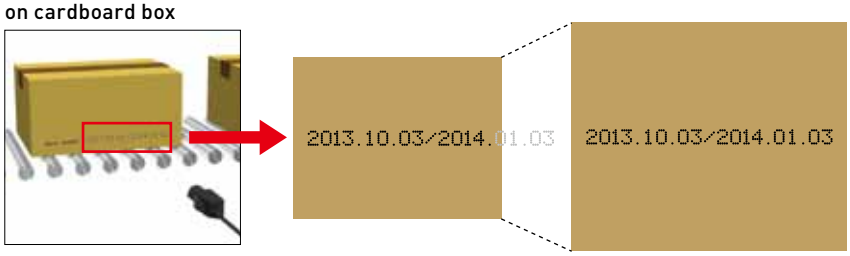
With mega pixel C-MOS image sensor, it achieved accurate print inspection by better character recognition.

Conventional MVS-OCR | MVS-OCR2

You can get bigger FOV (Field Of View)

With better resolution, you can set around 2 times bigger FOV.
Print inspection of long printing in wide area is available

Example of print inspection on cardboard box

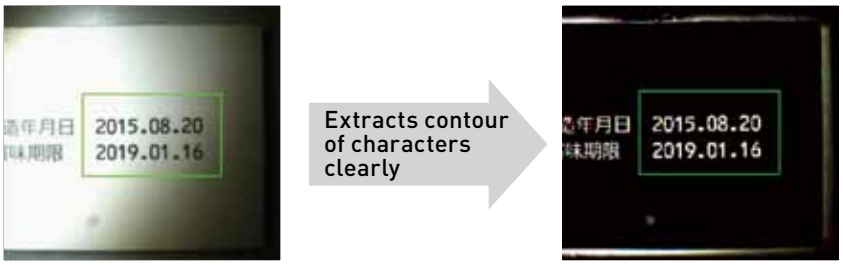


MVS-OCR
Long print can't be in the FOV

MVS-OCR2
Long print can be in the FOV thanks to better resolution.

Clear clipping out of the characters by new algorithm
It clips out of the characters clearly even if the lighting is uneven NEW

New algorithm achieved clipping out of the characters under uneven or unstable lighting.



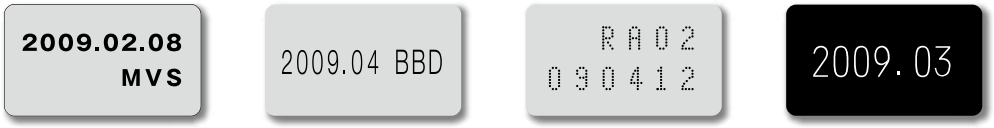
Original | Processed

Character recognition feature of MVS-OCR2

MVS-OCR2 compares captured image with internal dictionary and choose most alike character.
Then, it compares the recognized characters with expected characters. When all characters are correct, it outputs "OK". Otherwise, "NG" (No Good).

All correct:OK	Wrong character:NG	Lack partly:NG	Lack:NG
2014.07	2014.08	2014.07	2014.0

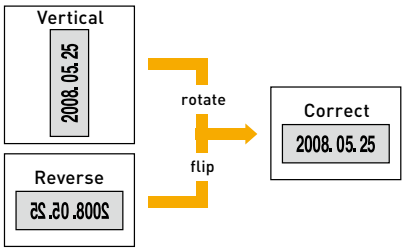
Recognizes various printer fonts



Thermal printer | Hot printer | Ink jet printer | Laser marker

Change the image direction

The image direction for each bank can be set. This makes it possible to read reverse printed characters such as printing on the opposite side of a transparent sheet.

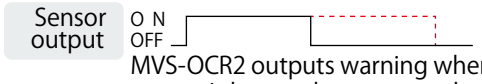


Functions to prevent miss recognition for stable inspection

We installed useful functions that are created based on our long experience in print inspection industry.

Warning (multiple objects run sticked) NEW

When the objects run sticked side by side, the photo sensor outputs only once and the conventional OCR sensor won't check second one. MVS-OCR2 has warning function by checking trigger signal length to detect this problem.



MVS-OCR2 outputs warning when the sensor output is longer than expected period.

Focus Monitor NEW

It is difficult to adjust focus of the camera if you are not get use to it. MVS-OCR2 has "Focus Monitor" function a kind of level gauge that shows how much the camera focuses at the point to be adjusted. It will be very easy to adjust by checking visualized level bar.

Focus Monitor display

Auto Calendar

MVS-OCR2 compares the date and hour with internal calendar which automatically runs so you don't have to re-setup the characters to check every time.

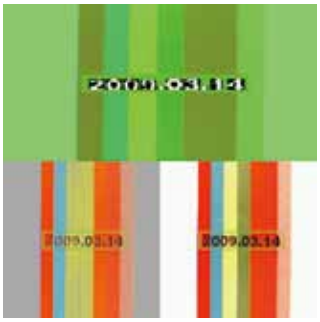
Date to compare | Passing 0:00 | Date to compare added one day automatically

Matching tolerance per character

The matching tolerance for each character can be set (ex. the numbers "6" an "8" are very close in shape and need to be checked closely).

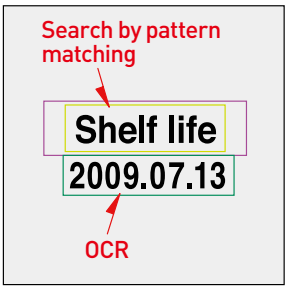
OCR regardless of color

The MVS-OCR2 is able to detect characters regardless of the color of the background.



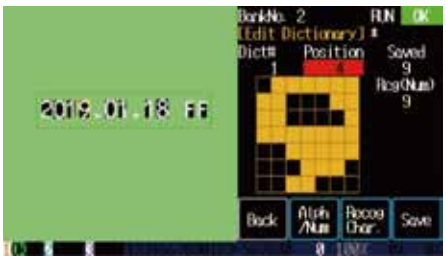
Search function

The MVS-OCR2 is able to search in both the X and Y directions, it also can do a rotational search of +/- 0~180 degrees by pattern maching.



User defined characters

The MVS-OCR2 can recognize lower case letters and special symbols defined by the user dictionary.
For example it can be used to distinguish between "H" and "M" when the font that is used makes these letters hard to distinguish.



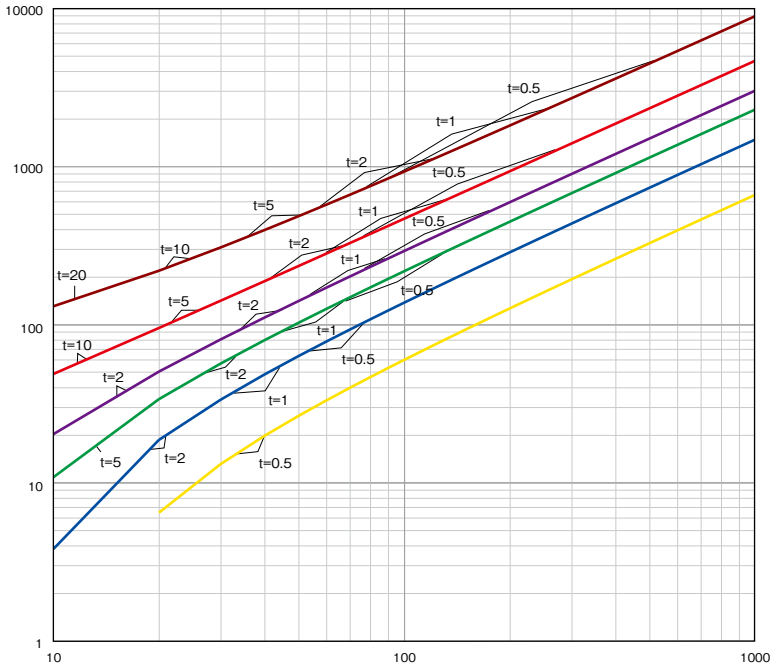
Code recognition

It can recognize Code of Month/Date/Hour/Minute.
Example: "CAO H" → "March 15th, 7 O'clock"

Conversion list example You can modify on the controller.

*This table is just for showing an example.

Camera Working Distance L (mm) **CCTV Lens**



Field of View A (mm)

"t=" indicates thickness of Extension ring to use (mm)

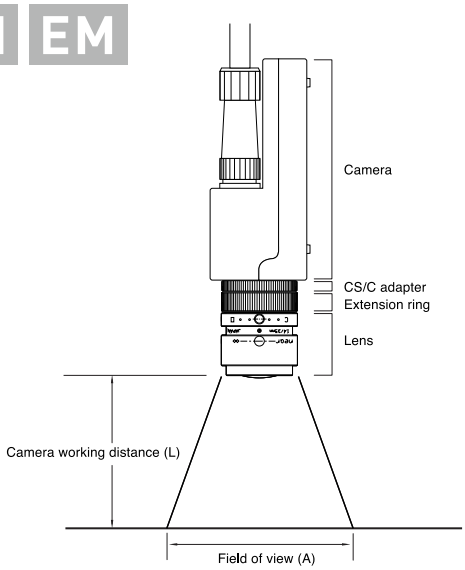
Lens

FASV-03514V FASV-1214V FASV-2514V
FASV-0813V FASV-1614V FASV-5018V

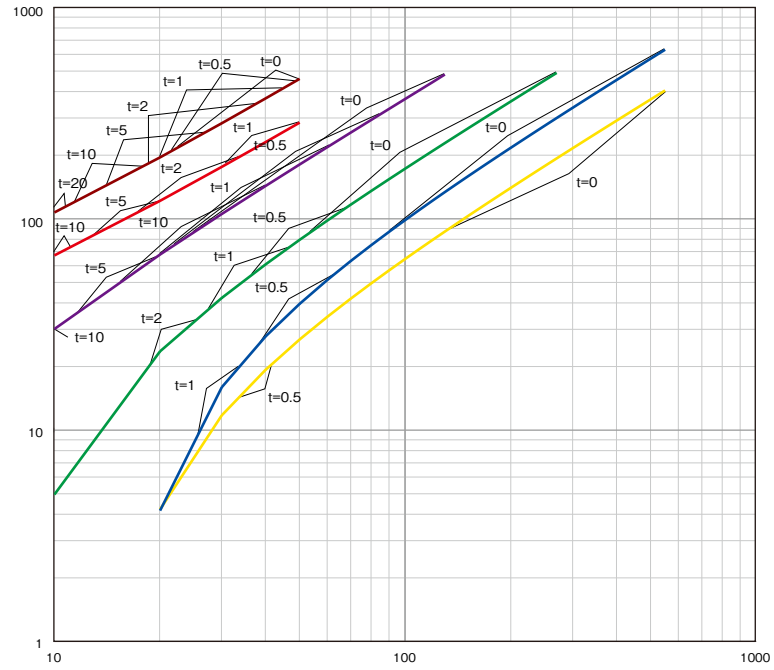
How to utilize the graph

1. Determine Working distance (L) and Field of view (A).
2. Choose the appropriate lens and extension ring according to the graph.

PM EM



Camera Working Distance L (mm) **Macro Lens for Mega-Pixel**



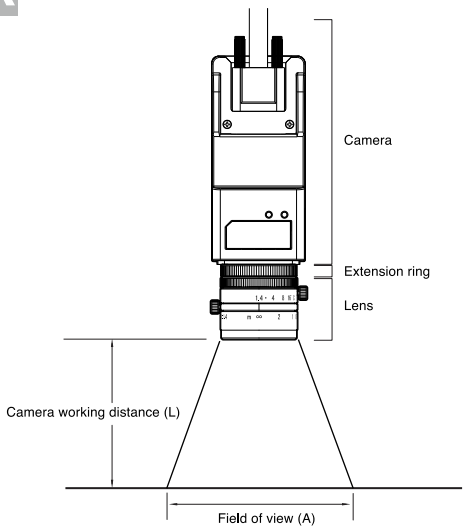
Field of View A (mm)

"t=" indicates thickness of Extension ring to use (mm)

Lens

FASV-LD4 FASV-LD10 FASV-LD30
FASV-LD6.5 FASV-LD20 FASV-LD50

OCR



SYSTEM PART NUMBERS

Camera unit

Model No. : **MVS-PM-R /MVS-EM-R**
Image sensor : CCD(color)
Capture mode : Color/Monochrome

Model No. : **MVS-OCR2**
Image sensor : CCD(color)
Capture mode : Color/Monochrome

*lens is not included. Please order separately

Camera cable

MVS-C2S : 2M Cable
MVS-C5S : 5M Cable
MVS-C5E : 5M Extension Cable
MVS-C5SR : 5M Robotic Cable
MVS-C5ER : 5M Extension Robotic Cable
MVS-C5W : 5M Cable with wiring for light (need MVS-LC05)
MVS-C2S-OCR2 : 2M Cable
MVS-C5S-OCR2 : 5M Cable

Controller

Model No. : **MVS-DN-E**
Camera No : Max 3
I / F : Touch panel display,
Ten-key
Ethernet

*PNP output type is MVS-DP-E

CCTV Lens (C mount)

Model No. : **FASV-03514V**
Focal Length : 3.5mm
F No. : F1.4
Filter size : -

Model No. : **FASV-0813V**
Focal Length : 8mm
F No. : F1.3
Filter size : M27 P0.5

Model No. : **FASV-1214V**
Focal Length : 12mm
F No. : F1.4
Filter size : M27 P0.5

Model No. : **FASV-1614V**
Focal Length : 16mm
F No. : F1.4
Filter size : M27 P0.5

Model No. : **FASV-2514V**
Focal Length : 25mm
F No. : F1.4
Filter size : M27 P0.5

Model No. : **FASV-5018V**
Focal Length : 50mm
F No. : F1.8
Filter size : M30.5 P0.5

Macro Lens for Mega-pixel (C mount)

Model No. : **FASV-LD4**
Focal Length : 4mm
F No. : F4.16
Filter size : M27 P0.5

Model No. : **FASV-LD6.5**
Focal Length : 6.5mm
F No. : F6.51
Filter size : M30.5 P0.5

Model No. : **FASV-LD10**
Focal Length : 10mm
F No. : F10.27
Filter size : M27 P0.5

Model No. : **FASV-LD20**
Focal Length : 20mm
F No. : F20.74
Filter size : M27 P0.5

Model No. : **FASV-LD30**
Focal Length : 30mm
F No. : F30.01
Filter size : M27 P0.5

Model No. : **FASV-LD50**
Focal Length : 50mm
F No. : F48.46
Filter size : M30.5 P0.5

Polarizing filter

Model No. : **FASV-PL255-RS**
size : M25.5 P0.5

Model No. : **FASV-PL270-RS**
size : M27 P0.5

Model No. : **FASV-PL305-RS**
size : M30.5 P0.5

IR cut filters

Model No. : FASV-IR270
size : M27 P0.5

Model No. : FASV-IR305
size : M30.5 P0.5

Extension ring set

Model No. : FASV-EXR-LT2
5 piece set

I/O Connector cable

MVS-C3I0 : 3m IEEE1284 half pitch 50p

Touch panel protective sheet

MVS-TP

External light

Model No. : OPR-S55-28W
Method : Direct ring
Spec : White LED/ DC12V, 5.1W
Cable : 500mm

Model No. : OPB-5015W2-B/ OPB-10015W2-B/ OPB-15015W2-B
Method : Direct bar
Spec : White LED/ bracket installed DC12V, 5.1W
Cable : 500mm

Filters for light

PL-OPR-S55-28 : Polarizing filter for OPR-S55-28
DF80-OPR-S55-28 : Diffuse filter (80%) for OPR-S55-28

PL-OPB-5015 : Polarizing filter for OPB-5015W2-B
DF80-OPB-5015 : Diffuse filter (80%) for OPB-5015W2-B
DF-OPB-5015 : Diffuse filter (60%) for OPB-5015W2-B

PL-OPB-10015 : Polarizing filter for OPB-10015W2-B
DF80-OPB-10015 : Diffuse filter (80%) for OPB-10015W2-B
DF-OPB-10015 : Diffuse filter (60%) for OPB-10015W2-B

PL-OPB-15015 : Polarizing filter for 15015W2-B
DF80-OPB-15015 : Diffuse filter (80%) for 15015W2-B
DF-OPB-15015 : Diffuse filter (60%) for 15015W2-B

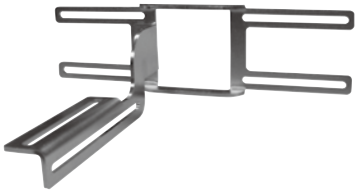
Light holder

OPAU-150A : Mounting bracket accessory for use with OPR-S55-28W

Mounting bracket for light

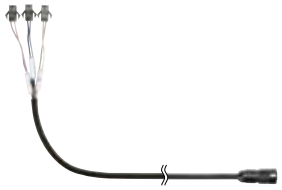
BKT-MVS-OPR : Mounting bracket for OPR-S55-28W

BKT-MVS-OPDB-01/BKT-MVS-OPDB-01-20
BKT-MVS-OPDB-02
Mounting bracket for OPB-5015W2-B/ OPB-10015W2-B/OPB-15015W2-B



Cable for light

MVS-LC05 : Controller to lighting connection cable, 500mm length

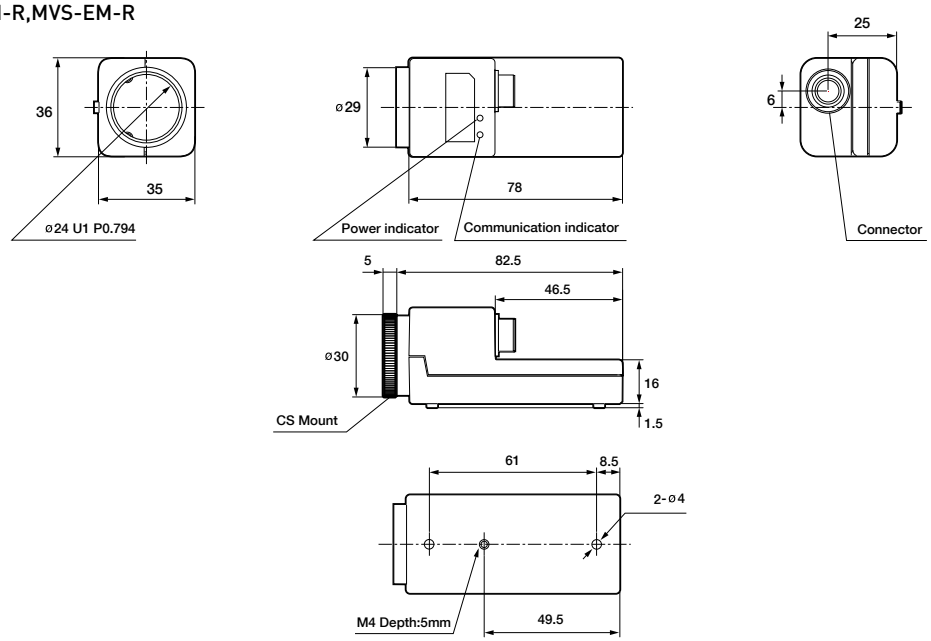


OP-CB1-2 : 2m Extension cable for light
OP-CB1-3 : 3m Extension cable for light
OP-CB1-5 : 5m Extension cable for light

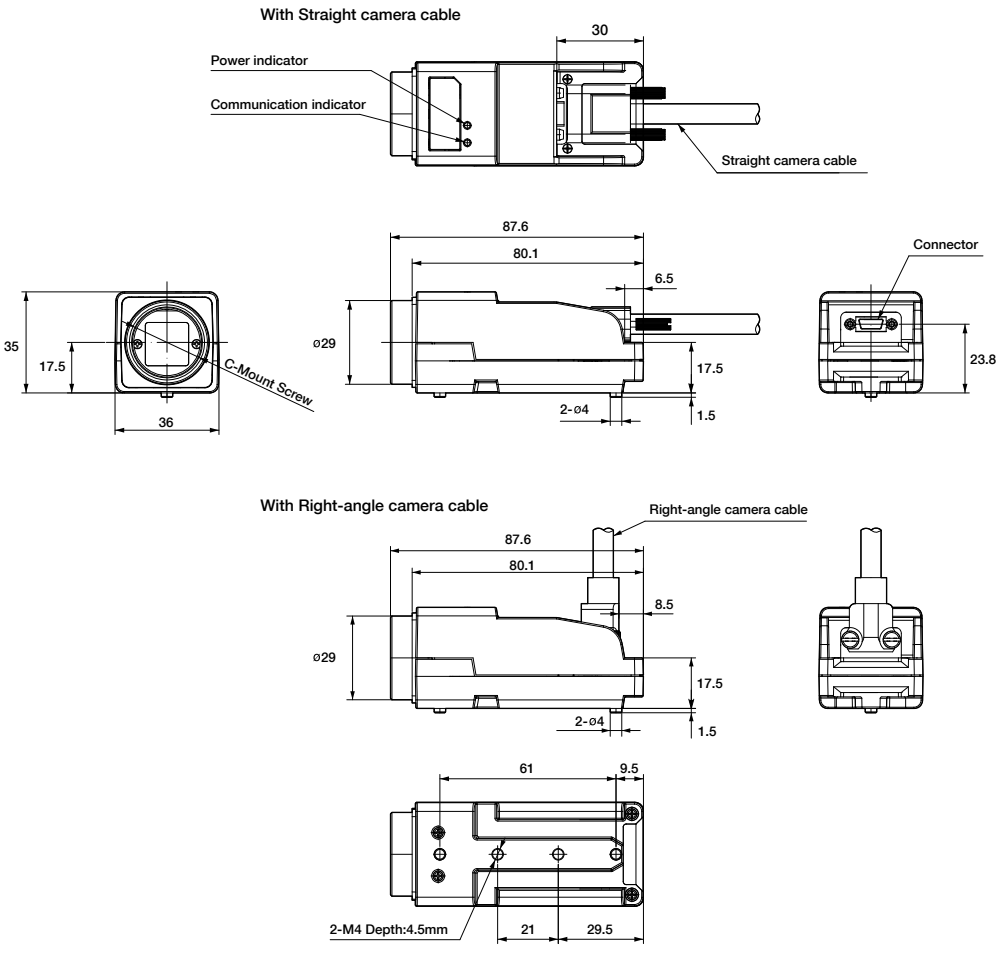
DIMENSIONS

Camera unit

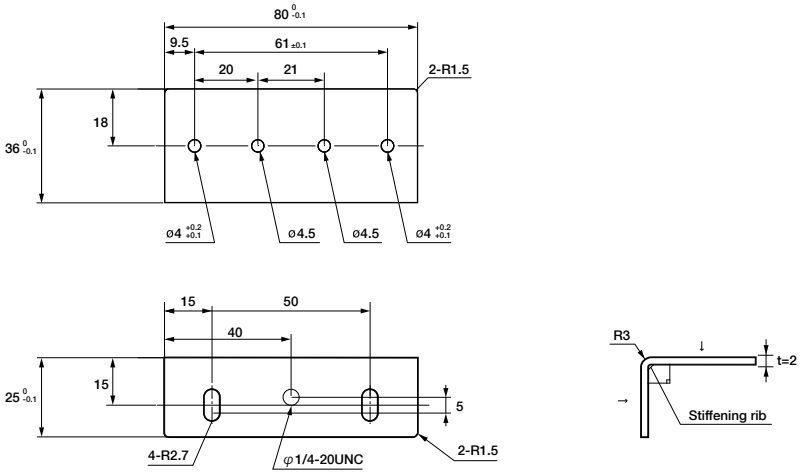
Model No. : MVS-PM-R,MVS-EM-R



Model No. : MVS-OCR2

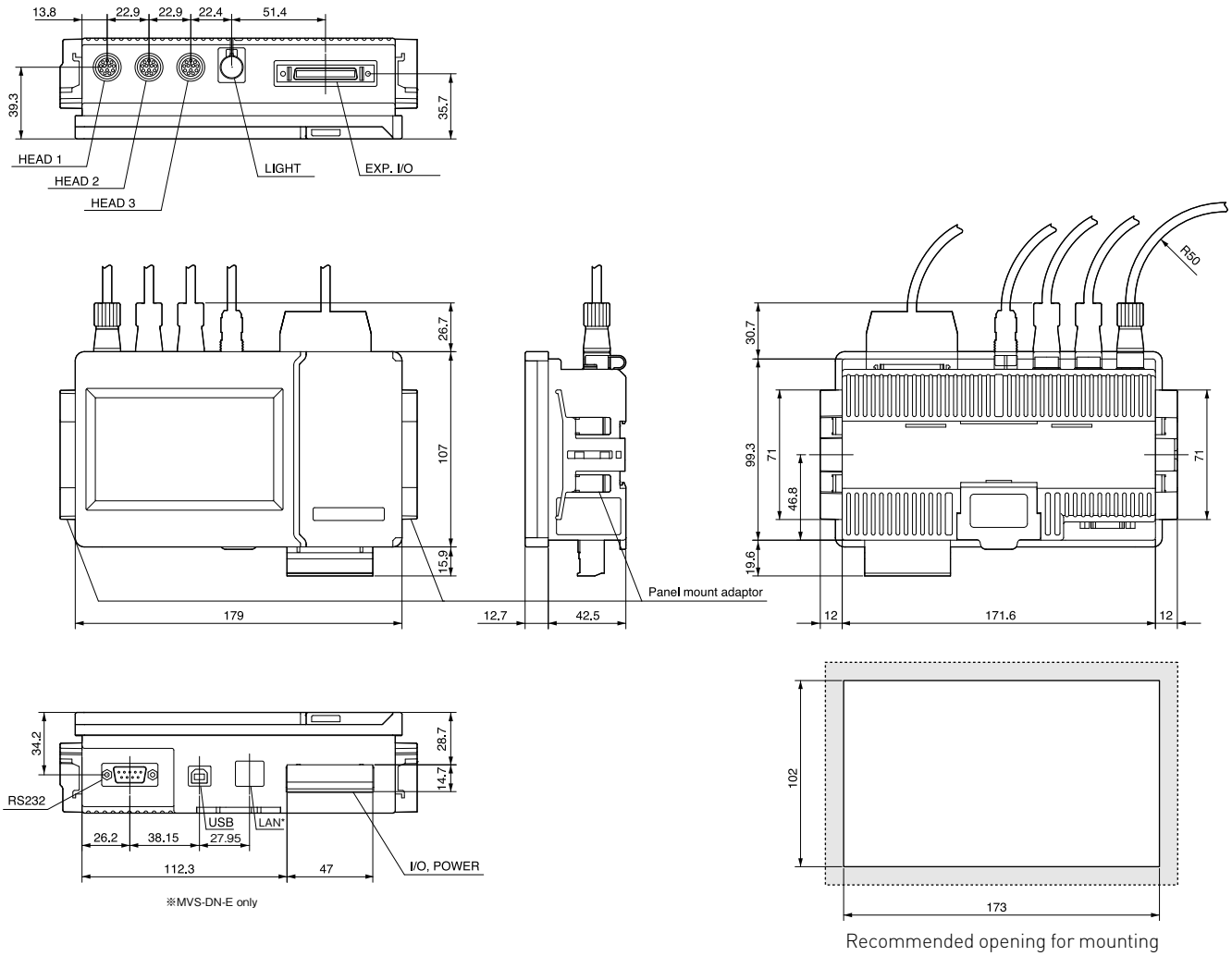


Mounting bracket



Controller

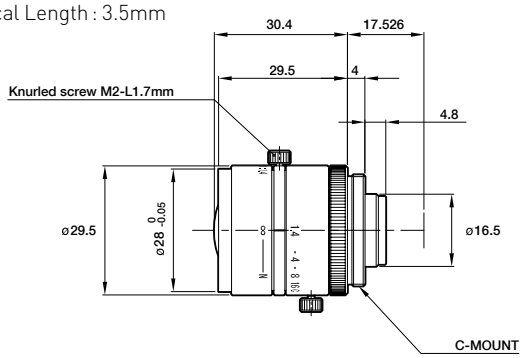
Model No. : MVS-DN-E



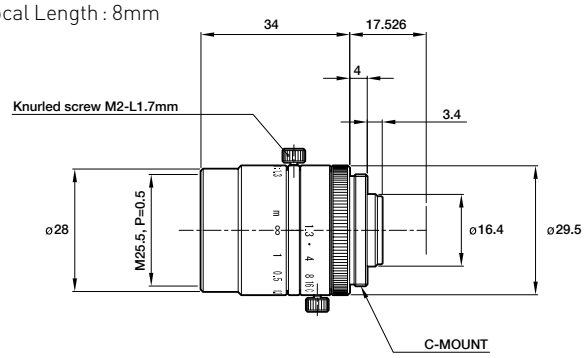
Recommended opening for mounting

CCTV Lens (C mount)

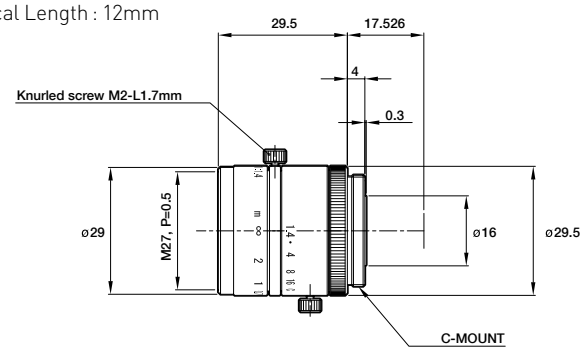
Model No. : FASV-03514V
Focal Length : 3.5mm



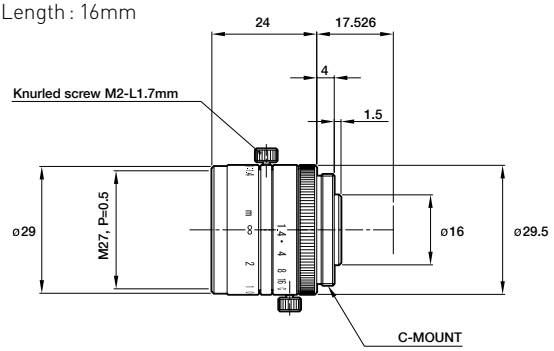
Model No. : FASV-0813V
Focal Length : 8mm



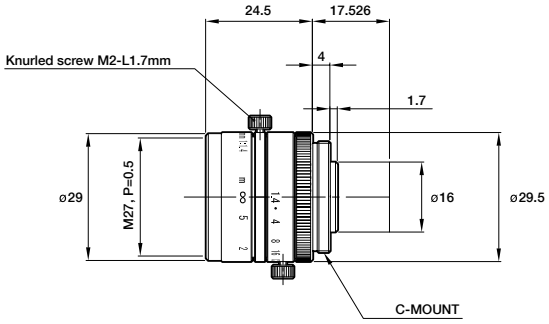
Model No. : FASV-1214V
Focal Length : 12mm



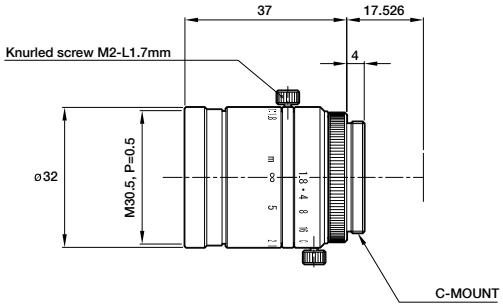
Model No. : FASV-1614V
Focal Length : 16mm



Model No. : FASV-2514V
Focal Length : 25mm

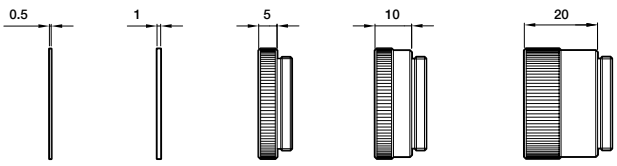


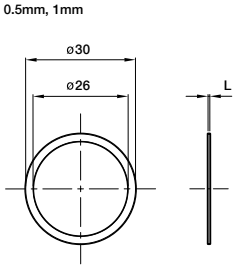
Model No. : FASV-5018V
Focal Length : 50mm

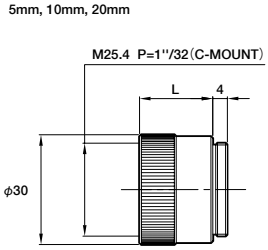


Extension ring set

Model No. : FASV-EXR-LT2

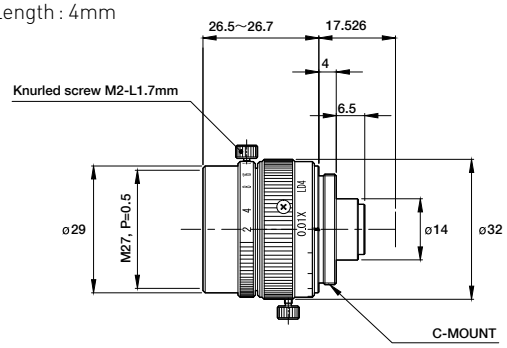




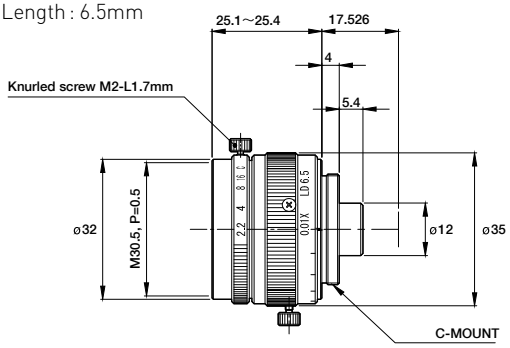


Macro Lens for Mega-pixel (C mount)

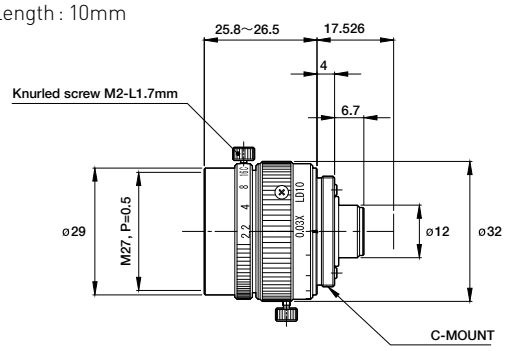
Model No. : FASV-LD4
Focal Length : 4mm



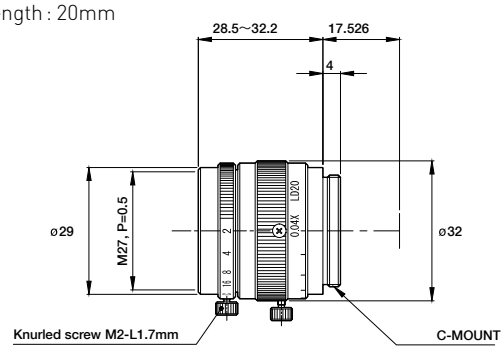
Model No. : FASV-LD6.5
Focal Length : 6.5mm



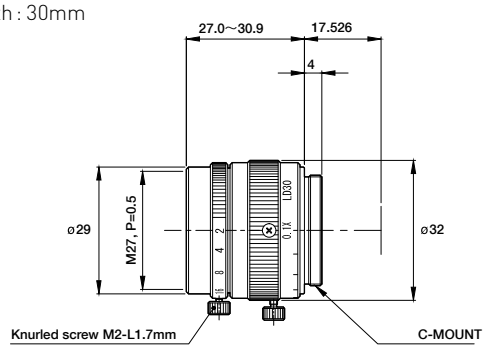
Model No. : FASV-LD10
Focal Length : 10mm



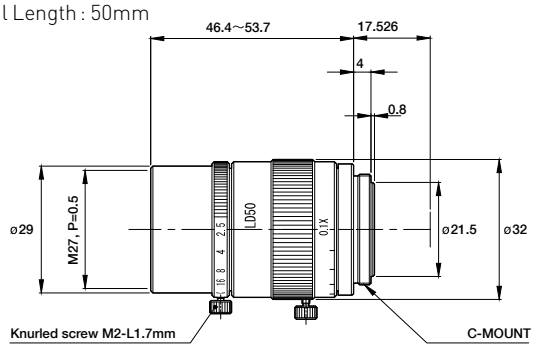
Model No. : FASV-LD20
Focal Length : 20mm



Model No. : FASV-LD30
Focal Length : 30mm



Model No. : FASV-LD50
Focal Length : 50mm

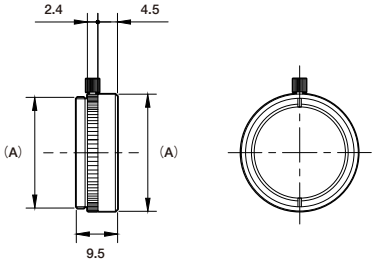


Polarizing filter

Model No. : FASV-PL255-RS
(A) size : M25.5 P0.5

Model No. : FASV-PL270-RS
(A) size : M27 P0.5

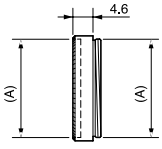
Model No. : FASV-PL305-RS
(A) size : M30.5 P0.5



IR cut filters

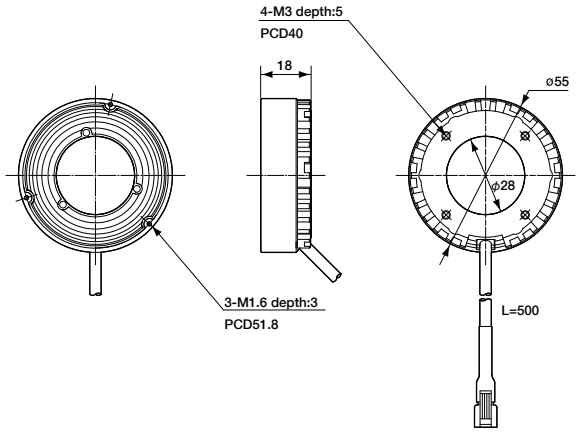
Model No. : FASV-IR270
(A) size : M27 P0.5

Model No. : FASV-IR305
(A) size : M30.5 P0.5

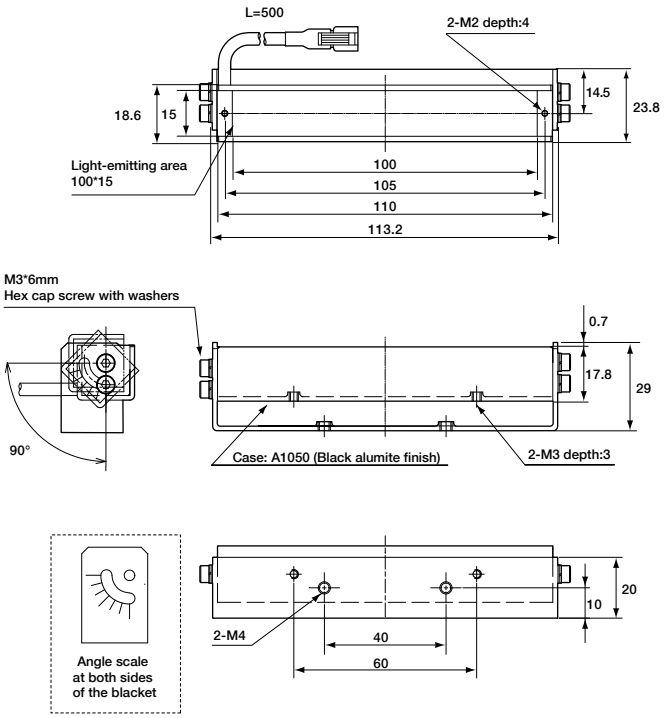


External light

Model No. : OPR-S55-28W



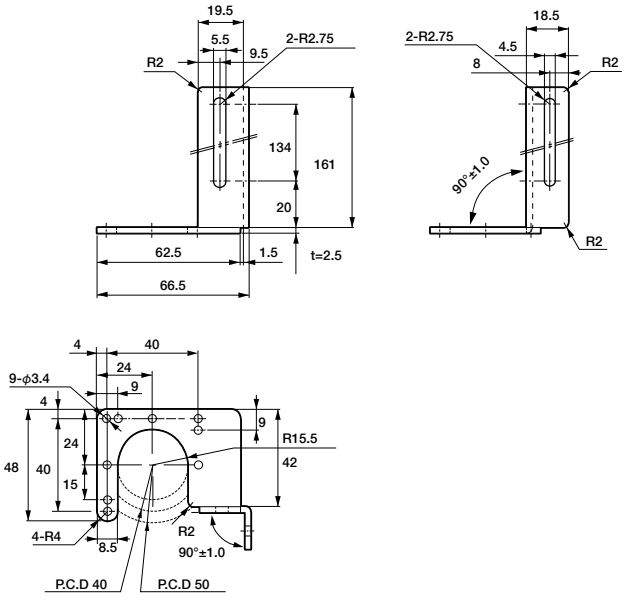
Model No. : OPB-10015W2-B (with bracket installed)



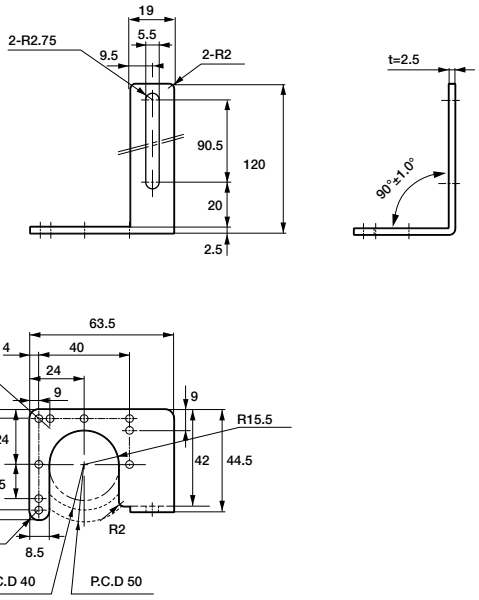
Mounting bracket for light

Mounting bracket for OPR-S55-28W

Model No. : BKT-MVS-OPR

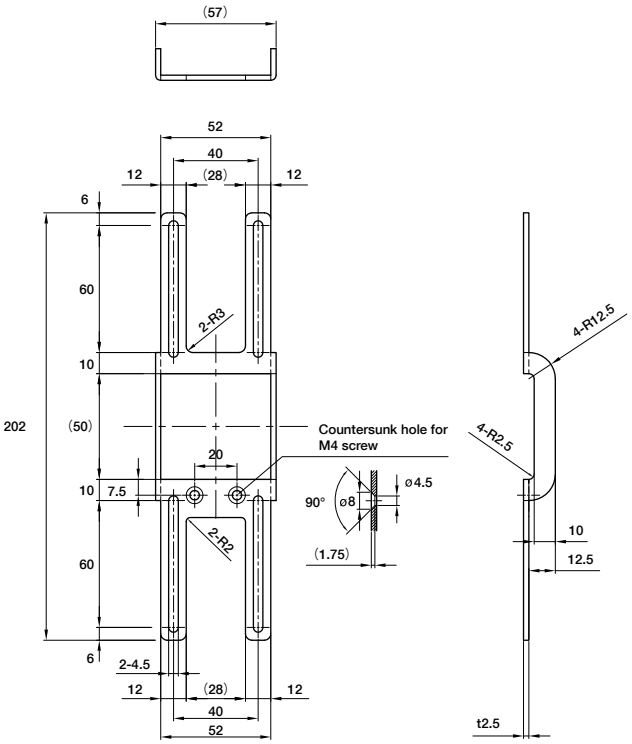


Model No. : BKTS-MVS-OPR

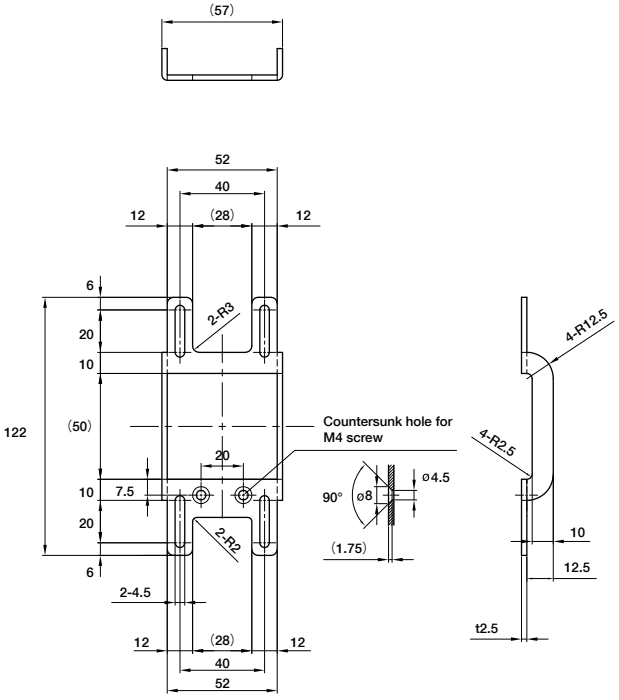


Mounting bracket for OPB-5015W2-B/OPB-10015W2-B/OPB-15015W2-B

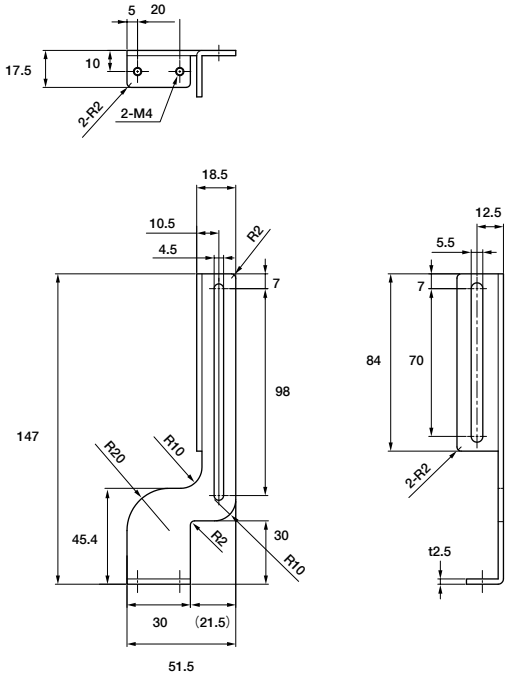
Model No. : BKT-MVS-OPDB-01



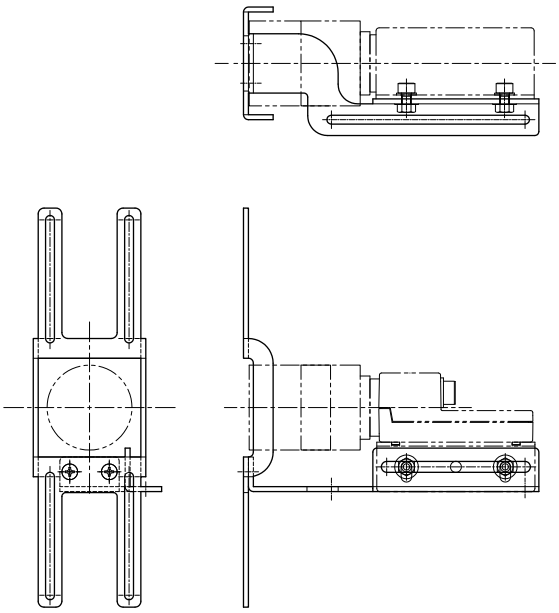
Model No. : BKT-MVS-OPDB-01-20



Model No. : BKT-MVS-OPDB-02



BKT-MVS-OPDB-01 and BKT-MVS-OPDB-02 (Example)



SPECIFICATIONS

Model	MVS-PM-R MVS-EM-R Common Specifications
Supply Voltage	DC 6VDC ±10% (From Controller)
Power consumption	Max. 100mA / 24V DC (in Controller)
Image sensor	430000 Pixel 1/3" CCD Color Image Sensor
Resolution	512 X 512 (512 X 256 by interlace processing)
Pixel size	H: 6.5 X V: 6.3μm (512 X 512 =→ 3.33 X 3.23 mm)
Lens type	CS mount (C mount adapter is included)
Communication I/F	LVDS (100Mbps) dedicated to Controller (Max. 10m)
Indicator	LED (Power, Status)
Operating Temp., Humid.	0~50℃, 35~85%/RH (Non Condensing)
Storage Temp., Humid	-20~70℃, 25~95%/RH (Non Condensing)
Vibration, Shock	Vibration : 10~ 55Hz /1.5mm, Shock : 15G
Regulatory compliance	CE (EMC: 2004/108/EC) / RoHS: 2011/65/EU) EMC standards (EN 61000-6-2, EN 61000-6-4)
Material	Aluminum
Protection Category	IP50 (IEC 60529)
Weight	Approx. 90g
Accessories	C mount adapter, mounting bracket

Model	MVS-PM-R Specifications
Image processing function	- Rotation Search up to +/- 180 degree - 16 Inspection Window - Judgment of Contour and Background, Color Normalized Correlation, Differential Normalized Correlation, Color Shape, Color Area, Stain - Variable shutter speed with continuous capture (up to 6 times) - Automatic Color/Black&White changeover - External Teaching (Auto-Shutter/Threshold/Color Extracting)

Model	MVS-EM-R Specifications
Measurement function	- Rotation Search up to +/- 45 degree - 16 Inspection Window - Measuring Outer/Inner size, Counting number of Edges, Measuring position of Edge, Measuring Edge to Edge, Measuring pitch of Edges - Variable shutter speed with continuous capture (up to 5 times) - Black&White capturing - External Teaching (Auto-Shutter/Threshold/Auto function selection)

Model	MVS-OCR2 Specifications
Supply Voltage	DC 6VDC ±10% (From Controller)
Power consumption	Max. 200mA / 24V DC (in Controller)
Image sensor	1000,000 Pixel 1/1.8" CMOS Color Image Sensor
Resolution	1024 X 1024 progressive
Pixel size	5.42 X 5.42 mm (1024 X 1024)
Lens type	C Mount
Communication I/F	LVDS (100Mbps) dedicated to Controller (Max. 10m)
Indicator	LED (Power, Status)
Response time	Approx. 48ms (2 lines, 20 characters, No search) Varies by shutter speed, inspection window size, etc.
Operating Temp., Humid.	0~50℃, 35~85%/RH (Non Condensing)
Storage Temp., Humid.	-20~70℃, 25~95%/RH (Non Condensing)
Vibration resistance	Vibration : 10~ 55Hz /1.5mm, X,Y,Z for 2 hours
Shock resistance	Approx. 15G, X,Y,Z 3 times each
Regulatory compliance	CE (EMC: 2004/108/EC) / RoHS: 2011/65/EU) EMC standards (EN 61000-6-2, EN 61000-6-4)
Material	Aluminum
Protection Category	IP50 (IEC 60529)
Weight	Approx. 140g
Accessories	Mounting bracket
Image processing function	- Rotation Search up to +/- 180 degree - 4 Inspection Window - Up to 6 lines and up to 60 characters per one inspection window. Up to 120 characters are recognizable totally. - Up to 2 DATE and 2 TIME and 4 strings (total 4) - User-defined dictionary : 1500 characters managed in 3 groups of 500 each - Available Date/Time code recognition: Month: 1 character, Date: 2 char., Hour: 1 char., Minutes: 1 char. - Variable shutter speed with continuous capturing (up to 6 times) - Automatic Color/Black&White changeover - External Teaching (Auto-Shutter/Threshold/Color Extracting)

SPECIFICATIONS

Model	MVS-DN/DP/DN-E/DP-E
Supply Voltage	DC 24V ±10% (DC 12V is possible without external Light)
Power consumption	Controller : Max. 80mA / 24V DC, With external light : max 1.5A (150% of Light power consumption)+ Power consumption of all camera heads
Number of camera	Max. 3 heads
Output	NPN/PNP open collector Residual voltage is less 1.0V, OK, NG : 1 each for every camera head (Total: 6) max. 100mA, Auxiliary output : Total 20, max. 50mA
Input	Synchronous: 3, Auxiliary: 10
I/O connector	Power/OK/NG/Synchronous : Terminal block 12P, Expansive I/O : IEEE1284 half pitch connector 50P
External Light out	12V PWM control (87kHz, 256steps) Out: 3, Total 24W
Communication I/F	USB1.1 (max 12Mbps) : USB standard connector, RS232 (max 500kbps) : D-Sub 9P, RJ45 (8P8C) : Ethernet (10BaseT/100BaseTX) MVS-DN-E / DP-E only
Display, Control device	4.3" wide TFT LCD, Touchscreen, Panel SW, Indicator : Power, Camera No.LED
Timer accuracy	-45sec. ~ +1min. 15sec. Per Month (Typical)
Timer backup battery	primary cell : 5 year with power off (Typical), secondary super capacitor : 7.8 year (Typical with 3 days backup)
Operating Temp., Humid.	0~50℃, 35~85%/RH (Non Condensing)
Storage Temp., Humid	-20~70℃, 25~95%/RH (Non Condensing)
Vibration, Shock	Vibration : 10~ 55Hz /1.5mm, Shock : 10G
Regulatory compliance	CE (EMC: 2004/108/EC) / RoHS: 2011/65/EU) EMC standards (EN 61000-6-2, EN 61000-6-4)
Material	polycarbonate
Protection	IP20 (IEC 60529)
Weight	Approx. 570g
Attachment	Panel mount bracket