

# DIGGER 1000 / 1500 / 2000 / 3000

SHIP UNLOADER

KOCKS







↑  
Digger 1500

# THE DIGGER: THE HIGH PERFORMANCE CRANE.

The steel and energy industry daily require immense quantities of coal, ore and additives – all around the globe. These large volumes are transported across the oceans and unloaded in the ports of destination. The owners' requirements are therefore absolutely clear: highly efficient unloading and shortest possible turnaround times are decisive.

Cranes play a key role in this system. The crane functions must be assured in all climates and they must deliver maximum handling rates.

→ **INFO**

What exactly characterises the best ship unloaders?

What are the important factors?

→ The essential factors are:

- low operation costs
- high performance
- permanent availability

→ In detail it depends on:

- efficient and safe handling of coal and other bulk material
- dynamic handling with maximum accelerations and speeds
- high performance under continuous operating conditions during full shifts
- minimum downtimes
- low maintenance and operational costs
- high service life

The Digger with its proven two-trolley system is the guarantor of such peak performance.



↑  
Material stock

# WITH THIS CRANE OUR ENGINEERS DEMONSTRATE AGAIN AND AGAIN THE MEANING OF TECHNICAL INTELLIGENCE. THE DIGGER. WITH THE **TWO-TROLLEY SYSTEM**.

What are our engineers working on with a system proven over many decades?

They have the ambition of making each component more efficient, more dynamic while at the same time reducing maintenance costs even further. They thus set new standards, again and again. The best example: the Digger.

Its technical strengths appear primarily in the perfect interaction of main trolley and auxiliary trolley via a pre-tensioned rope system. The use of automatic rope-adjusting devices and low-maintenance components are a must and assure extremely high availability.

The constructional design is characterised by the constant height of the grab during trolley travelling. The particular aspect: the hoisting mechanisms never need to interfere as a compensating factor due to the reeving of the hoisting ropes via the auxiliary trolley. The controlled superposition of the movement, however, is always possible.

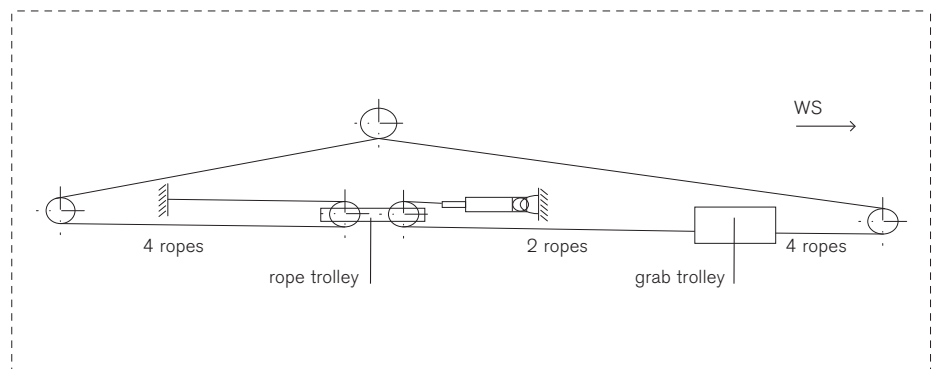
Rope slack of the trolley ropes is unknown with the two-trolley system and thus the slack of the holding and closing ropes during lowering of the bulk goods is minimised. In particular in the case of very high waterside or landside outreaches and large gauges, the principal advantage is totally decisive: the ropes neither beat against each other nor against parts of the structure of the unloader – neither when closing the grab nor when starting the hoisting procedure. Rope-supporting trolleys are not required.

In order to improve load paths, the hopper is positioned as close as possible to the ship.

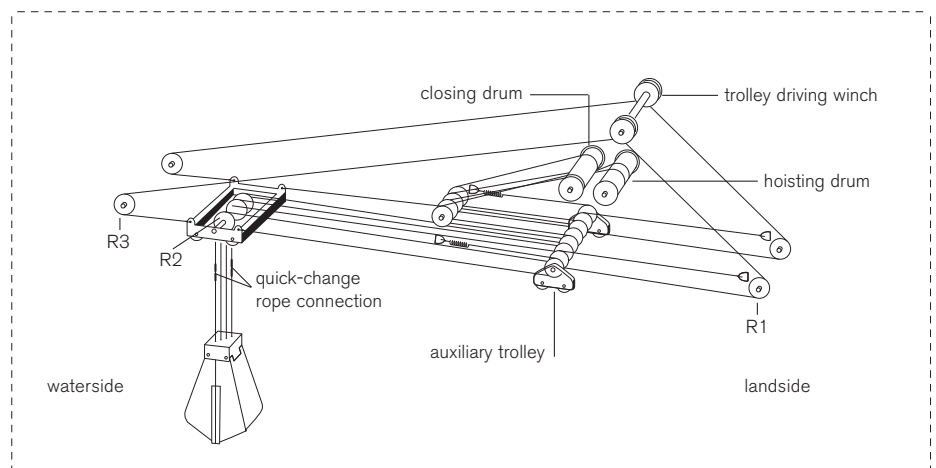
As environmental protection is a very important subject for us, a dust house is part of the basic equipment. If required, we install water spray devices and filter systems to almost completely avoid dust.

The rigid, very robust steel structure in box girder design is also characteristic of the Digger: it is, on the one hand, characterised by extremely low maintenance costs and, on the other hand, perfectly coordinated with the high dynamic mode of operation of the ship unloaders.

A particular aspect are the booms with optimised stability executed as a twin girder. The trolley rails are arranged above the internal webs. In this case, too, we act with environmental protection in mind: the rails are provided flexible lining (thus sound emissions remain reduced to a minimum), these are alternatively also welded directly onto the upper chord as a load-bearing member.



↑  
Rope system with tensioning device



↑  
Rope system with main and auxiliary trolleys





↑ Bulk handling – 3 Diggers unloading ore

One further advantage of the twin girder booms: as a result of their design, the main and auxiliary trolleys run between the boom girders. This means maximum free space for the movement of the trolley and hoisting ropes.

The Digger is also held in high regard because of its first-class electrical equipment. This equipment is designed, constructed and executed by a team of Kocks engineers or in cooperation with well-known suppliers of electrical equipment.

The latest methods of stress analysis measuring values from the wind tunnel and the intention to create an optimal crane system give the Digger its concrete form. Apart from all German engineering rules, daily practical experience also provides the inspiration for all further developments. Thus deformations under extreme conditions are not accidental.

These have already been calculated during the projecting and design phase and taken into account during dimensioning. Only a rigid and less flexible structure is the solid basis of a high capacity crane.

In summary, the Digger is ideal for efficient bulk handling. Its proven two-trolley system and robust structure assure highest hourly rating with lowest maintenance expense.

#### → INFO

##### Typically Digger:

- extremely efficient: pretensioned rope system with main and auxiliary trolley
- very low degree of wear: components with low maintenance costs
- particular environmental acceptance: dust house and trolley rails with flexible supports
- extremely stable: rigid, very robust steel structure



↑ Location of hopper next to vessel

# THERE ARE MANY REASONS FOR CHOOSING **THE DIGGER.** THE MOST COMPELLING ARE:



↑ Personnel elevator



↑ Grab inside dust house with activated spraying system

## 01 THE BOOMS

The weight and stability of the boom system of the Digger – with waterside boom and bridge girder in twin girder design – have been optimised. The characteristic feature of this structure is the fact that it is subject to extremely easy maintenance: the structure can a) be easily and safely reached from the exterior and b) the interior is accessible.

This is assured by platforms and railings. The waterside boom is connected with the bridge girder via low-maintenance pivots. The use of the latest bearing material is a must in this context. Box girders resistant to bending assure absolutely safe suspension in the gantry bolted via special fishplate joints.

We offer two types of trolley rails:

- as a welded rail: this can be calculated in the stress analysis as a load-bearing part by 75% of its cross-section.
- as a bolted rail: with or without flexible support.

A perfect rail transition assures shock-free travelling of the trolleys, executed as a dovetail or a diagonal cut.

## 02 THE GANTRY

Digger gantries are rigid and non-swinging, because the light box design with strengthening by diagonals and bracings has a particularly clever effect.

## 03 THE TIES

The sophisticated tie system consists of two waterside and two landside ties forming the suspension of the booms and also assuring the special stability of the crane. The landside ties are provided with pure steel hinges. This is quite different in the case of the waterside ties: in order to assure hoisting of the boom, these are equipped with maintenance-free hinged bushings.

## 04 ACCESS TO THE CRANE

The general technical concept of the Digger allows the complete structure to be reached easily and safely. Therefore ladders, stairs and platforms complement one another to form an intelligent system of access.



## 05 THE HOPPER AND HOPPER DISCHARGE UNIT

The hopper can receive a minimum of three grab fillings. In order to assure shortest distances and best load cycles, the hopper is arranged as close as possible to the waterside in the lower part of the gantry.

As the goods to be handled are different with different requirements, the hopper is adapted exactly to these requirements. This may be the installation of a wear-resistant coating, but also the installation of a special discharge unit (vibrating conveyor, belt conveyor, slat conveyor) in order to transport the goods perfectly either onto the quay-based belt conveyor or directly onto a landside dump.

In order to protect the hopper against overfilling and the unloader against overload, the same is arranged on load cells. These avoid further filling when the limit values are exceeded. It goes without saying that the complete discharge area is provided with walkways and platforms for maintenance purposes.

In order to avoid dust emissions, a dust house is part of the basic equipment of the hopper. The consistent use of spraying devices, suction and filter systems can reduce the dust burden on the environment to an absolute minimum.



↑ Hopper outlets

## 06 THE TROLLEYS

As performance-dominating crane components of the Digger, the main and auxiliary trolley are sophisticated examples of technical engineering. Thanks to the clever combination of the box girder design and welded profiles, the rope-drawn trolleys are very light but also extremely robustly executed. The pretensioned rope system assures very efficient interaction.

The rope pulleys for deflection of the hoisting and closing ropes and the wheels are arranged in the trolley on high-quality anti-friction bearings supplied by European fabricators. High-quality means above all: low degree of wear and thus long service life.

The rope winches are also special parts: these are arranged in the central machinery house and assure optimal movement of the trolley and maximum accelerations. Horizontal guide rollers lead the wheels without flanges almost wear-free.

We can also supply the main trolley with a grab-rotating device also permitting 90° rotations. Thus the grab can also be used as a grab longitudinal to holding / closing ropes or as a grab with the opening transverse to holding / closing ropes.



↑ Main and auxiliary trolley on twin girder boom



↑ Maintenance hoist inside of machinery house

## 07 THE CENTRAL MACHINERY HOUSE

The central machinery house is arranged within the gantry structure and is characterised by its clear layout and ease of maintenance. The holding and closing winches are installed in this house as well as the boom hoist winch and – in a separate area – the transformer.

A maintenance crane, which can travel over the complete surface, assures optimal access to all components: a decisive advantage in case of maintenance of all drive mechanisms. In this regard the hoisting height provides an extremely high degree of flexibility: all components can be lowered to the ground without causing any danger.

The house is pressure-ventilated. Dust and fine particles are not a matter for discussion thanks to an efficient filter system.

## 08 THE HOLDING AND CLOSING MECHANISM

Both winches of the holding and closing mechanism are arranged in the central machinery house in the gantry. These components have tasks of fundamental importance: the holding mechanism holds the grab during closing – always completely controlled. The closing mechanism also participates 50/50 regarding the load distribution. Both are responsible for hoisting and lowering of the grab, but also for holding during trolley travelling.

A Digger speciality are the rope drums of the winches: these are provided with rope stores, keeping one additional reserve length of holding and closing rope. The ropes can thus be re-adjusted repeatedly, an important advantage in case of premature wear (either due to the close position to the grab head or due to contact with the edge of the hatch, cracking-off the rope socket or rope connections). The service life of the ropes until they are discarded is thus extended repeatedly.



↑ Arrangement of hoisting and closing winch inside of machinery room

## 09 THE BOOM HOIST MECHANISM

Assuring maximum safety for all crane components is a core value of Kocks. This applies in particular to the hoisting winch. This winch is arranged in the spacious central machinery house within the gantry and is equipped with a safety brake as well as an emergency drive. Thus the boom can be kept safe even in case of excessive speed or failure of the drive. The emergency drive assures safe movement into the end position.



↑ Boom hoist system with safety band brake

## 10 THE CRANE TRAVEL MECHANISMS

We also set standards with regard to the crane travel mechanisms. The wheels are arranged in a bogie equalising system and are driven either as single wheels or in pairs. Either as support of the wheels or in gearboxes: anti-friction bearings from European suppliers are a must.

In case of endangered areas, we have developed floodable travel mechanisms – or, where necessary, also curveable trucks, thus assuring curving up to 90 degrees.

## 11 DRIVER'S CABIN

The cabin of the panoramic view type provides much comfort and a full range of visibility. The cabin is uncoupled from the trolley via a separate movable frame equipped with a travel drive mechanism. The cabin carriage is moved on a profile welded at the lower side of a boom girder equipped with a friction wheel drive or toothed bar drive, in accordance with the requirements.

The elements and indication devices required for operation are designed carefully and arranged meticulously in accordance with ergonomic aspects. In this cabin, the crane driver has everything under control.

In order to avoid the penetration of dust, the cabin is ventilated via a filter system. A comfortable air-conditioning unit is also available which is part of the standard equipment of the Digger.



↑ Total view to control the load



↑ Drivers seat inside of cabin with ergonomical arrangement of instruments

## 12 THE ELECTRICAL EQUIPMENT

The freely programmable electrical control, too, is state-of-the-art technical engineering. It is based on approved industry components communicating via bus systems with the digital three-phase frequency converters.

Anti-sway guiding of the hoist load or optimised hoist load guiding can be realised for optimal operating conditions. Semi-automatic or fully automatic operation assures continuously high handling rates during long periods of operation.

The communication of the devices is assured in accordance with the usual industrial standards by Industrial Ethernet, profibus or CANbus, to a large extent via LWL connections.



↑ Workplace place for engineers





↑ Efficient bulk handling

**THEORY:**  
 MAXIMUM HANDLING RATES  
 WITH HIGHEST RELIABILITY.  
**SOLUTION:** THE DIGGER.



↑  
Free digging pattern

The Digger is used where high quantities of coal and other bulk material are to be handled.

The Digger is operated both efficiently and reliably. The intelligent coaction of main and auxiliary trolley via the pre-tensioned rope system assures handling rates of 3000 tonnes and more.

The use of the latest technical equipment is the basis of continuous performance during full shifts. This includes

the anti-sway device and the automatic positioning control system as well as the progressive SIS systems providing fault diagnosis programs and maintenance modules precisely controlling the maintenance status of the devices and always informing accordingly.

The Digger has been developed exclusively for bulk handling and optimised over decades. This is emphasised by the dynamic, light and easy handling and unequalled precision of its manoeuvres.

→ **INFO**

The Digger is characterised as follows:

- high handling rates
- high positioning accuracy
- high working speeds
- low maintenance costs
- high availability
- long service life
- high resale value





↑  
Unloading directly to material stock



↑ Stability and rigidity of the gantry structure is the basis of high performance of the Digger



# WHY KOCKS?

## CRANE CONSTRUCTION SINCE 1872.

### → KNOW HOW

Kocks has developed high-performance ship unloaders since 1913. We are considered pioneers in the development of container cranes in Europe – and we are leaders on the world market in the field of Goliath cranes. Kocks sets standards for the high performance of cranes.

Our engineers consistently apply the approved regulations of German engineering when continuously developing and designing cranes. Designing and classification for continuous operation is carried out particularly conscientiously.

The goal always remains the same: increased efficiency, safety and environmental friendliness of the cranes.

### → QUALITY

To us quality means: a sophisticated product concept, profound know-how in the fields of design and control as well as the greatest accuracy with regard to fabrication and execution. It goes without saying that our engineers test and check all mechanical and electrical components meticulously.

This provides decisive advantages:

- maximum efficiency and reliability of the cranes
- low operational costs
- long service life (even under the toughest operating conditions).

### → SERVICE

Perfect maintenance is part of a good product for us. We therefore train the personnel of our customers intensely in the fields of crane theory and crane practice. We want to assure that continuous availability of the cranes is guaranteed.

If a failure should occur in spite of everything, we assist quickly and in a flexible and unbureaucratic way. Around the clock.

### → PARTNER APPROACH

The Digger is an extremely durable product. The decision in favour of the Digger means the start of a comprehensive relationship between customer and supplier, which is evident from the many repeat and follow-up orders.

We therefore attach great importance to ensuring that this relationship is fair and with long-term benefits for both sides. For us this starts long before the signing of contract. We will be pleased to advise you, simply give us a call.

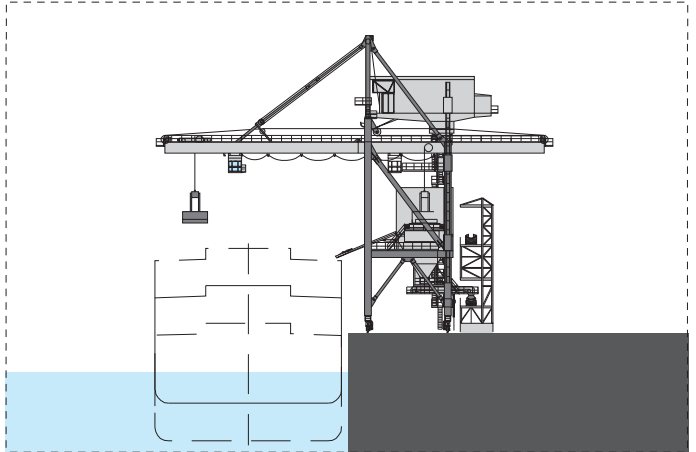


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Home of Kocks Crane in Bremen

# THE DIGGER – THE ESSENTIAL TECHNICAL DATA.

AN OVERVIEW OF THE DIGGER.

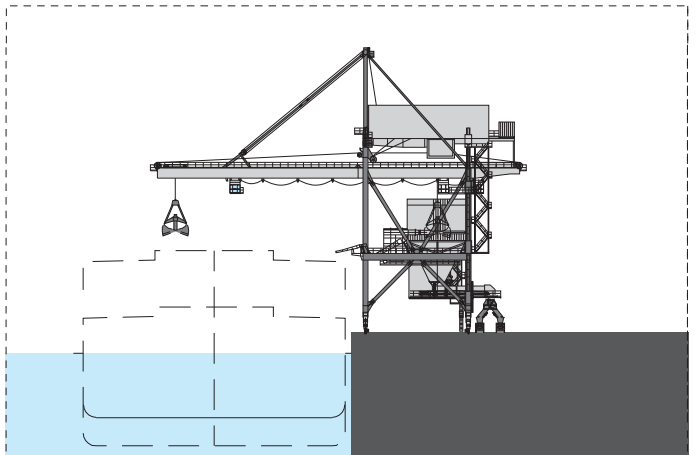
## DIGGER 1000



- Capacity at the ropes 20–25 t
- Hopper content 50 t
- Operating speeds
  - Hoisting/Closing 120m/min
  - Lowering/Opening 150m/min
  - Trolley travelling 200m/min

- Gantry travelling 25 m/min
- Size of vessel (on average) 70,000 DWT
- Nominal capacity (Free Digging)
  - Coal 1,000t/h
  - Ore 1,100t/h

## DIGGER 1500



- Capacity at the ropes 30–35 t
- Hopper content 70 t
- Operating speeds
  - Hoisting/Closing 120m/min
  - Lowering/Opening 150m/min
  - Trolley travelling 200m/min

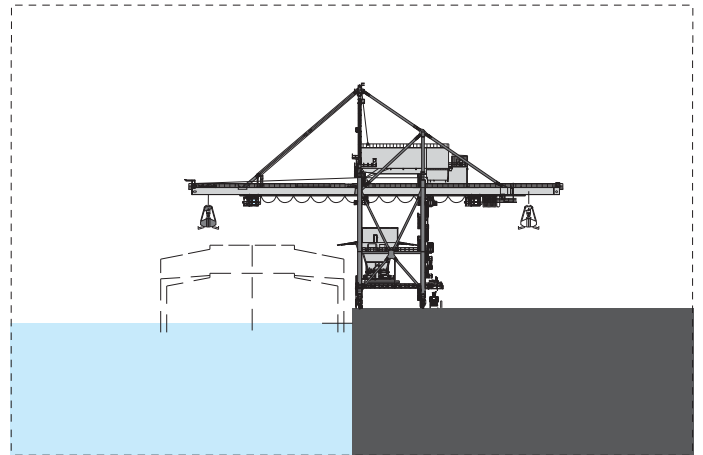
- Gantry travelling 30 m/min
- Size of vessel (on average) 120,000 DWT
- Nominal capacity (Free Digging)
  - Coal 1,500t/h
  - Ore 1,650t/h



## DIGGER 2000



- Capacity at the ropes 40–45t
- Hopper content 95t
- Operating speeds
  - Hoisting/Closing 150m/min
  - Lowering/Opening 180m/min
  - Trolley travelling 240m/min

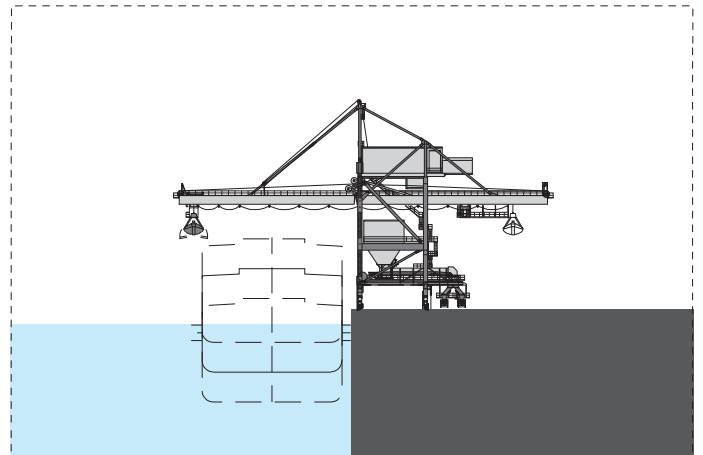


- Gantry travelling 30m/min
- Size of vessel (on average) 200,000 DWT
- Nominal capacity (Free Digging)
  - Coal 2,000t/h
  - Ore 2,200t/h

## DIGGER 3000



- Capacity at the ropes 60–65t
- Hopper content 140t
- Operating speeds
  - Hoisting/Closing 150m/min
  - Lowering/Opening 180m/min
  - Trolley travelling 240m/min



- Gantry travelling 30m/min
- Size of vessel (on average) 250,000 DWT
- Nominal capacity (Free Digging)
  - Coal 3,000t/h
  - Ore 3,300t/h

## **KRANUNION.** WORLD MARKET LEADERS UNITED.

Kranunion is an association of three crane manufacturers specialised in hoisting and transporting heavy loads.

KIROW is the world market leader for railway cranes and slag pot carriers

ARDELT is the world market leader for double jib level luffing cranes

KOCKS is the world market leader for Goliath cranes

Central to all Kranunion products are the technical design concepts created by our experts. Of course, we continue to optimise those fundamental concepts even further in the interests of our customers. Kranunion products are therefore based on practical requirements and are a symbiosis of tradition and innovation combining the tried and tested with the new.

Customers who choose Kranunion choose great German engineering skill: for environmentally-friendly and safe, modern technology, for low operating costs, for high performance and reliability.

