Unmanned Systems
EOD robots

The most important thing we build is trust.
To develop machines, equipment and systems that **PROTECT OR REPLACE HUMAN BEINGS** in situations where their presence would be either impossible or place them at great risk. **This is our motto, motivation and mission since 1994**

*Foundation of telerob Gesellschaft für Fernhantierungstechnik mbH. telerob is doing business as Cobham Mission Equipment - unmanned systems since 2011*
This basic rule with regard to disarming explosive devices means that bomb disposal officers increasingly prefer EOD robots as their tool of choice.

The telerob Explosive Ordnance Disposal and observation robot sets the standard worldwide. Robust, reliable and flexible in use, the innovative bomb disposal system provides a maximum degree of safety and protection.

More than 450 units in 41 countries help daily to prevent harm to people and the environment.

A total of 20 NATO countries place their trust in the superior reliability of the most widely sold EOD robot of recent years.

The highlights:

- Programmable 6-axis manipulator with linear axis
- Magazine for three additional EOD devices, with automatic tool change
- Parallel operation of up to five firing systems with a maximum of ten separate shots
- Universal interfaces to connect to all current firing systems
- Built-in diagnostic system with remote maintenance module
- Long list of accessories (more than 40 systems and devices)
- Can be used under all ambient conditions from –20°C to +60°C
The EOD robot **teODor**

### Technical Data

#### Vehicle
- **Length / Width / Height:** 1 300 / 685 / 1 240 mm
- **Weight:** 375 kg
- **Speed (infinite):** max. 3 km/h
- **Climbing ability:** 45°
- **Turn circle:** 1 460 mm
- **Payload:** 300 N
- **Reach vertical / horizontal:** 2 860 / 1 860 mm

#### Manipulator
- **Turret rotation:** ± 205°
- **Upper arm incline:** ± 144°, - 85°
- **Lower arm incline:** ± 110°
- **Upper arm extension:** 0 - 390 mm
- **Gripper incline:** ± 120°, - 95°
- **Gripper rotation:** ± endless
- **Gripper open/close:** 300 mm
- **Gripper force:** 600 N

#### Control panel
- **Width / Height / Depth:** 440 / 350 / 310 mm
- **Weight:** 9 kg

*Depending on ground and friction. Trained operators under ideal conditions may achieve more by using specific arm configurations.*
The basic vehicle is designed as a twin-track vehicle. Extremely good maneuverability, good properties on open ground and the ability to climb at angles of up to 45°* characterize the running gear that is equipped with sprung rollers. It is easy to replace individual links of the robust steel track if they become worn or damaged.

The high-torque drive units work with continuous 4-quadrant control both backwards and forwards. You can operate both the vehicle and the manipulator with extreme delicacy. When the vehicle stops on slopes or gradients the safety brakes operate automatically to hold the vehicle in place.

The manipulator is a 6-axis high-power manipulator with a range of 2,860 mm. It can handle even the heaviest objects thanks to a payload of up to 100 kg**. Slipping clutches protect the manipulator axes against damage in the event of overloading.

A unique feature in this class is that the manipulator has a linear axis in the lower arm. This simplifies all linear movements in particular and makes investigation underneath vehicles much easier. Just press a button to automatically initiate routine activities such as tool changes or folding up/folding.

* Depending on the surface and its friction characteristics. Greater values are possible if you position the arm accordingly and are working under ideal ambient conditions.
** See the Technical Data on page 6.
You can control the robot either by radio or by using a 200 m fiber optic cable.

A special data protocol allows secure and error-free operation. Important vehicle data such as the battery voltage or the gripper force is collected regularly and shown on the control panel.

A built-in diagnostic system allows simple troubleshooting. Special software allows access to the diagnostic system via the internet.

In the basic version the vision system consists of two drive cameras plus one overview camera and one gripper camera. Stereo, night vision or infrared cameras are available as option.

The control station has been designed as a mobile operations control center. It has its own power supply and can be brought easily to any desired place of use. A large TFT monitor gives a superb overview of the operations area. The compact control panel can also be operated separately from the control station in the event of operations within sight of the vehicle.
Sometimes less is more

The basic principle applies with special force if the situation involves working in confined spaces.

In all cases where the big robot EOD or cannot be used its little brother telemax provides that vital distance between the bomb disposal engineer and the explosive device that can mean the difference between life and death in aircraft, in subways, in buses or other means of public transport.

The EOD robot telemax

The highlights:

- Programmable manipulator with Tool Center Point control
- Excellent mobility through 4-track running gear with 2DRIVE technology
- 7-axis manipulator with rotating turret and linear axis
- Very high reach through the telescope and chassis that can be adjusted for height
- Two tool magazines with automatic tool change
- IATA-conforming Li-ion battery system (in compliance with UN 38.3)
- Interfaces for AQUASET, ABL 2000, PROPARMS 12.5 RC, PROPARMS 20 RC, RE 70 M3, RE 12g Mini, BENELLI M4 Super 90, NEEDLE and DemiMod
- Universal charger with intelligent battery management for Li-ion and NiMh technology
- Hybrid drive featuring fuel cells for long endurance missions
The EOD robot telemax

Technical Data

Length: 800 mm*
Width: 400 mm*
Height: 750 mm*
*Stowed position

Vertical reach (stretched): 1955 mm (2 400 mm) + 290 mm telescope

Horizontal reach:
Front: 1530 mm + 290 mm telescope

Gripper payload: 5 kg

Speed:
Standard speed version: 4 km/h (track)
High speed version: 10 km/h (wheel)

Climbing ability: 45°

Obstacle ability: 500 mm

Ambient conditions:
Temperature: -20 to +60°C

Protection: IP 65

Two men portability acc. to MIL STD 1472E

Chassis:
4-track system, 2DRIVE Technology optional 4 wheels

Power:
Battery NiMh 17Ah
Battery Li-ion 40Ah
Battery Li-ion 13.2 Ah

Operation time:
approx. 2-4 hours

Subject to change without notice!
The EOD robot: telemax

The chassis: A four-track running gear has been used for the first time in a vehicle of this size. It offers superior mobility compared to other forms of running gear. This means that it can handle gradients of 45° or 100% without difficulty. It can overcome obstacles of up to half a meter in height without problems (see page 25, Fig. 1), and also trenches of 600 mm in width. The four individually suspended track units are controlled separately (2DRIVE technology) and can be moved individually, in pairs or all together as desired.

An intelligent controller sets running gear configurations to cope with the relevant situation at the press of a button. This makes it easier for the operator to control the vehicle, especially in tricky situations such as narrow stairways, high steps, etc. (see page 25, Fig. 2). Inclination sensors ensure that the telemax always maintains its balance. And if you find that a travelling speed of 4 km/h is not enough, then the high speed version offers up to 10 km/h.

The operating concept: The vehicle is controlled from a control panel in laptop format. An ergonomically designed unit consisting of a thumb and finger joystick is responsible for the movement of the vehicle or the manipulator. The user can communicate directly with the system via a touch screen. The user interface adapts itself to suit the current circumstances and needs.

The signals from up to six colour cameras are displayed on a fold-out 10.4" LCD monitor. You can observe the situation simultaneously from two different perspectives thanks to a picture-in-picture function.

The control panel and the transmitting and receiving unit are stored in a robust trolley. This means that you can quickly and easily set up a control stand at any desired location.
The EOD robot telemax

The manipulator: In order to understand the crucial advantage of the telemax system you need to consider the type of control used by conventional EOD robots. If you wish to approach an object with the manipulator, you do this by moving the individual axes.

The operating concept of the telemax is almost revolutionary by comparison. It is the only EOD robot in the world that has a so-called TCP controller. TCP stands here for Tool Center Point, the middle point of the tool, or more simply, the gripper or disrupter. The gripper is positioned freely in space by the simultaneous movements of a thumb and finger joystick. The intelligent controller (Fig. 3) calculates which axis is to be moved, and how, in order to reach the desired goal.

What does that mean for the bomb disposal engineer? He gains vital time when approaching the suspicious object. This applies all the more as the approach route becomes increasingly complicated. The integrated robot controller also offers other advantages: It can be programmed. The operator can teach in and save routine movements of the manipulator or running gear positions, and call them up again if they are needed.

As the only vehicle in this class the telemax has two tool magazines that are incorporated into the chassis. This means that you can take along two additional tools/firing systems on an operation without needing to go back to the starting point. The manipulator automatically takes out the additional tools at the simple press of a button (Fig. 4).
High reach in aircraft: This system was designed with special emphasis on possible use in aircraft. It fits into any aisle thanks to a width of only 400 mm. With its running gear that can adjust for height and its telescope it can reach the overhead compartments in aircraft such as the Boeing 747.

The aircraft was parked on the apron? No problem, with its four-track running gear it can cope with even the steepest passenger staircase.

Diagnostic system: Making an important contribution to securing long-term usability, the controller offers the option to display various system states via a laptop. If there is an error, then a skilled operator or the service engineer can locate errors on the basis of the displayed data and provide a quick remedy.

Built-in test: The system first carries out a self-test after the start button is pressed. The main functions for internal communication and the system states are tested automatically.

Li-ion battery: We offer Li-ion batteries to increase the operation time. The 13.2Ah block was dimensioned to comply with the IATA transport guidelines and can be transported in any commercial passenger aircraft.

The firing system satisfies the most stringent requirements for safety. The coding of each individual firing process makes it impossible to fire shots outside of precisely specified conditions and operating steps. If any one of the conditions is not met or if a transmission error occurs, then the firing operation is cancelled. A suitable form of encryption also prevents unauthorized firing by other transmission units. The energy for the firing system is separated from the vehicle battery so that a defined amount of energy operates ignition elements of up to class HU. The robot offers an additional element of functional safety with resistance measurement of the firing circuit up to the firing element. Of course all the firing devices and weapons that can be used on the telemax have also been tested thoroughly on the firing range during development to ensure that they function correctly within the overall system.
Not only bomb disposal engineers are exposed to a wide and varied range of hazards today. Rescue forces and first responders such as the fire service, technical rescue specialists or international aid forces increasingly get into situations that involve an extremely high level of personal danger.

This applies increasingly to operations that involve hazardous materials, toxic substances or even biologically harmful materials such as viruses or bacteria. Once such substances have been released – whether through accidents or intentionally – the rescue forces are exposed to maximum danger if working manually.

True to its motto, we have developed an unmanned system for these response forces to allow them to inspect, and if applicable, deal with hazards from a safe distance.

The service robot NBCmax is a universal mobile sensor platform that can be equipped with a broad palette of sensors to detect and investigate chemical, biological, explosive or toxic substances. The collected data, everything from a simple gas concentration to gamma radiation up to evidence of explosives, is transmitted online to the control panel of the robot and processed for the operator.

The crowning achievement here is a sample-taking system that has been completely developed from scratch. The system consists of a magazine with up to five containers. The robot automatically opens one container, takes a sample, and conveys it fully automatically into the container. The robot then closes the container and can go on to take another sample with the next container. This means that if there is a suspicion that especially critical substances are involved, then samples of the material can be collected from a safe distance and subsequently transported to a suitable investigation point.
Cobham Mission Equipment - Unmanned Systems

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