

Kalmar DCF70-100, E4-E8 Empty container handlers 15,400 – 22,000 lbs



The result of a technical evolution

Kalmar machines especially adapted to handle empty containers have been developed for a long time. Now we have brought our empty container handlers in to the new generation, the Kalmar F series – the technical platform that represents a major technical revolution in container handling.

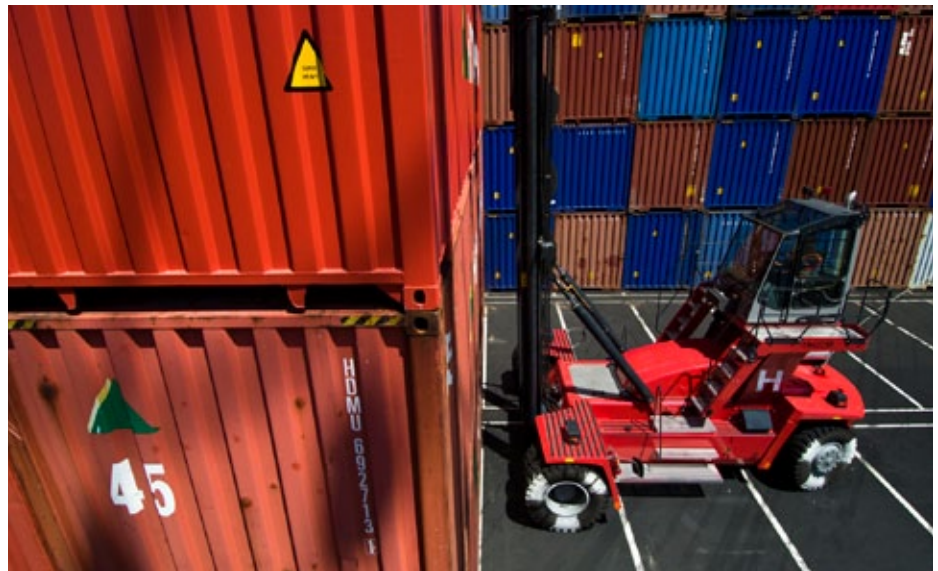
The DCF70-100 is a high quality machine that allows you to move as many units as possible in the shortest amount of time in the most profitable way. In order to get the optimum balance of economy, lifting height and performance for each client, Cargotec offers a wide range of empty container handlers.

As for all Kalmar F series machines safety is a key factor. The DCF70-100 can provide the best everyday performance and at the same time reassure the safety of the personnel. The components are well known and are often found in other Kalmar machines and have therefore been tested through an extended time and can provide the highest possible reliability.

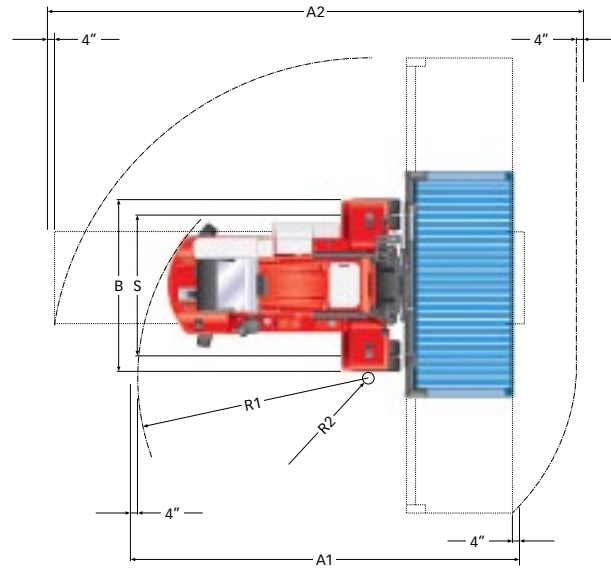
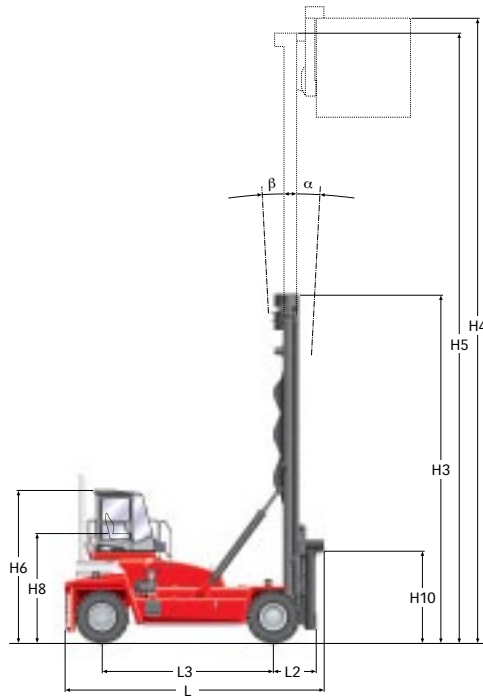
Efficient and reliable

The design of the chassis, mast and spreader has resulted in a machine with very good dimensional, stability and operational characteristics. These combined allow the operator to focus on the task instead of the management of the machine.

Additionally, we have ensured that every single detail, component and system have been selected and manufactured to provide the highest possible reliability. When we deliver the machine we want to make sure that all aspects are factored in. Once produced all machines go through an extensive testing program before they leave the factory in order to secure a high level of reliability.



Dimensions		DCF70-40	
		E4	E5
Lifting capacity	Rated (lb)	15,400	15,400
	Load center (in)	L4	48
	Number of containers, 8'6" container	4	5
	Number of containers, 9'6" container	4	5
Truck	Truck length (in)	L	252
	Truck width (in)	B	136.8
	Height, basic machine (in)	H6	153.5
	Seat height (in)	H8	106.3
	Distance between center of front axle – front of attachment (in)	L2	46.7
	Wheelbase (in)	L3	159.4
	Track (c-c) front – rear (in)	S	110.2 – 77.6
	Turning radius, outer – inner (in)	R1 – R2	265.7 – 74.8
	Ground clearance, min. (in)		9.1
	Min. aisle width for 90° stacking, 20' container (in)	A1	417.3
	Min. aisle width for 90° stacking, 40' container (in)	A2	566.9
Standard duplex mast	Lifting height (in)	H4	476.4
	Mast height, min. (in)	H3	279.7
	Mast height, max (in)	H5	476.4
	Mast tilting, forward – backward (°)	$\alpha - \beta$	3 – 3
	Ground clearance, min.		9.1
	Width (in)	b	238.8 – 480.3
	Height under twistlock (in)	H10	85.8
	Height under hooks (in)	H10	–
	Sideshift \pm (in)	V	23.6
Weight	Service weight (lb)		71,650
	Axle load front, unloaded (lb)		46,960
	Axle load front, at rated load (lb)		71,210
	Axle load back, unloaded (lb)		24,690
	Axle load back, at rated load (lb)		15,430
Wheels / tires	Type, front – rear		Pneumatic – Pneumatic
	Dimensions, front – rear (in)		12.00x20 – 12.00x20
	Number of wheels, front – rear (*driven)		4* – 2
	Pressure (psi)		145
Steering system	Type – maneuvering		Servo assisted – Steering wheel
Service brake system	Type – affected wheels		Wet disc brakes – Drive wheel
Parking brake system	Type – affected wheels		Spring brake – Drive wheel
Hydraulic pressure	Max. (psi)		3,046
Hydraulic fluid volume	(gal)		50.6
Fuel volume	(gal)		61.6



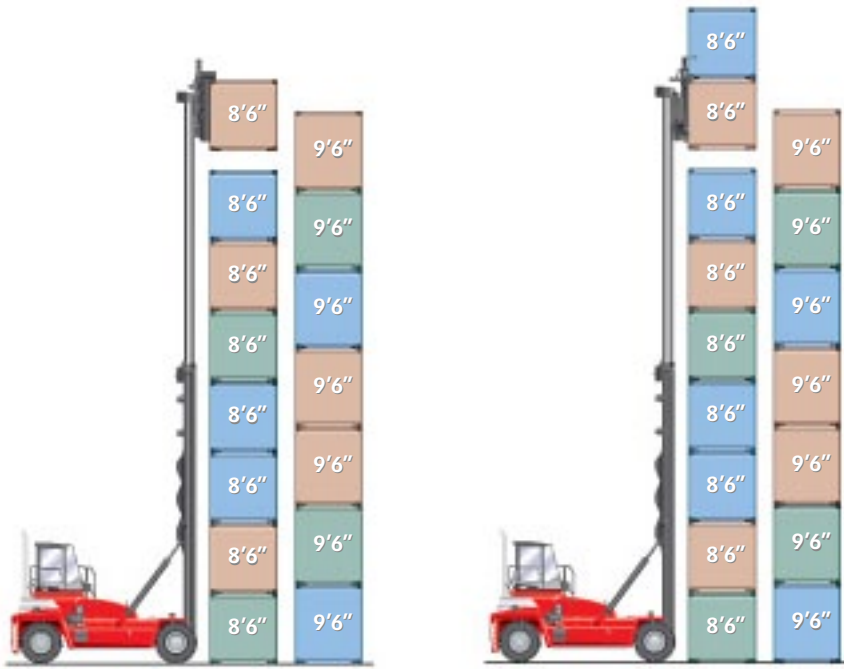
DCF80-45				DCF90-45				DCF100-45			
E5	E6	E7	E8	E5	E6	E7	E8	E5	E6	E7	E8
17,600	17,600	17,600	17,600	19,800	19,800	19,800	19,800	22,000	22,000	22,000	22,000
48	48	48	48	48	48	48	48	48	48	48	48
5	6	7	8	5	6	7	8	5+1	6+1	7+1	8+1
5	5	6	7	5	5	6	7	5+1	5+1	6+1	7+1
271.7	271.7	271.7	271.7	271.7	271.7	271.7	271.7	271.7	271.7	271.7	271.7
159.4	159.4	159.4	159.4	161.4	161.4	161.4	161.4	181.1	181.1	181.1	181.1
155.1	155.1	155.1	155.1	157.5	157.5	157.5	157.5	157.5	157.5	157.5	157.5
110.2	110.2	110.2	110.2	112.6	112.6	112.6	112.6	112.6	112.6	112.6	112.6
46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	48.8	48.8	48.8	48.8
179.1	179.1	179.1	179.1	179.1	179.1	179.1	179.1	179.1	179.1	179.1	179.1
128.7 – 88.6	128.7 – 88.6	128.7 – 88.6	147.6 – 88.6	128.7 – 86.6	128.7 – 86.6	128.7 – 86.6	128.7 – 86.6	147.6 – 86.6	147.6 – 86.6	147.6 – 86.6	147.6 – 86.6
265.7 – 45.3	265.7 – 45.3	265.7 – 45.3	265.7 – 45.3	275.6 – 59.1	275.6 – 59.1	275.6 – 59.1	275.6 – 59.1	275.6 – 49.2	275.6 – 49.2	275.6 – 49.2	275.6 – 49.2
9.8	9.8	9.8	9.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
417.3	417.3	417.3	417.3	427.2	427.2	427.2	427.2	427.2	427.2	427.2	427.2
559.1	559.1	559.1	559.1	565.0	565.0	565.0	565.0	565.0	565.0	565.0	565.0
599.2	638.6	737.0	835.4	601.6	640.9	739.4	837.8	602.4	641.7	740.2	838.6
336.2	355.9	405.1	454.3	338.6	358.3	407.5	456.7	338.6	358.3	407.5	456.7
592.1	631.5	729.9	828.3	594.5	633.9	732.3	830.7	594.5	633.9	732.3	830.7
3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3	3 – 3
9.8	9.8	9.8	9.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3	238.8 – 480.3
87.4	87.4	87.4	87.4	89.8	89.8	89.8	89.8	–	–	–	–
–	–	–	–	–	–	–	–	90.6	90.6	90.6	90.6
23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
78,260	79,590	82,890	86,200	80,250	81,570	84,880	88,180	89,400	90,830	94,360	97,890
50,040	51,370	54,670	57,980	50,490	51,810	55,120	58,420	56,550	57,980	61,510	65,040
76,940	78,260	81,570	84,880	80,910	82,230	85,540	88,850	90,500	91,930	95,460	98,990
28,220	28,220	28,220	28,220	29,760	29,760	29,760	29,760	32,850	32,850	32,850	32,850
18,960	18,960	18,960	18,960	19,180	19,180	19,180	19,180	20,940	20,940	20,940	20,940
Pneumatic – Pneumatic											
12.00x24 – 12.00x24				14.00x24 – 14.00x24				14.00x24 – 14.00x24			
4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2	4* – 2
145	145	145	145	145	145	145	145	145	145	145	145
Servo assisted – Steering wheel											
Wet disc brakes – Drive wheel											
Spring brake – Drive wheel											
2,756	2,756	2,756	2,756	2,901	2,901	2,901	2,901	3,263	3,263	3,263	3,263
70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6

Protective and safe with total control

The lifting equipment of Kalmar DCF is an integrated assembly consisting of mast, carriage, spreader, hydraulics and control system. This is to ensure you get a reliable and good running machine with high availability even after long shifts and high load stresses.

To leverage operational productivity it's essential that the driver has full control over every moment of the handling sequence. The open design of the mast optimizes the visual contact with the stack, container corners, twistlock and spreader.

Lifting as much as 8+1 high puts high demands on sturdiness of the equipment. Stronger dimensions on the tilting cylinders and with the top section threaded into the cylinder creates a robust lifting equipment.



Single and double stacking

We have developed empty container handling concepts for both single- and double stacking for different lifting heights. Our DCF Empty range stretches from a capacity of 4 high up to 8+1 high. The decision on which concept is most suitable depends on individual operational demands.

The open design of the mast optimizes the visual contact with the stack, container corners, twistlocks and spreader.

Single stacking with twistlocks

The single handling concept starts at 4 high stacking and up to 8 high. Characteristic for the machines dedicated for single stacking is flexibility, stability and high lifting speeds.

Twistlock attachments are widely used on many Kalmar machines over the globe.

High demands on selectivity and limitations in ground space are the key factors when considering single stacking equipment.

Double stacking with hooks

Double stacking of containers is an important step in increasing the productivity in the empty container handling business. Double stacking can be a very demanding application for the Empty Container Handler. The DCF100 model fulfils these high requirements of stability and strength with margin. Stacking two containers simultaneously is most of all a question of extreme demands of operational efficiency before demands on selectivity.

Mast

All machines in the DCF70-100 series are equipped with the sturdy profile, designed according to the free visibility principle. The mast profiles are made of high tensile steel, designed for minimal obstruction of the field of vision and for long service life with minimal deflection at high lifting heights.

The mast is made for high reliability and simple maintenance. It requires only two hoses and one cable passing over the mast roller to feed the hydraulic and electrical functions of the spreader.

Carriages

Three integrated carriages are available. Which one you choose is depending on your handling needs and which attachment you need. For single stacking the attachment is landing from above (twist-

locks) and a carriage with passive leveling is suitable, there are also carriages with mechanical or hydraulic leveling available as options. For double stacking the attachment approaches the container from the

front side (hooks). All carriages have support wheels to bear longitudinal stresses and sliding plates for lateral stresses.



Carriage for attachment with leveling in twistlocks, standard on DCF70-90 for single stacking



Carriage with mechanical leveling, available as option on DCF80-90 for single stacking.



Carriage with hydraulic leveling. Standard on DCF100 for double stacking and option on DCF80-90 for single stacking

Attachments

DCF70-90 are equipped with twistlock attachments. DCF100 is equipped with a C-hook attachment for double stacking. Both the hook and twistlock attachments have a hydraulic cylinder between the attachment and the carriage that allows $\pm 23.6''$ side-shift.

The leveling function on the standard twistlock attachment is enabled by the mobility on each twistlock. This gives a simpler construction which offers increased reliability and easier servicing.

The locking and unlocking procedure is made easier through individual monitoring of the twistlocks or the hooks. To guarantee good visibility when handling the containers in dark conditions the working light is placed on the mast directed towards the locking device, independent of the spreader extension.

Attachment for single stacking with twistlocks, available as option on DCF80-90.



DCF100 attachment for double stacking with hooks.

DCF70-90 attachment with leveling in twistlocks

Engineered to optimize performance

A key factor for productivity is the basic machine setup. We have put highest priority on overall technical reliability and how the components come together, all functions must perform optimally even after heavy use.

1 Chassis

The chassis creates the base for the machine's external dimensions, stability and maneuver characteristics. All chassis are built of fully welded steel profiles, which give a rigid design with strong mounting points for the drive axle and lift equipment. Stress concentrations have been eliminated for optimum tensile strength.

The chassis has a low profile for good visibility. The tanks are separately mounted and bolted to the chassis in a position that also contributes to good visibility. The cabin on each model is located for best visibility. The DCF70-100 series come in two different versions regarding the cabin position. Depending on market requirements the machines can be delivered with standard cabin height position or as an elevated version (only standard cabin available on DCF70).

2 Engine

The Cummins and Volvo engines (no Volvo alternative on DCF70) provide power for driving and the working hydraulics. The engines are low-emission turbo diesels with fuel injectors and intercoolers. The design of the combustion chambers, along with the precise fuel injection control, ensures more efficient combustion to provide lower emissions with increased torque and power. The engines meet the Tier 3 directives.

The radiator is a 3 chamber design with a single fan to provide cooling for the engine and transmission. The engine cooler's separate expansion chambers are fitted with a level sensor that indicates low coolant level.

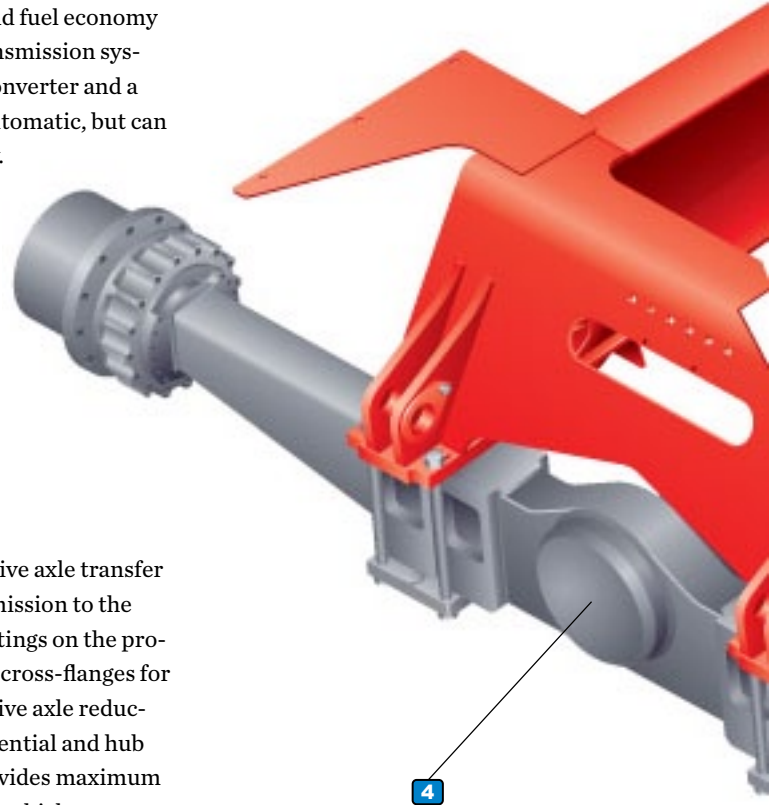


3 Transmission

The transmission is electronically controlled in the DCF. It transfers power from the engine to the hydraulic pumps and driveline. The engine and gearbox control systems work together to find the optimum balance between power and fuel economy at any given time. The transmission system consists of a torque converter and a gearbox. The gearbox is automatic, but can partly be shifted manually.

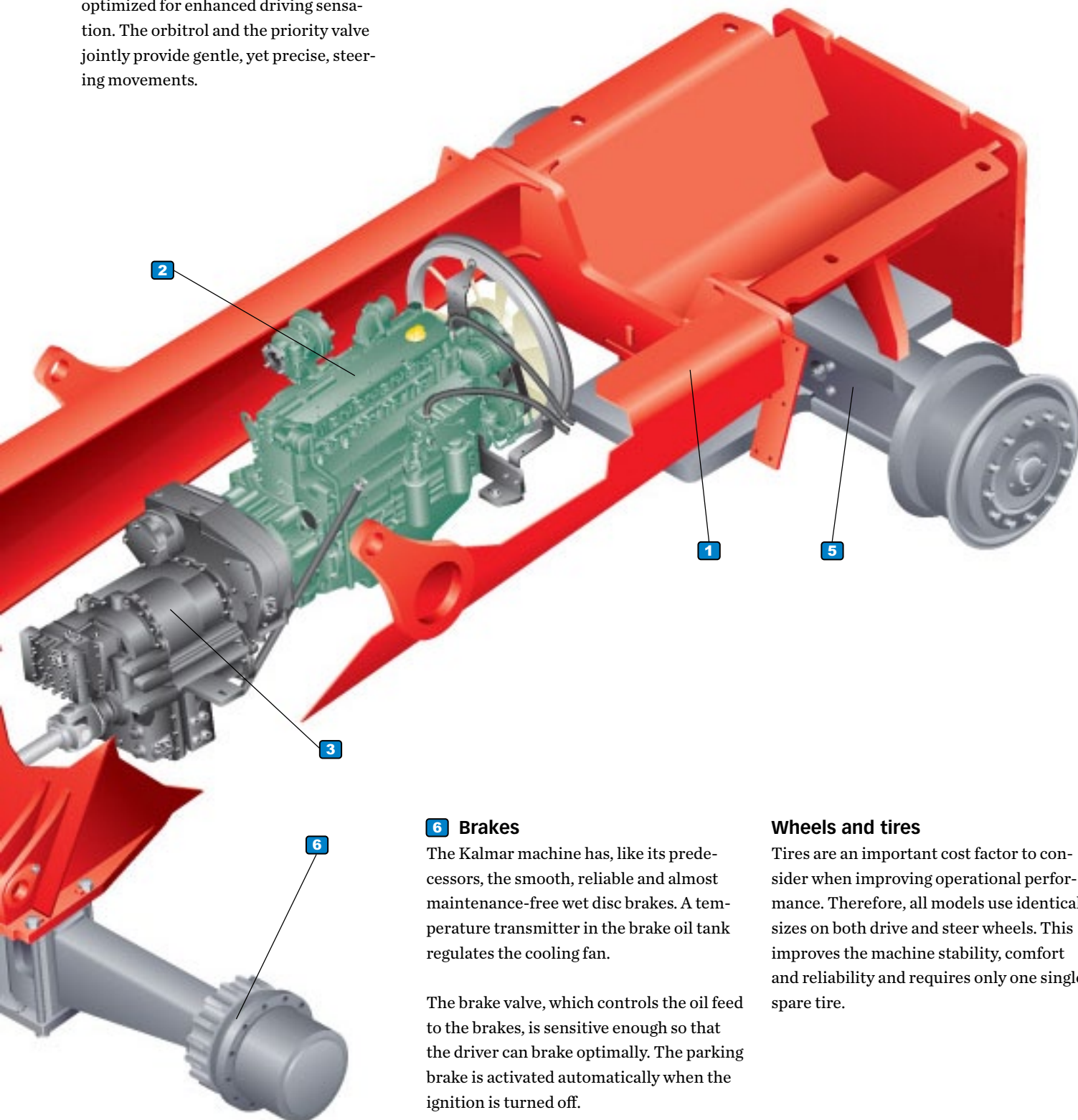
4 Driveline

The propeller shaft and drive axle transfer the power from the transmission to the driving wheels. The mountings on the propeller shaft are fitted with cross-flanges for optimum strength. The drive axle reduction is in two stages, differential and hub reduction. The engine provides maximum torque at the drive wheels, which spares the transmission.



5 Steering system

The steering axle is built of high strength steel with a high structural integrity. The suspension points on the steering axle are maintenance free. The hydraulics that feed oil to the steering cylinder are optimized for enhanced driving sensation. The orbitrol and the priority valve jointly provide gentle, yet precise, steering movements.



6 Brakes

The Kalmar machine has, like its predecessors, the smooth, reliable and almost maintenance-free wet disc brakes. A temperature transmitter in the brake oil tank regulates the cooling fan.

The brake valve, which controls the oil feed to the brakes, is sensitive enough so that the driver can brake optimally. The parking brake is activated automatically when the ignition is turned off.

Wheels and tires

Tires are an important cost factor to consider when improving operational performance. Therefore, all models use identical sizes on both drive and steer wheels. This improves the machine stability, comfort and reliability and requires only one single spare tire.

Drivetrains and performance

Drive train		Cummins QSB6.7 with Dana TE13000 (DCF70)	Volvo TAD760VE with Dana TE17000 (DCF80-100)	Cummins QSB6.7 with Dana TE17000 (DCF80-100)
Engine	Manufacturer, type designation	Cummins – QSB6.7 (Turbo-Intercooler)	Volvo – TAD760VE (Turbo-Intercooler)	Cummins – QSB6.7 (Turbo-Intercooler)
	Fuel – type of engine	Diesel – 4-stroke	Diesel – 4-stroke	Diesel – 4-stroke
	Rating ISO 3046 – at revs (hp – rpm)	173 – 2200	241 – 2200	220 – 2200
	Peak torque ISO 3046 – at revs (lb/ft – rpm)	590 – 1400	811 – 1500	700 – 1500
	Number of cylinders – displacement (in³)	6 – 409	6 – 436	6 – 409
	Fuel consumption, normal driving (gal/hr)	3.1-3.7	3.4-4.0	3.4-4.0
Gearbox	Manufacturer – type designation	Dana – TE13000	Dana – TE13000	Dana – TE17000
	Clutch, type	Torque converter	Torque converter	Torque converter
	Gearbox, type	Hydrodynamic Powershift	Hydrodynamic Powershift	Hydrodynamic Powershift
	Numbers of gears, forward – reverse	3 – 3	3 – 3	3 – 3
Alternator	Type – power (Amp)	AC – 70	AC – 80	AC – 70
Starting battery	Voltage – capacity (V – Ahr)	2×12 – 140	2×12 – 140	2×12 – 140
Driving axle	Type	Differential and hub reduction	Kessler – Differential and hub reduction	Kessler – Differential and hub reduction
Noise level, inside	LpAZ*, Spirit Delta (dB(A))	70	70	70
Noise level, outside	LwAZ** (dB(A))	-	-	-

* LpAZ according to EN12053 ** LwAZ according to 2000/14/EC

Performance – Cummins QSB6.7 with Dana TE13000		DCF70-40
Lifting speed	Unloaded (ft/s)	1.6
	At rated load (ft/s)	1.5
Lowering speed	Unloaded (ft/s)	1.8
	At rated load (ft/s)	1.8
Traveling speed, forward – reverse	Unloaded (mph)	18 – 18
	At rated load (mph)	16 – 16
Gradeability, max.	Unloaded (%)	28
	At rated load (%)	23
Gradeability, at 1.2 mph	Unloaded (%)	24
	At rated load (%)	20
Drawbar pull	Max. (lbf)	21,130

Performance – Volvo TAD760VE with Dana TE17000		DCF80-45	DCF90-45	DCF100-45
Lifting speed	Unloaded (ft/s)	2.1	2.1	2.1
	At rated load (ft/s)	1.5	1.5	1.5
Lowering speed	Unloaded (ft/s)	1.8	1.8	1.8
	At rated load (ft/s)	2.0	2.0	2.0
Traveling speed, forward – reverse	Unloaded (mph)	18 – 18	19 – 19	19 – 19
	At rated load (mph)	16 – 16	17 – 17	17 – 17
Gradeability, max.	Unloaded (%)	39	29	29
	At rated load (%)	32	23	23
Gradeability, at 1.2 mph	Unloaded (%)	31	24	24
	At rated load (%)	26	19	19
Drawbar pull	Max. (lbf)	32,370	28,550	28,550

Performance – Cummins QSB6.7 with Dana TE17000		DCF80-45	DCF90-45	DCF100-45
Lifting speed	Unloaded (ft/s)	2.1	2.1	2.1
	At rated load (ft/s)	1.5	1.5	1.5
Lowering speed	Unloaded (ft/s)	1.8	1.8	1.8
	At rated load (ft/s)	2.0	2.0	2.0
Traveling speed, forward – reverse	Unloaded (mph)	18 – 18	19 – 19	19 – 19
	At rated load (mph)	16 – 16	17 – 17	17 – 17
Gradeability, max.	Unloaded (%)	38	28	28
	At rated load (%)	32	22	22
Gradeability, at 1.2 mph	Unloaded (%)	30	23	23
	At rated load (%)	26	18	18
Drawbar pull	Max. (lbf)	31,470	27,430	27,430

Excellent operator comfort

To obtain the maximum out of your investment, you can never underestimate the importance of the drivers' working environment.

High productivity requires full driver concentration and efficiency to keep up handling speed, but also to avoid accidents causing injuries and costly damages. This is what ergonomics is all about. Comfort and awareness.

The F-generation cabin, the efficient Spirit Delta, offers excellent driver comfort with large display field on the instrument panel, generous glass surfaces that enable all around visibility and low levels of noise and vibration.

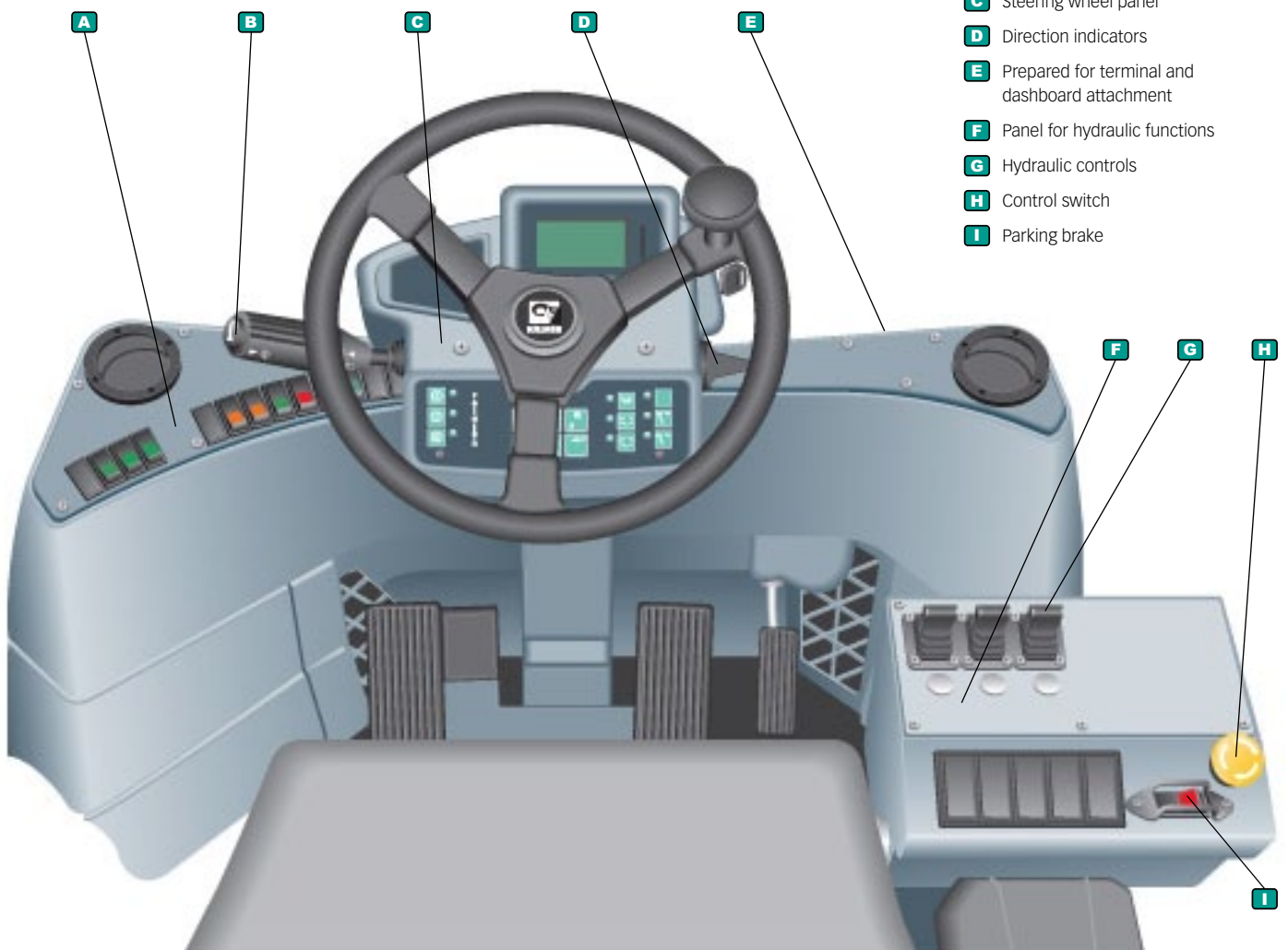
We focus on four important ergonomic areas:

- Operation
- Visibility
- Sound and vibrations
- Climate

The result is a cabin where everything is optimized to improve driver performance. Consider this:

- Individually adjustable controls (mini-levers as standard or joystick as option), steering wheel and seat.
- Intuitively positioned instruments.
- Switches and buttons with lights.
- Comfort pedals.
- Electronic accelerator pedal.

- Central operation/warning display.
- Separately suspended and isolated cabin.
- Shock absorption to minimize vibrations.
- Maximum sound level inside is 72 dB (A).
- Generous interior dimensions and floor space.
- Optimized visibility – 360° all around.
- Electronically controlled heating/ventilation.
- Filters for fresh air and recirculation.
- High performance air conditioning system, optional.
- Pollen filter, optional.



A Left instrument panel

B Gear selector and multi-function lever

C Steering wheel panel

D Direction indicators

E Prepared for terminal and dashboard attachment

F Panel for hydraulic functions

G Hydraulic controls

H Control switch

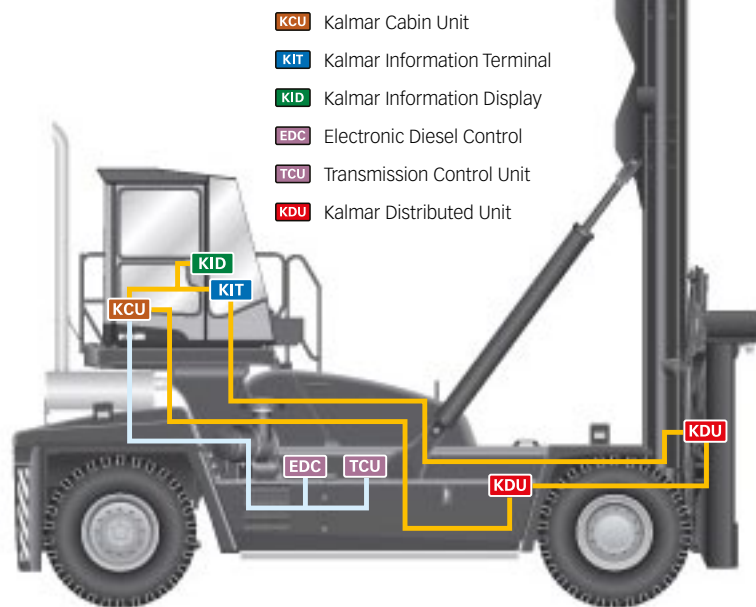
I Parking brake

The simple way to reach new levels of utilization

All vehicles today – cars, highway trucks, wheel-loaders, cranes etc – are designed with more and more sophisticated components and systems.

Each part interacts closely with the others and to reach the full potential requires computer assistance. This built-in intelligence is designed to support and leverage your handling operations, not confuse it.

The new Kalmar series possesses a well proven, thoroughly tested and optimized control system, which supports your driver, mechanics and financial controller. And it is simple to use.



The communication network layout.

A well-distributed control system

Two things are needed for a command initiated by the driver to result in a particular function, or for several functions to work together: power supply and communication. The power-feed supplies the machine's electrical or electro-hydraulic functions with voltage. The communication system controls and checks that the functions have been activated, waits in standby mode or indicates faults.

Communication

The distributed power-feed and communication network consists of electrical components and a microcomputer-based system for controlling and monitoring the functions.

The most important components in the network are the control units (nodes).

They distribute control of the machine's functions. Each node has its own processor. The nodes integrate with each other and all communication; control signals and signal information are sent via data buses.

The nodes transmit their signals in messages on the network. Each message contains several signals and has its own address. Any units that need to know the status of a signal listen out for the address of the signal's message. All the nodes in the network listen to each other.

CAN-bus is a two-wire transfer of data and a definition of a bus type. CAN-bus technology has been chosen because it provides a reliable, robust transfer of data and is difficult to disrupt. CAN-bus loops have been used in Kalmar machines since 1995. The greatest benefit of using CAN-bus technology is that the amount of cabling can be reduced. All that is needed to establish communication are two data-bearing leads and two leads for feeding the nodes' processors. The network loop for both the CAN-bus and the nodes' processor feed are redundant.

The Kalmar Cabin Unit (KCU) is the control node for the entire network. There are several nodes, called KDUs (Kalmar Distribution Units), nearby the network. Each node is positioned near to the functions it is designed to deal with.

The Transmission Control Unit (TCU), which is the gearbox node, deals with the gearbox. The unit is connected in a separate CAN-bus loop with the EDC engine node (Engine Diesel Control) and KCU. The engine node controls the fuel injection and receives its control signals from its own transmitters on the engine.

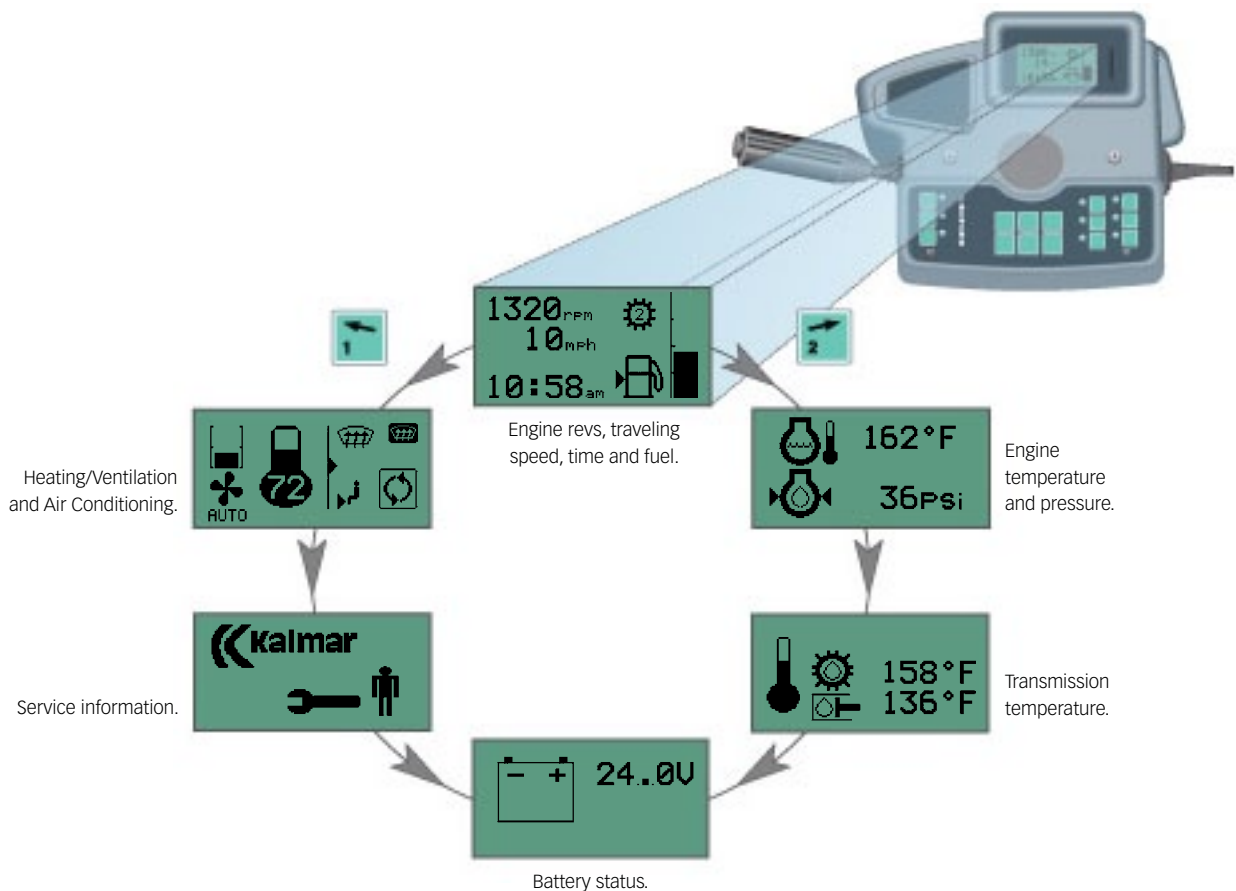
Power supply

Power-feed for the functions differ from the feed required for communication and feeding of the nodes' processors. Each distribution unit (node) in the distributed network is fed voltage from one of the power distribution boxes. The distribution boxes are located inside the cabin and on one side of the frame. The distribution units (nodes) guide power from the distribution box to the required functions based on the instructions in the messages from the communication network.

Control functions support the driver

The driver and machine communicate very simply via the Kalmar Information Terminal (KIT) and the Information Display located right in front of the driver in the cabin. The two-way communication – from the driver to the machine and opposite – is handled by the KCU (Kalmar Cabin Unit) which is the control node for the entire network. Information to the driver comprises alarm warnings, operating details and action guided information. Messages, status, fault indications etc are presented on the Information Display (KID), while warnings and other monitoring indications are presented to the left.

Messages are only presented when they are relevant to the driver and the operation. The driver can focus on the job instead of checking meters and indicators.



Superior availability ensures your investment is profitable

To understand the full potential of your investment requires being aware of the details, features and technical matters in a machine like the Kalmar empty container handler.



Fewer stops for planned maintenance

The service intervals are 500 hours. The DCF is designed for fast daily inspection and preventive maintenance. All check-points are easy accessible and concentrated to specific locations.

Lubrication free components or central lubrication points have been utilized. The wet disc brake system is practically maintenance free. The indicator and monitoring support built into our control system facilitate that the machine won't be misused or maintained incorrectly. The driver and mechanics will always get indications and guidance in time to avoid unnecessary and costly wear and tear or technical breakdowns. No unwanted stops.

A safe communication network.

The control and monitoring system, the redundant CAN-bus system is proven to be excellent in functionality and reliability. The network of control nodes allows for less wiring and connectors which reduces the number of sources of error.

The power-feed for each node and the transfer of control signals are independent of the other nodes, which means the risk of disruption becomes minimal. The redundant design means that there are always two paths to choose to maintain communication, which results in extra safety and reliability.

Reliability begins at the concept stage

One of the guiding principles in designing the DCF was to minimize the number of potential sources of error. Therefore the machines consist of as few components and moving parts as possible. The functionality and operational reliability is assured by extensive testing.



All hydraulic hoses are fitted with ORFS-couplings.

The hydraulic system is critical.

No other part of the machine is working so hard under continuous pressure. To secure the reliability we have minimized the number of hydraulic components and couplings.

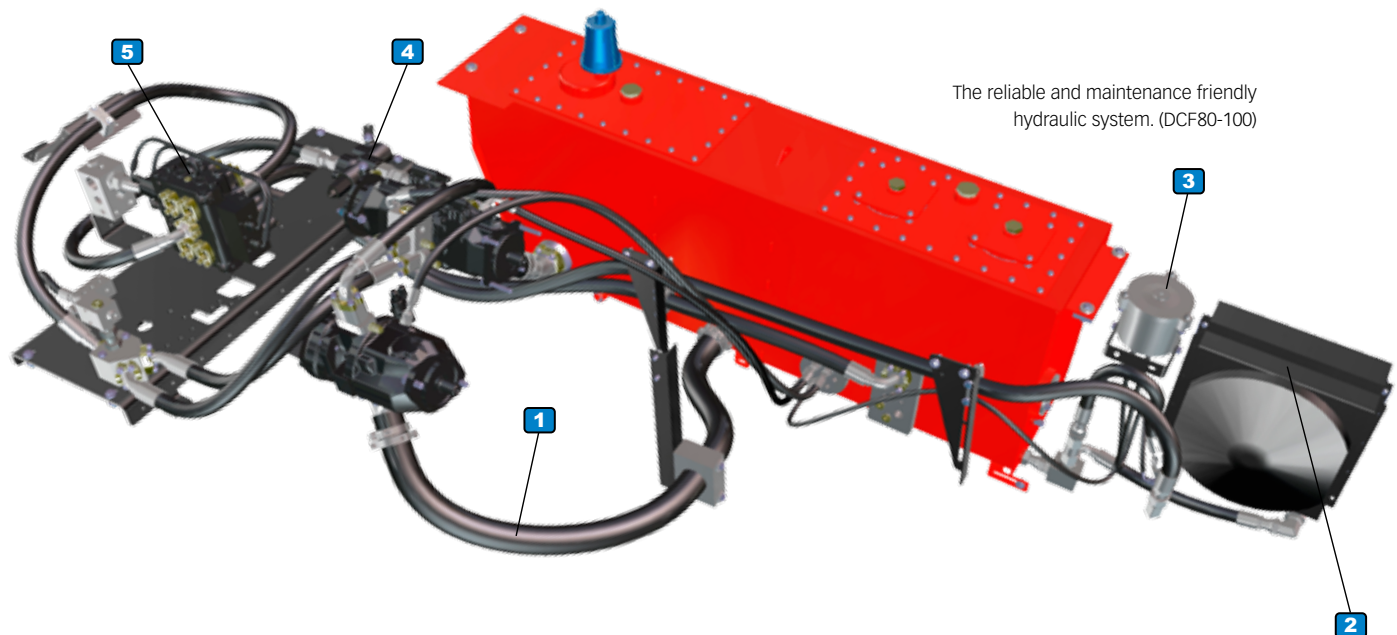
To ensure optimum oil pressure and security regardless of the handling operation the hydraulic system is based on three variable pumps – one for the brake system, cooling and filtering, one for working hydraulics and one supporting both steering and working hydraulics.

The distribution of pressure between working hydraulics and steering is done by the priority valve which ensures that the steering always receives enough pressure. The hydraulic oil pump for load handling is disconnected during forward driving, to use the engine power to its best.

All three pumps interact together, using the same oil tank and filters, which are located inside the tank. The system is equipped with one oil cooler and a separate fan to secure the right oil temperature, to

match the hydraulic brake heat generation as well as feeding the overall system during tough handling cycles.

Oil supply and temperature control is handled through Kalmar's distributed control system. All indications are presented when appropriate on the Kalmar Information Display (KID) in the cabin.



Other improving features:

- 1** The large dimensions of hydraulic hoses improves the hose's lifetime (slower flow, less friction and less heating).
- 2** Thermostatic cooling improves the oil lifetime (temperature control, optimized working temperature).

- 3** High density filter improves the oil lifetime (clean oil).
- 4** ORFS – leak proof couplings all around improves reliability (minimizes leakage).

- 5** All main hydraulic components at ground level are gathered on a separate plate, bolted to the chassis and therefore simple to remove.

Notes

[illegible]

[illegible]

Global presence and local service bring
our products and solutions closer to our customer.



Cargotec improves the efficiency of cargo flows on land and at sea - wherever cargo is on the move. Cargotec's daughter brands, Hiab, Kalmar and MacGregor are recognised leaders in cargo and load handling solutions around the world. Cargotec's global network is positioned close to customers and offers extensive services that ensure the continuous, reliable and sustainable performance of equipment. Cargotec's sales totalled EUR 2.6 billion in 2010 and it employs approximately 11,000 people. Cargotec's class B shares are quoted on NASDAQ OMX Helsinki under symbol CGCBV. www.cargotec.com



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