UTMⅡ

ROTATING TORQUE METER



TOKYO VENTURE TECHNOLOGY AWARD

RoHS2

Compact design suitable for installation in equipment —— Slip-ring-less rotating torque meter achieving high accuracy, high stability & high stiffness, simultaneously

Rotating torque meter, UTMⅡ, designed with Unipulse's improved unique torque sensing technology!
Suitable for installing in small confined space of machines which was not possible in the past.

- Available in 17 different capacities ranging from 0.05 to 10000 N m.
- Cut-off frequency of 1 kHz with high-speed sampling at 6 kHz.
- Safe overload of 500%
- Power supply DC 24 V
- No external amplification required: ±5 V analog output voltage
- A rotational pulse generating circuit (4 pulses/revolution) is built in as standard.
- Improved noise immunity by adopting an insulated power supply

Compact and easy to install

The six models (0.05, 0.1, 0.2, 0.5, 1, 2 N m) are particularly compact and light: 54(W)×50(H)×40(D) mm in size, 200 g or less in weight.

High accuracy and stability

1/10000 torque resolution with outstanding zero stability.
UTMⅡ accurately measures tiny torque variations.

Maintenance-free

No slip-ring.
The lifetime of UTMⅡ is mainly determined by the lifetime of bearings.

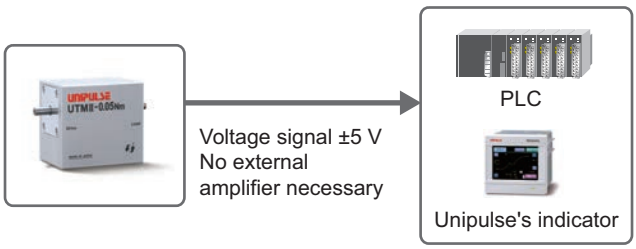
Small starting torque

The starting torque of the bearing in the UTMⅡ-0.05Nm is only 0.00001 N m (0.03% FS).
Actually, the effect of rotating friction can be negligible.

Maxaximum rotational speed 25000 rpm

0.05 to 10 N m	25000 rpm
20, 50 N m	20000 rpm
100 N m	15000 rpm
200 N m	12000 rpm
500 N m	10000 rpm
1000 N m	7000 rpm
2000 N m	6000 rpm
5000 N m	5000 rpm
10000 N m	4000 rpm

Smart system configuration with no external circuits needed



Full of measuring instruments dedicated for UTMⅡ

TM320
High-speed sampling
Torque, rotation speed, and power are displayed simultaneously.
More details: P.27

TM380
High-speed sampling
Torque, rotation speed, and angle are displayed simultaneously.
More details: P.28

TC80
High-speed sampling
Torque, rotation speed, and torque-angle curve can be monitored.
More details: P.29

TM301
Torque, rotation speed, and power are displayed simultaneously.
More details: P.30

TM400
High-speed sampling
Torque, rotation speed, and power curve can be monitored.
More details: P.31

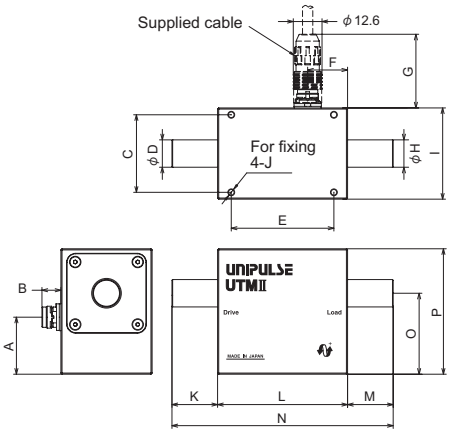
TM700
High-speed sampling
Monitoring of torque, rotation speed, and power curves.
More details: P.32

TM201
Torque, rotation speed, and power are monitored and saved on PC.
More details: P.33

Specifications

Measurement range	±0.05 N m	±0.1 N m	±0.2 N m	±0.5 N m	±1 N m	±2 N m	±5 N m	±10 N m	±20 N m	±50 N m	±100 N m	±200 N m	±500 N m	±1000 N m	±2000 N m	±5000 N m	±10000 N m
Power supply	DC 24 V±15%																
Consumption current	100 mA or less								150 mA or less					160 mA or less			
Output range	±5 V Load resistance must be more than 2 kΩ																
Responsivity	1 kHz																
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30 V DC, 10 mA																
Safe overload	500% FS (300% FS for key groove option)																
Non-linearity	0.03% FS or less																
Hysteresis	0.03% FS or less																
Repeatability	0.03% FS or less																
Operation temperature	−10 to +50℃																
Temperature effect on zero	0.01% FS/℃ or below																
Temperature effect on span	0.01% FS/℃ or below																
Maximum rotation speed	25000 rpm								20000 rpm		15000 rpm	12000 rpm	10000 rpm	7000 rpm	6000 rpm	5000 rpm	4000 rpm
Torsional spring constant (N m/rad)	5.67	11.57	26.10	93.1	188	414	691	1851	5386	8428	17.3×10^3	41.7×10^3	117×10^3	377×10^3	717×10^3	1649×10^3	3255×10^3
Maximum torsional angle (rad)	8.81×10^{-3} (0.505°)	8.64×10^{-3} (0.495°)	7.66×10^{-3} (0.439°)	5.37×10^{-3} (0.308°)	5.32×10^{-3} (0.305°)	4.83×10^{-3} (0.277°)	7.24×10^{-3} (0.415°)	5.40×10^{-3} (0.310°)	3.71×10^{-3} (0.213°)	5.93×10^{-3} (0.340°)	5.78×10^{-3} (0.331°)	4.79×10^{-3} (0.275°)	4.28×10^{-3} (0.246°)	2.65×10^{-3} (0.152°)	2.79×10^{-3} (0.160°)	3.03×10^{-3} (0.174°)	3.07×10^{-3} (0.176°)
Inertia moment (kg m²)	8.77×10^{-7}	8.87×10^{-7}	8.99×10^{-7}	1.49×10^{-6}	1.52×10^{-6}	1.42×10^{-6}	3.56×10^{-6}	3.66×10^{-6}	2.60×10^{-5}	2.67×10^{-5}	6.60×10^{-5}	1.40×10^{-4}	4.70×10^{-4}	2.90×10^{-3}	5.89×10^{-3}	2.01×10^{-2}	5.16×10^{-2}
Dimension (case size) W×H×D (mm)	54×50×40						57×55×40		70×68×51		67×74×57	67×79×62	67×79×72	86×103×98	86×119×111	97×141×137	103×166×162
Total length	74 mm			84 mm			97 mm		150 mm	170 mm	177 mm	187 mm	217 mm	286 mm	306 mm	387 mm	447 mm
Shaft diameter	ϕ5 mm			ϕ8 mm			ϕ12 mm		ϕ20 mm		ϕ25 mm	ϕ30 mm	ϕ40 mm	ϕ60 mm	ϕ70 mm	ϕ90 mm	ϕ110 mm
Approx. weight	160 g			180 g			270 g		700 g		1.1 kg	1.5 kg	2.6 kg	7.3 kg	11 kg	21 kg	36 kg
Supplied cable	6-conductor flexible cable (2 m) Cable end: 7 wires → Cable length is switchable to 5 m (Option: UTM Ⅱ-L5)																
Optionally available cable	CATM51: 6-conductor flexible cable (5 m) Cable end: 7 wires CATM12: 6-conductor flexible cable (10 m) Cable end: 7 wires																
Option: Rotary encoder	○	○	○	○	○	○	○	○	○	○							
Option: Key groove							○	○	○	○	○	○	○	○	○	○	○
Option: Key groove& Rotary encoder							○	○	○	○							
Option: Square drive											○		○				
Option: Square drive& Rotary encoder								○	○	○	○		○				

External dimension

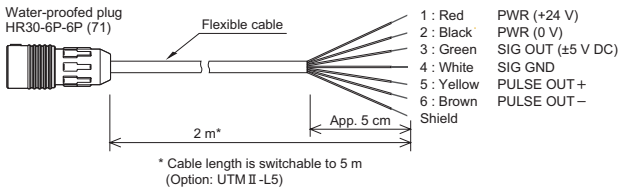


Measurement range(N m)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0.05 N m	25	8.3	32	5h7	45	18	32.3	5h7	40	M3 Depth 6	10	54	10	74	33	50
0.1 N m																
0.2 N m																
0.5 N m				8h7				8h7			15		15	84		
1 N m																
2 N m																
5 N m			34	12h7		19.5		12h7			20	57	20	97	35.5	55
10 N m																
20 N m	31.5	6.8	43	20h7	58	20.5	30.8	20h7	51		40	70	40	150	42.5	68
50 N m											50		50	170		
100 N m			48	25h7	54			25h7	57	M4 Depth 8	55	67	55	177	45.5	74
200 N m			54	30h7	52			30h7	62		60		60	187	48	79
500 N m	21.5		64	40h7				40h7	72		75		75	217	43	
1000 N m	25	5.3	86	60h7	66	28.5	29.3	60h7	98	M5 Depth 10	100	86	100	286	54	103
2000 N m			100	70h7	69			70h7	111		110		110	306	61.5	119
5000 N m		4.8	124	90h7	72		28.8	90h7	137	M6 Depth 12	145	97	145	387	72.5	141
10000 N m			144	110h7	76	36.5		110h7	162	M8 Depth 16	172	103	172	447	85	166

* For the dimensions of options, please refer to the page for each option.

Unit: mm

■Supplied cable **Flexible cable**

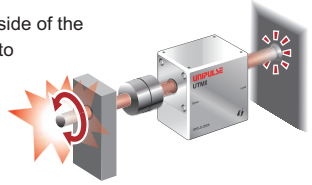


* Cable length is switchable to 5 m
(Option: UTM Ⅱ-L5)

Cautions for use

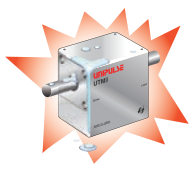
■ Possibility of overload during setup

When installing the sensor with one side of the shaft fixed, overload may occur due to unintended torque. Please pay extra attention to low capacity model.



■ Protection against water and condensation

Do not let water enter the shafts. Do not use the sensor in an environment where the main unit gets condensed.



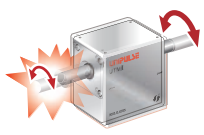
■ Alter the shape of shafts

Do not alter the shape of shafts under any circumstances (Will affect accuracy). Shafts of UTMⅢ/UTMⅡ have sensing function.



■ Overload due to resonance vibration

If sensor is used with vibrating devices, please be advised that torque may overload due to resonance.



Structure of product code

UTMⅡ- 0.05Nm (R) (K) (W)

- (W): Square drive option (100 N m, 500 N m)
- (K): Key groove option (5 to 10000 N m)
- (R): Rotary encoder option (0.05 to 50 N m)
- 0.05Nm: Measurement range (0.05 to 10000 N m)

* You can add both rotary encoder and key groove options to 5 N m, 10 N m, 20 N m and 50 N m capacity type.
Model numbers are UTMⅡ-ONm(RK) respectively.

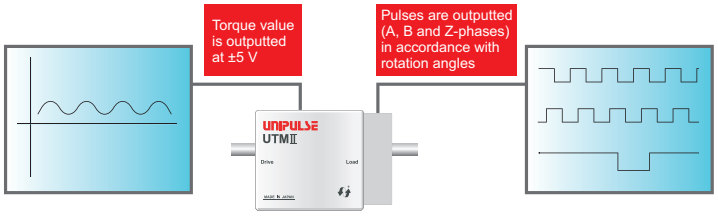
* You can add both rotary encoder and square drive options to 10 N m, 20 N m, 50 N m, 100 N m and 500 N m capacity type.
Model numbers are UTMⅡ-ONm(WR) respectively.

(R) Rotary encoder option: 0.05 to 50 N m



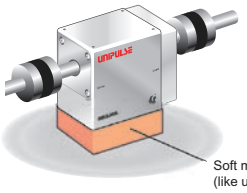
- Optical encoder
- Suitable for measurement of torque against angular variation

- Torque signal (analog ±5 V) and rotation angle signals (A, B and Z open collector outputs) are outputted.



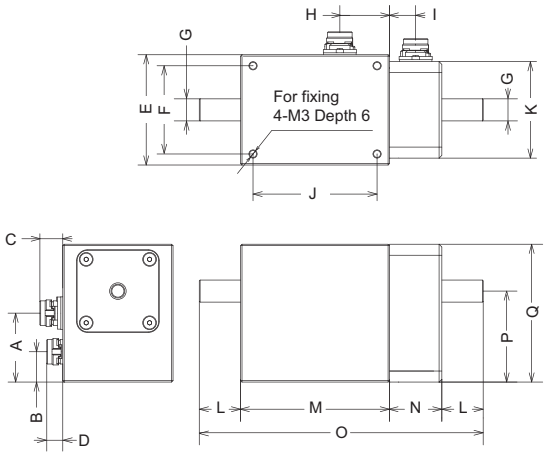
- Installation

Fix the main unit loosely to prevent angular error induced by rotation of the main unit.



Measurement range(N m)	Pulses per rev.	Maximum measurable rotation speed (rpm)	Torsional spring constant (N m/rad)	Maximum torsional angle (rad)	Inertia moment (kg m²)	Approx. weight (g)
0.05	2000	4500 rpm	5.55	9.01×10^{-3} (0.516°)	1.39×10^{-6}	200
0.1			11.08	9.02×10^{-3} (0.517°)	1.40×10^{-6}	
0.2			23.73	8.43×10^{-3} (0.483°)	1.41×10^{-6}	
0.5			88.32	5.66×10^{-3} (0.324°)	1.90×10^{-6}	220
1			169.41	5.90×10^{-3} (0.338°)	1.93×10^{-6}	
2			333.57	6.00×10^{-3} (0.344°)	1.83×10^{-6}	
5			831	6.02×10^{-3} (0.345°)	4.20×10^{-6}	330
10			1492	6.70×10^{-3} (0.384°)	4.30×10^{-6}	
20	1440	2000 rpm	4390	4.56×10^{-3} (0.261°)	0.30×10^{-4}	800
50			7578	6.60×10^{-3} (0.378°)	0.311×10^{-4}	

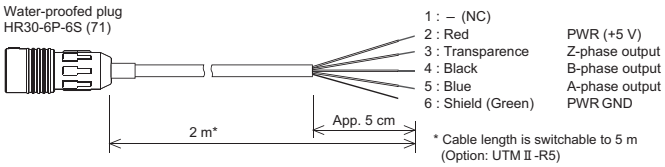
■ UTMⅡ-0.05Nm(R) to 50Nm(R)



Measurement range(N m)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
0.05	25	11	8.3	6.8	40	32	φ5h7	18	9.5	45	35	10	54	19	93	33	50
0.1																	
0.2																	
0.5				5.8			φ8h7					15			103		
1																	
2																	
5		13.5		6.8		34	φ12h7	19.5			37	20	57		116	35.5	55
10																	
20	31.5	13	6.8	8.5	51	43	φ20h7	20.5	7	58	51	40	70	17	167	42.5	68
50												50			187		

Unit: mm

■ Rotary encoder attached cable



* Cable length is switchable to 5 m (Option: UTMⅡ-R5)

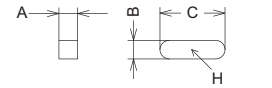
(K) Key groove option: 5 to 10000 N m

■ UTMⅡ-5Nm(K) to 10000Nm(K)

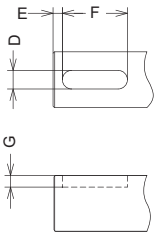
Due to the strength of the key, the safe overload is 300% FS.



・Key (Included in (K) option)



・Key groove

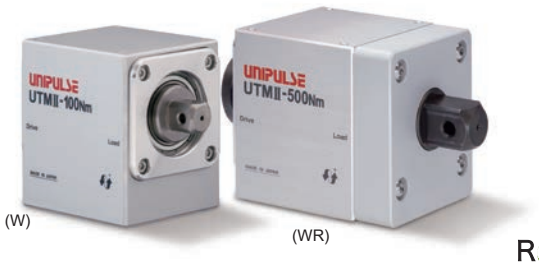


Measurement range(N m)	A	B	C	D	E	F	G	H
5	$4^{+0}_{-0.03}$	4h9 $^{+0}_{-0.03}$	$14^{+0}_{-0.18}$	$4^{-0.012}_{-0.042}$	2	$14^{+0.3}_{+0.1}$	$2.5^{+0.1}_{-0}$	—
10								
20	$6^{+0}_{-0.03}$	6h9 $^{+0}_{-0.03}$	$32^{+0}_{-0.25}$	$6^{-0.012}_{-0.042}$	3	$32^{+0.3}_{+0.1}$	$3.5^{+0.1}_{-0}$	M3
50			$38^{+0}_{-0.25}$			$38^{+0.3}_{+0.1}$		
100	$7^{+0}_{-0.036}$	8h9 $^{+0}_{-0.036}$	$48^{+0}_{-0.25}$	$8^{-0.015}_{-0.051}$		$48^{+0.3}_{+0.1}$	$4^{+0.2}_{-0}$	
200			$53^{+0}_{-0.25}$			$53^{+0.3}_{+0.1}$		
500	$8^{+0}_{-0.09}$	12h9 $^{+0}_{-0.043}$	$62^{+0}_{-0.3}$	$12^{-0.018}_{-0.061}$	4	$62^{+0.3}_{+0.1}$	$5^{+0.2}_{-0}$	M5
1000	$11^{+0}_{-0.11}$	18h9 $^{+0}_{-0.043}$	$90^{+0}_{-0.35}$	$18^{-0.018}_{-0.061}$	5	$90^{+0.3}_{+0.1}$	$7^{+0.2}_{-0}$	M6
2000	$12^{+0}_{-0.11}$	20h9 $^{+0}_{-0.052}$	$100^{+0}_{-0.35}$	$20^{-0.022}_{-0.074}$		$100^{+0.3}_{+0.1}$	$7.5^{+0.2}_{-0}$	M8
5000	$14^{+0}_{-0.11}$	25h9 $^{+0}_{-0.052}$	$135^{+0}_{-0.4}$	$25^{-0.022}_{-0.074}$		$135^{+0.3}_{+0.1}$	$9^{+0.2}_{-0}$	
10000	$18^{+0}_{-0.11}$	32h9 $^{+0}_{-0.062}$	$162^{+0}_{-0.4}$	$32^{-0.026}_{-0.088}$		$162^{+0.5}_{+0.1}$	$11^{+0.3}_{-0}$	M10

* During high-speed rotation, consider the imbalance caused by the key and adjust the rotation balance of the entire device.

Unit: mm

(W) Square drive option /(WR) Square drive & Rotary encoder option: 10/20/50/100/500 N m



RoHS2

Drive (Nut runner)



Load (Socket)



Contactless torque detection enables stable measurement without missing data.

- ■ It is ideal to monitor torque of nut runners (fastening tools)
- ■ With the high accuracy and high-speed response of UTMⅡ torque fluctuation can be monitored while tightening nuts.*

Torque: UTMⅡ(W)

Torque + Angle: UTMⅡ(WR)

* Note: Please do not use it with impact wrenches.

- ■ Torque can be easily checked by simply inserting and tightening it between the nut runners output shaft and socket.



Specifications

■ UTMⅡ(W)

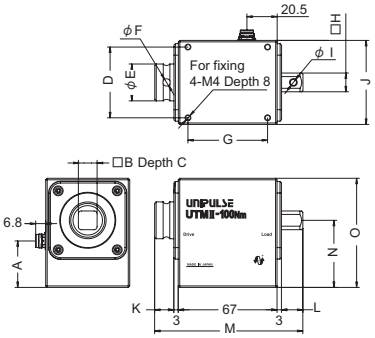
Model	UTMⅡ-100Nm(W)	UTMⅡ-500Nm(W)
Measurement range	±100 N m	±500 N m
Power supply	DC 24 V±15	
Power consumption	150 mA or less	
Output range	±5 V Load resistance must be more than 2 kΩ	
Responsivity	1 kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30 V, 10 mA	
Safe overload	150% FS	
Non-linearity	0.03% FS or less	
Hysteresis	0.03% FS or less	
Repeatability	0.03% FS or less	
Operation temperature	−10 to +50℃	
Temperature effect on zero	0.01% FS/℃ or below	
Temperature effect on span	0.01% FS/℃ or below	
Maximum rotation speed	15000 rpm	10000 rpm
Torsional spring constant	38.5×10^{3} N m/rad	265×10^{3} N m/rad
Maximum torsional angle	2.60×10^{-3} rad (0.149°)	1.88×10^{-3} rad (0.108°)
Inertia moment	3.8×10^{-5} kg m^2	2.15×10^{-4} kg m^2
Case size	67(W) × 74(H) × 57(D) mm	67(W) × 79(H) × 72(D) mm
Total length	100.5 mm	115 mm
Shaft diameter	□12.7 mm	□19.05 mm
Weight	Approx. 730 g	Approx. 1.4 kg

■ UTMⅡ(WR)

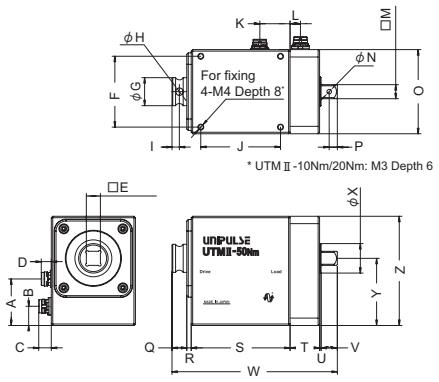
Model	UTMⅡ-10Nm(WR)-6.35	UTMⅡ-20Nm(WR)-6.35	UTMⅡ-50Nm(WR)-9.53	UTMⅡ-100Nm(WR)-12.7	UTMⅡ-100Nm(WR)-19.05	UTMⅡ-500Nm(WR)-19.05
Measurement range	±10 N m	±20 N m	±50 N m	±100 N m	±100 N m	±500 N m
Power supply	DC 24 V ±15%					
Power consumption	100 mA or less		150 mA or less			
Output range	±5 V Load resistance must be more than 2 kΩ					
Responsivity	1 kHz					
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30 V, 10 mA					
Angle of rotation (encoder) output	3600 pulses per rotation					
Safe overload	150% FS					
Non-linearity	0.03% FS or less					
Hysteresis	0.03% FS or less					
Repeatability	0.03% FS or less					
Operation temperature	−10 to +50℃					
Temperature effect on zero	0.01% FS/℃ or below					
Temperature effect on span	0.01% FS/℃ or below					
Maximum rotation speed (Measurable range for angle)	10000 rpm (800 rpm)					
Torsional spring constant	2.15×10^{3} N m/rad		17.6×10^{3} N m/rad	26.4×10^{3} N m/rad	54.6×10^{3} N m/rad	136×10^{3} N m/rad
Maximum torsional angle	4.64×10^{-3} rad (0.266°)	9.29×10^{-3} rad (0.532°)	2.84×10^{-3} rad (0.163°)	3.78×10^{-3} rad (0.217°)	1.83×10^{-3} rad (0.105°)	3.68×10^{-3} rad (0.211°)
Inertia moment	4.0×10^{-6} kg m^2		3.33×10^{-5} kg m^2	3.58×10^{-5} kg m^2	1.92×10^{-4} kg m^2	2.06×10^{-4} kg m^2
Case size	77(W) × 55(H) × 40(D) mm		87(W) × 74(H) × 57(D) mm		87(W) × 79(H) × 72(D) mm	
Total length	96.5 mm		112 mm	120.5 mm	133 mm	
Shaft diameter	□6.35 mm		□9.53 mm	□12.7 mm	□19.05 mm	
Weight	Approx. 310 g		Approx. 840 g	Approx. 860 g	Approx. 1.7 kg	Approx. 1.8 kg

External dimension

■ UTMⅡ-100Nm/500Nm(W)



■ UTMⅡ-10Nm/20Nm/50Nm/100Nm/500Nm(WR)



Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
UTMⅡ-100Nm(W)	31.5	12.7 $^{+0.3}_{+0.1}$	18	48	25	5	54	12.7 $^{0}_{-0.15}$	4.2	57	13	14.5	100.5	45.5	74
UTMⅡ-500Nm(W)	21.5	19.05 $^{+0.39}_{+0.06}$	27	64	38	6	52	19.05 $^{0}_{-0.13}$	6	72	19	23	115	43	79

Unit: mm

Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
UTMⅡ-10Nm(WR)-6.35 UTMⅡ-20Nm(WR)-6.35	25	12.9	8.5	8.5	6.35 $^{+0.28}_{+0.06}$ Depth 8.5	34	12	2.1	4	45	17.5	7	6.35 $^{0}_{-0.09}$	2.1	40	3.5	10	1	57	20	1	7.5	96.5	12	35.5	55
UTMⅡ-50Nm(WR)-9.53	31.5	13	8.5	6.8	9.53 $^{+0.27}_{+0.05}$ Depth 12	48	19	5	5	54	20.5	7	9.53 $^{0}_{-0.09}$	3.1	57	5.5	10	3	67	20	1	11	112	20	45.5	74
UTMⅡ-100Nm(WR)-12.7	31.5	13	8.5	6.8	12.7 $^{+0.3}_{+0.1}$ Depth 18	48	25	5	8	54	20.5	7	12.7 $^{0}_{-0.15}$	4.2	57	6.5	13	3	67	20	1	14.5	118.5	20	45.5	74
UTMⅡ-100Nm(WR)-19.05	25	21.5	6.8	8.5	19.05 $^{+0.39}_{+0.06}$ Depth 27	64	38	6	10.2	52	20.5	9	19.05 $^{0}_{-0.13}$	6	72	10.3	19	3	67	20	1	23	133	28	43	79
UTMⅡ-500Nm(WR)-19.05	21.5	25	8.5	6.8																						