APEX®

Utica®

Torque Products

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Torque Wrench Cautions

1. Do not use torque wrench to loosen tightened fasteners beyond maximum tool capacities.
2. Never use an extension unless authorized by the manufacturer.
3. Torque wrenches are precision instruments – provide adequate storage to protect from damage.
RETURN MICROMETER WRENCHES TO LOWEST SETTING AFTER EACH USE.
4. ALWAYS WEAR APPROVED EYE PROTECTION.

Model Number Index

APEX Utica

Utica Torque Products
Introduction

A Name You Can Trust

Utica products offer high quality solutions for your torque applications. Utica products add value to the assembly process by enabling you to assess, control and improve product reliability, which leads to customer satisfaction. Whether the application is cellular phone assembly involving fine threaded screws or an automotive assembly operation fastening bolts, Utica torque products are the right choice.

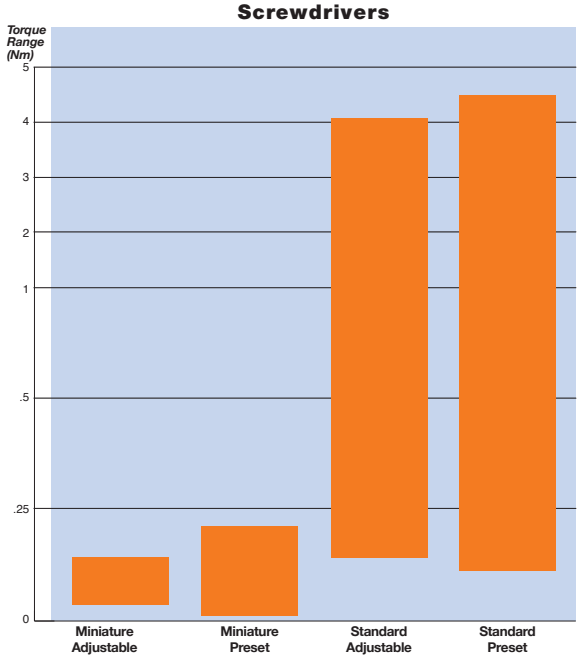
Quality

Our goal is to provide high quality torque tools that will maintain accuracy as long as possible. All Utica torque products are made of top grade materials. Working parts are heat treated for added strength and durability. Each Utica torque tool is calibrated according to ASME B107.14M before leaving the plant, using test equipment traceable to NIST. Utica manufacturing processes are ISO 9001 certified, which means that the Utica brand is manufactured to the highest standards.

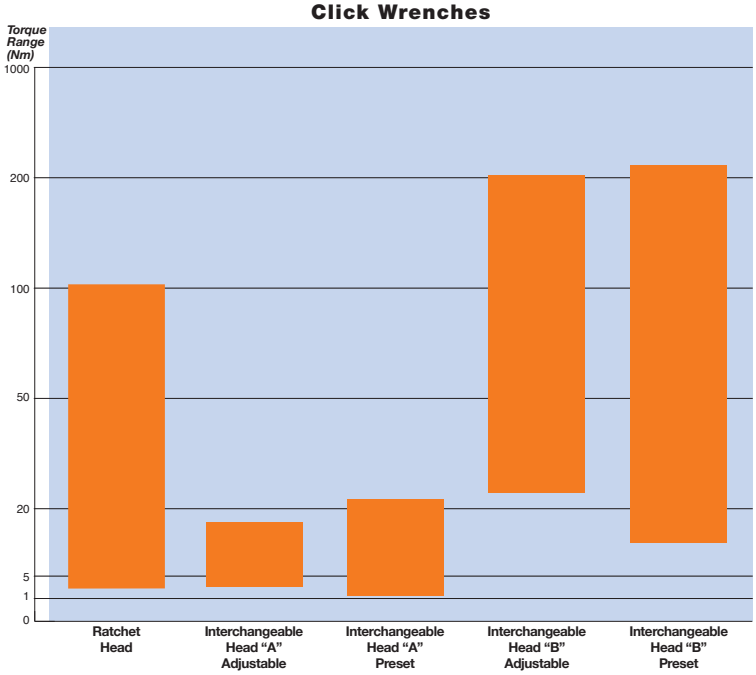
Calibration Intervals

As a general rule, we recommend calibrating Utica torque products every six months. However, accurate calibration intervals need to be based on quality objectives, number of cycles and other application related details.

Screwdrivers



Click Wrenches



What is Torque?

The concept of torque is a mystery for many people. Ask a group of people to define torque and you'll probably receive a variety of answers. Open a dictionary to the definition of torque and you'll be greeted with terms such as torsion, axis, and vector. However, if the definition of torque is boiled down to layman's terms, it's the measurement of a turning or twisting force.

A simple example is the force required to turn the head of a bolt on an automobile chassis. Most tool boxes would include some of the most common tools used to apply torque, such as screwdrivers, wrenches, and impact tools.

When torque is applied to the head of a bolt during a fastening process, there are actually two main forces at work. First, we are applying a force - torque to the bolt head to tighten it. The second force at work is the tension or stretch created that runs the length of the bolt. These two forces are closely related. The more torque applied to the bolt head, the more tension or "stretch" is applied to the length of the bolt.

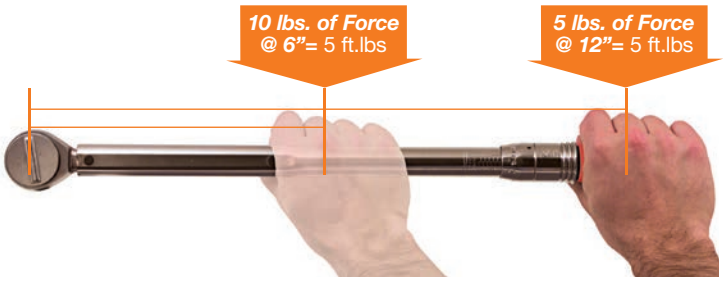
Why is Torque Important?

When we apply torque to fasteners such as bolts and screws, we are actually clamping parts together. The amount of torque applied determines how well the fastener does its job in the long run. If we apply too little torque, the fastener can vibrate and eventually loosen.

On the other hand, if we apply too much torque, the fastener will over stress and can break or strip the threads. Either way, the fastener doesn't do what its suppose to do – hold something together. The objective is to apply enough torque to a fastener, creating tension that is greater than any external force trying to separate it.

How is Torque Measured?

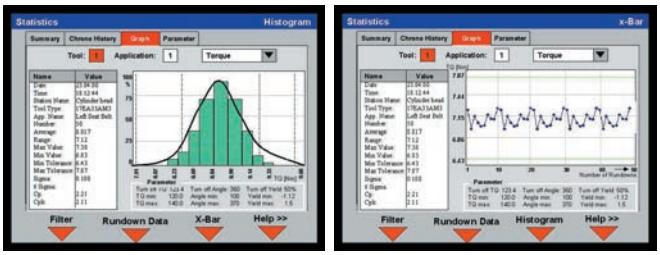
Torque is measured by multiplying the amount of force applied by the distance from the point we are turning. For instance, if we are turning a bolt and apply 5 lbs. of force at the end of a wrench measuring 1 ft., the torque would equal 5 ft. lbs. This doesn't tell us what the optimal torque is for the fastener, but it does allow us to quantify the amount of torque we are applying to a fastener.



What is the Correct Torque Level For A Fastener?

When an engineer calculates the correct torque level for a fastener, several issues must be addressed. The first issue is the maximum load that the fastener will experience. Second is the strength of the material that the fastener will clamp. Third is whether the joint is hard or soft. The fourth issue is the nature of the external force acting on the joint, such as vibration, pulling, or twisting.

Through statistical analysis, an engineer can determine the optimal level of torque that should be applied to a joint for maximum performance.



Torque Limiting Screwdrivers
Introduction

Torque Limiting Screwdrivers

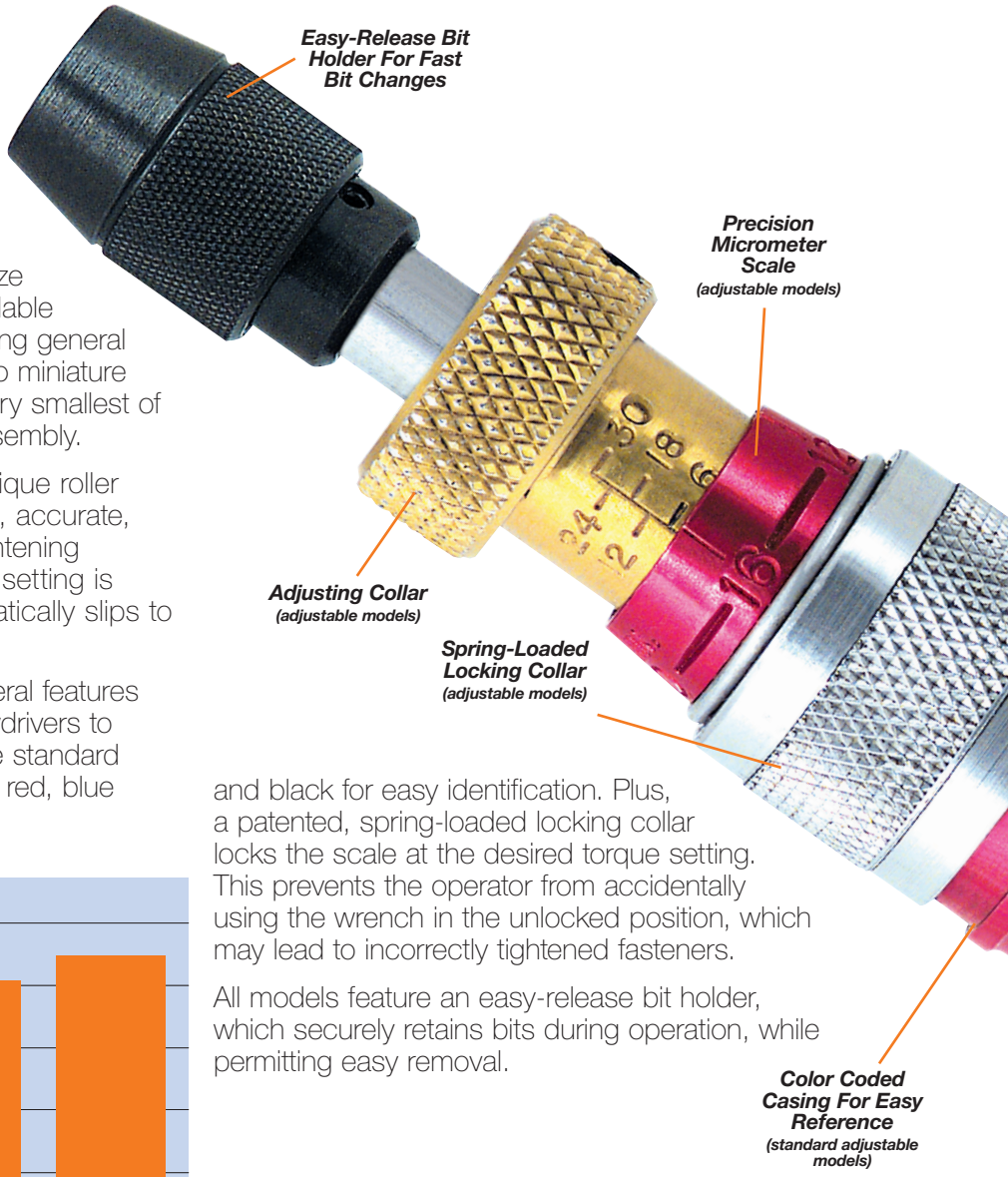
Utica offers a complete line of torque limiting screwdrivers covering a range of 2-640 in.-oz.

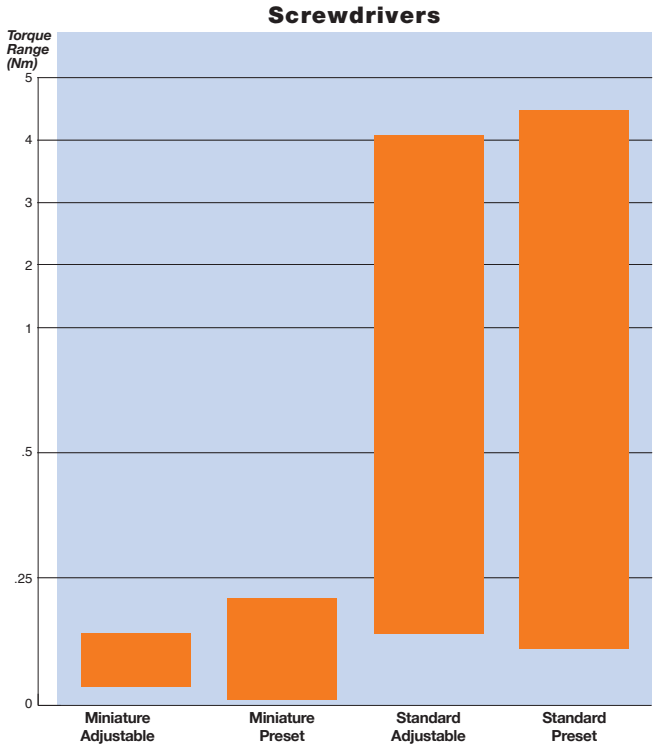
All Utica screwdrivers feature aluminum housings to reduce weight and maximize durability. Six standard models are available for light duty torque applications including general electronic and computer assembly. Two miniature models offer reliable fastening of the very smallest of applications such as cellular phone assembly.

Utica torque screwdrivers feature a unique roller bearing cam, which produces smooth, accurate, and consistent performance when tightening fasteners. When the maximum torque setting is achieved, the cam mechanism automatically slips to prevent over-tightening.

In addition to being highly durable, several features have been engineered into Utica screwdrivers to increase ease of use. Each of the three standard adjustable models are distinguished by red, blue and black for easy identification. Plus, a patented, spring-loaded locking collar locks the scale at the desired torque setting. This prevents the operator from accidentally using the wrench in the unlocked position, which may lead to incorrectly tightened fasteners.

All models feature an easy-release bit holder, which securely retains bits during operation, while permitting easy removal.





Quality

Electronics assembly and other light screw assembly applications demand precision that can only be accomplished with the use of precision tools.

All Utica torque screwdrivers are made of top grade materials machined to exacting tolerances. Working parts are heat treated for added strength and durability. Then, each tool is carefully assembled by our experienced technicians.

Each Utica screwdriver is calibrated according to ASME B107.14M before leaving the plant, using test equipment traceable to NIST.

Our manufacturing processes are ISO 9001 certified, which means that Utica products are manufactured to the highest standards. Quality materials, precision machining and assembly is what makes Utica torque screwdrivers the tool of choice.

Calibration Intervals

As a general rule, we recommend calibrating Utica torque products every six months. However, the quality objectives of the operator's organization will ultimately determine the frequency of tool calibration.

To locate your nearest Utica Service Center for calibration, visit our website at ***www.uticatools.com***.

Torque Limiting Screwdrivers
Standard Models

APEX Utica®

- Standard product calibrated right hand only. Left hand calibration on request.
- Choice of adjustable models with precision micrometer scale or factory preset models.
- U.S. Standard or metric scales
- Precision micrometer scale (adjustable models) calibrated in inch-ounces or inch-pounds. Metric models: cm-kg.
- Easy-release bit holders securely retain bits during operation while permitting easy removal.
- Anti-backlash design for repeatability.
- Meets or exceeds ASME B107.14M and ISO 6789 specifications.
- Adjustable model accuracy is ±6% of setting, starting at 20% of full scale to full scale. Right hand only.
- Calibration certificate can be requested when ordering.

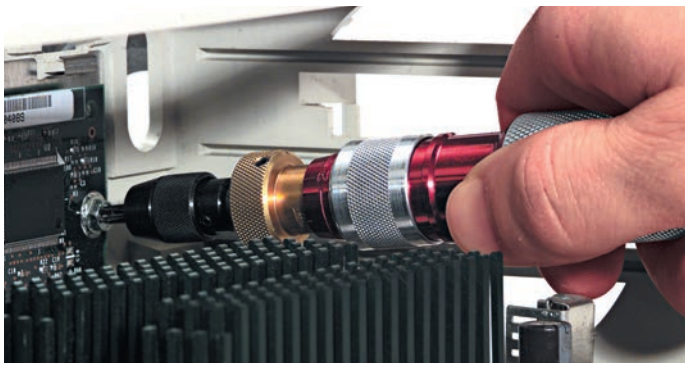
Adjustable Models

Model No.	Range	Collar Color	Increments	Hex Drive	Weight lbs.	Weight kg.
U.S. Standard						
TS-100	20–100 in.-oz.	Black	2 in.-oz.	1/4 Female	.50	.23
TS-30	6.0–30.0 in.-lb.	Red	1 in.-lb.	1/4 Female	.50	.23
TS-35	6.0–36.0 in.-lb.	Blue	1 in.-lb.	1/4 Female	.50	.23
Metric						
TS-3M*	0.7–3.5 Nm	Gold	.1 Nm	1/4 Female	.50	.23

Preset Models *(Preset models are designed for highly repetitive assembly line operations.)*

Model No.	Range				Hex Drive
	in.-oz.	in.-lb.	Nm	cm-kg	
TS-SN-1	20–150	1.3–9.4	0.1–1.1	1.4–10.8	1/4 Female
TS-SN-2	128–640	8–40	0.9–4.5	9.2–46.1	1/4 Female

NOTE: When ordering preset tools, specify desired torque setting.



TS-30

TS-SN-1

Torque Limiting Screwdrivers

Standard Model Accessories & Kits

APEX Utica

Hex Bits

Part No.	Hex Size	Cap Screw Size	Set Screw Size	Flathead Screw Size
185-000X	050	0	3,4	1,2
185-00X	1/16	1	5,6	3,4
185-0X	5/64	2,3	8	5,6
185-1X	3/32	4,5	10	8
185-9X	7/64	6	-	-
185-2X	1/8	-	1/4	10
185-10X	9/64	8	-	-
185-3X	5/32	10	5/16	1/4
185-4X	3/16	1/4	3/8	-

Phillips Bits

Part No.	Point Size	Screw Size
446-0X	0	0,1
446-1X	1	2,3,4
446-2X	2	5,6,7,8,10
440-3X	3	12,14

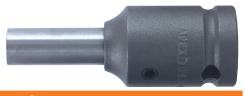
Screwdriver Bits

Part No.	Blade Width	Blade Thickness	Screw Size
445-00X	.134	.028	2,3
445-0X	.155	.030	3,4
445-10X	.185	.034	4,5
445-20X	.214	.036	5,6
445-30X	.250	.040	6,8

Square Drive Adapter

Part No.	Description
44-71-B	1/4 Hex to 1/4 Square.

Bit Holders



Part No.	Square Drive (in.)	Female Hex (in.)	Description
825	1/4	1/4	
M-825	1/4	1/4	Magnetic

SAE Size Sockets

Part No.	Square Dr. (in.)	Hex Opening (in.)
1108	1/4	1/4
1110	1/4	5/16
1112	1/4	3/8
1114	1/4	7/16

Metric Size Sockets

Part No.	Square Dr. (in.)	Hex Opening (mm)
6mm11	1/4	6mm
7mm11	1/4	7mm
8mm11	1/4	8mm
10mm11	1/4	10mm

Miniature Bit Holders

Part No.	Description
HW19	To adapt miniature accessories for use in standard models. See page 11 for accessories.

Kit No. KT-100

Range 20-100 in.-oz. 20 piece

Qty.	Part No. Comp.	Description
1	TS-100	Adj. torque screwdriver 1/4" fm. hex
1	TW3D	Torque screwdriver bld. .000
1	TW4D	Torque screwdriver bld. .100
1	TW6D	Hex socket 3/32"
1	TW7D	Hex socket 7/64"
1	TW12D	Hex key .028
1	TW13D	Hex key .035
1	185-000X	Screwdriver hex bit .050
1	185-00X	Screwdriver hex bit 1/16"
1	185-0X	Screwdriver hex bit 5/64"
1	445-00X	Screwdriver bld. torque screw SZ. 2, 3
1	445-10X	Screwdriver bld. torque screw SZ. 4, 5
1	446-0X	Phillips bld. torque screw SZ. 0, 1
1	446-1X	Phillips bld. torque screw SZ. 2, 3, 4
1	44-71-B	Adapter 1/4" drive
1	HW19	Bit holder mini. torque
1	1104	1/4" Dr. reg. socket 1/8"
1	1106	1/4" Dr. reg. socket 3/16"
1	Plas/case	
1	Insert	

Kit No. KT-30

Range 6 to 30 in.-lb. 24 piece

Qty.	Part No. Comp.	Description
1	TS-30	Adj. torque screwdriver 1/4" fm. hex
1	TW4D	Torque screwdriver bld. .100
1	TW7D	Hex socket 7/64"
1	TW13D	Hex key .035
1	185-000X	Screwdriver hex bit .050
1	185-00X	Screwdriver hex bit 1/16"
1	185-0X	Screwdriver hex bit 5/64"
1	185-1X	Screwdriver hex bit 3/32"
1	185-2X	Screwdriver hex bit 1/8"
1	185-3X	Screwdriver hex bit 5/32"
1	445-00X	Screwdriver bld. torque screw SZ. 2, 3
1	445-10X	Screwdriver bld. torque screw SZ. 4, 5
1	445-20X	Screwdriver bld. torque screw SZ. 5, 6
1	445-30X	Screwdriver bld. torque screw SZ. 6, 8
1	446-0X	Phillips bld. torque screw SZ. 0, 1
1	446-1X	Phillips bld. torque screw SZ. 2, 3, 4
1	44-71-B	Adapter 1/4" drive
1	HW19	Bit holder mini. torque
1	1104	1/4" Dr. reg. socket 1/8"
1	1106	1/4" Dr. reg. socket 3/16"
1	1108	1/4" Dr. reg. socket 1/4"
1	1110	1/4" Dr. reg. socket 5/16"
1	Plas/case	
1	Insert	

Kit No. KT-130

Range 20 in.-oz. to 30 in.-lb. 43 piece

Qty.	Part No. Comp.	Description
1	TS-30	Adj. torque screwdriver 1/4" fm. hex
1	TS-100	Adj. torque screwdriver 1/4" fm. hex
1	TW3D	Torque screwdriver bld. .080
2	TW4D	Torque screwdriver bld. .100
1	TW6D	Hex socket 3/32"
2	TW7D	Hex socket 7/64"
1	TW12D	Hex key .028
2	TW13D	Hex key .035
2	185-000X	Screwdriver hex bit .050
2	185-00X	Screwdriver hex bit 1/16"
2	185-0X	Screwdriver hex bit 5/64"
1	185-3X	Screwdriver hex bit 3/32"
1	185-2X	Screwdriver hex bit 1/8"
1	185-3X	Screwdriver hex bit 5/32"
2	445-00X	Screwdriver bld. torque screw SZ. 2, 3
2	445-10X	Screwdriver bld. torque screw SZ. 4, 5
1	445-20X	Screwdriver bld. torque screw SZ. 5, 6
1	445-30X	Screwdriver bld. torque screw SZ. 6, 8
2	446-0X	Phillips bld. torque screw SZ. 0, 1
2	446-1X	Phillips bld. torque screw SZ. 2, 3, 4
1	446-2X	Phillips bld. torque screw SZ. 4, 6, 7, 8, 10
2	44-71-B	Adapter 1/4" drive
2	HW19	Bit holder mini. torque
1	1104	1/4" Dr. reg. socket 1/8"
1	1105	1/4" Dr. reg. socket 5/32"
2	1106	1/4" Dr. reg. socket 3/16"
1	1108	1/4" Dr. reg. socket 1/4"
1	1110	1/4" Dr. reg. socket 5/16"
1	Plas/case	
1	Insert	

CAUTION: 1. Under normal use, periodic recalibration may be necessary to ensure accurate readings and applied torque.
2. FOR EXTENDED SPRING LIFE, RETURN TO LOWEST SETTING AFTER EACH USE.

Torque Limiting Screwdrivers
Miniature Models

APEX Utica®

- Specifically designed for reliable tightening of the very smallest threaded fasteners.
- Largest model weighs only 1 oz.
- Operate in same manner as standard models — reach set torque and slip to prevent over-torquing of delicate components.
- Accuracy ±6%, right hand only. Meets or exceeds ASME B107.14M and ISO 6789 specifications.
- Choice of micrometer adjustable or factory preset models.
- Calibration certificate can be requested when ordering.

Adjustable Models

Model No.	Range	Increments	Drive	Length		Weight	
				in.	mm	lbs.	kg
U.S. Standard							
TT-1	5–20 in.-oz.	1/4 in.-oz.	Univ.	3.625	92	.06	.03

Preset Models

	Range			Drive	Length		Weight	
Model No.	in.-oz.	Nm	cm-kg		in.	mm	lbs.	kg
TT-SN-1	5–30	.04–.21	.36–2.16	Univ.	3.625	92	.06	.03

NOTE: When ordering preset tools, specify desired torque setting

TT-1

TT-SN-1

Torque Limiting Screwdrivers

Miniature Model Accessories & Kit

APEX Utica®

Slotted Bits

Part No.	Blade Width	Blade Thickness	Screw Size
TW0	.040	.004	0000,000
TW1D	.055	.006	0000,000
TW2D	.070	.006	000,00
TW3D	.080	.008	00,0,1
TW4D	.100	.010	0,1,2

Hex Sockets

Part No.	Hex Size	Screw Size	Nut Size
TW5D	5/64	000,00	000,00
TW6D	3/32	0	-
TW7D	7/64	1	-
TW8D	1/8	2	-
TW9	5/32	-	0,1

Phillips Bits

Part No.	Point Size	Screw Size
TW10D	0	0,1
TW11D	1	2, 3, 4

Miniature Kit No. KTT-1

Range 5-20 in.-oz. 29 piece

Qty.	Part No. Comp.	Description
1	TT-1	Adj. torque screwdriver
1	TW0	Torque screwdriver bld. .040
1	TW1D	Torque screwdriver bld. .055
1	TW2D	Torque screwdriver bld. .070
1	TW3D	Torque screwdriver bld. .080
1	TW4D	Torque screwdriver bld. .100
1	TW10D	Phillips screwdriver SZ. 0,1
1	TW11D	Phillips screwdriver SZ. 2,3,4
1	28715-01	Spline key size .048 - 4 Flutes
1	28715-02	Spline key size .048 - 6 Flutes
1	28715-03	Spline key size .060 - 6 Flutes
1	28715-04	Spline key size .069 - 6 Flutes
1	28715-05	Spline key size .072 - 6 Flutes
1	28715-06	Spline key size .076 - 4 Flutes
1	28715-07	Spline key size .096 - 6 Flutes
2	HW20	Bit holder universal torque
1	TW5D	Hex socket 5/64”
1	TW6D	Hex socket 3/32”
1	TW7D	Hex socket 7/64”
1	TW8D	Hex socket 1/8”
1	TW9	Hex socket 5/32”
1	TW12D	Hex key .028
1	TW13D	Hex key .035
1	TW14D	Hex key .050
1	TW15D	Hex key 1/16
1	TW16D	Hex key 5/64
1	Case	
1	Insert	

Hex Keys

Part No.	Hex Size	Cap Screw Size	Set Screw Size	Flathead Screw Size
TW12D	.028	-	0	-
TW13D	.035	-	1, 2	0
TW14D	.050	0	3, 4	1, 2
TW15D	1/16	1	5, 6	3, 4
TW16D	5/64	2, 3	8	5, 6

Spline Key

Part No.	Spline Size	No. of Flutes
28715-01	.048	4
28715-02	.048	6
28715-03	.060	6
28715-04	.069	6
28715-05	.072	6
28715-06	.076	4
28715-07	.096	6

Universal Bit Holder

Part No.	Description
HW20	This holder can be drilled out to accommodate odd keys and bits. Also used as an adapter for checking light duty torque screwdrivers on Torque Testers.

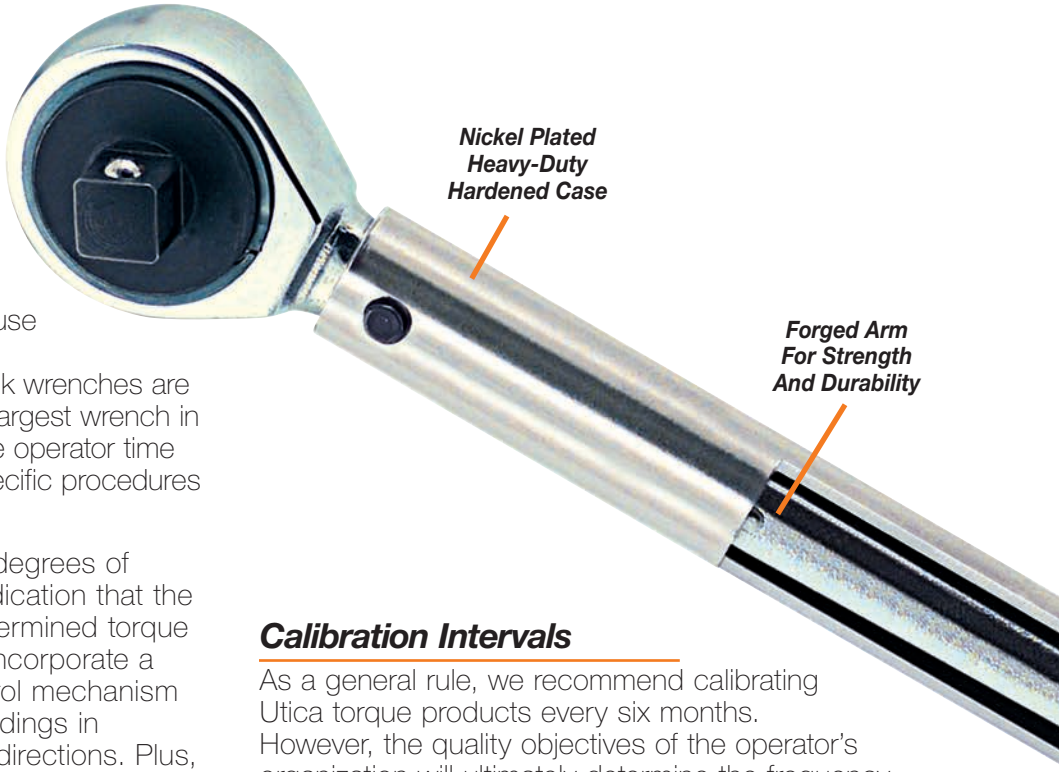
CAUTION: 1. Under normal use, periodic recalibration may be necessary to ensure accurate readings and applied torque.
2. FOR EXTENDED SPRING LIFE, RETURN TO LOWEST SETTING AFTER EACH USE.

"Click" Type Torque Sensing Wrenches

Introduction

Click Wrenches

Utica click style torque wrenches are built to exacting standards to maintain maximum accuracy. Only top grade materials are used in Utica click wrenches. Working parts are heat-treated to increase durability and service life. Each wrench is tested with equipment traceable to NIST standards. Because of a high commonality of parts, the procedures for calibrating Utica click wrenches are the same from the smallest to the largest wrench in our product offering. This saves the operator time and the expense of developing specific procedures for different wrench sizes.

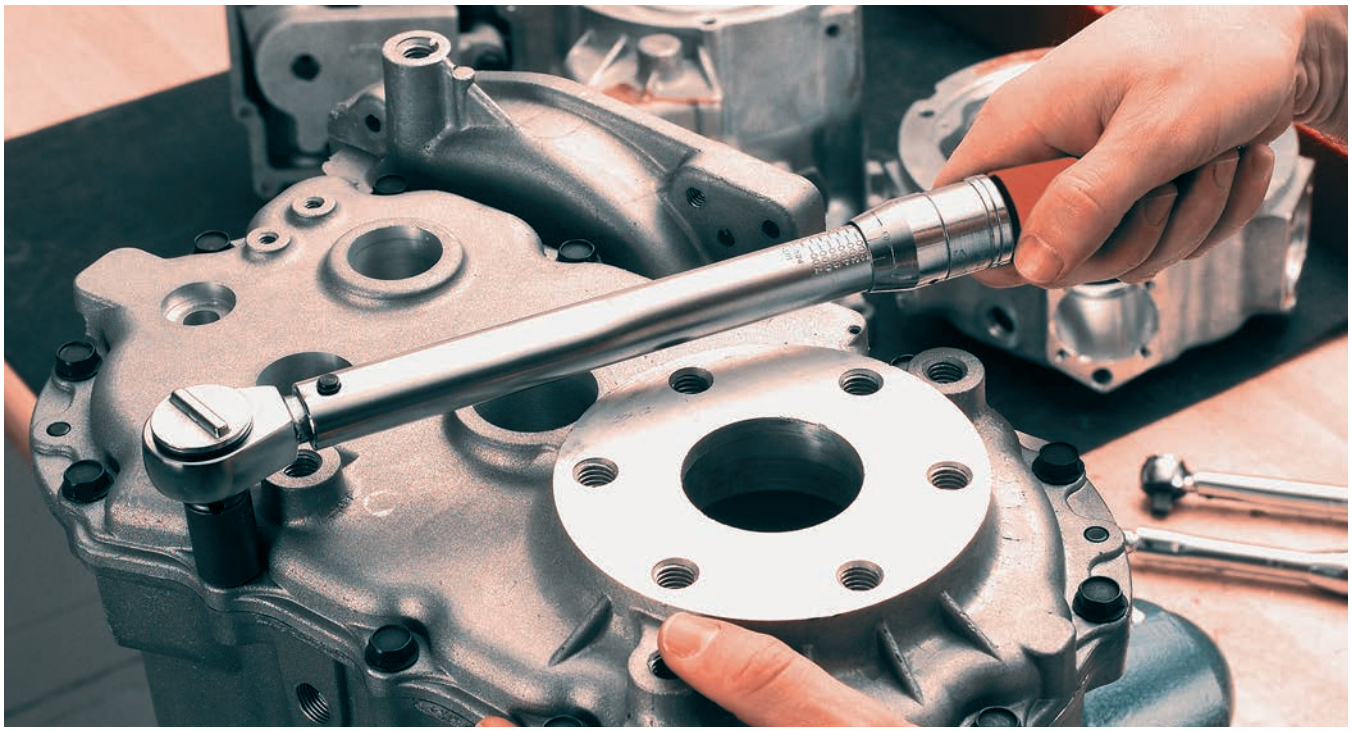


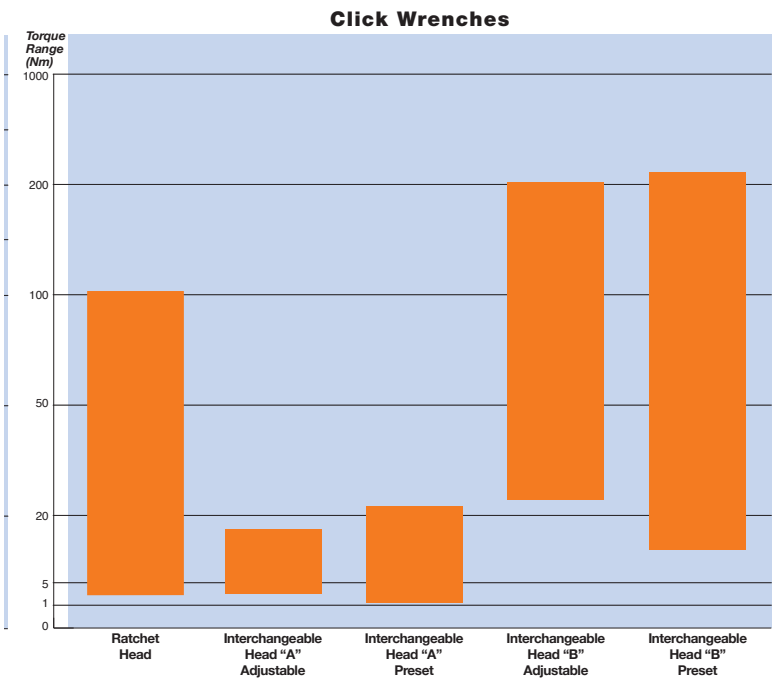
Utica's audible "click" plus a few degrees of travel provides a simple, quick indication that the operator has achieved the predetermined torque setting. All Utica click wrenches incorporate a patented, low friction torque control mechanism that produces highly accurate readings in clockwise and counterclockwise directions. Plus, a patented, spring-loaded locking collar locks the scale on the desired torque setting. This prevents the operator from accidentally using the wrench in the unlocked position.

Calibration Intervals

As a general rule, we recommend calibrating Utica torque products every six months. However, the quality objectives of the operator's organization will ultimately determine the frequency of tool calibration.

Visit our website at ***www.uticatools.com*** to locate your nearest Utica Service Center for calibration.





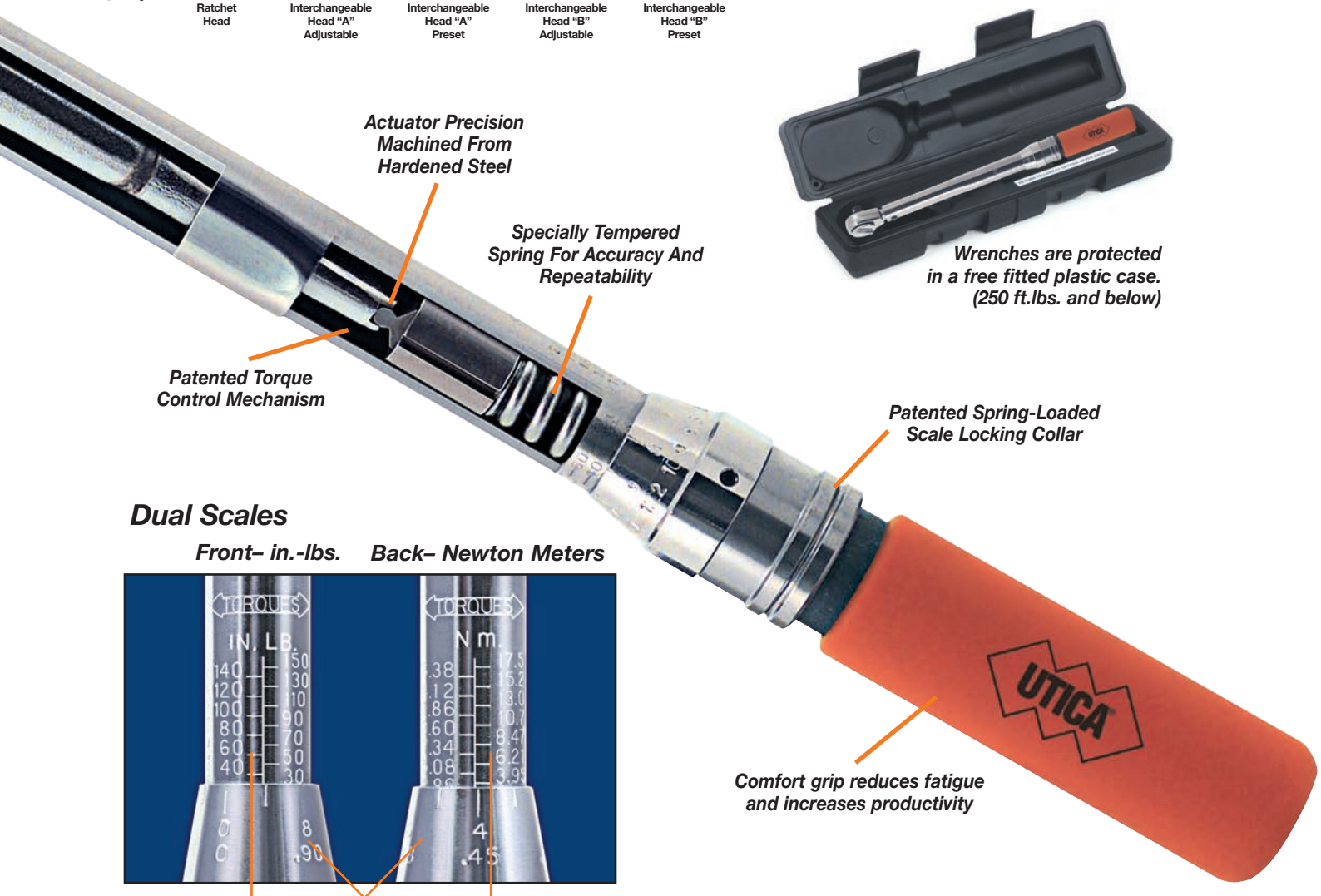
Ratchet Head Wrenches

Ratchets are mainly used in maintenance and assembly applications and provide fastening in both clockwise and counterclockwise directions. A quick shift lever allows for easy single-hand shifting.

Interchangeable Head Wrenches

Interchangeable head wrenches accept a variety of heads, allowing for greater versatility. Bidirectional versatility is obtained by simply removing the head, turning the wrench over and replacing the head.

Wrenches are protected in a free fitted plastic case. (250 ft.lbs. and below)



Dual Scales

Front– in.-lbs. *Back– Newton Meters*

Fine Adjustment

Major Adjustment

"Click" Type Torque Sensing Wrenches

Ratchet Head

APEX Utica®

- Drive Sizes: 1/4" through 1/2"
- Audible "click" and/or a few degrees of travel provide simple, fast indication of micrometer – accurate torque settings.
- Patented, low friction torque control mechanism produces accurate readings in either direction.
- Accuracy is ± 4% of setting right hand (clockwise) and ± 6% of setting left hand (counterclockwise) within upper 80% of scale.
- Two calibration adjustments (major and fine) permit easy and precise torque settings. Most conventional torque wrenches have only one adjustment.
- Dual scale models give readings in in.-lbs./Newton Meters or ft.-lbs./Newton Meters.
- Patented spring-loaded locking collar locks scale on desired reading and remains in locked position. Wrench cannot be left inadvertently unlocked.
- Heavy-duty, reversible ratchet models have quick-shift lever to allow easy single-hand shifting.
- Slim, lightweight design reduces fatigue and facilitates use in confined work areas.
- Store all adjustable models at their lowest torque setting.
- Calibration certificate can be requested when ordering.

"Click" Type Torque Sensing Wrenches

Ratchet Head

APEX Utica®

Ratchet Head *(in.-lb. Graduations)*

Drive Size (in.)	Model No.	Range		Graduations		Length		Weight	
		in.-lb.	Nm	in.-lb.	Nm	in.	mm	lb.	kg
1/4	TCI-150RA*	30–150	3.4–17	1.0	.113	9.5	241.3	0.9	0.4
3/8	TCI-150RA-3/8*	30–150	3.4–17	1.0	.113	9.5	241.3	0.9	0.4
3/8	TCI-750R	150 –750	–	5.0	–	14.25	362.0	3.4	1.5
3/8	TCI-250R*	50–250	6–28	1.0	.113	12.5	317.5	3.0	1.4
1/2	TCI-750R-1/2	150–750	–	5.0	–	14.5	368.3	2.5	1.1

Ratchet Head *(ft.-lb. Graduations)*

Drive Size (in.)	Model No.	Range		Graduations		Length		Weight	
		ft.-lb.	Nm	ft.-lb.	Nm	in.	mm	lb.	kg
3/8	TCI-75FRN*	15–75	20–102	.5	1.4	14.25	362.0	2.2	1.0

*Dual Scale Models: Either in.-lb./Nm graduations, or ft.-lb./Nm graduations.

Torque Wrench Repair Kits

Part No.	Repair Kit For:
V702KR	TCI-150RA
V152KR	TCI-150RA3/8, TCI-250R
T702KR	TCI-75FRN, TCI-750R
T153KR	TCI-750R-1/2

NOTE: Unless otherwise specified, all Utica® micrometer adjustable torque sensing wrenches are calibrated for use in both left and right hand directions.

"Click" Type Torque Sensing Wrenches

Interchangeable Head "A" Size Series

APEX Utica®

- Drive Sizes: 1/4" through 3/4"
- Accept variety of heads to suit specific application requirements.
- Common center principal allows simple exchange or replacement of heads without need for recalibration.
- Choice of micrometer adjustable or single setting (preset) models.
- Accuracy is ±4% of setting right hand and ±6% of setting left hand within upper 80% of scale.
- Calibration certificate can be requested when ordering.

Micrometer Adjustable Wrench – "A" Size

Model No.	Range		Graduations		Length		Weight	
	in.-lb.	Nm	in.-lb.	Nm	in.	mm	lb.	kg
CH-150	30–150	3.4–17	1.0	.113	9	228.6	1.0	0.5

Single Setting (Preset) Wrench – "A" Size*

Model No.	Range				Length		Weight	
	Nm	in.-lb.	ft.-lb.	cm-kg	in.	mm	lb.	kg
CHA-6	1.2–6	10.6–53	0.9–4.4	12.2–61.2	5.32	135.0	0.17	0.075
CHA-11	2.2–11	19.5–97.3	1.6–8.1	22.4–112.2	5.75	146.1	0.3	0.1
CHA-23	4.6–23	40.7–203.4	3.4–17	46.9–234.6	7.75	196.9	0.4	0.2

NOTE: Single setting wrenches do not have a scale and must be set on torque tester.
When ordering these preset tools, specify desired torque setting.

Head changes are quick and easy without the need for recalibration.

CH-150

CHA-23

"Click" Type Torque Sensing Wrenches

"A" Size Interchangeable Heads

APEX Utica®

Open End U.S. Standard "A"

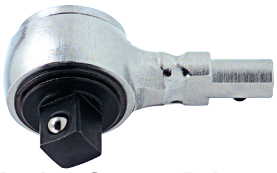
Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/8	OP 42	20	1.7	2.3
5/32	OP 52	35	2.9	4.0
3/16	OP 62	45	3.8	5.1
7/32	OP 72	50	4.2	5.6
1/4	OP 82	67	5.6	7.6
9/32	OP 92	78	6.5	8.8
5/16	OP 102	138	12	16
11/32	OP 112	193	16	22
3/8	OP 122	275	23	31
7/16	OP 142	410	34	46
1/2	OP 162	420	35	48
9/16	OP 182	420	35	48
5/8	OP 202	420	35	48
11/16	OP 222	420	35	48
3/4	OP 242	420	35	48

Open End Metric "A"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
6mm	MO 62	62	5.1	7
7mm	MO 72	71	5.9	8
8mm	MO 82	133	11	15
9mm	MO 92	186	16	21
10mm	MO 102	274	23	31
11mm	MO 112	410	34	46
12mm	MO 122	420	35	48
13MM	MO 132	420	35	48
14mm	MO 142	420	35	48
15mm	MO152	420	35	48

Plain Square Drive "A"

Drive Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/4	PS 82	203.41	16.95	23
3/8	PS 122	203.41	16.95	23



Ratcheting Square Drive "A"

Drive Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/4	RS 82	203.41	16.95	23
3/8	RS 122	203.41	16.95	23

Rachet Repair Kits

Part No.	Repair Kit
RS 82	V702KR
RS 122	V152KR

12 Point Box U.S. Standard"A"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
7/32	LB 72	50	4.0	5.6
1/4	LB 82	67	5.6	7.6
5/16	LB 102	138	12	7.6
3/8	LB 122	275	23	31
7/16	LB 142	410	34	48
1/2	LB 162	420	35	48
9/16	LB 182	420	35	48
5/8	LB 202	420	35	48
11/16	LB 222	420	35	48
3/4	LB 242	420	35	48

12 Point Box Metric "A"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
6mm	MB 62	62	5.2	7
7mm	MB 72	71	5.9	8
8mm	MB 82	133	11	15
9mm	MB 92	186	15	21
10mm	MB 102	274	23	31
11mm	MB 112	410	34	46
12mm	MB 122	420	35	48
13mm	MB 132	420	35	48
14mm	MB 142	420	35	48
15mm	MB 152	420	35	48

SAE Size Sockets

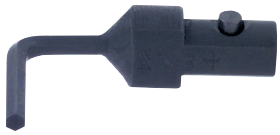
Part No.	Square Drive (in.)	Hex Opening (in.)
1108	1/4	1/4
1110	1/4	5/16
1112	1/4	3/8
1114	1/4	7/16
3108	3/8	1/4
3110	3/8	5/16
3112	3/8	3/8
3114	3/8	7/16
3116	3/8	1/2
3118	3/8	9/16
3120	3/8	5/8

Metric Size Sockets

Part No.	Square Drive (in.)	Hex Opening (mm)
6mm11	1/4	6mm
7mm11	1/4	7mm
8mm11	1/4	8mm
10mm11	1/4	10mm
10mm13	3/8	10mm
11mm13	3/8	11mm
12mm13	3/8	12mm
13mm13	3/8	13mm
14mm13	3/8	14mm
15mm13	3/8	15mm
16mm13	3/8	16mm

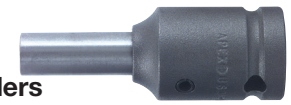
Flare Nut U.S. Standard "A"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
3/8	LF 122	130	11	15
7/16	LF 142	140	12	16
1/2	LF 162	200	17	23
9/16	LF 182	275	23	31
5/8	LF 202	325	27	37
11/16	LF 222	396	33	45
3/4	LF 242	420	35	48



Hex Keys U.S. Standard "A"

Hex Key Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/16	HX 42	8	0.6	0.9
5/64	HX 52	16	1.3	1.8
3/32	HX 62	28	2.3	3.2
7/64	HX 72	44	3.6	5.0
1/8	HX 82	65	5.4	7.3
9/64	HX 92	95	7.9	11
5/32	HX 102	128	11	14
3/16	HX 122	222	18	25
7/32	HX 142	350	29	40
1/4	HX 162	420	35	48



Bit Holders

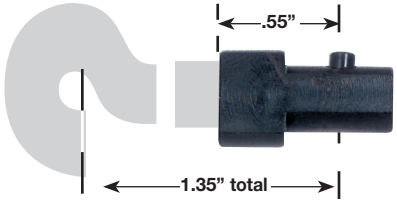
Part No.	Square Drive (in.)	Female Hex (in.)
825	1/4	1/4
M-825	1/4	1/4 Magnetic
838	3/8	1/4
M-838	3/8	1/4 Magnetic

Adapters

Part No.	Female Square Drive (in.)	Male Square Drive (in.)
EX-372	1/4	3/8
EX-254	3/8	1/4
EX-503	3/8	1/2

Head Adapter "A" 28522

Weld custom heads to adapters to couple with "A" handles to meet specific applications.



NOTES: 1. "A" series drive heads are not interchangeable with "B" series heads.
2. Utica torque heads when used with Utica torque wrenches, meet the accuracy statements for Utica wrenches. We cannot guarantee accuracy when other manufacturers heads or wrenches are interchanged with a Utica part.

"Click" Type Torque Sensing Wrenches

Interchangeable Head "B" Size Series

APEX Utica®

- Designed for higher torque applications than "A" size series.
- Accept a variety of head configurations to suit many fastener requirements.
- Common center principal allows simple exchange or replacement of heads without need for recalibration.
- Choice of micrometer adjustable or single setting (preset) models with same "click" action and features as "A" series wrenches.
- Accuracy is ±4% of setting right hand and ±6% of setting left hand within upper 80% of scale.
- Calibration certificate can be requested when ordering.

Micrometer Adjustable Wrench – "B" Size

Model No.	Range		Graduations		Length		Weight	
	ft.-lb.	Nm	ft.-lb.	Nm	in.	mm	lb.	kg
CH-75F*	15–75	20.3-102	0.5	0.7	14.0	355.6	2.0	0.9
CH-150F*	30–150	40.7-203	1.0	1.4	17.1	435.0	2.5	1.1

*Note: Dual Scale Models: Either in.-lb./Nm graduations, or ft.-lb./Nm graduations.

Single Setting (Preset) Wrench – "B" Size*

Model No.	Range				Length		Weight	
	in.-lb.	Nm	ft.-lb.	cm-kg	in.	mm	lb.	kg
CHB-55	100–500	11–55	8–40	112–560	8.25	209.6	1.0	0.5
CHB-85	150-750	17–85	12.5–62.5	172–860	10.5	266.7	1.3	0.6
CHB-110	200-1000	22–110	16–80	224-1120	12.5	317.5	1.5	0.7
CHB-170	300-1500	34–170	25–125	346-1730	14.25	362.0	1.7	0.8
CHB-225	400-2000	45–225	33–165	460-2300	16.25	412.8	1.9	0.9

NOTE: Single setting wrenches do not have a scale and must be set on torque tester.
When ordering these preset tools, specify desired torque setting.

CH-75F

CHB-110

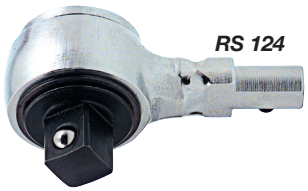
"Click" Type Torque Sensing Wrenches

"B" Size Interchangeable Heads

APEX Utica®

12 Point Flare Nut U.S. Standard "B"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/2	LF 164	200	17	23
9/16	LF 184	275	23	31
5/8	LF 204	325	27	37
11/16	LF 224	396	33	45
3/4	LF 244	500	42	56
7/8	LF 284	800	67	90
1	LF 324	1000	83	113
1 1/8	LF 364	1000	83	113



Ratcheting Square Drive "B"

Drive Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
3/8	RS 124	1199.25	99.94	135.6
1/2	RS 164	1992.0	166.0	225.0

Rachet Repair Kits

Part No.	Repair Kit
RS124	T702KR
RS164	T153KR

SAE Size Sockets

Part No.	Square Drive (in.)	Hex Opening (in.)
3108	3/8	1/4
3110	3/8	5/16
3112	3/8	3/8
3114	3/8	7/16
3116	3/8	1/2
3118	3/8	9/16
3120	3/8	5/8
5110	1/2	5/16
5112	1/2	3/8
5114	1/2	7/16
5116	1/2	1/2
5118	1/2	9/16
5120	1/2	5/8
5122	1/2	11/16
5124	1/2	3/4
7120	3/4	5/8
7124	3/4	3/4
7128	3/4	7/8
7130	3/4	15/16
7132	3/4	1

Open End U.S. Standard "B"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/2	OP 164	550	46	62
9/16	OP 184	770	64	87
5/8	OP 204	1100	92	124
11/16	OP 224	1375	115	155
3/4	OP 244	1650	138	186
13/16	OP 264	2100	175	237
7/8	OP 284	2100	175	237
15/16	OP 304	2100	175	237
1	OP 324	2100	175	237
1 1/16	OP 344	2100	175	237
1 1/8	OP 364	2100	175	237
1 3/16	OP 384	2100	175	237
1 1/4	OP 404	2100	175	237

Open End Metric "B"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
12mm	MO 124	434	36	49
13mm	MO 134	549	46	62
14mm	MO 144	761	63	86
15mm	MO 154	920	77	104
16mm	MO 164	1097	92	124
17mm	MO 174	1230	103	139
18mm	MO 184	1372	114	155
19mm	MO 194	1646	137	186
20mm	MO 204	1921	160	217
22mm	MO 224	2100	175	237
36mm	MO 364	2100	175	237

Metric Size Sockets

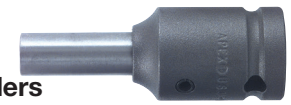
Part No.	Square Drive (in.)	Hex Opening (mm)
10mm13	3/8	10mm
11mm13	3/8	11mm
12mm13	3/8	12mm
13mm13	3/8	13mm
14mm13	3/8	14mm
15mm13	3/8	15mm
16mm13	3/8	16mm
13mm15	1/2	13mm
14mm15	1/2	14mm
15mm15	1/2	15mm
16mm15	1/2	16mm
17mm15	1/2	17mm
18mm15	1/2	18mm
19mm15	1/2	19mm
20mm15	1/2	20mm
21mm15	1/2	21mm
19mm17	3/4	19mm
21mm17	3/4	21mm
22mm17	3/4	22mm
14mm17	3/4	24mm
30mm17	3/4	30mm

12 Point Box U.S. Standard "B"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
1/2	LB 164	550	46	62
9/16	LB 184	770	64	87
5/8	LB 204	1100	92	124
11/16	LB 224	1375	115	155
3/4	LB 244	1650	138	186
13/16	LB 264	2100	175	237
7/8	LB 284	2100	175	237
15/16	LB 304	2100	175	237
1	LB 324	2100	175	237
1 1/16	LB 344	2100	175	237
1 1/8	LB 364	2100	175	237

12 Point Box Metric "B"

Opening Size	Part No.	Maximum Torque Load		
		in.-lb.	ft.-lb.	Nm
12mm	MB 124	434	36	49
13mm	MB 134	549	46	62
14mm	MB 144	761	63	86
15mm	MB 154	920	77	104
16mm	MB 164	1097	92	124
17mm	MB 174	1230	103	139
18mm	MB 184	1372	114	155
19mm	MB 194	1646	137	186
20mm	MB 204	1921	160	217
22mm	MB 224	2100	175	237



Bit Holders

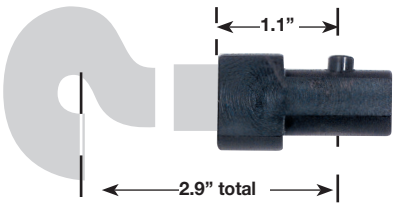
Part No.	Square Drive (in.)	Female Hex (in.)
825	1/4	1/4
M-825	1/4	1/4 Magnetic
838	3/8	1/4
M-838	3/8	1/4 Magnetic
858	1/2	1/4
M-858	1/2	1/4 Magnetic

Adapters

Part No.	Female Square Drive (in.)	Male Square Drive (in.)
EX-254	3/8	1/4
EX-503	3/8	1/2
EX-375	1/2	3/8
EX-623	1/2	5/8
EX-751	1/2	3/4

Head Adapter "B" 28523

Weld custom heads to adapters to couple with "B" handles to meet specific applications.



NOTES: 1. "A" series drive heads are not interchangeable with "B" series heads.
2. Utica torque heads when used with Utica torque wrenches, meet the accuracy statements for Utica wrenches. We cannot guarantee accuracy when other manufacturers heads or wrenches are interchanged with a Utica part.

Notes

APEX®

Quality Fastener Tools

For more than half a century, Apex has maintained the position of world leader in industrial fastening tools. Many power and insert bits, socket combinations and other drivers/adapters pioneered by Apex have today become industry standards, while Apex quality, service and selection give you unsurpassed value.

More Quality For Your Money

Apex quality starts with the selection of raw materials. Only carefully chosen, high grade tool steel is used to make Apex industrial fastener tools. Next, each tool is precision machined from solid bar stock to exacting standards of accuracy. You always get a snug, secure fit – a fit that is not possible from stamped tools.

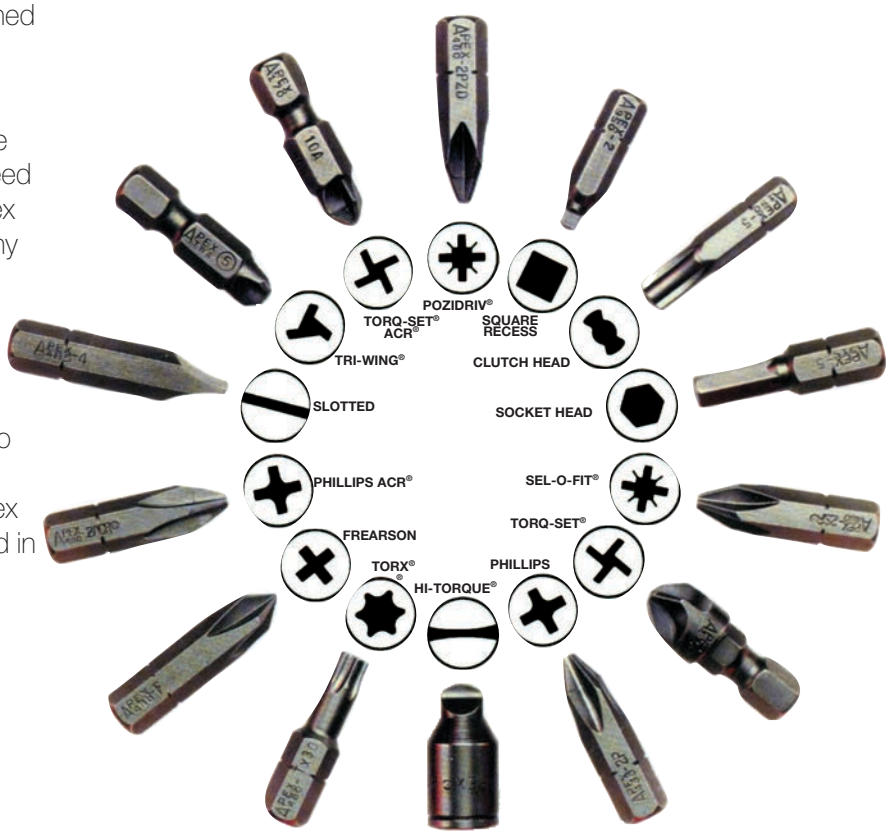
Finally, each Apex fastener tool is tempered with our exclusive heat treating process. During this step the degree of hardness is determined based upon the application.

Fast Delivery

All Apex standard catalog items are available off-the-shelf for immediate delivery. If you need special assistance with your order, your Apex manufacturer's representative can handle any questions your may have.

Special Orders

Apex offers the broadest selection of screw driver and nut runner tools available, from bits, sockets and universal wrenches to extensions, adapters and nut setters. If you have a special application, contact your Apex representative. We may have what you need in stock, or can design and produce special fastener tools for almost any application.



Conversion Tables

Millimeter – Decimal – Fraction

mm	Dec.	in.	mm	Dec.	in.	mm	Dec.	in.	mm	Dec.	in.	mm	Dec.	in.
0.100	.0039		**5.159**	**.2031**	**13/64**	10.300	.4055		15.400	.6063		20.400	.8031	
0.200	.0079		5.200	.2047		**10.319**	**.4063**	**13/32**	**15.478**	**.6094**	**39/64**	20.500	.8071	
0.300	.0118		5.300	.2087		10.400	.4094		15.500	.6102		20.600	.8110	
0.397	**.0156**	**1/64**	5.400	.2126		10.500	.4134		15.600	.6142		**20.638**	**.8125**	**13/16**
0.400	.0157		5.500	.2165		10.600	.4173		15.700	.6181		20.700	.8150	
0.500	.0197		**5.556**	**.2188**	**7/32**	10.700	.4219		15.800	.6220		20.800	.8189	
0.600	.0236		5.600	.2205		**10.716**	**.4219**	**27/64**	**15.875**	**.6250**	**5/8**	20.900	.8228	
0.700	.0276		5.700	.2244		10.800	.4252		15.900	.6250		21.000	.8268	
0.794	**.0313**	**1/32**	5.800	.2283		10.900	.4291		16.000	.6299		**21.034**	**.8182**	**53/64**
0.800	.0315		5.900	.2323		11.000	.4331		16.100	.6339		21.100	.8307	
0.900	.0354		**5.953**	**.2344**	**15/64**	11.100	.4370		16.200	.6378		21.200	.8307	
1.000	.0394		6.000	.2362		**11.113**	**.4375**	**7/16**	**16.272**	**.6406**	**41/64**	21.200	.8346	
1.100	.0433		6.100	.2402		11.200	.4409		16.300	.6417		21.300	.8386	
1.191	**.0469**	**3/64**	6.200	.2441		11.300	.4449		16.400	.6457		21.400	.8425	
1.200	.0472		6.300	.2480		11.400	.4488		16.500	.6496		**21.431**	**.8438**	**27/32**
1.300	.0512		**6.350**	**.2500**	**1/4**	11.500	.4528		16.600	.6535		21.500	.8465	
1.400	.0551		6.400	.2520		**11.509**	**.4531**	**29/64**	**16.669**	**.6563**	**21/32**	21.600	.8504	
1.500	.0591		6.500	.2559		11.600	.4567		16.700	.6575		21.700	.8543	
1.588	**.0625**	**1/16**	6.600	.2598		11.700	.4606		16.800	.6614		21.800	.8583	
1.600	.0630		6.700	.2638		11.800	.4646		16.900	.6654		**21.828**	**.8594**	**55/94**
1.700	.0669		**6.747**	**.2656**	**17/64**	11.900	.4685		17.000	.6693		21.900	.8622	
1.800	.0709		6.800	.2677		**11.906**	**.4688**	**15/32**	**17.066**	**.6719**	**43/64**	22.000	.8661	
1.900	.0748		6.900	.2717		12.000	.4724		17.100	.6732		22.100	.8701	
1.984	**.0781**	**5/64**	7.000	.2756		12.100	.4764		17.200	.6772		22.200	.8740	
2.000	.0878		7.100	.2795		12.200	.4803		17.300	.6811		**22.225**	**.8750**	**7/8**
2.100	.0827		**7.144**	**.2813**	**9/32**	12.300	.4843		17.400	.6850		22.300	.8780	
2.200	.0866		7.200	.2835		**12.303**	**.4844**	**31/64**	**17.463**	**.6875**	**11/16**	22.400	.8819	
2.300	.0906		7.300	.2874		12.400	.4882		17.500	.6890		22.500	.8858	
2.381	**.0938**	**3/32**	7.400	.2913		12.500	.4921		17.600	.6929		22.600	.8898	
2.400	.0945		7.500	.2953		12.600	.4961		17.700	.6968		**22.622**	**.8906**	**57/64**
2.500	.0984		**7.541**	**.2969**	**19/64**	**12.700**	**.5000**	**1/2**	17.800	.7008		22.700	.8937	
2.600	.1024		7.600	.2992		12.800	.5039		**17.859**	**.7031**	**45/64**	22.800	.8976	
2.700	.1063		7.700	.3031		12.900	.5079		17.900	.7047		22.900	.9016	
2.778	**.1094**	**7/64**	7.800	.3071		13.000	.5118		18.000	.7087		23.000	.9055	
2.800	.1102		7.900	.3110		**13.097**	**.5156**	**33/64**	18.100	.7126		**23.019**	**.9063**	**29/32**
2.900	.1142		**7.938**	**.3125**	**5/16**	13.100	.5157		18.200	.7165		23.100	.9094	
3.000	.1181		8.000	.3150		13.200	.5197		**18.256**	**.7188**	**23/32**	23.200	.9134	
3.100	.1220		8.100	.3189		13.300	.5236		18.300	.7205		23.300	.9173	
3.175	**.1250**	**1/8**	8.200	.3228		13.400	.5276		18.400	.7244		23.400	.9213	
3.200	.1260		8.300	.3268		**13.494**	**.5313**	**17/32**	18.500	.7283		**23.416**	**.9219**	**59/64**
3.300	.1299		**8.334**	**.3281**	**21/64**	13.500	.5315		18.600	.7323		23.500	.9252	
3.400	.1339		8.400	.3307		13.600	.5354		**18.653**	**.7344**	**47/64**	23.600	.9291	
3.500	.1378		8.500	.3346		13.700	.5394		18.700	.7362		23.700	.9331	
3.572	**.1406**	**9/64**	8.600	.3386		13.800	.5433		18.800	.7402		23.800	.9370	
3.600	.1417		8.700	.3425		**13.891**	**.5469**	**35/64**	18.900	.7441		23.900	.9409	
3.700	.1457		**8.731**	**.3438**	**11/32**	13.900	.5472		19.000	.7480		24.000	.9449	
3.800	.1496		8.800	.3465		14.000	.5512		**19.050**	**.7500**	**3/4**	24.100	.9488	
3.900	.1535		8.900	.3504		14.100	.5551		19.100	.7520		24.200	.9528	
3.969	**.1563**	**5/32**	9.000	.3543		14.200	.5591		19.200	.7559		**24.209**	**.9531**	**61/64**
4.000	.1575		9.100	.3583		**14.288**	**.5625**	**9/16**	19.300	.7598		24.300	.9567	
4.100	.1624		**9.128**	**.3594**	**23/64**	14.300	.5630		19.400	.7638		24.400	.9606	
4.200	.1654		9.200	.3622		14.400	.5669		**19.447**	**.7656**	**49/64**	24.500	.9646	
4.300	.1693		9.300	.3661		14.500	.5709		19.500	.7677		24.600	.9685	
4.366	**.1719**	**11/64**	9.400	.3701		14.600	.5748		19.600	.7717		**24.606**	**.9688**	**31/32**
4.400	.732		9.500	.3740		**14.684**	**.5781**	**37/64**	19.700	.7756		24.700	.9724	
4.500	.1772		**9.525**	**.3750**	**3/8**	14.700	.5787		19.800	.7795		24.800	.9764	
4.600	.1811		9.700	.3819		14.800	.5827		**19.844**	**.7813**	**25/32**	24.900	.9803	
4.700	.1850		9.800	.3858		14.900	.5866		19.900	.7835		25.000	.9843	
4.763	**.1875**	**3/16**	9.900	.3898		15.000	.5906		20.000	.7874		**25.003**	**.9844**	**63/64**
4.800	.1890		**9.922**	**.3902**	**25/64**	**15.081**	**.5938**	**19/32**	20.100	.7913		25.100	.9882	
4.900	.1929		10.000	.3937		15.100	.5945		20.200	.7953		25.200	.9921	
5.000	.1969		10.100	.3976		15.200	.5984		**20.241**	**.7969**	**51/64**	25.300	.9961	
5.100	.2008		10.200	.4016		15.300	.6024		20.300	.7992		**25.400**	**1.000**	**1**

Conversion Tables

Torque – Miscellaneous

APEX Utica

Torque Conversion – In. Lbs. (Nm)*					
In. Lbs.	Nm	In. Lbs.	Nm	In. Lbs.	Nm
5	0.6	50	5.7	140	15.8
10	1.1	60	6.8	150	17.0
15	1.7	70	7.9	160	18.1
20	2.3	80	9.0	170	19.2
25	2.8	90	10.2	180	20.3
30	3.4	100	11.3	190	21.5
35	4.0	110	12.4	200	22.6
40	4.5	120	13.6		
45	5.1	130	14.7		

*Rounded values.

Torque Conversion – Ft. Lbs. (Nm)*					
Ft. Lbs.	Nm	Ft. Lbs.	Nm	Ft. Lbs.	Nm
1	1.36	43	58.3	85	115.3
2	2.7	44	60.0	86	117.0
3	4.1	45	61.0	87	118.0
4	5.4	46	62.4	88	119.3
5	6.8	47	63.7	89	121.0
6	8.1	48	65.1	90	122.0
7	9.5	49	66.4	91	123.4
8	10.9	50	67.8	92	125.0
9	12.2	51	69.2	93	126.1
10	13.6	52	70.5	94	127.5
11	14.9	53	71.9	95	129.0
12	16.3	54	73.2	96	130.2
13	17.6	55	74.6	97	131.5
14	19.0	56	75.9	98	133.0
15	20.3	57	77.3	99	134.2
16	21.7	58	78.7	100	135.6
17	23.1	59	80.0	110	149.2
18	24.4	60	81.4	115	156.0
19	25.8	61	82.7	120	163.0
20	27.1	62	84.1	125	170.0
21	28.5	63	85.4	130	176.3
22	29.8	64	86.8	135	183.1
23	31.2	65	88.1	140	190.0
24	32.5	66	90.0	145	197.0
25	33.9	67	90.9	150	203.4
26	35.3	68	92.2	155	210.2
27	36.6	69	93.6	160	217.0
28	38.0	70	94.9	165	224.0
29	39.3	71	96.3	170	231.0
30	40.7	72	97.6	175	237.3
31	42.0	73	99.0	180	244.1
32	43.4	74	100.3	185	251.0
33	44.8	75	102.0	190	258.0
34	46.1	76	103.1	195	264.4
35	47.5	77	104.4	200	271.2
36	48.8	78	105.8	225	305.1
37	50.2	79	107.1	250	339.0
38	52.0	80	108.5	275	373.0
39	52.9	81	110.0	300	407.0
40	54.2	82	111.2	350	475.0
41	55.6	83	112.6	400	542.4
42	57.0	84	114.0		

*Rounded values.

Torque Conversion Factors		
To Convert	Into	Multiply By
Inch Pounds	Foot Pounds	0.0835
Inch Pounds	Newton meters	0.1130
Inch Pounds	Kg-meters	0.0115
Inch Pounds	Kg-Cm	1.1519
Foot Pounds	Inch Pounds	12.000
Foot Pounds	Newton meters	1.3560
Foot Pounds	Kg-meters	0.1382
Foot Pounds	Kg-Cm	13.8240
Newton Meters	Inch Pounds	8.8440
Newton Meters	Foot Pounds	0.7370
Newton Meters	Kg-meters	0.1020
Newton Meters	Kg-Cm	10.2000
Kg meters	Inch Pounds	86.8100
Kg meters	Foot Pounds	7.2340
Kg meters	Newton-meters	9.8040
Kg Cm	Inch Pounds	0.8681
Kg Cm	Foot Pounds	0.0723
Kg Cm	Newton-meters	0.0980

Miscellaneous Conversion Factors		
To Convert	Into	Multiply By
Inches	Millimeters	25.4000
Millimeters	Inches	0.0394
Pounds	Kilograms	0.4536
Kilograms	Pounds	2.2050
psi	bar	0.069
bar	psi	14.5