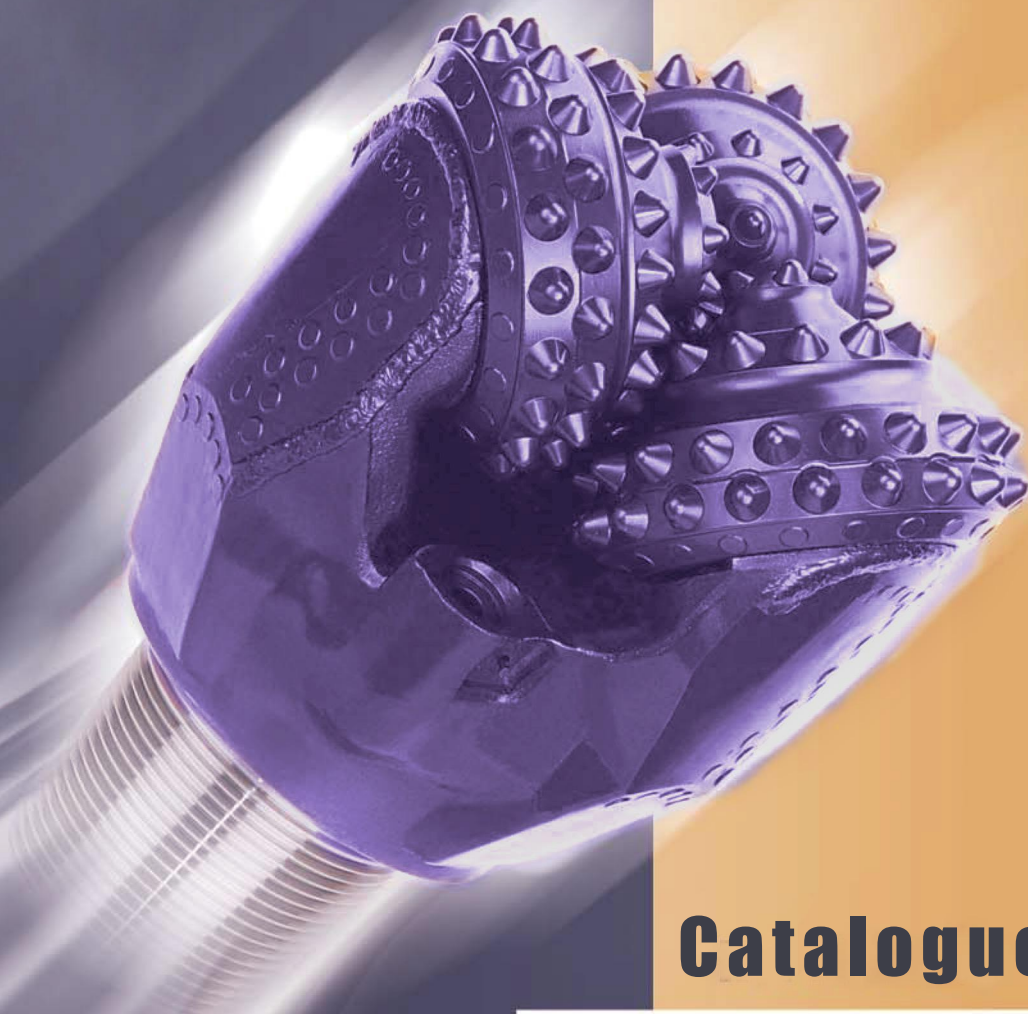




# **DRILL BITS**

**For mining industry**



**Catalogue**



## ABOUT THE COMPANY

■ «Universal Drilling Technique, LLC» is the company which runs its business under the **UniDrillTech** trademark and is the manufacturer of roller drill bits for mining industry from 76,0 mm to 320,0 mm in diameter for drilling different formations from soft to extra hard formations. **UniDrillTech** is located in Drohobych, L'viv region, Ukraine.

■ The main advantage of UniDrillTech is the highly qualified production, design and management personnel. For designing drill bits, highly qualified design engineers use modern software which enables to develop or optimize the design of the drill bit for specific drilling conditions in the shortest possible time.

■ The manufacturing process of the company is carried out according to the up-to-date technology on the equipment of well-known leading world machine building manufacturers.

■ In order to assure high quality of manufactured products at LLC «UNIDRILL-TECH», the quality management system has been implemented to comply with API Spec. Q1 standards.

■ The policy of the company in the work with the customers is based on establishing long-term and mutually beneficial partnership.

■ Despite your location, the technical servicing specialists of UniDrillTech will provide you with timely assistance in order to prevent the problem which has encountered, select immediately necessary parameters for proper and efficient operation of the drill bit and also optimize the design for specific purposes.



ТОВАРИСТВО З ОБМЕЖЕНОЮ ВІДПОВІДАЛЬНІСТЮ  
**UNIVERSAL DRILLING  
TECHNIQUE, LLC**

## PRODUCT LINES

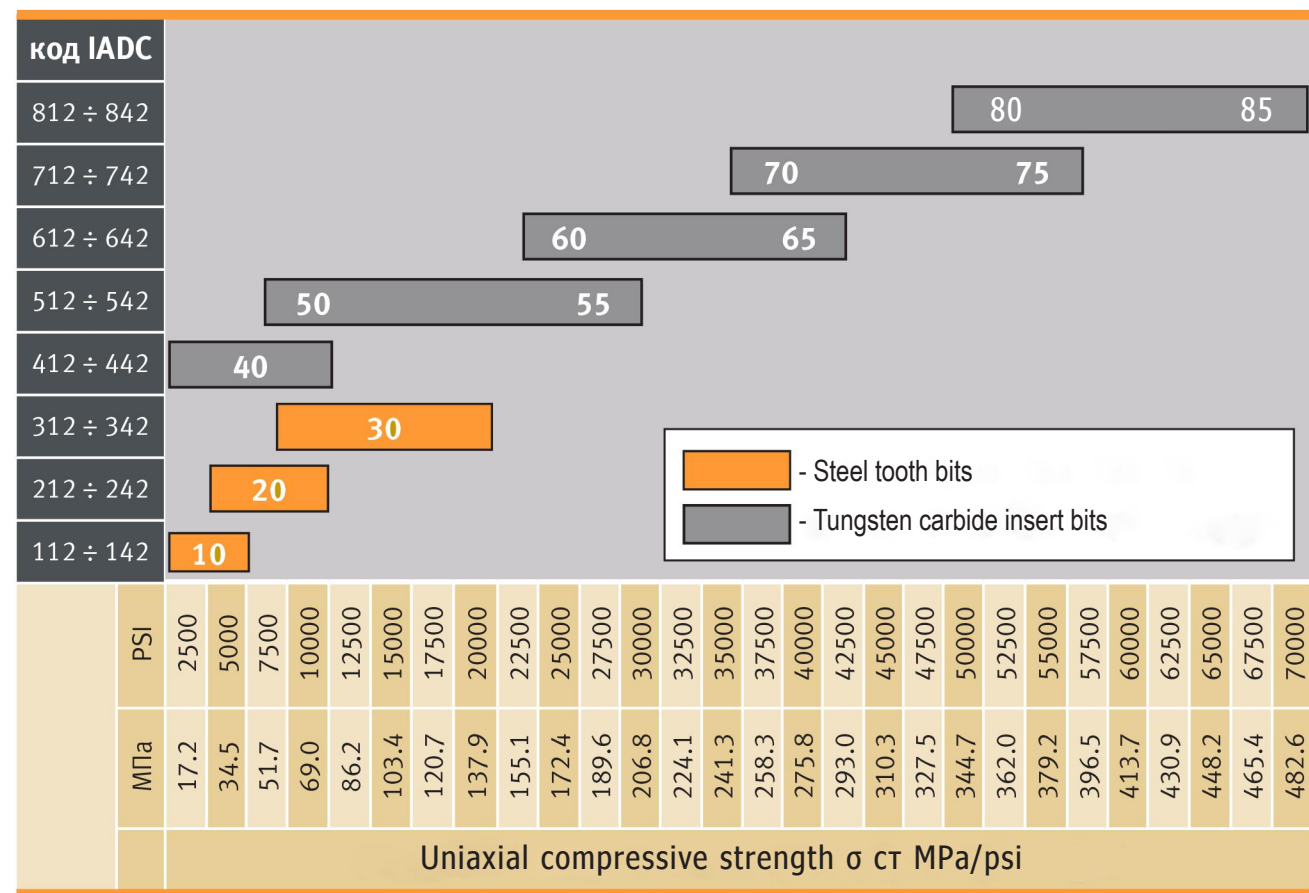
M	MC	MR
Drill bits with side air circulation	Drill bits with central air circulation	Drill bits with reverse circulation

## DRILL BIT DESIGNATION

250,8 M 70 T402			
Drill bit diameter, mm		Product line	Drill bit design number
		Type of cutting structure	

## PURPOSE OF USE OF THE DRILL BITS

Depending on IADC or uniaxial compressive strength



## Drill bits classification according to IADC

Series	Type	Description	Product line		
			M	MC	MR
Steel tooth bits	1	Soft formations with low strength		MC10	
	2	Medium and medium hard formations with high strength		MC20	
	3	Hard semi-abrasive formations		MC30	
Tungsten carbide insert bits	4	Soft abrasive low strength formations	M40		
	5	Soft and medium hard abrasive formations with low strength	M50	MC50	MR50
			M55	MC55	
	6	Medium hard abrasive formations with high strength	M60	MC60	MR60
			M65	MC65	
	7	Hard semi-abrasive and abrasive formations	M70	MC70	
			M75	MC75	
	8	Extra hard and abrasive formations	M80	MC85	



## M product line

Drill bits with side air circulation which are used for drilling from very soft to extra hard formations

### Modern design of the bearing

"M" line drill bits have modern bearings which are designed for high thrust and dynamic loads. The cooling channels system protects the bearings from overheating. The main elements of the bearings, roller elements and thrust bearings are made according to advanced technologies and of the materials which enable to enhance the strength of the drill bit in different drilling conditions. In order to protect the bearings from drilling sludge, protective filters are installed in the drill bits from 158,7mm in diameter and over and the additional return valve is installed in the drill bits from 200 mm in diameter and over.

### Improved cutting structure

The cutting structure of the drill bits manufactured by UniDrillTech is designed taking into account modern requirements to rock-destruction tools with air circulation. Using advanced technologies and software enables to manufacture high quality drill bits for drilling formations of different hardness from very soft to extra hard at high mechanical drilling speed.

### Optimal bottom-hole cleaning

In the drill bits of "M" line side bottom-hole cleaning system is used. The system of modern nozzles enables to obtain the necessary speed of output stream and achieve effective bottom-hole cleaning and extraction of drilling sludge from the bore hole. The drill bits with side bottom-hole cleaning are effective in most drilling conditions.

### Maximum protection of drill bit diameter

Enhanced protection of the cone gage and the leg with tungsten carbide inserts and special hard-facing material ensures high strength of the drill bits and protects from diameter loss in the drilling process.



## MC product line

Drill bits with central air circulation which are used for drilling from very soft to extra hard formations.

### Modern design of the bearing

"MC" line drill bits have modern bearings which are designed for high thrust and dynamic loads. The cooling channels system protects the bearings from overheating. The main elements of the bearings, roller elements and thrust bearings are made according to advanced technologies and of the materials which enable to enhance the strength of the drill bit in different drilling conditions. In order to protect the drill bits from drilling sludge, protective filters are installed in the drill bits from 158,7mm in diameter and over and the additional return valve is installed in the drill bits from 200 mm in diameter and over.

### Improved cutting structure

The cutting structure of the drill bits manufactured by UniDrillTech is designed taking into account modern requirements to rock-destruction tools with air circulation. Using advanced technologies and software enables to manufacture high quality drill bits for drilling formations of different hardness from very soft to extra hard at high mechanical drilling speed.

### Optimal bottom-hole cleaning

In the drill bits of "MC" line central bottom-hole cleaning system is used which enables to obtain the necessary speed of output stream and achieve effective bottom-hole cleaning and extraction of drilling sludge from the borehole. The drill bits with central bottom-hole cleaning are effective for drilling fractured formations.

### Maximum protection of drill bit diameter

Enhanced protection of the cone gage and the leg with tungsten carbide inserts and special hard-facing material ensures high strength of the drill bits and protects from diameter loss in the drilling process.

## MR product line

Drill bits with reverse circulation which are used for drilling a wide range of formations

### Modern design of the bearing

"MC" line drill bits have modern bearings which are designed for high thrust and dynamic loads.

### Improved cutting structure

The cutting structure of the drill bits manufactured by UniDrillTech is designed taking into account modern requirements to rock-destruction tools with air circulation. Using advanced technologies and software enables to manufacture high quality drill bits for drilling formations of different hardness from very soft to extra hard at high mechanical drilling speed.

### Optimal bottom-hole cleaning

In the drill bits of "MR" line the bottom-hole cleaning system with reverse air circulation is used. The central hole is of maximum possible diameter for the most effective bottom-hole cleaning and extraction of drilled solids.

### Maximum protection of drill bit diameter

Enhanced protection of the cone gage and the leg with tungsten carbide inserts and special hard-facing material ensures high strength of the drill bits and protects from diameter loss in the drilling process.



## LIST OF DRILL BITS

Drill bit diameter		Product lines			Connecting thread		Weight, kg
mm	inch	M	MC	MR	GOST	API	Kg/lbs
76,0	3		MC30		3-42	-	1,5/3,3
93,0	3 2/3		MC30		3-50		2,7/6
98,4	3 7/8		MC30		3-66 *	2 3/8 REG	3,7/8,2
114,3	4 1/2		MC50		3-66 *	2 3/8 REG	4,6/10,1
120,6	4 3/4		MC50 MC60		3-76 *	2 7/8 REG	5,5/12,1
130,2	5 1/8	M60	MC10 MC60	MR60	3-76 *	2 7/8 REG	6,4/14,1
133,4	5 1/4		MC50	MR50	3-76 *	2 7/8 REG	6,6/14,6
136,5	5 3/8		MC50	MR50	3-76 *	2 7/8 REG	7,1/15,7
139,7	5 1/2		MC50	MR50	3-76 *	2 7/8 REG	7,8/17,2
142,9	5 5/8	M65	MC50 MC60	MR50	3-88	3 1/2 REG	12,8/28,2
158,7	6 1/4	M50 M60	MC20		3-88	3 1/2 REG	18/39,7
171,4	6 3/4	M40 M50 M60 M65 M70	MC20		3-88	3 1/2 REG	19/41,9
187,3	7 3/8	M50			3-88	3 1/2 REG	22,8/50,3
200,0	7 7/8	M50 M60 M65 M70			3-117	4 1/2 REG	31/68,3
215,9	8 1/2	M10 M40 M60 M65	MC10 MC30 MC55 MC60 MC65 MC75 MC85		3-117*	4 1/2 REG	35/77,2
228,6	9	M40 M50 M60 M65			3-117	4 1/2 REG	40/88,2
244,5	9 5/8	M70 M75 M80 M85	MC30 MC70 MC80 MC85		3-121*	4 1/2 FH	50/110,5
250,8	9 7/8	M40 M50 M60 M65 M70 M75 M80	MC70 MC75 MC85		3-121* 3-152	4 1/2 FH 6 5/8 REG	55/121,2 62/136,6
258,0	10 3/16	M65			3-121*	4 1/2 FH	55/121,2
269,9	10 5/8	M40 M45 M50 M60 M65 M70			3-152	6 5/8 REG	71/156,5
311,1	12 1/4	M50 M60 M70 M75			3-152	6 5/8 REG	96/211,6
320,0	12 5/8	M30 M60	MC85		3-152	6 5/8 REG	100/220,4

\* – Short thread which meets the API Spec.7-2 requirements by all parameters except the length.

## LIST OF STANDARD NOZZLES

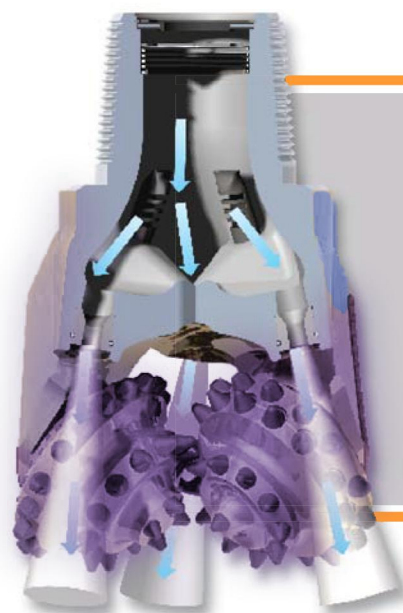
Drill bit diameter	Outlet diameter of the nozzles															
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22
130,2 – 154,2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
155,6 – 171,4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
187,3 – 228,6			*	*	*	*	*	*	*	*	*	*	*	*	*	*
244,5 – 320,0			*	*	*	*	*	*	*	*	*	*	*	*	*	*

## RECOMMENDED DRILLING CONDITIONS

Drill bit diameter		Rotation speed rpm	Cutting structure type											
mm	inch		10	20	30	40	50	55	60	65	70	75	80	85
			Load, kN											
76,0	3	115 - 60			3 - 6									
93,0	3 2/3	115 - 60			4 - 8									
98,4	3 7/8	115 - 60			4 - 8									
114,3	4 1/2	115 - 60					2 - 8							
120,6	4 3/4	115 - 60					2 - 8							
130,2	5 1/8	115 - 60	2 - 8						4 - 11					
133,4	5 1/4	115 - 60					2 - 9							
136,5	5 3/8	115 - 60					2 - 9							
139,7	5 1/2	115 - 60					2 - 9							
142,9	5 5/8	115 - 60					2 - 10		4 - 12	4 - 12				
158,7	6 1/4	115 - 60		5 - 12			2 - 11		5 - 13					
171,4	6 3/4	115 - 60		5 - 13		3 - 10	3 - 12		5 - 14	5 - 14	8 - 15			
187,3	7 3/8	115 - 60					3 - 13							
200	7 7/8	115 - 60					3 - 14		6 - 17	6 - 17	9 - 18			
215,9	8 1/2	115 - 60	3 - 13		10 - 18	3 - 13		3 - 15	6 - 18	6 - 18		10 - 19		11 - 22
228,6	9	115 - 60				3 - 14	3 - 15		7 - 19	7 - 19				
244,5	9 5/8	115 - 60			11 - 20						11 - 22	11 - 23	12 - 24	11 - 24
250,8	9 7/8	115 - 60				3 - 16	4 - 17		8 - 21	8 - 21	11 - 23	11 - 23		13 - 25
258,0	10 3/16	115 - 60								8 - 21		12 - 23		
269,9	10 5/8	115 - 60				4 - 16	4 - 18		8 - 22	8 - 22	12 - 24			
311,1	12 1/4	115 - 60					5 - 21		9 - 26		14 - 28	14 - 28		
320,0	12 5/8	115 - 60			14 - 26				10 - 26					13 - 27



## Bottom-hole cleaning



### Side air circulation

Side bottom-hole cleaning is used most often. In the body of the drill bit three side holes are made into which replaceable nozzles are installed with the help of which pressure of the drill bit can be adjusted depending on the performance and the pressure of the compressor. The system

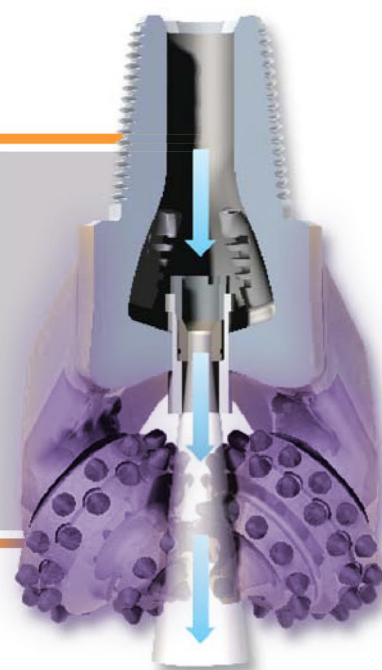
of channels is also provided in the legs to supply part of the blowing agent to the cavities of the bearings for cooling rolling elements and contact surfaces and to protect them from small drill solids (dust).

### Central air circulation

Central bottom-hole cleaning is used in the drill bits of small diameter. In the body of the drill bit the central hole is provided, the nozzle and the same channels system in the legs as in the side bottom-hole cleaning to supply part of the blowing agent to the cavities of the

bearings for cooling rolling elements and contact surfaces and to protect them from small drill solids (dust).

This type of bottom-hole cleaning is most effective for drilling fractured formations.



### Reverse circulation

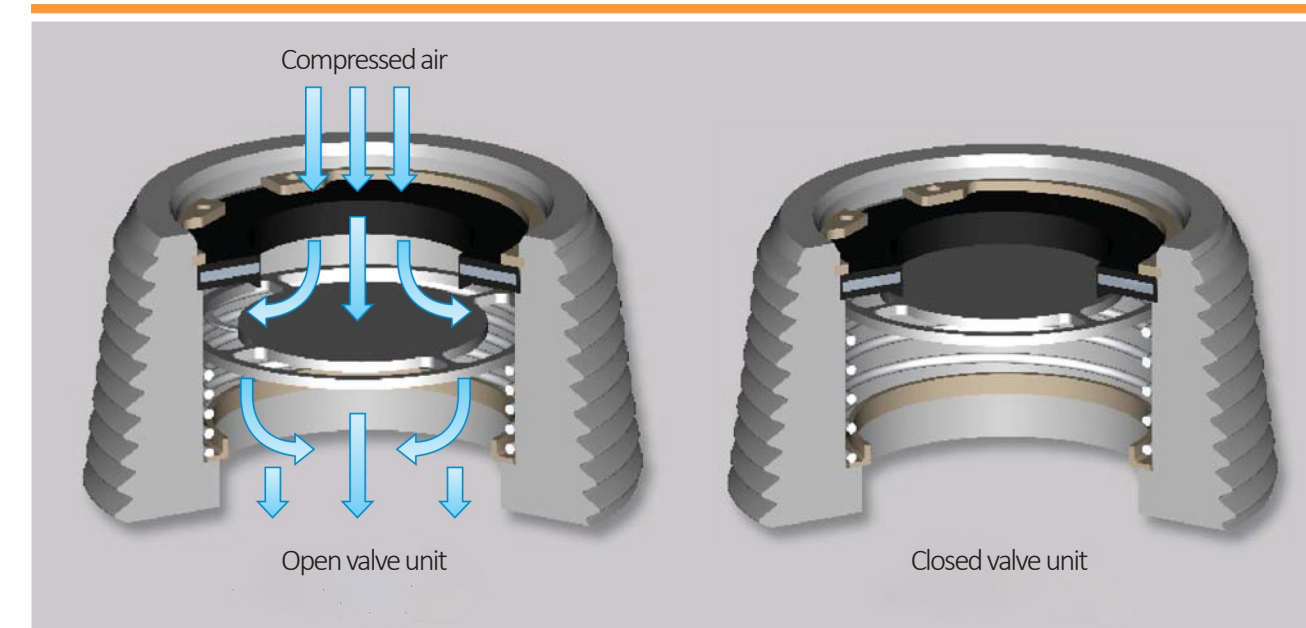
Reverse bottom-hole cleaning is used to ensure high efficiency in drilling a wide range of formations which are usually occurred in exploration of mineral resources. The central hole is

of maximum possible diameter for the most effective bottom-hole cleaning and extraction of drilled solids

## Bearing protection from drilling sludge

The return valve is installed in the drill bits in order to prevent drill solids from getting into the bearings of the cones through the air circulation channels. The design of the return valve enables to close immediately the central air circulation

channel in the pin of the drill bit after stopping the supply of the air and at the same time it prevents the water and drill solids from being absorbed into the cavity of the body of the drill bit over the inlet of the air circulation channels of the legs.



## Shirttail and leg protection

The enhanced strength of the drill bits depends to a great extent on the reliable protection of the shirttails and legs.





## COMPARISON TABLE OF CUTTING STRUCTURE TYPES

UDT	IADC	GOST	Rock formations
10	112 122 132 142	M	Argillaceous dense aleurolite, anthracite, medium density claystone, dense gypsum, soft dolomites, serpentinite with asbestos inclusions, talcose serpentinite, soft limestone, aggregation of soft sedimentary formations based on limestone cement rock, carnallite, marl, ochreous shale with clay streaks, bone coal, carbonaceous- argillaceous coal.
20	212 222 232 242	C	Soft, medium soft formations with low break-down point such as medium sandstone and medium hard shale, anhydrides and limestones.
30	312 322 332 342	T	Albitophyres, dense beresites, vesicular basalts, dolomites, fine-grained limestone, dolomite limestone, very dense limestone, quartz shales, small-grained siderites and liparites, gaizes, micaceous pegmatites, porphyritic tuffs, albitophires tuff breccia, tuff sandstones, phyllites, dense phosphorites.
40	412 422 432 442	M3	Soft, low or semi-abrasive formations with low break-down point such as sandstone, shales and uncompacted coal streak.
50	512 522	MC3	Soft, soft semi-abrasive formations with medium low break-down point such as sandstone and shales, medium soft slice copper formation and coal veins. Pyrite, shell, quartz-sericite shale, soft sand shale, salt rock, thin – grained silica clay, marl, breccia, limonite, hard coal.
55	532 542	C3	Soft abrasive formations with medium low and medium break-down point, aleurolite, soft limestone, alluvial formations. Interbedding of dense clays, bedded clays, sometimes claystone – like, sandy to a different extent, limestone, very often gypsum with inclusions of gypsum and anhydride, from fine-grained to hard-grained sandstones, quartz, micaceous, limestone, micaceous argillite, sometimes siliceous, quartz aleurolite, sandstones, micaceous, limestone. Streaks of aggregation, clay shales, hornstones, marls, tuffite.
60	612 622	T3	Soft and hard hematites, black iron oxides, hard copper, abrasive, golden and hard grew coal, specular hematite with carbonites and silicates, hard copper porphyry, asbestos, quartzite, sandstone, crystalline schists, gneiss, soft granites, soft iron ores. Quartz albitophires, apatite, quartz beresite, large and medium grain diabase, gabro, hard diorites, medium grain dunites, quartz limestone, medium grain whole sandstones, siliceous siderite, peridotites, siliceous serpentinite, whole beresites, habro amphibolites, large and medium grain gneisses, quartz dolomites, quartzrock with sulphides, quartz magnesite, micaceous pegmatite, pyroxenites, medium grain porphyrite, titanium magnetite formation, siliceous phosphates.
65	632 642	TK3	Hard abrasive formation with ruptures and high compression strength – siliceous schist, flint, quartz rocks and granite. Quartz albitophires, andesites and dense basalts, diabase and dense habro, large and medium grain granites, quartzrocks, quartz sandstones, porphirites and dense hornstones, silicic scarns, jasper. The drill bit drills at high loads and medium rotations.
70	712 722	K	Hard abrasive formations with fractures and high compression strength – silicic shale, flint, quartzites and granites. Quartz albitophyres, andesites and dense basalts, diabase and dense gabro, large and medium grain granites, quartzites, quartz sandstones, porphyrites and dense hornstones, silicic scarns, jasper. and medium rotations.
75	732 742		
80	812 822	OK	Extra hard massive formations with elastic properties – iron ores and quartz sands, flow andesites, quartzites, flint, flow micro quartzites, magnetite and hornlike hornstones, hornstones, magnetite scarns, titaniferous magnetite flow formations, flow jaspers. The drill bit drills at high loads and low rotations.
85	832 842		

## RECOMMENDATIONS TO ACHIEVE HIGH PERFORMANCE RESULTS IN THE PROCESS OF DRILLING

Following our recommendations will enable you to obtain high performance results of the drill bits.

### Before you start drilling

1. Check the condition of the thread of the machine spindle. If the condition of the thread is unsatisfactory, the spindle must be replaced.
2. Check the condition of the drill stems. Avoid using curved drill stems or the stems with worn thread.
3. Check the condition of the inserts. Avoid using worn inserts.
4. Check working capacity of the compressor by the values of the manometer in comparison with the passport values. If necessary, adjust the position of the flap.
5. Check the condition of the air hoses and hoses for leakages in the system.
6. Check the condition of the control and measuring devices. Replace the devices which are out of order.
7. Check the condition of the lifting jacks. Avoid losing the horizontal position of the drilling machine in the process of drilling.
8. Check the package of the drill bit, availability of special labels of the manufacturer and the certificates.
9. Check the condition and the completion of the drill bit: reliability of fixation, correct operation of the return valve, the availability of the nozzles and their diameter, the condition of the connecting thread.
10. Do not change the construction of the drill bit by burning out or welding on additional components or by removing the return valve and the nozzles from the drill bit.
11. Blow through the drilling machine before screwing the drill bit.
12. Screw the drill bits without impacts and skews.
13. Adjust pressure in the drill bit not less than 0.2 mPa by selecting the nozzles.

### In the process of drilling

1. Fill in the chart "Drilling Report" for every drill bit.
2. Begin operation of a new drill bit within 15 minutes at the rotational speed of the drilling machine of 30 rpm and at the load not over than 10% of the upper limit recommended by the certificate of the drill bit. Begin operation of the new drill bit in one borehole (except the boreholes in the first row) with the compressor turned on.
3. Adjust slowly the modes recommended by the certificate of the drill bit. Avoid exceeding load values on the drill bit and the values of rotational speed of the spindle recommended by the certificate.
  - 3.1. If in the process of gradual increasing of the drill bit load the mechanical speed does not increase or it decreases, then the load must be reduced to the previous level at which maximum mechanical drilling speed is obtained.
  - 3.2. In case vibrations of the drilling machine appear, the rotational speed or the load of the drill bit must be reduced to the level at which the vibrations disappear.
4. Optimal drilling modes are to be defined only by testing. The deciding factor is the maximum drilling speed.
5. Drilling is to be carried out only with the compressor turned on.
6. Do not load the drill bit without rotations.
7. Avoid drilling with the drill bit which cones do not rotate or are slided.
8. Avoid drilling with the drill bit which air circulation ports are clogged.
9. Do not finish the old borehole with a new drill bit. It may cause chipping of the shirrtail and the inserts in the heel rows or jam the cones.

10. Drill bits with the central air circulation are used for drilling boreholes in fractured or sloughing rocks.

11. Do not carry out tripping operations or borehole reaming without rotating of the drilling assembly or when the compressor is turned off.

12. Do not use new or trial drill bits for cleaning backfilled boreholes. Use only worn or used drill bits for this purpose.

13. Emergency shutdown of the drilling operation and leaving the drill bit in the borehole bottom when the compressor is turned off may cause sliming of the bearing of the drill bit and jamming of the cones. To prevent premature failure of the drill bit the following controlling measures are to be taken:

13.1. Lift the drill bit 1.5-2 meters over the borehole bottom without rotating, turn on the compressor and blow through the drill bit. Control increase of pressure in the air line of the machine with the help of the manometer.

13.2. Lift up the drill bit from the borehole and deslime it. Make control rotations of the cones by hand, turn on the compressor and control visually the air outlet from under the cones.

13.3. Drilling may be proceeded if the results of the controlling measures do not cause doubt of the drilling machine operator.

13.4. If the results of the controlling measures do not satisfy the drilling machine operator, the drill bit is to be removed for repair and renovation in the drill bits preparation area.

14. The drill bit is to be flushed, deslimed and checked visually before drilling a new borehole. The cones must rotate freely by hand.

15. The drill bits remain in operation until they get visible signs of failure:

- jamming of the bearing of at least one cone.
  - big gap which causes cone rotation jamming or cone meshing.
  - falling out of rolling elements of the bearing of at least one cone.
  - meshing of the cones between each other.
  - severe wear of the cutting structure of the cones.
  - damage wear of the drill bit (bearing pin breakage, cracks on welded seams, cones splitting etc).
- Chipping and falling out of part of tungsten carbide inserts can not be the cause to stop using the drill bit.

### After finishing the drilling process

1. Worn out drill bits which will probably be used in repair operations for drilling unfinished boreholes or for cleaning of backfilled boreholes are to be flushed and deslimed. The bearings and the connecting thread are to be lubricated.

2. Worn out drill bits which are to be utilized must be:

2.1. Examined by the operator of the drilling machine and recorded in the drill bits register and chart "Worn out drill bit report".

2.2. Dismantled into good return valves and nozzles which can be used for stock on the drill rig.

3. The sheets "Drilling report" and "Worn out drill bit report" are forwarded to the engineer who keeps records of the drill bits for analyzing "Statistics data of worn out drill bits".

4. The results of the analysis of the statistics data of worn out drill bits containing the information of drilled meters, operation life in hours and mechanical drilling speed are recommended to be sent to the address of the manufacturer.



## MEASURE UNITS CONVERSION TABLE

Length units		mm	m	inch	foot
mm	1 mm	1	0,001	0,03937	0,003281
m	1 m	1000	1	39,3701	3,2808
inch (in)	1 inch	25,4	0,0254	1	0,08333
foot (ft)	1 foot	304,8	0,3048	12	1

Weight units		kg	t	lb
kg	1 kg	1	1000	2,2046
t	1 t	1000	1	2204,6
lb	1 lb	0,45359	4,5359*10 <sup>-4</sup>	1

Pressure units		bar	atm	MPa	Kg/cm2	Psi (lb/in2)
bar	1 bar	1	0,98692	0,1	1,01972	14,504
atm	1 atm	1,01325	1	0,10132	1,03323	14,696
MPa	1 MPa	10	9,8692	1	10,197	145,0377
kg/cm <sup>2</sup>	1 kg/cm2	0,98067	0,96784	0,9806	1	14,2233
psi (lb/in <sup>2</sup> )	1 psi (lb/in2)	0,06895	0,06805	6,89*10 <sup>-3</sup>	0,07031	1

Units of volume		l	m3	cf
l	1 l	1	0,001	0,03531
m <sup>3</sup>	1 m <sup>3</sup>	1000	1	35,3146
cf (ft <sup>3</sup> )	1 cf (ft 3)	28,3168	0,02831	1

Time units (efficiency)		l/m	m3/min	cfm
l/min	1 l/m	1	0,001	0,03531
m <sup>3</sup> /min	1 m3/min	1000	1	35,3146
cfm (ft <sup>3</sup> /min)	1 cfm (ft3/min)	28,3168	0,02831	1

Speed units		m/s	km/h	m/h	ft/min
m/s	1 m/s	1	3,6	3600	196,85
km/h	1 km/h	0,2778	1	1000	54,68
m/h	1 m/h	2,778*10 <sup>-4</sup>	0,001	1	0,05468
ft/min	1 ft/min	0,00508	0,01828	18,2879	1







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