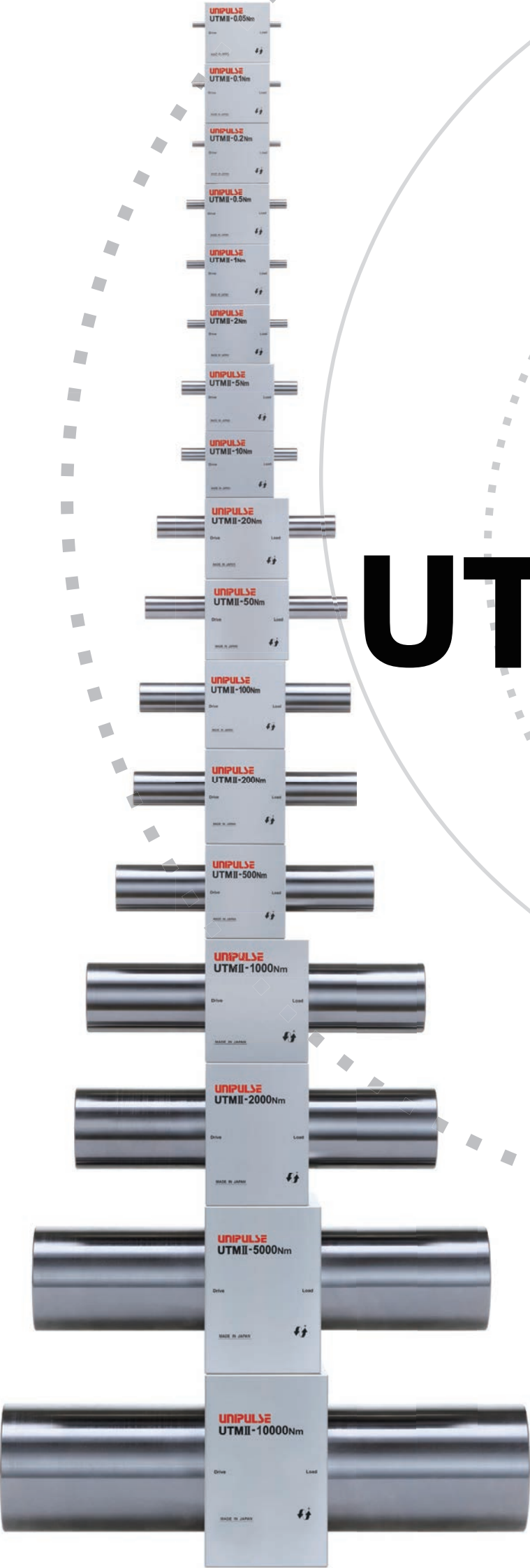


**UNIPULSE**

# UTMII

Rotating Torque Meter

# series



CE ROHS



## **A SLIP-RING-LESS TORQUE METER — CRAMMED OUTSTANDING SPECS INTO A TINY BODY**

A longtime dream, a slip-ring-less rotating torque meter, UTMII , has just become available. We developed it as a high performance sensor for embedded applications. Of course, it is also perfect for general dynamic torque measurement. This is our masterpiece, which has 1/10000-resolution, outstanding zero-point stability and 1kHz-bandwidth (sampling frequency of 6kHz).

UNIPULSE was established by several young engineers in 1970 and has specialized in industrial measurement since that time. We have developed a lot of unique products and expanded our own market. Though we had wished to make a high-performance torque meter for 40 years, we couldn't do so because miniaturization of electronics was not possible. However, we have finally succeeded in developing a rotating torque meter, UTMII , by adopting small advanced electronic components and integrating our own technologies related to precision machining, strain gauge technology and electronics.

UTMII has a range of 17 models (0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000Nm).

UTMII withstands overload of 500% and, with its internal circuits all insulated, operates stably even in a high noise environment. The models ranging from 0.05 to 10Nm guarantee operation at the max. speed of 25000rpm.

All the models of UTMII output a 4-pulse rotation detection signal per rotation. An optical encoder can optionally be built in models ranging from 0.05 to 50Nm. This encoder is used mainly for measuring torque variation (such as a physical sensory test) with angular position. Key grooves are optionally available for models ranging from 5 to 10000Nm. Square drive option is now available in 100Nm and 500Nm capacity for use with nut runners. Moreover, UTMV series, a rotating torque sensor with degree of protection equivalent to IP65 , is now available to meet users' needs for use in harsh environment. UTMV series is available in 10 capacity range: 0.1, 0.5, 1, 5, 10, 50, 100, 500, 1000, and 5000Nm capacity. For measurement signal voltage, full-scale values of normal/reverse rotations are calibrated to  $\pm 5.0000V$  before shipping.

We hope you are looking forward to our future products.



President & CEO  
**Takami Yoshimoto**  
(From an engineer's view point. . .)



**UNIPULSE**  
**UTMII-1Nm**

Drive                      Load

MADE IN JAPAN

# Features of UTM II

- High response speed with cut-off frequency of 1kHz (sampling frequency of 6kHz). This series can be used for not only fast process monitoring but also torque feedback control.
- Safe overload of 500%.
- 1, 2 and 5-line capacities are standardized from 0.05Nm to 10000Nm.
- A rotational pulse generating circuit (4 pulses/revolution) is built in as standard. Lower rotational speed can be measured accurately.
- Improved noise immunity with insulated powering and signaling system.
- 1/10000 resolution.
- Outstanding zero-point stability.
- Max. rotational speed: 25,000 rpm (up to 10Nm).
- Low frictional rotating torque.
- Smart system configuration with no external circuits needed. Voltage signal  $\pm 5V$  no external amplifier necessary.
- CE marking certification, RoHS-compliant product

## Line-up



Range Nm	0.05	0.1	0.2	0.5	1	2	5	10	20	50	100	200	500	1000	2000	5000	10000							
Max. speed rpm	25000						20000		15000		12000		10000		7000		4000							
Main frame dimension W x H x D mm	54 x 50 x 40				57 x 55 x 40		70 x 68 x 51		67 x 74 x 57		67 x 79 x 62		67 x 79 x 72		86 x 103 x 98		86 x 119 x 111		97 x 141 x 137		103 x 166 x 162			
Length mm	74		84		97		150		170		177		187		217		286		306		387		447	
Shaft dia. mm	$\phi 5$		$\phi 8$		$\phi 12$		$\phi 20$		$\phi 25$		$\phi 30$		$\phi 40$		$\phi 60$		$\phi 70$		$\phi 90$		$\phi 110$			
Approx. weight g	160		180		270		700		1100		1500		2600		7300		10500		21400		36000			
Option	Rotary encoder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	Key groove	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	Square drive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
UTMV drip-proof type	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

※ 1 : Rotary encoder and key groove cannot be installed together. ※ 2 : Rotary encoder can be installed as an option.



# Overview

## Principle of UTM II

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.

## Compact and easy to install

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

## High accuracy and stability

1/10000 resolution with outstanding zero stability. Even small torque variations can be detected by UTM II .

## Small starting torque

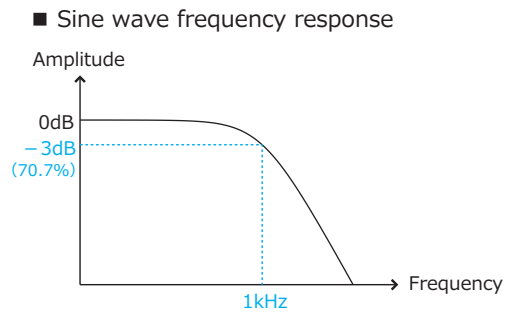
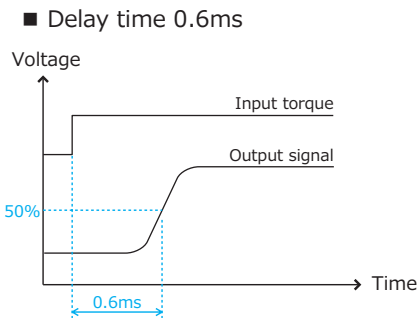
The starting torque of the bearing in the UTM II -0.05Nm is only 0.00001Nm (0.03 %FS). Actually, the effect of rotating friction can be negligible.

## Maintenance-free

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

## Response characteristics

With the high-speed A/D conversion at the rate of 6kS/s, we've achieved a very short delay time of 0.6ms and cut-off frequency of 1kHz.



## 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.



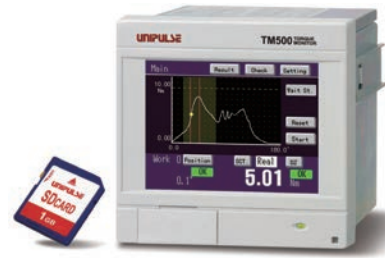
■ TM700:graphic monitor with high sampling speed

Display the waveforms of torque, rotation speed, and power.



■ TM500:angle monitor

Waveform display of torque variation against angles



■ TM400:portable type

Torque vs. rotation speed / torque-angle waveform can be monitored.



■ TM201:for R&D and laboratory use

Monitor and save torque, rotation speed, and power on PC



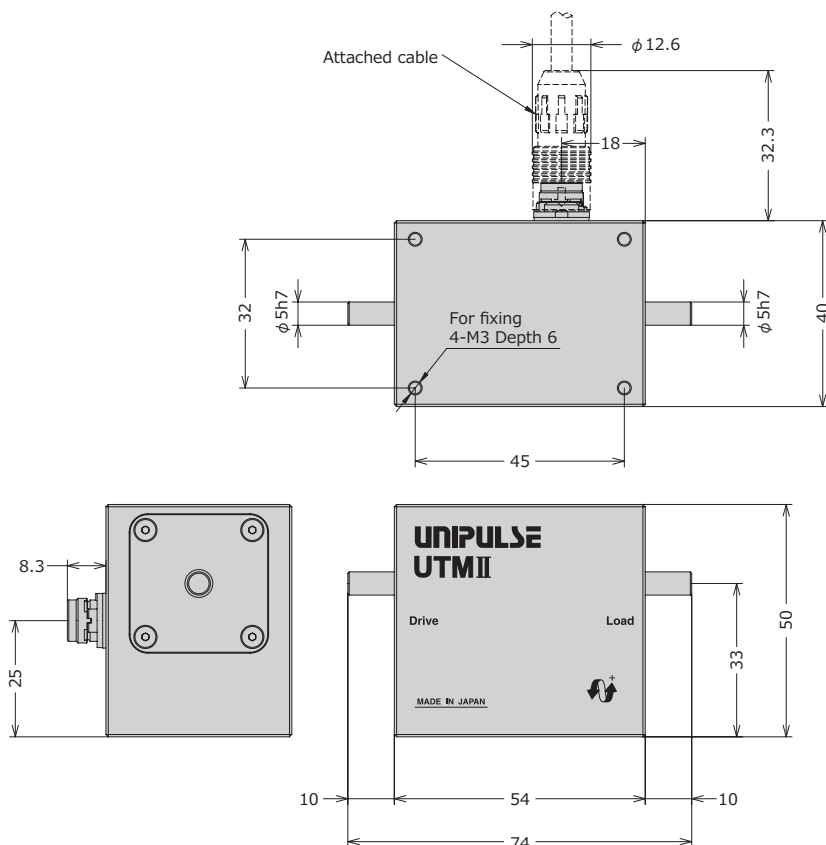
# UTMII-0.05/0.1/0.2Nm



## ■ Specification

Type	UTMII-0.05Nm	UTMII-0.1Nm	UTMII-0.2Nm	Type	UTMII-0.05Nm	UTMII-0.1Nm	UTMII-0.2Nm
Measurement range	± 0.05Nm	± 0.1Nm	± 0.2Nm	Torsional spring constant	5.67Nm/rad	11.57Nm/rad	26.10Nm/rad
Power supply	DC24V ± 15% Consumption current : 100mA or less			Maximum torsional angle	8.81 × 10 <sup>-3</sup> rad (0.505°)	8.64 × 10 <sup>-3</sup> rad (0.495°)	7.66 × 10 <sup>-3</sup> rad (0.439°)
Output range	± 5V DC Load resistance must be more than 2kΩ			Inertia moment	8.77 × 10 <sup>-7</sup> kgm <sup>2</sup>	8.87 × 10 <sup>-7</sup> kgm <sup>2</sup>	8.99 × 10 <sup>-7</sup> kgm <sup>2</sup>
Responsivity	1kHz			Dimension (Main frame)	54 (W) × 50 (H) × 40 (D) mm		
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA			Weight	Approx. 160g		
Safe overload	500% FS			Attached cable	6 wires (End points: Peeled insulator and soldered)		
Non-linearity	0.03% FS (Typ)			Accessories	CATM51 : 5m CATM12 : 10m		
Hysteresis	0.03% FS (Typ)			CE marking certification	EMC directives : EN61326-2-3 : 2013		
Repeatability	0.03% FS (Typ)			Installable option	Rotary encoder		
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						

## Dimension



### Supported couplings

UCM15
UCS15
UCM19
UCS19
UCM25
UCS25

Refer to page 26 for details of couplings

Unit : mm

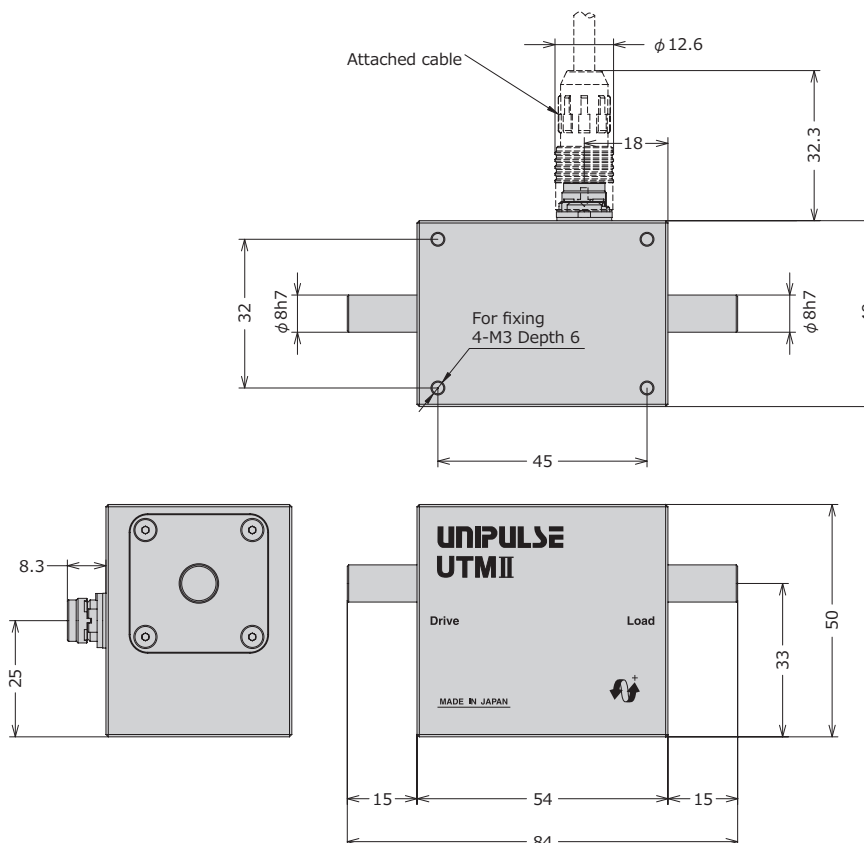
# UTMII-0.5/1/2Nm



## ■ Specification

Type	UTMII-0.5Nm	UTMII-1Nm	UTMII-2Nm	Type	UTMII-0.5Nm	UTMII-1Nm	UTMII-2Nm
Measurement range	± 0.5Nm	± 1Nm	± 2Nm	Torsional spring constant	93.1Nm/rad	188Nm/rad	414Nm/rad
Power supply	DC24V ± 15% Consumption current : 100mA or less			Maximum torsional angle	$5.37 \times 10^{-3}$ rad (0.308°)	$5.32 \times 10^{-3}$ rad (0.305°)	$4.83 \times 10^{-3}$ rad (0.277°)
Output range	± 5V DC Load resistance must be more than 2kΩ			Inertia moment	$1.49 \times 10^{-6}$ kgm <sup>2</sup>	$1.52 \times 10^{-6}$ kgm <sup>2</sup>	$1.42 \times 10^{-6}$ kgm <sup>2</sup>
Responsivity	1kHz			Dimension (Main frame)	54 (W) × 50 (H) × 40 (D) mm		
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA			Weight	Approx. 180g		
Safe overload	500% FS			Attached cable	6 wires (End points: Peeled insulator and soldered)		
Non-linearity	0.03% FS (Typ)			Accessories	CATM51 : 5m CATM12 : 10m		
Hysteresis	0.03% FS (Typ)			CE marking certification	EMC directives : EN61326-2-3 : 2013		
Repeatability	0.03% FS (Typ)			Installable option	Rotary encoder		
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						

## Dimension



### Supported couplings

- UCM19
- UCM25
- UCS25
- UCM30
- UCS30
- UCM34
- UCS34
- UCM39
- UCS39
- UCM44

Refer to page 26 for details of couplings

# UTMII-5/10Nm



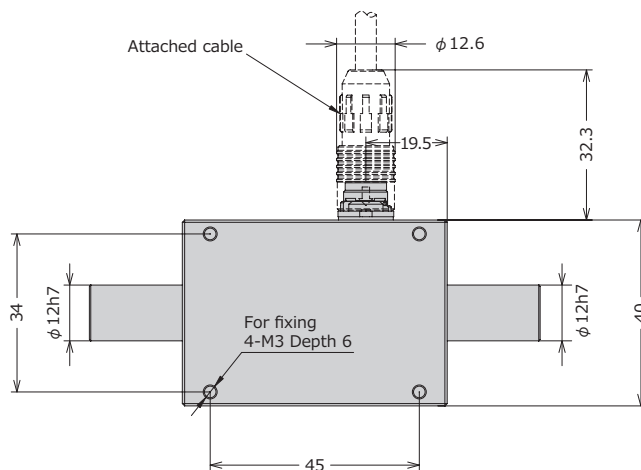
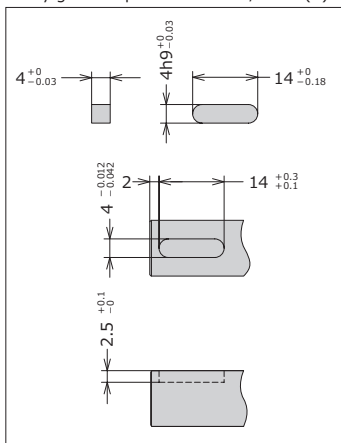
## ■ Specification

Type	UTMII-5Nm	UTMII-10Nm
Measurement range	± 5Nm	± 10Nm
Power supply	DC24V ± 15% Consumption current : 100mA or less	
Output range	± 5V DC Load resistance must be more than 2kΩ	
Responsivity	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	25000rpm	

Type	UTMII-5Nm	UTMII-10Nm
Torsional spring constant	691Nm/rad	1851Nm/rad
Maximum torsional angle	$7.24 \times 10^{-3}$ rad (0.415°)	$5.40 \times 10^{-3}$ rad (0.310°)
Inertia moment	$3.56 \times 10^{-6}$ kgm <sup>2</sup>	$3.66 \times 10^{-6}$ kgm <sup>2</sup>
Dimension (Main frame)	57 (W) × 55 (H) × 40 (D) mm	
Weight	Approx. 270g	
Attached cable	6 wires (End points: Peeled insulator and soldered)	
Accessories	CATM51 : 5m CATM12 : 10m	
CE marking certification	EMC directives : EN61326-2-3 : 2013	
Installable options	Rotary encoder, Key groove	

## Dimension

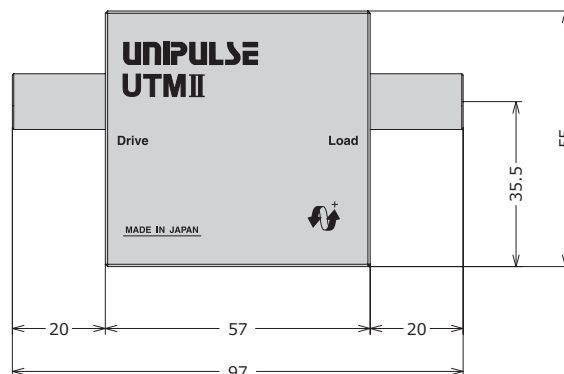
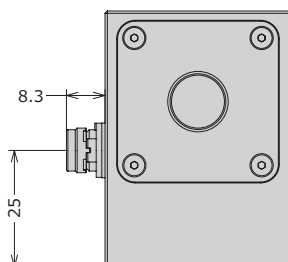
Key groove option : UTMII-5/10Nm(K)



### Supported couplings

UCM30  
UCM34  
UCS34  
UCM39  
UCS39  
UCM44  
UCM56

Refer to page 26 for details of couplings



Unit : mm



# UTM II -20Nm



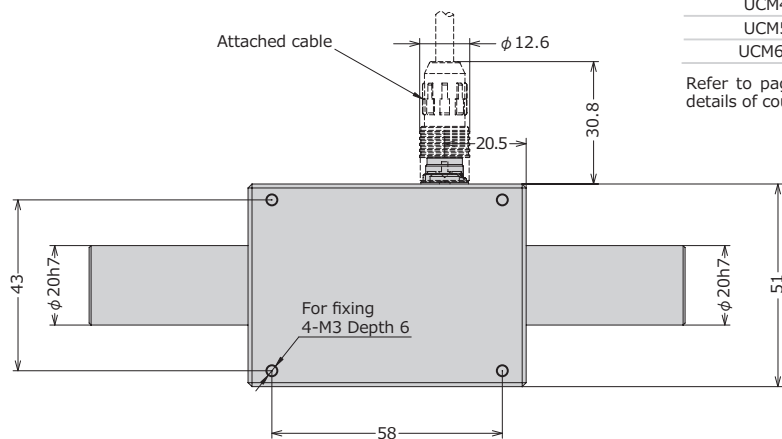
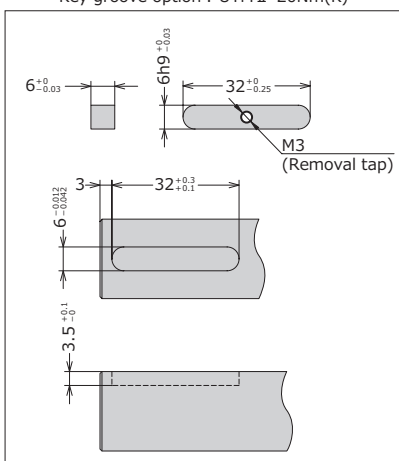
## ■ Specification

Type	UTM II -20Nm
Measurement range	± 20Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	20000rpm

Type	UTM II -20Nm
Torsional spring constant	5386Nm/rad
Maximum torsional angle	$3.71 \times 10^{-3}$ rad (0.213°)
Inertia moment	$2.60 \times 10^{-5}$ kgm <sup>2</sup>
Dimension (Main frame)	70 (W) × 68 (H) × 51 (D) mm
Weight	Approx. 700g
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable options	Rotary encoder, Key groove * Both cannot be installed together

## Dimension

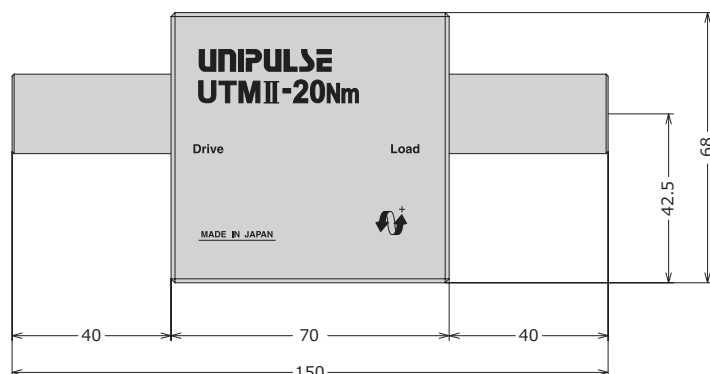
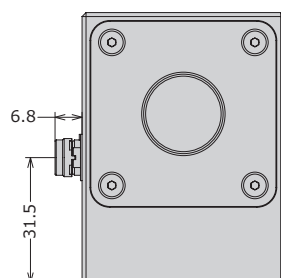
Key groove option : UTM II -20Nm(K)



Supported couplings

- UCM44
- UCM56
- UCM65B

Refer to page 26 for details of couplings



Unit : mm

UTM II -20Nm

Rotating Torque Meter

# UTM II-50Nm

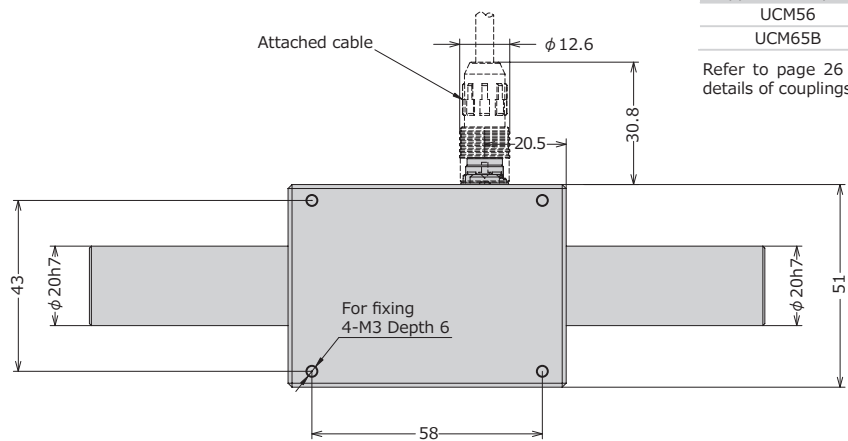
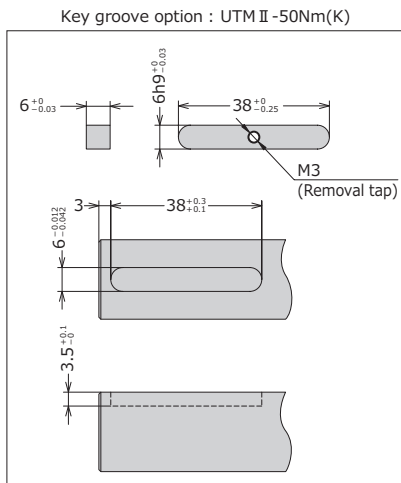


## ■ Specification

Type	UTM II-50Nm
Measurement range	± 50Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	20000rpm

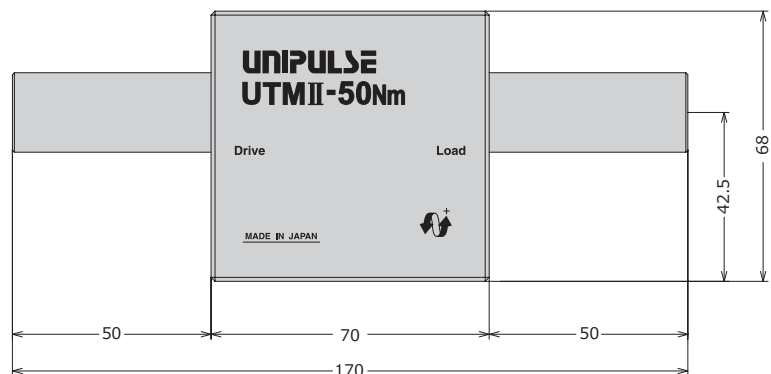
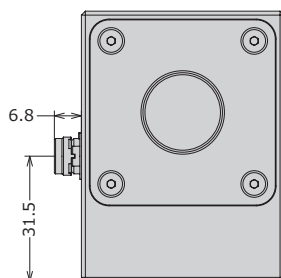
Type	UTM II-50Nm
Torsional spring constant	8428Nm/rad
Maximum torsional angle	$5.93 \times 10^{-3}$ rad (0.340°)
Inertia moment	$2.67 \times 10^{-5}$ kgm <sup>2</sup>
Dimension (Main frame)	70 (W) × 68 (H) × 51 (D) mm
Weight	Approx. 700g
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable options	Rotary encoder, Key groove * Both cannot be installed together

## Dimension



Supported couplings  
UCM56  
UCM65B

Refer to page 26 for details of couplings



Unit : mm

# UTM II-100Nm

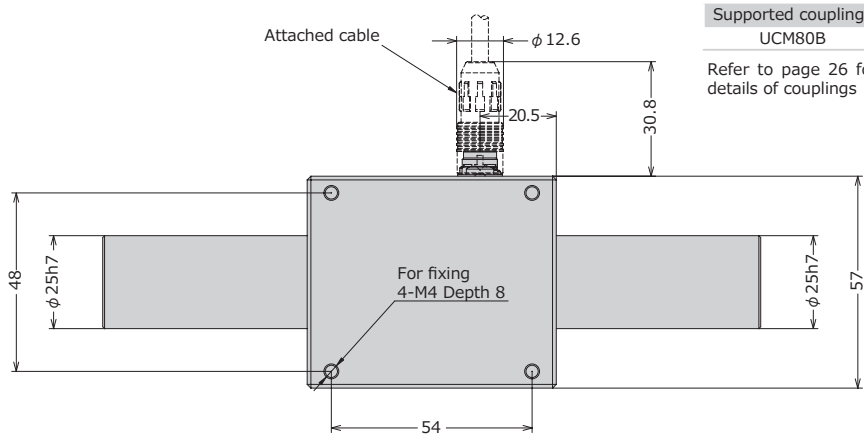
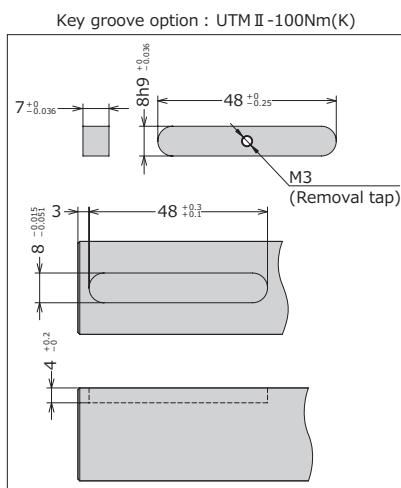


## ■ Specification

Type	UTM II-100Nm
Measurement range	± 100Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	1500rpm

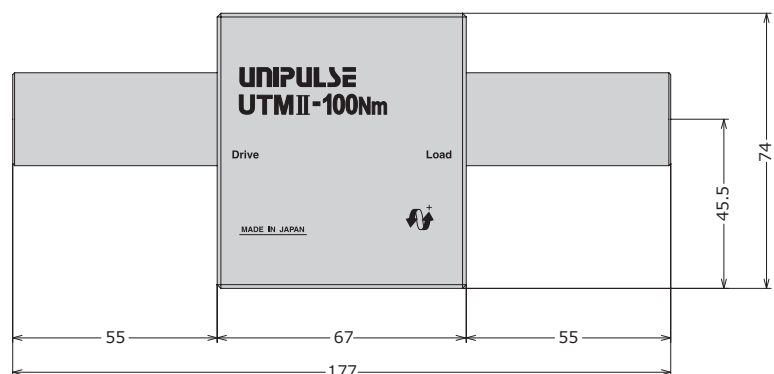
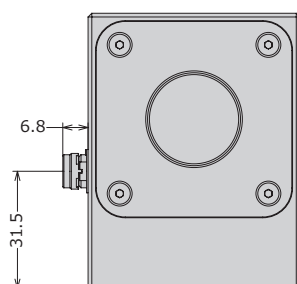
Type	UTM II-100Nm
Torsional spring constant	$17.3 \times 10^3 \text{Nm/rad}$
Maximum torsional angle	$5.78 \times 10^{-3} \text{rad}$ (0.331°)
Inertia moment	$6.60 \times 10^{-5} \text{kgm}^2$
Dimension (Main frame)	67 (W) × 74 (H) × 57 (D) mm
Weight	Approx. 1.1kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable options	Key groove, Square drive * Both cannot be installed together * Rotary encoder can be installed onto square drive type

## Dimension



Supported couplings  
UCM80B

Refer to page 26 for details of couplings



Unit : mm

UTM II-100Nm

Rotating Torque Meter

# UTM II-200Nm

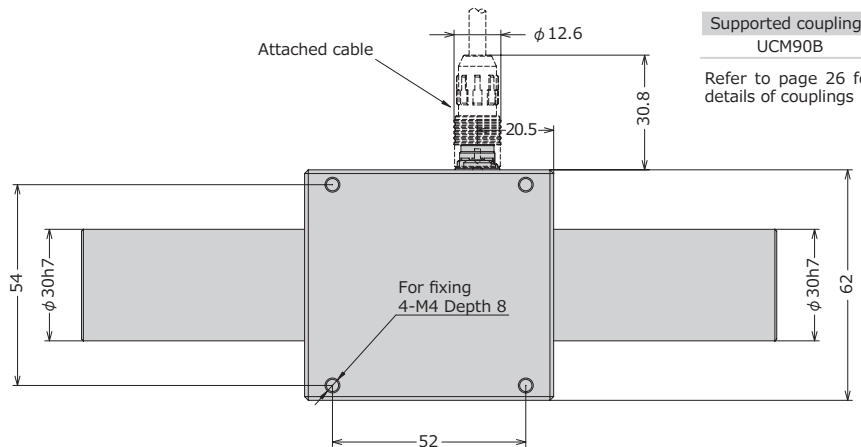
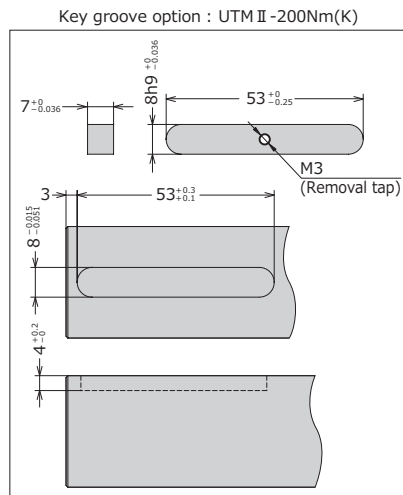


## ■ Specification

Type	UTM II-200Nm
Measurement range	± 200Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	12000rpm

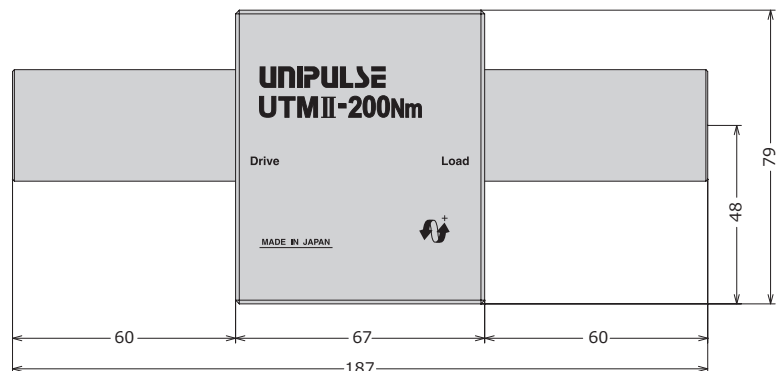
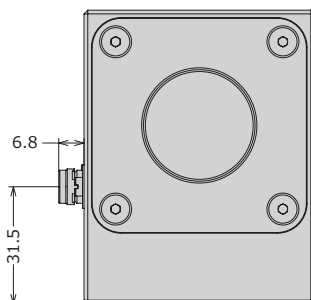
Type	UTM II-200Nm
Torsional spring constant	$41.7 \times 10^3 \text{ Nm/rad}$
Maximum torsional angle	$4.79 \times 10^{-3} \text{ rad}$ (0.275°)
Inertia moment	$1.40 \times 10^{-4} \text{ kgm}^2$
Dimension (Main frame)	67 (W) × 79 (H) × 62 (D) mm
Weight	Approx. 1.5kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable option	Key groove

## Dimension



Supported couplings  
UCM90B

Refer to page 26 for details of couplings



Unit : mm

# UTM II -500Nm



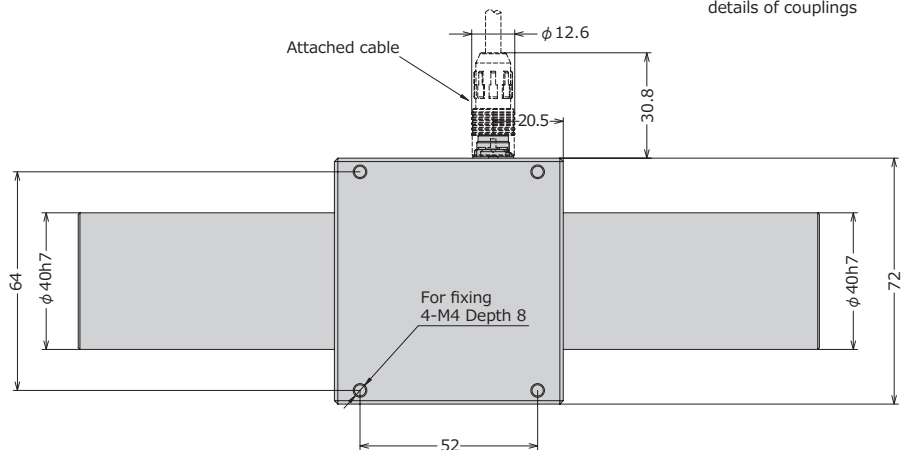
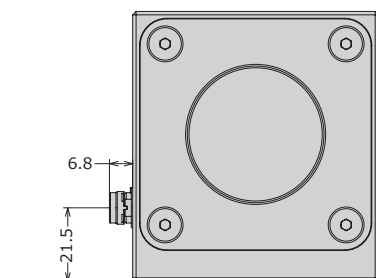
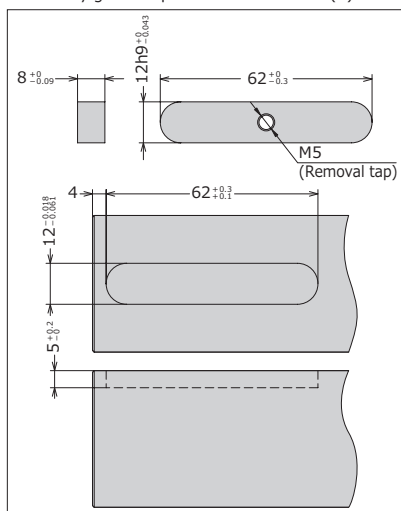
## ■ Specification

Type	UTM II -500Nm
Measurement range	± 500Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	10000rpm

Type	UTM II -500Nm
Torsional spring constant	117 × 10 <sup>3</sup> Nm/rad
Maximum torsional angle	4.28 × 10 <sup>-3</sup> rad (0.246°)
Inertia moment	4.70 × 10 <sup>-4</sup> kgm <sup>2</sup>
Dimension (Main frame)	67 (W) × 79 (H) × 72 (D) mm
Weight	Approx. 2.6kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable options	Key groove, Square drive * Both cannot be installed together * Rotary encoder can be installed onto square drive type

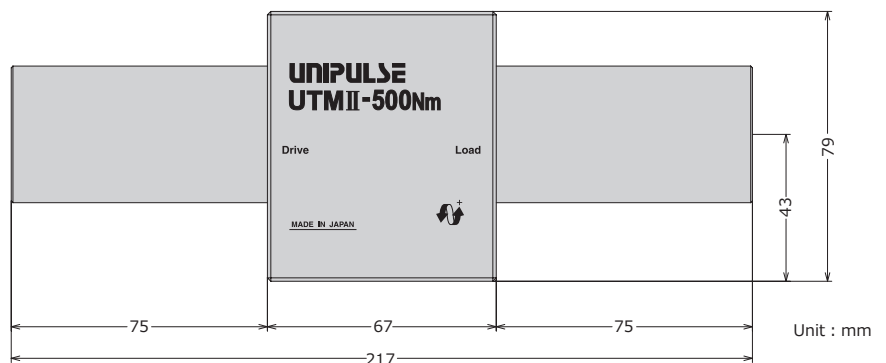
## Dimension

Key groove option : UTM II -500Nm(K)



Supported couplings  
UCM125B

Refer to page 26 for details of couplings



Unit : mm



# UTM II-1000Nm



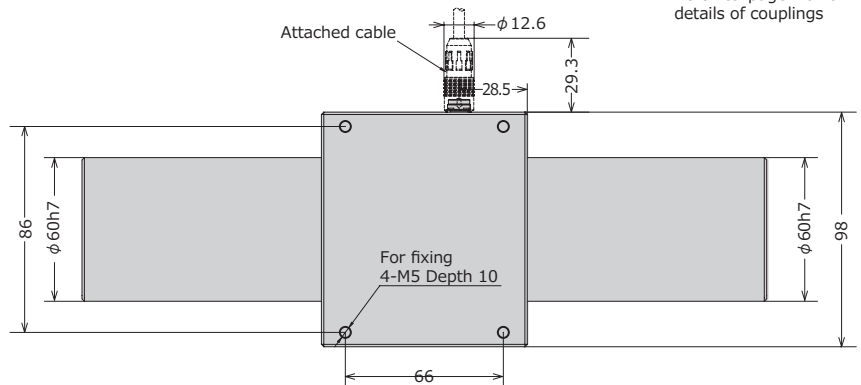
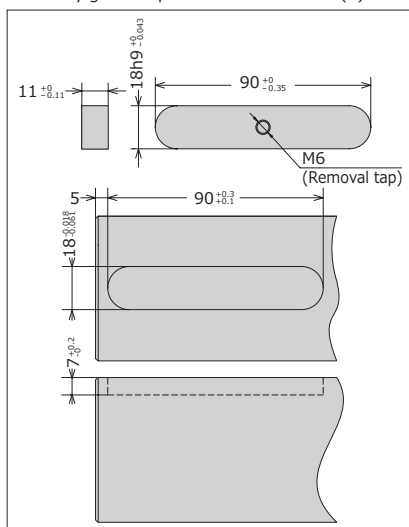
## ■ Specification

Type	UTM II-1000Nm
Measurement range	± 1000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	7000rpm

Type	UTM II-1000Nm
Torsional spring constant	$377 \times 10^3 \text{Nm/rad}$
Maximum torsional angle	$2.65 \times 10^{-3} \text{rad}$ (0.152°)
Inertia moment	$2.90 \times 10^{-3} \text{kgm}^2$
Dimension (Main frame)	86 (W) × 103 (H) × 98 (D) mm
Weight	Approx. 7.3kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable option	Key groove

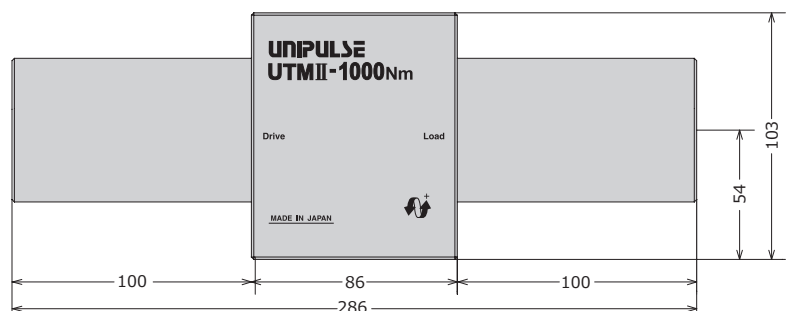
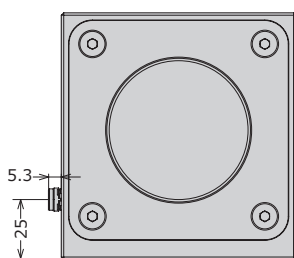
## Dimension

Key groove option : UTM II-1000Nm(K)



Supported couplings  
UCM155B  
UCM220

Refer to page 26 for details of couplings



Unit : mm

# UTM II-2000Nm



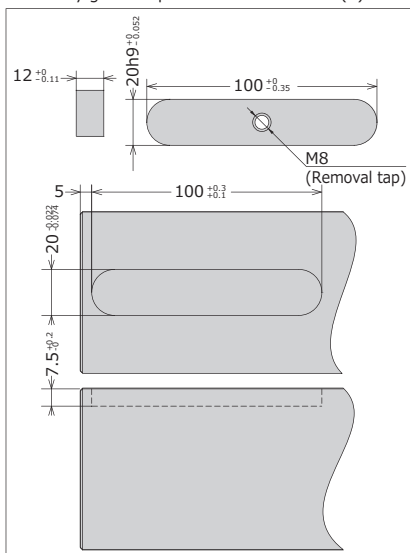
## ■ Specification

Type	UTM II-2000Nm
Measurement range	± 2000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	6000rpm

Type	UTM II-2000Nm
Torsional spring constant	$717 \times 10^3 \text{ Nm/rad}$
Maximum torsional angle	$2.79 \times 10^{-3} \text{ rad}$ (0.160°)
Inertia moment	$5.89 \times 10^{-3} \text{ kgm}^2$
Dimension (Main frame)	86 (W) × 119 (H) × 111 (D) mm
Weight	Approx. 10.5kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable option	Key groove

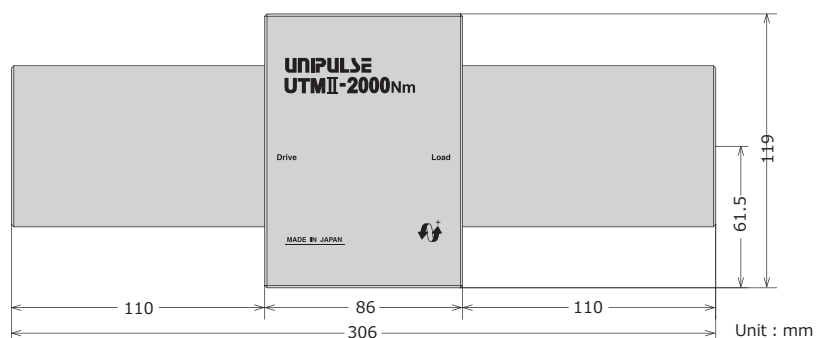
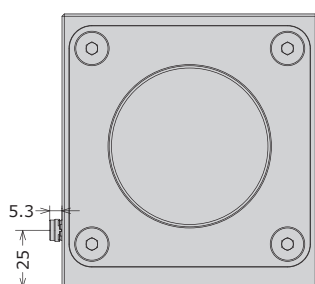
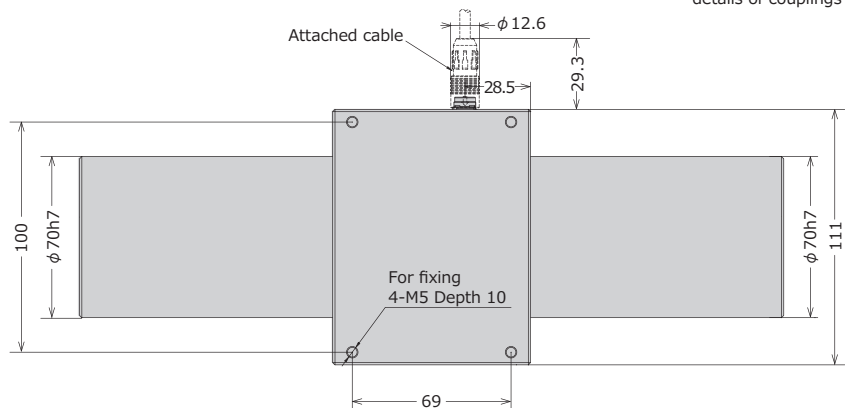
## Dimension

Key groove option : UTM II-2000Nm(K)



Supported couplings  
UCM220  
UCM260

Refer to page 26 for details of couplings



UTM II-2000Nm

Rotating Torque Meter

# UTM II-5000Nm



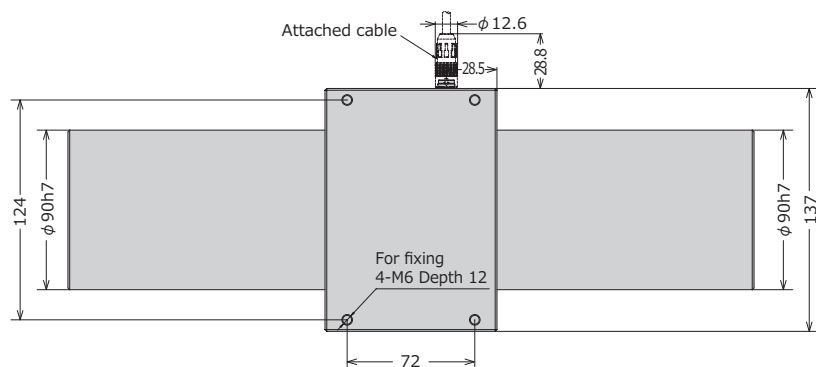
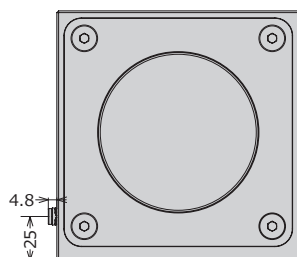
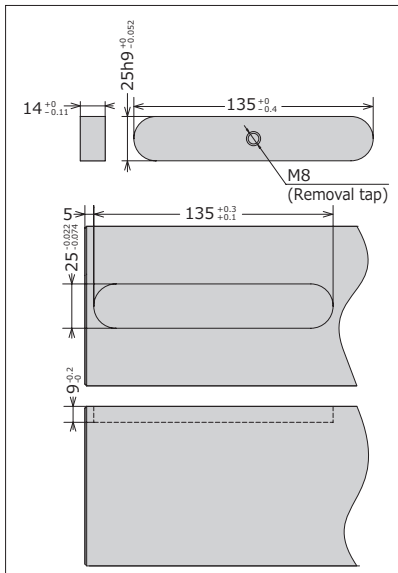
## ■ Specification

Type	UTM II-5000Nm
Measurement range	± 5000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	5000rpm

Type	UTM II-5000Nm
Torsional spring constant	1649 × 10 <sup>3</sup> Nm/rad
Maximum torsional angle	3.03 × 10 <sup>-3</sup> rad (0.174°)
Inertia moment	2.01 × 10 <sup>-2</sup> kgm <sup>2</sup>
Dimension (Main frame)	97 (W) × 141 (H) × 137 (D) mm
Weight	Approx. 21.4kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable option	Key groove

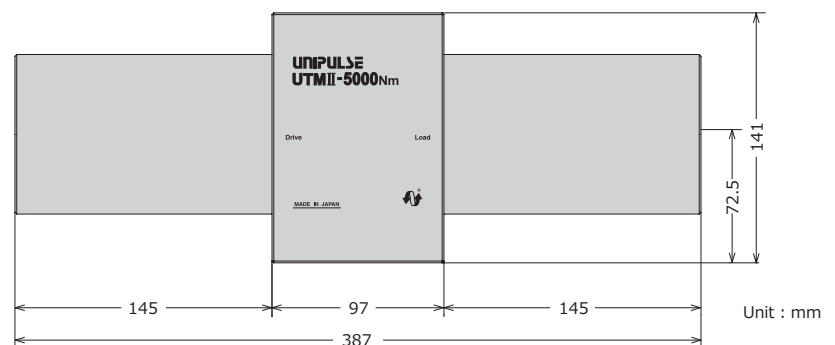
## Dimension

Key groove option : UTM II-5000Nm(K)



Supported couplings  
UCM260

Refer to page 26 for details of couplings



# UTM II-10000Nm



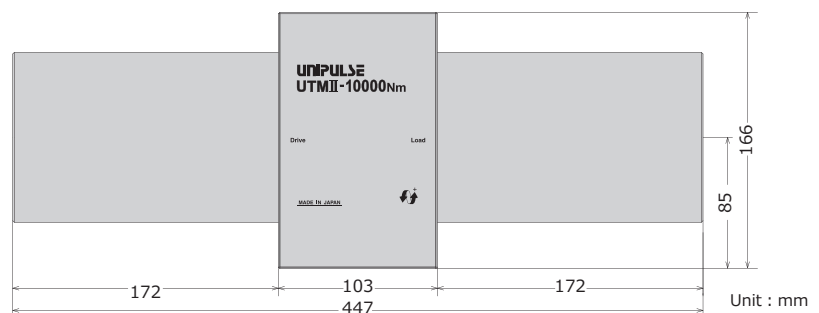
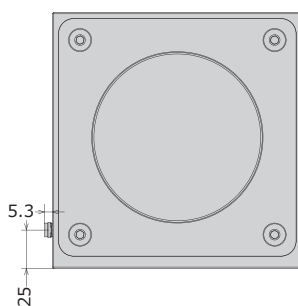
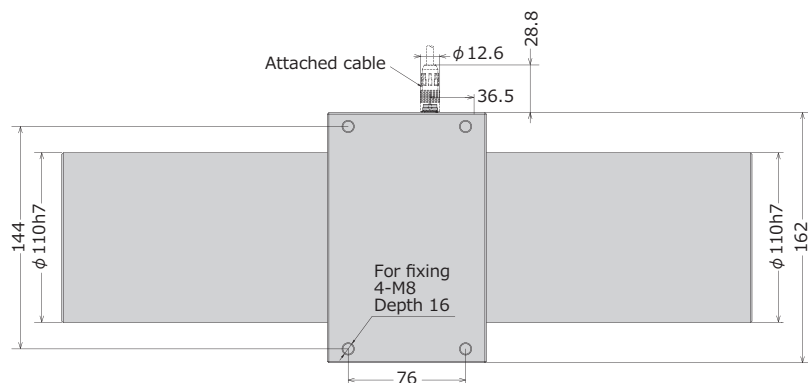
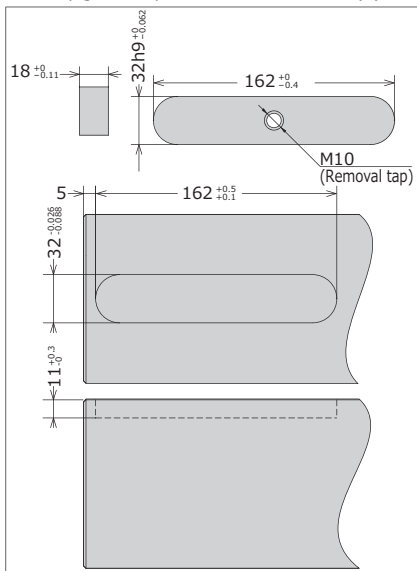
## ■ Specification

Type	UTM II-10000Nm
Measurement range	± 10000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	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	4000rpm

Type	UTM II-10000Nm
Torsional spring constant	3255 × 10 <sup>3</sup> Nm/rad
Maximum torsional angle	3.07 × 10 <sup>-3</sup> rad (0.176°)
Inertia moment	5.16 × 10 <sup>-2</sup> kgm <sup>2</sup>
Dimension (Main frame)	103 (W) × 166 (H) × 162 (D) mm
Weight	Approx. 36kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accessories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013
Installable option	Key groove

## Dimension

Key groove option : UTM II-10000Nm(K)



Unit : mm

UTM II-10000Nm

Rotating Torque Meter

# Option (To be specified at the time of order)

## Rotary encoder



Type
UTMII - 0.05Nm(R)
UTMII - 0.1Nm(R)
UTMII - 0.2Nm(R)
UTMII - 0.5Nm(R)
UTMII - 1Nm(R)
UTMII - 2Nm(R)
UTMII - 5Nm(R) ※
UTMII - 10Nm(R) ※
UTMII - 20Nm(R)
UTMII - 50Nm(R)

### Optical encoder

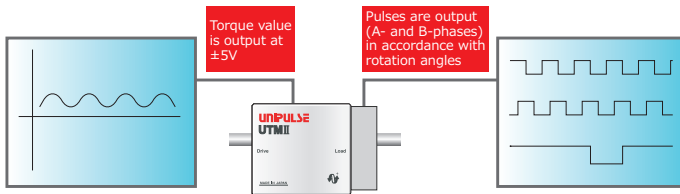
2000C/T : 0.05 to 10Nm  
1440C/T : 20Nm, 50Nm

### Suitable for measurement of torque variation against an angular variation

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

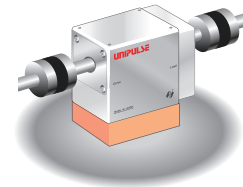
※ Key grooves are optionally available to the 5Nm and 10Nm models, indicated as UTMII - 5Nm(RK) and UTMII - 10Nm(RK), respectively.

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



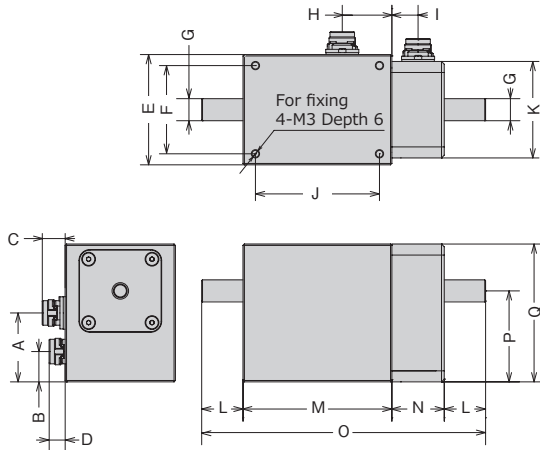
### Installation

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



## Dimension

### UTMII-0.05Nm (R) to 50Nm (R)



Range	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	$\phi 5h7$	18	9.5	45	35	15	54	19	103	33	50	93
0.1																		
0.2																		
0.5																		
1	13.5	6.8	34	$\phi 8h7$	19.5	37	20	57	116	35.5	55							
2																		
5																		
10	31.5	13	6.8	8.5	51	43	$\phi 20h7$	20.5	7	58	51	40	70	17	167	42.5	68	
20																		
50																		

Unit : mm

## Key groove



Type
UTMII - 5Nm(K) ※
UTMII - 10Nm(K) ※
UTMII - 20Nm(K)
UTMII - 50Nm(K)
UTMII - 100Nm(K)
UTMII - 200Nm(K)
UTMII - 500Nm(K)
UTMII - 1000Nm(K)
UTMII - 2000Nm(K)
UTMII - 5000Nm(K)
UTMII - 10000Nm(K)

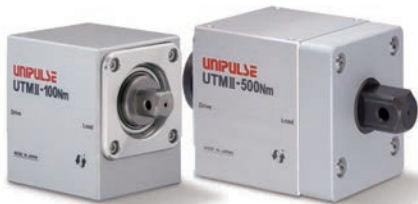
Refer to each product page (page 7 to 16) for external dimensions.

※ Rotary encoders are optionally available to the 5Nm and 10Nm models, indicated as UTMII - 5Nm(RK) and UTMII - 10Nm(RK), respectively.





## Square drive



Reliable and stable measurement without missing data by wireless signal transmission.

- Ideal to use with nut runner applications (fastening tools).
- With high accuracy and high-speed response of UTM II, torque fluctuation can be monitored in a fastening process.

Torque monitoring : UTM II (W)  
Torque+Angle monitoring : UTM II (WR)

\* This product is not for impact wrenches.

- Torque can be monitored easily just by setting the sensor between socket and shaft of a nut runner.



## Specification

### ■ UTM II (W)

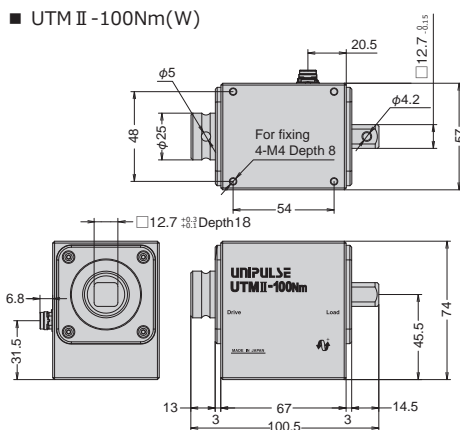
Model	UTMII-100Nm (W)	UTMII-500Nm (W)
Measurement range	±100Nm	±500Nm
Power supply	DC24V ±15%	
Power consumption	150mA or less	
Output range	±5V DC Load resistance must be more than 2kΩ	
Responsivity	1kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA	
Safe overload	500%FS	
Non-linearity	0.03%FS (Typ)	
Hysteresis	0.03%FS (Typ)	
Repeatability	0.03%FS (Typ)	
Operation temp. range	-10 ~ +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 <sup>3</sup> Nm/rad	265x10 <sup>3</sup> Nm/rad
Max. torsional angle	2.60x10 <sup>-3</sup> rad (0.149°)	1.88x10 <sup>-3</sup> rad (0.108°)
Inertia moment	3.8x10 <sup>-5</sup> kgm <sup>2</sup>	2.15x10 <sup>-4</sup> kgm <sup>2</sup>
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)

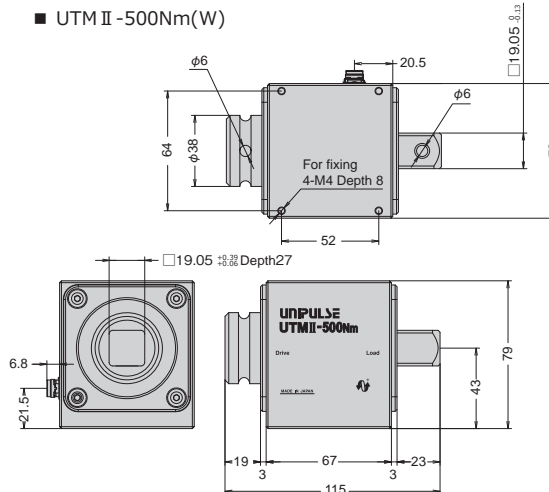
Model	UTMII-100Nm (WR)-12.7	UTMII-100Nm (WR)-19.05	UTMII-500Nm (WR)-19.05
Measurement range	±100Nm	±100Nm	±500Nm
Power supply	DC24V ±15%		
Power consumption	150mA or less		
Output range	±5V DC Load resistance must be more than 2kΩ		
Responsivity	1kHz		
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA		
Angle of rotation (encoder) output	3600 torque 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 ~ +50°C		
Temp. effect on ZERO	0.01%FS/°C (Typ)		
Temp. effect on span	0.01%FS/°C (Typ)		
Max. rotation speed	10000rpm	10000rpm	10000rpm
(Measurable range for angle)	2000rpm	2000rpm	2000rpm
Torsional spring constant	26.4x10 <sup>3</sup> Nm/rad	54.6x10 <sup>3</sup> Nm/rad	136x10 <sup>3</sup> Nm/rad
Max. torsional angle	3.78x10 <sup>-3</sup> rad (0.217°)	1.83x10 <sup>-3</sup> rad (0.105°)	3.68x10 <sup>-3</sup> rad (0.211°)
Inertia moment	3.58x10 <sup>-5</sup> kgm <sup>2</sup>	1.92x10 <sup>-4</sup> kgm <sup>2</sup>	2.06x10 <sup>-4</sup> kgm <sup>2</sup>
Case size	87 (W) x74 (H) x57 (D) mm	87 (W) x79 (H) x72 (D) mm	87 (W) x79 (H) x72 (D) mm
Total length	120.5mm	133mm	133mm
Shaft diameter	□12.7mm	□19.05mm	□19.05mm
Weight	Approx. 0.9kg	Approx. 1.7kg	Approx. 1.8kg
CE marking certification	EMC directives EN61326-2-3		

## Dimension

### ■ UTM II -100Nm(W)

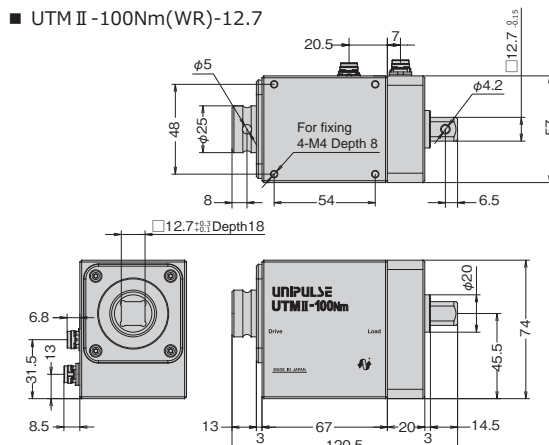


### ■ UTM II -500Nm(W)

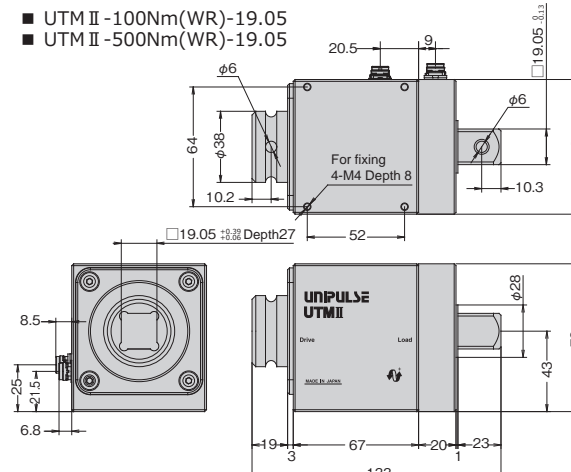


Type
UTM II - 100Nm(W)
UTM II - 500Nm(W)
UTM II - 100Nm (WR) -12.7
UTM II - 100Nm (WR) -19.05
UTM II - 500Nm (WR) -19.05

### ■ UTM II -100Nm(WR)-12.7



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

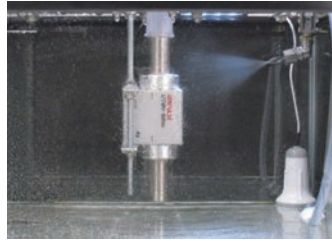


Unit mm

# UTMV (drip & rust proof type)



Drip & rust proof type with high safe overload rating for use in harsh conditions

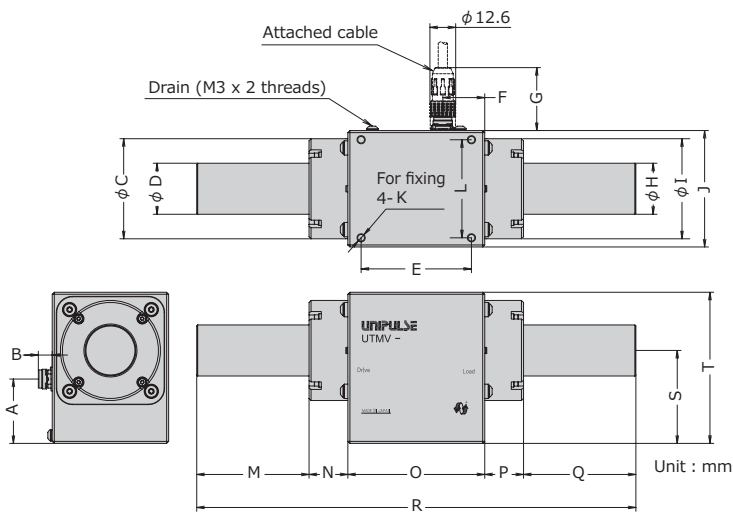


- Degree of protection: equivalent to IP65
- Made of rust-resistant stainless steel
- Labyrinth seal (standard)  
With the protection against rain and seawater, it can be used outside for wind and water turbine and so on.
- PTFE rotary seal: option (S)  
It can be used in environment with dust and/or oil mist as well.
- Key groove : option (K)

■ Specification (ST:Standard, (S):PTFE rotary seal option)

Measurement range	± 0.1Nm		± 0.5Nm		± 1Nm		± 5Nm		± 10Nm		± 50Nm		± 100Nm		± 500Nm		± 1000Nm		± 5000Nm	
Seal structure	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)
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 2kΩ																			
Responsivity	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 (rpm)	10000	2120	10000	1590	10000	1590	9000	1060	9000	1060	5700	680	4800	570	4800	380	4800	270	4000	180
Torsional spring constant (Nm/rad)	11.13		89.5		172		897		1400		6887		16.4 × 10 <sup>3</sup>		93.6 × 10 <sup>3</sup>		326 × 10 <sup>3</sup>		1418 × 10 <sup>3</sup>	
Maximum torsional angle (rad)	8.99 × 10 <sup>-3</sup> (0.515°)		5.59 × 10 <sup>-3</sup> (0.320°)		5.83 × 10 <sup>-3</sup> (0.334°)		5.58 × 10 <sup>-3</sup> (0.320°)		7.14 × 10 <sup>-3</sup> (0.409°)		7.26 × 10 <sup>-3</sup> (0.416°)		6.11 × 10 <sup>-3</sup> (0.350°)		5.34 × 10 <sup>-3</sup> (0.306°)		3.07 × 10 <sup>-3</sup> (0.176°)		3.53 × 10 <sup>-3</sup> (0.202°)	
Inertia moment (kgm <sup>2</sup> )	1.15 × 10 <sup>-6</sup>	0.99 × 10 <sup>-6</sup>	2.19 × 10 <sup>-6</sup>	1.90 × 10 <sup>-6</sup>	2.22 × 10 <sup>-6</sup>	1.93 × 10 <sup>-6</sup>	5.60 × 10 <sup>-6</sup>	4.90 × 10 <sup>-6</sup>	5.70 × 10 <sup>-6</sup>	5.00 × 10 <sup>-6</sup>	4.21 × 10 <sup>-5</sup>	3.86 × 10 <sup>-5</sup>	9.6 × 10 <sup>-5</sup>	10.9 × 10 <sup>-5</sup>	6.2 × 10 <sup>-4</sup>	6.1 × 10 <sup>-4</sup>	3.56 × 10 <sup>-3</sup>	3.51 × 10 <sup>-3</sup>	2.38 × 10 <sup>-2</sup>	2.34 × 10 <sup>-2</sup>
Approx. weight	390g		430g		430g		580g		580g		1.6kg		2.1kg		4.0kg		10.5kg		28.3kg	
Attached cable	6 wires (End points: Peeled insulator and soldered)																			
Accessories	CATM51 : 5m CATM12 : 10m																			
CE marking certification	EMC directives : EN61326-2-3 : 2013																			

## Dimension



Type	Type
UTMV- 0.1Nm	UTMV- 100Nm
UTMV- 0.1Nm(S)	UTMV- 100Nm(K)
UTMV- 0.5Nm	UTMV- 100Nm(S)
UTMV- 0.5Nm(S)	UTMV- 100Nm(SK)
UTMV- 1Nm	UTMV- 500Nm
UTMV- 1Nm(S)	UTMV- 500Nm(K)
UTMV- 5Nm	UTMV- 500Nm(S)
UTMV- 5Nm(K)	UTMV- 500Nm(SK)
UTMV- 5Nm(S)	UTMV- 1000Nm
UTMV- 5Nm(SK)	UTMV- 1000Nm(K)
UTMV- 10Nm	UTMV- 1000Nm(S)
UTMV- 10Nm(K)	UTMV- 1000Nm(SK)
UTMV- 10Nm(S)	UTMV- 5000Nm
UTMV- 10Nm(SK)	UTMV- 5000Nm(K)
UTMV- 50Nm	UTMV- 5000Nm(S)
UTMV- 50Nm(K)	UTMV- 5000Nm(SK)
UTMV- 50Nm(S)	
UTMV- 50Nm(SK)	

Measurement range	A	B	φ C	φ D	E	F	G	φ H	φ I	J	K	L	M	N	O	P	Q	R	S	T	Key groove
0.1	25	8.3	24	5h7	45	18	32.3	5h7	24	40	M3 Depth 6	32	10	11.5	54	11.5	10	97	33	50	-
0.5	25	8.3	26	8h7	45	18	32.3	8h7	26	40	M3 Depth 6	32	15	11.5	54	11.5	15	107	33	50	-
1	25	8.3	26	8h7	45	18	32.3	8h7	26	40	M3 Depth 6	32	15	11.5	54	11.5	15	107	33	50	-
5	25	8.3	30.5	12h7	45	19.5	32.3	12h7	30.5	40	M3 Depth 6	34	20	12	57	12	20	121	35.5	55	Refer to Page 7
10	25	8.3	30.5	12h7	45	19.5	32.3	12h7	30.5	40	M3 Depth 6	34	20	12	57	12	20	121	35.5	55	Refer to Page 7
50	31.5	6.8	43.4	20h7	58	20.5	30.8	20h7	43.4	51	M3 Depth 6	43	50	18.5	70	18.5	50	207	42.5	68	Refer to Page 9
100	31.5	6.8	49	25h7	54	20.5	30.8	25h7	49	57	M4 Depth 8	48	55	19	67	19	55	215	45.5	74	Refer to Page 10
500	21.5	6.8	64.2	40h7	52	20.5	30.8	40h7	64.2	72	M4 Depth 8	64	75	20	67	20	75	257	43	79	Refer to Page 12
1000	25	5.3	86.6	60h7	66	28.5	29.3	60h7	86.6	98	M5 Depth 10	86	100	20	86	20	100	326	54	103	Refer to Page 13
5000	25	4.8	124.6	90h7	72	28.5	28.8	90h7	124.6	137	M6 Depth 12	124	145	23	97	23	145	433	72.5	141	Refer to Page 15

\* Dimension of rotary seal type is same as standard type.

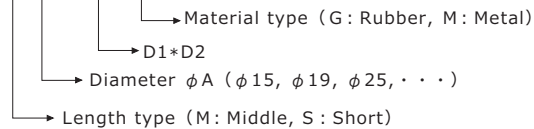
# Accessories

## UCM/UCS Coupling



- Recommended couplings for UTM II/UTMV
  - Connecting to external shafts accurately.
  - Preventing rotational resonance, and improving accuracy of torque measurement (rubber type).
- \* Refer to page 26 for details of couplings

### UCM15-3\*5G



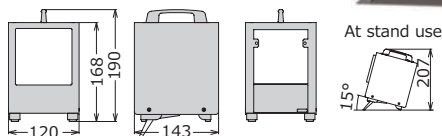
## TM301 Torque monitor - basic type, simple and easy operation



- Torque monitor for UTM II/UTMV.
- Torque, rotation speed and power\* are displayed simultaneously.
- Upper/lower comparators with hold functions.
- Data storage function.
- Easy connection to UTM II/UTMV with one cable.
- The unit supplies electric power to UTM II/UTMV.

\* Power (W) =  $2\pi \times$  Torque (Nm)  $\times$  Rotation speed (rpm) / 60

- Special case DTC2-PSL

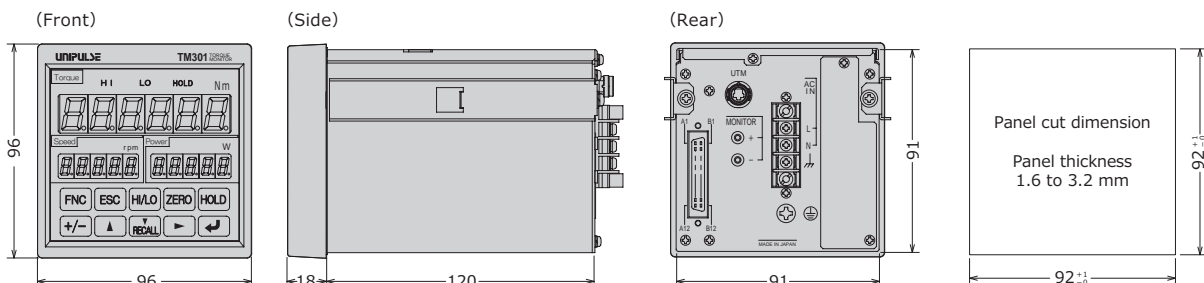


Analog	• Torque sensor input (voltage input) Signal input range -5 to +5V input impedance : 1MΩ or more Accuracy Non-linearity : Within 0.02%FS±1digit Zero drift : Within 0.2mV/°C RTI Gain drift : Within 0.01%/°C Analog filter Low pass filter (-6dB/oct.) Select from 3, 30, 300, 1kHz Data output rate 300 times/sec. Resolution : 24bit (binary) Approx. 1/30000 with respect to 5V Monitor output Output level : Input voltage cuff (For test point)
	• Pulse input for rpm (input for open collector type) Maximum input frequency: Compatible with the pulse output frequency of UTM II/UTMV series Minimum input frequency: Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr) Minimum pulse width: 50μs Circuit layout No-voltage (dry) contact input (minus common): open collector outputs can be connected (Ic= approx. 10mA)
Display	Display unit Main display : Character height 15mm 7-segment Green LED (5-digit+Sign) Sub display : Character height 8mm 7-segment Green LED (5-digit) ※Unit seal is attached.
External I/O signal	External output (12) Upper/Lower limit comparison(ALM HI, HI, OK, LO, ALM LO) / Hold complete / RUN
	External input (4) Hold control / Hold release / Digital zero(DZ) / Memory clear
Interface	Standard : SIF Option : BCD output / D/A converter voltage output / D/A converter current output / RS-232C / USB
General performance	Power supply AC100V to 240V (+10%~15%) (free power source 50/60Hz)
	Power consumption 7W typ
	Operating conditions Temperature : Operation -10°C to +40°C Storage -40°C to +80°C Humidity : 85%RH or less (non-condensing)
	Dimension 96(W)× 96(H)× 138(D)mm (Projections excluded) Weight Approx. 1.0kg
Attachment	Operation manual...1, External input/output connector...1, AC input cord 3m (with solderless terminal)*...1, Cable for connecting UTM II/UTMV 2m...1, Unit seal...1, Connector for BCD output (with BCD output option)...1, Mini screwdriver (with D/A converter option)...1 * The attached AC input cord is intended for 100V AC power in Japan.
Accessories	CA372-I/O:Cable with FCN connector at one-end 3m CA81-USB:miniUSB-computer USB cable 1.8m CAAC2P-B3:AC Supply cord 3m CAAC3P-CEE7/7-B2:AC Supply cord (250V)2m CATM21-M:Cable for connecting UTM II/UTMV 2m CATM51-M:Cable for connecting UTM II/UTMV 5m CN34:D-Sub9p connector for RS-232C CN50:FCN series I/O connector (with cover) CN51:BCD output connector CN55:FCN series I/O connector (with diagonal cover) CN90:Waterproof plastic connector for UTM II/UTMV DTC2-PSL:Case for TM301 GMP96x96 : Rubber seal

### PC Software

PC software for parameter settings (save and edit), graph display, and calibration can be downloaded from our website (USB interface option for TM301 is required).

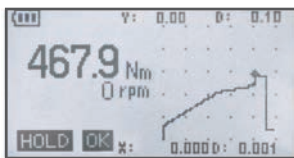
### Dimension



## TM400 Torque monitor - portable with built-in battery, compact & high-spec type



- Convenient portable monitor for easy use of UTM II/UTMV.
- Ideal for on-site calibration of nut runners (use with UTM II with the square drive option).
- With the built-in battery, it can be operated even without power source.
- Easy connection to UTM II/UTMV with one cable.
- Operation power can be supplied to the UTM II/UTMV. (also to an optional rotary encoder).
- High-speed sampling at 20ks/s
- Torque & rotation speed and torque-angle curve can be monitored.
- Data recording with memory function and USB.
- Various display mode: real-time, graph, recorded data, etc...
- Upper/lower limit & hold function.
- Change the display mode by pressing the ESC button.



Graph display



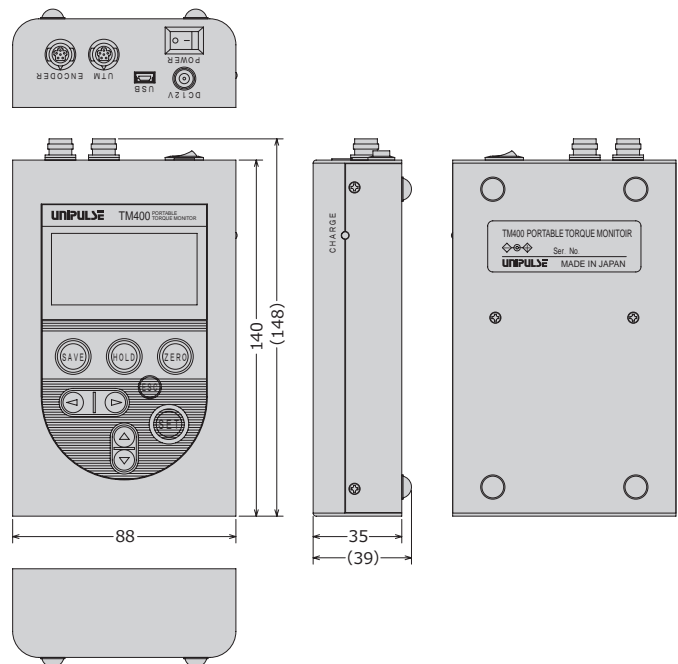
Indicated value display

Torque input	· voltage input	
	Signal input range	-5 to +5V Input impedance : 1MΩ or more
	Accuracy	Non-linearity : within 0.02%FS±1digit Zero drift : within 0.2mV/°C RTI Gain drift : within 0.01%/°C
	Analog filter	Low pass filter ( -6dB/oct.) Select from 10, 30, 100, 300, 1k, 3k, 10k, 30kHz
A/D converter	Rate	20000times/sec
	Resolution	24bit (binary) Approx. 1/30000 against 5V
Rotation input	· Pulse input (open-collector)	
	Maximum input frequency	In accordance with the output frequency of the UTM II/UTMV series
	Minimum input frequency	15rpm
	Minimum detection pulse width	50μs
	Circuit configuration	No-voltage contact input (minus common) Open collector connectable (Ic=Approx. 10mA)
Encoder input	· Pulse input (open-collector)	
	Maximum input frequency	50kHz
Display	Display unit	128×64 dots monochromatic LCD (display area: 28 x 57)
	Displayed data	Torque, rotation speed & angle (numeric), torque-time or torque-angle/displacement curve (graphic), and status display (high, low, OK, and hold)
Interface	USB	
Power supply	Built-in secondary battery, maximum operating time: 5 hours,	
	AC adpoter	
Operating conditions	Temperature	Operation temperature -10°C to +40°C Storage temperature -20°C to +60°C
	Humidity	85%RH or below (non-condensing)
	Dimension	88(W)× 140(H)× 35(D)mm (excluding projections)
Weight	Approx.500g	
Attachment	AC adpoter	.....1
	Operation manual	.....1
	Cable for connecting UTM II/UTMV (2m)	.....1
	Cable for connecting UTM II rotary encoder (2m)	.....1
Accessories	API2375:	AC adpoter (100V)
	CA81-USB:	miniUSB-computer USB cable 1.8m
	CATM21-M:	Cable for connecting UTM II/UTMV 2m
	CATM51-M:	Cable for connecting UTM II/UTMV 5m
	CATM(R)21:	Cable for UTM II with rotary encoder connection (non-connector at one end) 2m
	CATM(R)21-M:	Cable for connecting UTM II rotary encoder 2m
	CATM(R)51-M:	Cable for connecting UTM II rotary encoder 5m
	CN90 :	Waterproof plastic connector for UTM II/UTMV
CN91 :	Waterproof plastic connector for UTM II rotary encoder	
CE marking certification	· EMC directives : EN61326-1 : 2013 · Safety standard : EN62311 : 2008 Please specify requirement for CE marking certified product when making your order.	

### PC Software

PC software for importing parameter settings and hold/waveform data from TM400 can be downloaded from our website.

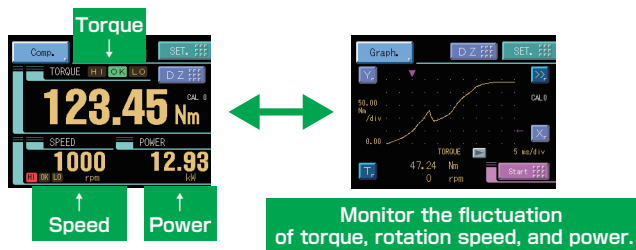
### Dimension



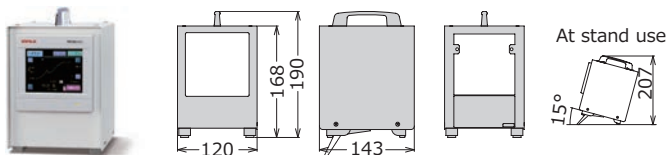


- High-speed sampling at 20kS/s!!
- A torque curve monitor supporting the high response time of UTM II/UTMV (1kHz).
- Display the curves of torque, rotation speed, and power※.
- Enable the cogging torque measurement with UTM II/UTMV .
- Upper/lower limits & hold function.
- Operation power can be supplied to the UTM II/UTMV .
- Easy connection to UTM II/UTMV with one cable.
- Data recording with USB.

※ Power (W) = 2π × Torque (Nm) × Rotation speed (rpm) / 60



- Special case DTC2

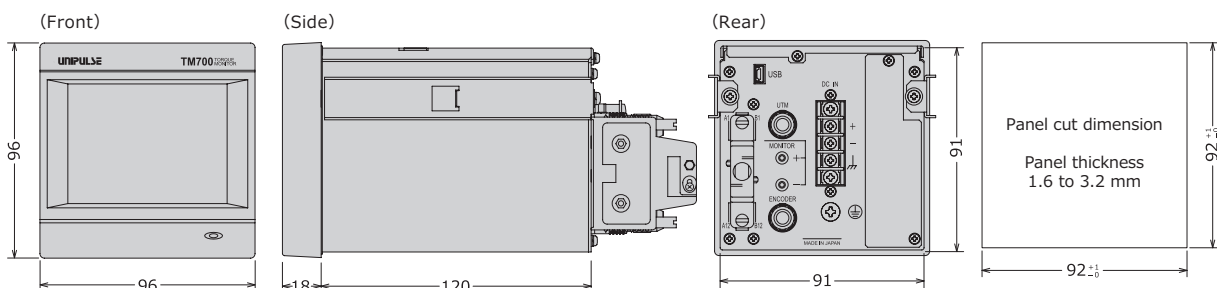


Torque input	• Voltage input
	Signal input range: -5 to +5V Input impedance : 1MΩ or more
	Accuracy Non-linearity : within 0.02%FS±1digit Zero drift : within 0.2mV/°C RTI Gain drift : within 0.01%/°C
	Analog filter Low pass filter (-6dB/oct.) Select from 10, 30, 100, 300, 1k, 3k, 10k, 30kHz
Rotation input	A/D converter Rate : 20000times/sec Resolution : 24bit (binary) Approx. 1/30000 against 5V
	Monitor output Output level : Input voltage cuff (For test point)
	• Pulse input (open-collector)
	■ high-speed (for standard UTM II/UTMV) Max. frequency Accordance with UTM II/UTMV Min. frequency Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr) Min. pulse width 50μs Circuit configuration: No-voltage contact input (minus common) Open collector connectable (Ic=Approx. 10mA)
Display	■ low-speed (for UTM II with rotary encoder option) Max. frequency Approx. 1000rpm Min. frequency 0.1rpm Min. pulse width 5μs Circuit configuration: No-voltage contact input (minus common) Open collector connectable (Ic=Approx. 10mA)
	Display unit 3.5 inch TFT color LCD
	External output (8) ex) high and low limit outputs
	External input (10) ex) hold control input, digital zero input(DZ)
Interface	SIF : 2-wire serial interface USB : USB interface D3V : D/A converter voltage output (3ch) (Option)
	Power supply DC24V (±15%)
Power consumption	6W typ
Operating conditions	Temperature : Operation -10°C ~ +40°C Storage -40°C ~ +80°C Humidity : 85%RH or below (non-condensing)
Dimension	96(W) × 96(H) × 138(D)mm (excluding projections)
Weight	Approx. 1.0kg
Attachment	Operation manual ·····1, External input/output connector ·····1, Cable for connecting UTM II/UTMV (2m) ·····1
Accessories	DTC2 : Case for TM700 (with AC power supply)
	CA372-1/O: Cable with FCN connector at one-end 3m
	CA81-USB: miniUSB-computer USB cable 1.8m
	CATM21-M: Cable for connecting UTM II/UTMV 2m
	CATM51-M: Cable for connecting UTM II/UTMV 5m
	CATM(R)21: Cable for UTM II with rotary encoder connection (non-connector at one end) UTM II 2m
	CATM(R)21-M: Cable for connecting UTM II rotary encoder 2m
	CATM(R)51-M: Cable for connecting UTM II rotary encoder 5m
	CN50: FCN series I/O connector (with cover)
	CN55: FCN series I/O connector (with diagonal cover)
	CN90 : Waterproof plastic connector for UTM II/UTMV
	CN91 : Waterproof plastic connector for UTM II rotary encoder
GMP96x96 : Rubber seal	
TSU03 : DC lighting surge unit	
CE marking certification	• EMC directives : EN61326-1 : 2013

PC Software

PC software for importing parameter settings and screenshots of the display/waveform data from TM700 can be downloaded from our website.

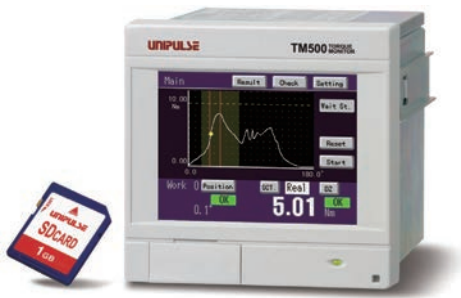
Dimension



Accessories Rotating Torque Meter

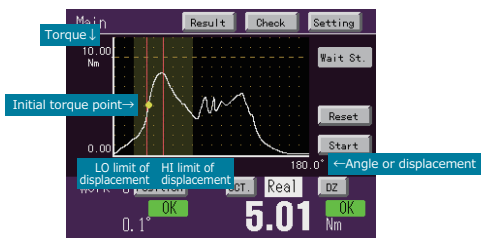


TM500 Torque monitor - torque & angle (or length) measurement, ideal for UTM II with the rotary encoder

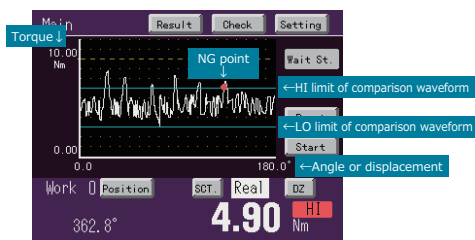


- Torque monitor for UTM II /UTMV.
- Suitable for low-speed rotation and linear motion applications.
- Data are recorded on SD cards.
- Easy connection to UTM II /UTMV with one cable.
- The unit supplies electric power to UTM II /UTMV(also to an optional rotary encoder).

- Upper/lower limit of displacement against a threshold torque can be compared



- Multi-turn inspection is available



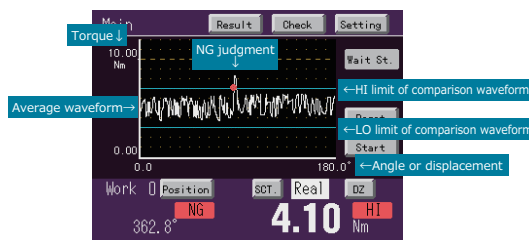
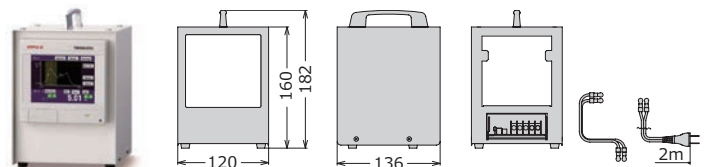
- Continuous mode  
Inspection can be done in a multi-turn application within 500 turns.

Analog	Torque input	-5 to +5V Input impedance : 1MΩ or more
	Accuracy	Non-linearity : Within 0.02%FS±1digit Zero drift : Within 0.2mV/°C RTI Gain drift : Within 0.01%/°C
	Analog filter	Low pass filter ( -6dB/oct.) Select from 30, 100, 300, 1kHz
	A/D converter	Rate : 4000times/sec Resolution : 24bit (binary) Approx. 1/30000 with respect to 5V
	Monitor output	Output level : Input voltage cuff (For test point)
	Pulse input (Open collector)	Maximum input frequency 50kHz Internal counting range Approx. 1000000
Display	Display unit	3.5 inch TFT color LCD
External I/O signal	External output (15)	Hold result (Load, DPM) / Overload / Wave result / Complete / RUN / Load OK / DPM OK / SD OK
	External input (12)	Load Digital Zero / DPM Positioning / Start / Stop / Hold / Reset / Backlight On / Prohibit Touch Panel / Work change
Interface	RS-232C	
Option	SDC : SD card slot (Approx. 80 waveforms can be preserved by 1MB., SDHC and SDXC are not supported.) All indicated values and all comparison waveforms can be saved and restored. Measured waveforms and judgment points can be saved automatically.	
General performance	Power supply	DC24V (±15%)
	Power consumption	7W typ
	Operating conditions	Temperature : Operation -10°C to +40°C Storage -20°C to +60°C Humidity : 85%RH or less (non-condensing)
Attachment	Dimension	96(W)×96(H)×117.3(D)mm(Projections excluded)
	Weight	Approx. 1.0kg
Accessories	Operation manual	···1, External input/output connector···1, Cable for connecting UTM II /UTMV 2m···1, Cable for connecting UTM II rotary encoder 2m···1, SD card (1GB)(with SDC option)···1
	DTC1 : Case for TM500 (with AC power supply)	
CE marking certification	EMC directives : EN61326-1 : 2013	

PC Software

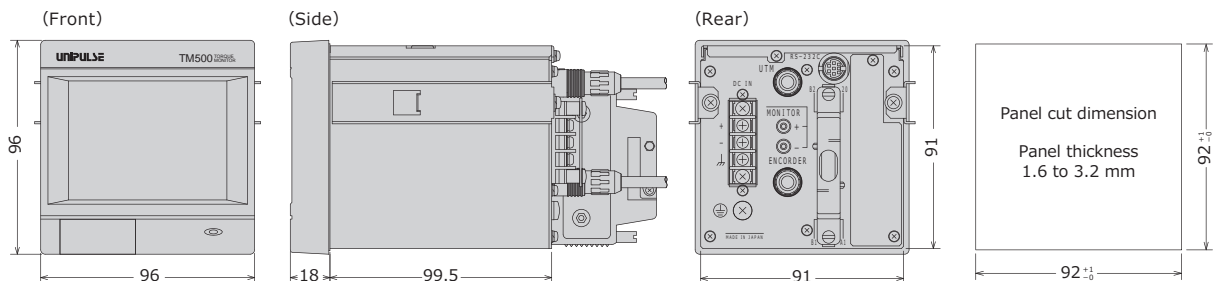
- SD card : conversion of saved data into CSV format, parameter settings (save and edit), and conversion of waveform/curve data into CSV format.
- RS-232C : For saving/editing parameter settings and importing waveforms/curves.
- \* PC software with above features can be downloaded from our website.

Special case DTC1



- Average mode  
NG recognition is done for an average value of n points data.

Dimension

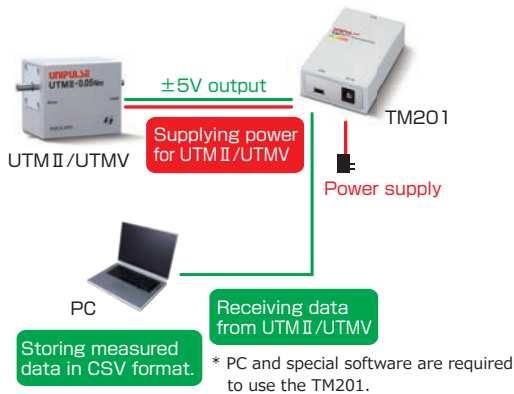


## TM201 USB interfacing unit - ideal for R&D and laboratory testing, save data on PC easily



- Variations of torque, rpm, and power\* can be monitored and saved on PC. (Application software for the USB interface option is available.)
- Maximum, minimum, and average value can be displayed.
- Measurement (numeric) data is automatically saved in CSV format.
- The unit supplies electric power to UTM II /UTMV.
- Two cables are attached: one for UTM II /UTMV and the other for PC.

\* Power (W) =  $2\pi \times \text{Torque (Nm)} \times \text{Rotation speed (rpm)} / 60$

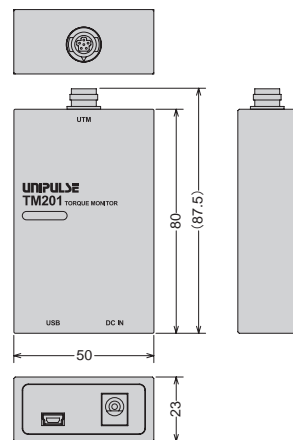


UTM II Interface	<ul style="list-style-type: none"> <li>• Torque sensor input (voltage input)</li> <li>Signal input range -5 to +5V input impedance : 1MΩ or more</li> <li>Accuracy Non-linearity : Within 0.02%FS±1digit</li> <li>Zero drift : Within 0.2mV/°C RTI</li> <li>Gain drift : Within 0.01%/°C</li> <li>Analog filter Primary low-pass filter 1kHz (fixed)</li> <li>Digital filter Secondary low-pass filter <math>f_c = 3, 30, 300, \text{OFF}</math> (variable)</li> <li>Data output rate 300 times/sec.</li> <li>Resolution : 24bit (binary) . Approx. 1/30000 with respect to 5V</li> <li>• Pulse input for rpm (input for open collector type)</li> <li>Maximum input frequency: Compatible with the pulse output frequency of UTM II/UTMV series</li> <li>Minimum input frequency: Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr)</li> <li>Minimum pulse width: 50μs</li> <li>Circuit layout No-voltage (dry) contact input (minus common): open collector outputs can be connected (<math>I_c = \text{approx. } 10\text{mA}</math>)</li> <li>• Power supply for UTM II</li> <li>Power supply DC24V (UTM II/UTMV 1 unit)</li> </ul>
Display	<ul style="list-style-type: none"> <li>LED status light LED (Red) : power supply/alarm status</li> <li>LED (Green) : UTM II/UTMV is operating normally</li> </ul>
Interface	USB
General performance	Power supply AC100V to 240V (+10%~15%) (free power source 50/60Hz)
	*When supplied AC adapter is used
	Power consumption 4W typ (AC adapter)
	Operating conditions Temperature : Operation 0°C to +40°C Storage -10°C to +60°C
	Humidity : 80%RH or less (non-condensing)
Attachment	Setup guide.....1 Cable for connecting UTM II/UTMV 2m.....1
	AC adapter for TM201 1.8m.....1 MiniUSB -USB cable 1.8m.....1
Accessories	CAB1-USB:miniUSB-computer USB cable 1.8m CATM21-M:Cable for connecting UTM II/UTMV 2m
	CATM51-M:Cable for connecting UTM II/UTMV 5m CN90:Waterproof plastic connector for UTM II/UTMV
CE marking certification	<ul style="list-style-type: none"> <li>• EMC directives : EN61326-1 : 2013</li> <li>• Safety standard : EN62311 : 2008</li> <li>Please specify requirement for CE marking certified product when making your order.</li> </ul>

### PC Software

PC software for parameter settings, graph display, and calibration of TM201 can be downloaded from our website.

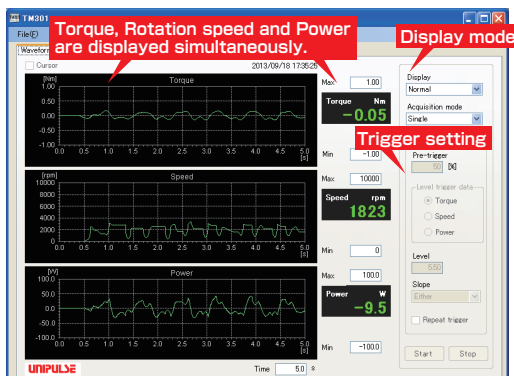
### Dimension



### Application software

- Support USB interface option for TM201, TM400, TM700, and TM301.
- Enabling real-time display of torque measured by UTM II /UTMV, parameter settings, calibration, and data recording in CSV format.

Example: PC software for TM301



#### ■ Display mode

<Normal>

1. Single

After "start" button is pressed, data will be recorded once for pre-set time period.

2. Continuous

"Single" mode operation will be repeated in cycle until "stop" button is pressed.

3. Hold trigger (only with the TM301)

After "start" button is pressed, it will be put on standby for a trigger ("hold").

It will start importing data when "Hold" button is pressed.

\* Pritrigger setting range: 0 to 99%

4. Level trigger

After "start" button is pressed, it will be put on standby for a trigger (variable conditions).

It will start importing data when the input level goes above or below the pre-set limit in pre-determined direction.

<History>

Display saved graph data

#### ■ Trigger function

Pre-trigger/trigger slope/repeating trigger

# UPM100 Power and energy monitor



Easy to set up and operate - energy conversion efficiency can be monitored at a glance!

- Record 1000 measured data of electric power and mechanical power and transfer the data to USB flash drive.
  - < Recorded Data >
  - Date & time, voltage (between each line), current (each line), electric power (effective, ineffective, apparent), torque, rotation speed, mechanical power, efficiency, power factor, assigned number, and recorded condition.

- High-speed sampling & wide variety of I/O for various applications.

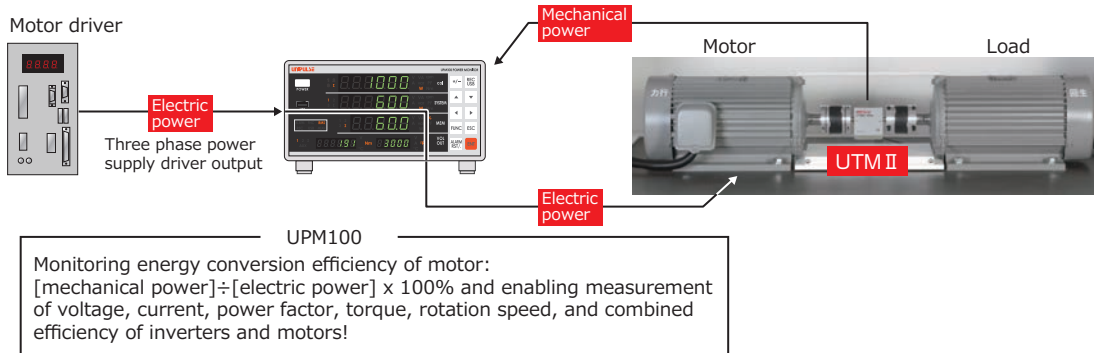


- High-speed sampling rate at 30ks/s (10S/s for thermocouples)
- 10 arithmetic processing per second

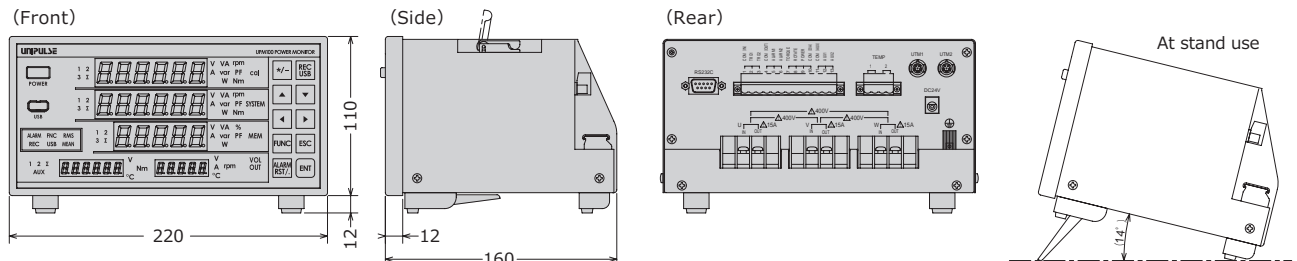
- Alarm recording function
  - Automatically save voltage, current, and electric power of each phase, torque, and rotation speed for 7 seconds before and 3 seconds after alarm turns ON in the internal memory.

<p>Analog</p> <ul style="list-style-type: none"> <li>Electric power measurement</li> <li>Supply system 1P2W(single phase two wires), 3P3W (three phase three wires)</li> <li>Input Voltage:resistance voltage division, Current:DCCT</li> <li>Measurement range Voltage:AC400Vrms (CF=1.5, peak =600V) Current:15Arms (CF=3, peak = 45A) Wattage:9999W</li> <li>Frequency range 10 to 600Hz (DC or less than 10Hz: average value for 0.1 second / Over 10Hz: display "RMS" or "MEAN")</li> <li>Accuracy Voltage:0.5%FS 0.05%/°C Current:1%FS 0.1%/°C Electricity:1.5%FS 0.15%/°C (for DC or 10 - 300Hz)</li> <li>Measurement range Voltage:400Vrms, Current:15Arms</li> <li>Sampling speed 30kSPS</li> <li>Analogue filter 480 kHz primary low-pass filter (-6dB/oct)</li> <li>Arithmetic calculation</li> <li>Voltage calculation effective value (RMS) / average rectified effective value / arithmetic average Voltage:1P2W measured point / 3P3W voltage between each phase and the sum</li> <li>Current calculation effective value current:1P2W measured point / 3P3W current of each phase and the sum</li> <li>Electric power calculation Effective power: 1P2W measured point / 3P3W the sum Apparent power: 1P2W measured point / 3P3W the sum Ineffective power: 1P2W measured point / 3P3W the sum Power factor: 1P2W measured point / 3P3W the sum</li> <li>Torque input (Voltage) Signal input range -5 to +5V / input impedance:1MΩ or more Accuracy Non-linearity:within 0.02%/FS ±1digit Zero drift:within 0.2mV/°C RTI Gain drift:within 0.01%/°C</li> <li>Analog filter primary low-pass filter (-6dB/oct.) 6kHz</li> <li>A/D converter speed:3000times/sec arithmetic processing speed:1000times/sec resolution:14bit(binary) 1/10000 of full-scale</li> <li>Pulse input(open-collector) Max. input frequency In accordance with the output frequency of the UTMII/UTMV series Min. input frequency Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr)</li> <li>Circuit configuration No-voltage contact input (minus common) Open collector can be connected (Ic=Approx. 10mA)</li> <li>Two voltage input: AUX1 and AUX2 Signal input range ±5V (over range: 6V) A/D converter speed:3000times/sec arithmetic processing speed:1000times/sec refresh speed:10times/sec</li> <li>2 thermocouple inputs: K type Temperature range:-200 ~+1300°C, refresh speed:10times/sec, accuracy:1%FS</li> </ul>	<p>Display</p> <ul style="list-style-type: none"> <li>Display unit</li> <li>Main display Upper and middle display: 15mm character heights, 7-segments green LED, 6 digits numeric display Lower display: 15mm character heights (7-segments green LED, 5 digits numeric display</li> <li>Sub display Left: 8mm character height, 7-segments, green LED, 6 digits numeric display Right: 8mm character height, 7-segments, green LED, 5 digits numeric display</li> <li>Status lamp ALARM, FNC, RMS, REC, USB, MEAN (red LED) 1, 2, 3, Z, AUX (orange LED) V, A, VA, var, W, rpm, PF, Nm, %, °C (orange LED)</li> <li>Frequency 10PPS or 2PPS (selectable)</li> <li>Digital filter OFF, 2, 4, 8, or 16 times (selectable)</li> </ul> <p>External signal</p> <ul style="list-style-type: none"> <li>Input signals(2) TRG1 / TRG2</li> <li>Output signals(2) ALARM1 / ALARM2</li> </ul> <p>Interface</p> <ul style="list-style-type: none"> <li>232: RS-232C communication interface</li> <li>DAV: D/A converter, voltage outputs (torque, rotation speed, and power)</li> <li>USB: USB memory: USB memory interface</li> </ul> <p>General specifications</p> <ul style="list-style-type: none"> <li>Power supply AC100 to 240V(+10%~15%) (free power source 50/60Hz)</li> <li>Power consumption 15W typ (AC adaptor)</li> <li>Operating conditions Temperature:Operation: -10 to +40°C Storage: -40 to +80°C Humidity:85%RH or less (non-condensing)</li> <li>External dimensions 220(W)×110(H)×160(D)mm(Projections excluded)</li> <li>Weight approx. 2.0kg</li> </ul> <p>Attachment</p> <ul style="list-style-type: none"> <li>AC adaptor(1.8m).....1 Cable for UTMII/UTMV connection(2m).....2 Operation manual.....1</li> </ul>
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## Example system configuration



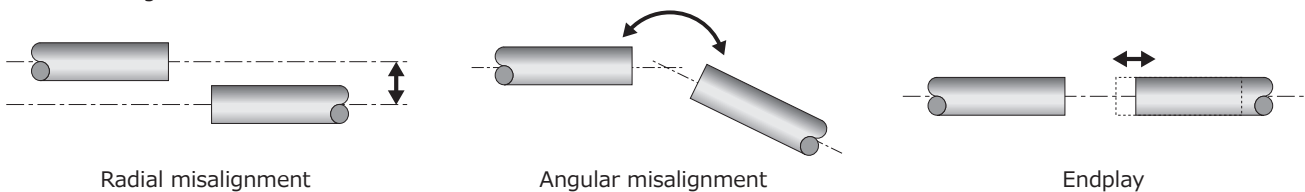
## Dimension



# Coupling

## What's coupling?

UTM II/UTMV adopts strain gauges for measuring torsional strain on the shaft. The shaft is designed to withstand any disturbing stress induced by radial or thrust forces. However, radial/thrust overloads will not only result in measurement error but also heating-up of the bearings and/or irreversible distortion or fracture of UTM II/UTMV. Typical misalignments, radial misalignment, angular misalignment, and endplay are shown in the figure below. Remaining misalignments between the UTM II/UTMV shaft and drive/load shafts induce radial and thrust forces. Hence couplings are required to absorb these disturbing forces and improve smoothness of rotating and accuracy. Allowance levels of the misalignments are dependent on the combination of the range of UTM II/UTMV and couplings; thus fine adjustment will be needed for actual usage.



## Recommended coupling

We strongly recommend rubber couplings shown in the right-hand side photograph (Correspondent couplings are indicated by ● in the following table). Rubber coupling is composed of two rigid parts connected to the axes with rubber joining the two parts.

No backlash, well rotation balance and excellent damping of vibration are the features of rubber coupling, and thus they are the most suitable couplings for UTM II/UTMV. If you can not choose rubber couplings, please select single disk couplings. If you use multiple double disk couplings or slit type couplings on the axis, unexpected vibration may occur because UTM II/UTMV is suspended by springs. Unexpected vibration reduces accuracy and results in damage on UTM II/UTMV in the worst case.



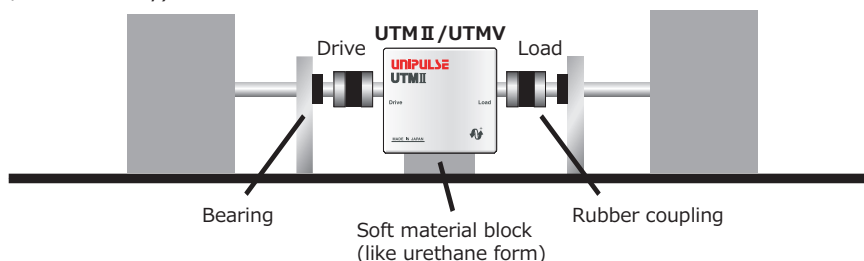
Coupling

Rotating Torque Meter

## How to use couplings

UTM II/UTMV shafts are connected to drive-side and load-side shafts with rubber couplings as shown in the below. If the load and driving devices have bearing internally, the bearings in the figure are unnecessary.

A soft block made of urethane and on should be put between main frame of UTM II/UTMV and base (to hold the main frame of UTM II/UTMV loosely).



Please minimize the torque fluctuation synchronized to rotation and adjust the misalignments carefully.

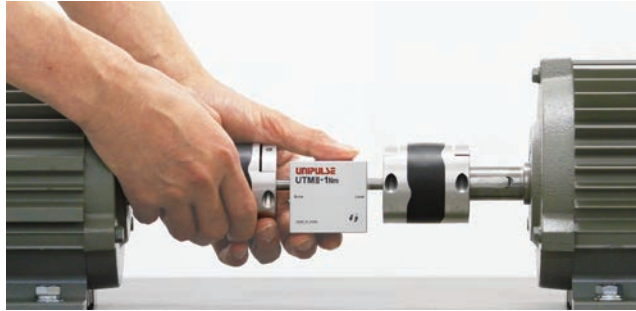
## Warning in high rotating speed

In case UTM II/UTMV is used at a high rotational speed, dynamic balance needs to be adjusted in addition to alignments. If shaft is unbalanced, vibration will be caused at high rotational speed due to resonance, which, in turn will damage UTM II/UTMV and couplings. Please adjust the balance carefully, increasing the rotational speed gradually. Key groove option is not recommended if UTM II/UTMV is used at high rotational speed.

## Prohibition

- Do not use Oldham coupling. UTM II/UTMV will come off the original position, and UTM II/UTMV or other devices will be damaged.
- Do not use double disk coupling or slit type coupling. In case a slit type or double disk type coupling is used on one end of shaft, please mount and fix the body of UTM II/UTMV on a fixture or stand. Otherwise, resonant vibration may occur, which, in turn, may cause overload and damages on UTM II/UTMV.

## Coupling correspondence table



Recommended couplings are indicated in the below table.

Consult one of our sales representatives for couplings for the UTM II-10000Nm and key groove option.

Supported UTM II /UTMV	UTM II /UTMV dia. (mm)	Coupling type	Max. torque (Nm)	Coupling dia. (mm)																																			
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90	
UTM II -0.05Nm UTM II -0.1Nm UTMV-0.1Nm UTM II -0.2Nm	5	UCM15	2.2	■	■	■																																	
		UCS15	1	■	■	■																																	
		UCM19	4.2		■	■	■																																
		UCS19	1.6		■	■	■																																
		UCM25	8				■	■	■	■																													
UCS25	4.6				■	■	■	■																															
UTM II -0.5Nm UTMV-0.5Nm UTM II -1Nm UTMV-1Nm UTM II -2Nm	8	UCM19	4.2		■	■	■																																
		UCM25	8			■	■	■	■																														
		UCS25	4.6			■	■	■	■																														
		UCM30	12.6				■	■	■	■	■																												
		UCS30	6.6				■	■	■	■	■																												
		UCM34	16					■	■	■	■	■	■																										
		UCS34	11					■	■	■	■	■	■																										
		UCM39	27																																				
UCS39	14																																						
UCM44	36																																						
UTM II -5Nm UTMV-5Nm UTM II -10Nm UTMV-10Nm	12	UCM30	12.6						■	■	■	■																											
		UCM34	16						■	■	■	■																											
		UCS34	11						■	■	■	■																											
		UCM39	27						■	■	■	■	■																										
		UCS39	14						■	■	■	■	■																										
		UCM44	36																																				
UCM56	70																																						
UTM II -20Nm	20	UCM44	36																																				
		UCM56	70																																				
		UCM65B	80																																				
UTM II -50Nm UTMV-50Nm	20	UCM56	70																																				
		UCM65B	80																																				
UTM II -100Nm UTMV-100Nm	25	UCM80B	140																																				
UTM II -200Nm	30	UCM90B	250																																				
UTM II -500Nm UTMV-500Nm	40	UCM125B	613																																				
UTM II -1000Nm UTMV-1000Nm	60	UCM155B	1197																																				
		UCM220	4800																																				
UTM II -2000Nm	70	UCM220	4800																																				
		UCM260	6880																																				
UTM II -5000Nm UTMV-5000Nm	90	UCM260	6880																																				

■ : Rubber coupling  
● : Metal type coupling (○ : TYPE II)



## Specification

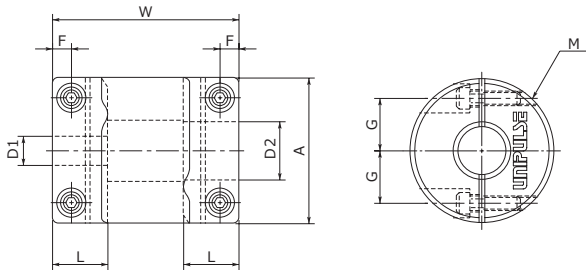
Type	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm <sup>2</sup> )	Torsional rigidity (Nm/rad)	Allowable eccentricity (mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (g)
UCM15	6	2.2	42000	$2.7 \times 10^{-7}$	43	0.15	1.5	± 0.2	8
UCS15		1		$2.0 \times 10^{-7}$	25				7
UCM19	8	4.2	33000	$8.4 \times 10^{-7}$	88	0.15	1.5	± 0.2	14
UCS19		1.6		$6.2 \times 10^{-7}$	63				12
UCM25	12	8	25000	$3.0 \times 10^{-6}$	170	0.15	1.5	± 0.2	28
UCS25		4.6		$2.3 \times 10^{-6}$	125				25
UCM30	15	12.6	21000	$6.9 \times 10^{-6}$	220	0.20	1.5	± 0.3	45
UCS30		6.6		$5.5 \times 10^{-6}$	160				39
UCM34	16	16	18000	$1.3 \times 10^{-5}$	390	0.20	1.5	± 0.3	65
UCS34		11		$1.0 \times 10^{-5}$	350				62
UCM39	20	27	16000	$2.7 \times 10^{-5}$	520	0.20	1.5	± 0.3	98
UCS39		14		$2.1 \times 10^{-5}$	440				85
UCM44	22	36	14000	$4.2 \times 10^{-5}$	640	0.20	1.5	± 0.3	136
UCM56	28	70	11000	$1.4 \times 10^{-4}$	1500	0.20	1.5	± 0.3	276

Type	TYPE	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm <sup>2</sup> )	Torsional rigidity (Nm/rad)	Allowable eccentricity (mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (g)
UCM65B	I	35	80	10000	$2.44 \times 10^{-4}$	$6.50 \times 10^4$	0.02	1.0	± 0.46	0.53
	II				$4.01 \times 10^{-4}$	$8.70 \times 10^4$				0.68
UCM80B	I	45	140	10000	$7.25 \times 10^{-4}$	$1.26 \times 10^5$	0.02	1.0	± 0.58	0.98
	II				$1.15 \times 10^{-3}$	$1.57 \times 10^5$				1.25
UCM90B	I	50	250	10000	$1.43 \times 10^{-3}$	$2.17 \times 10^5$	0.02	1.0	± 0.64	1.57
	II				$2.19 \times 10^{-3}$	$2.70 \times 10^5$				1.91
UCM125B	I	65	613	10000	$0.76 \times 10^{-2}$	$0.67 \times 10^6$	0.02	1.0	± 0.9	4.64
	II				$1.26 \times 10^{-2}$	$0.94 \times 10^6$				5.91
UCM155B	I	80	1197	8000	$2.20 \times 10^{-2}$	$1.52 \times 10^6$	0.02	1.0	± 1.1	8.4
	II				$3.59 \times 10^{-2}$	$2.05 \times 10^6$				10.8

Type	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm <sup>2</sup> )	Torsional rigidity (Nm/rad)	Axial spring constant (N/mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (kg)
UCM220	70	4800	4000	$112.34 \times 10^{-3}$	$5.94 \times 10^6$	448	1	± 0.6	23.5
UCM260	90	6880	3400	$248.75 \times 10^{-3}$	$1.078 \times 10^7$	612	1	± 0.7	35.3

## Dimension

### ■ UCM15 to 56 ■ UCS15 to 39



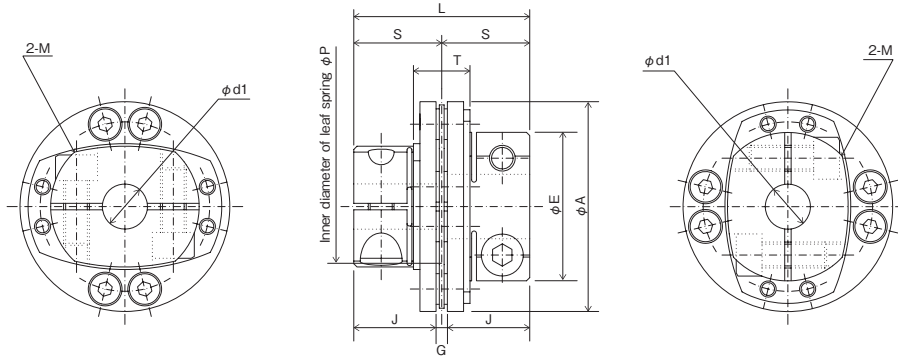
Corresponding measurement range of UTM II /UTMV (Nm)	Type	A	L	W	F	G	M	D1*D2	Screw tightening torque (Nm)
0.05, 0.1, 0.2	UCM15	15	6.5	23	2.15	5	M1.6	3*5, 4*5, 5*5, 5*6	0.25
	UCS15			18					
0.05, 0.1, 0.2, 0.5, 1, 2	UCM19	19	7.7	26	2.65	6.5	M2	4*5, 4*8, 5*5, 5*6, 5*8, 6*8, 8*8	0.5
	UCS19			20					
0.05, 0.1, 0.2	UCM25	25	9.5	32	3.25	9	M2.5	5*8, 5*10, 5*11, 5*12, 6*8, 8*8, 8*10, 8*11, 8*12	1
	UCS25			27					
0.05, 0.1, 0.2, 0.5, 1, 2	UCM30	30	11	36	4	11	M3	8*8, 8*10, 8*11, 8*12, 8*14, 8*15, 10*12, 11*12, 12*12, 12*14, 12*15	1.5
	UCS30			30					
0.5, 1, 2	UCM34	34	12	38	4	12.25	M3	8*8, 8*10, 8*11, 8*12, 8*14, 8*15, 8*16, 10*12, 11*12, 12*12, 12*14, 12*15	1.5
	UCS34			35					
0.5, 1, 2, 5, 10	UCM39	39	15.5	48	4.5	14.5	M4	8*16, 8*18, 8*19, 8*20, 10*12, 12*12, 12*14, 12*15, 12*16, 12*19, 12*20	2.5
	UCS39			40					
0.5, 1, 2, 5, 10, 20	UCM44	44	15	48	4.75	16	M4	8*16, 8*18, 8*19, 8*20, 8*22, 12*12, 12*14, 12*16, 12*19, 15*20, 16*20, 18*20, 19*20, 20*20, 20*22	2.5
	UCM56			60					
5, 10, 20, 50	UCM56	56	19.5	60	5.5	20	M5	12*12, 12*14, 12*15, 12*16, 12*18, 12*19, 12*20, 19*20, 20*20, 20*22, 20*24, 20*25, 20*28	7

Recommended size tolerance of shaft diameter is h6 or h7.

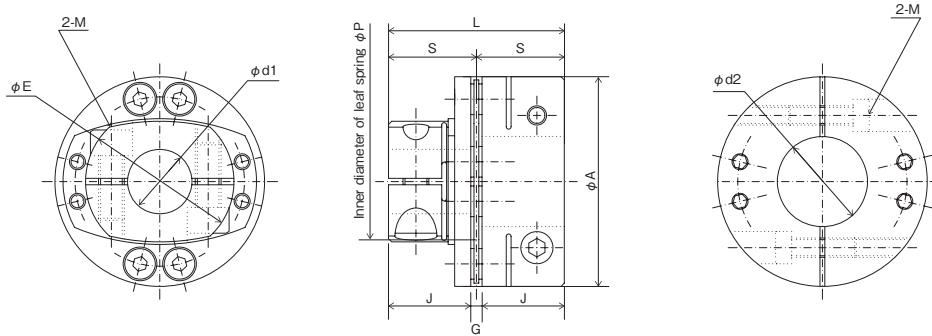
## Dimension

### ■ UCM65B, 80B, 90B

#### ■ TYPE I



#### ■ TYPE II



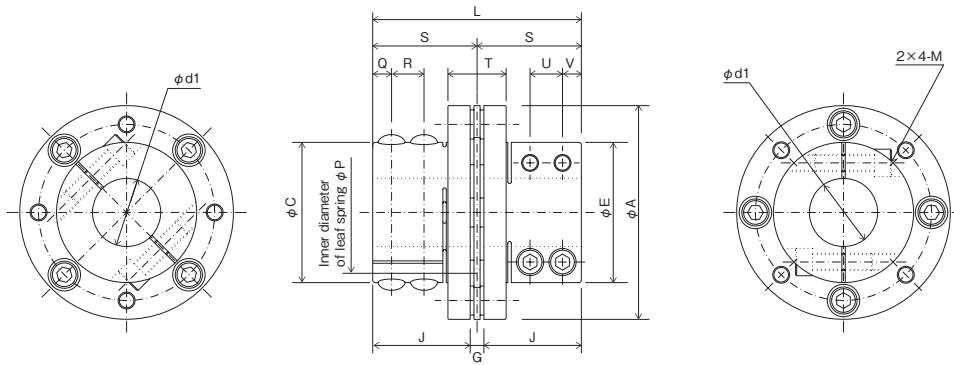
Corresponding measurement range of UTM II /UTMV (Nm)	Type	TYPE	d1	d2	A	E	P	L	S	T	J	G	M	d1*d2	Screw tightening torque (Nm)
20, 50	UCM65B	I	14~25	—	65	46	36	54.5	27.25	17.5	25.5	3.5	~ φ20 : M8 φ22~ : M6	14*20 15*20 16*20 18*20 19*20 20*20 20*22 20*24 20*25	M8 : 34.3 M6 : 13.7
		II	28~35	—	—	—	—	—	—	—	—	—	—	20*28 20*30 20*32 20*35	
100	UCM80B	I	15~35	—	80	59	46	67.5	33.75	20.5	32	3.5	~ φ28 : M10 φ30~ : M8	15*25 16*25 18*25 19*25 20*25 22*25 24*25 25*25 25*28 25*30 25*32 25*35	M10 : 67.6 M8 : 34.3
		II	38~45	—	—	—	—	—	—	—	—	—	—	25*38 25*40 25*42 25*45	
200	UCM90B	I	19~35	—	90	64	51	77	38.5	28	36.5	4	~ φ35 : M10 φ38~ : M8	19*30 20*30 22*30 24*30 25*30 28*30 30*30 30*32 30*35	M10 : 67.6 M8 : 34.3
		II	38~50	—	—	—	—	—	—	—	—	—	—	—	

Recommended size tolerance of shaft diameter is h6 or h7.

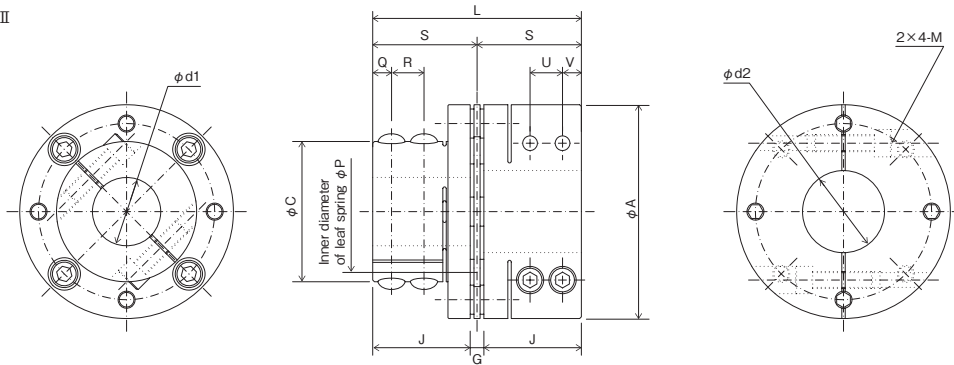
## Dimension

### ■ UCM125B, 155B

#### ■ TYPE I



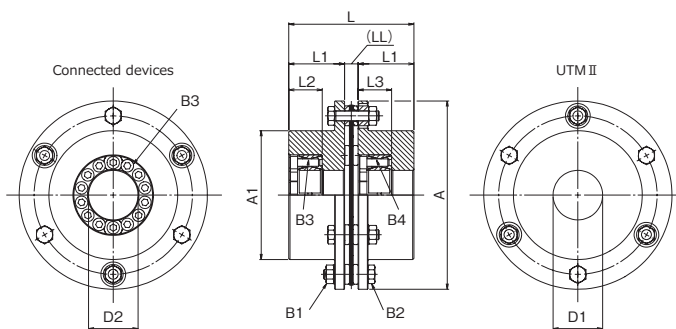
#### ■ TYPE II



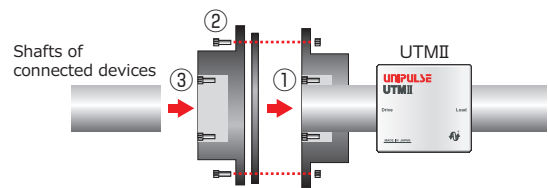
Corresponding measurement range of UTM II/UTMV (Nm)	Type	TYPE	d1	d2	A	E	C	P	L	S	T	Q	R	U	V	J	G	M	d1*d2	Screw tightening torque (Nm)
500	UCM125B	I	30~45	-	125	82	66	122	61	-	34	11	19	19	11	57	8	M10	30*40 32*40 35*40 38*40 40*40 40*42 40*45	67.6
		II	48~65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40*48 40*50 40*55 40*60 40*65	
1000	UCM155B	I	40~60	-	155	104	86	141	70.5	-	41	12.5	22	22	12.5	66	9	M12	40*60 42*60 45*60 48*60 50*60 55*60 60*60	118
		II	65~80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60*65 60*70 60*75 60*80	

Recommended size tolerance of shaft diameter is h6 or h7.

### ■ UCM220, 260



#### ■ Installation



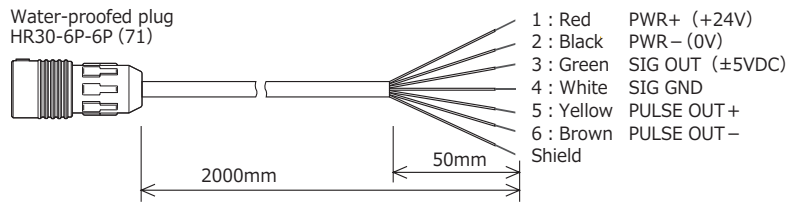
Numbers on figure show the order of fastening bolts of couplings.

Corresponding measurement range of UTM II/UTMV (Nm)	Type	A	A1	L	L1	L2	L3	LL	Hexagon nut B1	Reamer bolt B2	Clamping bolt		D1*D2	
											B3	B4		
1000, 2000	UCM220	225	144	200	90	33	33	20	M16	M16	M8	M8	60*65	
						33	39				M8	M10		70*50, 70*55, 70*60, 70*65
						39	39				M10	M10		
2000, 5000	UCM260	262	166	223	100	39	39	23	M20	M20	M10	M10	70*75, 70*80, 90*80, 90*85, 90*90	

Recommended size tolerance of shaft diameter is h9.

Coupling Rotating Torque Meter

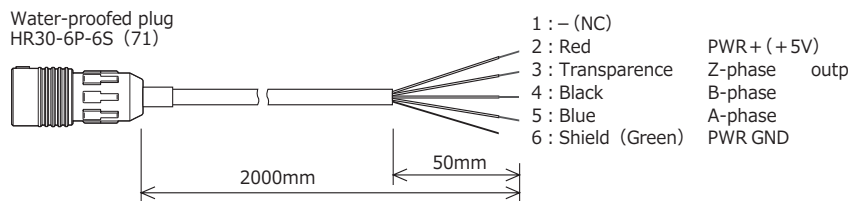
# Cable



Class	Pin number	Signal name	Details
Power	1	PWR+ (+ 24V)	Connect to +24V power supply. Voltage range must be within +24V plus-minus 15%. Use a power supply that can stably operate with a small load since the consumption current is 100mA or less (20Nm to 500Nm: 150mA, 1000Nm to 10000Nm: 160mA).
	2	PWR - (0V)	
Torque signal	3	SIG OUT (± 5V DC)	This is signal output. The signal is adjusted to 0V for no-load and 5V for full scale. The minimum resistant is 2kΩ.
	4	SIG GND	In case of electrically noisy environment, please try to insert RC low-pass filter as below. This is effective to reduce high frequency noises.
Rotating pulse	5	PULSE OUT + (Photocoupler)	Pulse signal output generates 4 pulses per 1 rotation. Rated voltage and current are 30V and 10mA, respectively.
	6	PULSE OUT -	

- PWR - , SIG GND, and PULSE OUT - are insulated respectively.
- The housing of UTM II/UTMV is electrically insulated from all electronic circuits.

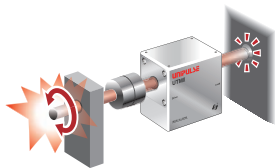
# Rotary encoder cable



# Precautions

## Possibility of overloads during setup

If one side of shaft (either "Drive" or "Load" side) is fixed during setup, excessive torque above rated capacity may be applied to shafts unintentionally. Please pay extra care especially for those types with low rated capacity.



## Alteration of shafts

Never make alteration to shafts of UTMII/UTMV (by machining), as it will affect the accuracy of the sensor.



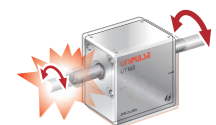
## Protection against water and condensation

UTM II /UTMV is not water-resistant, so please take measures to avoid water damage. Also, do not use the product under dew-condensing condition.



## Overload due to resonance vibration

In case UTM II /UTMV is used with device causing vibration, overloads may be caused due to resonance vibration.



# Definitions of technical terms

Word	Definition	Unit
Measurement range	Measurable torque range	Nm
Non-linearity	The maximum difference between ideal and actual outputs in the measurement range	%FS
Hysteresis	The maximum difference between loading and unloading outputs in the measurement range	%FS
Repeatability	he maximum deviation of output in several measurement under same conditions	%FS
Safe Overload	The allowable load keeping accuracy after unloading	%FS
Maximum Safe Overload	Load cells will fail (permanent deformation) if the yield strength is exceeded	%FS
Operation Temperature Range	Temperature range in which UTM II works properly	°C
Temperature Effect on Zero	Temperature coefficient at no-load	%FS/°C
Temperature Effect on Span	Temperature coefficient of the full scale value	%FS/°C
Cut-off Frequency	The frequency at which the sinusoidal signal becomes -3dB (70.7%) against DC signal	Hz
Torsional Constant	The torque for 1 rad torsional angle	Nm/rad
Max. Torsional Angle	The torsional angle when the full scale torque applied to the shaft	rad
Inertia Moment	The coefficient of angular acceleration to torque in the torsional equation of motion	kgm <sup>2</sup>
Thrust Direction	The parallel direction to the rotation axis in UTM II	
Radial Direction	Vertical direction to the rotation axis in UTM II	

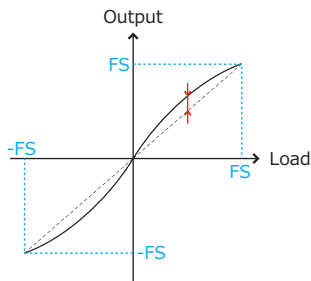
## Units

Unit	Description
Nm	A unit of torque. 1 Nm is the torque on the rotation axis when 1N force is applied to the end of 1m arm.
rpm	A unit of rotation speed. Rotation cycles in 1 minute.
rad	A unit of angle. 1 rad equals to approx. 57.2957°.
FS	The maximum value in the measurement range. %FS means % of Full Scale.

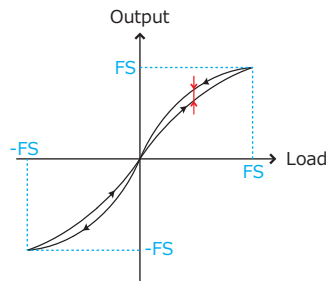
## Conversion table of torque units

	Nm	Ncm	kgm	kgcm	gcm	mNm
Nm ⇒	1	10 <sup>2</sup>	0.10197	10.197	1.0197×10 <sup>4</sup>	10 <sup>3</sup>
Ncm ⇒	10 <sup>-2</sup>	1	1.0197×10 <sup>-3</sup>	0.10197	1.0197×10 <sup>2</sup>	10
kgm ⇒	9.8067	9.8067×10 <sup>2</sup>	1	10 <sup>2</sup>	10 <sup>5</sup>	9.8067×10 <sup>3</sup>
kgcm ⇒	9.8067×10 <sup>-2</sup>	9.8067	10 <sup>-2</sup>	1	10 <sup>3</sup>	98.067
gcm ⇒	9.8067×10 <sup>-5</sup>	9.8067×10 <sup>-3</sup>	10 <sup>-5</sup>	10 <sup>-3</sup>	1	9.8067×10 <sup>-2</sup>
mNm ⇒	10 <sup>-3</sup>	0.1	1.0197×10 <sup>-4</sup>	1.0197×10 <sup>-2</sup>	10.197	1

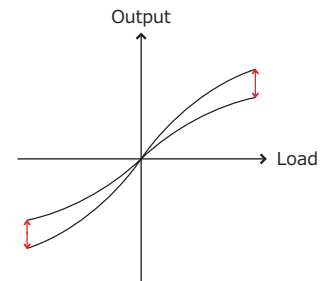
## Non-linearity



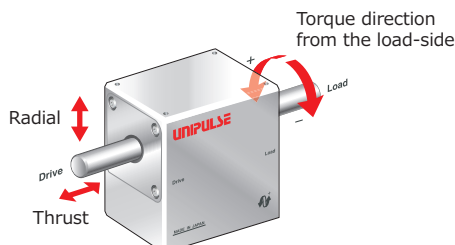
## Hysteresis



## Repeatability

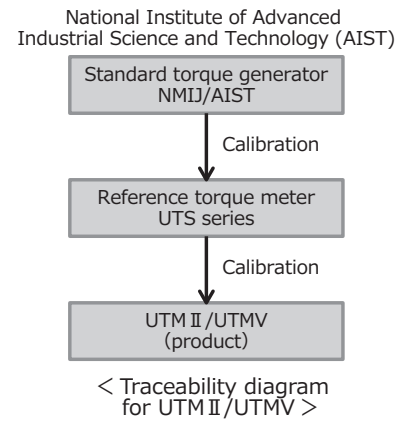


## Thrust direction, radial direction and torque direction

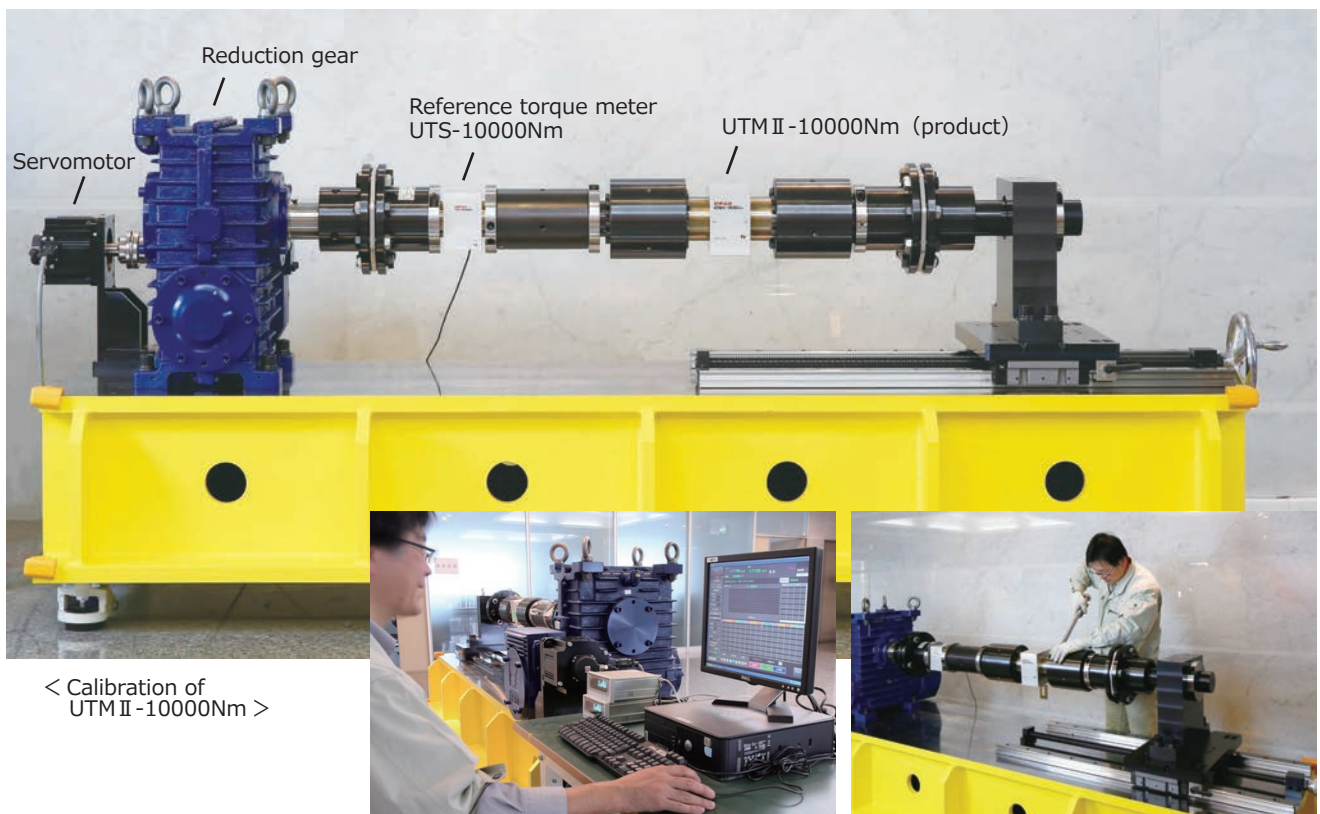


# Calibration of UTMII/UTMV

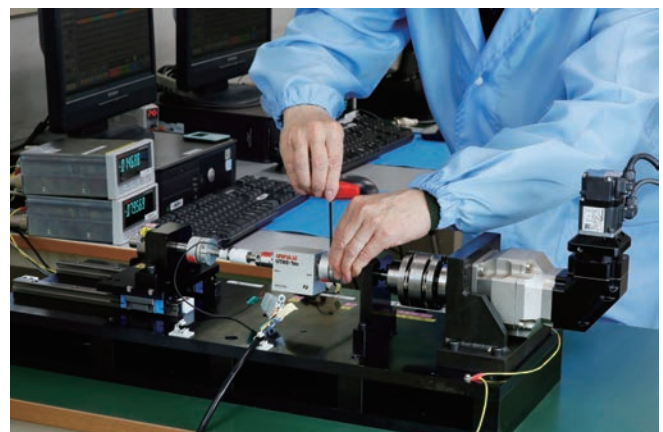
For calibrating torque meter, pure torque must be applied to the torque meter. The equipments for the calibration are designed to eliminate disturbing force and transmit the pure torque to UTMII/UTMV. Because UTMII and UTMV are available in wide capacity range (0.05-10000Nm for UTMII and 0.1-5000Nm for UTMV), different calibration tools (designed and built in-house) are used for different capacity ranges. The traceability diagram of UTMII/UTMV is shown on the right. UTS series are non-rotary torque sensors calibrated at AIST with the national standard torque generator, and those are used as calibration masters for calibration of torque meters at our facility. With those UTS series, UTMII and UTMV torque meters (products) are calibrated.



Pictures below show calibration equipment with UTS-10000Nm (calibration master for 10000Nm capacity). A calibrated torque meter and the calibration master (UTS) are directly connected, and the one side of the shaft is fixed. The other side of the shaft is connected to a reduction gear, and a servo motor is used as an actuator to apply torque on the connected shafts. The same torque is applied to the calibration master (UTS) and the calibrated product, and outputs (voltage) from the calibration master and the products are measured and compared for calibration.



Depending on capacity, calibration tools like below pictures are also used.

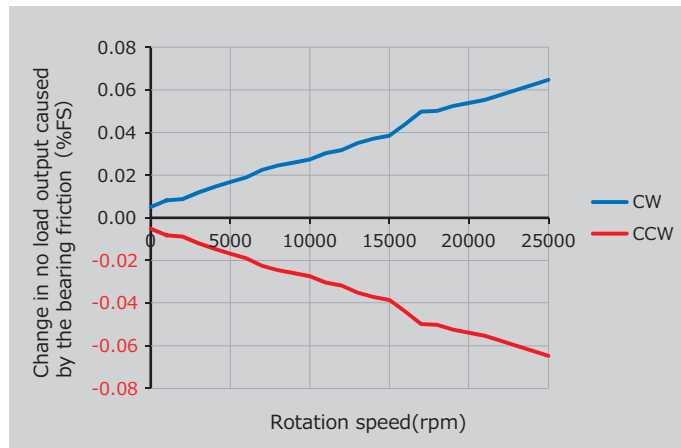




# Rotational characteristics of UTMII/UTMV

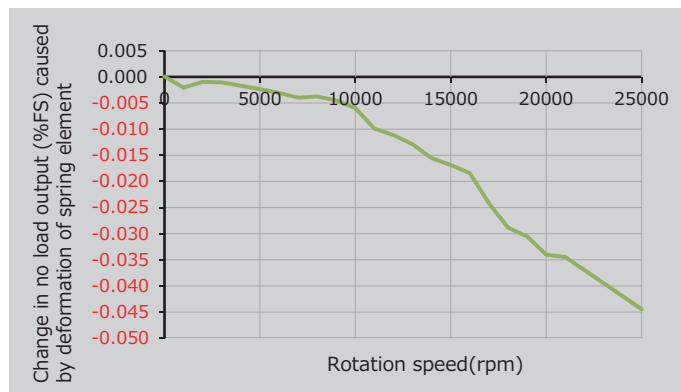
The error at the elevated rotation speed is mainly originated from rotational friction of the bearings and the distortion of the rotating shaft by centrifugal force.

As the rotation speed goes up, the bearing friction also increases like the graph on right. The condition of bearing (installation, frequency of use, temperature, etc...) also affects the bearing friction.



< Rotation speed vs. error caused by bearing friction (sample case with UTMII-0.2Nm) >

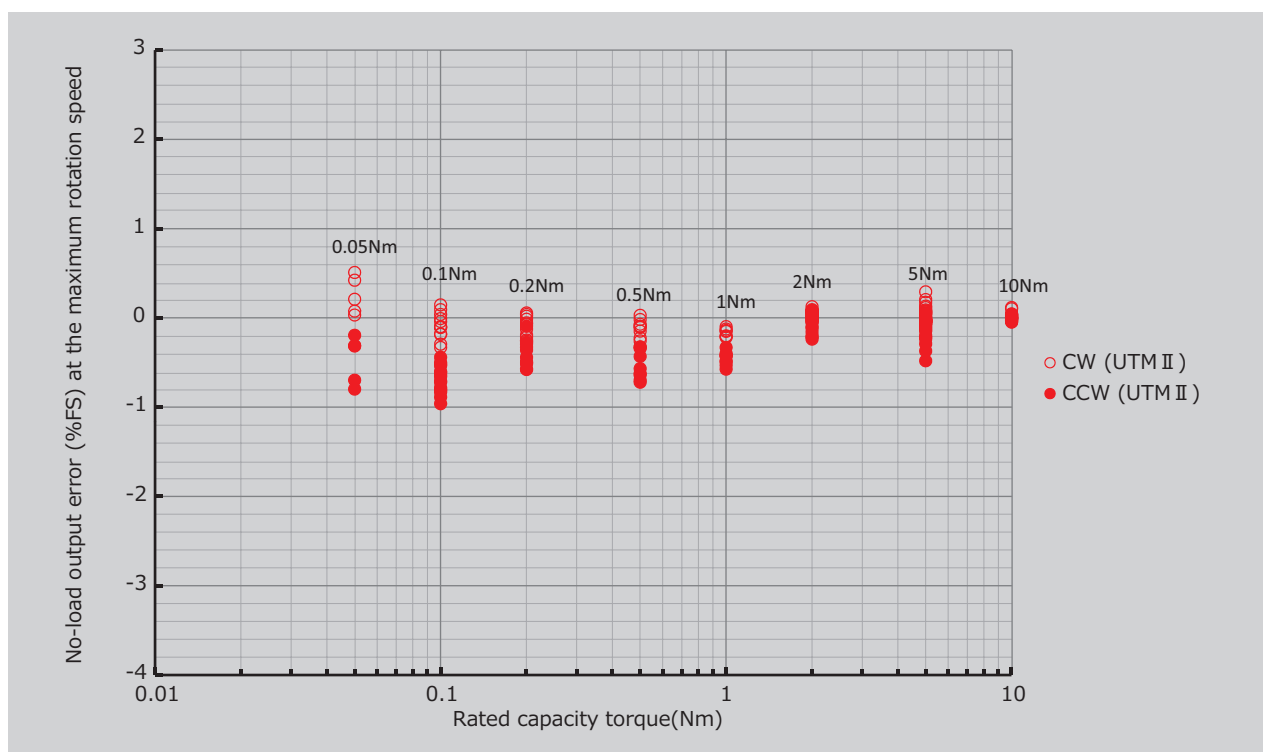
Also, centrifugal force could cause deformation of spring elements, affecting the output like the graph on right. The degree of error is related to rotation speed, and it is reproducible. Degree of change in output caused by deformation of spring element is different for each product depending on how symmetrically strain gauges are mounted on the shaft.



< Rotation speed vs. error caused by centrifugal force (UTMII-0.2Nm) >

Combination of those contributing factors for errors cause the fluctuation of no-load voltage output corresponding to rotation speed.

Graph below shows no-load output errors of 95 pieces of UTMII with capacity ranges from 0.05Nm to 10Nm at 25000 rpm (for both CW and CCW). Accuracy in voltage output is different for each product, but the maximum error is less than 1% of full scale.

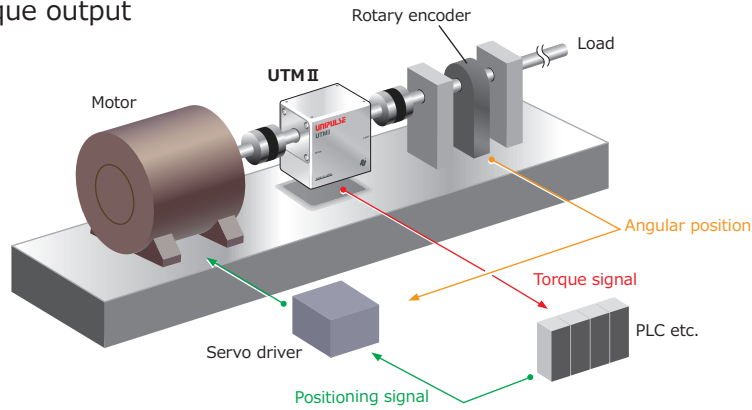


< No-load output error of UTMII at the maximum rotation speed >

# Application examples

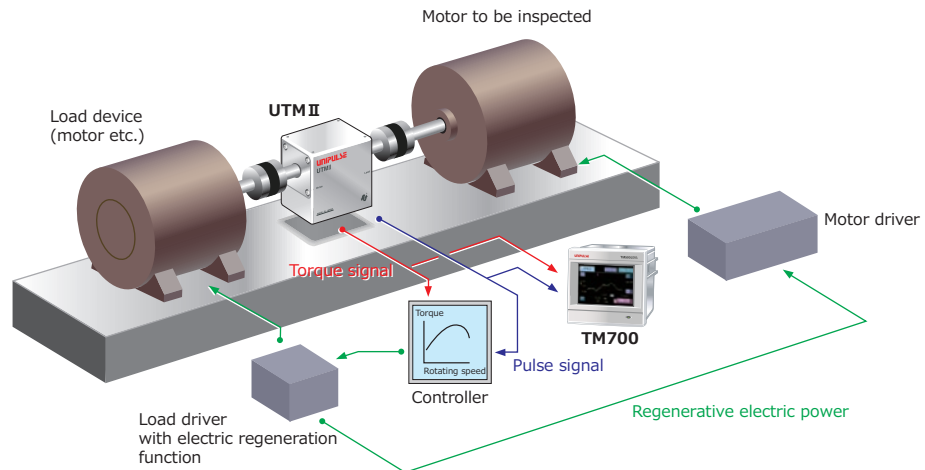
## Measurement of dynamic/running torque

### Servo-motor with torque output



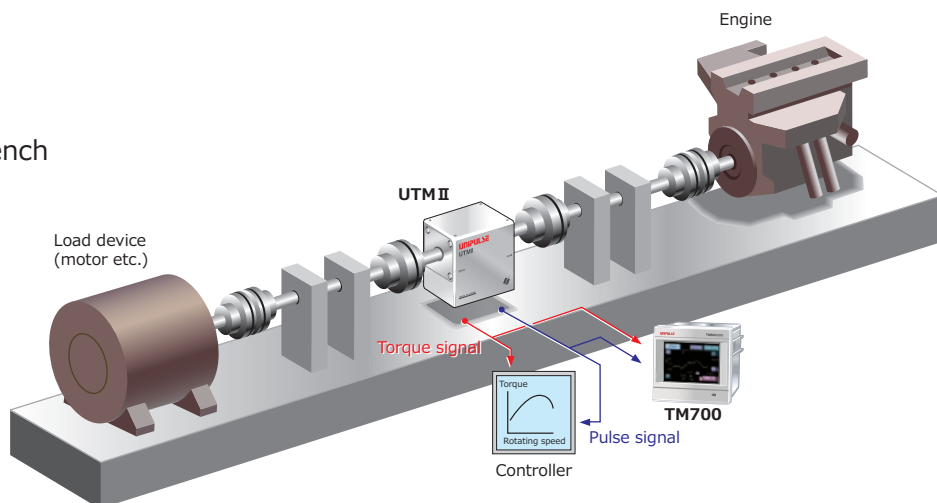
By setting UTM II between the rotary encoder and motor, you can make a servo motor system with torque output. The system can be applied to various applications, such as robot hands or other systems which can detect load.

### Motor test bench



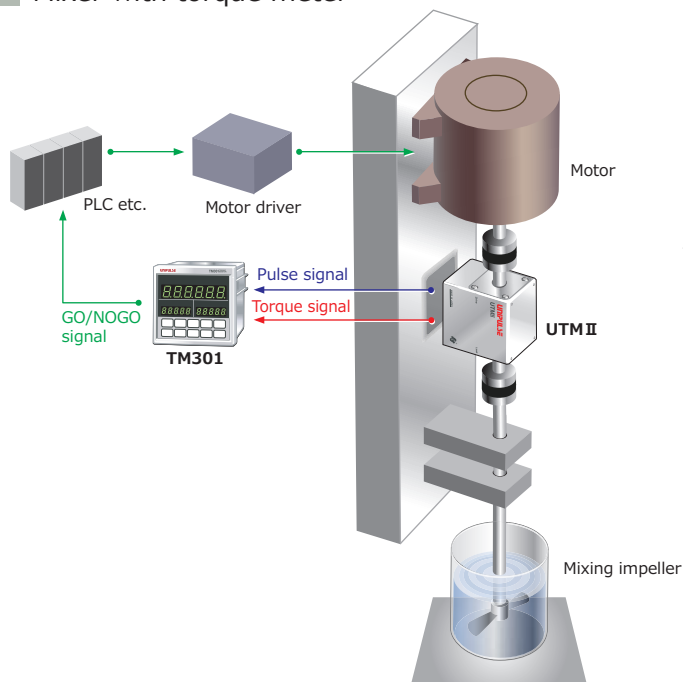
Mechanical power can be calculated from torque and rotating speed. Also, by applying energy recovery system, the test apparatus will be eco-friendly (energy-saving).

### Engine test bench



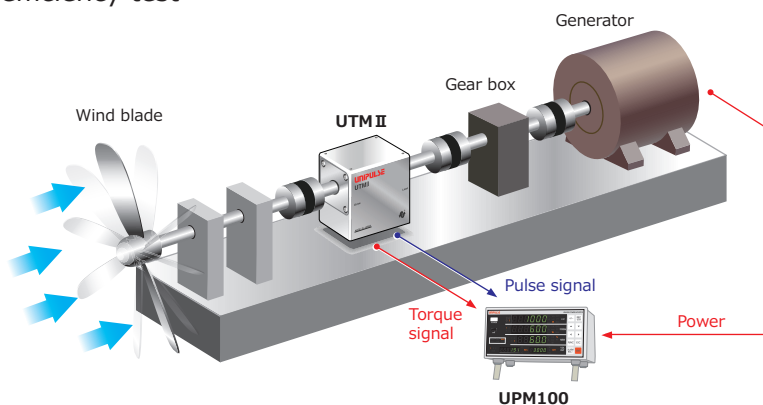
In case of torque measurement with large vibration, such as measurement of engines, please attach double disk coupling and use double bearing.

### Mixer with torque meter



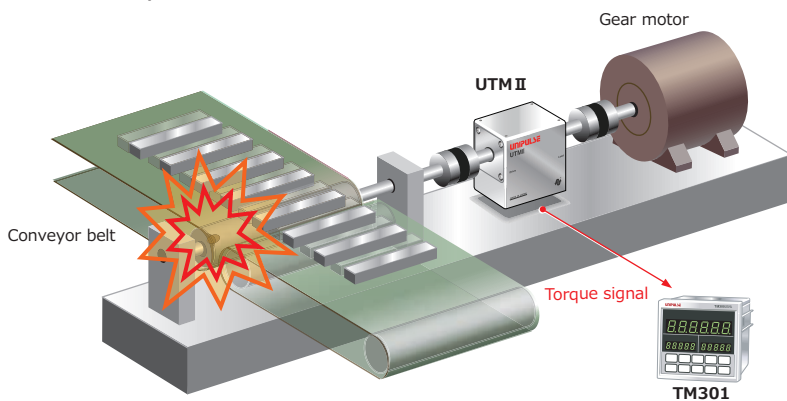
The system measures torque on the axis of mixing impellers. The change of viscosity can be detected by monitoring torque. By using TM301, I/O signals can be controlled by the threshold levels.

### Power generation efficiency test



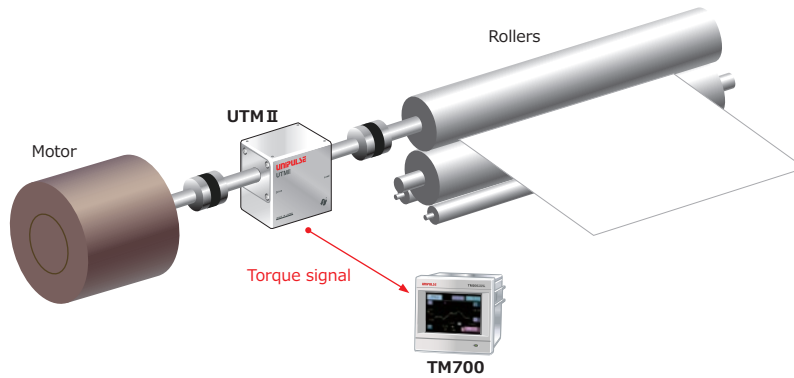
The efficiency of wind turbine generator and so on can be tested. Power can be estimated based on torque and rotational speed measured with UTM II, and power generation efficiency can be calculated by comparing power and generated energy.

### Fault detection of conveyor belt



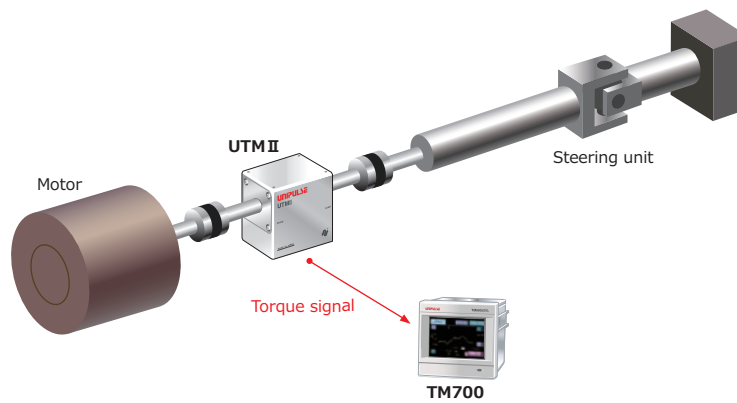
By monitoring the motor shaft torque of a conveyor belt, faults and conveyor-related hazards can be detected (e.g. materials get caught to conveyor system). Conveyor belts will be stopped immediately after faults like contamination and overturning of products are detected.

## 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.

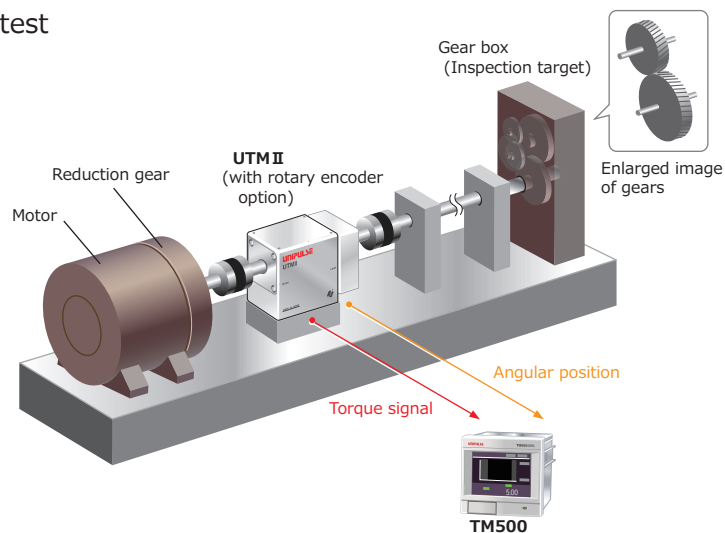
## Quality inspection of steering unit



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.

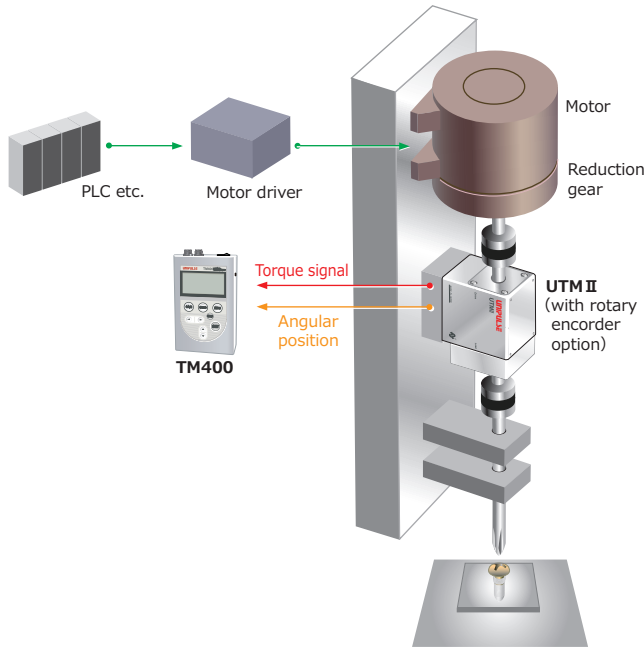
## Relationship between torque and angle/displacement (distance)

### Physical sensory test



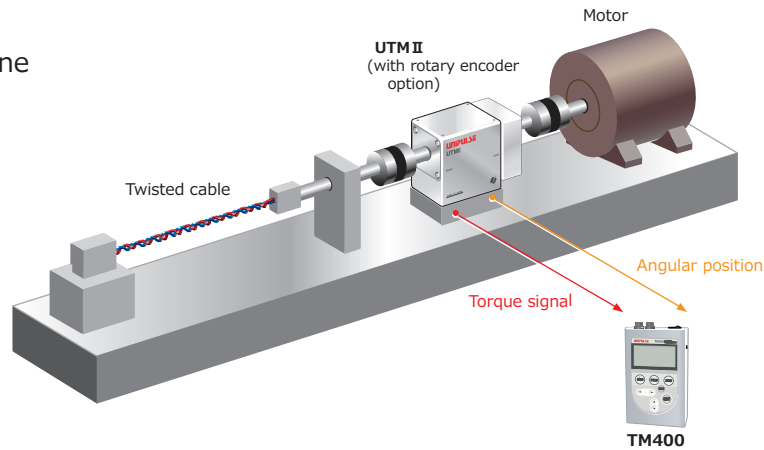
Torque corresponding to angular position can be monitored by using UTM II with rotary encoder option. The system can be applied to automation of physical sensory test.

## Screw driver with torque monitoring



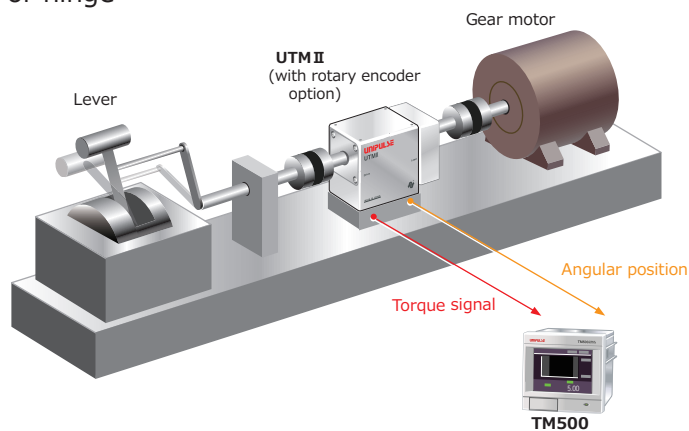
Torque can be measured in the process of tightening screws. Since the torque can be controlled during the whole process, the system can be applied to automation of process.

## Torsion testing machine

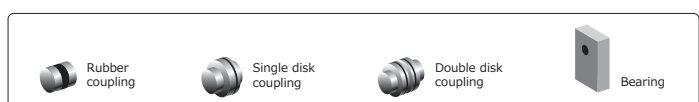


Stiffness and performance of wire or cable can be tested by checking torque applied by a torsion test machine with UTM II .

## 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.



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