

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 0.05Nm to 10000Nm.
- Cut-off frequency of 1kHz with high-speed sampling at 6kHz.
- Suitable for torque ripple measurement
- Safe overload of 500%
- Power supply DC24V
- No external amplification required: $\pm 5V$ 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, 2Nm) are particularly compact and light: 54Wx50Hx40Dmm in size, 200g 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 25000rpm

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

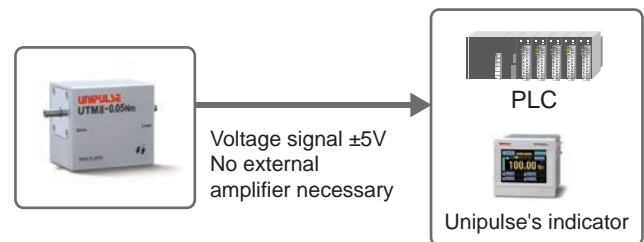
High accuracy and stability

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 0.00001Nm (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 20kHz sampling rate.



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

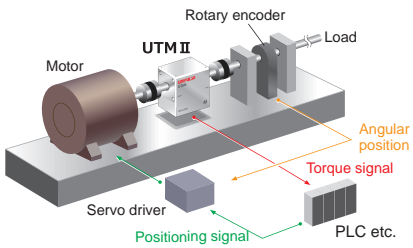


- TM201:for R&D and laboratory use
A USB interface converter for UTM II. Torque, rotation speed and power are monitored on PC.



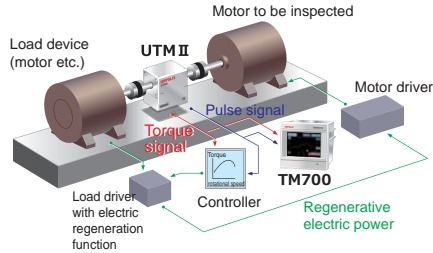
Measurement of dynamic/running torque

● Servo-motor with torque output



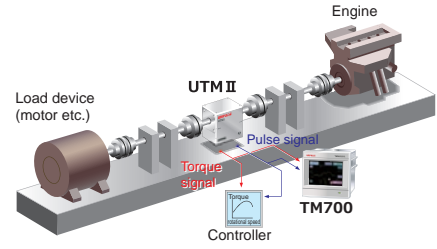
By setting UTM II between the rotary encoder and motor, you can make a servo motor system with torque output. The system can be applied to various applications, such as robot hands or other systems which can detect load.

● Motor test bench



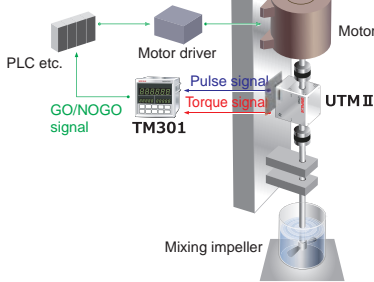
Mechanical power can be calculated from torque and rotational speed. Also, by applying energy recovery system, the test apparatus will be eco-friendly (energy-saving).

● Engine test bench



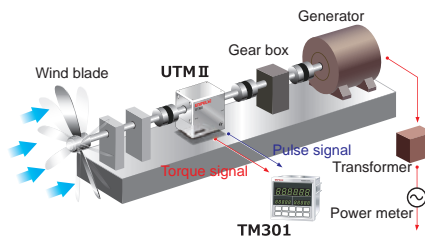
In case of torque measurement with large vibration, such as measurement of engines, please attach double disk coupling and use double bearing.

● Mixer with torque meter



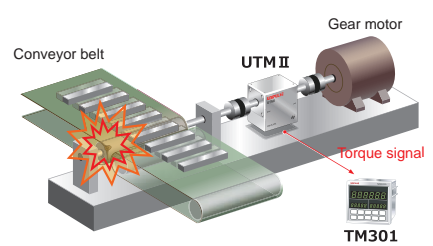
The system measures torque on the axis of mixing impellers. The change of viscosity can be detected by monitoring torque. By using TM301, I/O signals can be controlled by the threshold levels.

● Power generation efficiency test



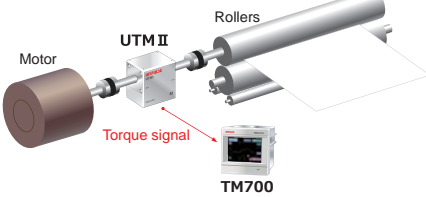
The efficiency of wind turbine generator and so on can be tested. Power can be estimated based on torque and rotational speed measured with UTM II, and power generation efficiency can be calculated by comparing power and generated energy.

● Fault detection of conveyor belt



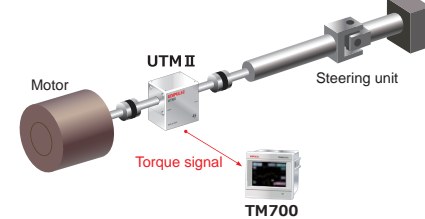
By monitoring the motor shaft torque of a conveyor belt, faults and conveyor-related hazards can be detected (e.g. materials get caught in conveyor system). Conveyor belts will be stopped immediately after faults like contamination and overturning of products are detected.

● Measurement of torque required to rotate feed rollers



Torque fluctuation can be monitored while a sheet of paper or film is fed by the drive roller. With torque measurement, quantitative management and maintenance of feed roller are possible.

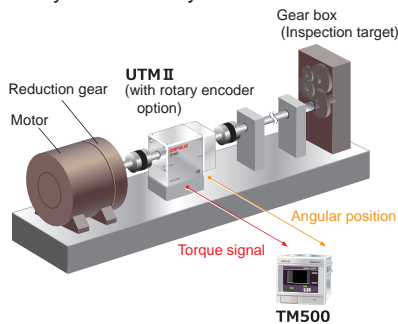
● Quality inspection of steering unit



By measuring the torque required to rotate automotive parts such as steering unit, it is possible to quantize the smoothness of the rotation for standardization of the quality inspection.

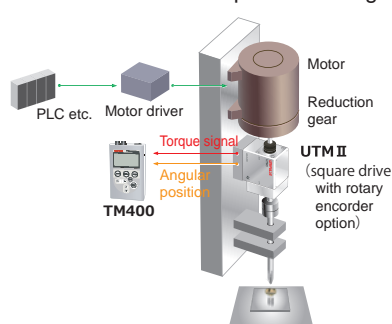
Relationship between torque and angle/displacement (distance)

● Physical sensory test



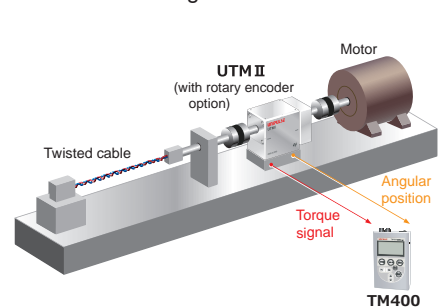
Torque corresponding to angular position can be monitored by using UTM II with rotary encoder option. The system can be applied to automation of physical sensory test.

● Screw driver with torque monitoring



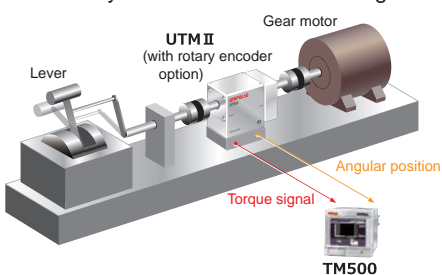
Torque can be measured in the process of tightening screws. Since the torque can be controlled during the whole process, the system can be applied to automation of process.

● Torsion testing machine



Stiffness and performance of wire or cable can be tested by checking torque applied by a torsion test machine with UTM II.

● Sensory evaluation of lever or hinge



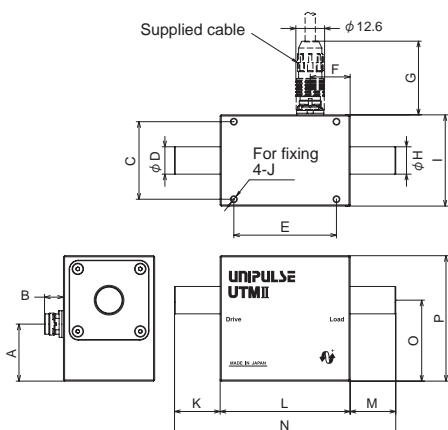
Smoothness of lever, hinge, and so on can be quantized for quality control purpose. With an optional rotary encoder, torque-angle relationship can be monitored.

Specifications

Measurement range	0.05Nm	0.1Nm	0.2Nm	0.5Nm	1Nm	2Nm	5Nm	10Nm	20Nm	50Nm	100Nm	200Nm	500Nm	1000Nm	2000Nm	5000Nm	10000Nm	
Power supply	DC24V±15%																	
Consumption current	100mA or less					150mA or less					160mA or less							
Output range	±5V DC Load resistance must be more than 2k																	
Bandwidth	1kHz																	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V DC, 10mA																	
Safe overload	500%FS																	
Non-linearity	0.03%FS (Typ)																	
Hysteresis	0.03%FS (Typ)																	
Repeatability	0.03%FS (Typ)																	
Operation temp. range	-10 to +50°C																	
Temp. effect on zero	0.01%FS/°C (Typ)																	
Temp. effect on span	0.01%FS/°C (Typ)																	
Max. rotation speed	25000rpm					20000rpm		15000rpm	12000rpm	10000rpm	7000rpm	6000rpm	5000rpm	4000rpm				
Dimension (case size) WxHxD mm	54x50x40				57x55x40			70x68x51		67x74x57	67x79x62	67x79x72	86x103x98		86x119x111		97x141x137	103x166x162
Total length mm	74		84			97		150	170	177	187	217	286	306	387	447		
Shaft diameter mm	φ5		φ8			φ12		φ20		φ25	φ30	φ40	φ60	φ70	φ90	φ110		
Approx. Weight	160g		180g			270g		700g		1.1kg	1.5kg	2.6kg	7.3kg	10.5kg	21.4kg	36kg		
Option	Rotary encoder	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Key groove							○	○	○	○	○	○	○	○	○	○	○
	Square drive										○ ^{※1}		○ ^{※1}					
CE marking certification	EMC directives EN61326-2-3																	

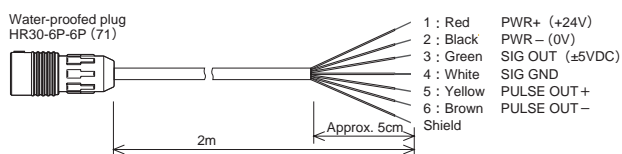
※1 : Rotary Encoder option is available ※2 : Square drive option is available

External dimension

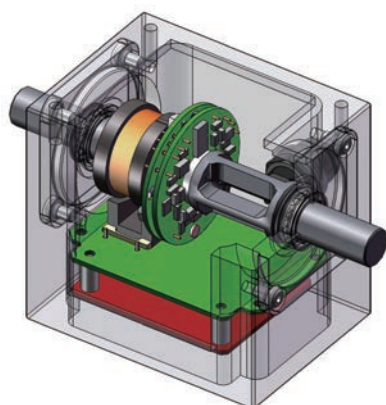


Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P				
0.05	25	8.3	32	5h7	45	18	32.3	5h7	40	M3 Depth 6	10	54	10	74	33	50				
0.1				8h7				8h7												
0.2			34	12h7	19.5	12h7	20h7	51			20	57	20	97	35.5	55				
0.5																	40	70	40	150
1			31.5	6.8	48	25h7	54	20.5			30.8	25h7	57	M4 Depth 8	55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

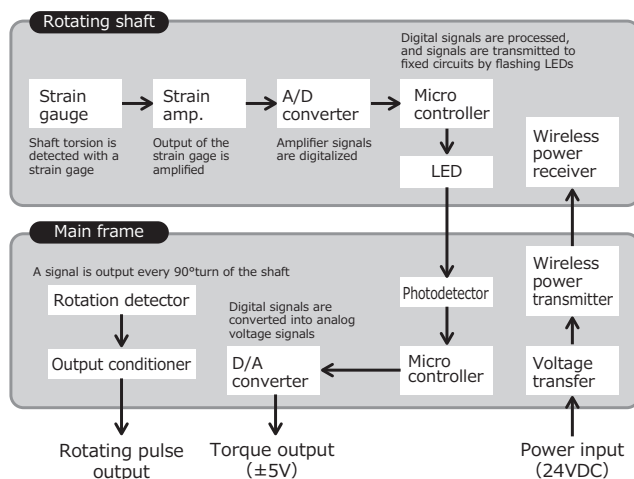
Supplied cable



Block diagram

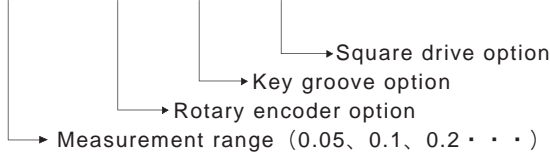


UTM II adopts strain gauges for detecting torsional strain, which is converted into an electric signal by a strain amplifier fixed on the rotating shaft. Electric power for the rotary electronics is supplied continuously through a wireless power system originally developed by UNIPULSE. The detected torque signal is converted into a digital signal, and it is transmitted to the main-frame electronics via a light signal. The rotating shaft is suspended with only two small bearings, resulting in very low rotational friction.



Structure of product code

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



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

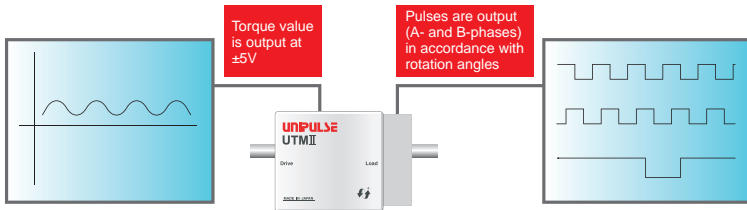
(R) Rotary encoder option : 0.05 to 50Nm



- Optical encoder
2000C/T : 0.05 to 10Nm
1440C/T : 20Nm, 50Nm
- Suitable for measurement of torque against angular variation

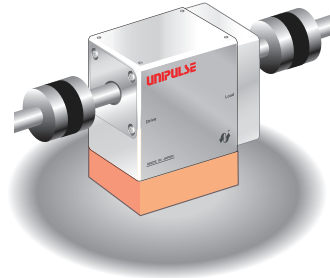
* Maximum rotation speed
4500rpm : 0.05 to 10Nm
2000rpm : 20Nm, 50Nm

- Torque signal (analog $\pm 5V$) and rotation angle signals (A, B and Z photo coupler outputs) are outputted.

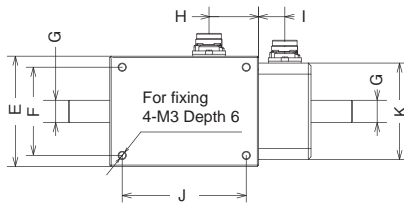


- Installation

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

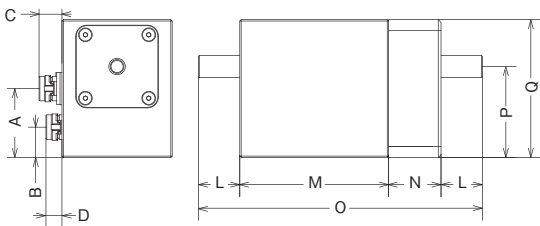


■ UTMII-0.05Nm (R) to 50Nm (R)

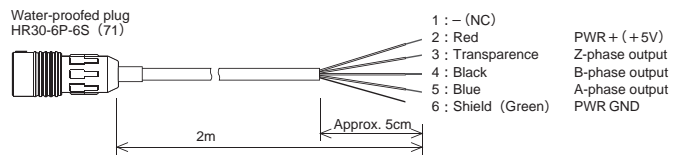


Measurement range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
0.05												10			93		
0.1				6.8			$\phi 5h7$										
0.2		11				32		18				35	54			33	50
0.5			8.3		40		$\phi 8h7$		9.5	45		15		19		103	
1	25			5.8													
2																	
5																	
10		13.5		6.8		34	$\phi 12h7$	19.5				37	20	57		116	35.5
20																	
50	31.5	13	6.8	8.5	51	43	$\phi 20h7$	20.5	7	58	51	40	70	17	167	42.5	68

Unit mm

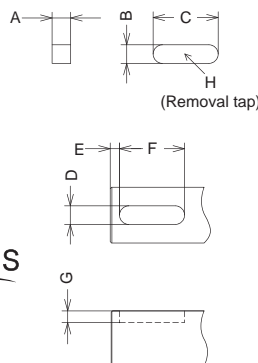


■ Rotary encoder attached cable



(K) Key groove option : 5 to 10000Nm

■ UTMII-5Nm (K) to 10000Nm (K)



Measurement range	A	B	C	D	E	F	G	H
5								
10	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	—
20								
20								
50	6 ⁺⁰ _{-0.03}	6h9 ⁺⁰ _{-0.03}	32 ⁺⁰ _{-0.043}	6 ^{-0.012} _{-0.042}		32 ^{+0.3} _{+0.1}	3.5 ^{+0.1} ₋₀	
100								
100								
200								
200								
500	8 ⁺⁰ _{-0.09}	12h9 ⁺⁰ _{-0.043}	62 ⁺⁰ _{-0.3}	12 ^{-0.018} _{-0.061}		62 ^{+0.3} _{+0.1}	5 ^{+0.2} ₋₀	M3
1000	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								
2000								
5000	14 ⁺⁰ _{-0.11}	25h9 ⁺⁰ _{-0.052}	135 ⁺⁰ _{-0.4}	25 ^{-0.022} _{-0.074}		100 ^{+0.3} _{+0.1}	7.5 ^{+0.2} ₋₀	M8
5000								
10000	18 ⁺⁰ _{-0.11}	32h9 ⁺⁰ _{-0.062}	162 ⁺⁰ _{-0.4}	32 ^{-0.026} _{-0.088}		135 ^{+0.3} _{+0.1}	9 ^{+0.2} ₋₀	M10
10000								



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.

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



Specifications

■ UTM II (W)

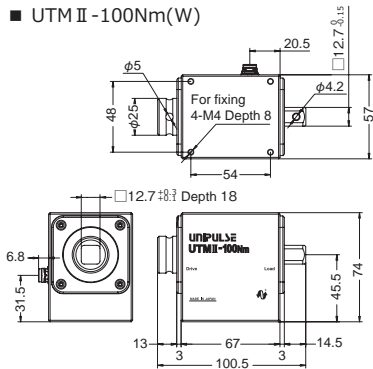
Model	UTMII-100Nm(W)	UTMII-500Nm(W)
Measurement range	±100Nm	±500Nm
Power supply	DC24V ±15%	
Power consumption	150mA or less	
Output range	±5V DC	Load resistance must be more than 2k
Bandwidth	1kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA	
Safe overload	500%FS	
Non-linearity	0.03%FS (Typ)	
Hysteresis	0.03%FS (Typ)	
Repeatability	0.03%FS (Typ)	
Operation temp. range	-10 to +50°C	
Temp. effect on ZERO	0.01%FS/°C (Typ)	
Temp. effect on span	0.01%FS/°C (Typ)	
Max. rotation speed	15000rpm	10000rpm
Torsional spring constant	38.5x10 ³ Nm/rad	265x10 ³ Nm/rad
Maximum torsional angle	2.60x10 ⁻³ rad(0.149°)	1.88x10 ⁻³ rad(0.108°)
Inertia moment	3.8x10 ⁻⁵ kgm ²	2.15x10 ⁻⁴ kgm ²
Case size	67(W)x74(H)x57(D)mm	67(W)x79(H)x72(D)mm
Total length	100.5mm	115mm
Shaft diameter	12.7mm	19.05mm
Weight	Approx. 0.8kg	Approx. 1.4kg
CE marking certification	EMC directives EN61326-2-3	

■ UTM II (WR)

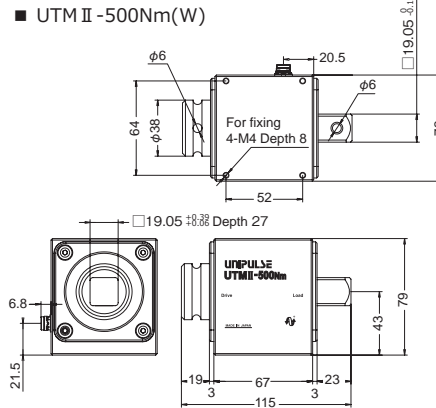
Model	UTMII-50Nm(WR)-9.53	UTMII-100Nm(WR)-12.7	UTMII-100Nm(WR)-19.05	UTMII-500Nm(WR)-19.05
Measurement range	±50Nm	±100Nm	±100Nm	±500Nm
Power supply	DC24V ±15%			
Power consumption	150mA or less			
Output range	±5V DC Load resistance must be more than 2k			
Bandwidth	1kHz			
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA			
Angle of rotation (encoder) output	3600 pulses per rotation			
Safe overload	500%FS			
Non-linearity	0.03%FS (Typ)			
Hysteresis	0.03%FS (Typ)			
Repeatability	0.03%FS (Typ)			
Operation temp. range	-10 to +50°C			
Temp. effect on ZERO	0.01%FS/°C (Typ)			
Temp. effect on span	0.01%FS/°C (Typ)			
Max. rotation speed	10000rpm (2000rpm)			
Torsional spring constant	17.6x10 ³ Nm/rad	26.4x10 ³ Nm/rad	54.6x10 ³ Nm/rad	136x10 ³ Nm/rad
Maximum torsional angle	2.84x10 ⁻³ rad(0.163°)	3.78x10 ⁻³ rad(0.217°)	1.83x10 ⁻³ rad(0.105°)	3.68x10 ⁻³ rad(0.211°)
Inertia moment	3.33x10 ⁻⁵ kgm ²	3.58x10 ⁻⁵ kgm ²	1.92x10 ⁻⁴ kgm ²	2.06x10 ⁻⁴ kgm ²
Case size	87(W)x74(H)x57(D)mm			
Total length	112mm	120.5mm	133mm	
Shaft diameter	9.53mm	12.7mm	19.05mm	
Weight	Approx. 0.8kg	Approx. 0.9kg	Approx. 1.7kg	Approx. 1.8kg
CE marking certification	EMC directives EN61326-2-3			

External dimension

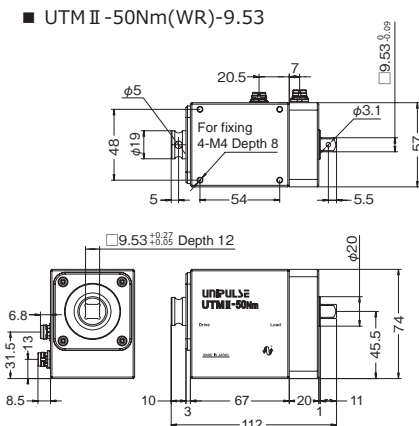
■ UTM II -100Nm(W)



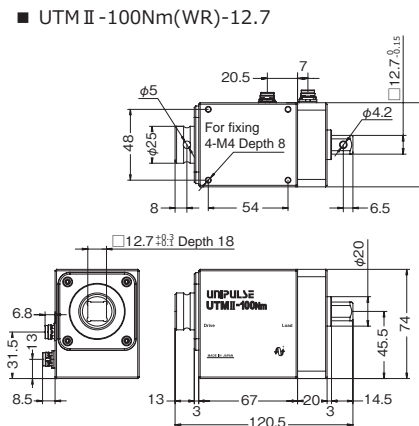
■ UTM II -500Nm(W)



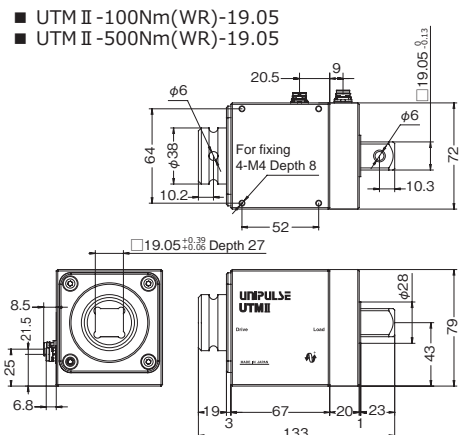
■ UTM II -50Nm(WR)-9.53



■ UTM II -100Nm(WR)-12.7



■ UTM II -100Nm(WR)-19.05
■ UTM II -500Nm(WR)-19.05



Unit mm