

# Raise Bore Equipment I



**MICON**

Mining and Construction  
Products GmbH & Co. KG

090a MI-RBE-10/04



## About MICON GmbH & Co. KG

The **MICON GmbH & Co. KG** is resident with their subsidiary, Eastman Whipstock GmbH, in Nienhagen close to Celle / Germany.

The spheres of activity of the enterprises extend over the special fields of service and supply for the mining, tunneling and geothermal drilling industries. In these fields MICON is engineering, manufacturing, selling and renting the following products:

- Full hole and core drilling bits from 25.4mm to 445mm
- Conventional and heavy duty wire line coring systems for up to 5000m borehole length
- Stabilizer from 47.6mm to 445mm
- Non magnetic BHA
- Casings and BOP for the mining drilling
- Borehole survey tools
- MWD Systems
- Target Drilling Systems (RVDS)
- API Drill Pipes and Collars
- Raise Bore BHA
- Rental equipment (Surface and Down hole)
- Directional Drilling Services
- Target Drilling Services
- Operator Training
- Special engineering, developing, prototyping and manufacturing



The MICON GmbH & Co. KG Company has more than 10 years experience in the drilling service and supply industries. Since "Christensen Mining Europe" becomes part of the MICON GmbH & Co. KG mainly the mining drilling market is focussed.



# Raise Boring - Overview Pilot String

For the conventional pilot hole drilling and afterwards reaming operation in the raise boring industries MICON GmbH & Co. KG provides various services and equipment.

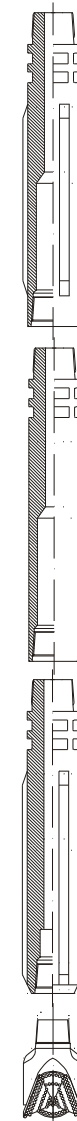
The directional and target drilling devices as Steering Tools, Measurement While Drilling Tools (MWD) and Rotary Vertical Drilling Systems (RVDS) are available for pilot hole diameters from 3 ¾" up to 26". Depending on the required accuracy for the pilot hole MICON works out proposals for the needed drilling devices and surface set up.

For all MICON equipment an operator training is offered before each project to enable the clients to work the systems on their own.

MICON engineers and manufactures all kind of necessary bottom hole assembly (BHA) for the conventional and directional pilot hole drilling operation. Also for the afterwards shaft raising or intermediate hole opening procedures MICON provides the necessary devices and equipment. Equipment for special purposes is available also for rent.

Standard raise bore equipment as rods, stabilizers, pilot stabilizers, flex joints, cross over, shock absorber and roller reamer is available within remarkable short delivery times for the most common drill string diameters of 8", 10", 11 ¼" and 12 7/8" in the MICON standard materials of 4145H for the small and 4330mod for the heavy duty assembly. Rental shock absorber and roller reamer as well as the most common stabilizer sizes are available ex-stock for rent.

Special equipment for the raise boring is developed, engineered, prototyped and manufactured on request. Together with the University of Clausthal and the University of Freiberg the MICON GmbH & Co. KG is performing also developments of new designs of BHA for the drilling industries as well as for the raise boring industries. For component, material and functional analysis testing benches are provided in corporation with both Universities.



Drill stabilizer

Raise bore rods

Bit stabilizer / reamer stabilizer

Roller bit

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Mining and Construction  
Products GmbH & Co. KG



## Technical information

**Technical specification for raw material raise bore rods: 8", 10", 11 1/4"**  
Material: AISI 4145 H, Mechanical Properties

Property	Symbol	Dimension	Raw material diameter 200 mm to 350mm
<b>Yield strength</b>	R <sub>p0.2</sub>	N/mm <sup>2</sup>	≥ <u>760</u>
<b>Tensile strength</b>	R <sub>m</sub>	N/mm <sup>2</sup>	1010-1150 <sup>5)</sup>
<b>Elongation after fracture (Lo 0 4x do)</b>	A4	%	≥=15
<b>Reduction of area</b>	Z	%	≥=45
<b>Notch impact strength Charpy V-Notch</b>	A	J	≥=48 <sup>4)</sup>
<b>Hardness on specified testing diameter</b>		HB	295-342
<b>Hardness on the circumferential surf.</b>		HB	≥=295

4) this value is the minimum value for each specimen tested

5) correlates to 147,207psi min. tensile strength  
167,612 psi max. tensile strength

# Technical information

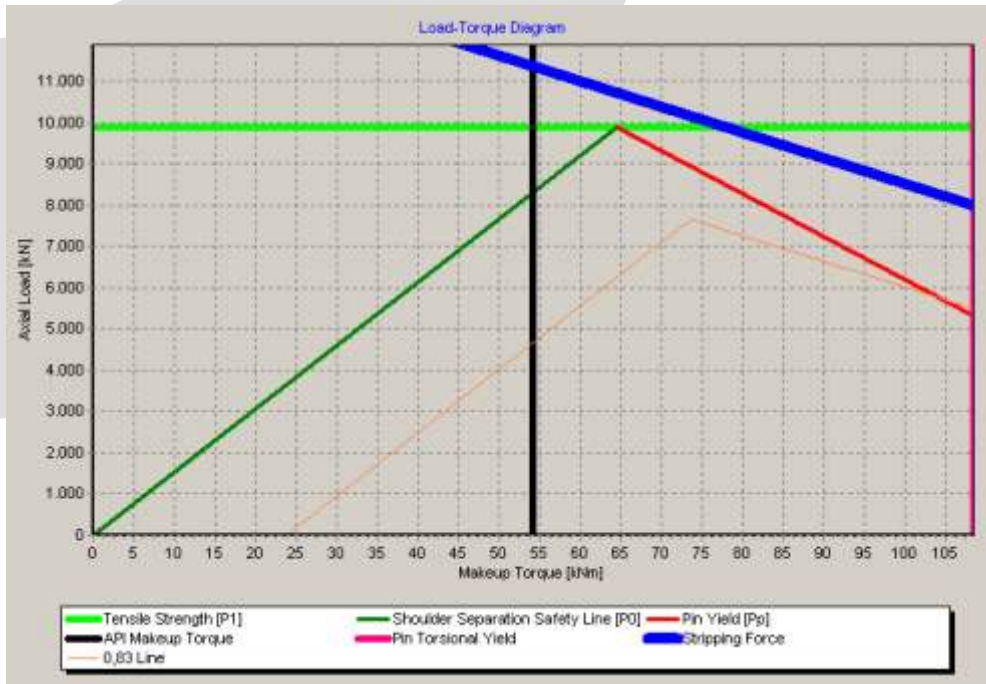
**Technical specification for high strength raw material: Raise Bore Rods: 8", 10", 11 1/4", 12 7/8"**  
 High strength material: AISI 4330mod, Mechanical Properties

Property	Symbol	Dimension	Raw material diameter 200 mm to 350mm
Yield strength	R <sub>p0.2</sub>	N/mm <sup>2</sup>	≥1050
Tensile strength	R <sub>m</sub>	N/mm <sup>2</sup>	1040-1230 <sup>5)</sup>
Elongation after fracture (Lo 0 4x do)	A4	%	≥15
Reduction of area	Z	%	≥45
Notch impact strength Charpy V-Notch	A	J	≥48 <sup>4)</sup>
Hardness on specified testing diameter		HB	305-360
Hardness on the circumferential surf.		HB	≥305

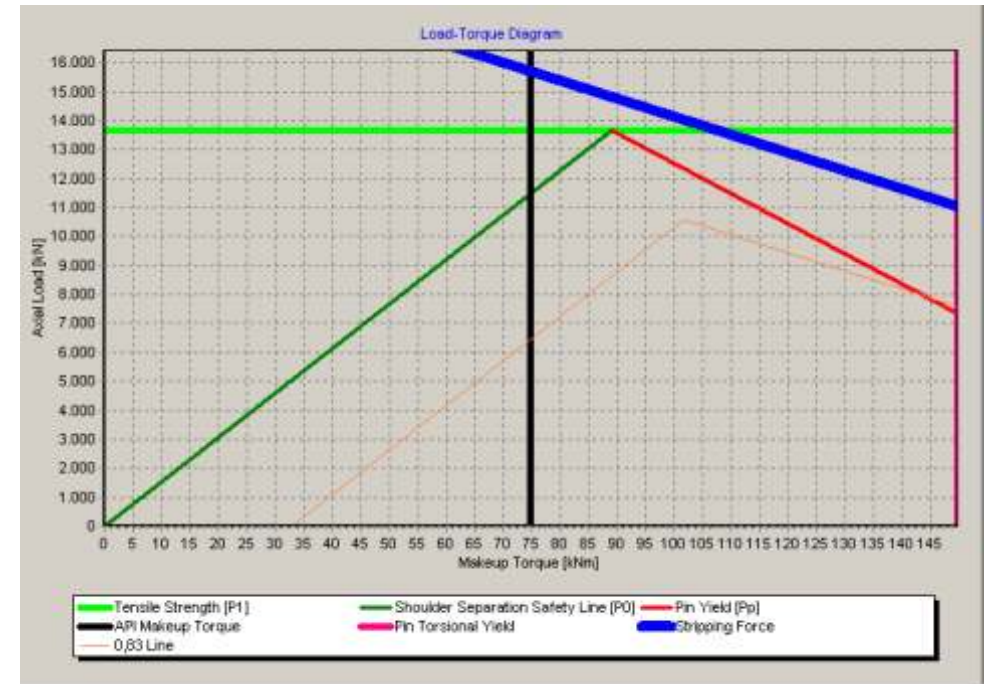
4) this value is the minimum value for each specimen tested, typical values should exceed 70 Joule

5) correlates to 152,300 psi min. tensile strength  
 178,400 psi max. tensile strength

## Torque / Tension diagram Safety Factor

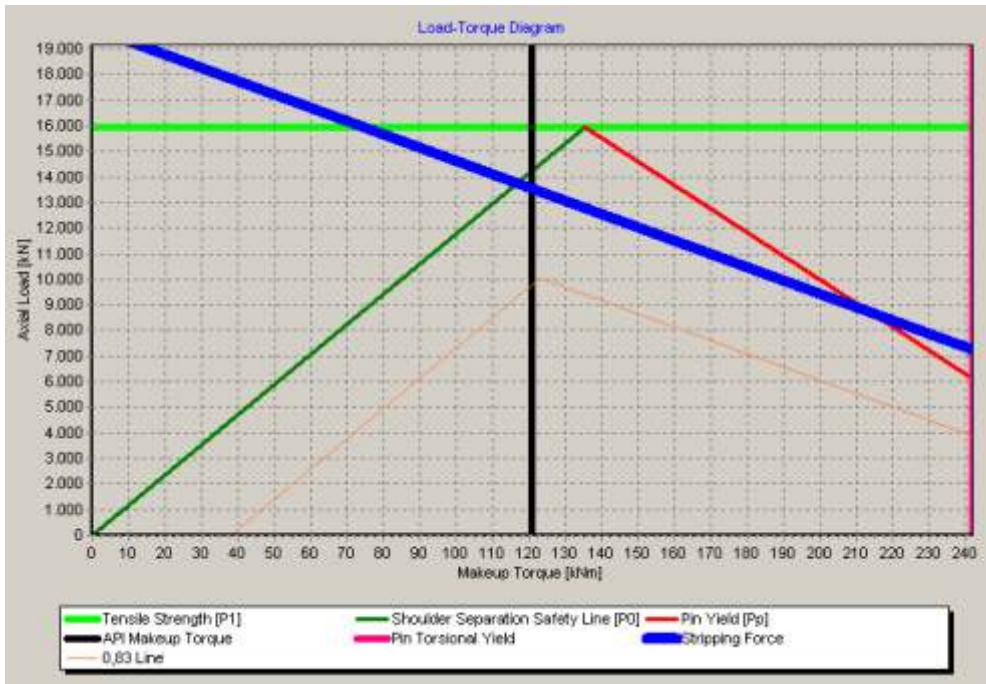


6.3/4" DI22  
 AISI 4145 H, Re = 760 N/mm<sup>2</sup>  
 Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 7.700 kN.

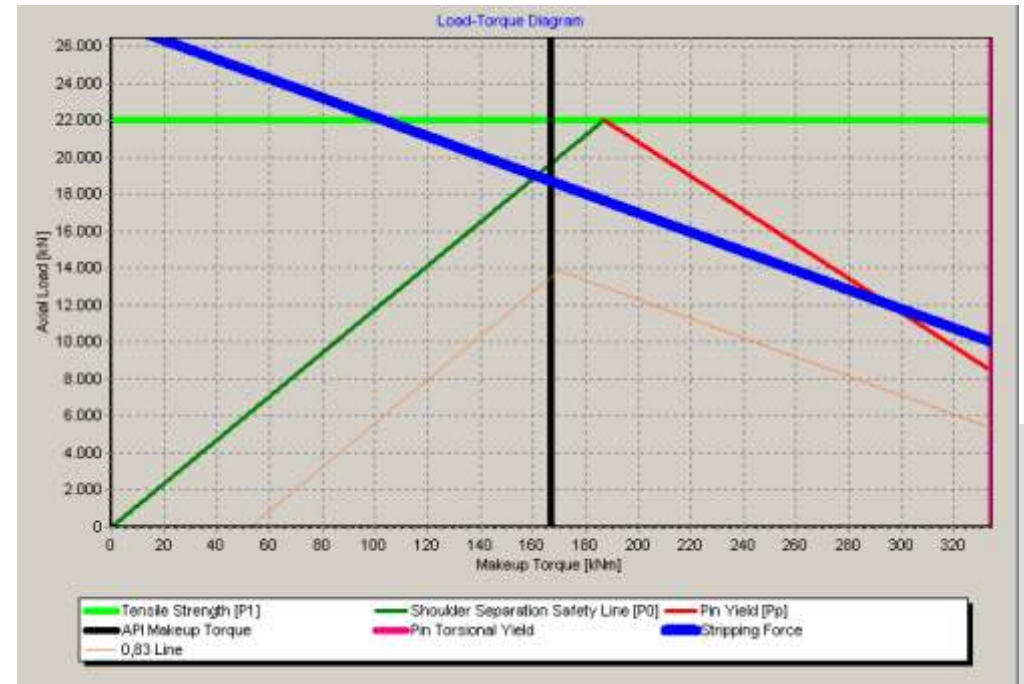


AISI 4330 mod, Re = 1050 N/mm<sup>2</sup>  
 Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 10.600 kN.

# Torque / Tension diagram Safety Factor

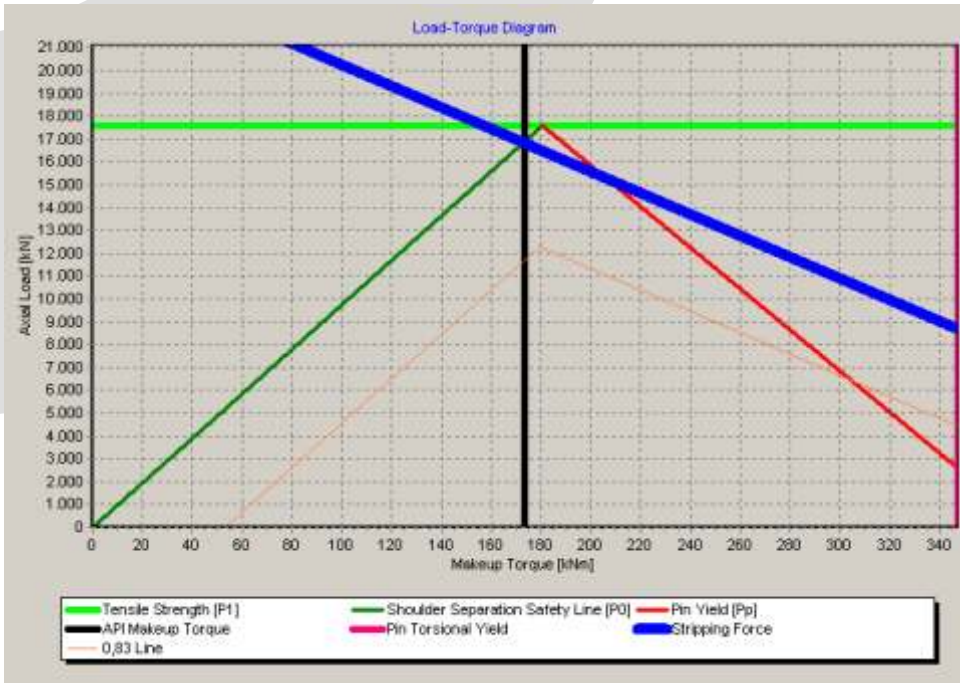


8.1/4" DI22  
AISI 4145 H, Re = 760 N/mm<sup>2</sup>  
Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 10.000 kN

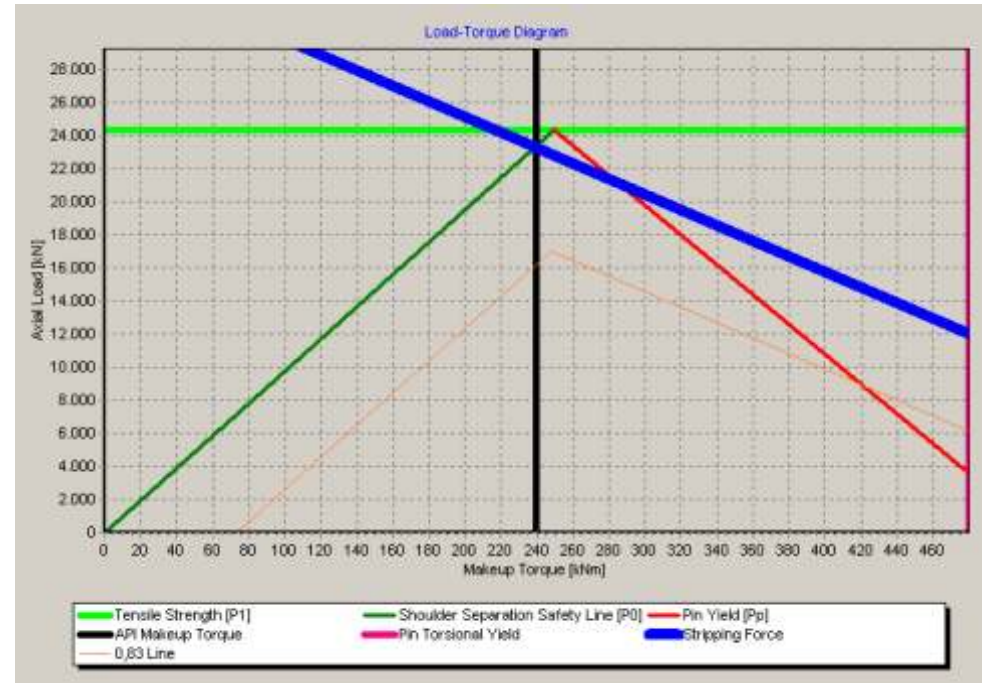


8.1/4" DI22  
AISI 4330 mod, Re = 1050 N/mm<sup>2</sup>  
Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 13.900 kN.

## Torque / Tension diagram Safety Factor

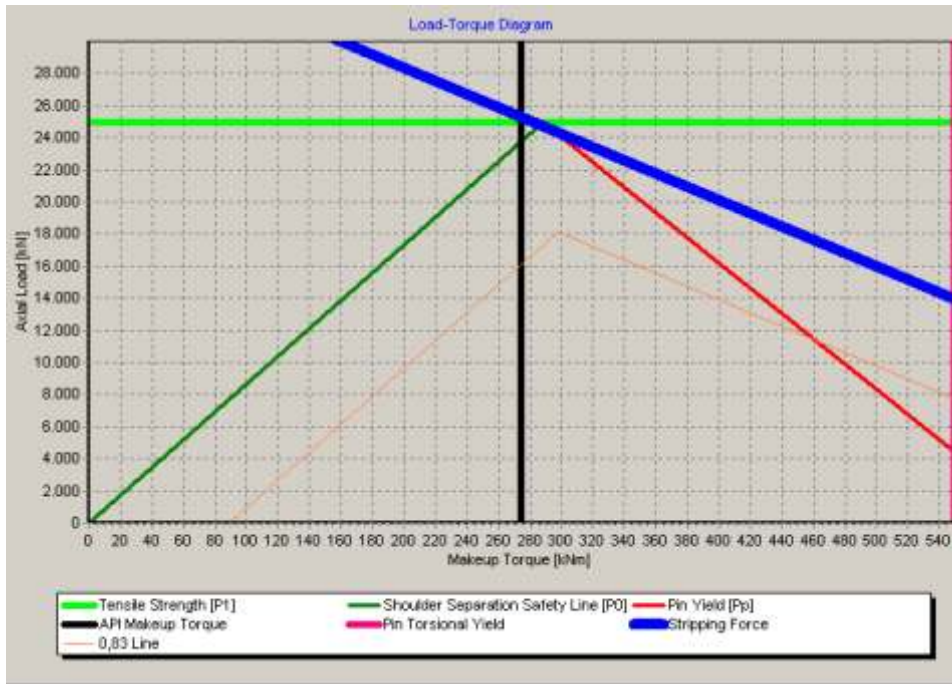


9.1/4" DI22  
 AISI 4145 H, Re = 760 N/mm<sup>2</sup>  
 Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 12.200 kN.

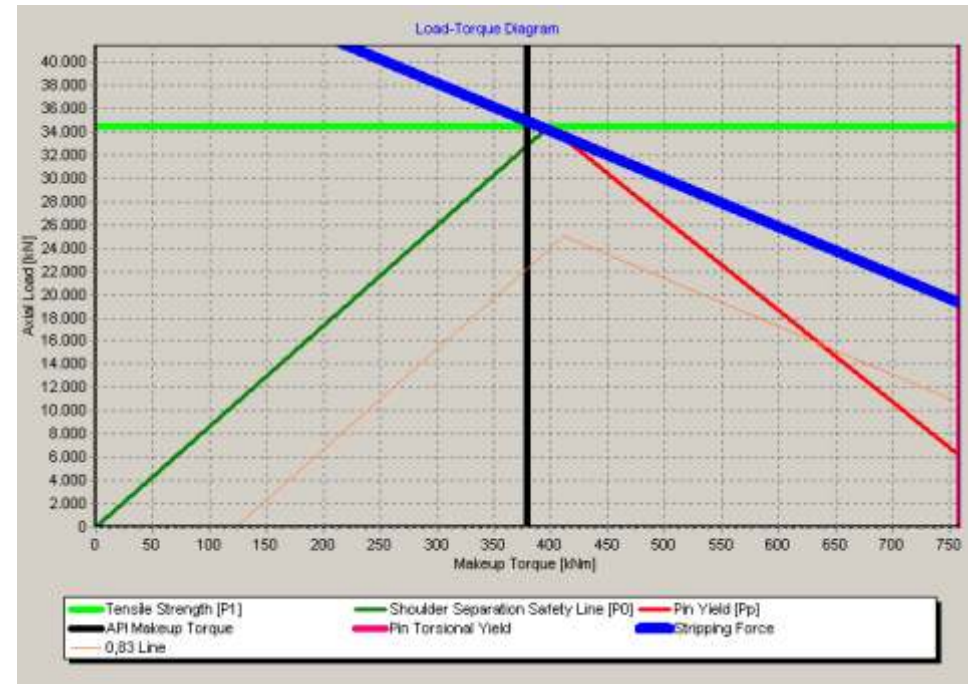


9.1/4" DI22  
 AISI 4330 mod, Re = 1050 N/mm<sup>2</sup>  
 Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 16.800 kN.

# Torque / Tension diagram Safety Factor

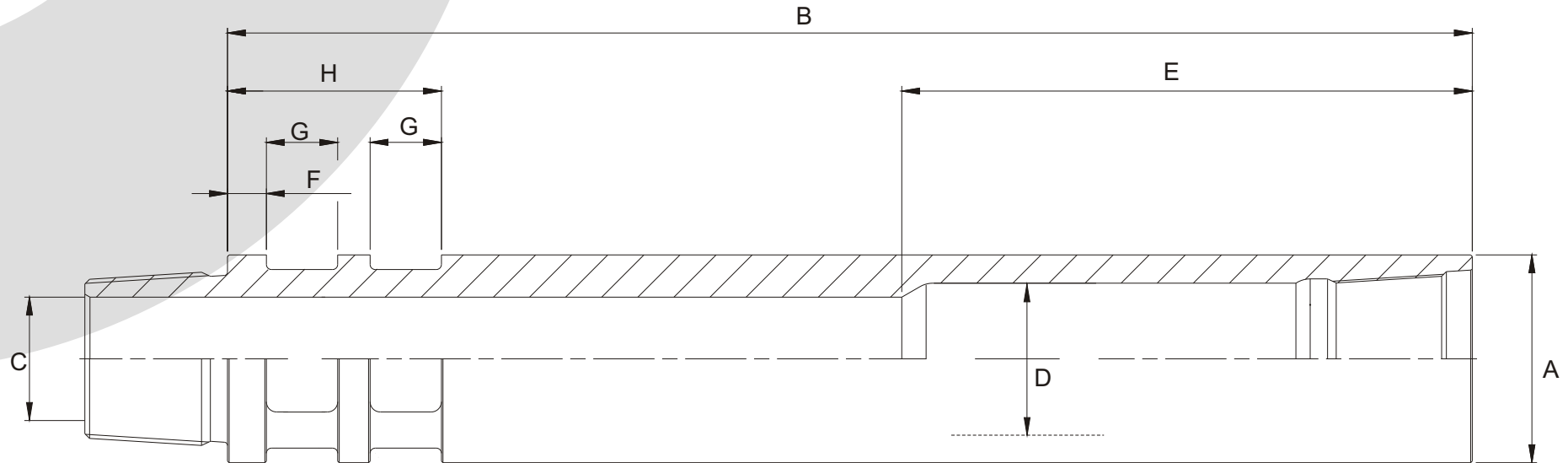


10.1/2" DI22  
AISI 4145 H, Re = 760 N/mm<sup>2</sup>  
Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 18.000 kN.



10.1/2" DI22  
AISI 4330 mod, Re = 1050 N/mm<sup>2</sup>  
Safe Working Zone: = 1,2 against shoulder separation and Thread stripping according to maximum Makeup Torque (0,83 Line). Maximum Tension 25.000 kN.

## Raise Boring Drill Pipe Integral Types

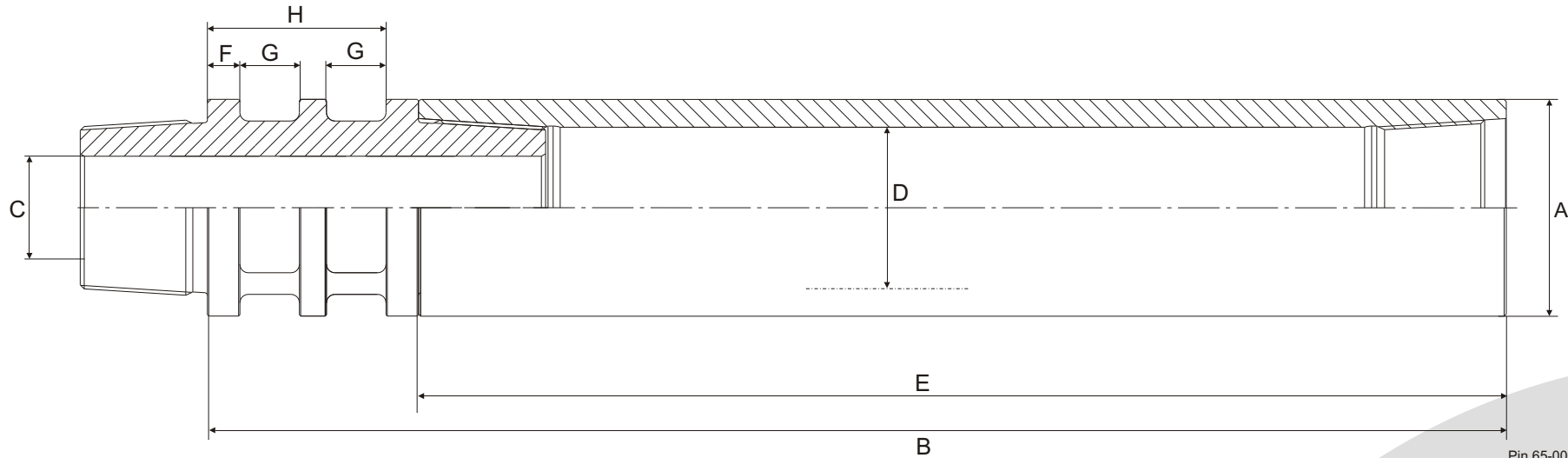


65-000013  
Deviation of the illustration to the material construction unit possible.

Nominal size		Shoulder to shoulder length		Small bore diam.		Diam. of boreback		Length of boreback		Shoulder to first spanner flat		Width of spanner flat		Shoulder to end of spanner flats		Dimension across spanner flat		Connections*	Weight
A		B		C		D		E		F		G		H					
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		kg
8"	203,2	48"	1219,2	4 3/4"	120,7	6 5/32"	156,4	22"	558,8	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 7/8"	174,6	6 3/4" R.B.-DI22	170
10"	254	60"	1524	4 3/4"	120,7	7 7/16"	188,9	36"	914,4	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8"	203,2	8 1/4" R.B.-DI22	345
11 1/4"	286,8	60"	1524	4 3/4"	120,7	7 11/16"	195,3	36"	914,4	1 1/2"	38,1	3 1/2"	88,9	10"	254	9"	228	9 1/4" R.B.-DI22	480
12 7/8"	323,9	60"	1524	5 7/16"	138,1	9"	228,6	36"	914,4	1 9/16"	39,7	3 15/16"	100	11"	279	10 1/2"	266,7	10 1/2" R.B.-DI22	640
12 7/8"	323,9	120"	3048	5 7/16"	138,1	9"	228,6	96"	2438,4	1 9/16"	39,7	3 15/16"	100	11"	279	10 1/2"	266,7	10 1/2" R.B.-DI22	1270

\* other threads on request

# Raise Boring Drill Pipe Double Pin Types



Pin 65-000052  
Box 65-000053

Deviation of the illustration to the material construction unit possible.

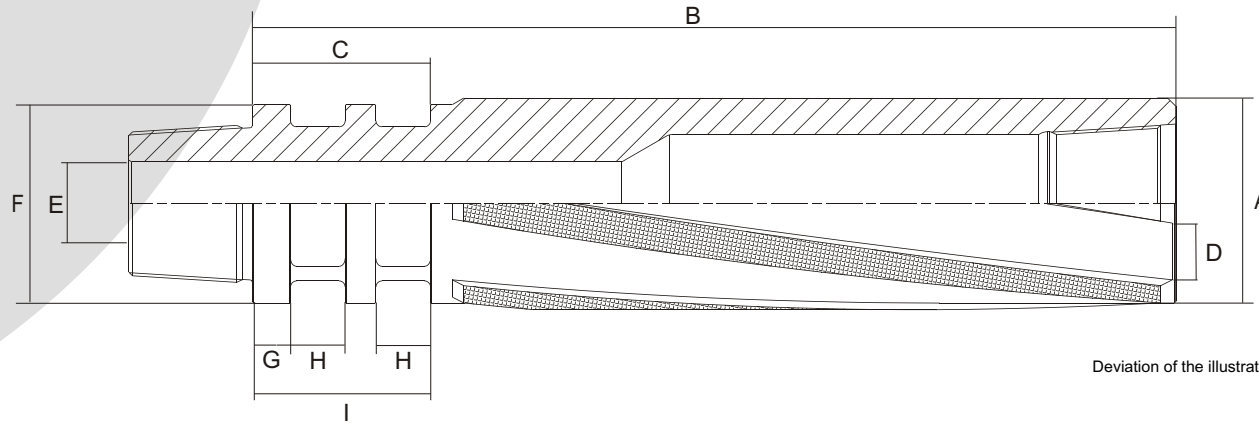
Nominal size		Shoulder to shoulder length		Thro bore dia.		Inside dia. of tube		Length of tube		Shoulder to first spanner flat		Width of spanner flat		Shoulder to end of spanner flats		Dimension across spanner flat		Connections *	Weight
A		B		C		D		E		F		G		H					
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		kg
8"	203,2	48"	1219,2	4 3/4"	120,7	6 5/32"	156,4	39 1/2"	1003,3	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 7/8"	174,6	6 3/4" R.B.-D122	175
10"	254	60"	1524	4 3/4"	120,7	7 1/16"	179,4	50 1/4"	1276,4	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8"	203,2	8 1/4" R.B.-D122	352
11 1/4"	285,8	60"	1524	4 3/4"	120,7	7 11/16"	195,3	48 7/16"	1230,3	1 1/2"	38,1	3 1/2"	88,9	10"	254	9"	228,6	9 1/4" R.B.-D122	465

\* other threads on request

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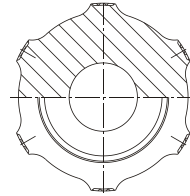


## Raise Boring Stabilizer Straight Ribs "Tungsten carbide hardfacing"



65-000047

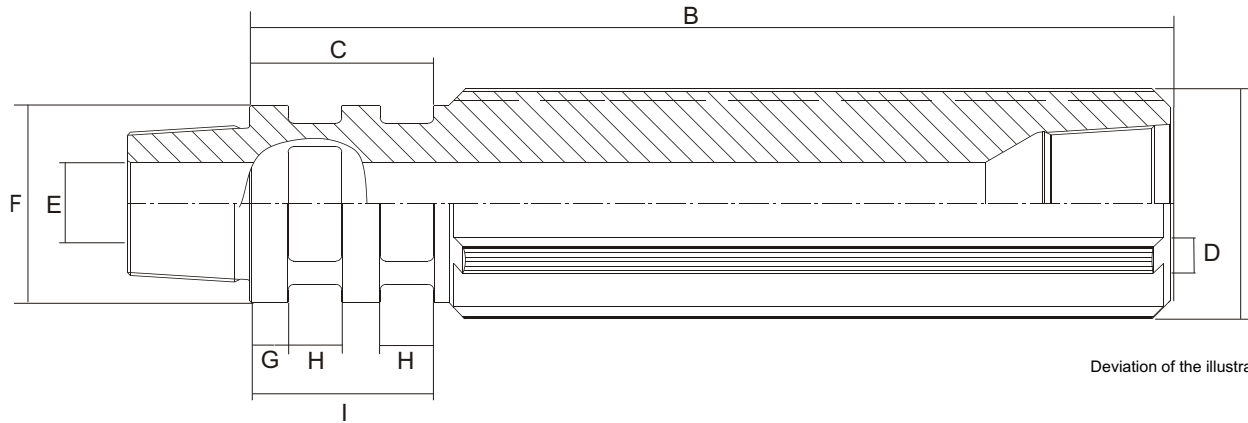
Deviation of the illustration to the material construction unit possible.



Nominal size		Shoulder to shoulder length		Shoulder to start of ribs		Rib width		Bore diam.		No. of ribs	Body diam.		Shoulder to first flat		Width of spanner flat		Shoulder to end of spanner flats		Connections*	Approx. weight
A		B		C		D		E			F		G		H		I			
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm		kg
6 3/4"	171,5	48"	1219,2	9 1/4"	235	1 3/8"	35	2 13/16"	71,4	4	5 3/4"	146,1	1"	25,5	2"	51	7"	177,8	4 3/4" R.B.-DI22	165
7 7/8"	200	48"	1219,2	9 1/4"	235	1 3/8"	35	2 13/16"	71,4	4	6 3/4"	171,5	1"	25,5	2"	51	7"	177,8	5 3/4" R.B.-DI22	202
9"	228	48"	1219,2	10 1/2"	266,7	1 3/8"	35	3"	76,2	6	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	280
9 7/8"	250,8	48"	1219,2	10 1/2"	266,7	1 3/8"	35	3"	76,2	6	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	320
11"	279,4	60"	1524	11"	279,4	1 3/8"	35	4 3/4"	120,7	6	10"	254	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8 1/4" R.B.-DI22	485
12 1/4"	311,2	60"	1524	13 5/8"	346,1	2 1/4"	57,2	4 3/4"	120,7	6	11 1/4"	286,8	1 1/2"	38,1	3 1/2"	88,9	10"	254	9 1/4" R.B.-DI22	750
13 3/4"	349,3	60"	1524	13 3/4"	349,3	2 1/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	864
15"	381	60"	1524	13 3/4"	349,3	2 5/8"	66,7	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	1050

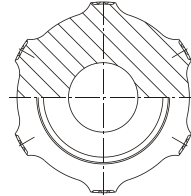
\* other threads on request

# Raise Boring Stabilizer Straight Ribs "Weld-on hardfacing"



65-000047

Deviation of the illustration to the material construction unit possible.



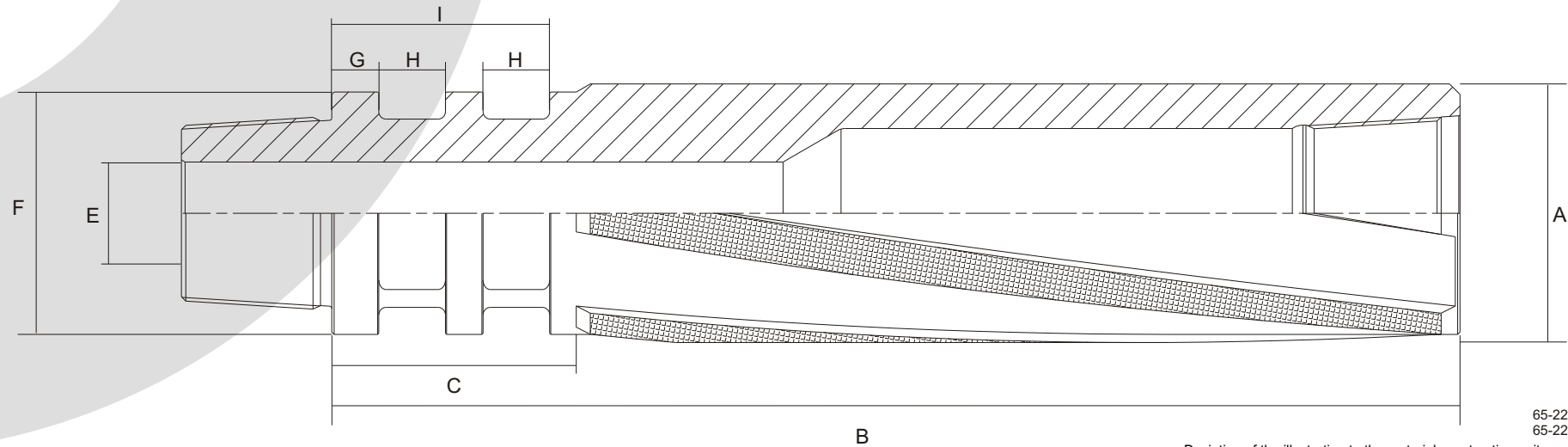
Nominal size		Shoulder to shoulder length		Shoulder to start of ribs		Rib width		Bore diam.		No. of ribs	Body diam.		Shoulder to first flat		Width of spanner flat		Shoulder to end of spanner flats		Connections*	Approx. weight
A		B		C		D		E			F		G		H		I			
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm		kg
6 3/4"	171,5	48"	1219,2	9 1/4"	235	1 3/8"	35	2 13/16"	71,4	4	5 3/4"	146,1	1"	25,5	2"	51	7"	177,8	4 3/4" R.B.-D122	165
7 7/8"	200	48"	1219,2	9 1/4"	235	1 3/8"	35	2 13/16"	71,4	4	6 3/4"	171,5	1"	25,5	2"	51	7"	177,8	5 3/4" R.B.-D122	202
9"	228	48"	1219,2	10 1/2"	266,7	1 3/8"	35	3"	76,2	6	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-D122	280
9 7/8"	250,8	48"	1219,2	10 1/2"	266,7	1 3/8"	35	3"	76,2	6	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-D122	320
11"	279,4	60"	1524	11"	279,4	1 3/8"	35	4 3/4"	120,7	6	10"	254	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8 1/4" R.B.-D122	485
12 1/4"	311,2	60"	1524	13 5/8"	346,1	2 1/4"	57,2	4 3/4"	120,7	6	11 1/4"	286,8	1 1/2"	38,1	3 1/2"	88,9	10"	254	9 1/4" R.B.-D122	750
13 3/4"	349,3	60"	1524	13 3/4"	349,3	2 1/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-D122	864
15"	381	60"	1524	13 3/4"	349,3	2 5/8"	66,7	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-D122	1050

\* other threads on request

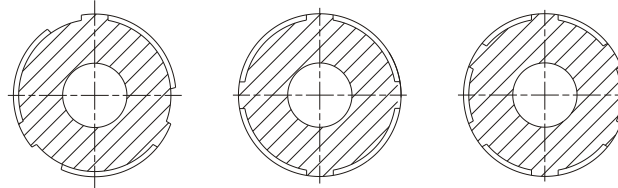
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## Raise Boring Stabilizer Spiral Ribs (Tungsten Carbide)


 65-223114  
65-223115

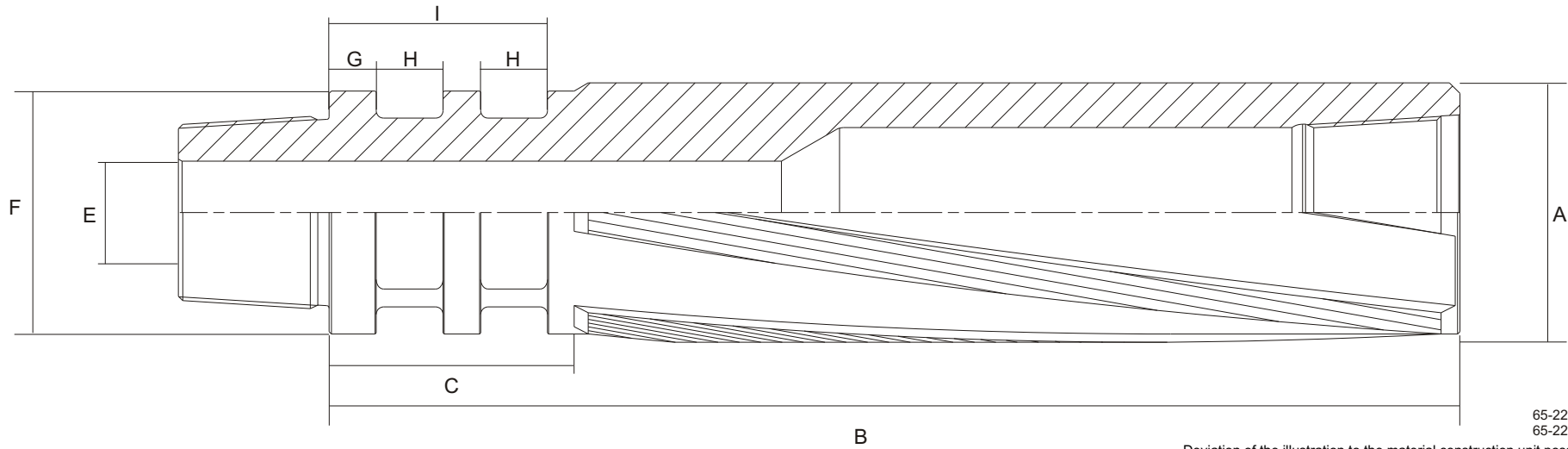
Deviation of the illustration to the material construction unit possible.



Nominal size		Shoulder to shoulder length		Shoulder to start of ribs		Rib width		Bore diam.		No. of ribs	Body diam.		Shoulder to first flat		Width of spanner flat		Shoulder to end of spanner flats		Connections*	Approx. weight
A		B		C		D		E			F		G		H		I			
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm		kg
9"	228	48"	1219,2	10 1/2"	266,7	1 1/2"	38,1	3"	76,2	5	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	280
9 7/8"	250,8	48"	1219,2	10 1/2"	266,7	1 1/2"	38,1	3"	76,2	5	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	320
11"	279,4	60"	1524	11"	279,4	1 1/2"	38,1	4 3/4"	120,7	5	10"	254	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8 1/4" R.B.-DI22	485
12 1/4"	311,2	60"	1524	13 5/8"	346,1	2 1/4"	57,2	4 3/4"	120,7	5	11 1/4"	286,8	1 1/2"	38,1	3 1/2"	88,9	10"	254	9 1/4" R.B.-DI22	750
13 3/4"	349,3	60"	1524	13 3/4"	349,3	2 1/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	864
15"	381	60"	1524	13 3/4"	349,3	2 3/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	1050
17 1/2"	444,5	on request		on request		on request		on request		on req.	12 7/8"	327	on request		on request		on request		on request	

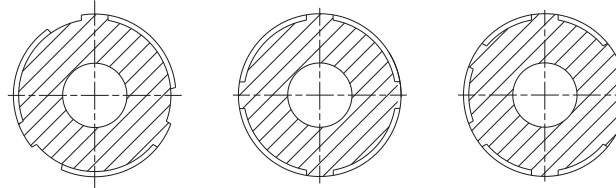
\* other threads on request

# Raise Boring Stabilizer Spiral Ribs (Welded)



65-223114  
65-223115

Deviation of the illustration to the material construction unit possible.



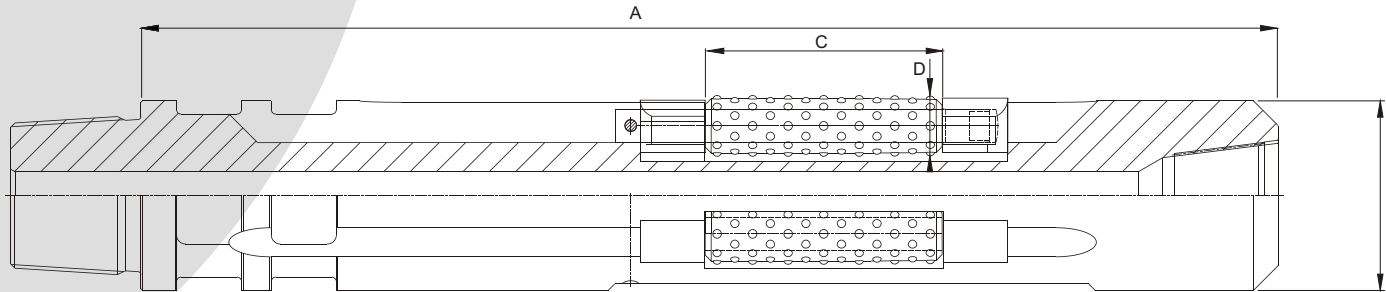
Nominal size		Shoulder to shoulder length		Shoulder to start of ribs		Rib width		Bore diam.		No. of ribs	Body diam.		Shoulder to first flat		Width of spanner flat		Shoulder to end of spanner flats		Connections*	Approx. weight
A		B		C		D		E			F		G		H		I			
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm		kg
9"	228	48"	1219,2	10 1/2"	266,7	1 1/2"	38,1	3"	76,2	5	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	280
9 7/8"	250,8	48"	1219,2	10 1/2"	266,7	1 1/2"	38,1	3"	76,2	5	8"	203,2	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	6 3/4" R.B.-DI22	320
11"	279,4	60"	1524	11"	279,4	1 1/2"	38,1	4 3/4"	120,7	5	10"	254	1 1/2"	38,1	2 3/4"	69,9	8 1/4"	209,6	8 1/4" R.B.-DI22	485
12 1/4"	311,2	60"	1524	13 5/8"	346,1	2 1/4"	57,2	4 3/4"	120,7	5	11 1/4"	286,8	1 1/2"	38,1	3 1/2"	88,9	10"	254	9 1/4" R.B.-DI22	750
13 3/4"	349,3	60"	1524	13 3/4"	349,3	2 1/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	864
15"	381	60"	1524	13 3/4"	349,3	2 3/4"	57,2	5 7/16"	138,1	6	12 7/8"	327	1 9/16"	39,7	3 15/16"	100	11"	279,4	10 1/2" R.B.-DI22	1050
17 1/2"	444,5	on request		on request		on request		on request		on req.	12 7/8"	327	on request		on request		on request		on request	

\* other threads on request

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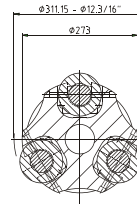


## Raise Boring 3-6 Point Roller Reamers - Standard



65-223124

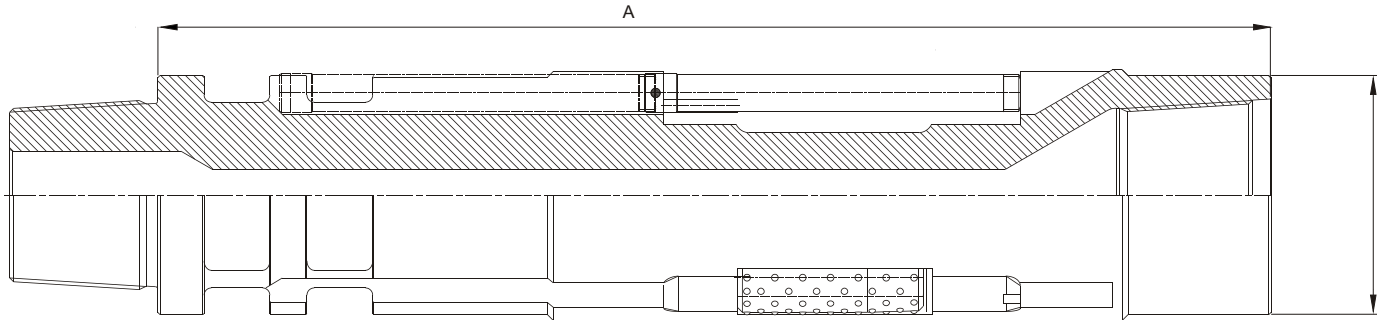
Deviation of the illustration to the material construction unit possible.



Hole size		Shoulder to shoulder length		Body diam.		Length of roller		Diameter of Roller		Pin connection*	Box connection*	Appox. weight dressed
		A		B		C		D				
in	mm	in	mm	in	mm	in	mm	in	mm			kg
11"	279.4	60"	1524	10"	254	10"	254	2 1/2"	65	8 1/4" RB. DI 22	8 1/4" RB. DI 22	541
12 1/4"	311.2	60"	1524	11 1/4"	285.8	10"	254	2 1/2"	65	9 1/4" RB. DI 22	9 1/4" RB. DI 22	595
13 3/4"	349.3	60"	1524	12 7/8"	327	10"	254	2 1/2"	65	10 1/2" RB. DI 22	10 1/2" RB. DI 22	680
15"	381	60"	1524	12 7/8"	327	10"	254	2 1/2"	65	10 1/2" RB. DI 22	10 1/2" RB. DI 22	700
17 1/2"	444.5	60"	1524	12 7/8"	327	10"	254	2 1/2"	65	10 1/2" RB. DI 22	10 1/2" RB. DI 22	--

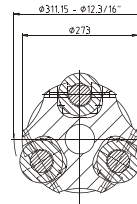
\* other threads on request

# Raise Boring 3 Point Roller Reamers - Heavy Duty



65-223124

Deviation of the illustration to the material construction unit possible.



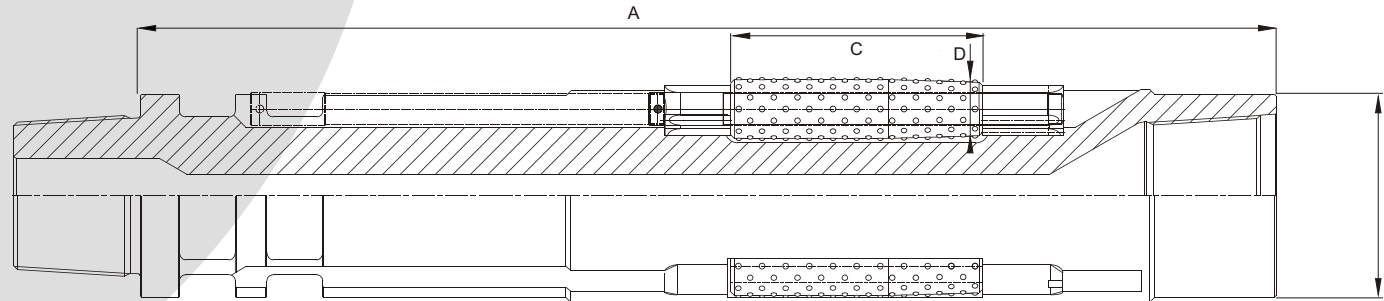
Hole size		Shoulder to shoulder length		Body diam.		Length of roller		Diameter of Roller		Pin connection*	Box connection*	Appox. weight dressed
		A		B		C		D				
in	mm	in	mm	in	mm	in	mm	in	mm			kg
12 1/4"	311.2	60"	1524	11 1/4"	285.8	10"	254	4"	101.6	9 1/4" RB. DI 22	9 1/4" RB. DI 22	595
13 3/4"	349.3	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	680
15"	381	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	700
17 1/2"	444.5	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	--

\* other threads on request

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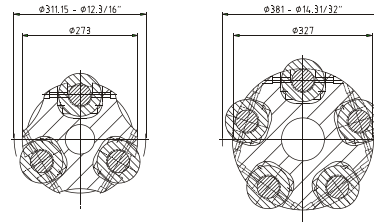


## Raise Boring 3/5 Point Roller Reamers - Extra Heavy Duty



65-223124

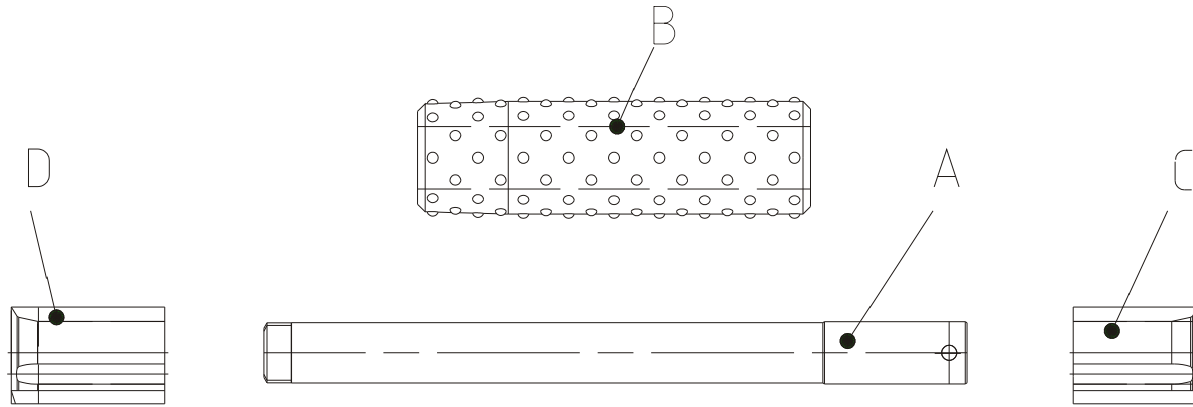
Deviation of the illustration to the material construction unit possible.



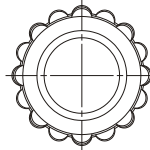
Hole size		Shoulder to shoulder length		Body diam.		Length of roller		Diameter of Roller		Pin connection*	Box connection*	Appox. weight dressed
		A		B		C		D				
in	mm	in	mm	in	mm	in	mm	in	mm			kg
12 1/4"	311.2	60"	1524	11 1/4"	285.8	10"	254	4"	101.6	9 1/4" RB. DI 22	9 1/4" RB. DI 22	595
13 3/4"	349.3	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	680
15"	381	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	700
17 1/2"	444.5	60"	1524	12 7/8"	327	10"	254	4"	101.6	10 1/2" RB. DI 22	10 1/2" RB. DI 22	--

\* other threads on request

# Raise Boring Roller Reamer Replacement Parts



65-223123



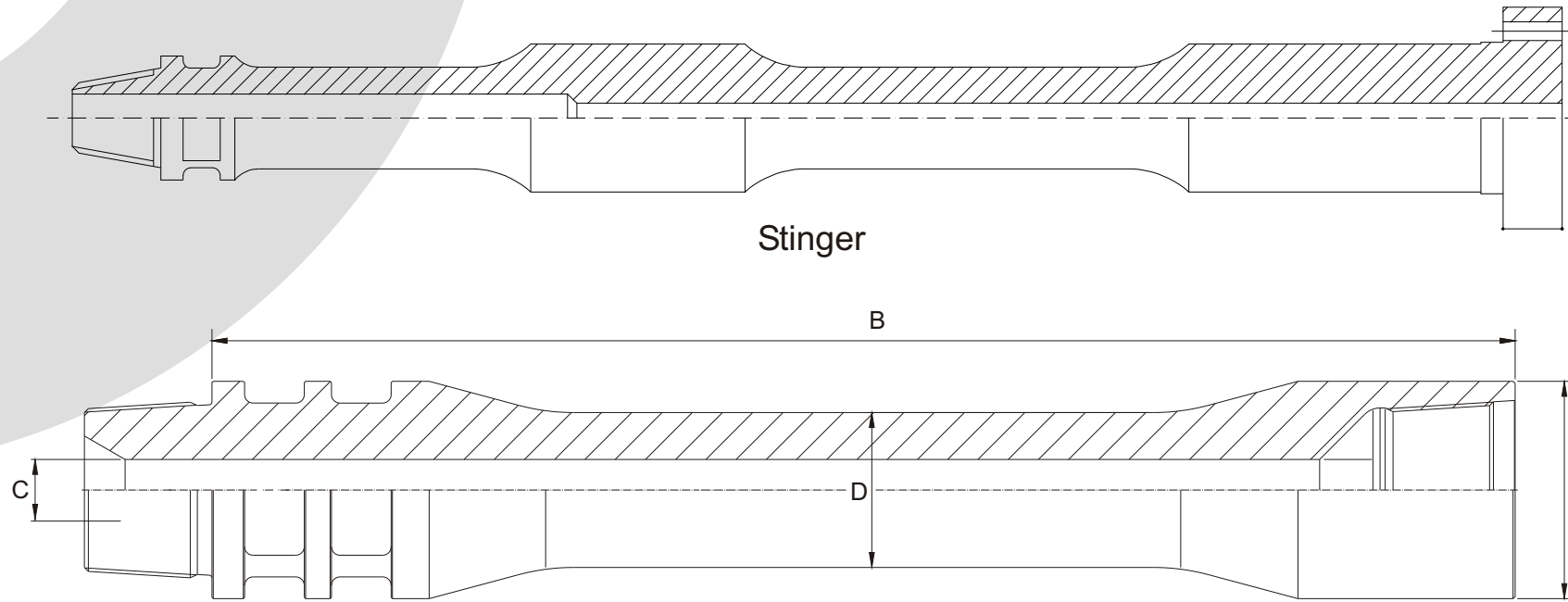
Chromed Reamer Pin

2 1/2" Roller Spare Set			4" Roller Spare Set		
A	Pin	65-00223128	A	Pin	65-00223002
B	Cutter	65-00022315	B	Cutter	65-00222007
C	Bottom Block	65-00223127	C	Bottom Block	65-00223011
D	Top Block	65-00223126	D	Top Block	65-00223010

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# Stinger / Flex Joints



65-000026

65-000048

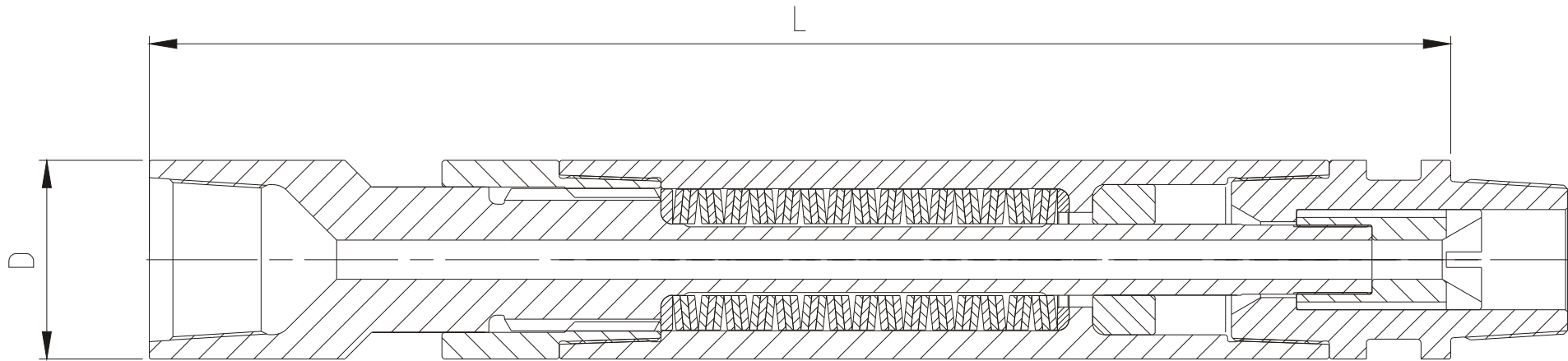
Deviation of the illustration to the material construction unit possible.

## Standard Flex Joint

Size		Shoulder to shoulder length		Bore diam.		Neck diam.		Diam. Over ribs		Diemensions across spanner flats		Pin and box connections*	Approx. weight dressed
A		B		C		D		E		F			
in	mm	in	mm	in	mm	in	mm	in	mm	mm			kg
8"	230,2	48"	1219,2	2 13/16"	71,4	6 1/4"	158,8	9" or 9 7/8"	235 or 250,8	6 7/8"	174,6	6 3/4" R.B.-D122	160
10"	245	60"	1524	2 13/16"	71,4	7 7/8"	200	11"	279,4	8"	203,2	8 1/4" R.B.-D122	315
11 1/4"	286,8	60"	1524	3 3/4"	95,3	9"	228	12 1/4"	311,2	9"	228	9 1/4" R.B.-D122	450
12 7/8"	323,9	60"	1524	4 3/4"	120,7	10 1/2"	266,7	13 3/4"	349,3	10 1/2"	266,7	10 1/2" R.B.-D122	700

\* other threads on request

# Shock Absorber



Deviation of the illustration to the material construction unit possible.

Shoulder to shoulder length*		Body diameter		Pin connection*	Box connection	Approx weight dressed
A		B				
in	mm	in	mm			kg
60"	1524	10"	254	8 ¼" RB. DI 22	8 ¼" RB. DI 22	350
60"	1524	12 7/8"	327	10 ½" RB. DI 22	10 ½" RB. DI 22	650
68"	1727	10"	254	8 ¼" RB. DI 22	8 ¼" RB. DI 22	385
68"	1727	12 7/8"	327	10 ½" RB. DI 22	10 ½" RB. DI 22	720

\* other threads on request

The MICON GmbH manufactures shock absorbers in different sizes and design on request, particularly on its requirements adapted.

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## Additional Equipment and Services for the Drilling Industry

Rental Equipment		
RVDS	5	RVDS 9 ½" (Borehole Diameter 12 ¼" - 13 ¾")
	8	RVDS 10" (Borehole Diameter 12 ¼" - 13 ¾") (2005)
	7	RVDS 12 7/8" (Borehole Diameter 15" - 17 ½")
MWD	4	3 ½" Systems (Borehole Diameter 3 ¾" - 5 7/8")
	4	4 ¾" Systems (Borehole Diameter 5 ¾" - 6 ¾")
Oriented Coring Equipment	2	8 ½" x 4" x 9m (18m) Core Barrels
	2	4 ¾" x 2 5/8" x 9m (18m) Core Barrels
Wassara Hammer		W80
		W100
		W150
Plunger Pumps 130 kW	2	National Oilwell
Centrifugal Pumps 130 kW	1	SIHI Hallberg (8 Stages)
Frequency Converter 200 kW	1	BLEMO
Shock Absorber	2	10" x 60" x 8 ¼" DI 22
	2	12 7/8" x 60" x 10 ½" DI 22
Roller Reamer	2	10" x 12 ¼" x 8 ¼" DI 22
	2	12 7/8" x 15" x 10 ½" DI 22
Stabilizer	2	10" x 12 ¼" x 8 ¼" DI 22
	2	11 ¼" x 13 ¾" x 9 ¼" DI 22
	2	12 7/8" x 15" x 10 ½" DI 22
Survey Instruments	1	High Precision Verticality Probe
	4	Eastman Whipstock Digital Multishot
	2	Eastman Whipstock Mechanical Multishot
	2	Eastman Whipstock Mechanical Single Shot
	2	Eastman Whipstock Drift Indicator
Cable Winches	1	Eastman Whipstock Winch 4.500m
	1	Antares Winch 1.200m
	2	Eastman Whipstock Winch 400m
Mud Cleaning Unit	1	Derrick Mixing Separation System
Field Maintenance Container	1	

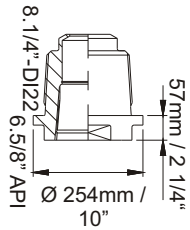
### Services

Target Drilling (RVDS)  
 Directional Drilling (MWD)  
 Oriented Coring  
 Borehole Survey (Gyro)  
 Borehole Survey (Magnetic)  
 Operator Training for target and directional drilling  
(on MICON equipment)  
 Operator Training for Magnetic Borehole Survey  
(on MICON equipment)  
 Engineering  
 Drill Pipe Inspection and Maintenance

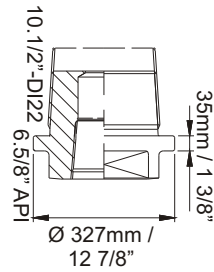
Further equipment please find in our specific brochures  
 or under [www.micon-drilling.de](http://www.micon-drilling.de)

# Raise Boring Starter Pipes, Subs, Cross Overs

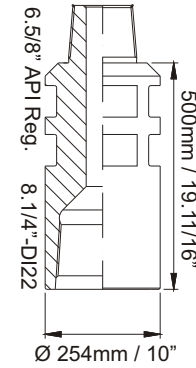
(a selection by examples / starter pipes without illustrations)



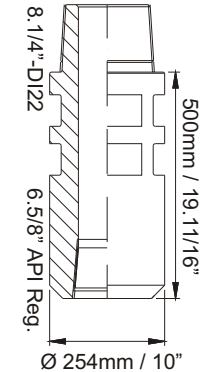
**Sub**



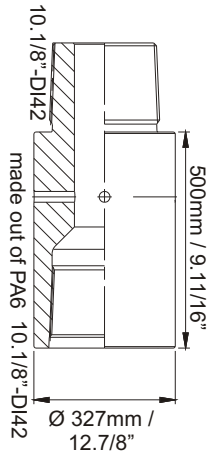
**Sub**



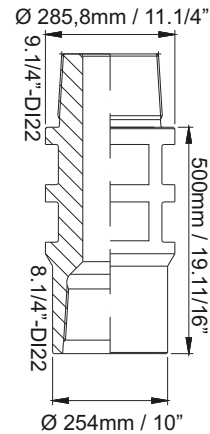
**Cross Over**



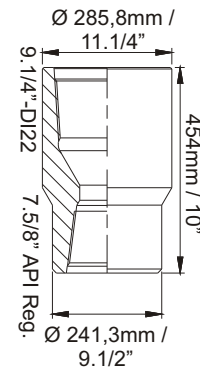
**Cross Over**



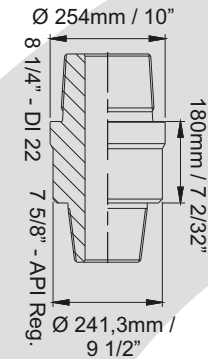
**Devices**



**Cross Over**



**Cross Over**



**Cross Over**

Further and special variants on request

Deviation of the illustration to the material construction unit possible.

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## Rotary Vertically Drilling System (RVDS)

The self steering MICON Rotary Vertical Drilling System (RVDS) was developed for the continental deep drilling project (KTB) in Windisch Eschenbach / Germany from 1991 to 1993. The main target of this development was to have a self steering system which was able to drill vertical boreholes with high precision to reach great depth with a straight, short borehole. Furthermore as a result of the straight borehole the string friction against the borehole wall was reduced significant.

Since the first operation of the RVDS system in 1991 by continuous engineering activities the system was modified into the today's MICON RVDS for the mining, tunneling and geothermal drilling industries.

The MICON RVDS consists of basically three / two parts which bear the steering, energy and communication modules. For the internally generated electric and hydraulic energy and also the communication of the tool to the surface the mudflow through the RVDS is utilized.

By flushing the for the drilling operation necessary mud through the tool by an internal turbine electric and hydraulic power is generated. The power is utilized to drive the RVDS internal electric units, the data storage units and sensor units. Now the actual position against the borehole axis is surveyed and by activating the steering module the system is enabled to steer against non-vertical drilling tendencies.

The simultaneously acting steerable stabilizer is driven by hydraulic energy

generated by the internal turbine. Four independent steering stabilizer ribs are positioned around this sub directly behind the drill bit. The ribs push the RVDS into the vertical direction. The stabilizer is non-rotating against the borehole.

The internal consumed hydraulic and electric energy is generated by a turbine / generator unit. Therefore no rotational energy out of the drill string is needed to activate the RVDS.

The RVDS internal communications is stored and at the same time send to an internal encoding unit. Here the internal data are transferred into pressure signals which are now pulsed from the tool to the surface. On the surface a decoding unit is connected to the stand pipe and decodes the pressure pulses into digital signals which can be read and displayed by a PC. This permits the operator to read the steering signals and surveyed data coming from the RVDS without delays.

The MICON RVDS is developed as a "stand alone" system. By the beginning of a project the tool is mobilized and initialized with the actual target demands. After this initial set-up the RVDS operate themselves from the beginning to the end of the operation. Actual position and verticality are reported to the operator.

If malfunctions occur they will be reported to the operator. If after running a defined routine procedure the malfunction is not determined the actual RVDS have to be changed against a backup tool. Using the backup units no operational delays occur.

If in the following field inspection the malfunction cannot be deleted the RVDS have to be send back to one of MICON's field workshops or to the MICON base in Nienhagen / Germany.

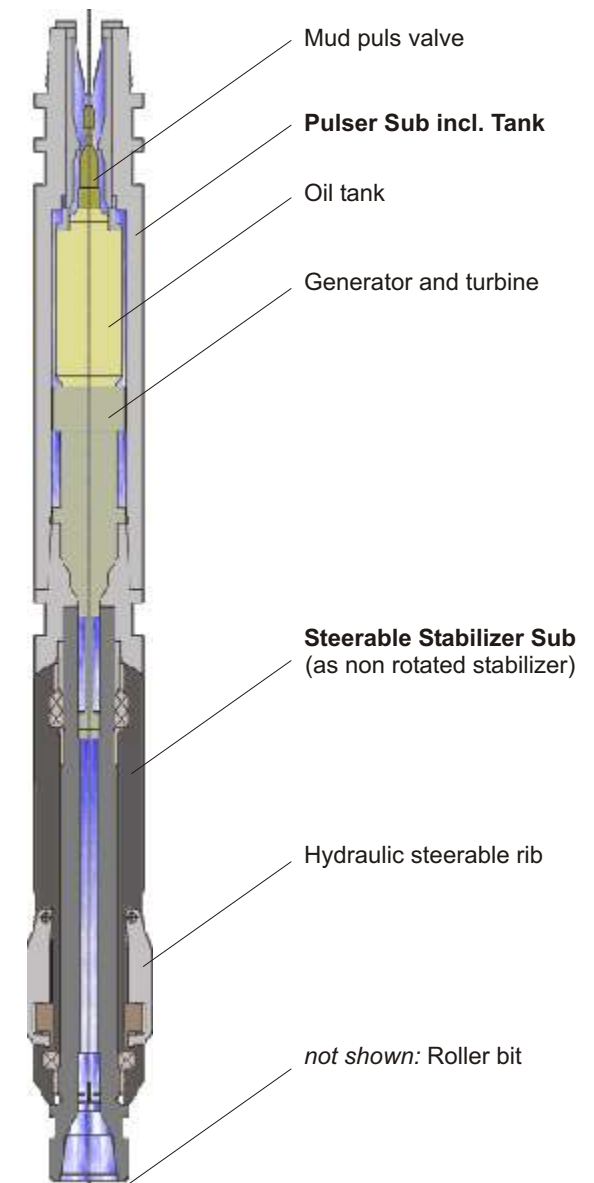
The average lifetimes of the tools range between 150 and 200 hrs. Usually the RVDS is tripped out together with the worn pilot bit and changed against the backup unit on the location during the bit change.

MICON provides an operator training on the RVDS system. By training the operators on the tool in a three days session at the MICON base in Germany a service engineer is not necessary to operate the tools.

Since 1991 the MICON RVDS was operated in 74 projects. The average accuracies range below 0.5‰ deviation per drilled distance. For example the Gotthard Basis Railway Tunnel Project in Switzerland drilled in 2002 and the Karahnjukar Damp Project in Iceland drilled in 2004.

In the Switzerland project a deviation of 0.38m on 785m (= 0.48‰) was measured by end of the operation, in the Iceland project a deviation of 0.14m on 410m (=0.34‰) was measured by end of the operation.

In 2005 a new generation of self steering RVDS is available. The main modification of the system is the reduction of internal units. As a result of these modification the lifetime of the tools increase and the maintenance times are reduced. The operational times will be increased by consequently performing the simplification of the RVDS.



# Technical Information MICON - RVDS

RVDS	9 1/2"	10"	12 7/8"
	Current Tool	2nd Generation, I. 2005	Current Tool, 2nd Generation
Borehole Diameter	12.¼" - 13.¾"		15" - 17"
Drillrod	9.½" (10")	12.¼" - 14.¾"	12.7/8"
Current Capacity	5 pcs.	ready 2005	7
Length	Steerable Sub	1632 mm	1815 mm
	Pulser Sub	1515 mm	1524 mm
	Tank Sub	1524 mm	--
	Total (w/o pin)	4670 mm	3050 mm
Thread Connection Tool	8.¼" R.B.-DI22	10.1/8" R.B.-Di42	10.½" R.B.-DI22 10.1/8" R.B.-DI22
Thread Connection Bit	6.5/8" API Reg.	6.5/8" API Reg.	7.5/8" API Reg.
Principle	External Steering (Expandable Stabilizer Ribs)		
Inclination Detection	two Accelerotmeter		
Data Processing	full digital downhole closed loop control and surface transmission by mud pulse		
	conventional Electronic	Power Bus System	conventional Electronic
Power Supply	Turbine driven Generator and Hydraulic Pump		
Min. Steering Force	11 kN	13 kN	17 kN
Theo. Build-up Rate	2,5° / 10 m	4° / 10 m	4° / 10 m
Max. Flow Rate	1400 l/min	2500 l/min	1800 l/min
Min. Flow Rate	500 l/min	500 l/min	1000 l/min
Max. Operating Temp.	85°C	120°C	85°C
RPM	10-60 RPM	10-60 RPM	10-60 RPM
Tool Pressure Drop	4-15 bar	4-20 bar	8-20 bar



# Further information request



## MICON

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- |             |                                     |                          |
|-------------|-------------------------------------|--------------------------|
| 010 MI-GP   | MICON General Overview              | <input type="checkbox"/> |
| 020 MI-BWZ  | Drilling Tools                      | <input type="checkbox"/> |
| 030 MI-MSK  | Wireline Systems                    | <input type="checkbox"/> |
| 040 MI-KR   | Single and Double Tube Core Barrels | <input type="checkbox"/> |
| 050 MI-BG   | Drill Rods                          | <input type="checkbox"/> |
| 060 MI-FR   | Casings                             | <input type="checkbox"/> |
| 070 MI-RB   | Mud Motors / Navi Drill             | <input type="checkbox"/> |
| 080 MI-RVDS | Vertical Drilling System (RVDS)     | <input type="checkbox"/> |
| 090 MI-RBE  | Raise Bore Equipment                | <input type="checkbox"/> |
| EW-GP       | Survey Equipment                    | <input type="checkbox"/> |
| 100 MI-Z    | Accessories                         | <input type="checkbox"/> |
| 110 MI-L    | Wage Manufacturing                  | <input type="checkbox"/> |

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