

TECHNICAL SPECIFICATION

TORO™ LH515i

Toro™ LH515i is a high capacity underground loader for hard rock applications.

Toro™ LH515i combines smart geometry with powerful thrust, high breakout forces, responsive controls and high tramming speeds. The advanced but still robust loader provides fast bucket filling, high fill factors, fast cycle times and proven reliability for underground mining use.

Toro™ LH515i is equipped with Sandvik Intelligent Control System, the backbone of the loader. The control system monitors the equipment productivity and health, and enables multiple smart solutions, such as the optionally available Integrated Weighing System and AutoMine® loading readiness for fully automated use.

SHARK™ Ground Engaging Tools (G.E.T.) are available on a wide range of bucket sizes, optimized for loader productivity and extended bucket service life.

CAPACITIES

Maximum tramming capacity	15 000 kg
Break out force, lift	28 100 kg
Break out force, tilt	24 500 kg
Standard bucket	6.3 m ³

SPEEDS FORWARD & REVERSE (LEVEL/LOADED) WITH VOLVO TAD1350VE ENGINE

1st gear	5.2 km/h
2nd gear	9.4 km/h
3rd gear	15.7 km/h
4th gear	28.2 km/h

BUCKET MOTION TIMES

Raising time	6.9 sec
Lowering time	4.3 sec
Dumping time	3.0 sec

OPERATING WEIGHTS *

Total operating weight	39 600 kg
Front axle	16 900 kg
Rear axle	22 700 kg

LOADED WEIGHTS *

Total loaded weight	54 600 kg
Front axle	40 000 kg
Rear axle	14 600 kg

* Unit weight depends on selected options



OPERATIONAL CONDITIONS AND LIMITS

Environmental temperature	From -20°C to +55°C
Standard operating altitude (at sea level)	± 1700m (variable of 5%)

REQUIREMENTS AND COMPLIANCE

Compliance with 2006/95/EC Low voltage directive
Compliance with 2004/108/EC Electromagnetic compatibility directive
Compliance with 2006/42/EC Machinery directive (Equipment for EU area, achieved with relevant options)
Design based on EN 1889-1. Machines for underground mines. Mobile machines working underground. Safety. Part 1: Rubber tyred vehicles.
Design based on MDG 15. Guideline for mobile and transportable equipment for use in mines. (Equipment for Australia, achieved with relevant options)
Electrical system based on IEC 60204-1. Safety of machinery – Electrical equipment of machines – Part 1: General requirements
CONTAINS FLUORINATED GREENHOUSE GASES Refrigerant R134a under pressure max 391 PSI Filled weight: 1.5 kg CO2e: 2145 kg GWP: 1430 Information based on the F Gas Regulation (EU) No 517/2016

POWER TRAIN

ENGINE

Diesel engine	Volvo TAD1350VE
Output	256 kW @ 2100 rpm
Torque	1 770 Nm @ 1260 rpm
Engine brake	No
Number of cylinders	In-line 6
Displacement	12.78 l
Cooling system	Liquid cooled and piston pump driven cooler fan
Combustion principle	4-stroke, direct injection, turbo with intercooler
Air filtration	Two stage filtration, dry type
Electric system	24 V
Emissions	Tier 3, Euro Stage III
Ventilation rate	UNECE R96
Particulate index	China III
Exhaust system	Catalytic purifier and muffler, double wall exhaust pipe
Average fuel consumption at 40% load	TAD1350VE - 29 L/h TAD1181VE - 28 L/h
Fuel tank refill capacity	550 l
Compatible with paraffinic diesel fuel (EN 15940)	Yes

TRANSMISSION

Fully automatic Dana transmission with electric shifting system. Includes converter with lock-up. Four gears forward and reverse with de-clutch function. Dana self-diagnostics fully integrated into Sandvik Intelligent Control System. Upbox: Kessler, ration 1:1

AXLES

Front axle, spring applied hydraulic operated brakes. Fixed.	Kessler D106, limited slip differential.
Rear axle, spring applied hydraulic operated brakes. Oscillating ± 8°.	Kessler D106, limited slip differential.

TIRES

Tire size (Tires are application approved. Brand and type subject to availability.)	26.5-R25
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HYDRAULICS

Electric filling pump for hydraulic oil
Door interlock for brakes and boom, bucket, and steering hydraulics
Oil cooler for hydraulic and transmission oil capability up to 50°C ambient temperature
ORFS fittings
MSHA approved hoses
Hydraulic oil tank capacity 249 l
Sight glass for oil level, 1 pc

STEERING HYDRAULICS

Full hydraulic, centre-point articulation, power steering with two double acting cylinders. Steering lock.	Steering controlled by electric joystick.
Steering main valve	Open circuit type, LS controlled
Steering hydraulic cylinders	100 mm, 2 pcs
Steering pump	Piston type
Steering and servo hydraulic pumps	Piston type

BUCKET HYDRAULICS

The oil flow from steering hydraulic pump is directed to bucket hydraulics when steering is not used.	Joystick bucket and boom control (electric), equipped with piston pump that delivers oil to the bucket hydraulic main valve.
Boom system	Z-link
Lift cylinders	160 mm, 2 pcs
Dump cylinder	220 mm, 1 pc
Main valve	Open circuit type
Pump for bucket hydraulics	Piston type

BRAKES

Service brakes are spring applied; hydraulically operated multidisc wet brakes on all wheels. Two independent circuits: one for the front and one for the rear axle. Service brakes also function as an emergency and parking brake. Brake system performance complies with requirements of EN ISO 3450, AS2958.1 and SABS 1589.
Neutral brake
Automatic brake activation system, ABA
Electrically driven emergency brake release pump
One tank system
Brake-by-wire

OPERATOR'S COMPARTMENT

Toro™ LH515i comes with a robust ROPS and FOPS certified cabin protecting the operator in case of roll over or falling objects.

CABIN

ROPS certification according to EN ISO 3471

FOPS certification according to EN ISO 3449

Sealed, air conditioned, over pressurized, noise suppressed closed cabin

Sound absorbent material to reduce noise

Laminated glass windows

Cabin mounted on rubber mounts to the frame to reduce vibrations

Air conditioning unit located outside the cabin to reduce noise inside the cabin

Powered pre-filter for A/C device

Adjustable joysticks

No high pressure hoses in the operator's compartment

Inclinometers to indicate operating angle

Emergency exit

Floor washable with water to reduce dust

Three-point contact access system with replaceable and colour coded handles and steps

12 V output

Remote circuit breaker switch

CONTROL SYSTEM, DASHBOARD AND DISPLAYS

A 12" color display with advanced touch screen functionality has all the needed information and alarms on one large display giving the operator more time to keep eyes on the road. New dark background graphics with clear symbols are designed for the underground mining environment to reduce eye fatigue, while red interior cabin lighting is also designed to not affect night vision during driving.

Sandvik Intelligent Control System

Critical warnings and alarms displayed as text and with light

12" color display with touch screen function and adjustable contrast and brightness, illuminated switches

My Sandvik Digital Services Knowledge Box™ on-board hardware

OPERATOR'S SEAT

Toro™ LH515i cabin is fitted with an adjustable low frequency suspension seat with two-point seat belt or optional high back seat with four-point seat belt. New softer padded arm rests and adjustable joysticks can be configured either on the cabin wall or fixed to the seat.

Low frequency suspension

Height adjustment

Adjustment according to the operator's weight

Padded and adjustable arm rests

Two-point seat belt

Fore & aft isolator to minimise vibrations in driving direction

Adjustable lumbar support

Selectable damping

MEASURED VIBRATION LEVEL

Whole body vibration was determined while operating the loader in a simulated working cycle consisting of loading, unloading and driving with and without load. The value is determined applying standards EN 1032 and ISO 2631-1.

Maximum r.m.s.value a_w [m/s²] 0,84

VDV_w over 15 min period [m/s^{1.75}] 7,49

MEASURED SOUND LEVEL

The sound pressure level and sound power level at the operator's compartment, in a closed cabin, have been determined in stationary conditions on high idle and at full load, with engine Volvo TAD1181VE Stage V.

Sound pressure level
 L_{pA} [dB re 20 μ Pa] 75 dB

Sound power level
 L_{WA} [dB re 1 p W] 117 dB

FRAME

REAR AND FRONT FRAME

A heavy duty rear frame with added weight in the rear of the loader balances the machine perfectly when lifting and pushing into the muck pile. Heavy duty rear frame and mask with integrated reaction bars minimize damages from wall impacts. High strength structure with optimized material thicknesses and reduced own weight contribute to higher overall hauling capacity and long structural lifetime. Welded steel box structures used in the frame and boom provide strong resistance to shock loads and are optimized to reduce stresses and extend frame lifetime.

Adjustable upper bearing in central hinge

Tanks welded to the frame

Automatic central lubrication

ELECTRICAL EQUIPMENT

MAIN COMPONENTS

Alternator 24 V, 150 A

Batteries 2 x 12 V, 180 Ah

Starter 9 kW, 24 V

Driving lights LED lights:
4 pcs in front, rear and cabin

Working lights LED lights:
1 pc under boom
2 pcs corner lights

Parking, brake and indicator (blinkers) lights LED lights:
2 pcs in front
2 pcs in rear

Control system with 12" Color display
1 CPU module, 8 modules, 2 pcs safety modules
inbuilt system diagnostics

Dual horn configuration with separate alarms for start and reverse

Flashing beacon

ILLUMINATION

Illuminance E_{av} in front of the loader with 3 pieces of 50 W led lights and 2 pieces of 28W led lights at a distance of 20 m in front of the loader

E_{av} low beam	125 lx
E_{av} high beam	133 lx

Illuminance E_{av} behind the loader with 4 pieces of 28 W led lights and 1 piece of 50 W led lights and at a distance of 20 m behind the loader::

E_{av} low beam	20 lx
E_{av} high beam	52 lx

Toro™ LH515i is compliant with South African Mine health and safety act 29 of 1996, because average light intensity in the direction of travel is more than 10 lux at a distance of 20 m.

INCLUDED SAFETY FEATURES

FIRE SAFETY

Portable fire extinguisher, 12 kg (CE requirement)
Hot side - cold side design
Isolation of combustibles and ignition sources
Heat insulation on exhaust manifold, turbo, and isolated exhaust pipe

ENERGY ISOLATION

Lockable main switch, ground level access
Starter isolator
Emergency stop push buttons according to EN ISO 13850: 1 pc in cabin, 2 pcs in rear
Pressure release in the expansion tank cap
Automatic discharge for pressure accumulators (brake system and pilot circuit)
Frame articulation locking device
Mechanical boom locking device
Wheel chocks and brackets

DOCUMENTATION

STANDARD MANUALS

Operator's Manual	English and other EU languages
Maintenance Manual	English and other EU languages
Parts Manual	English
Service and Repair Manual	English
ToolMan	2 x USB stick in pdf format, includes all manuals
Decals	English, Finnish, German and other languages as needed.

AVAILABLE BUCKETS***

Type	Volume SAE heaped (2:1) *	Width	Material broken density with fill factor 100%
G.E.T. (standard)	6.3 m ³	2740 mm	2400 kg/m ³
Bare Lip	6.8 m ³	2740 mm	2200 kg/m ³
G.E.T.	7.5 m ³	3066 mm	2000 kg/m ³

Note: Depending on the bucket size and type, the actual payload may deviate from the nominal payload.

***Other bucket sizes will become available later

OPTIONS

ANSUL Twin fire suppression system (CE requirement)
Arctic packages
AutoMine® Loading: Onboard Package
Boom suspension (ride control)
CE Declaration of conformity (CE requirement)
Cover grills for lamps
Disabled 4th gear
Driving direction lights (red / green)
Eclipse™ Fire suppression system with auto shutdown, Sustain or Extreme agent delivered separately (CE requirement)
Emergency steering (CE requirement)
High back rest seat with four point seatbelt
Integrated weighing system (IWS)
Jump start interface
Line of sight radio remote control system
Monitoring camera system
Neutral brake
Proximity detection system (PDS) interface
Retrieval hook (hydraulic brake release by pulling the hook)
Safety rails
Spare rim 22.00-25/3.0 (for tyres 26.5R25)
Traction control
Tyre pressure monitoring system
Wiggins quick filling set for fuel, coolant and oils (hydraulic, engine and transmission)

OPTIONAL ENGINE

Diesel engine	Volvo TAD1181VE
Output	265 kW @ 2 100 rpm
Engine brake	Yes
Emissions	Stage V
Ventilation rate (Ultra low sulphur fuel, AdBlue)	12 000
Particulate index (Ultra low sulphur fuel, AdBlue)	500
Average estimated fuel consumption at 40% load	27 l/h

GRADE PERFORMANCE (STANDARD ENGINE)

Volvo TAD1350 265 kW/1900 rpm (standard engine). With 3% rolling resistance and lock-up.

Empty

Percent grade	0.0	2.0	4.0	6.0	8.0	10.0	12.5	14.3	17.0	20.0
Ratio					1:12	1:10	1:8	1:7	1:6	1:5
1st gear (km/h)	5.2	5.1	5.1	5.1	5.1	5.1	5.0	5.0	5.0	5.0
2nd gear (km/h)	9.4	9.4	9.3	9.2	9.2	9.1	9.0	8.9	8.0	7.3
3rd gear (km/h)	15.8	15.6	15.4	15.2	14.2	12.6	8.9			
4th gear (km/h)	28.5	27.9	23.2							

Loaded

Percent grade	0.0	2.0	4.0	6.0	8.0	10.0	12.5	14.3	17.0	20.0
Ratio					1:12	1:10	1:8	1:7	1:6	1:5
1st gear (km/h)	5.2	5.1	5.1	5.1	5.0	5.0	5.0	5.0	4.9	4.9
2nd gear (km/h)	9.4	9.3	9.2	9.1	9.0	8.6	7.6	7.0		
3rd gear (km/h)	15.7	15.4	15.1	13.0	11.2					
4th gear (km/h)	28.2	23.5								

GRADE PERFORMANCE (OPTIONAL ENGINE)

Volvo TAD1181VE 265 kW/2000 rpm (optional engine). With 3% rolling resistance and lock-up.

Empty

Percent grade	0.0	2.0	4.0	6.0	8.0	10.0	12.5	14.3	17.0	20.0
Ratio					1:12	1:10	1:8	1:7	1:6	1:5
1st gear (km/h)	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
2nd gear (km/h)	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.1	8.3	7.5
3rd gear (km/h)	15.9	15.9	15.9	15.9	14.6	13.0	9.1			
4th gear (km/h)	29.2	29.2	24.0							

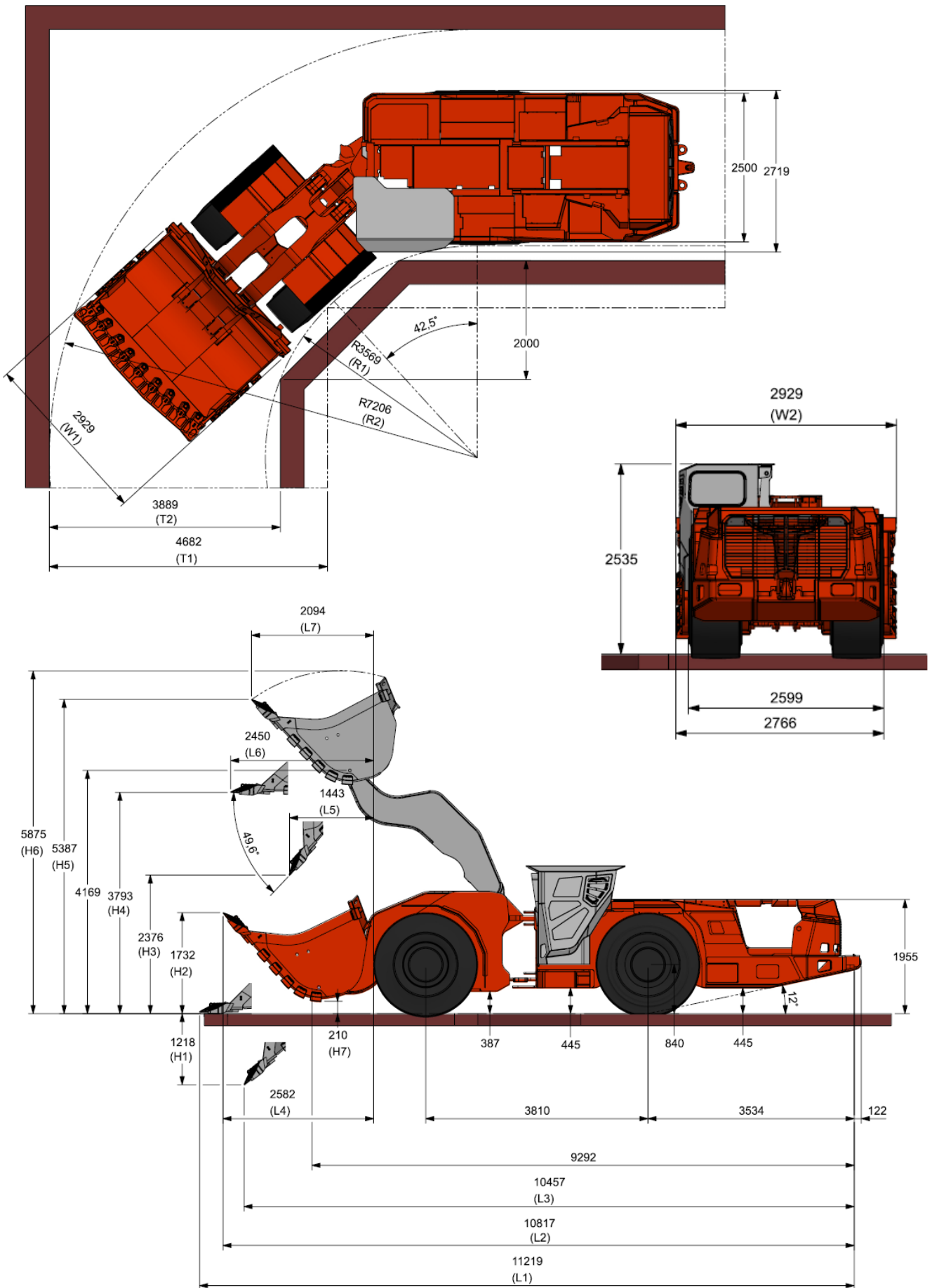
Loaded

Percent grade	0.0	2.0	4.0	6.0	8.0	10.0	12.5	14.3	17.0	20.0
Ratio					1:12	1:10	1:8	1:7	1:6	1:5
1st gear (km/h)	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
2nd gear (km/h)	9.4	9.4	9.4	9.4	9.4	8.9	7.9	7.3		
3rd gear (km/h)	15.9	15.9	15.9	13.4	11.5					
4th gear (km/h)	29.2	24.3								

DIMENSIONS (dimensions drawing on next page)

Volume SAE heaped 2:1 (m ³)	6.3 (standard)	6.8	7.5
Maximum material broken density with fill factor 100% (kg/m ³)	2400	2200	2000
Lip plate type	G.E.T.	Bare Lip	G.E.T.
L1(mm)	11219	11412	11418
L2(mm)	10817	10926	10946
L3(mm)	10457	10658	10605
L4(mm)	2582	2961	2711
L5(mm)	1443	1632	1577
L6(mm)	2450	2671	2645
L7(mm)	2094	2110	2228
H1(mm)	1218	1324	1345
H2(mm)	1732	1931	1878
H3(mm)	2376	2240	2228
H4(mm)	3793	3843	3793
H5(mm)	5387	5582	5528
H6(mm)	5875	5878	5879
H7(mm)	210	260	208
W1(mm)	2929	2830	3098
W2(mm)	2929	2835	3098
R1(mm)	3569	3569	3569
R2(mm)	7206	7203	7337
T1(mm)	4682	4682	4813
T2(mm)	3889	3886	4020

STANDARD DIMENSIONS (with standard bucket) in the drawing, necessary changing dimensions in a table.



TS3-LH515i-02-ENG-METRIC

MATCHING PAIR

TORO™ LH515i AND TH545i

Be safer, be stronger, and be smarter – together.

The loader Toro™ LH515i is a matching pair for three-pass loading with dump truck TH545i considering the designed payload capacities.

TH545i is a high performance 45 tonne articulated underground dump truck for use in 4.5 x 4.5 meter haulage ways. The truck's performance is based on proven design, high engine power and high payload related to own weight.

This robust and intelligent truck delivers benefits in safety, productivity and profitability. Safety, health and comfort are enhanced with enclosed and vibration isolated cabin. Optional EU Stage IV / Tier 4f low emission engine will further help reducing the fuel consumption and emissions without sacrificing the high productivity.

The TH545i truck features a wide range of intelligence integrated technology, such as Sandvik Intelligent Control system, My Sandvik Digital Services and Automation compatibility as standard, supplemented with Onboard Weighing System option for tracking the payload. With the latest addition of the AutoMine® Trucking Onboard option, TH545i enables autonomous haulage for both transfer level and decline ramp application.

CAPACITIES

Maximum payload capacity (SAE heaped 2:1)	45 000 kg
Standard dump box	22.0 m ³
Dump box range	18 - 26 m ³

SPEEDS (LEVEL/LOADED) WITH ENGINE VOLVO TAD1641VE-B

1st gear	5.4 km/h
2nd gear	7.2 km/h
3rd gear	9.7 km/h
4th gear	12.8 km/h
5th gear	16.9 km/h
6th gear	22.3 km/h
7th gear	30.1 km/h

DUMP BOX MOTION TIMES & MOVEMENTS

Discharging time	14 sec
Dumping angle	62°

OPERATING WEIGHTS *

Total operating weight	36 000 kg
Front axle	26 500 kg
Rear axle	9 500 kg

LOADED WEIGHTS *

Total loaded weight	81 000 kg
Front axle	37 900 kg
Rear axle	43 100 kg

* Unit weight is dependent on the selected options

