



## Automated Reach Truck

# R-MATIC (based on R16 HD)

Capacity 1.6 t | Series 1120

### Precise and reliable automation solution for high rack warehouses

- Benchmark with the smallest working aisle width in automated operation
- Unique 3D camera for optimal load detection
- Storage and retrieval up to a height of 11 meters
- 360 degree safety monitoring to detect people or obstacles in the work area
- SLAM (Simultaneous Localization And Mapping) without additional infrastructure

# TECHNICAL DATA (According to VDI 2198)

	1.1		Linde	Linde	Linde	Linde	
	Manufacturer						
Characteristics	1.2	Model	R 16 HD automated config. 1	R 16 HD automated config. 2	R 16 HD automated config. 3	R 16 HD automated config. 4	
	1.2a	Series	1120	1120	1120	1120	
	1.3	Power Unit	Battery	Battery	Battery	Battery	
	1.4	Operation	Automatic	Automatic	Automatic	Automatic	
	1.5	Load capacity/Load	Q (t)	1.6	1.6	1.6	1.6
	1.6	Load centre	c (mm)	500/600	500/600	500/600	500/600
	1.8	Axle Centre to fork face	x (mm)	342	342	342	170
	1.9	Wheel base	y (mm)	1453	1453	1453	1453
	Wheels/Tyres	3.1	Tyres rubber, SE, Pneumatic, Polyurethane	Polyurethane	Polyurethane	Polyurethane	Polyurethane
3.2		tyre size, front	(mm)	Ø 360 × 130	Ø 360 × 130	Ø 360 × 130	Ø 360 × 130
3.3		tyre size, rear	(mm)	Ø 285 × 100	Ø 285 × 100	Ø 285 × 100	Ø 285 × 100
3.5		Wheels, number front/rear (x = driven)		1x/2	1x/2	1x/2	1x/2
3.7		Track width, rear	b11 (mm)	1167	1167	1167	1167
Dimensions		4.1	Mast/fork carriage tilt, forward/backward	a/b(°)	0/0	0/0	0/0
	4.2	Height of mast lowered	h1 (mm)	2980	3530	3880	4930
	4.3	free lift	h2 (mm)	1774	2324	2674	3725
	4.4	Lift	h3 (mm)	6879	8479	9679	11379
	4.5	Height of mast, extended	h4 (mm)	7965/8414	9565/10014	10765/11214	12465/12914
	4.7	Height of overhead Guard (cabin or A-frame)	h6(mm)	2495	2495	2495	2495
	4.8	Height of seat/stand on platform	h7 (mm)	910 – 1040	910 – 1040	910 – 1040	910 – 1040
	4.10	Height of reach legs	h8 (mm)	307.5 – 348	307.5 – 348	307.5 – 348	307.5 – 348
	4.19	Overall Length	l1 (mm)	2475	2475	2475	2647
	4.20	Length to fork face	l2 (mm)	1370	1370	1370	1542
	4.21	Overall width front	b1/b2 (mm)	1290/1570	1290/1570	1290/1570	1290/1570
	4.22	Fork dimensions DIN ISO 2331	s/e/l (mm)	45 × 100 × 1150	45 × 100 × 1150	45 × 100 × 1150	45 × 100 × 1150
	4.23	Fork carriage to ISO 2328, class/type A, B		ISO 2B	ISO 2B	ISO 2B	ISO 2B
	4.24	Width of fork carriage	b3 (mm)	937	937	937	937
	4.25	Fork spread	b5 (mm)	471/710	471/710	471/710	471/710
	4.26	Distance between wheel arms/loading surfaces	b4 (mm)	920	920	920	920
	4.28	Reach Travel	l4 (mm)	537	537	537	365
	4.31	Ground Clearance, below mast	m1 (mm)	40	40	40	40
	4.32	Ground Clearance, centre of wheelbase	m2 (mm)	44	44	44	44
4.34.1	Aisle width for Pallets 1000 × 1200 crossways (AUTOMATIC) <sup>1)</sup>	Ast (mm)	3100	3100	3100	3250	
4.34.2	Aisle width for Pallets 800 × 1200 along forks (AUTOMATIC) <sup>2)</sup>	Ast (mm)	3000	3000	3000	3200	
4.35	front Turning Radius auto mode	Wa_auto (mm)	1808	1808	1808	1808	
4.37	Length of Chassis	l7 (mm)	1872	1872	1872	1872	
Performance	5.1	Travel Speed, (forward/backward)	(m/s)	1.95/0.75	1.95/0.75	1.95/0.75	1.95/0.75
	5.2	Lifting speed, with/without load	(m/s)	0.52/0.66	0.52/0.66	0.52/0.66	0.52/0.66
	5.3	Lowering speed with/without load	(m/s)	0.55/0.44	0.55/0.44	0.55/0.44	0.55/0.44
	5.4	Reach speed, with/without load	(m/s)	0.2	0.2	0.2	0.2
	5.8	Maximum Climbing ability, with/without load	%	44258	44258	44258	44258
	5.10	Service brake		hydr./mech.	hydr./mech.	hydr./mech.	hydr./mech.
Drive	6.1	Drive motor rating S2 60 min	(kW)	6.5	6.5	6.5	6.5
	6.2	Lift Motor Rating at S3 15 %	(kW)	14	14	14	14
	6.3	Battery according to DIN 43531/35/36/A, B, Cn no		3/3	3/3	3/3	3/3
	6.4	Battery voltage/rated capacity	(V/Ah)	48/560	48/560	48/560	48/700
	6.5	Battery weight (± 5 %)	(kg)	896	896	896	939
	6.6	Power consumption in relation to VDI Cycle (15 cycles/1 h)	(kWh/h)	1.59	1.59	1.59	1.59

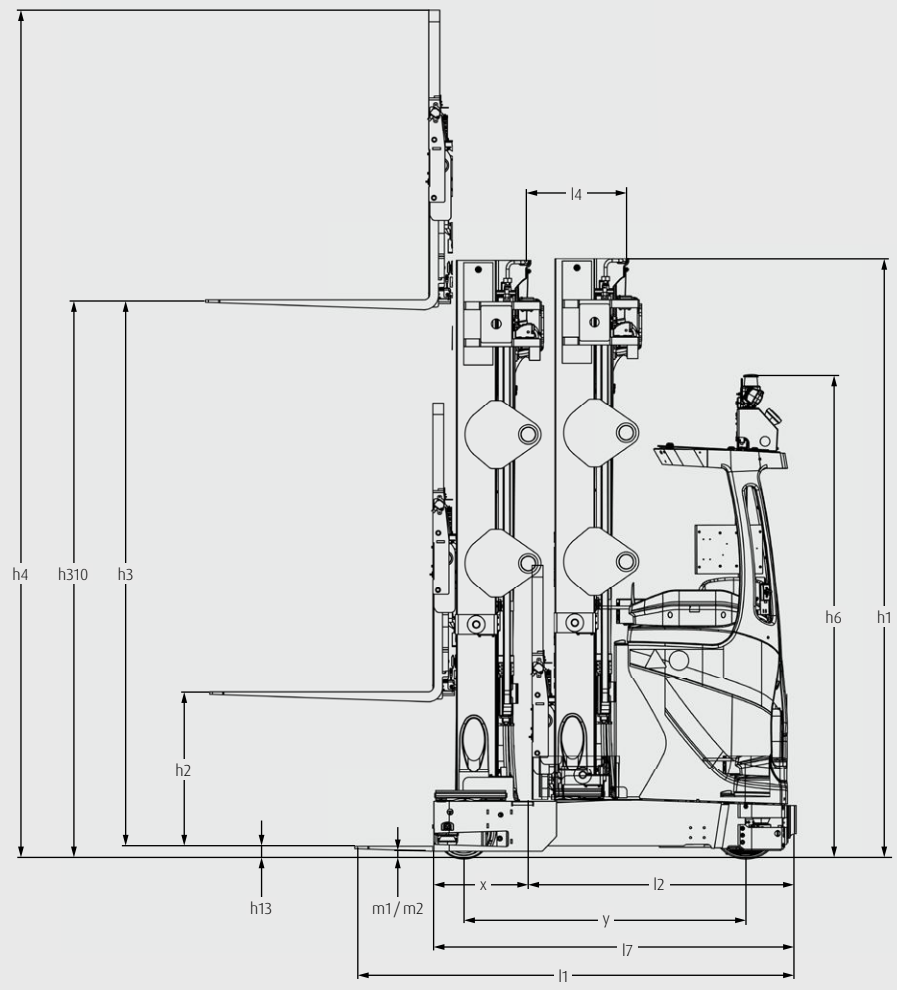
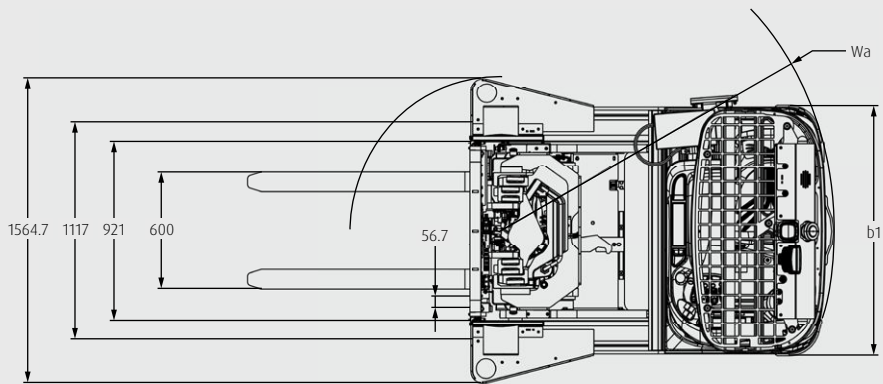
1) Depends on customer project conditions

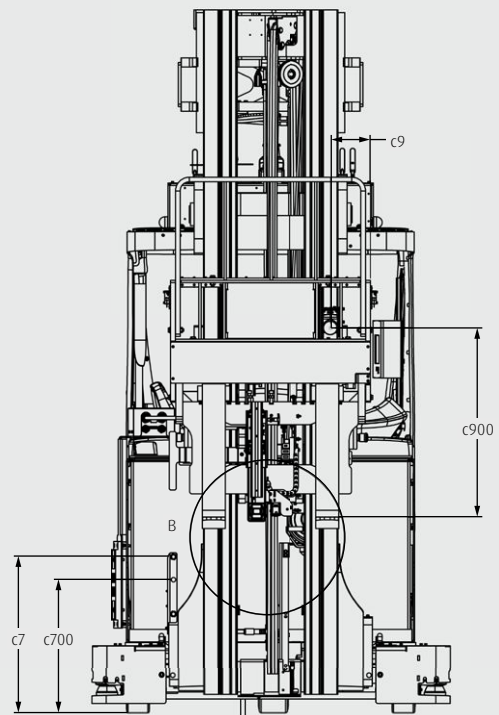
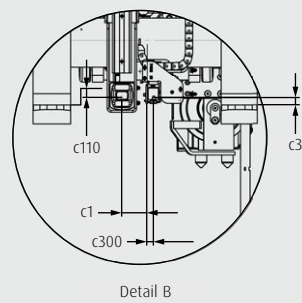
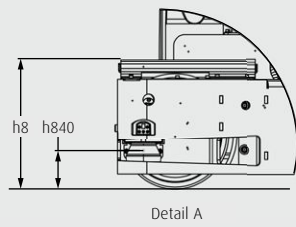
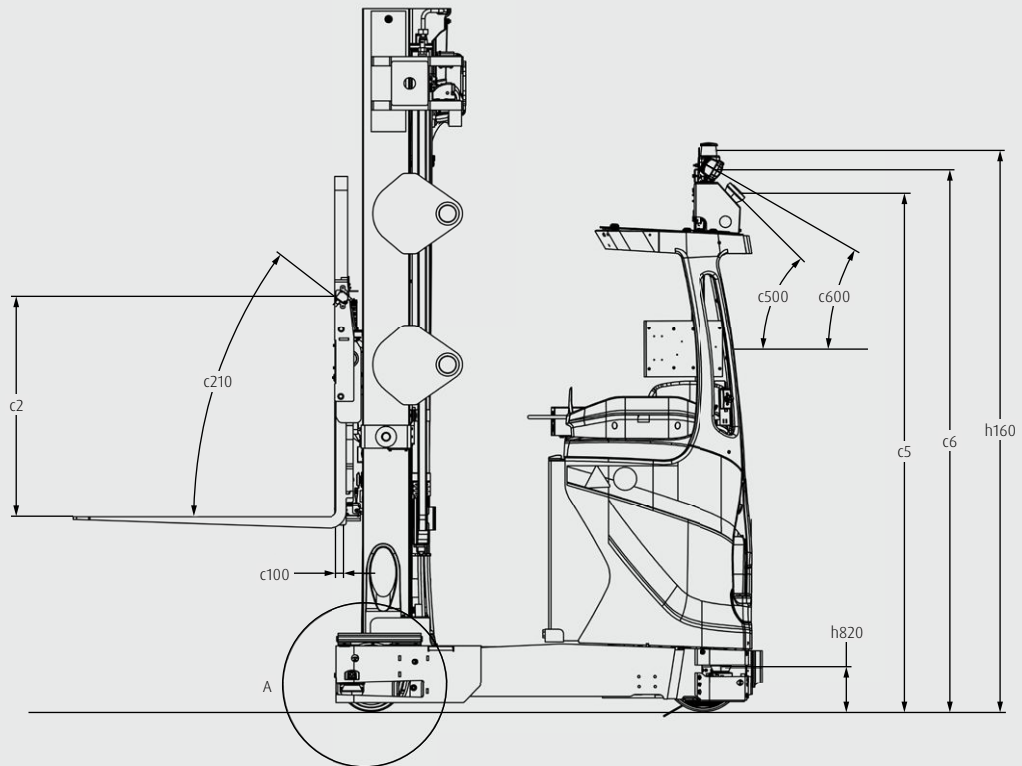
2) Max. 25 mm overhang included

# TECHNICAL DATA (According to VDI 2198)

	Manufacturer	Linde	Linde	Linde	Linde	
	Model	R 16 HD automated config. 1	R 16 HD automated config. 2	R 16 HD automated config. 3	R 16 HD automated config. 4	
Dimensions AGV	Power Unit Compartment size	4 PZS	4 PZS	4 PZS	5 PZS	
	Mast	6955 / 2980 / 1850	8555 / 3530 / 2400	9755 / 3880 / 2750	11455 / 4930 / 3800	
	Maximum forks height	h310 (mm)	6924	8524	9724	11424
	Backrest Height	h900 (mm)	1041 / 1490	1041 / 1490	1041 / 1490	1041 / 1490
	Maximum drop height	(mm)	6524	8124	9324	11024
	Maximum pick height	(mm)	6774	8374	9574	11274
	Localisation sensor scan height	h610 (mm)	2476	2476	2476	2476
	Front Safety Scan height	h810 (mm)	195	195	195	195
	Lateral Safety Scan height	h820 (mm)	195	195	195	195
	Rear Safety Scan height	h840 (mm)	103	103	103	103
	Rear Turning Radius (800/1000/1200 load width) auto mode	Wb_auto (mm)	1002 / 1065 / 1065	1002 / 1065 / 1065	1002 / 1065 / 1065	1137 / 1184 / 1184
	Front Turning Radius auto mode	Wa_auto (mm)	1808	1808	1808	1808
	Overall length manual	l1 (mm)	2476	2476	2476	2476
	Length to fork face	l2 (mm)	1370	1370	1370	1542
	Reach travel	l4 (mm)	537	537	537	365
	Ground clearance, below mast	m1 (mm)	40	40	40	40
	Ground clearance, centre of wheelbase	m2 (mm)	44	44	44	44
	Side shift actuator stroke	± mm	80	80	80	80
	Accuracy AGV	Lift control accuracy	± mm	10	10	10
Sideshift control accuracy		± mm	5	5	5	5
Truck longitudinal positioning precision at standstill		± mm	20	20	20	20
Truck lateral positioning precision at standstill		± mm	20	20	20	20
Speed AGV	Sideshifting speed	(m/s)	0.1	0.1	0.1	0.1
	Maximal Lateral Speed, with / without load	(m/s)	0.45 / 0.45	0.45 / 0.45	0.45 / 0.45	0.45 / 0.45
Detection devices AGV	Distance 3D camera to median plan	c1 (mm)	63	63	63	63
	Distance 3D camera to the backrest	c100 (mm)	26	26	26	26
	Distance 3D camera to the top of the forks	c110 (mm)	190	190	190	190
	Distance overhang sensors to the top of the forks	c2 (mm)	1432	1432	1432	1432
	Overhang sensors centerline distance	c200 (mm)	907	907	907	907
	Overhang sensors projection distance	c210 (mm)	1150	1150	1150	1150
	Distance rangefinder to median plan	c3 (mm)	11 (0...31)	11 (0...31)	11 (0...31)	11 (0...31)
	Distance rangefinder to median plan	c300 (mm)	20	20	20	20
	Distance vertical rangefinder to top of the forks	c4 (mm)	370	370	370	370
	Distance vertical rangefinder to median plan	c400 (mm)	56	56	56	56
	Curtain laser height	c5 (mm)	2272	2272	2272	2272
	Curtain laser projection distance	c500 (mm)	2530	2530	2530	2530
	Bluespot™ height	c6 (mm)	2361	2361	2361	2361
	Bluespot™ projection distance	c600 (mm)	4000	4000	4000	4000
	Inductive sensor "high" height	c7 (mm)	682	682	682	682
Barcode reader 1D / 2D, position 1	c9 / c900 (mm)	80 / 876	80 / 876	80 / 876	80 / 876	
Barcode reader 1D / 2D, position 2	c9 / c900 (mm)	80 / 932	80 / 932	80 / 932	80 / 932	
Barcode reader 1D / 2D, position 3	c9 / c900 (mm)	788 / 876	788 / 876	788 / 876	788 / 876	
Barcode reader 1D / 2D, position 4	c9 / c900 (mm)	788 / 932	788 / 932	788 / 932	788 / 932	







# MAST TABLES

## TRIPLEX MAST (in mm)

Series	1502							
Lift	h3: 6879		h3: 8479		h3: 9679		h3: 11379	
Height measurements	h1: 2980 h3: 6879	h2: 1774 h4: 7965	h1: 3530 h3: 8479	h2: 2324 h4: 9565	h1: 3880 h3: 9679	h2: 2674 h4: 10765	h1: 4930 h3: 11379	h2: 3725 h4: 12465
Model								
R16 HD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Standard equipment     
  Optional equipment

**h1:** Height of mast, lowered

**h2:** Free lift

**h3:** Lift

**h4:** Height of mast, extended

# STANDARD AND OPTIONAL EQUIPMENT

Model/Equipment		R16 HD
Off Board Software	Advanced routing algorithm	●
	Editor for integration of different rack types	●
	Smart AGV charging logic	○
	Interfaces to existing WMS, ERP, ...	●
	Interfaces with infrastructure: doors, conveyors, ...	●
	Linde WMS system	○
	Mail information on AGV performance	●
On Board Software	Load detection via 3D point cloud analysis	●
	SLAM navigation	●
	User friendly Log-file analysis	●
	Self-calibration algorithm	●
Safety	Anti-drag or push detection of load unit	●
	2D Curtain laser in front direction	●
	BlueSpot™ for visual warning	●
	Additional emergency buttons on Mast	●
	Safety edges to detect load tipping in curves	○
	Acoustic warning indicators	○
Load Handling	3D camera perception for load detection	●
	2D Barcode reader	○
	Overhang sensors	○
	Modular Backrest heights	○
Environment	Wifi Communication	●
	HMI - User Monitor in cabin	●
	Communication Box (ComBox)	●
Mast/ Forks	4 × Standard Triplex mast	○
	ISO forks	●
	Other masts and forks as customer option	○
Energy	Lead Acid battery for manual charging	●
	TPPL battery for automated charging	○

● Standard equipment

○ Optional equipment



Customer process focus as a standard

### Sales and Realization

- Project specific concept design of the automated solution including dynamic simulation and proof of concept on site if necessary
- Combination of manual handling processes and degree of automation can be optimized to fit the customer needs
- One face to the customer for the whole process from first contact to the lifecycle phase
- Intelligent, scalable software solutions to provide customers best control on their processes
- Project Management and Commissioning according to Linde standards with unified tools and templates in the entire network
- Realization expertise for project steering since 2015 with more than 600 installed AGV's

## CHARACTERISTICS



360 degree safety

### Safety

- 360° safety concept for personal protection all around the vehicle
- 2D curtain laser in front of the vehicle to detect higher obstacles
- Real time speed-adaptive detection fields
- Mixed environment with operators and other trucks



Unique 3D load-perception

### Handling

- Multiple loads type handling through innovative 3D camera perception
- Proven reliability for application up to 24/7
- Optimized pick and drop processes
- Speed adjustments according to environmental situations
- Touch screen with easy user interface
- Overall control software for task, traffic and energy management



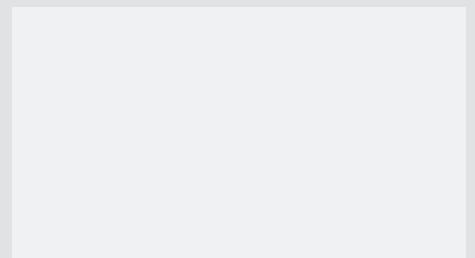
Low maintenance design

### Service

- AGVs based on robust and well known LMH base trucks
- Service coverage by existing LMH network supplemented by central hotline support
- Mostly use of standard (customer / AGV independent) spare parts
- Improved stocking concept, reduced costs (compared to other AGV solutions)

Subject to modification in the interest of progress. Illustrations and technical details could include options and not binding for actual constructions. All dimensions subject to usual tolerances.

Presented by:



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