WZL
Wenzel Downhole Tools

Wenzel Downhole Tools

The leading drilling motor and drilling tool supplier.

Product Catalogue



Wenzel Downhole Tools is the leading motor and drilling tool supplier, with worldwide operations supporting the oilfield and construction industries. Wenzel's capability to engineer, manufacture and service fleets of downhole tools directly impacts the success of clients' drilling operations. Wenzel's reputation for quality is upheld through excellence in design, expertise, and client focus.

Product Performance:

Optimized design features and the pursuit of technological advancements mean Wenzel tools offer exceptional performance. Industry-leading in their operational longevity and reliability, Wenzel tools contribute to longer uninterrupted run times.

Presence:

Wenzel's tools are utilized worldwide. Exceptional client support includes access to Wenzel's inhouse engineering, sales, operations, manufacturing, and downhole tool servicing. Wenzel has operations throughout Canada, the United States, Europe, South America and the Middle East.

Client Focus:

Wenzel is quick to respond and receptive to clients' questions and requests. Inhouse manufacturing and engineering expertise provides operational guidance, as well as detailing the tool's complete history. With flexibility to a client's specific business needs, Wenzel's offering includes rental, sales and tool service. Investing in client relationships means Wenzel places emphasis on time-sensitive turnaround, matched with quality control excellence, to assure reliable tool performance.

Wenzel's culture of safety, service, exceptional quality and innovation is a source of pride and identity. From the selection of steel through to client delivery, Wenzel's comprehensive manufacturing capability, processes and people set the industry benchmark for premium products and services.

Health, Safety and Environment:

Commitment to HSE is a core component of Wenzel's operations and company culture. Our strong HSE culture is reinforced through assessment, training, meetings, coaching, reporting and action.

Proven Quality:

Wenzel holds numerous patents for its innovative products, and offers exceptional quality with ISO 9001:2008 and API certifications. All material is of impeccable quality and sourced from well-respected suppliers. Each product component's lifecycle is individually tracked by Wenzel, including documentation on the mill certification and material base element composition.

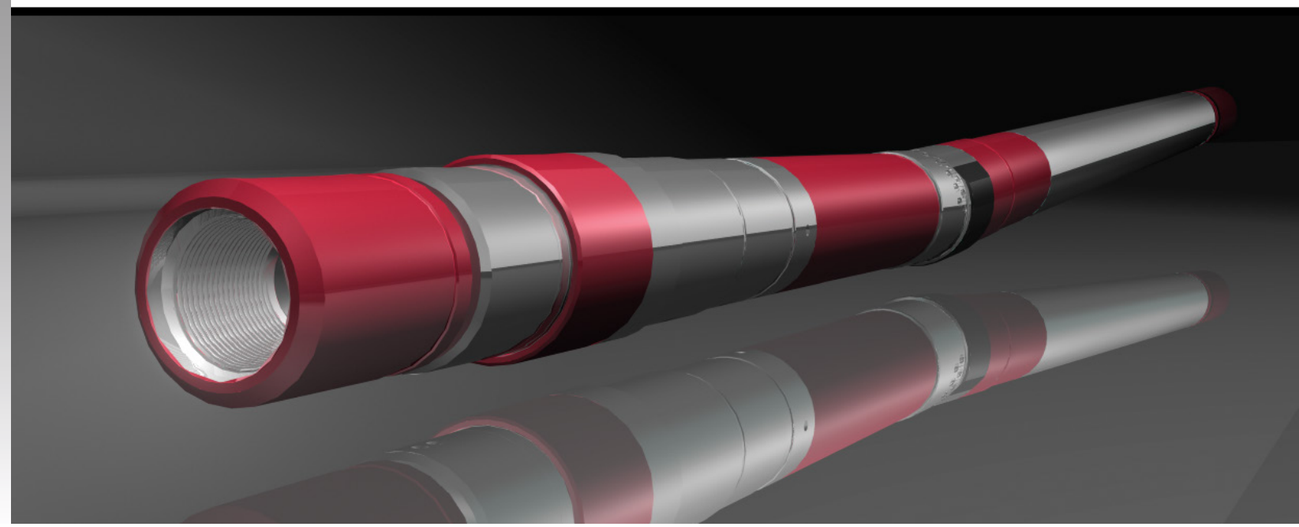
Tried and Tested:

Wenzel Downhole Tools' most significant assets are our leading edge technologies and employees who strive to develop new and better ways to enhance our products. Wenzel continues to pioneer and patent new concepts in product capabilities for numerous drilling situations.

WZL
Wenzel Downhole Tools

CONTENTS

WZL
Wenzel Downhole Tools



Millennium Motors

Designed for durability, Wenzel's Millennium Motors provide customers with an extended, reliable service life. Patented enhancements offer an increased torsional capacity for higher torque transmissions within our motors. Millennium Motor offerings include oil sealed, mud lubricated and patented short bit-to-bend motor bearing assemblies.

- **Oil Sealed Drilling Motors**
- **Mud Lubricated Drilling Motors**
- **Short Bit-to-Bend Drilling Motors**

Millennium Oil Sealed Drilling Motor

The Wenzel Downhole Tools Millennium Oil Sealed Drilling Motor is designed with patented technology for use with the latest developments in high torque power sections. Delivering superior performance and reliability, it provides users with an efficient tool for their drilling applications.

The Millennium Drilling Motors continue to offer the highest level of quality to customers through superior designs, materials, and manufacturing processes.

Features and Benefits

- High allowable WOB (weight on bit) and load capacities.
- Equipped with 0 - 3° Adjustable Bend Assembly.
- Option for shorter bit-to-bend Fixed Bend Assembly.
- Features the Maxi-Torque Driveline for use with even wall technology, hard rubber, and other high torque power sections.
- Inhouse manufactured components adhere to Wenzel's high standard of premium materials and quality production.
- Patented design.

Millennium Oil Sealed Drilling Motor Specifications

IMPERIAL

Nominal OD (inch)	Bit Box to Bend (inch)	Bit Box to Fixed Bend (inch)	Hole Size (inch)	Standard Bit Box Thread (API)	Max WOB* (lbs)	Max Bit Overpull* (lbs)	Max WOB to Re-run** (lbs)	Max Bit Overpull to Re-run** (lbs)	Absolute Body Overpull** (lbs)
2 7/8	33	N/A	3 1/2 - 4 1/2	2 3/8 REG	11 500	11 500	40 900	40 900	158 000
3 1/8	33	N/A	3 3/4 – 4 1/2	2 3/8 REG	11 500	11 500	40 900	40 900	167 000
3 1/2	37	30	4 1/4 – 5 7/8	2 7/8 REG	18 500	18 500	68 400	68 400	212 000
4 3/4	61	50	5 7/8 – 7 7/8	3 1/2 REG	54 000 (33 000)	31 000	222 000 (133 000)	138 000	436 000
5	61	50	5 7/8 – 7 7/8	3 1/2 REG	54 000 (33 000)	31 000	222 000 (133 000)	138 000	481 000
6 1/2	67	56	7 7/8 – 9 7/8	4 1/2 REG	91 000 (66 000)	51 000	396 000 (261 000)	210 000	550 000
6 3/4	67	56	8 1/2 – 9 7/8	4 1/2 REG	91 000 (66 000)	51 000	396 000 (261 000)	210 000	597 000
7 3/4	80	67	9 5/8 – 12 1/4	6 5/8 REG	88 000	73 000	365 000	318 000	638 000
8	80	67	9 5/8 – 12 1/4	6 5/8 REG	105 000	73 000	419 000	318 000	845 000
9 5/8	112	105	12 1/4 – 17 1/2	6 5/8 REG	190 000	82 000	907 000	416 000	1 256 000
11 1/4	122	108	14 3/4 - 26	7 5/8 REG	225 000	119 000	1 118 000	610 000	1 520 000

METRIC

Nominal OD (mm)	Bit Box to Bend (m)	Bit Box to Fixed Bend (m)	Hole Size (mm)	Standard Bit Box Thread (API)	Max WOB* (daN)	Max Bit Overpull* (daN)	Max WOB to Re-run** (daN)	Max Bit Overpull to Re-run** (daN)	Absolute Body Overpull** (daN)
73	0.84	N/A	89 – 114	2 3/8 REG	5 100	5 100	18 200	18 200	70 000
79	0.84	N/A	95 – 114	2 3/8 REG	5 100	5 100	18 200	18 200	74 000
89	0.94	0.76	108 – 149	2 7/8 REG	8 200	8 200	30 400	30 400	94 000
121	1.55	1.27	149 – 200	3 1/2 REG	24 000 (14 700)	13 800	99 000 (59 000)	61 400	194 000
127	1.55	1.27	149 - 200	3 1/2 REG	24 000 (14 700)	13 800	99 000 (59 000)	61 400	214 000
165	1.70	1.42	200 – 251	4 1/2 REG	40 500 (29 500)	23 000	176 000 (116 000)	93 000	245 000
171	1.70	1.42	216 – 251	4 1/2 REG	40 500 (29 500)	23 000	176 000 (116 000)	93 000	266 000
197	2.03	1.70	244 – 311	6 5/8 REG	39 000	32 000	162 000	141 000	284 000
203	2.03	1.70	244 – 311	6 5/8 REG	47 000	32 000	186 000	141 000	376 000
244	2.84	2.67	311 – 445	6 5/8 REG	85 000	36 000	403 000	185 000	559 000
286	3.10	2.74	375 – 660	7 5/8 REG	100 000	53 000	497 000	271 000	676 000

*Operating Capacity **Static Capacity

Motor Assemblies are available in a multitude of speeds and configurations.

(WOB Capacity) in brackets refers to the single On Bottom Bearing option.

Specifications are based on as new condition and are subject to change without notice.

Millennium Mud Lubricated Drilling Motor

The Wenzel Downhole Tools Millennium Mud Lubricated Motor is designed with patented technology for high reliability in aggressive, higher temperature wells. Using the latest developments in high torque power sections, it provides users with an effective tool for delivering superior performance.

The Millennium Drilling Motors continue to offer the highest level of quality to customers through superior designs, materials, and manufacturing processes.

Features and Benefits

- Industry proven thrust and radial bearing technology, custom designed for mud lubricated drilling motor applications.
- Bearing Assembly design is straight forward and compact, making for easier service.
- Equipped with 0 - 3° Adjustable Bend Assembly.
- Option for shorter bit-to-bend Fixed Bend Assembly.
- Features the Maxi-Torque Driveline for use with even wall technology, hard rubber, and other high torque power sections.
- Inhouse manufactured components adhere to Wenzel's high standard of premium materials and quality production.
- Patented design.

Millennium Mud Lubricated Drilling Motor Specifications

IMPERIAL

Nominal OD (inch)	Bit Box to Bend (inch)	Bit Box to Fixed Bend (inch)	Hole Size (inch)	Standard Bit Box Thread (API)	Max WOB* (lbs)	Max Bit Overpull* (lbs)	Max WOB to Re-run** (lbs)	Max Bit Overpull to Re-run** (lbs)	Absolute Body Overpull** (lbs)
4 3/4	57	46	5 7/8 – 7 7/8	3 1/2 REG	48 000	48 000	213 000	72 000	436 000
5	57	46	5 7/8 – 7 7/8	3 1/2 REG	48 000	48 000	213 000	72 000	481 000
6 1/2	64	52	7 7/8 – 9 7/8	4 1/2 REG	72 000	72 000	358 000	101 000	550 000
6 3/4	64	52	8 1/2 – 9 7/8	4 1/2 REG	87 000	87 000	360 000	137 000	597 000
7 3/4	78	65	9 5/8 – 12 1/4	6 5/8 REG	112 000	112 000	546 000	216 000	638 000
8	78	65	9 5/8 – 12 1/4	6 5/8 REG	112 000	112 000	546 000	216 000	845 000
9 5/8	96	91	12 1/4 – 17 1/2	6 5/8 REG	132 000	132 000	772 000	223 000	1 097 000

METRIC

Nominal OD (mm)	Bit Box to Bend (m)	Bit Box to Fixed Bend (m)	Hole Size (mm)	Standard Bit Box Thread (API)	Max WOB* (daN)	Max Bit Overpull* (daN)	Max WOB to Re-run** (daN)	Max Bit Overpull to Re-run** (daN)	Absolute Body Overpull** (daN)
121	1.45	1.17	149 – 200	3 1/2 REG	21 000	21 000	95 000	32 000	194 000
127	1.45	1.17	149 – 200	3 1/2 REG	21 000	21 000	95 000	32 000	214 000
165	1.63	1.32	200 – 251	4 1/2 REG	32 000	32 000	159 000	45 000	245 000
171	1.63	1.32	216 – 251	4 1/2 REG	39 000	39 000	160 000	61 000	266 000
197	1.98	1.65	244 – 311	6 5/8 REG	50 000	50 000	243 000	96 000	284 000
203	1.98	1.65	244 – 311	6 5/8 REG	50 000	50 000	243 000	96 000	376 000
244	2.44	2.31	311 – 445	6 5/8 REG	59 000	59 000	343 000	99 000	488 000

*Operating Capacity **Static Capacity

Motor assemblies are available in a multitude of speeds and configurations.

Specifications are based on as new condition and are subject to change without notice.

Millennium Short Bit-to-Bend Drilling Motor

The Wenzel Downhole Tools Millennium Short Bit-to-Bend Drilling Motor is designed to deliver higher build rates at lower rotatable bend settings. Using patented technology, the Millennium Drilling Motor provides users with a reliable tool for improving drilling time with more efficient well plans and reduced trips.

The Millennium Drilling Motors continue to offer the highest level of quality to customers through superior designs, materials, and manufacturing processes.

Features and Benefits

- Sealed and oil filled Bearing Assembly.
- Equipped with 0-2º Adjustable Bend Assembly.
- Compatible for use with even wall technology, hard rubber, and other high torque power sections.
- Suitable for use in formations with poor build tendencies, and short to medium radius wells.
- Reduces drilling time by completing vertical, build and lateral sections in a single trip.
- Utilizes Maxi-Torque Driveline for increased torsional capacity.
- Inhouse manufactured components adhere to Wenzel's high standard of premium materials and quality production.
- Patented design.

Millennium Short Bit-to-Bend Drilling Motor Specifications

IMPERIAL

Nominal OD (inch)	Bit Box to Bend (inch)	Hole Size (inch)	Standard Bit Box Thread (API)	Max WOB* (lbs)	Max Bit Overpull* (lbs)	Max WOB to Re-run** (lbs)	Max Bit Overpull to Re-run** (lbs)	Absolute Body Overpull** (lbs)
4 3/4	30	5 7/8 – 7 7/8	3 1/2 REG	42 500	22 000	157 000	100 000	436 000
5	30	5 7/8 – 7 7/8	3 1/2 REG	42 500	22 000	157 000	100 000	481 000
6 1/2	30	7 7/8 – 9 7/8	4 1/2 REG	68 500	33 000	266 000	162 000	550 000
6 3/4	30	8 1/2 – 9 7/8	4 1/2 REG	68 500	33 000	266 000	162 000	597 000

METRIC

Nominal OD (mm)	Bit Box to Bend (m)	Hole Size (mm)	Standard Bit Box Thread (API)	Max WOB* (daN)	Max Bit Overpull* (daN)	Max WOB to Re-run** (daN)	Max Bit Overpull to Re-run** (daN)	Absolute Body Overpull** (daN)
121	0.76	149 – 200	3 1/2 REG	19 000	10 000	70 000	44 000	194 000
127	0.76	149 – 200	3 1/2 REG	19 000	10 000	70 000	44 000	214 000
165	0.76	200 – 251	4 1/2 REG	30 000	15 000	118 000	72 000	245 000
171	0.76	216 – 251	4 1/2 REG	30 000	15 000	118 000	72 000	266 000

*Operating Capacity **Static Capacity

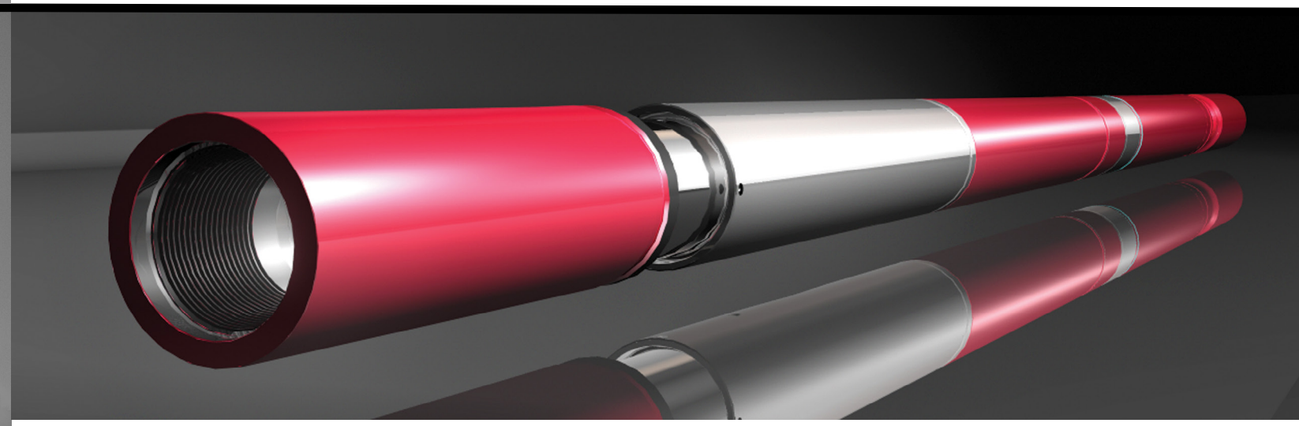
Millennium HB21 Short Bit-to-Bend Drilling Motor has an option for 40" bit-to-bend length.

Motor Assemblies are available in a multitude of speeds and configurations.

Specifications are based on as new condition and are subject to change without notice.

Drilling Jars and Tools

Wenzel offers a variety of rugged tools, versatile to a wide range of drilling applications. Wenzel's motors, jars, agitators, shock tools and other drilling products offer improved durability for longer uninterrupted run times and lower cost per meter of hole.



Ultimate Drilling Jars

- **Ultimate Hydraulic/Mechanical Drilling Jar (High Overpull)**
- **Ultimate Double Acting Hydraulic Jar (High Overpull)**

Conventional Drilling Jars

- **Ultimate Hydraulic/Mechanical Drilling Jar**
- **Ultimate Double Acting Hydraulic Drilling Jar**
- **Hydraulic/Mechanical Drilling Jar**
- **Double Acting Hydraulic Drilling Jar**
- **Double Acting Hydraulic/Mechanical Drilling Jar**
- **Hydraulic Fishing/Drilling Jar**

Drilling Tools

- **Hydraulic Jar Accelerator**
- **Double Acting Hydraulic Jar Accelerator**
- **SHAKER**
- **Shock Tool**
- **Bumper Sub**

Ultimate Hydraulic/Mechanical Drilling Jar

The Ultimate Hydraulic/Mechanical Drilling Jar (UHMJ) is a double acting jar, designed to deliver hydraulic delay when jarring in the up direction, and mechanical release when jarring in the down direction.
Using proprietary new technology, Wenzel Downhole Tools has been able to dramatically increase the allowable overpull force. The UHMJ incorporates a latch mechanism to keep the jar locked in the neutral position and eliminate unexpected jarring while tripping or racking on the derrick.

Features and Benefits

- The UHMJ is normally operated in the latched position to reduce unexpected jarring while drilling and eliminate movement between jar components, increasing service life.
- The UHMJ operates with a simple up and down motion and is not affected by torque.
- The spline drive and latch mechanism are enclosed in a single, sealed oil chamber without ports to the annulus. Such ports on other jars may fill with cuttings and restrict the down jar stroke.
- The hydraulic delay mechanism is located in a separate chamber to prevent contamination and increase reliability.
- With the latch mechanism in the latched position, the inner mandrel and outer housing act integrally, virtually eliminating seal and inner tool wear during normal drilling conditions. There is no need to extend or open the jar before running in the hole.
- Standard seals in the tool are effective to 250ºF (120ºC). The UHMJ can be dressed with seals effective to 400ºF (200ºC) for hot hole environments. External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.
- The UHMJ can be run in tension or in compression within the preset latch settings.

Ultimate Hydraulic / Mechanical Drilling Jar (High Overpull) Specifications

IMPERIAL

Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Nominal Up Latch Setting (lbs)	Nominal Down Latch Setting (lbs)	Max Pull During Delay (lbs)	Free Stroke Up (inch)	Free Stroke Down (inch)
4.13	18.9	2.00	280 000	15 000	45 000	25 000	110 000	5.0	6.0
4.75	19.6	2.25	391 000	20 000	55 000	30 000	132 000	5.0	6.0
5.25	19.6	2.25	391 000	31 500	55 000	30 000	132 000	5.0	6.0
6.25	20.5	2.25	777 000	48 500	90 000	40 000	250 000	5.0	6.0
6.50	20.5	2.25	777 000	52 400	90 000	40 000	250 000	5.0	6.0
6.62	20.6	2.75	722 500	53 800	90 000	40 000	250 000	5.0	6.0
6.75	20.5	2.75	907 500	48 800	95 000	42 000	270 000	5.0	6.0
8.00	20.7	2.81	949 000	98 000	100 000	45 000	400 000	5.5	6.0
10.00	21.9	3.00	1 658 500	182 200	110 000	50 000	400 000	5.5	6.0

METRIC

Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Nominal Up Latch Setting (daN)	Nominal Down Latch Setting (daN)	Max Pull During Delay (daN)	Free Stroke Up (mm)	Free Stroke Down (mm)
105	5.8	51	124 500	20 300	20 000	11 100	48 900	130	150
121	6.0	57	173 900	27 100	24 500	13 300	58 700	130	150
133	6.0	57	173 900	42 700	24 500	13 300	58 700	130	150
159	6.3	57	345 600	65 800	40 000	17 800	111 200	130	150
165	6.3	57	345 600	71 000	40 000	17 800	111 200	130	150
168	6.3	70	321 400	72 900	40 000	17 800	111 200	130	150
171	6.2	70	403 700	66 200	42 300	18 700	120 100	130	150
203	6.3	71	422 100	132 900	44 500	20 000	177 900	140	150
254	6.7	76	737 700	247 000	48 900	22 200	177 900	140	150

Other sizes are available upon request.
Specifications are based on as new condition and are subject to change without notice.

Operations

Jarring Up

- Jarring up is achieved by applying sufficient overpull to overcome the latch setting, which initiates the hydraulic time delay. During the time delay, the overpull at surface can be adjusted to vary the impact force.
- After impact, apply a down force sufficient to close jar and re-engage latch, then repeat the jarring cycle as required.

Jarring Down

- Jarring down is achieved by applying sufficient downward force to overcome the latch setting and pump open force. At that point, the UHMJ will release and jar downward.
- After impact, pick up the work string to re-engage the mechanical latch then repeat the jarring cycle as required.

Ultimate Double Acting Hydraulic Drilling Jar

The Ultimate Double Acting Hydraulic Drilling Jar (UHJDA) is a bi-directional drilling jar incorporating hydraulic delay without a latch mechanism. This jar will allow the operator to apply variable impact in both the up and down directions. Using proprietary new technology, Wenzel Downhole Tools has been able to dramatically increase the allowable overpull force. The UHJDA is intended for use in highly deviated or high friction wells, where conditions may prevent applying sufficient force to release a mechanical latch.

Features and Benefits

- The UHJDA is hydraulically controlled and jars in both directions, with impact force controlled by the operator.
- Impact force is controlled by a metering device that ensures consistent delay times over the full range of operating temperatures.
- The UHJDA operates via a simple up and down motion and is unaffected by right- or left-hand torque.
- Standard seals are suitable for use up to 250°F (120°C). Optional high temperature seal kits are available for service to 400°F (200°C). External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.

Operation

Jarring Up

- With the jar in the neutral position, apply the desired overpull in excess of the free string weight, starting the hydraulic delay sequence. At the end of the hydraulic delay, the jar will release causing an upward impact force.
- If necessary, lower the drill string sufficiently to close the jar to the neutral position, ready to jar up again.

Jarring Down

- With the jar in the neutral position, lower the drill string to apply the desired down force, starting the hydraulic delay sequence. At the end of the hydraulic delay, the jar will release causing a downward impact force.
- If necessary, raise the drill string sufficiently to open the jar to the neutral position, ready to jar down again.

Ultimate Double Acting Hydraulic Jar (High Overpull) Specifications

IMPERIAL							
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Max Pull During Delay (lbs)	Free Stroke Up / Down (inch)	Total Stroke (inch)
4.75	22.0	2.25	370 600	21 500	132 000	8.0	25.0
6.50	23.1	2.75	1 220 000	51 000	275 000	8.0	25.0
6.75	22.7	2.75	1 220 000	51 500	290 000	8.0	25.0
8.00	23.2	2.81	1 293 900	103 200	400 000	8.0	25.0
9.50	24.1	3.00	2 106 900	189 300	550 000	8.0	25.0

METRIC							
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Max Pull During Delay (daN)	Free Stroke Up / Down (mm)	Total Stroke (mm)
121	6.7	57	164 800	29 100	58 700	200	640
165	7.0	70	542 700	69 100	122 300	200	640
171	6.9	70	542 700	69 800	129 000	200	640
203	7.1	71	575 500	139 900	177 900	200	640
241	7.3	76	937 100	256 700	244 600	200	640

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice.

Handling

- To prevent unintentional tripping during handling, the UHJDA is fitted with a safety clamp to keep the jar in the fully extended position. The safety clamp must remain installed until the jar is ready to run into the hole.
- When preparing to run into the hole, connect the jar to the drill string and apply tension before removing the safety clamp.
- When coming out of the hole, install the safety clamp while the jar is still under tension and fully extended.

Hydraulic/Mechanical Drilling Jar

The Wenzel Downhole Tools Hydraulic/Mechanical Drilling Jar (HMJ) is a double acting jar, designed to deliver hydraulic delay when jarring in the up direction, and mechanical release when jarring in the down direction. The HMJ incorporates a latch mechanism to keep the jar locked in the neutral position and eliminate unexpected jarring while tripping or racking on the derrick.

Features and Benefits

- The HMJ is normally operated in the latched position to reduce unexpected jarring while drilling and eliminate movement between jar components, increasing service life.
- The HMJ operates with a simple up and down motion and is not affected by torque.
- The spline drive and latch mechanism are enclosed in a single, sealed oil chamber without ports to the annulus. Such ports on other jars may fill with cuttings and restrict the down jar stroke.
- The hydraulic delay mechanism is located in a separate chamber to prevent contamination and increase reliability.
- With the latch mechanism in the latched position, the inner mandrel and outer housing act integrally, virtually eliminating seal and inner tool wear during normal drilling conditions. There is no need to extend or open the jar before running in the hole.
- Standard seals in the tool are effective to 250°F (120°C). The jar can be dressed with seals effective to 400°F (200°C) for hot hole environments. External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.
- The HMJ can be run in tension or in compression within the preset latch setting.

Hydraulic/Mechanical Drilling Jar Specifications

IMPERIAL

Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Nominal Up Latch Setting (lbs)	Nominal Down Latch Setting (lbs)	Max Pull During Delay (lbs)	Free Stroke Up (inch)	Free Stroke Down (inch)
3.12	13.9	1.00	154 500	8 200	25 000	11 000	42 000	5.0	6.5
3.50	14.9	1.25	211 500	10 300	35 000	15 000	50 000	5.0	7.0
3.75	15.1	1.19	214 000	11 300	35 000	15 000	65 000	5.0	7.0
4.75	17.0	2.25	391 000	20 000	55 000	30 000	85 000	5.0	6.0
5.25	17.9	2.25	554 100	31 000	55 000	30 000	120 000	5.0	6.0
6.25	18.0	2.25	777 000	48 500	90 000	40 000	160 000	5.0	6.0
6.50	18.0	2.25	777 000	52 400	90 000	40 000	160 000	5.0	6.0
6.62	17.9	2.75	722 500	53 800	90 000	40 000	170 000	5.0	6.0
6.75	17.9	2.75	907 500	48 800	95 000	42 000	190 000	5.0	6.0
8.00	18.2	2.81	949 000	98 000	100 000	45 000	240 000	5.5	6.0
9.00	19.1	3.00	1 221 000	162 500	110 000	50 000	240 000	5.5	6.0
9.50	19.2	3.00	1 658 500	178 400	110 000	50 000	240 000	5.5	6.0

METRIC

Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Nominal Up Latch Setting (daN)	Nominal Down Latch Setting (daN)	Max Pull During Delay (daN)	Free Stroke Up (mm)	Free Stroke Down (mm)
79	4.2	25	68 700	11 100	11 100	4 900	18 700	130	170
89	4.5	32	94 100	14 000	15 600	6 700	22 200	130	180
95	4.6	30	95 200	15 300	15 600	6 700	28 900	130	180
121	5.2	57	173 900	27 100	24 500	13 300	37 800	130	150
133	5.5	57	246 500	42 000	24 500	13 300	53 400	130	150
159	5.5	57	345 600	65 800	40 000	17 800	71 200	130	150
165	5.5	57	345 600	71 000	40 000	17 800	71 200	130	150
168	5.5	70	321 400	72 900	40 000	17 800	75 600	130	150
171	5.5	70	403 700	66 200	42 300	18 700	84 500	130	150
203	5.5	71	422 100	132 900	44 500	20 000	106 800	140	150
229	5.8	76	543 100	220 300	48 900	22 200	106 800	140	150
241	5.9	76	737 700	241 900	48 900	22 200	106 800	140	150

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice.

Operation

Jarring Up

- Jarring up is achieved by applying sufficient overpull to overcome the latch setting, which initiates the hydraulic time delay. During the time delay, the overpull at surface can be adjusted to vary the impact force. See the table for the maximum pull during delay.
- After impact, apply a down force sufficient to close jar and re-engage latch, then repeat the jarring cycle as required.

Jarring Down

- Jarring down is achieved by applying sufficient downward force to overcome the latch setting and pump open force. At that point, the HMJ will release and jar downward.
- After impact, pick up the work string to re-engage the mechanical latch then repeat the jarring cycle as required.

Double Acting Hydraulic Drilling Jar

The Wenzel Downhole Tools Double Acting Hydraulic Drilling Jar (HJDA) is a bi-directional drilling jar incorporating hydraulic delay without a latch mechanism. This jar will allow the operator to apply variable impact in both the up and down directions. The HJDA is intended for use in highly deviated or high friction wells, where conditions may prevent applying sufficient force to release a mechanical latch.

Feature and Benefits

- The HJDA is hydraulically controlled and jars in both directions, with impact force controlled by the operator.
- Impact force is controlled by a metering device that ensures consistent delay times over the full range of operating temperatures.
- The HJDA operates via a simple up and down motion and is unaffected by right- or left-hand torque.
- Standard seals are suitable for use up to 250°F (120°C). Optional high temperature seal kits are available for service to 400°F (200°C). External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.

Operation

Jarring Up

- With the jar in the neutral position, apply the desired overpull in excess of the free string weight, starting the hydraulic delay sequence. At the end of the hydraulic delay, the jar will release causing an upward impact force.
- If necessary, lower the drill string sufficiently to close the jar to the neutral position, ready to jar up again.

Jarring Down

- With the jar in the neutral position, lower the drill string to apply the desired down force, starting the hydraulic delay sequence. At the end of the hydraulic delay, the jar will release causing a downward impact force.
- If necessary, raise the drill string sufficiently to open the jar to the neutral position, ready to jar down again.

Double Acting Hydraulic Drilling Jar Specifications

IMPERIAL							
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Max Pull During Delay (lbs)	Free Stroke Up / Down (inch)	Total Stroke (inch)
3.38	14.3	1.50	234 900	9 000	50 000	7.0	21.0
4.25	16.9	2.00	300 800	16 300	70 000	8.0	25.0
4.75	17.4	2.25	370 600	21 500	85 000	8.0	25.0
6.25	17.9	2.25	938 900	50 700	160 000	8.0	25.0
6.50	18.1	2.75	1 220 000	51 000	175 000	8.0	25.0
6.75	17.9	2.75	1 220 000	51 500	190 000	8.0	25.0
8.00	18.2	2.81	1 293 900	103 200	240 000	8.0	25.0
9.50	19.0	3.00	2 106 900	189 300	300 000	8.0	25.0

METRIC							
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Max Pull During Delay (daN)	Free Stroke Up / Down (mm)	Total Stroke (mm)
86	4.3	38	104 500	12 200	22 200	180	530
108	5.2	51	133 800	22 100	31 100	200	640
121	5.3	57	164 800	29 100	37 800	200	640
159	5.4	57	417 600	68 700	71 200	200	640
165	5.5	70	542 700	69 100	77 800	200	640
171	5.5	70	542 700	69 800	84 500	200	640
203	5.5	71	575 500	139 900	106 800	200	640
241	5.8	76	937 100	256 700	133 400	200	640

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice
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Handling

- To prevent unintentional tripping during handling, the UHJDA is fitted with a safety clamp to keep the jar in the fully extended position. The safety clamp must remain installed until the jar is ready to run into the hole.
- When preparing to run into the hole, connect the jar to the drill string and apply tension before removing the safety clamp.
- When coming out of the hole, install the safety clamp while the jar is still under tension and fully extended.

Double Acting Hydraulic/Mechanical Drilling Jar

The Wenzel Downhole Tools Double Acting Hydraulic/Mechanical Drilling Jar (HMDA) is a double acting jar, designed to deliver hydraulic delay when jarring up or down, complete with a mechanical lock in each direction. The HMDA incorporates a latch mechanism to keep the jar locked in the neutral position and eliminate unexpected jarring while tripping or racking back on the derrick.

Features and Benefits

- The HMDA is normally operated in the latched position to reduce unexpected jarring while drilling and eliminate movement between jar components, increasing service life.
- The HMDA operates with a simple up and down motion and is not affected by torque.
- The spline drive and latch mechanism are enclosed in a single, sealed oil chamber without ports to the annulus. Such ports on other jars may fill with cuttings and restrict the down jar stroke.
- The hydraulic delay mechanism is located in a separate chamber to prevent contamination and increase reliability.
- Impact force is controlled by the metering device that ensures consistent delay times over the full range of operating temperatures.
- With the latch mechanism in the latched position, the inner mandrel and outer housing act integrally, virtually eliminating seal and inner tool wear during normal drilling conditions. There is no need to extend or open the jar before running in the hole.
- Standard seals are suitable for use up to 250°F (120°C). Optional high temperature seal kits are available for service to 400°F (200°C). External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.
- The HMDA can be run in tension or in compression within the preset latch settings.

Hydraulic/Mechanical Double Acting Drilling Jar Specifications

IMPERIAL									
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Nominal Up Latch Setting (lbs)	Nominal Down Latch Setting (lbs)	Max Pull During Delay (lbs)	Free Stroke Up/Down (inch)	Total Stroke (inch)
4.75	18.3	2.25	370 600	21 500	55 000	30 000	85 000	8.0	25.0
6.50	19.7	2.75	1 220 000	51 000	90 000	40 000	175 000	8.0	25.0
6.75	17.9	2.75	1 220 000	51 500	95 000	42 000	190 000	8.0	25.0
8.00	19.7	2.81	1 293 900	103 200	100 000	45 000	240 000	8.0	25.0
9.50	20.6	3.00	2 106 900	189 300	110 000	50 000	300 000	8.0	25.0

METRIC									
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Nominal Up Latch Setting (daN)	Nominal Down Latch Setting (daN)	Max Pull During Delay (daN)	Free Stroke Up/Down (mm)	Total Stroke (mm)
121	5.6	57	164 800	29 100	24 500	13 300	37 800	200	640
165	6.0	70	542 700	69 100	40 000	17 800	77 800	200	640
171	5.5	70	542 700	69 800	42 300	18 700	84 500	200	640
203	6.0	71	575 500	139 900	44 500	20 000	106 800	200	640
241	6.3	76	937 100	256 700	48 900	22 200	133 400	200	640

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice.

Operation

Jarring Up

- Jarring up is achieved by applying sufficient overpull to overcome the latch setting, which initiates the hydraulic time delay. During the time delay, the overpull at surface can be adjusted to vary the impact force. See the table for the maximum load during delay.
- After impact, apply a down force sufficient to close jar and re-engage latch, then repeat the jarring cycle as required.

Jarring Down

- Jarring down is achieved by applying sufficient downward force to overcome the latch setting and pump open force. During the time delay, the load at the surface can be adjusted to vary the impact force. See the table for the maximum load during delay.
- After impact, pull up with enough force to re-engage the mechanical latch then repeat the jarring cycle as required.

Hydraulic Fishing/Drilling Jar

The Wenzel Downhole Tools Hydraulic Jar (HJ) is a single acting jar designed primarily for fishing applications, jarring in the upward direction. Hydraulically operated, with impact force controlled by the operator, the HJ is ideally suited for fishing, coring, milling or other downhole applications.

Features and Benefits

- The HJ is hydraulically controlled and jars in the up direction, with impact force controlled by the operator.
- Impact force is controlled by a metering device that ensures consistent delay times over the full range of operating temperatures.
- A long splined mandrel ensures the jar is not affected by torsional forces. These splines are sealed and lubricated to minimize friction and provide long wear life.
- While this jar is designed to be rugged enough for drilling applications, it is intended for fishing, coring, and milling applications.
- A free stroke of 4" to 6" (depending on tool size) provides an impact force to the stuck point several times higher than the overpull force applied to the jar.
- Standard seals in the tool are effective to 250°F (120°C). The jar can be dressed with seals effective to 400°F (200°C) for hot hole environments. External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.

Operation

Jarring Up

- The Hydraulic Jar (HJ) should be run in the hole in the open position.
- HJ is activated by applying upward pull from the closed position.
- The amount of upward impact force can be changed by varying the amount of overpull applied at surface. See the table for the maximum pull during delay.
- When upward overpull has been applied, the jar will fire after a timed delay. The delay is reduced as upward force is increased.
- After the jar strikes an upward blow, re-setting is quickly accomplished by lowering the drillstring until the jar is in the closed position.

Hydraulic Fishing/Drilling Jar Specifications

IMPERIAL

Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Max Pull During Delay (lbs)	Free Stroke (inch)	Total Stroke (inch)
3.12	9.5	1.00	198 000	6 600	41 000	7.0	11.0
3.38	9.0	1.50	235 000	7 400	50 000	4.0	8.5
3.75	9.2	1.25	196 000	10 100	60 000	4.0	8.0
4.25	9.5	2.00	301 000	13 800	70 000	4.0	8.5
4.75	11.2	2.25	352 000	16 100	75 000	6.5	11.0
5.00	10.2	2.25	352 000	23 300	85 000	6.5	11.0
6.25	9.7	2.25	868 000	35 000	130 000	6.5	11.0
6.50	11.5	2.25	868 000	44 000	150 000	6.5	11.0
7.75	9.2	3.00	900 000	79 600	220 000	6.5	11.0
8.00	10.6	3.00	900 000	86 900	240 000	6.5	11.0
9.00	11.3	3.00	1 288 000	128 800	270 000	6.0	10.5

METRIC

Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Max Pull During Delay (daN)	Free Stroke (mm)	Total Stroke (mm)
79	2.9	25	88 100	8 900	18 200	180	280
86	2.7	38	104 500	10 000	22 200	100	220
95	2.8	32	87 200	13 700	26 700	100	200
108	2.9	51	133 900	18 700	31 100	100	220
121	3.4	57	156 600	21 800	33 400	170	280
127	3.1	57	156 600	31 600	37 800	170	280
159	2.9	57	386 100	47 500	57 800	170	280
165	3.5	57	386 100	59 700	66 700	170	280
197	2.8	76	400 300	107 900	97 900	170	280
203	3.2	76	400 300	117 800	106 800	170	280
229	3.4	76	572 900	174 600	120 100	150	270

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice.

Hydraulic Jar Accelerator

The Wenzel Downhole Tools Hydraulic Jar Accelerator is a hydraulic spring that stores energy when tension is applied to the drilling string.
During the jarring stroke, the energy is released upwards to accelerate the drill collars and the upper portion of the Jar, intensifying the jarring impact.

Features and Benefits

- Featuring a sealed and lubricated spline drive, the Accelerator will provide long service life under high torque and stroking applications. Full torque can be transmitted through the Accelerator.
- Standard seals in the tool are effective to 250°F (120°C). The sub can be dressed with seals effective to 400°F (200°C) for hot hole environments. External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.
- The operation of the Accelerator is independent of the fluid circulation.
- The Accelerator is very useful in shallow holes where little pipe stretch is available.
- Recommended for use in extended reach or highly deviated wells where jar performance could suffer due to hole drag.

Operation

- The Hydraulic Jar Accelerator is traditionally used in fishing operations, but because it has a sealed spline and robust design it may also be used with drilling jars.
- Appling tension to the drill string will transfer energy to the hydraulic chamber. Follow normal recommended practices for operating the drilling jar.

Hydraulic Jar Accelerator Specifications

IMPERIAL							
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Load to Extend Tool (lbs)	Total Stroke (inch)	Approximate Weight (lbs)
3.12	11.3	1.00	227 000	7 800	34 000	8.0	225
3.42	13.5	1.50	235 000	8 000	36 000	8.0	340
4.75	14.4	2.25	371 000	19 800	58 000	8.0	650
6.50	14.7	2.25	950 000	54 200	141 000	8.0	1 350
6.62	14.7	2.75	783 000	52 100	136 000	8.0	1 300
6.75	15.0	2.75	783 000	48 300	150 000	8.0	1 500
7.00	15.3	2.75	715 000	48 800	160 000	8.0	1 550
8.00	15.5	3.00	1 149 000	110 600	198 000	8.0	2 240
8.25	15.5	3.00	1 149 000	125 600	198 000	8.0	2 300
9.50	14.3	3.00	1 643 000	180 000	211 000	8.0	2 950

METRIC							
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Load to Extend Tool (daN)	Total Stroke (mm)	Approximate Weight (kg)
79	3.4	25	101 000	10 600	15 100	203	100
87	4.1	38	105 000	10 800	16 000	203	150
121	4.4	57	165 000	27 000	25 800	203	300
165	4.5	57	423 000	73 000	62 700	203	610
168	4.5	70	348 000	71 000	60 500	203	590
171	4.6	70	348 000	65 000	66 700	203	680
178	4.7	70	318 000	66 000	71 200	203	700
203	4.7	76	511 000	150 000	88 100	203	1 020
210	4.7	76	511 000	170 000	88 100	203	1 050
241	4.4	76	731 000	244 000	93 900	203	1 340

Other sizes are available upon request.
Specifications are based on as new condition and are subject to change without notice.

Double Acting Hydraulic Jar Accelerator

The Wenzel Downhole Tools Double Acting Hydraulic Jar Accelerator is a hydraulic spring that stores energy when tension or compression is applied to the drilling string.
During the jarring stroke, the Accelerator's stored energy is released to accelerate the drill collars and the jar, intensifying the jarring impact.

Features and Benefits

- Featuring a sealed and lubricated spline drive, the Accelerator will provide long service life under high torque and stroking applications.
- Full torque can be transmitted through the Accelerator.
- Standard seals in the tool are effective to 250°F (120°C). The sub can be dressed with seals effective to 400°F (200°C) for hot hole environments. External sealing surfaces are tungsten carbide-coated to enhance wear and corrosion resistance.
- The operation of the Accelerator is independent of the fluid circulation.
- The Accelerator is useful in shallow holes where little pipe stretch is available.
- Recommended for use in extended reach or highly deviated wells where jar performance could suffer due to hole drag.

Operation

- The Double Acting Hydraulic Jar Accelerator is used to enhance the operation of double acting drilling/fishing jars.
- Appling tension or compression to the drill string will transfer energy to the hydraulic chamber. Follow normal recommended practices for operating the drilling jar.

Double Acting Hydraulic Jar Accelerator Specifications

IMPERIAL

Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Load to Extend (lbs)	Load to Compress (lbs)	Stroke Up (inch)	Stroke Down (inch)	Approximate Weight (lbs)
4.75	20.9	2.25	370 600	20 500	42 000	31 000	12.5	12.5	900
6.50	22.2	2.75	1 220 000	51 600	99 400	43 900	12.5	12.5	1 900
8.00	19.8	2.81	1 294 000	103 200	138 500	63 700	12.5	12.5	2 780

METRIC

Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Load to Extend (daN)	Load to Compress (daN)	Stroke Up (mm)	Stroke Down (mm)	Approximate Weight (kg)
121	6.4	57	165 000	28 000	18 700	13 800	318	318	410
165	6.8	70	543 000	70 000	44 200	19 500	318	318	860
203	6.0	71	576 000	140 000	61 600	28 300	318	318	1 260

Other sizes are available upon request.
Specifications are based on as new condition and are subject to change without notice.

SHAKER

The Wenzel Downhole Tools SHAKER generates vibrations to reduce friction between the drill string and the formation. These vibrations will reduce drag when in sliding mode and reduce torque during rotary drilling operation.

For maximum effectiveness the SHAKER should be positioned in the drill string near the region where the high friction values are expected.

Features and Benefits

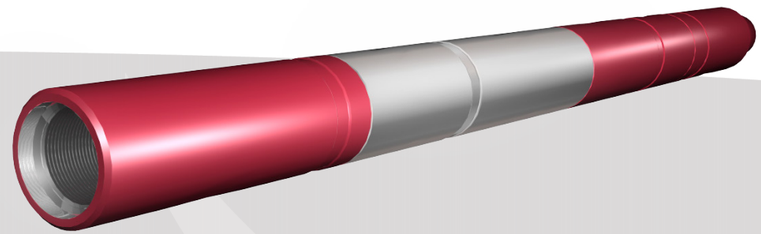
- Increases ROP in sliding mode.
- Provides consistent WOB to help maintain tool face orientation.
- Activated by drilling fluid flow.
- Low pressure drop permits use of multiple SHAKERS in drill string.
- A wireline removable plug provides full 2.25 inch thru-bore, allowing wireline operations below tool. The plug has a common 1.375" external fishing neck.
- Parts are produced from high grade materials for long life.

SHAKER Specifications

IMPERIAL								
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Torsional Limit (ft·lbs)	Flow Range (US GPM)	Pressure Drop (PSI)	Vibration Frequency (Hz)	Approx. Weight (lbs)
4 3/4	6.1	2.25	749 000	31 000	200 – 350	50 – 100	30 – 42	300
6 1/2	4.8	2.25	1 000 000	51 000	400 – 600	100 – 200	30 – 42	350

METRIC								
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Flow Range (LPM)	Pressure Drop (kPa)	Vibration Frequency (Hz)	Approx. Weight (kg)
121	1.9	57	333 000	42 000	757 – 1140	345 – 690	30 – 42	140
165	1.5	57	445 000	69 000	1510 – 2270	690 – 1380	30 – 42	160

Specifications are based on as new condition and are subject to change without notice.



Shock Tool

The Wenzel Downhole Tools Shock Tool effectively reduces impact loading on the bit to extend bit life and reduce bit trips. By isolating axial bit vibrations from the drill string, the Shock Tool will reduce lateral and torsional drill string vibrations, and related fatigue damage or failure of the rotary connections. The Shock Tool allows optimum bit speed to be used under rough drilling conditions, increasing the rate of penetration.

Features and Benefits

- Isolates bit induced vibrations from the drill string.
- Fully oil-sealed and lubricated for extended service life.
- Does not use temperature-sensitive elastomers for shock absorption, therefore is suitable for use in temperatures to 250°F (120°C), with optional seals available for temperatures up to 320°F (160°C).
- Reliable Belleville disc springs provide optimum load/deflection characteristics to maintain consistent contact between bit and formation, effectively reducing impact loading to extend bit life.
- Pressure balanced to eliminate the effect of downhole hydrostatic pressure.
- Low friction torsional drive permits free vertical movement.
- Well-stabilized, with internal three-point lateral support to minimize deflection.
- Reduces wear and tear on rig and equipment, and fatigue failures on drill collars and drill pipe.
- Automatically compensates for pump open force.

Shock Tool Specifications

IMPERIAL						
Nominal OD (inch)	Length (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Pump Open Area (in^2)	Torsional Limit (ft lbs)	Approx Weight (lbs)
3.38	7.9	1.00	102 000	5.9	8 000	225
3.50	7.8	1.00	239 000	5.9	10 000	230
4.75	10.7	1.50	561 500	11.0	20 000	540
6.25	11.7	2.25	926 600	19.6	37 900	1000
6.50	11.6	2.25	960 000	19.6	39 500	1030
6.75	11.5	2.75	837 400	21.6	46 400	1100
8.00	11.9	2.75	1 378 800	30.6	104 600	1690
9.00	12.3	3.00	1 502 000	38.5	125 000	2220
9.50	12.3	3.00	1 209 000	41.3	131 000	2500
10.00	12.3	3.00	1 246 500	41.3	132 300	2680
11.00	12.0	3.00	1 628 300	63.6	225 600	3240
11.25	14.6	3.00	1 775 300	56.7	255 800	4120
12.00	12.0	3.00	1 628 300	63.3	345 400	3900

METRIC						
Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Pump Open Area (mm^2)	Torsional Limit (N·m)	Approx Weight (kg)
86	2.4	25	45 400	3 800	11 000	100
89	2.4	25	106 300	3800	14 000	100
121	3.3	38	249 800	7000	28 000	250
159	3.6	57	412 200	12 700	53 000	450
165	3.5	57	427 000	12 700	55 000	470
171	3.5	70	372 500	13 900	64 000	500
203	3.6	70	613 300	19 700	145 000	770
229	3.7	76	668 100	24 800	174 000	1010
241	3.7	76	537 800	26 600	182 000	1140
254	3.7	76	554 500	26 600	184 000	1220
279	3.7	76	724 300	41 000	313 000	1470
286	4.4	76	789 700	36 600	355 000	1870
305	3.7	76	724 300	41 000	480 000	1770

Other sizes available upon request.
Specifications are based on as new condition and are subject to change without notice.

Operation

- For maximum effectiveness, the Shock Tool should be positioned immediately above the bit.
- With a packed bottom hole assembly, the Shock Tool may be located a minimum of two drill collar lengths above the top stabilizer, however bit protection will be reduced due to the greater un-sprung mass below the tool.
- Automatic compensation of pump open effect makes the Shock Tool effective with any combination of bit weight or circulating pressure.

Bumper Sub

The Wenzel Downhole Tools Bumper Sub is a traditional downhole tool, having numerous applications during fishing, coring, and workover operations.

Features and Benefits

- Featuring a sealed and lubricated spline drive, the Bumper Sub will provide long service life under high torque and stroking applications.
- Standard seals in the tool are effective to 250°F (120°C). The sub can be dressed with seals effective to 400°F (200°C) for hot hole environments.
- External sealing surfaces are tungsten carbide coated to enhance wear and corrosion resistance.

Operation

This easy-to-operate tool can be used to:

- Apply and release various fishing or testing tools.
- Apply constant weight to sensitive milling and cutting tools.
- Provide up and down jarring forces.

Bumper Sub Specifications

IMPERIAL							
Nominal OD (inch)	Length Closed (feet)	Thru Bore (inch)	Tensile Yield (lbs)	Pump Open Area (in^2)	Torsional Yield (ft lbs)	Total Stroke (inch)	Approximate Weight (lbs)
3.12	7.8	1.00	142 200	3.98	6560	20	160
4.25	8.3	1.88	233 400	8.30	13 800	20	300
6.50	11.1	2.25	968 800	19.63	44 600	20	990

METRIC							
Nominal OD (mm)	Length Closed (m)	Thru Bore (mm)	Tensile Yield (daN)	Pump Open Area (mm^2)	Torsional Yield (N·m)	Total Stroke (mm)	Approximate Weight (kg)
79	2.4	25.4	63 240	2570	8900	508	70
108	2.5	47.8	103 800	5350	18 700	508	140
165	3.4	57.2	430 900	12 660	60 500	508	450

Other sizes and connection options are available upon request.
Specifications are based on as new condition and are subject to change without notice.

WZL
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