



这种类型的大孔径潜孔冲击器是我公司针对水井、建筑桩和油气钻井的特点，自行设计开发和制造的高风压潜孔冲击器。

### 这种冲击器具有如下特点：

1. 采用最新凿岩理论，优化内部结构和配气尺寸，使冲击器获得最理想的能源传递，因此，钻进速度快，耗风量低。
2. 针对此类工程钻头断裂打捞十分困难的情况，专门设计了安全可靠的钻头防脱落装置。
3. 使用中如需加强排渣，可更换不同尺寸调气孔的逆止阀达到目的。
4. 接头和卡钎套采用特殊牙型的螺纹可使拆卸容易。

Based on the characteristics of the wells, oil, gas and construction drilling, our company self-designed, developed and manufactured this kind of high air pressure DTH hammer.

### It has the following characteristics:

1. Using the latest rock drilling theory, optimizing the inside structure and the size of the air distribution, to make the DTH Hammer obtain the optimal energy transfer and make it achieve faster drilling speed and lower air consumption.
2. For such projects as the drill bit break, retrieving very difficult, we specially designed a safe and reliable anti-shedding device for the bit.
3. The check valve can be replaced to the one with bigger air controlling hole to provide more efficient cuttings discharge.
4. The top sub and the drive chuck have special thread, which can achieve an easier disassemble.

### 水井、微型桩和石油钻井用大孔径冲击器名称解释 Explanation of product code

例:HD180A

D—DTH(潜孔钻)简称

180—表示冲击器的外径为180mm

A—表示冲击器的所配钻头不需要尼龙管

For example: HD180A

H

D—DTH (Down The Hole)

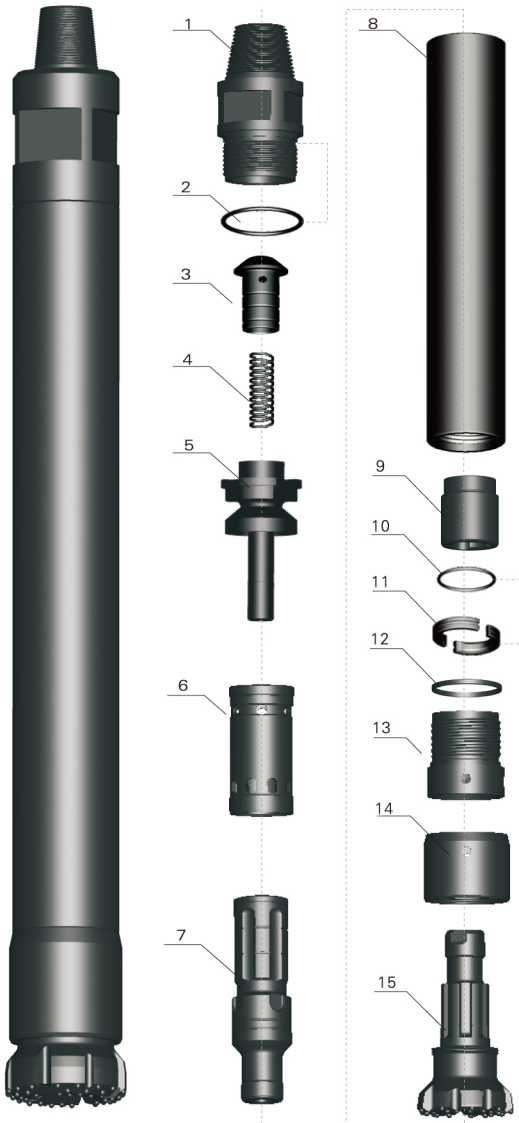
180—The O.D. of hammer is 180mm

A—Using without foot valve DTH Bit



HD142A 潜孔冲击器  
HD142A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers

|                                                                                                                                                                             |  |  |  | Item Description<br>( 零部件名称 ) | weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件 代号 ) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|-------------------------------|------------------------|---------------------------|
| 1、接 头                                                                                                                                                                                                                                                         |  |  |  | Top Sub                       | 20.00                  | HD142A01                  |
| 2、接头O形圈                                                                                                                                                                                                                                                       |  |  |  | “O” Ring of Top Sub           | 0.02                   | HD142A02                  |
| 3、逆 止 阀                                                                                                                                                                                                                                                       |  |  |  | Check Valve                   | 0.70                   | HD142A03                  |
| 4、弹 簧                                                                                                                                                                                                                                                         |  |  |  | Spring                        | 0.10                   | HD142A04                  |
| 5、配 气 座                                                                                                                                                                                                                                                       |  |  |  | Air Distributor               | 3.50                   | HD142A05                  |
| 6、内 缸                                                                                                                                                                                                                                                         |  |  |  | Internal Cylinder             | 4.20                   | HD142A06                  |
| 7、活 塞                                                                                                                                                                                                                                                         |  |  |  | Piston                        | 23.00                  | HD142A07                  |
| 8、外 缸                                                                                                                                                                                                                                                         |  |  |  | External Cylinder             | 31.50                  | HD142A08                  |
| 9、衬 套                                                                                                                                                                                                                                                         |  |  |  | Guided Sleeve                 | 6.50                   | HD142A09                  |
| 10、卡环O形圈                                                                                                                                                                                                                                                      |  |  |  | “O” Ring of Stop Ring         | 0.01                   | HD142A10                  |
| 11、卡 环                                                                                                                                                                                                                                                        |  |  |  | Stop Ring                     | 0.60                   | HD142A11                  |
| 12、垫 片                                                                                                                                                                                                                                                        |  |  |  | Breakout Ring                 | 0.20                   | HD142A12                  |
| 13、卡 钎 套                                                                                                                                                                                                                                                      |  |  |  | Drive Chuck                   | 5.00                   | HD142A13                  |
| 14、防 脱 套                                                                                                                                                                                                                                                      |  |  |  | Retainer                      | 3.50                   | HD142A14                  |
| 15、钻 头                                                                                                                                                                                                                                                        |  |  |  | Drill Bit                     | 27.00                  | HD142A15                  |
| 如客户需要，接头可采用两个方口，并在接头上装耐磨合金。需要加强排渣，可在逆止阀上钻调气孔。<br>According to your request, the top sub can be made into two spanners, and put protection buttons.<br>An air controlling hole can be drilled on the check valve to provide more efficient cuttings discharge. |  |  |  |                               |                        |                           |

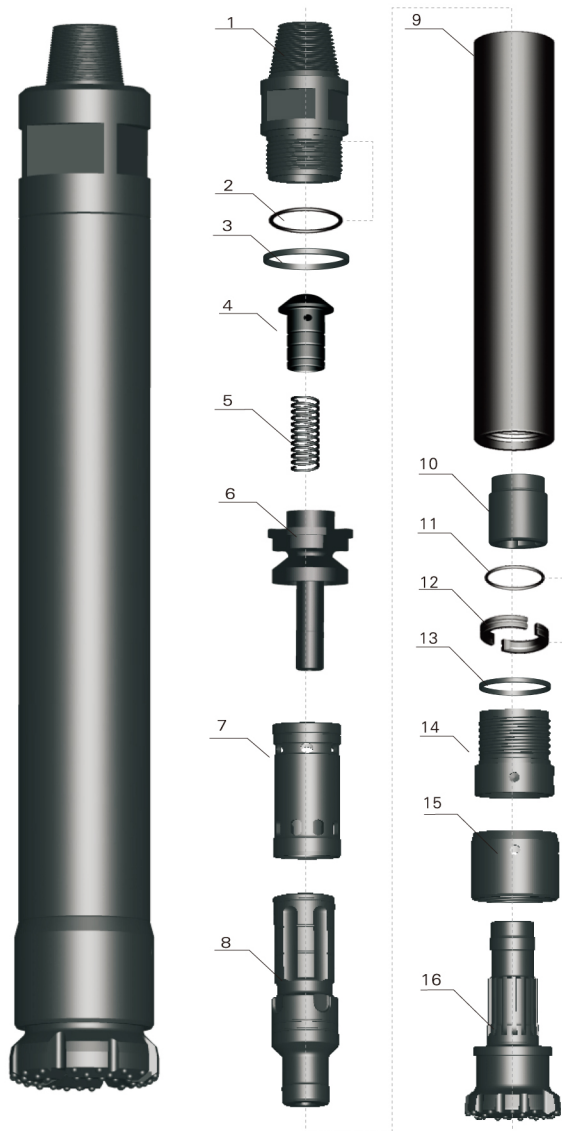
技 术 参 数  
Technical Data

|                                |                                        |                                    |                        |                    |                            |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------|
| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread |
| 1388mm                         | 102.00Kg                               | Φ 142mm                            | DHD360                 | Φ 155—Φ 195        | API 3 1/2" Reg             |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                            |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                     |
| 1.0—2.5Mpa                     | 25HZ                                   | 20—30r/min                         | 9m³/min                | 18m³/min           | 26m³/min                   |



# HD180A 潜孔冲击器 HD180A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers



| Item Description<br>( 零部件名称 )  | Weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件 代号 ) |
|--------------------------------|------------------------|---------------------------|
| 1、接 头 Top Sub                  | 34.00                  | HD180A01                  |
| 2、接头O形圈 “O” Ring of Top Sub    | 0.015                  | HD180A02                  |
| 3、垫 片 Breakout Ring            | 0.60                   | HD180A03                  |
| 4、逆 止 阀 Check Valve            | 1.20                   | HD180A04                  |
| 5、弹 簧 Spring                   | 0.10                   | HD180A05                  |
| 6、配 气 座 Air Distributor        | 6.00                   | HD180A06                  |
| 7、内 缸 Internal Cylinder        | 6.50                   | HD180A07                  |
| 8、活 塞 Piston                   | 42.50                  | HD180A08                  |
| 9、外 缸 External Cylinder        | 60.00                  | HD180A09                  |
| 10、衬 套 Guided Sleeve           | 6.30                   | HD180A10                  |
| 11、卡环O形圈 “O” Ring of Stop Ring | 0.01                   | HD180A11                  |
| 12、卡 环 Stop Ring               | 1.40                   | HD180A12                  |
| 13、垫 片 Breakout Ring           | 0.60                   | HD180A13                  |
| 14、卡 钎 套 Drive Chuck           | 12.00                  | HD180A14                  |
| 15、防 脱 套 Retainer              | 6.50                   | HD180A15                  |
| 16、钻 头 Drill Bit               | 37.00                  | HD180A16                  |

如客户需要，接头可采用两个方口，并在接头上装耐磨合金。需要加强排渣，可在逆止阀上钻调气孔。

According to your request, the top sub can be made into two spanners, and put protection buttons. An air controlling hole can be drilled on the check valve to provide more efficient cuttings discharge.

## 技 术 参 数 Technical Data

| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------|
| 1520mm                         | 178.00Kg                               | Φ 180mm                            | QL80                   | Φ 195—Φ 254        | API 4½"Reg                 |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                            |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                     |
| 1.0—2.5Mpa                     | 20HZ                                   | 20—30r/min                         | 12m³/min               | 22m³/min           | 28m³/min                   |



# HD225A 潜孔冲击器 HD225A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers

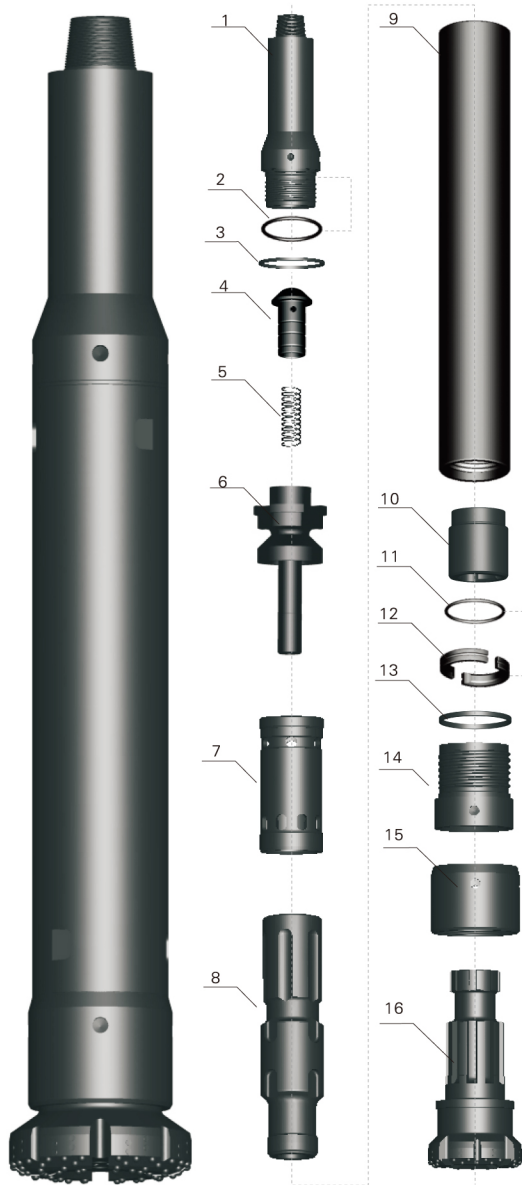
|                                                                                                                                                                                                                                                               |                                |                        |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------|--------------------------|
|                                                                                                                                                                                                                                                               | Item Description<br>( 零部件名称 )  | Weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件代号 ) |
|                                                                                                                                                                                                                                                               | 1、接 头 Top Sub                  | 59.00                  | HD225A01                 |
|                                                                                                                                                                                                                                                               | 2、接头O形圈 “O” Ring of Top Sub    | 0.03                   | HD225A02                 |
|                                                                                                                                                                                                                                                               | 3、垫 片 Breakout Ring            | 0.80                   | HD225A03                 |
|                                                                                                                                                                                                                                                               | 4、逆 止 阀 Check Valve            | 1.40                   | HD225A04                 |
|                                                                                                                                                                                                                                                               | 5、弹 簧 Spring                   | 0.30                   | HD225A05                 |
|                                                                                                                                                                                                                                                               | 6、配 气 座 Air Distributor        | 10.50                  | HD225A06                 |
|                                                                                                                                                                                                                                                               | 7、内 缸 Internal Cylinder        | 12.50                  | HD225A07                 |
|                                                                                                                                                                                                                                                               | 8、活 塞 Piston                   | 77.00                  | HD225A08                 |
|                                                                                                                                                                                                                                                               | 9、外 缸 External Cylinder        | 110.00                 | HD225A09                 |
|                                                                                                                                                                                                                                                               | 10、衬 套 Guided Sleeve           | 4.50                   | HD225A10                 |
|                                                                                                                                                                                                                                                               | 11、卡环O形圈 “O” Ring of Stop Ring | 0.02                   | HD225A11                 |
|                                                                                                                                                                                                                                                               | 12、卡 环 Stop Ring               | 1.90                   | HD225A12                 |
|                                                                                                                                                                                                                                                               | 13、垫 片 Breakout Ring           | 0.80                   | HD225A13                 |
|                                                                                                                                                                                                                                                               | 14、卡 钎 套 Drive Chuck           | 21.00                  | HD225A14                 |
|                                                                                                                                                                                                                                                               | 15、防 脱 套 Retainer              | 9.00                   | HD225A15                 |
|                                                                                                                                                                                                                                                               | 16、钻 头 Drill Bit               | 68.00                  | HD225A16                 |
| 如客户需要，接头可采用两个方口，并在接头上装耐磨合金。需要加强排渣，可在逆止阀上钻调气孔。<br>According to your request, the top sub can be made into two spanners, and put protection buttons.<br>An air controlling hole can be drilled on the check valve to provide more efficient cuttings discharge. |                                |                        |                          |

| 技 术 参 数<br>Technical Data      |                                        |                                    |                        |                    |                            |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------|
| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread |
| 1745mm                         | 315.00Kg                               | Φ 225mm                            | Numa100                | Φ254—Φ311          | API 4½"Reg<br>API 6⅝"Reg   |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                            |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                     |
| 1.0—2.5Mpa                     | 20HZ                                   | 15—25r/min                         | 22m³/min               | 40m³/min           | 65m³/min                   |



## HD275A 潜孔冲击器 HD275A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers



| Item Description<br>( 零部件名称 )  | Weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件 代号 ) |
|--------------------------------|------------------------|---------------------------|
| 1、接 头 Top Sub                  | 230.00                 | HD275A01                  |
| 2、接头O形圈 “O” Ring of Top Sub    | 0.04                   | HD275A02                  |
| 3、垫 片 Breakout Ring            | 1.00                   | HD275A03                  |
| 4、逆 止 阀 Check Valve            | 2.00                   | HD275A04                  |
| 5、弹 簧 Spring                   | 0.50                   | HD275A05                  |
| 6、配 气 座 Air Distributor        | 16.00                  | HD275A06                  |
| 7、内 缸 Internal Cylinder        | 25.00                  | HD275A07                  |
| 8、活 塞 Piston                   | 113.00                 | HD275A08                  |
| 9、外 缸 External Cylinder        | 170.00                 | HD275A09                  |
| 10、衬 套 Guided Sleeve           | 23.00                  | HD275A10                  |
| 11、卡环O形圈 “O” Ring of Stop Ring | 0.03                   | HD275A11                  |
| 12、卡 环 Stop Ring               | 4.00                   | HD275A12                  |
| 13、垫 片 Breakout Ring           | 1.00                   | HD275A13                  |
| 14、卡 钎 套 Drive Chuck           | 34.00                  | HD275A14                  |
| 15、防 脱 套 Retainer              | 30.00                  | HD275A15                  |
| 16、钻 头 Drill Bit               | 185.00                 | HD275A16                  |

可根据工地使用情况，选用不同直径气孔的逆止阀，以保证排渣效果。

According to the different drilling situation, you can choose check valves of different size air exhaust holes to assure the effective cuttings discharge.

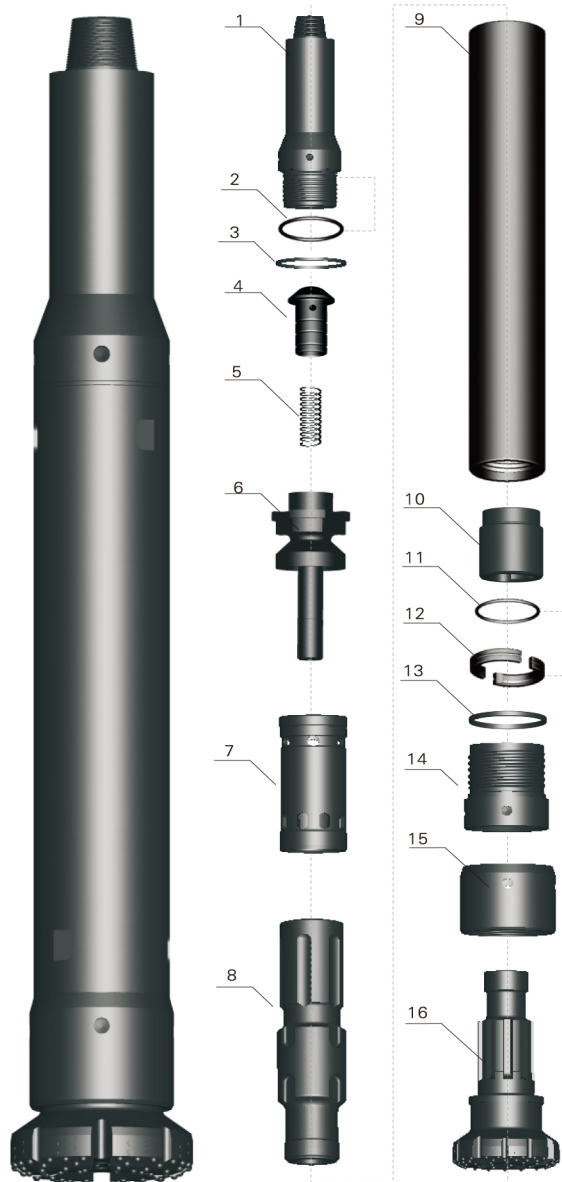
### 技 术 参 数 Technical Data

| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range    | 后接头螺纹<br>Connection Thread                           |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|-----------------------|------------------------------------------------------|
| 2626mm                         | 650.00Kg                               | Φ 275mm                            | Numa125                | Φ305—Φ445             | API 6 $\frac{5}{8}$ "Reg<br>API 7 $\frac{5}{8}$ "Reg |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                       |                                                      |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa                | 2.4Mpa                                               |
| 1.0—2.5Mpa                     | 20HZ                                   | 15—25r/min                         | 28m <sup>3</sup> /min  | 50m <sup>3</sup> /min | 71m <sup>3</sup> /min                                |



# HD330A 潜孔冲击器 HD330A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers



| Item Description<br>( 零部件名称 )  | weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件代号 ) |
|--------------------------------|------------------------|--------------------------|
| 1、接 头 Top Sub                  | 320.00                 | HD330A01                 |
| 2、接头O形圈 “O” Ring of Top Sub    | 0.10                   | HD330A02                 |
| 3、垫 片 Breakout Ring            | 2.00                   | HD330A03                 |
| 4、逆 止 阀 Check Valve            | 5.00                   | HD330A04                 |
| 5、弹 簧 Spring                   | 0.80                   | HD330A05                 |
| 6、配 气 座 Air Distributor        | 35.00                  | HD330A06                 |
| 7、内 缸 Internal Cylinder        | 30.00                  | HD330A07                 |
| 8、活 塞 Piston                   | 190.00                 | HD330A08                 |
| 9、外 缸 External Cylinder        | 316.00                 | HD330A09                 |
| 10、衬 套 Guided Sleeve           | 38.00                  | HD330A10                 |
| 11、卡环O形圈 “O” Ring of Stop Ring | 0.05                   | HD330A11                 |
| 12、卡 环 Stop Ring               | 6.00                   | HD330A12                 |
| 13、垫 片 Breakout Ring           | 2.00                   | HD330A13                 |
| 14、卡 钎 套 Drive Chuck           | 64.00                  | HD330A14                 |
| 15、防 脱 套 Retainer              | 42.00                  | HD330A15                 |
| 16、钻 头 Drill Bit               | 240.00                 | HD330A16                 |

可根据工地使用情况，选用不同直径气孔的逆止阀，以保证排渣效果。

According to the different drilling situation, you can choose check valves of different size air exhaust holes to assure the effective cuttings discharge.

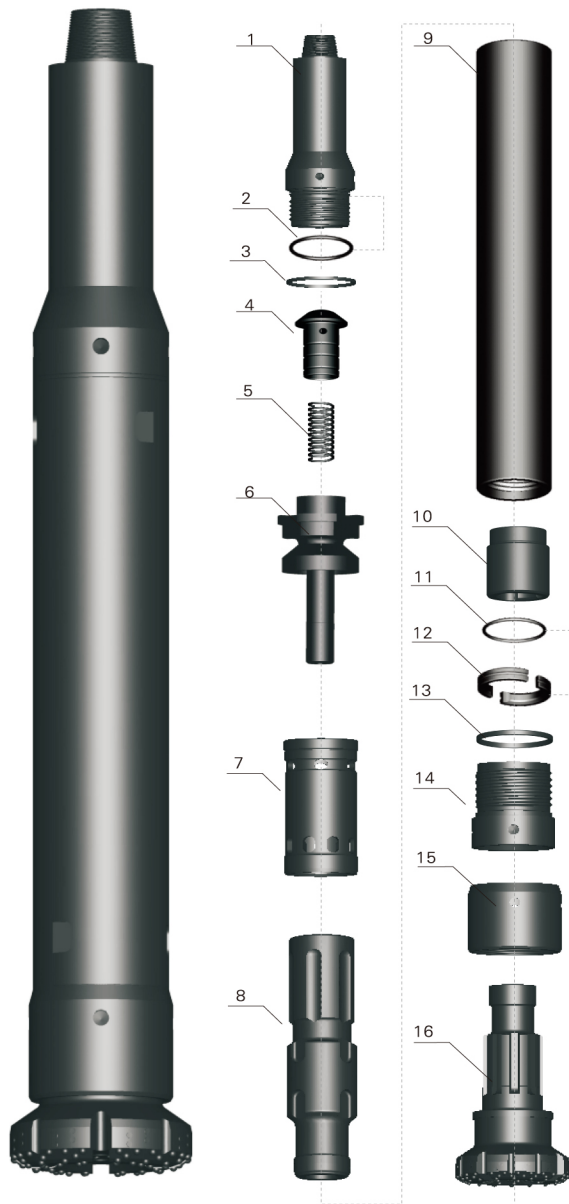
## 技 术 参 数 Technical Data

| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread             |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------------------|
| 3870mm                         | 1050.00Kg                              | Φ 330mm                            | HD330                  | Φ 350—Φ 660        | API 7 <sup>5</sup> / <sub>8</sub> "Reg |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                                        |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                                 |
| 1.0—2.5Mpa                     | 20HZ                                   | 15—25r/min                         | 32m³/min               | 58m³/min           | 85m³/min                               |



# HD475A 潜孔冲击器 HD475A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers



| Item Description<br>( 零部件名称 )  | Weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件 代号 ) |
|--------------------------------|------------------------|---------------------------|
| 1、接 头 Top Sub                  | 800.0                  | HD475A01                  |
| 2、接头O形圈 “O” Ring of Top Sub    | 0.02                   | HD475A02                  |
| 3、垫 片 Breakout Ring            | 3.55                   | HD475A03                  |
| 4、逆 止 阀 Check Valve            | 13.5                   | HD475A04                  |
| 5、弹 簧 Spring                   | 0.35                   | HD475A05                  |
| 6、配 气 座 Air Distributor        | 58.9                   | HD475A06                  |
| 7、内 缸 Internal Cylinder        | 101.6                  | HD475A07                  |
| 8、活 塞 Piston                   | 517.0                  | HD475A08                  |
| 9、外 缸 External Cylinder        | 952.0                  | HD475A09                  |
| 10、衬 套 Guided Sleeve           | 98.0                   | HD475A10                  |
| 11、卡环O形圈 “O” Ring of Stop Ring | 0.02                   | HD475A11                  |
| 12、卡 环 Stop Ring               | 14.25                  | HD475A12                  |
| 13、垫 片 Breakout Ring           | 3.55                   | HD475A13                  |
| 14、卡 钎 套 Drive Chuck           | 162.0                  | HD475A14                  |
| 15、防 脱 套 Retainer              | 50.0                   | HD475A15                  |
| 16、钻 头 Drill Bit               | 528.0                  | HD475A16                  |

可根据工地使用情况，选用不同直径气孔的逆止阀，以保证排渣效果。

According to the different drilling situation, you can choose check valves of different size air exhaust holes to assure the effective cuttings discharge.

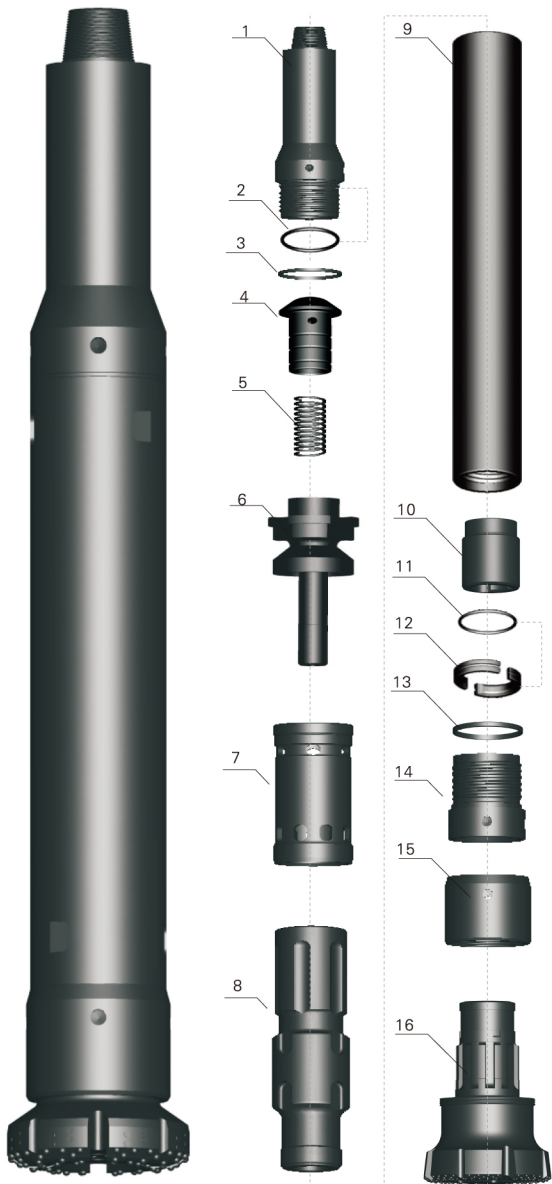
## 技术 参 数 Technical Data

| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread             |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------------------|
| 4080mm                         | 2775.0Kg                               | Φ475mm                             | HD475                  | Φ508—Φ760          | API 8 <sup>5</sup> / <sub>8</sub> "Reg |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                                        |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                                 |
| 1.0—2.5Mpa                     | 20HZ                                   | 15—25r/min                         | 56m³/min               | 75m³/min           | 85m³/min                               |



HD525A 潜孔冲击器  
HD525A DTH HAMMER

大孔径冲击器系列  
Big Hole DTH Hammers



| Item Description<br>( 零部件名称 )  | weight<br>( 重量 )<br>Kg | Part Number<br>( 零部件代号 ) |
|--------------------------------|------------------------|--------------------------|
| 1、接 头 Top Sub                  | 960.0                  | HD525A01                 |
| 2、接头O形圈 “O” Ring of Top Sub    | 0.03                   | HD525A02                 |
| 3、垫 片 Breakout Ring            | 5.00                   | HD525A03                 |
| 4、逆 止 阀 Check Valve            | 18.00                  | HD525A04                 |
| 5、弹 簧 Spring                   | 0.45                   | HD525A05                 |
| 6、配 气 座 Air Distributor        | 79.5                   | HD525A06                 |
| 7、内 缸 Internal Cylinder        | 137.0                  | HD525A07                 |
| 8、活 塞 Piston                   | 698.0                  | HD525A08                 |
| 9、外 缸 External Cylinder        | 1285.0                 | HD525A09                 |
| 10、衬 套 Guided Sleeve           | 132.0                  | HD525A10                 |
| 11、卡环O形圈 “O” Ring of Stop Ring | 0.02                   | HD525A11                 |
| 12、卡 环 Stop Ring               | 19.5                   | HD525A12                 |
| 13、垫 片 Breakout Ring           | 5.00                   | HD525A13                 |
| 14、卡 钎 套 Drive Chuck           | 219.0                  | HD525A14                 |
| 15、防 脱 套 Retainer              | 67.5                   | HD525A15                 |
| 16、钻 头 Drill Bit               | 1328.0                 | HD525A16                 |

可根据工地使用情况，选用不同直径气孔的逆止阀，以保证排渣效果。  
According to the different drilling situation, you can choose check valves of different size air exhaust holes to assure the effective cuttings discharge.

技 术 参 数  
Technical Data

|                                |                                        |                                    |                        |                    |                            |
|--------------------------------|----------------------------------------|------------------------------------|------------------------|--------------------|----------------------------|
| 总长 ( 含钻头 )<br>Length(With bit) | 总重 ( 不含钻头 )<br>Weight(Less bit)        | 冲击器外径<br>External diameter         | 可配钻头钎柄<br>Bit Shank    | 钻孔范围<br>Hole Range | 后接头螺纹<br>Connection Thread |
| 4260mm                         | 3626.0Kg                               | Φ 525mm                            | HD525                  | Φ 610—Φ 800        | API 8 5/8"Reg              |
| 可用工作风压<br>Working Pressure     | 在1.7Mpa时的冲击频率<br>Impact rate at 1.7Mpa | 推荐转速<br>Recommended rotation speed | 耗风量<br>Air consumption |                    |                            |
|                                |                                        |                                    | 1.0Mpa                 | 1.8Mpa             | 2.4Mpa                     |
| 1.0—2.5Mpa                     | 20HZ                                   | 15—25r/min                         | 50m³/min               | 80m³/min           | 99m³/min                   |