

The Kalmar Ottawa

T2E+

Electric Terminal Tractor

ECO
EFFICIENCY
IN ACTION



KALMAR

The time is now to go **ELECTRIC**

Kalmar's second generation of electrically powered terminal tractors will help improve the eco-efficiency of your operations while maintaining the highest levels of productivity and safety. With a range of modular battery options and charging solutions, we can work with you to design a solution that will deliver for your business.

Seven years in the making.

Our electrification journey began 7 years ago when we put our first prototypes into the field. Now with nearly 100 electric terminal tractors in operation, we have been able to identify where key changes needed to be made. These have all been brought together in our T2E+ electrically powered terminal tractor, changes which have helped us design a terminal tractor that will exceed your expectations.



Three big changes.

There are three big differences and many small ones to our new generation of electrically powered terminal tractors for you to benefit from.

Charge times cut in half. Our first big change has been to incorporate a DC FastCharge System, which has allowed us to cut the charge time in half.

No more transmission. The second is that we have removed the transmission from the driveline, moving to a direct drive solution where the electric motor is powering the drive axle, reducing the complexity of the driveline.

Ability to operate in extreme temperatures. Thirdly we have included an Active Thermal Management System, which will allow your electric terminal tractor to operate optimally at full power in extreme temperatures.

When all brought together you have the Kalmar Ottawa T2E+ Electric Terminal Tractor which can be charged quickly and easily, will operate optimally in extreme weather conditions, is easier to service and maintain and produces zero carbon emissions at source.

Eco-efficiency built in.

Being electrically powered, your terminal tractor will produce zero carbon emission at source, making them cleaner and safer to operate. You can cut your carbon emissions even further by using green energy sources where available or start to generate and use your own power. Getting an electrically powered terminal tractor is only the start of your eco-efficient journey. One that we will be with you every step of the way.



For complete peace of mind.

All Kalmar Electric Terminal Tractors come with a 2 year/6000 hour warranty and a 7 year/10000 hour warranty on the frame. Charging solutions are covered for 2 years and batteries for up to 5 years. Kalmar also offers a full range of service packages and genuine parts to keep your terminal tractor operating optimally, minimising downtime and maximising availability levels.



Our electric PORTFOLIO

Kalmar's electric terminal tractor is part of our complete range of eco-efficient solutions, which include electrically powered forklift trucks, reachstackers and empty container handlers.

Local Grid

Power Cabinets

Power cabinets manage the required electricity flow from the grid to your charging points. Power cabinets are modular and the number required is dependent on the number of charging points required.

Battery and Charging Monitoring

Real-time status on battery capacity and health along with charging usage and timing allows for optimised operational planning and usage.

Kalmar Insight

Kalmar Insight gives you the ability to monitor your fleet's operational status in real time no matter what type of your equipment you operate.

Charging Posts

We offer several different charging solutions. They can come with one or two charging guns and we have a small mobile unit that can be used to quickly charge your equipment if it isn't near a charging point and has run out of charge.

Sub Station Transformer

Site Power Grid

Additional Energy Storage

You can use additional energy storage units to capture excess power that you may have produced to use at a later time when required instead of buying from the grid.

Reachstackers

Kalmar offers a choice of electrically powered reachstackers with a wide range of lifting applications, battery solutions and 42 to 45 tonne lifting capacities.

Forklifts

Kalmar's electrical powered forklifts offer a broad range of lifting capacities from 5 to 33 tonnes, a choice of battery solutions and can be used for a variety of material handling applications.

Terminal Tractors

Kalmar's T2E+ electrically powered terminal tractor has been designed specifically for distribution centres and container terminals. There is a choice of different battery solutions designed to meet your operational requirements.

Empty Container Handler

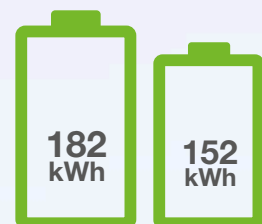
Kalmar is currently developing a range of electrically powered empty container handlers that can run up to 17 hours on a single charge, which will be able to lift 8-11 tonnes up to 2 containers at a time and stack them up to 8+1 containers high.

The **POWER** is in your hands

There are four different models available for you to choose from, two specifically designed for container ports and terminals two for distribution applications. With an on-road version available for North America.

Modular by design.

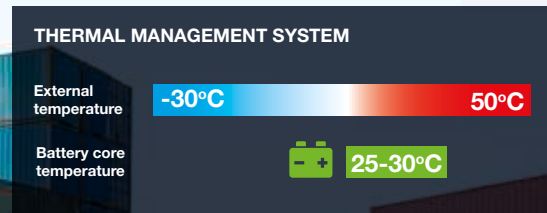
Batteries and chargers are a big part of your overall investment making it critical that you get a solution that is matched to your operational requirements, which is why Kalmar has taken a modular approach to our battery and charging solutions. There are three different charging solutions available with charging capacities of 24, 90 and 180kW and two different Li-ion battery capacities to choose from. Our battery solutions all come with a 5 year warranty and have an expected 10-12 year life*. Kalmar can help you work out which battery option and charging solution is right for your business based on your current work cycles.



Productive in extreme weather conditions.

Our portfolio of electrically powered terminal tractors all come fitted with a Thermal Management System, which allows your equipment to run optimally even in extreme weather temperatures. The system keeps your core battery temperature between 25-30°C for optimal performance even when the temperature outside gets down to -30°C or up to 50°C.

By linking the Thermal Management System to the Climate Control System energy used to heat or cool the operator's cabin will be reduced by 5%. Not only keeping your drivers comfortable, but reducing the overall energy required to run the AC or heating.



Managing your power.

Kalmar's Battery Monitoring System continually monitors the voltage, temperature, coolant and current flow of your battery solution to ensure that it operates optimally over its lifetime. This system also controls the charging of the batteries by redirecting recovered energy back into the battery packs making sure you are using the power available as efficiently as possible.

Extra safe.

With any electrically powered high voltage system you need to be extra safe which is why we have encased and shielded all high voltage lines. Should any connection be interrupted, the whole system will automatically shut down keeping your team safe. Knowing how to work with high voltage power sources is extremely important which is why Kalmar has specifically designed a High Voltage training course to enhance the skills of your workers and keep them extra safe.



BE SAFE

* First life measured as 80% capacity left in the battery.



OPTIONS



BE SAFE

Kalmar has a range of options* that make operating your equipment even safer:



Fire Suppression System. To protect your operator and machine from fire you can fit a Fire Suppression System* to your machine. The system utilises multiple spray nozzles that release a high pressure water mist where the fire has been detected from a re-chargeable water tank. This can be activated manually or automatically through an in-cabin temperature sensor.



Alcolock. To ensure that your driver is at their best when operating your equipment you can install an Alcolock system. This system makes sure that the driver meets alcohol blood level standards before being able to start the machine, much like a breathalyser.



Additional lighting. Extra lighting, particularly if you operate your machine at night, as you can bring greater operational visibility and safety for personnel working on the site. You can choose additional LED working lamps on specific positions.



Reversing cameras. To make sure your drivers can reverse safely and always know what's behind them, camera's can be mounted on your terminal tractor that give a clear rear view which is displayed within the cabin.

Other safety features you might want to consider:

- Fifth Wheel secondary locking device and sensors for extra security.
- Mechanical trailer stops to protect your cabin.
- Numerous interlocks to ensure seatbelts are fastened and parking brakes are on.
- Reflective stripping for extra visibility in limited or no light.
- Electronic Stability Control and ABS to prevent your terminal tractor and trailer ack-knifing.



There are a range of options* from Kalmar that can help raise your productivity:



DOT Approved. Our terminal tractors have been certified to operate on the road in certain markets with a restricted speed limit.



A range of lifting capacities to choose from:

- 37, 50, 70 or 90 tonnes GCW Max.



Various wheelbases:

- 3200 Or 3450mm



A variety of lifting heights:

- 431, 813 or 990mm

To help make your trailer picking more productive there are available:

- Beavertail and skid ramps
- Quick Trailer Air Delivery System
- Dolly master.

* Not all options are currently available for all models, please speak to Kalmar Sales Support to find out more.

DESIGNED

for the driver

A cabin designed for your drivers.

We have made sure that everything in our cabin has been ergonomically designed, down to the smallest detail. Your drivers will benefit from a comfortable driver's seat, a control panel that's always visible and within easy reach and even a brake pedal that has been redesigned to improve braking.



Excellent visibility.

Our T2E+ has one of the widest front view windscreens you will experience. Side mirrors are fitted as standard to ensure your drivers can always see behind them. Plus, there's added visibility onto the rear platform and trailer through a cleverly designed rear window.

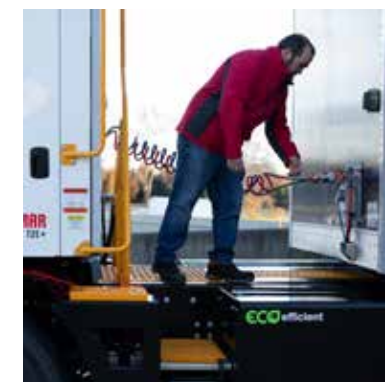


Easy and safe access.

Every Kalmar Ottawa T2E+ Electric Terminal Tractor has an optional driver side door, and also an additional level entry door off the rear platform.

More comfortable.

We've made sure your driver will always be comfortable no matter what the conditions are like outside the cabin. With effective heating and cooling, an adjustable seat that can be mounted in three different positions and a handy cup holder - your driver will be more comfortable and productive. Being an electrically powered terminal tractor, your drivers will experience less vibrations and noise in the cabin, adding to their overall comfort.



KEEP MOVING

with Kalmar Service

To keep your business moving Kalmar Services offers a range of services that can help you keep your equipment moving optimally.

Kalmar Care, making sure your business never stops.

Our job doesn't stop once we deliver your new machine, as Kalmar Care offers a range of service and maintenance contracts. Each of our Service Contracts are designed to meet your exact needs and will help you improve your operational efficiency, productivity and financial predictability. You just need to decide what you require to keep your day-to-day operations moving optimally.

MyKalmar.

Keeping your cargo moving.

The MyKalmar portal brings together many of Kalmar's digital services into one place. With a single point of access and a user-friendly design you'll benefit from greater visibility and control over your maintenance activities, parts ordering and equipment performance - helping you improve your operational performance, safety and efficiency across your entire fleet.

Kalmar MyParts.

A smarter way to order your parts.

Kalmar MyParts is your one stop shop for all the parts you need which is accessible through MyKalmar. Open 24/7, accessible on any screen and available in different languages, MyParts stocks 100s of thousands of Kalmar Genuine Parts at any given time and we can have them delivered quickly to you, no matter where you are in the world. You can search, order and then track your order all through the same application. MyParts has been designed to make your life easier.

Kalmar Insight.

Optimise your operations with Insight.

Kalmar Insight* is a performance management tool for cargo handling, which gives you an easy to use overview of your fleet operations, by aggregating data from multiple sources, including equipment built by other manufacturers.

Review your entire fleet activities, schedule maintenance activities and order the required parts automatically. All enabling you to take action on real-time information, that will help improve your overall operations immediately. Kalmar Insight comes fitted and ready to be activated in all new Kalmar equipment, it can also be retrofitted into existing Kalmar equipment or those built by other manufacturers.

Kalmar Training.

Enhance your skills.

To get the most out of your new machine our training centre offers a range of courses for both your technicians and operators. Operators can be taught how to drive the machine for optimum performance and minimum waste, and to learn what needs to be checked daily for optimal safety. Technicians can be educated with the knowledge they need to keep your new equipment in top condition in a safe way. Courses are a mix of theory and hands-on experience.

*Installation costs and/or an annual subscription fee may apply.

OT2E+ STANDARD EQUIPMENT

Kalmar Ottawa T2E+

Norms, Standards and Regulations

- Machinery Directive 2006/42/EC
- CE-marking for trucks within EU/EEA

Chassis

- 356MM X 108MM 89MM steel 345 MPa 9.50mm formed c-channel
- 6.25mm steel 207 MPa formed "L" reinforcer
- Modular frame design
- Reinforced removable bumper with 55° taper curb side
- Integral front and rear tow points
- Bolt-on side skirts
- 3200mm wheelbase

Steer Axle (Front)

- See model specification
- "S" cam type brakes
- Automatic slack adjusters

Drive Axle (Rear)

- See model specification
- "S" cam type brakes
- Automatic slack adjusters

Wheels (Tyres & Rims)

- See model specification
- Hub piloted

Suspension

- Front – parabolic 3-leaf spring, lube free, shackle free
- Rear — none, solid mount

Steering System

- Power assisted integral gear type with mechanical back-up

Powertrain

- Cummins traction motor 260 kW cont./370 kW peak, 1800 N*m cont./3400 N*m peak
- Regenerative braking
- Power battery 618V nominal
- Charging standards CCS1/CCS2
- Battery thermal management system (-30°C to +50°C)
- 660VDC-14VDC, 270A converter
- High voltage distribution and safety system

Hydraulics

- Lift system
- 15.5 MPa max. operating pressure
- 40 litre hydraulic tank with 10 micron internal return filter
- 57 l/min system
- Steering system
- 15 MPa max. operating pressure
- 5 litre steering reservoir

Lifting Boom

- See model specification
- Holland FW-35TT fifth wheel with 36 tonne plate rating
- Double acting cylinders with upper and lower spherical bearings
- 431mm lift height

Pneumatic System

- 510 l/min (constant) air compressor
- 89 litre reservoir capacity
- Colour-coded air lines, complies to TMC Recommended Practices
- Air brakes

Electrical System

- 12VDC low voltage system
- Two (2) 12V 925 CCA AGM batteries
- Battery disconnect switch
- LED cab interior lights
- LED head lights
- LED rear lights (Stop/Turn/Tail)
- LED rear facing high mount flood light on curb side of cab
- Electric back-up alarm
- All wires colour and number coded
- All connectors external to cab are sealed

Cabin

- Steel and composite cab with aluminium sliding rear door
- Designed in accordance with ROPS (roll-over protection structure)
- High roof cab
- 3-point cab mounting with Air Suspension
- Laminated solar grey window in rear door
- Air ride seat with isolator and 2-point retractable seat belt
- Mounting plate for yard management system
- Suspended brake and throttle pedals
- Coat hook behind driver seat
- Cup holder

- Cab insulation for thermal protection and noise abatement
- Cab tilt:
 - 40° with 90° tilt capability
 - Electric over hydraulic cab tilt system
- West coast 406mm x 178mm mirrors

Controls

- Suspended pneumatic brake pedal and electronic throttle pedal
- Joystick controlled lift system
- Keyed 4-position ignition switch
- Push button drive and reverse (DnR) control
- 406mm steering wheel

Climate

- Integral heating/ventilation system with (3) vents for driver; (4) front and (2) side defrost vents
- Air conditioning
- High air flow heater/defroster with molded air ducts
- Electric pantograph windshield wiper

Information Systems

- Digital display with touchscreen

Various Warning Lights & Signals

- Front and Rear Air Brake Pressure
- Battery State of Charge (SoC)
- Hour Meter
- Odometer
- Speedometer
- Critical Situation Indicators

Fleet Management

- Equipped with telemetric hardware for Kalmar Insight

Colour

- Cabin:
 - Metal structure/components - Full immersion, multi-stage, "E" coat with white powder top coat
 - Composite components - Color impregnated
 - Under cab - Rubberised undercoating
- Chassis: Black powder coat
- Rims: White powder coat
- Grab handles, steps and platforms: Yellow powder coat

Warranty

- Kalmar warranty 24 months/6000 hours
- Battery and BMS coverage 5 years/15000 H

MODEL SPECIFICATIONS

Kalmar Ottawa T2E+ D81-50 DOT

Distribution application
DOT = North American on-highway
37 tonne GCW
22.7 tonne lift capacity

Axles

- Front: Kalmar FA11, 11 tonne rated
- Front brake size: 410mm x 160mm
- Rear: Kalmar RA37, 37.6 tonne.@ 20 kph
- Rear brake size: 410mm x 220mm

Wheels (Tyres & Rims)

- 11R22.5, 8.25" x 22.5" - 335mm BC

Powertrain

- 152 kWh ESS

Lifting Boom

- Distribution Lift Boom
- 127mm Lift Cylinders

Kalmar Ottawa T2E+ D110-50

Distribution application
50 tonne GCW
22.7 lift capacity

Axles

- Front: Kalmar FA11, 11 tonne rated
- Front brake size: 410mm x 160mm
- Rear: Kalmar RA37, 37.6 tonne.@ 20 kph
- Rear brake size: 410mm x 220mm

Wheels (Tyres & Rims)

- 11R22.5, 8.25" x 22.5" - 335mm BC

Powertrain

- 152 kWh ESS

Lifting Boom

- Distribution Lift Boom
- 127mm Lift Cylinders

Kalmar Ottawa T2E+ CT150-60

Container Terminal application
70 tonne GCW
27 tonne lift capacity

Axles

- Front: Meritor MFS20, 9 tonne rated
- Front brake size: 419mm x 152mm
- Rear: Meritor MOR32, 32 tonne rated
- Rear brake size: 419mm x 178mm

Wheels (Tyres & Rims)

- 280/75R22.5, 8.25" x 22.5" - 335mm BC

Powertrain

- 182 kWh ESS

Lifting Boom

- Heavy Duty Lift Boom
- 127mm Lift Cylinders

Kalmar Ottawa T2E+ CT195-70

Container Terminal application
90 tonne GCW
32 tonne lift capacity

Axles

- Front: Meritor MFS20, 9 tonne rated
- Front brake size: 419mm x 152mm
- Rear: Meritor MOR32, 32 tonne rated
- Rear brake size: 419mm x 178mm

Wheels (Tyres & Rims)

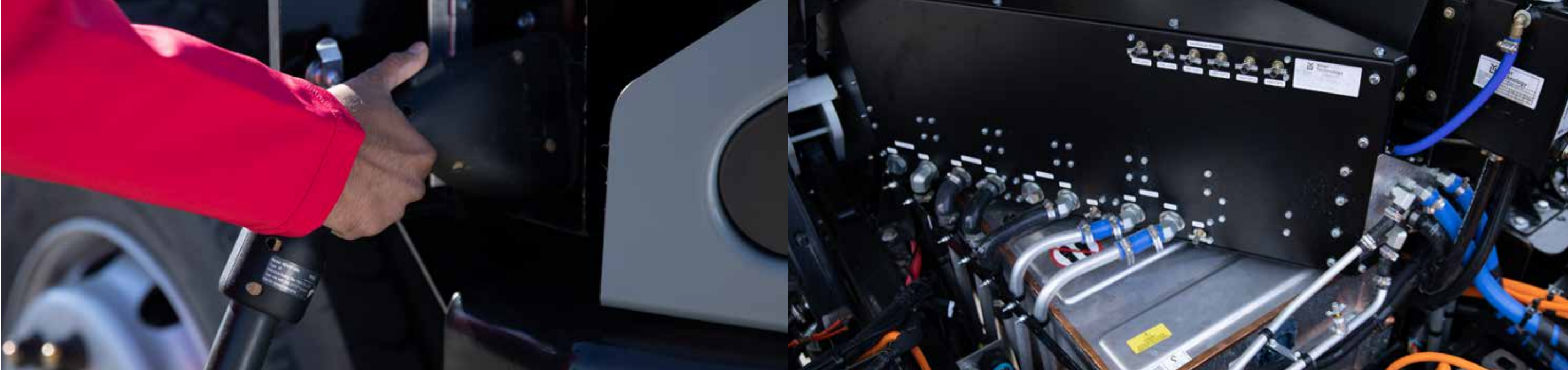
- 310/80R22.5, 9.00" x 22.5" - 335mm BC

Powertrain

- 182 kWh

Lifting Boom

- Heavy Duty Lift Boom
- 152mm Lift Cylinders



SPECIFICATIONS

Driving data	Travelling speed forward, - unloaded - KPH
	Travelling speed forward, - at rated load - KPH
	Gradeability, loaded – at rated load (%)
Weight of truck	Vehicle weight - unladen ** - kg
	Maximum Gross Combination Weight Rating - tonne
** Weights are calculatated values and may vary based on configuration	
Driveline	Drive motor/traction motor, manufacturer / type designation
	Drive motor/traction motor, rated power (continuous) - kW
	Drive motor/traction motor, rated power (peak) - kW
	Drive motor/traction motor, rated torque (continuous) - N*m
	Drive motor/traction motor, rated torque (peak) - N*m
	Energy consumption (kWh/h)
Front Axle (Steer)	Manufacturer / Model
	Dynamic capacity - kg
Rear Axle (Driving)	Manufacturer / Model
	Ratio
Wheels	Manufacturer / type designation
	Tyre dimensions, front – rear (mm)
	Overall Diameter - (mm)
	Rim dimensions, front – rear (mm)
	Bolt circle - (mm)
	Number of wheels, front / rear (driven)
5th Wheel	Max. Pressure - MPa
	Manufacturer / type designation
	Vertical capacity - kg
	King-pin diameter mm
Lifting cylinders	Type
	Lifting capacity - kg
	Lifting height - mm
	Lifting speed (s) *
	Lowering speed (s) *
	* Theoretical calculated values
Cabin	Cabin position
	Cabin upholstery
	Driver seat model
	Driver seat type
	Display type
Battery	Battery nominal capacity - Standard / Optional
	System voltage (nominal) (V)
	Charging inlet capacity (kW), max
	Charging inlet standard
Dimensions	L3 - Wheelbase - mm
	L - Overall Length - mm
	L2 - Distance between centre of front axle and front bumper - mm
	L5 - Distance between centre of rear axle and rear crossmember - mm
	B - Width - mm
	H8 - 5th wheel down height - mm
	H6 - Cabin height - mm
	G - Ground clearance (at center of truck)- mm
	C1 / C2 - Trailer clearance, boom up / boom down - mm
Miscellaneous	Steering system, type - maneuvering
	Foot brake system, type - affected wheels
	Parking brake system, type - affected wheels
	Noise level EN12053 - equivalent inside cabin LpAZ (dB(A))
	Noise level EN12053 - equivalent outside cabin LwAZ (dB(A))
	Hydraulic system flow rate - steering / lifting - l/min
	Lift system hydraulic oil volume - l
	Pneumatic capacity CFM (l/min)
	Pneumatic tank volume - liter
	Turning radius - mm
	Max. steering system hydraulic pressure - MPa
	Max. lift system hydraulic pressure - MPa

D81-50 DOT
53
25
3
7938
37
Cummins
260
370
1,800
3,400
8
Kalmar FA11
5443
Kalmar RA37
12.2:1
Generic On-Highway
11R22.5
1052
8.25 x 22.5
335
0.72
Holland / FW35-TT
36,000
50.4
Single stage - double acting
22,700
432
5
4
Left hand drive
Basic
National 2000
Air suspended
Digital display (kph, ° Centigrade, PSI)
152
618
150
CCS1 / CCS2
3200
5105
1270
635
2464
1168
3200
279
2280 / 2370
Gearbox type integral power steering
Pneumatic drum brakes - steer and drive wheels
Spring brake - Drive wheel
TBD
TBD
19 / 76
40
89
5651
14.8
15.5

D110-50	CT150-60	CT195-70
40	35	35
25	25	16
3	3	3
7938	8391	8391
50	70	90
	Cummins	
	260	
	370	
	1,800	
	3,400	
8	15	15
Kalmar FA11	Meritor MFS-20	Meritor MFS-20
10,886	9071	9071
Kalmar RA37	Meritor MOR-32	Meritor MOR-32
12.2:1	16.92:1	16.92:1
Generic On-Highway	Continental TerminalMaster	Continental TerminalMaster
11R22.5	280/75R22.5	310/80R22.5
1052	996	1085
8.25 x 22.5	8.25 x 22.5	9.00 x 22.5
335	335	335
0.72	1	1
	Holland / FW35-TT	
	36,000	
	50.4	
	Single stage - double acting	
22,700	27,200	32,000
	432	
	5	
	4	
	Left hand drive	
	Basic	
	National 2000	
	Air suspended	
	Digital display (kph, ° Centigrade, PSI)	
152	184	184
	618	
	150	
	CCS1 / CCS2	
	3200	
	5105	
	1270	
	635	
	2464	
	1168	
	3200	
	279	
	2280 / 2370	
	Gearbox type integral power steering	
	Pneumatic drum brakes - steer and drive wheels	
	Spring brake - Drive wheel	
	TBD	
	TBD	
	19 / 76	
	40	
	89	
	5651	
	14.8	
	15.5	



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