

SOTO 2.1

SOTO Datasheets

A mobile robot for industrial intralogistics:

SOTO takes over the intelligent handling and transport of KLTs in your warehouse and production environment.



General Information

Robot Data

Physical footprint (L × W)	2230 × 1060 mm
Virtual footprint (L × W)	2500 × 1310 mm
Height (in operation)	2240 mm (laser scanner extended)
Height (in transport)	2160 mm (laser scanner retracted)
Drive Mechanism	omni-directional drive
Maximum Speed	1.5 m/s
Battery	8 x Li-Ion, 25.6V, 21Ah each
Run Time without charging	up to 8 hours
Recharge Time	1.6 hours (5:1 ratio)
Battery Life Cycles	8000 (battery cell nominal)
Empty Weight (depends on backpack configuration)	686 kg – 735 kg 695 kg with default configuration
Maximum Payload (depends on backpack configuration)	200 kg – 249 kg 240 kg with default configuration
User interface	2 touch displays, LEDs

Operating area of the robot

Min. width for safe speed (0.3 m/s)	1650 mm
Min. width for maximum speed	2510 mm
Min. gripping height – frontal	500 mm
Min. gripping height – lateral	400 mm
Max. gripping height	1600 mm

Supported KLTs

Supported dimensions (L × W)	300 × 200 mm, 400 × 300 mm, 600 × 400 mm (tolerance: -1%/+0%)
Supported heights (W > H)	80 – 320 mm (no sticking out objects), the width must always be greater than the height
Max. number of KLTs per robot	8 (600×400 mm) – 24 (300×200 / 400×300 mm)
Supported standards	VDA 4500 (R-KLT, RL-KLT) and comparable KLTs



Supported KLTs

Alternative load carriers	E.g. made of EPP and cardboard must be checked in individual cases
Max. weight per KLT	20 kg (homogeneously distributed)
Center of gravity of the payload	max. 2/3 to one side
Rotation of KLT inside the robot	+/- 180° and +/- 90°

KLT identification

Types of identification codes on objects	QR, DataMatrix, and Code128
Min. line width of 1D barcodes	0.33 mm
Min. module width of 2D barcodes	0.33 × 0.33 mm
Max. alignment tolerances of 1D barcodes	0° / 90° +/- 10°
Max. tolerance in alignment of 2D barcodes	+/- 180°
Label surface condition	non-reflective

Miscellaneous

Safety features	Safe operation next to people due to certified safety components, 2D laser scanners, and 3D cameras for dynamic collision avoidance
Interface	Integration via VDA 5050 possible, alternatively connection of Magazino fleet manager via standardized REST interface to the WMS



Environment

Corridors		Recommended	Minimum
Width to drive slow (one lane)	A	1800 mm	1650 mm
Width to drive fast (one lane)	B	2800 mm	2510 mm
Width of dead ends		3500 mm	1650 mm
Width to drive slow (two lanes)	C	4000 mm	3100 mm
Width to drive fast (two lanes)		5500 mm	4520 mm
Height of passage during operation	L		2280 mm
Size of an L-intersection (equal aisles)	D × E	2400 mm × 2400 mm	2150 mm × 2150 mm
Size of an L-crossing for the smallest corridor	D × E	3000 mm × 1800 mm	2650 mm × 1650 mm
Size of an L-intersection (formula)		D > 1800 E > 1800 D + E > 4800	D > 1650 E > 1650 D + E > 4300
Turning circle	F	3500 mm	3100 mm

Corridors must be kept free at every height. In particular, shelf adapters must be considered when measuring corridor width.

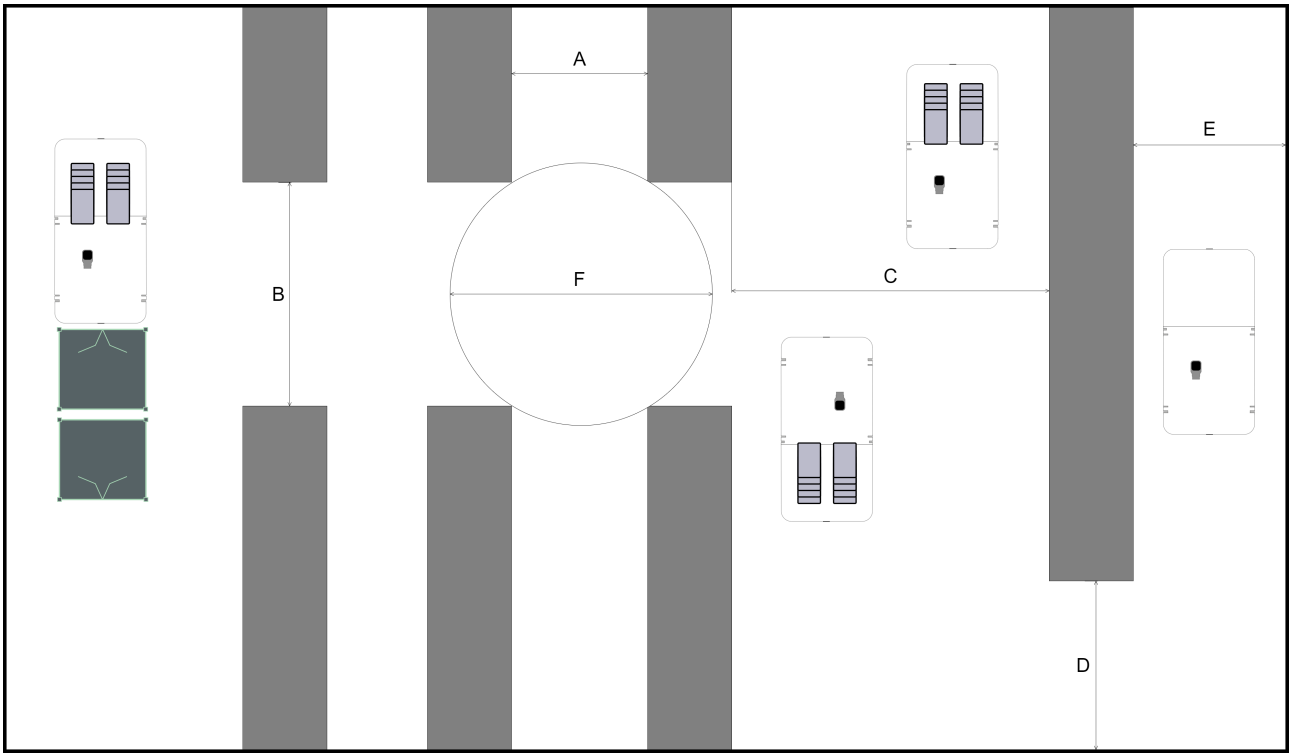
Floor		Recommended	Maximum
Load capacity (max. weight)			1000 kg
Gap width in the floor for driving over	G	0 mm	10 mm
Height of passable floor unevenness	H	0 mm	5 mm
Max. floor inclination	I	0°	0°
Condition		dry	

Additional floor properties according to DIN 18202 – Industrial floors

Operating Conditions

Temperature Range	15 °C – 25 °C
Max. Temperature (short term, up to 1h)	40 °C
Air Moisture	< 95%, non-condensing
Illumination	no direct “horizontal” light source





Grasping

Min. grasping height, lateral grasping	J	400 mm
Min. grasping height, frontal grasping		500 mm
Max. grasping height for KLT, lateral grasping	K	1600 mm
Max. grasping height for KLT, frontal grasping		1600 mm

Obstacles

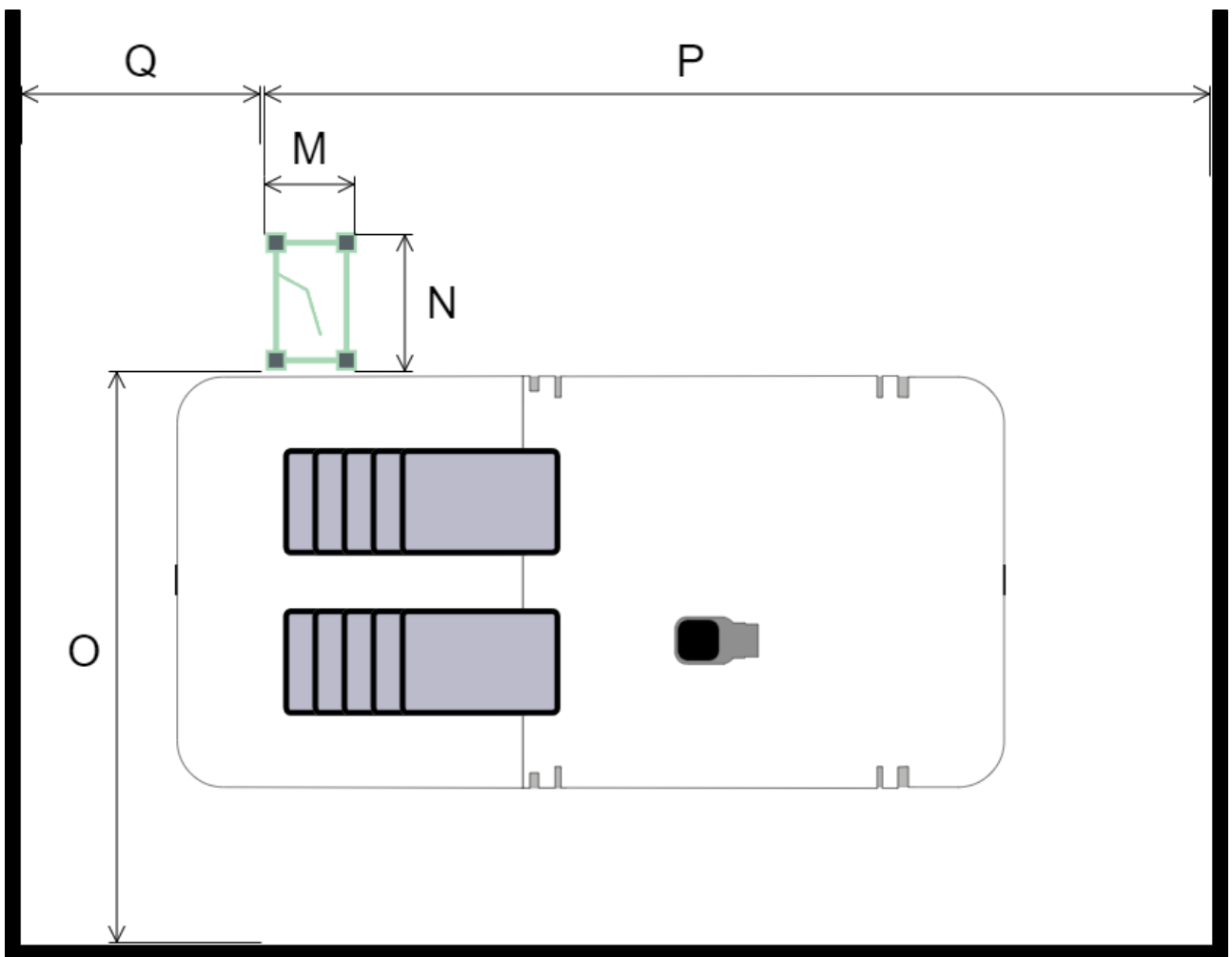
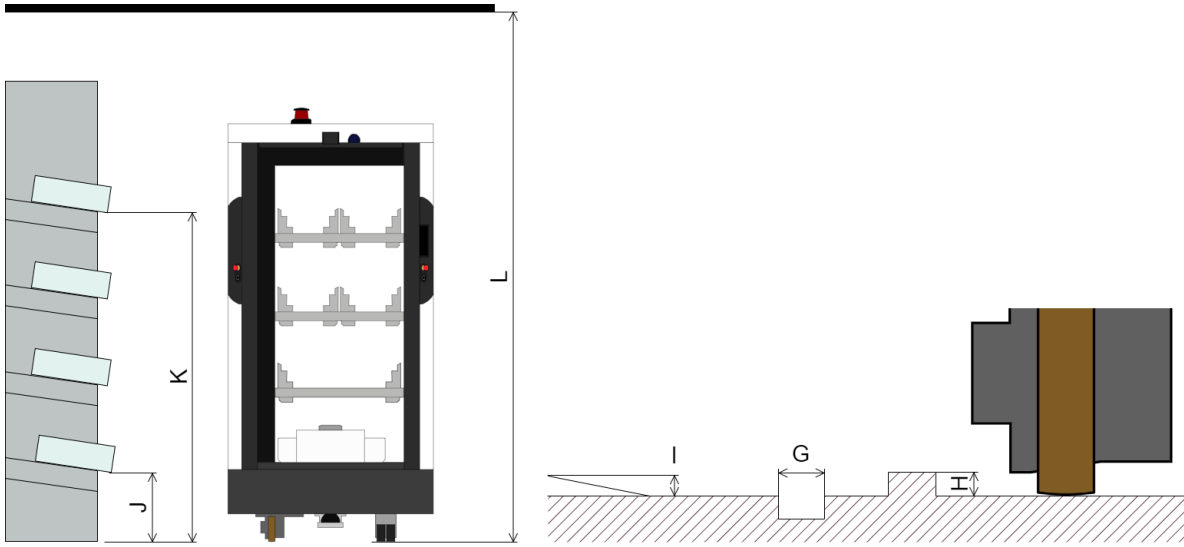
Laser scanner height		120 mm
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Charger

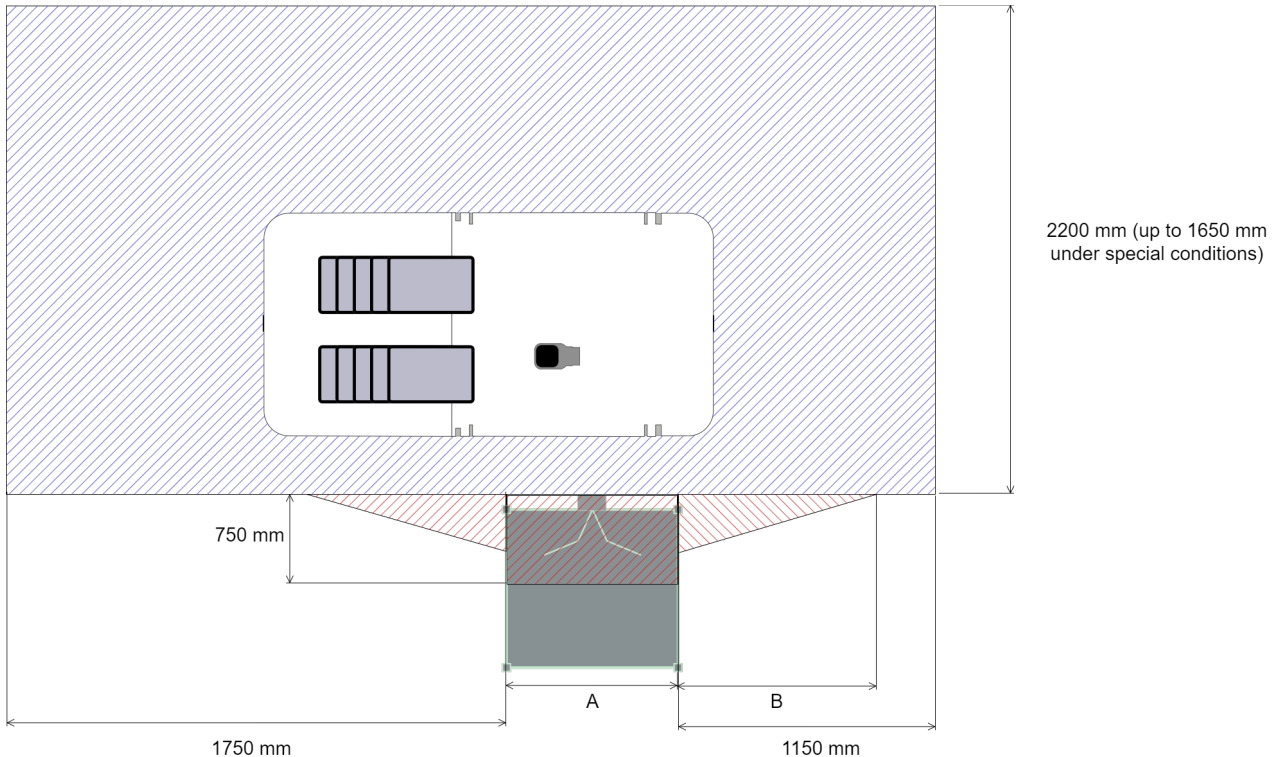
Charger width	M	450 mm
Charger depth	N	800 mm
Minimum depth in front of the charging station (with rotation / without rotation)	O	3000 mm / 1800 mm
Minimum space on the right side of the charging station	P	2575 mm
Minimum space on the left side of the charging station	Q	875 mm

The charger is used as a reference point for localization. It must be bolted to the ground.





Areas to be kept clear



Pictogram	Meaning
	<p>Navigational Space</p> <p>The area should be kept clear. Obstacles in this area can interfere with the robot when approaching the handover station.</p>
	<p>Free Space</p> <p>The area must be kept clear. Obstacles in this area will interfere with the robot approaching the handover station and may prevent docking.</p>
	<p>Handover Station</p> <p>If Bottom Docking is used:</p> <ul style="list-style-type: none"> • If $A \sim 500 \text{ mm} - 1150 \text{ mm}$, then $B = 200 \text{ mm}$. • If $A \sim 1150 \text{ mm} - 1400 \text{ mm}$, then $B = 320 \text{ mm}$. • If $A > 1400 \text{ mm}$, then no free space is needed. <p>If Top Docking is used:</p> <ul style="list-style-type: none"> • If $A \leq 2000 \text{ mm}$, then $B = 100 \text{ mm}$. • If $A > 2000 \text{ mm}$, then $B = 220 \text{ mm}$. <p>B denotes the space to be kept free at the respective height of the docking shape.</p>

Handover Solution

Grasping

Min. grasping height, lateral	A	400 mm
Min. grasping height, frontal	A	500 mm
Max. grasping height for KLT, lateral	B	1600 mm
Max. grasping height for KLT, frontal	B	1600 mm
Max. dimensions of pillar	C	30 mm × 30 mm
Min. width of the handover station		535 mm
Max. width of the handover station		2500 mm
Max. lateral offset between real and modeled position of the handover station		+/- 200 mm
Max. angular offset between real and modeled position of the handover station		+/- 5°

Pick-up Interface

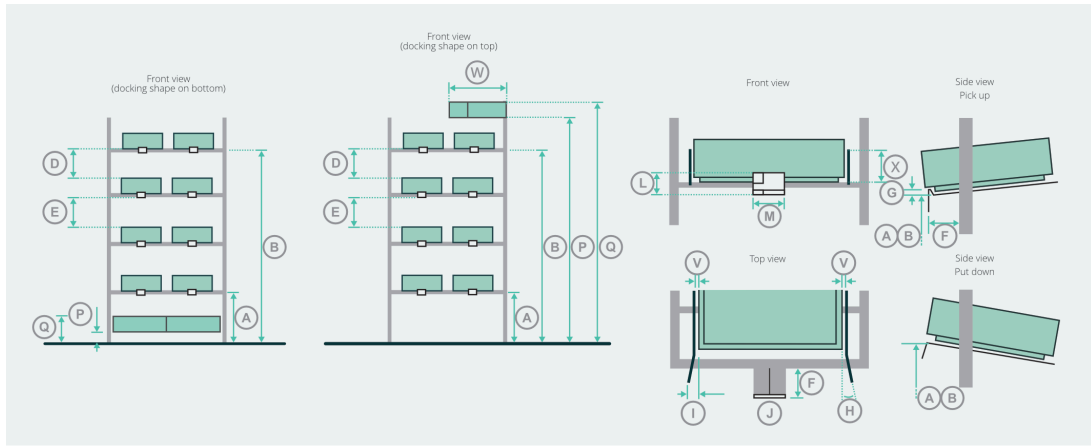
Min. free space below the bottom edge of the item	D	80 mm
Min. free space above the top edge of the item	E	60 mm
Min. depth for the conveyor gripper	F	100 mm
Clearance between KLT and guide rail	V	Max. 5 mm (every side)
Measuring line for adapter distance	J	Center of the adapter
Max. stopper height flow rack	G	20 mm
Max. stopper height conveyor	G	10 mm

Put-down Interface

Opening angle of the funnels to the front	H	10°
Min. width of the funnel to the side	I	7.5 mm
Min. funnel height	X	120 mm
Min. free space above the top edge of the item	E	30 mm
Min. space between KLT and guiding rail	V	5 mm (each side)
Measuring line for adapter distance	J	Center of the adapter

The Panel must be the most protruding part.





1 | For dimensions without tolerance specification, DIN ISO 2768-mK applies



Identification Panel

Height	L	60 mm
Width	M	80 mm (30 mm if compartment width < 200 mm)
Size of the 2D code (printed area)		25 × 25 mm (+/- 0.2 mm)
Position of the 2D code		Upper left edge
Surface properties of the barcode		non-reflective
Size of the reflective tape		15 × 30 mm
Position of the reflective tape		Lower left edge

Bottom docking shape (frontal picking)*

Max. width of the poles obstructing the Shape		30 mm
Shape		V-Shape
Angle of the shape	N	135°
Depth of the shape	O	100 mm
Position of the shape		Centered under the shelf
Surface of the shape		Matt white
Lower edge of the shape	P	70 mm
Upper edge of the shape	Q	170 mm
Distance adapter to the front edge of the shape	R	350 mm
Height for driving underneath	S	>400 mm

Bottom docking shape (lateral picking)

Shape		Star-Shape (consists of two V-shapes)
Frontal opening angle	T	45° (if width of shelf > 680 mm)
Position of the shape		Centered under the shelf
Distance adapter to the front edge of the shape	U	100 mm

Top docking shape (frontal* and lateral picking)

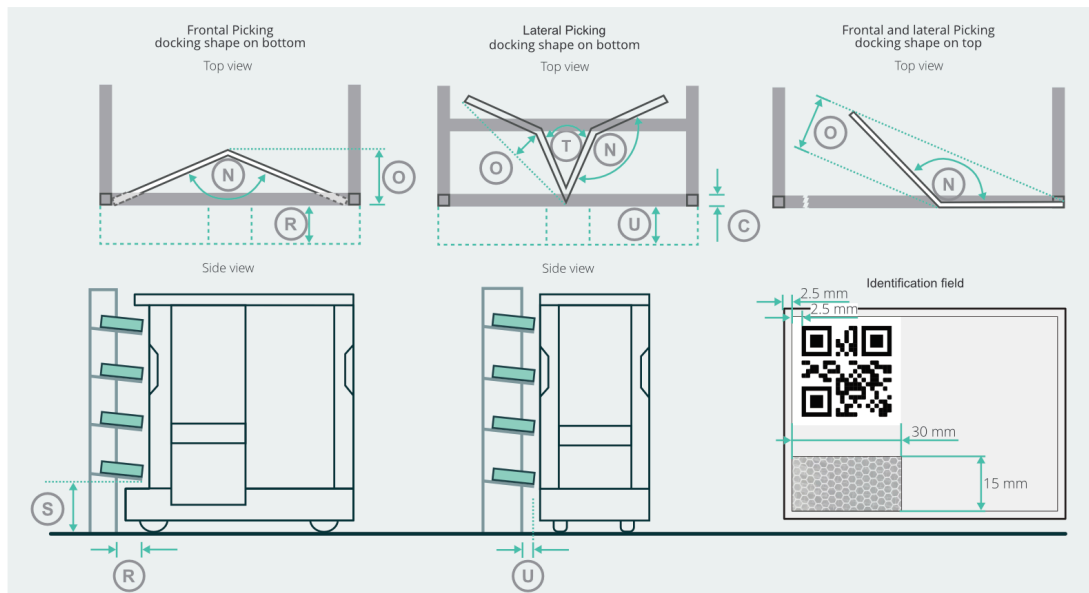
Max. width of the poles obstructing the Shape		30 mm
Shape		V-Shape
Angle of the shape	N	135°



Top docking shape (frontal* and lateral picking)

Position of the shape		Front left or front right side of the shelf (parallel to the front)
Surface of the shape		Matt white
Lower edge of the shape	P	2170 mm
Upper edge of the shape	Q	2270 mm
Width of the shape on top of the shelf	W	446 mm
Distance adapter to the front edge of the shape	R	350 mm (frontal picking)
Distance adapter to the front edge of the shape	U	100 mm (lateral picking)

*Only for single, vertically stacked compartments.



2 | For dimensions without tolerance specification, DIN ISO 2768-mK applies



Obstacle Avoidance

Obstacles

Minimum obstacle size (L × W × H)		100 × 50 × 50 mm
Minimum height above the ground	A	70 mm
Effective range in the direction of travel	B – C	700 mm – 2700 mm
Materials		Metal (matt), plastic, paper, and cardboard
Light source		Laser, invisible, infrared, 850 nm, ± 5 nm
Laser class		1, λ: 850 nm, P ₀ < 17 mW, t < 25 ns (EN 60825-1:2007 (Ed.2), EN 60825-1:2007 (Ed.2)) IEC 60825-1:2014 EN 60825-1:2014
Note		Obstacle detection is used to navigate around obstacles outside the field of view of the laser scanners. Obstacle detection is not part of the safety concept.

