

# Special Equipment for Tunnel Construction



**LIEBHERR**

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## Crawler Excavators

Liebherr tunnel excavators are special machines which can be used in all conventional types of tunnelling applications: After tunnel drilling machines have been used to create cross-tunnels, when explosives are being used for secondary profiling, and, of course, for direct excavator tunnelling. Particular features of these machines are their economic operation, high performance, and reliability.



# 2

## Wheel Loaders

Liebherr tunnel wheel loaders are specially designed for use in tunnel applications. The advantages of the wheel loader's hydrostatic drive are proven in difficult tunneling applications. The advantages are: reduced fuel consumption through improved utilization of the installed engine's output, minimal brake wear through the hydrostatic braking effect of the drive and reduced tyre wear thanks to stepless adjustment of the tractive force in line with what is required. Also, the Liebherr particle filter reduces particulate emissions by 99 %.

# 3

## Crawler Loaders

Thanks to their high break-out forces, excellent manoeuvrability, and robust equipment, Liebherr crawler loaders are the ideal machines for tunnel construction. Depending on the operational specifications, they can be configured with individual additional options to tailor the machines to particular applications and conditions. A high-performance climate control system matched to a pressurized cab helps create a pleasant working environment. The Liebherr particle filter is also optionally available to provide cleaner air in the tunnel.



# 1

# Crawler Excavators

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ing used for secondary profiling, and, of course, for direct excavator tunnelling. Particular features of these machines are their economic operation, high performance, and reliability.



### **Economy with High Performance**

Tunnel construction is one of the toughest environments for excavator operation that exists. The operation of a tunnel excavator becomes efficient when the machine, despite the harsh conditions, can cut out the tunnel profile required as rapidly as possible but in economical fashion. This means that a tunnel excavator must produce a high hydraulic capacity and, above all, be provided with operational fittings which are tailored to the particular application. The hydraulic system used with Liebherr tunnel excavators is optimized for milling. Liebherr tunnel excavators meet all the high demands imposed in tunnel construction in every respect, with both the basic machine and the attachment precisely matched to this particular type of work, and consistently designed to achieve real economical performance.

### **Reliability**

Liebherr tunnel excavators are the result of decades of practical experience in the development of truly reliable special equipment for demanding situations. All the materials used have undergone intensive, long-term tests and meet high Liebherr quality standards even under the hardest conditions. In addition to being extremely robust, the attachment on Liebherr tunnel excavators is able to rotate 2 x 45°. The mechanical quick coupling system is provided with a reinforced locking unit and a wear protection element on the hook side. The sophisticated concept and the tried and trusted quality make Liebherr tunnel excavators the absolute standard for reliability.

### **Safety**

The special cab is safeguarded with FOPS and FGPS as standard. To prevent damage from falling rocks, all the hoses in exposed locations on the equipment fittings are additionally secured by protection plates. The bucket cylinder is also attached in a lower position, and a cover fitted to both the lifting rams protects the hoses running between them.

### **Comfort**

Characteristic of the special cab on the Liebherr tunnel excavator are the ergonomic design and high standard of operating comfort and convenience. The windows on the right and at the rear are fitted with polycarbonate panes, resistant to scratches and impacts, and feature extremely good visibility properties. As an option, the cab is also available with polycarbonate window panes all round.



## Crawler Excavator for Tunnel Application

- Rotatable boom with 2 x 45° mounting
- Hoses on the attachment laid on the side and covered
- Pipe routing on the attachment protected by metal plates
- Special uppercarriage protection
- Protective box made of stainless steel for all electronics and electrical modules on the uppercarriage
- Power circuits protected by easily accessible automatic circuit-breakers
- IP 65 protection for optimum protection against dust and moisture
- All cables with high resistance insulation against mechanical and heat damage
- Particle filter certified in accordance with VERT Standard (reduction of emissions from real machines in tunnel construction)
- Special tunnel cab in heavy-duty design with seat made of artificial leather
- FOPS and FGPS fitted as standard
- Polycarbonate windows with high impact resistance on the right side and rear of the cab
- 3000 mm dozer blade with cylinder protection as standard
- Dirt scraper on undercarriage



### Crawler Excavator

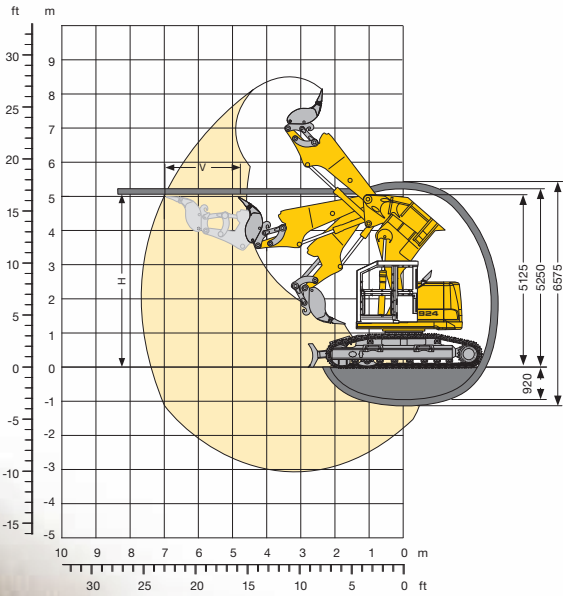
### R 924 Compact Litronic Tunnel

### R 944 C Litronic Tunnel

Operational weight	kg	32,440	43,490 - 43,950
Engine capacity	kW/hp	130/176	190/258

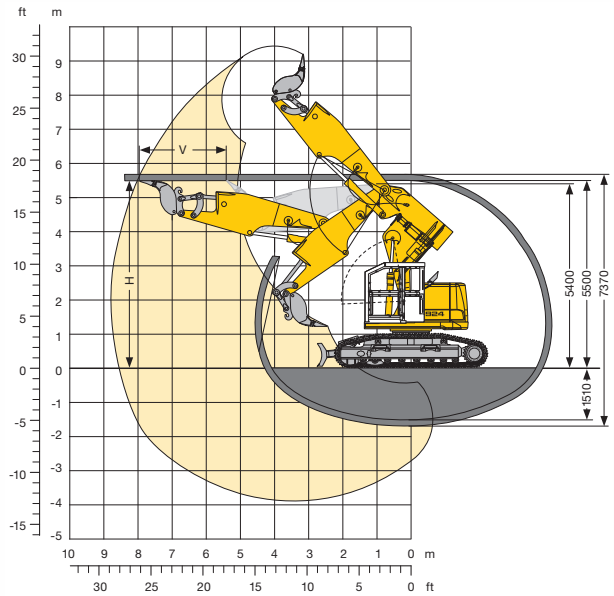
### R 924 Compact Tunnel (Version 5 m)

Litronic



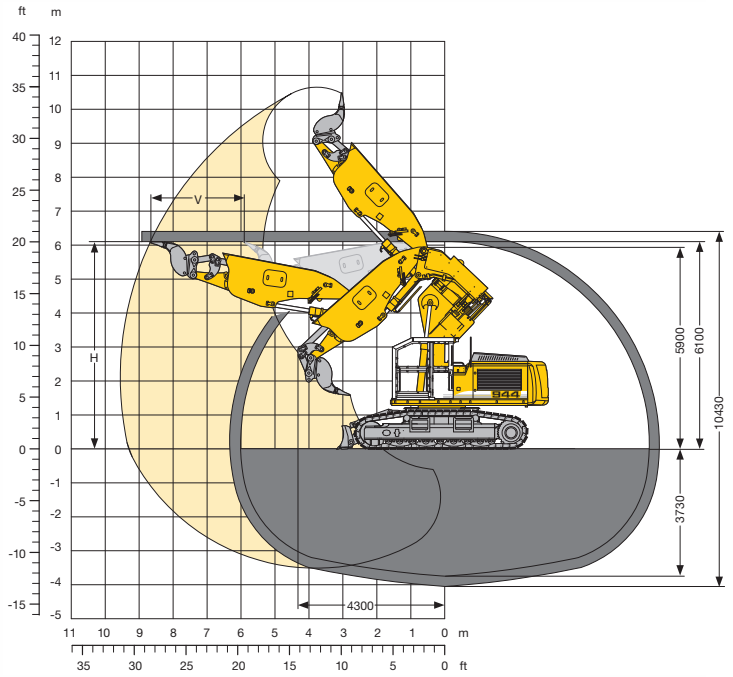
### R 924 Compact Tunnel

Litronic



### R 944 C Tunnel

Litronic



Protection for boom and hydraulic cylinders

Special tunnel cab

# 2 Wheel Loaders

Liebherr tunnel wheel loaders are specially designed for use in tunnel applications. The advantages of the wheel loader's hydrostatic drive are proven in difficult tunneling applications. The advantages are: reduced fuel consumption through improved utilization of the

installed engine's output, minimal brake wear through the hydrostatic braking effect of the drive and reduced tyre wear thanks to stepless adjustment of the tractive force in line with what is required. Also, the Liebherr particle filter reduces particulate emissions by 99 %.





### **Economy with High Performance**

In comparison with conventional drive systems, the hydrostatic drive used by Liebherr wheel loaders allows for a reduction in fuel consumption of up to 25%. This cuts operating costs and reduces burden on the environment. At the same time, the use of the hydrostatic drive means that the Liebherr Diesel engine can be installed in a special position, lengthwise at the rear, with the output shaft pointing backwards. In comparison with conventional wheel loaders, this leads to a noticeably lighter operating weight with a higher tipping load and greater production capacity per operating hour.

### **Reliability**

All the materials used in Liebherr wheel loaders have passed long-term tests to ensure that they match up to Liebherr's exacting standards even in the toughest conditions. The mature concept and proven quality make Liebherr wheel loaders to the benchmark for reliability.

### **Safety**

Liebherr wheel loaders adapted to the harsh operating conditions in tunnels are fitted with a large number of protective equipment. These include, for example, a cab developed specifically for tunnel construction with armoured glass, four operational spotlights on the rear, bucket cylinders with piston rod protection, and the rear collision protection.

### **Comfort**

The ultra-modern cab design with advanced ergonomics, continuously variable Liebherr driveline with 2plus2 gearbox for uninterrupted tractive force, standard Liebherr ride control, optimum weight distribution and easy service access thanks to unique engine installation position lead to extraordinary overall comfort.



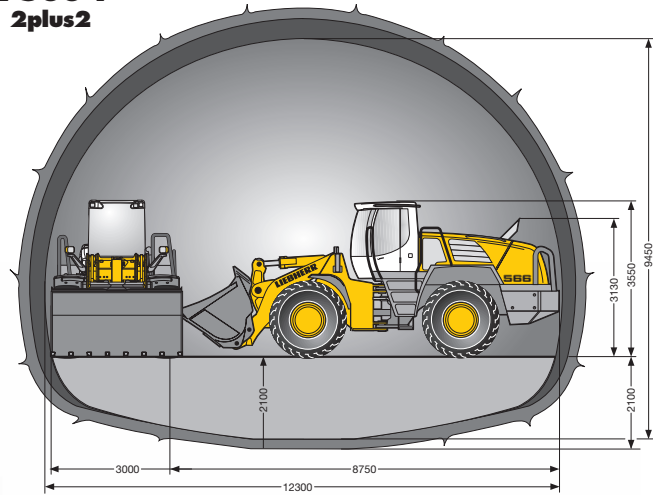
### **Wheel Loader for Tunnel Application**

- Cab design developed specifically for tunnel construction, with laminated safety glass
- Four working lights rear
- Hinged, detachable outside mirror
- Tilt cylinder protection
- Rear bumper
- Diesel particle filter beneath cladding
- Audible reversing warning device
- Fire extinguisher (6 kg) in protective box
- Air pre-cleaner Top-Air

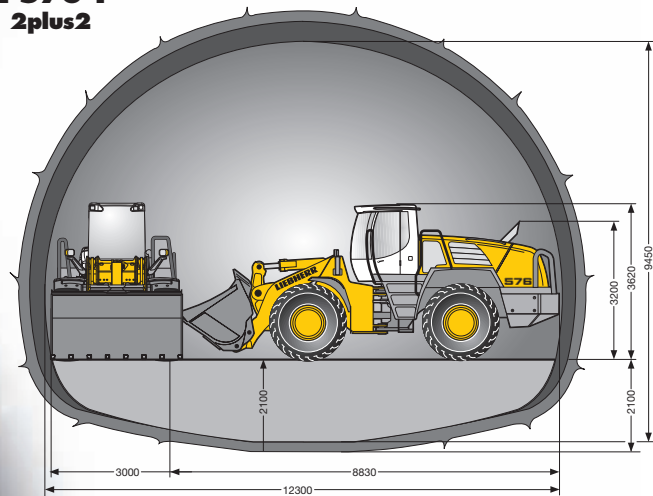


Wheel Loaders		L 566 T 2plus2	L 576 T 2plus2
Tipping load	kg	16,130	17,470
Bucket capacity	m <sup>3</sup>	3.5	4.0
Operating weight	kg	22,630	24,980
Engine capacity	kW/hp	190/259	200/272

### L 566 T 2plus2



### L 576 T 2plus2



Cab with laminated safety glass



Diesel particle filter beneath cladding



Air pre-cleaner Top-Air

# 3 Crawler Loaders

Thanks to their high break-out forces, excellent manoeuvrability, and robust equipment, Liebherr crawler loaders are the ideal machines for tunnel construction. Depending on the operational specifications, they can be configured with individual additional options to tailor

the machines to particular applications and conditions. A high-performance climate control system matched to a pressurized cab helps create a pleasant working environment. The Liebherr particle filter is also optionally available to provide cleaner air in the tunnel.



## **Economy with High Performance**

Liebherr crawler loaders provide impressive performance in tunnel operations thanks to their superb production capacity. This is the result of unbeatable manoeuvrability, short cycle times, and a high bucket filling factor. Thanks to the Liebherr hydrostatic travel drive, the full thrust capacity can be applied to both tracks without interruption, therefore ensuring excellent handling performance under load. And when it comes to manoeuvring in tight spaces, the practical “counterrotation” function comes into its own. The operating hydraulics consist of a solid Z-bar linkage, which allows for very high break-out forces when loading rock. Liebherr crawler loaders are powered by economical Diesel engines running at a constant engine speed- another bonus for the economic success of tunnel construction projects.

## **Reliability**

Liebherr crawler loaders offer maximum reliability. All components used feature extremely long service life even under the toughest conditions encountered in a tunnel. Parts subjected to particularly severe stress are made of the strongest possible material, and sensitive areas, such as the final drive or hydraulic pipes are provided with the best possible protection. Maintenance-free components, such as tracks and hinge pins, and lengthy maintenance intervals ensure that effort and expenditure on servicing and maintenance can be kept to a minimum.

## **Safety**

The tested and internationally certified ROPS/FOPS roll over and falling objects protection system provides the crawler loader operator with a safe place to work. As well as this, the front window can be fitted with a grille to provide protection against falling rock fragments. As another option, the Liebherr crawler loader can be fitted with a camera to monitor the area behind the machine. By way of a display in the cab, this provides a better view to the rear, and therefore provides greater safety for personnel who are within the working area of the machine.

## **Comfort**

The Liebherr single-lever operating system for travel and working hydraulics allows the crawler loader to be controlled with fingertip sensitivity. Functions integrated in the two joysticks make process sequences even easier. Depending on the application demands, travel speed forwards and backwards can be programmed from 0 – 10 km/h. In addition, the float position, automatic bucket positioner, and automatic lift kickout deactivation can be easily pre-selected in the operational controls.



### **Crawler Loader for Tunnel Applications (LR 624/LR 634):**

- Tank guard
- Heavy duty radiator guard
- Top Air filter
- Reversible fan
- Protective ring for final drive
- Lifting cylinder guards
- Tilt cylinder guard
- Four operational spotlights on the rear
- Diesel particulate filter (optional)
- Rear area monitoring camera (optional)
- Rotating beacon (optional)
- Protective ventilation system (optional)
- Protective grille for front window (optional)

#### **Laderaupen**

Engine capacity

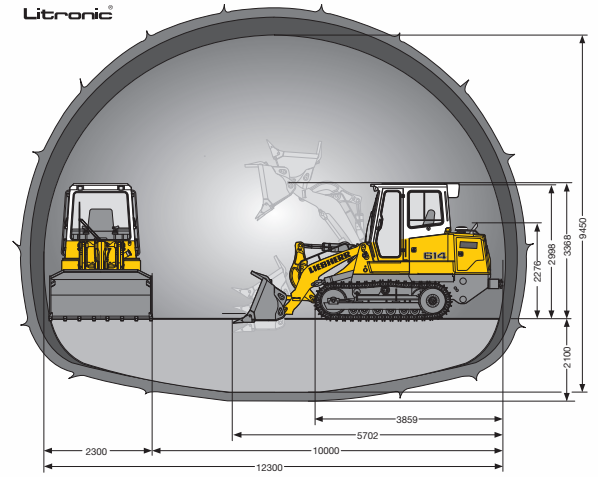
Operating weight

Bucket capacity

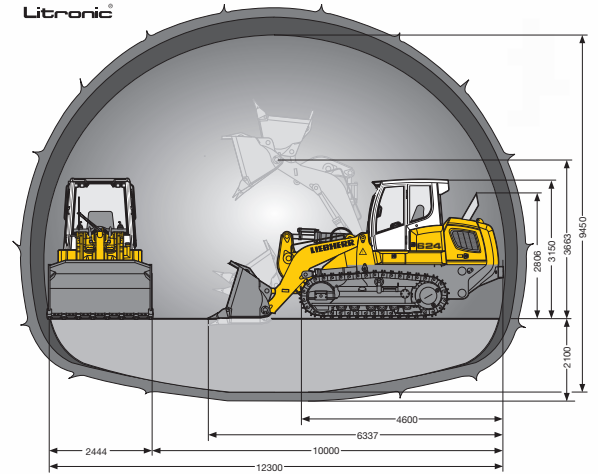


	<b>LR 614</b> Litronic	<b>LR 624</b> Litronic	<b>LR 634</b> Litronic
kW/hp	72/98	105/143	135/184
kg	11,000 - 12,004	16,894 - 18,549	20,746 - 22,694
m <sup>3</sup>	1.20 - 1.25	1.5 - 1.8	1.9 - 2.4

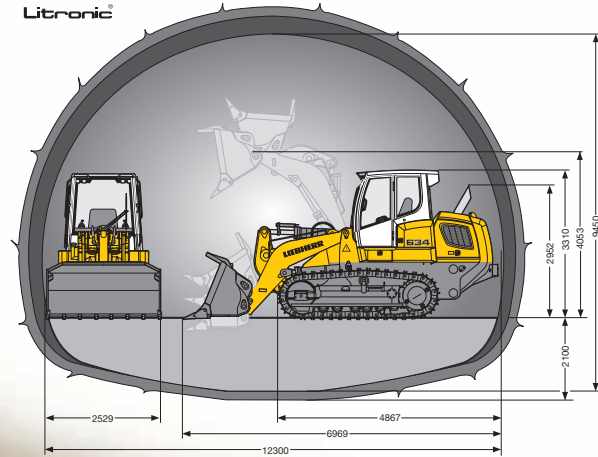
### LR 614 Litronic



### LR 624 Litronic



### LR 634 Litronic



Protective ring for driveline



Protective grille front window

# The Liebherr Group of Companies

## Wide product range

The Liebherr Group is one of the largest construction equipment manufacturers in the world. Liebherr's high-value products and services enjoy a high reputation in many other fields, too. The wide range includes domestic appliances, aerospace and transportation systems, machine tools and maritime cranes.

## Exceptional customer benefit

Every product line provides a complete range of models in many different versions. With both their technical excellence and acknowledged quality, Liebherr products offer a maximum of customer benefits in practical application.

## State-of-the-art technology

To provide consistent, top quality products, Liebherr attaches great importance to each product area, its components and core technologies. Important modules and components are developed and manufactured in-house, for instance the entire drive and control technology for construction equipment.

## Worldwide and independent

Hans Liebherr founded the Liebherr family company in 1949. Since that time, the enterprise has steadily grown to a group of more than 100 companies with over 32,000 employees located on all continents. The corporate headquarters of the Group is Liebherr-International AG in Bulle, Switzerland. The Liebherr family is the sole owner of the company.

[www.liebherr.com](http://www.liebherr.com)



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