

Introduction to Everdigm Multi-purpose Drill Rig EMR16

21st Jan, 2016

EVERDIGM

- Overview
- Drilling Depth Capacity
- Specifications Comparison
- Key Elements Description
- Main Parts List
- Option List
- Features and Benefits
- Local Field Test

- Our multipurpose drill rig, **EMR16** is capable of performing various drilling works with the drilling methods including diamond wireline coring, reverse circulation, down the hole, rotary and auger drilling in mineral exploration, geotechnical investigation, water well, geothermal drilling project with 7000 Nm torque and 1230 RPM speed of rotary head and 15200 kg pullback capacity.

Capable drilling methods:

- **Diamond core drilling** is the most widely used in mineral exploration and geological survey due to the maximum geological information it can obtain from core sample. The tools such as drill bit, reaming shell, drill rod, core barrel and overshot are needed and the mud pump is utilized for flushing and carrying the cuttings up the hole.
- **Reverse circulation drilling** is considerably faster than core drilling because it makes use of both percussion and rotation movements and eliminates the time-consuming retrieval of core barrel samples. Compressed air delivered from the air compressor is used for hammer percussion and taking samples. However, RC drilling produces only fragments and chips of broken rock, so there is less geological information available than would be obtained from core sample. The RC drilling ranges from 3.5" to 10" and the most commonly used sizes are 4 to 6".
- **Down the hole drilling** is the dominant method in the hole range 100mm - 254mm (4" -10") and in all application segments including blast hole, water well, foundation, oil & gas, and geothermal drilling.
- **Rotary drilling** is generally used for large-diameter blast holes or for deep drilling and is most effective in soft to medium rock. The typical rotary drilling applications are water & oil well, large open-pit mine, and geothermal research.



Drill Depth Guidelines*

P wireline	410 m	1345 ft
H wireline	860 m	2822 ft
N wireline	1300 m	4265 ft
B wireline	1800 m	5906 ft
3 ½" DTH	700 m	2297 ft
3 ½" RC	400m	1312 ft
4 ½" RC	290 m	951 ft

* The depth stated has been calculated. Actual drilling depth will depend upon in-hole tools and drilling technique.

SPECIFICATIONS COMPARISON

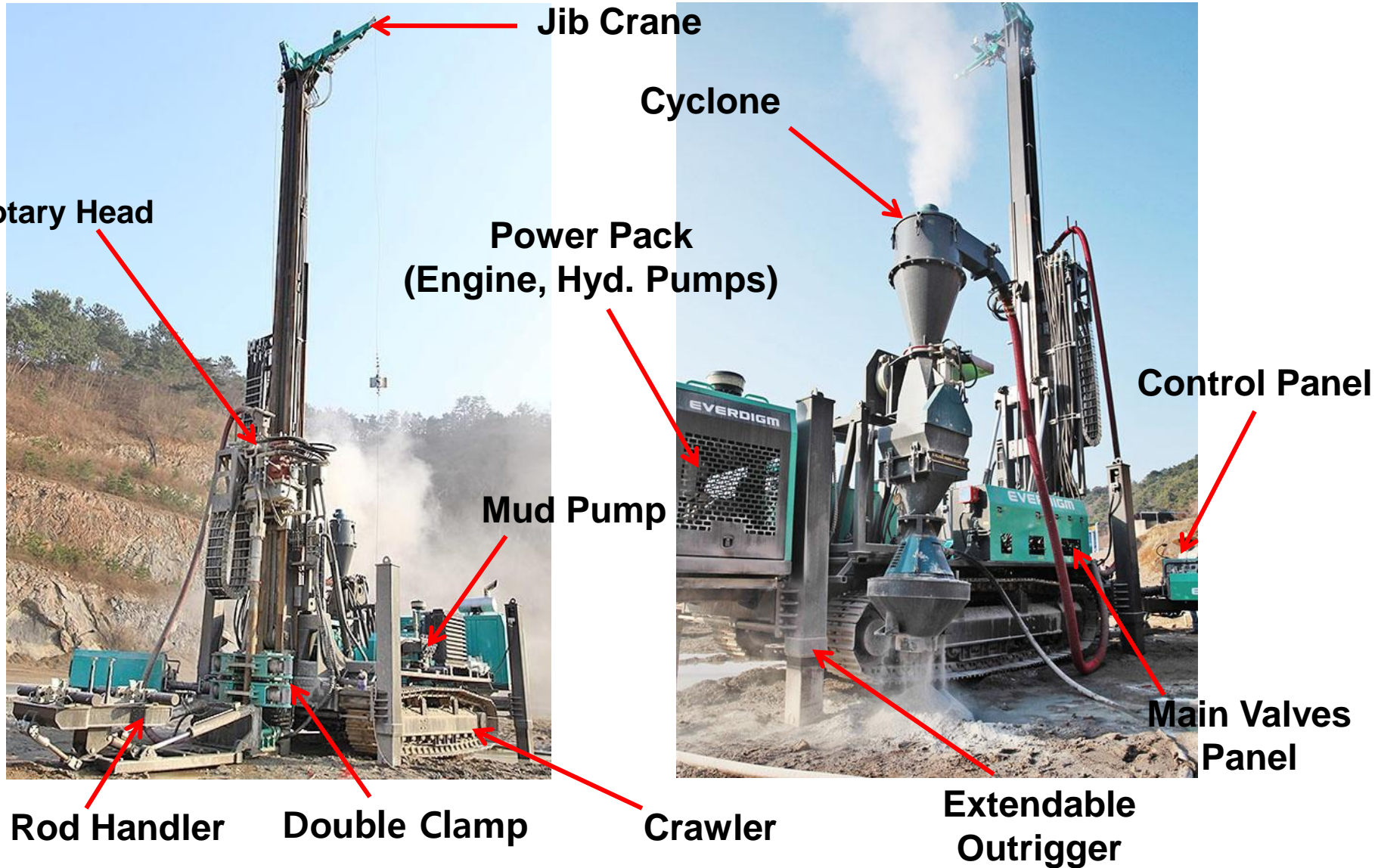


Manufacturer		Boart Longyear	Everdigm	Sandvik	Boart Longyear	Everdigm	Boart Longyear	Sandvik
Model		LX6(DB525)	EMR 8	DE810	LX10(DB540)	EMR 16	LX16(KWL1600)	DE840
Weight (kg)		6,500	-	9,600	16,500	17,000	-	18,500
Drilling Depth(m) based on NQ		350	600	954	955	1,300	2,319	2,223
Engine Output (kW (hp))		53 (71)	93 (125)	130 (174)	147 (193)	153 (205)	328 (440)	195 (261)
Rotary Head Output (kW (hp))		27 (36)	37 (50)	-	85 (114)	65 (97)	203 (273)	-
Primary Pump	1st	66L/m	90L/m	150L/m	120L/m	180L/m	-	-
	2nd	59L/m	50L/m	-	150L/m	70L/m	-	-
Feed System	Pull Back (kg)	5,612	7,700	7,653	15,306	15,200	18,520	23,061
	Thrust (kg)	3,469	3,244	4,592	10,204	8,188	9,633	11,531
	Stroke (m)	4	4	6.6	4	7.2	7.5	7.3
Main Hoist	Capacity (kg)	3,061	5,000	6,622	5,816	8,138	15,561	15,439
	Speed (m/min)	29	28	-	-	53	66	-
	Wire Dia. (mm)	14	14	14	18	16	-	-
Wireline Hoist	Capacity (kg)	663	1,071	796	663	1,071	1,502	2,184
	Speed (m/min)	100	115	101	100	115	-	255
	Wire Dia. (mm)	5	5	5	6	5	6	-
	Length (m)	350	350	1,000	-	1,600	2,000	2,000

* The above specifications for the competitors are based on their catalogues.

** For more detailed information on EMR16, please see the technical overview enclosed.

KEY ELEMENTS DESCRIPTION



MAIN PARTS LIST

Name	Maker	Spec
Engine	Cummins (USA)	6CTAA8.3C(205HP)
Main Pump	Doosan Mottrol (Korea)	T5V112DP
Gear Pump	Casappa (Italy)	PLP20.20 / PLP20.16
Rotary Head Motor	Parker (Sweden)	V14-110
Travel Motor	Doosan Mottrol (Korea)	TM10VC
Main Winch Motor	Doosan Mottrol (Korea)	TM18VC
Cooling Fan Motor	Casappa (Italy)	PLM20.19
Transmission	Powertech (Korea)	1st gear: 7.16 : 1 2nd gear: 3.17 : 1
Travel Valve	Walvoil (Italy)	DPX160/2
Main Valve	Walvoil (Italy)	DPX160/4
Clamp Valve	Walvoil (Italy)	SD5
Position Valve	Walvoil (Italy)	SDS100
Jib Valve	Walvoil (Italy)	SD5
Pilot Valve	Walvoil (Italy)	SVM100
Cartridge Valves	Hydraforce (USA)	
Lubrication Pump	A-Ryung (Korea)	Rotary Head

EMR16 Optional Components

Name	Maker	Spec
Water Pump	American Manufacturing (USA)	AW1122BCD
Remote Controller	HBC-Radiomatic (Germany)	
Wireline Motor	M+S (Bulgaria)	
Cyclone	Metzke (Australia)	1200 cfm
Cone Splitter	Metzke (Australia)	
Wear Bend	Harlsan (Australia)	4 ½" ACME thread
Blow Down System	Harlsan (Australia)	
Air Inlet Swivel	Harlsan (Australia)	4 ½" Remet thread
Sub (retains head wear tube)	Harlsan (Australia)	4 ½" Metzke or 4 ½" Remet thread
Saver Sub	Harlsan (Australia)	4 ½" Metzke or 4 ½" Remet thread

OPTION LIST

Description	Wireline Coring	RC	DTH	Rotary/Auger
Mud Pump	Required	-	-	Optional
Mud Mixer	Optional	-	-	Optional
Wireline Winch	Required	-	-	-
Cyclone	-	Required	-	-
Cone Splitter	-	Required	-	-
RC Kit (Blow Down System, Wear bend, Air Inlet Swivel, Top Bearing Swivel, Sub)	-	Required	-	-
Rod Handler	Optional	Optional	Optional	Optional
Oil Line Lubricator	-	Required	Required	Optional
3-Way Air Directional Valve	-	Required	-	-
Remote Controlled Crawler	Optional	Optional	Optional	Optional
Spin Guard	Optional	Optional	Optional	Optional
Rod Rack	Optional	Optional	Optional	Optional
Adaptor	Required	-	-	-

* The selection recommendation according to the drill method is given in the above table.

** The optional equipment listed are installed on the drill rig when ordered by customers.

❖ ROTARY HEAD

- High torque and high speed top drive rotary head
Covers various drill applications
- Hydraulic side shift
Makes it easier to handle rods
- Equipped with floating spindle
Minimizes the rod thread damage during rod makeup/breakout
- Manual high / low gear change
- Continuous variable RPM in each gear
- Robust Parker V14 piston motor
- Lubricated and cooled with forced oil circulation system
- Max torque 7.1kNm@97rpm
- Max rotation 1,233rpm@0.56kN

ROTARY HEAD TORQUE

	RPM	Nm	ft-lbf
Low gear	97 – 247	7,058 – 2,768	5,205 – 2,041
High gear	439 - 1,233	1,412 – 554	1,041 - 409



❖ ROD CLAMPING/BREAKING SYSTEM

- Fail safe double clamps with self energizing accumulators
- Equipped with bottom rod centralizer hydraulically operated
Prevents vibration and ensures hole straightness by centralizing and aligning rods
- Hydraulically operated and having enough capacity to clamp and break out 10”(254mm) rods
- Max. clamping range up to 260mm

MAXIMUM HOLDING FORCE AND BREAK OUT TORQUE

HOLDING FORCE	226 kN	50,706 lbf
BREAK OUT TORQUE	40 kNm	27,400 ft-lbf



❖ DRILL MAST

- Fully welded rigid and strong square section mast
- Rotary head carriage coupled with efficient mechanism: heavy duty dual leaf chains combined with hydraulic feed cylinder
- Max traverse speed 20.3 m/min
- Both rapid and variable fine feed available
- Rotary head travel 7.2m
 - Enables to pull 6m(10') long rod
- Drilling angle up to 45 degree
- Hydraulic mast dump 1.8 m
- Max Pull down force 8,188 kg(18050 lbf)
- Max Pull back force 15,200 kg (33510 lbf)

❖ JIB CRANE

- Capacity 250 kg
- Mounted on the top of the mast
- Swings horizontally up to 126 degree and tilts vertically up to 90 degree
 - Facilitates rod handling



❖ ENGINE

- Durable Cummins diesel engine CTAA8.3C power pack
- 205 hp(152kW)@2,200rpm Tier II mechanical engine with less electrical components allows easy maintenance and repair

❖ CONTROL PANEL

- Mounted on a swing out arm and adjustable and placed some distance away to provide safety and good visibility to operators
- Pilot hydraulic control for drilling and optional radio remote control for driving and outriggers
- Gages, lamps, levers and knobs ergonomically arranged and user friendly

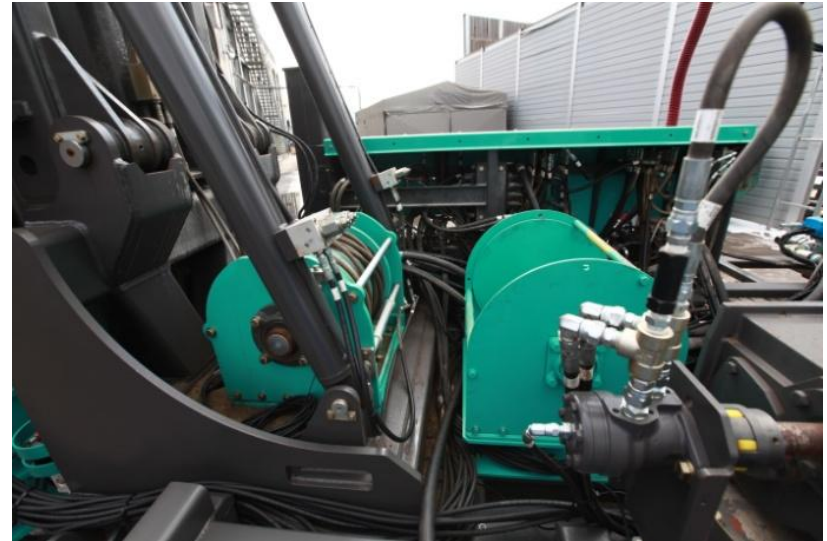


❖ MAIN WINCH

- Single line pull hoisting capacity 8,138 kg
- Fail safe spring applied hydraulic released brake system with over center valve
- Equipped with planetary reduction gearbox
- Comes with 16mm non-rotating wire rope

❖ WIRELINE WINCH (option)

- Fail safe spring applied hydraulic released brake system with over center valve
- Optional level winder enables the wire rope evenly wound on the drum
Keeps the wire rope from kinking
- Comes with 2,300-meter non rotating wire rope to cover the max drilling depth in core drilling

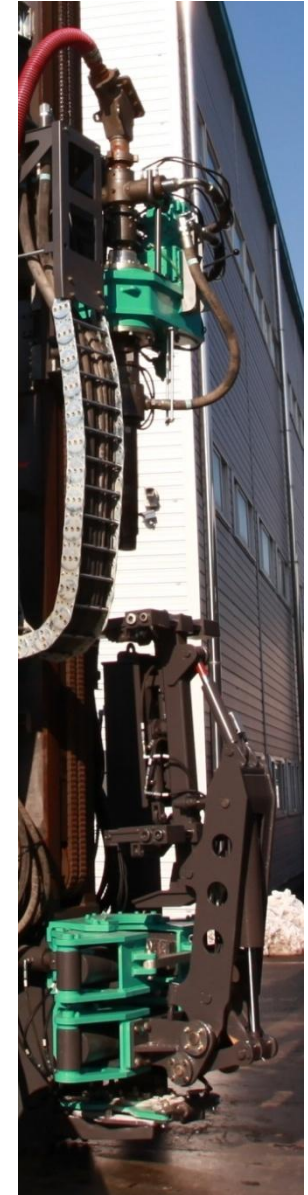


❖ ROD HANDLER (option)

- With robust and simple structure, rod handler makes possible to handle rods without risky, physical contact from the operators while making and breaking rod joints
- Fail safe rod clamping with self energizing accumulators
- Easily installed to the solid bottom mast of the rig and retrofitted to the existing rigs

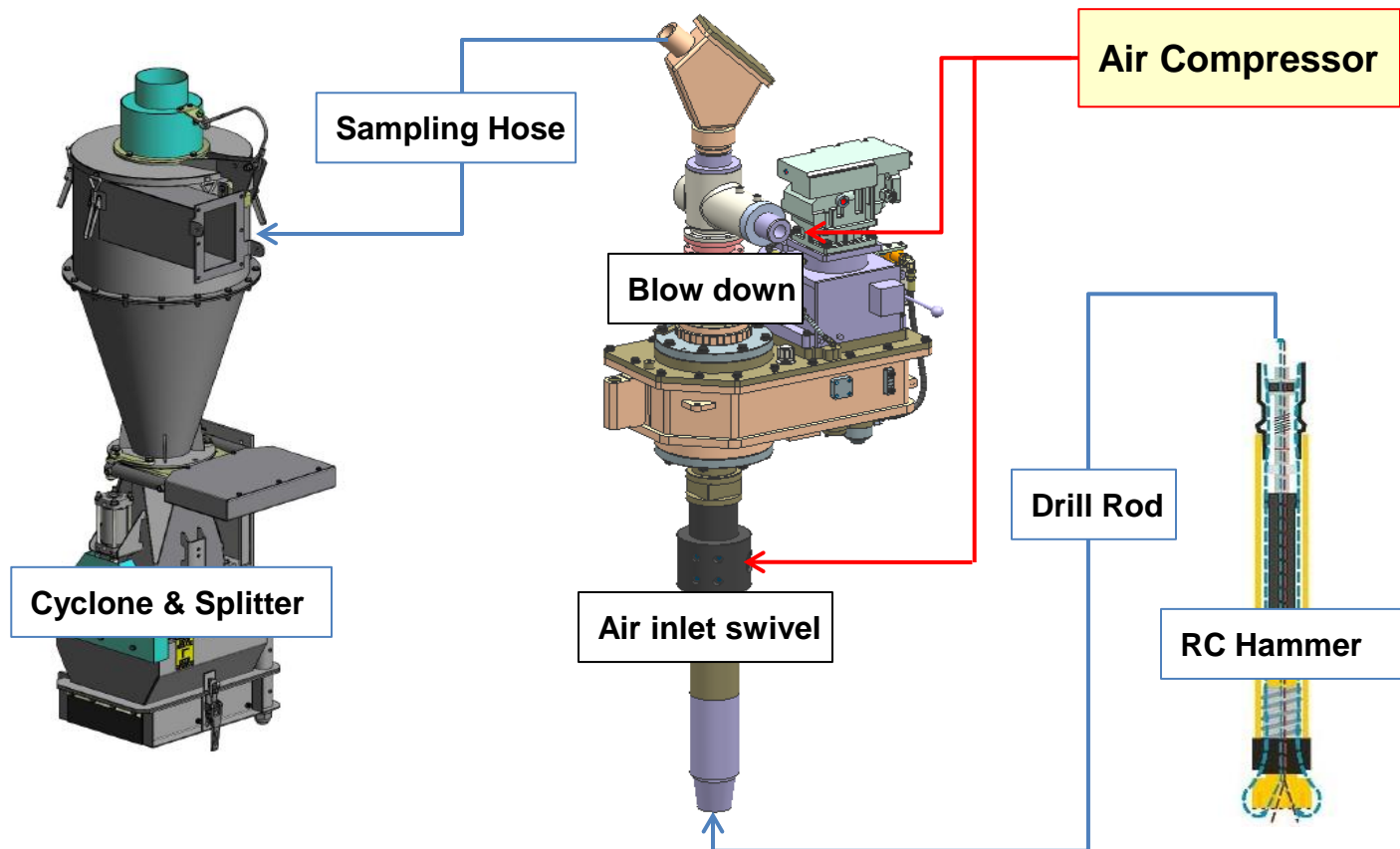
HANDLING CAPABILITY

3" up to 4 ½" RC drill rod(up to 6m length)
B/N/H/P wireline core drill rod



❖ RC SAMPLING SYSTEM (option)

- As shown in the picture below, RC drilling is performed with RC hammer, dual wall drill rods with inner and outer tubes. Samples are retrieved continuously into the cyclone through wear bend inside the rotary head and collected with splitter for analysis. The hydraulically operated blow down system clears drill rod blockage and improves sample purity.



❖ **CYCLONE (option)**

- Well known Metzke cyclone with CFM 1200 capacity
- Incorporated with Metzke fixed cone splitter having inspection door and sample bag holder
- Hydraulic cyclone raise/lower function, 180 degree cyclone rotation function. Placed to various positions depending on the ground condition onsite and transportation
- Equipped with hydraulic knife valve and pneumatic sample door and vibrator

The knife valve and pneumatic door enable the samples not to be blended according to the drilling depth. The pneumatic vibrator prevents cyclone blockage.



❖ EXTENDABLE OUTRIGGER

- Extends vertically and horizontally to load onto low bed trailer
- Makes more stable on rough terrain
- Vertical extension radio remote controlled for good leveling



❖ UNDERCARRIAGE

- Track mounted is standard
- Rugged steel triple grouser track
- Max gradeability 20 degree
- Max travel speed 3.3 km/h (2.1 mph)
- Radio remote controlled as option



❖ **MUD PUMP - option**

- Fitted while diamond core drilling
- Hydraulic operated and easily mounted on the rig
- Recognized American Manufacturing Mud Pump
- Max Flow 130 lpm (34.3 gpm)
- Max pressure 50 bar (725.2 psi)

❖ **MUD MIXER - option**

- Used to mix mud while diamond core drilling
- Hydraulic operated and easily, quickly connected to the rig via quick couplings and hydraulic operated
- Max flow 56.7 lpm (15 gpm)
- Max pressure 104 bar (1500 psi)



❖ OIL LINE LUBRICATOR (option)

- Utilized for lubricating a RC/DTH hammer during RC or DTH drilling
- Automatically actuated when start drilling

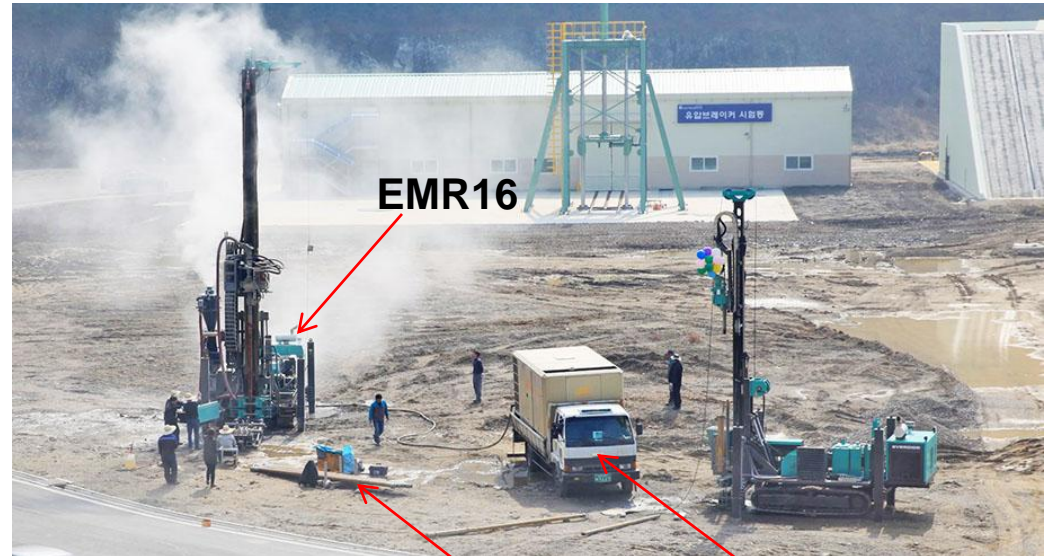


❖ 3-WAY AIR VALVE (option)

- Fitted while operating RC hammer
- Actuated by solenoid electrically controlled from the operator's control panel
- Diverts the compressed air from the air compressor to the air inlet swivel for operating RC hammer or to the blow down system for clearing the drill rod blockage



- ❑ The field testing in Korea for a prototype multipurpose drill rig, EMR16, has been completed using RC drilling and diamond core drilling to evaluate the performance, reliability, and fitness to use.
- ❑ The improvement has been reflected on the prototype according to the result of the testing.



EMR16

RC rods

Air compressor

❖ Equipment and consumables used in the field test

- ✓ **Air Compressor:** IR XHP1070
Delivered max flow: 1070 cfm (30m³/min)
Delivered max pressure: 350 psi (24.1 bar)
- ✓ **RC Hammer:** 5 1/2" hammer (Top thread Metzke 4 1/2")
Drill bit diameter: 139.7 – 146 mm
Air consumption: 860 cfm@350 psi
- ✓ **RC Rod:** 4 1/2" rod (Effective length 6m, 4 1/2" Metzke thread)

❖ Rock condition

Granite

❖ Penetration rate

310mm/min

Thank you!

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