



HANDTORQUE® TORQUE MULTIPLIERS

Torque wrench design offers just two solutions to the challenge of applying higher torques: either the load at the handle must be higher or the lever length must be greater. Clearly there are practical and safety limits to both of these solutions. Often there will not be the space to operate a torque wrench of sufficient length to comfortably apply such high torques and the chance that the wrench might slip off the nut increases as length increases.

Norbar's solution is to use a compact, epicyclic gearbox called a HandTorque® multiplier to accurately multiply the input torque provided by a torque wrench by a fixed ratio. This fixed ratio might be in the order of 5:1, 27:1 or even up to 135:1 for very high torque application. This means that a much smaller torque wrench can be used for a given torque application and the combined weight of the torque multiplier and torque wrench will often be lower than for a single large torque wrench. For example, one could apply 1,000 N·m using a Norbar Model 1000 torque wrench weighing 5.8 kg or an HT-52/22.2 combined with a NorTorque® 60 with a total weight of just under 3 kg and a lever length of just 310 mm.

The Norbar HandTorque® multiplier range is the most comprehensive available. Standard products are available up to 47,500 N·m (35,000 lbf·ft) and 'specials' to 300,000 N·m (220,000 lbf·ft). A range of 'nose extensions' for reaching difficult to access bolts and a full range of torque transducers for highly accurate torque monitoring are available.

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HANDTORQUE® TORQUE MULTIPLIERS

### What is a Torque Multiplier?

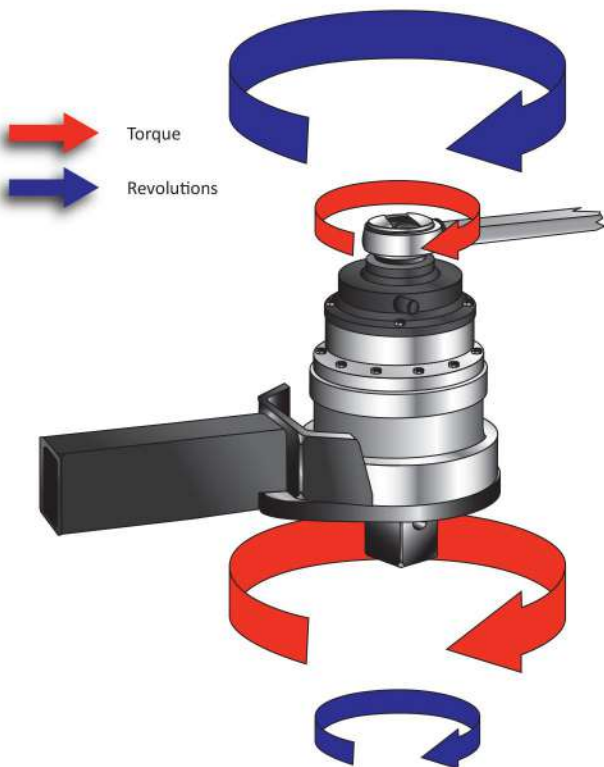
A torque multiplier is a device that increases the torque that can be applied by an operator. This is because the power output cannot exceed the power input, the number of output revolutions will be lower than the number of input revolutions (Torque x rpm = Power).

### How HandTorque® Torque Multipliers Work

HandTorque® multipliers incorporate an 'epicyclic' or 'planetary' gear train having one or more stages. Each stage of gearing increases the torque applied, allowing Norbar to offer multipliers typically in ratios of 5:1, 27:1 and 135:1.

In the planetary gear system, torque is applied to the input gear or 'sun' gear. Three or four planet gears whose teeth are engaged with the 'sun' gear therefore rotate. The outside casing of the multiplier, or 'annulus' is also engaged with the planet gear teeth, and would normally rotate in the opposite direction to the 'sun' gear. A reaction arm prevents the annulus from rotating, and this causes the planet gears to orbit around the 'sun'. The planet gears are held in a 'planetary' carrier which also holds the output square drive, therefore as the planet gears orbit around the sun gear, the carrier and so the square drive turns. Without the reaction arm to keep the annulus stationary, the output square will not apply torque.

No gearbox is 100% efficient, and so the velocity ratio (the number of turns that the input has to make to achieve one revolution of the output) is not the same as the torque multiplication ratio. Norbar multipliers are engineered such that each gear stage typically has a nominal 5:1 ratio, this means a velocity ratio of typically 5.45:1 which results in a true torque multiplication factor of 5.2:1.



### Why use a HandTorque® Multiplier?

- **Safety** – use of long levers can be dangerous. Torque multipliers allow for a reduction in the lever length or operator effort
- **Space limitation** – the use of a long lever may be impossible due to the available space
- **Accuracy** – torque will be applied most accurately when it is applied smoothly and slowly. Torque multipliers enable this by removing much of the physical effort from the tightening task

### Advantages of the Norbar HandTorque® System

Norbar gearboxes are built to an extremely high standard of precision. All gears rotate on needle roller bearings about hardened and ground journal pins. As a result, Norbar HandTorques can be relied upon to have a mean torque multiplication accuracy of ±4%, taking the uncertainty out of high torque tightening.

### Summary of Norbar torque multiplier advantages:

- The ratio stated is the mean torque multiplication factor
- No correction charts are needed to determine torque output
- Strong, safe Anti Wind-Up Ratchet available on most models for safe and comfortable operation
- A wide range of alternative reaction styles are available making the HandTorque® adaptable to many applications
- Electronic torque transducers are available on most models for precise torque control
- Compact Series are supplied with their own unique calibration certificate allowing the accurate calculation of input torque for critical applications

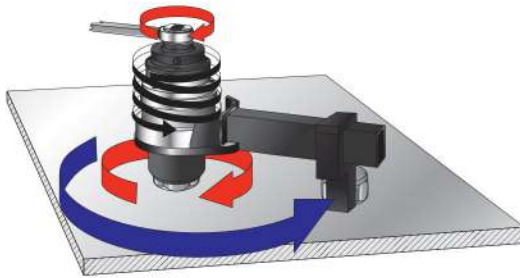


## ANTI WIND-UP RATCHETS (AWUR)

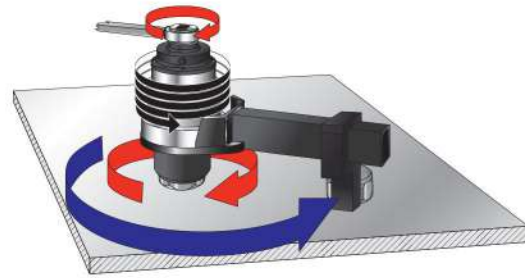

**Norbar Anti Wind-Up Ratchets (AWUR)**

Most multipliers with ratios of 15:1 and over are fitted with an Anti Wind-Up Ratchet. The multiplier can be thought of as a spring which must be fully wound before any tightening/untightening work can be applied to the bolt.

The AWUR ensures that the 'spring' stays wound and that any further torque input to the multiplier is applied directly to the bolt.



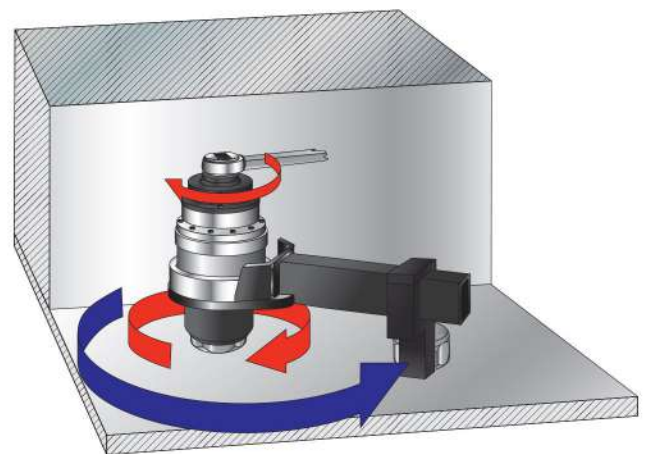
*Multiplier behaves like a very stiff 'spring'*



*Multiplier will achieve maximum torque only after the 'spring' has been taken up*


**AWUR benefits include:**

1. The torque input device cannot fly backwards against the direction of operation if it is suddenly released.
2. Without an Anti Wind-Up Ratchet, it will often be necessary to continue to make 360° sweeps with the torque input device otherwise the multiplier will 'unwind'. However, obstructions will often make this impossible (as demonstrated in this example).



*AWUR set to counter-clockwise operation*



*AWUR set to neutral*



*AWUR set to clockwise operation*



HANDTORQUE® HT3-1000



- 5:1 nominal torque multiplication, reaction dependant. Mean ratio with cranked foot is 4.8:1; with straight reaction is 4.9:1
- ±4% mean torque multiplication accuracy
- Small and compact design
- Updated aesthetics with tough silver metallic powder coat
- Supplied with 2 reaction bar styles for maximum versatility
- Quick-change cranked reaction with improved flexibility allowing reaction in 8 orientations
- Robust construction means minimal maintenance and long life
- If calibration is required, a UKAS accredited calibration certificate may be ordered (at extra cost)

2	HT3-1000
180260	HT3-1000, 1,000 N·m Kit, ½" input x ¾" output

HANDTORQUE® HT3 SERIES

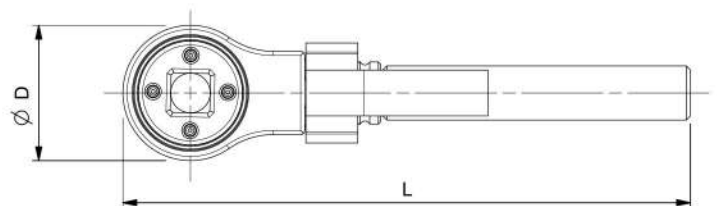
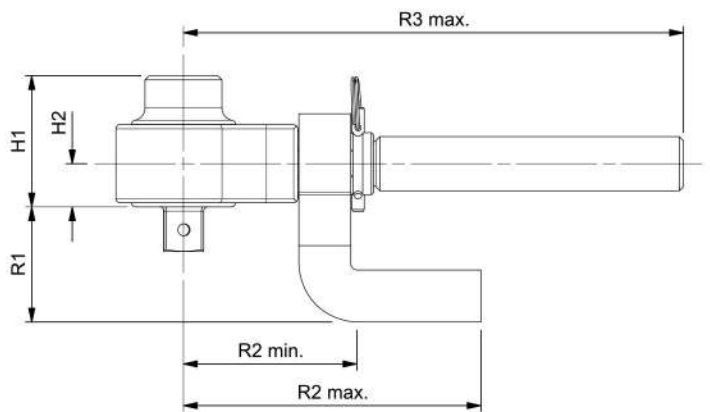


- 5:1 mean torque multiplication, accuracy ±4%
- Supplied with two reaction bar styles for maximum versatility
- Robust construction means minimal maintenance and long life
- Supplied in a carry case, the Highwayman is ideal for inclusion in the heavy vehicle tool kit
- 1,300 N·m version has a spare ¾" output square included in the kit
- Multiplier head only (no reaction bars or plastic box) also available
- 1,300 N·m version, part no. 17218
- 2,700 N·m version, part no. 17219
- If calibration is required, a UKAS accredited calibration certificate may be ordered (at extra cost)

2	HT3 SERIES
17220	HT3 1,300 N·m Kit, ½" input x ¾" output
17221	HT3 2,700 N·m Kit, ¾" input x 1" output

Kits are supplied in a carry case with a reaction bar and a reaction foot (17220 also contains a spare ¾" sq. dr.)

Model	HT3-1000	HT3 1,300 N·m	HT3 2,700 N·m
Part Number	180260	17220	17221
Mean Multiplication Ratio	Nominal	5:1	5:1
	With Cranked Reaction	4.8:1	4.75:1
	With Straight Reaction	4.9:1	5:1
Dimensions (mm)	ØD	65	108
	H1	63	103
	H2	21	44
	L	273	398
	R1	55	77
	R2 min.	83	140
	R2 max.	143	212
	R3 max.	240	344
Tool Weight (kg)	1.5	3.8	3.8
Reaction Weight (kg)	Cranked	0.5	1.36
	Straight	0.7	1.1



HT3 1300/2700 on right shown in comparison with HT3 1000





HANDTORQUE® HT4 SERIES

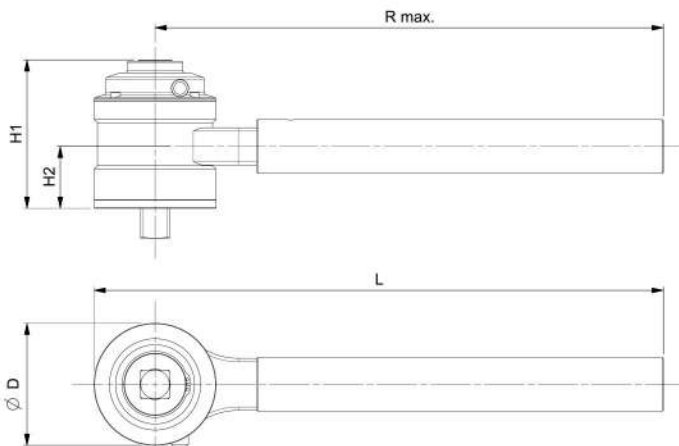


- Robust construction means minimal maintenance and long life
- Mean 15.5:1 (3,000 N·m) or 26:1 (4,500 N·m) torque multiplication, accuracy ±4%
- High ratios allow the use of a small torque wrench
- Supplied in carrying case with replacement square drive
- Anti Wind-Up Ratchet fitted to allow safer and more practical operation
- Angle protractor for easy torque and angle tightening
- If calibration is required, a UKAS accredited calibration certificate may be ordered (at extra cost)

4	HT4 SERIES
17022	HT4 AWUR, 3,000 N·m, ½" in 1" out
17021	HT4 AWUR, 4,500 N·m, ½" in 1" out



Model	HT4/15.5 AWUR	HT4/26 AWUR	
Part Number	17022	17021	
Mean Multiplication Ratio	15.5:1	26:1	
Dimensions (mm)	ØD	108	108
	H1	131	149
	H2	55	55
	L	498	498
	R max.	444	444
Tool Weight (kg)	6.1	7.0	
Reaction Weight (kg)	1.9	1.9	





HANDTORQUE® COMPACT SERIES



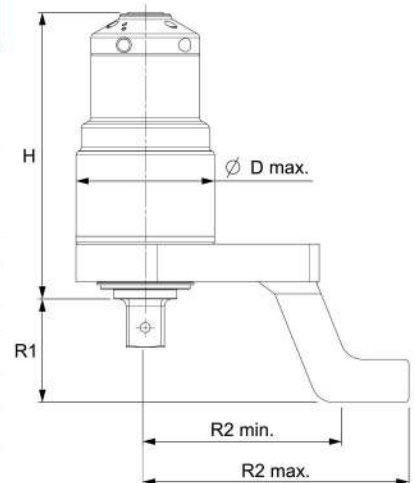
HT-72/27 (181450)



- Compact dimensions allow excellent access to applications and easy, safe handling
- Lightweight for torque capacity
- Supplied as standard with a steel reaction arm. Other options are available on request, including customised reactions
- Mean torque multiplication accuracy  $\pm 4\%$
- Robust, 48 tooth Anti Wind-Up Ratchet (AWUR) contains the forces generated during tightening for safe and easy operation
- Each multiplier is supplied with its own unique traceable calibration certificate allowing the accurate calculation of input torque for critical applications
- If you order a UKAS accredited calibration certificate (available at extra cost), this certificate will be provided in place of the traceable calibration certificate.

4	COMPACT SERIES
181440	HT-52/4.7, 1,000 N·m, ½" in ¾" out
181441	HT-52/22.2, 1,000 N·m, ¾" in ¾" out
181442	HT-52/22.2, 1,000 N·m, ½" in ¾" out
181443	HT-52/22.2 AWUR, 1,000 N·m, ¾" in ¾" out
181444	HT-52/22.2 AWUR, 1,000 N·m, ½" in ¾" out
181445	HT-52/22.2 AWUR, 1,000 N·m, ¾" in 1" out
181446	HT-52/22.2 AWUR, 1,000 N·m, ½" in 1" out
181447	HT-72/5.2, 1,500 N·m, ½" in 1" out
181448	HT-72/5.2, 1,000 N·m, ¾" in ¾" out
181449	HT-72/5.2, 2,000 N·m, ¾" in 1" out
181450	HT-72/27, 2,000 N·m, ½" in 1" out
181451	HT-72/27 AWUR, 2,000 N·m, ½" in 1" out
181452	HT-92/25 AWUR, 4,000 N·m, ½" in 1" out
181453	HT-119/25.5 AWUR, 7,000 N·m, ½" in 1½" out

Model	HT-52/4.7	HT-52/22.2	HT-52/22.2 AWUR	HT-72/5.2	HT-72/5.2	HT-72/5.2	HT-72/27	HT-72/27 AWUR	HT-92/25 AWUR	HT-119/25.5 AWUR
Part Number	181440	181441 181442	181443 181444 181445 181446	181447	181448	181449	181450	181451	181452	181453
Mean Multiplication Ratio	4.7:1	22.2:1	22.2:1	5.2:1	5.2:1	5.2:1	27:1	27:1	25:1	25.5:1
Dimensions (mm)	ØD max.	52	52	72	72	72	72	72	92	119
	H	91	116	130	117	122	117	132	150	212
	R1	58	58	58	74	69	74	74	69	91
	R2 max.	71	71	71	112	112	112	112	115	152
Tool Weight (kg)	1.0	1.3	1.4	2.5	2.5	2.6	2.9	3.2	5.4	9.3
Reaction Weight (kg)	0.9	0.9	0.9	1.4	1.4	1.4	1.4	1.4	2.5	4.0





## UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for 'As Found', for new manual torque multiplying gearboxes up to the maximum capacity shown.

12	ONE DIRECTION
HTCC2.CW	Up to 6,000 N·m / 5,000 lbf·ft
12	TWO DIRECTIONS
HTCC2.CW+CCW	Up to 6,000 N·m / 5,000 lbf·ft



## HANDTORQUE® STANDARD SERIES



HT 5/25

- Mean torque multiplication accuracy  $\pm 4\%$
- High ratios allow the use of a small torque wrench, multipliers can be used where access is limited
- Anti Wind-Up Ratchet available on high ratio models
- Other reaction styles can be designed to suit specific applications
- Electronic torque transducers can be fitted for precise torque monitoring, see page 92
- Other models available up to 300,000 N·m
- If calibration is required, a UKAS accredited calibration certificate may be ordered (at extra cost) up to 6,000 N·m



HT 7/25

4	STANDARD SERIES
16010	HT 1/5.2, 1,700 N·m, ½" in ¾" out
16012.HD	HT 2/5.2, 1,700 N·m, ¾" in 1" out
16034.HD	HT 2/27, 1,700 N·m, ½" in 1" out
16089.HD	HT 2/27 AWUR, 1,700 N·m, ½" in 1" out
16014	HT 5/5.2, 3,400 N·m, ¾" in 1" out
16028	HT 5/27, 3,400 N·m, ½" in 1" out
16090	HT 5/27 AWUR, 3,400 N·m, ½" in 1" out
16016	HT 6/5.2, 3,400 N·m, ¾" in 1½" out
16024	HT 6/27, 3,400 N·m, ½" in 1½" out
16092	HT 6/27 AWUR, 3,400 N·m, ½" in 1½" out
16093	HT 6/135 AWUR, 3,400 N·m, ½" in 1½" out
16067	HT 7/5.2, 6,000 N·m, ¾" in 1½" out
16018	HT 7/27, 6,000 N·m, ½" in 1½" out
16065	HT 7/27 AWUR, 6,000 N·m, ½" in 1½" out
16068	HT 7/135 AWUR, 6,000 N·m, ½" in 1½" out
16059	HT 9/27, 9,500 N·m, ¾" in 1½" out
16070	HT 9/27 AWUR, 9,500 N·m, ¾" in 1½" out
16071	HT 9/135 AWUR, 9,500 N·m, ½" in 1½" out
16082	HT 11/27, 20,000 N·m, ¾" in 2½" out
16049	HT 11/135 AWUR, 20,000 N·m, ½" in 2½" out
16053	HT 13/135 AWUR, 47,500 N·m, ½" in 2½" out

Other gear ratios may be available upon request.

If AWUR is not required please enquire for part number.

HT 13/135 fitted with weld prepared reaction ring as standard.

AWUR = Anti Wind-Up Ratchet. See page 44.

NOTE: Model name does not reflect multiplication ratios, see mean multiplication ratios on page 49

For spares kits for Norbar multipliers, please see page 130.



HANDTORQUE® STANDARD SERIES



Model	HT 1/5.2	HT 2/5.2	HT 2/27	HT 2/27 AWUR	HT 5/5.2	HT 5/27	HT 5/27 AWUR	HT 6/5.2	HT 6/27	HT 6/27 AWUR	HT 6/135 AWUR
Part Number	16010	16012.HD	16034.HD	16089.HD	16014	16028	16090	16016	16024	16092	16093
Mean Multiplication Ratio	5.2:1	5.2:1	27:1	27:1	5.2:1	27:1	27:1	5.2:1	27:1	27:1	135:1
Dimensions (mm)	∅D	108	108	108	108	119	119	119	119	119	119
	H	83	98	98	114	106	127	106	128	134	159
	L	303	303	303	303	355	355	355	355	355	355
	R1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	R2 min.	83	83	83	83	86	86	86	86	86	86
	R2 max.	216	216	216	216	263	263	263	263	263	263
Tool Weight (kg)	3.0	3.2	4.6	6.7	4.7	6.4	7.5	4.7	6.4	7.5	9.0
Reaction Weight (kg)	2.2	2.2	2.2	2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Model	HT 7/5.2	HT 7/27	HT 7/27 AWUR	HT 7/135 AWUR	HT 9/27	HT 9/27 AWUR	HT 9/135 AWUR	HT 11/27	HT 11/135 AWUR	HT 13/135 AWUR
Part Number	16067	16018	16065	16068	16059	16070	16071	16082	16049	16053
Mean Multiplication Ratio	5.2:1	27:1	27:1	135:1	27:1	27:1	135:1	27:1	135:1	135:1
Dimensions (mm)	∅D	144	144	144	184	184	184	212	212	315
	H	136	157	162	188	166	162	182	208	235
	L	423	423	423	423	448	448	448	609	609
	R1	84	84	84	84	84	84	84	N/A	N/A
	R2 min.	150	150	150	150	175	175	175	320	320
	R2 max.	331	331	331	331	351	351	351	500	500
Tool Weight (kg)	8.1	9.6	10.7	12.2	16.3	17.4	18.9	31.7	32.1	95.2
Reaction Weight (kg)	6.3	6.3	6.3	6.3	8.3	8.3	8.3	13.3	13.3	6.9

