

COMBINED SYSTEMS AND DUAL CAPABILITY FLAIL OR TILLER | MEDIUM SIZE | MV-10

DOK-ING d.o.o | Croatia

GENERAL DESCRIPTION

DOK-ING is a Croatian company which has earned its reputation from extensive experience in humanitarian mine clearance. The *MV-10* medium mine clearance system was developed in 2005 and can be configured as either a flail-and-tiller system or as a double-flail system. The MV-10 can be also equipped with a roller unit and a special blade/gripper unit. It is a remote-controlled, tracked system, designed for destruction of AP and AV mines and UXO.

The machine is protected by Swedish Hardox 400 armoured plates 10-20 mm thick. It is operated by a single operator from a safe distance or from the protection of a second mine-protected vehicle, or from behind a solid structure. Maximum operating range of the remote-control unit is 3,000 m. The video control system is used for operating distances over 800 m.

The MV-10 can endure climatic conditions from -19°C to +54°C and can function in up to 100% relative humidity. The system weighs around 19 tons, and can be loaded and transported on a flat-bed trailer. It can also be transported with the C-130 Hercules aircraft without any modification or shoring of the system.

The MV-10 has been developed exclusively for mine clearance purposes, with high performance abilities and resistance to all types of mine detonations. It is not adapted from any existing construction machine, loader or forestry machine.



DOK-ING | Product range

CLEARANCE METHODOLOGY

The MV-10 normally uses both tools – a rotating flail (designed to activate or shatter AP and AV mines) and a rotating tiller (designed to be a second activating method while maintaining a constant digging depth). It can penetrate soil to a maximum depth of 60 cm, depending on soil type. The force of the flail hammers cuts through dense vegetation and digs into soil. AP and AV mines are destroyed by the impact force of the suitably shaped tools – the hammers at the ends of 44 flail chains, or the 60 chisels on the tiller unit.

Flail chains and hammers and tiller chisels can be replaced quickly in case of damage. The MV-10 can turn 360° on a single point and is highly manoeuvrable. It can drive and work on highly inclined terrain – on transversal slopes up to 25° and on longitudinal slopes up to 37°.

MACHINES IN USE TO DATE

Four systems are currently being used by DOK-ING Demining in Croatia. In 2008, one system was produced and delivered for the Lithuanian Army. In 2009, one system was delivered to the ENIGMA demining company in Croatia. In 2009, DOK-ING started production of eight MV-10 systems for the Australian Ministry of Defence.

ENGINE, FUEL AND OIL

The MV-10 is powered by the Caterpillar C18 diesel engine with 571 kw (766 hp). Fuel consumption is about 50 litres per hour depending on terrain and soil conditions. Fuel tank capacity is 480 litres. The hydraulic system uses 400 litres of hydraulic oil.

FACTORY SUPPORT

The major components not produced by DOK-ING, such as the engine (Caterpillar) and hydraulics (Rexroth Bosch), are from major international manufacturers, so spare parts can be easily obtained worldwide.

DOK-ING has its own in-house service capabilities and can send a service team at short notice to any location in the world. DOK-ING maintains adequate stocks of spare parts – both those produced itself and those outsourced.

Instruction manuals are available in Croatian and English, and translation into the customer's language is possible. Manuals and documentation are part of the purchase package. Basic training of operators and mechanics is provided free by the manufacturer. The system has a one-year warranty. General support service is provided by the manufacturer. Additional equipment available includes additional tool attachments and a video system.

MAINTENANCE AND SUPPORT

The manufacturer recommends daily inspections, monthly maintenance and a major annual inspection. One operator and two mechanics are required for transport, operation, and repairs and maintenance.

TESTS AND EVALUATIONS

Two test reports are available at www.hcr.hr or www.ctro.hr:

1. Croatian Mine Action Centre – Centre for Testing, Development & Training, *Testing of the Mine Clearance Machine MV-10*, Zagreb, Croatia, October 2005.
2. Croatian Mine Action Centre Demining Machine Testing Committee: *Possible Effects of Tested Demining Machines, Appendix to CROMAC SOP 05.01: Efficiency Assessment of Technical Survey and Demining*, 2007.

Four other test reports are available at www.itep.ws.

1. Patrik Blomander, Test and Evaluation Report for DOK-ING MV 10, SWEDISH EOD AND DEMINING CENTRE, Sweden, 2008:
www.itep.ws/pdf/MV10_SWEDEC2008.pdf
2. R.W. Fall, W.C. Roberts, D.J. Roseveare, and J.L. Eagles, DOK-ING MV-10 Double Tool Mine Clearance System Test and Evaluation, Defence Research and Development Canada (DRDC), Canada 2007:
www.itep.ws/pdf/MV10_DRDC_Suffield.pdf
3. Geoff Coley, Machine Demonstration Analysis and Preliminary Results, International Symposium “Humanitarian Demining 2007” 24 - 27 April 2007, Šibenik, Croatia, 2007:
www.itep.ws/pdf/MachineDemoSibenik2007_Coley.pdf
4. Croatian Mine Action Centre – Centre for Testing, Development & Training, *Testing of the Mine Clearance Machine MV-10*, Zagreb, Croatia, 2005:
www.itep.ws/pdf/MV10_ReportHCR_trans.pdf



MV-10 | In service, detailed view of the working tool, driving on a flat bed trailer

REPORTED LIMITATIONS AND STRENGTHS

The 2005 CROMAC test report (cited above) said (page 44) of the MV-10:

- “
1. It is well suited for the mechanical processing of a mine suspected area.
 2. It can be used on a terrain with a soil type ranging from I to V.
 3. It removes low, medium and high vegetation successfully.
 4. It destroys all types of anti-personnel and anti-tank mines successfully...”

Limitations

- > Difficult to operate with precision from long distance, as with all remotely controlled machines.

Strengths

- > The machine combines the strengths of a tiller and a flail system.
- > High quality armour for vital parts of the machine

DIMENSIONAL DATA

1. Length without attachment	4,607 mm
2. Length total	7,232 mm
3. Width without attachment	2,240 mm
4. Width total	2,975 mm
5. Clearing Working width	2,450 mm
6. Height Overall	2,181 mm
7. Mass Basic vehicle	14,000 kg
8. Mass Detachable unit(s)	Flail/tiller: 4,680 kg Blade/gripper: 1,340 kg Roller: 3,730 kg
9. Mass Overall	19,000 kg

OPERATIONAL DATA

10. Wheels Tracks (description)	Metal tracks, 600 mm width
11. Ground Bearing Pressure (kPa)	0.47 kg/cm ²
12. Hill climbing ability (in degrees)	Longitudinal 37° Transversal 25°
13. Number of Chains Chisels Tools	Flail: 44 chains Tiller: 60 chisels
14. Beat pattern (hits per m ²) at different operating speeds	Not given
15. Length of Chains Tools	Flail chain: 550 mm Tiller chisel: 320 mm
16. Diameter of flail drum	Flail: 1,600 mm Tiller: 1,100 mm
17. Rotation Speed	Flail rotation: 0-800 rpm tiller rotation: 0-350 rpm
18. Clearance Working depth in varying terrain	Up to 600 mm
19. Working Speed (m ² /h)	
> Light Soil Medium Vegetation	Not given
> Medium Soil Medium Vegetation	Not given
> Heavy Soil Dense Vegetation	Not given
20. Control of Clearance Working depth	Mechanically adjusted
21. Additional attachable working tools	
22. Armour	10 – 20 mm HARDOX steel plates
23. Remote controlled	Yes
> greatest distance	3,000 m
24. Transportation	
> short distances	Road speed of 10 km/h and 20 t low bed trailer
> long distances	C130 transportable
> sea transport	
> air transport	

SYSTEM STATUS AND DEPLOYMENT

25. Machines in use	13
26. Other types	
27. Location of use	Croatia, Lithuania, Australia
28. Totally cleared so far (m ²)	3,000,000 m ²

ENGINE | FUEL | OIL

29. Engine	CATERPILLAR C18
30. Engine power at the flywheel	571 kw / 766 hp
31. Sufficient power supplied to working tool	Not given
32. Fuel capacity	480 l
33. Fuel consumption	25-50 l/h
34. Separate engine for working unit	No
35. Cooling system	Water cooled
36. Oil capacity (both engines)	68 l
37. Hydraulic oil capacity (both engines)	400 l

COSTS

39. Cost of system	On request
40. Other costs	On request
> training	
> spare part set chains belts	
41. Availability for hire	Yes

OTHER

41. Operator comfort	Remote and video controlled operation
42. Air conditioning	N/A