DMP Position finder

For accurate positioning in warehouse and conveying areas

SICK

Sensor Intelligence.

SENSICK DMP Position finder

The DMP position finders are opto-electronic sensors used for fine positioning with millimetre precision, for example in warehouse and conveying areas.

At transfer and storage locations, movement in the steelwork caused by temperature and load variations make reliable positioning impossible. The DMP position finder has been developed in order to solve this problem. The sensors are specifically used for fine positioning in x- and y- directions.

Industries and applications

> The DMP position finders are designed for applications reliant on extremely accurate transfer operations.

- For precise positioning of storage and retrieval units in high-bay warehouses,
- for automatic rail installation machines,
- for positioning of car elevators in automated car parks,

- for transfer stations between static and mobile handling transport systems,
- for the docking of driverless transport systems with pinpoint accuracy,
- many other applications.
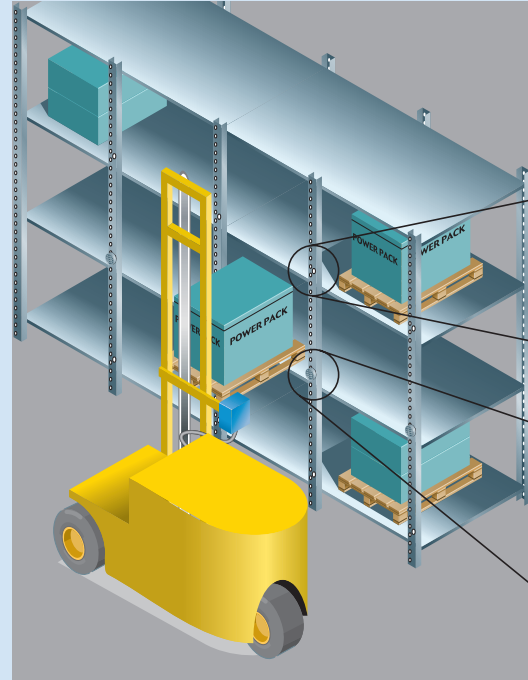
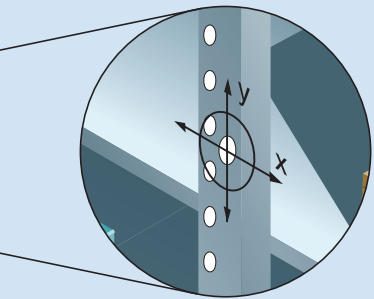> **High-bay warehouses/ Storage and retrieval units**
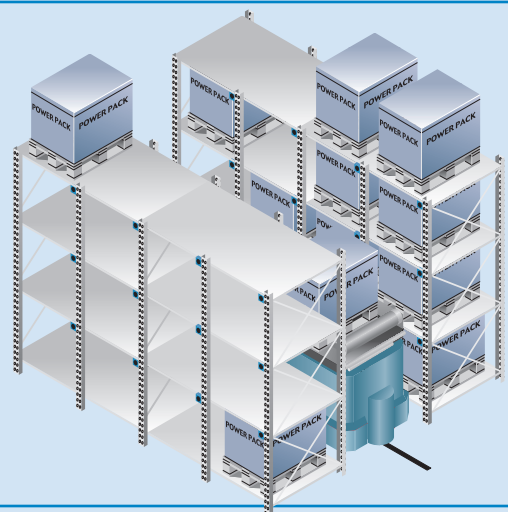
> **Automated truck unloading**

DMP3

The reflector-less DMP3 is recommended for working ranges from 200 to 350 mm. The device is a camera-based sensor for fine positioning on holes or coloured dots.
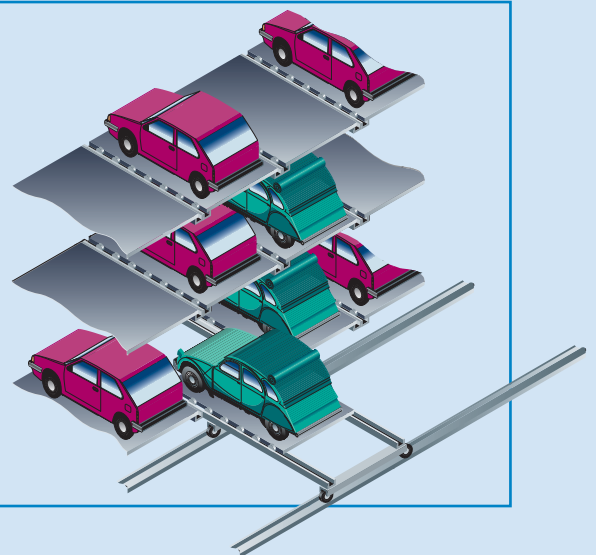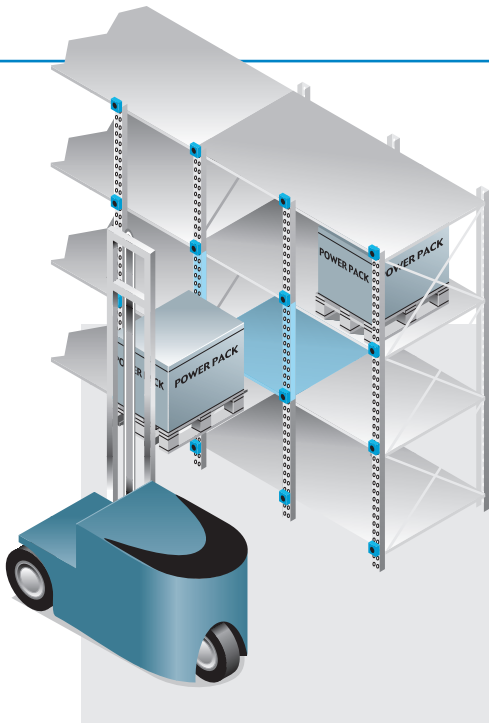
200 - 350 mm

DMP2

The DMP2 is used for greater working ranges up to 2000 mm. This sensor works with reflectors. Both devices always adapt to the current, actual conditions on site and thus enable secure entry and exit operations or even docking operations, with pinpoint accuracy.

10

PL80A

PL50A

PL22

200–500 mm

500–1200 mm

500–2000 mm
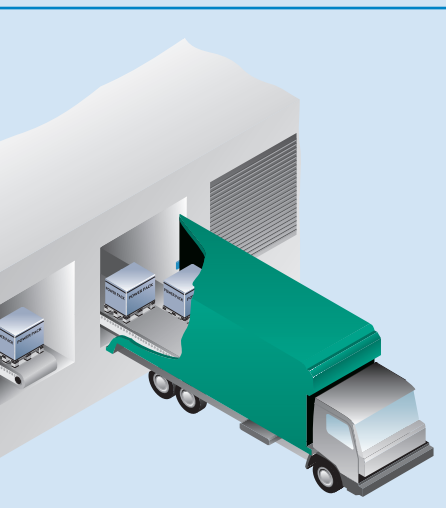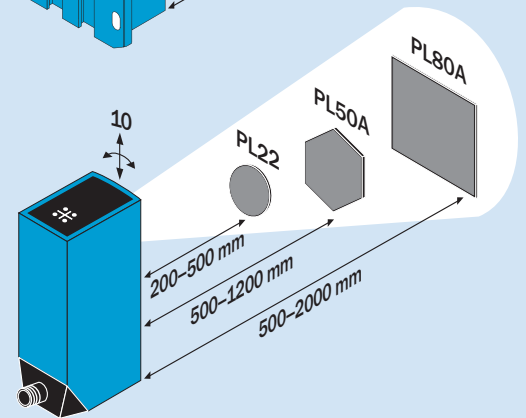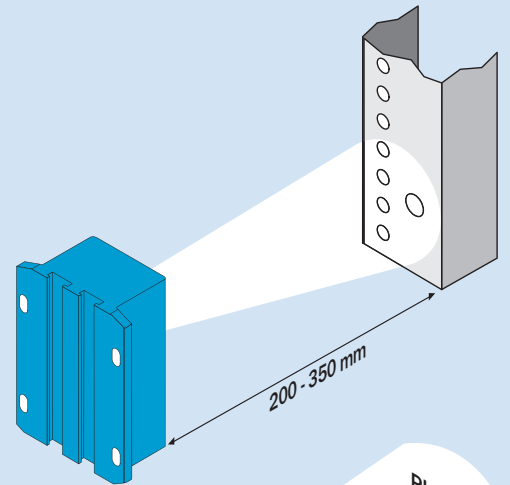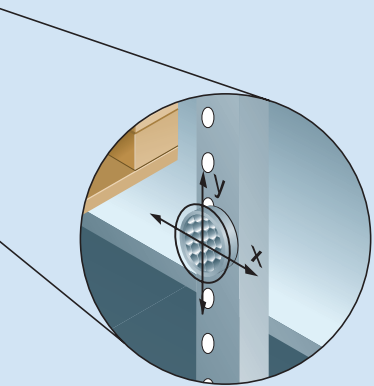
> Automated parking systems

DMP3 and DMP2 Position finder – many advantages.

Temperature-dependent tolerances do not have any influence on the positioning accuracy.

Temperature fluctuations can lead to changes in storage area dimensions, with loading and unloading operations becoming a non-calculable risk. The DMP sensors ensure reliable loading and unloading always based on the actual conditions.

Direct target approach by fixed reference point or reflector.

The DMP3 orientates itself onto pre-taught holes or coloured dots in the storage system, identified by the camera-based sensor. The DMP2 uses reflectors attached to each storage bay.
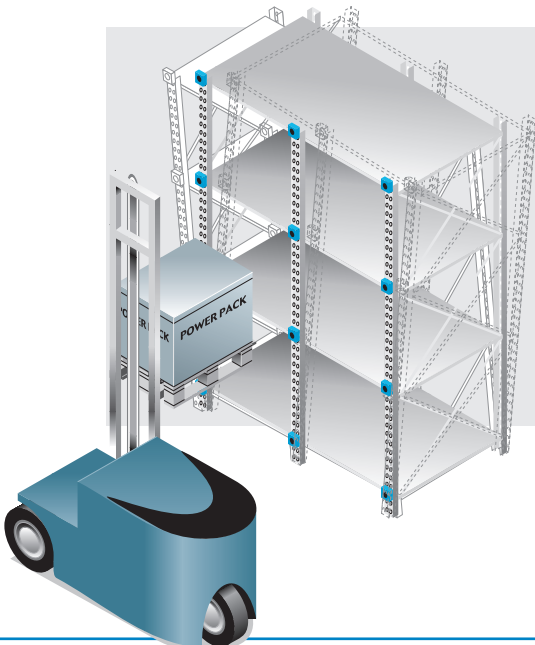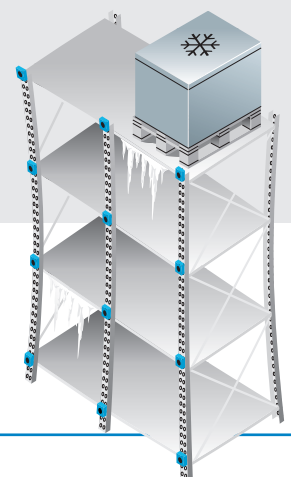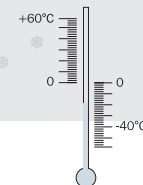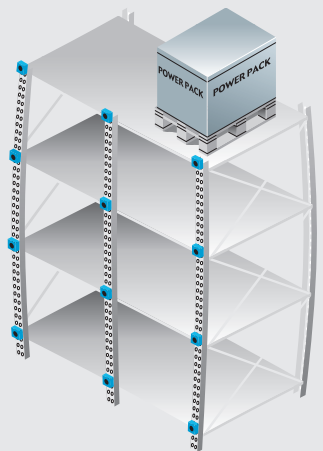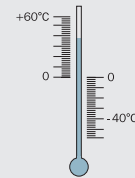
Compensation for tolerances in steel construction allow accurate positioning.

In high-bay storage bins, there can be tolerance-dependent storage measurements due to uneven warehouse floors in addition to material-dependent tolerances in the construction. These tolerances do not influence the accuracy of the DMP sensors.
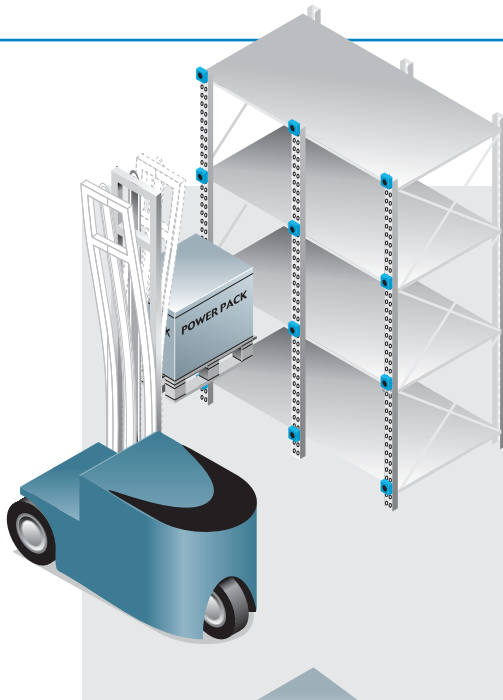
+60°C
0   0
        -40°C

+60°C
0   0
        -40°C

Compensation is made for inconsistencies in the travel of the storage and retrieval unit caused by acceleration and deceleration.

Acceleration and deceleration of high-bay stackers involves variations of the mast which require compensation in the case of automatic positioning. The DMP sensors take these variations into account, thus ensuring reliable positioning of the goods.

Increasing the degree of automation by using the DMP3s and DMP2s.

Even for constantly changing ambient conditions, the DMPs facilitate the precise selection of storage bays, and similar, and thus permit automatic loading and unloading sequences.

Changing location measurements caused by weight are compensated for.

The loading and unloading of pallets etc. generates weight-related tolerances in the storage area dimensions, which are rendered irrelevant when using the DMPs for positioning operations. The DMPs permit a space-saving and material-optimised bay construction.
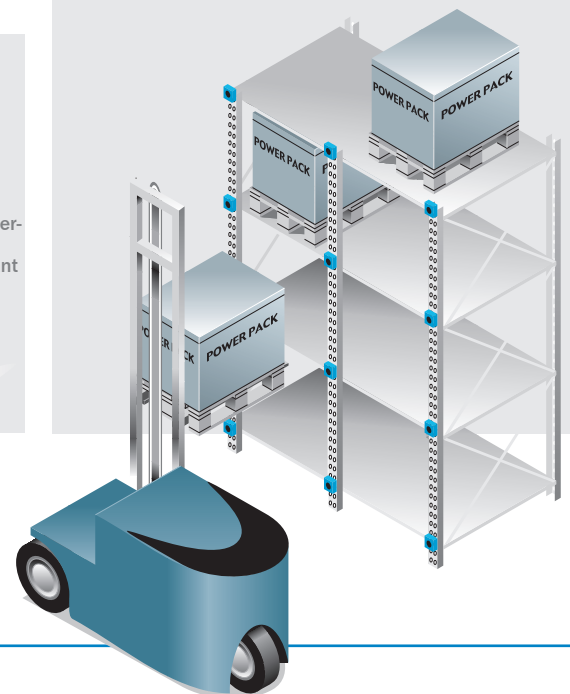
DMP3 and DMP2 Position finder – Simple, in principle.

DMP3 and DMP2 operating principle

The DMP position finders are opto-electronic sensors with a two-dimensional receiver element and are used – following rough positioning – for optical, non-contact fine positioning of a handling unit or moving unit in x- and y- direction.

A position display with four LEDs simplifies alignment by providing a visual indication of the state of the switching outputs.

The basic principle – autocollimation

The DMP sensors operate according to the autocollimation principle: the light emitted by the sensor is reflected, in case of the DMP3, from the periphery of the hole, ie. the internal diameter, by a sticker or, in the case of the DMP2, by a reflector and mapped to the receiver array of the sensor. From this image, the position of the hole, sticker or reflector is determined.
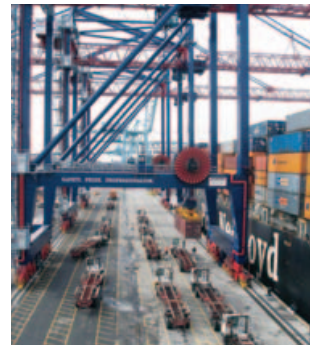
FEATURES

|	DMP3	DMP2
Light source	LED, infrared	Red light
Target/reference	Hole or coloured dot	Reflector
Range on hole/coloured dot	200 ... 350 mm	–
Scanning range with reflector PL22	–	200 ... 500 mm
Scanning range with reflector PL50A	–	500 ... 1.200 mm
Scanning range with reflector PL80A	–	500 ... 2.000 mm
Teach-in	Two different positions with Teach-in button	–
Scanning angle	± 10° in all axis	± 10° in all axis
	–	Vertical to the reflector
Supply voltage	18 ... 30 V DC	18 ... 30 V DC
Outputs	4 x Q (Q$_{-X}$, Q$_{+X}$, Q$_{-Y}$, Q$_{+Y}$)	2 x Q$_{Analogue}$ (Q$_{AX}$, Q$_{AY}$), 1 x Q$_R$ /
	–	4 x Q (Q$_{-X}$, Q$_{+X}$, Q$_{-Y}$, Q$_{+Y}$), 1 x Q$_R$
	M12, 8-pin	M12, 8-pin
	(DMP2-compatible)	
Ambient temperature	–40 ... +50 °C with heating	–25 ... +55 °C
Enclosure rating	IP 54	IP 67

The handling or transfer unit is moved until the centre point of the reflected light is in the middle of the receiver array. This operation leads to the fine positioning required, and the load handling can begin.
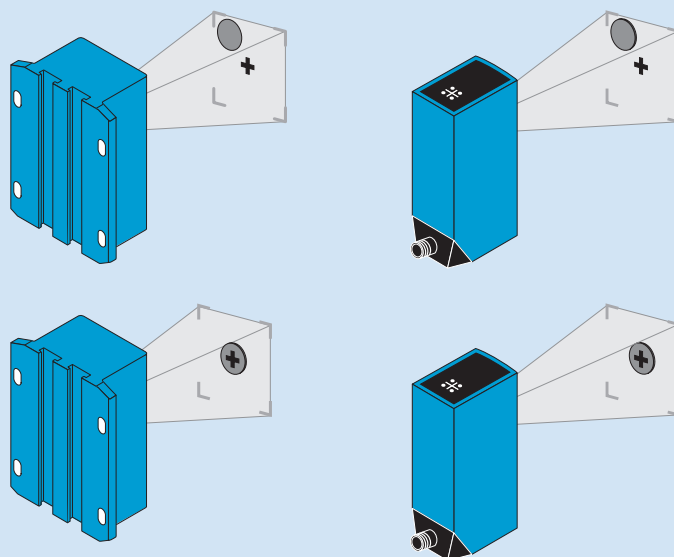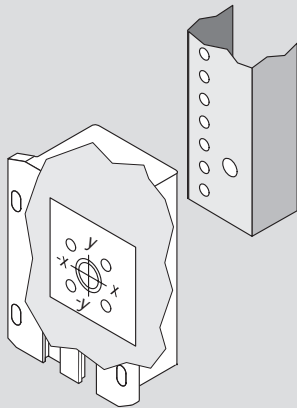
DMP3 and DMP2 Position finder – Connections made easy.
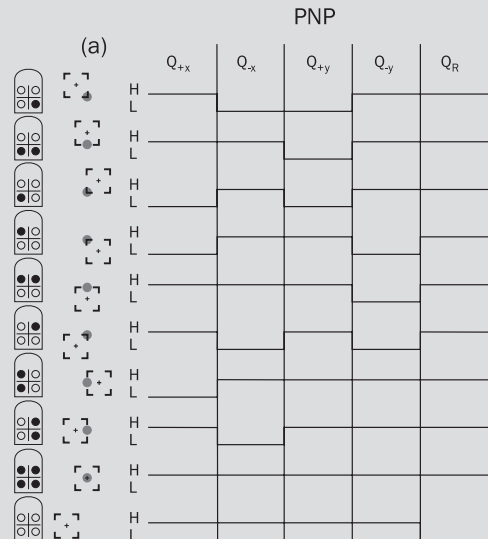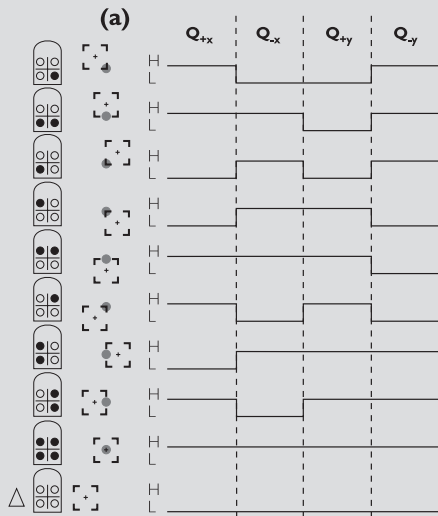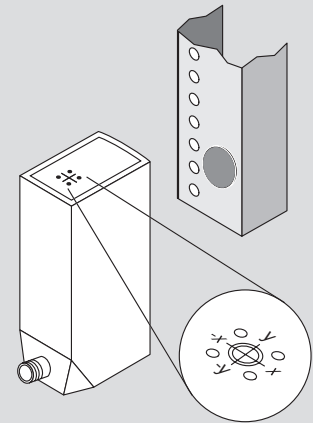
Switching output and crosshairs

The four LEDs in the crosshairs of the DMP3 significantly simplify positioning. Moreover, the corresponding switching behaviour of the switching outputs Q_{-x}, Q_{+x}, Q_{-y} and Q_{+y} can be easily read.

DMP2

PNP

From rough to fine positioning

The handling or transfer unit is prepositioned by the central control system ensuring it is in the detection range of the DMP. Following this rough positioning, the DMP position finder takes over the fine control of the drives until the final position is reached.

DMP3

– with switching output (Q_{-X}, Q_{+X}, Q_{-Y}, Q_{+Y})
Two switching outputs for the x- and two for the y-axis continuously report the relative distance of the hole/sticker from the centre of the receiver array.

DMP2

– with analogue (Q_{AX}, Q_{AY}) and switching output (Q, Q_R)
One analogue output for the x- and one for the y-axis continuously reports the relative distance of the reflectors from the centre of the receiver array. The switching output Q switches as soon as the reflector is in the detection range of the DMP (reflector detected). The switching output Q_R switches when the reflector is mapped in the centre of the receiver array ("correct position").

– with switching output (Q_{-X}, Q_{+X}, Q_{-Y}, Q_{+Y}, Q_R)
Two switching outputs for the x- and two for the y-axis continuously report the relative distance of the reflector from the centre of the receiver array. The switching output Q_R switches when the reflector is mapped in the centre of the receiver array ("correct position").

DMP3 – Teach-in for two different target positions

The DMP3 offers an additional feature: two different positions can be taught in within the detection range: thus, loading and unloading of the storage bay can be performed even more accurately.
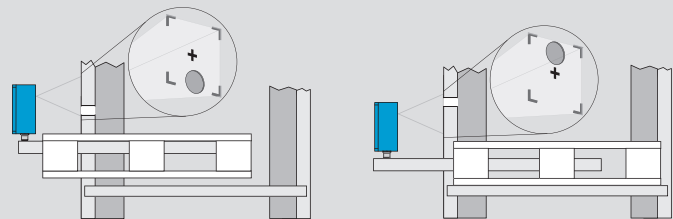
DMP2 – with analogue (Q_{RX}, Q_{RY}) and switching output (Q, Q_R)

The behaviour of the outputs Q (= "correct position") or Q_R (= "reflector detected") each for PNP or NPN.

Catchment area
Reflector

Q (PNP)
Q_R (PNP)
Q (NPN)
Q_R (NPN)
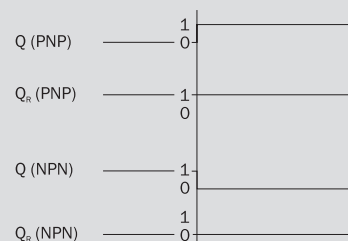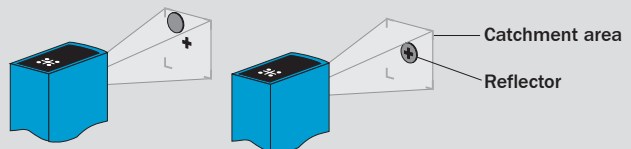
Scanning range 200 ... 350 mm

Position finder

- Four switching outputs
- Integrated evaluation
- Simple operation
- Teach-in: two different positions

CE

Accessories

Cable receptacle

Dimensional drawing
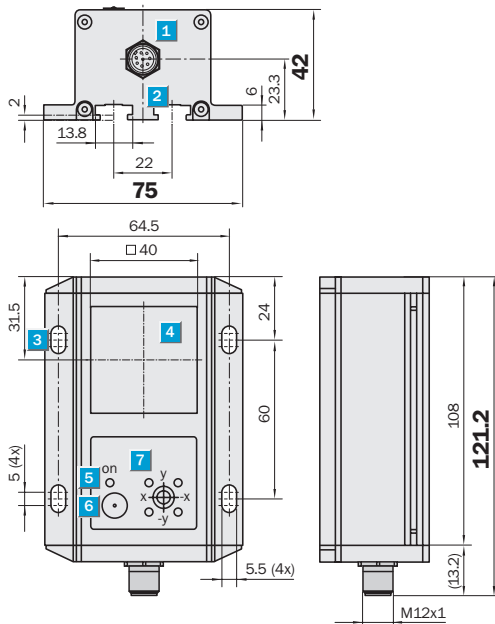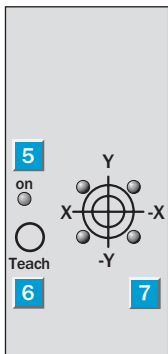
1	Connection plug M12, 8-pin
2	T-rail for mounting
3	Fixing hole
4	Optical axis
5	LED green, power indicator
6	Teach button
7	Four LEDs, position indicator

Adjustments possible

DMP3-xxxx

Connection type

DMP3-xxxx

8-pin, M12

pin	wire	signal
1	wht	Bank Select Input
2	brn	L+ (+18 ... 30 V)
3	grn	Q−X
4	yel	Q+X
5	gra	Q−Y
6	pnk	Q+Y
7	blu	M (0V)
8	red	Teach-in Input
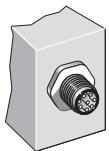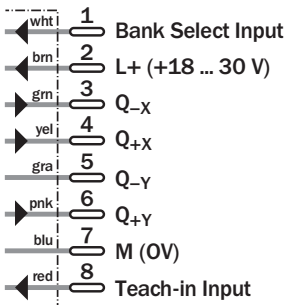
Technical data	DMP3-	B1111	B1211								
Scanning range	200 … 350 mm	▦	▦								
	(Hole diameter 10 … 20 mm)										
Repetition accuracy RW	0.15 mm (at 300 mm RW)	▦	▦								
Scanning angle	± 10 °	▦	▦								
Light sender, light source	LED, infrared, Class 1M	▦	▦								
Supply voltage V_S [1]	18 … 30 V DC	▦	▦								
Ripple [2]	< 5 V_{PP}	▦	▦								
Current consumption [3]	< 250 mA	▦	▦								
Current consumption with heating	< 1.3 A		▦								
Switching outputs	HIGH = V_S – ≤ 2 V/LOW ≤ 2 V	▦	▦								
Operating mode	Permanent	▦	▦								
Teach-in Input											
Active	> 7 V … < V_S max	▦	▦								
Inactive	0 V … < 2 V or unconnected	▦	▦								
Bank Select Input											
Bank 1	0 V … < 2 V or unconnected	▦	▦								
Bank 2	> 7 V … < V_S max	▦	▦								
Output current I_a max.	100 mA total	▦	▦								
Switching frequency	20/s	▦	▦								
Connection type	M12 plug, 8-pin	▦	▦								
VDE protection class	◇◇◇	▦	▦								
Enclosure rating	IP 54	▦	▦								
Ambient temperature [4]	Operation: 0 … +50 °C without heating	▦									
	Operation: –40 … +50 °C with heating		▦								
	Storage: –40 … +70 °C	▦	▦								
Shock resistance	According to IEC 68	▦	▦								
Weight	Approx. 450 g	▦	▦								
Housing material	Aluminium/zinc die-cast	▦	▦								

[1] Limit values, reverse-polarity protected
[2] Must be within V_S tolerances
[3] Without load
[4] Do not bend cable below 0 °C

Switching states

Viewing area

Order information

Type	Order no.
DMP3-B1111	1042918
DMP3-B1211	1042919
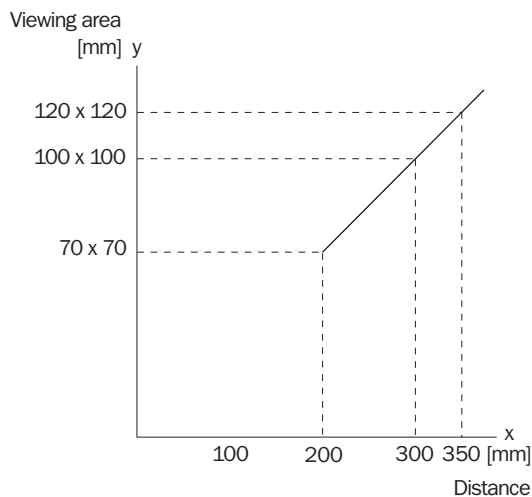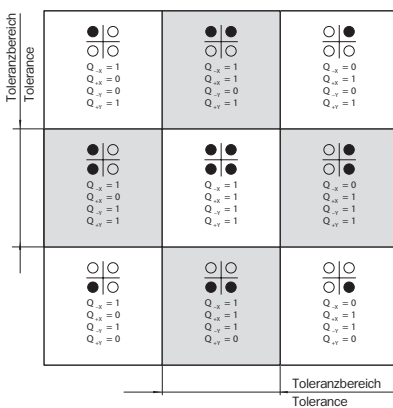
Scanning range 200 ... 2000 mm

Position finder

- Five switching outputs
- Integrated software
- Simple operation

CE □

Accessories

Cable receptacle

Reflectors

Dimensional drawing

43   81.5

92.5   124.5

38

25.7

25.7   38
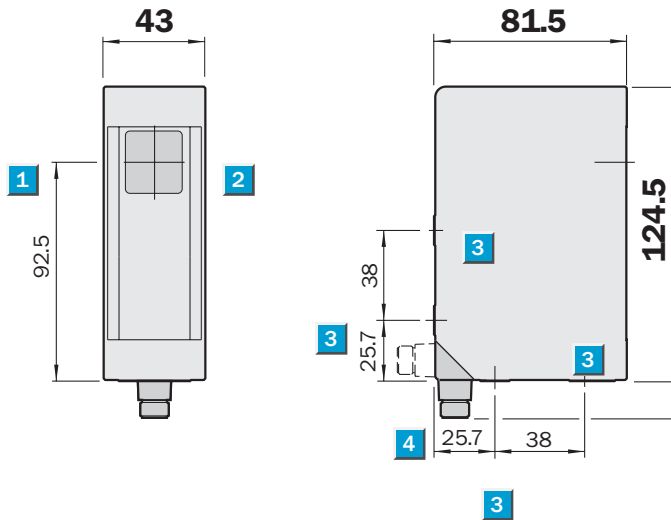
Adjustments possible

DMP2-P21111

DMP2-N21111

ON

Y

-X —— X

-Y

1	Middle of the optic axis
2	Receiver
3	Threaded mounting hole M6, 8 mm deep
4	Connection plug M12, 8-pin, 90° rotatable
5	Power indicator
6	Alignment aid
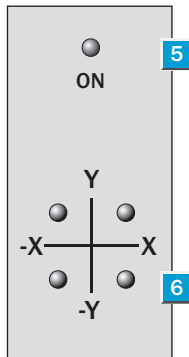
Connection type

DMP2-P21111

DMP2-N21111

8-pin, M12

wht	1	AT
brn	2	L+
grn	3	Q_{-X}
yel	4	Q_{+X}
gra	5	Q_{-Y}
pnk	6	Q_{+Y}
blu	7	M
red	8	Q_R

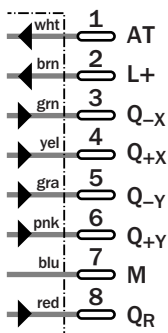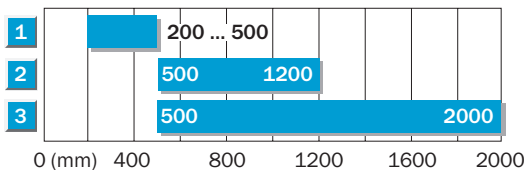| Technical data	DMP2	-P 21111	-N 21111								
Scanning range	200 ... 2,000 mm	▪	▪								
	(depending on reflector)										
Repetition accuracy RW	0.15 mm (at 300 mm RW)	▪	▪								
Scanning angle	± 10° in all axis vertical to the	▪	▪								
	reflector (PL22, PL50A, PL80A)										
Light sender [1], light source	LED, red light	▪	▪								
Supply voltage V_S [2]	18 ... 30 V DC	▪	▪								
Ripple [3]	< 5 V_{PP}	▪	▪								
Current consumption [4]	< 250 mA	▪	▪								
Switching outputs	PNP: HIGH = V_S – ≤ 2 V/LOW = 0 V	▪									
	NPN: HIGH = V_S/LOW ≤ 2 V		▪								
Operating mode	Permanent or synchronized	▪	▪								
	can be selected										
Blanking input AT											
Blanked (triggered)	PNP: > 18 V ... < V_S max.	▪									
	NPN: 0 V ... V_S (≥ 18 V)		▪								
Free-running	PNP: < 2 V or unconnected	▪									
	NPN: V_S – (≤ 2 V) or unconnected		▪								
Output current I_A max.	100 mA	▪	▪								
Switching frequency [5]	250/s	▪	▪								
Response time [6]	3 ms	▪	▪								
Connection type	M12 plug, 8-pin	▪	▪								
VDE protection class [7]	▫	▪	▪								
Circuit protection	A, B, C	▪	▪								
Enclosure rating	IP 67	▪	▪								
Ambient temperature [8]	Operation –25 ... +55 °C	▪	▪								
	Storage –25 ... +75 °C	▪	▪								
Shock resistance	According to IEC 68	▪	▪								
Weight	Approx. 990 g	▪	▪								
Housing material	Zinc	▪	▪								

[1] Average service life 100,000 h (at T_A = 25 °C)
[2] Limit values, reverse-polarity protected
[3] Must be within V_S tolerances
[4] Without load
[5] With light/dark ratio 1 : 1, no time delay
[6] With resistive load
[7] Reference voltage 50 V DC
[8] Do not bend cable below 0 °C

Scanning range

1	Scanning range on reflector PL22
2	Scanning range on reflector PL50A
3	Scanning range on reflector PL80A

Order information

Type	Order no.
DMP2-P21111	1016237
DMP2-N21111	1016238

Scanning range 200 ... 2000 mm

Position finder

- Two analogue outputs (for x- and y-direction)
- Two switching outputs
- Integrated software
- Simple operation

CE □

Accessories

Cable receptacle
Reflectors

Dimensional drawing

43

92.5

81.5

124.5

38

25.7

25.7 38
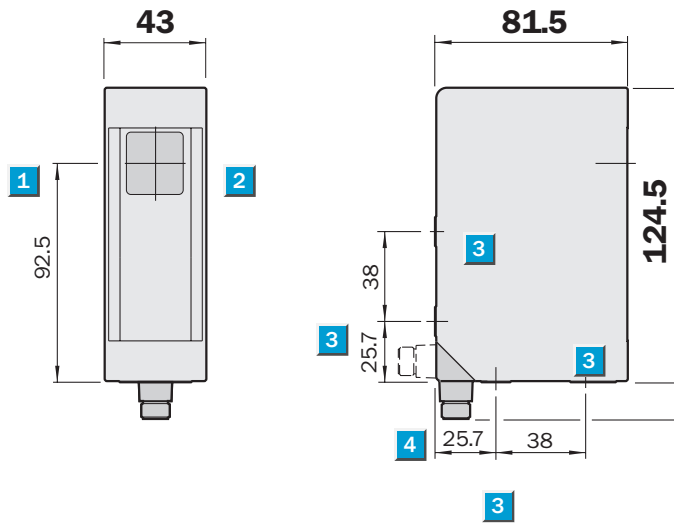
Adjustments possible

DMP2-P11111
DMP2-N11111
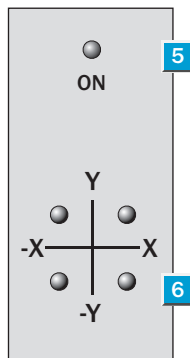
ON

Y
-X ——— X
-Y

1	Middle of the optic axis
2	Receiver
3	Threaded mounting hole M6, 8 mm deep
4	Connection plug M12, 8-pin, 90° rotatable
5	Power indicator
6	Alignment aid

Connection type

DMP2-P11111
DMP2-N11111

8-pin, M12

wht	1	AT
brn	2	L+
grn	3	Q_{AX}
yel	4	Q_{AY}
gra	5	NC
pnk	6	Q
blu	7	M
red	8	Q_R

Technical data	DMP2	-P 11111	-N 11111								
Scanning range	200 ... 2,000 mm	▨	▨								
	(depending on reflector)										
Repetition accuracy RW	0.15 mm (at 300 mm RW)	▨	▨								
Scanning angle	± 10° in all axis vertical to the	▨	▨								
	reflector (PL22, PL50A, PL80A)										
Light sender [1], light source	LED, red light	▨	▨								
Supply voltage V_S [2]	18 ... 30 V DC	▨	▨								
Ripple [3]	< 5 V_{PP}	▨	▨								
Current consumption [4]	< 250 mA	▨	▨								
Switching outputs	PNP: HIGH = V_S – ≤ 2 V/LOW = 0 V	▨									
	NPN: HIGH = V_S/LOW ≤ 2 V		▨								
Operating mode	Permanent or synchronised	▨	▨								
	can be selected										
Blanking input AT											
Blanked (triggered)	PNP: > 18 V ... < V_S max.	▨									
	NPN: 0 V ... V_S (≥ 18 V)		▨								
Free-running	PNP: < 2 V or unconnected	▨									
	NPN: V_S – (≤ 2 V) or unconnected		▨								
Output current I_A max.	100 mA	▨	▨								
Analogausgang [5]	4 mA ... 20 mA (within catchment area)	▨	▨								
	3 mA (external to the catchment area)	▨	▨								
Switching frequency	250/s	▨	▨								
Response time	3 ms	▨	▨								
Connection type [6]	M12 plug, 8-pin	▨	▨								
VDE protection class [7]	▯	▨	▨								
Circuit protection [8]	A, B, C	▨	▨								
Enclosure rating	IP 67	▨	▨								
Ambient temperature [9]	Operation: –25 ... +55 °C	▨	▨								
	Storage: –25 ... +75 °C	▨	▨								
Shock resistance	According to IEC 68	▨	▨								
Weight	Approx. 990 g	▨	▨								
Housing material	Zinc	▨	▨								

[1] Average service life 100,000 h (at T_A = 25 °C)
[2] Limit values, reverse-polarity protected
[3] Must be within V_S tolerances
[4] Without load
[5] With $R_{L\,max.}$ = 700 Ω
[6] With light/dark ratio 1 : 1, no time delay
[7] With resistive load
[8] Reference voltage 50 V DC
[9] Do not bend cable below 0 °C
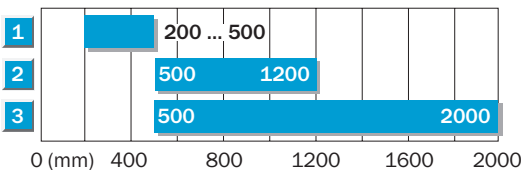
Scanning range

1	200 ... 500	
2	500 1200	
3	500 2000	

0 (mm) 400 800 1200 1600 2000

1	Scanning range on reflector PL22
2	Scanning range on reflector PL50A
3	Scanning range on reflector PL80A
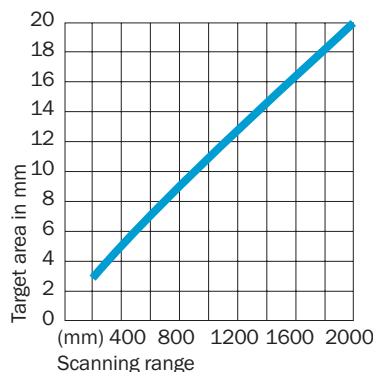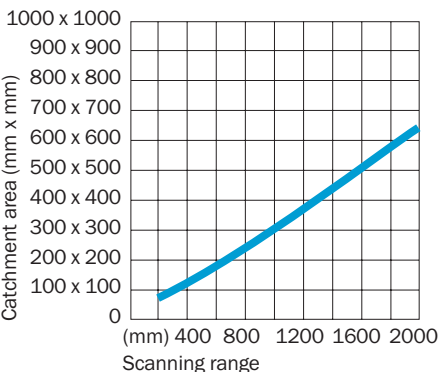
Order information

Type	Order no.
DMP2-P11111	1016235
DMP2-N11111	1016236

Catchment area (mm x mm): 1000 x 1000, 900 x 900, 800 x 800, 700 x 700, 600 x 600, 500 x 500, 400 x 400, 300 x 300, 200 x 200, 100 x 100, 0 — Scanning range (mm) 400 800 1200 1600 2000

Target area in mm: 20, 18, 16, 14, 12, 10, 8, 6, 4, 2, 0 — Scanning range (mm) 400 800 1200 1600 2000

Toleranzbereich / Tolerance
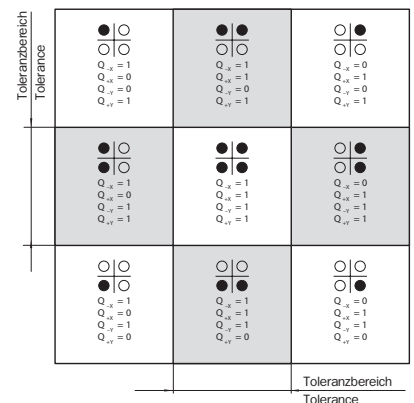
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