

**MH-17**

DEMINING MACHINE - Systems for humanitarian demining

# TIMELINE

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2005

## WE CREATED MH-05

We brought together a group of skillful military mechanical engineers with decades of experience in design and maintenance of such machines and their use in the process of humanitarian demining.

2016

## PROCESS OF HUMANITARIAN DEMINING

Over 10.000.000 m<sup>2</sup> were cleared during the last 10 years on the territory of Bosnia and Herzegovina with MH-05 machines.

2017

## WE CREATED MH-17

We have made improvements in terms of comfort, machine handling, protection against explosion, productivity and design

# MACHINE CONCEPT BASED ON PREVIOUS EXPERIENCE

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The concept of the demining machine MH-17 is based on the experience of MH 05 on demining sites in Bosnia and Herzegovina and Sudan in terms of:

1. PRODUCTION
2. USAGE
3. MAINTENANCE



# MASS AND DIMENSIONS

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The mass of the machine is about **15,5 TONS** and thus belongs to the **MEDIUM CATEGORY OF MACHINES** according to international standards for humanitarian demining (IMAS).

The dimensions of the **MACHINE WITHOUT A WORKING TOOL** (length 6 m, width 2.33 m and height 2.52 m) **ENABLE THE LOADING** of the machine with a set of working tools and spare parts **IN A 40-FOOT SHIPPING CONTAINER** (40' high-cube container) and **SUITABLE FOR ROAD TRANSPORT** either in a container or on a standard truck trailer.



## TECHNICAL DESCRIPTION OF EQUIPMENT

# AGILITY AND EXCELLENT VEHICLE HANDLING

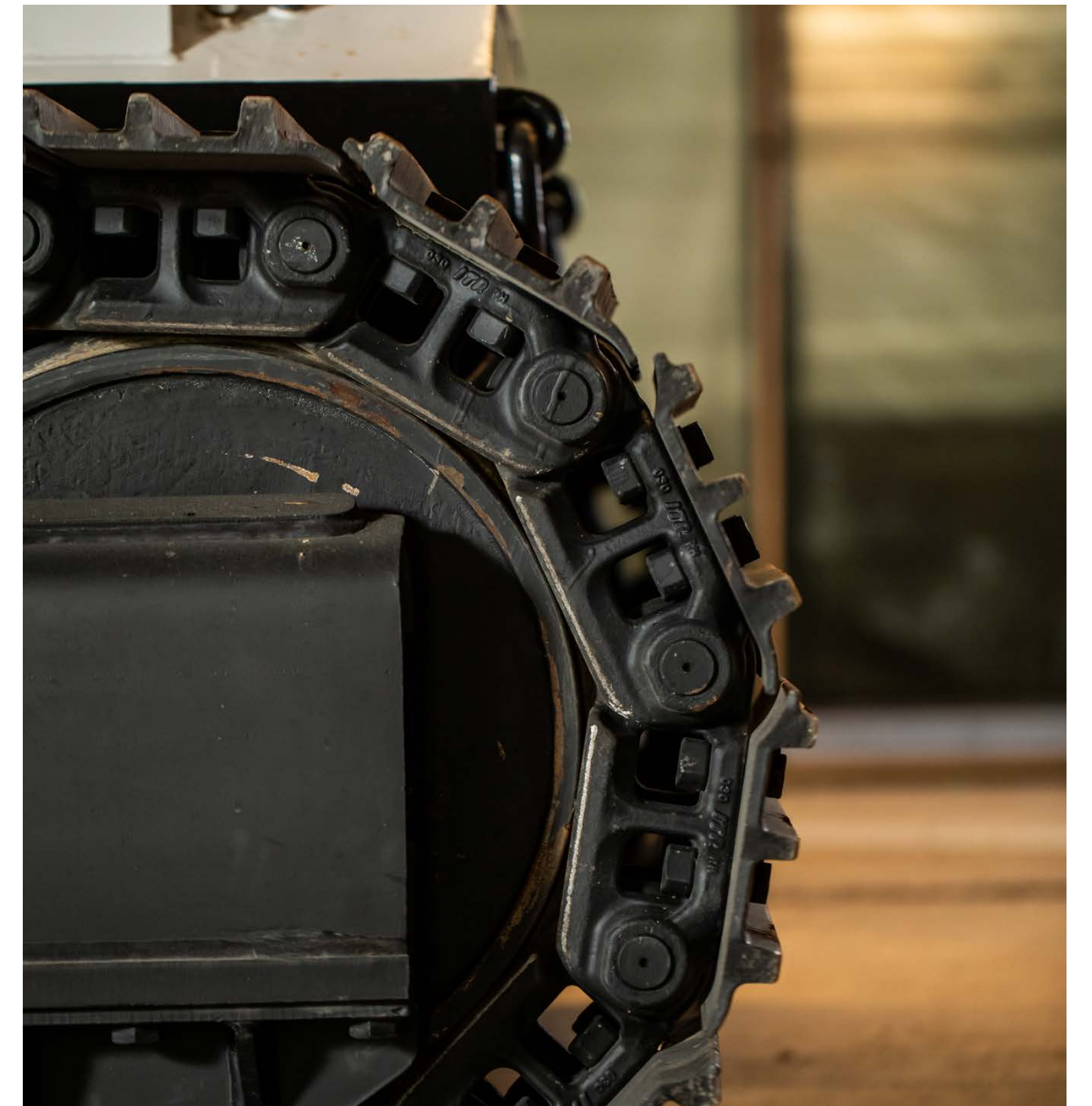
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Traction drive allows excellent maneuverability characteristics. Overcoming steepness over 30 degrees, lateral inclination over 25 degrees, vertical obstacles up to half a meter, channels over 1.5 m.

**INDEPENDENT HYDROSTATIC DRIVE** of the left and right tracks ensures continuous control of the speed of movement in the range **FROM 0.1 TO 5 km/h** and thus the speed of the machine can be adjusted to different **WORKING CONDITIONS, FROM THE MOST UNFAVORABLE** - when using the minimum speed of movement **TO THE MOST FAVORABLE** - when higher speeds are used.

The same **DRIVE SYSTEM ENABLES INDEPENDENT REGULATION OF THE SPEED** and **DIRECTION OF THE MOVEMENT** of the left and right tracks, so that rotation of the machine around its own vertical axes is 360 degrees.

The 0.5 m wide tracks with a 3.8 m long landing length provide a specific pressure on the ground below 0.40 kg/cm<sup>2</sup> with tools and 0.35 kg/cm<sup>2</sup> without tools, allowing the machine to move on soft soil.



## TECHNICAL DESCRIPTION OF EQUIPMENT

# WORKING TOOLS

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The machine is **DESIGNED TO ENABLE USAGE AND QUICK REPLACEMENT OF VARIOUS DEMINING and OTHER TOOLS** such as demining tiller, demining flail, vegetation cutter, universal excavator bucket with 6 functions (digging, loading, dozing, grading, backfilling, grabbing), forklift, robot arm and others.

Mounting of working tools allow the usage of tools or loads of mass up to 3 tons, lifting up to a height of about 3 m.

### **The mechanism for lifting the working tool allows:**

- ▶ continuous lifting and lowering speed control of the tool,
- ▶ regulation of the longitudinal inclination of the working tool (with the possibility of automatic preservation of the given inclination when lifting the tools),
- ▶ the tool's rotary drive (demining tiller, demining flail, vegetation cutter)

as well as an additional command on the tool (opening of the excavator bucket, grabbing with the robot arm and the like).

Working tools are designed so that the tool can be **REPLACED IN FIELD** conditions by the machine operator **WITHIN 15 MINUTES.**

# DEMINING AND NON-DEMINING TOOLS

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DEMINING TOOL - TILLER



DEMINING TOOL - FLAIL



NON DEMINING TOOL  
EXCAVATOR BUCKET



# DEMINING TOOLS

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The machine has two basic demining tools, **A DEMINING TILLER** and **A DEMINING FLAIL**.

Different demining tools enable efficient work with different soil types and vegetation.

**THE EFFECTIVE WORKING WIDTH** of the demining tools is **ABOUT 2.5 m**, which ensures that the tracks with a width of 2.28 m always move within the treated (demined) soil.

The hydrostatic drive of the working tool allows regulation of the direction of rotation and continuous regulation of the speed of rotation of the tool in the range of up to 700 rpm.

The hydrostatic drive of the working tool can draw from diesel engines up to 250 kW of power, and allows over 200 kW of power to be delivered to the working tool after all losses.

Accordingly, the **SPECIFIC POWER DRAWN** (power per meter of tool) is **100 kW/m**, and **TRANSFERRED SPECIFIC POWER** is **80 kW/m**, and according to this feature MH-17 is one of the most powerful, if not the most powerful, demining machines available.

This feature of the MH-17 guarantees high productivity in m<sup>2</sup>/h (demined surface per one hour of work of the machine), which results in lower demining costs per m<sup>2</sup>.

The regulation of the speed of rotation of the working tool and power for the drive of the tool is completely independent from the regulation of the speed of movement, in this way the **MACHINE CAN BE ADAPTED TO VARIED REQUIREMENTS IN THE FIELD**.

**THE DEPTH OF SOIL DIGGING** with the demining tools can be regulated in the range from **0 TO 30 cm** with mechanical limiters sleds.

**THE CORRECTION OF THE DEPTH OF DIGGING**, using the sleds, can be carried out by the machine operator during operation, continuously, **IN A RANGE OF ± 8 cm**.



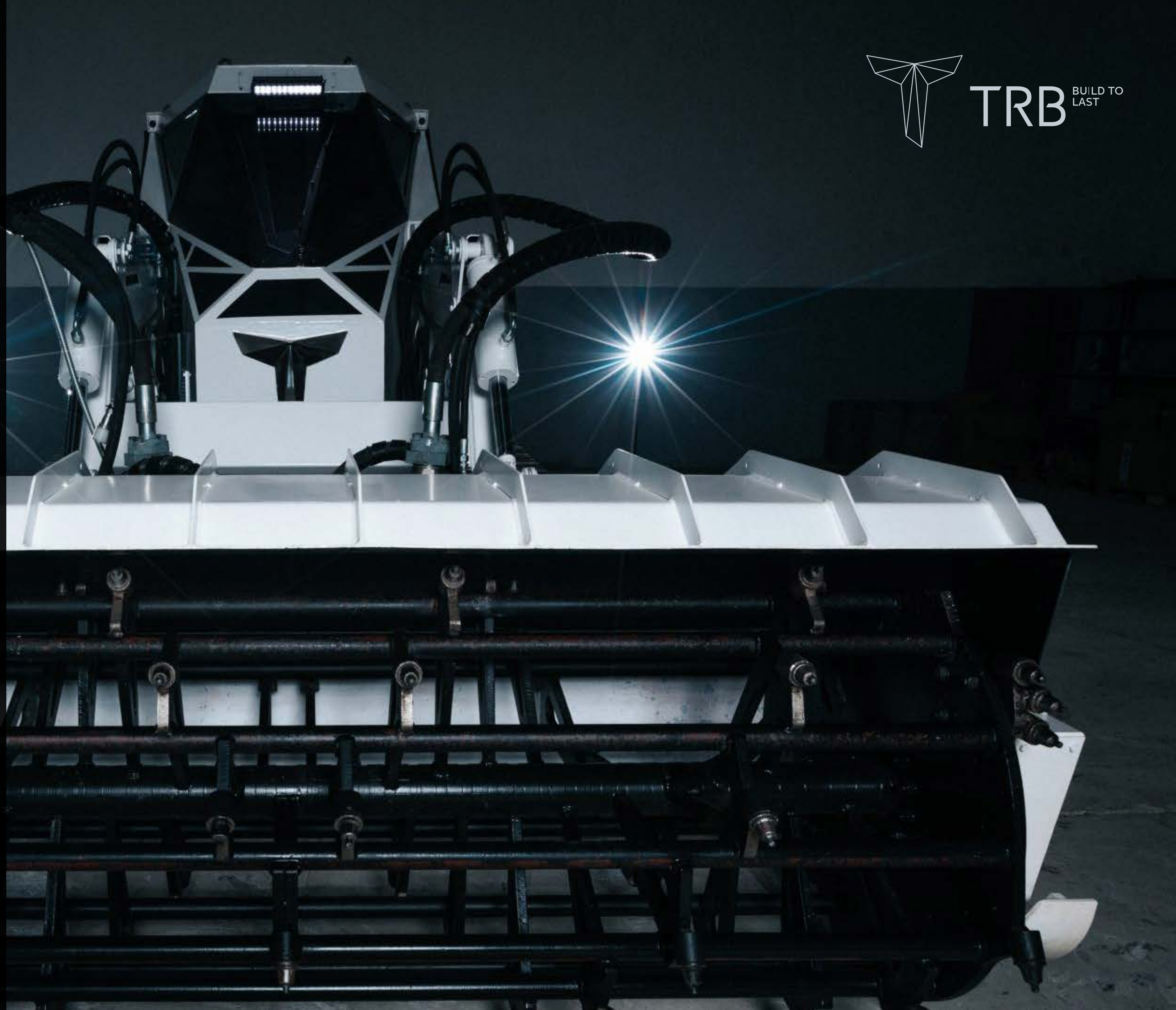
# DEMINING TOOLS

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Longitudinal adjusting of the working tools to ground level can be regulated by the machine operator or automatically by using a “floating” suspension on the working tool where the working tool relies on the depth limiters with a predefined force and thus follows the ground level.

The suspension method of the tools enables automatic adjustment to the variable lateral slopes of the terrain while maintaining the set depth of digging.

The mechanism for holding working tools, raising and lowering of tools and regulation of longitudinal inclination, allows demining tools to process channels up to a depth of 1 m and embankments up to 3 m in height.



# MACHINE MANAGEMENT AND OPERATOR COMFORT

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The machine is **OPERATED DIRECTLY FROM THE ARMoured CABIN.**

In addition to direct cabin control, the machine can also be **REMOVEDLY CONTROLLED** as an option.

The cabin is located in the front of the machine, raised above the working tool so that the operator can monitor the ground in front of the working tool and adjust the working conditions to the soil conditions.

Ballistic glass in the front, on the sides and in the back provide good visibility on all sides and for monitoring the circumstances at the demining site. Tinted ballistic glass protects the operator from direct sunlight.

**THE CABIN IS AIR-CONDITIONED**, with the ability to regulate the amount of outside air that is drawn into the cabin. The outside air, before entering the cabin, first passes through the air-condition filter.

The floor, walls, roof and doors of the cabin are made of double sheets filled with insulating material which provides **THERMAL AND SOUND INSULATION OF THE CABIN.**

The cabin rests on the chassis of the machine through elastic supports that **PREVENT THE TRANSMISSION OF VIBRATIONS** from the machine to the cabin.

The operator seat has **ADJUSTABLE ELASTIC SUPPORT, SEAT HEIGHT ADJUSTMENT, HEAD SUPPORT HEIGHT ADJUSTMENT, BACKREST INCLINATION** and **FORWARD-BACK SEAT MOVEMENT.**

The operator's seat has attached to it two armrests with joysticks and switches for controlling the movement of the machine and working tools.

On the dashboard in front of the operator there are digital displays for monitoring **ENGINE PARAMETERS, HYDRAULIC SYSTEM PARAMETERS** and **DISPLAY SCREEN CAMERAS** with a selection of cameras that are monitored (front camera general view, front camera display in front of working tool, rear camera).

# OPERATOR SAFETY IN CASE OF MINE ACTIVATION

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**THE DISTANCE** of the working tool, where the activation of **MINES IS EXPECTED**, is approximately **4m FROM THE OPERATOR**.



The working tool is manufactured of 10 mm thick sheets. The protective sheet of the working tool is made of 5 mm thick ballistic sheets. All mine shrapnel, after the detonation of the mines, must first break through one of these two sheet metals.

The operator's cabin is made of two layers of 5 mm thick ballistic sheets with a gap of about 20 mm.

**THE CABIN GLASS** is made of **MULTILAYER LAMINATED BALLISTIC GLASS** with a thickness of 40 mm.

In this way, the **BALLISTIC PROTECTION OF THE CABIN** itself exceeds the **FB6/BR6 LEVEL** according to the **EN 1522/1063 STANDARD**, i.e. exceeds **LV.1/PART3** according to the **STANAG 4569/AEP55 STANDARD**.

The cabin is constructed so that the surfaces of the cabin walls and the surface of the glass are positioned at an angle of 15 to 30 degrees to the expected direction of the shrapnel and the shock wave of the explosion, which further reduces the unwanted effects of the shock wave and shrapnel.

With the correct use of the machine, no track mine activation is expected.

# OPERATOR SAFETY IN CASE OF MINE ACTIVATION

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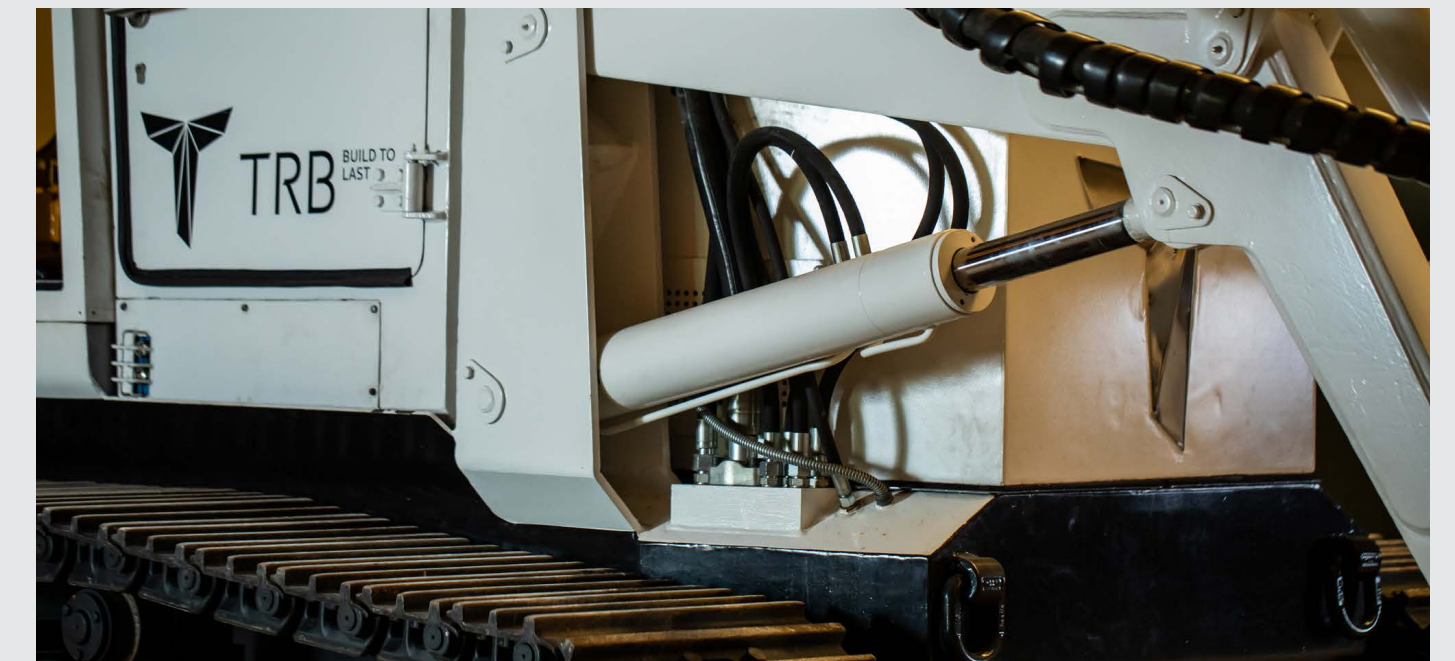
If, due to improper use, **A MINE IS ACTIVATED BY THE TRACK**, the construction of the **MACHINE ENSURES PROTECTION OF THE OPERATOR**.

In this case, the first barrier to the shock wave and the shrapnel is the floor of the machine, which is about 400 mm from the ground and is made of a ballistic sheet of 8 mm thickness. The angle under which shock waves and shrapnel impact the floor of the cabins is 45 degrees or less. From the floor of the machine to the floor of the cabin there is a space of 600 mm. The floor of the cabin is made of two layers of ballistic sheet of 5 mm thickness with a gap of about 20 mm.

In this way, **BALLISTIC PROTECTION FROM EXPLOSION UNDER THE CABIN** exceeds the **LEVEL OF FB7/BR7** according to the **EN 1522/1063 STANDARD**, i.e. exceeds **LV.3** according to the **STANAG 4569 STANDARD**.

The machine's mass of over 18 tons, the elastic suspension of the cabin to the chassis, the elastic suspension of the operator's seat and the operator's belt prevent that the impact force, in the event of the activation of anti-tank mines, either by the tool or by the track, cause operator injuries.

In case of the machine overturning onto the main door of the cabin, the cabin is equipped with an auxiliary door on the right side of the cabin.



# ENGINE

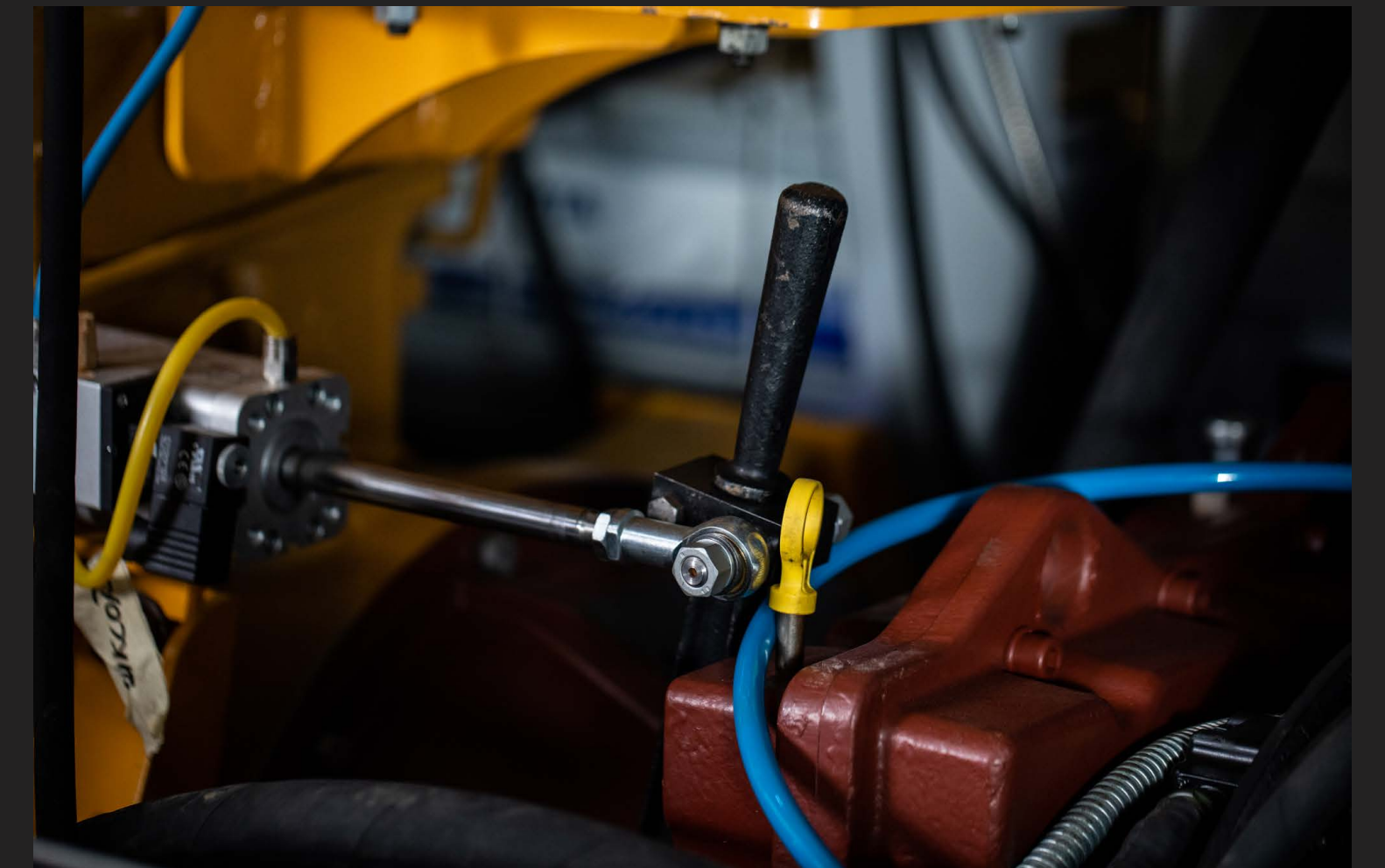
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The engine that is installed in the machine, **THE CAT® C13 ACERT™**, is one of the standard engines of the world renowned manufacturer of engines and construction machines - **CATERPILLAR**.

It is distinguished by its **WORK, RELIABILITY AND DURABILITY**.

Each CAT engine engine is manufactured to strict quality standards to ensure customer satisfaction.

Support is provided through the global CAT distributor network.



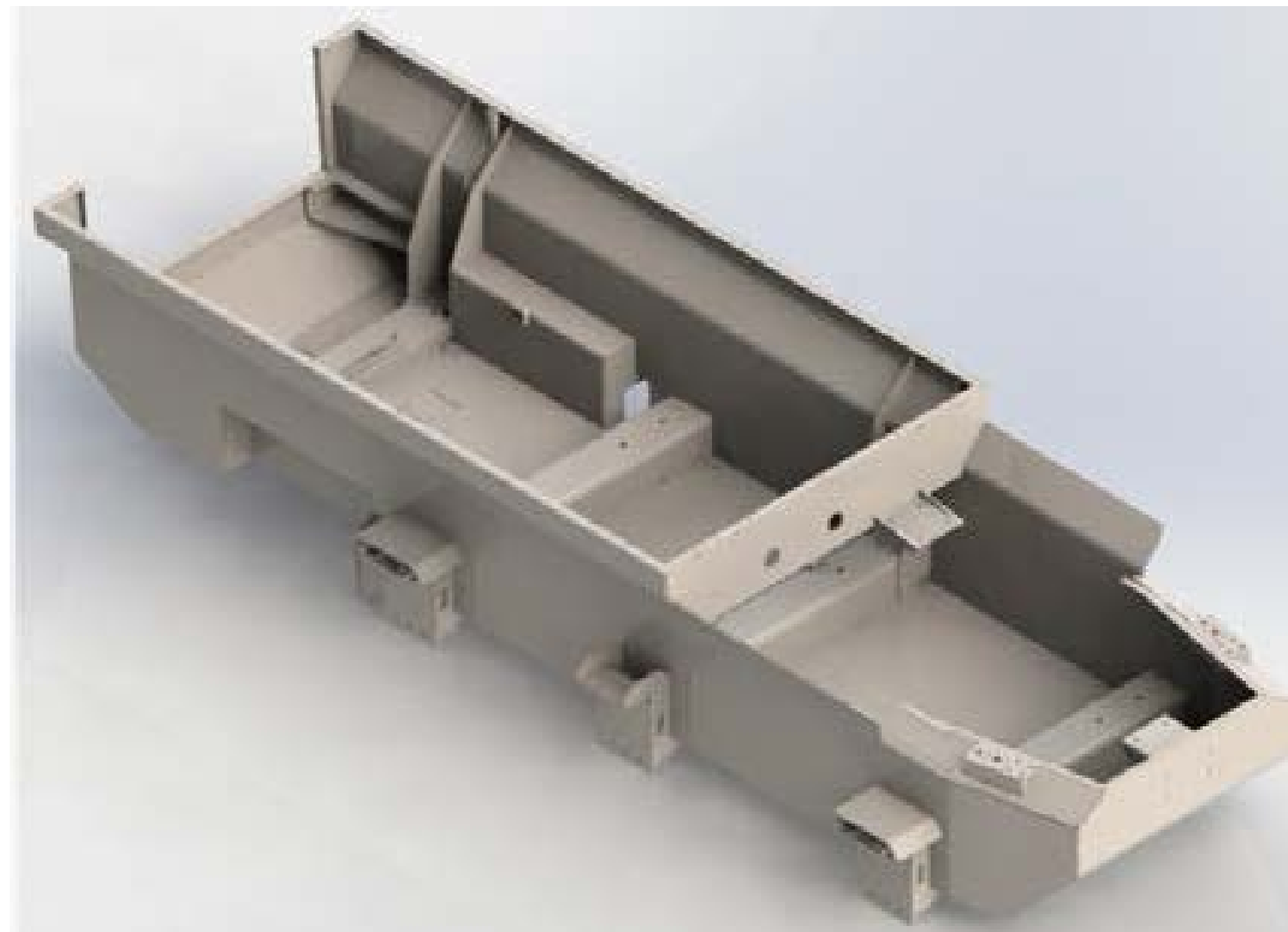
# PROTECTION OF VITAL PARTS OF THE MACHINE FROM MINE EXPLOSION

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Working tools and mounting mechanism are made of ballistic steel and steel of high hardness and strength for increased wear resistance and increased resistance to explosions.

**THE LOWER PART** of the chassis is made of **8 mm THICK BALLISTIC SHEETS**.

**THE UPPER PART** of the chassis is coated with **BALLISTIC SHEETS OF 3 mm THICKNESS**.



# MAINTENANCE SUITABILITY

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In the case of **EXPLOSIONS OF COMMON ANTI-PERSONNEL MINES, NO SIGNIFICANT DAMAGE IS EXPECTED** on the working tools or other parts of the machine.



In the event of an **EXPLOSION OF MINES** with a **HIGHER AMOUNT OF EXPLOSIVES** (anti-tank mines, other mines with more than 0.5 kg of explosives), **PARTS** of the working tool **MAY BE DAMAGED**.



These damages can usually be repaired in the field using original spare parts.

In exceptional cases, a complete spare tool should be installed instead of a damaged tool, and the damaged tool should be sent to the repair workshop.



**TRB PROVIDES** genuine **SPARE PARTS** and **CONSUMABLES** for all **MACHINE SYSTEMS**.



# TRAINING

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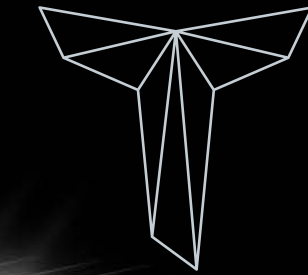
At the request of the buyer the following can be organised:

**01** Training (theoretical and practical) of staff handling machines



**02** Training (theoretical and practical) of staff for the maintenance of machines





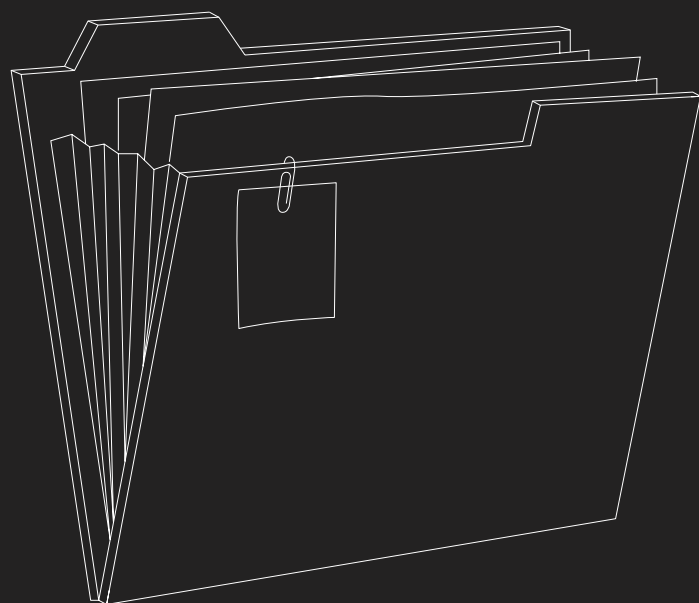
TRB  
BUILD TO  
LAST

# DOCUMENTATION

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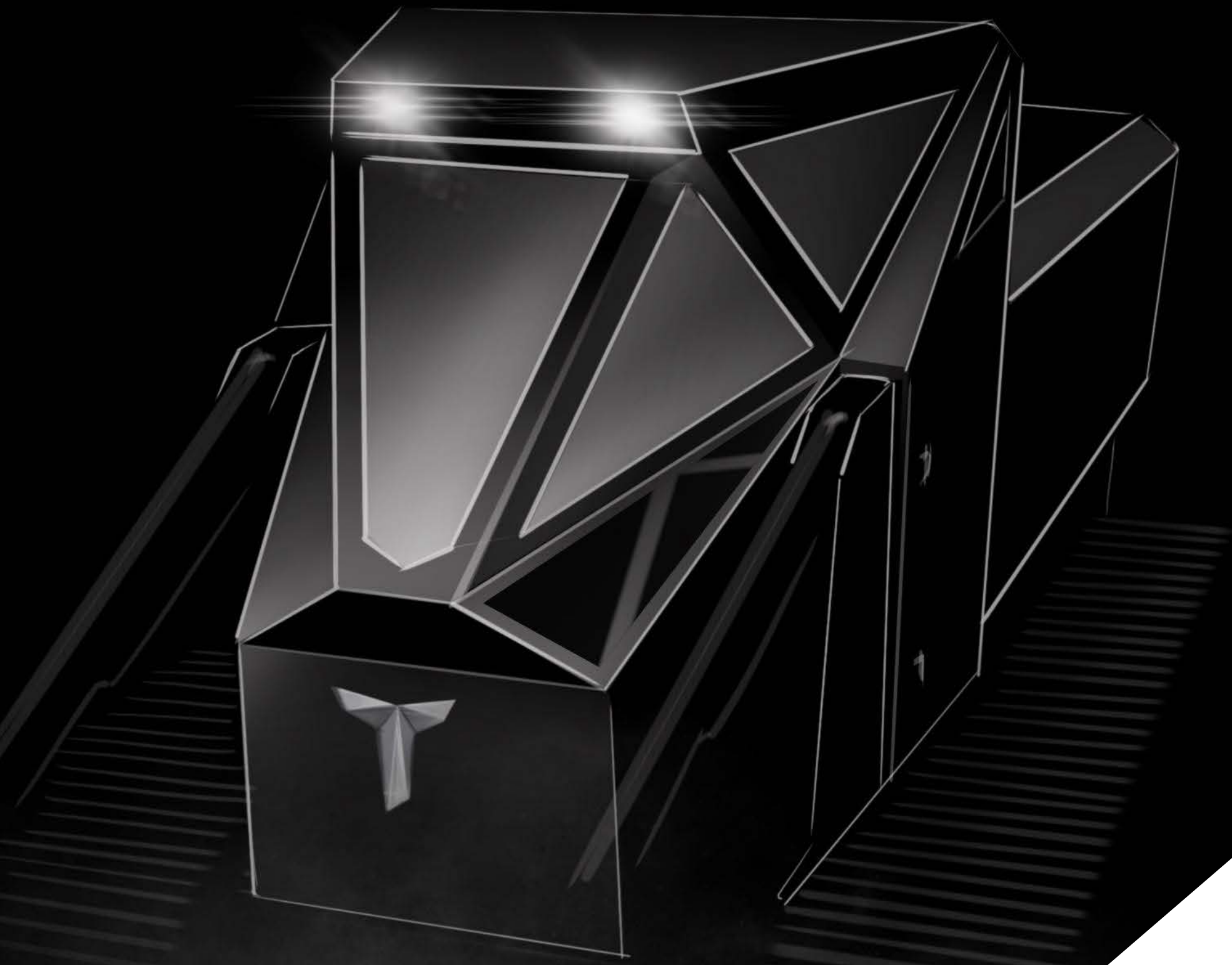
The following documents are supplied with the machine as standard:

- ▶ Instructions for handling the machine
  - ▶ Machine maintenance instructions.
  - ▶ Catalogue of spare parts
  - ▶ Specification of the required standard and special tools and equipment for maintenance of the machine.
  - ▶ Specifications of recommended spare parts for a certain period of use of the machine.
    - ▶ Specification of consumables for the machine.



# DESIGN

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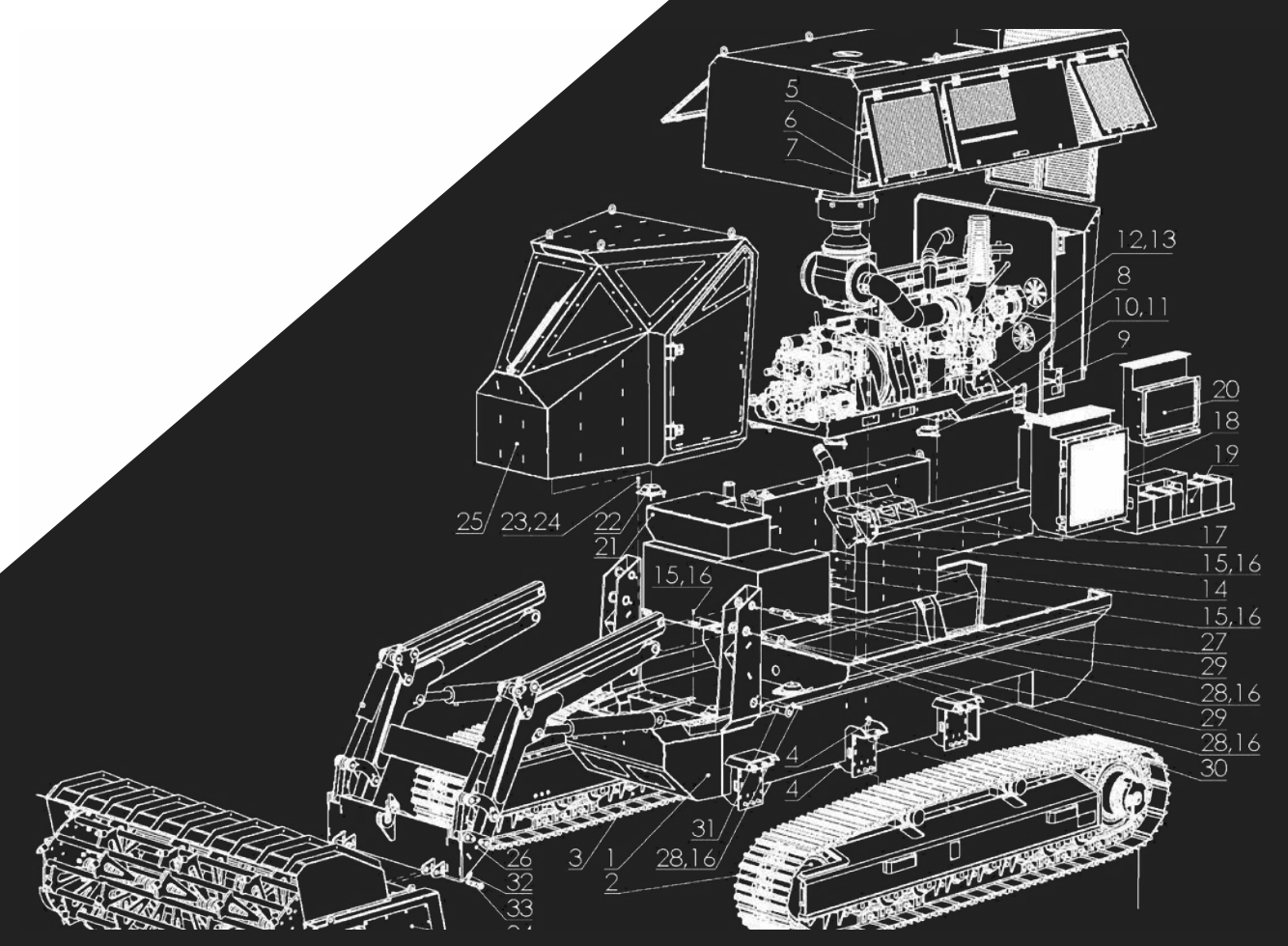
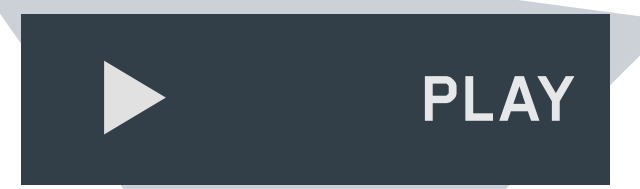


The specific shape of the cabin provides:

**01** Cabin geometry provides ricochet for additional protection from shrapnel

**02** Modern, aerodynamic and visually recognisable appearance on the market

VIDEO PRESENTATION



# TECHNICAL SPECIFICATION

## DIMENSIONS

Machine length without tool: **6 m**  
Machine width without tool: **2.33 m**  
Machine height: **2.52 m**  
Machine length with demining tool: **7.5 m**  
Machine width with demining tool: **2.95 m**  
Track width: **0.5 m**  
Overall length of track: **4.1 m**  
Length of track on the ground: **3.7 m**  
Specific pressure on the ground  
(machine without tool): **0.35 kg/cm<sup>2</sup>**  
Specific pressure on the ground  
(machine with demining tool): **0.40 kg/cm**

## MASS

Machine mass without tools: **13.5 t**  
Mass of demining tools (tiller or flail): **2 t**  
Mass of machine with demining tool: **15.5 t**

## TYPE OF OPERATION

Directly from the armored cabin  
Optional: **Remote Controlled**

## MACHINE DRIVE

Drive type: **Hydraulic, Two independent hydrostatic drives**  
Power taken: **Max 168 kW**  
Power delivered: **Max 122 kW**  
Capacity of the hydro-oil reservoir  
(together with the tool drive system): **500 l**

## DRIVE OF ROTARY TOOLS

Drive type: **Hydraulic, Hydrostatic drive**  
Power taken: **Max 250 kW**  
Power delivered: **Max 200 kW**  
Capacity of the hydro-oil reservoir  
(together with the machine drive system): **500 l**

## PASSAGE AND MOBILITY

Minimum speed: **0.1 km/h**  
Maximum speed: **5 km/h**  
Minimum turning radius: **0**  
(rotation around the vertical axis)  
Climb: **> 30 °**  
Side slope: **> 25 °**  
Channel width: **1.5 m**  
Height of vertical obstacles: **0.5 m**

# TECHNICAL SPECIFICATION

## ENGINE

Brand and type: **CATERPILLAR C13 ACERT**  
Fuel: **Diesel**  
Configuration: **Line, 6 cylinders, four-stroke**  
Air intake: **Turbo-charged with intercooler**  
Cylinder diameter: **113 mm**  
Piston stroke: **157 mm**  
Cubic capacity: **12.5 l**  
Compression ratio: **17:1**  
Direction of rotation (viewed from the side of the flywheel): **Counterclockwise**  
Maximum Power: **310 kW**  
RPM (maximum power mode): **2100 rpm**  
Maximum torque: **1496 Nm**  
RPM (maximum torque mode): **1400 rpm**  
Specific fuel consumption: **210 g/kWh**  
Cooling system capacity: **14.2 l**

## DEMINING WORKING TOOL TILLER

Tool mass: **< 3 t**  
Overall tool width: **2.95 m**  
Working width: **2.5 m**  
Rotor diameter: **1 m**  
Power on the tool: **200 kW**  
Specific power: **80 kW/m**  
RPM: **0 - 700 rpm**  
Direction of rotation: **Both directions**  
Digger type: **Removable hard- metal cogs**

## DEMINING WORKING TOOL FLAIL

Tool mass: **< 3 t**  
Overall tool width: **2.95 m**  
Working width: **2.5 m**  
Rotor diameter: **1 m**  
Power on the tool: **200 kW**  
Specific power: **80 kW/m**  
RPM: **0 - 700 rpm**  
Direction of rotation: **Both directions**  
Digger type: **BlastTip NT96**

# TECHNICAL SPECIFICATION

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## OTHER WORKING TOOLS

**Vegetation cutter**

**Universal dredger bucket with following functions:**

digging, loading, spreading, straightening and pushing

**Forklift**

**Robotic arm**

## BALLISTIC PROTECTION

**Cabin**

Two layers of 5 mm armored plate each and 40 mm armored glasses, which meets the minimum FB6 / BR6 according to EN 1522/1063 standard, i.e. exceeds Lv.1 / Part3 according to STANAG 4569 / AEP55 standard.

**Lower part of machine chassis**

Armoured plate 8 mm

**Upper part of machine chassis**

Armoured plate 3 mm

## OPERATOR COMFORT

Elastic suspension of the cabin to protect against vibrations

Two-layer armoured plate with an inner-layer of insulation material for thermal and sound insulation

Air-conditioned cabin

The operator's seat has adjustable elastic support, seat height adjustment, headrest adjustment, backrest inclination, backwards-forwards seat adjustment

Good visibility through tinted glass on the front, side and rear of the cabin

# OTHER TRB PRODUCTS

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- ▶ Despot - 4x4 armoured multi-purpose vehicle
- ▶ Drina - Small calibre ammunition production line
- ▶ RS9 Vampir - semi-automatic 9mm pistol
- ▶ Fuzes for military use
- ▶ Electronic systems
- ▶ Mobile security systems
- ▶ Mobile power & water systems

For further information please contact your TRB representative or:

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