

# MS series

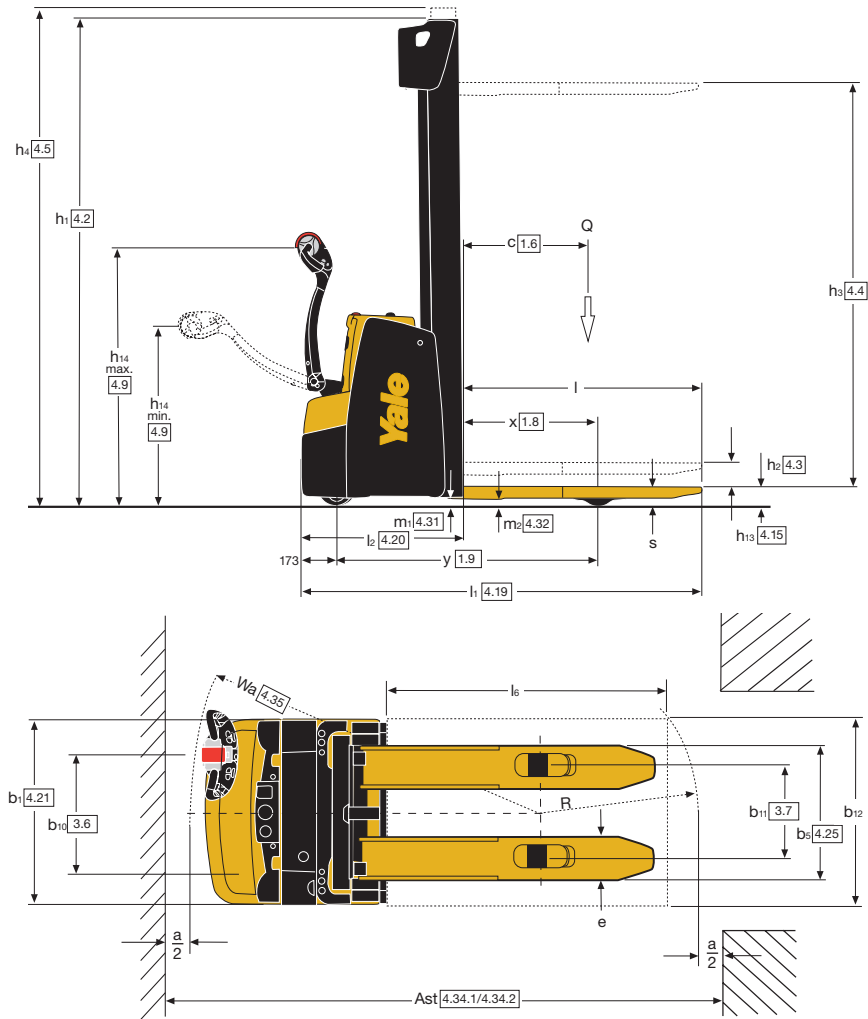
1,000kg / 1,200kg / 1,400kg / 1,600kg /  
2,000kg

## Pedestrian High Lift Stacker



- Vertically mid-mounted, horizontally off-set tiller arm
- Dual lift/lower controls on tiller head
- Excellent through-mast visibility
- Robust chassis design

## Truck Dimensions



## Mast details - MS10, MS12, MS14, MS16, MS16SL

Mast type	Model		$h_3$ (mm)	$h_2$ (mm)	$h_1$ <sup>(1)</sup> (mm)	$h_4$ <sup>(2)</sup> (mm)	Weight <sup>(3)</sup> (kg)			
2 stage NFL	MS12 MS14 MS16	MS10	2800	100	1900 <sup>(4)</sup>	3328	329			
			3000	100	2000 <sup>(4)</sup>	3528	343			
			3200	100	2100	3728	356			
			3400	100	2200	3928	369			
			3600	100	2300	4128	382			
			3800	100	2400	4328	395			
			4000	100	2500	4528	409			
2 stage FFL	MS12 MS14 MS16	MS10	4200	100	2600	4728	422			
			2740	1418	1850 <sup>(4)</sup>	3268	341			
			2940	1518	1950 <sup>(4)</sup>	3468	354			
			3140	1618	2050	3668	367			
			3340	1718	2150	3868	380			
			3540	1818	2250	4068	393			
			3740	1918	2350	4268	406			
3 stage FFL	MS16	MS14 MS16SL	MS12	3940	2018	2450	4468	419		
				4140	2118	2550	4668	432		
				4040	1318	1850 <sup>(4)</sup>	4606	462		
				4340	1418	1950 <sup>(4)</sup>	4906	481		
						4620	1518	2050	5186	499
						4900	1618	2150	5466	518
						5180	1718	2250	5746	537
						5460	1818	2350	6026	556
				5740	1918	2450	6306	575		
				6020	2018	2550	6586	594		

<sup>(1)</sup> With free lift of 100 mm for NFL mast.  
<sup>(2)</sup> With load backrest ( $h=1000$ ) for carriage  $h_4 + 562\text{mm}$  (2 stage mast), + 524mm (3 stage mast), + 518mm (2 ton. mast).

<sup>(3)</sup> All weights are: mast structures (weldment, cylinders, chain, pulley) + oil EXCLUDED: forks, accessories  
<sup>(4)</sup> Not available with vertical extraction of battery BS200Ah

All values are nominal values and they are subject to tolerances. For further information, please contact the manufacturer.  
 Yale products might be subject to

change without notice.  
 Lift trucks illustrated may feature optional equipment.  
 Values may vary with alternative configurations.

## VDI 2198 – General Specifications

Distinguishing mark	Yale								
	MS10	MS12	MS14	MS16	MS16SL	MS20			
1.1	Manufacturer (abbreviation)								
1.2	Manufacturer's type designation								
1.3	Drive: electric (battery or mains), diesel, petrol, fuel gas								
1.4	Operator type: hand, pedestrian, standing, seated, order-picker								
1.5	Rated capacity/Rated load	Q (t)	1.0	1.2	1.4	1.6	1.6	2.0	
1.6	Load centre distance	c (mm)	600	600	600	600	600	600	
1.8	Load distance, centre of drive axle to fork <sup>(1)</sup>	x (mm)	648	649	649	649	646	649	
1.9	Wheelbase	y (mm)	1204	1259	1259	1331	1408	1331	
Weights	2.1	Service weight <sup>(9)</sup>	kg	956	1005	1038	1145	1431	1151
	2.2	Axle loading, laden front/rear	kg	676 / 1280	708 / 1497	741 / 1697	805 / 1940	950/2081	846 / 2305
	2.3	Axle loading, unladen front/rear	kg	642 / 314	663 / 342	688 / 350	748 / 397	893/538	771 / 380
Tyres/chassis	3.1	Tyres: polyurethane, tophane, NDIIthane, front/rear		Tophane/Polyurethane	Tophane/Polyurethane	Tophane/Polyurethane	Tophane/Polyurethane	Tophane/Polyurethane	Tophane/Polyurethane
	3.2	Tyre size, front		230 x 70	230 x 70	230 x 70	230 x 70	230 x 70	230 x 70
	3.3	Tyre size, rear	ø mm x mm	85 x 100	85 x 100	85 x 70	85 x 70	85 x 70	85 x 70
	3.4	Additional wheels (dimensions)	ø mm x mm	150 x 54	150 x 54	150 x 54	150 x 54	125 x 60	150 x 54
	3.5	Wheels, number front/rear (x = driven wheels)	ø mm x mm	1x + 1/ 2	1x + 1/ 2	1x + 1/ 4	1x + 1/ 4	1x+1/4	1x + 1/4
	3.6	Tread, front	b <sub>10</sub> (mm)	510	510	510	510	522	510
	3.7	Tread, rear	b <sub>11</sub> (mm)	400	400	400	400	968/1168/1368	400
Dimensions	4.2	Height, mast lowered	h <sub>1</sub> (mm)	2100	2100	2100	2100	2100	2100
	4.3	Free lift	h <sub>2</sub> (mm)	100	100	100	100	100	100
	4.4	Lift	h <sub>3</sub> (mm)	3200	3200	3200	3200	3200	3000
	4.5	Height, mast extended	h <sub>4</sub> (mm)	3728	3728	3728	3728	3728	3572
	4.9	Height drawbar in driving position min./max.	h <sub>14</sub> (mm)	867 / 1223	867 / 1223	867 / 1223	867 / 1223	867/1223	867 / 1223
	4.15	Height, lowered	h <sub>13</sub> (mm)	90	90	90	90	55	90
	4.19	Overall length <sup>(2)</sup>	l <sub>1</sub> (mm)	1878	1933	1933	2005	2086	2005
	4.20	Length to face of forks <sup>(2)</sup>	l <sub>2</sub> (mm)	728	783	783	855	935	855
	4.21	Overall width	b <sub>1</sub> /b <sub>2</sub> (mm)	790	790	790	790	794/1095-1295-1495	790
	4.22	Fork dimensions <sup>(14)</sup>	s/e/l (mm)	55 / 185 / 1150 <sup>(14)</sup>	55 / 185 / 1150 <sup>(14)</sup>	55 / 185 / 1150 <sup>(14)</sup>	55 / 185 / 1150 <sup>(14)</sup>	35 / 120 / 1150	65 / 185 / 1150 <sup>(14)</sup>
	4.24	Fork carriage width	b <sub>3</sub> (mm)	-	-	-	-	800 / 1000 / 1200	-
	4.25	Distance between fork-arms <sup>(9)</sup>	b <sub>5</sub> (mm)	570 <sup>(10)</sup>	570 <sup>(10)</sup>	570 <sup>(10)</sup>	570 <sup>(10)</sup>	-	570 <sup>(10)</sup>
	4.26	Distance between wheel arms/loading surfaces	b <sub>4</sub> (mm)	-	-	-	-	841-1041-1241	-
	4.31	Ground clearance, laden, below mast	m <sub>1</sub> (mm)	42	42	42	42	42	42
4.32	Ground clearance, center of wheelbase	m <sub>2</sub> (mm)	32	32	32	32	26	32	
4.33	Load dimension b <sub>12</sub> x l <sub>6</sub> crossways	b <sub>12</sub> x l <sub>6</sub> (mm)	1000 x 1200	1000 x 1200	1000 x 1200	1000 x 1200	1000 x 1200	1000 x 1200	
4.34.1	Aisle width for pallets 1200mm x 1000mm crossways	A <sub>st</sub> (mm)	2307	2359	2359	2428	2504	2428	
4.34.2	Aisle width for pallets 800mm x 1200mm lengthwise	A <sub>st</sub> (mm)	2293	2345	2345	2414	2490	2414	
4.35	Turning radius	W <sub>a</sub> (mm)	1411	1464	1464	1533	1607	1533	
Performance data	5.1	Travel speed, with/without load	km/h	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6
	5.1.1	Travel speed, laden/unladen, backwards	km/h	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6
	5.2	Lift speed, laden/unladen	m/s	0.15 / 0.23	0.17 / 0.28	0.16 / 0.28	0.14 / 0.28	0.14 / 0.28	0.10 / 0.19
	5.3	Lowering speed, laden/unladen	m/s	0.37 / 0.35	0.4 / 0.35	0.4 / 0.35	0.4 / 0.35	0.40 / 0.35	0.24 / 0.17
	5.7	Gradeability, laden/unladen	%	5.1 / 12.4	4.3 / 11.7	3.7 / 11.3	3.1 / 10.1	3.1 / 8.9	2.5 / 10.3
	5.8	Max. gradeability, laden/unladen	%	13.2 / 24.6	11.5 / 24.0	10.2 / 24.7	8.9 / 23.8	7.4 / 17.8	7.5 / 24.3
	5.10	Service brake		Electromagnetic	Electromagnetic	Electromagnetic	Electromagnetic	Electromagnetic	Electromagnetic
Electric engine	6.1	Drive motor S2 60 minute rating	kW	1.2	1.2	1.2	1.2	1.2	1.2
	6.2	Lift motor S3 15% rating	kW	2.2 <sup>(12)</sup>	3 <sup>(13)</sup>	3 <sup>(13)</sup>	3 <sup>(13)</sup>	3 <sup>(13)</sup>	3 <sup>(13)</sup>
	6.3	Battery according to DIN 43531/35 /36 A,B,C, no		no	B	B	B	B	B
	6.4	Battery voltage/nominal capacity K5	(V)/(Ah)	24V / 200Ah <sup>(4)</sup>	24V / 250Ah <sup>(5)</sup>	24V / 250Ah <sup>(6)</sup>	24V / 375Ah <sup>(7)</sup>	24V / 375Ah <sup>(8)</sup>	24V / 375Ah <sup>(7)</sup>
	6.5	Battery weight <sup>(3)</sup>	kg	185	212	212	288	288	288
	6.6	Energy consumption according to VDI cycle	kWh/wh at no. of cycles	0.68 / 0.85	0.78 / 1.0	0.89 / 1.13	0.99 / 1.13	0.99 / 1.13	0.99 / 1.13
8.1	Type of drive unit		AC-Controller	AC-Controller	AC-Controller	AC-Controller	AC-Controller	AC-Controller	
10.7	Sound pressure level at the driver's position	dB(A)	67.6 / 64	67.6 / 64	67.6 / 64	67.6 / 64	67.6 / 64	67.6 / 64	

<sup>(1)</sup> With 3 stage mast +43mm  
<sup>(2)</sup> With 3 stage mast +43mm, with 3 stage mast with load backrest +43mm, with 2 stage mast with load backrest +27mm  
<sup>(3)</sup> These values may vary of +/-5%.  
<sup>(4)</sup> Available batteries 24V / 150Ah (144kg); 24V / 150Ah Polypropylene case version (125kg); 24V / 200Ah Polypropylene case version (160kg); 24V / 100Ah Li-Ion (144kg); 24V / 200Ah Li-Ion (154kg)  
<sup>(5)</sup> Available battery 24V / 210Ah (212kg); 24V / 250Ah Polypropylene case version (180kg + ballast 32kg); 24V / 200Ah Li-Ion (211kg)  
<sup>(6)</sup> Available battery 24V / 210Ah (212kg); 24V / 315Ah (288 kg); 24V / 375Ah (288kg); 24V / 250Ah Polypropylene case version (180kg + ballast 32kg); 24V / 200Ah Li-Ion (211kg); 24V / 300Ah Li-Ion (277kg); with 315/375Ah the wheelbase is increased y=+72mm  
<sup>(7)</sup> Available battery 24V / 315Ah (288 kg); 24V / 300Ah Li-Ion (277kg)  
<sup>(8)</sup> Value referred to S3 6%  
<sup>(9)</sup> Value referred to S3 12%  
<sup>(10)</sup> With 2 stage mast and b<sub>5</sub> = 570mm the s dimension increases 5mm for first 250mm at toe  
<sup>(11)</sup> LL: load section lowered +72mm  
<sup>(12)</sup> Available battery 24V / 315Ah (288kg)  
<sup>(13)</sup> With battery 200Ah BS -60mm  
<sup>(14)</sup> With 2 stage mast and b<sub>5</sub> = 570mm the s dimension increases 5mm for first 250mm at toe

## Mast details - MS20

Mast type	Model	h <sub>3</sub> (mm)	h <sub>2</sub> (mm)	h <sub>1</sub> <sup>(1)</sup> (mm)	h <sub>4</sub> <sup>(2)</sup> (mm)	Weight <sup>(3)</sup> (kg)
2 stage NFL	MS20	2600	100	1900	3172	327
		2800	100	2000	3372	340
		3000	100	2100	3572	353
		3200	100	2200	3772	366
		3400	100	2300	3972	379
		3600	100	2400	4172	393
		3800	100	2500	4372	406
		4000	100	2600	4572	419

<sup>(1)</sup> With free lift of 100 mm for NFL mast.  
<sup>(2)</sup> With load backrest (h=1000) for carriage h<sub>4</sub> + 562mm (2 stage mast), + 524mm (3 stage mast), + 518mm (2 ton. mast).  
<sup>(3)</sup> All weights are: mast structures (weldment, cylinders, chain, pulley) + oil EXCLUDED: forks, accessories.  
**All values are nominal values and they are subject to tolerances. For further information, please contact the manufacturer. Yale products might be subject to change without notice. Lift trucks illustrated may feature optional equipment. Values may vary with alternative configurations.**

# MS series

Models: MS10, MS12, MS14, MS16, MS16SL, MS20



## Tiller head and controls

Featuring an ergonomic shaped handle and integral hand guard. Large, low-effort, butterfly buttons control direction of travel, speed and the electromagnetic brake - all without the operator's hand moving from the handle.

Left hand buttons operate slow speeds for fine positioning, right hand ones control proportional lifting and lowering, the horn is on top.

When activated, the travel direction inverter button (emergency stop), automatically reverses travel direction, stopping the truck.

The creep speed control allows functions to be operated with the tiller in the vertical position at reduced speed for manoeuvring in tight confines.

## Tiller arm

The offset mid-mounted tiller arm aids visibility, spring assisted to return automatically to vertical. Minimum steering effort is required, the long length increases operating clearance.

## Dashboard instrumentation

The dashboard's Multifunctional Display Indicator (MDI) shows operating hours, battery discharge and error codes. Key control activates the truck.

## Chassis

The drive gear and main components are fully enclosed for maximum protection by the welded chassis. The compact standard 790mm width allows load handling in tight spaces, containers or for aisle stacking.

Load arms are integrated into the strengthened base frame, heavy duty covers reduce service and repair costs over the life of the machine.

## Mast and forks

Unique mast profiles reduce mast channel width, allowing quick and easy maintenance and mast changes.

Lift cylinders and cross members are positioned for optimum visibility for critical heights with a wire mesh mast guard.

Rollers are permanently lubricated and sealed for maximum service life.

Bolt-on mast types are also available and two and three stage with full free lift.

## Battery

Batteries from 24V-150Ah to 24V-375Ah.

Battery box types available are:

- Closed – vertical battery extraction.
- Open on left side – lateral battery extraction with a roller bed.

A connector handle aids easy battery connection and disconnection.

## Wheels

Four wheel layout for control and traction with various compounds available for specific applications.

**Drive, castor and high-traction wheels:** One size drive and castor wheels.

- Standard drive and castor wheels are Topthane 92Sh – ideal for high loads, high tear resistant and high elastic impact.
- High traction wheel (Redthane 75SH), long-distance wheel (DynaRoll Black

95SH), optional NDIIthane anti-static wheelsl.

## Load wheels:

Two option sizes;

- 85mm x 98mm - single load wheel
- 85mm x 66mm - tandem load wheels

Standard load wheel is polyurethane. NDIIthane 92 – applicable for high loads, high tear resistant and high elastic impact

## Electric motors

The maintenance free 1.27kW AC drive motor delivers instant response with considerable torque - long inspection intervals provide long, low-cost operational life.

The powerful 2-3 kW DC lift motor output matches operational requirements.

## Traction – steering unit

The drive motor, connected directly to the transmission, runs in an oil bath. Mounted vertically for efficient ventilation, reducing flexing stresses to the power cables, ensuring reduced downtime.

## Hydraulic unit

The pump is driven by a heavy duty motor, inputs to it and the proportional valve are received from the controller to control lifting and lowering via the Combi MOSFET controller.

A flow control valve regulates lowering speeds, a protection valve prevents further lowering in the event of a line break.

## Electronic controls

A Combi MOSFET controller regulates traction and pump operation, automatic braking, regenerative braking and anti-roll-back/start-up on gradients.

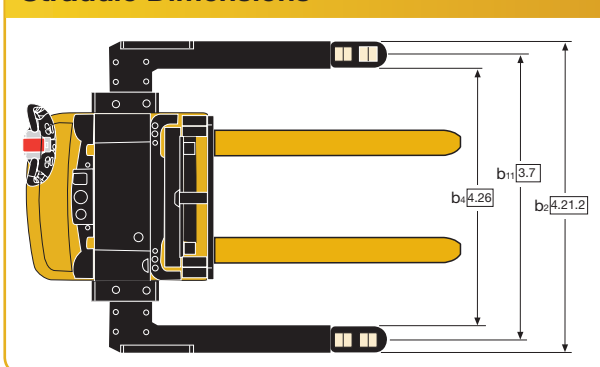
Functions can be adjusted via a plug-in console - operator and application performance requirements can be matched for maximum productivity.

## Options

A comprehensive range is available including:

- Cold store environment design: Temperature stability: min. -30 °C Low temperature hydraulic oil and lubrication grease
- Three configuration Acoustic alarm;
  - Travelling with; Forks leading, forks trailing or forks leading and trailing
- Stretch-wrap roll holder
- Bottle holder
- Universal support bracket
- Load backrest
- A4 document holder
- Lexan transparent mast guard.

## Straddle Dimensions



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**Safety:** This truck conforms to the current EU requirements. Specification is subject to change without notice.

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