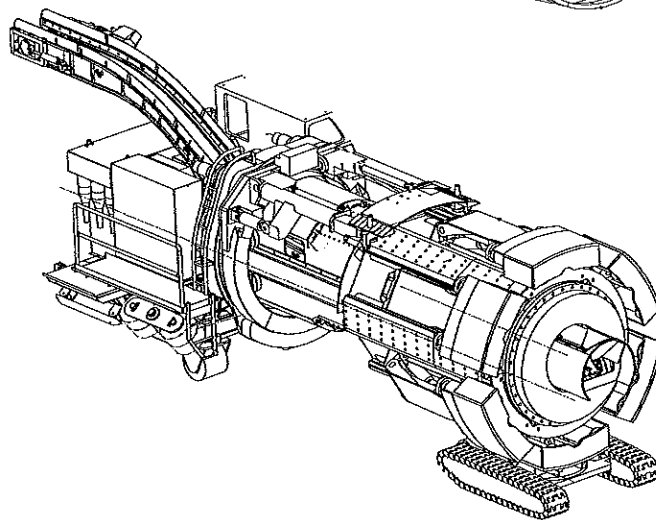
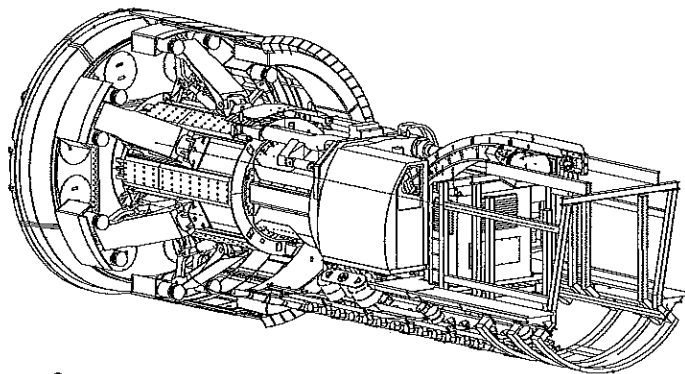




SANDVIK MINE DEVELOPMENT SYSTEM MDS485



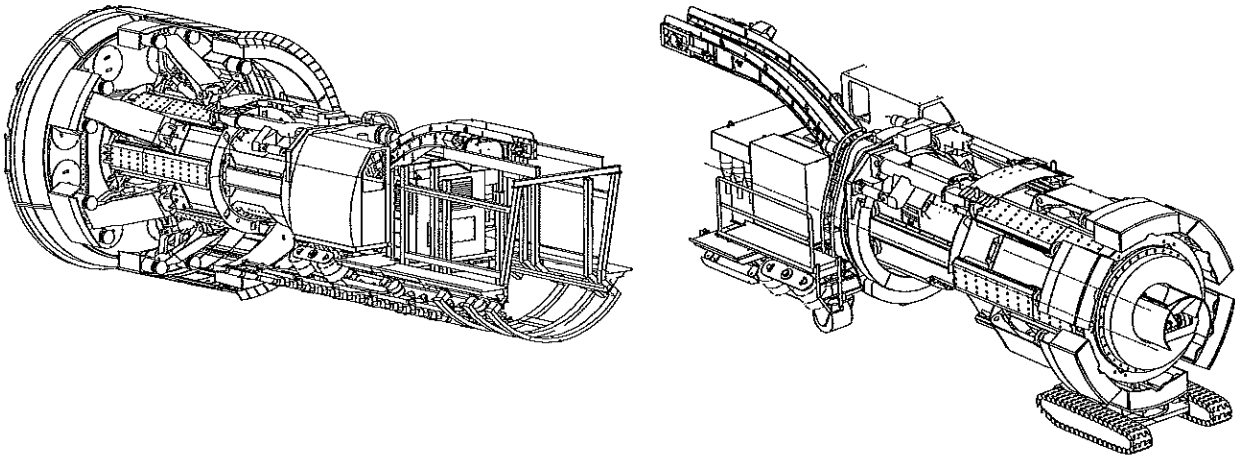
OPERATING MANUAL

Machine No.: 02

0.1 GENERAL

This operating manual is a guide to the operation, maintenance and servicing of the

MINE DEVELOPMENT SYSTEM MDS 485



The operating manual contains all the necessary details and information for the intended use of the MDS 485 (electrical and system with cables supplied by Cameco) in order to fulfil its purpose. The manual should be available at any time to all personnel concerned with the operation and servicing of the MDS.

The prerequisites for operational safety, readiness and full life-span of the MDS are as follows:

- attention must be paid to the safety regulations
- regular maintenance
- prompt repair of faults
- attention must be paid to recommendations in the context of the operation of the machine

Due to the vast amount of technical details, it is not possible to deal exhaustively with each detail in the scope of this operating manual.

In the case of problems which cannot be successfully dealt with using the manual, please contact your regional office.

For each machine, a part-list is produced which corresponds to the machine on delivery.

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NOTICE

Before starting any work, the operating personnel must be familiar with and understand the contents of this operating manual especially with regard to **Chapter 1, SAFETY**.

Only starting to study the book once operating has commenced is most emphatically not sufficient.

2.1 Shield

2.1.1 Shield structure

Type	6-part lost-shield	
Total length (incl. tail seal)		3910 mm
Diameter	cutting edge / tail	5150 / 5070 mm
Weight	appr.	21,1 tons
Part 1	-length	3910 mm
	-width	2980 mm
	-height	830 mm
	-weight	3880 kg
Part 2	-length	3910 mm
	-width	2575 mm
	-height	735 mm
	-weight	3310 kg
Part 3	-length	3910 mm
	-width	2575 mm
	-height	745 mm
	-weight	3190 kg
Part 4	-length	3910 mm
	-width	2575 mm
	-height	745 mm
	-weight	3190 kg
Part 5	-length	3190 mm
	-width	2980 mm
	-height	830 mm
	-weight	3650 kg
Part 6	-length	3910 mm
	-width	1810 mm
	-height	640 mm
	-weight	2260 kg

2.1.2 Tail Seal

Type	steel lamella	288 pc
	Wire brushes	160 pc

2.2 Advance & thrust system

2.2.1 Gripper System

Type	hydr.actuated lever sys. on sledges	
	number	6
Gripper cylinder	number	12
Type	double action	
	diameter piston	140 mm
	diameter rod	90 mm
	stroke	320 mm
	max. extend force (330 bar)	510 kN
	max. retract force (330 bar)	300 kN

2.2.2 Thrust system

Thrust rams	number	12
Type	double action, telescopic	
	diameter piston	225/175 mm
	diameter rod	205/160 mm
	stroke (626/594 mm)	1220 mm
	max. advance speed	2 mm/sec
	max. retracting speed	30 mm/sec
	max.thrust force at 400 bar total	1872 tons
Thrust shoes	number	12
	contact area diameter 194 mm	approx. 296 cm ²

2.2.3 Advance system

Advance cylinder	number	6
Type	double action	
	diameter piston	140 mm
	diameter rod	90 mm
	stroke	1100 mm
	max. advance speed	2 mm/sec
	max. retracting speed	30 mm/sec
	max.thrust force at 250 bar total	230 tons
	max.retracting force at 250 bar total	135 tons

2.3 Excavation system

2.3.1 Cutter wheel

Type	Closed face	
Effective boring diameter	with new bits / with ext. over-cutters	5192 mm
Diameter of steel structure		5150 mm
Weight complete	appr.	29 200 kg
Dimension center part	appr. [mm]	2600 x 2084 x 1215
Weight center part	appr.	8800 kg
Dimension segment I & III	appr. [mm]	3655 x 1533 x 1190
Weight segment I & III	appr.	5200 kg
Dimension segment II & IV	appr.	3265 x 1275 x 1190
Weight segment II & III	appr.	4500 / 4200 kg
Drag bits-type	ESCO drag bit V29	
	number	85
Roller cutter	triple disc cutter	
	number	16
	diameter	260 mm

2.3.2 Main drive

Type	electric driven peripheric drive electric motors working via planetary gear and pinion -running in bearings on both sides-on a common internal toothed bull gear	
2-speed-electric motors/water-cooled	number	4
	power	100 kW
	power supply	575 V/ 60 Hz
Two speed drive	1 st speed	2,2 rpm
	2 nd speed	4,4 rpm
	torque: 1 st stage	1711 kNm
	2 nd stage	854 kNm
	max.at 1 st stage	1935 kNm
	gear ratio total	403,2

Sealing	
Type-outer seal	multiple lipseal arrangement forming separated lubrication chambers
	number of seals 4
	number of chambers 2
	lubrication grease
Type-inner seal	
	multiple lipseal
	numbers of seals 2
	lubrication grease
Planetary gear	
Type	2-stage planetary gear
	number 4
	nom. power 100 kW
	gear ratio 63,049
	nom.output torque 900/1800 rpm 67, 2/33,6 kNm
	cooling water

2.3.3 Auxiliary drive

Type	radial-piston motor with multiple disc brake for slow rotation of cutter-head
	max. torque at 210 bar 334 Nm
	speed 630 rpm
	cutter head speed 1,2 rpm
	max.cutter head torque 170 kNm
Aux.drive engaging cylinder	
Type	double action
	diameter piston 32 mm
	diameter rod 18 mm
	stroke 36 mm
	max.extend force at 100 bar 8 kN
	max.retract force at 100 bar 5,5 kN

2.3.4 Main frame

Type	3-part welded steel structure	
	length total	7450 mm
	max.diameter	2490 mm
Weight total	appr.	21 000 kg

2.4 Muck transport

2.4.1 Chain conveyer

Type	double chain conveyer ,discharging the muck from inside the cutter wheel to the container	
	trough width	444 mm
	length	12 m
Drive unit	(electrically driven via planetary gear and set of bevel gear)	
	Power	36 kW
	Power supply	575 V/ 60Hz
	Gear ratio	24,11
	Conveyor speed	1,0 m/s
	Torque nom.	4600 Nm
Chain tensioning cylinder	Number	2
	Double action	
	Diameter piston	63 mm
	Diameter rod stroke	170 mm
	Max. extended force at 250 bar	78 kN

2.4.2 Container handling system

Steel structure		
	length/width/height [mm]	3840/3770/3650
Weight	appr.	3500 kg
Lifting unit		
Type	hydr.driven chain hoist	
	number	2
	nom.lifting capacity /hoist	4100 kg
	lifting speed	0,2 m/s
Drive unit	planetary gear with hydr.brake motor:	
		2

	nominal pressure	200 bar
	torque	1500 Nm
	gear ratio	6,273

Positioning cylinder		
Type	double action	
	diameter piston	63 mm
	diameter rod	45 mm
	stroke	750 mm
	max.extend force at 250 bar	78 kN
	max.retract force at 250 bar	38 kN

2.5 Segment erector

2.5.1 Erector

Type of erector	ring erector with telescopic arms and bridge with integrated gripping devices moving on runway fixed to rear part of main frame	
Lifting capacity		3 tons
Rotation drive units	number	2
Type	hydraulic motor, multiple disc brake	
	nom.torque (per motor)	6200 Nm
	max. operating pressure	210 bar
	operating angle	+/- 190°
	rotary speed	0,3 / 2,5 rpm
Length moving cylinder	number	2
Type	double action double telescopic cyl.	
	speed	10 / 140 mm/s
	diameter piston	110/80/50 mm
	diameter rod	100/68/28 mm
	stroke	2100 mm
	max./min. extend force	47,4/9,8 kN
	max./min. retract force	37,9/30,7 kN
Telescopic arm cylinder	number	2
Type	double action	
	speed	50 mm/s
	max.extend force at 100 bar	31 kN

	max.retract force at 160 bar	24 kN
	diameter: piston	63 mm
	diameter rod	45 mm
	stroke	850 mm
Lifting cylinder	number	2
Type	double action	
	speed	10 mm/s
	extend force at 60 bar	73,6 kN
	retract force at 120 bar	50 kN
	diameter piston	125 mm
	diameter rod	70 mm
	stroke	100 mm
Positioning cylinder	number	2
Type	double action	
	speed	10 mm/s
	extend force at 30 bar	9,3 kN
	retract force at 30 bar	6,3 kN
	diameter piston	63 mm
	diameter rod	36 mm
	stroke	50 mm

2.5.2 Gripping device

Type	hydraulic activated spread pin pretensioned with disc springs	
	number	2
	nominal load per gripper pin	30 kN
	pin diameter	64 mm
	diameter piston	130 mm
	diameter rod	28 mm
	stroke	31 mm
	clamping force	2x125 kN

2.6 Segment transport system

2.6.1 Segment conveyor

	segments are transported on special containers into the container-handling system and placed onto the segment conveyor	
Type of segment conveyor	hydraulic actuated transport rake	
Dimension	length	8560 mm
	weight	1175 kg
	storage capacity	6 segments
Segment moving cylinder	number	2
Type	double action	
	speed	50 mm/s
	extend force at 80 bar	25 kN
	retract force at 120 bar	49 kN
	diameter piston	63 mm
	diameter rod	45 mm
	stroke	1320 mm

2.7 Hydraulic system

2.7.1 Oil tank

Oil capacity: approx. 1000 l

2.7.2 Hydraulic power pack

Electric motor		
	power	45 kW
	number	1
	voltage	575 V/60Hz
	speed	1740 rpm
Hydraulic pump		
Type	axial piston pump	
	A4VSO40HD	
	number	1
	flow rate appr.	70 l/min
	nom.working pressure	350 bar
	max.pressure	400 bar
Type	axial piston pump	A10VSO28DR

	number	2
	flow rate(per pump) appr.	49 l/min
	nom.working pressure	280 bar
	max.pressure	315 bar
Electric motor		
	power	14,5/9 kW
	number	2
	voltage	575 V/60Hz
	speed 2-speed motor	1740/870 rpm
Hydraulic pump		
Type	radial piston pump	6010DR (HAWE)
	number	2
	flow rate(per pump) appr.	11,4/5,7 l/min
	nom.working pressure	400 bar
	max.working pressure	600 bar

2.8 Electric system

Voltages	primary-voltage	4160 V/60Hz
	secondary-voltage	575 V 3 PH/60Hz
	receptacles-voltage	120 V/60Hz
	light-voltage	120 V/60Hz
	control-voltage	24 VDC 120VAC

2.8.1 Installed power

Excavation system		
	cutter-head drive	4 x 100 kW
	lubrication main gear	3 kW
	seal greasing	0,18 kW
	total	403,18 kW
	Chain conveyer	36 kW
Hydraulics		
		45 kW
		2 x 14,5/9 kW
	total	74 kW

Receptacles, lighting & control	7,5 kW
Auxiliary exits	45 kW
Spare	7,5 kW
total installed on MDS +36	573 kW
Ventilation	73 kW
	2 x 6,5 kW
	1,5 kW
Total appr.	660 kW

2.9 Ventilation

2.9.1 Fan unit

Type	ABC	VAD
	30F21	
number	1	
Fan capacity	550 m ³ /min	
power	73 kW	
voltage	575 V/60Hz	
speed	3500 rpm	
Silencer	Type	ABC Satin Sound

2.9.2 Air duct

Main air duct / suction line			
Type	fiberglass-airduct	dia.	24"x20'
Telescopic air duct			
Type	fiberglass-airduct	dia./length	22"x20'
Main air duct blow line			
Type	lay-flat air duct	dia.	24"x50'
Secondary air duct			
Type	flexible air duct	dia.	12"

2.10 Water supply system

Required values for water inlet
at tunnel entrance

	max. flow rate	200 l/min
	pressure	12-20 bar
	filtration	< 500 µm
	pH-value	7 - 8,5
MDS water system	system pressure	10 bar
main drive cooling	max. flow rate	4 x 20 l/min
hydraulic cooling	flow rate	40 l/min
muck spray	max. flow rate	2 x 14 l/min
Tunnel line water supply	dia.	1"
Tunnel line waste water	dia.	1"

2.11 Fire fighting system

Type	ANSUL dry-chemical (monoammonium-phosphate-base) (Customer supply)
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2.12 Tracks

2.12.1 Crawler

Type	hydraulic driven crawler with turntable	
	max. load capacity	80tons
	max. traction force	2 x 36 tons
	speed	3,5 m/min
Dimension	length/with/height [mm]	2524/2020/520
	weight	5120 kg
	chain with	370 mm
	ground contact length	1500 mm
Crawler drive	number	2
Type	hydr.motor with planetary gear	
	max. torque	55000 Nm
	max. pressure motor	300 bar
	max. pressure brake	15 bar
	Output speed	6 rpm
	gear ratio	6,6

2.12.2 Rear roller gear

Type	steerable roller gear	
	number of wheels	2 x 2
	wheel diameter	500 mm
Steering cylinder	number	1
Type	double action	
	extend force at 250 bar	125 kN
	retract force at 250 bar	85 kN
	diameter piston	80 mm
	diameter rod	45 mm
	stroke	340 mm

2.13 Container gripping device

Type	hydr.quick detach system with rotating device for muck-container	
	max. load capacity	7500 kg
	rotation angle	180°
Hydr.drive rotation		
Type	hydr.motor with planetary-gear and multiple disc brake	
	torque at 210 bar	6200 Nm
Locking cylinder		
Type	double action	
	extend force at 200 bar	62 kN
	retract force at 200 bar	42 kN
	diameter piston	63 mm
	diameter rod	36 mm
	stroke	80 mm

4.2.1 Boring operation with thrust rams

This mode is designated to be the main operation mode for the MDS.

The shield skin together with the main frame, carrying the cutter wheel, the main drive as well as the erector and the operator's cab is propelled forward by means of the thrust rams. The 12 thrust rams are located, in groups of 2, inside the top segments of the 6 gripper arms.

