



ZIPPTORK

Bolting Technology

Torque Control Series Products

Introduction

ZIPP Assembly Technology presents fastening solutions for the industrial assembly market in bolting threaded fasteners, squeezing solid rivets, riveting blind rivets and rivet nuts, and fastening lock bolts, etc.

This system takes advantage of our combined patented control device, control algorithm, and wireless rotary torque transducer, with the best practice on IoT (Internet of Things), making the controllability and traceability of fastener assembly, fastening processes, and fastening records possible and accessible.

An Innovative Revolution of Impact Wrench Torque Control

Making the torque control easy and affordable

No more precision and costly torque-controlled tools required,
regardless of air tool brand, manufacturer, design, and grade.

Applicable to

Any Air Driven Continuous & Discontinuous Torque Tools

Air Clutch Tools

Air Impact Driver

Air Impact Ratchet

Air Pulse Wrenches

Air Impact Wrenches

Geared Wrench / Torque Multipliers

&

Electrical / Cordless Tool with auto-shut off Torque Control Mechanism

ZIPPTORK Bolting Torque Control Solution

Real Time Monitoring / Data Logging / Intelligent Control / Auto Compensation

◀ Applications

ZIPPTORK Wireless Torque Transducer and Torque Controller are applicable to most of power torque tools for bolting intelligently with excellent torque control accuracy and data collection.

- **Prior to Assembly:** For checking the torque tool capability and calibrating the torque setting.
- **During Assembly:** For controlling and recording the torque being applied to the bolted joint instantly and wirelessly.
- **After Assembly:** For effectively verifying the residual torque accuracy with angle / torque mode.

◀ Wireless Torque Transducer

- Patented anti-vibration mechanism, designed for tolerating violent vibration of discontinuous torque tools during assembly.
- Ideal for
 1. dynamic torque control of air impact wrenches, oil pulse wrenches to do closed loop torque control.
 2. oil pulse wrench or clutch type torque tool or the torque tool equipped with built-in torque mechanism to do torque calibration prior to work and real time torque monitoring during assembly while display the data in the tablet instantly via a Dongle and APP for further transmitting to peripheral devices or cloud server.
 3. click wrench to collect torque data as soon as it clicks to make audible click visible.

◀ Torque Controller

- With patented control algorithm and device for controlling the output torque of all continuous and discontinuous air driven torque tools especially air impact wrenches, air ratchet wrenches, air oil pulse wrenches as well as geared torque multipliers, regardless of tool brand and its designed mechanism with proven satisfactory control accuracy and durability.
- Programmable function of bolting sequence control while applying with the tagged bolt or sensing bolt.
- Solves problems of torque loss that may be caused by the variation of the joint hardness, the rise of temperature of hydraulic fluid in pulse tools or the posture of holding the tool during continuous operation and compensate the dynamic torque loss automatically within its allowable working torque range.

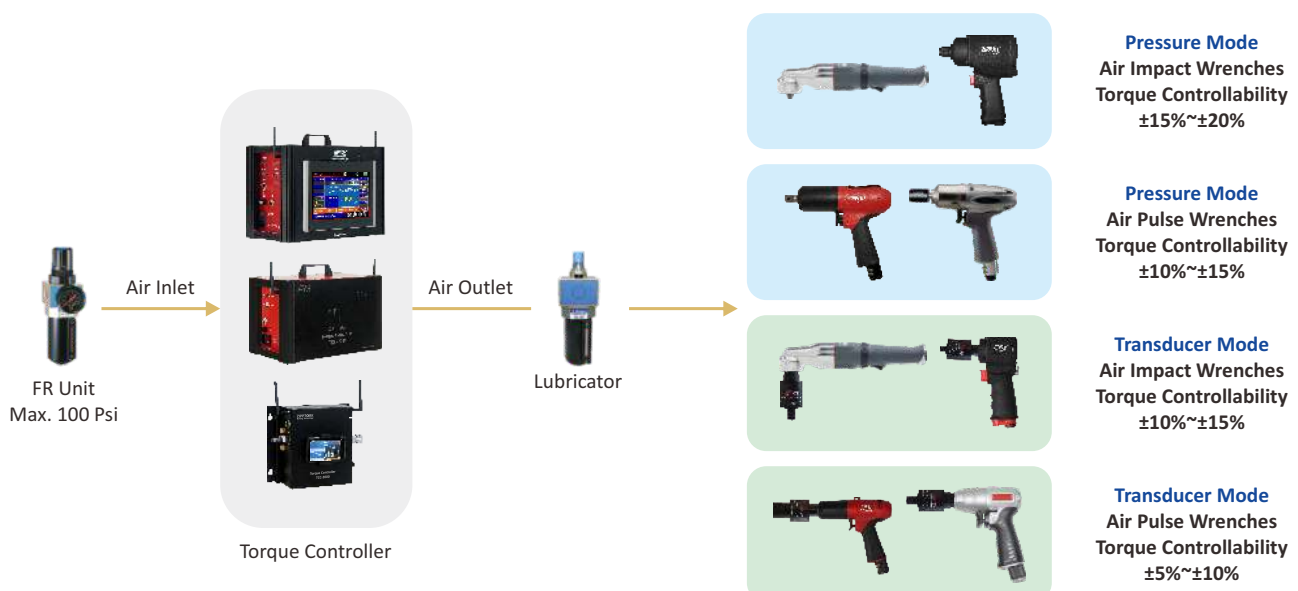


Torque Controller Features

Real-Time Monitoring / Data Logging / Intelligent Control / Auto Torque Compensation

ZIPPTORK presents a series of **Torque Controllers** with **patented mechanisms and control algorithms** for controlling the bolting torque of air impact wrenches & pulse wrenches regardless of the tool brand and mechanism.

- With a patented control algorithm and device for controlling the output torque of all continuous and discontinuous air-driven torque tools, especially air impact wrenches, air hammerhead impact wrenches, air oil pulse wrenches and geared torque multipliers, regardless of tool brand and its designed mechanism, with proven satisfactory control accuracy and durability.
- Works with an air impact wrench under "**Pressure Mode**", the torque controllability within **+/-15%~20%**, and with an air pulse wrench instead, the torque controllability within **+/-10%~15%** can be achieved. **It is ideal for pre-tightening of most bolting works in the assembly line.**
- While working with an air impact wrench under "**Transducer Mode**" with a **ZIPPTORK's wireless Rotary Torque Transducer** fitted between the tool and impact socket, The torque controllability can be improved to **+/-10%~15%** and with an air pulse wrench instead, the torque controllability can be obtained within **+/-5%~10%**. It is ideal for higher precision complicated and time-consuming bolting works to eliminate torque auditing after bolting.
- Programmable function of bolting sequence control while applying with the tagged bolt or sensing bolt.
- Solves problems of torque loss that the variation of the joint hardness may cause, the rise of the temperature of hydraulic fluid in pulse tools, or the posture of holding the tool during continuous operation and compensates the dynamic torque loss automatically within its allowable working torque range.
- Multi-language support for this product.
- Air impact wrench with torque controller in **Pressure Mode** can control the torque accuracy within **+/-20%** or under **+25%**, it's enough to meet most of the pre-tightening operations in the torque control needs, it's an economical and efficient solution for bolting works.



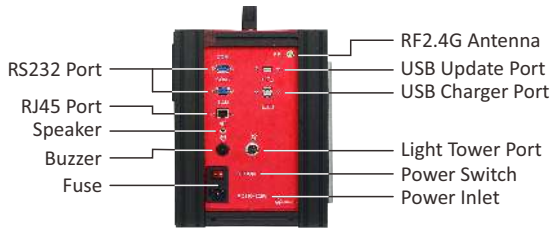
TCA/TCB Torque Controller



TCA-2000



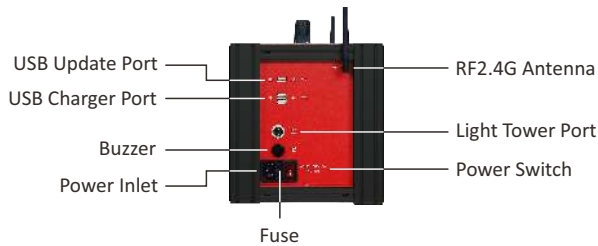
- Blue: Tightening Process
- Green: Transducer Connected



TCB-2000



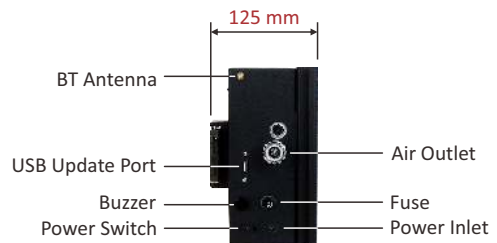
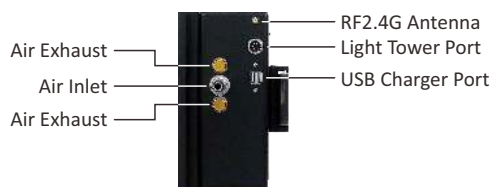
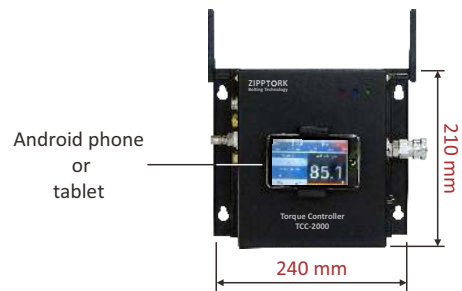
- Green: Tightening Process
- Blue: RF Connected
- Red: Bluetooth Connected



TCC-2000



- Green: Tightening Process
- Blue: RF Connected
- Red: Bluetooth Connected



TCA/TCB Torque Controller



Model		TCA-2000	TCB-2000	TCC-2000
Max. Flow Rate		2000 L/min	2000 L/min	2000 L/min
Touch Panel Size		10" Touch Panel	NB / Tablet	NB / Tablet
Power Source		AC 100V~240V /2A	AC 100V~240V /2A	AC 100V~240V /2A
Connection Port	USB	1	1	1
	RS232	2	1	N/A
	RJ45	1	N/A	N/A
Wireless Antenna	RF2.4G	2	1	1
BT Antenna		N/A	1	1
Speaker		1	1	1
Light Tower Output Port		1	1	1
Buzzer		80dB	80dB	80dB
USB Charger Port		2	1	1
Flow Rate Detection		Yes	No	No
Automatic Flow rate Control		Yes	No	No
Operation Mode	Oil Pulse Wrench	Yes	Yes	Yes
	Air Impact Wrench	Yes	Yes	Yes
	Manual Torque Wrench	Yes	Yes	N/A
	Air Torque Multiplier	Yes	Yes	N/A
	Job Sequence	Yes	Yes	N/A
Control Accuracy	Static Torque (%)	±1%~±5%	±1%~±5%	±1%~±5%
	Dynamic Torque (%)	±5%~±15%	±5%~±15%	±5%~±15%
Thread Size	Inlet	1/2" NPT	1/2" NPT	1/2" NPT
	Outlet	1/2" NPT	1/2" NPT	1/2" NPT
Language		Simplified/Traditional Chinese, English, Japanese	Simplified/Traditional Chinese, English, Japanese, Spanish, Italian, Indonesian	
System Parameter		Yes	Yes	Yes
Static Torque		Yes	Yes (torque & angle)	No
Dynamic Torque		Yes	Yes	No
Multi-stage training		Yes	Yes	No
Job Sequence (Dynamic & Static)		Dynamic	Dynamic + Stastic	No
Tyre Assembly System		No	Yes	Yes
Display		HMI onboard	On-board or Separate display	On-board or Separate display
Job Data		Full Job report	Full Job report	Full Job report
Cloud		FTP	WEB	WEB
Job Data Export		All data in CSV format	Available in Excel, PDF, or CSV format	Available in Excel, PDF, or CSV format
Job Data Memory		150K	No Limit	No Limit
Torque Curve Display		No	Yes	Yes
Dimensions	Length(L)	370mm	320mm	210mm
	Width(W)	214mm	217mm	240mm
	High(H)	266mm	210mm	125mm
Net Weight		10.5kg±0.5kg	6kg±0.5kg	3.7kg±0.2kg

Torque Controller

RoHS
compliant

- **Standard Packaging:**

Controller, Power cable, Air Hose Coupler, Antenna x 2.,

TCA-IPC01 Controller Inlet –

2M hose+coupler + F.R unit -10kg/cm2 max.,

&

TCA-OPC01 Controller Outlet – 3M hose+coupler.

- **Optional Accessories:**

1. 24V Tri-color light pole w/ Buzzer
2. Barcode Scanner
3. Printer.



Optional:
ZTPAMB6-73ROG
24V Tri-color
light pole w/ Buzzer

- **Minimum system requirements:**

- **Windows:**

- Operating system: Windows 10 or above
- Minimum CPU: Core i3
- Minimum system memory (RAM): 4G
- Minimum free storage space: 32GB

- **Android:**

- Operating system: Android 7.0 or above
- Minimum CPU: Quad core
- Minimum system memory (RAM): 3G
- Minimum free storage space: 32GB

Software & Functions

- **Pulse Wrench**

- Transducer mode (Work with transducer)
- Pressure mode (Without transducer)
- Accu mode (For soft joint)

- **Torque wrench**

- Torque
- Torque + Angle
- Click wrench track mode
- Click wrench inspection mode

- Signal Source: Torque Transducer, Air Pressure Sensor, Sensing Bolt or Tagged Bolt.

- Torque Revise: Deviation & Replacement.

- Tool Torque Capacity Calibration: Easy set-up **TH** & **TL** within operable working air pressure range in minutes.

- Target Torque Setting: Any target torque value can be selected and inputted within the calibrated torque range.

- Working air pressure : Automatic adjusted to correspondent target torque (Inlet Air Pressure between 100~120psi is recommended).

- Air flow rate: Only **TCA/TCB** equipped with digital flow meter. Turn the tool air flow regulator to maximum, the system will regulate the proper flow rate to correspondent target torque automatically.

- Bolting in stages: Preset the bolting stages and percentage of target torque for each stage from 1 to 4 stages as required. The system will regulate the air pressure and flow rate correspondently.

- Number of bolts: Preset the number of bolts to be fastened. Only when all bolts of each stage fastened, the system will switch to next stage and regulate the air pressure and flow rate correspondently and automatically.

- Torque Compensation: The system will compensate the torque loss that may be caused by the variation in the bolted joint hardness or the rise in temperature of hydraulic fluid of pulse wrench or the posture of operator to hold the tool during the process automatically within its allowable working air pressure range.

- Remote monitoring: Via Internet or Ethernet with **VNC** to monitor data on cell phone, tablet and PC, or to do parameter setting on the torque controller.

- Operation Management: Constraints Via permission setting to access the operable functions such as logging the operator's ID and duration of operation.

- Torque Control Accuracy: $\pm 5\% \sim \pm 15\%$.

- Job Sequence: Support 10 sets of torque tool preset available for bolting sequentially.

- Production Record: Traceable through USB, Ethernet or exported to the cloud server through wired or wireless connections.

- Torque Controller Warranty period:

- * 12 months from purchase date.

- * Manufacturer will repair or replace, any defects due to faulty materials or workmanship. This Warranty does not cover part failure due to broken / missing seal label, misuse, modification, negligence, abuse or normal wear and tear.

- **Impact Wrench**

- Transducer mode (Work with transducer)
- Pressure mode (Work without transducer)
- Accu mode (For soft joint)

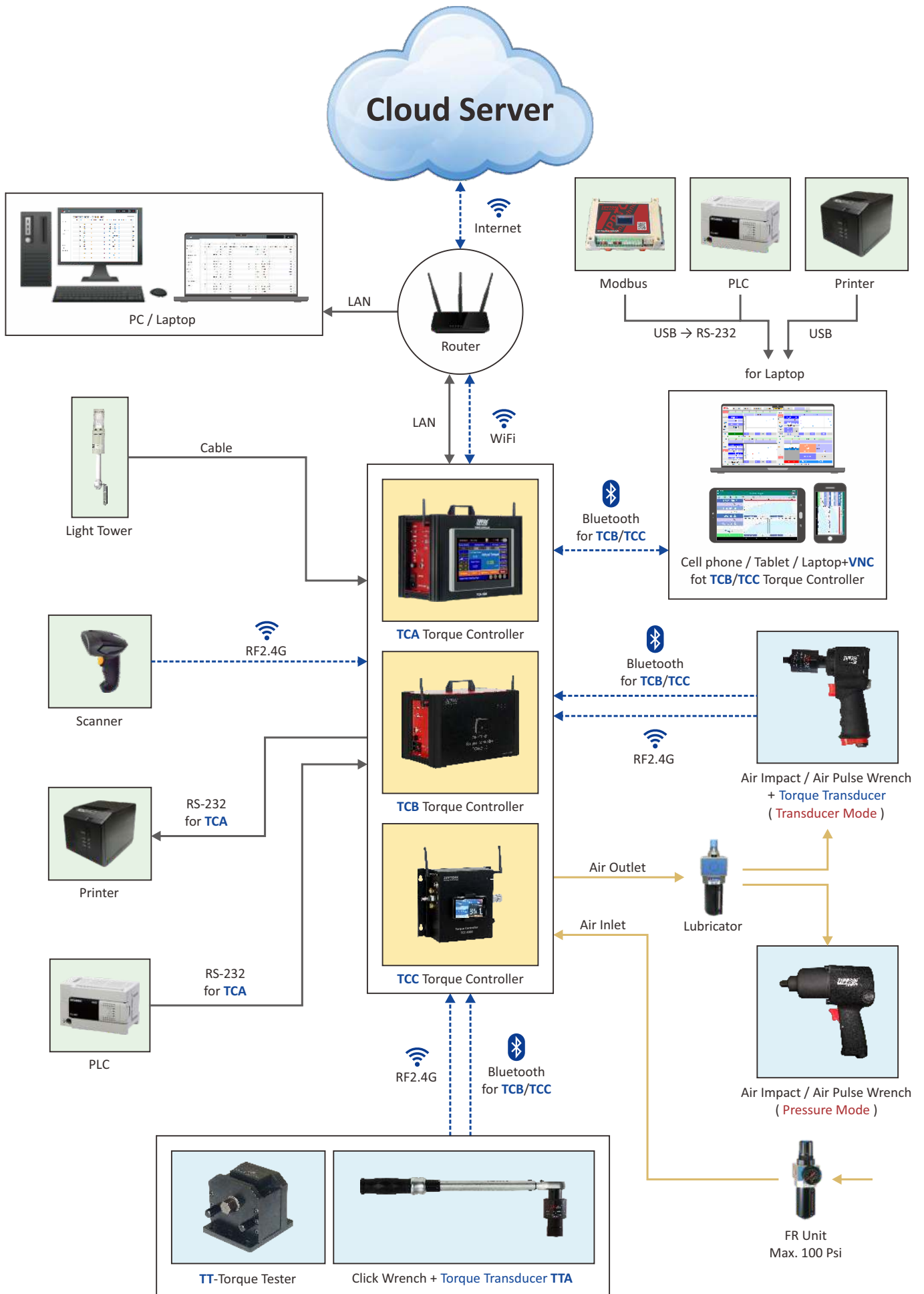
- **Job sequence**

- **Geared Wrench (Opt. mode)**

- **Torque Tester (Opt. mode)**

- **Torque multiplier (Opt. mode)**

Torque Controller Application System Architecture



Torque Controller Application Embodiments

Applicable to Any Air Impact and Pulse Wrenches from Any manufacturer with any impact or pulse mechanism

Not recommended for clutch type, ratchet type and auto-shutoff type torque tools



TCA / TCB / TCC Torque Controller



Air Oil Pulse Wrench

Air Impact Wrench
Hammerhead-Angle Impact Wrench



Pressure Mode
Torque Controllability
 $\pm 10\% \sim \pm 15\%$

Pressure Mode
Torque Controllability
 $\pm 15\% \sim \pm 20\%$



Wireless Torque Transducer



Wireless Torque Transducer

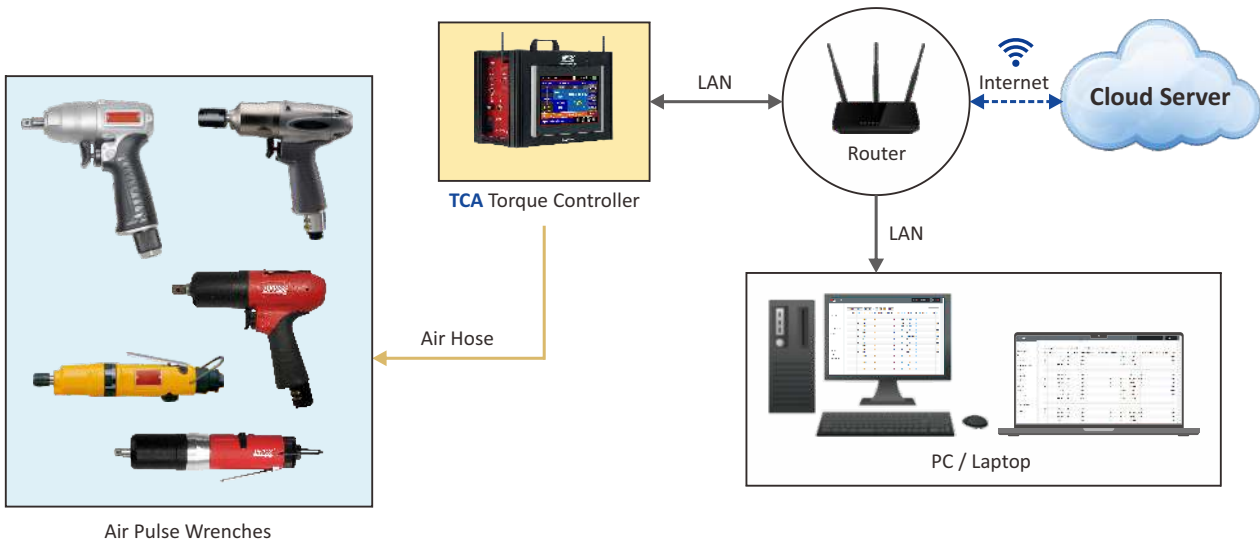
Transducer Mode
Torque Controllability
 $\pm 5\% \sim \pm 10\%$

Transducer Mode
Torque Controllability
 $\pm 10\% \sim \pm 15\%$

Bolting Torque Control of Air Pulse Wrenches Application Embodiment

Air Pulse Wrenches + **TCA Torque Controller**, under **Pressure Mode**
→ WiFi → peripheral devices or cloud server

Torque control accuracy within $\pm 10\% \sim \pm 15\%$

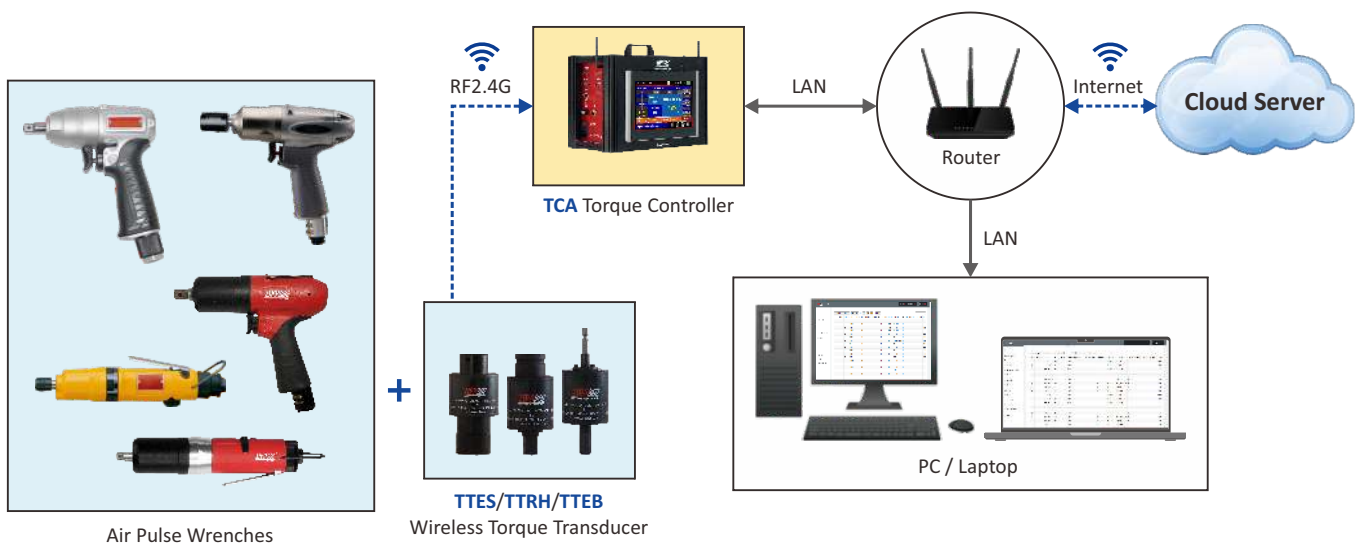


Video Link ~ <https://youtu.be/ZcE4XDcLGqE>

Bolting Torque Control of Air Pulse Wrenches Application Embodiment

Air Pulse Wrenches + **TCA Torque Controller** + **TTES wireless Torque Transducer**
+ Laptop, under **Transducer Mode** → Wifi → peripheral devices or cloud server

Torque control accuracy within $\pm 5\% \sim \pm 10\%$

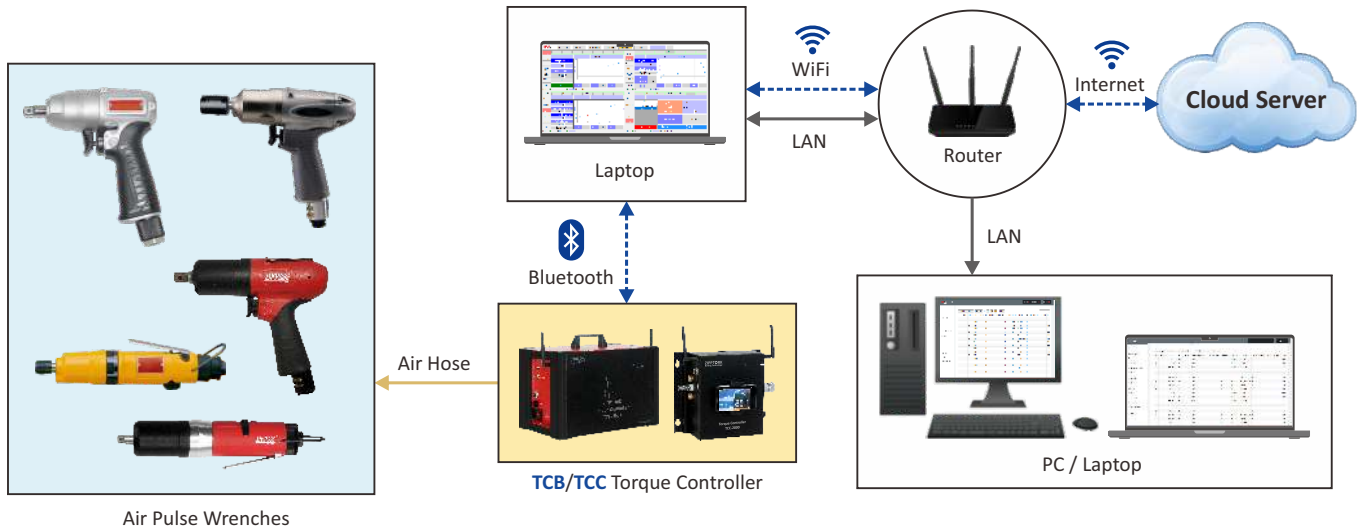


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Bolting Torque Control of Air Pulse Wrenches Application Embodiment

Air Pulse Wrenches + **TCB/TCC Torque Controller** + Laptop, under **Pressure Mode**
→ WiFi → peripheral devices or cloud server

Torque control accuracy within $\pm 10\% \sim \pm 15\%$

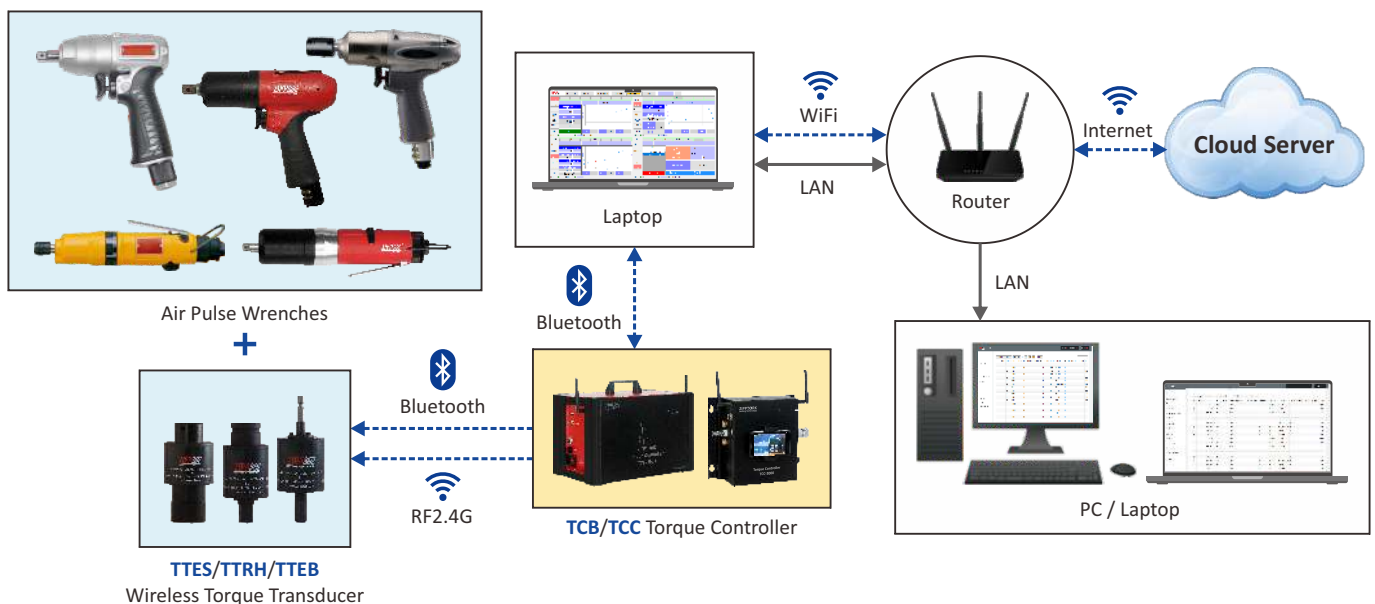


Video Link ~ <https://youtu.be/ZcE4XDcLGqE>

Bolting Torque Control of Air Pulse Wrenches Application Embodiment

Air Pulse Wrenches + **TCB/TCC Torque Controller** + **TTES wireless Torque Transducer**
+ Laptop, under **Transducer Mode** → WiFi → peripheral devices or cloud server

Torque control accuracy within $\pm 5\% \sim \pm 10\%$

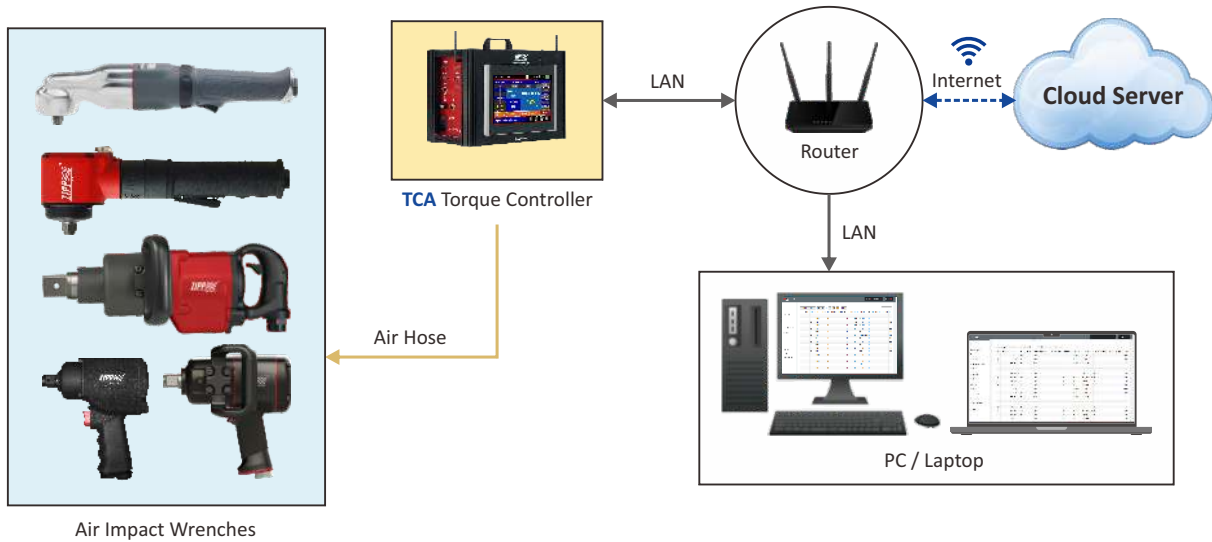


Video Link ~ <https://youtu.be/ZcE4XDcLGqE>

Bolting Torque Control of Air Impact Wrenches Application Embodiment

Air Impact Wrenches + **TCA Torque Controller**, under **Pressure Mode**
→ Wifi → peripheral devices or cloud server

Torque control accuracy within $\pm 15\% \sim \pm 20\%$

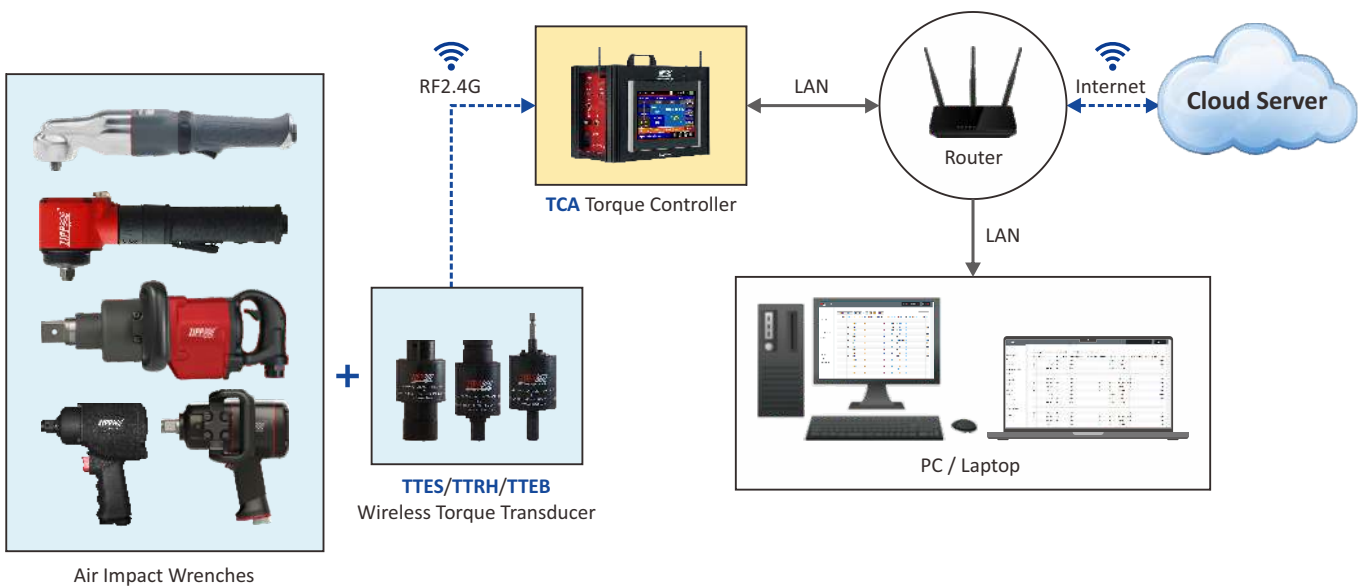


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Bolting Torque Control of Air Impact Wrenches Application Embodiment

Air Impact Wrenches + **TCA Torque Controller** + **TTEs wireless Torque Transducer**
+ Laptop, under **Transducer Mode** → Wifi → peripheral devices or cloud server

Torque control accuracy within $\pm 10\% \sim \pm 15\%$

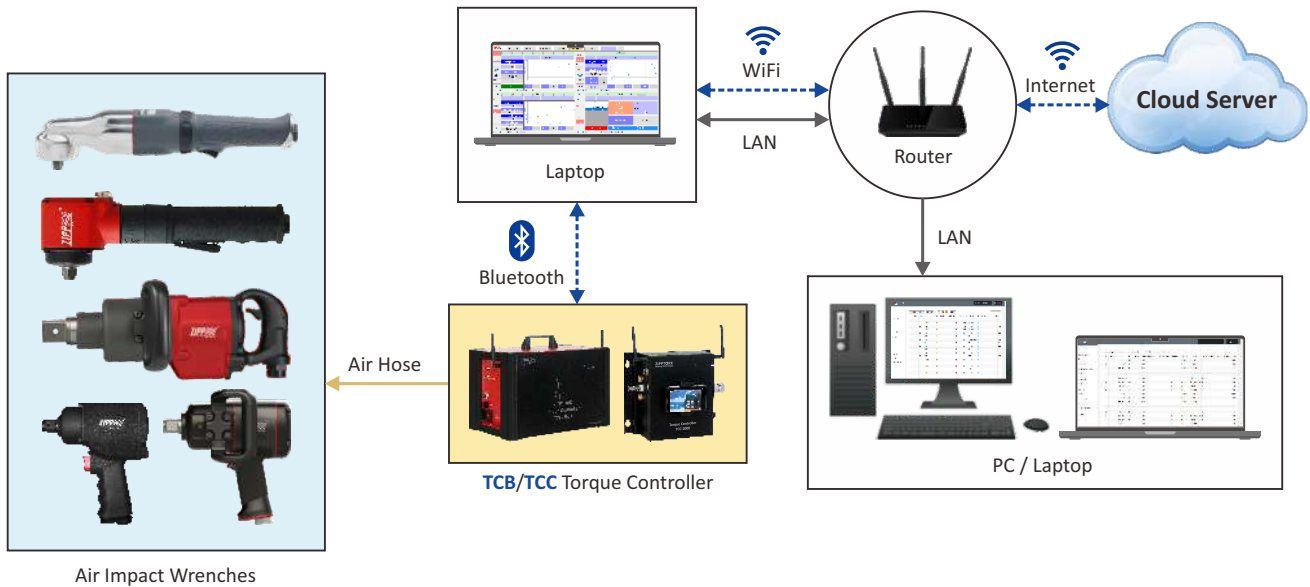


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Bolting Torque Control of Air Impact Wrenches Application Embodiment

Air Impact Wrenches + **TCB/TCC Torque Controller** + Laptop, under **Pressure Mode**
→ Wifi → peripheral devices or cloud server

Torque control accuracy within $\pm 15\% \sim \pm 20\%$

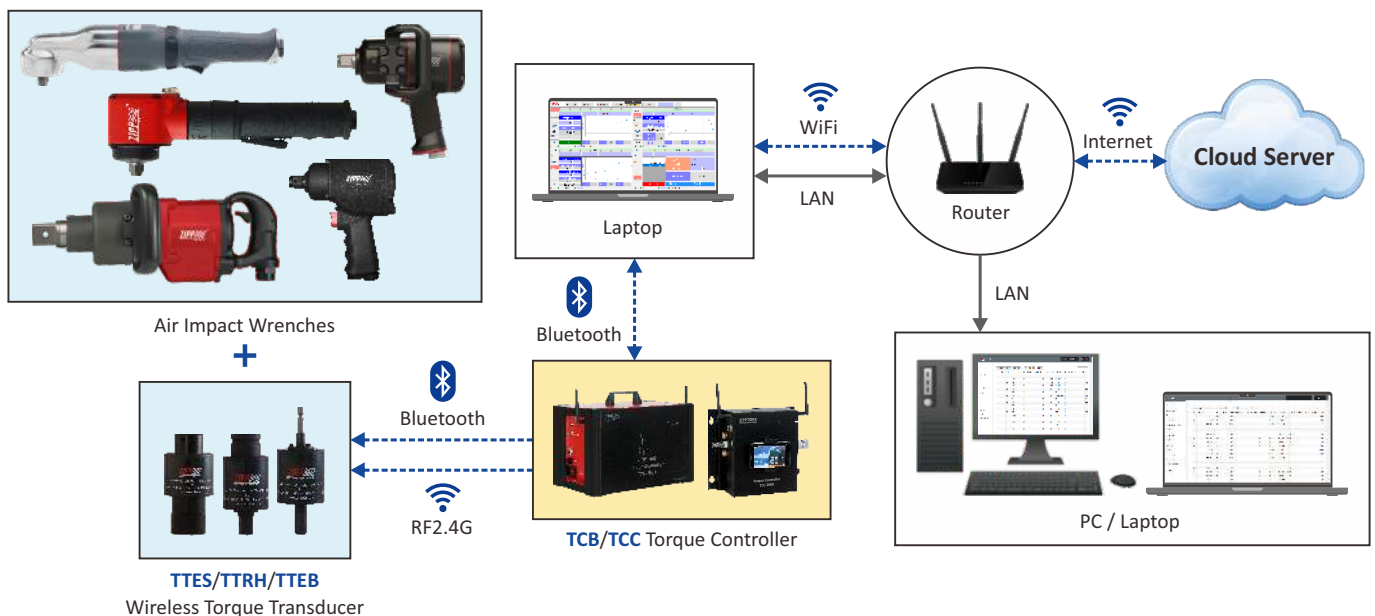


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Bolting Torque Control of Air Impact Wrenches Application Embodiment

Air Impact Wrenches + **TCB/TCC Torque Controller** + **TTES wireless Torque Transducer**
+ Laptop, under **Transducer Mode** → Wifi → peripheral devices or cloud server

Torque control accuracy within $\pm 10\% \sim \pm 15\%$



Video Link ~ <https://youtu.be/ZcE4XDcLGqE>



ZBSC-BT-421 BT

Bluetooth Barcode Scanner
for use on Android PAD or Window PC / Laptop

ZBSC-N-421 RF 2.4G

RF 2.4G Barcode Scanner
for use on TCA/TCB Torque Controller, Android PAD
or Window PC / Laptop

	ZBSC-BT-421	ZBSC-N-421
Specification	Descriptions	
Communication	Blue tooth Class II, Blue 4.0	RF 2.4G
Memory	2MB	
Main Battery	2000 mAh, Li-ion Battery	
Keys	One Key	
Indicator	Beep and LED	
Interfaces	SPP & HID Interface (Compatible Android, iOS, Windows Mobile)	
Battery Charge Time	Approx. 4-5 hours per full charge	
Scan per full charge	30,000 scans	60,000 scans
Scan Speed	270 Scans/sec.	
Light Source	RED LED (660nm)	
Resolution	0.075mm (3mil)	
PCS value	30% or more	
Scan Angle	45°	
Scan Width	Up to 250mm or more (PCS90%)	
Scan Distance (PCS 90% code 39)	20-600mm (PCS 90%)	
Decodable Capability	Code 39, Full ASCII Code 39, Code 32, Code 128, Code 93, Code 11, Codabar/NW7, All UPC/EAN/JAN code (EAN-13, EAN-8, UPC-A, UPC-E, EAN-128), Interleave 2 of 5, STD 2 of 5, Industrial 2 of 5, matrix 2 of 5, Chinese Postage Code, IATA, MSI/PLESSY, Italian Pharmacy Code, Telepen, RSS-14, RSS Limited, RSS Expanded	
Electrical		
Voltage	5V DC ±5%	
Operation Current	100-120mA	
Stand-by Current	20-30mA	
Environment		
Operating Temperature	32°F to 105°F (0°C to 50°C)	
Storage Temperature	-15°F to +140°F (-26°C to 60°C)	
Humidity	10% to 90% RH	
Drop	Approved by 1.5M drop test on concrete	
Ambient Light Rejection	6000 Lux max. (Fluorescence)	
Safety Approval	CE & RoHS	
Physical		
Case Material	ABS + Rubber	
Dimension	L:166mm W:66mm H:86mm	
Weight	150g	
Standard package	1.Main unit 2.Micro USB cable 3.Quick Guide manual	



ZP-9363 80mm Thermal Receipt Printer with LAN

Specification	Descriptions	
Print	Printing Method	Thermal Line
	Printing Speed	300 mm/sec.
	Resolution	8 dots/mm, 576 dot/line
	Effective Printing Width	72mm
Character	Character Set	ANK, GB18030 (Chinese)
	Print Font	ANK: 12*24.9*17, Chinese: 24*24
	Character per Line	48-font A/64-font B
Paper Spec	Paper Type	Thermal paper
	Paper Width	79.5±0.5mm
	Paper Roll Diameter	Max: 80mm
	Roll Core Inner Diameter	13mm (min)
	Paper thickness	0.06 to 0.07mm
Paper Supply Method		Dorp-in paper load
Reliability	MCBF	60 million line
	Auto Cutter	1,000,000 cuts
	TPH	100km
Barcodes	UPC-A, UPC-E, EAN-13, EAN8, CODE39, ITF, CODEBAR, CODE39, CODE128	
Emulation		ESC/POS
Driver		Windows 2000/XP/7/Vista/8
Sensor		Paper Near End Secsor. Paper End Sensor
Interface		RS-232+USB or USB+LPT1
Power Supply (Adapter)		AC100-240V (±10%), DC24V, 2.5A
Auto Cutter	Type	Guillotine
	Life	1,000,000 cuts
Physical	Net Weight	1.12kg
	Printer Dimension (W*L*H)	136*130*179mm
Application	Restaurants, Department Stores, Kitchen, Convenience Stores, Specialy Retail, Super market	

Wireless Rotary Torque Transducer Features

Unique wireless and anti-vibration design / Cost-Effective Solutions / Easy set-up in minutes /
Data collection for traceability / Cost-effective solutions /
The only rotary type torque transducer in the industry for dynamic bolting torque control

ZIPPTORK presents a series of torque-sensing device features with wireless transmission and a patented anti-vibration design for accurate static and dynamic torque measurement, validation, and audits of all continuous and discrete type torque tools. These devices have proven to perform reliably in applications worldwide.

- The rotary-type series can be fitted in-line between the assembly tool and the fastener, such as a manual torque wrench, to make its audible clicks visible with recordable data for transmission or a clutch type or auto-shutoff type tools for bolting torque monitoring and data collection and even an impact wrench or pulse wrench for bolting torque monitor or control.
- Patented anti-vibration design for durability.
- The only wireless rotary-type torque transducer applies to air impact and Air/DC-driven pulse wrenches.
- Wireless features for the greatest maneuverability, especially during the bolting process.
- For measuring, monitoring, and recording torque before, during, or after assembly.
- It is designed for torque testing and provides solutions for most torque auditing applications in the manufacturing and quality department.
- Test the capability of your power torque tools, verify the accuracy of your hand tools, monitor the capability of your fastening process, or audit the quality of your assembled joints.
- Data logging to peripheral devices or cloud servers for multiple transducers via Gateway.
- Capacity ranges from 5NM to 2,000NM; 2500NM & above can be custom-made upon request.
- Socket drive type-TTEH can be custom-made.
- The only durable wireless rotary torque transducer with a warranty of ONE year or 200,000 cycles of dynamic bolting & 500,000 cycles of static bolting in the field.



It's the field's only patented design capable of tolerating the violent impact during bolting ~

Wireless Rotary Torque Transducer



DONGLE(Optional)
for RF version Transducer only:
P/N: **DG-CP** for **Android**
P/N: **DG-WIN** for **Window**



Transducer Protection Cover (Optional)
for all types of rotary torque transducer:
P/N: **TPC-100** for **20/50/100Nm**
P/N: **TPC-250** for **180/250Nm**
P/N: **TPC-500** for **500/750Nm**
P/N: **TPC-2000** for **1000/1500/2000Nm**

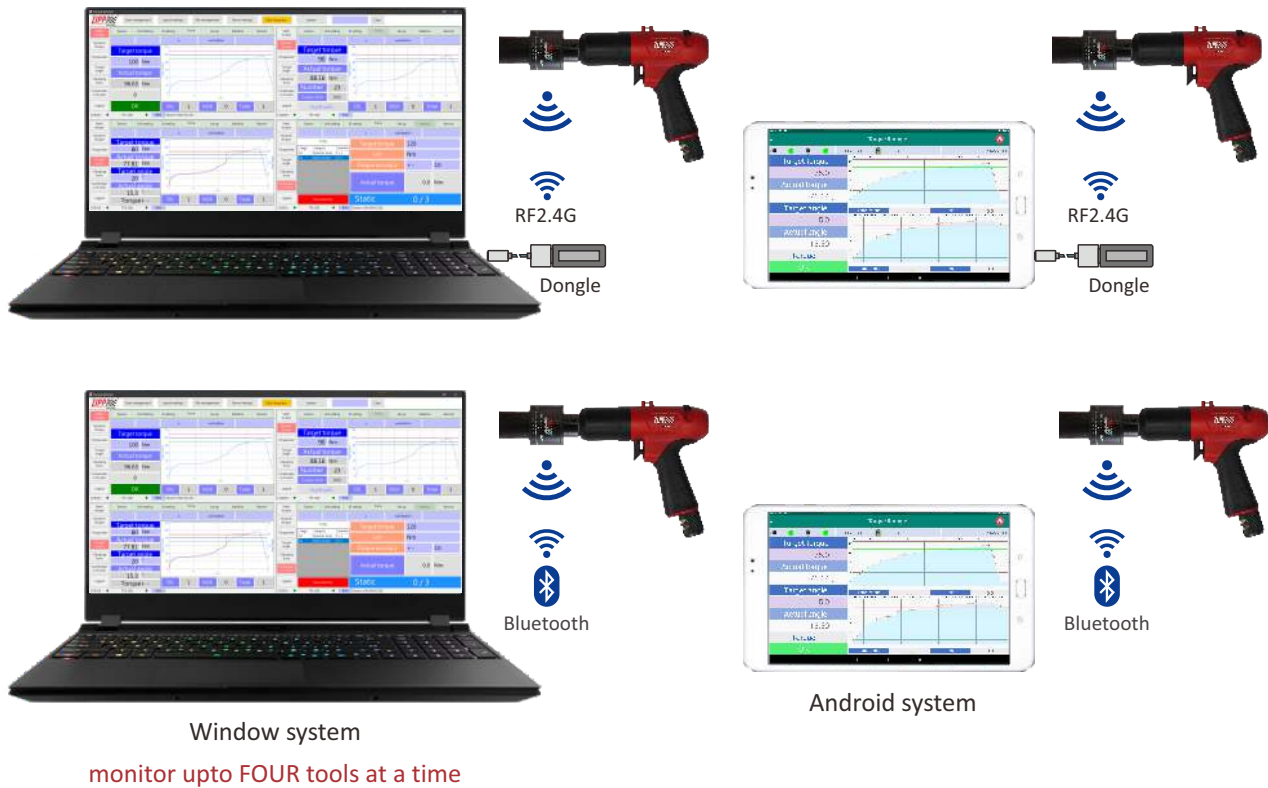
Charger	Type-C 5V/1A
IO(1)	USB Type-C *1
IO(2) Wireless	RF 2.4G up-to 20M
Zero Balance	<±0.5% FSD/°C
Static Accuracy	±1% FSD
Temperature	-10°C~60°C
Humidity	10~75% Non-condensing
Charging time	5% to 100%, 2 hours

Software and Functions



- Applicable to:
Oil Pulse Wrench, Impact Wrench, Geared Wrench, Torque Wrench, Clutch Type, Torque Tool & Click Wrench.
- Measurement: Torque, Angular Movement & Pulse Count.
- RF version Working Frequency: 60 channels available to be paired with **TCA/TCB**.
- Functions Check: Automatic check the status of power rate, signal quality, torque & angle, etc. when turned on.
- Switch: Use magnet to turn on.
- LED Light:
Blue/Orange twin color:
Orange last long~Low Power, Blue last long~RF in communication, Blue twinkling~pairing with Controller, Orange Twinkling~Abnormal.
Red/Green twin color: Red~In Charging, Green~Full Charge.

Wireless Rotary Torque Transducer

Minimum system requirements:



monitor upto FOUR tools at a time

	 Windows	android 
Operating system	Windows 10 or above	Android 7.0 or above
Minimum CPU	Core i3	Quad core
Minimum system memory (RAM)	4G	3G
Minimum free storage space:	32GB	32GB

Warranty period:

- **TTE(H)** series: 12 months from purchase date or 200,000 cycles.
- **TTA(H)** & **TTEB** series: 12 months from purchase date or 500,000 cycles.
- Battery: 3 months from purchase date.
- Signal acquisition board: 12 months from purchase date.
- Manufacturer will repair or replace, any defects due to faulty materials or workmanship. This Warranty does not cover part failure due to over torque, using **TTA(H)** series on impact tools or cordless tools, broken /missing seal label, misuse, modification, negligence, abuse or normal wear and tear.
- Dongle - 12 months from purchase date.

Wireless Rotary Torque Transducer



Detent ball anvil

ITEM NO.	Torque Range Nm	Inlet Size	Outlet Size	Profile Dimension O.D. X Length (mm)	Net Weight kgs	Battery Capacity
TTES-20-FS3MS3(B)	2~16	3/8"	3/8"	45x83	0.18	DC3.7V/650mAh
TTES-50-FS3MS3(B)	5~40	3/8"	3/8"	45x83	0.2	DC3.7V/650mAh
TTES-100-FS3MS4(B)	10~80	3/8"	1/2"	45x90	0.21	DC3.7V/650mAh
TTES-180-FS4MS4(B)	18~145	1/2"	1/2"	45x97	0.26	DC3.7V/650mAh
TTES-250-FS4MS4(B)	25~200	1/2"	1/2"	45x97	0.35	DC3.7V/650mAh
TTES-500-FS4MS6	50~400	1/2"	3/4"	57x114	0.7	DC3.7V/650mAh
TTES-750-FS6MS6	75~600	3/4"	3/4"	57x114	0.75	DC3.7V/650mAh
TTES-1000-FS8MS8	100~800	1"	1"	57x127	0.85	DC3.7V/650mAh
TTES-1500-FS8MS8	150~1200	1"	1"	57x134	0.95	DC3.7V/650mAh
TTES-2000-FS8MS12	200~1600	1"	1-1/2"	57x144	1.14	DC3.7V/650mAh
TTES-3000-FS12MS12	300~2400	1-1/2"	1-1/2"	86x166	3.8	DC3.7V/650mAh
TTAS-20-FS3MS3(B)	2~20	3/8"	3/8"	45x83	0.18	DC3.7V/650mAh
TTAS-50-FS3MS3(B)	5~50	3/8"	3/8"	45x83	0.2	DC3.7V/650mAh
TTAS-100-FS3MS4(B)	10~100	3/8"	1/2"	45x90	0.21	DC3.7V/650mAh
TTAS-180-FS4MS4(B)	18~180	1/2"	1/2"	45x97	0.26	DC3.7V/650mAh
TTAS-250-FS4MS6	25~250	1/2"	3/4"	45x104	0.35	DC3.7V/650mAh
TTAS-500-FS6MS6	50~500	3/4"	3/4"	57x114	0.55	DC3.7V/650mAh
TTAS-750-FS6MS8	75~750	3/4"	1"	57x114	0.75	DC3.7V/650mAh
TTAS-1000-FS8MS8	100~1000	1"	1"	57x127	0.85	DC3.7V/650mAh
TTAS-1500-FS8MS8	150~1500	1"	1"	57x134	0.95	DC3.7V/650mAh
TTAS-2000-FS8MS12	200~2000	1"	1-1/2"	57x144	1.14	DC3.7V/650mAh
TTAS-3000-FS12MS12	300~3000	1-1/2"	1-1/2"	86x166	3.8	DC3.7V/650mAh

TTES series are designed for dynamic bolting works while TTAS series are for static torque control and measurement.

For transducers above 3000Nm will all be custom made, please contact us for price.

*B = Steel Ball Anvil, P = Lock Pin Anvil, H = Through Hole Anvil

ITEM NO.	Torque Range Nm	Inlet Size	Outlet Size	Profile Dimension O.D. X Length (mm)	Net Weight kgs	Battery Capacity
TTER-1000-FS4FH30	1000	1/2"	Hex. 30	60x118.7	1.3	DC3.7V/650mAh

TTER type Transducer can be custom-made upon request while ordering.

Wireless Rotary Torque Transducer



ITEM NO.	Torque Range Nm	Inlet Size	Outlet Size	Profile Dimension O.D. X Length (mm)	Net Weight kgs	Battery Capacity
TTEH-180-FS4FH17L	18~145	1/2"	Hex. 17	45x134	0.5	DC3.7V/650mAh
TTEH-180-FS4FH19L	18~145	1/2"	Hex. 19	45x134	0.5	DC3.7V/650mAh
TTEH-180-FS4FH21L	18~145	1/2"	Hex. 21	45x131	0.5	DC3.7V/650mAh
TTEH-250-FS4FH18	25~200	1/2"	Hex. 18	45x94	0.28	DC3.7V/650mAh
TTEH-250-FS4FH24	25~200	1/2"	Hex. 24	45x97	0.34	DC3.7V/650mAh
TTEH-500-FS4FH27	50~400	1/2"	Hex. 27	57x102	0.7	DC3.7V/650mAh
TTEH-500-FS6FH27	50~400	3/4"	Hex. 27	57x111	0.75	DC3.7V/650mAh
TTEH-750-FS6FH46	75~600	3/4"	Hex. 46	57x128	0.8	DC3.7V/650mAh
TTEH-1000-FS8FHM30L	100~800	1"	Hex. 30	57x169	1.65	DC3.7V/650mAh
TTEH-1000-FS8FHM32L	100~800	1"	Hex. 32	57x169	1.6	DC3.7V/650mAh
TTAH-180-FS4FH17L	18~180	1/2"	Hex. 17	45x134	0.5	DC3.7V/650mAh
TTAH-180-FS4FH19L	18~180	1/2"	Hex. 19	45x134	0.5	DC3.7V/650mAh
TTAH-180-FS4FH21L	18~180	1/2"	Hex. 21	45x131	0.5	DC3.7V/650mAh
TTAH-250-FS4FH18	25~250	1/2"	Hex. 18	45x94	0.28	DC3.7V/650mAh
TTAH-250-FS4FH24	25~250	1/2"	Hex. 24	45x97	0.34	DC3.7V/650mAh
TTAH-500-FS4FH27	50~500	1/2"	Hex. 27	57x102	0.7	DC3.7V/650mAh
TTAH-500-FS6FH27	50~500	3/4"	Hex. 27	57x111	0.75	DC3.7V/650mAh
TTAH-750-FS6FH46	75~750	3/4"	Hex. 46	57x128	0.8	DC3.7V/650mAh

This series of Transducer can be custom made with specific size of hexagonal opening for correspondent size of bolt or nut.



ITEM NO.	Torque Range Nm	Inlet Size	Outlet Size	Profile Dimension O.D. X Length (mm)	Net Weight kgs	Battery Capacity
TTEB-5-MHB6FHB6	0.5~5	Hex. 6.35	Hex. 6.35	45x121	0.15	DC3.7V/650mAh
TTEB-10-MHB6FHB6	1~10	Hex. 6.35	Hex. 6.35	45x121	0.15	DC3.7V/650mAh
TTEB-20-MHB6FHB6	2~20	Hex. 6.35	Hex. 6.35	45x121	0.15	DC3.7V/650mAh

TTEB series are designed for screwdrivers with bit holder.

Wireless Rotary Torque Transducer

Standard Type / Hybrid Type

E = For dynamic use,
w/o angular movement detection
A = For static use,
with angular movement detection

B = Bluetooth Version
R = RF 2.4

F = Female
M = Male

S = SQ.
HM = Metric Hex.
HI = Imperial Hex.
HB = Bit Hex.

Size =
2 = 6.35mm Bit or 1/4" Square
3 = 3/8" Square 12 = 1-1/2" Square
4 = 1/2" Square 20 = 2-1/2" Square
6 = 3/4" Square 28 = 3-1/2" Square
8 = 1" Square 5 = #5 Spline

TT **E S** — **2000 B** — **F HM 12** **F HM 12 B**

Output-End Shape

S = Square
H = Hexagonal
B = Bit
P = Spline

Torque Range(Tnom)

0005 = 5 Nm	0100 = 100 Nm	1000 = 1000 Nm
0010 = 10 Nm	0180 = 180 Nm	1500 = 1500 Nm
0020 = 20 Nm	0250 = 250 Nm	2000 = 2000 Nm
0050 = 50 Nm	0500 = 500 Nm	3000 = 3000 Nm
	0750 = 750 Nm	

B = Steel Ball Anvil
P = Lock Pin Anvil
H = Through Hole Anvil



Item		
T _{nom}	50~3000Nm	5~20Nm
Power	DC 3.7V / 650 mAh	DC 3.7V / 650 mAh
Measured Range	10% T _{nom} ~100% T _{nom}	10% T _{nom} ~100% T _{nom}
Torque Resolution (Nm)	0.1% T _{nom}	0.1% T _{nom}
Accuracy (CW)	±1%	±1%
Accuracy (CCW)	±2%	±2%
Static Measured Angle Range	0°~360°	0°~360°
Angle Resolution (Degree)	0.5°	0.5°
Maximum Torque (Nm)	100% T _{nom}	100% T _{nom}
Wireless communication	RF 2.4GHz or Bluetooth	
Cable	USB-Type C	
Charger	USB (5V/1A)	
Operation Temperature (°C)	0°C~50°C	
Storage Temperature (°C)	-10°C~60°C	

Products Combination for Various Applications

Air / DC Impact / Hammerhead Impact Ratchet / Pulse wrench



Wireless Rotary Torque Transducer

Air / DC Driven Torque Tools with Clutch or Auto-Shutoff Mechanism



Tool + Wireless Rotary Torque Transducer

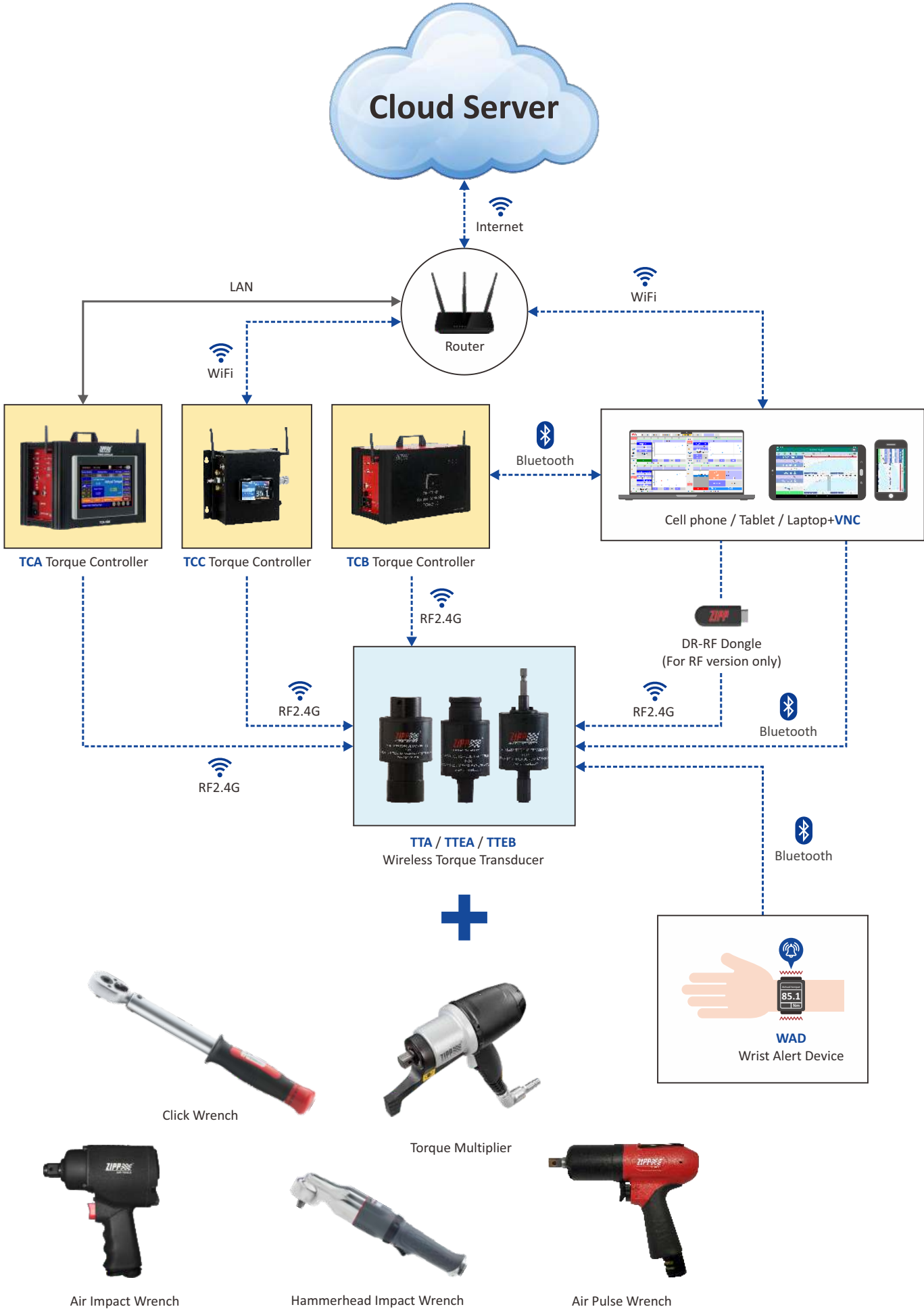
Click Wrench + Wireless Rotary Torque Transducer

Index	Applicable Torque Tools	Torque Controller	Torque Transducer	Media	Functions
1	Any brand manual torque wrench		TTAB/TTAS	Laptop/Tablet/WAD	Data collection, Residual torque verification
2	Any brand cordless pulse wrench		TTEB/TTES	Laptop/Tablet/WAD	Torque monitoring & data collection
3	Any brand cordless impact wrench		TTEB/TTES	Laptop/Tablet/WAD	Torque monitoring & data collection
4	Any brand air-driven pulse wrench	TCA/TCB/TCC	TTEB/TTES	Laptop/Tablet/WAD	Under Transducer Mode , Torque control & data collection
5	Any brand air-driven impact wrench	TCA/TCB/TCC	TTEB/TTES	Laptop/Tablet/WAD	Under Transducer Mode , Torque control & data collection
6	Any air-driven or cordless torque tools with clutch or auto-shutoff mechanism		TTEB/TTES	Laptop/Tablet/WAD	Torque monitoring & data collection
7	Cordless impact wrench with built-in control board	ECB	TTEB/TTES	Laptop/Tablet/WAD	Under Transducer Mode , Torque control & data collection
8	Cordless pulse wrench with built-in control board	ECB	TTEB/TTES	Laptop/Tablet/WAD	Under Transducer Mode , Torque control & data collection

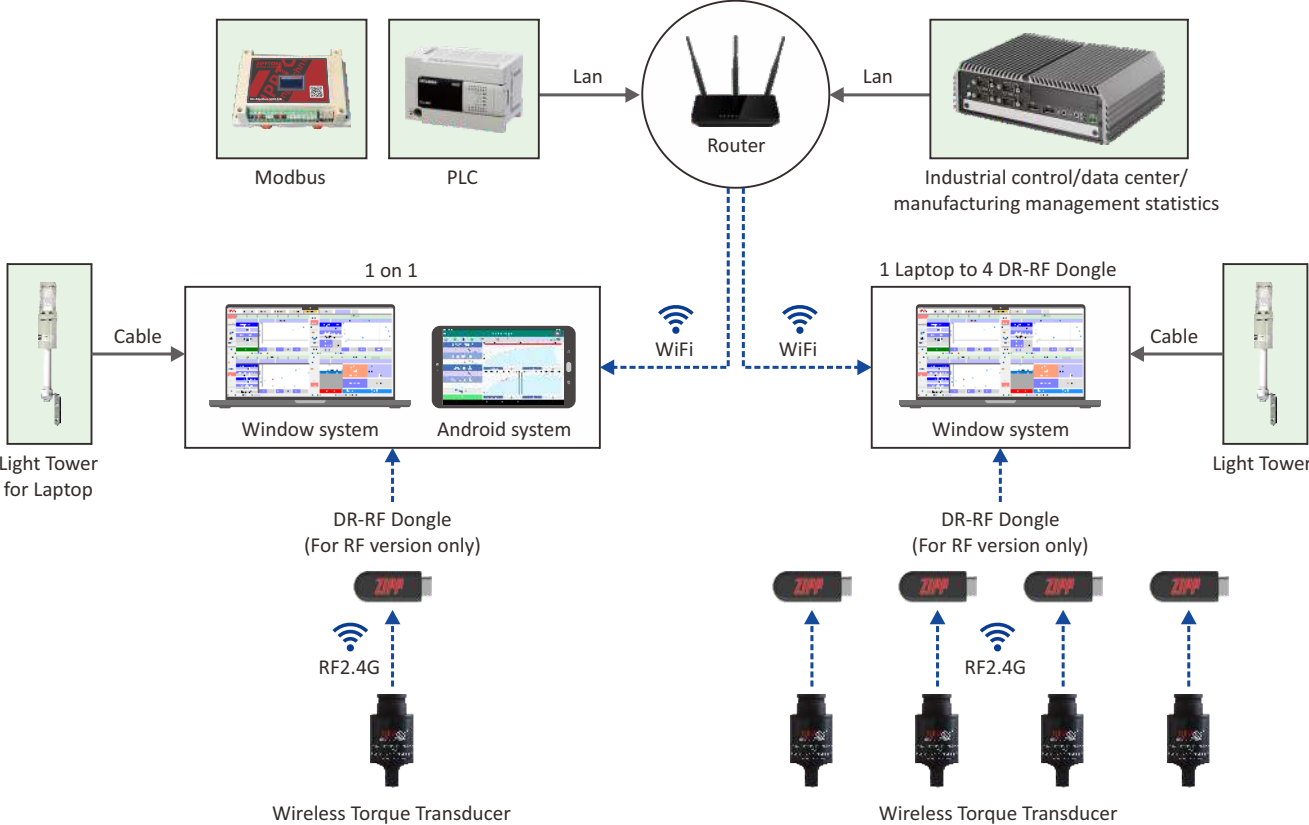
Note:

1. **WAD**: A **W**rist **A**lert **D**evice with vibration and buzz alert functions and a display of torque data to be installed on the operator's wrist.
2. **WAD** can be used as an auxiliary monitor for operators during bolting.
3. For items 2 and 3, the operator needs to release the trigger as soon as they feel the vibration, hear the buzz from the **WAD**, and see the display on the monitor.
4. **WAD** receives BT signals from the Transducer and transmits the data to peripheral devices as programmed.
5. The Listed **Transducers** above are all **BT** versions. For the **RF** version, a **DR-RF Dongle** is required to transmit the data from the **Transducer** to the laptop or tablet.
6. **Android** and **Windows** operation systems are available for options.

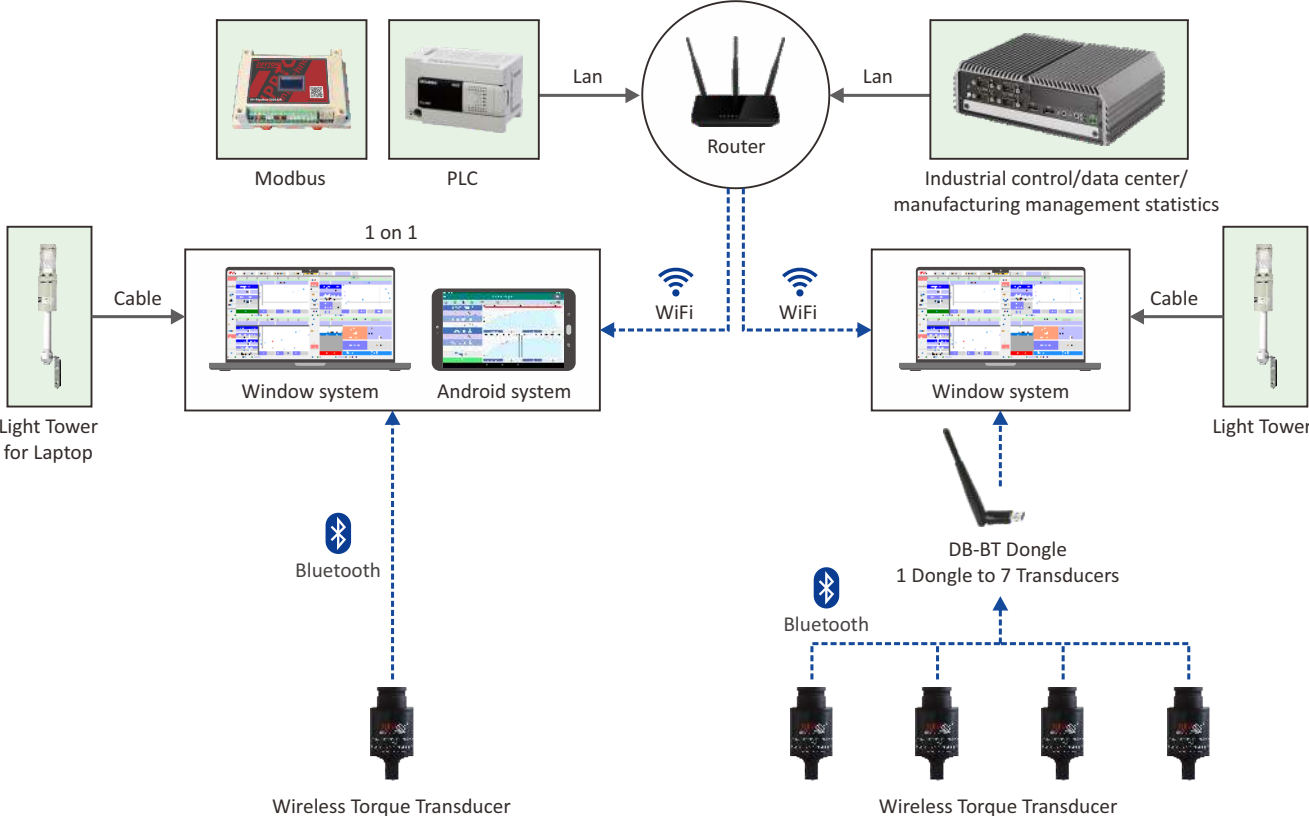
Application System Architecture



TMS Torque Monitoring System Application System Architecture (RF Version)



TMS Torque Monitoring System Application System Architecture (BT Version)

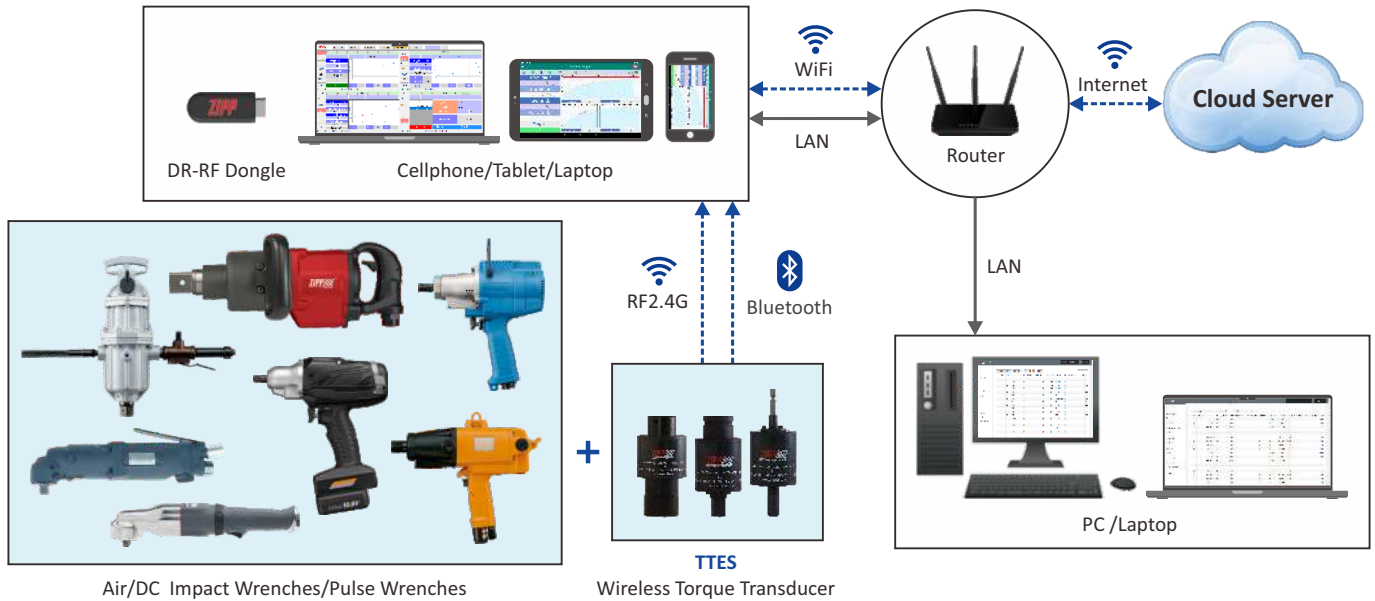


Application Embodiment

Bolting Torque Monitoring of Air /DC Impact Wrenches or Pulse Wrenches

Air/DC Impact Wrenches/Pulse Wrenches + **TTES wireless Torque Transducer** + **WAD** + Laptop,
 → WiFi → peripheral devices or Cloud Server

Torque control accuracy within $\pm 15\% \sim \pm 20\%$



Video Link ~ <https://tinyurl.com/mpteadxp>

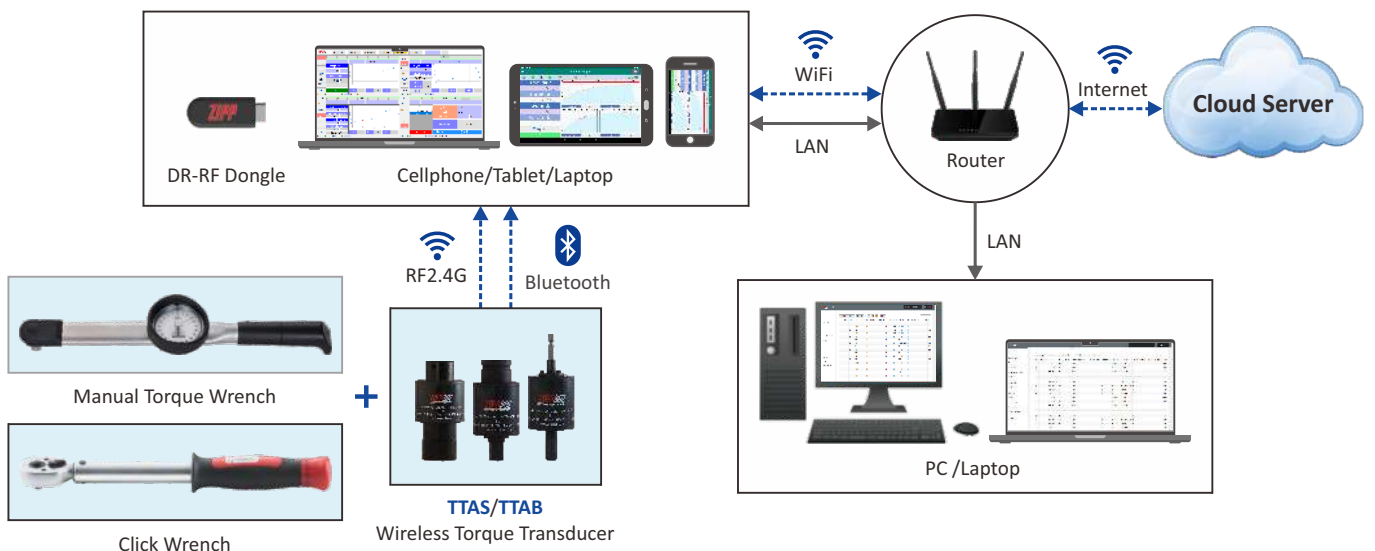
Video Link ~ <https://tinyurl.com/ycxs66wk>

Application Embodiment

Data Collection for Manual Torque Wrenches

Manual Torque Wrench /Click Wrench + **TTAS/TTAB wireless Rotary Type Torque Transducer** → RF 2.4G
 → **DR-RF Dongle** (For RF version only) + Tablet / Laptop (**Android APP/Windows software**)
 → WiFi → peripheral devices or Cloud Server

Torque control accuracy within $\pm 5\%$ or less, depending on the quality and stability
 of the tool used and the grip of the device during operation



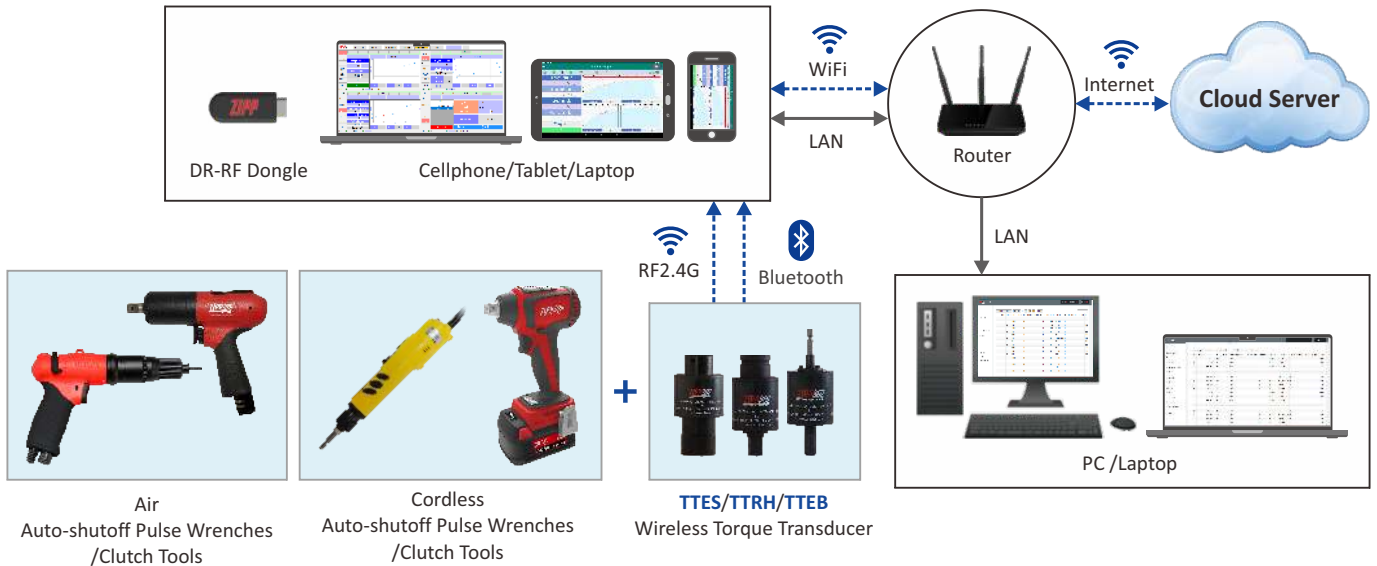
Video Link ~ <https://tinyurl.com/bdfrfx2>

Video Link ~ <https://tinyurl.com/ycxs66wk>

Application Embodiment

Monitoring bolting torque of clutch or Auto-shutoff Type Tool

Any Air or DC driven torque tool with the **clutch or auto-shutoff mechanism** + **TTES/TTEB wireless Rotary Torque Transducer** → RF 2.4G → **DR-RF Dongle** (For RF version only)
 + Tablet / Laptop (**Android APP/Windows software**) → WiFi → peripheral devices or Cloud Server
 Torque control accuracy within $\pm 5\%$ or less, depending on the quality and stability of the tool used and the grip posture of the device during operation



Video Link ~ <https://tinyurl.com/49nnbejy>

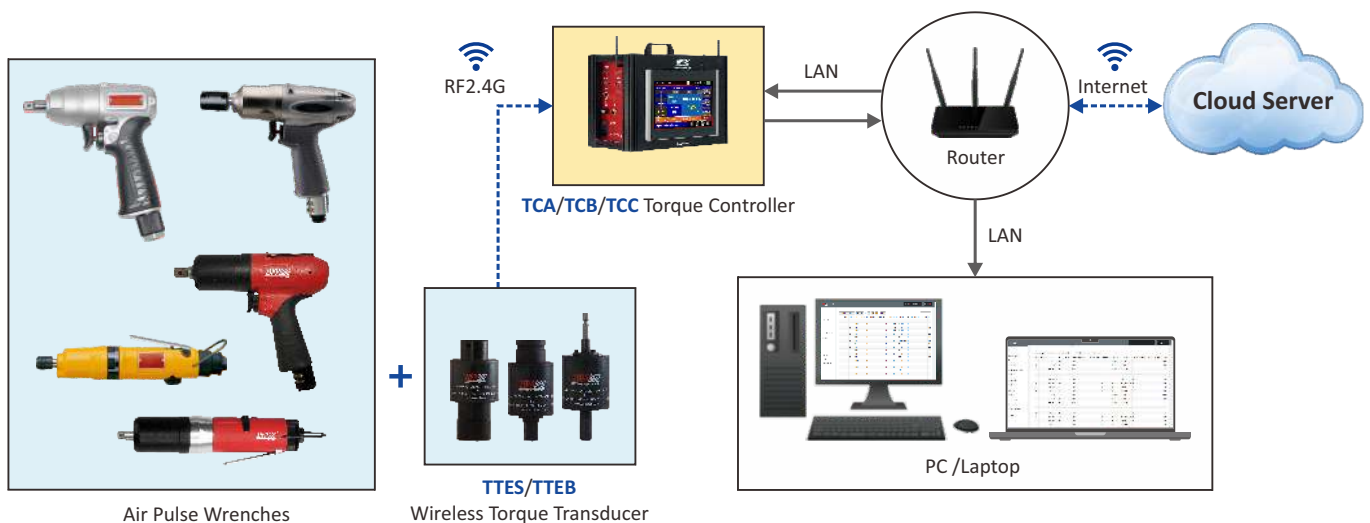
Video Link ~ <https://tinyurl.com/4rme8szx>

Application Embodiment

Bolting Torque Control of Air Pulse Wrenches

Air Pulse Wrenches + **TCA/TCB Torque Controller** + **TTES wireless Rotary Torque Transducer** + Laptop, under **Transducer Mode** → WiFi → peripheral devices or Cloud Server

Torque control accuracy within $\pm 5\% \sim \pm 10\%$

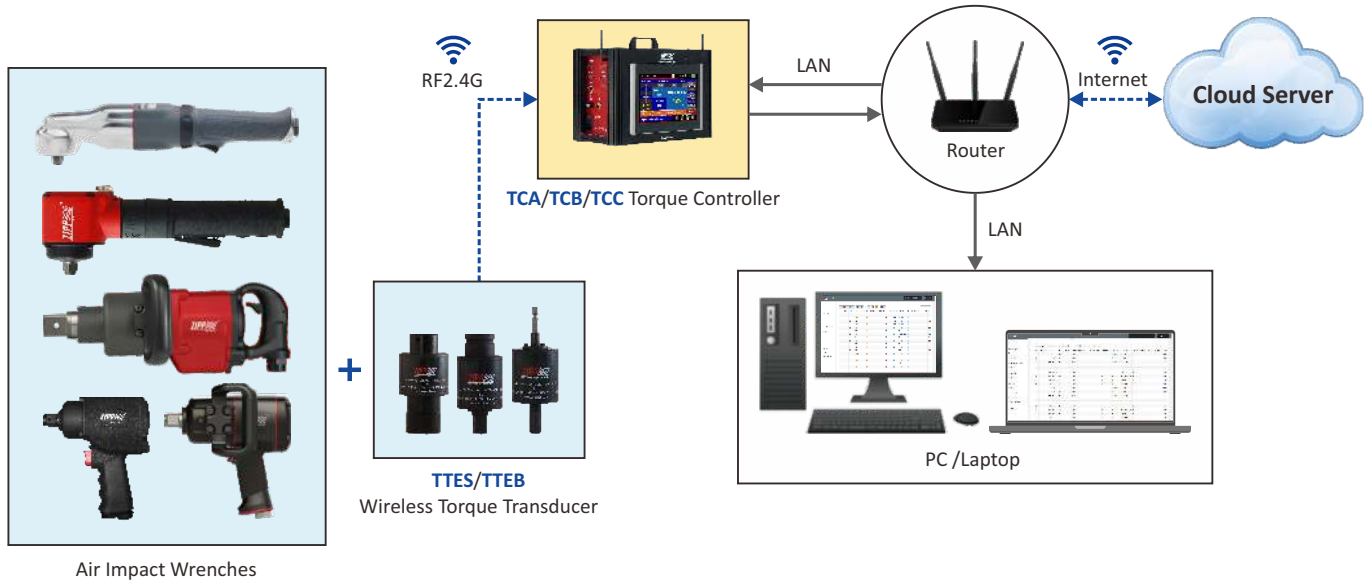


Video Link ~ <https://tinyurl.com/bdctdc4t>

Application Embodiment Bolting Torque Control of Air Impact Wrenches

Air Impact Wrenches + **TCA/TCB/TCC Torque Controller** + **TTES wireless Torque Transducer** + Laptop,
under **Transducer Mode** → WiFi → peripheral devices or Cloud Server

Torque control accuracy within $\pm 10\% \sim \pm 15\%$

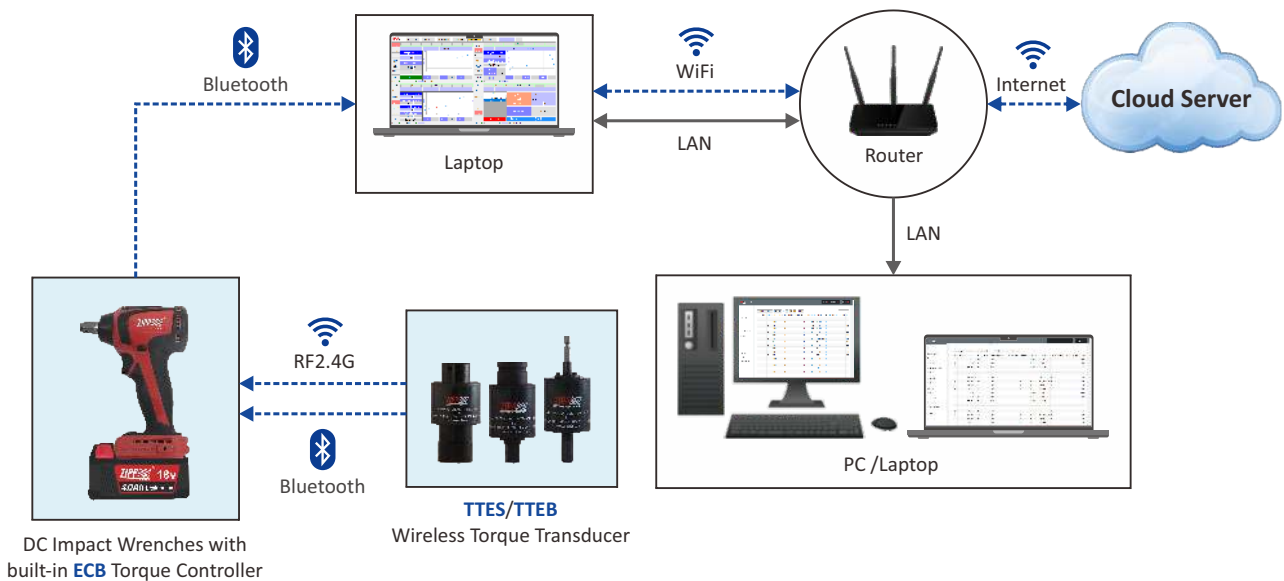


Video Link ~ <https://tinyurl.com/4yrvrufp>

Application Embodiment Bolting Torque Control of Cordless Pulse Wrenches

Cordless Pulse Wrench with **built-in ECB Controller** + Laptop, under **Transducer Mode**
→ WiFi → peripheral devices or Cloud Server

Torque control accuracy within $\pm 5\% \sim \pm 10\%$



Video Link ~ <https://tinyurl.com/mt7p79fb>

Features

Unique wireless and anti-vibration design / Cost-Effective Solutions /
Easy set-up in minutes / Data collection for traceability /
Digitalize conventional "Interchangeable Head Torque Wrenches" for smart bolting

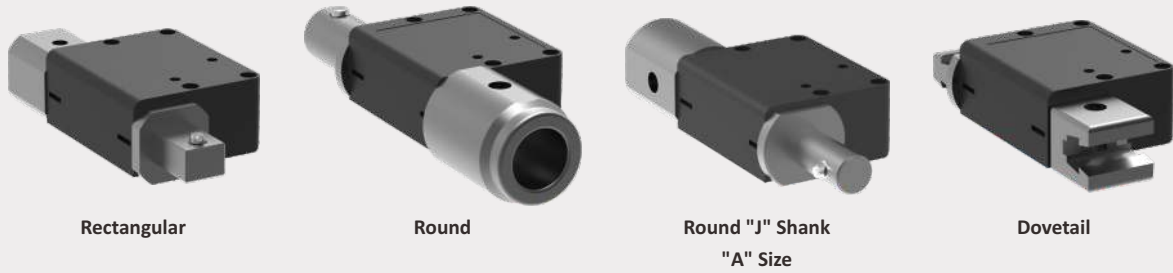
ZIPPTORK presents a series of torque-sensing device features with wireless transmission and a patented anti-vibration design for accurate static and dynamic torque measurement, validation, and audits of all continuous and discrete type torque tools. These devices have proven to perform reliably in applications worldwide.

- The swing-type series is designed for mounting between the interchangeable head torque wrenches and the correspondent type of heads, controlling the threaded fasteners' bolting torque and angular movement.
- Both ends of the Transducer can be custom-made to accommodate various types of Head structures, such as European DIN Rectangular Type, Spigot Type, Dovetail Type of Sturtevant Richmond, Round Type of Stanley-Proto, Snap-on-CDI, UTICA, Tone and Tohnichi, etc., or any combination.
- Making it possible to control the torque and collect data of any "Interchangeable Head Torque Wrench"
- Flexibility to expand the use of "Interchangeable Head Torque Wrench" with other structure types of heads.
- Patented design with wireless transmission for an easy adapt or upgrade between various types of "Interchangeable Head Torque Wrench" and the heads
- Easy-to-use torque tester, torque transducer, and angle gauge for torque and angle calibration
- Laptop or tablet for setting, torque calibration, and data collection
- It's required to do calibration again once any head, the STA transducer, or the wrench is replaced to ensure the accuracy of torque, angle sensing, and control.
- After changing any of the heads, the STA, or the wrench and re-calibrating it, a new indication is prompted for easy scale adjustment while making audible clicks visible and torque data collectible.
- A special tool kit to have one swing-type torque transducer converted to several torque capacity torque tools with a correspondent size of extension bar is available for option.
- Customized sizes are acceptable.

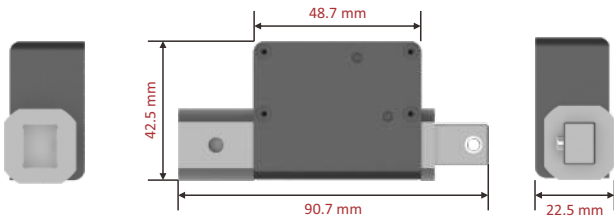


STA Type / Size & Photos-Dimensions shown below are for torque capacity under 120 NM only

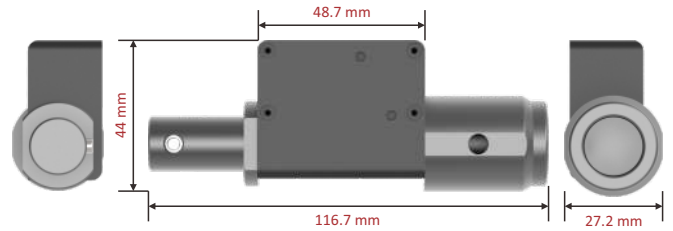
Standard Type



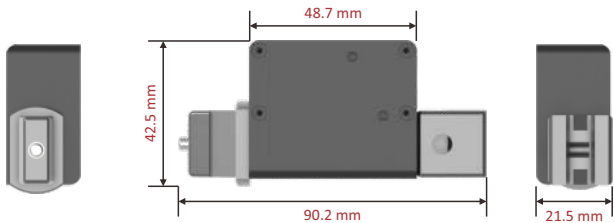
Rectangular- 9 x 12mm



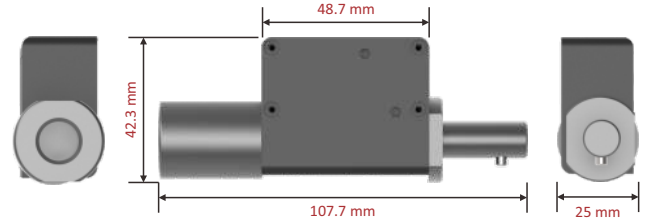
Round-16mm Dia.



Dovetail-S



Round 'J' Shank-0.425"



Hybrid Type

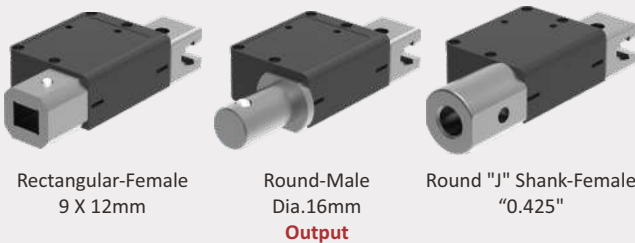
Input-Rectangular Male-9 X 12mm



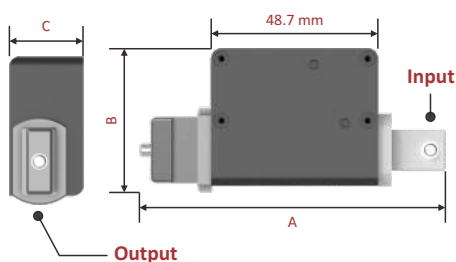
Input-Round Female-Dia.16mm



Input-Dovetail Female




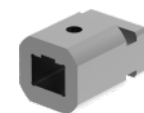
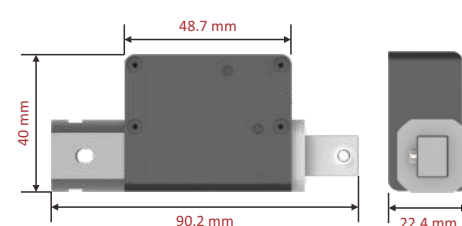
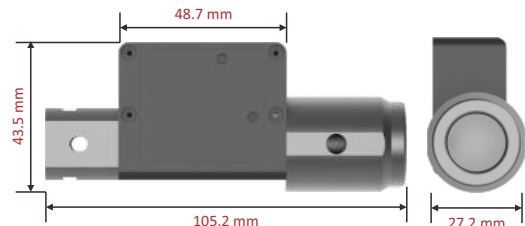

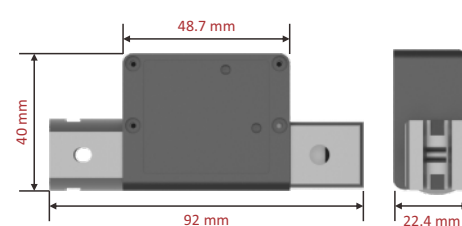
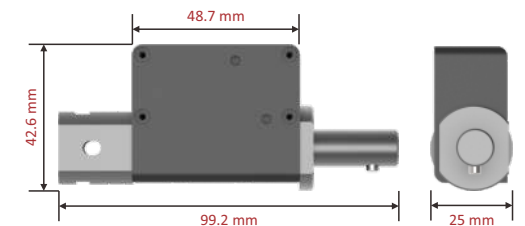

Input-Round 'J' Shank Male-0.425"



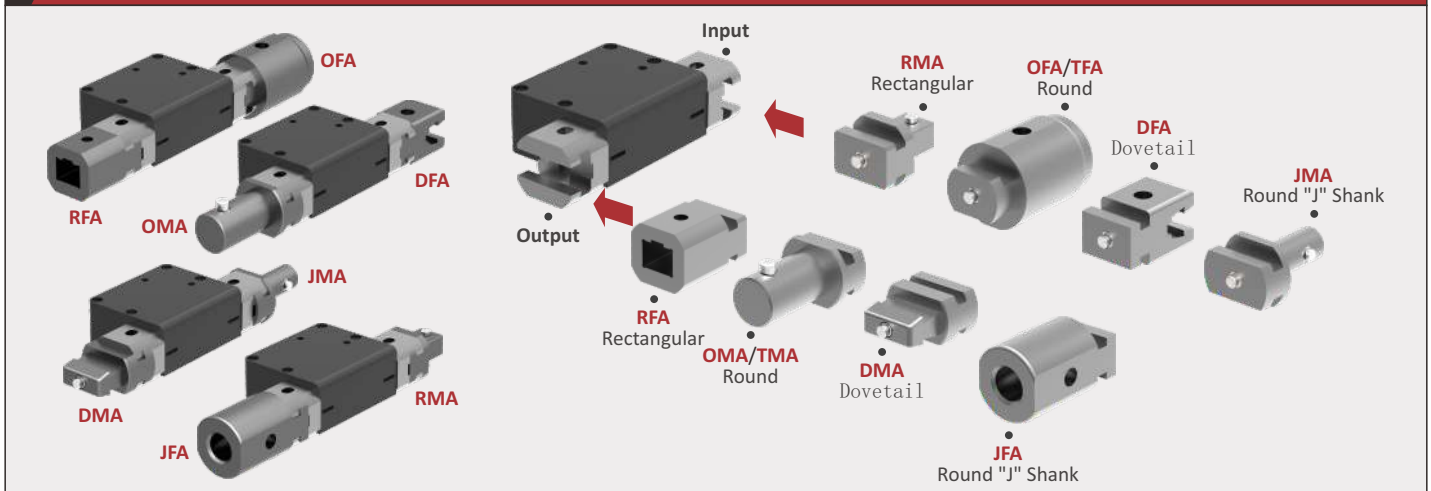
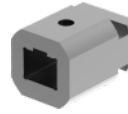

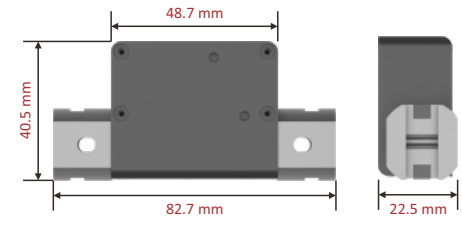






Input-Rectangular Male- 9 X 12mm				Input-Round Female Dia.16mm			
Output	A	B	C	Output	A	B	C
Round	100.7mm	42.5mm	22.4mm	Rectangular	100.7mm	44mm	28mm
Dovetail	90.1mm	42mm	22.4mm	Dovetail	100.2mm	44mm	28mm
Round 'J' Shank	99.7mm	44mm	27.9mm	Round 'J' Shank	108.7mm	44mm	27.9mm
Input-Dovetail Female				Input-Round Male "0.425" 'J' Shank			
Output	A	B	C	Output	A	B	C
Rectangular	91.2mm	40mm	21.5mm	Rectangular	99.7mm	42.5mm	22.5mm
Round	101.2mm	42.5mm	22.5mm	Round	109.7mm	42.5mm	22.5mm
Round 'J' Shank	99.2mm	44mm	27.9mm	Dovetail	98.2mm	42.5mm	22.5mm

STA Type / Size & Photos-Dimensions shown below are for torque capacity under 120 NM only

Versatile Type-Input End Standard + Output End with Adaptor Head

 <p>Rectangular Round Dovetail Round "J" Shank</p> <p>RFA DMA OMA JFA</p>		
<p>Output Head Adaptor</p> <p>RFA-Rectangular Female</p> 	<p>Input RM-Rectangular Male</p>  <p>48.7 mm 40 mm 90.2 mm 22.4 mm</p>	<p>Input OF-Round Female</p>  <p>48.7 mm 43.5 mm 105.2 mm 27.2 mm</p>
<p>OMA-Round Male</p> 	<p>Input DF-Dovetail Female</p>  <p>48.7 mm 40 mm 92 mm 22.4 mm</p>	<p>Input OM-Round "J" Shank Male</p>  <p>48.7 mm 42.6 mm 99.2 mm 25 mm</p>
<p>DMA-Dovetail Male</p> 		

Combo Type- Both Ends with Adaptor Head for adapting Head Adaptors

 <p>Input</p> <p>Output</p> <p>RFA Rectangular</p> <p>OMA/TMA Round</p> <p>DMA Dovetail</p> <p>JFA Round "J" Shank</p> <p>RMA Rectangular</p> <p>OFA/TFA Round</p> <p>DFA Dovetail</p> <p>JMA Round "J" Shank</p>		
<p>Output End Head Adaptor</p> <p>RFA-Rectangular</p>  <p>OMA/TMA-Round</p> 	 <p>48.7 mm 40.5 mm 82.7 mm 22.5 mm</p>	<p>Input End Head Adaptor</p> <p>RMA-Rectangular</p>  <p>OFA/TFA-Round</p> 
<p>DMA-Dovetail</p>  <p>JFA-Round "J" Shank</p> 		<p>DFA-Dovetail</p>  <p>JMA-Round "J" Shank</p> 

Standard Type / Hybrid Type

RM = Rectangular Male
 OF = Round Female
 TF = Tohnichi Female
 JM = Round "J" Shank Male
 DF = Dovetail Female

0005 = 0.5~5(Nm) 0300 = 30~300(Nm)
 0010 = 1~10(Nm) 0500 = 50~500(Nm)
 0050 = 5~50(Nm) 0600 = 60~600(Nm)
 0100 = 10~100(Nm) 0800 = 80~800(Nm)
 0120 = 12~120(Nm) 1200 = 120~1200(Nm)
 0200 = 20~200(Nm)

RF = Rectangular Female
 OM = Round Male
 TM = Tohnichi Male
 JF = Round "J" Shank Female
 DM = Dovetail Male



RM / RF Size	OF / OM Size	TF / TM Size			JM / JF Size	DF / DM Size
1 = 9x12 mm	1 = 16 mm	1 = 6mm	5 = 15mm	9 = 32mm	1 = 0.425"	1 = Small
2 = 14x18 mm	2 = 22 mm	2 = 8mm	6 = 19mm		2 = 0.56"	2 = Medium
3 = 24x32 mm	3 = 28 mm	3 = 10mm	7 = 22mm		3 = 0.735"	3 = Large
4 = 27x38 mm	4 = 32 mm	4 = 12mm	8 = 27mm		4 = 0.99"	

Versatile Type

RM = Rectangular Male
 OF = Round Female
 TF = Tohnichi Female
 JM = Round "J" Shank Male
 DF = Dovetail Female

0005 = 0.5~5(Nm) 0300 = 30~300(Nm)
 0010 = 1~10(Nm) 0500 = 50~500(Nm)
 0050 = 5~50(Nm) 0600 = 60~600(Nm)
 0100 = 10~100(Nm) 0800 = 80~800(Nm)
 0120 = 12~120(Nm) 1200 = 120~1200(Nm)
 0200 = 20~200(Nm)

AH-(Adaptor Head)
 For adapting correspondent type of Head Adaptor
 RFA / OMA / JFA / DMA, etc.



RM Size	OF Size	TF Size			JM Size	DF Size
1 = 9x12 mm	1 = 16 mm	1 = 6mm	5 = 15mm	9 = 32mm	1 = 0.425"	1 = Small
2 = 14x18 mm	2 = 22 mm	2 = 8mm	6 = 19mm		2 = 0.56"	2 = Medium
3 = 24x32 mm	3 = 28 mm	3 = 10mm	7 = 22mm		3 = 0.735"	3 = Large
4 = 27x38 mm	4 = 32 mm	4 = 12mm	8 = 27mm		4 = 0.99"	

Combo Type

AH- (Adaptor Head)
 For adapting correspondent type of Head Adaptor
 RMA / OFA / JMA / DFA, etc.

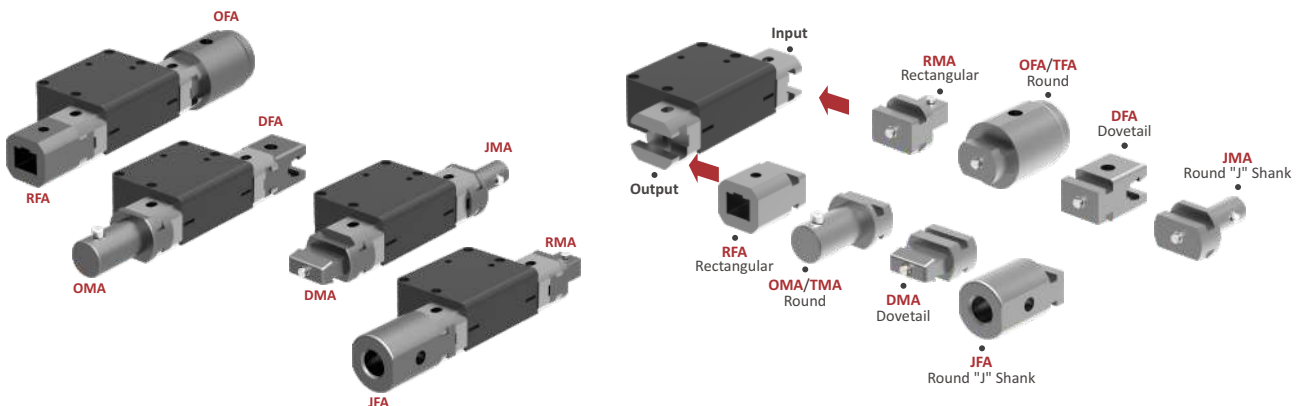
AH-(Adaptor Head)
 For adapting correspondent type of Head Adaptor
 RFA / OMA / JFA / DMA, etc.



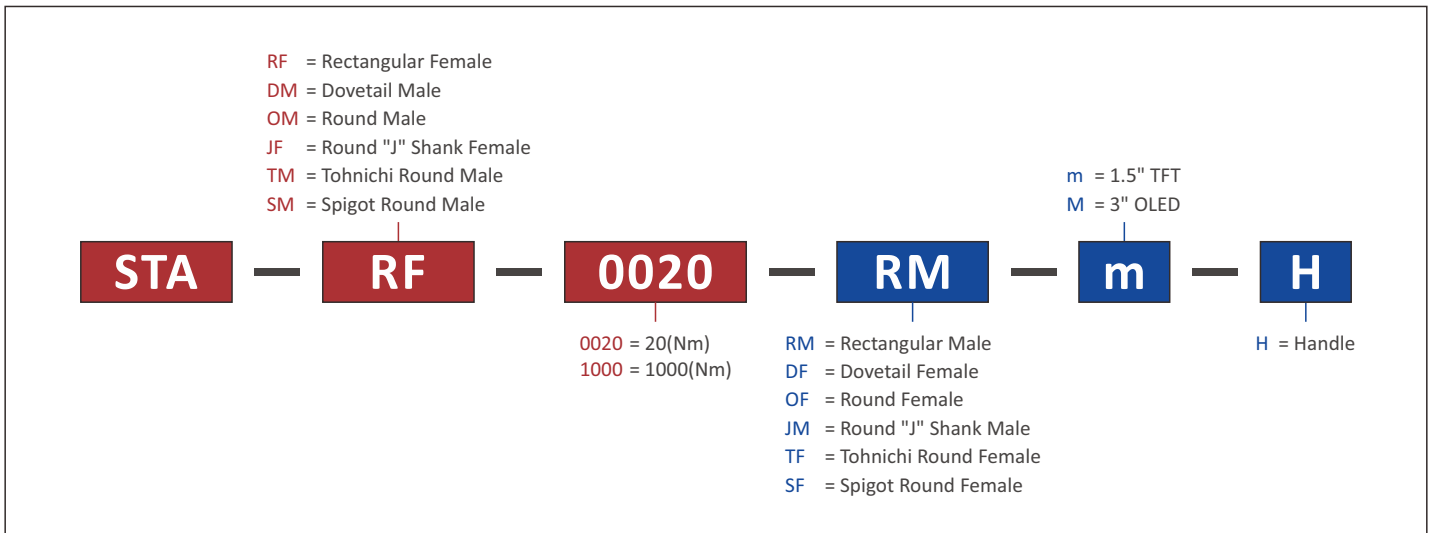
0005 = 0.5~5(Nm) 0100 = 10~100(Nm) 0300 = 30~300(Nm) 0800 = 80~800(Nm)
 0010 = 1~10(Nm) 0120 = 12~120(Nm) 0500 = 50~500(Nm) 1200 = 120~1200(Nm)
 0050 = 5~50(Nm) 0200 = 20~200(Nm) 0600 = 60~600(Nm)

AH

Any input Head Adaptor (RMA / OFA / JMA / DFA) + Sensor Body with Adaptor Head on both ends + Any output Head Adaptor (RFA / OMA / JFA / DMA) + Correspondent type of HEADS



Coding of Tool Kits of STA and Handle with Extension Bars

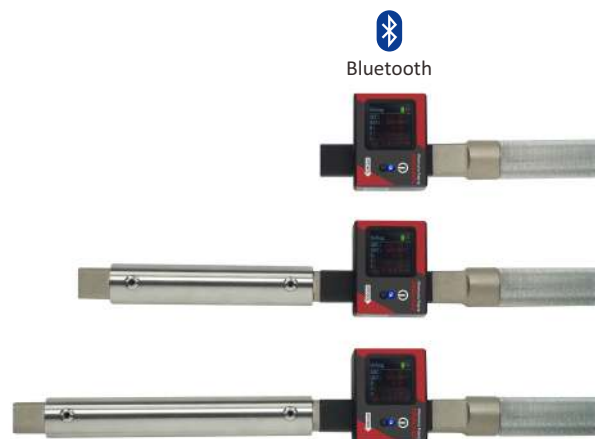


Coding of Head Adaptor

- RF-DM ~ for converting Rectangular Female to Dovetail Male
- RF-OM ~ for converting Rectangular Female to Round Male
- RF-JF ~ for converting Rectangular Female to "J" Shank Female
- RF-TM ~ for converting Rectangular Female to Tohnichi Round Male
- RF-SM ~ for converting Rectangular Female to Spigot Round Male

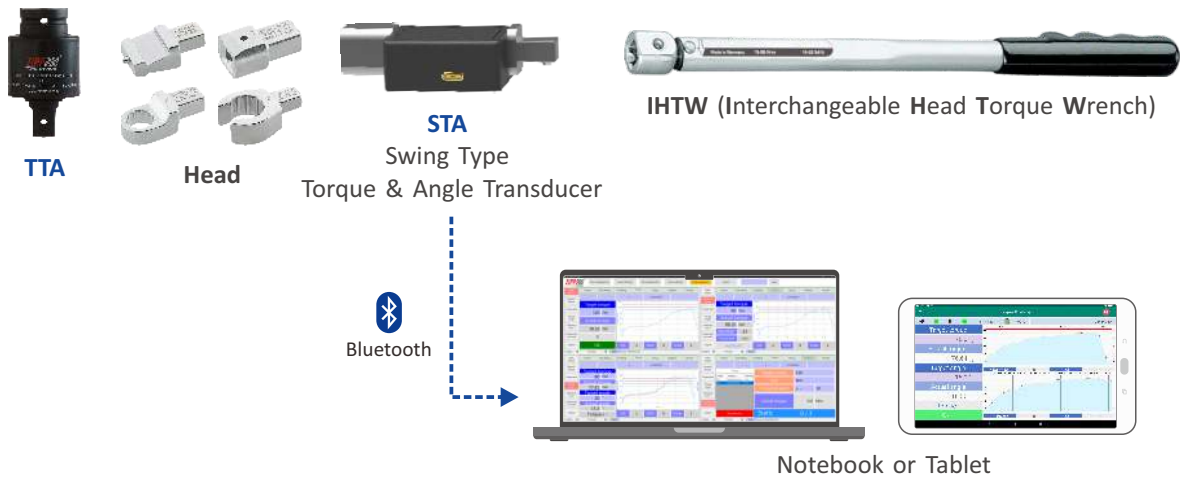
Tool Kit, includes one set of STA-m and Handle with REB-85 & REB-120 Extension Bars. Only BT Version Available

- STA-RF-0020-RM-m-H for 20Nm Torque Capacity
- STA-RF-0020-RM-m-H+ REB-85 for converting to 85Nm Torque Capacity
- STA-RF-0020-RM-m-H+ REB-120 for converting to 120Nm Torque Capacity

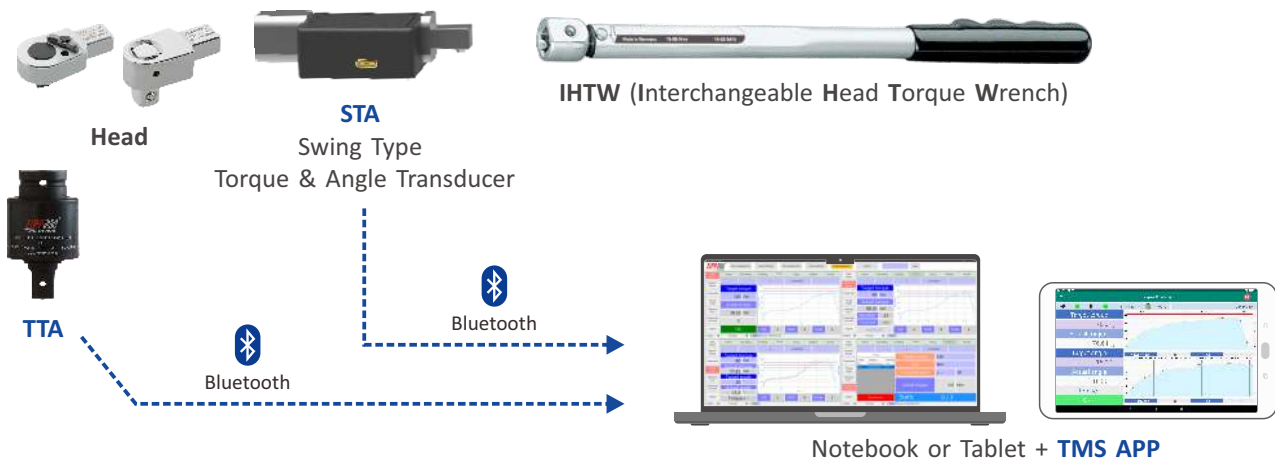


STA (BT version)-Torque & Angle Calibration

What are required



System Architecture

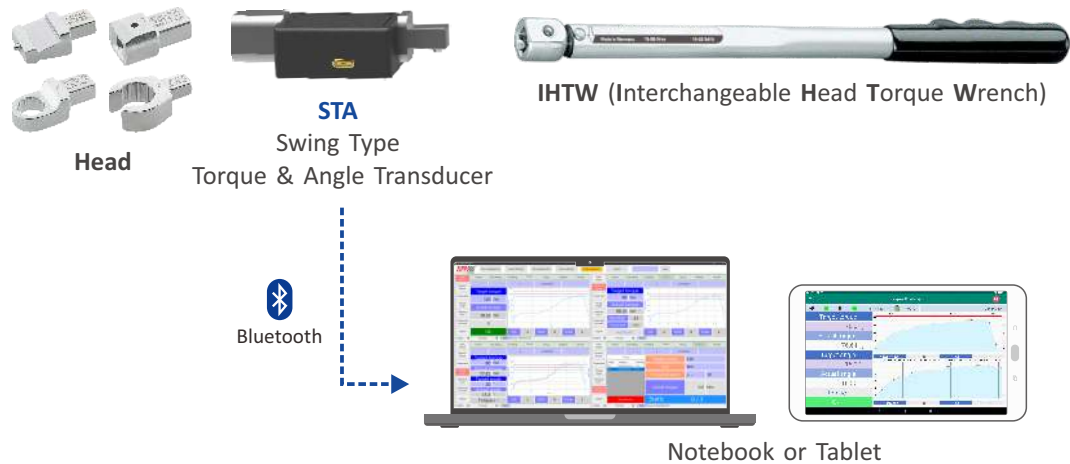


Procedures

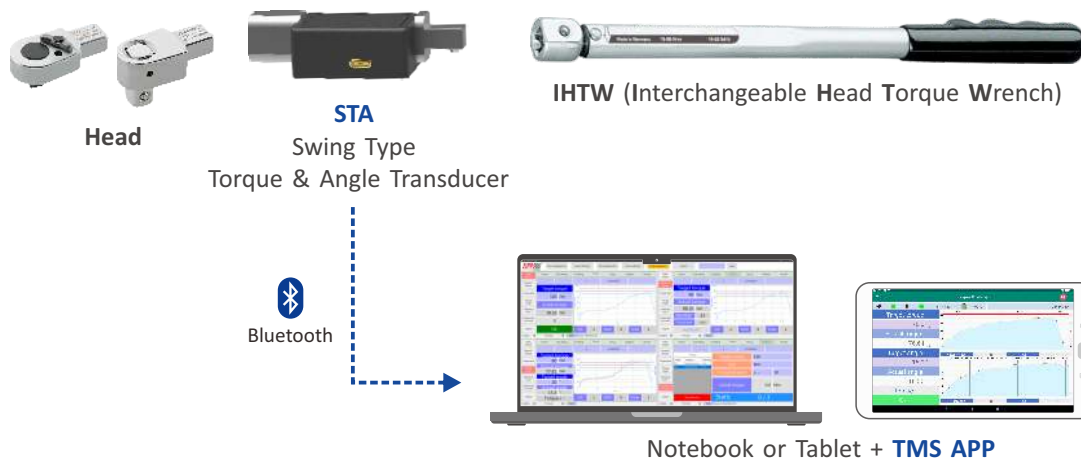
1. Assemble the **HEAD** with **STA** & Interchangeable Head Torque Wrench.
2. Open **TMS APP** software.
3. Complete the pairing of **TTA** and **STA** respectively, after setting, turn on the **TTA** and **STA**.
4. Continue to press the "Torque Correction" button to enter the "Torque Correction" page.
5. Select the **STA** mode in **TMS APP** to enter the setting page and select the **STA** model you want to use.
6. In **TMS APP**, select **STA** mode to enter the setting page and select the **TTA** model you want to use.
7. Press the "Add" button and enter the tool combination number & name, Head number and torque wrench number
The system automatically catches the **STA** number in the connection.
8. Set the target torque.
9. Insert the assembled **STA** wrench into the **TTA**, then continue to attach the socket and start to tighten the bolt.
10. Stop tightening when the **TTA** indicates that the target torque has been reached.
11. The system automatically fills the static torque value of **TTA** and **STA** into the corresponding form field in the software to complete the torque calibration.
12. After the system completes the correction of the torque value, the operator needs to measure the length of the torque arm and fill in the angle parameter, then press the "Save" button to complete the angle calibration.

STA (BT version)-Torque Control

What are required



System Architecture

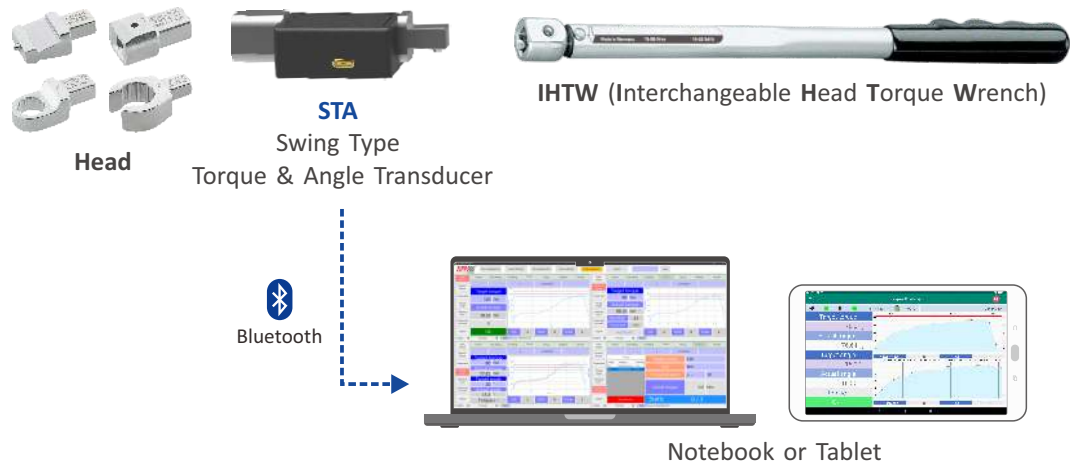


Procedures

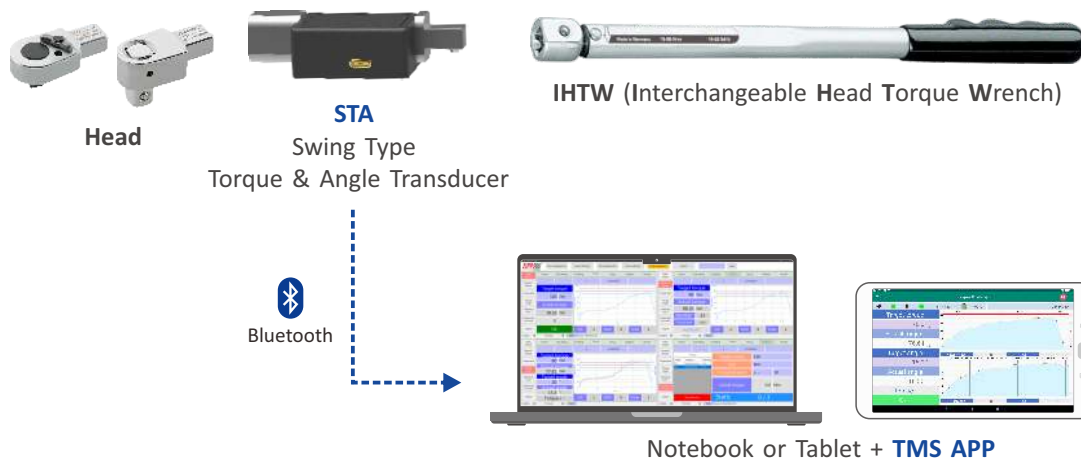
1. Open the **TMS** software.
2. Enter the **STA** mode and then press the "Setup" button to enter the "Setup" page.
3. Select the combination code.
4. Please follow the combination shown in the tool combination code to complete the assembly (head with **STA** and interchangeable head wrench) in order.
5. Turn on the **STA** transducer power.
6. Select the **STA** transducer you want to use (should be the same as the tool combination setting).
7. Select the working mode <torque>.
8. Set the inspection conditions and accuracy.
9. Return to the work page.
10. Set the final target torque.
11. Start bolting.
12. Release the **STA** after bolting to the target torque prompted by the system.
13. QC judgment.
14. System complete on work record (operator ID, date & time, target torque, actual torque, accuracy and tool combination code).

STA (BT version)-Torque & Angle Control

What are required



System Architecture

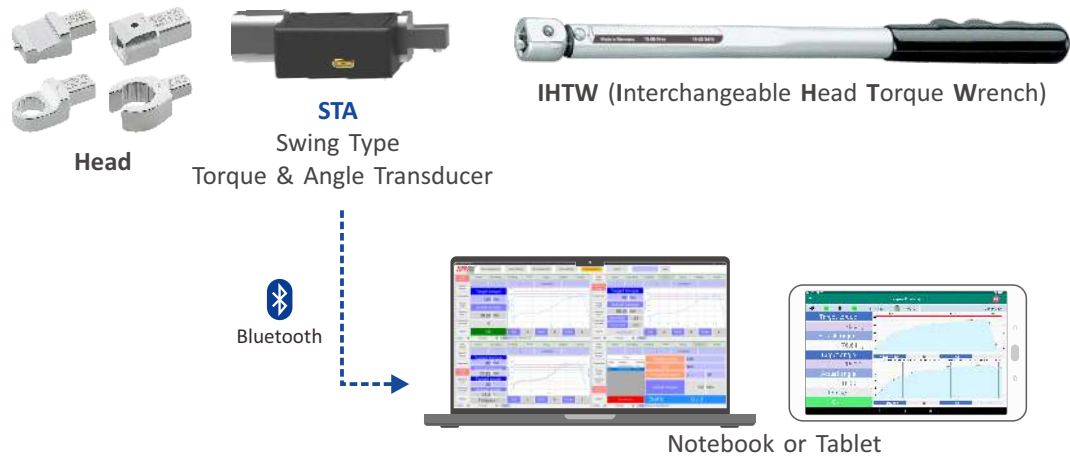


Procedures

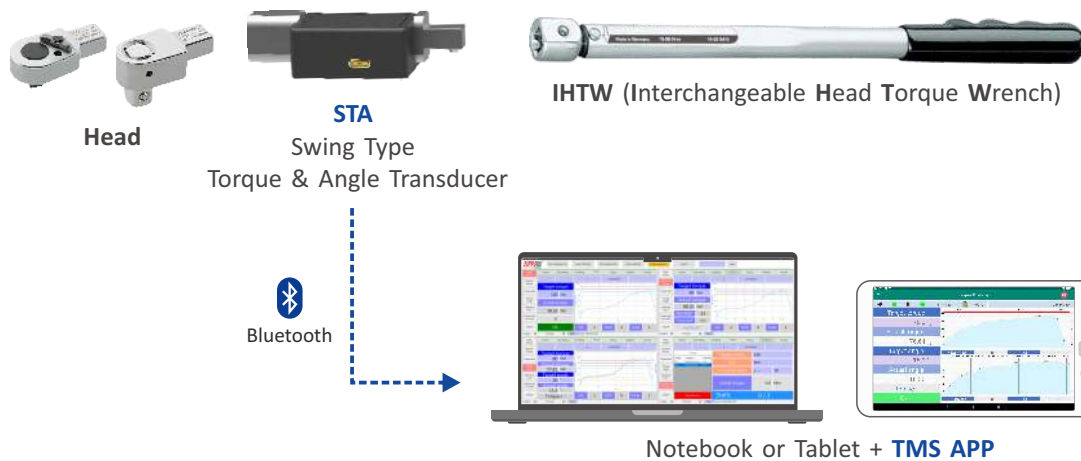
1. Open the **TMS** software.
2. Enter the **STA** mode and then press the "Setup" button to enter the "Setup" page.
3. Select the combination code.
4. Please follow the combination shown in the tool combination code to complete the tool combination (headset with **STA** and interchangeable head torque wrench) in order.
5. Turn on the **STA** transducer power.
6. Select the **STA** transducer you want to use (the same tool combination setting is required).
7. Select the working mode <Torque + Angle>.
8. Set the inspection conditions and accuracy.
9. Return to the work page.
10. Set the initial target torque.
11. Set the final target torque.
12. Set the target angle.
13. Start bolting.
14. Release the **STA** after bolting to the target torque prompted by the system.
15. Start bolting again and release **STA** after reaching the target angle.
16. QC judgment.
17. The system completes the work record (operator ID, date & time, target torque, actual torque, QC result and tool combination code).

STA (BT version)-Residual Torque Verification

What are required



System Architecture



Procedures

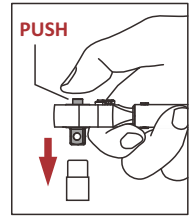
1. Open the **TMS** software.
2. Enter the **STA** mode and then press the "Setup" button to enter the "Setup" page.
3. Select the combination code.
4. Follow the combination shown in the tool combination code to complete the tool combination (head with **STA** and the wrench)
5. Turn on the **STA** transducer.
6. Select the **STA** transducer you want to use (To be the same tool combination setting).
7. Select the working mode <**Torque Verification**>.
8. Set the inspection conditions and accuracy.
9. Return to work page.
10. Set the target torque.
11. Set the target angle.
12. Start inspection.
13. Loosen the **STA** after tightening to the target angle prompted by the system.
14. QC judgment.
15. System complete with work record (operator ID, date & time target torque, actual torque, inspection conditions & accuracy and tool combination code).

Adjustable Torque Wrench, Window Scale Type



ZCW15N & 30N
ZCW150i & 250i

Quick release button design.
Push the button to release
socket.

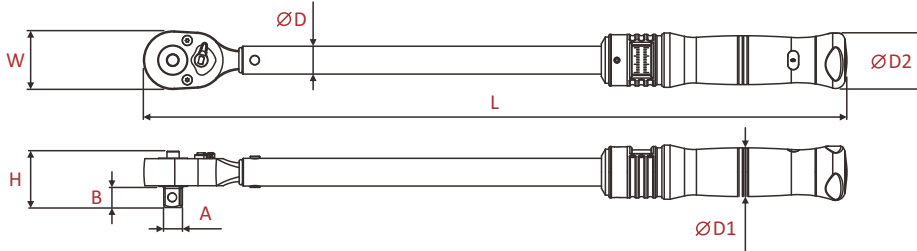
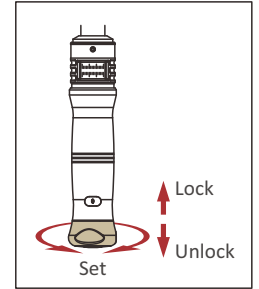


Main scale Graduation scale
Other series

ZCW1500N & 2000N
ZCW1000F & 1500F



ZCW3000N
ZCW2000F



Specification Metric

Accuracy : c.w. ±4% / c.c.w. ±6%

ITEM NO.	⊙ A	Range	سسلس	W	H	B	L	ØD	ØD1	ØD2	KG	Packing
ZCW15N2	1/4"	3-15 Nm	0.4 Nm	28.5	24.0	7.6	202	16.0	25.7	26.2	0.27	30 pcs/CTN
ZCW30N2	1/4"	6-30 Nm	0.4 Nm	28.5	20.2	7.4	300	16.0	21.5	34.1	0.30	20 pcs/CTN
ZCW60N3	3/8"	10-60 Nm	0.5 Nm	36.9	32.3	11.0	420	20.5	38.0	34.1	1.07	10 pcs/CTN
ZCW100N3	3/8"	20-100 Nm	0.5 Nm	36.9	32.3	11.0	460	20.5	38.0	34.1	1.14	10 pcs/CTN
ZCW200N4	1/2"	40-200 Nm	1 Nm	43.9	40.3	15.6	515	20.5	35.5	40.0	1.36	10 pcs/CTN
ZCW320N4	1/2"	60-320 Nm	2 Nm	43.9	40.3	15.2	585	22.0	35.5	40.0	1.69	6 pcs/CTN
ZCW500N6	3/4"	100-500 Nm	4 Nm	64.4	55.0	24.0	820	27.7	35.5	40.0	3.65	4 pcs/CTN
ZCW800N6	3/4"	100-800 Nm	5 Nm	64.4	55.0	24.0	1110	32.1	35.5	40.0	5.48	2 pcs/CTN
ZCW1000N6	3/4"	200-1000 Nm	5 Nm	64.4	54.0	23.1	1334	32.1	35.5	40.0	6.30	1 pcs/CTN
ZCW1000N8	1"	200-1000 Nm	5 Nm	64.4	60.4	30.7	1334	32.1	35.5	40.0	6.30	1 pcs/CTN
ZCW1500N6	3/4"	300-1500 Nm	10 Nm	65.8	57.0	24.6	1704	33.1	35.5	40.0	11.87	1 pcs/CTN
ZCW1500N8	1"	300-1500 Nm	10 Nm	79.7	66.8	29.8	1704	33.1	35.5	40.0	11.87	1 pcs/CTN
ZCW2000N8	1"	400-2000 Nm	10 Nm	79.7	66.8	27.8	2160	38.2	35.5	40.0	13.78	1 pcs/CTN
ZCW3000N9	1-1/2"	600-3000 Nm	20 Nm	68.2	107.9	38.1	3330	33.1	35.5	40.0	23.00	1 pcs/CTN

Specification SAE

Unit:mm

ITEM NO.	⊙ A	Range	سسلس	W	H	B	L	ØD	ØD1	ØD2	KG	Packing
ZCW150i2	1/4"	30-150 in.lb	2 in.lb	28.5	24.0	7.6	202	16.0	25.7	26.2	0.27	30 pcs/CTN
ZCW250i2	1/4"	50-250 in.lb	5 in.lb	28.5	20.2	7.4	300	16.0	21.5	34.1	0.30	20 pcs/CTN
ZCW45F3	3/8"	10-45 ft.lb	0.5 ft.lb	36.9	32.3	11.0	420	20.5	38.0	34.1	1.07	10 pcs/CTN
ZCW75F3	3/8"	15-75 ft.lb	0.5 ft.lb	36.9	32.3	11.0	460	20.5	38.0	34.1	1.14	10 pcs/CTN
ZCW150F4	1/2"	30-150 ft.lb	1 ft.lb	43.9	40.3	15.6	515	20.5	35.5	40.0	1.36	10 pcs/CTN
ZCW230F4	1/2"	50-230 ft.lb	2 ft.lb	43.9	40.3	15.2	585	22.0	35.5	40.0	1.69	6 pcs/CTN
ZCW300F6	3/4"	50-300 ft.lb	2.5 ft.lb	64.4	55.0	24.0	820	27.7	35.5	40.0	3.65	4 pcs/CTN
ZCW600F6	3/4"	100-600 ft.lb	5 ft.lb	64.4	55.0	24.0	1110	32.1	35.5	40.0	5.48	2 pcs/CTN
ZCW700F6	3/4"	100-700 ft.lb	5 ft.lb	64.4	54.0	23.1	1334	32.1	35.5	40.0	6.30	1 pcs/CTN
ZCW700F8	1"	100-700 ft.lb	5 ft.lb	64.4	60.4	30.7	1334	32.1	35.5	40.0	6.30	1 pcs/CTN
ZCW1000F6	3/4"	200-1000 ft.lb	10 ft.lb	65.8	57.0	24.6	1704	33.1	35.5	40.0	11.87	1 pcs/CTN
ZCW1000F8	1"	200-1000 ft.lb	10 ft.lb	79.7	66.8	29.8	1704	33.1	35.5	40.0	11.87	1 pcs/CTN
ZCW1500F8	1"	300-1500 ft.lb	20 ft.lb	79.7	66.8	27.8	2160	38.2	35.5	40.0	13.78	1 pcs/CTN
ZCW2000F9	1-1/2"	400-2000 ft.lb	20 ft.lb	68.2	107.9	38.1	3330	33.1	35.5	40.0	23.00	1 pcs/CTN

Common problems & solutions of bolting works

Item	Problems	Solutions
1	Hard to control the target torque accuracy due to the hydraulic fluid temperature rise in pulse tool which causes the torque to decline and torque created by uncontrollable air impact wrench mechanism which causes a considerably strong vibration during intermittent operation	Take advantage of ZIPPTORK Torque Controller-TCA/TCB & Wireless Rotary Torque Transducer-TTES , the sensed torque and angle signal will be transmitted from the TTE to TCA/TCB simultaneously and wirelessly while controlled by the patented control device and algorithm to effectively control any air driven impact or oil pulse tool with satisfactory control accuracy within $\pm 5\% \sim \pm 15\%$
2	Bolt joints characteristics - hard or soft joint, cause unstable torque controllability	The patented control algorithm and device on Torque Controller-TCA/TCB will compensate the dynamic torque loss automatically to allow it to achieve the target torque range
3	The torque control accuracy is always affected by the tool impact mechanism and the posture of how the operator holds the tool during operation	The closed-loop control and patented control algorithm enables the Torque Controller-TCA/TCB to control the torque accuracy effectively regardless of the tool brand and impact mechanism as well as the holding posture of the operator
4	The operator didn't follow the bolting sequence to fasten the bolts and led to uneven clamping force on the joints	Use the Torque Controller-TCA/TCB and the Torque Sensing and Transmitting Socket-TTER/TSSR along with the Tagged Bolt-TB or Sensing Bolt-SB , the bolting sequence and stage of bolting can be programmed in advance, not only the operator has to obey the bolting sequence, but also the torque can be appropriately controlled at each stage. The bolting data can also be recorded for traceability to verify the responsibility of fastened joints to ensure the highest quality and reliability of bolting
5	The torque controller needs to be paired with specific torque tool	TCA/TCB applies to any air driven torque tool regardless of the brand and its mechanism

Bolting Issues with Power Torque Tools

Q&A

- **How to control the output torque of an impact wrench?**

ZIPP's Torque Controller~TCA/TCB + Wireless Rotary Torque Transducer~TTES with the patented control apparatus and algorithm will enable you to control oil Pulse tools torque within $\pm 5\sim 10\%$ accuracy and $\pm 10\sim 15\%$ for air impact wrenches.

- **How to do the bolting sequence control & tighten the bolt in several runs?**

With the programmable **Torque Controller~TCA/TCB + Wireless Rotary Torque Sensing and Transmitting Socket~TTER + Tagged Bolt~TB**, not only the bolting sequence, but also the torque to be applied within several runs can all be programmed in advance.

- **How to control the joint tightness effectively?**

With the **Torque Controller~TCA/TCB + Wireless Rotary Torque Sensing and Transmitting Socket~TTER + Sensing Bolt~SB**, it will assure that homogeneous clamping force can be fulfilled.

- **How to control the bolting torque on tire stud and monitor the status of the bolted joint as the function of TPMS?**

With the **Torque Controller~TCA/TCB + Wireless Rotary Torque Sensing and Transmitting Socket~TTER + Sensing Bolt~SB + Transmitting Cap~TC**, it will not only ensure that the clamping force can be applied evenly on each bolt/stud, but also the joint status can be monitored remotely by the car computer.

- **How to monitor the bolted joint status periodically & remotely?**

With the **Torque Controller~TCA/TCB + Wireless Rotary Torque Sensing and Transmitting Socket~TTER + Sensing Bolt~SB + Transmitting Cap~TC + Gateway~ZG**, the joint status can be monitored remotely and periodically.

- **How to trace the responsibility of the bolting work after bolted?**

Use the **Wireless Rotary Torque Sensing and Transmitting Socket~TTER** with the features of the **Tagged Bolt~TB & Sensing Bolt~SB**, not only the production record of the bolt, but also the bolting process and its result can be recorded in the memory of each bolt for traceability to verify the responsibility and cease the controversy if there is any.

- **How to monitor the bolting status of a power clutch type torque tool?**

With the **Wireless Rotary Torque Transducer~TTES/TTEB + Dongle~ZD** to PC/Tablet/Handset, the bolting status of a power clutch type torque tool either electric or pneumatic can be recorded simultaneously during work. The data can be collected for production control and time study to improve the productivity.

- **How to collect bolted data with the torque tool which has built-in torque limit mechanism?**

Use the **Wireless Rotary Torque Transducer~TTES/TTEB** with a manual, electric or pneumatic torque tool while bolting, the bolted data can be recorded immediately after bolted and transmitted to the PC/Tablet/Handset via a **Dongle**, then, uploading to other peripheral devices.

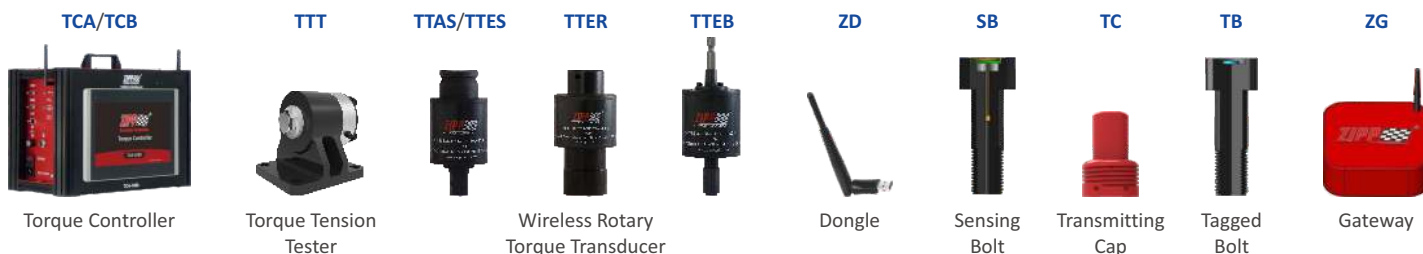
- **How to collect the bolted torque data tightened with a click wrench?**

Use the **Wireless Rotary Torque Transducer~TTAS** with a click wrench, the audible "CLICK" sound can be detected and become the visible bolted data and transmitted to the PC/Tablet/Handset via a **Dongle** while verifying if it's OK or not. The collected data can be uploaded to peripheral devices for traceability.

- **How to verify the residual torque of a bolted joint?**

Use the **Wireless Rotary Torque Transducer~TTAS** with a manual torque wrench, the data will be transmitted to the PC/Tablet/Handset via a **Dongle** to verify if it's OK or not. The collected data can be uploaded to peripheral devices for traceability.

Applying the most advanced bolting technology



How to Choose A Torque Controller & Air Impact Tool properly

- T_T -Target Torque to be tightened.
- T_o -The output torque of the discrete type torque tool, measured by a torque tester.
- **Wireless rotary torque transducer selection for dynamic bolting works**
It's recommended to select the nominated torque capacity **1.5 to 2 times the output torque capacity** of a power-driven discrete type torque tools, such as an impact or pulse type wrench.

The hard joint is defined as having high resistance to turning until its bolt or nut reaches its seating. After which, its resistance rapidly increases. It is usually referenced as an angle of less than 30° from the start of fastening to reaching the final torque. (torque rises from 10% to 100% and the rotation angle is less than 27°), Eg of, hard joints are metal or metal to gasket

The soft joint is defined as low resistance to turning until its bolt or nut reaches its seating. After which, its resistance slowly increases. It is usually referenced as an angle of more than 720° from the start of fastening to reaching the final torque. (torque rises from 10% to 100%, and the rotation is more than 650°), Eg of soft joints are rubber or wood

T_o is the output torque of the impact driver or hydraulic pulse driver measured on a torque tester under specific operation conditions. the output torque of the Impact Wrench or Hydraulic Pulse Wrench will get different residual torque T_R during the process of bolting the thread fasteners due to the principle of the screw mechanism it works, the number of seconds of impact, and the different characters of hardness and softness of the fasteners and objects to be tightened.

What is a Residual Torque(T_R)? It is the amount of tension that remains in a bolted joint after fastening a threaded fastener.

First Movement Test-The most accurate method for verifying the bolted torque on the joint.

Once the fastener has been tightened, use a torque measuring tool. Mark the tightened fastener. In the tightening direction, slowly apply force to the tool until the first movement in the fastener is noted. The reading recorded is a good indication of the original torque applied to the joint.

A better alternative is using a digital torque wrench or having a torque transducer attached to the drive anvil to do the test. It will sense the torque applied to tighten the bolted joint while making the joint move instantly (can be 0.1° to 1° depending on the sensitivity of the gyroscope equipped)

Torque Controller	Joint Hardness (Soft /Hard)	Target Torque T_T	Suggested Torque Transducer Capacity	Tightening time (s) Seconds	Tool Torque Capacity under 90PSI
The flow rate of the Torque Controller should be higher than the air torque tool's air consumption to be used. TCA - Measured by Flow Meter and air pressure can be adjusted automatically TCB - Flow sensor equipped and air pressure can be adjusted automatically TCC - Manual air pressure adjustment and air pressure can be adjusted automatically	Soft	T_T	$1.5 \sim 2 T_o$	t- 5 s	$T_5 \geq 2 \times T_T$
				t- 4 s	$T_4 \geq 3 \times T_T$
				t- 3 s	$T_3 \geq 4 \times T_T$
				t- 2 s	$T_2 \geq 5 \times T_T$
	Hard	T_T		t- 5 s	$T_5 \geq 1.5 \times T_T$
				t- 4 s	$T_4 \geq 2 \times T_T$
				t- 3 s	$T_3 \geq 2.5 \times T_T$
				t- 2 s	$T_2 \geq 3 \times T_T$

Functions of **ZIPPTORK** Torque Controller

Model	TCA-2000	TCB-2000	ZD
Max. Flow Rate Liter per Minute	2000	2000	
Air Pressure Regulation	Auto	Auto	
Flow Rate Selection	Auto	Auto	
Tool Air Consumption Test	●	●	
Torque Display	●	●	●
Torque Control	●	●	Static
Torque Measurement	●	●	●
Job Sequence	●	●	●
Bolting in Several stages	●	●	
Bolting Sequence Control	●	●	
No. of Torque Multiplier can be Attached	3	3	3
Bolt Count	●	●	●
Job Record	●	●	●
Cloud Server	●	●	●
Software Authorization	●	●	●
Operation Management	●	●	●

Brief Exemplary Applications of **ZIPPTORK** Torque Control Products

Exemplary	Current Method	Improved Solution	What to be used?
1	Use a Click Wrench to tighten a bolt or nut to specified target torque	Attached with a Wireless Torque Transducer to the click wrench , the torque value will be recorded in the tablet or cellphone via a Dongle as soon as it clicks. ~It makes audible "click" visible~	Click Wrench + Wireless Torque Transducer → Dongle + Tablet Control Accuracy~±5%
2	Use an Oil Pulse Wrench to tighten a bolt or nut to specified target torque	Use a simplified Controller and have a Wireless Torque Transducer attached to the oil pulse wrench , It will shut off the air supply as soon as it reaches the target torque and the torque applied to the bolt will be recorded in the tablet or cellphone via a Dongle as soon as bolted.	FR Unit + TCB + Lubricator → Oil Pulse Wrench + Wireless Torque Transducer → Dongle + Tablet Control Accuracy~±10%
3	Use an Air Impact Wrench to tighten a bolt or nut to specified target torque	Use an Air Impact Wrench tighten the bolt to maximum 80% of the target torque. Then, Use the Click Wrench + Wireless Torque Transducer to tighten the bolt till it clicks and the data will be recorded in the tablet or cellphone via a Dongle simultaneously. ~It makes audible "click" visible~	Air Impact Wrench → Click Wrench + Wireless Torque Transducer → Dongle + Tablet Control Accuracy~±5%
4	Use an Air Impact Wrench to tighten a bolt or nut to specified target torque	Use a Torque Controller and have the Air Impact Wrench attached with a Wireless Torque Transducer , to be tightened in 2 rounds under Transducer Mode . The tool will be shut off as soon as it reaches the target torque and the data will be recorded in the Controller or logging up to peripheral devices.	FR Unit+ Lubricator → Air Impact Wrench + Wireless Torque Transducer TCA/TCB by Transducer Mode and to be tightened in 2 rounds Control Accuracy~±15%
5	Use an Air Impact Wrench to tighten a bolt or nut to specified target torque	Use a Torque Controller and have the Air Impact Wrench attached with a Wireless Torque Transducer , to be tightened in 2 rounds under Air Pressure Mode . The tool will be shut off as soon as it reaches the target torque and the data will be recorded in the Controller or logging up to peripheral devices.	FR Unit+ Lubricator → Air Impact Wrench TCA/TCB by Air Pressure Mode and to be tightened in 2 rounds Control Accuracy~±20%
6	Use an Clutch Type Torque Tool to tighten a screw, bolt or nut to specified target torque	Attached with a Wireless Torque Transducer with Bit Holder to the Clutch Type Torque Tool , the torque applied to the bolt will be monitored throughout the process and the data will be recorded in the tablet or cellphone via a Dongle as soon as bolted.	Clutch Type Torque Tool + Wireless Torque Transducer → Dongle + Tablet Control Accuracy~±10%

In exemplary applications 4 or 5 above, if use an oil pulse tool instead, the control accuracy can be improved at least ±5%.

Exemplary Applications of **ZIPPTORK** Torque Control Products Bolting Technology

Type of Work	Embodiment	Description	Control Accuracy
Tyre Shop Works	1	<p>1st Step~Use F/R/L Unit + Air Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTAS (Wireless Torque Transducer) + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	2	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench + TTES/TTEH – Under Transducer Mode & Training T_H/T_U, then torque to 50-60 % of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	+10% or ±5%
	3	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench – Under Air Pressure Mode & Training T_H/T_U, then torque to 50-60 % of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	+15%
	4	<p>1st Step~Use Cordless Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTAS + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	5	<p>Use a Click Wrench + TTAS (Wireless Torque Transducer) + ZD (Dongle) + Cell Phone/Tablet to tighten the bolt/nut to verify if the bolted torque is correct.</p> <p>Preset the target angle on the Tablet under Torque Wrench Mode, tighten the bolt/nut slowly until it clicks. The angular movement should exceed the preset angle when it clicks. If it clicks before reaching the target angle, the joint will be judged as over-torqued already and need to be reworked.</p>	Torque control or Verification

Exemplary Applications of **ZIPPTORK** Torque Control Products Bolting Technology

Type of Work	Embodiment	Description	Control Accuracy
General Assembly Works	1	<p>1st Step~Calibrate the tool torque of Air Screwdriver or Electric Brushless Screwdriver with the TTEB + Dongle + Tablet to the desired target torque prior to work.</p> <p>2nd Step~Use the Air Screwdriver or Electric Brushless Screwdriver with the TTEB to tighten the Screw/Bolt to the target torque. The Tablet will monitor the bolting torque throughout the process and judge the result as OK or NOK.</p>	±10%~±15%
	2	<p>1st Step~Use F/R/L Unit + Air Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTAS + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	3	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench – Under Air Pressure Mode & Training T_H/T_L, then torque to 50-60% of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	±15%
	4	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench + TTES/TTEH – Under Transducer Mode & Training T_H/T_L, then torque to 50-60% of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	+10% or ±5%
	5	<p>1st Step~Use F/R/L Unit + Oil Pulse tool + TTES + Dongle + Tablet to calibrate the target torque on TF or Simulator.</p> <p>2nd Step~Torque to Target T_T. The Tablet will monitor the bolting torque throughout the process and judge the result as OK or NOK.</p>	±10%
	6	<p>1st Step~Use Cordless Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTES + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	7	<p>Use a Click Wrench + TTAS (Wireless Torque Transducer) + ZD (Dongle) + Cell Phone/Tablet to tighten the bolt/nut to verify if the bolted torque is correct.</p> <p>Preset the target angle on the Tablet under Torque Wrench Mode, tighten the bolt/nut slowly until it clicks. The angular movement should exceed the preset angle when it clicks. If it clicks before reaching the target angle, the joint will be judged as over-torqued already and need to be reworked.</p>	Torque control or Verification

Exemplary Applications of **ZIPPTORK** Torque Control Products Bolting Technology

Type of Work	Embodiment	Description	Control Accuracy
Industrial Bolting Works	1	<p>1st Step~Use F/R/L Unit + Air Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTAS + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	2	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench – Under Air Pressure Mode & Training T_H/T_L, then torque to 50-60% of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	±15%
	3	<p>1st Step~Use F/R Unit + Lubricator + Air Impact Wrench + TTES/TTEH – Under Transducer Mode & Training T_H/T_L, then torque to 50-60 % of T_T.</p> <p>2nd Step~Torque to Target T_T.</p>	+10% or ±5%
	4	<p>1st Step~Use F/R/L Unit + Oil Pulse tool + TTES + Dongle + Tablet to calibrate the target torque on TF or Simulator.</p> <p>2nd Step~Torque to Target T_T. The Tablet will monitor the bolting torque throughout the process and judge the result as OK or NOK.</p>	±10%
	5	<p>1st Step~Use Cordless Impact Wrench~Torque to 80% maximum of T_T.</p> <p>2nd Step~Use Click Wrench - preset to T_T + TTES + Dongle + Tablet to Target T_T. ~It makes audible "click" visible~</p>	±5%
	6	<p>Use a Click Wrench + TTAS (Wireless Torque Transducer) + ZD (Dongle) + Cell Phone/Tablet to tighten the bolt/nut to verify if the bolted torque is correct.</p> <p>Preset the target angle on the Tablet under Torque Wrench Mode, tighten the bolt/nut slowly until it clicks. The angular movement should exceed the preset angle when it clicks. If it clicks before reaching the target angle, the joint will be judged as over-torqued already and need to be reworked.</p>	Torque control or Torque Verification

Exemplary Applications of **ZIPPTORK** Torque Control Products Bolting Technology

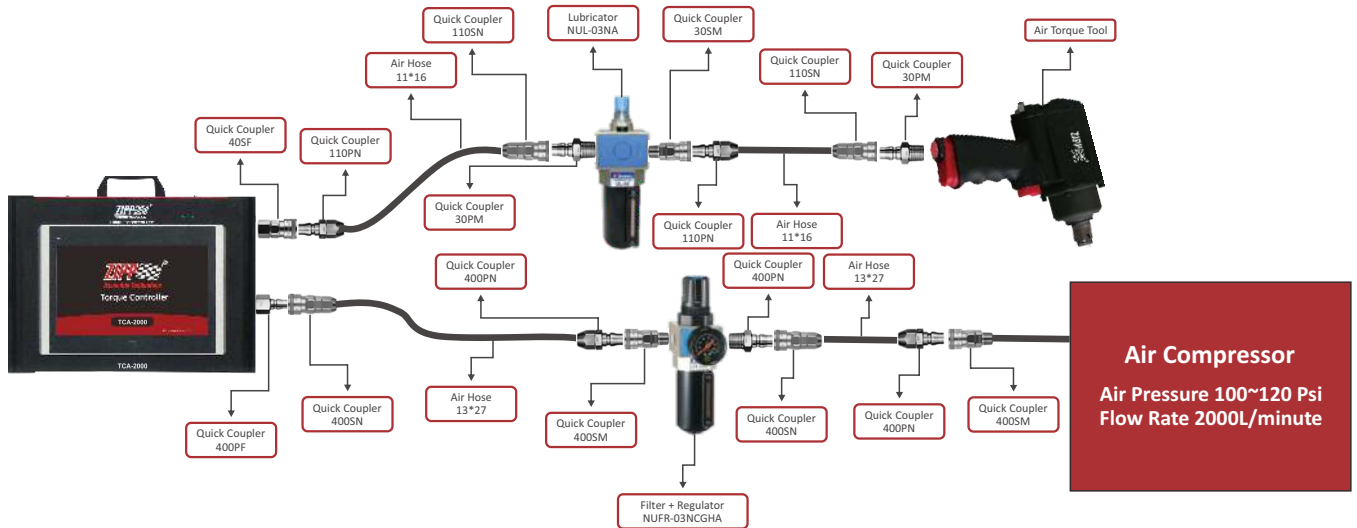
Type of Work	Embodiment	Description	Control Accuracy
High Torque Bolting Works	1	1 st Step~Use F/R/L Unit + Air Impact Wrench ~Torque to its maximum capacity.	±10%
		2 nd Step~Select Torque Multiplier Mode on Tablet . Input the target torque and torque ratio of the TM , the Tablet will show the torque value to be set on Click Wrench and the capacity of the TTAS to be selected.	
		3 rd Step~Use Click Wrench + TTAS + Dongle + Tablet to tighten the bolt until it clicks (reach the Target torque T_T). ~It makes audible "click" visible~	
	2	1 st Step~Use any high torque Wrench ~Torque to its maximum capacity.	±10%
	2 nd Step~Select Torque Multiplier Mode on Tablet . Input the target torque and torque ratio of the TM , the Tablet will show the torque value to be set on Click Wrench and the capacity of the TTAS to be selected.		
	3 rd Step~Use Click Wrench + TTAS + Dongle + Tablet to tighten the bolt until it clicks (reach the Target torque T_T). ~It makes audible "click" visible~		
	3	1 st Step~Select Inspection Mode under Torque Multiplier Mode on Tablet . Input the target torque, Target Angle, gear reduction ratio and torque ratio of the TM , the Tablet will show the torque value to be set on Click Wrench and the capacity of the TTAS to be selected.	Torque + Angle control or Torque Verification
	2 nd Step~Use Click Wrench + TTAS + Dongle + Tablet to tighten the bolt until it clicks (just the moment to exceed the residual torque on the bolted joint and turn to move).		
	3 rd Step~If it clicks before reaching the target angular movement, it means that it was over-torqued and to be judged as NOK .		

Exemplary Embodiment for the Application of Torque Control Products

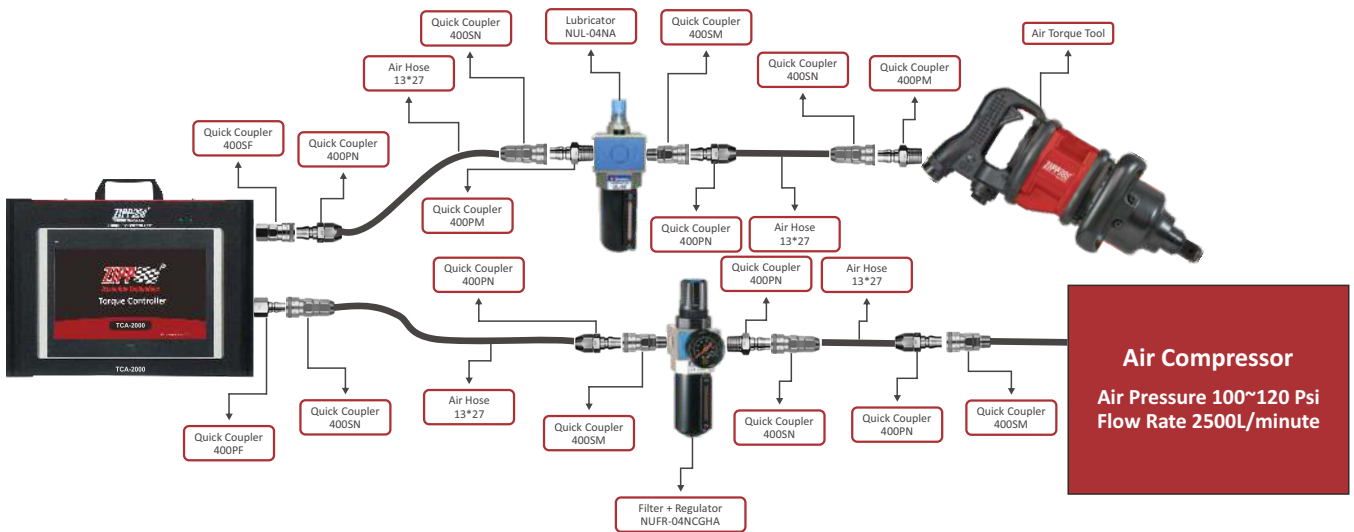
Type of Torque Tools	Manual Torque Wrench 	Manual Click Wrench 	Pneumatic / Electric / Cordless Torque Tools 
Current Control Method	Use a Digital torque wrench instead 	It clicks as soon as it reaches the preset torque	The tool is equipped with built-in torque control mechanism. Auto shut off as soon as it reaches the preset torque.
Advanced Torque Control Method	Use any manual torque wrench with TTAS along with a Dongle and APP to collect torque data and up load the data immediately.	Use the click wrench with TTAS along with a Dongle and APP to collect torque data and up load the data immediately as soon as it clicks.	Use the power torque wrench with TTEs along with a Dongle and APP to collect torque data and up load the data immediately as soon as it reaches preset torque and the clutch dis-engaged.
ZIPPTORK products	TTAS + Dongle + APP	TTAS + Dongle + APP	TTEs + Dongle + APP
Features of ZIPPTORK Solutions	Detects and records the torque data just at the moment of 0.5o angular movement of the bolt and through a Dongle to display the let-go torque simultaneously.	Detects and records the torque data and upload the data immediately as soon as it clicks. ~Makes audible "clicks" visible~	Detects and records the torque data and up loaded immediately as soon as it reaches preset torque and the clutch dis-engaged.
Type of Torque Tools	Electric / Cordless Impact Wrench 	Air Impact Wrench 	Manual Torque Wrench + Torque Multiplier 
Current Control Method	The tool is equipped with built-in torque control mechanism. Auto shut off as soon as it reaches the preset torque.	Torque controlled by air pressure and/or airflow rate, or driving a torsion stick	Use digital torque wrench + TM (Torque Multiplier) 
Advanced Torque Control Method	Use the power torque wrench with TTEs along with a Dongle and APP to collect torque data and up load the data immediately as soon as it reaches preset torque and the clutch dis-engaged.	Use the air impact wrench and control the torque by patented control algorithm and device of TCA/TCB and TTEs to collect torque data and up-loads the data simultaneously.	Use any manual torque wrench to drive the TTAS + a selected size of TM and take advantage of the patented control algorithm of TTAS to display / verify / record the final torque applied to the joint.
ZIPPTORK products	TTEs + Dongle + APP	TCA/TCB + TTEs	TTAS + TM + Dongle + APP
Features of ZIPPTORK Solutions	Detects and records the torque data and uploaded immediately as soon as it reaches preset torque and the clutch dis-engaged.	Capable to do Bolting sequence control by TCA/TCB + TTEs to tighten the bolts to its target within several rounds, data collection and upload the data.	For high torque bolting, use any impact tool to drive the bolt to certain level and then use any torque wrench along with a TTAS + selected TM to tighten the bolt to the target torque.

The air installation guide of TCA-2000/TCB-2000

for the tool with air consumption between 900L/min and 1500L/min



for the tool with air consumption between 1500L/min and 2000L/min



ZIPPTORK Bolting Technology

Bolt Load Control of Threaded Fasteners

In order to meet the industrial development trend of Industry 4.0, our company has introduced a full range of patented products related to bolt tightening technology, which provides a cost-effective solution for the industry. Bolting of threaded fasteners is affected by many factors, such as the softness of the material of the fasteners (bolts, nuts and washers) and the surface roughness of the fasteners to be tightened, the influence of bruises or oil contamination on the threads during the process, and the difference in the structure and quality of the tools used, all of which make it difficult to control accurately and effectively.

Furthermore, for the most important purpose of bolting works ~ the clamping force applied to the bolted joint, most of the industry can only control the clamping force of the bolt load by ultrasonic sensing & bolting technology. Some applications even require monitoring of the bolted joint status after bolted and real-time notification when abnormal conditions occur. For this purpose, **ZIPPTORK** has developed a series of bolt load control technologies to provide the ultimate solution for threaded fastener tightening works, fully meeting the requirements of the Industrial Internet of Things (IIoT) applications.

Sensing Bolt & patented anti-vibration Sensing Washer for bolt load control & monitoring

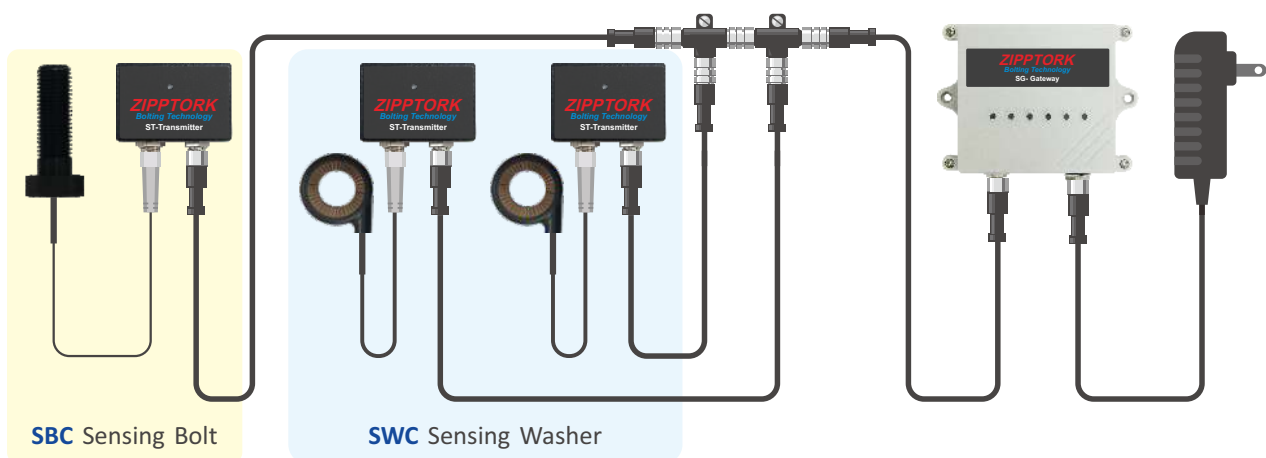
It is ideal for all kinds of bolt tightening operations that require precise control of the clamping force and monitoring the bolted joint status at any time, and the patented anti-loosening design and ease of use make it more advantageous than the conventional ultrasonic sensing & bolting technology in mainstream applications as a great cost-effective alternative.

Patented Bolt Load Transducer

It can be used with any brand and type or design of manual, pneumatic or electric torque tools to directly control and display the corresponding clamping force generated on the bolted joint by the applied torque at the time, and can collect relevant data.

It overturns the traditional method of controlling the bolting torque by torque tools, and directly measures the clamping force induced in the bolted joint instead, effectively improving the quality of bolting operations. A new era of "**Bolt Load Wrench**" is to come!

Ideal for critical bolted joints where bolt load control is important & bolted joint status monitoring is required



SBC Sensing Bolt



SWB/SWC Sensing Washer



ST Transmitter



SG Gateway



BLT Wireless Bolt Load Transducer

The Ultimate Solution of Bolting Technology

Sensing Washer with functions of anti-loosening for controlling bolt load and monitoring the bolted joint status

1. What is different from the past products or current market products?

Currently, following methods are commonly used to test the clamping force in the market:

- Ultrasonic inspection method - This inspection method is time-consuming, labor-intensive and expensive.
- Wired sensor bolt - This test method is wired, difficult to achieve wirelessly, and expensive.
- Load cell-This inspection method is wired, difficult to achieve wirelessly, and expensive.

The clamping force control is only for the sensor to connect to the PLC or other display device by wired, the layout of the bolt load sensor of these methods are laborious and time-consuming, and the clamping force sensor does not have any anti-loosening design, and does not have the bolting sequence control function.

2. Our company has been in the field of pneumatic tools for more than 40 years, and has been dedicated to the research and development of bolting technology for decades.

However, in the field of bolting operation, torque control is not the most accurate technology, but bolt load (clamping force) control is the ultimate and most accurate method; since the bolt load sensor is more expensive than the torque sensor, the market is still dominated by torque control. In recent years, customers' demand for bolting work and data recording is getting higher and higher, and there is an urgent demand for clamping force control in the market, therefore, our company has spared no effort to innovate and breakthrough in research and development in order to make the best and ultimate clamping force control and monitoring for thread fasteners.

3. Due to the difficulty in mass production of the wireless bolt load sensor, the Sensing Bolt developed by our company at the beginning is hard to improve the yield rate and reduce the cost. With our efforts, we have finally developed a new generation of Sensing Washers to replace the Sensing Bolts, which have the following advantages:

- a. The Sensing Washer is suitable for both wireless communication and wired connection. The wireless Sensing Washer is suitable for small magnetic field interference fields - such as automotive industry, oil mining industry, etc.; the wired induction spacer is suitable for large magnetic field interference fields - such as construction and bridge industry, aerospace industry, etc.
- b. Low production cost and high yield rate
- c. Anti-loosening design (the sensing bolt itself does not have an anti-loosening design) - this anti-loosening design is patented. In practice, it is easy to carry, easy to install and easy to operate.
- d. Higher accuracy and stability than sensing bolts, with dynamic bolt load control accuracy of $\pm 10\%$ and static bolt load control accuracy of $\pm 5\%$.
- e. No need to use special or custom-made bolts, just use general bolts and sensing washers to achieve the following functions:

During bolting process:

- a) The bolting sequence can be controlled with our innovative controller and tag.
- b) Bolt load control
- c) Torque equivalent for reference After bolted,

combined with Industry 4.0-IoT:

- a) Bolted joint (bolt load-clamping force) monitoring
 - b) Torque equivalent display
 - c) Clamping force, torque equivalent abnormal alarm
- f. Applicable tools: Any brand of manual, pneumatic and electric torque tools (static, impact, hydraulic pulse)
 - g. Application: Construction, oil, mining, automotive, aerospace, etc., where clamping force monitoring is required.
 - h. Applicable environment: High magnetic field interference environment, lightning strike environment...etc.
 - i. The application can be used not only with our self-developed controller to achieve the clamping force and bolting sequence control, but also as a stand-alone device, the detailed application structure is attached.

ZIPPTORK Bolt Load Control & Monitoring

Anti-vibration Sensing Washer



SWB/SWC Sensing Washer

- Patented anti-vibration design to ensure the best stability of the bolted joint.
- Bolt axial load control during bolting process by any torque tool.
- Bolt joint status such as bolt load, temperature and vibration variation remote monitoring.
- The best alternative for transmission equipment preventive maintenance work.
- Applicable to any axial load joint status monitoring including HUCK lock bolt.
- Remote monitoring bolted joint periodically or continuously and alert as soon as reach the preset threshold.
- The most economic yet effective alternative of ultrasonic bolting technologies.
- **SWBN/SWBR** should be custom-made. Please contact Sales personnel.

Sensing Bolt



SBC Sensing Bolt

- Bolt axial load control during bolting process by any torque tool.
- Bolt joint status such as bolt load, temperature and vibration variation remote monitoring.
- The best alternative for transmission equipment preventive maintenance work.
- Remote monitoring bolted joint periodically or continuously and alert as soon as reach the preset threshold.
- The most economic yet effective alternative of ultrasonic bolting technologies.

ZIPPTORK Bolt Load Control Technology

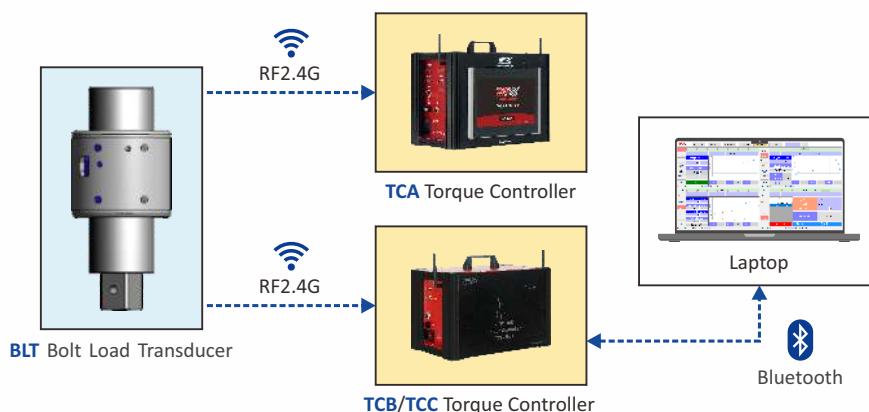
Wireless Bolt Load Transducer



BLT Wireless Bolt Load Transducer

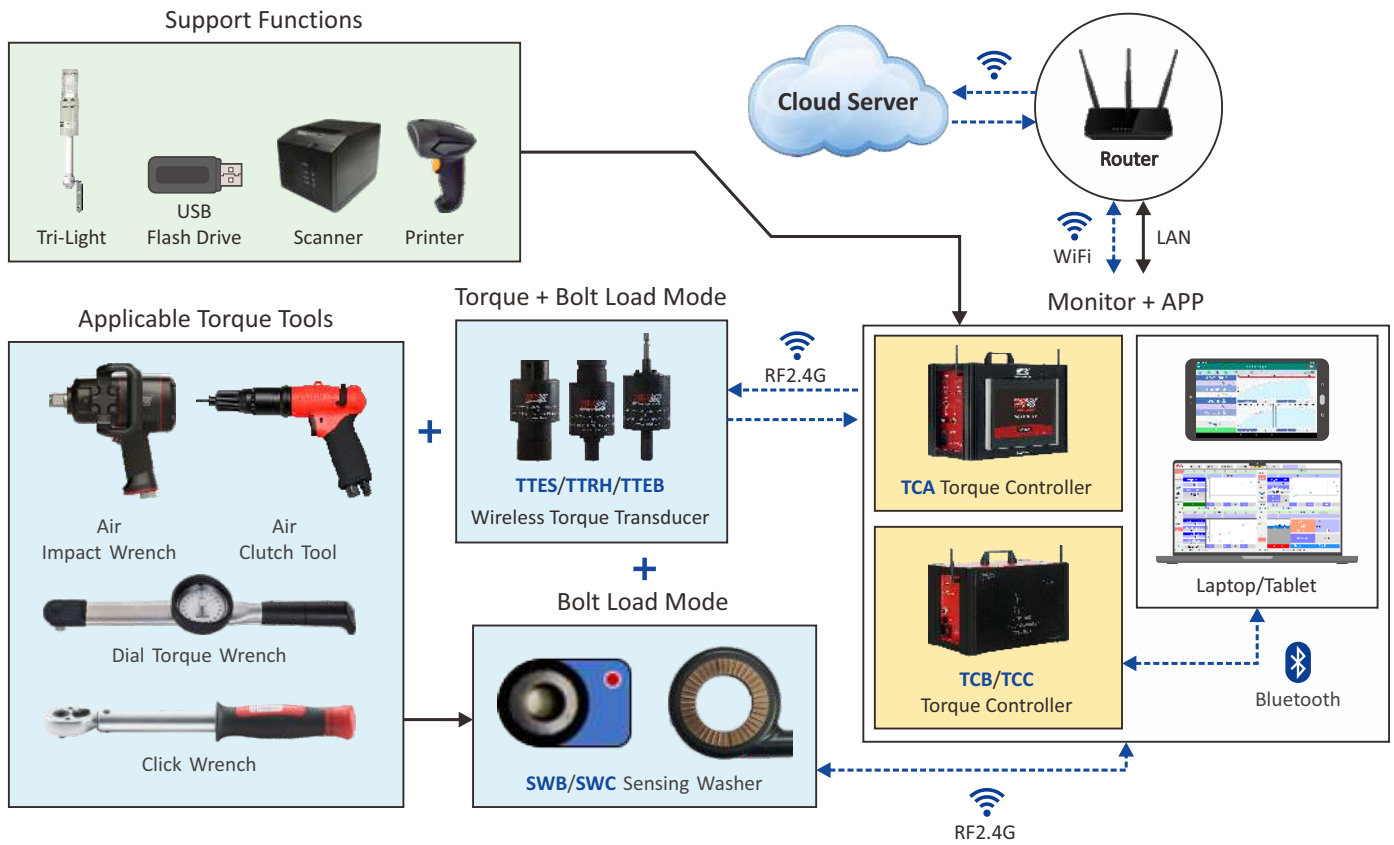
For sensing and controlling bolt load generated in the bolted joint instantly throughout the bolting process

- Patented design for direct sensing the bolt load induced on the joint during the bolting process.
- With functions of data logging and up load to peripheral device or cloud server.
- To be attached to the drive anvil of any type of torque tool for direct bolt load control.
- Patented vibration proof design, also good for impact torque tools.
- RF2.4G wireless transmission and data collection.

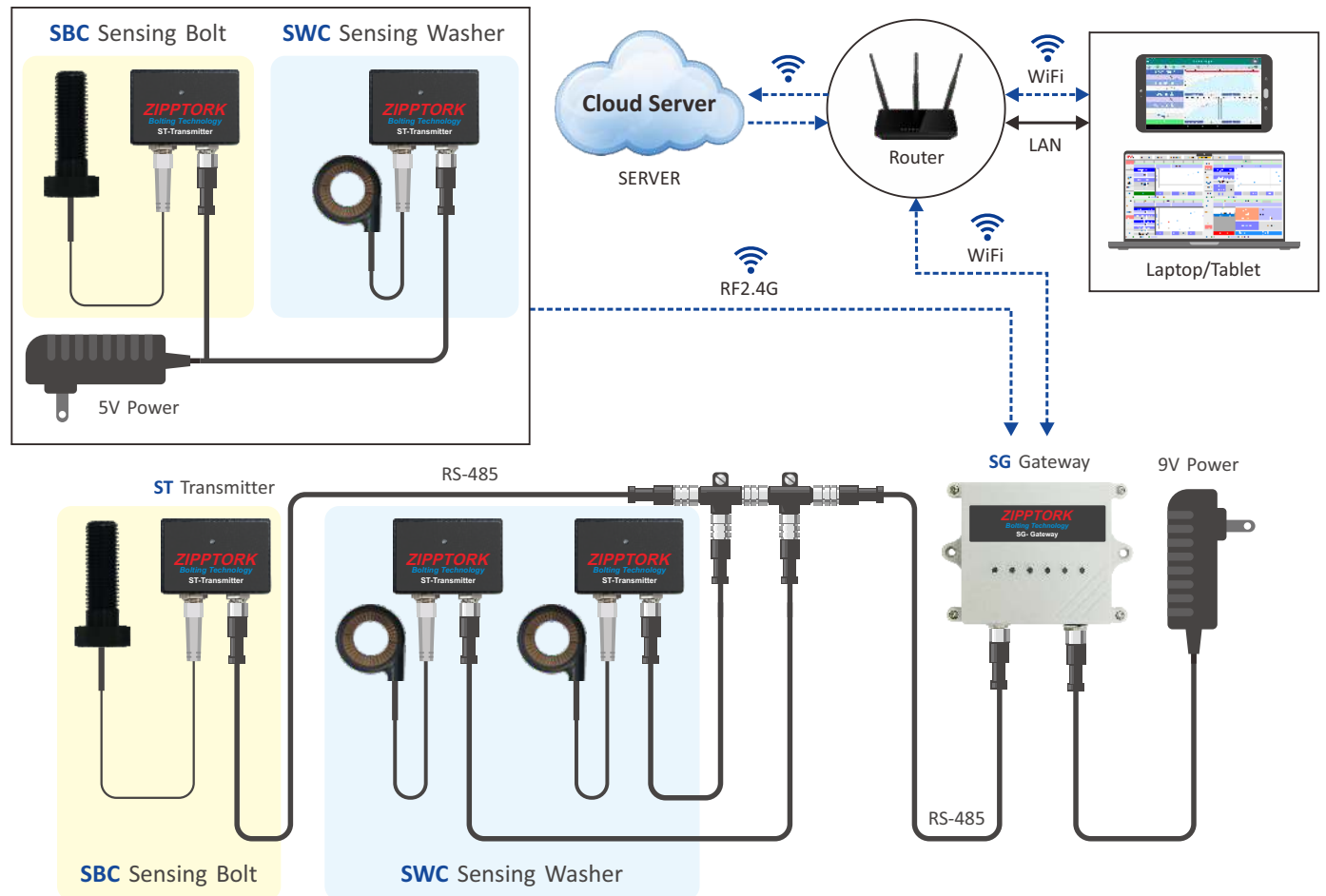




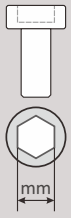
Bolt Load Control Products Application Embodiment

Bolt Load Control During Bolting Process



Bolted Joint Status Monitoring



				Bolts and nuts classes (Metric threads, triangular shape, high pitch, 0.15coefficient)					
				4.8	5.8	6.8	8.8	10.9	12.9
	mm	mm	mm	Torque Nm	Torque Nm	Torque Nm	Torque Nm	Torque Nm	Torque Nm
M3	5.5	2.5	0.64	0.8	0.91	1.21	1.79	2.09	
M4	7	3	1.48	1.83	2.09	2.78	4.09	4.79	
M5	8	4	2.93	3.62	4.14	5.5	8.1	9.5	
M6	10	5	5	6.2	7.1	9.5	14	16.4	
M8	13	6	12.3	15.2	17.4	23	34	40	
M10	16	8	24	30	34	46	67	79	
M12	18	10	42	52	59	79	116	136	
M14	21	12	67	83	95	127	187	219	
M16	24	14	105	130	148	198	291	341	
M18	27	14	145	179	205	283	402	471	
M20	30	17	206	254	291	402	570	667	
M22	34	17	283	350	400	552	783	917	
M24	36	19	354	438	500	691	981	1148	
M27	41	19	525	649	741	1022	1452	1700	
M30	46	22	712	880	1005	1387	1969	2305	
M33	50	24	968	1195	1366	1884	2676	3132	
M36	55	27	1242	1534	1754	2418	3435	4020	
M39	60		1614	1994	2279	3139	4463	5223	
M42	65	32	1995	2464	2816	3872	5515	6453	
M45	70		2497	3085	3525	4847	6903	8079	
M48	75	36	3013	3722	4254	5849	8330	9748	
M52	80		3882	4795	5480	7535	10731	12558	
M56	85	41	4839	5978	6832	9394	13379	15656	
M60	90		6013	7428	8490	11673	16625	19455	
M64	95	46	7233	8935	10212	14041	19998	23402	

1 Nm= 0.738 ft.lb.= 8.85 In.lb.= 0.1 kgf.m= 10.2 kgf.cm

Conversion Table

PRESSURE				
Pa	Mpa	bar	psi	Kg/cm ²
1,000,000	1	10	145	10.197
100,000	0.1	1	14.5	1.0197
6,890	0.00689	0.0689	1	0.0703
98,070	0.09807	0.9807	14.223	1
620,000	0.62	6.2	90	6.3

psi>>kg/cm²:90psi x 0.0703=6.327kg/cm²
bar>>psi:7bar x 14.5=101.5psi

TORQUE				
N-m	Kg-m	Kg-cm	ft-lb	in-lb
1	0.102	10.1972	0.7376	8.8507
9.8067	1	100	7.233	86.77
0.0986	0.01	1	0.0723	0.8677
1.3558	0.1383	13.83	1	12

N-m>>ft-lb:10N-m x 0.7376=7.376 ft-lb
N-m>>kg-m:10N-m x 0.102=1.02 kg-m

FLOW RATE			
m ³ /min	cfm	l/min	l/s
1	35.317	1,000	16.668
0.0283	1	28.3168	0.4719
0.001	0.035	1	1.0165
0.061	2.1189	60.606	1

cfm>>l/min:10cfm x 28.3168=283.168 l/min
m³/min>>cfm:10m³/min x 35.317=353.17cfm

Po:PSI
SCFM=CFM*((Po+14.7)/14.7)

LENGTH			
mm	m	Inch	ft
1	0.01	0.03941	0.0033
1,000	1	39.37	3.2809
25.4	0.0254	1	0.0833
304.8	0.3048	12	1

mm>>inch:10mm x 0.0394=0.394 inch
Inch>>mm:10inch x 25.4=254mm

WEIGHT OR FORCE		
lb	kg	N
1	0.4536	4.4484
2.2046	1	9.807
0.2248	0.102	1

kg>>N:10kg x 9.807=98.07N
N>>kg:10N x 0.102=1.02kg

POWER	
KW	HP
1	1.341
0.746	1

HP>>KW:10HP x 0.746=7.46KW



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