Digital color/mark detection type

DM series

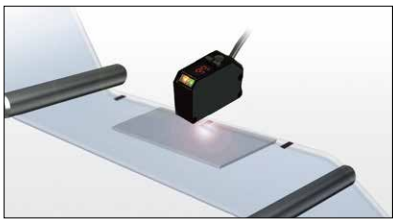
RGB color/mark sensor for automatically selecting light source color

- 3-color (red, green, blue) light source switching function
- Threshold value digital adjustment function
- 8-bank switching function

Selection table

Type	Shape	Sensing distance	Bank function	Model	
				NPN type	PNP type
Color/ mark detection type		18 ±2 mm	8CH	**DM-18TN**	**DM-18TP**

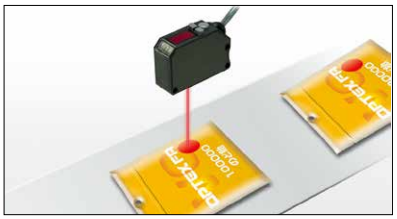
Detection of registration marks on films



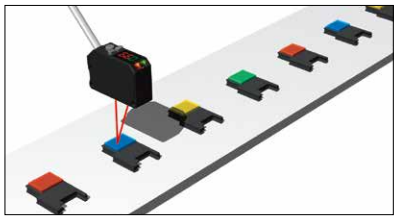
Trigger signal for vision sensors

Mark detection on tube injection machines

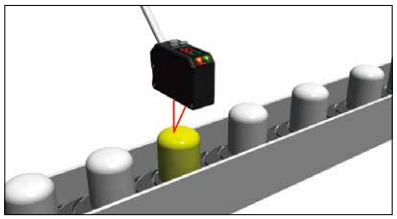
Detection of multicolor printing marks



Connector color detection



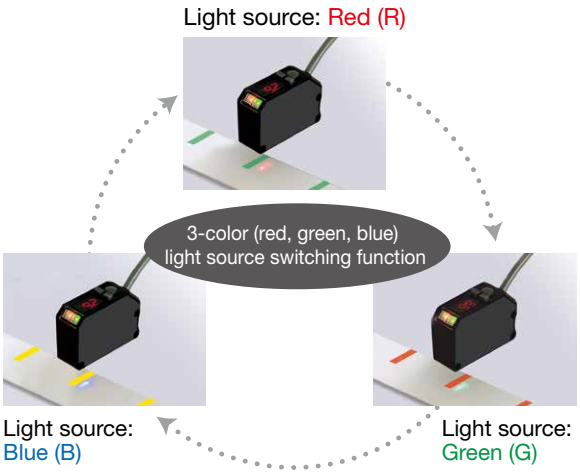
Detection of wrong color of caps



3-color (red, green, blue) light source switching function

Versatile and high precision

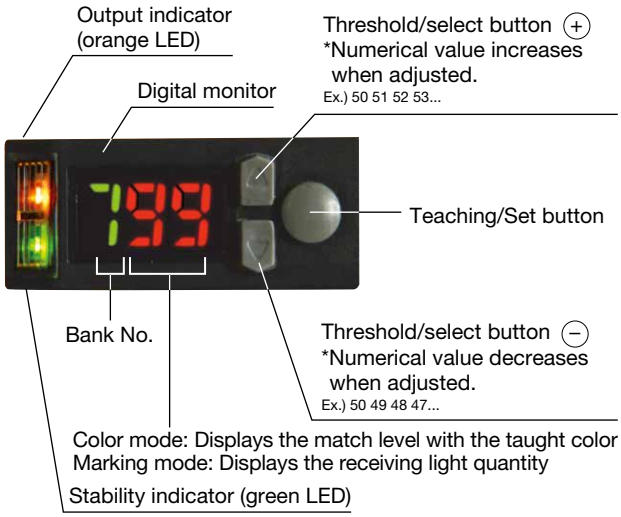
Thanks to a built-in RGB 3-color light source and because the optimum light source is automatically selected to match the base and mark color, there is no need to change the sensor depending on the color. Additionally, since the light source most easily contrasted is automatically selected, mark detection can easily be performed even under difficult conditions as in the diagram below.



Digital adjustment function

Adjustment while watching values possible

Simple settings and fine adjustments are possible. Thanks to the teaching method, setting is possible by simply pressing a button. There are also buttons for manual adjustments, making it possible to configure sensitivity settings to the desired level while viewing the digital display.



Bank switching function

Settings can be registered

Up to 8 settings can be recalled with the built-in bank switching function. Eliminates time wasted when changing setup of multi-product lines. Of course, external recall is also possible.

Bank number and input signal (NPN)

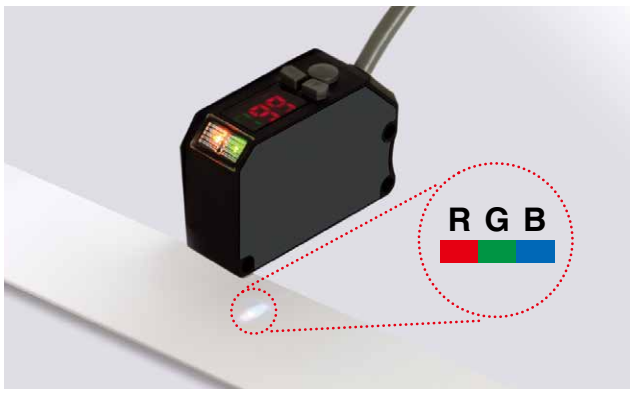
Bank number	Lead wire		
	Green wire	Pink wire	Yellow wire
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

ON: Connected to the blue wire (0 V)
OFF: Open or connected to the brown wire (+V)

Equipped with color mode

Color detection possible, tolerant to variations

Built-in color mode for color detection. Only the colors set can be distinguished. 3 colors (red, green, blue) are always emitted and the ratio thereof is calculated, making it tolerant to workpiece variation. Depending on the object to be detected, mark mode and color mode can be selected with 1 sensor.

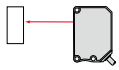
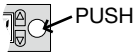
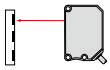
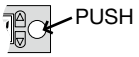
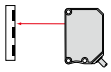
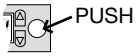


Specifications

Type		Color/mark detection
Model	NPN	**DM-18TN**
	PNP	**DM-18TP**
Sensing distance		18 ± 2 mm
Light source		R / G / B Mark mode: 1 color selection during teaching Color mode: 3 color simultaneous illumination
Spot size		Approx. 1 × 6 mm at a distance of 18 mm
Response time		Mark mode: 0.25, 0.5, 1.2 ms switching Color mode: 0.8, 1.6, 4 ms switching
Distance adjustment		Mark mode: 2-point teaching, auto-teaching Color mode: 1-point teaching
Threshold adjustment		Manual adjustment is possible after teaching
Indicators		Output indicator (orange), Stability indicator (green)
Digital display		7-segment, 3-digit display
Control output		NPN/PNP open collector Max. 100 mA/30 VDC
External input		8-bank switching
Timer function		ON delay / OFF delay / One-shot 0 to 990 ms (setting is possible in 10 ms increments), 1 to 10 s (setting is possible in 1 s increments)
Output mode		Light ON (output when matched) / Dark ON (output when mismatched) selectable by setting*
Connection type		Cable type: Cable length: 2 m ø4 mm
Insulation resistance		20 MΩ or more (with 500 VDC)
Rating	Supply voltage	10 to 30 VDC, including 10% ripple (p-p)
	Current consumption	40 mA
Applicable regulations		EMC directive (2004/108/EC)
Applicable standards		EN 60947-5-2
Company standards		Noise resistance: Feilen Level 3 cleared
Environmental resistance	Ambient temperature/humidity	-25 to +55°C (no freezing) / 35 to 85% RH (no condensation)
	Ambient illuminance	Sunlight: 10,000 lx or less Incandescent light: 3,000 lx or less
	Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions
	Shock resistance	Approx. 50 G (500 m/s^2), 3 times in each of the X, Y, and Z directions
	Degree of protection	IP67
Material		Housing: ABS Lens front cover: PMMA
Weight (including cable)		Approx. 75 g
Included accessories		Mounting bracket: BEF-WK-190

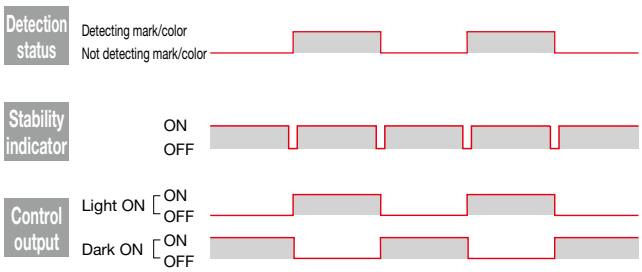
● Specifications are subject to change without prior notice for product improvement purposes.
*During mark mode 2-point teaching, the first point color becomes the ON color.

Distance adjustment

	Order	Diagram	Teaching procedure
Color mode	1		Apply the spot light to the color to be detected at the sensor sensing distance.
	2		Press the teaching button.
	3		Setting is complete.
Mark mode	1		Apply the spot light to the mark to be detected at the sensor sensing distance.
	2		Press the teaching button.
	3		Apply the spot light to the base at the sensor sensing distance.
	4		Press the teaching button.
	5		Setting is complete. The threshold value is set and stored between the base and the mark (intermediate reflectivity). In addition, the optimal Light source is determined automatically.

●To adjust threshold using the buttons, press the Up or Down button. The status display will show the threshold and flash.
Adjust the threshold using the Up and Down buttons. Pressing the teach button will return to Run Mode.
(Even if the teach button is not pressed, a return to Run Mode will occur after 10 sec.)

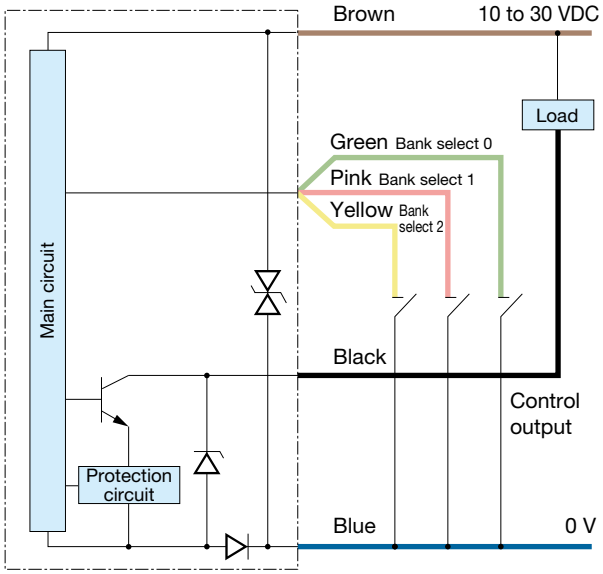
Operation mode



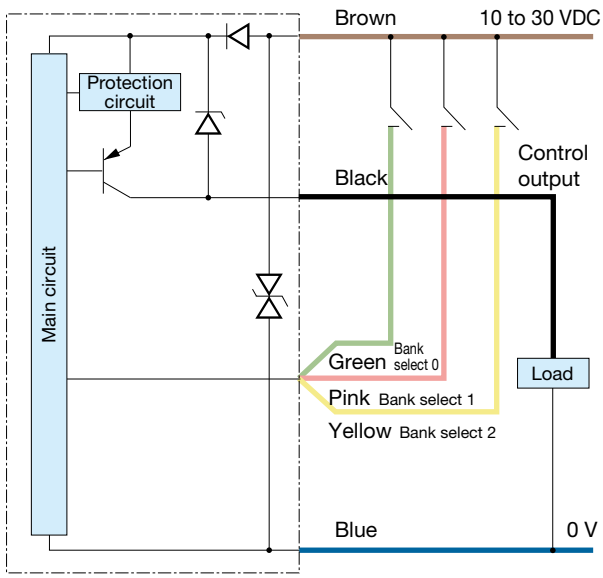
*The operation mode is the same for NPN output and PNP output.

I/O circuit diagram

NPN output type



PNP output type



Bank number and input signal (NPN)

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2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

ON : Connected to the blue wire (0 V)
OFF : Open or connected to the brown wire (+V)

Connecting

- When the bank switching line is not needed, cut the lead wire and wrap it individually with insulating tape, and do not connect it to any other terminal.

Notes

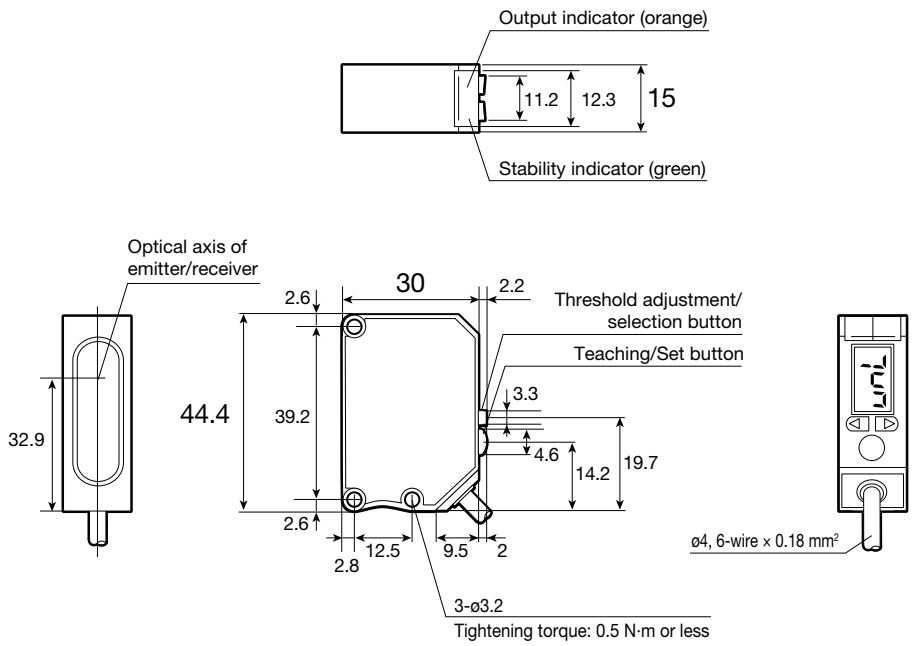
- When using a switching regulator for the power supply, be sure to ground the frame ground terminal.
- Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 100 ms).

Dimensions

Sensor

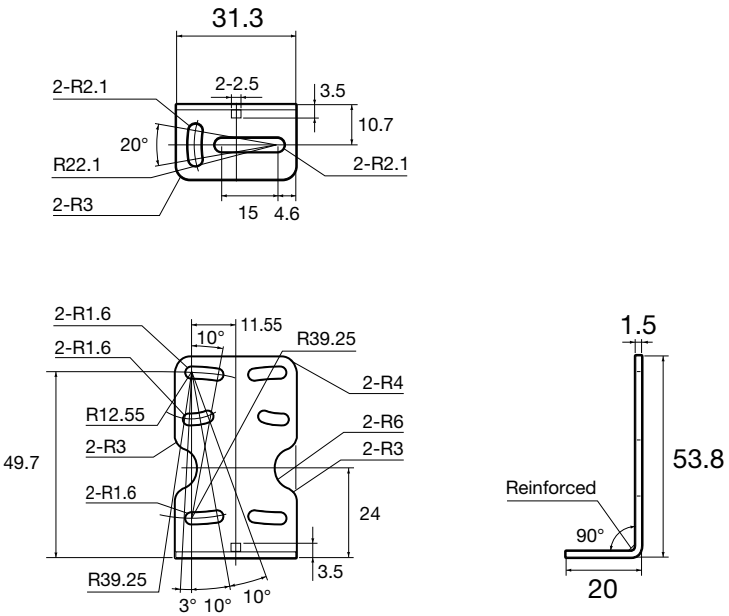
(Unit: mm)

Cable type



Mounting bracket (included)

BEF-WK-190

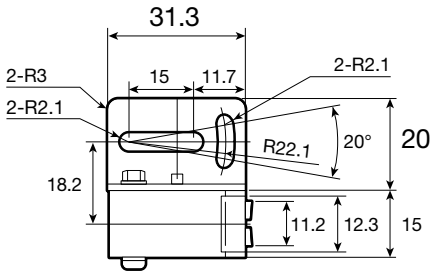


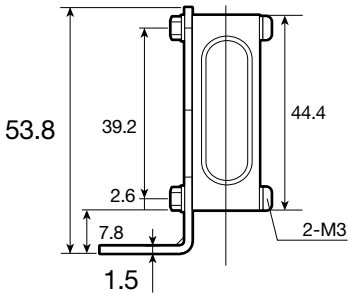
Dimensions

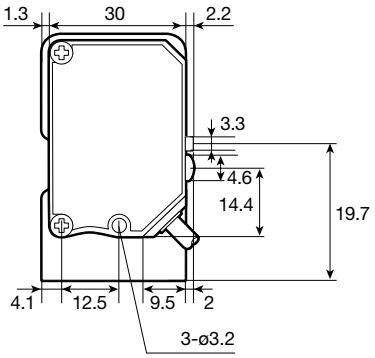
With mounting bracket

(Unit: mm)

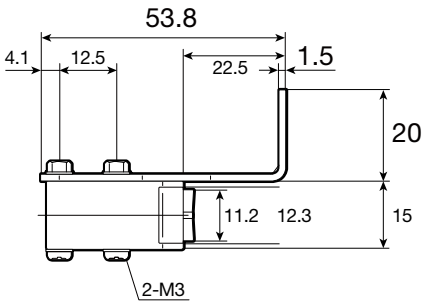
■ BEF-WK-190 floor-mounted

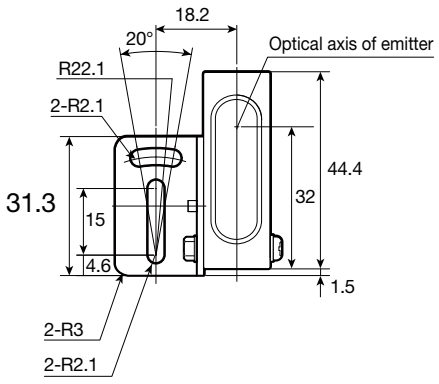


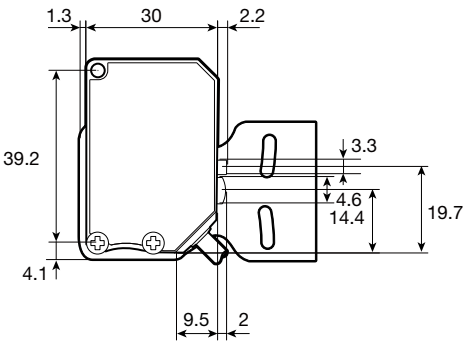




■ BEF-WK-190 wall-mounted







Typical characteristic data

Color mode color detection data

<How to view characteristic data>

Tolerances used for color detection between the colors indicated by columns and rows are expressed using colors. The relationship between tolerance and colors is as follows.

: Reliable detection : Good detection : Can be detection : Cannot be detection

Teaching color		Determination color																													
		33 N (violet)				43 N (blue)				47 N (light blue)				54 N (green)				4 N (yellow)				8 N (orange)				23 N (red)				77 N (brown)				88 N (black)			
		100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25	100	75	50	25
33 N (violet)	100		88	63	34	0	0	0	2	0	0	0	0	0	0	0	3	30	32	38	31	59	57	57	42	67	69	67	47	55	54	38	21	60	58	42	23
	75	90		74	44	1	0	2	12	0	0	0	0	0	0	1	12	32	33	40	41	60	58	58	54	58	66	69	56	56	57	47	32	61	60	54	32
	50	66	77		68	26	21	27	36	0	0	0	22	1	8	21	36	43	45	51	61	45	54	70	71	34	42	76	76	69	68	68	54	75	72	71	54
	25	37	46	70		40	51	55	66	0	0	10	50	22	38	52	66	51	60	65	75	15	25	54	85	4	12	47	88	59	74	84	84	55	67	86	84
43 N (blue)	100	0	0	0	0		90	61	18	43	47	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75	0	0	0	0	88		68	24	52	54	55	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	67	74		77	0	4	48	68	16	31	47	0	0	0	0	0	0	0	0	0	0	0	0	0	14	33	0	0	22	26	51	0
	25	1	10	34	63	40	49	76		0	1	42	85	37	53	69	80	15	26	44	67	0	0	18	54	0	0	10	52	23	37	61	76	18	32	57	77
47 N (light blue)	100	0	0	0	0	47	51	56	28		88	60	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75	0	0	0	0	51	55	57	40	85		75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	34	70	66	79		0	39	56	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	6	30	0
	25	0	1	24	55	31	42	67	89	0	9	50		45	61	76	86	5	17	35	57	0	0	9	45	0	0	1	43	10	28	51	68	12	20	52	62
54 N (green)	100	0	0	0	0	0	0	0	14	36	42	41	34		83	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12	0
	75	0	0	0	0	0	0	0	27	32	46	54	48	85		78	0	0	0	0	0	0	0	0	0	0	0	0	0	1	13	0	0	0	1	24	0
	50	0	0	0	9	0	0	1	42	28	41	62	69	62	79		78	0	11	38	66	0	0	0	38	0	0	0	20	0	22	45	54	0	3	35	52
	25	4	13	38	66	18	28	56	80	0	0	38	84	57	69	85		17	29	47	70	0	0	22	58	0	0	14	55	23	40	65	80	23	33	56	80
4 N (yellow)	100	30	32	43	51	1	0	10	17	0	0	0	4	0	0	5	17		87	69	47	64	72	72	60	53	60	62	62	74	74	52	35	68	70	57	35
	75	31	34	44	59	1	10	19	26	0	0	0	12	0	2	17	30	88		80	60	52	61	74	71	39	48	63	67	75	75	64	50	71	71	70	48
	50	38	40	51	65	6	17	36	44	0	0	0	29	7	16	33	47	70	82		76	34	46	74	80	24	33	67	75	76	82	80	64	75	78	79	65
	25	34	44	61	76	16	25	53	68	0	0	14	53	27	37	57	68	48	60	78		12	24	52	86	1	11	44	83	51	70	92	87	52	64	89	88
8 N (orange)	100	58	61	43	14	0	0	0	0	0	0	0	0	0	0	0	0	62	51	32	12		86	58	23	87	88	66	25	59	40	15	1	60	47	22	1
	75	57	60	53	25	0	0	0	0	0	0	0	0	0	0	0	0	72	62	43	22	89		69	34	78	86	78	36	71	53	26	11	72	56	32	14
	50	57	60	69	54	10	4	12	21	0	0	0	5	0	0	6	22	72	74	74	51	60	70		63	47	57	88	68	96	80	56	42	91	85	61	41
	25	45	55	70	85	26	34	49	57	0	0	2	42	22	27	45	58	57	71	80	87	23	34	63		12	21	55	93	63	80	93	75	65	76	95	76
23 N (red)	100	64	56	31	3	0	0	0	0	0	0	0	0	0	0	0	0	54	41	22	1	87	76	47	12		90	56	15	46	30	4	0	54	35	10	0
	75	69	63	41	12	0	0	0	0	0	0	0	0	0	0	0	0	59	49	32	10	88	86	56	22	90		64	24	54	39	16	1	58	47	20	0
	50	67	71	76	45	2	0	3	13	0	0	0	0	0	0	0	14	61	63	65	42	68	78	89	55	56	67		69	86	72	47	31	91	82	52	33
	25	49	58	75	87	26	33	45	53	0	0	0	41	18	25	40	53	61	68	74	83	27	37	66	93	14	25	59		69	86	89	74	64	75	91	72
77 N (brown)	100	0	0	0	0	1	1	11	19	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0		79	0	0	85	85	58	0
	75	0	0	0	0	15	16	31	0	0	0	0	27	1	9	26	0	0	0	0	0	0	0	0	0	0	0	0	0	81		0	0	90	94	74	0
	50	40	50	69	84	25	35	54	60	0	0	5	48	32	32	48	63	51	64	80	90	19	28	58	92	7	16	49	89	60	75		82	70	66	95	83
	25	25	34	57	85	23	35	62	78	0	0	20	63	42	50	64	80	38	48	66	88	3	12	42	76	0	0	34	74	44	60	84		52	50	80	97
88 N (black)	100	0	0	0	0	10	13	24	35	0	0	0	0	1	9	21	0	0	0	0	0	0	0	0	0	0	0	0	0	85	91	0	0		92	71	0
	75	0	0	0	0	11	8	21	32	0	0	0	0	0	5	15	0	0	0	0	0	0	0	0	0	0	0	0	0	89	92	0	0	80		69	0
	50	0	0	0	0	25	32	48	0	0	0	0	0	24	30	44	0	0	0	0	0	0	0	0	0	0	0	0	0	70	85	0	0	87	77		0
	25	26	35	57	86	25	35	63	78	0	0	20	64	45	52	64	78	37	46	68	88	3	13	43	77	0	1	34	75	41	58	84	97	56	53	78	

n < 80
80<=n < 85
85<=n < 90
90<=n

Setting of response time	Hysteresis
H1 : 0.8 ms	8
H2 : 1.6 ms	6
L : 4 ms	4

*Please contact a sales representative for marking mode characteristic data that may be required.