FORKLIFT TRUCKS 32-50 TONNES

TECHNICAL INFORMATION KALMAR DCD320-500, DIESEL

A machine for every application

The DCD 320-500 with a lift capacity of 32-50 tonnes is the latest generation of forklift trucks in the heavy segment of Kalmars range of 5-90 tonnes trucks – a well proven range of trucks incorporating the latest design solutions for optimum productivity and overall economy.

Kalmars heavy trucks are of a well proven design, manufactured in large volumes for demanding environments such as:

- Saw mills
- Steel works and foundries
- Concrete industry
- Ports and terminals
- Other heavy industries

A comprehensive range of optional equipment packages facilitates adaptation to special handling environments and different types of goods.

A well-planned and protected operator environment makes Kalmars trucks efficient and comfortable working implements.

Three different models are available in the series:

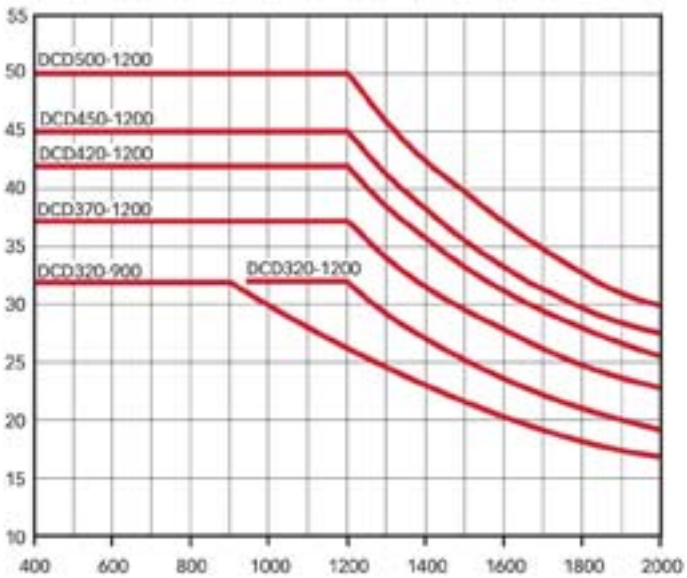
- Standard (Std) with high tilt cylinder and side positioned cab (320-500)
- Low-built (LB) with low tilt cylinder and central positioned cab (320)
- Container special (CS) with low tilt cylinders and raised central positioned cab (370-500)

Clarification of model designation

DCD320-12(LB)(CS)

- **Diesel engine**
- **Counter-balance truck**
- **Generation**
- **Lift capacity, deciton**
- **Load centre, decimetre**
- **Low built truck**
- **Container Special**

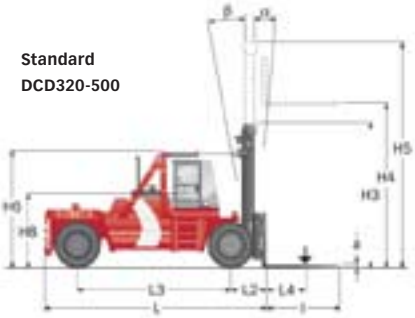
Lifting capacity



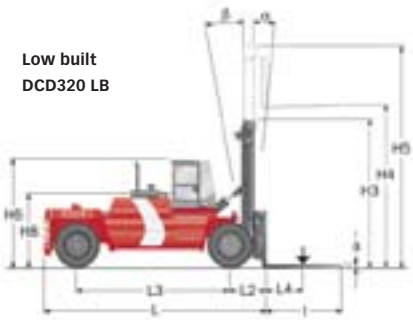
Dimensions	Truck	Truck length without forks	L	mm	
		Truck width	B	mm	
		Truck height, basic machine	H6	mm	
		Seat height	H8	mm	
		Distance between centre of front axle - frontface of fork arm	L2	mm	
		Wheelbase	L3	mm	
		Load centre	L4	mm	
		Track (c-c), front - rear	S	mm	
		Turning radius, outer	R1	mm	
		Turning radius, inner	R2	mm	
		Ground clearance, min.		mm	
		Max height when tilting cab		mm	
		Max width, tilted cab		mm	
	Minimum aisle width for 90° stacking with forks		A1	mm	
	Standard duplex stativ	Lyfting height	H4	mm	
		Mast height, min	H3	mm	
		Mast height, max	H5	mm	
		Mast tilting, forw. - backw.	α - ß	°	
	Forks	Width	b	mm	
		Thickness	a	mm	
		Length of fork arms	l	mm	
		Width across fork arms, max.	V	mm	
		Width across fork arms, min.	V	mm	
		Sideshift. ± at width across fork arms	V1 - V	mm	
Weight	Service weight			kg	
	Axle load front	Unloaded		kg	
		At rated load		kg	
	Axle load back	Unloaded		kg	
		At rated load		kg	
Lifting data	Lifting capacity	Rated		kg	
		At max lifting height		kg	
	Lifting speed	Rated		m/s	
		At 70% of rated load		m/s	
	Lowering speed	Unloaded		m/s	
		At rated load		m/s	
Performance	Driving speed, F/R	Unloaded		km/h	
		At rated load		km/h	
	Gradient capacity	Max, unloaded		%	
		Max, at rated load		%	
		At 2 km/h, unloaded		%	
		At 2 km/h, at rated load		%	
	Drawbar pull	Max		kN	

Dimensions

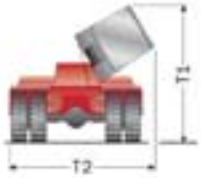
Standard
DCD320-500



Low built
DCD320 LB



Container Special
DCD370-450 CS



	DCD 320-9 LB	DCD 320-12	DCD 320-12 LB	DCD 370-12	DCD 370-12 CS	DCD 420-12	DCD 420-12 CS	DCD 450-12	DCD 450-12 CS	DCD 500-12
	6500	6925		7345		7845		7845		8450
	3410			4150		4150		4450		4450
	3415	3650	3415	3725	4450	3725	4450	3725	4450	3750
	2300			2350	3350	2350	3350	2350	3350	2450
	1125			1295		1295		1295		1380
	4250	4750		5000		5500		5500		6000
	900	1200		1200		1200		1200		1200
	2440 - 2540			3020 - 2600		3020 - 2600		3020 - 2600		3030-2600
	6100	6600		6900		7400		7400		8100
	750	950		1000		1100		1100		1300
	300			300		300		300		250
	3800	-	3800	-		-		-		-
	3850	-	3850	-		-		-		-
	9825	10325		10795		11295		11295		12200
	5000			5000		5000		5000		5000
	4520			5110		5110		5110		5640
	7020			7610		7610		7610		8140
	5 - 10			5 - 10		5 - 10		5 - 10		5 - 10
	300			300		300		300		300
	110			135		135		135		145
	2400			2400		2400		2400		2400
	2750			2750		2750		2750		2700
	1550			1950		1950		1950		1900
	300 - 2150			200 - 2350		200 - 2350		200 - 2350		200 - 2300
	39200			47500		50000		53200		58000
	19000			23700		25500		26100		30500
	66800	66700		79200		86600		91500		102000
	20200			23800		24500		26200		27500
	4400	4500		5300		5400		5800		6000
	32000			37000		42000		45000		50000
	32000			37000		42000		45000		50000
	0.30			0.28		0.28		0.28		0.28
	0.22			0.25		0.25		0.25		0.20
	0.30			0.30		0.30		0.30		0.30
	0.40			0.40		0.40		0.40		0.40
	25			25		24		24		24
	22			22		22		22		20
	29			30		30		30		30
	24			40		37		34		30
	29			30		30		30		30
	18			26		24		23		19
	187			343		343		343		343

Operator environment

The Spirit Delta cab is of a new and modern design that provides the operator with an efficient and safe place of work. The design of the cab is the result of a comprehensive analysis of operators' working conditions providing optimum visibility with large glass areas and no forward corner posts to inhibit the field of vision. The instrument panel is gently rounded and ergonomically designed with an uninhibited clear view of all essential information. Access to the cab is comfortable and secure thanks to several steps up to the cab and many well located hand rails. The CS model has separate steps to the cab with hand rail.

Low-built trucks have tippable cabs, for optimum service access. Noise and vibration levels are extremely low thanks to the insulated mounting to the chassis.

The operator's seat, steering wheel and hydraulic controls are all individually adjustable for optimum working position.

Two easily operated, ergonomically positioned multi-function levers are provided for gear changing, windscreen wipers, washers and horn.

Spirit Delta cab

A powerful heating/ventilation unit ensures a comfortable cab temperature. An easily replaced fresh air filter cleans the incoming air.

The unit slides out to give easy access for service. As standard, the equipment includes a powerful 3-speed fan for cooling, heating, defrosting and recirculation

Instrumentation

The instrument panel has logically grouped units, all within easy reach. Standard instrumentation includes warning lamps for battery charging, low engine and gearbox lubrication oil pressure, low brake pressure, high coolant temperature, high gearbox oil temperature and applied parking brake. In addition, gauges display values for gearbox oil pressure, engine coolant temperature, fuel quantity and operating time.

Trucks fitted with ECS monitoring are not equipped with warning lamps or gauges. These functions are handled by the ECS which has a single warning lamp and full text display showing current values and any faults that occur.

Electrical System
The electrical system is logically structured, easily serviced and coordinated with the other trucks in the Kalmar range. The system is supplied by two 12V batteries connected in series charged by an alternator, with related electronics for rectification and current stabilization. The system provides high power levels even at low engine revs. The electrical fuses, relays and connectors are located in an easily accessible position within a central electrical unit inside the cab, behind the operator's seat.

ECS – Electronic Control System
Trucks can be equipped with ECS, a state of the art system for optimum operational security and overall economy. The systems consists of a number of modules that can be combined in different ways, depending on the nature of the operations.

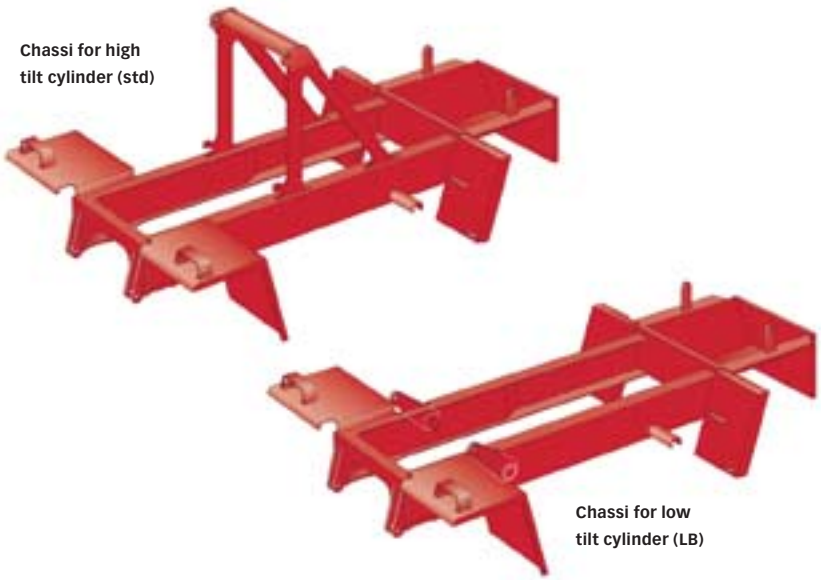
For example, the following functions are available:

- Automatic gear changing (Load sensing system) Manages gear changing, makes operation easier and extends the service life of the transmission
- Monitoring, checks to ensure that engine and gearbox operate within reasonable parameters and thereby prevent breakdowns occurring. Also monitors the correct function of system components, such as, sensors.
- Lever steering
- Mini-steering
- Electrohydraulic servo

Chassis

The chassis is built of fully welded steel profiles which gives a rigid construction with extremely strong mounting points for the drive axle and lift equipment. Stress concentrations have been eliminated for optimum tensile strength. The chassis is flexible and is used for a number of different drive line combinations.

The space at the rear of the chassis is used for counter-weights, the number of which are adapted to the machine in question. The chassis has an extremely low profile for good visibility. The tanks are separately constructed and bolted to the chassis in a position that also contributes to good visibility.



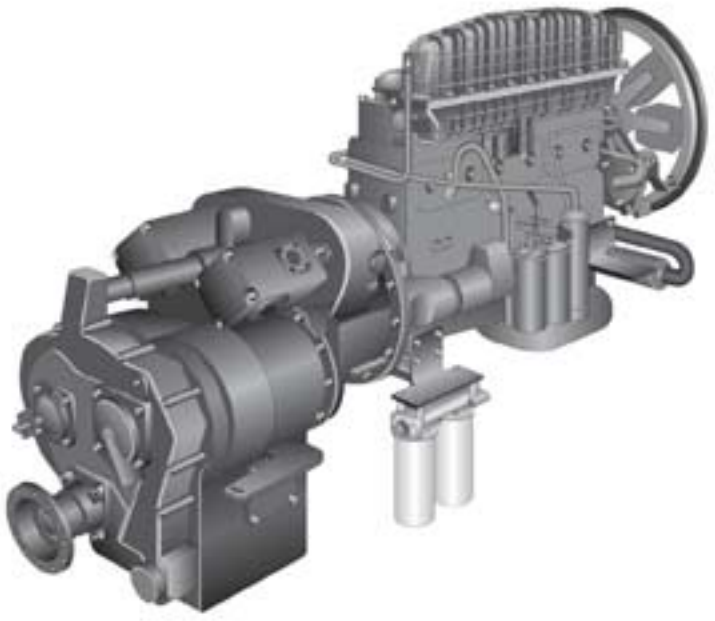
Chassi for high tilt cylinder (std)

Chassi for low tilt cylinder (LB)

Performance

Engine
As standard, the DCD320 truck is equipped with Volvo's TAD 720VE diesel engine and the DCD370-500 with Volvo's TWD 1240VE (EU), both turbocharged straight six diesel engines with intercooler. Both are adapted to the specialized working requirements of a forklift truck, with high power and torque levels, even at low engine speeds. The engine has low exhaust emission levels and complies with today's stringent legal environmental demands (EU, CARB, EPA).

All engines are characterized by low fuel consumption and low noise and vibration levels.



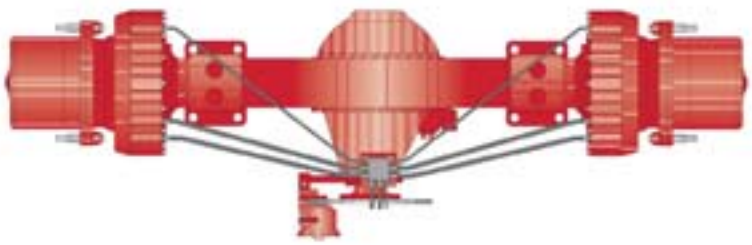
Transmission
All trucks in the series are equipped with Spicer Off Highways's well proven hydrodynamic transmissions.

The transmissions have integrated gearbox and torque converter, for smooth, quick acceleration with a minimum of "clutch-slip". A number of different transmissions are available, depending on the selected engine. Constant mesh gears and gear changing by hydraulically applied clutches (Powershift) are, however, common to all gearboxes. Gear changing is electrically achieved via solenoid valves, with three reverse and three forward gears, controlled by means of an easily operated multi-func-tion lever.

Alternative drive lines			DCD320-9	DCD320-12	DCD270-12	DCD420-12	DCD450-12	DCD500-12
Engine	Volvo TWD 731VE	167 kW / 893 Nm	●	●				
	Volvo TAD 720VE	174 kW / 854 Nm	●	●				
	Cummins 6CTAA8.3-C	153 kW / 994 Nm	●	●				
	Volvo TWD 1031VE	235 kW / 1548 Nm			●	●	●	●
	Volvo TWD 1240VE	246 kW / 1751 Nm			●	●	●	●
	Cummins QSM11	246 kW / 1674 Nm			●	●	●	●
Gearbox	Spicer Off Highways 13.7 HR 32000	3+3 gears	●	●				
	Spicer Off Highways 15.5 HR 36432	4+4 gears			●	●	●	●
	Meritor PRLC3805 W4H		●	●				
	Meritor PRLC5334 W4H				●	●	●	●
	16.00x25		●	●				
	18.00x25				●	●		
	Front 23.5x25 Rear 18.00x25						●	●

Drive axle
The drive axle is of an extremely robust design to be able to cope with tough working environments such as in the paper and pulp industries, saw mills, steel works, ports and terminals.

The axle has reduction in two stages - differential and hub reduction – which ensures a minimum of strain on the transmission system. The drive axle is fitted with hydraulic braking system.



Parking Brake System
The parking brake system consists of a dry disc brake on the in-going shaft of the drive axle. The disc brake is applied by means of a powerful spring in the parking brake cylinder and is released by means of hydraulic pressure from the parking brake valve in the cab.

Service Brake System

The service brake system is of the Wet Disc Brake type, a system with oilcooled discs that are alternately fixed to and rotating with the hub. When the brakes are applied, the discs are pressed together by hydraulic pressure from the brake pedal, which provides extremely effective braking. The system is virtually maintenance free and can cope with heavy loads over an extended period of time, with no fade and without the need for brake adjustments.

The heat generated during braking is dissipated via a cooling circuit in which the truck's total volume of hydraulic fluid comes into play. A special filter protects the brakes.

Steering System

The steering system is completely hydraulic and is fed from hydraulic pump 1 (see the hydraulic system diagram), via a priority valve. When the steering wheel is turned, the steering valve transmits a load signal to the priority valve which ensures that the steering system always has sufficient hydraulic pressure. The steering axle is an extremely robust construction with double-action cylinder.

The pendulum suspension of the axle, over powerful, spherical rubber bearings has a long operative lifespan and provides good shock-absorption. The minimal number of parts ensures operational reliability, a minimum of service points and easy maintenance. The steering geometry allows large wheel displacement and thereby, a tight turning circle.

				DCD 320-9 LB	DCD 320-12	DCD 320-12 LB	DCD 370-12	DCD 370-12 CS	DCD 420-12	DCD 420-12 CS	DCD 450-12	DCD 450-12 CS	DCD 500-12
Drive system	Engine	Manufacturer - type designation		Volvo - TAD 720VE (Turbo + intercooler)			Volvo - TWD 1240VE (Turbo + intercooler)						
		Fuel - type of engine		Diesel - 4-stroke			Diesel - 4-stroke						
		Rating ISO 3046 - at revs	kW/hp - rpm	174/237 - 2300			246/330 - 2000						
		Peak torque ISO 3046	Nm - rpm	854 - 1400			1751 - 1200						
		No of cylinders - displacement	cm^3	6 - 6730			6 - 9600						
		Fuel consumption, normal operation	l/h	12 - 16			18 - 22						
	Alternator	Type - power	W	AC - 1540			AC - 1540						
	Starting battery	Voltage - capacity	V - Ah	2x12 - 140			2x12 - 140						
	Gearbox	Manufacturer - type designation		Spicer off Highways 13.7HR 32312			Spicer Off Highways - 15,5HR 36432						
		Clutch, type		Torque converter			Torque converter						
		Gearbox, type		Hydrodynamic - Powershift			Hydrodynamic - Powershift						
		No of gears forward - reverse		3 - 3			4 - 4						
	Drive axle	Type		Differential and hub reduction			Differential and hub reduction						
Wheels, brakes, steering	Wheels/tyres	Type front and rear		Pneumatic									
		Dimensions, front and rear	inch	16.00x25 - 16.00x25			18.00x25 - 18.00x25				23.5x25 - 18x25		
		No of wheels, front and rear (*driven)		4* - 2									
		Inflation pressure	MPa	1.0									
	Steering system	Type - manoeuvring		Hydraulic servo - Steering wheel									
	Service brake system	Type - affected wheels		Oil cooled disc brakes (Wet disc brakes) - drive wheels									
	Parking brake system	Type - affected wheels		Dry, spring activated disc brakes - drive wheels									
Misc.	Hydraulic pressure	Max		16.5			15.0		17.0		18.0		20.0
	Noice level DIN 45635-36	Equivalent noice level in cab (Lm)	dB(A)	72									
	Fuel volume		L	300	380		400		400		400		400
	Hydraulic fuel volume		L	32	350		600		600		600		600

Hydraulic system

The hydraulic system includes the following sub-systems:

- Working hydraulics
- Service brake system with braking circuit and cooling circuit
- Parking brake system
- Hydraulic servo (standard)
- Steering system

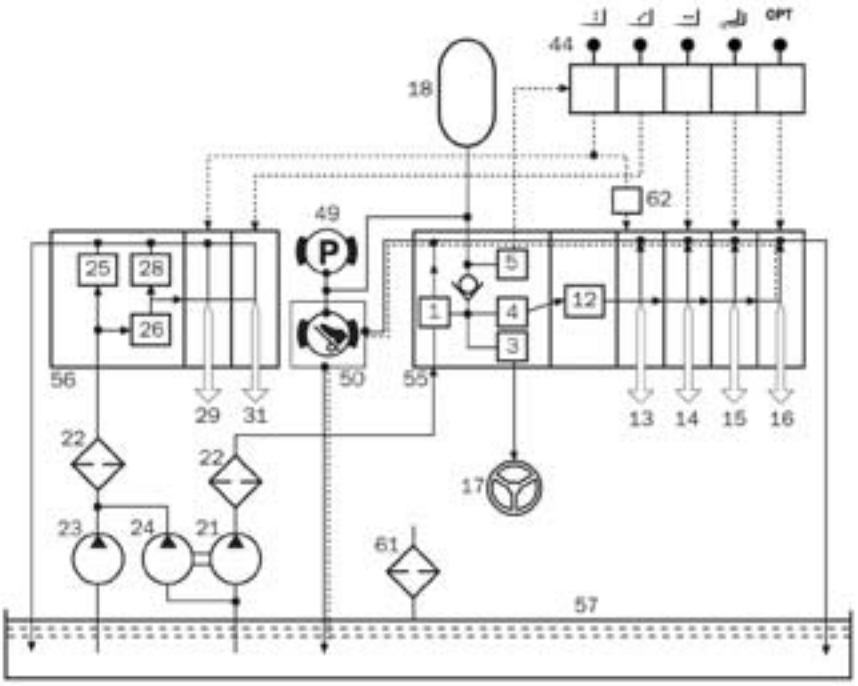
The hydraulic system for the DCD320 is built around two wing type hydraulic pumps, the DCD370-DCD500 has one double and one single pump. Pumps 2 and 3 feed the lift and tilt functions whilst pump 1 feeds the other working hydraulics functions and the hydraulic accumulator, which in turn, supplies the brake and servo system. The excess flow from pump 1 is directed to the brake cooling circuit.

Common to both systems

- Constructed with a valve block making for easy installation with a minimum number of hoses. All hydraulic flow from the pumps is fed to the valve block.
- Accumulator that provides brake pressure enabling the brakes to be applies a number of times, as a safety measure, should the engine temporarily stop.
- Cooling circuit for the dissipation of heat from the brake system to the tank.
- Hydraulic servo system for the control levers

Optional extras

- El-servo controls
- Piston type accumulator
- Additional hydraulic functions
- Electronic joy stick



1. **Accumulator charging valve**
3. **Feed to steering system**
4. **Priority valve (sequential valve), prioritises steering and accumulator charging. Gives 11 bars back pressure at constant flow**
5. **Pressure reducing valve, 35 bars, feeding servo system for operating lever**
12. **Main pressure limiting valve**
13. **Control section, LIFT 2**
14. **Control section, EXTENSION**
15. **Control section, SIDESHIFT**
16. **Control section, TILT**
17. **Steering system**
18. **Accumulator**
21. **Hydraulic pump, LIFT 2, EXTENSION, SIDESHIFT**
22. **High pressure filter**
23. **Hydraulic pump, LIFT 1, TILT**
24. **Hydraulic pump, LIFT 1, TILT (37-50 tonnes machines)**
25. **Idle release valve, opens to tank at unaffected manoeuvre sections. Reduces the manoeuvre forces on the levers since the valve slides are decompressed when the function activates**
26. **Shunt valve, controlled by load signal from lift- and tilt circuit. Releases by shunt excessive flow to tank and minimises therefore pressure loss and heating in the control valves**
28. **Main pressure limiting valve**
29. **Control section LIFT, equipped with load signal valve in the supply line for steering of shunt valve 26**
31. **Control section TILT, equipped with load signal valve in both supply and return line för steering of shunt valve 26.**
44. **Servo assisted control leavers**
49. **Parking brake system**
50. **Service brake system**
55. **Valve block and main valve**
56. **Main valve**
57. **Hydraulic tank**
61. **Breathing filter**
62. **Magnetic valve, disconnects LIFT 2 during driving**

Lifting equipment

Lift Masts

All masts are constructed on the "free visibility principle" and can be supplied with the area steered free-lift system which, in terms of function, is extremely reliable and secure.

The robust mast profiles are of high tensile steel, dimensioned for minimal obstruction of the field of vision and long service life. The lift cylinders are positioned in the "dead" angles of the mast. All mast wheels are conical and fitted with high quality roller bearings.

As standard, trucks are fitted with the duplex free visibility mast.

Duplex mast free visibility

Duplex mast free visibility free-lift

Fork Carriages

The fork carriages are supplied with hydraulic side-shift and fork positioning.

Forks

The forks are one-piece forged in high tensile steel. They are fitted over rollers running on bearings - four upper rollers and two lower support for each fork. For ease of changing between forks and other attachments, a fork shaft system is available, where the forks are mounted on a separate fork holder.

Attachments

The fork-lift truck's areas of operation are considerably extended by different types of fork-mounted attachments. The attachments can be used with standard and inverted forks.

The following attachments are available:

- Fixed 20' top lift with swivelling
- Fixed 40' top lift with swivelling
- Adjustable 20'-40' top lift with swivelling
- Bottom-lift for trailers with 2 or 4 hydraulically raised/lowered legs

Lift mast

	Lift-height	Lift mast height		Free-lift	Lift mast height		Freel-ift	Lift mast height		Freel-ift
	H4	Min 1) H3	Max 1) H5	H2	Min 1) H3	Max 1) H5	H2	Min 1) H3	Max 1) H5	H2
		DCD280-320			DCD370-450			DCD500		
Duplex free visibility	4000	–	–	–	–	–	–	–	–	–
	4500	4270	6250	–	4860	7070	–	5410	7620	–
	5000	4520	7020	–	5110	7520	–	5660	8120	–
	5500	4770	7520	–	5360	8070	–	5910	8620	–
	6000	5020	8020	–	5610	8570	–	6160	9129	–
	6500	5270	8520	–	5860	9070	–	6410	9620	–
	7000	5520	9020	–	5860	9070	–	6660	10120	–
	7500	5770	9520	–	6360	10070	–	6910	10620	–
	8000	6020	10020	–	6610	10570	–	7160	11120	–
	8500	6270	11520	–	6860	11070	–	7410	11620	–
	9000	6520	11020	–	7140	11570	–	7660	12120	–
	9500	6770	11520	–	7360	12070	–	7910	12620	–
	10000	7020	12020	–	7610	12570	–	8160	13120	–
Duplex free visibility, free lift	4000	4020	6020	2000	4610	6570	2000	–	–	–
	4500	4270	6250	2250	4860	7070	2250	–	–	–
	5000	4520	7020	2500	5110	7570	2500	–	–	–
	5500	4770	7520	2750	5360	8070	2750	–	–	–
	6000	5020	8020	3000	5610	8570	3000	–	–	–
	6500	5270	8520	3250	5860	9070	3250	–	–	–
	7000	5520	9020	3500	6110	9570	3500	–	–	–
	7500	5770	9520	3750	6360	10070	3750	–	–	–
	8000	6020	10020	4000	6570	10570	4000	–	–	–
	8500	6270	10520	4250	6860	10070	4250	–	–	–
	9000	6250	11020	4500	7110	11570	4500	–	–	–
	9500	6770	11520	4750	7360	12070	4750	–	–	–
	10000	–	–	–	7570	12750	5000	–	–	–

Fork carriage

Forkshaft system

Integrated forks

Inverted forks

Standard equipment

All Kalmar trucks are CE-marked and constructed to and comply with the following norms:

- EN1551
- EN12895 (EMC Test, Europe)
- EN20000/14 (Sound) (Europe)
- 97/68 EC stage 2,
  US EPA Tier 2 (Standard engines)
- ANSI B56.1 compliance

The standard specification of our trucks includes important and vital components that contribute to the efficiency and safety of the truck.

- Robust truck chassis
- Spirit Delta operator environment with low noise level
- Cab insulated against vibration
- Powerful ventilation unit with efficient filter
- Roof window of lexan
- Sliding window on the left hand side
- Wash/wipers, front, rear and roof
- Lockable cab doors
- Wide bottom step and three extra steps on both sides. Steps with hand rail on the CS model
- Adjustable, shock absorbing, ergonomic operator seat
- Two-way adjustable hydraulic lever console
- Arm support on right hand side
- Environment friendly powerful engines
- Fully dimensioned radiator for engine and oil cooler for gearbox
- Powerful gearboxes with powershift
- Drive axle with oil cooled disc brakes
- Free visibility lift equipment
- Steering axle with double-action cylinder
- Hydraulic system with finger tip control
- Simple, reliable electrical system
- Comprehensive and logically grouped instrumentation
- Accelerator, brake pedal and forward-reverse selector
- Lighting: Working lights, indicators, brake, reversing and positional lights
- Large service hatches and tiltable cab for daily inspections, tiltable cab on model LB
- Towing hitch
- Complete documentation, including drive line

Optional equipment

A wide range of optional equipment and packages are available for our trucks, to satisfy further specialisation and provide added efficiency.

- Alternative engines and gearboxes
- Exterior and interior cab equipment
- Lighting and mirrors
- A wide range of alternative lift equipment's:
  - masts
  - carriages
  - attachments
- ECS (control system) with different types of modules (functions)

Service Access

Routine daily service checks contribute to a safer work place and reduce the risk of break-downs.

Daily service checks are made easier thanks to well thought out and grouped service points. The operator can reach all service points without having to climb up onto the truck.

The cabs on the low built trucks (320) can be tilted by means of a hydraulic cylinder operated by a manual pump. When the cab has been tilted the gearbox, hydraulic pumps, hydraulic fluid filter, parking brake, main valves, control valves etc. are readily accessible for service.

Standard machines have side cabs and large hatches for ease of service. All machines have hinged hoods that can be raised to facilitate engine service.

Optional extra:
• Electric oil pump for cab tipping

Contact information:

Kalmar global partner

Local presence, globally
Kalmar is a global supplier of heavy materials handling equipment and services for ports, terminals, industry and intermodal handling.

Local presence means that we can support our customers throughout the product's life cycle, wherever they are.

Our products are manufactured in Sweden, Finland, the USA and the Netherlands.

Available heavy forklift models

DCD320-12

DCD200-12LB

DCD450-12CS

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