

# MS series

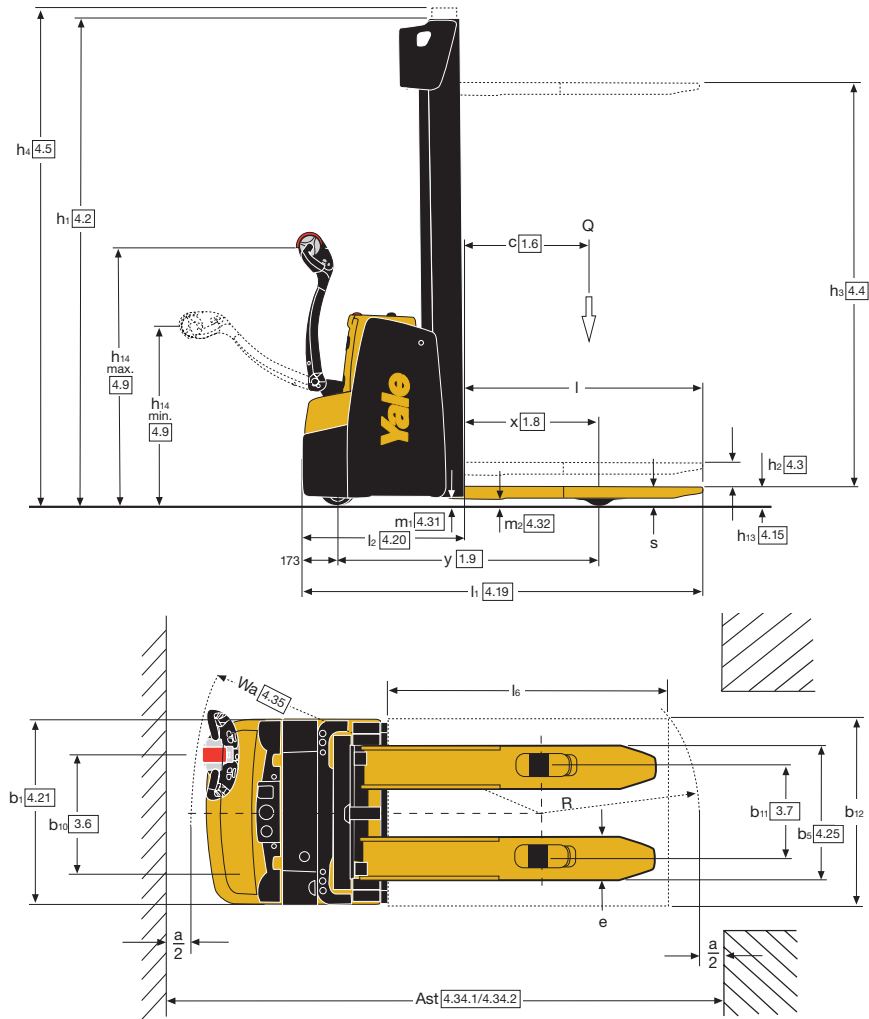
## Pedestrian high lift stacker

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

- 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

Mast type	Model		$h_3$ (mm)	$h_2$ (mm)	$h_1$ <sup>(1)</sup> (mm)	$h_4$ <sup>(2) (5)</sup> (mm)	Weight <sup>(3) (2)</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>(3)</sup>	3268	341
			2940	1518	1950 <sup>(3)</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	3940	2018	2450	4468	419
			4140	2118	2550	4668	432
			4040	1318	1850 <sup>(3)</sup>	4606	462
			4340	1418	1950 <sup>(3)</sup>	4906	481
		MS12	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.

<sup>(2)</sup> With load backrest (h=1000) for carriage h4 + 562 mm.

<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.

<sup>(5)</sup> With load backrest (h=1000) for carriage h4 + 524 mm.

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	Yale	Yale	Yale	Yale	
1.1	Manufacturer (abbreviation)		Yale	Yale	Yale	Yale	
1.2	Manufacturer's type designation		<b>MS10</b>	<b>MS12</b>	<b>MS14</b>	<b>MS16</b>	<b>MS20</b>
1.3	Drive: electric (battery or mains), diesel, petrol, fuel gas		Electric (battery)	Electric (battery)	Electric (battery)	Electric (battery)	Electric (battery)
1.4	Operator type: hand, pedestrian, standing, seated, order-picker		Pedestrian	Pedestrian	Pedestrian	Pedestrian	Pedestrian
1.5	Rated capacity/Rated load	Q (t)	1000	1200	1400	1600	2000
1.6	Load centre distance	c (mm)	600	600	600	600	600
1.8	Load distance, centre of drive axle to fork <sup>(1)</sup>	x (mm)	648	649	649	649	644
1.9	Wheelbase	y (mm)	1204	1259	1259	1331	1331
<b>Weights</b>							
2.1	Service weight <sup>(8)</sup>	kg	956	1005	1038	1145	1151
2.2	Axle loading, laden front/rear	kg	676 / 1280	708 / 1497	741 / 1697	805 / 1940	846 / 2305
2.3	Axle loading, unladen front/rear	kg	642 / 314	663 / 342	688 / 350	748 / 397	771 / 380
<b>Tyres/chassis</b>							
3.1	Tyres: polyurethane, tophane, vulkollan, front/rear		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
3.3	Tyre size, rear	ø mm x mm	85 x 100	85 x 100	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	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
3.6	Tread, front	b <sub>10</sub> (mm)	510	510	510	510	510
3.7	Tread, rear	b <sub>11</sub> (mm)	400	400	400	400	400
<b>Dimensions</b>							
4.2	Height, mast lowered	h <sub>1</sub> (mm)	2100	2100	2100	2100	2100
4.3	Free lift	h <sub>2</sub> (mm)	100	100	100	100	100
4.4	Lift	h <sub>3</sub> (mm)	3200	3200	3200	3200	3000
4.5	Height, mast extended	h <sub>4</sub> (mm)	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
4.10	Height of wheel arms	h <sub>8</sub> (mm)	85	85	85	85	85
4.15	Height, lowered	h <sub>13</sub> (mm)	90	90	90	90	90
4.19.1	Overall length (pedestrian) <sup>(2)</sup>	l <sub>1</sub> (mm)	1878	1933	1933	2005	2005
4.20.1	Length to face of forks (pedestrian) <sup>(2)</sup>	l <sub>2</sub> (mm)	728	783	783	855	855
4.21	Overall width	b <sub>1</sub> /b <sub>2</sub> (mm)	790	790	790	790	790
4.22	Fork dimensions	s/e/l (mm)	55 / 185 / 1150	55 / 185 / 1150	55 / 185 / 1150	55 / 185 / 1150	55 / 185 / 1150
4.25	Distance between fork-arms <sup>(9)</sup>	b <sub>5</sub> (mm)	570	570	570	570	570
4.31	Ground clearance, laden, below mast	m <sub>1</sub> (mm)	42	42	42	42	42
4.32	Ground clearance, center of wheelbase	m <sub>2</sub> (mm)	32	32	32	32	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
4.34.1	Aisle width for pallets 1200mm x 1000mm crossways (pedestrian)	A <sub>st</sub> (mm)	2307	2359	2359	2428	2428
4.34.2	Aisle width for pallets 800mm x 1200mm lengthwise (pedestrian)	A <sub>st</sub> (mm)	2293	2345	2345	2414	2414
4.35.2	Turning radius (pedestrian)	W <sub>a</sub> (mm)	1411	1464	1464	1533	1533
<b>Performance data</b>							
5.1	Travel speed, with/without load (pedestrian)	km/h	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	0.10 / 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	0.24 / 0.17
5.7	Gradeability, laden/unladen	%	5.1 / 12.4	4.3 / 11.7	3.7 / 11.3	3.1 / 10.1	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	7.5 / 24.3
5.10	Service brake		Electromagnetic	Electromagnetic	Electromagnetic	Electromagnetic	Electromagnetic
<b>Electric engine</b>							
6.1	Drive motor S2 60 minute rating	kW	1.2	1.2	1.2	1.2	1.2
6.2	Lift motor S3 15% rating	kW	2.2kW (S3 6%)	3kW (S3 11%)	3kW (S3 11%)	3kW (S3 11%)	3kW (S3 11%)
6.3	Battery according to DIN 43531/35 /36 A,B,C, no		no	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>(7)</sup>
6.5	Battery weight <sup>(3)</sup>	kg	185	212	212	288	288
6.6	Energy consumption according to VDI cycle	kWh/h at no. of cycles	0.68	0.78	0.89	0.99	0.99
8.1	Type of drive unit		AC-Controller	AC-Controller	AC-Controller	AC-Controller	AC-Controller
10.7	Sound pressure level at the driver's position	dB(A)	67.7	67.7	67.7	67.7	67.6

<sup>(1)</sup> With 3 stage mast -43mm

<sup>(4)</sup> Available batteries 24V / 200Ah (160kg);  
24V / 150Ah (144kg / 125kg)

<sup>(5)</sup> Available battery 24V / 210Ah; 24V /  
315Ah (288kg); 24V / 375Ah (288kg)

<sup>(6)</sup> With forks 1400 / 1600mm +14kg

<sup>(2)</sup> With 3 stage mast +43mm

<sup>(5)</sup> Available battery 24V / 210Ah

<sup>(7)</sup> Available battery 24V / 315Ah

<sup>(9)</sup> Available b<sub>5</sub> 680mm: with b<sub>5</sub> 680mm,  
x -43mm, l<sub>1</sub> and l<sub>2</sub> +43mm.

<sup>(3)</sup> These values may vary of +/-5%

## 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.

<sup>(2)</sup> With load backrest (h=1000) for carriage  
h<sub>4</sub> + 518mm.

<sup>(3)</sup> All weights are: mast structures

(weldment, cylinders, chain, pulley) + oil.

**Excluded:** forks, accessories

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# MS series

Models: MS10, MS12, MS14, MS16, MS20



## Tiller head and controls

The tiller head is designed for operator comfort featuring an ergonomic shaped handle with angled grips and integral hand guard. Large, low-effort, butterfly buttons control the direction of travel, speed and the electromagnetic brake. All controls are accessible without the operator's hand being removed from the handle.

The left hand buttons offer slow speeds for fine positioning, the right hand ones allow proportional lifting and lowering.

Additional hydraulic on/off valve on the lifting line reduces inertia of the forks at the end of the lifting movement.

The travel direction inverter button (emergency stop) is designed for maximum angle of contact with the operator's body. When activated, the direction of travel is automatically reversed and the truck comes to a stop.

The horn is located on top of the tiller head and can be actuated by the thumb or fore finger.

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

## Tiller arm

The tiller arm is mid-mounted onto the drive unit, offset to enhance visibility around the mast and is spring assisted to return automatically to the vertical position when released.

The mid-mounted anchor point requires the minimum steering effort for either hand and the long tiller arm increases the operating clearance when working inside the truck's envelope.

The tiller must be in the operating position, or the creep speed button depressed for the truck to be fully operational, including traction and mast operations.

## Dashboard instrumentation

The truck's dashboard features a Multifunctional Display Indicator (MDI) displaying operating hours, battery discharge indicator and error code display.

The red emergency stop button can be pressed to stop the truck immediately in case of an emergency.

Key control activates the truck.

## Chassis

The drive gear and main components are fully enclosed for maximum protection by the welded chassis.

The chassis is surface treated and painted with two pack epoxy paint.

The compact chassis width of 790mm is standard across the range allowing the handling of loads in tight spaces, containers or in aisle stacking applications.

Load arms are integrated into the base frame. 130x45mm thickness for 1.0t/ 1.2t and 130x55mm for 1.4t/ 1.6t capacity models.

Strengthened frame and heavy duty covers reduce service and repair costs over the life of the machine.

## Mast and forks

The new mast incorporates unique designed profiles to reduce the total mast channel width, allowing quick and easy disassembly/assembly for servicing and mast changes.

The position of the lift cylinders is optimized to deliver high operator-visibility and cross members are not in direct line of visibility for critical heights. The mast guard is made from wire mesh.

A variety of bolt-on mast types are offered including two and three stage with full free lift. Rollers are permanently lubricated and sealed for maximum service life. The standard fork section is 55mm; an option with a 65mm profile is available.

## Battery

A selection of batteries is available from 24V-150 Ah to 24V-375 Ah to provide a choice of power options.

A range of battery box types are available:

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

The connector handle has a comfortable grip for quick and easy battery connection and disconnection when charging or changing of battery (not available with 150Ah-200Ah BS batteries)

## Wheels

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

### Drive, castor and high-traction wheels:

One size drive and castor wheels is offered, 230mm x 70mm width with round surface.

- Standard drive and castor wheels are made from Tophane 92Sh – applicable for high loads, high tear resistant and high elastic impact.
- High traction wheel (Redthane 75SH), long-distance wheel (DynaRoll Black 95SH), Vulkollan anti-static wheels are available as options.

### Load wheels:

Two sizes of load wheels are offered.

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

Standard load wheel has a polyurethane wheels - Vulkollan 92 – applicable for high loads, high tear resistant and high elastic impact

## Electric motors

The MS10-20 features a 1.27kW AC drive motor, delivering instant response for forward and reverse with considerable torque.

The maintenance free motor also has long inspection intervals and provides a long,

low-cost operational life.

The 2-3 kW DC lift motor provides the power output to match the truck's operational requirements.

## Traction – steering unit

The drive motor is connected directly to the helicoidal gear transmission running in an oil bath. It is mounted vertically for efficient ventilation and to reduce flexing stresses to the power cables, ensuring reduced downtime.

## Hydraulic unit

A heavy duty compound wound motor drives the pump. Inputs to the motor and proportional valve are received from the controller to control lifting and lowering performance. Lift/lower functions are actuated directly from the tiller head controls via the Combi MOSFET controller.

A flow control valve regulates lowering speeds and a protection valve prevents further lowering in the event of a line break. A transparent oil reservoir allows the oil level to be easily checked.

## Electronic controls

A Combi MOSFET controller is used to regulate both traction and pump operation. High energy efficiency and motor performance allows considerable hourly operational usage. Smooth progressive control is available at all times. The controller features automatic braking (reverse current braking), regenerative braking and anti-roll-back/start-up on gradients.

Using a plug-in console, the controller can be adjusted for forward and reverse travel speeds, reverse current braking, release braking, acceleration, lift and lowering speeds, ramp performance and deceleration on lifting and lowering. The operator and application performance requirements can be easily matched to ensure maximum productivity.

## Options

A comprehensive range of options including:

- Special truck design for the use in a cold store environment:
  - Cold store temperature stability: min. -30 °C
  - Low temperature hydraulic oil and lubrication grease
- Acoustic alarm while travelling, three configurations possible:
  - Audible alarm while travelling forks leading
  - Audible alarm while travelling forks trailing
  - Audible alarm while travelling forks leading and forks trailing
- Stretch-wrap roll holder
- Bottle holder
- Universal support bracket
- Load backrest
- A4 document holder
- Lexan transparent mast guard

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

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