

FORKLIFT TRUCKS 6 – 9 TONNES
TECHNICAL INFORMATION
KALMAR DCE60-90L, GEARBOX





Kalmar Lifttrucks 6 – 9 tonnes

The Kalmar DCE60-90L is a modern range of diesel and LPG fork trucks with a 6 – 9 tonnes capacity. The machines are built for reliability and efficiency in demanding industrial applications.

The trucks with gearboxes are extremely powerful, robust and constructed in every detail for tough conditions, day after day, year on year. The engines have smooth drive with low noise levels and emissions that meet the latest environmental requirements. Low fuel consumption, good access with a low service requirement and excellent quality all result in good operational economy.

Our operator's environment has been developed and expanded to now cover three different concepts. The electronic systems represent a modern generation, which can also be expanded by the addition of a whole range of intelligent handling options.

The Kalmar DCE60-90L is in every respect a real Kalmar truck built for tough handling.



DCE80-6 - Spirit Delta



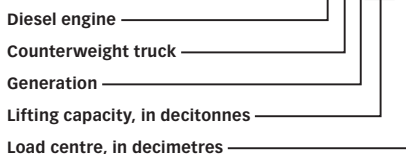
Spirit Delta Space



FlexCab

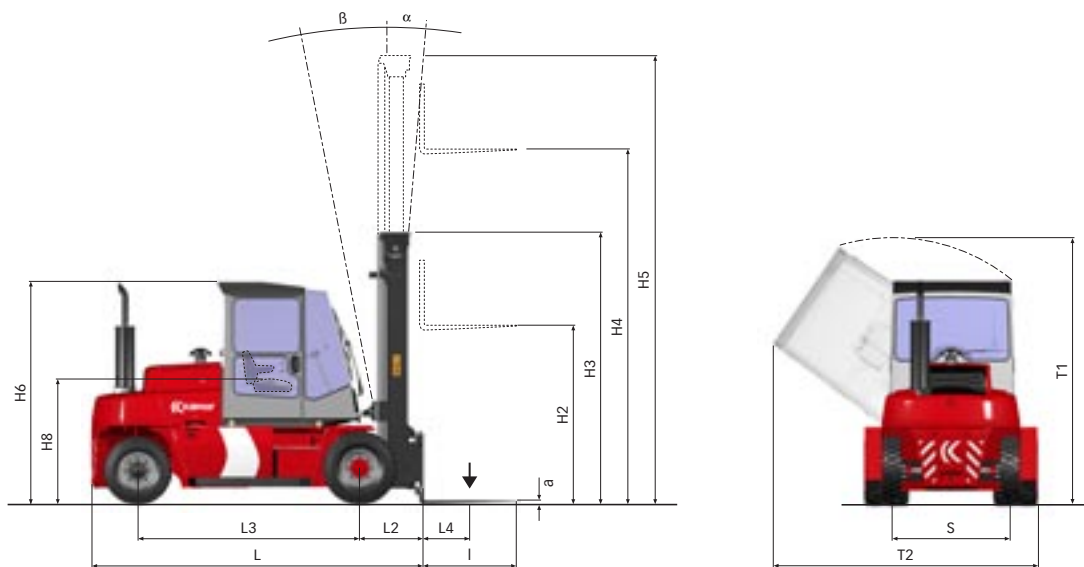
Model designation

eg. DCE60-6

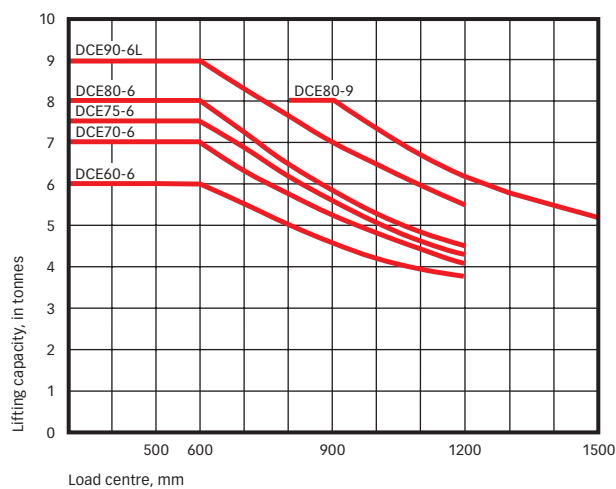
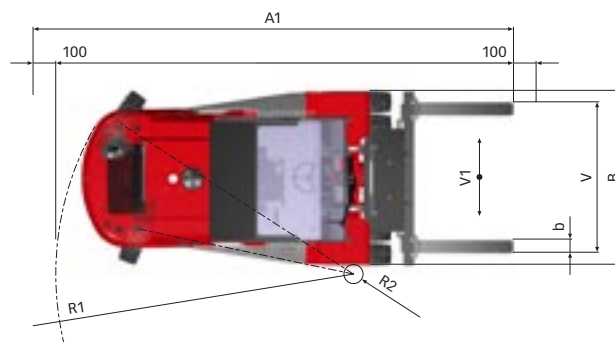


Dimensions				DCE60-6	DCE70-6	
Lifting	Lift capacity	Rated	kg	6000	7000	
		Load centre	L4	mm	600	600
	Truck	Truck length	L	mm	3700	3700
		Truck width	B	mm	2000	2000
		Height, basic machine, Spirit Delta	H6	mm	2590	2590
		Height, basic machine, Spirit Delta Space	H6	mm	3090	3090
		Height, basic machine, FlexCab	H6	mm	2690	2690
		Seat height Spirit Delta/FlexCab	H8	mm	1440	1440
		Seat height Spirit Delta Space	H8	mm	1940	1940
		Distance between centre of front axle – front face of fork arm	L2	mm	710	710
		Wheelbase	L3	mm	2450	2450
		Track (c-c) front – rear	S	mm	1500 – 1360	1500 – 1360
		Turning radius, outer	R1	mm	3300	3300
		Turning radius, inner	R2	mm	150	150
		Ground clearance, min.		mm	160	160
	Dimensions	Height when tilting cab, max. Spirit Delta	T1	mm	3050	3050
		Width when tilting cab, max. Spirit Delta	T2	mm	3100	3100
		Height when tilting cab, max. Spirit Delta Space	T1	mm	3300	3300
		Width when tilting cab, max. Spirit Delta Space	T2	mm	3200	3200
		Height when tilting cab, max. FlexCab	T1	mm	3150	3150
Width when tilting cab, max. FlexCab		T2	mm	3150	3150	
Min. aisle width for 90° stacking with forks		A1	mm	5410	5410	
Standard duplex mast		Lifting height	H4	mm	3500	3500
		Mast height, min.	H3	mm	2625	2625
		Mast height, max.	H5	mm	4500	4500
	Mast tilting, forward – backward*	$\alpha - \beta$	°	5 – 10	5 – 10	
	Ground clearance, min.		mm	170	170	
Forks	Width	b	mm	150	150	
	Thickness	a	mm	60	60	
	Length of fork arm	l	mm	1200	1200	
	Width across fork arms, max.	V	mm	1900	1900	
	Width across fork arms, min.	V	mm	420	420	
	Sideshift \pm at width across fork arms	V1 – V	mm	375 – 1160	375 – 1160	
Weight	Service weight		kg	8900	9600	
	Axle load front	Unloaded	kg	4600	4600	
		At rated load	kg	14000	15600	
	Axle load back	Unloaded	kg	4300	5000	
At rated load		kg	900	1000		
Wheels, brakes, steering	Wheels/tyres	Type, front – rear		Pneumatic – Pneumatic		
		Dimensions, front – rear	inch	8,25x15 – 8,25x15		
		Number of wheels, front – rear (*driven)		4* – 2		
		Pressure	MPa	0,85 – 0,85		
	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 brake – drive wheels		
Misc.	Hydraulic pressure	Max.	MPa	19,5	19,5	
	Hydraulic fluid volume	Gearbox	l	155	155	
	Fuel volume		l	155	155	
	Starting battery	Voltage – capacity	V-Ah	24 – 75	24 – 75	

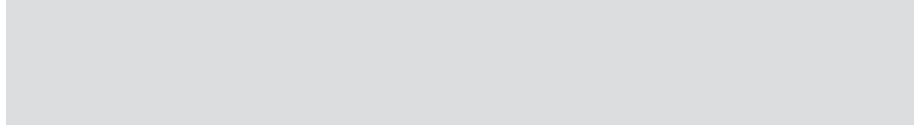
* Spirit Delta Space, backward = 5°



	DCE75-6	DCE80-6	DCE80-9	DCE90-6L
	7500	8000	8000	9000
	600	600	900	600
	3915	3915	4075	4120
	2000	2000	2000	2000
	2590	2590	2570	2570
	3090	3090	3070	3070
	2690	2690	2670	2670
	1440	1440	1440	1440
	1940	1940	1940	1940
	770	770	735	770
	2600	2600	2800	2800
	1500 – 1360	1500 – 1360	1500 – 1360	1500 – 1360
	3500	3500	3700	3700
	250	250	250	250
	160	160	160	160
	3050	3050	3050	3050
	3100	3100	3100	3100
	3300	3300	3300	3300
	3200	3200	3200	3200
	3150	3150	3150	3150
	3150	3150	3150	3150
	5675	5675	6435	5880
	3500	3500	3500	3500
	2935	2935	2935	2935
	4660	4660	4660	4660
	5 – 10	5 – 10	5 – 10	5 – 10
	170	170	170	170
	150	150	200	200
	60	60	60	60
	1200	1200	1800	1200
	1900	1900	–	1900
	420	420	–	520
	375 – 1160	375 – 1160	–	375 – 1210
	10400	10700	11700	11300
	5200	5200	5500	5300
	16900	17600	18400	19100
	5200	5500	6200	6000
	1000	1100	1300	1200
	Pneumatic – Pneumatic			
	8,25x15 – 8,25x15			
	4* – 2			
	0,85 – 0,85			1,0 – 0,85
	Hydraulic servo – Steering wheel			
	Oil cooled disc brakes (Wet disc brakes – drive wheels)			
	Dry, spring activated disc brake – drive wheels			
	19,5	19,5	19,5	19,5
	155	155	155	155
	155	155	155	155
	24 – 75	24 – 75	24 – 75	24 – 75



1. Full lifting capacity up to 4 m lifting height with duplex/duplex free lift/triplex mast and fork carriage with side shift/fork positioning. Applies to DCE60-6 to DCE90-6, except for DCE80-9
2. Full lifting capacity up to a lift height of 4 m with duplex mast and FEM fork carriage. Only applies to DCE80-9.



Operator's environment in three versions

Kalmar is the world leader in terms of ergonomics and operators' environments. There are three operator's environment versions available for the Kalmar DCE60-90L:

The Spirit Delta, the Spirit Delta Space and the robust FlexCab/FlexGuard. Choose the one that best meets your needs!

Spirit Delta

Our highly regarded Spirit Delta is the best thought-out and most functional operator's environment in the entire industry. Based on extensive research, it provides superior ergonomics and total control of all the truck's various functions.

The Spirit Delta provides extra space for installing your own equipment, for example a computer and communications equipment. The overall design and all the various adjustment options mean that the Spirit Delta is suitable for all kinds of operators. The instrument and control layout provides an entirely clear view and control of all the machine's functions. There is an optimal field of vision in every direction and a wide



range of options means that it is easy to customise the operators's environment.

All the options and accessories for ergonomics and smart handling are available for the Spirit Delta.



Spirit Delta Space

The Spirit Delta Space has been developed in close collaboration with our customers in order to achieve the best possible degree of safety and comfort. This modern concept is based on a more spacious version of the Spirit Delta, with a variably reversible operator's seat. The field of vision is optimised, with all the instruments located to the operator's right. The bottom corners of the front window are located low down for maximum vision.

By activating a switch on the steering wheel panel, the operator can simply turn the entire seat or adjust it to the required position. Pedals, steering spindle, instruments, levers, controls and any additional equipment are mounted on a turning plate that follows the operator's seat.

All the options and accessories for ergonomics and smart handling are available for the Spirit Delta Space.



FlexCab/FlexGuard

The FlexCab and FlexGuard are robust alternatives for activities that do not require the Spirit Delta's total concept or the most advanced options. FlexCab is a complete cab that can be converted into an open safety cage, FlexGuard, with or without glass, door and heating system depending on climate and environment.

FlexCab and FlexGuard allow for good ergonomics with an excellent field of vision in all directions. The construction of the body is robust with profiled beams for optimal vision. The interior is airy and robust with very good close-up vision and generously increased headroom.



FlexCab



FlexGuard

KCS – Kalmar Control System

KCS is Kalmar's own in-house developed electronic control system that allows for increased safety and efficiency. KCS is based around fast processors and modern CAN-bus technology, resulting in a high level of performance and considerable operating safety.

Information is presented on a clear display on the steering wheel panel by means of a simple, non-language-based interface. Function buttons simplify navigation around the menus and provide fast access to information on operation, diagnostics and alarms where appropriate.

There are many options available in KCS with considerable opportunities for customising the truck's functions – everything from functions for improving productivity, such



as pre-selected lifting height and automatic gearing, to ergonomics functions, such as joystick control and mini-steering wheel as well as further functions for improving safety, for example chain slack monitoring and prevention.

KCS functions	Perkins 1106D-E66TA ZF 2WG 94		Perkins 1104C-44T Dana 20000		GM V8 LPG Dana 20000	
	Standard	Option	Standard	Option	Standard	Option
Display	•			•		•
Monitoring	•			•		•
Inching		•		•		•
Automatic gear change		•		•		•
Weighing scale		•		•		•
Mini steering		•		•		•
Lever steering		•		•		•



Modern drive trains for diesel and LPG

The Kalmar DCE60-90L range has modern drive trains for efficient running with minimal emissions and good fuel economy. The engine, gearbox, drive axle and brakes are all constructed and combined to form the highest performance and a long lifetime.

The diesel trucks are available with two turbo-charged engine versions: a four-cylinder and a six-cylinder engine, both from Perkins. The torque is powerful already from low revolutions, giving a smooth drive with good acceleration. Low fuel consumption and a low service requirement mean a good working economy.



The new LPG engine from GM has been developed from the very beginning to operate on LPG, which means it is very reliable and has a low fuel consumption. The engine is a high-performance V8, producing excellent driving comfort.

All engine variants are characterised by low noise and exhaust emissions that meet the latest requirements. The environmental features can be further improved by a range of catalysers and various particle filters. The environmentally-suited engines need a lot of cooling and they are therefore fitted with efficient and easily-serviced split cooling for air, engine cooling water and transmission oil.

Hydrodynamic transmission

We have two different gearboxes; Dana 20000 or ZF 2WG 94, depending on the selected engine.

The Dana gearbox is a tried and tested and very reliable hydrodynamic transmission. It has been constructed around a torque converter for gradual and rapid acceleration with a small skid range. Electronically controlled gears with powershift allow simple and efficient running. Automatic gearing is available as an option.

The ZF gearbox has integrated electronic control, monitoring and intelligence. The gearbox has built-in reversing lock and modulation, providing safe and smooth gear changing. In addition we also optimise slipping electronically before delivery to provide the best gear-changing characteristics depending on power train, wheel dimension and drive shaft.

Drive train			Perkins 4 cyl *			Perkins 6 cyl **			GM V8 LPG ***		
Engine	Manufacturer, type designation		Perkins 1104C-44T			Perkins 1106D-E66TA			GM 5.7L V8		
	Fuel – type of engine		Diesel – 4-stroke			Diesel – 4-stroke			LPG – 4-stroke		
	Rating ISO 3046 – at revs		kW/hp – rpm			74,5 – 2200			89 – 2200		
	Peak torque ISO 3046 – at revs		Nm – rpm			412 – 1400			545 – 1400		
	Number of cylinders – displacement		cm ³			4 – 4400			6 – 6600		
	Fuel consumption, normal driving		l/h			4-6			6-8		
Gearbox	Manufacturer, type designation		Dana 20000			ZF 2WG 94			Dana 20000		
	Clutch, type		Torque converter			Torque converter			Torque converter		
	Gearbox, type		Hydrodynamic Powershift			Hydrodynamic Powershift			Hydrodynamic Powershift		
	Numbers of gears, forward – reverse		2 – 2			2 – 2			2 – 2		
Alternator	Type – power	W	1540			2100			1540		
Driving axle	Type		Differential and hub reduction			Differential and hub reduction			Differential and hub reduction		

Performance			DCE60-6			DCE70-6			DCE75-6			DCE80-6			DCE80-9			DCE90-6L				
			*	**	***	*	**	***	*	**	***	*	**	***	*	**	***	*	**	***		
Performance	Lifting speed	Unloaded	m/s	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40		
		At rated load	m/s	0,30	0,35	0,30	0,30	0,35	0,30	0,30	0,35	0,30	0,30	0,35	0,30	0,30	0,35	0,30	0,30	0,35	0,30	
	Lowering speed	Unloaded	m/s	0,40	0,45	0,40	0,40	0,45	0,40	0,40	0,45	0,40	0,40	0,45	0,40	0,40	0,45	0,40	0,40	0,45	0,40	
		At rated load	m/s	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	
	Travelling speed, f/r	Unloaded	km/h	23	24	23	23	24	23	23	23	23	23	23	23	23	23	23	23	23	23	
		At rated load	km/h	23	23	23	23	23	23	22	23	22	22	22	22	22	22	22	22	22	22	
Gradeability	Max.	unloaded	%	63	84	72	56	74	64	51	66	57	49	63	55	44	57	49	46	59	52	
		at rated load	%	32	42	36	29	37	32	26	34	29	25	32	28	23	30	26	23	29	25	
	At 2 km/h	unloaded	%	49	72	56	45	65	51	41	58	43	39	56	44	36	50	40	37	53	42	
		at rated load	%	25	37	30	23	33	26	21	30	24	20	29	23	19	27	21	19	26	21	
Drawbar pull	Max.	kN	43	58	53	43	58	53	43	58	53	43	58	53	43	58	53	43	58	53		
Noise	Noise level according to EN12053	LpAZ (inside) Spirit Delta	dB(A)	70	72	74	70	72	74	70	72	74	70	72	74	70	72	74	70	72	74	
		LpAZ (inside) Spirit Delta Space	dB(A)	70	72	74	70	72	74	70	72	74	70	72	74	70	72	74	70	72	74	
		LpAZ (inside) FlexGuard	dB(A)	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
		LpAZ (inside) FlexCab	dB(A)	76	77	77	76	77	77	76	77	77	76	77	77	76	77	77	76	77	77	
	Noise level according to 2000/14/EC	LwAZ (outside)	dB(A)	106	105	108	106	105	108	106	105	108	106	105	108	106	105	108	106	105	108	



Lifting equipment

The lifting equipment on Kalmar machines is characterised by robust and high-quality design and numerous options combined with excellent visibility. We can offer many different types of masts all of clear view design. In combination with forks and/or attachments, we can provide the handling solution to meet your needs.

For even better handling, there are also a number of intelligent functions for machines with KCS:

- Pre-selected lifting height – the operator can simply find the right lifting height by means of 15 pre-selected lifting heights.
- No chain slack – the chains are kept tensioned at all times, eliminating undesired movements of the forks or the attachment.
- Vertical hold– the automatic tilt device ensures that the load is taken up and put down vertically to the loading surface.

Mast									
	Lift height	Mast height		Free lift H2	Lift height	Mast height		Free lift H2	
		H3 min.	H5 max.			H3 min.	H5 max.		
		DCE60-70			DCE75-90L				
Duplex standard, clear view	2650	2200	3650	–	2030	2200	3200	–	
	2950	2350	3950	–	2330	2350	3500	–	
	3500	2620	4500	–	3500	2935	4660	–	
	3750	2750	4750	–	3750	3060	4910	–	
	4000	2870	5000	–	4000	3185	5160	–	
	4250	3000	5250	–	4250	3310	5410	–	
	4500	3120	5500	–	4500	3435	5660	–	
	4750	3250	5750	–	4750	3560	5910	–	
	5000	3370	6000	–	5000	3685	6160	–	
	5250	3500	6250	–	5250	3810	6410	–	
	5500	3620	6500	–	5500	3935	6660	–	
	5750	3750	6750	–	5750	4060	6910	–	
	6000	3870	7000	–	6000	4185	7160	–	
	Duplex full free lift, clear view	2400	2200	3500	1105	2030	2200	3190	1065
		2700	2350	3800	1255	2330	2350	3490	1215
3250		2620	4350	1530	3250	2810	4410	1675	
3500		2750	4600	1655	3500	2935	4660	1800	
3750		2870	4850	1780	3750	3060	4910	1925	
4000		3000	5100	1905	4000	3185	5160	2025	
4250		3120	5350	2030	4250	3310	5410	2175	
4500		3250	5600	2155	4500	3435	5660	2300	
4750		3370	5850	2280	4750	3560	5910	2425	
5000		3500	6100	2405	5000	3685	6160	2550	
5250		3620	6350	2530	5250	3810	6410	2675	
5500		3750	6600	2655	5500	3935	6660	2800	
5750		3870	6850	2780	5750	4060	6910	2925	
6000		4000	7100	2905	6000	4185	7160	3050	
Triplex full free lift, clear view		3840	2200	4900	1160	3060	2200	4190	1090
	4290	2350	5350	1310	3510	2350	4640	1240	
	4950	2570	6010	1530	4200	2580	5330	1470	
	5450	2740	6515	1690	4700	2750	5825	1640	
	5950	2910	7015	1860	5200	2920	6330	1800	
	6450	3070	7510	2030	5700	3080	6825	1970	
–	–	–	–	6200	3250	7330	2140		

Masts



Duplex standard, clear view



Duplex full free lift, clear view

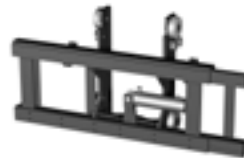


Triplex full free lift, clear view

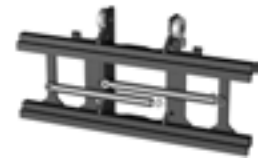
Carriages



Fork carriage for manually adjustable forks



Sideshift carriage



Sideshift and fork positioning carriage

Forks



Standard forks for manual operation



Forks with roller brackets for hydraulic operation



Fork shaft system with separate carriers for each fork



Fork with hydraulic levelling

Quality and service

The Kalmar DCE60-90L has been developed from the very beginning to give safe operation and a long lifetime with minimum downtime. In part this is due to technical solutions and components, but also to the fact that the truck is not exposed to any in-built loads that produce unnecessary wear and tear and higher costs.

Optimised chassis modules, fittings, mast, dynamic stability, electronically controlled driving, wet disc brakes, double seals in all hydraulic cylinders, ORFS hydraulic couplings, reinforced drive axle bracket, a KCS system, welded cab mounting, etc. all result in a very high quality machine with low running costs.

Simple inspection and service

Daily inspection is simple and fast. All inspection points are directly accessible at working height and the large inspection hatches are easy to open. The cab tilts, providing ease of access to the entire drive train.

Safety and the environment

The Kalmar DCE60-90L is CE marked its construction complies with the following standards:

- The Machinery Directive 98/37/EC incl. visibility norm ISO/DIS 13564 1:2004
- The EMC Directive 89/336/EC
- The Noise Emission Directive 2000/14/EC
- The Exhaust Gas Directive 97/68/EC

