

UTM II ROTATING TORQUE METER



Compact design suitable for installation in equipment — Contactless torque meter for automation of torque control

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

- Available in 17 different capacity ranging from 0.05 to 10000 Nm.
- 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 with insulated powering and signaling system.

Compact and easy to install

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

Maintenance-free

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

Max. rotational speed 25000 rpm

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

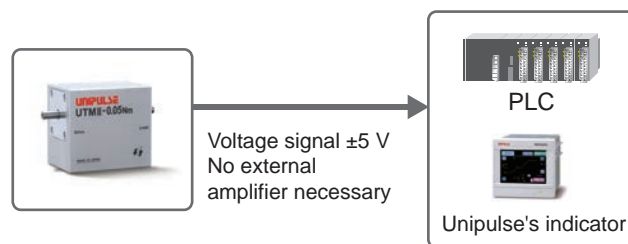
High accuracy and stability

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

Small starting torque

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

Smart system configuration with no external circuits needed



Indicators for UTM II

Easy connection to UTM II just by using a snap-on cable.

- TM301: basic type
Torque, rotation speed, and power are displayed simultaneously.



- TM400: portable type
Torque vs. rotation speed / torque-angle waveform can be monitored.



- TM700: graphic monitor with high sampling speed
Torque, rotation speed and power are measured at 20 kHz sampling rate.



- TM500: angle monitor
"Torque vs. Angle curve" is monitored. (Designed for UTM II encoder option)



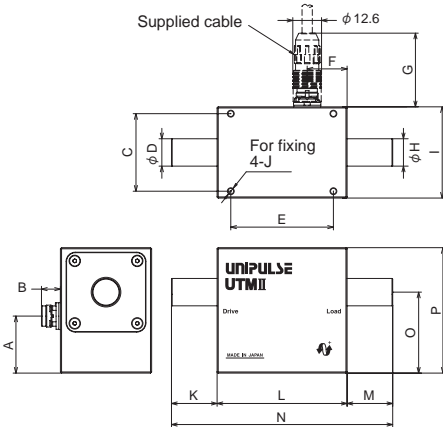
- TM201: for R&D and laboratory use
A USB interface converter for UTM II. Torque, rotation speed and power are monitored on PC.



Specifications

Measurement range	±0.05 Nm	±0.1 Nm	±0.2 Nm	±0.5 Nm	±1 Nm	±2 Nm	±5 Nm	±10 Nm	±20 Nm	±50 Nm	±100 Nm	±200 Nm	±500 Nm	±1000 Nm	±2000 Nm	±5000 Nm	±10000 Nm							
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 k																							
Responsivity	1 kHz																							
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30 V DC, 10 mA																							
Safe overload	500% FS																							
Non-linearity	0.03% FS or less																							
Hysteresis	0.03% FS or less																							
Repeatability	0.03% FS or less																							
Operation temp. range	-10 to +50°C																							
Temp. effect on zero	0.01% FS/°C or below																							
Temp. effect on span	0.01% FS/°C or below																							
Max. rotation speed	25000 rpm																							
Torsional spring constant (Nm/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 (kgm ²)	8.77×10 ⁻⁷	8.87×10 ⁻⁷	8.99×10 ⁻⁷	1.49×10 ⁻⁶	1.52×10 ⁻⁶	1.42×10 ⁻⁶	3.66×10 ⁻⁶	3.66×10 ⁻⁶	2.60×10 ⁻⁶	2.67×10 ⁻⁶	6.60×10 ⁻⁶	1.40×10 ⁻⁶	4.70×10 ⁻⁶	2.90×10 ⁻⁶	5.89×10 ⁻⁶	2.01×10 ⁻⁶	5.16×10 ⁻⁶							
Dimension (case size) WxHxD (mm)	54x50x40						57x55x40		70x68x51		67x74x57		67x79x62		67x79x72		86x103x98		86x119x111		97x141x137		103x166x162	
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	φ 5 mm			φ 8 mm			φ 12 mm		φ 20 mm		φ 25 mm		φ 30 mm		φ 40 mm		φ 60 mm		φ 70 mm		φ 90 mm		φ 110 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	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Key groove																							
	Key groove & Rotary encoder																							
	Square drive																							
	Square drive & Rotary encoder																							
CE marking certification	EMC directives EN61326-1, EN61326-3																							

External dimension

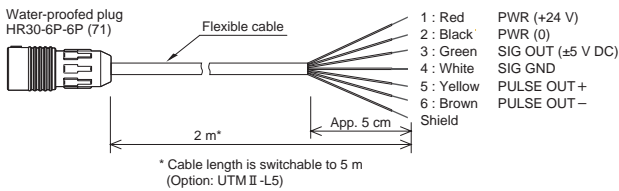


Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0.05 Nm	25	8.3	32	5h7	45	18	32.3	5h7	40	M3 depth 6	15	54	10	74	33	50
0.1 Nm																
0.2 Nm																
0.5 Nm																
1 Nm																
2 Nm																
5 Nm	31.5	6.8	34	12h7	58	19.5	30.8	12h7	51	M4 depth 8	20	57	20	97	35.5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

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

Unit: mm

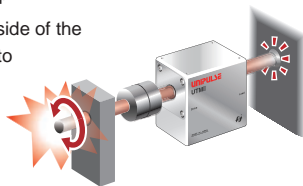
Supplied cable Flexible cable



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 UTM III/UTM II have sensing function.

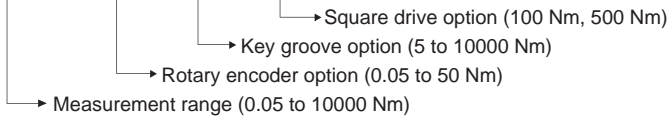


Overload due to resonance vibration

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



UTM II- 0.05Nm (R) (K) (W)



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

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

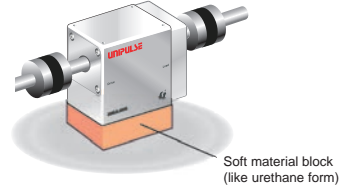
(R) Rotary encoder option: 0.05 to 50 Nm



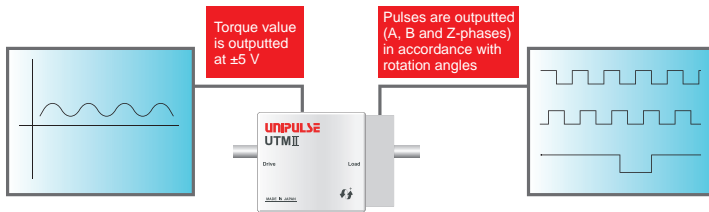
- Optical encoder
- Suitable for measurement of torque against angular variation

● Installation

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

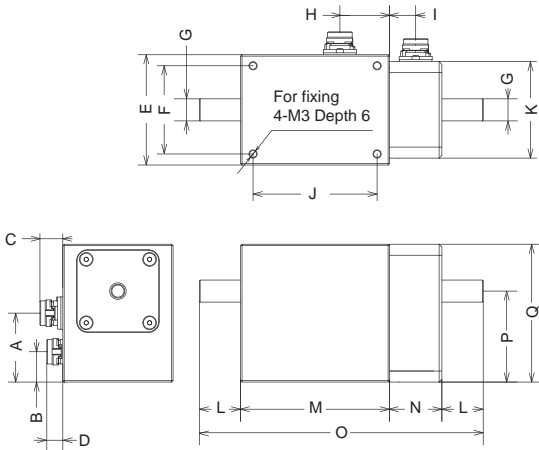


- Torque signal (analog ± 5 V) and rotation angle signals (A, B and Z open collector outputs) are outputted.



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

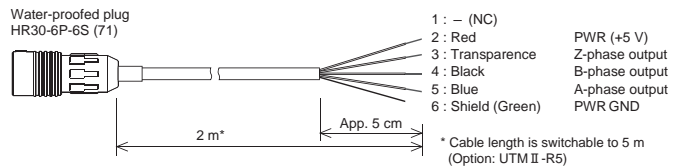
■ UTM II-0.05Nm(R) to 50Nm(R)



Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
0.05 Nm																	
0.1 Nm				6.8			$\phi 5h7$					10				93	
0.2 Nm		11											54			33	50
0.5 Nm	25		8.3		40		$\phi 8h7$		9.5	45		15		19		103	
1 Nm				5.8													
2 Nm																	
5 Nm		13.5		6.8		34	$\phi 12h7$	19.5				37	20	57		116	35.5
10 Nm																	
20 Nm	31.5	13	6.8	8.5	51	43	$\phi 20h7$	20.5	7	58	51	40	70	17	167	42.5	68
50 Nm												50			187		

Unit: mm

■ Rotary encoder attached cable

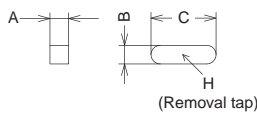


(K) Key groove option: 5 to 10000 Nm

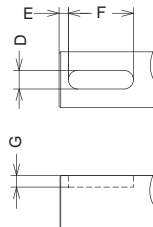
■ UTM II-5Nm(K) to 10000Nm(K)



- Key (Included in (K) option)



- Key groove



Measurement range	A	B	C	D	E	F	G	H
5 Nm	$4^{+0}_{-0.03}$	$4h9^{+0}_{-0.03}$	$14^{+0}_{-0.18}$	$4^{-0.012}_{-0.042}$	2	$14^{+0.3}_{+0.1}$	$2.5^{+0.1}_{-0}$	-
10 Nm								
20 Nm	$6^{+0}_{-0.03}$	$6h9^{+0}_{-0.03}$	$32^{+0}_{-0.25}$	$6^{-0.012}_{-0.042}$		$32^{+0.3}_{+0.1}$	$3.5^{+0.1}_{-0}$	M3
50 Nm			$38^{+0}_{-0.25}$		3	$38^{+0.3}_{+0.1}$		
100 Nm	$7^{+0}_{-0.036}$	$8h9^{+0}_{-0.036}$	$48^{+0}_{-0.25}$	$8^{-0.015}_{-0.051}$		$48^{+0.3}_{+0.1}$	$4^{+0.2}_{-0}$	M4
200 Nm			$53^{+0}_{-0.25}$			$53^{+0.3}_{+0.1}$		
500 Nm	$8^{+0}_{-0.09}$	$12h9^{+0}_{-0.043}$	$62^{+0}_{-0.25}$	$12^{-0.018}_{-0.061}$	4	$62^{+0.3}_{+0.1}$	$5^{+0.2}_{-0}$	M5
1000 Nm	$11^{+0}_{-0.11}$	$18h9^{+0}_{-0.043}$	$90^{+0}_{-0.35}$	$18^{-0.018}_{-0.061}$		$90^{+0.3}_{+0.1}$	$7^{+0.2}_{-0}$	M6
2000 Nm	$12^{+0}_{-0.11}$	$20h9^{+0}_{-0.052}$	$100^{+0}_{-0.35}$	$20^{-0.022}_{-0.074}$		$100^{+0.3}_{+0.1}$	$7.5^{+0.2}_{-0}$	M8
5000 Nm	$14^{+0}_{-0.11}$	$25h9^{+0}_{-0.052}$	$135^{+0}_{-0.4}$	$25^{-0.022}_{-0.074}$	5	$135^{+0.3}_{+0.1}$	$9^{+0.2}_{-0}$	
10000 Nm	$18^{+0}_{-0.11}$	$32h9^{+0}_{-0.062}$	$162^{+0}_{-0.4}$	$32^{-0.026}_{-0.088}$		$162^{+0.5}_{+0.1}$	$11^{+0.3}_{-0}$	M10

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

Unit: mm

Drive (Nut runner)

Load (Socket)



Specifications

Contactless torque detection enables stable measurement without missing data.

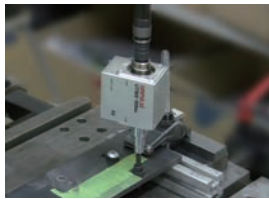
- It is ideal to monitor torque of nut runners (fastening tools)
- With the high accuracy and high-speed response of UTM II torque fluctuation can be monitored while tightening nuts.*

Torque: UTM II (W)

Torque + Angle: UTM II (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.



■ UTM II (W)

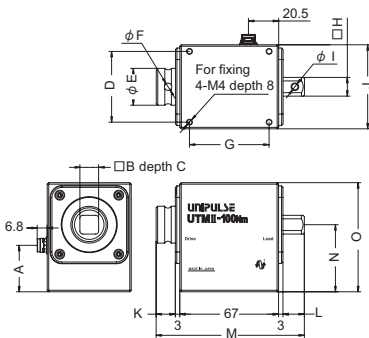
Model	UTM II-100Nm(W)	UTM II-500Nm(W)
Measurement range	±100 Nm	±500 Nm
Power supply	DC 24 V±15	
Power consumption	150 mA or less	
Output range	±5 V Load resistance must be more than 2 kΩ	
Responsivity	1 kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30 V, 10 mA	
Safe overload	500% FS	
Non-linearity	0.03% FS or less	
Hysteresis	0.03% FS or less	
Repeatability	0.03% FS or less	
Operation temp. range	-10 to +50°C	
Temp. effect on ZERO	0.01% FS/°C or below	
Temp. effect on span	0.01% FS/°C or below	
Max. rotation speed	15000 rpm	10000 rpm
Torsional spring constant	38.5×10 ³ Nm/rad	265×10 ³ Nm/rad
Maximum torsional angle	2.60×10 ⁻³ rad (0.149°)	1.88×10 ⁻³ rad (0.108°)
Inertia moment	3.8×10 ⁻⁵ kgm ²	2.15×10 ⁻⁴ kgm 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
CE marking certification	EMC directives EN61326-1, EN61326-2-3	

■ UTM II (WR)

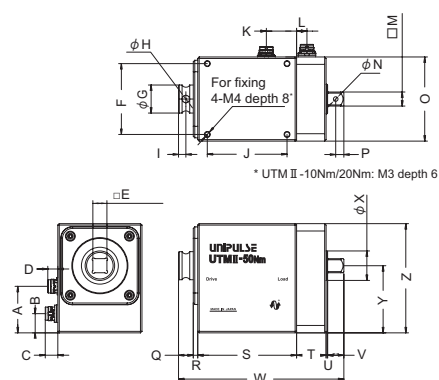
Model	UTM II-10Nm(WR)-6.35	UTM II-20Nm(WR)-6.35	UTM II-50Nm(WR)-9.53	UTM II-100Nm(WR)-12.7	UTM II-100Nm(WR)-19.05	UTM II-500Nm(WR)-19.05
Measurement range	±10 Nm	±20 Nm	±50 Nm	±100 Nm	±100 Nm	±500 Nm
Power supply	DC 24 V ±15%					
Power consumption	100 mA or less			150 mA or less		
Output range	±5V Load 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	300% FS	150% FS				500% FS
Non-linearity	0.03% FS or less					
Hysteresis	0.03% FS or less					
Repeatability	0.03% FS or less					
Operation temp. range	-10 to +50°C					
Temp. effect on ZERO	0.01% FS/°C or below					
Temp. effect on span	0.01% FS/°C or below					
Max. rotation speed (Measurable range for angle)	10000 rpm (800 rpm)					
Torsional spring constant	2.15×10 ³ Nm/rad		17.6×10 ³ Nm/rad	26.4×10 ³ Nm/rad	54.6×10 ³ Nm/rad	136×10 ³ Nm/rad
Maximum torsional angle	4.64×10 ⁻³ rad (0.266°)		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 kgm ²		3.33×10 ⁻⁵ kgm ²	3.58×10 ⁻⁵ kgm ²	1.92×10 ⁻⁴ kgm ²	2.06×10 ⁻⁴ kgm 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
CE marking certification	EMC directives EN61326-1, EN61326-2-3					

External dimension

■ UTM II -100Nm/500Nm(W)



■ UTM II -10Nm/20Nm/50Nm/100Nm/500Nm(WR)



Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
UTM II -100Nm(W)	31.5	12.7	18.0	48	25	5	54	12.7	4.2	57	13	14.5	100.5	45.5	74
UTM II -500Nm(W)	21.5	19.05	27	64	38	6	52	19.05	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
UTM II -10Nm(WR)-6.35	25	12.9	8.5	8.5	6.35	34	12	2.1	4	45	17.5	7	6.35	2.1	40	3.5	10	1	57	20	1	7.5	96.5	12	35.5	55
UTM II -20Nm(WR)-6.35																										
UTM II -50Nm(WR)-9.53	31.5	13	8.5	6.8	9.53	48	19	5	5	54	20.5	7	9.53	3.1	57	5.5	10	3	67	20	1	11	112	20	45.5	74
UTM II -100Nm(WR)-12.7	31.5	13	8.5	6.8	12.7	48	25	5	8	54	20.5	7	12.7	4.2	57	6.5	13	3	67	20	1	14.5	118.5	20	45.5	74
UTM II -100Nm(WR)-19.05	25	21.5	6.8	8.5		64	38	6	10.2	52	20.5	9		6	72	10.3	19	3	67	20	1	23	133	28	43	79
UTM II -500Nm(WR)-19.05	21.5	25	8.5	6.8																						