BUMA Reverse Circulation Drilling Rig
BUMA CE is a leading manufacturer and supplier of foundation equipment in Korea. Since the company was built in 1992, we have been supplying the equipment to all around world with outstanding reputation of not only good quality products but also much knowledge in foundation work.

Our mission is to provide the best solution to customers based on engineering know-how of many year’s experiences.
Reverse Circulation Drilling System (RCD), also known as air-lift system is that compressed air is injected into the drill pipe below water level just above the drill bit. This reduces the density of the internal water column and starts the circulation. The mixture of water, air and cuttings is then flushed out through the drill pipe into setting tanks.

Working with RCD Rigs is highly efficient, safe and environmentally friendly solution for drilling large diameters and depths.

If there are drilling conditions required as follows,
1) Large Diameter (more than 800mm)
2) Deep Depth (more than 50m)
3) Hard Rock Drilling (75MPa ~ 250MPa)
4) Bore Piling in Marine Condition

Definitely the most suitable equipment is RCD Rig.
Composition

- Power Pack
- Power Swivel
- Mast
- Control Room
- Suction Pipe
- Clamping Device
- Air Compressor
- Pull-Down Cylinder
- Drill Rod Pipe Stabilizer
- Drill Rod Pipe
- Sub Drill Pipe
- Heavy Duty Stabilizer
- Heavy Duty Space Pipe
- Drum Stabilizer
- Drill Bit
## Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>R1315</th>
<th>R1815</th>
<th>R1820</th>
<th>R3025</th>
<th>R3030</th>
<th>R3733</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Drilling Diameter</td>
<td>1,500mm</td>
<td>1,500mm</td>
<td>2,000mm</td>
<td>2,500mm</td>
<td>3,000mm</td>
<td>3,300mm</td>
</tr>
<tr>
<td>Max. Drilling Torque</td>
<td>129kN.m</td>
<td>179kN.m</td>
<td>179kN.m</td>
<td>300kN.m</td>
<td>300kN.m</td>
<td>372kN.m</td>
</tr>
<tr>
<td>Rotation Speed</td>
<td>0~24rpm</td>
<td>0~16.2rpm</td>
<td>0~16.2rpm</td>
<td>0~21rpm</td>
<td>0~21rpm</td>
<td>0~20rpm</td>
</tr>
<tr>
<td>Thrust/Pull-Up Force</td>
<td>88ton / 129ton</td>
<td>88ton / 129ton</td>
<td>88ton / 129ton</td>
<td>122ton / 201ton</td>
<td>122ton / 201ton</td>
<td>122ton / 201ton</td>
</tr>
<tr>
<td>Mast Tilting</td>
<td>22˚</td>
<td>22˚</td>
<td>26˚</td>
<td>30˚</td>
<td>32˚</td>
<td>35˚</td>
</tr>
<tr>
<td>Platform Tilting</td>
<td>16˚</td>
<td>16˚</td>
<td>20˚</td>
<td>16˚</td>
<td>12.5˚</td>
<td>10.5˚</td>
</tr>
<tr>
<td>Weight (Approx.)</td>
<td>21.8ton</td>
<td>27.8ton</td>
<td>28.5ton</td>
<td>36ton</td>
<td>39.8ton</td>
<td>41.9ton</td>
</tr>
<tr>
<td>Drill String</td>
<td>NW200</td>
<td>NW200</td>
<td>NW200 / NW300</td>
<td>NW300</td>
<td>NW300</td>
<td>NW300</td>
</tr>
<tr>
<td>Power Pack</td>
<td>P2612C / P3618C / P4214D</td>
<td>P2612C / P3618C / P4214D</td>
<td>P2612C / P3618C / P4214D</td>
<td>P3618C / P5318C / P4218D</td>
<td>P3618C / P5318C / P4218D</td>
<td>P6028C</td>
</tr>
</tbody>
</table>

### Necessary Equipment & Tools

<table>
<thead>
<tr>
<th>Equipment</th>
<th>RCD R1815</th>
<th>RCD R1820</th>
<th>RCD R3025</th>
<th>RCD R3030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting Crane</td>
<td>100 ton-grade</td>
<td>100 ton-grade</td>
<td>120 ton-grade</td>
<td>120 ton-grade</td>
</tr>
<tr>
<td>Air Compressor</td>
<td>Volume 600cfm / Pressure 8bar / Air Hose 2&quot; - 40m</td>
<td>Volume 600~800cfm / Pressure 8bar / Air Hose 2&quot; - 40m</td>
<td>Volume 800cfm / Pressure 8bar / Air Hose 2&quot; - 40m</td>
<td>Volume 800cfm / Pressure 8bar / Air Hose 2&quot; - 40m</td>
</tr>
<tr>
<td>Water Pump</td>
<td>Volume 5m³/min / Head 20~30m / Water Hose 8&quot;</td>
<td>Volume 5<del>10m³/min / Head 20</del>30m / Water Hose 8&quot;</td>
<td>Volume 10m³/min / Head 20~30m / Water Hose 8&quot;</td>
<td>Volume 10m³/min / Head 20~30m / Water Hose 8&quot;</td>
</tr>
<tr>
<td>Generator</td>
<td>Generator 175kW</td>
<td>Generator 175kW</td>
<td>Generator 175kW</td>
<td>Generator 175kW</td>
</tr>
</tbody>
</table>

** In application of water side (Offshore), Jack-up barge (20 x 40m) and Disposal barge may be necessary.

** According to the drilling depth, the required pressure of Air Compressor is decided. In 10m depth, pressure of 1bar is required. Ex) 50m depth → 5bar, For efficient air lifting, 7 bar is required.
## Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>Engine Emission Compliance</th>
<th>Engine Output &amp; rpm</th>
<th>Hyd.Pump</th>
<th>Size (mm)</th>
<th>Weight (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2612C</td>
<td>TIER 2, 3, 4F</td>
<td>194kW / 260HP / 2,200rpm</td>
<td>228ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 4,800L × 2,476H</td>
<td>7.5ton</td>
</tr>
<tr>
<td>P3618C</td>
<td>TIER 3</td>
<td>268kW / 360HP / 2,100rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 4,800L × 2,476H</td>
<td>8ton</td>
</tr>
<tr>
<td>P3818C</td>
<td>TIER 4F</td>
<td>285kW / 388HP / 1,900rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 4,800L × 2,476H</td>
<td>8ton</td>
</tr>
<tr>
<td>P4214D</td>
<td>TIER 1</td>
<td>307kW / 418HP / 1,800rpm</td>
<td>252ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,900W × 4,800L × 2,340H</td>
<td>8.5ton</td>
</tr>
<tr>
<td>P4218D</td>
<td>TIER 1</td>
<td>307kW / 418HP / 1,800rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,900W × 5,400L × 2,300H</td>
<td>8.5ton</td>
</tr>
<tr>
<td>P5318C</td>
<td>TIER 3, 4F</td>
<td>399kW / 535HP / 2,100rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 5,400L × 2,562H</td>
<td>11ton</td>
</tr>
<tr>
<td>P5418V</td>
<td>TIER 3</td>
<td>397kW / 540HP / 1,800rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 5,400L × 2,562H</td>
<td>11ton</td>
</tr>
<tr>
<td>P5518V</td>
<td>TIER 4F</td>
<td>405kW / 551HP / 1,900rpm</td>
<td>324ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,900W × 5,400L × 2,300H</td>
<td>11ton</td>
</tr>
<tr>
<td>P6028C</td>
<td>TIER 3, 4F</td>
<td>447kW / 600HP / 2,100rpm</td>
<td>504ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 5,400L × 2,562H</td>
<td>11.5ton</td>
</tr>
<tr>
<td>P6128V</td>
<td>TIER 4F</td>
<td>450kW / 612HP / 1,800rpm</td>
<td>504ℓ/min x 2 250bar (Max. 350bar)</td>
<td>1,912W × 5,400L × 2,562H</td>
<td>11.5ton</td>
</tr>
</tbody>
</table>
Drill String

BUMA provides 2 types of Drill String (Drill Pipe) according to internal pipe diameter, NW200 (182mm) and NW300 (281mm). NW200 Drill Pipe can be used up to RCD R1820 because of handling torque limit. Mainly up to drilling dia. 1.5m, NW200 Drill Pipe is recommended.

Basic Drill String

To prevent buckling in bottom part of casing and for better verticality, Basic Drill String is required. The Basic Drill String is composed of Drum Stabilizer, Heavy Duty Space Pipe, Heavy Duty Stabilizer and Sub Drill Pipe (Reducing Pipe).

Drill Rod Pipe Stabilizer

To prevent bending of Drill String and keep verticality, the Drill Rod Pipe Stabilizer is used for every 3 units of Drill Rod Pipe (1 Drill Rod Pipe = 3m).

### Stabilizer Dia. (mm)

<table>
<thead>
<tr>
<th></th>
<th>750</th>
<th>900</th>
<th>1,100</th>
<th>1,200</th>
<th>1,500</th>
<th>2,000 …… 3,000</th>
</tr>
</thead>
</table>
According to strata condition, BUMA provides 3 types of Roller Cutters. (Tooth Cutter, TCI Button Cutter and TCI Button Disc Cutter)

**Tooth Cutter**
It was designed and used for drilling soft soil and soft rock layer (0~75MPa).

**TCI Button Cutter**
It was designed and used for drilling hard rock layer (80~250MPa).

**TCI Button Disc Cutter**
It was designed and used for drilling hard rock layer (80~350 MPa).

** According to the structure of the tool, it can be used for both soil and rock layers.

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<table>
<thead>
<tr>
<th>Drill Bit Cutting Dia.</th>
<th>850mm</th>
<th>1,050mm</th>
<th>1,350mm</th>
<th>1,650mm</th>
<th>1,830mm</th>
<th>2,300mm</th>
<th>2,750mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill Bit Length</td>
<td>1,500mm</td>
<td>2,000mm</td>
<td>2,000mm</td>
<td>2,000mm</td>
<td>2,500mm</td>
<td>2,500mm</td>
<td>2,500mm</td>
</tr>
<tr>
<td>Suction Pipe</td>
<td>NW200</td>
<td>NW200</td>
<td>NW200/NW300</td>
<td>NW300</td>
<td>NW300</td>
<td>NW300</td>
<td>NW300</td>
</tr>
<tr>
<td>Roller Cutter</td>
<td>8SER.</td>
<td>8SER.</td>
<td>12SER.</td>
<td>12SER.</td>
<td>12SER.</td>
<td>12SER.</td>
<td>12SER.</td>
</tr>
<tr>
<td>-5˚ Cutter</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>+10˚ Cutter</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>+20˚ Cutter</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>+35˚ Cutter</td>
<td>2</td>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>+40˚ Cutter</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>10</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Weight</td>
<td>1,500kg</td>
<td>2,500kg</td>
<td>3,500kg</td>
<td>6,000kg</td>
<td>7,500kg</td>
<td>10,350kg</td>
<td>10,500kg</td>
</tr>
</tbody>
</table>

---

Drill Bit Size 
- **850mm**
- **1,050mm**
- **1,350mm**
- **1,650mm**
- **1,830mm**
- **2,300mm**
- **2,750mm**

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**Drilling Rate (mm/hr)**

**Compressive Strength (MPa)**

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**Tooth Cutter**
**TCI Button Cutter**
**TCI Button Disc Cutter**
### Signature Bridge Construction

**Location:** Delhi, India  
**Year:** 2014  
**Pile Diameter:** Ø 1,250mm  
**Depth:** 49m  
**Rock:** Weathered Basalt, Hard Rock 80~120 MPa  
**Equipment:** RCD R1820

### Black Sea Dry Dock Construction

**Location:** Black Sea, Russia  
**Year:** 2014  
**Pile Diameter:** Ø 1,420mm & Ø 1,220mm  
**Depth:** 40m  
**Rock:** Soft Rock 60~80 MPa  
**Equipment:** RCD R1820, RCD R1815

### Baltimore Bridge Expansion

**Location:** Baltimore, USA  
**Year:** 2012  
**Pile Diameter:** Ø 1,300  
**Depth:** 60m  
**Equipment:** RCD R1820  
**Details**  
For the bridge expansion, 2m-class BUMA RCD Rig R1820 was operated. For the rock socketing, TCI button cutter drill bit was used.
Bandra-Worli Sea Link

Location: Mumbai, India  
Year: 2000  
Pile Diameter: Ø 1,500mm  
Depth: 50m  
Rock: Basalt (200MPa+)  
Equipment: RCD R1820

Malaka Gas Terminal

Location: Malaka, Malaysia  
Year: 2011  
Pile Diameter: Ø 1,200mm  
Depth: 50m  
Rock: Granite (120–150MPa)  
Equipment: RCD R1820  
Details: It was for building gas terminal in Malaka. For the project, BUMA supplied 7 sets of 2m-class RCD Rig R1820. Customer drilled sand & clay layer with tooth cutter drill bit. And BUMA RCD Rig showed the excellent performance on the raker piles.

Incheon Bridge Project

Location: Incheon, Korea  
Year: 2005  
Pile Diameter: Ø 3,000mm, Ø 2,400mm, Ø 1,800mm  
Depth: 80m  
Rock: Granite (150–200MPa)  
Equipment: RCD R3030, RCD R3025, RCD R1820  
Details: Incheon Bridge construction was the biggest bridge project in Korea. It was completed in 2009. After the successful completion of the project, the bridge became the longest one in Korea.
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E-mail : bumace@bumace.com